Ivanhoe Cambridge Inc.

100 Bayshore Drive

Stormwater Management Report

September 17, 2021

100 Bayshore Drive

Stormwater Management Report

Ivanhoe Cambridge Inc.

Confidential
Issue for City Review
Project No.: 211-02810-00
Date: September 17, 2021

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Revision History

FIRST ISSUE

April 28, 2021	First Submission			
Prepared by	Reviewed by	Approved By		
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REVISION 1				
July 23, 2021	Second Submission			
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September 17, 2021	Third Submission			
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Signatures

Prepared by

September 17, 2021

Kathryn Kerker
Water Resources E.I.T.

Date

APPROVED BY

September 17, 2021

Michelle Hughes, P.Eng., MSc.
Team Lead, Water Resources

Date

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1 INTRODUCTION

1.1 Scope

WSP Canada Inc. was retained by Ivanhoe Cambridge Inc. to conduct a stormwater management study in support of proposals to develop two residential buildings on previously undeveloped land.

1.2 Site Location

The site is located at 100 Bayshore Drive, Ottawa, Ontario, adjacent to Bayshore Shopping Centre and Bayshore Station. The location of the proposed development is illustrated in **Figure 1**.

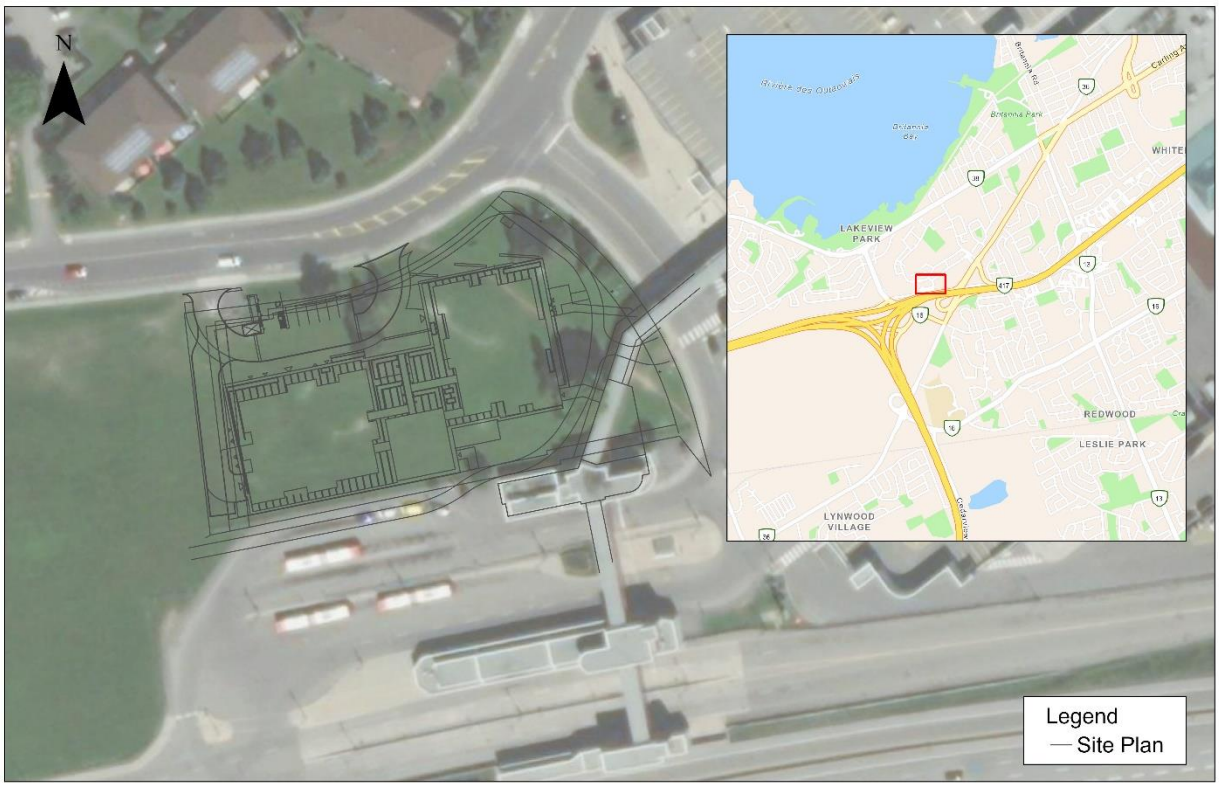

Figure 1: Site Location

1.3 Stormwater Management Plan Objectives

The objectives of the stormwater management (SWM) study are as follows:

— Collect and review background information.
— Confirm applicable SWM design criteria with City of Ottawa staff.
— Evaluate various SWM practices that meet the stormwater management requirements and recommend a preferred strategy—specifically related to the applicable quantity and quality control criteria.

1.4 Design Criteria

Design criteria were confirmed through pre-consultation with the city of Ottawa held on February 17, 2021 (Meeting minutes included in **Appendix A**). Criteria for 100 Bayshore Drive are as follows:

Water Quantity Control and Discharge to Municipal Infrastructure

- Stormwater must be controlled to the peak flow for the 2-year pre-development storm event. Runoff must be detained onsite to control all storm events up to and including the 100-year event.
- Allowable Runoff coefficient (C): C = the lesser of the existing pre-development conditions to a maximum of 0.5 (OSDG 8.3.7.3)
- Time of concentration (Tc): Tc = pre-development (Calculated); maximum Tc = 10 min

Water Quality

- RVCA requires enhanced water quality protection (80% TSS removal) be provided on-site

2 PRE-DEVELOPMENT CONDITIONS

2.1 General

Currently the land proposed for the new development is undeveloped, mainly covered by grass and trees with an estimated runoff coefficient of 0.20. The total study area (i.e. portion of the site affected by the proposed works) is 0.57 ha.

2.2 Rainfall Information

The rainfall intensity is calculated in accordance with Section 5.4.2 of the Ottawa Sewer Design Guidelines (October 2012):

$$i = \left[\frac{A}{(T_d + C)^B}\right]$$

Where;

- A, B, C = regression constants for each return period (defined in section 5.4.2)
- i = rainfall intensity (mm/hour)
- T_d = storm duration (minutes)
- The IDF parameters/regression constants are included in **Appendix B**.

2.3 Allowable Flow Rates

As noted in **Section 1.4**, post-development stormwater runoff from the 2-year to 100-year design storms must not exceed the pre-development peak 2-year flow rate, calculated using a runoff coefficient being the lesser of 0.50 or existing conditions. In this instance existing conditions are represented by a runoff coefficient of 0.20, therefore this value has been used to calculate the allowable release rate.

The area will discharge north to a 675mm concrete storm pipe on Woodridge Crescent through a new storm connection. The calculated peak flow rates for the site in the pre-development condition are summarized below in Table 2-1. Rational method calculations are included in **Appendix B**.

Table 2-1: Pre-Development Peak Flow Rate Calculations (Runoff Coefficient, C = 0.20 and T_c=10 min)

Return Period (Years)	Rainfall Intensity (MM/hour)	Peak Flow Rate (l/s)	Target Release Rate (l/s)
2	76.8	**24**	**24**
5	104.2	33	
10	122.1	38	
25	144.7	50	
50	161.5	61	
100	178.6	70	

3 POST-DEVELOPMENT CONDITIONS

3.1 General

The site will be developed with two new residential high-rise buildings and a three-storey parking podium. The final buildout includes the west residential building, parking podium with rooftop amenity, amenity pavilion, and east residential building. The developed site will have a runoff coefficient of 0.81 and study area of 0.57 ha. Underground storage will be used to control the peak discharge of the newly developed site to 24 L/s.

Note that this report should be read in conjunction with the proposed site servicing drawing package—specifically drawings C02 (Grading Plan), C03 (Servicing Plan), and C04 (Storm Drainage Area Plan).

3.2 Water Quantity

As noted in **Section 2.3**, the target allowable discharge rate to Woodridge Crescent sewer is 24 L/s. This is equivalent to the peak runoff rate under pre-development conditions during a 2-year design storm event with a runoff coefficient of 0.20. Compliance with the 100-yr target offsite discharge rate will be achieved through use of an underground storage tank with pumped outflow prior to discharge into the Woodridge Crescent storm sewer.

It is noted that a small portion of the study area will not drain to the proposed storage tank due to grading and pipe configuration constraints. Post-development runoff calculations have accounted for uncontrolled runoff from these areas. There are no external areas draining to the site.

The rational method has been used to determine a conservative maximum pump rate from the underground storage tank to the storm sewer. Table 3-1 shows the post-development peak flow calculations. In order to meet the 2-year existing target of 24 L/s while overcontrolling for the uncontrolled area (4 L/s), the maximum pump rate from the storage unit should be 20 L/s.

Table 3-1: Post-Development Peak Flow Rate Calculations (Td=10 min)

Return Period (Years)	Existing Peak Flow (L/s)	Proposed Peak Flow Uncontrolled Area (L/s)	Proposed Peak Flow Controlled Area (L/s)
	C = 0.2	C = 0.44	C = 0.81
2	**24**	2	95
5	33	2	129
10	38	2	151
25	50	3	197
50	61	4	240
100	70	**4**	277

Post-development rational method calculations are included in **Appendix C**.

The required storage volume in order to meet the maximum pump rate is determined in the site servicing report.

3.3 Water Quality

As noted in section 1.4, quality control is required to provide enhanced water quality treatment of the site (80% TSS removal). An OGS unit (Stormceptor EFO6 or equivalent) will be installed just upstream of the city storm sewer connection to provide the required quality treatment. OGS sizing is provided in **Appendix D**.

4 CONCLUSIONS

A stormwater management plan has been prepared to support the site plan application for the 100 Bayshore Drive development in the City of Ottawa. The key points are summarized below.

WATER QUANTITY

Runoff collected from the project site will be directed to an underground storage tank with outflow controlled by a pump with a maximum pump rate set at or below 20 L/s. The overall peak 100-year discharge from the site including uncontrolled areas meets the allowable release rate of 24 L/s.

WATER QUALITY

Water treatment is provided by an OGS unit placed just upstream of the city storm sewer connection.

This report demonstrates that the proposed SWM strategy will address stormwater management related impacts from this project and meet the requirements of the City of Ottawa.

APPENDIX

A

Pre-consultation meeting minutes (February 17, 2021)

Kerker, Kathryn

From: Christine McCuaig <christine@q9planning.com>
Sent: March 3, 2021 10:32 AM
To: Mark Garber; Jean-François Lavallée; Henry Poon; Patrick Bisson; McCaughey, Stephen; Coleman Ney; Dave Lashley
Subject: Fwd: Pre-Consultation Follow-Up: 100 Bayshore Drive
Attachments: Plans & Study List.pdf; design_brief_TOR_100 Bayshore.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello All,

See precon notes below.

Thanks,
Christine

_____
Christine McCuaig, RPP MCIP M.Pl
c. 613-850-8345

Sent from my iPhone

Begin forwarded message:

> **From:** "McCreight, Laurel" <Laurel.McCreight@ottawa.ca>
> **Date:** March 3, 2021 at 9:55:19 AM EST
> **To:** Christine McCuaig <christine@q9planning.com>
> **Subject: Pre-Consultation Follow-Up: 100 Bayshore Drive**
>
> Hi Christine,
>
> Please refer to the below regarding the Pre-Application for 100 Bayshore Drive for a Site Plan Control Application for a residential development containing two high-rise towers. I have also attached the required Plans & Study List for application submission.
>
> Below are staff's preliminary comments based on the information available at the time of the pre-consultation meeting:
>
> **Planning / Urban Design**
>
> - A Design Brief is required for the site plan control application. The Terms of Reference is attached for convenience.
> - Please note a secondary wind study is required for the application. Please refer to the Terms of Reference of the wind study for details.
> - The preliminary wind study prepared for the OPA and rezoning identifies a number of areas that will experience rather windy conditions.
> - The detailed design should respond and mitigate such conditions to the extent possible.
> - The secondary wind study should confirm the adequacy of the design measures.

- The site is not within a Design Priority Area. However, as identified in the zoning exception, the applicant is required to visit the Urban Design Review Panel (UDRP) for formal approval.
- Please contact udrp@ottawa.ca for any questions regarding UDRP.
- Regarding the detailed design:
    - Please investigate possible architectural and landscaping measures to mitigate wind impacts/improve conditions in the public realm as well as at the roof top patio.
        - Some refined sculpting at the building corners and Tower A may be helpful.
    - The front yard of the site should be designed as a welcoming pedestrian forecourt through landscaping details where vehicular functions are accommodated but not dominating.
        - Considerations should be given to paving the entire area with interlocks, using depressed curbs, and locating parking only on one side of the central pedestrian walkway.
    - The entrances of both towers should be treated equally within the pedestrian forecourt through landscape design.
    - Please provide details of the parking lot screens.
    - Considerations may be given to refining the building facades to display some commercial characteristics.
    - Considerations should be given to exterior lighting.
- Cash-in-lieu of Parkland will be required.
- Please consult the new Draft Official Plan for emerging directions.
- Please refer to the recently approved Bird-Friendly Design Guidelines.
- LRT Proximity Study – Confirm details with File Lead prior to application submission. In process of reviewing Stage 2 requirements.

- You are encouraged to contact the Ward Councillor, Councillor Theresa Kavanagh, about the proposal.

    - It is recommended to reach out to the Councillor to discuss the working group as required per the direction of Council.

    - I would be happy to attend this meeting as well.

Engineering

- All exterior light fixtures must be included and approved as part of the site plan approval. Therefore, the lights must be clearly identified by make, model and part number. All external light fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). In order to satisfy these criteria, the applicant must provide certification from an acceptable professional engineer. The location of all exterior fixtures, a table showing the fixture types (including make, model, part number), and the mounting heights must be included on a plan

Servicing and site works shall be in accordance with the following documents:

Ottawa Sewer Design Guidelines (October 2012)
Ottawa Design Guidelines – Water Distribution (2010)
Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
City of Ottawa Environmental Noise Control Guidelines (January, 2016)
City of Ottawa Park and Pathway Development Manual (2012)
City of Ottawa Accessibility Design Standards (2012)
Ottawa Standard Tender Documents (latest version)

Ontario Provincial Standards for Roads & Public Works (2013)

Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580- 2424 x.44455).

The Stormwater Management Criteria, for the subject site, is to be based on the following:

- The IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.
- The existing storm system in the RoW was built pre-1970, as such the post-development peak flow rate for storm events up to and including the 100 year event will need to be controlled to the 2 year pre-development storm event. Runoff will need to be detained onsite to control all storm events, up to and including the 100 year event, with an allowable release rate calculated based on the peak flow for the pre-development 2 year event.
- The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).
- A calculated time of concentration (cannot be less than 10 minutes).
- Redevelopment will be expected to provide water quality protection at an enhanced level (minimum 80% TSS removal), as per the RVCA.

The proposed sanitary flows need to be provided to the City to confirm capacity / identify the impact on the downstream West Nepean Collector.

Deep Services (Storm, Sanitary & Water Supply)

- Provide existing servicing information and the recommended location for the proposed connections. Services should ideally be grouped in a common trench to minimize the number of road cuts.
- Connections to trunk sewers and easement sewers are typically not permitted.
- Provide information on the monitoring manhole requirements – should be located in an accessible location on private property near the property line (ie. Not in a parking area).
- Review provision of a high-level sewer.
- Provide information on the type of connection permitted
  - Sewer connections to be made above the springline of the sewermain as per:
    - Std Dwg S11.1 for flexible main sewers – connections made using approved tee or wye fittings.
    - Std Dwg S11 (For rigid main sewers) – lateral must be less that 50% the diameter of the sewermain,
    - Std Dwg S11.2 (for rigid main sewers using bell end insert method) – for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,
    - Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.
    - No submerged outlet connections.

Please refer to ISDTB – 2014-2: individual residential facilities with a basic day demand greater than 50 m3/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid the creation of a vulnerable service area.

Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

- Location of service
- Type of development and the amount of fire flow required (as per FUS, 1999).
- Average daily demand:____l/s.
- Maximum daily demand:____l/s.
- Maximum hourly daily demand:____l/s.
- Note that if Accora Village is proposed to re-develop in its entirety, the proponent may be required to (or may consider) modelling the loop along Woodridge Crescent to provide sub-division level details above.

Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

- Please refer to Ontario Regulation 153/04:
  - "the date the last work on all of the records review, interviews and site reconnaissance required for the phase one environmental site assessment that is the subject of the report was done is no later than 18 months before the submission of the record of site condition or the commencement of the phase two environmental site assessment" and

"the date the last work on all of the planning the site investigation, conducting the site investigation and reviewing and evaluating the information gathered through the site investigation required for the phase two environmental site assessment that is the subject of the report was done is no later than 18 months before the submission of the record of site condition or the commencement of the risk assessment".

MOECC ECA Requirements

Please note that an ECA is not required for zoning amendment however the following applies to the Site Plan Control process:

An MOECC Environmental Compliance Approval (Municipal/Private Sewage Works) will be required for the proposed development where the storm sewer network is designed to service more than one lot or parcel of land. The proposed development boundary appears to include two parcels of land.

Although not required for the rezoning amendment, please note that for Site Plan Control, there is an existing public STM sewer running through the site. Please identify the easement associated with this sewer and provide details of how this will be taken into consideration in the proposed design.

Although not required for the rezoning amendment, please note that for Site Plan Control, please ensure that all easements within the property and adjacent to the subject property are identified on the drawing set and please provide details for all easements identified.

Please contact Infrastructure Project Manager Ahmed Elsayed for follow-up questions.

Transportation

- Please submit an addendum/memo to the Transportation Impact Assessment previously provided.
- A noise study is required.

Please contact Transportation Project Manager, Mike Giampa for follow-up questions.

Other

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-consultation comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please do not hesitate to contact me if you have any questions.

Regards,
Laurel

Laurel McCreight MCIP, RPP
Planner
Development Review West
Urbaniste

Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa

613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

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APPENDIX

B

Pre-Development Stormwater Management Calculations

Project:	100 Bayshore Drive	No.:	211-02810-00	
By:	KK	Date:	2021-09-17	Page:
Checked:	MH	Checked:	2021-09-17	1

Subject: **SWM CALCULATIONS- Pre-Development Peak Flow**

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CiA$

Where: Q = peak flow rate (litres/second)
C = runoff coefficient
i = rainfall intensity (mm/hour)
A = catchment area (hectares)

Site Area, A	5,667	m^2
Site Area, A	0.57	hectares
Runoff Coefficient, C	0.20	

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes) 10 minutes

Return Period (Years)	2	5	10	25	50	100
A	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
B	0.810	0.814	0.816	0.819	0.820	0.820
C	6.199	6.053	6.014	6.018	6.014	6.014
T (mins)	10	10	10	10	10	10
I (mm/hr)	76.8	104.2	122.1	144.7	161.5	178.6
Multiplier	1.0	1.0	1.0	1.1	1.2	1.25
Q (litres/sec)	24	33	38	50	61	70
Q (m3/sec)	0.02	0.03	0.04	0.05	0.06	0.07

APPENDIX

C

Post-Development Stormwater Management Calculations

Project:	100 Bayshore Drive	No.:	211-02810-00	
By:	KK	Date:	2021-09-17	Page:
Checked:	MH	Checked:	2021-09-17	1

Subject: **SWM CALCULATIONS- Post-Development Peak Flow - Uncontrolled Area**

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CiA$

Where: Q = peak flow rate (litres/second)
C = runoff coefficient
i = rainfall intensity (mm/hour)
A = catchment area (hectares)

Site Area, A	160	m^2
Site Area, A	0.02	hectares
Runoff Coefficient, C	0.44	

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes) 10 minutes

Return Period (Years)	2	5	10	25	50	100*
A	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
B	0.810	0.814	0.816	0.819	0.820	0.820
C	6.199	6.053	6.014	6.018	6.014	6.014
T (mins)	10	10	10	10	10	10
I (mm/hr)	76.8	104.2	122.1	144.7	161.5	178.6
Multiplier	1.0	1.0	1.0	1.1	1.2	1.25
Q (litres/sec)	2	2	2	3	4	4
Q (m3/sec)	0.00	0.00	0.00	0.00	0.00	0.00

Project:	100 Bayshore Drive	No.:	211-02810-00	
By:	KK	Date:	2021-09-17	Page:
Checked:	MH	Checked:	2021-09-17	1

Subject: **SWM CALCULATIONS- Post-Development Peak Flow - Controlled Area**

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CiA$

Where: Q = peak flow rate (litres/second)
C = runoff coefficient
i = rainfall intensity (mm/hour)
A = catchment area (hectares)

Site Area, A	5,507	m^2
Site Area, A	0.55	hectares
Runoff Coefficient, C	0.81	

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes) 10 minutes

Return Period (Years)	2	5	10	25	50	100*
A	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
B	0.810	0.814	0.816	0.819	0.820	0.820
C	6.199	6.053	6.014	6.018	6.014	6.014
T (mins)	10	10	10	10	10	10
I (mm/hr)	76.8	104.2	122.1	144.7	161.5	178.6
Multiplier	1.0	1.0	1.0	1.1	1.2	1.25
Q (litres/sec)	95	129	151	197	240	277
Q (m3/sec)	0.10	0.13	0.15	0.20	0.24	0.28

APPENDIX

D

OGS Sizing

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/17/2021

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA MACDONALD-CARTIER INT'L AP
NCDC Rainfall Station Id:	6000
Years of Rainfall Data:	37

Project Name:	100 Bayshore Drive
Project Number:	211-02810-00
Designer Name:	Kathryn Kerker
Designer Company:	WSP
Designer Email:	kathryn.kerker@wsp.com
Designer Phone:	613-690-1206
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	
Drainage Area (ha):	0.55
Runoff Coefficient 'c':	0.81
Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	16.10
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	20.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	78
EFO6	85
EFO8	89
EFO10	91
EFO12	92

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 85

Water Quality Runoff Volume Capture (%): > 90

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.

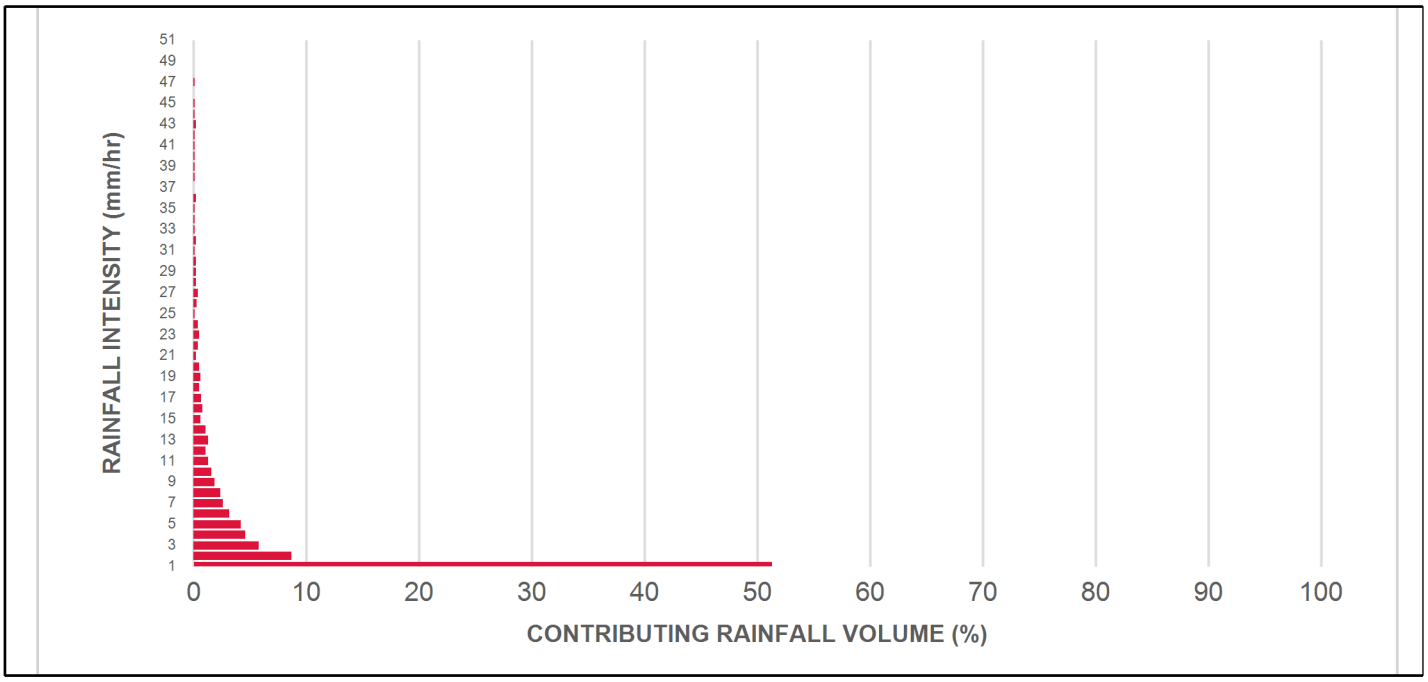
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

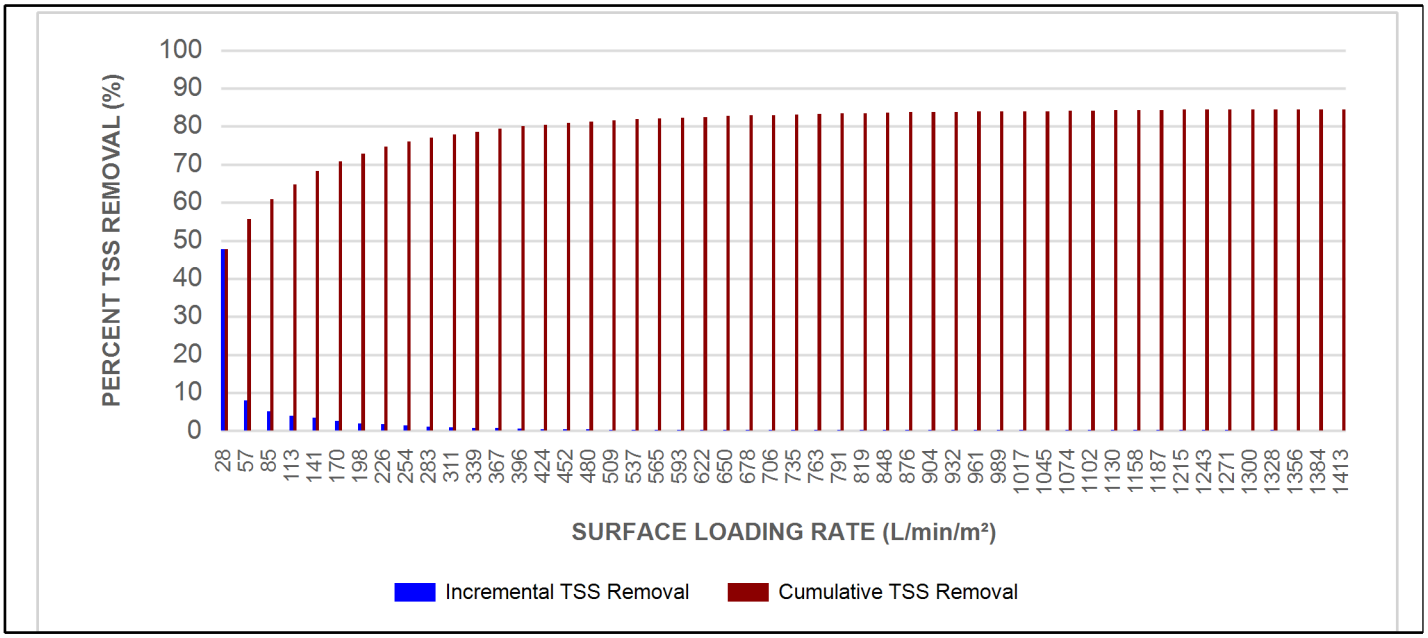
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	51.3	51.3	1.24	74.0	28.0	93	47.7	47.7
2	8.7	60.0	2.48	149.0	57.0	92	8.0	55.7
3	5.8	65.8	3.72	223.0	85.0	89	5.2	60.9
4	4.6	70.4	4.95	297.0	113.0	86	3.9	64.8
5	4.2	74.6	6.19	372.0	141.0	83	3.5	68.3
6	3.2	77.8	7.43	446.0	170.0	79	2.5	70.8
7	2.6	80.4	8.67	520.0	198.0	77	2.0	72.8
8	2.4	82.8	9.91	594.0	226.0	74	1.8	74.6
9	1.9	84.7	11.15	669.0	254.0	72	1.4	76.0
10	1.6	86.3	12.38	743.0	283.0	69	1.1	77.1
11	1.3	87.6	13.62	817.0	311.0	66	0.9	77.9
12	1.1	88.7	14.86	892.0	339.0	63	0.7	78.6
13	1.3	90.0	16.10	966.0	367.0	62	0.8	79.4
14	1.1	91.1	17.34	1040.0	396.0	59	0.6	80.1
15	0.6	91.7	18.58	1115.0	424.0	57	0.3	80.4
16	8.3	100.0	19.82	1189.0	452.0	57	4.7	85.1
17	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
18	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
19	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
20	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
21	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
22	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
23	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
24	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
25	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1

