

BRANTHAVEN MCCRANEY INC.

STORMWATER MANAGEMENT REPORT

MCCRANEY ST. EAST
BLOCK E, PLAN M-172, OAKVILLE, ON

JANUARY 12, 2018





STORMWATER MANAGEMENT REPORT MCCRANEY ST. EAST, OAKVILLE, ON

BRANTHAVEN MCCRANEY INC.

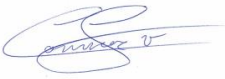

SITE PLAN APPLICATION

PROJECT NO.: 16M-0050-01-SWM
DATE: JANUARY 2018

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

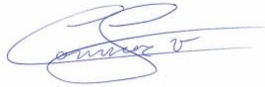
TEL.: +1 905 882-0055
WSP.COM

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Rezoning and Site Plan Application			
Date	January 12, 2018			
Prepared by	Connor van Steekelenburg			
Signature				
Checked by	AMB			
Signature				
Project number	16M-0050-01-SWM			

SIGNATURES

PREPARED BY



Connor van Steekelenburg, B. Eng, EIT
Designer

REVIEWED BY



Alyssa Mohino-Barrie, P. Eng.
Project Engineer

This report was prepared by WSP Canada Group Limited for the account of Branthaven McCraney Inc., in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP Canada Group Limited's best judgment in light of the information available to it at the time of preparation. Aside from the City of Toronto, who may rely on this report, any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Group Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

PRODUCTION TEAM

CLIENT

Branthaven McCraney Inc.

WSP

Designer

Connor van Steekelenburg, B.Eng, EIT

Project Engineer

Alyssa Mohino-Barrie, P.Eng.



TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Scope	1
1.2	Site Location	1
1.3	Stormwater Management Plan Objectives	1
1.4	Design Criteria.....	1
2	PRE-DEVELOPMENT CONDITIONS.....	2
2.1	General	2
2.2	Rainfall Information	2
2.3	Allowable Flow Rates	2
3	POST-DEVELOPMENT CONDITIONS	4
3.1	General	4
3.2	Water Quantity Control	4
3.3	Water Quality Control	5
4	CONCLUSIONS	6
5	STANDARD LIMITATIONS	7

TABLES

TABLE 2.1	RAINFALL PARAMETERS.....	2
TABLE 2.2	EXISTING DRAINAGE CONDITIONS.....	3
TABLE 2.3	PEAK FLOW RATE CALCULATIONS & ALLOWABLE SITE DISCHARGE RATE.....	3
TABLE 3.1	PROPOSED LAND-USE AREA BREAKDOWN	4
TABLE 3.3	SUMMARY OF MODELLING RESULTS.....	5

FIGURES (LOCATED AFTER PAGE)

FIGURE 1:	SITE LOCATION.....	1
FIGURE 2:	EXISTING CONDITIONS	3
FIGURE 3:	PROPOSED CONDITIONS.....	6

APPENDICES

A	STORMWATER MANAGEMENT CALCULATIONS
B	HYDROLOGIC MODEL OUTPUT (HYDROCAD)
C	OGS UNIT

1 INTRODUCTION

1.1 SCOPE

WSP has been retained by Branthaven McCraney Inc. to prepare a Stormwater Management (SWM) Report to support the rezoning and site plan application for the proposed development at McCraney Street East, in the Town of Oakville. This SWM report examines the potential water balance, water quality, and water quantity impacts of the proposed development and summarizes how each will be addressed in accordance with both the Town of Oakville's Development Engineering Procedures and Guidelines, and the requirements of Conservation Halton.

1.2 SITE LOCATION

The site is located at the northwest corner of McCraney St. E and Montclair Drive, in the Town of Oakville. The site is bordered by a branch of West Morrison Creek to the north. The location of the proposed re-development is shown in Figure 1.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

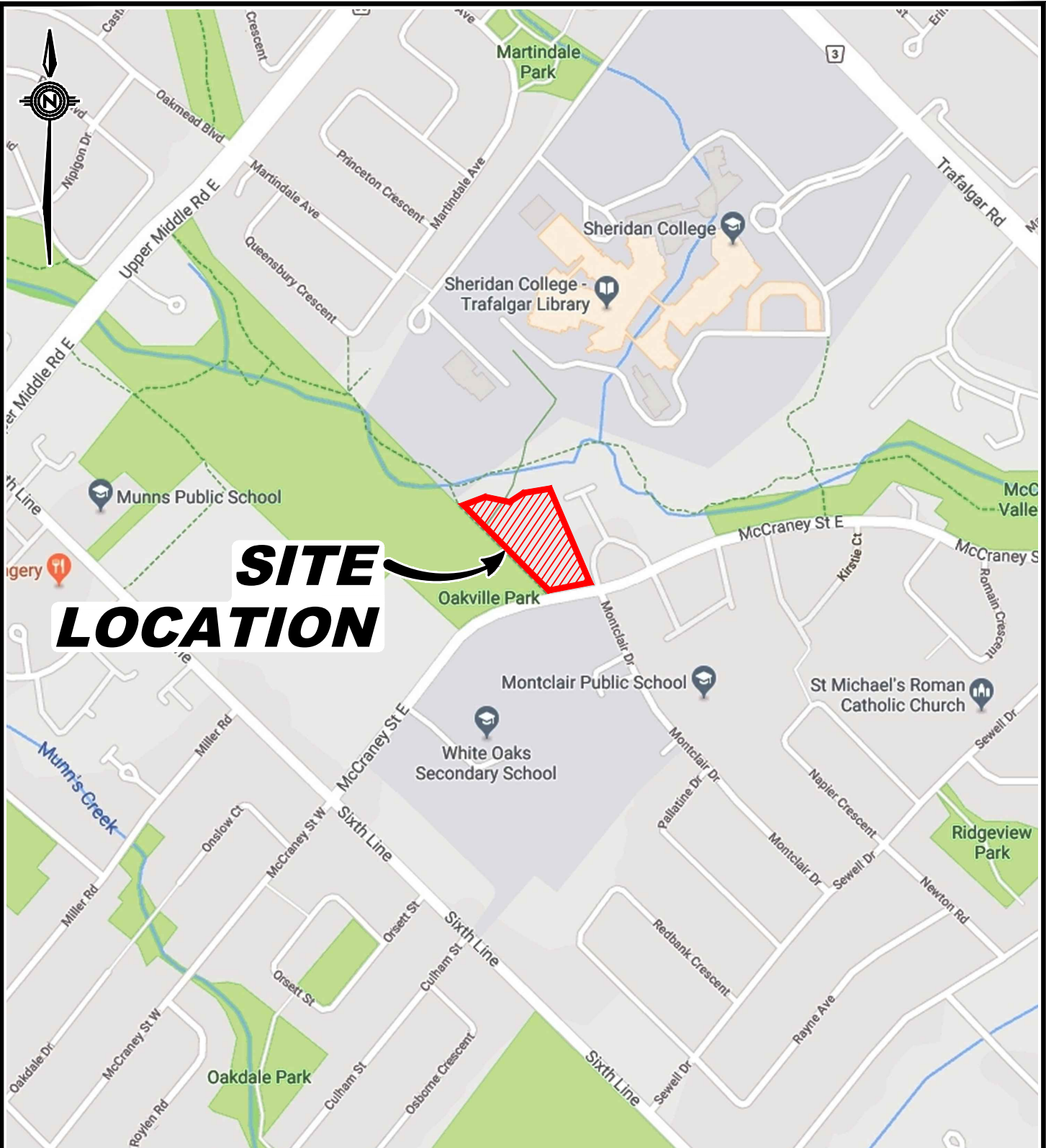
The objectives of the stormwater management plan are as follows:

- Determine site specific stormwater management requirements to ensure that the proposals are in conformance with the Town of Oakville stormwater management requirements;
 - Evaluate various stormwater management practices that meet the requirements of the Town and recommend a preferred strategy; and
 - Prepare a stormwater management report documenting the strategy along with the technical information necessary for the justification and preliminary sizing of the proposed stormwater management facilities.
-

1.4 DESIGN CRITERIA

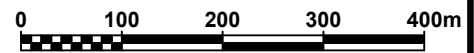
A summary of the stormwater management criteria applicable to this project follows:

- **Water Quality** – Under the Town of Oakville's Development Engineering Procedures & Guidelines Manual (DEPGM), the site is required to target a long-term removal of 80% of total suspended solids (TSS) on an annual loading basis, as per the latest Ministry of Environment and Climate Change Stormwater Management Planning and Design Manual (2003).
- **Water Quantity Control** – The Town of Oakville's DEPGM requires the site's post-development discharge rates to be controlled to the capacity of the receiving municipal storm sewer. It was determined that the receiving storm sewer was designed to convey the 5 year design storm. As such the site's discharge will be controlled such that the 100 year post-development release rate will not exceed the 5 year pre-development runoff rate.
- **Water Balance & Erosion Control** – No explicit water balance and erosion control requirements apply for this site.



