10^{th} Ave Estates Stormwater Management Report

Graham Design & Construction
1260 2nd. Ave. East,
Unit 2 Owen Sound, ON, N4K 2J3

Clearwater Shores Inc.
37 Alice Street
Allenford ON N0H 1A0 CANADA

June 4th
24003

10th Ave Estates Stormwater Management Report

June 2024

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June 2024

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1 Introduction

Clearwater Shores Inc. has been retained by Graham Design and Construction to prepare a Stormwater Management Report for the 10th Avenue Estates development. The new development is a 2.53 ha residential site plan development on the northeast side of Owen Sound. The proposed new development consists of a 29-unit apartment, a 34-unit apartment, two single story 3-plex residences and four single story 4-plex residences. The development will extend off the end of the 10th Avenue East cul-de-sac, where there currently exists a residential subdivision. The site plan will be bound to the South by the existing subdivision. The east side of the proposed development will be adjacent to the Kenny Drain with the northern and western sides abutting woodlands and residential lots.

2 Existing conditions

2.1 Pre-Development Stormwater

The 10th Ave Estates site exists in the northeast portion of Owen Sound, extending off of 10th Ave East. To the south and west lie residential properties, with a single industrial property south of the site as well. The east side of the land borders the Kenny drain with woodlands to the north.

The total area of development of 10th Ave Estates is 2.53 ha. The project site is currently vacant with some trees and low-lying shrubs and vegetation.

The topography of the site allows for significant stormwater runoff relief. The current highpoint exists on the west of the site along the preexisting subdivision on 10th Ave E. From the west there is a consistent decrease in elevation towards the eastern side of the site. The natural slope allows for water to drain eastward where it discharges into the Kenny Drain.

Soil mapping from the area (obtained from Ontario Geohub) indicates that much of the site consists of Dunedin Clay, with a hydrologic soil group of C. There was also a geotechnical study completed for the site (Geotechnical Investigation, GEI Consulting Engineers and Scientists, 2024) which indicated mainly Clayey Silt soils near the surface, which is consistent with the soil mapping.

2.2 Pre-Development Runoff Results

A PCSWMM model was developed for the site to determine the pre-development peak runoff rates from the site for the 2- and 5-year storm events. Since all drainage discharges fairly uniformly to the Kenny Drain, a single catchment encompassing the whole site was considered (see Figure 1). The Curve Number infiltration method was applied in the model with a CN value of 86. This is consistent with rangeland or pasture type conditions over a type C soil. The model applied a 3-hour Chicago design storm, consistent with the City of Owen Sound criteria. The modeling results are shown below, with complete modeling details found in Appendix A.

Table 1 - Pre-Development Peak Runoff Flow Rates

Design Storm	Peak Runoff Flow (m^3/s)
2-Year	0.031
5-Year	0.060

As per the City of Owen Sound criteria, post development peak flow rates must not exceed the pre-development flow rates for the 2- and 5-year design storm events. All infrequent storm events up to the 100-year event must not exceed the pre-development 5-year peak runoff noted in Table 1 above.

3 Proposed Conditions

3.1 Post-Development Runoff Conditions

Post development, the drainage patterns on site will resemble the existing drainage conditions. The highpoint of the site will remain on the west side of the site adjacent to the 10th Ave East subdivision and sloping will allow for water to drain eastwards toward the Kenny Drain.

A storm sewer network will be constructed along the proposed roadways. This network is intended to convey the minor system from the roadways, parking areas and front yards. The roadways will convey the major system flows in a similar fashion. The storm sewer network and internal roads will discharge into the proposed stormwater management pond on the northeast side of the site. Rear yard swales along the north and south site boundaries will also convey rear roof and yard drainage to the pond. The stormwater management pond will discharge controlled flows into the Kenny Drain.

3.2 Post Development Runoff Results

As per existing conditions, a PCSWMM model was developed to determine the post development peak runoff flows. As shown in Figure 2, the site was divided into 3 catchments representing areas draining to the north swale, the internal drainage network and the south swale respectively. The proposed conditions curve number was updated to 74, representing the future maintained lawns throughout the property. The imperviousness for each catchment was measured off the proposed site plan. Complete catchment parameters can be found in Appendix B. The model also included the proposed stormwater management pond and control orifice, described in further detail below.

Detailed modeling was completed for the 2 through 100-year design storm events. Complete modeling details can be found in Appendix B with results presented below.

Table 2 – Post-Development Peak Runoff Flow Rates

Design Storm	Pre-Development Peak Runoff Flow (m^3/s)	Post-Development Peak Runoff Flow (m^3/s)
2-Year	0.031	0.019
5-Year	0.060	0.028
100-Year	Per 5-Year	0.038

As shown in the table above, all peak flows are maintained at or below the 5-year pre-development runoff rate, for storms up to the 100-year design storm.

3.3 Proposed Stormwater Management Facility Design

The stormwater management facility is proposed to be a dry pond, to provide the necessary quantity control. The proposed outlet will consist of an outlet micropool and a headwall with a 300mm sewer. The sewer will be fit with a 130mm orifice plate to control the 2 through 100-year storms. The proposed pond outlet is set at an elevation of 207.20m. The Kenny Drain Regulatory flood elevation in the vicinity of the pond is about 206.33. Therefore, the pond outlet elevation ensures free flowing conditions. Key pond characteristics and elevations are shown below.

