

EDENSHAW FAIRVIEW DEVELOPMENTS LIMITED

STORMWATER MANAGEMENT REPORT

1 FAIRVIEW ROAD EAST

DECEMBER 13, 2019





STORMWATER MANAGEMENT REPORT 1 FAIRVIEW ROAD EAST

EDENSHAW FAIRVIEW DEVELOPMENTS LIMITED

REZONING APPLICATION

PROJECT NO.: 19M-01759
DATE: DECEMBER 2019

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

WSP.COM

QUALITY MANAGEMENT

ISSUE/REVISION FIRST ISSUE REVISION 1 REVISION 2 REVISION 3

Remarks	Rezoning			
Date	December 13 th , 2019			
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Project number	19M-01759			

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1 INTRODUCTION

1.1 SCOPE

WSP has been retained by Edenshaw Fairview Developments Limited to prepare a Stormwater Management (SWM) Report to support the site plan application for the proposed development located at 1 Fairview Road in the City of Mississauga. The site will be the location of a proposed residential tower with retail space at ground level. This SWM report examines the potential water quality, quantity, balance, and erosion impacts of the proposed development and summarizes how each will be addressed in accordance with the City of Mississauga's Development Requirements (2016) and the Credit Valley Conservation Authority (CVC) Stormwater Management Criteria (2012).

1.2 SITE LOCATION

The property is located in the north corner of the intersection of Hurontario Street and Fairview Road. The property occupies an area of approximately 0.29 ha which includes a right of way at the north side of the site providing access from the adjacent northwest property to Fairview Road. The right of way is not being modified as part of this development and therefore a 0.27 ha development area (hereafter referred to as "the site") will be considered for the remainder of this report which excludes this access driveway. The location of the proposed development is illustrated in Figure 1.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

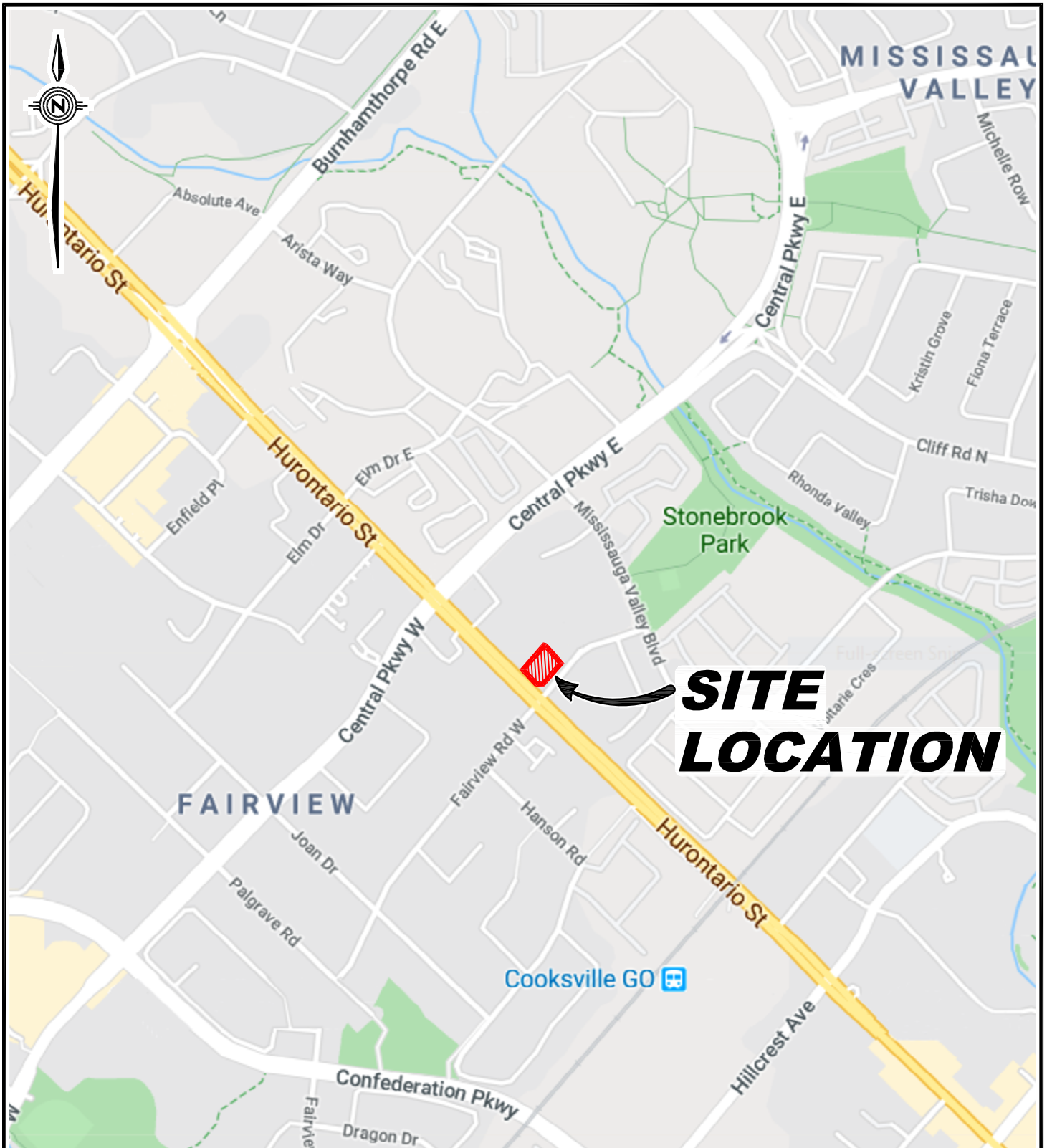
- Determine the site-specific stormwater management requirements to ensure that the development is in conformance with the City of Mississauga and CVC SWM criteria;
 - Evaluate various stormwater management practices that meet the requirements of the City and the conservation authority and recommend 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 reuse.
- **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** – As stated in the City of Mississauga's Development Requirements, within the Cooksville Creek subwatershed, runoff from the 2- 5 year design storms in

post development must not exceed the pre-development flow level for those same storms. As per the MECP (formerly MOECC) Stormwater Management Practices Planning and Design Manual, post-development flows shall not exceed pre-development levels. Since the City's storm sewer system is designed to accommodate a 10-year storm, the release rate from the site to the storm sewer connection for events greater than the 10-year storm must not exceed the 10-year pre-development flow level or the receiving capacity of the storm sewer, whichever is less.



**SITE
LOCATION**

@2019 Google - Map data @2019 Tele Atlas

0 0.1 0.2 0.3 0.4 0.5km

CLIENT

EDENSHAW FAIRVIEW DEVELOPMENTS LIMITED

TITLE

1 FAIRVIEW ROAD EAST

SITE LOCATION



Checked
I.S.

Drawn
AutoCAD/B.K.B.

Date
DECEMBER 2019

Proj. No.
19M-01759

Scale
AS SHOWN

Figure No.
1

Gr.No.
.

2 PRE-DEVELOPMENT CONDITIONS

2.1 GENERAL

Under pre-development conditions, the 0.27 ha site was covered by grassed open space. The pre-development runoff coefficient is estimated at 0.25 for the 2 year event. Under pre-development conditions, the site generally drains to the northeast. Ultimately, all flows from the site are collected by the storm sewer along the Fairview Road. The site receives minor overland runoff from a portion of the park area of the adjacent northwest property.

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: $I = A/(B + T)^C$

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 site location is within the Cooksville Creek watershed. According to the City of Mississauga Design Requirements, water quantity control is required within this sub-watershed. The City of Mississauga requires that the site's post-development discharge rates for 2-, 5 year storms do not exceed the pre-development flow rates for the equivalent event.

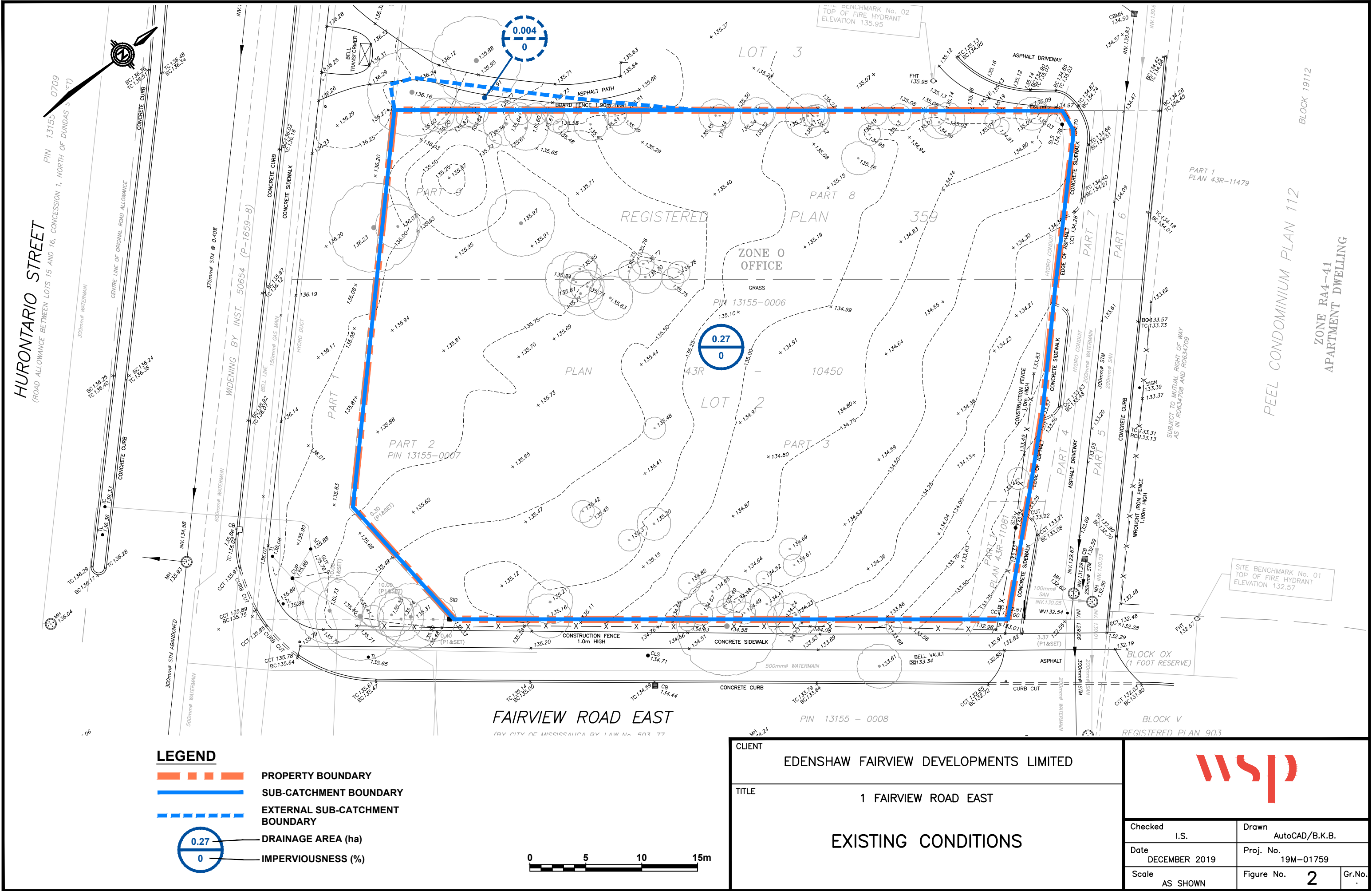
For 25-, 50- and 100-year events, post development flows must not exceed pre-development discharge rates, or the receiving capacity of the storm sewer. Since the City's storm sewer is designed to accommodate a 10-year storm, the maximum allowable release rate from the site to the storm sewer is 10-year pre-development flow. This has been calculated to be 18.9 L/s. This existing peak flow rate has been calculated including the external flows received by the site from the adjacent park entering the site from the west.

