SERVICING AND STORMWATER MANAGEMENT REPORT

ENVEST CORP.

SOUTHGATE RENEWABLES RECYCLING PROJECT
Project No.: 2021-0713-10

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1.0 INTRODUCTION

WalterFedy was retained by Envest Corp. (Envest) to prepare a Servicing and Stormwater Management Report in support of the Site Plan Development for a biofuel and renewables recycling facility located in Dundalk, ON, in the Township of Southgate. The site will be used as an anaerobic digestion facility and is expected to receive and process organic waste and convert it into biogas and digestate. The biogas produced will be further upgraded to Renewable Natural Gas (RNG) for injection into the natural gas pipeline network through the injection station provided by Enbridge.

The purpose of this report is to identify how the site will be serviced, including water and sanitary connections to the municipal infrastructure, as well the storm sewer outlet to the neighbouring ditch. The report will discuss the existing boundary servicing conditions and the availability in the municipal system to accommodate the development. Stormwater management design has been presented, demonstrating consistency with the Township of Southgate and Grand River Conservation Authority design criteria.

1.1 Background

The proposed development is located on the southern side of Eco Parkway, approximately 600 m east of the intersection with Ida Street. Eco Parkway is a gravel road. The site is approximately 4.04 ha and is surrounded by future development lots to the west and north, a wetland and municipal sewage treatment lagoons to the south, and to the east by a developed industrial lot. A ditch separates the site from the property to the west. This ditch drains from the northern side of Eco Parkway, beneath the road through a culvert, and southerly towards the sanitary lagoon side of the subject property. The ditch is also regulated by the Grand River Conservation Authority (GRCA).

The site is zoned Holding General Industrial Exception 553 (M1-SS3-H) pursuant to a zoning amendment dated February 21, 2024, allowing for the intended use. The development itself will consist of a ventilated organics receiving building with below-grade organic waste storage areas, for a total building footprint of approximately 2,800 m^2, as well as an office and maintenance shop with a total building footprint of 570 m^2. The site will also include a tank containment area that includes partially below-grade pasteurizer tanks, hydrolyzer tanks, anaerobic digester tanks, a digestate storage tank, and pump shelter.

1.2 Reference Reports and Drawings

In preparation of this report, the following background information was referenced:

1. *Geotechnical Investigation – Dundalk EcoPark – 100 Eco Parkway, Township of Southgate, Ontario*, V.A. Wood (Guelph) Incorporated, July 2019, prepared for Petawawa Biofuel LP
2. *Draft Supplemental Geotechnical Investigation – Southgate Renewables Facility – 100 Eco Parkway, Township of Southgate, Ontario*, JLP Services Inc., January 13, 2023, prepared for Envest Corp.
3. *Draft Hydrogeological Investigation Report – 100 Eco Park Way, Southgate, Ontario*, JLP Services Inc., May 31, 2023, prepared for Envest Corp.
4. *Eco-Parkway Plan and Profile Drawings,* Triton Engineering Services Limited, July 2012

The following guidance documents were also referenced in preparation of this report:

1. *Municipal Servicing Standards*, Township of Southgate, June 2016.
2. *Design Guidelines for Sewage Works*, Ministry of the Environment and Climate Change, March 2019.
3. *Design Guidelines for Drinking Water Systems,* Ministry of the Environment and Climate Change, May 2019.

4. *OFM-TG-03-1999 – Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code* – October 1999.
5. Ontario Building Code (OBC)- current version.

2.0 EXISTING INFORMATION

2.1 Existing Topography

The site is an open field which was recently cleared of all trees within the northern portion of the site. A 1- to 1.5-m-tall berm was also removed along the eastern site limits, which was originally constructed by the neighbouring owner and consisted of topsoil removed from the property to the east. The ditch immediately outside the property boundary to the west conveys stormwater from the north of Eco Parkway south towards the Foley Drain. This ditch is located within a GRCA regulated area, with the estimated floodplain limits extending within the site boundaries.

Existing topographical information for the northern half of the site was obtained from a survey by Van Harten Surveying Inc., dated July 22, 2019. Additional topographical information for the southern half of the site was obtained from a survey by Van Harten Surveying Inc., dated June 7, 2022.

The topography of the site generally falls from an elevation of 509.0 m along the northeastern limits towards the western ditch. The elevation of the ditch ranges from approximately 506.0 m at the northern limits, just south of Eco Parkway, and runs south to an elevation of approximately 505.40 m at a slope of approximately 0.3%. The ditch was not surveyed as part of the additional survey, but it is assumed to continued to run towards the south at a similar slope. The eastern property line ranges between an elevation of 509.0 m at the northeastern corner, to an elevation of approximately 507.3 m at the southeastern corner. The edge-of-gravel elevations fronting the site range between 509.0 m and 509.6 m, meaning the majority of the site is sunken below Eco Parkway. All existing drainage from the site sheet flows across the surface from east-to-west toward the ditch.

A Provincially Significant Wetland (PSW) extends into the southern portion of the site. The site will be developed in a manner that ensures no work will be conducted within a 15 m setback of the PSW.

2.2 Geotechnical Report

A geotechnical investigation was completed by V.A. Wood (Guelph) Incorporated in June 2019 to assess the existing soils and groundwater conditions. A supplemental geotechnical investigation was completed by JLP Services Inc. (formerly V.A. Wood (Guelph)), in January 2023.

The initial investigation consisted of seven boreholes. Surficial topsoil was encountered at all boreholes, with a depth between 150 and 300 mm. This topsoil was underlain with approximately 400 mm of sand at the northeastern corner of the site (BH-2), and approximately 500 mm of organic silty sand at BH4. These sand and organic silty sand layers, as well as the topsoil at the other boreholes, were underlain with silty sand till to the full depth of the borehole.

Groundwater was encountered approximately 0.8 to 2.4 m below the surface during the drilling operation. Piezometers were installed in BH-3 and BH-6, and free water surfaces were discovered to be approximately 0.3 m below the surface. Groundwater elevations are assumed in the Geotechnical report to be between 505.5 m and 506.5 m. The topsoil and loose, saturated zones are not suitable to support the foundations. The Geotechnical Report states the depths to suitable bearing stratum for all the completed boreholes ranges between 2.6 and 3.3 m.

The supplemental geotechnical information consisted of seven boreholes, with two monitoring wells being installed, and focused on the southern portion of the site. Surficial topsoil was encountered, with a depth between 100- and 300-mm. Brown native material was encountered beneath the topsoil and extends to depths between 1.5 m and 1.7 m below the surface. The native material is underlain with sandy silt till that extends to depths between 6.4 and 9.6 m below grade, which is where the boreholes were terminated.
Groundwater was observed to be right below the surface, or at the surface. However, the Geotechnical Investigation states that the actual groundwater table is expected to be below the depth of investigation. The groundwater near the surface is believed to be perched groundwater due to artesian pressure. Dewatering during construction will need to be considered. The supplemental investigation also states that the depth to suitable bearing stratum for foundations is between 2.0 and 2.5 m below grade. Combining both investigations together, the depth to suitable bearing stratum is between 1.8 and 3.3 m below grade.

2.3 Existing Servicing and Utilities

A 150-mm-diameter watermain exists along Eco Parkway, with municipal hydrants along the northern side of the road. A 38-mm-diameter HDPE "Goldstripe" sanitary forcemain also fronts the site within an easement, servicing the domestic flows (washrooms and plumbing fixtures) from the Lystek facility to the east. This forcemain connects to a manhole approximately 150 m west of the site's western limits, where it transitions to a 250-mm-diameter gravity sewer. This gravity sewer then combines with a 600-mm-diameter concrete sanitary sewer, which flows towards the sanitary lagoon system. The Township is currently considering sanitary servicing options for Eco Parkway.

A water tower was commissioned in Dundalk in 2023, which increased the available capacity within the municipal watermain. However, based on initial conversations with the Township, adequate fire pressure is still not expected to be available for the proposed development.

There is no storm sewer infrastructure along Eco Parkway. All runoff from storm events is conveyed to the ditch along the western limits of the site. This tributary flows towards the Foley Drain, south of the site.

Overhead hydro lines run on the northern side of Eco Parkway. A gas distribution main is installed on the southern (site) side of the Eco Parkway right-of-way.

3.0 REVIEW AGENCIES

3.1 Township of Southgate

The Township of Southgate will be responsible for the review and approval of the final Site Plan, as well as final Site Servicing, Grading, and Stormwater Management designs.

3.2 Grand River Conservation Authority

The Grand River Conservation Authority will be responsible for reviewing the grading and servicing design since a portion of the development takes place within their estimated floodplain limits. The GRCA has issued a permit to the Owner previously, based on a previous site plan provided to them.

3.3 Ministry of the Environment, Conservation and Parks

The Ministry of the Environment, Conservation and Parks (MECP) has reviewed aspects of this project to date and has granted an Environmental Compliance Approval (ECA) for process-related aspects of this project including waste, odour, and air in 2019 (Reference No. 1984-BD9NBD). An amendment to this ECA is currently in progress. An ECA for the on-site stormwater management facility has been submitted to the MECP for approval (Reference No. 4528-CYWQBN) in December 2023.

4.0 SANITARY SERVICING

Southgate Township does not explicitly state an industrial sanitary flow rate in their Servicing Standards. The MECP Guidelines for Sewage Works explains that sanitary flows for industrial developments vary greatly depending on many factors, including the type of industry/process for which the development is designed. It is noted that building's processes will not contribute to the peak sanitary flow, as the water used for the processes is recycled.

Based on the OBC, Part 8, Table 8.2.1.3.B, Item 10 "factory (with showers)", the average daily flow expected from the Organics Receiving Building is 125 L/person/8-hour shift. Item 15 states that for office buildings, the average expected daily flow is 75 L/person/8-hour shift. The maximum number of employees expected at any given time are as follows:

- Office Building – assume 12-hour shifts, 6 employees.
  - 12/8 x 6 x 75 = 675 L/day
- Maintenance Shop – assume 12-hour shifts, 3 employees.
  - 12/8 x 3 x 125 = 562.5 L/day
- Organics Receiving Building – assume 12-hour shifts, 8 employees.
  - 12/8 x 8 x 125 = 1,500 L/day
- Occasional use truckdrivers, maintenance visitors (allocate 1 person)
  - 8/8 x 1 x 75 = 75 L/day

This equates to a total demand of 2,812.50 L/day (1.95 L/min or 0.03 L/s).

The total fixture unit count for the site is assumed to be between 20 and 30. This will be confirmed during detailed design of the building interiors. Also, if it is assumed that the toilets are flush valves, Table 7.4.10.5 of the OBC states that the peak sanitary flow rate that can be expected is 2.1 L/s. According to Southgate Township's standards, the industrial flow rate is to be coupled with an extraneous flow rate of 0.15 L/s/ha, however, it should be noted that no extraneous flows are expected to occur within the system.

The sanitary flow from the site will be conveyed to a pump station located north of the Office Building. Actual discharge from the site will be less than the instantaneous peak flow rate of 2.1 L/s and will be governed by the system curve of the receiving forcemain and the pump selected. A flow rate of approximately 0.4 to 0.6 L/s will be selected for design of the pump station. The pump station will convey sewage via private forcemain towards the existing 38-mm-diameter HDPE "Goldstripe" sanitary forcemain that services the Lystek site to the east. The total dynamic head for the pump station will be specified to overcome pressure in this existing forcemain. A check valve and isolation valve will be included as part of the pump station design to allow for protection and maintenance of the proposed buildings. Additional check valves may be required on the existing forcemain to prevent back pressure.

5.0 WATER SERVICING

5.1 Design Criteria

The MECP states that watermain distribution systems are to be designed to convey the larger of the maximum daily demand combined with fire flow, or the peak hourly demand. Additionally, it is recommended that the average daily flow from any development be conveyed with a resulting pressure within the range of 350 kPa (50 psi) to 470 kPa (70 psi).

The guidelines also stipulate that the minimum resultant pressure under any non-fire demand scenario shall not be less than 275 kPa (40 psi). With the inclusion of fire flows, the minimum residual pressure in the distribution system shall not be less than 140 kPa (20 psi). Static pressure in the system cannot exceed 700 kPa (100 psi) in any scenario.

5.2 Domestic Water Demand

Southgate Township's Servicing Standards direct the domestic water demand calculations for industrial developments to the guidelines outlined within the MECP Drinking-Water Systems guidelines.

However, as uses of the site are known and the equipment and machinery will not contribute to the water demand calculations, the average daily sanitary demand can be used as the average daily domestic water demand. The peaking factor may vary, but a factor of 2.0 was used for the maximum daily demand, and a factor of 4.0 was assumed for the peak hourly demand.

The domestic water demands are summarized in Table I below.

Table I: Proposed Domestic Water Demands

Average Daily Demand	2,812.50 L/day (0.03 L/s)
Peaking Factors	
Maximum Day Peaking Factor (MECP)	2.0
Maximum Hour Peaking Factor (MECP)	4.0
Peak Water Demand	
Total Maximum Day Domestic Demand	**0.06 L/s**
Total Peak Hourly Domestic Demand	**0.12 L/s**

The maximum daily demand for the proposed development is estimated to be 0.06 L/s, and the maximum hourly demand is expected to be 0.12 L/s. It should also be noted that the instantaneous peak water demand is assumed to be the same as the peak instantaneous sanitary demand, which is 2.1 L/s.

The site requires 175 m^3/day for process water within the Organics Receiving Building, which the Township has agreed to provide from their municipal watermain system. The water allocation agreement will be finalized with the Site Plan Application. Envest is exploring supplementing this allocation with consumption obtained from the neighbouring wastewater treatment facility in the future. It has been identified that this demand will occur over 12 hours, resulting in a total process demand of 4.05 L/s.

5.3 Fire Flow Demand

In addition to the daily domestic demand from the proposed development, fire flow demands are required to assess the adequacy of any proposed watermain system. Triton Engineering Services Limited, who serves as the Township's Engineer, provided an estimated static pressure within the existing 150-mm-diameter watermain on Eco Parkway of 94 psi, based on topography. However, at 20 psi, the available flow in the system is only 45.4 L/s, which would not provide adequate fire protection. The Township commissioned a new water tower in Dundalk in 2023; however, it was noted that the water tower will only marginally increase the pressure on Eco Parkway and there is not sufficient water available to provide fire protection for this development. Therefore, an on-site water supply for fire protection will be required. The available water pressure will be provided prior to finalizing the design, which may reduce the required size of the on-site water supply.

The fire protection water supply will be provided via underground holding tanks. The volume and rate requirements were calculated in accordance with *Fire Protection Water Supply Guideline for Part 3 in the OBC* (OFM-TG-03-1999). The required volume of water supply is calculated based on volume of the buildings, exposure to other buildings, and a water supply coefficient. The fire demand was calculated for the Organic Receiving Building, as it will require a larger demand than the Office Building and Maintenance Shop.

Minimum Supply of Water ($Q = K*V*S_{TOT}$)

The value of K is provided from Table 1 in OFM-TG-03-1999 and values of S_{TOT} are selected from Figure 1 in the same technical bulletin. Based on a review of the proposed building, its classification, and construction the following is noted:

- The proposed building meets the classification of Low Hazard, Group F Division 3 building (F3), in accordance with the OBC
- The proposed building is of non-combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns, and arches
- A water supply coefficient, K, of 12 is applicable to the building based on Table 1 of OFM-TG-03-1999
- The building has no exposures to other buildings within 10 m of its footprint and, therefore, the total spatial coefficient is 1, based on no exposure on either side.

With the above, the following is noted regarding the size of the building:

- The building has a footprint of 2,800 m^2
- 30% of this footprint has a height of 18.24 m, resulting in a volume of 15,321.6 m^3
- 70% of this footprint has a height of 7.63 m, resulting in a volume of 14,954.8 m^3
- The total volume is noted to be 30,276.4 m^3

Table II below summarizes the calculations.

Table II: Fire Protection Water Supply Calculations

Water Supply Coefficient (K)	12
Building Dimensions	
Building Footprint	2,800 m^2
Building Height	Varies
Volume (V)	30,276.4 m^3
Spatial Coefficients (S_{TOT})	1.0
Minimum Supply of Water ($Q = K*V*S_{TOT}$)	**363,318.8 L**
Minimum Supply Rate[1]	**9000 L/min (150 L/s)**

[1] *From Table 2 of OFM-TG-03-1999*

Given the values noted above, the volume of water required for fire protection for the building, **Q**, is noted to be 363,319 L. Based on Table 2 of OFM-TG-03-1999, this flow must be delivered at a minimum rate of 9000 L/min or 150 L/s at 140 kPa (20 psi) and must be delivered for at least 30 minutes. At the minimum flow rate, the required volume is sufficient for a constant draw of 40.4 minutes.

The subject property is to be connected to the municipal water supply for domestic water and fire protection use. As the building is not sprinklered, the fire protection will be provided by means of private hydrants on the site. As previously stated, the municipal watermain can currently only provide 45.4 L/s at 140 kPa, and on-site storage is required to account for the remainder of the fire demand.

To calculate the required amount of storage, it is assumed that:

- 4.1 L/s is unavailable for firefighting purposes to provide the maximum daily domestic demand for the facility.
- It is further assumed that, due to hydraulic losses within the piping leading up to the hydrant, approximately 2 psi is lost.

Therefore, approximately 39.3 L/s is available at the private hydrant for fire fighting purposes from the municipal supply, and an additional 110.7 L/s of supplementary water is required for a minimum duration of 30 minutes. A minimum private supply of 199,260 L is required to provide adequate capacity for fire protection on the site.

It is proposed that two Wilkinson Heavy Precast storage tanks (one model H100S and one model H114S) are connected in series to provide the required supply volume. These tanks will provide a combined volume of 214,000 L. The tanks should be installed below grade with a minimum cover of 1.5 m to provide adequate frost protection. These tanks will be connected to a dry hydrant, conforming to *NFPA 1142: Standard on Water Supplies for Suburban and Rural Fire Fighting*. Annex B of NFPA 1142 should be referred to for specifications for the tanks, and the type of hard suction threaded fitting and cap on the dry hydrant should meet requirements of the municipality and the local fire department.

The water levels in the cistern should be monitored to ensure adequate supply is available in the event of a fire and that no leaks are developed over time. It is recommended that the tanks be equipped with a float sensor to allow for automatic refill if the tanks empty to a certain level. If the cisterns are installed in an area with shallow ground water, the design of the cistern and base shall consider buoyancy. The automatic refill water line is proposed to come from the Office Building/Maintenance Shop to allow for it to be metered. A backflow preventer will also be required on this line within the building.

5.4 Service Design

The water service for the proposed development will be responsible for providing domestic demand to the buildings, as well as some fire demand to a private hydrant. A 150-mm-diameter watermain is proposed to service the private hydrant, and the domestic demand for each building can be serviced via 25-mm-diameter services, threaded from the 150-mm-diameter main. The owner has requested a 100-mm-diameter water service to provide the combined demand for their domestic uses and their process demand of 175 m^3/day. The 25-mm-diameter domestic services for each building will be connected to this 100-mm-diameter service. It is anticipated that the Township will require metering and backflow prevention on the domestic services; the development manual did not indicate or provide specifics. As such, metering and backflow prevention of the domestic services will be determined during the detailed design and building permitting phase of the project.

6.0 STORM SERVICING AND STORM WATER MANAGEMENT

As per GRCA requirements, stormwater runoff from the site is to be controlled to pre-development flow peak flow rates for the 2-year through the 100-year storm events. For the purposes of this report, a minor storm event is characterized by storm patterns that occur more frequently (e.g., 25 mm storm, 2-year storm event, 5-year storm event) and are used to design and size minor storm system conveyance features such as storm sewers. A major storm event is one that is larger and less frequent in nature (e.g., 100-year and Regional storm) and is typically conveyed via overland flow. Drainage areas were delineated, and catchment parameters were determined for inclusion in pre- and post-development modelling. The stormwater management design for both existing and proposed conditions was completed using the hydraulic modelling software MIDUSS. Modelling for the Site was completed using the 4-hour Chicago Storm distributions. The 4-hour Chicago Storm distribution was determined to generate the greatest runoff volumes between the analyzed storm distributions –this gave greater volume control requirements utilized for sizing the proposed stormwater management measures. This distribution was chosen as the “worst-case scenario” and was therefore selected for use in further analysis and detailed design for the Site. Also, for small drainage areas such as this development, the use of 3-hour to 4-hour Chicago Storms is typical. The modeling also utilized Hurricane Hazel for the Regional event. Since only the last 12 hours of the event were utilized (212 mm rainfall), the pervious Curve Number (CN) values were increased to reflect AMC-III conditions.

Quality control guidelines for the Township are directed to the MECP *Stormwater Management Planning and Design Manual*. This manual stipulates that “Enhanced” protection that removes a long-term average of 80% of total suspended solids (TSS) for up to the 25 mm storm event is required.

6.1 Pre-Development Conditions

The existing conditions were modeled using MIDUSS to determine the peak release rates. The site appears to drain from northeast-to-northwest towards the ditch, with no controls in place. The site consists mostly of grass and an impervious percentage of 0% was used for the entire 4.04 ha development area. Additionally, an external area for the adjacent development consisting mainly of grass and gravel areas was identified along the eastern limits of the site. An impervious percentage of 70% was used for the 0.51 ha external area. A catchment area plan for the pre-development conditions of the Site and a pre-development flow schematic are provided in Figures 1 and 3, respectively. A summary of the catchment parameters utilized under pre-development modelling is shown in Table III, a more detailed summary of parameters can be found in Appendix A.

Table III: Pre-Development Catchment Parameters

Catchment ID	Description	Area (ha)	Percent Impervious
101	Existing Site	4.04	0%
102	External Drainage Area East of Site	0.51	70%

The peak flow rates for the 2-year to 100-year design storm events are summarized in Table IV. These flow rates are not to be exceeded in post-development conditions. Rainfall parameters were gathered from the Ministry of Transportation (MTO) IDF Curve Lookup Tool. The IDF Parameters used in MIDUSS can be found in Appendix A.

Table IV: Pre-Development Peak Flow Summary

Storm Event	Peak Flow Rate (m^3/s)
2-Year	0.086
5-Year	0.136
10-Year	0.197
25-Year	0.303
50-Year	0.423
100-Year	0.522

The proposed quantity controls will be required to limit the post-development peak flow rates to pre-development rates for all storm events from the 2-year through the 100-year.

6.2 Post-Development Conditions

Post-development peak flows were also modelled using MIDUSS. Post-development peak flow rates are required to be controlled to pre-development rates, or less. The site and external areas were divided into five catchments. A catchment area plan and flow schematic of the post-development conditions are provided within Figures 2 and 4, respectively. A summary of the catchment parameters used are provided in Table V, with a more detailed table provided within Appendix A. The assumed percent impervious for the site is conservative given that large portions of the site will have gravel surfaces which will absorb rainfall into the aggregate, provide storage within the voids of the granular material, and potential infiltration into the subgrade, thereby reducing runoff compared to an asphalt/concrete surface.

Table V: Post-Development Catchment Parameters

Catchment ID	Description	Area (ha)	Percent Impervious
201	Controlled flow to Pond	1.08	90%
202	Uncontrolled to Creek	1.82	5%
203	Containment Area & Driveway	1.14	95%
301	External drainage area east of Site - Drains to 201	0.39	70%
302	External drainage area east of Site - Drains to 202	0.12	70%

The post-development conditions of the Site were modelled without any mitigation measures in place in order to determine how much storage would be required in order to meet quantity control requirements. The results of this analysis are presented in Table VI and shows that, without SWM controls, post-development peak flows exceed pre-development flows by a factor ranging from 2.5 to 6.

Table VI: Comparison of Pre-Development and Post-Development (Uncontrolled) Flow Rates

Storm Event	Pre-Development Peak Flow Rate (m^3/s)	Post-Development Peak Flow Rate (m^3/s)	Increase in Flow (%)
2-Year	0.086	0.512	595
5-Year	0.136	0.714	525
10-Year	0.197	0.867	440
25-Year	0.303	1.062	350
50-Year	0.423	1.207	285
100-Year	0.522	1.353	259
Regional	0.674	0.658	-2

The following sections outline the stormwater management practices that are proposed to be implemented in order to meet quantity and quality control objectives.

6.2.1 Continuous Flow Dry Pond

In order to attenuate flows directed towards the ditch from catchments 201 and 301, a continuous flow dry pond located west of the proposed office and maintenance shop building is proposed to be installed. The proposed dry pond provides approximately 477.6 m^3 of storage with a total depth of 1.00 m. The proposed pond contains 3 piped outlets and an emergency overflow weir that will direct stormwater to the riprap lined spillway south of the pond. A 50 mm orifice plate located at the base of the pond will act as a low flow out to drawdown the runoff generated from the 25 mm storm event. The Drawdown time calculation for the facility for various design storm events is provided in Table 8 within Appendix A. A 300 mm and a 250 mm diameter orifice were placed at an elevation of 506.70 m to control larger storm events, and a 75-mm-diameter horizontal orifice was placed at an elevation of 507.10 m at the top of the control structure to control larger storm events. A 5-m-wide overflow weir is proposed at elevation 507.30. A summary of the design components and operating levels of the proposed dry pond is given in Table VII. A detailed stage-storage-discharge listing is provided in Appendix A.

Table VII: Summary of Dry Pond Design Operating Levels

Component of Pond	Elevation (m)	Volume (m^3)
Bottom of pond & 50 mm diameter low flow orifice invert	506.40	0
300 mm and 250 mm diameter orifice inverts	506.70	111
75 mm diameter horizontal orifice invert	507.10	301
Bottom of emergency overflow weir	507.30	415
Top of Pond	507.40	478

6.2.2 Containment Area

Catchment 203 represents the containment area for the storage tanks behind the proposed organics receiving building, and also includes the southern half of the building and gravel driveway/yard area. The containment area is designed to contain any potential leaks from the storage tanks and to control the 100-year storm in the event it coincides with any spillage. The containment area will include an impermeable liner system. The storage area within the catchment is proposed to hold up to a volume of approximately 2919.6 m^3 on the surface at a maximum depth of 1.85 m. A trained staff member will sample the water after a rainfall event, and if it meets storm sewer bylaw standards a valve within the surrounding piped system can be opened to allow runoff to enter the southern riprap spillway and ultimately enter the ditch. A 150-mm-diameter pipe is proposed to convey the clean runoff towards the ditch. Another valve and outlet are proposed to potentially allow for the runoff within the containment area to be reused for processing within the Organic Receiving Building. This outlet is proposed to be directed towards a manhole with a pump that would convey the stormwater to the building through a forcemain. The lowest bottom elevation of the containment area is set at approximately 507.15, and the Pump Shelter is proposed to have a finished floor elevation of 507.50. The top of the containment berm is set to an elevation of 507.95 m at the lowest section.

The performance of the proposed containment area, assuming the outlet valve is open and discharging from the area, is shown within Table 6 in Appendix A and indicates water ponding elevations ranging from 507.28 m to 507.50 m for the 2-year to Regional storm events, respectively. Under the worst-case condition where the downstream valve is closed and all runoff is impounded within the containment area, the 2-year to Regional ponding elevations will range from 507.46 m to 507.79 m events, respectively, which is still below the top of the containment berm at elevation 507.95 m. Therefore, the containment area is capable of safely storing flows generated from all modelled storm events, up to and including the regional storm event.

6.3 Water Quantity/Peak Flow Control

As outlined in section 6.0, peak flow control is required to attenuate runoff generated from the 2-year through 100-year storm events to the peak flow rates recorded under pre-development conditions. The proposed continuous dry pond and containment area measures are able to provide peak flow control to meet the stormwater quantity control objectives for the Site. A peak flow comparison at the Site's outlet is provided within Appendix A and is also summarized in Table VIII .

Table VIII: Comparison of Pre-Development and Post-Development (Controlled) Flow Rates

Storm Event	Pre-Development Peak Flow Rate (m^3/s)	Post-Development Peak Flow Rate (m^3/s)	Reduction in Flow (%)
2-Year	0.086	0.084	2
5-Year	0.136	0.132	3
10-Year	0.197	0.197	0
25-Year	0.303	0.296	2
50-Year	0.423	0.335	21
100-Year	0.522	0.373	29
Regional	0.674	0.530	21

It should be noted that the modelling results shown in Table VIII account for the unlikely event that flows generated from Catchment 203 are released to the outlet during storm events. In practice, the valve from the containment area is closed under normal conditions and runoff during rainfall events is impounded within the containment area until it is tested to confirm it satisfies the Sewer Use Bylaw criteria prior to release. Therefore, runoff from this catchment would occur well after the storm event and after the combined peak flows from the other catchments has occurred. Under normal operating procedures, with the valve in the containment area closed, post-development flows will be approximately 0.038 m^3/s lower than those indicated in Table VIII resulting in a peak flow that is 15% to 47% less than pre-development flow.

Table 6 in Appendix A outlines the proposed pond's performance under all of the storm events modelled. A summary of the maximum ponding elevations during each storm event is shown in Table IX. All storm events, including the Regional event are contained within the SWM facility.

Table IX: Summary of Maximum Ponding Elevations Under Various Storm Events

Storm Event	Maximum Ponding Elevation (m)
25 mm	506.813
2-Year	506.895
5-Year	507.012
10-Year	507.082
25-Year	507.168
50-Year	507.232
100-Year	507.297
Regional	507.203

A series of catchbasins is proposed in the northern gravel area to collect runoff from the majority of Catchment 201. The runoff is conveyed to an oil/grit separator (OGS) unit through a 450-mm-diameter pipe, and then outlets west to the dry-pond. As previously stated, the runoff from Catchment 203 is controlled manually via a valve. Runoff is directed towards a catchbasin at the western side of the catchment, and a 150-mm-diameter American AVK Resilient Seated Ductile Iron Gate Valve is proposed on the outlet.

Refer to drawings C2-1 and C3-1 for the grading and servicing design of the site. Stormwater modelling results and a storm sewer design sheet can be found in Appendix A.

6.4 Quality Control

Stormwater quality objectives within the site require "Enhanced" protection, resulting in 80% long-term average removal of total suspended solid for the 25 mm storm event.

For flow entering the proposed dry pond, a Stormceptor EFO6 OGS unit was sized to provide 85% TSS removal. This unit will act to remove any total suspended solids from gravel and other hardscaped areas with vehicle traffic and potential salt applications, before being conveyed to the dry pond. It is noted that the GRCA only recognizes a maximum of 50% TSS removal for OGS units – this value was carried forward through the treatment train water quality calculations conducted for the Site. In order to meet the 80% long-term average removal of total suspended solids, the proposed dry pond was sized such that the storage volume provided exceeds the total required water quality storage volume for a "Basic" level of protection (60% TSS removal) with a continuous dry pond structure dictated by Table 3.3.2 in the MECP's Stormwater Management Manual. The drawdown time for the 25 mm event and the MECP water quality volume was 22.8 hours and 23.7 hours, respectively. A drawdown time of 24 to 48 hours is typically preferred; however, it is recognized that for small drainage areas, the storage volumes generated are small and would require unacceptably small orifices to achieve flow rates that would result in drawdown times that range from 24 to 48 hours. As such, the MECP indicates that the drawdown time can be reduced to a minimum of 12 hours. Therefore, at just under 24 hours, the SWM facility provides an appropriate detention time. Using the treatment train calculation shown in Table 9 of Appendix A, it is shown that this treatment train approach can provide the 80% long-term average removal of TSS required. Sizing output for the Stormceptor units along with maintenance information is provided in Appendix A.

It should be noted that catchments 202 and 203 do not require quality control measures as only clean water will be conveyed to the Site's outlet. An OGS unit is proposed to be implemented at the outlet of the containment area (Catchment 203) as an extra quality control measure on top of the monitoring activities proposed under section 6.2.2.

7.0 SITE GRADING

The grading of the site respects the existing grades along all property lines, as well as the road grades on Eco Parkway. The site is graded to comply with slopes outlined as part of the Accessibility for Ontarians with Disabilities Act (AODA), and Southgate Township standards.

The grading allows for the stormwater water management objectives of directing minor and major flows towards the dry-pond and ditch along the western property limits. A portion of the site is graded directly towards this ditch.

The dry-pond has been graded to ensure it is separated from the remainder of the site within the GRCA floodplain area and sufficiently elevated above the groundwater table. The proposed grades of the building and gravel area result in a fill scenario in the GRCA floodplain. As a result, the remaining area of the site within the floodplain, excluding the dry-pond, has been graded to allow for a cut/fill balance.

A containment berm is proposed around the outdoor storage tanks, providing adequate volume to contain the substances in the event of leakage. The containment volume is required to be at least 100% of the above-ground volume of the largest tank plus 10% of the volume of all other tanks. At this time, the tanks are proposed to be 2 m underground, which results in a required secondary containment volume of 3,264 m^3 as approved by the MECP. This volume is achieved via a berm surrounding the tanks and pump shelter. The grades within the secondary containment area are designed to direct runoff towards a series of catchbasins that convey runoff towards the northwest, where the outlet is controlled by the valve. The top-of-berm elevations are at a minimum elevation of 507.95 m to allow for a containment volume of approximately 3,301 m^3. It should be noted that this volume includes the largest tank area as it is the largest governing factor for the required storage volume. The water will be sampled prior to being released and conveyed to the ditch west of the site.

The maximum ponding elevation during the 100-year storm event is 507.46 m, and the finished floor elevation of the pump shelter is set to an elevation of 507.50 m. This accounts for the total rainfall volume when the outflow pipe valve is shut.

A ramp at approximately 2% is also proposed from the gravel area behind the Organic Receiving Building to the bottom of the containment area, providing access to the pump shelter, and monitoring equipment.

Cut-fill within the GRCA's floodplain results in a net-cut of approximately 24 m^3. This is calculated as the difference between a cut of 1,137 m^3 and a net fill of 1,113 m^3. The volume required for the SWM pond has not been included in these calculations, so the net-gain of floodplain storage is 24 m^3. The proposed cut in the GRCA floodplain area has been designed to ensure it is not deeper than 0.5 m from the existing surface.

7.1 Compliance with On-Site and Excess Soil Management Provincial Regulations

The MECP regulation O.Reg. 406/19 "On-Site and Excess Soil Management" under the Environmental Protection Act states that the excavation of excess material, and subsequent off-site disposal of excess soils from this site, will require testing and reporting in the MECP's Environmental Activity and Sector Registry (EASR). The Owner and Contractor will be responsible for complying with all of the noted requirements.

8.0 EROSION AND SEDIMENT CONTROL

Sediment tracked onto the roadway during the course of construction will be cleaned by the Contractor. To help minimize the amount of mud being tracked onto the roadway, a mud mat will be installed at the primary construction exit.

Additionally, silt fence will be installed around the development area to eliminate sediment from leaving the site and will remain in place and be maintained until landscaping has been completed and soil has been vegetated.

Silt fence will also be installed around stockpiles on site, with the stockpiles kept a minimum 2.5 m from the property boundary.

Filter fabric will be wrapped around storm and sanitary structures to prevent silt or sediment-laden water from entering inlets. These will be inspected periodically to ensure that they have been properly installed and function as designed throughout construction.

It is assumed that the Contractor will keep in mind weather conditions when scheduling work to minimize dust migrating to surrounding developments due to construction activities.

The controls will be maintained, and accumulated sediments removed once their capture capacity has been decreased by one third. It is proposed that, during construction activities, visual monitoring will be conducted bi-weekly and within 24 hours of any rainfall event of 25 mm or greater. During the construction period, monitoring will consist of visual observation for the effectiveness of the sediment and erosion controls and sediment migration off site. Construction inspections will be conducted until such time as the construction activities are complete and vegetation has established itself to a density equivalent to 70% of the background native vegetation density.

9.0 CONCLUSIONS

Based on the analysis presented in this report it is concluded that:

- A sanitary forcemain will be required to pump the sanitary flows from the site to the existing forcemain on Eco Parkway.
- The existing 150-mm-diameter watermain within the right-of-way is sufficient to provided domestic water demand for the proposed building.
- The municipal system cannot provide the necessary fire protection for the proposed development. A flow rate of 150 L/s is required to provide fire protection to the site, and only 45.4 L/s is available in the system at 20 psi. Approximately 39.3 L/s will be provided by the municipal main via a private hydrant, and the remaining 110.7 L/s will be provided via underground storage tanks and a dry hydrant.
- Stormwater quantity control is provided via a dry-pond and containment area storage. 2-year through the 100-year storm events are controlled to a peak flow rate lower than the existing conditions peak flow rates.
- Stormwater quality control is provided via an EFO-6 OGS unit, and a treatment train approach is provided with the dry-pond. An additional ERO-6 OGS unit will service the storm runoff released from the containment area.
- Grading of the site complies with AODA and Township of Southgate guidelines.
- Perimeter silt fence, silt fence at the base of all stockpiles, silt sacs in storm structures and a construction entrance mud mat would be required to provide erosion and sediment control.

