FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

1108 & 1094 EGLINTON AVENUE EAST

CITY OF MISSISSAUGA
REGION OF PEEL

PREPARED FOR:

ALI MOTORS

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC.
2800 HIGH POINT DRIVE, SUITE 100
MILTON, ON L9T 6P4

DECEMBER 2018

CFCA FILE NO. 1277-4440

CROZIER
CONSULTING ENGINEERS

Revision Number	Date	Comments
Rev.0	April 2017	Issued for First Submission
Rev. 1	December 2018	Issued for Second Submission (additional property added)

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1.0 INTRODUCTION

C.F. Crozier & Associates Inc. (Crozier) was retained by Ali Motors to prepare a Functional Servicing & Preliminary Stormwater Management Report in support of the Zoning By-Law (ZBA) for a proposed commercial development at 1094 and 1108 Eglinton Avenue East in the City of Mississauga, Region of Peel. The Zoning By-Law in effect (0225-2007) classifies the existing zoning for 1108 and 1094 Eglinton Avenue East as Development (D) and Commercial (C3-64), respectively.

The purpose of this report is to demonstrate that the proposed site can be developed in accordance with the City of Mississauga and Region of Peel guidelines from a functional servicing & preliminary stormwater management perspective.

The following reports and design standards were referenced during the preparation of this report:

- Region of Peel Public Works Design, Specifications & Procedures Manual, July 2009
- City of Mississauga Transportation and Works Department Development Requirements Manual, 2016
- Ministry of Environment (MOE) Stormwater Management Planning and Design Manual, 2003
- Greater Golden Horseshoe Area Conservation Authorities Erosion & Sediment Control Guidelines for Urban Construction, 2006

2.0 SITE DESCRIPTION

The subject property, comprising of the adjacent properties 1108 and 1094 Eglinton Avenue East, covers a combined area of approximately 0.55 ha. The property is located in a commercial/industrial neighbourhood with some mixed residential units in the area. The properties currently consists of a detached dwelling, compacted gravel parking area, and landscaped area.

The property is bounded by:

- Eglinton Avenue East to the north
- A treed lot and commercial development to the south
- A detached dwelling to the east
- Little Etobicoke Creek to the west

The proposed Site Plan (Lew Associates Ltd., October 3, 2018) consists of:

- Two proposed 1-storey commercial buildings with an approximate gross floor area of 590m^2 and 317m^2 respectively
- An entrance driveway off of Eglinton Avenue East
- Parking areas and landscaped areas
- 3.5 m ROW widening from Eglinton Avenue East

3.0 WATER SERVICING

The Region of Peel is responsible for the operation and maintenance of the public water and treatment system in the City of Mississauga, and any local servicing will have to connect to this public system.

3.1 Existing Water Servicing

A review of the Region of Peel as-constructed drawing 28461-D dated March 2002 indicates that:

- There is an existing 300 mm watermain (local watermain) along Eglinton Avenue East. The watermain runs on the north side of Eglinton Avenue, approximately 35 m away from the property line.
- The subject properties are currently serviced by an existing water service connection connecting to the 300 mm watermain.
- There is also an existing 600 mm watermain (local transmission feedermain) along Eglinton Avenue. This watermain runs approximately 9 m away from the property line.

3.2 Design Water Demand

To estimate the proposed water demand, Region of Peel design criteria was considered and used to determine the maximum flows generated by the proposed development. A summary of the results are presented below in **Table 1**, and detailed domestic water demand calculations are provided in **Appendix A.**

Table 1: Estimated Design Water Demand

Method	**Average Day** (L/s)	**Max Day** (L/s)	**Peak Hour** (L/s)	**Standard**
Region of Peel	0.10	0.14	0.29	Region of Peel Standards – Public Works Sanitary Sewer Design Criteria (July, 2009)

For this application, there is one individual domestic service sized to convey a peak hour demand rate of 0.29 L/s, as determined by Region of Peel Standards.

3.3 Proposed Water Servicing

The development is proposed to be serviced by a 50 mm diameter water service. The proposed 50 mm diameter water service will connect to the existing 300 mm diameter watermain using a tapping sleeve and valve. A valve & box per City standards is proposed at the property line.

The proposed Water Servicing Plan is shown on the Site Servicing Plan (**Drawing C01**).

4.0 SANITARY SERVICING

The Region of Peel is responsible for the operation and maintenance of the public sewage collection and treatment system in the City of Mississauga, and any local sewage services will have to connect to this public system.

4.1 Existing Sanitary Servicing

A review of the Region of Peel as-constructed drawing 28461-D dated March 2002 indicates that there is an existing 450 mm sanitary sewer along Eglinton Avenue East approximately 38 m away from the property line. The sanitary sewer flows westward from the property at a 1.72% slope. The existing residential house on the site is not shown to be connected to this sanitary line.

4.2 Design Sanitary Flow

To estimate the proposed sanitary design flows, Region of Peel design criteria has been considered and used to determine the design flows generated by the development. A summary of the results is presented below in **Table 2**, and detailed sanitary demand calculations are provided in **Appendix B.**

Table 2: Estimated Sanitary Design Flows

Design Criteria	Total			Standard
	Average Day (L/s)	**Peak Flow** (L/s)	**Peak Flow** (L/s) **+ Infiltration Flow** (L/s)	
Region of Peel	0.10	0.43	0.54	Region of Peel Public Works Design Criteria Manual – Sanitary Sewer July 2009

Based on the Region of Peel Standard Drawing 2-9-2, the minimum flow rate for a population of less than 1000 people shall be 13 L/s. As such, sanitary services will be sized to meet the requirement of 13 L/s.

4.3 Proposed Sanitary Servicing

A proposed sanitary service will be constructed as shown on the Site Servicing Plan (**Drawing C01**) in accordance to City of Mississauga and Region of Peel criteria. The proposed sanitary service, a 150 mm diameter sanitary sewer installed at 1% slope, will discharge to the 450 mm diameter sanitary sewer flowing westward along Eglinton Avenue. The proposed sewer service will have a capacity of 15 L/s which is sufficient to service the development.

The Site Servicing Plan (**Drawing C01**) illustrates the location of the sanitary sewer and all connections. The internal sanitary system of the building will be designed per the mechanical engineer's details and specifications.

5.0 DRAINAGE CONDITIONS

The drainage conditions for the site in both pre-development and post-development conditions have been outlined separately below.

5.1 Existing Drainage

The subject properties currently consist of an existing detached dwelling, paved entrance driveway shared with 1120 Eglinton Avenue East, compacted gravel parking area, and landscaped area.

A review of topographic survey indicates that under existing conditions, the site drains uncontrolled via sheet flow towards Little Etobicoke Creek. The majority of the site runoff flows and discharges south-west towards Little Etobicoke Creek, and the remaining discharges north-east towards Little Etobicoke Creek. This existing drainage conditions are shown on the Pre-Development Drainage Plan (**Drawing C03**).

Upon review of Section 2 – Design Requirements of the City of Mississauga Transportation and Works Department Development Requirements Manual (2016) and discussions with City of Mississauga engineering staff, it was concluded that a pre-development runoff coefficient of 0.50 be used for the site area envisioned for development. Refer to Section 6.0 for a discussion on stormwater management and the application of the pre-development runoff coefficient.

5.2 Proposed Drainage

Upon development of the subject property, drainage will be collected and conveyed via an internal storm sewer system sized to convey the 5-year storm event in accordance with City of Mississauga design requirements. This storm sewer system will discharge to Little Etobicoke Creek. Peak flows discharging to the storm outfall will be controlled through a combination of surface ponding, and underground storage.

The major overland flow route of the site is proposed to remain consistent with existing conditions with drainage flowing southeast toward Little Etobicoke Creek.

The Post-Development Drainage Plan (**Drawing C04**) illustrates the proposed drainage of the site. **Table 3** provides a summary of the land area comparison for pre- and post-development conditions.

Table 3: Site Land Area Comparison

Conditions	Impervious Area (m^2)	Pervious Area (m^2)	Total Area (m^2)
Pre-Development[2]	1,173	4,327	5,500
Post-Development[1]	3,500	2,000	5,500

1. Refer to **Appendix C** for stormwater management calculations.

6.0 STORMWATER MANAGEMENT

Stormwater management design criteria were established with the City of Mississauga, Region of Peel, Toronto Region Conservation Authority (TRCA), and Ministry of Environment. The following criteria are applicable for the subject property:

- **Stormwater Quantity Control Design Criteria:** City of Mississauga criteria dictate that a control for all design storms (2, 5, 10, 25, 50, and 100-year) to 2-year pre-development control, using a pre-development runoff coefficient of 0.50 be provided for the site. Per TRCA's 'Stormwater Management Criteria' (August, 2012), post-development release rates are required to meet the mandated Etobicoke Creek stormwater unit flow control release rates. The more stringent of the two shall govern.

- **Stormwater Quality Control Design Criteria:** Enhanced Level of runoff water quality protection equivalent to 80% total suspended solids removal as specified in 'Stormwater Management Criteria' (August, 2012).

- **Water Balance:** The TRCA requires the on-site retention of the first 5 mm of every rainfall event.

- **Erosion:** Best efforts to reduce erosion and sediment during construction, additionally, first 5 mm of every rainfall event are to be retained on site.

