LAND & BUILDING EXPERTS

2020

STORMWATER MANAGEMENT REPORT

PROPOSED HOTEL

1144 DIVISION STREET
TOWN OF COBOURG

PROJECT NO: DIVISION-20-01

DATE: November 30, 2020
REVISED ON:

PREPARED BY: LAND & BUILDING EXPERTS LTD.
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1.0 INTRODUCTION

Land & Building Experts has been retained by Archisystem INC. to prepare a Stormwater management report for the proposed hotel, 1144 Division Street, Cobourg, Ontario.

The existing land at Division Street is presently consist of existing building, paved area and landscaped area. The owners of this property wish to develop the hotel.

The existing property is approximately 0.4927 ha in size and consist of existing building, paved area and landscaped area. The subject property westerly drains to the east side of Division Street which in turn drains to catch basins connected to the City storm sewer network on Division Street.

The proposed new area will consist of existing/proposed buildings, pavement parking lot areas and landscaped areas. The pavement parking area will be used as storm water management ponds.

The stormwater management for the area will consist of dry retention ponds and orifice pipes to control quantity and Stormceptor for quality control. The on-site storm sewer piping will be connected to existing storm sewers on Division Street.

The proposed new parking will consist of asphalt surface, curbs, etc. The project will also include concrete sidewalks. The proposed area will consist of 0.1387 ha of building, 0.2244 ha of paved parking and 0.1296 ha of landscape.

The stormwater management plan for this area is to provide catchbasins and piped storm sewers. The quantity control to pre-development flows will be by surface storage and orifice pipe. For quality control this area will be piped to the stormceptor servicing the property.

2.0 STORMWATER MANAGEMENT

2.1 DESIGN CRITERIA

The Town requires that the stormwater management system for this proposed site shall be as per the Town of Cobourg Design Criteria.

Quantity Control:
Post-development peak flows from the proposed development site, be controlled to the predevelopment peak flow levels of 5 year under the 100-year storm events.

Quality Control:
A Level-1 quality control (80% TSS removal) shall be designed for this proposed site.

Analysis:
- Rational method for calculation of water quality storage.
- $T_{C\ PRE}$ = 15 min for 5 year target release rate which need to be controlled to under 100 year storm event.
- $T_{C\ POST}$ = 15 min (Town criteria)

2.2 SITE DETAILS

PREDEVELOPMENT CONDITION

0.025 ha of existing site presently drains to Regional sewer through existing catchbasin. And 0.092 ha of site drain south into the property. Drainage area consists of one building, asphalt parking areas, concrete walkways and grass area as noted below:

Existing building area	= 0.0539 ha
Existing paved area	= 0.1712 ha
Existing grass area	= 0.2676 ha
Total site area	= 0.4927 ha
Composite runoff coefficient	= 0.55

The predevelopment drainage areas and flow directions are provided on Figure-1, page 8. The runoff coefficient calculations are provided on Appendix-2.

POST-DEVELOPMENT CONDITION

The Owners of the subject property wish to construct the additional hotel building and renovate the parking area. (See dwg. SS-1 and Figure-2, page 9). The proposed development site statistics would be as follows:

Existing/Proposed building area	= 0.1387 ha
Existing/Proposed paved area	= 0.2244 ha
Existing/Proposed grass area	= 0.1296 ha
Total site area	= 0.4927 ha
Composite runoff coefficient	= 0.73

The proposed grading and the proposed parking lot area would contain stormwater from the site up to 100-year storm draining to the proposed control manhole.

The proposed development would also consist of a stormwater quantity control system (orifice pipe), quality control system (Stormceptor model EFO4) as required by Town (see dwg. SS-1).

The overland flows shall drain westerly to the front, during the major storm events (see dwg. SS-1 and Figure-2, page 9).

2.3 DESIGN DETAILS

PREDEVELOPMENT CONDITION

The existing site presently consists of a building, paved areas, and landscape area. The composite runoff coefficient for this existing site is 0.55.

Rational formula was utilized to establish the 5 year predevelopment peak flows for the entire site using the following parameters.

Total area	= 0.4927 ha
Composite runoff coefficient	= 0.55
Time of concentration (Tc)	= 15 min

Rational formula calculation have been attached in Appendix 3.

The 5 year predevelopment peak flow (see Appendix 3) = 0.060 cu.m/s

POST-DEVELOPMENT CONDITION

Quantity Control

The proposed development would consist of an existing building, proposed building, proposed parking areas and landscape areas (see DWG. SS-1 and Figure-2, page 9).