All of which is respectfully submitted,

WALTERFEDY

Tyler Keller, P.Eng.
Engineer, Civil

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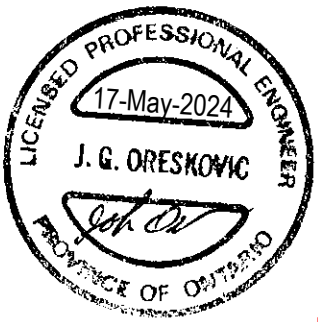

John Oreskovic, P.Eng.
Senior Water Resources Engineer

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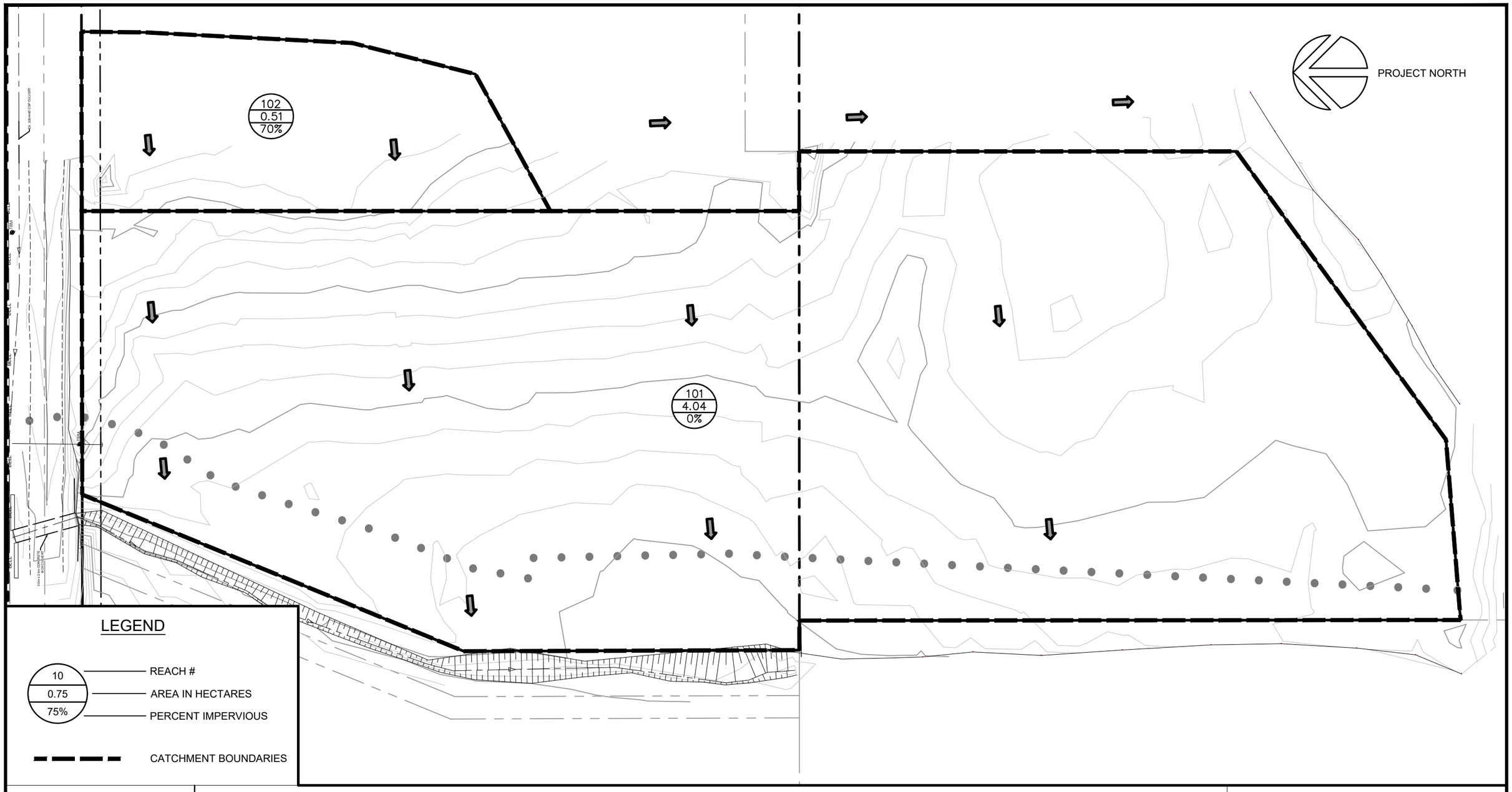
FIGURES



LEGEND

- 10 / 0.75 / 75% — REACH # / AREA IN HECTARES / PERCENT IMPERVIOUS
- CATCHMENT BOUNDARIES

PROJECT:

SOUTHGATE RENEWABLES RECYCLING PROJECT

TITLE:

EXISTING CATCHMENT AREAS

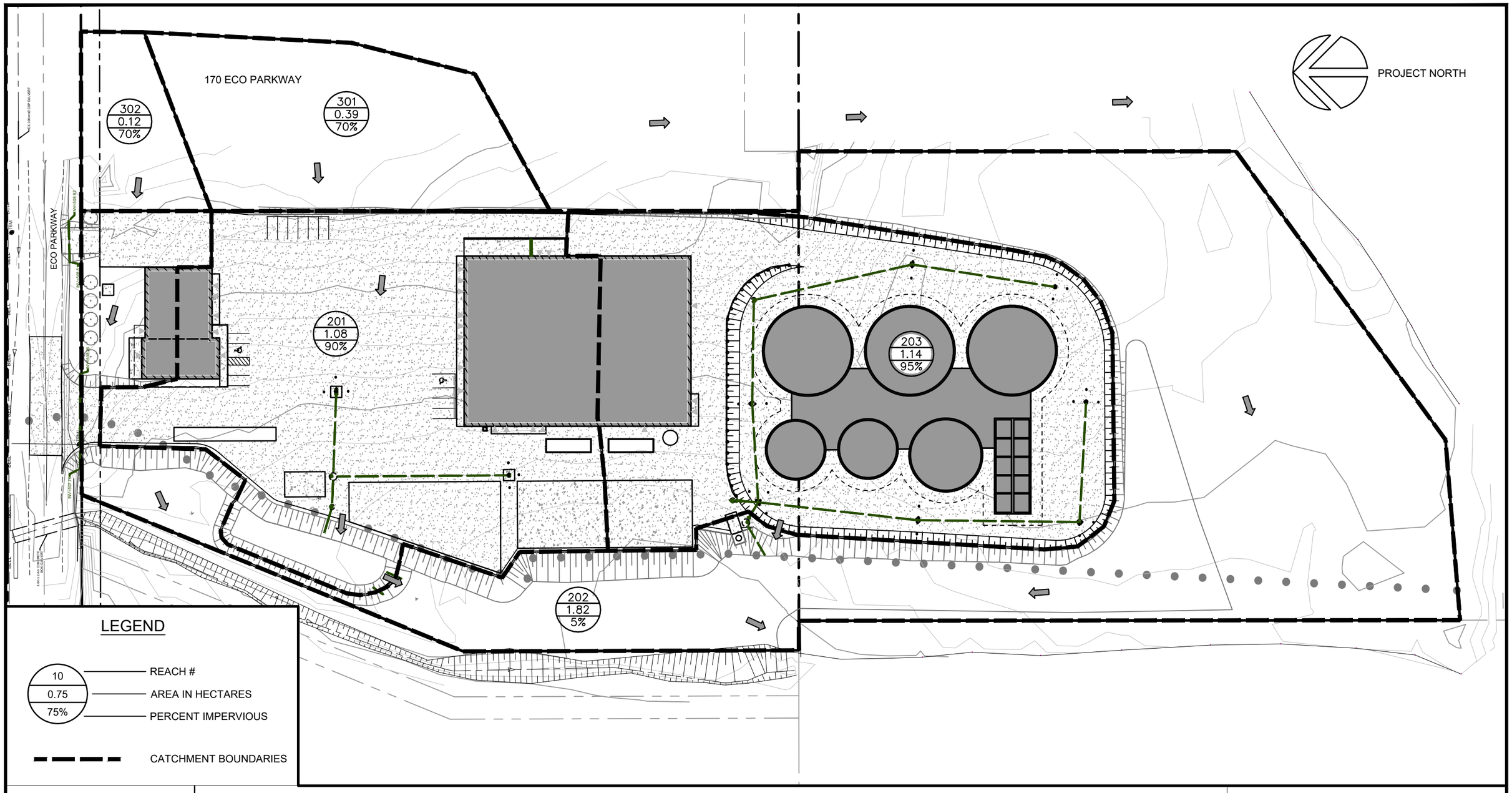
WALTERFEDY

KITCHENER OFFICE
675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1
T: 519.576.2150 F: 519.576.5499 walterfedy.com

SCALE:	1:1000	DATE:	2023.03.07
DRAWN BY:	TK	PROJECT NO.:	2021-0713-10
CHECKED BY:	MH	FILE:	2021-0713-10 - SWM

SHEET NO.:

FIG-1



LEGEND

- 10 / 0.75 / 75% — REACH # / AREA IN HECTARES / PERCENT IMPERVIOUS
- CATCHMENT BOUNDARIES

PROJECT:

SOUTHGATE RENEWABLES RECYCLING PROJECT

TITLE:

PROPOSED CATCHMENT AREAS

WALTERFEDY

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SHEET NO.:

FIG-2

FIGURE 3

Pre-Development Flow Schematic

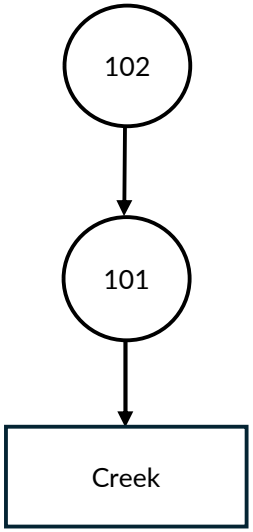
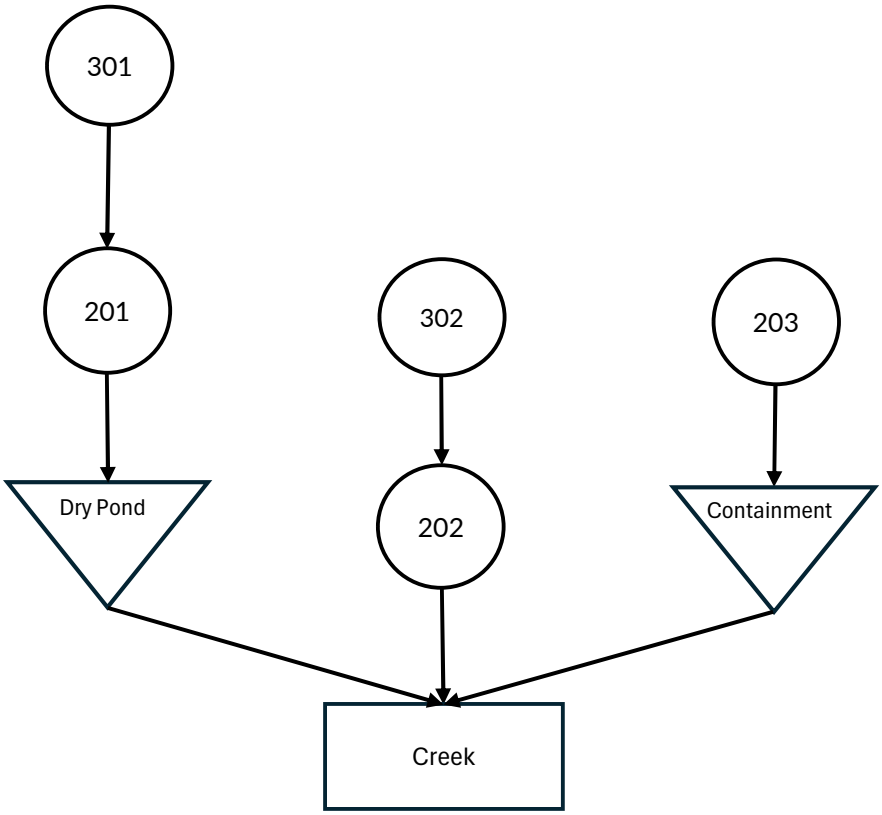


FIGURE 4

Post-Development Flow Schematic



DRAWINGS

LEGEND

- PROPERTY LINE
- LEGAL EASEMENT
- SIB — STANDARD IRON BAR
- EX HP — EXISTING HYDRO POLE
- EXISTING GUY WIRE
- EX SIGN — EXISTING SIGN
- EX HYD — EXISTING FIRE HYDRANT
- EX WV — EXISTING WATERMAIN VALVE
- EX CS — EXISTING CURB STOP
- BOREHOLE No. — EXISTING BOREHOLE LOCATION
- +ELEV — EXISTING SPOT ELEVATION
- 325.0 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING EMBANKMENT
- EXISTING TREE DRIPLINE
- EXISTING SANITARY SERVICE
- EXISTING STORM SERVICE
- EXISTING WATERMAIN
- GAS — EXISTING GASMAIN
- EXISTING INTERNET SERVICE PROVIDER LINE
- OH HYDRO — EXISTING OVERHEAD HYDRO LINE
- EXISTING DITCH CENTRELINE
- EXISTING CHAINLINK FENCE
- EXISTING GRAVEL
- ESTIMATED GRCA REGULATORY FLOODPLAIN

GENERAL NOTES

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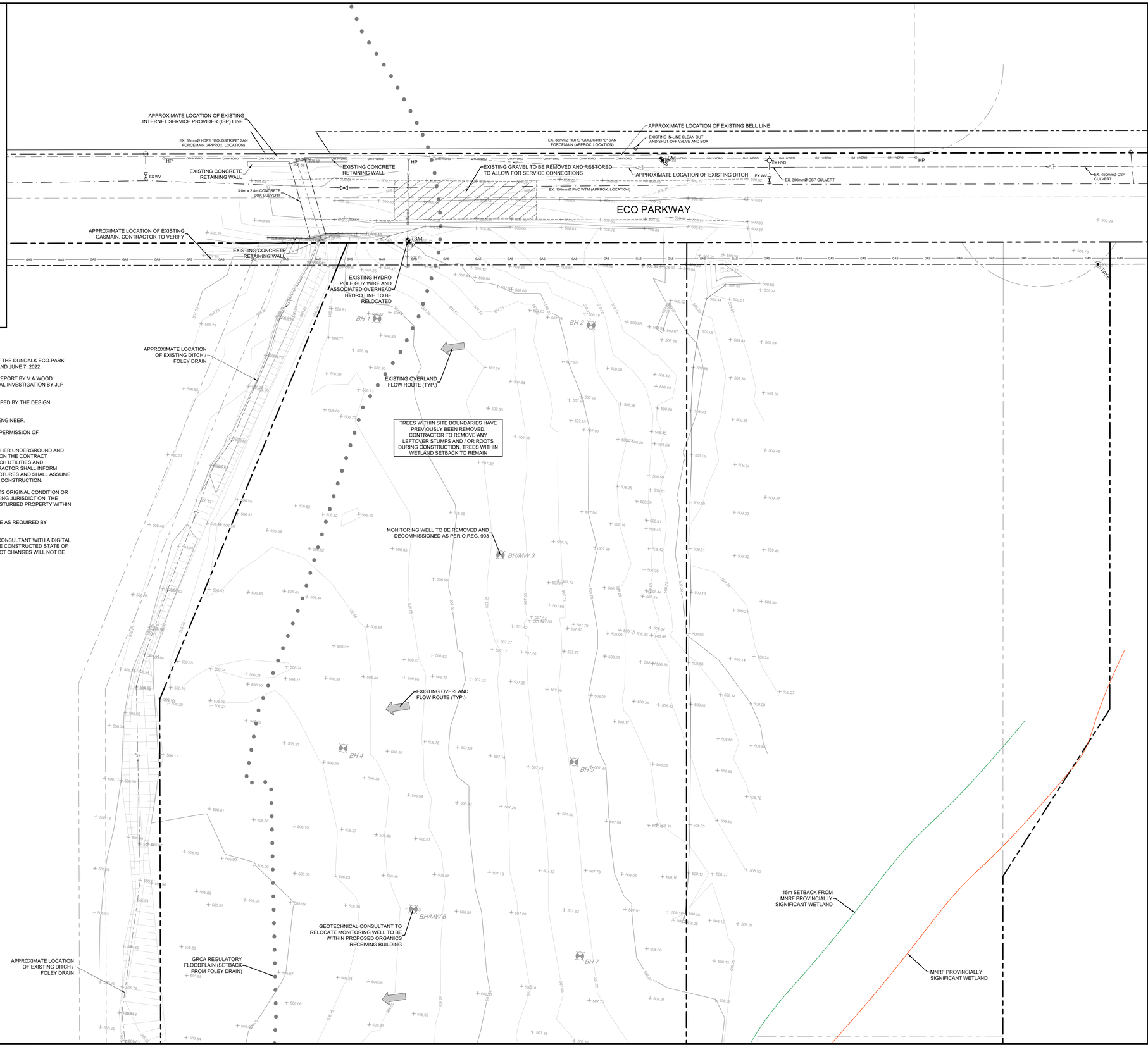

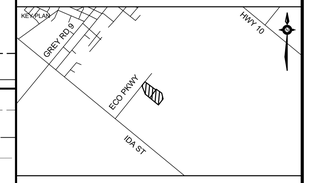

PROJECT NORTH TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED FOR SITE PLAN APPROVAL	
2024.05.17	REISSUED FOR SITE PLAN APPROVAL	

CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

EXISTING CONDITIONS & REMOVALS PLAN (1 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

SCALE:	1:400
DATE:	2023.03.10
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	JZ / MH

SHEET NO.: C1-1

LEGEND

- PROPERTY LINE
- LEGAL EASEMENT
- SIB — STANDARD IRON BAR
- EX HP — EXISTING HYDRO POLE
- EXISTING GUY WIRE
- EX SIGN — EXISTING SIGN
- EX HYD — EXISTING FIRE HYDRANT
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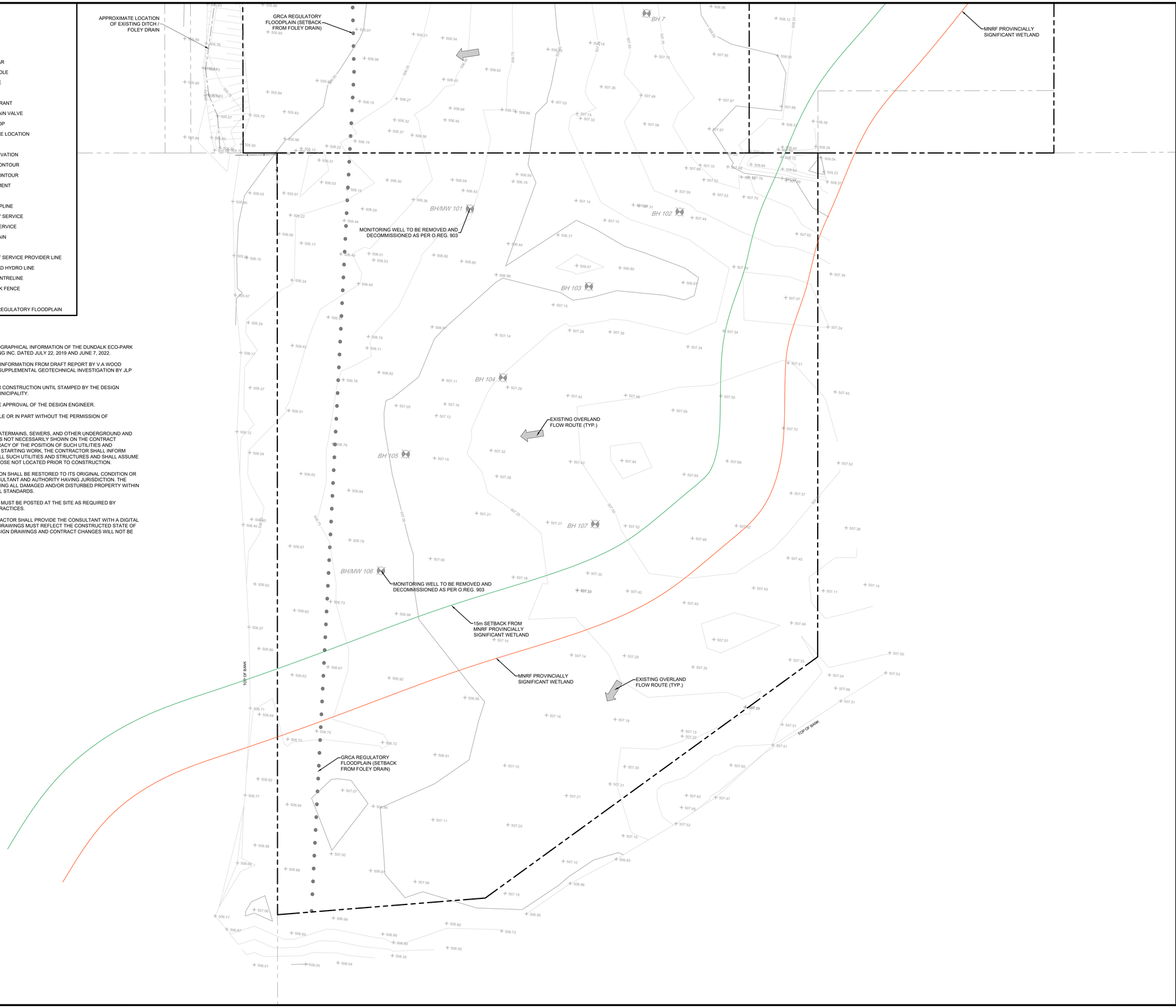

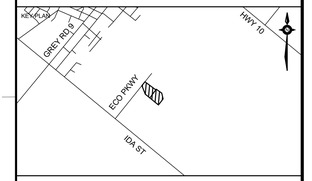

PROJECT NORTH

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CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

EXISTING CONDITIONS & REMOVALS PLAN (2 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
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LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

SCALE:	1:400
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DRAWN BY:	TK
CHECKED BY:	JZ / MH

SHEET NO.:

C1-2

LEGEND

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- EXISTING DITCH CENTRELINE
- EXISTING CHAINLINK FENCE
- EXISTING GRAVEL
- ESTIMATED GRCA REGULATORY FLOODPLAIN
- CB — PROPOSED CATCHBASIN
- MH — PROPOSED STORM MANHOLE
- MH — PROPOSED SANITARY MANHOLE
- HYD — PROPOSED FIRE HYDRANT
- PROPOSED LAMP STANDARD
- [123.45] — PROPOSED GRADE
- 2.0% 2.0% — PROPOSED DRAINAGE ARROW/SLOPE
- PROPOSED EMBANKMENT (3:1 MAX UNLESS OTHERWISE NOTED)
- PROPOSED CHAINLINK FENCE
- PROPOSED CONCRETE SURFACE
- PROPOSED GRAVEL SURFACE
- PROPOSED RIPRAP
- PROPOSED CURB
- PROPOSED DROP CURB

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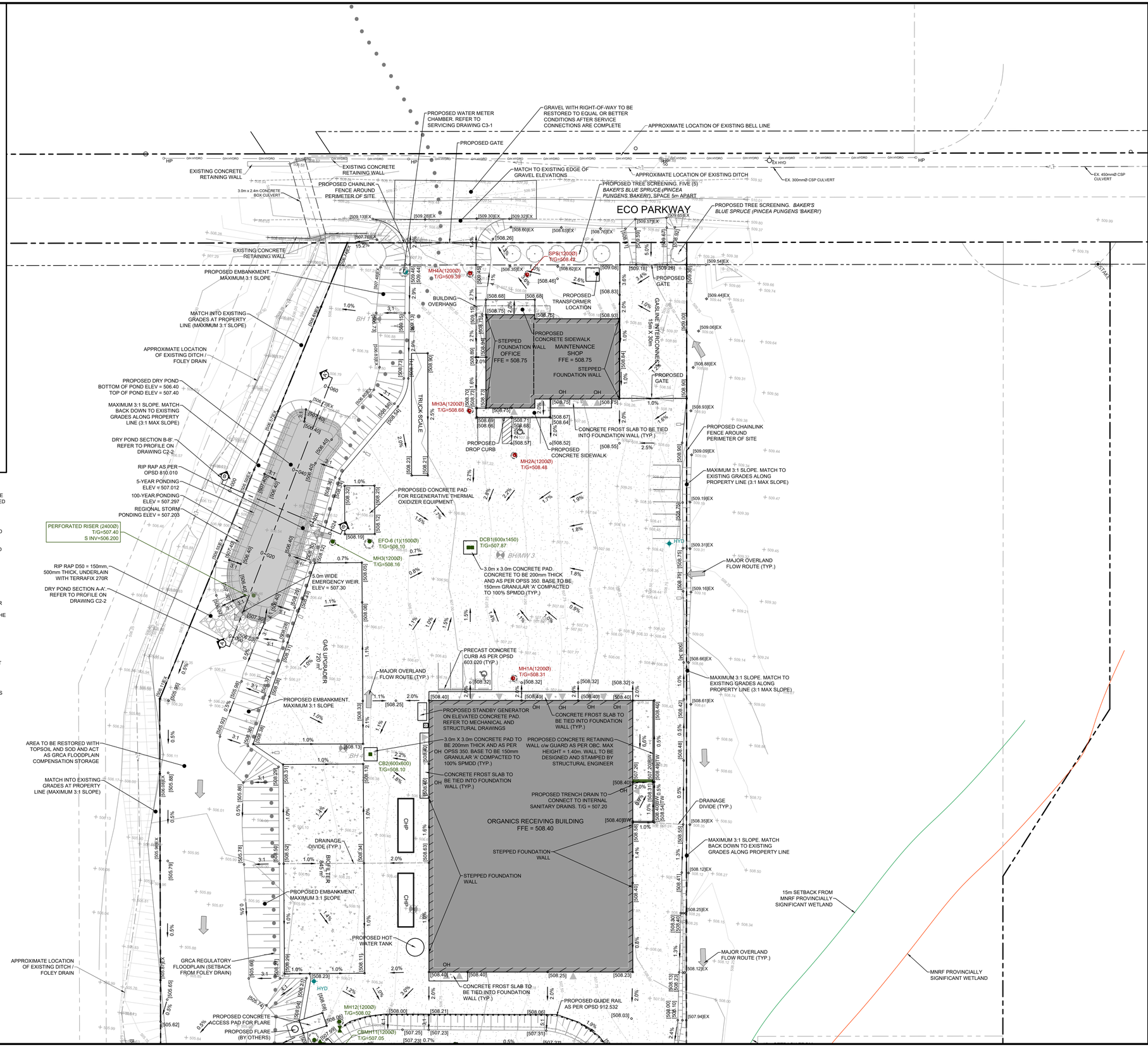

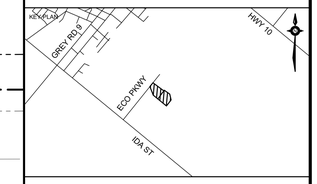

PROJECT NORTH | TRUE NORTH

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CLIENT
ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT
SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE
GRADING PLAN (1 OF 2)

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T. B. KELLER
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LEGEND

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- EX CS — EXISTING CURB STOP
- BOREHOLE No. — EXISTING BOREHOLE LOCATION
- +ELEV — EXISTING SPOT ELEVATION
- 325.0 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING EMBANKMENT
- EXISTING TREE DRIPLINE
- EXISTING OVERHEAD HYDRO LINE
- EXISTING DITCH CENTRELINE
- EXISTING CHAINLINK FENCE
- EXISTING GRAVEL
- ESTIMATED GRCA REGULATORY FLOODPLAIN
- CB — PROPOSED CATCHBASIN
- MH — PROPOSED STORM MANHOLE
- MH — PROPOSED SANITARY MANHOLE
- HYD — PROPOSED FIRE HYDRANT
- PROPOSED LAMP STANDARD
- [123.45] — PROPOSED GRADE
- 2.0% 2.0% — PROPOSED DRAINAGE ARROW/SLOPE
- PROPOSED EMBANKMENT (3:1 MAX UNLESS OTHERWISE NOTED)
- PROPOSED CHAINLINK FENCE
- PROPOSED CONCRETE SURFACE
- PROPOSED GRAVEL SURFACE
- PROPOSED RIPRAP
- PROPOSED CURB
- PROPOSED DROP CURB

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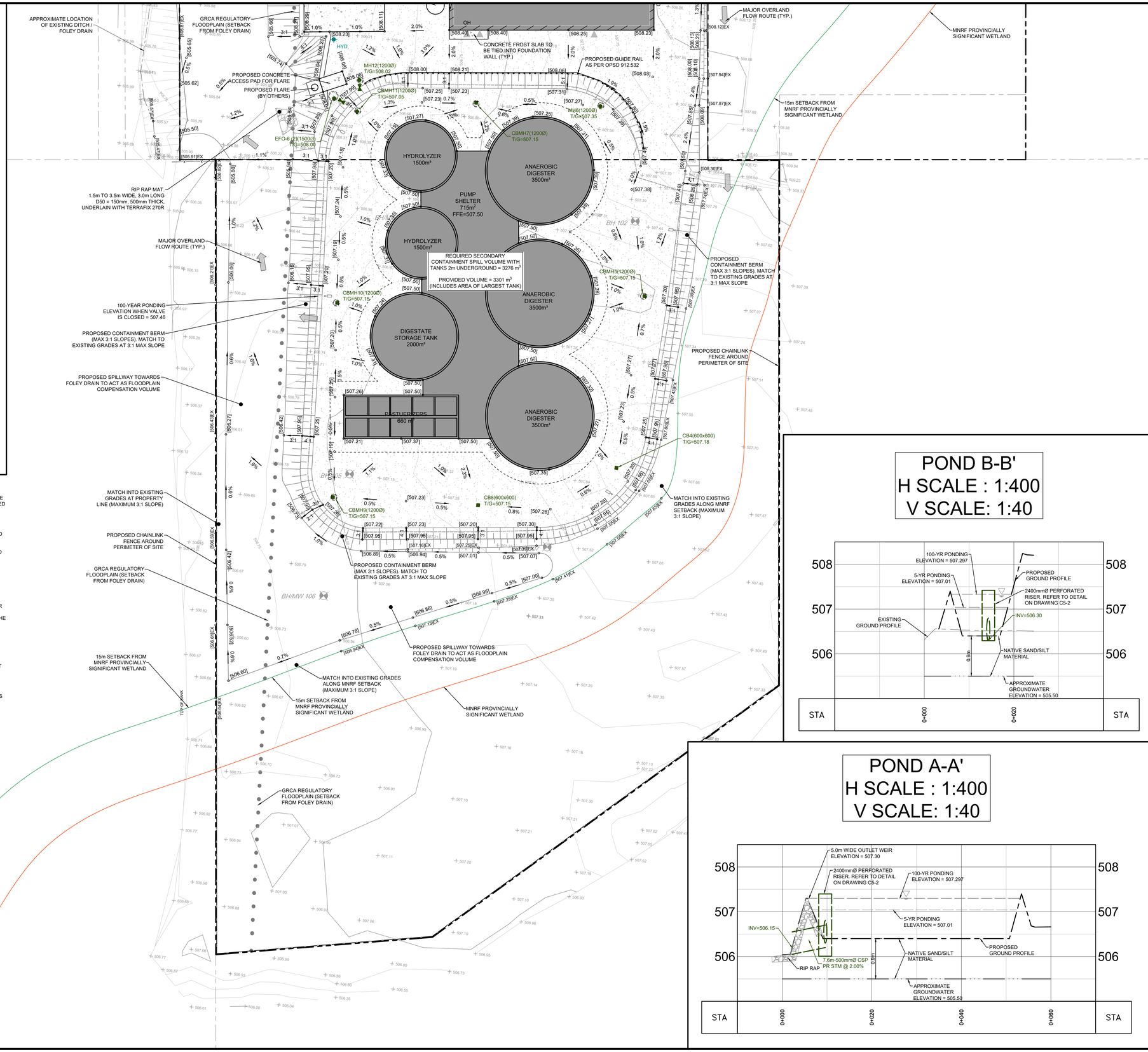
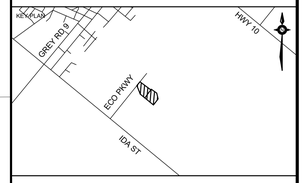


POND B-B'
H SCALE : 1:400
V SCALE: 1:40

POND A-A'
H SCALE : 1:400
V SCALE: 1:40



PROJECT NORTH — TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED FOR SITE PLAN APPROVAL	
2024.05.17	REISSUED FOR SITE PLAN APPROVAL	

CLIENT
ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT
SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE
GRADING PLAN (2 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER — T. B. KELLER — 100529026 — 2024.05.17 — PROVINCE OF ONTARIO

SCALE:	1:400
DATE:	2023.03.10
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	JZ / MH

SHEET NO.: C2-2

LEGEND

- PROPERTY LINE
- LEGAL EASEMENT
- SIB — STANDARD IRON BAR
- EX HP — EXISTING HYDRO POLE
- EXISTING GUY WIRE
- EX SIGN — EXISTING SIGN
- EX HYD — EXISTING FIRE HYDRANT
- EX WV — EXISTING WATERMAIN VALVE
- EX CS — EXISTING CURB STOP
- BOREHOLE No. — EXISTING BOREHOLE LOCATION
- EXISTING EMBANKMENT
- EXISTING TREE DRIPLINE
- EXISTING SANITARY SERVICE
- EXISTING STORM CULVERT
- EXISTING WATERMAIN
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- EXISTING CHAINLINK FENCE
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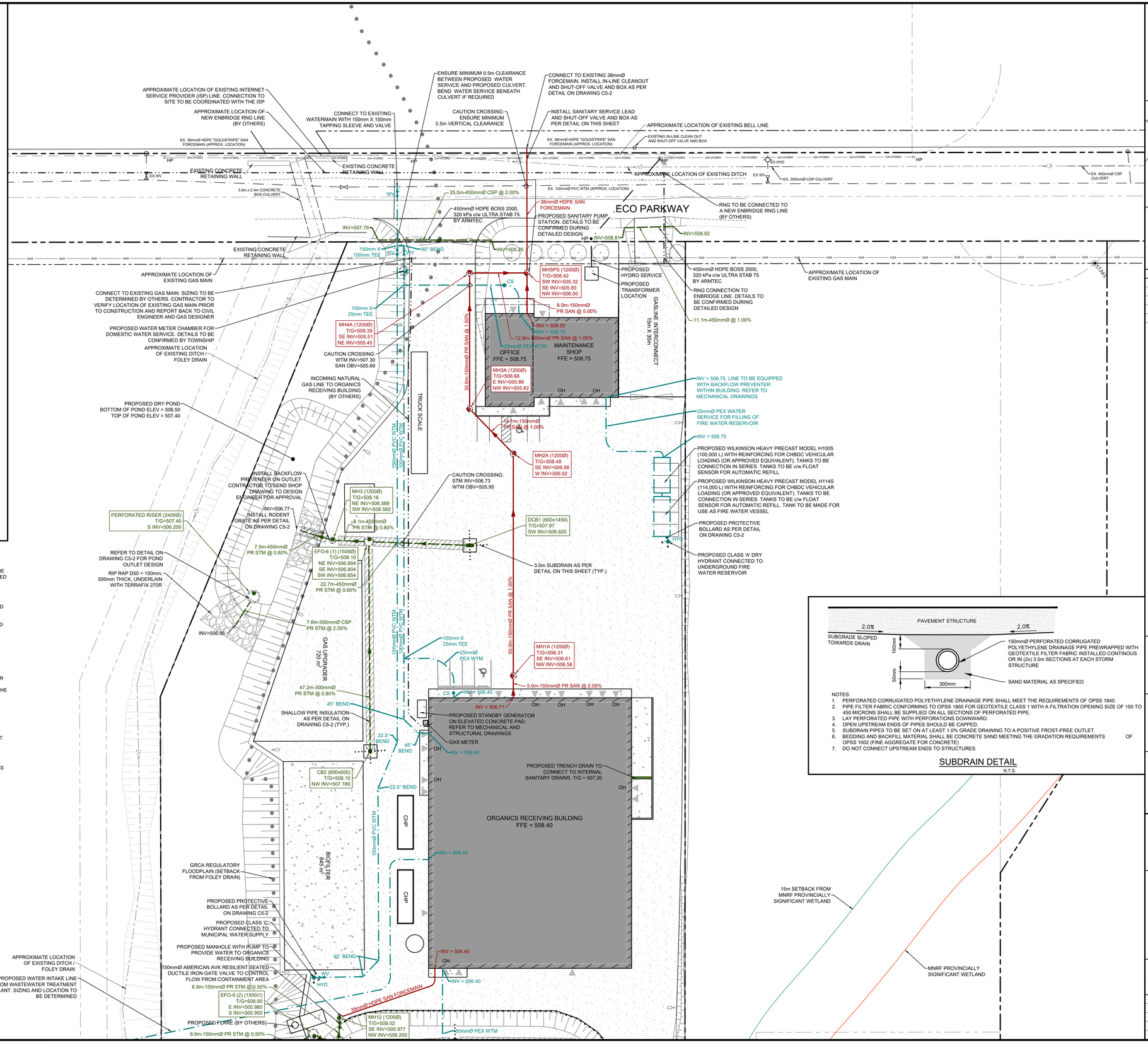
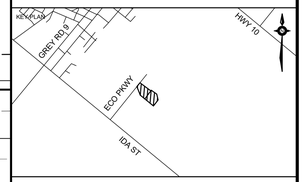


NOTES:
1. PERFORATED CORRUGATED POLYETHYLENE DRAINAGE PIPE SHALL MEET THE REQUIREMENTS OF OPSS 1840.
2. PIPE FILTER FABRIC CONFORMING TO OPSS 1860 FOR GEOTEXTILE CLASS 1 WITH A FILTRATION OPENING SIZE OF 150 TO 450 MICRONS SHALL BE SUPPLIED ON ALL SECTIONS OF PERFORATED PIPE.
3. LAY PERFORATED PIPE WITH PERFORATIONS DOWNWARD.
4. OPEN UPSTREAM ENDS OF PIPES SHOULD BE CAPPED.
5. SUBDRAIN PIPES TO BE SET ON AT LEAST 1.0% GRADE DRAINING TO A POSITIVE FROST-FREE OUTLET.
6. BEDDING AND BACKFILL MATERIAL SHALL BE CONCRETE SAND MEETING THE GRADATION REQUIREMENTS OF OPSS 1002 (FINE AGGREGATE FOR CONCRETE)
7. DO NOT CONNECT UPSTREAM ENDS TO STRUCTURES

SUBDRAIN DETAIL
N.T.S.



