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Servicing and Stormwater Management Report

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SERVICING AND STORMWATER MANAGEMENT REPORT

COPART FACILITY
300 SOMME STREET
OTTAWA, ONTARIO

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

May 27, 2020
Revised: Nov. 9, 2020

Novatech File: 119181
Ref No. R-2020-070

Nov. 9, 2020

Planning and Infrastructure Approvals
City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario, K1P 1J1

Attention: Seana Turkington, Planner I – Planning Services

Reference: Copart Facility
300 Somme Street, Ottawa, ON
Servicing and Stormwater Management Report
Our File No.: 119181

Please find enclosed the 'Servicing and Stormwater Management Report', revised November 9, 2020 for the above noted project. The report outlines the detailed servicing and stormwater management design to meet the requirements of the City of Ottawa and South Nation Conservation Authority (SNCA) in support of a Site Plan Control application and is submitted for your review and approval. This report has been revised in response to City of Ottawa comments dated July 29, 2020 and South Nation Conservation Authority dated July 20, 2020. The comment letters and responses are included in Appendix G.

Under separate cover we have forwarded a copy to the South Nation Conservation Authority.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH

Alex McAuley, P. Eng.
Project Manager | Land Development Engineering

Encl.

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Appendix C Septic System Design Brief
Appendix D Stormwater Management Calculations
Appendix E OGS Units
Appendix F Development Servicing Study Checklist
Appendix G Correspondence
Appendix H Drawings

1. 119181-GS1 Rev 4 Overall Grading, Erosion, Sediment Control and Servicing Plan
2. 119181-GS2 Rev 3 Detailed Grading and Servicing Plan
3. 119181-ND Rev 3 Notes and Details Plan
4. 119181-SEP Rev 3 Septic System Plan
5. 119181-POST Rev 4 Post-Development Storm Drainage Area Plan
6. 119181-SP Rev 1 Sections Plan

1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed outdoor storage area, with accessory office/warehouse building located at 300 Somme Street, Ottawa, Ontario. This report provides the detailed design for site servicing, storm drainage and stormwater management for the proposed site, in support of a Site Plan Application for the subject development.

The site is a parcel within the existing Hawthorne Industrial Park and is described as Block 6, Plan 4M-1388. **Figure 1** Key Plan shows the site location.

1.1 Background Reports

This report references the following background documents:

- Stormwater Management Report, Hawthorne Industrial Park, JLR 20983, JL Richards (May 2009);
- Hydrogeological Investigation and Terrain Analysis, 65080.01, prepared by Gemtec (November 4, 2020);
- Geotechnical Report, 65080.01, prepared by Gemtec (September 9, 2020);
- City of Ottawa Sewer Design Guidelines

1.2 Existing Conditions

The site is approximately 17.8 hectares and is currently vacant.

There is an approximate grade change of 5.5m across the site from the southwest corner to the northeast corner. **Figure 2** shows the existing site conditions.

Soils

The soils on this site are primarily imported fill underlain by silty sand and clay. Boreholes and test pits were advanced during geotechnical investigations. Refer to the Geotechnical Report for more information.

Topography / Storm Outlet

Under existing conditions, the site is gradually sloped from the south west towards the north east and drains towards the existing roadside ditches on Somme Street. The existing industrial subdivision is serviced by roadside ditches and a quantity control stormwater management facility.

The post-development storm drainage areas for the site are outlined in the JL Richards report for the Hawthorne Industrial Park subdivision. In this report, it is proposed that the site be divided into three drainage areas that all generally drain from the center of the site towards the existing roadside ditches that surround the site. The existing roadside ditches are designed to convey stormwater to the existing stormwater management facility on the north side of Somme Street. Excerpts from the JL Richards Report are in **Appendix A**.

1.3 Proposed Development

The proposed development is primarily a vehicle storage yard for short term storage (typically 50 to 60 days) and will include an accessory building which will contain office and warehouse space. The proposed 1,200m^2 building would be located on the northwest portion of the site along with an associated drilled well and septic system. The site access will be from Somme Street. Refer to the **Site Plans (119181-SP1 & 119181-SP2)** for the proposed site layout.

1.4 Site Constraints

The geotechnical report completed by Gemtec indicates that existing fill should be removed to native soil below sensitive structures. This means that under the building and the septic system, the existing fill must be removed and backfilled or replaced with suitable material.

1.5 Approvals

The proposed stormwater conveyance and stormwater management design will require approval from the City of Ottawa and the South Nation Conservation Authority (SNCA). A Ministry of the Environment Conservation and Parks (MECP) Environmental Compliance Approval (EC) will be required for the proposed stormwater management, as the site is zoned industrial.

The proposed septic system design will require approval from the Ottawa Septic System Office (OSSO).

2.0 GRADING AND SERVICING

Since municipal services are not available on Sappers Ridge or on Somme Street, it is proposed to service the accessory office/warehouse building with a drilled well and septic system.

The stormwater runoff will be conveyed overland to proposed perimeter swales, which will outlet to the existing roadside ditches.

2.1 Grading

The site will be graded to drain towards perimeter swales via overland flow. The detailed grading around the proposed accessory building allows for drainage away from the proposed building, and towards proposed grassed swales.

2.1.1 Pavement Design

The recommended pavement structure is noted on the Notes and Details Plan (Drawing 119181-ND), as follows:

Table 1: Pavement Structure

Pavement Material Description	Layer Thickness (mm)		
	Heavy Duty	Light Duty	Gravel
Asphalt Wear Course (Superpave 12.5)	40	50	-
Asphalt Base Course (Superpave 19.0)	60	-	-
OPSS Granular A	150	150	150
OPSS Granular B Type II	450	300	450
TOTAL	**700**	**500**	**600**

The proposed pavement structure is consistent with the recommendations provided in the Geotechnical Report.

2.2 Water Supply

The building will be serviced by a new well drilled as part of the Hydrogeological Investigation and Terrain Analysis report (Gemtec, November 4, 2020). The approximate location of the well is shown on the Detailed Grading and Servicing Plan (119181-GS2).

Water supply for fire protection will be stored in underground precast tanks, to provide water for firefighting in accordance with the rural water storage requirements. A dry hydrant will be provided to draw water from the proposed tanks. The dry hydrant location has been located in consultation with City of Ottawa Fire Services.

Fire storage requirements are based on the Ontario Building Code for a 'low hazard industrial occupancy' with non-combustible construction and no sprinklers. The volume of water required for fire protection for this building is 132m^3. The volume of water to be provided in the precast underground storage tanks is 150m^3 minimum.

Fire Underwriters Survey (FUS) calculations were also performed for the site, producing a required volume of fire flow of 720 m^3. This is primarily driven by the FUS requirement for 2 hours of flow. This requirement cannot be realistically obtained through the use of fire storage tanks in a rural environment. However, rural fire protection shuttle service is provided and therefore the required volume per the Ontario Building Code was deemed sufficient. This approach has been accepted by Ottawa Fire Services.

Refer to **Appendix B** for fire flow calculations. Correspondence with City of Ottawa Fire Services is included in **Appendix G.**

2.3 Wastewater Disposal

The building will be serviced by an individual sewage disposal system (septic system) in accordance with the recommendations of the Terrain Analysis Report. The septic system is shown on the Detailed Grading and Servicing Plan (119181-GS2) and is a fully raised conventional (Class IV) tile field system based on a design flow of 3,800L/day.

A Sewage System Permit will be required from the Ottawa Septic System Office.

Refer to **Appendix C** for details on the proposed septic system design.

3.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The stormwater management criteria and storm drainage design are consistent with the JL Richards report. Relevant excerpts of the report are provided in **Appendix A**.

The stormwater management pond designed and constructed for the industrial subdivision is a dry pond, providing water quantity control, assuming a runoff factor of 0.7 of the developed sites. The Copart site is within the catchment area for the pond.

3.1 Stormwater Management Criteria

The following criteria have been applied to the stormwater management design:

Water Quantity

- Stormwater Quantity Control is provided in an existing downstream dry pond for storms up to and including the 100-year storm event. If the runoff factor of the entire site exceeds 0.7, provide storage to attenuate post-development peak flows to the equivalent runoff factor of 0.7.
- Design the storm drainage system to convey post-development flows for all storms up-to and including the 100-year storm event.

Water Quality

- Provide on-site oil/grit separators to achieve an Enhanced level of water quality treatment corresponding to 80% long-term removal of total suspended solids (TSS).
- Implement best management practices.

Infiltration

- Infiltration is not proposed due to the proposed industrial use per the JL Richards report.

Erosion and Sediment Control

- Provide erosion and sediment control to minimize erosion and sediment transport during and after construction.

3.2 Proposed Drainage System

The proposed storm drainage system will consist of perimeter swales located within the 15m buffer around the perimeter of the outdoor storage area. The perimeter swales will outlet to the roadside ditches via oil-grit separators (OGS units) and spillways. A portion of the building roof and adjacent landscaped areas will drain directly to the Somme Street roadside ditch.

The site will sheet drain from a high point towards the perimeter swales. The swales have been designed to provide stormwater conveyance, some detention, and water quality treatment. The swales outlet through ditch-inlet catchbasins which will drain to OGS units and then to the adjacent roadside ditches. Flows which exceed the capacity of the OGS units will flow directly to the roadside ditch via a rip-rap lined spillway. Inlet control devices (ICDs) are proposed for the ditch-inlet catchbasins to control the peak flow rates to the OGS units to reduce the size of the units required.

Since the proposed site runoff factor does not exceed 0.7, stormwater quantity control is not required. While not required, the flow attenuation discussed above will result in some storage of stormwater within the on-site perimeter swales. Refer to **Appendix D** for the weighted runoff coefficient calculations.

3.3 Storm Drainage Area Plan

The Post-Development Storm Drainage Area Plan (119181-POST) generally maintains the storm drainage areas outlined in the JL Richards report. The drainage boundaries have been adjusted slightly to reflect the proposed grading design for the site.

3.4 Overland Flow Route

As mentioned above, flows which exceed the capacity of the OGS units will flow directly to the roadside ditches via a trapezoidal rip-rap spillway adjacent to each OGS unit. The spillways are designed to be used for storm events which exceed the 25mm water quality event. This includes all storm events up to and including the 100-year storm event. The spillways provide an overland flow route to the subdivision stormwater management pond via the roadside ditches.

The 5-year and 100-year ponding contours at each OGS unit as well as overland flow routes are shown on the Overall Grading, Erosion, Sediment Control and Servicing Plan (119181-GS1).

3.5 Stormwater Management Modeling

The PCSWMM hydrologic / hydraulic model was used to complete the storm drainage analysis for the proposed storm drainage system. The hydrologic analysis includes the delineation of storm drainage areas and the selection of modelling parameters for each subcatchment area. The PCSWMM model schematic and model output for post-development conditions are provided in **Appendix D**.

3.6 Allowable Flows

The allowable release rate for the site is based on a runoff coefficient of 0.70 per the JL Richards report. Since the post-development runoff coefficient is less than 0.70 for all drainage areas, the allowable flow is the post development flow. Therefore, flow attenuation is not required to meet the runoff criteria. Refer to Table 6 in **Appendix D** for runoff coefficient calculations.

Table 2 provides a summary of the design parameters used in the JL Richards report and the post-development conditions for the site. Since the design parameters for the site under post-development conditions are similar to those used in the JL Richards report (as demonstrated by **Table 2** below), downstream analysis of the existing roadside ditches is not required.

Table 2: Comparison of Design Parameters

	Drainage Area				
	West	**North**		**South/East**	**Total**
JL Richards Design (Allowable)					
ID	2	3		1	
Runoff Coefficient	0.70	0.70		0.70	0.70
Area (ha)	3.75	6.91		7.13	17.79
Post-Development Conditions (Site)					
ID	U-1	U-2	U-4	U-3	
Runoff Coefficient	0.61	0.65	0.33	0.61	0.61 (weighted avg)
Area (ha)	3.48	8.45	0.32	5.48	17.73

3.7 Stormwater Conveyance and Quantity Control

Stormwater conveyance and quantity control will be provided for the site based on the following measures. Quantity control is only being provided to reduce the size of the water quality treatment units as the weighted runoff coefficient is with the allowable to the existing dry pond.

Building Rooftops:

Stormwater runoff from the building rooftops will runoff uncontrolled to the landscaped areas immediately adjacent to the building.

Parking / Landscaped Areas:

Stormwater runoff from the parking / landscaped areas will be directed towards a grassed swale which will outlet to the perimeter swale on the north side of the site.

Uncontrolled Areas:

A portion of the building rooftop, and adjacent landscaped area will runoff uncontrolled directly to the Somme Street roadside ditch. Since this area does not exceed the allowable runoff coefficient, it is not being controlled.

3.7.1 Swales (Conveyance)

The proposed perimeter swales have been sized to convey the 100-year peak flows, based on Manning's equation. The proposed typical perimeter swale cross-sections are shown on the Sections Plan (119181-SP).

In all cases, the maximum capacity of the perimeter swales exceeds the 100-year design flow. Supporting calculations for the swales are included in **Appendix D**.

3.7.2 Outlet Structures

The outlet control structures will consist of a 600mm by 600mm ditch inlet catchbasin, complete with 600mm sump, a plug type orifice and a 250mm diameter catchbasin lead. The catchbasin lead will connect to the OGS unit, which will outlet to the roadside ditch via storm sewer outlet and rip-rap lined swale. Each outlet will have an adjacent rip-rap lined spillway to convey flows in excess of the controlled flow through the orifice and OGS unit. The spillways will be constructed of 150 mm diameter D_{50} rip-rap. The design of the outlet structure is based on the model results to control flows to the OGS units.

Details of the storm outlets are shown on the Notes and Details Plan (119181-ND).

3.8 Stormwater Quality Control

The site is located within the jurisdiction of South Nation Conservation Authority (SNCA) which requires an *enhanced* level of treatment (80% long term removal of total suspended solids). In addition per the JL Richards SWM Report, OGS units are required to provide stormwater quality control.

3.8.1 BMP Treatment Train

A treatment train approach will be used to provide to required quality control of stormwater. The treatment train consists of site level conveyance controls and Best Management Practices as follows:

- The overall site drainage patterns are generally consistent with those proposed by the JL Richards report.
- Stormwater from roof areas is considered 'clean' and quality control of stormwater for these areas is not required.
- The drainage system for the proposed works will consist of grassed perimeter swales. The proposed swales will be constructed at minimum grades.
- Oil-grit separator units will be provided at each outlet.

3.8.1.1 Grassed Swales

Although grassed swales are generally used for the conveyance of stormwater, under the appropriate conditions they permit significant amounts of total suspended solid (TSS) removal. Grassed swales are effective for treatment when the bottom width is maximized while the depth of flow and channel slope is minimized.

The grassed swales have been designed based on guidelines from the following publications:

- Young et. al., "Evaluation and Management of Highway Runoff Water Quality (FHWA, 1996)
- Stormwater Best Management Practices in an Urban Setting: Selection and Monitoring (FHWA, 1996)
- Stormwater Management Planning and Design Manual (MOE, 2003)

Case studies on the effectiveness of grassed ditches and swales for water quality control have provided variable results, which precludes the ability to precisely calculate pollutant removal efficiencies. However, the above referenced publications indicate that properly designed grassed channels can provide in excess of 80% long-term TSS removal, which will meet the requirements for an Enhanced level of quality control as per the MOE guidelines.

Both dry and wet swales demonstrate good pollutant removal, with dry swales providing significantly better performance for metals and nitrate. Dry swales typically remove 65 percent of total phosphorus (TP), 50 percent of total nitrogen (TN), and between 80 and 90 percent of metals. Wet swale removal rates are closer to 20 percent of TP, 40 percent of TN, and between 40 and 70 percent of metals. The total suspended solids removal for both swale types is typically between 80 and 90 percent. (FHWA, 1996)
The proposed swales have been designed to meet MOE standards for water quality treatment. The recommended MOE and FHWA criteria for water quality and the results of the analysis for the site are summarized in **Table 3**.

Table 3: Grassed Channel Design (Based on MOE & FHWA Guidelines)

Criteria	Recommended	West Swale OGS 1	North Swale OGS 2	South Swale OGS 3
Channel Dimensions				
Channel Slope	< 4.0% (MOE)	0.5%	0.5% to 1.0%	0.6%
Bottom Width	> 0.75 m (MOE)	2.0 m	2.0 m	2.0 m
Side Slopes (H:V)	> 2.5:1 (MOE)	3:1	3:1	3:1
Length	N/A	288	514	613
Water Quality Event (25mm – 4-hour Chicago)				
Peak Flow	-	0.061 m^3/s	0.187 m^3/s	0.112 m^3/s
Flow Depth*	± 0.1 m (FHWA)	0.05 – 0.58 m	0.06 – 0.61 m	0.05 – 0.69 m
Velocity	< 0.5 m/s (MOE)	0.16 – 0.32 m/s	0.13 – 0.51 m/s	0.17 – 0.45 m/s
100-year Event (3-hour Chicago)				
Peak Flow	-	0.439 m^3/s	1.208 m^3/s	0.856 m^3/s
Flow Depth*	< 0.5 m (MOE)	0.17 – 0.93 m	0.18 – 0.80 m	0.17 – 0.88 m
Velocity	N/A	0.26 – 0.56 m/s	0.29 – 0.89 m/s	0.29 – 0.83 m/s

*The recommended flow depths are only exceeded near the outlets due to the flow restriction and ponding as a result of the orifice controls.

The results summarized in **Table 3** indicate that the flow depths and velocities in the swales meet the recommended flow depth and velocity criteria for the 25mm event (water quality event). As the grassed swales meet the water quality criteria for frequent storm events, they should provide long-term water quality control.

3.8.1.2 Oil-grit Separators (OGS units)

As required in the JL Richards report, OGS units are required to provide stormwater quality. Since the conveyance system to the OGS units consists of grassed water quality swales, a credit for the pre-treatment provided by the grassed swales has been applied to the design of the OGS units. Refer to **Appendix E** for details on the proposed OGS Units.

3.8.2 Maintenance

Pollutant removal efficiencies of swales are related to flow retardance, vegetation density and the stiffness of grass blades, providing a "scrub brush" effect (Khan, 1993). Best removal rates have been achieved through dense turf grasses where a uniform blade height is maintained at least 50mm (2 in) above the design water depth. Grasses too short do not provide sufficient flow reduction or pollutant filtration; grasses too long tend to bend and flatten, allowing the runoff to skim over the bent grass, reducing flow retardance and filtration. (FHWA, 1996).

Based on the above statement, the proposed perimeter swales should be planted with dense turf grass or similar vegetation. The height of vegetation in the swales should be maintained at approximately 100 to 150mm (4 to 6 inches) by the Owner.

Annual inspection of the swales and OGS units is recommended to monitor accumulation of sediment or debris:

- Sediment removal should be performed when sediment depths build up to no more than 100mm;
- Grass damaged during the sediment removal process should be promptly replaced using the same seed mix used during initial vegetation establishment;
- If any areas are eroded, they should be filled, compacted, and reseeded so that the final grade is level with the bottom of the swale;
- Inspect the outlet structure regularly and remove any blockage.
- OGS Units are to be inspected and cleaned per manufacturer recommendations.

4.0 Erosion and Sediment Control

Erosion and sediment control measures would be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987). Details and specific locations of temporary and permanent Erosion and Sediment Control measures are shown on the Overall Grading, Erosion, Sediment Control and Servicing Plan (119181-GS1).

4.1 Temporary Measures

Temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control, as follows.

- Placement of geosocks under the ditch inlet catch basins;
- Silt fences around the area under construction;
- Rock flow check dams and light duty straw bales at key locations in the ditches and swales as shown on the plans;
- Vegetating disturbed areas.

The erosion and sediment control measures are to be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures are to be undertaken.

4.2 Permanent Measures

Permanent erosion and sediment control measures will include the following:

- Roof leaders are to be directed to the landscape areas.
- Ditches and swales have been designed at minimum grade, where possible.
- Ditches and swales are to be vegetated to provide permanent erosion and sediment control.
- Rip-rap will be installed at spillways.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions are as follows:

Servicing

- Potable water will be provided by means of a new drilled well in accordance with the recommendations of the Hydrogeological Investigation and Terrain Analysis dated November 4, 2020) prepared by Gemtec.
- Water for fire protection will be stored onsite in underground tanks.
- The proposed septic system is based on design flow of 3,800 L/day for a fully raised conventional system. A Sewage System Permit application will be required from the Ottawa Septic System Office.

Stormwater Management

- Storm drainage will be provided via grassed perimeter swales.
- Quantity control of storm runoff is not required as the weighted runoff coefficient of the site is within the subdivision design parameters.
- The grassed perimeter swales in combination with the oil-grit separator units will provide an enhanced level of water quality treatment corresponding to 80% long-term total suspended solids removal.

Erosion and Sediment control

- Erosion and sediment control will be provided to minimize erosion and sediment transport during and after construction.

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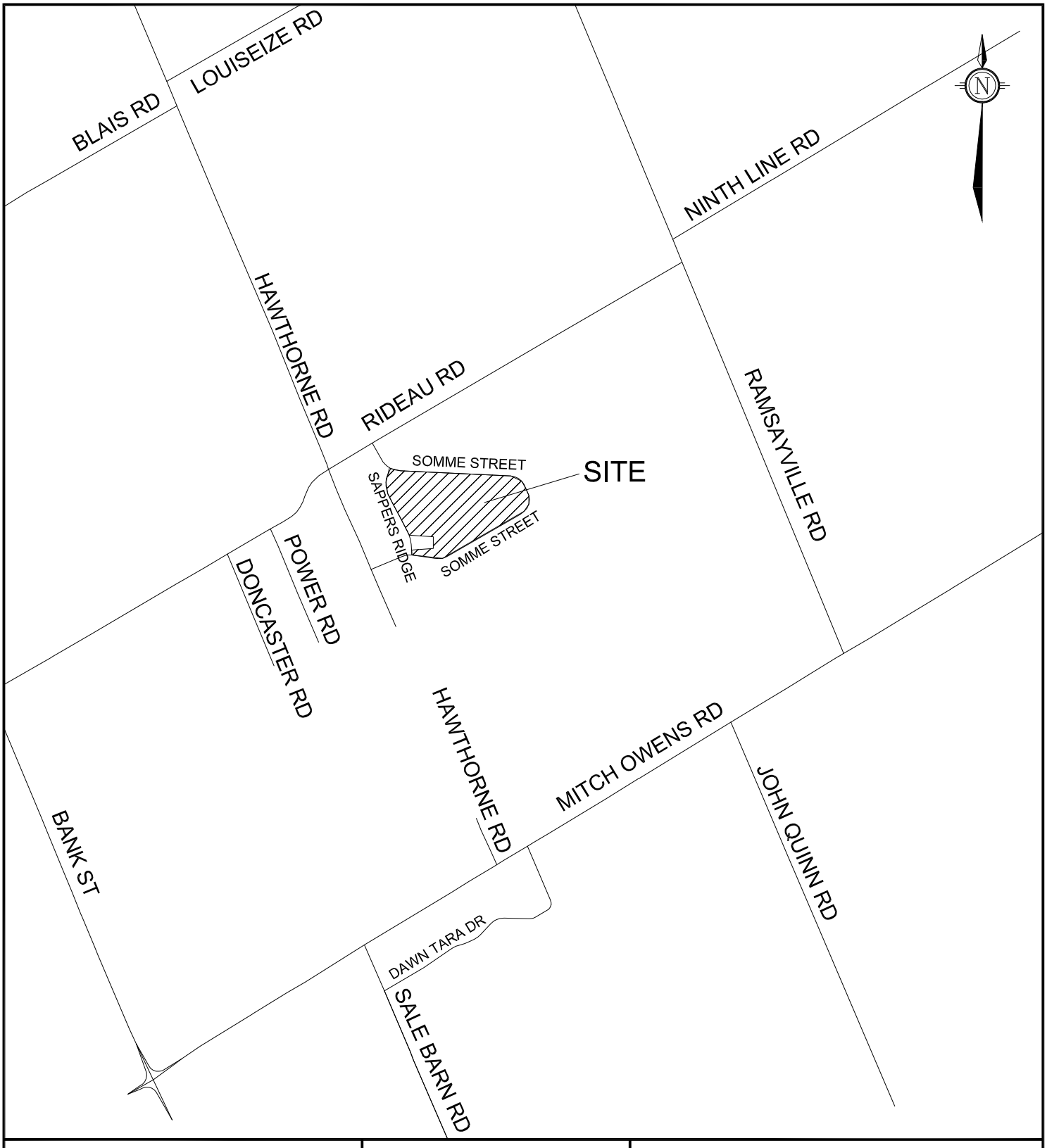
Director | Land Development

Reviewed by:

Alex McAuley, P.Eng.
Project Manager |
Land Development Engineering



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CITY OF OTTAWA

300 SOMME STREET
COPART FACILITY

KEY PLAN

DATE	JOB	FIGURE
NOV 2020	119181	FIG-1

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CITY OF OTTAWA

300 SOMME STREET
COPART FACILITY

EXISTING CONDITIONS

SCALE

DATE	JOB	FIGURE
NOV 2020	119181	FIG-2

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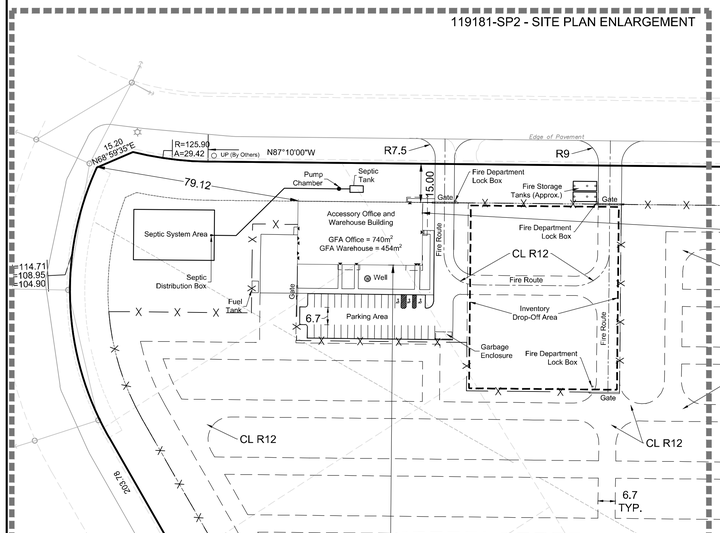
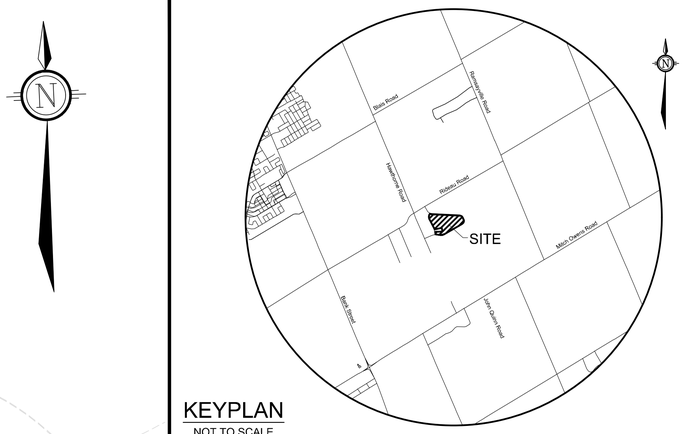
LEGEND

- Property Line
- Zoning Setback Line
- Proposed Curb
- Proposed Security Fence
- Proposed Gate
- Proposed Building Entrance
- Proposed Well
- UP — Proposed Utility Guy Pole (By Others)
- *Existing Utility Pole c/w Guy Wire*
- LS — *Existing Streetlight*





KEYPLAN
NOT TO SCALE

SITE PLAN 1
OVERALL SITE

300 SOMME STREET

BLOCK 6, RPLAN 4M-1388
CITY OF OTTAWA

Rural Heavy Industrial Zone (RH)

Performance Standard	Required	Provided
Minimum Lot Width (m)	50	212
Minimum Lot Area (m²)	8,000	178,333
Minimum Front Yard Setback (m)	15	79.1
Minimum Rear Yard Setback (m)	15	519.4
Minimum Interior Side Yard Setback	3	252.1
Minimum Corner Side Yard Setback	15	15.0
Maximum Building Height (m)	15	5.5
Maximum Lot Coverage (%)	50	0.7
Outdoor Storage	a) Outside storage is not permitted within any required front yard or corner side yard; b) Outside storage must be screened from abutting residential uses and public streets by an opaque screen at least 1.8m in height from finished grade.	
Parking		
Parking Spaces	740 m² gfa Office @ 2.4/100m² gfa = 17.8 454 m² gfa Warehouse @ 0.8/100m² gfa = 3.6 Total = 21	35
Accessible Parking Spaces	2 (1 Type A & 1 Type B)	3 (1 Type A, 2 Type B)
Loading Spaces	740 m² gfa Office = 0 454 m² gfa Warehouse = 0 Total = 0	0

NOTE::
THIS PLAN HAS BEEN COMPILED USING LEGAL INFORMATION OBTAINED FROM
H. A. KEN SHIPMAN SURVEYING LTD., ONTARIO LAND SURVEYORS
PLAN OF SURVEY; DATED JANUARY 24, 2020.
REF No. GL-513, FILE No. 20-12056

Copart
14185 Dallas Parkway
Suite 300
Dallas, Texas 75254

0 10 25 50 100 metres

SCALE 1:1000

No.	REVISION	DATE	BY
4	REVISED PER CITY COMMENTS	NOV 10/20	RP
3	ISSUED TO CLIENT	SEPT 1, 20	AR
2	ISSUED FOR SITE PLAN CONTROL APPLICATION	MAY 28, 20	RP
1	ISSUED TO CLIENT FOR REVIEW	MAY 07, 20	RP

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Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

ISSUED
NOVEMBER, 2020

PROJECT No.
119181

DRAWING No.
119181-SP1

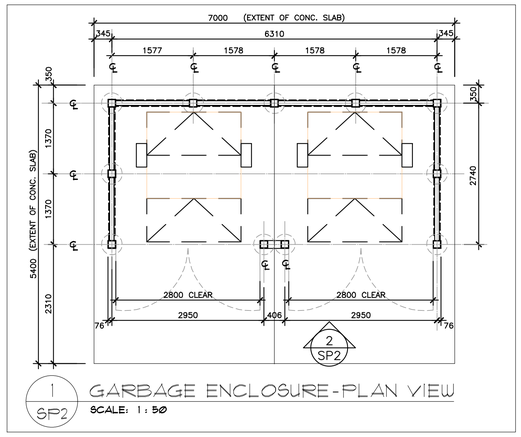
D07-12-20-0067

M:\2019\119181\CAD\Planning\Site Plans\119181-SP.dwg, SP-1, Nov 10, 2020 - 3:03pm, wbiss

LEGEND

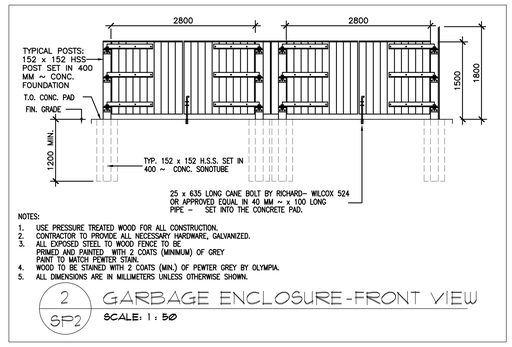
- Property Line
- Zoning Setback Line
- Proposed Curb
- Proposed Security Fence
- Proposed Gate
- Proposed Building Entrance
- Proposed Asphalt Surface
- Proposed Concrete Surface
- Proposed Well
- Proposed Utility Guy Pole (By Others)
- *Existing Utility Pole c/w Guy Wire*
- *Existing Streetlight*

Rural Heavy Industrial Zone (RH)		
Performance Standard	**Required**	**Provided**
Minimum Lot Width (m)	50	212
Minimum Lot Area (m²)	8,000	178,333
Minimum Front Yard Setback (m)	15	79.1
Minimum Rear Yard Setback (m)	15	519.4
Minimum Interior Side Yard Setback	3	252.1
Minimum Corner Side Yard Setback	15	15.0
Maximum Building Height (m)	15	5.5
Maximum Lot Coverage (%)	50	0.7
Outdoor Storage	a) Outside storage is not permitted within any required front yard or corner side yard; b) Outside storage must be screened from abutting residential uses and public streets by an opaque screen at least 1.8m in height from finished grade.	
Parking		
Parking Spaces	740 m² gfa Office @ 2.4/100m² gfa = 17.8 454 m² gfa Warehouse @ 0.8/100m² gfa = 3.6 Total = 21	35
Accessible Parking Spaces	2 (1 Type A & 1 Type B)	3 (1 Type A, 2 Type B)
Loading Spaces	740 m² gfa Office = 0 454 m² gfa Warehouse = 0 Total = 0	0



1 SP2 GARBAGE ENCLOSURE-PLAN VIEW

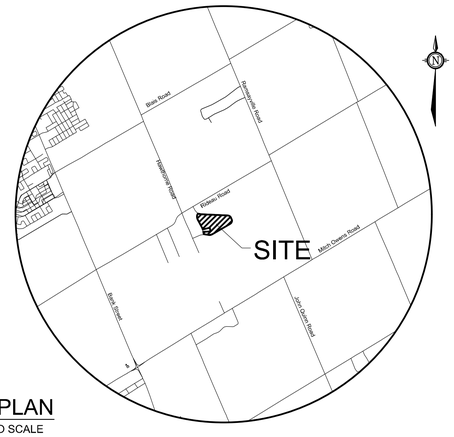
SCALE: 1 : 50



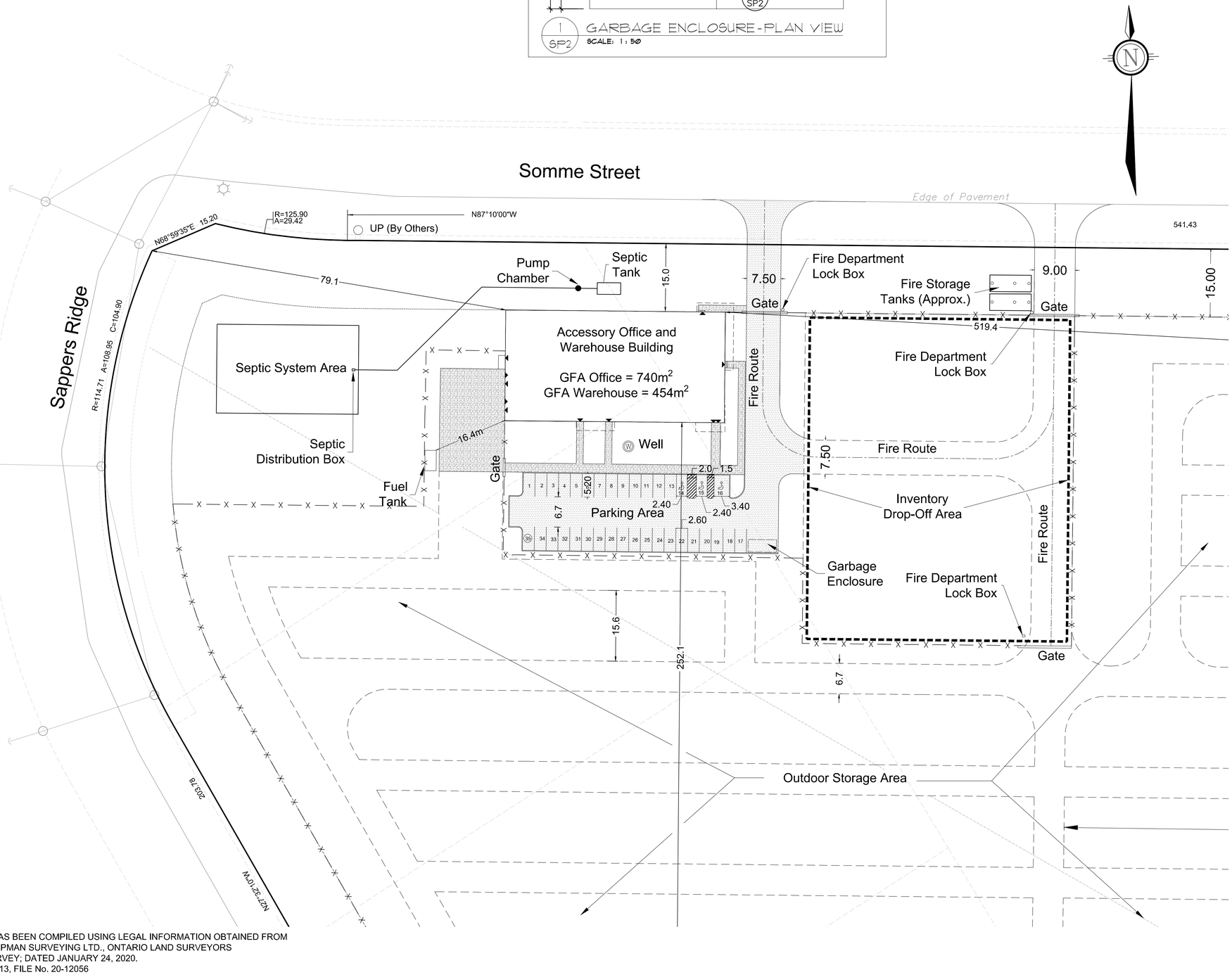
NOTES:
1. USE PRESSURE TREATED WOOD FOR ALL CONSTRUCTION.
2. CONTRACTOR TO PROVIDE ALL NECESSARY HARDWARE, GALVANIZED.
3. ALL EXPOSED STEEL TO WOOD FENCE TO BE PRIMED AND PAINTED WITH 2 COATS (MINIMUM) OF GREY PAINT TO MATCH PEWTER STAIN.
4. WOOD TO BE STAINED WITH 2 COATS (MIN.) OF PEWTER GREY BY OLYMPIA.
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

2 SP2 GARBAGE ENCLOSURE-FRONT VIEW

SCALE: 1 : 50



KEYPLAN
NOT TO SCALE



NOTE:
THIS PLAN HAS BEEN COMPILED USING LEGAL INFORMATION OBTAINED FROM H. A. KEN SHIPMAN SURVEYING LTD., ONTARIO LAND SURVEYORS PLAN OF SURVEY; DATED JANUARY 24, 2020.
REF No. GL-513, FILE No. 20-12056

SITE PLAN 2
ENLARGEMENT

300 SOMME STREET

BLOCK 6, RPLAN 4M-1388
CITY OF OTTAWA

Copart
14185 Dallas Parkway
Suite 300
Dallas, Texas 75254

0 4 8 12 20 40 metres

SCALE 1:400

No.	REVISION	DATE	BY
4	REVISED PER CITY COMMENTS	NOV 10/20	RP
3	ISSUED TO CLIENT	SEPT 1, 20	AR
2	ISSUED FOR SITE PLAN CONTROL APPLICATION	MAY 28, 20	RP
1	ISSUED TO CLIENT FOR REVIEW	MAY 07, 20	RP

NOVATECH
Engineers, Planners & Landscape Architects
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Website www.novatech-eng.com

ISSUED
NOVEMBER, 2020

PROJECT No.
119181

DRAWING No.
119181-SP2

D07-12-20-0067

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APPENDIX A

Excerpts from "Stormwater Management Report, Hawthorne Industrial Park" JL Richards (May 2009)

RIDEAU ROAD

PAVED SHOULDER

BLOCK 11

BLOCK 13

BLOCK 5

BLOCK 9

BLOCK 4

BLOCK 3

BLOCK 2

BLOCK 1

BLOCK 7

BLOCK 8

SOMME STREET

SAPPERS RIDGE

ABANDONED FORMER ALIGNMENT OF FINDLAY CREEK

VACANT (FUTURE DEVELOPMENT BLOCK)

FINDLAY CREEK MUNICIPAL DRAIN (BY-LAW NO. 2005-141)

SOD FARM

ESTABLISHED DIVISION LINE BETWEEN THE EAST AND WEST HALVES OF LOT 26

EXISTING AGRICULTURAL LANDS

R.M. TOMLINSON LANDS

CITY OF OTTAWA LANDS

HAWTHORNE AVENUE

EX. SETTLING PONDS

MAINTENANCE ACCESS ROAD (BY OTHERS)

ESTABLISHED DIVISION LINE BETWEEN LOTS 26 AND 27

EXISTING QUARRY SITE

ORGAWORLD 10.1ha
(REFER TO APPENDIX 'G')

ORGANICS COMPOSTING FACILITY
FFE=95.00
BSE=93.80

PROPOSED STORMWATER MANAGEMENT POND

LIMIT OF ROCK OUTCROP

20 METRE WIDE TREE BUFFER (NATURAL TREES WITH SUPPLEMENTAL PLANTING)

8 METRE WIDE BUFFER (NATURAL TREES WITH SUPPLEMENTAL PLANTING)

3.68 ha

6.91 ha

0.07 ha BY OTHERS

7.13 ha

2	17.0
71	50

3	18.1
71	50

1	19.9
71	50

5	6.8
76	0.37

6	5.3
76	0.80

4	4.0
85	0.17

LEGEND:

UNDEVELOPED BASINS :

SUB-AREA NO. — AREA (ha.)

