Engineers, Planners & Landscape Architects

March 27, 2020

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

Attention: Ahmed Elsayed, P.Eng

Dear Mr. Elsayed

Reference: 3026 Solandt Road, Ottawa
Servicing and Stormwater Management Report
Our File No. : 119200

Please find enclosed the revised 'Servicing and Stormwater Management Report' for the above noted project. This report has been revised according to city comments received on March 6, 2020 and is hereby submitted for review and approval.

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

Yours truly,

NOVATECH

Cara Ruddle, P.Eng.
Senior Project Manager | Land Development Engineering

cc: Bonnie Martell, Colonnade Bridgeport

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1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed development located at 3026 Solandt Road, Ottawa (formerly Kanata), Ontario. This report will support a Site Plan Application for the subject development. **Figure 1** Key Plan shows the site location.

2.0 EXISTING CONDITIONS

There is presently an existing 5-storey office building (450 March Road) located on the subject site with associated parking areas and access to March Road and Solandt Road. Previously there was also a 1-storey office building (4100m^2) which has been demolished. The site is bounded by Solandt Road to the north, asphalt parking and an office building (3000 Solandt Road) to the east, 350 March Road and the Kizell Drain to the south and March Road to the west. The site is generally flat and at grade with Solandt and March Roads, with drainage divided between the Kizell drain and Solandt Road. There are existing private services on the site which connect to municipal services under Solandt Road. **Figure 2** shows the existing site conditions.

The design for the original development was completed by David McManus Engineering Ltd. and presented in a report entitled 'Stormwater Management and Servicing Report, Betz Building – 3026 Solandt Road, Morguard Investments, City of Kanata' (McManus Report), dated February 2001. This report provides a basis for the design of the subject development as discussed in the following sections of this report. A copy of the McManus Report is provided in **Appendix A** for reference.

3.0 PROPOSED DEVELOPMENT

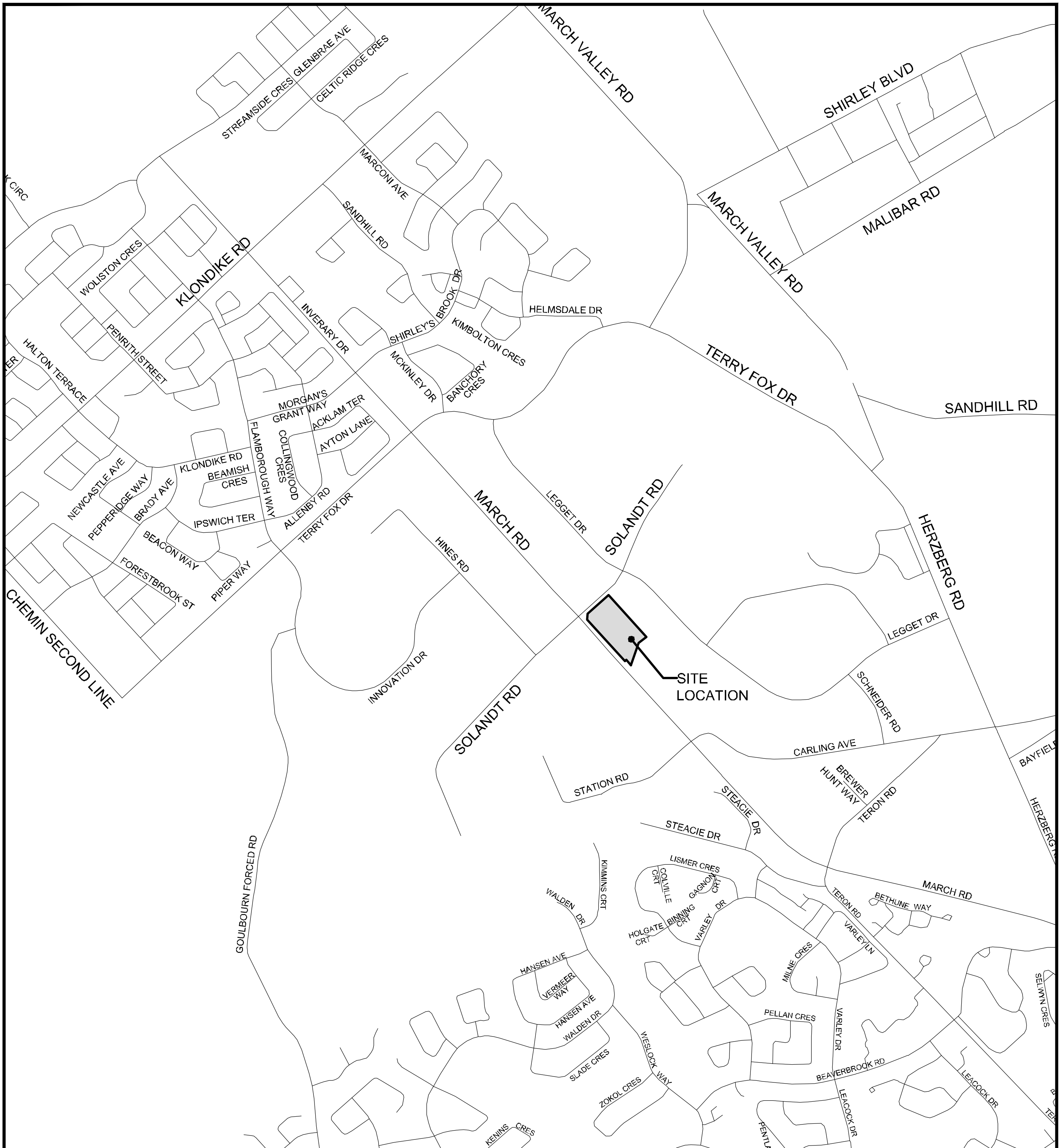
The site is a total of 2.6 hectares in size including the existing office building addressed 450 March Road. The area subject to re-development is approximately 1.6 hectares. It is proposed to develop a five-storey office building on the west side of the property at the corner of March and Solandt Road. Access to the building is to be provided by the two entrances from Solandt Road. The existing north entrance will be maintained to service the proposed development. The south entrance will be removed and relocated to the northeast as a 'Right In' access only. Refer to **Figure 3** for the proposed site layout.

A Pre-Consultation meeting was held with the City on November 1, 2019 to discuss the proposed development. A copy of the Pre-Consultation meeting minutes is included in **Appendix B** for reference.

4.0 SITE CONSTRAINTS

A geotechnical investigation was completed for the subject development. A report entitled 'Geotechnical Investigation Proposed Multi-Storey Building 3026 Solandt Road Ottawa, Ontario' prepared by Paterson Group Inc. dated January 10, 2020. The report indicates there are some issues to be considered in the grading and servicing design due to the native soils present such as:

- seepage barriers along sewer trenches to prevent potential groundwater lowering and
- subdrains at catchbasins to provide adequate drainage of the parking areas and
- grade raise restriction of 2.0m.



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3026 SOLANDT ROAD

KEY PLAN

SCALE		
N.T.S		
DATE: JAN 2020	JOB: 119200	FIGURE: FIG - 1

SHT8X11.DWG - 216mmx279mm

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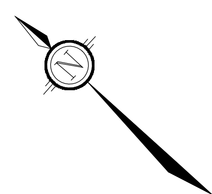

3026 SOLANDT ROAD

EXISTING CONDITIONS PLAN

SCALE 1 : 1500 (0, 15, 30, 45, 60)		
DATE JAN 2020	JOB 119200	FIGURE FIG - 2

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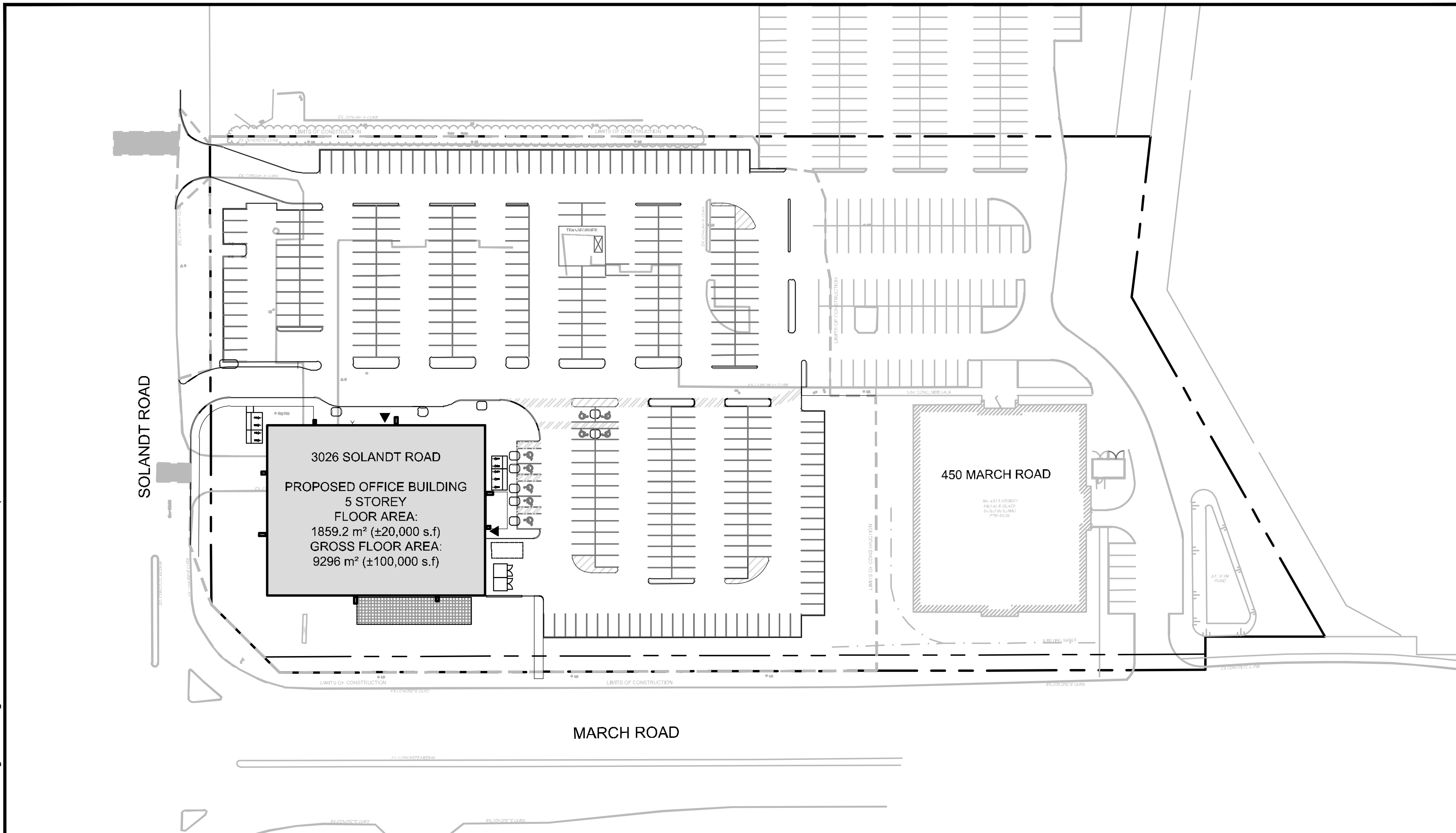

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3026 SOLANDT ROAD

SITE PLAN

SCALE 1 : 1250 (0 10 20 30 40 50)		
DATE MAR 2020	JOB 119200	FIGURE FIG - 3

SHT8X11.DWG - 216mmx279mm

The report also indicates that bedrock is present at an expected depth ranging from 3-10m. It should also be noted that an Environmental Activity and Sector Registry (EASR) may be required depending on groundwater levels at the time of construction. A that a temporary permit to take water from the MOE may be required if more than 400,000 L/day are to be pumped during excavation and construction.

5.0 WATER SERVICING

There is an existing 400mm diameter watermain in the Soland Road right-of-way, and a 600mm diameter watermain in the March Road right-of-way. An existing 200mm diameter water service connected to the 400mm diameter main under Solandt Road provides service to the site. A 150mm private watermain connected to the 200mm water service provides service to the existing 450 March Road and an existing hydrant.

The Ontario Building Code (Table 8.2.1.3) was used to calculate the combined theoretical water demand for the proposed five-storey office building, and the existing five-storey office building at 350 March Road. The water demand has been calculated for the buildings based on a water demand of 75 L/9.3m^2/day and a summary of the flows is provided in **Table 6.1** below.

Table 5.1 Water Demand Summary

	Proposed Office Building	Existing Office Building	Total
Water Demand Rate (L/9.3m^2/d)	75		
Total Floor Area (m^2)	9296	9048	
Total Daily Volume (L)	74,967.7	72,967.7	147,935.5
Average Day Demand (L/s)	0.868	0.845	1.71
Maximum Daily Demand (L/s)	1.302	1.267	2.57
Peak Hour Demand (L/s)	2.343	2.280	4.62
FUS Fire Flow Requirement (L/s)	150.00	N/A	150
Max Day+Fire Flow (L/s)			152.57

The required fire demand was calculated using the Fire Underwriters Survey (FUS) Guidelines. The proposed building is to be sprinklered with the Siamese connection located by the front entrance of the building. A proposed hydrant will provide fire protection for the proposed development. The required fire demand was calculated to be 2,378 USGPM (or 9000 L/min). Refer to **Appendix C** for a copy of the water calculations, and the fire hydrant coverage plan.

This water demand information was submitted to the City and boundary conditions provided from the City's water model. The boundary conditions are provided in **Table 6.2**.

Table 5.2 Water Boundary Conditions

Criteria	Head (m)	Pressure (psi)
Max HGL	130.6	72.6
Peak Hour	126.5	66.7
Max Day + Fire Flow	124.7	64.1

These boundary conditions were used to analyze the performance of the proposed watermain for three theoretical conditions: 1) High Pressure check under Average Day conditions 2) Peak Hour demand 3) Maximum Day + Fire Flow demand. The following **Table 5.3** summarizes the results from the hydraulic water analysis.

Table 6.3 Water Analysis Results Summary

Condition	Demand (L/s)	Min/Max Allowable Operating Pressures (psi)	Limits of Design Operating Pressures (psi)
High Pressure	1.71	80psi (Max)	71.5
Maximum Daily Demand and *Fire Flow*	152.57	20psi (Min)	63.1
Peak Hour	4.62	40psi (Min)	65.7

Based on the proceeding analysis it can be concluded that the watermain, as designed, will provide adequate system pressures for the fire flow + maximum day demand and peak hour demand. Refer to **Appendix C** for detailed hydraulic calculations, and boundary conditions.

As per Ottawa design guidelines two service connections are required since the basic day demand exceeds 50 m^3/d. A second 150mm diameter water service connection to the existing 400mm diameter main under Solandt Road is proposed, in addition to the existing 200mm diameter water service to meet the above guideline. Refer to the General Plan of Services drawing (119200-GP) for water servicing information.

6.0 SANITARY SERVICING

The existing development is serviced by an existing 150mm diameter sanitary sewer that runs through the site and connects to the existing 750mm diameter trunk sewer along Solandt Road. To accommodate the development a portion of the existing 150mm diameter sanitary sewer within the site will be re-routed around the proposed building. The rerouted sewer will be utilized to service the proposed building. Refer to the General Plan of Services (119200-GP) for sanitary servicing information.

Sanitary flows for the proposed development have been calculated based on the total office floor areas, and found to be 1.83 L/s. Detailed sanitary flow calculations, sanitary design sheet and sanitary drainage area plan are included in **Appendix D** for reference. Design information on the existing sanitary sewer system servicing the previous development was taken from the McManus Report, included in **Appendix D**.

7.0 STORM SERVICING

There is an existing private storm sewer system currently servicing a portion of the existing development. The existing storm sewers range in diameter from 250mm to 375mm. The private storm sewer system outlets to the existing 375mm diameter storm sewer within the right-of-way of Solandt Road. The remainder of the site (western portion) drains to an existing stormwater management pond which outlets to the Kizell Drain. This existing pond was constructed as part of the 2001 Betz Building Addition development.

The existing private storm sewer has minimal cover and will not be able to service the proposed development area. It is proposed to replace the existing storm sewer and construct a new connection to the 375mm diameter storm sewer along Solandt Road to achieve cover requirements. The proposed storm sewer will range in diameter from 250mm to 375mm diameter, as per the existing sewer design. The proposed storm sewers are part of a stormwater management system utilizing orifice controls to limit the release rate of stormwater discharging from the site. The underground storm sewer system will be utilized to store and convey stormwater. The existing and proposed storm servicing information is shown on the General Plan of Services (119200-GP).

The storm sewers are designed based on the criteria outlined in the Ottawa Sewer Design Guidelines. The design criteria used in sizing the storm sewers are summarized in **Table 7.1**.

Table 7.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Private Roads	2 Year Return Period
Storm Sewer Design	Rational Method
IDF Rainfall Data	Ottawa Sewer Design Guidelines
Initial Time of Concentration (Tc)	10 min
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

A storm sewer drainage area plan and design sheet for the proposed storm sewer system is provided in **Appendix E** for reference.

8.0 STORMWATER MANAGEMENT

The proposed stormwater management design for the site are discussed in the following sections of the report.

8.1 Stormwater Management Criteria

The stormwater management criteria and objectives for the site are listed below, as per the City of Ottawa's requirements:

- Stormwater quantity control of stormwater is required for storms up to and including the 100-year storm event to pre-development conditions.
- There shall be no surface ponding in private parking areas during the 2-year storm event.
- Ensure that ponding is confined within the parking areas at a maximum depth of 0.35 m.
- Provide on-site stormwater quality control equivalent to an ‘Enhanced’ Level of Protection (80% long-term TSS removal).

8.2 Quantity Control

As outlined in the controlled storm sewer design sheet in the McManus Report, the previous development released flows to the Solandt Road sewer system at a controlled rate of 98.15 L/s. This controlled release rate was used as the allowable release rate for the proposed development to be consistent with the original design. The proposed and previous drainage areas were also compared to ensure conformance with the original design. Refer to **Figure 4** for the combined drainage areas plan.

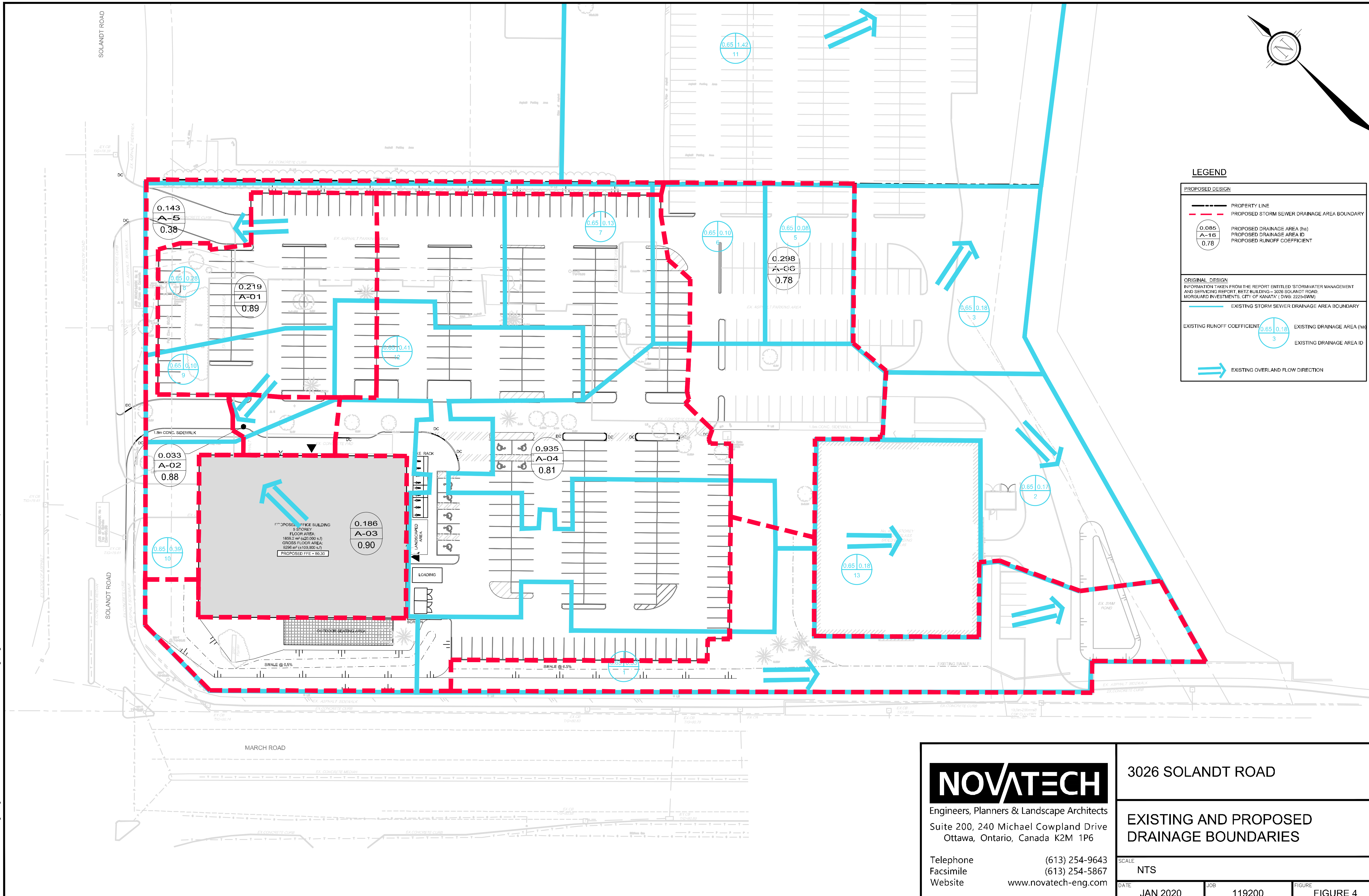
The overall drainage areas to each outlet are consistent with the original design. In the previous design, Areas 9 and 10 (McManus Report) drained uncontrolled from the site into the roadside ditch. The remaining areas that drained to Solandt Road, were controlled using ICDs and discharged into the Solandt Road storm sewer.
The uncontrolled area of the proposed development (Area A-15) has been designed to be below the pre-development uncontrolled flows to Solandt Road (McManus Report Areas 9 and 10). Calculations using Modified Rational Method to calculate the previous development uncontrolled flows are provided in **Appendix F**.

Underground Storage

Peak flows to the Solandt Road storm sewer system will be controlled using inlet control devices (ICDs) sized to restrict flows from the site to the allowable release rate. Underground storage is required for storms up to the 2-year storm event. The underground storage will be provided using Stormtech SC-740 arch-type chambers (or approved equivalent), which are covered in 50mm dia. (D_{50}) clearstone. The chambers will be installed under the parking areas immediately upstream the ICDs. A total of 76 storage chambers will provide 161.0 m^3 of storage. Refer to **Appendix F** for calculations details. The proposed layout of underground storage chambers is shown on the General Plan of Services (drawing 119200-GP).

Surface Storage

Storage for storms greater than the 2-year event will be provided via surface ponding in the parking areas. The total surface storage at each inlet is provided in **Appendix F**. Approximately 565.3 m^3 of surface storage is available within the low-points of the parking area, and grassed swale. The parking areas have been designed to store runoff from storms that exceed the capacity of the underground storage chambers at each inlet. The site has been graded to ensure that ponding is confined within the parking areas at a maximum depth of 0.35 m. A comparison of the provided versus required on-site storage is shown in **Table 8.1**.



LEGEND

PROPOSED DESIGN

PROPERTY LINE
PROPOSED STORM SEWER DRAINAGE AREA BOUNDARY
0.085 / A-16 / 0.78
PROPOSED DRAINAGE AREA (ha)
PROPOSED DRAINAGE AREA ID
PROPOSED RUNOFF COEFFICIENT

ORIGINAL DESIGN
INFORMATION TAKEN FROM THE REPORT ENTITLED 'STORMWATER MANAGEMENT AND SERVICING REPORT, BETZ BUILDING – 3026 SOLANDT ROAD, MORGUARD INVESTMENTS, CITY OF KANATA' (DWG: 2225-SWM)

EXISTING STORM SEWER DRAINAGE AREA BOUNDARY
EXISTING RUNOFF COEFFICIENT 0.65 | 0.18 EXISTING DRAINAGE AREA (ha)
3 EXISTING DRAINAGE AREA ID
EXISTING OVERLAND FLOW DIRECTION

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3026 SOLANDT ROAD

EXISTING AND PROPOSED DRAINAGE BOUNDARIES

SCALE		
NTS		
DATE: JAN 2020	JOB: 119200	FIGURE: FIGURE 4

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Table 8.1: Provided and Required On-Site Storage

Area	Provided Storage Volume (m³)			Required Storage Volume (m³)		
	Ponding	Underground	Total	Ponding	Underground	Total
Total Site	565	161	726	305	161	466

The subcatchments with existing storm infrastructure (Areas A-01 to A-03) do not have detailed topographic information available. Ponding areas for the existing catchbasins were estimated using proposed grades and an as-built drawing by McManus Engineering (refer to **Appendix A**). In the McManus design, Existing CB01 would spill towards the West SWM pond above the 5-year storm. The ICD and storage chambers associated with Existing CB01 were sized to ensure that runoff from Area A-01 will only spill towards the existing SWM pond during a storm event greater than the 100-year storm event.

8.3 Hydrologic and Hydraulic Modelling

The *City of Ottawa Sewer Design Guidelines* (October 2012) requires hydrologic modeling for all dual drainage systems. The performance of the proposed storm drainage system for the site was evaluated using the PCSWMM hydrologic/ hydraulic model.

The PCSWMM model schematics and 100-year model output data are provided in **Appendix F**. Digital copies of the modeling files and model output for all storm events are provided on the enclosed CD.

8.3.1 Design Storms

The hydrologic analysis was completed using the following synthetic design storms: the 3-hour Chicago and the 12-hour SCS Type II storms for return periods of 2-year, 5-year, 100-year and 100-year (+20%). The IDF parameters used to generate the design storms were taken from the *City of Ottawa Sewer Design Guidelines* (October 2012).

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 of the storm drainage system.

The proposed drainage system has also been stress tested using a 3-hour Chicago design storm that has a 20% higher intensity and total volume compared to the 100-year event.

8.3.2 Model Development

The PCSWMM model has been developed to account for both minor and major system flows from the site, adhere to the allowable release rates. The results of the analysis were used to:

- Determine the total major and minor system runoff from the site;
- Determine the required underground storage volume;
- Evaluate overland flow depths and ponding volumes during the 100-year event.

Infiltration

Infiltration losses for all catchment areas were modeled using Horton's infiltration equation, which defines the infiltration capacity of soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values as specified in the Sewer Design Guidelines were used for all catchments.

Horton's Equation:	Initial infiltration rate:	f_o = 76.2 mm/hr
$f(t) = f_c + (f_o - f_c)e^{-k(t)}$	Final infiltration rate:	f_c = 13.2 mm/hr
	Decay Coefficient:	k = 4.14/hr

Depression Storage

The default values for depression storage in the City of Ottawa were used for all catchments.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

The rooftops assumed to provide no depression storage (zero-impervious parameter).

Equivalent Width

'Equivalent Width' refers to the width of the sub-catchment flow path. This parameter (Table 5.1) is calculated as described in the *Sewer Design Guidelines, October 2012, Section 5.4.5.6*. The flow path lengths are shown on the PCSWMM model schematics provided in **Appendix F**.

Impervious Values

Runoff coefficients for each subcatchment area were determined based on the proposed site plan. Refer to the Stormwater Management Plan (119200-SWM) for details. Percent impervious values were calculated using the following formula:

$$\%imp = \frac{c - 0.2}{0.7}$$

Storm Drainage Areas

For modeling purposes, the site has been divided into subcatchments based on the drainage areas tributary to each inlet of the proposed storm sewer system. The subcatchment areas are shown on the Stormwater Management Area Plan (drawing 119200-SWM) in **Appendix G**.

The hydrologic modeling parameters for each subcatchment were developed based on the Site Plan (**Figure 3**) and the Stormwater Management Plan specified above. Subcatchment parameters are provided in **Appendix F**.

8.3.3 Minor System Design and Analysis

The following sections outline the model parameters and results of the PCSWMM model, pertaining to the minor system (storm sewers).

Inlet Controls

Inflows to the storm sewer were modeled based on the characteristics of each inlet. All the catchbasins in the parking area are located at low points. Inflows to the storm sewer are based on the ICD specified for the inlet and the maximum depth of ponding. ICDs have been sized to limit the outlet peak flows to the pre-development release rate to the Solandt Road storm sewer. Details are outlined as follows in **Table 8.2**. ICD information is indicated on the General Plan of

Services (drawing 119200-GP). Documentation on the Tempest LMF ICDs are provided in **Appendix F**.

Table 8.2: Orifice Parameters

Structure	ICD Size & Release Rate*						
	Orifice Diameter / Tempest LMF ICD Size	Orifice Invert (m)	T/G (m)	100-year HGL (m)	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
CBMH103	Vortex 85	77.64	79.55	79.79	5.9	8.9	9.2
CBMH104	108mm	77.77	79.60	79.91	29.2	35.0	36.3
CBMH5	Vortex 71	77.83	79.85	79.98	5.1	6.2	6.4
MH108	108mm	77.61	80.08	79.85	25.3	26.9	36.7

**From PCSWMM model.*

<u>*Roof Drains*</u>

The proposed rooftop was simulated in PCSWMM based on an outlet rating curve for the proposed Watts roof drains and using a storage node to represent the available storage provided by the roof surface. It has been assumed that the roof will have one roof drain for every 250 m^2. This assumes there will be 8 roof drains for the proposed building. The Watts roof drains are to be set at ½ open, giving the flow rates outlined in **Table 8.3** for a single drain (converted from inches and gallons per minute). For modeling purposes, a single outlet link for the roof has been used.

Table 8.3: Watts Roof Drain Rating Curve

Head (m)	Controlled Flow Rate (L/s)	
	Single Drain*	Proposed Building (8 drains)
0.000	0.00	0.00
0.025	0.32	2.56
0.051	0.63	5.04
0.076	0.79	6.32
0.102	0.95	7.60
0.127	1.10	8.80
0.150	1.26	10.08
1.000	1.26	10.08

**Watts Flow Control Roof Drains Rating Curve (single drain, ½ open)*

The available storage and flow rating curve for the roof drains has been multiplied by the number of drains on the roof, and the storage lumped into a single storage node. Approximately 84 m^3 of storage can be provided by the proposed building's rooftop. This assumes that storage is provided for 60% of the roof area. **Table 8.4** summarizes the controlled post-development design flows from the building rooftop, the maximum anticipated ponding depths, storage volumes required, and the storage volumes provided for the 5-year and 100-year storm events.

Table 8.4: Roof Drain Design Flow

Area ID	Roof Drain Type	Setting	No. of Drains	1:5 - Year Event			1:100 - Year Event		
				Head (m)	Flow (L/s)	Vol (m^3)	Head (m)	Flow (L/s)	Vol (m^3)
Proposed Building	Watts Roof Drains - Adjustable	½ Open	8	0.11	7.8	42	0.15	8.5	80

As shown in **Table 8.4**, the roof will provide sufficient storage for all storm events, with the exception of the stress test event. During the 100-year (+20%) event, flows exceeding the available storage will overflow through the scuppers and onto the ground surface below and will be conveyed to storm sewer inlets via the major system flow routes. The overflow scuppers have been included in the PCSWMM model as an overflow conduit towards the uncontrolled area outfall. The model only accounts for the release rate to the storm sewer system for the 100-year (+20%) stress test event.

Peak Flows

The overall release rates from the ICDs and rooftop outlets were added to determine the overall release rate from the developed portion of the site. The results of this analysis indicate that the allowable release rates will be met for each storm event. Refer to **Table 8.5** for the modelled peak flows for each storm event.

Table 8.5: Comparison of Peak Flows

Scenario / Area	Drainage Area (ha)	Peak Flows[1] (L/s)		
		2-yr	5-yr	100-yr
Allowable Release Rate				
Controlled Areas	1.67	98.2	98.2	98.2
Uncontrolled Areas	0.14	68.0	92.3	178.1
TOTAL (Allowable)	**1.81**	**166.2**	**190.5**	**276.3**
Proposed Conditions - Overall				
Controlled Areas	1.67	70.6	83.8	97.6
Uncontrolled Areas	0.14	8.5	22.4	59.3
TOTAL (Overall)	**1.81**	**79.1**	**106.2**	**156.9**
Difference (post - allowable)	-	*-87.1*	*-84.2*	*-119.4*

[1]3-hour Chicago Storm.

The results of the PCSWMM analysis indicate that outflows from the proposed development will not exceed the allowable release rate for all storm events. The ICDs were sized to control peak flows to the McManus Report release rates.

Hydraulic Grade Line

The results of the analysis were used to determine if there would be any surcharging from the storm sewer system during the 100-year storm event. **Appendix F** provides a summary of the 100-year HGL elevation at each storm manhole within the proposed development, as well as a summary of the HGL elevations for a 20% increase (rainfall intensity and total precipitation) in the 100-year design event. The results of the HGL analysis and the stress testing indicates that the storm sewer does not surcharge during the 100-year event and 100-year (+20%) storm event.

8.3.4 Major System Design and Analysis

The major system network was evaluated using the PCSWMM model to ensure that the ponding depths conform to City standards. A summary of ponding depths at each inlet for the 2-year, 5-year, 100-year and 100-year (+20%) events are provided in **Appendix F**. No ponding occurs during the 2-year storm event and the maximum static and dynamic ponding depths are less than 0.35m during all events, thereby meeting the major system criteria.

Overland flow paths have been provided to ensure that runoff from extreme storm events exceeding the available storage can be safely directed towards Solandt Road. The overland flow route is shown on the Grading Plan (drawing 119200-GR). A Stormwater Management Plan (drawing 119200-SWM) is provided in **Appendix G** which shows the proposed drainage areas, inlet control device information and the limits of 5-year,100-year, and 100-year+20% events.

8.4 Quality Control

Quality control of stormwater shall be provided to an Enhanced level of treatment or 80% removal of total suspended solids. Quality control of stormwater for the site will be provided through the installation of an oil grit separator unit. The proposed water quality unit (CDS PMSU2025_5) located in the north-east corner of the site. This unit will achieve on site removal of 80% TSS, as required by the Conservation Authority prior to discharging to the Solandt Road system. Details for the proposed unit are included in **Appendix F**.

9.0 EROSION AND SEDIMENT CONTROL

9.1 Temporary Measures

Temporary erosion and sediment control measures will be implemented during construction. Silt fence, mud mats and filter socks in catchbasins will be used as erosion and sediment control measures.

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Erosion and Sediment Control Plan (119200-ESC) for additional information.

10.0 CONCLUSIONS AND RECOMMENDATIONS

- Water servicing for the proposed development will be provided by the existing 200mm diameter service on the site, and a second proposed 150mm diameter service connecting to the 400mm watermain in the Solandt Road right-of-way. These services connect to the existing 400mm diameter watermain within the right-of-way of Solandt Road. The existing watermain infrastructure can provide adequate domestic flows and pressure for fire protection.
- The proposed building will be serviced by connecting to the existing 150mm diameter sanitary service present on the subject property. The existing service connects to the 750mm diameter trunk sewer within the Solandt Road right-of-way.
- Quantity control of stormwater will be provided for storms up to and including the 100-year storm event. Runoff from the property will be controlled with inlet control devices.
- Quality control of stormwater is provided from the proposed water quality unit (CDS PMSU2025_5) located in the north-east corner of the site.
- An overland flow route is provided;
- Erosion and sediment control measures will be implemented prior to and during construction.

NOVATECH

Prepared by:

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Reviewed by:

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C.J. RUDDLE
MAR 30/20
PROVINCE OF ONTARIO

Cara Ruddle, P.Eng.
Senior Project Manager
Land Development Engineering

APPENDIX A
Referenced Reports

Library Copy

R-2784

DME Ltd.

David McManus
Engineering Ltd.

STORM WATER MANAGEMENT AND SERVICING REPORT

BETZ BUILDING - 3026 SOLANDT
MORGUARD INVESTMENTS
CITY OF KANATA

CITY OF KANATA
Reviewed and approved for engineering related details only
Per
Date March 12, 2001

Prepared by:

DAVID McMANUS ENGINEERING LTD.

Project No. 2225

October, 2000
Revised February, 2001

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1.0 INTRODUCTION

David McManus Engineering Ltd. was appointed by Edmundson Matthews Architects to provide engineering services for the site development of a new building on the exisiting Morguard site. The development is located on the east corner of the intersection of March Road and Solandt Road. The location of the development is shown on Drawing 2225-S1 (Key Plan).

2.0 WATER DISTRIBUTION SYSTEM

This development will be serviced with a 152mm diameter from the existing 609.6mm diameter main located on March Road.

The location of the proposed water main on the site is shown on Drawing No. 2225-S1 attached to this report.

3.0 SANITARY SEWER DESIGN

The sanitary sewer service for this development is proposed to be a 150mm diameter connection and will connect to the existing sanitary system within the existing site The location of the proposed sanitary sewer on the site is shown on Drawing No. 2225-S1 attached to this report.

4.0 STORM DRAINAGE SYSTEM

This development site is designed to surface drain to proposed storm water ponds which will outlet to the Kizell Drain. Drawing No. 2225-SWM identifies the individual drainage areas for this site and outlet locations. At the request of the City of Kanata, an analysis of the existing storm system was conducted to determine the impact of the proposed storm sewer on the existing system. It was found that the existing storm system would not be able to accommodate the capacities produced without the use of inlet control devices (ICD's). Therefore, plate type ICD's will be placed under the frame and covers of the proposed catch basin in the front of the proposed building and in the existing catch basin located at the north west entrance to the site from Solandt Drive. "Uncontrolled" and "Controlled" Storm Sewer Design Sheets are attached hereto, and show the relationship between capacity and peak flows in controlled and uncontrolled conditions. Storage Volume Calculations and Orifice Sizing Calculations are included in this report.

5.0 STORM WATER MANAGEMENT CALCULATIONS

5.1 Storm Water Management Philosophy

To meet the City's and Conservation Authority's requirements, the runoff from the parking lot, landscaped areas and roof will be controlled to the pre development 5 year peak flow. Site BMP's will be implemented in the site grading design to provide quality enhancements to the storm water leaving the site. BMP's which will be implemented on this site include, grassed swales to convey runoff from parking lot areas and construction of detention ponds to provide quantity storage and filtration of runoff from frequent events.

Two detention ponds have been designed to provide storage and filtration for the first 15mm of runoff from the impervious areas. The West Pond will be controlled by an outlet pipe sized for the five year pre development release rate. Storms in excess of the 100 year rainfall event will be controlled by a spillway at the required elevation. The East Pond will have 15 mm (0.015 m) of runoff from the impervious areas. The West Pond will be controlled by an outlet pipe sized for the five year pre development release rate. Storms in excess of the 100 year rainfall event will be controlled by a spillway at the required elevation. The two ponds will also detain, store and slowly drain off the post development 5 and 100 year flows generated from the site.

5.2 West Pond Calculations

Allowable Pre-development Release rate

Area = (0.33+0.18+0.17)=0.68 Ha.
Pre-development Run-off Coefficient = 0.25
Time of Concentration = Tc = 20 min.
Rainfall Intensity (5 year)= 67 mm/hr.

Q = 2.78 C I A
Q = 2.78 (0.25) (67) (0.68)
Q = 31.7 L/s

Post Development Calculations

Average Run-off Coefficient

Impervious Areas (Roof and Asphalt, C = 0.90)	= 0.27 ha.
Pervious Areas (Landscaped Areas, C= 0.25)	= 0.41 ha.

Average Runoff Coeff. = 0.51

Quality Volume Calculations

The required volume of "quality" storage is calculated as follows:

Impervious area tributary to Pond # 1= 0.27 Ha. = 2700 m^2
"Quality" storage volume required = 2700 X 0.015 = 40.5 m^3

In addition to the "quality" storage volume, "quantity" storage volume will be provided in the pond to control runoff from the site to the pre-development 5 year level

The "quantity" storage volume required for the 5 year and 100 year design storms are shown in Table 1 below.

WEST POND
Storage Volume Calculations

Return Period	Time (min)	Intensity (mm/hr)	* Flow Q in l/s	** Allowable Runoff in l/s	Net Runoff To Be Stored in l/s	Storage Req'd m3	
5 Year	14	84.3	81.3	31.7	49.6	41.6	Avg. C = 0.51
	15	81.0	78.1	31.7	46.4	41.8	Area = 0.68
	16	**78.1**	**75.3**	31.7	**43.6**	**41.8**	
	17	75.4	72.7	31.7	41.0	41.8	
	18	72.9	70.3	31.7	38.6	41.7	
	19	70.6	68.1	31.7	36.4	41.4	
100 Year	15	136.4	131.5	31.7	99.8	89.8	
	16	130.2	125.5	31.7	93.8	90.1	
	17	124.6	120.1	31.7	88.4	90.2	
	18	**119.5**	**115.3**	**31.7**	**83.6**	**90.2**	
	19	115.0	110.8	31.7	79.1	90.2	
	20	110.8	106.8	31.7	75.1	90.1	

* Q = 2.78 CiA

STORAGE AVAILABLE=159.1 m3

The pond volume required for "quantity" storage is as follows:

5 Year Storage Volume	= 41.8 m^3
100 Year Storage Volume	= 90.2m^3

The maximum storage required for quality and quantity is 130.7m^3

The storage volume available in the pond is 159.1 m^3 as calculated by the end area method.

The 5 year water level will be 78.90m to accommodate the 5 year storage required.

The 100 year water level will be 79.11m to accommodate the 100 year storage required.

When water exceeds elevation 79.11m, water will overflow and discharge to the Kizell Drain.

5.3 West Pond Orifice Sizing

An orifice will be installed in each of the outlet pipes located in the SWM Pond

West Pond - Orifice Size 100 year water level head = 79.11-78.69-(0.20/2)=0.32m

$$Q = (\text{Area of Orifice})\,(0.60)\,(2g \text{ X Head on Orifice})^{0.5}$$

$$\text{Area of Orifice} = \frac{0.0317}{(0.60)(2 \text{ X } 9.81 \text{ X } 0.32)^{0.5}} = 0.021\text{m}^2$$

Use 1 – 200mm diameter CSP with a plate type orifice with a 160mm diameter opening in the upstream end of the pipe to restrict outlet flow to the 5 year pre-development release rate of 74.5 L/s.

5.4 East Pond Calculations

Allowable Pre-development Release rate

Area = (1.42+0.18)=1.60 Ha.
Pre-development Run-off Coefficient = 0.25
Time of Concentration = Tc = 20 min.
Rainfall Intensity (5 year)= 67 mm/hr.

Q = 2.78 C I A
Q = 2.78 (0.25) (67) (1.60)

Q = 74.5 L/s

Post Development Calculations

Average Run-off Coefficient
Impervious Areas (Roof and Asphalt, C = 0.90) = 0.78 ha.
Pervious Areas (Landscaped Areas, C= 0.25) = 0.82 ha.
Average Runoff Coeff. = 0.57

Quality Volume Calculations

The required volume of "quality" storage is calculated as follows:

Impervious area tributary to Pond # 1= 0.78 Ha. = 7,800 m^2
"Quality" storage volume required = 7,800 X 0.015 = 117.0 m^3

In addition to the "quality" storage volume, "quantity" storage volume will be provided in the pond to control runoff from the site to the pre-development 5 year level

The "quantity" storage volume required for the 5 year and 100 year design storms are shown in Table 2 below.