PROJECT NORTH — TRUE NORTH

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CLIENT
ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT
SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE
SERVICING PLAN (1 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER — T. B. KELLER — 100529026 — 2024.05.17 — PROVINCE OF ONTARIO

SCALE:	1:400
DATE:	2023.03.10
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	JZ / MH

SHEET NO.: C3-1

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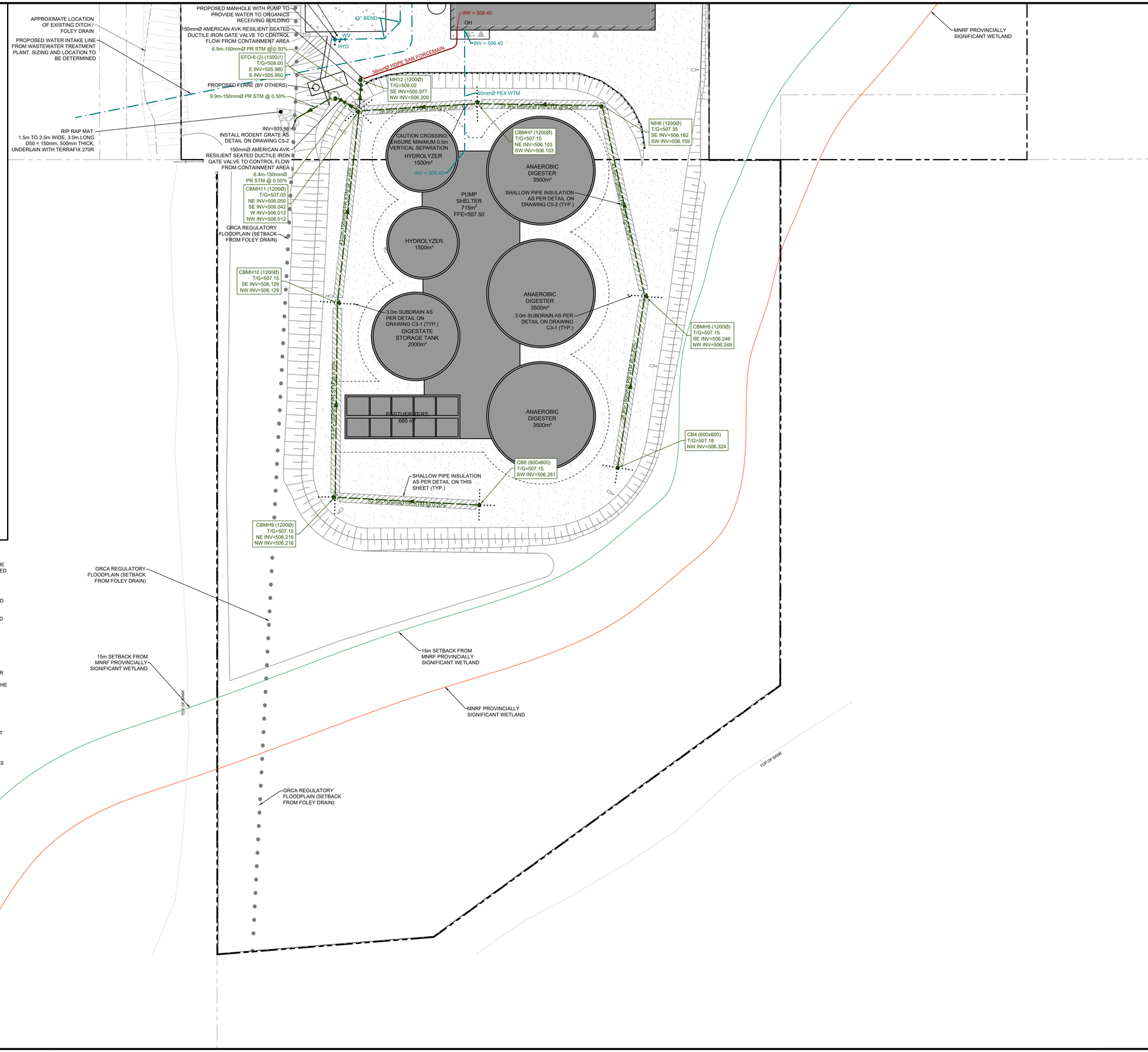

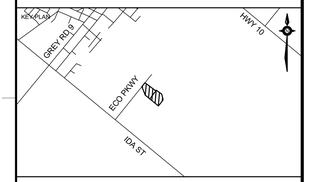

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CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

SERVICING PLAN (2 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

SCALE:	1:400
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CHECKED BY:	JZ / MH

SHEET NO.:

C3-2

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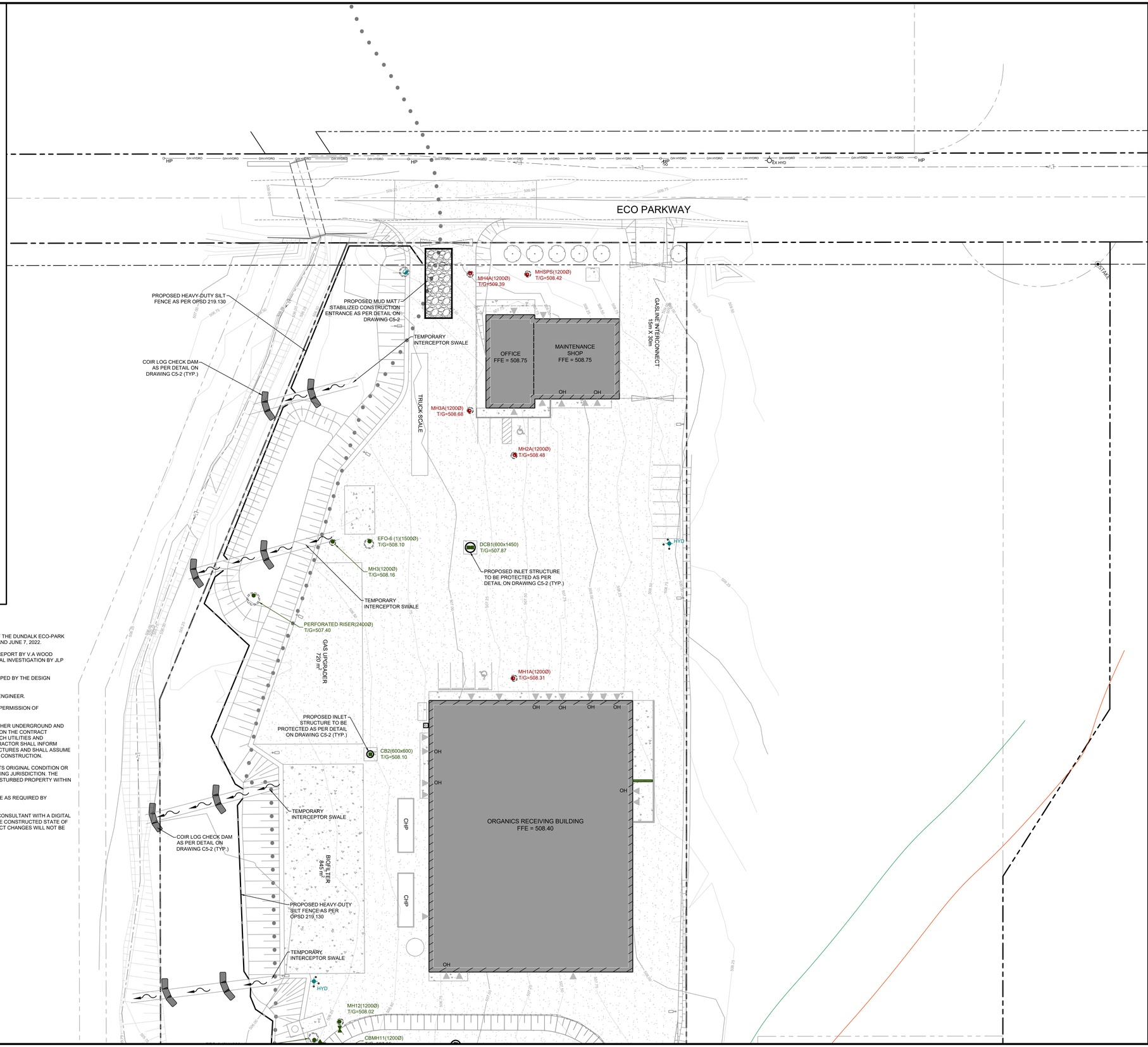

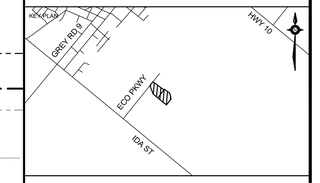

PROJECT NORTH

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CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

EROSION AND SEDIMENT CONTROL PLAN (1 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

SCALE:	1:400
DATE:	2023.03.10
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CHECKED BY:	JZ / MH

SHEET NO.: C4-1

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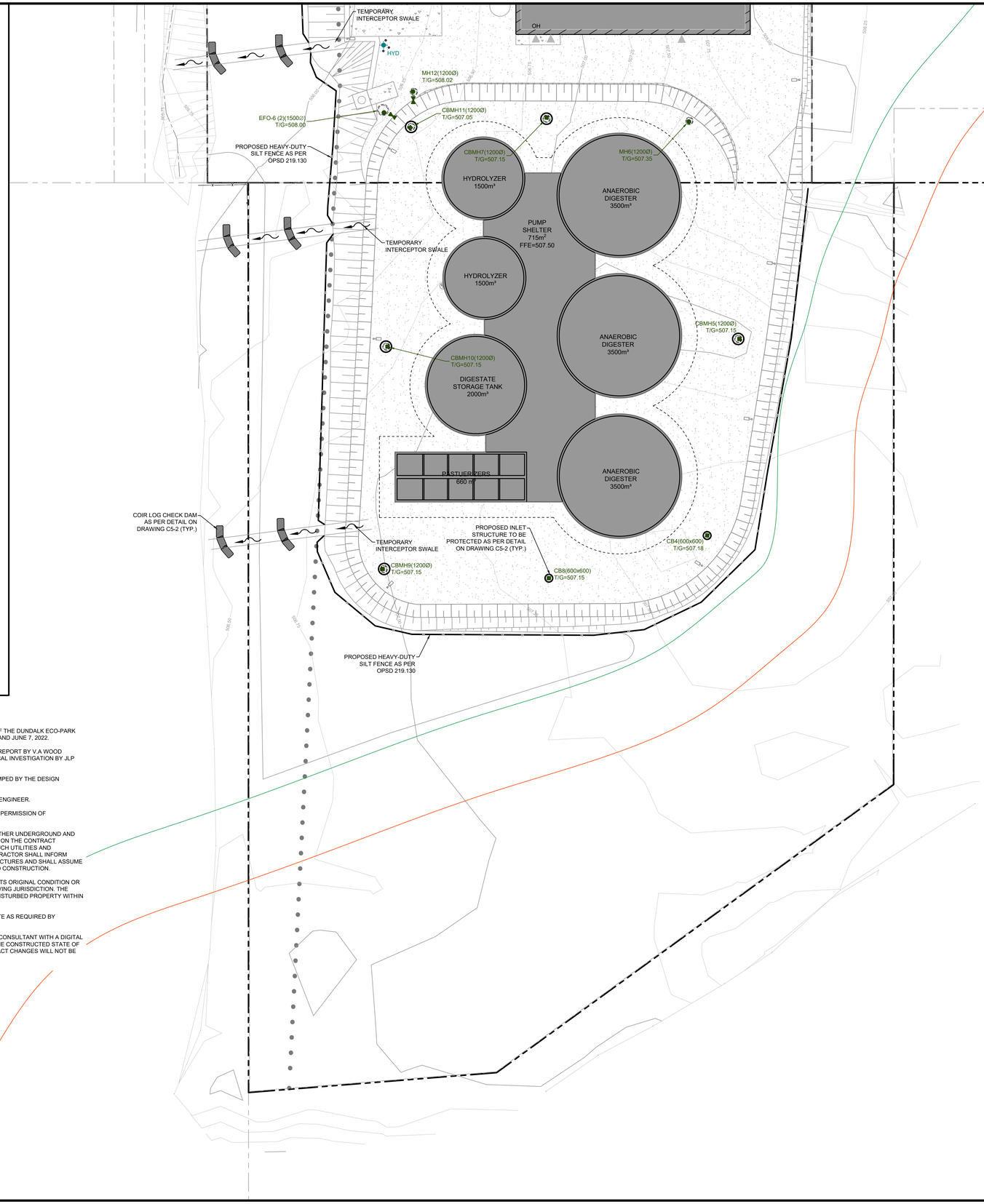
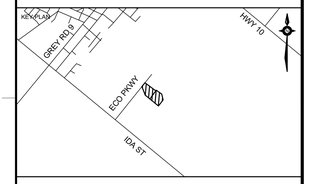
9. AT THE END OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE CONSULTANT WITH A DIGITAL FILE OF AS-CONSTRUCTED DRAWINGS. THE DRAWINGS MUST REFLECT THE CONSTRUCTED STATE OF THE WORK. SUBMISSION OF UNALTERED DESIGN DRAWINGS AND CONTRACT CHANGES WILL NOT BE ACCEPTED.





PROJECT NORTH TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED FOR SITE PLAN APPROVAL	
2024.05.17	REISSUED FOR SITE PLAN APPROVAL	

CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

EROSION AND SEDIMENT CONTROL PLAN (2 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
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LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

SCALE:	1:400
DATE:	2023.03.10
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	JZ / MH

SHEET NO.: C4-2

GENERAL NOTES

1. LEGAL BOUNDARY DATA AND EXISTING TOPOGRAPHICAL INFORMATION OF THE DUNDALK ECO-PARK LOT (THE SITE) FROM VAN HARTEN SURVEYING INC. DATED JULY 22, 2019 AND JUNE 7, 2022.
2. BOREHOLE LOCATIONS AND GEOTECHNICAL INFORMATION FROM DRAFT REPORT BY V.A WOOD (GUELPH) DATED JULY 2019 AND FROM THE SUPPLEMENTAL GEOTECHNICAL INVESTIGATION BY JLP SERVICES INC., DATED JANUARY 13, 2023.
3. THIS SET OF PLANS SHALL NOT BE USED FOR CONSTRUCTION UNTIL STAMPED BY THE DESIGN ENGINEER AND APPROVED BY THE LOCAL MUNICIPALITY.
4. NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.
5. THIS PLAN NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF WALTERFEDY.
6. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM AND THOSE NOT LOCATED PRIOR TO CONSTRUCTION.
7. ANY AREA DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ITS ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE CONSULTANT AND AUTHORITY HAVING JURISDICTION. THE CONTRACTOR IS RESPONSIBLE FOR RESTORING ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY TO MUNICIPAL STANDARDS.
8. ALL HEALTH AND SAFETY RELATED SIGNAGE MUST BE POSTED AT THE SITE AS REQUIRED BY APPLICABLE LAW AND BEST MANAGEMENT PRACTICES.
9. AT THE END OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE CONSULTANT WITH A DIGITAL FILE OF AS-CONSTRUCTED DRAWINGS. THE DRAWINGS MUST REFLECT THE CONSTRUCTED STATE OF THE WORK. SUBMISSION OF UNALTERED DESIGN DRAWINGS AND CONTRACT CHANGES WILL NOT BE ACCEPTED.

EROSION CONTROL NOTES

1. ALL EROSION CONTROL FENCING, TEMPORARY FILTRATION AND MUD MATS MUST BE INSTALLED BY THE CONTRACTOR AND INSPECTED BY THE CONSULTANT PRIOR TO COMMENCEMENT OF ANY AREA GRADING, EXCAVATING, OR DEMOLITION. CONTRACTOR TO NOTIFY CONSULTANT FOR INSPECTION.
2. ATTACH EROSION CONTROL FENCE TO EXISTING CHAINLINK FENCE WITHIN THE LIMITS OF THE SITE WHERE POSSIBLE.
3. EROSION CONTROL FENCING TO BE PLACED AROUND THE BASE OF ALL STOCKPILES. ALL STOCKPILES TO BE KEPT A MINIMUM OF 2.5m FROM PROPERTY LINES.
4. FILTER FABRIC TO BE TERRAFIX 270R OR APPROVED EQUIVALENT.
5. MUD MATS TO BE PROVIDED ON SITE AT ALL LOCATIONS WHERE CONSTRUCTION VEHICLES EXIT THE SITE. MUD MATS SHALL BE SUPPLIED AS INSTALLED AS PER THE DETAIL ON DRAWING C4-1. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MAT IS MAINTAINED IN A MANNER TO MAXIMIZE ITS EFFECTIVENESS AT ALL TIMES.
6. ALL DITCH INLET CATCHBASINS, CATCHBASINS AND CATCHBASIN MANHOLES TO HAVE TEMPORARY FILTRATION INSTALLED AND MAINTAINED AS PER THE DETAIL ON DRAWING C4-1.
7. NO ALTERNATE METHODS OF EROSION CONTROL PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY CONSULTANT AND THE AUTHORITY HAVING JURISDICTION.
8. ALL EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RE-STABILIZED EITHER BY PAVING OR RESTORATION WITH VEGETATIVE GROUND COVER.
9. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING SEDIMENTS FROM THE PUBLIC ROADWAY AND SIDEWALKS AT THE END OF EACH WORK DAY OR AS DIRECTED BY THE CONSULTANT.
10. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSPECTED BY THE CONTRACTOR AFTER MAJOR RAINFALL AND SNOWMELT EVENTS AND CLEANED OR REPLACED AS REQUIRED TO MEET THEIR INTENDED FUNCTION. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF ONE THIRD (1/3) THE STRUCTURE CAPACITY.
11. THE CONSULTANT SHALL MONITOR SITE DEVELOPMENT TO ENSURE ALL EROSION CONTROLS ARE INSTALLED AND MAINTAINED TO TOWNSHIP OF SOUTHGATE REQUIREMENTS. CONTRACTOR TO COMPLY WITH THE CONSULTANTS INSTRUCTIONS TO INSTALL, MODIFY, OR MAINTAIN EROSION CONTROL WORKS.
12. THIS PLAN TO BE READ IN CONJUNCTION WITH THE EXISTING CONDITIONS PLAN, SITE SERVICING PLAN, GRADING PLAN, LANDSCAPING PLAN, AND THE STORM WATER MANAGEMENT REPORT DATED OCTOBER 2020.

GRADING NOTES

1. MATCH EXISTING GRADES AT ALL PROPERTY LINES AND/OR LIMITS OF CONSTRUCTION EXCEPT WHERE PROPOSED GRADES ARE NOTED.
2. MANAGEMENT OF EXCESS MATERIALS SHALL BE IN ACCORDANCE WITH OPSS 180. ENVIRONMENTALLY IMPACTED SOILS, WHERE AND WHEN ENCOUNTERED, SHALL BE MANAGED ON SITE AS REQUIRED UNTIL SUCH TIME THAT LABORATORY TESTING RESULTS HAVE CONFIRMED THE NATURE OF THE IMPACTS AND A SUITABLE DISPOSAL METHOD.
3. SURPLUS MATERIAL OF ALL TYPES NOT REQUIRED FOR BACKFILL, GRADING OR LANDSCAPING SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND BE REMOVED FROM THE SITE AS DIRECTED BY THE CONSULTANT. THE COSTS OF ALL OFFSITE DISPOSAL SHALL BE BORNE BY THE CONTRACTOR UNLESS A SPECIFIC PROVISION IS MADE IN THE CONTRACT DOCUMENTS FOR PAYMENT FROM DISPOSAL OF A SPECIFIC SURPLUS MATERIAL.
4. MATERIALS TO BE REMOVED SHALL BE NEATLY SAW-CUT ALONG ITS LIMITS, IN ADVANCE OF THE REMOVAL. THE LIMITS OF REMOVAL SHALL BE AS NOTED ON THE PLANS UNLESS AN EXTENSION OR REDUCTION OF THE MATERIAL TO BE REMOVED IS APPROVED IN ADVANCE BY THE CONSULTANT. AS SUCH, THE COSTS OF ANY OVER-EXCAVATION NOT APPROVED IN ADVANCE SHALL BE THE FINANCIAL RESPONSIBILITY OF THE CONTRACTOR. THIS RESPONSIBILITY SHALL ALSO EXTEND TO RESTORATION OR REPLACEMENT OF DISTURBED FEATURES AND SURFACES DUE TO UNAUTHORIZED EXCAVATION.
5. ALL FILL PLACED ON SITE SHALL BE COMPACTED TO A MINIMUM 98% SPMDD (UNLESS OTHERWISE RECOMMENDED BY THE GEOTECHNICAL ENGINEER OR ON THE DRAWINGS AND IN THE SPECIFICATIONS). ALL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 200mm LIFTS EXCEPT WHERE UNDER PAVING, AND WALKS WHEN LAYERS SHALL BE 150mm MAX.
6. MAXIMUM SLOPE IN GRASSED AREAS TO BE 3:1. SLOPES GREATER THAN 3:1 TO BE LANDSCAPED WITH LOW MAINTENANCE GROUND COVER. MINIMUM SLOPE IN GRASSED AREAS TO BE 1%. GRASS SWALES WITH A SLOPE LESS THAN 1% TO BE UNDERLAIN WITH A FRENCH DRAIN.
7. FINISH GRADE AT FOUNDATION WALLS TO BE MINIMUM 150mm BELOW THE TOP OF FOUNDATION WALL/BRICK LINE UNLESS SPECIFIED OTHERWISE ON THE DRAWINGS.
8. CONTRACTOR TO PROVIDE POSITIVE DRAINAGE ON ALL SURFACES TO THE APPROPRIATE OUTLET STRUCTURE. AREAS OF PONDING CAUSED BY CONSTRUCTION ERROR WILL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE CONSULTANT AT THE CONTRACTORS EXPENSE.
9. SHOULD THE NATURE OF THE SOIL AT THE DEPTH INDICATED PROVE UNSATISFACTORY AS DETERMINED BY THE GEOTECHNICAL ENGINEER, THE EXCAVATION SHALL BE CARRIED DOWN TO SUCH A DEEPER LEVEL AS THE GEOTECHNICAL ENGINEER MAY REQUIRE UNTIL A SATISFACTORY BEARING STRATUM IS REACHED.
   - 9.1. THIS CONTRACTOR SHALL BE PAID THE COST OF SUCH EXTRA EXCAVATION AT THE UNIT PRICE ESTABLISHED IN THE CONTRACT (WRITER TO CONFIRM IN FRONT END).
   - 9.2. ALL EXTRA DEPTHS OF EXCAVATION AND FILLING MUST HAVE THEIR AREA AND VOLUME DOCUMENTED BY AN INDEPENDENT INSPECTION AND TESTING COMPANY OR THE CONSULTANT TO QUALIFY FOR PAYMENT.
   - 9.3. QUANTITIES USED FOR PAYMENT OF EXCAVATION AND FILLING AT EXTRA DEPTHS TO BE DETERMINED BY THE CONSULTANT.

GENERAL SERVICING

1. ALL WORK TO BE COMPLETED IN ACCORDANCE WITH THE REGULATIONS SET OUT BY THE MUNICIPALITY HAVING JURISDICTION.
2. RIGID PIPE BEDDING: CLASS 'B' AS PER OPSD 802.030 (EARTH EXCAVATION, TYPE 1 OR 2 SOIL), OPSD 802.031 (EARTH EXCAVATION, TYPE 3 SOIL), OPSD 802.032 (EARTH EXCAVATION, TYPE 4 SOIL)
3. FLEXIBLE PIPE BEDDING: AS PER OPSD 802.010 (EARTH)
4. NATIVE FILL MATERIAL IN ACCORDANCE WITH SECTION 31 30 00 SHALL BE DEPOSITED IN THE TRENCH, FOR THE FULL WIDTH OF THE TRENCH, COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY IN LAYERS NOT OVER 300mm DEPTH, EXCEPT WHERE UNDER PAVING, AND WALKS WHEN LAYERS SHALL BE 150mm MAX.
5. SITE SERVICING CONTRACTOR TO TERMINATE ALL SERVICES 1.0m FROM FOUNDATION WALL AND COORDINATE WITH THE GENERAL OR MECHANICAL CONTRACTOR AS REQUIRED TO FACILITATE THE CONNECTION.
6. WHEN BELL AND SPIGOT PIPE IS LAID, THE BELL END OF THE PIPE SHALL BE LAID UPGRADE.
7. PIPE SHALL BE KEPT CLEAN AND DRY AS WORK PROGRESSES. THE TRENCH SHALL BE KEPT DRY.
8. A REMOVABLE WATERTIGHT BULKHEAD SHALL BE INSTALLED DAILY AT THE OPEN END OF THE LAST PIPE LAID.
9. PIPE SHALL NOT BE LAID UNTIL THE PRECEDING PIPE JOINT HAS BEEN COMPLETED AND THE PIPE IS BEDDED AND SECURED IN PLACE.
10. ALL PIPE ENDS SHALL BE THOROUGHLY CLEANED PRIOR TO THE INSTALLATION OF GASKETS. ALL GASKETS TO BE LUBRICATED PRIOR TO BEING INSTALLED OR AS RECOMMENDED BY THE PIPE MANUFACTURER.
11. A TEMPORARY LOCATION MARKER 50x75mm SHALL BE PLACED AT THE END OF ALL CAPPED SERVICE CONNECTIONS. THE MARKER SHALL BE PLACED 300mm ABOVE THE PLUGGED END OF THE SERVICE PIPE, CUT AT LEAST 500mm ABOVE THE FINISHED GRADE, AND MARKED WITH BRIGHT PAINT.
12. ALL MANHOLES, BASINS, CHAMBERS ETC. TO BE INSTALLED LEVEL AND PLUMB TO THE SATISFACTION OF THE CONSULTANT.

STORM AND SANITARY SEWER

1. POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS: SMOOTH PROFILES, TO OPSS 1841 AND CSA B182.2, WITH SEPARATE GASKET AND INTEGRAL BELL SYSTEM, IN 6.0m NOMINAL LENGTHS AS FOLLOWS:
   - 1.1. 200mm OD AND LARGER: SDR35 PVC WITH 320 kPa STIFFNESS.
2. SUBSURFACE DRAINAGE PIPE AND FITTINGS: TO OPSS 405, PERFORATED PVC PIPE TO OPSS 1841 OR PE PIPE TO OPSS.MUNI 1840, TO CAN/CSA-B182.1; COMPLETE WITH KNITTED SOCK GEOTEXTILE AS REQUIRED (TERRAFIX 270R OR EQUIVALENT).
3. CORRUGATED STEEL PIPE (CSP): TO OPSS 1801 AND CSA G401, COMPLETE WITH COUPLINGS, NEOPRENE GASKETS, BENDS AND OTHER FITTINGS; JOINTING TO BE 2-PIECE BAND WITH ANGLES COMPLETE WITH NEOPRENE GASKETS FOR NON-PERFORATED PIPE.
4. MANHOLES AND CATCHBASIN MANHOLES TO BE PRECAST 1200mm DIAMETER WITH ALUMINUM STEPS AT 300mm SPACING AS PER OPSD 701.010 UNLESS SPECIFIED OTHERWISE.
5. CATCHBASINS TO BE 600mm SQUARE PRECAST AS PER OPSD 705.010. DOUBLE CATCHBASINS TO BE 600x1450mm PRECAST AS PER OPSD 705.020.
6. CATCHBASIN MANHOLES, CATCHBASINS, AND DOUBLE CATCHBASINS TO HAVE A MINIMUM 600mm DEEP SUMP.
7. MANHOLE AND CATCHBASIN, FRAMES, GRATES, CASTINGS, LIDS TO BE AS PER OPSS 1850.
8. CAST IRON FRAMES AND COVERS OR GRATES- STORM SEWERS: TO OPSS 1850 AND (OPSD 400.010, OPSD 400.020), OPSD 401.010 (A, CLOSED).
9. STORM SEWERS AND SERVICES TO HAVE MINIMUM 1.2m COVER TO TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED SEWER PIPE IN ACCORDANCE WITH APPLICABLE 'SEWER PIPE INSULATION DETAIL' INDICATED IN DRAWING DETAILS.
10. ALL PIPES, TO BE INSTALLED FLUSH WITH THE INSIDE WALLS OF THE STRUCTURE AND PARGED TO A SMOOTH FINISH.
11. ALL MANHOLES TO BE PRE-BENCHED OR BENCHED WITH 30MPa CONCRETE AS PER OPSD 701.021. BENCHING SHALL EXTEND TO THE SPRING LINE OF LARGEST PIPE IN THE MANHOLE AND SHALL HAVE A SLOPE OF 1:8.
12. CONTRACTOR TO SUPPLY AND PAY FOR CCTV INSPECTION OF ALL SEWER LINES AND STRUCTURES.
13. ACCEPTANCE OF SEWER LINES AND STRUCTURES SHALL BE MADE AFTER THE CONSULTANT HAS REVIEWED THE CCTV DOCUMENTATION AND VIDEOS, AND EXPRESSED IN WRITING THAT THE SEWER LINES AND STRUCTURES ARE ACCEPTABLE.
14. IF CCTV INSPECTIONS SHOW ADDITIONAL CLEANING IS REQUIRED, CLEAN AND RE-INSPECT THE SEWER UNTIL ACCEPTED BY THE CONSULTANT.
15. A MINIMUM OF ONE (1) AND MAXIMUM OF THREE (3) ADJUSTMENT UNITS SHALL BE INSTALLED ON EACH STRUCTURE TO A MINIMUM HEIGHT OF 75mm AND MAXIMUM OF 300mm. THE FIRST ADJUSTMENT UNIT SHALL BE LAID IN A FULL BED OF MORTAR AND ALIGNED WITH THE OPENING IN THE STRUCTURE. SUCCESSIVE ADJUSTMENT UNITS SHALL BE LAID PLUMB TO THE FIRST ADJUSTMENT UNIT AND SEALED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS. FRAMES WITH GRATES OR COVERS SHALL BE SET IN A FULL BED OF MORTAR ON THE ADJUSTMENT UNITS AND SUPPORTED USING SHIMS. ROCKS, STONES AND DEBRIS WILL NOT BE PERMITTED FOR USE AS SHIMS.

FORCEMAIN

1. FORCEMAIN SHALL BE DR26 PVC WITH GASKETED OR FUSION WELDED JOINTS OR DR17 HDPE WITH FUSION WELDED JOINTS.
2. CONSTRUCTION TO CONFORM TO OPSS 412. ALL PRODUCTS TO BE CSA CERTIFIED.
3. INSTALL NO. 14 A.W.C.TYPE T.W.V. 75 660V INSULATED STRANDED COPPER TRACK WIRE RATED FOR UNDERGROUND USE ON ALL FORCEMAINS AND SERVICES.
4. PIPE BEDDING AND BACKFILL TO CONFORM TO OPSD 802.010 AND 802.013. PIPE EMBEDMENT MATERIAL TO SPRINGLINE SHALL CONSIST OF GRANULAR “A” . BEDDING FROM SPRINGLINE TO 300MM ABOVE THE PIPE SHALL CONSIST OF SAND. TRENCH BACKFILL SHALL CONSIST OF APPROVED NATIVE MATERIAL COMPACTED TO 95% SPD. SEE FORCEMAIN BEDDING DETAIL.
5. ALL FORCEMAINS TO HAVE MIN. 2.0m COVER.
6. ALL ELBOW BENDS, BOTH VERTICAL AND HORIZONTAL SHALL BE RESTRAINED AT JOINTS.