**SITE
LOCATION**

@2017 Google - Map data @2017 Tele Atlas



CLIENT	BRANTHAVEN MCCRANEY INC.
TITLE	MCCRANEY STREET EAST, OAKVILLE
SITE LOCATION	

Checked A.M.B.	Drawn AutoCAD/B.K.B.
Date JANUARY 2018	Proj. No. 16M-00050-01-SWM
Scale AS SHOWN	Figure No. 1
	Gr.No. 01

FIGURE 1.dwg - 20 McCraney St E - Site Location X:\DIV\10\10-16058 McCraney\MunS\WMFIGURES\ Jan 12, 2018 - 3:16pm

2 PRE-DEVELOPMENT CONDITIONS

2.1 GENERAL

The 1.42 ha site is primarily occupied by disturbed areas that were cleared of small trees and shrubs as well as shrubby thicket along the eastern, western and southern property limited. The northern extent of the property consists of woodland associated with the West Morrison Creek Valley corridor. The existing runoff coefficient is estimated at 0.20, as the entire site is comprised of unimproved areas. The site's drainage is currently split, with the catchment 200 draining overland to West Morrison Creek and catchment 100 draining overland to the municipal sewer system on McCraney Street. The existing condition of the site is shown in Figure 2.

2.2 RAINFALL INFORMATION

The rainfall intensity for the site was calculated using the following equation:

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

Where;

I = rainfall intensity in mm/hour

t_c = time of concentration in minutes

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

The parameters (A, B and C) recommended for use by the Town of Oakville (per Section 3.1.3.07 of the Town of Oakville's DEPGM) are summarized in Table 2.1.

Table 2.1 Rainfall Parameters

RETURN PERIOD (years)	2	5	10	25	50	100
A	725.0	1170.0	1400.0	1680.0	1960.0	2150.0
B	4.8	5.8	5.8	5.6	5.8	5.7
C	0.81	0.84	0.85	0.85	0.86	0.86

Source: Town of Oakville DEPGM

An initial time of concentration, T_C , of 10 minutes (or 0.167 hours) was used.

2.3 ALLOWABLE FLOW RATES

The site is located in an urbanized area. As noted in the Town of Oakville's DEPGM the post-development discharge rate for any storm event from this site is to be controlled to the capacity of the receiving municipal storm sewer. The site will discharge all captured stormwater as well as runoff from a small uncontrolled area south to the storm sewer on McCraney Street. Additionally, the uncontrolled area at the north end of the site is part of a conservation area and will not be

developed. Runoff from this area will be allowed to drain to West Morrison Creek to the north as it does under existing conditions. A summary of the existing drainage conditions of this site is displayed in Table 2.2.

Table 2.2 Existing Drainage Conditions

CATCHMENT	AREA (ha)	RUNOFF COEFFICIENT, C	DISCHARGE POINT
100	0.635	0.20	West Morrison Creek
200	0.785	0.20	McCraney Street East
Total Site Area	1.420	0.20	-

To determine the allowable site discharge rates, the following rational method equation from the Town of Oakville’s DEPGM was used:

$$Q = 2.78CIA$$

Where;

I = rainfall intensity (mm/hour)

A = Site area (ha)

C = Runoff coefficient

Since catchment 200, the area draining to West Morrison Creek, is reduced in size under post-development conditions and no changes will be made to its land use, post-development runoff rates will not exceed pre-development rates, and no further analysis is required for this catchment.

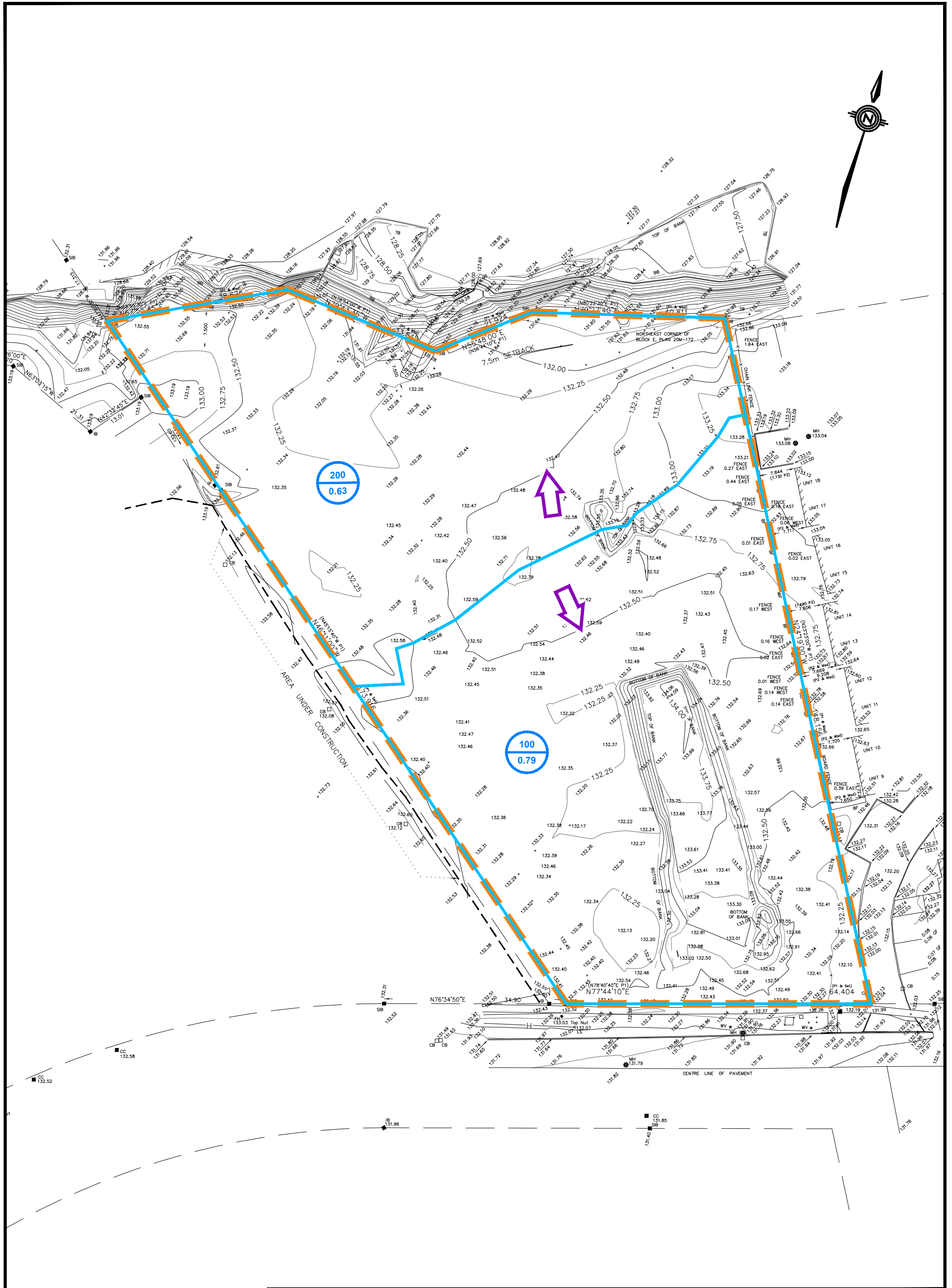
The allowable peak flow rate for catchment 100 was calculated in accordance with the Town of Oakville’s DEPGM. It was determined that the receiving municipal storm sewer on McCraney Street East, was designed to convey up to the 1 in 5 year rainfall event. Therefore, the site will be controlled such that the post-development discharge rate from the 1-100 year rainfall event does not exceed the existing runoff rate from the 1 in 5 year event.

The existing runoff rates and the post-development allowable release rate are summarized in Table 2.3. Detailed calculations are contained within Appendix A.

Table 2.3 Peak Flow Rate Calculations & Allowable Site Discharge Rate

RETURN PERIOD (years)	RAINFALL INTENSITY, I (mm/hour)	EXISTING RUNOFF RATES, Q* (L/s)	DEPGM ALLOWABLE RELEASE RATE, Q _A * (L/s)
2	82.2	35.9	49.9
5	114.2	49.9	
10	134.8	58.9	
25	162.2	70.8	
50	182.1	79.5	
100	200.8	87.7	

*C=0.2, area of 0.79 ha and time of concentration of 10 minutes



LEGEND


- SUB-CATCHMENT BOUNDARIES
- - - PROPERTY BOUNDARY
- 100 / 0.79 SUB-CATCHMENT ID.
- DRAINAGE AREA (ha)
- ➔ OVERLAND FLOW ROUTE

0 5 10 15 20 25m

CLIENT
BRANTHAVEN MCCRANEY INC.

TITLE
MCCRANEY STREET EAST, OAKVILLE

EXISTING CONDITIONS



Checked A.M.B.	Drawn AutoCAD/C.V.S.
Date JANUARY 2018	Proj. No. 16M-00050-01-SWM
Scale 1:750	Figure No. 2 Gr.No.

