250228 Ontario Ltd.

3033 Dundas Street West, City of Mississauga

Stormwater Management Report

April 10, 2025

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Stormwater Management Report

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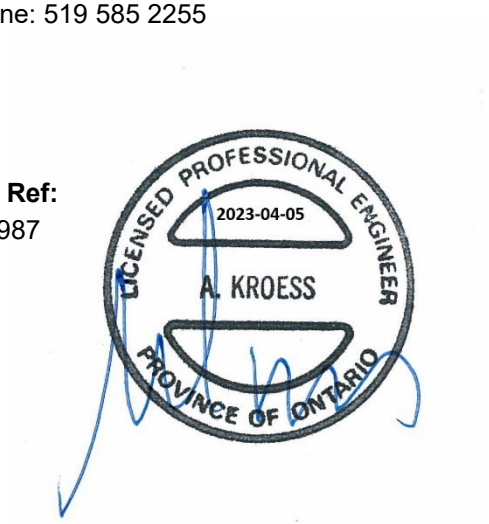
Our Ref:
136987



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Water & Environmental Resources

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
	0	April 10, 2025			

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Appendices

1 Introduction

1.1 Site Location and Description

The subject property/site development has an area of 0.9475ha and is located at 3033 Dundas Street West within the City of Mississauga.

The site will be developed with a single commercial/retail/medical building. The site consists of an abandoned motel, related parking, and a large vacant area north of the existing motel and parking. The site is in the City of Mississauga on the west side of Winston Churchill Boulevard and north of Dundas Street W as shown in Figure 1.

Figure 1 *Site Location*

1.2 Reference Documents

The stormwater management report titled “Stormwater Management Report For 3033 Dundas Street West City Of Mississauga March 26th, 2018 (#1646)”, completed by A.M. Candaras Associates Inc. was utilized for reference and background information in developing the stormwater management strategy and design herein.

The document “Hydrogeological Investigation, Proposed Office Building, 3033 Dundas Street West, Mississauga, On L5L 3R8”, complete by HVL2K Engineering Limited, March 9, 2022, summarizes the soil and groundwater conditions for the property. The native soils consist of silty clay to clayey silt till / sand and gravel to silty sand.

Groundwater observations were made in the boreholes at completion of the drilling and on subsequent dates throughout the year. Borehole BH102 is located adjacent to the location of a proposed stormwater infiltration tank, and a high groundwater elevation of 158.71 was observed. The soils at BH102 consist of sand and gravel, and a minimum infiltration rate of 15 mm/hour has been utilized for stormwater calculations.

1.3 Stormwater Plan Design Criteria

This report outlines necessary stormwater controls for compliance with the design criteria, which are based on the City of Mississauga Development Requirement Manual (November 2020) and MECP Stormwater Planning & Design Manual (2003). Design criteria for the subject development include:

- The site is located within the Loyalist Creek Subwatershed, west of Winston Churchill Boulevard. Post-development flows for all storm events (2 through 100-year design storms) should not exceed the pre-development peak flow rates resulting from the corresponding storm events;
- The City of Mississauga Intensity-Duration-Frequency (IDF) rainfall data as indicated within the City standards shall be used for the analysis;
- Stormwater should be treated to an Enhanced Protection Level as defined in the 2003 MOE (now MECP) Stormwater Management Planning & Design (SWMPD) Manual; and,
- The first 5mm of runoff must be retained on site.

2 Stormwater Management

The stormwater management facilities will comprise of onsite stormwater detention storage, stormwater quality control, and water balance requirements as outlined below.

The civil drawings show the existing and proposed site services, stormwater management measures, and site grading which are referenced throughout this report.

2.1 Pre-Development Peak Flows

To determine the pre-development peak flows, the rainfall intensity is to be determined from the most recent City of Mississauga Intensity - Duration -Frequency Rainfall Curves utilizing the formula I = a/(t+c)^b mm/hr., where t is storm duration (min), I intensity (mm/hour), and the variables are summarized in **Table 2.1**.

Table 2.1 City of Mississauga IDF Variables

IDF Parameter	a	b	c
2-year	610	4.6	0.78
5-year	820	4.6	0.78
10-year	1010	4.6	0.78
25-year	1160	4.6	0.78
50-year	1300	4.7	0.78
100-year	1450	4.9	0.78

As per City of Mississauga criteria, a minimum 15-minute time of concentration and the City's IDF rainfall data was used to calculate the pre-development peak flows using Rational Method calculations. Results are summarized in **Table 2.2** are calculations are provided in **Appendix A**. Existing conditions catchment areas are shown on **Drawing C-101**.

Table 2.2 Existing Peak Flows

	Impervious Area (ha)		
	Area (ha)	**Runoff C**	**Peak Flow (m^3/s)**
2-year	0.9475	0.41	0.065
5-year			0.087
10-year			0.107
25-year			0.123
50-year			0.137
100-year			0.152

2.2 Stormwater Quantity

Runoff from the proposed development will be captured and ultimately discharged to the existing 900 mm diameter storm sewer on Dundas Street West, and post-development peak flows will be controlled to the pre-development levels for events up to the 100-year storm. Proposed conditions catchment areas are shown on **Drawing C-102**.

The Visual OTTHYMO model was used to simulate a 4-hour duration Chicago Storm distribution based on City of Mississauga IDF curves for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year storms to determine the on-site storage volumes required in order to control post-development flows to the allowable pre-development levels. The modelling variables are summarized in **Table 2.3**.

Table 2.3 Visual OTTYMO Model Variables

Catchment	Area (ha)	TIMP/XIMP	Pervious CN
C101 – C111	0.9475	0.795	75

The Visual OTTHYMO model output is provided in **Appendix C** and results of the analysis are summarized in **Table 2.3**.

Table 2.4 Peak Flow and Storage Volume Summary

Storm Event	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow (m^3/s)	Total Storage Volume Required (m^3)
2-Year	0.065	0.063	110
5-Year	0.087	0.081	151
10-Year	0.107	0.094	190
25-Year	0.123	0.104	222
50-Year	0.137	0.112	253
100-Year	0.152	0.121	286

Results of the Visual OTTHYMO modelling show that a total storage volume of 286 m^3 will be required in order to reduce post-development flows to pre-development levels for events up to the 100 year storm. The required on-site storage will be accommodated by an underground storage tank system providing 286 m^3 of active storage and controlled with a 225mm diameter orifice pipe at the outlet of MH2. For storm events greater than the 100-year storm, overland flows will spill east to the future mid-block connector road location. Refer to **Site Servicing Plan,** enclosed with the Functional Servicing Report, showing the locations of the stormwater storage facility and flow controls.

2.3 Stormwater Quality

Stormwater quality treatment requirements to meet the City of Mississauga guidelines are based on Ministry of Environment, Conservation and Parks (MECP) Enhanced Protection Level 80% long-term TSS removal.