WATERMAINS

1. POLYVINYL CHLORIDE (PVC) PIPE: MANUFACTURED TO CAST IRON OD (CIOD); COLOUR CODED BLUE, WITH INTEGRAL WALL THICKENED BELL DESIGNED FOR JOINT ASSEMBLY USING AN ELASTOMERIC GASKET CONFORMING TO ASTM D3139 AND CSA B137.3., TO CSA B137.3, COMPLETE WITH TRACER WIRE.
   - 1.1. 100 TO 300mm: TO AWWA C900, DR 18, IPEX OR APPROVED EQUAL.
2. ALL WATER SERVICING TO HAVE MINIMUM 2.0m COVER.
3. ALL WATER SERVICING PROVIDING FIRE FLOWS MUST BE PRESSURE TESTED TO 200 PSI AS PER THE OBC PLUMBING CODE.
4. FITTINGS: FOR POLYVINYL CHLORIDE (PVC) AND MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVCO) PIPE SHALL BE EITHER:
   - 4.1. GRAY IRON ACCORDING TO AWWA C110/A21.10.
   - 4.2. DUCTILE IRON ACCORDING TO C110/A21.10 OR AWWA C153 AND SHALL BE CEMENT LINED ACCORDING TO AWWA C104/A21.4.
   - 4.3. INJECTION MOULDED POLYVINYL CHLORIDE, BLUE IN COLOUR AND ACCORDING TO AWWA C907 AND CSA B137.2.
   - 4.4. PREFABRICATED POLYVINYL CHLORIDE, BLUE IN COLOUR AND ACCORDING TO AWWA C905 AND CSA B137.3.
5. JOINT RESTRAINTS:
   - 5.1. FOR PVC PIPE AND FITTINGS: TO ASTM F1674 AND AWWA C111, SERRATED RING TYPE; FOR PUSH ON JOINTS UNIFLANGE (SERIES 1300, 1350 & 1360), EBAA (SERIES 1600, 2500 & 2800) OR CLOW (SERIES 300 & 350); OR WEDGE ACTION TYPE AS MANUFACTURED BY EBAA (SERIES 2000PV), OR UNIFLANGE (SERIES 1500) AND STAR STARGRIP 4000, 4100P.
   - 5.2. FOR PVCO PIPE (AWWA C909) AND FITTINGS: SERRATED RING TYPE; FOR PUSH ON JOINTS UNIFLANGE (SERIES 1360), EBAA (SERIES 2500); WEDGE ACTION TYPE AS MANUFACTURED BY CLOW (SERIES 2000 TUF GRIP), STAR (STARGRIP 3500).
   - 5.3. ALL MECHANICAL JOINTS IN TEMPORARY AND PERMANENT CONNECTIONS TO INCLUDE MECHANICAL JOINT RESTRAINTS.
   - 5.4. WATERMAIN FITTINGS WHICH CHANGE DIRECTIONS VERTICALLY OR HORIZONTALLY TO BE FULLY RESTRAINED BY MECHANICAL JOINT RESTRAINT OR THRUST BLOCKS (OPSD 1103.01 AND 1103.02). THREADED ROD WILL NOT BE PERMITTED.
   - 5.5. WATERMAIN FITTINGS TO BE SUPPLIED WITH MECHANICAL JOINT RESTRAINTS. FOR WATERMAIN PIPE SIZES 150mmØ OR LESS ALL PIPE JOINTS TO BE RESTRAINED WITHIN 5.0m FROM ALL FITTINGS, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. FOR WATERMAIN PIPE SIZES GREATER THAN 150mmØ ALL PIPE JOINTS TO BE RESTRAINED WITHIN 10.0m FROM ALL FITTING, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. ALL TEES TO HAVE MINIMUM 2.0m SOLID PIPE LENGTH ON EACH RUN OF THE TEE, OR PROVIDE A THRUST BLOCK PER OPSD 1103.010.
6. TRACER WIRE:
   - 6.1. T.W.U. #12 GAUGE MULTI-STRANDED COPPER WIRE.
   - 6.2. PVC WATERMAIN SHALL HAVE TWO STRANDED COPPER, AWG #8 TRACER WIRE STRAPPED TO TOP AT 5.0m INTERVALS. TRACER WIRE SHALL BE BROUGHT TO THE SURFACE AT ALL HYDRANTS AND CONNECTED TO THE LOWER FLANGE OF THE HYDRANT.
   - 6.3. DO NOT CONNECT THE TRACER WIRE ON NON-METALLIC SYSTEMS TO NEW OR EXISTING METALLIC WATERMAIN PIPING AND/OR ASSOCIATED FITTINGS
7. WATERMAIN VALVES, 100mm AND LARGER, SHALL BE AS PER AWWA C509-MUELLER A2360-23 OR APPROVED EQUIVALENT (OPEN LEFT) INCLUDING VALVE BOX AND DZP-12 5.4kg ANODE.
8. HYDRANTS: CONFORM TO AWWA C502 FOR DRY-BARREL HYDRANTS, WITH TWO 63.5mm HOSE NOZZLES AT 180 DEGREES AND A 114.3mm PUMPER NOZZLE WITH A 100mm ULC APPROVED STORTZ CONNECTION; 32mm SQUARE OPERATING NUT, OPEN COUNTER-CLOCKWISE AND HAVE MECHANICAL JOINT END; COMPLETE WITH 150mm LEAD, 150mm GATE VALVE, ANCHOR TEE, VALVE AND BOX PROVIDED IN ACCORDANCE WITH THE TOWNSHIP OF SOUTHGATE.
9. SERVICE PIPE:
   - 9.1. SERVICES LESS THAN 100mm: TYPE K SOFT COPPER, TO ASTM B88 OR POLYETHYLENE TO CSA B137.1 WITH INSERTS (STIFFENER) USED AT CONNECTIONS. OR CROSS-LINKED POLYETHYLENE ("MUNICIPEX" BY REHAU AND "BLUE904" BY IPEX). COPPER SERVICES SHALL HAVE 5.5Kg ANODE.
   - 9.2. SERVICES 100mm OR GREATER: PVC CLASS 150 TO CSA B137.3.
10. ANODES TO BE PROVIDED AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION AND TO THE REQUIREMENTS OUTLINED IN THE CONTRACT SPECIFICATIONS. ANODES TO BE DZP-12 5.4kg ANODE
11. PETROLATUM TAPE SYSTEMS: TO BE COMPRISED OF THREE COMPONENTS; PASTE, MASTIC, AND TAPE THAT MEET AWWA C217-09, SUPPLIED BY DENSO NORTH AMERICA INC. OR PETRO COATING SYSTEMS LTD. OR RUSTROL SYSTEMS (INTERPROVINCIAL CORROSION CONTROL COMPANY LTD.). ONLY MATERIAL FROM SUPPLIERS LISTED SHALL BE USED. AT NO TIME SHALL MATERIALS FROM EITHER SYSTEM BE UTILISED WITH ONE AND OTHER.
   - 11.1. ALL MECHANICAL JOINT RESTRAINTS TO BE WRAPPED WITH APPROVED PETROLEUM TAPE SYSTEM.
12. PROVIDE ADEQUATE SUMP BELOW CONNECTION, AND PUMPING IF REQUIRED, TO PREVENT CONTAMINATION OF NEW WATERMAIN WITH TRENCH GROUND WATER OR ANY OTHER FOREIGN MATTER.
13. ALL WATERMAIN AND SERVICE COMMISSIONING, PRESSURE/LEAKAGE TESTING, DISINFECTION, BACTERIOLOGICAL ANALYSIS AND FLUSHING TO BE SUCCESSFULLY COMPLETED BY THE CONTRACTOR AND ACCEPTED BY THE TOWNSHIP OF SOUTHGATE AND CONSULTANT PRIOR TO PERMANENT CONNECTION TO WATER DISTRIBUTION SYSTEM. REFER TO CONTRACT SPECIFICATIONS FOR REQUIREMENTS.
   - 13.1. CONTRACTOR TO SUBMIT A WATERMAIN COMMISSIONING PLAN TO THE CONSULTANT AND TOWNSHIP OF SOUTHGATE AT LEAST TWO WEEKS PRIOR TO CHLORINE RESIDUAL & BACTERIOLOGICAL TESTING.

CONSTRUCTION NOTES

GENERAL

1. PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST:
   - 1.1. CHECK AND VERIFY ALL DIMENSIONS AND EXISTING ELEVATIONS WHICH INCLUDES, BUT IS NOT LIMITED TO, THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS AND EXISTING INVERTS.
   - 1.2. OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.
   - 1.3. VERIFY THAT THE FINISHED FLOOR ELEVATIONS COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.
   - 1.4. CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION.
   - 1.5. REPORT DISCREPANCIES IN EXISTING CONDITION INFORMATION IMMEDIATELY TO THE CONSULTANT.
2. THE CONTRACTOR SHALL ASSUME ALL LIABILITY FOR DAMAGE TO EXISTING WORKS. DAMAGE SHALL BE RECTIFIED TO THE SATISFACTION OF THE CONSULTANT AND OWNER.
3. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SUPPORT AND/OR RELOCATION OF EXISTING UTILITIES DURING CONSTRUCTION. THE CONTRACTOR SHALL COORDINATE AND COMPLY WITH THE REQUIREMENTS OF ALL UTILITY COMPANIES WHEN CROSSING OR WORKING NEAR THEIR PLANT.
4. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE ACCURACY OF ALL TEMPORARY BENCHMARKS ESTABLISHED FOR DESIGN PURPOSES, PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES TO THE CONTRACT ADMINISTRATOR BEFORE COMMENCING WORK.
5. THE CONTRACTOR SHALL CONTACT THE CONSULTANT 48 HOURS PRIOR TO COMMENCING WORK TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION.
6. THE RIGHT-OF-WAY (INCLUDING THE BOULEVARD) IS NOT TO BE USED FOR ANY CONSTRUCTION ACTIVITY UNTIL A WORK PERMIT HAS BEEN OBTAINED AS PER THE TOWNSHIP OF SOUTHGATE REQUIREMENTS.
7. ALL WORK ON THE MUNICIPAL RIGHT-OF-WAY WILL BE INSTALLED BY THE SITE CONTRACTOR UPON SUCCESSFUL APPLICATION FOR A WORK PERMIT BY THE CONTRACTOR.
8. LIMIT CONSTRUCTION TO ACCEPTABLE TIMES WITHIN THE TOWNSHIP OF SOUTHGATE NOISE BYLAW. CONSTRUCTION HOURS ARE 7AM TO 8PM MONDAY TO SATURDAY, AND 9AM TO 6PM ON SUNDAY, WITHOUT EXCEPTION.
9. IF, FOR UNFORESEEN REASONS, THE OWNER AND/OR THEIR REPRESENTATIVE MUST ENCROACH ONTO PRIVATE LANDS TO UNDERTAKE ANY WORKS, THEY MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNERS PRIOR TO ENTERING UPON THE PRIVATE PROPERTY TO PERFORM ANY WORKS. COPIES OF THESE LETTERS OF CONSENT MUST BE SUBMITTED TO TOWNSHIP OF SOUTHGATE ENGINEERING DEVELOPMENT DIVISION, PRIOR TO ANY WORK BEING PERFORMED. FAILURE TO COMPLY WITH THE ABOVE IS AT THE PROPERTY OWNER'S & CONTRACTOR'S OWN RISK.

TRAFFIC, ACCESS, SAFETY

1. PEDESTRIANS MUST BE ASSURED SAFE PASSAGE ALONG ECO PARKWAY AT ALL TIMES. ALL PEDESTRIAN WALKWAYS MUST BE MAINTAINED AS LONG AS POSSIBLE AFTER WHICH TIME IT IS TEMPORARILY REPLACED BY A SUITABLE GRANULAR MATERIAL TO THE SATISFACTION OF THE CONSULTANT AND TOWNSHIP OF SOUTHGATE.
2. ON STREET PARKING WILL NOT BE PERMITTED FOR ANY CONSTRUCTION VEHICLES OR CONSTRUCTION STAFF. THE CONTRACTOR SHALL PROVIDE ADEQUATE PARKING FACILITIES ON SITE TO SUIT THE NATURE AND LOCATION OF THE WORK.
3. FOR EMERGENCY RESPONSE, CONTRACTOR MUST MAINTAIN CONSTRUCTION ACCESS FREE AND CLEAR OF DEBRIS, MATERIALS, VEHICLES, AND EQUIPMENT.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD INCLUDING THE SUPPLY, INSTALLATION, AND REMOVAL OF ALL NECESSARY SIGNALS, DELINEATORS, MARKERS, AND BARRIERS. ALL SIGNS, ETC. SHALL CONFORM TO THE STANDARDS OF THE TOWNSHIP OF SOUTHGATE AND THE MTO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

REMOVALS

1. ALL REMOVALS TO BE IN ACCORDANCE WITH OPSS.MUNI 510.

CONCRETE

1. UNSHRINKABLE FILL: TO OPSS 1359, 28-DAY COMPRESSIVE STRENGTH: 0.4 - 0.7 MPa, MAXIMUM 25mm COURSE AGGREGATE SIZE.
2. SUBMIT ONE COPY OF ALL PROPOSED CONCRETE MIX DESIGNS DIRECTLY TO THE CONSULTANT A MINIMUM OF TWO WEEKS IN ADVANCE OF SCHEDULED CONCRETE POURING.

GRANULAR

1. ALL GRANULAR BASE, SUBBASE, SUBGRADE AND BACKFILL TO BE PROVIDED AS PER OPSS.MUNI 1010 AND INSTALLED AS PER OPSS.MUNI 314.
2. COARSE GRANULAR FILL: MATERIAL AS SPECIFIED BELOW; COMPACTED TO 98% STANDARD PROCTOR MAXIMUM DRY DENSITY, UNLESS SPECIFIED OTHERWISE, IN LIFTS NOT EXCEEDING 300mm IN COMPACTED THICKNESS; MOISTURE CONTENT WITHIN PLUS OR MINUS 2% OF THE REQUIREMENTS OF ASTM D698.
   - 2.1. GRANULAR 'B', TYPE 2 TO OPSS.MUNI 1010.
3. FINE GRANULAR FILL: MATERIAL AS SPECIFIED BELOW; COMPACTED TO 98% STANDARD PROCTOR MAXIMUM DRY DENSITY, UNLESS SPECIFIED OTHERWISE, IN LIFTS NOT EXCEEDING 150mm IN COMPACTED THICKNESS; MOISTURE CONTENT WITHIN PLUS OR MINUS 2% OF THE REQUIREMENTS OF ASTM D698.
   - 3.1. GRANULAR 'A' TO OPSS.MUNI 1010.

EARTHWORK

1. IN ACCORDANCE WITH THE TOWNSHIP OF SOUTHGATE SITE ALTERATION BY-LAW; NO FILLING, PRE-GRADING OR TREE REMOVAL SHALL OCCUR, IN ADVANCE OF THE FINAL SITE PLAN ENGINEERING ACCEPTANCE, WITHOUT PERMIT. SHOULD THE DEVELOPER OR CONTRACTOR WISH TO PREPARE THE SITE FOR CONSTRUCTION PRIOR TO ENGINEERING ACCEPTANCE, AN APPLICATION FOR A SITE ALTERATION PERMIT MUST BE SUBMITTED BY THE CONTRACTOR TO THE ENGINEERING AND CONSTRUCTION DIVISION FOR REVIEW AND APPROVAL.
2. ANY AREAS WHICH REQUIRE FILL IN EXCESS OF 0.30m ARE SUBJECT TO COMPACTION TESTS AND SUCH TESTS MUST SHOW A MINIMUM COMPACTION OF 98% SPMDD AT ALL DEPTHS.
3. RETAINING WALLS TO BE DESIGNED BY OTHERS. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ALL PROPOSED RETAINING WALLS, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER CERTIFIED IN THE PROVINCE OF ONTARIO TO THE CONSULTANT, PRIOR TO CONSTRUCTION. SHOP DRAWINGS TO BE APPROVED BY CONSULTANT IN ADVANCE OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE A CERTIFICATE OF COMPLETION COMPLETED BY A CERTIFIED INSPECTION COMPANY BEFORE ACCEPTANCE OF THE WORK.

TOPSOIL/SOD

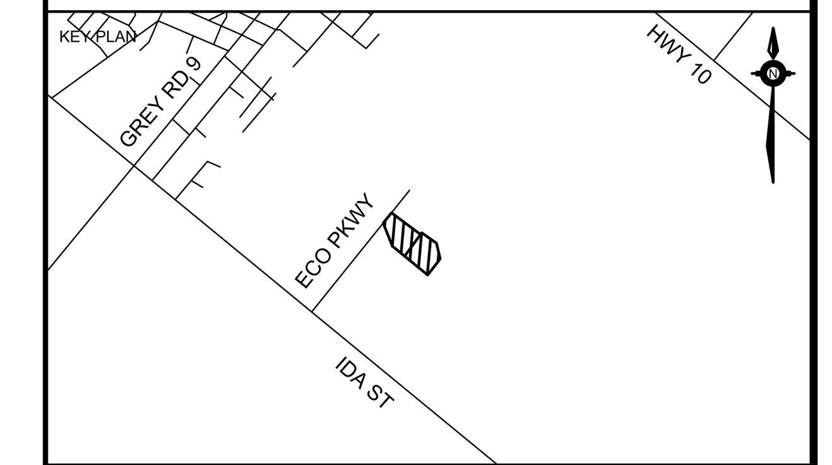
1. TOPSOIL TO BE PROVIDED AND INSTALLED AS PER OPSS 802. SOD TO BE PROVIDED AND INSTALLED AS PER OPSS 803.

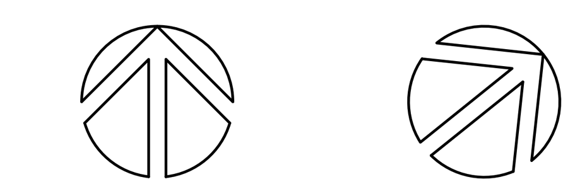
OTHER

1. ALL EXISTING SIGNS, MAIL BOXES, POSTS, ETC., WHICH MUST BE REMOVED TO ACCOMMODATE CONSTRUCTION SHALL BE SALVAGED AND REINSTATED AS DIRECTED BY THE CONTRACT ADMINISTRATOR IN EQUAL OR BETTER CONDITION. THE CONTRACTOR SHALL MAKE GOOD ANY DAMAGE CAUSED TO SUCH FACILITIES AT HIS OWN EXPENSE. ALL EXISTING TRAFFIC CONTROL SIGNS MUST BE REINSTATED BY THE END OF EACH WORKING DAY. EXISTING STOP CONTROL SIGNS SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION TO THE SATISFACTION OF THE ROAD AUTHORITY AND THE CONTRACT ADMINISTRATOR.

LANDSCAPE NOTES

1. ALL WORKMANSHIP SHALL CONFORM TO THE LANDSCAPE ONTARIO SPECIFICATIONS STANDARDS.
2. ALL NURSERY STOCK SHALL MEET STANDARDS OF THE CANADIAN NURSERY TRADES ASSOCIATION, LATEST EDITION.
3. ALL PLANT MATERIAL SHALL BE STAKED FOR LOCATION BY LANDSCAPE ARCHITECT AND CONTRACTOR JOINTLY.
4. BACKFILL IS TO CONSIST OF MATERIAL NATIVE TO THE SITE.
5. ALL TREES SHALL HAVE AN EARTH SAUCER AT ITS BASE WITH A DIAMETER AS LARGE AS EXCAVATED AREA TO RETAIN WATER.
6. ALL BURLAP SHALL BE CUT AND BURIED BELOW SURFACE DURING PLANTING.
7. CONTRACTOR SHALL MAINTAIN ALL LANDSCAPE AREAS UNTIL OWNER'S ACCEPTANCE OF PROJECT.
8. SPREAD MULCH TO A MINIMUM 100mm COMPACTED DEPTH ON ALL TREE PITS AND PLANTING BEDS.
9. STAKING OF TREES SHALL BE AS PER MUNICIPAL STANDARDS. ALTERNATIVE METHODS MAY BE ACCEPTABLE WITH THE APPROVAL OF THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
10. REPORT ALL DISCREPANCIES IN WRITING TO THE LANDSCAPE ARCHITECT AND CONSULTANT.
11. CONTRACTOR TO LOCATE ALL UNDERGROUND UTILITIES PRIOR TO ANY WORK.
12. PLANTING MAY BE ADJUSTED TO SUIT LOCATIONS OF SITE UTILITY STRUCTURES/SERVICES.
13. SUBMIT A WRITTEN GUARANTEE TO THE EFFECT THAT ALL PLANTS ACCEPTED DURING THE PERIOD OF JANUARY 1st TO JULY 15th SHALL BE GUARANTEED UNTIL JULY 15th THE FOLLOWING YEAR. PLANTS ACCEPTED DURING THE PERIOD OF JULY 15th TO DECEMBER 31st SHALL BE GUARANTEED FOR ONE YEAR FROM THE DATE OF ACCEPTANCE. THE GUARANTEE PERIODS LISTED ABOVE SHALL APPLY TO ALL "NURSERY GROWN" PLANTS.
14. ALL MATERIALS TO BE APPROVED BY LANDSCAPE ARCHITECT AND CONSULTANT PRIOR TO INSTALLATION.
15. CHECK AND VERIFY ALL DIMENSIONS AND QUANTITIES PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE LANDSCAPE ARCHITECT AND CONSULTANT. QUANTITIES NOTED WITHIN THE PLAN SUPERSEDE THOSE IN THE PLANT SCHEDULE. ANY SUBSTITUTIONS ARE TO BE APPROVED BY THE LANDSCAPE ARCHITECT AND CONSULTANT.
16. PLANTING BEDS ARE TO BE MOUNDED A MINIMUM 100mm.
17. SOD ANY AREAS MARKED WITH NURSERY SOD ON 200mm CLEAN TOPSOIL. FINE GRADE AND SOD ALL BOULEVARD AREAS TO MUNICIPAL SPECIFICATIONS AND REPAIR DAMAGE TO ADJACENT PROPERTIES, AS REQUIRED. REFER TO WRITTEN SPECIFICATION RELATED TO THIS PROJECT FOR TURF GRASS MIXTURE.
18. FINAL INSPECTION AND ACCEPTANCE OF PLANTING WORK SHALL COINCIDE WITH THE FINAL INSPECTION AND ACCEPTANCE OF ALL WORK INCLUDED IN THE CONTRACT.
19. AT THE TIME OF FINAL INSPECTION ALL PLANTS SHALL BE IN A HEALTHY, VIGOUROUS GROWING CONDITION, PLANTED IN FULL ACCORDANCE WITH DRAWINGS AND CONDITIONS.





DATE	ISSUANCE	NO.
2023.03.29	ISSUED FOR SITE PLAN APPROVAL	
2024.05.17	REISSUED FOR SITE PLAN APPROVAL	

CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

NOTES

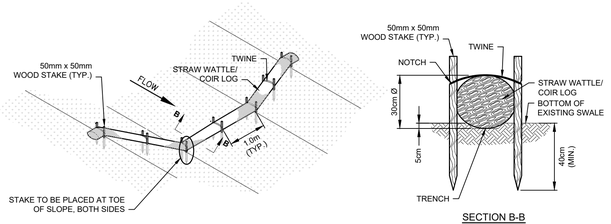
WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

SCALE:	1:400
DATE:	2023.03.10
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	JZ / MH

SHEET NO.: C5-1

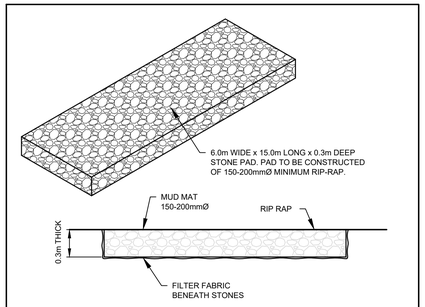
P:\2021\0713\10\06-DWGS\Civil\Plot Files\2021-0713-10 - DET_PLOT: C5-1; None; Tyler Keller; 2024-05-17 9:58:43 AM



SECTION B-B

STRAW WATTLE/COIR LOG CHECK DAM DETAIL

N.T.S.

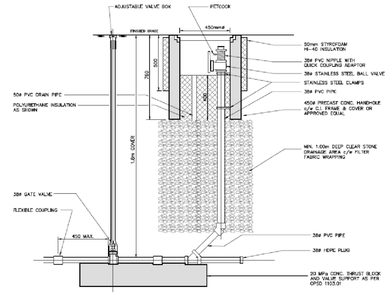


NOTE:

1. MUD MAT TO BE CONSTRUCTED PRIOR TO ANY SITE WORKS AND TO BE THE DESIGNATED ACCESS FOR ALL CONSTRUCTION TRAFFIC.
2. CONTRACTOR TO CLEAN MUD MAT DAILY. MAT TO BE MAINTAINED IN GOOD WORKING ORDER UNTIL GRADING WORKS ARE COMPLETED AND GRANULAR "A" & "B" HAVE BEEN PLACED.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ANY MUD/SEDIMENT TRACKED ON TO MUNICIPAL ROADS.

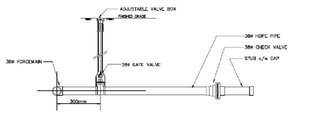
CONSTRUCTION MUD MAT DETAIL

N.T.S.



TYPICAL IN-LINE CLEAN-OUT AND SHUT-OFF VALVE & BOX DETAIL

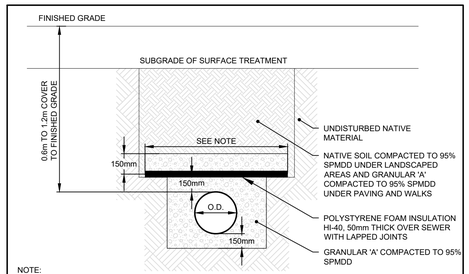
N.T.S.



TYPICAL SERVICE LEAD

N.T.S.

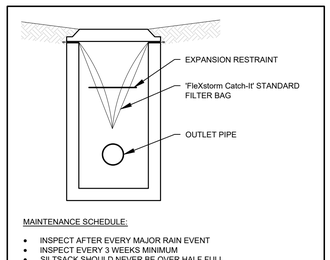
TYPICAL SANITARY FORCEMAIN CONNECTION DETAIL



NOTE:
INSULATION TO BE 1.8m WIDE FOR PIPES UP TO 250mmØ AND 2.4m WIDE
FOR PIPES 300mmØ TO 600mmØ

SHALLOW PIPE INSULATION DETAIL

N.T.S.

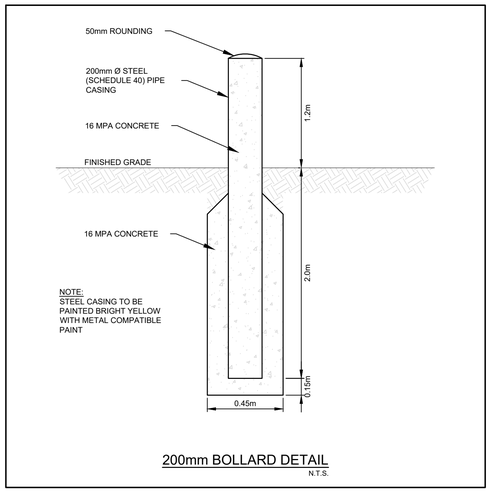


MAINTENANCE SCHEDULE:

- INSPECT AFTER EVERY MAJOR RAIN EVENT
- INSPECT EVERY 3 WEEKS MINIMUM
- SILTSACK SHOULD NEVER BE OVER HALF FULL
- FULL BAG CAN BE REMOVED, DUMPED, CLEANED, AND REUSED (TO REMOVE INSERT 25mm REBAR INTO REMOVAL FLAP POCKETS) (TO DUMP INSERT 25mm REBAR INTO BOTH DUMPING STRAPS)
- ANY DEBRIS THAT ENTERS STRUCTURE TO BE CLEANED IMMEDIATELY

TEMPORARY SILTATION CONTROL DETAIL

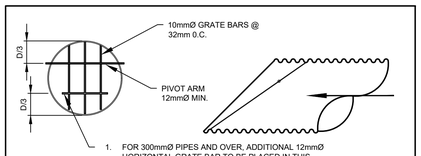
N.T.S.



NOTE:
STEEL CASING TO BE
PAINTED BRIGHT YELLOW
WITH METAL COMPATIBLE
PAINT

200mm BOLLARD DETAIL

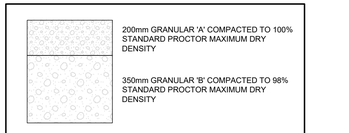
N.T.S.



1. FOR 300mmØ PIPES AND OVER, ADDITIONAL 12mmØ HORIZONTAL GRATE BAR TO BE PLACED IN THIS LOCATION.
2. FOR PIPES LESS THAN 300mmØ, NO HORIZONTAL GRATE BARS REQUIRED.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.

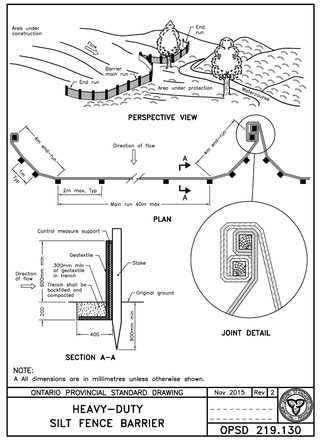
RODENT GRATE DETAIL

N.T.S.



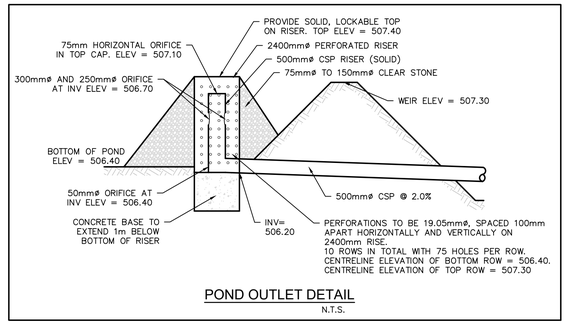
GRAVEL STRUCTURE DETAIL

N.T.S.



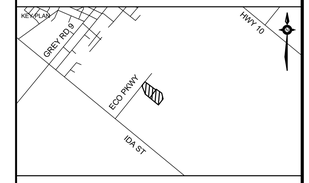
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
HEAVY-DUTY SILT FENCE BARRIER			
OPSD 219.130			



POND OUTLET DETAIL

N.T.S.



PROJECT NORTH TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED FOR SITE PLAN APPROVAL	
2024.05.17	REISSUED FOR SITE PLAN APPROVAL	

CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES
RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

DETAILS

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

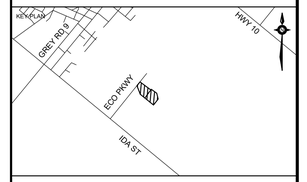
SCALE:	1:400
DATE:	2023.03.10
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	JZ / MH

SHEET NO.:

C5-2

CUT/FILL LEGEND				
Number	MIN.	MAX	Color	VOLUME
1	-0.432	-0.300		33.5
2	-0.300	-0.200		181.2
3	-0.200	-0.100		398.1
4	-0.100	0.000		524.4
5	0.000	0.100		123.9
6	0.100	0.600		482.6
7	0.600	1.700		475.4
8	1.700	2.300		30.8

TOTAL CUT: 1137.2 m^3
TOTAL FILL: 1112.7 m^3
NET CUT: 24.5 m^3



PROJECT NORTH

TRUE NORTH

DATE	ISSUANCE	NO.
2024.05.17	REISSUED FOR SITE PLAN APPROVAL	

CLIENT

ENVEST CORP.
77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

PROJECT

SOUTHGATE RENEWABLES RECYCLING PROJECT
100 ECO PARKWAY, DUNDALK, ON

TITLE

FLOODPLAIN CUT FILL ANALYSIS

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2024.05.17
PROVINCE OF ONTARIO

SCALE:	1:500
DATE:	2024-05-13
PROJECT NO.:	2021-0713-10
DRAWN BY:	TK
CHECKED BY:	MH

SHEET NO.:

C6-1

APPENDIX A

Stormwater Management Information

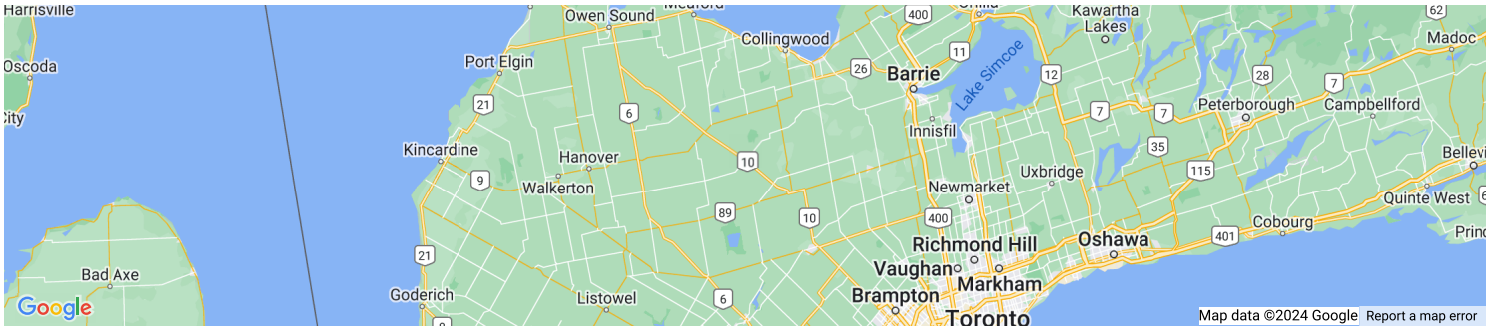
- SWM Summary Tables
- Drawdown Time Calculations
- Quality Control Calculations
- OGS Unit Sizing Reports

Ontario IDF CURVE LOOKUP

Active coordinate

44° 9' 45" N, 80° 22' 44" W (44.162500,-80.379167)

Retrieved: Wed, 17 Apr 2024 21:11:48 GMT



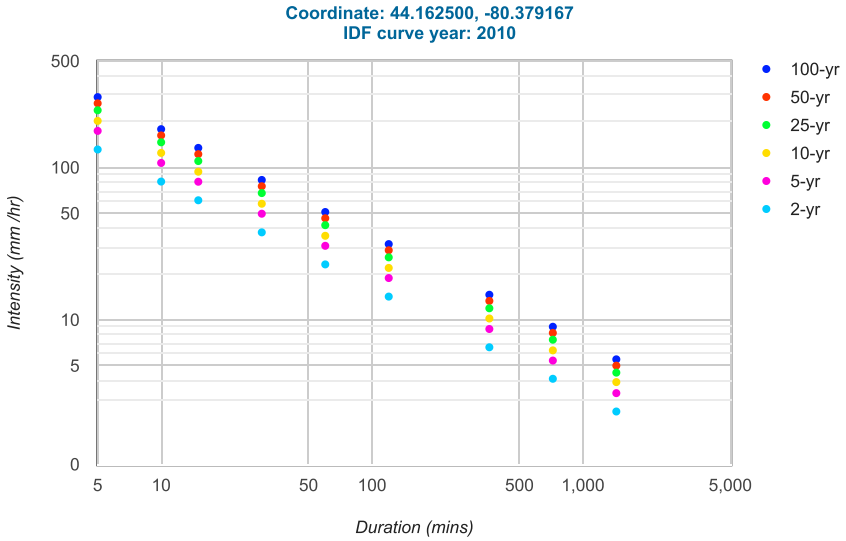
Location summary

These are the locations in the selection.