Table 3 - Proposed Stormwater Management Facility

Pond Elevations	Feature / Storm
207.20	Pond Bottom, Invert of 130mm Orifice
207.84	5-Year Water Level
208.35	100-Year Water Level
208.50	Emergency Spillway Elevation
208.70	Freeboard
209.00	Top of Pond

During storm events exceeding the 100-year peak flow, or in the event of a blockage, an emergency spillway has been provided within the stormwater pond. The spillway is a 10m wide trapezoidal weir on the east side of the facility, discharging toward the Kenny Drain. The spillway has been sized to convey the uncontrolled 100-year design storm and Regional Timmins storm. The spillway weir is for emergency situations only and will no be used for the normal operation of the 2 through 100-year design storm events. Complete details of the spillway design can be found in Appendix C.

3.4 Proposed Stormwater Quality Controls

As per the MECP Stormwater Management Planning and Design Manual (2003), a dry pond can provide 60% Total Suspended Solids (TSS) removal. In addition, it is proposed to include an Oil Grit Separator (OGS) upstream of the pond for all areas directed to the storm sewers. The proposed OGS is a Stormceptor EF10 which provides up to 61% TSS removal, or an approved equivalent. See Appendix D for the OGS sizing. However, general practice indicates that only 50% TSS removal from OGS units will be accredited.

Therefore, assuming an OGS with 50% TSS removal and a dry pond with 60% OGS removal in a treatment train configuration yields the following overall TSS removal.

Removal Rate = 50 + 60 – [(50 x 60) / 100] = 80%

Therefore, enhanced level quality control, or 80% TSS removal, can be achieved through the site.

The rear yards, that drain to the north and south swales consist of clean rooftop and rear yard drainage and therefore do not require further quality control.

4 Erosion and Sediment Control

Erosion and sediment controls will be implemented on-site prior to construction. The controls will consist of a combination of sediment fence and straw bale check dams within the on-site swales and an entrance mudmat.

These controls have been specified on the Erosion and Sediment Control Plan, including notes pertaining to the maintenance of the control works.

Swale and Straw Bale Flow Check Dams

Swales have been provided throughout the site to collect any runoff during construction. Check dams within the swales will reduce the velocity of the runoff promoting sediment settling.

Silt Fencing

Silt fence will be installed where required to intercept sheet flow. It should be noted that additional silt fencing may be added based on field decisions by the Engineer and Developer prior to, during and following construction until the site is stabilized.

Mudmat

A mudmat located at the proposed site entrance off 10th Avenue East will limit tracking of mud off of the site.

Dust Suppression

During earthwork activities, the Contractor will ensure that measures for dust suppression are provided as required, such as the application of water or lime.

Topsoil Stockpiles

It will be necessary to strip topsoil prior to earth moving. A temporary topsoil stockpile will be located on the site with silt fencing provided around the stockpile. A stockpile that will be left to stand longer than 30 days will require seeding.

5 Conclusions

- The proposed stormwater facility has been designed to ensure post development peak runoff flows are at or below existing conditions 5-year runoff flows.

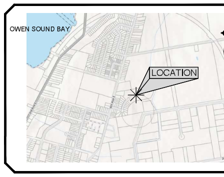
- The proposed stormwater facility has been designed to control the 100-year storm with the capacity to safely discharge the entirety of the uncontrolled flow (100-Year and Regional) in the event of a larger storm.
- Enhanced level quality control will be achieved through the use of a dry pond and OGS.