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed development consists of the construction of a multi-storey residential building, providing 219 units. On the surface, the site includes both hard and soft-landscaped surfaces, as well as a driveway, loading dock and visitor parking. An underground parking garage is proposed to take up the majority of the site limits. The development limits extend north up to the 10m buffer/setback from the valleyland woodlands.

Under proposed conditions the un-developed northern part of the site will be allowed to flow uncontrolled to West Morrison Creek, as it did under existing conditions. Runoff from a portion at the southern end of the site will be allowed to flow uncontrolled to the municipal sewer system on McCraney Street. This flow will be accounted for in the allowable release rate. The remaining site area will be captured and controlled in a stormwater cistern.

An area breakdown for the new site layout is provided in Table 3.1. Please refer to Figure 3 for details of the post-development conditions, land-uses, and stormwater catchments.

Table 3.1 Proposed Land-Use Area Breakdown

LAND-USE	AREA (m ²)	RUNOFF COEFFICIENT, C
Impervious Roof	3198	0.9
Impervious At-Grade	1359	0.9
Pervious Landscape	2467	0.25
Vehicular Road Surface	7180	0.9
Total Site Area	14204	0.57

3.2 WATER QUANTITY CONTROL

A HydroCAD model of the project was constructed and utilized to determine the required storage volume in the stormwater cistern, and to calculate the discharge rates achieved by the proposed flow controls under all storm events. The Modified Rational Method (an inherent subroutine of the HydroCAD software) has been used for the modelling exercise.

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

The cistern was designed to provide a storage volume of 297.5 m³, with a base area of 85 m² and the primary gravity outlet set at the base of the tank. A 100 mm orifice plate is proposed as the primary outlet control – this provides sufficient flow restriction to control release rates to or below the target release rate.

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

Table 3.2 Summary of Modelling Results

RETURN PERIOD (YEARS)	ALLOWABLE PEAK FLOW RATE (L/s)	MODELLED POST-DEVELOPMENT PEAK FLOW RATE (L/s)	UTILIZED CISTERN STORAGE (m ³)	PEAK WATER ELEVATION IN CISTERN (m)
2	49.9	24.7	109.5	1.289
5		30.2	158.9	1.869
100		42.1	290.9	3.422

The modelling results demonstrate that the post-development peak flow rates for all events up to the 100-year storm are lower than the target release rate established in accordance with the Town of Oakville’s DEPGM. The maximum required storage volume to control the 100-year post-development runoff is 290.9 m³.

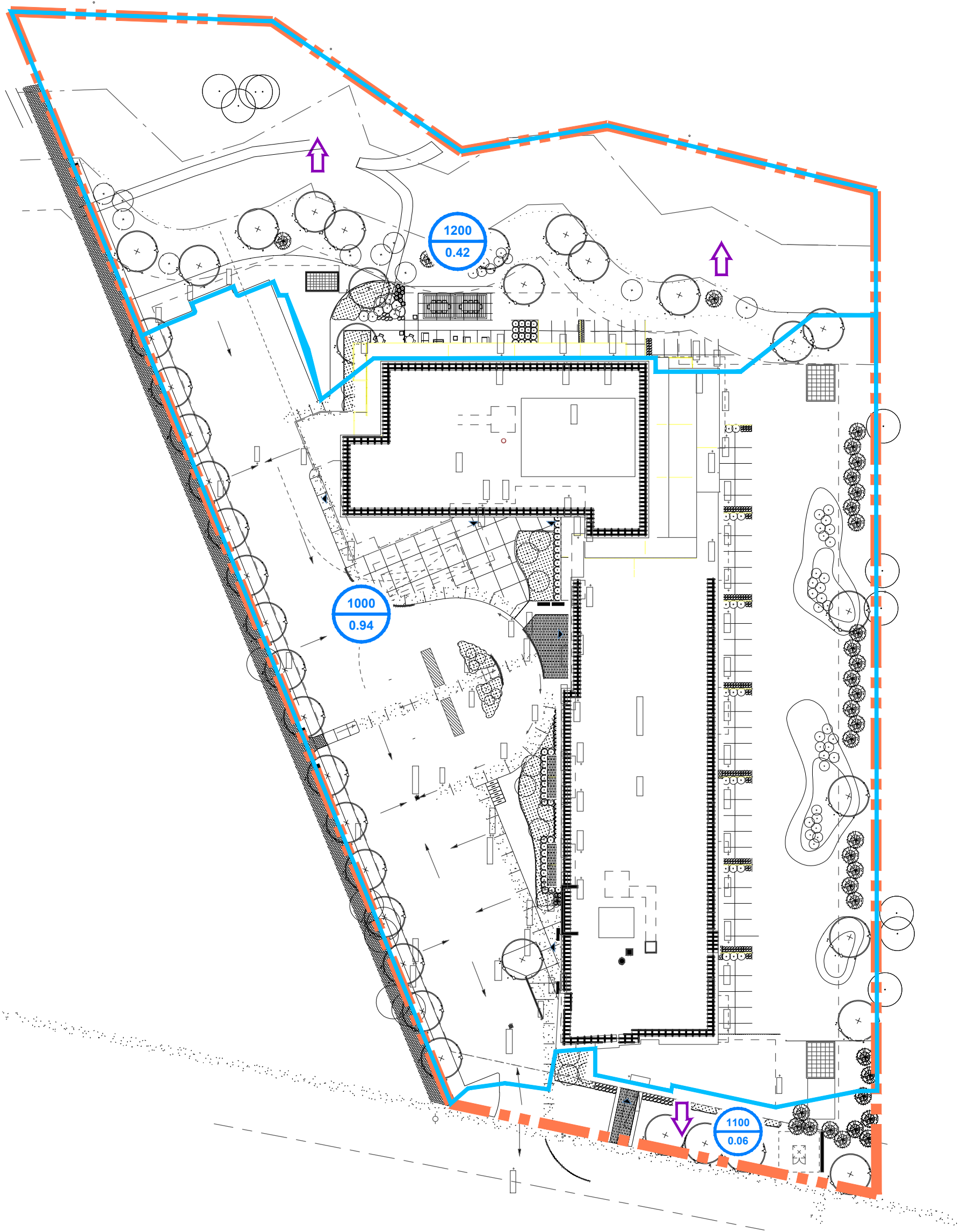
The rainfall intensity and storm duration resulting in the site’s total peak outflow has been iteratively determined at $t_d = 39$ minutes (for the 100-year event) according to the Modified Rational Method process.

3.3 WATER QUALITY CONTROL

The site proposes impervious driveway and parking lot areas, various soft and hardscaping, and a large residential condominium building. The runoff from the soft landscaped areas and from the impervious roof is considered clean for the water quality purposes. The development proposes approximately 3,825 m² of impervious area, which will be prone to sediment and oil grit generation. To meet the water quality requirement, one OGS unit will be used, at the inlet of the stormwater storage tank. This unit will be a CDS 2015. The unit will provide 80% TSS removal, and all sizing calculations are attached in Appendix C. This strategy will ensure that water quality measures for the proposed development are met.

3.4 WATER BALANCE & EROSION CONTROL

As stated in section 1.4 of this report, no explicit water balance and erosion control requirements apply to this site. Halton Region Conservation Authority has indicated that a basic hydrogeological assessment is required since the site abuts West Morrison Creek. Upon completion of the hydrogeological assessment, Halton Region Conservation Authority will be further consulted to determine if any water balance and erosion control measures are required for this site



LEGEND

- - - PROJECT AREA BOUNDARY
- SUB-CATCHMENT BOUNDARIES
- 1100 SUB-CATCHMENT ID.
- 0.05 DRAINAGE AREA (ha)
- ➔ OVERLAND FLOW ROUTE



CLIENT	BRANTHAVEN MCCRANEY INC.
TITLE	MCCRANEY STREET EAST, OAKVILLE
PROPOSED CONDITIONS	



Checked A.M.B.	Drawn B.D.
Date JANUARY 2018	Proj. No. 16M-00050-01-SWM
Scale AS SHOWN	Figure No. 3 Gr.No. 01

4 CONCLUSIONS

This stormwater management plan has been prepared to support the rezoning and site plan application for the proposed development at McCraney Street East, Town of Oakville. The key points are summarized below.

WATER QUANTITY

Runoff captured on the site will be directed to a 297.5 m³ stormwater cistern controlled by a 100 mm orifice plate. Discharge rates for event storms from the 2-year to the 100-year for post-development conditions are limited to the capacity of the receiving municipal sewer.

WATER QUALITY

Stormwater runoff from proposed roof and landscaped areas are considered clean and expected to leave the site effectively unchanged in terms of water quality. Runoff from sediment generating surfaces will be contained and treated on-site. An OGS unit Model #CDS 2015 will treat water for 80% TSS removal before the water enters the stormwater cistern.

The report has demonstrated that the proposed stormwater management strategy will address stormwater management related impacts from this project in adherence with the Town of Oakville's Development Engineering Procedures & Guidelines Manual.