A combination of infiltration and an oil/grit separator (OGS) unit will be utilized to provide stormwater quality control. Runoff from all catchment areas will be routed through a stormwater tank at the north part of the site. The tank will include an open bottom to accommodate infiltration. The total drainage area to the gallery is 0.9475 ha (79.9 percent impervious level). Based on Table 3.2 of the MECP Stormwater Planning & Design Manual (2003), a total infiltration storage of 40 m^3/ha is required to provide an Enhanced Protection Level of 80 percent TSS removal (based on 85 percent impervious level). The infiltration gallery therefore requires a total infiltration storage volume of 37.9 m^3. The infiltration gallery will provide a total storage volume of 47.6 m^3. The bottom elevation of the infiltration gallery (159.96m) will remain over 1m above the observed groundwater elevation of 158.71m at the southwest part of the site.

A Stormceptor OGS unit (EFO8) will be installed at the inlet of the stormwater tank to provide additional stormwater quality control. Based on output from the Stormceptor Sizing Program included in **Appendix B**, the EFO8 unit will provide a TSS removal efficiency of 63 percent for greater than 90 percent of annual flows generated by drainage areas, based on the ETV particle size distribution.

The infiltration area and the OGS unit will provide an Enhanced Protection Level for suspended solids (80% TSS removal) using a treatment train approach. The following equation (based on the New Jersey SWM BMP Manual Chapter 4, 2004) has been utilized for calculating the total TSS removal efficiency for BMPs in series:

R = A + B - [(A x B) / 100]

where:

- A is the TSS removal rate of the first BMP (OGS unit, TSS removal efficiency of 63%, maximum value of 50% assumed for the calculations);
- B is the TSS removal rate of the second BMP (infiltration, TSS removal efficiency of 80%); and
- R is the Total TSS removal rate.

R = 50% + 80% - [(50% x 80%) / 100] = 90%.

The location of the infiltration tank and the OGS unit are provided on the **Site Servicing Plan** included with the FSR.

2.4 Water Balance

The City's Stormwater Design Criteria requires new developments to provide a water balance. Where it is not possible to achieve a water balance, developments must achieve the minimum requirements, which are dependent on-site area and land use.

As a minimum, the City requires the first 5mm of any storm to be retained and disposed/reused onsite. Based on this approach the required volume for retention is as follows:

- 0.9475ha x 5mm = ***47.3 m^3 (Required)***

Table 2.5 summarizes the retention measures proposed for the development.

Table 2.5 LID Retention Measures

Facility	Area	5mm Retention Volume
	m^2	m^3
Pervious Areas	1,942	9.7
Permeable Pavers	1,664	8.3
Impervious Areas	5,869	29.3
Total	**9,475**	**47.3**

Accounting for infiltration/retention from pervious and permeable paver areas (9.7 m^3 + 8.3 m^3 = 18.0 m^3), a retention deficit of 29.3 m^3 remains (47.3 m^3 - 18.0 m^3 = 29.3 m^3). A total retention storage volume of 47.6 m^3 is proposed in the underground storage tank for stormwater quality control, which exceeds the 29.3 m^3 retention deficit. Therefore, the water balance requirement for the site can be met. The 47.6 m^3 retention storage drain-down time is approximately 8.4 hours, refer to **Appendix A** for calculations.

3 Erosion and Sediment Control During Construction

The following erosion & sediment controls are proposed for implementation during construction to minimize erosion potential and soil migration from the development site to adjacent lands or receiving waters:

- Install silt fence and/or wattle at the downslope side of disturbed areas along the perimeter of the site, prior to the start of construction.
- Install stone mud mats at all construction entrances.
- Stockpiles will be contained by silt fences and/or wattles on the downslope side.
- Temporary swales with check dams are to be constructed prior to the beginning of site grading.
- The accumulated silt shall be removed from all sediment control devices as required during the construction and disposed in the locations approved by the City of Mississauga and/or CVC.
- All exposed soils are to be stabilized and vegetated as soon as possible using seed and mulch application on 100 mm of topsoil, as directed by the engineer.
- Additional erosion/sediment controls may be required on site as determined by the engineer.

- No construction activities and machineries shall intrude beyond the silt fence or property limit. All construction vehicles shall enter and leave the site via the designated entrances.
- All regraded areas that are not occupied by building facility, roads, sidewalks, driveways, parks, and other services shall be covered by 100 mm topsoil and sodded or seeded immediately after completion of final grading operations, as directed by the engineer.
- All temporary erosion and sediment controls must be installed prior to the commencement of construction, must be inspected on a regular basis and after every rainfall event, and must be cleaned and maintained as required to prevent the migration of sediment from the site.
- All temporary erosion and sediment controls must be removed after construction once the development site has been stabilized to the City and Engineer's satisfaction.
- All areas disturbed by erosion or sediment control devices are to be restored to proposed or original condition after construction.
- The contractor shall keep public roadways free of debris during construction. Any material tracked from the site shall be promptly removed from roadways at the contractor's expenses.
- The contractor is responsible to locate and protect all existing utilities and municipal services and make arrangements with utility companies prior to construction.
- All excavations shall be in accordance with the Ontario "Occupational Health and Safety Act", and other federal and provincial regulations related to construction projects.

4 Conclusions and Recommendations

Based on our review and analysis, we conclude that the proposed development is readily serviceable and provide the following summary and recommendations:

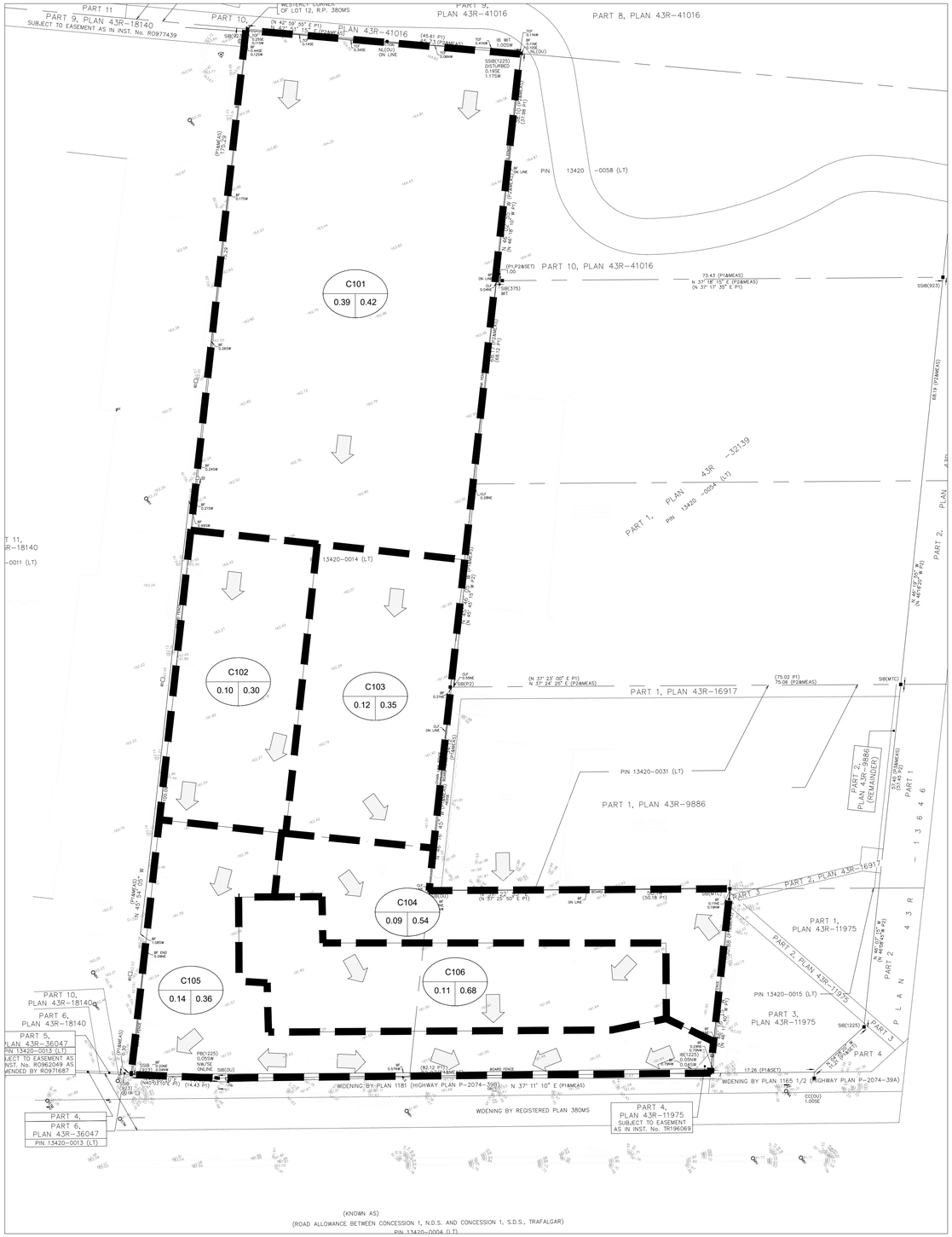
- A SWM plan is proposed to reduce the increase in runoff volumes and peak flows as a result of change in land use for the proposed development;
- In order to meet the design criteria, set forth by the City of Mississauga and the MECP, quantity and quality control measures are proposed;
    - On-site detention facilities with a total active storage volume of 286 m^3 have been proposed so that post-development peak flow rates do not exceed the pre-development peak flow rates;
    - The overall post development flows meet the required pre-development peak flow rates for all design storms;
    - Quality control to an Enhanced Protection Level will be met through a combination of infiltration and an OGS unit; and
    - The first 5mm of runoff will be retained on site using active and passive infiltration measures.