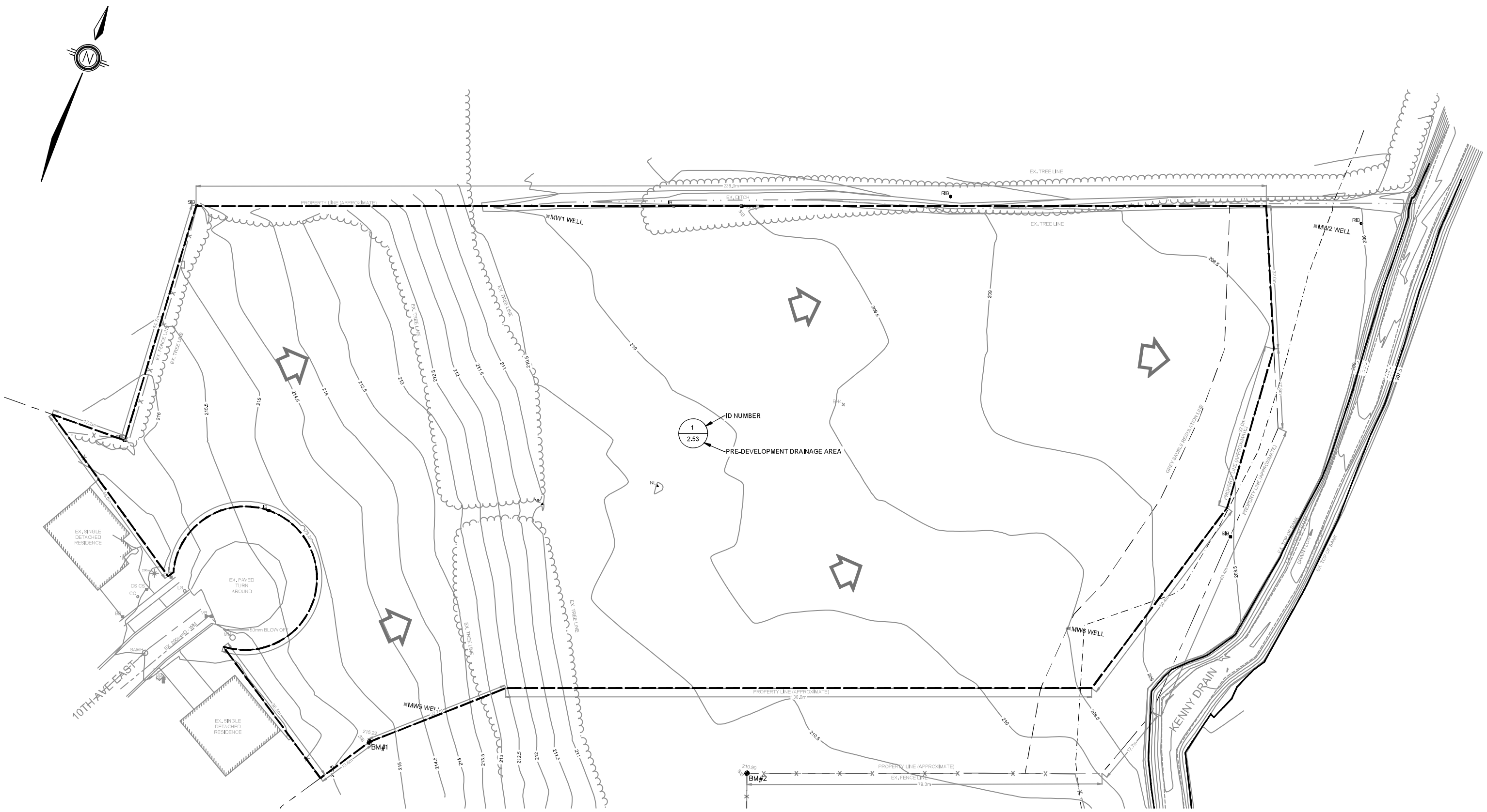
Report Prepared By:

Michelle Henry, P.Eng.
Clearwater Shores Inc.

CLEARWATER SHORES
CIVIL ENGINEERING

Figures





LEGEND

EXISTING CENTRELINE
SITE PROPERTY LINE
EXISTING PROPERTY LINE
PROPOSED EDGE OF PAVEMENT
PROPOSED BUILDING
ZONING SET BACK LIMITS
EXISTING ELEVATION
IRON BAR/STANDARD IRON BAR
EXISTING HYDRO POLE — HP
EXISTING HYDRO POLE LIGHT STANDARD — HPLS
EXISTING LIGHT STANDARD — LS
BELL PEDESTAL — BPED
GUY WIRE
BENCHMARK — BM
CONIFEROUS TREE
DECIDUOUS TREE

BENCHMARK #1 ELEV=215.22
BENCHMARK IS TOP OF SIB LOCATED NEAR THE SOUTH WEST CORNER OF THE WEST SECTION OF SUBJECT PROPERTY

BENCHMARK #2 ELEV=210.90
BENCHMARK IS TOP OF SIB LOCATED ON THE NORTH WEST CORNER OF THE ENBRIDGE COMMERCIAL PROPERTY

ELEVATIONS SHOWN ON THIS DRAWING ARE BASED ON GPS OBSERVATIONS USING THE CANNET VIRTUAL BASE STATION REFERENCE NETWORK, THE ELEVATIONS ARE BASED ON THE VERTICAL DATUM GEOID HT2_0.

PROPERTY LINES ARE APPROXIMATE, IN THE EVENT THAT THERE IS A DISPUTE OR DISCREPANCY IN THE LOCATION OF THE PROPERTY LINES, IT IS RECOMMENDED THAT THE OWNER RETAIN AN ONTARIO LAND SURVEYOR (OLS) TO PROVIDE CONFIRMATION.

CAUTION :

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DATE	DESCRIPTION
04/29/24	30% DESIGN ISSUED FOR CLIENT REVIEW
05/17/24	50% DESIGN ISSUED FOR CLIENT REVIEW
05/22/24	50% DESIGN ISSUED FOR CITY REVIEW
05/30/24	ISSUED FOR CLIENT REVIEW
06/04/24	ISSUED FOR SPA

REVISION / ISSUE

Seal not valid unless signed and dated

LEGEND

ID NUMBER
PRE-DEVELOPMENT DRAINAGE AREA
PRE-DEVELOPMENT DRAINAGE BOUNDARY
EXISTING OVERLAND FLOW ROUTE

CLEARWATER SHORES
ALLENFORD, ONTARIO
EMAIL: KWELSH@CLEARWATERSHORES.CA

Title:

10TH AVE ESTATES PRE-DEVEOPMENT CATCHMENT AREAS

Client: GRAHAM DESIGN & CONSTRUCTION

Design:	KJW	Scale:	1:500
Drawn:	KJW	DRAWING No.	SWM1
Checked:	MH		
Date:	JUNE, 2024		
PROJECT No.		24003.000	