IDF Curve: 44° 9' 45" N, 80° 22' 44" W (44.162500,-80.379167)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 44° 9' 45" N, 80° 22' 44" W (44.162500,-80.379167)

Retrieved: Wed, 17 Apr 2024 21:11:48 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	23.1	30.6	35.6	41.8	46.4	51.0
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	131.2	80.8	60.9	37.5	23.1	14.2	6.6	4.1	2.5
5-yr	173.8	107.1	80.6	49.7	30.6	18.8	8.7	5.4	3.3
10-yr	202.2	124.6	93.8	57.8	35.6	21.9	10.2	6.3	3.9
25-yr	237.4	146.3	110.2	67.9	41.8	25.7	11.9	7.4	4.5
50-yr	263.6	162.3	122.3	75.3	46.4	28.6	13.3	8.2	5.0
100-yr	289.7	178.4	134.4	82.8	51.0	31.4	14.6	9.0	5.5

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.9	13.5	15.2	18.8	23.1	28.5	39.6	48.8	60.1
5-yr	14.5	17.8	20.2	24.8	30.6	37.7	52.5	64.6	79.6
10-yr	16.9	20.8	23.5	28.9	35.6	43.9	61.0	75.2	92.7
25-yr	19.8	24.4	27.5	33.9	41.8	51.5	71.7	88.3	108.8
50-yr	22.0	27.1	30.6	37.7	46.4	57.2	79.6	98.0	120.8
100-yr	24.1	29.7	33.6	41.4	51.0	62.8	87.5	107.7	132.7

Terms of Use

MTO storm parameters adjusted for T_c time in minutes for use in MIDUSS

$$i = A / T_c^{B}$$

where: i = intensity (mm/hr)
Tc = Time of concentration (min)

Return Period -	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
A	404.1	535.4	622.8	731.3	811.8	892.3
B	0.699	0.699	0.699	0.699	0.699	0.699

TABLE 1
DESIGN STORM PARAMETERS

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Design Storm	IDF Storm Parameters			Time of Peak Ratio	Storm Duration	Total Rainfall	Max. Rainfall Intensity
	a	b	c	r	D (h)	(mm)	(mm/h)
25-mm	449.205	0.00	0.780	0.4	4	25.0	128.0
2-Year	404.1	0.00	0.699	0.4	4	35.1	131.2
5-Year	535.4	0.00	0.699	0.4	4	46.4	173.8
10-Year	622.8	0.00	0.699	0.4	4	54.0	202.2
25-Year	731.3	0.00	0.699	0.4	4	63.4	237.4
50-Year	811.8	0.00	0.699	0.4	4	70.4	263.6
100-Year	892.3	0.00	0.699	0.4	4	77.4	289.7
Regional [2]	-	-	-	-	-	212.0	53.0

Notes:

(1) IDF Information taken from MTO's IDF Curve Lookup Tool

(2) Regional storm event modelled using the Hurricane Hazel (Last 12 hours) mass curve

TABLE 2
EXISTING CATCHMENT PARAMETERS

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Subcatchment	Comment	Area (ha)	Percent Impervious (%)	Flow Length (m)	Slope (%)	Mannings Roughness		SCS Curve Number	
						Impervious	Pervious	Pervious	Impervious
To Western Drainage Ditch									
101	Existing Site	4.04	0	60	3.0	0.015	0.250	75.00	98.00
102	External drainage area north of Site	0.51	70	49	2.5	0.015	0.250	75.00	98.00
Total Area		4.55	8						

Note: Under the Regional Storm conditions CNIII values were used for pervious areas (CN = 88)

TABLE 3
PROPOSED CATCHMENT PARAMETERS

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Subcatchment	Comment	Area (ha)	Percent Impervious (%)	Flow Length (m)	Slope (%)	Mannings Roughness		SCS Curve Number	
						Impervious	Pervious	Pervious	Impervious
To Western Drainage Ditch									
201	Controlled flow to Pond	1.08	90	80	2.0	0.015	0.250	75.00	98.00
202	Uncontrolled to Creek	1.82	5	80	0.5	0.015	0.250	75.00	98.00
203	Containment Area	1.14	95	35	0.5	0.015	0.250	75.00	98.00
301	External drainage area north of Site - Drains to 201	0.39	70	50	1.0	0.015	0.250	75.00	98.00
302	External drainage area north of Site - Drains to 202	0.12	70	50	1.0	0.015	0.250	75.00	98.00
Total Area		4.55	55						

Note: Under the Regional Storm conditions CNIII values were used for pervious areas (CN = 88)

TABLE 4
RUNOFF VOLUME SUMMARY

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Subcatchment	Design Storms							
	25-mm (m^3)	2-year (m^3)	5-year (m^3)	10-year (m^3)	25-year (m^3)	50-year (m^3)	100-year (m^3)	Regional (m^3)
Existing Conditions								
To Drainage Ditch								
101	109.11	256.66	474.87	643.64	874.12	1054.60	1249.24	7221.92
102	75.64	116.07	164.15	196.87	238.17	269.53	301.11	989.48
Proposed Conditions								
To Drainage Ditch								
201	194.68	291.62	406.54	484.72	581.99	654.61	727.57	2188.58
202	65.00	137.10	240.73	319.68	426.66	511.22	599.46	3278.98
203	214.20	321.60	447.65	531.67	636.48	714.34	791.70	2335.31
301	56.74	87.55	124.87	150.33	182.60	206.91	231.29	769.78
302	17.46	26.94	38.42	46.26	56.19	63.66	71.17	236.85

TABLE 5
PEAK FLOW SUMMARY

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Subcatchment	Design Storms							
	Chicago 25-mm (m^3/s)	**Chicago** 2-Year (m^3/s)	**Chicago** 5-Year (m^3/s)	**Chicago** 10-Year (m^3/s)	**Chicago** 25-Year (m^3/s)	**Chicago** 50-Year (m^3/s)	**Chicago** 100-Year (m^3/s)	**MRD** Regional (m^3/s)
Existing Conditions								
To Outlet								
101	0.016	0.044	0.114	0.170	0.261	0.374	0.465	0.603
102	0.069	0.081	0.116	0.139	0.169	0.191	0.214	0.072
Proposed Conditions								
To Outlet								
201	0.181	0.200	0.273	0.332	0.405	0.460	0.516	0.159
202	0.018	0.022	0.033	0.047	0.070	0.097	0.119	0.271
203	0.195	0.218	0.315	0.382	0.465	0.527	0.588	0.169
301	0.049	0.055	0.080	0.097	0.118	0.134	0.150	0.058
302	0.015	0.017	0.024	0.030	0.036	0.041	0.046	0.018

TABLE 6
STORMWATER MANAGEMENT MEASURE PERFORMANCE SUMMARY

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Storage Element	Design Storm	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Max. Storage Volume (m^3)	Max. Ponding Elevation (m)
Dry Pond - Captures flows from Catchments 201 and 301					
	25-mm	0.23	0.019	159.235	506.813
	2-year	0.256	0.045	197.001	506.895
	5-year	0.353	0.067	254.591	507.012
	10-year	0.428	0.122	291.188	507.082
	25-year	0.523	0.190	338.445	507.168
	50-year	0.594	0.212	374.980	507.232
	100-year	0.666	0.232	413.763	507.297
	Regional	0.217	0.203	358.175	507.203
Containment Area Storage - Captures flows from Catchment 203					
	25-mm	0.195	0.071	90.411	507.240
	2-year	0.218	0.037	117.102	507.257
	5-year	0.315	0.037	187.573	507.285
	10-year	0.382	0.038	238.622	507.305
	25-year	0.465	0.038	305.916	507.332
	50-year	0.527	0.038	358.050	507.352
	100-year	0.588	0.039	412.581	507.366
	Regional	0.169	0.041	974.026	507.501

TABLE 7
OUTLET SUMMARY COMPARISON

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

	To Creek		
Design Storm Event	Existing Conditions (m^3/s)	Proposed (no mitigation) (m^3/s)	Proposed (with mitigation) (m^3/s)
25-mm	0.071	0.458	0.071
2-year	0.086	0.512	0.084
5-year	0.136	0.714	0.132
10-year	0.197	0.867	0.197
25-year	0.303	1.062	0.296
50-year	0.423	1.207	0.335
100-year	0.522	1.353	0.373
Regional Storm	0.674	0.658	0.530

TABLE 8
DRAWDOWN TIME CALCULATION

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Low Flow Outlet Information

Orifice Diameter	50.000	mm
Time to release all of 25mm storm event[1]	1370.000	minutes
	22.833	hours

Design Storm	Inflow (m^3/s)	Outflow[1] (m^3/s)	Water Surface Elevation (m)	Storage (m^3)	Drain Down Time[2] (hrs)	Drain Down Time[2] (days)
Proposed Conditions						
25mm	0.241	0.086	506.93	159	22.83	0.95
10 Year	0.428	0.122	507.08	302	23.67	0.99
25 Year	0.523	0.190	507.17	352	23.75	0.99
MOE Quality Control Volume[3]	-	-	507.16	347	23.74	0.99

Note:

1. Outflow from the pond and the time to release the peak volume from the 25 mm storm event were taken from the pond's Outflow Hydrograph generated in MIDUSS. These values do not include infiltration

2. Drain Down Time based on outflow hydrograph generated by MIDUSS modelling

3. MOE Drawdown Time was estimated using a linear interpolation drawn down times listed for the 10-year and 25-year storm events from MIDUSS

TABLE 9
WATER QUALITY CONTROL SUMMARY

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Areas Contributing to Dry Pond for WQ Event

Subcatchment ID	Area (ha)	Percent Impervious (%)
Infiltration		
301	0.390	70
201	1.050	90

Infiltration Gallery

Contributing Drainage Area =	1.440	ha
Impervious Level =	84.6	%
Total Required Water Quality Storage Volume Per Hectare =	241	m^3/ha
Total Required Water Quality Storage Volume =	347	m^3
Total Provided Storage Volume =	**478**	**m^3**

MOE SWM Design Manual Table 3.2

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	*55%*	*70%*	*85%*
Basic (60% long-term S.S. removal)	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continu	90	150	200	240

1. Galleries are represented by dry ponds (60% long-term S.S. Removal)

Oil Grit Seperator Sizing

OGS Size =	STC EF06	
Designed TSS Removal Efficiency =	85	%
Claimed TSS Removal Efficiency =	50	%

Overall Water Quality Performance - Treatment Train

Drainage Area ID	Drainage Area	Primary Removal Feature	Percentage Removed	Percentage Remaining	Secondary Removal Feature	Percentage Removed	Percentage Remaining	Tertiary Removal Feature	Percentage Removed	Total Removal Efficiency	Weighted Efficiency
201	0.440	Dry Pond	60%	40%	OGS	50%	20%	-	0%	80%	80%
Total Removal Efficiency											**80%**

Notes:
1. Subcatchments 301 and 302 (external areas) are not to be redeveloped and do not require water quality treatment
2. Impervious areas within subcatchments 302 and 202 are directed to pervious areas, and are therefore not considered for water quality treatment
3. Flows from catchment 203 will be monitored by a trained staff member - only clean water will be allowed to leave the containment facility

APPENDIX A
STORMWATER MANAGEMENT MEASURE STAGE-STORAGE CURVES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Pond 1 - Recieves flows from catchments 201 and EXT-1		
Level (m)	**Discharge (m^3/s)**	**Volume (m^3)**
506.4	0.00000	0
506.5	0.00146	34.948
506.6	0.00231	71.40165
506.7	0.00292	110.90055
506.8	0.01578	153.5096
506.9	0.04667	199.29075
507.0	0.10140	248.30585
507.1	0.16390	300.60325
507.2	0.20200	356.2584
507.3	0.23270	415.2879
507.35	0.33240	446.04345
507.4	0.50230	477.6141

Weir Information	
Elevation (m)	507.3
Coefficient	0.9
Crest width (m)	5
left slope	0
right slope	0

Outflow Pipe Information				
Component	**Orifice 1**	**Orifice 2**	**Orifice 3**	**Orifice 4**
Orifice Diameter (m)	0.075	0.250	0.350	0.075
Orifice Invert (m)	506.400	506.700	506.700	507.100
Orifice Coefficient	0.650	0.650	0.650	0.650

APPENDIX A
STORMWATER MANAGEMENT MEASURE STAGE-STORAGE CURVES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
SOUTHGATE RENEWABLES RECYCLING PROJECT
DUNDALK, ONTARIO

Pond 2 - Recieves flows from catchment 203		
Level (m)	**Discharge (m^3/s)**	**Volume (m^3)**
506.05	0	0
507.05	0.03373	2
507.15	0.03538	6.932
507.25	0.03695	99.984
507.35	0.03846	351.582
507.45	0.03991	741.19
507.55	0.04131	1197.54
507.65	0.04266	1666.8
507.75	0.04398	2153.836
507.85	0.04525	2658.672
507.90	0.04587	2919.547

Outflow Pipe Information	
Upstream Invert (m)	506.05
Downstream Invert (m)	505.98
Pipe Length (m)	13.9
Pipe Diameter (m)	0.15
Manning's n	0.015
Entry loss coefficient	0.5

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/02/2024

Province:	Ontario
City:	Dundalk
Nearest Rainfall Station:	OWEN SOUND MOE
Climate Station Id:	6116132
Years of Rainfall Data:	40

Site Name:	

Drainage Area (ha):	1.14
% Imperviousness:	95.00

Runoff Coefficient 'c': 0.87

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	37.46
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	27.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	
Estimated Average Annual Sediment Volume (L/yr):	1056

Project Name:	Envest Southgate
Project Number:	2021-0713-10
Designer Name:	Circe Mahoney
Designer Company:	WalterFedy
Designer Email:	cmahoney@walterfedy.com
Designer Phone:	613-532-8941
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	75
EFO6	85
EFO8	92
EFO10	95
EFO12	99

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 85

Water Quality Runoff Volume Capture (%): > 90

imbrium

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 waterwavs.

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.

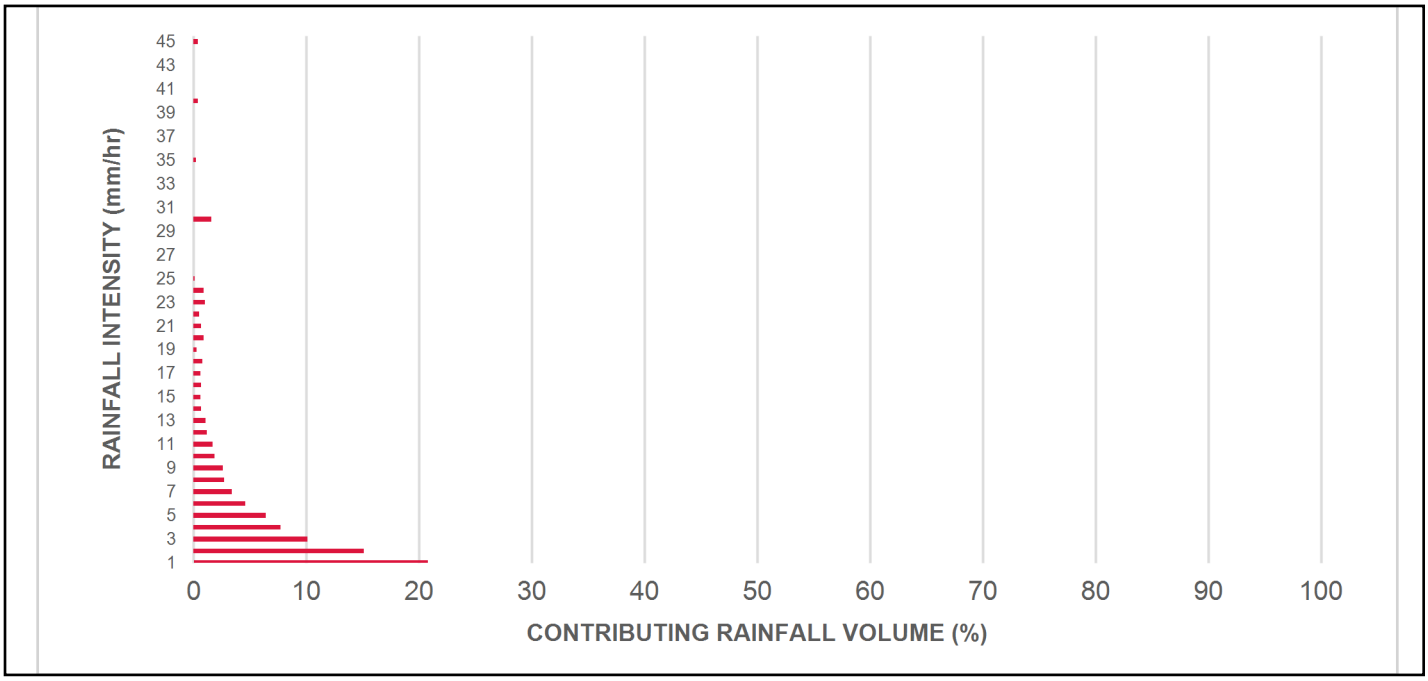
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

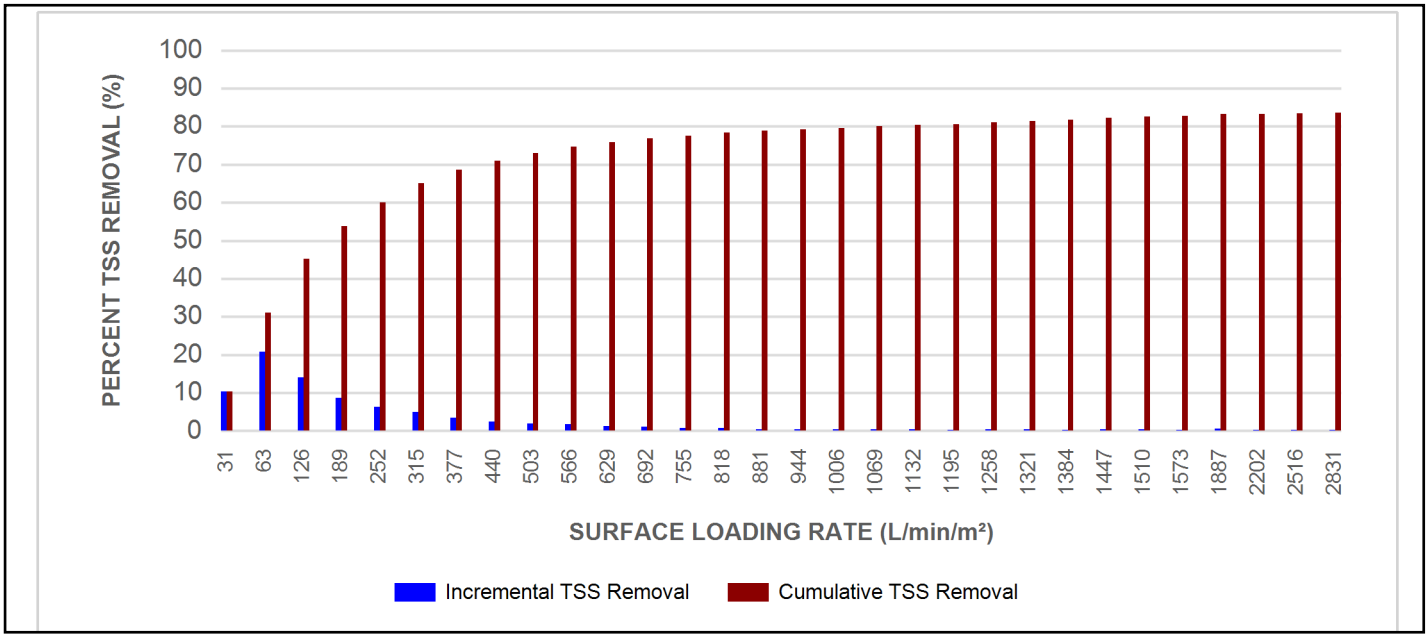
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	10.3	10.3	1.38	83.0	31.0	100	10.3	10.3
1.00	20.8	31.1	2.76	165.0	63.0	100	20.8	31.1
2.00	15.1	46.2	5.51	331.0	126.0	93	14.1	45.2
3.00	10.1	56.3	8.27	496.0	189.0	86	8.6	53.8
4.00	7.7	64.0	11.03	662.0	252.0	81	6.2	60.1
5.00	6.4	70.4	13.79	827.0	315.0	78	5.0	65.1
6.00	4.6	75.1	16.54	993.0	377.0	75	3.5	68.6
7.00	3.4	78.4	19.30	1158.0	440.0	72	2.4	71.0
8.00	2.7	81.1	22.06	1323.0	503.0	69	1.9	72.9
9.00	18.9	100.0	24.81	1489.0	566.0	66	12.5	85.4
10.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
11.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
12.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
13.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
14.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
15.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
16.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
17.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
18.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
19.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
20.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
21.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
22.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
23.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
24.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
25.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
30.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
35.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
40.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
45.00	0.0	100.0	27.00	1620.0	616.0	65	0.0	85.4
Estimated Net Annual Sediment (TSS) Load Reduction =								**85 %**

Climate Station ID: 6116132 *Years of Rainfall Data*: 40

RAINFALL DATA FROM OWEN SOUND MOE 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

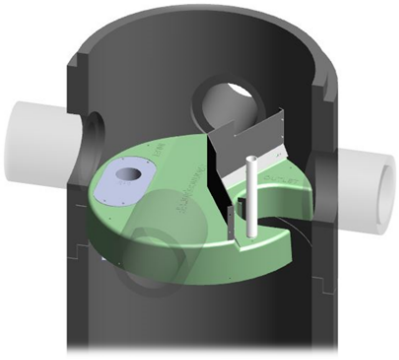
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

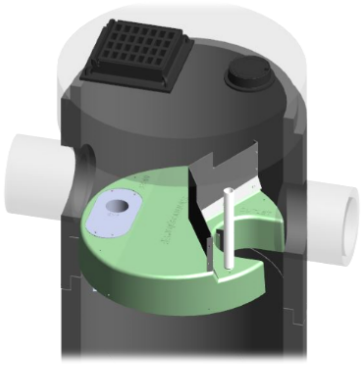
DESIGN FLEXIBILITY

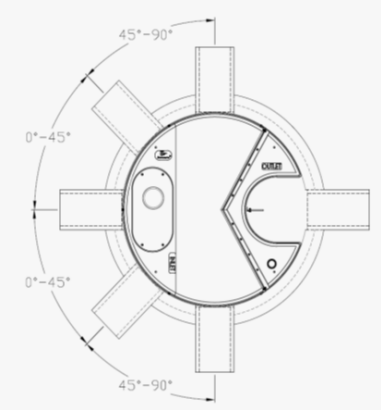
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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

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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** S**eparators**

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.

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/02/2024

Province:	Ontario
City:	Dundalk
Nearest Rainfall Station:	OWEN SOUND MOE
Climate Station Id:	6116132
Years of Rainfall Data:	40

Site Name:	Controlled to Pond

Drainage Area (ha):	1.47
% Imperviousness:	85.00

Runoff Coefficient 'c': 0.81

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	44.97
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	
Estimated Average Annual Sediment Volume (L/yr):	1161

Project Name:	Envest Southgate
Project Number:	2021-0713-10
Designer Name:	Circe Mahoney
Designer Company:	WalterFedy
Designer Email:	cmahoney@walterfedy.com
Designer Phone:	613-532-8941
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	68
EFO6	81
EFO8	88
EFO10	92
EFO12	95

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 81

Water Quality Runoff Volume Capture (%): > 90

imbrium

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 waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

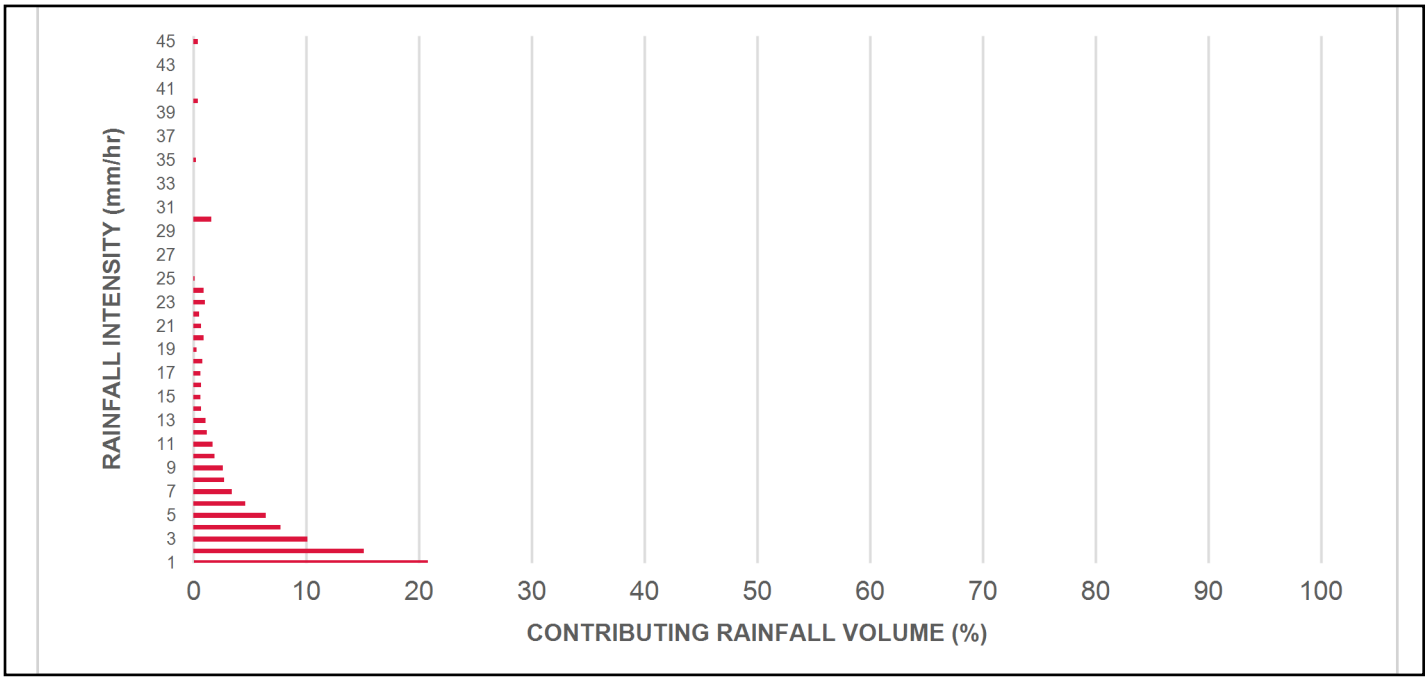
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a 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

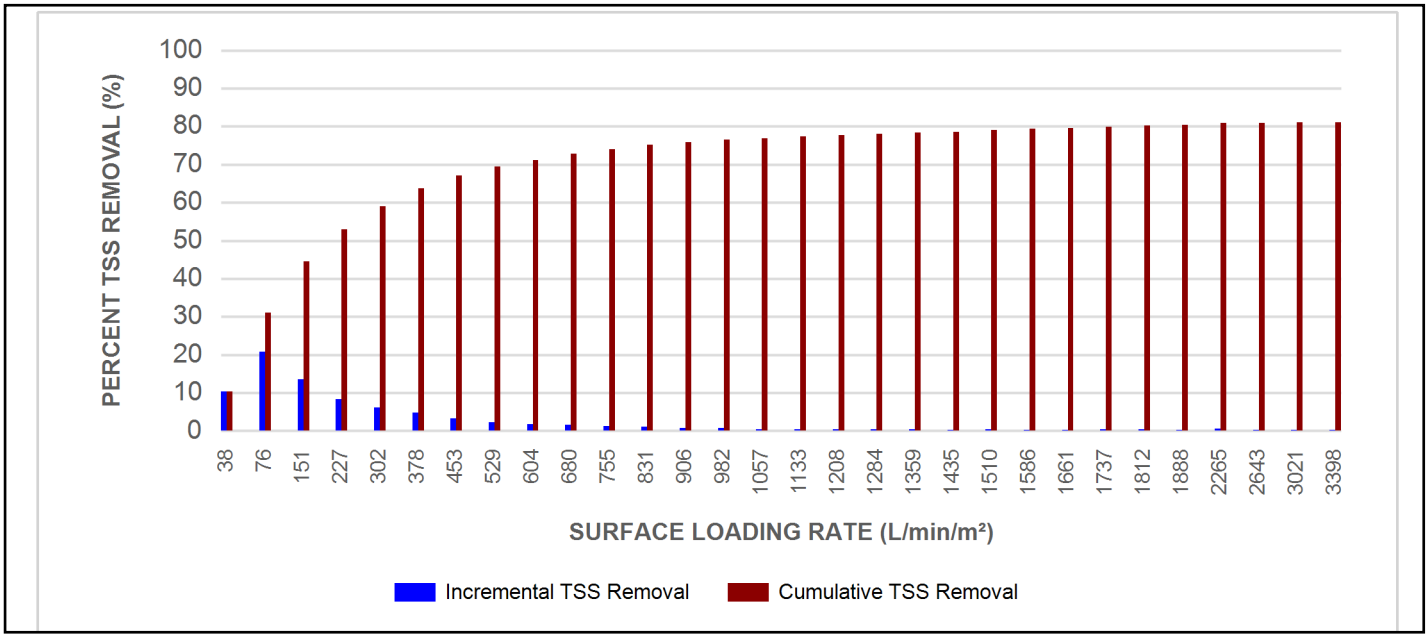
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	10.3	10.3	1.66	99.0	38.0	100	10.3	10.3
1.00	20.8	31.1	3.31	199.0	76.0	100	20.8	31.1
2.00	15.1	46.2	6.62	397.0	151.0	89	13.5	44.6
3.00	10.1	56.3	9.93	596.0	227.0	82	8.3	52.9
4.00	7.7	64.0	13.24	794.0	302.0	78	6.1	59.0
5.00	6.4	70.4	16.55	993.0	378.0	75	4.8	63.8
6.00	4.6	75.1	19.86	1192.0	453.0	72	3.3	67.1
7.00	3.4	78.4	23.17	1390.0	529.0	68	2.3	69.4
8.00	2.7	81.1	26.48	1589.0	604.0	65	1.8	71.2
9.00	2.6	83.7	29.79	1787.0	680.0	64	1.7	72.8
10.00	1.9	85.6	33.10	1986.0	755.0	63	1.2	74.0
11.00	1.7	87.3	36.41	2185.0	831.0	63	1.1	75.1
12.00	1.2	88.5	39.72	2383.0	906.0	62	0.7	75.8
13.00	1.1	89.6	43.03	2582.0	982.0	62	0.7	76.5
14.00	0.7	90.3	46.34	2781.0	1057.0	60	0.4	76.9
15.00	0.6	90.9	49.65	2979.0	1133.0	59	0.4	77.3
16.00	0.7	91.6	52.96	3178.0	1208.0	57	0.4	77.7
17.00	0.6	92.3	56.27	3376.0	1284.0	55	0.4	78.0
18.00	0.8	93.0	59.58	3575.0	1359.0	53	0.4	78.4
19.00	0.3	93.3	62.89	3774.0	1435.0	51	0.2	78.6
20.00	0.9	94.2	66.20	3972.0	1510.0	48	0.4	79.0
21.00	0.7	94.9	69.51	4171.0	1586.0	46	0.3	79.3
22.00	0.5	95.3	72.82	4369.0	1661.0	44	0.2	79.5
23.00	1.0	96.3	76.13	4568.0	1737.0	42	0.4	79.9
24.00	0.9	97.2	79.44	4767.0	1812.0	40	0.4	80.3
25.00	0.1	97.3	82.75	4965.0	1888.0	39	0.1	80.4
30.00	1.6	98.9	99.30	5958.0	2265.0	32	0.5	80.9
35.00	0.2	99.1	115.86	6951.0	2643.0	28	0.1	80.9
40.00	0.4	99.5	132.41	7944.0	3021.0	24	0.1	81.0
45.00	0.4	99.9	148.96	8937.0	3398.0	22	0.1	81.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**81 %**

Climate Station ID: 6116132 *Years of Rainfall Data*: 40

RAINFALL DATA FROM OWEN SOUND MOE 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

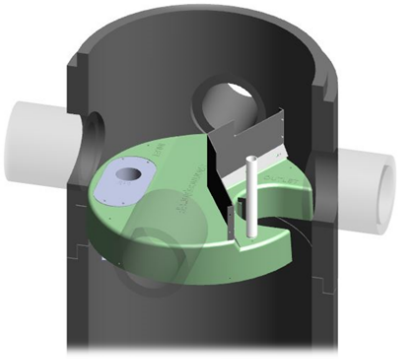
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

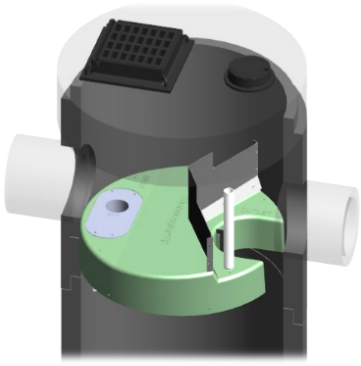
DESIGN FLEXIBILITY

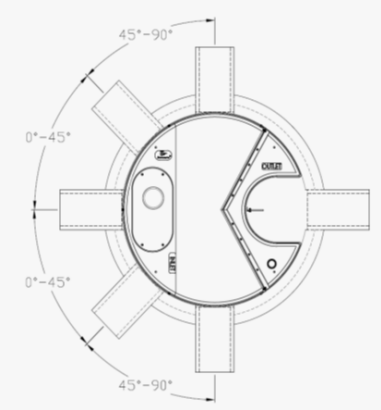
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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

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STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

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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.

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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.

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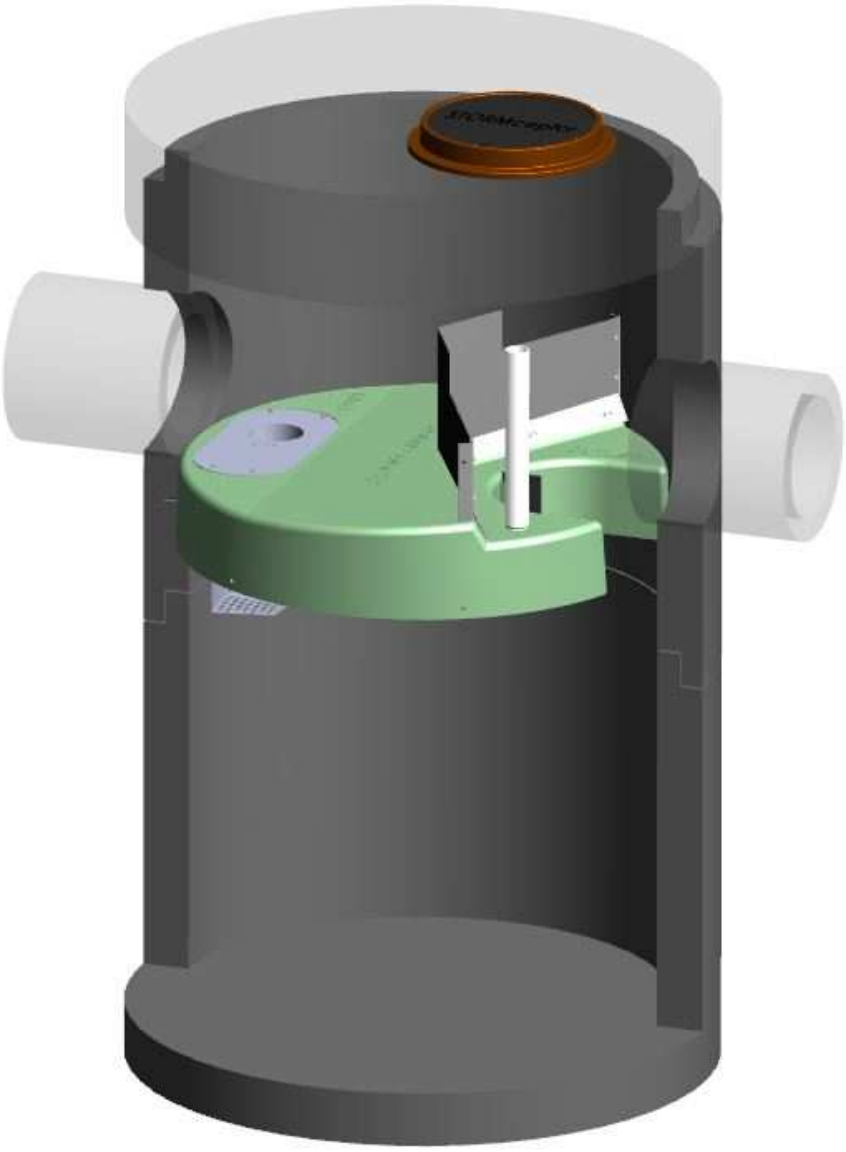
Stormceptor® EF

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

Table of Contents:

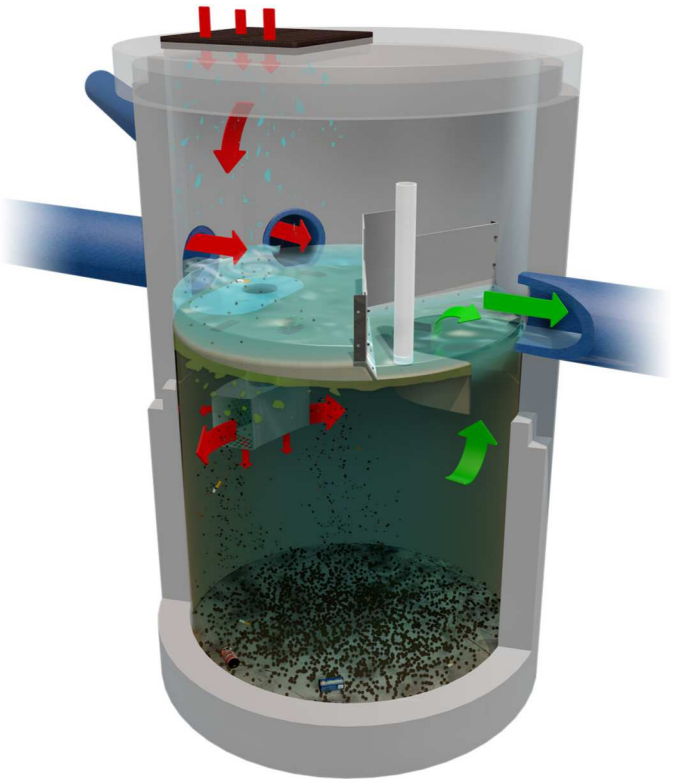
OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