EAST POND
Storage Volume Calculations

Return Period	Time (min)	Intensity (mm/hr)	* Flow Q in l/s	** Allowable Runoff in l/s	Net Runoff To Be Stored in l/s	Storage Req'd m3	
5 Year	5	140.6	256.4	74.5	281.9	84.6	Avg. C = 0.57
	10	101.2	256.5	74.5	182.0	109.2	Area = 1.60
	15	81.0	205.5	74.5	131.0	117.9	
	20	**68.5**	**173.5**	**74.5**	**99.0**	**118.9**	
	25	59.7	151.4	74.5	76.9	115.3	
	30	53.2	134.9	74.5	60.4	108.7	
100 Year	10	183.0	463.9	74.5	389.4	233.6	
	15	136.4	345.9	74.5	271.4	244.2	
	20	**110.8**	**280.8**	74.5	**206.3**	**247.6**	
	25	94.2	238.9	74.5	164.4	246.7	
	30	82.6	209.4	74.5	134.9	242.8	

* Q = 2.78 CiA

STORAGE AVAILABLE=388.4 m3

The pond volume required for "quantity" storage is as follows:

5 Year Storage Volume = 118.9m^3
100 Year Storage Volume = 247.6m^3

The maximum storage required for quality and quantity is 364.6m^3

The storage volume available in the pond is 388.4 m^3 as calculated by the end area method.

The 5 year water level will be 78.26 m to accommodate the 5 year storage required.

The 100 year water level will be 78.52m to accommodate the 100 year storage required.

When water exceeds elevation 78.52 m, water will overflow and discharge to the Kizell Drain.

5.5 East Pond Orifice Sizing

An orifice will be installed in each of the outlet pipes located in the SWM Pond

East Pond - Orifice Size 100 year water level head = 78.52-78.00-(0.25/2)=0.395m

$$Q = (\text{Area of Orifice})\,(0.60)\,(2g \times \text{Head on Orifice})^{0.5}$$

$$\text{Area of Orifice} = \frac{0.0745}{(0.60)(2 \times 9.81 \times 0.395)^{0.5}} = 0.045\text{m}^2$$

Use 1 – 250mm diameter CSP with orifice (plate type) in upstream end of pipe with a 240mm diameter opening to restrict flow to the Kizell Drain. However, this is not a practical solution. Since the culvert will have slightly less capacity than a simple orifice, it will be sufficiently accurate to assume that the 250mm diameter culvert itself will control the flows to 74.5 L/s.

5.6 Sedimentation Control During Construction

In order to control sediments leaving the site during construction a silt fence will be constructed along the Kizell Drain until final landscaping and vegetation has been established. The location of the silt fence has been shown on Drawing No. 2225-S1.

6.0 CONCLUSIONS

This report and design adequately addresses the method by which this site will meet the overall servicing and storm water management requirements of the City of Kanata and the Mississippi Valley Conservation Authority.

Prepared by
David McManus Engineering Ltd.

Larry S. Colbran J. David McManus, P. Eng.

February 14, 2001

David McManus Engineering Ltd.

Storm Design Sheet

UNCONTROLLED

LOCATION			AREA (ha)							PROPOSED SEWER							
AREA No.	FROM MH	TO MH	R= 0.65	R= 0.7	R= 0.62	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	TYPE OF PIPE	PIPE SIZE (mm)	GRADE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)
6	EXMH 1	EXMH 2	0.27			0.49	0.49	20.00	67.35	32.86	PVC	304.8	0.36	25	60.59	1.08	0.39
5	EXCB 3	EXCB 2	0.08			0.14	0.14	20.00	67.35	9.74	PVC	304.8	0.11	18.5	33.49	0.60	0.52
6	EXCB 2	EXMH 2	0.10			0.18	0.33	20.52	66.11	21.50	PVC	304.8	0.90	5.5	95.80	1.71	0.05
7	EXMH 2	EXCB 1					0.81	20.52	66.10	53.75	PVC	304.8	0.27	18.5	52.47	0.93	0.33
7	EXCB 1	EXMH 3	0.13			0.23	1.05	20.85	65.34	68.48	PVC	254	0.45	20	41.66	1.07	0.31
7_8	EXMH 3	EXMH 4					1.05	21.16	64.64	67.74	PVC	304.8	0.27	18.5	52.47	0.93	0.33
8	EXMH 4	OUTLET	0.69			1.25	2.29	21.49	63.91	146.67	PVC	381	0.29	75.5	98.60	1.12	1.12

Q = 2.78 AIR

where Q = peak flow in litres per second (L/s)
A = area in hectares (ha)
I = rainfall intensity in millimetres per hour (mm/h)
R = runoff coefficient

SPECIFY:
Coefficient of friction in pipe
N = 0.013

David McManus Engineering Ltd.

Storm Design Sheet

CONTROLLED

LOCATION			AREA (ha)							PROPOSED SEWER							
AREA No.	FROM MH	TO MH	R= 0.65	R= 0.7	R= 0.62	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	TYPE OF PIPE	PIPE SIZE (mm)	GRADE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)
4	BLDG	EXMH 1						20.00	67.35	**5.00**	PVC	203.2	1.00	38.5	34.25	1.37	0.47
6	EXMH 1	EXMH 2						20.47	66.22	5.00	PVC	304.8	0.36	25	60.59	1.08	0.39
5	EXCB 3	EXCB 2	0.08			0.14	0.14	20.00	67.35	9.74	PVC	304.8	0.11	18.5	33.49	0.60	0.52
6	EXCB 2	EXMH 2	0.10			0.18	0.33	20.52	66.11	21.50	PVC	304.8	0.90	5.5	95.80	1.71	0.05
7	EXMH 2	EXCB 1					0.33	20.52	66.10	26.50	PVC	304.8	0.27	18.5	52.47	0.93	0.33
7	EXCB 1	EXMH 3	0.13			0.23	0.56	20.85	65.34	41.60	PVC	254	0.45	20	41.66	1.07	0.31
7_8	EXMH 3	EXMH 4					0.56	21.16	64.64	41.21	PVC	304.8	0.27	18.5	52.47	0.93	0.33
8	EXMH 4	OUTLET	0.41			0.74	1.30	21.49	63.91	**98.15**	PVC	381	0.29	75.5	98.60	1.12	1.12

Q = 2.78 AIR

where Q = peak flow in litres per second (L/s)
A = area in hectares (ha)
I = rainfall intensity in millimetres per hour (mm/h)
R = runoff coefficient

PEAK FLOWS IN **BOLD** INDICATE A CONTROLLING ORIFICE PLATE TO LIMIT THE RELEASE RATE.

SPECIFY:
Coefficient of friction in pipe
N = 0.013

Storage Volume Calculations

RUNOFF= 0.65 **AREA # 4**
AREA(HA) = 0.27 **CATCH BASIN No.1**

Return Period	Time (min)	Intensity (mm/hr)	* Flow Q in l/s	** Allowable Runoff in l/s	Net Runoff To Be Stored in l/s	Storage Req'd m3
5 Year	40	44.1	21.5	5	16.5	39.7
	50	38.0	18.5	5	13.5	40.6
	60	33.6	**16.4**	**5**	**11.4**	**40.9**
	70	30.2	14.7	5	9.7	40.8
	80	27.5	13.4	5	8.4	40.3
	90	25.3	12.3	5	7.3	39.6

* Q = 2.78 CiA

Q(L/S)	H(M)	ORIFICE AREA(SQ.M)	SQUARE (1-side mm)	CIRC (DIA-mm)
5.0	0.37	0.003	55.6	62.8

STORAGE AVAILABLE=41.4m4

Storage Volume Calculations

RUNOFF= 0.65 **AREA # 8**
AREA(HA) = 0.28 **EXIST. CATCH BASIN No.4**

Return Period	Time (min)	Intensity (mm/hr)	* Flow Q in l/s	** Allowable Runoff in l/s	Net Runoff To Be Stored in l/s	Storage Req'd m3
5 Year	20	68.5	34.6	10	24.6	29.6
	30	**53.2**	**26.9**	**10**	**16.9**	**30.5**
	40	44.1	22.3	10	12.3	29.6
	50	38.0	19.2	10	9.2	27.7
	60	33.6	17.0	10	7.0	25.1
	70	30.2	15.3	10	5.3	22.1

* Q = 2.78 CiA

Q(L/S)	H(M)	ORIFICE AREA(SQ.M)	SQUARE (1-side mm)	CIRC (DIA-mm)
10.0	0.33	0.007	80.9	91.3

STORAGE AVAILABLE=30.8m4

STORMWATER MANAGEMENT WEST POND SUMMARY CHART

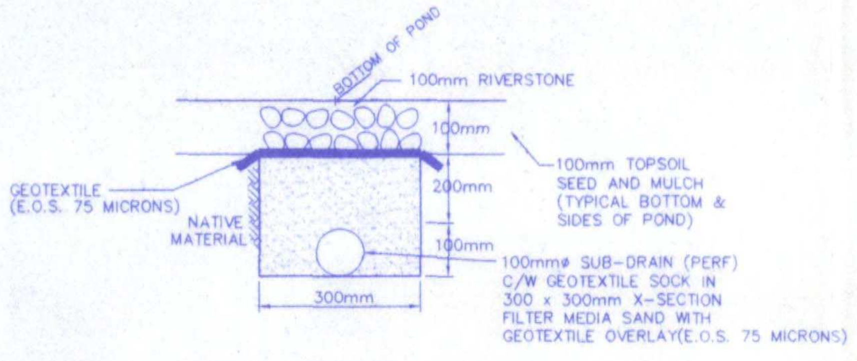
RETURN PERIOD	ALLOWABLE RELEASE RATE	VOLUME REQUIRED	W/L
5 YR	31.7 L/s	41.8 m^3	78.90
100 YR	31.7 L/s	90.2 m^3	79.11

* SPILLWAY ELEVATION = 79.11
POND INVERT ELEVATION = 78.45

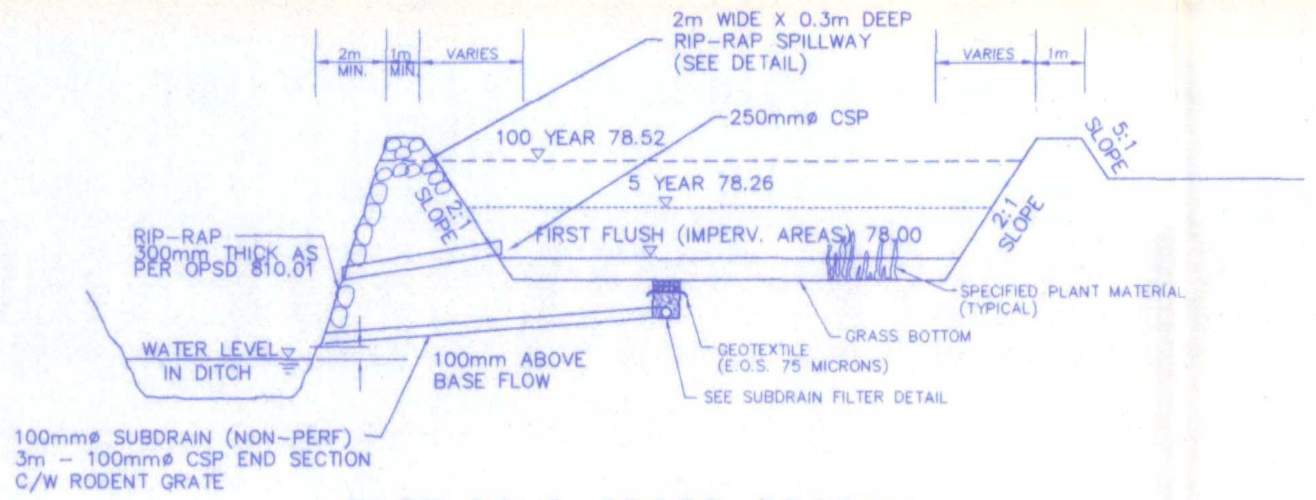
STORMWATER MANAGEMENT EAST POND SUMMARY CHART

RETURN PERIOD	ALLOWABLE RELEASE RATE	VOLUME REQUIRED	W/L
5 YR	74.5 L/s	117.9m^3	78.26
100 YR	74.5 L/s	247.6 m^3	78.52

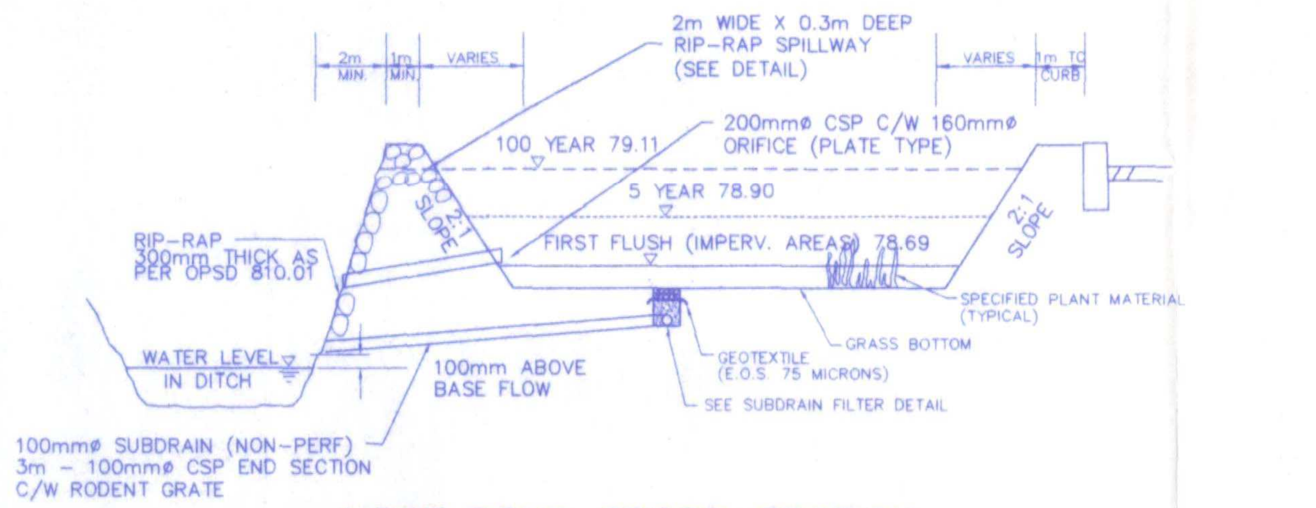
* SPILLWAY ELEVATION = 78.52
POND INVERT ELEVATION = 77.70



SUBDRAIN FILTER DETAIL (TYPICAL)
N.T.S.



EAST POND CROSS-SECTION
N.T.S.



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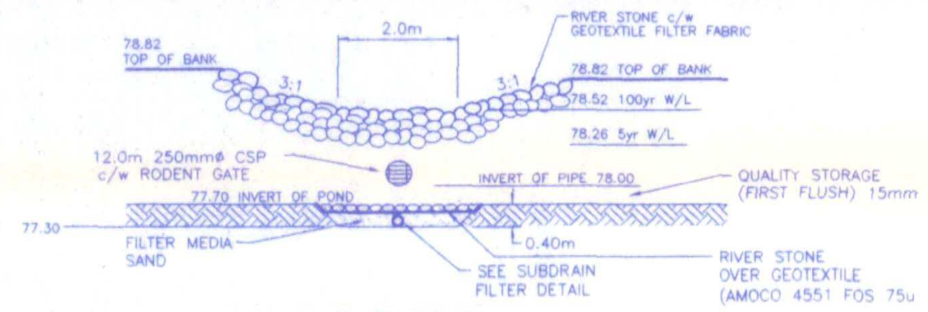
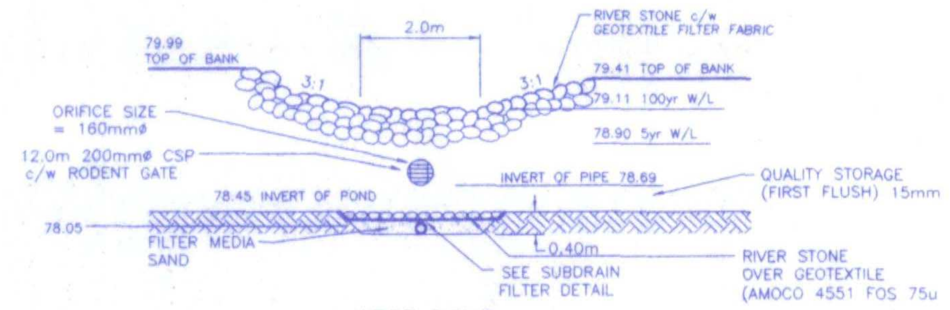
N.T.S.



EAST POND
SPILLWAY DETAIL
N.T.S.



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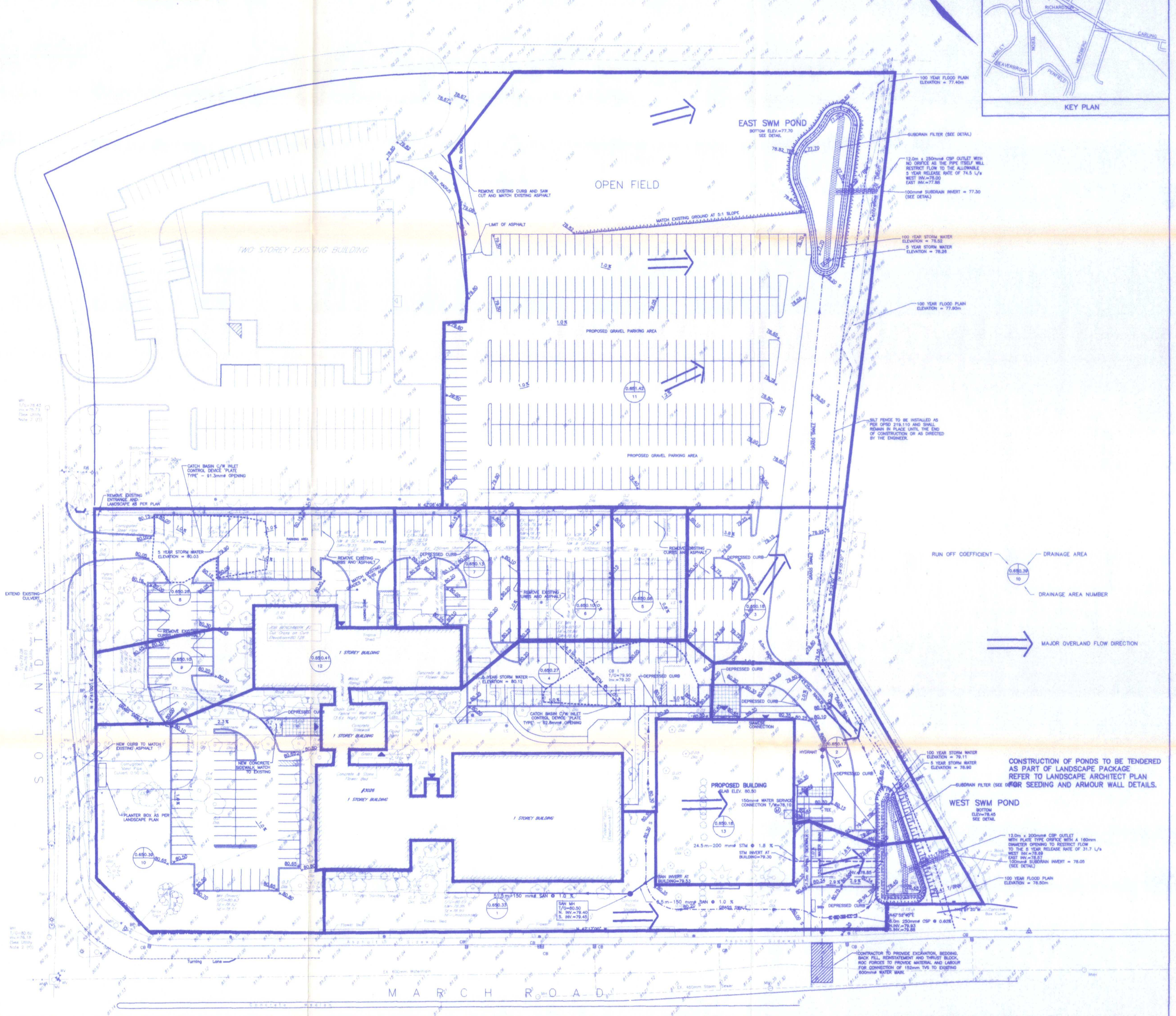
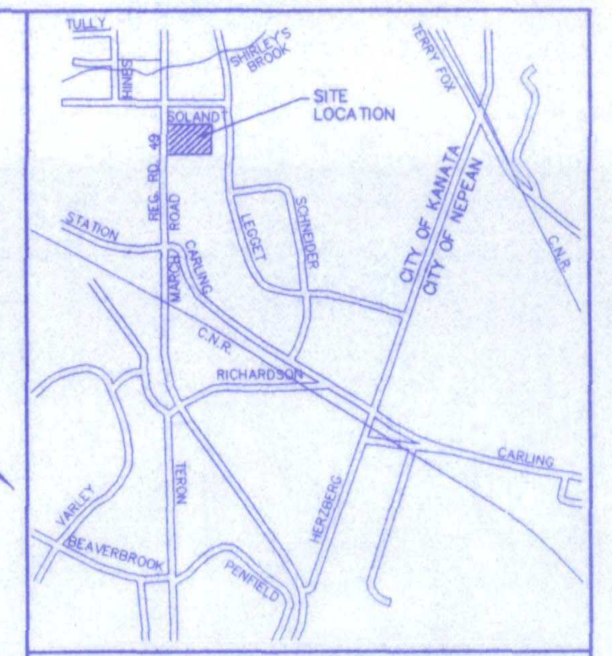
SPILLWAY DETAIL
N.T.S.





KEY PLAN

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.

No.	REVISION	DATE	BY
3.	REVISED SWM PONDS AS PER MVC COMMENTS	FEB 14/01	JDM
2.	REVISED SWM PONDS	JAN 08/01	JLS
1.	ISSUED FOR APPROVAL	NOV 2/00	JLS

REGISTERED PROFESSIONAL ENGINEER J. D. McMANUS PROVINCE OF ONTARIO

DME Ltd.
David McManus Engineering Ltd.
200 - 39 Camelot Drive
Nepean Ontario, K2H 5W6
E-mail: mcmanus@dmel.on.ca
Ph. 225-1929 Fax 225-7330

BASEPLAN	DME
DESIGN	LSC/JLS
CHECKED	JLS
CAD	LSC
PROJ. MGR.	JLS
APPROVED	JDM

SCALE 1:500
0 10 20

BETZ BUILDING ADDITION

CITY OF KANATA

STORM WATER MANAGEMENT PLAN

PROJECT No.	2225
SURVEY BY	DME
DATE	AUG 2000
DRAWING No.	2225-SWM

NOTES: GENERAL

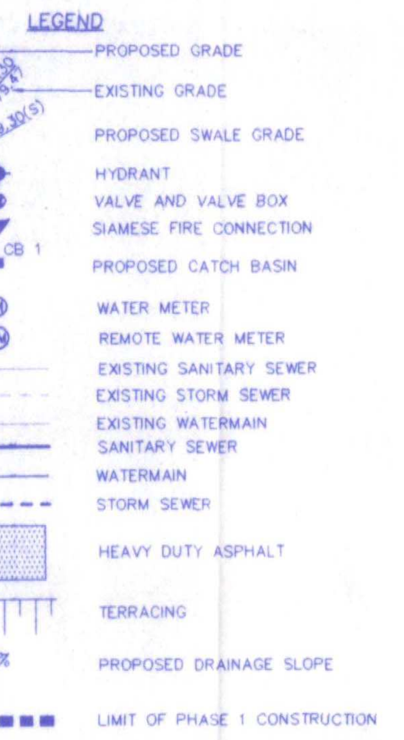
1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK – CONFIRM WITH McMANUS ENGINEERING PRIOR TO UTILIZATION.
4. REFER TO SOILS REPORT BY GOLDER FOR SUBSURFACE CONDITIONS.
5. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCHBASIN OUTLETS ARE PROVIDED.
6. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
7. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
8. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAWCUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT.
9. CURBS TO BE AS PER CITY OF KANATA STANDARD KSD 600.110
10. CONTRACTOR IS TO COMPLY WITH THE CITY OF KANATA REQUIREMENTS FOR TRAFFIC CONTROL WHEN WORKING ON MARCH OR SOLANDT ROAD.
11. RESTORE PAVEMENT STRUCTURE, CURBS AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
12. IN EXISTING ASPHALT AREAS WHICH WILL BE OVERLAID AND REGRADED, THE EXISTING ASPHALT SHALL BE PULVERIZED. PULVERIZED MATERIAL TO BE REGRADED AND MIXED WITH NEW GRANULAR 'A' MATERIAL. EXISTING CURBS AND BOLLARDS NOT REQUIRED FOR THE PROPOSED PLAN SHALL BE REMOVED.
13. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. (CONSTRUCTION OPSS 206, 310 & 314 MATERIALS OPSS 1001, 1003 & 1010).
14. REFER TO ARCHITECT'S PLANS FOR BUILDING DIMENSIONS AND SITE LAYOUT. DIMENSIONS AND LAYOUT INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
15. SUPPLY AND INSTALL ALL PIPING AND APPURTENANCES AS SHOWN TO WITHIN 1.0m OF BUILDING WALLS. PROVIDE TEMPORARY CAPS.
16. REFER TO LANDSCAPE ARCHITECTS PLAN BY DOUGLAS ASSOCIATES LANDSCAPE ARCHITECT FOR SIDEWALK, PATHWAYS, CONCRETE MEDIAN, PLANTING AND OTHER LANDSCAPE FEATURE MATERIALS AND LOCATIONS.
17. ALL EXISTING CATCH BASINS SHALL BE INSTALLED WITH GEOTEXTILE FILTER CLOTH TO PREVENT DEBRIS FROM ENTERING THE CATCH BASIN DURING CONSTRUCTION. FILTER CLOTH SHALL REMAIN IN PLACE UNTIL THE END OF CONSTRUCTION OR AS DIRECTED BY THE ENGINEER.
18. A CIVIL ENGINEERING FIRM SHALL BE PROVIDED FOR FULL TIME INSPECTION FOR ALL WORKS UNDERTAKEN WITHIN THE CITY ROAD ALLOWANCE. THE CIVIL ENGINEERING FIRM SHALL BE RESPONSIBLE FOR SUPPLYING, WITHIN 48 HOURS OF REINSTATEMENT, A WRITTEN REPORT DETAILING THE WORKS WITHIN THE CITY'S ROAD ALLOWANCE. THIS REPORT SHALL CONFIRM THAT THE REINSTATEMENT HAS BEEN IN ACCORDANCE WITH THE CITY STANDARDS, SPECIFICATIONS AND BY-LAWS. FAILURE TO COMPLY SHALL MEAN SEIZURE OF SECURITIES TO COVER COSTS INCURRED BY THE CITY TO INVESTIGATE AND, WHERE REQUIRED, UNDERTAKE REINSTATEMENT TO THE SATISFACTION OF THE CITY OF KANATA.
19. CONTACT THE CITY FOR INSPECTION OF ROUGH GRADING OF PARKING LOTS, ROADWAYS AND LANDSCAPED AREAS PRIOR TO PLACEMENT OF ASPHALT AND TOPSOIL. ALL DEFICIENCIES NOTED SHALL BE RECTIFIED TO THE CITY'S SATISFACTION PRIOR TO PLACEMENT OF ANY ASPHALT OR TOPSOIL AND SOD.
20. DO NOT ALTER GRADING OF SITE WITHOUT PRIOR APPROVAL OF CITY.

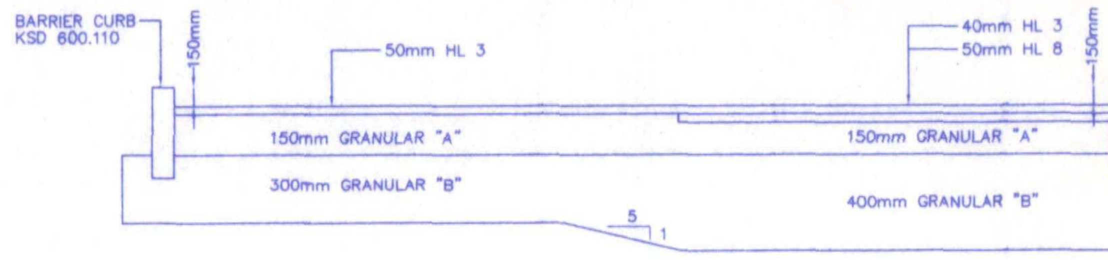
NOTES: WATERMAIN

1. ALL WATERMAIN WORK AND MATERIAL SHALL BE IN ACCORANCE WITH R.O.C. STANDARDS. NO WORK SHALL COMMENCE UNLESS A REGIONAL WATER WORKS INSPECTOR IS ON SITE.
2. INSTALLATION OF WATER METER AND REMOTE RECEPTACLE SHALL BE IN ACCORDANCE WITH R.O.C. STANDARDS.
3. WATERMAIN IS TO BE 152mmø PVC DR18 (WITH TRACER WIRE AS PER R.O.C. STANDARD WSD–40).
4. VALVE BOXES AS PER R.O.C. DETAIL WSD–24.
5. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m.
6. WATERMAIN BEDDING IS TO BE AS PER R.O.C. DETAIL WSD–17.
7. CONCRETE THRUST BLOCKS AS PER OPSD 1103.01.
8. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS PER R.O.C. DETAILS WSD–40 AND WSD–42.
9. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THE MAX RECOMMENDED BY THE MANUFACTURER.
10. FIRE HYDRANTS AND SIAMESE CONNECTION ARE IN ACCORDANCE WITH THE BUILDING CODE

NOTES: SEWER

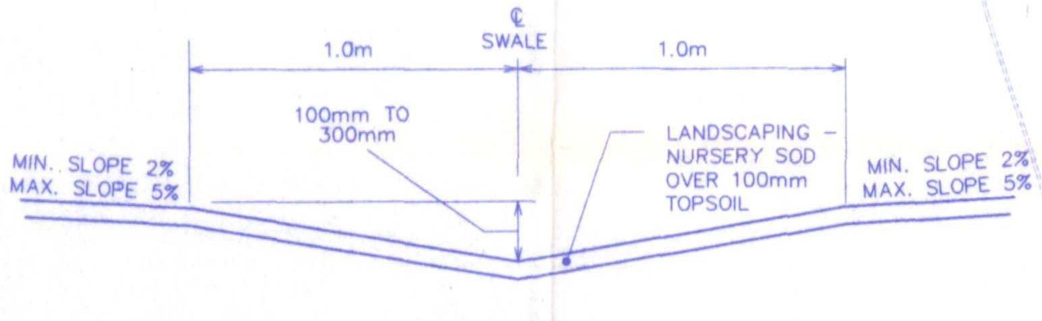
1. SEWER BEDDING AS PER CITY OF KANATA STANDARD WITH 0.30m GRANULAR BEDDING COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH R.O.C. STANDARD SPECIFICATIONS, CITY OF KANATA SPECIFICATIONS, AND IN PARTICULAR, WITH O.P.S.S. 407, AND 410.
3. ALL MANHOLES, CATCH BASINS TO BE BACK FILLED WITH MIN. 0.3m HORIZ. THICKNESS OF SAND.
4. SANITARY SEWERS SHALL BE PVC DR 35.





PARKING AREAS (LIGHT DUTY)

MAJOR ACCESS ROUTES (HEAVY DUTY)



SWALE DETAIL

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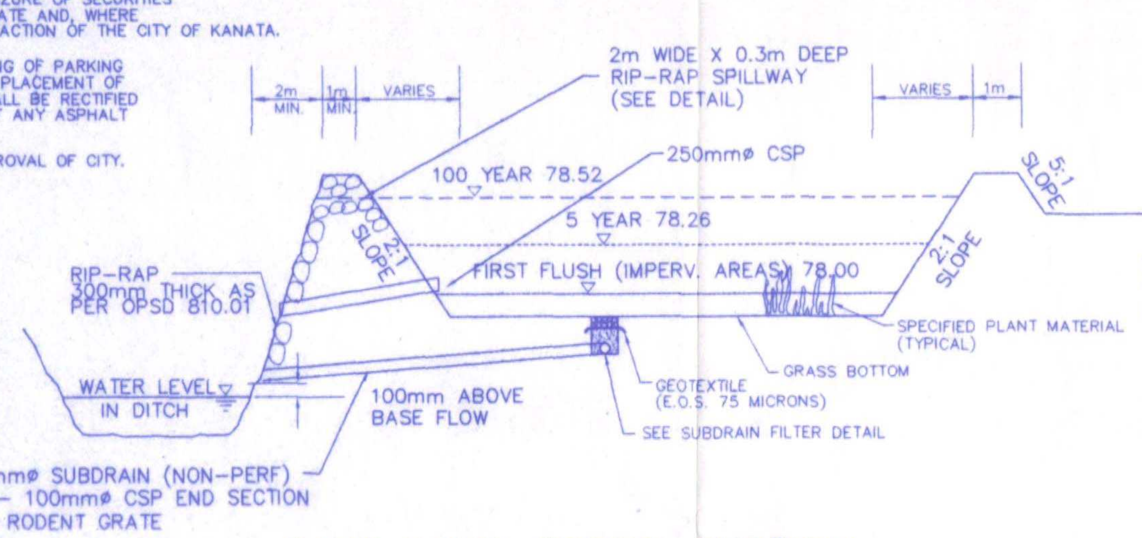

EAST POND CROSS-SECTION

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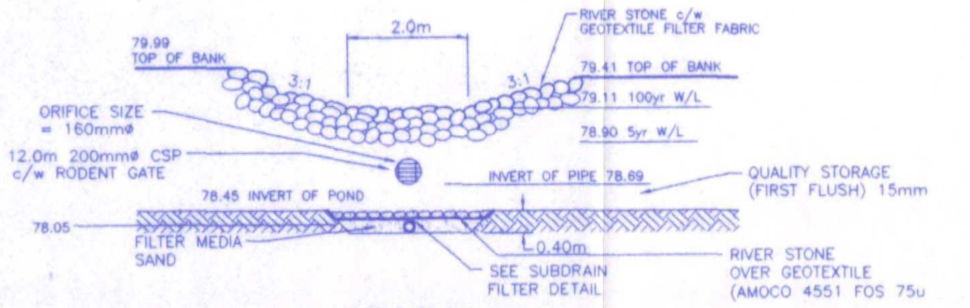

WEST POND SPILLWAY DETAIL

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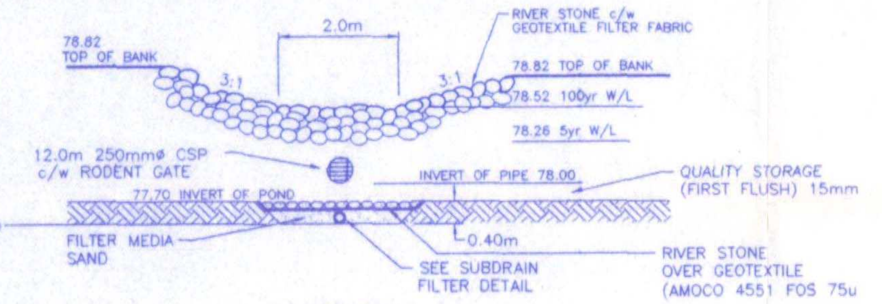

EAST POND SPILLWAY DETAIL

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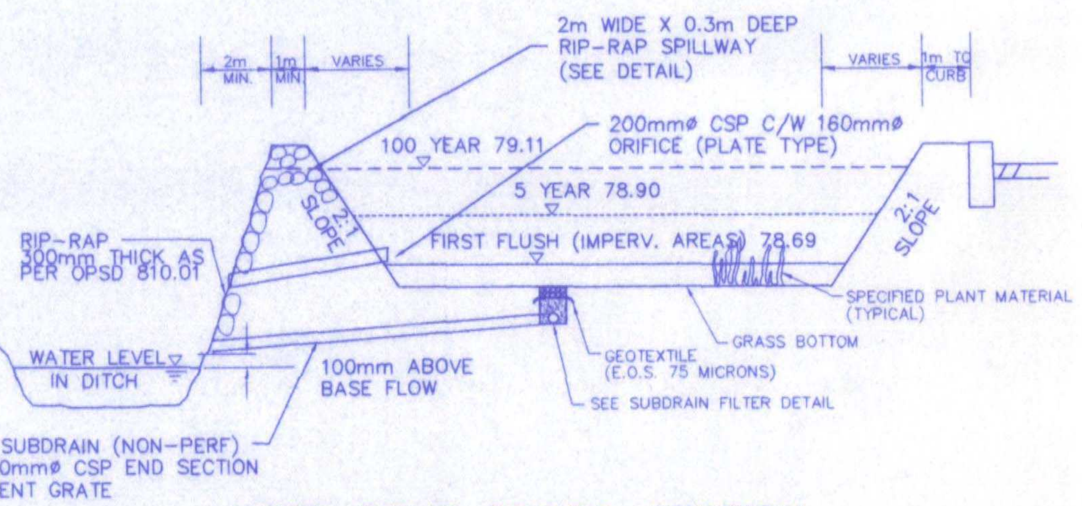


WEST POND CROSS-SECTION

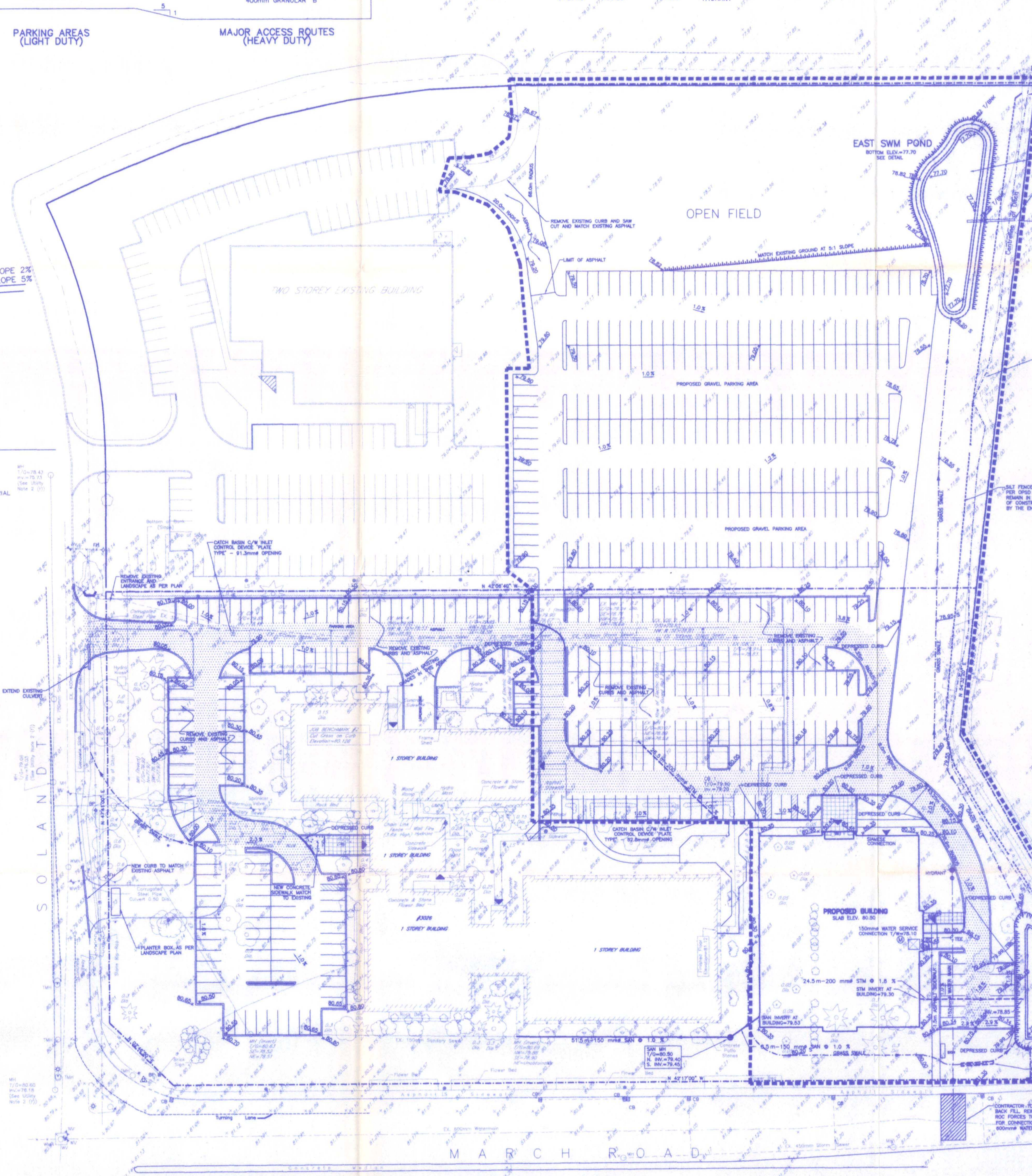
N.T.S.

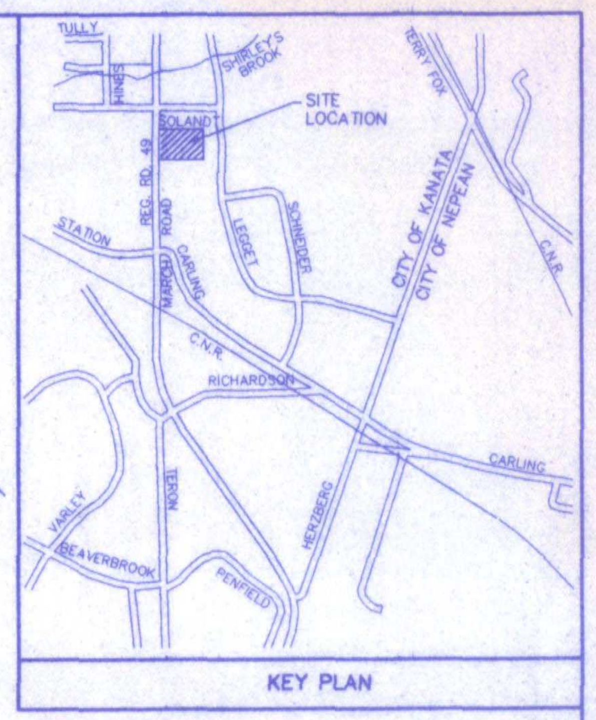
NOTE

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.