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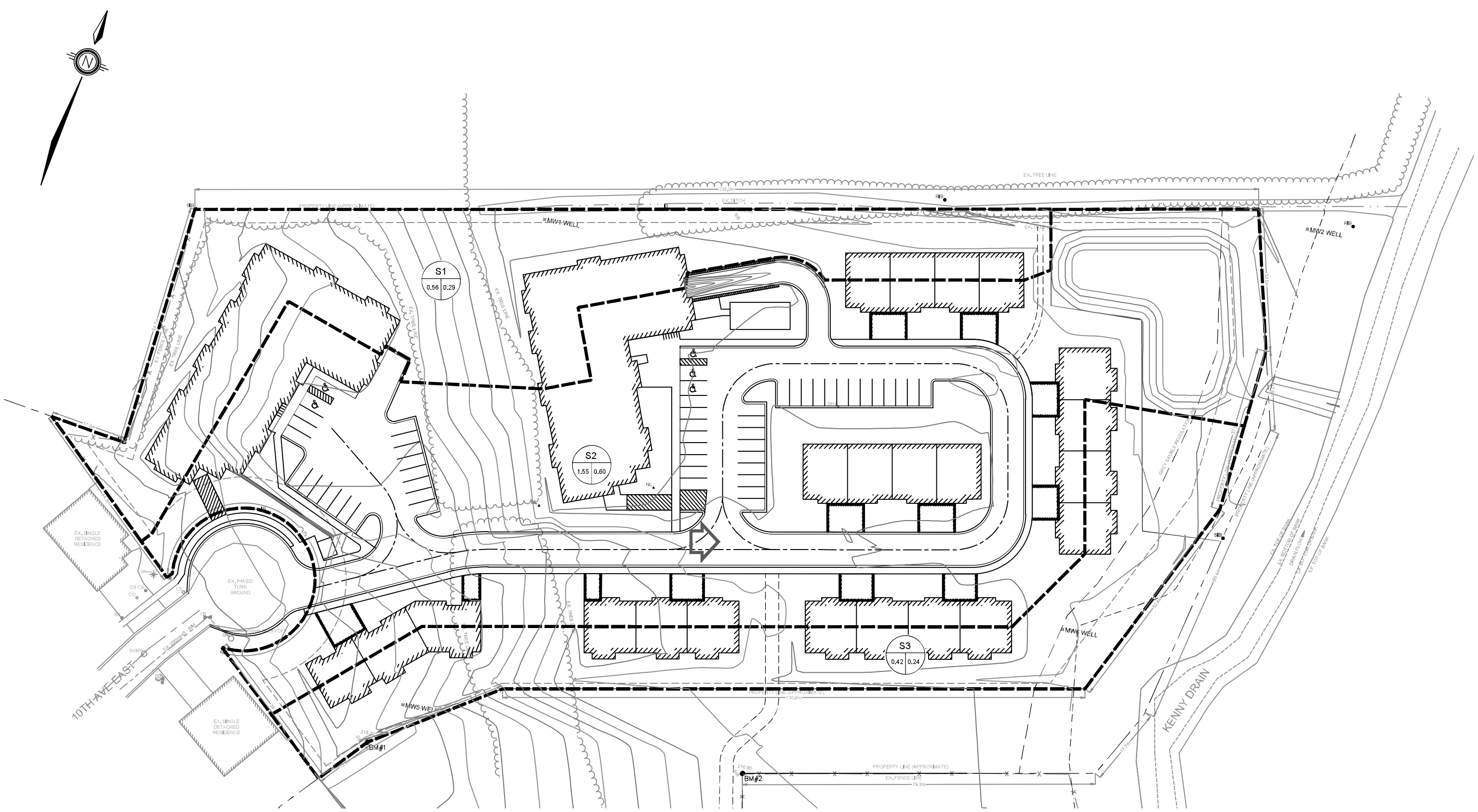

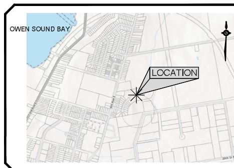

LEGEND

- EXISTING CENTRELINE
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- EXISTING PROPERTY LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED BUILDING
- ZONING SET BACK LIMITS
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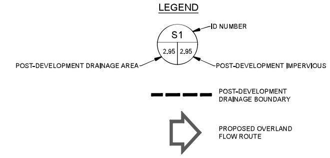
06/04/24	ISSUED FOR SPA

REVISION / ISSUE

Seal not valid unless signed and dated

LEGEND



CLEARWATER SHORES
ALLENFORD, ONTARIO

Title:

10TH AVE ESTATES POST-DEVEOPMENT CATCHMENT AREAS

Client: GRAHAM DESIGN & CONSTRUCTION

Design:	KJW	Scale:	1:500
Drawn:	KJW	DRAWING No.	SWM2
Checked:	MH		
Date:	MAY. 2024		
PROJECT No.		24003,000	

