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. 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 currently zoned as M1 (General Industrial) and will remain as such. 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. *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 investigation also states that suitable bearing stratum for foundations is between 2.0 and 2.5 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 is planned to be commissioned in Dundalk by August 2023, which will increase 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. We anticipate that an ECA will also be required for stormwater management.

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. Approximately 1-ha of site area will drain towards the catch basins on site, near the proposed gravity sanitary service. Therefore, an additional 0.15 L/s can be anticipated. The overall peak sanitary demand for the site is 2.25 L/s.

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 2.25 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 municipal watermain will also provide an additional 175 m^3/day of water for processes within the Organics Receiving Building. 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 is expected to commission a new water tower in Dundalk by August 2023; however, it was noted that the water tower will not increase pressure enough to adequately provide fire protection for this development. Therefore, an on-site water supply for fire protection will be required. The available water pressure after the water tower is in service will be provided prior to finalizing the design, which will most likely 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. The available rate is expected to increase once the water tower is commissioned.

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.

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 Southgate Township's requirements, stormwater runoff from the site is to be controlled to pre-development rates for the 5-year through the 100-year design storms; however, the GRCA has previously requested modelling for all design storms, so the 2-year storm has been included. Drainage areas were delineated, and catchment parameters were determined for inclusion in pre- and post-development modeling. The stormwater management design for both existing and proposed conditions was completed using the hydrological modelling software MIDUSS. Storm catchment areas for pre- and post-development can be found in Figures 1 and 2, respectively.

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 Peak Flows

The existing conditions were modeled using MIDUSS to determine the peak release rates. The site appears to drain from east-to-west 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.

The peak flow rates for the 2-year, 5-year and 100-year design storms for the existing site are summarized in Table III. Rainfall parameters were gathered from the Ministry of Transportation (MTO) IDF Curve Lookup Tool and were converted in MIDUSS using the IDF Curve Fit Tool. These flow rates are not to be exceeded in post-development conditions.

Table III: Rainfall Intensity and Peak Flow Summary

Parameters $I = A / (T_c+B)^c$	2-yr	5-yr	100-yr
A	404.13	537.3	895.4
B	0.009	0.029	0.029
C	0.699	0.699	0.699
Time Step (T_c)	5	5	5
Maximum Intensity (mm/hr), I	**131.1**	**173.5**	**289.2**
MIDUSS Peak Flow (L/s)	**35**	**96**	**408**

The impervious percentage of the site is increasing to approximately 50%, greatly increasing the peak flow rates. As a result, 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 Peak Flows

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 was divided into three catchments, which are summarized in Table IV.

Table IV: Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious
101	Existing flow to Western Ditch	4.04	0%
201	Gravel Driveway / Yard, Building, and Dry-Pond	1.08	90%
202	Uncontrolled Off Site	1.82	5%
203	Gravel Driveway / Yard, Containment Area	1.14	95%

The proposed grading of the site was designed to ensure that runoff from the majority of the gravel driveway / yard, building footprints, and the equipment areas of the site will be conveyed to a depressed area acting as a dry-pond at the northwestern limits of the site. This area is represented by Catchment 201. A series of catchbasins will convey the minor storm events towards this pond. The dry-pond will be the method of quantity control for the site. The pond provides approximately 440 m^3 of storage and overflows to a rip rap spillway before outletting to the ditch off site. The bottom of the pond is at a proposed elevation of 506.5, and the top of the pond is at 507.4 m to separate it from the remainder of the GRCA floodplain area. Groundwater in the area is expected to be at an elevation of approximately 505.5 m, thus maintaining 1.0 m separation between the bottom of the pond and the groundwater.

Two 150-mm-diameter outlet pipes are proposed from the pond, with one being set to an elevation of 506.70, and the other being set at an elevation of 506.90. This allows for the first 80 m^3 of rainfall to infiltrate with a maximum drain down time of 48 hours. Additional rainfall greater than 80 m^3 will be conveyed through the pipe and into the rip rap spillway. Refer to the Appendix for drain down time calculations. A 5.0-m-wide emergency weir is provided for overflow at an elevation of 507.30. Catchment 202 represents the area of the site that drains uncontrolled off site, including the spillway swale.

Catchment 203 represents the containment area for the storage tanks behind the proposed building, and also includes the southern half of the Organics Receiving 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. A trained staff member will sample the water after a rainfall event, and if it meets storm sewer bylaw standards, the valve can be opened, and the runoff conveyed to the western ditch. Because of the testing regimen in place, no additional quality control measures are being proposed. A 150-mm-diameter pipe is proposed to convey the clean runoff towards the ditch. Another valve and outlet is 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 bottom of the containment area is set to an elevation of approximately 507.15, and the Pump Shelter is proposed to have a finished floor elevation of 507.42. The top of the containment berm is set to an elevation of 507.9 m at the lowest section.

Table V summarizes the peak flows for proposed conditions.

Table V: Post-Development Peak Flow Summaries

Modelled Flow Rate	2-yr	5-yr	100-yr
Pre-Development (L/s)	35	96	408
Catchment 201 (L/s)	17	30	60
Catchment 202 (L/s)	21	31	107
Catchment 203 (L/s)	37	38	39
Combined Peak Flow Towards Ditch (L/s)	**64**	**93**	**206**
Percent Reduction	-182.9%	3.1%	49.5%
Maximum Ponding in Dry-Pond	506.93	507.04	507.33
Maximum Ponding in Containment Area	507.26	507.29	507.37

The modelling results show that post-development peak flows are overcontrolled for the 5-year through the 100-year storm. This accounts for the unlikely event of Catchment 203 being released to the ditch during the storm event. The post-development, 2-year storm event is not controlled to pre-development levels due to Catchment 203 being included. In practice, the valve from the containment area would not be opened during rainfall events because the water needs to be tested, and the peak flow from this catchment would occur after the combined peak flow from the other two catchments.

It should also be noted that the peak flows from the catchments do not fully align, as the pond lags the peak flow from Catchment 201, and peak flow from Catchment 203 will depend on when the valve is opened.

Therefore, stormwater peak quantity control for all storm events for the 2-year storm through the 100-year storm is maintained to pre-development levels.

A series of catchbasins are 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.

6.3 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.

A Stormceptor EFO6 OGS unit will provide 85% TSS removal and will meet water quality objectives for the gravel and other hardscaped areas with vehicle traffic and potential salt applications, before being conveyed to the dry-pond. However, the GRCA recognizes a maximum of 50% TSS removal for OGS units. The roof of the building is considered clean water and will be directed to the dry-pond directly without pre-treatment. It is understood that a treatment train approach is preferred, and this is satisfied via infiltration in the dry-pond. According to Table 3.3.2 in the MECP’s Stormwater Management Manual, a dry-pond (infiltration) requires a storage volume of 20 m^3/ha to provide 60% TSS removal. With a catchment area of 1.08 ha, a storage volume of 21.6 m^3 is required to meet 80% TSS removal, and approximately 80 m^3 is provided. Therefore, the infiltration portion of the dry-pond can provide the additional 30% TSS removal required.

Catchments 202 and 203 do not require quality control, as only clean water will be conveyed offsite.

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 all tanks. At this time, the tanks are proposed to be 3 m underground, which results in a required secondary containment volume of 2,978 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 507.9 m to allow for a containment volume of approximately 2,984 m^3. The water will be sampled prior to being released and conveyed to the ditch west of the site.

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 10 m^3. This is calculated as the difference between a cut of 1,135 m^3 and a net fill of 1,125 m^3. The volume required for the SWM pond has not been included in these calculations, so the net-gain of floodplain storage is 10 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. 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.
- 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.

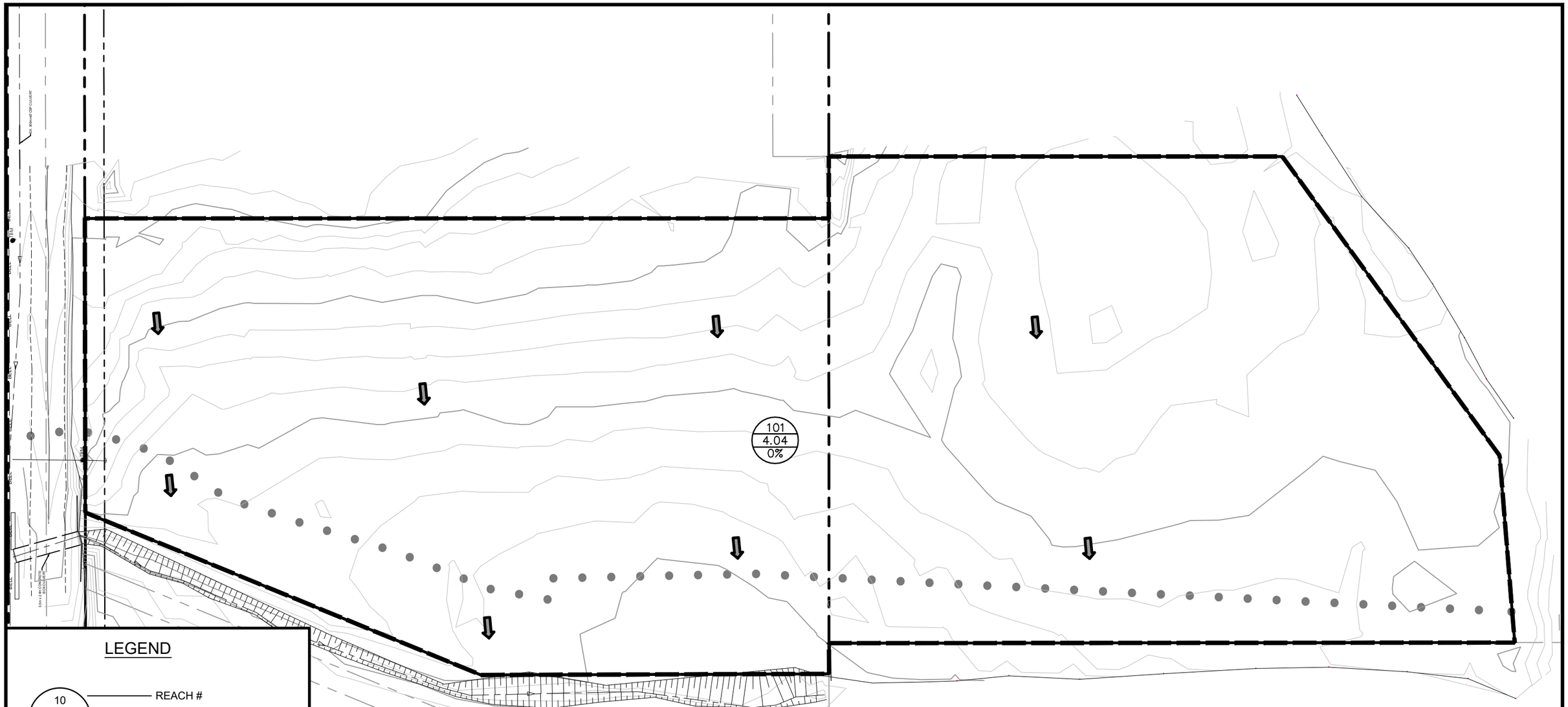
All of which is respectfully submitted,

WALTERFEDY

Tyler Keller, P.Eng.
Engineer, Civil

tkeller@walterfedy.com
519.576.2150 Ext. 237

FIGURES



LEGEND

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

PROJECT:

SOUTHGATE RENEWABLES RECYCLING PROJECT

TITLE:

EXISTING CATCHMENT AREAS

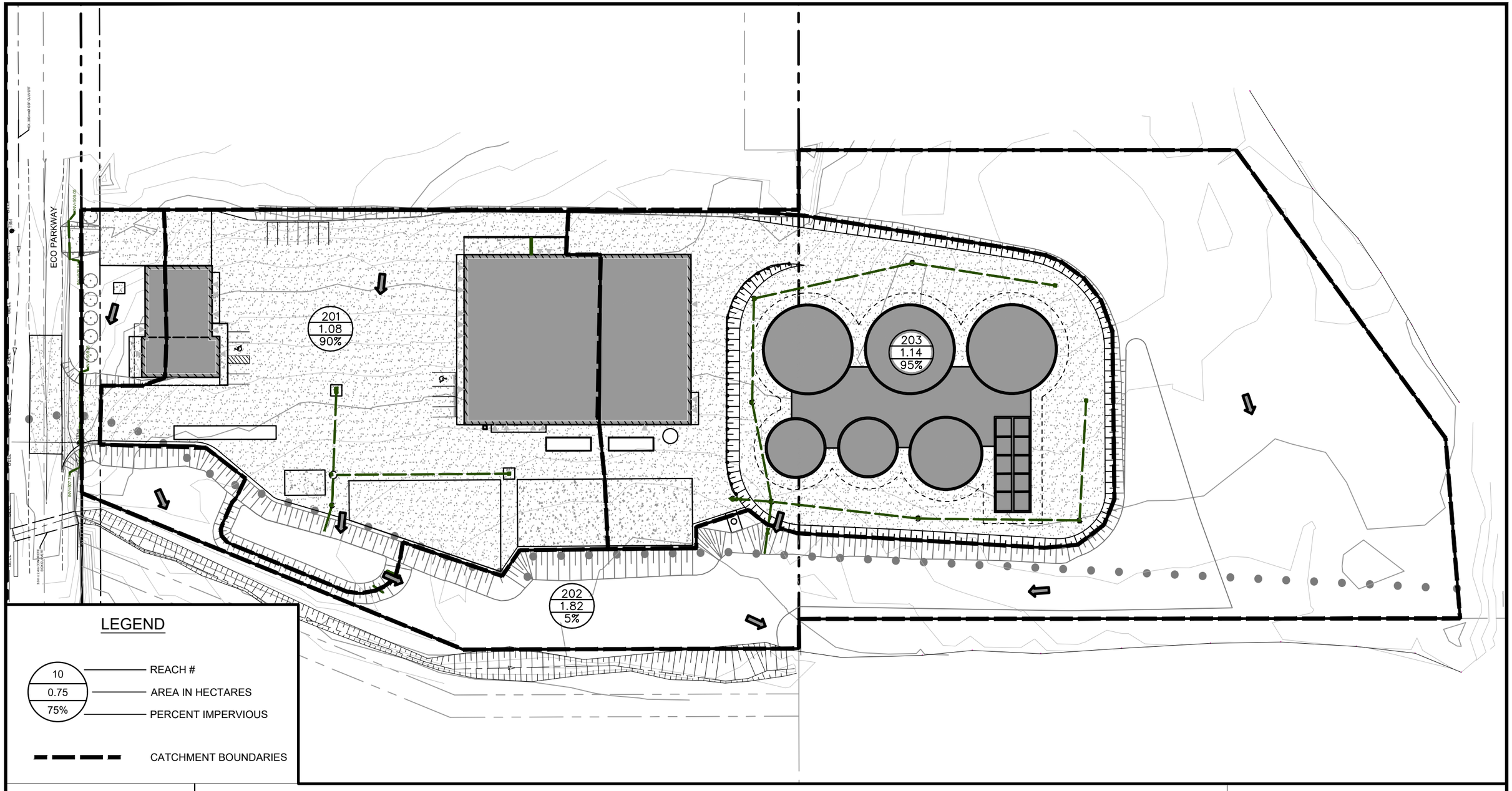
WALTERFEDY

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 — REACH #

0.75 — AREA IN HECTARES

75% — PERCENT IMPERVIOUS

CATCHMENT BOUNDARIES

PROJECT:

SOUTHGATE RENEWABLES RECYCLING PROJECT

TITLE:

PROPOSED CATCHMENT AREAS

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FIG-2

DRAWINGS

C1-1	Existing Conditions Plan (1 of 2)
C1-2	Existing Conditions Plan (2 of 2)
C2-1	Grading Plan (1 of 2)
C2-2	Grading Plan (2 of 2)
C3-1	Servicing Plan (1 of 2)
C3-2	Servicing Plan (2 of 2)
C4-1	Erosion and Sediment Control Plan (1 of 2)
C4-2	Erosion and Sediment Control Plan (2 of 2)
C5-1	Notes
C5-2	Details

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 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
OH HYDRO	EXISTING OVERHEAD HYDRO LINE
	EXISTING DITCH CENTRELINE
	EXISTING CHAINLINK FENCE
	EXISTING GRAVEL
	ESTIMATED GRCA REGULATORY FLOODPLAIN

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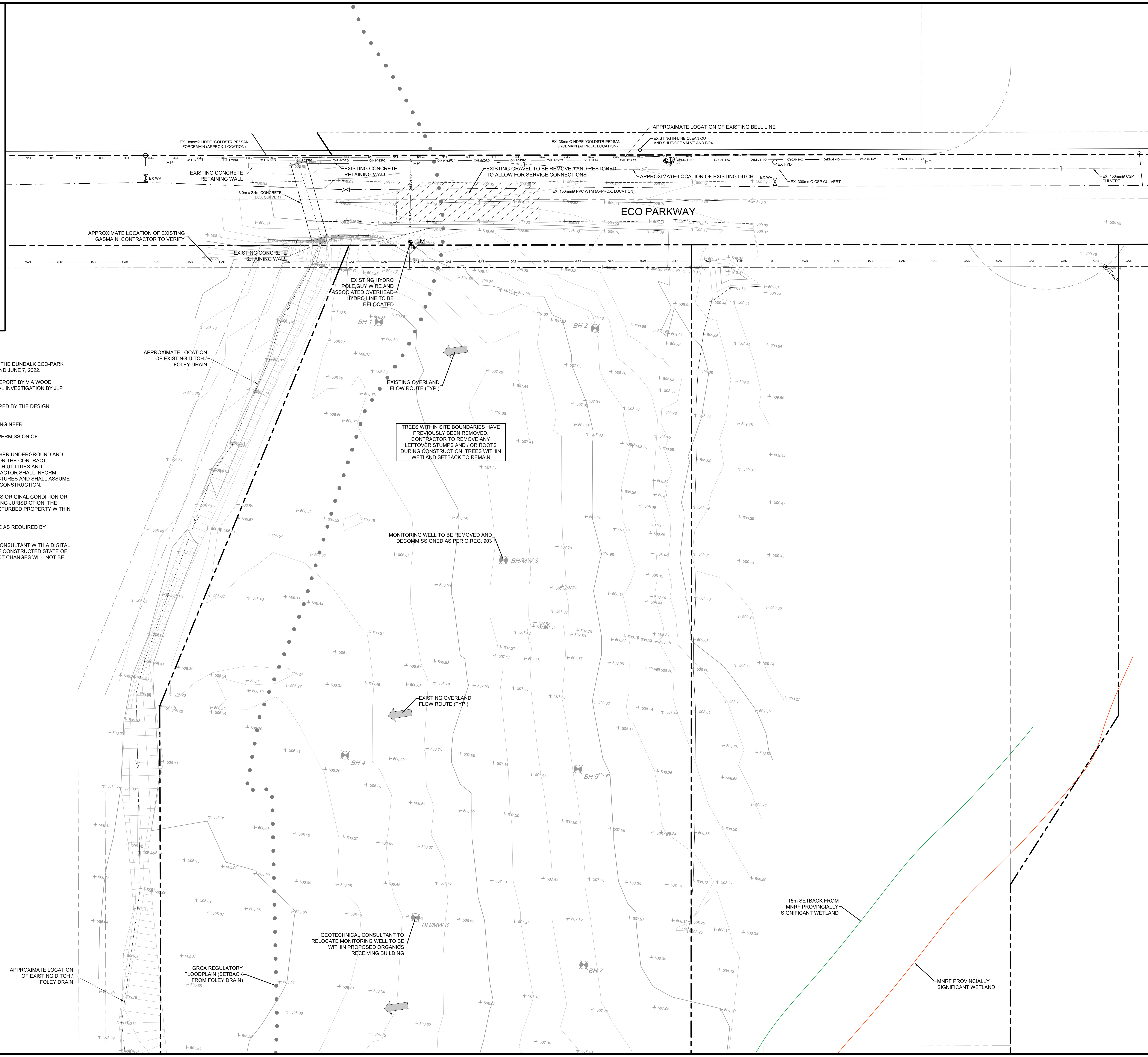

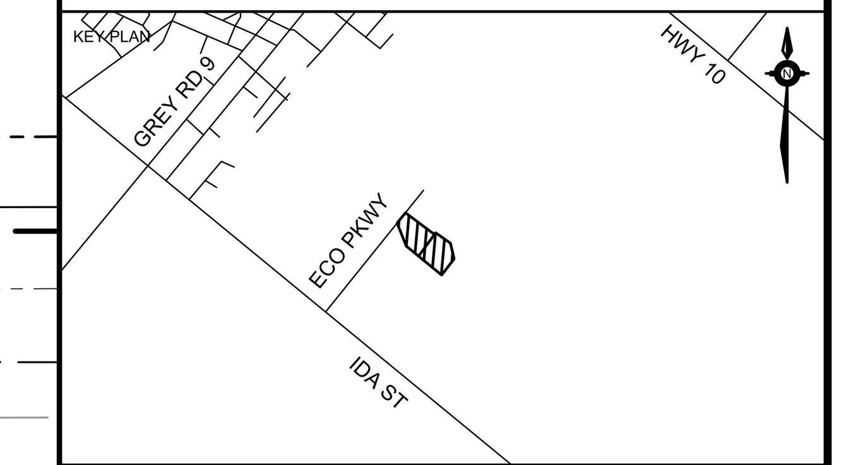

PROJECT NORTH | TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED 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
2023.03.29
PROVINCE OF ONTARIO

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

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
- EX WV — EXISTING WATERMAIN VALVE
- EX CS — EXISTING CURB STOP
- BOREHOLE No. — EXISTING BOREHOLE LOCATION
- +325.00 — 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
- OH HYDRO — EXISTING OVERHEAD HYDRO LINE
- EXISTING DITCH CENTRELINE
- X—X—X — EXISTING CHAINLINK FENCE
- EXISTING GRAVEL
- ESTIMATED GRCA REGULATORY FLOODPLAIN

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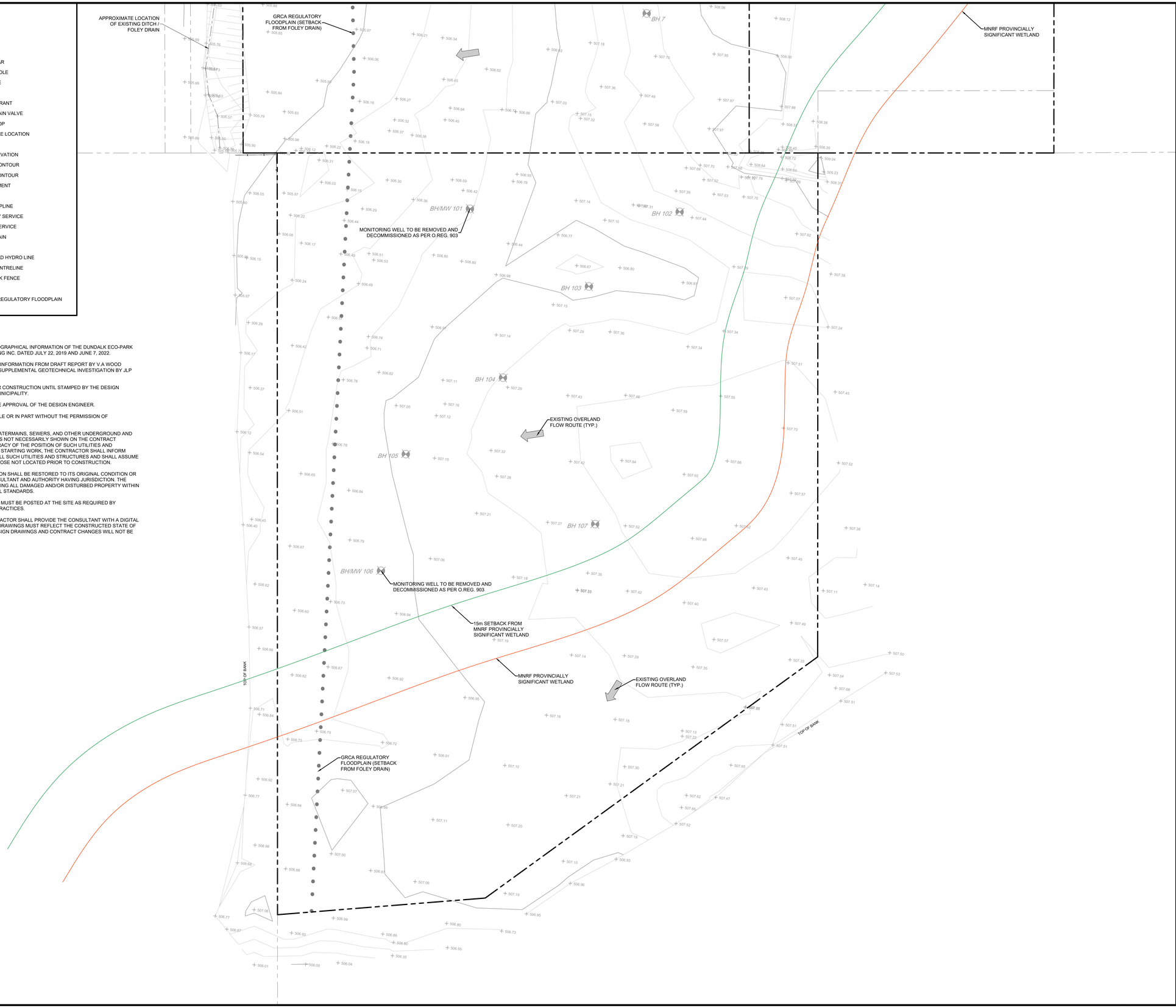