CURVE NUMBER (CN) — TIME TO PEAK (hrs)

1	70.0
76	1.5

URBANIZED BASINS :

SUB-AREA NO. — AREA (ha.)

TOTAL IMPERVIOUSNESS (%) — DIRECTLY CONNECTED IMPERVIOUSNESS (%)

5	2.66
97	97

APPROXIMATE DRAINAGE AREA BOUNDARY

DIRECTION OF OVERLAND FLOW

NOVATECH
119181
BLOCK 6 DRAINAGE AREAS

This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richords & Associates Limited.

PROJECT:
HAWTHORNE INDUSTRIAL PARK

DRAWING:
POST DEVELOPMENT – PHASE 1 STORM DRAINAGE AREA PLAN

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

DESIGN:	M.B.
DRAWN:	ARM
CHECKED:	G.F.
PLOTTED:	Apr 30, 2009

DRAWING NO.: FIGURE 3

JLR NO: 20983

v. \20983\...\20983 - FIGURE 3.dwg

This Stormwater Management Report (SWMR) has been written to demonstrate that the subject land could be developed in compliance with the above surface water criteria and also prepared in accordance with the SWMPDM. The proposed stormwater management strategy for the HIP was developed to meet a "normal" level of protection, which corresponds to a standard approach used in land development to obtain a targeted TSS removal rate of 70%.

3.0 STORM SERVICING

3.1 General

Peak flow estimation is an important task that is carried out for any proposed development. There are several reasons that explain why flood flow rates are computed as part of site development. The main purpose of these calculations, however, is to allow for the proper configuration and sizing of the proposed conveyance systems to minimize the risk of flooding.

Drainage works are designed for a real or hypothetical storm event that may or may not happen during the lifetime of the facilities. At the onset of the design process, design criteria are adopted that may vary with the type of project, in recognition of the impacts of failure. For this particular project, the level of protection adopted (storm events up to a 1:100 year recurrence) was based on design storm characteristics of an infrequent storm event having a low probability to occur.

3.2 Description of Conveyance Systems and Design Basis

Flowing water can be conveyed to an outlet by either open-channel flow or pipe flow. Storm runoff generated by the subject lands is to be collected and conveyed by a roadside ditch/culvert system before discharging to Findlay Creek via an end-of-pipe stormwater management facility (SWMF).

Sizing of the conveyance systems was carried out using various levels of service. The open ditch system was sized with sufficient capacity to convey, under free-flowing conditions, storm runoff up to the 1:100 year recurrence, while roadway culverts were sized to provide conveyance of the 1:10 year peak flow rates without overtopping the roadway embankments.

As part of this sizing exercise, Storm Drainage Area Plans were prepared and included in this Report (refer to Drawing D-ST1 for the HIP and Drawing D-ST2 for Hawthorne and Rideau Road) that show the delineated area for each of the conveyance segments (i.e., from node location to node location), along with its assigned runoff coefficient (C-factor) based on the type of surface. Since the final development of Hawthorne Industrial Park is unknown at this time, a conservative on-site runoff coefficient (C-factor) of 0.70 was used. Table 2 illustrates the breakdown of a typical site that would generate a weighted runoff coefficient of 0.70.

Table 2 - Typical Potential Land Use Breakdown

Type of Surface	Area (%)	C-Factor
Building	10	1.0
Asphalt Parking	35	0.90
Gravel	35	0.70
Grass	20	0.20
Overall	100	**0.70**

It should be noted that the C-factors shown on the Storm Drainage Area Plans denote those associated with 1:10 year peak flow calculations. As recommended in Section 5.4.5.2.1 of the City of Ottawa's Sewer Design Guidelines, C-factors shown on drawings were increased by 10% and 25% for the 1:25 year and 1:100 year peak flow calculations, respectively (refer to Appendix 'A' for copies of the Rational Method Design Sheets).

3.2.1 Open Ditch System

An open ditch channel is a conduit used to convey flowing water from one location to another, with a free surface. A channel can be classified as either artificial (i.e., manmade) or natural. Artificial channels are those constructed or developed as a result of human activity. This type of conveyance system is usually implemented as a long and mild-sloped channel built in the ground, which provides conveyance of water between two points, with sections of regular geometry and shape. An open ditch system is generally designed to follow site topography and the vertical profile of the adjacent roadway. The most commonly used shapes for open channel ditches are trapezoidal and triangular, with the latter shape utilized mainly for ditches servicing small drainage areas.

that there was a high groundwater table at the proposed pond location. In addition, in-situ soils in the area exhibited poor drainage properties which would have resulted in long retention times at the base of the pond, making it difficult to meet the water balance deficit requirements for the entire site while attempting to mimic the pre-development hydrological cycle.

Representatives from the City and SNC were consulted, and it was concluded that the SCSS groundwater balance targets for this site would be difficult to meet. It was also recognized that on-site infiltration strategies for this industrial subdivision could have a detrimental effect on groundwater quality and jeopardize the natural ecological integrity of receiving waters. In light of the above, it was decided by the approval authorities that the requirement for the water balance would be waived for the HIP development.

5.0 WATER QUALITY

5.1 General

Urbanization has been found to modify the hydrological regime of a receiving stream if inadequate stormwater management measures are implemented. The potential impacts associated with runoff arise primarily from the amount of urban area that is impervious to rain and snowmelt water. These impervious surfaces increase the amount of direct surface runoff that is generated and is conveyed more efficiently to the receiving stream. As part of the SCSS, fisheries resources have been inventoried along this watercourse, along with its associated tributaries. Given that the receiving watercourses were found to shelter fisheries, the approved document recommended that a "normal" level of protection be achieved. To fulfil this requirement, it is proposed that each individual site provide an oil/grit separator and infiltration storage be provided within the roadside open ditch system, as per the requirements presented in the SWMPDM.

5.2 Water Quality Requirement

Stormwater servicing for the HIP has been developed in accordance with the water quality recommendations of the SCSS (70% TSS removal). To fulfil this requirement, individual sites will be required to provide an oil/grit separator be installed to provide quality treatment (i.e., 70% TSS removal) of surface runoff before entering the roadside open ditch/culvert system. In addition, the oil/grit separator will be able to capture and contain hydrocarbons in the event of an on-site accidental spill.

APPENDIX B
Fire Protection Calculations

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

Novatech Project #: 119181
Project Name: 300 Somme Street
Date: 5/27/2020
Input By: A. McAuley
Reviewed By: A.McAuley

Legend
Input by User
No Input Required

Building Description: Single Storey Occupancy F-3 and D, non combustible construction

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**				
	Building Classification =	F-3		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**19**
2	**Total Building Volume**				
	Building Width - W	25.30	m		
	Building Length - L	50.00	m	Area (W * L) = 1265 m^2	
	Building Height - H	5.5	m		
	Total Building Volume - V =			W * L * H	**6958 m^3**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	46.00	m	Sside 1 = **0.00**	
	East	520.00	m	Sside 2 = **0.00**	
	South	250.00	m	Sside 3 = **0.00**	
	West	100.00	m	Sside 4 = **0.00**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**1.00**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**132,193 L**
Required Minimum Water Supply Flow Rate					
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**3,600 L/min** or **60 L/s**
Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**108,000 L**
Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)	**132,193 L**
Notes	Fire Protection Water supply to be provided with underground storage tanks				

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 119181
Project Name: 300 Somme Street
Date: 9/11/2020
Input By: A. Rongve
Reviewed By: A. McAuley

Legend: Input by User; No Information or Input Required

Building Description: Single Storey Occupancy F-3 and D, non-combustible construction
Unsprinklered

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1265			
		Number of Floors/Storeys	1			
		Area of structure considered (m^2)			**1,265**	
	F	**Base fire flow without reductions**				**6,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**6,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**0**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**0%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**6,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**100**
				or	USGPM	1,585
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	720

APPENDIX C
Septic System Design Brief

May 27, 2020
Revised: November 9, 2020

Septic System Design Brief

300 Somme Street, Ottawa

Report Reference: R-2020-068
Novatech File No.: 119181

Proposed Development Scenario

The proposed development, located at 300 Somme Street, is primarily a vehicle storage yard and will include an accessory building which will contain office and warehouse space. The proposed 1,200m^2 office/receiving building would be located on the northwest portion of the 17.84 hectare site and would be serviced by a conventional septic system. Refer to the Overall Grading, Erosion, Sediment Control and Servicing Plan (119181-GS1) attached for the location of the septic system on the site.

Existing Soil Conditions

Gemtec has prepared the following document in support of the site development and septic system design:

1. Geotechnical Report – Proposed Office/Receiving Building, 300 Somme Street (September 9, 2020)
2. Hydrogeological Investigation and Terrain Analysis – Vehicle Storage Yard, 300 Somme Street, (November 4, 2020)

Topsoil and Fill Material: The geotechnical report confirms an approximate topsoil depth of 0.1m below ground surface in the area of the septic bed. The underlying material is imported fill which consists of brown silty sand and gravel with trace clay extending approximately 2.3m below ground surface. It is recommended by the geotechnical consultant that the topsoil and fill material be removed below the proposed leaching bed down to insitu soil in order to limit settlement.

Insitu Soils: The geotechnical report notes insitu soils beginning approximately 2.3m below ground surface and consisting of grey silt, clay, and trace gravel.

Water Table Elevation: No groundwater was noted to a depth of approximately 3.7m below ground surface.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Design Flow

The theoretical design flow is based on 35 employees per day working 8-hour shifts as well as 100 visitors per day.

Activity	People	Flow (L/day)	Total Flow (L/day)
Employees (per employee, per 8 hour shift)	35	75	2,625
Visitors (per day)	100	8	800
			3,425

The design flow used to size system will be 3,800Lday, providing some margin.

Septic System Design

The proposed septic system consists of a septic tank, gravity sewer, pump chamber (complete with dual pumps), forcemain, and a conventional absorption trench bed. Details of the septic system design are indicated on the attached Septic System Plan (119181-SEP).

The design flow used to size the septic tank is 3,800L/day.

Septic Tank

Size required (Commercial): = 3 x 3,800L = 11,400L
Minimum tank size required: = 11,400L
Tank Size provided: = 11,500L

Septic tank is to be fitted with an effluent filter.

Absorption Trench Bed Design

Length of distribution pipe:

Length of distribution pipe required: L = QT/200 = (3,800 x 8)/200 = 152m

Length of distribution pipe provided: L = 12 runs at 13m = 156m

Mantle Requirements

A 15.0-metre sand mantle is required. The mantle will be extended an additional 11m to the onsite swale, in order to provide outlet for the underside of the mantle.

The imported sand, which is to be used to construct the septic system including the mantle, is to have a percolation rate of 8 min/cm, with less than 8% silt, tested and approved before placement.

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Loading Rate Calculations

Contact area required:	A = Q/6 = 3,800/6 A = 633.3m^2
Contact area provided:	Width = 5 + 17.6 + 5 = 27.6m Length= 13 + 15 + 11 + 1 = 40m Area = 27.6m x 40m = 1,104m^2

Pump Chamber

A dosing pump is required due to the length of distribution pipe exceeding 150m and the proposed change in elevation between the pump chamber and the distribution box.

Pipe Volume

Length of Distribution Piping = 156m

75% of pipe volume = (L x π r^2 x 75%) = 156m x 0.0044m^2 x 0.75 = 0.515m^3

Pump Rate

The tile field would be dosed with a maximum 515L per cycle (filling 75% of the pipe volume).

Therefore, the number of cycles per day is: 3,800L/day ÷ 515 L = 7 cycles per day, with an on time of approximately 4 to 5 minutes.

Based on the Myers SSM33i pump performance curve (see attached), the pump would operate at a 1.8L/s.

Pump Specifications

- The pump would be equipped with variable floats to control the discharge of effluent to the septic bed. The elevations are indicated on the Septic System Plan – Septic Tank & Pump chamber Detail.
- The floats shall be set for a pump volume of 515L (ie 0.45m depth in the 1200mm diameter pump chamber) at a flow rate of 1.8 L/s, and this cycle will occur 7 times daily.
- A high float alarm should be installed a minimum of 0.05m below the inlet of the pump chamber.
- A low float should be set to ensure the pump does not run dry for any period of time.
- If at any time during the pumping cycle the effluent level in the tank reaches the low float level, the pump would turn off and remain off until the effluent rises to the high float elevation.
- For redundancy, two alternating pumps would be installed on the pump chamber.

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Setbacks

The following minimum setbacks are required based on the bed being raised up to 1.5m above original ground:

- Tile to any drilled well: 18.0m
- Tile to property line: 6.0m
- Septic tank to structure: 5.0m
- Septic tank to any drilled well: 15.0m

Septic System Installation

The septic system is to be installed in accordance with the following engineering drawings prepared by Novatech:

- Overall Grading, Erosion, Sediment Control and Servicing Plan (119181-GS1, rev 4)
- Detailed Grading and Servicing Plan (119181-GS2, rev 3)
- Septic System Plan (119181-SEP, rev 3)

The absorption trench bed is to be constructed at the elevations shown on the Grading Plans and the Septic System Plan. The elevations are not to be revised without written permission from Novatech.

The existing topsoil and underlying fill in the area of the septic bed, including the mantle and extended area to the onsite swale, is to be removed prior to placement of sand.

Installation of the septic system and materials used to construct the septic system are to be in accordance with current Ontario Building Code requirements.

The surface area of the septic system is to be graded to provide positive drainage and treated with 100mm permeable topsoil, seed, and mulch. No impermeable material is to be placed over or adjacent to the septic bed.

This septic system has been designed to treat domestic waste. The following are not to be connected to the septic system.

- Water softener
- Sump pump
- Roof drains
- Refrigeration or condensing unit
- Floor drains
- Industrial or automotive waste

Construction traffic and materials are to be kept away from the septic system, including the mantle.

Installation of septic system is to be inspected by Ottawa Septic System Office and Novatech.

Novatech's design and inspection services do not relieve the septic system installer of the responsibility for guaranteeing workmanship and materials.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Prepared by:

NOVATECH

Aden Rongve, B.E. (Civil Engineering), EIT

Reviewed by:

NOVATECH

Alex McAuley, P.Eng.
Project Manager |
Land Development Engineering

Attachments

1. Myers SSM33i pump specification
2. Drawings
    - Septic System Plan (119181-SEP rev 3)
    - Overall Grading, Erosion, Sediment Control and Servicing Plan (119181-GS1 rev 4)
    - Detailed Grading and Servicing Plan (119181-GS2 rev 3)

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MYERS® SSM33I SERIES

The Myers SSM33I series pumps are engineered for performance in a variety of demanding drainage applications. The heavy-duty cast iron housing and oil-filled motor maximize heat dissipation for trouble-free operation and years of reliable service. Models available with tethered or vertical switch.

APPLICATIONS

Basement sumps, dewatering, light effluent

SPECIFICATIONS

Capacities – 31 GPM (117 LPM)
Shut-off Head – 23' (7 m)
Operation: On – 9.94" (252 mm)
Off – 4.06" (103 mm)
Solids Handling – 1/2" (12.7 mm)
Liquids Handling – Drainage effluent
Intermittent Liquid Temperature – Up to 140°F (60°C)
Motor/Electrical Data – 1/3 HP, shaded pole, 115V, 9A, 1Ø, 60Hz
Acceptable pH Range – 5-9
Shaft Seal – Type 11A, carbon and ceramic
Housing – Heavy cast iron
Power Cord – 10' and 20', 16/3, SJTW, SJTW-A
Discharge, NPT – 1-1/2"
Min. Sump Diameter – 12" (304.8 mm)

FEATURES

Rugged and Reliable
Durable oil-filled motor for continuous bearing lubrication and maximum heat dissipation

Versatile Performance
Designed for demanding drainage applications, light septic tank effluent and basement sump

Heavy-duty Design
Rugged cast iron housing and volute aid in heat dissipation and stand tough in harsh conditions

Choice of Switch Types
Available in manual, tethered automatic*, or vertical automatic*

Ease of Flow
Recessed vortex impeller for free flow-flow passage solids and liquid

Overload Protection
Shaded pole motor eliminates failure-prone starting switches and relays

Heat Safety
Heat sensor protection with automatic reset when motor cools to a safe operating temperature

ORDERING INFORMATION

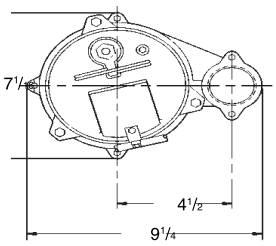
Catalog Number	HP	Volts	Phase/ Cycles	Amps	Discharge Size	Switch Type	Cord Length	Approx. Wt. Lbs.
SSM33IM1C	1/3	115	1/60	9	1-1/2"	Manual	20'	28
SSM33IP-1	1/3	115	1/60	9	1-1/2"	Teth/Auto*	10'	28
SSM33IPC-1	1/3	115	1/60	9	1-1/2"	Teth/Auto*	20'	28
SSM33IPV1	1/3	115	1/60	9	1-1/2"	Vert/Auto*	10'	28
SSM33IPV1C	1/3	115	1/60	9	1-1/2"	Vert/Auto*	20'	28

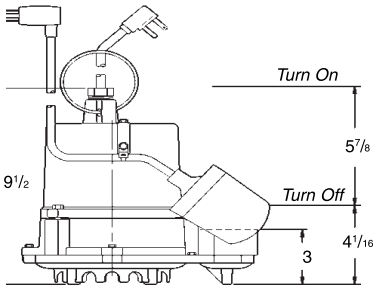
*Piggyback

MYERS® SSM33I SERIES

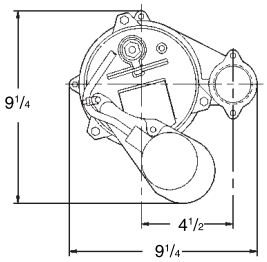
DIMENSIONS

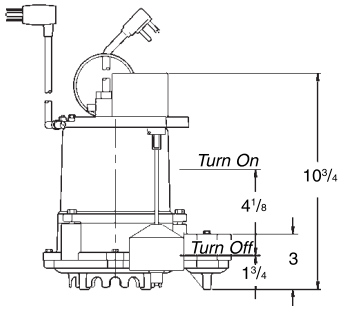
Tethered Automatic



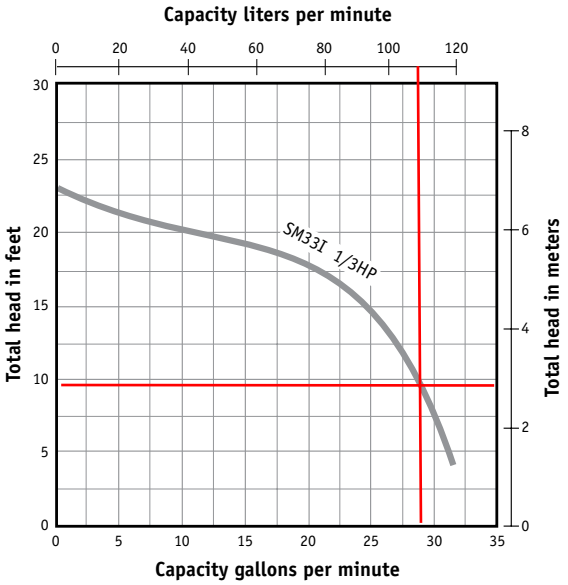


Vertical Automatic





PUMP PERFORMANCE



PENTAIR

USA
293 WRIGHT STREET, DELAVAN, WI 53115 WWW.FEMYERS.COM
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CANADA
490 PINEBUSH ROAD, UNIT 4, CAMBRIDGE, ONTARIO N1T 0A5
PH: 800-363-7867 ORDERS FAX: 888-606-5484

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.

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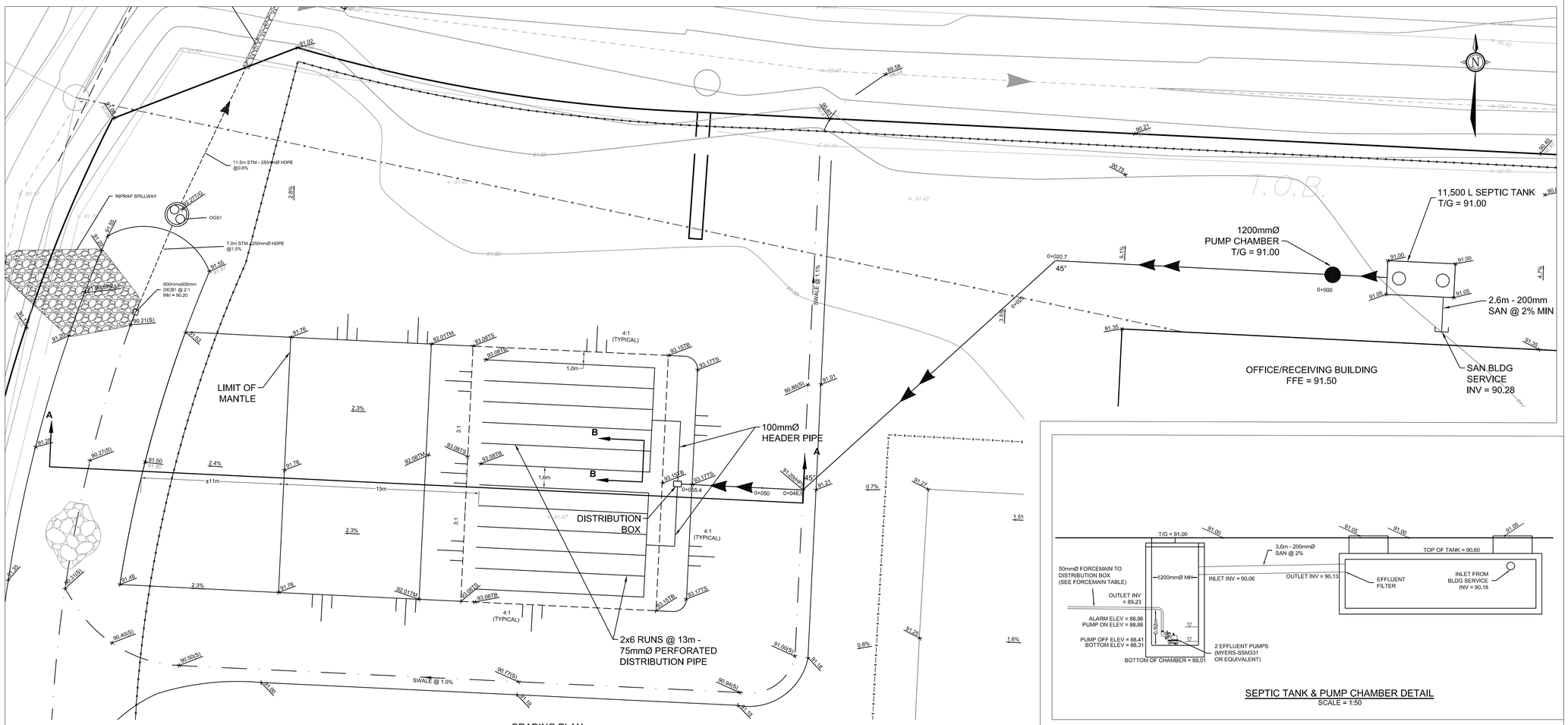
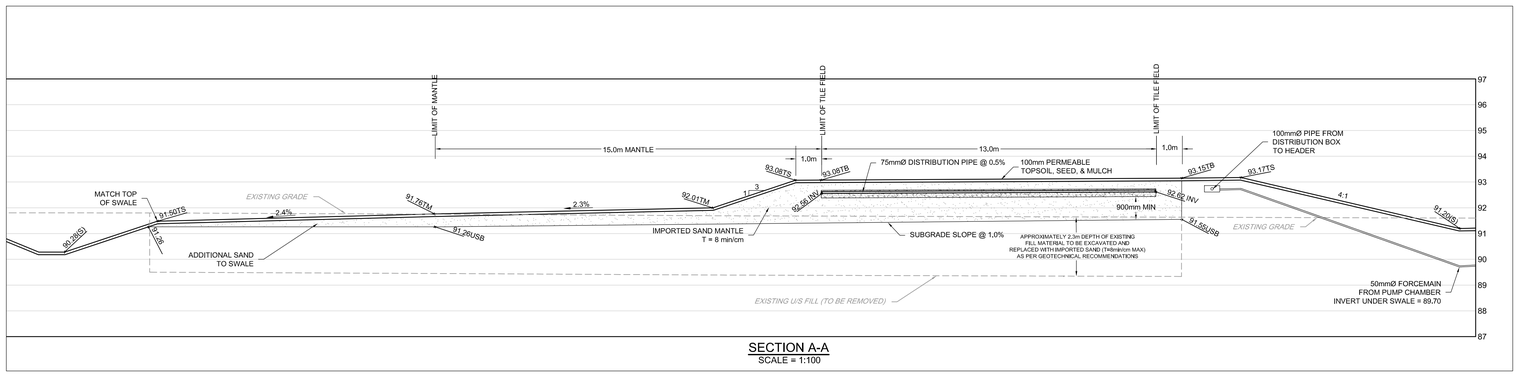
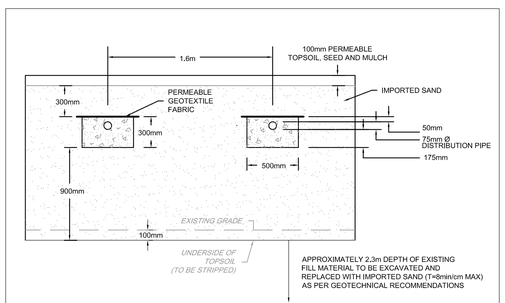


GRADING PLAN
SCALE = 1:150

SEPTIC TANK & PUMP CHAMBER DETAIL
SCALE = 1:50



SECTION A-A
SCALE = 1:100



SECTION B-B
SCALE = 1:25

KEY PLAN
N.T.S.

LEGEND

- PROPOSED ELEVATION / *EXISTING ELEVATION*
- PROPOSED TOP OF SLOPE ELEVATION
- PROPOSED TOP OF BED ELEVATION
- PROPOSED TOP OF MANTLE ELEVATION
- PROPOSED INVERT
- PROPOSED UNDERSIDE OF BED ELEVATION
- TERRACING; MAXIMUM 3:1 SIDESLOPE
- SLOPE AND DIRECTION
- PROPOSED PUMP CHAMBER & FORCEMAIN
- U/G HYDRO SERVICE
- PROPOSED SILT FENCE PER OPSD 219.110

GENERAL NOTES

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION, PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA, OTTAWA SEPTIC SYSTEM OFFICE (OSSO), RIDEAU VALLEY CONSERVATION AUTHORITY (MVCA) AND THE MINISTRY OF THE ENVIRONMENT, CLIMATE AND PARKS (MECP) BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $2,000,000.00, INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.
9. PROVIDE LINE/PARKING PAINTING.
10. TOPOGRAPHIC SURVEY PROVIDED BY NOVATECH.

SEPTIC SYSTEM NOTES

1. THE PROPOSED SEPTIC SYSTEM CONSISTS OF A SEPTIC TANK, GRAVITY SEWER, PUMP CHAMBER (c/w DUAL PUMPS), FORCEMAIN, AND AN ABSORPTION TRENCH LEACHING BED WHICH HAS BEEN DESIGNED BASED ON A SEWAGE FLOW OF 3,800 L/DAY.
2. INSTALLATION IS TO BE IN ACCORDANCE WITH CURRENT ONTARIO BUILDING CODE REQUIREMENTS AND THE ENGINEER'S REPORT PREPARED BY NOVATECH, REVISED NOV 9, 2020.
3. SEPTIC SYSTEM ELEVATIONS ARE NOT TO BE REVISED WITHOUT THE WRITTEN PERMISSION OF NOVATECH.
4. ALL BENDS IN THE PIPE FROM THE BUILDING TO THE HEADER ARE TO BE 22.5 OR 45.0 DEGREES.
5. THE FOLLOWING SETBACKS ARE REQUIRED:
   - -TILE FIELD TO ANY DRILLED WELL = 18.0m (min)
   - -TILE FIELD TO PROPERTY LINE = 6.0m (min)
   - -SEPTIC TANK TO ANY DRILLED WELL= 15.0m (min)
   - -SEPTIC TANK TO BUILDING= 1.5m (min)
6. TANK SIZE = 11,500L (MACGREGOR CONCRETE OR APPROVED EQUIVALENT)
7. THE SEPTIC TANK IS TO BE FITTED WITH AN EFFLUENT FILTER IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
8. TANK AND MANHOLE LIDS ARE TO BE LEFT ACCESSIBLE FOR PUMPING/ MAINTENANCE/ INSPECTION.
9. A MANTLE IS REQUIRED IN THE DIRECTION OF THE SURFACE DRAINAGE FLOW. IMPORTED SAND MATERIAL IS REQUIRED, THE IMPORTED SAND, WHICH IS TO BE USED TO CONSTRUCT THE SEPTIC SYSTEM INCLUDING THE MANTLE, IS TO HAVE A MAXIMUM PERCOLATION RATE OF 8 MIN/CM, WITH LESS THAN 8% SILT, TESTED AND APPROVED BEFORE PLACEMENT.
10. CONSTRUCTION TRAFFIC AND MATERIALS ARE TO BE KEPT AWAY FROM THE SEPTIC SYSTEM, INCLUDING THE MANTLE.
11. THE SEPTIC SYSTEM HAS BEEN DESIGNED TO TREAT DOMESTIC WASTE ONLY. THE FOLLOWING ARE NOT TO BE CONNECTED TO THE SEPTIC SYSTEM.
    - -WATER SOFTENER
    - -SUMP PUMP
    - -EAVESTROUGHS/ROOF DRAINS
    - -REFRIGERATION OR CONDENSING UNIT
    - -FLOOR DRAINS
    - -INDUSTRIAL OR AUTOMOTIVE WASTE
12. NOVATECH'S DESIGN AND INSPECTION SERVICES DO NOT RELIEVE THE SEPTIC SYSTEM INSTALLER OF THE RESPONSIBILITY FOR GUARANTEEING WORKMANSHIP AND MATERIALS.
13. INSTALLATION OF SEPTIC SYSTEM TO BE INSPECTED BY OTTAWA SEPTIC SYSTEM OFFICE (OSSO) AND NOVATECH
14. THE CONTRACTOR IS RESPONSIBLE FOR SURVEYING ASBUILT ELEVATIONS AND PROVIDING THE REQUIRED ASBUILT INFORMATION AND DRAWING(S) TO THE OSSO.
15. THE PUMPS ARE TO BE EQUIPED WITH A HIGH FLOAT ALARM WHICH IS TO BE INSTALLED A MINIMUM OF 0.05m BELOW THE INLET OF THE PUMP CHAMBER AS WELL AS A LOW FLOW ALARM.