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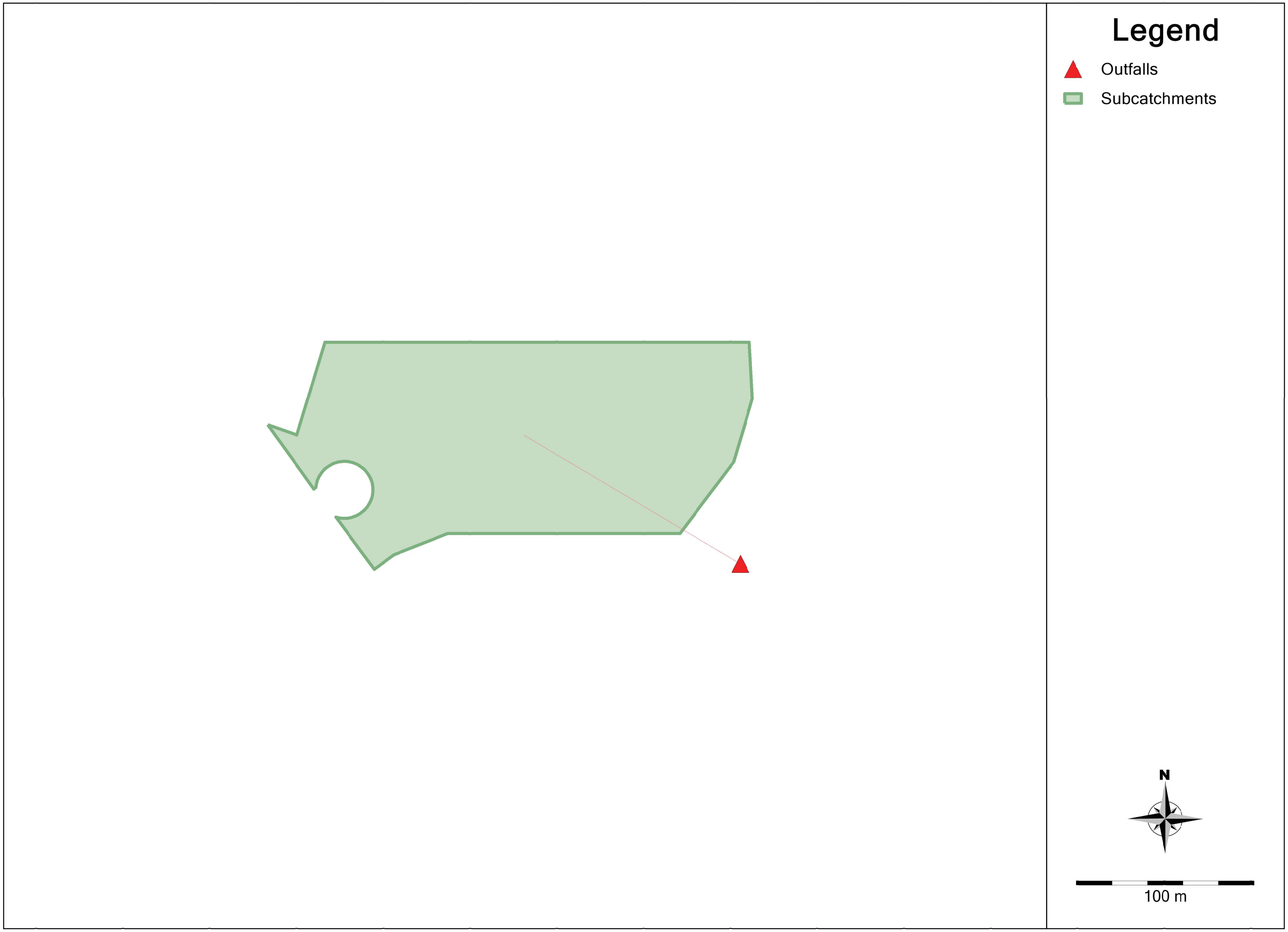
CLEARWATER SHORES
CIVIL ENGINEERING

Appendix A

Pre-Development Stormwater



Legend
Outfalls
Subcatchments
N
100 m

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****

Number of rain gages 4
Number of subcatchments ... 1
Number of nodes 1
Number of links 0
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
a_2y_Chicago_3h	a_2y_Chicago_3h	INTENSITY	5 min.
b_5yr_Chicago_3h	b_5yr_Chicago_3h	INTENSITY	5 min.
c_25yr_Chicago_3h	c_25yr_Chicago_3h	INTENSITY	5 min.
d_100yr_Chicago_3h	d_100yr_Chicago_3h	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.52	125.85	5.00	3.0000	b_5yr_Chicago_3h	OF1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	

****
Analysis Options
****

Flow Units .... CMS
Process Models:
  Rainfall/Runoff .... YES
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... NO
  Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER
Surcharge Method .... EXTRAN
Starting Date 04/28/2024 00:00:00
Ending Date 04/29/2024 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:00:01
Wet Time Step 00:01:00
Dry Time Step 00:01:00

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.108	42.929
Evaporation Loss	0.000	0.000
Infiltration Loss	0.065	25.901
Surface Runoff	0.040	15.728
Final Storage	0.003	1.305
Continuity Error (%)	-0.011	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.040	0.396

Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.040	0.396
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	42.93	0.00	0.00	25.90	2.05	13.68	15.73	0.40	0.06	0.366

Analysis begun on: Wed May 29 20:45:05 2024
Analysis ended on: Wed May 29 20:45:05 2024
Total elapsed time: < 1 sec

CLEARWATER SHORES
CIVIL ENGINEERING

Appendix B

Post-Development Stormwater


Legend
Junctions
Outfalls
Storages
Conduits
Orifices
Weirs
Subcatchments
N
50 m

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 5
Number of subcatchments ... 3
Number of nodes 3
Number of links 3
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
a_2y_Chicago_3h	a_2y_Chicago_3h	INTENSITY	5 min.
b_5yr_Chicago_3h	b_5yr_Chicago_3h	INTENSITY	5 min.
c_25yr_Chicago_3h	c_25yr_Chicago_3h	INTENSITY	5 min.
d_100yr_Chicago_3h	d_100yr_Chicago_3h	INTENSITY	5 min.
Timmins_Storm_(0-25)	Timmins_Storm_(0-25)	INTENSITY	60 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	0.56	31.06	29.00	4.0000	d_100yr_Chicago_3h	SU1
S2	0.42	26.18	25.00	1.0000	d_100yr_Chicago_3h	SU1
S3	1.56	778.10	60.00	3.0000	d_100yr_Chicago_3h	SU1