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	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
27	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
28	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
29	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
30	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
31	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
32	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
33	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
34	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
35	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
36	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
37	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
38	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
39	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
40	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
41	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
42	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
43	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
44	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
45	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
46	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
47	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
48	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
49	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
50	0.0	100.0	20.00	1200.0	456.0	57	0.0	85.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**85 %**

RAINFALL DATA FROM OTTAWA MACDONALD-CARTIER INT'L 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

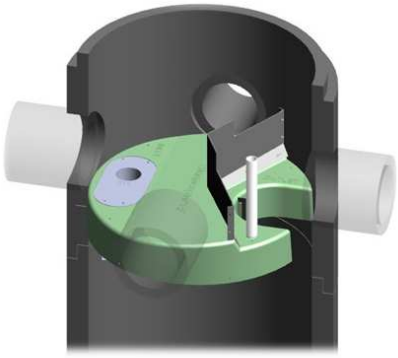
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

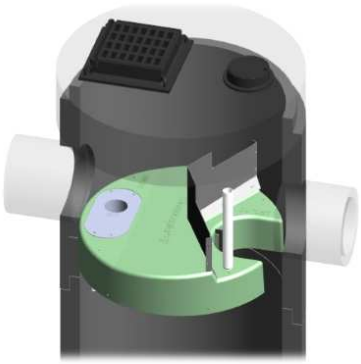
DESIGN FLEXIBILITY

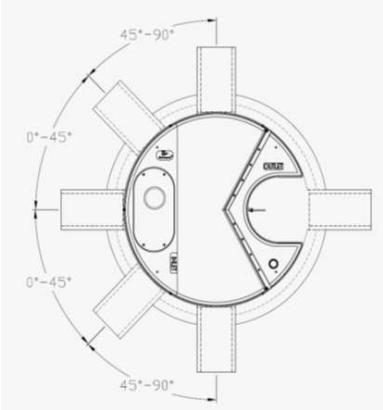
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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







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

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.