SANITARY FORCEMAIN TABLE

Station	Invert of Forcemain Elevation (m)	Top of Forcemain Elevation (m)	Finished Ground Elevation (m)	Depth of Cover (m)
0+000.0	89.23	89.28	91.00	1.72
0+020.7	89.44	89.49	90.76	1.27
0+025.0	89.48	89.53	90.84	1.31
0+046.9	89.70	89.75	91.20	1.45
0+050.0	90.79	90.84	91.92	1.08
0+055.4	92.70	92.75	93.17	0.42

NOTE: NO SUMPS

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
3.	REVISED PER COMMENTS	NOV 9/20	AAR
2.	ISSUED FOR REVIEW	MAY 27/20	AAR
1.	ISSUED FOR CLIENT INFORMATION	MAY 20/20	AAR

SCALE: AS NOTED

DESIGN: AAR
CHECKED: ARM
DRAWN: AAR
CHECKED: ARM
APPROVED: SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — S.M. GORDON — Nov 9/20 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — A.R. MCAULEY — 100141256 — NOV 9, 2020 — PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
300 SOMME STREET
BLOCK 6

DRAWING NAME
SEPTIC SYSTEM PLAN

PROJECT No. 119181
REV REV # 3
DRAWING No. 119181-SEP

D07-12-20-0067

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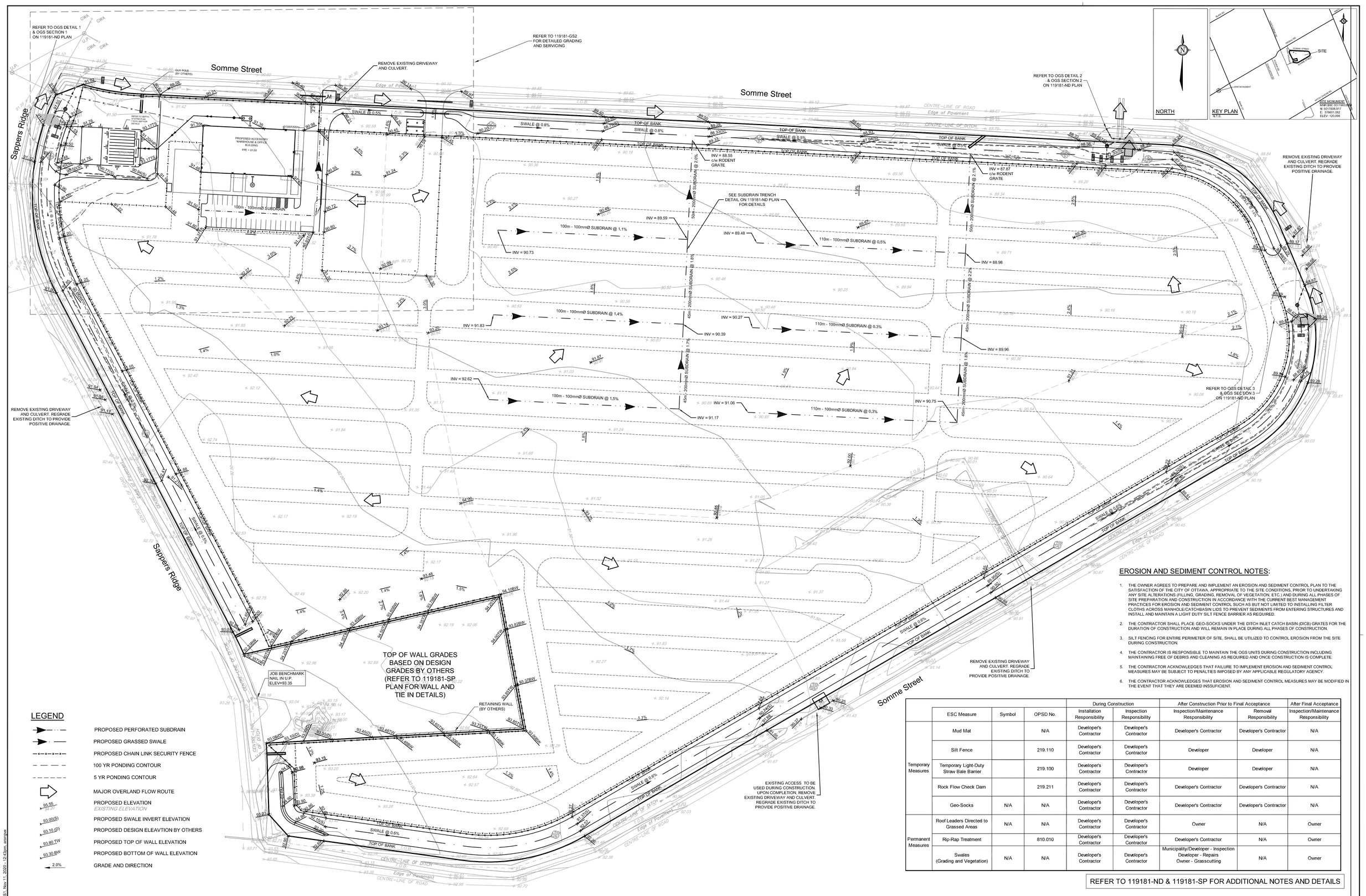

LEGEND

- PROPOSED PERFORATED SUBDRAIN
- PROPOSED GRASSED SWALE
- PROPOSED CHAIN LINK SECURITY FENCE
- 100 YR PONDING CONTOUR
- 5 YR PONDING CONTOUR
- MAJOR OVERLAND FLOW ROUTE
- PROPOSED ELEVATION / *EXISTING ELEVATION*
- PROPOSED SWALE INVERT ELEVATION
- PROPOSED DESIGN ELEAVTION BY OTHERS
- PROPOSED TOP OF WALL ELEVATION
- PROPOSED BOTTOM OF WALL ELEVATION
- GRADE AND DIRECTION

EROSION AND SEDIMENT CONTROL NOTES:

1. THE OWNER AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL SUCH AS BUT NOT LIMITED TO INSTALLING FILTER CLOTHS ACROSS MANHOLE/CATCHBASIN LIDS TO PREVENT SEDIMENTS FROM ENTERING STRUCTURES AND INSTALL AND MAINTAIN A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.
2. THE CONTRACTOR SHALL PLACE GEO-SOCKS UNDER THE DITCH INLET CATCH BASIN (DICB) GRATES FOR THE DURATION OF CONSTRUCTION AND WILL REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION.
3. SILT FENCING FOR ENTIRE PERIMETER OF SITE, SHALL BE UTILIZED TO CONTROL EROSION FROM THE SITE DURING CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN THE OGS UNITS DURING CONSTRUCTION INCLUDING MAINTAINING FREE OF DEBRIS AND CLEANING AS REQUIRED AND ONCE CONSTRUCTION IS COMPLETE.
5. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
6. THE CONTRACTOR ACKNOWLEDGES THAT EROSION AND SEDIMENT CONTROL MEASURES MAY BE MODIFIED IN THE EVENT THAT THEY ARE DEEMED INSSUFICIENT.

	ESC Measure	Symbol	OPSD No.	During Construction: Installation Responsibility	During Construction: Inspection Responsibility	After Construction Prior to Final Acceptance: Inspection/Maintenance Responsibility	After Construction Prior to Final Acceptance: Removal Responsibility	After Final Acceptance: Inspection/Maintenance Responsibility
Temporary Measures	Mud Mat		N/A	Developer's Contractor	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A
	Silt Fence		219.110	Developer's Contractor	Developer's Contractor	Developer	Developer	N/A
	Temporary Light-Duty Straw Bale Barrier		219.100	Developer's Contractor	Developer's Contractor	Developer	Developer	N/A
	Rock Flow Check Dam		219.211	Developer's Contractor	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A
	Geo-Socks	N/A	N/A	Developer's Contractor	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A
Permanent Measures	Roof Leaders Directed to Grassed Areas	N/A	N/A	Developer's Contractor	Developer's Contractor	Owner	N/A	Owner
	Rip-Rap Treatment		810.010	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A	Owner
	Swales (Grading and Vegetation)	N/A	N/A	Developer's Contractor	Developer's Contractor	Municipality/Developer - Inspection Developer - Repairs Owner - Grasscutting	N/A	Owner

REFER TO 119181-ND & 119181-SP FOR ADDITIONAL NOTES AND DETAILS

NOTE:
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No.	REVISION	DATE	BY
4.	REVISED PER COMMENTS	NOV 9/20	AAR
3.	ISSUED FOR REVIEW	MAY 27/20	AAR
2.	ISSUED FOR CLIENT INFORMATION	MAY 20/20	AAR
1.	ISSUED FOR COORDINATION	MAY 8/20	AAR

SCALE 1:750 (1:750, 0 10 20 30)

DESIGN AAR
CHECKED ARM
DRAWN AAR
CHECKED AAR
APPROVED SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER S.M. GORDON Nov 9/20 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER A.R. MCAULEY 100141256 NOV 9, 2020 PROVINCE OF ONTARIO

NOVATECH
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Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
300 SOMME STREET
BLOCK 6

DRAWING NAME
OVERALL GRADING, EROSION, SEDIMENT CONTROL AND SERVICING PLAN

PROJECT No. 119181
REV REV # 4
DRAWING No. 119181-GS1

D07-12-20-0067

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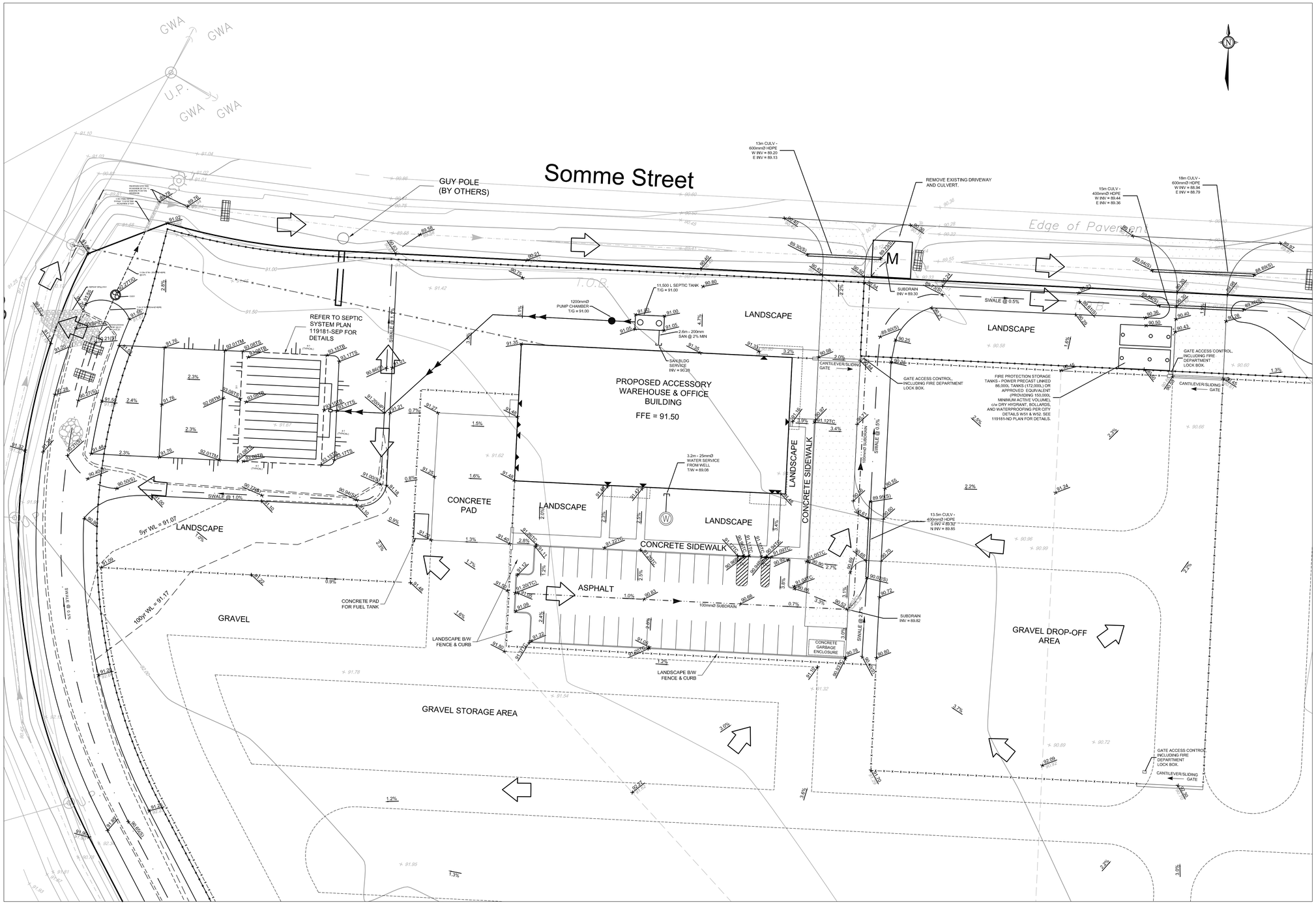

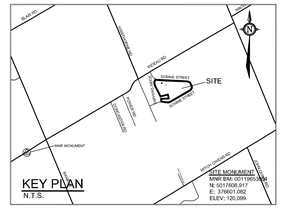

LEGEND

- PROPOSED ELEVATION / *EXISTING ELEVATION*
- PROPOSED SWALE INVERT ELEVATION
- PROPOSED TOP OF SEPTIC BED ELEVATION
- PROPOSED TOP OF SEPTIC MANTLE ELEVATION
- TERRACING: MAXIMUM 3:1 SIDESLOPE
- GRADE AND DIRECTION
- PROPOSED PUMP CHAMBER & FORCEMAIN
- PROPOSED CENTERLINE OF SWALE
- PROPOSED 100mmØ SUBDRAIN
- PROPOSED U/G HYDRO SERVICE
- LIGHT DUTY ASPHALT (SEE 119181-ND PLAN FOR PAVEMENT STRUCTURE DETAILS)
- HEAVY DUTY ASPHALT (SEE 119181-ND PLAN FOR PAVEMENT STRUCTURE DETAILS)
- TEMPORARY MUD MAT
- TEMPORARY SILT FENCE PER OPSD 219.110
- TEMPORARY STRAW BALE PER OPSD 219.100
- TEMPORARY ROCK FLOW CHECK DAM PER OPSD 219.211

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL REPORT (No. 6508I.01, DATED SEPTEMBER 9, 2020), PREPARED BY GEMTEC FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.
10. REFER TO STORMWATER MANAGEMENT REPORT(R-2020-070) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 100% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
7. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
8. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
9. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
13. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN.

BENCHMARK INFORMATION:

1. JOB BENCHMARK: NAIL IN UTILITY POLE AT SOUTHWEST CORNER OF SITE. GEODETIC ELEVATION = 93.32
2. MNR BENCHMARK MONUMENT: STATION 00119653004 DATUM: NAD 83, ORIG. GEODETIC ELEVATION = 120.099
3. THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM PLAN OF SURVEY OF PART OF BLOCK 6 REGISTERED PLAN 4M-1388 PREPARED BY H.A.KEN SHIPMAN SURVEYING LTD (JAN 24/20).

REFER TO 119181-ND & 119181-SP FOR ADDITIONAL NOTES AND DETAILS

NOTE:
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3.	REVISED PER COMMENTS	NOV 9/20	AAR
2.	ISSUED FOR REVIEW	MAY 27/20	AAR
1.	ISSUED FOR CLIENT INFORMATION	MAY 20/20	AAR

SCALE 1:300 (1:300, 0 3 6 9 12)

DESIGN AAR
CHECKED ARM
DRAWN AAR
CHECKED AAR
APPROVED SMG

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LICENSED PROFESSIONAL ENGINEER A.R. MCAULEY 100141256 NOV 9, 2020 PROVINCE OF ONTARIO

NOVATECH
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Telephone (613) 254-9643
Facsimile (613) 254-5867
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LOCATION
300 SOMME STREET
BLOCK 6

DRAWING NAME
DETAILED GRADING AND SERVICING PLAN

PROJECT No. 119181
REV REV # 3
DRAWING No. 119181-GS2

D07-12-20-0067

M:\2019\119181\CAD\Design\119181-GS2.dwg, GS2, Nov 10, 2020 - 2:56pm, ahargrave
PLANBT.DWG - 1000mmx700mm

APPENDIX D
Stormwater Management Calculations

NOVATECH
Engineers, Planners & Landscape Architects

M E M O R A N D U M

DATE: **NOVEMBER 9, 2020**

TO: **ALEX MCAULEY**

FROM: **MELANIE SCHROEDER / CONRAD STANG**

RE: **COPART FACILITY - 300 SOMME STREET**
SUPPLEMENTAL SWM MODELING INFORMATION

PROJECT NO: 119181

This memorandum provides supplemental SWM modeling information in support the *Copart Facility Servicing and Stormwater Management Report (Novatech, revised November 9, 2020).* No changes have been made to this memorandum since its inclusion in the previous version of the Report *(Novatech, May 28, 2020).*

In response to South Nation Conservation comments dated July 20, 2020, the *Copart Facility SWM Modelling Approach Memorandum* (September 4, 2020) was prepared in support of this memorandum and has been added as an attachment.

The proposed storm drainage and stormwater management system for the Copart Facility (300 Somme Street) was analysed using the PCSWMM hydrologic / hydraulic modelling suite. The PCSWMM model parameters and results are provided in this memorandum.

Model schematics and output data are attached.

MODEL PARAMETERS:

Hydrology

The hydrologic analysis includes the delineation of storm drainage areas and the selection of modelling parameters for each subcatchment area that is based on a combination of soil type, land use, and topography; as follows:

- Soil types were identified as Hydrological Soil Group (HSG) Soil Type 'C' based on the "Geotechnical Report" prepared by Gemtec (April 24, 2020).
- Land use, ground cover, and slope were determined from the Overall Grading & Servicing Plan (119181-GS1).
- Subcatchments are represented as 'ARM Subcatchments' using the NASHYD routine (SCS Curve Number runoff-based calculations) with 3 linear reservoirs (N=3).
- SCS Curve Numbers (CN) were assigned for each ARM subcatchment based on combination of soil type (HSG) and land use.
- Initial abstraction (Ia) was calculated using Ia = 0.10 x S, where S = [(25400 / CN) – 254].

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- Time-of-Concentration (T_c) was calculated using Airport Method, with a minimum time of concentration of 10 minutes (attached).

Subcatchment parameters are summarized in Table 1 below. It should be noted that Area U-4 is occupied by landscaped areas and part of the building roof. Stormwater runoff from this area is considered clean; therefore, does not require additional water quality treatment.

Table 1: Subcatchment Parameters (NASHYD's)

Area ID	Area (ha)	CN (HSG 'C')	Ia (mm)	Tc (min)	Slope (%)
U-1a	0.24	78	7	22.9	1.0
U-1b	0.81	86	4	22.7	1.0
U-1c	1.52	87	4	19.8	1.0
U-1d	0.92	86	4	18.6	1.0
U-2a	0.73	88	3	11.9	2.0
U-2b	2.06	87	4	15.6	1.5
U-2c	4.34	88	3	18.6	1.5
U-2d	0.83	88	3	13.5	1.5
U-2e	0.48	84	5	12.0	1.5
U-3a	0.83	85	4	13.5	1.2
U-3b	1.63	87	4	18.0	1.2
U-3c	2.40	87	4	15.2	1.2
U-3d	0.62	85	4	13.0	1.2
U-4	0.32	79	7	10.0	2.0
TOTAL	**17.73**	**-**	**-**	**-**	**-**

Hydraulics

The PCSWMM model includes the inverts and dimensions of the on-site ditches, ditch inlet catchbasins, OGS units, pipes and spillways based on the information from the Overall Grading & Servicing Plan (119181-GS1).

DESIGN STORMS:

The hydrologic analysis was completed using the following design storms; generated using IDF parameters presented in the City of Ottawa Sewer Design Guidelines (October 2012).

- 3-hour Chicago Storm Distribution (10-minute time step)
- 12-hour SCS Type II Storm Distribution (30-minute time step)
- 24-hour SCS Type II Storm Distribution (60-minute time step)

Each storm distribution includes the 2-year, 5-year, 100-year return periods. In addition to the listed design storms, the 25 mm – 4-hour Chicago storm event was used as the water quality event for sizing the inlet control devices to the OGS units.

The 3-hour Chicago distribution generates the highest peak flows for both the minor and major systems and was determined to be the critical storm distribution for the design and analysis of the storm drainage system.

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PCSWMM MODEL RESULTS:

Inlet Control Devices

Inlet control devices (ICDs) are proposed in the ditch inlet catchbasins. The ICDs were sized by maximizing the storage in the swales during the 25 mm 4-hour Chicago storm event. The OGS units have been designed to provide water quality treatment based on the following flow rates controlled by the ICDs (Table 2).

Table 2: Controlled Peak Flows to OGS Units

OGS Unit ID	OGS Location	ICD Size (mm)	Design Head[1] (m)	Peak Flow (L/s)		
				25mm[1]	2-year[2]	100-year[2]
OGS-1	Area U-1	83	1.17	13	14	15
OGS-2	Area U-2	152	1.02	40	42	42
OGS-3	Area U-3	108	1.04	22	22	23

[1]PCSWMM Model Results for a 25mm – 4-hour Chicago Storm.
[2]PCSWMM Model results for a 3-hour Chicago Storm

Overflow Spillways (weirs)

The overflow spillways (weirs) will be trapezoidal in shape with 3H:1V side slopes and a depth of 0.20 m. The bottom width or length of the weir was designed to convey the 100-year event from the on-site ditches to the roadside ditch. Refer to Table 3 below.

Table 3: Peak Flow Over Weirs

Spillway ID	Spillway Location	Bottom Width (m)	100-year Depth[2] (m)	Peak Flow (L/s)		
				25mm[1]	2-year[2]	100-year[2]
W1	Area U-1	3	0.17	0	9	425
W2	Area U-2	10	0.17	0	180	1,365
W3	Area U-3	6	0.17	0	96	831

[1]PCSWMM Model Results for a 25mm – 4-hour Chicago Storm.
[2]PCSWMM Model results for a 3-hour Chicago Storm

Overall Peak Flows

The site outlets to the adjacent roadside ditches. Table 4 provides the total peak flow measured at each outfall.

Table 4: Total Peak Flow

Outfall	Location	Peak Flow (L/s)		
		25mm[1]	2-year[2]	100-year[2]
OF1	Area U-1	13	23	439
OF2	Area U-2	40	222	1,405
OF3	Area U-3	22	119	852
OF4	Area U-4	4	8	47

[1]PCSWMM Model Results for a 25mm – 4-hour Chicago Storm.
[2]PCSWMM Model results for a 3-hour Chicago Storm

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On-Site Ditches

The results from the PCSWMM model and Manning's open channel capacity calculations (attached) show that the proposed on-site ditches will be able to convey the 100-year peak flow. In addition, the proposed swales have been designed to provide initial water quality treatment. A comparison of the recommended water quality treatment criteria and PCSWMM model results for the on-site ditches is summarized in Table 5.

Table 5: PCSWMM Model Results for On-Site Ditches

Criteria	Recommended	West Swale OGS 1	North Swale OGS 2	South Swale OGS 3
Channel Dimensions				
Channel Slope	< 4.0% (MOE)	0.5%	0.5% to 1.0%	0.6%
Bottom Width	> 0.75 m (MOE)	2.0 m	2.0 m	2.0 m
Side Slopes (H:V)	> 2.5:1 (MOE)	3:1	3:1	3:1
Length	N/A	288	514	613
Water Quality Event (25mm – 4-hour Chicago)				
Peak Flow	-	0.061 m^3/s	0.187 m^3/s	0.112 m^3/s
Flow Depth	± 0.1 m (FHWA)	0.05 – 0.58 m	0.06 – 0.61 m	0.05 – 0.69 m
Velocity	< 0.5 m/s (MOE)	0.16 – 0.32 m/s	0.13 – 0.51 m/s	0.17 – 0.45 m/s
100-year Event (3-hour Chicago)				
Peak Flow	-	0.439 m^3/s	1.208 m^3/s	0.856 m^3/s
Flow Depth	< 0.5 m (MOE)	0.17 – 0.93 m	0.18 – 0.80 m	0.17 – 0.88 m
Velocity	N/A	0.26 – 0.56 m/s	0.29 – 0.89 m/s	0.29 – 0.83 m/s

CONCLUSIONS:

This memorandum has been prepared to provide supplemental SWM modeling information for *Copart Facility Servicing and Stormwater Management Report (Novatech, November 9, 2020).* The PCSWMM model results provided herein are to support the design of the proposed storm drainage and stormwater management system for the Copart Facility (300 Somme Street).

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ATTACHMENTS:

- Time-of-Concentration Calculations
- On-Site Ditch Capacity (Manning's) Calculations
- PCSWMM Model Schematics
- PCSWMM Model Output Data:
  - 25mm 4-hour Chicago storm
  - 2-year 3-hour Chicago storm
  - 100-year 3-hour Chicago storm
- Packaged PCSWMM model (digital file)
- Copart Facility SWM Modelling Approach – prepared by Novatech, Sept. 4/20

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Copart Facility - 300 Somme Street (119181)
Time of Concentration Calculations (Airport Method)

Area ID	Airport Method				
	Drainage Area (ha)	Runoff Coef.	Slope (%)	Length (m)	Time of Concentration* (min)
U-1a	0.24	0.31	1.0%	79.2	22.9
U-1b	0.81	0.61	1.0%	202	22.7
U-1c	1.52	0.64	1.0%	174.2	19.8
U-1d	0.92	0.62	1.0%	140.7	18.6
U-2a	0.73	0.64	2.0%	99.7	11.9
U-2b	2.06	0.65	1.5%	147.4	15.6
U-2c	4.34	0.67	1.5%	229.9	18.6
U-2d	0.83	0.65	1.5%	111.4	13.5
U-2e	0.48	0.55	1.5%	58.9	12.0
U-3a	0.83	0.55	1.2%	63.8	13.5
U-3b	1.63	0.65	1.2%	170.1	18.0
U-3c	2.40	0.62	1.2%	106.2	15.2
U-3d	0.62	0.55	1.2%	59.6	13.0
U-4	0.32	0.34	2.0%	23.7	10.0

**Min. time-of-concentration (T_c) = 10-minutes.*

Airport Method

$$T_c = \frac{3.26\,(1.1 - C)L^{0.5}}{S_w^{0.33}}$$

Source: MTO Drainage Manual (1997)

Copart Facility - 300 Somme Street (119181)
On-Site Ditch Capacity (Manning's) Calculations

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Area U-1
Junction J14 to DICB-1

100-year Peak Flow 439 L/s
0.439 m^3/s

Trapezoidal Channel - Flat bottom ditch

Depth	m	1
Bottom Width	m	2
Side slope (L)	1 to X	3
Side slope (R)	1 to X	3
Top Width (L)	m	3.0
Top Width (R)	m	3.0
Area	m^2	5.000
Perimeter	m	8.32
R=A/P	m	0.60
n		0.035
Slope	m/m	0.005
Q_{max}	m^3/s	7.191
V_{max}	m/s	1.438

Area U-2
Junction J13 to J12

100-year Peak Flow 150 L/s
0.150 m^3/s

Trapezoidal Channel - Flat bottom ditch

Depth	m	1
Bottom Width	m	2
Side slope (L)	1 to X	3
Side slope (R)	1 to X	3
Top Width (L)	m	3.0
Top Width (R)	m	3.0
Area	m^2	5.000
Perimeter	m	8.32
R=A/P	m	0.60
n		0.035
Slope	m/m	0.005
Q_{max}	m^3/s	7.191
V_{max}	m/s	1.438

Area U-2
Junction J12 to J10

100-year Peak Flow 497 L/s
0.497 m^3/s

Trapezoidal Channel - Flat bottom ditch

Depth	m	1
Bottom Width	m	2
Side slope (L)	1 to X	3
Side slope (R)	1 to X	3
Top Width (L)	m	3.0
Top Width (R)	m	3.0
Area	m^2	5.000
Perimeter	m	8.32
R=A/P	m	0.60
n		0.035
Slope	m/m	0.008
Q_{max}	m^3/s	9.096
V_{max}	m/s	1.819

Area U-2
Junction J10 to DICB-2

100-year Peak Flow 1208 L/s
1.208 m^3/s

Trapezoidal Channel - Flat bottom ditch

Depth	m	1
Bottom Width	m	2
Side slope (L)	1 to X	3
Side slope (R)	1 to X	3
Top Width (L)	m	3.0
Top Width (R)	m	3.0
Area	m^2	5.000
Perimeter	m	8.32
R=A/P	m	0.60
n		0.035
Slope	m/m	0.005
Q_{max}	m^3/s	7.191
V_{max}	m/s	1.438

Area U-2
Junction J07 to DICB-2

100-year Peak Flow 262 L/s
0.262 m^3/s

Trapezoidal Channel - Flat bottom ditch

Depth	m	1
Bottom Width	m	2
Side slope (L)	1 to X	3
Side slope (R)	1 to X	3
Top Width (L)	m	3.0
Top Width (R)	m	3.0
Area	m^2	5.000
Perimeter	m	8.32
R=A/P	m	0.60
n		0.035
Slope	m/m	0.01
Q_{max}	m^3/s	10.170
V_{max}	m/s	2.034

Area U-3
Junction J01 to DICB-3

100-year Peak Flow 856 L/s
0.856 m^3/s

Trapezoidal Channel - Flat bottom ditch

Depth	m	1
Bottom Width	m	2
Side slope (L)	1 to X	3
Side slope (R)	1 to X	3
Top Width (L)	m	3.0
Top Width (R)	m	3.0
Area	m^2	5.000
Perimeter	m	8.32
R=A/P	m	0.60
n		0.035
Slope	m/m	0.006
Q_{max}	m^3/s	7.877
V_{max}	m/s	1.575

Copart Facility - 300 Somme Street (119181)
PCSWMM Model Schematics

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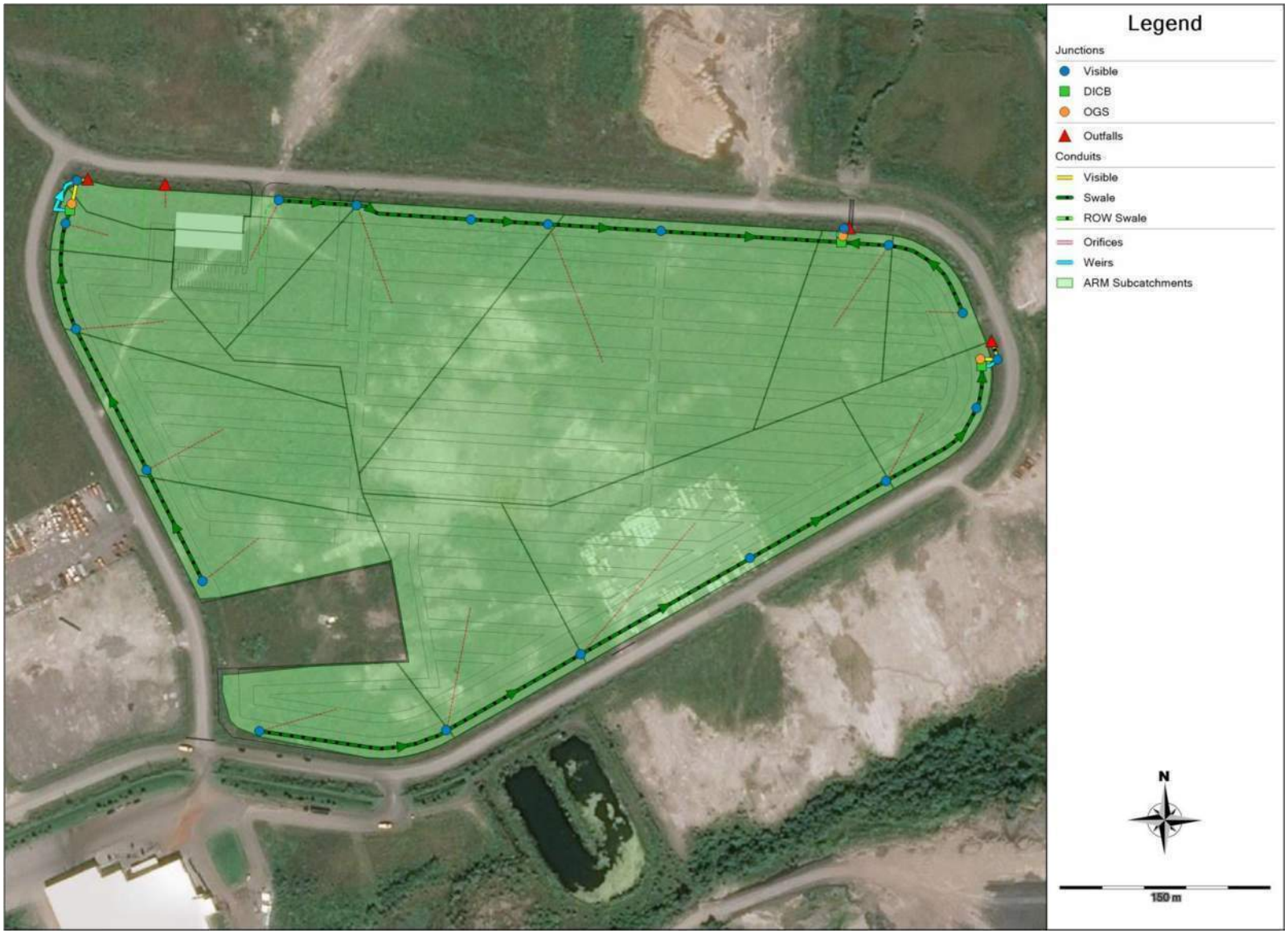
Overall Model Schematic



Date: 2020-05-26
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Copart Facility - 300 Somme Street (119181)
PCSWMM Model Schematics

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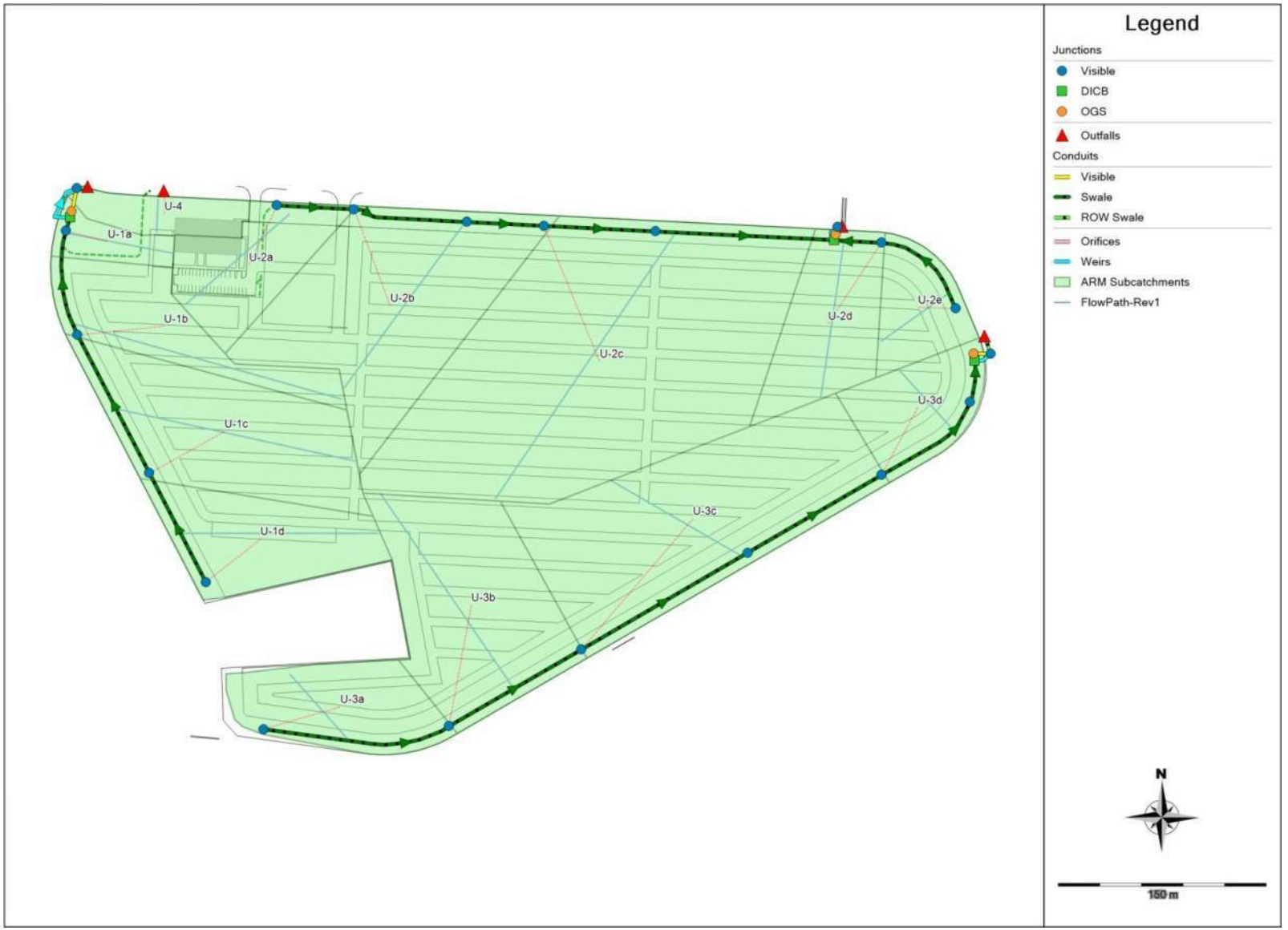
Subcatchments and Flow Paths



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Copart Facility - 300 Somme Street (119181)
PCSWMM Model Schematics

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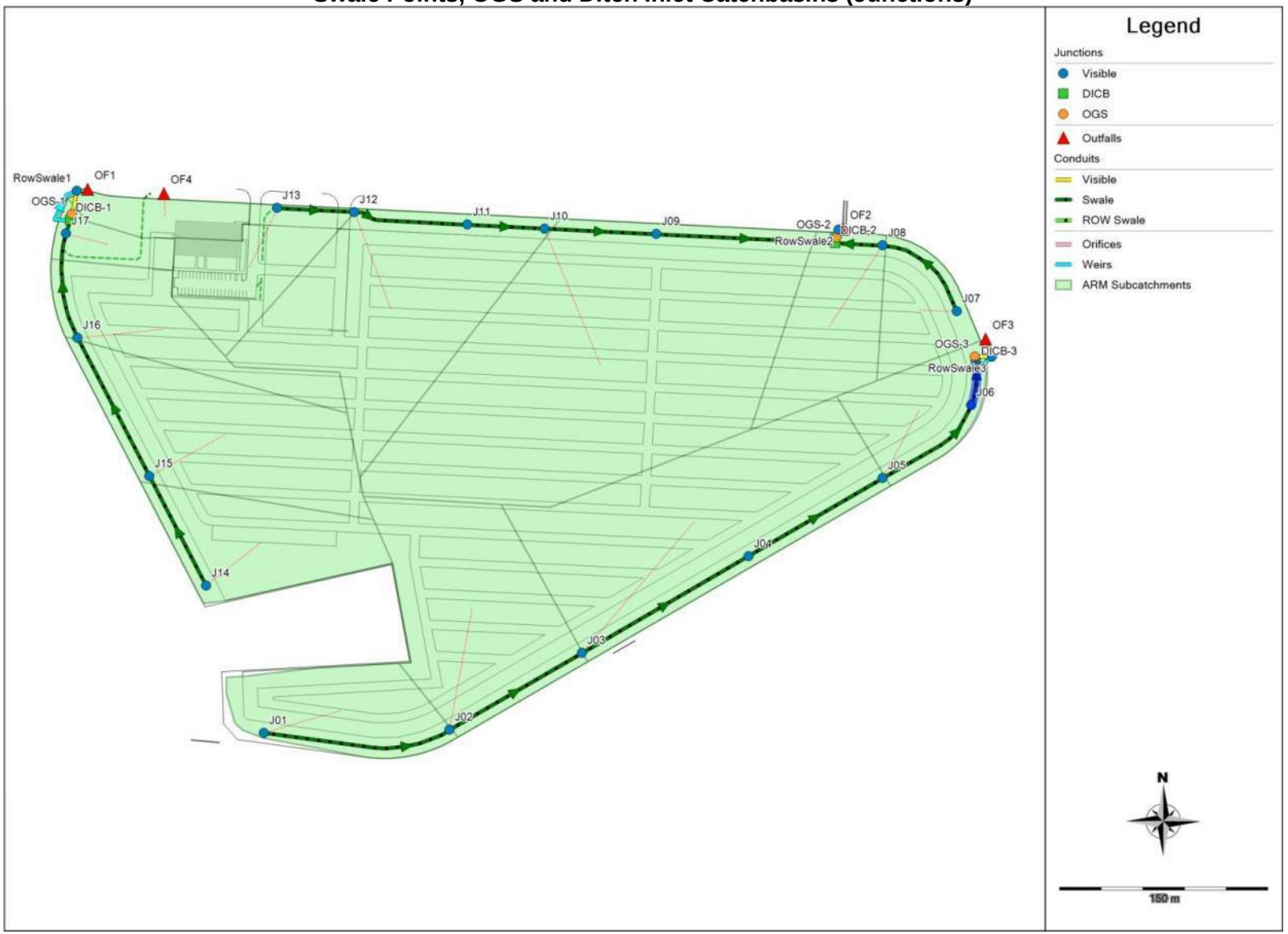
Swale Points, OGS and Ditch Inlet Catchbasins (Junctions)



Date: 2020-05-26
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```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM BETA VERSION 7.2.2785
---------------------------------------------------------------

This is a *BETA* version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                 05/04/2020 00:00:00
Simulation end time:                   05/05/2020 00:00:00
Runoff wet weather time steps:         300 seconds
Report time steps:                     60 seconds
Number of data points:                 1441


*****************************
Unit Hydrographs Runoff Method
*****************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Pe
U-4	Nash IUH	Design_Storms	0.32	10	6.67	38.33
U-2e	Nash IUH	Design_Storms	0.48	12	8	47
U-2c	Nash IUH	Design_Storms	4.34	18.6	12.4	82.6
U-2a	Nash IUH	Design_Storms	0.73	11.9	7.93	47.07
U-2b	Nash IUH	Design_Storms	2.06	15.6	10.4	64.6
U-2d	Nash IUH	Design_Storms	0.83	13.5	9	56
U-3b	Nash IUH	Design_Storms	1.63	18	12	73
U-3d	Nash IUH	Design_Storms	0.62	13	8.67	51.33
U-3c	Nash IUH	Design_Storms	2.4	15.2	10.13	64.87
U-3a	Nash IUH	Design_Storms	0.83	13.5	9	56
U-1c	Nash IUH	Design_Storms	1.52	19.8	13.2	76.8
U-1a	Nash IUH	Design_Storms	0.24	22.9	15.27	69.73
U-1b	Nash IUH	Design_Storms	0.81	22.7	15.13	79.87
U-1d	Nash IUH	Design_Storms	0.92	18.6	12.4	72.6

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
U-4	25.003	21.213	3.722	0.012	3.707	0.149
U-2e	25.003	19.152	5.796	0.028	9.246	0.232
U-2c	25.003	16.456	8.532	0.37	110.123	0.341
U-2a	25.003	16.456	8.466	0.062	22.594	0.339
U-2b	25.003	17.521	7.456	0.154	47.309	0.298
U-2d	25.003	16.456	8.498	0.071	24.721	0.34
U-3b	25.003	17.521	7.466	0.122	35.478	0.299
U-3d	25.003	18.302	6.655	0.041	13.914	0.266
U-3c	25.003	17.521	7.454	0.179	56.112	0.298
U-3a	25.003	18.302	6.661	0.055	18.313	0.266
U-1c	25.003	17.521	7.474	0.114	31.34	0.299
U-1a	25.003	21.388	3.606	0.009	1.889	0.144
U-1b	25.003	17.928	7.065	0.057	14.586	0.283
U-1d	25.003	17.928	7.061	0.065	18.485	0.282

```
WARNING ARM01: Computed UH depth for ARM subcatchment U-4 is not unity. Consider reducing wet weather time step.


EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
---------------------------------------------------------------

WARNING 02: maximum depth increased for Node DICB-2
WARNING 02: maximum depth increased for Node DICB-3

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 30
Number of links ........... 29
Number of pollutants ...... 0
Number of land uses ....... 0


***************
Raingage Summary
***************
```

Name	Data Source	Data Type	Recording Interval
Design_Storms	C4hr-25mm	INTENSITY	10 min.

