PROPOSED STACKED TOWNHOUSE

RESIDENTIAL DEVELOPMENT SITE

PART OF PARK LOT 12

R-PLAN 162

1258 MARENGER STREET

CITY OF OTTAWA

STORM DRAINAGE REPORT

REPORT R-819-98

T.L. MAK ENGINEERING CONSULTANTS LTD.

JUNE 2020

REFERENCE FILE NUMBER 819-98

Introduction

The residential development property under consideration will consist of constructing (2) separate three storey stacked townhouse building on-site. This lot is located on the west side of Marenger Street and situated south of Youville Drive and north of St. Joseph Boulevard in Ward #1 within the City of Ottawa. Its legal property description is Part of Park Lot 12 Registered Plan 162 City of Ottawa. Presently, the existing residential lot is occupied by a single family home. The municipal address of the property is 1258 Marenger Street.

The lot area size of this property is approximately ±1,417.37 square meters. This site is proposed for the development of (2)-three storey stacked townhouses where the ground floor is approximately 50% below grade and three (3) storeys above the ground level.

There are (12) stacked townhouse units proposed in this project. The west building will have 8 units with gross floor area of ±8,720 ft^2 (±810 m^2). The east building will have 4 units with gross floor area of ±4,360 ft^2 (±405 m^2). Both of the townhouse buildings will have 2 bedroom units at the upper and lower levels. The storm water outlet for this site is the existing 675mm diameter storm sewer located within the Marenger Street 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 lesser of C=0.4 (max.) and the five (5)-year pre-development conditions. Therefore, the allowable pre-development runoff coefficient is based on the lesser of the calculated "C" existing value or C=0.4 maximum. At this site, which is currently a typical residential lot, the calculated existing "C" value is 0.37. 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=0.67, which exceeds the pre-developement calculated "C" value of 0.37 for the Marenger 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 to Dwg. No. 819-98, D-1.

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 Plan and Site Servicing Plan (Dwg. #819-98 G-1 and Dwg. #819-98 S-1 respectively), the storm water of this lot will be controlled on site.

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.

Site Data

1. Development Property Area

Post-Development Site Area Characteristics

Development Lot Area	=	1,417.37 m^2
Roof Surface Area	=	316.78 m^2
Asphalt Area	=	507.46 m^2
Concrete/Interlock Area	=	127.63 m^2
Grass Area	=	465.50 m^2

$$C = \frac{(316.78 \times 0.9) + (507.46 \times 0.9) + (127.63 \times 0.9) + (465.5 \times 0.2)}{1{,}417.37}$$

$$C = \frac{949.781}{1{,}417.37}$$

$$C = 0.6701$$

Say "C" = 0.67

Therefore, the average post-development "C" for this site is 0.67.

2. Controlled Area Data

The entire lot area of 1,417.37 m^2 will be controlled on-site.

Roof Surface Area	=	316.78 m^2
Asphalt Area	=	507.46 m^2
Concrete/Interlock Area	=	127.63 m^2
Grass Area	=	465.50 m^2

Total Storm-water Controlled Area = 1,417.37 m^2

$$C = \frac{(316.78 \times 0.9) + (465.50 \times 0.2) + (507.46 \times 0.9) + (127.63 \times 0.9)}{1{,}417.37}$$

$$C = \frac{949.781}{1{,}417.37}$$

$$C = 0.6701$$

Say "C" = 0.67

Therefore, the post-development "C" for the controlled (Entire Site) storm-water drainage area is 0.67.

3. Uncontrolled Area Data

The entire lot area will be controlled for SWM purposes.

There are no proposed tributary areas that will be out-letting off site uncontrolled from the residential development site.

The SWM area to be controlled is 1,417.37m^2. Refer to the attached "Drainage Area Plan" in Appendix A for details.

The site SWM storage area to be controlled by the specified ICD in CB/MH#1 is 0.01417 ha.

Pre-Development Flow Estimation

Maximum allowable off-site flow: five (5)-year storm

For details of pre-Development Site Area Characteristics See Dwg. 819-98 D-1 for pre-development storm drainage area. The current site condition before development from a recent 2015 aerial photographic image of the site showed that the site is a typical residential lot with a building, asphalt driveway curbing, landscaping areas, etc. Refer to Appendix B for the 2015 aerial photographic images and the 2019 Google image from GeoOttawa for details.)

Development Lot Area	=	1,417.37 m^2
Asphalt Area	=	34.93 m^2
Concrete/Interlock Area	=	36.30 m^2
Roof Area	=	100.17 m^2
Gravel Area	=	197.87 m^2
Grass Area	=	1,048.10 m^2

$$C = \frac{(34.93 \times 0.9) + (36.30 \times 0.9) + (100.17 \times 0.9) + (197.87 \times 0.8) + (1048.10 \times 0.2)}{1,417.37}$$

$$C = \frac{522.176}{1,417.37}$$

$$C = 0.368$$

Say C = 0.37

Therefore, using the predevelopment runoff coefficient of C=0.37, the five-year pre-development flow is estimated to be 15.22 L/s [2.78(0.37)(104.4)(0.1417)] where T_c=10 minutes. The 100-year predevelopment is estimated to be 26.03 L/s [2.78(0.37)(0.1417)(178.6)].

The detailed calculations that follow (shown below) estimate the pre-development flow where the C_{pre}=0.37 maximum value is used for redevelopment.

T_c=D/V where D=59.0m, ΔH=0.48m, S=0.81%, and V=1.5 feet/second=0.46m/s

Therefore,

$$T_c = \frac{59.0m}{0.46m/s}$$

T_c = 2.14 minutes

Use T_c = 10 minutes

I_5=104.4mm/hr [City of Ottawa, five(5)-year storm]

Using the Rational Method

Q = 2.78 (0.37) (104.4) (0.1417)

Q = 15.22L/s

Because the entire site is controlled, the **net** discharge for this site into the existing Marenger Street storm sewer system is Q = 15.22 L/s.

Storm-Water Management Analysis

The calculated flow rate of 15.22 L/s for on-site storm-water management detention volume storage will be used for this SWM analysis. Because there is no flat rooftop storage available for SWM attenuation on this site, flow restriction will therefore be regulated by a proposed ICD in CB/MH#1 at an allowable release rate on 15.22 L/s into the Marenger Street 675mm diameter storm sewer up to and including the 100-year event.

Therefore, the total allowable five (5)-year release rate of 15.22 L/s will be entering in to the existing 675mm diameter Marenger Street storm sewer. Runoff that is greater than the allowable release rate will be stored on site within the proposed storm-water management ponding areas at the site asphalt parking lot areas, underground storm pipes, and underground drainage structures, for attenuation purposes. See Appendix C for site storm sewer design details shown on sheet 1 of 1.

The post-development inflow rate during the five (5)-year and 100-year storms for the parking lot drainage system can be calculated as follows.

Design Discharge Computation

Parking Lot Surface and Underground Drainage System

The Rational Method was used to estimate peak flows.

$Q=2.78\ CIA$

Inflow rate Q_{ACTUAL} for this site is:

Five (5)-year event $C_5=0.67$ (average "C" value of controlled area)

$A=0.1417$ ha.

Inflow rate $(Q_A)_5$	=	2.78 CIA	
	=	2.78 (0.67) (0.1417) I	
	=	0.264 I	I=mm/hour

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

$Q_5=0.264\ I$

100-year event $C_{100}=0.76$ (average "C" value of controlled area)

Where,

$$C_{100} = \frac{(316.78 \times 1.0) + (507.46 \times 1.0) + (127.63 \times 1.0) + (1.25 \times 465.5 \times 0.2)}{1,417.37}$$

$$C_{100} = \frac{1,068.25}{1,417.37}$$

$$C_{100} = 0.754$$

Say $C_{100} = 0.76$

Inflow rate $(Q_A)_{100}$	=	2.78 CIA	
	=	2.78 (0.76) (0.1417) I	
	=	0.2994 I	I=mm/hour

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

Actual flow Q_{ACTUAL}=2.78 CIA

$Q_{STORED}=Q_{ACTUAL} - Q_{ALLOW}$

The summary results of the calculated inflow and the required storage volume of the site to store the five (5)-year and 100-year storm events are shown in Tables 1 and 2.

Water Quality

Storm water quality treatment is required for this proposed development.

For this site, based on the City of Ottawa's drainage criteria and on recommendations set out by Rideau Valley Conservation Authority (RVCA), water quality treatment for 80 percent (min.) removal of total suspended solids (TSS) is required for redevelopment of this property. See (Appendix D) regarding RVCA's pre-consultation comments for water quality requirements.

The said property is in the watershed area where the existing 300mm diameter storm sewer fronting on 1258 Marenger Street 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 (Model EF-04) was selected to provide the water quality objective removal of TSS at a level above 80 percent, which is above the minimum requirement of 80 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 Marenger 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. #819-98 ESC-1 for details.

Conclusion

For development of this residential site (±0.1417ha.) and in controlling the five(5)-year storm-water release rate off site to an allowable rate of 15.22 L/s, a site storage volume of approximately 13.14m^3 minimum is required during the five (5)-year event.

The calculated site storage volume of 13.14m^3 minimum is required from the site development area for the five (5)-year storm event. The estimated HWL of 58.85m will provide a total available storage volume of 16.44m^3 consisting of parking lot and roadway surface ponding together with the proposed parking lot underground storm pipes and drainage structures. In total, the five (5)-year available site storage volume is approximately 16.44m^3, which is greater than the required site storage volume of 13.14m^3. See Appendix E for details.

To control the (100-year + 20.0%) storm-water release rate off site to an allowable rate of 15.22L/s, a site storage volume of approximately 35.95m^3 minimum is required during the 100-year event.

The calculated site storage volume of 35.95m^3 minimum is required from the site development area for the (100-year + 20.0%) storm event. The estimated HWL of 58.95m will provide a total available storage volume of 45.19m^3 consisting of the parking-lot and roadway surface ponding together with the proposed parking-lot underground storm pipes and drainage structures. In total, the 100-year available site storage volume is 45.19m^3, which is greater than the required site storage volume of 35.95m^3. See Appendix E for details.

Therefore, by means of grading the site to the proposed grades and constructing the proposed underground storm piping and drainage structures as shown on the Proposed Site Grading Plan Dwg. 819-98 G-1 and Site Servicing Plan Dwg. 819-98 S-1 respectively, the desirable five (5)-year and (100+20.0%)-year storm event detention volume of 16.44m^3 and 45.19m^3 respectively will be available on site, as detailed on the Proposed Site Grading Plan Dwg. 819-98 G-1.

An inlet control device (ICD) will be installed at the outlet of CB/MH1 in the 300 mm diameter storm pipe (outlet pipe) with Q=15.22 L/s under a head of 2.28m. The ICD type recommended is a Hydrovex Regulator (125 VHV-2) or equivalent. See Appendix F for ICD details.

The building weeping tile drainage will be outletted via a proposed 200mm diameter PVC storm pipe system which is proposed to WYE into the proposed 300mm diameter PVC site outlet storm sewer where the wye connection is located downstream of stormceptor EF-04. The townhouse building 100mm diameter PVC storm lateral will be connected directly into this separate storm pipe system to avoid potential surcharging storm water into the building. Refer to Dwg. 819-98 S-1 for details.

To achieve a minimum of 80 percent TSS removal, a Stormceptor structure (Model EF-04) is proposed to be installed for the site development of this property. This structure shall be located downstream of the proposed CB/MH1, which houses the site's inlet control device (ICD). Based on the Stormceptor system that is proposed for this site, area of the lot, and impervious ratio, a greater than 80 percent TSS removal is estimated for all rainfall events including large storms.

PREPARED BY T.L. MAK ENGINEERING CONSULTANTS LTD.

TONY L. MAK, P.ENG

PROPOSED 1258 MARENGER STREET

STACKED TOWNHOUSE

DEVELOPMENT SITE

TABLE 1

FIVE (5) - YEAR EVENT

SITE REQURED STORAGE VOLUME

A=1,417.37m^2 C_5=0.67 average Drainage Nodes 1, 2, and 3

t_c TIME (minutes)	I FIVE(5)-YEAR (mm/hr)	Q ACTUAL (L/s)	Q ALLOW (L/s)	Q STORED (L/s)	VOLUME STORED (m^3)
5	141.20	37.28	7.61	29.67	8.90
10	104.20	27.51	7.61	19.90	11.98
15	83.50	22.04	7.61	14.43	12.99
20	70.30	18.56	7.61	10.95	13.14
25	60.90	16.08	7.61	8.47	12.71
30	53.93	14.24	7.61	6.63	11.93
35	48.50	12.80	7.61	5.19	10.90

Therefore, the required underground storage volume is 13.14 m^3.

*Q_{ALLOW} = ½ of 15.22 L/s = 7.61 L/s

Refer to Storm Drainage Area Plan Dwg. 819-98 D-1 for locations of drainage nodes.

PROPOSED 1258 MARENGER STREET

STACKED TOWNHOUSE

DEVELOPMENT SITE

TABLE 2

(100 – YEAR + 20.0%) EVENT

SITE REQURED STORAGE VOLUME

$A=1,417.37m^2$ $C_5=0.67$ average Drainage Nodes 1, 2, and 3

t_c TIME (minutes)	**I FIVE(5)-YEAR** (mm/hr)	**Q ACTUAL** (L/s)	**Q ALLOW** (L/s)	**Q STORED** (L/s)	**VOLUME STORED** (m^3)
10	178.6	53.47	7.61	45.86	27.52
15	142.9	42.78	7.61	35.17	31.65
20	120.0	35.93	7.61	28.32	33.98
25	103.9	31.11	7.61	23.50	35.25
30	91.9	27.52	7.61	19.91	35.84
35	82.6	24.73	7.61	17.12	35.95
40	75.1	22.49	7.61	14.88	35.71
45	69.1	20.69	7.61	13.08	35.32
50	63.9	19.13	7.61	11.52	34.56

Therefore, the required underground storage volume is 35.95 m^3.

*Q_{ALLOW} = ½ of 15.22 L/s = 7.61 L/s

Refer to Storm Drainage Area Plan Dwg. 819-98 D-1 for locations of drainage nodes.

PROPOSED STACKED TOWNHOUSE

RESIDENTIAL DEVELOPMENT SITE

R-PLAN 162

1258 MARENGER STREET

CITY OF OTTAWA

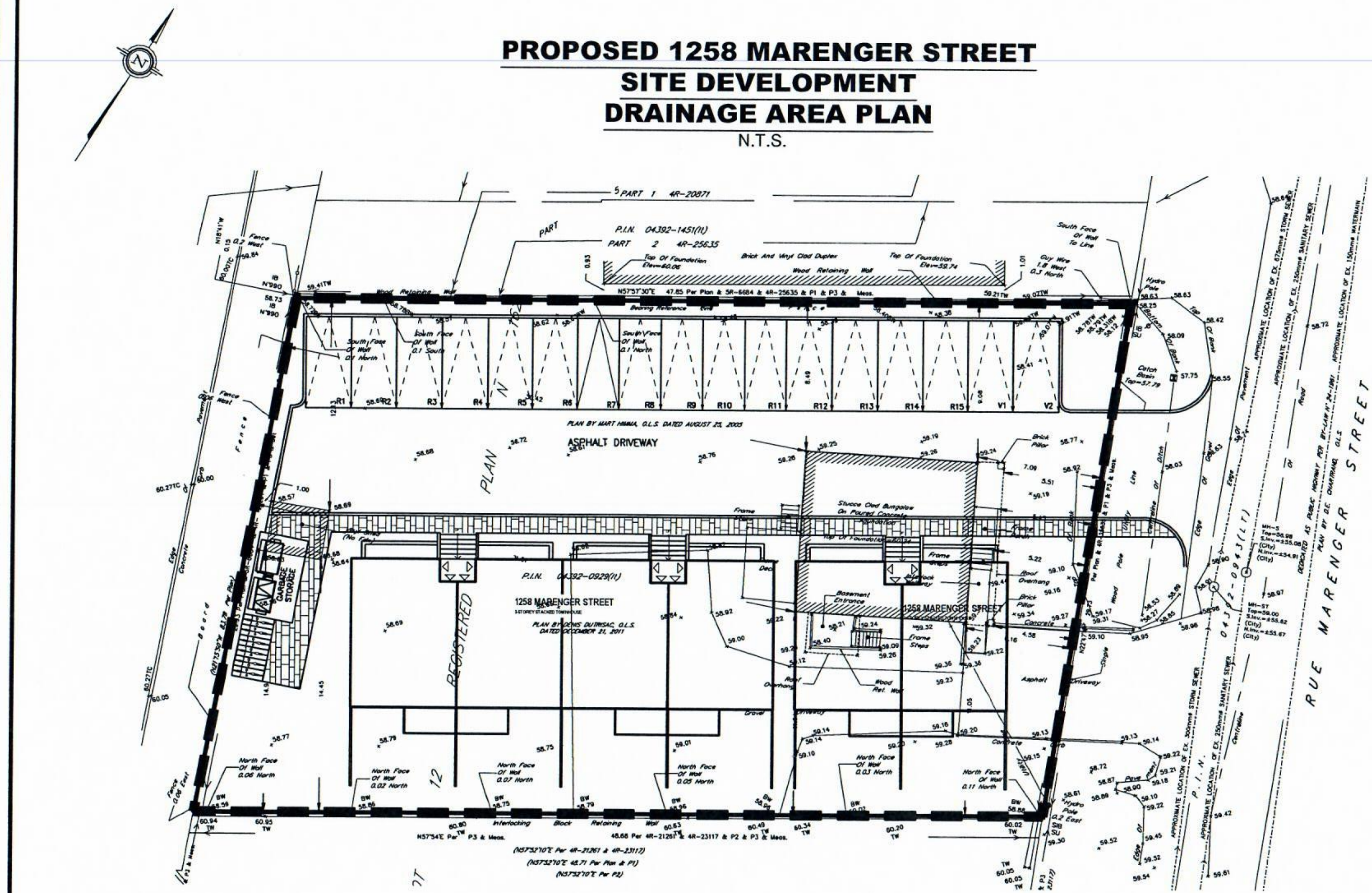
APPENDIX A

STORM DRAINAGE AREA PLAN

FIGURE 1

PROPOSED 1258 MARENGER STREET
SITE DEVELOPMENT
DRAINAGE AREA PLAN

N.T.S.



LEGEND

LIMIT OF CONTROLLED STORM DRAINAGE AREA = 1417.37 SQ. M

TOTAL AREA = 1417.37 SQ. M

POST-DEVELOPMENT SITE AVERAGE "C" = 0.67

T.L. MAK ENGINEERING CONSULTANTS LTD.
CONSULTING ENGINEERS

PROJECT No.	DATE	DRAWING No.
819-98	MARCH 2020	FIGURE 1

PROPOSED STACKED TOWNHOUSE

RESIDENTIAL DEVELOPMENT SITE

R-PLAN 162

1258 MARENGER STREET

CITY OF OTTAWA

APPENDIX B

SITE PRE-DEVELOPMENT CONDITION

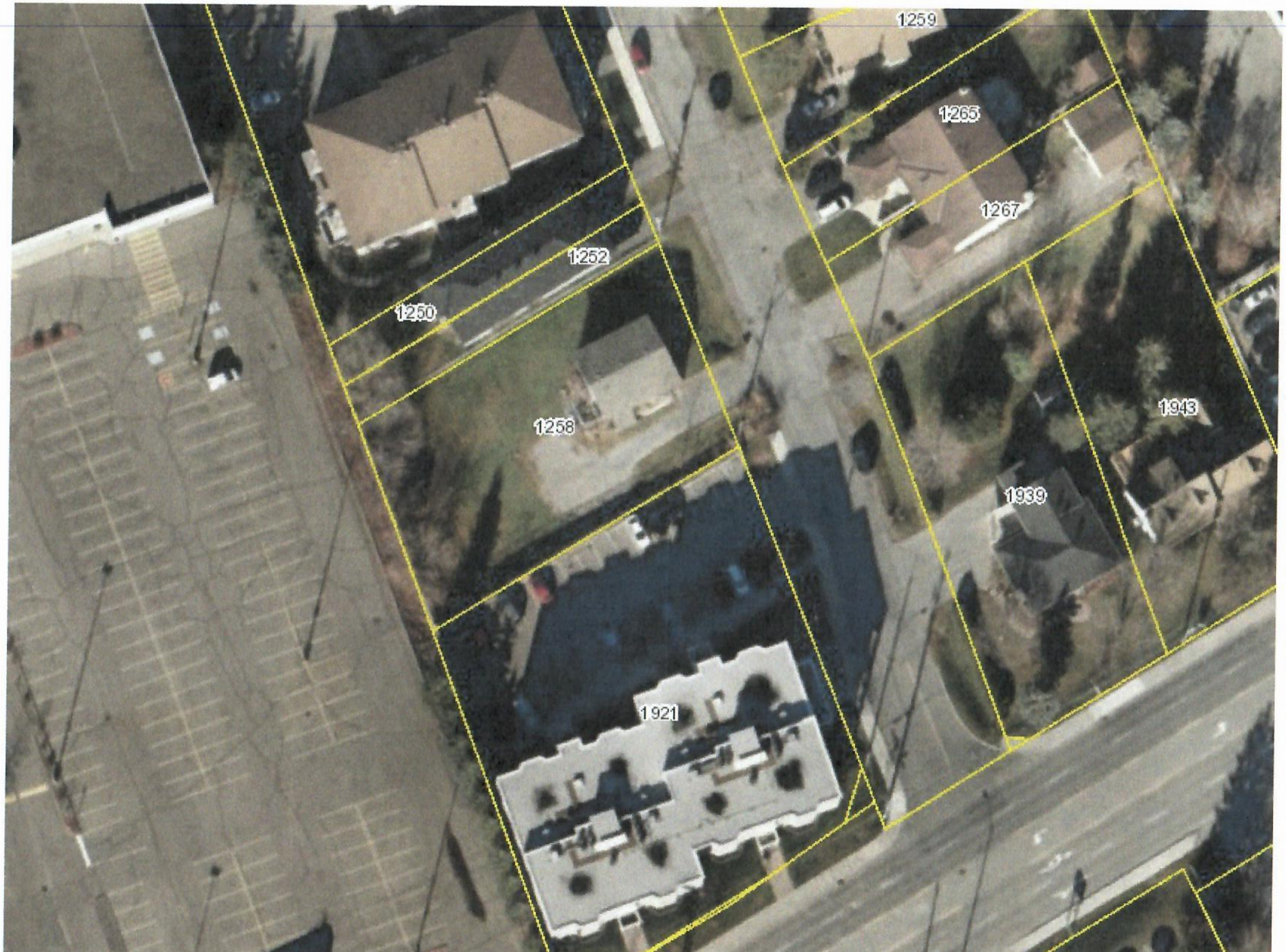
GOOGLE IMAGE (2019)

AND

AERIAL PHOTOGRAPHY 2015 (GEOOTTAWA)

1238
1259
1265
1267
1252
1250
1258
1943
1939
1921
1934
rue Marenger St
boul. St-Joseph Blvd.

2015



2015

2019

PROPOSED STACKED TOWNHOUSE

RESIDENTIAL DEVELOPMENT SITE

R-PLAN 162

1258 MARENGER STREET

CITY OF OTTAWA

APPENDIX C

STORM SEWER DESIGN SHEET

SHEET 1 OF 1

STORM SEWER DESIGN SHEET

5 YEAR STORM EVENT

Q = 2.78 AIR

Where Q = peak flow in litres per second (L/s)
A = area in hectares (ha)
I = rainfall intensity in millimetres per hour (mm/h)
R = runoff coefficient

T_c = 10 minutes

LOCATION			AREAS (ha)			Indiv. 2.78 AR	Accum 2.78 AR	Time of Conc.	Rainfall Intensity I	Peak Flow Q (L/s)	SEWER DATA						
STREET	FROM	TO	R = 0.45	R = 0.65	R = 0.8						Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s) n = 0.013	Velocity (m/s)	Time of Flow (minutes)	
1258 MARENGER STREET	CB #4	ST.MH #3	0.021			0.026	0.026	10.0	104.4	3.4	300	1.0	16.5	100.17	1.38	0.20	NODE #3
	ST.MH #3	CB/MH #1			0.048	0.1068	0.1328	10.2	103.15	13.7	300	1.2	32.0	109.7	1.51	0.35	NODE #2
	CB/MH #1	STORM-CEPTOR EF 4		0.073		0.1319	0.2647	10.55	101.37	26.8	300	1.5	10.5	122.7	1.69	0.10	NODE #1 CONTROLLED
	STORM-CEPTOR EF-4	EX. 675Ø STORM SWM	—	—	—	Ø	0.265	10.65	100.88	26.7	300	1.9	10.0	138.1	1.90		

LICENSED PROFESSIONAL ENGINEER
06/03/20
TONY L.M. MAK
PROVINCE OF ONTARIO

File #819-98

DESIGN	TLM	PROJECT 1258 MARENGER STREET	SHEET No.
CHECKED	TLM	PROPOSED STACKED TOWNHOUSE	1 OF 1
DATE	JUNE 2020	RESIDENTIAL DEVELOPMENT SITE	

PROPOSED STACKED TOWNHOUSE

RESIDENTIAL DEVELOPMENT SITE

R-PLAN 162

1258 MARENGER STREET

CITY OF OTTAWA

APPENDIX D

RVCA'S PRE-CONSULTATION COMMENTS

OF MAY 5, 2020

AND

STORMCEPTOR MODEL No. EF-04

SIZING AND DETAILS

MAY 27, 2020

TL MaK

From: Jamie Batchelor [jamie.batchelor@rvca.ca]
Sent: May 5, 2020 2:49 PM
To: TL MaK
Cc: 'Rocco - My Revelstoke Home'
Subject: RE: 1258 Marenger Street
Attachments: image003.jpg

Hi Tony,

I hope all is well with you. Based on the scale of development and the downstream outlet to a watercourse is less than 400 metres away, the water quality objective for this site would be 80% TSS removal.

Jamie Batchelor, MCIP, RPP
Planner, ext. 1191
Jamie.batchelor@rvca.ca

Rideau Valley Conservation Authority
3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca

From: TL MaK <tlmakecl@bellnet.ca>
Sent: Monday, May 4, 2020 11:04 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: 'Rocco - My Revelstoke Home' <rocco@myrevelstokehome.com>
Subject: RE: 1258 Marenger Street

Hi Jamie,

We are contacting you at this time to ascertain RVCA comments regarding the above-referenced site regarding storm water management issues. Attached is a Site Plan for the proposed development property. Please comment on the water quality issues for the site if any. We look forward to hearing from you shortly.

Please note, we are currently at the design stage of this project. Let us know if you have any comments or questions.

Thank you,

Tony Mak

T.L. Mak Engineering Consultants Ltd.
1455 Youville Drive, Suite 218

Ottawa, ON. K1C 6Z7
Tel. 613-837-5516 | Fax: 613-837-5277
E-mail: tlmakecl@bellnet.ca

Stormceptor® FORTERRA

Stormceptor® EF Sizing Report

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION STORMCEPTOR®

06/03/2020

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA MACDONALD-CARTIER INT'L AP
NCDC Rainfall Station Id:	6000
Years of Rainfall Data:	37
Site Name:	1258 Marenger St.
Drainage Area (ha):	0.1417
Runoff Coefficient 'c':	0.67

Project Name:	1258 Marenger St.
Project Number:	819-98
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	(902) 630-0359
EOR Name:	Tony Mak
EOR Company:	T.L. Mak Engineering Consultants Ltd.
EOR Email/Phone:	

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.0
Require Hydrocarbon Spill Capture?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	15.22
Estimated Water Quality Flow Rate (L/s):	3.39
Peak Conveyance (maximum) Flow Rate (L/s):	15.22

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	89
EFO6	92
EFO8	93
EFO10	93
EFO12	93

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 89

Water Quality Runoff Volume Capture (%): > 90

imbrium

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.

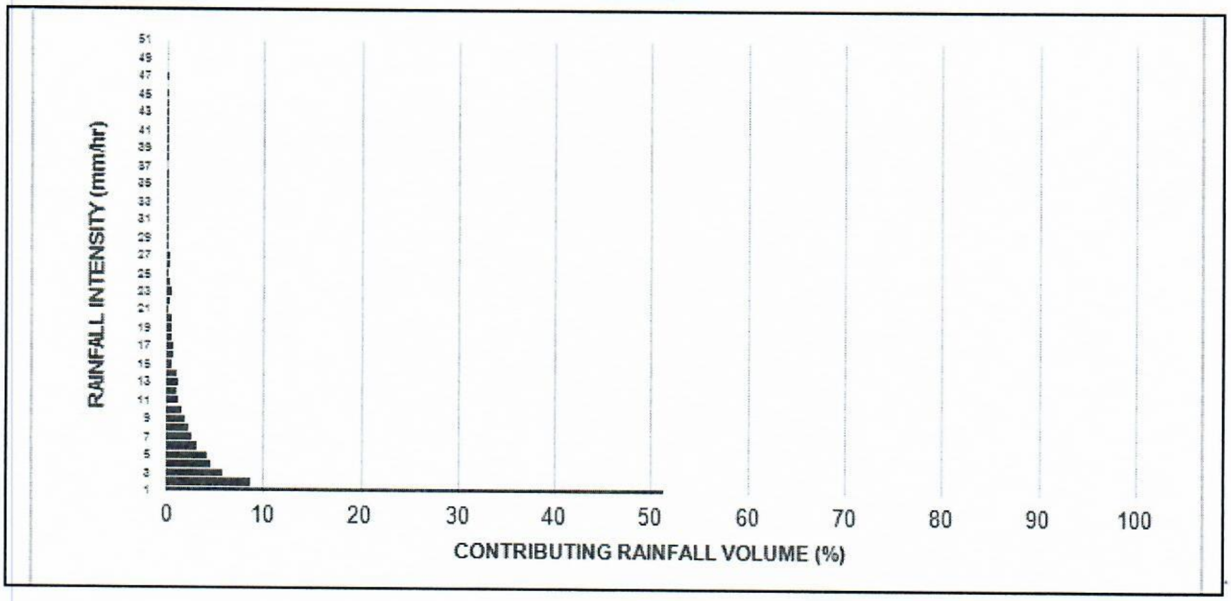
Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

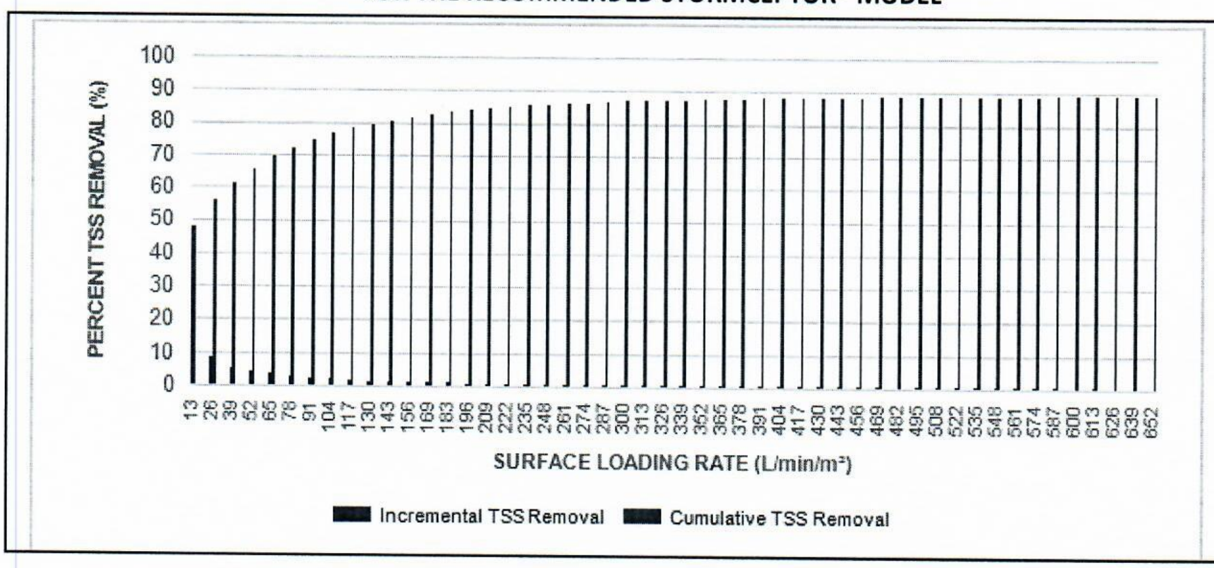
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	51.3	51.3	0.26	16.0	13.0	93	47.7	47.7
2	8.7	60.0	0.52	31.0	26.0	93	8.1	55.8
3	5.8	65.8	0.78	47.0	39.0	93	5.4	61.2
4	4.6	70.4	1.04	63.0	52.0	92	4.2	65.4
5	4.2	74.6	1.30	78.0	65.0	91	3.8	69.2
6	3.2	77.8	1.56	94.0	78.0	90	2.9	72.1
7	2.6	80.4	1.83	110.0	91.0	88	2.3	74.4
8	2.4	82.8	2.09	125.0	104.0	87	2.1	76.5
9	1.9	84.7	2.35	141.0	117.0	86	1.6	78.1
10	1.6	86.3	2.61	156.0	130.0	84	1.3	79.5
11	1.3	87.6	2.87	172.0	143.0	83	1.1	80.5
12	1.1	88.7	3.13	188.0	156.0	81	0.9	81.4
13	1.3	90.0	3.39	203.0	169.0	79	1.0	82.5
14	1.1	91.1	3.65	219.0	183.0	78	0.9	83.3
15	0.6	91.7	3.91	235.0	196.0	77	0.5	83.8
16	0.8	92.5	4.17	250.0	209.0	76	0.6	84.4
17	0.7	93.2	4.43	266.0	222.0	74	0.5	84.9
18	0.5	93.7	4.69	282.0	235.0	73	0.4	85.3
19	0.6	94.3	4.95	297.0	248.0	72	0.4	85.7
20	0.5	94.8	5.22	313.0	261.0	71	0.4	86.1
21	0.2	95.0	5.48	329.0	274.0	70	0.1	86.2
22	0.4	95.4	5.74	344.0	287.0	69	0.3	86.5
23	0.5	95.9	6.00	360.0	300.0	67	0.3	86.8
24	0.4	96.3	6.26	376.0	313.0	66	0.3	87.1
25	0.1	96.4	6.52	391.0	326.0	65	0.1	87.1

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	0.3	96.7	6.78	407.0	339.0	64	0.2	87.3
27	0.4	97.1	7.04	422.0	352.0	63	0.3	87.6
28	0.2	97.3	7.30	438.0	365.0	62	0.1	87.7
29	0.2	97.5	7.56	454.0	378.0	61	0.1	87.8
30	0.2	97.7	7.82	469.0	391.0	59	0.1	88.0
31	0.1	97.8	8.08	485.0	404.0	58	0.1	88.0
32	0.2	98.0	8.34	501.0	417.0	58	0.1	88.1
33	0.1	98.1	8.61	516.0	430.0	57	0.1	88.2
34	0.1	98.2	8.87	532.0	443.0	57	0.1	88.2
35	0.1	98.3	9.13	548.0	456.0	57	0.1	88.3
36	0.2	98.5	9.39	563.0	469.0	56	0.1	88.4
37	1.5	100.0	9.65	579.0	482.0	56	0.8	89.2
38	0.1	100.1	9.91	595.0	495.0	55	0.1	89.3
39	0.1	100.2	10.17	610.0	508.0	55	0.1	89.4
40	0.1	100.3	10.43	626.0	522.0	54	0.1	89.4
41	0.1	100.4	10.69	641.0	535.0	54	0.1	89.5
42	0.1	100.5	10.95	657.0	548.0	54	0.1	89.5
43	0.2	100.7	11.21	673.0	561.0	53	0.1	89.6
44	0.1	100.8	11.47	688.0	574.0	53	0.1	89.7
45	0.1	100.9	11.73	704.0	587.0	53	0.1	89.7
46	-0.9	100.0	12.00	720.0	600.0	52	0.0	89.3
47	0.1	100.1	12.26	735.0	613.0	52	0.1	89.3
48	-0.1	100.0	12.52	751.0	626.0	52	0.0	89.3
49	0.0	100.0	12.78	767.0	639.0	52	0.0	89.3
50	0.0	100.0	13.04	782.0	652.0	52	0.0	89.3
							Estimated Net Annual Sediment (TSS) Load Reduction =	**89 %**

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

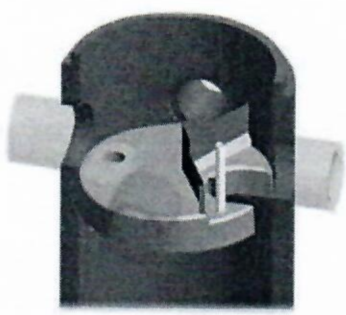
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

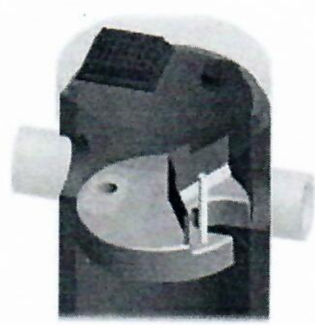
DESIGN FLEXIBILITY

► **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.

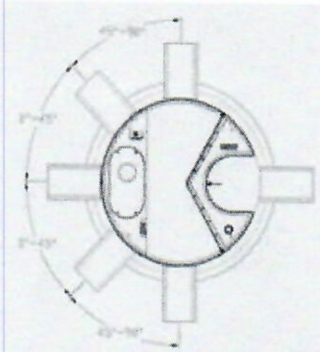
OIL CAPTURE AND RETENTION

► 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.





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	197	52	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	348	92	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	545	144	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	874	231	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	1219	322	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

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 m³ sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m³ 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.

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

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3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

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

PROPOSED STACKED TOWNHOUSE

RESIDENTIAL DEVELOPMENT SITE

R-PLAN 162

1258 MARENGER STREET

CITY OF OTTAWA

APPENDIX E

DETAILED CALCULATIONS

FOR FIVE (5)-YEAR AND (100-YEAR + 20.0%)

AVAILABLE STORAGE VOLUME

AVAILABLE STORAGE VOLUME CALCULATIONS

A. Five (5)-Year Event

1) Parking Lot Surface Storage Volume

Assume 5-year H.W.L. = 58.85m (See attached Proposed Site Grading Plan Dwg. No. 819-98 G-1 with the ponding limit shown).

CB/MH#1

Available Storage Volume = $\dfrac{\text{d}\ (A1\ +\ 4A2\ +\ A3)}{6}$

$$= \frac{(0.15\text{ m})[103.45 + 4(24.43) + 0]}{6}$$

$$= \frac{(0.15\text{ m})(201.17)}{6}$$

$$= 5.03\text{ m}$$

CB#2

$$= \frac{(0.15\text{ m})[86.4 + 4(20.19) + 0]}{6}$$

$$= \frac{(0.15\text{ m})(167.16)}{6}$$

$$= 4.18\text{ m}$$

Total parking lot surface area storage volume = 9.21 m^3.

2) Storm Pipe Storage

- 48.5 m of 300mm diameter

$V_1 = \pi\ (0.15)^2\ (48.5)$

$= 3.43\ m^3$

Total pipe storage volume = 3.43 m^3

3) <u>Drainage Structure Storage</u>

- CB/MH#1 = $\pi (0.3)^2 (1.22) + \pi (0.6)^2 (0.96)$
  $= 0.35 + 1.09$
  $= 1.44\ m^3$

- CB#2 $= (0.6)(0.6)(1.7)$
  $= 0.61\ m^3$

- ST. MH#3 = $\pi (0.3)^2 (1.22) + \pi (0.6)^2 (0.7)$
  $= 0.35 + 0.79$
  $= 1.14\ m^3$

- CB#4 $= (0.6)(0.6)(1.7)$
  $= 0.61\ m^3$

Total drainage structure storage volume = $3.80\ m^3$

Therefore, at the estimated 5-year H.W.L. = 58.85 m, the available parking lot drainage system volume is estimated at <u>$16.44\ m^3$</u> > <u>$13.14\ m^3$</u> (min.) from Table 1.

Thus, the 5-year available site storage volume is estimated at <u>$16.44\ m^3$</u> which is greater than the required storage volume of <u>$13.14\ m^3$</u>.

AVAILABLE STORAGE VOLUME CALCULATIONS

A. <u>100-Year Event</u>

1) Parking Lot Surface Storage Volume

Assume 100-year H.W.L. = 58.95m (See attached Proposed Site Grading Plan Dwg. No. 819-98 G-1 with the ponding limit shown).

CB/MH#1

Available Storage Volume = $\frac{\mathrm{d}\ (A1\ +\ 4A2\ +\ A3)}{6}$

$$= \frac{(0.25\ \mathrm{m})[211.44 + 4(69.39) + 0]}{6}$$

$$= \frac{(0.15\ \mathrm{m})(489.0)}{6}$$

$$= 20.38\ \mathrm{m}$$

CB#2

$$= \frac{(0.25\ \mathrm{m})[183.07 + 4(58.84) + 0]}{6}$$

$$= \frac{(0.25\ \mathrm{m})(418.43)}{6}$$

$$= 17.42\ \mathrm{m}$$

Total parking lot surface area storage volume = 37.81 m^3.

2) Storm Pipe Storage

- 21.0 m of 300mm diameter

$V_1 = \pi\ (0.15)^2\ (48.5)$

$= 3.43\ m^3$

Total pipe storage volume = 3.43 m^3

3) Drainage Structure Storage

- CB/MH#1 $= \pi (0.3)^2 (1.22) + \pi (0.6)^2 (0.96)$
  $= 0.35 + 1.09$
  $= 1.44\ m^3$

- CB#2 $= (0.6)(0.6)(1.7)$
  $= 0.61\ m^3$

- ST. MH#3 $= \pi (0.3)^2 (1.22) + \pi (0.6)^2 (0.8)$
  $= 0.35 + 0.90$
  $= 1.25\ m^3$

- CB#4 $= (0.6)(0.6)(1.8)$
  $= 0.65\ m^3$

Total drainage structure storage volume = 3.95 m^3

Therefore, at the estimated 100-year H.W.L. = 58.95 m, the available parking lot drainage system volume is estimated at <u>45.19 m^3</u> > <u>35.95 m^3</u> (min.) from Table 2.

Thus, the 5-year available site storage volume is estimated at <u>45.19 m^3</u> which is greater than the required storage volume of <u>35.95 m^3</u>.

PROPOSED STACKED TOWNHOUSE

RESIDENTIAL DEVELOPMENT SITE

R-PLAN 162

1258 MARENGER STREET

CITY OF OTTAWA

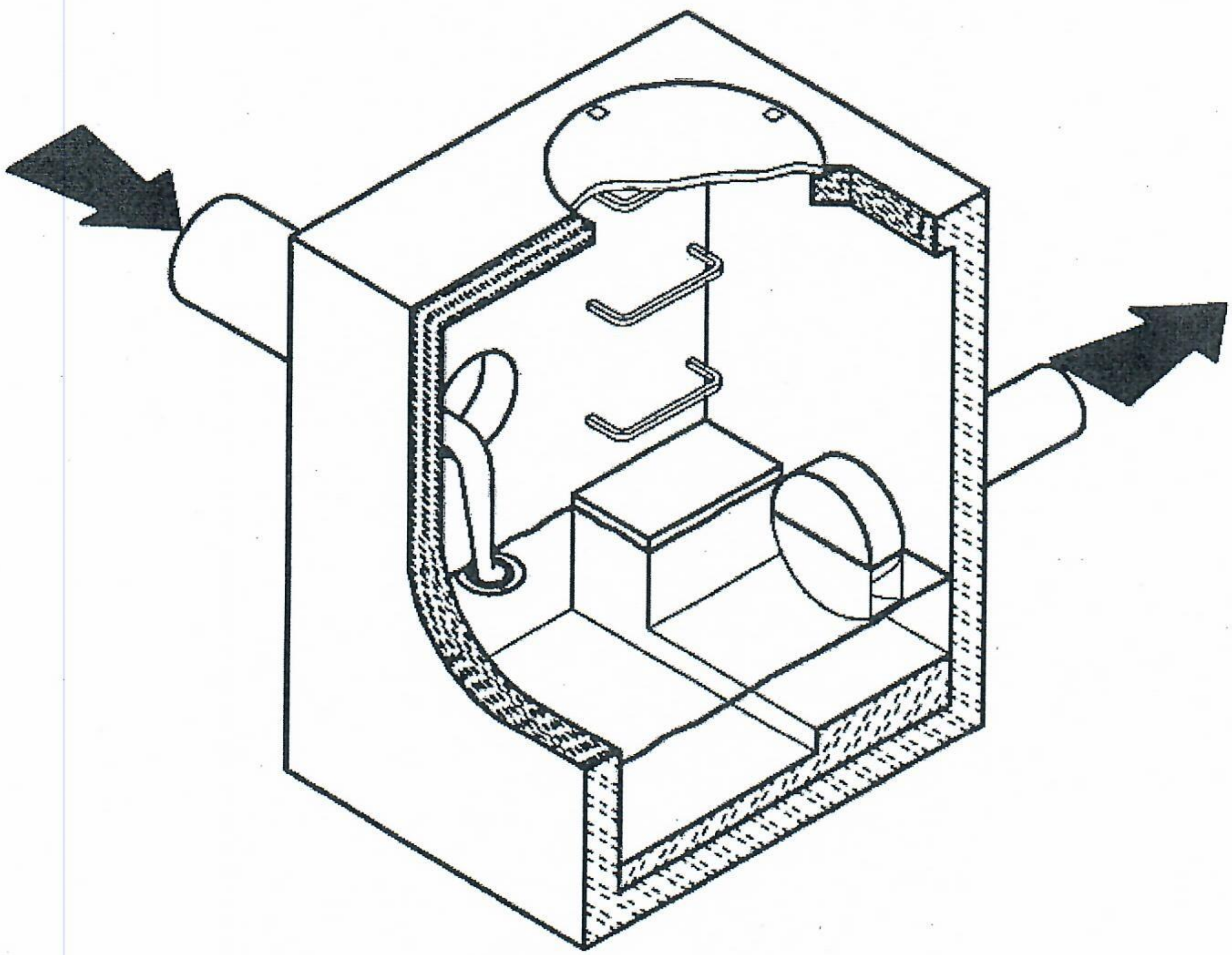
APPENDIX F

INLET CONTROL DEVICE (ICD) DETAILS

HYDROVEX MODEL 125 VHV-2

CSO/STORMWATER MANAGEMENT

® HYDROVEX® 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

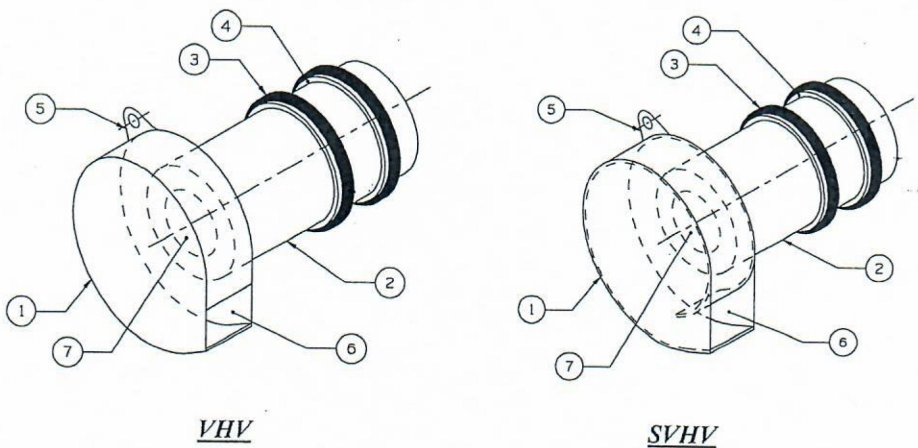


FIGURE 1: HYDROVEX® VHV-SVHV VERTICAL VORTREX FLOW REGULATORS

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

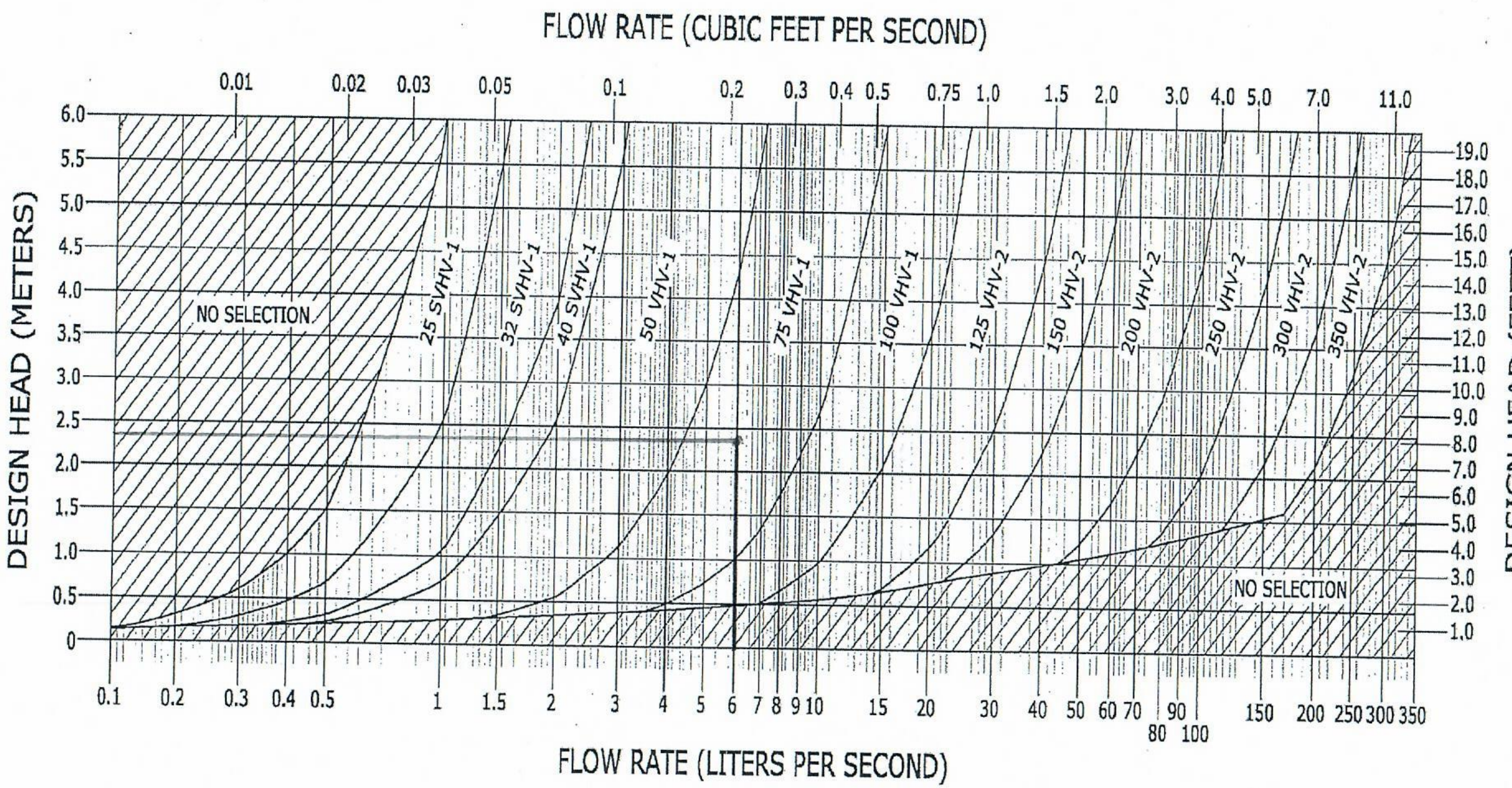


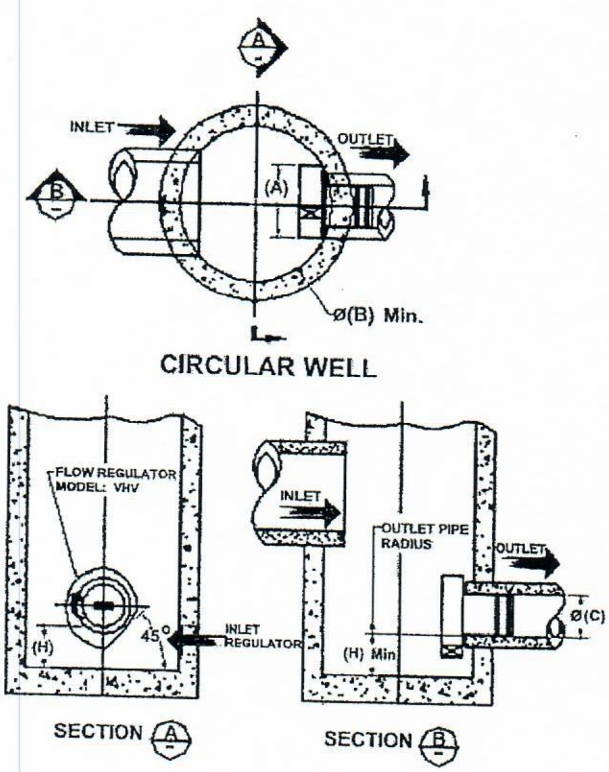
FIGURE 3

JOHN MEUNIER

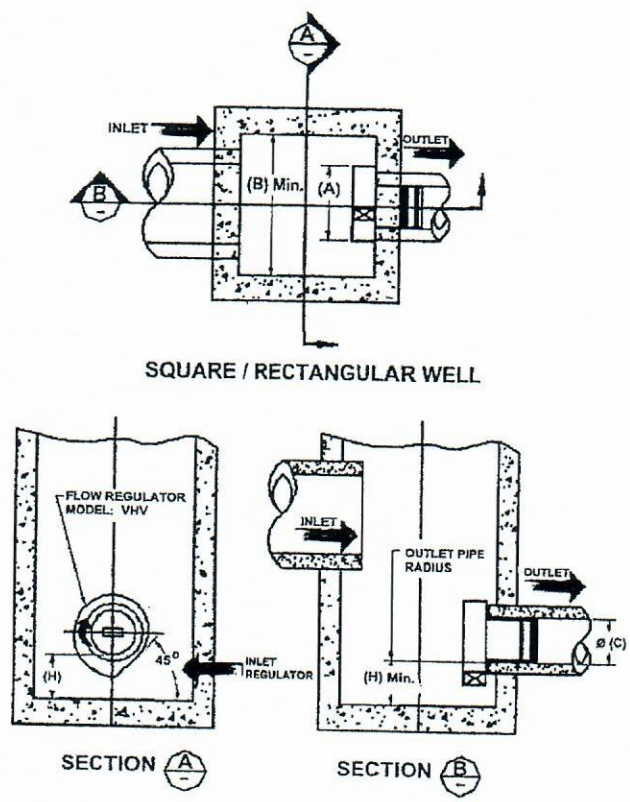
TYPICAL INSTALLATION OF A VORTEX FLOW REGULATOR IN A CIRCULAR OR SQUARE/RECTANGULAR MANHOLE
FIGURE 4

Model	Regulator Diameter A (mm) [in]	CIRCULAR Minimum Manhole Diameter B (mm) [in]	SQUARE Minimum Chamber Width B (mm) [in]	Minimum Outlet Pipe Diameter C (mm) [in]	Minimum Clearance H (mm) [in]
25 SVHV-1	125 [5]	600 [24]	600 [24]	150 [6]	150 [6]
32 SVHV-1	150 [6]	600 [24]	600 [24]	150 [6]	150 [6]
40 SVHV-1	200 [8]	600 [24]	600 [24]	150 [6]	150 [6]
50 VHV-1	150 [6]	600 [24]	600 [24]	150 [6]	150 [6]
75 VHV-1	250 [10]	600 [24]	600 [24]	150 [6]	150 [6]
100 VHV-1	325 [13]	900 [36]	600 [24]	150 [6]	200 [8]
125 VHV-2	275 [11]	900 [36]	600 [24]	150 [6]	200 [8]
150 VHV-2	350 [14]	900 [36]	600 [24]	150 [6]	225 [9]
200 VHV-2	450 [18]	1200 [48]	900 [36]	200 [8]	300 [12]
250 VHV-2	575 [23]	1200 [48]	900 [36]	250 [10]	350 [14]
300VHV-2	675 [27]	1600 [64]	1200 [48]	250 [10]	400 [16]
350VHV-2	800 [32]	1800 [72]	1200 [48]	300 [12]	500 [20]

Circular Manhole



Square / Rectangular Manhole



NOTE: *In the case of a square manhole, the outlet pipe must be centered on the wall to ensure that there is enough clearance for installation of the regulator.*