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)	RUNOFF COEFFICIENT	RAINFALL INTENSITY, I (mm/hour)	EXISTING PEAK FLOW RATE, Q (L/s) *	ALLOWABLE RELEASE RATE, Q (L/s) *
2	0.25	59.9	11.4	11.4
5	0.25	80.5	15.3	15.3
10	0.25	99.2	18.9	18.9
25	0.25	113.9	23.9	
50	0.25	127.1	29.1	
100	0.25	140.7	33.5	

*Area of 0.27 ha, C=0.25 and time of concentration of 15 minutes



3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed development consists of the construction of a new mixed-use condominium building. The building provides basement parking, with the parking structure underlying the majority of the footprint of the site. There is also a small external 38 m² area west of the site that will be conveyed to the site and controlled by the site's proposed stormwater system. 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

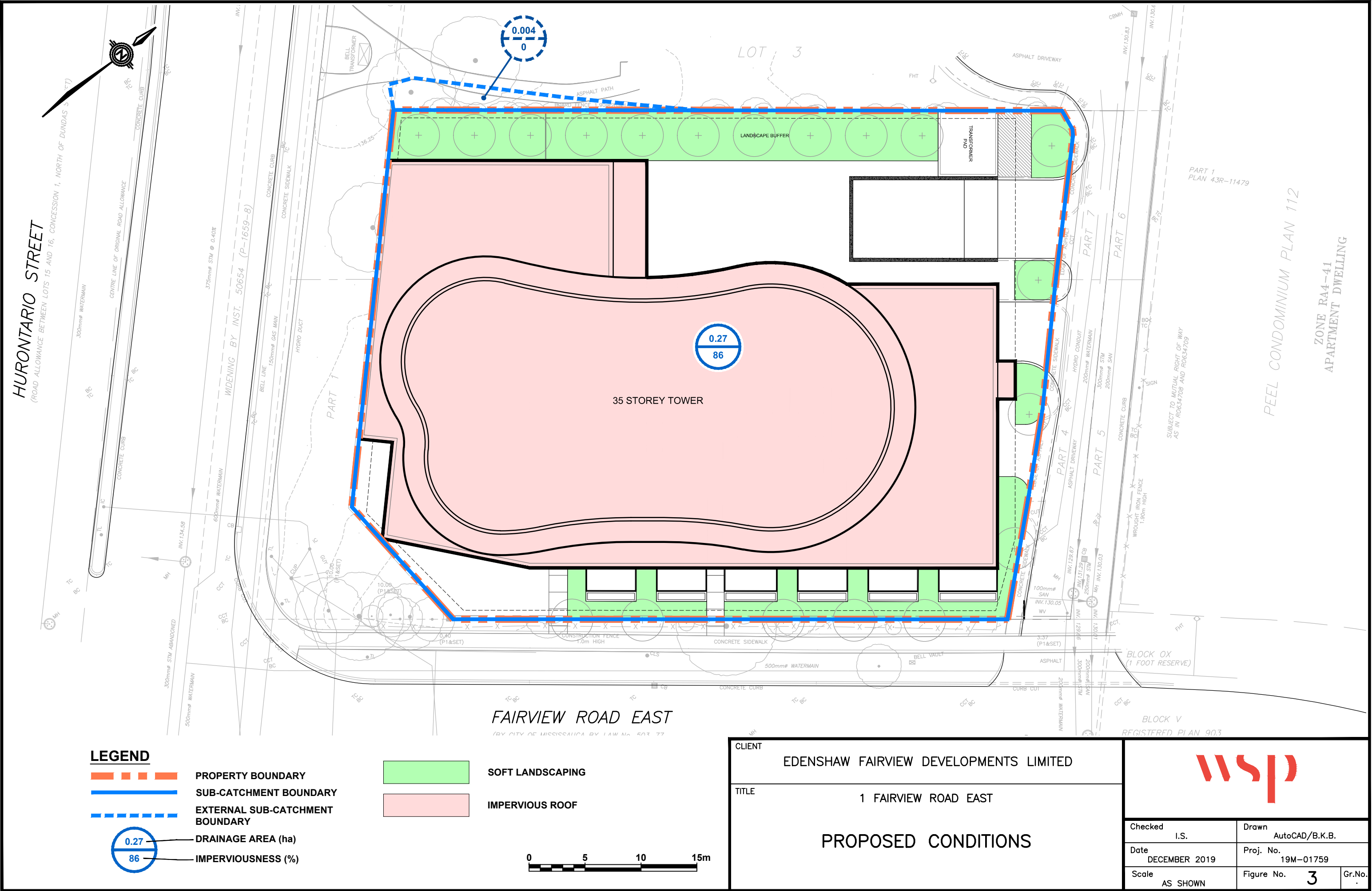
LAND-USE	AREA (m ²)	2-YEAR RUNOFF COEFFICIENT,	IMPERVIOUSNESS
		C	
Impervious Roof Area	1,682	0.90	100%
Soft/Pervious Landscaping	376	0.25	0%
At-Grade Impervious	646	0.90	100%
Total Developed Area (or Average):	2,704	0.81	86%
West External Area	38	0.25	0%
Total Area Conveyed to Cistern	2742	0.80	85%

3.2 RUNOFF VOLUME REDUCTION

As detailed in section 1.4, the site will be required to provide retention and reuse for the first 5mm of runoff from each rainfall event. The potential for infiltration is low as the underground parking structure will occupy the majority site area below grade. Options for implementing best management practices include irrigation of landscaped areas, vegetated landscaping and greywater systems inside the building.

The site will have 376 m² of uncovered soft landscaping. The total volume of 5 mm runoff from the site impervious areas is 13.52 m³. The external area was not included in this calculation as this area will not be developed and will remain unchanged in the post development conditions. Calculations are provided in Appendix A.

Stormwater reuse is proposed on site. The re-use methods for the captured stormwater are still being assessed in conjunction with the mechanical design of the building's water supply systems. Proposed reuse options include irrigation of landscaped areas, flushing of toilets in the interior amenity areas on the ground floor level, and any additional non-potable demand in the communal building areas. Sufficient opportunities exist within the development to re-use the full volume of retained stormwater within the required drawdown time. The mechanical design of the rainwater re-use pump systems from the cistern will ensure that the cistern is empty prior to switching to The City's water supply. The reuse will be supplied by a 15 m³ sump within the base of the primary stormwater cistern.



3.3 WATER QUALITY CONTROL

Architectural plans indicate that the majority of the site area will be covered by building rooftop surfaces or landscaping with the exception of a 646 m² area of impervious at-grade. As rooftop areas are free of typical sediment-generating activities (e.g. vehicle traffic) runoff will leave them effectively unchanged, and can be considered clean for the purposes of water quality assessment.

The Ontario Ministry of the Environment, Conservation and Parks requires 80% TSS removal from new developments. As the majority of the site runoff originated from the clean roof areas, the water quality requirements are considered to be met.

An oil grit separator unit has been sized for the site to provide 80% TSS removal for the at-grade paved areas. A CDS PMSU2015-4 unit has been specified to provide the required level of treatment for at grade flows prior to entering the site cistern.

Please note that the site owner will need to complete a monitoring plan at the time of the stormwater treatment unit connection and maintain the unit thereafter.

3.4 EROSION CONTROL

The City of Mississauga Design Guidelines do not specify long term in-stream erosion control requirements for sites under 1.0 ha. Since the site area for this application is 0.27 ha, no additional long term site-specific erosion controls are recommended. However, the measures of erosion and sediment control during construction should be installed. The details will be outlined in the Erosion and Sediment Control Plan and should conform to the City and CVC Requirements.

3.5 WATER QUANTITY CONTROL

As discussed in Section 2.3, the target discharge rate to the municipal sewer system from the site during the 2, and 5-year storms is 11.4 L/s and 15.3 L/s respectively. This is equivalent to the peak runoff rate under pre-development conditions during a 2-year and 5-year design storm event using a runoff coefficient of 0.25. For events equal to and greater than the 10-year storm, the target discharge rate to the municipal sewer system from the site is 18.9 L/s. This is equivalent to the peak runoff rate under pre-development conditions during a 10-year design storm event using a runoff coefficient of 0.25. The 10-year storm is used as this is the City of Mississauga's criterion for the storm pipe design.

A HydroCAD model of the project was constructed and utilized to determine the required storage volume in the stormwater cisterns, 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. Per the City's Design Requirements, the adjustment factors for runoff coefficients have been applied to the 25-, 50- and 100-year storms.

It is recommended that an emergency overflow be provided at the top of the cisterns, 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.

A cistern has been designed for this site which will collect flows from the at grade areas and building roof. All runoff from the site is collected in the cistern, there are no uncontrolled areas draining off site.

As previously discussed, there is an external area to the northwest of the site which directs flows overland onto the site. In order to ensure this flow route is maintained, a swale along the northwest perimeter of the site will collect flows from this external area. The swale will convey these flows to a catchbasin and direct the flows into the site cistern.

The cistern was designed to provide a total storage volume of 150 m³. This includes the active water quantity storage volume and the sump volume. The cistern has a base area of 60m² and a height of 2.5 m. The primary gravity outlet of the

cistern is set at 0.25 m above the base. Given that the base the cistern has a footprint of 60m², the sump volume below the outlet is 15 m³. A 75 mm diameter orifice plate is proposed as the primary outlet. The sump volume is assumed full at the onset of the storm event, and is therefore not considered as part of the active water quantity storage.

A summary of the modelling results is provided below in Table 3.2. Full HydroCAD modelling output is provided in Appendix B.

Table 3.2 Summary of Modelling Results

RETURN PERIOD (YEARS)	MODELLED POST-DEVELOPMENT PEAK FLOW RATE (L/s)	TARGET STORM EVENT RELEASE RATE (L/s)	UTILIZED CISTERN 1 STORAGE (150 m ³ AVAILABLE) (m ³)	PEAK WATER DEPTH IN CISTERN 1* (m)
2	8.1	11.4	45.6	0.761
5	9.7	15.3	58.4	0.973
10	11.1	18.9	70.4	1.174
25	12.8		88.1	1.468
50	13.8		99.6	1.659
100	14.7		111.4	1.856

* Depth is from the internal cistern bottom.

3.6 GROUNDWATER, HYDROGEOLOGY AND GROUNDWATER CHARACTERIZATION

Groundwater pumping rates will be determined as a part of the hydrogeological investigations prior to Site Plan Application. For this rezoning submission it is assumed that any groundwater would be discharged to the sanitary system and would not enter the storm cistern.

4 SUMMARY

A stormwater management plan has been prepared to support the rezoning application for the proposed development, at 3383 Hurontario Street in the City of Mississauga. The key points are summarized below.

RUNOFF VOLUME REDUCTION

A sump storage volume of 15 m³ will be provided in the storm cistern to collect runoff from the site for retention and reuse. The proposed use for the stored sump volume is for irrigation of on site landscaping.

WATER QUANTITY

Runoff from all areas of the site will be directed to the proposed stormwater cisterns for quantity control. The cistern will have a total storage volume of 150 m³. A 75 mm orifice plate will control the flow from site to the target release rates which have been set in compliance with the City's Design Requirement for all events up to the 100-year storm. It is recommended that an emergency outlet pipe be provided above the storage volume in each 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. One CDS PMSU2015-4 unit is proposed upstream of the stormwater cistern to treat the at-grade impervious runoff.

APPENDIX

A STORMWATER MANAGEMENT CALCULATIONS



Project:	Edenshaw Hurontario &	No.:	19M-01759
By:	JKC	Date:	12/3/2019
Checked:	IS	Checked:	12/3/2019
			Page: 1

Subject: Stormwater Management Calculations - Existing 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 **0.27** hectares

Pre-Development
Runoff Coefficient, C 0.25

There is a 38 m² external park area which flows onto the site. It has a runoff coefficient of 0.25 and will be conveyed through the cistern in the proposed condition.

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

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

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

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
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 _{site} (L/sec)	11.3	15.1	18.6	23.5	28.7	33.0
Q _{site + external area} (L/sec)	11.4	15.3	18.9	23.9	29.1	33.5
Q (m ³ /sec)	0.011	0.015	0.019	0.024	0.029	0.034

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

Subject: Stormwater Management Calculations - Water Balance Calculations

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)	Runoff C	Impervious	CN
Impervious Roof Area	1,682	0.90	100%	98
Green Roof	-	0.45	50%	81
Soft/Pervious Landscaping	376	0.25	0%	74
At Grade Impervious Surfaces	646	0.90	100%	98
Totals	2,704	0.81	86%	95

Surface Type	Area (m ²)	IA (mm)	Volume Abstracted (m ³)	5 mm Volume (m ³)	Water Balance (m ³)
Impervious Roof Area	1,682	0.000	0.00	8.41	8.41
Green Roof	-	0.000	0.00	0.00	0.00
Soft/Pervious Landscaping	376	0.000	0.00	1.88	1.88
At Grade Impervious Surfaces	646	0.000	0.00	3.23	3.23
Totals	2,704	-	0.00	13.52	13.52

** Water Balance will not be provided for Laneway area as there is no feasible reuse method within the laneway*

For the purposes of the water balance calculation it is assumed that green roofs can accept 10 mm of rainfall without producing any runoff. This is supported by EPA analysis of green roof manufacturer data sheets (dry unit weights versus saturated unit weights).