****
Node Summary

****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	207.00	1.80	0.0	
OF1	OUTFALL	206.00	1.00	0.0	
SU1	STORAGE	207.20	1.80	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C2	J1	OF1	CONDUIT	24.1	4.1509	0.0350
C1	SU1	J1	ORIFICE			
W1	SU1	J1	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C2	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	36.94

****
Analysis Options
****
Flow Units .... CMS
Process Models:
  Rainfall/Runoff .... YES
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... YES
  Ponding Allowed .... NO
  Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER

```
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/28/2024 00:00:00
Ending Date .............. 04/29/2024 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:01
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.176        69.443
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.059        23.448
Surface Runoff ...........         0.113        44.441
Final Storage ............         0.004         1.612
Continuity Error (%) .....        -0.083


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.113         1.126
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.112         1.122
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.004
Continuity Error (%) .....        -0.003


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*********************************
Most Frequent Nonconverging Nodes
*********************************
Convergence obtained at all time steps.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     2.00
% of Steps Not Converging   :     0.00
Time Step Frequencies       :
    1.000 -  0.871 sec      :   100.00 %
    0.871 -  0.758 sec      :     0.00 %
    0.758 -  0.660 sec      :     0.00 %
    0.660 -  0.574 sec      :     0.00 %
    0.574 -  0.500 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	69.44	0.00	0.00	32.07	19.58	16.34	35.92	0.20	0.11	0.517
S2	69.44	0.00	0.00	34.81	16.88	16.33	33.21	0.14	0.07	0.478
S3	69.44	0.00	0.00	17.29	40.53	10.00	50.53	0.79	0.70	0.728

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.01	0.02	207.02	0 02:35	0.02
OF1	OUTFALL	0.01	0.02	206.02	0 02:35	0.02
SU1	STORAGE	0.32	1.15	208.35	0 02:34	1.15

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	0.038	0 02:34	0	1.12	0.003
OF1	OUTFALL	0.000	0.038	0 02:35	0	1.12	0.000
SU1	STORAGE	0.878	0.878	0 01:10	1.13	1.13	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.215	13.7	0.0	0.0	0.851	54.4	0 02:34	0.038

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	97.87	0.013	0.038	1.122

System	97.87	0.013	0.038	1.122

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C2	CONDUIT	0.038	0 02:35	0.40	0.00	0.02
C1	ORIFICE	0.038	0 02:34			1.00
W1	WEIR	0.000	0 00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
C2	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.14	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue May 28 21:08:10 2024
Analysis ended on: Tue May 28 21:08:10 2024
Total elapsed time: < 1 sec

CLEARWATER SHORES
CIVIL ENGINEERING

Appendix C

Emergency Spillway

Project Name: 10th Ave
Project No.: 24003
Created By: MLH
Date Modified: 2024-05-28

Weir Equation

$$Q = CL(H^{1.5}) + CSH^{2.5}$$

Weir Calculations - Input Parameters	
Width (m) =	10.00
Coefficient, C =	1.60
Rectangular =	n
Side Slope X:1 =	3.00
Crest Elevation (m) =	208.50
Incremental Depth (m) =	0.02

Weir Calculations - Output Results

W.S. Elevation (m)	Head (m)	Weir Q (m^3/sec)	Water Surface Elevation Notes
208.50	0.00	**0.000**	
208.52	0.02	**0.046**	
208.54	0.04	**0.130**	
208.56	0.06	**0.239**	
208.58	0.08	**0.371**	Regional Uncontrolled Flow = 0.28 m^3/s
208.60	0.10	**0.521**	
208.62	0.12	**0.689**	
208.64	0.14	**0.873**	100-Year Uncontrolled Flow = 0.88 m^3/s
208.66	0.16	**1.073**	
208.68	0.18	**1.288**	
208.70	0.20	**1.517**	
208.72	0.22	**1.760**	
208.74	0.24	**2.017**	
208.76	0.26	**2.287**	
208.78	0.28	**2.570**	
208.80	0.30	**2.866**	
208.82	0.32	**3.174**	
208.84	0.34	**3.496**	
208.86	0.36	**3.829**	
208.88	0.38	**4.175**	
208.90	0.40	**4.533**	Top of Pond

Appendix D

Oil Grit Separator

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/29/2024

Province:	Ontario
City:	Owen Sound
Nearest Rainfall Station:	GODERICH
Climate Station Id:	6122847
Years of Rainfall Data:	20

Site Name:	10th AVe

Drainage Area (ha):	2.5
% Imperviousness:	47.00

Runoff Coefficient 'c': 0.58

Project Name:	10th Ave
Project Number:	64839
Designer Name:	Michelle Henry
Designer Company:	Clearwater Shores
Designer Email:	mhenry@clearwatershores.ca
Designer Phone:	519-379-8164
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

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):	56.37
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	
Estimated Average Annual Sediment Volume (L/yr):	756

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	45
EF6	53
EF8	58
EF10	61
EF12	64

Recommended Stormceptor EF Model: EF10

Estimated Net Annual Sediment (TSS) Load Reduction (%): 61

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 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.