WATERMAIN TABLE

STATION	FIN/GRADE	T/W GRADE	COMMENT
0+000	EXISTING	EXISTING	CONNECTION TO EXISTING WITH 150mm TVS
0+009.9	81.12	78.72	VALVE
0+020.5	80.05	77.65	TOP OF WATER MAIN
0+041.0	80.05	77.65	TOP OF WATER MAIN
0+044.8	80.25	77.85	SERVICE TO BUILDING
0+059.0	80.25	77.85	VALVE
0+061.0	80.25	77.85	HYDRANT





STORMWATER MANAGEMENT EAST POND SUMMARY CHART

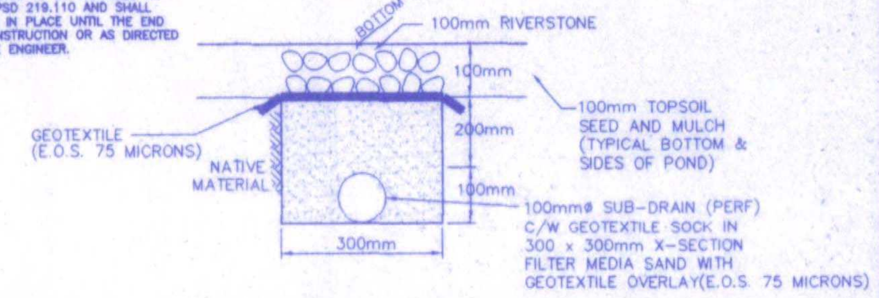
RETURN PERIOD	ALLOWABLE RELEASE RATE	VOLUME REQUIRED	W/L
5 YR	74.5 L/s	117.9m ^{3}	78.26
100 YR	74.5 L/s	247.6 m^3	78.52

* SPILLWAY ELEVATION = 78.52
POND INVERT ELEVATION = 77.70

STORMWATER MANAGEMENT WEST POND SUMMARY CHART

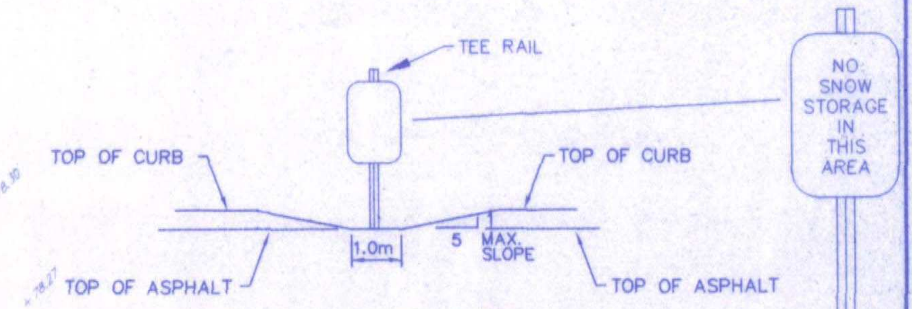
RETURN PERIOD	ALLOWABLE RELEASE RATE	VOLUME REQUIRED	W/L
5 YR	31.7 L/s	41.8 m^3	78.90
100 YR	31.7 L/s	90.2 m^3	79.11

* SPILLWAY ELEVATION = 79.11
POND INVERT ELEVATION = 78.45



SUBDRAIN FILTER DETAIL (TYPICAL)

N.T.S.



CURB DEPRESSION DETAIL

N.T.S.

(FOR DRAINAGE OUTLETS)

No.	REVISION	DATE	BY
11.	REVISED SWM PONDS AS PER MVC COMMENTS	FEB 14/01	JDM
10.	REVISED STORM SEWER, SWALE & SWM PONDS	JAN 08/01	JLS
9.	REVISED HEAVY-DUTY ASPHALT AREA	DEC 19/00	JLS
8.	REVISED ENTRANCES, WEST SIDE AND LEGGET	DEC 18/00	JLS
7.	ISSUED FOR STORM SEWER CONSTRUCTION	NOV 29/00	JLS
6.	ADD STORM SERVICE TO PROPOSED BUILDING	NOV 7/00	JLS
5.	REVISED CATCH BASINS AND SWM PONDS	NOV 2/00	JLS
4.	ISSUED FOR TENDER	OCT 19/00	JLS
3.	REVISED LOCATION OF WATER SERVICE	OCT 11/00	JLS
2.	REVISED PARKING AND SWM POND LOCATIONS	OCT 3/00	JLS
1.	ISSUED FOR SITE PLAN APPROVAL	AUG 29/00	JLS

REGISTERED PROFESSIONAL ENGINEER J. D. McMANUS PROVINCE OF ONTARIO

DME Ltd.
David McManus Engineering Ltd.
200 – 39 Camelot Drive
Nepean Ontario, K2H 5W6
E-mail: mcmanus@dmel.on.ca
Ph. 225-1929 Fax 225-7330

BASEPLAN	DME
DESIGN	LSC/JLS
CHECKED	JLS
CAD	LSC
PROJ. MGR.	JLS
APPROVED	JDM

SCALE 1:500 (0 10 20)

BETZ BUILDING ADDITION

CITY OF KANATA

SITE SERVICING PLAN AND GRADING PLAN

PROJECT No.	2225
SURVEY BY	DME
DATE	AUG 2000
DRAWING No.	2225-S1

File path: D:\2225\AS_BUILTS\2225-S1-AB.DWG

x-refs: 2225-ab [P:\Drawings\2200\2225\As_Builts\2225-ab.dwg]

Date of plot: Tue, Jul 05, 2005 - 9:52am

NOTES: GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK – CONFIRM WITH McMANUS ENGINEERING PRIOR TO UTILIZATION.
4. REFER TO SOILS REPORT BY GOLDER FOR SUBSURFACE CONDITIONS.
5. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
6. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
7. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
8. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT.
9. CURBS TO BE AS PER CITY OF OTTAWA STANDARD KSD 600.110
10. CONTRACTOR IS TO COMPLY WITH THE CITY OF OTTAWA REQUIREMENTS FOR TRAFFIC CONTROL WHEN WORKING ON MARCH OR SOLANDT ROAD.
11. RESTORE PAVEMENT STRUCTURE, CURBS AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
12. IN EXISTING ASPHALT AREAS WHICH WILL BE OVERLAID AND REGRADED, THE EXISTING ASPHALT SHALL BE PULVERIZED. PULVERIZED MATERIAL TO BE REGRADED AND MIXED WITH NEW GRANULAR 'A' MATERIAL. EXISTING CURBS AND BOLLARDS NOT REQUIRED FOR THE PROPOSED PLAN SHALL BE REMOVED.
13. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. (CONSTRUCTION OPSS 206, 310 & 314 MATERIALS OPSS 1001, 1003 & 1010).
14. REFER TO ARCHITECT'S PLANS FOR BUILDING DIMENSIONS AND SITE LAYOUT. DIMENSIONS AND LAYOUT INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
15. SUPPLY AND INSTALL ALL PIPING AND APPURTENANCES AS SHOWN TO WITHIN 1.0m OF BUILDING WALLS. PROVIDE TEMPORARY CAPS.
16. REFER TO LANDSCAPE ARCHITECTS PLAN BY DOUGLAS ASSOCIATES LANDSCAPE ARCHITECT FOR SIDEWALK, PATHWAYS, CONCRETE MEDIAN, PLANTING AND OTHER LANDSCAPE FEATURE MATERIALS AND LOCATIONS.
17. ALL EXISTING CATCH BASINS SHALL BE INSTALLED WITH GEOTEXTILE FILTER CLOTH TO PREVENT DEBRIS FROM ENTERING THE CATCH BASIN DURING CONSTRUCTION. FILTER CLOTH SHALL REMAIN IN PLACE UNTIL THE END OF CONSTRUCTION OR AS DIRECTED BY THE ENGINEER.
18. A CIVIL ENGINEERING FIRM SHALL BE PROVIDED FOR FULL TIME INSPECTION FOR ALL WORKS UNDERTAKEN WITHIN THE CITY ROAD ALLOWANCE. THE CIVIL ENGINEERING FIRM SHALL BE RESPONSIBLE FOR SUPPLYING, WITHIN 48 HOURS OF REINSTATEMENT, A WRITTEN REPORT DETAILING THE WORKS WITHIN THE CITY'S ROAD ALLOWANCE. THIS REPORT SHALL CONFIRM THAT THE REINSTATEMENT HAS BEEN IN ACCORDANCE WITH THE CITY STANDARDS, SPECIFICATIONS AND BY-LAWS. FAILURE TO COMPLY SHALL MEAN SEIZURE OF SECURITIES TO COVER COSTS INCURRED BY THE CITY TO INVESTIGATE AND, WHERE REQUIRED, UNDERTAKE REINSTATEMENT TO THE SATISFACTION OF THE CITY OF OTTAWA
19. CONTACT THE CITY FOR INSPECTION OF ROUGH GRADING OF PARKING LOTS, ROADWAYS AND LANDSCAPED AREAS PRIOR TO PLACEMENT OF ASPHALT AND TOPSOIL. ALL DEFICIENCIES NOTED SHALL BE RECTIFIED TO THE CITY'S SATISFACTION PRIOR TO PLACEMENT OF ANY ASPHALT OR TOPSOIL AND SOD.
20. DO NOT ALTER GRADING OF SITE WITHOUT PRIOR APPROVAL OF CITY.

NOTES: WATER MAIN

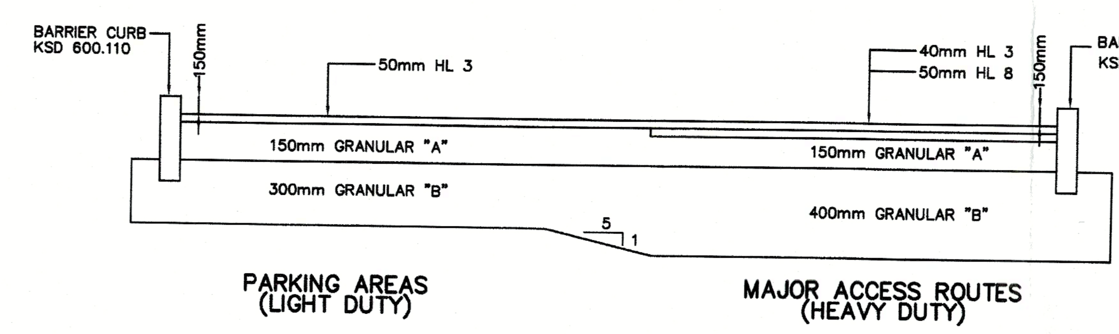
1. ALL WATERMAIN WORK AND MATERIAL SHALL BE IN ACCORANCE WITH CITY STANDARDS. NO WORK SHALL COMMENCE UNLESS A CITY WATER WORKS INSPECTOR IS ON SITE.
2. INSTALLATION OF WATER METER AND REMOTE RECEPTACLE SHALL BE IN ACCORDANCE WITH CITY STANDARDS.
3. WATERMAIN IS TO BE 152mmø PVC DR18 (WITH TRACER WIRE AS PER CITY STANDARD WSD-40).
4. VALVE BOXES AS PER CITY DETAIL WSD-24.
5. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m.
6. WATERMAIN BEDDING IS TO BE AS PER CITY DETAIL WSD-17.
7. CONCRETE THRUST BLOCKS AS PER CITY STANDARD WSC-4. USE TYPICAL SOIL BEARING CAPACITY 100 kPa.
8. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS PER CITY DETAILS WSD-40 AND WSD-42.
9. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THE MAX RECOMMENDED BY THE MANUFACTURER.
10. FIRE HYDRANTS AND SIAMESE CONNECTION ARE IN ACCORDANCE WITH THE BUILDING CODE
11. FIRE HYDRANTS TO BE LOCATED AS PER CITY STANDARDS.
12. MAINTAIN 0.25m PIPE TO PIPE SEPARATION TO ANY SEWER PIPE.

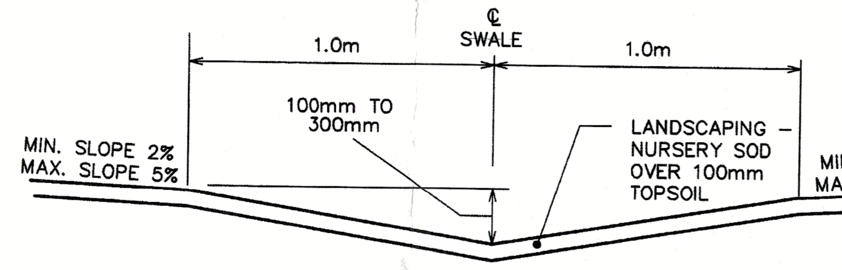
NOTES: SEWER

1. SEWER BEDDING AS PER CITY OF OTTAWA STANDARD WITH 0.30m GRANULAR BEDDING COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH CITY STANDARD SPECIFICATIONS, CITY OF OTTAWA SPECIFICATIONS, AND IN PARTICULAR, WITH O.P.S.S. 407, AND 410.
3. ALL MANHOLES, CATCH BASINS TO BE BACK FILLED WITH MIN. 0.3m HORIZ. THICKNESS OF SAND.
4. SANITARY SEWERS SHALL BE PVC DR 35.

LEGEND

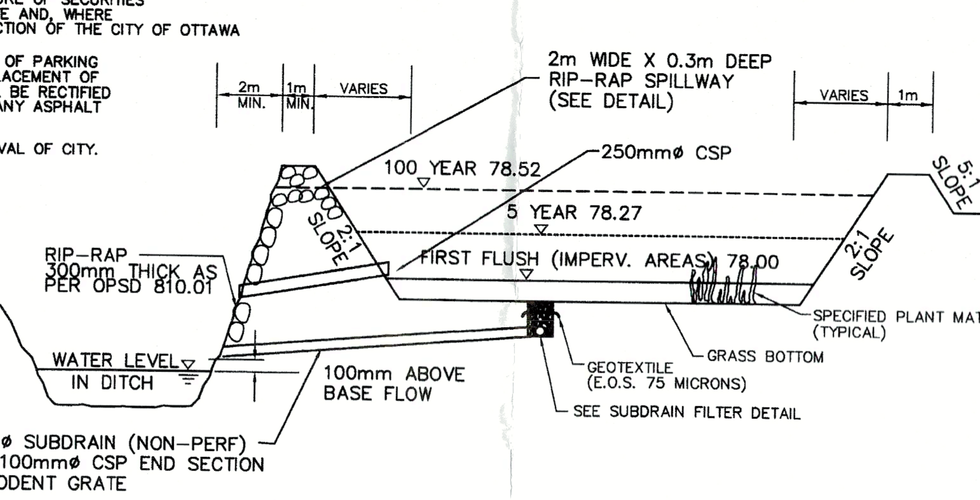
- 79.30 AS BUILT GRADE
- 79.47 PROPOSED GRADE
- 79.30(S) PROPOSED SWALE GRADE
- HYDRANT
- VALVE AND VALVE BOX
- SIAMESE FIRE CONNECTION
- CB 1 PROPOSED CATCH BASIN
- WATER METER
- REMOTE WATER METER
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- SANITARY SEWER
- WATERMAIN
- STORM SEWER
- HEAVY DUTY ASPHALT
- TERRACING
- 2.0% PROPOSED DRAINAGE SLOPE





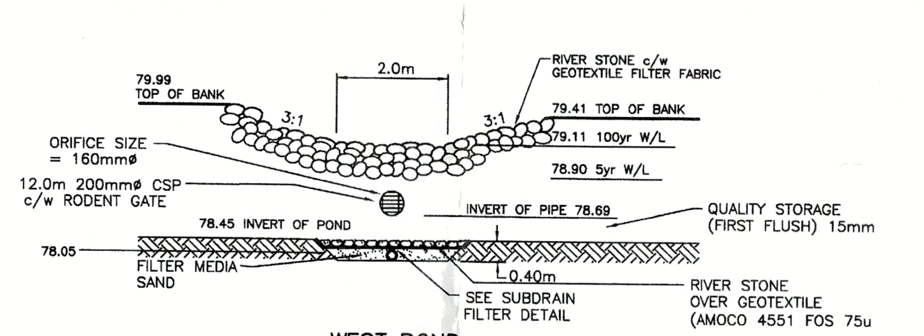
SWALE DETAIL

N.T.S.



EAST POND CROSS-SECTION

N.T.S.



WEST POND SPILLWAY DETAIL

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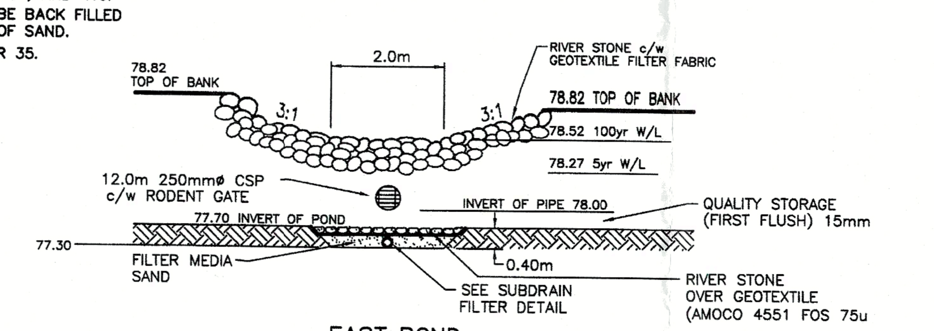

EAST POND SPILLWAY DETAIL

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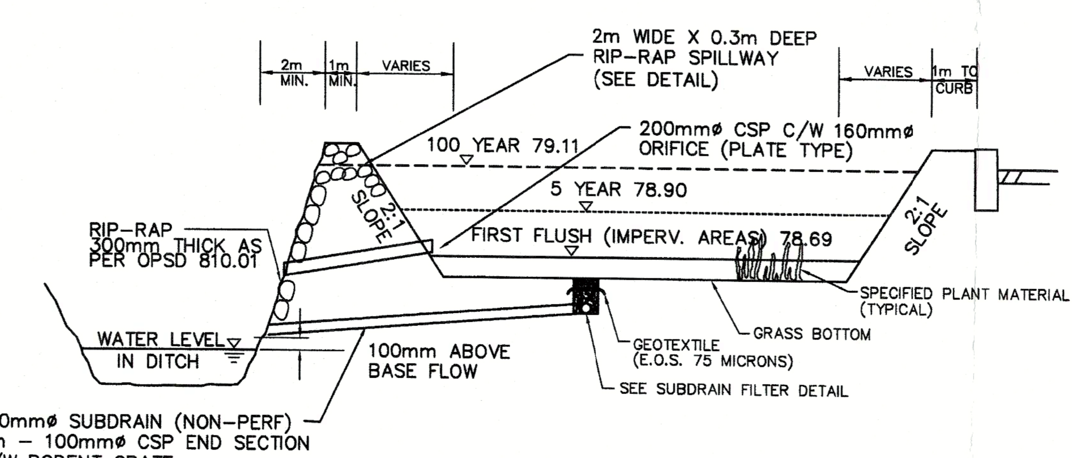
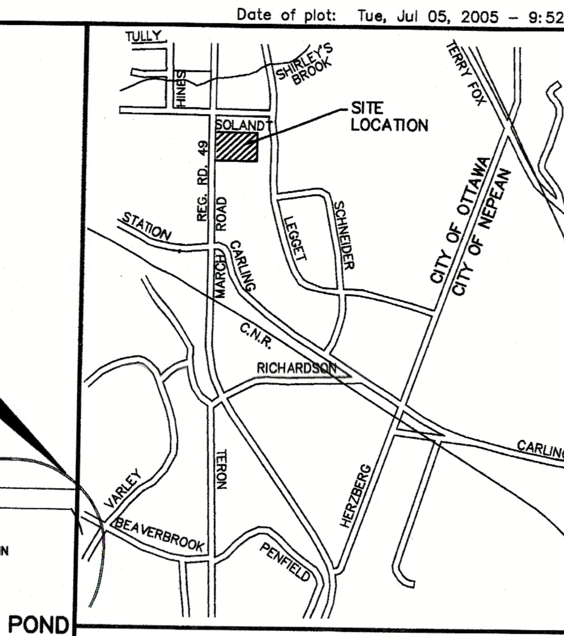


WEST POND CROSS-SECTION

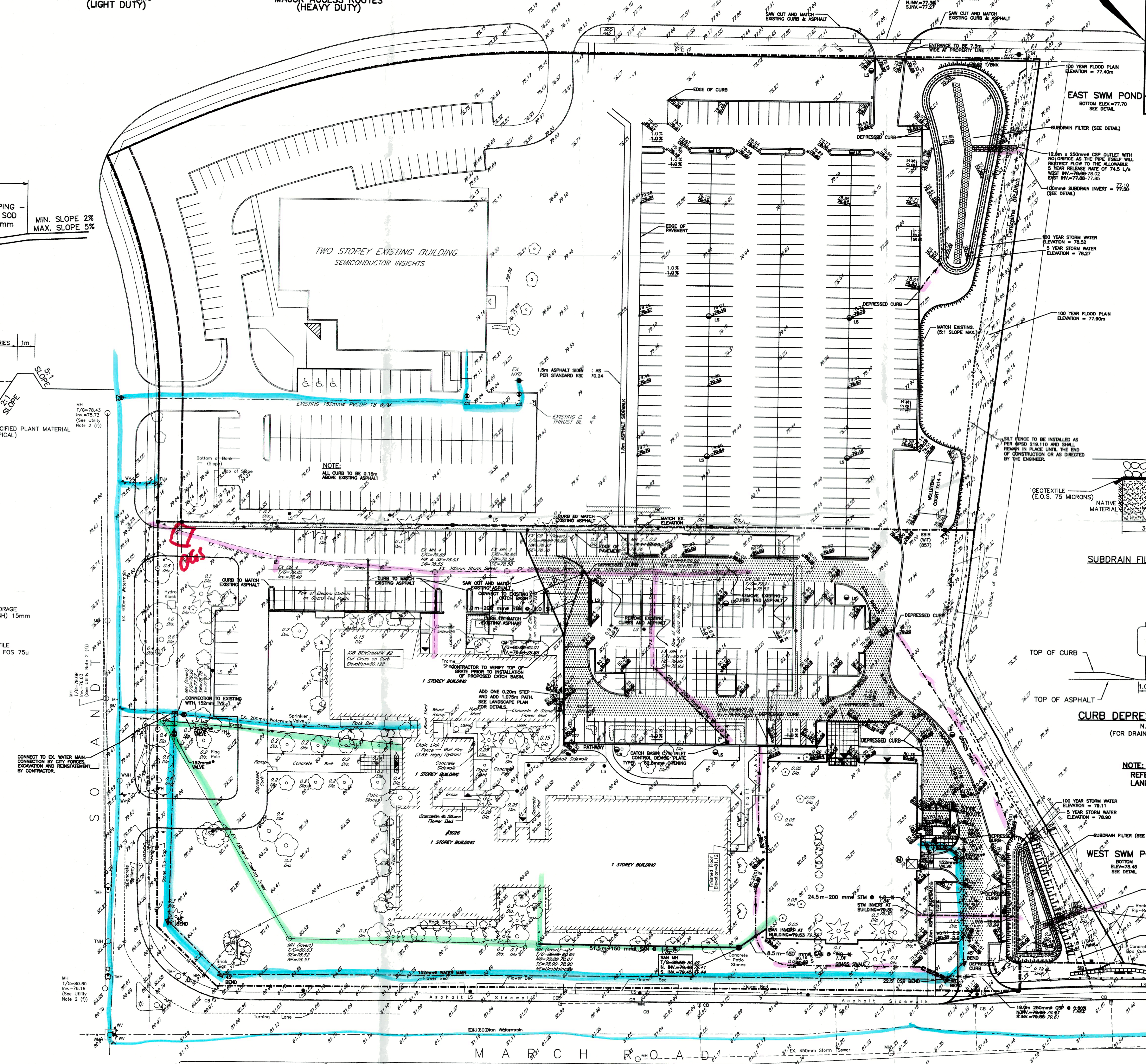
N.T.S.

WATERMAIN TABLE

AS-BUILT	STATION	FIN/GRADE	T/W GRADE	COMMENT
77.65	0+000	EXISTING	EXISTING	CONNECTION TO EXISTING WITH 152mm TVS
77.61	0+005.0	80.08	77.68	VALVE AND VALVE BOX
77.45	0+020.0	79.86	77.46	TOP OF WATER MAIN
77.64	0+053.3	80.06	77.66	45° BEND
77.95	0+072.4	80.37	77.97	45° BEND
78.06	0+100.0	80.45	78.05	TOP OF WATER MAIN
78.16	0+125.0	80.58	78.18	TOP OF WATER MAIN
78.06	0+150.0	80.40	78.00	TOP OF WATER MAIN
77.79	0+175.0	80.27	77.87	TOP OF WATER MAIN
77.80	0+200.0	80.23	77.83	TOP OF WATER MAIN
77.93	0+225.0	80.30	77.90	TOP OF WATER MAIN
77.52	0+259.5	79.94	77.54	45° BEND
77.44	0+265.7	79.84	77.44	45° BEND
77.75	~~0+292.8~~ 0+295.3	80.15	77.75	152 OFF 152 TEE
77.73	0+299.3	80.12	77.72	22.5° BEND
77.70	0+301.3	80.10	77.70	VALVE AND VALVE BOX
77.85	0+309.9	80.25	77.85	HYDRANT



KEY PLAN



STORMWATER MANAGEMENT EAST POND SUMMARY CHART

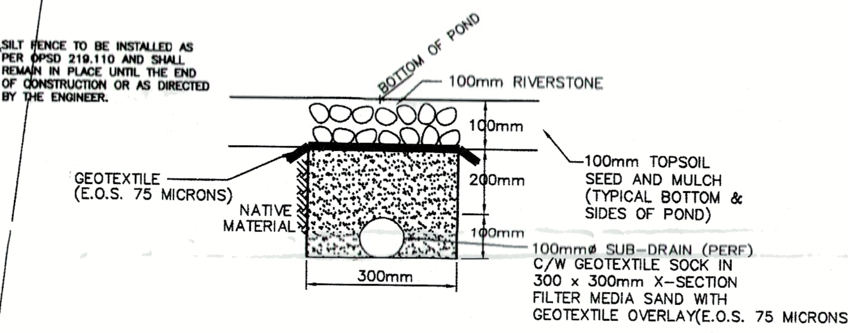
RETURN PERIOD	ALLOWABLE RELEASE RATE	VOLUME REQUIRED	W/L
5 YR	74.5 L/s	$167.3 m^3$	78.27
100 YR	74.5 L/s	$329.0 m^3$	78.52

* SPILLWAY ELEVATION = 78.52
POND INVERT ELEVATION = 77.70

STORMWATER MANAGEMENT WEST POND SUMMARY CHART

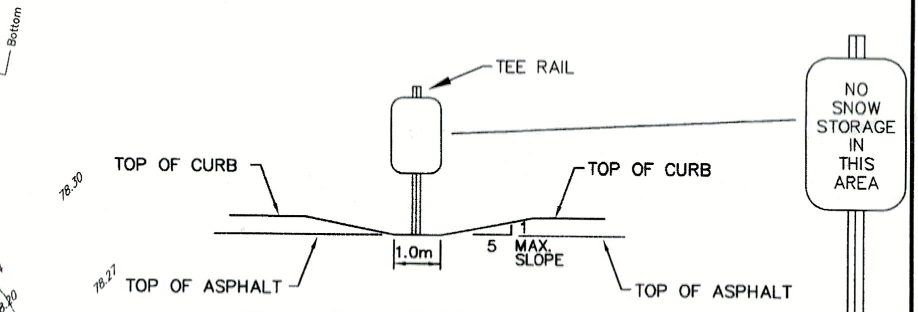
RETURN PERIOD	ALLOWABLE RELEASE RATE	VOLUME REQUIRED	W/L
5 YR	31.7 L/s	$41.8 m^3$	78.90
100 YR	31.7 L/s	$90.2 m^3$	79.11

* SPILLWAY ELEVATION = 79.11
POND INVERT ELEVATION = 78.45



SUBDRAIN FILTER DETAIL (TYPICAL)

N.T.S.



CURB DEPRESSION DETAIL

N.T.S.

(FOR DRAINAGE OUTLETS)

NOTE:
REFER TO LANDSCAPE ARCHITECT PLAN FOR LANDSCAPING DETAILS AROUND SWM PONDS.

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.

No.	REVISION	DATE	BY
20.	AS BUILT	SEPT 27/02	JDM
19.	ISSUED FOR SITE PLAN AMENDMENT (REVISED)	JULY 10/01	JDM
18.	REVISED PARKING	JUNE 21/01	JDM
17.	ISSUED FOR SITE PLAN AMENDMENT	MAY 29/01	JDM
16.	ISSUED FOR WATER MAIN PERMIT	MAY 28/01	JDM
15.	REVISED WATER MAIN AS PER CITY COMMENTS	MAY 18/01	JDM
14.	REVISED WATER MAIN AS PER CITY COMMENTS	MAY 15/01	JDM
13.	ISSUED FOR WATER MAIN TENDER	APR 25/01	JDM
12.	REVISED WATER MAIN LOCATION	MAR 14/01	JDM
11.	REVISED SWM PONDS AS PER MVC COMMENTS	FEB 14/01	JDM
10.	REVISED STORM SEWER, SWALE & SWM PONDS	JAN 08/01	JLS
9.	REVISED HEAVY-DUTY ASPHALT AREA	DEC 19/00	JLS
8.	REVISED ENTRANCES, WEST SIDE AND LEGGET	DEC 18/00	JLS
7.	ISSUED FOR STORM SEWER CONSTRUCTION	NOV 29/00	JLS
6.	ADD STORM SERVICE TO PROPOSED BUILDING	NOV 7/00	JLS
5.	REVISED CATCH BASINS AND SWM PONDS	NOV 2/00	JLS
4.	ISSUED FOR TENDER	OCT 19/00	JLS
3.	REVISED LOCATION OF WATER SERVICE	OCT 11/00	JLS
2.	REVISED PARKING AND SWM POND LOCATIONS	OCT 3/00	JLS
1.	ISSUED FOR SITE PLAN APPROVAL	AUG 29/00	JLS

REGISTERED PROFESSIONAL ENGINEER J. D. McMANUS PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER S. H. [illegible] PROVINCE OF ONTARIO JULY 5/05

DME Ltd.
David McManus Engineering Ltd.
200 – 39 Camelot Drive
Nepean Ontario, K2G 5W6
E-mail: mcmanus@dmel.on.ca
Ph. 225-1929 Fax 225-7330

BASEPLAN	DME
DESIGN	LSC/JLS
CHECKED	JLS
CAD	LSC
PROJ. MGR.	JLS
APPROVED	JDM

SCALE 1:500
0 10 20

BETZ BUILDING ADDITION

CITY OF OTTAWA

SITE SERVICING PLAN AND GRADING PLAN

PROJECT No.	2225
SURVEY BY	DME
DATE	AUG 2000
DRAWING No.	2225-S1-ab

13207

APPENDIX B
Pre-Consultation Meeting Minutes

File Number: PC 2019-0286
November 1, 2019

3026 Solandt Road
Pre-Consultation Meeting Minutes

Location: Room 4102E, City Hall
Date: November 1, 1:30pm to 2:30pm

Attendee	**Role**	**Organization**
Mark Young	Planner	City of Ottawa
Ahmed Elsayed	Project Manager (Infrastructure)	
Neeti Paudel	Project Manager (Transportation)	
Matthew Ippersiel	Planner (Urban Design)	
Samantha Gatchene	Planning Assistant	
Bonnie Martell	Owner's Representative	Colonnade Bridgeport
Robert Matthews	Architect	N45
Lee Sheets	Civil Engineer	Novatech
Gordon Scobie	Transportation Engineer	CIMA

Comments from Applicant

1. The applicant is proposing the construction of a five-storey office building with approximately 100,000 square feet of office space.
2. Parking would be provided by an associated surface parking lot. Shared parking is proposed as the owner also owns the property to the east, 3000 Solandt Road.
3. Vehicle access is proposed via two access points from Solandt Road, in addition to existing shared access points on the abutting property.

Planning Comments

1. The proposal will require a complex site plan approval application.
2. Please ensure that all zoning requirements and provisions are indicated on the provided plans.
3. Please provide detailed parking counts if shared parking is proposed.

Urban Design Comments

1. Please provide strong pedestrian connection between both buildings on site and into the parking areas.
2. Please provide enhanced screening for the garbage and loading area abutting March Road.
3. Please ensure that the corner treatment of both the building and the landscape design enhance and emphasize the corner of March Road and Solandt Drive.

Parks Planning:

Cash-in-lieu of parkland may be required based on the parkland dedication by-law. If this has been provided previously confirmation will be required.

Engineering Comments

General

- Local Conservation Authority (MVCA) clearance is required.
- Please note that servicing and site works shall be in accordance with the following documents:
    - Ottawa Sewer Design Guidelines (October 2012)
    - Ottawa Design Guidelines-Water Distribution (July 2010)
    - Stormwater Management Planning and Design Manual, Ministry of the Environment, March 2003
    - Technical Bulletin PIEDTB-2016-01
    - Technical Bulletins ISTB-2018-01, ISTB-2018-02 and ISTB-2018-03.
    - Ottawa Design Guidelines – Water Distribution (2010)
    - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
    - City of Ottawa Accessibility Design Standards (2012)
    - Ottawa Standard Tender Documents (latest version)
    - Ontario Provincial Standards for Roads & Public Works (2013)

Stormwater Management Criteria:

- On site removal of 80% of TSS is required to be achieved.
- *The 100 year post development runoff from ICI sites are controlled to the 2 or 5 year predevelopment runoff rate. It can be accepted controlling to the 5 year pre if there is capacity in the receiving storm system (i.e. system was design to accommodate the 5 year pre from this site).*
- As per *Technical Bulletin PIEDTB-2016-01 section 8.3.11.1 (p.12 of 14)* **there shall be no surface ponding on private parking areas during the 2-year storm rainfall event**. Depending on the SWM strategy proposed underground or additional underground storage may be required to satisfy this requirement.
- When using the modified rational method to calculate the storage requirements for the site any underground storage (pipe storage etc.) should not be included in the overall available storage. The modified rational method assumes that the restricted flow rate is constant throughout the storm which

underestimates the storage requirement prior to the 1:100 year head elevation being
reached. Please note that if you wish to utilize any underground storage as available storage, the $Q_{(release)}$ must be modified to compensate for the lack of head on the orifice. An assumed average release rate equal to 50% of the peak allowable rate shall be applied. Otherwise, disregard the underground storage as available storage or provide modeling to support SWM strategy.

- Please note that the minimum orifice dia. for a plug style ICD is 83mm and the minimum flow rate from a vortex ICD is 6 L/s in order to reduce the likelihood of plugging.
- Please provide a **Pre-Development Drainage Area Plan** as part of the engineering drawing set to define the pre-development drainage area(s)/patterns.
- A stress-test (100-year plus 20%) of the stormwater management system shall be preformed as per Section 8.3.12 of the City's sewer design guidelines. Drainage systems shall be stress tested using design storms calculated on the basis of a 20% increase in the City's IDF curves rainfall values.
- A stormwater summary table shall be provided in the report.
- The new proposed building does not require an ECA, as for the existing building, the applicant is advised to do all necessary efforts to locate and include the ECA for the existing works on site, if no ECA was made, a new ECA will be required for the existing works

Sanitary:

- The sanitary sewer on Solandt Road is classified as a trunk (750 mm). Our guidelines discourages/prohibits direct connections off backbone sewers.
- Consultant confirmed existing sanitary pipes on site that can be used to service proposed building.
- Analysis and demonstration that there is sufficient/adequate residual capacity to accommodate any increase in wastewater flows in the receiving and downstream wastewater systems are required to be provided.
- Please review the wastewater design flow parameters *in Technical Bulletin PIEDTB-2018-01.*

Water:

- The site contains a private 152 mm watermain. Confirm size is adequate to support this development.
- The maximum fire flow capacity of a fire hydrant shall be reviewed and documented to ensure a sufficient number of fire hydrants are available to service the proposed development. Please review Technical Bulletin ISTB-2018-0. A **fire hydrant coverage plan** shall be provided.

- Please provide the following information to the City of Ottawa via email to request water distribution network boundary conditions for the subject site. Please note that once this information has been provided to the City of Ottawa it takes approximately 5-10 business days to receive boundary conditions.
  - Type of Development
  - Site Address
  - A plan showing the proposed water service connection location(s).
  - **Average Daily Demand** (L/s)
  - **Maximum Daily Demand** (L/s)
  - **Peak Hour Demand** (L/s)
  - **Fire Flow** (L/min)

    [*Fire flow demand requirements shall be based on Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection 1999*]
  - **FUS Fire Flow Calculations**

Geotechnical Investigation:

- A Geotechnical Study shall be prepared in support of this development proposal.

Please note that these comments are considered preliminary based on the conceptual information provided to date and therefore maybe amended as additional details become available and presented to the City

<u>Transportation Comments</u>

1. Follow Traffic Impact Assessment Guidelines:
   a. A TIA is required.
   b. Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
   c. Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services).
2. ROW protection is as follows:
   a. March Rd between Terry Fox and Richardson is 44.5m even. This ROW protection appears to already be accounted for on the site plan.
   b. Solandt Rd along its entire length is 24m even.
   c. Legget Dr along its entire length is 24m even.

3. Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required (measure on the property line/ROW protected line; no structure above or below this triangle):
    a. Collector Road to Arterial Road: 5 m x 5 m
4. Sight triangle as per Zoning by-law is 6 m x 6 m (measure on the curb line).
5. Corner Clearance is 55m for the site access.
6. Clear throat length for accesses on Solandt is to be 15m.
7. Sidewalks on property to be updated to City standard. Sidewalks are to be continuous across accesses as per City Specification 7.1.
8. On site plan:
    a. Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    b. Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    c. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    d. Show lane/aisle widths.
    e. Grey out any area that will not be impacted by this application.
9. AODA legislation is in effect for all organizations, please ensure that the design conforms to these standards (see attached checklist).
10. Noise Impact Study required for the Road noise.

Planning Forester:

1. a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City; an approved TCR is a requirement of Site Plan or Plan of Subdivision approval
2. any removal of privately-owned trees 10cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw; the permit is based on the approved TCR
3. any removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR
4. for this site, the TCR may be combined with the Landscape Plan provided all information is clearly displayed
    a. if possible, please submit separate plans showing 1) existing tree inventory, and 2) a plan showing to be retained and to be removed trees with tree protection details
5. the TCR must list all trees on site by species, diameter and health condition – separate stands of trees may be combined using averages
6. the TCR must address all trees with a critical root zone that extends into the developable area – all trees that could be impacted by the construction that are outside the developable area need to be addressed.

7. trees with a trunk that crosses/touches a property line are considered co-owned by both property owners; permission from the adjoining property owner must be obtained prior to the removal of co-owned trees
8. If trees are to be removed, the TCR must clearly show where they are, and document the reason they can not be retained – please provide a plan showing retained and removed treed areas
9. All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines listed on Ottawa.ca
    a. the location of tree protection fencing must be shown on a plan
    b. include distance indicators from the trunk of the retained tree to the nearest part of the tree protection fencing
    c. show the critical root zone of the retained trees
    d. if excavation will occur within the critical root zone, please show the limits of excavation and calculate the percentage of the area that will be disturbed
10. the City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
11. Please ensure newly planted trees have an adequate soil volume for their size at maturity
12. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca

Environment:

The parcel is adjacent to the Kizel Drain (runs along the southern property boundary). The MNRF has mapped portions of the Kizel Drain as Blanding's turtle habitat and the status of this section has not been assessed (the limit stops approximately 170 m west of the site. Accordingly I recommend that if they are proposing site alteration on their site within 30 m of the watercourse that an Environmental Impact Statement be prepared. If an EIS is triggered, I would like to meet on site to discuss the scope of the EIS.

Mississippi Valley Conservation Authority:

1. The southern portion of this site abuts the Kizell Drain, our regulation limit extends onto the property but not as far as the development proposed in the site plan that was provided.
2. Aerial imagery indicates that the portion of the lands proposed for development were previously developed with office buildings, which appear to have been demolished between 2014 and 2017. Mapping layers on the City of Ottawa website indicate that the storm sewers along Solandt Drive outlet to Shirley's Brook whereas the stormsewers along March Road outlet to Kizell. I suspect that

the redevelopment will be utilizing an existing infrastructure connection to outlet stormwater. If this is not the case, the stormwater should be directed towards the natural receiver – this would need to be confirmed through topographic conditions.

3. We have regulation mapping on both of these watercourses and erosion is a documented issue. The SWM for the proposed redevelopment should demonstrate post-to-pre runoff. We would be reviewing the formal reports to ensure no adverse impacts to our regulated floodplain and meander belt hazards. We also recommend that the applicant demonstrate enhanced treatment (80% TSS removal).

Requested Plans and Studies

1. A list of required plans and studies required for a complete Site Plan Control application have been attached.

Process

1. This is a pre-consultation for a Site Plan Control application at 3026 Solandt Road to the requirements for a complete application.

2. This proposal will trigger a Site Plan Control application, Manager Approval, subject to Public Consultation. The proposal would fall under the 'complex' category as per the Site Plan Control Subtype Threholds. The application form, timeline and fees can be found here.

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-con comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please contact me at Mark.Young@ottawa.ca or at 613-580-2424 extension 41396 if you have any questions.

Sincerely,

Mark Young

Mark Young MCIP RPP
Planner III
Development Review - West

APPENDIX C
Water Servicing Information

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 119200
Project Name: 3026 Solandt Road
Date: 1/17/2020
Input By: Anthony Mestwarp
Reviewed By: Cara Ruddle

Legend: Input by User; No Information or Input Required

Building Description: Proposed Office Building (5 Storey)
Non-combustible construction

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)	1859.2			
		Number of Floors/Storeys	5			
		Area of structure considered (m^2)			9,296	
	F	**Base fire flow without reductions**				17,000
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	17,000
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	-8,500
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
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**	**9,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**150**
				or	USGPM	2,378
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	1080

FUS - Fire Flow Calculations - User Guide

Novatech Project #:	119200	• Please use the notes below as a guide when completing the FUS Fire Flow Calculations
Project Name:	3026 Solandt Road	
Date:	1/17/2020	• When in doubt, confirm construction material, firewalls, etc. with architect/owner
Input By:	Anthony Mestwarp	
Reviewed By:	Cara Ruddle	• When in doubt, err on conservative side

Note: This form only applies for Wood Frame, Ordinary or Non-combustible

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary

Construction Type	Non-combustible construction	
Area	9,296	m^2
Occupancy Reduction	0%	
Sprinkler Reduction	-50%	
Exposure Surcharge	0%	
Total Fire Flow	9,000	L/min

Project Manager Review

Date: ____________________

Name: ____________________

Signature: ____________________

Base Fire Flow

1 **Construction Material**

Generally most OBC Part 9 Buildings

Only Use if can be confirmed with client/architect

Only Use if can be confirmed with client/architect

2 **Floor Area**

If considered gross floor area, then enter 1 floor/storey

If Fire wall, then reduce footprint accordingly

Reductions or Surcharges

3 **Occupancy hazard reduction or surcharge**

Residential - with no garage - Not Typical

Residential - with garage

General Commercial **- Generally, for commercial buildings no reduction**

Check usage with FUS

Check usage with FUS

4 **Sprinkler Reduction**

Is the building sprinklered?

Only Use if can be confirmed with client/architect

Only Use if can be confirmed with client/architect (Fully Supervised generally means full time active monitoring)

5 **Exposure Surcharge (cumulative %)**

For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per National Building Code of Canada

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

Proposed Development Conditions

	Proposed Office	Proposed Office	Totals
Total Floor Area (m^2)	9296	9048	
Total Daily Volume (Liters)	74967.7	72967.7	147935.5
Avg Day Demand (L/s)	0.868	0.845	1.71
Max Day Demand (L/s)	1.302	1.267	2.57
Peak Hour Demand (L/s)	2.343	2.280	4.62

Establishment	Daily Demand Volume		Source
Office:	75	l/9.3m² /day	Daily Demands from OBC Table 8.2.1.3
Industrial/Commercial:	28000	l/ha/day	

Commercial / Industrial Peaking Factors City of Ottawa Water Distrubution Guidelines

Conditions	Peaking Factor	
Maximum Day	1.5	x avg day
Peak Hour	1.8	x max day

Anthony Mestwarp

From: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Sent: Thursday, January 16, 2020 9:22 AM
To: Anthony Mestwarp
Cc: Cara Ruddle
Subject: RE: 3026 Solandt Road Watermain Boundary condition request
Attachments: 3026 Solandt Road _Boundary Conditions_15Jan2020.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Anthony,

Attached is the boundary conditions as requested.