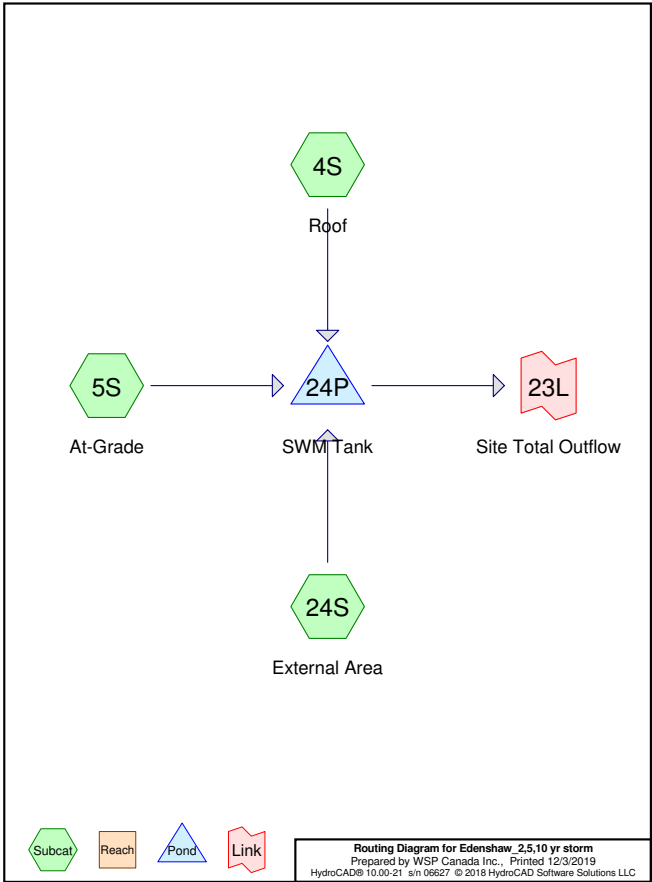
It is assumed that the remaining hard surfaces on the site can abstract 1 mm of rainfall, and that all soft landscaped areas can absorb 5 mm

Therefore, volume of runoff during a 5 mm storm event: 13.52 m³

APPENDIX

B HYDROLOGIC MODEL OUTPUT (HydroCAD)

Area Listing (all nodes)		
Area (hectares)	C	Description (subcatchment-numbers)
0.0038	0.25	External Pervious Area (24S)
0.0647	0.90	Impervious At-Grade (5S)
0.1682	0.90	Impervious Roof Area (4S)
0.0376	0.25	soft landscaping (5S)
0.2742	0.80	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	
0.2742	Other	4S, 5S, 24S
0.2742		TOTAL AREA

Ground Covers (all nodes)							
HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatchment Numbers
0.0000	0.0000	0.0000	0.0000	0.0038	0.0038	External Pervious Area	24S
0.0000	0.0000	0.0000	0.0000	0.0647	0.0647	Impervious At-Grade	5S
0.0000	0.0000	0.0000	0.0000	0.1682	0.1682	Impervious Roof Area	4S
0.0000	0.0000	0.0000	0.0000	0.0376	0.0376	soft landscaping	5S
0.0000	0.0000	0.0000	0.0000	0.2742	0.2742	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 4S: Roof Runoff Area=1,681.6 m² 0.00% Impervious Runoff Depth=19 mm
 Tc=15.0 min C=0.90 Runoff=0.0124 m³/s 0.033 MI

Subcatchment 5S: At-Grade Runoff Area=1,022.4 m² 0.00% Impervious Runoff Depth=14 mm
 Tc=15.0 min C=0.66 Runoff=0.0055 m³/s 0.015 MI

Subcatchment 24S: External Area Runoff Area=38.0 m² 0.00% Impervious Runoff Depth=5 mm
 Tc=15.0 min C=0.25 Runoff=0.0001 m³/s 0.000 MI

Pond 24P: SWM Tank Peak Elev=0.761 m Storage=45.6 m³ Inflow=0.0180 m³/s 0.048 MI
 Outflow=0.0081 m³/s 0.047 MI

Link 23L: Site Total Outflow Inflow=0.0081 m³/s 0.047 MI
 Primary=0.0081 m³/s 0.047 MI

Total Runoff Area = 0.2742 ha Runoff Volume = 0.048 MI Average Runoff Depth = 17 mm
100.00% Pervious = 0.2742 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 4S: Roof

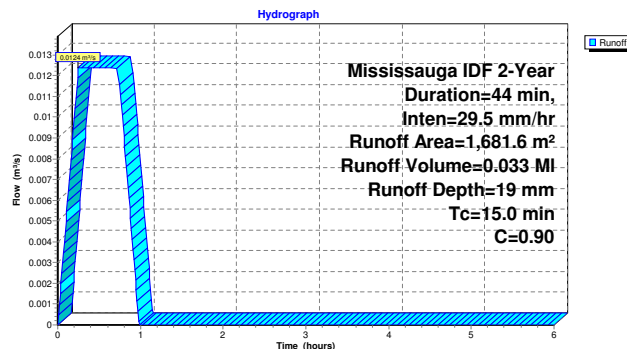
Runoff = 0.0124 m³/s @ 0.25 hrs, Volume= 0.033 MI, Depth= 19 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Mississauga IDF 2-Year Duration=44 min, Inten=29.5 mm/hr

Area (m ²)	C	Description
1,681.6	0.90	Impervious Roof Area
1,681.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m ³ /s)	Description
15.0					Direct Entry,

Subcatchment 4S: Roof



Summary for Subcatchment 5S: At-Grade

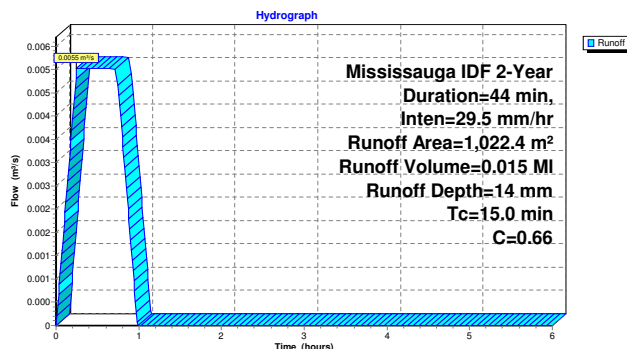
Runoff = 0.0055 m³/s @ 0.25 hrs, Volume= 0.015 MI, Depth= 14 mm

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=44 min, Inten=29.5 mm/hr

Area (m ²)	C	Description
646.5	0.90	Impervious At-Grade
375.9	0.25	soft landscaping
1,022.4	0.66	Weighted Average
1,022.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m ³ /s)	Description
15.0					Direct Entry,

Subcatchment 5S: At-Grade



Summary for Subcatchment 24S: External Area

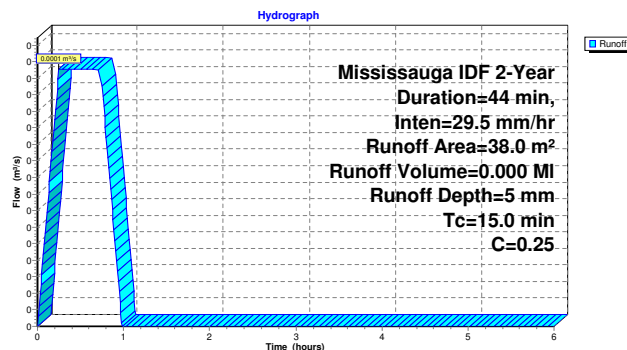
Runoff = 0.0001 m³/s @ 0.25 hrs, Volume= 0.000 MI, Depth= 5 mm

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=44 min, Inten=29.5 mm/hr

Area (m ²)	C	Description
38.0	0.25	External Pervious Area
38.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m ³ /s)	Description
15.0					Direct Entry,

Subcatchment 24S: External Area



Summary for Pond 24P: SWM Tank

Inflow Area = 0.2742 ha, 0.00% Impervious, Inflow Depth = 17 mm for 2-Year event
Inflow = 0.0180 m³/s @ 0.25 hrs, Volume= 0.048 MI
Outflow = 0.0081 m³/s @ 0.87 hrs, Volume= 0.047 MI, Atten= 55%, Lag= 37.3 min
Primary = 0.0081 m³/s @ 0.87 hrs, Volume= 0.047 MI

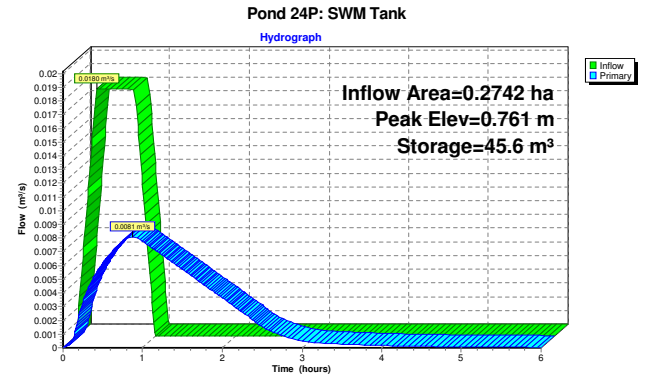
Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.250 m Surf.Area= 60.0 m² Storage= 15.0 m³
Peak Elev= 0.761 m @ 0.87 hrs Surf.Area= 60.0 m² Storage= 45.6 m³ (30.6 m³ above start)

Plug-Flow detention time= 78.2 min calculated for 0.032 MI (68% of inflow)
Center-of-Mass det. time= 49.9 min (79.4 - 29.5)

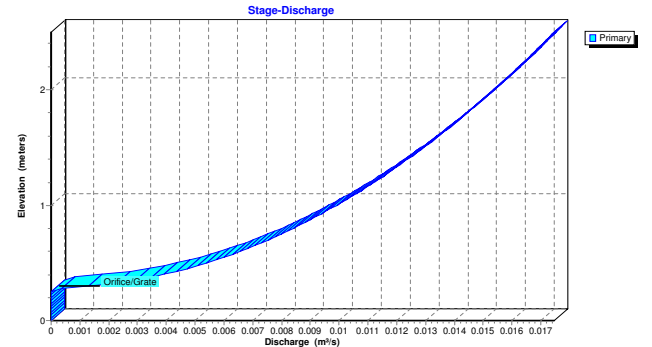
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	150.0 m³	60.00 mW x 1.00 mL x 2.50 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.250 m	75 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.0081 m³/s @ 0.87 hrs HW=0.761 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0081 m³/s @ 1.83 m/s)



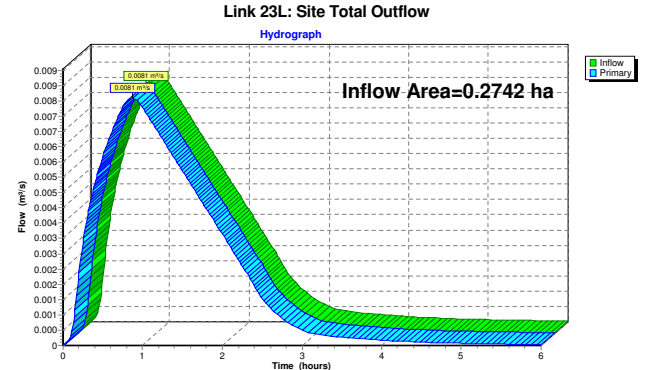
Pond 24P: SWM Tank



Summary for Link 23L: Site Total Outflow

Inflow Area = 0.2742 ha, 0.00% Impervious, Inflow Depth > 17 mm for 2-Year event
Inflow = 0.0081 m³/s @ 0.87 hrs, Volume= 0.047 MI
Primary = 0.0081 m³/s @ 0.87 hrs, Volume= 0.047 MI, Atten= 0%, Lag= 0.0 min

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



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 4S: Roof Runoff Area=1,681.6 m² 0.00% Impervious Runoff Depth=26 mm
Tc=15.0 min C=0.90 Runoff=0.0167 m³/s 0.044 MI

Subcatchment 5S: At-Grade Runoff Area=1,022.4 m² 0.00% Impervious Runoff Depth=19 mm
Tc=15.0 min C=0.66 Runoff=0.0074 m³/s 0.020 MI

Subcatchment 24S: External Area Runoff Area=38.0 m² 0.00% Impervious Runoff Depth=7 mm
Tc=15.0 min C=0.25 Runoff=0.0001 m³/s 0.000 MI

Pond 24P: SWM Tank Peak Elev=0.972 m Storage=58.3 m³ Inflow=0.0242 m³/s 0.064 MI
Outflow=0.0097 m³/s 0.064 MI