6.1 Stormwater Quantity Control

The Modified Rational Method was used to determine the pre-development and post-development runoff peak flows for the proposed development, based on the City of Mississauga intensity-duration-frequency (IDF) rainfall data and an initial time of concentration of 15 minutes. These peak flows were used to determine the volume of storage required on-site in accordance with City of Mississauga stormwater management criteria.

The TRCA Stormwater Management Criteria report (August 2012) was used to obtain unit release rates for discharge to Little Etobicoke Creek. These release rates, in comparison to the City of Mississauga stormwater guidelines, provide higher release rates for the post-development catchments 200 – 204. Hence, City of Mississauga peak flows were used to determine the required on-site detention storage.

Runoff generated from the internal catchments (excluding catchments 205 and 206) will be controlled by a 75mm diameter orifice device and associated detention storage will be provided via surface ponding, and sub-surface storage (Triton system or similar). A storage volume of approximately 157 m^3 is required to meet the City of Mississauga criterion of controlling the 100-year post-development peak flow down to the 2-year pre-development peak flow. Refer to **Appendix C** for complete stormwater calculations. The Site Servicing Plan (**Drawing C01**) illustrates the location of the storm servicing and proposed orifice control. Final volume calculations will be determined at the detailed design stage.

A summary of site flows and required storage volumes have been provided in **Table 4.**

Table 4: Site Pre-Development and Post-Development Flow Rates and Required Storage Volumes

Storm	Post-Development Uncontrolled Flow Rate (L/s)	TRCA Target Release Rate (Total Site) (L/s)	City of Mississauga Target 2 year Release Rate (L/s)	$Q_{orifice}$ (L/s)	Storage Volume Required (m^3)
2-year	53.3	17.1	42.3	8.8	57.3
5-year	71.6	24.9		10.4	81.3
10-year	88.2	30.8		11.8	103.7
25-year	101.3	38.1		12.8	121.9
50-year	113.1	45.2		13.7	138.9
100-year	125.2	51.2		14.5	157.2

1. Refer to **Appendix C** for detailed stormwater management calculations.

6.2 Stormwater Quality Control

To provide stormwater quality control for the proposed development, an oil-grit separator (OGS) is proposed prior to discharging flows to Little Etobicoke Creek. A Jellyfish Filter System OGS (JF4-2-1 or similar), has been proposed to meet the Enhanced Level of Protection. Detailed OGS sizing will be provided during detailed design. Preliminary Sizing calculations have been provided in **Appendix C**.

6.3 Water Balance

The water balance criteria for the site based on City of Mississauga design criteria is to retain the first 5 mm of runoff on site by infiltration, evapotranspiration, and/or reuse. The water balance volume requirements for the site are listed in **Table 5**. Detailed calculations are presented in **Appendix C**.

Table 5: Site Water Balance Summary

Total Approx. Impervious Area (m^2)	Water Balance Criteria	Water Balance Volume Requirements (m^3)	Retention Options
3,500	Retain first 5 mm	17.5	• Open Bottom Underground Storage Chamber • On-Site Reuse

<u>Open Bottom Underground Storage Chamber</u>

One option to retain stormwater runoff on site for water balance purposes is to provide the required storage volume within a small underground storage chamber system complete with an open bottom. This system would be designed to infiltrate storage rain water into the underlying native soils.

<u>On-Site Reuse</u>

One alternative to infiltration to retain the first 5 mm of rainfall is to store the runoff volume within an on-site cistern or reservoir to reuse for irrigation purposes.

Further review and design of the chosen option for meeting the water balance criteria will be completed during detailed design.

7.0 EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION

Erosion and sediment controls will be installed prior to the commencement of any construction activities and will be maintained until the site is stabilized or as directed by the Site Engineer and/or the City of Mississauga. Controls are to be inspected after each significant rainfall event and maintained in proper working condition. A detailed Removals & Erosion and Sediment Control Plan will be prepared at the detailed design stage.

The following sediment and erosion control options will be incorporated at detailed design:

Heavy Duty Silt Fencing

Heavy Duty Silt fence will be installed on the perimeter of the site to intercept sheet flow. Additional silt fence may be added based on field decisions by the Site Engineer and Owner, prior to, during and following construction.

Rock Mud Mat

A rock mud mat will be installed at the entrance to the construction zone in order to prevent mud tracking from the site onto the surrounding lands and perimeter roadway network. All construction traffic will be restricted to this access only.

Double Wrapped Catchbasins

The existing storm sewer catchbasins located in the vicinity of the site on Eglinton Avenue East shall be double wrapped in filter cloth during construction.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information contained within this Functional Servicing and Preliminary Stormwater Management Report, we offer the following conclusions:

1. The proposed development can be serviced through connections to the existing water and sanitary infrastructure located within Eglinton Avenue East ROW.
2. The water demand for the proposed development will be met using a new 50 mm diameter water service connection, which will connect to the existing 300 mm municipal watermain along Eglinton Avenue.
3. The sanitary flow for the proposed development will be met using a new 150 mm diameter PVC sanitary sewer connection, which will connect to the existing 450 mm sanitary sewer along Eglinton Avenue.
4. The internal storm sewer will be sized to convey the 5-year storm event in accordance with City of Mississauga design requirements.
5. Drainage will be collected and conveyed via an internal storm sewer system that will connect into the storm outfall to Little Etobicoke Creek.
6. Stormwater management quantity control for the proposed development will control the 100-year post-development peak flow rate to the 2-year pre-development peak flow in accordance with City of Mississauga's requirements for stormwater quantity control. Stormwater quantity control will be provided through approximately 157.2m^3 of underground storage in a Triton system or equivalent.

7. Stormwater quality control for the proposed development will be met by Jellyfish Filter System OGS (JF4-2-1 or similar), which has been proposed to meet the Enhanced Level of Protection. Detailed OGS sizing will be provided during detailed design.

8. As per the City of Mississauga design criteria for water balance, the first 5 mm of runoff on site must be retained by infiltration, evapotranspiration, and/or reuse. As such, a storage volume of 17.5 m^3 will be provided through an open-bottom underground storage chamber.

9. Erosion and sediment controls, such as silt fences and rock mud mat, are proposed to be installed prior to the commencement of any construction activities. A detailed Removals & Erosion and Sediment Control Plan will be prepared at the detailed design stage.

As such, we recommend approval of the Zoning By-Law for the development of the subject lands from the perspective of site servicing and stormwater management requirements.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

James Harnum, E.I.T.
Land Development
/hj

C.F. CROZIER & ASSOCIATES INC.

K.J. Firth, P.Eng.
Associate

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APPENDIX A

Water Demand Calculations

Project: 1108 Eglington Avenue East
Project No.: 1277-4440

Date: 2018.12.06
Revised: 2018.12.06
Designed By: HJ
Checked By:

WATER DEMAND CALCULATIONS - 1094 and 1108 Eglinton Avenue East

Region of Peel Design Standards: City of Mississauga

References

Site Area	0.55	ha	(Commercial)

Commercial Water Demand

Population Density =	50	persons/ha	
Population =	28	persons	
Average Daily Demand =	300	L/cap/d	
Max Day Factor =	1.4	-	
Peak Hour Factor =	3.0	-	

*Population density for commercial buildings per *Region of Peel - Public Works Sanitary Sewer Design Criteria (July 2009) - Section 2.1*

**Region of Peel - Public Works Watermain Design Criteria (July 2009) - Section 2.3 (Revised June 2010)*

Average Day Demand	8,400	L/d
	0.10	L/s
Maximum Daily Demand	11,760	L/d
	0.14	L/s
Peak Hourly Demand	25,200	L/d
	0.29	L/s

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APPENDIX B

Theoretical Sanitary Design Flow Calculations

CROZIER & ASSOCIATES Consulting Engineers

Project: 1094 & 1108 Eglinton Avenue East
Project No.: 1277-4440

Date: 2018.12.06
Revised: 2018.12.06
Designed By: HJ
Checked By:

SANITARY FLOW CALCULATIONS - 1094 & 1108 Eglinton Avenue East

Region of Peel - Sanitary Demand Flow

References

Total Site Area = 0.55 ha (Commercial)

Sanitary Design

Population Density = 50 persons/ha

*Population density for commercial buildings per *Region of Peel - Public Works Sanitary Sewer Design Criteria (July 2009) - Section 2.1 (Modified March 2017)*

Population = 28 persons

Harmon Peaking Factor (M) = $1 + \frac{14}{4 + P^{(0.5)}}$

Where:

P is population in thousands

*Peaking factor per *Region of Peel - Public Works Sanitary Sewer Design Criteria (July 2009) - Section 2.2*

M = 4.36

Region of Peel - Public Works Design Specifications Manual- Sanitary Sewers Sect. 2.2, 2009 (Modified March 2017)

Average Daily Demand = 302.8 L/cap/d
Infiltration Flow = 0.20 L/s/ha

According to Region of Peel - Public Works Sanitary Sewer Design Criteria - Standard Drawing 2-9-2

Average Day Flow	8,478	L/d
	0.10	L/s
Peak Flow	36,961	L/d
	0.43	L/s
Infiltration Flow	0.11	L/s
TOTAL PROPOSED SANITARY FLOW	0.54	L/s

Based on the Region of Peel Standard drawing 2-9-2, the minimum flow rate for a population of less than 1000 people shall be 13 L/s.