COMPONENTS

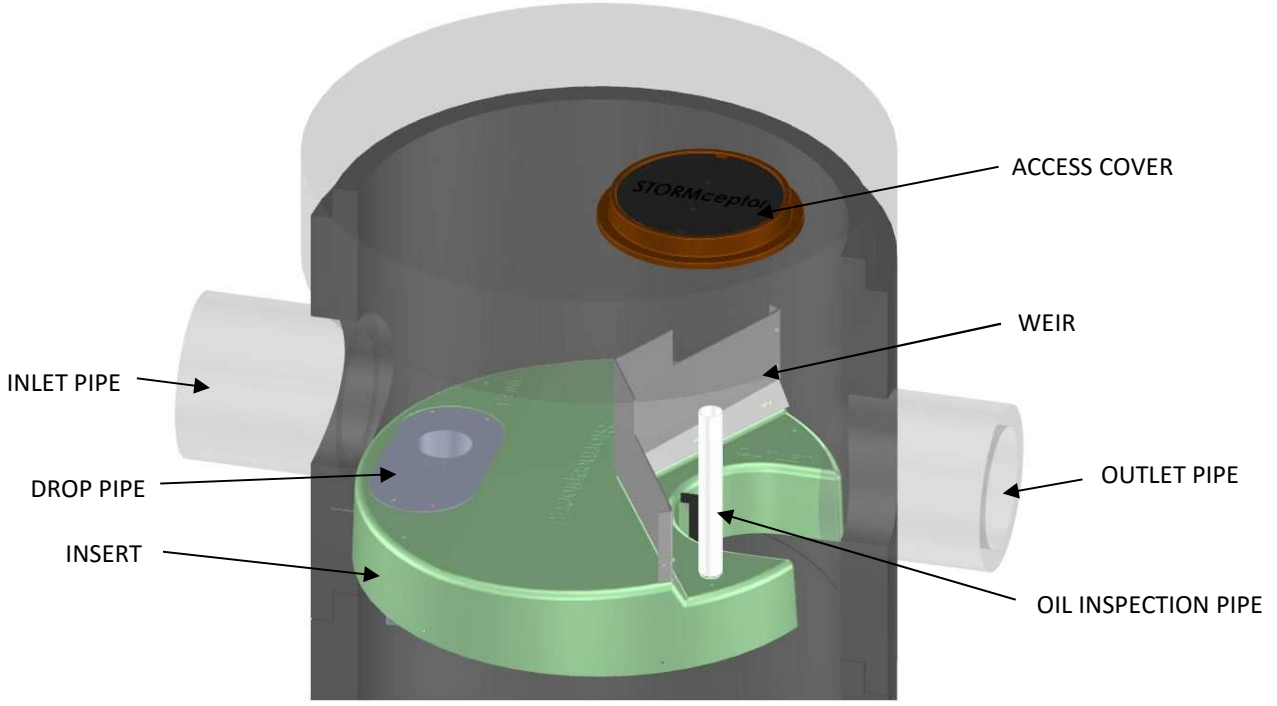


Figure 1

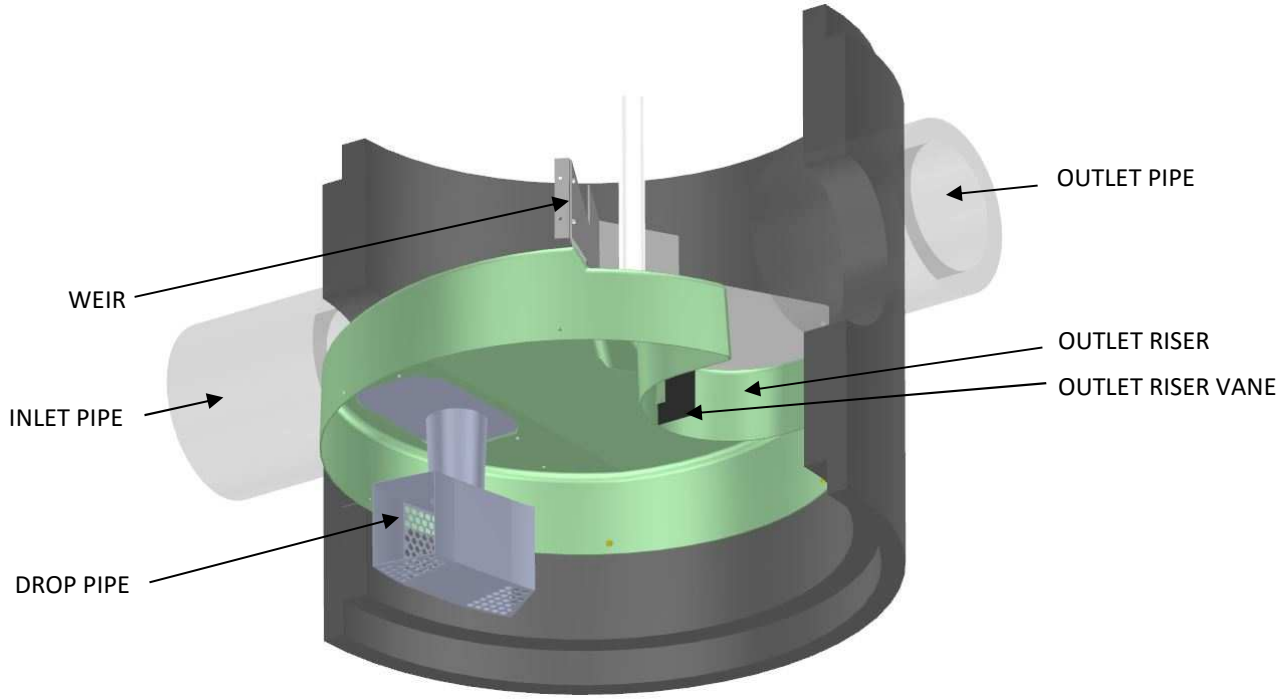


Figure 2

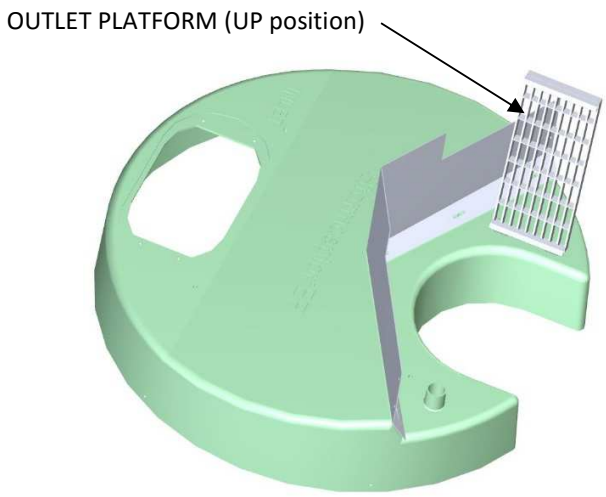


Figure 3A

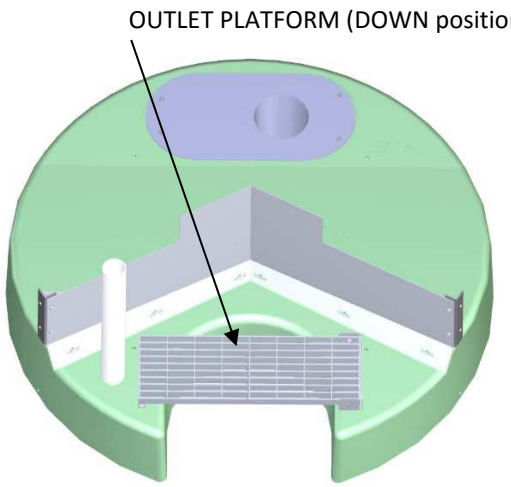


Figure 3B

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Table 1

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity [1] (m^3)	Hydrocarbon Storage Capacity [2] (L)	Maximum Flow Rate into Lower Chamber [3] (L/s)	Peak Conveyance Flow Rate [4] (L/s)
EF4 / EFO4	1.22	915	1524	1780	1.19	265	22.1 / 10.4	425
EF6 / EFO6	1.83	915	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1524	3886	40800	31.22	2475	198.7 / 93.7	2830

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m^2.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Table 2

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity [1] (ft^3)	Hydrocarbon Storage Capacity [2] (gal)	Maximum Flow Rate into Lower Chamber [3] (cfs)	Peak Conveyance Flow Rate [4] (cfs)
EF4 / EFO4	4	36	60	471	42	70	0.78 / 0.37	15
EF6 / EFO6	6	36	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	60	153	10779	1103	655	7.02 / 3.31	100

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft^2.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name ***Stormceptor***® embossed on the access cover at grade as shown in **Figure 3**. The tradename ***Stormceptor***® is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

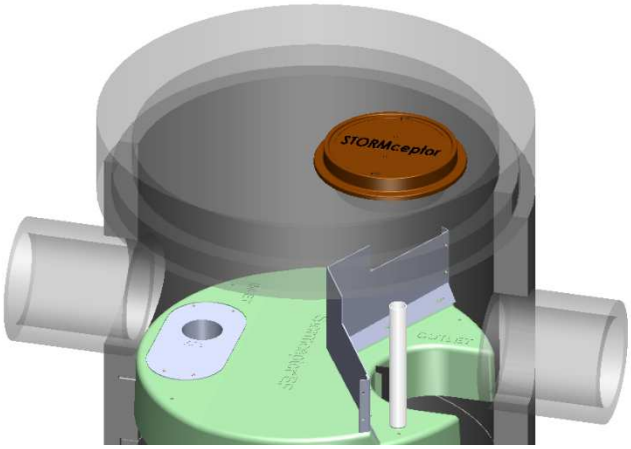


Figure 4

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

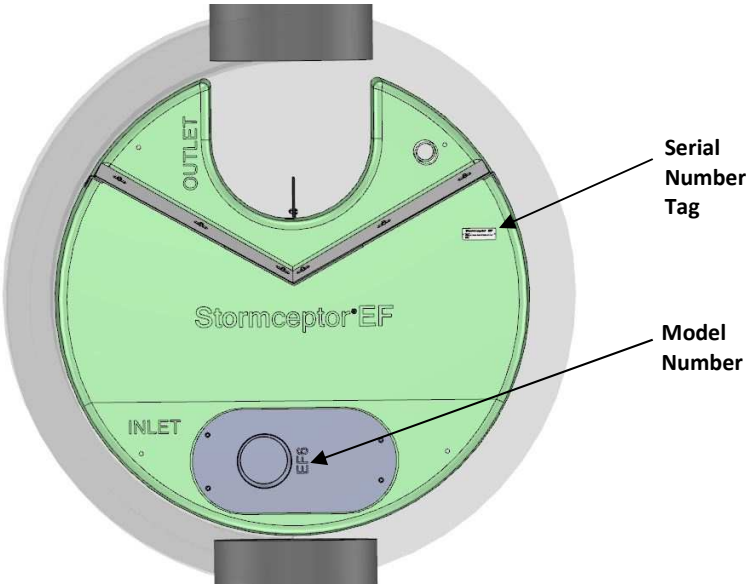


Figure 5

INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
  NOTE: EF4/EFO4 requires the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

Table 3

Recommended Sediment Depths for Maintenance Service*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF6 / EFO6	12 /305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

Maintenance Procedures

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.

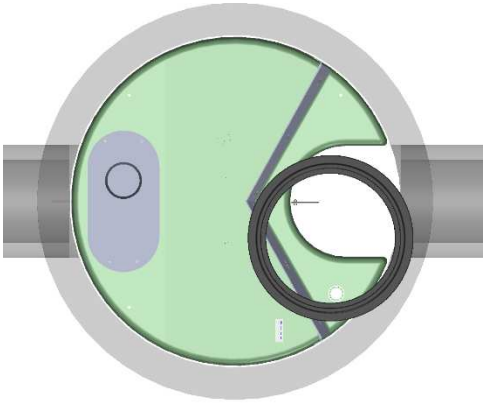


Figure 6

- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

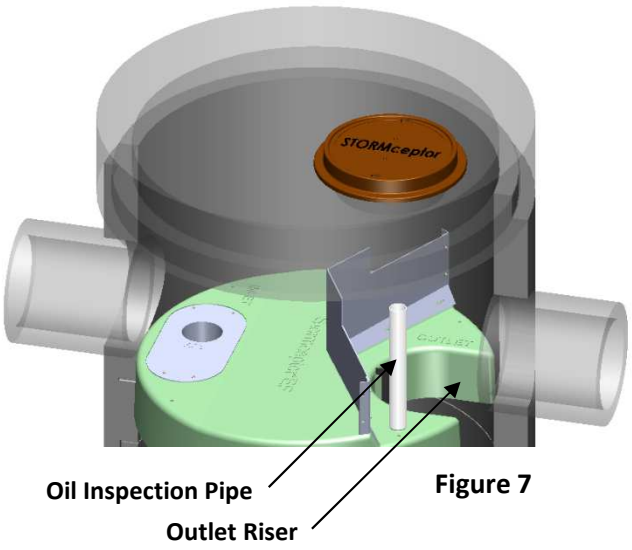


Figure 7

Figure 8

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.

Figure 9

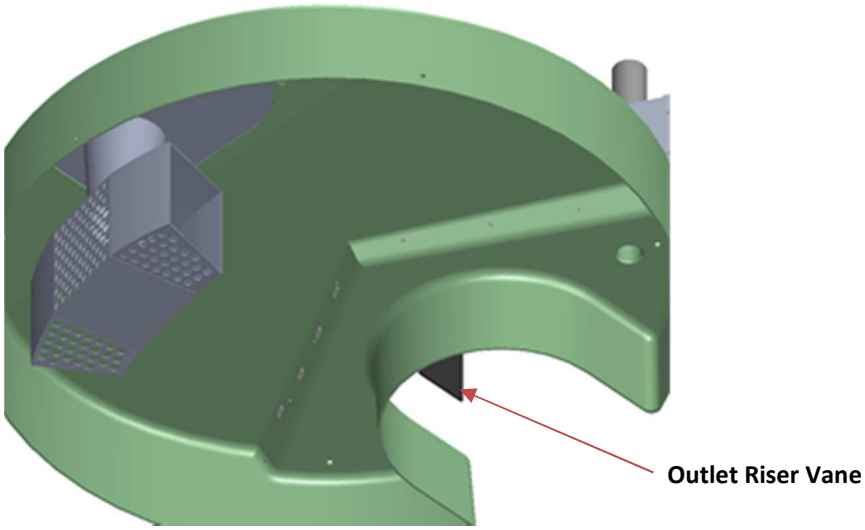
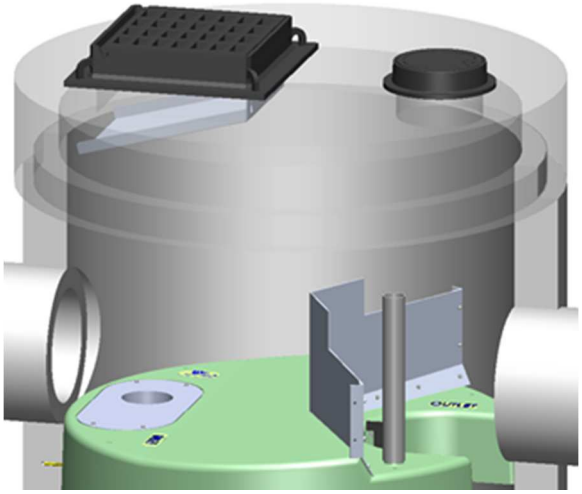


Figure 10

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

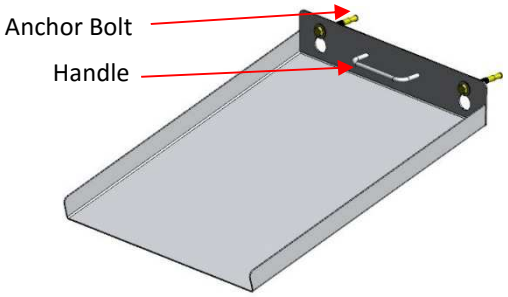
Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 model requires a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.



How to Remove:

1. Loosen anchor bolts
2. Pull up and out using the handle



Removable Flow Deflector

Figure 11

Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems.

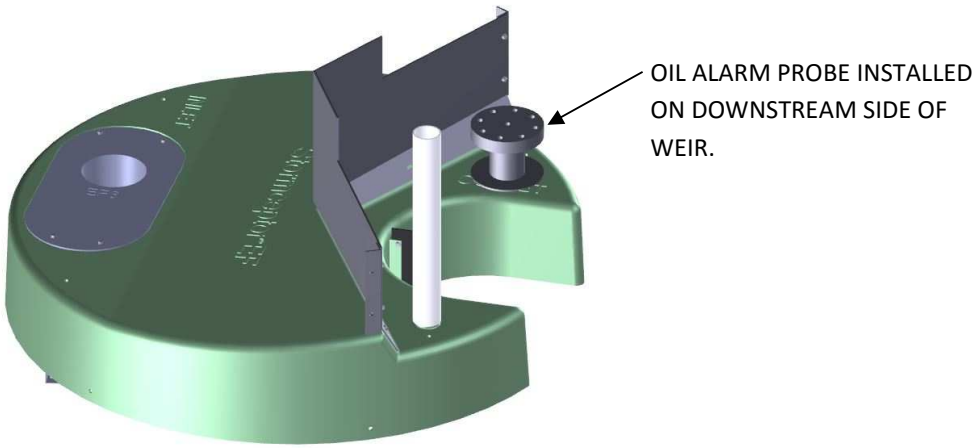


Figure 12

Replacement Parts

Stormceptor has no moving parts to wear out. Therefore inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Recommended Sediment Maintenance Depth: _____

DATE	SEDIMENT DEPTH (inch or mm)	OIL DEPTH (inch or mm)	SERVICE REQUIRED (Yes / No)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments:

Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Stormceptor representative or by visiting our website at **www.stormceptor.com.**

Imbrium Systems Inc. & Imbrium Systems LLC

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United States	1-301-279-8827 / 1-888-279-8826
International	+1-416-960-9900 / +1-301-279-8827

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www.stormceptor.com
info@imbriumsystems.com

APPENDIX B

MIDUSS Modelling Files

MIDUSS Hydrologic Modelling

Pre-Development

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"        2.500  Overland Slope"
"        0.153  Pervious Area"
"       49.000  Pervious length"
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"       49.000  Impervious length"
"        2.500  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.108  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.801  Impervious Runoff coefficient"
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"        0.518  Impervious Initial abstraction"
```

```
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"             Surface Area           0.153      0.357      0.510      hectare"
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"             Time to Centroid       197.740    120.862    125.063    minutes"
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"             Rainfall volume        38.25      89.25      127.50     c.m"
"             Rainfall losses        22.299     4.971      10.170     mm"
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"       70.000   % Impervious"
"        0.510   Total Area"
"       49.000   Flow length"
"        2.500   Overland Slope"
"        0.153   Pervious Area"
"       49.000   Pervious length"
"        2.500   Pervious slope"
"        0.357   Impervious Area"
"       49.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.850   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.081     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.153      0.357      0.510      hectare"
"             Time of concentration  29.058     2.592      4.808      minutes"
"             Time to Centroid       184.544    122.778    127.949    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        53.64      125.16     178.79     c.m"
"             Rainfall losses        28.706     5.266      12.298     mm"
"             Runoff depth           6.351      29.791     22.759     mm"
"             Runoff volume          9.72       106.36     116.07     c.m"
"             Runoff coefficient     0.181      0.850      0.649      "
"             Maximum flow           0.002      0.081      0.081      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.081     0.081     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.081     0.081     0.081     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.081     0.081     0.081     0.000"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing site conditions"
"        0.000   % Impervious"
"        4.040   Total Area"
"       60.000   Flow length"
"        3.000   Overland Slope"
"        4.040   Pervious Area"
"       60.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.044     0.081     0.081     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  31.066     2.772      31.066     minutes"
```

```
"             Time to Centroid       187.575    123.121    187.575    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        1416.32    0.00       1416.32    c.m"
"             Rainfall losses        28.705     5.320      28.704     mm"
"             Runoff depth           6.353      29.737     6.353      mm"
"             Runoff volume          256.66     0.00       256.66     c.m"
"             Runoff coefficient     0.181      0.000      0.181      "
"             Maximum flow           0.044      0.000      0.044      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.044     0.086     0.081     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.044     0.086     0.086     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     0.357    hectare"
"             Total % impervious                        7.846"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                        ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                   2021-0713-10\New SWM Files\MIDUSS modelling\Pre-Development"
"                Output filename:                     5 Year Pre-Development.out"
"                Licensee name:                                  Circe Mahoney"
"                Company                                            WalterFedy"
"                Date & Time last used:                2024-05-02 at 8:12:55 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      535.400   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           170.160    mm/hr"
"             Total depth                  46.448    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   External drainage area east of Site"
"       70.000   % Impervious"
"        0.510   Total Area"
"       49.000   Flow length"
"        2.500   Overland Slope"
"        0.153   Pervious Area"
"       49.000   Pervious length"
"        2.500   Pervious slope"
"        0.357   Impervious Area"
"       49.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.881   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.116     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.153      0.357      0.510      hectare"
"             Time of concentration  21.673     2.293      4.416      minutes"
"             Time to Centroid       171.053    120.950    126.439    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        71.07      165.82     236.89     c.m"
"             Rainfall losses        34.695     5.507      14.263     mm"
"             Runoff depth           11.754     40.942     32.185     mm"
"             Runoff volume          17.98      146.16     164.15     c.m"
"             Runoff coefficient     0.253      0.881      0.693      "
"             Maximum flow           0.004      0.115      0.116      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.116     0.116     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.116     0.116     0.116     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.116     0.116     0.116     0.000"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing site conditions"
"        0.000   % Impervious"
"        4.040   Total Area"
"       60.000   Flow length"
"        3.000   Overland Slope"
"        4.040   Pervious Area"
"       60.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.114     0.116     0.116     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  23.170     2.451      23.170     minutes"
```

```
"             Time to Centroid       173.417    121.267    173.417    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        1876.51    0.00       1876.52    c.m"
"             Rainfall losses        34.694     5.487      34.694     mm"
"             Runoff depth           11.754     40.962     11.754     mm"
"             Runoff volume          474.87     0.00       474.87     c.m"
"             Runoff coefficient     0.253      0.000      0.253      "
"             Maximum flow           0.114      0.000      0.114      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.114     0.136     0.116     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.114     0.136     0.136     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     0.357    hectare"
"             Total % impervious                        7.846"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                        ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                   2021-0713-10\New SWM Files\MIDUSS modelling\Pre-Development"
"                Output filename:                    10 Year Pre-Development.out"
"                Licensee name:                                  Circe Mahoney"
"                Company                                            WalterFedy"
"                Date & Time last used:                2024-05-02 at 8:15:55 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      622.800   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           197.937    mm/hr"
"             Total depth                  54.031    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   External drainage area east of Site"
"       70.000   % Impervious"
"        0.510   Total Area"
"       49.000   Flow length"
"        2.500   Overland Slope"
"        0.153   Pervious Area"
"       49.000   Pervious length"
"        2.500   Pervious slope"
"        0.357   Impervious Area"
"       49.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.894   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.139     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.153      0.357      0.510      hectare"
"             Time of concentration  18.894     2.149      4.220      minutes"
"             Time to Centroid       165.491    120.122    125.733    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        82.67      192.89     275.56     c.m"
"             Rainfall losses        38.116     5.707      15.429     mm"
"             Runoff depth           15.915     48.324     38.601     mm"
"             Runoff volume          24.35      172.52     196.87     c.m"
"             Runoff coefficient     0.295      0.894      0.714      "
"             Maximum flow           0.007      0.138      0.139      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.139     0.139     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.139     0.139     0.139     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.139     0.139     0.139     0.000"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing site conditions"
"        0.000   % Impervious"
"        4.040   Total Area"
"       60.000   Flow length"
"        3.000   Overland Slope"
"        4.040   Pervious Area"
"       60.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.170     0.139     0.139     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  20.199     2.298      20.199     minutes"
```

```
"             Time to Centroid       167.558    120.367    167.558    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        2182.84    0.00       2182.84    c.m"
"             Rainfall losses        38.099     5.636      38.099     mm"
"             Runoff depth           15.932     48.394     15.932     mm"
"             Runoff volume          643.64     0.00       643.64     c.m"
"             Runoff coefficient     0.295      0.000      0.295      "
"             Maximum flow           0.170      0.000      0.170      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.170     0.197     0.139     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.170     0.197     0.197     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     0.357    hectare"
"             Total % impervious                        7.846"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                        ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                   2021-0713-10\New SWM Files\MIDUSS modelling\Pre-Development"
"                Output filename:                    25 Year Pre-Development.out"
"                Licensee name:                                  Circe Mahoney"
"                Company                                            WalterFedy"
"                Date & Time last used:                2024-05-02 at 8:18:40 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      731.300   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           232.421    mm/hr"
"             Total depth                  63.444    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   External drainage area east of Site"
"       70.000   % Impervious"
"        0.510   Total Area"
"       49.000   Flow length"
"        2.500   Overland Slope"
"        0.153   Pervious Area"
"       49.000   Pervious length"
"        2.500   Pervious slope"
"        0.357   Impervious Area"
"       49.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.340   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.906   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.169     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.153      0.357      0.510      hectare"
"             Time of concentration  16.508     2.009      4.021      minutes"
"             Time to Centroid       160.469    119.364    125.067    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        97.07      226.49     323.56     c.m"
"             Rainfall losses        41.846     5.985      16.743     mm"
"             Runoff depth           21.598     57.459     46.701     mm"
"             Runoff volume          33.04      205.13     238.17     c.m"
"             Runoff coefficient     0.340      0.906      0.736      "
"             Maximum flow           0.011      0.167      0.169      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.169     0.169     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.169     0.169     0.169     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.169     0.169     0.169     0.000"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing site conditions"
"        0.000   % Impervious"
"        4.040   Total Area"
"       60.000   Flow length"
"        3.000   Overland Slope"
"        4.040   Pervious Area"
"       60.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.261     0.169     0.169     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  17.649     2.148      17.649     minutes"
```

```
"             Time to Centroid       162.240    119.532    162.240    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        2563.12    0.00       2563.12    c.m"
"             Rainfall losses        41.807     5.860      41.807     mm"
"             Runoff depth           21.637     57.583     21.637     mm"
"             Runoff volume          874.12     0.00       874.12     c.m"
"             Runoff coefficient     0.341      0.000      0.341      "
"             Maximum flow           0.261      0.000      0.261      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.261     0.303     0.169     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.261     0.303     0.303     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     0.357    hectare"
"             Total % impervious                        7.846"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 467"
"               MIDUSS created                                  July 6, 2008"
"           10  Units used:                                        ie METRIC"
"               Job folder:            C:\Users\cmahoney\Documents\2024 Work\"
"                  2021-0713-10\New SWM Files\MIDUSS modelling\Pre-Development"
"               Output filename:                   50 Year Pre-Development.out"
"               Licensee name:                                  Circe Mahoney"
"               Company                                            WalterFedy"
"               Date & Time last used:              2024-05-02 at 8:22:26 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      240.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"            1  Chicago storm"
"      811.800  Coefficient A"
"        0.000  Constant B"
"        0.699  Exponent C"
"        0.400  Fraction R"
"      240.000  Duration"
"        1.000  Time step multiplier"
"             Maximum intensity          258.005    mm/hr"
"             Total depth                 70.427    mm"
"            6  050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 102"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          102  External drainage area east of Site"
"       70.000  % Impervious"
"        0.510  Total Area"
"       49.000  Flow length"
"        2.500  Overland Slope"
"        0.153  Pervious Area"
"       49.000  Pervious length"
"        2.500  Pervious slope"
"        0.357  Impervious Area"
"       49.000  Impervious length"
"        2.500  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.371  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.913  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
```

```
"                    0.191     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.153      0.357      0.510      hectare"
"             Time of concentration  15.196     1.923      3.894      minutes"
"             Time to Centroid       157.490    118.852    124.589    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        107.75     251.43     359.18     c.m"
"             Rainfall losses        44.269     6.139      17.578     mm"
"             Runoff depth           26.159     64.289     52.850     mm"
"             Runoff volume          40.02      229.51     269.53     c.m"
"             Runoff coefficient     0.371      0.913      0.750      "
"             Maximum flow           0.015      0.188      0.191      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.191     0.191     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.191     0.191     0.191     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.191     0.191     0.191     0.000"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing site conditions"
"        0.000   % Impervious"
"        4.040   Total Area"
"       60.000   Flow length"
"        3.000   Overland Slope"
"        4.040   Pervious Area"
"       60.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.371   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.374     0.191     0.191     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  16.246     2.056      16.246     minutes"
```

```
"             Time to Centroid       159.296    119.065    159.295    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        2845.26    0.00       2845.27    c.m"
"             Rainfall losses        44.323     6.053      44.323     mm"
"             Runoff depth           26.104     64.374     26.104     mm"
"             Runoff volume          1054.60    0.00       1054.60    c.m"
"             Runoff coefficient     0.371      0.000      0.371      "
"             Maximum flow           0.374      0.000      0.374      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                      0.374     0.423     0.191     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                      0.374     0.423     0.423     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        4.550    hectare"
"             Total Impervious area                       0.357    hectare"
"             Total % impervious                          7.846"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                        ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                   2021-0713-10\New SWM Files\MIDUSS modelling\Pre-Development"
"                Output filename:                   100 Year Pre-Development.out"
"                Licensee name:                                  Circe Mahoney"
"                Company                                            WalterFedy"
"                Date & Time last used:                2024-05-02 at 8:23:41 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      892.300   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           283.589    mm/hr"
"             Total depth                  77.411    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   External drainage area east of Site"
"       70.000   % Impervious"
"        0.510   Total Area"
"       49.000   Flow length"
"        2.500   Overland Slope"
"        0.153   Pervious Area"
"       49.000   Pervious length"
"        2.500   Pervious slope"
"        0.357   Impervious Area"
"       49.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.918   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.214     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.153      0.357      0.510      hectare"
"             Time of concentration  14.140     1.849      3.780      minutes"
"             Time to Centroid       155.046    118.394    124.151    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        118.44     276.36     394.80     c.m"
"             Rainfall losses        46.499     6.313      18.369     mm"
"             Runoff depth           30.912     71.098     59.042     mm"
"             Runoff volume          47.30      253.82     301.11     c.m"
"             Runoff coefficient     0.399      0.918      0.763      "
"             Maximum flow           0.018      0.209      0.214      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.214     0.214     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.214     0.214     0.214     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.214     0.214     0.214     0.000"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing site conditions"
"        0.000   % Impervious"
"        4.040   Total Area"
"       60.000   Flow length"
"        3.000   Overland Slope"
"        4.040   Pervious Area"
"       60.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.465     0.214     0.214     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  15.117     1.977      15.117     minutes"
```

```
"             Time to Centroid       156.670    118.640    156.670    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        3127.41    0.00       3127.41    c.m"
"             Rainfall losses        46.489     6.217      46.489     mm"
"             Runoff depth           30.922     71.195     30.922     mm"
"             Runoff volume          1249.23    0.00       1249.24    c.m"
"             Runoff coefficient     0.399      0.000      0.399      "
"             Maximum flow           0.465      0.000      0.465      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.465     0.522     0.214     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.465     0.522     0.522     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     0.357    hectare"
"             Total % impervious                        7.846"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
"               Job folder:            C:\Users\cmahoney\Documents\2024 Work\"
"                  2021-0713-10\New SWM Files\MIDUSS modelling\Pre-Development"
"               Output filename:                  Regional Pre-Development.out"
"               Licensee name:                                  Circe Mahoney"
"               Company                                            WalterFedy"
"               Date & Time last used:               2024-05-08 at 7:55:39 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      720.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32          STORM Mass Curve"
"            3  Mass Curve"
"      212.000  Rainfall depth"
"      720.000  Duration"
"           44  C:\Program Files (x86)\MIDUSSNet\Hazel12.mrd   Hurricane Hazel
(last 12 h)"
"             Maximum intensity           53.000    mm/hr"
"             Total depth                212.000    mm"
"            6  250hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 102"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          102  External drainage area east of Site"
"       70.000  % Impervious"
"        0.510  Total Area"
"       49.000  Flow length"
"        2.500  Overland Slope"
"        0.153  Pervious Area"
"       49.000  Pervious length"
"        2.500  Pervious slope"
"        0.357  Impervious Area"
"       49.000  Impervious length"
"        2.500  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       88.000  Pervious SCS Curve No."
"        0.841  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        3.464  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.947  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
"                    0.072     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.153      0.357      0.510      hectare"
"             Time of concentration  19.682     3.591      8.029      minutes"
"             Time to Centroid       522.490    473.408    486.944    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        324.36     756.84     1081.20    c.m"
"             Rainfall losses        33.643     11.273     17.984     mm"
"             Runoff depth           178.357    200.727    194.016    mm"
"             Runoff volume          272.89     716.60     989.48     c.m"
"             Runoff coefficient     0.841      0.947      0.915      "
"             Maximum flow           0.023      0.052      0.072      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.072     0.072     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.072     0.072     0.072     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.072     0.072     0.072     0.000"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing site conditions"
"        0.000   % Impervious"
"        4.040   Total Area"
"       60.000   Flow length"
"        3.000   Overland Slope"
"        4.040   Pervious Area"
"       60.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.603     0.072     0.072     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  21.042     3.840      21.042     minutes"
"             Time to Centroid       524.177    474.621    524.177    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
```

