EDENSHAW SSR DEVELOPMENTS LIMITED

STORMWATER MANAGEMENT REPORT

49 SOUTH SERVICE ROAD - MISSISSAUGA

OCTOBER 13, 2022

STORMWATER MANAGEMENT REPORT

49 SOUTH SERVICE ROAD-MISSISSAUGA

EDENSHAW SSR DEVELOPMENTS LIMITED

REZONING APPLICATION

PROJECT NO.: 221-08605-00
DATE: OCTOBER 2022

WSP
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON, CANADA L3T 0A1

WSP.COM

QUALITY MANAGEMENT

ISSUE/REVISION FIRST ISSUE

Remarks	Rezoning Application				
Date	2022/10/13				
Prepared by	Ramin Jalalirad, EIT				
Signature					
Checked by	Vladimir Nikolic, P. Eng				
Signature					
Project number	221-08605				

SIGNATURES

PREPARED BY

Ramin Jalalirad, EIT
Designer, Water Resources

REVIEWED BY

Vladimir Nikolic, P.Eng.
Project Engineer

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PRODUCTION TEAM

CLIENT	EDENSHAW SSR DEVELOPMENTS LIMITED
WSP	
Designer	Ramin Jalalirad, EIT
Project Engineer	Vladimir Nikolic, P.Eng.

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1 INTRODUCTION

1.1 SCOPE

WSP has been retained by EDENSHAW SSR DEVELOPMENTS LIMITED to prepare a Stormwater Management (SWM) Report to support rezoning application for the proposed intensification of the property located at 49 South Service RD in the City of Mississauga. The proposed development will be a 26-storey multi-unit residential building with a total of 352 units.

This SWM report examines the potential water quality, quantity, balance, and erosion impacts of the proposed residential development and summarizes how each will be addressed in accordance with the City of Mississauga's Development Requirements (2016).

1.2 SITE LOCATION

The site occupies an area of approximately 0.44 ha. The site is located at the east corner of the Queen Elizabeth Way (QEW) and Hurontario Street and north of the Service RD in the City of Mississauga. The location of the proposed re-development is illustrated in Figure 1.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

- Determine the site-specific stormwater management requirements to ensure that the development is in conformance with the City of Mississauga criteria;
- Evaluate various stormwater management practices that meet the requirements of the City and recommend a preferred strategy; and,
- Prepare a stormwater management report documenting the strategy along with the technical information necessary for the justification and sizing of the proposed stormwater management facilities.

1.4 DESIGN CRITERIA

The City of Mississauga issued a Development Requirements Manual in 2016 to provide direction on the management of rainfall and runoff inside the City's jurisdiction. A summary of the stormwater management criteria applicable to this project follows:

- **Runoff Volume Reduction** – The City's Design Manual requires the first 5 mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration or technical reuse. There are no applicable subwatershed studies or master drainage plans for the subject site area published that indicates any higher minimum requirement.
- **Water Quality** – The City's Design Requirements specify that water quality control is to be implemented in accordance with the applicable Master Drainage Plan or Subwatershed Plan, the City's Stormwater Quality Control Strategy (January 1996) and the MECP (formerly MOECC) Stormwater Management Practices Planning and Design Manual. Based on the MECP 's Manual, the long-term removal of 80% of the TSS loading is required for this site.
- **Erosion Control** – As indicated in the City of Mississauga's Development Requirements, sites under one hectare are not required to provide long term erosion control measures.
- **Water Quantity Control and Discharge to Municipal Infrastructure** – Through use of Table 2.01.03.03a of The City of Mississauga's Development Requirements and correspondence with City, it has been determined that water quantity control for this site will be limited by the existing storm sewer capacity. Additionally, the site's post

development release rate would be limited to the 2-year pre-development release rate with a runoff coefficient of 0.5 to provide relief to the system.

@2022 Google - Map Canada

CLIENT

EDENSHAW SSR DEVELOPMENTS LIMITED

TITLE

49 SOUTH SERVICE ROAD

SITE LOCATION

wsp

Checked A.M.B.	Drawn AutoCAD/M.S.L.	
Date OCTOBER 2022	Proj. No. 221–08605–00	
Scale N.T.S.	Figure No. 1	Gr.No. 00

FIGURE 1-221-08605.dwg FIGURE 1 C:\Users\stlouism\ACCDocs\WSP Canada projects (AMER)\LDO\Files\221-08605 49 South Service Road\Mun\SWM\FIGURES\ Oct 05, 2022 - 12:52pm

2 PRE-DEVELOPMENT CONDITIONS

2.1 GENERAL

Under pre-development conditions, the 0.44 ha site is occupied by a home to the Ontario Provincial Police (OPP) and consists of two (2) existing buildings, a main institutional building, and a separate garage. Parking lots surround the buildings, and the remaining area is landscaped. The pre-development runoff coefficient is estimated at 0.52. Under pre-development conditions, the site drains to the southeast, and ultimately, all flows from the site are collected by the 425mm/ 525mm storm sewer on South Service Road.

The allowable flow rate will be calculated by determining the existing 2-year flows for the site. The existing condition of the site is shown in Figure 2.

2.2 RAINFALL INFORMATION

The rainfall intensity for the site was calculated using the following equation: $I = A/(T + B)^C$

Where;

I = rainfall intensity in mm/hour

T = time of concentration in hours

A, B, and C = constant parameters (see below)

The parameters (A, B, C) for use in the City of Mississauga are summarized in Table 2.1.

Table 2.1 Rainfall Parameters

RETURN PERIOD (years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.60	4.60	4.60	4.60	4.70	4.90
C	0.78	0.78	0.78	0.78	0.78	0.78

Source: City of Mississauga's Development Requirements (2016)

An initial time of concentration, T_C, of 15 minutes (or 0.25 hours) is recommended in the City of Mississauga's Development Requirements.

2.3 ALLOWABLE FLOW RATES

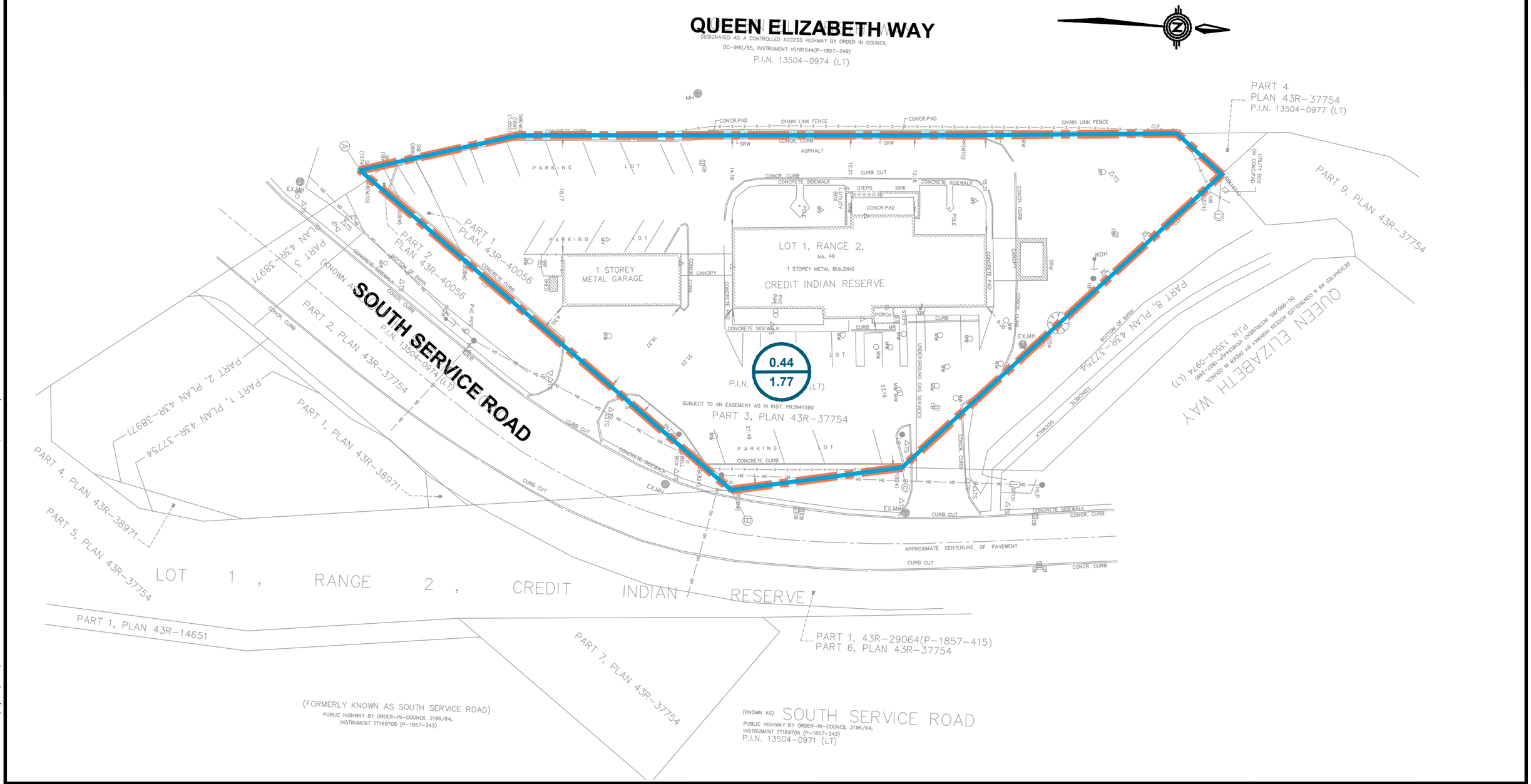
The City of Mississauga requires that the site's post-development discharge rates for the 2-, 5-, 10-, 25-, 50- and 100-year storm events do not exceed the 2-year pre-development flow rates with the maximum runoff coefficient of 0.5. Consequently, the 2-year pre-development discharge from the site, and, therefore, the allowable release rate from the subject site, is 36.4 l/s which was calculated using the runoff coefficient value of 0.5.

The calculated peak flow rates for the site under pre-development conditions are summarized below in Table 2.2. Detailed calculations are contained within **Appendix A**.

Table 2.2 Pre-Development Peak Discharge Rates and Allowable Release Rates

RETURN PERIOD (years)	RAINFALL INTENSITY, I (mm/hour)	ALLOWABLE RELEASE RATE, Q_A (L/s)*
2	59.9	**36.4**
5	80.5	49.0
10	99.2	60.3
25	113.9	69.3
50	127.1	77.4
100	140.7	85.6

** Are of 0.44 ha existing site area with a maximum runoff coefficient C=0.5 and time of concentration of 15 minutes*



LEGEND

- PROJECT BOUNDARY
- SUB-CATCHMENT BOUNDARY
- 100 / 1.77 — DRAINAGE AREA (ha) / AVERAGE RUNOFF COEFFICIENT

-5 0 10 20m

CLIENT
EDENSHAW SSR DEVELOPMENTS LIMITED

TITLE
49 SOUTH SERVICE ROAD

EXISTING CONDITIONS

Checked A.M.B.	Drawn AutoCAD/M.S.L.
Date OCTOBER 2022	Proj. No. 221-08605-00
Scale AS SHOWN	Figure No. 2
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FIGURE 2-221-08605.dwg FIGURE 2 C:\Users\stlouism\ACCDocs\WSP Canada projects (AMER)\LDO\Files\221-08605 49 South Service Road\Mun\SWM\FIGURES\ Oct 05, 2022 - 12:53pm

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed development consists of the construction of a new 26-storey multi-unit residential building. The building provides an estimated 352 residential units and three levels of underground parking. The parking structure underlies the northwest portion footprint of the site. Vehicular access to the site continues to be provided via the proposed driveway connecting to South Service Road.

An area breakdown for the proposed site layout is provided below in Table 3.1. Please refer to Figure 3 for details of the post-development conditions.

Table 3.1 Proposed Land-Use Area Breakdown

	LAND-USE	AREA (m^2)	2-YEAR RUNOFF COEFFICIENT, C	IMPERVIOUSNESS
Captured & Controlled	Impervious Roof Area	1,233.0	0.90	100%
	Soft/Pervious Landscaping	1,355.3	0.25	0%
	Controlled At Grade Impervious / Walkway / Driveway	1,569.8	0.90	100%
	Uncontrolled At-Grade Impervious	220.0	0.9	100%
	Total (or Average):	**4,378**	**0.70**	**69%**

3.2 RUNOFF VOLUME REDUCTION

The City of Mississauga requires that the first 5 mm of rainfall shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use. Note that the City of Mississauga does not typically allow initial abstractions when calculating the runoff reduction volume, and, therefore, the initial abstraction will be disregarded. Since the ground water level is high, infiltration is not feasible for this project (please see the accompanying hydrogeology report prepared by Palmer 2022). A water reuse volume stored within the stormwater cistern is the mechanism proposed to achieve the water balance requirement.