Respectfully submitted,

WSP



Alyssa Mohino-Barrie, P.Eng.

Project Engineer, Water Resources



Connor van Steekelenburg, E.I.T.

Designer, Water Resources

5 STANDARD LIMITATIONS

This report was prepared by WSP Group Canada Limited for the client in accordance with the agreement between WSP and the client. This report is based on information provided to WSP which has not been independently verified.

The disclosure of any information contained in this report is the sole responsibility of the client. The material in this report, accompanying spreadsheets and all information relating to this activity reflect WSP's judgment in light of the information available to us at the time of preparation of this report. With the exception of the City of Toronto who can rely on this report, any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this report.

WSP warrants that it performed services hereunder with that degree of care, skill, and diligence normally provided in the performance of such services in respect of projects of similar nature at the time and place those services were rendered. WSP disclaims all other warranties, representations, or conditions, either express or implied, including, without limitation, warranties, representations, or conditions of merchantability or profitability, or fitness for a particular purpose.

This Standard Limitations statement is considered part of this report.

APPENDIX

A STORMWATER MANAGEMENT CALCULATIONS



Stormwater Management Calculations

Project: McCraney Street

No.: 16M-00050-01-SWM

Allowable Discharge Rate - McCraney Street Municipal Storm Sewer

By: CVS

Date: 1/12/2018

Page:

Checked: AMB

Checked: AMB

1

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)

Project Area, A **0.79** hectares

Runoff Coef, C 0.20 (woodlot)

Rainfall intensity calculated in accordance with Town of Oakville Development Engineering Procedures & Guidelines Manual (Section 3.1.3.07):

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

Where: A, B and C = Parameters defined in Town of Oakville DEPGM Table 3.1

I = Rainfall intensity (mm/hour)

T = Time of concentration (hours)

Return Period (Years)	2	5	10	25	50	100
A	725.0	1170.0	1400.0	1680.0	1960.0	2150.0
B	4.8	5.8	5.8	5.6	5.8	5.7
C	0.81	0.84	0.85	0.85	0.86	0.86
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)	82.2	114.2	134.8	162.2	182.1	200.8
Q (litres/sec)	35.9	49.9	58.9	70.8	79.5	87.7
Q (m3/sec)	0.036	0.050	0.059	0.071	0.080	0.088

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

Allowable release rate to municipal storm sewer system is therefore 49.9 litres/second.

(As per Town of Oakville DEPGM section 2.2.3.7)



Stormwater Management Calculations	Project: 20 McCraney Street	No.: 16M-00050-01-SWM	
	Post-Development Uncontrolled Area - Uncontrolled Discharge Rate	By: CVS Checked: AMB	Date: 1/12/2018 Checked: AMB
			Page: 2

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

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

Project Area, A hectares
 Runoff Coef, C* 0.42

Rainfall intensity calculated in accordance with Town of Oakville Development Engineering Procedures & Guidelines Manual (Section 3.1.3.07):

$$I = \frac{A}{(t_c + B)^c}$$

Where: A and C = Parameters defined in WWFMG section 3.1.
 I = Rainfall intensity (mm/hour)
 T = Time of concentration (hours)

Return Period (Years)	2	5	10	25	50	100
A	725.0	1170.0	1400.0	1680.0	1960.0	2150.0
B	4.8	5.8	5.8	5.6	5.8	5.7
C	0.81	0.84	0.85	0.85	0.86	0.86
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)	82.2	114.2	134.8	162.2	182.1	200.8
Q (litres/sec)	5.7	7.9	9.3	11.2	12.6	13.8
Q (m3/sec)	0.006	0.008	0.009	0.011	0.013	0.014

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

Under post-development conditions the site's uncontrolled area contributes 13.8 litres/second to the site's total discharge rate during the 1 in 100 year rainfall event.



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

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

Project Area, A **0.94** hectares
 Runoff Coef, C* 0.72

Rainfall intensity calculated in accordance with Town of Oakville Development Engineering Procedures & Guidelines Manual (Section 3.1.3.07):

$$I = \frac{A}{(t_c + B)^c}$$

Where: A and C = Parameters defined in WWFMG section 3.1.
 I = Rainfall intensity (mm/hour)
 T = Time of concentration (hours)

Return Period (Years)	2	5	10	25	50	100
A	725.0	1170.0	1400.0	1680.0	1960.0	2150.0
B	4.8	5.8	5.8	5.6	5.8	5.7
C	0.81	0.84	0.85	0.85	0.86	0.86
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)	82.2	114.2	134.8	162.2	182.1	200.8
Q (litres/sec)	155.9	216.6	255.7	307.6	345.3	380.9
Q (m3/sec)	0.156	0.217	0.256	0.308	0.345	0.381

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

Allowable Release Rate **49.9**
 Total Post-Development Uncontrolled Discharge Rate **394.7**

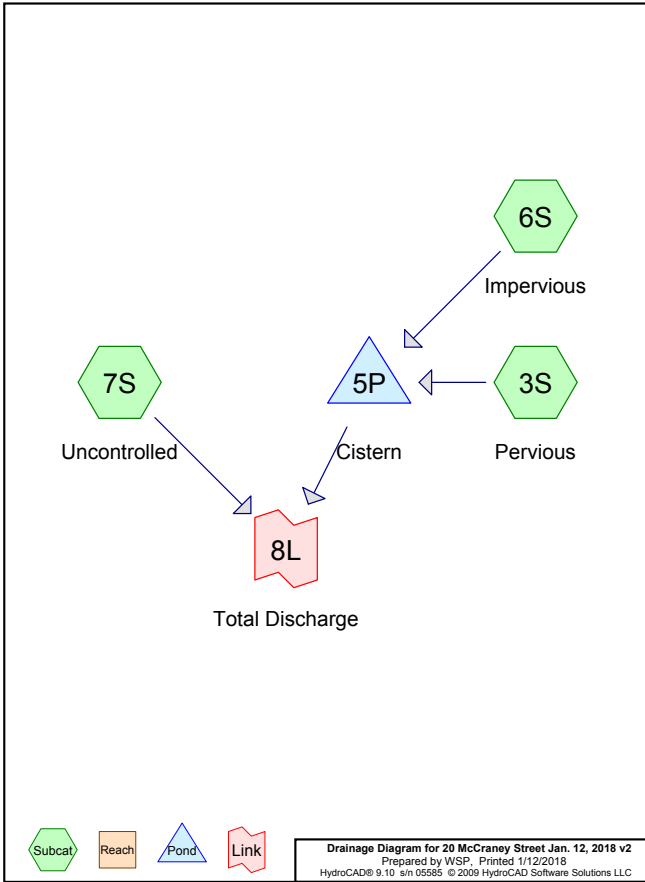
The post-development uncontrolled discharge rate to the municipal storm sewer on McCraney Street East is much greater than in existing conditions. Therefore, the site will require an orifice plate/tube for outlet control and a stormwater cistern for storage of runoff.

APPENDIX

B HYDROLOGIC MODEL OUTPUT (HydroCAD)

Area Listing (all nodes)

Area (hectares)	C	Description (subcatchment-numbers)
0.2998	0.25	Soft-Landscaping (3S, 7S)
0.2467	0.90	Driveway (6S, 7S)
0.1359	0.90	Impervious At-Grade (6S, 7S)
0.3199	0.90	Roof (6S)
1.0022		TOTAL AREA



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

Subcatchment 3S: Pervious Runoff Area=2,569.1 m² 0.00% Impervious Runoff Depth=4 mm
Tc=10.0 min C=0.25 Runoff=0.0049 m³/s 0.011 MI

Subcatchment 6S: Impervious Runoff Area=6,867.6 m² 0.00% Impervious Runoff Depth=16 mm
Tc=10.0 min C=0.90 Runoff=0.0468 m³/s 0.110 MI

Subcatchment 7S: Uncontrolled Runoff Area=585.4 m² 0.00% Impervious Runoff Depth=7 mm
Tc=10.0 min C=0.42 Runoff=0.0019 m³/s 0.004 MI

Pond 5P: Cistern Peak Elev=0.993 m Storage=84.4 m³ Inflow=0.0517 m³/s 0.121 MI
Outflow=0.0203 m³/s 0.121 MI

Link 8L: Total Discharge Inflow=0.0214 m³/s 0.125 MI
Primary=0.0214 m³/s 0.125 MI

Total Runoff Area = 1.0022 ha Runoff Volume = 0.125 MI Average Runoff Depth = 12 mm
100.00% Pervious = 1.0022 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 3S: Pervious

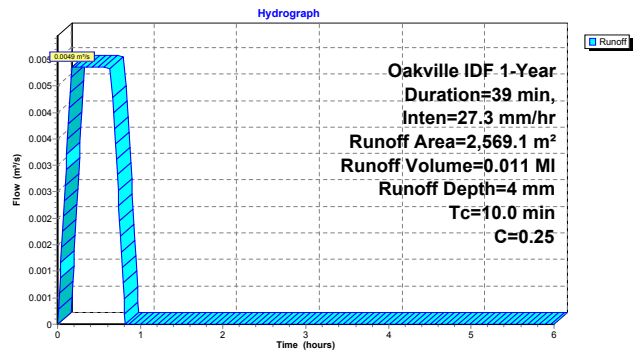
Runoff = 0.0049 m³/s @ 0.17 hrs, Volume= 0.011 MI, Depth= 4 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
Oakville IDF 1-Year Duration=39 min, Inten=27.3 mm/hr