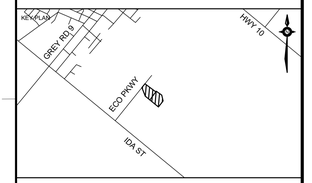

PROJECT NORTH

TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED 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 (2 OF 2)

WALTERFEDY

KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2023.03.29
PROVINCE OF ONTARIO

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

SHEET NO.:

C1-2

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
- +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
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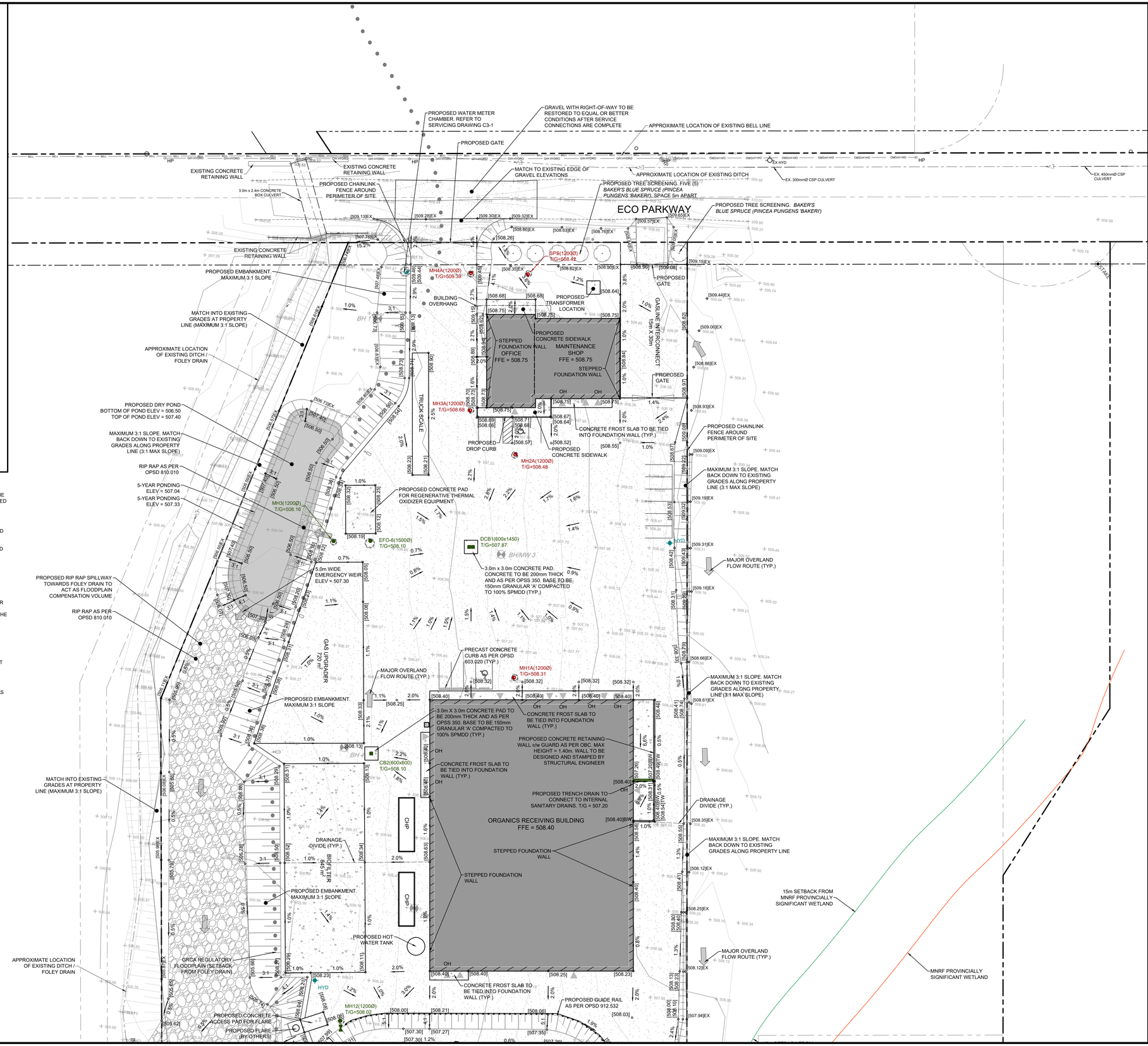

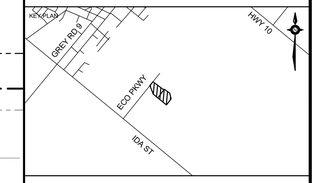

PROJECT NORTH TRUE NORTH

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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)

WALTERFEDY

KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2023.03.29
PROVINCE OF ONTARIO

SCALE:	1:400
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CHECKED BY:	JZ

SHEET NO.: **C2-1**

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LEGEND

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- EX SIGN — EXISTING SIGN
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- EX CS — EXISTING CURB STOP
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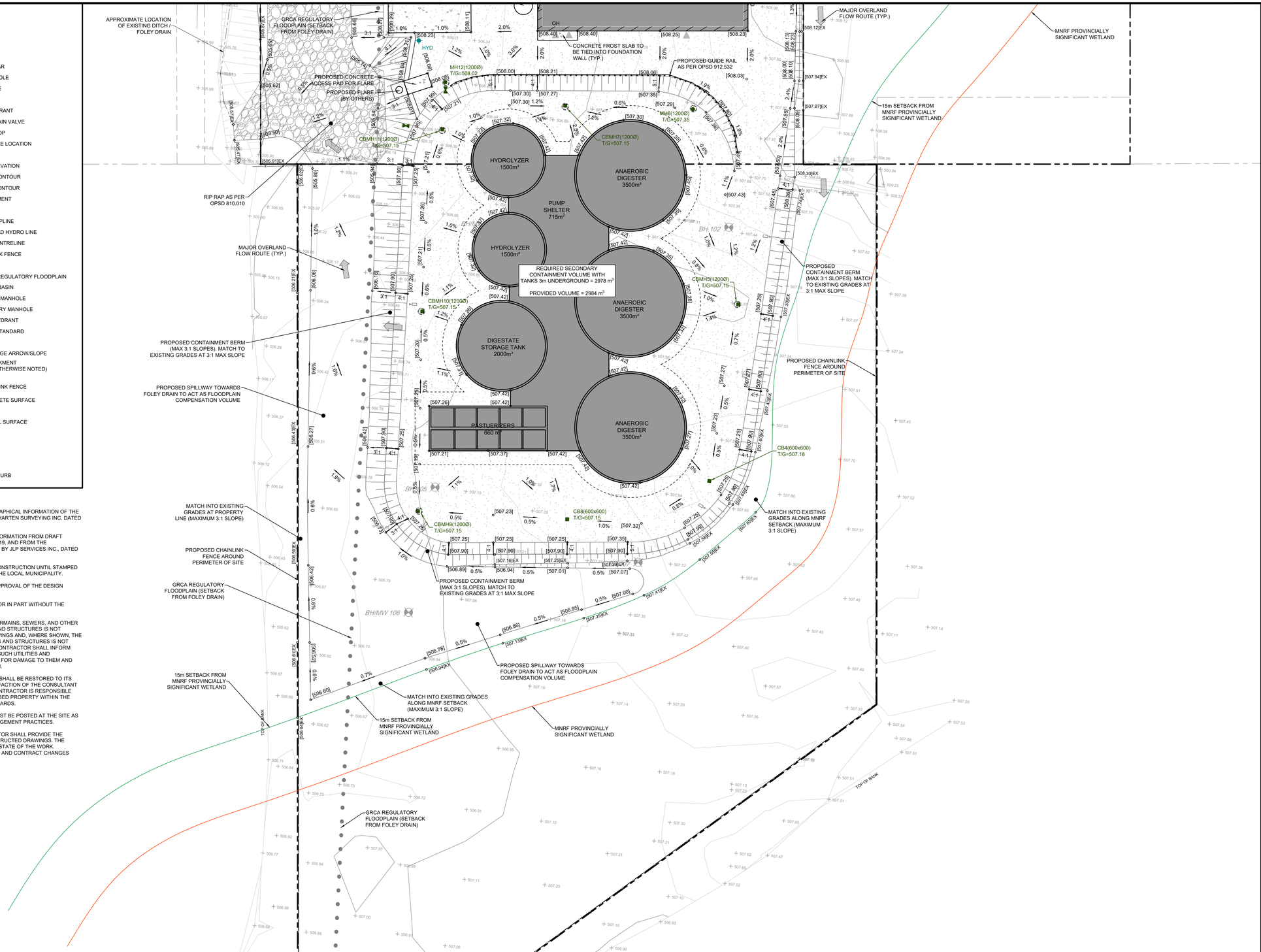

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TRUE NORTH

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

PROJECT

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100 ECO PARKWAY, DUNDALK, ON

TITLE

GRADING PLAN (2 OF 2)

WALTERFEDY

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LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
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2023.03.29
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C2-2