The total volume of 5 mm runoff retention from the site is 21.89 m^3. Table 3.2 shows the required storage volume to meet the water balance target for the site. Calculations are provided in **Appendix A**.

Table 3.2 Water Balance Summary

SURFACE TYPE	AREA (m^2)	5 MM VOLUME (m^3)
Impervious Roof Area	1,233.0	6.2
Soft/Pervious Landscaping	1,355.3	6.8
Controlled At Grade Impervious / Walkway / Driveway	1,569.8	7.8
Uncontrolled At-Grade Impervious	220.0	1.1
Total Site Area	**4,378**	**21.89**

The proposed rainwater reuse options may include irrigation of the trees and soft landscaping. The reuse methods for the captured stormwater are still being assessed in conjunction with the mechanical design of the building's water supply systems. It is assumed that enough opportunities exist to reuse the sump volume within a reasonable time frame, typically 72-hour period.

LEGEND

- PROJECT BOUNDARY
- SUB-CATCHMENT BOUNDARY
- 100 / 1.77 — DRAINAGE AREA (ha) / AVERAGE RUNOFF COEFFICIENT
- AT GRADE IMPERVIOUS
- PERVIOUS LANDSCAPE
- IMPERVIOUS ROOF

-5 0 10 20m

CLIENT
EDENSHAW SSR
DEVELOPMENTS LIMITED

TITLE
49 SOUTH SERVICE ROAD

PROPOSED CONDITIONS

Checked A.M.B.	Drawn AutoCAD/M.S.L.
Date OCTOBER 2022	Proj. No. 221-08605-00
Scale AS SHOWN	Figure No. 3
	Gr.No. -

FIGURE 3-221-08605.dwg FIGURE 3 C:\Users\stlouism\ACCDocs\WSP Canada projects (AMER)\LDOFiles\221-08605 49 South Service Road\Mun\SWM\FIGURES\ Oct 05, 2022 - 12:48pm

3.3 WATER QUALITY CONTROL

As mentioned in Section 1.4 of this report, the Development Requirements Manual (City of Mississauga) states that the site is required to target a long-term removal of 80% total suspended solids (TSS) on an annual loading basis.

Architectural plans indicate that the majority of the area will be covered by building rooftop and walkways surfaces. As those areas are free of typical sediment-generating activities (i.e., vehicle traffic) runoff will leave the site effectively unchanged and can be considered clean for the purposes of water quality assessment. As all flows are conveyed to the underground tank (please see Section 3.5), which will detain water onsite, an OGS connected upstream of the storm sewer is recommended for the site.

A SFPF0608 (CIP) with six 18" high cartridges are recommended to meet TSS removal requirements. This oil-grit separator is a filter-based system and has a removal rate of over 80%. The unit is sized to treat the site's uncontrolled driveway / at-grade surfaces. The remainder of the site will be captured and sent to the cistern directly. Treatment unit specifications as provided by Echelon Environmental are located in **Appendix C** of this report.

3.4 EROSION CONTROL

The City of Mississauga Design guidelines do not specify long term erosion control requirements for sites under 1.0 ha. Since the site area for this application is about 0.44 ha, and the site discharges to the existing storm sewer network on South Service Road, no additional long-term site-specific erosion controls are recommended. However, proper erosion and sediment control measures during construction should be installed. The details will be outlined in the Erosion and Sediment Control Plan and should conform to the city requirements.

3.5 GROUNDWATER

A hydrogeological investigation prepared under separate cover was carried out by Palmer in August 2022. It assessed the groundwater conditions, soil characteristics, dewatering requirements and tested for the presence of groundwater contamination.

The City of Mississauga requires that all groundwater shall be discharged to the storm sewer. The long term (permanent) groundwater flow rate is 65,000 L/day which is equivalent to 0.75 L/s. The groundwater will be piped to the proposed cistern; as such, 0.75 L/s has been accounted as a base flow to the SWM cistern node in the HydroCAD model. Note that a groundwater treatment system will be required, designed by others, should exceed the City's water quality requirements. The hydrogeological investigation report will be submitted under separate cover.

3.6 WATER QUANTITY CONTROL

The City of Mississauga requires that water quantity control be designed in accordance with the capacity of the local municipal storm sewer. The allowable release rate to the municipal storm sewer system from the development site will be limited to the 2-year pre-development flow rate discussed in Section 2.3.

A HydroCAD model of the subject site was developed and utilized to determine the required storage volume in the stormwater cistern, and to calculate the discharge rates achieved by the proposed flow controls under all storm events. The Modified Rational Method (an inherent subroutine of the HydroCAD software) has been used for the modelling exercise. There will be a tank in the system at P1 level.

An emergency overflow manhole will be provided at the top of the cistern, with discharge to street level and the adjacent right of way. This will prevent flow backing up into the building pipework if the primary outlet is blocked, or if a storm event in excess of the 100-year return period occurs.

The underground cistern was designed to provide a storage volume of 146.4 m^3, with a base area of 97.6 m^2 and a height of 1.5 m and will be located in the parking structure. The tank must be waterproofed and sealed as the site is in an area with high groundwater table. Cistern outflow control towards the South Service Road storm sewer system (existing 525 mm sewer pipe) will be provided by a 100 mm orifice tube outlet installed at 0.23 m above the tank bottom. A summary of the modeling result is presented in Table 3.3. Please see the accompanying Functional Servicing Report (FSR) prepared by WSP under separate cover for cistern location details.

Uncontrolled at-grade areas were modelled to ensure they were considered in the allowable release rate. The results show that the site's combined discharge rate does not exceed the allowable release rate. the long-term dewatering rate in the proposed condition will be 0.75 L/s, as such a base flow of 0.75 L/s has been added to the SWM Cistern node in the modelling.

A summary of the modelling results is provided in Table 3.3. Full HydroCAD modelling output is provided in **Appendix B**.

Table 3.3 Summary of Modelling Results

RETURN PERIOD (YEARS)	UTILIZED TANK STORAGE (m^3)	PEAK WATER ELEVATION IN TANK* (m)	POST-DEVELOPMENT TANK DISCHARGE RATE (L/s)	UNCONTROLLED AREA DISCHARGE RATE (L/s)	POST-DEVELOPMENT TOTAL DISCHARGE RATE (L/s)	TARGET RELEASE RATE (L/s)
2	56.7	0.58	15.3	1.9	16.5	**36.4**
5	70.5	0.72	18.5	2.6	20.2	
10	83.6	0.86	21.1	3.2	23.2	
25	102.8	1.05	24.5	3.9	27.1	
50	115.6	1.18	26.5	4.2	29.3	
100	**129.4**	1.33	28.5	4.6	**31.6**	

** Depth is from the internal cistern bottom.*

The modelling results demonstrate that the post-development peak flow rates for all events up to the 100-year storm are lower than the target release rate established in accordance with the City of Mississauga's Development Requirements Manual. The maximum required storage volume to control the 100-year post-development runoff is 129.4 m^3. Note that the sump volume is collected in the tank in P1 level assumed to be full at the start of each rainfall event in modelling.

The rainfall intensity and storm duration resulting in the site's peak discharge rate has been iteratively determined at t_d = 17 minutes (for the 100-year event).

4 CONCLUSIONS

A stormwater management plan has been prepared to support the Rezoning Application for the proposed redevelopment of 49 South Service RD in the City of Mississauga. The key points are summarized below.

RUNOFF VOLUME REDUCTION

The site is required to retain 5 mm of runoff from each rainfall event to be for reuse on site. Water balance will be addressed through a 21.89 m^3 sump volume (equivalent to the post-development 5 mm runoff volume) within the proposed cistern.

WATER QUALITY

Stormwater runoff from proposed impervious roof areas is considered clean and expected to leave the site effectively unchanged in terms of water quality. The 80% TSS removal of the runoff produced by the at-grade driveway surfaces on the site will be achieved through installation of a filter-based oil and grit separator. The recommended model is a SFPF0608 (CIP) with six 18" high cartridges.

EROSION CONTROL

The 5 mm on-site retention for storage used for water balance will meet The City of Mississauga's minimum 5 mm retention requirement to satisfy erosion control.

WATER QUANTITY

Runoff from all areas of the site will be directed to a 146.4 m^3 underground cistern. Post-development flows have been controlled to below 36.4 L/s in compliance with the target release rate to the municipal storm sewer system.

The report has demonstrated that the proposed stormwater management strategy will address stormwater management related impacts from this project in adherence with The City of Mississauga's Development Requirements Manual (2016).

Respectfully submitted,

WSP Canada INC

BIBLIOGRAPHY

— City of Mississauga. (2016, September). Development Requirements Manual.

— Credit Valley Conservation Authority and Toronto and Region Conservation Authority. (2010). Low Impact Development Stormwater Management Planning and Design Guideline Version 1.0, Toronto, Ontario, Final Report. Ontario, Canada.

APPENDIX

A STORMWATER MANAGEMENT CALCULATIONS

	Stormwater Management Calculations	Project:	49 South Service RD	No.:	221-08605
	Area Takeoffs	RJ	RJ	Date:	2022-10-14
		VN	VN	Checked:	2022-10-14

Page: 1

Total Area (m2)
4378.1

Existing			
Land Use	Area (m^2)	Runoff C	% Coverage
Impervious Roof Area	700	0.90	16%
Soft/Pervious Landscaping	2,575	0.25	59%
At-Grade Impervious	1,103	0.9	25%
Total Site Area:	4,378	0.52	100%

	Proposed						
	Land Use	Area (m^2)	Runoff C, 2, 5, 10	Runoff C, 25	Runoff C, 50	Runoff C, 100	Imperviousness
Controlled and Captured	Impervious Roof Area	1,233.0	0.90	0.99	1.00	1.00	100%
	Soft/Pervious Landscaping	1,355.3	0.25	0.28	0.30	0.31	0%
	Controlled At Grade Impervious / Walkway / Driveway	1,569.8	0.90	0.99	1.00	1.00	100%
	Uncontrolled At-Grade Impervious	220.0	0.90	0.99	1.00	1.00	100%
		-	0.90	0.99	1.00	1.00	100%
	Total Site Area:	4,378.1	0.70	0.77	0.78	0.79	69%

Project:	49 South Service RD	No.:	211-10685	
By:	RJ	Date:	2022-10-14	Page:
Checked:	VN	Checked:	2022-10-14	2

Subject: Stormwater Management Calculations - Existing Site Peak Flows

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CIA$

Where: Q = Peak flow rate (litres/second)
C = Runoff coefficient
I = Rainfall intensity (mm/hour)
A = Catchment area (hectares)

Site Area, A	**0.44**	hectares
Pre-Development Runoff Coefficient, C	0.52	

Rainfall Intensity is calculated based on City of Mississauga Intensity-Duration-Frequency (IDF) Equations:

$$I = \frac{a}{(t+b)^c}$$

Where: I = Rainfall Intensity in mm/hr
T = Time of Concentration in minutes, use
a, b, c = Rainfall parameters used by City of Mississauga

Return Period (Years)	2	5	10	25	50	100
a	610	820	1010	1160	1300	1450
b	4.60	4.60	4.60	4.60	4.70	4.90
c	0.78	0.78	0.78	0.78	0.78	0.78
Runoff Coefficent C*	0.52	0.52	0.52	0.57	0.62	0.65
T (mins) **	15	15	15	15	15	15
T (hrs)	0.250	0.250	0.250	0.250	0.250	0.250
I (mm/hr)	59.9	80.5	99.2	113.9	127.1	140.7
Q (litres/sec)	37.7	50.7	62.5	78.9	96.1	110.8
Q (m^3/sec)	0.038	0.051	0.062	0.079	0.096	0.111

* Note that adjustment factors are applied to the runoff coefficent for larger, less frequent storms for 10 to 100 year events as per City of Mississauga Development Requirements Manual

** Note recommended minimum value for time of concentration for small sites (<2.0ha) is 15 minutes.

Project:	49 South Service RD	No.:	211-10685	
By:	RJ	Date:	2022-10-14	Page:
Checked:	VN	Checked:	2022-10-14	4

Subject: Stormwater Management Calculations - Allowable Release Rate

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CIA$

Where: Q = Peak flow rate (litres/second)
C = Runoff c 721.6783119
I = Rainfall intensity (mm/hour)
A = Catchment area (hectares)

660

Site Area, A **0.44** hectares

Pre-Development Runoff Coefficient, C* 0.50

This area will be controlled down to its existing 2-year release rate to improve existing conditions. The allowable flow rate will be the sum of the site's 2-year existing flow rate with a runoff coefficient of 0.5 and the existing 2-year external area flow rate.