Area (m ²)	C	Description
2,569.1	0.25	Soft-Landscaping
2,569.1		100.00% Pervious Area

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

Subcatchment 3S: Pervious



Summary for Subcatchment 6S: Impervious

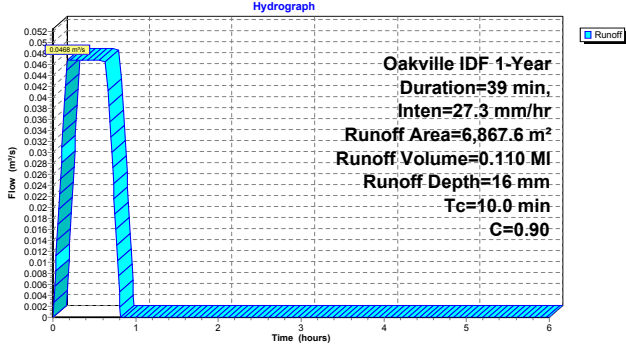
Runoff = 0.0468 m³/s @ 0.17 hrs, Volume= 0.110 MI, Depth= 16 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 1-Year Duration=39 min, Inten=27.3 mm/hr

Area (m²)	C	Description
3,198.5	0.90	Roof
1,234.1	0.90	Impervious At-Grade
2,435.0	0.90	Driveway
6,867.6	0.90	Weighted Average
6,867.6		100.00% Pervious Area

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

Subcatchment 6S: Impervious



Summary for Subcatchment 7S: Uncontrolled

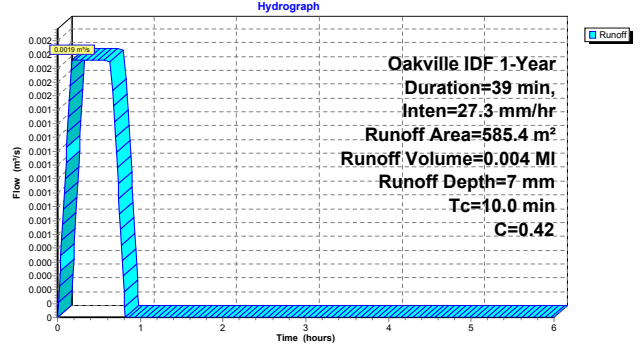
Runoff = 0.0019 m³/s @ 0.17 hrs, Volume= 0.004 MI, Depth= 7 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 1-Year Duration=39 min, Inten=27.3 mm/hr

Area (m²)	C	Description
124.4	0.90	Impervious At-Grade
32.0	0.90	Driveway
429.0	0.25	Soft-Landscaping
585.4	0.42	Weighted Average
585.4		100.00% Pervious Area

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

Subcatchment 7S: Uncontrolled



Summary for Pond 5P: Cistern

Inflow Area = 0.9437 ha, 0.00% Impervious, Inflow Depth = 13 mm for 1-Year event
 Inflow = 0.0517 m³/s @ 0.17 hrs, Volume= 0.121 MI
 Outflow = 0.0203 m³/s @ 0.75 hrs, Volume= 0.121 MI, Atten= 61%, Lag= 34.9 min
 Primary = 0.0203 m³/s @ 0.75 hrs, Volume= 0.121 MI

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.993 m @ 0.75 hrs Surf.Area= 85.0 m² Storage= 84.4 m³

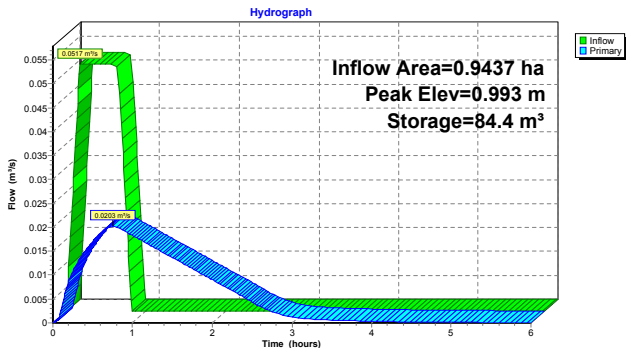
Plug-Flow detention time= 52.5 min calculated for 0.121 MI (100% of inflow)
 Center-of-Mass det. time= 52.5 min (77.0 - 24.5)

Volume	Invert	Avail. Storage	Storage Description
#1	0.000 m	297.5 m³	8.50 mW x 10.00 mL x 3.50 mH Prismatoid

Device	Routing	Invert	Outlet Devices	C
#1	Primary	0.000 m	100 mm Vert. Orifice/Grate	C= 0.600

Primary OutFlow Max=0.0203 m³/s @ 0.75 hrs HW=0.993 m (Free Discharge)
 1=Orifice/Grate (Orifice Controls 0.0203 m³/s @ 2.58 m/s)

Pond 5P: Cistern

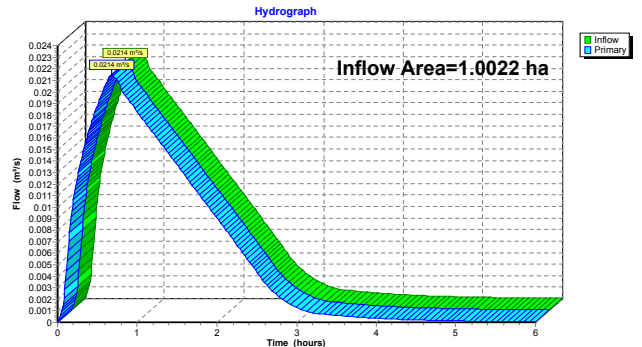


Summary for Link 8L: Total Discharge

Inflow Area = 1.0022 ha, 0.00% Impervious, Inflow Depth > 12 mm for 1-Year event
 Inflow = 0.0214 m³/s @ 0.67 hrs, Volume= 0.125 MI
 Primary = 0.0214 m³/s @ 0.67 hrs, Volume= 0.125 MI, Atten= 0%, Lag= 0.0 min

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

Link 8L: Total Discharge



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

Subcatchment3S: Pervious Runoff Area=2,569.1 m² 0.00% Impervious Runoff Depth=6 mm
 Tc=10.0 min C=0.25 Runoff=0.0061 m³/s 0.014 MI

Subcatchment6S: Impervious Runoff Area=6,867.6 m² 0.00% Impervious Runoff Depth=20 mm
 Tc=10.0 min C=0.90 Runoff=0.0587 m³/s 0.137 MI

Subcatchment7S: Uncontrolled Runoff Area=585.4 m² 0.00% Impervious Runoff Depth=9 mm
 Tc=10.0 min C=0.42 Runoff=0.0023 m³/s 0.005 MI

Pond 5P: Cistern Peak Elev=1.289 m Storage=109.5 m³ Inflow=0.0648 m³/s 0.152 MI
 Outflow=0.0232 m³/s 0.151 MI

Link 8L: Total Discharge Inflow=0.0247 m³/s 0.157 MI
 Primary=0.0247 m³/s 0.157 MI

Total Runoff Area = 1.0022 ha Runoff Volume = 0.157 MI Average Runoff Depth = 16 mm
100.00% Pervious = 1.0022 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 3S: Pervious

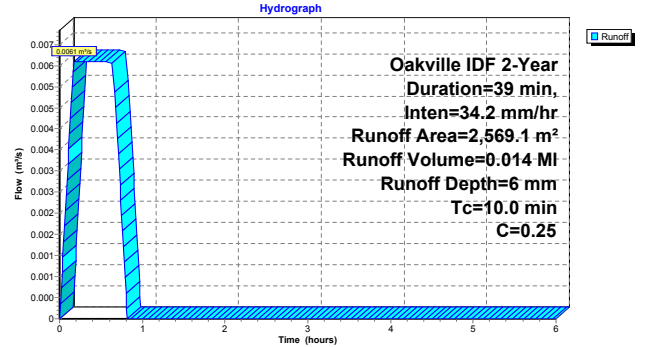
Runoff = 0.0061 m³/s @ 0.17 hrs, Volume= 0.014 MI, Depth= 6 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 2-Year Duration=39 min, Inten=34.2 mm/hr

Area (m ²)	C	Description
2,569.1	0.25	Soft-Landscaping
2,569.1		100.00% Pervious Area