Region of Peel - Std. Dwg. 2-9-2

APPENDIX C

Stormwater Management Calculations

PROJECT: 1108 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 2018.12.06
UPDATE: 2018.12.12
DESIGN: HJ
CHECK: JA

Modified Rational Method - Runoff Coefficients

	Pervious	Impervious
Runoff Coefficients	0.25	0.90

(Per City of Mississauga Standard Drawing No. 2111.010)

PRE DEVELOPMENT CONDITIONS

Drainage Area	Pervious Area (m^2)	Impervious Area (m^2)	Total Area (m^2)	[1]Weighted Runoff Coefficient
Catchment 100	3427	1173	4,600	0.42
Catchment 101	900	0	900	0.25
Site Total	4,327	1,173	5,500	0.39

[1]Note: Pre-development weighted runoff coefficient of 0.50 is minimum criteria from City of Mississauga Development Requirements Manual (2016) and Comments dated October 2, 2017

POST DEVELOPMENT CONDITIONS *(Per Site Plan dated October 3, 2018)*

Drainage Area	Pervious Area (m^2)	Impervious Area (m^2)	Total Area (m^2)	Weighted Runoff Coefficient
Catchment 200	0	2000	2000	0.90
Catchment 201	0	700	700	0.90
Catchment 202	0	500	500	0.90
Catchment 203	100	0	100	0.25
Catchment 204	100	0	100	0.25
Catchment 205	900	0	900	0.25
Catchment 206	900	0	900	0.25
Ext.	0	300	300	0.90
Site Total	2,000	3,500	5,500	0.66

Note: Post-development runoff coefficient of 0.75 is per minimum runoff coefiicient criteria established by City of Mississauga per Development Requirements Manual (January 2009) Section 2

Note: Catchments considered entirely pervious or entirely impervious as a conservative measure. Runoff coefficient of 0.90 used for impervious catchments and 0.25 used for pervious catchments.

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: 1108 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 2018.12.06
UPDATE: 2018.12.12
DESIGN: HJ
CHECK: JA

PRE DEVELOPMENT CONDITIONS

Drainage Area	Total Area (m^2)	Weighted Runoff Coefficient	2 Year Uncontrolled Peak Flow (L/s)	5 Year Uncontrolled Peak Flow (L/s)	10 Year Uncontrolled Peak Flow (L/s)	25 Year Uncontrolled Peak Flow (L/s)	50 Year Uncontrolled Peak Flow (L/s)	100 Year Uncontrolled Peak Flow (L/s)
Catchment 100	4,600	0.50	39	52	64	73	82	91
Catchment 101	900	0.25	3.8	5.1	6.2	7.2	8.0	8.9
Site Total	5,500	0.50	42	57	70	81	90	99

Note: Pre-development runoff coefficient of 0.50 used per requirement.

POST DEVELOPMENT CONDITIONS

Drainage Area	Total Area (m^2)	Weighted Runoff Coefficient	2 Year Uncontrolled Peak Flow (L/s)	5 Year Uncontrolled Peak Flow (L/s)	10 Year Uncontrolled Peak Flow (L/s)	25 Year Uncontrolled Peak Flow (L/s)	50 Year Uncontrolled Peak Flow (L/s)	100 Year Uncontrolled Peak Flow (L/s)
Catchment 200	2,000	0.90	30.2	40.6	50	57	64	71
Catchment 201	700	0.90	10.6	14.2	17	20	22	25
Catchment 202	500	0.90	7.5	10.1	12.5	14.4	16.0	17.7
Catchment 203	100	0.25	0.4	0.6	0.7	0.8	0.9	1.0
Catchment 204	100	0.25	0.4	0.6	0.7	0.8	0.9	1.0
Catcment 205	900	0.25	3.8	5.1	6.2	7.2	8.0	8.9
Catchment 206	900	0.25	3.8	5.1	6.2	7.2	8.0	8.9
Ext.	300	0.90	4.5	6.1	7.5	8.6	9.6	10.6
Site Total (minus Catchment 205,206)	3,700	0.86	54	72	89	102	113.91	126
SITE TOTAL	5,500	0.66	61	82	101	116	130	144

RAINFALL INTENSITIES 1,800

Time of Concentration: 15 min

Return Period	A	B	C	I mm/hr
2 yr	610	4.6	0.78	59.89
5 yr	820	4.6	0.78	80.51
10 yr	1010	4.6	0.78	99.17
25 yr	1160	4.6	0.78	113.89
50 yr	1300	4.7	0.78	127.13
100 yr	1450	4.9	0.78	140.69

(per City of Mississauga Development Requirements Manual, 2016)

Peak Flow
$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(T_d)} \bullet A$

Intensity
$i_{(T_d)} = A / (T_c + B)^C$

PROJECT: 1108 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 2018.12.12
UPDATE: 2018.12.12
DESIGN: HJ
CHECK: JA

Storage Requirements (Total Site minus Catchment 205 and 206)

Storm	Post-Development Flow Rate (L/s)	Orifice Flow Rate (L/s)	Storage Required (m3)
100 yr	125	14.5	157.2
50 yr	113	13.7	138.9
25 yr	101	12.8	121.9
10 yr	88	11.8	103.7
5 yr	72	10.4	81.3
2 yr	53	8.8	57.3

Post Development Controlled Flow Rate (with Catchment 205 and 206)

Storm	Qorifice (L/s)	Q205 (L/s)	Q206 (L/s)	Qtotal (L/s)	TRCA Target Release Rate (L/s)	Mississauga Target (2 yr pre)
100 yr	14.5	8.9	8.9	**32.2**	51.2	42.3
50 yr	13.7	8.0	8.0	**29.7**	45.2	
25 yr	12.8	7.2	7.2	**27.1**	38.1	
10 yr	11.8	6.2	6.2	**24.3**	30.8	
5 yr	10.4	5.1	5.1	**20.6**	24.9	
2 yr	8.8	3.8	3.8	**16.3**	17.1	

TRCA Unit Release Rate Criteria for Etobicoke Creek

Event	TRCA Target Release Rate (L/s/ha)	Target Release Rate TOTAL SITE
100 yr	93.0	51.2
50 yr	82.1	45.2
25 yr	69.3	38.1
10 yr	56.0	30.8
5 yr	45.2	24.9
2 yr	31.1	17.1

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: 1277 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 2018.12.06
UPDATE: 2018.12.12
DESIGN: HJ
CHECK: JA

Modified Rational Method - Storage Volume Determination

SCENARIO: Control 100-Year Post to Orifice Control

Target Flow Rate

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 100	0.42	59.89	0.46	0.032	31.84	2-year pre-development peak flow
Catchment 101	0.25	59.89	0.09	0.004	3.75	
			Qorifice	0.0145	**14.5**	

100-yr Post-Development Peak Flow

	C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
Total Site (minus Catchment 205, 206)	0.86	140.69	0.37	0.13	125.16
Catchment 205	0.25	140.69	0.09	0.01	8.80
Catchment 206	0.25	140.69	0.09	0.01	8.80
	Controlling Total Site minus 205, 206 catchment			0.125	**125**

Intensity

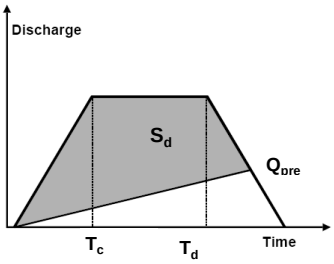
$i_{(T_d)} = A/(T_c+B)^C$

Peak Flow

$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$

Storage

$S_d = Q_{post} \cdot T_d - Q_{pre} (T_d + T_c) / 2$



Preliminary Storage Volume Determination

T_d	$i_{@Td}$	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m^3/s*	*m^3*
10	*176.31*	*600*	0.158	83.9
15	*140.69*	*900*	0.126	100.4
20	*118.12*	1200	0.106	111.8
25	*102.41*	1500	0.092	120.2
30	*90.77*	1800	0.081	126.8
35	*81.77*	2100	0.073	132.1
40	*74.58*	2400	0.067	136.4
45	*68.68*	2700	0.062	140.0
50	*63.75*	3000	0.057	143.1
55	*59.56*	3300	0.053	145.6
60	*55.95*	3600	0.050	147.8
65	*52.81*	3900	0.047	149.7
70	*50.03*	4200	0.045	151.3
75	*47.58*	4500	0.043	152.6
80	*45.38*	4800	0.041	153.8
85	*43.39*	5100	0.039	154.8
90	*41.60*	5400	0.037	155.6
95	*39.97*	5700	0.036	156.2
100	*38.47*	6000	0.034	156.8
105	*37.10*	6300	0.033	157.2
110	*35.84*	6600	0.032	157.5

TOTAL STORAGE VOLUME REQUIRED: 157.2 m^3

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: 1277 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 06-Dec-2018
UPDATE:
DESIGN: HJ
CHECK: JA

Modified Rational Method - Storage Volume Determination

SCENARIO: Control 50-Year Post to Orifice Control

Target Flow Rate

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 100	0.42	59.89	0.46	0.032	31.84	2-year pre-development peak flow
Catchment 101	0.25	59.89	0.09	0.004	3.75	
			Q orifice	0.0137	**13.7**	

50-yr Post-Development Peak Flow

	C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
Total Site (minus Catchment 205, 206)	0.86	127.13	0.37	0.11	113.10
Catchment 205	0.25	127.13	0.09	0.01	7.95
Catchment 206	0.25	127.13	0.09	0.01	7.95
	Controlling Total Site minus 205,206 catchment			0.113	**113**