```
"             Rainfall volume        8564.79    0.01       8564.80    c.m"
"             Rainfall losses        33.240     10.816     33.240     mm"
"             Runoff depth           178.760    201.184    178.760    mm"
"             Runoff volume          7221.91    0.01       7221.92    c.m"
"             Runoff coefficient     0.843      0.000      0.843      "
"             Maximum flow           0.603      0.000      0.603      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.603     0.674     0.072     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.603     0.674     0.674     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     0.357    hectare"
"             Total % impervious                        7.846"
" 19          EXIT"
```

MIDUSS Hydrologic Modelling

Post-Development (Uncontrolled - No SWM)

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                       25 mm Developed Rev1.out"
"                Licensee name:                                    Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:                2024-05-08 at 12:22:43 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      449.205   Coefficient A"
"        0.000   Constant B"
"        0.780   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           125.787    mm/hr"
"             Total depth                  25.000    mm"
"            6   001hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.785   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.049     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  52.587     3.553      6.284      minutes"
"             Time to Centroid       217.722    122.821    128.107    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        29.25      68.25      97.50      c.m"
"             Rainfall losses        22.299     5.375      10.452     mm"
"             Runoff depth           2.701      19.625     14.548     mm"
"             Runoff volume          3.16       53.58      56.74      c.m"
"             Runoff coefficient     0.108      0.785      0.582      "
"             Maximum flow           0.000      0.049      0.049      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.049     0.049     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.049     0.049     0.049     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.049     0.049     0.049     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.789   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.181     0.049     0.049     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
```

```
"             Time of concentration  56.630     3.826      4.617      minutes"
"             Time to Centroid       223.882    123.247    124.755    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        27.00      243.00     270.00     c.m"
"             Rainfall losses        22.300     5.271      6.974      mm"
"             Runoff depth           2.700      19.729     18.026     mm"
"             Runoff volume          2.92       191.77     194.68     c.m"
"             Runoff coefficient     0.108      0.789      0.721      "
"             Maximum flow           0.000      0.181      0.181      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.181     0.230     0.049     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.181     0.230     0.230     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.230    c.m/sec"
"             Hydrograph volume           251.419    c.m"
"                     0.181     0.230     0.230     0.230"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.181     0.000     0.230     0.230"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.785   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.015     0.000     0.230     0.230 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  52.587     3.553      6.284      minutes"
"             Time to Centroid       217.722    122.821    128.107    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        9.00       21.00      30.00      c.m"
"             Rainfall losses        22.299     5.375      10.452     mm"
"             Runoff depth           2.701      19.625     14.548     mm"
"             Runoff volume          0.97       16.48      17.46      c.m"
"             Runoff coefficient     0.108      0.785      0.582      "
"             Maximum flow           0.000      0.015      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.015     0.015     0.230     0.230"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.015     0.015     0.015     0.230"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.015     0.015     0.015     0.230"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.804   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.018     0.015     0.015     0.230 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  85.835     5.799      63.302     minutes"
```

```
"             Time to Centroid       268.350    126.695    228.470    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        432.25     22.75      455.00     c.m"
"             Rainfall losses        22.299     4.891      21.429     mm"
"             Runoff depth           2.701      20.109     3.571      mm"
"             Runoff volume          46.70      18.30      65.00      c.m"
"             Runoff coefficient     0.108      0.804      0.143      "
"             Maximum flow           0.004      0.017      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.018     0.033     0.015     0.230"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.018     0.033     0.033     0.230"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.263    c.m/sec"
"             Hydrograph volume           333.875    c.m"
"                     0.018     0.033     0.033     0.263"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.018     0.000     0.033     0.263"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.785   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.195     0.000     0.033     0.263 c.m/sec"
```

```
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  52.270     3.531      3.882      minutes"
"             Time to Centroid       217.234    122.771    123.450    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        14.25      270.75     285.00     c.m"
"             Rainfall losses        22.299     5.363      6.210      mm"
"             Runoff depth           2.701      19.637     18.790     mm"
"             Runoff volume          1.54       212.66     214.20     c.m"
"             Runoff coefficient     0.108      0.785      0.752      "
"             Maximum flow           0.000      0.195      0.195      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.195     0.195     0.033     0.263"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.195     0.195     0.195     0.263"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                 0.458    c.m/sec"
"             Hydrograph volume            548.079    c.m"
"                  0.195     0.195     0.195     0.458"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                       2 Year Developed Rev1.out"
"                Licensee name:                                     Circe Mahoney"
"                Company                                               WalterFedy"
"                Date & Time last used:                 2024-05-08 at 12:26:00 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      404.100   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           128.430    mm/hr"
"             Total depth                  35.058    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.837   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.055     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  38.717     3.454      6.449      minutes"
"             Time to Centroid       199.134    124.574    130.905    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        41.02      95.71      136.72     c.m"
"             Rainfall losses        28.704     5.713      12.610     mm"
"             Runoff depth           6.354      29.345     22.447     mm"
"             Runoff volume          7.43       80.11      87.55      c.m"
"             Runoff coefficient     0.181      0.837      0.640      "
"             Maximum flow           0.001      0.055      0.055      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.055     0.055     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.055     0.055     0.055     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.055     0.055     0.055     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.836   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.200     0.055     0.055     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
```

```
"             Time of concentration  41.694     3.720      4.613      minutes"
"             Time to Centroid       203.630    125.095    126.943    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        37.86      340.76     378.62     c.m"
"             Rainfall losses        28.705     5.762      8.056      mm"
"             Runoff depth           6.353      29.296     27.002     mm"
"             Runoff volume          6.86       284.76     291.62     c.m"
"             Runoff coefficient     0.181      0.836      0.770      "
"             Maximum flow           0.001      0.200      0.200      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.200     0.256     0.055     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.200     0.256     0.256     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.256    c.m/sec"
"             Hydrograph volume           379.162    c.m"
"                     0.200     0.256     0.256     0.256"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.200     0.000     0.256     0.256"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.837   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.017     0.000     0.256     0.256 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  38.718     3.454      6.449      minutes"
"             Time to Centroid       199.134    124.574    130.905    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        12.62      29.45      42.07      c.m"
"             Rainfall losses        28.704     5.713      12.610     mm"
"             Runoff depth           6.354      29.345     22.447     mm"
"             Runoff volume          2.29       24.65      26.94      c.m"
"             Runoff coefficient     0.181      0.837      0.640      "
"             Maximum flow           0.000      0.017      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.017     0.017     0.256     0.256"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.017     0.017     0.017     0.256"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.017     0.017     0.017     0.256"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.854   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.022     0.017     0.017     0.256 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  63.196     5.638      51.760     minutes"
```

```
"             Time to Centroid       236.123    128.286    214.698    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        606.14     31.90      638.05     c.m"
"             Rainfall losses        28.704     5.125      27.525     mm"
"             Runoff depth           6.354      29.932     7.533      mm"
"             Runoff volume          109.86     27.24      137.10     c.m"
"             Runoff coefficient     0.181      0.854      0.215      "
"             Maximum flow           0.011      0.020      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.039     0.017     0.256"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.022     0.039     0.039     0.256"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.294    c.m/sec"
"             Hydrograph volume           543.198    c.m"
"                     0.022     0.039     0.039     0.294"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.022     0.000     0.039     0.294"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.838   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.218     0.000     0.039     0.294 c.m/sec"
```

```
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  38.484     3.433      3.828      minutes"
"             Time to Centroid       198.783    124.528    125.365    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        19.98      379.67     399.66     c.m"
"             Rainfall losses        28.705     5.697      6.847      mm"
"             Runoff depth           6.353      29.361     28.211     mm"
"             Runoff volume          3.62       317.98     321.60     c.m"
"             Runoff coefficient     0.181      0.838      0.805      "
"             Maximum flow           0.001      0.218      0.218      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.218     0.218     0.039     0.294"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.218     0.218     0.218     0.294"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                 0.512    c.m/sec"
"             Hydrograph volume            864.798    c.m"
"                  0.218     0.218     0.218     0.512"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                      5 Year Developed Rev1.out"
"                Licensee name:                                    Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:                2024-05-08 at 12:27:42 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      535.400   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           170.160    mm/hr"
"             Total depth                  46.448    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.876   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.080     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  28.877     3.055      5.898      minutes"
"             Time to Centroid       182.422    122.455    129.058    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        54.34      126.80     181.15     c.m"
"             Rainfall losses        34.697     5.744      14.430     mm"
"             Runoff depth           11.752     40.705     32.019     mm"
"             Runoff volume          13.75      111.12     124.87     c.m"
"             Runoff coefficient     0.253      0.876      0.689      "
"             Maximum flow           0.003      0.079      0.080      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.080     0.080     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.080     0.080     0.080     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.080     0.080     0.080     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.872   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.273     0.080     0.080     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
```

```
"             Time of concentration  31.097     3.290      4.158      minutes"
"             Time to Centroid       185.907    122.984    124.949    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        50.16      451.48     501.64     c.m"
"             Rainfall losses        34.692     5.929      8.806      mm"
"             Runoff depth           11.757     40.519     37.643     mm"
"             Runoff volume          12.70      393.84     406.54     c.m"
"             Runoff coefficient     0.253      0.872      0.810      "
"             Maximum flow           0.002      0.273      0.273      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.273     0.353     0.080     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.273     0.353     0.353     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.353    c.m/sec"
"             Hydrograph volume           531.414    c.m"
"                     0.273     0.353     0.353     0.353"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.273     0.000     0.353     0.353"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.876   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.024     0.000     0.353     0.353 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  28.877     3.055      5.898      minutes"
"             Time to Centroid       182.422    122.455    129.058    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        16.72      39.02      55.74      c.m"
"             Rainfall losses        34.697     5.744      14.430     mm"
"             Runoff depth           11.752     40.705     32.019     mm"
"             Runoff volume          4.23       34.19      38.42      c.m"
"             Runoff coefficient     0.253      0.876      0.689      "
"             Maximum flow           0.001      0.024      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.024     0.024     0.353     0.353"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.024     0.024     0.024     0.353"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.024     0.024     0.024     0.353"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.886   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.033     0.024     0.024     0.353 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  47.135     4.986      40.579     minutes"
```

```
"             Time to Centroid       211.196    125.881    197.928    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        803.09     42.27      845.36     c.m"
"             Rainfall losses        34.691     5.306      33.222     mm"
"             Runoff depth           11.758     41.142     13.227     mm"
"             Runoff volume          203.29     37.44      240.73     c.m"
"             Runoff coefficient     0.253      0.886      0.285      "
"             Maximum flow           0.027      0.027      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.033     0.056     0.024     0.353"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.033     0.056     0.056     0.353"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.398    c.m/sec"
"             Hydrograph volume           810.567    c.m"
"                     0.033     0.056     0.056     0.398"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.033     0.000     0.056     0.398"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.877   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.315     0.000     0.056     0.398 c.m/sec"
```

```
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  28.703     3.036      3.420      minutes"
"             Time to Centroid       182.153    122.412    123.306    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        26.48      503.04     529.51     c.m"
"             Rainfall losses        34.700     5.733      7.181      mm"
"             Runoff depth           11.749     40.716     39.268     mm"
"             Runoff volume          6.70       440.95     447.65     c.m"
"             Runoff coefficient     0.253      0.877      0.845      "
"             Maximum flow           0.001      0.315      0.315      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.315     0.315     0.056     0.398"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.315     0.315     0.315     0.398"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                 0.714    c.m/sec"
"             Hydrograph volume         1258.215    c.m"
"                    0.315     0.315     0.315     0.714"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.550    hectare"
"             Total Impervious area                    2.503    hectare"
"             Total % impervious                      55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                     10 Year Developed Rev1.out"
"                Licensee name:                                   Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:               2024-05-08 at 12:29:07 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      622.800   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           197.937    mm/hr"
"             Total depth                  54.031    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.893   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.097     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  25.174     2.864      5.629      minutes"
"             Time to Centroid       175.554    121.463    128.167    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        63.22      147.50     210.72     c.m"
"             Rainfall losses        38.105     5.788      15.483     mm"
"             Runoff depth           15.926     48.242     38.547     mm"
"             Runoff volume          18.63      131.70     150.33     c.m"
"             Runoff coefficient     0.295      0.893      0.713      "
"             Maximum flow           0.004      0.096      0.097      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.097     0.097     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.097     0.097     0.097     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.097     0.097     0.097     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.890   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.332     0.097     0.097     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
```

```
"             Time of concentration  27.110     3.084      3.937      minutes"
"             Time to Centroid       178.636    121.923    123.937    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        58.35      525.18     583.53     c.m"
"             Rainfall losses        38.091     5.933      9.149      mm"
"             Runoff depth           15.940     48.098     44.882     mm"
"             Runoff volume          17.21      467.51     484.72     c.m"
"             Runoff coefficient     0.295      0.890      0.831      "
"             Maximum flow           0.004      0.331      0.332      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.332     0.428     0.097     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.332     0.428     0.428     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.428    c.m/sec"
"             Hydrograph volume           635.057    c.m"
"                     0.332     0.428     0.428     0.428"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.332     0.000     0.428     0.428"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.893   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.030     0.000     0.428     0.428 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  25.174     2.864      5.629      minutes"
"             Time to Centroid       175.554    121.463    128.167    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        19.45      45.39      64.84      c.m"
"             Rainfall losses        38.105     5.788      15.483     mm"
"             Runoff depth           15.926     48.242     38.547     mm"
"             Runoff volume          5.73       40.52      46.26      c.m"
"             Runoff coefficient     0.295      0.893      0.713      "
"             Maximum flow           0.001      0.030      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.030     0.030     0.428     0.428"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.030     0.030     0.030     0.428"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.030     0.030     0.030     0.428"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.047     0.030     0.030     0.428 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  41.090     4.675      36.053     minutes"
```

```
"             Time to Centroid       201.083    124.752    190.524    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        934.19     49.17      983.36     c.m"
"             Rainfall losses        38.099     5.433      36.466     mm"
"             Runoff depth           15.932     48.597     17.565     mm"
"             Runoff volume          275.46     44.22      319.68     c.m"
"             Runoff coefficient     0.295      0.899      0.325      "
"             Maximum flow           0.044      0.032      0.047      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.047     0.069     0.030     0.428"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.047     0.069     0.069     0.428"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.485    c.m/sec"
"             Hydrograph volume          1000.997    c.m"
"                     0.047     0.069     0.069     0.485"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.047     0.000     0.069     0.485"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.893   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.382     0.000     0.069     0.485 c.m/sec"
```

```
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  25.022     2.847      3.225      minutes"
"             Time to Centroid       175.305    121.436    122.356    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        30.80      585.15     615.95     c.m"
"             Rainfall losses        38.102     5.776      7.393      mm"
"             Runoff depth           15.928     48.254     46.638     mm"
"             Runoff volume          9.08       522.59     531.67     c.m"
"             Runoff coefficient     0.295      0.893      0.863      "
"             Maximum flow           0.002      0.382      0.382      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.382     0.382     0.069     0.485"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.382     0.382     0.382     0.485"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.867    c.m/sec"
"             Hydrograph volume          1532.672    c.m"
"                  0.382     0.382     0.382     0.867"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                     25 Year Developed Rev1.out"
"                Licensee name:                                   Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:               2024-05-08 at 12:30:43 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      731.300   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           232.421    mm/hr"
"             Total depth                  63.444    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.908   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.118     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  21.996     2.677      5.352      minutes"
"             Time to Centroid       169.356    120.544    127.304    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        74.23      173.20     247.43     c.m"
"             Rainfall losses        41.828     5.820      16.622     mm"
"             Runoff depth           21.615     57.624     46.821     mm"
"             Runoff volume          25.29      157.31     182.60     c.m"
"             Runoff coefficient     0.341      0.908      0.738      "
"             Maximum flow           0.007      0.117      0.118      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.118     0.118     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.118     0.118     0.118     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.118     0.118     0.118     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.906   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.405     0.118     0.118     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
```

```
"             Time of concentration  23.687     2.882      3.718      minutes"
"             Time to Centroid       172.095    120.908    122.964    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        68.52      616.67     685.19     c.m"
"             Rainfall losses        41.807     5.972      9.556      mm"
"             Runoff depth           21.637     57.471     53.888     mm"
"             Runoff volume          23.37      558.62     581.99     c.m"
"             Runoff coefficient     0.341      0.906      0.849      "
"             Maximum flow           0.006      0.404      0.405      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.405     0.523     0.118     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.405     0.523     0.523     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.523    c.m/sec"
"             Hydrograph volume           764.592    c.m"
"                     0.405     0.523     0.523     0.523"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.405     0.000     0.523     0.523"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.908   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.036     0.000     0.523     0.523 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  21.996     2.677      5.352      minutes"
"             Time to Centroid       169.356    120.544    127.304    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        22.84      53.29      76.13      c.m"
"             Rainfall losses        41.829     5.820      16.622     mm"
"             Runoff depth           21.615     57.624     46.821     mm"
"             Runoff volume          7.78       48.40      56.19      c.m"
"             Runoff coefficient     0.341      0.908      0.738      "
"             Maximum flow           0.002      0.036      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.036     0.036     0.523     0.523"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.036     0.036     0.036     0.523"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.036     0.036     0.036     0.523"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.910   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.070     0.036     0.036     0.523 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  35.903     4.369      32.022     minutes"
```

```
"             Time to Centroid       191.988    123.664    183.579    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        1096.94    57.73      1154.67    c.m"
"             Rainfall losses        41.804     5.738      40.001     mm"
"             Runoff depth           21.639     57.706     23.443     mm"
"             Runoff volume          374.15     52.51      426.66     c.m"
"             Runoff coefficient     0.341      0.910      0.370      "
"             Maximum flow           0.066      0.037      0.070      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.070     0.087     0.036     0.523"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.070     0.087     0.087     0.523"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.597    c.m/sec"
"             Hydrograph volume          1247.435    c.m"
"                     0.070     0.087     0.087     0.597"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.070     0.000     0.087     0.597"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.908   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.465     0.000     0.087     0.597 c.m/sec"
```

```
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  21.863     2.661      3.032      minutes"
"             Time to Centroid       169.131    120.513    121.454    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        36.16      687.09     723.26     c.m"
"             Rainfall losses        41.824     5.811      7.612      mm"
"             Runoff depth           21.620     57.632     55.832     mm"
"             Runoff volume          12.32      624.16     636.48     c.m"
"             Runoff coefficient     0.341      0.908      0.880      "
"             Maximum flow           0.003      0.464      0.465      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.465     0.465     0.087     0.597"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.465     0.465     0.465     0.597"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                 1.062    c.m/sec"
"             Hydrograph volume         1883.918    c.m"
"                  0.465     0.465     0.465     1.062"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    4.550    hectare"
"             Total Impervious area                   2.503    hectare"
"             Total % impervious                     55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                     50 Year Developed Rev1.out"
"                Licensee name:                                   Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:               2024-05-08 at 12:32:16 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      811.800   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           258.005    mm/hr"
"             Total depth                  70.427    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.372   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.134     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  20.248     2.563      5.179      minutes"
"             Time to Centroid       165.776    119.964    126.742    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        82.40      192.27     274.67     c.m"
"             Rainfall losses        44.262     5.851      17.374     mm"
"             Runoff depth           26.165     64.576     53.053     mm"
"             Runoff volume          30.61      176.29     206.91     c.m"
"             Runoff coefficient     0.372      0.917      0.753      "
"             Maximum flow           0.009      0.132      0.134      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.134     0.134     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.134     0.134     0.134     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.134     0.134     0.134     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.371   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.915   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.460     0.134     0.134     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
```

```
"             Time of concentration  21.804     2.760      3.581      minutes"
"             Time to Centroid       168.350    120.330    122.402    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        76.06      684.55     760.62     c.m"
"             Rainfall losses        44.273     5.986      9.815      mm"
"             Runoff depth           26.154     64.441     60.612     mm"
"             Runoff volume          28.25      626.37     654.61     c.m"
"             Runoff coefficient     0.371      0.915      0.861      "
"             Maximum flow           0.008      0.459      0.460      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.460     0.594     0.134     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.460     0.594     0.594     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.594    c.m/sec"
"             Hydrograph volume           861.521    c.m"
"                     0.460     0.594     0.594     0.594"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.460     0.000     0.594     0.594"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.372   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.041     0.000     0.594     0.594 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  20.248     2.563      5.179      minutes"
"             Time to Centroid       165.777    119.964    126.742    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        25.35      59.16      84.51      c.m"
"             Rainfall losses        44.262     5.851      17.374     mm"
"             Runoff depth           26.165     64.576     53.053     mm"
"             Runoff volume          9.42       54.24      63.66      c.m"
"             Runoff coefficient     0.372      0.917      0.753      "
"             Maximum flow           0.003      0.041      0.041      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.041     0.041     0.594     0.594"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.041     0.041     0.041     0.594"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.041     0.041     0.041     0.594"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.372   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.914   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.097     0.041     0.041     0.594 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  33.049     4.183      29.742     minutes"
```

```
"             Time to Centroid       186.837    123.021    179.526    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        1217.69    64.09      1281.78    c.m"
"             Rainfall losses        44.248     6.062      42.338     mm"
"             Runoff depth           26.180     64.365     28.089     mm"
"             Runoff volume          452.65     58.57      511.22     c.m"
"             Runoff coefficient     0.372      0.914      0.399      "
"             Maximum flow           0.090      0.040      0.097      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.097     0.104     0.041     0.594"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.097     0.104     0.104     0.594"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.680    c.m/sec"
"             Hydrograph volume          1436.403    c.m"
"                     0.097     0.104     0.104     0.680"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.097     0.000     0.104     0.680"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.371   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.527     0.000     0.104     0.680 c.m/sec"
```

```
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  20.126     2.547      2.914      minutes"
"             Time to Centroid       165.579    119.932    120.885    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        40.14      762.73     802.87     c.m"
"             Rainfall losses        44.266     5.845      7.766      mm"
"             Runoff depth           26.161     64.582     62.661     mm"
"             Runoff volume          14.91      699.43     714.34     c.m"
"             Runoff coefficient     0.371      0.917      0.890      "
"             Maximum flow           0.004      0.526      0.527      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.527     0.527     0.104     0.680"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.527     0.527     0.527     0.680"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                 1.207    c.m/sec"
"             Hydrograph volume         2150.741    c.m"
"                  0.527     0.527     0.527     1.207"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.550    hectare"
"             Total Impervious area                    2.503    hectare"
"             Total % impervious                      55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                    100 Year Developed Rev1.out"
"                Licensee name:                                   Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:               2024-05-08 at 12:33:57 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      892.300   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           283.589    mm/hr"
"             Total depth                  77.411    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.150     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  18.840     2.464      5.024      minutes"
"             Time to Centroid       162.850    119.461    126.243    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        90.57      211.33     301.90     c.m"
"             Rainfall losses        46.512     5.930      18.105     mm"
"             Runoff depth           30.899     71.481     59.306     mm"
"             Runoff volume          36.15      195.14     231.29     c.m"
"             Runoff coefficient     0.399      0.923      0.766      "
"             Maximum flow           0.011      0.148      0.150      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.150     0.150     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.150     0.150     0.150     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.150     0.150     0.150     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.516     0.150     0.150     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
```

```
"             Time of concentration  20.288     2.654      3.463      minutes"
"             Time to Centroid       165.225    119.833    121.917    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        83.60      752.44     836.04     c.m"
"             Rainfall losses        46.482     5.995      10.044     mm"
"             Runoff depth           30.929     71.416     67.368     mm"
"             Runoff volume          33.40      694.17     727.57     c.m"
"             Runoff coefficient     0.400      0.923      0.870      "
"             Maximum flow           0.009      0.514      0.516      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.516     0.666     0.150     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.516     0.666     0.666     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.666    c.m/sec"
"             Hydrograph volume           958.863    c.m"
"                     0.516     0.666     0.666     0.666"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.516     0.000     0.666     0.666"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.046     0.000     0.666     0.666 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  18.840     2.464      5.024      minutes"
"             Time to Centroid       162.850    119.461    126.243    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        27.87      65.03      92.89      c.m"
"             Rainfall losses        46.512     5.930      18.105     mm"
"             Runoff depth           30.899     71.481     59.306     mm"
"             Runoff volume          11.12      60.04      71.17      c.m"
"             Runoff coefficient     0.399      0.923      0.766      "
"             Maximum flow           0.003      0.045      0.046      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.046     0.046     0.666     0.666"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.046     0.046     0.046     0.666"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.046     0.046     0.046     0.666"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.119     0.046     0.046     0.666 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  30.751     4.022      27.871     minutes"
```

```
"             Time to Centroid       182.566    122.468    176.090    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        1338.44    70.44      1408.88    c.m"
"             Rainfall losses        46.476     6.431      44.474     mm"
"             Runoff depth           30.935     70.980     32.937     mm"
"             Runoff volume          534.86     64.59      599.46     c.m"
"             Runoff coefficient     0.400      0.917      0.425      "
"             Maximum flow           0.113      0.044      0.119      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.119     0.128     0.046     0.666"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.119     0.128     0.128     0.666"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.765    c.m/sec"
"             Hydrograph volume          1629.486    c.m"
"                     0.119     0.128     0.128     0.765"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.119     0.000     0.128     0.765"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.588     0.000     0.128     0.765 c.m/sec"
```

```
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  18.726     2.449      2.811      minutes"
"             Time to Centroid       162.654    119.430    120.392    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        44.12      838.36     882.49     c.m"
"             Rainfall losses        46.507     5.935      7.964      mm"
"             Runoff depth           30.905     71.476     69.447     mm"
"             Runoff volume          17.62      774.09     791.70     c.m"
"             Runoff coefficient     0.399      0.923      0.897      "
"             Maximum flow           0.005      0.587      0.588      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.588     0.588     0.128     0.765"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.588     0.588     0.588     0.765"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                 1.353    c.m/sec"
"             Hydrograph volume         2421.186    c.m"
"                  0.588     0.588     0.588     1.353"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.550    hectare"
"             Total Impervious area                    2.503    hectare"
"             Total % impervious                      55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 467"
"                MIDUSS created                                      July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development - no
mitigation"
"                Output filename:                    Regional Developed Rev2.out"
"                Licensee name:                                   Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:               2024-05-08 at 12:35:31 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      720.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"      212.000   Rainfall depth"
"      720.000   Duration"
"           44   C:\Program Files (x86)\MIDUSSNet\Hazel12.mrd   Hurricane Hazel
(last 12 h)"
"             Maximum intensity            53.000    mm/hr"
"             Total depth                 212.000    mm"
"            6   250hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External catchment area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.969   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.058     0.000     0.000     0.000 c.m/sec"
```

```
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  26.225     4.785      10.609     minutes"
"             Time to Centroid       529.681    477.235    491.481    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        248.04     578.76     826.80     c.m"
"             Rainfall losses        33.290     6.621      14.622     mm"
"             Runoff depth           178.710    205.379    197.378    mm"
"             Runoff volume          209.09     560.68     769.78     c.m"
"             Runoff coefficient     0.843      0.969      0.931      "
"             Maximum flow           0.018      0.041      0.058      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.058     0.058     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.058     0.058     0.058     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.058     0.058     0.058     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to Pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       45.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       45.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       45.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.842   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.946   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.150     0.058     0.058     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  19.997     3.649      5.121      minutes"
"             Time to Centroid       522.950    473.543    477.991    minutes"
```

```
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        228.96     2060.64    2289.60    c.m"
"             Rainfall losses        33.479     11.509     13.706     mm"
"             Runoff depth           178.521    200.491    198.294    mm"
"             Runoff volume          192.80     1948.78    2141.58    c.m"
"             Runoff coefficient     0.842      0.946      0.935      "
"             Maximum flow           0.016      0.142      0.150      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.150     0.207     0.058     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.150     0.207     0.207     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.207    c.m/sec"
"             Hydrograph volume          2911.355    c.m"
"                     0.150     0.207     0.207     0.207"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.150     0.000     0.207     0.207"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   External drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.969   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.018     0.000     0.207     0.207 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  26.225     4.785      10.609     minutes"
"             Time to Centroid       529.682    477.235    491.481    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        76.32      178.08     254.40     c.m"
"             Rainfall losses        33.290     6.621      14.622     mm"
"             Runoff depth           178.710    205.379    197.378    mm"
"             Runoff volume          64.34      172.52     236.85     c.m"
"             Runoff coefficient     0.843      0.969      0.931      "
"             Maximum flow           0.005      0.013      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.018     0.018     0.207     0.207"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.018     0.018     0.018     0.207"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.018     0.018     0.018     0.207"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.971   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.271     0.018     0.018     0.207 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  42.805     7.811      40.807     minutes"
"             Time to Centroid       547.357    480.188    543.520    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
```

```
"             Rainfall volume        3665.48    192.92     3858.40    c.m"
"             Rainfall losses        33.186     6.193      31.836     mm"
"             Runoff depth           178.814    205.807    180.164    mm"
"             Runoff volume          3091.70    187.28     3278.98    c.m"
"             Runoff coefficient     0.843      0.971      0.850      "
"             Maximum flow           0.258      0.014      0.271      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.271     0.287     0.018     0.207"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.271     0.287     0.287     0.207"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.491    c.m/sec"
"             Hydrograph volume          6427.188    c.m"
"                     0.271     0.287     0.287     0.491"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.271     0.000     0.287     0.491"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       98.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.023   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.117   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.969   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.169     0.000     0.287     0.491 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.023      1.117      1.140      hectare"
```

```
"             Time of concentration  26.067     4.756      5.128      minutes"
"             Time to Centroid       529.494    477.198    478.111    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        48.34      2368.46    2416.80    c.m"
"             Rainfall losses        33.306     6.614      7.148      mm"
"             Runoff depth           178.694    205.386    204.852    mm"
"             Runoff volume          40.74      2294.57    2335.31    c.m"
"             Runoff coefficient     0.843      0.969      0.966      "
"             Maximum flow           0.003      0.168      0.169      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   0.169     0.169     0.287     0.491"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                   0.169     0.169     0.169     0.491"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlet to Creek"
"             Maximum flow                  0.658    c.m/sec"
"             Hydrograph volume          8762.504    c.m"
"                   0.169     0.169     0.169     0.658"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.537    hectare"
"             Total % impervious                       55.763"
" 19          EXIT"
```

MIDUSS Hydrologic Modelling

Post-Development (with SWM)

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 467"
"               MIDUSS created                                  July 6, 2008"
"           10  Units used:                                        ie METRIC"
"               Job folder:            C:\Users\cmahoney\Documents\2024 Work\"
"                 2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"               Output filename:                    25 mm Post-Dev - REV10.out"
"               Licensee name:                                 Circe Mahoney"
"               Company                                           WalterFedy"
"               Date & Time last used:              2024-05-08 at 11:09:15 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      240.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"            1  Chicago storm"
"      449.205  Coefficient A"
"        0.000  Constant B"
"        0.780  Exponent C"
"        0.400  Fraction R"
"      240.000  Duration"
"        1.000  Time step multiplier"
"             Maximum intensity          125.787    mm/hr"
"             Total depth                 25.000    mm"
"            6  001hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          301  External drainage area - drains to 201"
"       70.000  % Impervious"
"        0.390  Total Area"
"       50.000  Flow length"
"        1.000  Overland Slope"
"        0.117  Pervious Area"
"       50.000  Pervious length"
"        1.000  Pervious slope"
"        0.273  Impervious Area"
"       50.000  Impervious length"
"        1.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.108  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.785  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
```

```
"                    0.049     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  52.587     3.553      6.284      minutes"
"             Time to Centroid       217.722    122.821    128.107    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        29.25      68.25      97.50      c.m"
"             Rainfall losses        22.299     5.375      10.452     mm"
"             Runoff depth           2.701      19.625     14.548     mm"
"             Runoff volume          3.16       53.58      56.74      c.m"
"             Runoff coefficient     0.108      0.785      0.582      "
"             Maximum flow           0.000      0.049      0.049      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.049     0.049     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.049     0.049     0.049     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.049     0.049     0.049     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.789   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.181     0.049     0.049     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  56.630     3.826      4.617      minutes"
```

```
"             Time to Centroid       223.882    123.247    124.755    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        27.00      243.00     270.00     c.m"
"             Rainfall losses        22.300     5.271      6.974      mm"
"             Runoff depth           2.700      19.729     18.026     mm"
"             Runoff volume          2.92       191.77     194.68     c.m"
"             Runoff coefficient     0.108      0.789      0.721      "
"             Maximum flow           0.000      0.181      0.181      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.181     0.230     0.049     0.000"
" 54          POND DESIGN"
"         0.230   Current peak flow    c.m/sec"
"         0.367   Target outflow    c.m/sec"
"         251.4   Hydrograph volume    c.m"
"           12.   Number of stages"
"       506.400   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.400     0.000     0.000"
"                 506.500   0.00146    34.948"
"                 506.600   0.00231    71.402"
"                 506.700   0.00292   110.901"
"                 506.800   0.01578   153.510"
"                 506.900   0.04667   199.291"
"                 507.000    0.1014   248.306"
"                 507.100    0.1639   300.603"
"                 507.200    0.2020   356.258"
"                 507.300    0.2327   415.288"
"                 507.350    0.3324   446.043"
"                 507.400    0.5023   477.614"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 507.300     0.900     5.000     0.000     0.000"
"            3.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 506.400     0.650    0.0500     1.000"
"                 506.700     0.650    0.2500     1.000"
"                 506.700     0.650    0.3000     1.000"
"            1.   HOR. ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 507.100     0.650    0.0750     1.000"
"              Peak outflow                  0.019    c.m/sec"
"              Maximum level              506.813    metre"
"              Maximum storage            159.235    c.m"
```

```
"             Centroidal lag                7.623   hours"
"                  0.181     0.230     0.019     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.019    c.m/sec"
"             Hydrograph volume           243.302    c.m"
"                     0.181     0.230     0.020     0.020"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.181     0.000     0.019     0.019"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.785   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.015     0.000     0.019     0.019 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  52.587     3.553      6.284      minutes"
"             Time to Centroid       217.722    122.821    128.107    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        9.00       21.00      30.00      c.m"
"             Rainfall losses        22.299     5.375      10.452     mm"
"             Runoff depth           2.701      19.625     14.548     mm"
"             Runoff volume          0.97       16.48      17.46      c.m"
"             Runoff coefficient     0.108      0.785      0.582      "
"             Maximum flow           0.000      0.015      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.015     0.015     0.020     0.019"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.015     0.015     0.015     0.019"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.015     0.015     0.015     0.019"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.804   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.018     0.015     0.015     0.020 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  85.835     5.799      63.302     minutes"
"             Time to Centroid       268.350    126.695    228.470    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        432.25     22.75      455.00     c.m"
"             Rainfall losses        22.299     4.891      21.429     mm"
"             Runoff depth           2.701      20.109     3.571      mm"
"             Runoff volume          46.70      18.30      65.00      c.m"
"             Runoff coefficient     0.108      0.804      0.143      "
"             Maximum flow           0.004      0.017      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.018     0.033     0.015     0.019"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.018     0.033     0.033     0.019"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.035    c.m/sec"
"             Hydrograph volume           325.758    c.m"
"                    0.018     0.033     0.033     0.035"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.018     0.000     0.033     0.035"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.108   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.785   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.195     0.000     0.033     0.036 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  52.270     3.531      3.882      minutes"
"             Time to Centroid       217.234    122.771    123.450    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        14.25      270.75     285.00     c.m"
"             Rainfall losses        22.299     5.363      6.210      mm"
"             Runoff depth           2.701      19.637     18.790     mm"
"             Runoff volume          1.54       212.66     214.20     c.m"
"             Runoff coefficient     0.108      0.785      0.752      "
"             Maximum flow           0.000      0.195      0.195      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.195     0.195     0.033     0.035"
" 54          POND DESIGN"
"        0.195   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"        214.2   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                  0.037    c.m/sec"
"             Maximum level               507.240    metre"
"             Maximum storage              90.411    c.m"
"             Centroidal lag                2.388   hours"
"                  0.195     0.195     0.037     0.035 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 outlet to creek"
"             Maximum flow                  0.071    c.m/sec"
"             Hydrograph volume           538.992    c.m"
"                     0.195     0.195     0.037     0.072"
" 38          START/RE-START TOTALS 203"
"             3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
"               Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                 2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"               Output filename:                    2 Year Post-Dev - REV10.out"
"               Licensee name:                                  Circe Mahoney"
"               Company                                            WalterFedy"
"               Date & Time last used:               2024-05-08 at 11:07:15 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      240.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"            1  Chicago storm"
"      404.100  Coefficient A"
"        0.000  Constant B"
"        0.699  Exponent C"
"        0.400  Fraction R"
"      240.000  Duration"
"        1.000  Time step multiplier"
"             Maximum intensity          128.430    mm/hr"
"             Total depth                 35.058    mm"
"            6  002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          301  External drainage area - drains to 201"
"       70.000  % Impervious"
"        0.390  Total Area"
"       50.000  Flow length"
"        1.000  Overland Slope"
"        0.117  Pervious Area"
"       50.000  Pervious length"
"        1.000  Pervious slope"
"        0.273  Impervious Area"
"       50.000  Impervious length"
"        1.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.181  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.837  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
```

```
"                    0.055     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  38.717     3.454      6.449      minutes"
"             Time to Centroid       199.134    124.574    130.905    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        41.02      95.71      136.72     c.m"
"             Rainfall losses        28.704     5.713      12.610     mm"
"             Runoff depth           6.354      29.345     22.447     mm"
"             Runoff volume          7.43       80.11      87.55      c.m"
"             Runoff coefficient     0.181      0.837      0.640      "
"             Maximum flow           0.001      0.055      0.055      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.055     0.055     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.055     0.055     0.055     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.055     0.055     0.055     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.836   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.200     0.055     0.055     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  41.694     3.720      4.613      minutes"
```

```
"             Time to Centroid       203.630    125.095    126.943    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        37.86      340.76     378.62     c.m"
"             Rainfall losses        28.705     5.762      8.056      mm"
"             Runoff depth           6.353      29.296     27.002     mm"
"             Runoff volume          6.86       284.76     291.62     c.m"
"             Runoff coefficient     0.181      0.836      0.770      "
"             Maximum flow           0.001      0.200      0.200      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.200     0.256     0.055     0.000"
" 54          POND DESIGN"
"         0.256   Current peak flow    c.m/sec"
"         0.367   Target outflow    c.m/sec"
"         379.2   Hydrograph volume    c.m"
"           12.   Number of stages"
"       506.400   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.400     0.000     0.000"
"                 506.500   0.00146    34.948"
"                 506.600   0.00231    71.402"
"                 506.700   0.00292   110.901"
"                 506.800   0.01578   153.510"
"                 506.900   0.04667   199.291"
"                 507.000    0.1014   248.306"
"                 507.100    0.1639   300.603"
"                 507.200    0.2020   356.258"
"                 507.300    0.2327   415.288"
"                 507.350    0.3324   446.043"
"                 507.400    0.5023   477.614"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 507.300     0.900     5.000     0.000     0.000"
"            3.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 506.400     0.650    0.0500     1.000"
"                 506.700     0.650    0.2500     1.000"
"                 506.700     0.650    0.3000     1.000"
"            1.   HOR. ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 507.100     0.650    0.0750     1.000"
"              Peak outflow                  0.045    c.m/sec"
"              Maximum level               506.895    metre"
"              Maximum storage             197.001    c.m"
```

```
"             Centroidal lag                6.137   hours"
"                  0.200     0.256     0.045     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                   0.032    c.m/sec"
"             Hydrograph volume            370.626    c.m"
"                     0.200     0.256     0.045     0.045"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.200     0.000     0.032     0.032"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.837   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.017     0.000     0.032     0.032 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  38.718     3.454      6.449      minutes"
"             Time to Centroid       199.134    124.574    130.905    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        12.62      29.45      42.07      c.m"
"             Rainfall losses        28.704     5.713      12.610     mm"
"             Runoff depth           6.354      29.345     22.447     mm"
"             Runoff volume          2.29       24.65      26.94      c.m"
"             Runoff coefficient     0.181      0.837      0.640      "
"             Maximum flow           0.000      0.017      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.017     0.017     0.032     0.032"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.017     0.017     0.017     0.032"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.017     0.017     0.017     0.032"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.854   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.022     0.017     0.017     0.032 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  63.196     5.638      51.760     minutes"
"             Time to Centroid       236.123    128.286    214.698    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        606.14     31.90      638.05     c.m"
"             Rainfall losses        28.704     5.125      27.525     mm"
"             Runoff depth           6.354      29.932     7.533      mm"
"             Runoff volume          109.86     27.24      137.10     c.m"
"             Runoff coefficient     0.181      0.854      0.215      "
"             Maximum flow           0.011      0.020      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.039     0.017     0.032"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.022     0.039     0.039     0.032"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.047    c.m/sec"
"             Hydrograph volume           534.661    c.m"
"                    0.022     0.039     0.039     0.060"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.022     0.000     0.039     0.047"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.181   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.838   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.218     0.000     0.039     0.047 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  38.484     3.433      3.828      minutes"
"             Time to Centroid       198.783    124.528    125.365    minutes"
"             Rainfall depth         35.058     35.058     35.058     mm"
"             Rainfall volume        19.98      379.67     399.66     c.m"
"             Rainfall losses        28.705     5.697      6.847      mm"
"             Runoff depth           6.353      29.361     28.211     mm"
"             Runoff volume          3.62       317.98     321.60     c.m"
"             Runoff coefficient     0.181      0.838      0.805      "
"             Maximum flow           0.001      0.218      0.218      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.218     0.218     0.039     0.047"
" 54          POND DESIGN"
"        0.218   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"        321.6   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"               Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                 invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                  0.037    c.m/sec"
"             Maximum level               507.257    metre"
"             Maximum storage             117.102    c.m"
"             Centroidal lag                2.538   hours"
"                  0.218     0.218     0.037     0.047 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.084    c.m/sec"
"             Hydrograph volume           857.954    c.m"
"                    0.218     0.218     0.037     0.097"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
"               Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                 2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"               Output filename:                    5 Year Post-Dev - REV10.out"
"               Licensee name:                                  Circe Mahoney"
"               Company                                            WalterFedy"
"               Date & Time last used:               2024-05-08 at 11:04:57 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      240.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"            1  Chicago storm"
"      535.400  Coefficient A"
"        0.000  Constant B"
"        0.699  Exponent C"
"        0.400  Fraction R"
"      240.000  Duration"
"        1.000  Time step multiplier"
"             Maximum intensity          170.160    mm/hr"
"             Total depth                 46.448    mm"
"            6  005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          301  External drainage area - drains to 201"
"       70.000  % Impervious"
"        0.390  Total Area"
"       50.000  Flow length"
"        1.000  Overland Slope"
"        0.117  Pervious Area"
"       50.000  Pervious length"
"        1.000  Pervious slope"
"        0.273  Impervious Area"
"       50.000  Impervious length"
"        1.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.253  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.876  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
```