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
DICB-1	JUNCTION	90.00	1.20	0.0	
DICB-2	JUNCTION	87.25	1.05	0.0	
DICB-3	JUNCTION	88.60	1.07	0.0	
J01	JUNCTION	92.15	1.00	0.0	
J02	JUNCTION	91.37	1.00	0.0	
J03	JUNCTION	90.74	1.00	0.0	
J04	JUNCTION	89.95	1.00	0.0	
J05	JUNCTION	89.32	1.00	0.0	
J06	JUNCTION	88.85	1.00	0.0	
J07	JUNCTION	88.40	1.00	0.0	
J08	JUNCTION	87.64	1.00	0.0	
J09	JUNCTION	87.94	1.00	0.0	
J10	JUNCTION	88.33	1.00	0.0	
J11	JUNCTION	88.79	1.00	0.0	
J12	JUNCTION	89.46	1.00	0.0	
J13	JUNCTION	89.73	1.00	0.0	
J14	JUNCTION	91.65	1.00	0.0	
J15	JUNCTION	91.21	1.00	0.0	
J16	JUNCTION	90.65	1.00	0.0	
J17	JUNCTION	90.27	1.00	0.0	
OGS-1	JUNCTION	89.93	2.33	0.0	
OGS-2	JUNCTION	87.23	2.33	0.0	
OGS-3	JUNCTION	88.56	2.33	0.0	
RowSwale1	JUNCTION	89.78	1.00	0.0	
RowSwale2	JUNCTION	87.15	1.00	0.0	
RowSwale3	JUNCTION	88.43	1.00	0.0	
OF1	OUTFALL	89.76	1.00	0.0	
OF2	OUTFALL	86.98	1.00	0.0	
OF3	OUTFALL	87.87	1.54	0.0	
OF4	OUTFALL	0.00	0.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C01	J01	J02	CONDUIT	136.9	0.5698	0.0350
C02	J02	J03	CONDUIT	110.4	0.5707	0.0350
C03	J03	J04	CONDUIT	138.9	0.5688	0.0350
C04	J04	J05	CONDUIT	111.6	0.5645	0.0350
C05	J05	J06	CONDUIT	85.3	0.5510	0.0350
C06	J06	DICB-3	CONDUIT	30.1	0.5980	0.0350
C07	OGS-3	RowSwale3	CONDUIT	15.0	0.5333	0.0130
C08	RowSwale3	OF3	CONDUIT	4.2	0.4762	0.0350
C09	J07	J08	CONDUIT	76.3	0.9961	0.0350
C10	J08	DICB-2	CONDUIT	34.0	1.0001	0.0350
C11	J13	J12	CONDUIT	55.7	0.4847	0.0350
C12	J12	J11	CONDUIT	83.0	0.8073	0.0350
C13	J11	J10	CONDUIT	55.5	0.8289	0.0350
C14	J10	J09	CONDUIT	80.6	0.4839	0.0350
C15	J09	DICB-2	CONDUIT	129.3	0.4950	0.0350
C16	OGS-2	RowSwale2	CONDUIT	5.5	0.5455	0.0130
C17	RowSwale2	OF2	CONDUIT	3.0	5.6758	0.0350
C18	J14	J15	CONDUIT	88.6	0.4966	0.0350
C19	J15	J16	CONDUIT	112.3	0.4987	0.0350
C20	J16	J17	CONDUIT	77.3	0.4916	0.0350
C21	J17	DICB-1	CONDUIT	9.9	0.7071	0.0350
C22	OGS-1	RowSwale1	CONDUIT	16.0	0.6250	0.0130
C23	RowSwale1	OF1	CONDUIT	5.2	0.3846	0.0350
OR1	DICB-1	OGS-1	ORIFICE			
OR2	DICB-2	OGS-2	ORIFICE			
OR3	DICB-3	OGS-3	ORIFICE			
W1	DICB-1	RowSwale1	WEIR			
W2	DICB-2	RowSwale2	WEIR			
W3	DICB-3	RowSwale3	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7676.85
C02	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7682.87
C03	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7670.08
C04	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7641.45
C05	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7549.39
C06	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7864.86
C07	CIRCULAR	0.25	0.05	0.06	0.25	1	43.43
C08	TRIANGULAR	1.00	3.00	0.47	6.00	1	3597.77
C09	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	10150.55
C10	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	10170.56

C11	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7080.94
C12	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	9137.76
C13	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	9259.21
C14	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7074.59
C15	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7155.29
C16	CIRCULAR	0.25	0.05	0.06	0.25	1	43.92
C17	TRIANGULAR	1.00	3.00	0.47	6.00	1	12420.90
C18	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7167.15
C19	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7181.93
C20	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7130.81
C21	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	8552.06
C22	CIRCULAR	0.25	0.05	0.06	0.25	1	47.02
C23	TRIANGULAR	1.00	3.00	0.47	6.00	1	3233.37

```
**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2020 00:00:00
Ending Date .............. 05/05/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m
```

```
*************************        Volume        Volume
Flow Routing Continuity       hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.134         1.337
External Outflow .........         0.134         1.338
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.108

************************
Highest Continuity Errors
************************
Node J09 (-1.12%)

***************************
Time-Step Critical Elements
***************************
Link C17 (57.43%)

*******************************
Highest Flow Instability Indexes
*******************************
Link C21 (2)
Link C06 (1)

************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.29 sec
Average Time Step           :     2.96 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
```

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
DICB-1	JUNCTION	0.36	0.81	90.81	0 03:09	0.81
DICB-2	JUNCTION	0.33	0.83	88.08	0 02:49	0.83
DICB-3	JUNCTION	0.36	0.85	89.45	0 03:07	0.85
J01	JUNCTION	0.00	0.04	92.19	0 01:45	0.04
J02	JUNCTION	0.01	0.07	91.44	0 01:50	0.07
J03	JUNCTION	0.02	0.12	90.86	0 01:46	0.12
J04	JUNCTION	0.02	0.10	90.05	0 01:54	0.10
J05	JUNCTION	0.03	0.13	89.45	0 03:08	0.13
J06	JUNCTION	0.22	0.60	89.45	0 03:10	0.60
J07	JUNCTION	0.00	0.02	88.42	0 01:41	0.02
J08	JUNCTION	0.13	0.44	88.08	0 02:49	0.44
J09	JUNCTION	0.03	0.15	88.09	0 01:48	0.15
J10	JUNCTION	0.02	0.16	88.49	0 01:41	0.16
J11	JUNCTION	0.01	0.07	88.86	0 01:44	0.07
J12	JUNCTION	0.01	0.08	89.54	0 01:38	0.08
J13	JUNCTION	0.00	0.04	89.77	0 01:40	0.04
J14	JUNCTION	0.01	0.04	91.69	0 01:47	0.04
J15	JUNCTION	0.01	0.07	91.28	0 01:50	0.07
J16	JUNCTION	0.05	0.16	90.81	0 03:08	0.16
J17	JUNCTION	0.22	0.54	90.81	0 03:09	0.54
OGS-1	JUNCTION	0.05	0.09	90.02	0 03:09	0.09
OGS-2	JUNCTION	0.08	0.17	87.40	0 02:49	0.17
OGS-3	JUNCTION	0.06	0.12	88.68	0 03:07	0.12
RowSwale1	JUNCTION	0.07	0.13	89.91	0 03:09	0.13
RowSwale2	JUNCTION	0.06	0.12	87.27	0 02:49	0.12
RowSwale3	JUNCTION	0.08	0.14	88.57	0 03:10	0.14
OF1	OUTFALL	0.07	0.13	89.89	0 03:09	0.13
OF2	OUTFALL	0.06	0.12	87.10	0 02:49	0.12
OF3	OUTFALL	0.00	0.00	87.87	0 00:00	0.00
OF4	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
DICB-1	JUNCTION	0.00	21.69	0 01:42	0	0.244	-0.054
DICB-2	JUNCTION	0.00	208.55	0 01:46	0	0.727	0.722
DICB-3	JUNCTION	0.00	60.85	0 01:48	0	0.396	-0.108
J01	JUNCTION	18.31	18.31	0 01:40	0.0553	0.0553	-0.117
J02	JUNCTION	35.48	52.65	0 01:45	0.122	0.177	0.077
J03	JUNCTION	56.11	100.94	0 01:45	0.179	0.356	-0.176
J04	JUNCTION	0.00	110.47	0 01:50	0	0.356	0.095
J05	JUNCTION	13.91	113.47	0 01:53	0.0412	0.397	-0.681
J06	JUNCTION	0.00	111.70	0 01:55	0	0.4	0.873
J07	JUNCTION	9.24	9.24	0 01:40	0.0278	0.0278	-1.191
J08	JUNCTION	24.72	91.79	0 01:47	0.0705	0.135	0.775
J09	JUNCTION	0.00	187.33	0 01:45	0	0.586	-1.104
J10	JUNCTION	110.12	181.23	0 01:45	0.37	0.585	-0.154
J11	JUNCTION	0.00	72.87	0 01:41	0	0.215	0.125
J12	JUNCTION	47.31	69.73	0 01:40	0.154	0.215	-0.060
J13	JUNCTION	22.59	22.59	0 01:40	0.0618	0.0618	-0.053
J14	JUNCTION	18.48	18.48	0 01:45	0.0649	0.0649	-0.045
J15	JUNCTION	31.34	49.16	0 01:46	0.114	0.178	-0.266
J16	JUNCTION	14.59	62.36	0 01:50	0.0572	0.236	-0.497
J17	JUNCTION	1.89	63.03	0 01:53	0.00865	0.246	0.776
OGS-1	JUNCTION	0.00	12.83	0 03:09	0	0.244	-0.000
OGS-2	JUNCTION	0.00	40.28	0 02:49	0	0.685	0.001
OGS-3	JUNCTION	0.00	21.64	0 03:07	0	0.397	-0.004
RowSwale1	JUNCTION	0.00	12.83	0 03:09	0	0.244	0.002
RowSwale2	JUNCTION	0.00	40.28	0 02:49	0	0.685	0.001
RowSwale3	JUNCTION	0.00	21.64	0 03:08	0	0.397	0.002
OF1	OUTFALL	0.00	12.83	0 03:09	0	0.244	0.000
OF2	OUTFALL	0.00	40.28	0 02:49	0	0.685	0.000
OF3	OUTFALL	0.00	21.64	0 03:10	0	0.397	0.000
OF4	OUTFALL	3.71	3.71	0 01:40	0.0119	0.0119	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	60.08	10.21	12.83	0.244
OF2	57.64	30.22	40.28	0.685
OF3	67.50	14.78	21.64	0.397
OF4	28.00	1.02	3.71	0.012
System	53.30	56.22	3.71	1.338

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C01	CONDUIT	17.17	0	01:45	0.17	0.00	0.05
C02	CONDUIT	49.23	0	01:50	0.25	0.01	0.09
C03	CONDUIT	110.47	0	01:50	0.45	0.01	0.11
C04	CONDUIT	104.41	0	01:54	0.42	0.01	0.11
C05	CONDUIT	111.70	0	01:55	0.43	0.01	0.36
C06	CONDUIT	60.85	0	01:48	0.25	0.01	0.69
C07	CONDUIT	21.64	0	03:08	0.92	0.50	0.48
C08	CONDUIT	21.64	0	03:10	0.49	0.01	0.12
C09	CONDUIT	8.95	0	01:41	0.13	0.00	0.22
C10	CONDUIT	63.44	0	01:47	0.31	0.01	0.61
C11	CONDUIT	22.42	0	01:40	0.16	0.00	0.06
C12	CONDUIT	72.87	0	01:41	0.43	0.01	0.08
C13	CONDUIT	71.25	0	01:44	0.26	0.01	0.12
C14	CONDUIT	187.33	0	01:45	0.51	0.03	0.15
C15	CONDUIT	180.63	0	01:48	0.32	0.03	0.46
C16	CONDUIT	40.28	0	02:49	1.15	0.92	0.67
C17	CONDUIT	40.28	0	02:49	0.99	0.00	0.12
C18	CONDUIT	18.07	0	01:47	0.16	0.00	0.05
C19	CONDUIT	47.86	0	01:50	0.29	0.01	0.09
C20	CONDUIT	61.14	0	01:53	0.32	0.01	0.35
C21	CONDUIT	21.69	0	01:42	0.24	0.00	0.58
C22	CONDUIT	12.83	0	03:09	0.82	0.27	0.36
C23	CONDUIT	12.83	0	03:09	0.27	0.00	0.13
OR1	ORIFICE	12.83	0	03:09			1.00
OR2	ORIFICE	40.28	0	02:49			1.00
OR3	ORIFICE	21.64	0	03:07			1.00
W1	WEIR	0.00	0	00:00			0.00
W2	WEIR	0.00	0	00:00			0.00
W3	WEIR	0.00	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C01	1.00	0.03	0.16	0.00	0.81	0.00	0.00	0.00	0.94	0.00
C02	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.95	0.00
C03	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.92	0.00
C04	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.95	0.00
C05	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.81	0.00
C06	1.00	0.03	0.00	0.00	0.53	0.00	0.00	0.43	0.02	0.00
C07	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00
C08	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00
C09	1.00	0.30	0.07	0.00	0.63	0.00	0.00	0.00	0.94	0.00
C10	1.00	0.30	0.00	0.00	0.57	0.00	0.00	0.13	0.09	0.00
C11	1.00	0.21	0.15	0.00	0.63	0.00	0.00	0.00	0.94	0.00
C12	1.00	0.12	0.09	0.00	0.78	0.00	0.00	0.00	0.92	0.00
C13	1.00	0.03	0.10	0.00	0.88	0.00	0.00	0.00	0.94	0.00
C14	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.92	0.00
C15	1.00	0.03	0.00	0.00	0.57	0.00	0.00	0.40	0.17	0.00
C16	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
C17	1.00	0.03	0.00	0.00	0.40	0.57	0.00	0.00	0.66	0.00
C18	1.00	0.03	0.25	0.00	0.72	0.00	0.00	0.00	0.94	0.00
C19	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.93	0.00

C20	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.69	0.00
C21	1.00	0.05	0.00	0.00	0.53	0.00	0.00	0.42	0.00	0.00
C22	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00
C23	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.65	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Wed May 27 13:18:15 2020
Analysis ended on: Wed May 27 13:18:17 2020
Total elapsed time: 00:00:02

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM BETA VERSION 7.2.2785
---------------------------------------------------------------

This is a *BETA* version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                 05/04/2020 00:00:00
Simulation end time:                   05/05/2020 00:00:00
Runoff wet weather time steps:         300 seconds
Report time steps:                     60 seconds
Number of data points:                 1441


*******************************
Unit Hydrographs Runoff Method
*******************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Pe (min)
U-4	Nash IUH	Design_Storms	0.32	10	6.67	38.33
U-2e	Nash IUH	Design_Storms	0.48	12	8	47
U-2c	Nash IUH	Design_Storms	4.34	18.6	12.4	82.6
U-2a	Nash IUH	Design_Storms	0.73	11.9	7.93	47.07
U-2b	Nash IUH	Design_Storms	2.06	15.6	10.4	64.6
U-2d	Nash IUH	Design_Storms	0.83	13.5	9	56
U-3b	Nash IUH	Design_Storms	1.63	18	12	73
U-3d	Nash IUH	Design_Storms	0.62	13	8.67	51.33
U-3c	Nash IUH	Design_Storms	2.4	15.2	10.13	64.87
U-3a	Nash IUH	Design_Storms	0.83	13.5	9	56
U-1c	Nash IUH	Design_Storms	1.52	19.8	13.2	76.8
U-1a	Nash IUH	Design_Storms	0.24	22.9	15.27	69.73
U-1b	Nash IUH	Design_Storms	0.81	22.7	15.13	79.87
U-1d	Nash IUH	Design_Storms	0.92	18.6	12.4	72.6

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
U-4	31.857	25.168	6.566	0.021	7.772	0.206
U-2e	31.857	22.27	9.496	0.046	17.332	0.298
U-2c	31.857	18.742	13.092	0.568	186.374	0.411
U-2a	31.857	18.742	12.989	0.095	38.205	0.408
U-2b	31.857	20.065	11.752	0.242	84.528	0.369
U-2d	31.857	18.742	13.036	0.108	41.982	0.409
U-3b	31.857	20.065	11.767	0.192	62.53	0.369
U-3d	31.857	21.18	10.602	0.066	24.942	0.333
U-3c	31.857	20.065	11.746	0.282	100.136	0.369
U-3a	31.857	21.18	10.613	0.088	32.886	0.333
U-1c	31.857	20.065	11.77	0.179	55.486	0.369
U-1a	31.857	25.454	6.387	0.015	3.926	0.201
U-1b	31.857	20.644	11.198	0.091	25.754	0.351
U-1d	31.857	20.644	11.196	0.103	32.837	0.351

```
WARNING ARM01: Computed UH depth for ARM subcatchment U-4 is not unity. Consider reducing wet weather time step.


EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
---------------------------------------------------------------

WARNING 02: maximum depth increased for Node DICB-2
WARNING 02: maximum depth increased for Node DICB-3

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 30
Number of links ........... 29
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
Design_Storms	C3hr-2yr	INTENSITY	10 min.

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
DICB-1	JUNCTION	90.00	1.20	0.0	
DICB-2	JUNCTION	87.25	1.05	0.0	
DICB-3	JUNCTION	88.60	1.07	0.0	
J01	JUNCTION	92.15	1.00	0.0	
J02	JUNCTION	91.37	1.00	0.0	
J03	JUNCTION	90.74	1.00	0.0	
J04	JUNCTION	89.95	1.00	0.0	
J05	JUNCTION	89.32	1.00	0.0	
J06	JUNCTION	88.85	1.00	0.0	
J07	JUNCTION	88.40	1.00	0.0	
J08	JUNCTION	87.64	1.00	0.0	
J09	JUNCTION	87.94	1.00	0.0	
J10	JUNCTION	88.33	1.00	0.0	
J11	JUNCTION	88.79	1.00	0.0	
J12	JUNCTION	89.46	1.00	0.0	
J13	JUNCTION	89.73	1.00	0.0	
J14	JUNCTION	91.65	1.00	0.0	
J15	JUNCTION	91.21	1.00	0.0	
J16	JUNCTION	90.65	1.00	0.0	
J17	JUNCTION	90.27	1.00	0.0	
OGS-1	JUNCTION	89.93	2.33	0.0	
OGS-2	JUNCTION	87.23	2.33	0.0	
OGS-3	JUNCTION	88.56	2.33	0.0	
RowSwale1	JUNCTION	89.78	1.00	0.0	
RowSwale2	JUNCTION	87.15	1.00	0.0	
RowSwale3	JUNCTION	88.43	1.00	0.0	
OF1	OUTFALL	89.76	1.00	0.0	
OF2	OUTFALL	86.98	1.00	0.0	
OF3	OUTFALL	87.87	1.54	0.0	
OF4	OUTFALL	0.00	0.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C01	J01	J02	CONDUIT	136.9	0.5698	0.0350
C02	J02	J03	CONDUIT	110.4	0.5707	0.0350
C03	J03	J04	CONDUIT	138.9	0.5688	0.0350
C04	J04	J05	CONDUIT	111.6	0.5645	0.0350
C05	J05	J06	CONDUIT	85.3	0.5510	0.0350
C06	J06	DICB-3	CONDUIT	30.1	0.5980	0.0350
C07	OGS-3	RowSwale3	CONDUIT	15.0	0.5333	0.0130
C08	RowSwale3	OF3	CONDUIT	4.2	0.4762	0.0350
C09	J07	J08	CONDUIT	76.3	0.9961	0.0350
C10	J08	DICB-2	CONDUIT	34.0	1.0001	0.0350
C11	J13	J12	CONDUIT	55.7	0.4847	0.0350
C12	J12	J11	CONDUIT	83.0	0.8073	0.0350
C13	J11	J10	CONDUIT	55.5	0.8289	0.0350
C14	J10	J09	CONDUIT	80.6	0.4839	0.0350
C15	J09	DICB-2	CONDUIT	129.3	0.4950	0.0350
C16	OGS-2	RowSwale2	CONDUIT	5.5	0.5455	0.0130
C17	RowSwale2	OF2	CONDUIT	3.0	5.6758	0.0350
C18	J14	J15	CONDUIT	88.6	0.4966	0.0350
C19	J15	J16	CONDUIT	112.3	0.4987	0.0350
C20	J16	J17	CONDUIT	77.3	0.4916	0.0350
C21	J17	DICB-1	CONDUIT	9.9	0.7071	0.0350
C22	OGS-1	RowSwale1	CONDUIT	16.0	0.6250	0.0130
C23	RowSwale1	OF1	CONDUIT	5.2	0.3846	0.0350
OR1	DICB-1	OGS-1	ORIFICE			
OR2	DICB-2	OGS-2	ORIFICE			
OR3	DICB-3	OGS-3	ORIFICE			
W1	DICB-1	RowSwale1	WEIR			
W2	DICB-2	RowSwale2	WEIR			
W3	DICB-3	RowSwale3	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7676.85
C02	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7682.87
C03	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7670.08
C04	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7641.45
C05	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7549.39
C06	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7864.86
C07	CIRCULAR	0.25	0.05	0.06	0.25	1	43.43
C08	TRIANGULAR	1.00	3.00	0.47	6.00	1	3597.77
C09	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	10150.55
C10	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	10170.56

C11	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7080.94
C12	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	9137.76
C13	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	9259.21
C14	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7074.59
C15	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7155.29
C16	CIRCULAR	0.25	0.05	0.06	0.25	1	43.92
C17	TRIANGULAR	1.00	3.00	0.47	6.00	1	12420.90
C18	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7167.15
C19	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7181.93
C20	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7130.81
C21	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	8552.06
C22	CIRCULAR	0.25	0.05	0.06	0.25	1	47.02
C23	TRIANGULAR	1.00	3.00	0.47	6.00	1	3233.37

```
**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2020 00:00:00
Ending Date .............. 05/05/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m
```

```
**************************        Volume         Volume
Flow Routing Continuity       hectare-m      10^6 ltr
**************************    ---------      ---------
Dry Weather Inflow .......          0.000          0.000
Wet Weather Inflow .......          0.000          0.000
Groundwater Inflow .......          0.000          0.000
RDII Inflow ..............          0.000          0.000
External Inflow ..........          0.209          2.094
External Outflow .........          0.210          2.096
Flooding Loss ............          0.000          0.000
Evaporation Loss .........          0.000          0.000
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.000          0.000
Continuity Error (%) .....         -0.070

***************************
Time-Step Critical Elements
***************************
Link C17 (58.68%)
Link C23 (4.41%)

*******************************
Highest Flow Instability Indexes
*******************************
Link C21 (2)

************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.88 sec
Average Time Step           :     2.82 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00

******************
Node Depth Summary
******************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
DICB-1	JUNCTION	0.53	1.01	91.01	0	02:38	1.01
DICB-2	JUNCTION	0.36	0.90	88.15	0	01:41	0.90
DICB-3	JUNCTION	0.39	0.91	89.51	0	01:50	0.91
J01	JUNCTION	0.01	0.05	92.20	0	01:22	0.05
J02	JUNCTION	0.01	0.09	91.46	0	01:27	0.09
J03	JUNCTION	0.02	0.16	90.90	0	01:23	0.16
J04	JUNCTION	0.02	0.15	90.10	0	01:30	0.15
J05	JUNCTION	0.05	0.19	89.51	0	01:49	0.19
J06	JUNCTION	0.26	0.66	89.51	0	01:50	0.66
J07	JUNCTION	0.00	0.03	88.43	0	01:20	0.03
J08	JUNCTION	0.16	0.51	88.15	0	01:41	0.51
J09	JUNCTION	0.05	0.21	88.15	0	01:43	0.21
J10	JUNCTION	0.03	0.21	88.54	0	01:20	0.21
J11	JUNCTION	0.01	0.10	88.89	0	01:23	0.10
J12	JUNCTION	0.01	0.11	89.57	0	01:17	0.11
J13	JUNCTION	0.01	0.06	89.79	0	01:20	0.06
J14	JUNCTION	0.01	0.05	91.70	0	01:26	0.05
J15	JUNCTION	0.01	0.10	91.31	0	01:29	0.10
J16	JUNCTION	0.14	0.36	91.01	0	02:40	0.36
J17	JUNCTION	0.36	0.74	91.01	0	02:38	0.74
OGS-1	JUNCTION	0.06	0.10	90.03	0	02:59	0.10
OGS-2	JUNCTION	0.09	0.18	87.41	0	01:41	0.18
OGS-3	JUNCTION	0.07	0.14	88.70	0	01:50	0.14
RowSwale1	JUNCTION	0.08	0.16	89.94	0	02:39	0.16
RowSwale2	JUNCTION	0.07	0.22	87.37	0	01:41	0.22
RowSwale3	JUNCTION	0.09	0.25	88.68	0	01:50	0.25
OF1	OUTFALL	0.08	0.16	89.92	0	02:39	0.16
OF2	OUTFALL	0.07	0.22	87.20	0	01:41	0.22
OF3	OUTFALL	0.00	0.00	87.87	0	00:00	0.00
OF4	OUTFALL	0.00	0.00	0.00	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
DICB-1	JUNCTION	0.00	30.13	0	01:32	0	0.388	-0.031
DICB-2	JUNCTION	0.00	319.10	0	01:21	0	1.11	0.748
DICB-3	JUNCTION	0.00	118.76	0	01:50	0	0.627	-0.076
J01	JUNCTION	32.88	32.88	0	01:20	0.088	0.088	-0.141
J02	JUNCTION	62.53	93.50	0	01:25	0.192	0.28	0.093
J03	JUNCTION	100.13	183.75	0	01:25	0.282	0.561	-0.205
J04	JUNCTION	0.00	197.43	0	01:27	0	0.563	0.022
J05	JUNCTION	24.94	207.20	0	01:30	0.0657	0.628	-0.584
J06	JUNCTION	0.00	203.04	0	01:32	0	0.632	0.811
J07	JUNCTION	17.33	17.33	0	01:20	0.0456	0.0456	-1.501
J08	JUNCTION	41.97	153.69	0	01:22	0.108	0.198	0.726
J09	JUNCTION	0.00	312.64	0	01:24	0	0.906	-0.948
J10	JUNCTION	186.37	307.62	0	01:25	0.568	0.905	-0.210
J11	JUNCTION	0.00	123.64	0	01:21	0	0.337	0.119
J12	JUNCTION	84.52	122.64	0	01:20	0.242	0.337	-0.062
J13	JUNCTION	38.20	38.20	0	01:20	0.0948	0.0948	-0.052
J14	JUNCTION	32.84	32.84	0	01:25	0.103	0.103	-0.051
J15	JUNCTION	55.48	87.49	0	01:25	0.179	0.282	-0.709
J16	JUNCTION	25.75	111.04	0	01:29	0.0907	0.375	-0.075
J17	JUNCTION	3.93	113.16	0	01:32	0.0153	0.39	0.664
OGS-1	JUNCTION	0.00	14.42	0	02:38	0	0.364	-0.001
OGS-2	JUNCTION	0.00	42.08	0	01:40	0	0.722	0.001
OGS-3	JUNCTION	0.00	22.38	0	01:46	0	0.415	-0.004
RowSwale1	JUNCTION	0.00	23.27	0	02:38	0	0.388	0.002
RowSwale2	JUNCTION	0.00	222.11	0	01:41	0	1.06	0.000
RowSwale3	JUNCTION	0.00	118.52	0	01:50	0	0.627	0.001
OF1	OUTFALL	0.00	23.26	0	02:39	0	0.388	0.000
OF2	OUTFALL	0.00	222.12	0	01:41	0	1.06	0.000
OF3	OUTFALL	0.00	118.52	0	01:50	0	0.627	0.000
OF4	OUTFALL	7.77	7.77	0	01:20	0.021	0.021	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	66.45	13.15	23.26	0.388
OF2	59.03	50.93	222.12	1.060
OF3	67.94	25.69	118.52	0.627
OF4	24.51	2.26	7.77	0.021
System	54.48	92.04	7.77	2.096

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C01	CONDUIT	31.30	0	01:23	0.21	0.00	0.07
C02	CONDUIT	89.45	0	01:27	0.31	0.01	0.13
C03	CONDUIT	197.43	0	01:27	0.54	0.03	0.15
C04	CONDUIT	189.12	0	01:30	0.52	0.02	0.15
C05	CONDUIT	203.04	0	01:32	0.50	0.03	0.43
C06	CONDUIT	118.76	0	01:50	0.27	0.02	0.75
C07	CONDUIT	22.39	0	01:52	0.93	0.52	0.66
C08	CONDUIT	118.52	0	01:50	0.80	0.03	0.22
C09	CONDUIT	17.00	0	01:20	0.17	0.00	0.26
C10	CONDUIT	97.24	0	01:22	0.35	0.01	0.68
C11	CONDUIT	38.11	0	01:20	0.20	0.01	0.08
C12	CONDUIT	123.64	0	01:21	0.52	0.01	0.10
C13	CONDUIT	122.29	0	01:23	0.32	0.01	0.16
C14	CONDUIT	312.64	0	01:24	0.60	0.04	0.20
C15	CONDUIT	306.66	0	01:27	0.36	0.04	0.53
C16	CONDUIT	42.11	0	01:45	1.17	0.96	0.70
C17	CONDUIT	222.12	0	01:41	1.51	0.02	0.22
C18	CONDUIT	32.29	0	01:26	0.20	0.00	0.08
C19	CONDUIT	85.32	0	01:29	0.36	0.01	0.20
C20	CONDUIT	109.26	0	01:32	0.36	0.02	0.55
C21	CONDUIT	30.13	0	01:32	0.25	0.00	0.78
C22	CONDUIT	14.42	0	02:39	0.84	0.31	0.40
C23	CONDUIT	23.26	0	02:39	0.31	0.01	0.16
OR1	ORIFICE	14.42	0	02:38			1.00
OR2	ORIFICE	42.08	0	01:40			1.00
OR3	ORIFICE	22.38	0	01:46			1.00
W1	WEIR	8.85	0	02:38			0.07
W2	WEIR	180.07	0	01:41			0.23
W3	WEIR	96.16	0	01:50			0.21

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C01	1.00	0.02	0.17	0.00	0.81	0.00	0.00	0.00	0.95	0.00
C02	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
C03	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.94	0.00
C04	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
C05	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.81	0.00
C06	1.00	0.02	0.00	0.00	0.55	0.00	0.00	0.43	0.02	0.00
C07	1.00	0.03	0.00	0.00	0.12	0.00	0.00	0.86	0.00	0.00
C08	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
C09	1.00	0.29	0.08	0.00	0.63	0.00	0.00	0.00	0.96	0.00
C10	1.00	0.29	0.00	0.00	0.58	0.00	0.00	0.13	0.08	0.00
C11	1.00	0.22	0.15	0.00	0.64	0.00	0.00	0.00	0.95	0.00
C12	1.00	0.13	0.09	0.00	0.78	0.00	0.00	0.00	0.93	0.00
C13	1.00	0.02	0.11	0.00	0.87	0.00	0.00	0.00	0.96	0.00
C14	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.94	0.00
C15	1.00	0.02	0.00	0.00	0.58	0.00	0.00	0.40	0.16	0.00
C16	1.00	0.02	0.00	0.00	0.01	0.00	0.00	0.97	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.39	0.59	0.00	0.00	0.67	0.00
C18	1.00	0.02	0.26	0.00	0.72	0.00	0.00	0.00	0.95	0.00
C19	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.95	0.00
C20	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.61	0.00
C21	1.00	0.04	0.00	0.00	0.62	0.00	0.00	0.34	0.00	0.00
C22	1.00	0.03	0.00	0.00	0.07	0.01	0.00	0.90	0.01	0.00
C23	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.58	0.00

```
************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Wed May 27 14:11:30 2020
Analysis ended on:  Wed May 27 14:11:32 2020
Total elapsed time: 00:00:02
```

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM BETA VERSION 7.2.2785
---------------------------------------------------------------

This is a *BETA* version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                 05/04/2020 00:00:00
Simulation end time:                   05/05/2020 00:00:00
Runoff wet weather time steps:         300 seconds
Report time steps:                     60 seconds
Number of data points:                 1441


*****************************
Unit Hydrographs Runoff Method
*****************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Pe (min)
U-4	Nash IUH	Design_Storms	0.32	10	6.67	38.33
U-2e	Nash IUH	Design_Storms	0.48	12	8	47
U-2c	Nash IUH	Design_Storms	4.34	18.6	12.4	82.6
U-2a	Nash IUH	Design_Storms	0.73	11.9	7.93	47.07
U-2b	Nash IUH	Design_Storms	2.06	15.6	10.4	64.6
U-2d	Nash IUH	Design_Storms	0.83	13.5	9	56
U-3b	Nash IUH	Design_Storms	1.63	18	12	73
U-3d	Nash IUH	Design_Storms	0.62	13	8.67	51.33
U-3c	Nash IUH	Design_Storms	2.4	15.2	10.13	64.87
U-3a	Nash IUH	Design_Storms	0.83	13.5	9	56
U-1c	Nash IUH	Design_Storms	1.52	19.8	13.2	76.8
U-1a	Nash IUH	Design_Storms	0.24	22.9	15.27	69.73
U-1b	Nash IUH	Design_Storms	0.81	22.7	15.13	79.87
U-1d	Nash IUH	Design_Storms	0.92	18.6	12.4	72.6

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
U-4	71.667	40.031	31.056	0.099	46.744	0.433
U-2e	71.667	33.035	38.271	0.184	80.7	0.534
U-2c	71.667	26.023	45.553	1.977	710.426	0.636
U-2a	71.667	26.023	45.205	0.33	152.051	0.631
U-2b	71.667	28.316	43.199	0.89	355.23	0.603
U-2d	71.667	26.023	45.373	0.377	160.023	0.633
U-3b	71.667	28.316	43.264	0.705	256.872	0.604
U-3d	71.667	30.963	40.419	0.251	106.086	0.564
U-3c	71.667	28.316	43.167	1.036	419.142	0.602
U-3a	71.667	30.963	40.458	0.336	140.696	0.565
U-1c	71.667	28.316	43.283	0.658	227.502	0.604
U-1a	71.667	40.988	30.596	0.073	21.837	0.427
U-1b	71.667	29.666	41.938	0.34	108.014	0.585
U-1d	71.667	29.666	41.924	0.386	136.087	0.585

```
WARNING ARM01: Computed UH depth for ARM subcatchment U-4 is not unity. Consider reducing wet weather time step.


EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
---------------------------------------------------------------

WARNING 02: maximum depth increased for Node DICB-2
WARNING 02: maximum depth increased for Node DICB-3

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 30
Number of links ........... 29
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
Design_Storms	C3hr-100yr	INTENSITY	10 min.