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

Subcatchment 3S: Pervious



Summary for Subcatchment 6S: Impervious

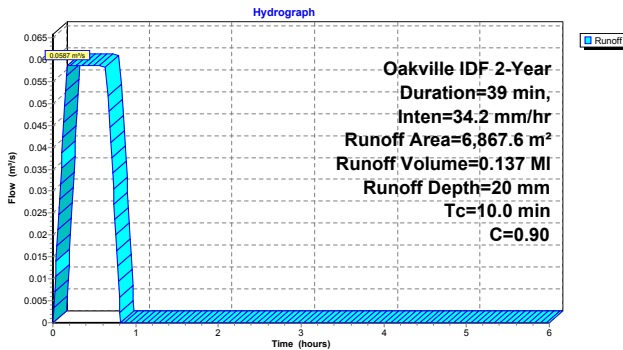
Runoff = 0.0587 m³/s @ 0.17 hrs, Volume= 0.137 MI, Depth= 20 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 2-Year Duration=39 min, Inten=34.2 mm/hr

Area (m ²)	C	Description
3,198.5	0.90	Roof
1,234.1	0.90	Impervious At-Grade
2,435.0	0.90	Driveway
6,867.6	0.90	Weighted Average
6,867.6		100.00% Pervious Area

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

Subcatchment 6S: Impervious



Summary for Subcatchment 7S: Uncontrolled

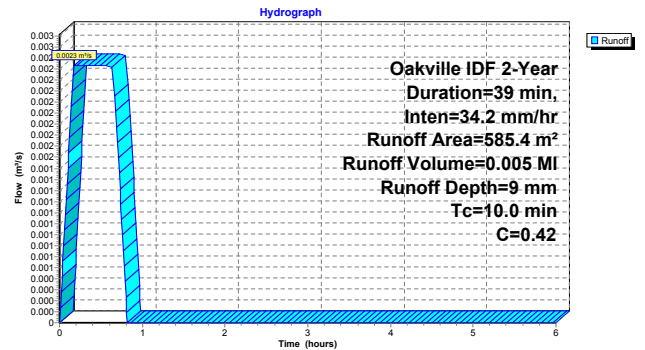
Runoff = 0.0023 m³/s @ 0.17 hrs, Volume= 0.005 MI, Depth= 9 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 2-Year Duration=39 min, Inten=34.2 mm/hr

Area (m ²)	C	Description
124.4	0.90	Impervious At-Grade
32.0	0.90	Driveway
429.0	0.25	Soft-Landscaping
585.4	0.42	Weighted Average
585.4		100.00% Pervious Area

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

Subcatchment 7S: Uncontrolled



Summary for Pond 5P: Cistern

Inflow Area = 0.9437 ha, 0.00% Impervious, Inflow Depth = 16 mm for 2-Year event
 Inflow = 0.0648 m³/s @ 0.17 hrs, Volume= 0.152 MI
 Outflow = 0.0232 m³/s @ 0.76 hrs, Volume= 0.151 MI, Atten= 64%, Lag= 35.2 min
 Primary = 0.0232 m³/s @ 0.76 hrs, Volume= 0.151 MI

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.289 m @ 0.76 hrs Surf.Area= 85.0 m² Storage= 109.5 m³

Plug-Flow detention time= 57.7 min calculated for 0.151 MI (100% of inflow)
 Center-of-Mass det. time= 58.0 min (82.5 - 24.5)

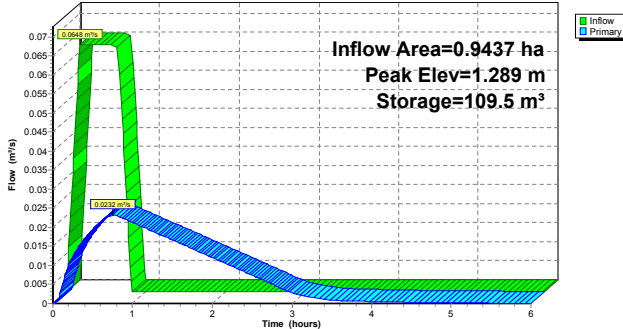
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	297.5 m³	8.50 mW x 10.00 mL x 3.50 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.000 m	100 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.0232 m³/s @ 0.76 hrs HW=1.289 m (Free Discharge)
 1=Orifice/Grate (Orifice Controls 0.0232 m³/s @ 2.96 m/s)

Pond 5P: Cistern

Hydrograph



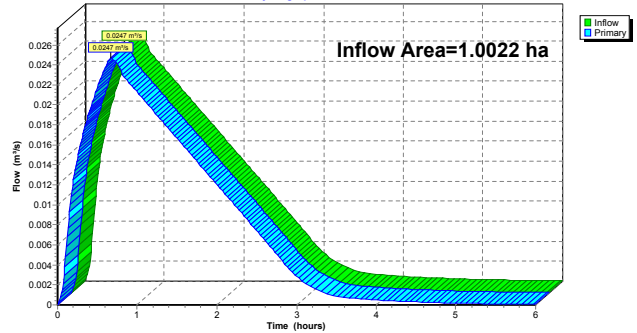
Summary for Link 8L: Total Discharge

Inflow Area = 1.0022 ha, 0.00% Impervious, Inflow Depth > 16 mm for 2-Year event
 Inflow = 0.0247 m³/s @ 0.67 hrs, Volume= 0.157 MI
 Primary = 0.0247 m³/s @ 0.67 hrs, Volume= 0.157 MI, Atten= 0%, Lag= 0.0 min

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

Link 8L: Total Discharge

Hydrograph



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

Subcatchment3S: Pervious Runoff Area=2,569.1 m² 0.00% Impervious Runoff Depth=8 mm
 Tc=10.0 min C=0.25 Runoff=0.0085 m³/s 0.020 MI

Subcatchment6S: Impervious Runoff Area=6,867.6 m² 0.00% Impervious Runoff Depth=28 mm
 Tc=10.0 min C=0.90 Runoff=0.0815 m³/s 0.191 MI

Subcatchment7S: Uncontrolled Runoff Area=585.4 m² 0.00% Impervious Runoff Depth=13 mm
 Tc=10.0 min C=0.42 Runoff=0.0032 m³/s 0.008 MI

Pond 5P: Cistern Peak Elev=1.869 m Storage=158.9 m³ Inflow=0.0899 m³/s 0.210 MI
 Outflow=0.0282 m³/s 0.210 MI

Link 8L: Total Discharge Inflow=0.0302 m³/s 0.218 MI
 Primary=0.0302 m³/s 0.218 MI

Total Runoff Area = 1.0022 ha Runoff Volume = 0.218 MI Average Runoff Depth = 22 mm
 100.00% Pervious = 1.0022 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 3S: Pervious

Runoff = 0.0085 m³/s @ 0.17 hrs, Volume= 0.020 MI, Depth= 8 mm

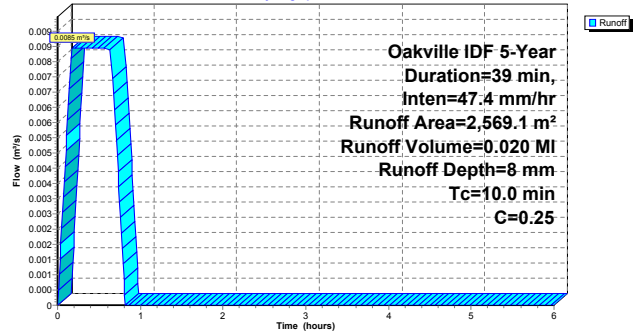
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 5-Year Duration=39 min, Inten=47.4 mm/hr

Area (m²)	C	Description
2,569.1	0.25	Soft-Landscaping
2,569.1		100.00% Pervious Area

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

Subcatchment 3S: Pervious

Hydrograph



Summary for Subcatchment 6S: Impervious

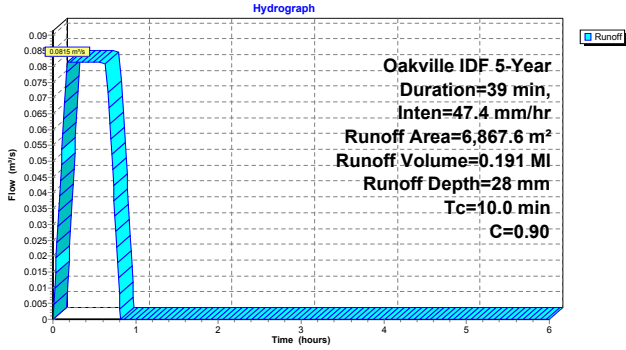
Runoff = 0.0815 m³/s @ 0.17 hrs, Volume= 0.191 MI, Depth= 28 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 5-Year Duration=39 min, Inten=47.4 mm/hr

Area (m²)	C	Description
3,198.5	0.90	Roof
1,234.1	0.90	Impervious At-Grade
2,435.0	0.90	Driveway
6,867.6	0.90	Weighted Average
6,867.6		100.00% Pervious Area