We therefore recommend that the proposed development stormwater management and associated drawings be implemented based on the conclusions provided herein.

Appendix A

Stormwater Quantity Calculations

NOT FOR CONSTRUCTION



LEGEND

- PROPERTY LINE
- CATCHMENT BOUNDARIES
- 100 — DRAINAGE AREA NUMBER
- 0.55 | 0.70 — RUNOFF COEFFICIENT
- DRAINAGE AREA (ha)
- OVERLAND FLOW ROUTE

5 2 0 5 10 15
1:400 (m)

True North | Project North

CLIENT

CANADIAN PLANNING AND DEVELOPMENT CONSULTANTS

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR SPA	APRIL 08, 2025

KEY PLAN

SEAL

PRIME CONSULTANT

ARCADIS
8133 Warden Avenue - Unit 300
Markham ON L6G 1B3 Canada
tel 905 763 2322
www.arcadis.com

PROJECT

3033 DUNDAS STREET WEST

PROJECT NO: 136987	
DRAWN BY: **K.Y.**	CHECKED BY: **G.M.**
PROJECT MGR: **A.C.**	APPROVED BY: **A.C.**

SHEET TITLE

EXISTING DRAINAGE AREA PLAN

SHEET NUMBER	ISSUE
C-101	1

SCALE CHECK 10mm 1 in

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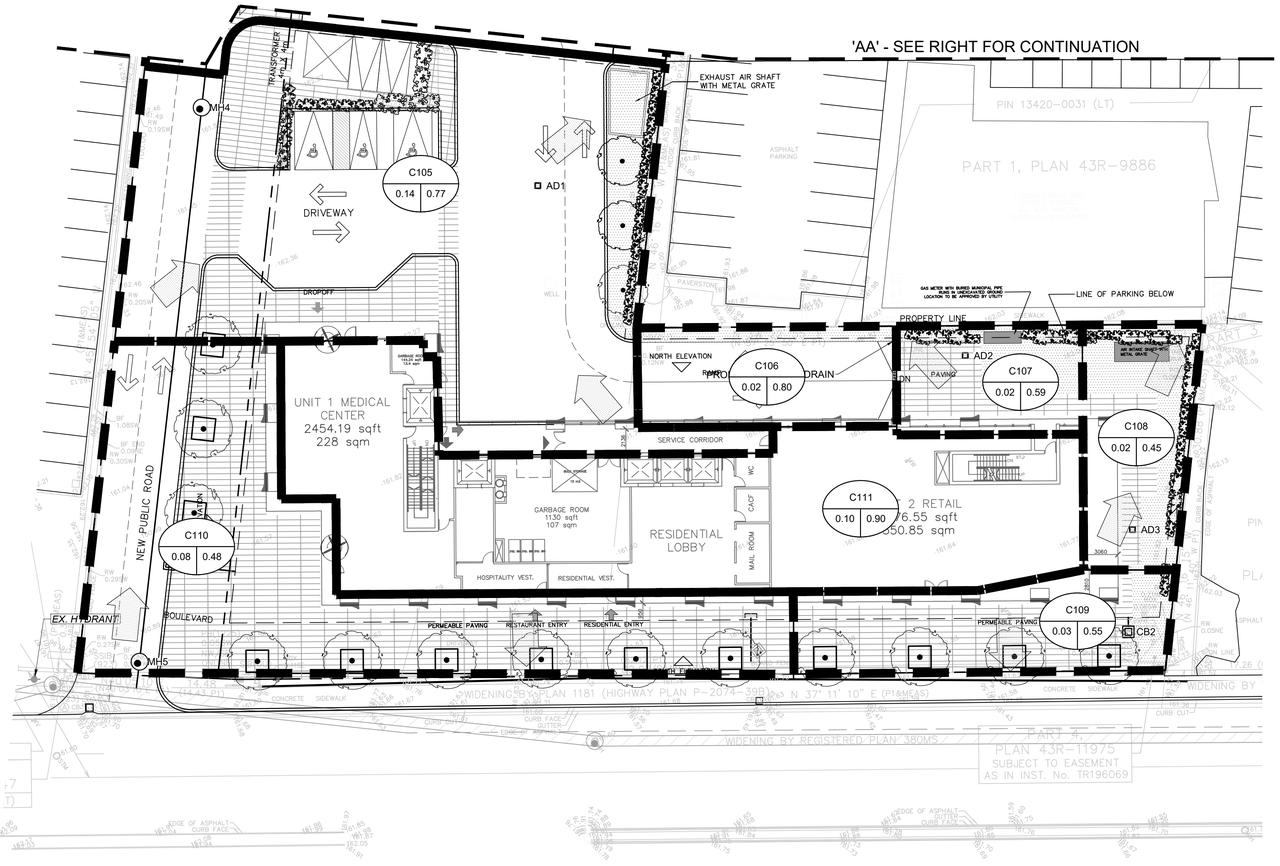
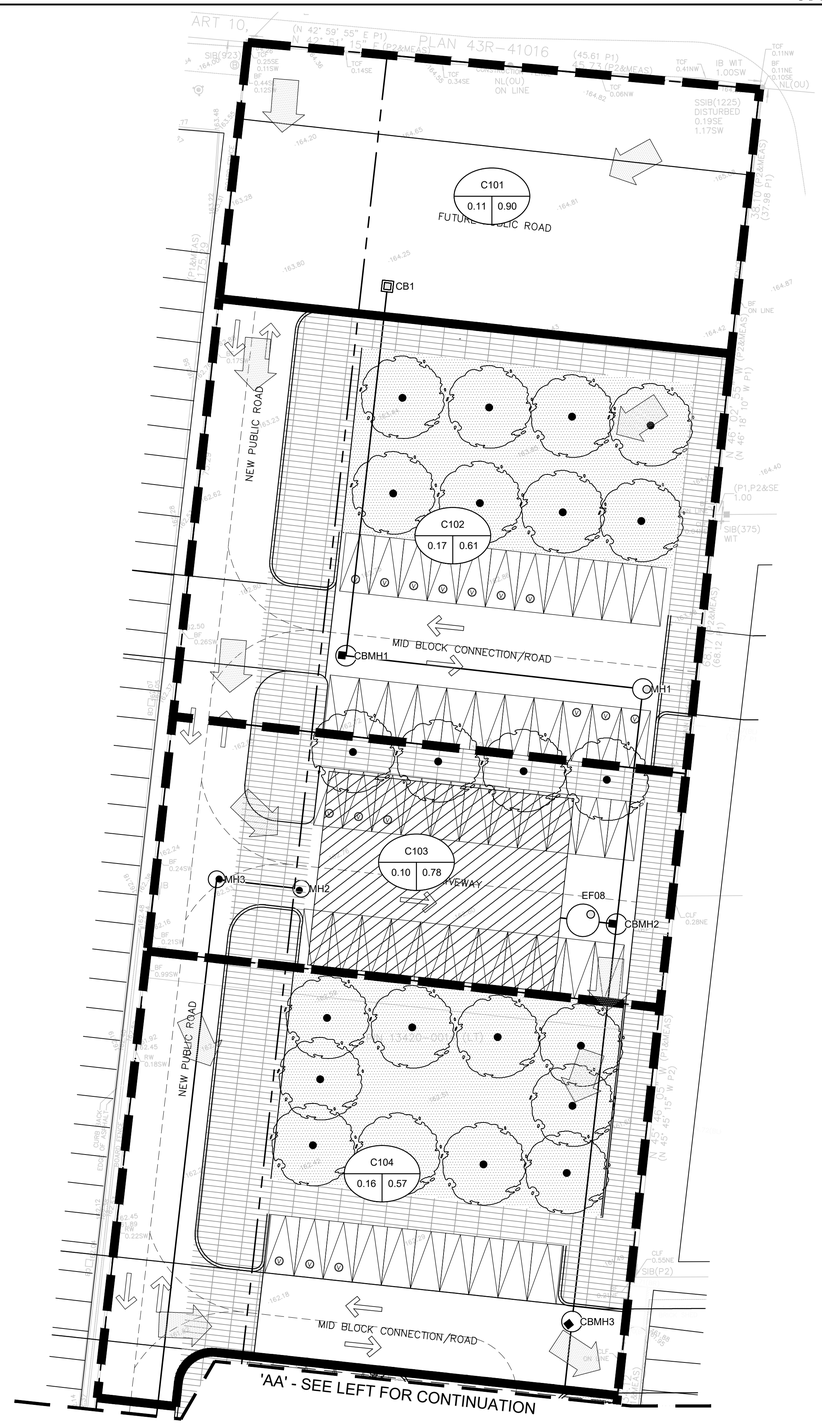
NOT FOR CONSTRUCTION