```
************
Node Summary
************
                                 Invert      Max.    Ponded    External
Name                Type          Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------
DICB-1              JUNCTION      90.00      1.20       0.0
DICB-2              JUNCTION      87.25      1.05       0.0
DICB-3              JUNCTION      88.60      1.07       0.0
J01                 JUNCTION      92.15      1.00       0.0
J02                 JUNCTION      91.37      1.00       0.0
J03                 JUNCTION      90.74      1.00       0.0
J04                 JUNCTION      89.95      1.00       0.0
J05                 JUNCTION      89.32      1.00       0.0
J06                 JUNCTION      88.85      1.00       0.0
J07                 JUNCTION      88.40      1.00       0.0
J08                 JUNCTION      87.64      1.00       0.0
J09                 JUNCTION      87.94      1.00       0.0
J10                 JUNCTION      88.33      1.00       0.0
J11                 JUNCTION      88.79      1.00       0.0
J12                 JUNCTION      89.46      1.00       0.0
J13                 JUNCTION      89.73      1.00       0.0
J14                 JUNCTION      91.65      1.00       0.0
J15                 JUNCTION      91.21      1.00       0.0
J16                 JUNCTION      90.65      1.00       0.0
J17                 JUNCTION      90.27      1.00       0.0
OGS-1               JUNCTION      89.93      2.33       0.0
OGS-2               JUNCTION      87.23      2.33       0.0
OGS-3               JUNCTION      88.56      2.33       0.0
RowSwale1           JUNCTION      89.78      1.00       0.0
RowSwale2           JUNCTION      87.15      1.00       0.0
RowSwale3           JUNCTION      88.43      1.00       0.0
OF1                 OUTFALL       89.76      1.00       0.0
OF2                 OUTFALL       86.98      1.00       0.0
OF3                 OUTFALL       87.87      1.54       0.0
OF4                 OUTFALL        0.00      0.00       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C01              J01              J02              CONDUIT          136.9    0.5698    0.0350
```

```
C02              J02              J03              CONDUIT          110.4    0.5707    0.0350
C03              J03              J04              CONDUIT          138.9    0.5688    0.0350
C04              J04              J05              CONDUIT          111.6    0.5645    0.0350
C05              J05              J06              CONDUIT           85.3    0.5510    0.0350
C06              J06              DICB-3           CONDUIT           30.1    0.5980    0.0350
C07              OGS-3            RowSwale3        CONDUIT           15.0    0.5333    0.0130
C08              RowSwale3        OF3              CONDUIT            4.2    0.4762    0.0350
C09              J07              J08              CONDUIT           76.3    0.9961    0.0350
C10              J08              DICB-2           CONDUIT           34.0    1.0001    0.0350
C11              J13              J12              CONDUIT           55.7    0.4847    0.0350
C12              J12              J11              CONDUIT           83.0    0.8073    0.0350
C13              J11              J10              CONDUIT           55.5    0.8289    0.0350
C14              J10              J09              CONDUIT           80.6    0.4839    0.0350
C15              J09              DICB-2           CONDUIT          129.3    0.4950    0.0350
C16              OGS-2            RowSwale2        CONDUIT            5.5    0.5455    0.0130
C17              RowSwale2        OF2              CONDUIT            3.0    5.6758    0.0350
C18              J14              J15              CONDUIT           88.6    0.4966    0.0350
C19              J15              J16              CONDUIT          112.3    0.4987    0.0350
C20              J16              J17              CONDUIT           77.3    0.4916    0.0350
C21              J17              DICB-1           CONDUIT            9.9    0.7071    0.0350
C22              OGS-1            RowSwale1        CONDUIT           16.0    0.6250    0.0130
C23              RowSwale1        OF1              CONDUIT            5.2    0.3846    0.0350
OR1              DICB-1           OGS-1            ORIFICE
OR2              DICB-2           OGS-2            ORIFICE
OR3              DICB-3           OGS-3            ORIFICE
W1               DICB-1           RowSwale1        WEIR
W2               DICB-2           RowSwale2        WEIR
W3               DICB-3           RowSwale3        WEIR


*********************
Cross Section Summary
*********************
                                  Full      Full      Hyd.      Max.   No. of      Full
Conduit          Shape           Depth      Area      Rad.     Width  Barrels      Flow
-------------------------------------------------------------------------------------
C01              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1   7676.85
C02              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1   7682.87
C03              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1   7670.08
C04              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1   7641.45
C05              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1   7549.39
C06              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1   7864.86
C07              CIRCULAR         0.25      0.05      0.06      0.25        1     43.43
C08              TRIANGULAR       1.00      3.00      0.47      6.00        1   3597.77
C09              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1  10150.55
C10              TRAPEZOIDAL      1.00      5.00      0.60      8.00        1  10170.56
```

C11	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7080.94
C12	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	9137.76
C13	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	9259.21
C14	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7074.59
C15	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7155.29
C16	CIRCULAR	0.25	0.05	0.06	0.25	1	43.92
C17	TRIANGULAR	1.00	3.00	0.47	6.00	1	12420.90
C18	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7167.15
C19	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7181.93
C20	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	7130.81
C21	TRAPEZOIDAL	1.00	5.00	0.60	8.00	1	8552.06
C22	CIRCULAR	0.25	0.05	0.06	0.25	1	47.02
C23	TRIANGULAR	1.00	3.00	0.47	6.00	1	3233.37

```
**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

***************
Analysis Options
***************
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 05/04/2020 00:00:00
Ending Date ..... 05/05/2020 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 4
Head Tolerance ..... 0.001500 m
```

```
*************************        Volume        Volume
Flow Routing Continuity       hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .....          0.000         0.000
Wet Weather Inflow .....          0.000         0.000
Groundwater Inflow .....          0.000         0.000
RDII Inflow ............          0.000         0.000
External Inflow ........          0.764         7.639
External Outflow .......          0.764         7.641
Flooding Loss ..........          0.000         0.000
Evaporation Loss .......          0.000         0.000
Exfiltration Loss ......          0.000         0.000
Initial Stored Volume ....        0.000         0.000
Final Stored Volume ......        0.000         0.000
Continuity Error (%) .....       -0.028

**************************
Time-Step Critical Elements
**************************
Link C17 (63.52%)
Link C23 (4.15%)

*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.

************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     2.53 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.02

******************
Node Depth Summary
******************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
DICB-1	JUNCTION	0.62	1.17	91.17	0 01:33	1.17
DICB-2	JUNCTION	0.44	1.02	88.27	0 01:24	1.02
DICB-3	JUNCTION	0.47	1.04	89.64	0 01:27	1.04
J01	JUNCTION	0.02	0.12	92.27	0 01:20	0.12
J02	JUNCTION	0.03	0.22	91.59	0 01:23	0.22
J03	JUNCTION	0.05	0.33	91.07	0 01:21	0.33
J04	JUNCTION	0.05	0.32	90.27	0 01:25	0.32
J05	JUNCTION	0.09	0.36	89.68	0 01:27	0.36
J06	JUNCTION	0.32	0.79	89.64	0 01:27	0.79
J07	JUNCTION	0.01	0.08	88.48	0 01:17	0.08
J08	JUNCTION	0.22	0.63	88.27	0 01:24	0.63
J09	JUNCTION	0.09	0.42	88.36	0 01:24	0.42
J10	JUNCTION	0.07	0.42	88.75	0 01:21	0.42
J11	JUNCTION	0.03	0.23	89.02	0 01:21	0.23
J12	JUNCTION	0.03	0.23	89.69	0 01:20	0.23
J13	JUNCTION	0.02	0.13	89.86	0 01:16	0.13
J14	JUNCTION	0.02	0.13	91.78	0 01:25	0.13
J15	JUNCTION	0.04	0.22	91.43	0 01:25	0.22
J16	JUNCTION	0.19	0.52	91.17	0 01:33	0.52
J17	JUNCTION	0.44	0.90	91.17	0 01:33	0.90
OGS-1	JUNCTION	0.08	0.33	90.26	0 01:33	0.33
OGS-2	JUNCTION	0.12	0.39	87.62	0 01:24	0.39
OGS-3	JUNCTION	0.10	0.38	88.94	0 01:20	0.38
RowSwale1	JUNCTION	0.14	0.47	90.25	0 01:33	0.47
RowSwale2	JUNCTION	0.11	0.44	87.59	0 01:24	0.44
RowSwale3	JUNCTION	0.14	0.49	88.92	0 01:27	0.49
OF1	OUTFALL	0.14	0.47	90.23	0 01:33	0.47
OF2	OUTFALL	0.11	0.44	87.42	0 01:24	0.44
OF3	OUTFALL	0.00	0.00	87.87	0 00:00	0.00
OF4	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
DICB-1	JUNCTION	0.00	438.79	0 01:33	0	1.46	-0.007
DICB-2	JUNCTION	0.00	1433.73	0 01:23	0	3.8	0.364
DICB-3	JUNCTION	0.00	851.88	0 01:27	0	2.33	-0.022
J01	JUNCTION	140.69	140.69	0 01:20	0.336	0.336	-0.158
J02	JUNCTION	256.87	395.33	0 01:20	0.705	1.04	0.103
J03	JUNCTION	419.13	787.58	0 01:21	1.04	2.08	-0.184
J04	JUNCTION	0.00	798.54	0 01:23	0	2.08	0.072
J05	JUNCTION	106.08	876.96	0 01:24	0.25	2.33	-0.304
J06	JUNCTION	0.00	856.36	0 01:26	0	2.34	0.401
J07	JUNCTION	80.70	80.70	0 01:15	0.184	0.184	-1.080
J08	JUNCTION	160.02	476.78	0 01:16	0.376	0.588	0.406
J09	JUNCTION	0.00	1207.83	0 01:22	0	3.2	-0.401
J10	JUNCTION	710.42	1203.76	0 01:21	1.98	3.2	-0.107
J11	JUNCTION	0.00	497.49	0 01:20	0	1.22	0.059
J12	JUNCTION	355.22	499.62	0 01:20	0.89	1.22	-0.037
J13	JUNCTION	152.05	152.05	0 01:15	0.33	0.33	-0.047
J14	JUNCTION	136.09	136.09	0 01:25	0.386	0.386	-0.047
J15	JUNCTION	227.50	363.48	0 01:25	0.658	1.04	-0.553
J16	JUNCTION	108.01	466.92	0 01:25	0.34	1.39	0.149
J17	JUNCTION	21.84	445.53	0 01:31	0.0734	1.46	0.285
OGS-1	JUNCTION	0.00	14.81	0 01:23	0	0.389	-0.001
OGS-2	JUNCTION	0.00	42.18	0 01:16	0	0.778	-0.000
OGS-3	JUNCTION	0.00	22.73	0 01:20	0	0.446	-0.007
RowSwale1	JUNCTION	0.00	438.75	0 01:33	0	1.46	0.001
RowSwale2	JUNCTION	0.00	1404.99	0 01:24	0	3.76	0.001
RowSwale3	JUNCTION	0.00	851.64	0 01:27	0	2.33	0.000
OF1	OUTFALL	0.00	438.74	0 01:33	0	1.46	0.000
OF2	OUTFALL	0.00	1405.01	0 01:24	0	3.76	0.000
OF3	OUTFALL	0.00	851.64	0 01:27	0	2.33	0.000
OF4	OUTFALL	46.74	46.74	0 01:15	0.0993	0.0993	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
OGS-1	JUNCTION	0.43	0.082	1.998
OGS-2	JUNCTION	0.59	0.136	1.944
OGS-3	JUNCTION	0.53	0.129	1.951

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	70.61	74.40	438.74	1.456
OF2	64.01	235.15	1405.01	3.758
OF3	71.71	127.95	851.64	2.327
OF4	31.92	11.44	46.74	0.099
System	59.56	448.94	46.74	7.641

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C01	CONDUIT	138.74	0 01:20	0.34	0.02	0.17
C02	CONDUIT	385.77	0 01:23	0.51	0.05	0.27
C03	CONDUIT	798.54	0 01:23	0.83	0.10	0.32
C04	CONDUIT	787.04	0 01:25	0.79	0.10	0.34
C05	CONDUIT	856.36	0 01:26	0.66	0.11	0.58
C06	CONDUIT	851.88	0 01:27	0.29	0.11	0.88
C07	CONDUIT	23.52	0 01:20	0.93	0.54	1.00
C08	CONDUIT	851.64	0 01:27	1.32	0.24	0.46
C09	CONDUIT	79.58	0 01:17	0.29	0.01	0.35
C10	CONDUIT	261.68	0 01:20	0.34	0.03	0.80
C11	CONDUIT	149.90	0 01:16	0.33	0.02	0.18
C12	CONDUIT	497.49	0 01:20	0.81	0.05	0.23
C13	CONDUIT	495.04	0 01:21	0.51	0.05	0.33
C14	CONDUIT	1207.83	0 01:22	0.89	0.17	0.42
C15	CONDUIT	1195.11	0 01:24	0.42	0.17	0.69
C16	CONDUIT	42.09	0 02:23	1.17	0.96	1.00
C17	CONDUIT	1405.01	0 01:24	2.40	0.11	0.44
C18	CONDUIT	135.98	0 01:25	0.32	0.02	0.17
C19	CONDUIT	359.38	0 01:25	0.56	0.05	0.36
C20	CONDUIT	424.08	0 01:31	0.43	0.06	0.71
C21	CONDUIT	438.79	0 01:33	0.26	0.05	0.93
C22	CONDUIT	14.77	0 02:31	0.84	0.31	1.00
C23	CONDUIT	438.74	0 01:33	0.65	0.14	0.47
OR1	ORIFICE	14.81	0 01:23			1.00
OR2	ORIFICE	42.18	0 01:16			1.00
OR3	ORIFICE	22.73	0 01:20			1.00
W1	WEIR	424.84	0 01:33			0.83
W2	WEIR	1365.29	0 01:24			0.86
W3	WEIR	830.86	0 01:27			0.85

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C01	1.00	0.01	0.15	0.00	0.84	0.00	0.00	0.00	0.96	0.00
C02	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
C03	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.94	0.00
C04	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
C05	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.79	0.00
C06	1.00	0.02	0.00	0.00	0.60	0.00	0.00	0.38	0.02	0.00
C07	1.00	0.02	0.00	0.00	0.29	0.00	0.00	0.69	0.00	0.00
C08	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C09	1.00	0.25	0.07	0.00	0.68	0.00	0.00	0.00	0.97	0.00
C10	1.00	0.25	0.00	0.00	0.63	0.00	0.00	0.12	0.08	0.00
C11	1.00	0.19	0.13	0.00	0.68	0.00	0.00	0.00	0.96	0.00
C12	1.00	0.11	0.08	0.00	0.81	0.00	0.00	0.00	0.94	0.00
C13	1.00	0.01	0.10	0.00	0.89	0.00	0.00	0.00	0.97	0.00
C14	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.94	0.00
C15	1.00	0.02	0.00	0.00	0.63	0.00	0.00	0.35	0.17	0.00
C16	1.00	0.01	0.00	0.00	0.17	0.00	0.00	0.82	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.35	0.64	0.00	0.00	0.70	0.00

C18	1.00	0.01	0.23	0.00	0.76	0.00	0.00	0.00	0.96	0.00
C19	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.95	0.00
C20	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.61	0.00
C21	1.00	0.03	0.00	0.00	0.67	0.00	0.00	0.31	0.00	0.00
C22	1.00	0.02	0.00	0.00	0.29	0.00	0.00	0.69	0.04	0.00
C23	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.57	0.00

****
Conduit Surcharge Summary
****

		Hours Full		Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
C07	0.53	0.53	0.80	0.01	0.01
C16	0.59	0.59	0.60	0.01	0.01
C22	0.43	0.43	0.82	0.01	0.01

Analysis begun on: Wed May 27 14:14:25 2020
Analysis ended on: Wed May 27 14:14:27 2020
Total elapsed time: 00:00:02

NOVATECH
Engineers, Planners & Landscape Architects

M E M O R A N D U M

DATE: **SEPTEMBER 4, 2020**

TO: **ALEX MCAULEY**

FROM: **CONRAD STANG / MELANIE SCHROEDER**

RE: **COPART FACILITY – 300 SOMME STREET**
SWM MODELLING APPROACH

CC: **MIKE PETEPIECE**

PROJECT NO: 119181

This memorandum provides additional information on the stormwater management (SWM) modelling approach that was provided in support of the following documents:

Copart Facility Servicing and Stormwater Management Report
(Novatech, May 28, 2020)

Supplemental SWM Modelling Information Memorandum
(Novatech, May 27, 2020)

Specifically, this memorandum provides a response to the following review comment (No. 5) provided on July 20, 2020 by South Nation Conservation (SNC).

5. *It is noted that the report uses the "NASH" command to calculate flows. Typically, areas with imperviousness values greater than 20% use the "STAND" command. Review and revise accordingly.*

The proposed storm drainage and stormwater management system for the Copart Facility (300 Somme Street) was analysed using Alternative Runoff Methods in the PCSWMM hydrologic / hydraulic modelling suite. The PCSWMM model parameters and results are provided in the May 27, 2020 memorandum.

SWM MODELLING APPROACH (NASH IUH)

The SWM analysis utilized the NASH Instantaneous Unit Hydrograph (IUH) approach based on the SCS Curve Number (CN) Method to transform rainfall to runoff. This methodology is suitable for runoff conditions that predominantly consists of sheet drainage and open channels.

For the Copart Facility, the CN values were estimated by area-weighting the reference CN values shown in Table 1. The layout of the proposed land uses / SCS Curve Number parameters that were used to area-weight the CN values for each subcatchment are attached (Figure 1).

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Table 1: SCS Curve Numbers (CN)

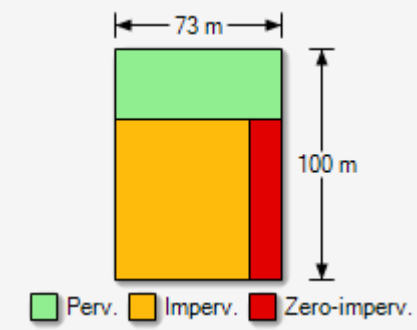
Land Use	SCS Curve Number (HSG 'C')
Building	100
Pavement	98
Gravel	89
Grass	74

Per the Geotechnical Investigation (Gemtec, April 24, 2020), the surficial soils consist of silty-sand / fill material. The CN values provided in Table 1 are for hydrologic soil group (HSG) type 'C' based on the attached reference TR-55 CN tables.

STANDHYD ROUTINE

The STANDHYD routine separates the subcatchment into two (2) or three (3) distinctive areas. In PCSWMM these areas are represented as follows:

- Impervious areas (with minimal depression storage)
- Impervious areas (with no initial depression storage – zero imperv.)
- Pervious areas (with depression storage)



A gravel surface is similar to a pervious area with minimal depression storage. The recommended runoff coefficient (0.70) for gravel does not equate to an equivalent impervious area of 71.4%, using the methodologies presented in the City of Ottawa Sewer Design Guidelines.

Gravel surfaces are not strictly equivalent to impervious areas, such as building rooftops and asphalt / concrete surfaces. The permeability of gravel, even compacted gravel, is higher than asphalt / concrete. As such, gravel surfaces will promote infiltration better than typical impervious areas.

The NASH IUH was used in the SWM analysis as the SCS Curve Number method better represents the parameters of the predominantly compacted gravel land use versus dividing the land use into equivalent impervious and pervious areas (i.e. STANDHYD).

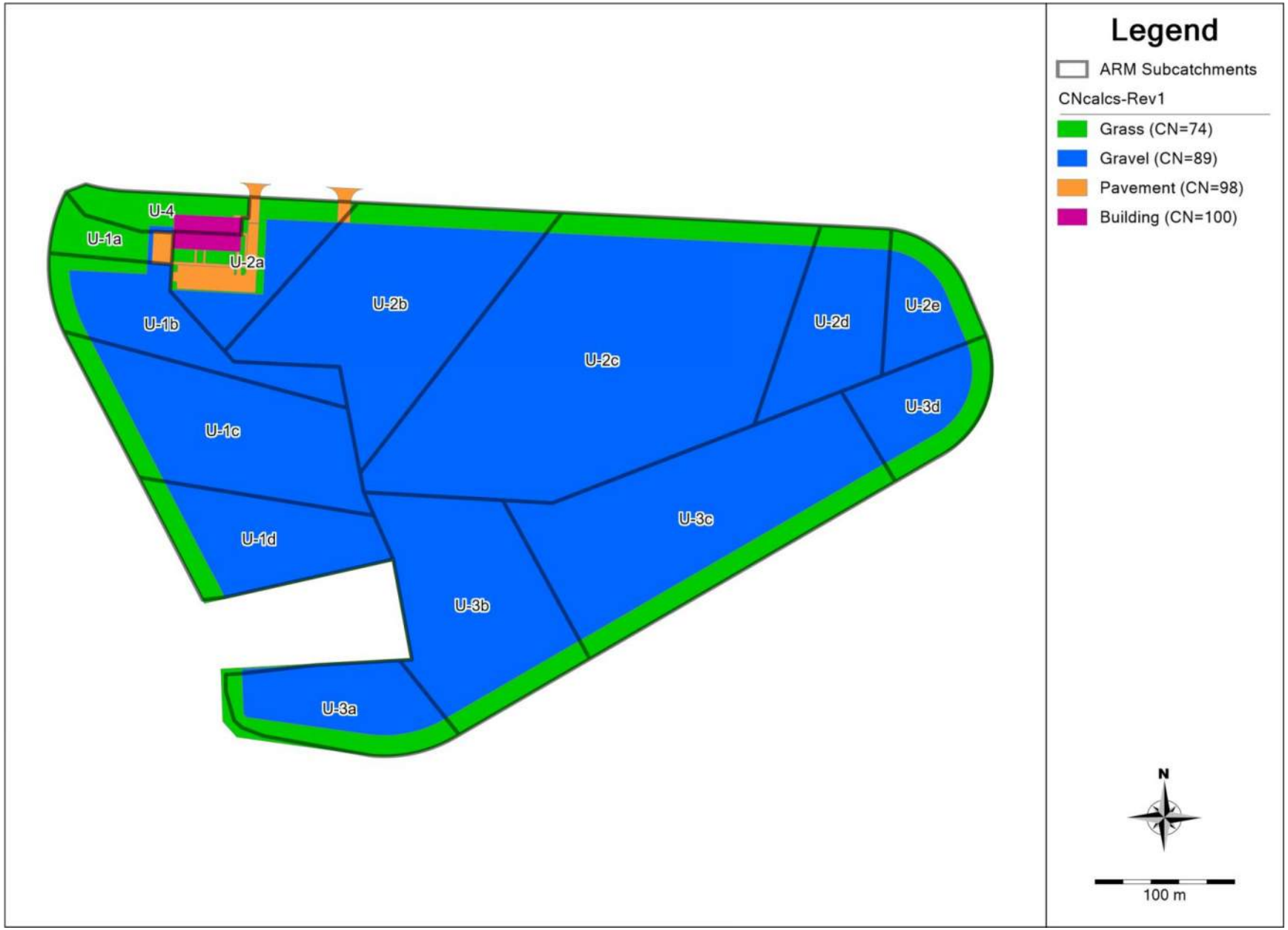
The actual impervious areas of the proposed development (shown in Figure 1) consist of 2% of the total area. This is less than the recommended 20% imperviousness threshold for using the STANDHYD routines.

ATTACHMENTS:

- Figure 1 – Proposed Land Use / SCS Curve Number Parameters
- Reference Curve Number Tables (TR-55)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Copart Facility – 300 Somme Street (119181)
Figure 1 – Proposed Land Use / SCS Curve Number (CN) Parameters



Date: 2020-09-04
\\novatech2018\nova2\2019\119181\DATA\Correspondence\Memos\20200904-SWM Model Approach\Attachments\CN Figure.docx

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2/]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 6: Calculation of Runoff Coefficients

Area ID	Area (ha)	Soft Surface Area (C=0.2)	Gravel Surface Area (C=0.7)	Hard Surface Area (C=0.9)	"C" Factor	"C" Factor Total Site
U-1	3.48	0.66	2.79	0.03	0.61	**0.62**
U-2	8.45	0.90	7.32	0.22	0.65	
U-3	5.48	0.97	4.51	0	0.61	
U-4	0.32	0.26	0	0.06	0.33	

PROJECT #: 119181
PROJECT NAME: COPART - 300 Somme St.
LOCATION: 5123 Hawthorne Rd, Block 6

NOVATECH
Engineers, Planners & Landscape Architects

DATE PREPARED: NOV.9/20

Table 4: DRIVEWAY CULVERT SIZING (PRIVATE SWALE)

Post-Development Runoff Coefficient "C"

Area	Surface	Ha	"C"	C_{avg}
Total	Hard	0.222	0.90	0.63
0.918	Gravel	0.535	0.65	
	Soft	0.161	0.20	

Equations:

Runoff Coefficient Equation

$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

* Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event

Post-Development Uncontrolled Flow

Area (ha)	C_{avg}	Tc (min)	$Q_{5\ Year}$ (L/s)
0.918	0.63	10	**167.9**

Time of Concentration	Tc=	10	min
Intensity (5 Year Event)	I_5=	104.19	mm/hr

Flow Equation
Q = 2.78 x C x I x A
Where:
C is the runoff coefficient
I is the rainfall intensity, City of Ottawa IDF
A is the total drainage area

2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$
5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$

Time of Concentration (Uplands Overland Flow Method)

Channel Flow						Overall	
Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (Uplands) (m/s)	Travel Time (min)	Time of Concentration (min)	Time to Peak (min)
171	**93.15**	**89.54**	**2.11%**	**0.67**	**4**	**4**	**3**

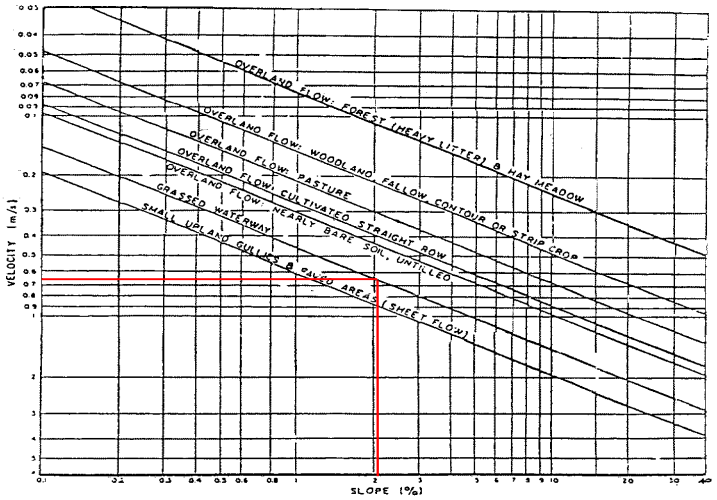


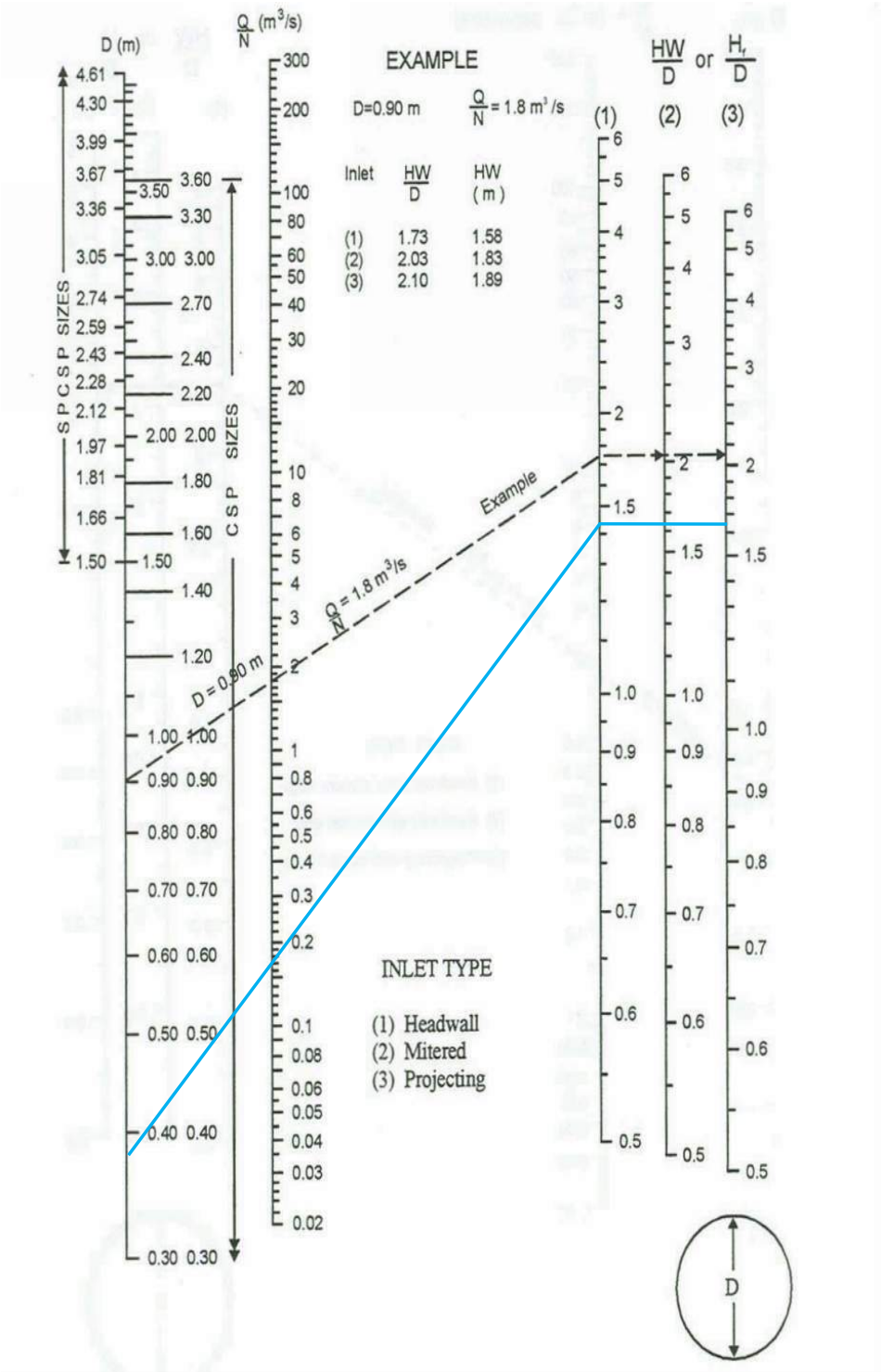
Figure A.5.2: Upland Method for Estimating Time of Concentration
(SCS National Engineering Handbook, 1971)

PROJECT #: 119181
PROJECT NAME: COPART - 300 Somme St.
LOCATION: 5123 Hawthorne Rd, Block 6

NOVATECH
Engineers, Planners & Landscape Architects

DATE PREPARED: NOV.9/20

STORMWATER CALCULATIONS - PROPOSED 400mmØ DRIVEWAY CULVERT (PRIVATE SWALE)
MTO Drainage Management Manual
Design Chart 2.32: Inlet Control: Circular Culverts (Source: Herr 1997)



PROJECT #: 119181
PROJECT NAME: COPART - 300 Somme St.
LOCATION: 5123 Hawthorne Rd, Block 6

DATE PREPARED: NOV.9/20

Table 4: DRIVEWAY CULVERT SIZING (ROADSIDE DITCH)

Post-Development Runoff Coefficient "C"

Area	Surface	Ha	"C"	C_{avg}
Total	Hard	0.238	0.90	0.66
5.528	Gravel	5.290	0.65	

Post-Development Uncontrolled Flow

Area (ha)	C_{avg}	Tc (min)	$Q_{5\ Year}$ (L/s)
5.528	0.66	25	**614.7**

Time of Concentration	Tc=	25	min
Intensity (5 Year Event)	I_5=	60.54	mm/hr

Equations:

Runoff Coefficient Equation

$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

* Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event

Flow Equation

$Q = 2.78 \times C \times I \times A$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$

Time of Concentration (Uplands Overland Flow Method)

Channel Flow						Overall	
Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (Uplands) (m/s)	Travel Time (min)	Time of Concentration (min)	Time to Peak (min)
560	**92.84**	**89.3**	**0.63%**	**0.37**	**25**	**25**	**17**

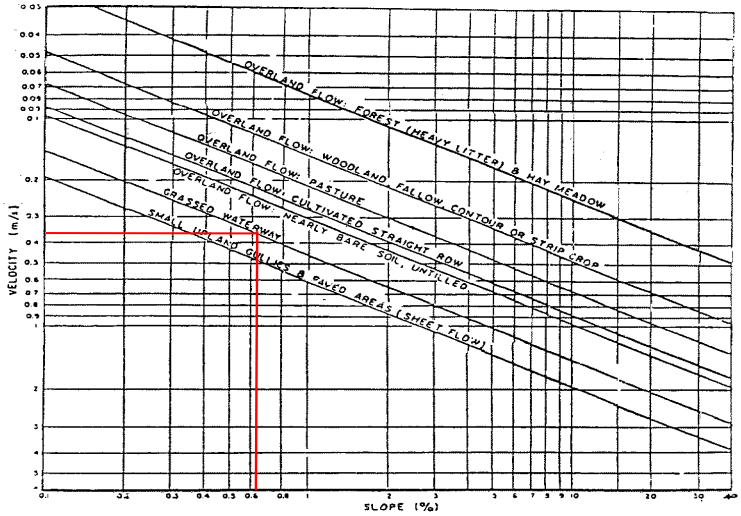


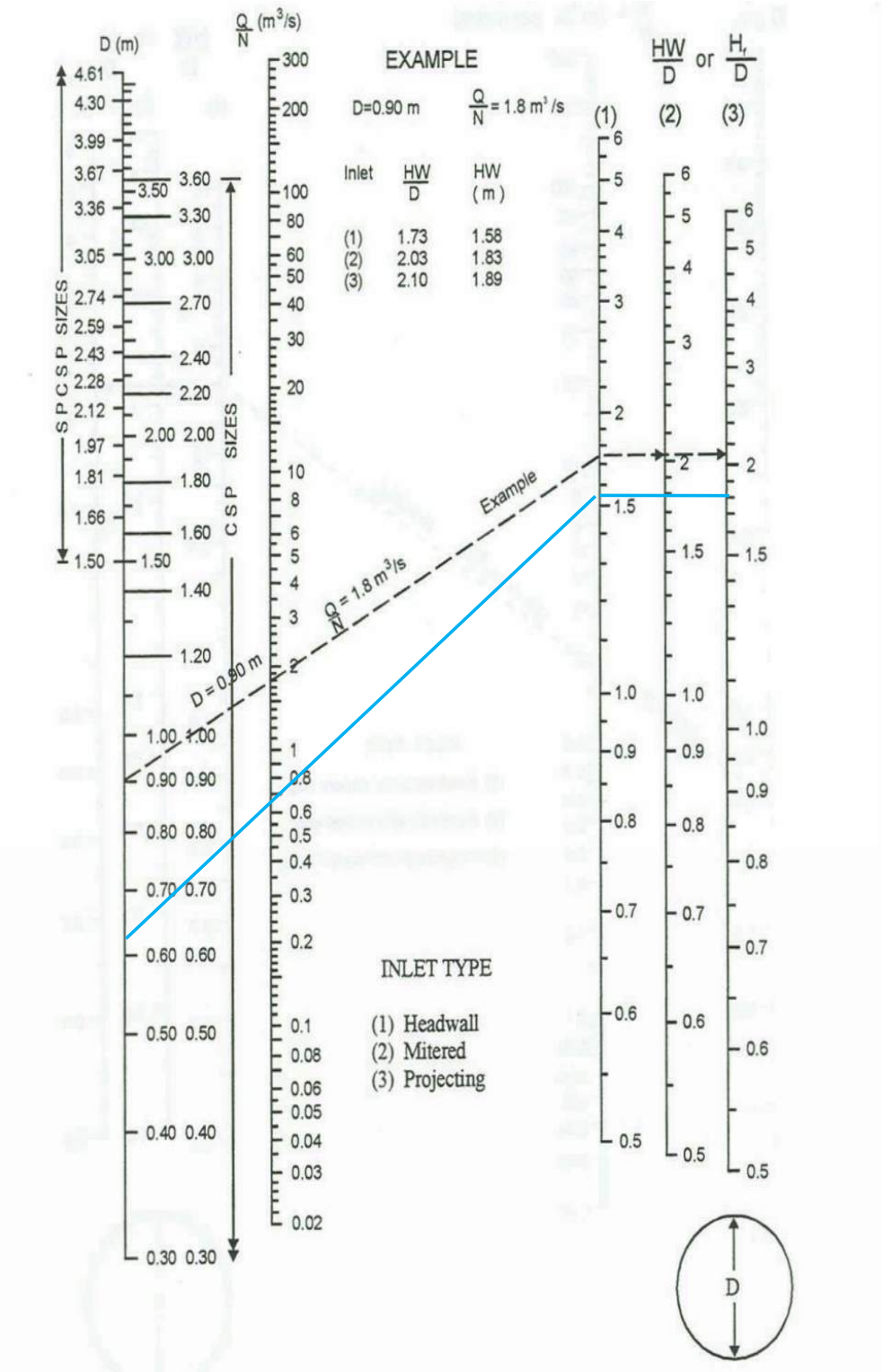
Figure A.5.2: Upland Method for Estimating Time of Concentration
(SCS National Engineering Handbook, 1971)

PROJECT #: 119181
PROJECT NAME: COPART - 300 Somme St.
LOCATION: 5123 Hawthorne Rd, Block 6

NOVATECH
Engineers, Planners & Landscape Architects

DATE PREPARED: NOV.9/20

STORMWATER CALCULATIONS - PROPOSED 600mmØ DRIVEWAY CULVERTS (ROADSIDE DITCH)
MTO Drainage Management Manual
Design Chart 2.32: Inlet Control: Circular Culverts (Source: Herr 1997)



APPENDIX E
OGS Units

ECHELON ENVIRONMENTAL

Phone: 905-948-0000
Fax: 905-948-0577
info@echelonenvironmental.ca
www.echelonenvironmental.ca

Estimate of Annual Grit Collection

Engineer:	Novatech	**Project:**	5123 Hawthorne Road OGS 1
Contact:	Alex McAuley, P.Eng	**CDS Model:**	20_15_5
Report Date:	27-May-20	**OGS Location:**	Ottawa, ON

Area :	3.48	ha
Runoff Coefficient :	0.61	

Assumptions:

1. Annual Rainfall	943.4	mm	
2. Typical Grit Concentration	120	mg/l	
3. Apparent Grit Density	1.6	kg/l	(estimated)
4. Grit Capture Efficiency	80%		

Runoff Volume = Area x Rainfall Depth x Runoff Coefficient = 20,026 cu.m

Grit Collected = Grit Concentration x Runoff Volume x Grit Capture Efficiency = 1,923 kg

Grit Volume = Mass / Apparent Density = 1,202 litres or 1.202 cu.m

30% Upstream Swale Pretreatment Credit = 1,202 x 70% 0.841 cu.m

Therefore it can be expected that this site will generate approximately 0.841cu.m of grit annually.