Regards,

Ahmed Elsayed, P. Eng.
Project Manager, Infrastructure Approvals

Planning, Infrastructure and Economic Development Dept.

City of Ottawa
613.580.2400 ext. 21206

From: Anthony Mestwarp <a.mestwarp@novatech-eng.com>
Sent: January 07, 2020 1:52 PM
To: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Cc: Cara Ruddle <c.ruddle@novatech-eng.com>
Subject: 3026 Solandt Road Watermain Boundary condition request

Hi Ahmed,

Please find below water demand information for the proposed development at 3026 Solandt Road, which will add a 5 storey office building to the existing site. Also, attached is a key plan showing the site location. Please provide boundary conditions for the existing watermain infrastructure highlighted on the attached plan so we can confirm the existing infrastructure has capacity for the proposed development.

Water Demands proposed development (including the existing office building demands):

AVG DAY = 1.71 L/s
MAX DAY = 2.57 L/s

PEAK HOUR = 4.62 L/s
MAX DAY + FIRE =152.57 L/s

Thanks,

Anthony Mestwarp, **P.Eng.**, Project Engineer | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext. 216 | Fax: 613.254.5867

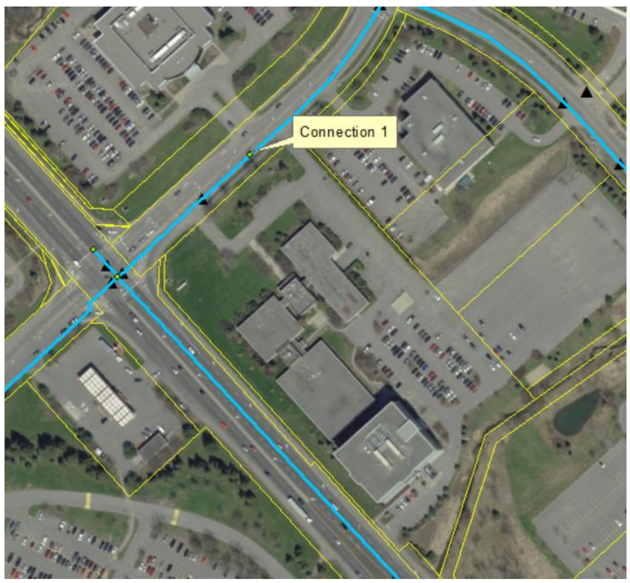
Boundary Conditions for 3026 Solandt Road

Provided Information:

Date Provided January-2020

Scenario	Demand	
	L/min	L/s
Average Daily Demand	103	1.71
Maximum Daily Demand	154	2.57
Peak Hour	277	4.62
Fire Flow Demand	9,000	150.00

Location:



Results:

Connection 1 - Solandt Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.6	72.6
Peak Hour	126.5	66.7
Max Day plus Fire 1	124.7	64.1

[1] Ground Elevation = 79.5m

Notes:

1. A second connection is required since the basic day demand exceeds 50 m^3/d (Ottawa Design Guidelines, Water Distribution, Section 4.3.1).

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

CALCULATED WATER DEMNADS:

PROPOSED DEVELOPMENT (5 STOREY BUILDING)

AVERAGE DAY =	1.71	L/s
MAXIMUM DAY =	2.57	L/s
PEAK HOUR =	4.62	L/s
MAX DAY + FIRE =	152.57	L/s

CITY OF OTTAWA BOUNDARY CONDITIONS:

BOUNDAY CONDITIONS BASED ON CONNECTION TO 400mm DIA. WATERMAIN ON SOLANDT ROAD.

MINIMUM HGL =	126.5	m
MAXIMUM HGL =	130.6	m
MAX DAY + FIRE =	124.7	m

WATERMAIN ANALYSIS:

FINSIHED FLOOR GROUND ELEVATION = 80.30 m

HIGH PRESSURE TEST = MAX HGL - AVG GROUND ELEV x 1.42197 PSI/m < 80 PSI

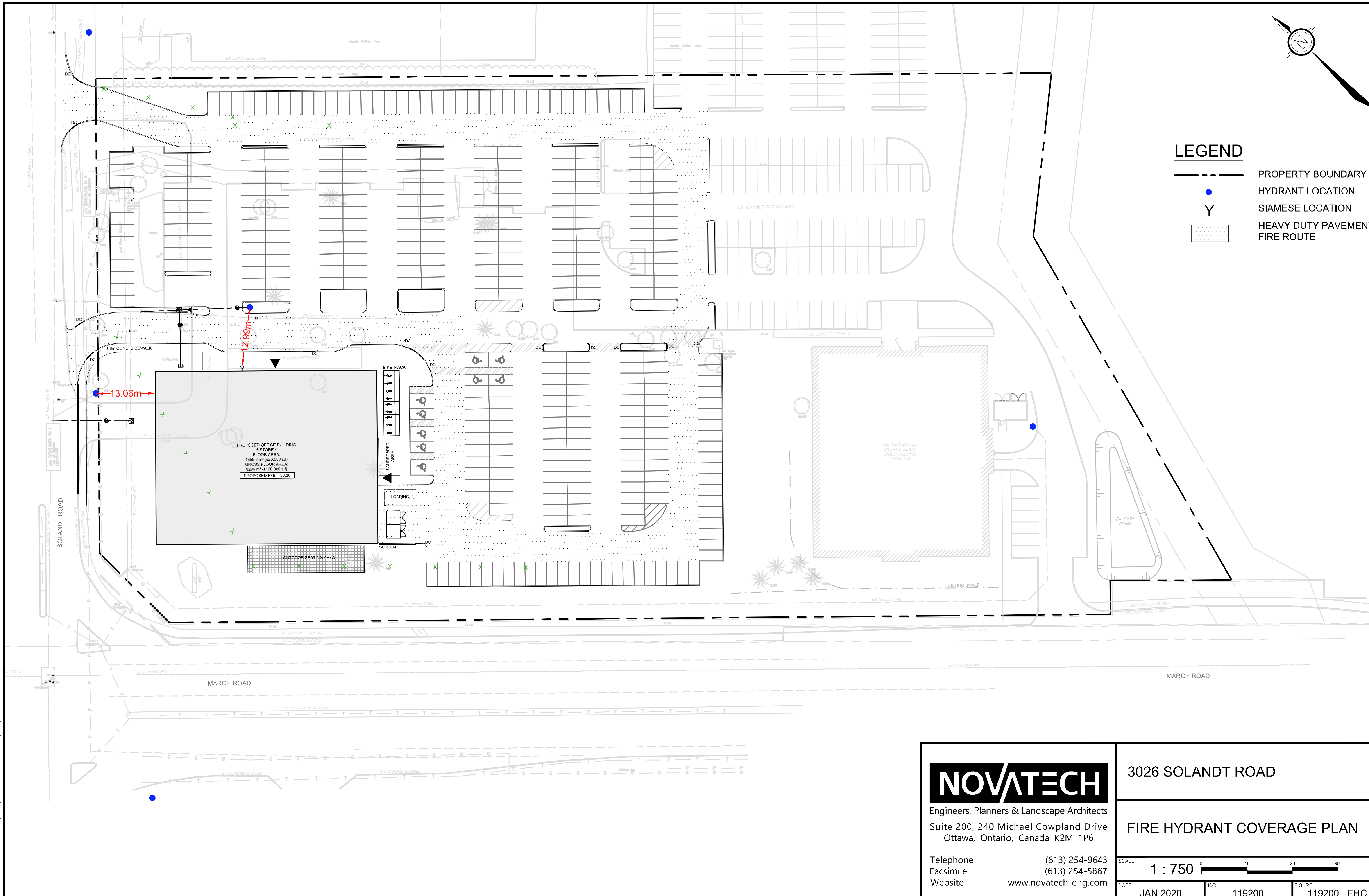
HIGH PRESSURE = 71.5 PSI

LOW PRESSURE TEST = MIN HGL - AVG GROUND ELEV x 1.42197 PSI/m > 40 PSI

LOW PRESSURE = 65.7 PSI

MAX DAY + FIRE TEST = MAX DAY + FIRE - AVG GROUND ELEV x 1.42197 PSI/m > 20 PSI

LOW PRESSURE = 63.1 PSI



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

3026 SOLANDT ROAD

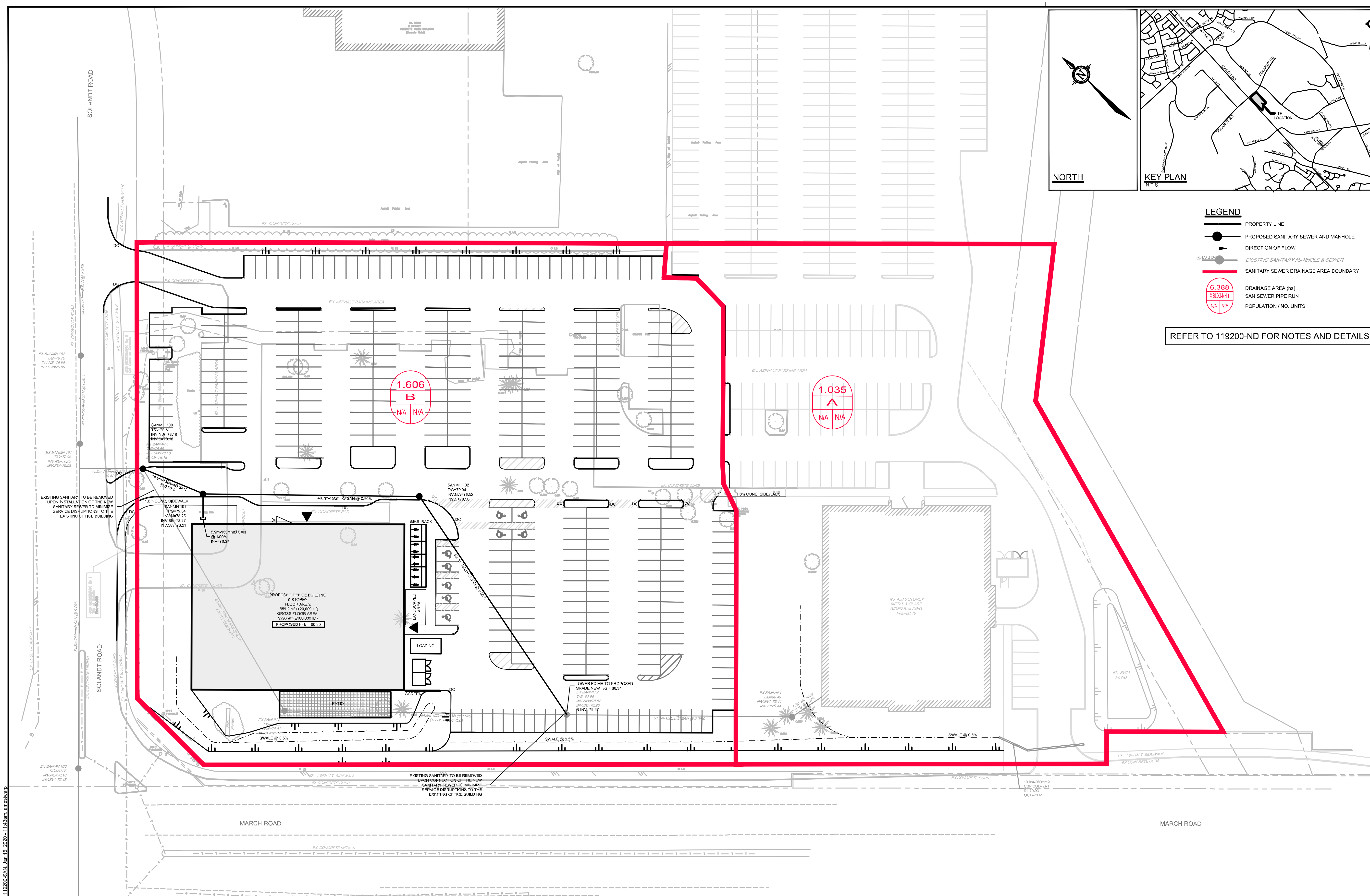
FIRE HYDRANT COVERAGE PLAN

SCALE 1 : 750

DATE JAN 2020 | JOB 119200 | FIGURE 119200 - FHC

M:\2019\119200\CAD\Design\Figures\Water\FHC.dwg, Figure 3, Jan 17, 2020 - 10:41am, amestwarp

APPENDIX D
Sanitary Servicing Information



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.

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN AGREEMENT	JAN 17/20	CJR

SCALE	
NTS	
DESIGN	ARM
CHECKED	CJR
DRAWN	ARM
CHECKED	CJR
APPROVED	JLS

FOR REVIEW ONLY

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
3026 SOLANDT ROAD, OTTAWA, ONTARIO

DRAWING NAME
SANITARY SEWER DRAINAGE AREA PLAN

PROJECT No. 119200
REV REV #1
DRAWING No. 119200-SAN

Project No. 119200
Project Name: 3026 Soldandt Rd
Project Location: Ottawa, Ontario

NOVATECH
Engineers, Planners & Landscape Architects

Date: January, 2020

Sanitary Sewer Design Sheet

LOCATION			COMMERCIAL / INDUTRIAL FLOW							PIPE					
AREA ID	FROM	TO	AREA (ha)	ACCUM AREA (ha)	PEAK FACTOR	PEAK FLOW (l/s)	ACCUM PEAK FLOW (l/s)	INFIL. FLOW (l/s)	TOTAL PEAK FLOW (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	Q/Qfull
A	Ex. Office	EX MH 1	1.035	1.035	1.5	1.27	1.27	0.34	1.61	150	1.34	8.2	17.6	1.0	9.1%
	EX MH 1	EX MH 2	0.000	1.035	1.5	0.00	1.27	0.34	1.61	150	0.99	51.7	15.1	0.9	10.6%
	EX MH 2	MH 102	0.000	1.035	1.5	0.00	1.27	0.34	1.61	150	0.50	60.4	10.8	0.6	15.0%
	MH 102	MH 101	0.000	1.035	1.5	0.00	1.27	0.34	1.61	150	0.50	49.7	10.8	0.6	15.0%
B	PR. OFFICE	MH 101	1.606	1.606	1.5	1.30	1.30	0.53	1.83	150	1.00	5.9	15.2	0.9	12.0%
	MH101	MH 100	0.000	2.641	1.5	0.00	2.57	0.87	3.44	150	0.50	14.9	10.8	0.6	32.0%
	MH 100	EX SAN	0.000	2.641	1.5	0.00	2.57	0.87	3.44	150	10.60	14.5	49.5	2.8	6.9%

Design Parameters:

Ontario Building Code (Table 8.2.1.3)

Office per each 9.3m2 of floor space	75	l/9.3m² /day

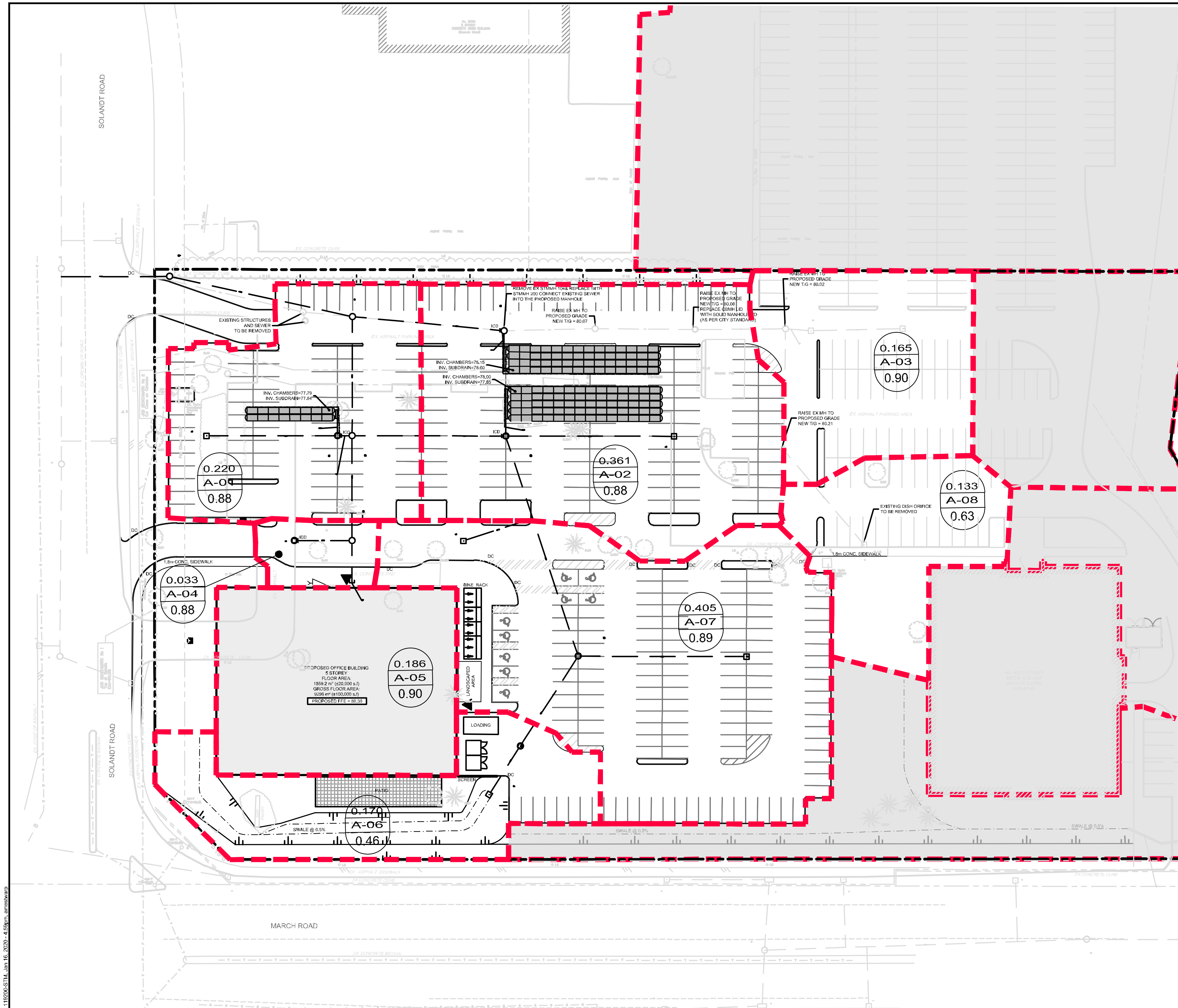
City of Ottawa Sewer Design Guidelines (Appendix 4-A)

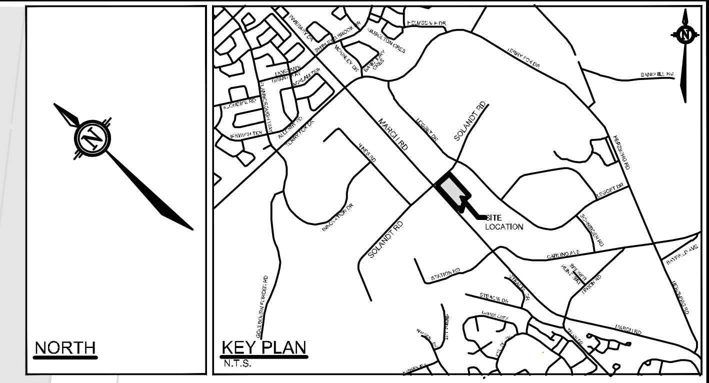
- Avg Commercial Flow	28000	l/ha/day
- Extraneous Flows	0.33	l/s/ha
- ICI Peaking Factor	1.5	

Proposed Office			Existing Office		
Gross Floor Area per floor	1859.2	m²	Gross Floor Area per floor	1809.6	m²
Floors	5		Floors	5	
Total Floor area	9296	m²	Total Floor area	9048	m²
Site Area	1.606	m²	Site Area	1.035	m²
Flow (Floor Area)	0.87	l/s	Flow (Floor Area)	0.84	l/s
Flow (28000 l/ha/day)	0.52	l/s	Flow (28000 l/ha/day)	0.34	l/s

Value used for design flow
Existing sanitary sewer

APPENDIX E
Storm Servicing Information





LEGEND

- PROPERTY LINE
- PROPOSED STORM SEWER AND MANHOLE
- DIRECTION OF FLOW
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORMTECH STC-740 UNDERGROUND STORAGE SYSTEM (REFER 119200-ND FOR DETAILS)
- STM MH — *EXISTING STORM MANHOLE & SEWER*
- CB 1 — *EXISTING CATCHBASIN*
- STORM SEWER DRAINAGE AREA BOUNDARY
- AREA TRIBUTARY TO EXISTING SWMF PONDS
- 0.085 / A-16 / 0.78 — DRAINAGE AREA (ha) / DRAINAGE AREA ID / RUNOFF COEFFICIENT

REFER TO 119200-ND FOR NOTES AND DETAILS

TEMPEST LMF/MHF ICDs	
LOCATION	MODEL NO.
CBMH 103	LMF 70
CBMH 05	LMF 70
CBMH 104	LMF 105
STMMH 108	LMF 105

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.

No.	REVISION	DATE	BY
1.	ISSUED FOR SITE PLAN AGREEMENT	JAN 17/20	CJR

SCALE: NTS

DESIGN: ARM
CHECKED: CJR
DRAWN: ARM
CHECKED: CJR
APPROVED: JLS

FOR REVIEW ONLY

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

LOCATION
3026 SOLANDT ROAD, OTTAWA, ONTARIO

DRAWING NAME
STORM SEWER DRAINAGE AREA PLAN

PROJECT No. 119200
REV: REV #1
DRAWING No. 119200-STM

PLANA1.DWG - 841mmx594mm

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2 Year Storm Sewer Design Sheet - Controlled Flows

LOCATION			AREA (Ha)				UNCONTROLLED 2-YEAR FLOW					CONTROLLED 100-YEAR FLOW			PROPOSED SEWER							
AREA ID	FROM	TO	TOTAL AREA (ha)	R= 0.2	R= 0.9	R	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	ICD LOCATION	FLOWS (L/S)	ACCUM FLOWS (L/S)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull (Controlled)
A-06	CBMH 106	CBMH 105	0.170	0.106	0.064	0.46	0.22	0.22	10.00	76.81	16.86				381.0	0.50	21.7	129.47	1.13	0.32	N/A	N/A
A-07	CBMH 105	CBMH 104	0.405	0.005	0.400	0.89	1.00	1.22	10.32	75.60	92.46				381.0	0.30	49.1	100.29	0.88	0.93	N/A	N/A
A-02	CBMH 104	STMMH 102	0.361	0.011	0.350	0.88	0.88	2.11	11.25	72.32	152.27	CBMH 104	36.3	36.3	381.0	0.74	21.0	157.50	1.38	0.25	121.20	0.23
A-05	BLDG	STMMH 107	0.186	0.000	0.186	0.90	0.47	0.47	10.00	76.81	35.74	BLDG	9.9	9.9	254.0	1.00	8.6	62.10	1.22	0.12	52.20	0.16
A-04	STMMH 107	STMMH 102	0.033	0.001	0.032	0.88	0.08	0.55	10.12	76.36	41.72	CBMH 5	6.4	16.3	305.0	0.40	21.3	63.98	0.87	0.41	47.68	0.25
A-01	CBMH 103	STMMH 102	0.220	0.005	0.215	0.88	0.54	0.54	10.00	76.81	41.53	CBMH 103	9.2	9.2	305.0	0.37	8.0	61.53	0.84	0.16	52.33	0.15
	STMMH 102	STMMH 101	0.000	0.000	0.000	0.00	0.00	3.19	11.50	71.48	228.20		0.0	61.8	381.0	0.30	23.8	100.29	0.88	0.45	38.49	0.62
A-08	EX STMMH 100	EX STMMH 101	0.133	0.052	0.081	0.63	0.23	0.23	10.00	76.81	17.82				305.0	0.36	24.6	60.70	0.83	0.49	N/A	N/A
A-03	EX STMMH 101	EX STMMH 102	0.165	0.000	0.165	0.90	0.41	0.64	10.49	74.96	48.33				305.0	0.27	18.4	52.56	0.72	0.43	N/A	N/A
	EX STMMH 102	EX STMMH 103	0.000	0.000	0.000	0.00	0.00	0.64	10.92	73.44	47.35				254.0	0.44	20.3	41.19	0.81	0.42	N/A	N/A
	EX STMMH 103	STMMH 108		0.000	0.000	0.00	0.00	0.64	11.34	72.03	46.44				305.0	0.27	18.5	52.56	0.72	0.43	N/A	N/A
	STMMH 108	STMMH 101		0.000	0.000	0.00	0.00	0.64	11.77	70.63	45.54	STMMH 108	36.7	98.5	381.0	0.60	25.9	141.83	1.24	0.35	43.33	0.69
	STMMH 101	STMMH 100		0.000	0.000	0.00	0.00	3.84	12.11	69.54	266.87			98.5	381.0	0.30	43.0	100.29	0.88	0.82	1.79	0.98

***Note: Storm sewer design sheet flows are peak uncontrolled flows. Flows will be attenuated with ICD's which will increase the excess capacity in the pipes**

Existing storm sewer

Definitions
Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = 2 YEAR Rainfall Intensity (mm/h)

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min Velocity = 0.76 m/sec.
3) 2 Year intensity = 732.951 / (time + 6.199)$^{0.810}$

APPENDIX F
Stormwater Management Calculations

Paul Newcombe

From:	Cara Ruddle
Sent:	Monday, March 23, 2020 2:00 PM
To:	Paul Newcombe
Subject:	FW: PG5196 - Geotechnical 3026 Solandt Road
Attachments:	Paterson Group Report PG5196, dated Jauary 10, 2020.pdf

Cara Ruddle, P.Eng., Senior 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: 220 | Cell: 613.261.7719 | Fax: 613.254.5867

From: David Gilbert <DGilbert@Patersongroup.ca>
Sent: Thursday, March 19, 2020 3:12 PM
To: Cara Ruddle <c.ruddle@novatech-eng.com>
Subject: FW: PG5196 - Geotechnical 3026 Solandt Road

Hi Cara,

As discussed, the groundwater level will be between 4 to 5 m depth. Seasonal fluctuations in the clay will not be above those levels due to the imperviousness of the clay.

Dave

David Gilbert, P.Eng.
Senior Geotechnical Engineer
patersongroup
solution oriented engineering
over 60 years serving our clients

154 Colonnade Road South
Ottawa, Ontario, K2E 7J5
Tel: (613) 226-7381 Ext. 205

From: Joey Villeneuve <JVilleneuve@Patersongroup.ca>
Sent: January 10, 2020 9:34 AM
To: Bonnie Martell <bmartell@colonnadebridgeport.ca>
Cc: David Gilbert <DGilbert@Patersongroup.ca>
Subject: PG5196 - Geotechnical 3026 Solandt Road

Good morning Bonnie,

Please see attached geotechnical report for the proposed project at 3026 Solandt Road.

Have a great day,

Joey R Villeneuve, *M.A.Sc, P.Eng.*

patersongroup
solution oriented engineering
over 60 years servicing our clients

154 Colonnade Road South
Ottawa, Ontario, K2E 7J5
Tel: (613) 226-7381 Ext.253

Pre-Development Runoff Coefficient "C" - McManus Report Areas 9 & 10

Area	Surface	Ha	"C"	C_{avg}	$^*C_{100}$
Total	Hard	0.315	0.90	0.65	0.73
0.490	Soft	0.175	0.20		

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

Pre-Development Flows - McManus Report Areas 9 & 10

Outlet Options	**Area (ha)**	C_{avg}	**Tc (min)**	**$Q2_{Year}$ (L/s)**	**$Q_{5 Year}$ (L/s)**	**$Q_{100 Year}$ (L/s)**
Solandt	0.490	0.65	10	**68.0**	**92.3**	**178.1**

Time of Concentration	Tc=	10.0	min
Intensity (2 Year Event)	I_2=	76.81	mm/hr
Intensity (5 Year Event)	I_5=	104.19	mm/hr
Intensity (100 Year Event)	I_{100}=	178.56	mm/hr

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

Equations:
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

3026 Solandt Road (119200)
Post-Development Model Parameters

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Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
A-01	0.133	0.62	60%	0%	29.10	45.70	2.0%
A-02	0.084	0.90	100%	0%	14.71	57.09	2.0%
A-03	0.080	0.90	100%	0%	10.57	75.69	2.0%
A-04	0.122	0.30	14%	0%	63.39	19.25	0.5%
A-05	0.047	0.90	100%	0%	20.30	23.15	2.0%
A-06	0.177	0.88	97%	0%	19.63	90.16	2.0%
A-07	0.192	0.90	100%	0%	17.12	112.18	2.0%
A-08	0.036	0.87	96%	0%	12.93	27.83	2.0%
A-09	0.197	0.88	97%	0%	21.92	89.89	2.0%
A-10	0.165	0.87	96%	0%	17.45	94.57	2.0%
A-11	0.186	0.90	100%	100%	36.77	50.59	0.5%
A-12	0.033	0.88	97%	0%	8.76	37.65	2.0%
A-13	0.060	0.90	100%	0%	7.94	75.60	2.0%
A-14	0.158	0.88	97%	0%	16.59	95.23	2.0%
A-15	0.143	0.38	26%	0%	11.81	121.07	4.0%
TOTAL:	**1.81**						

3026 Solandt Road (119200)
Catchbasin Information

Engineers, Planners & Landscape Architects

CB / CBMH ID	TAG	STM Area ID	Drainage Area (ha)	Invert Elev. (m)	Rim Elev. (m)	Spill Elev. (m)	Ponding Volume (m^3)
CB1	PR-CB	A-13	0.06	78.01	79.60	79.92	6.1
CB2	PR-CB	A-09	0.20	78.07	79.65	80.00	87.1
CB3	PR-CB	A-07	0.19	78.27	79.70	80.05	85.4
CB4	PR-CB	A-04	0.12	78.28	79.65	80.00	35.0
CB6	PR-CB	A-08	0.04	78.12	79.85	79.95	2.6
CBMH103	PR-CBMH	A-14	0.16	77.64	79.55	79.90	101.1
CBMH104	PR-CBMH	A-10	0.17	77.77	79.60	79.95	72.6
CBMH105	PR-CBMH	A-06	0.18	77.98	79.65	80.00	91.7
CBMH106	PR-CBMH	A-05	0.05	78.21	79.82	79.95	9.5
CBMH5	PR-CBMH	A-12	0.03	77.83	79.85	79.98	3.9
EX-CB01	EX-CB	A-01	0.13	79.15	79.84	80.01	17.0
EX-CB02	EX-CB	A-03	0.08	78.81	79.86	80.15	44.5
EX-CB03	EX-CB	A-02	0.08	78.83	79.86	79.93	8.8
STORAGE CHAMBERS							
ST-CBMH103	STORAGE	N/A	N/A	77.80	79.55	N/A	0.0
ST-CBMH106	STORAGE	N/A	N/A	78.31	79.82	N/A	0.0
ST-MH108	STORAGE	N/A	N/A	78.15	80.08	N/A	0.0

3026 Solandt Road (119200)
Summary of Underground and Surface Storage Provided

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CB / CBMH ID	STM ID	Drainage Area (ha)	Elevations (m)			Depths (m)			Provided Storage (m^3)			StormTech STC-740 Storage Chambers	
			Invert	RIM	Ponding	CB	Ponding	Total	UG	Surface[1]	Total	Number	Storage (m^3)[2]
CB1	A-13	0.06	78.01	79.60	79.92	1.59	0.32	1.91	0.0	6.1	6.1	0	0.0
CB2	A-09	0.20	78.07	79.65	80.00	1.58	0.35	1.93	0.0	87.1	87.1	0	0.0
CB3	A-07	0.19	78.27	79.70	80.05	1.43	0.35	1.78	0.0	85.4	85.4	0	0.0
CB4	A-04	0.12	78.28	79.65	80.00	1.37	0.35	1.72	0.0	35.0	35.0	0	0.0
CB6	A-08	0.04	78.12	79.85	79.95	1.73	0.10	1.83	0.0	2.6	2.6	0	0.0
CBMH103	A-14	0.16	77.64	79.55	79.90	1.91	0.35	2.26	0.0	101.1	101.1	0	0.0
CBMH104	A-10	0.17	77.77	79.60	79.95	1.83	0.35	2.18	0.0	72.6	72.6	0	0.0
CBMH105	A-06	0.18	77.98	79.65	80.00	1.67	0.35	2.02	0.0	91.7	91.7	0	0.0
CBMH106	A-05	0.05	78.21	79.82	79.95	1.61	0.13	1.74	0.0	9.5	9.5	0	0.0
CBMH5	A-12	0.03	77.83	79.85	79.98	2.02	0.13	2.15	0.0	3.9	3.9	0	0.0
EX-CB01	A-01	0.13	79.15	79.84	80.01	0.69	0.17	0.86	0.0	17.0	17.0	0	0.0
EX-CB02	A-03	0.08	78.81	79.86	80.15	1.05	0.29	1.34	0.0	44.5	44.5	0	0.0
EX-CB03	A-02	0.08	78.83	79.86	79.93	1.03	0.07	1.10	0.0	8.8	8.8	0	0.0
STORAGE CHAMBERS													
ST-CBMH103	N/A	N/A	77.80	79.55	N/A	1.75	0.00	1.75	33.9	0.0	33.9	16	33.9
ST-CBMH106	N/A	N/A	78.31	79.82	N/A	1.51	0.00	1.51	97.5	0.0	97.5	46	97.5
ST-MH108	N/A	N/A	78.15	80.08	N/A	1.93	0.00	1.93	29.6	0.0	29.6	14	29.6
TOTAL		**1.48**	**-**			**-**			**161.0**	**565.3**	**726.3**	**76**	**161.0**

[1] *Based on Grading Design / Autodesk Civil 3D (refer to Drawing 117148-SWM)*

[2] *Based on StormTech Site Calculator for STC-740*

**Highlighted Rows Represent Underground storage*

Date: 3/26/2020
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3026 Solandt Road (119200)
Summary of Underground and Surface Storage Provided

Storage Provided by StormTech STC-740 Chambers		System Length (m)[1]	
Number	Storage (m^3)[1]	1 Row	2 Rows
1	2.1	3.27	3.27
2	4.2	5.44	3.27
3	6.3	7.61	5.44
4	8.4	9.78	5.44
5	10.6	11.95	7.61
6	12.7	14.12	7.61
7	14.8	16.29	9.78
8	16.9	18.46	9.78
9	19.0	20.63	11.95
10	21.2	22.80	11.95
11	23.3	24.97	14.12
12	25.4	27.14	14.12
13	27.5	29.31	16.29
14	29.6	31.48	16.29
15	31.8	33.65	18.46
16	33.9	35.82	18.46
17	36.0	37.99	20.63
18	38.1	40.16	20.63
19	40.2	42.33	22.80
20	42.4	44.50	22.80
21	44.5	46.67	24.97
22	46.6	48.84	24.97
23	48.7	51.01	27.14
24	50.8	53.18	27.14
25	53.0	55.35	29.31
26	55.1	57.52	29.31
27	57.2	59.69	31.48
28	59.3	61.86	31.48
30	63.6	66.20	33.65
32	67.8	70.54	35.82
34	72.0	74.88	37.99
36	76.3	79.22	40.16
40	84.8	87.90	44.50
46	97.5	100.92	51.01
50	106.0	109.60	55.35
54	114.5	118.28	59.69
56	118.7	122.62	61.86
60	127.2	131.30	66.20
64	135.7	139.98	70.54
66	139.9	144.32	72.71
70	148.4	153.00	77.05

[1] *Based on StormTech Site Calculator for STC-740*
- 150mm stone foundation
- 40% void ratio for surrounding stone
- 1 row; Width = 1.90m
- 2 rows; Width = 3.35m
- Includes end caps

Date: 3/26/2020
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3026 Solandt Road (119200)
PCSWMM Storage Curves

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CB Storage Curves

STM ID	CB ID	Provided Storage	
		Underground	Surface
CB1	**A-13**	**0.0**	**6.1**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.59	0.00	0.0	0.0
1.91	38.13	6.1	6.1
1.92	0.00	0.2	6.3
2.59	0.00	0.0	6.3

0x Stormtech STC-740 Storage Chambers (0 m3)
0.32m Static Ponding Depth (6.1 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
CB2	**A-09**	**0.0**	**87.1**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.58	0.00	0.0	0.0
1.93	497.71	87.1	87.1
1.94	0.00	2.5	89.6
2.58	0.00	0.0	89.6

0x Stormtech STC-740 Storage Chambers (0 m3)
0.35m Static Ponding Depth (87.1 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
CB3	**A-07**	**0.0**	**85.4**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.43	0.00	0.0	0.0
1.78	488.00	85.4	85.4
1.79	0.00	2.4	87.8
2.43	0.00	0.0	87.8

0x Stormtech STC-740 Storage Chambers (0 m3)
0.35m Static Ponding Depth (85.4 m3)

3026 Solandt Road (119200)
PCSWMM Storage Curves

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STM ID	CB ID	Provided Storage	
		Underground	Surface
CB4	**A-04**	**0.0**	**35.0**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.37	0.00	0.0	0.0
1.72	200.00	35.0	35.0
1.73	0.00	1.0	36.0
2.37	0.00	0.0	36.0

0x Stormtech STC-740 Storage Chambers (0 m3)
0.35m Static Ponding Depth (35 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
CB6	**A-08**	**0.0**	**2.6**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.73	0.00	0.0	0.0
1.83	52.00	2.6	2.6
1.84	0.00	0.3	2.9
2.73	0.00	0.0	2.9

0x Stormtech STC-740 Storage Chambers (0 m3)
0.1m Static Ponding Depth (2.6 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
CBMH103	**A-14**	**0.0**	**101.1**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.91	0.00	0.0	0.0
2.26	577.71	101.1	101.1
2.27	0.00	2.9	104.0
2.91	0.00	0.0	104.0

0x Stormtech STC-740 Storage Chambers (0 m3)
0.35m Static Ponding Depth (101.1 m3)

3026 Solandt Road (119200)
PCSWMM Storage Curves

STM ID	CB ID	Provided Storage	
		Underground	Surface
CBMH104	**A-10**	**0.0**	**72.6**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.83	0.00	0.0	0.0
2.18	414.86	72.6	72.6
2.19	0.00	2.1	74.7
2.83	0.00	0.0	74.7

0x Stormtech STC-740 Storage Chambers (0 m3)
0.35m Static Ponding Depth (72.6 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
CBMH105	**A-06**	**0.0**	**91.7**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.67	0.00	0.0	0.0
2.02	524.00	91.7	91.7
2.03	0.00	2.6	94.3
2.67	0.00	0.0	94.3

0x Stormtech STC-740 Storage Chambers (0 m3)
0.35m Static Ponding Depth (91.7 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
CBMH106	**A-05**	**0.0**	**9.5**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.61	0.00	0.0	0.0
1.74	146.15	9.5	9.5
1.75	0.00	0.7	10.2
2.61	0.00	0.0	10.2

0x Stormtech STC-740 Storage Chambers (0 m3)
0.13m Static Ponding Depth (9.5 m3)

3026 Solandt Road (119200)
PCSWMM Storage Curves

NOVATECH
Engineers, Planners & Landscape Architects

STM ID	CB ID	Provided Storage	
		Underground	Surface
CBMH5	**A-12**	**0.0**	**3.9**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
2.02	0.00	0.0	0.0
2.15	60.00	3.9	3.9
2.16	0.00	0.3	4.2
3.02	0.00	0.0	4.2

0x Stormtech STC-740 Storage Chambers (0 m3)
0.13m Static Ponding Depth (3.9 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
EX-CB01	**A-01**	**0.0**	**17.0**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
0.69	0.00	0.0	0.0
0.86	200.00	17.0	17.0
0.87	0.00	1.0	18.0
1.69	0.00	0.0	18.0

0x Stormtech STC-740 Storage Chambers (0 m3)
0.17m Static Ponding Depth (17 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
EX-CB02	**A-03**	**0.0**	**44.5**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.05	0.00	0.0	0.0
1.34	306.90	44.5	44.5
1.35	0.00	1.5	46.0
2.05	0.00	0.0	46.0

0x Stormtech STC-740 Storage Chambers (0 m3)
0.29m Static Ponding Depth (44.5 m3)

3026 Solandt Road (119200)
PCSWMM Storage Curves

STM ID	CB ID	Provided Storage	
		Underground	Surface
EX-CB03	**A-02**	**0.0**	**8.8**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	0.00	0.0	0.0
0.77	0.00	0.0	0.0
1.03	0.00	0.0	0.0
1.10	251.43	8.8	8.8
1.11	0.00	1.3	10.1
2.03	0.00	0.0	10.1

0x Stormtech STC-740 Storage Chambers (0 m3)
0.07m Static Ponding Depth (8.8 m3)

3026 Solandt Road (119200)
PCSWMM Storage Curves

NOVATECH Engineers, Planners & Landscape Architects

Underground Storage Curves

STM ID	CB ID	Provided Storage	
		Underground	Surface
ST-CBMH103	**N/A**	**33.9**	**0.0**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	89.21	33.9	33.9
0.7601	0.00	0.0	33.9
1.74	0.00	0.0	33.9
1.75	0.00	0.0	33.9
1.76	0.00	0.0	33.9
2.74	0.00	0.0	33.9

16x Stormtech STC-740 Storage Chambers (33.9 m3)
0m Static Ponding Depth (0 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
ST-CBMH106	**N/A**	**97.5**	**0.0**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	256.58	97.5	97.5
0.7601	0.00	0.0	97.5
1.50	0.00	0.0	97.5
1.51	0.00	0.0	97.5
1.52	0.00	0.0	97.5
2.50	0.00	0.0	97.5

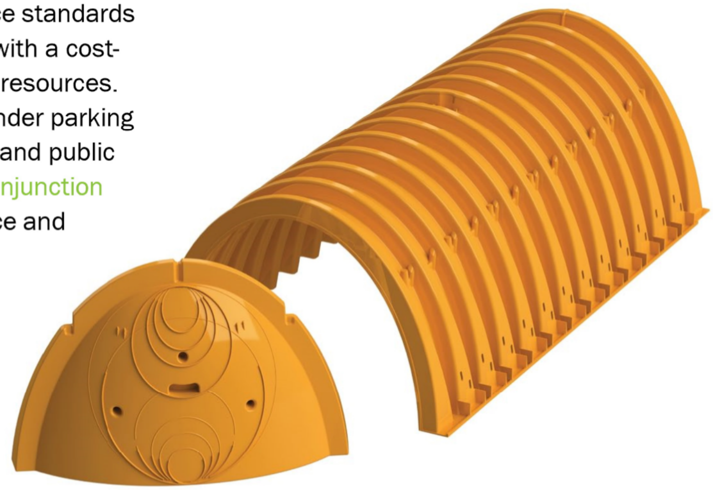
46x Stormtech STC-740 Storage Chambers (97.5 m3)
0m Static Ponding Depth (0 m3)

STM ID	CB ID	Provided Storage	
		Underground	Surface
ST-MH108	**N/A**	**29.6**	**0.0**
Depth (m)	**Equivalent Area (m^2)**	**Incremental Volume (m^3)**	**Total Volume (m^3)**
0.00	0.00	0.0	0.0
0.76	77.89	29.6	29.6
0.7601	0.00	0.0	29.6
1.92	0.00	0.0	29.6
1.93	0.00	0.0	29.6
1.94	0.00	0.0	29.6
2.92	0.00	0.0	29.6

14x Stormtech STC-740 Storage Chambers (29.6 m3)
0m Static Ponding Depth (0 m3)

StormTech SC-740 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



StormTech SC-740 Chamber (not to scale)

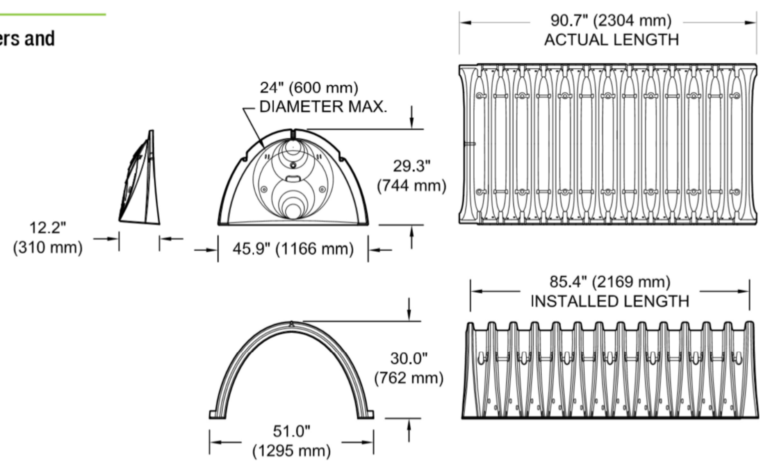
Nominal Chamber Specifications

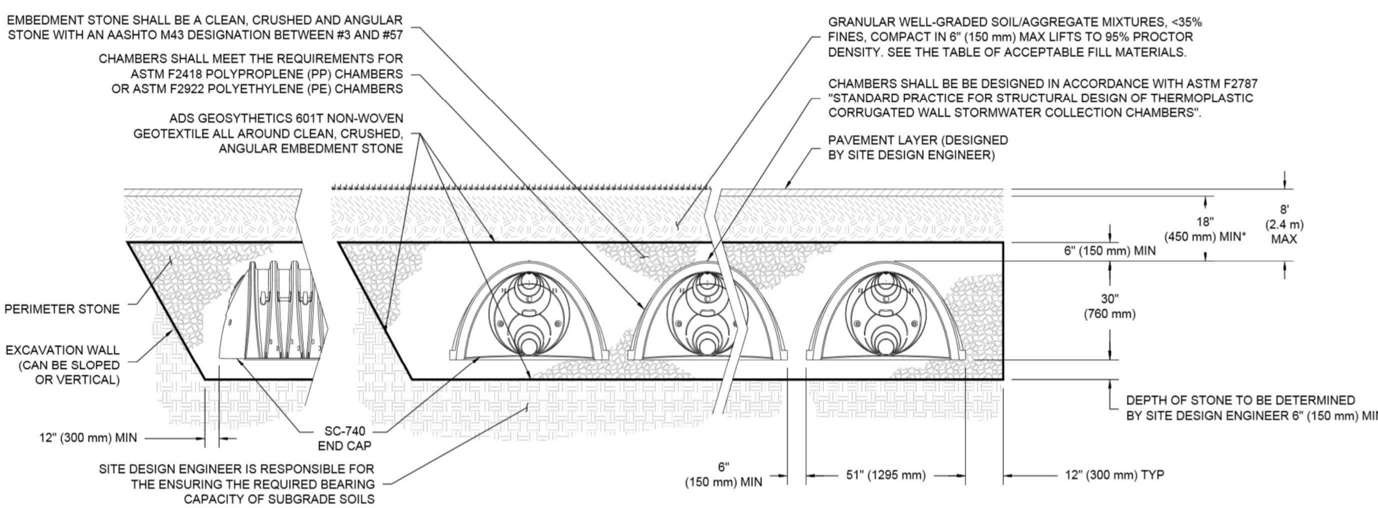
Size (Lx W x H)	85.4” x 51.0” x 30.0” (2,170 x 1,295 x 762 mm)
Chamber Storage	45.9 ft^3 (1.30 m^3)
Min. Installed Storage*	74.9 ft^3 (2.12 m^3)
Weight	74.0 lbs (33.6 kg)

*Assumes 6” (150 mm) stone above, below and between chambers and 40% stone porosity.