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

Subcatchment 6S: Impervious



Summary for Subcatchment 7S: Uncontrolled

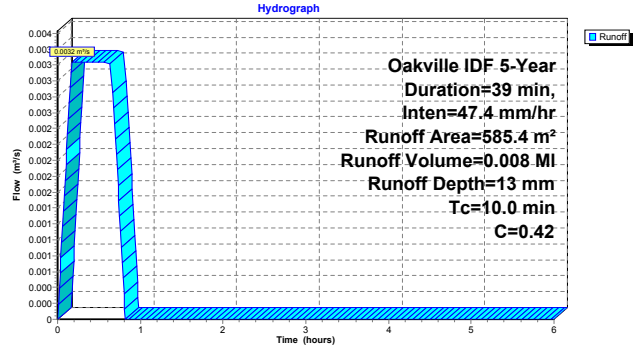
Runoff = 0.0032 m³/s @ 0.17 hrs, Volume= 0.008 MI, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 5-Year Duration=39 min, Inten=47.4 mm/hr

Area (m²)	C	Description
124.4	0.90	Impervious At-Grade
32.0	0.90	Driveway
429.0	0.25	Soft-Landscaping
585.4	0.42	Weighted Average
585.4		100.00% Pervious Area

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

Subcatchment 7S: Uncontrolled



Summary for Pond 5P: Cistern

Inflow Area = 0.9437 ha, 0.00% Impervious, Inflow Depth = 22 mm for 5-Year event
 Inflow = 0.0899 m³/s @ 0.17 hrs, Volume= 0.210 MI
 Outflow = 0.0282 m³/s @ 0.76 hrs, Volume= 0.210 MI, Atten= 69%, Lag= 35.7 min
 Primary = 0.0282 m³/s @ 0.76 hrs, Volume= 0.210 MI

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.869 m @ 0.76 hrs Surf.Area= 85.0 m² Storage= 158.9 m³

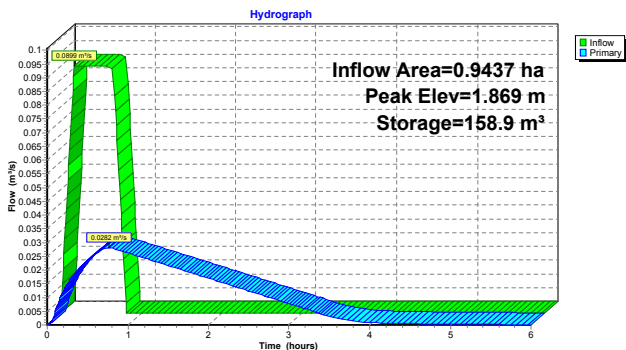
Plug-Flow detention time= 67.3 min calculated for 0.210 MI (100% of inflow)
 Center-of-Mass det. time= 67.7 min (92.2 - 24.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	297.5 m³	8.50 mW x 10.00 mL x 3.50 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.000 m	100 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.0282 m³/s @ 0.76 hrs HW=1.869 m (Free Discharge)
 1=Orifice/Grate (Orifice Controls 0.0282 m³/s @ 3.58 m/s)

Pond 5P: Cistern

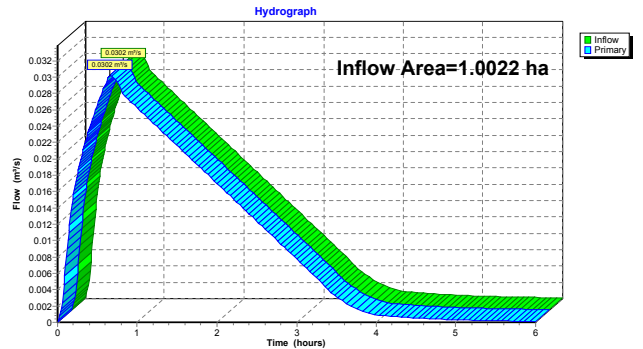


Summary for Link 8L: Total Discharge

Inflow Area = 1.0022 ha, 0.00% Impervious, Inflow Depth > 22 mm for 5-Year event
 Inflow = 0.0302 m³/s @ 0.66 hrs, Volume= 0.218 MI
 Primary = 0.0302 m³/s @ 0.66 hrs, Volume= 0.218 MI, Atten= 0%, Lag= 0.0 min

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

Link 8L: Total Discharge



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

Subcatchment3S: Pervious Runoff Area=2,569.1 m² 0.00% Impervious Runoff Depth=13 mm
 Tc=10.0 min C=0.25 Runoff=0.0146 m³/s 0.034 MI

Subcatchment6S: Impervious Runoff Area=6,867.6 m² 0.00% Impervious Runoff Depth=48 mm
 Tc=10.0 min C=0.90 Runoff=0.1400 m³/s 0.328 MI

Subcatchment7S: Uncontrolled Runoff Area=585.4 m² 0.00% Impervious Runoff Depth=22 mm
 Tc=10.0 min C=0.42 Runoff=0.0056 m³/s 0.013 MI

Pond 5P: Cistern Peak Elev=3.422 m Storage=290.9 m³ Inflow=0.1546 m³/s 0.362 MI
 Outflow=0.0383 m³/s 0.361 MI

Link 8L: Total Discharge Inflow=0.0421 m³/s 0.374 MI
 Primary=0.0421 m³/s 0.374 MI

Total Runoff Area = 1.0022 ha Runoff Volume = 0.375 MI Average Runoff Depth = 37 mm
100.00% Pervious = 1.0022 ha 0.00% Impervious = 0.0000 ha

Summary for Subcatchment 3S: Pervious

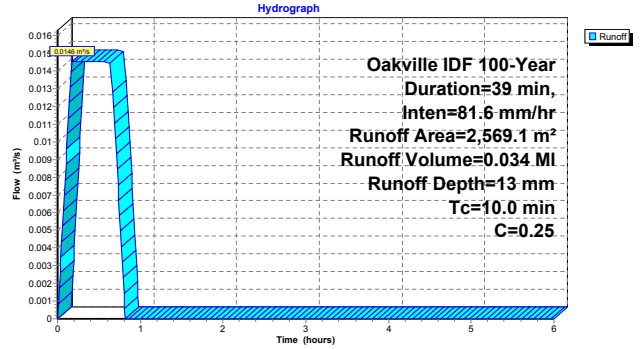
Runoff = 0.0146 m³/s @ 0.17 hrs, Volume= 0.034 MI, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 100-Year Duration=39 min, Inten=81.6 mm/hr

Area (m ²)	C	Description
2,569.1	0.25	Soft-Landscaping
2,569.1		100.00% Pervious Area

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

Subcatchment 3S: Pervious



Summary for Subcatchment 6S: Impervious

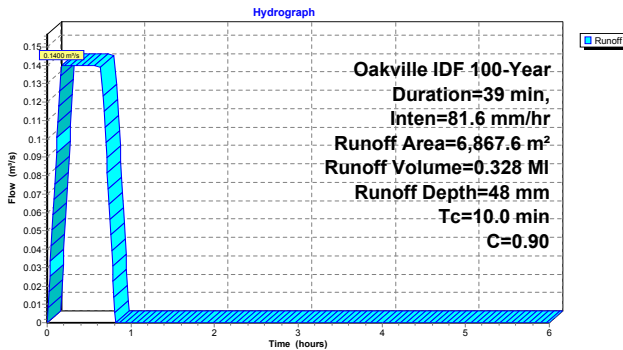
Runoff = 0.1400 m³/s @ 0.17 hrs, Volume= 0.328 MI, Depth= 48 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 100-Year Duration=39 min, Inten=81.6 mm/hr

Area (m ²)	C	Description
3,198.5	0.90	Roof
1,234.1	0.90	Impervious At-Grade
2,435.0	0.90	Driveway
6,867.6	0.90	Weighted Average
6,867.6		100.00% Pervious Area

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

Subcatchment 6S: Impervious



Summary for Subcatchment 7S: Uncontrolled

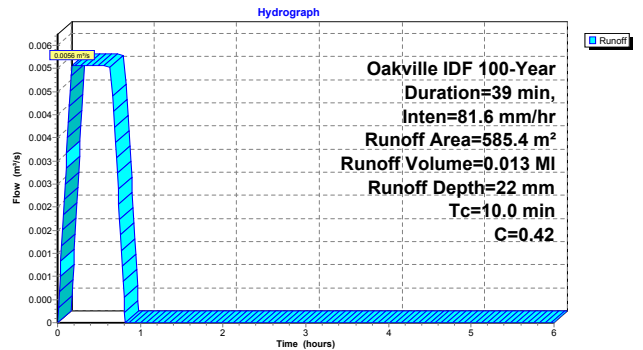
Runoff = 0.0056 m³/s @ 0.17 hrs, Volume= 0.013 MI, Depth= 22 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Oakville IDF 100-Year Duration=39 min, Inten=81.6 mm/hr

Area (m ²)	C	Description
124.4	0.90	Impervious At-Grade
32.0	0.90	Driveway
429.0	0.25	Soft-Landscaping
585.4	0.42	Weighted Average
585.4		100.00% Pervious Area