Sump Capacity of CDS unit = 1.668 cu.m

Therefore the design sump capacity will accommodate a cleaning frequency of one time per 20 to 24 months.

CDS Average Annual Efficiency For TSS Removal & Total Annual Volume Treated

Project:	**5123 Hawthorne Road**		
Location:	**Ottawa, ON**		
Date:	**5/27/2020**		
By:	**PG**	**OGS ID:**	1 - Revision 2
PSD:	**FINE**	**Area:**	3.480 ha
CDS Model:	**PMSU20_15**	**C-Value**	0.61
CDS Design Flow:	**20 l/s**	**IDF Data:**	Ottawa, ON

Return Period		Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	4.69	92.94	25335	25335	**100.00**	4.69	4.69	0.00	100.00
2-M	0.17	6.17	91.05	33229	33229	**99.75**	6.17	6.17	0.00	100.00
3-M	0.25	7.39	89.49	39707	39707	**98.17**	7.39	7.39	0.00	100.00
4-M	0.33	8.47	88.09	45518	45518	**95.04**	8.47	8.47	0.00	100.00
5-M	0.42	9.28	87.03	49937	49937	**90.91**	9.28	9.28	0.00	100.00
6-M	0.50	10.09	85.96	54356	54356	**86.47**	10.09	10.09	0.00	100.00
7-M	0.58	10.68	85.19	57592	57592	**82.01**	10.68	10.68	0.00	100.00
8-M	0.67	11.27	84.41	60828	60828	**77.67**	11.27	11.27	0.00	100.00
9-M	0.75	11.86	83.63	64064	64064	**73.64**	11.86	11.86	0.00	100.00
10-M	0.83	12.31	83.03	66553	66553	**69.90**	12.31	12.31	0.00	100.00
11-M	0.92	12.76	82.43	69042	69042	**66.40**	12.76	12.76	0.00	100.00
1-Yr	1	13.20	81.83	71531	71531	**63.21**	13.20	13.20	0.00	100.00
2-Yr	2	16.68	77.10	91214	91214	**39.35**	16.68	16.68	0.00	100.00
5-Yr	5	19.83	72.71	109539	109540	**18.13**	19.83	19.82	0.01	100.00
10-Yr	10	22.33	67.18	118122	124442	**9.52**	22.33	19.82	2.50	94.92
25-Yr	25	24.89	60.11	119379	140109	**3.92**	24.89	19.82	5.07	85.20
50-Yr	50	27.54	53.96	119895	156654	**1.98**	27.54	19.82	7.72	76.53
100-Yr	100	27.29	54.50	119853	155045	**1.00**	27.29	19.82	7.47	77.30

Average Annual TSS Removal Efficiency [%]: **86.3** Ave. Ann. T. Volume [%]: **99.87%**

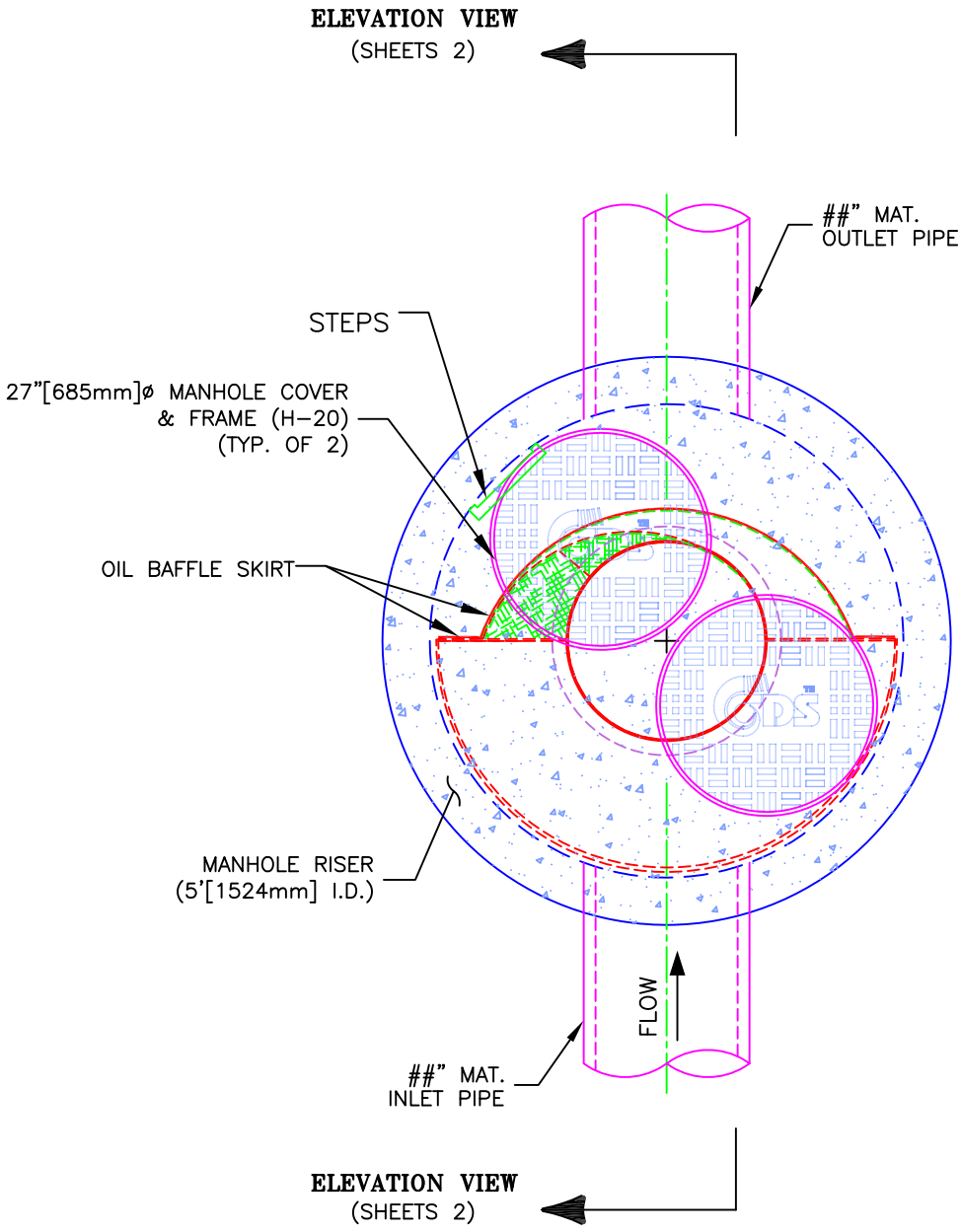
1 - CDS Efficiency based on testing conducted at the University of Central Florida

2 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES

PLAN VIEW

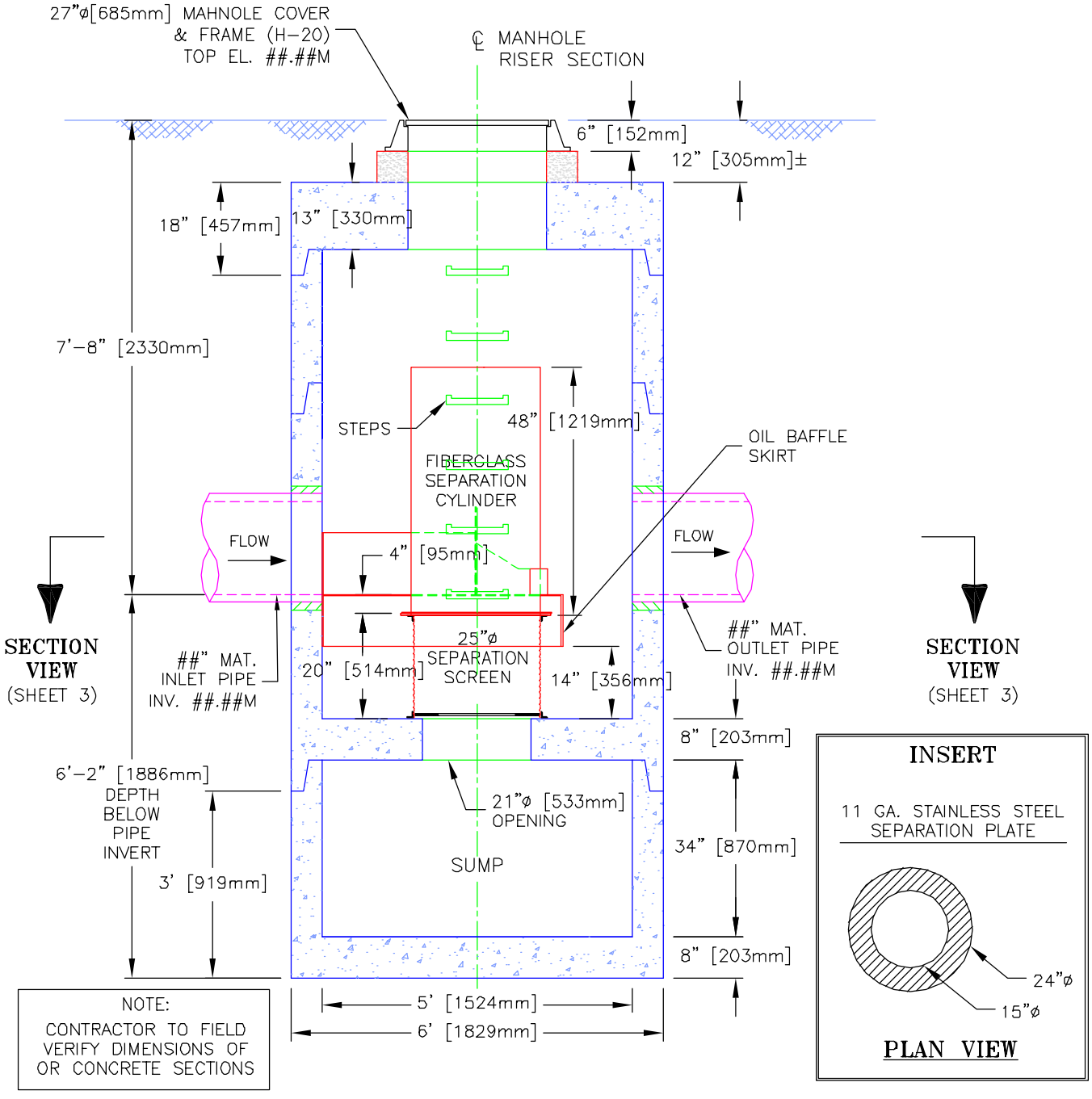


CDS MODEL PMSU20_15m, 0.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 200 Enterprise Drive, Scarborough, Maine 04074 Tel: (877) 907-8676 Fax: (207) 885-9825

ELEVATION VIEW



CDS MODEL PMSU20_15m, 0.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS

PROJECT NAME
CITY, STATE

JOB#	XX-##-###	SCALE 1" = 2.5'
DATE	##/##/##	SHEET 2
DRAWN	INITIALS	
APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 200 Enterprise Drive, Scarborough, Maine 04074 Tel: (877) 907-8676 Fax: (207) 885-9825

ECHELON ENVIRONMENTAL

Phone: 905-948-0000
Fax: 905-948-0577
info@echelonenvironmental.ca
www.echelonenvironmental.ca

Estimate of Annual Grit Collection

Engineer:	Novatech	**Project:**	5123 Hawthorne Road OGS 2
Contact:	Alex McAuley, P.Eng	**CDS Model:**	20_20_5 Ext. Sump.
Report Date:	27-May-20	**OGS Location:**	Ottawa, ON

Area :	8.45	ha
Runoff Coefficient :	0.65	

Assumptions:

1. Annual Rainfall	943.4	mm	
2. Typical Grit Concentration	120	mg/l	
3. Apparent Grit Density	1.6	kg/l	(estimated)
4. Grit Capture Efficiency	80%		

Runoff Volume = Area x Rainfall Depth x Runoff Coefficient = 51,816 cu.m

Grit Collected = Grit Concentration x Runoff Volume x Grit Capture Efficiency = 4,974 kg

Grit Volume = Mass / Apparent Density = 3,109 litres or 3.109 cu.m

30% Upstream Swale Pretreatment Credit = 3,109 x 70% 2.176 cu.m

Therefore it can be expected that this site will generate approximately 2.176cu.m of grit annually.

Sump Capacity of CDS unit = 2.224 cu.m

Therefore the design sump capacity will accommodate a cleaning frequency of one time per 12 to 16 months.

CDS Average Annual Efficiency For TSS Removal & Total Annual Volume Treated

Project:	**5123 Hawthorne Road**		
Location:	**Ottawa, ON**		
Date:	**5/27/2020**		
By:	**PG**	**OGS ID:**	2
PSD:	**FINE**	**Area:**	8.330 ha
CDS Model:	**PMSU20_20**	**C-Value**	0.65
CDS Design Flow:	**31 l/s**	**IDF Data:**	Ottawa, ON

Return Period	Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	9.62	91.45	48917	48917	**100.00**	9.62	9.62	0.00	100.00
2-M	0.17	13.62	88.30	69325	69325	**99.75**	13.62	13.62	0.00	100.00
3-M	0.25	16.40	86.07	83734	83734	**98.17**	16.40	16.40	0.00	100.00
4-M	0.33	18.91	84.05	96873	96873	**95.04**	18.91	18.91	0.00	100.00
5-M	0.42	20.48	82.76	105237	105237	**90.91**	20.48	20.48	0.00	100.00
6-M	0.50	22.06	81.47	113600	113600	**86.47**	22.06	22.06	0.00	100.00
7-M	0.58	24.14	79.74	124934	124934	**82.01**	24.14	24.14	0.00	100.00
8-M	0.67	26.23	78.00	136267	136267	**77.67**	26.23	26.23	0.00	100.00
9-M	0.75	28.31	76.26	147601	147601	**73.64**	28.31	28.31	0.00	100.00
10-M	0.83	32.32	71.18	160797	170526	**69.90**	32.32	31.15	1.17	95.50
11-M	0.92	36.33	66.10	173994	193452	**66.40**	36.33	31.15	5.18	91.01
1-Yr	1	40.33	61.02	187190	216377	**63.21**	40.33	31.15	9.18	86.51
2-Yr	2	42.03	58.38	187513	226510	**39.35**	42.03	31.15	10.88	82.78
5-Yr	5	42.22	58.09	187544	227661	**18.13**	42.22	31.15	11.07	82.38
10-Yr	10	42.22	58.09	187544	227661	**9.52**	42.22	31.15	11.07	82.38
25-Yr	25	43.47	56.28	187746	235206	**3.92**	43.47	31.15	12.33	79.82
50-Yr	50	42.48	57.71	187585	229188	**1.98**	42.48	31.15	11.33	81.85
100-Yr	100	43.06	56.86	187679	232716	**1.00**	43.06	31.15	11.91	80.65

Average Annual TSS Removal Efficiency [%]: **80.0** Ave. Ann. T. Volume [%]: **97.70%**

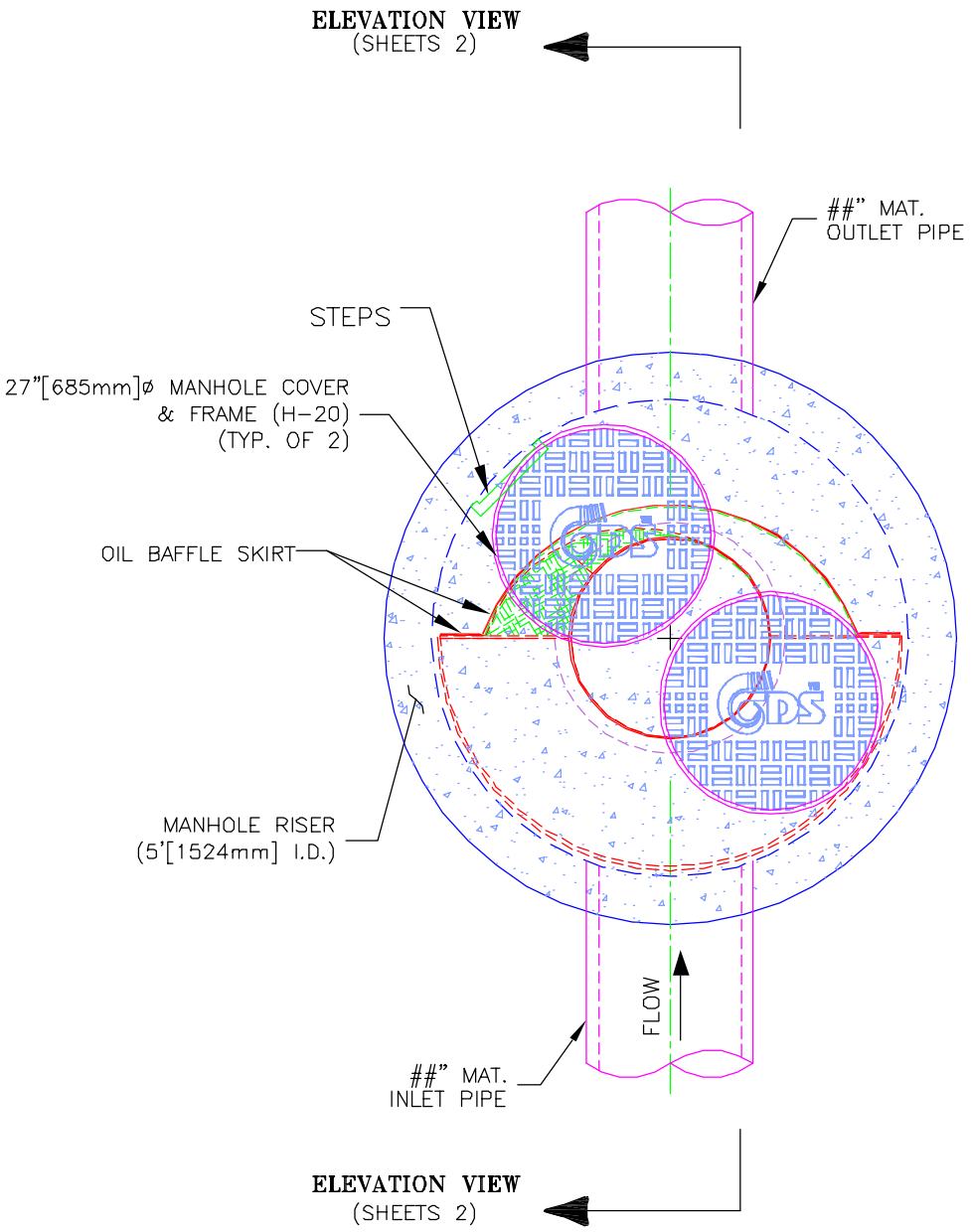
1 - CDS Efficiency based on testing conducted at the University of Central Florida

2 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES

PLAN VIEW

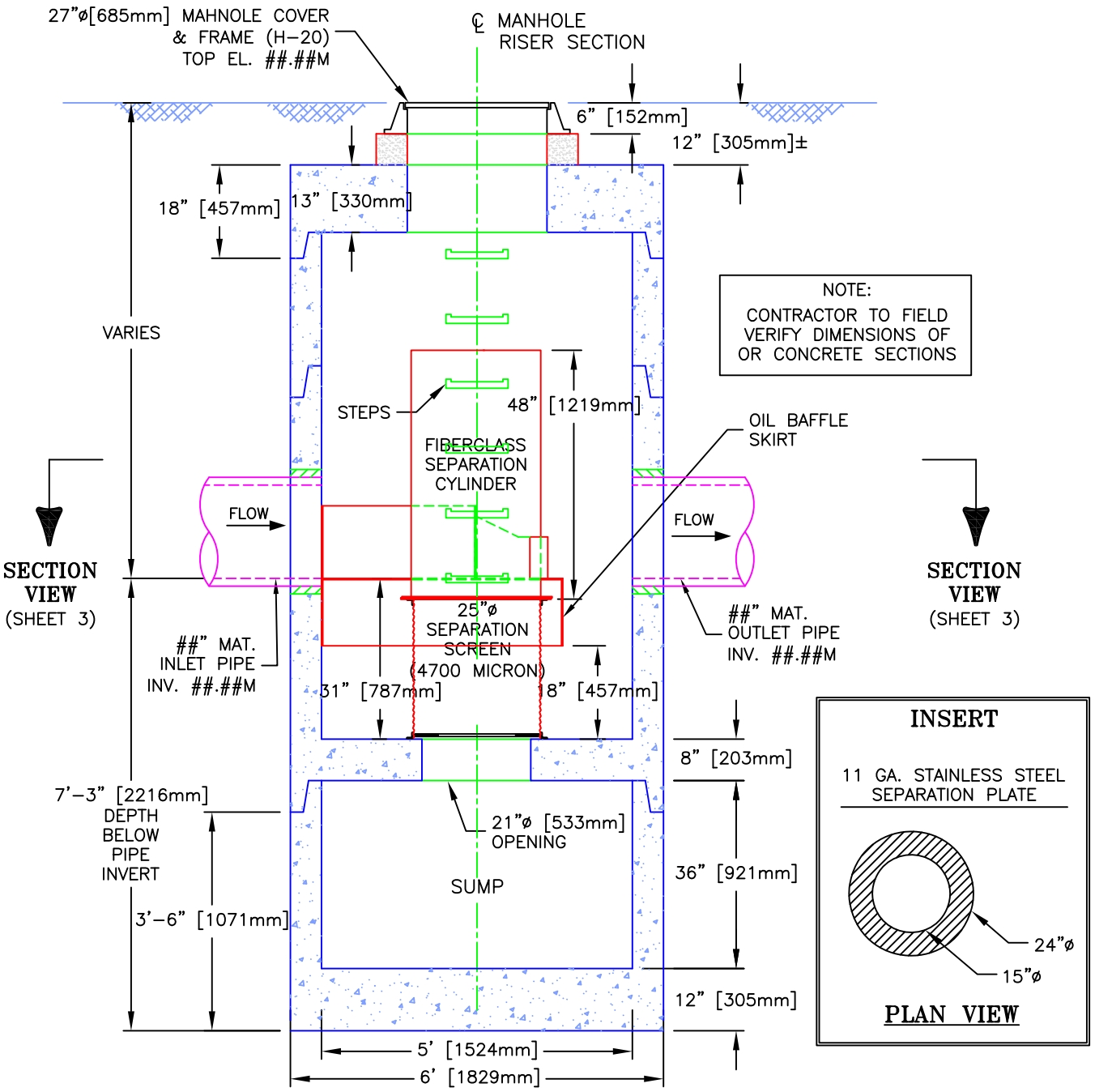


MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY
STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET
		DRAWN INITIALS	1
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

ELEVATION VIEW



MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2.5'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

ECHELON ENVIRONMENTAL

Phone: 905-948-0000
Fax: 905-948-0577
info@echelonenvironmental.ca
www.echelonenvironmental.ca

Estimate of Annual Grit Collection

Engineer:	Novatech	**Project:**	5123 Hawthorne Road OGS 3
Contact:	Alex McAuley, P.Eng	**CDS Model:**	20_15_5
Report Date:	27-May-20	**OGS Location:**	Ottawa, ON

Area :	5.48	ha
Runoff Coefficient :	0.61	

Assumptions:

1. Annual Rainfall	943.4	mm	
2. Typical Grit Concentration	120	mg/l	
3. Apparent Grit Density	1.6	kg/l	(estimated)
4. Grit Capture Efficiency	80%		

Runoff Volume = Area x Rainfall Depth x Runoff Coefficient = 31,536 cu.m

Grit Collected = Grit Concentration x Runoff Volume x Grit Capture Efficiency = 3,027 kg

Grit Volume = Mass / Apparent Density = 1,892 litres or 1.892 cu.m

30% Upstream Swale Pretreatment Credit = 1,892 x 70% 1.325 cu.m

Therefore it can be expected that this site will generate approximately 1.325cu.m of grit annually.

Sump Capacity of CDS unit = 1.668 cu.m

Therefore the design sump capacity will accommodate a cleaning frequency of one time per 16 to 20 months.

CDS Average Annual Efficiency For TSS Removal & Total Annual Volume Treated

Project:	**5123 Hawthorne Road**		
Location:	**Ottawa, ON**		
Date:	**5/27/2020**		
By:	**PG**	**OGS ID:**	3 - Revision 1
PSD:	**FINE**	**Area:**	5.480 ha
CDS Model:	**PMSU20_15**	**C-Value**	0.61
CDS Design Flow:	**20 l/s**	**IDF Data:**	Ottawa, ON

Return Period	Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	6.03	91.52	31161	31161	**100.00**	6.03	6.03	0.00	100.00
2-M	0.17	8.17	88.89	42059	42059	**99.75**	8.17	8.17	0.00	100.00
3-M	0.25	9.90	86.73	51010	51010	**98.17**	9.90	9.90	0.00	100.00
4-M	0.33	11.44	84.78	59046	59046	**95.04**	11.44	11.44	0.00	100.00
5-M	0.42	12.60	83.31	65162	65162	**90.91**	12.60	12.60	0.00	100.00
6-M	0.50	13.76	81.83	71279	71279	**86.47**	13.76	13.76	0.00	100.00
7-M	0.58	14.59	80.75	75762	75762	**82.01**	14.59	14.59	0.00	100.00
8-M	0.67	15.43	79.67	80245	80245	**77.67**	15.43	15.43	0.00	100.00
9-M	0.75	16.26	78.58	84728	84728	**73.64**	16.26	16.26	0.00	100.00
10-M	0.83	18.50	74.96	95006	97103	**69.90**	18.50	18.50	0.00	98.28
11-M	0.92	20.73	71.33	105284	109478	**66.40**	20.73	19.82	0.90	96.56
1-Yr	1	22.96	67.70	115562	121853	**63.21**	22.96	19.82	3.13	94.84
2-Yr	2	23.05	67.49	115783	122389	**39.35**	23.05	19.82	3.23	94.60
5-Yr	5	23.09	67.40	115870	122606	**18.13**	23.09	19.82	3.27	94.51
10-Yr	10	23.15	67.27	116000	122930	**9.52**	23.15	19.82	3.32	94.36
25-Yr	25	23.14	67.29	115985	122894	**3.92**	23.14	19.82	3.32	94.38
50-Yr	50	23.15	67.27	116000	122930	**1.98**	23.15	19.82	3.32	94.36
100-Yr	100	25.22	62.37	119097	134862	**1.00**	25.22	19.82	5.40	88.31

Average Annual TSS Removal Efficiency [%]: **81.8** Ave. Ann. T. Volume [%]: **99.17%**

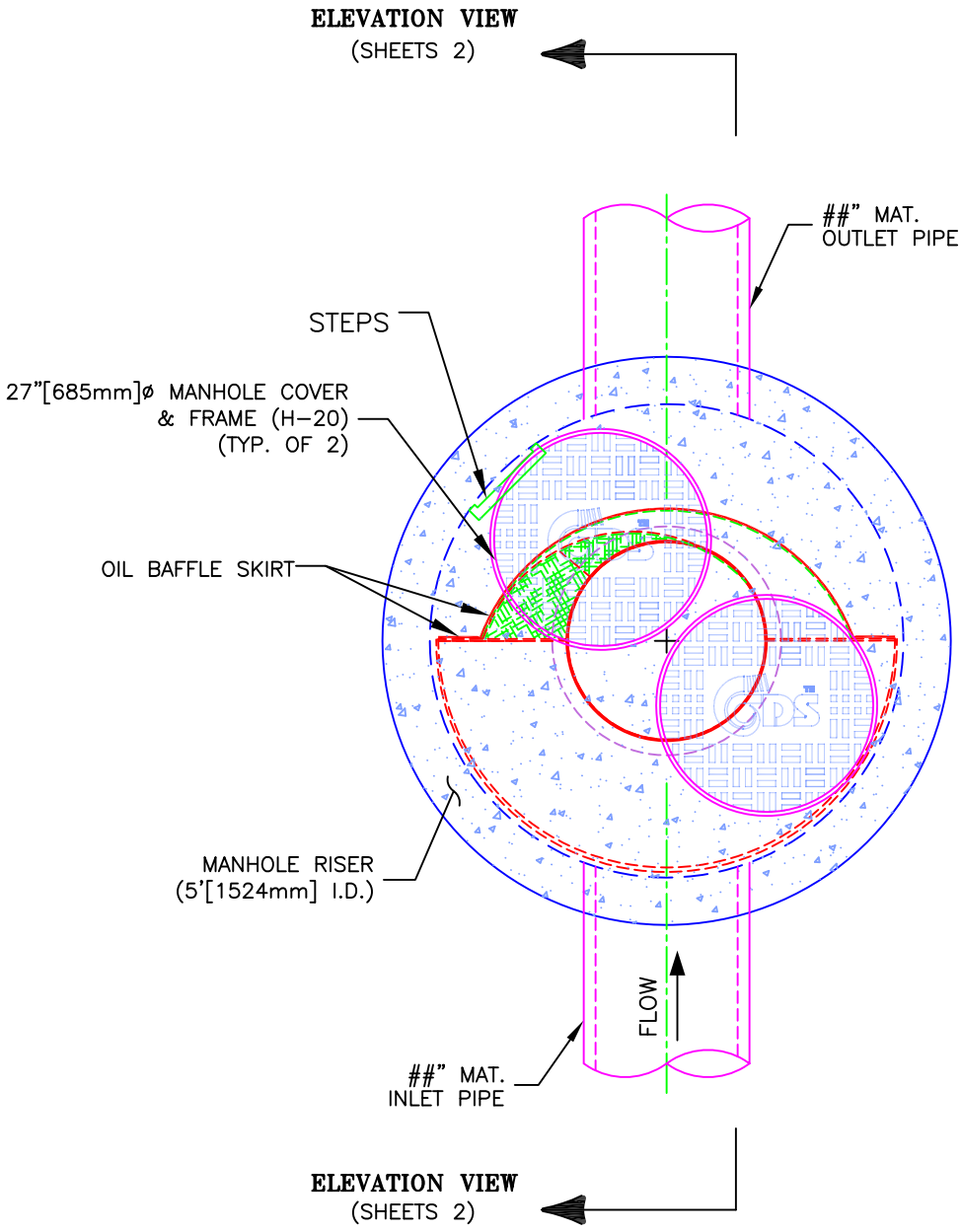
1 - CDS Efficiency based on testing conducted at the University of Central Florida

2 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES

PLAN VIEW

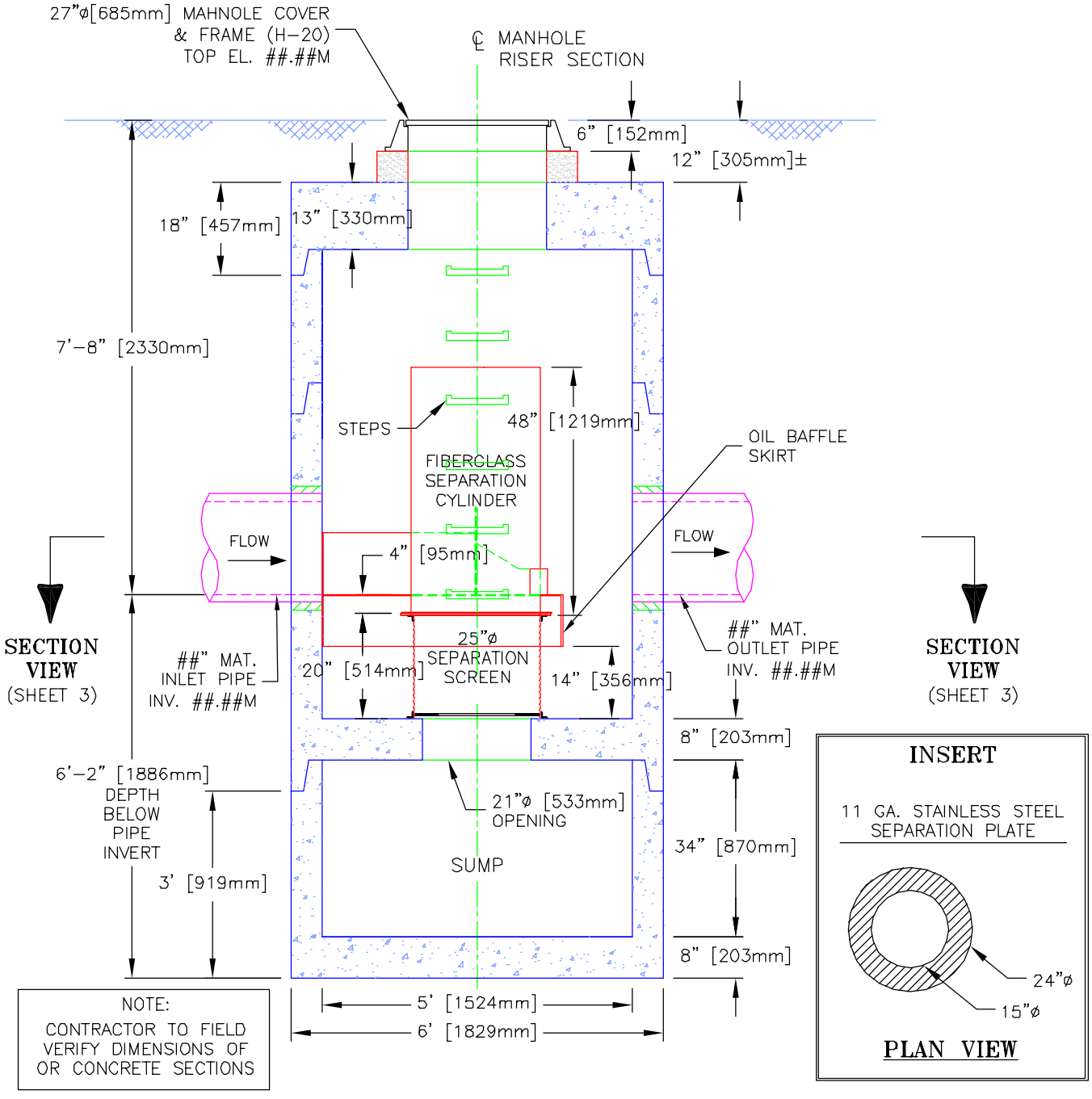


CDS MODEL PMSU20_15m, 0.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 200 Enterprise Drive, Scarborough, Maine 04074 Tel: (877) 907-8676 Fax: (207) 885-9825

ELEVATION VIEW



CDS MODEL PMSU20_15m, 0.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS

PROJECT NAME
CITY, STATE

JOB#	XX-##-###	SCALE 1" = 2.5'
DATE	##/##/##	SHEET 2
DRAWN	INITIALS	
APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 200 Enterprise Drive, Scarborough, Maine 04074 Tel: (877) 907-8676 Fax: (207) 885-9825

APPENDIX F
Development Servicing Study Checklist

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

N/A ☐ Executive Summary (for larger reports only).