Link 23L: Site Total Outflow Inflow=0.0097 m³/s 0.064 MI
Primary=0.0097 m³/s 0.064 MI

Total Runoff Area = 0.2742 ha Runoff Volume = 0.064 MI Average Runoff Depth = 23 mm
100.00% Pervious = 0.2742 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 4S: Roof

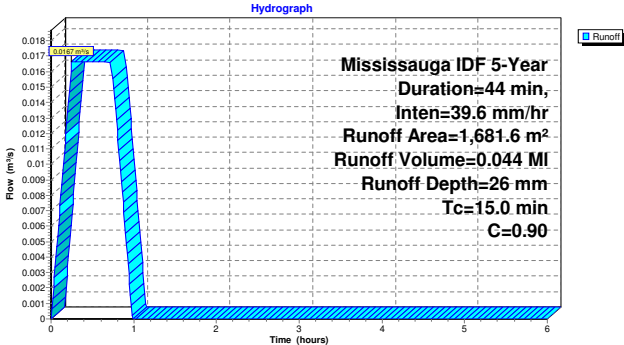
Runoff = 0.0167 m³/s @ 0.25 hrs, Volume= 0.044 MI, Depth= 26 mm

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=44 min, Inten=39.6 mm/hr

Area (m²)	C	Description
1,681.6	0.90	Impervious Roof Area
1,681.6	100.00%	Pervious Area

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

Subcatchment 4S: Roof



Summary for Subcatchment 5S: At-Grade

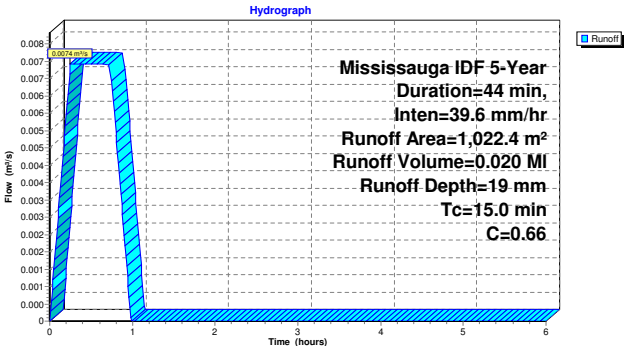
Runoff = 0.0074 m³/s @ 0.25 hrs, Volume= 0.020 MI, Depth= 19 mm

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=44 min, Inten=39.6 mm/hr

Area (m²)	C	Description
646.5	0.90	Impervious At-Grade
375.9	0.25	soft landscaping
1,022.4	0.66	Weighted Average
1,022.4	100.00%	Pervious Area

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

Subcatchment 5S: At-Grade



Summary for Subcatchment 24S: External Area

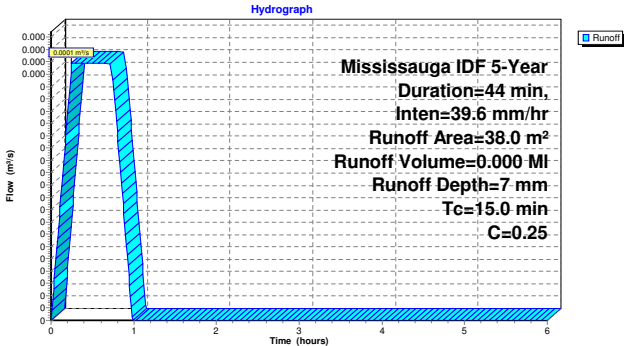
Runoff = 0.0001 m³/s @ 0.25 hrs, Volume= 0.000 MI, Depth= 7 mm

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=44 min, Inten=39.6 mm/hr

Area (m²)	C	Description
38.0	0.25	External Pervious Area
38.0	100.00%	Pervious Area

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

Subcatchment 24S: External Area



Summary for Pond 24P: SWM Tank

Inflow Area = 0.2742 ha, 0.00% Impervious, Inflow Depth = 23 mm for 5-Year event
Inflow = 0.0242 m³/s @ 0.25 hrs, Volume= 0.064 MI
Outflow = 0.0097 m³/s @ 0.88 hrs, Volume= 0.064 MI, Atten= 60%, Lag= 38.0 min
Primary = 0.0097 m³/s @ 0.88 hrs, Volume= 0.064 MI

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.250 m Surf.Area= 60.0 m² Storage= 15.0 m³
Peak Elev= 0.972 m @ 0.88 hrs Surf.Area= 60.0 m² Storage= 58.3 m³ (43.3 m³ above start)

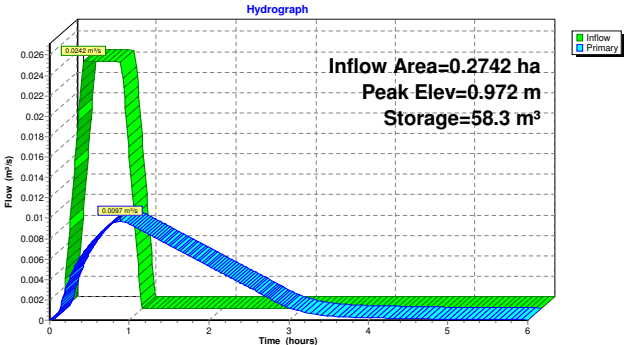
Plug-Flow detention time= 78.8 min calculated for 0.049 MI (76% of inflow)
Center-of-Mass det. time= 56.3 min (85.8 - 29.5)

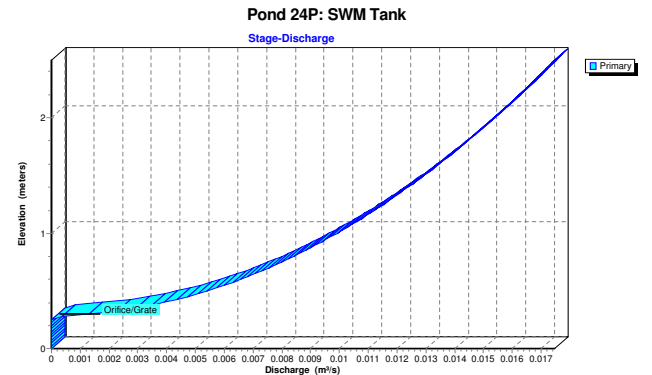
Volume	Invert	Avail.Storage	Storage	Description
#1	0.000 m	150.0 m³	60.0 mW x 1.00 mL x 2.50 mH	Prismatoid

Device	Routing	Invert	Outlet	Devices
#1	Primary	0.250 m	75 mm Vert. Orifice/Grate	C= 0.600

Primary OutFlow Max=0.0097 m³/s @ 0.88 hrs HW=0.972 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0097 m³/s @ 2.20 m/s)

Pond 24P: SWM Tank

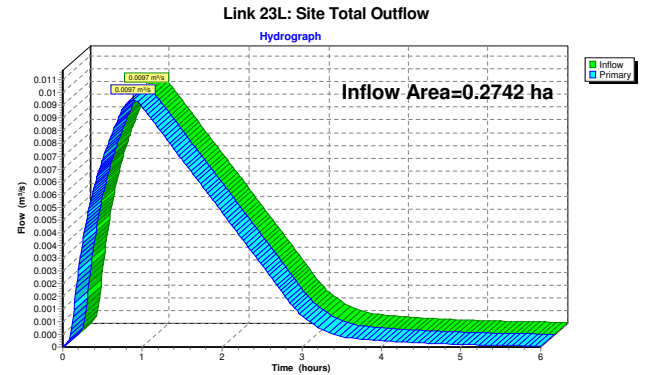




Summary for Link 23L: Site Total Outflow

Inflow Area = 0.2742 ha, 0.00% Impervious, Inflow Depth > 23 mm for 5-Year event
Inflow = 0.0097 m³/s @ 0.88 hrs, Volume= 0.064 MI
Primary = 0.0097 m³/s @ 0.88 hrs, Volume= 0.064 MI, Atten= 0%, Lag= 0.0 min

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



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 4S: Roof Runoff Area=1,681.6 m² 0.00% Impervious Runoff Depth=32 mm
Tc=15.0 min C=0.90 Runoff=0.0205 m³/s 0.054 MI

Subcatchment 5S: At-Grade Runoff Area=1,022.4 m² 0.00% Impervious Runoff Depth=24 mm
Tc=15.0 min C=0.66 Runoff=0.0092 m³/s 0.024 MI

Subcatchment 24S: External Area Runoff Area=38.0 m² 0.00% Impervious Runoff Depth=9 mm
Tc=15.0 min C=0.25 Runoff=0.0001 m³/s 0.000 MI

Pond 24P: SWM Tank Peak Elev=1.169 m Storage=70.1 m³ Inflow=0.0298 m³/s 0.079 MI
Outflow=0.0110 m³/s 0.079 MI

Link 23L: Site Total Outflow Inflow=0.0110 m³/s 0.079 MI
Primary=0.0110 m³/s 0.079 MI

Total Runoff Area = 0.2742 ha Runoff Volume = 0.079 MI Average Runoff Depth = 29 mm
100.00% Pervious = 0.2742 ha 0.00% Impervious = 0.0000 ha

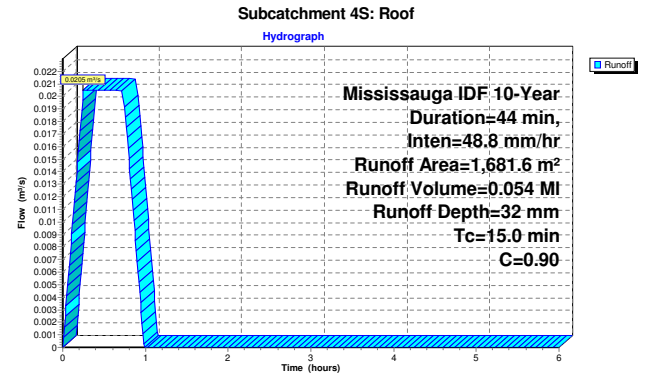
Summary for Subcatchment 4S: Roof

Runoff = 0.0205 m³/s @ 0.25 hrs, Volume= 0.054 MI, Depth= 32 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=44 min, Inten=48.8 mm/hr

Area (m²)	C	Description
1,681.6	0.90	Impervious Roof Area
1,681.6		100.00% Pervious Area

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



Summary for Subcatchment 5S: At-Grade

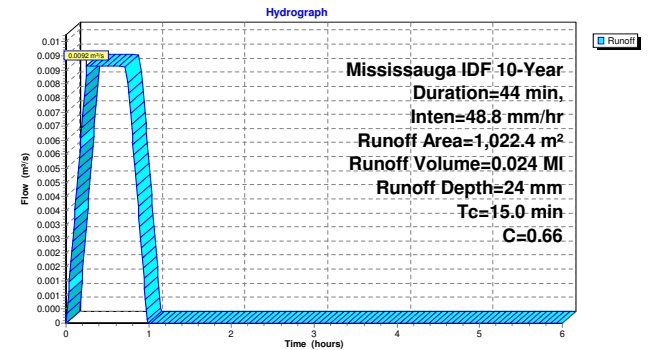
Runoff = 0.0092 m³/s @ 0.25 hrs, Volume= 0.024 MI, Depth= 24 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 10-Year Duration=44 min, Inten=48.8 mm/hr

Area (m²)	C	Description
646.5	0.90	Impervious At-Grade
375.9	0.25	soft landscaping
1,022.4	0.66	Weighted Average
1,022.4		100.00% Pervious Area

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

Subcatchment 5S: At-Grade



Summary for Subcatchment 24S: External Area

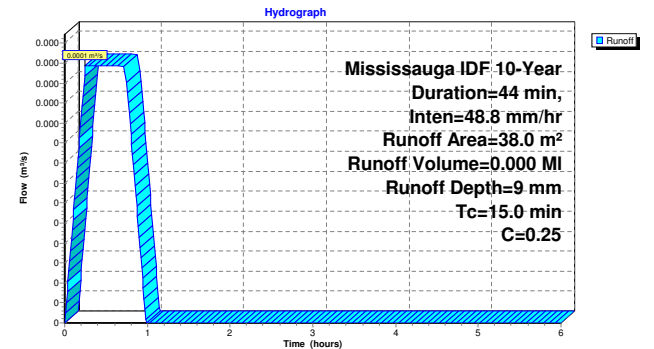
Runoff = 0.0001 m³/s @ 0.25 hrs, Volume= 0.000 MI, Depth= 9 mm

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=44 min, Inten=48.8 mm/hr

Area (m²)	C	Description
38.0	0.25	External Pervious Area
38.0		100.00% Pervious Area

