

Salter Pilon Architecture

St. Joseph Douro Addition and Parking Lot Stormwater Management Report

March 04, 2022

Original





St. Joseph Douro Addition and Parking Lot

Stormwater Management Report

Salter Pilon Architecture

Original

Project No.: 20M-01337-00

Date: March 04, 2022

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REVISION 2

FINAL

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04.03.2022

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1 INTRODUCTION

1.1 Scope

WSP has been retained by Salter Pilon Architecture to prepare a Stormwater Management (SWM) report to support the building permit and tender application for the proposed expansion at St. Joseph C.E.S in Douro, Ontario. This SWM report examines the potential water quality, quantity and balance impacts of the proposed development and summarizes how each will be addressed in accordance with the Township of Douro-Dummer and the Ministry of Environment, Conservation and Parks (MECP).

1.2 Site Location

The site is located at the northeast corner of Douro 4th Line and Regional Road 8. 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 site specific stormwater management requirements to ensure that the proposals are in conformance with the MECP's Design Manual;
 - 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

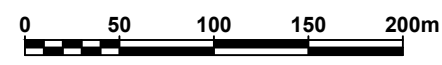
The Otonabee Region Conservation Authority (ORCA) issued the Watershed Planning & Regulations Policy Manual (December 2015) and Ministry of Environment, Conservation and Parks issued the Stormwater Management Planning and Design Manual (March 2003) to provide direction on the management of rainfall and runoff in Ontario. A summary of the stormwater management criteria applicable to this project is as follows:

- **Water Balance** – This site is not located within a CTC Source Water Protection Area nor in an ORCA regulated area. As per best practices, the site will target the retention of the 5 mm storm event and utilize Low Impact Development (LID) measures where feasible.
- **Water Quality** – Under the MECP, the site is required to target a long-term removal of 80% total suspended solids (TSS) on an annual loading basis.
- **Water Quantity** – The 2-, 5-, 10-, 25-, 50- and 100-year storm events will be controlled from post-development to pre-development levels.
- **Erosion Control** – This site is below 2 ha and does not discharge directly into a stream; the potential of stream erosion is low. During construction, appropriate erosion and sediment controls will be implemented.

FIGURE 1.dwg Fig 1 - Site Location C:\Users\charlie\OneDrive\Documents\Projects\20M-1337 St Joseph's\Map\Figures\ Mar 01, 2022 - 10:18am



@2021 Google - MAP DATA @2021 TELE ATLAS



CLIENT	SALTER PILON ARCHITECTURE INC.		
TITLE	ST. JOSEPH CATHOLIC ELEMENTARY SCHOOL		
SITE LOCATION		Checked V.N	Drawn AutoCAD/G.W
		Date MARCH 2022	Proj. No. 20M-1337-00
		Scale AS SHOWN	Figure No. 1

2 PRE-DEVELOPMENT CONDITIONS

2.1 General

The school's total property is 3.87 ha; however, the majority of this area is not part of the proposed building addition, parking lot and basketball court; therefore, only 0.35 ha will be developed and considered in the SWM design of this report.

The 0.35 ha development area is currently pervious landscaping and an impervious paved basketball court. The development area generally drains to the north. To the south of the site, there is a 0.16 ha area of Regional Road 8 that drains to a ditch on the north side of the road before draining to the subject development area; this external area will be conveyed through the proposed SWM system.

The existing conditions are presented in **Figure 2**.

2.2 Rainfall Information

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

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 and C) were taken from the 2002 Peterborough Airport IDF curves. They are summarized in **Table 2.1**.

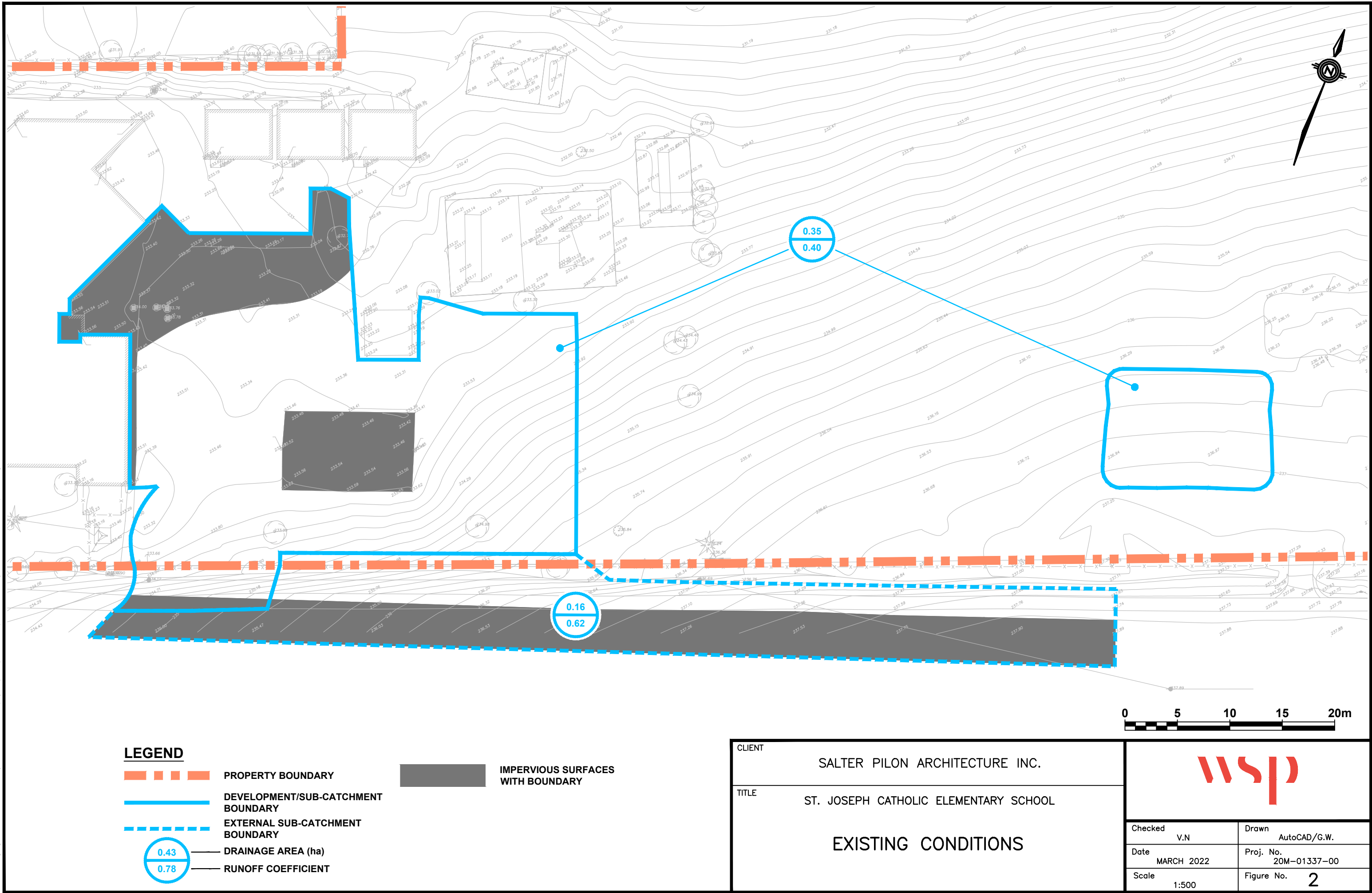
Table 2.1 Rainfall Parameters

RETURN PERIOD (years)	2	5	10	25	50	100
A	662	1098	1560	2010	2200	2507
B	7.5	10.1	13.0	14.0	14.6	14.8
C	0.79	0.83	0.86	0.88	0.87	0.88

Source: City of Toronto Wet Weather Flow Management Guidelines (November 2006)

An initial time of concentration, T_c , of 10 minutes (or 0.167 hours) is recommended for small sites.

FIGURE 2.dwg Fig 2 - Ex. Cond C:\Users\scham\BIM 360\WSP Canada projects (AMER)\Land Development Ontario\Project Files\20M-01337 St. Joseph\SWM\Figures\ Mar 01, 2022 - 10:30am



2.3 Allowable Flow Rates

As discussed in Section 1.4, the 2- to 100-year storm events will be controlled from post-development to pre-development levels. The Rational Method was used to calculate the pre-development flow rates for the development and external area.

The calculated peak flow rates are summarized in **Table 2.2**. Detailed calculations are attached in **Appendix A**.

Table 2.2 Pre-Development Peak Flow Rates

RETURN PERIOD (YEARS)	RAINFALL INTENSITY (mm/hour)	DEVELOPMENT AREA EXISTING PEAK FLOW RATE (L/s)	EXTERNAL AREA PEAK FLOW RATE (L/s)	ALLOWABLE RELEASE RATE (L/s)
2	69.0	26.9	19.5	46.4
5	91.0	35.5	25.7	61.1
10	105.2	41.0	29.7	70.7
25	122.6	47.8	34.6	82.4
50	135.6	52.9	38.2	91.1
100	148.6	57.9	41.9	99.9

3 POST-DEVELOPMENT CONDITIONS

3.1 General

The proposed development consists of the construction of a building expansion and parking lot. The stormwater strategy for this proposed development consists of a bioretention facility and rooftop storage.

In the existing conditions, there is a 0.16 ha external area that drains to the site; the flows from this area will be conveyed through the proposed SWM system.

An area breakdown of the proposed development is provided in **Table 3.1**. The proposed conditions are shown in **Figure 3**.

Table 3.1: Proposed Condition – Area Breakdown

LAND-USE	AREA (m ²)	% COVERAGE	RUNOFF COEFFICIENT
Impervious Roof	681	20	0.90
Soft Landscaping	1,037	30	0.25
At-grade Impervious	1,754	51	0.90
Total Development Area	3,472	100	0.71
External Impervious	933	-	0.9
External Pervious	699	-	0.25
Total External Area	1,632	-	0.62

3.2 Water Balance

The site will target the retention of the 5 mm storm event as best practices.

Allowing for initial abstraction of 1 mm from impervious surfaces and 5 mm from pervious surfaces (soft landscaping), a water balance of 9.74 m³ after abstractions will be retained. This volume will be provided within the bioretention cell, below the outlet. Section 3.4 discusses the details and configuration of the bioretention cell.

In the Geotechnical Investigation Report dated March 2021, GHD conducted Falling Head Tests to measure the hydraulic conductivity of the native soils at the development area. From their tests, it was estimated that the hydraulic conductivity ranges from 10⁻⁵

to 10^{-6} cm/s; this is equivalent to an infiltration rate between 12-30 mm/hr according to the Supplementary Guidelines to the Ontario Building Code. To be conservative it is assumed that the native site soil has a design infiltration rate of 12 mm/hr. While 12 mm/hr is slightly lower than the MECP's recommended 15 mm/hr infiltration rate, the design of the engineered fill and clearstone layer in the bioretention facility will have drawdown time of 69.1 hours which is within the 72-hour window recommended by the MECP.

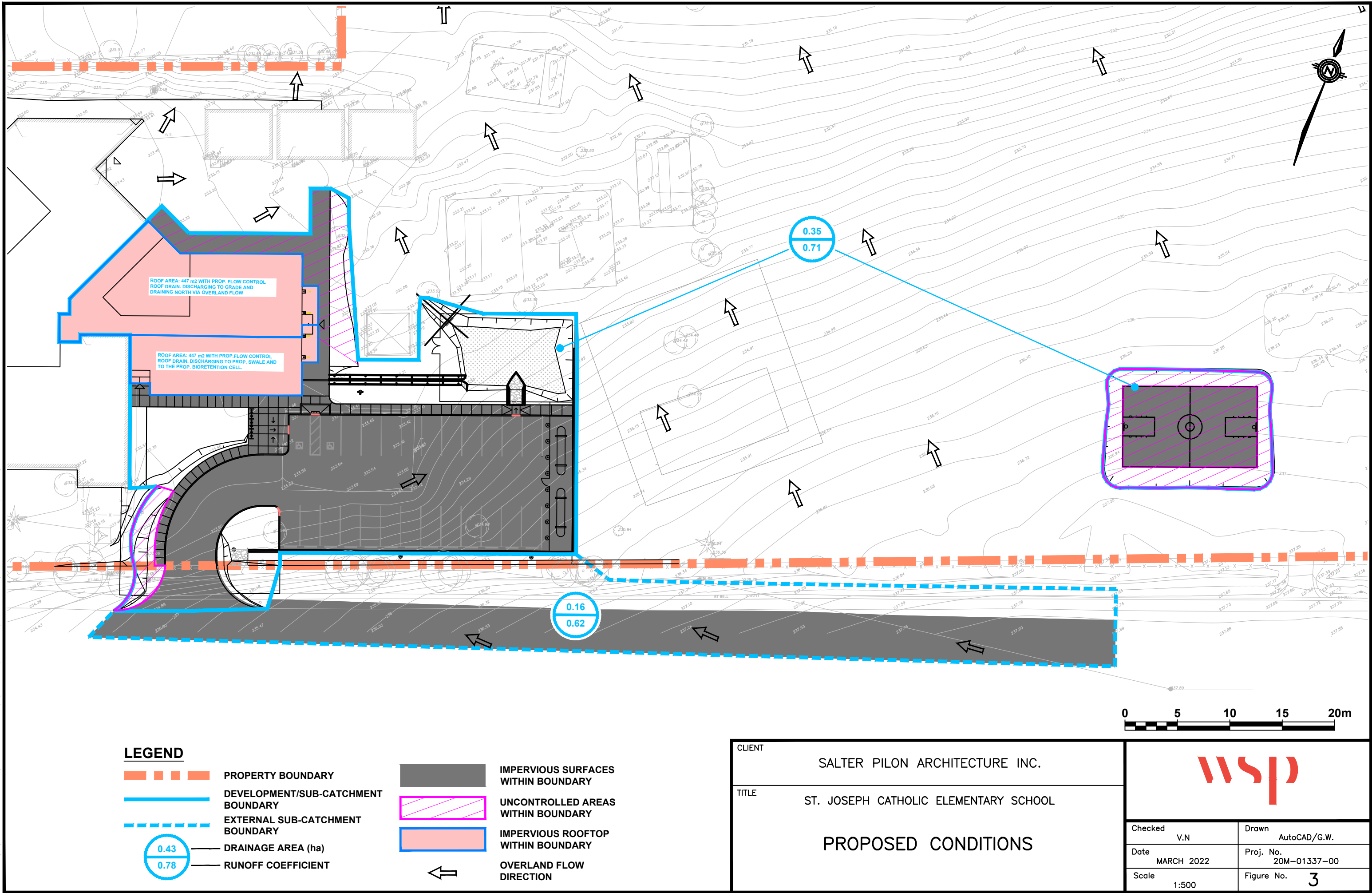
Furthermore, monitoring wells were installed throughout the site and the groundwater level ranges from 3.0 to over 5.2 m below ground surface. For BH6, which is located within the footprint of the bioretention cell, the borehole was 5.2 m deep and free of groundwater accumulation upon completion. The below ground portion of the bioretention facility will be 1.0 m deep; there will be at least 4.2 m of clearance between the bottom of the facility and the groundwater.

A summary of the water balance calculation for this site is provided below in **Table 3.2**. A summary of the water balance and drawdown time calculations is provided in **Appendix A**.

Table 3.2 Water Balance Calculation

SURFACE TYPE	AREA (m ²)	INITIAL ABSTRACTION (m)	VOLUME ABSTRACTED (m ³)	5 mm VOLUME (m ³)	WATER BALANCE (m ³)
Impervious Roof Area	681	0.001	0.68	3.41	2.72
Soft Landscaping	1,027	0.005	5.14	5.14	0.00
At-Grade Impervious	1,754	0.001	1.75	8.77	7.02
Total Site Area	3,462	-	7.57	17.31	9.74

FIGURE 3.dwg Fig 3 - Pr. Cond C:\Users\chanj\BIM 360\WSP Canada projects (AMER)\Land Development Ontario\Project Files\20M-01337 St. Joseph\SWM\Figures\ Mar 01, 2022 - 10:44am



3.3 Water Quality Control

As noted in Section 1.4, the site will target the Enhanced Protection Level - 80% TSS removal as per the MECP criteria. Within the site, the proposed roof area is not prone to sediment generation and may be considered clean for the purposes of water quality control. Stormwater runoff from vehicular surfaces and parking area are sediment generating and will require water quality treatment.

A bioretention cell was designed to provide an infiltration volume to meet the water quality requirement. Using Table 3.2 of the MECP Design Manual, the minimum required storage volume is calculated using the development area and percent impervious for an infiltration facility. The required volume for this 0.35 ha area is 12.17 m³; the bioretention cell will provide this minimum volume within the engineered fill and clearstone layers. Section 3.4 discusses the details and configuration of the bioretention cell. Water quality calculations can be found in **Appendix A**.

3.4 Water Quantity Control

As noted in 2.3, the 2- to 100-year storm events will be controlled from post-development to pre-development levels.

To meet the quantity control requirements, the development area will utilize roof drains for the building expansion and a bioretention facility. The majority of the site will drain to the bioretention facility while a portion of the roof will discharge to grade and flow north via overland flow. A small portion of the landscaped area to the west of the ramp driveway will discharge west, off site. The proposed basketball court area will also drain north uncontrolled via overland flow.

The controlled portion of the roof discharging to the bioretention facility will provide 6.7 m³ of storage and 3 roof drains while the portion of the roof discharging at grade will provide 13.3 m³ of storage and 5 roof drains. Each of the roof drains are specified to have a maximum discharge of 1.51 L/s with a ponding depth of 0.15 m. Note that the detailed specification/configuration of the roof storage, recommended roof drains and its flow rates will be provided by the responsible mechanical engineer.

The bioretention facility will have a footprint of 124.7 m² and will be comprised of three stacked layers: 250 mm depth of ponding, 600 mm depth of engineered fill and 400 mm depth of clearstone. The total storage volume provided is 78.0 m³; the outlet is a broad-crested rectangular weir 2.0 m long by 0.5 m breadth set at 1.15 m above the bottom of

clearstone. As such, 42.4 m³ will be provided within the engineered fill and clearstone layer for water quality and water balance control.

From a conservative modelling perspective, it is assumed the clearstone portion of the bioretention cell is full at the beginning of each storm event.

The 'HydroCAD' software package (Version 10.00) has been used to model the behaviour of the proposed SWM system and determine its response under various storm events. This software utilises the Modified Rational Method to calculate flow rates and related storage values. Detailed output from the modelling is included in **Appendix B**.

A summary of the modelled peak discharge rates for the roof storage discharging to the bioretention cell, roof storage discharging to grade, and the uncontrolled area are presented in **Table 3.3**. A summary of the modelled peak discharge rates for the bioretention cell and overall development area are presented in **Table 3.4**.

Table 3.3 Summary of Modelling Results – Roof Storage and Uncontrolled Areas

RETURN PERIOD (YEARS)	DISCHARGE FROM UNCONTROLLED AREA* (L/s)	DISCHARGE FROM ROOF STORAGE TO BIORETENTION** (L/s)	DISCHARGE FROM ROOF STORAGE TO GRADE** (L/s)
2	8.0	1.7	2.9
5	10.6	2.0	3.5
10	12.3	2.3	3.9
25	14.3	2.5	4.2
50	15.8	2.6	4.4
100	17.3	2.7	4.6

**Peak flow from uncontrolled area occurs at 10 minutes for the 100-year event*

***Peak flow from roof storage to bioretention facility occurs at 31 minutes for the 100-year event*

****Peak flow from the roof storage to grade occurs at 35 minutes for the 100-year event*

Table 3.4 Summary of Modelling Results – Bioretention Facility and Overall Development Site

RETURN PERIOD (YEARS)	BIORETENTION FACILITY PEAK ELEVATION (m)	BIORETENTION FACILITY UTILIZED STORAGE (m ³)	BIORETENTION FACILITY DISCHARGE (L/s)	TOTAL DEVELOPMENT AREA DISCHARGE (L/s)	ALLOWABLE RELEASE RATE (L/s)
2	1.152	62.9	0.6	8.5	46.4
5	1.189	68.5	22.4	29.7	61.1
10	1.205	70.9	37.1	47.2	70.7
25	1.218	72.9	51.2	64.0	82.4
50	1.227	74.3	61.3	76.1	91.1
100	1.234	75.4	69.6	85.9	99.9

The HydroCAD model was used to determine the event duration that generates the highest peak flows from the development area. This has been iteratively determined at $t_d = 21$ minutes (for the 100-year event) according to the Modified Rational Method process. **Table 3.4** presents the highest flows from the bioretention facility during the 21-minute event for the 2-100 year storms.

Note that the peak flows from the roof storages, uncontrolled area and bioretention facility occur at different times within the storm event; as such the total site discharge rate is not necessarily the sum of the peak discharge rates of the roof storages, uncontrolled area and bioretention facility as demonstrated in the tables above.

The modelling results demonstrate that the post-development peak flow rates for all events up to the 100-year storm are lower than the allowable release rate established in Section 2.3. The required storage for the bioretention facility to control the 100-year post-development runoff is 75.4 m³ which is less than the provided volume. Note that this utilized volume includes the previously quoted water balance storage.

3.5 Erosion Control

This site is below 2 ha and does not discharge directly into a stream; the potential of stream erosion is low. During construction, appropriate erosion and sediment controls will be implemented.

During construction, there is potential for short-term sediment wash-off from the site. To protect the downstream receiving watercourse, on-site erosion and sediment control (ESC) measures are necessary during construction.

The ESC measures focus on minimizing adverse environmental impacts by restricting the mobilization and transport of sediment, the following general practices are recommended:

- ESC measures should be in place prior to the commencement of construction, and not removed until the end of the construction period, when the site has been stabilized.
- All disturbed areas should be stabilized as quickly as possible. Stabilization of disturbed areas may be accomplished by sodding, seeding, mulching, hydro-seeding, planting, or covering of constructed slopes with appropriate material such as geotextile or jute mesh.
- Access to the construction site must be minimized and installed with aggregates.
- A continuous siltation fence must be constructed along the perimeter of the proposed development.

Routine inspection and maintenance of the ESC measures is required to ensure these measures to function properly and effectively. An ESC plan will be submitted under separate cover.

4 CONCLUSIONS

A stormwater management plan has been prepared to support the building permit and tender application for the proposed development at St. Joseph C.E.S. The key points are summarized below.

Water Balance

The bioretention facility will provide the required water balance volume of 9.74 m³ within the engineered fill and clearstone layer to retain the 5 mm storm event.

Water Quality

The bioretention facility will provide the required 12.17 m³ infiltration volume within the engineered fill and clearstone layer to meet the MECP's required 80% TSS removal.

Water Quantity

Roof storage and a bioretention facility will be used to control the discharge from the post-development conditions to pre-development flows. The roof storage will have roof drains and the bioretention facility will have a broad-crested rectangular weir.

Erosion Control

This site is below 2 ha and does not discharge directly into a stream; the potential of stream erosion is low. During construction, appropriate erosion and sediment controls will be implemented.

The report has demonstrated that the proposed stormwater management strategy will address the stormwater management related impacts from this project in adherence with the Ministry of Environment, Conservation and Parks design guidelines.