Shipping

30 chambers/pallet
60 end caps/pallet
12 pallets/truck





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

SC-740 CUMLATIVE STORAGE VOLUMES PER CHAMBER

Assumes 40% Stone Porosity. Calculations are Based Upon a 6” (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)		Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
42 (1067)		45.90 (1.300)	74.90 (2.121)
41 (1041)		45.90 (1.300)	73.77 (2.089)
40 (1016)	Stone	45.90 (1.300)	72.64 (2.057)
39 (991)	Cover	45.90 (1.300)	71.52 (2.025)
38 (965)		45.90 (1.300)	70.39 (1.993)
37 (940)		45.90 (1.300)	69.26 (1.961)
36 (914)		45.90 (1.300)	68.14 (1.929)
35 (889)		45.85 (1.298)	66.98 (1.897)
34 (864)		45.69 (1.294)	65.75 (1.862)
33 (838)		45.41 (1.286)	64.46 (1.825)
32 (813)		44.81 (1.269)	62.97 (1.783)
31 (787)		44.01 (1.246)	61.36 (1.737)
30 (762)		43.06 (1.219)	59.66 (1.689)
29 (737)		41.98 (1.189)	57.89 (1.639)
28 (711)		40.80 (1.155)	56.05 (1.587)
27 (686)		39.54 (1.120)	54.17 (1.534)
26 (660)		38.18 (1.081)	52.23 (1.479)
25 (635)		36.74 (1.040)	50.23 (1.422)
24 (610)		35.22 (0.977)	48.19 (1.365)
23 (584)		33.64 (0.953)	46.11 (1.306)
22 (559)		31.99 (0.906)	44.00 (1.246)
21 (533)		30.29 (0.858)	1.85 (1.185)
20 (508)		28.54 (0.808)	39.67 (1.123)
19 (483)		26.74 (0.757)	37.47 (1.061)
18 (457)		24.89 (0.705)	35.23 (0.997)
17 (432)		23.00 (0.651)	32.96 (0.939)
16 (406)		21.06 (0.596)	30.68 (0.869)
15 (381)		19.09 (0.541)	28.36 (0.803)
14 (356)		17.08 (0.484)	26.03 (0.737)
13 (330)		15.04 (0.426)	23.68 (0.670)
12 (305)		12.97 (0.367)	21.31 (0.608)
11 (279)		10.87 (0.309)	18.92 (0.535)
10 (254)		8.74 (0.247)	16.51 (0.468)
9 (229)		6.58 (0.186)	14.09 (0.399)
8 (203)		4.41 (0.125)	11.66 (0.330)
7 (178)		2.21 (0.063)	9.21 (0.264)
6 (152)		0 (0)	6.76 (0.191)
5 (127)		0 (0)	5.63 (0.160)
4 (102)	Stone	0 (0)	4.51 (0.128)
3 (76)	Foundation	0 (0)	3.38 (0.096)
2 (51)		0 (0)	2.25 (0.064)
1 (25)		0 (0)	1.13 (0.032)

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-740 Chamber	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6” (150 mm) stone above chambers, 6” (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

ENGLISH TONS (yds³)	Stone Foundation Depth		
	6”	12”	16”
SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
METRIC KILOGRAMS (m³)	150 mm	300 mm	450 mm
SC-740	3,450 (2.1)	4,170 (2.5)	4,490 (3.0)

Note: Assumes 6” (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Assumes 6” (150 mm) of row separation and 18” (450 mm) of cover. The volume of excavation will vary as depth of cover increases.

3026 Solandt Road (119200)
Estimated Roof Drains and Rating Curves (PCSWMM)

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Estimated Number of Roof Drains

Building	Area (ha)	Estimated Number of Roof Drains*
BLDG	0.186	8
TOTAL	**0.186**	**8**

*Roof drain every 250m²

Watts Flow Control Roof Drain Rating Curves

Head (m)	Controlled Flow Rate (L/s)	
	Single Drain*	Proposed Building (8 drains)
0.000	0.00	0.00
0.025	0.32	2.56
0.051	0.63	5.04
0.076	0.79	6.32
0.102	0.95	7.60
0.127	1.10	8.80
0.150	1.26	10.08
1.000	1.26	10.08

Watts Flow Control Roof Drains Rating Curve (single drain, 1/2 Open)

Date: 3/26/2020
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TEMPEST Product Submittal Package R1

Date: March 27, 2020

Customer: Novatech

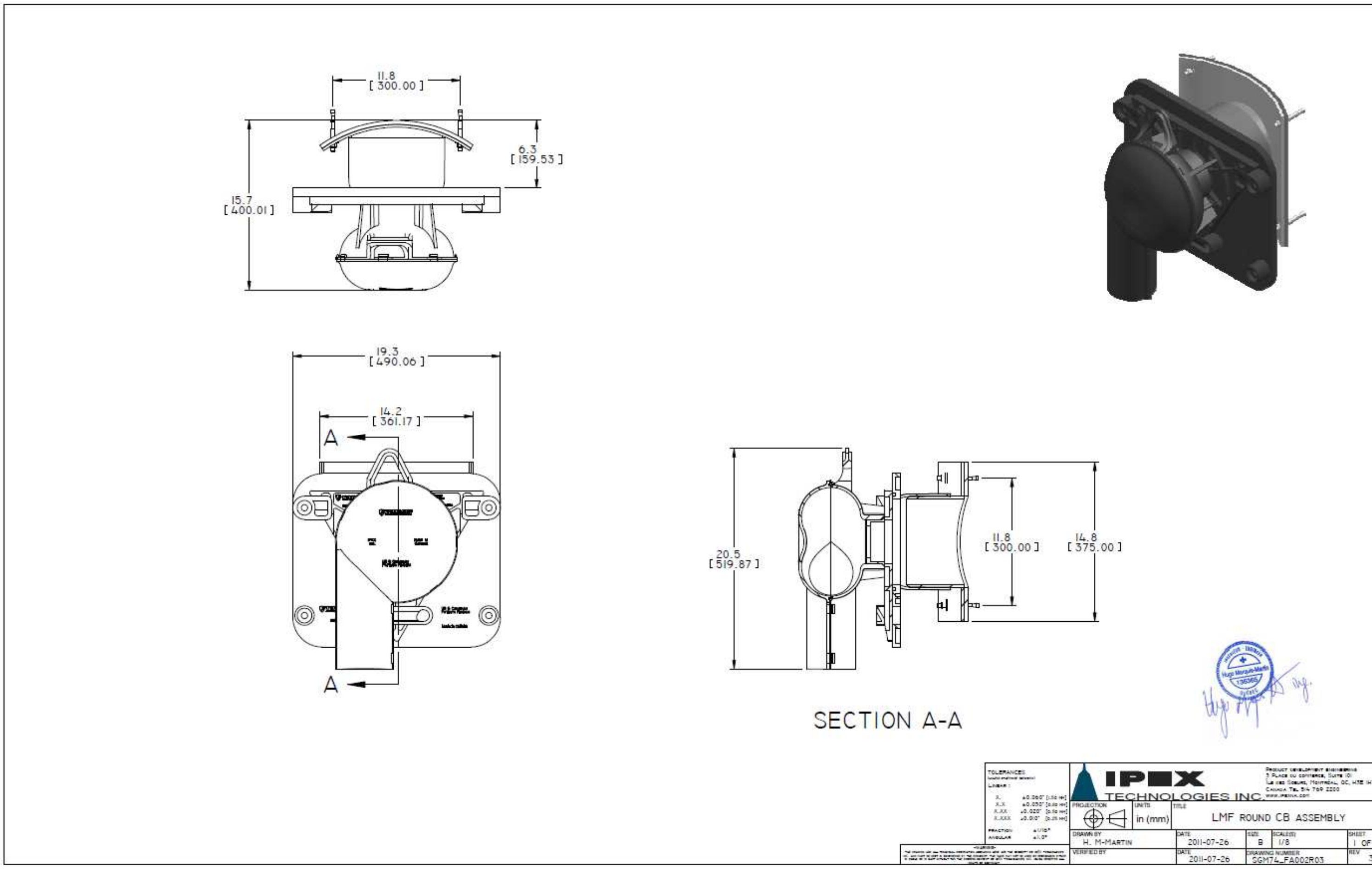
Contact: Melanie Schroeder

Location: Ottawa

Project Name: Solandt Road

IPEX

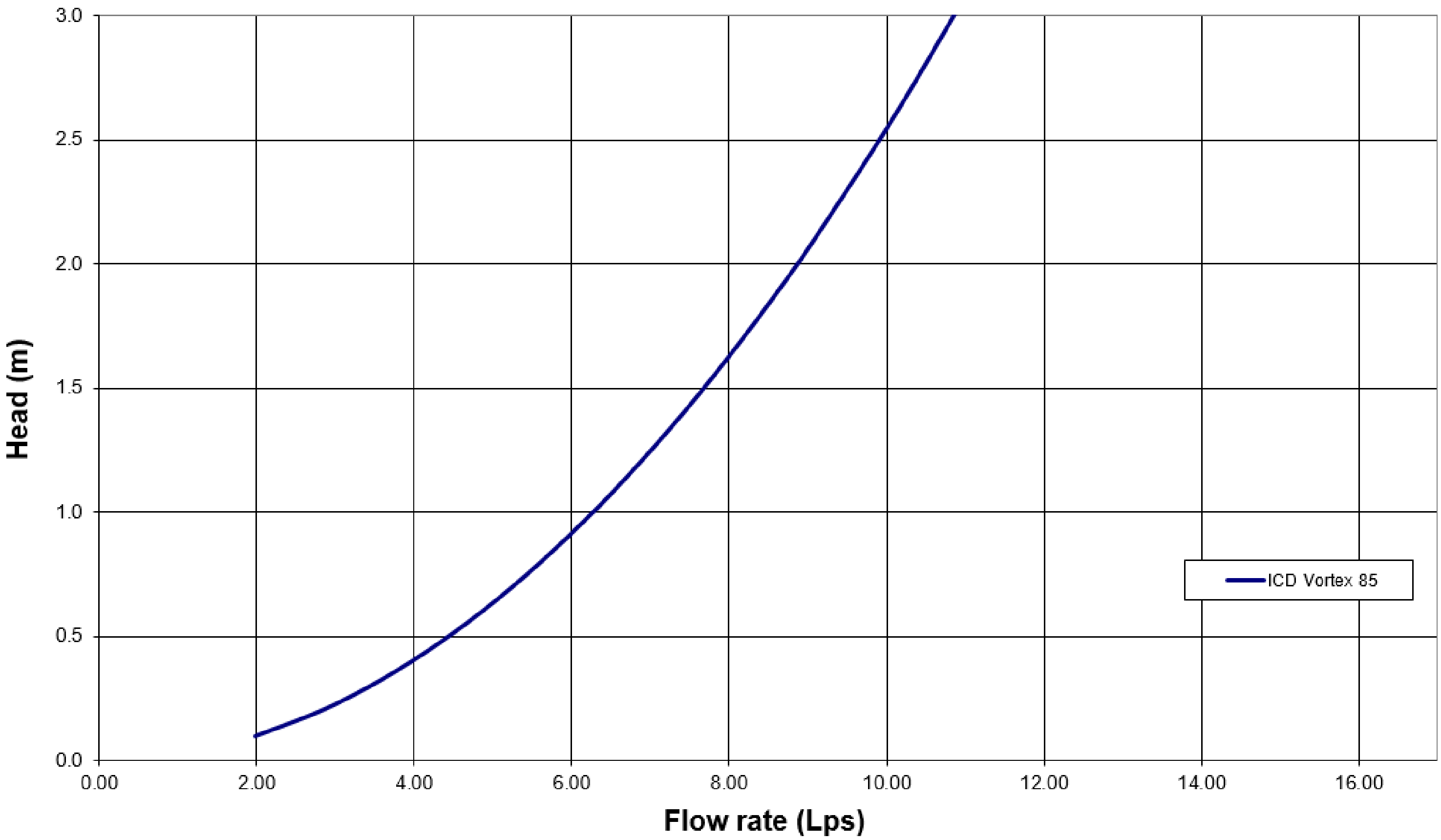
Tempest LMF ICD Rd Shop Drawing



IPEX

Tempest LMF ICD Flow Curve

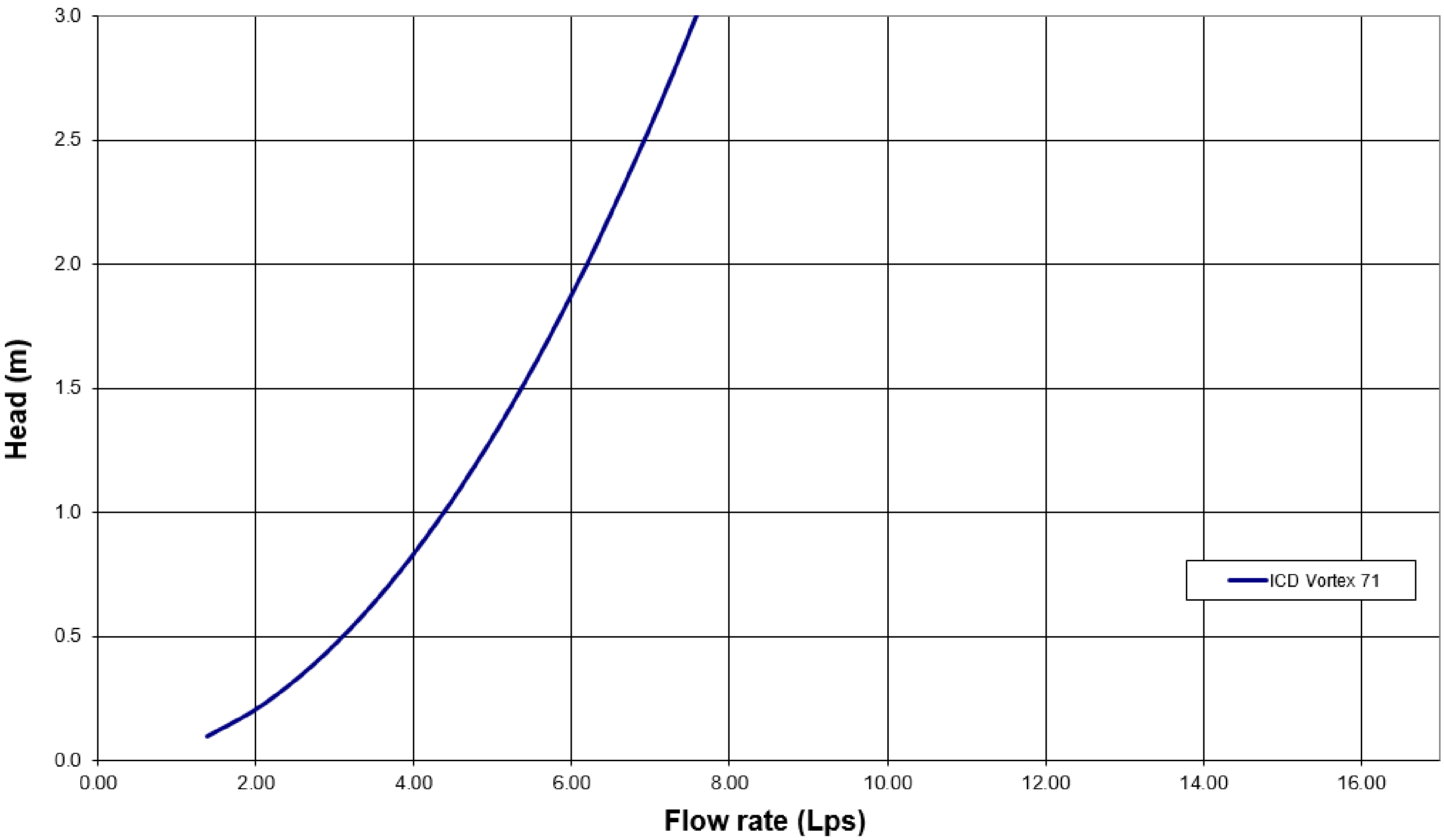
Flow: 9.2 L/s
Head: 2.15 m
CBMH103



IPEX

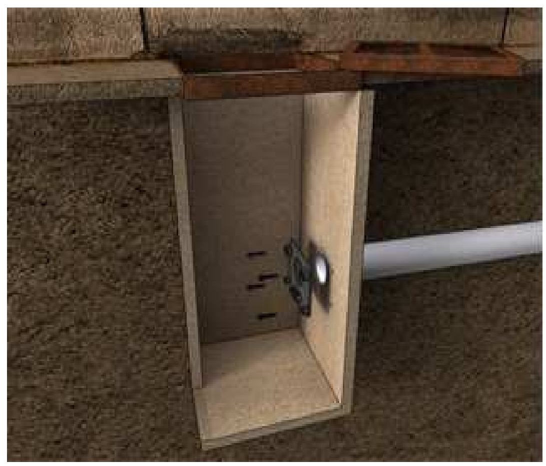
Tempest LMF ICD Flow Curve

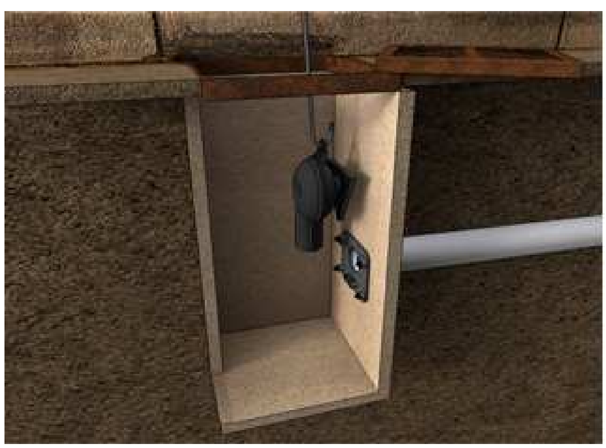
Flow: 6.4 L/s
Head: 2.15 m
CBMH5



Square CB Installation Notes:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8'' concrete bit, torque wrench for 9/16''nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8x3-1/2, (4) washers, (4) nuts
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8'' concrete bit to make the four holes at a minimum of 1-1/2'' depth up to 2-1/2''. Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you will hit the anchors with the hammer. Remove the nuts on the ends of the anchors
5. Install the wall mounting plate on the anchors and screw the nut in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the LMF device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.

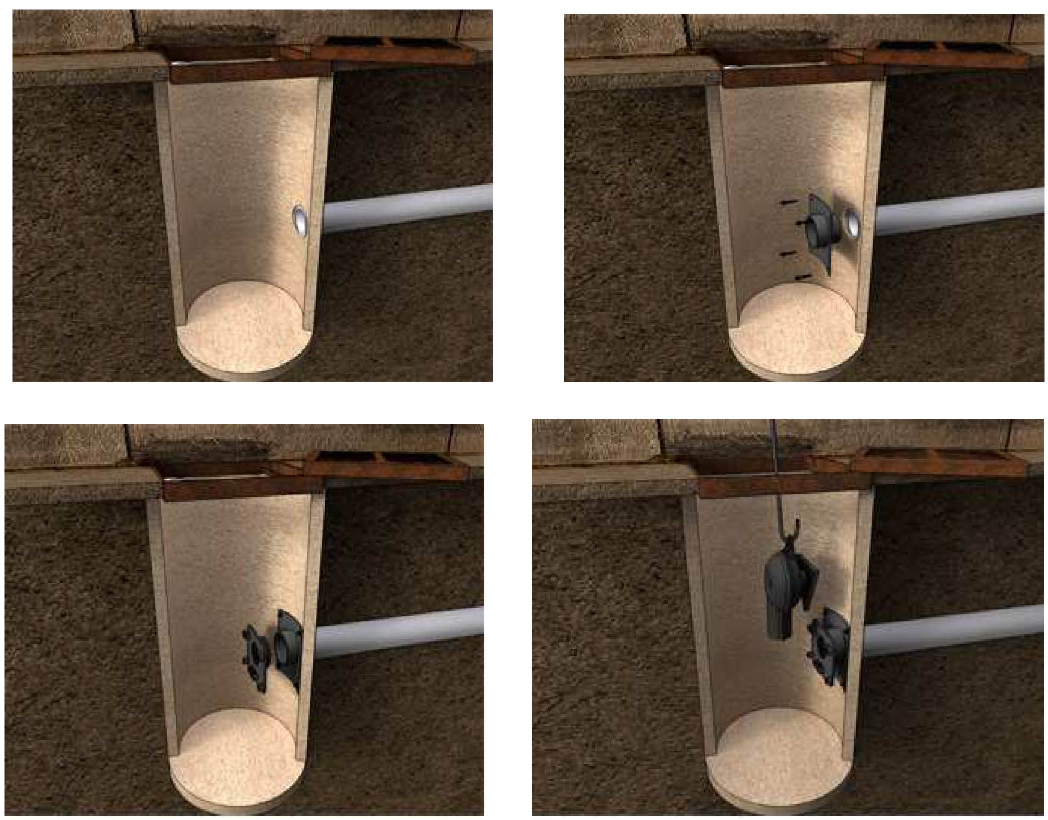




IPEX

Round CB Installation Notes: (Refer to square install notes above for steps 1 , 3, & 4)

2. Use spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lb-ft). There should be no gap between the CB spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate and the spigot of the spigot CB wall plate. Slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered into the mounting plate and has created a seal.



CAUTION/WARNING/DISCLAIM:

- Verify that the inlet(s) pipe(s) is not protruding into the catch basin. If it is, cut it back so that the inlet pipe is flush with the catch basin wall.
- Any required cement in the installation must be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Please refer to the IPEX solvent cement guide to confirm required curing times or attend the IPEX **Online Solvent Cement Training Course**.
- Call your IPEX representative for more information or if you have any questions about our products.

IPEX TEMPEST Inlet Control Devices Technical Specification

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's must have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

4149 Strandherd Drive - Myers Site Plan (117148)
PCSWMM Model Results (Ponding)

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CB / CBMH ID	Invert Elev. (m)	Rim Elev. (m)	Spill Elev. (m)	Ponding Depth (m)	HGL Elev. (m)[1]				Ponding Depth (m)				Spill Depth (m)			
					2-yr	5-yr	100-yr	100-yr (+20%)	2-yr	5-yr	100-yr	100-yr (+20%)	2-yr	5-yr	100-yr	100-yr (+20%)
CB1	78.01	79.60	79.92	0.32	78.55	79.64	79.81	79.88	0.00	0.04	0.21	0.28	0.00	0.00	0.00	0.00
CB2	78.07	79.65	80.00	0.35	79.32	79.76	79.91	79.96	0.00	0.11	0.26	0.31	0.00	0.00	0.00	0.00
CB3	78.27	79.70	80.05	0.35	79.32	79.77	79.93	79.98	0.00	0.07	0.23	0.28	0.00	0.00	0.00	0.00
CB4	78.28	79.65	80.00	0.35	79.07	79.76	79.92	79.97	0.00	0.11	0.27	0.32	0.00	0.00	0.00	0.00
CB6	78.12	79.85	79.95	0.10	79.17	79.76	79.91	79.95	0.00	0.00	0.06	0.10	0.00	0.00	0.00	0.00
CBMH103	77.64	79.55	79.90	0.35	78.55	79.64	79.79	79.87	0.00	0.09	0.24	0.32	0.00	0.00	0.00	0.00
CBMH104	77.77	79.60	79.95	0.35	79.17	79.75	79.91	79.95	0.00	0.15	0.31	0.35	0.00	0.00	0.00	0.00
CBMH105	77.98	79.65	80.00	0.35	79.14	79.76	79.92	79.97	0.00	0.11	0.27	0.32	0.00	0.00	0.00	0.00
CBMH106	78.21	79.82	79.95	0.13	79.07	79.76	79.92	79.97	0.00	0.00	0.10	0.15	0.00	0.00	0.00	0.02
CBMH5	77.83	79.85	79.98	0.13	79.22	79.87	79.98	79.99	0.00	0.02	0.13	0.14	0.00	0.00	0.00	0.01
EX-CB01	79.15	79.84	80.01	0.17	79.26	79.48	80.01	80.03	0.00	0.00	0.17	0.19	0.00	0.00	0.00	0.02
EX-CB02	78.81	79.86	80.15	0.29	79.00	79.28	79.93	80.00	0.00	0.00	0.07	0.14	0.00	0.00	0.00	0.00
EX-CB03	78.83	79.86	79.93	0.07	79.01	79.29	79.93	80.01	0.00	0.00	0.07	0.15	0.00	0.00	0.00	0.08

[1] *3-hour Chicago Storm.*

4149 Strandherd Drive - Myers Site Plan (117148)
Summary of Hydraulic Grade Line (HGL) Elevations

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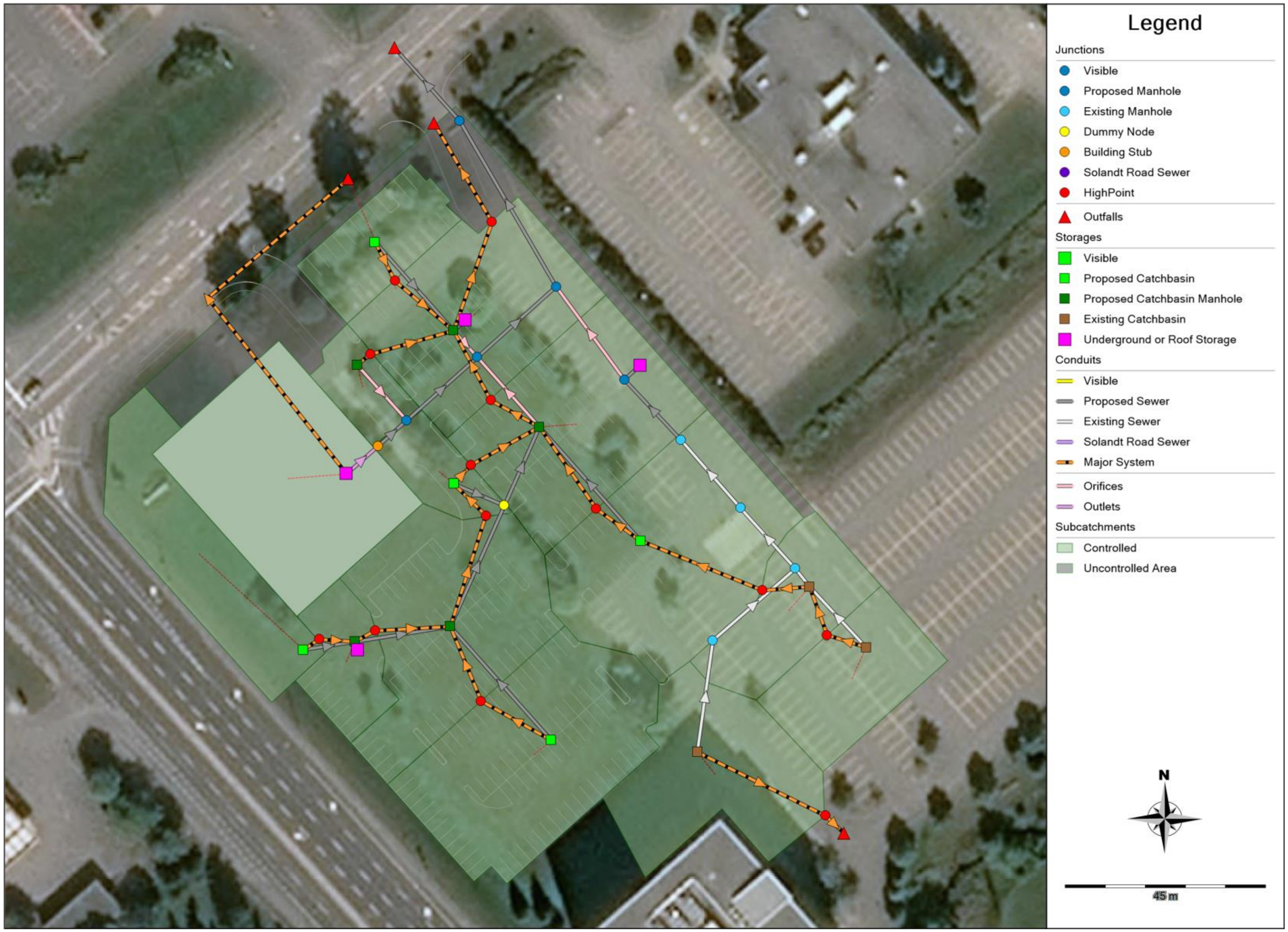
Engineers, Planners & Landscape Architects

MH ID	Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation[1] (m)	Surcharge (m)	Clearance from T/G (m)	HGL in Stress Test[1] (m)
EX-MH100	79.19	80.21	79.94	0.75	0.27	80.00
EX-MH101	79.05	80.02	79.93	0.88	0.09	79.99
EX-MH102	78.92	80.06	79.90	0.98	0.16	79.97
EX-MH103	78.88	80.07	79.86	0.98	0.21	79.89
MH100	77.66	78.96	77.60	0.00	1.36	77.61
MH101	77.80	78.58	77.75	0.00	0.83	77.75
MH102	77.93	78.71	77.81	0.00	0.90	77.82
MH107	78.02	78.74	77.82	0.00	0.92	77.83
MH108	77.99	80.08	79.85	1.86	0.23	79.87
PR-STUB	78.11	78.24	77.93	0.00	0.31	77.93

[1] 3-hour Chicago Storm.

3026 Solandt Road (119200)
PCSWMM Model Schematics

Overall Model Schematic



Date: 2020-03-26
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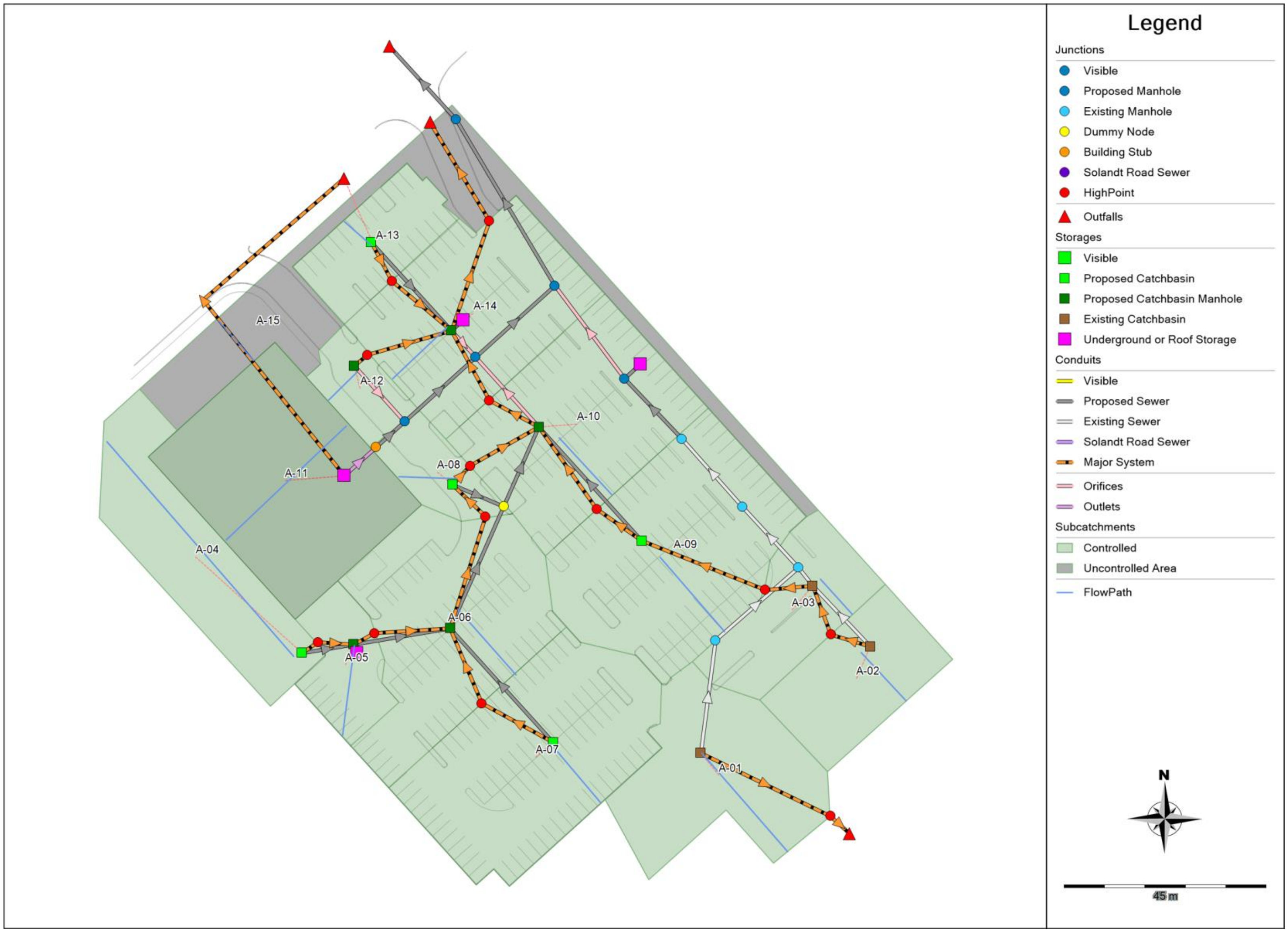
3026 Solandt Road (119200)
PCSWMM Model Schematics

Subcatchments and Flow Paths



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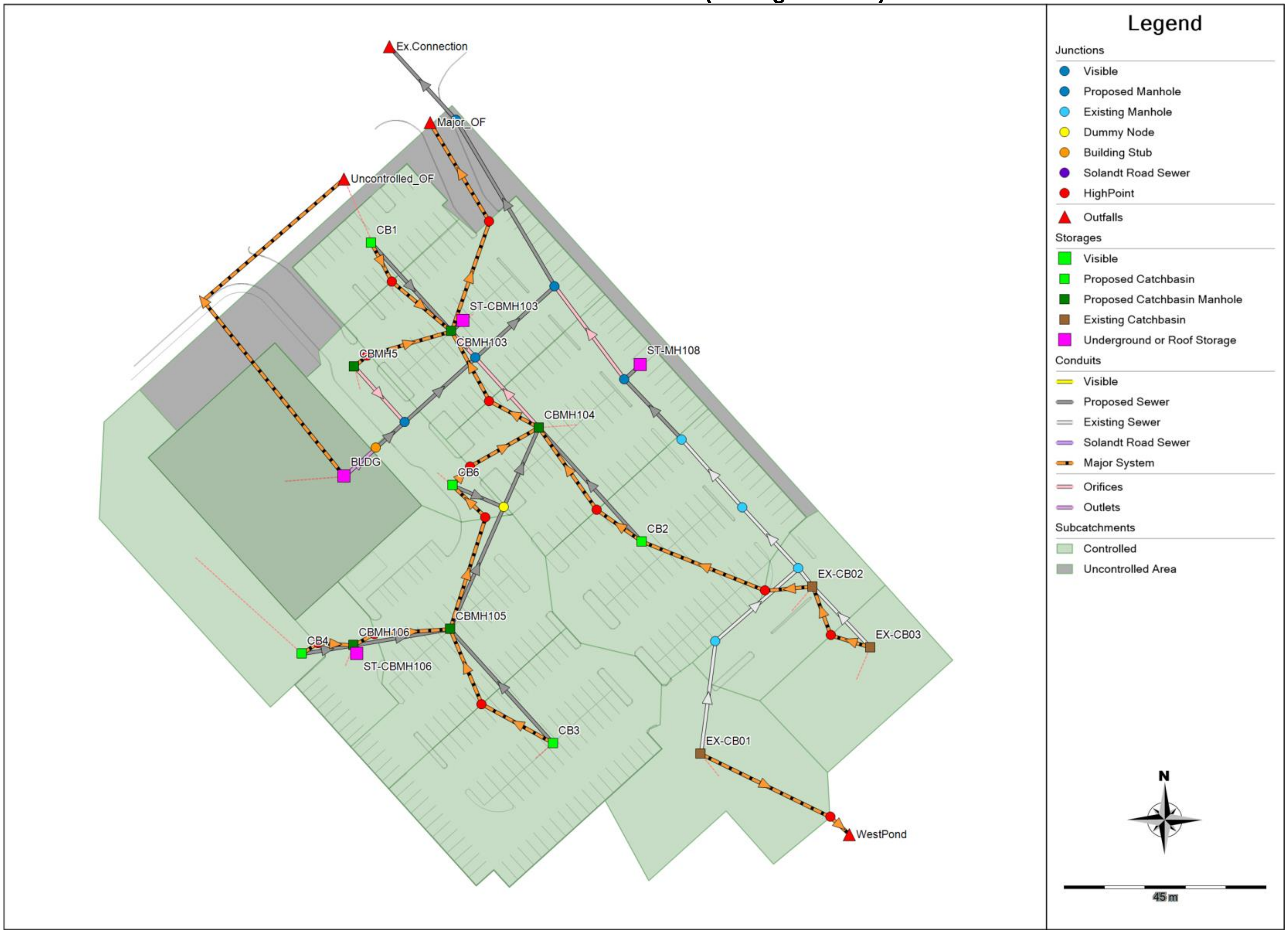
3026 Solandt Road (119200)
PCSWMM Model Schematics

Catchbasins and Catchbasin Manholes (Storage Nodes) and Outfalls



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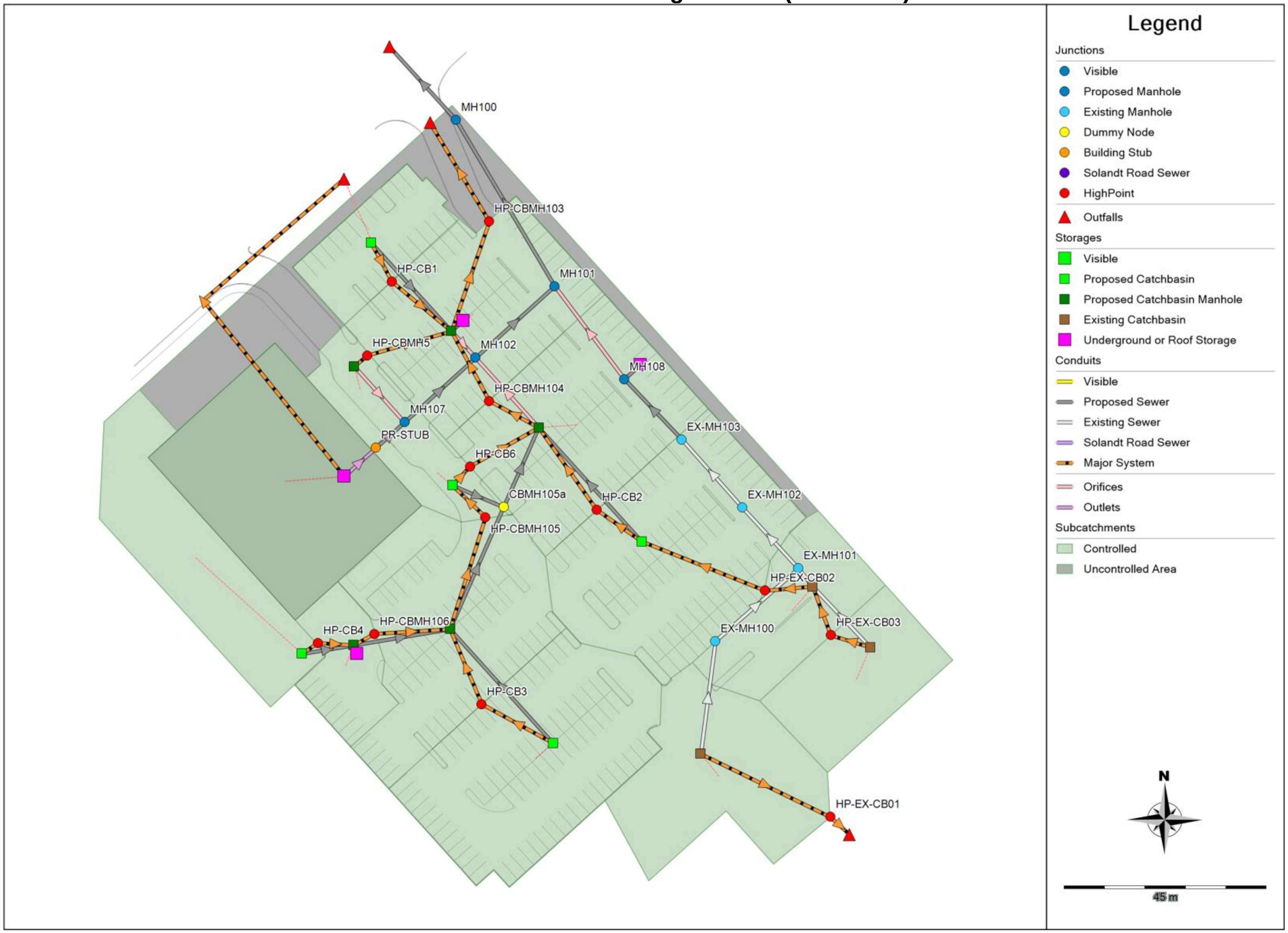
3026 Solandt Road (119200)
PCSWMM Model Schematics