The Town requires that the post-development peak flows for 5 year to 100-year storms be controlled to predevelopment peak flow levels. Therefore, an orifice pipe at maintenance hole #1 has been provided to control the storm flows from the site. The post-development peak flows from the site have been established using the following runoff coefficients;

Runoff coefficient for:	
Building areas	= 0.90
paved areas	= 0.90
Landscape/grass area	= 0.25
Existing and proposed site areas;	
Existing/Proposed building area	= 0.1387 ha
Existing/Proposed paved area	= 0.2244 ha
Existing/Proposed grass area	= 0.1296 ha
Total site area	= 0.4927 ha
Composite runoff coefficient	= 0.73
Uncontrolled impermeable area	= 0.0565 ha
Uncontrolled landscaped area	= 0.0877 ha
Controlled impermeable area	= 0.3066 ha
Controlled landscaped area	= 0.0419 ha
Total area	= 0.4927 ha

A 100mm diameter orifice pipe would be installed at Manhole # 1 (see DWG. SS-1) to control the post-development flows to 5 year predevelopment peak flow level. The calculations of the orifice flows are provided in Appendix 2 (Orifice, Stage Storage Details).

The proposed grading in the permeable paved area would provide the required storage for storms up to 100 year.

The Rational method was used for the required storage volumes (see Appendix 3) using the rainfall data provided by the Town of Cobourg. The results of the above are listed below.

Uncontrolled area peak flow	= 0.026 cu.m/s
Controlled area peak flow	= 0.034 cu.m/s
The 5-year predevelopment peak flow	= 0.060 cu.m/s
The 100-year routed peak flow (100mm Orifice)	= 0.060 cu.m/s
Required storage (100-year storm)	= 77.81 cu.m
Available storage at 0.3m pond (Appendix 3)	= 80.42 cu.m

The overland flows shall drain westerly to the front, during the major storm events (see dwg. SS-1, rear pocket and Figure-2, page 9).

Quality Control

The Town requires that a Level-1 protection shall be provided for an 80% TSS removal from the stormwater runoff for the site upon development. A Stormceptor model EFO4 has been recommended (see dwg. SS-1 and Appendix 1).

The following parameters were utilized for the stormceptor sizing:

Total paved area	= 0.2244 ha
Runoff coefficient	= 0.90
Maximum flow	= 0.052 cu.m/s
Storage	= 0.0080 ha.m

The stormceptor sizing printout is attached on Appendix-1.

Furthermore, the following steps shall be taken to ensure additional stormwater quality, downstream of the proposed development during construction.

a. Protect all exposed surfaces and control all runoff during constructions;
b. All erosion control measures to be in place before starting construction and remain in place until restoration/construction is complete;
c. Maintain erosion control measures during construction in good working order;
d. Minimize area disturbed during construction;
e. Protect all catchbasins, manholes and pipe ends from sediment intrusions;
f. Silt fence to be used as specified and as directed by the engineer during construction;
g. Gravel entrance shall be provided wherever equipment leaves the site to prevent mud tracking onto paved surface. Gravel entrance shall be maintained in clean condition.

3.0 CONCLUSION AND RECOMMENDATIONS

The preceding sections and the detailed design analysis appended herewith indicate that the proposed stormwater management system meets with the Region requirements.

Predevelopment peak flow (5 year storm)	= 0.060 cu.m/s
Designed post-development peak flow (100 year storm)	= 0.060 cu.m/s
Required storage (100 year storm)	= 77.81 cu.m
Available storage (0.3m pond)	= 80.42 cu.m

A Stormceptor model EFO4 has been recommended to address quality control requirements.

Existing drainage patterns on adjacent properties shall not be altered and stormwater runoff from the subject development shall not be directed to drain onto adjacent properties.

It is therefore, recommended that this report be adopted for detailed design if the Town finds the analysis noted herein, acceptable.