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

Subcatchment 7S: Uncontrolled



Summary for Pond 5P: Cistern

Inflow Area = 0.9437 ha, 0.00% Impervious, Inflow Depth = 38 mm for 100-Year event
 Inflow = 0.1546 m³/s @ 0.17 hrs, Volume= 0.362 MI
 Outflow = 0.0383 m³/s @ 0.78 hrs, Volume= 0.361 MI, Atten= 75%, Lag= 36.3 min
 Primary = 0.0383 m³/s @ 0.78 hrs, Volume= 0.361 MI

Routing by Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.422 m @ 0.78 hrs Surf.Area= 85.0 m² Storage= 290.9 m³

Plug-Flow detention time= 88.2 min calculated for 0.361 MI (100% of inflow)
 Center-of-Mass det. time= 88.2 min (112.7 - 24.5)

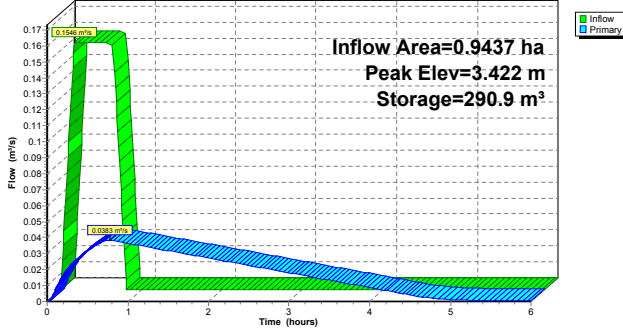
Volume	Invert	Avail. Storage	Storage Description
#1	0.000 m	297.5 m³	8.50 mW x 10.00 mL x 3.50 mH Prismatic

Device	Routing	Invert	Outlet Devices
#1	Primary	0.000 m	100 mm Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.0383 m³/s @ 0.78 hrs HW=3.422 m (Free Discharge)
 1=Orifice/Grate (Orifice Controls 0.0383 m³/s @ 4.88 m/s)

Pond 5P: Cistern

Hydrograph



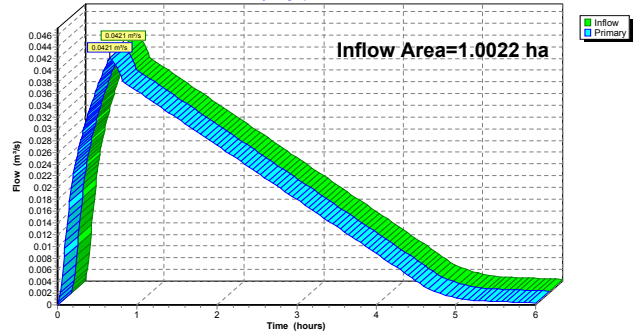
Summary for Link 8L: Total Discharge

Inflow Area = 1.0022 ha, 0.00% Impervious, Inflow Depth > 37 mm for 100-Year event
 Inflow = 0.0421 m³/s @ 0.65 hrs, Volume= 0.374 MI
 Primary = 0.0421 m³/s @ 0.65 hrs, Volume= 0.374 MI, Atten= 0%, Lag= 0.0 min

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

Link 8L: Total Discharge

Hydrograph



APPENDIX

C OGS UNIT SPECIFICATIONS



**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION**



Project Name: 20 McCraney Street East	Engineer: WSP
Location: Oakville, ON	Contact: Brenden Ding, EIT
OGS #: OGS	Report Date: 12-Jan-18

Area 0.3826 ha	Rainfall Station # 201	
Weighted C 0.90	Particle Size Distribution FINE	
CDS Model 2015	CDS Treatment Capacity 20 l/s	

<u>Rainfall Intensity¹</u> (mm/hr)	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate</u> (l/s)	<u>Treated Flowrate (l/s)</u>	<u>Operating Rate (%)</u>	<u>Removal Efficiency (%)</u>	<u>Incremental Removal (%)</u>
0.5	9.3%	9.3%	0.5	0.5	2.4	98.2	9.2
1.0	10.6%	20.0%	1.0	1.0	4.8	97.5	10.4
1.5	10.0%	30.0%	1.4	1.4	7.2	96.8	9.7
2.0	8.5%	38.5%	1.9	1.9	9.7	96.1	8.2
2.5	7.3%	45.8%	2.4	2.4	12.1	95.4	7.0
3.0	6.8%	52.6%	2.9	2.9	14.5	94.7	6.4
3.5	4.8%	57.4%	3.4	3.4	16.9	94.0	4.5
4.0	4.9%	62.3%	3.8	3.8	19.3	93.3	4.5
4.5	3.9%	66.2%	4.3	4.3	21.7	92.6	3.6
5.0	2.9%	69.1%	4.8	4.8	24.1	91.9	2.7
6.0	5.3%	74.4%	5.7	5.7	29.0	90.6	4.8
7.0	3.7%	78.1%	6.7	6.7	33.8	89.2	3.3
8.0	2.9%	81.0%	7.7	7.7	38.6	87.8	2.5
9.0	3.0%	84.0%	8.6	8.6	43.5	86.4	2.6
10.0	2.3%	86.3%	9.6	9.6	48.3	85.0	1.9
15.0	7.4%	93.7%	14.4	14.4	72.4	78.1	5.8
20.0	2.7%	96.4%	19.1	19.1	96.6	71.2	1.9
25.0	1.4%	97.8%	23.9	19.8	100.0	58.2	0.8
30.0	0.8%	98.6%	28.7	19.8	100.0	48.5	0.4
35.0	0.8%	99.4%	33.5	19.8	100.0	41.5	0.3
40.0	0.2%	99.5%	38.3	19.8	100.0	36.3	0.1
45.0	0.0%	99.5%	43.1	19.8	100.0	32.3	0.0
50.0	0.0%	99.5%	47.9	19.8	100.0	29.1	0.0
							90.6

Removal Efficiency Adjustment² = 6.5%
Predicted Net Annual Load Removal Efficiency = 84.1%
Predicted % Annual Rainfall Treated = 98.6%

- 1 - Based on 34 years of hourly rainfall data from Canadian Station 6153194, Hamilton ON
- 2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
- 3 - CDS Efficiency based on testing conducted at the University of Central Florida
- 4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications



**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION**



Project Name: 20 McCraney Street East	Engineer: WSP
Location: Oakville, ON	Contact: Brenden Ding, EIT
OGS #: OGS	Report Date: 12-Jan-18

Area 0.3826 ha	Rainfall Station # 201	
Weighted C 0.90	Particle Size Distribution FINE	
CDS Model 2015	CDS Treatment Capacity 20 l/s	

<u>Rainfall Intensity¹</u> (mm/hr)	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (l/s)</u>	<u>Treated Flowrate (l/s)</u>	<u>Operating Rate (%)</u>	<u>Removal Efficiency (%)</u>	<u>Incremental Removal (%)</u>
0.5	9.3%	9.3%	0.5	0.5	2.4	98.2	9.2
1.0	10.6%	20.0%	1.0	1.0	4.8	97.5	10.4
1.5	10.0%	30.0%	1.4	1.4	7.2	96.8	9.7
2.0	8.5%	38.5%	1.9	1.9	9.7	96.1	8.2
2.5	7.3%	45.8%	2.4	2.4	12.1	95.4	7.0
3.0	6.8%	52.6%	2.9	2.9	14.5	94.7	6.4
3.5	4.8%	57.4%	3.4	3.4	16.9	94.0	4.5
4.0	4.9%	62.3%	3.8	3.8	19.3	93.3	4.5
4.5	3.9%	66.2%	4.3	4.3	21.7	92.6	3.6
5.0	2.9%	69.1%	4.8	4.8	24.1	91.9	2.7
6.0	5.3%	74.4%	5.7	5.7	29.0	90.6	4.8
7.0	3.7%	78.1%	6.7	6.7	33.8	89.2	3.3
8.0	2.9%	81.0%	7.7	7.7	38.6	87.8	2.5
9.0	3.0%	84.0%	8.6	8.6	43.5	86.4	2.6
10.0	2.3%	86.3%	9.6	9.6	48.3	85.0	1.9
15.0	7.4%	93.7%	14.4	14.4	72.4	78.1	5.8
20.0	2.7%	96.4%	19.1	19.1	96.6	71.2	1.9
25.0	1.4%	97.8%	23.9	19.8	100.0	58.2	0.8
30.0	0.8%	98.6%	28.7	19.8	100.0	48.5	0.4
35.0	0.8%	99.4%	33.5	19.8	100.0	41.5	0.3
40.0	0.2%	99.5%	38.3	19.8	100.0	36.3	0.1
45.0	0.0%	99.5%	43.1	19.8	100.0	32.3	0.0
50.0	0.0%	99.5%	47.9	19.8	100.0	29.1	0.0
							90.6

Removal Efficiency Adjustment² = 6.5%
Predicted Net Annual Load Removal Efficiency = 84.1%
Predicted % Annual Rainfall Treated = 98.6%

- 1 - Based on 34 years of hourly rainfall data from Canadian Station 6153194, Hamilton ON
- 2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
- 3 - CDS Efficiency based on testing conducted at the University of Central Florida
- 4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications