SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

1164-1166 Highcroft Drive
Ottawa, Ontario

Report No. 18035

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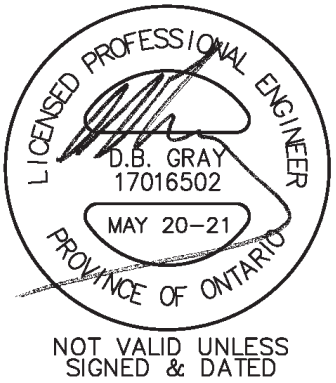

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Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

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SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

1164-1166 Highcroft Drive
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a 3542 sq.m. property at 1164-1166 Highcroft Drive, Manotick in Ottawa. The property currently has two single-family dwellings that will be demolished. Ten single-family dwellings are proposed. Four dwellings will front on Highcroft Drive and six will front onto a proposed private road. There is a significant grade difference across the property such that there is an approximate 7.7 m elevation difference between the floor level of the lowest and highest proposed dwelling. The slope of Highcroft Drive is also significant, varying from approximately 8 to 14% in front of the subject property.

This report forms part of the stormwater management design for the proposed development. Refer to drawing C-1 to C-14 also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

Currently there is no watermain in Highcroft Drive but a municipal watermain is proposed that will connect to an existing 400 mm watermain in Manotick Main Street at the intersection with Highcroft Drive. A private watermain is proposed to be located in the private road. A new municipal fire hydrant will be located at the end of the municipal watermain and a new private hydrant will be located at the end of the 200mm private watermain. There is also an existing municipal fire hydrant on Manotick Main Street near the intersection with Highcroft Drive. It is 147m from the furthest building in the proposed development.

A fire flow of 183.3 L/s (11,000 L/min) is required, as calculated as per the Fire Underwriter Survey "Water Supply For Fire Protection".

The City provided two sets of boundary conditions both based on a 168.2 l/s flowrate (Max day (1.5 L/s) + Fire Flow (166.7 L/s). The pre-configuration boundary conditions reflect the current conditions and the post configuration boundary conditions reflect the future conditions due to a new pump station and changes to the boundaries of a pressure zone. Since the “pre” and “post” fire flow HGLs are approximately the same (being 123.9 m and 123.6 m respectively), only the lower “post” boundary condition was used for the fire flow hydraulic analysis.

A model was created using EPANET software to analyze the hydraulics of the proposed 200mm municipal and private watermain serving the proposed municipal and private on-site fire hydrant. Using the 123.6 m HGL boundary condition and using a 95 L/s flowrate at the on-site fire hydrant and 62 L/s at the proposed municipal fire hydrant, the pressure at the on-site hydrant was determined to be 181 kPa (26.3 psi) and 139 kPa (20.1 psi) at the new municipal hydrant. Since the pressures are above 138 kPa (20 psi) or above, the watermain is adequately sized.

As per City of Ottawa Tech Bulletin ISTB-2018-02, the aggregate fire flow of all contributing fire hydrants within 150 m of the building can used to supply the required fire flow. The private on-site hydrant will be a Class AA contributing 5,700 L/min (95 L/s) (as per Table 1 of ISTB-2018-02). The new municipal hydrant is also Class AA but can only contribute 3,720 L/min (62 L/s) during fire flow conditions (62 L/s is the maximum flow available at 20 psi at this hydrant). The existing municipal fire hydrant in Manotick Main Street is a Class AA hydrant, and since it is greater than 75 m and less than 150 m of the building, it can contribute up to 3800 L/min (63.3 L/s) (as per Table 1). Therefore, the aggregate flow from all three hydrants is 13,220 L/min (220.3 L/s); greater than the required fire flow of 11,000 L/min 183.3 L/s).

WATER SERVICE:

As previously mentioned, there is currently no watermain in Highcroft Drive but a municipal watermain is proposed that will connect to an existing 400 mm watermain in Manotick Main Street.

Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (10 single-family dwellings / 3.4 person per dwelling – 350 L/person/day) and Ministry of the Environment Design Guidelines for peaking factors the daily average flow is 0.1 L/s with a maximum daily and maximum hourly demand of 1.3 and 1.9 L/s respectively.

To determine water pressure under these demands, boundary conditions, based on the City of Ottawa computer simulation of the water distribution system, at the subject location, are required. The boundary conditions for the subject area based on the following:

Average Daily Demand: 0.2 L/s.
Maximum Daily Demand: 1.3 L/s.
Maximum Hourly Demand: 2.1 L/s

As previously mentioned, the City provided two sets of boundary conditions, pre-configuration boundary conditions, reflecting the current conditions, and the post configuration boundary conditions, reflecting the future conditions.

Based on the “pre” boundary conditions, the minimum HGL (hydraulic grade line) is 141.6 m and the maximum is 158.8 m. With these HGLs, the water pressure at the

water meter of the lowest dwelling is calculated to vary from 515 kPa to 684 kPa (75 to 99 psi) and 442 kPa to 610 kPa (64 to 89 psi) at the highest dwelling.

Based on the “post” boundary conditions, the minimum HGL is 144.6 m and the maximum is 147.7 m. With these HGLs, the water pressure at the water meter of the lowest dwelling is calculated to vary from 545 kPa to 575 kPa (79 to 83 psi) and 471 kPa to 502 kPa (68 to 73 psi) at the highest dwelling.

These are acceptable pressures for the proposed development, however, since it is calculated that the water pressure can be above 80 psi at times an on-site pressure check is recommended to determine if a pressure reducing valve (PRV) is required.

As request from the City, a hydraulic analysis for the 50mm watermain is required. The analysis includes Peak Hour Flows and assumes that lawn sprinklers are operating at all proposed dwellings (at 5 USgpm / 0.33 L/s each). A model was created using EPANET software. To simplify the analysis (and to be very conservative) the entire demand is assumed to be required at the end of the watermain. The result is a 57 kPa (8 psi) pressure drop in the 50mm watermain. Since the actual demand would be distributed along the length of the watermain, the actual pressure drop would be significantly less, which means that the under above conditions the pressure at the water meter at the Lot 10 dwelling (the highest of the dwellings) would be greater than the 442 kPa (64 psi) calculated. This is obviously an acceptable pressure under any condition.

SANITARY SERVICE:

Currently there are no sanitary sewers in Highcroft Drive, but a 200 mm municipal sanitary sewer is proposed that will connect to an existing 600 mm sanitary sewer in Manotick Main Street at the intersection with Highcroft Drive. A private 200 mm sanitary sewer is proposed to be located in the private road.

Based on the City of Ottawa Sewer Design Guidelines for residential properties (10 single-family dwellings / 3.4 person per dwelling – 280 L/person/day – 3.2 peaking factor); and based on a 0.33 l/s/ha infiltration flow; the post development flow is calculated to be 0.61 L/s (this flow includes a future connection to the house across the street – 1167 Highcroft Drive).

This flow will be adequately handled by the proposed sanitary sewers (200 mm at 0.32% to 0.65% - 19.36 to 27.59 L/s capacity) since, at the design flows, these sewers will be at 3% of capacity or less.

The 0.61 L/s increase in sanitary flows contributing to the existing 600 mm municipal sanitary sewer (at $\pm$0.2%) is expected to have a negligible impact given its capacity of 248.1 L/s.

The 600 mm sanitary sewer drains to the Manotick Main Pump Station. As per a conversation John Bougadis (City of Ottawa, Senior Project Manager, Infrastructure Planning) the peak flow at the pump station is currently 5 to 10 L/s during dry conditions and 45 to 50 L/s during wet; the capacity of the pump station is 60 L/s; and renovation in 2020 will increase the capacity to 120 L/s. John Bougadis advised that the proposed development (with a 0.53 L/s increase in sanitary flows) will have a negligible impact on the pump station.

STORMWATER MANAGEMENT:

Water Quality:
The Rideau Valley Conservation Authority (RVCA) has advised that 80% total suspended solids (TSS) removal is required.

To achieve 80% TSS removal manhole MH-12 will be an oil/grit separator (OGS) manhole (a Stormceptor Model EFO4). The Stormceptor Model EFO4 has a sediment capacity of 1.19 cubic metres and an oil/debris capacity of 265 litres.

Based on software supplied by the manufacturer, the OGS will remove approximately 86% of TSS from the runoff. Output from the manufacturer's software is attached to the report.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-6 and notes 2.1 to 2.7 on drawing C-7). In summary: to filter out construction sediment a silt fence barrier will be installed adjacent to the south and east property line; sediment capture filter sock inserts will be installed in all new catch basins as they are installed; and geotextile fabric mud mats will be install at all points of egress to public roads.

Water Quantity:

Currently there is no storm sewer in Highcroft Drive but 300 and 375 mm municipal storm sewers are proposed connecting to an existing 375 mm storm sewer in Manotick Main Street at the intersection with Highcroft Drive. Private 250 to 375 mm storm sewers are proposed to be located in the private road.

The stormwater management criteria for quantity control are to control the post development peak flows to the pre-development peak flow using a pre-development runoff coefficient and a calculated time of concentration (but not less than 10 minutes). It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.33 and a 4.0 minute time of concentration (using the Bransby Williams Formula). The 100-year runoff coefficient is 0.39 and time of concentration is 4.0 minutes. Using the Rational Method, the maximum allowable release rate is 33.82 L/s for the 5-year event and 68.38 L/s for the 100-year.

Storage calculations are based on the Modified Rational Method. The runoff coefficients for the 100-year event are increased by 25% to maximum 1.00.

To the west of the subject property 1,230 sq.m. of lands drain onto the property. This off-site drainage area is not required to be controlled but is included in the stormwater management calculations and the storm sewer design form.

Stormwater will be stored within the development in underground in cisterns. To calculate the required storage volume in an underground cistern an average release rate is assumed to be equal to 50% of the maximum release rate.

Drainage Area I
(Uncontrolled Flow Off Site – 345 sq.m.):
The runoff from front yards of the dwellings fronting on Highcroft Drive will be allowed to flow uncontrolled off the site. The flow from is calculated at 10 minutes concentration.

	100-year	5-year
Maximum flow rate:	14.93 L/s	7.80 L/s

Drainage Area II (1,227 sq.m.):
An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-4 will control the release of stormwater from this drainage area. The ICD will restrict the flow and force the stormwater to back up into an underground cistern (Cistern 1). The ICD was sized for the 5-year event. During the one hundred-year event, 18.08 L/s is released through the ICD and 2.62 L/s flows out an overflow pipe at CB/MH-4. The 2.62 L/s is included in the total release rate (20.69 L/s) from this drainage area. The cistern was sized by ignoring the off-site drainage. The off-site drainage area was then included in the calculations, but the since the size of the cistern was not increased the excess water will flow out the overflow pipe located at CB/MH-4 (27.92 L/s during the 100-year event). The ICD shall be a plug style with a round orifice design manufactured by Pedro Plastics (or approved equal) and shall be sized by the manufacturer for a discharge rate of 18.08 L/s at 2.54 m head. It is calculated that an orifice area of 4,195 sq.mm. (±73 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 18.08 L/s at a head of 2.54 m. Based on this orifice the maximum outflow rate for the 1:5-year storm event is calculated to be 14.72 L/s at 1.69 m (ignoring the off-site drainage).

	100-year	5-year
Maximum ICD release rate:	18.08 L/s	14.72 L/s
Maximum overflow release rate:	2.62 L/s	0.00 L/s
Maximum total release rate:	20.69 L/s	14.72 L/s
Maximum water elevation:	89.41 m	88.55 m
Maximum stored volume:	18.55 cu.m.	8.37 cu.m.

Including Off Site Drainage:

	100-year	5-year
Maximum ICD release rate:	18.08 L/s	17.72 L/s
Maximum overflow release rate:	27.92 L/s	0.00 L/s
Maximum total release rate:	45.99 L/s	17.72 L/s

Maximum water elevation:	89.41 m	89.31 m
Maximum stored volume:	18.55 cu.m.	17.36 cu.m.

Drainage Area III (1,970 sq.m.):
An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-10 will control the release of stormwater from this drainage area. The ICD will restrict the flow and force the stormwater to back up into two underground cisterns (Cisterns 2 and 3). The ICD was sized for the 5-year event. During the one hundred-year event, 13.47 L/s is released through the ICD and 6.50 L/s flows out an overflow pipe at CB/MH-10. The 6.50 L/s is included in the total release rate from this drainage area. The ICD shall be a plug style with a round orifice design manufactured by Pedro Plastics (or approved equal) and shall be sized by the manufacturer for a discharge rate of 13.47 L/s at 1.41 m head. It is calculated that an orifice area of 4,195 sq.mm. (±73 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 13.47 L/s at a head of 1.41 m. Based on this orifice the maximum outflow rate for the 1:5-year storm event is calculated to be 11.30 L/s at 0.99 m.

	100-year	5-year
Maximum ICD release rate:	13.47 L/s	11.30 L/s
Maximum overflow release rate:	6.50 L/s	0.00 L/s
Maximum total release rate:	19.97 L/s	11.30 L/s
Maximum water elevation:	87.67 m	87.25 m
Maximum stored volume:	30.87 cu.m.	17.55 cu.m.

The Entire Site:

	100-year	5-year
Maximum permitted release rate:	68.38 L/s	33.82 L/s
Maximum release rate:	55.59 L/s	33.82 L/s
Maximum stored volume:	49.42 cu.m.	25.92 cu.m.

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be 19% less that the maximum allowable and the maximum post-development release rate for the 5-year storm event is calculated to be equal to the maximum allowable.

At 73 mm diameter the ICDs are slightly less than the minimum 75 mm recommended in the City guidelines. The alternative is a vortex style ICD, however, since vortex style ICDs are much more prone to blockages than a plug style ICDs we strongly recommend using the 73 mm diameter plug style ICD rather than a vortex style ICD. To reduce the risk of blockages in the plug style ICD, the ICDs are specified to be manufactured with a trash basket.