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LAND & BUILDING EXPERTS

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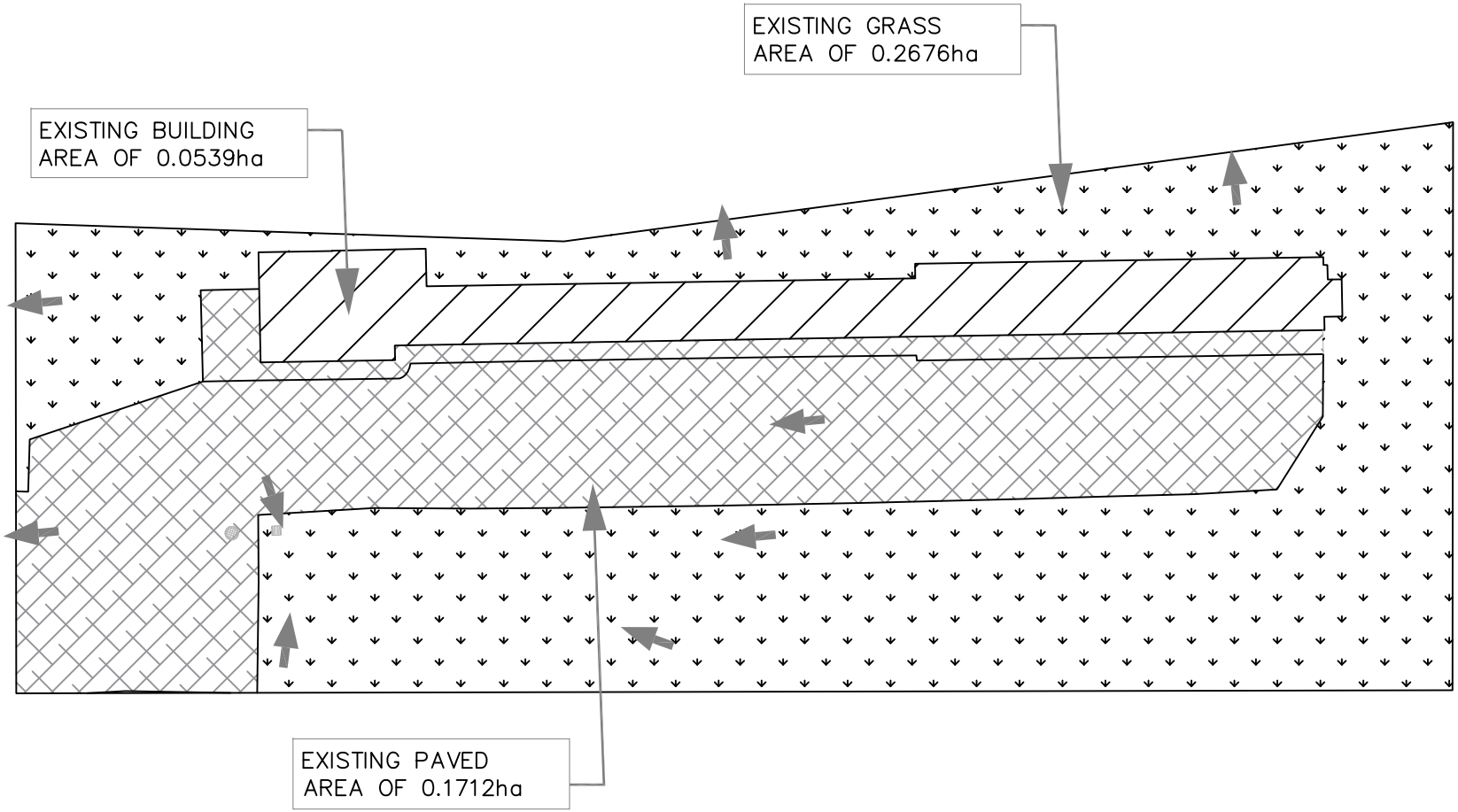
Joomin Park, M.Eng

Edgar Labuac, P.Eng.



DRAINAGE AREA STATISTICS:	
EXISTING GRASS AREA	= 0.2676 ha
EXISTING BUILDING AREA	= 0.0539 ha
EXISTING PAVED AREA	= 0.1712 ha
TOTAL SITE AREA	= 0.4927 ha
COMPOSITE RUNOFF COEFFICIENT	= 0.55

OVERLAND FLOW DIRECTION

FIGURE 1. PREDEVELOPMENT DRAINAGE AREAS

SCALE: N.T.S

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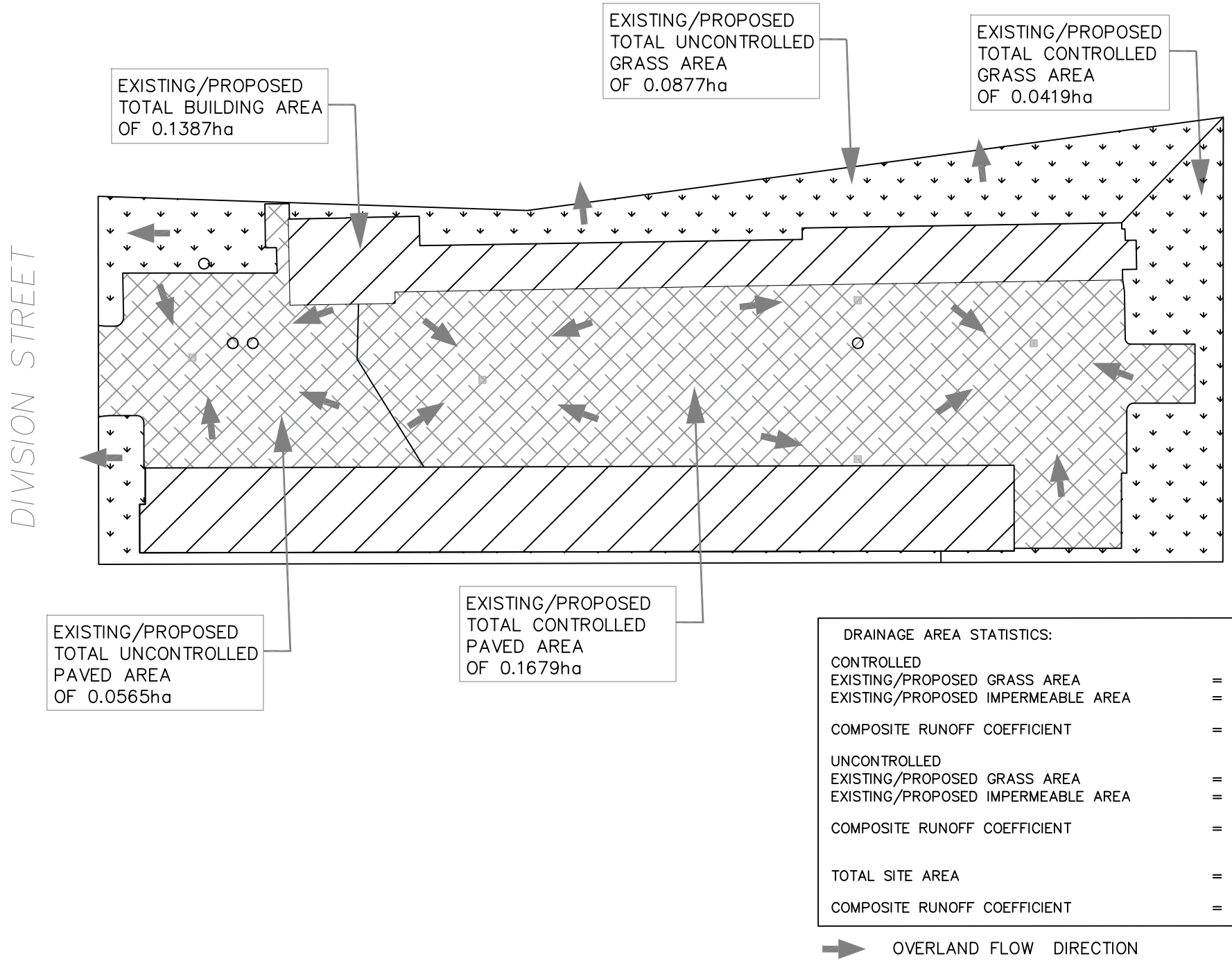

DRAINAGE AREA STATISTICS:

CONTROLLED	
EXISTING/PROPOSED GRASS AREA	= 0.0419 ha
EXISTING/PROPOSED IMPERMEABLE AREA	= 0.3066 ha
COMPOSITE RUNOFF COEFFICIENT	= 0.82
UNCONTROLLED	
EXISTING/PROPOSED GRASS AREA	= 0.0877 ha
EXISTING/PROPOSED IMPERMEABLE AREA	= 0.0565 ha
COMPOSITE RUNOFF COEFFICIENT	= 0.50
TOTAL SITE AREA	= 0.4927 ha
COMPOSITE RUNOFF COEFFICIENT	= 0.73

OVERLAND FLOW DIRECTION

FIGURE 2. POST–DEVELOPMENT DRAINAGE AREAS

SCALE: N.T.S

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APPENDICES

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APPENDIX 1

STORMCEPTOR
SYSTEM SIZING

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/29/2020

Province:	Ontario
City:	Cobourg
Nearest Rainfall Station:	PETERBOROUGH AP
NCDC Rainfall Station Id:	6418
Years of Rainfall Data:	32

Site Name:	Cobourg

Drainage Area (ha):	0.4927
Runoff Coefficient 'c':	0.73

Particle Size Distribution:	Fine

Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.0

Oil / Fuel Spill Risk Site?	Yes

Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	85

Peak Conveyance (maximum) Flow Rate (L/s):	85

Project Name:	Cobourg
Project Number:	-
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	905-630-0359
EOR Name:	Joomin Park
EOR Company:	Ontario Land & Building Experts Canada Ltd.
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	80
EFO6	86
EFO8	90
EFO10	91
EFO12	92

Recommended Stormceptor EFO Model: **EFO4**

Estimated Net Annual Sediment (TSS) Load Reduction (%): **80**

Water Quality Runoff Volume Capture (%): **> 90**

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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 waterways.

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

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Upstream Flow Controlled Results

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 (%)
1	50.7	50.7	0.99	60.0	50.0	92	46.6	46.6
2	9.4	60.1	1.99	119.0	99.0	87	8.2	54.8
3	6.0	66.1	2.98	179.0	149.0	81	4.9	59.7
4	4.4	70.5	3.98	239.0	199.0	77	3.4	63.1
5	3.8	74.3	4.97	298.0	249.0	72	2.8	65.8
6	2.8	77.1	5.97	358.0	298.0	68	1.9	67.7
7	2.5	79.6	6.96	418.0	348.0	63	1.6	69.3
8	2.6	82.2	7.96	477.0	398.0	59	1.5	70.9
9	2.0	84.2	8.95	537.0	447.0	57	1.1	72.0
10	1.9	86.1	9.94	597.0	497.0	55	1.1	73.0
11	1.8	87.9	10.94	656.0	547.0	54	1.0	74.0
12	1.5	89.4	11.93	716.0	597.0	52	0.8	74.8
13	1.0	90.4	12.93	776.0	646.0	52	0.5	75.3
14	1.0	91.4	13.92	835.0	696.0	52	0.5	75.8
15	0.9	92.3	14.92	895.0	746.0	51	0.5	76.3
16	0.7	93.0	15.91	955.0	796.0	51	0.4	76.6
17	0.6	93.6	16.90	1014.0	845.0	51	0.3	76.9
18	1.0	94.6	17.90	1074.0	895.0	51	0.5	77.5
19	0.6	95.2	18.89	1134.0	945.0	50	0.3	77.8
20	0.4	95.6	19.89	1193.0	994.0	50	0.2	78.0
21	0.3	95.9	20.88	1253.0	1044.0	50	0.1	78.1
22	0.6	96.5	21.88	1313.0	1094.0	49	0.3	78.4
23	0.3	96.8	22.87	1372.0	1144.0	49	0.1	78.5
24	0.4	97.2	23.87	1432.0	1193.0	48	0.2	78.7
25	0.3	97.5	24.86	1492.0	1243.0	48	0.1	78.9

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 (%)
26	0.2	97.7	25.85	1551.0	1293.0	47	0.1	79.0
27	2.3	100.0	26.85	1611.0	1342.0	47	1.1	80.0
28	0.0	100.0	27.84	1671.0	1392.0	46	0.0	80.0
29	0.0	100.0	28.84	1730.0	1442.0	45	0.0	80.0
30	0.0	100.0	29.83	1790.0	1492.0	43	0.0	80.0
31	0.0	100.0	30.83	1850.0	1541.0	42	0.0	80.0
32	0.2	100.2	31.82	1909.0	1591.0	41	0.1	80.1
33	-0.2	100.0	32.82	1969.0	1641.0	39	0.0	80.0
34	0.2	100.2	33.81	2029.0	1690.0	38	0.1	80.1
35	-0.2	100.0	34.80	2088.0	1740.0	37	0.0	80.1
36	0.0	100.0	35.80	2148.0	1790.0	36	0.0	80.1
37	0.0	100.0	36.79	2208.0	1840.0	35	0.0	80.1
38	0.0	100.0	37.79	2267.0	1889.0	34	0.0	80.1
39	0.0	100.0	38.78	2327.0	1939.0	33	0.0	80.1
40	0.0	100.0	39.78	2387.0	1989.0	33	0.0	80.1
41	0.0	100.0	40.77	2446.0	2039.0	32	0.0	80.1
42	0.0	100.0	41.77	2506.0	2088.0	31	0.0	80.1
43	0.0	100.0	42.76	2566.0	2138.0	30	0.0	80.1
44	0.0	100.0	43.75	2625.0	2188.0	30	0.0	80.1
45	0.0	100.0	44.75	2685.0	2237.0	29	0.0	80.1
46	0.0	100.0	45.74	2745.0	2287.0	28	0.0	80.1
47	0.0	100.0	46.74	2804.0	2337.0	28	0.0	80.1
48	0.0	100.0	47.73	2864.0	2387.0	27	0.0	80.1
49	0.0	100.0	48.73	2924.0	2436.0	27	0.0	80.1
50	0.0	100.0	49.72	2983.0	2486.0	26	0.0	80.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**80 %**

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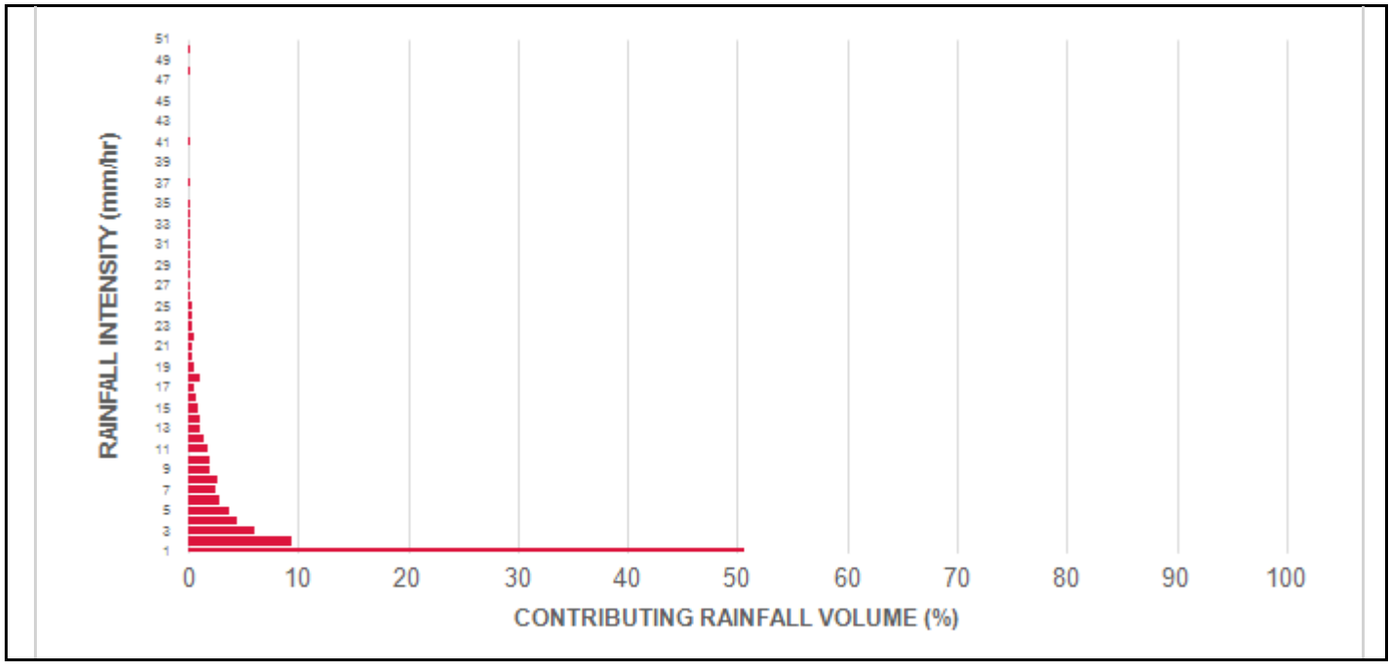
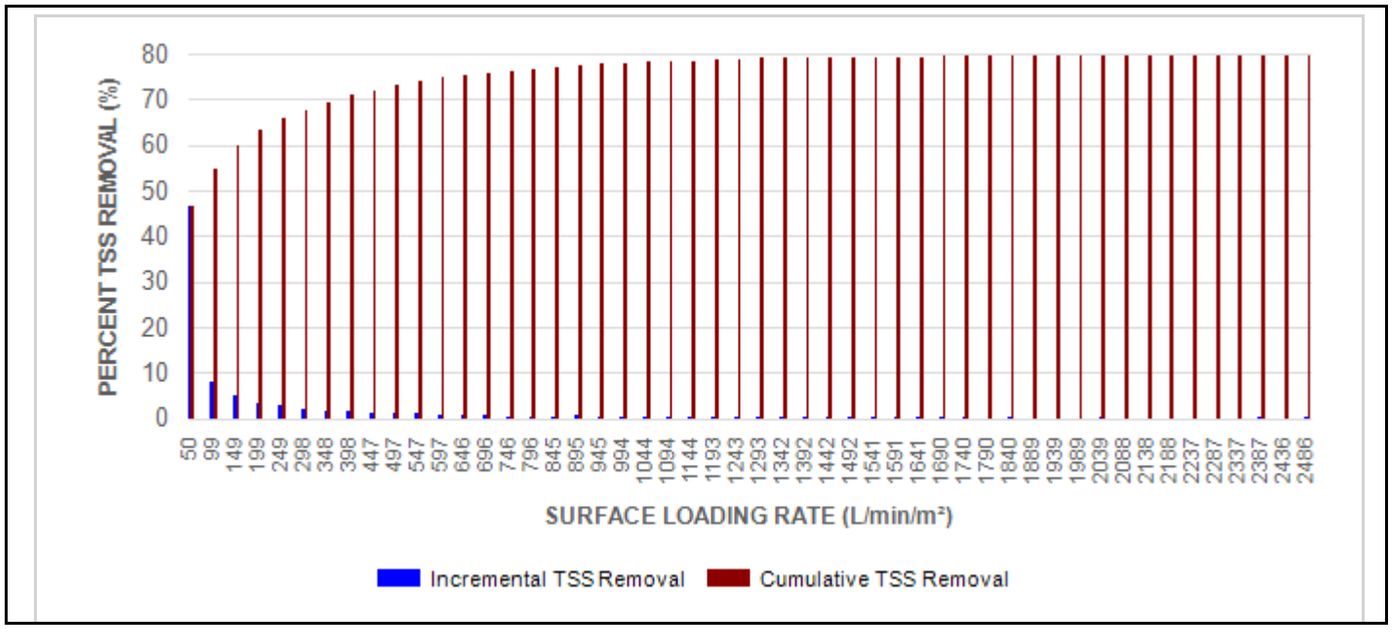
RAINFALL DATA FROM PETERBOROUGH AP RAINFALL STATION



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
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

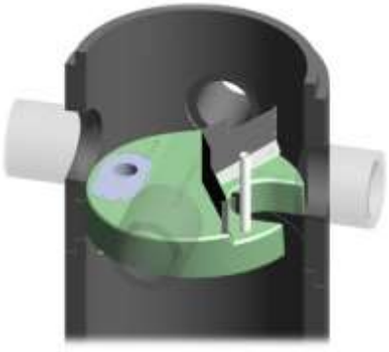
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

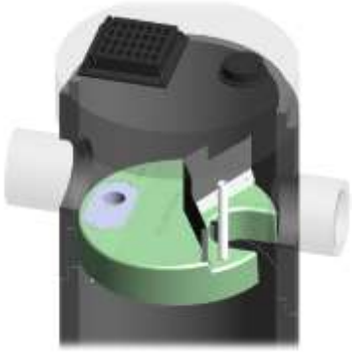
DESIGN FLEXIBILITY

►**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.





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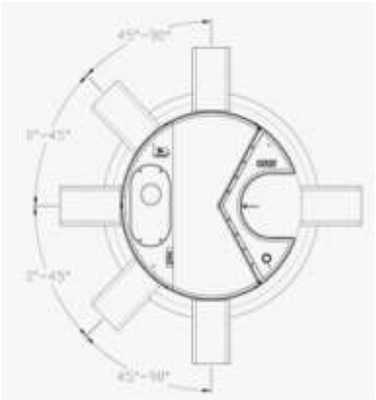

INLET-TO-OUTLET DROP

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
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

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STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT 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** S**eparators**

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
	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 shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. 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/m2 to 2600 L/min/m2) 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.

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APPENDIX 2

ORIFICE, STAGE STORAGE DETAILS

ORIFICE, STAGE-STORAGE DETAILS

a. Orifice Capacity '**Q' = CA$\sqrt{(2gh)}$** where **C** = 0.60
Invert Elevation at Control MH # 1(100 mmϕ Orifice) = 100.27
Orifice Centre Elevation = 100.32

Orifice pipe size = 100 mm

'Q' for outfall at water elevation 100.87 = 0.0339 cu.m/s

b. Stage storage at parking area and discharge details (100mmΦ orifice)

Water Elev. (m)	**Head (m)**	**Outflow (cu.m/s)**	**Storage (ha.m)**
100.57	2.25	0.0318	0.0004
100.67	2.35	0.0325	0.0013
100.77	2.45	0.0332	0.0038
100.87	2.55	0.0339	0.0080

PIPE VOLUME (300mmΦ 63.5m) = 4.5 cu.m

5-year predevelopment peak flow = 0.060 cu.m/s
100-year routed post-development peak flow = 0.060 cu.m/s
Required 100-year storage volume (Appendix 4) = 77.81 cu.m
Available storage volume (0.3m pond) = 80.42 cu.m

c. Predevelopment Runoff Coefficient

Existing building area	= 0.0539 ha
Existing paved area	= 0.1712 ha
Existing grass area	= 0.2676 ha

Total Site area	= 0.4927 ha
Composite runoff coefficient	= {(0.0539+0.1712)x0.90+0.2676x0.25}/0.4927
	= **0.55**

d. Post-development Runoff Coefficient for controlled area

Existing/Proposed impermeable area	= 0.3066 ha
Existing/Proposed landscaped area	= 0.0419 ha

Total area	= 0.3485 ha
Composite runoff coefficient	=(0.3066x0.9 + 0.0419x0.25)/0.3485
	= 0.82

e. Post-development Runoff Coefficient for uncontrolled area

Existing/Proposed impermeable area	= 0.0565 ha
Existing/Proposed landscaped area	= 0.0877 ha

Total area	= 0.1442 ha
Composite runoff coefficient	=(0.0565x0.9 + 0.0877x0.25)/0.1442
	= 0.50

f. Post-development Runoff Coefficient

Existing/Proposed building area	= 0.1387 ha
Existing/Proposed paved area	= 0.2244 ha
Existing/Proposed landscaped area	= 0.1296 ha

Total site area	= 0.4927 ha
Composite runoff coefficient	=(0.3631x0.9 + 0.1296x0.25)/0.4927
	= 0.73

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APPENDIX 3

RATIONAL METHOD CALCULATION

5 Year Predevelopment Flow Conditions for 0.4927 ha Site

C = 0.55
I = 79.48 mm/hr
A = 0.4927 ha
Q = C x I x A /360
= 0.55 x 79.48 x 0.4927 / 360
= 0.060 m^3/s

100 Year Post-Development Flow Conditions for 0.1442 ha Uncontrolled area

C = 0.50
I = 129.95 mm/hr
A = 0.1442 ha
Q = C x I x A /360
= 0.50 x 129.95 x 0.1442 / 360
= 0.026 m^3/s

100 Year Post-Development Flow Conditions for 0.3485 ha controlled area

area 0.3485 co-ef 0.82

duration	intensity	Qpost	Qpre	Vpost	Vpre	Vrequired
15	129.9535	0.103983	0.034	93.58476	30.6	62.98476
16	127	0.10162	0.034	97.55502	32.64	64.91502
17	124.1778	0.099362	0.034	101.3488	34.68	66.66883
18	121.4783	0.097202	0.034	104.9777	36.72	68.25768
19	118.8936	0.095133	0.034	108.4521	38.76	69.69212
20	116.4167	0.093151	0.034	111.7818	40.8	70.98179
21	114.0408	0.09125	0.034	114.9756	42.84	72.13556
22	111.76	0.089425	0.034	118.0416	44.88	73.16157
23	109.5686	0.087672	0.034	120.9874	46.92	74.06735
24	107.4615	0.085986	0.034	123.8198	48.96	74.85983
25	105.434	0.084364	0.034	126.5454	51	75.54543
26	103.4815	0.082801	0.034	129.1701	53.04	76.13007
27	101.6	0.081296	0.034	131.6993	55.08	76.61928
28	99.78571	0.079844	0.034	134.1382	57.12	77.01815
29	98.03509	0.078443	0.034	136.4915	59.16	77.33145
30	96.34483	0.077091	0.034	138.7636	61.2	77.56361
31	94.71186	0.075784	0.034	140.9587	63.24	77.71874
32	93.13333	0.074521	0.034	143.0807	65.28	77.8007
33	**91.60656**	**0.0733**	**0.034**	**145.1331**	**67.32**	**77.81308**
34	90.12903	0.072117	0.034	147.1193	69.36	77.75926
35	88.69841	0.070973	0.034	149.0424	71.4	77.64239
36	87.3125	0.069864	0.034	150.9054	73.44	77.46542
37	85.96923	0.068789	0.034	152.7111	75.48	77.23113
38	84.66667	0.067747	0.034	154.4621	77.52	76.94211
39	83.40299	0.066735	0.034	156.1608	79.56	76.60083
40	82.17647	0.065754	0.034	157.8096	81.6	76.20959

Required storage volume = 77.81 m^3