*Section 2.01.03.03 of The City of Mississauga's Development Requirements Manual (2016) states a maximum of 0.5 may be used for the pre-development runoff coefficient.

Rainfall Intensity is calculated based on City of Mississauga Intensity-Duration-Frequency (IDF) Equations: $I = \frac{a}{(t+b)^c}$

Where: I = Rainfall Intensity in mm/hr
T = Time of Concentration in minutes, use
a, b, c = Rainfall parameters used by City of Mississauga

Return Period (Years)	2	5	10	25	50	100	
a	610	820	1010	1160	1300	1450	36.4
b	4.60	4.60	4.60	4.60	4.70	4.90	49.0
c	0.78	0.78	0.78	0.78	0.78	0.78	60.3
T (mins) **	15	15	15	15	15	15	69.3
T (hrs)	0.250	0.250	0.250	0.250	0.250	0.250	77.4
I (mm/hr)	59.9	80.5	99.2	113.9	127.1	140.7	85.6
Q Site (litres/sec)	**36.4**	49.0	60.3	69.3	77.4	85.6	
Q (area A) (m3/sec)	0.04	0.05	0.06	0.07	0.08	0.09	

* Note that adjustment factors are applied to the runoff coefficent for larger, less frequent storms for 10 to 100 year events as per City of Mississauga Development Requirements Manual

** Note recommended minimum value for time of concentration for small sites (<2.0ha) is 15 minutes.

Through review of the CVC's guidelines, City of Mississauga's Development Requirements Manual (2016), correspondence with City Staff and through downstream analysis, it was determined that the downstream sewer capacity was the governing factor. It was decided that the release rate to the municipal storm sewer system would be limited to the 2 year pre-development release rate to provide relief to the municipal storm sewer system.

Resulting allowable release rate to municipal storm sewer system is therefore 36.4 litres/second.

In this case, best efforts on-site runoff retention will be provided such that the site retains all runoff from 5 mm storm event for rainwater reuse.

The current area measurements and land use types for the site are as follows:

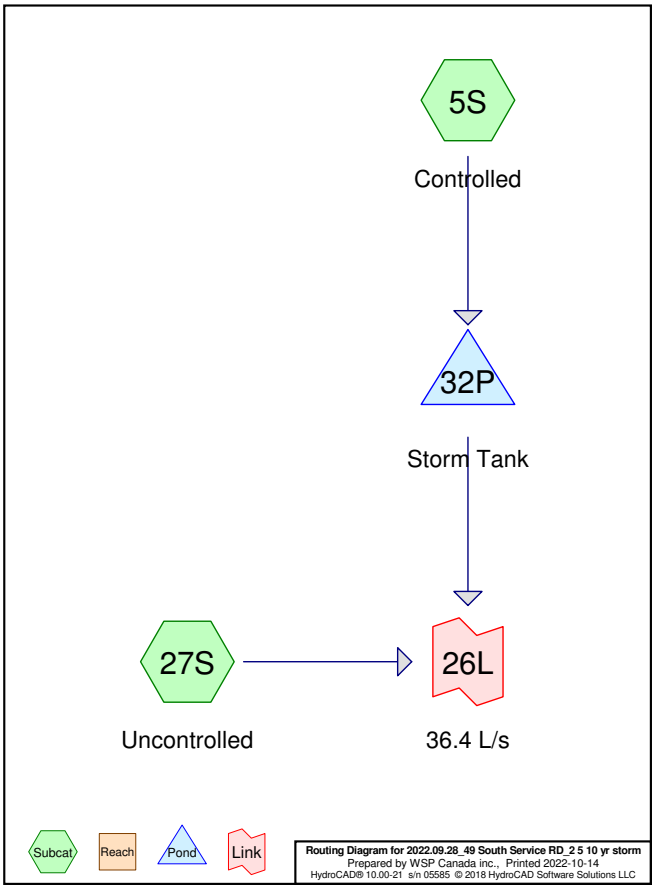
	Land Use	Area (m^2)	2,5,10 Year Runoff C	Imperviousness	CN
Controlled and Captured	Impervious Roof Area	1,233	0.90	100%	98
	Soft/Pervious Landscaping	1,355	0.25	0%	74
	Controlled At Grade Impervious / Walkway / Driveway	1,570	0.90	100%	98
	Uncontrolled At-Grade Impervious	220	0.90	100%	98
	Totals	4,378	0.70	69%	91

Surface Type	Area (m^2)	5 mm Volume (m^3)
Impervious Roof Area	1,233	6.2
Soft/Pervious Landscaping	1,355	6.8
Controlled At Grade Impervious / Walkway / Driveway	1,570	7.8
Uncontrolled At-Grade Impervious	220	1.1
		0.0
Total Site Area:	**4,378**	**21.9**

Therefore, volume of runoff during a 5 mm storm event: 21.89 m^3

APPENDIX

B HYDROCAD MODEL RESULTS



Area Listing (all nodes)

Area (hectares)	C	Description (subcatchment-numbers)
0.1570	0.90	At Grade Impervious / Walkway (5S)
0.0220	0.90	At Grade-Impervious (27S)
0.1233	0.90	Impervious Roof (5S)
0.1355	0.25	Soft Landscaping (5S)
0.4378	**0.70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (hectares)	Soil Group	Subcatchment Numbers
0.0000	HSG A	
0.0000	HSG B	
0.0000	HSG C	
0.0000	HSG D	
0.4378	Other	5S, 27S
0.4378		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatc Number
0.0000	0.0000	0.0000	0.0000	0.1570	0.1570	At Grade Impervious / Walkway	
0.0000	0.0000	0.0000	0.0000	0.0220	0.0220	At Grade-Impervious	
0.0000	0.0000	0.0000	0.0000	0.1233	0.1233	Impervious Roof	
0.0000	0.0000	0.0000	0.0000	0.1355	0.1355	Soft Landscaping	
0.0000	**0.0000**	**0.0000**	**0.0000**	**0.4378**	**0.4378**	**TOTAL AREA**	

Time span=0.00-6.00 hrs, dt=0.01 hrs, 601 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: Controlled Runoff Area=4,158.1 m² 0.00% Impervious Runoff Depth=14 mm
Tc=15.0 min C=0.69 Runoff=0.0276 m³/s 0.058 Ml

Subcatchment 27S: Uncontrolled Runoff Area=220.0 m² 0.00% Impervious Runoff Depth=18 mm
Tc=15.0 min C=0.90 Runoff=0.0019 m³/s 0.004 Ml

Pond 32P: Storm Tank Peak Elev=0.581 m Storage=56.7 m³ Inflow=0.0283 m³/s 0.073 Ml
Outflow=0.0153 m³/s 0.070 Ml

Link 26L: 36.4 L/s Inflow=0.0165 m³/s 0.074 Ml
Primary=0.0165 m³/s 0.074 Ml

Total Runoff Area = 0.4378 ha Runoff Volume = 0.062 Ml Average Runoff Depth = 14 mm
100.00% Pervious = 0.4378 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 5S: Controlled

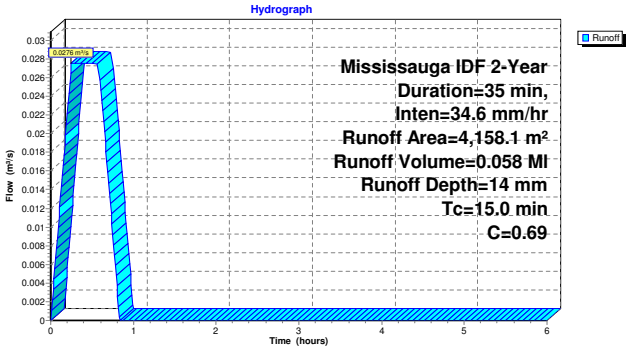
Runoff = 0.0276 m³/s @ 0.25 hrs, Volume= 0.058 Ml, Depth= 14 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 2-Year Duration=35 min, Inten=34.6 mm/hr

Area (m²)	C	Description
1,233.0	0.90	Impervious Roof
1,355.3	0.25	Soft Landscaping
1,569.8	0.90	At Grade Impervious / Walkway
4,158.1	0.69	Weighted Average
4,158.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 5S: Controlled



Summary for Subcatchment 27S: Uncontrolled

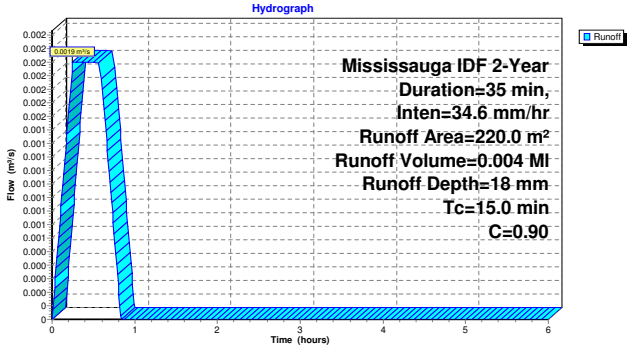
Runoff = 0.0019 m³/s @ 0.25 hrs, Volume= 0.004 Ml, Depth= 18 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 2-Year Duration=35 min, Inten=34.6 mm/hr

Area (m²)	C	Description
220.0	0.90	At Grade-Impervious
220.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 27S: Uncontrolled



Summary for Pond 32P: Storm Tank

Inflow Area = 0.4158 ha, 0.00% Impervious, Inflow Depth > 18 mm for 2-Year event
Inflow = 0.0283 m³/s @ 0.25 hrs, Volume= 0.073 Ml, Incl. 0.0007 m³/s Base Flow
Outflow = 0.0153 m³/s @ 0.70 hrs, Volume= 0.070 Ml, Atten= 46%, Lag= 27.1 min
Primary = 0.0153 m³/s @ 0.70 hrs, Volume= 0.070 Ml

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.230 m Surf.Area= 97.6 m² Storage= 22.4 m³
Peak Elev= 0.581 m @ 0.70 hrs Surf.Area= 97.6 m² Storage= 56.7 m³ (34.2 m³ above start)

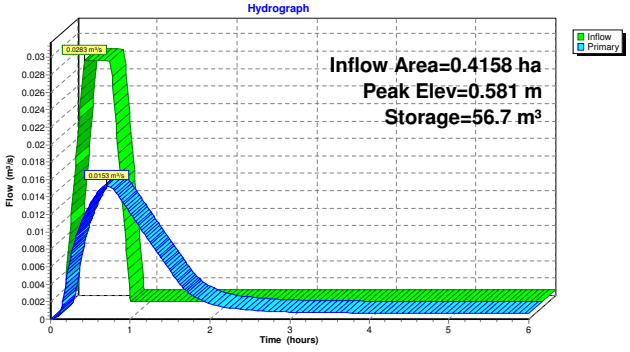
Plug-Flow detention time= 86.5 min calculated for 0.048 Ml (66% of inflow)
Center-of-Mass det. time= 25.3 min (82.5 - 57.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	146.4 m³	**13.01 mW x 7.50 mL x 1.50 mH Storm Tank**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.230 m	**100 mm Vert. Orifice/Grate** C= 0.800

Primary OutFlow Max=0.0153 m³/s @ 0.70 hrs HW=0.581 m (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.0153 m³/s @ 1.94 m/s)

Pond 32P: Storm Tank

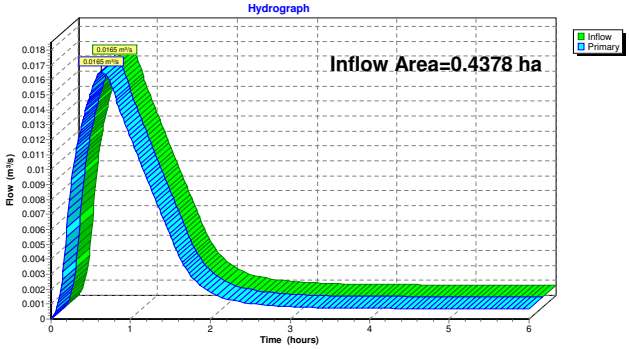


Summary for Link 26L: 36.4 L/s

Inflow Area = 0.4378 ha, 0.00% Impervious, Inflow Depth > 17 mm for 2-Year event
Inflow = 0.0165 m³/s @ 0.63 hrs, Volume= 0.074 Ml
Primary = 0.0165 m³/s @ 0.63 hrs, Volume= 0.074 Ml, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs

Link 26L: 36.4 L/s



Time span=0.00-6.00 hrs, dt=0.01 hrs, 601 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: Controlled Runoff Area=4,158.1 m² 0.00% Impervious Runoff Depth=19 mm
Tc=15.0 min C=0.69 Runoff=0.0371 m³/s 0.078 Ml

Subcatchment 27S: Uncontrolled Runoff Area=220.0 m² 0.00% Impervious Runoff Depth=24 mm
Tc=15.0 min C=0.90 Runoff=0.0026 m³/s 0.005 Ml

Pond 32P: Storm Tank Peak Elev=0.722 m Storage=70.5 m³ Inflow=0.0378 m³/s 0.093 Ml
Outflow=0.0185 m³/s 0.090 Ml

Link 26L: 36.4 L/s Inflow=0.0202 m³/s 0.096 Ml
Primary=0.0202 m³/s 0.096 Ml

Total Runoff Area = 0.4378 ha Runoff Volume = 0.083 Ml Average Runoff Depth = 19 mm
100.00% Pervious = 0.4378 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 5S: Controlled

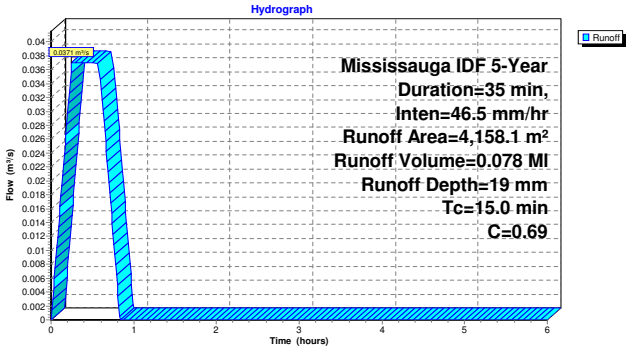
Runoff = 0.0371 m³/s @ 0.25 hrs, Volume= 0.078 Ml, Depth= 19 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 5-Year Duration=35 min, Inten=46.5 mm/hr

Area (m²)	C	Description
1,233.0	0.90	Impervious Roof
1,355.3	0.25	Soft Landscaping
1,569.8	0.90	At Grade Impervious / Walkway
4,158.1	0.69	Weighted Average
4,158.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 5S: Controlled



Summary for Subcatchment 27S: Uncontrolled

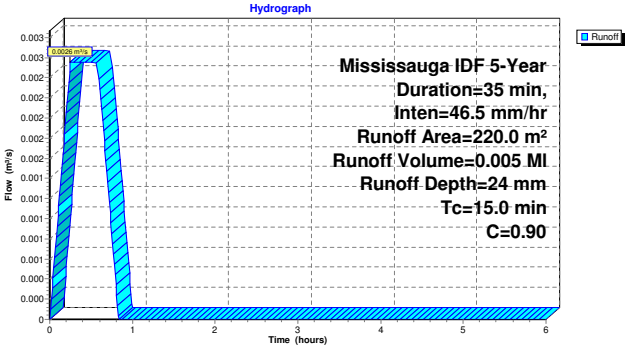
Runoff = 0.0026 m³/s @ 0.25 hrs, Volume= 0.005 Ml, Depth= 24 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 5-Year Duration=35 min, Inten=46.5 mm/hr

Area (m²)	C	Description
220.0	0.90	At Grade-Impervious
220.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 27S: Uncontrolled



Summary for Pond 32P: Storm Tank

Inflow Area = 0.4158 ha, 0.00% Impervious, Inflow Depth > 22 mm for 5-Year event
Inflow = 0.0378 m³/s @ 0.25 hrs, Volume= 0.093 Ml, Incl. 0.0007 m³/s Base Flow
Outflow = 0.0185 m³/s @ 0.71 hrs, Volume= 0.090 Ml, Atten= 51%, Lag= 27.8 min
Primary = 0.0185 m³/s @ 0.71 hrs, Volume= 0.090 Ml

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.230 m Surf.Area= 97.6 m² Storage= 22.4 m³
Peak Elev= 0.722 m @ 0.71 hrs Surf.Area= 97.6 m² Storage= 70.5 m³ (48.0 m³ above start)

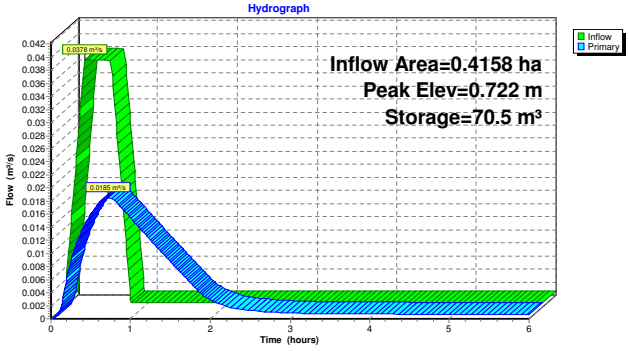
Plug-Flow detention time= 74.9 min calculated for 0.068 Ml (73% of inflow)
Center-of-Mass det. time= 29.3 min (79.6 - 50.2)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	146.4 m³	**13.01 mW x 7.50 mL x 1.50 mH Storm Tank**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.230 m	**100 mm Vert. Orifice/Grate** C= 0.800

Primary OutFlow Max=0.0185 m³/s @ 0.71 hrs HW=0.722 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.0185 m³/s @ 2.36 m/s)

Pond 32P: Storm Tank

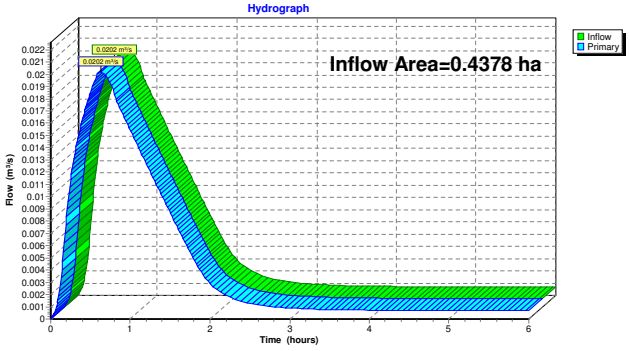


Summary for Link 26L: 36.4 L/s

Inflow Area = 0.4378 ha, 0.00% Impervious, Inflow Depth > 22 mm for 5-Year event
Inflow = 0.0202 m³/s @ 0.63 hrs, Volume= 0.096 Ml
Primary = 0.0202 m³/s @ 0.63 hrs, Volume= 0.096 Ml, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs

Link 26L: 36.4 L/s



Time span=0.00-6.00 hrs, dt=0.01 hrs, 601 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: Controlled Runoff Area=4,158.1 m² 0.00% Impervious Runoff Depth=23 mm
Tc=15.0 min C=0.69 Runoff=0.0457 m³/s 0.096 Ml

Subcatchment 27S: Uncontrolled Runoff Area=220.0 m² 0.00% Impervious Runoff Depth=30 mm
Tc=15.0 min C=0.90 Runoff=0.0032 m³/s 0.007 Ml

Pond 32P: Storm Tank Peak Elev=0.856 m Storage=83.6 m³ Inflow=0.0464 m³/s 0.111 Ml
Outflow=0.0211 m³/s 0.108 Ml

Link 26L: 36.4 L/s Inflow=0.0232 m³/s 0.115 Ml
Primary=0.0232 m³/s 0.115 Ml

Total Runoff Area = 0.4378 ha Runoff Volume = 0.103 Ml Average Runoff Depth = 23 mm
100.00% Pervious = 0.4378 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 5S: Controlled

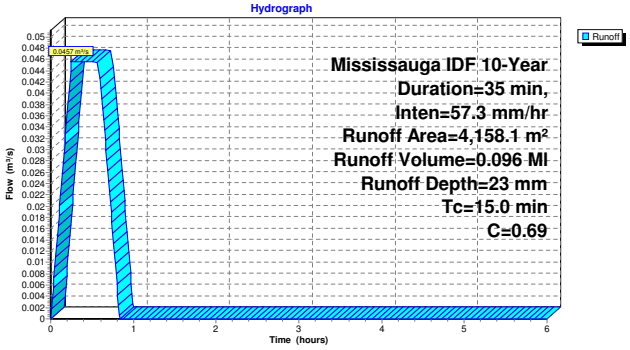
Runoff = 0.0457 m³/s @ 0.25 hrs, Volume= 0.096 Ml, Depth= 23 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 10-Year Duration=35 min, Inten=57.3 mm/hr

Area (m²)	C	Description
1,233.0	0.90	Impervious Roof
1,355.3	0.25	Soft Landscaping
1,569.8	0.90	At Grade Impervious / Walkway
4,158.1	0.69	Weighted Average
4,158.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 5S: Controlled



Summary for Subcatchment 27S: Uncontrolled

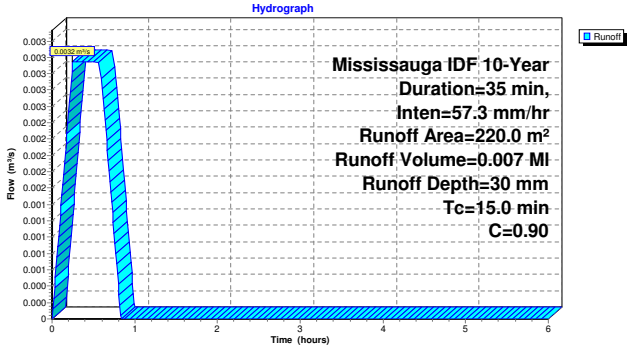
Runoff = 0.0032 m³/s @ 0.25 hrs, Volume= 0.007 Ml, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 10-Year Duration=35 min, Inten=57.3 mm/hr

Area (m²)	C	Description
220.0	0.90	At Grade-Impervious
220.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 27S: Uncontrolled



Summary for Pond 32P: Storm Tank

Inflow Area = 0.4158 ha, 0.00% Impervious, Inflow Depth > 27 mm for 10-Year event
Inflow = 0.0464 m³/s @ 0.25 hrs, Volume= 0.111 Ml, Incl. 0.0007 m³/s Base Flow
Outflow = 0.0211 m³/s @ 0.72 hrs, Volume= 0.108 Ml, Atten= 54%, Lag= 28.3 min
Primary = 0.0211 m³/s @ 0.72 hrs, Volume= 0.108 Ml

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.230 m Surf.Area= 97.6 m² Storage= 22.4 m³
Peak Elev= 0.856 m @ 0.72 hrs Surf.Area= 97.6 m² Storage= 83.6 m³ (61.1 m³ above start)

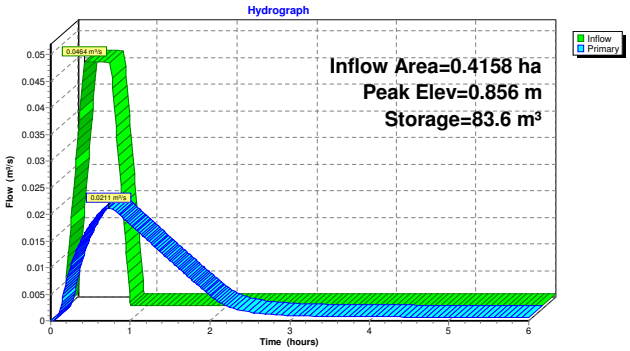
Plug-Flow detention time= 70.3 min calculated for 0.086 Ml (77% of inflow)
Center-of-Mass det. time= 32.8 min (78.9 - 46.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	146.4 m³	**13.01 mW x 7.50 mL x 1.50 mH Storm Tank**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.230 m	**100 mm Vert. Orifice/Grate** C= 0.800

Primary OutFlow Max=0.0211 m³/s @ 0.72 hrs HW=0.856 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.0211 m³/s @ 2.69 m/s)