Respectfully submitted,

WSP

BIBLIOGRAPHY

- Ministry of Environment, Conservation and Parks. (2003, March). Stormwater Management Planning and Design Manual. Retrieved September 22, 2021
- Otonabee Conservation Authority. (2005, December). Watershed Planning & Regulations Policy Manual. Retrieved September 22, 2021

APPENDIX

A

Stormwater Management Calculations

**Stormwater Management Calculations**

Project: St Joseph Catholic Elementary School

No.: 20M-01337-00

Area Takeoff

By: GW/JKC

Date: 3/4/2022

Checked: VN

Page: 1

Pre-Development Area Takeoff

Land Use	Area (m2)	Runoff C	% Imperviou	%Coverage
Impervious Roof Area	0	0.9	100	0%
Soft Landscaping	2649	0.25	0	76%
At-Grade Impervious	823	0.9	100	24%
Total Development Area	3472	0.40	23.69	
External Impervious	933	0.9	100	
External Pervious	699	0.25	0	
External Area	1632	0.62	57.19	

Post Development Area Takeoff

Land Use	Area (m2)	Runoff C	% Imperviou	%Coverage
Impervious Roof Area	681	0.9	100	20%
Soft Landscaping	1037	0.25	0	30%
At-Grade Impervious	1754	0.9	100	51%
Total Development Area	3472	0.71	70	100%
External Impervious	933	0.9	100	
External Pervious	699	0.25	0	
External Area	1632	0.62	57.19	

Total Area Discharging to Bioretention Cell

Land Use	Area (m2)	Runoff C	% Imperviou	%Coverage
Impervious Roof Area	233.6	0.9	100	7%
Soft Landscaping	703.0	0.25	0	20%
At-Grade Impervious	1376.0	0.9	100	40%
Total Development Area	2312.6	0.70	69.60	
External Impervious	933.1	0.9	100	
External Pervious	698.5	0.25	0	
External Area	1631.6	0.62	57.19	

Uncontrolled Area

Land Use	Area (m2)	Runoff C	% Imperviou	%Coverage
Impervious Roof Area*	447.4	0.9	100	13%
Soft Landscaping**	333.7	0.25	0	10%
At-Grade Impervious***	378.2	0.9	100	11%
Total Uncontrolled Area	1159.3	0.71	71.22	

*Note: 447.4 m2 of the roof has roof drains but will not discharge to the Bioretention Cell. It will discharge to grade and flow north via overland flow

**Note: 63.8 m2 of the landscape area to the west of the ramp discharge west and not to the north

***This includes the impervious paved area of the basketball court

**Stormwater Management Calculations****Project:** St Joseph Catholic Elementary School**No.:** 20M-01337-00**Existing and Allowable Offsite Discharge Rate****By:** GW/JKC**Checked:** VN**Date:** 3/4/2022**Page:**
2

Calculation of existing runoff rate is undertaken using the Rational Method:

Q = 2.78 CIA

Where: Q = Peak flow rate (litres/second)

C = Runoff coefficient

I = Rainfall intensity (mm/hour)

A = Catchment area (hectares)

Area, A **0.35** hectares
Runoff Coef, C* **0.40**

$$I = \frac{A}{(T+B)^C}$$

Rainfall Intensity is calculated based on the 2002 Peterborough Airport IDF curves:

Where:

I = Rainfall Intensity in mm/hr

T = Time of Concentration in minutes, use

A, B, C = Rainfall parameters from Peterborough Airport

Return Period (Years)	2	5	10	25	50	100
A	662	1098	1560	2010	2200	2507
B	7.5	10.1	13.0	14.0	14.6	14.8
C	0.79	0.83	0.86	0.88	0.87	0.88
T (mins) **	10	10	10	10	10	10
T (hrs)	0.167	0.167	0.167	0.167	0.167	0.167
I (mm/hr)	69.0	91.0	105.2	122.6	135.6	148.6
Q Site (L/sec)	26.9	35.5	41.0	47.8	52.9	57.9
Q Site (m ³ /sec)	0.03	0.04	0.04	0.05	0.05	0.06
Q Allowable (Site + External) (L/s)	46.4	61.1	70.7	82.4	91.1	99.9

* Note recommended minimum value for time of concentration for small sites (<2.0 ha) is 10 minutes.

**Stormwater Management Calculations****Project:** St Joseph Catholic Elementary School**No.:** 20M-01337-00**External Flows Entering into Proposed SWM Facility****By:** GW/JKC**Checked:** VN**Date:** 3/4/2022**Page:**
3

Calculation of existing runoff rate is undertaken using the Rational Method:

Q = 2.78 CIA

Where: Q = Peak flow rate (litres/second)

C = Runoff coefficient

I = Rainfall intensity (mm/hour)

A = Catchment area (hectares)

Area, A **0.16** hectares
Runoff Coef, C* **0.62**

$$I = \frac{A}{(T+B)^C}$$

Rainfall Intensity is calculated based on the 2002 Peterborough Airport IDF curves:

Where:

I = Rainfall Intensity in mm/hr

T = Time of Concentration in minutes, use

A, B, C = Rainfall parameters from Peterborough Airport

Return Period (Years)	2	5	10	25	50	100
A	662.0	1098.0	1560.0	2010.0	2200.0	2507.0
B	7.5	10.1	13.0	14.0	14.6	14.8
C	0.79	0.83	0.86	0.88	0.87	0.88
T (mins) **	10	10	10	10	10	10
T (hrs)	0.167	0.167	0.167	0.167	0.167	0.167
I (mm/hr)	69.0	91.0	105.2	122.6	135.6	148.6
Q (litres/sec)	19.5	25.7	29.7	34.6	38.2	41.9
Q (m ³ /sec)	0.02	0.03	0.03	0.03	0.04	0.04

* Note recommended minimum value for time of concentration for small sites (<2.0 ha) is 10 minutes.

**Stormwater Management Calculations****Project:** St Joseph Catholic Elementary School**No.:** 20M-01337-00**Abstractions and Water Balance****By:** GW/JKC**Checked:** VN**Date:** 3/4/2022**Page:**
4

No Water Balance Criteria was determined for this Site. As per best practices, the stormwater management facility will be designed to retain the runoff from a 5 mm storm event for infiltration into the native soil

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

Land Use	Area (m ²)	Runoff C	Impervious
Impervious Roof Area	681	0.90	100%
Soft Landscaping	1,037	0.25	0%
At-Grade Impervious	1,754	0.90	100%
Total Site Area:	3,472	0.90	100%

Surface Type	Area (m ²)	Initial Abstraction (m)	Volume Abstracted (m ³)	5 mm Volume (m ³)	Water Balance (m ³)
Impervious Roof Area	681	0.001	0.68	3.41	2.72
Soft Landscaping	1,037	0.005	5.18	5.18	0.00
At-Grade Impervious	1,754	0.001	1.75	8.77	7.02
Total Site Area:	3,472	-	7.62	17.36	9.74

For the purposes of the water balance calculation it is assumed that green roofs can accept 5 mm of rainfall without producing any runoff. 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: 9.74 m³

	Stormwater Management Calculations	Project:	St Joseph Catholic Elementary School	No.: 20M-01337-00	
	Water Balance and Water Quality	By:	GW/JKC	Date: 3/4/2022	Page: 5
		Checked:	VN		

Water Balance

Water Balance Requirement 9.74 m³
Infiltration Gallery Area 124.70 m²

Bioretention Layers	Depth (mm)	Depth (m)	Porosity	Storage Volume (m ³)
Ponding	200	0.2	1.0	27.7
Engineered Fill	600	0.6	0.3	22.4
Clearstone	400	0.4	0.4	20.0
Total				70.1

*Weir is set at the top of the engineered fill

42.4 m³ is greater than 9.74 m³. Therefore, the bioretention cell meets the water balance requirement.

Water Quality

The TSS removal efficiency of the infiltration system shall be evaluated per Table 3.2 of 2003 MECP SWMPDM

Table 3.2 Water Quality Storage Requirements based on Receiving Waters^{1, 2}

Protection Level	SWMP Type	Storage Volume (m ³ /ha) for Impervious Level			
		35%	55%	70%	85%
<i>Enhanced</i> 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
<i>Normal</i> 70% long-term S.S. removal	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
<i>Basic</i> 60% long-term S.S. removal	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

Catchment Area (ha)*	Imperviousness (%)
0.35	70.1%

SWMP Type	Infiltration	
Target TSS Removal	80	%
Required Storage Volume (m ³ /ha)	35.05	m ³ /ha
Required Storage Volume (m ³)	12.17	m ³

42.4 m³ is greater than 12.17 m³. Therefore, the bioretention cell meets the water quality requirement.

	Stormwater Management Calculations	Project: St Joseph Catholic Elementary School	No.: 20M-01337-00	
	Drawdown Time Calculation	By: GW/JKC	Date: 3/4/2022	Page: 6
		Checked: VN		

A Geotechnical Investigation Report dated March 15, 2021 has been prepared by GHD. The subsurface includes topsoil, fill and till. Monitoring wells were installed throughout the site and the groundwater level ranges from 3.0 to over 5.2 m below the ground surface. For BH 6, which is located within the footprint of the proposed stormwater management facility, the borehole was 5.2 m deep and it was free of groundwater accumulation upon completion.

Additionally, GHD conducting Falling Head tests to measure the hydraulic conductivity of the native site soils. From their tests, it was estimated that the hydraulic conductivity ranges from 10^{-5} to 10^{-6} cm/s; this is equivalent to an infiltration rate between 12-30 mm/hr according to the Supplementary Guidelines to the Ontario Building Code. To be conservative it is assumed that the native site soils has an infiltration rate of 12 mm/hr

The following calculation determines the drawdown time for the infiltration system.

$$T = \frac{n}{q} * \frac{A}{P} * \ln \left(\frac{d + \frac{A}{P}}{\frac{A}{P}} \right)$$

Where

T = Time to Drain (hours)

n = void ratio of soil

A = Area of infiltration system (m²)

d = depth of water (m)

q = Infiltration rate of soil (m/h)

P = perimeter length of base of infiltration system (m)

For this site:

n	0.4	
A	124.7 m²	
d	1.00 m	*Depth of engineered soil and clearstone layer
q	0.012 m/h	
P	54.6	
Safety Factor	2.5	
T	69.1 h	

Therefore the engineered soil and clearstonr layers will fully drain in 69.1 hours. This is within the 72 hour window required for full drawdown.

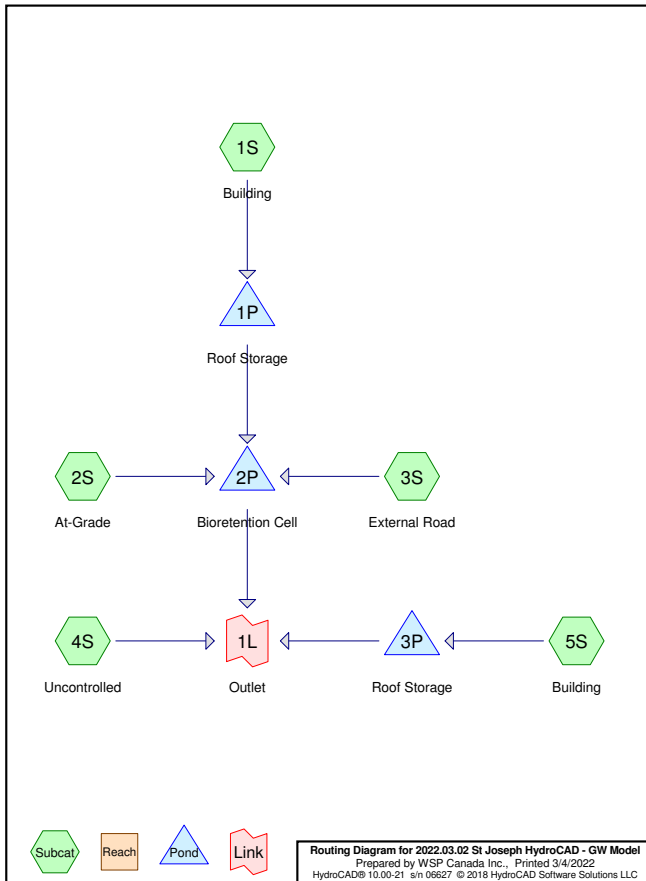
APPENDIX

B

Hydrologic Modelling Results

Area Listing (all nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
1,754.2	0.90	At-Grade Impervious (2S, 4S)
933.1	0.90	External Impervious (3S)
698.5	0.25	External Pervious (3S)
681.0	0.90	Impervious Roof (1S, 5S)
1,027.2	0.25	Soft Landscaping (2S, 4S)
5,094.0	0.68	TOTAL AREA



2022.03.02 St Joseph HydroCAD - GW Model

Prepared by WSP Canada Inc.

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Soil Listing (all nodes)

Area (sq-meters)	Soil Group	Subcatchment Numbers
0.0	HSG A	
0.0	HSG B	
0.0	HSG C	
0.0	HSG D	
5,094.0	Other	1S, 2S, 3S, 4S, 5S
5,094.0		TOTAL AREA

2022.03.02 St Joseph HydroCAD - Peterborough 2-Year Duration=21 min, Inten=46.9 mm/hr

Prepared by WSP Canada Inc.

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 1S: Building	Runoff Area=233.6 m ² 0.00% Impervious Runoff Depth=15 mm Tc=10.0 min C=0.90 Runoff=0.0027 m ³ /s 3.5 m ³
Subcatchment 2S: At-Grade	Runoff Area=2,069.5 m ² 0.00% Impervious Runoff Depth=11 mm Tc=10.0 min C=0.68 Runoff=0.0183 m ³ /s 23.1 m ³
Subcatchment 3S: External Road	Runoff Area=1,631.6 m ² 0.00% Impervious Runoff Depth=10 mm Tc=10.0 min C=0.62 Runoff=0.0132 m ³ /s 16.6 m ³
Subcatchment 4S: Uncontrolled	Runoff Area=711.9 m ² 0.00% Impervious Runoff Depth=10 mm Tc=10.0 min C=0.60 Runoff=0.0056 m ³ /s 7.0 m ³
Subcatchment 5S: Building	Runoff Area=447.4 m ² 0.00% Impervious Runoff Depth=15 mm Tc=10.0 min C=0.90 Runoff=0.0053 m ³ /s 6.6 m ³
Pond 1P: Roof Storage	Peak Elev=10.059 m Storage=1.3 m ³ Inflow=0.0027 m ³ /s 3.5 m ³ Outflow=0.0018 m ³ /s 3.5 m ³
Pond 2P: Bioretention Cell	Peak Elev=1.152 m Storage=62.9 m ³ Inflow=0.0333 m ³ /s 43.2 m ³ Outflow=0.0006 m ³ /s 0.5 m ³
Pond 3P: Roof Storage	Peak Elev=10.060 m Storage=2.9 m ³ Inflow=0.0053 m ³ /s 6.6 m ³ Outflow=0.0030 m ³ /s 6.6 m ³
Link 1L: Outlet	Inflow=0.0085 m ³ /s 14.1 m ³ Primary=0.0085 m ³ /s 14.1 m ³

Total Runoff Area = 5,094.0 m² Runoff Volume = 56.8 m³ Average Runoff Depth = 11 mm
100.00% Pervious = 5,094.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1S: Building

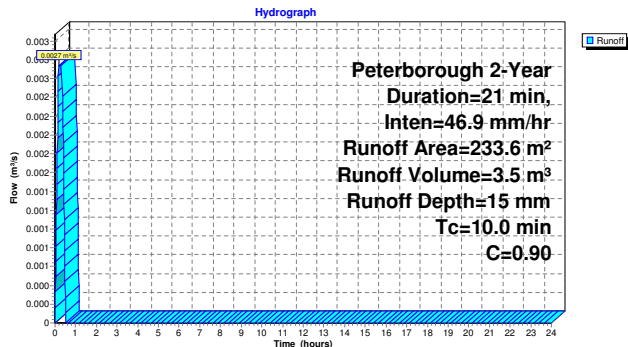
Runoff = 0.0027 m³/s @ 0.17 hrs, Volume= 3.5 m³, Depth= 15 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 2-Year Duration=21 min, Inten=46.9 mm/hr

Area (m²)	C	Description
233.6	0.90	Impervious Roof
233.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 1S: Building



Summary for Subcatchment 2S: At-Grade

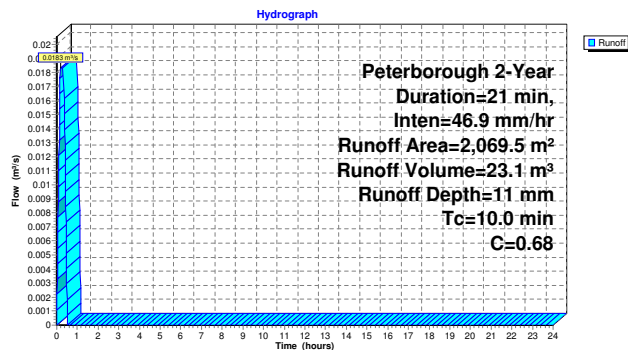
Runoff = 0.0183 m³/s @ 0.17 hrs, Volume= 23.1 m³, Depth= 11 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 2-Year Duration=21 min, Inten=46.9 mm/hr

Area (m²)	C	Description
693.5	0.25	Soft Landscaping
1,376.0	0.90	At-Grade Impervious
2,069.5	0.68	Weighted Average
2,069.5		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 2S: At-Grade



Summary for Subcatchment 3S: External Road

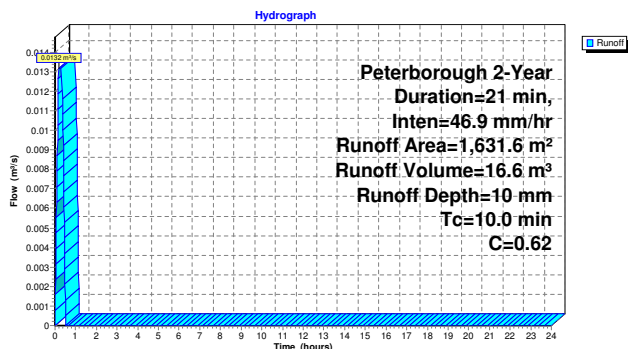
Runoff = 0.0132 m³/s @ 0.17 hrs, Volume= 16.6 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 2-Year Duration=21 min, Inten=46.9 mm/hr

Area (m²)	C	Description
933.1	0.90	External Impervious
698.5	0.25	External Pervious
1,631.6	0.62	Weighted Average
1,631.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 3S: External Road



Summary for Subcatchment 4S: Uncontrolled

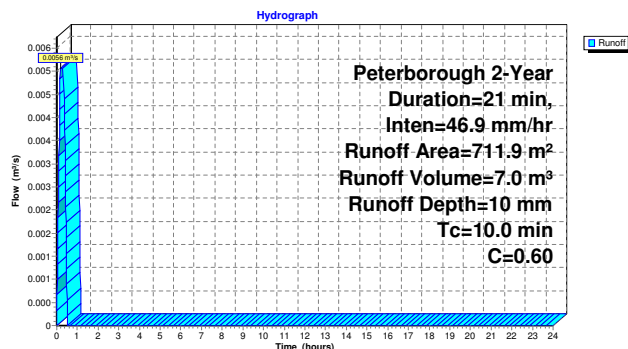
Runoff = 0.0056 m³/s @ 0.17 hrs, Volume= 7.0 m³, Depth= 10 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 2-Year Duration=21 min, Inten=46.9 mm/hr

Area (m²)	C	Description
333.7	0.25	Soft Landscaping
378.2	0.90	At-Grade Impervious
711.9	0.60	Weighted Average
711.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 4S: Uncontrolled



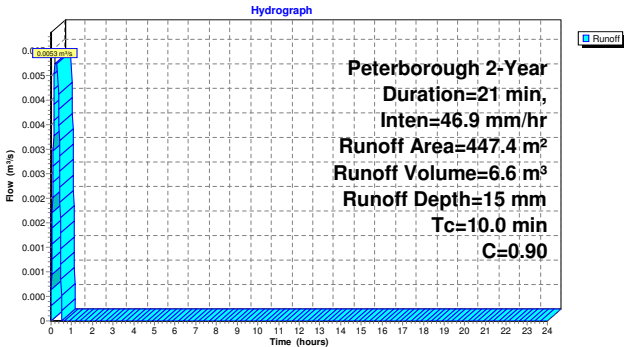
Summary for Subcatchment 5S: Building

Runoff = 0.0053 m³/s @ 0.17 hrs, Volume= 6.6 m³, Depth= 15 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peterborough 2-Year Duration=21 min, Inten=46.9 mm/hr

Area (m²)	C	Description
447.4	0.90	Impervious Roof
447.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 5S: Building



Summary for Pond 1P: Roof Storage

Inflow Area = 233.6 m², 0.00% Impervious, Inflow Depth = 15 mm for 2-Year event
Inflow = 0.0027 m³/s @ 0.17 hrs, Volume= 3.5 m³
Outflow = 0.0018 m³/s @ 0.41 hrs, Volume= 3.5 m³, Atten= 36%, Lag= 14.4 min
Primary = 0.0018 m³/s @ 0.41 hrs, Volume= 3.5 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.059 m @ 0.41 hrs Surf.Area= 68.5 m² Storage= 1.3 m³
Plug-Flow detention time= 8.6 min calculated for 3.5 m³ (100% of inflow)
Center-of-Mass det. time= 8.6 min (24.1 - 15.5)

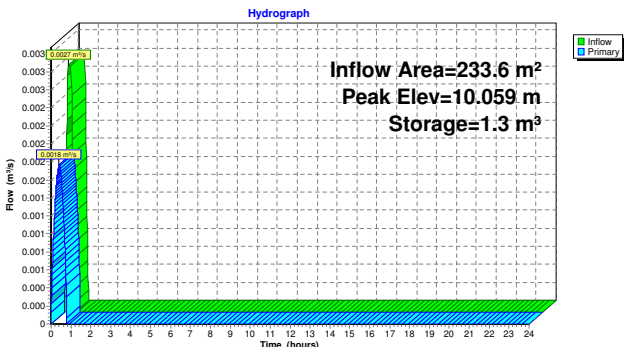
Volume	Invert	Avail.Storage	Storage Description
#1	10.000 m	6.7 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	200.0	6.7	6.7	200.0

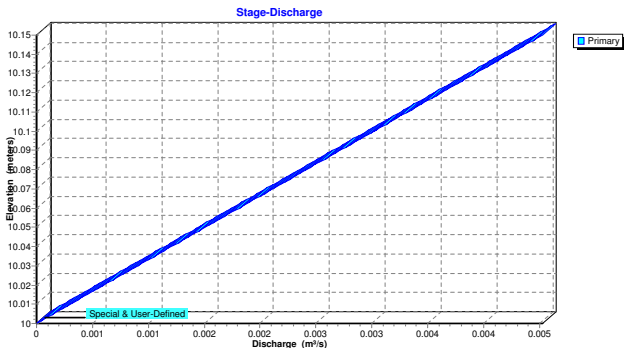
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 3.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0018 m³/s @ 0.41 hrs HW=10.059 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0018 m³/s)