```
"                    0.080     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  28.877     3.055      5.898      minutes"
"             Time to Centroid       182.422    122.455    129.058    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        54.34      126.80     181.15     c.m"
"             Rainfall losses        34.697     5.744      14.430     mm"
"             Runoff depth           11.752     40.705     32.019     mm"
"             Runoff volume          13.75      111.12     124.87     c.m"
"             Runoff coefficient     0.253      0.876      0.689      "
"             Maximum flow           0.003      0.079      0.080      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.080     0.080     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.080     0.080     0.080     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.080     0.080     0.080     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.872   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.273     0.080     0.080     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  31.097     3.290      4.158      minutes"
```

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"             Time to Centroid       185.907    122.984    124.949    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        50.16      451.48     501.64     c.m"
"             Rainfall losses        34.692     5.929      8.806      mm"
"             Runoff depth           11.757     40.519     37.643     mm"
"             Runoff volume          12.70      393.84     406.54     c.m"
"             Runoff coefficient     0.253      0.872      0.810      "
"             Maximum flow           0.002      0.273      0.273      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.273     0.353     0.080     0.000"
" 54          POND DESIGN"
"         0.353   Current peak flow    c.m/sec"
"         0.367   Target outflow    c.m/sec"
"         531.4   Hydrograph volume    c.m"
"           12.   Number of stages"
"       506.400   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.400     0.000     0.000"
"                 506.500   0.00146    34.948"
"                 506.600   0.00231    71.402"
"                 506.700   0.00292   110.901"
"                 506.800   0.01578   153.510"
"                 506.900   0.04667   199.291"
"                 507.000    0.1014   248.306"
"                 507.100    0.1639   300.603"
"                 507.200    0.2020   356.258"
"                 507.300    0.2327   415.288"
"                 507.350    0.3324   446.043"
"                 507.400    0.5023   477.614"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                 507.300     0.900     5.000     0.000     0.000"
"            3.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 506.400     0.650    0.0500     1.000"
"                 506.700     0.650    0.2500     1.000"
"                 506.700     0.650    0.3000     1.000"
"            1.   HOR. ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 507.100     0.650    0.0750     1.000"
"              Peak outflow                  0.067    c.m/sec"
"              Maximum level                507.012    metre"
"              Maximum storage              254.591    c.m"
```

```
"             Centroidal lag                5.104   hours"
"                  0.273     0.353     0.067     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.067    c.m/sec"
"             Hydrograph volume           522.881    c.m"
"                     0.273     0.353     0.067     0.067"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.273     0.000     0.067     0.067"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.876   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.067     0.067 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  28.877     3.055      5.898      minutes"
"             Time to Centroid       182.422    122.455    129.058    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        16.72      39.02      55.74      c.m"
"             Rainfall losses        34.697     5.744      14.430     mm"
"             Runoff depth           11.752     40.705     32.019     mm"
"             Runoff volume          4.23       34.19      38.42      c.m"
"             Runoff coefficient     0.253      0.876      0.689      "
"             Maximum flow           0.001      0.024      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.024     0.024     0.067     0.067"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.024     0.024     0.024     0.067"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.024     0.024     0.024     0.067"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.886   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.033     0.024     0.024     0.067 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  47.135     4.986      40.579     minutes"
"             Time to Centroid       211.196    125.881    197.928    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        803.09     42.27      845.36     c.m"
"             Rainfall losses        34.691     5.306      33.222     mm"
"             Runoff depth           11.758     41.142     13.227     mm"
"             Runoff volume          203.29     37.44      240.73     c.m"
"             Runoff coefficient     0.253      0.886      0.285      "
"             Maximum flow           0.027      0.027      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.033     0.056     0.024     0.067"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.033     0.056     0.056     0.067"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.094    c.m/sec"
"             Hydrograph volume           802.032    c.m"
"                    0.033     0.056     0.056     0.094"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.033     0.000     0.056     0.094"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.253   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.877   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.315     0.000     0.056     0.094 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  28.703     3.036      3.420      minutes"
"             Time to Centroid       182.153    122.412    123.306    minutes"
"             Rainfall depth         46.448     46.448     46.448     mm"
"             Rainfall volume        26.48      503.04     529.51     c.m"
"             Rainfall losses        34.700     5.733      7.181      mm"
"             Runoff depth           11.749     40.716     39.268     mm"
"             Runoff volume          6.70       440.95     447.65     c.m"
"             Runoff coefficient     0.253      0.877      0.845      "
"             Maximum flow           0.001      0.315      0.315      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.315     0.315     0.056     0.094"
" 54          POND DESIGN"
"        0.315   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"        447.6   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"               Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                 invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                 0.037    c.m/sec"
"             Maximum level              507.285    metre"
"             Maximum storage            187.573    c.m"
"             Centroidal lag               2.833   hours"
"                  0.315     0.315     0.037     0.094 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                 0.132    c.m/sec"
"             Hydrograph volume         1250.398    c.m"
"                    0.315     0.315     0.037     0.174"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.550    hectare"
"             Total Impervious area                    2.503    hectare"
"             Total % impervious                      55.011"
" 19          EXIT"
```

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
"               Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                 2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"               Output filename:                   10 Year Post-Dev - REV10.out"
"               Licensee name:                                  Circe Mahoney"
"               Company                                            WalterFedy"
"               Date & Time last used:               2024-05-08 at 11:01:23 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      240.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"            1  Chicago storm"
"      622.800  Coefficient A"
"        0.000  Constant B"
"        0.699  Exponent C"
"        0.400  Fraction R"
"      240.000  Duration"
"        1.000  Time step multiplier"
"             Maximum intensity          197.937    mm/hr"
"             Total depth                 54.031    mm"
"            6  010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          301  External drainage area - drains to 201"
"       70.000  % Impervious"
"        0.390  Total Area"
"       50.000  Flow length"
"        1.000  Overland Slope"
"        0.117  Pervious Area"
"       50.000  Pervious length"
"        1.000  Pervious slope"
"        0.273  Impervious Area"
"       50.000  Impervious length"
"        1.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.295  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.893  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
```

```
"                    0.097     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  25.174     2.864      5.629      minutes"
"             Time to Centroid       175.554    121.463    128.167    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        63.22      147.50     210.72     c.m"
"             Rainfall losses        38.105     5.788      15.483     mm"
"             Runoff depth           15.926     48.242     38.547     mm"
"             Runoff volume          18.63      131.70     150.33     c.m"
"             Runoff coefficient     0.295      0.893      0.713      "
"             Maximum flow           0.004      0.096      0.097      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.097     0.097     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.097     0.097     0.097     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.097     0.097     0.097     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.890   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.332     0.097     0.097     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  27.110     3.084      3.937      minutes"
```

```
"             Time to Centroid       178.636    121.923    123.937    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        58.35      525.18     583.53     c.m"
"             Rainfall losses        38.091     5.933      9.149      mm"
"             Runoff depth           15.940     48.098     44.882     mm"
"             Runoff volume          17.21      467.51     484.72     c.m"
"             Runoff coefficient     0.295      0.890      0.831      "
"             Maximum flow           0.004      0.331      0.332      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.332     0.428     0.097     0.000"
" 54          POND DESIGN"
"         0.428   Current peak flow    c.m/sec"
"         0.367   Target outflow    c.m/sec"
"         635.1   Hydrograph volume    c.m"
"           12.   Number of stages"
"       506.400   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.400     0.000     0.000"
"                 506.500   0.00146    34.948"
"                 506.600   0.00231    71.402"
"                 506.700   0.00292   110.901"
"                 506.800   0.01578   153.510"
"                 506.900   0.04667   199.291"
"                 507.000    0.1014   248.306"
"                 507.100    0.1639   300.603"
"                 507.200    0.2020   356.258"
"                 507.300    0.2327   415.288"
"                 507.350    0.3324   446.043"
"                 507.400    0.5023   477.614"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                 507.300     0.900     5.000     0.000     0.000"
"            3.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 506.400     0.650    0.0500     1.000"
"                 506.700     0.650    0.2500     1.000"
"                 506.700     0.650    0.3000     1.000"
"            1.   HOR. ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 507.100     0.650    0.0750     1.000"
"              Peak outflow                  0.122    c.m/sec"
"              Maximum level              507.082    metre"
"              Maximum storage            291.188    c.m"
```

```
"             Centroidal lag                4.331   hours"
"                  0.332     0.428     0.122     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.122    c.m/sec"
"             Hydrograph volume           626.414    c.m"
"                    0.332     0.428     0.122     0.122"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.332     0.000     0.122     0.122"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.893   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.030     0.000     0.122     0.122 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  25.174     2.864      5.629      minutes"
"             Time to Centroid       175.554    121.463    128.167    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        19.45      45.39      64.84      c.m"
"             Rainfall losses        38.105     5.788      15.483     mm"
"             Runoff depth           15.926     48.242     38.547     mm"
"             Runoff volume          5.73       40.52      46.26      c.m"
"             Runoff coefficient     0.295      0.893      0.713      "
"             Maximum flow           0.001      0.030      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.030     0.030     0.122     0.122"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.030     0.030     0.030     0.122"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.030     0.030     0.030     0.122"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.047     0.030     0.030     0.122 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  41.090     4.675      36.053     minutes"
"             Time to Centroid       201.083    124.752    190.524    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        934.19     49.17      983.36     c.m"
"             Rainfall losses        38.099     5.433      36.466     mm"
"             Runoff depth           15.932     48.597     17.565     mm"
"             Runoff volume          275.46     44.22      319.68     c.m"
"             Runoff coefficient     0.295      0.899      0.325      "
"             Maximum flow           0.044      0.032      0.047      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.047     0.069     0.030     0.122"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.047     0.069     0.069     0.122"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.159    c.m/sec"
"             Hydrograph volume           992.354    c.m"
"                    0.047     0.069     0.069     0.159"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.047     0.000     0.069     0.159"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.295   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.893   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.382     0.000     0.069     0.159 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  25.022     2.847      3.225      minutes"
"             Time to Centroid       175.305    121.436    122.356    minutes"
"             Rainfall depth         54.031     54.031     54.031     mm"
"             Rainfall volume        30.80      585.15     615.95     c.m"
"             Rainfall losses        38.102     5.776      7.393      mm"
"             Runoff depth           15.928     48.254     46.638     mm"
"             Runoff volume          9.08       522.59     531.67     c.m"
"             Runoff coefficient     0.295      0.893      0.863      "
"             Maximum flow           0.002      0.382      0.382      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.382     0.382     0.069     0.159"
" 54          POND DESIGN"
"        0.382   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"        531.7   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"               Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                 invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                  0.038    c.m/sec"
"             Maximum level               507.305    metre"
"             Maximum storage             238.622    c.m"
"             Centroidal lag                3.041   hours"
"                  0.382     0.382     0.038     0.159 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.197    c.m/sec"
"             Hydrograph volume          1521.423    c.m"
"                    0.382     0.382     0.038     0.228"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                          ie METRIC"
"                Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                  2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"                Output filename:                   25 Year Post-Dev - REV10.out"
"                Licensee name:                                   Circe Mahoney"
"                Company                                             WalterFedy"
"                Date & Time last used:               2024-05-08 at 10:57:21 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      731.300   Coefficient A"
"        0.000   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           232.421    mm/hr"
"             Total depth                  63.444    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          301   External drainage area - drains to 201"
"       70.000   % Impervious"
"        0.390   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.117   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.273   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.908   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.118     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  21.996     2.677      5.352      minutes"
"             Time to Centroid       169.356    120.544    127.304    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        74.23      173.20     247.43     c.m"
"             Rainfall losses        41.828     5.820      16.622     mm"
"             Runoff depth           21.615     57.624     46.821     mm"
"             Runoff volume          25.29      157.31     182.60     c.m"
"             Runoff coefficient     0.341      0.908      0.738      "
"             Maximum flow           0.007      0.117      0.118      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.118     0.118     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.118     0.118     0.118     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.118     0.118     0.118     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.906   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.405     0.118     0.118     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  23.687     2.882      3.718      minutes"
```

```
"             Time to Centroid       172.095    120.908    122.964    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        68.52      616.67     685.19     c.m"
"             Rainfall losses        41.807     5.972      9.556      mm"
"             Runoff depth           21.637     57.471     53.888     mm"
"             Runoff volume          23.37      558.62     581.99     c.m"
"             Runoff coefficient     0.341      0.906      0.849      "
"             Maximum flow           0.006      0.404      0.405      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.405     0.523     0.118     0.000"
" 54          POND DESIGN"
"         0.523   Current peak flow    c.m/sec"
"         0.367   Target outflow    c.m/sec"
"         764.6   Hydrograph volume    c.m"
"           12.   Number of stages"
"       506.400   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.400     0.000     0.000"
"                 506.500   0.00146    34.948"
"                 506.600   0.00231    71.402"
"                 506.700   0.00292   110.901"
"                 506.800   0.01578   153.510"
"                 506.900   0.04667   199.291"
"                 507.000    0.1014   248.306"
"                 507.100    0.1639   300.603"
"                 507.200    0.2020   356.258"
"                 507.300    0.2327   415.288"
"                 507.350    0.3324   446.043"
"                 507.400    0.5023   477.614"
"             1.   WEIRS"
"                    Crest      Weir     Crest      Left     Right"
"                elevation coefficie   breadth sideslope sideslope"
"                  507.300     0.900     5.000     0.000     0.000"
"             3.   ORIFICES"
"                  Orifice   Orifice   Orifice Number of"
"                   invert coefficie  diameter  orifices"
"                  506.400     0.650    0.0500     1.000"
"                  506.700     0.650    0.2500     1.000"
"                  506.700     0.650    0.3000     1.000"
"             1.   HOR. ORIFICES"
"                  Orifice   Orifice   Orifice Number of"
"                   invert coefficie  diameter  orifices"
"                  507.100     0.650    0.0750     1.000"
"               Peak outflow                  0.190    c.m/sec"
"               Maximum level               507.168    metre"
"               Maximum storage             338.445    c.m"
```

```
"             Centroidal lag                4.004   hours"
"                  0.405     0.523     0.190     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.190    c.m/sec"
"             Hydrograph volume           755.349    c.m"
"                    0.405     0.523     0.190     0.190"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.405     0.000     0.190     0.190"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.908   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.036     0.000     0.190     0.190 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  21.996     2.677      5.352      minutes"
"             Time to Centroid       169.356    120.544    127.304    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        22.84      53.29      76.13      c.m"
"             Rainfall losses        41.829     5.820      16.622     mm"
"             Runoff depth           21.615     57.624     46.821     mm"
"             Runoff volume          7.78       48.40      56.19      c.m"
"             Runoff coefficient     0.341      0.908      0.738      "
"             Maximum flow           0.002      0.036      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.036     0.036     0.190     0.190"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.036     0.036     0.036     0.190"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.036     0.036     0.036     0.190"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.910   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.070     0.036     0.036     0.190 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  35.903     4.369      32.022     minutes"
"             Time to Centroid       191.988    123.664    183.579    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        1096.94    57.73      1154.67    c.m"
"             Rainfall losses        41.804     5.738      40.001     mm"
"             Runoff depth           21.639     57.706     23.443     mm"
"             Runoff volume          374.15     52.51      426.66     c.m"
"             Runoff coefficient     0.341      0.910      0.370      "
"             Maximum flow           0.066      0.037      0.070      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.070     0.087     0.036     0.190"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.070     0.087     0.087     0.190"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.258    c.m/sec"
"             Hydrograph volume          1238.193    c.m"
"                    0.070     0.087     0.087     0.258"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.070     0.000     0.087     0.258"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.341   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.908   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.465     0.000     0.087     0.258 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  21.863     2.661      3.032      minutes"
"             Time to Centroid       169.131    120.513    121.454    minutes"
"             Rainfall depth         63.444     63.444     63.444     mm"
"             Rainfall volume        36.16      687.09     723.26     c.m"
"             Rainfall losses        41.824     5.811      7.612      mm"
"             Runoff depth           21.620     57.632     55.832     mm"
"             Runoff volume          12.32      624.16     636.48     c.m"
"             Runoff coefficient     0.341      0.908      0.880      "
"             Maximum flow           0.003      0.464      0.465      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.465     0.465     0.087     0.258"
" 54          POND DESIGN"
"        0.465   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"        636.5   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                  0.038    c.m/sec"
"             Maximum level               507.332    metre"
"             Maximum storage             305.916    c.m"
"             Centroidal lag                3.322   hours"
"                  0.465     0.465     0.038     0.258 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 outlet to creek"
"             Maximum flow                  0.296    c.m/sec"
"             Hydrograph volume          1873.685    c.m"
"                     0.465     0.465     0.038     0.296"
" 38          START/RE-START TOTALS 203"
"             3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
"               Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                 2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"               Output filename:                  50 Year Post-Dev - REV10.out"
"               Licensee name:                                 Circe Mahoney"
"               Company                                           WalterFedy"
"               Date & Time last used:               2024-05-08 at 10:53:44 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      240.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32         STORM Chicago storm"
"            1  Chicago storm"
"      811.800  Coefficient A"
"        0.000  Constant B"
"        0.699  Exponent C"
"        0.400  Fraction R"
"      240.000  Duration"
"        1.000  Time step multiplier"
"             Maximum intensity          258.005    mm/hr"
"             Total depth                 70.427    mm"
"            6  050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          301  External drainage area - drains to 201"
"       70.000  % Impervious"
"        0.390  Total Area"
"       50.000  Flow length"
"        1.000  Overland Slope"
"        0.117  Pervious Area"
"       50.000  Pervious length"
"        1.000  Pervious slope"
"        0.273  Impervious Area"
"       50.000  Impervious length"
"        1.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.372  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.917  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
```

```
"                    0.134     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  20.248     2.563      5.179      minutes"
"             Time to Centroid       165.776    119.964    126.742    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        82.40      192.27     274.67     c.m"
"             Rainfall losses        44.262     5.851      17.374     mm"
"             Runoff depth           26.165     64.576     53.053     mm"
"             Runoff volume          30.61      176.29     206.91     c.m"
"             Runoff coefficient     0.372      0.917      0.753      "
"             Maximum flow           0.009      0.132      0.134      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.134     0.134     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.134     0.134     0.134     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.134     0.134     0.134     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.371   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.915   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.460     0.134     0.134     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  21.804     2.760      3.581      minutes"
```

```
"             Time to Centroid       168.350    120.330    122.402    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        76.06      684.55     760.62     c.m"
"             Rainfall losses        44.273     5.986      9.815      mm"
"             Runoff depth           26.154     64.441     60.612     mm"
"             Runoff volume          28.25      626.37     654.61     c.m"
"             Runoff coefficient     0.371      0.915      0.861      "
"             Maximum flow           0.008      0.459      0.460      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.460     0.594     0.134     0.000"
" 54          POND DESIGN"
"         0.594   Current peak flow    c.m/sec"
"         0.367   Target outflow    c.m/sec"
"         861.5   Hydrograph volume    c.m"
"           12.   Number of stages"
"       506.400   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.400     0.000     0.000"
"                 506.500   0.00146    34.948"
"                 506.600   0.00231    71.402"
"                 506.700   0.00292   110.901"
"                 506.800   0.01578   153.510"
"                 506.900   0.04667   199.291"
"                 507.000    0.1014   248.306"
"                 507.100    0.1639   300.603"
"                 507.200    0.2020   356.258"
"                 507.300    0.2327   415.288"
"                 507.350    0.3324   446.043"
"                 507.400    0.5023   477.614"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 507.300     0.900     5.000     0.000     0.000"
"            3.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 506.400     0.650    0.0500     1.000"
"                 506.700     0.650    0.2500     1.000"
"                 506.700     0.650    0.3000     1.000"
"            1.   HOR. ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 507.100     0.650    0.0750     1.000"
"              Peak outflow                  0.212    c.m/sec"
"              Maximum level              507.232    metre"
"              Maximum storage            374.980    c.m"
```

```
"             Centroidal lag                3.824   hours"
"                  0.460     0.594     0.212     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.212    c.m/sec"
"             Hydrograph volume           852.398    c.m"
"                    0.460     0.594     0.212     0.212"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.460     0.000     0.212     0.212"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.372   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.041     0.000     0.212     0.212 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  20.248     2.563      5.179      minutes"
"             Time to Centroid       165.777    119.964    126.742    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        25.35      59.16      84.51      c.m"
"             Rainfall losses        44.262     5.851      17.374     mm"
"             Runoff depth           26.165     64.576     53.053     mm"
"             Runoff volume          9.42       54.24      63.66      c.m"
"             Runoff coefficient     0.372      0.917      0.753      "
"             Maximum flow           0.003      0.041      0.041      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.041     0.041     0.212     0.212"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.041     0.041     0.041     0.212"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.041     0.041     0.041     0.212"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.372   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.914   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.097     0.041     0.041     0.212 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  33.049     4.183      29.742     minutes"
"             Time to Centroid       186.837    123.021    179.526    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        1217.69    64.09      1281.78    c.m"
"             Rainfall losses        44.248     6.062      42.338     mm"
"             Runoff depth           26.180     64.365     28.089     mm"
"             Runoff volume          452.65     58.57      511.22     c.m"
"             Runoff coefficient     0.372      0.914      0.399      "
"             Maximum flow           0.090      0.040      0.097      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.097     0.104     0.041     0.212"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.097     0.104     0.104     0.212"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.297    c.m/sec"
"             Hydrograph volume          1427.281    c.m"
"                    0.097     0.104     0.104     0.297"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.097     0.000     0.104     0.297"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.371   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.527     0.000     0.104     0.297 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  20.126     2.547      2.914      minutes"
"             Time to Centroid       165.579    119.932    120.885    minutes"
"             Rainfall depth         70.427     70.427     70.427     mm"
"             Rainfall volume        40.14      762.73     802.87     c.m"
"             Rainfall losses        44.266     5.845      7.766      mm"
"             Runoff depth           26.161     64.582     62.661     mm"
"             Runoff volume          14.91      699.43     714.34     c.m"
"             Runoff coefficient     0.371      0.917      0.890      "
"             Maximum flow           0.004      0.526      0.527      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.527     0.527     0.104     0.297"
" 54          POND DESIGN"
"        0.527   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"        714.3   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"                Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                  invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                  0.038    c.m/sec"
"             Maximum level               507.352    metre"
"             Maximum storage             358.050    c.m"
"             Centroidal lag                3.535   hours"
"                  0.527     0.527     0.038     0.297 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.335    c.m/sec"
"             Hydrograph volume          2142.820    c.m"
"                    0.527     0.527     0.038     0.335"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.503    hectare"
"             Total % impervious                       55.011"
" 19          EXIT"
```

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
"               Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                 2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"               Output filename:                 100 Year Post-Dev - REV10.out"
"               Licensee name:                                 Circe Mahoney"
"               Company                                          WalterFedy"
"               Date & Time last used:               2024-05-08 at 10:44:34 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      240.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32         STORM Chicago storm"
"            1  Chicago storm"
"      892.300  Coefficient A"
"        0.000  Constant B"
"        0.699  Exponent C"
"        0.400  Fraction R"
"      240.000  Duration"
"        1.000  Time step multiplier"
"             Maximum intensity          283.589    mm/hr"
"             Total depth                 77.411    mm"
"            6  100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          301  External drainage area - drains to 201"
"       70.000  % Impervious"
"        0.390  Total Area"
"       50.000  Flow length"
"        1.000  Overland Slope"
"        0.117  Pervious Area"
"       50.000  Pervious length"
"        1.000  Pervious slope"
"        0.273  Impervious Area"
"       50.000  Impervious length"
"        1.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       75.000  Pervious SCS Curve No."
"        0.399  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        8.467  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.923  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
```

```
"                    0.150     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  18.840     2.464      5.024      minutes"
"             Time to Centroid       162.850    119.461    126.243    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        90.57      211.33     301.90     c.m"
"             Rainfall losses        46.512     5.930      18.105     mm"
"             Runoff depth           30.899     71.481     59.306     mm"
"             Runoff volume          36.15      195.14     231.29     c.m"
"             Runoff coefficient     0.399      0.923      0.766      "
"             Maximum flow           0.011      0.148      0.150      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.150     0.150     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.150     0.150     0.150     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.150     0.150     0.150     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.516     0.150     0.150     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  20.288     2.654      3.463      minutes"
```

```
"             Time to Centroid       165.225    119.833    121.917    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        83.60      752.44     836.04     c.m"
"             Rainfall losses        46.482     5.995      10.044     mm"
"             Runoff depth           30.929     71.416     67.368     mm"
"             Runoff volume          33.40      694.17     727.57     c.m"
"             Runoff coefficient     0.400      0.923      0.870      "
"             Maximum flow           0.009      0.514      0.516      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.516     0.666     0.150     0.000"
" 54          POND DESIGN"
"         0.666   Current peak flow    c.m/sec"
"         0.367   Target outflow    c.m/sec"
"         958.9   Hydrograph volume    c.m"
"           12.   Number of stages"
"       506.400   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.400     0.000     0.000"
"                 506.500   0.00146    34.948"
"                 506.600   0.00231    71.402"
"                 506.700   0.00292   110.901"
"                 506.800   0.01578   153.510"
"                 506.900   0.04667   199.291"
"                 507.000    0.1014   248.306"
"                 507.100    0.1639   300.603"
"                 507.200    0.2020   356.258"
"                 507.300    0.2327   415.288"
"                 507.350    0.3324   446.043"
"                 507.400    0.5023   477.614"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 507.300     0.900     5.000     0.000     0.000"
"            3.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 506.400     0.650    0.0500     1.000"
"                 506.700     0.650    0.2500     1.000"
"                 506.700     0.650    0.3000     1.000"
"            1.   HOR. ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 507.100     0.650    0.0750     1.000"
"              Peak outflow                  0.232    c.m/sec"
"              Maximum level               507.297    metre"
"              Maximum storage             413.763    c.m"
```

```
"             Centroidal lag                3.681   hours"
"                  0.516     0.666     0.232     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.232    c.m/sec"
"             Hydrograph volume           950.226    c.m"
"                     0.516     0.666     0.232     0.232"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.516     0.000     0.232     0.232"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.046     0.000     0.232     0.232 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  18.840     2.464      5.024      minutes"
"             Time to Centroid       162.850    119.461    126.243    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        27.87      65.03      92.89      c.m"
"             Rainfall losses        46.512     5.930      18.105     mm"
"             Runoff depth           30.899     71.481     59.306     mm"
"             Runoff volume          11.12      60.04      71.17      c.m"
"             Runoff coefficient     0.399      0.923      0.766      "
"             Maximum flow           0.003      0.045      0.046      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.046     0.046     0.232     0.232"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.046     0.046     0.046     0.232"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.046     0.046     0.046     0.232"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.119     0.046     0.046     0.232 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  30.751     4.022      27.871     minutes"
"             Time to Centroid       182.566    122.468    176.090    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        1338.44    70.44      1408.88    c.m"
"             Rainfall losses        46.476     6.431      44.474     mm"
"             Runoff depth           30.935     70.980     32.937     mm"
"             Runoff volume          534.86     64.59      599.46     c.m"
"             Runoff coefficient     0.400      0.917      0.425      "
"             Maximum flow           0.113      0.044      0.119      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.119     0.128     0.046     0.232"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.119     0.128     0.128     0.232"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.335    c.m/sec"
"             Hydrograph volume          1620.849    c.m"
"                    0.119     0.128     0.128     0.335"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.119     0.000     0.128     0.335"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.399   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.588     0.000     0.128     0.335 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  18.726     2.449      2.811      minutes"
"             Time to Centroid       162.654    119.430    120.392    minutes"
"             Rainfall depth         77.411     77.411     77.411     mm"
"             Rainfall volume        44.12      838.36     882.49     c.m"
"             Rainfall losses        46.507     5.935      7.964      mm"
"             Runoff depth           30.905     71.476     69.447     mm"
"             Runoff volume          17.62      774.09     791.70     c.m"
"             Runoff coefficient     0.399      0.923      0.897      "
"             Maximum flow           0.005      0.587      0.588      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.588     0.588     0.128     0.335"
" 54          POND DESIGN"
"        0.588   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"        791.7   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"               Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                 invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                 0.039    c.m/sec"
"             Maximum level              507.366    metre"
"             Maximum storage            412.581    c.m"
"             Centroidal lag               3.752   hours"
"                  0.588     0.588     0.039     0.335 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                 0.373    c.m/sec"
"             Hydrograph volume         2415.408    c.m"
"                    0.588     0.588     0.039     0.373"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.550    hectare"
"             Total Impervious area                    2.503    hectare"
"             Total % impervious                      55.011"
" 19          EXIT"
```

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
"               Job folder:             C:\Users\cmahoney\Documents\2024 Work\"
"                 2021-0713-10\New SWM Files\MIDUSS modelling\Post-Development"
"               Output filename:                 Regional Post-Dev - REV10.out"
"               Licensee name:                                  Circe Mahoney"
"               Company                                            WalterFedy"
"               Date & Time last used:               2024-05-08 at 10:51:17 AM"
" 31          TIME PARAMETERS"
"        5.000  Time Step"
"      720.000  Max. Storm length"
"     1500.000  Max. Hydrograph"
" 32          STORM Mass Curve"
"            3  Mass Curve"
"      212.000  Rainfall depth"
"      720.000  Duration"
"           44  C:\Program Files (x86)\MIDUSSNet\Hazel12.mrd   Hurricane Hazel
(last 12 h)"
"             Maximum intensity           53.000    mm/hr"
"             Total depth                212.000    mm"
"            6  250hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 301"
"            1  Triangular SCS"
"            1  Equal length"
"            1  SCS method"
"          301  External drainage area - drains to 201"
"       70.000  % Impervious"
"        0.390  Total Area"
"       50.000  Flow length"
"        1.000  Overland Slope"
"        0.117  Pervious Area"
"       50.000  Pervious length"
"        1.000  Pervious slope"
"        0.273  Impervious Area"
"       50.000  Impervious length"
"        1.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       88.000  Pervious SCS Curve No."
"        0.843  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        3.464  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.969  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
"                    0.058     0.000     0.000     0.000 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.117      0.273      0.390      hectare"
"             Time of concentration  26.225     4.785      10.609     minutes"
"             Time to Centroid       529.681    477.235    491.481    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        248.04     578.76     826.80     c.m"
"             Rainfall losses        33.290     6.621      14.622     mm"
"             Runoff depth           178.710    205.379    197.378    mm"
"             Runoff volume          209.09     560.68     769.78     c.m"
"             Runoff coefficient     0.843      0.969      0.931      "
"             Maximum flow           0.018      0.041      0.058      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.058     0.058     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.058     0.058     0.058     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.058     0.058     0.058     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled flow to pond"
"       90.000   % Impervious"
"        1.080   Total Area"
"       80.000   Flow length"
"        2.000   Overland Slope"
"        0.108   Pervious Area"
"       80.000   Pervious length"
"        2.000   Pervious slope"
"        0.972   Impervious Area"
"       80.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.842   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.968   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.159     0.058     0.058     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  28.241     5.153      7.188      minutes"
"             Time to Centroid       531.736    477.444    482.229    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
```

```
"             Rainfall volume        228.96     2060.64    2289.60    c.m"
"             Rainfall losses        33.417     6.680      9.353      mm"
"             Runoff depth           178.583    205.320    202.647    mm"
"             Runoff volume          192.87     1995.71    2188.58    c.m"
"             Runoff coefficient     0.842      0.968      0.956      "
"             Maximum flow           0.016      0.147      0.159      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.159     0.217     0.058     0.000"
" 54          POND DESIGN"
"        0.217   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"       2958.4   Hydrograph volume    c.m"
"          12.   Number of stages"
"      506.400   Minimum water level    metre"
"      507.400   Maximum water level    metre"
"      506.400   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.400     0.000     0.000"
"                506.500   0.00146    34.948"
"                506.600   0.00231    71.402"
"                506.700   0.00292   110.901"
"                506.800   0.01578   153.510"
"                506.900   0.04667   199.291"
"                507.000    0.1014   248.306"
"                507.100    0.1639   300.603"
"                507.200    0.2020   356.258"
"                507.300    0.2327   415.288"
"                507.350    0.3324   446.043"
"                507.400    0.5023   477.614"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                507.300     0.900     5.000     0.000     0.000"
"           3.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                506.400     0.650    0.0500     1.000"
"                506.700     0.650    0.2500     1.000"
"                506.700     0.650    0.3000     1.000"
"           1.   HOR. ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                507.100     0.650    0.0750     1.000"
"             Peak outflow                 0.203    c.m/sec"
"             Maximum level              507.203    metre"
"             Maximum storage            358.175    c.m"
"             Centroidal lag               9.224   hours"
"                  0.159     0.217     0.203     0.000 c.m/sec"
```

```
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.203    c.m/sec"
"             Hydrograph volume          2928.224    c.m"
"                    0.159     0.217     0.203     0.203"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.159     0.000     0.203     0.203"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          302   external drainage area - drains to 202"
"       70.000   % Impervious"
"        0.120   Total Area"
"       50.000   Flow length"
"        1.000   Overland Slope"
"        0.036   Pervious Area"
"       50.000   Pervious length"
"        1.000   Pervious slope"
"        0.084   Impervious Area"
"       50.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.969   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.018     0.000     0.203     0.203 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.084      0.120      hectare"
"             Time of concentration  26.225     4.785      10.609     minutes"
"             Time to Centroid       529.682    477.235    491.481    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        76.32      178.08     254.40     c.m"
"             Rainfall losses        33.290     6.621      14.622     mm"
"             Runoff depth           178.710    205.379    197.378    mm"
"             Runoff volume          64.34      172.52     236.85     c.m"
"             Runoff coefficient     0.843      0.969      0.931      "
"             Maximum flow           0.005      0.013      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.018     0.018     0.203     0.203"
```

```
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.018     0.018     0.018     0.203"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.018     0.018     0.018     0.203"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled to creek"
"        5.000   % Impervious"
"        1.820   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        1.729   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.091   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.971   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.271     0.018     0.018     0.203 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  42.805     7.811      40.807     minutes"
"             Time to Centroid       547.357    480.188    543.520    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        3665.48    192.92     3858.40    c.m"
"             Rainfall losses        33.186     6.193      31.836     mm"
"             Runoff depth           178.814    205.807    180.164    mm"
"             Runoff volume          3091.70    187.28     3278.98    c.m"
"             Runoff coefficient     0.843      0.971      0.850      "
"             Maximum flow           0.258      0.014      0.271      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.271     0.287     0.018     0.203"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.271     0.287     0.287     0.203"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.490    c.m/sec"
"             Hydrograph volume          6444.072    c.m"
"                    0.271     0.287     0.287     0.490"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.271     0.000     0.287     0.490"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment area"
"       98.000   % Impervious"
"        1.140   Total Area"
"       35.000   Flow length"
"        0.500   Overland Slope"
"        0.023   Pervious Area"
"       35.000   Pervious length"
"        0.500   Pervious slope"
"        1.117   Impervious Area"
"       35.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       88.000   Pervious SCS Curve No."
"        0.843   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        3.464   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.969   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.169     0.000     0.287     0.490 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.023      1.117      1.140      hectare"
"             Time of concentration  26.067     4.756      5.128      minutes"
"             Time to Centroid       529.494    477.198    478.111    minutes"
"             Rainfall depth         212.000    212.000    212.000    mm"
"             Rainfall volume        48.34      2368.46    2416.80    c.m"
"             Rainfall losses        33.306     6.614      7.148      mm"
"             Runoff depth           178.694    205.386    204.852    mm"
"             Runoff volume          40.74      2294.57    2335.31    c.m"
"             Runoff coefficient     0.843      0.969      0.966      "
"             Maximum flow           0.003      0.168      0.169      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.169     0.169     0.287     0.490"
" 54          POND DESIGN"
```

```
"        0.169   Current peak flow    c.m/sec"
"        0.367   Target outflow    c.m/sec"
"       2335.3   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.900   Maximum water level    metre"
"      506.050   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.050     0.000     0.000"
"                507.050   0.03373     2.000"
"                507.150   0.03538     6.932"
"                507.250   0.03695    99.984"
"                507.350   0.03846   351.582"
"                507.450   0.03991   741.190"
"                507.550   0.04131  1197.540"
"                507.650   0.04266  1666.800"
"                507.750   0.04398  2153.836"
"                507.850   0.04525  2658.672"
"                507.900   0.04587  2919.547"
"           1.   OUTFLOW PIPE"
"               Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                 invert    invert    Length  Diameter       'n'   loss Ke"
"                506.050   505.980    13.900     0.150     0.015     0.500"
"             Peak outflow                  0.041    c.m/sec"
"             Maximum level               507.501    metre"
"             Maximum storage             974.026    c.m"
"             Centroidal lag               10.678   hours"
"                  0.169     0.169     0.041     0.490 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                outlet to creek"
"             Maximum flow                  0.530    c.m/sec"
"             Hydrograph volume          8776.912    c.m"
"                     0.169     0.169     0.041     0.530"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.550    hectare"
"             Total Impervious area                     2.537    hectare"
"             Total % impervious                       55.763"
" 19          EXIT"
```