Pond 32P: Storm Tank

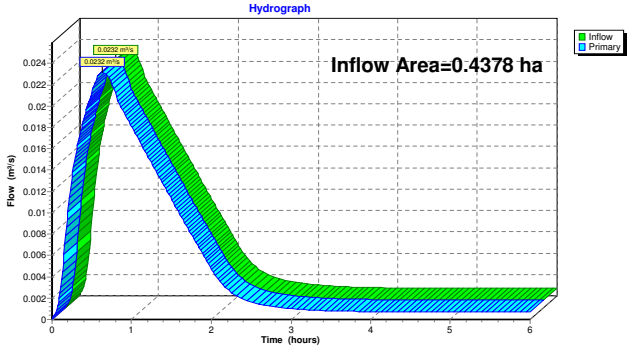


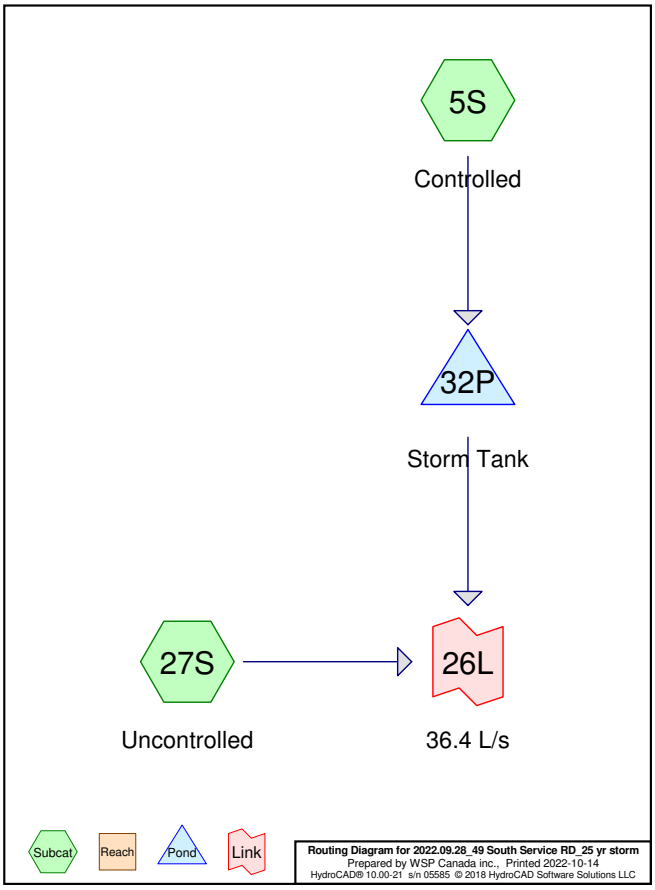
Summary for Link 26L: 36.4 L/s

Inflow Area = 0.4378 ha, 0.00% Impervious, Inflow Depth > 26 mm for 10-Year event
Inflow = 0.0232 m³/s @ 0.63 hrs, Volume= 0.115 Ml
Primary = 0.0232 m³/s @ 0.63 hrs, Volume= 0.115 Ml, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs

Link 26L: 36.4 L/s





Area Listing (all nodes)

Area (hectares)	C	Description (subcatchment-numbers)
0.1570	0.99	At Grade Impervious / Walkway (5S)
0.0220	0.99	At Grade-Impervious (27S)
0.1233	0.99	Impervious Roof (5S)
0.1355	0.28	Soft Landscaping (5S)
0.4378	**0.77**	**TOTAL AREA**

Soil Listing (all nodes)

Area (hectares)	Soil Group	Subcatchment Numbers
0.0000	HSG A	
0.0000	HSG B	
0.0000	HSG C	
0.0000	HSG D	
0.4378	Other	5S, 27S
0.4378		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatc Number
0.0000	0.0000	0.0000	0.0000	0.1570	0.1570	At Grade Impervious / Walkway	
0.0000	0.0000	0.0000	0.0000	0.0220	0.0220	At Grade-Impervious	
0.0000	0.0000	0.0000	0.0000	0.1233	0.1233	Impervious Roof	
0.0000	0.0000	0.0000	0.0000	0.1355	0.1355	Soft Landscaping	
0.0000	**0.0000**	**0.0000**	**0.0000**	**0.4378**	**0.4378**	**TOTAL AREA**	

Time span=0.00-6.00 hrs, dt=0.01 hrs, 601 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: Controlled Runoff Area=4,158.1 m² 67.41% Impervious Runoff Depth=29 mm
Tc=15.0 min C=0.76 Runoff=0.0567 m³/s 0.122 Ml

Subcatchment 27S: Uncontrolled Runoff Area=220.0 m² 100.00% Impervious Runoff Depth=38 mm
Tc=15.0 min C=0.99 Runoff=0.0039 m³/s 0.008 Ml

Pond 32P: Storm Tank Peak Elev=1.053 m Storage=102.8 m³ Inflow=0.0574 m³/s 0.138 Ml
Outflow=0.0245 m³/s 0.135 Ml

Link 26L: 36.4 L/s Inflow=0.0270 m³/s 0.143 Ml
Primary=0.0270 m³/s 0.143 Ml

Total Runoff Area = 0.4378 ha Runoff Volume = 0.131 Ml Average Runoff Depth = 30 mm
30.96% Pervious = 0.1355 ha 69.04% Impervious = 0.3023 ha

Summary for Subcatchment 5S: Controlled

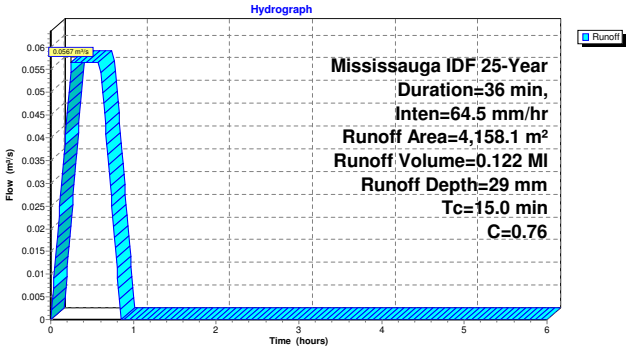
Runoff = 0.0567 m³/s @ 0.25 hrs, Volume= 0.122 Ml, Depth= 29 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 25-Year Duration=36 min, Inten=64.5 mm/hr

Area (m²)	C	Description
1,233.0	0.99	Impervious Roof
1,355.3	0.28	Soft Landscaping
1,569.8	0.99	At Grade Impervious / Walkway
4,158.1	0.76	Weighted Average
1,355.3		32.59% Pervious Area
2,802.8		67.41% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 5S: Controlled



Summary for Subcatchment 27S: Uncontrolled

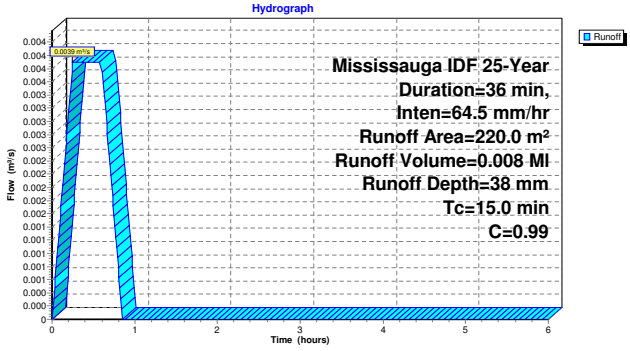
Runoff = 0.0039 m³/s @ 0.25 hrs, Volume= 0.008 Ml, Depth= 38 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 25-Year Duration=36 min, Inten=64.5 mm/hr

Area (m²)	C	Description
220.0	0.99	At Grade-Impervious
220.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 27S: Uncontrolled



Summary for Pond 32P: Storm Tank

Inflow Area = 0.4158 ha, 67.41% Impervious, Inflow Depth > 33 mm for 25-Year event
Inflow = 0.0574 m³/s @ 0.25 hrs, Volume= 0.138 Ml, Incl. 0.0007 m³/s Base Flow
Outflow = 0.0245 m³/s @ 0.75 hrs, Volume= 0.135 Ml, Atten= 57%, Lag= 29.7 min
Primary = 0.0245 m³/s @ 0.75 hrs, Volume= 0.135 Ml

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.230 m Surf.Area= 97.6 m² Storage= 22.4 m³
Peak Elev= 1.053 m @ 0.75 hrs Surf.Area= 97.6 m² Storage= 102.8 m³ (80.3 m³ above start)

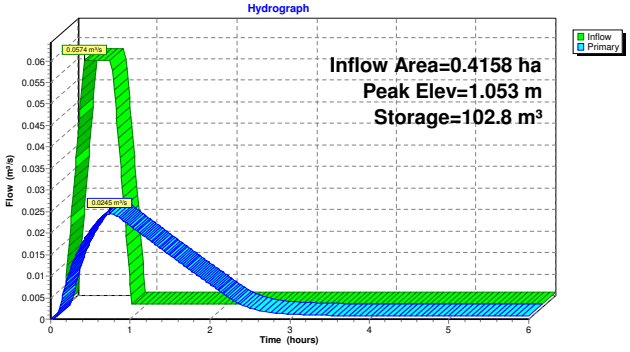
Plug-Flow detention time= 67.9 min calculated for 0.112 Ml (82% of inflow)
Center-of-Mass det. time= 37.4 min (79.9 - 42.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	146.4 m³	**13.01 mW x 7.50 mL x 1.50 mH Storm Tank**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.230 m	**100 mm Vert. Orifice/Grate** C= 0.800

Primary OutFlow Max=0.0245 m³/s @ 0.75 hrs HW=1.053 m (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.0245 m³/s @ 3.12 m/s)

Pond 32P: Storm Tank

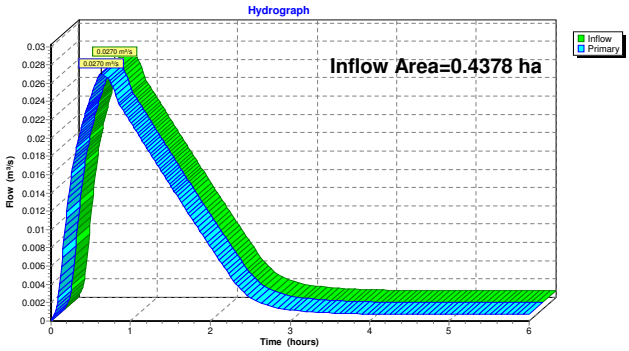


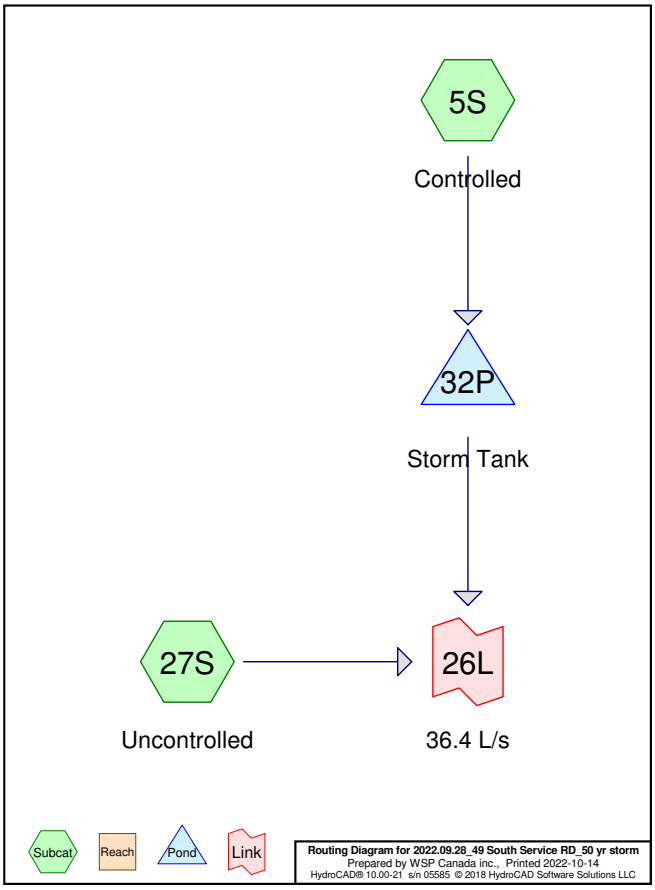
Summary for Link 26L: 36.4 L/s

Inflow Area = 0.4378 ha, 69.04% Impervious, Inflow Depth > 33 mm for 25-Year event
Inflow = 0.0270 m³/s @ 0.63 hrs, Volume= 0.143 Ml
Primary = 0.0270 m³/s @ 0.63 hrs, Volume= 0.143 Ml, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs

Link 26L: 36.4 L/s





Area Listing (all nodes)

Area (hectares)	C	Description (subcatchment-numbers)
0.1570	1.00	At Grade Impervious / Walkway (5S)
0.0220	1.00	At Grade-Impervious (27S)
0.1233	1.00	Impervious Roof (5S)
0.1355	0.30	Soft Landscaping (5S)
0.4378	**0.78**	**TOTAL AREA**

Soil Listing (all nodes)

Area (hectares)	Soil Group	Subcatchment Numbers
0.0000	HSG A	
0.0000	HSG B	
0.0000	HSG C	
0.0000	HSG D	
0.4378	Other	5S, 27S
0.4378		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatc Number
0.0000	0.0000	0.0000	0.0000	0.1570	0.1570	At Grade Impervious / Walkway	
0.0000	0.0000	0.0000	0.0000	0.0220	0.0220	At Grade-Impervious	
0.0000	0.0000	0.0000	0.0000	0.1233	0.1233	Impervious Roof	
0.0000	0.0000	0.0000	0.0000	0.1355	0.1355	Soft Landscaping	
0.0000	**0.0000**	**0.0000**	**0.0000**	**0.4378**	**0.4378**	**TOTAL AREA**	