Pond 1P: Roof Storage



Pond 1P: Roof Storage



Stage-Discharge for Pond 1P: Roof Storage

Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0016	10.104	0.0031
10.001	0.0000	10.053	0.0016	10.105	0.0032
10.002	0.0001	10.054	0.0016	10.106	0.0032
10.003	0.0001	10.055	0.0017	10.107	0.0032
10.004	0.0001	10.056	0.0017	10.108	0.0033
10.005	0.0002	10.057	0.0017	10.109	0.0033
10.006	0.0002	10.058	0.0018	10.110	0.0033
10.007	0.0002	10.059	0.0018	10.111	0.0034
10.008	0.0002	10.060	0.0018	10.112	0.0034
10.009	0.0003	10.061	0.0018	10.113	0.0034
10.010	0.0003	10.062	0.0019	10.114	0.0034
10.011	0.0003	10.063	0.0019	10.115	0.0035
10.012	0.0004	10.064	0.0019	10.116	0.0035
10.013	0.0004	10.065	0.0020	10.117	0.0035
10.014	0.0004	10.066	0.0020	10.118	0.0036
10.015	0.0005	10.067	0.0020	10.119	0.0036
10.016	0.0005	10.068	0.0021	10.120	0.0036
10.017	0.0005	10.069	0.0021	10.121	0.0037
10.018	0.0005	10.070	0.0021	10.122	0.0037
10.019	0.0006	10.071	0.0021	10.123	0.0037
10.020	0.0006	10.072	0.0022	10.124	0.0037
10.021	0.0006	10.073	0.0022	10.125	0.0038
10.022	0.0007	10.074	0.0022	10.126	0.0038
10.023	0.0007	10.075	0.0023	10.127	0.0038
10.024	0.0007	10.076	0.0023	10.128	0.0039
10.025	0.0008	10.077	0.0023	10.129	0.0039
10.026	0.0008	10.078	0.0024	10.130	0.0039
10.027	0.0008	10.079	0.0024	10.131	0.0040
10.028	0.0008	10.080	0.0024	10.132	0.0040
10.029	0.0009	10.081	0.0024	10.133	0.0040
10.030	0.0009	10.082	0.0025	10.134	0.0040
10.031	0.0009	10.083	0.0025	10.135	0.0041
10.032	0.0010	10.084	0.0025	10.136	0.0041
10.033	0.0010	10.085	0.0026	10.137	0.0041
10.034	0.0010	10.086	0.0026	10.138	0.0042
10.035	0.0011	10.087	0.0026	10.139	0.0042
10.036	0.0011	10.088	0.0027	10.140	0.0042
10.037	0.0011	10.089	0.0027	10.141	0.0043
10.038	0.0011	10.090	0.0027	10.142	0.0043
10.039	0.0012	10.091	0.0027	10.143	0.0043
10.040	0.0012	10.092	0.0028	10.144	0.0043
10.041	0.0012	10.093	0.0028	10.145	0.0044
10.042	0.0013	10.094	0.0028	10.146	0.0044
10.043	0.0013	10.095	0.0029	10.147	0.0044
10.044	0.0013	10.096	0.0029	10.148	0.0045
10.045	0.0014	10.097	0.0029	10.149	0.0045
10.046	0.0014	10.098	0.0030	10.150	0.0045
10.047	0.0014	10.099	0.0030		
10.048	0.0014	10.100	0.0030		
10.049	0.0015	10.101	0.0031		
10.050	0.0015	10.102	0.0031		
10.051	0.0015	10.103	0.0031		

Summary for Pond 2P: Bioretention Cell

Inflow Area = 3,934.7 m², 0.00% Impervious, Inflow Depth = 11 mm for 2-Year event
 Inflow = 0.0333 m³/s @ 0.35 hrs, Volume= 43.2 m³
 Outflow = 0.0006 m³/s @ 0.75 hrs, Volume= 0.5 m³, Atten= 98%, Lag= 23.8 min
 Primary = 0.0006 m³/s @ 0.75 hrs, Volume= 0.5 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 0.400 m Surf.Area= 249.4 m² Storage= 20.0 m³
 Peak Elev= 1.152 m @ 0.75 hrs Surf.Area= 395.4 m² Storage= 62.9 m³ (43.0 m³ above start)

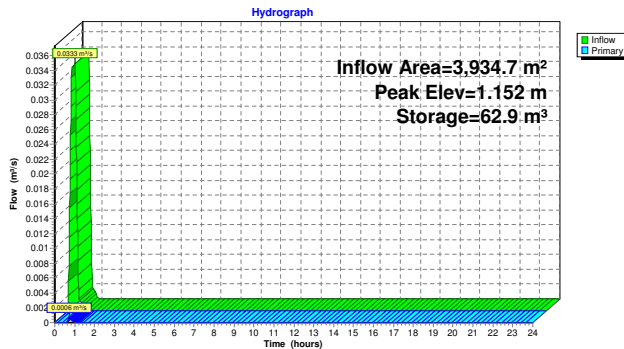
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 32.5 min (48.6 - 16.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1.000 m	35.6 m ³	12.47 mW x 10.00 mL x 0.25 mH Ponding Z=3.0
#2	0.400 m	22.4 m ³	12.47 mW x 10.00 mL x 0.60 mH Engineered Soil Media 74.8 m ³ Overall x 30.0% Voids
#3	0.000 m	20.0 m ³	12.47 mW x 10.00 mL x 0.40 mH Clear Stone 49.9 m ³ Overall x 40.0% Voids
		78.0 m ³	Total Available Storage

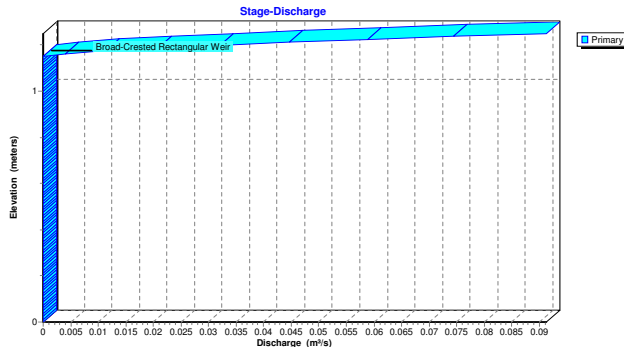
Device	Routing	Invert	Outlet Devices
#1	Primary	1.150 m	2.00 m long x 0.50 m breadth Broad-Crested Rectangular Weir Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 Coef. (Metric) 1.43 1.45 1.45 1.47 1.50 1.55 1.59 1.67 1.67 1.64 1.78 1.81 1.83

Primary OutFlow Max=0.0002 m³/s @ 0.75 hrs HW=1.152 m (Free Discharge)
 1=Broad-Crested Rectangular Weir (Weir Controls 0.0002 m³/s @ 0.06 m/s)

Pond 2P: Bioretention Cell



Pond 2P: Bioretention Cell



Stage-Discharge for Pond 2P: Bioretention Cell

Elevation (meters)	Primary (m³/s)
0.000	0.0000
0.015	0.0000
0.030	0.0000
0.045	0.0000
0.060	0.0000
0.075	0.0000
0.090	0.0000
0.105	0.0000
0.120	0.0000
0.135	0.0000
0.150	0.0000
0.165	0.0000
0.180	0.0000
0.195	0.0000
0.210	0.0000
0.225	0.0000
0.240	0.0000
0.255	0.0000
0.270	0.0000
0.285	0.0000
0.300	0.0000
0.315	0.0000
0.330	0.0000
0.345	0.0000
0.360	0.0000
0.375	0.0000
0.390	0.0000
0.405	0.0000
0.420	0.0000
0.435	0.0000
0.450	0.0000
0.465	0.0000
0.480	0.0000
0.495	0.0000
0.510	0.0000
0.525	0.0000
0.540	0.0000
0.555	0.0000
0.570	0.0000
0.585	0.0000
0.600	0.0000
0.615	0.0000
0.630	0.0000
0.645	0.0000
0.660	0.0000
0.675	0.0000
0.690	0.0000
0.705	0.0000
0.720	0.0000
0.735	0.0000
0.750	0.0000
0.765	0.0000

Elevation (meters)	Primary (m³/s)
0.780	0.0000
0.795	0.0000
0.810	0.0000
0.825	0.0000
0.840	0.0000
0.855	0.0000
0.870	0.0000
0.885	0.0000
0.900	0.0000
0.915	0.0000
0.930	0.0000
0.945	0.0000
0.960	0.0000
0.975	0.0000
0.990	0.0000
1.005	0.0000
1.020	0.0000
1.035	0.0000
1.050	0.0000
1.065	0.0000
1.080	0.0000
1.095	0.0000
1.110	0.0000
1.125	0.0000
1.140	0.0000
1.155	0.0010
1.170	0.0081
1.185	0.0187
1.200	0.0320
1.215	0.0474
1.230	0.0650
1.245	0.0844

Summary for Pond 3P: Roof Storage

Inflow Area = 447.4 m², 0.00% Impervious, Inflow Depth = 15 mm for 2-Year event
 Inflow = 0.0053 m³/s @ 0.17 hrs, Volume= 6.6 m³
 Outflow = 0.0030 m³/s @ 0.42 hrs, Volume= 6.6 m³, Atten= 42%, Lag= 15.0 min
 Primary = 0.0030 m³/s @ 0.42 hrs, Volume= 6.6 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 10.060 m @ 0.42 hrs Surf.Area= 145.9 m² Storage= 2.9 m³

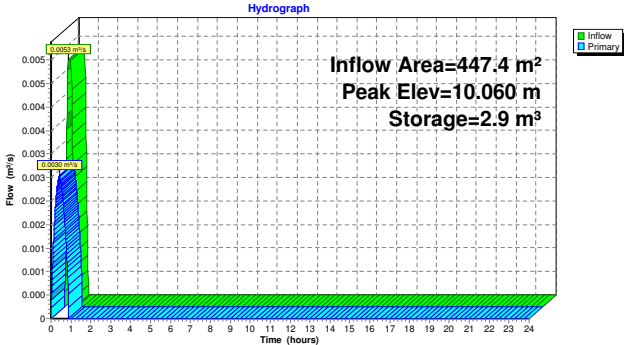
Plug-Flow detention time= 10.8 min calculated for 6.6 m³ (100% of inflow)
 Center-of-Mass det. time= 10.8 min (26.3 - 15.5)

Volume	Invert	Avail.Storage	Storage Description	
#1	10.000 m	13.3 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)	
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	400.0	13.3	13.3	400.0

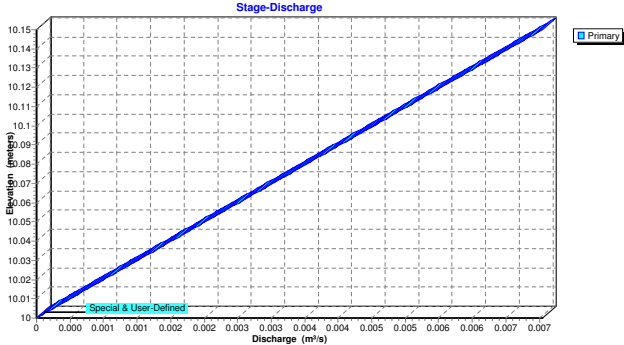
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 5.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0030 m³/s @ 0.42 hrs HW=10.060 m (Free Discharge)
 1=Special & User-Defined (Custom Controls 0.0030 m³/s)

Pond 3P: Roof Storage



Pond 3P: Roof Storage



Stage-Discharge for Pond 3P: Roof Storage

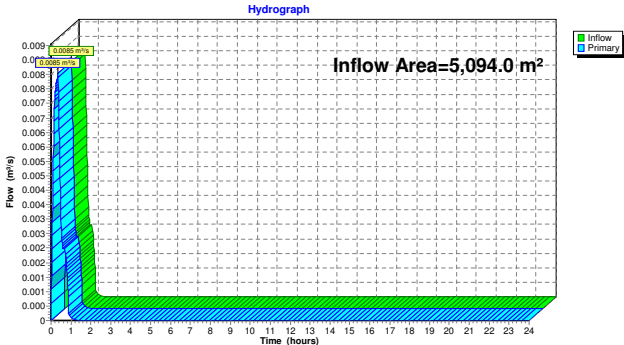
Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0026	10.104	0.0052
10.001	0.0001	10.053	0.0027	10.105	0.0053
10.002	0.0001	10.054	0.0027	10.106	0.0053
10.003	0.0002	10.055	0.0028	10.107	0.0054
10.004	0.0002	10.056	0.0028	10.108	0.0054
10.005	0.0003	10.057	0.0029	10.109	0.0055
10.006	0.0003	10.058	0.0029	10.110	0.0055
10.007	0.0004	10.059	0.0030	10.111	0.0056
10.008	0.0004	10.060	0.0030	10.112	0.0056
10.009	0.0005	10.061	0.0031	10.113	0.0057
10.010	0.0005	10.062	0.0031	10.114	0.0057
10.011	0.0006	10.063	0.0032	10.115	0.0058
10.012	0.0006	10.064	0.0032	10.116	0.0058
10.013	0.0007	10.065	0.0033	10.117	0.0059
10.014	0.0007	10.066	0.0033	10.118	0.0059
10.015	0.0008	10.067	0.0034	10.119	0.0060
10.016	0.0008	10.068	0.0034	10.120	0.0060
10.017	0.0009	10.069	0.0035	10.121	0.0061
10.018	0.0009	10.070	0.0035	10.122	0.0061
10.019	0.0010	10.071	0.0036	10.123	0.0062
10.020	0.0010	10.072	0.0036	10.124	0.0062
10.021	0.0011	10.073	0.0037	10.125	0.0063
10.022	0.0011	10.074	0.0037	10.126	0.0063
10.023	0.0012	10.075	0.0038	10.127	0.0064
10.024	0.0012	10.076	0.0038	10.128	0.0064
10.025	0.0013	10.077	0.0039	10.129	0.0065
10.026	0.0013	10.078	0.0039	10.130	0.0065
10.027	0.0014	10.079	0.0040	10.131	0.0066
10.028	0.0014	10.080	0.0040	10.132	0.0066
10.029	0.0015	10.081	0.0041	10.133	0.0067
10.030	0.0015	10.082	0.0041	10.134	0.0067
10.031	0.0016	10.083	0.0042	10.135	0.0068
10.032	0.0016	10.084	0.0042	10.136	0.0068
10.033	0.0017	10.085	0.0043	10.137	0.0069
10.034	0.0017	10.086	0.0043	10.138	0.0069
10.035	0.0018	10.087	0.0044	10.139	0.0070
10.036	0.0018	10.088	0.0044	10.140	0.0070
10.037	0.0019	10.089	0.0045	10.141	0.0071
10.038	0.0019	10.090	0.0045	10.142	0.0071
10.039	0.0020	10.091	0.0046	10.143	0.0072
10.040	0.0020	10.092	0.0046	10.144	0.0072
10.041	0.0021	10.093	0.0047	10.145	0.0073
10.042	0.0021	10.094	0.0047	10.146	0.0073
10.043	0.0022	10.095	0.0048	10.147	0.0074
10.044	0.0022	10.096	0.0048	10.148	0.0074
10.045	0.0023	10.097	0.0049	10.149	0.0075
10.046	0.0023	10.098	0.0049	10.150	0.0076
10.047	0.0024	10.099	0.0050		
10.048	0.0024	10.100	0.0050		
10.049	0.0025	10.101	0.0051		
10.050	0.0025	10.102	0.0051		
10.051	0.0026	10.103	0.0052		

Summary for Link 1L: Outlet

Inflow Area = 5,094.0 m², 0.00% Impervious, Inflow Depth = 3 mm for 2-Year event
Inflow = 0.0085 m³/s @ 0.35 hrs, Volume= 14.1 m³
Primary = 0.0085 m³/s @ 0.35 hrs, Volume= 14.1 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Outlet



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 1S: Building	Runoff Area=233.6 m² 0.00% Impervious Runoff Depth=20 mm Tc=10.0 min C=0.90 Runoff=0.0037 m³/s 4.7 m³
Subcatchment 2S: At-Grade	Runoff Area=2,069.5 m² 0.00% Impervious Runoff Depth=15 mm Tc=10.0 min C=0.68 Runoff=0.0248 m³/s 31.2 m³
Subcatchment 3S: External Road	Runoff Area=1,631.6 m² 0.00% Impervious Runoff Depth=14 mm Tc=10.0 min C=0.62 Runoff=0.0178 m³/s 22.4 m³
Subcatchment 4S: Uncontrolled	Runoff Area=711.9 m² 0.00% Impervious Runoff Depth=13 mm Tc=10.0 min C=0.60 Runoff=0.0075 m³/s 9.5 m³
Subcatchment 5S: Building	Runoff Area=447.4 m² 0.00% Impervious Runoff Depth=20 mm Tc=10.0 min C=0.90 Runoff=0.0071 m³/s 8.9 m³
Pond 1P: Roof Storage	Peak Elev=10.069 m Storage=2.1 m³ Inflow=0.0037 m³/s 4.7 m³ Outflow=0.0021 m³/s 4.7 m³
Pond 2P: Bioretention Cell	Peak Elev=1.189 m Storage=68.5 m³ Inflow=0.0445 m³/s 58.3 m³ Outflow=0.0224 m³/s 15.6 m³
Pond 3P: Roof Storage	Peak Elev=10.070 m Storage=4.6 m³ Inflow=0.0071 m³/s 8.9 m³ Outflow=0.0035 m³/s 8.9 m³
Link 1L: Outlet	Inflow=0.0297 m³/s 34.0 m³ Primary=0.0297 m³/s 34.0 m³

Total Runoff Area = 5,094.0 m² Runoff Volume = 76.7 m³ Average Runoff Depth = 15 mm
100.00% Pervious = 5,094.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1S: Building

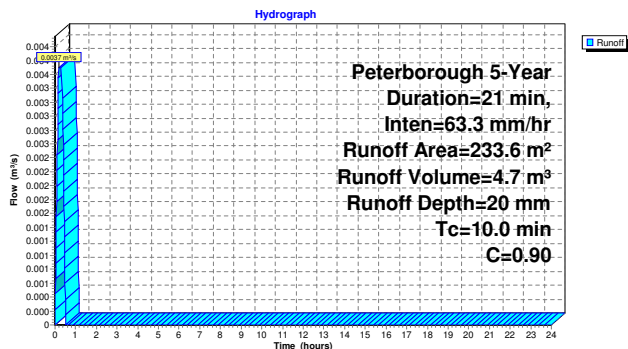
Runoff = 0.0037 m³/s @ 0.17 hrs, Volume= 4.7 m³, Depth= 20 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 5-Year Duration=21 min, Inten=63.3 mm/hr

Area (m²)	C	Description
233.6	0.90	Impervious Roof
233.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 1S: Building



Summary for Subcatchment 2S: At-Grade

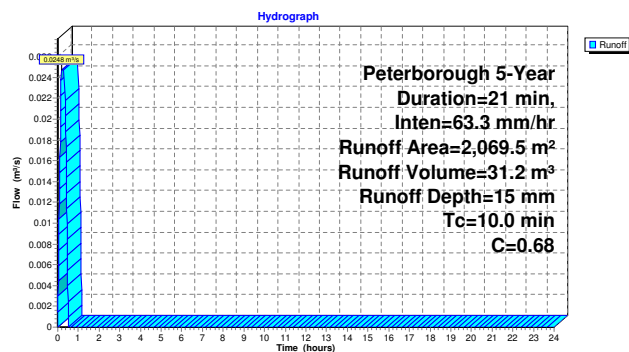
Runoff = 0.0248 m³/s @ 0.17 hrs, Volume= 31.2 m³, Depth= 15 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 5-Year Duration=21 min, Inten=63.3 mm/hr

Area (m²)	C	Description
693.5	0.25	Soft Landscaping
1,376.0	0.90	At-Grade Impervious
2,069.5	0.68	Weighted Average
2,069.5		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 2S: At-Grade



Summary for Subcatchment 3S: External Road

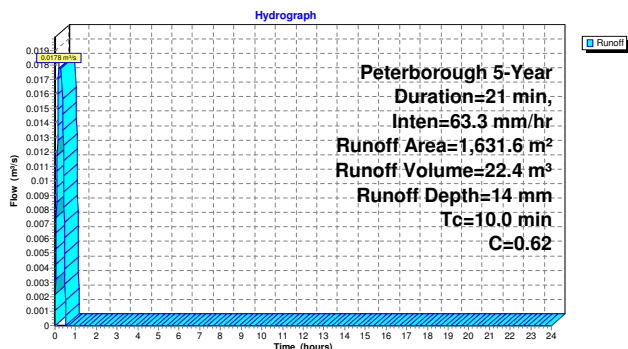
Runoff = 0.0178 m³/s @ 0.17 hrs, Volume= 22.4 m³, Depth= 14 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 5-Year Duration=21 min, Inten=63.3 mm/hr

Area (m²)	C	Description
933.1	0.90	External Impervious
698.5	0.25	External Pervious
1,631.6	0.62	Weighted Average
1,631.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 3S: External Road



Summary for Subcatchment 4S: Uncontrolled

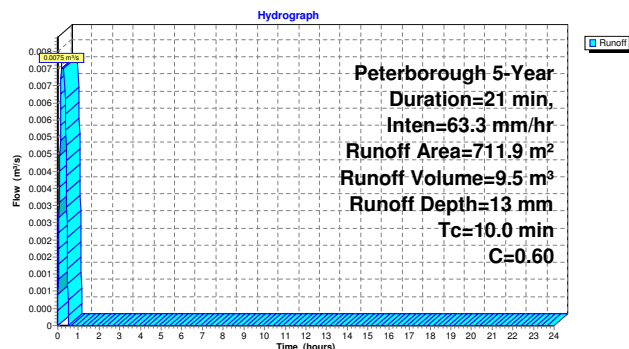
Runoff = 0.0075 m³/s @ 0.17 hrs, Volume= 9.5 m³, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 5-Year Duration=21 min, Inten=63.3 mm/hr

Area (m²)	C	Description
333.7	0.25	Soft Landscaping
378.2	0.90	At-Grade Impervious
711.9	0.60	Weighted Average
711.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 4S: Uncontrolled



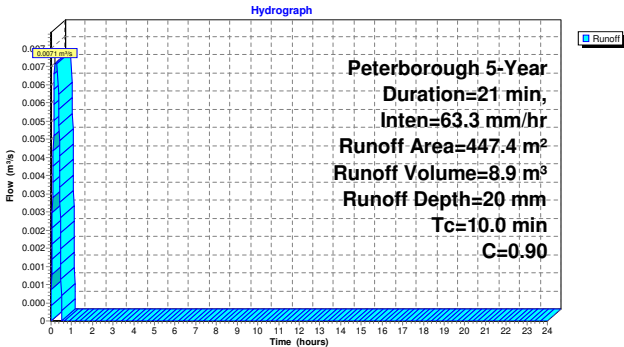
Summary for Subcatchment 5S: Building

Runoff = 0.0071 m³/s @ 0.17 hrs, Volume= 8.9 m³, Depth= 20 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peterborough 5-Year Duration=21 min, Inten=63.3 mm/hr

Area (m²)	C	Description
447.4	0.90	Impervious Roof
447.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 5S: Building



Summary for Pond 1P: Roof Storage

Inflow Area = 233.6 m², 0.00% Impervious, Inflow Depth = 20 mm for 5-Year event
Inflow = 0.0037 m³/s @ 0.17 hrs, Volume= 4.7 m³
Outflow = 0.0021 m³/s @ 0.42 hrs, Volume= 4.7 m³, Atten= 44%, Lag= 15.2 min
Primary = 0.0021 m³/s @ 0.42 hrs, Volume= 4.7 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.069 m @ 0.42 hrs Surf.Area= 94.0 m² Storage= 2.1 m³

Plug-Flow detention time= 11.5 min calculated for 4.7 m³ (100% of inflow)
Center-of-Mass det. time= 11.6 min (27.1 - 15.5)

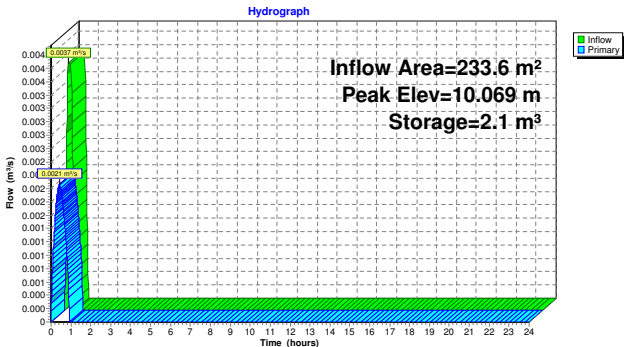
Volume	Invert	Avail.Storage	Storage Description
#1	10.000 m	6.7 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	200.0	6.7	6.7	200.0