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

Subcatchment 24S: External Area



Summary for Pond 24P: SWM Tank

Inflow Area = 0.2742 ha, 0.00% Impervious, Inflow Depth = 29 mm for 10-Year event
Inflow = 0.0298 m³/s @ 0.25 hrs, Volume= 0.079 MI
Outflow = 0.0110 m³/s @ 0.89 hrs, Volume= 0.079 MI, Atten= 63%, Lag= 38.5 min
Primary = 0.0110 m³/s @ 0.89 hrs, Volume= 0.079 MI

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.250 m Surf.Area= 60.0 m² Storage= 15.0 m³
Peak Elev= 1.169 m @ 0.89 hrs Surf.Area= 60.0 m² Storage= 70.1 m³ (55.1 m³ above start)

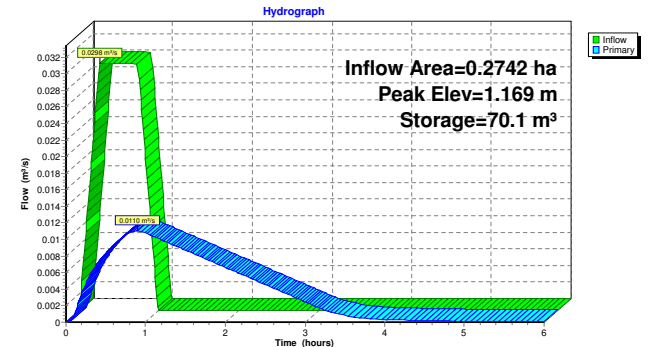
Plug-Flow detention time= 81.1 min calculated for 0.064 MI (81% of inflow)
Center-of-Mass det. time= 61.8 min (91.3 - 29.5)

Volume	Invert	Avail. Storage	Storage Description
#1	0.000 m	150.0 m³	60.00 mW x 1.00 mL x 2.50 mH Prismatoid

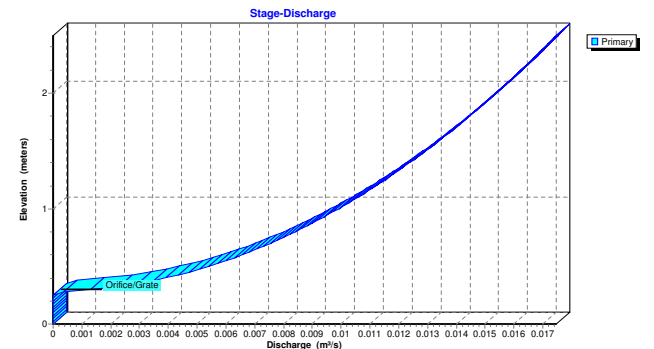
Device	Routing	Invert	Outlet Devices
#1	Primary	0.250 m	75 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.0110 m³/s @ 0.89 hrs HW=1.169 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0110 m³/s @ 2.49 m/s)

Pond 24P: SWM Tank



Pond 24P: SWM Tank

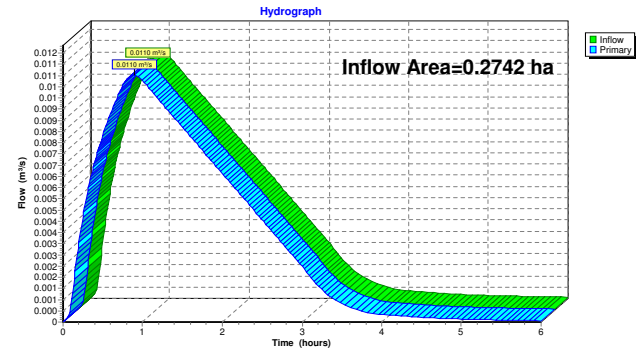


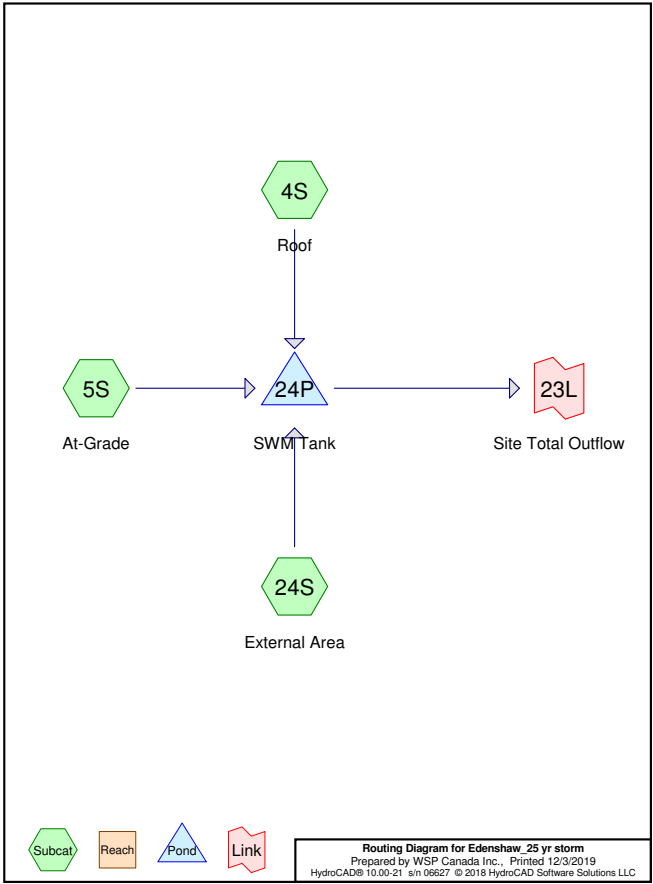
Summary for Link 23L: Site Total Outflow

Inflow Area = 0.2742 ha, 0.00% Impervious, Inflow Depth > 29 mm for 10-Year event
Inflow = 0.0110 m³/s @ 0.89 hrs, Volume= 0.079 MI
Primary = 0.0110 m³/s @ 0.89 hrs, Volume= 0.079 MI, Atten= 0%, Lag= 0.0 min

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

Link 23L: Site Total Outflow





Area Listing (all nodes)		
Area (hectares)	C	Description (subcatchment-numbers)
0.0038	0.28	External Pervious Area (24S)
0.0647	0.99	Impervious At-Grade (5S)
0.1682	0.99	Impervious Roof Area (4S)
0.0376	0.28	soft landscaping (5S)
0.2742	0.88	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	
0.2742	Other	4S, 5S, 24S
0.2742		TOTAL AREA

Ground Covers (all nodes)							
HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatchment Numbers
0.0000	0.0000	0.0000	0.0000	0.0038	0.0038	External Pervious Area	24S
0.0000	0.0000	0.0000	0.0000	0.0647	0.0647	Impervious At-Grade	5S
0.0000	0.0000	0.0000	0.0000	0.1682	0.1682	Impervious Roof Area	4S
0.0000	0.0000	0.0000	0.0000	0.0376	0.0376	soft landscaping	5S
0.0000	0.0000	0.0000	0.0000	0.2742	0.2742	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 4S: Roof Runoff Area=1,681.6 m² 100.00% Impervious Runoff Depth=44 mm
Tc=15.0 min C=0.99 Runoff=0.0216 m³/s 0.074 MI

Subcatchment 5S: At-Grade Runoff Area=1,022.4 m² 63.23% Impervious Runoff Depth=32 mm
Tc=15.0 min C=0.73 Runoff=0.0097 m³/s 0.033 MI

Subcatchment 24S: External Area Runoff Area=38.0 m² 0.00% Impervious Runoff Depth=12 mm
Tc=15.0 min C=0.28 Runoff=0.0001 m³/s 0.000 MI

Pond 24P: SWM Tank Peak Elev=1.468 m Storage=88.1 m³ Inflow=0.0314 m³/s 0.107 MI
Outflow=0.0128 m³/s 0.107 MI

Link 23L: Site Total Outflow Inflow=0.0128 m³/s 0.107 MI
Primary=0.0128 m³/s 0.107 MI

Total Runoff Area = 0.2742 ha Runoff Volume = 0.107 MI Average Runoff Depth = 39 mm
15.09% Pervious = 0.0414 ha 84.91% Impervious = 0.2328 ha

Summary for Subcatchment 4S: Roof

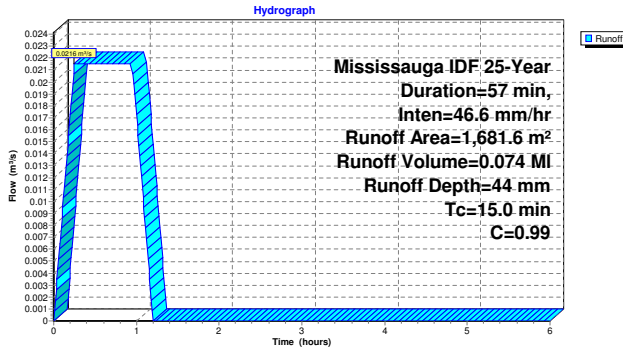
Runoff = 0.0216 m³/s @ 0.25 hrs, Volume= 0.074 MI, Depth= 44 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Mississauga IDF 25-Year Duration=57 min, Inten=46.6 mm/hr

Area (m²)	C	Description
1,681.6	0.99	Impervious Roof Area
1,681.6		100.00% Impervious Area

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

Subcatchment 4S: Roof



Summary for Subcatchment 5S: At-Grade

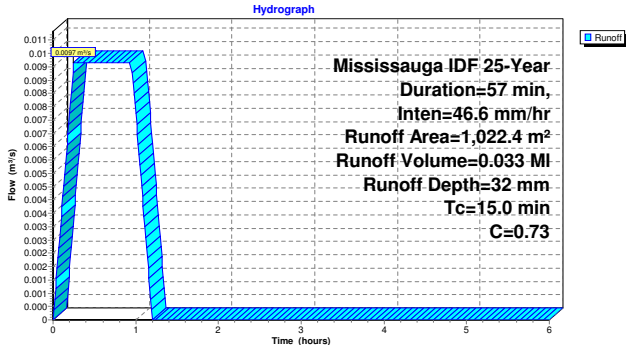
Runoff = 0.0097 m³/s @ 0.25 hrs, Volume= 0.033 MI, Depth= 32 mm

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=57 min, Inten=46.6 mm/hr

Area (m²)	C	Description
646.5	0.99	Impervious At-Grade
375.9	0.28	soft landscaping
1,022.4	0.73	Weighted Average
375.9		36.77% Pervious Area
646.5		63.23% Impervious Area

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

Subcatchment 5S: At-Grade



Summary for Subcatchment 24S: External Area

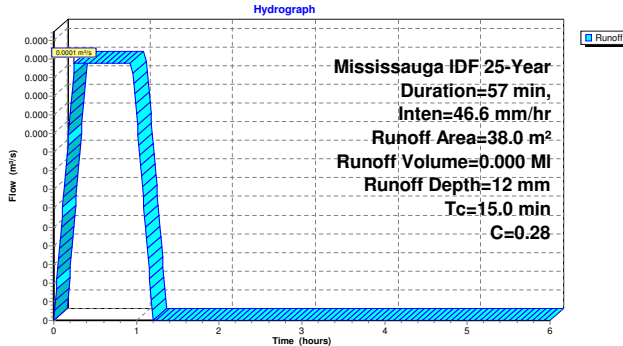
Runoff = 0.0001 m³/s @ 0.25 hrs, Volume= 0.000 MI, Depth= 12 mm

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=57 min, Inten=46.6 mm/hr

Area (m²)	C	Description
38.0	0.28	External Pervious Area
38.0		100.00% Pervious Area

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

Subcatchment 24S: External Area



Summary for Pond 24P: SWM Tank

Inflow Area = 0.2742 ha, 84.91% Impervious, Inflow Depth = 39 mm for 25-Year event

Inflow = 0.0314 m³/s @ 0.25 hrs, Volume= 0.107 MI

Outflow = 0.0128 m³/s @ 1.10 hrs, Volume= 0.107 MI, Atten= 59%, Lag= 50.9 min

Primary = 0.0128 m³/s @ 1.10 hrs, Volume= 0.107 MI

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs

Starting Elev= 0.250 m Surf.Area= 60.0 m² Storage= 15.0 m³

Peak Elev= 1.468 m @ 1.10 hrs Surf.Area= 60.0 m² Storage= 88.1 m³ (73.1 m³ above start)

Plug-Flow detention time= 86.5 min calculated for 0.092 MI (86% of inflow)

Center-of-Mass det. time= 69.6 min (105.6 - 36.0)

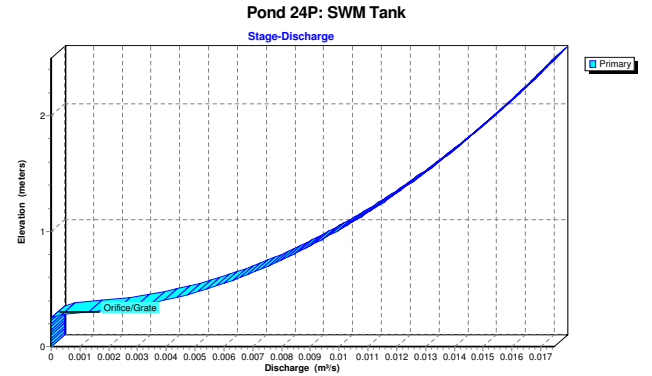
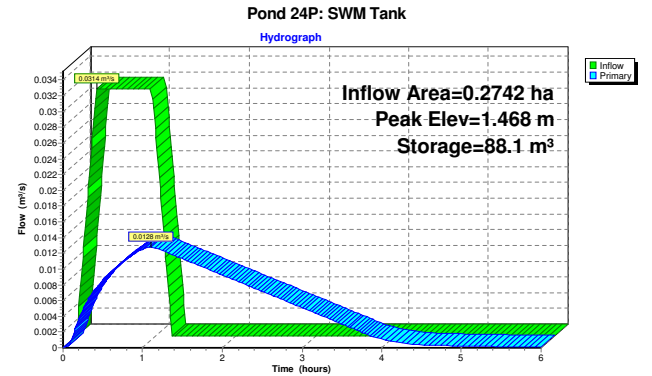
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	150.0 m³	60.00 mW x 1.00 mL x 2.50 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.250 m	75 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow

Max=0.0128 m³/s @ 1.10 hrs HW=1.468 m (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.0128 m³/s @ 2.89 m/s)



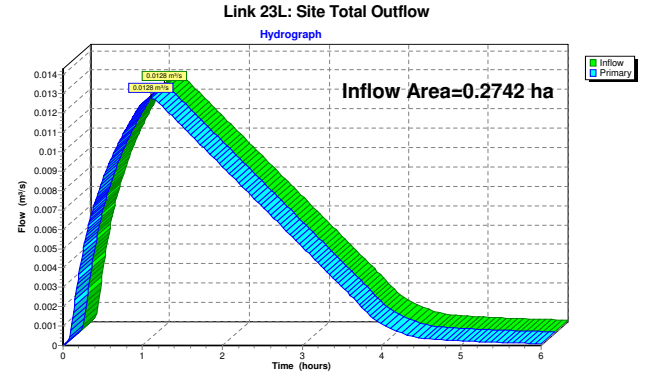
Summary for Link 23L: Site Total Outflow

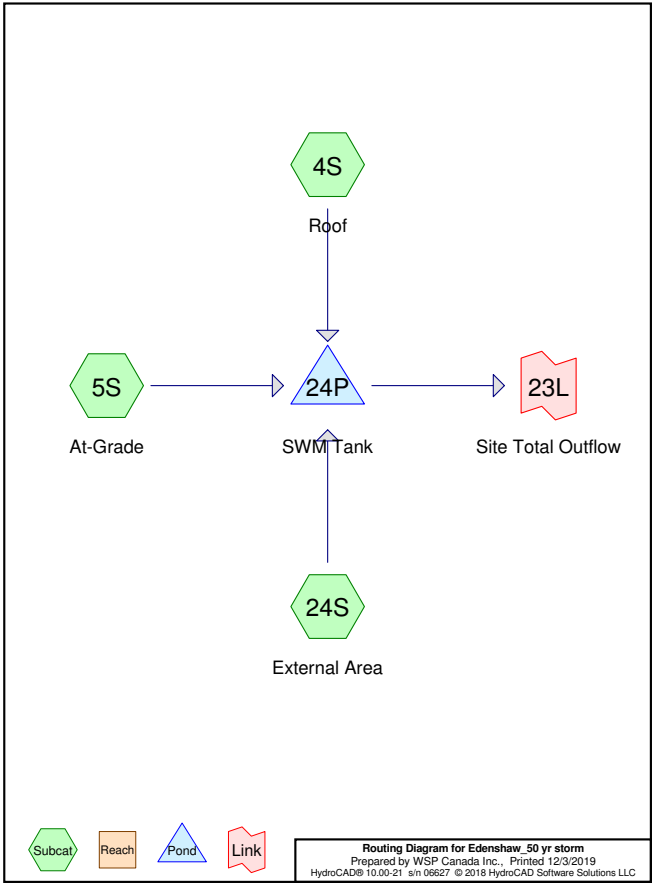
Inflow Area = 0.2742 ha, 84.91% Impervious, Inflow Depth > 39 mm for 25-Year event

Inflow = 0.0128 m³/s @ 1.10 hrs, Volume= 0.107 MI

Primary = 0.0128 m³/s @ 1.10 hrs, Volume= 0.107 MI, Atten= 0%, Lag= 0.0 min

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





Area Listing (all nodes)

Area (hectares)	C	Description (subcatchment-numbers)
0.0038	0.30	External Pervious Area (24S)
0.0647	1.00	Impervious At-Grade (5S)
0.1682	1.00	Impervious Roof Area (4S)
0.0376	0.30	soft landscaping (5S)
0.2742	0.89	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	
0.2742	Other	4S, 5S, 24S
0.2742		TOTAL AREA

Ground Covers (all nodes)

HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatchment Numbers
0.0000	0.0000	0.0000	0.0000	0.0038	0.0038	External Pervious Area	24S
0.0000	0.0000	0.0000	0.0000	0.0647	0.0647	Impervious At-Grade	5S
0.0000	0.0000	0.0000	0.0000	0.1682	0.1682	Impervious Roof Area	4S
0.0000	0.0000	0.0000	0.0000	0.0376	0.0376	soft landscaping	5S
0.0000	0.0000	0.0000	0.0000	0.2742	0.2742	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 4S: Roof Runoff Area=1,681.6 m² 100.00% Impervious Runoff Depth=50 mm
Tc=15.0 min C=1.00 Runoff=0.0235 m³/s 0.085 MI

Subcatchment 5S: At-Grade Runoff Area=1,022.4 m² 63.23% Impervious Runoff Depth=37 mm
Tc=15.0 min C=0.74 Runoff=0.0106 m³/s 0.038 MI

Subcatchment 24S: External Area Runoff Area=38.0 m² 0.00% Impervious Runoff Depth=15 mm
Tc=15.0 min C=0.30 Runoff=0.0002 m³/s 0.001 MI

Pond 24P: SWM Tank Peak Elev=1.659 m Storage=99.6 m³ Inflow=0.0342 m³/s 0.123 MI
Outflow=0.0138 m³/s 0.123 MI

Link 23L: Site Total Outflow Inflow=0.0138 m³/s 0.123 MI
Primary=0.0138 m³/s 0.123 MI

Total Runoff Area = 0.2742 ha Runoff Volume = 0.123 MI Average Runoff Depth = 45 mm
15.09% Pervious = 0.0414 ha 84.91% Impervious = 0.2328 ha

Summary for Subcatchment 4S: Roof

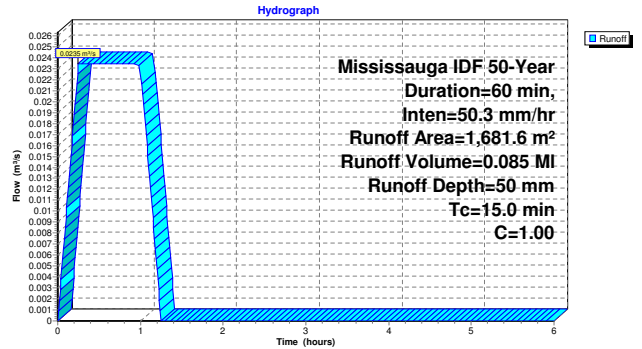
Runoff = 0.0235 m³/s @ 0.25 hrs, Volume= 0.085 MI, Depth= 50 mm

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=60 min, Inten=50.3 mm/hr

Area (m²)	C	Description
1,681.6	1.00	Impervious Roof Area
1,681.6		100.00% Impervious Area

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

Subcatchment 4S: Roof



Summary for Subcatchment 5S: At-Grade

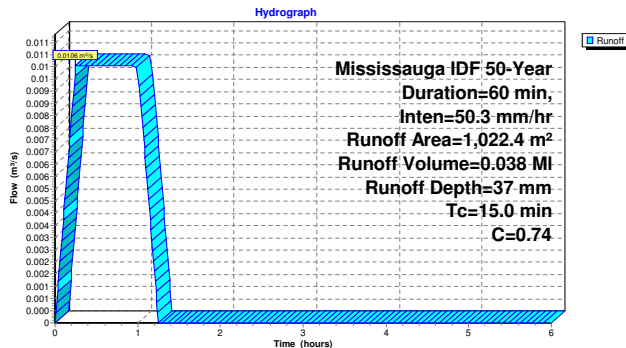
Runoff = 0.0106 m³/s @ 0.25 hrs, Volume= 0.038 MI, Depth= 37 mm

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=60 min, Inten=50.3 mm/hr

Area (m²)	C	Description
646.5	1.00	Impervious At-Grade
375.9	0.30	soft landscaping
1,022.4	0.74	Weighted Average
375.9		36.77% Pervious Area
646.5		63.23% Impervious Area

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

Subcatchment 5S: At-Grade



Summary for Subcatchment 24S: External Area

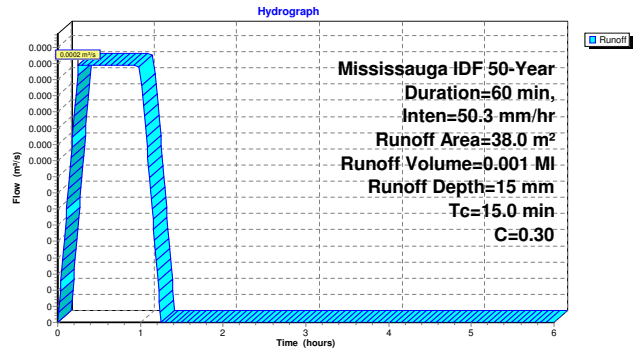
Runoff = 0.0002 m³/s @ 0.25 hrs, Volume= 0.001 MI, Depth= 15 mm

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=60 min, Inten=50.3 mm/hr

Area (m²)	C	Description
38.0	0.30	External Pervious Area
38.0		100.00% Pervious Area

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

Subcatchment 24S: External Area



Summary for Pond 24P: SWM Tank

Inflow Area = 0.2742 ha, 84.91% Impervious, Inflow Depth = 45 mm for 50-Year event
Inflow = 0.0342 m³/s @ 0.25 hrs, Volume= 0.123 MI
Outflow = 0.0138 m³/s @ 1.15 hrs, Volume= 0.123 MI, Atten= 60%, Lag= 54.0 min
Primary = 0.0138 m³/s @ 1.15 hrs, Volume= 0.123 MI

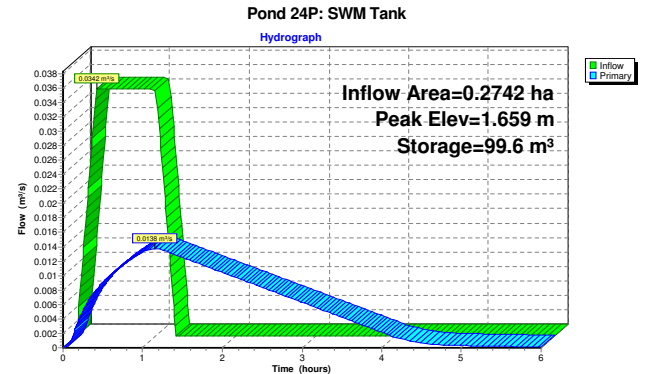
Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.250 m Surf.Area= 60.0 m² Storage= 15.0 m³
Peak Elev= 1.659 m @ 1.15 hrs Surf.Area= 60.0 m² Storage= 99.6 m³ (84.6 m³ above start)

Plug-Flow detention time= 89.7 min calculated for 0.108 MI (87% of inflow)
Center-of-Mass det. time= 74.1 min (111.6 - 37.5)