Intensity

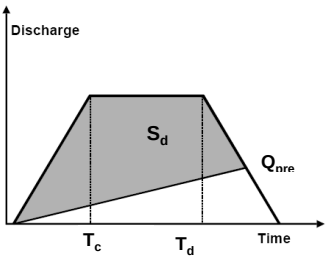
$i_{(Td)} = A/(T_c+B)^C$

Peak Flow

$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$

Storage

$S_d = Q_{post} \cdot T_d - Q_{pre} (T_d + T_c) / 2$



Preliminary Storage Volume Determination

T_d	$i_{@Td}$	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m^3/s*	*m^3*
10	*159.75*	*600*	0.143	75.6
15	*127.13*	*900*	0.114	90.2
20	*106.57*	1200	0.095	100.3
25	*92.30*	1500	0.083	107.7
30	*81.75*	1800	0.073	113.4
35	*73.60*	2100	0.066	118.0
40	*67.10*	2400	0.060	121.8
45	*61.77*	2700	0.055	124.9
50	*57.32*	3000	0.051	127.5
55	*53.54*	3300	0.048	129.6
60	*50.28*	3600	0.045	131.5
65	*47.45*	3900	0.043	133.0
70	*44.95*	4200	0.040	134.4
75	*42.74*	4500	0.038	135.5
80	*40.76*	4800	0.037	136.4
85	*38.97*	5100	0.035	137.1
90	*37.36*	5400	0.033	137.8
95	*35.89*	5700	0.032	138.2
100	*34.54*	6000	0.031	138.6
105	*33.31*	6300	0.030	138.9
110	*32.17*	6600	0.029	139.1

TOTAL STORAGE VOLUME REQUIRED: 138.9 m^3

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: 1277 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 06-Dec-2018
UPDATE:
DESIGN: HJ
CHECK: JA

Modified Rational Method - Storage Volume Determination

SCENARIO: Control 25-Year Post toOrifice Control

Target Flow Rate

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 100	0.42	59.89	0.46	0.032	31.84	2-year pre-development peak flow
Catchment 101	0.25	59.89	0.09	0.004	3.75	
			Q orifice	0.0128	**12.8**	

25-yr Post-Development Peak Flow

	C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
Total Site (minus Catchment 205, 206)	0.86	113.89	0.37	0.10	101.32
Catchment 205	0.25	113.89	0.09	0.01	7.12
Catchment 206	0.25	113.89	0.09	0.01	7.12
	Controlling Total Site minus 205,206 catchment			0.101	**101**

Intensity

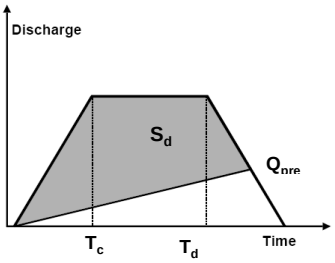
$i_{(T_d)} = A/(T_c+B)^C$

Peak Flow

$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$

Storage

$S_d = Q_{post} \cdot T_d - Q_{pre} (T_d + T_c) / 2$



Preliminary Storage Volume Determination

T_d	$i_{@Td}$	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m^3/s*	*m^3*
10	*143.31*	*600*	0.128	67.5
15	*113.89*	*900*	0.102	80.3
20	*95.40*	1200	0.085	89.2
25	*82.58*	1500	0.074	95.6
30	*73.11*	1800	0.066	100.7
35	*65.80*	2100	0.059	104.6
40	*59.98*	2400	0.054	107.9
45	*55.21*	2700	0.049	110.5
50	*51.22*	3000	0.046	112.8
55	*47.84*	3300	0.043	114.6
60	*44.92*	3600	0.040	116.2
65	*42.39*	3900	0.038	117.4
70	*40.15*	4200	0.036	118.5
75	*38.17*	4500	0.034	119.4
80	*36.40*	4800	0.033	120.1
85	*34.81*	5100	0.031	120.7
90	*33.36*	5400	0.030	121.2
95	*32.05*	5700	0.029	121.5
100	*30.85*	6000	0.028	121.7
105	*29.74*	6300	0.027	121.9
110	*28.73*	6600	0.026	122.0

TOTAL STORAGE VOLUME REQUIRED: 121.9 m^3

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: 1277 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 06-Dec-2018
UPDATE:
DESIGN: HJ
CHECK: JA

Modified Rational Method - Storage Volume Determination

SCENARIO: Control 10-Year Post to Orifice Control

Target Flow Rate

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 100	0.42	59.89	0.46	0.032	31.84	2-year pre-development peak flow
Catchment 101	0.25	59.89	0.09	0.004	3.75	
			Q orifice	0.0118	**11.8**	

10-yr Post-Development Peak Flow

	C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
Total Site (minus Catchment 205, 206)	0.86	99.17	0.37	0.09	88.22
Catchment 205	0.25	99.17	0.09	0.01	6.20
Catchment 206	0.25	99.17	0.09	0.01	6.20
Controlling Total Site minus 205, 206 catchment				0.088	**88**

Intensity

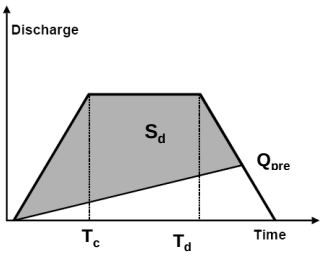
$i_{(T_d)} = A/(T_c+B)^C$

Peak Flow

$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(T_d)} \cdot A$

Storage

$S_d = Q_{post} \cdot T_d - Q_{pre} (T_d + T_c) / 2$



Preliminary Storage Volume Determination

T_d	$i_{@Td}$	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m^3/s*	*m^3*
10	*124.77*	*600*	0.112	58.2
15	*99.17*	*900*	0.089	69.4
20	*83.06*	1200	0.074	76.9
25	*71.90*	1500	0.064	82.5
30	*63.66*	1800	0.057	86.7
35	*57.30*	2100	0.051	90.1
40	*52.22*	2400	0.047	92.8
45	*48.07*	2700	0.043	95.1
50	*44.60*	3000	0.040	96.9
55	*41.65*	3300	0.037	98.4
60	*39.11*	3600	0.035	99.6
65	*36.91*	3900	0.033	100.7
70	*34.96*	4200	0.031	101.5
75	*33.24*	4500	0.030	102.2
80	*31.69*	4800	0.028	102.7
85	*30.31*	5100	0.027	103.1
90	*29.05*	5400	0.026	103.4
95	*27.90*	5700	0.025	103.6
100	*26.86*	6000	0.024	103.7
105	*25.90*	6300	0.023	103.7
110	*25.01*	6600	0.022	103.7

TOTAL STORAGE VOLUME REQUIRED: 103.7 m^3

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: 1277 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 06-Dec-2018
UPDATE:
DESIGN: HJ
CHECK:

Modified Rational Method - Storage Volume Determination

SCENARIO: Control 5-Year Post to Orifice Control

Target Flow Rate

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 100	0.42	59.89	0.46	0.032	31.84	2-year pre-development peak flow
Catchment 101	0.25	59.89	0.09	0.004	3.75	
			Q orifice	0.0104	**10.4**	

5-yr Post-Development Peak Flow

	C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
Total Site (minus Catchment 205, 206)	0.86	80.51	0.37	0.07	71.62
Catchment 205	0.25	80.51	0.09	0.01	5.04
Catchment 206	0.25	80.51	0.09	0.01	5.04
Controlling Total Site minus 205, 206 catchment				0.010	**10**

Intensity

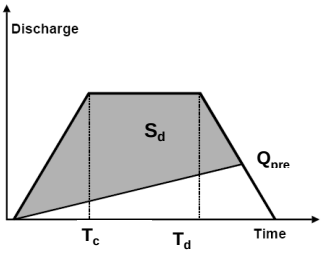
$i_{(T_d)} = A/(T_c+B)^C$

Peak Flow

$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$

Storage

$S_d = Q_{post} \cdot T_d - Q_{pre} (T_d + T_c) / 2$



Preliminary Storage Volume Determination

T_d	$i_{@Td}$	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m^3/s*	*m^3*
10	*101.30*	*600*	0.091	46.6
15	*80.51*	*900*	0.072	55.5
20	*67.43*	1200	0.060	61.5
25	*58.37*	1500	0.052	65.9
30	*51.68*	1800	0.046	69.3
35	*46.52*	2100	0.042	71.9
40	*42.40*	2400	0.038	73.9
45	*39.02*	2700	0.035	75.6
50	*36.21*	3000	0.032	77.0
55	*33.82*	3300	0.030	78.1
60	*31.76*	3600	0.028	78.9
65	*29.96*	3900	0.027	79.6
70	*28.38*	4200	0.025	80.2
75	*26.98*	4500	0.024	80.6
80	*25.73*	4800	0.023	80.9
85	*24.60*	5100	0.022	81.1
90	*23.58*	5400	0.021	81.2
95	*22.66*	5700	0.020	81.3
100	*21.81*	6000	0.020	81.2
105	*21.03*	6300	0.019	81.1
110	*20.31*	6600	0.018	80.9

TOTAL STORAGE VOLUME REQUIRED: 81.3 m^3

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: 1277 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Modified Rational Method
DATE: 06-Dec-2018
UPDATE:
DESIGN: HJ
CHECK:

Modified Rational Method - Storage Volume Determination

SCENARIO: Control 2-Year Post to Orifice Control

Target Flow Rate

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 100	0.42	59.89	0.46	0.032	31.84	2-year pre-development peak flow
Catchment 101	0.25	59.89	0.09	0.004	3.75	
			Q orifice	0.0088	**8.8**	