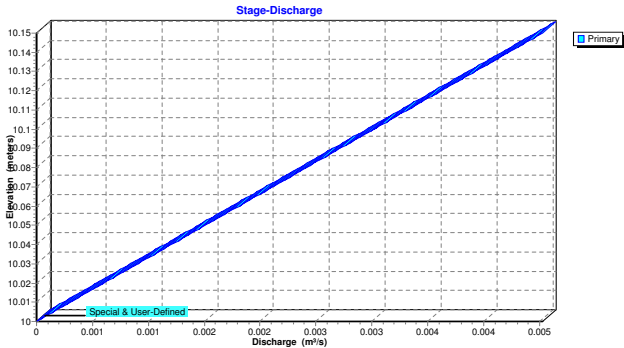
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 3.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0021 m³/s @ 0.42 hrs HW=10.069 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0021 m³/s)

Pond 1P: Roof Storage



Pond 1P: Roof Storage



Stage-Discharge for Pond 1P: Roof Storage

Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0016	10.104	0.0031
10.001	0.0000	10.053	0.0016	10.105	0.0032
10.002	0.0001	10.054	0.0016	10.106	0.0032
10.003	0.0001	10.055	0.0017	10.107	0.0032
10.004	0.0001	10.056	0.0017	10.108	0.0033
10.005	0.0002	10.057	0.0017	10.109	0.0033
10.006	0.0002	10.058	0.0018	10.110	0.0033
10.007	0.0002	10.059	0.0018	10.111	0.0034
10.008	0.0002	10.060	0.0018	10.112	0.0034
10.009	0.0003	10.061	0.0018	10.113	0.0034
10.010	0.0003	10.062	0.0019	10.114	0.0034
10.011	0.0003	10.063	0.0019	10.115	0.0035
10.012	0.0004	10.064	0.0019	10.116	0.0035
10.013	0.0004	10.065	0.0020	10.117	0.0035
10.014	0.0004	10.066	0.0020	10.118	0.0036
10.015	0.0005	10.067	0.0020	10.119	0.0036
10.016	0.0005	10.068	0.0021	10.120	0.0036
10.017	0.0005	10.069	0.0021	10.121	0.0037
10.018	0.0005	10.070	0.0021	10.122	0.0037
10.019	0.0006	10.071	0.0021	10.123	0.0037
10.020	0.0006	10.072	0.0022	10.124	0.0037
10.021	0.0006	10.073	0.0022	10.125	0.0038
10.022	0.0007	10.074	0.0022	10.126	0.0038
10.023	0.0007	10.075	0.0023	10.127	0.0038
10.024	0.0007	10.076	0.0023	10.128	0.0039
10.025	0.0008	10.077	0.0023	10.129	0.0039
10.026	0.0008	10.078	0.0024	10.130	0.0039
10.027	0.0008	10.079	0.0024	10.131	0.0040
10.028	0.0008	10.080	0.0024	10.132	0.0040
10.029	0.0009	10.081	0.0024	10.133	0.0040
10.030	0.0009	10.082	0.0025	10.134	0.0040
10.031	0.0009	10.083	0.0025	10.135	0.0041
10.032	0.0010	10.084	0.0025	10.136	0.0041
10.033	0.0010	10.085	0.0026	10.137	0.0041
10.034	0.0010	10.086	0.0026	10.138	0.0042
10.035	0.0011	10.087	0.0026	10.139	0.0042
10.036	0.0011	10.088	0.0027	10.140	0.0042
10.037	0.0011	10.089	0.0027	10.141	0.0043
10.038	0.0011	10.090	0.0027	10.142	0.0043
10.039	0.0012	10.091	0.0027	10.143	0.0043
10.040	0.0012	10.092	0.0028	10.144	0.0043
10.041	0.0012	10.093	0.0028	10.145	0.0044
10.042	0.0013	10.094	0.0028	10.146	0.0044
10.043	0.0013	10.095	0.0029	10.147	0.0044
10.044	0.0013	10.096	0.0029	10.148	0.0045
10.045	0.0014	10.097	0.0029	10.149	0.0045
10.046	0.0014	10.098	0.0030	10.150	0.0045
10.047	0.0014	10.099	0.0030		
10.048	0.0014	10.100	0.0030		
10.049	0.0015	10.101	0.0031		
10.050	0.0015	10.102	0.0031		
10.051	0.0015	10.103	0.0031		

Summary for Pond 2P: Bioretention Cell

Inflow Area = 3,934.7 m², 0.00% Impervious, Inflow Depth = 15 mm for 5-Year event
Inflow = 0.0445 m³/s @ 0.35 hrs, Volume= 58.3 m³
Outflow = 0.0224 m³/s @ 0.44 hrs, Volume= 15.6 m³, Atten= 50%, Lag= 5.2 min
Primary = 0.0224 m³/s @ 0.44 hrs, Volume= 15.6 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.400 m Surf.Area= 249.4 m² Storage= 20.0 m³
Peak Elev= 1.189 m @ 0.44 hrs Surf.Area= 400.9 m² Storage= 68.5 m³ (48.6 m³ above start)

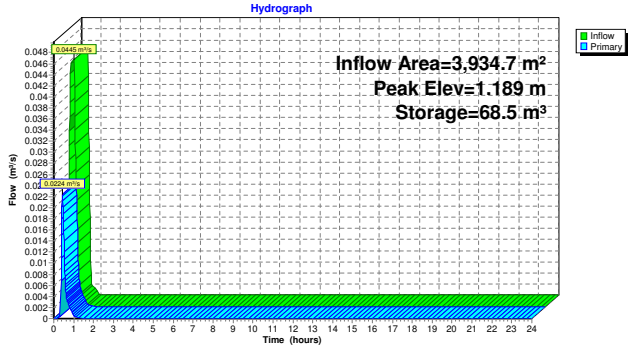
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 15.5 min (31.9 - 16.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1.000 m	35.6 m ³	12.47 mW x 10.00 mL x 0.25 mH Ponding Z=3.0
#2	0.400 m	22.4 m ³	12.47 mW x 10.00 mL x 0.60 mH Engineered Soil Media 74.8 m ³ Overall x 30.0% Voids
#3	0.000 m	20.0 m ³	12.47 mW x 10.00 mL x 0.40 mH Clear Stone 49.9 m ³ Overall x 40.0% Voids
78.0 m ³			Total Available Storage

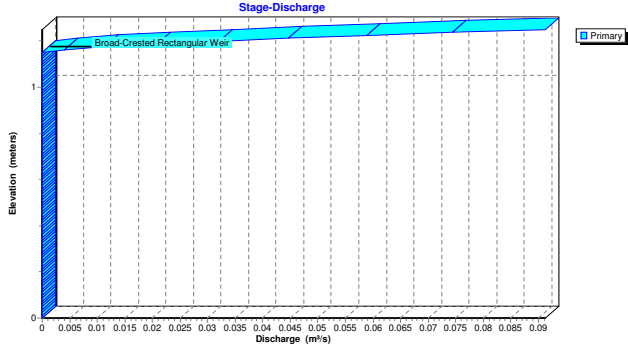
Device	Routing	Invert	Outlet Devices
#1	Primary	1.150 m	2.00 m long x 0.50 m breadth Broad-Crested Rectangular Weir Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 Coef. (Metric) 1.43 1.45 1.45 1.47 1.50 1.55 1.59 1.67 1.67 1.64 1.78 1.81 1.83

Primary OutFlow Max=0.0223 m³/s @ 0.44 hrs HW=1.189 m (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.0223 m³/s @ 0.28 m/s)

Pond 2P: Bioretention Cell



Pond 2P: Bioretention Cell



Stage-Discharge for Pond 2P: Bioretention Cell

Elevation (meters)	Primary (m³/s)
0.000	0.0000
0.015	0.0000
0.030	0.0000
0.045	0.0000
0.060	0.0000
0.075	0.0000
0.090	0.0000
0.105	0.0000
0.120	0.0000
0.135	0.0000
0.150	0.0000
0.165	0.0000
0.180	0.0000
0.195	0.0000
0.210	0.0000
0.225	0.0000
0.240	0.0000
0.255	0.0000
0.270	0.0000
0.285	0.0000
0.300	0.0000
0.315	0.0000
0.330	0.0000
0.345	0.0000
0.360	0.0000
0.375	0.0000
0.390	0.0000
0.405	0.0000
0.420	0.0000
0.435	0.0000
0.450	0.0000
0.465	0.0000
0.480	0.0000
0.495	0.0000
0.510	0.0000
0.525	0.0000
0.540	0.0000
0.555	0.0000
0.570	0.0000
0.585	0.0000
0.600	0.0000
0.615	0.0000
0.630	0.0000
0.645	0.0000
0.660	0.0000
0.675	0.0000
0.690	0.0000
0.705	0.0000
0.720	0.0000
0.735	0.0000
0.750	0.0000
0.765	0.0000

Elevation (meters)	Primary (m³/s)
0.780	0.0000
0.795	0.0000
0.810	0.0000
0.825	0.0000
0.840	0.0000
0.855	0.0000
0.870	0.0000
0.885	0.0000
0.900	0.0000
0.915	0.0000
0.930	0.0000
0.945	0.0000
0.960	0.0000
0.975	0.0000
0.990	0.0000
1.005	0.0000
1.020	0.0000
1.035	0.0000
1.050	0.0000
1.065	0.0000
1.080	0.0000
1.095	0.0000
1.110	0.0000
1.125	0.0000
1.140	0.0000
1.155	0.0010
1.170	0.0081
1.185	0.0187
1.200	0.0320
1.215	0.0474
1.230	0.0650
1.245	0.0844

Summary for Pond 3P: Roof Storage

Inflow Area = 447.4 m², 0.00% Impervious, Inflow Depth = 20 mm for 5-Year event
Inflow = 0.0071 m³/s @ 0.17 hrs, Volume= 8.9 m³
Outflow = 0.0035 m³/s @ 0.43 hrs, Volume= 8.9 m³, Atten= 50%, Lag= 15.8 min
Primary = 0.0035 m³/s @ 0.43 hrs, Volume= 8.9 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.070 m @ 0.43 hrs Surf.Area= 196.8 m² Storage= 4.6 m³

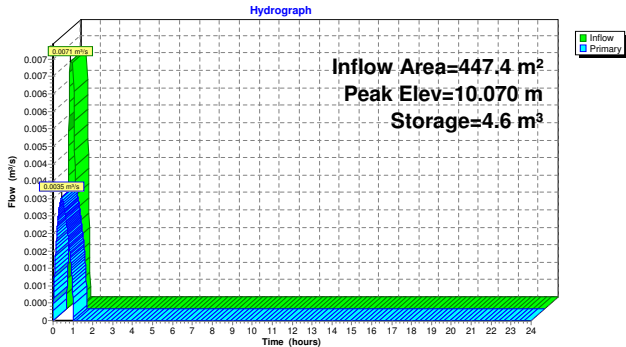
Plug-Flow detention time= 14.3 min calculated for 8.9 m³ (100% of inflow)
Center-of-Mass det. time= 14.3 min (29.8 - 15.5)

Volume	Invert	Avail.Storage	Storage Description	
#1	10.000 m	13.3 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)	
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	400.0	13.3	13.3	400.0

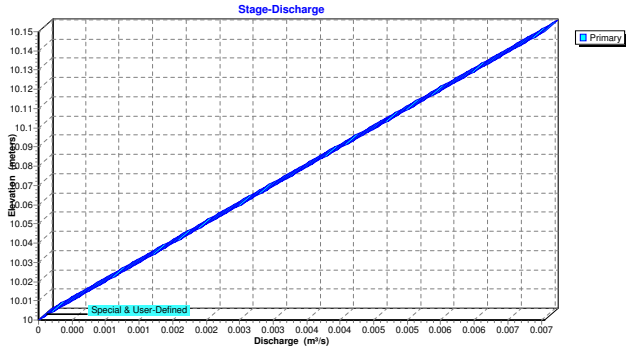
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 5.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0035 m³/s @ 0.43 hrs HW=10.070 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0035 m³/s)

Pond 3P: Roof Storage



Pond 3P: Roof Storage



Stage-Discharge for Pond 3P: Roof Storage

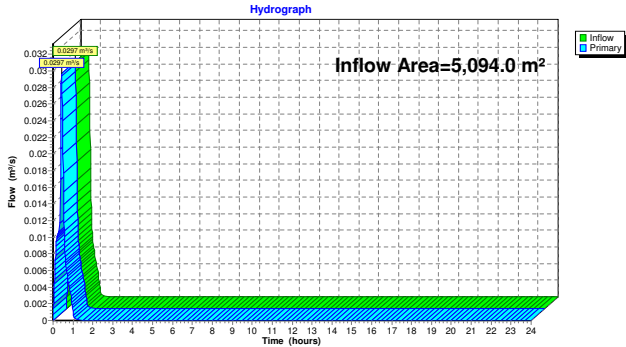
Elevation (meters)	Primary (m ³ /s)	Elevation (meters)	Primary (m ³ /s)	Elevation (meters)	Primary (m ³ /s)
10.000	0.0000	10.052	0.0026	10.104	0.0052
10.001	0.0001	10.053	0.0027	10.105	0.0053
10.002	0.0001	10.054	0.0027	10.106	0.0053
10.003	0.0002	10.055	0.0028	10.107	0.0054
10.004	0.0002	10.056	0.0028	10.108	0.0054
10.005	0.0003	10.057	0.0029	10.109	0.0055
10.006	0.0003	10.058	0.0029	10.110	0.0055
10.007	0.0004	10.059	0.0030	10.111	0.0056
10.008	0.0004	10.060	0.0030	10.112	0.0056
10.009	0.0005	10.061	0.0031	10.113	0.0057
10.010	0.0005	10.062	0.0031	10.114	0.0057
10.011	0.0006	10.063	0.0032	10.115	0.0058
10.012	0.0006	10.064	0.0032	10.116	0.0058
10.013	0.0007	10.065	0.0033	10.117	0.0059
10.014	0.0007	10.066	0.0033	10.118	0.0059
10.015	0.0008	10.067	0.0034	10.119	0.0060
10.016	0.0008	10.068	0.0034	10.120	0.0060
10.017	0.0009	10.069	0.0035	10.121	0.0061
10.018	0.0009	10.070	0.0035	10.122	0.0061
10.019	0.0010	10.071	0.0036	10.123	0.0062
10.020	0.0010	10.072	0.0036	10.124	0.0062
10.021	0.0011	10.073	0.0037	10.125	0.0063
10.022	0.0011	10.074	0.0037	10.126	0.0063
10.023	0.0012	10.075	0.0038	10.127	0.0064
10.024	0.0012	10.076	0.0038	10.128	0.0064
10.025	0.0013	10.077	0.0039	10.129	0.0065
10.026	0.0013	10.078	0.0039	10.130	0.0065
10.027	0.0014	10.079	0.0040	10.131	0.0066
10.028	0.0014	10.080	0.0040	10.132	0.0066
10.029	0.0015	10.081	0.0041	10.133	0.0067
10.030	0.0015	10.082	0.0041	10.134	0.0067
10.031	0.0016	10.083	0.0042	10.135	0.0068
10.032	0.0016	10.084	0.0042	10.136	0.0068
10.033	0.0017	10.085	0.0043	10.137	0.0069
10.034	0.0017	10.086	0.0043	10.138	0.0069
10.035	0.0018	10.087	0.0044	10.139	0.0070
10.036	0.0018	10.088	0.0044	10.140	0.0070
10.037	0.0019	10.089	0.0045	10.141	0.0071
10.038	0.0019	10.090	0.0045	10.142	0.0071
10.039	0.0020	10.091	0.0046	10.143	0.0072
10.040	0.0020	10.092	0.0046	10.144	0.0072
10.041	0.0021	10.093	0.0047	10.145	0.0073
10.042	0.0021	10.094	0.0047	10.146	0.0073
10.043	0.0022	10.095	0.0048	10.147	0.0074
10.044	0.0022	10.096	0.0048	10.148	0.0074
10.045	0.0023	10.097	0.0049	10.149	0.0075
10.046	0.0023	10.098	0.0049	10.150	0.0076
10.047	0.0024	10.099	0.0050		
10.048	0.0024	10.100	0.0050		
10.049	0.0025	10.101	0.0051		
10.050	0.0025	10.102	0.0051		
10.051	0.0026	10.103	0.0052		

Summary for Link 1L: Outlet

Inflow Area = 5,094.0 m², 0.00% Impervious, Inflow Depth = 7 mm for 5-Year event
Inflow = 0.0297 m³/s @ 0.43 hrs, Volume= 34.0 m³
Primary = 0.0297 m³/s @ 0.43 hrs, Volume= 34.0 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Outlet



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 1S: Building	Runoff Area=233.6 m ² 0.00% Impervious Runoff Depth=24 mm Tc=10.0 min C=0.90 Runoff=0.0044 m ³ /s 5.5 m ³
Subcatchment 2S: At-Grade	Runoff Area=2,069.5 m ² 0.00% Impervious Runoff Depth=18 mm Tc=10.0 min C=0.68 Runoff=0.0294 m ³ /s 37.0 m ³
Subcatchment 3S: External Road	Runoff Area=1,631.6 m ² 0.00% Impervious Runoff Depth=16 mm Tc=10.0 min C=0.62 Runoff=0.0211 m ³ /s 26.6 m ³
Subcatchment 4S: Uncontrolled	Runoff Area=711.9 m ² 0.00% Impervious Runoff Depth=16 mm Tc=10.0 min C=0.60 Runoff=0.0089 m ³ /s 11.2 m ³
Subcatchment 5S: Building	Runoff Area=447.4 m ² 0.00% Impervious Runoff Depth=24 mm Tc=10.0 min C=0.90 Runoff=0.0084 m ³ /s 10.6 m ³
Pond 1P: Roof Storage	Peak Elev=10.075 m Storage=2.8 m ³ Inflow=0.0044 m ³ /s 5.5 m ³ Outflow=0.0023 m ³ /s 5.5 m ³
Pond 2P: Bioretention Cell	Peak Elev=1.205 m Storage=70.9 m ³ Inflow=0.0527 m ³ /s 69.2 m ³ Outflow=0.0371 m ³ /s 26.4 m ³
Pond 3P: Roof Storage	Peak Elev=10.076 m Storage=5.9 m ³ Inflow=0.0084 m ³ /s 10.6 m ³ Outflow=0.0038 m ³ /s 10.6 m ³
Link 1L: Outlet	Inflow=0.0472 m ³ /s 48.3 m ³ Primary=0.0472 m ³ /s 48.3 m ³

Total Runoff Area = 5,094.0 m² Runoff Volume = 91.0 m³ Average Runoff Depth = 18 mm
100.00% Pervious = 5,094.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1S: Building

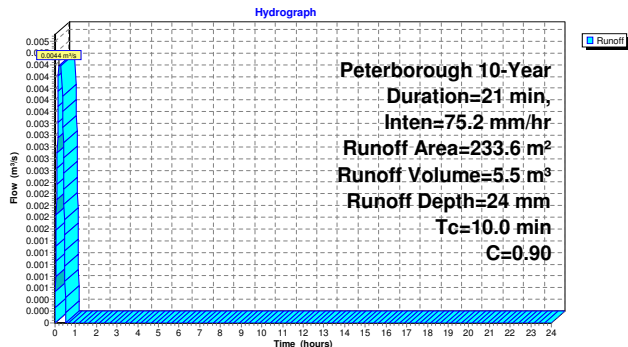
Runoff = 0.0044 m³/s @ 0.17 hrs, Volume= 5.5 m³, Depth= 24 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 10-Year Duration=21 min, Inten=75.2 mm/hr

Area (m²)	C	Description
233.6	0.90	Impervious Roof
233.6	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 1S: Building



Summary for Subcatchment 2S: At-Grade

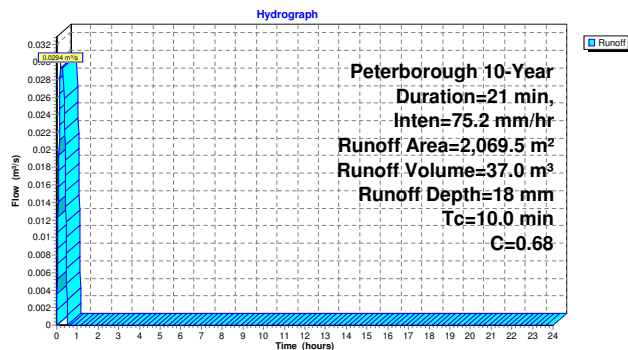
Runoff = 0.0294 m³/s @ 0.17 hrs, Volume= 37.0 m³, Depth= 18 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 10-Year Duration=21 min, Inten=75.2 mm/hr

Area (m²)	C	Description
693.5	0.25	Soft Landscaping
1,376.0	0.90	At-Grade Impervious
2,069.5	0.68	Weighted Average
2,069.5	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 2S: At-Grade



Summary for Subcatchment 3S: External Road

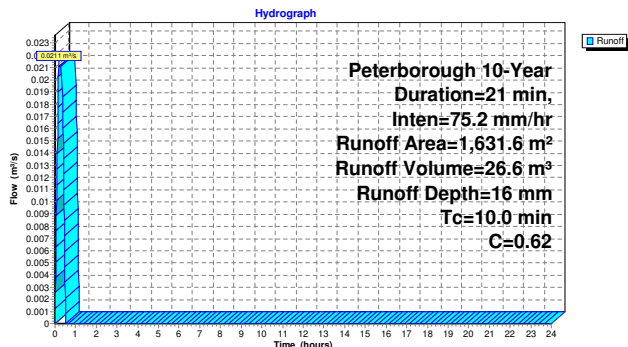
Runoff = 0.0211 m³/s @ 0.17 hrs, Volume= 26.6 m³, Depth= 16 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 10-Year Duration=21 min, Inten=75.2 mm/hr

Area (m²)	C	Description
933.1	0.90	External Impervious
698.5	0.25	External Pervious
1,631.6	0.62	Weighted Average
1,631.6	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 3S: External Road



Summary for Subcatchment 4S: Uncontrolled

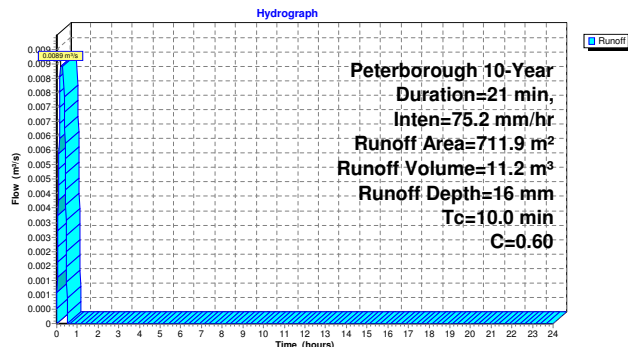
Runoff = 0.0089 m³/s @ 0.17 hrs, Volume= 11.2 m³, Depth= 16 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 10-Year Duration=21 min, Inten=75.2 mm/hr

Area (m²)	C	Description
333.7	0.25	Soft Landscaping
378.2	0.90	At-Grade Impervious
711.9	0.60	Weighted Average
711.9	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 4S: Uncontrolled

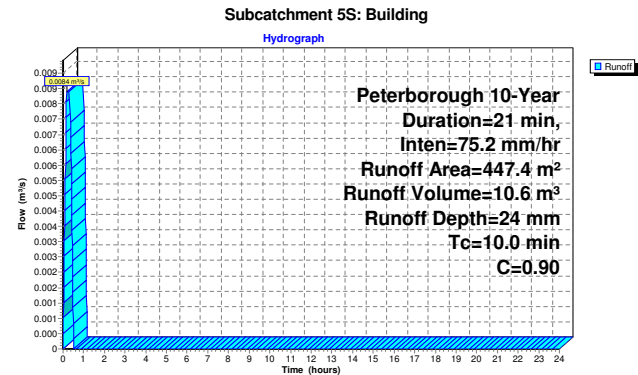


Summary for Subcatchment 5S: Building

Runoff = 0.0084 m³/s @ 0.17 hrs, Volume= 10.6 m³, Depth= 24 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peterborough 10-Year Duration=21 min, Inten=75.2 mm/hr

Area (m²)	C	Description
447.4	0.90	Impervious Roof
447.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)



Summary for Pond 1P: Roof Storage

Inflow Area = 233.6 m², 0.00% Impervious, Inflow Depth = 24 mm for 10-Year event
Inflow = 0.0044 m³/s @ 0.17 hrs, Volume= 5.5 m³
Outflow = 0.0023 m³/s @ 0.43 hrs, Volume= 5.5 m³, Atten= 49%, Lag= 15.7 min
Primary = 0.0023 m³/s @ 0.43 hrs, Volume= 5.5 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.075 m @ 0.43 hrs Surf.Area= 111.5 m² Storage= 2.8 m³
Plug-Flow detention time= 13.6 min calculated for 5.5 m³ (100% of inflow)
Center-of-Mass det. time= 13.6 min (29.1 - 15.5)

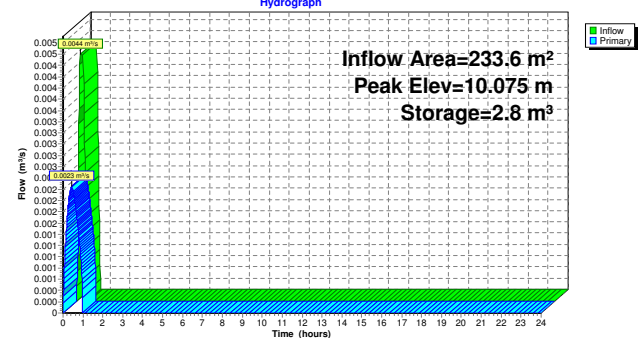
Volume	Invert	Avail.Storage	Storage Description
#1	10.000 m	6.7 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	200.0	6.7	6.7	200.0

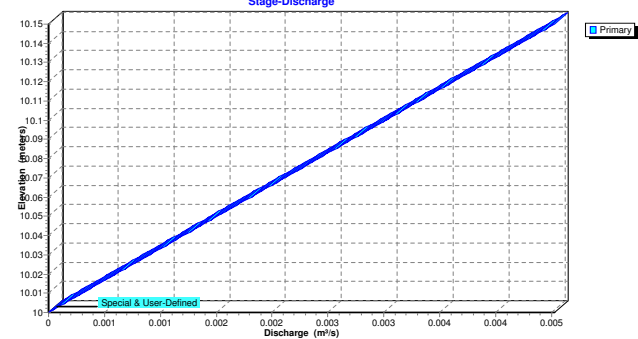
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 3.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0023 m³/s @ 0.43 hrs HW=10.075 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0023 m³/s)

Pond 1P: Roof Storage



Pond 1P: Roof Storage



Stage-Discharge for Pond 1P: Roof Storage

Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0016	10.104	0.0031
10.001	0.0000	10.053	0.0016	10.105	0.0032
10.002	0.0001	10.054	0.0016	10.106	0.0032
10.003	0.0001	10.055	0.0017	10.107	0.0032
10.004	0.0001	10.056	0.0017	10.108	0.0033
10.005	0.0002	10.057	0.0017	10.109	0.0033
10.006	0.0002	10.058	0.0018	10.110	0.0033
10.007	0.0002	10.059	0.0018	10.111	0.0034
10.008	0.0002	10.060	0.0018	10.112	0.0034
10.009	0.0003	10.061	0.0018	10.113	0.0034
10.010	0.0003	10.062	0.0019	10.114	0.0034
10.011	0.0003	10.063	0.0019	10.115	0.0035
10.012	0.0004	10.064	0.0019	10.116	0.0035
10.013	0.0004	10.065	0.0020	10.117	0.0035
10.014	0.0004	10.066	0.0020	10.118	0.0036
10.015	0.0005	10.067	0.0020	10.119	0.0036
10.016	0.0005	10.068	0.0021	10.120	0.0036
10.017	0.0005	10.069	0.0021	10.121	0.0037
10.018	0.0005	10.070	0.0021	10.122	0.0037
10.019	0.0006	10.071	0.0021	10.123	0.0037
10.020	0.0006	10.072	0.0022	10.124	0.0037
10.021	0.0006	10.073	0.0022	10.125	0.0038
10.022	0.0007	10.074	0.0022	10.126	0.0038
10.023	0.0007	10.075	0.0023	10.127	0.0038
10.024	0.0007	10.076	0.0023	10.128	0.0039
10.025	0.0008	10.077	0.0023	10.129	0.0039
10.026	0.0008	10.078	0.0024	10.130	0.0039
10.027	0.0008	10.079	0.0024	10.131	0.0040
10.028	0.0008	10.080	0.0024	10.132	0.0040
10.029	0.0009	10.081	0.0024	10.133	0.0040
10.030	0.0009	10.082	0.0025	10.134	0.0040
10.031	0.0009	10.083	0.0025	10.135	0.0041
10.032	0.0010	10.084	0.0025	10.136	0.0041
10.033	0.0010	10.085	0.0026	10.137	0.0041
10.034	0.0010	10.086	0.0026	10.138	0.0042
10.035	0.0011	10.087	0.0026	10.139	0.0042
10.036	0.0011	10.088	0.0027	10.140	0.0042
10.037	0.0011	10.089	0.0027	10.141	0.0043
10.038	0.0011	10.090	0.0027	10.142	0.0043
10.039	0.0012	10.091	0.0027	10.143	0.0043
10.040	0.0012	10.092	0.0028	10.144	0.0043
10.041	0.0012	10.093	0.0028	10.145	0.0044
10.042	0.0013	10.094	0.0028	10.146	0.0044
10.043	0.0013	10.095	0.0029	10.147	0.0044
10.044	0.0013	10.096	0.0029	10.148	0.0045
10.045	0.0014	10.097	0.0029	10.149	0.0045
10.046	0.0014	10.098	0.0030	10.150	0.0045
10.047	0.0014	10.099	0.0030		
10.048	0.0014	10.100	0.0030		
10.049	0.0015	10.101	0.0031		
10.050	0.0015	10.102	0.0031		
10.051	0.0015	10.103	0.0031		

Summary for Pond 2P: Bioretention Cell

Inflow Area = 3,934.7 m², 0.00% Impervious, Inflow Depth = 18 mm for 10-Year event
Inflow = 0.0527 m³/s @ 0.35 hrs, Volume= 69.2 m³
Outflow = 0.0371 m³/s @ 0.40 hrs, Volume= 26.4 m³, Atten= 30%, Lag= 3.1 min
Primary = 0.0371 m³/s @ 0.40 hrs, Volume= 26.4 m³
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.400 m Surf.Area= 249.4 m² Storage= 20.0 m³
Peak Elev= 1.205 m @ 0.40 hrs Surf.Area= 403.3 m² Storage= 70.9 m³ (50.9 m³ above start)

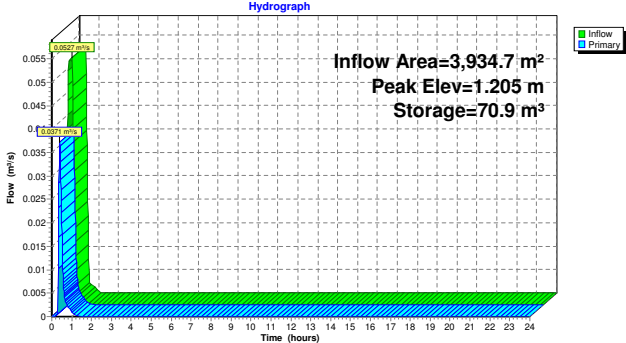
Plug-Flow detention time= 38.5 min calculated for 6.5 m³ (9% of inflow)
Center-of-Mass det. time= 13.0 min (29.6 - 16.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1.000 m	35.6 m ³	12.47 mW x 10.00 mL x 0.25 mH Ponding Z=3.0
#2	0.400 m	22.4 m ³	12.47 mW x 10.00 mL x 0.60 mH Engineered Soil Media 74.8 m ³ Overall x 30.0% Voids
#3	0.000 m	20.0 m ³	12.47 mW x 10.00 mL x 0.40 mH Clear Stone 49.9 m ³ Overall x 40.0% Voids
78.0 m ³			Total Available Storage

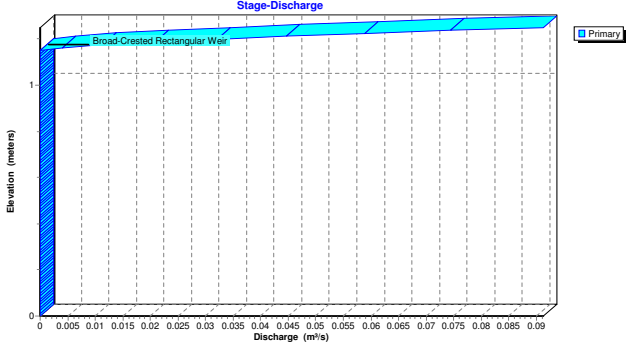
Device	Routing	Invert	Outlet Devices
#1	Primary	1.150 m	2.00 m long x 0.50 m breadth Broad-Crested Rectangular Weir Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 Coef. (Metric) 1.43 1.45 1.45 1.47 1.50 1.55 1.59 1.67 1.67 1.64 1.78 1.81 1.83

Primary OutFlow Max=0.0368 m³/s @ 0.40 hrs HW=1.205 m (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.0368 m³/s @ 0.34 m/s)

Pond 2P: Bioretention Cell



Pond 2P: Bioretention Cell



Stage-Discharge for Pond 2P: Bioretention Cell

Elevation (meters)	Primary (m³/s)
0.000	0.0000
0.015	0.0000
0.030	0.0000
0.045	0.0000
0.060	0.0000
0.075	0.0000
0.090	0.0000
0.105	0.0000
0.120	0.0000
0.135	0.0000
0.150	0.0000
0.165	0.0000
0.180	0.0000
0.195	0.0000
0.210	0.0000
0.225	0.0000
0.240	0.0000
0.255	0.0000
0.270	0.0000
0.285	0.0000
0.300	0.0000
0.315	0.0000
0.330	0.0000
0.345	0.0000
0.360	0.0000
0.375	0.0000
0.390	0.0000
0.405	0.0000
0.420	0.0000
0.435	0.0000
0.450	0.0000
0.465	0.0000
0.480	0.0000
0.495	0.0000
0.510	0.0000
0.525	0.0000
0.540	0.0000
0.555	0.0000
0.570	0.0000
0.585	0.0000
0.600	0.0000
0.615	0.0000
0.630	0.0000
0.645	0.0000
0.660	0.0000
0.675	0.0000
0.690	0.0000
0.705	0.0000
0.720	0.0000
0.735	0.0000
0.750	0.0000
0.765	0.0000

Elevation (meters)	Primary (m³/s)
0.780	0.0000
0.795	0.0000
0.810	0.0000
0.825	0.0000
0.840	0.0000
0.855	0.0000
0.870	0.0000
0.885	0.0000
0.900	0.0000
0.915	0.0000
0.930	0.0000
0.945	0.0000
0.960	0.0000
0.975	0.0000
0.990	0.0000
1.005	0.0000
1.020	0.0000
1.035	0.0000
1.050	0.0000
1.065	0.0000
1.080	0.0000
1.095	0.0000
1.110	0.0000
1.125	0.0000
1.140	0.0000
1.155	0.0010
1.170	0.0081
1.185	0.0187
1.200	0.0320
1.215	0.0474
1.230	0.0650
1.245	0.0844

Summary for Pond 3P: Roof Storage

Inflow Area = 447.4 m², 0.00% Impervious, Inflow Depth = 24 mm for 10-Year event
Inflow = 0.0084 m³/s @ 0.17 hrs, Volume= 10.6 m³
Outflow = 0.0038 m³/s @ 0.44 hrs, Volume= 10.6 m³, Atten= 54%, Lag= 16.2 min
Primary = 0.0038 m³/s @ 0.44 hrs, Volume= 10.6 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.076 m @ 0.44 hrs Surf.Area= 231.5 m² Storage= 5.9 m³

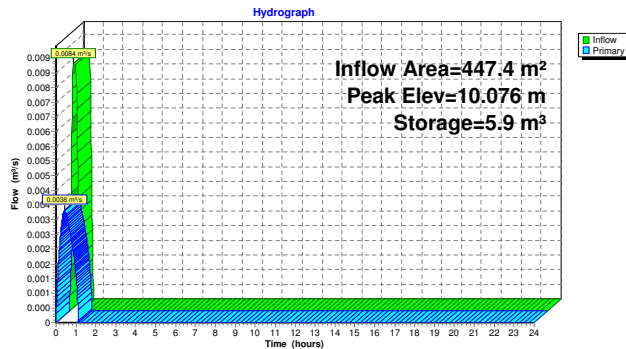
Plug-Flow detention time= 16.7 min calculated for 10.6 m³ (100% of inflow)
Center-of-Mass det. time= 16.7 min (32.2 - 15.5)

Volume	Invert	Avail.Storage	Storage Description	
#1	10.000 m	13.3 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)	
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	400.0	13.3	13.3	400.0

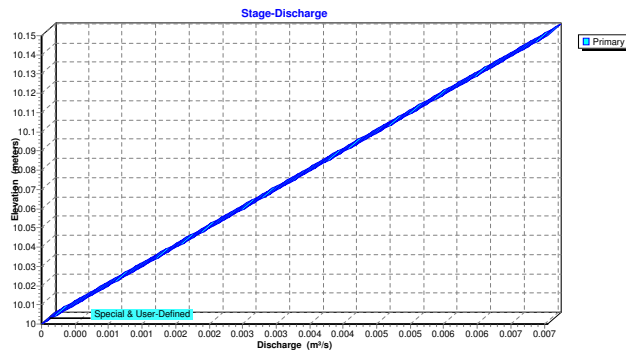
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 5.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0038 m³/s @ 0.44 hrs HW=10.076 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0038 m³/s)

Pond 3P: Roof Storage



Pond 3P: Roof Storage



Stage-Discharge for Pond 3P: Roof Storage

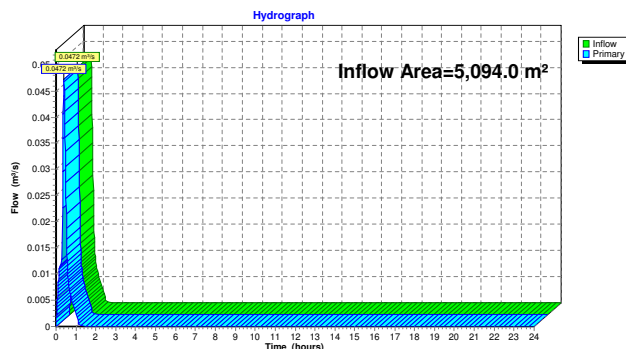
Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0026	10.104	0.0052
10.001	0.0001	10.053	0.0027	10.105	0.0053
10.002	0.0001	10.054	0.0027	10.106	0.0053
10.003	0.0002	10.055	0.0028	10.107	0.0054
10.004	0.0002	10.056	0.0028	10.108	0.0054
10.005	0.0003	10.057	0.0029	10.109	0.0055
10.006	0.0003	10.058	0.0029	10.110	0.0055
10.007	0.0004	10.059	0.0030	10.111	0.0056
10.008	0.0004	10.060	0.0030	10.112	0.0056
10.009	0.0005	10.061	0.0031	10.113	0.0057
10.010	0.0005	10.062	0.0031	10.114	0.0057
10.011	0.0006	10.063	0.0032	10.115	0.0058
10.012	0.0006	10.064	0.0032	10.116	0.0058
10.013	0.0007	10.065	0.0033	10.117	0.0059
10.014	0.0007	10.066	0.0033	10.118	0.0059
10.015	0.0008	10.067	0.0034	10.119	0.0060
10.016	0.0008	10.068	0.0034	10.120	0.0060
10.017	0.0009	10.069	0.0035	10.121	0.0061
10.018	0.0009	10.070	0.0035	10.122	0.0061
10.019	0.0010	10.071	0.0036	10.123	0.0062
10.020	0.0010	10.072	0.0036	10.124	0.0062
10.021	0.0011	10.073	0.0037	10.125	0.0063
10.022	0.0011	10.074	0.0037	10.126	0.0063
10.023	0.0012	10.075	0.0038	10.127	0.0064
10.024	0.0012	10.076	0.0038	10.128	0.0064
10.025	0.0013	10.077	0.0039	10.129	0.0065
10.026	0.0013	10.078	0.0039	10.130	0.0065
10.027	0.0014	10.079	0.0040	10.131	0.0066
10.028	0.0014	10.080	0.0040	10.132	0.0066
10.029	0.0015	10.081	0.0041	10.133	0.0067
10.030	0.0015	10.082	0.0041	10.134	0.0067
10.031	0.0016	10.083	0.0042	10.135	0.0068
10.032	0.0016	10.084	0.0042	10.136	0.0068
10.033	0.0017	10.085	0.0043	10.137	0.0069
10.034	0.0017	10.086	0.0043	10.138	0.0069
10.035	0.0018	10.087	0.0044	10.139	0.0070
10.036	0.0018	10.088	0.0044	10.140	0.0070
10.037	0.0019	10.089	0.0045	10.141	0.0071
10.038	0.0019	10.090	0.0045	10.142	0.0071
10.039	0.0020	10.091	0.0046	10.143	0.0072
10.040	0.0020	10.092	0.0046	10.144	0.0072
10.041	0.0021	10.093	0.0047	10.145	0.0073
10.042	0.0021	10.094	0.0047	10.146	0.0073
10.043	0.0022	10.095	0.0048	10.147	0.0074
10.044	0.0022	10.096	0.0048	10.148	0.0074
10.045	0.0023	10.097	0.0049	10.149	0.0075
10.046	0.0023	10.098	0.0049	10.150	0.0076
10.047	0.0024	10.099	0.0050		
10.048	0.0024	10.100	0.0050		
10.049	0.0025	10.101	0.0051		
10.050	0.0025	10.102	0.0051		
10.051	0.0026	10.103	0.0052		

Summary for Link 1L: Outlet

Inflow Area = 5,094.0 m², 0.00% Impervious, Inflow Depth = 9 mm for 10-Year event
Inflow = 0.0472 m³/s @ 0.40 hrs, Volume= 48.3 m³
Primary = 0.0472 m³/s @ 0.40 hrs, Volume= 48.3 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Outlet



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 1S: Building	Runoff Area=233.6 m² 0.00% Impervious Runoff Depth=28 mm Tc=10.0 min C=0.90 Runoff=0.0051 m³/s 6.5 m³
Subcatchment 2S: At-Grade	Runoff Area=2,069.5 m² 0.00% Impervious Runoff Depth=21 mm Tc=10.0 min C=0.68 Runoff=0.0344 m³/s 43.3 m³
Subcatchment 3S: External Road	Runoff Area=1,631.6 m² 0.00% Impervious Runoff Depth=19 mm Tc=10.0 min C=0.62 Runoff=0.0247 m³/s 31.2 m³
Subcatchment 4S: Uncontrolled	Runoff Area=711.9 m² 0.00% Impervious Runoff Depth=18 mm Tc=10.0 min C=0.60 Runoff=0.0104 m³/s 13.2 m³
Subcatchment 5S: Building	Runoff Area=447.4 m² 0.00% Impervious Runoff Depth=28 mm Tc=10.0 min C=0.90 Runoff=0.0098 m³/s 12.4 m³
Pond 1P: Roof Storage	Peak Elev=10.081 m Storage=3.5 m³ Inflow=0.0051 m³/s 6.5 m³ Outflow=0.0024 m³/s 6.5 m³
Pond 2P: Bioretention Cell	Peak Elev=1.218 m Storage=72.9 m³ Inflow=0.0614 m³/s 81.0 m³ Outflow=0.0512 m³/s 38.3 m³
Pond 3P: Roof Storage	Peak Elev=10.082 m Storage=7.3 m³ Inflow=0.0098 m³/s 12.4 m³ Outflow=0.0041 m³/s 12.4 m³
Link 1L: Outlet	Inflow=0.0640 m³/s 63.8 m³ Primary=0.0640 m³/s 63.8 m³

Total Runoff Area = 5,094.0 m² Runoff Volume = 106.5 m³ Average Runoff Depth = 21 mm
100.00% Pervious = 5,094.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1S: Building

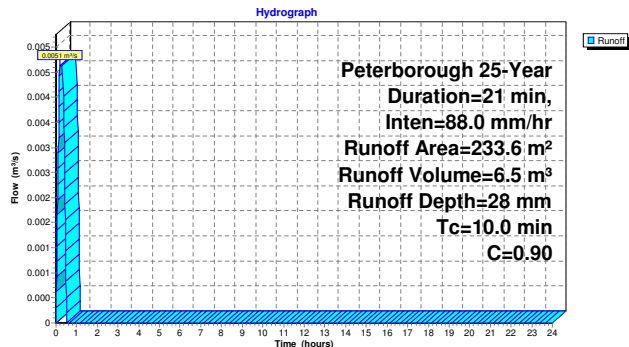
Runoff = 0.0051 m³/s @ 0.17 hrs, Volume= 6.5 m³, Depth= 28 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 25-Year Duration=21 min, Inten=88.0 mm/hr

Area (m²)	C	Description
233.6	0.90	Impervious Roof
233.6	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 1S: Building



Summary for Subcatchment 2S: At-Grade

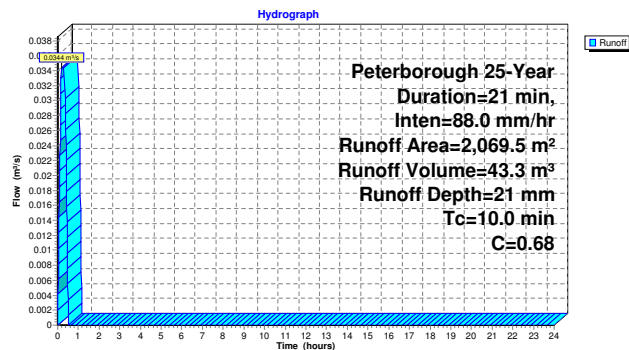
Runoff = 0.0344 m³/s @ 0.17 hrs, Volume= 43.3 m³, Depth= 21 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 25-Year Duration=21 min, Inten=88.0 mm/hr

Area (m²)	C	Description
693.5	0.25	Soft Landscaping
1,376.0	0.90	At-Grade Impervious
2,069.5	0.68	Weighted Average
2,069.5	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 2S: At-Grade



Summary for Subcatchment 3S: External Road

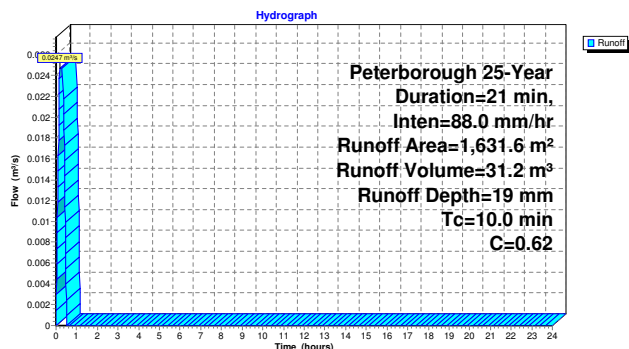
Runoff = 0.0247 m³/s @ 0.17 hrs, Volume= 31.2 m³, Depth= 19 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 25-Year Duration=21 min, Inten=88.0 mm/hr

Area (m²)	C	Description
933.1	0.90	External Impervious
698.5	0.25	External Pervious
1,631.6	0.62	Weighted Average
1,631.6	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 3S: External Road