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- EXISTING WATERMAIN
- EXISTING GASMAIN
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- PROPOSED CHAINLINK FENCE
- PROPOSED EMBANKMENT (3:1 MAX UNLESS OTHERWISE NOTED)
- PROPOSED CONCRETE SURFACE
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- PROPOSED RIPRAP
- PROPOSED CURB
- PROPOSED DROP CURB
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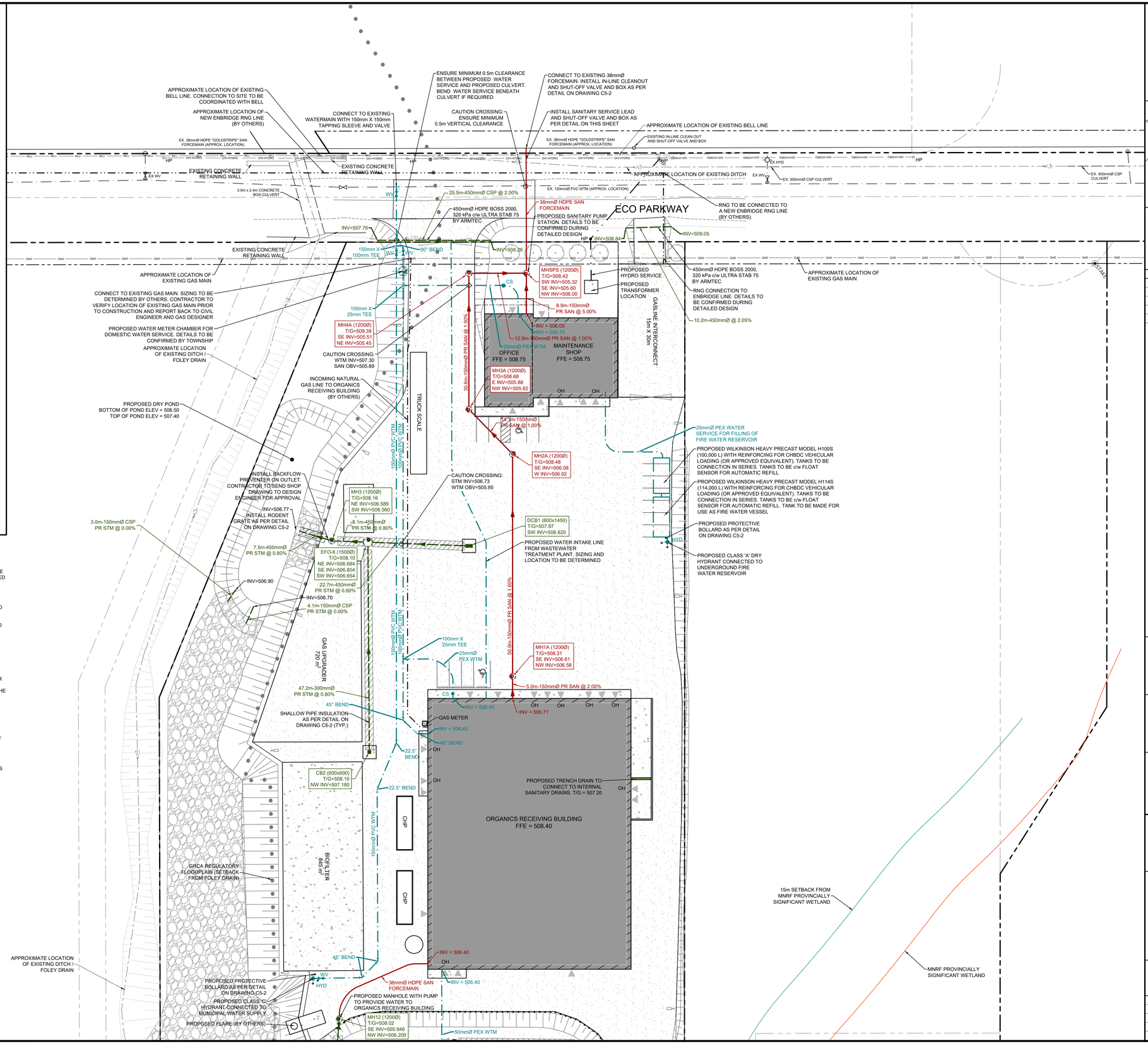

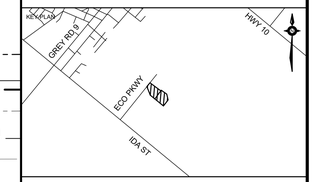

PROJECT NORTH | TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED 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
SERVICING PLAN (1 OF 2)

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER — T. B. KELLER — 100529026 — 2023.03.29 — PROVINCE OF ONTARIO

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

SHEET NO.: C3-1

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
- EX WV — EXISTING WATERMAIN VALVE
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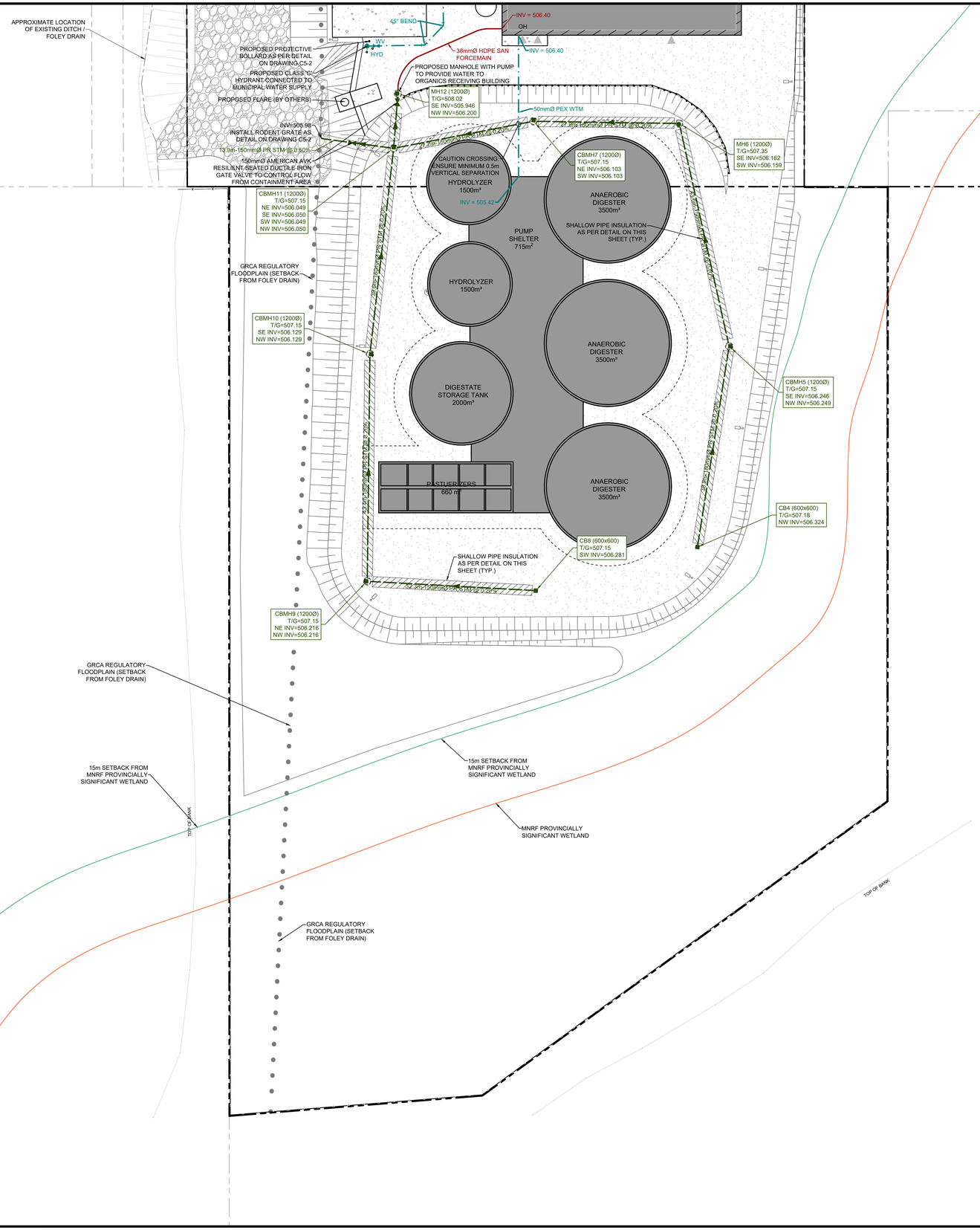

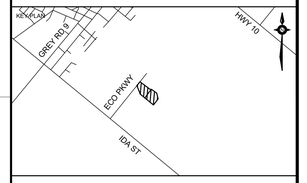

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CLIENT

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
2023.03.29
PROVINCE OF ONTARIO

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C3-2

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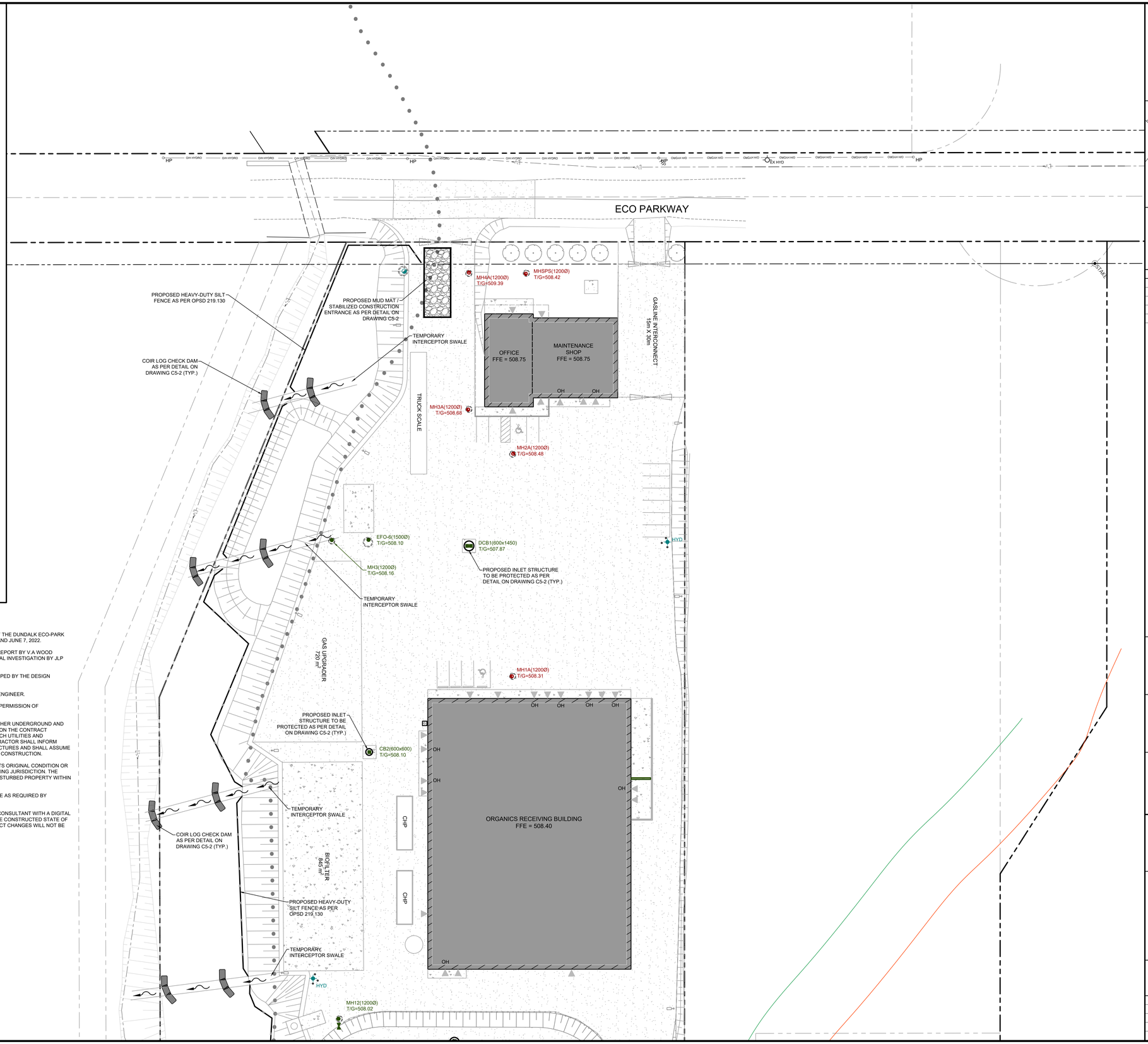

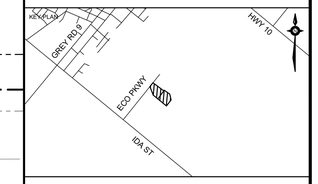

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77 KING ST WEST, SUITE 3000
TORONTO, ON M5K 1G8

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
2023.03.29
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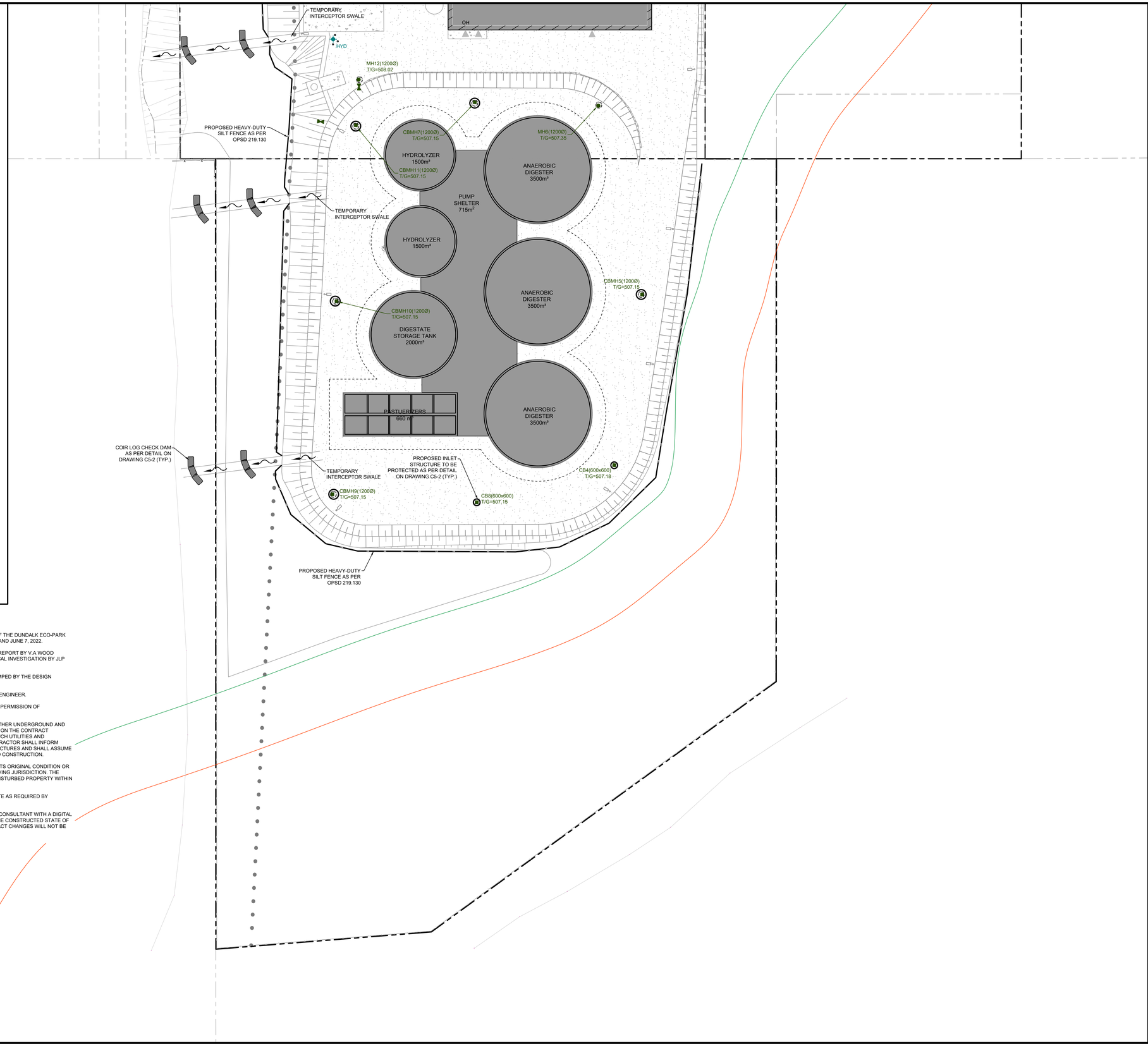

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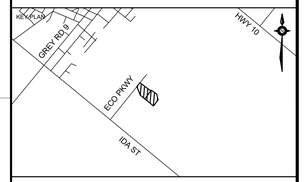

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EROSION CONTROL NOTES

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

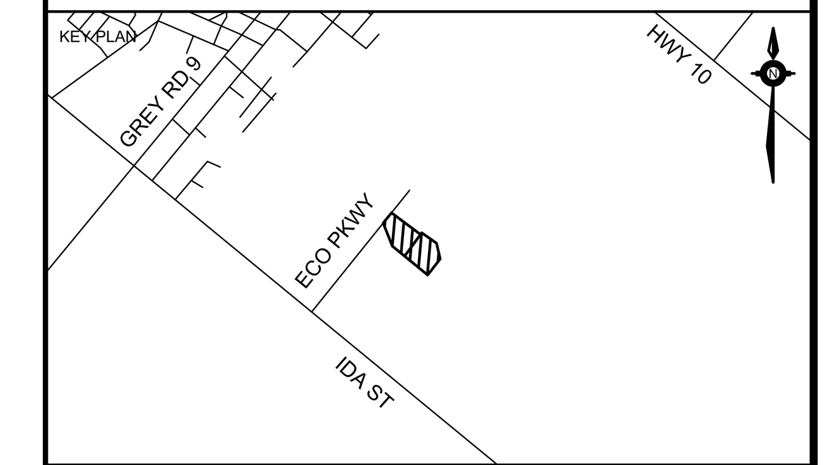
1. TOPSOIL TO BE PROVIDED AND INSTALLED AS PER OPSS 802. SOD TO BE PROVIDED AND INSTALLED AS PER OPSS 803.

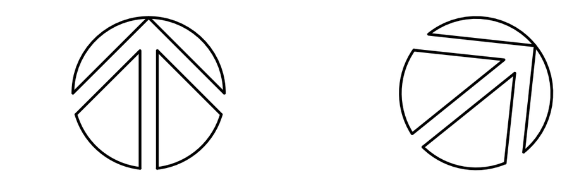
OTHER

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.





PROJECT NORTH | TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED 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

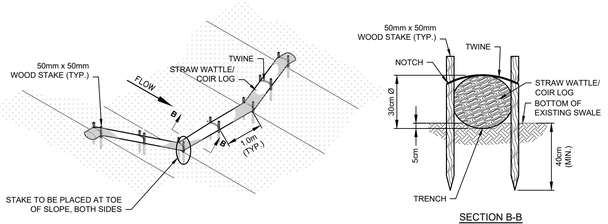
TITLE
NOTES

WALTERFEDY
KITCHENER | HAMILTON | TORONTO
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER
T. B. KELLER
100529026
2023.03.29
PROVINCE OF ONTARIO

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

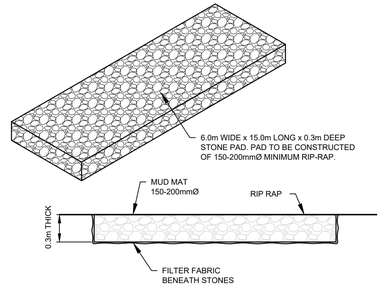
SHEET NO.: C5-1



SECTION B-B

STRAW WATTLE/COIR LOG CHECK DAM DETAIL

N.T.S.

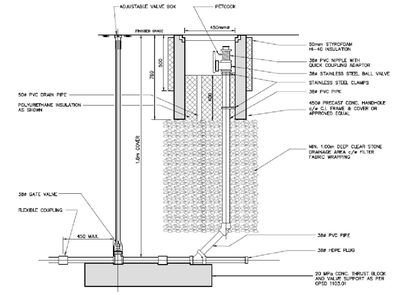


NOTE:

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.

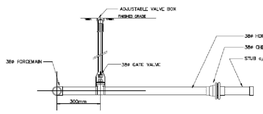
CONSTRUCTION MUD MAT DETAIL

N.T.S.



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

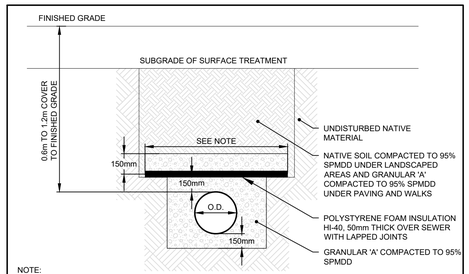
N.T.S.



TYPICAL SERVICE LEAD

N.T.S.

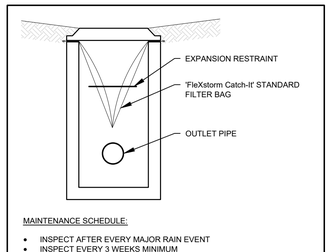
TYPICAL SANITARY FORCEMAIN CONNECTION DETAIL



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.

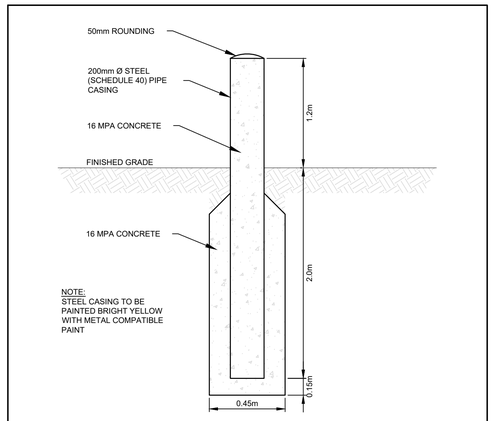


MAINTENANCE SCHEDULE:

- 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

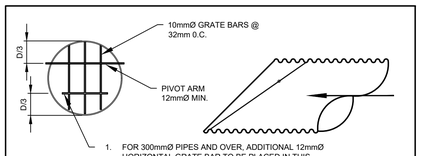
N.T.S.



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

200mm BOLLARD DETAIL

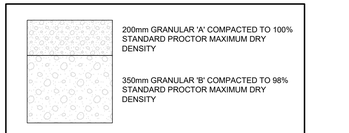
N.T.S.



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.

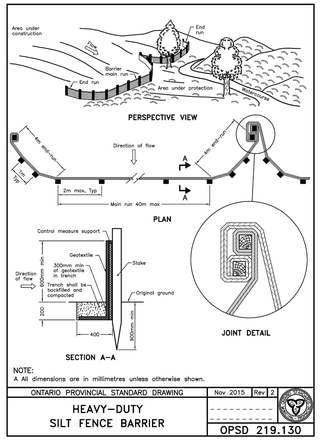
RODENT GRATE DETAIL

N.T.S.



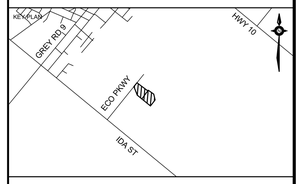
GRAVEL STRUCTURE DETAIL

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			



PROJECT NORTH TRUE NORTH

DATE	ISSUANCE	NO.
2023.03.29	ISSUED 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
2023.03.29
PROVINCE OF ONTARIO

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

SHEET NO.:

C5-2

APPENDIX A

Stormwater Management

- MIDUSS Model Outputs
- Storm Sewer Design Sheet
- Stormceptor Sizing Report
- Infiltration Drain Down Times
- Stage Storage

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                       ie METRIC"
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"                                                                    SWM\MIDUSS"
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"               Company                                                WalterFedy"
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" 85          IDF CURVE FIT"
"            1  Number of Storms"
"            1  Storm no."
"            2  Return interval"
"           12  Data Pairs"
"                 5.000    10.000    15.000    30.000    60.000"
"               120.000   180.000   240.000   360.000   720.000"
"              1080.000  1440.000   minutes"
"                10.933    13.467    15.225    18.750    23.100"
"                28.400     0.000     0.000    39.600    49.200"
"                 0.000    60.000   mm"
"               131.200    80.800    60.900    37.500    23.100"
"                14.200     0.000     0.000     6.600     4.100"
"                 0.000     2.500   mm/hr"
"      404.127    mm/hr 'A' coeff."
"       0.0090    minutes 'B' coeff."
"      0.69882           'C' exponent"
"       0.1372           Std.error of estimate"
" 31         TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32         STORM Chicago storm"
"            1   Chicago storm"
"      404.130   Coefficient A"
"        0.009   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          131.080    mm/hr"
"             Total depth                 32.184    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing to Creek"
"        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."
"        0.161   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"
"                    0.035     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  34.326     2.768      34.326     minutes"
"             Time to Centroid       153.019    0.000      153.019    minutes"
"             Rainfall depth         32.184     32.184     32.184     mm"
"             Rainfall volume        1300.24    0.00       1300.24    c.m"
"             Rainfall losses        26.996     32.184     26.996     mm"
"             Runoff depth           5.188      0.000      5.188      mm"
"             Runoff volume          209.60     0.00       209.60     c.m"
"             Runoff coefficient     0.161      0.000      0.161      "
"             Maximum flow           0.035      0.000      0.035      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.035     0.035     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.035     0.035     0.035     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.040    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
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"               Company                                                WalterFedy"
"               Date & Time last used:                2023-01-30 at 2:01:19 PM"
" 85          IDF CURVE FIT"
"           1   Number of Storms"
"           1   Storm no."
"           5   Return interval"
"          12   Data Pairs"
"                 5.000    10.000    15.000    30.000    60.000"
"               120.000   180.000   240.000   360.000   720.000"
"              1080.000  1440.000   minutes"
"                14.483    17.850    20.150    24.850    30.600"
"                37.600     0.000     0.000    52.500    64.600"
"                 0.000    79.600   mm"
"               173.800   107.100    80.600    49.700    30.600"
"                18.800     0.000     0.000     8.750     5.383"
"                 0.000     3.317   mm/hr"
"      537.295    mm/hr 'A' coeff."
"       0.0294    minutes 'B' coeff."
"      0.69969           'C' exponent"
"       0.0259           Std.error of estimate"
" 31         TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32         STORM Chicago storm"
"           1   Chicago storm"
"      537.300   Coefficient A"
"        0.029   Constant B"
"        0.700   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          173.536    mm/hr"
"             Total depth                 42.587    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33         CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Existing to Creek"
"        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."
"        0.230   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"
"                    0.096     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  24.807     2.443      24.807     minutes"
"             Time to Centroid       139.336    0.000      139.336    minutes"
"             Rainfall depth         42.587     42.587     42.587     mm"
"             Rainfall volume        1720.51    0.00       1720.51    c.m"
"             Rainfall losses        32.794     42.587     32.794     mm"
"             Runoff depth           9.793      0.000      9.793      mm"
"             Runoff volume          395.63     0.00       395.63     c.m"
"             Runoff coefficient     0.230      0.000      0.230      "
"             Maximum flow           0.096      0.000      0.096      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.096     0.096     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.096     0.096     0.096     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.040    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                            Version 2.25  rev. 467"
"               MIDUSS created                                    July 6, 2008"
"           10  Units used:                                        ie METRIC"
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"                                                                     SWM\MIDUSS"
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"               Company                                             WalterFedy"
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"            1  Number of Storms"
"            1  Storm no."
"          100  Return interval"
"           12  Data Pairs"
"                 5.000    10.000    15.000    30.000    60.000"
"               120.000   180.000   240.000   360.000   720.000"
"              1080.000  1440.000   minutes"
"                24.142    29.733    33.600    41.400    51.000"
"                62.800     0.000     0.000    87.500   107.700"
"                 0.000   132.700   mm"
"               289.700   178.400   134.400    82.800    51.000"
"                31.400     0.000     0.000    14.583     8.975"
"                 0.000     5.529   mm/hr"
"      895.373    mm/hr 'A' coeff."
"       0.0294    minutes 'B' coeff."
"      0.69960           'C' exponent"
"       0.0965           Std.error of estimate"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      895.370   Coefficient A"
"        0.029   Constant B"
"        0.700   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          289.232    mm/hr"
"             Total depth                 71.005    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Existing to Creek"
"        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."
"        0.373   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"
"                    0.408     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           4.040      0.000      4.040      hectare"
"             Time of concentration  15.742     1.966      15.742     minutes"
"             Time to Centroid       123.764    0.000      123.764    minutes"
"             Rainfall depth         71.005     71.005     71.005     mm"
"             Rainfall volume        2868.58    0.00       2868.58    c.m"
"             Rainfall losses        44.499     71.005     44.499     mm"
"             Runoff depth           26.505     0.000      26.505     mm"
"             Runoff volume          1070.82    0.00       1070.82    c.m"
"             Runoff coefficient     0.373      0.000      0.373      "
"             Maximum flow           0.408      0.000      0.408      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.408     0.408     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.408     0.408     0.408     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.040    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                         ie METRIC"
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"                                                                     SWM\MIDUSS"
"                Output filename:                                  2yr-POST.out"
"                Licensee name:                                    Tyler Keller"
"                Company                                             WalterFedy"
"                Date & Time last used:                2023-01-30 at 4:33:39 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      404.127   Coefficient A"
"        0.009   Constant B"
"        0.699   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           131.074    mm/hr"
"             Total depth                  32.181    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled 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'"
"       75.000   Pervious SCS Curve No."
"        0.161   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"
```

```
"                    0.210     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  32.624     2.631      3.258      minutes"
"             Time to Centroid       150.750    93.900     95.090     minutes"
"             Rainfall depth         32.181     32.181     32.181     mm"
"             Rainfall volume        34.76      312.80     347.55     c.m"
"             Rainfall losses        26.994     5.207      7.386      mm"
"             Runoff depth           5.187      26.974     24.795     mm"
"             Runoff volume          5.60       262.18     267.79     c.m"
"             Runoff coefficient     0.161      0.838      0.770      "
"             Maximum flow           0.001      0.210      0.210      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.210     0.210     0.000     0.000"
" 54          POND DESIGN"
"        0.210   Current peak flow    c.m/sec"
"        0.278   Target outflow    c.m/sec"
"        267.8   Hydrograph volume    c.m"
"          11.   Number of stages"
"      506.500   Minimum water level    metre"
"      507.400   Maximum water level    metre"
"      506.500   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                506.500     0.000     0.000"
"                506.600  1.01E-05    36.454"
"                506.700  1.01E-05    75.953"
"                506.800   0.00542   118.562"
"                506.900   0.01321   164.343"
"                507.000   0.02494   213.358"
"                507.100   0.03789   265.655"
"                507.200   0.04859   321.310"
"                507.300   0.05759   380.340"
"                507.350   0.06163   411.095"
"                507.400    0.1512   442.666"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                507.350     0.900     5.000     0.000     0.000"
"           2.   OUTFLOW PIPE"
"               Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                 invert    invert    Length  Diameter       'n'   loss Ke"
"                506.700   506.700     3.000     0.150     0.015     0.500"
"                506.900   506.900     3.000     0.150     0.015     0.500"
"             Peak outflow                 0.017    c.m/sec"
"             Maximum level              506.932    metre"
"             Maximum storage            180.088    c.m"
"             Centroidal lag               3.692   hours"
"                  0.210     0.210     0.017     0.000 c.m/sec"
```

```
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"             Maximum flow                  0.017    c.m/sec"
"             Hydrograph volume           192.000    c.m"
"                    0.210     0.210     0.017     0.017"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.210     0.000     0.017     0.017"
" 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."
"        0.161   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."
"        0.843   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.021     0.000     0.017     0.017 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  69.836     5.631      55.981     minutes"
"             Time to Centroid       200.470    98.969     178.568    minutes"
"             Rainfall depth         32.181     32.181     32.181     mm"
"             Rainfall volume        556.40     29.28      585.69     c.m"
"             Rainfall losses        26.993     5.058      25.896     mm"
"             Runoff depth           5.188      27.123     6.285      mm"
"             Runoff volume          89.70      24.68      114.38     c.m"
"             Runoff coefficient     0.161      0.843      0.195      "
"             Maximum flow           0.009      0.020      0.021      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.021     0.021     0.017     0.017"
```

```
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.021     0.021     0.021     0.017"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"             Maximum flow                  0.027    c.m/sec"
"             Hydrograph volume           306.385    c.m"
"                     0.021     0.021     0.021     0.027"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.021     0.000     0.021     0.027"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment Area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       45.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       45.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       45.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.161   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."
"        0.832   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.225     0.000     0.021     0.027 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  49.448     3.987      4.446      minutes"
"             Time to Centroid       173.228    96.337     97.114     minutes"
"             Rainfall depth         32.181     32.181     32.181     mm"
"             Rainfall volume        18.34      348.52     366.86     c.m"
"             Rainfall losses        26.993     5.421      6.500      mm"
"             Runoff depth           5.188      26.759     25.681     mm"
"             Runoff volume          2.96       289.80     292.76     c.m"
"             Runoff coefficient     0.161      0.832      0.798      "
"             Maximum flow           0.000      0.225      0.225      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.225     0.225     0.021     0.027"
" 54          POND DESIGN"
"         0.225   Current peak flow    c.m/sec"
"         0.278   Target outflow    c.m/sec"
"         292.8   Hydrograph volume    c.m"
"           10.   Number of stages"
"       506.050   Minimum water level    metre"
"       507.950   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"
"                 507.150   0.03538     2.000"
"                 507.250   0.03695    83.666"
"                 507.350   0.03846   337.411"
"                 507.450   0.03991   718.563"
"                 507.550   0.04131  1146.528"
"                 507.650   0.04266  1593.363"
"                 507.750   0.04398  2058.429"
"                 507.850   0.04525  2541.840"
"                 507.950   0.04649  3041.880"
"            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               507.263    metre"
"              Maximum storage             117.077    c.m"
"              Centroidal lag                2.110   hours"
"                   0.225     0.225     0.037     0.027 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"              Maximum flow                  0.064    c.m/sec"
"              Hydrograph volume           600.401    c.m"
"                     0.225     0.225     0.037     0.064"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"              Total Catchment area                      4.040    hectare"
"              Total Impervious area                     2.146    hectare"
"              Total % impervious                       53.119"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                         ie METRIC"
"                Job folder:        \\BEL1\Job_Files\2021\0713\10\05-DSGN\CIVL\"
"                                                                      SWM\MIDUSS"
"                Output filename:                            5yr-POST revised.out"
"                Licensee name:                                    Tyler Keller"
"                Company                                             WalterFedy"
"                Date & Time last used:                2023-01-30 at 4:13:59 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      537.295   Coefficient A"
"        0.029   Constant B"
"        0.700   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           173.451    mm/hr"
"             Total depth                  42.520    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled 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'"
"       75.000   Pervious SCS Curve No."
"        0.230   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."
"        0.873   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.302     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  23.602     2.323      2.927      minutes"
"             Time to Centroid       137.608    92.381     93.665     minutes"
"             Rainfall depth         42.520     42.520     42.520     mm"
"             Rainfall volume        45.92      413.30     459.22     c.m"
"             Rainfall losses        32.755     5.400      8.135      mm"
"             Runoff depth           9.765      37.120     34.385     mm"
"             Runoff volume          10.55      360.81     371.36     c.m"
"             Runoff coefficient     0.230      0.873      0.809      "
"             Maximum flow           0.003      0.302      0.302      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                    0.302     0.302     0.000     0.000"
" 54          POND DESIGN"
"         0.302   Current peak flow    c.m/sec"
"         0.278   Target outflow    c.m/sec"
"         371.4   Hydrograph volume    c.m"
"           10.   Number of stages"
"       506.500   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.500   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.500     0.000     0.000"
"                 506.600  1.01E-05    36.454"
"                 506.700  1.01E-05    75.953"
"                 506.800   0.00542   118.562"
"                 506.900   0.01321   164.343"
"                 507.000   0.02494   213.358"
"                 507.100   0.03789   265.655"
"                 507.200   0.04859   321.310"
"                 507.300   0.05759   380.340"
"                 507.400    0.3081   442.666"
"             1.   WEIRS"
"                    Crest      Weir     Crest      Left     Right"
"                elevation coefficie   breadth sideslope sideslope"
"                  507.300     0.900     5.000     0.000     0.000"
"             2.   OUTFLOW PIPE"
"                 Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                   invert    invert    Length  Diameter       'n'   loss Ke"
"                 506.700   506.700     3.000     0.150     0.015     0.500"
"                 506.900   506.900     3.000     0.150     0.015     0.500"
"               Peak outflow                 0.030    c.m/sec"
"               Maximum level              507.041    metre"
"               Maximum storage            234.586    c.m"
"               Centroidal lag               3.409   hours"
"                    0.302     0.302     0.030     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"             Maximum flow                  0.030    c.m/sec"
"             Hydrograph volume           295.573    c.m"
"                    0.302     0.302     0.030     0.030"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.302     0.000     0.030     0.030"
" 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."
"        0.230   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"
"                    0.031     0.000     0.030     0.030 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  50.523     4.972      42.904     minutes"
"             Time to Centroid       175.853    96.920     162.652    minutes"
"             Rainfall depth         42.520     42.520     42.520     mm"
"             Rainfall volume        735.17     38.69      773.87     c.m"
"             Rainfall losses        32.756     5.261      31.382     mm"
"             Runoff depth           9.764      37.259     11.138     mm"
"             Runoff volume          168.81     33.91      202.72     c.m"
"             Runoff coefficient     0.230      0.876      0.262      "
"             Maximum flow           0.023      0.027      0.031      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.031     0.031     0.030     0.030"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.031     0.031     0.031     0.030"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"             Maximum flow                  0.056    c.m/sec"
"             Hydrograph volume           498.293    c.m"
"                     0.031     0.031     0.031     0.056"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.031     0.000     0.031     0.056"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment Area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       45.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       45.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       45.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.230   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."
"        0.857   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.301     0.000     0.031     0.056 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  35.773     3.520      3.969      minutes"
"             Time to Centroid       154.890    94.662     95.500     minutes"
"             Rainfall depth         42.520     42.520     42.520     mm"
"             Rainfall volume        24.24      460.49     484.73     c.m"
"             Rainfall losses        32.755     6.092      7.426      mm"
"             Runoff depth           9.765      36.428     35.095     mm"
"             Runoff volume          5.57       394.51     400.08     c.m"
"             Runoff coefficient     0.230      0.857      0.825      "
"             Maximum flow           0.001      0.301      0.301      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.301     0.301     0.031     0.056"
" 54          POND DESIGN"
"        0.301   Current peak flow    c.m/sec"
"        0.278   Target outflow    c.m/sec"
"        400.1   Hydrograph volume    c.m"
"          10.   Number of stages"
"      506.050   Minimum water level    metre"
"      507.950   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"
"                507.150   0.03538     2.000"
"                507.250   0.03695    83.666"
"                507.350   0.03846   337.411"
"                507.450   0.03991   718.563"
"                507.550   0.04131  1146.528"
"                507.650   0.04266  1593.363"
"                507.750   0.04398  2058.429"
"                507.850   0.04525  2541.840"
"                507.950   0.04649  3041.880"
"           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               507.287    metre"
"             Maximum storage             178.756    c.m"
"             Centroidal lag                2.370   hours"
"                  0.301     0.301     0.038     0.056 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"             Maximum flow                  0.093    c.m/sec"
"             Hydrograph volume           896.750    c.m"
"                     0.301     0.301     0.038     0.093"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.040    hectare"
"             Total Impervious area                     2.146    hectare"
"             Total % impervious                       53.119"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 467"
"                MIDUSS created                                    July 6, 2008"
"           10   Units used:                                         ie METRIC"
"                Job folder:        \\BEL1\Job_Files\2021\0713\10\05-DSGN\CIVL\"
"                                                                      SWM\MIDUSS"
"                Output filename:                          100yr-POST revised.out"
"                Licensee name:                                    Tyler Keller"
"                Company                                             WalterFedy"
"                Date & Time last used:                2023-01-30 at 4:23:56 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      895.373   Coefficient A"
"        0.029   Constant B"
"        0.700   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           289.217    mm/hr"
"             Total depth                  71.005    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled 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'"
"       75.000   Pervious SCS Curve No."
"        0.374   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."
"        0.912   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.561     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.108      0.972      1.080      hectare"
"             Time of concentration  14.960     1.868      2.439      minutes"
"             Time to Centroid       122.544    90.226     91.634     minutes"
"             Rainfall depth         71.005     71.005     71.005     mm"
"             Rainfall volume        76.69      690.17     766.85     c.m"
"             Rainfall losses        44.456     6.244      10.065     mm"
"             Runoff depth           26.549     64.761     60.940     mm"
"             Runoff volume          28.67      629.48     658.15     c.m"
"             Runoff coefficient     0.374      0.912      0.858      "
"             Maximum flow           0.011      0.559      0.561      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                    0.561     0.561     0.000     0.000"
" 54          POND DESIGN"
"         0.561   Current peak flow    c.m/sec"
"         0.278   Target outflow    c.m/sec"
"         658.1   Hydrograph volume    c.m"
"           11.   Number of stages"
"       506.500   Minimum water level    metre"
"       507.400   Maximum water level    metre"
"       506.500   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 506.500     0.000     0.000"
"                 506.600  1.01E-05    36.454"
"                 506.700  1.01E-05    75.953"
"                 506.800   0.00542   118.562"
"                 506.900   0.01321   164.343"
"                 507.000   0.02494   213.358"
"                 507.100   0.03789   265.655"
"                 507.200   0.04859   321.310"
"                 507.300   0.05759   380.340"
"                 507.350   0.06163   411.095"
"                 507.400    0.1512   442.666"
"             1.   WEIRS"
"                    Crest      Weir     Crest      Left     Right"
"                elevation coefficie   breadth sideslope sideslope"
"                  507.350     0.900     5.000     0.000     0.000"
"             2.   OUTFLOW PIPE"
"                 Upstream Downstr'm      Pipe      Pipe   Manning     Entry"
"                   invert    invert    Length  Diameter       'n'   loss Ke"
"                 506.700   506.700     3.000     0.150     0.015     0.500"
"                 506.900   506.900     3.000     0.150     0.015     0.500"
"               Peak outflow                 0.060    c.m/sec"
"               Maximum level              507.332    metre"
"               Maximum storage            400.036    c.m"
"               Centroidal lag               3.184   hours"
"                    0.561     0.561     0.060     0.000 c.m/sec"
```

```
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"             Maximum flow                  0.060    c.m/sec"
"             Hydrograph volume           582.330    c.m"
"                    0.561     0.561     0.060     0.060"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.561     0.000     0.060     0.060"
" 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."
"        0.374   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"
"                    0.107     0.000     0.060     0.060 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           1.729      0.091      1.820      hectare"
"             Time of concentration  32.024     3.999      28.841     minutes"
"             Time to Centroid       148.350    93.979     142.176    minutes"
"             Rainfall depth         71.005     71.005     71.005     mm"
"             Rainfall volume        1227.67    64.61      1292.29    c.m"
"             Rainfall losses        44.457     6.386      42.553     mm"
"             Runoff depth           26.548     64.618     28.451     mm"
"             Runoff volume          459.01     58.80      517.82     c.m"
"             Runoff coefficient     0.374      0.910      0.401      "
"             Maximum flow           0.100      0.045      0.107      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.107     0.107     0.060     0.060"
```

```
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.107     0.107     0.107     0.060"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"             Maximum flow                  0.167    c.m/sec"
"             Hydrograph volume          1100.143    c.m"
"                     0.107     0.107     0.107     0.167"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.107     0.000     0.107     0.167"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Containment Area"
"       95.000   % Impervious"
"        1.140   Total Area"
"       45.000   Flow length"
"        0.500   Overland Slope"
"        0.057   Pervious Area"
"       45.000   Pervious length"
"        0.500   Pervious slope"
"        1.083   Impervious Area"
"       45.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.374   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"
"                     0.542     0.000     0.107     0.167 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.057      1.083      1.140      hectare"
"             Time of concentration  22.675     2.832      3.249      minutes"
"             Time to Centroid       134.221    91.911     92.801     minutes"
"             Rainfall depth         71.005     71.005     71.005     mm"
"             Rainfall volume        40.47      768.98     809.45     c.m"
"             Rainfall losses        44.474     6.058      7.979      mm"
"             Runoff depth           26.530     64.947     63.026     mm"
"             Runoff volume          15.12      703.37     718.50     c.m"
"             Runoff coefficient     0.374      0.915      0.888      "
"             Maximum flow           0.004      0.541      0.542      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.542     0.542     0.107     0.167"
" 54          POND DESIGN"
"         0.542   Current peak flow    c.m/sec"
"         0.278   Target outflow    c.m/sec"
"         718.5   Hydrograph volume    c.m"
"           10.   Number of stages"
"       506.050   Minimum water level    metre"
"       507.950   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"
"                 507.150   0.03538     2.000"
"                 507.250   0.03695    83.666"
"                 507.350   0.03846   337.411"
"                 507.450   0.03991   718.563"
"                 507.550   0.04131  1146.528"
"                 507.650   0.04266  1593.363"
"                 507.750   0.04398  2058.429"
"                 507.850   0.04525  2541.840"
"                 507.950   0.04649  3041.880"
"           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               507.368    metre"
"              Maximum storage             404.345    c.m"
"              Centroidal lag                3.264   hours"
"                   0.542     0.542     0.039     0.167 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Post to Creek"
"              Maximum flow                  0.206    c.m/sec"
"              Hydrograph volume          1820.143    c.m"
"                       0.542     0.542     0.039     0.206"
" 38          START/RE-START TOTALS 203"
"            3   Runoff Totals on EXIT"
"              Total Catchment area                       4.040    hectare"
"              Total Impervious area                      2.146    hectare"
"              Total % impervious                        53.119"
" 19          EXIT"
```

TABLE 1
POND PERFORMANCE SUMMARY
PROPOSED CONDITIONS

Infiltration		
Permeability rate	0.000001	cm/s
Percolation Time[3]	50	(min/cm)
Safety Factor[3]	2.5	
Design infiltration rate (1/T)	4.8	mm/hr
Infiltration Footprint Area Pond	349	m^2
Design Infiltration flow rate	1.675	m^3/hr

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						
48 Hour Drawdown			506.70	80	48	2.0
2-year	0.210	0.017	506.93	180	108	4.5
5-year	0.302	0.030	507.04	235	140	5.8
100-year	0.561	0.060	507.33	400	239	10.0

Note:

1. Outflow does not include infiltration

2. Drain Down Time based on permeability rate of $1x10^{-6}$ cm/s in accordance with the Stormwater Management Report prepared by V.A. Wood (Guelph) Inc. in July 2019

3. Percolation Time and Factor of Safety from Appendix C of the Credit Valley Conservation Authority LID Design Guide

TABLE 2
DRY-POND STAGE STORAGE
(USED IN MIDUSS MODEL)

Stage	Incremental Area	Incremental Volume	Cumulative Volume
(m)	*(m^2)*	*(m^3)*	*(m^3)*
506.50	349.480	0.000	0.000
506.60	379.593	36.454	36.454
506.70	410.385	39.499	75.953
506.80	441.796	42.609	118.562
506.90	473.827	45.781	164.343
507.00	506.475	49.015	213.358
507.10	539.473	52.297	265.655
507.20	573.630	55.655	321.310
507.30	606.960	59.030	380.340
507.35	623.262	30.756	411.095
507.40	639.564	31.571	442.666

TABLE 3
SECONDARY CONTAINMENT STAGE STORAGE
(USED IN MIDUSS MODEL)

Stage	Incremental Area	Incremental Volume	Cumulative Volume
(m)	*(m^2)*	*(m^3)*	*(m^3)*
507.15	0.000	2.000	2.000
507.25	1633.326	81.666	83.666
507.35	3441.577	253.745	337.411
507.45	4181.451	381.151	718.563
507.55	4377.861	427.966	1146.528
507.65	4558.833	446.835	1593.363
507.75	4742.474	465.065	2058.429
507.85	4925.752	483.411	2541.840
507.95	5075.051	500.040	3041.880

WALTERFEDY

RATIONAL METHOD CALCULATIONS

Project:	Southgate Biofuels Facility							Storm Parameters															
Project No:	2019-0413-20							A	537.295														
Date:	07-Mar-23							B	0.0294	Design Frequency	2-yr	Maximum Permitted Full Flow Velocity (m/s)											6
Designed By:	TK	Checked By:	MH					C	0.699	Manning's 'n'	0.013	Minimum Permitted Full Flow Velocity (m/s)											0.6

	Pipe Data			Drainage Area				Time		Design Flow		Pipe Flow									
	From	To	Length	Area	C	AC	∑AC	Inlet	System	I	Q	Diameter	Slope	Q_{FULL}	Q/Q_{FULL}	V_{FULL}	V	Flow Time	Remarks
			(m)	*(ha)*				*(min)*	*(min)*	*(mm/hr)*	*(L/s)*	*(mm)*	*(%)*	*(L/s)*		*(m/s)*	*(m/s)*	*(min)*	
	CB1	OGS	22.7	**0.79**	**0.90**	**0.711**	**0.711**	10	**10.00**	**107.2**	**211.78**	450	0.60%	**220.84**	**0.96**	**1.39**	**1.58**	**0.24**	**No Surcharge**
	CB2	OGS	47.2	**0.21**	**0.90**	**0.189**	**0.189**	10	**10.00**	**107.2**	**56.30**	300	0.80%	**86.49**	**0.65**	**1.22**	**1.30**	**0.60**	**No Surcharge**
	OGS	MH3	26.4	**0.00**	**0.00**	**0.000**	**0.900**		**10.60**	**102.9**	**257.35**	450	0.80%	**255.01**	**1.01**	**1.60**	**1.83**	**0.24**	**No Surcharge**
	MH3	DRY POND	26.4	**0.00**	**0.00**	**0.000**	**0.900**		**10.84**	**101.3**	**253.35**	450	0.80%	**255.01**	**0.99**	**1.60**	**1.83**	**0.24**	**No Surcharge**

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

03/28/2023

Province:	Ontario
City:	Dundalk
Nearest Rainfall Station:	OWEN SOUND MOE
Climate Station Id:	6116132
Years of Rainfall Data:	40
Site Name:	
Drainage Area (ha):	1.08
% Imperviousness:	90.00

Runoff Coefficient 'c': 0.84

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	34.26
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Southgate Renewables Recycling Project
Project Number:	33322
Designer Name:	Tyler Keller
Designer Company:	WalterFedy
Designer Email:	tkeller@walterfedy.com
Designer Phone:	519-576-2150
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	73
EFO6	85
EFO8	91
EFO10	94
EFO12	96

Recommended Stormceptor EFO Model: EFO6

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

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream 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

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Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	10.3	10.3	1.26	76.0	29.0	100	10.3	10.3
1	20.8	31.1	2.52	151.0	58.0	100	20.8	31.1
2	15.1	46.2	5.04	303.0	115.0	95	14.3	45.4
3	10.1	56.3	7.57	454.0	173.0	87	8.8	54.2
4	7.7	64.0	10.09	605.0	230.0	82	6.3	60.5
5	6.4	70.4	12.61	757.0	288.0	79	5.1	65.6
6	4.6	75.1	15.13	908.0	345.0	77	3.5	69.1
7	3.4	78.4	17.65	1059.0	403.0	74	2.5	71.6
8	2.7	81.1	20.18	1211.0	460.0	71	1.9	73.5
9	2.6	83.7	22.70	1362.0	518.0	69	1.8	75.3
10	1.9	85.6	25.22	1513.0	575.0	66	1.2	76.5
11	1.7	87.3	27.74	1665.0	633.0	64	1.1	77.6
12	1.2	88.5	30.26	1816.0	690.0	64	0.7	78.4
13	1.1	89.6	32.79	1967.0	748.0	64	0.7	79.1
14	0.7	90.3	35.31	2118.0	806.0	63	0.5	79.5
15	0.6	90.9	37.83	2270.0	863.0	63	0.4	79.9
16	0.7	91.6	40.35	2421.0	921.0	62	0.4	80.4
17	0.6	92.3	42.87	2572.0	978.0	62	0.4	80.8
18	0.8	93.0	45.40	2724.0	1036.0	61	0.5	81.2
19	0.3	93.3	47.92	2875.0	1093.0	59	0.2	81.4
20	0.9	94.2	50.44	3026.0	1151.0	58	0.5	81.9
21	0.7	94.9	52.96	3178.0	1208.0	57	0.4	82.3
22	0.5	95.3	55.48	3329.0	1266.0	56	0.3	82.5
23	1.0	96.3	58.01	3480.0	1323.0	54	0.5	83.1
24	0.9	97.2	60.53	3632.0	1381.0	53	0.5	83.5
25	0.1	97.3	63.05	3783.0	1438.0	51	0.1	83.6
30	1.6	98.9	75.66	4540.0	1726.0	43	0.7	84.3
35	0.2	99.1	88.27	5296.0	2014.0	36	0.1	84.4
40	0.4	99.5	100.88	6053.0	2301.0	32	0.1	84.5
45	0.4	99.9	113.49	6809.0	2589.0	28	0.1	84.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**85 %**

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

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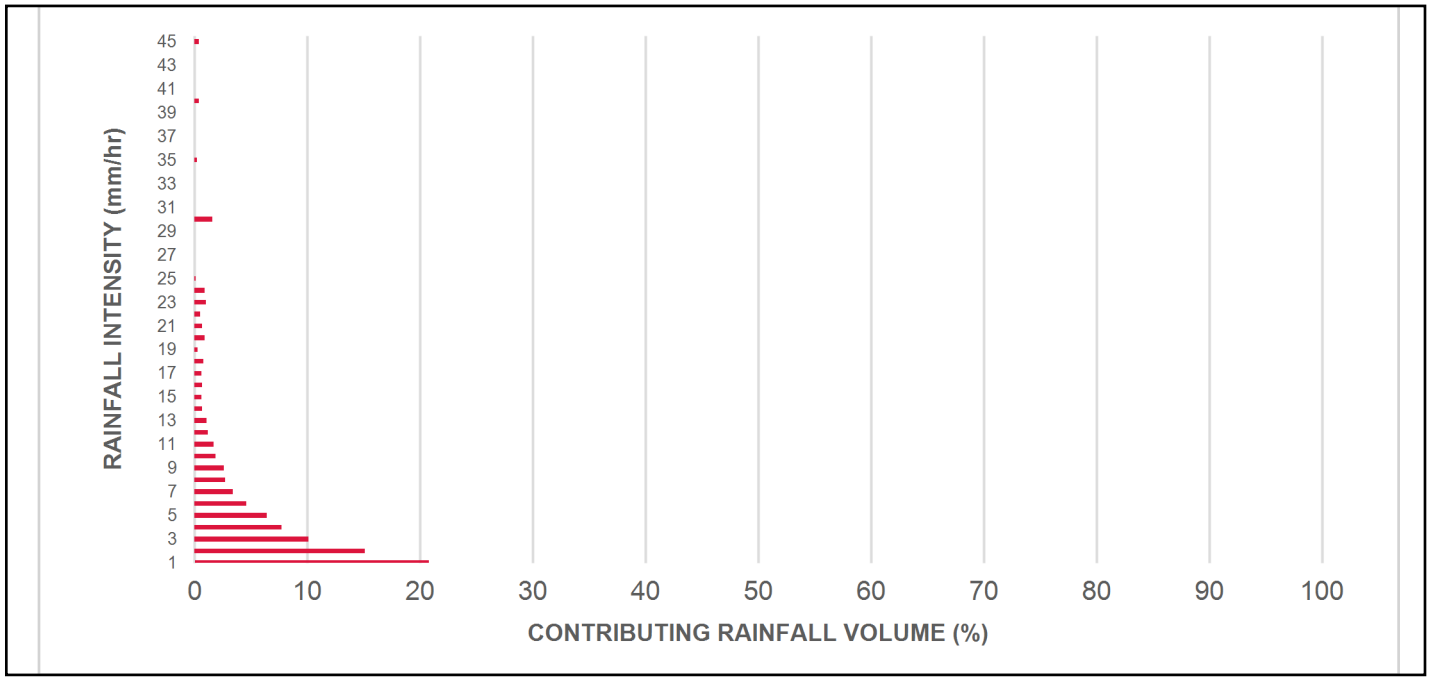
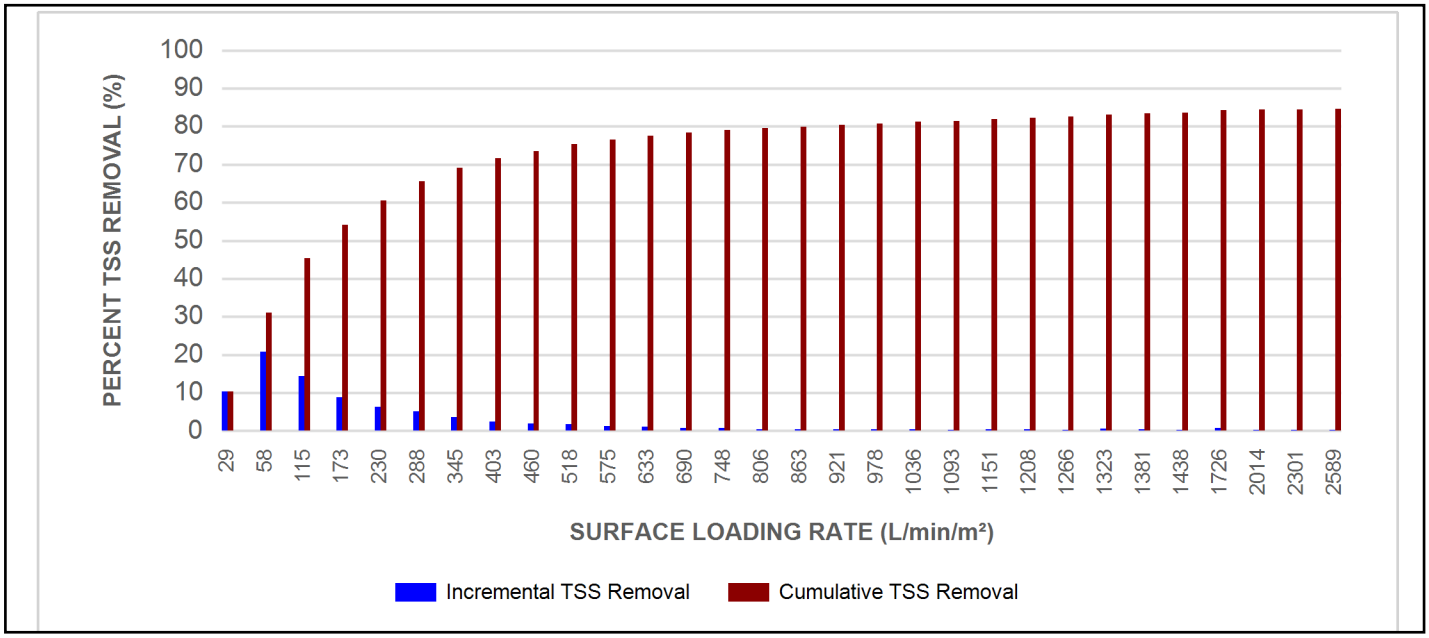
RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



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

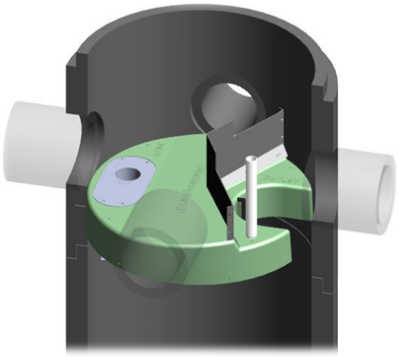
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

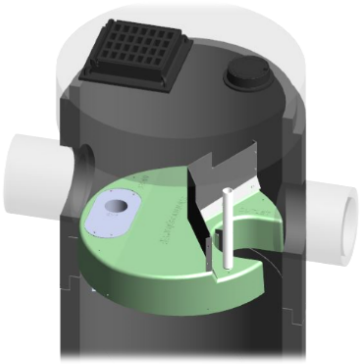
DESIGN FLEXIBILITY

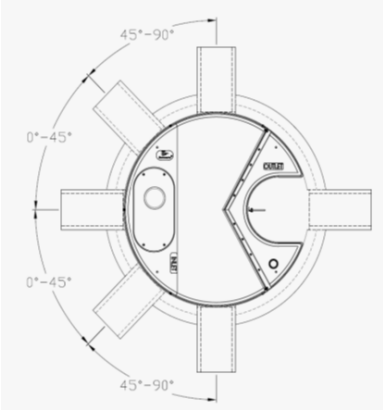
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

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

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.