☒ Date and revision number of the report.

☒ Location map and plan showing municipal address, boundary, and layout of proposed development.

☒ Plan showing the site and location of all existing services.

☒ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.

☒ Summary of Pre-consultation Meetings with City and other approval agencies.

☒ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.

☒ Statement of objectives and servicing criteria.

☒ Identification of existing and proposed infrastructure available in the immediate area.

☒ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

☒ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.

N/A ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.

N/A ☐ Proposed phasing of the development, if applicable.

☒ Reference to geotechnical studies and recommendations concerning servicing.

☒ All preliminary and formal site plan submissions should have the following information:

- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

4.2 Development Servicing Report: Water

N/A ☐ Confirm consistency with Master Servicing Study, if available

N/A ☐ Availability of public infrastructure to service proposed development

N/A ☐ Identification of system constraints

N/A ☐ Identify boundary conditions

☒ Confirmation of adequate domestic supply and pressure

☒ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.

N/A ☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.

N/A ☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

N/A ☐ Address reliability requirements such as appropriate location of shut-off valves

N/A ☐ Check on the necessity of a pressure zone boundary modification.

N/A ☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

N/A ☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.

N/A ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

N/A ☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

N/A ☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

N/A ☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).

N/A ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.

N/A ☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.

N/A ☐ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

N/A ☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)

N/A ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.

☒ Description of proposed sewer network including sewers, pumping stations, and forcemains.

N/A ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).

N/A ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.

N/A ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.

N/A ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

N/A ☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

☒ Analysis of available capacity in existing public infrastructure.

☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

☒ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.

☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

☒ Set-back from private sewage disposal systems.

N/A ☐ Watercourse and hazard lands setbacks.

N/A ☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

N/A ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

N/A ☐ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).

N/A ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

☒ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.

N/A ☐ Any proposed diversion of drainage catchment areas from one outlet to another.

☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

☒ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.

N/A ☐ Identification of potential impacts to receiving watercourses

N/A ☐ Identification of municipal drains and related approval requirements.

☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.

☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

N/A ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.

☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

N/A ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.

☒ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

☒ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.

N/A ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

N/A ☐ Changes to Municipal Drains.

N/A ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

☒ Clearly stated conclusions and recommendations

N/A ☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX G
Correspondence

1. Ottawa Fire Services email – Fire Protection Pre-Consult (dated May 9, 2020)
2. Ottawa Fire Services email – 300 Somme Street Storage Fire Access (dated Sept. 4, 2020)
3. South Nation Conservation SWM memo approval email – 300 Somme St SNC-1276-2020 (dated Sept. 16, 2020)
4. Response to City of Ottawa Comments (prepared by Novatech dated Nov. 9, 2020)
5. Response to South Nation Conservation Comments (prepared by Novatech dated Nov. 9, 2020)

Alex McAuley

From: Evans, Allan <Allan.Evans@ottawa.ca>
Sent: Saturday, May 9, 2020 9:59 PM
To: Alex McAuley
Cc: Susan Gordon; Lisa Bowley; Aden Rongve; Roy, Larry
Subject: RE: 300 Sommes Street - Fire protection pre consult
Attachments: 20200507-119181-SP2-markup.pdf; 119181-SP-1.pdf; W51 to 54 Combined (2).pdf

Some clarifications and additional comments below in blue

Allan Evans

Fire Protection Engineer / Ingénieur de Protection d'Incendies
Prevention Division / Prévention des Incendies
Ottawa Fire Services / Service des Incendies d'Ottawa
1445 Carling Avenue / 1445 Avenue Carling
Ottawa, ON K1Z 7L9
Allan.Evans@Ottawa.ca
☎ (613) 913-2747 | ☎ (613) 580-2424 x24119 | 🖷 (613) 580-2866 | Mail Code: 25-102 | @OFSFPE

OTTAWA FIRE SERVICES
SERVICE DES INCENDIES D'OTTAWA
Protecting Our Nation's Capital With Pride
Protéger notre capitale nationale avec fierté

CFAI
An internationally accredited agency 2014-2019

From: Alex McAuley <a.mcauley@novatech-eng.com>
Sent: May 07, 2020 10:18 AM
To: Evans, Allan <Allan.Evans@ottawa.ca>
Cc: Susan Gordon <s.gordon@novatech-eng.com>; Lisa Bowley <l.bowley@novatech-eng.com>; Aden Rongve <a.rongve@novatech-eng.com>
Subject: 300 Sommes Street - Fire protection pre consult

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Allan,
Thank you for taking the time on Tuesday to speak with us. We wanted to followup our call with some notes for each of the sites located on Somme Street in the Tomlinson Industrial Business Park.

General:

- Fire fighting methodology:
  - First truck fights fire at the source (building).
  - Second truck connects to water source and becomes the fire pump.
- Fire protection water source:
  - Preference is to have the water source be 60m to 100m away from the building entrance.

Incorrect – we want the water source 60-100m away from the building in all aspects (collapse zone), not the building entrance necessarily. It should typically be on the approach path for

the fire trucks to the building along the fire route and must have enough clearance (4.5m min) for other trucks to get by. I probably said the entrance because that is where the FACP and/or FDC are typically located.

- Dry hydrant to be located 3m to 4m off the edge of the fire route and protected by curb or bollards.

Incorrect – dry hydrant to be located 1-1.5m from the edge of the fire route protected by curb or bollards. Our hard suction hose that connects the truck to the hydrant/tank is 3m long. (in the rare case where we cannot get the 1-1.5m, we have gone to a 4-4.5m distance and we use two hard suction hoses instead, but not our preference)

- If a layby is provided for the pumper truck, then it needs to accommodate a 3.0m x 11m truck.

Including ability to drive-in and get close enough. Due to turning radii, etc, the layby would have to be significantly longer than 11m long.

- Dry hydrant to be located near the mid point of the layby.

Roughly – it could be a bit closer to the far end, but the draft point on the truck is roughly 5-6m from the front bumper.

- Gates:
  - We will confirm the type of gates, and locking mechanism with the clients.
  - The swing opening of the gates needs to not impede fire access.
  - You indicated that a lock box could be provided for Ottawa Fire department access (key or swipe card) to allow access.
  - If a chain and lock is used, the chain may be cut if needed.

Yes – but lockbox for a key to access still required – also good to note we can put the key for the draft box (assuming you are doing W51/W52 style) in the same lockbox.

Site specific:
The followings notes are for the CoPart (Car Auction Site), located at 300 Sommes Street.

- Attached Overall Site Plan (119181-SP1, May 2020), Enlarged Site Plan (119181-SP2, marked up May 7, 2020). We are anticipating a Site Plan submission in the next month.
- The accessory warehouse/office building will be split with a 2 hour fire wall between the uses.
- The warehouse portion would be rated Group F, Division 3 with a low combustible content, and the office would be Group D. No sprinklers are proposed.
- The proposed building will be unrated steel frame (ie non-combustible construction) approximately 5.5m in height.
- The preliminary fire flow rate is 3,600L/min (60L/s), with a volume requirement of approximately 132,000L, which would be accommodated in two interconnected tanks. The tanks currently being proposed are each 90,900L precast tanks.
- We are proposing to provide the required volume in pre-fabricated underground storage tanks.
- The outdoor storage area will be gravel, and used for short term storage of vehicles. We will confirm the typical length of storage.
- The fencing which surrounds the entire site will be confirmed, but is likely 8’ metal panel privacy fencing.
- We have marked up the Enlarged Site Plan (119181-SP2) to show:
  - How vehicles in the outdoor storage area will typically be parked,
  - Preliminary fire storage tank distance to building, (this distance would be adjusted based on our conversation)
  - Distance from road to fire storage tanks.

A second email will be provided regarding the Mini storage building site.

Please let us know if any of the above needs correction, or if you had any further questions.

I think it is worth discussing having informal fire access routes throughout the site as well. If a vehicle was to catch on fire, we could potentially have dozens of cars burning at once – site

access for trucks to move around and lay hose to fight the fire could be critical. As a rough guideline, I have attached the information for tire storage yards below. That's not the application here, but can serve as a guideline.

Chief - due to the very transient nature of the vehicles, I don't think we need a remote hydrant system here – vehicles are intended to come in and be auctioned off within a week or two. I would suggest possibly putting extinguishers mounted on poles like we would at a salvage yard. Thoughts on all this?

Fire department access

3.2.1.7. (1) Each storage yard shall be provided with fire access routes.

(2) The fire access routes shall

(a) have a clear width of at least 6 m,

(b) be designed to support the loads imposed by fire fighting equipment,

(c) be surfaced with material designed to permit accessibility under all climatic conditions,

(d) be connected with a public thoroughfare in at least two places that are located as remotely from each other as is possible in the circumstances,

(e) be located within all storage pile clearances identified in Clauses 3.2.1.4.(2)(a) and (b) and Article 3.2.1.5.,

(f) be at least 6 m away from any storage pile,

(g) be accessible and unobstructed at all times, and

(h) be located so that every point in the storage yard where storage piles are located is within 50 m of a fire access route.

(3) Despite Sentences (1) and (2), alternate fire access routes may be provided if

(a) the routes permit fire fighting vehicles and equipment access and permit the use of fire suppression techniques appropriate in the circumstances, and

(b) the routes are **approved**.

Fencing and gateways

3.2.1.8. (1) If the bulk volume of stored tires and shredded tires is more than 600 m^3, the storage yard shall be surrounded by a firmly anchored fence or other **approved** method of security that controls unauthorized access to the storage yard.

(2) If a fence is used, the fence shall be at least 1.8 m high and constructed to discourage climbing.

(3) The fence shall have gateways with a clear width of at least 3.5 m.

(4) The gateways shall be high enough to permit the entry of **fire department** vehicles.

(5) The gateways shall be kept clear of obstructions so that the gates may be fully opened at all times.

(6) The gateways shall be locked when the storage yard is not staffed.

Water supply

3.2.1.9. (1) A public or private water supply shall be provided so that any part of the storage yard can be reached by using not more than 150 m of hose.

(2) If the bulk volume of stored tires and shredded tires is between 300 m^3 and 1200 m^3, the water supply system shall be capable of supplying at least 1860 L/min for a minimum of 3 h.

(3) If the quantity of stored product is 1200 m^3 or more, the water supply system shall be capable of supplying at least 3780 L/min for a minimum of 3 h.

(4) If on-site reservoirs or other established water supplies are used as a **fire department** draft source to meet the requirements of Sentences (1), (2) and (3), they shall be equipped with dry hydrants in accordance with Chapter 9 of NFPA 1142, “Standard on Water Supplies for Suburban and Rural Fire Fighting”.

Thank you,

Alex McAuley, P.Eng., Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 292 | Cell: 613.261.9166 | Fax: 613.254.5867
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'

Aden Rongve

From: Alex McAuley
Sent: Friday, September 4, 2020 3:46 PM
To: Allan Evans
Cc: Susan Gordon; Aden Rongve; Murray Chown; Ryan Poulton
Subject: 300 Somme Street - storage fire access
Attachments: 119181-SP1 r3.pdf; 119181-SP2 r3.pdf

Allan,
Further to our call with you on August 25th, we have revised the site plan based on your comments. The revised site plans (119181-SP1, rev 3 and 119181-SP2, rev 3) are attached.

Please confirm if the layout of the access routes through the storage area are acceptable as shown on the attached plans.

We discussed the following:

- OFS generally in agreement with the draft revised site plan
    - OFS requested 2 additional east-west accesses to allow access for every third row.
    - Revisions per discussion were completed and are shown on the attached site plans.
- OFS needs to have a method to keep the gates open during a fire. Copart will need to confirm this.
- Novatech will revise the site plans to label and dimension the fire routes for the building.
    - Revisions per discussion were completed and are attached.
- As the access routes in the storage area are 'informal' they won't be signed, but we have indicated on the plan where the minimum 12m centreline radius applies.
- OFS indicated that they require Fire Underwriters Survey (FUS) calculations to be provided for rural sites to determine flow requirements, but that fire flow volume is usually determined by the Ontario Building code. OFS indicated that they are flexible if FUS results in very high values.
    - Novatech to review FUS calculations
    - This should not impact the site plan application as the City's comments indicated that the fire fighting volume would be confirmed at the time of the building permit application.
- Novatech will provide additional details and dimensions for the fire storage tanks. In particular the dimensions from the draft point/dry hydrant to the gate, asphalt width, lock box access.

Regards,

Alex McAuley, P.Eng., Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 292 | Cell: 613.261.9166 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

Aden Rongve

Subject: 300 Somme St - SNC-1276-2020

From: James Holland <jholland@nation.on.ca>
Sent: Wednesday, September 16, 2020 8:30 AM
To: Alex McAuley <a.mcauley@novatech-eng.com>
Cc: Turkington, Seana <Seana.Turkington@ottawa.ca>
Subject: RE: 300 Somme St - SNC-1276-2020

Hi Alex,
South Nation Conservation has reviewed and accepts the memo in response to comment #5 in our review dated July 20, 2020.
Kind regards,
James

From: Alex McAuley <a.mcauley@novatech-eng.com>
Sent: September 15, 2020 2:24 PM
To: James Holland <jholland@nation.on.ca>
Subject: RE: 300 Somme St - SNC-1276-2020

Hi James,
Have you had an opportunity to review the SWM memo?

Thank you,

Alex McAuley, P.Eng., Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 292 | Cell: 613.261.9166 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: James Holland <jholland@nation.on.ca>
Sent: Tuesday, September 8, 2020 1:25 PM
To: Alex McAuley <a.mcauley@novatech-eng.com>
Subject: RE: 300 Somme St - SNC-1276-2020

Hi Alex,
Sure, we can do that.
Cheers,
James

From: Alex McAuley <a.mcauley@novatech-eng.com>
Sent: September 8, 2020 1:12 PM
To: James Holland <jholland@nation.on.ca>
Subject: RE: 300 Somme St - SNC-1276-2020

James,

We are expecting to be able to submit within the next 3 weeks as we are waiting for another study, by others, requested by the City to be.

We were hoping that SNC would be able to at least provide preliminary acceptance with the use of the "NASH" command for the stormwater modelling (SNC comment #5). During our discussion with SNC, the balance of the other comments would require only minor clarification.

A change to the stormwater modeling methodology would require revisions to the design and report.

Please feel free to call me to discuss.

Thank you,

Alex McAuley, P.Eng., Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 292 | Cell: 613.261.9166 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: James Holland <jholland@nation.on.ca>
Sent: Tuesday, September 8, 2020 11:21 AM
To: Alex McAuley <a.mcauley@novatech-eng.com>
Subject: RE: 300 Somme St - SNC-1276-2020

Thanks Alex,
When do you anticipate the revised Servicing and Stormwater Report? If possible, I would prefer to review with the technical memo and have a single clearance for all SNC comments.
James

From: Alex McAuley <a.mcauley@novatech-eng.com>
Sent: September 4, 2020 3:44 PM
To: James Holland <jholland@nation.on.ca>; David Scholz <dscholz@nation.on.ca>
Cc: Susan Gordon <s.gordon@novatech-eng.com>; Murray Chown <m.Chown@novatech-eng.com>; Aden Rongve <a.rongve@novatech-eng.com>; Ryan Poulton <r.poulton@novatech-eng.com>
Subject: 300 Somme St - SNC-1276-2020

External email - if you don't know or can't confirm the identity of the sender, please exercise caution and do not open links or attachments.

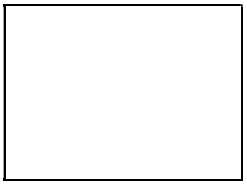
James,
As discussed during our call on August 17, we have prepared the attached memo, dated Sept 4, 2020, to support the stormwater modelling methodology used by Novatech. Please review the memo, and if you have further comments please let us know so that we can respond. If you are in agreement with the approach, we will include this memo as part of our Servicing and Stormwater Report.

As discussed during our call, the other SNC comments will be addressed as part of the re-submission of the Servicing and Stormwater Report.

Regards,

Alex McAuley, P.Eng., Project Manager | Land Development Engineering

NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 292 | Cell: 613.261.9166 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.



James Holland | M.Sc. RPP, Watershed Planner
38 Victoria Street, Box 29, Finch, ON K0C 1K0
Tel: 613-984-2948 or 1-877-984-2948 | Fax: 613-984-2872
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Our local environment, we're in it together.
Notre environnement local, protégeons-le ensemble.

Nov. 9, 2020 **By Email**

City of Ottawa
Planning, Infrastructure & Economic Development
110 Laurier Street West, 4th Floor
Ottawa, Ontario K1P 1J1

Attention: Seana Turkington, Planner I – Planning Services

Reference: **300 Somme Street**
1st Review - Response to Engineering Comments
City File No.: D07-12-20-0067
Our File No.: 119181

Novatech has updated the Development Servicing and Stormwater Management Report (revised Nov. 9, 2020) and provides the following response to the City of Ottawa Engineering comments and Building Code Services and Fire comments dated July 29, 2020.

Engineering Comments

A. Plans
Detailed Grading and Servicing Plan:

1. ***The benchmark and monument location information are missing from the plan. Please add the information to the plan accordingly.***

Novatech Response:
- *The monument location has been added to the key plans.*
- *The job benchmark is a nail in the utility pole at the southwest corner of the site and has been labelled on the Overall Grading, Erosion, Sediment Control, and Servicing Plan.*
- *Benchmark Information notes have been added to the Detailed Grading and Servicing Plan.*

2. ***Please show the overland flow routes.***

Novatech Response: Overland flow routes have been added to the Overall Grading, Erosion, Sediment Control, and Servicing Plan (119181-GS1) as well as the Detailed Grading and Servicing Plan (119181-GS2).

3. ***Please confirm that the access culvert size matches the subdivision design, and approved documents for the subdivision.***

Novatech Response: The subdivision design does not specify requirements for culvert sizing. Culvert sizing calculations have been added to Appendix D of the report.

4. ***The plan appears to show a second pad of sorts, beside the concrete pad. Please label, indicate the material, and note its purpose.***

Novatech Response: The second pad is a concrete pad for a proposed fuel tank. A label has been added to the drawing to provide clarification.

Overall Grading, Erosion, Sediment Control, Servicing Plan:

5. ***Please note if a mud mat is available to be constructed at the access to the site during the construction phase.***

Novatech Response: Mud mats have been added to the drawing at the existing south entrance to the site, as well as the existing north entrance near the proposed building.

6. ***Please provide slope percentages for the subdrains.***

Novatech Response: Slope percentages have been added to the subdrains.

7. ***The swales along the outer portion of the site are quite flat. Please confirm of a subdrain could be installed to ensure the ditches remain dry.***

Novatech Response: We have reviewed the option for subdrains under the perimeter swales. With no municipal sewers in the area to provide outlet, the effectiveness of subdrains will be minimal. To help keep the swales dry, they have been set, in general, above the invert of the adjacent roadside ditches. In addition, they have been set with a minimum longitudinal slope of 0.5% which meets the minimum allowable ditch/swale slope of 0.5% required for rural ditches per the City of Ottawa Sewer Design Guidelines.

8. ***Please provide a cross-section detail for the retaining wall and the fence around the neighbouring property. The retaining wall appears to be greater than 1 meter in places. It is also unclear how the fence will be constructed. Please provide details on this note. Note if the fence will be on the retaining wall, as well as setbacks from the wall and if the wall sufficient strength to hold up the fence in the future.***

Novatech Response: The future wall be located on the adjacent property and will be designed and constructed by others. Cross-sections along the common property line have been added to the Section Plan (new drawing 119181-SP). The cross sections show how the grading and fence will be construction as part of this project and what the future wall (by others) could look like. In addition, the grading has been revised to maintain a maximum potential grade difference between the sites of 0.95m.

9. ***There appears to be some funny "jogs" between the septic system and the hydro pole (one example). Please fix.***

Novatech Response: The "jogs" represent easements to accommodate the guy wires from the overhead hydro poles.

Notes and Details Plan:

10. Please indicate the pipe material for the pipe entering and exiting the OGS unit. The pipe that outlets to the ditch should not be PVC. The sun will destroy them over time.

Novatech Response: The inlet and outlet pipes for the OGS units will be HDPE. This information has been added to the OGS details and sections on the Notes and Details Plan.

11. Outlet pipes from the OGS unit should end at the property line. A rip rap lined swale can be constructed from the end of the pipe to the invert of the ditch.

Novatech Response: The outlet pipes have been revised to terminate at the property line. A rip-rap lined swale has been added to convey the flow to the roadside ditch.

12. The culvert for the access is shown as a 400mm and on the other drawings it is a 500mm for the fire tank talk detail. Please explain or fix.

Novatech Response: The access culvert within the right-of-way should be 600mm diameter and has been corrected to on all plans. The culvert within the site under the access by the fire tanks is 400mm diameter.

B. Reports

Stormwater Report:

13. In section 3.4 it is not clearly demonstrated how the spillway works. It states that storms that exceed the 25mmm event will use the spillway and 100-year storms will overtop it. Please discuss if the spillway is to act like a "v" notch weir.

Novatech Response: Section 3.4 of the report has been revised to clarify how the spillways will function. The spillways are designed to accommodate flow for all storm events exceeding the 25mm storm event. In addition, the 5-year and 100-year water levels in each onsite swale have been shown on the Overall Grading, Erosion, Sediment Control, and Servicing Plan (119181-GS1) and the Notes and Details Plan (119181-ND).

14. The post development C values appear to be a little low. Gravel should have a C value of 0.7 or greater. Please review and confirm.

Novatech Response: A C value of 0.7 was used for the gravel surface. Composite C values for each drainage area are less than 0.7 due to the landscaped areas (C value of 0.2) between the property line and the perimeter fence. Table 6 has been added to Appendix D of the report to provide clarification on C values for each drainage area.

15. It is noted in the report the 70% TSS removal is required. Please provide the percentage of removal that the OGS is expected to achieve.

Novatech Response: The report has been revised to indicate that 80% TSS removal is required, and that each of the OGS units meet this requirement. OGS performance details are also provided in Appendix E.

Geotechnical Report:

16. Please provide grade raise restriction information in the report and discuss.

Novatech Response: And updated geotechnical report will be provided separately.

Building Code Services and Fire Comments

Building Code Services (from City comment letter dated July 29, 2020)

1. ***The Fire Access Route (FAR) proposed to the new building is compliant with the Ontario Building Code I.E., width, length less than 90m, 3 to 15m to the principal entrance, ETC. the fire access route's design is not Ontario Building Code compliant with respect to the minimum centreline turning radius requirement of 12 meters, as stipulated in Article 3.2.5.6. for the future vehicle storage lot. Please contract Ottawa Fire Services for confirmation of the minimum Fire Route width and turning radius required for the vehicle storage lot.***

Novatech Response: Ottawa Fire Services has been contacted to confirm fire route requirements. See Ottawa Fire Services comments and responses below.

2. ***Please contact our Fire Services Branch for acceptable methods of accessing passage through the security gates.***

Novatech Response: Ottawa Fire Services has been contacted to confirm gate access. See Ottawa Fire Services comments and responses below.

3. ***Please contact our Fire Services Branch regarding the size and location of the proposed fire water storage tank(s). Note: Building Code service Branch (BCSB) will confirm size and location of the water storage tank(s) at the time of the building permit application for compliance with the Ontario Building Code and Ottawa Fire Services branch.***

Novatech Response: Ottawa Fire Services has been contacted to confirm size and location requirements for the fire storage tank. See Ottawa Fire Services comments and responses below.

Ottawa Fire Services Comments (from email correspondence Sept. 4, 2020)

- ***Ottawa Fire Services (OFS) requested 2 additional east-west accesses to allow access for every third row***

Novatech Response: The site layout has been revised to accommodate drive aisles every third row throughout the storage area. Refer to revised Site Plan (119181-SP1). The associated changes have been carried through to the other drawings.

- ***OFS needs to have a method to keep the gates open during a fire.***

Novatech Response: The gates will be rolling, sliding cantilever gates which will be manually opened and closed. They stay open once moved aside.

- ***Site Plans to be revised to label and dimension the fire routes for the building.***

Novatech Response: Fire route labels and dimensions have been added to the Site Plans.

- ***As the access routes in the storage area are 'informal' they won't be signed, but we have indicated on the plan where the minimum 12m centreline radius applies.***

Novatech Response: Centerline radii (12m minimum) have been added and labelled along the informal fire routes in the storage area on the Site Plans.

- ***OFS indicated that they require Fire Underwriters Survey (FUS) calculations to be provided for rural sites to determined flow requirements, but that fire flow volume is usually determined by the Ontario Building Code (OBC). OFS indicated that they are flexible if the FUS results in very high values.***

Novatech Response: Novatech has included FUS calculations in Appendix B of the report. The storage volume requirement from the FUS is significantly higher than the OBC requirements, and therefore the OBC storage volume will be used. The OBC required volume is 132cu.m. and the FUS required volume is 720cu.m. See Section 2.2 of the Report.

- ***Novatech to provide additional details and dimensions for the fire storage tanks. In particular, the dimensions from the draft point/dry hydrant to the gate, asphalt width, lock box access.***

Novatech Response: Dimensions have been added to the fire storage tank detail on the Notes and Details Plan (119181-ND).

Should you have any questions or concerns do not hesitate to contact us.

Yours truly,

NOVATECH

Alex McAuley, P.Eng.
Project Manager | Land Development Engineering

Encl.

Nov. 9, 2020 **By Email**

South Nation Conservation
38 Victoria Street. P.O. Box 29
Finch, Ontario K0C 1K0

Attention: James Holland, MSc RPP Watershed Planner

Reference: **300 Somme Street**
South Nation Conservation 1st Review - Response to Comments
SNC File No.: SNC-1276-2020
Our File No.: 119181

Novatech has updated the Development Servicing and Stormwater Management Report (revised Nov. 9/20) and provides the following response to the South Nation Conservation comments dated July 20, 2020.

1. ***Please confirm the status of the dry pond construction and associated landscaping and provide current pictures of the site.***

Novatech Response: The pond construction is complete and vegetated. See photos below.

Dry pond inlet culverts looking north into pond (taken July 31, 2020)

Dry pond outlet culverts looking south into pond (taken July 31, 2020)

2. ***The report states that the site does not exceed 70% imperviousness. What is the final proposed imperviousness of the site? It is noted that a runoff coefficient of 0.7 was determined however this is not the same a % impervious.***

Novatech Response: The Report has been revised to consistently use runoff coefficients. The runoff coefficient assigned for gravel was 0.70 per City of Ottawa Sewer Design Guidelines. Refer to Table 6 in Appendix D of the report for calculation of runoff coefficients.

3. ***If runoff coefficients are to be used, the report should provide calculations demonstrating how the weighted runoff coefficient was determined,***

Novatech Response: Refer to Table 6 in Appendix D for calculation of the weighted runoff coefficients.

4. ***The report states a target removal rate of 70% TSS is required. As stated at the pre-consultation meeting on October 7, 2019, 80% TSS is the currently accepted removal rate.***

Novatech Response: The report has been revised to indicate that 80% TSS removal is required, and that each of the OGS units meet this requirement. OGS performance details are also provided in Appendix E.

5. ***It is noted that the report uses the "NASH" command to calculate flows. Typically, areas with imperviousness values greater than 20% use the "STAND" command. Review and revise accordingly.***

Novatech Response: The SWM Modelling Approach Memorandum (dated Sept. 4/20) was provided to and accepted by SNC and is including in Appendix D. The email from SNC accepting the modelling approach is included in Appendix G.

6. ***The Sediment and Erosion Control Plan should:***
    a. ***Identify who is responsible to install, maintain and remove the control measures***
    b. ***Identify the inspection and maintenance schedule (how, when, how often i.e. daily/weekly)***
    c. ***Indicate that it is to be considered a "Living Document" which may be modified in the event the control measures are insufficient.***

    Furthermore, it is noted that the plan refers to installing filter cloths across manholes. Due to the potential for clogging, geosocks with overflows are recommended over the proposed filter cloth over manhole covers. In addition, to better protect the existing storm facility silt fencing should be in place in between the proposed swales and construction activities.

Novatech Response: The above details have been added to the Overall Grading, Erosion, Sediment Control, and Servicing Plan. Geosocks have now been specified in lieu of filter cloths.

Should you have any questions or concerns do not hesitate to contact us.

Yours truly,

NOVATECH

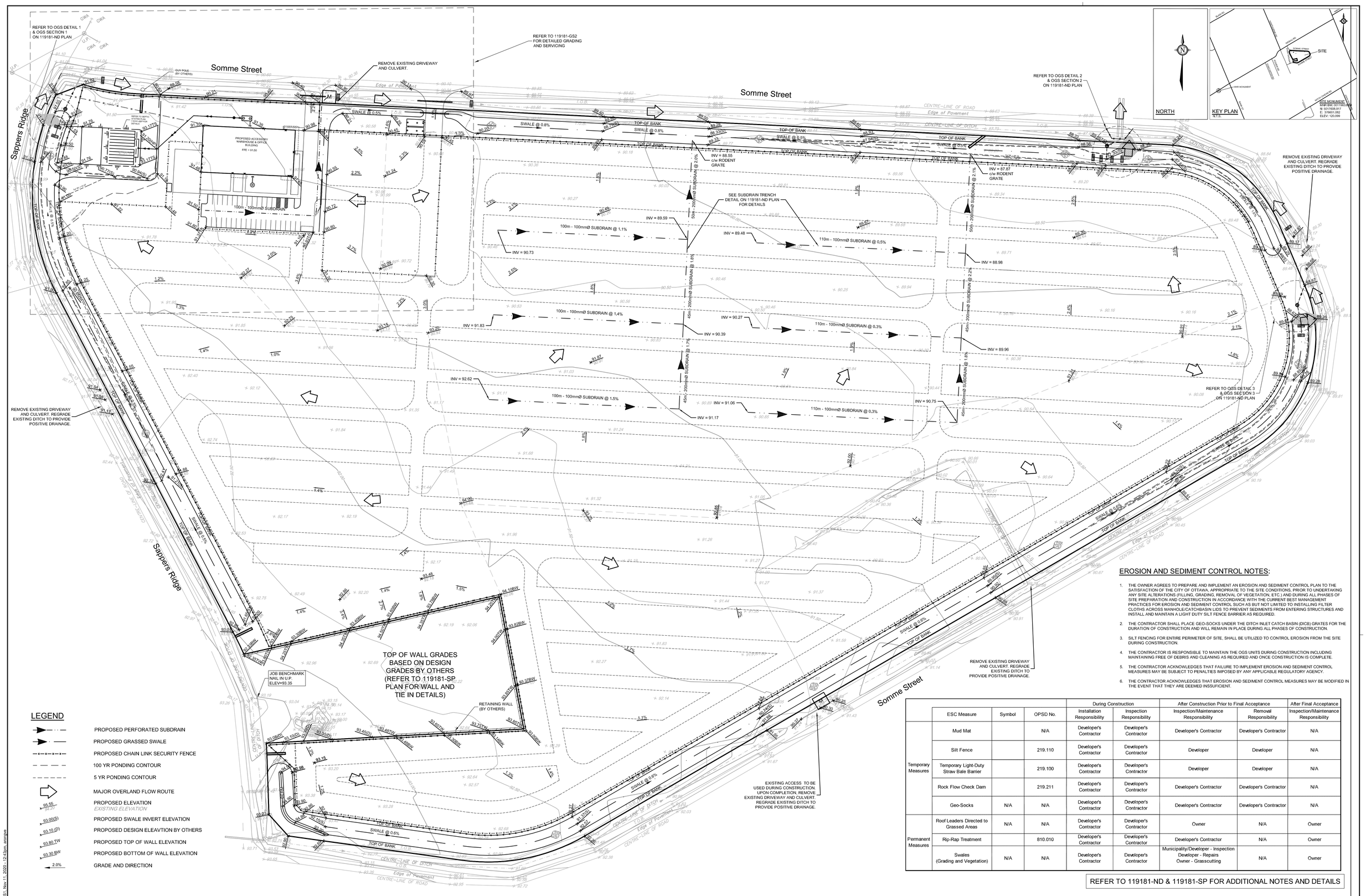
Alex McAuley, P.Eng.
Project Manager | Land Development Engineering

Encl.

Cc: City of Ottawa – Kevin Hall, and Planner

APPENDIX H
Drawings

1. 119181-GS1 Rev 4 Overall Grading, Erosion, Sediment Control and Servicing Plan
2. 119181-GS2 Rev 3 Detailed Grading and Servicing Plan
3. 119181-ND Rev 3 Notes and Details Plan
4. 119181-SEP Rev 3 Septic System Plan
5. 119181-POST Rev 4 Post-Development Storm Drainage Area Plan
6. 119181-SP Rev 1 Sections Plan



LEGEND

- PROPOSED PERFORATED SUBDRAIN
- PROPOSED GRASSED SWALE
- PROPOSED CHAIN LINK SECURITY FENCE
- 100 YR PONDING CONTOUR
- 5 YR PONDING CONTOUR
- MAJOR OVERLAND FLOW ROUTE
- PROPOSED ELEVATION / *EXISTING ELEVATION*
- PROPOSED SWALE INVERT ELEVATION
- PROPOSED DESIGN ELEAVTION BY OTHERS
- PROPOSED TOP OF WALL ELEVATION
- PROPOSED BOTTOM OF WALL ELEVATION
- GRADE AND DIRECTION

EROSION AND SEDIMENT CONTROL NOTES:

1. THE OWNER AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL SUCH AS BUT NOT LIMITED TO INSTALLING FILTER CLOTHS ACROSS MANHOLE/CATCHBASIN LIDS TO PREVENT SEDIMENTS FROM ENTERING STRUCTURES AND INSTALL AND MAINTAIN A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.
2. THE CONTRACTOR SHALL PLACE GEO-SOCKS UNDER THE DITCH INLET CATCH BASIN (DICB) GRATES FOR THE DURATION OF CONSTRUCTION AND WILL REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION.
3. SILT FENCING FOR ENTIRE PERIMETER OF SITE, SHALL BE UTILIZED TO CONTROL EROSION FROM THE SITE DURING CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN THE OGS UNITS DURING CONSTRUCTION INCLUDING MAINTAINING FREE OF DEBRIS AND CLEANING AS REQUIRED AND ONCE CONSTRUCTION IS COMPLETE.
5. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
6. THE CONTRACTOR ACKNOWLEDGES THAT EROSION AND SEDIMENT CONTROL MEASURES MAY BE MODIFIED IN THE EVENT THAT THEY ARE DEEMED INSSUFICIENT.