Maintenance Holes and High Points (Junctions)



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3026 Solandt Road (119200)
PCSWMM 2-Year Model Output

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

Ensure no spill to ex. ponding in 5 yr
Match McManus controlled STM sheet peak flow in sewer using ICDs
Ensure uncontrolled area matches uncontrolled areas (9, 10) from McManus report (drain overland to roadside ditch and not colle

WARNING 08: elevation drop exceeds length for Conduit C23

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 15
Number of nodes 45
Number of links 55
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.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-01	0.13	45.70	60.00	2.0000	Design_Storms	EX-CB01
A-02	0.08	57.09	100.00	2.0000	Design_Storms	EX-CB03
A-03	0.08	75.69	100.00	2.0000	Design_Storms	EX-CB02
A-04	0.12	19.25	14.30	0.5000	Design_Storms	CB4
A-05	0.05	23.15	100.00	2.0000	Design_Storms	CBMH106
A-06	0.18	90.16	97.10	2.0000	Design_Storms	CBMH105
A-07	0.19	112.17	100.00	2.0000	Design_Storms	CB3
A-08	0.04	27.83	95.70	2.0000	Design_Storms	CB6
A-09	0.20	89.89	97.10	2.0000	Design_Storms	CB2
A-10	0.17	94.57	95.70	2.0000	Design_Storms	CBMH104
A-11	0.19	50.59	100.00	1.5000	Design_Storms	BLDG
A-12	0.03	37.65	97.10	2.0000	Design_Storms	CBMH5
A-13	0.06	75.60	100.00	2.0000	Design_Storms	CB1
A-14	0.16	95.23	97.10	2.0000	Design_Storms	CBMH103
A-15	0.14	121.07	25.70	4.0000	Design_Storms	Uncontrolled_OF

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CBMH105a	JUNCTION	77.89	2.73	0.0	
EX-MH100	JUNCTION	78.89	1.32	0.0	
EX-MH101	JUNCTION	78.75	1.27	0.0	
EX-MH102	JUNCTION	78.67	1.39	0.0	
EX-MH103	JUNCTION	78.58	1.49	0.0	
HP-CB1	JUNCTION	79.92	1.00	0.0	
HP-CB2	JUNCTION	80.00	1.00	0.0	
HP-CB3	JUNCTION	80.05	1.00	0.0	
HP-CB4	JUNCTION	80.00	1.00	0.0	
HP-CB6	JUNCTION	79.95	1.03	0.0	
HP-CBMH103	JUNCTION	79.90	1.00	0.0	
HP-CBMH104	JUNCTION	79.95	1.00	0.0	
HP-CBMH105	JUNCTION	80.00	1.00	0.0	
HP-CBMH106	JUNCTION	79.95	1.00	0.0	
HP-CBMH5	JUNCTION	79.98	1.00	0.0	
HP-EX-CB01	JUNCTION	80.01	1.00	0.0	
HP-EX-CB02	JUNCTION	80.15	1.00	0.0	
HP-EX-CB03	JUNCTION	79.93	1.00	0.0	
MH100	JUNCTION	77.28	1.68	0.0	
MH101	JUNCTION	77.42	1.16	0.0	
MH102	JUNCTION	77.55	1.16	0.0	
MH107	JUNCTION	77.72	1.02	0.0	
MH108	JUNCTION	77.61	2.47	0.0	
PR-STUB	JUNCTION	77.86	0.38	0.0	
Ex.Connection	OUTFALL	77.17	0.38	0.0	
Major_OF	OUTFALL	78.65	1.00	0.0	
Uncontrolled_OF	OUTFALL	78.65	1.00	0.0	
WestPond	OUTFALL	78.45	1.00	0.0	
BLDG	STORAGE	97.80	1.00	0.0	
CB1	STORAGE	78.01	2.59	0.0	
CB2	STORAGE	78.07	2.58	0.0	
CB3	STORAGE	78.27	2.43	0.0	
CB4	STORAGE	78.28	2.37	0.0	
CB6	STORAGE	78.12	2.73	0.0	

CBMH103	STORAGE	77.64	2.91	0.0
CBMH104	STORAGE	77.77	2.83	0.0
CBMH105	STORAGE	77.98	2.67	0.0
CBMH106	STORAGE	78.21	2.61	0.0
CBMH5	STORAGE	77.83	3.02	0.0
EX-CB01	STORAGE	79.15	1.69	0.0
EX-CB02	STORAGE	78.81	2.05	0.0
EX-CB03	STORAGE	78.83	2.03	0.0
ST-CBMH103	STORAGE	77.80	2.75	0.0
ST-CBMH106	STORAGE	78.31	2.51	0.0
ST-MH108	STORAGE	78.15	1.93	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
14_(STM)	MH101	MH100	CONDUIT	43.0	0.2558	0.0130
24_(STM)_1	CBMH105	CBMH105a	CONDUIT	29.7	0.3030	0.0130
24_(STM)_2	CBMH105a	CBMH104	CONDUIT	19.3	0.3109	0.0130
25_(STM)	CB2	CBMH104	CONDUIT	34.2	0.4971	0.0130
27_(STM)	CB3	CBMH105	CONDUIT	34.2	0.4971	0.0130
31_(1)_(STM)	MH107	MH102	CONDUIT	21.3	0.4225	0.0130
31_(STM)	PR-STUB	MH107	CONDUIT	8.6	1.0466	0.0130
36_(STM)	CB1	CBMH103	CONDUIT	26.6	1.0151	0.0130
47_(STM)	MH100	Ex.Connection	CONDUIT	22.0	0.5000	0.0130
53_(STM)	MH102	MH101	CONDUIT	23.8	0.2941	0.0130
58_(STM)	CB6	CBMH105a	CONDUIT	12.4	1.0484	0.0130
60_(1)_(STM)	CBMH106	CBMH105	CONDUIT	21.7	0.5069	0.0130
60_(STM)	CB4	CBMH106	CONDUIT	11.7	0.5128	0.0130
61_(STM)	ST-CBMH103	CBMH103	CONDUIT	3.5	3.1444	0.0130
68_(STM)	ST-MH108	MH108	CONDUIT	4.8	2.0838	0.0130
68_(X-STM)	EX-CB03	EX-CB02	CONDUIT	18.7	0.1070	0.0130
70_(STM)	EX-MH103	MH108	CONDUIT	18.5	0.2703	0.0130
70_(X-STM)	EX-CB02	EX-MH101	CONDUIT	5.2	0.9616	0.0130
71_(STM)	ST-CBMH106	CBMH106	CONDUIT	2.0	3.0014	0.0130
72_(X-STM)	EX-MH101	EX-MH102	CONDUIT	18.4	0.2717	0.0130
74_(X-STM)	EX-MH102	EX-MH103	CONDUIT	20.3	0.3941	0.0130
83_(X-STM)	EX-CB01	EX-MH100	CONDUIT	25.3	0.9882	0.0130
84_(X-STM)	EX-MH100	EX-MH101	CONDUIT	24.6	0.3659	0.0130
C1	CB4	HP-CB4	CONDUIT	3.0	-11.7469	0.0150
C10	CB2	HP-CB2	CONDUIT	3.0	-11.7469	0.0150
C11	HP-CB2	CBMH104	CONDUIT	3.0	13.4535	0.0150
C12	CBMH104	HP-CBMH104	CONDUIT	3.0	-11.7469	0.0150
C13	HP-CBMH104	CBMH103	CONDUIT	3.0	13.4535	0.0150
C14	HP-CB6	CBMH104	CONDUIT	3.0	11.7469	0.0150
C15	CBMH5	HP-CBMH5	CONDUIT	3.0	-4.3374	0.0150
C16	HP-CBMH5	CBMH103	CONDUIT	3.0	14.4829	0.0150
C17	CB1	HP-CB1	CONDUIT	3.0	-10.7279	0.0150
C18	HP-CB1	CBMH103	CONDUIT	3.0	12.4282	0.0150
C19	CBMH103	HP-CBMH103	CONDUIT	3.0	-11.7469	0.0150
C2	HP-CB4	CBMH106	CONDUIT	3.0	6.0108	0.0150
C20	EX-CB02	HP-EX-CB02	CONDUIT	3.0	-9.7122	0.0150
C21	HP-EX-CB02	CB2	CONDUIT	3.0	16.9031	0.0150
C22	HP-CBMH103	Major_OF	CONDUIT	3.0	45.8349	0.0150
C23	BLDG	Uncontrolled_OF	CONDUIT	3.0	643.3333	0.0150
C25	EX-CB03	HP-EX-CB03	CONDUIT	3.0	-2.3340	0.0150
C26	HP-EX-CB03	EX-CB02	CONDUIT	3.0	2.3340	0.0150
C27	EX-CB01	HP-EX-CB01	CONDUIT	3.0	-5.6758	0.0150
C28	HP-EX-CB01	WestPond	CONDUIT	3.0	60.8781	0.0150
C3	CBMH106	HP-CBMH106	CONDUIT	3.0	-4.3374	0.0150
C4	HP-CBMH106	CBMH105	CONDUIT	3.0	10.0504	0.0150
C5	CB3	HP-CB3	CONDUIT	3.0	-11.7469	0.0150
C6	HP-CB3	CBMH105	CONDUIT	3.0	13.4535	0.0150
C7	CBMH105	HP-CBMH105	CONDUIT	3.0	-11.7469	0.0150
C8	HP-CBMH105	CB6	CONDUIT	3.0	5.0063	0.0150
C9	CB6	HP-CB6	CONDUIT	3.0	-3.3352	0.0150
ICD-CBMH103	CBMH103	MH102	ORIFICE			
ICD-CBMH104	CBMH104	MH102	ORIFICE			
ICD-CBMH5	CBMH5	MH107	ORIFICE			
ICD-MH108	MH108	MH101	ORIFICE			
OL1	BLDG	PR-STUB	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
14_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	88.68
24_(STM)_1	CIRCULAR	0.38	0.11	0.09	0.38	1	96.52
24_(STM)_2	CIRCULAR	0.38	0.11	0.09	0.38	1	97.76
25_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	41.93
27_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	41.93
31_(1)_(STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	62.86
31_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	60.84
36_(STM)	CIRCULAR	0.20	0.03	0.05	0.20	1	33.05
47_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	123.99
53_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	95.09
58_(STM)	CIRCULAR	0.20	0.03	0.05	0.20	1	33.59

60_(1)_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	124.84
60_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	42.59
61_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	105.46
68_(STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	139.60
68_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	31.63
70_(STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	50.28
70_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	94.83
71_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	303.77
72_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	50.41
74_(X-STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	37.33
83_(X-STM)	CIRCULAR	0.20	0.03	0.05	0.20	1	32.61
84_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	58.49
C1	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C10	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C11	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
C12	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C13	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
C14	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C15	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
C16	RECT_OPEN	1.00	3.00	0.60	3.00	1	54148.25
C17	RECT_OPEN	1.00	3.00	0.60	3.00	1	46602.99
C18	RECT_OPEN	1.00	3.00	0.60	3.00	1	50160.45
C19	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C2	RECT_OPEN	1.00	3.00	0.60	3.00	1	34883.83
C20	RECT_OPEN	1.00	3.00	0.60	3.00	1	44341.94
C21	RECT_OPEN	1.00	3.00	0.60	3.00	1	58497.86
C22	RECT_OPEN	1.00	3.00	0.60	3.00	1	96328.60
C23	RECT_OPEN	1.00	3.00	0.60	3.00	1	360890.13
C25	RECT_OPEN	1.00	3.00	0.60	3.00	1	21737.24
C26	RECT_OPEN	1.00	3.00	0.60	3.00	1	21737.24
C27	RECT_OPEN	1.00	3.00	0.60	3.00	1	33897.68
C28	RECT_OPEN	1.00	3.00	0.60	3.00	1	111016.48
C3	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
C4	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
C5	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C6	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
C7	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C8	RECT_OPEN	1.00	3.00	0.60	3.00	1	31835.65
C9	RECT_OPEN	1.00	3.00	0.60	3.00	1	25984.66

```
*********************************************************
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
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 03/10/2020 00:00:00
Ending Date .............. 03/12/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.058        31.857
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.009         5.068
Surface Runoff ...........         0.047        25.811
Final Storage ............         0.002         1.159
Continuity Error (%) .....        -0.568

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.047         0.468
```

Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.047	0.468
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 (%)	0.035	

****
Time-Step Critical Elements
****

Link 71_(STM) (3.08%)
Link 61_(STM) (1.17%)

****
Highest Flow Instability Indexes
****

All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step :	0.50 sec
Average Time Step :	1.95 sec
Maximum Time Step :	2.00 sec
Percent in Steady State :	0.00
Average Iterations per Step :	2.00
Percent Not Converging :	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-01	31.86	0.00	0.00	12.72	18.29	0.04	18.32	0.02	17.19	0.575
A-02	31.86	0.00	0.00	0.00	30.46	0.00	30.46	0.03	17.92	0.956
A-03	31.86	0.00	0.00	0.00	30.43	0.00	30.43	0.02	17.07	0.955
A-04	31.86	0.00	0.00	27.30	4.36	0.01	4.37	0.01	3.76	0.137
A-05	31.86	0.00	0.00	0.00	30.49	0.00	30.49	0.01	10.03	0.957
A-06	31.86	0.00	0.00	0.91	29.60	0.04	29.64	0.05	36.90	0.931
A-07	31.86	0.00	0.00	0.00	30.48	0.00	30.48	0.06	40.96	0.957
A-08	31.86	0.00	0.00	1.35	29.13	0.06	29.19	0.01	7.42	0.916
A-09	31.86	0.00	0.00	0.91	29.62	0.04	29.65	0.06	41.04	0.931
A-10	31.86	0.00	0.00	1.36	29.16	0.05	29.21	0.05	33.95	0.917
A-11	31.86	0.00	0.00	0.00	32.10	0.00	32.10	0.06	39.56	1.008
A-12	31.86	0.00	0.00	0.92	29.53	0.06	29.59	0.01	6.91	0.929
A-13	31.86	0.00	0.00	0.00	30.41	0.00	30.41	0.02	12.80	0.955
A-14	31.86	0.00	0.00	0.92	29.58	0.04	29.63	0.05	32.97	0.930
A-15	31.86	0.00	0.00	23.61	7.82	0.13	7.95	0.01	8.45	0.249

****
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
CBMH105a	JUNCTION	0.07	1.27	79.16	0 01:10	1.27
EX-MH100	JUNCTION	0.00	0.13	79.02	0 01:10	0.13
EX-MH101	JUNCTION	0.01	0.25	79.00	0 01:10	0.25
EX-MH102	JUNCTION	0.01	0.28	78.95	0 01:10	0.28
EX-MH103	JUNCTION	0.01	0.22	78.80	0 01:10	0.22
HP-CB1	JUNCTION	0.00	0.00	79.92	0 00:00	0.00
HP-CB2	JUNCTION	0.00	0.00	80.00	0 00:00	0.00
HP-CB3	JUNCTION	0.00	0.00	80.05	0 00:00	0.00
HP-CB4	JUNCTION	0.00	0.00	80.00	0 00:00	0.00
HP-CB6	JUNCTION	0.00	0.00	79.95	0 00:00	0.00
HP-CBMH103	JUNCTION	0.00	0.00	79.90	0 00:00	0.00
HP-CBMH104	JUNCTION	0.00	0.00	79.95	0 00:00	0.00
HP-CBMH105	JUNCTION	0.00	0.00	80.00	0 00:00	0.00
HP-CBMH106	JUNCTION	0.00	0.00	79.95	0 00:00	0.00
HP-CBMH5	JUNCTION	0.00	0.00	79.98	0 00:00	0.00
HP-EX-CB01	JUNCTION	0.00	0.00	80.01	0 00:00	0.00
HP-EX-CB02	JUNCTION	0.00	0.00	80.15	0 00:00	0.00
HP-EX-CB03	JUNCTION	0.00	0.00	79.93	0 00:00	0.00
MH100	JUNCTION	0.02	0.25	77.53	0 01:13	0.25
MH101	JUNCTION	0.02	0.25	77.67	0 01:12	0.25
MH102	JUNCTION	0.02	0.21	77.76	0 01:11	0.21

MH107	JUNCTION	0.01	0.09	77.81	0	01:13	0.09
MH108	JUNCTION	0.02	1.07	78.68	0	01:15	1.07
PR-STUB	JUNCTION	0.01	0.06	77.92	0	01:28	0.06
Ex.Connection	OUTFALL	0.01	0.20	77.37	0	01:13	0.20
Major_OF	OUTFALL	0.00	0.00	78.65	0	00:00	0.00
Uncontrolled_OF	OUTFALL	0.00	0.00	78.65	0	00:00	0.00
WestPond	OUTFALL	0.00	0.00	78.45	0	00:00	0.00
BLDG	STORAGE	0.00	0.09	97.89	0	01:28	0.09
CB1	STORAGE	0.03	0.54	78.55	0	01:33	0.54
CB2	STORAGE	0.05	1.25	79.32	0	01:10	1.24
CB3	STORAGE	0.04	1.05	79.32	0	01:10	1.04
CB4	STORAGE	0.04	0.79	79.07	0	01:29	0.79
CB6	STORAGE	0.05	1.05	79.17	0	01:10	1.05
CBMH103	STORAGE	0.06	0.91	78.55	0	01:33	0.91
CBMH104	STORAGE	0.08	1.40	79.17	0	01:10	1.39
CBMH105	STORAGE	0.06	1.16	79.14	0	01:10	1.16
CBMH106	STORAGE	0.04	0.86	79.07	0	01:30	0.86
CBMH5	STORAGE	0.01	1.39	79.22	0	01:11	1.39
EX-CB01	STORAGE	0.00	0.11	79.26	0	01:05	0.10
EX-CB02	STORAGE	0.00	0.19	79.00	0	01:10	0.19
EX-CB03	STORAGE	0.00	0.18	79.01	0	01:10	0.18
ST-CBMH103	STORAGE	0.05	0.75	78.55	0	01:33	0.75
ST-CBMH106	STORAGE	0.03	0.76	79.07	0	01:29	0.76
ST-MH108	STORAGE	0.01	0.53	78.68	0	01:15	0.53

****
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
CBMH105a	JUNCTION	0.00	48.94	0	01:10	0	0.195	-0.043
EX-MH100	JUNCTION	0.00	17.19	0	01:10	0	0.0243	-0.460
EX-MH101	JUNCTION	0.00	51.93	0	01:10	0	0.0743	0.094
EX-MH102	JUNCTION	0.00	51.69	0	01:10	0	0.0742	0.253
EX-MH103	JUNCTION	0.00	51.65	0	01:10	0	0.0741	0.129
HP-CB1	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB2	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB3	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB4	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB6	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH103	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH104	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH105	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH106	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH5	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-EX-CB01	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-EX-CB02	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-EX-CB03	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
MH100	JUNCTION	0.00	70.64	0	01:12	0	0.457	-0.003
MH101	JUNCTION	0.00	70.68	0	01:12	0	0.457	0.021
MH102	JUNCTION	0.00	46.00	0	01:11	0	0.383	-0.039
MH107	JUNCTION	0.00	11.63	0	01:13	0	0.0695	0.006
MH108	JUNCTION	0.00	51.62	0	01:10	0	0.0885	-0.087
PR-STUB	JUNCTION	0.00	6.95	0	01:28	0	0.0597	0.006
Ex.Connection	OUTFALL	0.00	70.63	0	01:13	0	0.457	0.000
Major_OF	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
Uncontrolled_OF	OUTFALL	8.45	8.45	0	01:10	0.0114	0.0114	0.000
WestPond	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
BLDG	STORAGE	39.56	39.56	0	01:10	0.0597	0.0597	-0.004
CB1	STORAGE	12.80	12.80	0	01:10	0.0183	0.0183	0.037
CB2	STORAGE	41.04	41.04	0	01:10	0.0585	0.0585	0.086
CB3	STORAGE	40.96	40.96	0	01:10	0.0586	0.0586	0.292
CB4	STORAGE	3.76	3.76	0	01:10	0.00533	0.00541	0.019
CB6	STORAGE	7.42	7.42	0	01:10	0.0105	0.0105	0.049
CBMH103	STORAGE	32.97	45.11	0	01:10	0.0468	0.0985	-0.005
CBMH104	STORAGE	33.95	73.70	0	01:10	0.0482	0.273	-0.018
CBMH105	STORAGE	36.90	125.32	0	01:10	0.0525	0.248	-0.093
CBMH106	STORAGE	10.03	134.31	0	01:10	0.0143	0.206	0.015
CBMH5	STORAGE	6.91	6.91	0	01:10	0.00977	0.00977	0.004
EX-CB01	STORAGE	17.19	17.19	0	01:10	0.0244	0.0244	0.557
EX-CB02	STORAGE	17.07	34.93	0	01:09	0.0244	0.05	0.016
EX-CB03	STORAGE	17.92	17.92	0	01:10	0.0256	0.0256	0.015
ST-CBMH103	STORAGE	0.00	38.98	0	01:10	0	0.0334	0.008
ST-CBMH106	STORAGE	0.00	132.72	0	01:10	0	0.0977	0.010
ST-MH108	STORAGE	0.00	26.76	0	01:09	0	0.0146	0.066

****
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

CBMH105a	JUNCTION	2.53	0.897	1.458

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
BLDG	0.001	1	0	0	0.029	33	0 01:28	6.95
CB1	0.000	0	0	0	0.000	0	0 00:00	12.19
CB2	0.000	0	0	0	0.000	0	0 00:00	39.77
CB3	0.000	0	0	0	0.000	0	0 00:00	39.70
CB4	0.000	0	0	0	0.000	0	0 00:00	2.96
CB6	0.000	0	0	0	0.000	0	0 00:00	6.90
CBMH103	0.000	0	0	0	0.000	0	0 00:00	44.44
CBMH104	0.000	0	0	0	0.000	0	0 00:00	71.48
CBMH105	0.000	0	0	0	0.000	0	0 00:00	121.42
CBMH106	0.000	0	0	0	0.000	0	0 00:00	132.72
CBMH5	0.000	0	0	0	0.000	0	0 00:00	5.12
EX-CB01	0.000	0	0	0	0.000	0	0 00:00	17.19
EX-CB02	0.000	0	0	0	0.000	0	0 00:00	34.89
EX-CB03	0.000	0	0	0	0.000	0	0 00:00	17.86
ST-CBMH103	0.002	5	0	0	0.033	98	0 01:33	4.54
ST-CBMH106	0.003	3	0	0	0.097	100	0 01:29	16.62
ST-MH108	0.000	0	0	0	0.014	48	0 01:15	14.11

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Ex.Connection	12.98	26.24	70.63	0.457
Major_OF	0.00	0.00	0.00	0.000
Uncontrolled_OF	7.24	1.34	8.45	0.011
WestPond	0.00	0.00	0.00	0.000
System	5.06	27.58	0.00	0.468

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
14_(STM)	CONDUIT	70.64	0 01:12	0.96	0.80	0.63
24_(STM)_1	CONDUIT	48.76	0 01:10	0.49	0.51	1.00
24_(STM)_2	CONDUIT	42.37	0 01:10	0.40	0.43	1.00
25_(STM)	CONDUIT	39.77	0 01:10	0.81	0.95	1.00
27_(STM)	CONDUIT	39.70	0 01:10	0.81	0.95	1.00
31_(1)_(STM)	CONDUIT	11.63	0 01:13	0.52	0.18	0.36
31_(STM)	CONDUIT	6.95	0 01:28	0.82	0.11	0.23
36_(STM)	CONDUIT	12.19	0 01:10	0.44	0.37	1.00
47_(STM)	CONDUIT	70.63	0 01:13	1.01	0.57	0.60
53_(STM)	CONDUIT	45.96	0 01:11	0.86	0.48	0.53
58_(STM)	CONDUIT	6.90	0 01:10	0.42	0.21	1.00
60_(1)_(STM)	CONDUIT	121.42	0 01:10	1.10	0.97	1.00
60_(STM)	CONDUIT	2.96	0 01:10	0.29	0.07	1.00
61_(STM)	CONDUIT	38.98	0 01:10	0.79	0.37	1.00
68_(STM)	CONDUIT	26.76	0 01:09	0.70	0.19	1.00
68_(X-STM)	CONDUIT	17.86	0 01:09	0.48	0.56	0.61
70_(STM)	CONDUIT	51.62	0 01:10	1.05	1.03	0.66
70_(X-STM)	CONDUIT	34.89	0 01:10	0.77	0.37	0.71
71_(STM)	CONDUIT	132.72	0 01:10	1.20	0.44	1.00
72_(X-STM)	CONDUIT	51.69	0 01:10	0.90	1.03	0.83
74_(X-STM)	CONDUIT	51.65	0 01:10	1.10	1.38	0.91
83_(X-STM)	CONDUIT	17.19	0 01:10	1.02	0.53	0.57
84_(X-STM)	CONDUIT	17.06	0 01:10	0.52	0.29	0.55
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C11	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C12	CONDUIT	0.00	0 00:00	0.00	0.00	0.00

C13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C14	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C15	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C16	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C17	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C18	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C19	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C2	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C20	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C21	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C22	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C23	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C25	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C26	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C27	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C28	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C3	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C4	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C5	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C6	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C7	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C8	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C9	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
ICD-CBMH103	ORIFICE	5.86	0	01:39			1.00
ICD-CBMH104	ORIFICE	29.21	0	01:10			1.00
ICD-CBMH5	ORIFICE	5.12	0	01:11			1.00
ICD-MH108	ORIFICE	25.25	0	01:15			1.00
OL1	DUMMY	6.95	0	01:28			

****
Flow Classification Summary
****

	Adjusted	----------	Fraction	of Time	in Flow	Class	----------			
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
14_(STM)	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
24_(STM)_1	1.00	0.01	0.03	0.00	0.96	0.00	0.00	0.00	0.93	0.00
24_(STM)_2	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
25_(STM)	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
27_(STM)	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
31_(1)_(STM)	1.00	0.00	0.00	0.00	0.08	0.00	0.00	0.92	0.06	0.00
31_(STM)	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
36_(STM)	1.00	0.01	0.00	0.00	0.10	0.00	0.00	0.89	0.01	0.00
47_(STM)	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.90	0.00
53_(STM)	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
58_(STM)	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
60_(1)_(STM)	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
60_(STM)	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
61_(STM)	1.00	0.01	0.00	0.00	0.10	0.00	0.00	0.89	0.00	0.00
68_(STM)	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.96	0.00	0.00
68_(X-STM)	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.89	0.00
70_(STM)	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
70_(X-STM)	1.00	0.01	0.00	0.00	0.07	0.01	0.00	0.91	0.04	0.00
71_(STM)	1.00	0.02	0.00	0.00	0.07	0.00	0.00	0.91	0.00	0.00
72_(X-STM)	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
74_(X-STM)	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
83_(X-STM)	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
84_(X-STM)	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
C1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C18	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C20	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C22	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C23	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C25	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C26	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C27	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C28	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C8	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****

3026 Solandt Road (119200)
PCSWMM 2-Year Model Output

Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
24_(STM)_1	2.46	2.46	2.53	0.01	0.01
24_(STM)_2	2.53	2.53	2.58	0.01	0.01
25_(STM)	2.49	2.49	2.63	0.01	0.01
27_(STM)	2.24	2.24	2.46	0.01	0.09
36_(STM)	2.50	2.50	3.29	0.01	0.01
58_(STM)	2.48	2.48	2.59	0.01	0.01
60_(1)_(STM)	2.11	2.11	2.29	0.01	0.01
60_(STM)	2.21	2.21	2.30	0.01	0.01
61_(STM)	2.98	2.98	3.29	0.01	0.01
68_(STM)	0.39	0.39	0.48	0.01	0.01
70_(STM)	0.01	0.01	0.01	0.06	0.01
71_(STM)	1.86	1.86	2.02	0.01	0.01
72_(X-STM)	0.01	0.01	0.01	0.06	0.01
74_(X-STM)	0.01	0.10	0.01	0.15	0.01

Analysis begun on: Thu Mar 26 14:53:09 2020
Analysis ended on: Thu Mar 26 14:53:24 2020
Total elapsed time: 00:00:15

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

Ensure no spill to ex. ponding in 5 yr
Match McManus controlled STM sheet peak flow in sewer using ICDs
Ensure uncontrolled area matches uncontrolled areas (9, 10) from McManus report (drain overland to roadside ditch and not colle

WARNING 08: elevation drop exceeds length for Conduit C23

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 15
Number of nodes ........... 45
Number of links ........... 55
Number of pollutants ...... 0
Number of land uses ....... 0


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


********************
Subcatchment Summary
********************
Name                           Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-01                           0.13     45.70     60.00    2.0000 Design_Storms        EX-CB01
A-02                           0.08     57.09    100.00    2.0000 Design_Storms        EX-CB03
A-03                           0.08     75.69    100.00    2.0000 Design_Storms        EX-CB02
A-04                           0.12     19.25     14.30    0.5000 Design_Storms        CB4
A-05                           0.05     23.15    100.00    2.0000 Design_Storms        CBMH106
A-06                           0.18     90.16     97.10    2.0000 Design_Storms        CBMH105
A-07                           0.19    112.17    100.00    2.0000 Design_Storms        CB3
A-08                           0.04     27.83     95.70    2.0000 Design_Storms        CB6
A-09                           0.20     89.89     97.10    2.0000 Design_Storms        CB2
A-10                           0.17     94.57     95.70    2.0000 Design_Storms        CBMH104
A-11                           0.19     50.59    100.00    1.5000 Design_Storms        BLDG
A-12                           0.03     37.65     97.10    2.0000 Design_Storms        CBMH5
A-13                           0.06     75.60    100.00    2.0000 Design_Storms        CB1
A-14                           0.16     95.23     97.10    2.0000 Design_Storms        CBMH103
A-15                           0.14    121.07     25.70    4.0000 Design_Storms        Uncontrolled_OF


************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                 Type                  Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
CBMH105a             JUNCTION              77.89      2.73       0.0
EX-MH100             JUNCTION              78.89      1.32       0.0
EX-MH101             JUNCTION              78.75      1.27       0.0
EX-MH102             JUNCTION              78.67      1.39       0.0
EX-MH103             JUNCTION              78.58      1.49       0.0
HP-CB1               JUNCTION              79.92      1.00       0.0
HP-CB2               JUNCTION              80.00      1.00       0.0
HP-CB3               JUNCTION              80.05      1.00       0.0
HP-CB4               JUNCTION              80.00      1.00       0.0
HP-CB6               JUNCTION              79.95      1.03       0.0
HP-CBMH103           JUNCTION              79.90      1.00       0.0
HP-CBMH104           JUNCTION              79.95      1.00       0.0
HP-CBMH105           JUNCTION              80.00      1.00       0.0
HP-CBMH106           JUNCTION              79.95      1.00       0.0
HP-CBMH5             JUNCTION              79.98      1.00       0.0
HP-EX-CB01           JUNCTION              80.01      1.00       0.0
HP-EX-CB02           JUNCTION              80.15      1.00       0.0
HP-EX-CB03           JUNCTION              79.93      1.00       0.0
MH100                JUNCTION              77.28      1.68       0.0
MH101                JUNCTION              77.42      1.16       0.0
MH102                JUNCTION              77.55      1.16       0.0
MH107                JUNCTION              77.72      1.02       0.0
MH108                JUNCTION              77.61      2.47       0.0
PR-STUB              JUNCTION              77.86      0.38       0.0
Ex.Connection        OUTFALL               77.17      0.38       0.0
Major_OF             OUTFALL               78.65      1.00       0.0
Uncontrolled_OF      OUTFALL               78.65      1.00       0.0
WestPond             OUTFALL               78.45      1.00       0.0
BLDG                 STORAGE               97.80      1.00       0.0
CB1                  STORAGE               78.01      2.59       0.0
CB2                  STORAGE               78.07      2.58       0.0
CB3                  STORAGE               78.27      2.43       0.0
CB4                  STORAGE               78.28      2.37       0.0
CB6                  STORAGE               78.12      2.73       0.0
```

CBMH103	STORAGE	77.64	2.91	0.0
CBMH104	STORAGE	77.77	2.83	0.0
CBMH105	STORAGE	77.98	2.67	0.0
CBMH106	STORAGE	78.21	2.61	0.0
CBMH5	STORAGE	77.83	3.02	0.0
EX-CB01	STORAGE	79.15	1.69	0.0
EX-CB02	STORAGE	78.81	2.05	0.0
EX-CB03	STORAGE	78.83	2.03	0.0
ST-CBMH103	STORAGE	77.80	2.75	0.0
ST-CBMH106	STORAGE	78.31	2.51	0.0
ST-MH108	STORAGE	78.15	1.93	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
14_(STM)	MH101	MH100	CONDUIT	43.0	0.2558	0.0130
24_(STM)_1	CBMH105	CBMH105a	CONDUIT	29.7	0.3030	0.0130
24_(STM)_2	CBMH105a	CBMH104	CONDUIT	19.3	0.3109	0.0130
25_(STM)	CB2	CBMH104	CONDUIT	34.2	0.4971	0.0130
27_(STM)	CB3	CBMH105	CONDUIT	34.2	0.4971	0.0130
31_(1)_(STM)	MH107	MH102	CONDUIT	21.3	0.4225	0.0130
31_(STM)	PR-STUB	MH107	CONDUIT	8.6	1.0466	0.0130
36_(STM)	CB1	CBMH103	CONDUIT	26.6	1.0151	0.0130
47_(STM)	MH100	Ex.Connection	CONDUIT	22.0	0.5000	0.0130
53_(STM)	MH102	MH101	CONDUIT	23.8	0.2941	0.0130
58_(STM)	CB6	CBMH105a	CONDUIT	12.4	1.0484	0.0130
60_(1)_(STM)	CBMH106	CBMH105	CONDUIT	21.7	0.5069	0.0130
60_(STM)	CB4	CBMH106	CONDUIT	11.7	0.5128	0.0130
61_(STM)	ST-CBMH103	CBMH103	CONDUIT	3.5	3.1444	0.0130
68_(STM)	ST-MH108	MH108	CONDUIT	4.8	2.0838	0.0130
68_(X-STM)	EX-CB03	EX-CB02	CONDUIT	18.7	0.1070	0.0130
70_(STM)	EX-MH103	MH108	CONDUIT	18.5	0.2703	0.0130
70_(X-STM)	EX-CB02	EX-MH101	CONDUIT	5.2	0.9616	0.0130
71_(STM)	ST-CBMH106	CBMH106	CONDUIT	2.0	3.0014	0.0130
72_(X-STM)	EX-MH101	EX-MH102	CONDUIT	18.4	0.2717	0.0130
74_(X-STM)	EX-MH102	EX-MH103	CONDUIT	20.3	0.3941	0.0130
83_(X-STM)	EX-CB01	EX-MH100	CONDUIT	25.3	0.9882	0.0130
84_(X-STM)	EX-MH100	EX-MH101	CONDUIT	24.6	0.3659	0.0130
C1	CB4	HP-CB4	CONDUIT	3.0	-11.7469	0.0150
C10	CB2	HP-CB2	CONDUIT	3.0	-11.7469	0.0150
C11	HP-CB2	CBMH104	CONDUIT	3.0	13.4535	0.0150
C12	CBMH104	HP-CBMH104	CONDUIT	3.0	-11.7469	0.0150
C13	HP-CBMH104	CBMH103	CONDUIT	3.0	13.4535	0.0150
C14	HP-CB6	CBMH104	CONDUIT	3.0	11.7469	0.0150
C15	CBMH5	HP-CBMH5	CONDUIT	3.0	-4.3374	0.0150
C16	HP-CBMH5	CBMH103	CONDUIT	3.0	14.4829	0.0150
C17	CB1	HP-CB1	CONDUIT	3.0	-10.7279	0.0150
C18	HP-CB1	CBMH103	CONDUIT	3.0	12.4282	0.0150
C19	CBMH103	HP-CBMH103	CONDUIT	3.0	-11.7469	0.0150
C2	HP-CB4	CBMH106	CONDUIT	3.0	6.0108	0.0150
C20	EX-CB02	HP-EX-CB02	CONDUIT	3.0	-9.7122	0.0150
C21	HP-EX-CB02	CB2	CONDUIT	3.0	16.9031	0.0150
C22	HP-CBMH103	Major_OF	CONDUIT	3.0	45.8349	0.0150
C23	BLDG	Uncontrolled_OF	CONDUIT	3.0	643.3333	0.0150
C25	EX-CB03	HP-EX-CB03	CONDUIT	3.0	-2.3340	0.0150
C26	HP-EX-CB03	EX-CB02	CONDUIT	3.0	2.3340	0.0150
C27	EX-CB01	HP-EX-CB01	CONDUIT	3.0	-5.6758	0.0150
C28	HP-EX-CB01	WestPond	CONDUIT	3.0	60.8781	0.0150
C3	CBMH106	HP-CBMH106	CONDUIT	3.0	-4.3374	0.0150
C4	HP-CBMH106	CBMH105	CONDUIT	3.0	10.0504	0.0150
C5	CB3	HP-CB3	CONDUIT	3.0	-11.7469	0.0150
C6	HP-CB3	CBMH105	CONDUIT	3.0	13.4535	0.0150
C7	CBMH105	HP-CBMH105	CONDUIT	3.0	-11.7469	0.0150
C8	HP-CBMH105	CB6	CONDUIT	3.0	5.0063	0.0150
C9	CB6	HP-CB6	CONDUIT	3.0	-3.3352	0.0150
ICD-CBMH103	CBMH103	MH102	ORIFICE			
ICD-CBMH104	CBMH104	MH102	ORIFICE			
ICD-CBMH5	CBMH5	MH107	ORIFICE			
ICD-MH108	MH108	MH101	ORIFICE			
OL1	BLDG	PR-STUB	OUTLET			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
14_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	88.68
24_(STM)_1	CIRCULAR	0.38	0.11	0.09	0.38	1	96.52
24_(STM)_2	CIRCULAR	0.38	0.11	0.09	0.38	1	97.76
25_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	41.93
27_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	41.93
31_(1)_(STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	62.86
31_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	60.84
36_(STM)	CIRCULAR	0.20	0.03	0.05	0.20	1	33.05
47_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	123.99
53_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	95.09
58_(STM)	CIRCULAR	0.20	0.03	0.05	0.20	1	33.59

60_(1)_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	124.84
60_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	42.59
61_(STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	105.46
68_(STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	139.60
68_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	31.63
70_(STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	50.28
70_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	94.83
71_(STM)	CIRCULAR	0.38	0.11	0.09	0.38	1	303.77
72_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	50.41
74_(X-STM)	CIRCULAR	0.25	0.05	0.06	0.25	1	37.33
83_(X-STM)	CIRCULAR	0.20	0.03	0.05	0.20	1	32.61
84_(X-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	58.49
C1	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C10	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C11	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
C12	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C13	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
C14	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C15	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
C16	RECT_OPEN	1.00	3.00	0.60	3.00	1	54148.25
C17	RECT_OPEN	1.00	3.00	0.60	3.00	1	46602.99
C18	RECT_OPEN	1.00	3.00	0.60	3.00	1	50160.45
C19	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C2	RECT_OPEN	1.00	3.00	0.60	3.00	1	34883.83
C20	RECT_OPEN	1.00	3.00	0.60	3.00	1	44341.94
C21	RECT_OPEN	1.00	3.00	0.60	3.00	1	58497.86
C22	RECT_OPEN	1.00	3.00	0.60	3.00	1	96328.60
C23	RECT_OPEN	1.00	3.00	0.60	3.00	1	360890.13
C25	RECT_OPEN	1.00	3.00	0.60	3.00	1	21737.24
C26	RECT_OPEN	1.00	3.00	0.60	3.00	1	21737.24
C27	RECT_OPEN	1.00	3.00	0.60	3.00	1	33897.68
C28	RECT_OPEN	1.00	3.00	0.60	3.00	1	111016.48
C3	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
C4	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
C5	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C6	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
C7	RECT_OPEN	1.00	3.00	0.60	3.00	1	48766.13
C8	RECT_OPEN	1.00	3.00	0.60	3.00	1	31835.65
C9	RECT_OPEN	1.00	3.00	0.60	3.00	1	25984.66

```
*********************************************************
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
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 03/10/2020 00:00:00
Ending Date .............. 03/12/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.130        71.667
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.014         7.463
Surface Runoff ...........         0.115        63.482
Final Storage ............         0.002         1.159
Continuity Error (%) .....        -0.610

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.115         1.151
```

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Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.115         1.151
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 (%) .....         0.014
```

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***************************
Time-Step Critical Elements
***************************
Link 71_(STM) (2.99%)
Link 61_(STM) (1.35%)
```

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********************************
Highest Flow Instability Indexes
********************************
All links are stable.
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*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.95 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.03
```

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***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-01	71.67	0.00	0.00	17.93	42.19	11.29	53.48	0.07	56.87	0.746
A-02	71.67	0.00	0.00	0.00	70.27	0.00	70.27	0.06	41.66	0.981
A-03	71.67	0.00	0.00	0.00	70.22	0.00	70.22	0.06	39.68	0.980
A-04	71.67	0.00	0.00	43.78	10.06	17.83	27.88	0.03	16.05	0.389
A-05	71.67	0.00	0.00	0.00	70.35	0.00	70.35	0.03	23.31	0.982
A-06	71.67	0.00	0.00	1.27	68.29	0.95	69.24	0.12	87.42	0.966
A-07	71.67	0.00	0.00	0.00	70.31	0.00	70.31	0.13	95.23	0.981
A-08	71.67	0.00	0.00	1.88	67.22	1.41	68.63	0.02	17.74	0.958
A-09	71.67	0.00	0.00	1.27	68.32	0.95	69.27	0.14	97.29	0.967
A-10	71.67	0.00	0.00	1.88	67.28	1.40	68.68	0.11	81.32	0.958
A-11	71.67	0.00	0.00	0.00	72.10	0.00	72.10	0.13	92.23	1.006
A-12	71.67	0.00	0.00	1.27	68.16	0.95	69.11	0.02	16.30	0.964
A-13	71.67	0.00	0.00	0.00	70.19	0.00	70.19	0.04	29.76	0.979
A-14	71.67	0.00	0.00	1.27	68.25	0.95	69.20	0.11	78.03	0.966
A-15	71.67	0.00	0.00	32.93	18.04	21.91	39.95	0.06	59.31	0.557