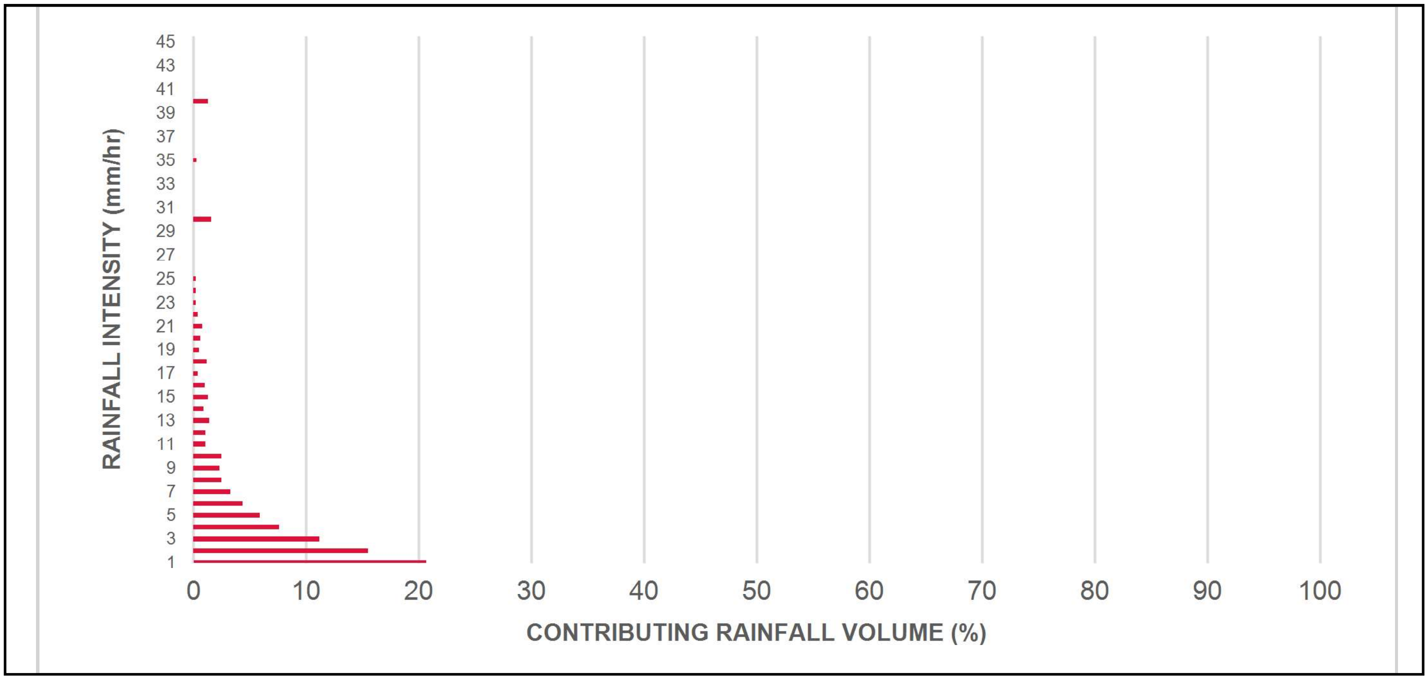
Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

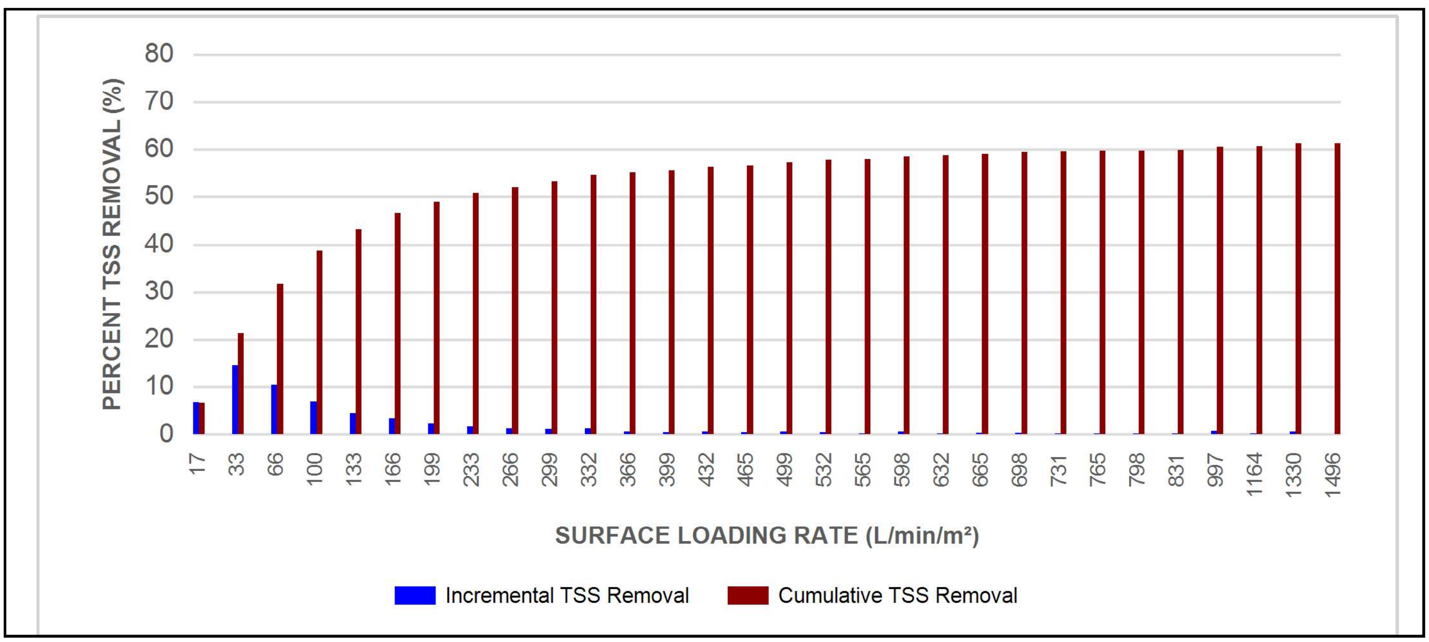
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	9.6	9.6	2.02	121.0	17.0	70	6.7	6.7
1.00	20.7	30.3	4.04	243.0	33.0	70	14.6	21.3
2.00	15.5	45.8	8.09	485.0	66.0	67	10.4	31.7
3.00	11.2	56.9	12.13	728.0	100.0	62	7.0	38.7
4.00	7.6	64.6	16.18	971.0	133.0	60	4.6	43.2
5.00	5.9	70.5	20.22	1213.0	166.0	57	3.4	46.7
6.00	4.4	74.9	24.27	1456.0	199.0	54	2.4	49.0
7.00	3.3	78.2	28.31	1699.0	233.0	53	1.7	50.8
8.00	2.5	80.7	32.36	1942.0	266.0	52	1.3	52.1
9.00	2.3	83.0	36.40	2184.0	299.0	51	1.2	53.3
10.00	2.5	85.6	40.45	2427.0	332.0	50	1.3	54.6
11.00	1.1	86.7	44.49	2670.0	366.0	49	0.6	55.1
12.00	1.1	87.8	48.54	2912.0	399.0	48	0.5	55.6
13.00	1.4	89.2	52.58	3155.0	432.0	48	0.6	56.3
14.00	0.9	90.1	56.63	3398.0	465.0	47	0.4	56.7
15.00	1.3	91.4	60.67	3640.0	499.0	47	0.6	57.3
16.00	1.0	92.4	64.72	3883.0	532.0	47	0.5	57.8
17.00	0.4	92.8	68.76	4126.0	565.0	46	0.2	58.0
18.00	1.2	94.0	72.81	4368.0	598.0	46	0.5	58.5
19.00	0.5	94.4	76.85	4611.0	632.0	46	0.2	58.8
20.00	0.6	95.1	80.90	4854.0	665.0	46	0.3	59.0
21.00	0.8	95.9	84.94	5097.0	698.0	46	0.4	59.4
22.00	0.4	96.3	88.99	5339.0	731.0	45	0.2	59.6
23.00	0.2	96.5	93.03	5582.0	765.0	45	0.1	59.7
24.00	0.2	96.7	97.08	5825.0	798.0	45	0.1	59.8
25.00	0.2	96.9	101.12	6067.0	831.0	45	0.1	59.9
30.00	1.6	98.4	121.35	7281.0	997.0	44	0.7	60.5
35.00	0.3	98.7	141.57	8494.0	1164.0	46	0.1	60.7
40.00	1.3	100.0	161.80	9708.0	1330.0	48	0.6	61.3
45.00	0.0	100.0	182.02	10921.0	1496.0	46	0.0	61.3
Estimated Net Annual Sediment (TSS) Load Reduction =								**61 %**

Climate Station ID: 6122847 *Years of Rainfall Data*: 20

RAINFALL DATA FROM GODERICH 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

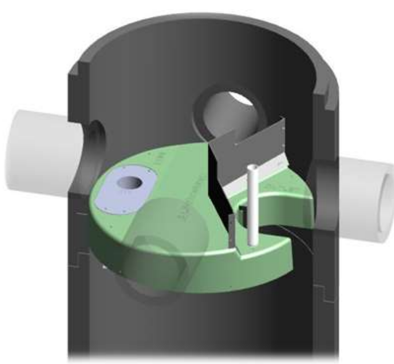
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

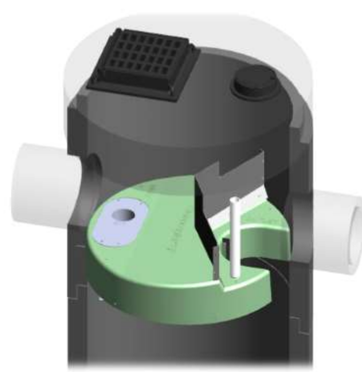
DESIGN FLEXIBILITY

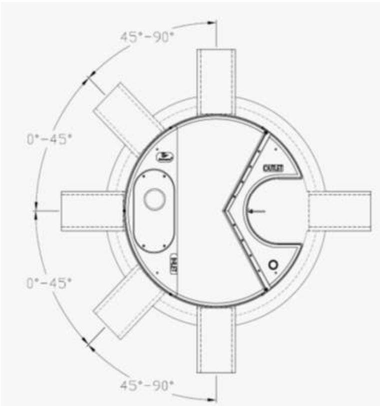
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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







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)	(ft³)	(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/ft³)

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® EF

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

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 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
	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.