2-yr Post-Development Peak Flow

	C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
Total Site (minus Catchment 205, 206)	0.86	59.89	0.37	0.05	53.28
Catchment 205	0.25	59.89	0.09	0.004	3.75
Catchment 206	0.25	59.89	0.09	0.004	3.75
Controlling Total Site minus 205, 206 catchment				0.053	**53**

Intensity

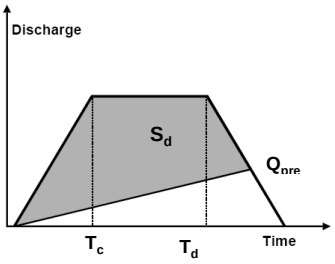
$i_{(T_d)} = A/(T_c+B)^C$

Peak Flow

$Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(Td)} \cdot A$

Storage

$S_d = Q_{post} \cdot T_d - Q_{pre} (T_d + T_c) / 2$



Preliminary Storage Volume Determination

T_d	$i_{@Td}$	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	m^3/s	m^3
10	*75.36*	*600*	0.068	33.9
15	*59.89*	*900*	0.054	40.4
20	*50.16*	1200	0.045	44.7
25	*43.42*	1500	0.039	47.8
30	*38.45*	1800	0.034	50.2
35	*34.60*	2100	0.031	52.0
40	*31.54*	2400	0.028	53.4
45	*29.03*	2700	0.026	54.4
50	*26.94*	3000	0.024	55.3
55	*25.16*	3300	0.023	56.0
60	*23.62*	3600	0.021	56.5
65	*22.29*	3900	0.020	56.8
70	*21.12*	4200	0.019	57.1
75	*20.07*	4500	0.018	57.3
80	*19.14*	4800	0.017	57.3
85	*18.30*	5100	0.016	57.3
90	*17.54*	5400	0.016	57.3
95	*16.85*	5700	0.015	57.1
100	*16.22*	6000	0.015	57.0
105	*15.64*	6300	0.014	56.7
110	*15.11*	6600	0.014	56.4

TOTAL STORAGE VOLUME REQUIRED: 57.3 m^3

CROZIER & ASSOCIATES
Consulting Engineers

Project: 1094 & 1108 Eglinton Avenue
Project No.: 1277-4440
Created By: JA
Checked By: JA
Date: 2018.12.12
Updated: 2018.12.12

Orifice Design

Depth Increment (m) =	0.05
Inlet Elevation (m) =	139.21

Orifice: $Q=CA(2gH)^{0.5}$	Orifice 1
Discharge Coef., Cd=	0.80
Orifice Diameter (mm) =	75
Area of Orifice (m^2) =	0.0044
Orifice (Side/Bottom) =	Side
Invert (m) =	139.21

	Storage Rating Curve				
	Water Elev. (m)	Depth (m)	Head 1 (m)	Volume (m3)	Orifice1 Q (Side) L/s
BOTTOM	139.21	0.00	0.00	0.00	0.00
	139.26	0.05	0.01	2.29	1.75
	139.31	0.10	0.06	11.44	3.91
	139.36	0.15	0.11	20.58	5.25
	139.41	0.20	0.16	29.73	6.31
	139.46	0.25	0.21	38.88	7.22
	139.51	0.30	0.26	48.03	8.02
	139.56	0.35	0.31	57.18	8.75
	139.61	0.40	0.36	66.32	9.43
	139.66	0.45	0.41	75.47	10.05
	139.71	0.50	0.46	84.62	10.65
	139.76	0.55	0.51	93.77	11.21
	139.81	0.60	0.56	102.92	11.74
	139.86	0.65	0.61	112.06	12.25
	139.91	0.70	0.66	121.21	12.74
	139.96	0.75	0.71	130.36	13.21
	140.01	0.80	0.76	139.51	13.67
	140.06	0.85	0.81	148.66	14.11
TOP	140.11	0.90	0.86	157.80	14.54

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: 1108 Eglinton Ave E
PROJECT No.: 1277-4440
FILE: Water Balance
DATE: 2018.12.06
UPDATE:
DESIGN: HJ
CHECK:

Water Balance Calculation

Description	Initital Abstraction (mm)	Area (ha)	Volume (m^3)
5mm Initial Abstraction Over Impervious Area			
Total Impervious (Catchments 200-202 and Ext)	5.0	0.35	17.5
Total Pervious (Catchments 203- 206)	5.0	0.20	-
Site Total	-	0.55	17.5
Required			
Required Water Balance Volume	(To be provided in Open Bottom Storage		17.5

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Tuesday, December 11, 2018
Project Name	Mississauga site
Project Number	
Location	Mississauga

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.

Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF4-2-1 is recommended to meet the water quality objective by treating a flow of 12.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 142 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-2-1	2	1	1.2	12.6	142

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

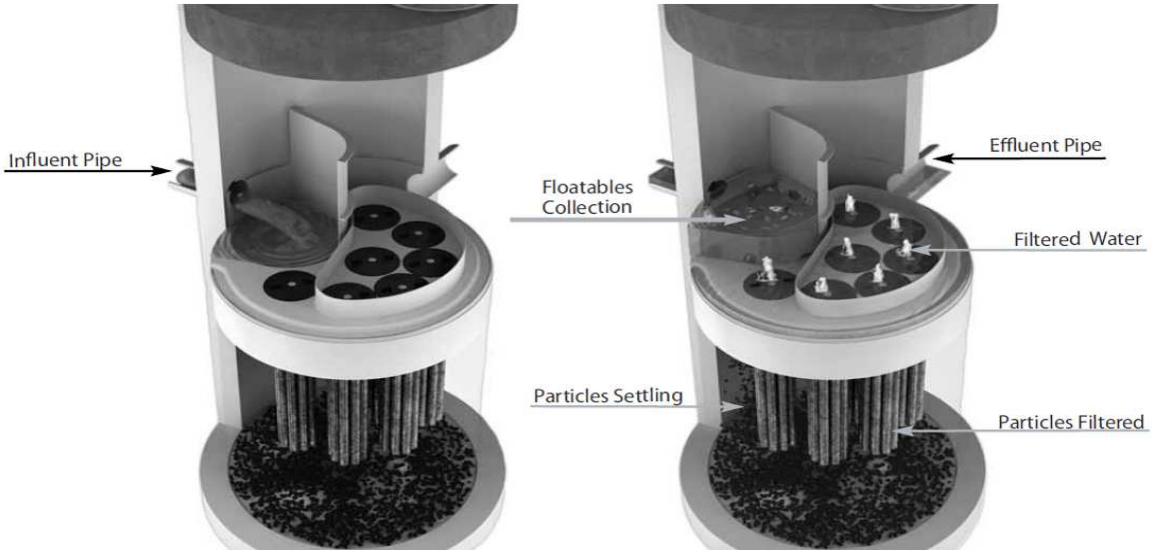
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 59% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TARP qualifying rain events and field monitored according to the TARP field test protocol, demonstrating:

- A median TSS removal efficiency of 89%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 59%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Tuesday, December 11, 2018
Project Name:	Mississauga site
Project Number:	
Location:	Mississauga

Designer Information

Company:	CF Crozier
Contact:	Himanshi Juneja
Phone #:	

Notes

Rainfall

Name:	TORONTO CENTRAL
State:	ON
ID:	100
Record:	1982 to 1999
Co-ords:	45°30'N, 90°30'W

Drainage Area

Total Area:	0.55 ha
Imperviousness:	63%

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 18 years of TORONTO CENTRAL rainfall data:	**10.3 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 2085 m^3, with a suspended sediment concentration of 60 mg/L.	**125 kg**

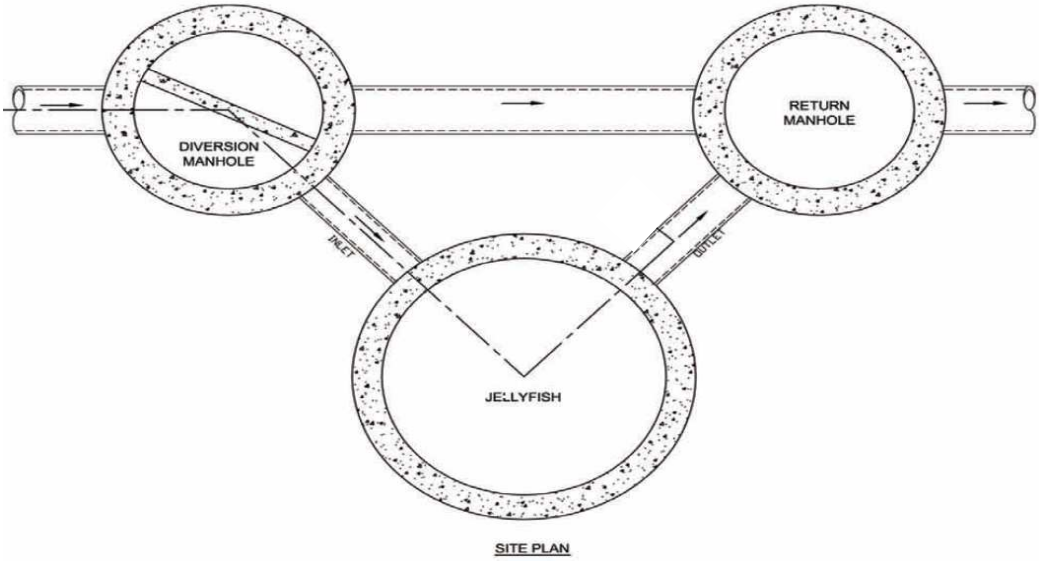
Recommendation

The Jellyfish Filter model JF4-2-1 is recommended to meet the water quality objective by treating a flow of 12.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 142 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m^3)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	2313	0.34	379	7.6	85
JF4-2-1	**2**	**1**	**1.2**	**2313**	**0.34**	**379**	**12.6**	**142**
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	5	1	1.8	5205	0.79	848	27.8	313
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	12	3	3.0	14456	2.21	2302	68.2	768
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	**62º**	**150**	**200**
1.8	59º	200	250
2.4	52º	250	300
3.0	48º	300	450
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow

event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the

local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

Parameters 2.0

Units: Metric

Storage Volume: 167 Cu. M

Chamber Selection: S-29 [+]