The unrestricted flowrate in resulting from one in five-year storm event will produce a peak flow of 61.44 L/s in the proposed private storm sewer system. The proposed storm sewer system is adequate with no pipe segment no more than 68% of its capacity. (This flow includes the 1230 sq.m. off-site area to the west that drains to catch basin CB-3.)

The unrestricted flowrate in resulting from one in five-year storm event will produce a peak flow of 108.24 L/s in the proposed municipal storm sewer system. The proposed storm sewer system is adequate with no pipe segment no more than 79% of its capacity. (This flow includes the 3843 sq.m. area to the west that is draining to the existing driveway culvert for 1172 Highcroft Drive.)

The stormwater flowrate contributing to the existing municipal storm sewer in Manotick Main Street is expected to have an acceptable impact on the existing stormwater infrastructure given that the post release rate is less than or equal to the pre-development flows.

UTILITIES:

An existing utility pole located in the Highcroft Drive ROW in front of Lot 3 conflicts with a proposed driveway will be removed. Prior to removal, a new pole will be installed approximately 1 m to the west. The pole will have a street light; and other necessary equipment; and the work will coordinated with the utility companies to minimize disruption to services.

CONCLUSIONS:

1. There is an adequate water supply for firefighting.

2. The water pressure in the municipal and private watermain will be acceptable for the proposed development, however, since it is calculated that the water pressure can be above 80 psi at times an on-site pressure check is recommended to determine if a pressure reducing valve (PRV) is required.

3. The sanitary flow generated by the proposed development will be adequately handled by the proposed sanitary sewers.

4. The 0.61 L/s increase in sanitary flows contributing to the existing 600 mm municipal sanitary sewer is expected to have a negligible impact.

5. The proposed development will have a negligible impact Manotick Main Pump Station.

6. To achieve 80% TSS removal manhole MH-12 will be an oil/grit separator (OGS) manhole.

7. An erosion and sediment control plan has been developed to be implemented during construction.

8. The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year and 100-year storm event respectively. To achieve quantity control, stormwater will be stored within the development in an underground cistern.

9. The flowrate produced by a one in five-year storm event will be adequately handled by the proposed private and municipal storm sewers.

10. The restricted stormwater flow contributing to the existing municipal storm sewer is expected to have an acceptable impact.

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08-Aug-19
REVISED 12-Nov-20
REVISED 24-Dec-20

1164-1166 Highcroft Dr
Residential Dwellings on Highcroft Dr - Two Houses (on Lots 1 & 2)
Ottawa, Ontario

Fire Flow Requirements

Fire flow requirement as calculated as per Fire Undewriter Survey "Water Supply For Fire Protection".

$F = 220\ C\ A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
= 1.5 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

Proposed House Lot 1 (Dwelling Type 1)	2nd Floor	102	sq.m.
	Ground Floor	100	sq.m.
	Walkout Basment	95	sq.m.
	TOTAL AREA:	297	sq.m.
Proposed House Lot 2 (Dwelling Type 1)	2nd Floor	102	sq.m.
	Ground Floor	100	sq.m.
	Walkout Basment	95	sq.m.
	TOTAL AREA:	297	sq.m.
	TOTAL FIRE AREA:	594	sq.m.

F = 8,043 L/min
= 8,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 6,800 L/min

0% Reduction to above for no sprinkler protection

= 6,800 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
18%	East	3.1 to 10m	W-F	16	3	48
17%	South	3.1 to 10m	W-F	8	3	24
17%	West	3.1 to 10m	W-F	13	2	26
5%	North	30.1 to 45m				0

57% Total Increase for Exposure (maximum 75%)
= 3,876 L/min Increase

= 10,676 L/min
F = 11,000 L/min (rounded off to the nearest 1,000 L/min)
= 183.3 l/s

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08-Aug-19
12-Nov-20
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1164-1166 Highcroft Dr
Residential Dwelling on the Private Rd - Two Houses (Lots 5 & 6)
Ottawa, Ontario

Fire Flow Requirements

Fire flow requirement as calculated as per Fire Undewriter Survey "Water Supply For Fire Protection".

$F = 220\ C\ A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
= 1.5 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

Proposed House Lot 5 (Dwelling Type 3)	2nd Floor	91	sq.m.
	Ground Floor	90	sq.m.
	Walkout Basment	68	sq.m.
	TOTAL AREA:	249	sq.m.
Proposed House Lot 6 (Dwelling Type 3)	2nd Floor	91	sq.m.
	Ground Floor	90	sq.m.
	Walkout Basment	68	sq.m.
	TOTAL AREA:	249	sq.m.
	TOTAL FIRE AREA:	498	sq.m.

F = 7,364 L/min
= 7,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 5,950 L/min

0% Reduction to above for no sprinkler protection

= 5,950 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
12%	East	10.1 to 20m	W-F	3	1	3
18%	South	3.1 to 10m	W-F	15	3	45
13%	West	10.1 to 20m	W-F	8	4	32
0%	North	>45m				0

43% Total Increase for Exposure (maximum 75%)
= 2,559 L/min Increase

= 8,509 L/min
F = 9,000 L/min (rounded off to the nearest 1,000 L/min)
= 150.0 l/s

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1164-1166 Highcroft Dr
Residential Dwelling on Private Rd - Lot 9
Ottawa, Ontario

Fire Flow Requirements

Fire flow requirement as calculated as per Fire Undewriter Survey "Water Supply For Fire Protection".

F = 220 C $A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
= 1.5 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

3rd Floor	74	sq.m.
2nd Floor	114	sq.m.
Ground Floor	114	sq.m.
Basement	106	sq.m.
TOTAL AREA:	408	sq.m.

F = 6,666 L/min
= 7,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 5,950 L/min

0% Reduction to above for no sprinkler protection

= 5,950 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
12%	East	10.1 to 20m	W-F	6	2	12
18%	South	3.1 to 10m	W-F	15	4	60
0%	West	>45m				0
18%	North	3.1 to 10m	W-F	15	4	60
48%	Total Increase for Exposure (maximum 75%)					

= 2,856 L/min Increase

= 8,806 L/min
F = 9,000 L/min (rounded off to the nearest 1,000 L/min)
= 150.0 l/s

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08-Aug-19
REVISED 17-Jun-20

1164 & 1166 Highcroft Dr
Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
Single-Family Dwelling:	10	3.4	34
		TOTAL:	34

DAILY AVERAGE 350 litres / person / day
8.3 l/min 0.1 l/s 2 USgpm

MAXIMUM DAILY DEMAND 9.3 (Peaking Factor for a population of 34: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)
77.2 l/min 1.3 l/s 20 USgpm

MAXIMUM HOURLY DEMAND 14.1 (Peaking Factor for a population of 36: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)
116.3 l/min 1.9 l/s 31 USgpm

PRE-CONFIGURATION

DWELLING AT THE HIGHEST ELEVATION
Elevation of Water Meter: 96.54 m ASL
Finish Floor Elevation: 95.64 m ASL

			Static Pressure at Water Meter			
MINIMUM HGL:	141.6	m ASL	64	psi	442	kPa
MAXIMUM HGL:	158.8	m ASL	89	psi	610	kPa

DWELLING AT THE LOWEST ELEVATION
Elevation of Water Meter: 89.04 m ASL
Finish Floor Elevation: 88.14 m ASL

			Static Pressure at Water Meter			
MINIMUM HGL:	141.6	m ASL	75	psi	515	kPa
MAXIMUM HGL:	158.8	m ASL	99	psi	684	kPa

POST CONFIGURATION

DWELLING AT THE HIGHEST ELEVATION
Elevation of Water Meter: 96.54 m ASL
Finish Floor Elevation: 95.64 m ASL

			Static Pressure at Water Meter			
MINIMUM HGL:	144.6	m ASL	68	psi	471	kPa
MAXIMUM HGL:	147.7	m ASL	73	psi	502	kPa

DWELLING AT THE LOWEST ELEVATION
Elevation of Water Meter: 89.04 m ASL
Finish Floor Elevation: 88.14 m ASL

			Static Pressure at Water Meter			
MINIMUM HGL:	144.6	m ASL	79	psi	545	kPa
MAXIMUM HGL:	147.7	m ASL	83	psi	575	kPa

BOUNDARY CONDITIONS

Boundary Conditions For: 1164/1166 Highcroft Dr.

Date of Boundary Conditions: 2019-Jan-31

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	6.0	0.1
Maximum Daily Demand	72.0	1.2
Peak Hour	114.0	1.9
Fire Flow #1 Demand	10,000	166.7

Number Of Connections: 1

Location:

BOUNDARY CONDITIONS

Results:

Pre

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	158.8	100.6
Peak Hour	141.6	76.4
Max Day Plus Fire (10,000) L/min	123.9	51.2

[1]Elevation: **87.870 m**

Post

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.7	85.4
Peak Hour	144.6	80.8
Max Day Plus Fire (10,000) L/min	123.6	51.0

[1]Elevation: **87.870 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

Gmail by Google

Douglas Gray <d.gray@dbgrayengineering.com>

1164 Highcroft Dr. Boundary Conditions Revision.

1 message

Alvey, Harry <Harry.Alvey@ottawa.ca> Tue, Jan 29, 2019 at 1:47 PM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: "Whittaker, Damien" <Damien.Whittaker@ottawa.ca>, "McCormick, Sarah" <sarah.mccormick@ottawa.ca>

Good Afternoon Doug,

Enclosed is the revised Boundary Conditions based on your latest information. In addition, I received a correction as to what our Asset Management Group meant by "Pre" and "Post". The following is their explanation of the use of these terms and how it applies to this project:

The "pre" Boundary condition provided reflects the current water pressure zone HGLs and pressures for BARR (which is where the current development is located). The "post" zone reflects the future pressure zone configuration, which will be "3SW" and the pressure and HGL, will improve significantly due to a new pump station that will be installed, and changes to the boundaries of the pressure zone "BARR". Currently, we have both scenarios modelled and, for future developments requesting boundary conditions, we give HGLs and Pressures for both scenarios, because we still do not know when the configuration will take place.

The consultant is generally asked to design to the "pre" configured pressure zone HGLs and pressures for conservative design.

There are several administrative steps that are being negotiated with stakeholders in that area that is delaying the installation of the new pump station and the reconfiguration of the pressure zone.

Harry

Harry R. Alvey, P.E., P.Eng.

Project Manager

Planning, Infrastructure and Economic Development Department

Development Review Rural Branch

Services de la planification, de l'infrastructure et du développement économique

City of Ottawa | Ville d'Ottawa

613.580.2424 ext./poste 28103

ottawa.ca/planning / ottawa.ca/urbanisme

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1164, 1166 Highcroft Dr_Rev1.docx
198K

8-Aug-19
REVISED 17-Jun-20
REVISED 12-Nov-20
REVISED 12-Mar-21

1164-1166 Higcroft Drive
Ottawa, Ontario

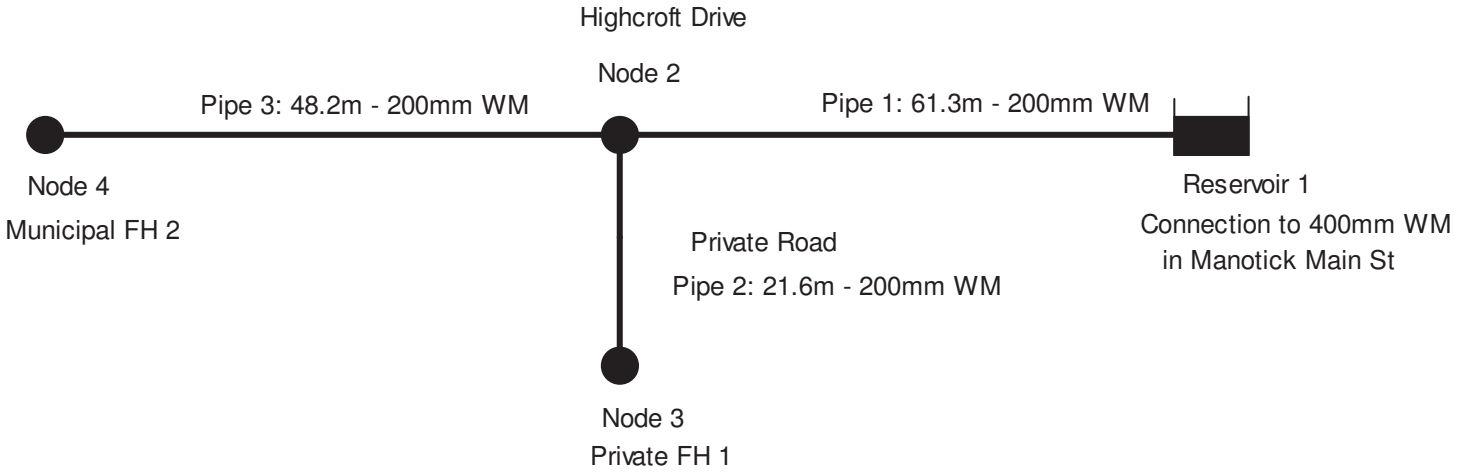
EPANET HYDRAULIC MODELLING RESULTS

MAX DAY + FIRE FLOW: 158.3 L/s - HGL: 123.6

200mm WM in Highcroft Dr & Private Rd
(95 L/s Fire Flow at New Private Hydrant + 62.0 L/s Flow at new Municipal FH)

Node ID	Demand	Head	Elevation	Pressure		
	l/s	m	m	m	psi	kPa
1 Reservoir 1 (Connection to 400 WM)	-158.3	123.60	87.81	35.79	50.9	351
2	0.0	111.44	90.73	20.71	29.4	203
3 Fire Hydrant 1 (inc. 0.8 L/s Domestic)	95.8	109.23	90.72	18.51	26.3	181
4 Fire Hydrant 2 (inc. 0.5 L/s Domestic)	62.5	110.04	95.87	14.17	20.1	139

Link ID	Diameter	Length	Roughness	Loss Coeff.	Flow	Velocity
	mm	m			l/s	m/s
Pipe 1	200	61.3	110	2.40	158.30	5.04
Pipe 2	200	21.6	110	2.00	95.80	3.05
Pipe 3	200	48.2	110	0.60	62.50	1.99


Highcroft Drive
Node 2
Pipe 3: 48.2m - 200mm WM
Pipe 1: 61.3m - 200mm WM
Node 4
Municipal FH 2
Reservoir 1
Connection to 400mm WM
in Manotick Main St
Private Road
Pipe 2: 21.6m - 200mm WM
Node 3
Private FH 1

Network Table - Nodes

Node ID	Elevation m	Base Demand LPS	Demand LPS	Head m	Pressure m
Junc 2	90.73	0	0.00	111.44	20.71
Junc 3	90.72	95.8	95.80	109.23	18.51
Junc 4	95.87	62.5	62.50	110.04	14.17
Resvr 1	123.6	#N/A	-158.30	123.60	0.00

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s
Pipe 1	61.3	200	110	158.30	5.04
Pipe 2	21.6	200	110	95.80	3.05
Pipe 3	48.2	200	110	62.50	1.99

12-Mar-21

1164-1166 Higcroft Drive
Ottawa, Ontario

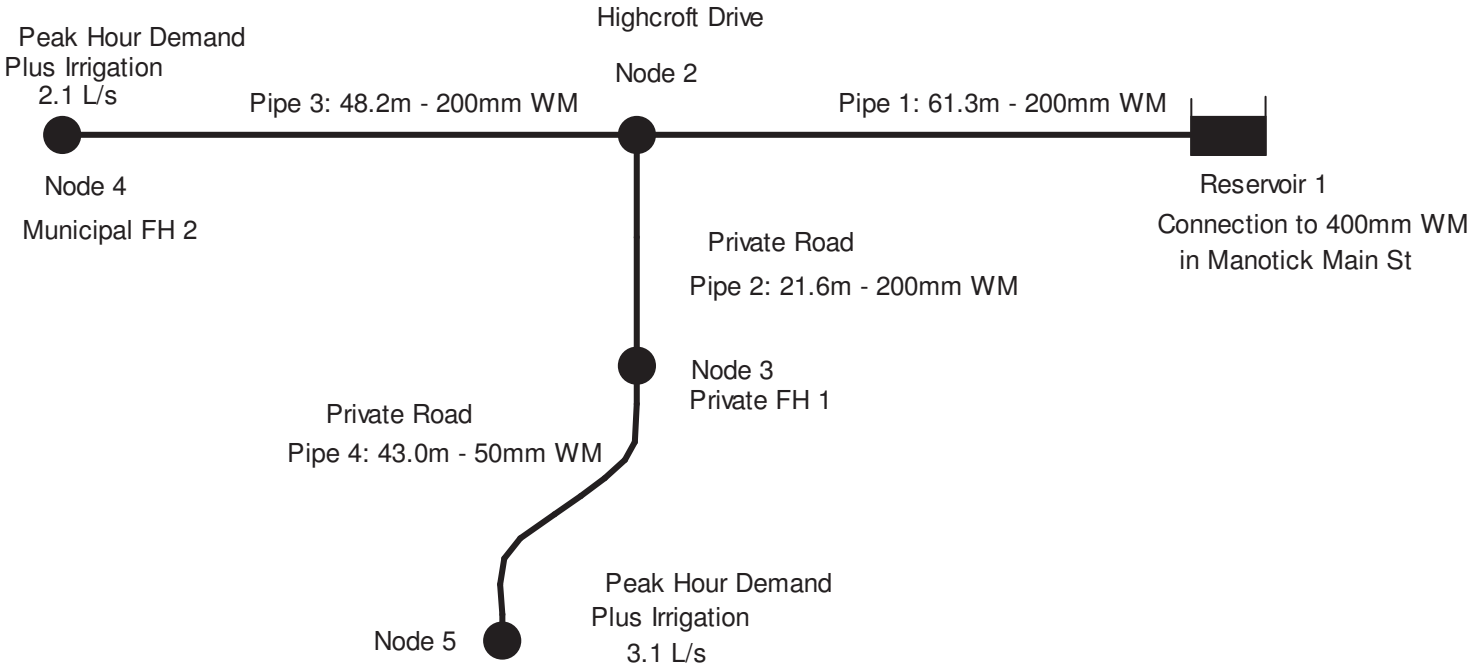
EPANET HYDRAULIC MODELLING RESULTS

Peak Dometsic Demand Including Irrigation

50mm WM in Private Rd

Node ID	Demand	Head	Elevation	Pressure		
	l/s	m	m	m	psi	kPa
1 Reservoir 1 (Connection to 400 WM)	-5.2	141.60	87.81	53.79	76.5	527
2	0.0	141.58	90.73	50.85	72.3	499
3 (FH 1)	0.0	141.58	90.72	50.86	72.3	499
4 (FH 2) Peak Domestic Demand)	2.1	141.58	95.63	45.95	65.3	451
5 Peak Domestic Demand	3.1	136.87	91.80	45.07	64.1	442

Link ID	Diameter	Length	Roughness	Loss Coeff.	Flow	Velocity
	mm	m			l/s	m/s
Pipe 1	200	61.3	110	2.40	5.2	0.17
Pipe 2	200	21.6	110	2.00	3.1	0.10
Pipe 3	200	48.2	110	0.60	2.1	0.07
Pipe 4	50	43.0	100	2.00	3.1	1.58


Highcroft Drive
Peak Hour Demand
Plus Irrigation
2.1 L/s
Node 2
Pipe 3: 48.2m - 200mm WM
Pipe 1: 61.3m - 200mm WM
Node 4
Municipal FH 2
Reservoir 1
Connection to 400mm WM
in Manotick Main St
Private Road
Pipe 2: 21.6m - 200mm WM
Node 3
Private FH 1
Private Road
Pipe 4: 43.0m - 50mm WM
Peak Hour Demand
Plus Irrigation
3.1 L/s
Node 5

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Junc 2	90.73	0.00	141.58	50.85
Junc 3	90.72	0.00	141.58	50.86
Junc 4	95.87	2.10	141.58	45.71
Junc 5	91.80	3.10	136.87	45.07
Resvr 1	141.6	-5.20	141.60	0.00

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s
Pipe 1	61.3	200	110	5.20	0.17
Pipe 2	21.6	200	110	3.10	0.10
Pipe 3	48.2	200	110	2.10	0.07
Pipe 4	43.0	50	100	3.10	1.58

D.B. GRAY ENGINEERING INC.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

SANITARY SEWER DESIGN FORM

Average Daily Flows:
- Residential: 280 l / capita / day
- Commercial: 28,000 l / ha / day
- Instituational: 28,000 l / ha / day
- Light Industrial: 35,000 l / ha / day
- Heavy Industrial: 55,000 l / ha / day

Infiltration Allowance: 0.33 l / s / ha

Peaking Factor:
- Residential (Harmon Equation): $P.F. = 1 + \frac{14}{4 + P^{0.5}}$
- P = Population / 1000
- Harmon Correction Factor 0.8
- Commercial & Institutional: 1.5 If contrinbution > 20%
- Commercial & Institutional: 1.0 If contrinbution < 20%
- Industrial: As per Ottawa Guidelines Appendix 4-B

PROJECT: 1164-1166 Highcroft

Designed By: DBG

12-Mar-21

		Section								Cumulative Residential		Section Non-Residential			Cumulative					SEWER DATA								COMMENTS
		Single Family	Semi/Townhouse	Duplex / Triplex	Apartment (average)	Apartment (1 Bed.)	Apartment (2 Bed.)	Apartment (3 Bed.)	Residential Area	Pop.	Peaking Factor	Area	Flow	Peaking Factor	Flow	Area	Sewage Flow	Infiltration Flow	Total Flow	n = 0.013								
FROM	TO	ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.8	ppu = 1.4	ppu = 2.1	ppu = 3.1												Type of Pipe	Dia. Actual (mm)	Dia. Nom. (mm)	Slope (%)	Length (m)	Capacity (l/s)	Velocity (m/s)	Ratio Q/Qfull	
		No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	ha			ha	l/ha/day		l/s	ha	l/s	l/s	l/s								
MH.-SA.2	MH-SA.3	5							0.151	17	3.2					0.151	0.18	0.05	0.23	PVC	203.2	200	0.65	21.3	27.6	0.85	0.01	
MH-SA.3	MH-SA.4	1							0.070	20	3.2					0.220	0.21	0.07	0.28	PVC	203.2	200	0.32	23.6	19.4	0.60	0.01	
MH-SA.4	MH.-SA.5								0.017	20	3.2					0.238	0.21	0.08	0.29	PVC	203.2	200	0.32	14.1	19.4	0.60	0.01	
MH-SA.5	MH.-SA.6								0.013	20	3.2					0.251	0.21	0.08	0.29	PVC	203.2	200	0.32	14.5	19.4	0.60	0.02	
MH-SA.1	MH.-SA.6	5							0.338	17	3.2					0.338	0.18	0.11	0.29	PVC	203.2	200	8.00	45.7	96.8	2.98	0.00	
MH.-SA.6	MH-SA.7								0.097	37	3.2					0.685	0.39	0.23	0.61	PVC	203.2	200	4.24	48.3	70.5	2.17	0.01	
MH-SA.7	EXISTING STUB								0	37	3.2					0.6852	0.39	0.23	0.61	PVC	203.2	200	0.32	18.4	19.4	0.60	0.03	
																				MUNICIPAL SANITARY SEWER IN MANOTICK MAIN ST								
																					609.6	600	0.15		248.1	0.85		

Gmail by Google

Douglas Gray <d.gray@dbgrayengineering.com>

RE: 1164/1166 Highcroft Dr

1 message

Eric Lalande <eric.lalande@rvca.ca> Thu, Sep 19, 2019 at 3:35 PM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Ryan Faith <r.faith@dbgrayengineering.com>

Hi Doug,

It would appear that the site drains through overland flow (ditches) to the city's storm sewer on Manotick Main,

We are looking for 80% TSS removal, and defer quantity requirements to the City.

Let me know if you require anything else.

Thank you,

Eric Lalande, MCIP, RPP

Planner, Rideau Valley Conservation Authority

613-692-3571 x1137

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: Thursday, September 19, 2019 8:31 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Ryan Faith <r.faith@dbgrayengineering.com>
Subject: 1164/1166 Highcroft Dr

Hi Eric

We are working on a proposed residential development on a 3542 sq.m. property at 1164/1166 Highcroft Dr in Manotick Dr. It will consist of eleven single-family dwellings. The property currently has two single-family dwellings that will be demolished.

Attached is a site plan.

Please comment concerning the stormwater management for this site.

Regards, Doug

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle Tel: 613-425-8044

Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/20/2021

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:	1164-1166 Highcroft Dr.

Drainage Area (ha):	0.3197
Runoff Coefficient 'c':	0.54

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.0

Estimated Water Quality Flow Rate (L/s):	6.24
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	

Project Name:	1164-1166 Highcroft Dr.
Project Number:	18035
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	905-630-0359
EOR Name:	Doug Gray
EOR Company:	D.B. Gray Engineering Inc.
EOR Email:	d.gray@dbgrayengineering.com
EOR Phone:	613-425-8044

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	86
EFO6	90
EFO8	92
EFO10	93
EFO12	93

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 86

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

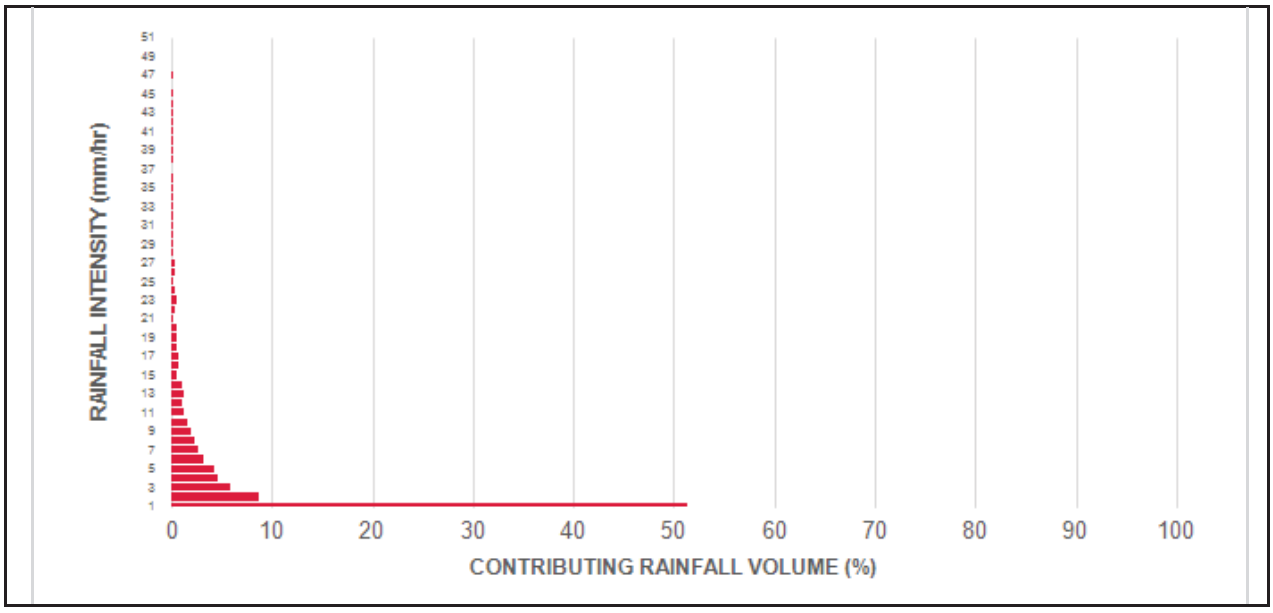
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