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

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
CBMH105a	JUNCTION	0.18	2.03	79.92	0	01:50	2.02
EX-MH100	JUNCTION	0.02	1.05	79.94	0	01:21	1.05
EX-MH101	JUNCTION	0.02	1.18	79.93	0	01:21	1.18
EX-MH102	JUNCTION	0.02	1.23	79.90	0	01:22	1.23
EX-MH103	JUNCTION	0.02	1.28	79.86	0	01:10	1.25
HP-CB1	JUNCTION	0.00	0.00	79.92	0	00:00	0.00
HP-CB2	JUNCTION	0.00	0.00	80.00	0	00:00	0.00
HP-CB3	JUNCTION	0.00	0.00	80.05	0	00:00	0.00
HP-CB4	JUNCTION	0.00	0.00	80.00	0	00:00	0.00
HP-CB6	JUNCTION	0.00	0.00	79.95	0	00:00	0.00
HP-CBMH103	JUNCTION	0.00	0.00	79.90	0	00:00	0.00
HP-CBMH104	JUNCTION	0.00	0.00	79.95	0	00:00	0.00
HP-CBMH105	JUNCTION	0.00	0.00	80.00	0	00:00	0.00
HP-CBMH106	JUNCTION	0.00	0.00	79.95	0	00:00	0.00
HP-CBMH5	JUNCTION	0.00	0.00	79.98	0	00:00	0.00
HP-EX-CB01	JUNCTION	0.00	0.00	80.01	0	00:00	0.00
HP-EX-CB02	JUNCTION	0.00	0.00	80.15	0	00:00	0.00
HP-EX-CB03	JUNCTION	0.00	0.00	79.93	0	01:22	0.00
MH100	JUNCTION	0.03	0.32	77.60	0	01:32	0.32
MH101	JUNCTION	0.03	0.33	77.75	0	01:32	0.33
MH102	JUNCTION	0.03	0.26	77.81	0	01:33	0.26

MH107	JUNCTION	0.01	0.10	77.82	0	01:32	0.10
MH108	JUNCTION	0.06	2.24	79.85	0	01:10	2.19
PR-STUB	JUNCTION	0.01	0.07	77.93	0	01:37	0.07
Ex.Connection	OUTFALL	0.02	0.25	77.42	0	01:32	0.25
Major_OF	OUTFALL	0.00	0.00	78.65	0	00:00	0.00
Uncontrolled_OF	OUTFALL	0.00	0.00	78.65	0	00:00	0.00
WestPond	OUTFALL	0.00	0.00	78.45	0	00:00	0.00
BLDG	STORAGE	0.01	0.15	97.95	0	01:37	0.15
CB1	STORAGE	0.13	1.80	79.81	0	01:12	1.80
CB2	STORAGE	0.16	1.84	79.91	0	01:51	1.84
CB3	STORAGE	0.13	1.66	79.93	0	01:31	1.66
CB4	STORAGE	0.13	1.64	79.92	0	01:45	1.64
CB6	STORAGE	0.15	1.79	79.91	0	01:49	1.79
CBMH103	STORAGE	0.18	2.15	79.79	0	01:43	2.15
CBMH104	STORAGE	0.20	2.14	79.91	0	01:50	2.14
CBMH105	STORAGE	0.17	1.94	79.92	0	01:47	1.94
CBMH106	STORAGE	0.14	1.71	79.92	0	01:46	1.71
CBMH5	STORAGE	0.03	2.15	79.98	0	01:14	2.15
EX-CB01	STORAGE	0.02	0.86	80.01	0	01:21	0.86
EX-CB02	STORAGE	0.02	1.12	79.93	0	01:21	1.12
EX-CB03	STORAGE	0.02	1.10	79.93	0	01:22	1.10
ST-CBMH103	STORAGE	0.16	1.99	79.79	0	01:43	1.99
ST-CBMH106	STORAGE	0.13	1.61	79.92	0	01:46	1.61
ST-MH108	STORAGE	0.03	1.70	79.85	0	01:10	1.65

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Node Inflow Summary
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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
CBMH105a	JUNCTION	0.00	78.89	0	01:04	0	0.407	-0.023
EX-MH100	JUNCTION	0.00	31.82	0	01:03	0	0.0709	-0.427
EX-MH101	JUNCTION	0.00	101.49	0	01:06	0	0.186	0.077
EX-MH102	JUNCTION	0.00	101.11	0	01:06	0	0.186	-0.094
EX-MH103	JUNCTION	0.00	101.14	0	01:06	0	0.186	0.188
HP-CB1	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB2	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB3	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB4	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB6	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH103	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH104	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH105	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH106	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CBMH5	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-EX-CB01	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-EX-CB02	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-EX-CB03	JUNCTION	0.00	0.94	0	01:22	0	0.000196	0.150
MH100	JUNCTION	0.00	97.56	0	01:32	0	1.09	0.000
MH101	JUNCTION	0.00	97.56	0	01:31	0	1.09	0.007
MH102	JUNCTION	0.00	61.61	0	01:33	0	0.907	-0.039
MH107	JUNCTION	0.00	16.17	0	01:31	0	0.157	0.032
MH108	JUNCTION	0.00	101.14	0	01:06	0	0.217	-0.230
PR-STUB	JUNCTION	0.00	9.91	0	01:37	0	0.134	0.002
Ex.Connection	OUTFALL	0.00	97.56	0	01:32	0	1.09	0.000
Major_OF	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
Uncontrolled_OF	OUTFALL	59.31	59.31	0	01:10	0.0571	0.0571	0.000
WestPond	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
BLDG	STORAGE	92.23	92.23	0	01:10	0.134	0.134	0.016
CB1	STORAGE	29.76	39.49	0	01:06	0.0421	0.0424	0.086
CB2	STORAGE	97.29	97.29	0	01:10	0.136	0.137	0.088
CB3	STORAGE	95.23	95.23	0	01:10	0.135	0.135	0.140
CB4	STORAGE	16.05	76.41	0	01:07	0.034	0.042	0.259
CB6	STORAGE	17.74	17.74	0	01:10	0.0247	0.0248	0.030
CBMH103	STORAGE	78.03	105.96	0	01:05	0.109	0.187	0.054
CBMH104	STORAGE	81.32	157.00	0	01:09	0.113	0.625	0.005
CBMH105	STORAGE	87.42	201.49	0	01:04	0.123	0.448	-0.014
CBMH106	STORAGE	23.31	222.56	0	01:05	0.0331	0.265	-0.005
CBMH5	STORAGE	16.30	16.30	0	01:10	0.0228	0.0228	0.106
EX-CB01	STORAGE	56.87	56.87	0	01:10	0.0711	0.0711	0.403
EX-CB02	STORAGE	39.68	81.06	0	01:06	0.0562	0.116	0.060
EX-CB03	STORAGE	41.66	48.22	0	01:11	0.059	0.0601	0.012
ST-CBMH103	STORAGE	0.00	97.47	0	01:05	0	0.0357	-0.290
ST-CBMH106	STORAGE	0.00	220.08	0	01:05	0	0.0991	0.174
ST-MH108	STORAGE	0.00	73.25	0	01:06	0	0.031	-0.102

****
Node Surcharge Summary
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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

CBMH105a	JUNCTION	5.05	1.654	0.701
EX-MH100	JUNCTION	0.80	0.749	0.271
EX-MH101	JUNCTION	0.82	0.828	0.092
EX-MH102	JUNCTION	0.84	0.902	0.158
EX-MH103	JUNCTION	0.89	0.975	0.215
MH108	JUNCTION	0.91	1.020	0.230

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Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
BLDG	0.004	5	0	0	0.080	90	0 01:37	9.91
CB1	0.000	1	0	0	0.003	42	0 01:12	28.07
CB2	0.002	2	0	0	0.049	55	0 01:51	54.66
CB3	0.001	2	0	0	0.037	42	0 01:31	56.59
CB4	0.001	2	0	0	0.020	57	0 01:45	11.63
CB6	0.000	1	0	0	0.001	34	0 01:49	17.26
CBMH103	0.002	2	0	0	0.048	46	0 01:43	104.43
CBMH104	0.003	3	0	0	0.056	75	0 01:50	99.75
CBMH105	0.002	2	0	0	0.053	56	0 01:47	191.41
CBMH106	0.000	1	0	0	0.005	51	0 01:46	220.08
CBMH5	0.000	1	0	0	0.004	87	0 01:14	6.37
EX-CB01	0.000	1	0	0	0.017	92	0 01:21	31.82
EX-CB02	0.000	0	0	0	0.003	6	0 01:21	80.86
EX-CB03	0.000	1	0	0	0.009	92	0 01:22	41.38
ST-CBMH103	0.003	9	0	0	0.034	100	0 01:05	13.41
ST-CBMH106	0.008	9	0	0	0.098	100	0 01:06	33.29
ST-MH108	0.001	2	0	0	0.030	100	0 01:09	18.10

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Ex.Connection	15.63	44.72	97.56	1.094
Major_OF	0.00	0.00	0.00	0.000
Uncontrolled_OF	6.76	5.27	59.31	0.057
WestPond	0.00	0.00	0.00	0.000
System	5.60	49.99	0.00	1.151

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
14_(STM)	CONDUIT	97.56	0 01:32	1.01	1.10	0.83
24_(STM)_1	CONDUIT	78.74	0 01:04	0.71	0.82	1.00
24_(STM)_2	CONDUIT	67.20	0 01:03	0.61	0.69	1.00
25_(STM)	CONDUIT	54.66	0 01:03	1.11	1.30	1.00
27_(STM)	CONDUIT	56.59	0 01:03	1.15	1.35	1.00
31_(1)_(STM)	CONDUIT	16.17	0 01:31	0.49	0.26	0.48
31_(STM)	CONDUIT	9.91	0 01:37	0.91	0.16	0.27
36_(STM)	CONDUIT	28.07	0 01:05	0.89	0.85	1.00
47_(STM)	CONDUIT	97.56	0 01:32	1.07	0.79	0.77
53_(STM)	CONDUIT	61.61	0 01:34	0.92	0.65	0.71
58_(STM)	CONDUIT	17.26	0 01:06	0.55	0.51	1.00
60_(1)_(STM)	CONDUIT	191.41	0 01:04	1.73	1.53	1.00
60_(STM)	CONDUIT	63.47	0 01:07	1.29	1.49	1.00
61_(STM)	CONDUIT	97.47	0 01:05	1.99	0.92	1.00
68_(STM)	CONDUIT	73.25	0 01:06	1.04	0.52	1.00
68_(X-STM)	CONDUIT	41.38	0 01:06	0.59	1.31	1.00
70_(STM)	CONDUIT	101.14	0 01:06	1.49	2.01	1.00
70_(X-STM)	CONDUIT	80.86	0 01:06	1.14	0.85	1.00
71_(STM)	CONDUIT	220.08	0 01:05	1.99	0.72	1.00
72_(X-STM)	CONDUIT	101.11	0 01:06	1.43	2.01	1.00
74_(X-STM)	CONDUIT	101.14	0 01:06	2.06	2.71	1.00
83_(X-STM)	CONDUIT	31.82	0 01:03	1.10	0.98	1.00

84_(X-STM)	CONDUIT	31.16	0	01:04	0.53	0.53	1.00
C1	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
C10	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
C11	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
C12	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
C13	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
C14	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
C15	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
C16	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
C17	CONDUIT	0.00	0	00:00	0.00	0.00	0.11
C18	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
C19	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
C2	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
C20	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
C21	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
C22	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C23	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C25	CONDUIT	0.94	0	01:22	0.01	0.00	0.04
C26	CONDUIT	0.93	0	01:22	0.01	0.00	0.04
C27	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
C28	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C3	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
C4	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
C5	CONDUIT	0.00	0	00:00	0.00	0.00	0.11
C6	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
C7	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
C8	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
C9	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
ICD-CBMH103	ORIFICE	9.23	0	01:56			1.00
ICD-CBMH104	ORIFICE	36.33	0	01:50			1.00
ICD-CBMH5	ORIFICE	6.37	0	01:14			1.00
ICD-MH108	ORIFICE	36.65	0	01:10			1.00
OL1	DUMMY	9.91	0	01:37			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
14_(STM)	1.00	0.00	0.00	0.00	0.08	0.00	0.00	0.92	0.00	0.00
24_(STM)_1	1.00	0.01	0.03	0.00	0.97	0.00	0.00	0.00	0.88	0.00
24_(STM)_2	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.00	0.00
25_(STM)	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.00	0.00
27_(STM)	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.87	0.00	0.00
31_(1)_(STM)	1.00	0.00	0.00	0.00	0.13	0.00	0.00	0.87	0.10	0.00
31_(STM)	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
36_(STM)	1.00	0.01	0.00	0.00	0.15	0.00	0.00	0.85	0.01	0.00
47_(STM)	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.86	0.00
53_(STM)	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
58_(STM)	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.00	0.00
60_(1)_(STM)	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.00	0.00
60_(STM)	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.01	0.00
61_(STM)	1.00	0.01	0.00	0.00	0.15	0.00	0.00	0.84	0.00	0.00
68_(STM)	1.00	0.02	0.00	0.00	0.04	0.00	0.00	0.94	0.00	0.00
68_(X-STM)	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.89	0.00
70_(STM)	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
70_(X-STM)	1.00	0.01	0.00	0.00	0.07	0.00	0.00	0.92	0.04	0.00
71_(STM)	1.00	0.02	0.00	0.00	0.12	0.00	0.00	0.86	0.00	0.00
72_(X-STM)	1.00	0.01	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
74_(X-STM)	1.00	0.01	0.00	0.00	0.04	0.00	0.00	0.95	0.00	0.00
83_(X-STM)	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
84_(X-STM)	1.00	0.01	0.00	0.00	0.03	0.00	0.00	0.96	0.00	0.00
C1	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C18	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C22	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C23	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.97	0.00
C26	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.97	0.00
C27	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C28	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C8	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
14_(STM)	0.01	0.01	0.01	0.69	0.01
24_(STM)_1	4.97	4.97	5.05	0.01	0.01
24_(STM)_2	5.05	5.05	5.11	0.01	0.01
25_(STM)	5.00	5.00	5.19	0.03	0.03
27_(STM)	4.72	4.72	4.98	0.05	0.09
36_(STM)	4.72	4.72	5.62	0.01	0.01
58_(STM)	5.00	5.00	5.13	0.01	0.01
60_(1)_(STM)	4.59	4.59	4.78	0.08	0.01
60_(STM)	4.69	4.69	4.78	0.01	0.01
61_(STM)	5.26	5.26	5.62	0.01	0.01
68_(STM)	1.29	1.29	1.38	0.01	0.01
68_(X-STM)	0.81	0.81	0.82	0.09	0.10
70_(STM)	0.85	0.89	0.91	0.12	0.05
70_(X-STM)	0.82	0.82	0.83	0.01	0.01
71_(STM)	4.37	4.37	4.52	0.01	0.01
72_(X-STM)	0.83	0.83	0.84	0.14	0.11
74_(X-STM)	0.86	0.89	0.95	0.15	0.11
83_(X-STM)	0.79	0.79	0.82	0.01	0.01
84_(X-STM)	0.80	0.80	0.82	0.01	0.01

Analysis begun on: Thu Mar 26 15:20:53 2020
Analysis ended on: Thu Mar 26 15:21:10 2020
Total elapsed time: 00:00:17

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

Area = 1.67 ha
Impervious: 89 %
CDS Model: PMSU2025_5
Flowrate: 45 l/s
IDF Data: Ottawa
PSD: FINE

Upstream Storage:
100yr Storage 470 m^3

Engineer: NOVATECH
Contact: Paul Newcombe
Date: 24-Mar-20

Project: 3026 Solandt Rd.
Location: Kanata, ON
OGS ID: CDS

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	11.18	94.26	21173	21173	**100.00**	11.18	11.18	0.00	100.00
2-M	0.17	18.15	91.34	34922	34922	**99.75**	18.15	18.15	0.00	100.00
3-M	0.25	23.86	88.92	46576	46576	**98.17**	23.86	23.86	0.00	100.00
4-M	0.33	28.96	86.72	57340	57340	**95.04**	28.96	28.96	0.00	100.00
5-M	0.42	37.18	83.07	76018	76023	**90.91**	37.18	37.18	0.00	99.99
6-M	0.50	45.39	79.41	94696	94707	**86.47**	45.39	45.31	0.08	99.99
7-M	0.58	47.46	78.13	98886	99822	**82.01**	47.46	45.31	2.16	99.15
8-M	0.67	49.54	76.86	103076	104938	**77.67**	49.54	45.31	4.23	98.31
9-M	0.75	51.61	75.58	107266	110054	**73.64**	51.61	45.31	6.31	97.47
10-M	0.83	55.27	73.00	113167	119756	**69.90**	55.27	45.31	9.96	94.91
11-M	0.92	58.93	70.42	119069	129459	**66.40**	58.93	45.31	13.62	92.36
1-Yr	1	62.58	67.84	124970	139162	**63.21**	62.58	45.31	17.28	89.80
2-Yr	2	67.87	64.16	132217	154298	**39.35**	67.87	45.31	22.57	85.69
5-Yr	5	82.28	54.75	149071	200529	**18.13**	82.28	45.31	36.97	74.34
10-Yr	10	89.17	50.64	156629	226853	**9.52**	89.17	45.31	43.87	69.04
25-Yr	25	91.33	49.45	159025	235701	**3.92**	91.33	45.31	46.02	67.47
50-Yr	50	94.64	47.72	162674	249530	**1.98**	94.64	45.31	49.33	65.19
100-Yr	100	97.30	46.41	165723	261163	**1.00**	97.30	45.31	51.99	63.46

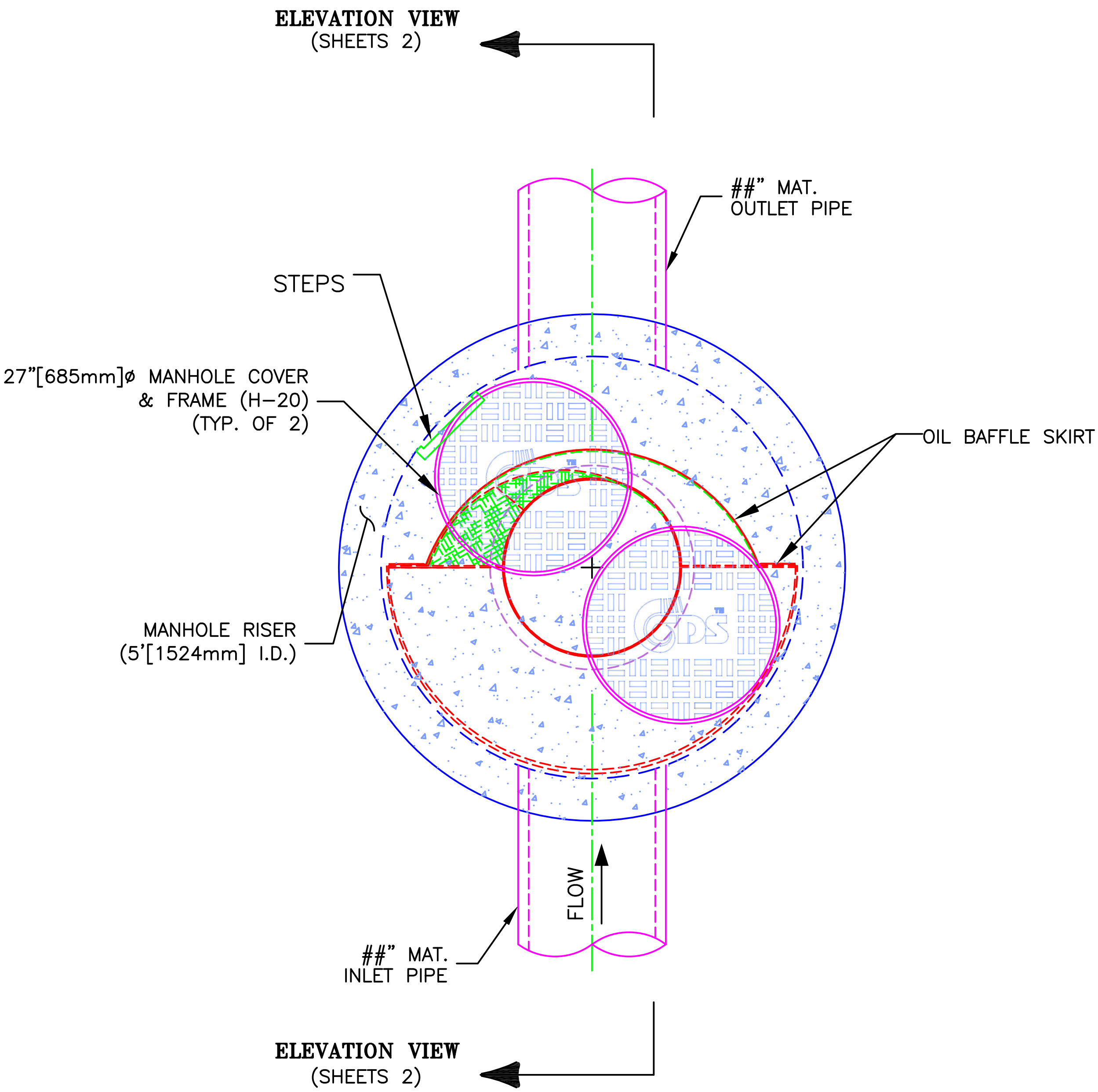
Average Annual TSS Removal Efficiency [%]: **80.7** Ave. Ann. T. Volume [%]: **97.1**

Notes:
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 specificiations

ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES

PLAN VIEW



CDS MODEL PMSU20_25m, 45 L/s TREATMENT CAPACITY
STORM WATER TREATMENT UNIT

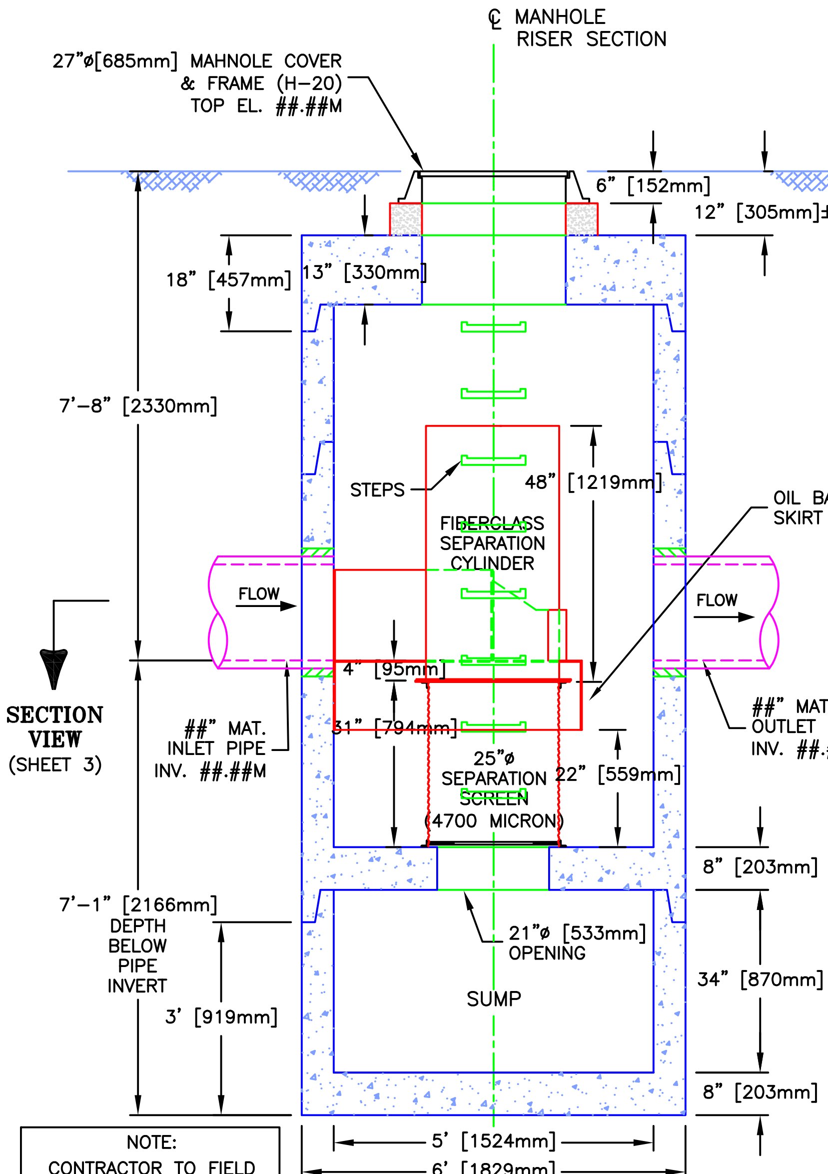
CONTECH STORMWATER SOLUTIONS

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
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

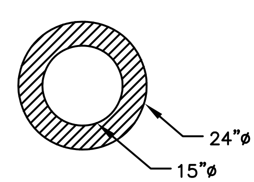
ELEVATION VIEW



NOTE:
CONTRACTOR TO FIELD VERIFY DIMENSIONS OF OR CONCRETE SECTIONS

INSERT

11 GA. STAINLESS STEEL SEPARATION PLATE



PLAN VIEW

CDS MODEL PMSU20_25m, 45 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS

PROJECT NAME

CITY, STATE

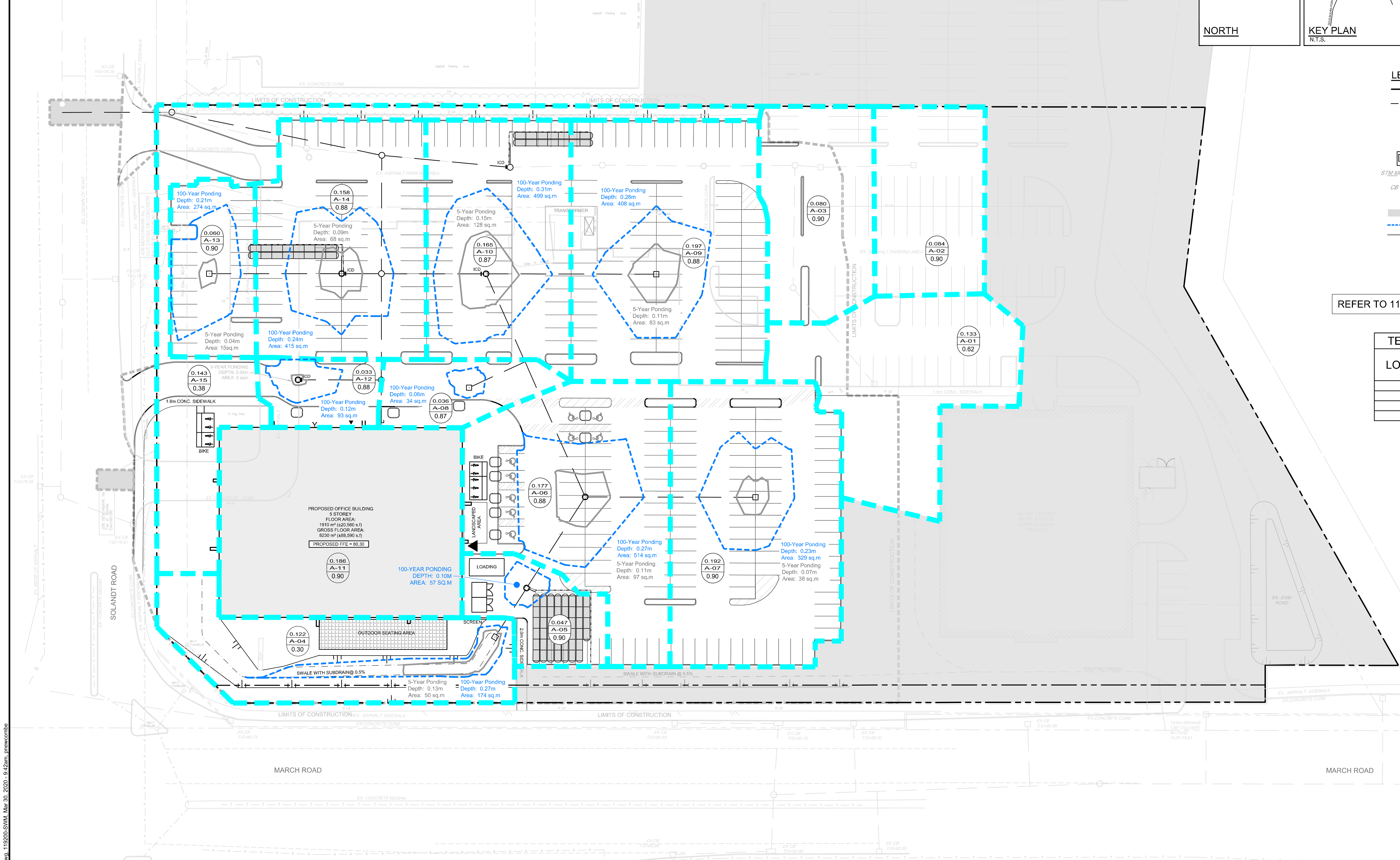
JOB#	XX-##-###	SCALE 1" = 3'
DATE	##/##/##	SHEET
DRAWN	INITIALS	2
APPROV.		

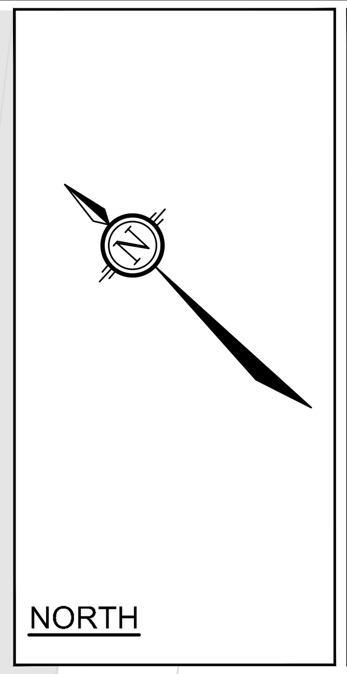
Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

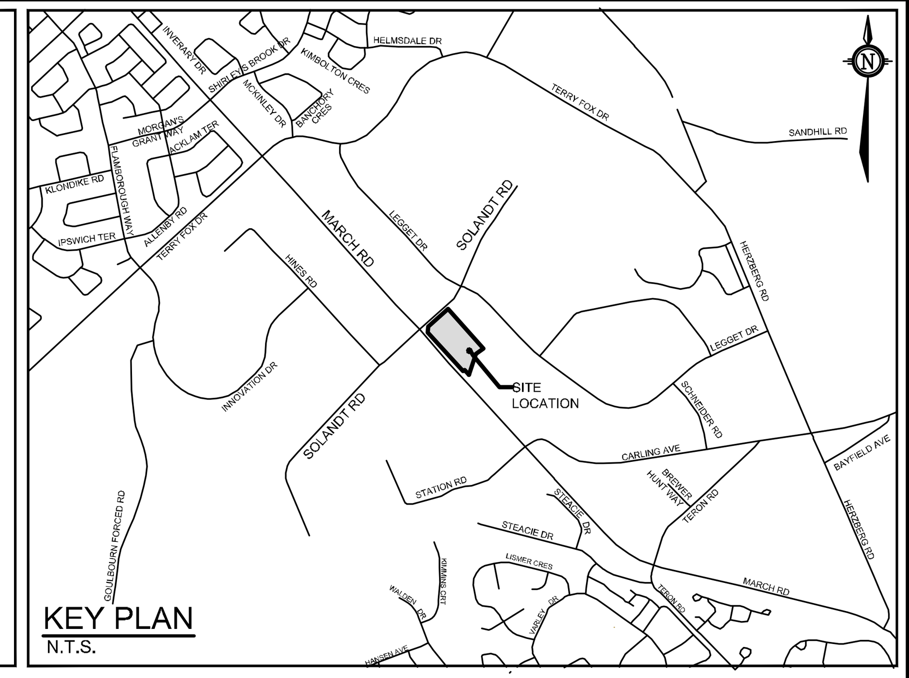
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

APPENDIX G
Stormwater Management Drawings

AREA ID	5 YEAR PONDING ELEVATION	100 YEAR PONDING ELEVATION	5 YEAR SURFACE STORAGE	100 YEAR SURFACE STORAGE
A-01	79.48	80.01	N/A	N/A
A-02	79.29	79.93	N/A	N/A
A-03	79.28	79.93	N/A	N/A
A-04	79.76	79.92	3 m³	20 m³
A-05	79.76	79.92	0 m³	5 m³
A-06	79.76	79.92	9 m³	53 m³
A-07	79.77	79.93	3 m³	37 m³
A-08	79.76	79.91	0 m³	1 m³
A-09	79.76	79.91	8 m³	49 m³
A-10	79.75	79.91	14 m³	56 m³
A-12	79.87	79.98	0 m³	4 m³
A-13	79.64	79.81	0 m³	1 m³
A-14	79.64	79.79	7 m³	48 m³







LEGEND

- PROPERTY LINE
- PROPOSED STORM SEWER AND MANHOLE
- DIRECTION OF FLOW
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORMTECH STC-740 UNDERGROUND STORAGE SYSTEM (REFER 119200-ND FOR DETAILS)
- STM MH — EXISTING STORM MANHOLE & SEWER
- CB 1 — EXISTING CATCHBASIN
- STORM SEWER DRAINAGE AREA BOUNDARY
- AREA TRIBUTARY TO EXISTING SWMF PONDS
- 100YR PONDING LIMITS
- 5YR PONDING LIMITS
- DRAINAGE AREA (ha) / DRAINAGE AREA ID / RUNOFF COEFFICIENT

REFER TO 119200-ND FOR NOTES AND DETAILS

TEMPEST LMF/MHF ICDs	
LOCATION	MODEL NO. / ORFICE DIAMETER
CBMH 103	VORTEX 85
CBMH104	108mm
CBMH 5	VORTEX 71
MH 108	108mm

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.

No.	REVISION	DATE	BY
2.	REVISED PER CITY COMMENTS	MAR 27/20	CJR
1.	ISSUED FOR SITE PLAN SUBMISSION	JAN 17/20	CJR

SCALE 1:400

DESIGN ARM
CHECKED CJR
DRAWN ARM
CHECKED CJR
APPROVED JLS

FOR REVIEW ONLY

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
3026 SOLANDT ROAD, OTTAWA, ONTARIO

DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 119200
REV 2
DRAWING No. 119200-SWM

M:\2019\119200\CAD\Design\119200 - SWM.dwg, 119200-SWM, Mar 30, 2020 - 9:42am, pnewcombe

APPENDIX H
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

☒ Availability of public infrastructure to service proposed development

N/A ☐ Identification of system constraints

☒ 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.

☒ 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

☒ Address reliability requirements such as appropriate location of shut-off valves

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

☒ 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

☒ 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.

☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

☒ 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).

☒ 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.

☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

☒ 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)

☒ 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)

N/A ☐ 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.

N/A ☐ 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.

☒ 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.

N/A ☐ 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.

N/A ☐ 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

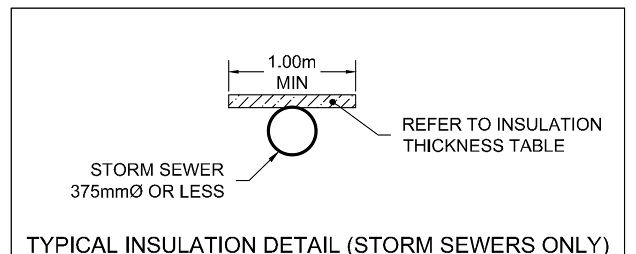
☒ Clearly stated conclusions and recommendations

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

INSULATION THICKNESS TABLE

FROM MH	TO MH	INSULATION THICKNESS
EX PIPE	STMMH 100	75mm
STMMH 100	STMMH 101	75mm
STMMH 101	STMMH 102	50mm
STMMH 102	STMMH 104	50mm
STMMH 102	STMMH 107	50mm
STMMH 107	CBMH 5	50mm
STMMH 104	STMMH 105	75mm
STMMH 105	STMMH 106	100mm
STMMH 108	CHAMBERS	50mm
STMMH 103	CHAMBERS	75mm
STMMH 106	CHAMBERS	100mm
SANMH 100	SANMH 101	75mm
SANMH 101	BLDG	75mm
SANMH 101	SANMH 102	100mm
SANMH 102	EX SANMH 2	75mm



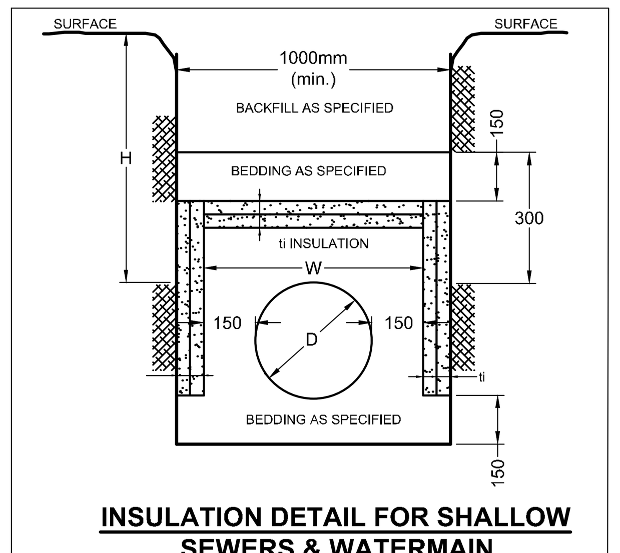
TYPICAL INSULATION DETAIL (STORM SEWERS ONLY)
SCALE = 1:50

SEWER & WATERMAIN INSULATION NOTES:

1. INSULATE ALL SEWER PIPES THAT HAVE LESS THAN 2.0m COVER AND ALL WATERMAIN WITH LESS THAN 2.4m OF COVER WITH EXPANDED POLYSTYRENE INSULATION AS PER OPSD 1109.030.
2. THE THICKNESS OF INSULATION SHALL BE THE EQUIVALENT OF 25mm FOR EVERY 300mm REDUCTION IN THE REQUIRED DEPTH OF COVER WITH 50mm MINIMUM (SEE TABLE)

T = THICKNESS OF INSULATION (mm)
W = WIDTH OF INSULATION (mm)
W = D + 300 (1000 min.)
D = O.D OF PIPE (mm)

COVER SEWER / WATER (mm)	INSULATION THICKNESS (mm)
2000-1400 / 2400-2100	50
1400-1100 / 2100-1800	75
1100-800 / 1800-1500	100



INSULATION DETAIL FOR SHALLOW SEWERS & WATERMAIN
N.T.S.

150mmØ WATERMAIN TABLE - 3026 SOLANDT ROAD

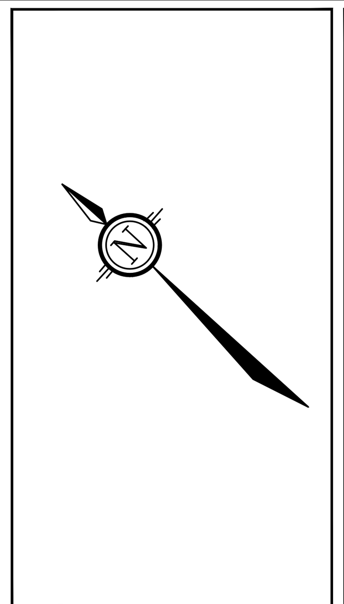
STATION	SURFACE ELEVATION	TOP OF WM ELEVATION	DESCRIPTION
0+000.0	79.75	77.75	CONNECT TO EXISTING 400mmØ WM
0+011.5	79.90	77.50	VALVE AND VALVE BOX @ ℄
0+017.2	80.00	77.60	CONNECT TO EXISTING PRIVATE WATERMAIN

200mmØ WATERMAIN TABLE - 3026 SOLANDT ROAD

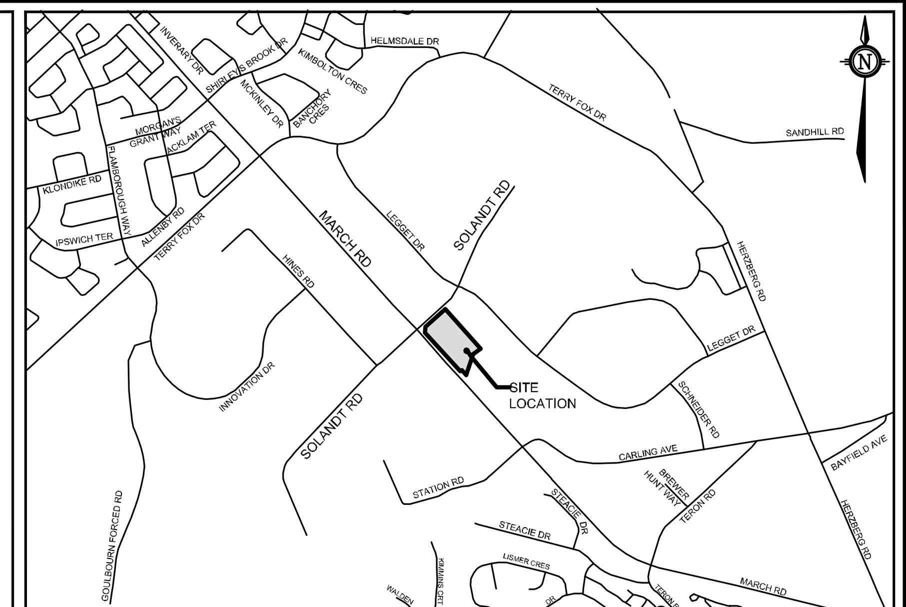
STATION	SURFACE ELEVATION	TOP OF WM ELEVATION	DESCRIPTION
1+000.0	79.95	77.55	EXTEND EXISTING WATERMAIN
1+018.3	79.95	77.55	TEE CONNECTION WITH 45 DEGREE BEND AND HYDRANT LEAD
1+022.0	79.92	77.52	VALVE AND VALVE BOX @ BUILDING SERVICE
1+064.6	79.92	77.52	45 DEGREE BEND WITH THRUST BLOCK
1+032.4	80.15	77.75	CAP AT BUILDLING

TEMPEST LMF/MHF ICDs

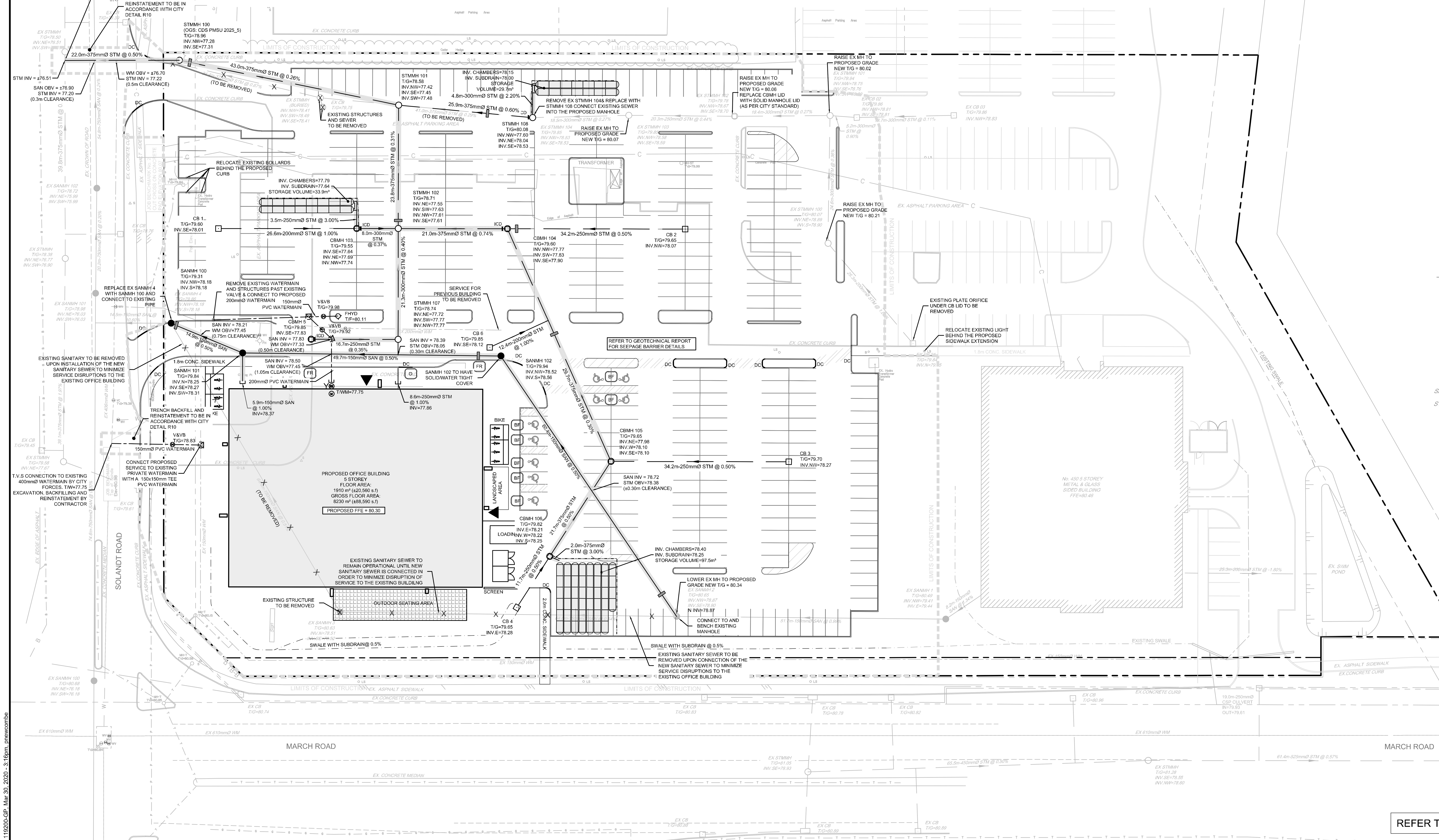
LOCATION	MODEL NO. / OFFICE DIAMETER
CBMH 103	VORTEX 85
CBMH104	108mm
CBMH 5	VORTEX 71
MH 108	108mm



NORTH



KEY PLAN
N.T.S.