Header Row Position: Left

Fill Over Embedment Stone: 30 cm

Embedment Stone:

Over: 15 Under: 15 Porosity: 0.4

Controlled By (in M):

Width 18

Accessories:

Dumpsters: 0 Bins: 0 Floors:

Double Stacked

Double Stacked?:

Lower Chamber: S-29

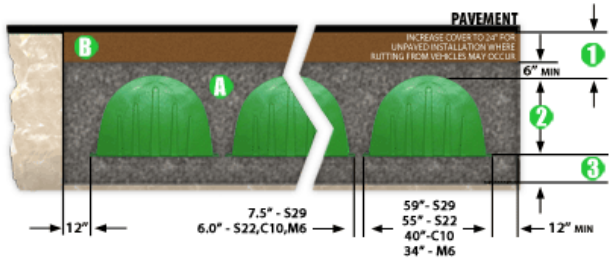
Stone Between: 15

Note: After making an input change you must hit recalculate to update the Field Diagram and Project Results.

RECALCULATE SAVE

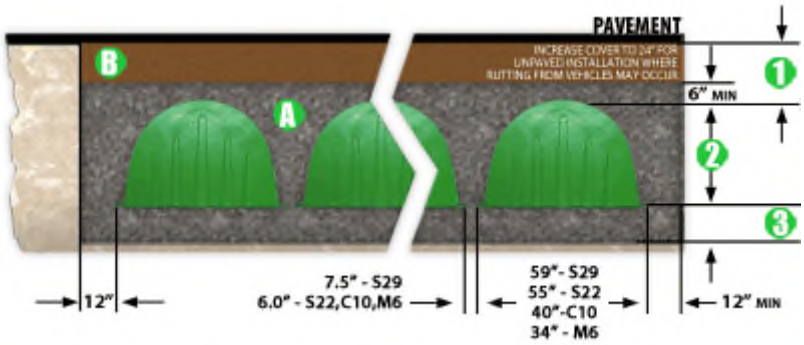
A NOTICE: This calculator works best in when used with Firefox browser. If using Internet Explorer, please be sure to disable Protected Mode. This calculator has shown issues when used in Chrome with AdBlock enabled. If using Chrome, please disable AdBlock.
This calculator is provided for your convenience only and is not meant for final quotation and/or engineering purposes. Please contact Triton for more information.

Project Results



1. Total Cover Over Chambers: 45.72 cm
2. Height of Chamber: 91.44 cm
3. Embedment Stone Under Chambers: 15.24 cm
A. Volume of Embedment Stone Required: 161 Cu. M
B. Volume of Fill Material Required: 66 Cu. M

Total Storage Provided:	167.3 Cu. M
Type of Distribution Chambers:	S-29
# of Distribution Chambers Required:	112
# of end caps required:	22
Type of header row chambers required:	S-29
# of header row chambers required:	20
Floors:	0
Bins:	0
Dumpsters:	0
Required Bed Size:	216.63 Sq. M
Volume of Embedment Stone Required:	161.38 Cu. M
Volume of Fill Material Required:	66.03 Cu. M
Volume of Excavation:	330.15 Cu. M
Area of Filter Fabric:	289.36 Sq. M
# of Chambers long:	12
# of rows:	10
Actual Trench Length:	12.515 M
Actual Trench Width:	17.31 M



- 1 Total Cover Over Chambers: 45.72 cm
- 2 Height of Chamber: 91.44 cm
- 3 Embedment Stone Under Chambers: 15.24 cm
- A Volume of Embedment Stone Required: 161 Cu. M
- B Volume of Fill Material Required: 66 Cu. M

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# of Chambers long:	12
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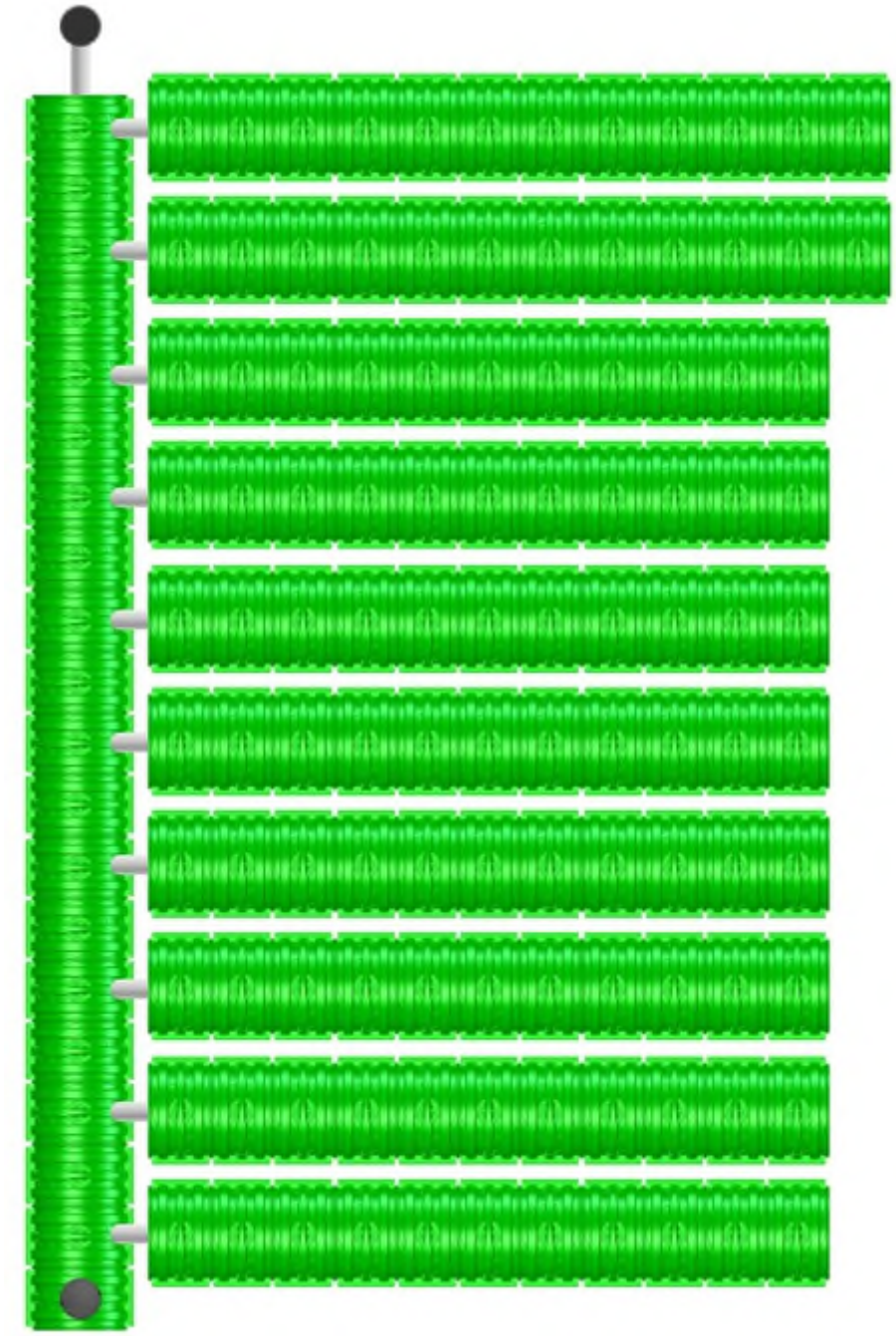
Field Diagram

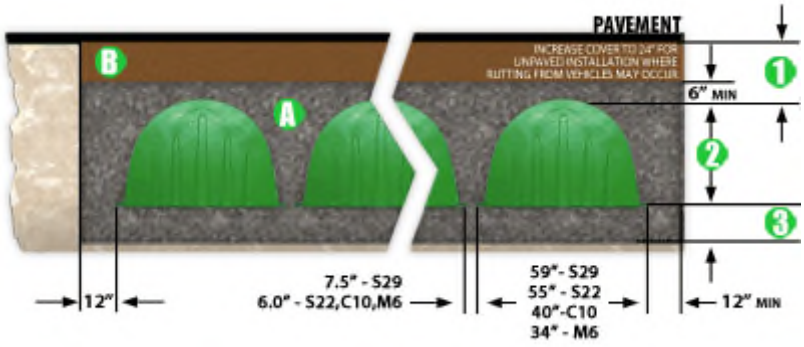


WIRE DIAGRAM

Chamber Type

Dimensions 59" x 36" x 35" (WxHxL)
1498.6mm x 914.4mm x 889mm
Weight 32 lbs / 14.5 kg
Bare Chamber Storage 29 ft³ / 0.82 m³