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

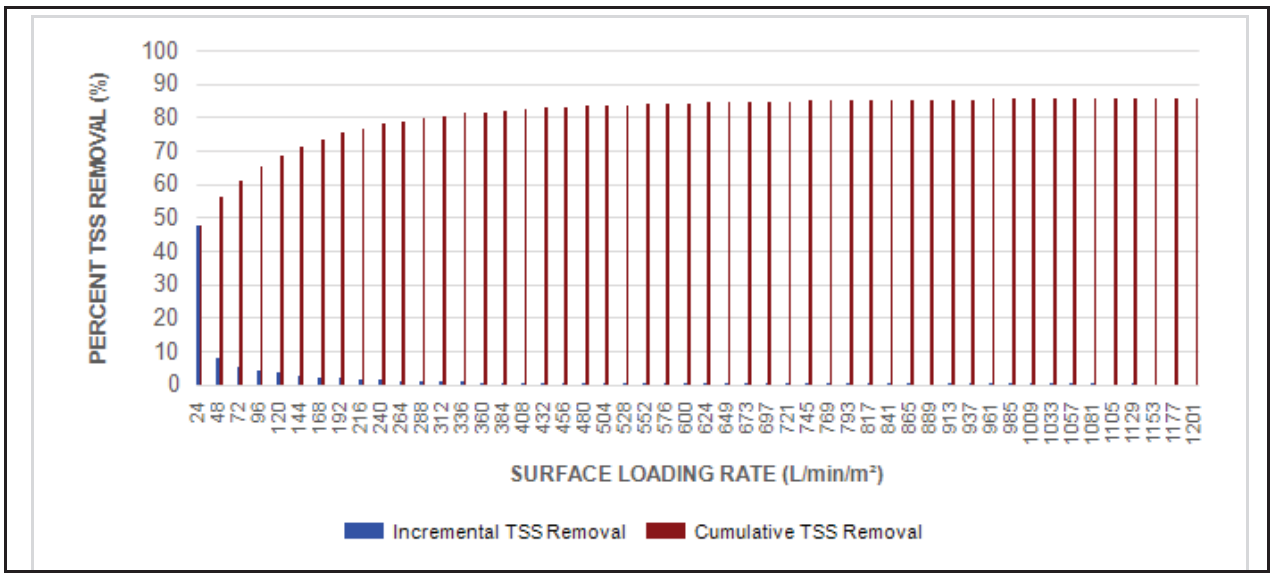
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	51.3	51.3	0.48	29.0	24.0	93	47.7	47.7
2	8.7	60.0	0.96	58.0	48.0	93	8.1	55.8
3	5.8	65.8	1.44	86.0	72.0	90	5.2	61.0
4	4.6	70.4	1.92	115.0	96.0	88	4.0	65.1
5	4.2	74.6	2.40	144.0	120.0	85	3.6	68.6
6	3.2	77.8	2.88	173.0	144.0	83	2.6	71.3
7	2.6	80.4	3.36	202.0	168.0	80	2.1	73.3
8	2.4	82.8	3.84	231.0	192.0	77	1.9	75.2
9	1.9	84.7	4.32	259.0	216.0	75	1.4	76.6
10	1.6	86.3	4.80	288.0	240.0	72	1.2	77.8
11	1.3	87.6	5.28	317.0	264.0	71	0.9	78.7
12	1.1	88.7	5.76	346.0	288.0	69	0.8	79.5
13	1.3	90.0	6.24	375.0	312.0	66	0.9	80.3
14	1.1	91.1	6.73	404.0	336.0	64	0.7	81.0
15	0.6	91.7	7.21	432.0	360.0	62	0.4	81.4
16	0.8	92.5	7.69	461.0	384.0	60	0.5	81.9
17	0.7	93.2	8.17	490.0	408.0	58	0.4	82.3
18	0.5	93.7	8.65	519.0	432.0	57	0.3	82.6
19	0.6	94.3	9.13	548.0	456.0	57	0.3	82.9
20	0.5	94.8	9.61	576.0	480.0	56	0.3	83.2
21	0.2	95.0	10.09	605.0	504.0	55	0.1	83.3
22	0.4	95.4	10.57	634.0	528.0	54	0.2	83.5
23	0.5	95.9	11.05	663.0	552.0	54	0.3	83.8
24	0.4	96.3	11.53	692.0	576.0	53	0.2	84.0
25	0.1	96.4	12.01	721.0	600.0	52	0.1	84.0

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	12.49	749.0	624.0	52	0.2	84.2
27	0.4	97.1	12.97	778.0	649.0	52	0.2	84.4
28	0.2	97.3	13.45	807.0	673.0	52	0.1	84.5
29	0.2	97.5	13.93	836.0	697.0	52	0.1	84.6
30	0.2	97.7	14.41	865.0	721.0	51	0.1	84.7
31	0.1	97.8	14.89	894.0	745.0	51	0.1	84.8
32	0.2	98.0	15.37	922.0	769.0	51	0.1	84.9
33	0.1	98.1	15.85	951.0	793.0	51	0.1	84.9
34	0.1	98.2	16.33	980.0	817.0	51	0.1	85.0
35	0.1	98.3	16.81	1009.0	841.0	51	0.1	85.0
36	0.2	98.5	17.29	1038.0	865.0	51	0.1	85.1
37	0.0	98.5	17.77	1066.0	889.0	51	0.0	85.1
38	0.1	98.6	18.25	1095.0	913.0	50	0.1	85.2
39	0.1	98.7	18.73	1124.0	937.0	50	0.1	85.2
40	0.1	98.8	19.22	1153.0	961.0	50	0.1	85.3
41	0.1	98.9	19.70	1182.0	985.0	50	0.1	85.3
42	0.1	99.0	20.18	1211.0	1009.0	50	0.1	85.4
43	0.2	99.2	20.66	1239.0	1033.0	50	0.1	85.5
44	0.1	99.3	21.14	1268.0	1057.0	50	0.1	85.5
45	0.1	99.4	21.62	1297.0	1081.0	49	0.0	85.6
46	0.0	99.4	22.10	1326.0	1105.0	49	0.0	85.6
47	0.1	99.5	22.58	1355.0	1129.0	49	0.0	85.6
48	0.0	99.5	23.06	1384.0	1153.0	49	0.0	85.6
49	0.0	99.5	23.54	1412.0	1177.0	48	0.0	85.6
50	0.0	99.5	24.02	1441.0	1201.0	48	0.0	85.6
Estimated Net Annual Sediment (TSS) Load Reduction =								86 %

RAINFALL DATA FROM OTTAWA MACDONALD-CARTIER INT'L AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

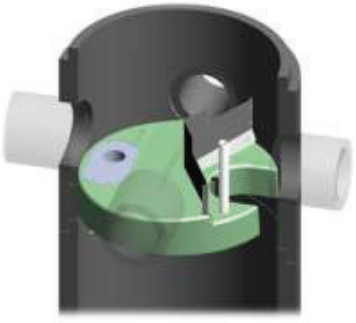
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

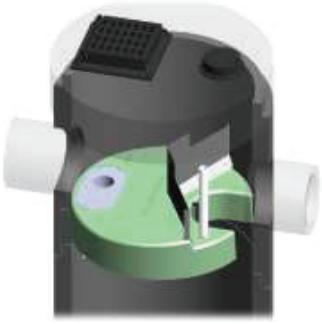
DESIGN FLEXIBILITY

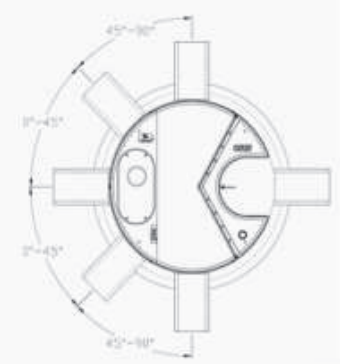
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

imbrium

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing 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.

◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF and EFO Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

Registration: GPS-ETV_VR2020-11-15_Imbrium-SC

In accordance with

ISO 14034:2016

Environmental management —
Environmental technology verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

November 15, 2020
Vancouver, BC, Canada

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Stormceptor® EF and EFO are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

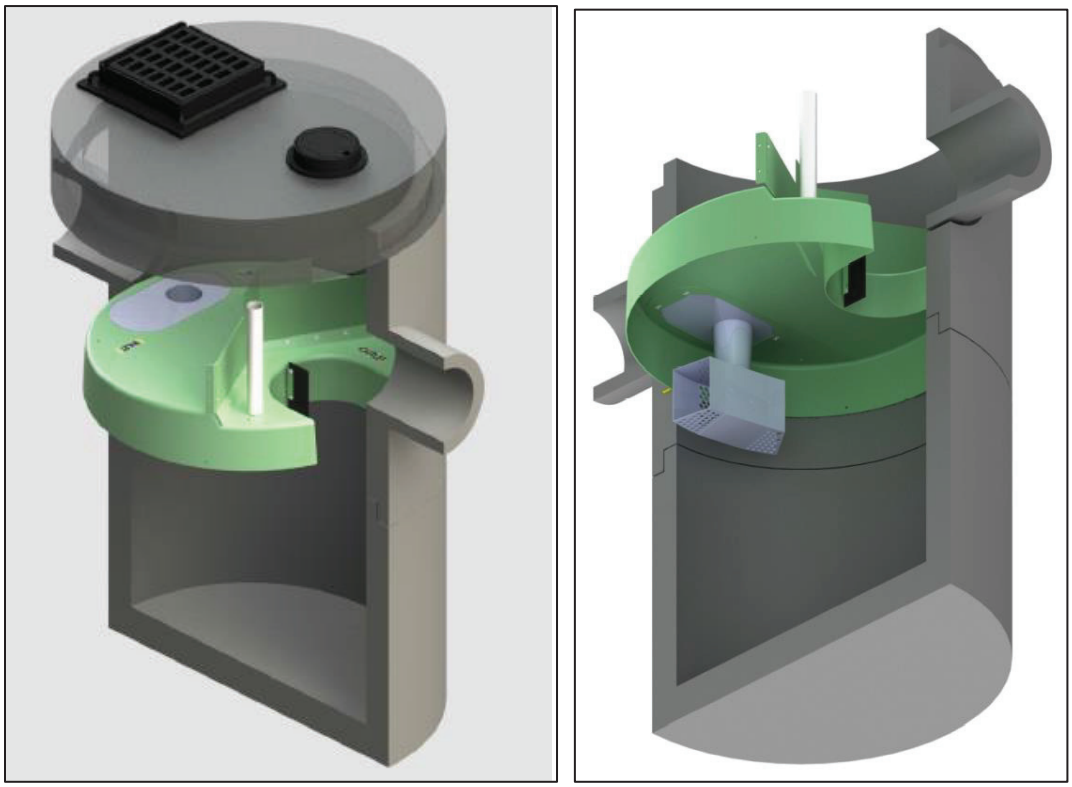


Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m^2 (27.9 gal/min/ft^2) and 535 L/min/m^2 (13.1 gal/min/ft^2) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of

additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® EF4 and EFO4 Oil-Grit Separators, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test[a]:

During the capture test, the Stormceptor® EF4 OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Stormceptor® EFO4, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 42, 40, and 34 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Scour test[a]:

During the scour test, the Stormceptor® EF4 and Stormceptor® EFO4 OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Stormceptor® EFO4 OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2.

[a] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

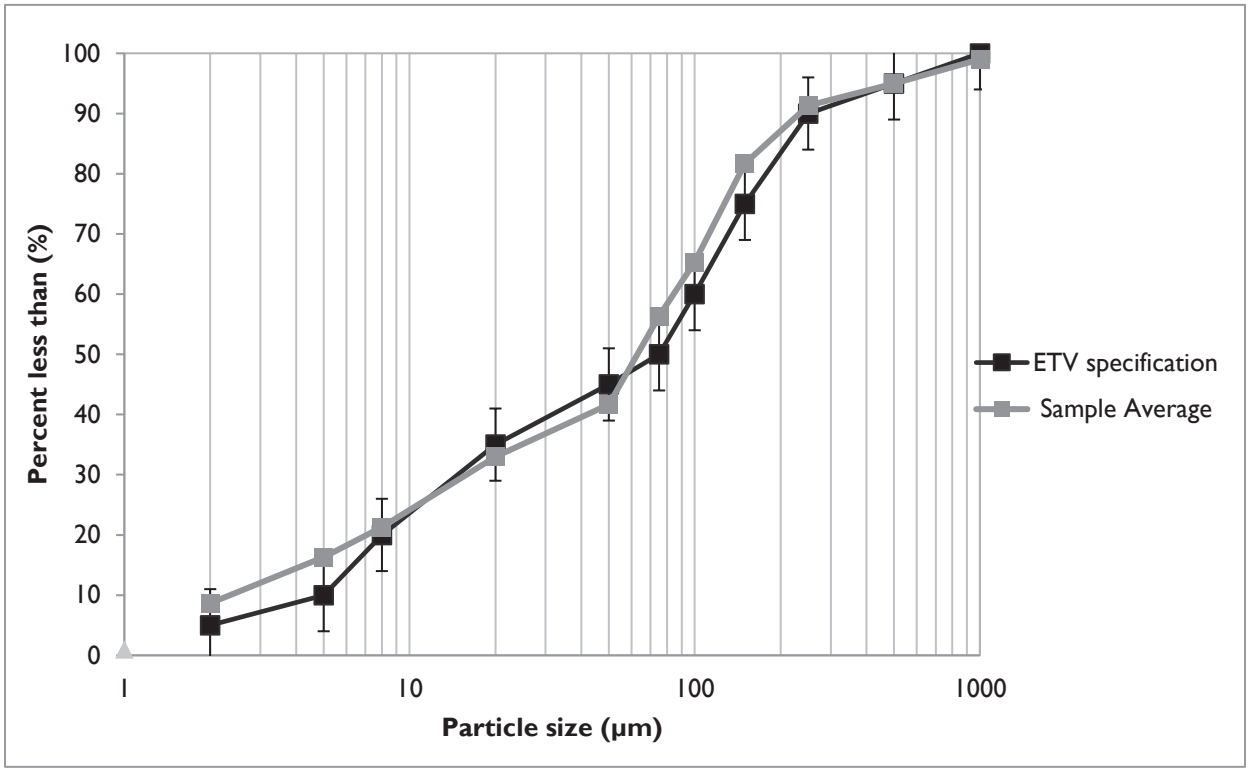


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m^2 (13.1 gpm/ft^2), sediment capture tests at surface loading rates from 40 to 400 L/min/m^2 were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m^2 were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory

analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	Surface loading rate (L/min/m²)						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined [a]	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 – 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	**70.4**	**63.8**	**53.9**	**47.5**	**46.0**	**43.7**	**49.0**

[a] An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.
* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and Bulletin # CETV 2016-11-0001 for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m²

Particle size fraction (µm)	Surface loading rate (L/min/m²)		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 – 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	**41.7**	**39.7**	**34.2**

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m².