Time span=0.00-6.00 hrs, dt=0.01 hrs, 601 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: Controlled Runoff Area=4,158.1 m² 67.41% Impervious Runoff Depth=34 mm
Tc=15.0 min C=0.77 Runoff=0.0618 m³/s 0.141 Ml

Subcatchment 27S: Uncontrolled Runoff Area=220.0 m² 100.00% Impervious Runoff Depth=44 mm
Tc=15.0 min C=1.00 Runoff=0.0042 m³/s 0.010 Ml

Pond 32P: Storm Tank Peak Elev=1.184 m Storage=115.6 m³ Inflow=0.0625 m³/s 0.156 Ml
Outflow=0.0265 m³/s 0.154 Ml

Link 26L: 36.4 L/s Inflow=0.0293 m³/s 0.163 Ml
Primary=0.0293 m³/s 0.163 Ml

Total Runoff Area = 0.4378 ha Runoff Volume = 0.151 Ml Average Runoff Depth = 34 mm
30.96% Pervious = 0.1355 ha 69.04% Impervious = 0.3023 ha

Summary for Subcatchment 5S: Controlled

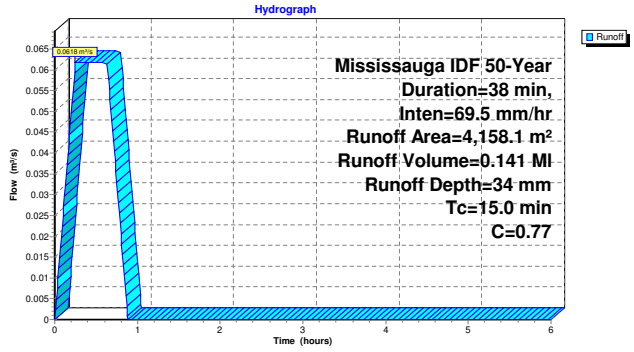
Runoff = 0.0618 m³/s @ 0.25 hrs, Volume= 0.141 Ml, Depth= 34 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 50-Year Duration=38 min, Inten=69.5 mm/hr

Area (m²)	C	Description
1,233.0	1.00	Impervious Roof
1,355.3	0.30	Soft Landscaping
1,569.8	1.00	At Grade Impervious / Walkway
4,158.1	0.77	Weighted Average
1,355.3		32.59% Pervious Area
2,802.8		67.41% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 5S: Controlled



Summary for Subcatchment 27S: Uncontrolled

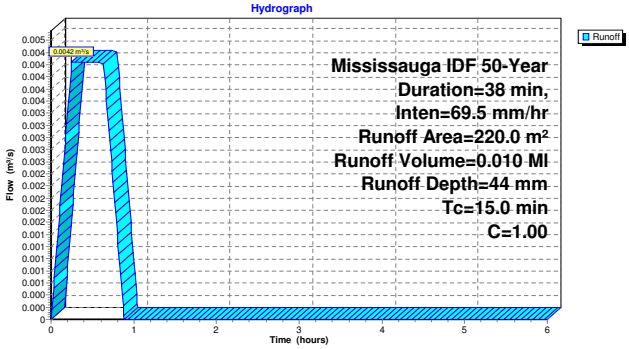
Runoff = 0.0042 m³/s @ 0.25 hrs, Volume= 0.010 Ml, Depth= 44 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 50-Year Duration=38 min, Inten=69.5 mm/hr

Area (m²)	C	Description
220.0	1.00	At Grade-Impervious
220.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 27S: Uncontrolled



Summary for Pond 32P: Storm Tank

Inflow Area = 0.4158 ha, 67.41% Impervious, Inflow Depth > 38 mm for 50-Year event
Inflow = 0.0625 m³/s @ 0.25 hrs, Volume= 0.156 Ml, Incl. 0.0007 m³/s Base Flow
Outflow = 0.0265 m³/s @ 0.78 hrs, Volume= 0.154 Ml, Atten= 58%, Lag= 31.8 min
Primary = 0.0265 m³/s @ 0.78 hrs, Volume= 0.154 Ml

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.230 m Surf.Area= 97.6 m² Storage= 22.4 m³
Peak Elev= 1.184 m @ 0.78 hrs Surf.Area= 97.6 m² Storage= 115.6 m³ (93.1 m³ above start)

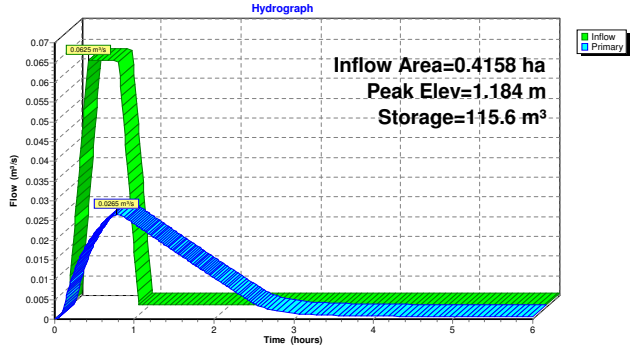
Plug-Flow detention time= 67.3 min calculated for 0.131 Ml (84% of inflow)
Center-of-Mass det. time= 40.3 min (81.6 - 41.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	146.4 m³	**13.01 mW x 7.50 mL x 1.50 mH Storm Tank**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.230 m	**100 mm Vert. Orifice/Grate** C= 0.800

Primary OutFlow Max=0.0265 m³/s @ 0.78 hrs HW=1.184 m (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.0265 m³/s @ 3.37 m/s)

Pond 32P: Storm Tank

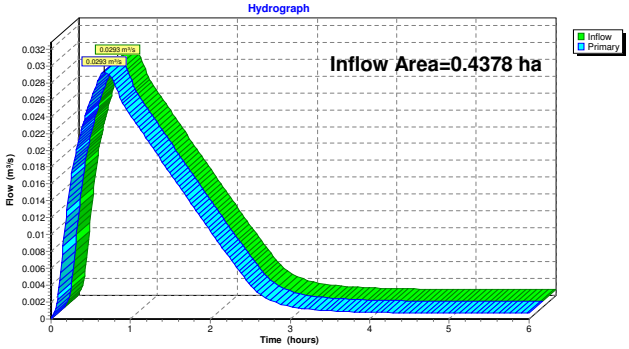


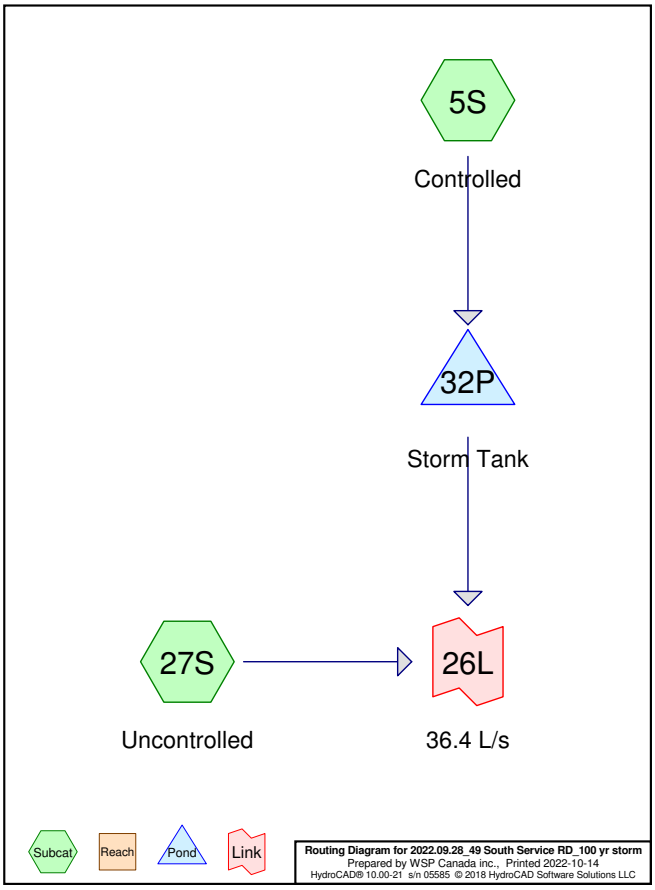
Summary for Link 26L: 36.4 L/s

Inflow Area = 0.4378 ha, 69.04% Impervious, Inflow Depth > 37 mm for 50-Year event
Inflow = 0.0293 m³/s @ 0.66 hrs, Volume= 0.163 Ml
Primary = 0.0293 m³/s @ 0.66 hrs, Volume= 0.163 Ml, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs

Link 26L: 36.4 L/s





Area Listing (all nodes)

Area (hectares)	C	Description (subcatchment-numbers)
0.1570	1.00	At Grade Impervious / Walkway (5S)
0.0220	1.00	At Grade-Impervious (27S)
0.1233	1.00	Impervious Roof (5S)
0.1355	0.31	Soft Landscaping (5S)
0.4378	**0.79**	**TOTAL AREA**

Soil Listing (all nodes)

Area (hectares)	Soil Group	Subcatchment Numbers
0.0000	HSG A	
0.0000	HSG B	
0.0000	HSG C	
0.0000	HSG D	
0.4378	Other	5S, 27S
0.4378		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatc Number
0.0000	0.0000	0.0000	0.0000	0.1570	0.1570	At Grade Impervious / Walkway	
0.0000	0.0000	0.0000	0.0000	0.0220	0.0220	At Grade-Impervious	
0.0000	0.0000	0.0000	0.0000	0.1233	0.1233	Impervious Roof	
0.0000	0.0000	0.0000	0.0000	0.1355	0.1355	Soft Landscaping	
0.0000	**0.0000**	**0.0000**	**0.0000**	**0.4378**	**0.4378**	**TOTAL AREA**	

Time span=0.00-6.00 hrs, dt=0.01 hrs, 601 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: Controlled Runoff Area=4,158.1 m² 67.41% Impervious Runoff Depth=38 mm
Tc=15.0 min C=0.78 Runoff=0.0684 m³/s 0.160 Ml

Subcatchment 27S: Uncontrolled Runoff Area=220.0 m² 100.00% Impervious Runoff Depth=49 mm
Tc=15.0 min C=1.00 Runoff=0.0046 m³/s 0.011 Ml

Pond 32P: Storm Tank Peak Elev=1.327 m Storage=129.4 m³ Inflow=0.0691 m³/s 0.175 Ml
Outflow=0.0285 m³/s 0.173 Ml

Link 26L: 36.4 L/s Inflow=0.0316 m³/s 0.183 Ml
Primary=0.0316 m³/s 0.183 Ml

Total Runoff Area = 0.4378 ha Runoff Volume = 0.171 Ml Average Runoff Depth = 39 mm
30.96% Pervious = 0.1355 ha 69.04% Impervious = 0.3023 ha

Summary for Subcatchment 5S: Controlled

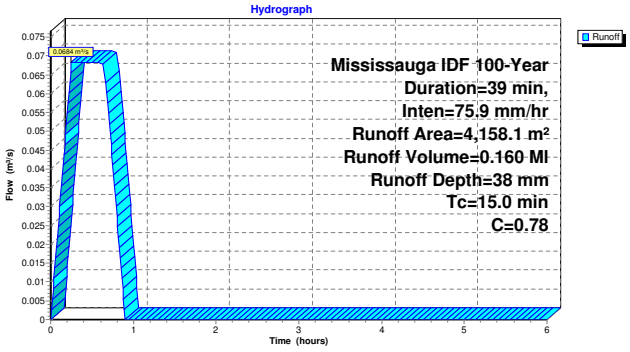
Runoff = 0.0684 m³/s @ 0.25 hrs, Volume= 0.160 Ml, Depth= 38 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 100-Year Duration=39 min, Inten=75.9 mm/hr

Area (m²)	C	Description
1,233.0	1.00	Impervious Roof
1,355.3	0.31	Soft Landscaping
1,569.8	1.00	At Grade Impervious / Walkway
4,158.1	0.78	Weighted Average
1,355.3		32.59% Pervious Area
2,802.8		67.41% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 5S: Controlled