Project Results



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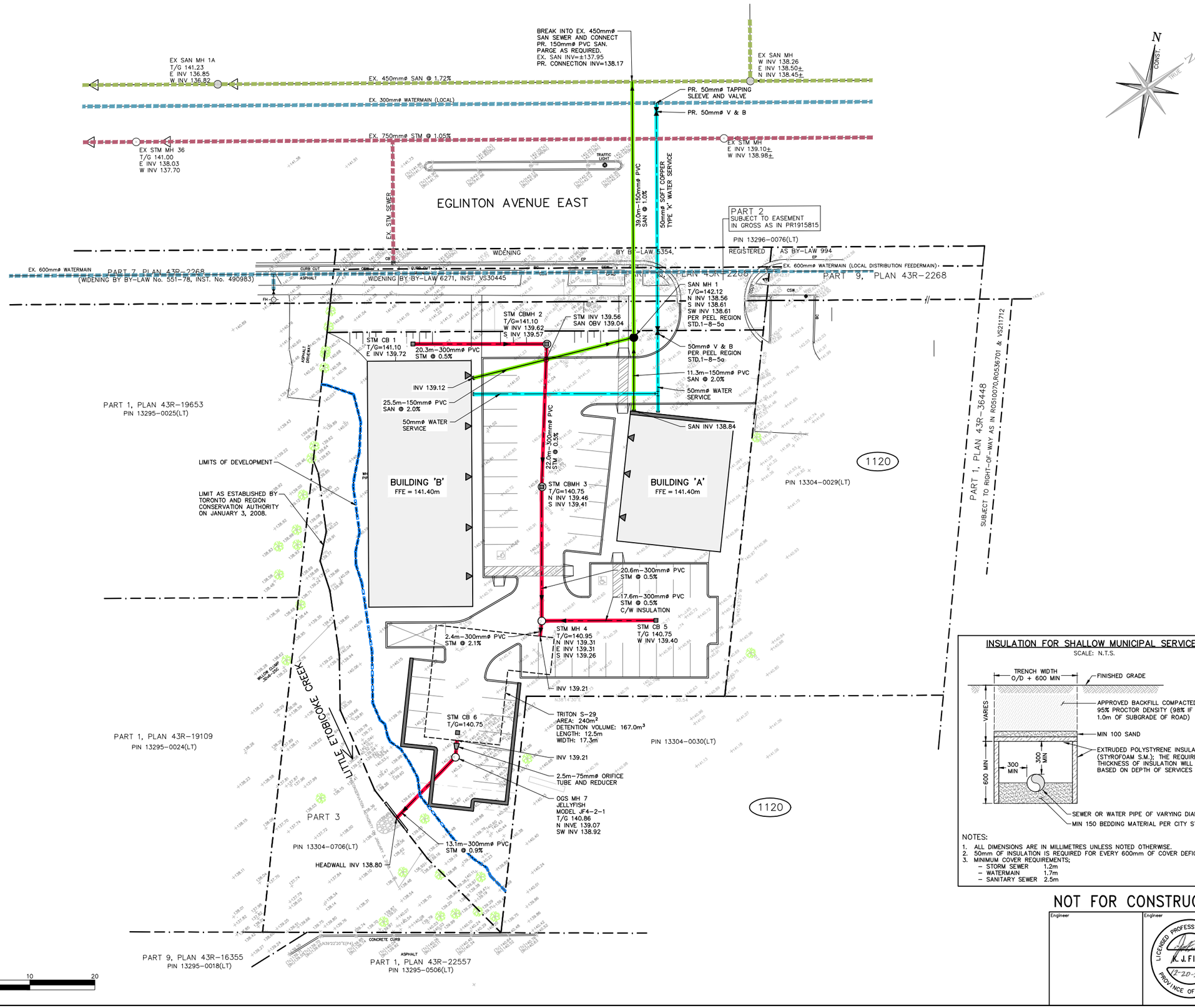
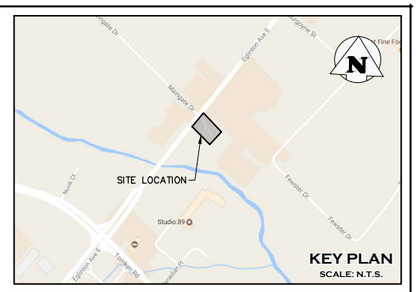
Triton Stormwater Solutions, LLC
7600 Grand River Rd, Suite 195
Brighton, Michigan 48114
Phone: (810) 222-7652 - Fax: (810) 222-1769

DRAWINGS





LEGEND

- PROPERTY LINE
- EXISTING WATERMAIN & GATE VALVE
- EXISTING STORM SEWER & MANHOLE
- EXISTING SINGLE / DOUBLE CATCHBASIN
- EXISTING SANITARY SEWER & MANHOLE
- PROPOSED WATERMAIN & GATE VALVE
- PROPOSED WATER SERVICE LATERAL (XXmmø)
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SINGLE / DOUBLE CATCHBASIN
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED SAN. SERVICE LATERAL (XXXmmø)
- PROPOSED ELECTRICAL TRANSFORMER
- BUILDING ENTRANCE (PERSONNEL DOOR)

INSULATION FOR SHALLOW MUNICIPAL SERVICES

SCALE: N.T.S.

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. 50mm OF INSULATION IS REQUIRED FOR EVERY 600mm OF COVER DEFICIENCY.
3. MINIMUM COVER REQUIREMENTS;
   - STORM SEWER 1.2m
   - WATERMAIN 1.7m
   - SANITARY SEWER 2.5m

NOT FOR CONSTRUCTION

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED FOR 2ND SUBMISSION	2018/DEC/20
0	ISSUED FOR 1ST SUBMISSION	2017/APR/20

ELEVATION NOTE:

ELEVATIONS SHOWN ON THIS PLAN ARE DERIVED FROM THE CITY OF MISSISSAUGA BENCHMARK No. 1031

ELEVATION = 142.565m

SURVEY NOTES:

SURVEY COMPLETED BY DAVID B. SEARLES SURVEY. (2015/OCT/30)
REFERENCE No.: 139–0–15

BEARINGS ARE UTM GRID, DERIVED FROM RTN OBSERVATIONS
UTM ZONE 17, NAD83 (GSRS) (2010.0)

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996781

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY LEW ASSOCIATES LTD.
DATED OCT 3, 2018

AS CONSTRUCTED INFORMATION:

AS CONSTRUCTED INFORMATION TAKEN FROM:
– REGION OF PEEL DRAWING 28461–D (CIRCA MARCH, 2002)
– SKIRA AND ASSOCIATES STORM SEWER EASEMENT (CIRCA MARCH, 2014)