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

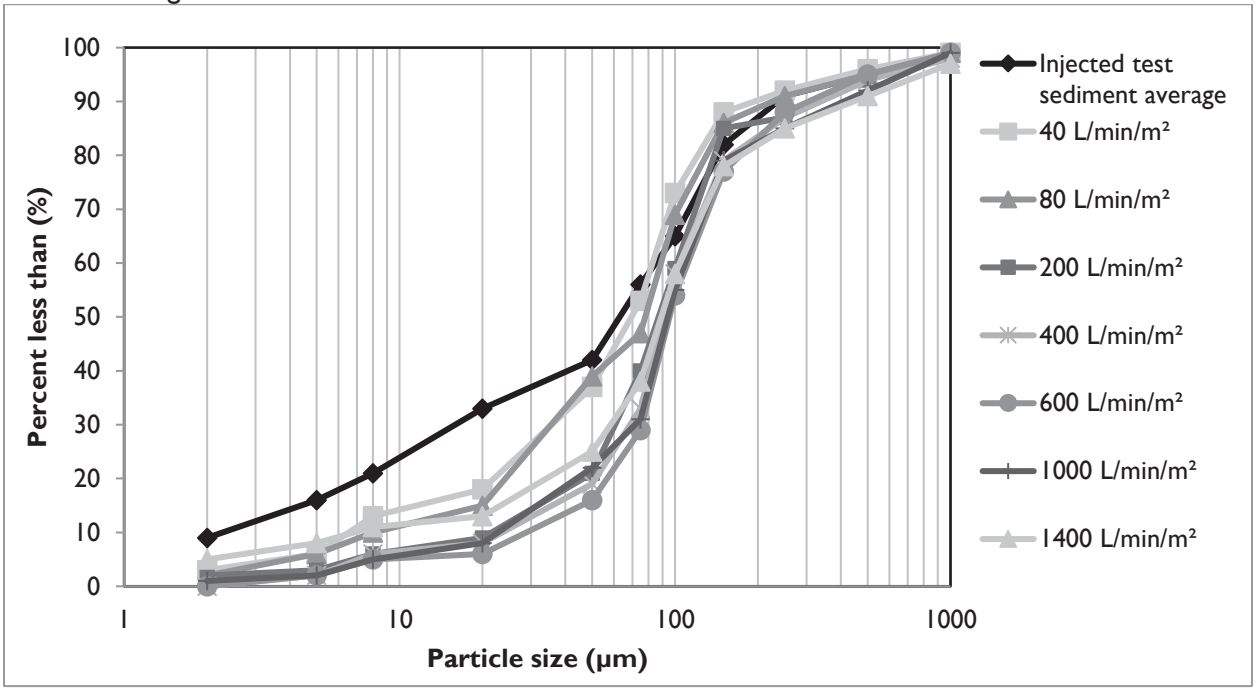


Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

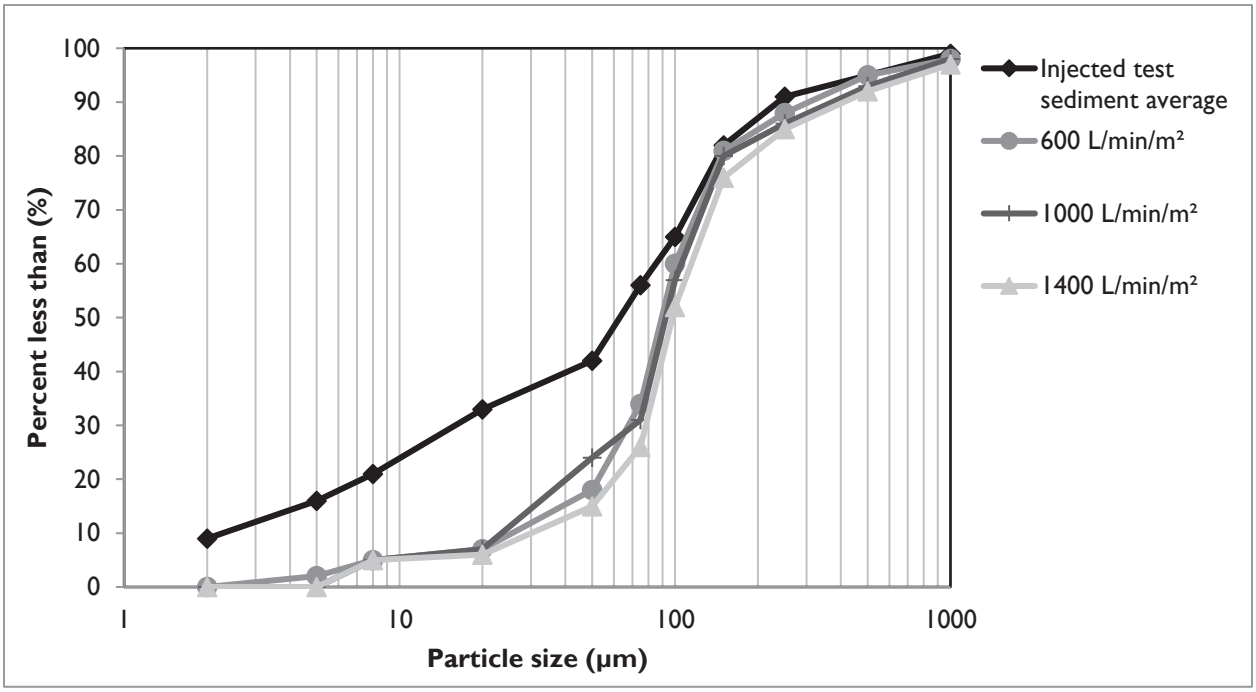


Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m²

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm of fresh test sediment into

the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Clean water was run through the device at five surface loading rates over a 30 minute period. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m^2 sediment capture test is also used to adjust the concentration, as per the method described in Bulletin # CETV 2016-09-0001. However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m^2, potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m^2)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) [a]	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	
		24:00		0.4	

5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

[a] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m^2) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m^2). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m2)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)[a]	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

[a] Determined from bead bulk density of 0.56074 g/cm^3

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. During the capture test, the 40 L/min/m^2 and 80 L/min/m^2 surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m^2) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m^2 run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.

3. Due to pressure build up in the filters, the runs at 1000 L/min/m^2 for the Stormceptor® EF4 and 1000 and 1400 L/min/m^2 for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF and EFO OGS please contact:

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For more information on ISO 14034:2016 / ETV please contact:

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World Trade Centre
404 – 999 Canada Place
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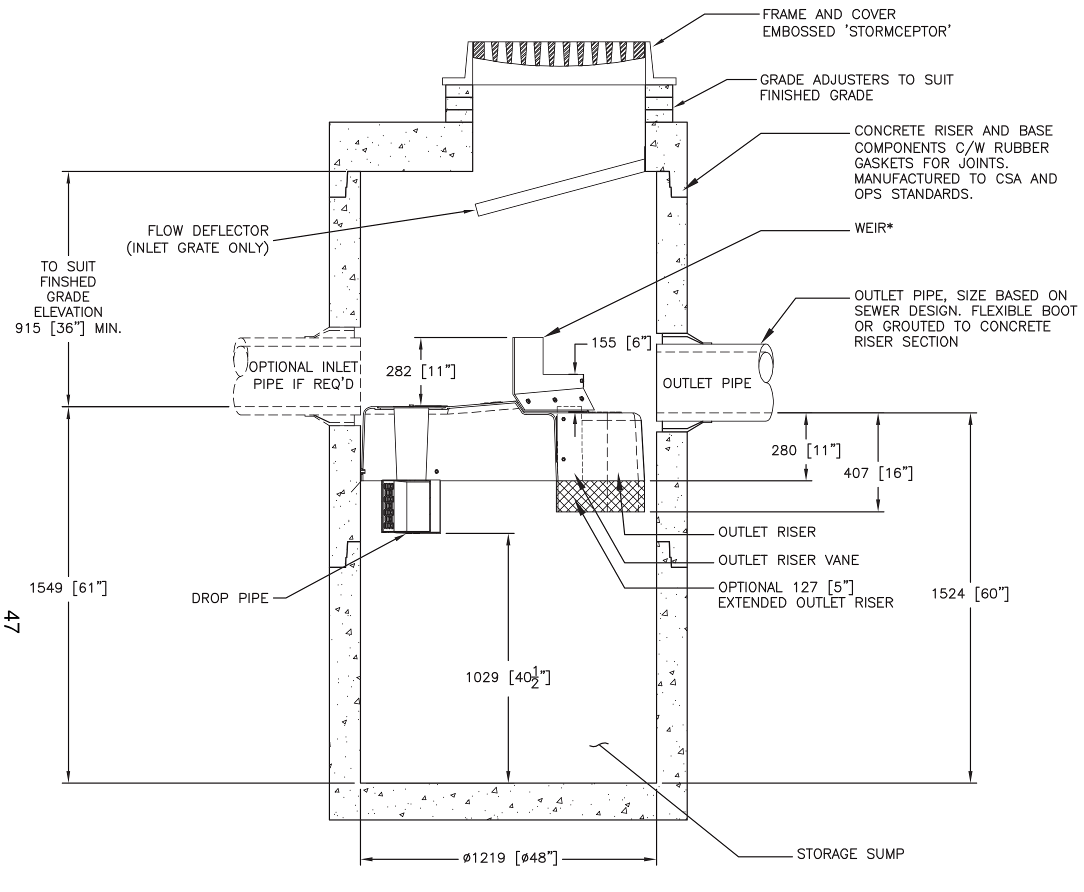
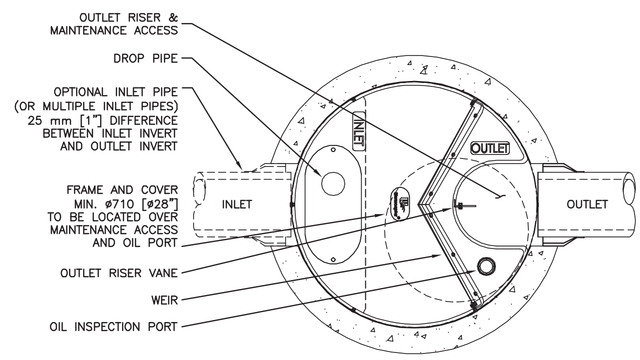
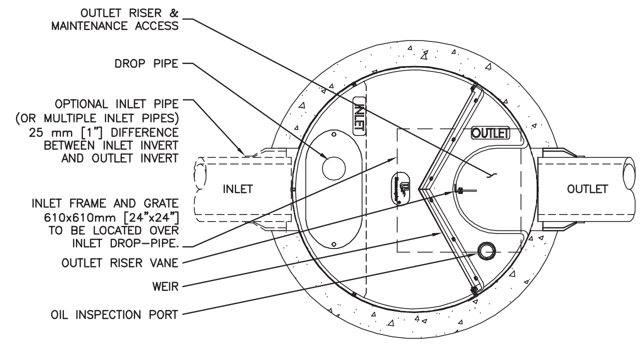
Limitation of verification - Registration: GPS-ETV_VR2020-11-15_Imbrium-SC
GLOBE Performance Solutions and the Verification Expert provide the verification services solely on the basis of the information supplied by the applicant or vendor and assume no liability thereafter. The responsibility for the information supplied remains solely with the applicant or vendor and the liability for the purchase, installation, and operation (whether consequential or otherwise) is not transferred to any other party as a result of the verification.



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION 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).

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF4 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO4 (OIL CAPTURE CONFIGURATION). WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

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

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO4				
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
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

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MARK	DATE	REVISION DESCRIPTION	BY
####	####	####	####
####	####	####	####
####	####	####	####
1	6/8/18	UPDATES	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®

7037 RIDGE ROAD, SUITE 350, HANOVER, MD 21076
USA 888-279-8826 CA 800-565-4801 INTL +1-416-960-9900

DATE: 10/13/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EFO4	SEQUENCE No.: *
SHEET: 1 OF 1	

STORMWATER MANAGEMENT CALCULATIONS

The orifice calculations are based on the following formula:

$$Q = C_d \times A_o \sqrt{2gh} \times 1000$$

where:

- Q = flowrate in litres per second
- C_d = coefficient of discharge
- A_o = orifice area in sq.m.
- g = 9.81 m/s2
- h = head above orifice in meters

Summary Tables

ONE HUNDRED YEAR EVENT

Drainage Area	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	14.93	-	-
AREA II	-	20.69	18.55	18.55
AREA III	-	19.97	30.87	30.87
TOTAL	68.38	55.59	49.42	49.42

FIVE YEAR EVENT

Drainage Area	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	7.80	-	-
AREA II	-	14.72	8.37	8.37
AREA III	-	11.30	17.55	17.55
TOTAL	33.82	33.82	25.92	25.92

ICD TABLE

Location	Type	Orifice Size (mm)	Head (m)	Fllow Rate (L/s)
Outlet Pipe of CB/MH-4	plug style with trash basket and orifice located at bottom of plug	73.08	2.54	18.08
Outlet Pipe of CB/MH-10	plug style with trash basket and orifice located at bottom of plug	73.08	1.41	13.47

July 26, 2019
REVISED September 27, 2019
REVISED May 4, 2020
REVISED February 26, 2021

1164-1166 Highcroft Drive

Manotick, Ontario

STORM WATER MANAGEMENT CALCULATIONS

Rational Method

ONE HUNDRED YEAR EVENT

(Calculations Assuming No Off Site Drainage)

Pre-Development Conditions

			C
Roof Area:	264	sq.m	1.00
Asphalt/Concrete Area:	392	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	2886	sq.m	0.25
Total Catchment Area:	3542	sq.m	0.39

Bransby William Formula

$$Tc = \frac{0.057\ L}{Sw^{0.2}\ A^{0.1}}\ min$$

Sheet Flow Distance (L):	98	m	
Slope of Land (Sw):	9	%	
Area (A):	0.354	ha	
Time of Concentration (Sheet Flow):	4.0	min	
Area (A):	3542	sq.m	
Time of Concentration:	10.0	min	
Rainfall Intensity (i):	179	mm/hr	(100 year event)
Runoff Coeficient (C):	0.39		
Maximum Allowable 100 Year Release Rate (2.78AiC):	68.38	L/s	

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	201	sq.m	1.00
Asphalt/Concrete Area:	85	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	59	sq.m	0.25
Total Catchment Area:	345	sq.m	0.87
Area (A):	345	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.87		
Release Rate (2.78AiC):	14.93	L/s	

DRAINAGE AREA II

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	300	sq.m	1.00
Asphalt/Concrete Area:	374	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	553	sq.m	0.25
Total Catchment Area:	1227	sq.m	0.66

Water Elevation:	89.41	m
Invert of Outlet Pipe:	86.83	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	86.87	m
Head:	2.54	m
Orifice Diameter:	73	mm
Orifice Area:	4195	sq.mm
Coefficient of Discharge:	0.61	
Maximum ICD Release Rate:	18.08	L/s
Maximum Overflow Pipe Release Rate:	2.62	L/s
Total Maximum Release Rate:	20.69	L/s

Cistern 1

Length (m)	Width (m)	Depth (m)	Volume	
4.975	2.39	1.56	18.55	cu.m

Achieved Volume: 18.55 cu.m

Maximum Volume Required: 18.55 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	50% ICD Release Rate (L/s)	Overflow Pipe Release Rate (L/s)	Total Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	54.80	9.04	0.00	9.04	45.77	13.73
10	179	40.32	9.04	0.37	9.40	30.91	18.55
15	143	32.27	9.04	2.62	11.66	20.61	18.55
20	120	27.09	9.04	2.59	11.63	15.46	18.55
25	104	23.45	9.04	2.05	11.08	12.37	18.55
30	92	20.74	9.04	1.40	10.44	10.30	18.55
35	83	18.65	9.04	0.78	9.81	8.83	18.55
40	75	16.97	9.04	0.20	9.24	7.73	18.55
45	69	15.59	9.04	0.00	9.04	6.55	17.70
50	64	14.44	9.04	0.00	9.04	5.40	16.21
55	60	13.46	9.04	0.00	9.04	4.43	14.61
60	56	12.62	9.04	0.00	9.04	3.58	12.90
65	53	11.89	9.04	0.00	9.04	2.85	11.12
70	50	11.24	9.04	0.00	9.04	2.21	9.26
75	47	10.67	9.04	0.00	9.04	1.63	7.35
80	45	10.16	9.04	0.00	9.04	1.12	5.38
85	43	9.70	9.04	0.00	9.04	0.66	3.37
90	41	9.28	9.04	0.00	9.04	0.25	1.33
95	39	8.90	8.90	0.00	8.90	0.00	0.00
100	38	8.56	8.56	0.00	8.56	0.00	0.00
105	36	8.24	8.24	0.00	8.24	0.00	0.00
110	35	7.95	7.95	0.00	7.95	0.00	0.00
115	34	7.68	7.68	0.00	7.68	0.00	0.00
120	33	7.43	7.43	0.00	7.43	0.00	0.00
125	32	7.19	7.19	0.00	7.19	0.00	0.00
130	31	6.98	6.98	0.00	6.98	0.00	0.00
135	30	6.77	6.77	0.00	6.77	0.00	0.00
140	29	6.58	6.58	0.00	6.58	0.00	0.00
145	28	6.40	6.40	0.00	6.40	0.00	0.00
150	28	6.23	6.23	0.00	6.23	0.00	0.00
180	24	5.40	5.40	0.00	5.40	0.00	0.00
210	21	4.77	4.77	0.00	4.77	0.00	0.00
240	19	4.29	4.29	0.00	4.29	0.00	0.00
270	17	3.91	3.91	0.00	3.91	0.00	0.00
300	16	3.59	3.59	0.00	3.59	0.00	0.00
330	15	3.32	3.32	0.00	3.32	0.00	0.00
360	14	3.10	3.10	0.00	3.10	0.00	0.00

DRAINAGE AREA III

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	615	sq.m	1.00
Asphalt/Concrete Area:	286	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	1069	sq.m	0.25
Total Catchment Area:	1970	sq.m	0.59

Water Elevation: 87.67 m

Invert of Outlet Pipe: 86.22 m

Centroid of ICD Orifice: 86.26 m
(ICD in Outlet Pipe of CB/MH-10)

Head: 1.41 m

Orifice Diameter: 73 mm

Orifice Area: 4195 sq.mm

Coefficient of Discharge: 0.61

Maximum ICD Release Rate: 13.47 L/s

Maximum Overflow Pipe Release Rate: 6.50 L/s

Total Maximum Release Rate: 19.97 L/s

Cistern 2

Length (m)	Width (m)	Depth (m)	Volume	
5.795	2.75	0.96	15.27	cu.m

Cistern 3

Length (m)	Width (m)	Depth (m)	Volume	
5.795	2.75	0.98	15.59	cu.m

Achieved Volume: 30.87 cu.m

Maximum Volume Required: 30.87 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	50% ICD Release Rate (L/s)	Overflow Pipe Release Rate (L/s)	Total Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	78.82	6.73	0.00	6.73	72.09	21.63
10	179	57.99	6.73	0.00	6.73	51.26	30.75
15	143	46.41	6.73	5.38	12.11	34.30	30.87
20	120	38.96	6.73	6.50	13.23	25.72	30.87
25	104	33.73	6.73	6.41	13.15	20.58	30.87
30	92	29.84	6.73	5.95	12.69	17.15	30.87
35	83	26.82	6.73	5.39	12.12	14.70	30.87
40	75	24.41	6.73	4.81	11.54	12.86	30.87
45	69	22.43	6.73	4.26	10.99	11.43	30.87
50	64	20.77	6.73	3.75	10.48	10.29	30.87
55	60	19.36	6.73	3.28	10.01	9.35	30.87
60	56	18.15	6.73	2.85	9.58	8.57	30.87
65	53	17.10	6.73	2.45	9.18	7.91	30.87
70	50	16.17	6.73	2.09	8.82	7.35	30.87
75	47	15.35	6.73	1.75	8.49	6.86	30.87
80	45	14.61	6.73	1.45	8.18	6.43	30.87
85	43	13.95	6.73	1.16	7.90	6.05	30.87
90	41	13.35	6.73	0.90	7.64	5.72	30.87
95	39	12.81	6.73	0.66	7.39	5.42	30.87
100	38	12.31	6.73	0.43	7.17	5.14	30.87
105	36	11.85	6.73	0.22	6.95	4.90	30.87
110	35	11.43	6.73	0.02	6.76	4.68	30.87
115	34	11.04	6.73	0.00	6.73	4.31	29.74
120	33	10.68	6.73	0.00	6.73	3.95	28.44
125	32	10.35	6.73	0.00	6.73	3.61	27.11
130	31	10.03	6.73	0.00	6.73	3.30	25.75
135	30	9.74	6.73	0.00	6.73	3.01	24.37
140	29	9.47	6.73	0.00	6.73	2.73	22.97
145	28	9.21	6.73	0.00	6.73	2.48	21.55
150	28	8.97	6.73	0.00	6.73	2.23	20.10
180	24	7.76	6.73	0.00	6.73	1.03	11.12
210	21	6.87	6.73	0.00	6.73	0.13	1.68
240	19	6.17	6.17	0.00	6.17	0.00	0.00
270	17	5.62	5.62	0.00	5.62	0.00	0.00
300	16	5.16	5.16	0.00	5.16	0.00	0.00
330	15	4.78	4.78	0.00	4.78	0.00	0.00
360	14	4.46	4.46	0.00	4.46	0.00	0.00

DRAINAGE AREA II

(ONE HUNDRED YEAR EVENT- Calculations Including Off Site Drainage)

			C
Roof Area:	495	sq.m	1.00
Asphalt/Concrete Area:	509	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	1453	sq.m	0.25
Total Catchment Area:	2457	sq.m	0.56

Water Elevation:	89.41	m
Invert of Outlet Pipe:	86.83	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	86.87	m
Head:	2.54	m
Orifice Diameter:	73	mm
Orifice Area:	4195	sq.mm
Coefficient of Discharge:	0.61	
Maximum ICD Release Rate:	18.08	L/s
Maximum Overflow Pipe Release Rate:	27.92	L/s
Total Maximum Release Rate:	45.99	L/s

Cistern 1

Length (m)	Width (m)	Depth (m)	Volume	
4.975	2.39	1.56	18.55	cu.m

Achieved Volume: 18.55 cu.m

Maximum Volume Required: 18.55 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	50% ICD Release Rate (L/s)	Overflow Pipe Release Rate (L/s)	Total Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	92.25	9.04	21.38	30.42	61.83	18.55
10	179	67.87	9.04	27.92	36.95	30.91	18.55
15	143	54.31	9.04	24.67	33.70	20.61	18.55
20	120	45.59	9.04	21.10	30.14	15.46	18.55
25	104	39.47	9.04	18.07	27.11	12.37	18.55
30	92	34.92	9.04	15.58	24.61	10.30	18.55
35	83	31.39	9.04	13.52	22.55	8.83	18.55
40	75	28.56	9.04	11.80	20.83	7.73	18.55
45	69	26.25	9.04	10.34	19.38	6.87	18.55
50	64	24.31	9.04	9.09	18.13	6.18	18.55
55	60	22.66	9.04	8.00	17.04	5.62	18.55
60	56	21.25	9.04	7.06	16.09	5.15	18.55
65	53	20.01	9.04	6.22	15.25	4.76	18.55
70	50	18.92	9.04	5.47	14.51	4.42	18.55
75	47	17.96	9.04	4.80	13.84	4.12	18.55
80	45	17.10	9.04	4.20	13.24	3.86	18.55
85	43	16.33	9.04	3.65	12.69	3.64	18.55
90	41	15.63	9.04	3.15	12.19	3.43	18.55
95	39	14.99	9.04	2.70	11.73	3.25	18.55
100	38	14.41	9.04	2.28	11.32	3.09	18.55
105	36	13.87	9.04	1.89	10.93	2.94	18.55
110	35	13.38	9.04	1.53	10.57	2.81	18.55
115	34	12.93	9.04	1.20	10.24	2.69	18.55
120	33	12.50	9.04	0.89	9.93	2.58	18.55
125	32	12.11	9.04	0.60	9.64	2.47	18.55
130	31	11.74	9.04	0.33	9.37	2.38	18.55
135	30	11.40	9.04	0.07	9.11	2.29	18.55
140	29	11.08	9.04	0.00	9.04	2.04	17.16
145	28	10.78	9.04	0.00	9.04	1.74	15.15
150	28	10.49	9.04	0.00	9.04	1.46	13.11
180	24	9.09	9.04	0.00	9.04	0.05	0.52
210	21	8.04	8.04	0.00	8.04	0.00	0.00
240	19	7.22	7.22	0.00	7.22	0.00	0.00
270	17	6.57	6.57	0.00	6.57	0.00	0.00
300	16	6.04	6.04	0.00	6.04	0.00	0.00
330	15	5.59	5.59	0.00	5.59	0.00	0.00
360	14	5.22	5.22	0.00	5.22	0.00	0.00

FIVE YEAR EVENT

(Calculations Assuming No Off Site Drainage)

Pre-development Conditions

			C
Roof Area:	264	sq.m	0.90
Asphalt/Concrete Area:	392	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	2886	sq.m	0.20
Total Catchment Area:	3542	sq.m	0.33

Bransby William Formula (Used if C > 0.40)

$$Tc = \frac{0.057\ L}{Sw^{0.2}\ A^{0.1}} \text{ min}$$

Sheet Flow Distance (L):	98	m
Slope of Land (Sw):	9	%
Area (A):	0.354	ha
Time of Concentration (Sheet Flow):	4.0	min
Area (A):	3542	sq.m
Time of Concentration:	10.0	min
Rainfall Intensity (i):	104	mm/hr (5 year event)
Runoff Coeficient (C):	0.33	
Maximum Allowable 5 Year Release Rate (2.78AiC):	33.82	L/s

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE YEAR EVENT)

			C
Roof Area:	201	sq.m	0.90
Asphalt/Concrete Area:	85	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	59	sq.m	0.20
Total Catchment Area:	345	sq.m	0.78
Area (A):	345	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.78		
Release Rate (2.78AiC):	7.80	L/s	

DRAINAGE AREA II

(FIVE YEAR EVENT)