Summary for Subcatchment 4S: Uncontrolled

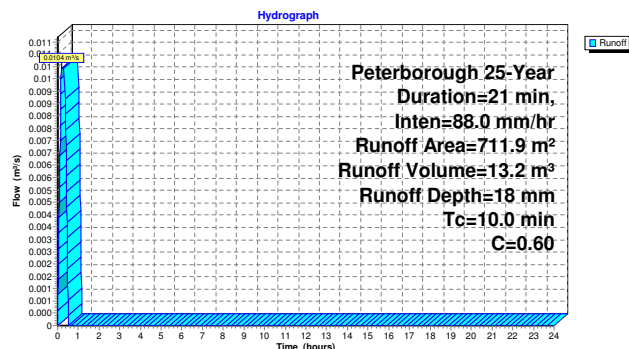
Runoff = 0.0104 m³/s @ 0.17 hrs, Volume= 13.2 m³, Depth= 18 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 25-Year Duration=21 min, Inten=88.0 mm/hr

Area (m²)	C	Description
333.7	0.25	Soft Landscaping
378.2	0.90	At-Grade Impervious
711.9	0.60	Weighted Average
711.9	100.00%	Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 4S: Uncontrolled



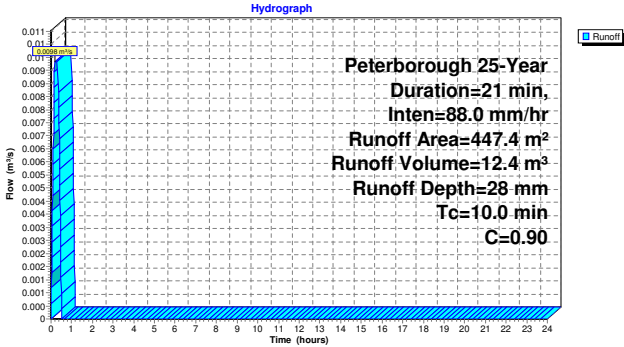
Summary for Subcatchment 5S: Building

Runoff = 0.0098 m³/s @ 0.17 hrs, Volume= 12.4 m³, Depth= 28 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peterborough 25-Year Duration=21 min, Inten=88.0 mm/hr

Area (m²)	C	Description
447.4	0.90	Impervious Roof
447.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 5S: Building



Summary for Pond 1P: Roof Storage

Inflow Area = 233.6 m², 0.00% Impervious, Inflow Depth = 28 mm for 25-Year event
Inflow = 0.0051 m³/s @ 0.17 hrs, Volume= 6.5 m³
Outflow = 0.0024 m³/s @ 0.44 hrs, Volume= 6.5 m³, Atten= 53%, Lag= 16.1 min
Primary = 0.0024 m³/s @ 0.44 hrs, Volume= 6.5 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.081 m @ 0.44 hrs Surf.Area= 129.7 m² Storage= 3.5 m³
Plug-Flow detention time= 15.7 min calculated for 6.5 m³ (100% of inflow)
Center-of-Mass det. time= 15.7 min (31.2 - 15.5)

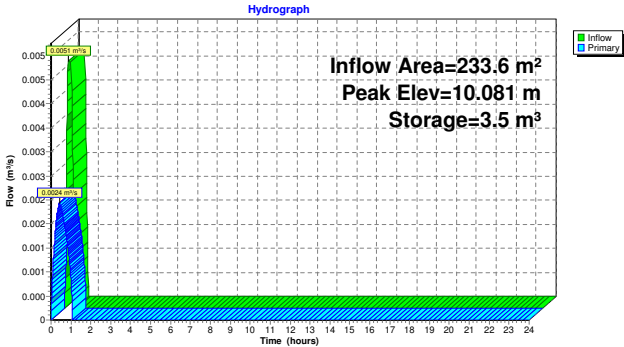
Volume	Invert	Avail.Storage	Storage Description
#1	10.000 m	6.7 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	200.0	6.7	6.7	200.0

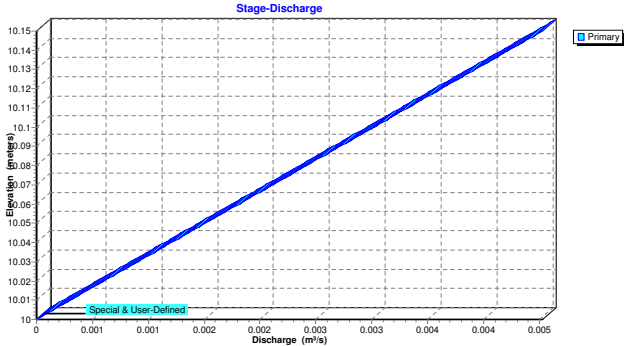
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 3.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0024 m³/s @ 0.44 hrs HW=10.081 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0024 m³/s)

Pond 1P: Roof Storage



Pond 1P: Roof Storage



Stage-Discharge for Pond 1P: Roof Storage

Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0016	10.104	0.0031
10.001	0.0000	10.053	0.0016	10.105	0.0032
10.002	0.0001	10.054	0.0016	10.106	0.0032
10.003	0.0001	10.055	0.0017	10.107	0.0032
10.004	0.0001	10.056	0.0017	10.108	0.0033
10.005	0.0002	10.057	0.0017	10.109	0.0033
10.006	0.0002	10.058	0.0018	10.110	0.0033
10.007	0.0002	10.059	0.0018	10.111	0.0034
10.008	0.0002	10.060	0.0018	10.112	0.0034
10.009	0.0003	10.061	0.0018	10.113	0.0034
10.010	0.0003	10.062	0.0019	10.114	0.0034
10.011	0.0003	10.063	0.0019	10.115	0.0035
10.012	0.0004	10.064	0.0019	10.116	0.0035
10.013	0.0004	10.065	0.0020	10.117	0.0035
10.014	0.0004	10.066	0.0020	10.118	0.0036
10.015	0.0005	10.067	0.0020	10.119	0.0036
10.016	0.0005	10.068	0.0021	10.120	0.0036
10.017	0.0005	10.069	0.0021	10.121	0.0037
10.018	0.0005	10.070	0.0021	10.122	0.0037
10.019	0.0006	10.071	0.0021	10.123	0.0037
10.020	0.0006	10.072	0.0022	10.124	0.0037
10.021	0.0006	10.073	0.0022	10.125	0.0038
10.022	0.0007	10.074	0.0022	10.126	0.0038
10.023	0.0007	10.075	0.0023	10.127	0.0038
10.024	0.0007	10.076	0.0023	10.128	0.0039
10.025	0.0008	10.077	0.0023	10.129	0.0039
10.026	0.0008	10.078	0.0024	10.130	0.0039
10.027	0.0008	10.079	0.0024	10.131	0.0040
10.028	0.0008	10.080	0.0024	10.132	0.0040
10.029	0.0009	10.081	0.0024	10.133	0.0040
10.030	0.0009	10.082	0.0025	10.134	0.0040
10.031	0.0009	10.083	0.0025	10.135	0.0041
10.032	0.0010	10.084	0.0025	10.136	0.0041
10.033	0.0010	10.085	0.0026	10.137	0.0041
10.034	0.0010	10.086	0.0026	10.138	0.0042
10.035	0.0011	10.087	0.0026	10.139	0.0042
10.036	0.0011	10.088	0.0027	10.140	0.0042
10.037	0.0011	10.089	0.0027	10.141	0.0043
10.038	0.0011	10.090	0.0027	10.142	0.0043
10.039	0.0012	10.091	0.0027	10.143	0.0043
10.040	0.0012	10.092	0.0028	10.144	0.0043
10.041	0.0012	10.093	0.0028	10.145	0.0044
10.042	0.0013	10.094	0.0028	10.146	0.0044
10.043	0.0013	10.095	0.0029	10.147	0.0044
10.044	0.0013	10.096	0.0029	10.148	0.0045
10.045	0.0014	10.097	0.0029	10.149	0.0045
10.046	0.0014	10.098	0.0030	10.150	0.0045
10.047	0.0014	10.099	0.0030		
10.048	0.0014	10.100	0.0030		
10.049	0.0015	10.101	0.0031		
10.050	0.0015	10.102	0.0031		
10.051	0.0015	10.103	0.0031		

Summary for Pond 2P: Bioretention Cell

Inflow Area = 3,934.7 m², 0.00% Impervious, Inflow Depth = 21 mm for 25-Year event
Inflow = 0.0614 m³/s @ 0.35 hrs, Volume= 81.0 m³
Outflow = 0.0512 m³/s @ 0.38 hrs, Volume= 38.3 m³, Atten= 17%, Lag= 1.8 min
Primary = 0.0512 m³/s @ 0.38 hrs, Volume= 38.3 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.400 m Surf.Area= 249.4 m² Storage= 20.0 m³
Peak Elev= 1.218 m @ 0.38 hrs Surf.Area= 405.2 m² Storage= 72.9 m³ (53.0 m³ above start)

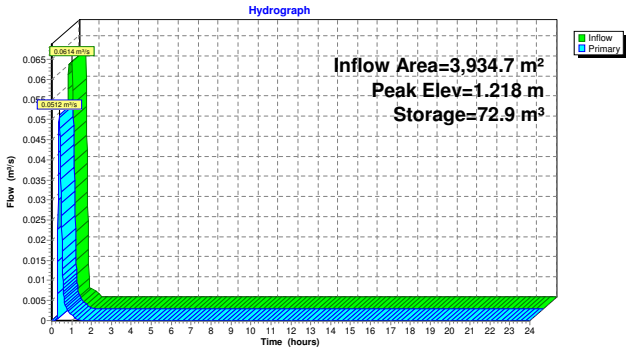
Plug-Flow detention time= 27.9 min calculated for 18.3 m³ (23% of inflow)
Center-of-Mass det. time= 11.3 min (28.1 - 16.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1.000 m	35.6 m ³	12.47 mW x 10.00 mL x 0.25 mH Ponding Z=3.0
#2	0.400 m	22.4 m ³	12.47 mW x 10.00 mL x 0.60 mH Engineered Soil Media 74.8 m ³ Overall x 30.0% Voids
#3	0.000 m	20.0 m ³	12.47 mW x 10.00 mL x 0.40 mH Clear Stone 49.9 m ³ Overall x 40.0% Voids
			78.0 m ³ Total Available Storage

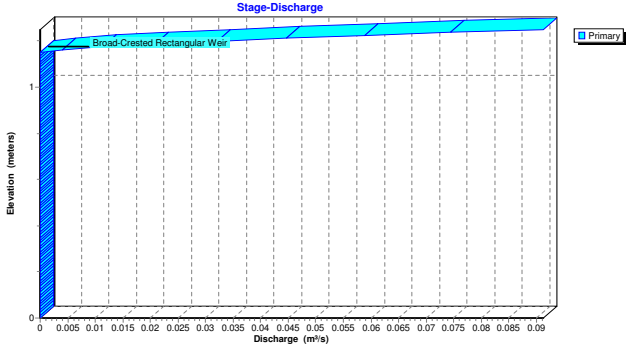
Device	Routing	Invert	Outlet Devices
#1	Primary	1.150 m	2.00 m long x 0.50 m breadth Broad-Crested Rectangular Weir Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 Coef. (Metric) 1.43 1.45 1.45 1.47 1.50 1.55 1.59 1.67 1.67 1.64 1.78 1.81 1.83

Primary OutFlow Max=0.0510 m³/s @ 0.38 hrs HW=1.218 m (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.0510 m³/s @ 0.37 m/s)

Pond 2P: Bioretention Cell



Pond 2P: Bioretention Cell



Stage-Discharge for Pond 2P: Bioretention Cell

Elevation (meters)	Primary (m³/s)
0.000	0.0000
0.015	0.0000
0.030	0.0000
0.045	0.0000
0.060	0.0000
0.075	0.0000
0.090	0.0000
0.105	0.0000
0.120	0.0000
0.135	0.0000
0.150	0.0000
0.165	0.0000
0.180	0.0000
0.195	0.0000
0.210	0.0000
0.225	0.0000
0.240	0.0000
0.255	0.0000
0.270	0.0000
0.285	0.0000
0.300	0.0000
0.315	0.0000
0.330	0.0000
0.345	0.0000
0.360	0.0000
0.375	0.0000
0.390	0.0000
0.405	0.0000
0.420	0.0000
0.435	0.0000
0.450	0.0000
0.465	0.0000
0.480	0.0000
0.495	0.0000
0.510	0.0000
0.525	0.0000
0.540	0.0000
0.555	0.0000
0.570	0.0000
0.585	0.0000
0.600	0.0000
0.615	0.0000
0.630	0.0000
0.645	0.0000
0.660	0.0000
0.675	0.0000
0.690	0.0000
0.705	0.0000
0.720	0.0000
0.735	0.0000
0.750	0.0000
0.765	0.0000

Elevation (meters)	Primary (m³/s)
0.780	0.0000
0.795	0.0000
0.810	0.0000
0.825	0.0000
0.840	0.0000
0.855	0.0000
0.870	0.0000
0.885	0.0000
0.900	0.0000
0.915	0.0000
0.930	0.0000
0.945	0.0000
0.960	0.0000
0.975	0.0000
0.990	0.0000
1.005	0.0000
1.020	0.0000
1.035	0.0000
1.050	0.0000
1.065	0.0000
1.080	0.0000
1.095	0.0000
1.110	0.0000
1.125	0.0000
1.140	0.0000
1.155	0.0010
1.170	0.0081
1.185	0.0187
1.200	0.0320
1.215	0.0474
1.230	0.0650
1.245	0.0844

Summary for Pond 3P: Roof Storage

Inflow Area = 447.4 m², 0.00% Impervious, Inflow Depth = 28 mm for 25-Year event
Inflow = 0.0098 m³/s @ 0.17 hrs, Volume= 12.4 m³
Outflow = 0.0041 m³/s @ 0.45 hrs, Volume= 12.4 m³, Atten= 58%, Lag= 16.6 min
Primary = 0.0041 m³/s @ 0.45 hrs, Volume= 12.4 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.082 m @ 0.45 hrs Surf.Area= 267.5 m² Storage= 7.3 m³

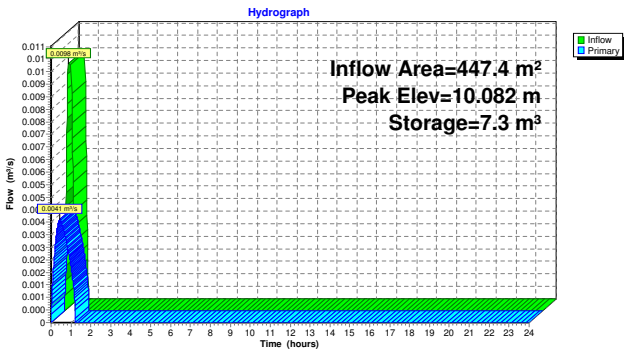
Plug-Flow detention time= 19.2 min calculated for 12.4 m³ (100% of inflow)
Center-of-Mass det. time= 19.2 min (34.7 - 15.5)

Volume	Invert	Avail.Storage	Storage Description	
#1	10.000 m	13.3 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)	
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	400.0	13.3	13.3	400.0

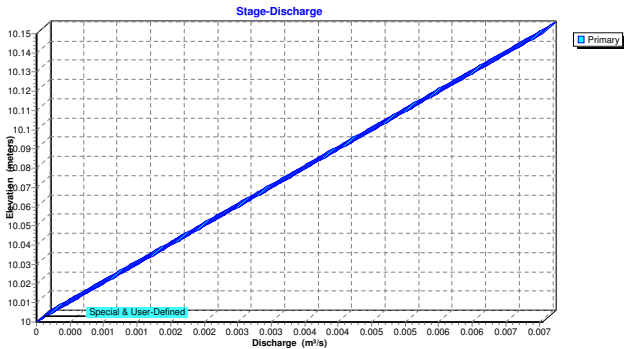
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 5.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0041 m³/s @ 0.45 hrs HW=10.082 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0041 m³/s)

Pond 3P: Roof Storage



Pond 3P: Roof Storage



Stage-Discharge for Pond 3P: Roof Storage

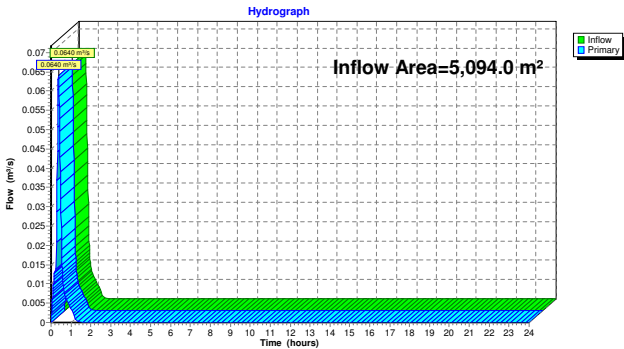
Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0026	10.104	0.0052
10.001	0.0001	10.053	0.0027	10.105	0.0053
10.002	0.0001	10.054	0.0027	10.106	0.0053
10.003	0.0002	10.055	0.0028	10.107	0.0054
10.004	0.0002	10.056	0.0028	10.108	0.0054
10.005	0.0003	10.057	0.0029	10.109	0.0055
10.006	0.0003	10.058	0.0029	10.110	0.0055
10.007	0.0004	10.059	0.0030	10.111	0.0056
10.008	0.0004	10.060	0.0030	10.112	0.0056
10.009	0.0005	10.061	0.0031	10.113	0.0057
10.010	0.0005	10.062	0.0031	10.114	0.0057
10.011	0.0006	10.063	0.0032	10.115	0.0058
10.012	0.0006	10.064	0.0032	10.116	0.0058
10.013	0.0007	10.065	0.0033	10.117	0.0059
10.014	0.0007	10.066	0.0033	10.118	0.0059
10.015	0.0008	10.067	0.0034	10.119	0.0060
10.016	0.0008	10.068	0.0034	10.120	0.0060
10.017	0.0009	10.069	0.0035	10.121	0.0061
10.018	0.0009	10.070	0.0035	10.122	0.0061
10.019	0.0010	10.071	0.0036	10.123	0.0062
10.020	0.0010	10.072	0.0036	10.124	0.0062
10.021	0.0011	10.073	0.0037	10.125	0.0063
10.022	0.0011	10.074	0.0037	10.126	0.0063
10.023	0.0012	10.075	0.0038	10.127	0.0064
10.024	0.0012	10.076	0.0038	10.128	0.0064
10.025	0.0013	10.077	0.0039	10.129	0.0065
10.026	0.0013	10.078	0.0039	10.130	0.0065
10.027	0.0014	10.079	0.0040	10.131	0.0066
10.028	0.0014	10.080	0.0040	10.132	0.0066
10.029	0.0015	10.081	0.0041	10.133	0.0067
10.030	0.0015	10.082	0.0041	10.134	0.0067
10.031	0.0016	10.083	0.0042	10.135	0.0068
10.032	0.0016	10.084	0.0042	10.136	0.0068
10.033	0.0017	10.085	0.0043	10.137	0.0069
10.034	0.0017	10.086	0.0043	10.138	0.0069
10.035	0.0018	10.087	0.0044	10.139	0.0070
10.036	0.0018	10.088	0.0044	10.140	0.0070
10.037	0.0019	10.089	0.0045	10.141	0.0071
10.038	0.0019	10.090	0.0045	10.142	0.0071
10.039	0.0020	10.091	0.0046	10.143	0.0072
10.040	0.0020	10.092	0.0046	10.144	0.0072
10.041	0.0021	10.093	0.0047	10.145	0.0073
10.042	0.0021	10.094	0.0047	10.146	0.0073
10.043	0.0022	10.095	0.0048	10.147	0.0074
10.044	0.0022	10.096	0.0048	10.148	0.0074
10.045	0.0023	10.097	0.0049	10.149	0.0075
10.046	0.0023	10.098	0.0049	10.150	0.0076
10.047	0.0024	10.099	0.0050		
10.048	0.0024	10.100	0.0050		
10.049	0.0025	10.101	0.0051		
10.050	0.0025	10.102	0.0051		
10.051	0.0026	10.103	0.0052		

Summary for Link 1L: Outlet

Inflow Area = 5,094.0 m², 0.00% Impervious, Inflow Depth = 13 mm for 25-Year event
Inflow = 0.0640 m³/s @ 0.37 hrs, Volume= 63.8 m³
Primary = 0.0640 m³/s @ 0.37 hrs, Volume= 63.8 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Outlet



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 1S: Building	Runoff Area=233.6 m² 0.00% Impervious Runoff Depth=31 mm Tc=10.0 min C=0.90 Runoff=0.0057 m³/s 7.2 m³
Subcatchment 2S: At-Grade	Runoff Area=2,069.5 m² 0.00% Impervious Runoff Depth=23 mm Tc=10.0 min C=0.68 Runoff=0.0384 m³/s 48.4 m³
Subcatchment 3S: External Road	Runoff Area=1,631.6 m² 0.00% Impervious Runoff Depth=21 mm Tc=10.0 min C=0.62 Runoff=0.0276 m³/s 34.8 m³
Subcatchment 4S: Uncontrolled	Runoff Area=711.9 m² 0.00% Impervious Runoff Depth=21 mm Tc=10.0 min C=0.60 Runoff=0.0117 m³/s 14.7 m³
Subcatchment 5S: Building	Runoff Area=447.4 m² 0.00% Impervious Runoff Depth=31 mm Tc=10.0 min C=0.90 Runoff=0.0110 m³/s 13.9 m³
Pond 1P: Roof Storage	Peak Elev=10.085 m Storage=4.1 m³ Inflow=0.0057 m³/s 7.2 m³ Outflow=0.0026 m³/s 7.2 m³
Pond 2P: Bioretention Cell	Peak Elev=1.227 m Storage=74.3 m³ Inflow=0.0685 m³/s 90.5 m³ Outflow=0.0613 m³/s 47.8 m³
Pond 3P: Roof Storage	Peak Elev=10.086 m Storage=8.5 m³ Inflow=0.0110 m³/s 13.9 m³ Outflow=0.0043 m³/s 13.9 m³
Link 1L: Outlet	Inflow=0.0761 m³/s 76.3 m³ Primary=0.0761 m³/s 76.3 m³

Total Runoff Area = 5,094.0 m² Runoff Volume = 119.0 m³ Average Runoff Depth = 23 mm
100.00% Pervious = 5,094.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1S: Building

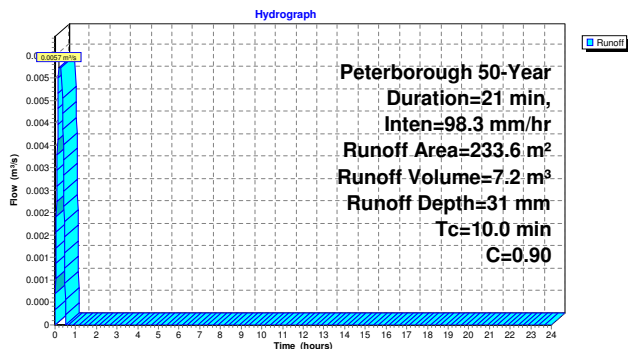
Runoff = 0.0057 m³/s @ 0.17 hrs, Volume= 7.2 m³, Depth= 31 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 50-Year Duration=21 min, Inten=98.3 mm/hr

Area (m²)	C	Description
233.6	0.90	Impervious Roof
233.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 1S: Building



Summary for Subcatchment 2S: At-Grade

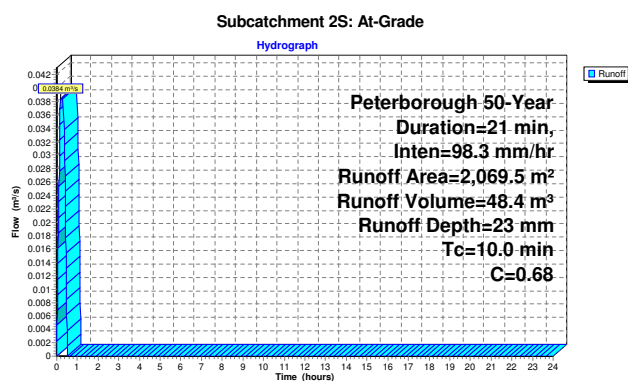
Runoff = 0.0384 m³/s @ 0.17 hrs, Volume= 48.4 m³, Depth= 23 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 50-Year Duration=21 min, Inten=98.3 mm/hr

Area (m²)	C	Description
693.5	0.25	Soft Landscaping
1,376.0	0.90	At-Grade Impervious
2,069.5	0.68	Weighted Average
2,069.5		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 2S: At-Grade



Summary for Subcatchment 3S: External Road

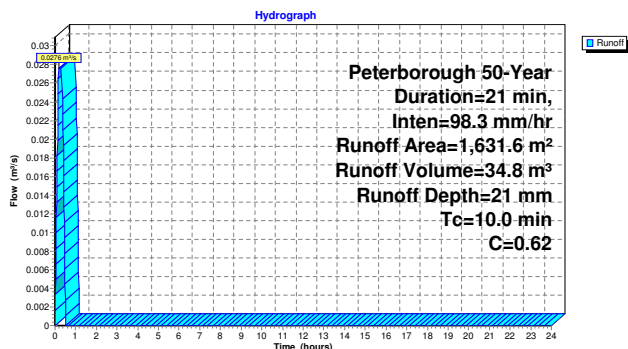
Runoff = 0.0276 m³/s @ 0.17 hrs, Volume= 34.8 m³, Depth= 21 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 50-Year Duration=21 min, Inten=98.3 mm/hr

Area (m²)	C	Description
933.1	0.90	External Impervious
698.5	0.25	External Pervious
1,631.6	0.62	Weighted Average
1,631.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 3S: External Road



Summary for Subcatchment 4S: Uncontrolled

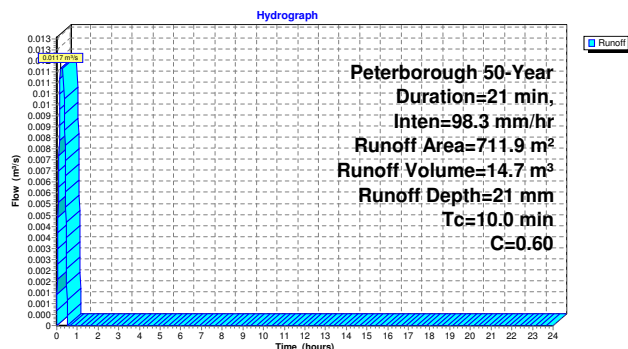
Runoff = 0.0117 m³/s @ 0.17 hrs, Volume= 14.7 m³, Depth= 21 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 50-Year Duration=21 min, Inten=98.3 mm/hr

Area (m²)	C	Description
333.7	0.25	Soft Landscaping
378.2	0.90	At-Grade Impervious
711.9	0.60	Weighted Average
711.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 4S: Uncontrolled



Summary for Subcatchment 5S: Building

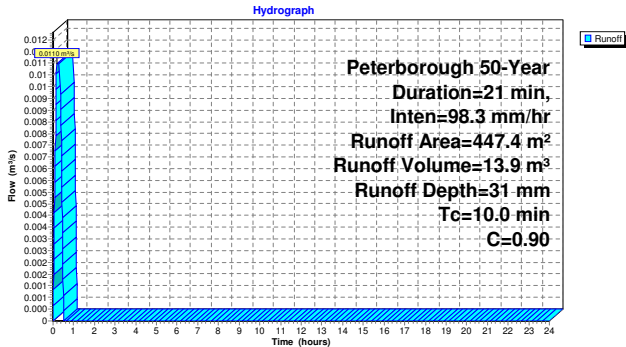
Runoff = 0.0110 m³/s @ 0.17 hrs, Volume= 13.9 m³, Depth= 31 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peterborough 50-Year Duration=21 min, Inten=98.3 mm/hr

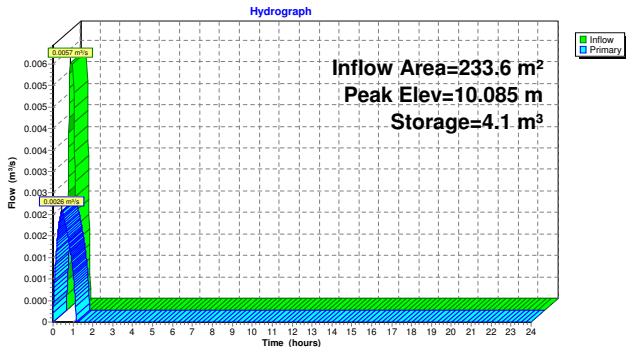
Area (m²)	C	Description
447.4	0.90	Impervious Roof
447.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

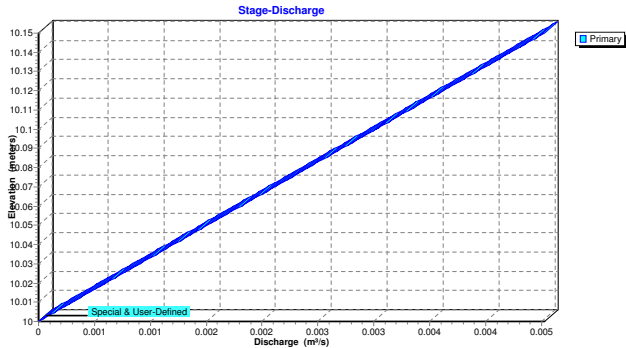
Subcatchment 5S: Building



Pond 1P: Roof Storage



Pond 1P: Roof Storage



Summary for Pond 1P: Roof Storage

Inflow Area = 233.6 m², 0.00% Impervious, Inflow Depth = 31 mm for 50-Year event
Inflow = 0.0057 m³/s @ 0.17 hrs, Volume= 7.2 m³
Outflow = 0.0026 m³/s @ 0.44 hrs, Volume= 7.2 m³, Atten= 55%, Lag= 16.3 min
Primary = 0.0026 m³/s @ 0.44 hrs, Volume= 7.2 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.085 m @ 0.44 hrs Surf.Area= 143.9 m² Storage= 4.1 m³

Plug-Flow detention time= 17.3 min calculated for 7.2 m³ (100% of inflow)
Center-of-Mass det. time= 17.3 min (32.8 - 15.5)

Volume	Invert	Avail.Storage	Storage Description
#1	10.000 m	6.7 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	200.0	6.7	6.7	200.0

Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 3.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0026 m³/s @ 0.44 hrs HW=10.085 m (Free Discharge)
└─1=Special & User-Defined (Custom Controls 0.0026 m³/s)

Stage-Discharge for Pond 1P: Roof Storage

Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0016	10.104	0.0031
10.001	0.0000	10.053	0.0016	10.105	0.0032
10.002	0.0001	10.054	0.0016	10.106	0.0032
10.003	0.0001	10.055	0.0017	10.107	0.0032
10.004	0.0001	10.056	0.0017	10.108	0.0033
10.005	0.0002	10.057	0.0017	10.109	0.0033
10.006	0.0002	10.058	0.0018	10.110	0.0033
10.007	0.0002	10.059	0.0018	10.111	0.0034
10.008	0.0002	10.060	0.0018	10.112	0.0034
10.009	0.0003	10.061	0.0018	10.113	0.0034
10.010	0.0003	10.062	0.0019	10.114	0.0034
10.011	0.0003	10.063	0.0019	10.115	0.0035
10.012	0.0004	10.064	0.0019	10.116	0.0035
10.013	0.0004	10.065	0.0020	10.117	0.0035
10.014	0.0004	10.066	0.0020	10.118	0.0036
10.015	0.0005	10.067	0.0020	10.119	0.0036
10.016	0.0005	10.068	0.0021	10.120	0.0036
10.017	0.0005	10.069	0.0021	10.121	0.0037
10.018	0.0005	10.070	0.0021	10.122	0.0037
10.019	0.0006	10.071	0.0021	10.123	0.0037
10.020	0.0006	10.072	0.0022	10.124	0.0037
10.021	0.0006	10.073	0.0022	10.125	0.0038
10.022	0.0007	10.074	0.0022	10.126	0.0038
10.023	0.0007	10.075	0.0023	10.127	0.0038
10.024	0.0007	10.076	0.0023	10.128	0.0039
10.025	0.0008	10.077	0.0023	10.129	0.0039
10.026	0.0008	10.078	0.0024	10.130	0.0039
10.027	0.0008	10.079	0.0024	10.131	0.0040
10.028	0.0008	10.080	0.0024	10.132	0.0040
10.029	0.0009	10.081	0.0024	10.133	0.0040
10.030	0.0009	10.082	0.0025	10.134	0.0040
10.031	0.0009	10.083	0.0025	10.135	0.0041
10.032	0.0010	10.084	0.0025	10.136	0.0041
10.033	0.0010	10.085	0.0026	10.137	0.0041
10.034	0.0010	10.086	0.0026	10.138	0.0042
10.035	0.0011	10.087	0.0026	10.139	0.0042
10.036	0.0011	10.088	0.0027	10.140	0.0042
10.037	0.0011	10.089	0.0027	10.141	0.0043
10.038	0.0011	10.090	0.0027	10.142	0.0043
10.039	0.0012	10.091	0.0027	10.143	0.0043
10.040	0.0012	10.092	0.0028	10.144	0.0043
10.041	0.0012	10.093	0.0028	10.145	0.0044
10.042	0.0013	10.094	0.0028	10.146	0.0044
10.043	0.0013	10.095	0.0029	10.147	0.0044
10.044	0.0013	10.096	0.0029	10.148	0.0045
10.045	0.0014	10.097	0.0029	10.149	0.0045
10.046	0.0014	10.098	0.0030	10.150	0.0045
10.047	0.0014	10.099	0.0030		
10.048	0.0014	10.100	0.0030		
10.049	0.0015	10.101	0.0031		
10.050	0.0015	10.102	0.0031		
10.051	0.0015	10.103	0.0031		

Summary for Pond 2P: Bioretention Cell

Inflow Area = 3,934.7 m², 0.00% Impervious, Inflow Depth = 23 mm for 50-Year event
Inflow = 0.0685 m³/s @ 0.35 hrs, Volume= 90.5 m³
Outflow = 0.0613 m³/s @ 0.37 hrs, Volume= 47.8 m³, Atten= 11%, Lag= 1.1 min
Primary = 0.0613 m³/s @ 0.37 hrs, Volume= 47.8 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.400 m Surf.Area= 249.4 m² Storage= 20.0 m³
Peak Elev= 1.227 m @ 0.37 hrs Surf.Area= 406.5 m² Storage= 74.3 m³ (54.4 m³ above start)

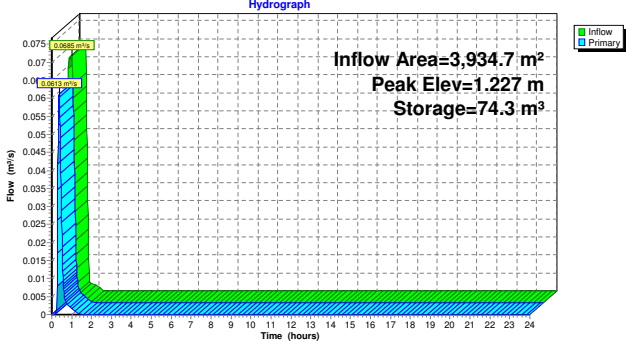
Plug-Flow detention time= 24.4 min calculated for 27.8 m³ (31% of inflow)
Center-of-Mass det. time= 10.4 min (27.3 - 16.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1.000 m	35.6 m ³	12.47 mW x 10.00 mL x 0.25 mH Ponding Z=3.0
#2	0.400 m	22.4 m ³	12.47 mW x 10.00 mL x 0.60 mH Engineered Soil Media 74.8 m ³ Overall x 30.0% Voids
#3	0.000 m	20.0 m ³	12.47 mW x 10.00 mL x 0.40 mH Clear Stone 49.9 m ³ Overall x 40.0% Voids
78.0 m ³			Total Available Storage

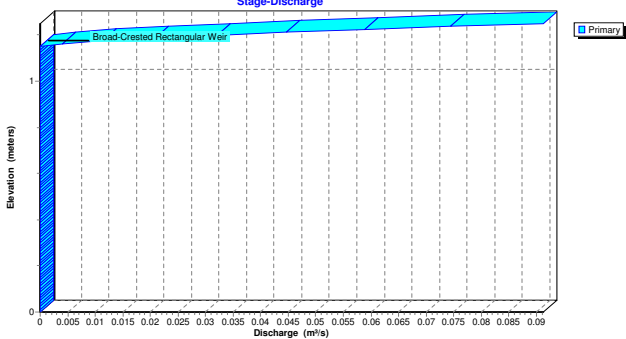
Device	Routing	Invert	Outlet Devices
#1	Primary	1.150 m	2.00 m long x 0.50 m breadth Broad-Crested Rectangular Weir Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 Coef. (Metric) 1.43 1.45 1.45 1.47 1.50 1.55 1.59 1.67 1.67 1.64 1.78 1.81 1.83

Primary OutFlow Max=0.0612 m³/s @ 0.37 hrs HW=1.227 m (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.0612 m³/s @ 0.40 m/s)

Pond 2P: Bioretention Cell



Pond 2P: Bioretention Cell



Stage-Discharge for Pond 2P: Bioretention Cell

Elevation (meters)	Primary (m³/s)
0.000	0.0000
0.015	0.0000
0.030	0.0000
0.045	0.0000
0.060	0.0000
0.075	0.0000
0.090	0.0000
0.105	0.0000
0.120	0.0000
0.135	0.0000
0.150	0.0000
0.165	0.0000
0.180	0.0000
0.195	0.0000
0.210	0.0000
0.225	0.0000
0.240	0.0000
0.255	0.0000
0.270	0.0000
0.285	0.0000
0.300	0.0000
0.315	0.0000
0.330	0.0000
0.345	0.0000
0.360	0.0000
0.375	0.0000
0.390	0.0000
0.405	0.0000
0.420	0.0000
0.435	0.0000
0.450	0.0000
0.465	0.0000
0.480	0.0000
0.495	0.0000
0.510	0.0000
0.525	0.0000
0.540	0.0000
0.555	0.0000
0.570	0.0000
0.585	0.0000
0.600	0.0000
0.615	0.0000
0.630	0.0000
0.645	0.0000
0.660	0.0000
0.675	0.0000
0.690	0.0000
0.705	0.0000
0.720	0.0000
0.735	0.0000
0.750	0.0000
0.765	0.0000

Elevation (meters)	Primary (m³/s)
0.780	0.0000
0.795	0.0000
0.810	0.0000
0.825	0.0000
0.840	0.0000
0.855	0.0000
0.870	0.0000
0.885	0.0000
0.900	0.0000
0.915	0.0000
0.930	0.0000
0.945	0.0000
0.960	0.0000
0.975	0.0000
0.990	0.0000
1.005	0.0000
1.020	0.0000
1.035	0.0000
1.050	0.0000
1.065	0.0000
1.080	0.0000
1.095	0.0000
1.110	0.0000
1.125	0.0000
1.140	0.0000
1.155	0.0010
1.170	0.0081
1.185	0.0187
1.200	0.0320
1.215	0.0474
1.230	0.0650
1.245	0.0844

Summary for Pond 3P: Roof Storage

Inflow Area = 447.4 m², 0.00% Impervious, Inflow Depth = 31 mm for 50-Year event
Inflow = 0.0110 m³/s @ 0.17 hrs, Volume= 13.9 m³
Outflow = 0.0043 m³/s @ 0.45 hrs, Volume= 13.9 m³, Atten= 61%, Lag= 16.9 min
Primary = 0.0043 m³/s @ 0.45 hrs, Volume= 13.9 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.086 m @ 0.45 hrs Surf.Area= 295.5 m² Storage= 8.5 m³

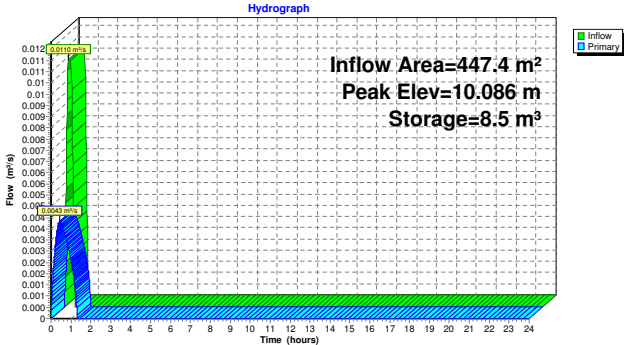
Plug-Flow detention time= 21.1 min calculated for 13.9 m³ (100% of inflow)
Center-of-Mass det. time= 21.1 min (36.6 - 15.5)

Volume	Invert	Avail.Storage	Storage Description	
#1	10.000 m	13.3 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)	
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	400.0	13.3	13.3	400.0

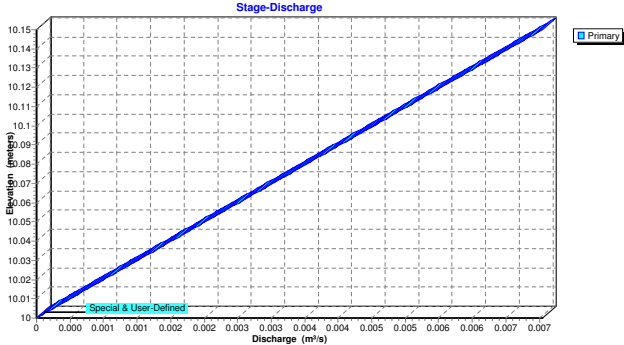
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 5.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0043 m³/s @ 0.45 hrs HW=10.086 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0043 m³/s)

Pond 3P: Roof Storage



Pond 3P: Roof Storage



Stage-Discharge for Pond 3P: Roof Storage

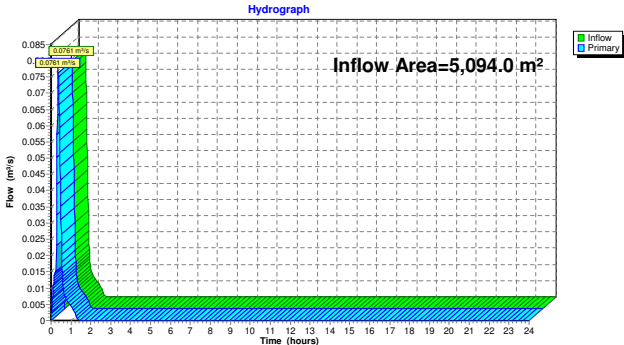
Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0026	10.104	0.0052
10.001	0.0001	10.053	0.0027	10.105	0.0053
10.002	0.0001	10.054	0.0027	10.106	0.0053
10.003	0.0002	10.055	0.0028	10.107	0.0054
10.004	0.0002	10.056	0.0028	10.108	0.0054
10.005	0.0003	10.057	0.0029	10.109	0.0055
10.006	0.0003	10.058	0.0029	10.110	0.0055
10.007	0.0004	10.059	0.0030	10.111	0.0056
10.008	0.0004	10.060	0.0030	10.112	0.0056
10.009	0.0005	10.061	0.0031	10.113	0.0057
10.010	0.0005	10.062	0.0031	10.114	0.0057
10.011	0.0006	10.063	0.0032	10.115	0.0058
10.012	0.0006	10.064	0.0032	10.116	0.0058
10.013	0.0007	10.065	0.0033	10.117	0.0059
10.014	0.0007	10.066	0.0033	10.118	0.0059
10.015	0.0008	10.067	0.0034	10.119	0.0060
10.016	0.0008	10.068	0.0034	10.120	0.0060
10.017	0.0009	10.069	0.0035	10.121	0.0061
10.018	0.0009	10.070	0.0035	10.122	0.0061
10.019	0.0010	10.071	0.0036	10.123	0.0062
10.020	0.0010	10.072	0.0036	10.124	0.0062
10.021	0.0011	10.073	0.0037	10.125	0.0063
10.022	0.0011	10.074	0.0037	10.126	0.0063
10.023	0.0012	10.075	0.0038	10.127	0.0064
10.024	0.0012	10.076	0.0038	10.128	0.0064
10.025	0.0013	10.077	0.0039	10.129	0.0065
10.026	0.0013	10.078	0.0039	10.130	0.0065
10.027	0.0014	10.079	0.0040	10.131	0.0066
10.028	0.0014	10.080	0.0040	10.132	0.0066
10.029	0.0015	10.081	0.0041	10.133	0.0067
10.030	0.0015	10.082	0.0041	10.134	0.0067
10.031	0.0016	10.083	0.0042	10.135	0.0068
10.032	0.0016	10.084	0.0042	10.136	0.0068
10.033	0.0017	10.085	0.0043	10.137	0.0069
10.034	0.0017	10.086	0.0043	10.138	0.0069
10.035	0.0018	10.087	0.0044	10.139	0.0070
10.036	0.0018	10.088	0.0044	10.140	0.0070
10.037	0.0019	10.089	0.0045	10.141	0.0071
10.038	0.0019	10.090	0.0045	10.142	0.0071
10.039	0.0020	10.091	0.0046	10.143	0.0072
10.040	0.0020	10.092	0.0046	10.144	0.0072
10.041	0.0021	10.093	0.0047	10.145	0.0073
10.042	0.0021	10.094	0.0047	10.146	0.0073
10.043	0.0022	10.095	0.0048	10.147	0.0074
10.044	0.0022	10.096	0.0048	10.148	0.0074
10.045	0.0023	10.097	0.0049	10.149	0.0075
10.046	0.0023	10.098	0.0049	10.150	0.0076
10.047	0.0024	10.099	0.0050		
10.048	0.0024	10.100	0.0050		
10.049	0.0025	10.101	0.0051		
10.050	0.0025	10.102	0.0051		
10.051	0.0026	10.103	0.0052		

Summary for Link 1L: Outlet

Inflow Area = 5,094.0 m², 0.00% Impervious, Inflow Depth = 15 mm for 50-Year event
Inflow = 0.0761 m³/s @ 0.36 hrs, Volume= 76.3 m³
Primary = 0.0761 m³/s @ 0.36 hrs, Volume= 76.3 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Outlet



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 1S: Building	Runoff Area=233.6 m² 0.00% Impervious Runoff Depth=34 mm Tc=10.0 min C=0.90 Runoff=0.0063 m³/s 7.9 m³
Subcatchment 2S: At-Grade	Runoff Area=2,069.5 m² 0.00% Impervious Runoff Depth=26 mm Tc=10.0 min C=0.68 Runoff=0.0421 m³/s 53.0 m³
Subcatchment 3S: External Road	Runoff Area=1,631.6 m² 0.00% Impervious Runoff Depth=23 mm Tc=10.0 min C=0.62 Runoff=0.0302 m³/s 38.1 m³
Subcatchment 4S: Uncontrolled	Runoff Area=711.9 m² 0.00% Impervious Runoff Depth=23 mm Tc=10.0 min C=0.60 Runoff=0.0128 m³/s 16.1 m³
Subcatchment 5S: Building	Runoff Area=447.4 m² 0.00% Impervious Runoff Depth=34 mm Tc=10.0 min C=0.90 Runoff=0.0120 m³/s 15.2 m³
Pond 1P: Roof Storage	Peak Elev=10.088 m Storage=4.6 m³ Inflow=0.0063 m³/s 7.9 m³ Outflow=0.0027 m³/s 7.9 m³
Pond 2P: Bioretention Cell	Peak Elev=1.234 m Storage=75.4 m³ Inflow=0.0748 m³/s 99.0 m³ Outflow=0.0696 m³/s 56.3 m³
Pond 3P: Roof Storage	Peak Elev=10.089 m Storage=9.5 m³ Inflow=0.0120 m³/s 15.2 m³ Outflow=0.0045 m³/s 15.2 m³
Link 1L: Outlet	Inflow=0.0859 m³/s 87.5 m³ Primary=0.0859 m³/s 87.5 m³

Total Runoff Area = 5,094.0 m² Runoff Volume = 130.2 m³ Average Runoff Depth = 26 mm
100.00% Pervious = 5,094.0 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1S: Building