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Project

1108 EGLINTON AVENUE EAST CITY OF MISSISSAUGA

Drawing

SITE SERVICING PLAN

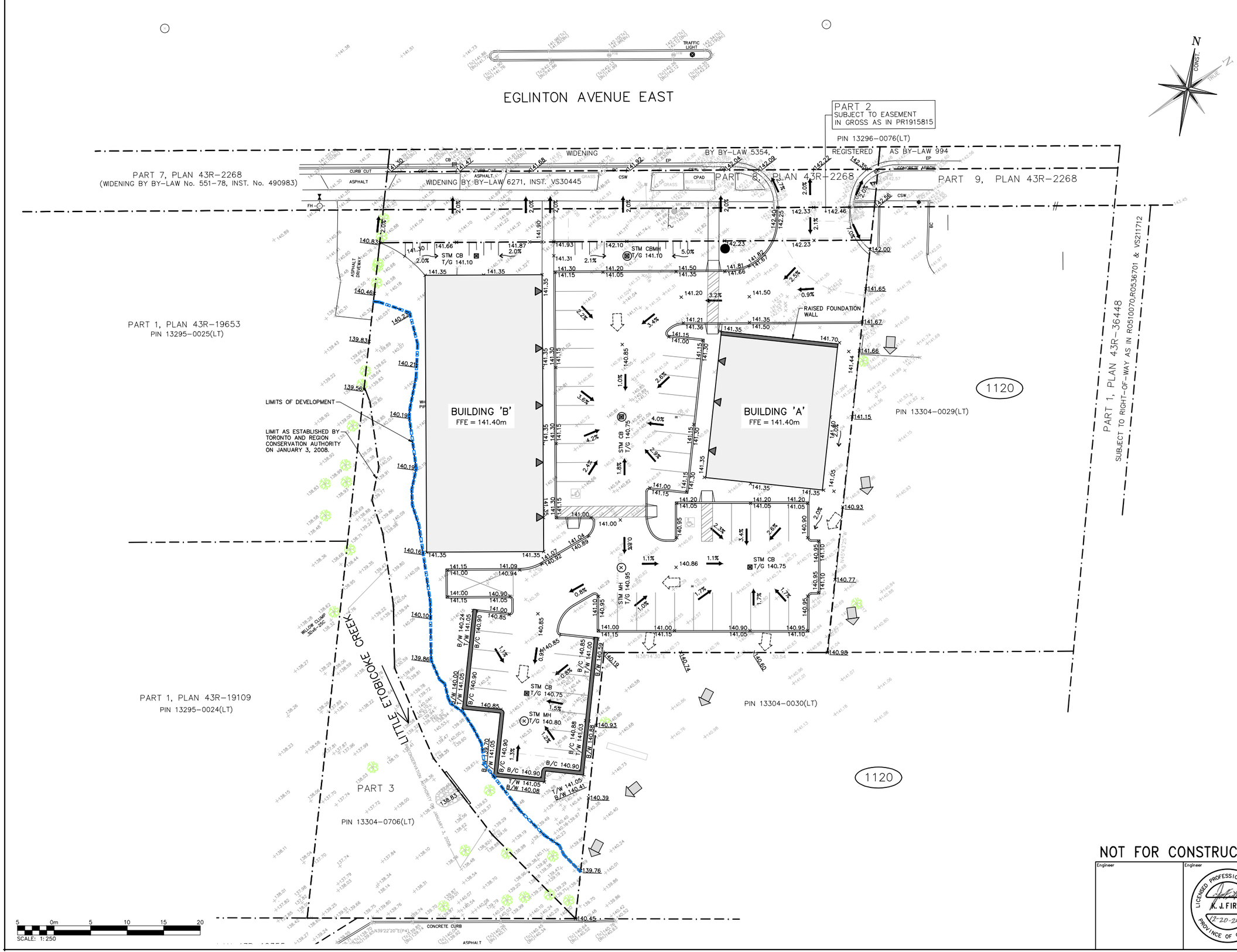
Engineer

Engineer

LICENSED PROFESSIONAL ENGINEER — K. J. FIRTH — 11-20-2018 — PROVINCE OF ONTARIO

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.
S.T.T.	S.T.T.	1277–4440
Check	Check	Scale / Dwg.
H.J.	K.J.F.	1:300 / C 01



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING FENCE
- x215.00 EXISTING GRADE
- x215.00 PROPOSED GRADE
- x215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- 2.0% PROPOSED GRASSED SWALE
- PROPOSED RETAINING WALL
- PROPOSED SLOPE (3:1 MAX.)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- EXISTING OVERLAND FLOW DIRECTION

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED FOR 2ND SUBMISSION	2018/DEC/20
0	ISSUED FOR 1ST SUBMISSION	2017/APR/20

ELEVATION NOTE:

ELEVATIONS SHOWN ON THIS PLAN ARE DERIVED FROM THE CITY OF MISSISSAUGA BENCHMARK No. 1031

ELEVATION = 142.565m

SURVEY NOTES:

SURVEY COMPLETED BY DAVID B. SEARLES SURVEY. (2015/OCT/30)
REFERENCE No.: 139-0-15

BEARINGS ARE UTM GRID, DERIVED FROM RTN OBSERVATIONS
UTM ZONE 17, NAD83 (CSRS) (2010.0)

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DATED OCT 3. 2018

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Project

1108 EGLINTON AVENUE EAST
CITY OF MISSISSAUGA

Drawing

SITE GRADING PLAN

NOT FOR CONSTRUCTION

Engineer

Engineer

LICENSED PROFESSIONAL ENGINEER
K. J. FIRTH
12-20-2018
PROVINCE OF ONTARIO

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875 0026 T
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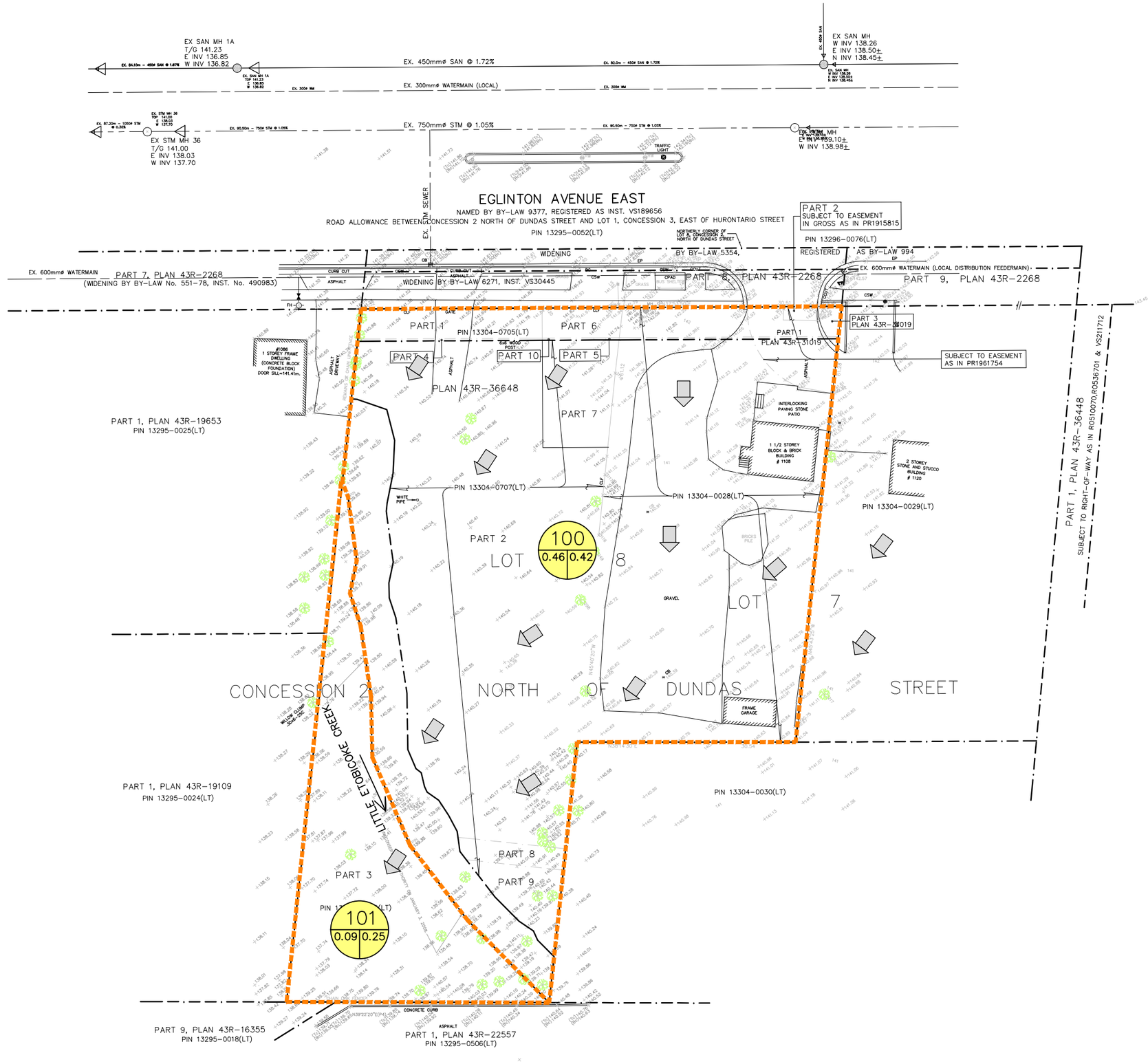
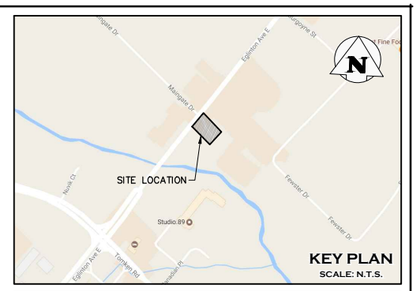
WWW.CFCROZIER.CA

Drawn	S.T.T.	Design	M.C.B.	Project No.	1277-4440
Check	S.C.S.	Check	K.J.F.	Scale	1:250
				Dwg.	C 02

SCALE: 1:250





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE (× 215.00)
- EXISTING OVERLAND FLOW DIRECTION
- PRE-DEVELOPMENT STORM DRAINAGE CATCHMENT AREA
- CATCHMENT I.D. (ID / A | RC)
- AREA (ha) | RUNOFF COEFFICIENT

No.	ISSUE / REVISION	YYYY/MMM/DD
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Project

1108 EGLINTON AVENUE EAST CITY OF MISSISSAUGA

Drawing

PRE-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

SPA# 0000-000

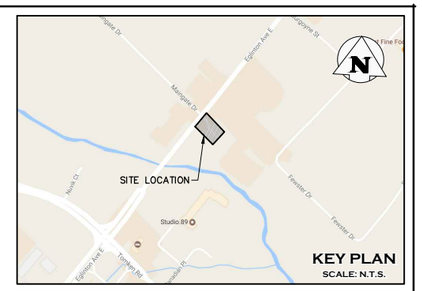
Engineer

Engineer

LICENSED PROFESSIONAL ENGINEER — K. J. FIRTH — 12-20-2018 — PROVINCE OF ONTARIO

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 8750026 T
905 8754915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M.	M.C.B.		1277-4440
Check	Check	Scale	Dwg.
S.C.S.	K.J.F.	1:300	FIG 1



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- PROPERTY LINE
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- EXISTING GRADE (x 215.00)
- EXISTING OVERLAND FLOW DIRECTION
- PR. STORM DRAINAGE CATCHMENT AREA
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Project

1108 EGLINTON AVENUE EAST CITY OF MISSISSAUGA

Drawing

POST-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

SPA# 0000-000

Engineer

Engineer

LICENSED PROFESSIONAL ENGINEER
K. J. FIRTH
11-20-2018
PROVINCE OF ONTARIO

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Drawn	M.I.M.	Design	M.C.B.	Project No.	1277-4440
Check	S.C.S.	Check	K.J.F.	Scale 1:300	Dwg. FIG 2