	ESC Measure	Symbol	OPSD No.	During Construction: Installation Responsibility	During Construction: Inspection Responsibility	After Construction Prior to Final Acceptance: Inspection/Maintenance Responsibility	After Construction Prior to Final Acceptance: Removal Responsibility	After Final Acceptance: Inspection/Maintenance Responsibility
Temporary Measures	Mud Mat		N/A	Developer's Contractor	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A
	Silt Fence		219.110	Developer's Contractor	Developer's Contractor	Developer	Developer	N/A
	Temporary Light-Duty Straw Bale Barrier		219.100	Developer's Contractor	Developer's Contractor	Developer	Developer	N/A
	Rock Flow Check Dam		219.211	Developer's Contractor	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A
	Geo-Socks	N/A	N/A	Developer's Contractor	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A
Permanent Measures	Roof Leaders Directed to Grassed Areas	N/A	N/A	Developer's Contractor	Developer's Contractor	Owner	N/A	Owner
	Rip-Rap Treatment		810.010	Developer's Contractor	Developer's Contractor	Developer's Contractor	N/A	Owner
	Swales (Grading and Vegetation)	N/A	N/A	Developer's Contractor	Developer's Contractor	Municipality/Developer - Inspection Developer - Repairs Owner - Grasscutting	N/A	Owner

REFER TO 119181-ND & 119181-SP FOR ADDITIONAL NOTES AND DETAILS

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
4.	REVISED PER COMMENTS	NOV 9/20	AAR
3.	ISSUED FOR REVIEW	MAY 27/20	AAR
2.	ISSUED FOR CLIENT INFORMATION	MAY 20/20	AAR
1.	ISSUED FOR COORDINATION	MAY 8/20	AAR

SCALE 1:750 (1:750, 0 10 20 30)

DESIGN AAR
CHECKED ARM
DRAWN AAR
CHECKED AAR
APPROVED SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER S.M. GORDON Nov 9/20 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER A.R. MCAULEY 100141256 NOV 9, 2020 PROVINCE OF ONTARIO

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Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
300 SOMME STREET
BLOCK 6

DRAWING NAME
OVERALL GRADING, EROSION, SEDIMENT CONTROL AND SERVICING PLAN

PROJECT No. 119181
REV REV # 4
DRAWING No. 119181-GS1

D07-12-20-0067

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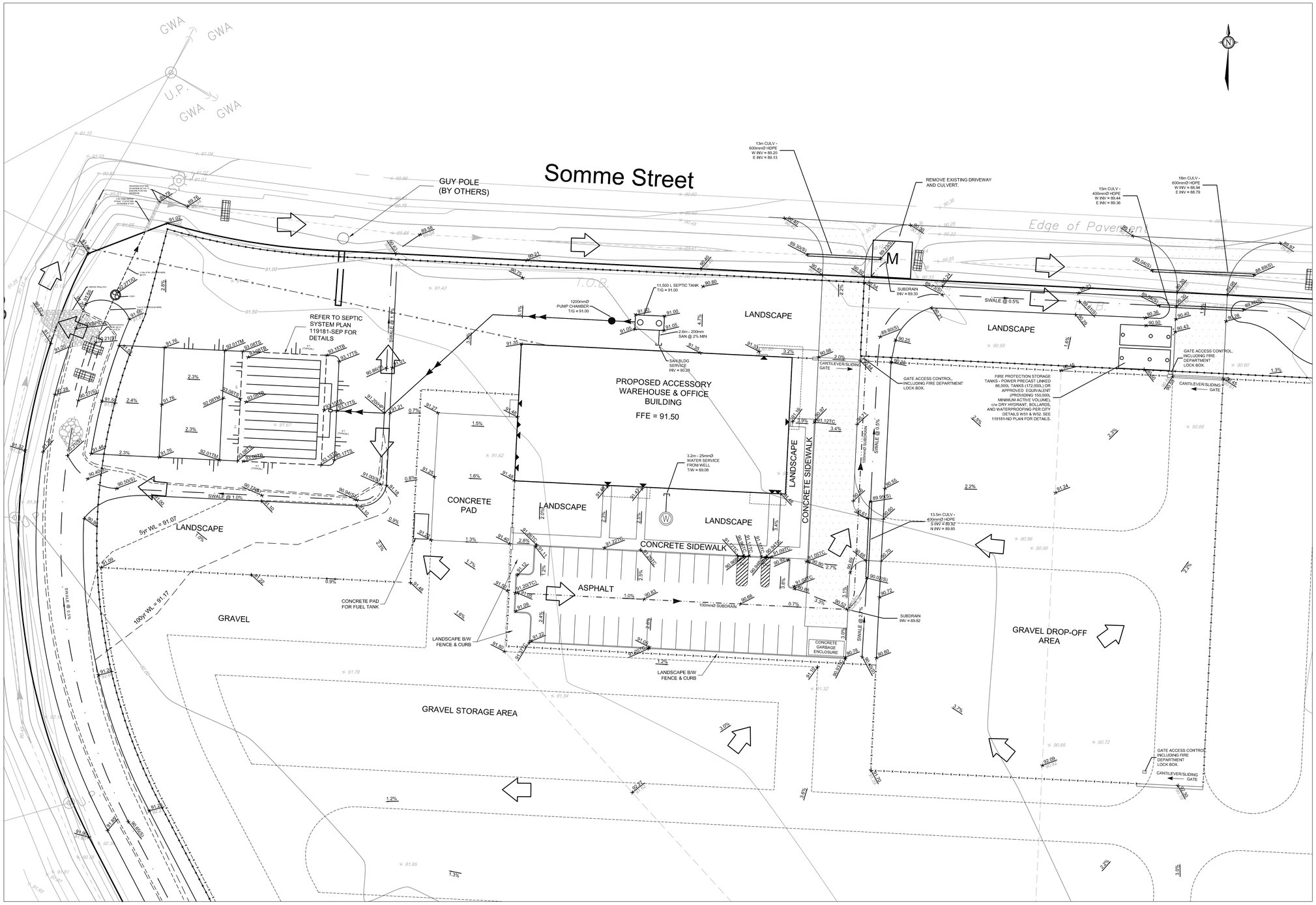

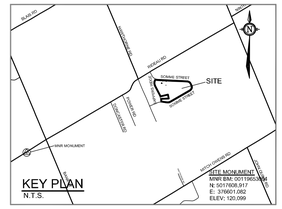

LEGEND

- PROPOSED ELEVATION / *EXISTING ELEVATION*
- PROPOSED SWALE INVERT ELEVATION
- PROPOSED TOP OF SEPTIC BED ELEVATION
- PROPOSED TOP OF SEPTIC MANTLE ELEVATION
- TERRACING: MAXIMUM 3:1 SIDESLOPE
- GRADE AND DIRECTION
- PROPOSED PUMP CHAMBER & FORCEMAIN
- PROPOSED CENTERLINE OF SWALE
- PROPOSED 100mmØ SUBDRAIN
- PROPOSED U/G HYDRO SERVICE
- LIGHT DUTY ASPHALT (SEE 119181-ND PLAN FOR PAVEMENT STRUCTURE DETAILS)
- HEAVY DUTY ASPHALT (SEE 119181-ND PLAN FOR PAVEMENT STRUCTURE DETAILS)
- TEMPORARY MUD MAT
- TEMPORARY SILT FENCE PER OPSD 219.110
- TEMPORARY STRAW BALE PER OPSD 219.100
- TEMPORARY ROCK FLOW CHECK DAM PER OPSD 219.211

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL REPORT (No. 6508I.01, DATED SEPTEMBER 9, 2020), PREPARED BY GEMTEC FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.
10. REFER TO STORMWATER MANAGEMENT REPORT(R-2020-070) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 100% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
7. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
8. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
9. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
13. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN.

BENCHMARK INFORMATION:

1. JOB BENCHMARK: NAIL IN UTILITY POLE AT SOUTHWEST CORNER OF SITE. GEODETIC ELEVATION = 93.32
2. MNR BENCHMARK MONUMENT: STATION 00119653004 DATUM: NAD 83, ORIG. GEODETIC ELEVATION = 120.099
3. THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM PLAN OF SURVEY OF PART OF BLOCK 6 REGISTERED PLAN 4M-1388 PREPARED BY H.A.KEN SHIPMAN SURVEYING LTD (JAN 24/20).

REFER TO 119181-ND & 119181-SP FOR ADDITIONAL NOTES AND DETAILS

NOTE:
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1.	ISSUED FOR CLIENT INFORMATION	MAY 20/20	AAR

SCALE 1:300 (1:300, 0 3 6 9 12)

DESIGN AAR
CHECKED ARM
DRAWN AAR
CHECKED AAR
APPROVED SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER S.M. GORDON Nov 9/20 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER A.R. MCAULEY 100141256 NOV 9, 2020 PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech- eng.com

LOCATION
300 SOMME STREET
BLOCK 6

DRAWING NAME
DETAILED GRADING AND SERVICING PLAN

PROJECT No. 119181
REV REV # 3
DRAWING No. 119181-GS2

D07-12-20-0067

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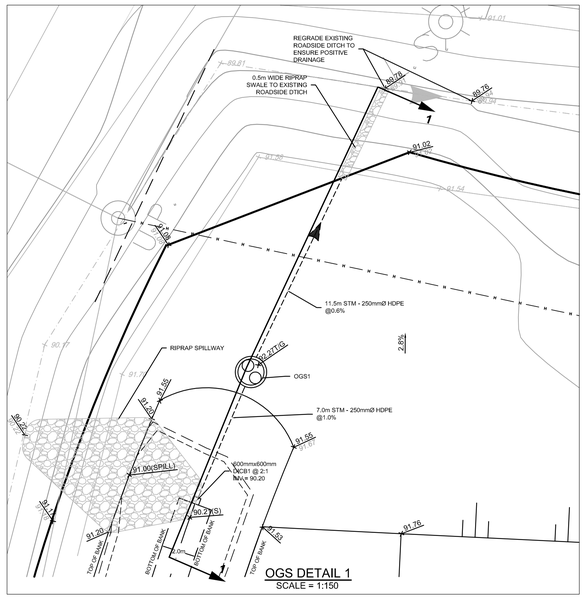

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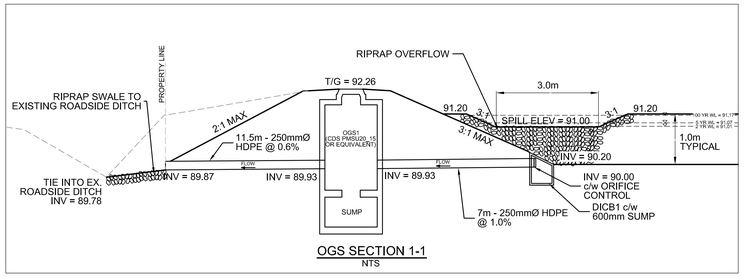

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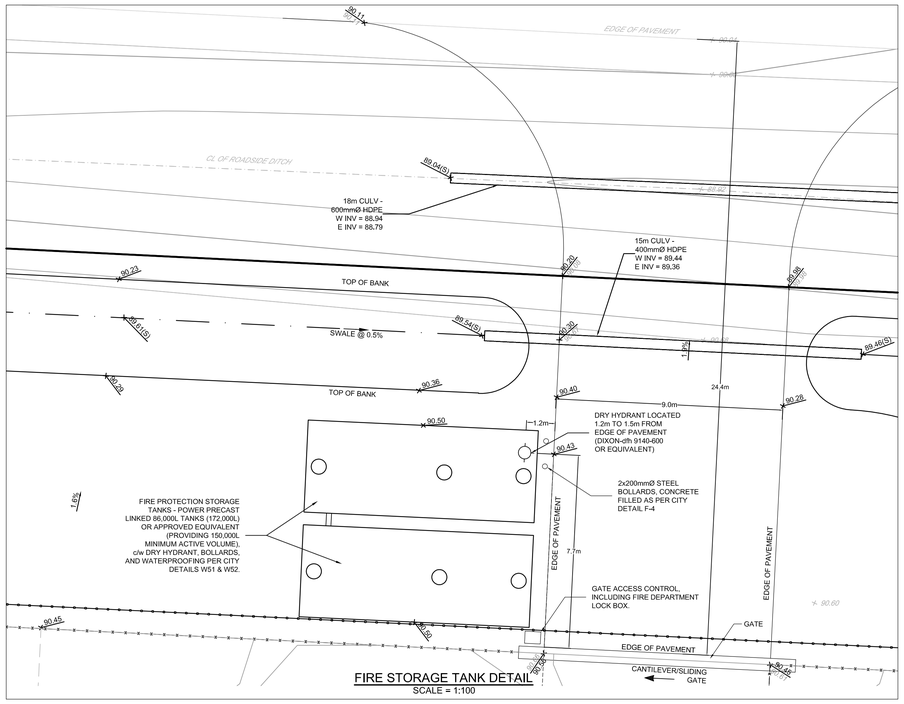
NTS



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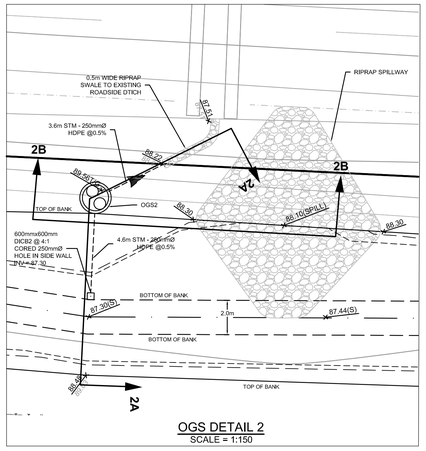

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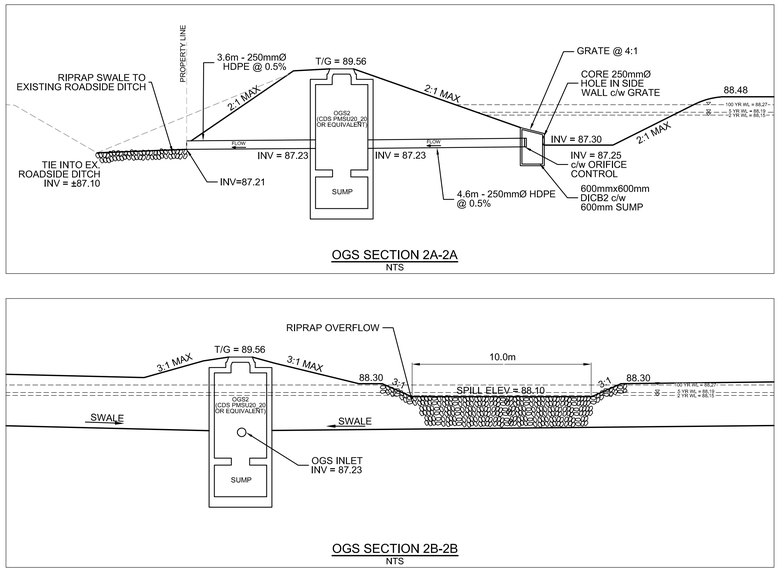

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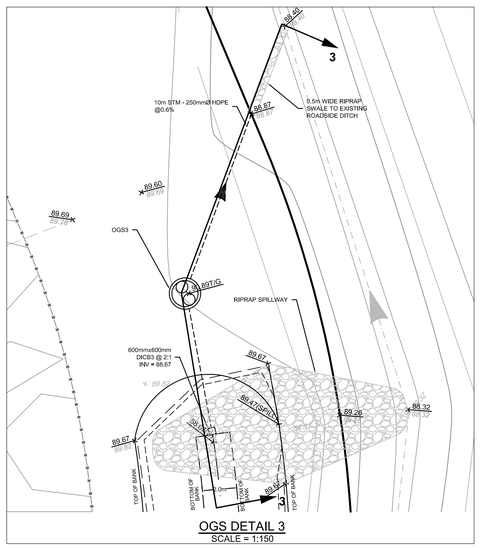
NTS

OGS SECTION 2B-2B
NTS



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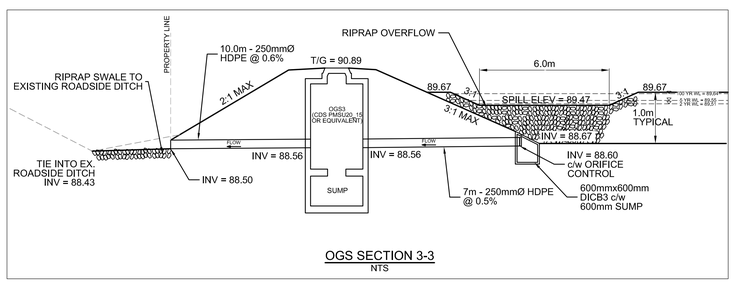

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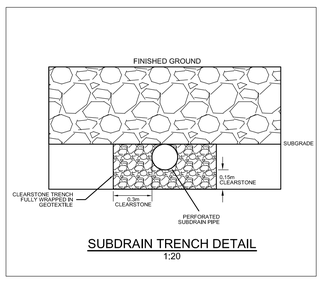

SUBDRAIN TRENCH DETAIL
1:20

PAVEMENT STRUCTURE:

- LIGHT DUTY
  50mm SUPERPAVE 12.5
  150mm GRAN "A"
  300mm GRAN "B" TYPE II OR III SUBBASE
- HEAVY DUTY
  40mm SUPERPAVE 12.5
  60mm SUPERPAVE 19.0
  150mm GRAN "A"
  450mm GRAN "B" TYPE II
- GRAVEL STORAGE AREA
  150mm GRAN "A"
  450mm GRAN "B" TYPE II

INLET CONTROL DEVICE TABLE:

ICD Location	ICD Size (mm)	ICD Type
DICB 1	83	Slot
DICB 2	152	Slot
DICB 3	108	Slot

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DESIGN: AAR
CHECKED: ARM
DRAWN: AAR
CHECKED: ARM
APPROVED: SMG

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S.M. GORDON
Nov 9/20
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A.R. MCAULEY
100141256
NOV 9, 2020
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LOCATION
300 SOMME STREET
BLOCK 6

DRAWING NAME
NOTES AND DETAILS PLAN

PROJECT No. 119181
REV REV # 3
DRAWING No. 119181-ND

D07-12-20-0067

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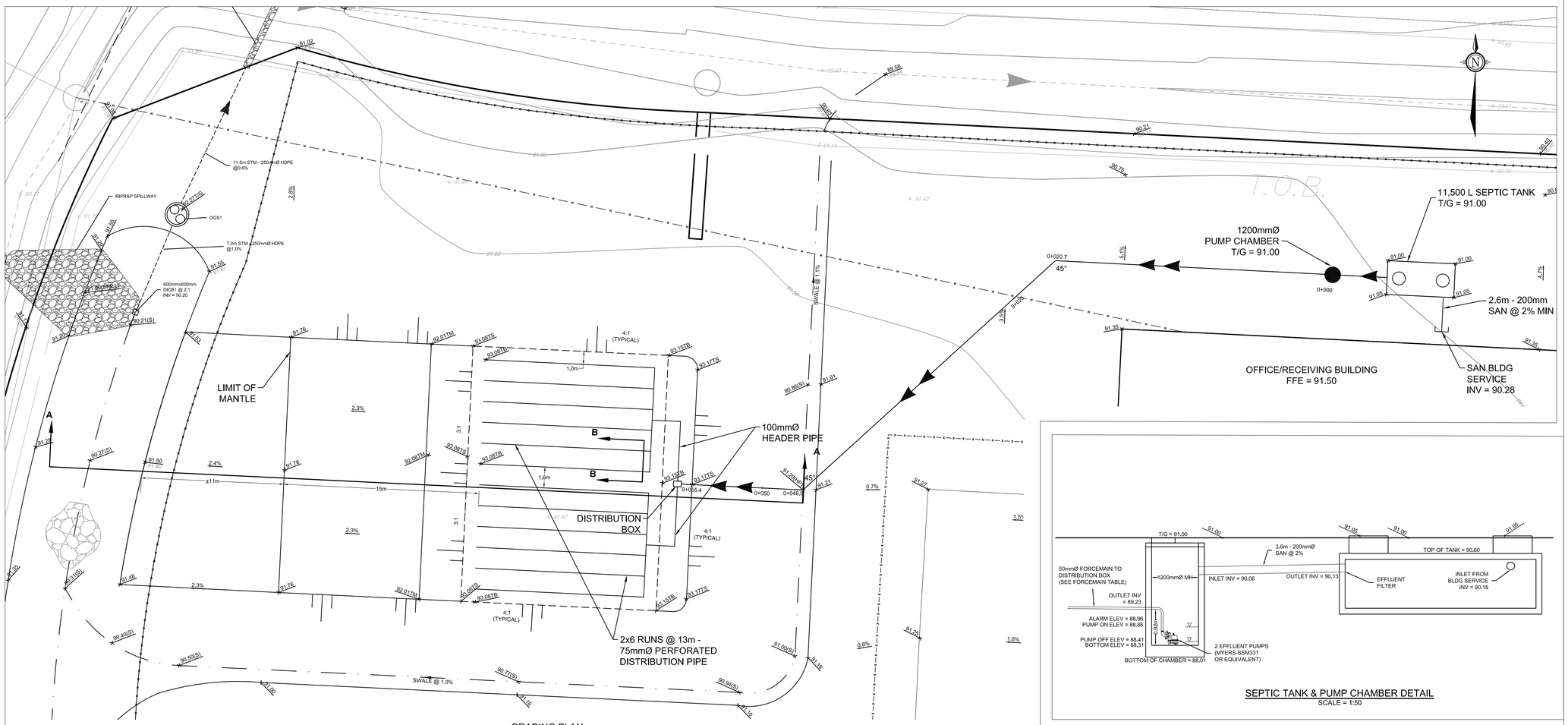
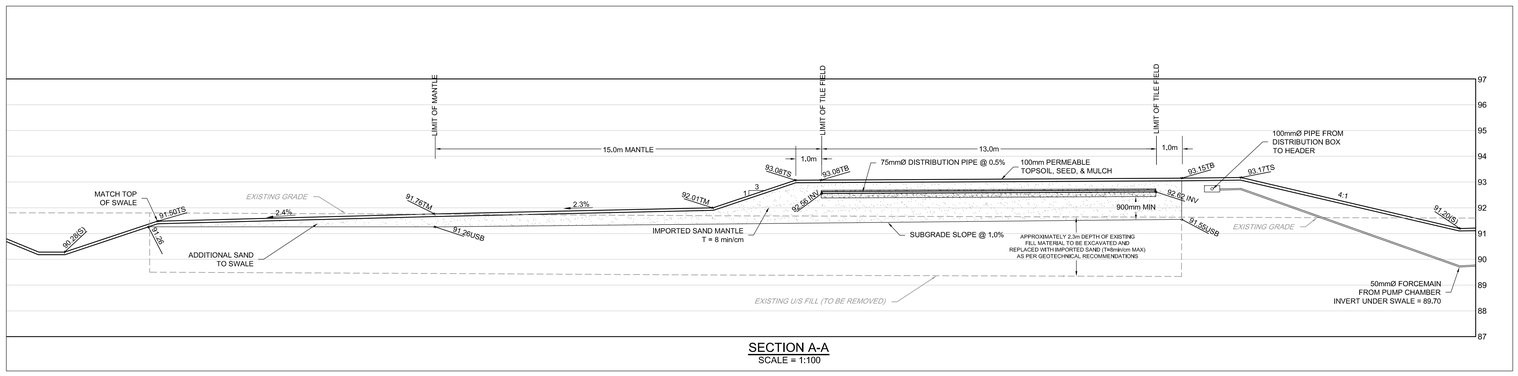


GRADING PLAN
SCALE = 1:150

SEPTIC TANK & PUMP CHAMBER DETAIL
SCALE = 1:50



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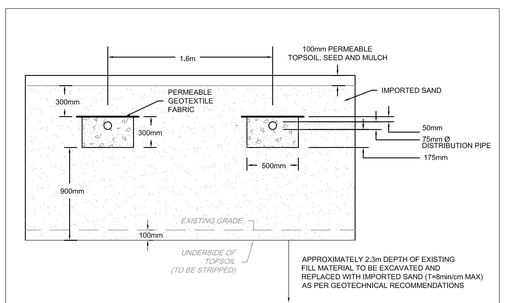

SECTION B-B
SCALE = 1:25

KEY PLAN
N.T.S.

LEGEND

- PROPOSED ELEVATION / *EXISTING ELEVATION*
- PROPOSED TOP OF SLOPE ELEVATION
- PROPOSED TOP OF BED ELEVATION
- PROPOSED TOP OF MANTLE ELEVATION
- PROPOSED INVERT
- PROPOSED UNDERSIDE OF BED ELEVATION
- TERRACING; MAXIMUM 3:1 SIDESLOPE
- SLOPE AND DIRECTION
- PROPOSED PUMP CHAMBER & FORCEMAIN
- U/G HYDRO SERVICE
- PROPOSED SILT FENCE PER OPSD 219.110

GENERAL NOTES

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION, PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA, OTTAWA SEPTIC SYSTEM OFFICE (OSSO), RIDEAU VALLEY CONSERVATION AUTHORITY (MVCA) AND THE MINISTRY OF THE ENVIRONMENT, CLIMATE AND PARKS (MECP) BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $2,000,000.00, INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.
9. PROVIDE LINE/PARKING PAINTING.
10. TOPOGRAPHIC SURVEY PROVIDED BY NOVATECH.

SEPTIC SYSTEM NOTES

1. THE PROPOSED SEPTIC SYSTEM CONSISTS OF A SEPTIC TANK, GRAVITY SEWER, PUMP CHAMBER (c/w DUAL PUMPS), FORCEMAIN, AND AN ABSORPTION TRENCH LEACHING BED WHICH HAS BEEN DESIGNED BASED ON A SEWAGE FLOW OF 3,800 L/DAY.
2. INSTALLATION IS TO BE IN ACCORDANCE WITH CURRENT ONTARIO BUILDING CODE REQUIREMENTS AND THE ENGINEER'S REPORT PREPARED BY NOVATECH, REVISED NOV 9, 2020.
3. SEPTIC SYSTEM ELEVATIONS ARE NOT TO BE REVISED WITHOUT THE WRITTEN PERMISSION OF NOVATECH.
4. ALL BENDS IN THE PIPE FROM THE BUILDING TO THE HEADER ARE TO BE 22.5 OR 45.0 DEGREES.
5. THE FOLLOWING SETBACKS ARE REQUIRED:
   - -TILE FIELD TO ANY DRILLED WELL = 18.0m (min)
   - -TILE FIELD TO PROPERTY LINE = 6.0m (min)
   - -SEPTIC TANK TO ANY DRILLED WELL= 15.0m (min)
   - -SEPTIC TANK TO BUILDING= 1.5m (min)
6. TANK SIZE = 11,500L (MACGREGOR CONCRETE OR APPROVED EQUIVALENT)
7. THE SEPTIC TANK IS TO BE FITTED WITH AN EFFLUENT FILTER IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
8. TANK AND MANHOLE LIDS ARE TO BE LEFT ACCESSIBLE FOR PUMPING/ MAINTENANCE/ INSPECTION.
9. A MANTLE IS REQUIRED IN THE DIRECTION OF THE SURFACE DRAINAGE FLOW. IMPORTED SAND MATERIAL IS REQUIRED, THE IMPORTED SAND, WHICH IS TO BE USED TO CONSTRUCT THE SEPTIC SYSTEM INCLUDING THE MANTLE, IS TO HAVE A MAXIMUM PERCOLATION RATE OF 8 MIN/CM, WITH LESS THAN 8% SILT, TESTED AND APPROVED BEFORE PLACEMENT.
10. CONSTRUCTION TRAFFIC AND MATERIALS ARE TO BE KEPT AWAY FROM THE SEPTIC SYSTEM, INCLUDING THE MANTLE.
11. THE SEPTIC SYSTEM HAS BEEN DESIGNED TO TREAT DOMESTIC WASTE ONLY. THE FOLLOWING ARE NOT TO BE CONNECTED TO THE SEPTIC SYSTEM.
    - -WATER SOFTENER
    - -SUMP PUMP
    - -EAVESTROUGHS/ROOF DRAINS
    - -REFRIGERATION OR CONDENSING UNIT
    - -FLOOR DRAINS
    - -INDUSTRIAL OR AUTOMOTIVE WASTE
12. NOVATECH'S DESIGN AND INSPECTION SERVICES DO NOT RELIEVE THE SEPTIC SYSTEM INSTALLER OF THE RESPONSIBILITY FOR GUARANTEEING WORKMANSHIP AND MATERIALS.
13. INSTALLATION OF SEPTIC SYSTEM TO BE INSPECTED BY OTTAWA SEPTIC SYSTEM OFFICE (OSSO) AND NOVATECH
14. THE CONTRACTOR IS RESPONSIBLE FOR SURVEYING ASBUILT ELEVATIONS AND PROVIDING THE REQUIRED ASBUILT INFORMATION AND DRAWING(S) TO THE OSSO.
15. THE PUMPS ARE TO BE EQUIPED WITH A HIGH FLOAT ALARM WHICH IS TO BE INSTALLED A MINIMUM OF 0.05m BELOW THE INLET OF THE PUMP CHAMBER AS WELL AS A LOW FLOW ALARM.

SANITARY FORCEMAIN TABLE

Station	Invert of Forcemain Elevation (m)	Top of Forcemain Elevation (m)	Finished Ground Elevation (m)	Depth of Cover (m)
0+000.0	89.23	89.28	91.00	1.72
0+020.7	89.44	89.49	90.76	1.27
0+025.0	89.48	89.53	90.84	1.31
0+046.9	89.70	89.75	91.20	1.45
0+050.0	90.79	90.84	91.92	1.08
0+055.4	92.70	92.75	93.17	0.42

NOTE: NO SUMPS

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SCALE: AS NOTED

DESIGN: AAR
CHECKED: ARM
DRAWN: AAR
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LICENSED PROFESSIONAL ENGINEER — S.M. GORDON — Nov 9/20 — PROVINCE OF ONTARIO

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LOCATION
300 SOMME STREET
BLOCK 6

DRAWING NAME
SEPTIC SYSTEM PLAN

PROJECT No. 119181
REV REV # 3
DRAWING No. 119181-SEP

D07-12-20-0067

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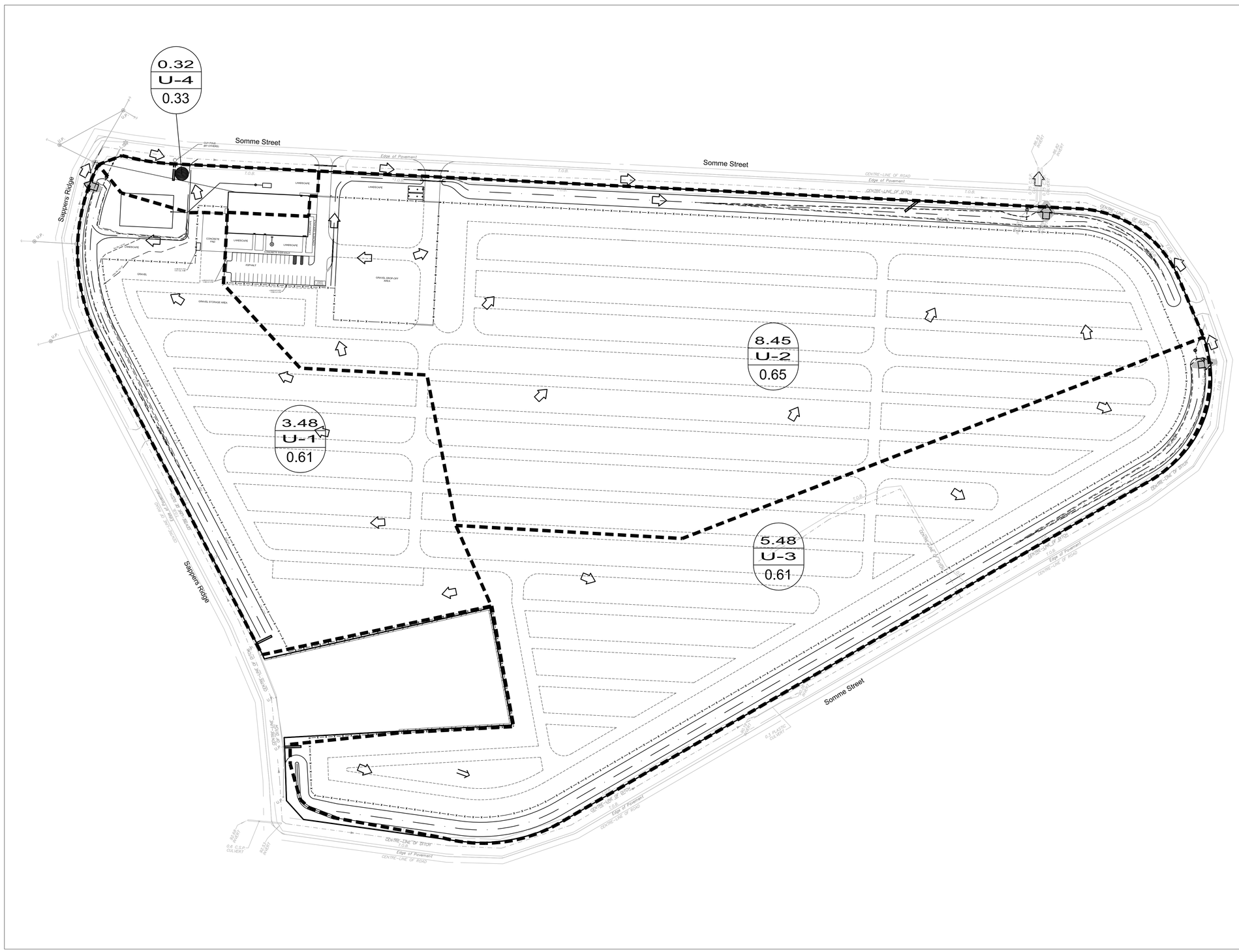

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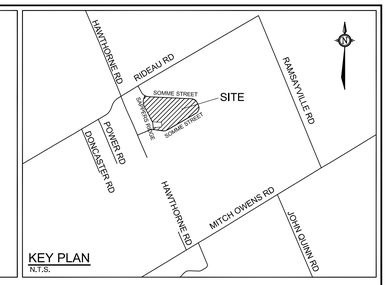

KEY PLAN
N.T.S.

LEGEND

- 6.71 / EX-2 / 0.70 — DRAINAGE AREA (hectares) / ID / RUNOFF COEFFICIENT (C)
- STORM DRAINAGE AREA
- OVERLAND FLOW DIRECTION
- 100 YR PONDING CONTOUR
- 5 YR PONDING CONTOUR

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1.	ISSUED FOR DISCUSSION	MAY 7/20	AAR

SCALE
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DESIGN AAR
CHECKED ARM
DRAWN AAR
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LOCATION
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DRAWING NAME
POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

PROJECT No. 119181
REV REV # 4
DRAWING No. 119181-POST

D07-12-20-0067

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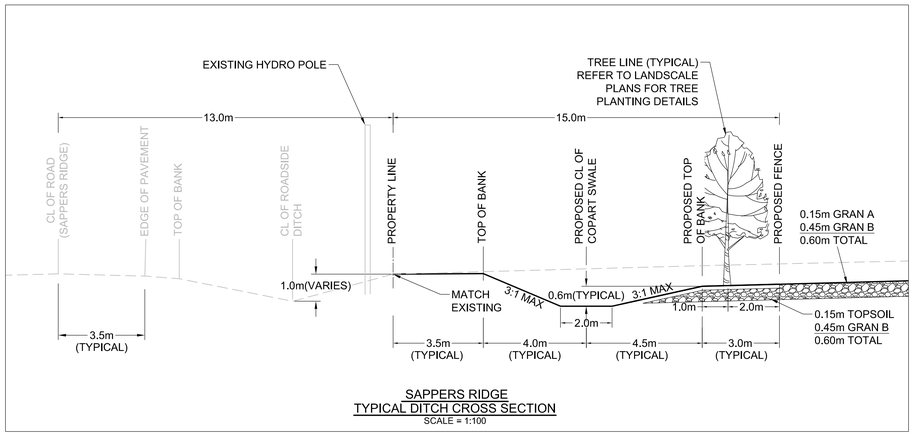

SAPPERS RIDGE
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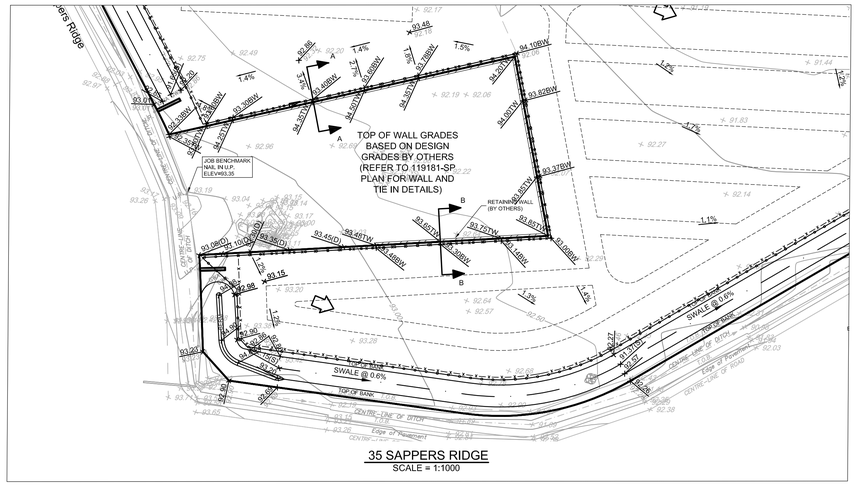

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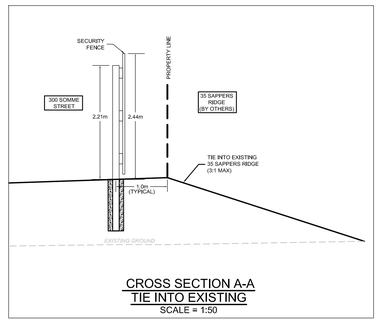

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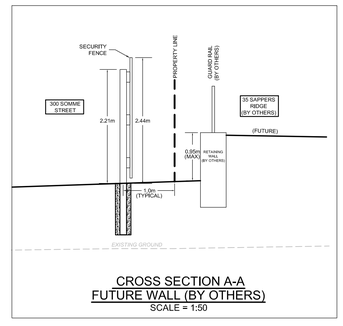

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FUTURE WALL (BY OTHERS)
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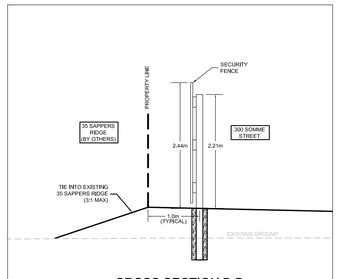

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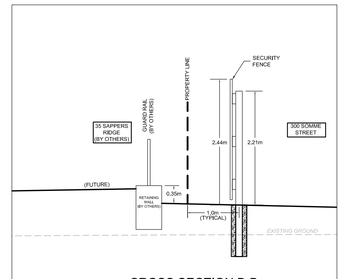

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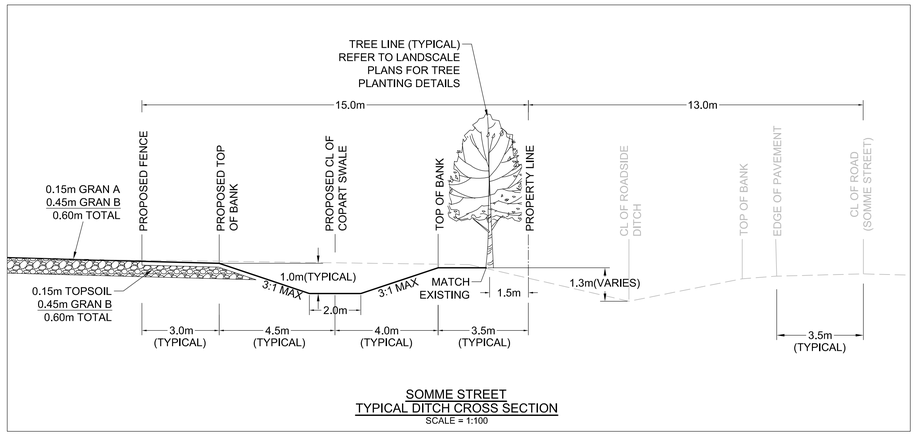

SOMME STREET
TYPICAL DITCH CROSS SECTION
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DRAWING NAME
SECTIONS PLAN

PROJECT No. 119181
REV REV # 1
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