LEGEND

- PROPERTY LINE
- PROPOSED CURB
- DC PROPOSED DEPRESSED CURB AS PER CITY DETAIL SC1.1
- PROPOSED WATER SERVICE
- PROPOSED HYDRANT c/w LEAD & VALVE
- V&VB PROPOSED VALVE AND VALVE BOX
- PROPOSED SIAMESE CONNECTION
- PROPOSED CAP
- PROPOSED SANITARY SERVICE c/w MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED STORMTECH STC-740 UNDERGROUND STORAGE SYSTEM (REFER 119200-ND FOR DETAILS)
- PROPOSED PIPE INSULATION
- ICD PROPOSED INLET CONTROL DEVICE
- SEEPAGE BARRIER (REFER TO GEOTECH REPORT FOR DETAILS)
- PROPOSED BUILDING ENTRANCE
- DIRECTION OF FLOW
- PROPOSED PAVEMENT MARKINGS
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- LIMITS OF CONSTRUCTION
- M WATER METER LOCATION
- RM REMOTE WATER METER LOCATION
- PERFORATED SUBDRAIN
- EXISTING STRUCTURE/LIGHT POST REMOVALS
- EXISTING PIPE REMOVALS
- EXISTING UTILITY POLE C/W GUY WIRES
- V&VC EXISTING WATERMAIN C/W VALVE & VALVE CHAMBER
- EXISTING HYDRANT C/W VALVE & LEAD
- SAN MH EXISTING SANITARY MANHOLE & SEWER
- STM MH EXISTING STORM MANHOLE & SEWER
- CB 1 EXISTING CATCHBASIN
- B EXISTING BELL LINE
- T EXISTING UNDERGROUND TRAFFIC LINE
- P EXISTING UNDERGROUND POWER LINE
- LS EXISTING STREETLIGHT
- TB-B EXISTING BELL TERMINAL BOX
- EXISTING EASEMENT

REFER TO 119200-ND FOR 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
2.	REVISED PER CITY COMMENTS	MAR 27/20	CJR
1.	ISSUED FOR SITE PLAN SUBMISSION	JAN 17/20	CJR

SCALE 1:400

1:400 — 0 4 8 12 16

DESIGN ARM
CHECKED CJR
DRAWN ARM
CHECKED CJR
APPROVED JLS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER C.J. RUDDLE MAR 30/20 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
3026 SOLANDT ROAD, OTTAWA, ONTARIO

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 119200
REV REV 2
DRAWING No. 119200-GP

D07-12-20-0003

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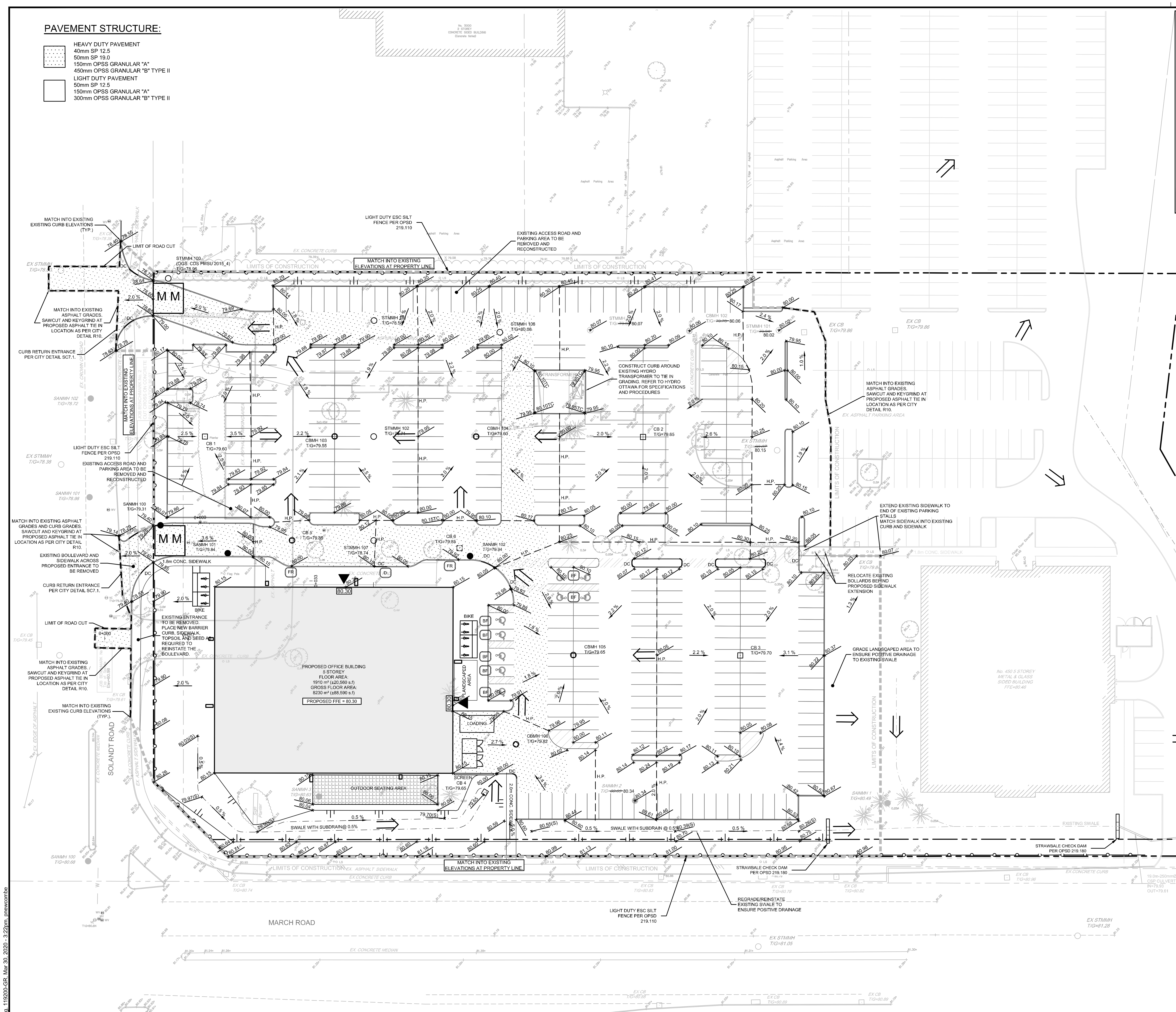
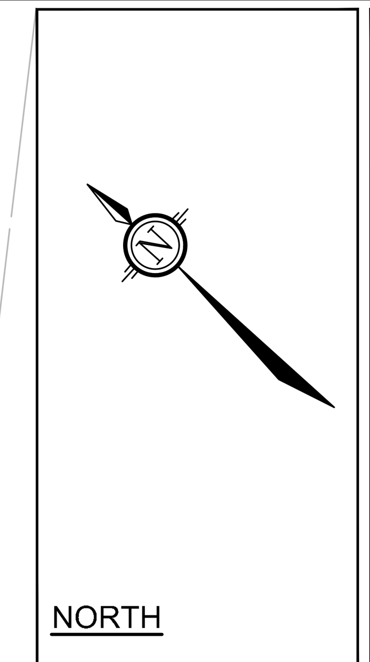
PLANA1.DWG - 841mmx594mm

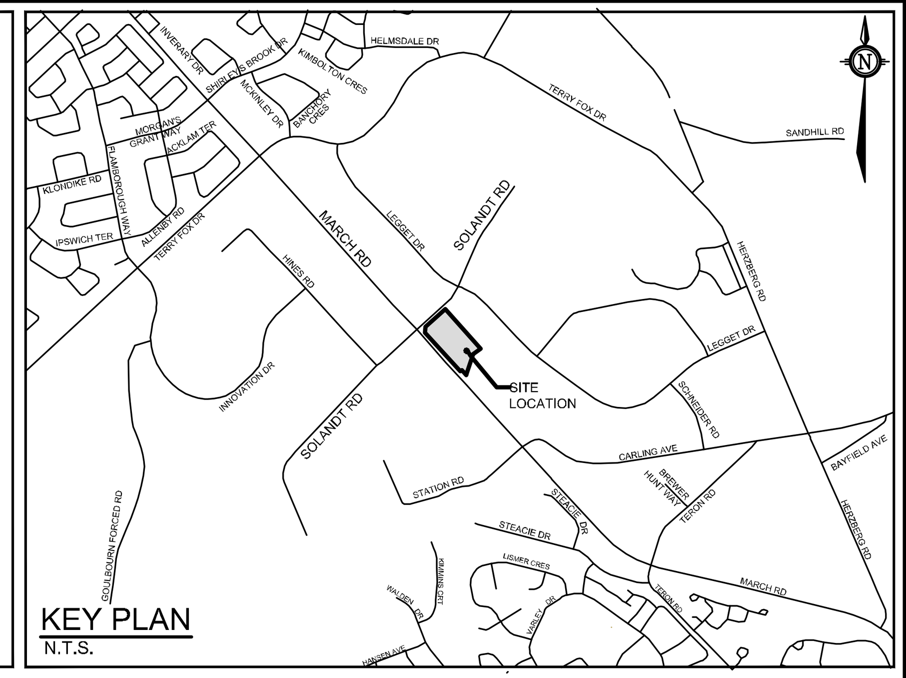
PAVEMENT STRUCTURE:

HEAVY DUTY PAVEMENT
40mm SP 12.5
50mm SP 19.0
150mm OPSS GRANULAR "A"
450mm OPSS GRANULAR "B" TYPE II

LIGHT DUTY PAVEMENT
50mm SP 12.5
150mm OPSS GRANULAR "A"
300mm OPSS GRANULAR "B" TYPE II

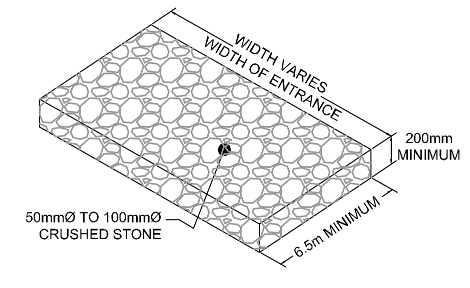






LEGEND

- PROPERTY LINE
- 77.50 PROPOSED ELEVATION
- 76.45 EXISTING ELEVATION
- 76.35(S) PROPOSED SWALE ELEVATION
- 96.10 PROPOSED ENTRANCE FLOOR ELEVATION
- PROPOSED FIRE HYDRANT
- V&VB PROPOSED VALVE AND VALVE BOX
- PROPOSED BUILDING ENTRANCE
- DIRECTION OF MAJOR OVERLAND FLOW
- PROPOSED SAN MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- H.P. PROPOSED HIGH POINT
- PROPOSED ASPHALT MATCHLINE
- PROPOSED PAVEMENT MARKINGS
- PROPOSED CURB
- DC PROPOSED DEPRESSED CURB AS PER CITY DETAIL SC1.1
- SWALE c/w SUBDRAIN AND DIRECTION OF FLOW
- TERRACING 3:1 SLOPE MAX (UNLESS OTHERWISE INDICATED)
- 2.0% SLOPE AND DIRECTION
- M M PROPOSED MUD MAT
- LIGHT DUTY SILT FENCE (OPSD 219.110)
- STRAWBALE CHECK DAM (OPSD 219.180)
- LIMITS OF CONSTRUCTION
- EXISTING UTILITY POLE C/W GUY WIRES
- V&VC EXISTING VALVE & VALVE CHAMBER
- V&VB EXISTING VALVE & VALVE BOX
- EXISTING HYDRANT
- SAN MH EXISTING SANITARY MANHOLE
- STM MH EXISTING STORM MANHOLE
- CB 1 EXISTING CATCHBASIN
- LS EXISTING LIGHT STANDARD
- EXISTING EASEMENT
- EXISTING SWALE



MUD MAT DETAIL
NOT TO SCALE

NOTE:
AS PART OF THE EROSION AND SEDIMENT CONTROL MEASURES ALL PROPOSED AND EXISTING CATCHBASINS AND CATCHBASIN MANHOLES TO BE INSTALLED WITH FILTERBAGS. REFER TO 119200-ND FOR DETAILS

REFER TO 119200-ND FOR NOTES AND DETAILS
REFER TO 119200-REM FOR REMOVAL INFORMATION

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
2.	REVISED PER CITY COMMENTS	MAR 27/20	CJR
1.	ISSUED FOR SITE PLAN SUBMISSION	JAN 17/20	CJR

SCALE 1:400
0 4 8 12 16

DESIGN ARM
CHECKED CJR
DRAWN ARM
CHECKED CJR
APPROVED JLS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER C.J. RUDDLE MAR 30/20 PROVINCE OF ONTARIO

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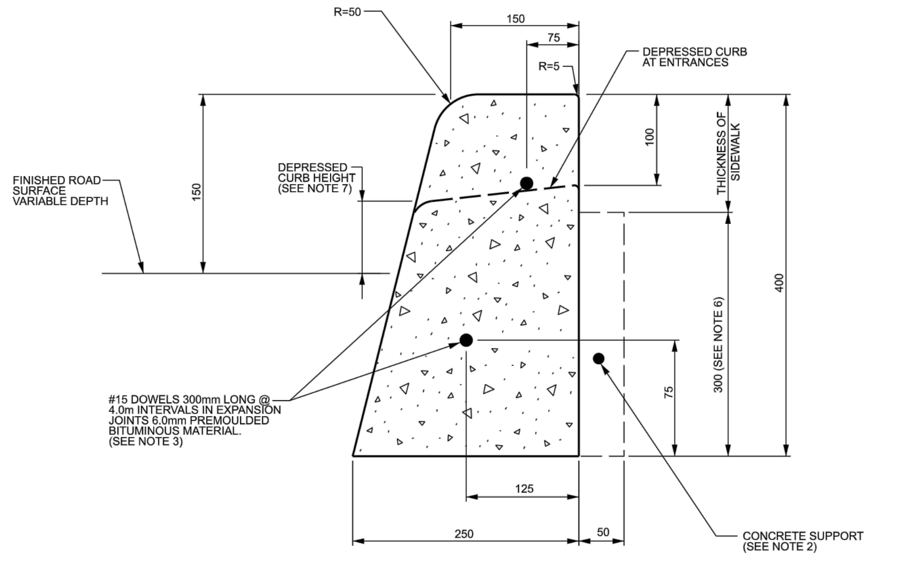
LOCATION
3026 SOLANDT ROAD, OTTAWA, ONTARIO

DRAWING NAME
GRADING AND EROSION SEDIMENT CONTROL PLAN

PROJECT No. 119200
REV REV 2
DRAWING No. 119200 - GR

D07-12-20-0003



CONCRETE BARRIER CURB

NOTES:

1. THE FULL CURB DEPTH SHALL BE CARRIED THROUGH THE DEPRESSED ACCESS CROSSING.
2. A CONCRETE SUPPORT IS REQUIRED WHEN BUILT ADJACENT TO THE SIDEWALK.
3. IF AN EXTRUSION CURBING MACHINE IS USED, THE EXPANSION BITUMINOUS MATERIAL AND THE #15 DOWELS ARE TO BE PLACED AT THE END OF THE EXTRUSION.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
5. DUMMY JOINTS SHALL BE 25mm DEEP, FRONT, BACK AND TOP OF SECTION AT 4m SPACING OR MATCH JOINTING WHERE SIDEWALK IS ADJACENT.
6. FOR DEPRESSED CURB AT ENTRANCES USE 250.
7. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 25mm.

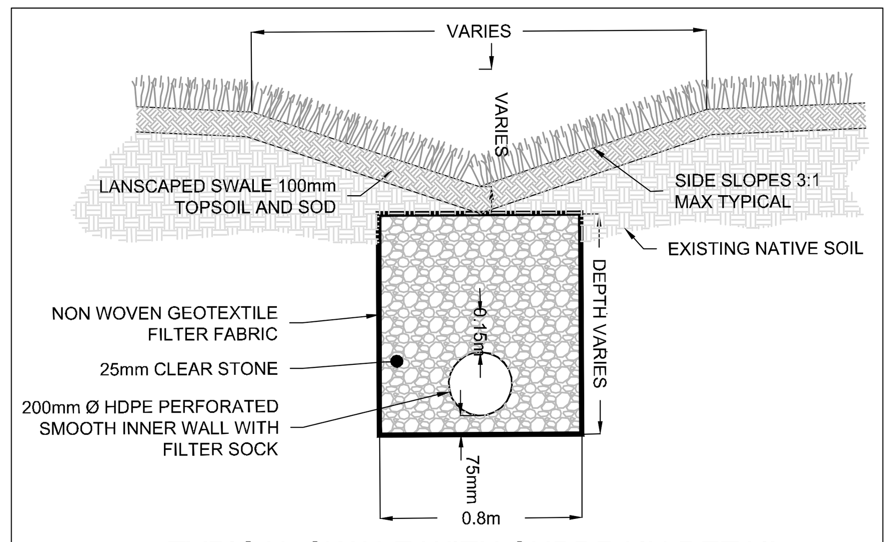
N.T.S.

Ottawa	CONCRETE BARRIER CURB FOR GRANULAR BASE PAVEMENT (MODIFIED OPSD-600.110)	DATE:	JANUARY 2003
		REV. DATE:	MARCH 2019
		DWG. No.:	SC1.1

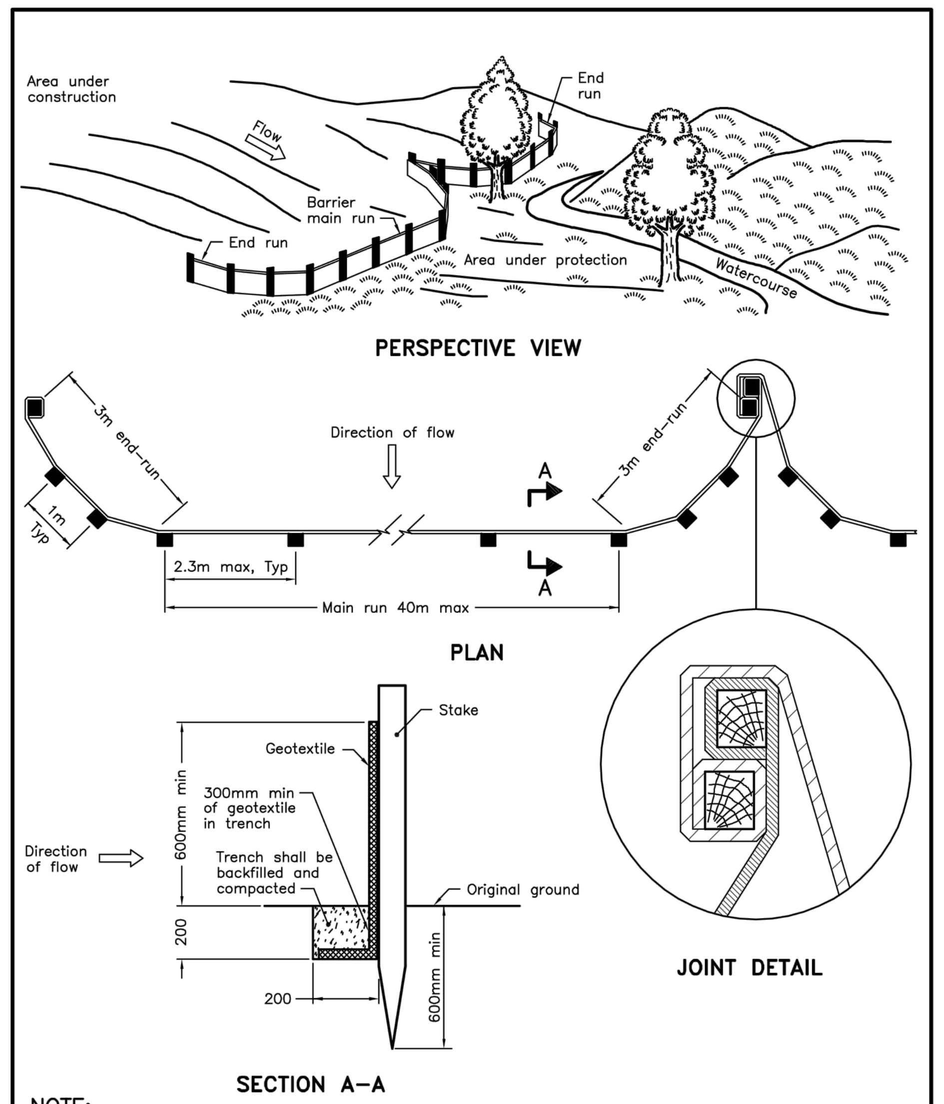
PAVEMENT STRUCTURE:

HEAVY DUTY PAVEMENT
40mm SP 12.5
50mm SP 19.0
150mm OPSS GRANULAR "A"
450mm OPSS GRANULAR "B" TYPE II

LIGHT DUTY PAVEMENT
50mm SP 12.5
150mm OPSS GRANULAR "A"
300mm OPSS GRANULAR "B" TYPE II



TYPICAL SWALE WITH SUBDRAIN DETAIL
SCALE NTS



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

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
LIGHT-DUTY SILT FENCE BARRIER	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 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 AND THE CITY OF OTTAWA AS THIRD PARTY.
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.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS. ALL CONTAMINATED MATERIAL (IF ANY) SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC. THE SITE BENCHMARK IS THE FIRE HYDRANT TOP OF SPINDLE LOCATED TO THE NORTH OF THE EXISTING SOUTHREN ENTRANCE TO THE PROPERTY ON SOLANDT RD (ELEV. = 80.98). REFER TO ANNIS, O'SULLIVAN, VOLLEBEKK LTD. TOPOGRAPHIC PLAN OF PART OF LOT 7 CONCESSION 4 GEOGRAPHICAL TOWNSHIP OF MARCH CITY OF OTTAWA).
8. REFER TO GEOTECHNICAL REPORT No. PG5196-1 PREPARED BY PATERSON GROUP, DATED JANUARY 10,2020, 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 THE DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT No. R-2020-004 DATED JANUARY, 17, 2020 PREPARED BY NOVATECH.
10. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
11. SAW CUT AND KEYGRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10). ALL ROAD CUTS TO BE REINSTATED WITH FULL MILL OVERLAY AS PER CITY OF OTTAWA STANDARDS (R10).
12. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES AND GRADING PLAN INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THE PLANS. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, T/WM ELEVATIONS, ANY ALIGNMENT CHANGES, AND ALL SURFACE ELEVATION AS BUILT GRADES.
13. REFER TO THE REMOVALS DRAWING (119200-REM) FOR ALL REMOVAL INFORMATION

GRADING NOTES:

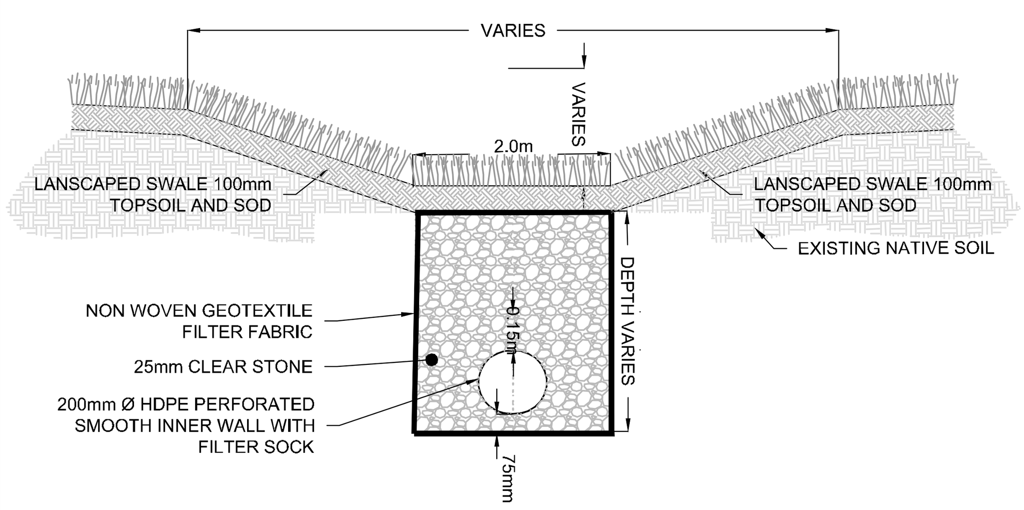
1) ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS.
2) EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL CONSULTANT.
3) ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUBEXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS.
4) THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 98% 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) GRADE AND/OR FILL BEHIND PROPOSED CURB AND BETWEEN BUILDINGS AND CURBS, WHERE REQUIRED TO PROVIDE POSITIVE DRAINAGE.
6) MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
7) ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).

EROSION AND SEDIMENT CONTROL NOTES:

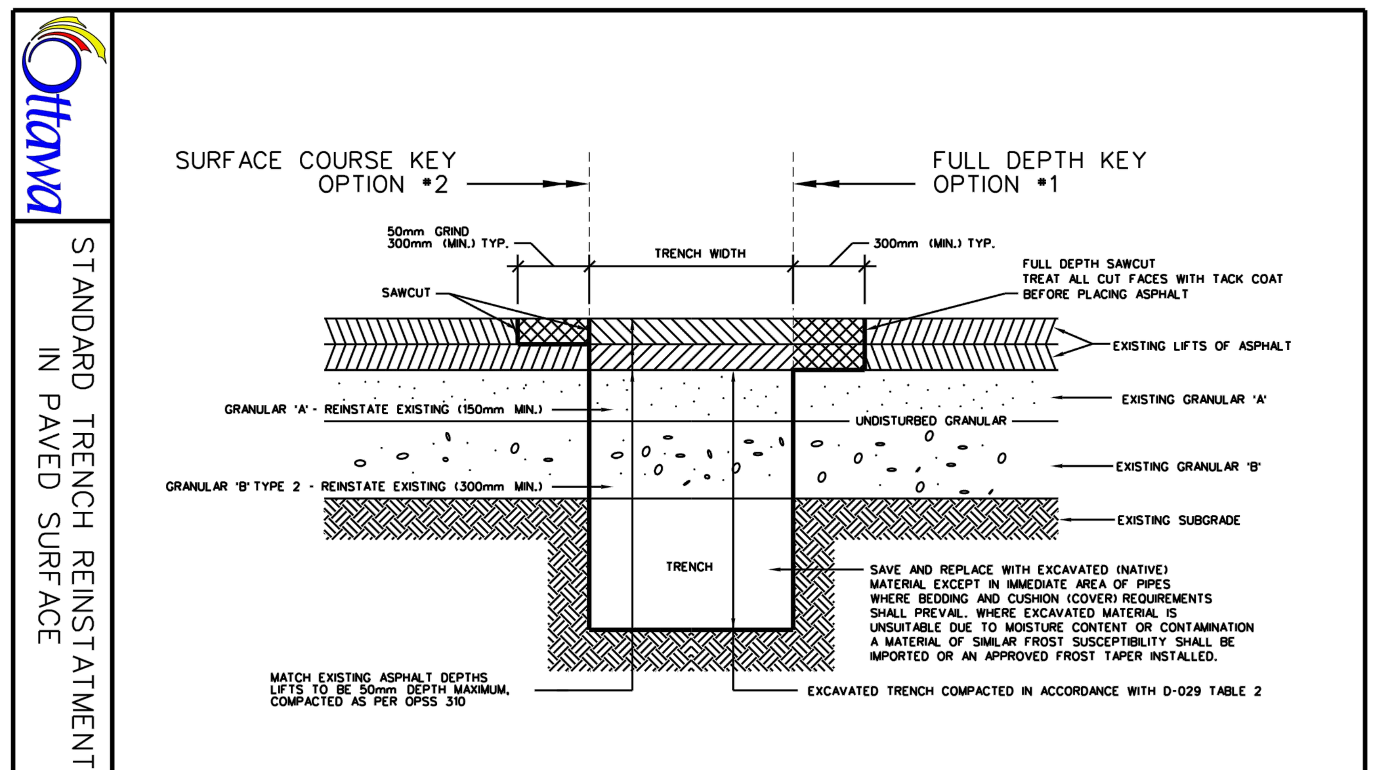
REFER TO ESC PLAN 119200-GR FOR FURTHER DETAILS

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

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 FILTER BAGS UNDER THE CATCHBASIN AND MANHOLE 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 ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
5) PROVIDE MUD MATS AT ALL CONSTRUCTION ACCESS POINTS TO MINIMIZE SEDIMENT TRANSPORT OFFSITE.
6) EROSION AND SEDIMENT CONTROL MEASURES MAY BE MODIFIED IN THE FIELD AT THE DISCRETION OF THE CITY OF OTTAWA SITE INSPECTOR OR CONSERVATION AUTHORITY.



TYPICAL 2.0m WIDE SWALE WITH SUBDRAIN DETAIL
SCALE NTS



Ottawa

STANDARD TRENCH REINSTATMENT IN PAVED SURFACE

DATE: MAY 2001
REV. DATE: MARCH 2017
DWG. No.: R10

NOTES

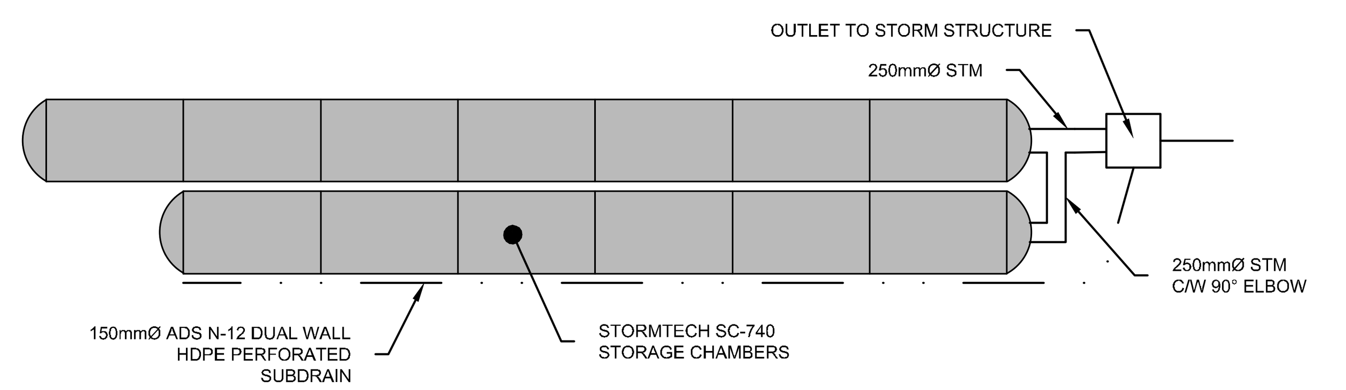
1. ALL EXISTING ASPHALT TO BE SAW CUT.
2. UNLESS SPECIFIED ELSEWHERE, SURFACE COURSE ASPHALT SUPERPAVE 12.5mm LEVEL B (PG58-34) AND BASE COURSE ASPHALT SUPERPAVE 19.0mm LEVEL B (PG58-34) IS TO BE USED.
3. UNLESS SPECIFIED ELSEWHERE, WHERE EXISTING PAVEMENT STRUCTURE EXCEEDS 150mm IN DEPTH, ASPHALT REINSTATEMENT SHALL BE 150mm AND GRANULAR "A" FOR THE REMAINDER.
4. UNLESS SPECIFIED ELSEWHERE, WHERE AN UNDERLYING LAYER OF CONCRETE PAVEMENT EXISTS, REINSTATEMENT SHALL CONSIST OF 150mm OF SUPERPAVE 19.0mm LEVEL B (PG58-34) COMPACTED IN LIFTS.
5. UNLESS SPECIFIED ELSEWHERE, HOT MIX ASPHALT PLACEMENT AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH F-3130.

SEWER NOTES:

1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
STORM / SANITARY MANHOLE (1200Ø)	701.010	OPSD
CATCHBASIN (600x600mm)	705.010	OPSD
CB, FRAME & COVER	400.020	OPSD
STORM / SANITARY MH FRAME	S25	CITY OF OTTAWA
SANITARY COVER	S24	CITY OF OTTAWA
STORM COVER (CLOSED)	S24.1	CITY OF OTTAWA
STORM COVER (OPEN)	S28.1	CITY OF OTTAWA
SEWER TRENCH	S6 & S7	CITY OF OTTAWA
STORMTECH CHAMBERS	SC-740	ADS Inc.
STORM SEWER < 450mmØ	PVC SDR 35 (UNLESS SPECIFIED OTHERWISE)	
SANITARY SEWER	PVC DR 35	CITY OF OTTAWA

3. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0%.
3. ALL STORM AND SANITARY SERVICE LATERALS SHALL BE EQUIPPED WITH BACKFLOW PREVENTION DEVICES AS PER THE CITY OF OTTAWA STANDARD DETAILS S14 AND S14.1 OR S14.2.
4. ALL WEEPING TILE CONNECTIONS TO BE MADE TO THE PROPOSED STORM SEWER SYSTEM DOWNSTREAM OF ANY INLET CONTROL DEVICES.
5. ALL CATCHBASINS AND CATCHBASIN MANHOLES TO BE PROVIDED WITH MINIMUM 3 METER LONG PERFORATED SUBDRAINS WHICH EXTEND IN FOUR ORTHOGONAL DIRECTIONS OR LONGITUDINALLY WHEN PLACED ALONG A CURB. SUBDRAIN INVERTS SHOULD BE APPROXIMATELY 300mm BELOW SUBGRADE LEVEL. THE SUBGRADE SURFACE SHOULD BE SHAPED TO PROMOTE WATER FLOW TO THE DRAINAGE LINES.
6. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 2.0m COVER PER INSULATION DETAIL FOR SHALLOW SEWERS. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
7. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
8. STORM MANHOLES AND CBMHS ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED.
9. ALL CATCHBASINS, MANHOLES AND/OR CATCHBASIN MANHOLES THAT ARE TO HAVE ICD'S INSTALLED WITHIN THEM ARE TO HAVE 600mm SUMPS.
10. ALL CATCHBASINS AND CATCHBASIN MANHOLES ARE TO BE PROVIDED WITH MINIMUM 3 METER LONG PERFORATED SUBDRAINS WHICH EXTEND IN TWO DIRECTIONS LONGITUDINALLY AT THE SUBGRADE LEVEL.
11. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES AND RE CCTV PRIOR TO ACCEPTANCE.
12. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
13. CLAY SEALS SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL INVESTIGATION SUCH THAT, "THE SEALS SHOULD BE AT LEAST 1.5 M LONG AND SHOULD EXTEND FROM TRENCH WALL TO TRENCH WALL. GENERALLY, THE SEALS SHOULD EXTEND FROM THE FROST LINE AND FULLY PENETRATE THE BEDDING, SUBBEDDING AND COVER MATERIAL. THE BARRIERS SHOULD CONSIST OF RELATIVELY DRY AND COMPACTABLE BROWN SILTY CLAY PLACED IN MAXIMUM 225 MM THICK LOOSE LAYERS AND COMPACTED TO A MINIMUM OF 95% OF THE MATERIAL'S SPMDD."



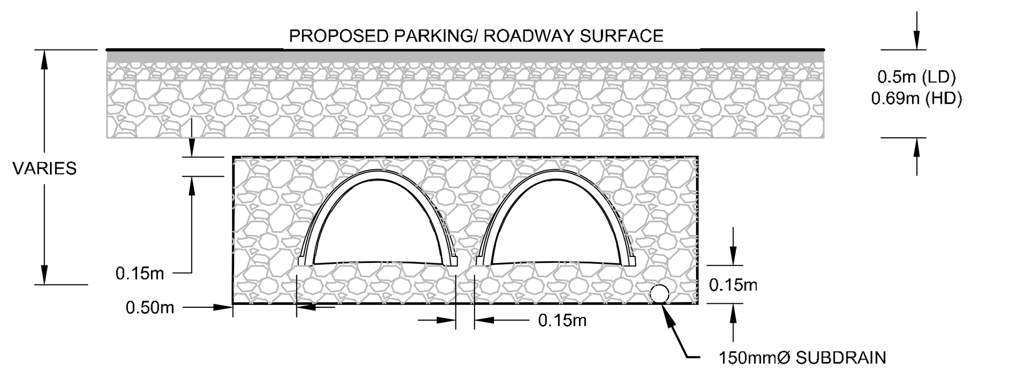
STORMTECH CHAMBER PLAN VIEW
SCALE 1:100

WATERMAIN NOTES:

1. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER	W25	CITY OF OTTAWA
WATERMAIN	PVC DR 18	

2. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.5m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.



TYPICAL CHAMBER CROSS SECTION
SCALE 1:50

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1.	ISSUED FOR SITE PLAN SUBMISSION	JAN 17/20	CJR

SCALE

DESIGN ARM
CHECKED CJR
DRAWN ARM
CHECKED CJR
APPROVED JLS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
C.J. RUDDLE
MAR 30/20
PROVINCE OF ONTARIO

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LOCATION
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DRAWING NAME
NOTES AND DETAILS

PROJECT No. 119200
REV REV 2
DRAWING No. 119200 - ND

D07-12-20-0003

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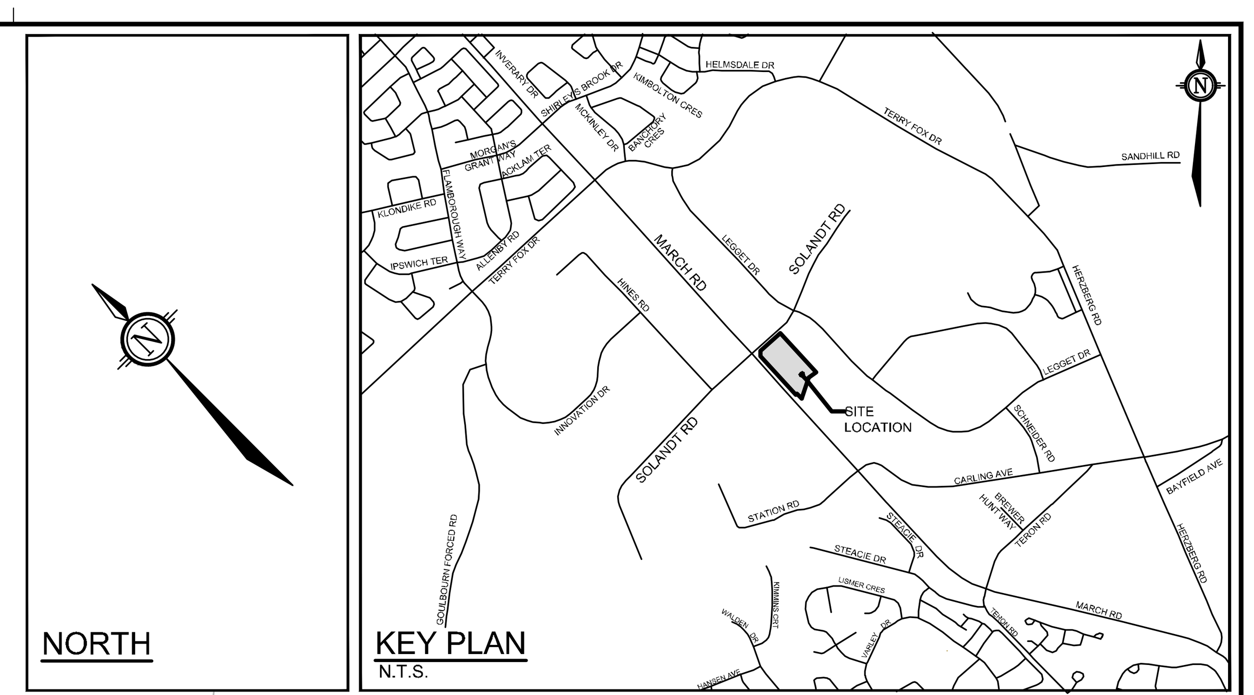
ASPHALT AND CONCRETE SURFACES TO BE REMOVED

X REMOVAL

REMOVALS NOTES:

1. OBTAIN ALL APPROVALS AND PERMITS FROM THE CITY OF OTTAWA PRIOR TO ANY REMOVAL WORK OR CONSTRUCTION.
2. ALL STRUCTURES AND PIPES WITHIN THE PROPOSED BUILDING AREA TO BE REMOVED AND DISPOSED OF OFF SITE.
3. REFER TO LANDSCAPE DRAWINGS AND TREE CONSERVATION REPORT BY RUHLAND & ASSOCIATES FOR LANDSCAPING REMOVAL INFORMATION



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NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
1.	SUBMITTED TO CITY IN RESUBMISSION PACKAGE	MAR 27/20	CJR

SCALE 1:400

1:400 — 0 4 8 12 16

DESIGN
CHECKED
DRAWN
CHECKED
APPROVED

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
C.J. RUDDLE
MAR 30/20
PROVINCE OF ONTARIO

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LOCATION
3026 SOLANDT ROAD, OTTAWA ON.

DRAWING NAME
REMOVALS PLAN

PROJECT No. 119200
REV REV. 1
DRAWING No. 119140-REM

D07-12-20-0003

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