Summary for Subcatchment 27S: Uncontrolled

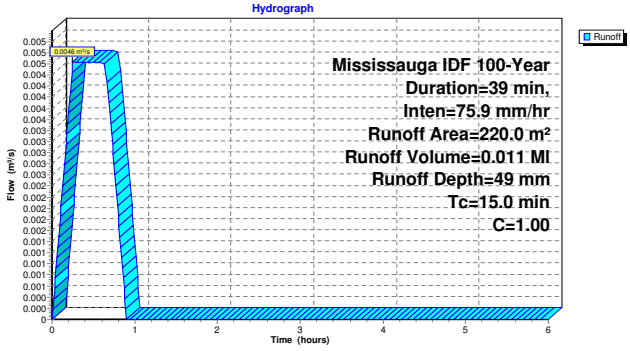
Runoff = 0.0046 m³/s @ 0.25 hrs, Volume= 0.011 Ml, Depth= 49 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 100-Year Duration=39 min, Inten=75.9 mm/hr

Area (m²)	C	Description
220.0	1.00	At Grade-Impervious
220.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					**Direct Entry,**

Subcatchment 27S: Uncontrolled



Summary for Pond 32P: Storm Tank

Inflow Area = 0.4158 ha, 67.41% Impervious, Inflow Depth > 42 mm for 100-Year event
Inflow = 0.0691 m³/s @ 0.25 hrs, Volume= 0.175 Ml, Incl. 0.0007 m³/s Base Flow
Outflow = 0.0285 m³/s @ 0.80 hrs, Volume= 0.173 Ml, Atten= 59%, Lag= 32.9 min
Primary = 0.0285 m³/s @ 0.80 hrs, Volume= 0.173 Ml

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.230 m Surf.Area= 97.6 m² Storage= 22.4 m³
Peak Elev= 1.327 m @ 0.80 hrs Surf.Area= 97.6 m² Storage= 129.4 m³ (107.0 m³ above start)

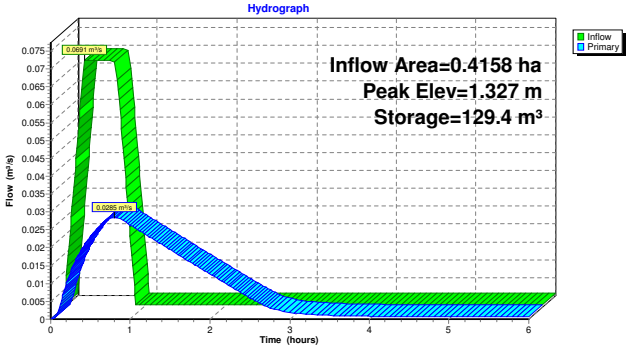
Plug-Flow detention time= 67.0 min calculated for 0.150 Ml (86% of inflow)
Center-of-Mass det. time= 43.1 min (83.3 - 40.2)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	146.4 m³	**13.01 mW x 7.50 mL x 1.50 mH Storm Tank**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.230 m	**100 mm Vert. Orifice/Grate** C= 0.800

Primary OutFlow Max=0.0285 m³/s @ 0.80 hrs HW=1.327 m (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.0285 m³/s @ 3.63 m/s)

Pond 32P: Storm Tank

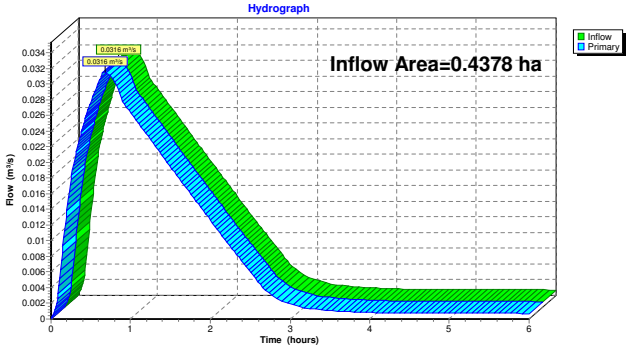


Summary for Link 26L: 36.4 L/s

Inflow Area = 0.4378 ha, 69.04% Impervious, Inflow Depth > 42 mm for 100-Year event
Inflow = 0.0316 m³/s @ 0.67 hrs, Volume= 0.183 Ml
Primary = 0.0316 m³/s @ 0.67 hrs, Volume= 0.183 Ml, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs

Link 26L: 36.4 L/s



APPENDIX

C WATER QUALITY UNIT SPECIFICATIONS

Determining Number of Cartridges for Flow Based Systems

Date	**29/09/2022**	**Black Cells =**	**Calculation**

Site Information

Project Name	**49 South Service Road**		
Project Location	**Mississauga, ON**		
OGS ID	**OGS**		
Drainage Area, Ad	**0.32**	ac	(0.13 ha)
Impervious Area, Ai	**0.32**	ac	
Pervious Area, Ap	**0.00**		
% Impervious	**100%**		
Runoff Coefficient, Rc	**0.90**		
Treatment storm flow rate, Q_{treat}	**0.15**	cfs	(4.2 L/s)
Peak storm flow rate, Q_{peak}	**TBD**	cfs	

Filter System

Filtration brand	**StormFilter**	
Cartridge height	**18**	in
Specific Flow Rate	**1.67**	gpm/ft²
Flow rate per cartridge	**12.53**	gpm

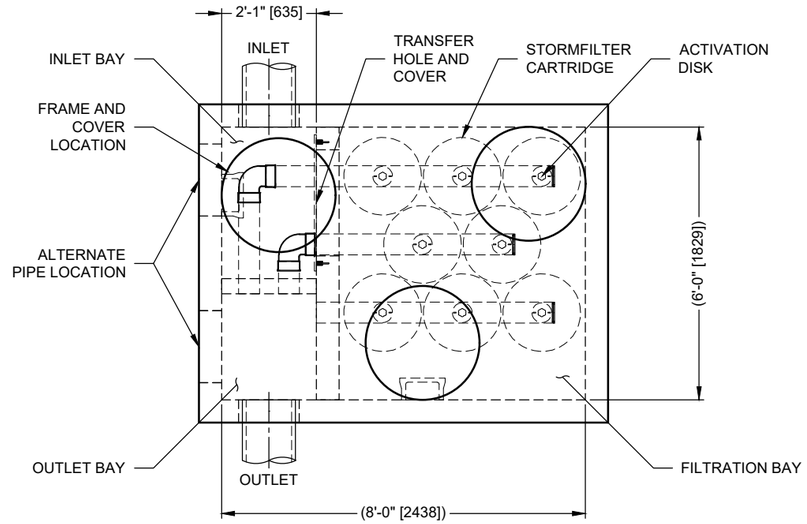
SUMMARY

Number of Cartridges	6
Media Type	Perlite

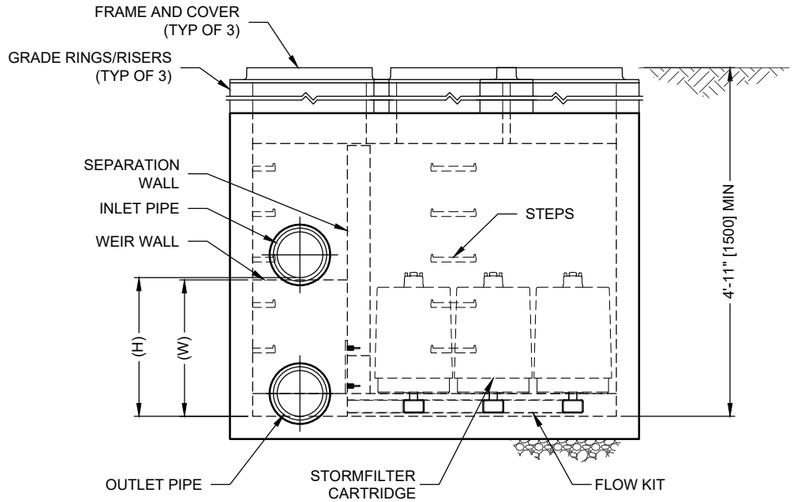
Event Mean Concentration (EMC)	**150**	mg/L
Annual TSS Removal	**80%**	
Percent Runoff Capture	**90%**	

Recommend SFPD0608 vault or CIP

200 Enterprise Drive
Scarborough, ME 04074
Phone 877-907-8676
Fax 207-885-9825



PLAN



ELEVATION

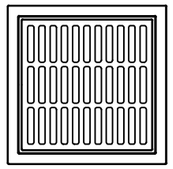
The Stormwater Management StormFilter®

STORMFILTER DESIGN NOTES

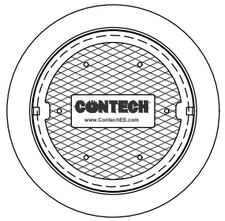
- STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD
- A 6' x 8' [1829 x 2438] PEAK DIVERSION STYLE STORMFILTER IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (8) AND IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR A RIGHT INLET CONFIGURATION
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS NOTED OTHERWISE

CARTRIDGE SIZE (in. [mm])	27 [686]			18 [457]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H) (ft. [mm])	3.05 [930]			2.3 [701]			1.8 [549]		
HEIGHT OF WEIR (W) (ft. [mm])	3.00 [914]			2.25 [686]			1.75 [533]		
SPECIFIC FLOW RATE (gpm/sf [L/s/m^2])	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]
CARTRIDGE FLOW RATE (gpm [L/s])	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.47]	10 [0.63]	8.35 [0.53]	5 [0.32]

* 1.67 gpm/sf [1.13 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND GRATE
(24" SQUARE)
(NOT TO SCALE)



FRAME AND COVER
(30" ROUND)
(NOT TO SCALE)

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
CARTRIDGE FLOW RATE	
CARTRIDGE SIZE (27, 18, LOW DROP (LD))	
MEDIA TYPE (PERLITE, ZPG, PSORB)	
NUMBER OF CARTRIDGES REQUIRED	
INLET BAY RIM ELEVATION	
FILTER BAY RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES/SPECIAL REQUIREMENTS:

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7" [178].** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF [1.36 L/s/m^2] (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF [13.39 L/s/m^3] OF MEDIA (MAXIMUM).**

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. ALTERNATE DIMENSIONS ARE IN MILLIMETERS [mm] UNLESS NOTED OTHERWISE.
4. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
5. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
6. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 10' [3048] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
F. CONTRACTOR TO REMOVE THE TRANSFER OPENING COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

CONTECH ENGINEERED SOLUTIONS LLC
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SFPD0608 (6' x 8')
PEAK DIVERSION STORMFILTER
STANDARD DETAIL

The Stormwater Management StormFilter®

Cast-In-Place Peak Diversion Pre-Installation

TO BE USED IN CONJUCTION WITH

APPROVED STORMFILTER® DRAWINGS AND

STORMFILTER® INSTALLATION GUIDE

CONTECH® ENGINEERED SOLUTIONS

VER. 1.0

ECHELON ENVIRONMENTAL

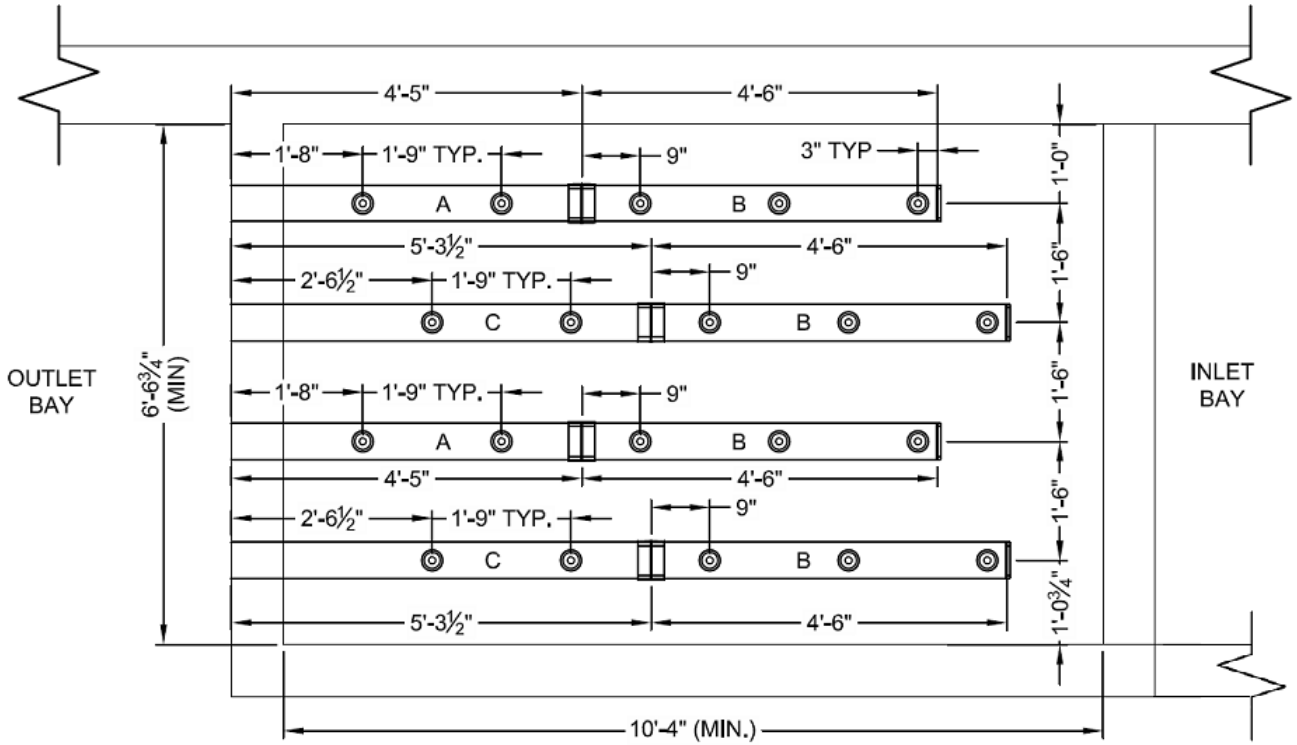
Installation

- Recommended Tools
  - Roto Hammer
  - 3/8” and 1/2” roto bit
  - 3/8” SS Concrete Anchor(s)
  - PVC Glue
  - Duct Tape/ Masking Tape
  - Tape Measure
  - Wrenches/ Sockets
  - Hammer
  - Caulking Gun
  - Sikaflex 1A Sealant (or equivalent)