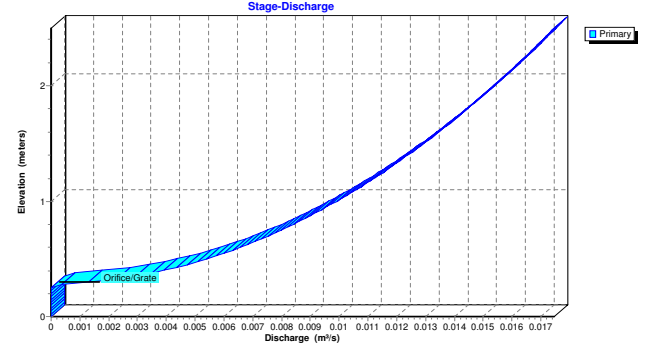
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	150.0 m³	60.00 mW x 1.00 mL x 2.50 mH Prismatic

Device	Routing	Invert	Outlet Devices
#1	Primary	0.250 m	75 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.0138 m³/s @ 1.15 hrs HW=1.659 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0138 m³/s @ 3.11 m/s)



Pond 24P: SWM Tank

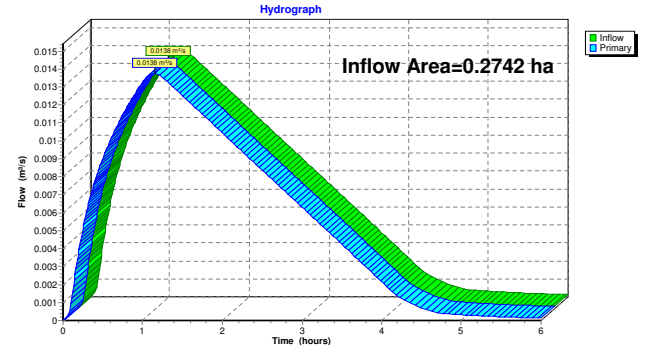


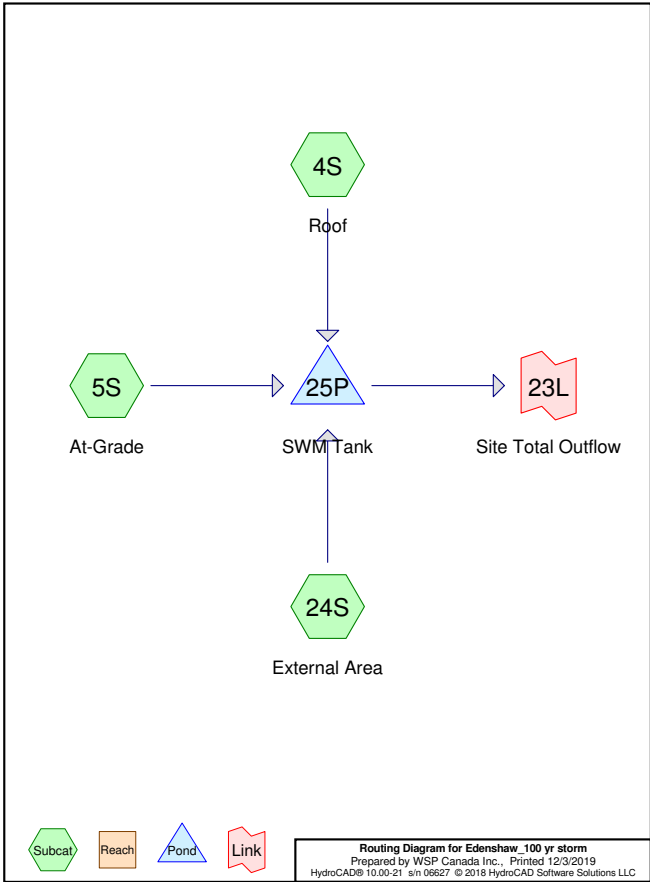
Summary for Link 23L: Site Total Outflow

Inflow Area = 0.2742 ha, 84.91% Impervious, Inflow Depth > 45 mm for 50-Year event
Inflow = 0.0138 m³/s @ 1.15 hrs, Volume= 0.123 MI
Primary = 0.0138 m³/s @ 1.15 hrs, Volume= 0.123 MI, Atten= 0%, Lag= 0.0 min

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

Link 23L: Site Total Outflow





Area Listing (all nodes)

Area (hectares)	C	Description (subcatchment-numbers)
0.0038	0.31	External Pervious Area (24S)
0.0647	1.00	Impervious At-Grade (5S)
0.1682	1.00	Impervious Roof Area (4S)
0.0376	0.31	soft landscaping (5S)
0.2742	0.90	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	
0.2742	Other	4S, 5S, 24S
0.2742		TOTAL AREA

Ground Covers (all nodes)

HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatchment Numbers
0.0000	0.0000	0.0000	0.0000	0.0038	0.0038	External Pervious Area	24S
0.0000	0.0000	0.0000	0.0000	0.0647	0.0647	Impervious At-Grade	5S
0.0000	0.0000	0.0000	0.0000	0.1682	0.1682	Impervious Roof Area	4S
0.0000	0.0000	0.0000	0.0000	0.0376	0.0376	soft landscaping	5S
0.0000	0.0000	0.0000	0.0000	0.2742	0.2742	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 4S: Roof	Runoff Area=1,681.6 m² 100.00% Impervious Runoff Depth=57 mm Tc=15.0 min C=1.00 Runoff=0.0252 m³/s 0.095 MI
Subcatchment 5S: At-Grade	Runoff Area=1,022.4 m² 63.23% Impervious Runoff Depth=43 mm Tc=15.0 min C=0.75 Runoff=0.0115 m³/s 0.043 MI
Subcatchment 24S: External Area	Runoff Area=38.0 m² 0.00% Impervious Runoff Depth=18 mm Tc=15.0 min C=0.31 Runoff=0.0002 m³/s 0.001 MI
Pond 25P: SWM Tank	Peak Elev=1.856 m Storage=111.4 m³ Inflow=0.0369 m³/s 0.140 MI Outflow=0.0147 m³/s 0.139 MI
Link 23L: Site Total Outflow	Inflow=0.0147 m³/s 0.139 MI Primary=0.0147 m³/s 0.139 MI

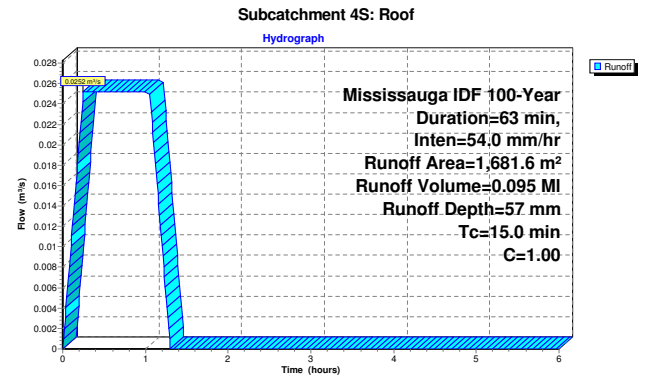
Total Runoff Area = 0.2742 ha Runoff Volume = 0.140 MI Average Runoff Depth = 51 mm
15.09% Pervious = 0.0414 ha 84.91% Impervious = 0.2328 ha

Summary for Subcatchment 4S: Roof

Runoff = 0.0252 m³/s @ 0.25 hrs, Volume= 0.095 MI, Depth= 57 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=63 min, Inten=54.0 mm/hr

Area (m²)	C	Description
1,681.6	1.00	Impervious Roof Area
1,681.6		100.00% Impervious Area

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

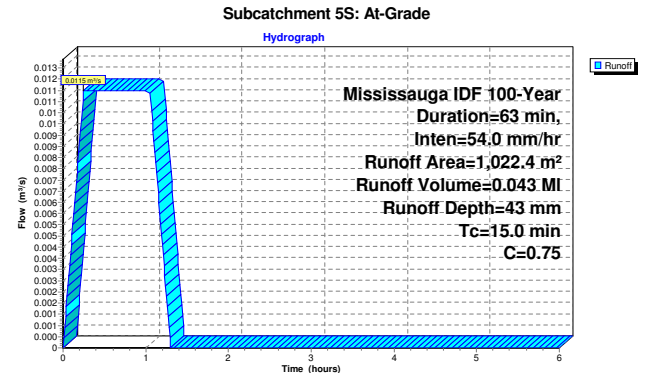


Summary for Subcatchment 5S: At-Grade

Runoff = 0.0115 m³/s @ 0.25 hrs, Volume= 0.043 MI, Depth= 43 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=63 min, Inten=54.0 mm/hr

Area (m²)	C	Description
646.5	1.00	Impervious At-Grade
375.9	0.31	soft landscaping
1,022.4	0.75	Weighted Average
375.9		36.77% Pervious Area
646.5		63.23% Impervious Area

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

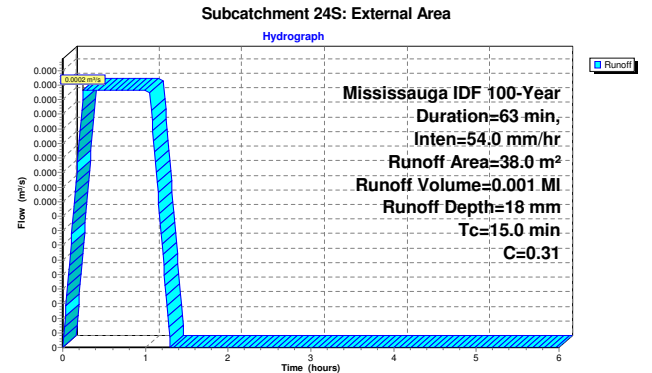


Summary for Subcatchment 24S: External Area

Runoff = 0.0002 m³/s @ 0.25 hrs, Volume= 0.001 MI, 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 100-Year Duration=63 min, Inten=54.0 mm/hr

Area (m²)	C	Description
38.0	0.31	External Pervious Area
38.0		100.00% Pervious Area

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



Summary for Pond 25P: SWM Tank

Inflow Area = 0.2742 ha, 84.91% Impervious, Inflow Depth = 51 mm for 100-Year event
Inflow = 0.0369 m³/s @ 0.25 hrs, Volume= 0.140 MI
Outflow = 0.0147 m³/s @ 1.20 hrs, Volume= 0.139 MI, Atten= 60%, Lag= 57.0 min
Primary = 0.0147 m³/s @ 1.20 hrs, Volume= 0.139 MI

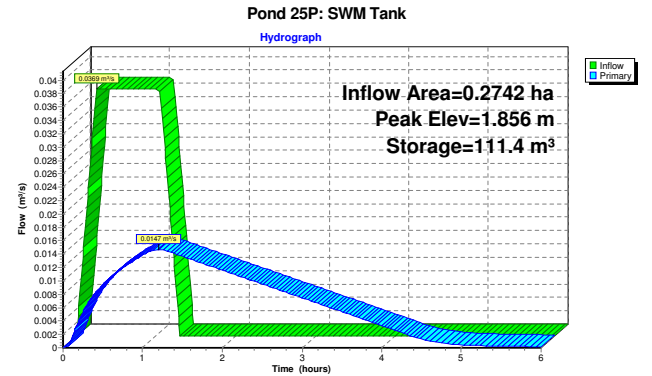
Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Starting Elev= 0.250 m Surf.Area= 60.0 m² Storage= 15.0 m³
Peak Elev= 1.856 m @ 1.20 hrs Surf.Area= 60.0 m² Storage= 111.4 m³ (96.4 m³ above start)

Plug-Flow detention time= 92.7 min calculated for 0.124 MI (89% of inflow)
Center-of-Mass det. time= 78.3 min (117.3 - 39.0)

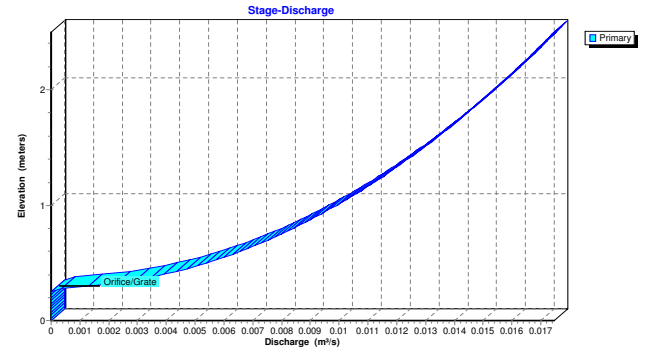
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	150.0 m³	60.00 mW x 1.00 mL x 2.50 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.250 m	75 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.0147 m³/s @ 1.20 hrs HW=1.856 m (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.0147 m³/s @ 3.33 m/s)



