

**PROPOSED  
THREE STOREY APARTMENT BUILDING SITE  
LOTS 191 AND 192  
R-PLAN 441  
304-308 DONALD STREET  
CITY OF OTTAWA**

**STORM DRAINAGE REPORT  
REPORT R-824-63 (REV. #1)  
NOVEMBER 2024**

**T.L. MAK ENGINEERING CONSULTANTS LTD.**

**JULY 2024**

**REFERENCE FILE NUMBER 824-63**

## Introduction

The proposed three (3) storey apartment building site is located on the south side of Donald Street and situated east of Edith Avenue and west of Lola Street. Its legal property description is Lots 191 and 192 Registered Plan 441 in City of Ottawa (Ward 13 Rideau-Rockcliffe). Presently, the (2) residential properties under consideration houses a 2-storey brick and siding multi-unit dwelling at 304 Donald Street and a 1-storey brick dwelling at 308 Donald Street. The municipal addresses of the properties are referenced as 304-308 Donald Street.

The site development area under consideration is approximately 1,085.98 square metres. This site is proposed for the development of a (3) storey residential apartment building plus a basement. Each floor covers an area of approximately 5,547 ft<sup>2</sup> ( $\pm 515.0$  m<sup>2</sup>), for a gross area of approximately 16,640 ft<sup>2</sup> ( $\pm 1,545$  m<sup>2</sup>).

The building will house a total of 31 apartment units, including eight (8) 2-bedroom units, ten (10) 1-bedroom units and thirteen (13) bachelor units. The storm water outlet for this site is the existing 1350 mm diameter storm sewer located within the Edith Avenue road right of way.

From storm-drainage criteria set by the staff at the City of Ottawa's Engineering Department, the allowable post-development runoff release rates shall not exceed the two (2)-year pre-development conditions. The allowable pre-development runoff coefficient is the lesser of the calculated "C" existing value = 0.57 or  $C_{allow} = 0.5$  maximum. If the uncontrolled storm-water runoff exceeds the specified requirements, then on-site storm-water management (SWM) control measures are necessary. The post-development runoff coefficient for this site is estimated at  $C = 0.70$ , which exceeds the pre-development allowable  $C_{allow} = 0.5$  criteria for the Donald Street storm sewer without on-site SWM control. Therefore, SWM measures are required. Refer to the attached Drainage Area Plan (Figure 1) as detailed in Appendix A. For Pre and Post site development characteristics, refer also to Dwg. No. 824-63 D-1 for details.

This report will address and detail the grading, drainage, and storm-water management control measures required to develop this property. Based on the Proposed Site Grading and Servicing Plan (Dwg. No. 824-63 G-1), and on the Proposed Rooftop Storm-water Management Plan (Dwg. No. 824-63 SWM-1), the storm water of this lot will be controlled on site by means of the building's flat rooftop, the combined rear of lot asphalt parking and grassed surface area together with underground storm pipe storage.

The storm-water management calculations that follow will detail the extent of on-site SWM control to be implemented and the storage volume required on site to attain the appropriate runoff release that will conform to the City's established drainage criteria and review requirements.

Because the site will be connecting to and outletting into the separated Donald Street storm sewer, therefore, the approval exemption under Ontario Regulations 525/98 would apply since storm water discharges from this site will outlet flow into a downstream a storm sewer. Thus, an Environmental Compliance Application (ECA) application will not be required to be submitted to the Ministry.

## Site Data

### 1. Development Property Area

Post-Development Site Area Characteristics

Development Lot Area	=	1,085.98m <sup>2</sup>
Roof Surface Area	=	596.32m <sup>2</sup>
Concrete and Interlock Area	=	55.31m <sup>2</sup>
Asphalt Area	=	117.16m <sup>2</sup>
Grass Area	=	317.19m <sup>2</sup>

$$C = \frac{(596.32 \times 0.9) + (117.16 \times 0.9) + (55.31 \times 0.9) + (317.19 \times 0.2)}{1,085.98}$$

$$C = \frac{755.491}{1,085.98}$$

$$C = 0.696$$

Say "C" = 0.70

Therefore, the average post-development "C" for this site is 0.70.

### 2. Controlled Area Data (NODE #1 TO NODE #6)

Roof Surface Area	=	596.32m <sup>2</sup>
Concrete Area	=	6.03m <sup>2</sup>
Grass Area	=	6.86m <sup>2</sup>
Asphalt Area	=	205.78m <sup>2</sup>
Total Storm-water Controlled Area	=	814.99m <sup>2</sup>

$$C = \frac{(596.32 \times 0.9) + (6.03 \times 0.9) + (6.86 \times 0.2) + (205.78 \times 0.9)}{814.99}$$

$$C = \frac{728.689}{814.99}$$

$$C = 0.894$$

Say "C" = 0.89

Therefore, the post-development "C" for the controlled storm-water drainage area of this site is 0.89.

### 3. Uncontrolled Area Data (NODE #7)

#### PROPOSED SITE

Asphalt Area	=	12.14m <sup>2</sup>
Grass Area	=	191.49m <sup>2</sup>
Interlock Paver and Concrete Area	=	67.36m <sup>2</sup>
Total Storm-water Uncontrolled Area	=	270.99m <sup>2</sup>

$$C_5 = \frac{(12.14 \times 0.9) + (191.49 \times 0.2) + (67.36 \times 0.9)}{270.99}$$

$$C_5 = \frac{109.848}{270.99}$$

$$C_5 = 0.405$$

$$\text{Say "C}_5\text{"} = 0.41$$

$$C_{100} = \frac{127.37}{270.99}$$

$$C_{100} = 0.47$$

$$\text{Say "C}_{100}\text{"} = 0.47$$

Therefore, the average post-development coefficient runoff for the uncontrolled storm-water drainage area of 270.99m<sup>2</sup> from this site is "C<sub>5</sub>" = 0.41 and for "C<sub>100</sub>" = 0.47.

The total tributary area consisting of approximately 270.99 square metres will be out-letting off site uncontrolled from the residential apartment building site which is also the surface area draining to the front of the lot and outletting to the Donald Street road right of way.

The uncontrolled drainage area draining to the front of the lot is 270.99m<sup>2</sup> and the controlled drainage area of this site is 814.99m<sup>2</sup> which totals to 1,085.98m<sup>2</sup>.

The SWM area to be controlled is 814.99m<sup>2</sup>. Refer to the attached "Drainage Area Plan" in Figure 1 of Appendix A for further details.

## Pre-Development Flow Estimation

Maximum allowable off-site flow: two (2)-year storm

### Node #101

#### Pre-Development Site Area Characteristics

Development Lot Area	=	1,085.98m <sup>2</sup>
Asphalt Area	=	172.99m <sup>2</sup>
Concrete and Interlock Area	=	49.40m <sup>2</sup>
Roof Area	=	338.92m <sup>2</sup>
Grass Area	=	524.67m <sup>2</sup>

$$C_{2pre} = \frac{(172.99 \times 0.9) + (49.40 \times 0.9) + (338.92 \times 0.9) + (524.67 \times 0.2)}{1,085.98}$$

$$C_{2pre} = \frac{610.113}{1,085.98}$$

$$C_{2pre} = 0.562$$

Say  $C_{2pre} = 0.57$

Use  $C_{pre} = 0.5$  maximum allowable for redevelopment

$$T_c = D/V \text{ where } D = 31.5\text{m}, \Delta H = 0.12\text{m}, S = 0.38\%, \text{ and } V = 0.50 \text{ feet/second} = 0.15 \text{ m/s}$$

Therefore,

$$T_c = \frac{31.5\text{m}}{0.15 \text{ m/s}}$$

$$T_c = 3.5 \text{ minutes}$$

Use  $T_c = 10$  minutes

$$I_2 = 77.10 \text{ mm/hr [City of Ottawa, two (2)-year storm]}$$

Using the Rational Method

$$Q = 2.78 (0.5) (77.10) (0.1086)$$

$$Q = 11.64 \text{ L/s}$$

Therefore, the total allowable flow off-site is 11.64 L/s.

The pre-development flow of the two (2)-year and 100-year storm event draining off-site is as follows:

Where,  $T_c = 10$  min.

$$Q_{2pre} = 2.78 \text{ CIA}$$

$$C_{2pre} = \frac{610.113}{1,085.98}$$

$$C_{2pre} = 0.562$$

Say,  $C_{2pre} = 0.57$

$$Q_{2pre} = 2.78 (0.57) (77.10) (0.1086)$$
$$= 13.27 \text{ L/s draining off-site}$$

$$C_{100pre} = \frac{(172.99 \times 1.0) + (49.40 \times 1.0) + (338.92 \times 1.0) + (524.67 \times 0.2 \times 1.25)}{1,085.98}$$

$$C_{100pre} = \frac{692.48}{1,085.98}$$

$$C_{100pre} = 0.638$$

Say,  $C_{100pre} = 0.64$

$$Q_{100pre} = 2.78 (0.64) (178.6) (0.1086)$$
$$= 34.51 \text{ L/s draining off-site}$$

Therefore under current site conditions the 2-year pre-development flow is estimated at 13.27 L/s and the 100 year pre-development flow is estimated at 34.51 L/s.

A coloured Google image and aerial photography of these current pre-development conditions of the site is provided in Appendix B of this report for reference.

For this site, because 270.99 square meters of the site area is drained uncontrolled off-site, the net allowable discharge for this site into the existing Edith Avenue sewer system using the two (2)-year storm event criteria at  $C = 0.5$  (max) is calculated as follow:  $Q = \{2.78 (0.5) (77.10) (0.1086) - [2.78 (0.47) (178.6) (0.0271)]\} = 11.64 \text{ L/s} - 6.32 \text{ L/s} = 5.32 \text{ L/s}$ .

## Stormwater Management Analysis

The calculated net allowable flow rate of 5.32 L/s for on-site stormwater management detention volume storage will be used for this SWM analysis. Since a total of five (5) controlled roof drains are proposed to restrict flow from the building flat roof top at a rate of 4.75 L/s (5 x 0.95 L/s) into the Edith Avenue storm sewer, therefore, the remainder of the site allowable release rate controlled from the ICD in CB/MH#1 is 5.32 L/s – 4.75 L/s = 0.57 L/s. The minimum ICD size with flow rate permitted by the City is 6.0 L/s for site developments. Therefore, a 6.0 L/s ICD will be used to calculate ground surface and underground pipe storage requirements of the site instead of 0.57 L/s which is not practical.

Therefore, the calculated net allowable flow to be controlled to the 2-Year pre-development release rate is 5.32 L/s. However due to ICD flow rate requirements of 6.0 L/s (min.), the 5-Year up to the 100-Year event will be controlled to 10.75 L/s (4.75 L/s + 6.0 L/s) for this site. Runoff greater than the allowable release rate will be stored on-site in the proposed stormwater management ponding area , underground piping and at the asphalt parking lot area located at the rear of the building and the flat rooftop of the proposed apartment building will be used for stormwater detention purposes.

The post-development inflow rate during the 5-Year and 100-Year storm for the parking lot drainage system and rooftop areas can now be calculated as follows:

### Design Discharge Computation

#### 1.) Parking Lot Surface Storage Requirements (NODE #6)

The Rational Method was used to estimate peak flows.

$$Q = 2.78 \text{ CIA}$$

Inflow rate  $Q_{\text{ACTUAL}}$  for the site is:

#### 5-Year Event

$C_5 = (\text{Avg. "C" value of controlled area excluding roof area})$

Total Area	=	218.67 m <sup>2</sup>
Asphalt Area	=	205.78 m <sup>2</sup>
Concrete Area	=	6.03 m <sup>2</sup>
Grass Area	=	6.86 m <sup>2</sup>

Where,

$$C_5 = \frac{(205.78 \times 0.9) + (6.03 \times 0.9) + (6.86 \times 0.2)}{218.67}$$

$$C_5 = \frac{192.001}{218.67}$$

$$C_5 = 0.878$$

$$\therefore C_5 = 0.88$$

A = 0.0219 ha.

Inflow Rate  $(Q_A)_5 = 2.78 \text{ CIA}$

$$= 2.78 (0.88) (0.0219) \text{ l}$$

$$= 0.0536 \text{ l}$$

I = (mm/hr)

The inflow rate for the controlled site tributary area can be calculated as follows:

$$Q_5 = 0.0536 \text{ l}$$

### **100-Year Event**

$C_{100} = 0.98$  (Avg. "C" value of controlled area excluding roof area)

Where,

$$C_{100} = \frac{(205.78 \times 1.0) + (6.86 \times 0.2 \times 1.25) + (6.03 \times 1.0)}{218.67}$$

$$C_{100} = \frac{213.525}{218.67} = 0.977$$

$$\therefore C_{100} = 0.98$$

A = 0.0219 ha.

Inflow Rate  $(Q_A)_{100} = 2.78 \text{ CIA}$

$$= 2.78 (0.98) (0.0219) \text{ l}$$

$$= 0.0597 \text{ l}$$

I = (mm/hr)



This can now be used to determine the storage volume for the site using the Modified Rational Method.

- Actual Flow  $Q_{ACTUAL}$  is calculated as:

$$Q = 2.78 CIA$$

-  $Q_{STORED}$  is calculated as:

$$Q_S = Q_A - Q_{ALLOW}$$

## 2.) To Calculate Roof Storage Requirements

The proposed flat roof of the apartment building on the property will incorporate five (5) roof drains to control flow off-site for this development property. The roof drain flow rate proposed is at 0.95 L/s (15.0 US gal/min.) for Roof Drain #1 to Roof Drain #5 inclusive. The specified roof drain is the Watts "Adjustable Accutrol Weir" (Model No. RD-100-A-ADJ) with weir opening in the 1/4 open position, which will allow a flow of 0.95 L/s under a head of 150mm water above the drain for Roof Drain #1, Roof Drain #2, Roof Drain #3, Roof Drain #4, and Roof Drain #5 inclusive. The weir opening is also in the 1/4 open position which will allow a flow of 0.95 L/s under a head of 150mm water above the drain. See Appendix C for roof drain details. Therefore, the stormwater flow that can be controlled from this building flat rooftop and outletted off-site is  $(5 \times 0.95 \text{ L/s}) = 4.75 \text{ L/s}$ . Refer to the Proposed Stormwater Management Plan (Dwg. No. 824-63 SWM-1) for roof drain details.

$C = 0.9$  will be used for sizing roof storage volume in this case.

Inflow rate ( $Q_A$ ) = 2.78 CIA

Where,  $C = 0.9$

$A$  = Surface area of roof

$I$  = (mm/hr)

### For Roof Area No. 1 (NODE #1)

$Q_{A1} = 2.78 CIA$

#### 5-Year Event

$C_s = 0.90$

$A = 119.55 \text{ m}^2$

$I = (\text{mm/hr})$

$Q_{A1} = 2.78 (0.90) (0.012 \text{ ha.}) I$

$Q_{A1} = 0.030 I$

100-Year Event

$$C_{100} = 1.0$$
$$A = 119.55 \text{ m}^2$$
$$I = (\text{mm/hr})$$

$$Q_{A1} = 2.78 (1.0) (0.012 \text{ ha.}) I$$
$$Q_{A1} = 0.034 I$$

**For Roof Area No. 2 (NODE #2)**

$$Q_{A2} = 2.78 \text{ CIA}$$

5-Year Event

$$C_5 = 0.90$$
$$A = 113.0 \text{ m}^2$$
$$I = (\text{mm/hr})$$

$$Q_{A2} = 2.78 (0.90) (0.0113 \text{ ha.}) I$$
$$Q_{A2} = 0.0283 I$$

100-Year Event

$$C_{100} = 1.0$$
$$A = 113.0 \text{ m}^2$$
$$I = (\text{mm/hr})$$

$$Q_{A2} = 2.78 (1.0) (0.0113 \text{ ha.}) I$$
$$Q_{A2} = 0.0314 I$$

**For Roof Area No. 3 (NODE #3)**

$$Q_{A3} = 2.78 \text{ CIA}$$

5-Year Event

$$C_5 = 0.90$$
$$A = 132.09 \text{ m}^2$$
$$I = (\text{mm/hr})$$

$$Q_{A3} = 2.78 (0.90) (0.0132 \text{ ha.}) I$$
$$Q_{A3} = 0.033 I$$

100-Year Event

$$C_{100} = 1.0$$

$$A = 132.09 \text{ m}^2$$

$$I = (\text{mm/hr})$$

$$Q_{A3} = 2.78 (1.0) (0.0132 \text{ ha.}) I$$

$$Q_{A3} = 0.0367 I$$

**For Roof Area No. 4 (NODE #4)**

$$Q_{A4} = 2.78 \text{ CIA}$$

5-Year Event

$$C_5 = 0.90$$

$$A = 115.21 \text{ m}^2$$

$$I = (\text{mm/hr})$$

$$Q_{A4} = 2.78 (0.90) (0.0115 \text{ ha.}) I$$

$$Q_{A4} = 0.0288 I$$

100-Year Event

$$C_{100} = 1.0$$

$$A = 115.21 \text{ m}^2$$

$$I = (\text{mm/hr})$$

$$Q_{A4} = 2.78 (1.0) (0.0115 \text{ ha.}) I$$

$$Q_{A4} = 0.032 I$$

**For Roof Area No. 5 (NODE #5)**

$$Q_{A5} = 2.78 \text{ CIA}$$

5-Year Event

$$C_5 = 0.90$$

$$A = 116.47 \text{ m}^2$$

$$I = (\text{mm/hr})$$

$$Q_{A5} = 2.78 (0.90) (0.0117 \text{ ha.}) I$$

$$Q_{A5} = 0.0293 I$$

## 100-Year Event

$$C_{100} = 1.0$$

$$A = 116.47 \text{ m}^2$$

$$I = (\text{mm/hr})$$

$$Q_{A5} = 2.78 (1.0) (0.0117 \text{ ha.}) I$$

$$Q_{A5} = 0.0325 I$$

The summary results of the calculated inflow and the required storage volume of the site rear parking area and building's flat rooftop to store the five (5)-year and 100-year storm events are shown in **Tables 1 to 6** inclusive and **7 to 12** inclusive. **Table 13** is the City of Ottawa's required volume for the 100-Year + 20.0% stress test storm event.

**Table 14** summarizes the post-development design flows from the building rooftop area as well as the type of roof drains, the maximum anticipated ponding depths, storage volumes required, and storage volumes provided for the five (5)-year, and 100-year design events.

**Table 14: Design Flow and Roof Drain Table**

Roof Drain ID & Drainage Area (ha)	Number of Roof Drains	Watts Roof Drain Model ID (Weir Opening)	Controlled Flow per Drain (L/s)		Approximate Ponding Depth Above Drains (m)		Storage Volume Required (m <sup>3</sup> )		Max. Storage Available (m <sup>3</sup> )
			5 YR	100 YR	5 YR	100 YR	5 YR	100 YR	
RD-1 (0.0120 ha)	1	RD-100-A-ADJ (1/4 OPENING)	0.87	0.95	0.12	0.15	1.49	3.91	5.80
RD-2 (0.0113 ha)	1	RD-100-A-ADJ (1/4 OPENING)	0.87	0.95	0.12	0.15	1.35	3.49	5.28
RD-3 (0.0132 ha)	1	RD-100-A-ADJ (1/4 OPENING)	0.87	0.95	0.12	0.15	1.74	4.37	6.23
RD-4 (0.0115 ha)	1	RD-100-A-ADJ (1/4 OPENING)	0.87	0.95	0.12	0.15	1.39	3.58	5.46
RD-5 (0.0117 ha)	1	RD-100-A-ADJ (1/4 OPENING)	0.87	0.95	0.12	0.15	1.43	3.67	5.44
<b>Total Roof (0.0597 ha)</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>7.40</b>	<b>19.02</b>	<b>28.21</b>

## Water Quality

Storm water quality is required for this proposed development.

For this site, based on the City of Ottawa's drainage criteria and recommendations set out for this site, water quality treatment of 60 percent (min.) removal of total suspended solids (TSS) is required for this development of this property.

The said property is in the watershed area where the existing 1350mm diameter storm sewer fronts on Edith Avenue outlets to a water course where no municipal treatment for water quality is provided. Therefore, a Stormceptor system is proposed to support the water quality improvement objective. Stormceptor (EFO4) was selected to provide the water quality removal of TSS at a level above 60 percent, which is above the minimum requirement of 60 percent TSS removal. In addition to TSS

removal, the Stormceptor system is also an oil and sediment separator. Refer to Appendix "D" for the Stormceptor sizing details from the manufacturer.

## Erosion and Sediment Control

The contractor shall implement Best Management Practices to provide for protection of the receiving storm sewer during construction activities. These practices are required to ensure no sediment and/or associated pollutants are released to the receiving watercourse. These practices include installation of a "siltsack" catch basin sediment control device or equal in catch basins as recommended by manufacturer on-site and off-site within the Donald Street road right of way adjacent to this property. Siltsack shall be inspected every 2 to 3 weeks and after every major storm. The deposits will be disposed of as per the requirements of the contract. See Dwg. #824-63 ESC-1 for details.

## Conclusion

For development of this residential site ( $\pm 0.1086$  ha. in size) and in controlling the 2 year stormwater release rate off-site to a total allowable rate of 11.64 L/s with a net allowable controlled flow rate of 5.32 L/s from this site, a site storage volume of approximately  $7.87 \text{ m}^3$  (min.) is required during the 5 year event. We estimate that approximately  $7.40 \text{ m}^3$  (min.) of rooftop storage and  $0.47 \text{ m}^3$  (min.) from the proposed parking lot surface storage and underground storm piping at the rear of lot are necessary to attenuate the 5 year post development storm event.

During the 5 year storm event for the flat rooftop storage, the ponding depth on this rooftop is estimated at 120 mm at the drain and 0 mm at the roof perimeter assuming a 1.8% (min.) roof pitch to the drain. The rooftop storage available at Roof Area #1 is  $2.76 \text{ m}^3$ , Roof Area #2 is  $2.58 \text{ m}^3$ , Roof Area #3 is  $3.16 \text{ m}^3$ , Roof Area #4 is  $2.64 \text{ m}^3$ , and  $2.93 \text{ m}^3$  at Roof Area #5 for a total of  $14.07 \text{ m}^3$  which is greater than the required volume of  $7.40 \text{ m}^3$ .

As for the remaining storage volume of  $0.47 \text{ m}^3$  (min.) required from the controlled site development area, during the 5 year storm event, the estimated H.W.L. of 60.30 m will provide a total available storage volume of  $0.84 \text{ m}^3$  consisting of the rear parking lot surface storage and underground storm piping. In total the 5 year available site storage volume is approximately  $14.91 \text{ m}^3$  which is greater than the required site storage volume of  $7.87 \text{ m}^3$ . See Appendix D for details.

In order to control the 100 year stormwater release rate off-site to a net allowable controlled rate of 5.32 L/s, a site storage volume of approximately  $21.82 \text{ m}^3$  (min.) is required during the 100 year event. We estimate that approximately  $19.02 \text{ m}^3$  (min.) of rooftop storage and  $2.80 \text{ m}^3$  (min.) from the proposed parking lot stormwater ponding area at CB#2, CB/MH#1 and underground storm piping between CB/MH#1 and CB#2 are necessary to attenuate the 100 year post development storm event. For the rear yard ponding areas, the City requires the 100-Year + 20.0% stress test storm event volume

to be calculated and based on **Table 13**, 3.36 m<sup>3</sup> (min.) storage volume is required from the related underground storm piping and surface ponding area at CB/MH#1 and CB#2.

During the 100 year storm event for the flat rooftop storage, the ponding depth on this rooftop is estimated at 150 mm at the drain and 0 mm at the roof perimeter assuming a 1.8% (min.) roof pitch to the drain. The rooftop storage available at Roof Area #1 is 5.80 m<sup>3</sup>, Roof Area #2 is 5.28 m<sup>3</sup>, Roof Area #3 is 6.23 m<sup>3</sup>, Roof Area #4 is 5.46 m<sup>3</sup>, and 5.44 m<sup>3</sup> at Roof Area #5 for a total of 28.21 m<sup>3</sup> which is greater than the required volume of 19.02 m<sup>3</sup>.

From the site, the 100-Year storage volume of 2.80 m<sup>3</sup> (min.) is required from the controlled site development area during the 100 year storm event. The required volume is 3.36 m<sup>3</sup> for the 100-Year + 20.0% stress test storm event. At the estimated H.W.L. of 60.35 m, at this level it will provide a total available storage volume of 3.38 m<sup>3</sup> consisting of the proposed parking lot stormwater ponding area at CB/MH#1, CB#2 and underground storm piping between CB/MH#1 and CB#2 which are necessary to attenuate the 100-Year + 20.0% post development flow. In total the 100 year available site storage volume is 31.59 m<sup>3</sup> which is greater than the required site storage volume of 22.38 m<sup>3</sup>. See Appendix E for details.

Therefore by means of flat building rooftop storage, grading the site to the proposed grades and constructing the proposed underground storm piping and drainage structures as shown on the Proposed Site Grading and Servicing Plan (Dwg. No. 824-63, G-1) and Proposed Stormwater Management Plan (Dwg. No. 824-63, SWM-1), the desirable 5 year and 100 year storm event detention volume of 14.91 m<sup>3</sup> and 31.59 m<sup>3</sup> respectively will be available on-site.

An inlet control device (ICD) will be installed at the outlet of CB/MH #1 in the 250 mm diameter storm pipe (outlet pipe) with Q = 6.0 L/s minimum ICD size required by the City of Ottawa under a head of 1.10 m. A rooftop drain with a maximum release rate of 0.95 L/s will be installed at Roof Drain #1 to Roof Drain #5 inclusive on the proposed residential building flat rooftop as depicted on Dwg. No. 824-63, G-1 and Dwg. No. 824-63, SWM-1.

The ICD type recommended is a Hydrovex Regulator (No. 75 VHV-1) or equivalent. See Appendix F for details.

In comparing the pre-development flow of the current site conditions to the post development flow, the SWM regulated flow plus uncontrolled flow from the proposed site under the post development conditions at the 2-Year event = 13.13 L/s (4.75 L/s + 6.0 L/s + 2.38 L/s) and the 100-Year event = 17.08 L/s (4.75 L/s + 6.0 L/s + 6.33 L/s) where both of the post development flow events are less than current pre-development flow estimate for the site at 2-Year<sub>pre</sub> = 13.27 L/s and 100-Year<sub>pre</sub> = 34.51 L/s. Therefore with this proposed development, stormwater flow is improved from that of the existing condition.

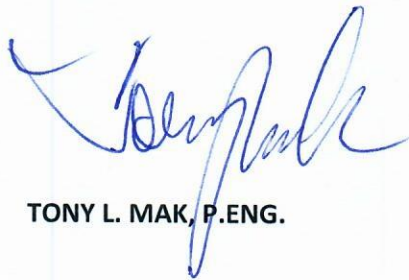
The building weeping tile drainage will outlet via its separate 150mm diameter PVC storm lateral. The roof drains will be outletted also via a separate 150mm PVC storm lateral, whereupon both laterals are

connected directly to the existing Edith Avenue 1350mm diameter storm sewer. The City of Ottawa recommends that pressurized drain pipe material be used in the building for the roof drain leader pipe in the event of surcharging in the City Storm sewer system. Refer to the proposed grading and servicing plan Dwg. 824-63 G-1 for details.

Due to high HGL of the existing Edith Avenue and Donald Street storm sewer segment located in front of this property, the City of Ottawa will require a sump pump with emergency discharge that outlets onto the ground surface that drains to City's right-of-way, refer to City Dwg. No. P01 Rev. Date July 2019 for details.

For water quality control, to achieve a minimum 60 percent TSS removal, a Stormceptor structure (Model No. EFO4) is proposed to be installed for site development of this property. This Stormceptor structure shall be located downstream of the proposed CB/MH#1, which houses the site's inlet control device (ICD). Based on the Stormceptor system that is proposed for this site, size of lot and impervious ratio, a greater than 60 percent TSS removal is estimated for all rainfall events including large storms. (See Appendix "D" for details).

**PREPARED BY T.L. MAK ENGINEERING CONSULTANTS LTD.**



TONY L. MAK, P.ENG.



PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 1  
FIVE (5)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME (NODE #1)

$t_c$ TIME (minutes)	I 5-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m <sup>3</sup> )
5	141.20	4.24	0.87	3.37	1.01
10	104.20	3.13	0.87	2.26	1.36
15	83.50	2.51	0.87	1.64	1.48
20	70.30	2.11	0.87	1.24	<u>1.49</u>
25	60.90	1.83	0.87	0.96	1.44
30	53.93	1.62	0.87	0.75	1.35
35	48.50	1.46	0.87	0.59	1.24

Therefore, the required rooftop storage volume is 1.49 m<sup>3</sup>.



PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 2  
FIVE (5)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME (NODE #2)

$t_c$ TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m <sup>3</sup> )
5	141.20	4.00	0.87	3.13	0.94
10	104.20	2.95	0.87	2.08	1.25
15	83.50	2.37	0.87	1.50	<u>1.35</u>
20	70.30	1.99	0.87	1.12	1.34
25	60.90	1.73	0.87	0.86	1.29
30	53.93	1.53	0.87	0.66	1.19
35	48.50	1.37	0.87	0.50	1.05

Therefore, the required rooftop storage volume is 1.35 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 3  
FIVE (5)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 3 STORAGE VOLUME (NODE #3)

t <sub>c</sub> TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m <sup>3</sup> )
5	141.20	4.66	0.87	3.79	1.14
10	104.20	3.44	0.87	2.57	1.54
15	83.50	2.76	0.87	1.89	1.70
20	70.30	2.32	0.87	1.45	<u>1.74</u>
25	60.90	2.01	0.87	1.14	1.71
30	53.93	1.78	0.87	0.91	1.64
35	48.50	1.60	0.87	0.73	1.53

Therefore, the required rooftop storage volume is 1.74 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 4  
FIVE (5)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 4 STORAGE VOLUME (NODE #4)

<b>t<sub>c</sub> TIME (minutes)</b>	<b>I 100-YEAR (mm/hr)</b>	<b>Q ACTUAL (L/s)</b>	<b>Q ALLOW (L/s)</b>	<b>Q STORED (L/s)</b>	<b>VOLUME STORED (m<sup>3</sup>)</b>
5	141.20	4.07	0.87	3.20	0.96
10	104.20	3.00	0.87	2.13	1.28
15	83.50	2.41	0.87	1.54	1.386
20	70.30	2.03	0.87	1.16	<u>1.39</u>
25	60.90	1.75	0.87	0.88	1.32
30	53.93	1.55	0.87	0.68	1.22

Therefore, the required rooftop storage volume is 1.39 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 5  
FIVE (5)-YEAR EVENT

REQUIRED BUILDING ROOF AREA 5 STORAGE VOLUME (NODE #5)

$t_c$ TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m <sup>3</sup> )
5	141.20	4.14	0.87	3.27	0.98
10	104.20	3.06	0.87	2.19	1.31
15	83.50	2.45	0.87	1.58	1.42
20	70.30	2.06	0.87	1.19	<u>1.43</u>
25	60.90	1.79	0.87	0.92	1.38
30	53.93	1.58	0.87	0.71	1.28

Therefore, the required rooftop storage volume is 1.43 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 6  
FIVE (5)-YEAR EVENT

PARKING LOT REQUIRED SURFACE STORAGE VOLUME (NODE #6)

<b>t<sub>c</sub> TIME (minutes)</b>	<b>I 100-YEAR (mm/hr)</b>	<b>Q ACTUAL (L/s)</b>	<b>Q ALLOW (L/s)</b>	<b>Q STORED (L/s)</b>	<b>VOLUME STORED (m<sup>3</sup>)</b>
5	141.20	7.57	6.0	1.57	<u>0.47</u>
10	104.20	5.59	6.0	0.41	0

Therefore, the required parking lot storage volume is 0.47 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 7  
100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME (NODE #1)

$t_c$ TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m <sup>3</sup> )
10	178.6	6.07	0.95	5.12	3.07
15	142.9	4.86	0.95	3.91	3.52
20	120.0	4.08	0.95	3.13	3.76
25	103.9	3.53	0.95	2.58	3.87
30	91.9	3.12	0.95	2.17	<u>3.91</u>
35	82.6	2.81	0.95	1.86	3.906
40	75.1	2.55	0.95	1.60	3.84
45	69.1	2.35	0.95	1.40	3.78

Therefore, the required rooftop storage volume is 3.91 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 8  
100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME (NODE #2)

<b>t<sub>c</sub></b> <b>TIME</b> (minutes)	<b>I</b> <b>100-YEAR</b> (mm/hr)	<b>Q</b> <b>ACTUAL</b> (L/s)	<b>Q</b> <b>ALLOW</b> (L/s)	<b>Q</b> <b>STORED</b> (L/s)	<b>VOLUME</b> <b>STORED</b> (m <sup>3</sup> )
10	178.6	5.61	0.95	4.66	2.80
15	142.9	4.49	0.95	3.54	3.19
20	120.0	3.77	0.95	2.82	3.38
25	103.9	3.26	0.95	2.31	3.47
30	91.9	2.89	0.95	1.94	<u>3.49</u>
35	82.6	2.59	0.95	1.64	3.44
40	75.1	2.36	0.95	1.41	3.38
45	69.1	2.17	0.95	1.22	3.29

Therefore, the required rooftop storage volume is 3.49 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 9  
100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 3 STORAGE VOLUME (NODE #3)

$t_c$ TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m <sup>3</sup> )
10	178.6	6.56	0.95	5.61	3.37
15	142.9	5.25	0.95	4.30	3.87
20	120.0	4.41	0.95	3.46	4.15
25	103.9	3.82	0.95	2.87	4.31
30	91.9	3.37	0.95	2.42	4.36
35	82.6	3.03	0.95	2.08	<u>4.37</u>
40	75.1	2.76	0.95	1.81	4.34
45	69.1	2.54	0.95	1.59	4.29

Therefore, the required rooftop storage volume is 4.37 m<sup>3</sup>.



PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 10  
100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 4 STORAGE VOLUME (NODE #4)

$t_c$ TIME (minutes)	I 100-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m <sup>3</sup> )
10	178.6	5.72	0.95	4.77	2.86
15	142.9	4.57	0.95	3.62	3.26
20	120.0	3.84	0.95	2.89	3.47
25	103.9	3.32	0.95	2.37	3.56
30	91.9	2.94	0.95	1.99	<u>3.58</u>
35	82.6	2.64	0.95	1.69	3.55
40	75.1	2.40	0.95	1.45	3.48
45	69.1	2.21	0.95	1.26	3.40

Therefore, the required rooftop storage volume is 3.58 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 11  
100-YEAR EVENT

REQUIRED BUILDING ROOF AREA 5 STORAGE VOLUME (NODE #5)

<b>t<sub>c</sub> TIME (minutes)</b>	<b>I 100-YEAR (mm/hr)</b>	<b>Q ACTUAL (L/s)</b>	<b>Q ALLOW (L/s)</b>	<b>Q STORED (L/s)</b>	<b>VOLUME STORED (m<sup>3</sup>)</b>
10	178.6	5.81	0.95	4.86	2.93
15	142.9	4.65	0.95	3.70	3.33
20	120.0	3.90	0.95	2.95	3.54
25	103.9	3.38	0.95	2.43	3.65
30	91.9	2.99	0.95	2.04	<u>3.67</u>
35	82.6	2.69	0.95	1.74	3.65
40	75.1	2.44	0.95	1.49	3.58
45	69.1	2.25	0.95	1.30	3.51

Therefore, the required rooftop storage volume is 3.67 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 12

100-YEAR EVENT

PARKING LOT REQUIRED SURFACE STORAGE VOLUME (NODE #6)

<b>t<sub>c</sub> TIME (minutes)</b>	<b>I 100-YEAR (mm/hr)</b>	<b>Q ACTUAL (L/s)</b>	<b>Q ALLOW (L/s)</b>	<b>Q STORED (L/s)</b>	<b>VOLUME STORED (m<sup>3</sup>)</b>
5	242.8	14.50	6.0	8.5	2.55
10	178.6	10.66	6.0	4.66	<u>2.80</u>
15	142.9	8.53	6.0	2.53	2.25
20	120.0	7.16	6.0	1.16	1.39
25	103.9	6.20	6.0	0.20	0.30

Therefore, the required parking lot storage volume is 2.80 m<sup>3</sup>.

PROPOSED 304-308 DONALD STREET APARTMENT BUILDING DEVELOPMENT SITE

TABLE 13

100-YEAR EVENT + 20.0% (STRESS TEST)

PARKING LOT REQUIRED SURFACE STORAGE VOLUME (NODE #6)

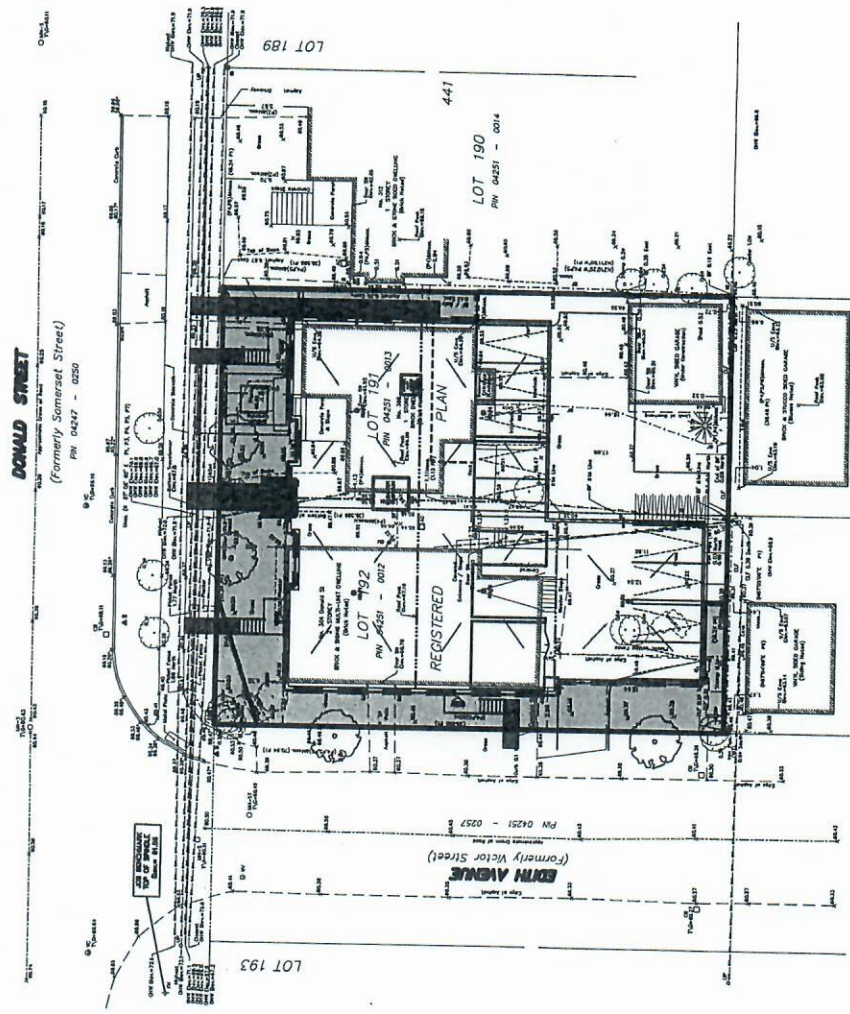
<b>t<sub>c</sub></b> <b>TIME</b> (minutes)	<b>I</b> <b>100-YEAR</b> (mm/hr)	<b>Q</b> <b>ACTUAL</b> (L/s)	<b>Q</b> <b>ALLOW</b> (L/s)	<b>Q</b> <b>STORED</b> (L/s)	<b>VOLUME STORED</b> <b>100-Year</b> (m <sup>3</sup> )	<b>VOLUME STORED</b> <b>100-Year + 20.0%</b> (m <sup>3</sup> )
5	242.8	14.50	6.0	8.5	2.55	3.06
10	178.6	10.66	6.0	4.66	2.80	<u>3.36</u>
15	142.9	8.53	6.0	2.53	2.25	2.70
20	120.0	7.16	6.0	1.16	1.39	1.67
25	103.9	6.20	6.0	0.20	0.30	0.36

Therefore, the required parking lot storage volume is 3.36 m<sup>3</sup>.

**PROPOSED  
THREE STOREY APARTMENT BUILDING SITE  
LOTS 191 AND 192  
R-PLAN 441  
304-308 DONALD STREET  
CITY OF OTTAWA**

**APPENDIX A  
STORM DRAINAGE AREA PLAN  
FIGURE 1**


**PROPOSED 304-308 DONALD STREET  
SITE DEVELOPMENT  
DRAINAGE AREA PLAN**  
N.T.S.



**LEGEND**

- LIMIT OF CONTROLLED STORM  
 DRAINAGE AREA = 814.99 SQ. M
  - UNCONTROLLED STORM  
 DRAINAGE AREA = 270.99 SQ. M
- TOTAL AREA = 1,085.98 SQ. M

POST-DEVELOPMENT SITE  
AVERAGE "C" = 0.70



**I.L. MAK ENGINEERING CONSULTANTS LTD.**  
CONSULTING ENGINEERS

PROJECT No.	824-63	DRAWING No.	FIGURE 1
DATE	JUNE 2024		

**PROPOSED  
THREE STOREY APARTMENT BUILDING SITE  
LOTS 191 AND 192  
R-PLAN 441  
304-308 DONALD STREET  
CITY OF OTTAWA**

**APPENDIX B  
SITE PRE-DEVELOPMENT CONDITION  
GOOGLE IMAGE 2021  
AND  
AERIAL PHOTOGRAPHY 2022 (GEOOTTAWA)**









**PROPOSED**  
**THREE STOREY APARTMENT BUILDING SITE**  
**LOTS 191 AND 192**  
**R-PLAN 441**  
**304-308 DONALD STREET**  
**CITY OF OTTAWA**

**APPENDIX C**  
**PROPOSED ROOF DRAIN**  
**DETAILS**



# Adjustable Accutrol Weir

Tag: \_\_\_\_\_

## Adjustable Flow Control for Roof Drains

### ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

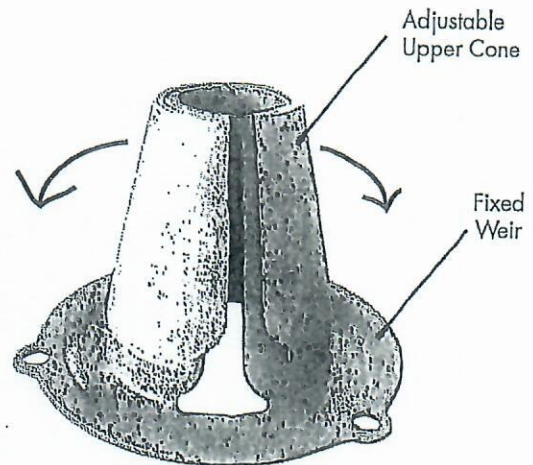
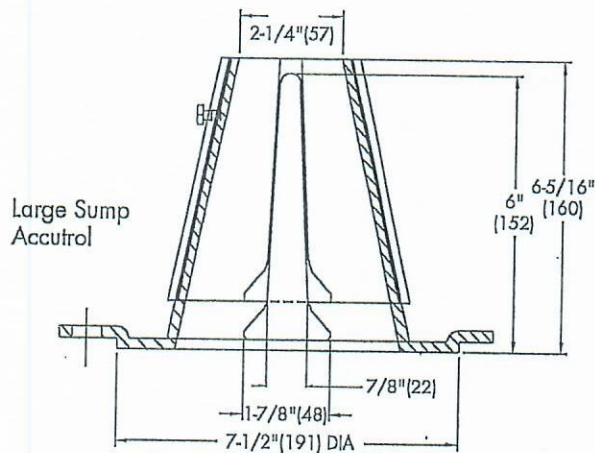
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.

Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

#### EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2" of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3" of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:  
 $[5 \text{ gpm (per inch of head)} \times 2 \text{ inches of head}] + 2\text{-}1/2 \text{ gpm (for the third inch of head)} = 12\text{-}1/2 \text{ gpm.}$



1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name \_\_\_\_\_

Contractor \_\_\_\_\_

Job Location \_\_\_\_\_

Contractor's P.O. No. \_\_\_\_\_

Engineer \_\_\_\_\_

Representative \_\_\_\_\_

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.



A Watts Water Technologies Company

USA: Tel: (800) 338-2681 • Fax: (828) 248-3929 • Watts.com  
 Canada: Tel: (905) 832-4090 • Fax: (905) 332-7068 • Watts.ca  
 Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

ES-WD-RD-ACCUTROLADJ-CAN 1615

**PROPOSED  
THREE STOREY APARTMENT BUILDING SITE  
LOTS 191 AND 192  
R-PLAN 441  
304-308 DONALD STREET  
CITY OF OTTAWA**

**APPENDIX D  
STORMCEPTOR MODEL No. EFO4  
SIZING AND DETAILS  
JULY 2024**

Stormceptor® **EF** Sizing Report

**Imbrium® Systems**

**ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION**

07/12/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Project Name:	304-308 Donald Street
Project Number:	824-63
Designer Name:	Jessica Steffler
Designer Company:	Forterra Pipe & Precast
Designer Email:	jessica.steffler@RinkerPipe.com
Designer Phone:	519-239-6958
EOR Name:	tony Mak
EOR Company:	T.L. Mak Engineering Consultants Ltd
EOR Email:	tmakecl@bellnet.ca
EOR Phone:	613-837-5516

Site Name:	304-308 Donald Street
------------	-----------------------

Drainage Area (ha):	0.11
Runoff Coefficient 'c':	0.88

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):	3.12
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	91
Estimated Average Annual Sediment Volume (L/yr):	74

Net Annual Sediment (TSS) Load Reduction Sizing Summary	
Stormceptor Model	TSS Removal Provided (%)
EFO4	67
EFO6	69
EFO8	70
EFO10	70
EFO12	70

**Recommended Stormceptor EFO Model: EFO4**  
**Estimated Net Annual Sediment (TSS) Load Reduction (%): 67**  
**Water Quality Runoff Volume Capture (%): > 90**

## Stormceptor® EF Sizing Report

### 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	8.6	8.6	0.13	8.0	7.0	70	6.1	6.1
1.00	20.3	29.0	0.27	16.0	13.0	70	14.3	20.4
2.00	16.2	45.2	0.54	32.0	27.0	70	11.4	31.8
3.00	12.0	57.2	0.81	48.0	40.0	70	8.5	40.3
4.00	8.4	65.6	1.08	65.0	54.0	69	5.8	46.1
5.00	5.9	71.6	1.35	81.0	67.0	67	4.0	50.1
6.00	4.6	76.2	1.61	97.0	81.0	64	3.0	53.0
7.00	3.1	79.3	1.88	113.0	94.0	63	1.9	55.0
8.00	2.7	82.0	2.15	129.0	108.0	62	1.7	56.7
9.00	3.3	85.3	2.42	145.0	121.0	61	2.0	58.7
10.00	2.3	87.6	2.69	161.0	135.0	60	1.4	60.1
11.00	1.6	89.2	2.96	178.0	148.0	59	0.9	61.0
12.00	1.3	90.5	3.23	194.0	161.0	57	0.8	61.7
13.00	1.7	92.2	3.50	210.0	175.0	57	1.0	62.7
14.00	1.2	93.5	3.77	226.0	188.0	56	0.7	63.4
15.00	1.2	94.6	4.04	242.0	202.0	54	0.6	64.0
16.00	0.7	95.3	4.31	258.0	215.0	54	0.4	64.4
17.00	0.7	96.1	4.57	274.0	229.0	53	0.4	64.8
18.00	0.4	96.5	4.84	291.0	242.0	53	0.2	65.0
19.00	0.4	96.9	5.11	307.0	256.0	53	0.2	65.2
20.00	0.2	97.1	5.38	323.0	269.0	52	0.1	65.3
21.00	0.5	97.5	5.65	339.0	283.0	52	0.2	65.6
22.00	0.2	97.8	5.92	355.0	296.0	51	0.1	65.7
23.00	1.0	98.8	6.19	371.0	309.0	51	0.5	66.2
24.00	0.3	99.1	6.46	388.0	323.0	50	0.1	66.3
25.00	0.0	99.1	6.73	404.0	336.0	50	0.0	66.3
30.00	0.9	100.0	8.07	484.0	404.0	48	0.4	66.8
35.00	0.0	100.0	9.42	565.0	471.0	46	0.0	66.8
40.00	0.0	100.0	10.76	646.0	538.0	44	0.0	66.8
45.00	0.0	100.0	12.11	727.0	605.0	42	0.0	66.8
<b>Estimated Net Annual Sediment (TSS) Load Reduction =</b>								<b>67 %</b>

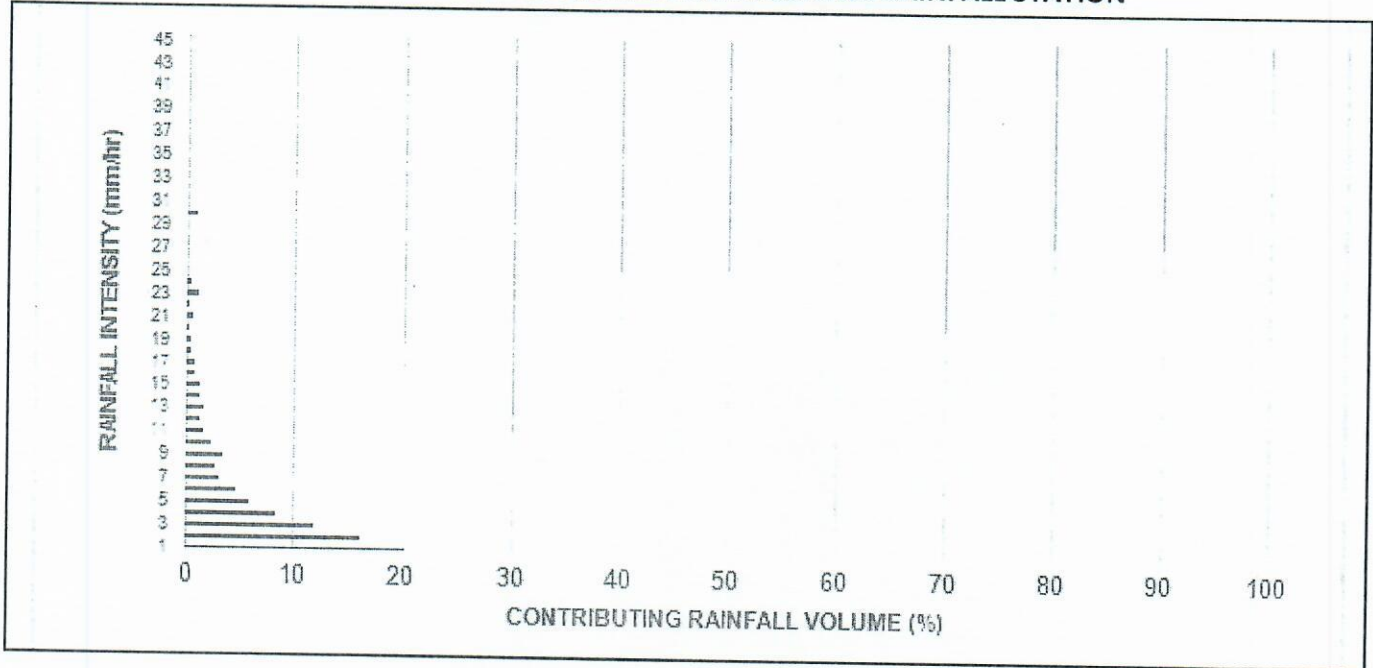
Climate Station ID: 6105978 Years of Rainfall Data: 20



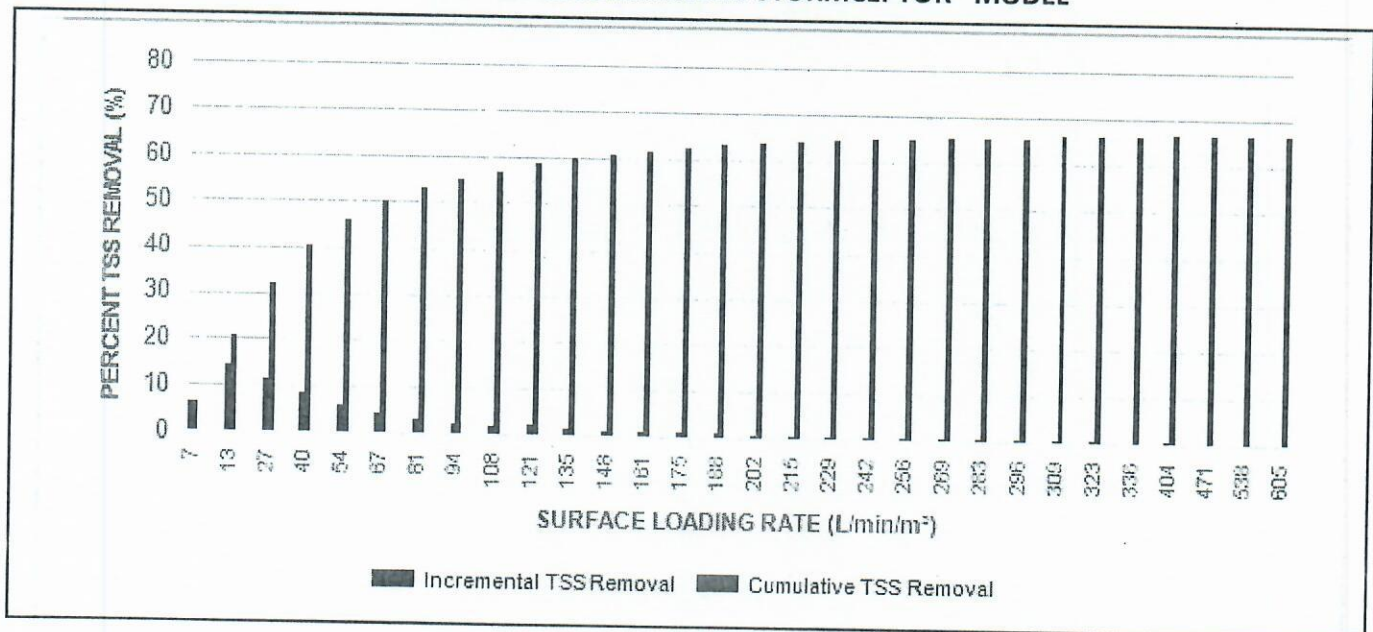


Stormceptor®EF Sizing Report

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



## Stormceptor® EF Sizing Report

### 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

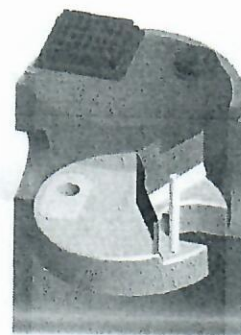
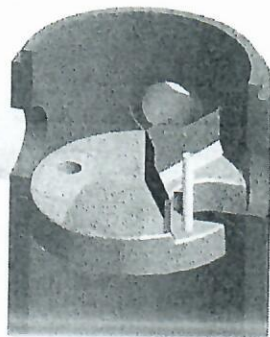
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators, and the exceptional scour test performance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

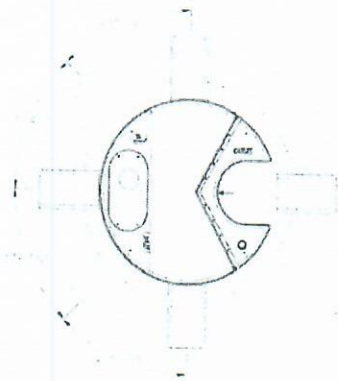
► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle,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



**Stormceptor®EF Sizing Report**



**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>



**Stormceptor®EF Sizing Report**

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

SLR (L/min/m <sup>2</sup> )	TSS % REMOVAL	SLR (L/min/m <sup>2</sup> )	TSS % REMOVAL	SLR (L/min/m <sup>2</sup> )	TSS % REMOVAL	SLR (L/min/m <sup>2</sup> )	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

Stormceptor®**EF** Sizing Report

**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 <sup>3</sup> sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m <sup>3</sup> sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m <sup>3</sup> sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m <sup>3</sup> sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m <sup>3</sup> sediment / 2,476 L oil



## Stormceptor® EF Sizing Report

### 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<sup>2</sup> to 1400 L/min/m<sup>2</sup>, 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<sup>2</sup> and 1400 L/min/m<sup>2</sup> 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<sup>2</sup> shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m<sup>2</sup>. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m<sup>2</sup>.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m<sup>2</sup> shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m<sup>2</sup>, and shall be calculated using a simple proportioning formula, with 1400 L/min/m<sup>2</sup> 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<sup>2</sup>.

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



**Stormceptor®EF Sizing Report**

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<sup>2</sup>.

### 3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

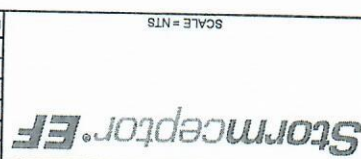
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m<sup>2</sup> to 2600 L/min/m<sup>2</sup>) 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.

MARK	DATE	REVISION DESCRIPTION	BY
0	5/26/17	INITIAL RELEASE	JSK
1	6/16/18	UPDATES	JSK
###	###	###	###
###	###	###	###
###	###	###	###
###	###	###	###

THE DESIGN AND DIMENSIONS SHOWN ON THIS DRAWING ARE THE PROPERTY OF IMPERIUM. ANY REVISIONS TO THIS DRAWING SHALL BE MADE BY IMPERIUM. IMPERIUM SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS IN THIS DRAWING. IMPERIUM SHALL NOT BE RESPONSIBLE FOR ANY DAMAGE TO PROPERTY OR PERSONS ARISING FROM THE USE OF THIS DRAWING. IMPERIUM SHALL NOT BE RESPONSIBLE FOR ANY CONSTRUCTION DEFECTS OR OMISSIONS IN THE CONSTRUCTION OF THE WORK. IMPERIUM SHALL NOT BE RESPONSIBLE FOR ANY CHANGES TO THE WORK NOT SHOWN ON THIS DRAWING. IMPERIUM SHALL NOT BE RESPONSIBLE FOR ANY DELAYS TO THE WORK NOT SHOWN ON THIS DRAWING. IMPERIUM SHALL NOT BE RESPONSIBLE FOR ANY COSTS INCURRED BY THE CONTRACTOR AS A RESULT OF THIS DRAWING. IMPERIUM SHALL NOT BE RESPONSIBLE FOR ANY OTHER MATTERS NOT SHOWN ON THIS DRAWING.

SCALE = NTS

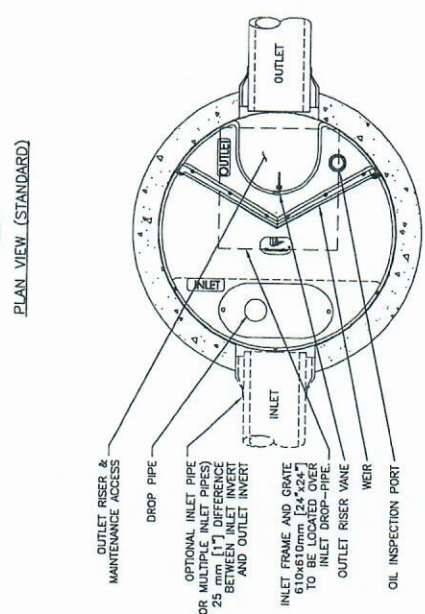
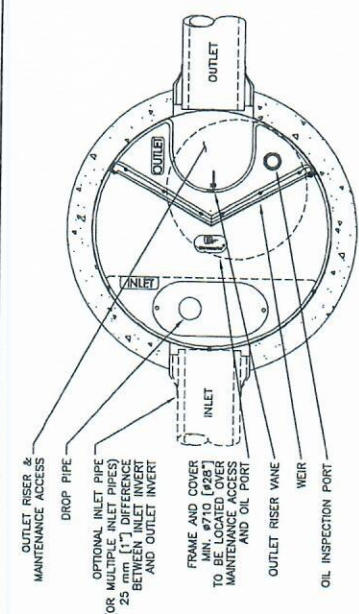


IMPERIUM  
4077 AVENUE DRIVE, WESTPORT, CA 94091  
TEL: 415-922-8800 FAX: 415-922-8801  
WWW.IMPERIUM.COM

DATE: 10/16/2017

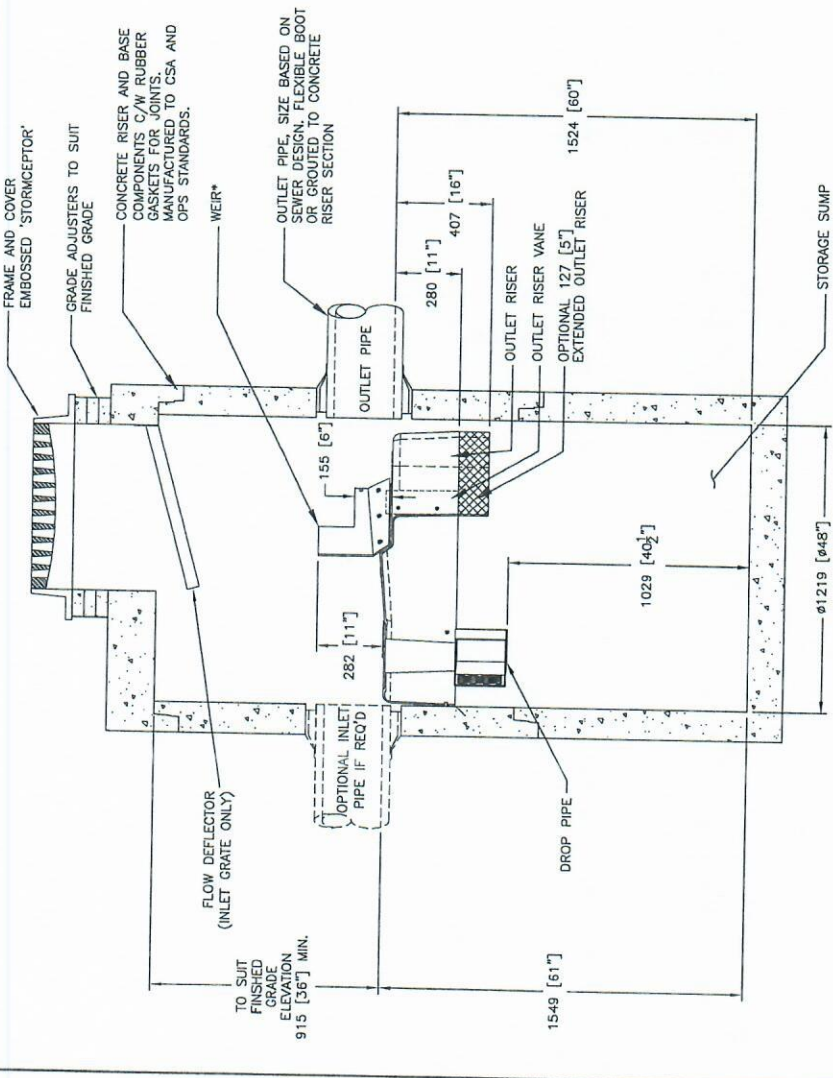
DESIGNED	JSK
CHECKED	BSF
APPROVED	SP
PROJECT NO.	EF04
SEQUENCE NO.	1

SHEET: 1 OF 1



FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS WILL BE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SITE SPECIFIC DRAWING OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION. REVISIONS, ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

SITE SPECIFIC DATA REQUIREMENTS	
STORMCEPTOR MODEL	EF04
STRUCTURE ID	
HYDROCARBON STORAGE REQ'D (L)	
WATER QUALITY FLOW RATE (Us)	
PEAK FLOW RATE (Us)	
RETURN PERIOD OF PEAK FLOW (yrs)	
DRAINAGE AREA (HA)	
DRAINAGE AREA IMPERVIOUSNESS (%)	
PIPE DATA:	
I.E. MAT'L	
DIA	
SLOPE %	
HGL	
INLET #1	
INLET #2	
OUTLET	
* PER ENGINEER OF RECORD	



INSTALLATION NOTES

- ANY SUB-BASE BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLOUTLES PROVIDED)
- CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE SEALS TO THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
- DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

GENERAL NOTES:

- MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m<sup>2</sup> (27.8 gpm/m<sup>2</sup>) FOR STORMCEPTOR EF4 AND 535 L/min/m<sup>2</sup> (13.1 gpm/m<sup>2</sup>) FOR STORMCEPTOR EF04 OIL CAPTURE CONFIGURATION. WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.
- OTHER DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
- STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATION PURPOSES ONLY.
- UPSTREAM DIVERSION STRUCTURES, BYPASS INFRASTRUCTURE, SUCH AS ALL CONDUITS CONNECTING TO COMPLETELY CONNECTING STRUCTURES, OR PIPE PROVIDED AND ADDRESSED SEPARATELY. THE STORMCEPTOR SYSTEM SHALL BE DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEERS SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
- NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

# STANDARD DETAIL

## NOT FOR CONSTRUCTION



**PROPOSED  
THREE STOREY APARTMENT BUILDING SITE  
LOTS 191 AND 192  
R-PLAN 441  
304-308 DONALD STREET  
CITY OF OTTAWA**

**APPENDIX E  
DETAILED CALCULATIONS  
FOR FIVE (5)-YEAR AND 100-YEAR  
AVAILABLE STORAGE VOLUME**

## AVAILABLE STORAGE VOLUME CALCULATIONS

### Five (5)-Year Event

#### Roof Storage at Flat Roof Building

The flat Roof Area 1 to Roof Area 5 inclusive will be used for storm-water detention. Each roof area will be drained by a controlled drain designed for a release rate of 13.75 U.S. gal./min. or 0.87 L/s under a head of 120mm at the drain. Refer to Dwg. 824-63 SWM-1 for roof drain details.

#### **1. Roof Storage Area 1 (NODE No. 1)**

Available flat roof area for storage = 112.80 m<sup>2</sup>, C = 0.9, @roof slope of 1.9% minimum or 120mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.12\text{m})[68.71 + 4(17.28) + 0]}{6}$$

$$V = \frac{(0.12)(137.83)}{6}$$

$$V = 2.76 \text{ m}^3$$

The available Roof Area 1 storage volume of 2.76 m<sup>3</sup> > required five (5)-year storage volume of 1.49 m<sup>3</sup> from Table 1.

#### **2. Roof Storage Area 2 (NODE No. 2)**

Available flat roof area for storage = 102.37 m<sup>2</sup>, C = 0.9, @roof slope of 2.0% minimum or 120mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.12\text{m})[63.76 + 4(16.36) + 0]}{6}$$

$$V = \frac{(0.12)(129.2)}{6}$$

$$V = 2.58 \text{ m}^3$$

The available Roof Area 2 storage volume of 2.58 m<sup>3</sup> > required five (5)-year storage volume of 1.35 m<sup>3</sup> from Table 2.

### 3. Roof Storage Area 3 (NODE No. 3)

Available flat roof area for storage = 127.07 m<sup>2</sup>, C = 0.9, @roof slope of 1.8% minimum or 120mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.12\text{m})[78.54 + 4(19.92) + 0]}{6}$$

$$V = \frac{(0.12)(158.22)}{6}$$

$$V = 3.16 \text{ m}^3$$

The available Roof Area 3 storage volume of 3.16 m<sup>3</sup> > required five (5)-year storage volume of 1.74 m<sup>3</sup> from Table 3.

### 4. Roof Storage Area 4 (NODE No. 4)

Available flat roof area for storage = 110.27 m<sup>2</sup>, C = 0.9, @roof slope of 2.0% minimum or 120mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.12\text{m})[66.30 + 4(16.44) + 0]}{6}$$

$$V = \frac{(0.12)(132.06)}{6}$$

$$V = 2.64 \text{ m}^3$$

The available Roof Area 4 storage volume of 2.64 m<sup>3</sup> > required five (5)-year storage volume of 1.39 m<sup>3</sup> from Table 4.

### 5. Roof Storage Area 5 (NODE No. 5)

Available flat roof area for storage = 111.47 m<sup>2</sup>, C = 0.9, @roof slope of 2.0% minimum or 120mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.12\text{m})[71.86 + 4(18.62) + 0]}{6}$$

$$V = \frac{(0.12)(146.34)}{6}$$

$$V = 2.93 \text{ m}^3$$

The available Roof Area 5 storage volume of  $2.93 \text{ m}^3 >$  required five (5)-year storage volume of  $1.43 \text{ m}^3$  from Table 5.

Therefore, the ponding depth at the Roof Drain 1 to 5 location is approximately 0.12m (120mm), and the five (5)-year level is estimated not to reach the roof perimeter of the building.

#### **6. Asphalt Parking Lot Area – Surface Storage Volume (NODE #6)**

Assume 100-Year HWL = 60.30 m (See attached Dwg. No. 824-63 G-1 with the flood limit shown)

CB#2

$$\text{Available Storage Volume} = \frac{d (A_1 + 4A_2 + A_3)}{6}$$

$$V = \frac{(0.05\text{m})[19.44 + 4(5.13) + 0]}{6}$$

$$V = \frac{(0.05)(39.96)}{6}$$

$$V = 0.33 \text{ m}^3$$

The total parking lot area surface storage volume =  $0.33 \text{ m}^3$ .

#### **7. Storm Pipe Storage Volume - CB#2 to CB/MH#1**

14.5m of 300mm diameter

$$V = \pi (0.15)^2 (14.5)$$

$$V = 1.02 \text{ m}^3$$

$$\text{Pipe Volume} = 1.02 \text{ m}^3$$

$$\text{Effective pipe storage volume} = 1.02 \text{ m}^3 / 2 = 0.51 \text{ m}^3$$

$$\text{Therefore, effective pipe storage volume} = 0.51 \text{ m}^3$$

Thus at the estimated 5-Year HWL = 60.30 m, the available parking lot surface storage volume is  $0.33\text{m}^3$  and the underground storm pipe storage volume is  $0.51\text{m}^3$  which totals to  $0.84\text{ m}^3 > 0.47\text{ m}^3$  from Table 6.

Hence, Roof Area 1 to Roof Area 5 inclusive of the proposed residential building flat rooftop storage are adequate to store the minimum required five (5)-year storm event volume of  $7.40\text{ m}^3$  given it can store up to  $14.07\text{ m}^3$ . The total available parking lot surface and underground piping storage volume is calculated at  $0.84\text{ m}^3$  at the estimated HWL = 60.30 m in which this volume is greater than the required volume of  $0.47\text{ m}^3$  from Table 6.

Therefore, the total 5-Year site storage available is  $14.91\text{ m}^3$  which is greater than the minimum required volume of  $7.87\text{ m}^3$ .

## AVAILABLE STORAGE VOLUME CALCULATIONS

### 100-Year Event

#### Roof Storage at Flat Roof Building

The flat Roof Area 1 to Roof Area 5 inclusive will be used for storm-water detention. Each roof area will be drained by a controlled drain designed for a release rate of 15.0 U.S. gal./min. or 0.95 L/s under a head of 150mm at the drain. Refer to Dwg. 824-63 SWM-1 for roof drain details.

#### **1. Roof Storage Area 1 (NODE No. 1)**

Available flat roof area for storage = 112.80 m<sup>2</sup>, C = 1.0, @roof slope of 1.9% minimum or 150mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.15\text{m})[112.80 + 4(29.77) + 0]}{6}$$

$$V = \frac{(0.15)(231.88)}{6}$$

$$V = 5.80 \text{ m}^3$$

The available Roof Area 1 storage volume of 5.80 m<sup>3</sup> > required 100-year storage volume of 3.91 m<sup>3</sup> from Table 7.

#### **2. Roof Storage Area 2 (NODE No. 2)**

Available flat roof area for storage = 102.37 m<sup>2</sup>, C = 1.0, @roof slope of 2.0% minimum or 150mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.15\text{m})[102.37 + 4(27.20) + 0]}{6}$$

$$V = \frac{(0.15)(211.17)}{6}$$

$$V = 5.28 \text{ m}^3$$

The available Roof Area 2 storage volume of 5.28 m<sup>3</sup> > required 100-year storage volume of 3.49 m<sup>3</sup> from Table 8.

### 3. Roof Storage Area 3 (NODE No. 3)

Available flat roof area for storage = 127.07 m<sup>2</sup>, C = 1.0, @roof slope of 1.8% minimum or 150mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.15\text{m})[127.07 + 4(30.52) + 0]}{6}$$

$$V = \frac{(0.15)(249.15)}{6}$$

$$V = 6.23 \text{ m}^3$$

The available Roof Area 3 storage volume of 6.23 m<sup>3</sup> > required 100-year storage volume of 4.37 m<sup>3</sup> from Table 9.

### 4. Roof Storage Area 4 (NODE No. 4)

Available flat roof area for storage = 110.27 m<sup>2</sup>, C = 1.0, @roof slope of 2.0% minimum or 150mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.15\text{m})[110.27 + 4(27.06) + 0]}{6}$$

$$V = \frac{(0.15)(218.51)}{6}$$

$$V = 5.46 \text{ m}^3$$

The available Roof Area 4 storage volume of 5.46 m<sup>3</sup> > required 100-year storage volume of 3.58 m<sup>3</sup> from Table 10.

### 5. Roof Storage Area 5 (NODE No. 5)

Available flat roof area for storage = 111.47 m<sup>2</sup>, C = 1.0, @roof slope of 2.0% minimum or 150mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.15\text{m})[111.47 + 4(26.50) + 0]}{6}$$

$$V = \frac{(0.15)(217.47)}{6}$$

$$V = 5.44 \text{ m}^3$$

The available Roof Area 5 storage volume of  $5.44 \text{ m}^3 >$  required 100-year storage volume of  $3.67 \text{ m}^3$  from Table 11.

Therefore, the ponding depth at the Roof Drain 1 to Roof Drain 5 inclusive location are approximately 0.15 m (150 mm), and at the perimeter of the flat roof area is 0 mm above the roof perimeter surface. Accordingly, it is recommended that ten (10) roof scuppers as shown on Dwg. No. 824-63 G-1 and Dwg. No. 824-63 SWM-1 and the architect's roof plan be installed at the perimeter height of the rooftop for emergency overflow purposes in case of blockage from debris build up at the roof drain.

#### **6. Asphalt Parking Lot Area – Surface Storage Volume (NODE #6)**

Assume 100-Year + 20.0% HWL = 60.35 m

(See attached Dwg. No. 824-63 G-1 with the flood limit shown)

CB#2

$$\text{Available Storage Volume} = \frac{d (A_1 + 4A_2 + A_3)}{6}$$

$$V = \frac{(0.10\text{m})[79.27 + 4(20.29) + 0]}{6}$$

$$V = \frac{(0.10)(160.43)}{6}$$

$$V = 2.67 \text{ m}^3$$

CB/MH#1

$$V = \frac{(0.05\text{m})[11.94 + 4(3.09) + 0]}{6}$$

$$V = \frac{(0.05)(24.3)}{6}$$

$$V = 0.20 \text{ m}^3$$



The total rear yard parking lot area and grass area surface storage volume = 2.87 m<sup>3</sup>.

#### 7. Storm Pipe Storage Volume - CB#2 to CB/MH#1

14.5m of 300mm diameter

$$V = \pi (0.15)^2 (14.5)$$

$$V = 1.02 \text{ m}^3$$

$$\text{Pipe Volume} = 1.02 \text{ m}^3$$

$$\text{Effective pipe storage volume} = 1.02 \text{ m}^3 / 2 = 0.51 \text{ m}^3$$

$$\text{Therefore, effective pipe storage volume} = 0.51 \text{ m}^3$$

Thus at the estimated 100-Year + 20.0% HWL = 60.35 m, the available parking lot surface storage volume is 2.87 m<sup>3</sup> and the underground storm pipe storage volume is 0.51 m<sup>3</sup> which totals to 3.38 m<sup>3</sup> > 3.36 m<sup>3</sup> from Table 13.

Hence, Roof Area 1 to Roof Area 5 inclusive of the proposed residential building flat rooftop storage are adequate to store the minimum required 100-Year storm event volume of 19.02 m<sup>3</sup> given it can store up to 28.21 m<sup>3</sup>. The total available parking lot surface and underground piping storage volume is calculated at 3.38 m<sup>3</sup> where the estimated 100-Year + 20.0% HWL = 60.35 m in which this volume is greater than the required volume of 3.36 m<sup>3</sup> from Table 13.

Therefore, the total 100-Year site storage available is 31.59 m<sup>3</sup> which is greater than the minimum required volume of 22.38 m<sup>3</sup>.

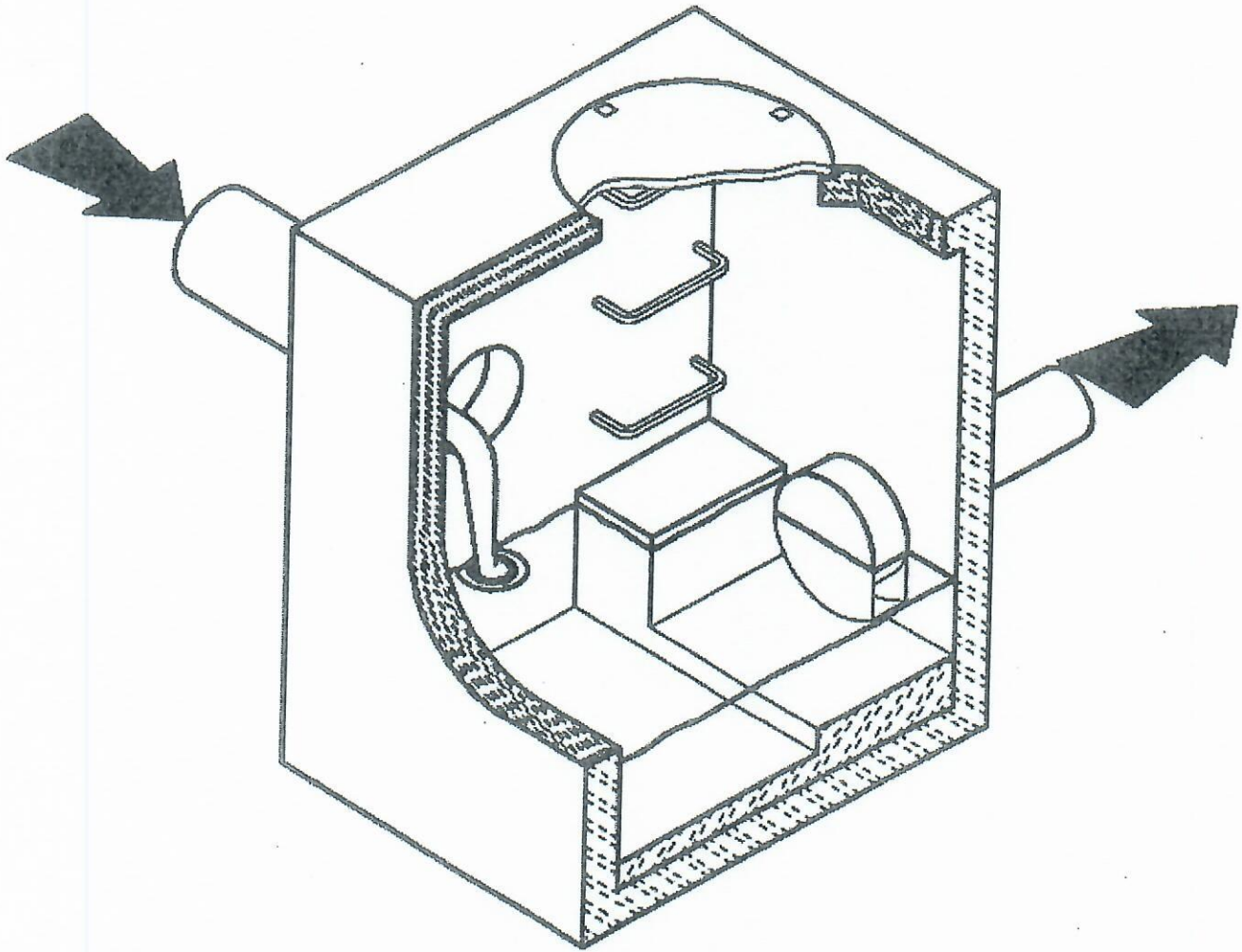
**PROPOSED**  
**THREE AND ONE HALF STOREY APARTMENT BUILDING SITE**  
**LOTS 212 AND 213**  
**R-PLAN 441**  
**212-214 DONALD STREET**  
**CITY OF OTTAWA**

**APPENDIX F**  
**INLET CONTROL DEVICE**  
**(ICD) DETAILS**  
**HYDROVEX MODEL No. (75-VHV-1)**

# CSO/STORMWATER MANAGEMENT



## **HYDROVEX<sup>®</sup> VHV / SVHV** **Vertical Vortex Flow Regulator**



**JOHN MEUNIER**

# HYDROVEX® VHV / SVHV VERTICAL VORTEX FLOW REGULATOR

## APPLICATIONS

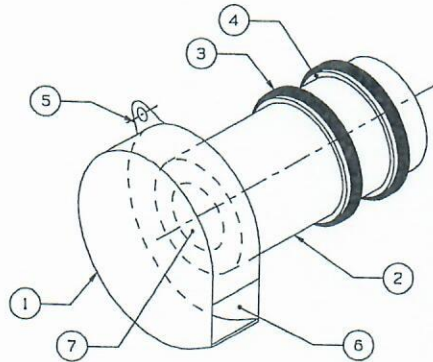
One of the major problems of urban wet weather flow management is the runoff generated after a heavy rainfall. During a storm event, uncontrolled flows may overload the drainage system and cause flooding. Sewer pipe wear and network deterioration are increased dramatically as a result of increased flow velocities. In a combined sewer system, the wastewater treatment plant will experience a significant increase in flows during storms, thereby losing its treatment efficiency.

A simple means of managing excessive water runoff is to control excessive flows at their point of origin, the manhole. **John Meunier Inc.** manufactures the **HYDROVEX® VHV / SVHV** line of vortex flow regulators for point source control of stormwater flows in sewer networks, as well as manholes, catch basins and other retention structures.

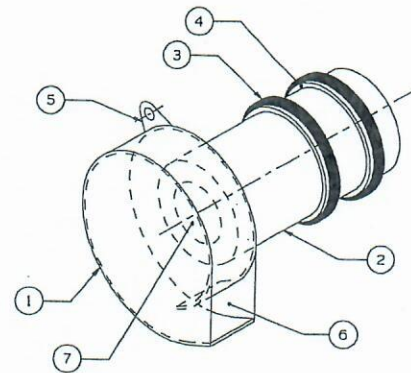
The **HYDROVEX® VHV / SVHV** design is based on the fluid mechanics principle of the forced vortex. The discharge is controlled by an air-filled vortex which reduces the effective water passage area without physically reducing orifice size. This effect grants precise flow regulation without the use of moving parts or electricity, thus minimizing maintenance. Although the concept is quite simple, over 12 years of research and testing have been invested in our vortex technology design in order to optimize its performance.

The **HYDROVEX® VHV / SVHV** Vertical Vortex Flow Regulators (refer to **Figure 1**) are manufactured entirely of stainless steel, and consist of a hollow body (1) (in which flow control takes place) and an outlet orifice (7). Two rubber "O" rings (3) seal and retain the unit inside the outlet pipe. Two stainless steel retaining rings (4) are welded on the outlet sleeve to ensure that there is no shifting of the "O" rings during installation and operation.

1. BODY
2. SLEEVE
3. O-RING
4. RETAINING RINGS  
(SQUARE BAR)
5. ANCHOR PLATE
6. INLET
7. OUTLET ORIFICE



VHV



SVHV

**FIGURE 1: HYDROVEX® VHV-SVHV VERTICAL VORTEX FLOW REGULATORS**

## ADVANTAGES

- As a result of the air-filled vortex, a **HYDROVEX® VHV / SVHV** flow regulator will typically have an opening 4 to 6 times larger than an orifice plate. Larger opening sizes decrease the chance of blockage caused by sediments and debris found in stormwater flows. **Figure 2** shows the discharge curve of a vortex regulator compared to an equally sized orifice plate. One can see that for the same height of water and same opening size, the vortex regulator controls a flow approximately four times smaller than the orifice plate.
- Having no moving parts, they require minimal maintenance.
- Submerged inlet for floatables control.
- The **HYDROVEX® VHV / SVHV** line of flow regulators are manufactured entirely of stainless steel, making them durable and corrosion resistant.
- Installation of the **HYDROVEX® VHV / SVHV** flow regulators is quick and straightforward and is performed after all civil works are completed.
- Installation requires no assembly, special tools or equipment and may be carried out by any contractor.

# HYDROVEX® VHV/SVHV Vortex Flow Regulator

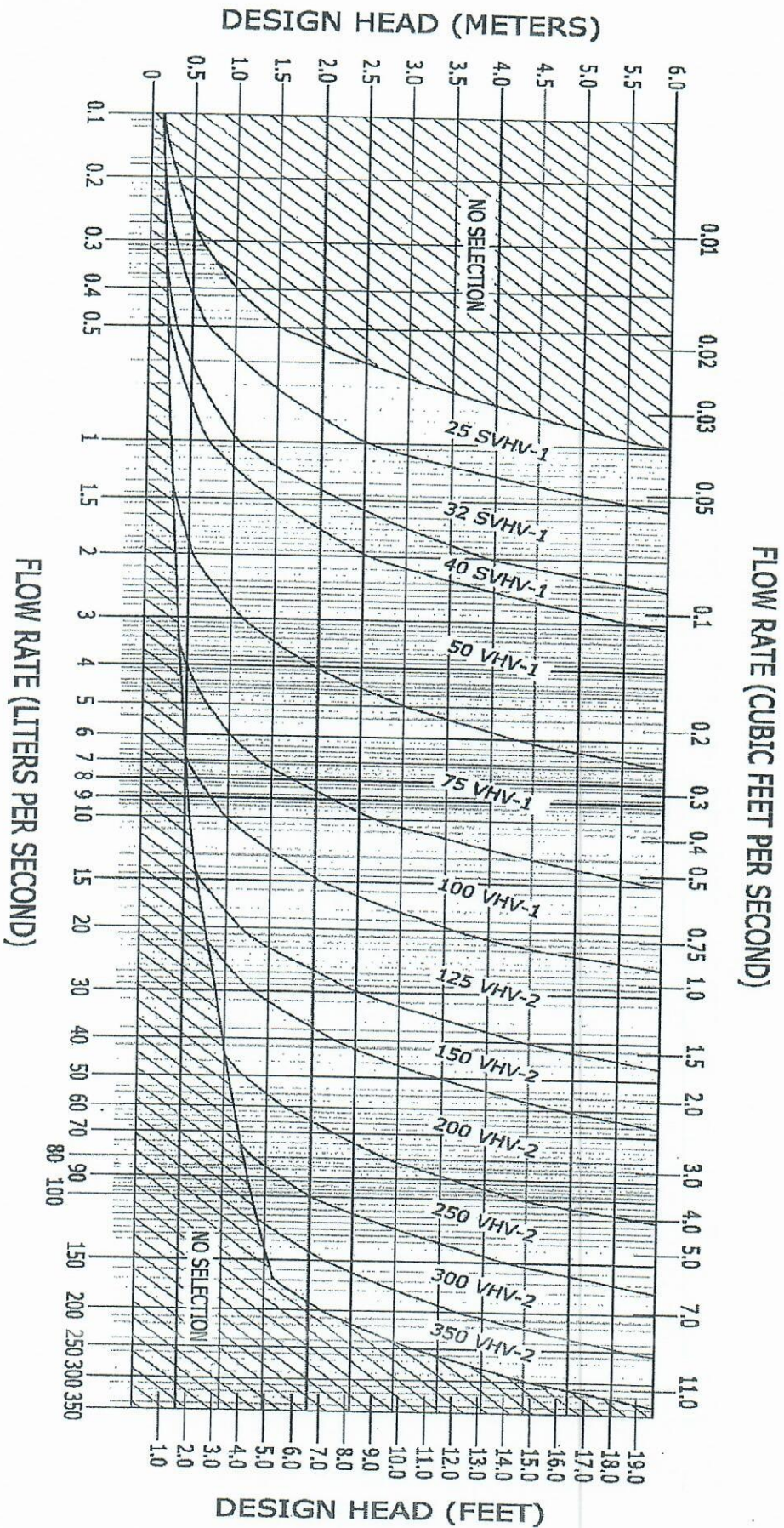


FIGURE 3

JOHN MEUNIER