Installation

1) Manifold (Flowkit) Installation in Filtration Bay
2) Secondary Concrete Pour in Filtration Bay
   - **CONCRETE LEVEL - DO NOT EXCEED TOP OF YELLOW CAP/ PORT**
3) Installing Restrictor Disks & Connector Fittings
   - One per cartridge
4) Installing the 2” PVC Plug
   - For unused connector fittings
   - **DO NOT GLUE**
5) Install StormFilter Cartridges

Manifold (Flowkit) Alignment



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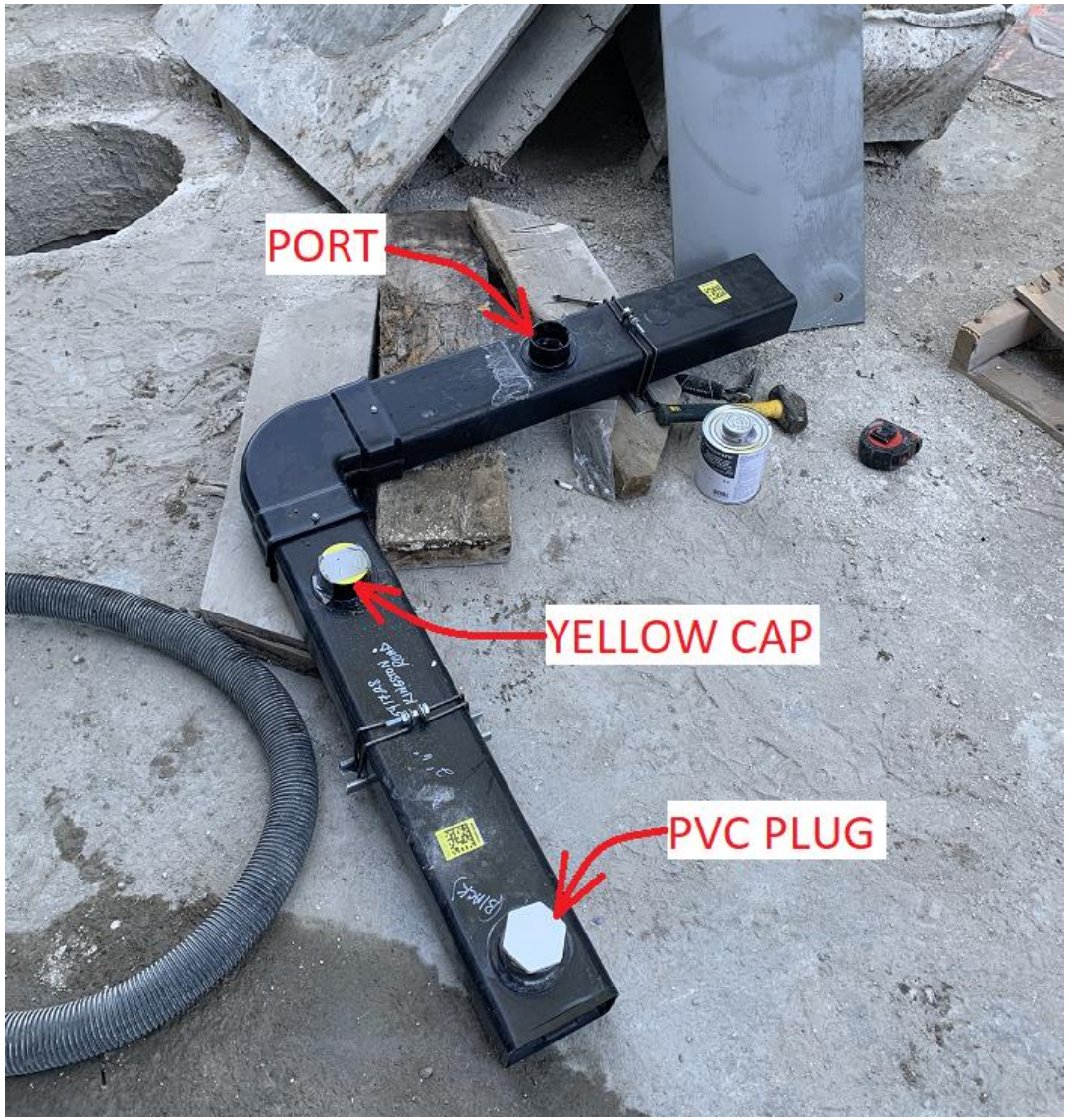
ECHELON ENVIRONMENTAL



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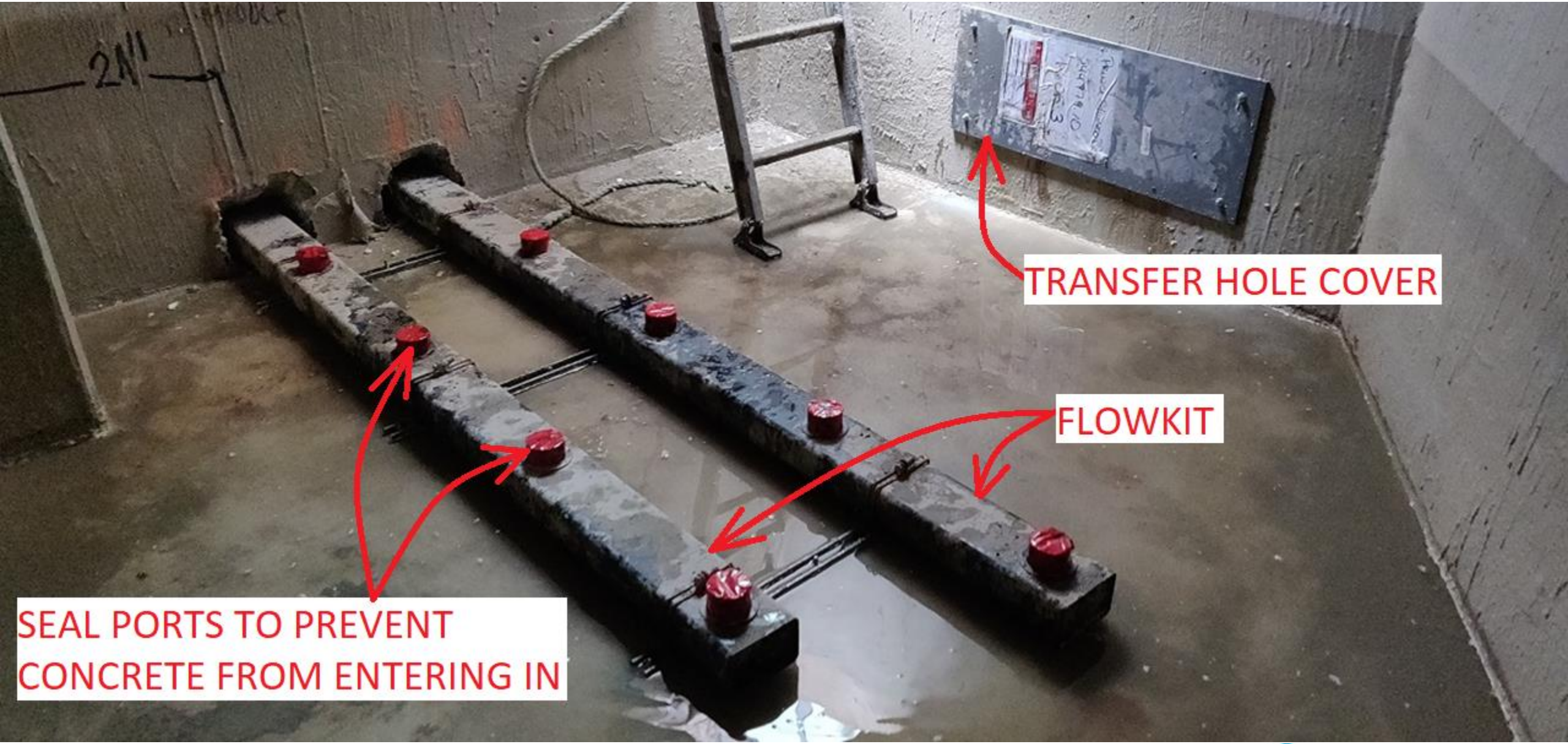
ECHELON ENVIRONMENTAL



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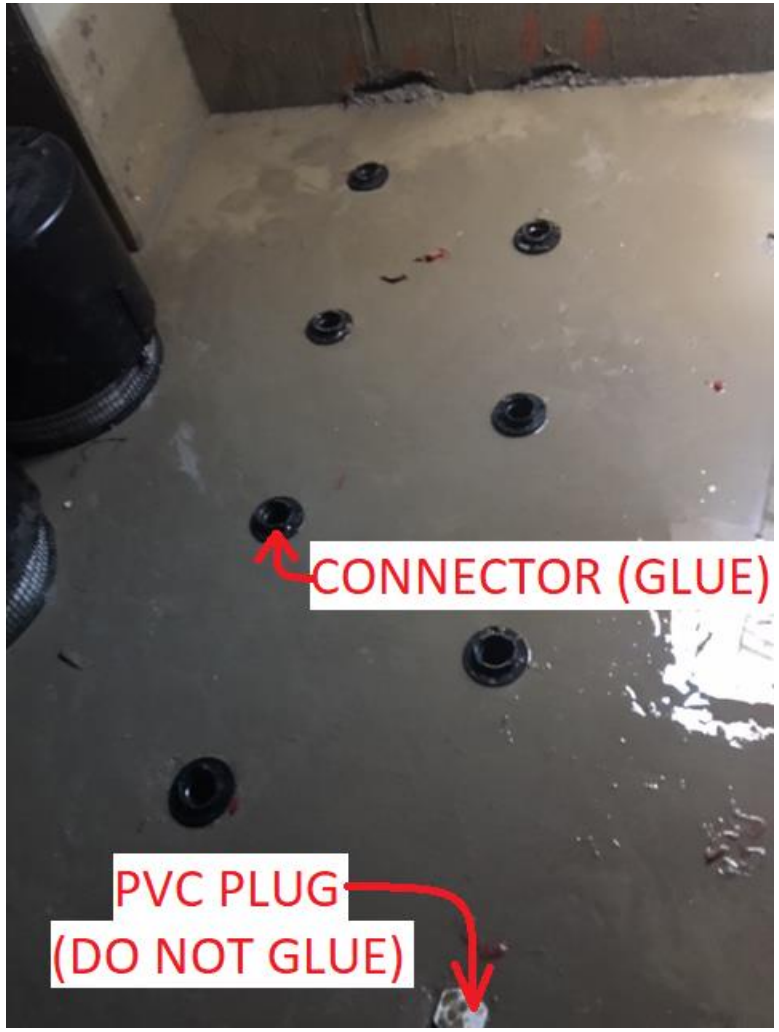
Installing Connector Fittings



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Installing StormFilter Cartridges

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Activating the StormFilter System

- The StormFilter system should only be activated once construction is complete, and the site has stabilized
- Activate the StormFilter system by removing the anchors securing the Transfer Hole Cover over the Transfer Hole
- Remove the Activation Disk from the StormFilter cartridge by unscrewing the cartridge's Air Lock Cap, and resecuring the Air Lock Cap after discarding the Activation Disk

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