			C
Roof Area:	300	sq.m	0.90
Asphalt/Concrete Area:	374	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	553	sq.m	0.20
Total Catchment Area:	1227	sq.m	0.58

Water Elevation:	88.55	m
Invert of Outlet Pipe:	86.83	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	86.87	m
Head:	1.69	m
Orifice Diameter:	73	mm
Orifice Area:	4195	sq.mm
Coefficient of Discharge:	0.61	
Maximum ICD Release Rate:	14.72	L/s
Maximum Overflow Pipe Release Rate:	0.00	L/s
Total Maximum Release Rate:	14.72	L/s

Cistern 1

Length (m)	Width (m)	Depth (m)	Volume	
4.975	2.39	0.70	8.37	cu.m

Achieved Volume: 8.37 cu.m

Maximum Volume Required: 8.37 cu.m

Time	i	2.78AiC	50% ICD Release Rate	Overflow Pipe Release Rate	Total Release Rate	Stored Rate	Stored Volume
min	mm/hr	L/s	L/s	(L/s)	(L/s)	L/s	cu.m
5	141	28.15	7.36	0.00	7.36	20.79	6.24
10	104	20.77	7.36	0.00	7.36	13.41	8.05
15	84	16.66	7.36	0.00	7.36	9.30	8.37
20	70	14.01	7.36	0.00	7.36	6.65	7.98
25	61	12.14	7.36	0.00	7.36	4.78	7.17
30	54	10.75	7.36	0.00	7.36	3.39	6.10
35	49	9.67	7.36	0.00	7.36	2.31	4.86
40	44	8.81	7.36	0.00	7.36	1.45	3.48
45	41	8.10	7.36	0.00	7.36	0.74	2.00
50	38	7.51	7.36	0.00	7.36	0.15	0.44
55	35	7.00	7.00	0.00	7.00	0.00	0.00
60	33	6.57	6.57	0.00	6.57	0.00	0.00
65	31	6.19	6.19	0.00	6.19	0.00	0.00
70	29	5.86	5.86	0.00	5.86	0.00	0.00
75	28	5.56	5.56	0.00	5.56	0.00	0.00
80	27	5.30	5.30	0.00	5.30	0.00	0.00
85	25	5.06	5.06	0.00	5.06	0.00	0.00
90	24	4.84	4.84	0.00	4.84	0.00	0.00
95	23	4.65	4.65	0.00	4.65	0.00	0.00
100	22	4.47	4.47	0.00	4.47	0.00	0.00
105	22	4.30	4.30	0.00	4.30	0.00	0.00
110	21	4.15	4.15	0.00	4.15	0.00	0.00
115	20	4.01	4.01	0.00	4.01	0.00	0.00
120	19	3.88	3.88	0.00	3.88	0.00	0.00
125	19	3.76	3.76	0.00	3.76	0.00	0.00
130	18	3.65	3.65	0.00	3.65	0.00	0.00
135	18	3.54	3.54	0.00	3.54	0.00	0.00
140	17	3.44	3.44	0.00	3.44	0.00	0.00
145	17	3.35	3.35	0.00	3.35	0.00	0.00
150	16	3.26	3.26	0.00	3.26	0.00	0.00
180	14	2.83	2.83	0.00	2.83	0.00	0.00
210	13	2.50	2.50	0.00	2.50	0.00	0.00
240	11	2.25	2.25	0.00	2.25	0.00	0.00
270	10	2.05	2.05	0.00	2.05	0.00	0.00
300	9	1.89	1.89	0.00	1.89	0.00	0.00
330	9	1.75	1.75	0.00	1.75	0.00	0.00
360	8	1.63	1.63	0.00	1.63	0.00	0.00

DRAINAGE AREA III

(FIVE YEAR EVENT)

			C
Roof Area:	615	sq.m	0.90
Asphalt/Concrete Area:	286	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	1069	sq.m	0.20
Total Catchment Area:	1970	sq.m	0.52

Water Elevation:	87.25	m
Invert of Outlet Pipe:	86.22	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-10)	86.26	m
Head:	0.99	m
Orifice Diameter:	73	mm
Orifice Area:	4195	sq.mm
Coefficient of Discharge:	0.61	
Maximum ICD Release Rate:	11.30	L/s
Maximum Overflow Pipe Release Rate:	0.00	L/s
Total Maximum Release Rate:	11.30	L/s

Cistern 2	Length (m)	Width (m)	Depth (m)	Volume	
	5.795	2.75	0.54	8.61	cu.m

Cistern 3	Length (m)	Width (m)	Depth (m)	Volume	
	5.795	2.75	0.56	8.93	cu.m

Achieved Volume:	17.55	cu.m
Maximum Volume Required:	17.55	cu.m

Time	i	2.78AiC	50% ICD Release Rate	Overflow Pipe Release Rate	Total Release Rate	Stored Rate	Stored Volume
min	mm/hr	L/s	L/s	(L/s)	(L/s)	L/s	cu.m
5	141	40.22	5.65	0.00	5.65	34.57	10.37
10	104	29.68	5.65	0.00	5.65	24.03	14.42
15	84	23.80	5.65	0.00	5.65	18.15	16.34
20	70	20.01	5.65	0.00	5.65	14.36	17.24
25	61	17.35	5.65	0.00	5.65	11.70	17.55
30	54	15.36	5.65	0.00	5.65	9.71	17.48
35	49	13.82	5.65	0.00	5.65	8.17	17.16
40	44	12.59	5.65	0.00	5.65	6.94	16.65
45	41	11.57	5.65	0.00	5.65	5.92	15.99
50	38	10.73	5.65	0.00	5.65	5.08	15.23
55	35	10.01	5.65	0.00	5.65	4.36	14.37
60	33	9.38	5.65	0.00	5.65	3.73	13.45
65	31	8.84	5.65	0.00	5.65	3.19	12.46
70	29	8.37	5.65	0.00	5.65	2.72	11.41
75	28	7.94	5.65	0.00	5.65	2.29	10.33
80	27	7.57	5.65	0.00	5.65	1.92	9.20
85	25	7.23	5.65	0.00	5.65	1.58	8.04
90	24	6.92	5.65	0.00	5.65	1.27	6.85
95	23	6.64	5.65	0.00	5.65	0.99	5.64
100	22	6.38	5.65	0.00	5.65	0.73	4.40
105	22	6.15	5.65	0.00	5.65	0.50	3.14
110	21	5.93	5.65	0.00	5.65	0.28	1.86
115	20	5.73	5.65	0.00	5.65	0.08	0.56
120	19	5.55	5.55	0.00	5.55	0.00	0.00
125	19	5.37	5.37	0.00	5.37	0.00	0.00
130	18	5.21	5.21	0.00	5.21	0.00	0.00
135	18	5.06	5.06	0.00	5.06	0.00	0.00
140	17	4.92	4.92	0.00	4.92	0.00	0.00
145	17	4.79	4.79	0.00	4.79	0.00	0.00
150	16	4.66	4.66	0.00	4.66	0.00	0.00
180	14	4.04	4.04	0.00	4.04	0.00	0.00
210	13	3.58	3.58	0.00	3.58	0.00	0.00
240	11	3.22	3.22	0.00	3.22	0.00	0.00
270	10	2.93	2.93	0.00	2.93	0.00	0.00
300	9	2.69	2.69	0.00	2.69	0.00	0.00
330	9	2.50	2.50	0.00	2.50	0.00	0.00
360	8	2.33	2.33	0.00	2.33	0.00	0.00

DRAINAGE AREA II

(FIVE YEAR EVENT - Calculations Including Off Site Drainage)

			C
Roof Area:	495	sq.m	0.90
Asphalt/Concrete Area:	509	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	1453	sq.m	0.20
Total Catchment Area:	2457	sq.m	0.49

Water Elevation:	89.31	m
Invert of Outlet Pipe:	86.83	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	86.87	m
Head:	2.44	m
Orifice Diameter:	73	mm
Orifice Area:	4195	sq.mm
Coefficient of Discharge:	0.61	
Maximum ICD Release Rate:	17.72	L/s
Maximum Overflow Pipe Release Rate:	0.00	L/s
Total Maximum Release Rate:	17.72	L/s

Cistern 1

Length (m)	Width (m)	Depth (m)	Volume	
4.975	2.39	1.46	17.36	cu.m

Achieved Volume: 17.36 cu.m

Maximum Volume Required: 17.36 cu.m

Time min	i mm/hr	2.78AiC L/s	50% ICD Release Rate L/s	Overflow Pipe Release Rate (L/s)	Total Release Rate (L/s)	Stored Rate L/s	Stored Volume cu.m
5	141	46.87	8.86	0.00	8.86	38.01	11.40
10	104	34.59	8.86	0.00	8.86	25.73	15.44
15	84	27.74	8.86	0.00	8.86	18.88	16.99
20	70	23.32	8.86	0.00	8.86	14.46	17.36
25	61	20.22	8.86	0.00	8.86	11.36	17.04
30	54	17.90	8.86	0.00	8.86	9.05	16.28
35	49	16.11	8.86	0.00	8.86	7.25	15.22
40	44	14.67	8.86	0.00	8.86	5.81	13.95
45	41	13.49	8.86	0.00	8.86	4.63	12.50
50	38	12.50	8.86	0.00	8.86	3.64	10.93
55	35	11.66	8.86	0.00	8.86	2.80	9.25
60	33	10.94	8.86	0.00	8.86	2.08	7.48
65	31	10.31	8.86	0.00	8.86	1.45	5.65
70	29	9.75	8.86	0.00	8.86	0.89	3.75
75	28	9.26	8.86	0.00	8.86	0.40	1.80
80	27	8.82	8.82	0.00	8.82	0.00	0.00
85	25	8.42	8.42	0.00	8.42	0.00	0.00
90	24	8.06	8.06	0.00	8.06	0.00	0.00
95	23	7.74	7.74	0.00	7.74	0.00	0.00
100	22	7.44	7.44	0.00	7.44	0.00	0.00
105	22	7.17	7.17	0.00	7.17	0.00	0.00
110	21	6.91	6.91	0.00	6.91	0.00	0.00
115	20	6.68	6.68	0.00	6.68	0.00	0.00
120	19	6.46	6.46	0.00	6.46	0.00	0.00
125	19	6.26	6.26	0.00	6.26	0.00	0.00
130	18	6.07	6.07	0.00	6.07	0.00	0.00
135	18	5.90	5.90	0.00	5.90	0.00	0.00
140	17	5.73	5.73	0.00	5.73	0.00	0.00
145	17	5.58	5.58	0.00	5.58	0.00	0.00
150	16	5.43	5.43	0.00	5.43	0.00	0.00
180	14	4.71	4.71	0.00	4.71	0.00	0.00
210	13	4.17	4.17	0.00	4.17	0.00	0.00
240	11	3.75	3.75	0.00	3.75	0.00	0.00
270	10	3.41	3.41	0.00	3.41	0.00	0.00
300	9	3.14	3.14	0.00	3.14	0.00	0.00
330	9	2.91	2.91	0.00	2.91	0.00	0.00
360	8	2.71	2.71	0.00	2.71	0.00	0.00

CISTERN STORAGE

Cistern 1 MacGregor 18,600 Litre Tank			
Length (m)	Width (m)	Water Depth (m)	Volume Stored (cu.m.)
4.975	2.39	1.80	21.40
4.975	2.39	1.70	20.21
4.975	2.39	1.60	19.02
4.975	2.39	1.50	17.84
4.975	2.39	1.40	16.65
4.975	2.39	1.30	15.46
4.975	2.39	1.20	14.27
4.975	2.39	1.10	13.08
4.975	2.39	1.00	11.89
4.975	2.39	0.90	10.70
4.975	2.39	0.80	9.51
4.975	2.39	0.70	8.32
4.975	2.39	0.60	7.13
4.975	2.39	0.50	5.95
4.975	2.39	0.40	4.76
4.975	2.39	0.30	3.57
4.975	2.39	0.20	2.38
4.975	2.39	0.10	1.19
4.975	2.39	0.00	0.00

Cisterns 2 & 3 MacGregor 41,300 Litre Tanks			
Length (m)	Width (m)	Depth (m)	Volume (cu.m.)
5.795	2.75	2.80	44.62
5.795	2.75	2.70	43.03
5.795	2.75	2.60	41.43
5.795	2.75	2.50	39.84
5.795	2.75	2.40	38.25
5.795	2.75	2.30	36.65
5.795	2.75	2.20	35.06
5.795	2.75	2.10	33.47
5.795	2.75	2.00	31.87
5.795	2.75	1.90	30.28
5.795	2.75	1.80	28.69
5.795	2.75	1.70	27.09
5.795	2.75	1.60	25.50
5.795	2.75	1.50	23.90
5.795	2.75	1.40	22.31
5.795	2.75	1.30	20.72
5.795	2.75	1.20	19.12
5.795	2.75	1.10	17.53
5.795	2.75	1.00	15.94
5.795	2.75	0.90	14.34
5.795	2.75	0.80	12.75
5.795	2.75	0.70	11.16
5.795	2.75	0.60	9.56
5.795	2.75	0.50	7.97
5.795	2.75	0.40	6.37
5.795	2.75	0.30	4.78
5.795	2.75	0.20	3.19
5.795	2.75	0.10	1.59
5.795	2.75	0.00	0.00