Pond 25P: SWM Tank

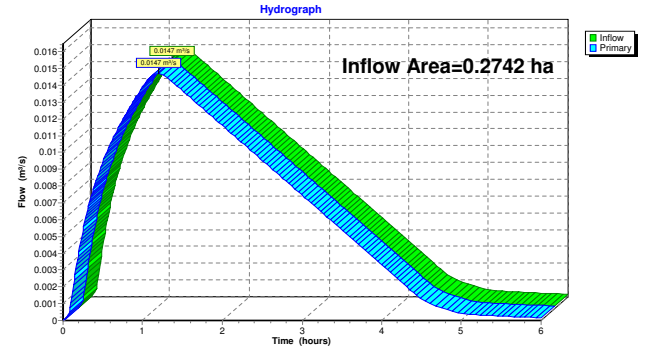


Summary for Link 23L: Site Total Outflow

Inflow Area = 0.2742 ha, 84.91% Impervious, Inflow Depth > 51 mm for 100-Year event
Inflow = 0.0147 m³/s @ 1.20 hrs, Volume= 0.139 MI
Primary = 0.0147 m³/s @ 1.20 hrs, Volume= 0.139 MI, Atten= 0%, Lag= 0.0 min

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

Link 23L: Site Total Outflow



APPENDIX

C WATER QUALITY UNIT DOCUMENTATION



Annual TSS Removal Efficiency Using Historical Weather Data

Area (ha) = 0.1022

C = 0.66

Rational Conv. 2.775 converts from m³/s to l/s

CDS Model: PMSU2015-4

Flowrate = 20 l/s

Weather Station: 6158350

PSD: FINE

Engineer: WSP

Contact: Jennifer Chan, EIT

Report Date: 02-Dec-19

Site: 3383 Hurontario Street

Location: Mississauga, ON

OGS ID: OGS

Rainfall Intensity Range (mm/hr)	Total Rainfall* (mm)	Rainfall intensity mm/hr (l)	Runoff Rate Per The Rational Method (l/s) $Q = C \times I \times A \times 2.77$	Rainfall Volume %	CDS Flow Rate (l/s)	Operating Rate	Efficiency** (%)	Relative Efficiency (%)
0.0 - 0.5	620.70	0.5	0.1	7.3%	0.1	0.00	98.7	7.2
0.5 - 1.0	791.80	1.0	0.2	9.4%	0.2	0.01	98.6	9.3
1.0 - 1.5	809.20	1.5	0.3	9.6%	0.3	0.01	98.5	9.5
1.5 - 2.0	765.50	2.0	0.4	9.1%	0.4	0.02	98.3	8.9
2.0 - 2.5	546.70	2.5	0.5	6.5%	0.5	0.02	98.2	6.4
2.5 - 3.0	512.90	3.0	0.6	6.1%	0.6	0.03	98.1	6.0
3.0 - 4.0	840.50	4.0	0.7	10.0%	0.7	0.04	97.8	9.8
4.0 - 5.0	644.80	5.0	0.9	7.6%	0.9	0.05	97.5	7.4
5.0 - 6.0	505.30	6.0	1.1	6.0%	1.1	0.06	97.2	5.8
6.0 - 7.0	430.30	7.0	1.3	5.1%	1.3	0.07	97.0	4.9
7.0 - 8.0	302.10	8.0	1.5	3.6%	1.5	0.07	96.7	3.5
8.0 - 9.0	167.40	9.0	1.7	2.0%	1.7	0.08	96.4	1.9
9.0 - 10.0	275.00	10.0	1.9	3.3%	1.9	0.09	96.2	3.2
10.0 - 11.0	198.10	11.0	2.1	2.3%	2.1	0.10	95.9	2.2
11.0 - 12.0	160.70	12.0	2.2	1.9%	2.2	0.11	95.6	1.8
12.0 - 13.0	136.50	13.0	2.4	1.6%	2.4	0.12	95.4	1.5
13.0 - 15.0	150.10	15.0	2.8	1.8%	2.8	0.14	94.8	1.7
15.0 - 20.0	366.60	20.0	3.7	4.3%	3.7	0.19	93.5	4.0
20.0 - 25.0	70.80	25.0	4.7	0.8%	4.7	0.23	92.2	0.7
25.0 - 30.0	111.90	30.0	5.6	1.3%	5.6	0.28	90.8	1.2
30.0 - 35.0	0.00	35.0	6.6	0.0%	6.6	0.33	89.5	0.0
35.0 - 40.0	38.70	40.0	7.5	0.5%	7.5	0.37	88.1	0.4

8445.60

TSS Removal: **97.4%**

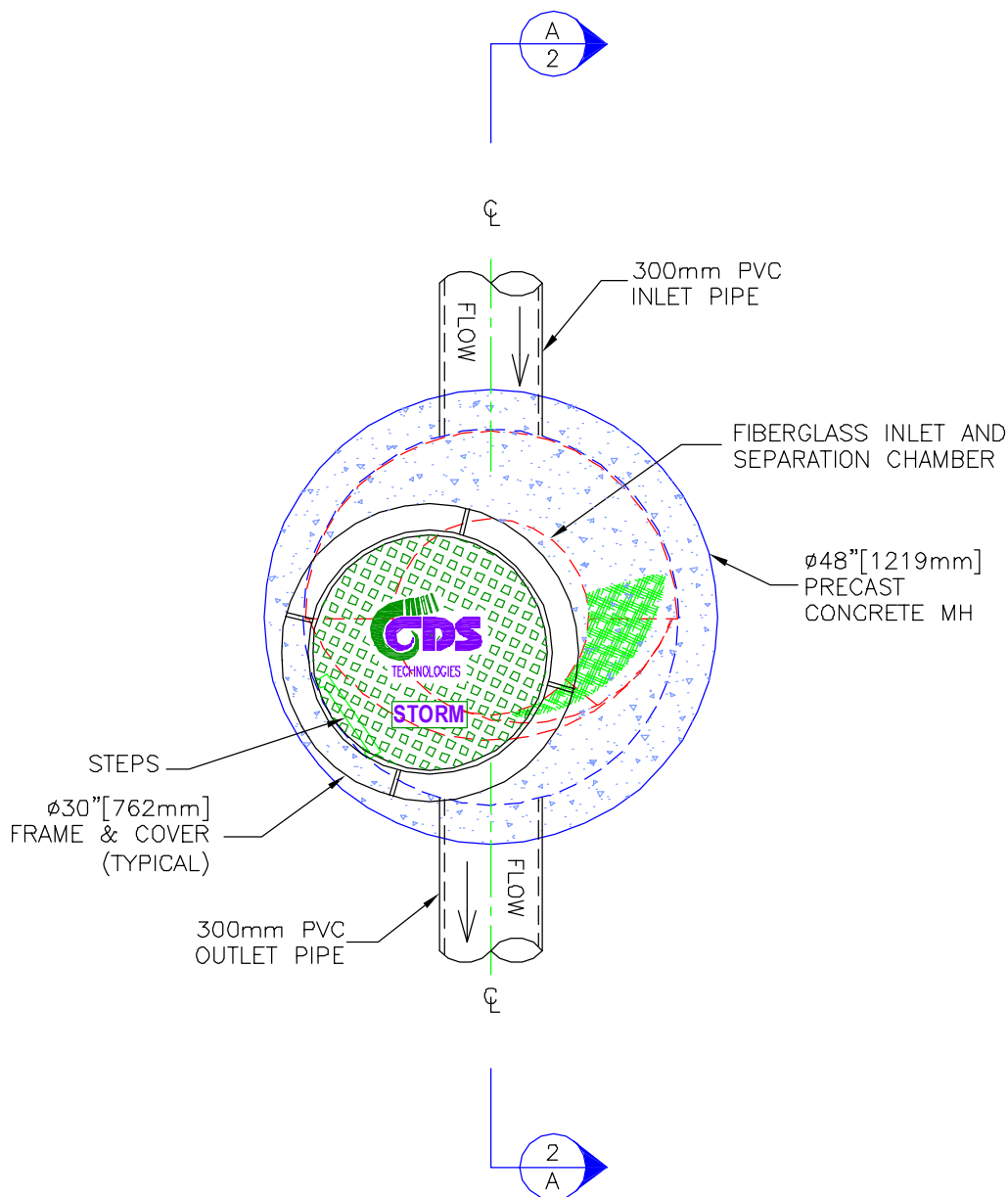
Efficiency Adjustment: **6.5%**

Net Annual TSS Removal: 90.9%

Net Annual Volume Treated: 99.9%

- 1) Historical Data including years 1982 to 1998 from Ontario Climate Centre
- 2) CDS Efficiency based on testing conducted at the University of Central Florida
- 3) Adjustment for use of 60 minute time step data on site with a time of concentration less than 30 minutes
- 4) CDS design flowrate and scaling based on standard manufacturer model & product specifications

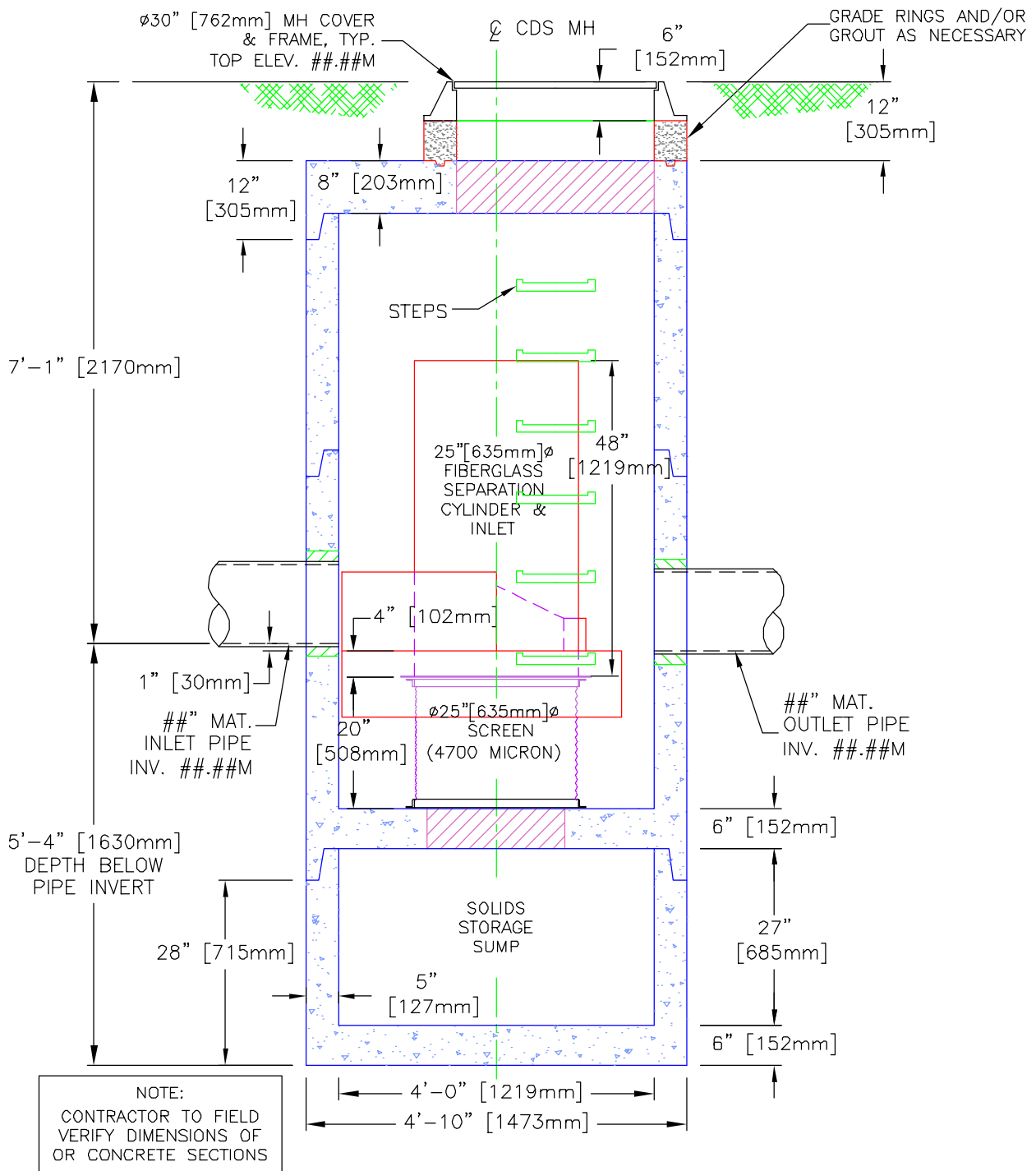
PLAN VIEW



CDS MODEL PMSU20_15_4m STORMWATER TREATMENT UNIT



SECTION A-A ELEVATION VIEW



CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT



PROJECT NAME
CITY, STATE

JOB# XX-##-###

DATE ##/##/##

DRAWN INITIALS

APPROV.

SCALE
1" = 2'

SHEET

2