LEGEND

- PROPERTY LINE
- CATCHMENT BOUNDARIES
- 100 / 0.55 | 0.70 — DRAINAGE AREA NUMBER / RUNOFF COEFFICIENT / DRAINAGE AREA (ha)
- OVERLAND FLOW ROUTE





3 0 5 10
1:250 (m)

True North | Project North

CLIENT

CANADIAN PLANNING AND DEVELOPMENT CONSULTANTS

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR SPA	APRIL 08, 2025

KEY PLAN

CONSULTANTS

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PROJECT

3033 DUNDAS STREET WEST

PROJECT NO: 136987	
DRAWN BY: **K.Y.**	CHECKED BY: **G.M.**
PROJECT MGR: **A.C.**	APPROVED BY: **A.C.**

SHEET TITLE

PROPOSED DRAINAGE AREA PLAN

SHEET NUMBER	ISSUE
C-102	1

SCALE CHECK 50mm 1in

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ARCADIS

Rational Method
Target Flow Calculations- Pre- Development
3033 Dundas Street, City of Mississauga
File No. 136987

Pre-Development Areas

	Area (ha)	C	Time of (min)
Site Area	0.9475	0.41	15

Event 2 yr
IDF Data Set City of Mississauga IDF Curves
A = 610.00
B = 4.60
C = 0.78

Area	A (ha)	C	AC	Time of (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
Site Area	0.9475	0.41	0.39	15.00	59.9	0.065	64.6

Event 5 yr
IDF Data Set City of Mississauga IDF Curves
A = 820.00
B = 4.60
C = 0.78

Area	A (ha)	C	AC	Time of (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
Site Area	0.9475	0.41	0.39	15.00	80.5	0.087	86.9

Event 10 yr
IDF Data Set City of Mississauga IDF Curves
A = 1010.00
B = 4.60
C = 0.78

Area	A (ha)	C	AC	Time of (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
Site Area	0.9475	0.41	0.39	15.00	99.2	0.107	107.0

Event 25 yr
IDF Data Set City of Mississauga IDF Curves
A = 1160.00
B = 4.60
C = 0.78

Area	A (ha)	C	AC	Time of (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
Site Area	0.9475	0.41	0.39	15.00	113.9	0.123	122.9

Event 50 yr
IDF Data Set City of Mississauga IDF Curves
A = 1300.00
B = 4.70
C = 0.78

Area	A (ha)	C	AC	Time of (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
Site Area	0.9475	0.41	0.39	15.00	127.1	0.137	137.2

Event 100 yr
IDF Data Set City of Mississauga IDF Curves
A = 1450.00
B = 4.90
C = 0.78

Area	A (ha)	C	AC	Time of (min)	I (mm/h)	Q (m^3/s)	Q (L/s)
Site Area	0.9475	0.41	0.39	15.00	140.7	0.152	151.8

136987 - 3033 Dundas Street, City of Mississauga
Post-Development Areas

Catchment Area	Total Area (m^2)	Landscaped Pervious Area (m^2)	Paver Area (m^2)	Impervious Area (m^2)	Sum of Paver and Impervious Areas (m^2)
101	1,061	0	0	1,061	1,061
102	1,710	486	431	792	1,223
103	958	0	285	673	958
104	1,627	566	403	658	1,061
105	1,419	100	304	1,015	1,319
106	204	30	0	173	173
107	160	65	17	78	94
108	205	113	44	47	91
109	265	31	181	52	234
110	850	550	0	300	300
111	1,018	0	0	1,018	1,018
Total	***9,475***	**1,942**	**1,664**	**5,869**	**7,532**
				Impervious =	**79.5%**

136987 - 3033 Dundas Street, City of Mississauga
Underground Tank Stage-Storage-Discharge Relationship

Orifice Pipe # 1

Pipe Invert =	160.09	m (@ Tank Outlet)
Pipe Radius =	0.1125	m
Pipe Diameter =	225	mm
Pipe Centreline =	160.203	m
Orifice Coefficient =	0.8	
Orifice Area =	0.0397596	m^2

Tank # 1 Storage

Tank Invert =	159.96	m		
Tank Obvert =	160.79	m		
Length =	21.84	m	24	units
Width =	17.29	m	38	units
Height =	0.91	m	1	units
Voids =	0.97			
Storage =	366.29	m^3/m		
Total Storage =	333.32	m^3		

Hydraulic Depth (m)	Elevation (m)	Description	Orifice # 1 Flow (m^3/s)	Total Flow (m^3/s)	Tank Total Storage (m^3)	Tank Active Storage (m^3)
-	159.96	Tank # 1 Invert			0.0	
-	160.00		-	-	14.7	-
-	160.05		-	-	33.0	-
0.00	160.09	(Tank Retention Storage = 47.6 m^3)	0.00000	0.00000	47.6	0.0
0.05	160.14		0.00560	0.00560	65.9	18.3
0.10	160.19		0.01800	0.01800	84.2	36.6
0.15	160.24		0.02864	0.02864	102.6	54.9
0.20	160.29		0.04375	0.04375	120.9	73.3
0.25	160.34		0.05484	0.05484	139.2	91.6
0.30	160.39		0.06404	0.06404	157.5	109.9
0.35	160.44		0.07208	0.07208	175.8	128.2
0.40	160.49		0.07931	0.07931	194.1	146.5
0.45	160.54		0.08592	0.08592	212.4	164.8
0.50	160.59		0.09207	0.09207	230.8	183.1
0.55	160.64		0.09783	0.09783	249.1	201.5
0.60	160.69		0.10327	0.10327	267.4	219.8
0.65	160.74		0.10844	0.10844	285.7	238.1
0.70	160.79		0.11337	0.11337	304.0	256.4
0.78	160.87	Tank # 1 Obvert	0.12084	0.12084	333.3	285.7
2.29	162.43	Surface Grade	0.22075	0.22075	333.3	285.7

Orifice equation: $Q = C_o \times A \times (2 \times g \times h)^{0.5}$

where:

A = orifice area (m^2)

g = 9.806 m/s^2

h = head above c/l of orifice (m)

Drain Down Time Calculation:

Tank Footprint Area =	377.6	m^2
Infiltration Rate =	15	mm/hour
Infiltration Rate =	4.16667E-06	m/s
Flow Rate =	0.0016	m^3/s
Retention Volume =	47.6	m^3
Drain Down Time =	**8.4**	**hours**

Appendix B

Stormwater Quality Calculations

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

04/09/2025

Province:	Ontario
City:	Mississauga
Nearest Rainfall Station:	TORONTO INTL AP
Climate Station Id:	6158731
Years of Rainfall Data:	20

Project Name:	3033 Dundas Street West
Project Number:	136987
Designer Name:	Andy Kroess
Designer Company:	IBI Group
Designer Email:	andy.kroess@ibigroup.com
Designer Phone:	519-585-2255
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	Proposed Conditions

Drainage Area (ha):	0.95
% Imperviousness:	79.50

Runoff Coefficient 'c': 0.77

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	22.95
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	100
Estimated Average Annual Sediment Load (kg/yr):	292
Estimated Average Annual Sediment Volume (L/yr):	237

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	51
EFO5	55
EFO6	59
EFO8	63
EFO10	66
EFO12	68

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 63

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

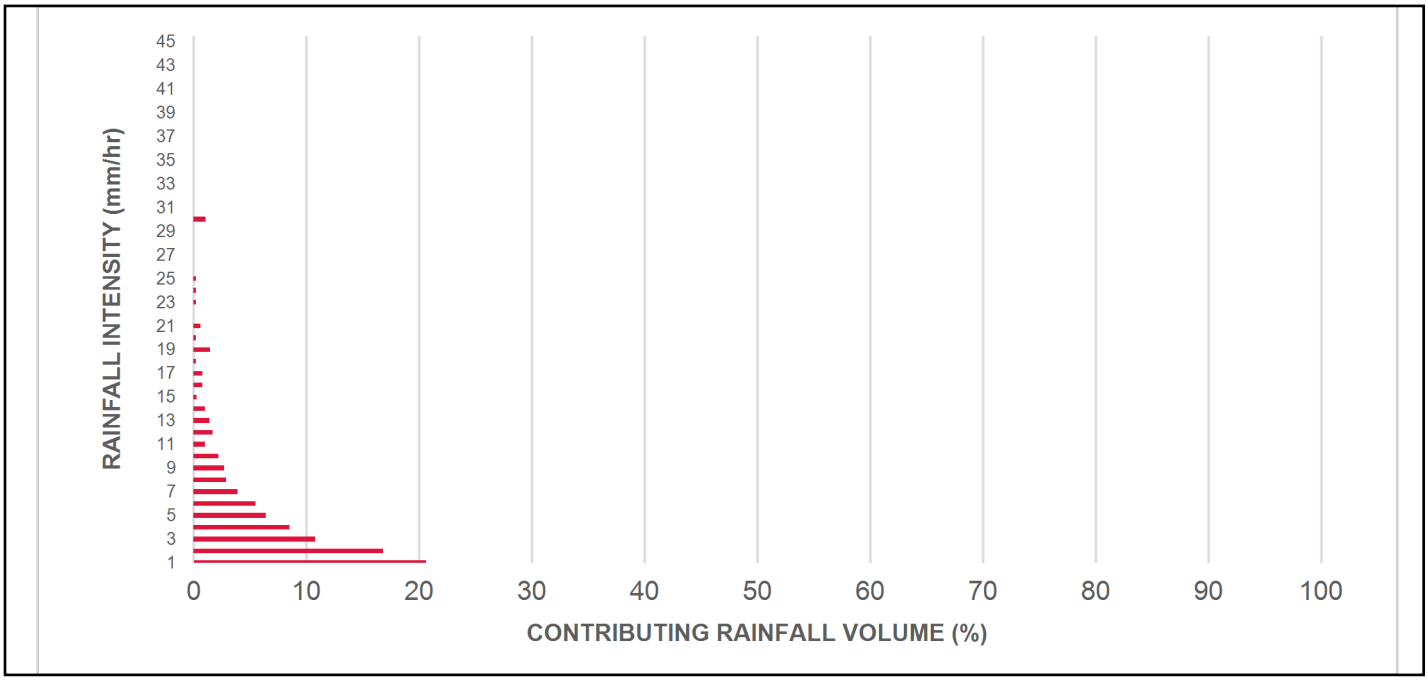
Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	1.03	62.0	13.0	70	6.0	6.0
1.00	20.6	29.1	2.05	123.0	26.0	70	14.5	20.5
2.00	16.8	45.9	4.10	246.0	52.0	69	11.6	32.1
3.00	10.8	56.7	6.16	369.0	79.0	66	7.1	39.1
4.00	8.5	65.2	8.21	492.0	105.0	62	5.3	44.4
5.00	6.4	71.6	10.26	616.0	131.0	60	3.8	48.2
6.00	5.5	77.0	12.31	739.0	157.0	58	3.2	51.4
7.00	3.9	81.0	14.36	862.0	183.0	56	2.2	53.6
8.00	2.9	83.9	16.42	985.0	210.0	54	1.6	55.2
9.00	2.7	86.5	18.47	1108.0	236.0	53	1.4	56.6
10.00	2.2	88.7	20.52	1231.0	262.0	52	1.1	57.7
11.00	1.0	89.7	22.57	1354.0	288.0	52	0.5	58.2
12.00	1.7	91.3	24.62	1477.0	314.0	51	0.8	59.1
13.00	1.4	92.8	26.68	1601.0	341.0	50	0.7	59.8
14.00	1.0	93.7	28.73	1724.0	367.0	49	0.5	60.2
15.00	0.3	94.0	30.78	1847.0	393.0	48	0.1	60.4
16.00	0.8	94.8	32.83	1970.0	419.0	47	0.4	60.8
17.00	0.8	95.7	34.88	2093.0	445.0	47	0.4	61.2
18.00	0.2	95.8	36.94	2216.0	472.0	46	0.1	61.2
19.00	1.5	97.3	38.99	2339.0	498.0	45	0.7	61.9
20.00	0.2	97.5	41.04	2462.0	524.0	44	0.1	62.0
21.00	0.6	98.2	43.09	2586.0	550.0	44	0.3	62.3
22.00	0.0	98.2	45.15	2709.0	576.0	43	0.0	62.3
23.00	0.2	98.4	47.20	2832.0	603.0	42	0.1	62.4
24.00	0.2	98.6	49.25	2955.0	629.0	42	0.1	62.5
25.00	0.2	98.9	51.30	3078.0	655.0	42	0.1	62.6
30.00	1.1	100.0	61.56	3694.0	786.0	41	0.5	63.0
35.00	0.0	100.0	71.82	4309.0	917.0	40	0.0	63.0
40.00	0.0	100.0	82.08	4925.0	1048.0	39	0.0	63.0
45.00	0.0	100.0	92.34	5541.0	1179.0	37	0.0	63.0
Estimated Net Annual Sediment (TSS) Load Reduction =								**63 %**

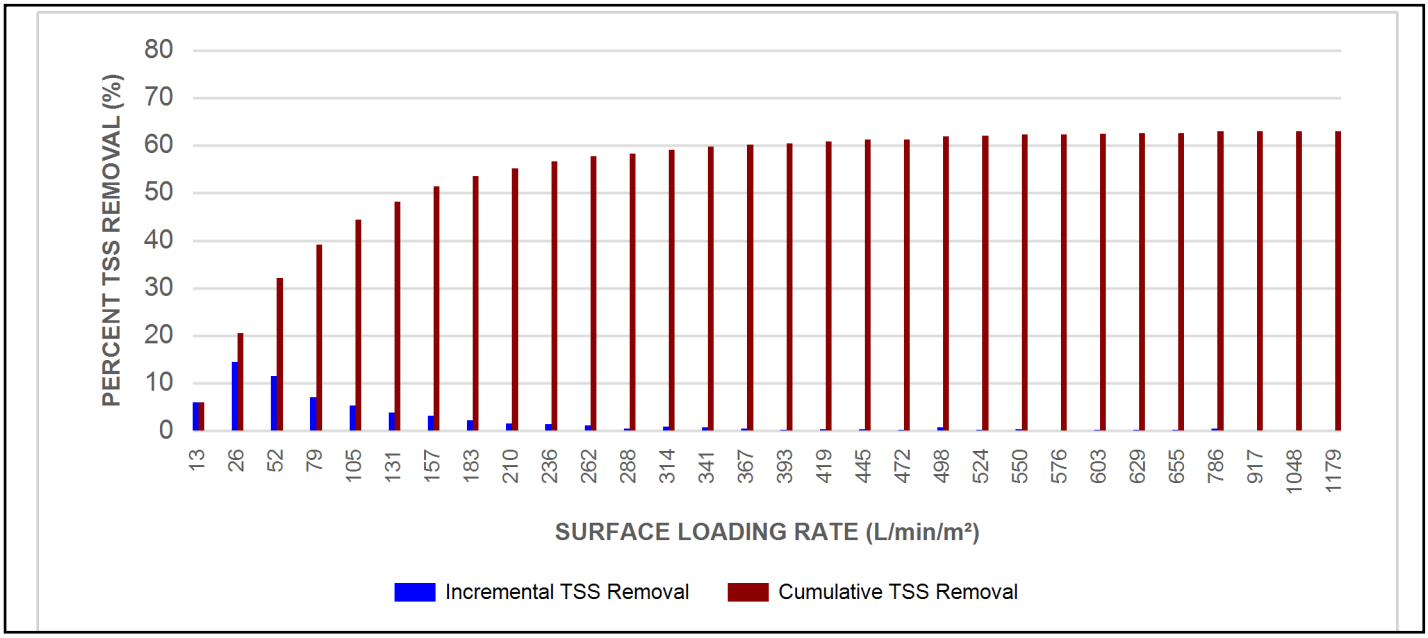
Climate Station ID: 6158731 *Years of Rainfall Data*: 20

imbrium

RAINFALL DATA FROM TORONTO INTL AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

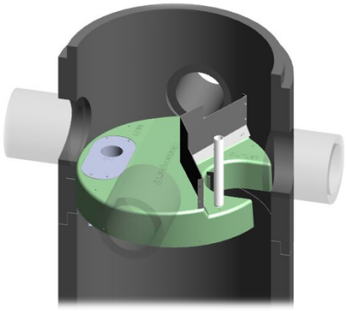
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

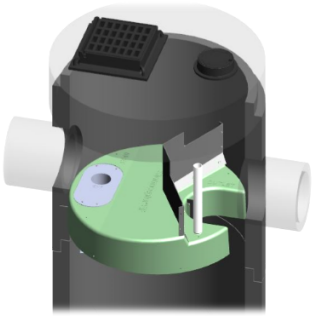
DESIGN FLEXIBILITY

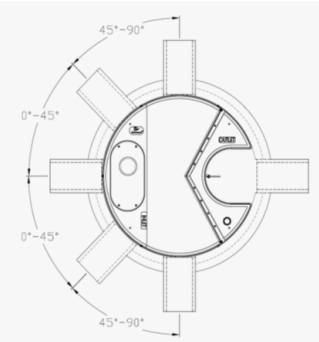
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-

entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Appendix C

Visual OTTHYMO Output

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       V    V   I    SS     U   U   A A   L
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        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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DATE: 04/10/2025                          TIME: 09:39:00

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 2 Year Storm - City of Missis **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 610.000
| Ptotal= 33.45 mm |                          B=   4.600
--------------------                          C=   0.780
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.08	1.00	5.41	2.00	7.59	3.00	2.90
0.08	2.18	1.08	6.41	2.08	6.60	3.08	2.77
0.17	2.30	1.17	7.92	2.17	5.86	3.17	2.65
0.25	2.42	1.25	10.50	2.25	5.27	3.25	2.54
0.33	2.57	1.33	15.92	2.33	4.80	3.33	2.45
0.42	2.74	1.42	34.55	2.42	4.42	3.42	2.36
0.50	2.93	1.50	104.51	2.50	4.10	3.50	2.28
0.58	3.16	1.58	40.00	2.58	3.82	3.58	2.20
0.67	3.43	1.67	21.22	2.67	3.59	3.67	2.13
0.75	3.76	1.75	14.48	2.75	3.38	3.75	2.06
0.83	4.18	1.83	11.05	2.83	3.20	3.83	2.00
0.92	4.71	1.92	8.98	2.92	3.04	3.92	1.95

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 0.95 Total Imp(%)= 79.50 Dir. Conn.(%)= 79.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.75	0.19	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	79.48	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	104.51	19.16	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	2.19 (ii)	4.85 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.31	0.22	
				TOTALS
PEAK FLOW	(cms)=	0.20	0.01	0.213 (iii)
TIME TO PEAK	(hrs)=	1.58	1.58	1.58
RUNOFF VOLUME	(mm)=	32.45	8.75	27.59
TOTAL RAINFALL	(mm)=	33.45	33.45	33.45
RUNOFF COEFFICIENT	=	0.97	0.26	0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0793      0.0147
                          0.0056     0.0018    |   0.0859      0.0165
                          0.0180     0.0037    |   0.0921      0.0183
                          0.0286     0.0055    |   0.0978      0.0202
                          0.0438     0.0073    |   0.1033      0.0220
                          0.0548     0.0092    |   0.1084      0.0238
                          0.0640     0.0110    |   0.1134      0.0256
                          0.0721     0.0128    |   0.1208      0.0286

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.947      0.213      1.58      27.59
   OUTFLOW: ID= 1 (  0002)      0.947      0.063      1.75      27.51

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 29.75
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0110

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================================================================================
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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2015)
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        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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DATE: 04/10/2025                          TIME: 09:39:00

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 5 Year Storm - City of Missis **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 820.000
| Ptotal= 44.96 mm |                          B=   4.600
--------------------                          C=   0.780
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.80	1.00	7.28	2.00	10.21	3.00	3.89
0.08	2.93	1.08	8.61	2.08	8.88	3.08	3.72
0.17	3.09	1.17	10.64	2.17	7.87	3.17	3.56
0.25	3.26	1.25	14.11	2.25	7.09	3.25	3.42
0.33	3.45	1.33	21.40	2.33	6.46	3.33	3.29
0.42	3.68	1.42	46.44	2.42	5.94	3.42	3.17
0.50	3.94	1.50	140.49	2.50	5.51	3.50	3.06
0.58	4.25	1.58	53.77	2.58	5.14	3.58	2.96
0.67	4.61	1.67	28.53	2.67	4.82	3.67	2.86
0.75	5.06	1.75	19.46	2.75	4.54	3.75	2.77
0.83	5.61	1.83	14.85	2.83	4.30	3.83	2.69
0.92	6.33	1.92	12.07	2.92	4.09	3.92	2.62

CALIB STANDHYD (0001) | ID= 1 DT= 5.0 min	Area (ha)= 0.95 Total Imp(%)= 79.50 Dir. Conn.(%)= 79.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.75	0.19	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	79.48	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	140.49	32.84	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.94 (ii)	4.31 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.31	0.23	
				TOTALS
PEAK FLOW	(cms)=	0.28	0.02	0.296 (iii)
TIME TO PEAK	(hrs)=	1.58	1.58	1.58
RUNOFF VOLUME	(mm)=	43.96	14.74	37.97
TOTAL RAINFALL	(mm)=	44.96	44.96	44.96
RUNOFF COEFFICIENT	=	0.98	0.33	0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0793      0.0147
                          0.0056     0.0018    |   0.0859      0.0165
                          0.0180     0.0037    |   0.0921      0.0183
                          0.0286     0.0055    |   0.0978      0.0202
                          0.0438     0.0073    |   0.1033      0.0220
                          0.0548     0.0092    |   0.1084      0.0238
                          0.0640     0.0110    |   0.1134      0.0256
                          0.0721     0.0128    |   0.1208      0.0286

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.947      0.296      1.58      37.97
   OUTFLOW: ID= 1 (  0002)      0.947      0.081      1.75      37.89

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 27.23
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0151

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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

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19c6afe-a000-4fc5-a312-ef2f034451e4\


DATE: 04/10/2025                          TIME: 09:39:00

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 10 Year Storm - City of Missi **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1010.000
| Ptotal= 55.38 mm |                          B=   4.600
--------------------                          C=   0.780
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.44	1.00	8.96	2.00	12.58	3.00	4.79
0.08	3.61	1.08	10.61	2.08	10.93	3.08	4.58
0.17	3.80	1.17	13.11	2.17	9.70	3.17	4.39
0.25	4.01	1.25	17.38	2.25	8.73	3.25	4.21
0.33	4.26	1.33	26.35	2.33	7.96	3.33	4.05
0.42	4.53	1.42	57.21	2.42	7.32	3.42	3.90
0.50	4.85	1.50	173.04	2.50	6.78	3.50	3.77
0.58	5.23	1.58	66.23	2.58	6.33	3.58	3.64
0.67	5.68	1.67	35.14	2.67	5.94	3.67	3.53
0.75	6.23	1.75	23.97	2.75	5.60	3.75	3.42
0.83	6.91	1.83	18.29	2.83	5.30	3.83	3.32
0.92	7.79	1.92	14.87	2.92	5.03	3.92	3.22

CALIB STANDHYD (0001) | ID= 1 DT= 5.0 min	Area (ha)= 0.95 Total Imp(%)= 79.50 Dir. Conn.(%)= 79.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.75	0.19	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	79.48	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	173.04	47.25	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.79 (ii)	3.96 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.32	0.24	
				TOTALS
PEAK FLOW	(cms)=	0.35	0.03	0.373 (iii)
TIME TO PEAK	(hrs)=	1.58	1.58	1.58
RUNOFF VOLUME	(mm)=	54.38	20.95	47.52
TOTAL RAINFALL	(mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT	=	0.98	0.38	0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0793      0.0147
                          0.0056     0.0018    |   0.0859      0.0165
                          0.0180     0.0037    |   0.0921      0.0183
                          0.0286     0.0055    |   0.0978      0.0202
                          0.0438     0.0073    |   0.1033      0.0220
                          0.0548     0.0092    |   0.1084      0.0238
                          0.0640     0.0110    |   0.1134      0.0256
                          0.0721     0.0128    |   0.1208      0.0286

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.947      0.373      1.58      47.52
   OUTFLOW: ID= 1 (  0002)      0.947      0.094      1.75      47.45

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 25.23
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0190

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

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6bfd90b-58fa-45ce-a84b-c87adaa65a26\


DATE: 04/10/2025                          TIME: 09:39:00

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
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  ************************************************
  ** SIMULATION : 25 Year Storm - City of Missi **
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1160.000
| Ptotal= 63.60 mm |                          B=   4.600
--------------------                          C=   0.780
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.96	1.00	10.29	2.00	14.44	3.00	5.51
0.08	4.15	1.08	12.19	2.08	12.56	3.08	5.26
0.17	4.37	1.17	15.06	2.17	11.14	3.17	5.04
0.25	4.61	1.25	19.96	2.25	10.03	3.25	4.84
0.33	4.89	1.33	30.27	2.33	9.14	3.33	4.65
0.42	5.20	1.42	65.70	2.42	8.40	3.42	4.48
0.50	5.57	1.50	198.74	2.50	7.79	3.50	4.33
0.58	6.01	1.58	76.06	2.58	7.27	3.58	4.18
0.67	6.53	1.67	40.36	2.67	6.82	3.67	4.05
0.75	7.16	1.75	27.53	2.75	6.43	3.75	3.92
0.83	7.94	1.83	21.01	2.83	6.09	3.83	3.81
0.92	8.95	1.92	17.08	2.92	5.78	3.92	3.70

CALIB STANDHYD (0001) | ID= 1 DT= 5.0 min	Area (ha)= 0.95 Total Imp(%)= 79.50 Dir. Conn.(%)= 79.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.75	0.19	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	79.48	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	198.74	59.72	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.69 (ii)	3.75 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.32	0.25	
				TOTALS
PEAK FLOW	(cms)=	0.40	0.03	0.435 (iii)
TIME TO PEAK	(hrs)=	1.58	1.58	1.58
RUNOFF VOLUME	(mm)=	62.60	26.28	55.15
TOTAL RAINFALL	(mm)=	63.60	63.60	63.60
RUNOFF COEFFICIENT	=	0.98	0.41	0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0793      0.0147
                          0.0056     0.0018    |   0.0859      0.0165
                          0.0180     0.0037    |   0.0921      0.0183
                          0.0286     0.0055    |   0.0978      0.0202
                          0.0438     0.0073    |   0.1033      0.0220
                          0.0548     0.0092    |   0.1084      0.0238
                          0.0640     0.0110    |   0.1134      0.0256
                          0.0721     0.0128    |   0.1208      0.0286

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.947      0.435      1.58      55.15
   OUTFLOW: ID= 1 (  0002)      0.947      0.104      1.75      55.07

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.88
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0222

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================================================================================
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

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3280d7a-6ab0-4183-aee0-5027564d727b\


DATE: 04/10/2025                          TIME: 09:39:00

USER:



COMMENTS: _____________________________________________________________


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  ************************************************
  ** SIMULATION : 50 Year Storm - City of Missi **
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1300.000
| Ptotal= 71.26 mm |                          B=   4.700
--------------------                          C=   0.780
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.44	1.00	11.57	2.00	16.24	3.00	6.18
0.08	4.66	1.08	13.70	2.08	14.11	3.08	5.90
0.17	4.90	1.17	16.93	2.17	12.51	3.17	5.66
0.25	5.17	1.25	22.45	2.25	11.27	3.25	5.43
0.33	5.48	1.33	34.05	2.33	10.26	3.33	5.22
0.42	5.84	1.42	73.78	2.42	9.44	3.42	5.03
0.50	6.26	1.50	220.93	2.50	8.75	3.50	4.86
0.58	6.74	1.58	85.37	2.58	8.16	3.58	4.69
0.67	7.33	1.67	45.39	2.67	7.66	3.67	4.54
0.75	8.03	1.75	30.97	2.75	7.22	3.75	4.40
0.83	8.92	1.83	23.63	2.83	6.83	3.83	4.27
0.92	10.05	1.92	19.20	2.92	6.49	3.92	4.15

CALIB STANDHYD (0001) | ID= 1 DT= 5.0 min	Area (ha)= 0.95 Total Imp(%)= 79.50 Dir. Conn.(%)= 79.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.75	0.19	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	79.48	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	220.93	71.69	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.62 (ii)	3.59 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.32	0.26	
				TOTALS
PEAK FLOW	(cms)=	0.45	0.04	0.490 (iii)
TIME TO PEAK	(hrs)=	1.58	1.58	1.58
RUNOFF VOLUME	(mm)=	70.26	31.51	62.31
TOTAL RAINFALL	(mm)=	71.26	71.26	71.26
RUNOFF COEFFICIENT	=	0.99	0.44	0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0793      0.0147
                          0.0056     0.0018    |   0.0859      0.0165
                          0.0180     0.0037    |   0.0921      0.0183
                          0.0286     0.0055    |   0.0978      0.0202
                          0.0438     0.0073    |   0.1033      0.0220
                          0.0548     0.0092    |   0.1084      0.0238
                          0.0640     0.0110    |   0.1134      0.0256
                          0.0721     0.0128    |   0.1208      0.0286

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.947      0.490      1.58      62.31
   OUTFLOW: ID= 1 (  0002)      0.947      0.112      1.75      62.23

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.94
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0253

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================================================================================
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


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DATE: 04/10/2025                          TIME: 09:39:00

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-----------------------
  ********************************************
  ** SIMULATION : 100 Year Storm - City of Miss **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1450.000
| Ptotal= 79.43 mm |                          B=   4.900
--------------------                          C=   0.780
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used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.96	1.00	12.96	2.00	18.22	3.00	6.91
0.08	5.20	1.08	15.36	2.08	15.83	3.08	6.60
0.17	5.48	1.17	19.00	2.17	14.03	3.17	6.33
0.25	5.78	1.25	25.22	2.25	12.63	3.25	6.07
0.33	6.13	1.33	38.26	2.33	11.50	3.33	5.84
0.42	6.53	1.42	82.58	2.42	10.57	3.42	5.62
0.50	7.00	1.50	242.53	2.50	9.80	3.50	5.43
0.58	7.55	1.58	95.48	2.58	9.14	3.58	5.25
0.67	8.20	1.67	50.99	2.67	8.57	3.67	5.08
0.75	8.99	1.75	34.80	2.75	8.08	3.75	4.92
0.83	9.99	1.83	26.55	2.83	7.64	3.83	4.78
0.92	11.26	1.92	21.56	2.92	7.26	3.92	4.64

CALIB STANDHYD (0001) | ID= 1 DT= 5.0 min	Area (ha)= 0.95 Total Imp(%)= 79.50 Dir. Conn.(%)= 79.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.75	0.19	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	79.48	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	242.53	84.59	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.56 (ii)	3.46 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.33	0.26	
				TOTALS
PEAK FLOW	(cms)=	0.49	0.05	0.543 (iii)
TIME TO PEAK	(hrs)=	1.58	1.58	1.58
RUNOFF VOLUME	(mm)=	78.43	37.35	70.00
TOTAL RAINFALL	(mm)=	79.43	79.43	79.43
RUNOFF COEFFICIENT	=	0.99	0.47	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

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            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0793      0.0147
                          0.0056     0.0018    |   0.0859      0.0165
                          0.0180     0.0037    |   0.0921      0.0183
                          0.0286     0.0055    |   0.0978      0.0202
                          0.0438     0.0073    |   0.1033      0.0220
                          0.0548     0.0092    |   0.1084      0.0238
                          0.0640     0.0110    |   0.1134      0.0256
                          0.0721     0.0128    |   0.1208      0.0286

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.947      0.543      1.58      70.00
   OUTFLOW: ID= 1 (  0002)      0.947      0.121      1.75      69.93

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.18
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0286

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