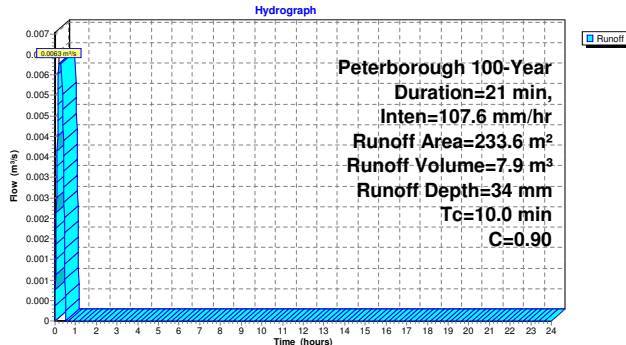
Runoff = 0.0063 m³/s @ 0.17 hrs, Volume= 7.9 m³, Depth= 34 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 100-Year Duration=21 min, Inten=107.6 mm/hr

Area (m²)	C	Description
233.6	0.90	Impervious Roof
233.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 1S: Building



Summary for Subcatchment 2S: At-Grade

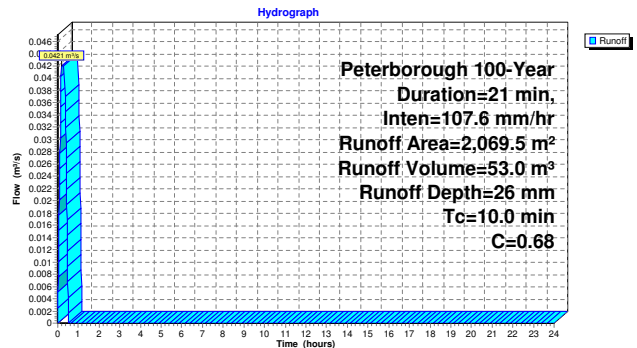
Runoff = 0.0421 m³/s @ 0.17 hrs, Volume= 53.0 m³, Depth= 26 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 100-Year Duration=21 min, Inten=107.6 mm/hr

Area (m²)	C	Description
693.5	0.25	Soft Landscaping
1,376.0	0.90	At-Grade Impervious
2,069.5	0.68	Weighted Average
2,069.5		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 2S: At-Grade



Summary for Subcatchment 3S: External Road

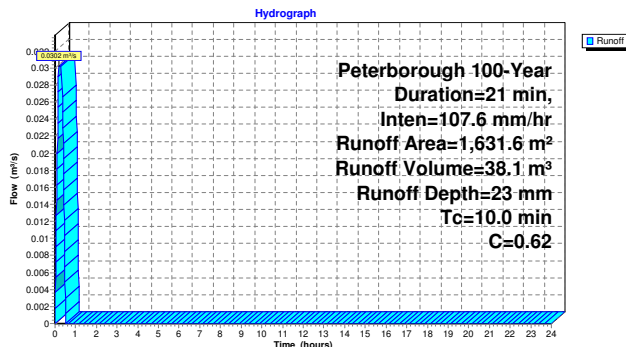
Runoff = 0.0302 m³/s @ 0.17 hrs, Volume= 38.1 m³, Depth= 23 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 100-Year Duration=21 min, Inten=107.6 mm/hr

Area (m²)	C	Description
933.1	0.90	External Impervious
698.5	0.25	External Pervious
1,631.6	0.62	Weighted Average
1,631.6		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 3S: External Road



Summary for Subcatchment 4S: Uncontrolled

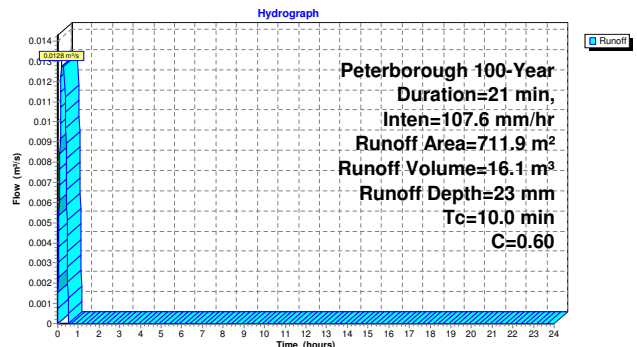
Runoff = 0.0128 m³/s @ 0.17 hrs, Volume= 16.1 m³, Depth= 23 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peterborough 100-Year Duration=21 min, Inten=107.6 mm/hr

Area (m²)	C	Description
333.7	0.25	Soft Landscaping
378.2	0.90	At-Grade Impervious
711.9	0.60	Weighted Average
711.9		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 4S: Uncontrolled



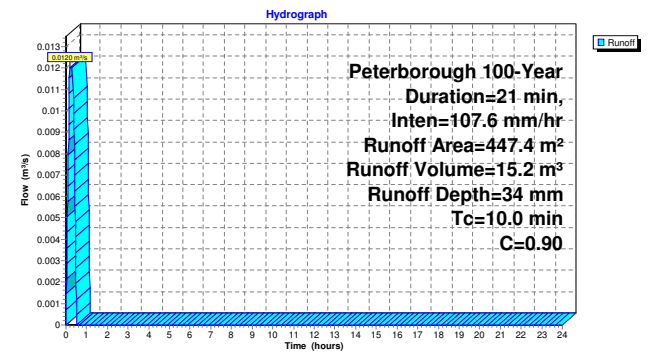
Summary for Subcatchment 5S: Building

Runoff = 0.0120 m³/s @ 0.17 hrs, Volume= 15.2 m³, Depth= 34 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peterborough 100-Year Duration=21 min, Inten=107.6 mm/hr

Area (m²)	C	Description
447.4	0.90	Impervious Roof
447.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					Direct Entry, Time of Concentration (Direct Entry)

Subcatchment 5S: Building



Summary for Pond 1P: Roof Storage

Inflow Area = 233.6 m², 0.00% Impervious, Inflow Depth = 34 mm for 100-Year event
Inflow = 0.0063 m³/s @ 0.17 hrs, Volume= 7.9 m³
Outflow = 0.0027 m³/s @ 0.45 hrs, Volume= 7.9 m³, Atten= 58%, Lag= 16.6 min
Primary = 0.0027 m³/s @ 0.45 hrs, Volume= 7.9 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.088 m @ 0.45 hrs Surf.Area= 156.3 m² Storage= 4.6 m³

Plug-Flow detention time= 18.7 min calculated for 7.9 m³ (100% of inflow)
Center-of-Mass det. time= 18.7 min (34.2 - 15.5)

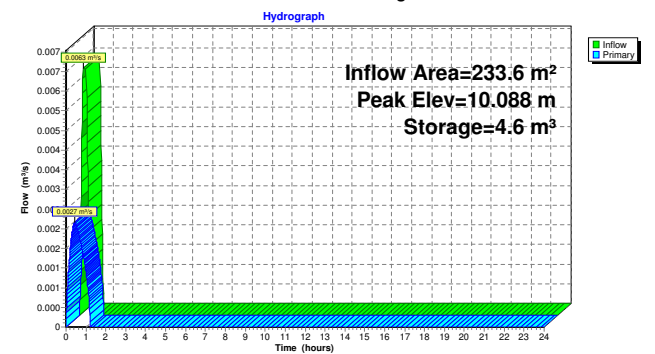
Volume	Invert	Avail.Storage	Storage Description
#1	10.000 m	6.7 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	200.0	6.7	6.7	200.0

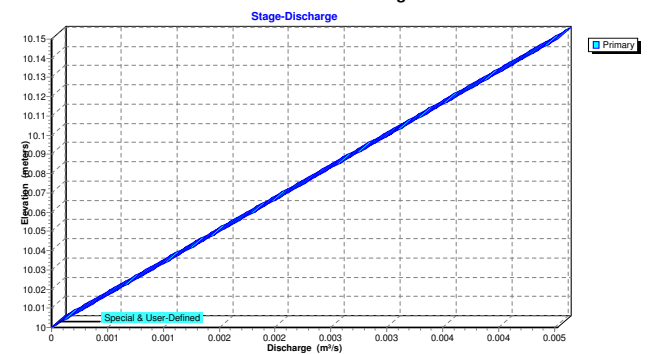
Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 3.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0027 m³/s @ 0.45 hrs HW=10.088 m (Free Discharge)
1=Special & User-Defined (Custom Controls 0.0027 m³/s)

Pond 1P: Roof Storage



Pond 1P: Roof Storage



Stage-Discharge for Pond 1P: Roof Storage

Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0016	10.104	0.0031
10.001	0.0000	10.053	0.0016	10.105	0.0032
10.002	0.0001	10.054	0.0016	10.106	0.0032
10.003	0.0001	10.055	0.0017	10.107	0.0032
10.004	0.0001	10.056	0.0017	10.108	0.0033
10.005	0.0002	10.057	0.0017	10.109	0.0033
10.006	0.0002	10.058	0.0018	10.110	0.0033
10.007	0.0002	10.059	0.0018	10.111	0.0034
10.008	0.0002	10.060	0.0018	10.112	0.0034
10.009	0.0003	10.061	0.0018	10.113	0.0034
10.010	0.0003	10.062	0.0019	10.114	0.0034
10.011	0.0003	10.063	0.0019	10.115	0.0035
10.012	0.0004	10.064	0.0019	10.116	0.0035
10.013	0.0004	10.065	0.0020	10.117	0.0035
10.014	0.0004	10.066	0.0020	10.118	0.0036
10.015	0.0005	10.067	0.0020	10.119	0.0036
10.016	0.0005	10.068	0.0021	10.120	0.0036
10.017	0.0005	10.069	0.0021	10.121	0.0037
10.018	0.0005	10.070	0.0021	10.122	0.0037
10.019	0.0006	10.071	0.0021	10.123	0.0037
10.020	0.0006	10.072	0.0022	10.124	0.0037
10.021	0.0006	10.073	0.0022	10.125	0.0038
10.022	0.0007	10.074	0.0022	10.126	0.0038
10.023	0.0007	10.075	0.0023	10.127	0.0038
10.024	0.0007	10.076	0.0023	10.128	0.0039
10.025	0.0008	10.077	0.0023	10.129	0.0039
10.026	0.0008	10.078	0.0024	10.130	0.0039
10.027	0.0008	10.079	0.0024	10.131	0.0040
10.028	0.0008	10.080	0.0024	10.132	0.0040
10.029	0.0009	10.081	0.0024	10.133	0.0040
10.030	0.0009	10.082	0.0025	10.134	0.0040
10.031	0.0009	10.083	0.0025	10.135	0.0041
10.032	0.0010	10.084	0.0025	10.136	0.0041
10.033	0.0010	10.085	0.0026	10.137	0.0041
10.034	0.0010	10.086	0.0026	10.138	0.0042
10.035	0.0011	10.087	0.0026	10.139	0.0042
10.036	0.0011	10.088	0.0027	10.140	0.0042
10.037	0.0011	10.089	0.0027	10.141	0.0043
10.038	0.0011	10.090	0.0027	10.142	0.0043
10.039	0.0012	10.091	0.0027	10.143	0.0043
10.040	0.0012	10.092	0.0028	10.144	0.0043
10.041	0.0012	10.093	0.0028	10.145	0.0044
10.042	0.0013	10.094	0.0028	10.146	0.0044
10.043	0.0013	10.095	0.0029	10.147	0.0044
10.044	0.0013	10.096	0.0029	10.148	0.0045
10.045	0.0014	10.097	0.0029	10.149	0.0045
10.046	0.0014	10.098	0.0030	10.150	0.0045
10.047	0.0014	10.099	0.0030		
10.048	0.0014	10.100	0.0030		
10.049	0.0015	10.101	0.0031		
10.050	0.0015	10.102	0.0031		
10.051	0.0015	10.103	0.0031		

Summary for Pond 2P: Bioretention Cell

Inflow Area = 3,934.7 m², 0.00% Impervious, Inflow Depth = 25 mm for 100-Year event
 Inflow = 0.0748 m³/s @ 0.35 hrs, Volume= 99.0 m³
 Outflow = 0.0696 m³/s @ 0.36 hrs, Volume= 56.3 m³, Atten= 7%, Lag= 0.8 min
 Primary = 0.0696 m³/s @ 0.36 hrs, Volume= 56.3 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 0.400 m Surf.Area= 249.4 m² Storage= 20.0 m³
 Peak Elev= 1.234 m @ 0.36 hrs Surf.Area= 407.6 m² Storage= 75.4 m³ (55.4 m³ above start)

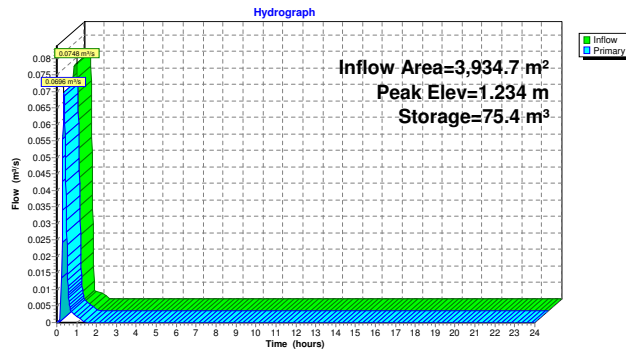
Plug-Flow detention time= 22.3 min calculated for 36.3 m³ (37% of inflow)
 Center-of-Mass det. time= 9.7 min (26.7 - 17.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1.000 m	35.6 m ³	12.47 mW x 10.00 mL x 0.25 mH Ponding Z=3.0
#2	0.400 m	22.4 m ³	12.47 mW x 10.00 mL x 0.60 mH Engineered Soil Media 74.8 m ³ Overall x 30.0% Voids
#3	0.000 m	20.0 m ³	12.47 mW x 10.00 mL x 0.40 mH Clear Stone 49.9 m ³ Overall x 40.0% Voids
		78.0 m ³	Total Available Storage

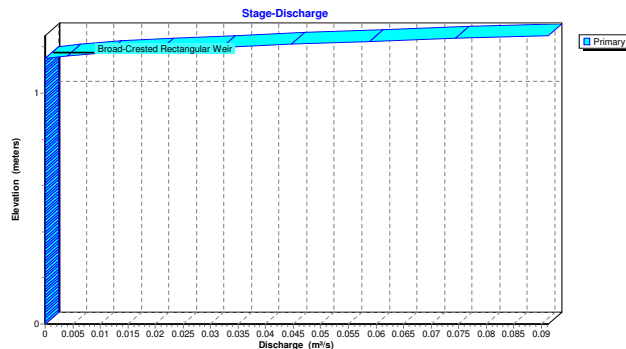
Device	Routing	Invert	Outlet Devices
#1	Primary	1.150 m	2.00 m long x 0.50 m breadth Broad-Crested Rectangular Weir Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 Coef. (Metric) 1.43 1.45 1.45 1.47 1.50 1.55 1.59 1.67 1.67 1.64 1.78 1.81 1.83

Primary OutFlow Max=0.0693 m³/s @ 0.36 hrs HW=1.233 m (Free Discharge)
 1=Broad-Crested Rectangular Weir (Weir Controls 0.0693 m³/s @ 0.42 m/s)

Pond 2P: Bioretention Cell



Pond 2P: Bioretention Cell



Stage-Discharge for Pond 2P: Bioretention Cell

Elevation (meters)	Primary (m³/s)
0.000	0.0000
0.015	0.0000
0.030	0.0000
0.045	0.0000
0.060	0.0000
0.075	0.0000
0.090	0.0000
0.105	0.0000
0.120	0.0000
0.135	0.0000
0.150	0.0000
0.165	0.0000
0.180	0.0000
0.195	0.0000
0.210	0.0000
0.225	0.0000
0.240	0.0000
0.255	0.0000
0.270	0.0000
0.285	0.0000
0.300	0.0000
0.315	0.0000
0.330	0.0000
0.345	0.0000
0.360	0.0000
0.375	0.0000
0.390	0.0000
0.405	0.0000
0.420	0.0000
0.435	0.0000
0.450	0.0000
0.465	0.0000
0.480	0.0000
0.495	0.0000
0.510	0.0000
0.525	0.0000
0.540	0.0000
0.555	0.0000
0.570	0.0000
0.585	0.0000
0.600	0.0000
0.615	0.0000
0.630	0.0000
0.645	0.0000
0.660	0.0000
0.675	0.0000
0.690	0.0000
0.705	0.0000
0.720	0.0000
0.735	0.0000
0.750	0.0000
0.765	0.0000

Elevation (meters)	Primary (m³/s)
0.780	0.0000
0.795	0.0000
0.810	0.0000
0.825	0.0000
0.840	0.0000
0.855	0.0000
0.870	0.0000
0.885	0.0000
0.900	0.0000
0.915	0.0000
0.930	0.0000
0.945	0.0000
0.960	0.0000
0.975	0.0000
0.990	0.0000
1.005	0.0000
1.020	0.0000
1.035	0.0000
1.050	0.0000
1.065	0.0000
1.080	0.0000
1.095	0.0000
1.110	0.0000
1.125	0.0000
1.140	0.0000
1.155	0.0010
1.170	0.0081
1.185	0.0187
1.200	0.0320
1.215	0.0474
1.230	0.0650
1.245	0.0844

Summary for Pond 3P: Roof Storage

Inflow Area = 447.4 m², 0.00% Impervious, Inflow Depth = 34 mm for 100-Year event
 Inflow = 0.0120 m³/s @ 0.17 hrs, Volume= 15.2 m³
 Outflow = 0.0045 m³/s @ 0.45 hrs, Volume= 15.2 m³, Atten= 63%, Lag= 17.1 min
 Primary = 0.0045 m³/s @ 0.45 hrs, Volume= 15.2 m³

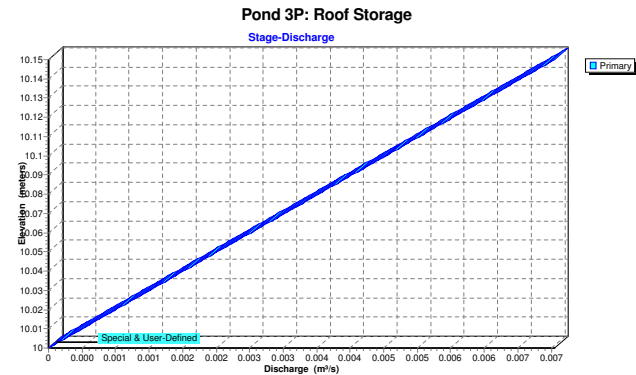
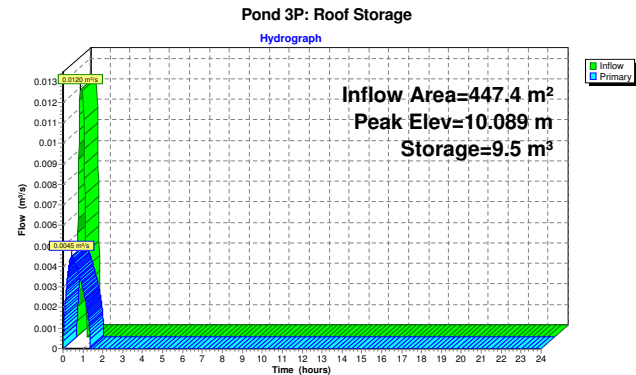
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 10.089 m @ 0.45 hrs Surf.Area= 319.9 m² Storage= 9.5 m³

Plug-Flow detention time= 22.7 min calculated for 15.2 m³ (100% of inflow)
 Center-of-Mass det. time= 22.7 min (38.2 - 15.5)

Volume	Invert	Avail.Storage	Storage Description	
#1	10.000 m	13.3 m³	Custom Stage Data (Pyramidal) Listed below (Recalc)	
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
10.000	0.0	0.0	0.0	0.0
10.100	400.0	13.3	13.3	400.0

Device	Routing	Invert	Outlet Devices
#1	Primary	10.000 m	Special & User-Defined X 5.00 Head (meters) 0.000 0.150 Disch. (m³/s) 0.00000 0.00151

Primary OutFlow Max=0.0045 m³/s @ 0.45 hrs HW=10.089 m (Free Discharge)
 1=Special & User-Defined (Custom Controls 0.0045 m³/s)



Stage-Discharge for Pond 3P: Roof Storage

Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)	Elevation (meters)	Primary (m³/s)
10.000	0.0000	10.052	0.0026	10.104	0.0052
10.001	0.0001	10.053	0.0027	10.105	0.0053
10.002	0.0001	10.054	0.0027	10.106	0.0053
10.003	0.0002	10.055	0.0028	10.107	0.0054
10.004	0.0002	10.056	0.0028	10.108	0.0054
10.005	0.0003	10.057	0.0029	10.109	0.0055
10.006	0.0003	10.058	0.0029	10.110	0.0055
10.007	0.0004	10.059	0.0030	10.111	0.0056
10.008	0.0004	10.060	0.0030	10.112	0.0056
10.009	0.0005	10.061	0.0031	10.113	0.0057
10.010	0.0005	10.062	0.0031	10.114	0.0057
10.011	0.0006	10.063	0.0032	10.115	0.0058
10.012	0.0006	10.064	0.0032	10.116	0.0058
10.013	0.0007	10.065	0.0033	10.117	0.0059
10.014	0.0007	10.066	0.0033	10.118	0.0059
10.015	0.0008	10.067	0.0034	10.119	0.0060
10.016	0.0008	10.068	0.0034	10.120	0.0060
10.017	0.0009	10.069	0.0035	10.121	0.0061
10.018	0.0009	10.070	0.0035	10.122	0.0061
10.019	0.0010	10.071	0.0036	10.123	0.0062
10.020	0.0010	10.072	0.0036	10.124	0.0062
10.021	0.0011	10.073	0.0037	10.125	0.0063
10.022	0.0011	10.074	0.0037	10.126	0.0063
10.023	0.0012	10.075	0.0038	10.127	0.0064
10.024	0.0012	10.076	0.0038	10.128	0.0064
10.025	0.0013	10.077	0.0039	10.129	0.0065
10.026	0.0013	10.078	0.0039	10.130	0.0065
10.027	0.0014	10.079	0.0040	10.131	0.0066
10.028	0.0014	10.080	0.0040	10.132	0.0066
10.029	0.0015	10.081	0.0041	10.133	0.0067
10.030	0.0015	10.082	0.0041	10.134	0.0067
10.031	0.0016	10.083	0.0042	10.135	0.0068
10.032	0.0016	10.084	0.0042	10.136	0.0068
10.033	0.0017	10.085	0.0043	10.137	0.0069
10.034	0.0017	10.086	0.0043	10.138	0.0069
10.035	0.0018	10.087	0.0044	10.139	0.0070
10.036	0.0018	10.088	0.0044	10.140	0.0070
10.037	0.0019	10.089	0.0045	10.141	0.0071
10.038	0.0019	10.090	0.0045	10.142	0.0071
10.039	0.0020	10.091	0.0046	10.143	0.0072
10.040	0.0020	10.092	0.0046	10.144	0.0072
10.041	0.0021	10.093	0.0047	10.145	0.0073
10.042	0.0021	10.094	0.0047	10.146	0.0073
10.043	0.0022	10.095	0.0048	10.147	0.0074
10.044	0.0022	10.096	0.0048	10.148	0.0074
10.045	0.0023	10.097	0.0049	10.149	0.0075
10.046	0.0023	10.098	0.0049	10.150	0.0076
10.047	0.0024	10.099	0.0050		
10.048	0.0024	10.100	0.0050		
10.049	0.0025	10.101	0.0051		
10.050	0.0025	10.102	0.0051		
10.051	0.0026	10.103	0.0052		

Summary for Link 1L: Outlet

Inflow Area = 5,094.0 m², 0.00% Impervious, Inflow Depth = 17 mm for 100-Year event
Inflow = 0.0859 m³/s @ 0.36 hrs, Volume= 87.5 m³
Primary = 0.0859 m³/s @ 0.36 hrs, Volume= 87.5 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Outlet