STORM SEWER COMPUTATION FORM

Rational Method

FIVE YEAR EVENT

Q = 2.78 A i C

May 19, 2021

n = 0.013

Location		Areas (ha)										Pipe Data									Notes
		Hard	Gravel	Landscape	Roof	Individual	Accum.	Time of Conc.	Rainfall Intensity i	Peak Flow Q		Actual Diameter	Nominal Diameter	Slope	Length	Capacity	Velocity	Time of Flow	Ratio	
From	To	C = 0.9	C = 0.7	C = 0.2	C = 0.9	2.78AC	2.78AC	(min)	(mm/hr)	(L/s)	Material	(mm)	(mm)	(%)	(m)	(L/s)	(m/s)	(min)	Q/Qfull	
																					1,230 sq.m offsite drainage
	CB-3	0.0135		0.0900	0.0195	0.1326	0.1326	10.00	104	13.82											
CB-3	CB/MH-4	0.0018		0.0338	0.0054	0.0368	0.1694	10.00	104	17.65	PVC	254.0	250	6.00	28.4	152.0	3.00	0.16	0.12		
CB/MH-4	MH-5	0.0336		0.026	0.0251	0.1613	0.3307	10.16	103	34.30	PVC	304.8	300	0.34	20.7	58.8	0.81	0.43	0.58		Q inc. 0.45 L/s/ha for foundation drains
										17.72	PVC	304.8	300	0.34	20.7	58.8	0.81	0.43	0.30		Restricted flow
																					Q inc. 0.45 L/s/ha for foundation drains
MH-5	MH-11						0.3307	10.59	101	33.58	PVC	304.8	300	0.34	24.3	58.8	0.81	0.50	0.57		
										17.72	PVC	304.8	300	0.34	24.3	58.8	0.81	0.50	0.30		Restricted flow
CB-6	CB/MH-7	0.0033		0.0323	0.0240	0.0863	0.0863	10.00	104	8.99	PVC	304.8	300	0.34	26.1	58.8	0.81	0.54	0.15		
CB/MH-7	CB/MH-8			0.002	0.0043	0.0119	0.0981	10.54	101	9.95	PVC	304.8	300	0.34	3.8	58.8	0.81	0.08	0.17		
CB/MH-8	CB/MH-10			0.0325		0.0181	0.1162	10.62	101	11.74	PVC	304.8	300	0.34	9.8	58.8	0.81	0.20	0.20		
CB-9	CB/MH-10	0.0253		0.0401	0.0332	0.1687	0.1687	10.00	104	17.57	PVC	254.0	250	0.43	10.0	40.7	0.80	0.21	0.43		
CB/MH-10	MH-11					0.0000	0.2849	10.82	100	28.50	PVC	304.8	300	0.34	2.0	58.8	0.81	0.04	0.48		
										11.30	PVC	304.8	300	0.34	2.0	58.8	0.81	0.04	0.19		Restricted flow
																					Q inc. 0.45 L/s/ha for foundation drains
MH-11	MH-12					0.0000	0.6156	11.09	99	60.92	PVC	381.0	375	0.25	16.8	91.5	0.80	0.35	0.67		
										29.02	PVC	381.0	375	0.25	16.8	91.5	0.80	0.35	0.32		Restricted flow
																					Q inc. 0.45 L/s/ha for foundation drains
MH-12	MH-13					0.0000	0.6156	11.44	97	59.93	PVC	381.0	375	0.25	14.5	91.5	0.80	0.30	0.66		
										29.02	PVC	381.0	375	0.25	14.5	91.5	0.80	0.30	0.32		Restricted flow
EXIST. 450 CULV.				C = 0.35																	
	CB/MH-15			0.3843		0.3739	0.3739	10.00	104	38.96		457.2	450	7.00	12.0	786.9	4.79	0.04	0.05		
CB/MH-15	MH-1	0.0055		0.0013		0.0145	0.3884	10.04	104	40.38	PVC	304.8	300	4.69	9.5	218.5	2.99	0.05	0.18		
CB-16	MH-1	0.0064		0.0052		0.0189	0.0189	10.00	104	1.97	PVC	254.0	250	1.00	5.8	62.0	1.22	0.08	0.03		
MH-1	MH-2					0.0000	0.4073	10.09	104	42.24	PVC	304.8	300	4.69	25.1	218.5	2.99	0.14	0.19		
CB-17	MH-2	0.0229		0.0132	0.0106	0.0912	0.0912	10.00	104	9.50	PVC	254.0	250	1.00	5.7	62.0	1.22	0.08	0.15		
MH-2	MH-13					0.0000	0.4985	10.23	103	51.33	PVC	304.8	300	4.69	29.3	218.5	2.99	0.16	0.23		
																					Q inc. 0.45 L/s/ha for foundation drains
MH-13	MH-14					0.0000	1.1141	11.74	96	106.88	CONC	457.2	450	0.21	60.7	136.3	0.83	1.22	0.78		
										80.35	CONC	457.2	450	0.21	60.7	136.3	0.83	1.22	0.59		Restricted flow
											CAPACITY OFEXISTING STORM SEWER IN MANOTICK MAIN ST										
												381.0	375	0.64		146.3	1.28				

Pre-Application Consultation Notes

Date:	May 22, 2019
Subject Address:	1164 Highcroft Drive
Attendees:	Sarah McCormick, Planner II Harry Alvey, Project Manager Matthew Hayley, Environmental Planner Amira Shehata, Transportation Engineer Eric Lalande, RVCA
Existing Use:	2 detached dwelling units on 2 properties.
Existing Policies:	
Zoning:	Village residential First Density Zone, subzone P (V1P)
Official Plan:	Village
Manotick Secondary Plan	Residential – Detached (low-density)
Proposed Use:	To demolish the two existing detached dwellings on 1164 and 1166 Highcroft Drive and build 11 detached dwellings. Five (5) of the unit would front onto Highcroft Drive, with the remaining 6 units fronting on a private street. As part of this proposal, the ownership of the private road is unknown. As part of the initial townhouse design, the private road was intended to proceed as tenants in common.
Comments:	
Planning **Sarah.McCormick@ottawa.ca** **(613) 580-2424 Ext. 24487**	The proposal is for the re-development of 1164 and 1166 Highcroft Drive with 11 detached dwellings; Five (5) of which would front onto Highcroft Drive, with the remaining 6 units fronting on a private street. The property is designated 'Residential – Detached (low density)' in the Manotick Secondary Plan. Single detached dwellings are to be built to a maximum density of 12 units per gross hectare in this designation. Given the lot area of approximately 0.36 hectares, the maximum density for this property is 4.32 units. An **Official Plan Amendment will be required** to permit the increase in density. It is unclear how the applicant wishes to develop the property. Additional information is required as application types will vary based on various methods of lot creation such as: • Severances for lots on Highcroft • Planned Unit Development (PUD); this would require a Major Zoning By-law Amendment to add the use, and would trigger Site Plan Control. • Subdivision/condominium The following planning comments have been noted:

	• If development as a PUD, please ensure the development meets all requirements of Section 131 of the Zoning By-law. • As lot areas and widths have not been provided, and depending on the mechanisms chosen on how to develop the properties, a Minor Zoning By-law Amendment may be required. • Staff would note that the driveway associated with the most north dwelling unit on Highcroft Road, adjacent to the proposed private road seems to be located too close to the private road. Please ensure the driveway is adequately setback from the laneway, as per the Private Approach By-law. • How is garbage being accommodated on site? Will there be a communal pick up location? • How is visitor parking being handled within the development? • The private road cannot end in a dead end; some method of turn around must be provided; turning circle, hammer head, etc. • Please ensure you contact fire services to ensure the Private Road is sufficiently sized to accommodate emergency vehicles. Staff would require additional information in order to fully comment on the planning aspects of this proposal.
Infrastructure Harry.Alvey@ottawa.ca **(613)580-2424 ext. 28103**	Please see the comments below which are associated with the revised proposal. These comments are in addition to the comments provided as part of the initial proposal (see in italics below). • The plans indicate the onsite road is also the Fire Route Access. However, when a fire truck reaches the end of the road there is no place for them to be able to turn around. This is generally required. It is suggested that Fire Services be contacted regarding their access requirements prior to finalizing this design and submitting the site plan application. • A vehicle restraint system will be required at the south end of the onsite street adjacent to the retaining wall of sufficient strength to prevent any vehicles entering the site from going over the retaining wall. • The developer's design team must check the capacity of the downstream system per the following sections of the City of Ottawa Sewer Design Guidelines prior to submission of this design for review. The pertinent sections are, section 3.2.1, 3.2.3.3, 4.1.1, 5.1.3 (end), 5.1.4 (middle), 5.7.3, 8.3.1 (second paragraph), 8.3.6, 8.3.6.1 (second bullet point), and 8.3.7. • Due to the revised site plan it is suggested that revised information regarding the water boundary conditions be

	submitted so the City's modeling group make a new determination of the existing conditions in Manotick Main. • There currently is a ditch with culverts is located along the south side of Highcroft Dr. The proposed design appears to ignore this ditch. The ditch and culverts must be maintained along the edge of Highcroft Dr. as per the ditch alteration policy approved by council and the drainage By-law. This will require the installation of culverts under the proposed driveways and street. • Previous comments were provided on an earlier design back on December 14, 2018. When the site application is actually submitted, there are several of those previous comments, which might be pertinent to this revised design. • *The Eastern road radius return cannot extend beyond the extension of the property line to the centerline of the R.O.W.* • *Identify the location of the proposed onsite SWM storage that will accommodate the volumetric difference between Pre- and Post- runoff volumes for this site.* • *Identify the proposed location for fire suppression water storage and proposed onsite fire hydrant* ***Water/Sanitary/Storm Servicing:*** <u>*Water pipes*</u>*:* *No municipal water pipes are adjacent the proposed development. A groundwater impact study is required to determine that a satisfactory quality of groundwater is available and a quantity of flow that exceeds design requirements should the proponent wish to source groundwater for potable water. The parameters tested shall be the "subdivision suite" known to local well testing companies. Alternatively the developer may wish to, entirely at their cost, review extending the waterline in Manotick Main Street to include the development and at their cost provide such extension. The water pipe in Manotick Main Street is a 406 mm dia. C301.* <u>*Sanitary Sewers*</u>*:* *No municipal sanitary pipes are adjacent the proposed development. Provincial limits do not permit more than 5 dwellings to be serviced by one unit. Alternatively the developer could provide a licensed operated facility. A hydrogeological and terrain analysis is required to determine the amount of septage treatment that is available. Alternatively the developer may wish to, entirely at their cost, review extending the sanitary sewer in Manotick Main Street to include the development and at their cost*

	provide such extension. The sanitary pipe nearest the proposed development is a 600 mm dia. conc. *<u>Storm Sewers</u>:* *No municipal storm pipes are adjacent the proposed development. The developer will need to, entirely at their cost, review extending conveyance systems in Manotick Main Street to include the development and, entirely at their cost, provide such extension. No data is known of the storm pipe nearest the proposal.* ***Storm Water Management:*** *The consultant should determine a stormwater management regime for the application and, generally, maintain post-development flows to pre-development levels by way of providing storage to offset increased impervious areas. The existing runoff coefficient shall be taken as that from approved development; non-approved development should be ignored by the consultant in the determination of existing runoff coefficient and will not be taken into consideration by City engineering review staff.* *Any existing stormwater runoff from adjacent site(s) that crosses the property must be accommodated by the proposed stormwater management design.* *Stormwater quality control is required for the site. The Rideau Valley Conservation Authority (RVCA) can be contacted to determine the level of stormwater quality control required for the site.* *All stormwater management determinations shall have supporting rationale.* *Stormwater management solutions should be in concurrence with the content of the jock River reach 2 and mud Creek Subwatershed Study.* ***Roads:*** *Please refer to the City of Ottawa Private Approach By-Law 2003-447 for the entrance design.* ***Exterior Site Lighting:*** *Any exterior lighting proposed for the site is required by the City of Ottawa to be certified by a qualified engineer conforming the design complies with the following criteria:* *1 - It must be designed using only fixtures that meet the*

	criteria for Full-Cut-Off (Sharp cut-off) Classification, as recognized by the illuminating Engineering Society of North America (IESNA or IES). *2 - It must result in minimal light spillage onto adjacent properties. As a guide, 0.5 foot-candle is normally the maximum allowable spillage.* *3 - The location of the fixtures, fixture types (make, model, and part number) and the mounting heights must be provided.* ***Road Widening:*** *The Official Plan of the City of Ottawa requires a ROW width of 20 m at this location, being a local road in the rural area- Transportation Project Manager to provide confirmation.* ***Fire Route:*** *Fire Routes now require designation with By-law parallel to the planning application/s; please contact Jennifer Therkelsen at the City of Ottawa (Jennifer.Therkelsen@ottawa.ca).* ***Fire protection:*** *The provision of fire protection depends on a number of factors that will be reviewed upon submission; please contact Allan Evans (Fire Protection Engineer, City of Ottawa, 613-580-2424 x24119)* ***Snow Storage:*** *Any portion of the subject property which is intended to be used of permanent or temporary snow storage shall be as shown on the approved site plan and grading plan. Snow storage shall not interfere with approved grading and drainage patterns or servicing. Snow storage areas shall be setback from the property lines, foundations, fencing or landscaping a minimum of 1.5m. Snow storage areas shall not occupy driveways, aisles, required parking spaces or any portion of a road allowance.* ***Permits and Approvals:*** *Please contact the Ministry of the Environment, Conservation and Parks (MOECP) and the Rideau Valley Conservation Authority (RVCA), amongst other federal and provincial departments/agencies, to identify all the necessary permits and approvals required to facilitate the development: responsibility rests with the developer and their consultant for determining which approvals are needed and for obtaining all external agency approvals. The address shall be in good standing with all*

approval agencies, for example the RVCA, prior to approval. Copies of confirmation of correspondence will be required by the City of Ottawa from all approval agencies that a form of assent is given. Please note that a stormwater program for multiple lots is understood to be a to the direct type of Environmental Compliance Approval (ECA) application with the MOECC; please speak with your engineering consultant to understand the impact this has on the application. An MOECP ECA application is not submitted until after planning approval. No construction shall commence until after a commence work notification is given.

Ministry of the Environment, Conservation and Parks	*Rideau Valley Conservation Authority*
Contact Information:	*Contact Information:*
Christina Des Rochers	*Roxanne Coghlan*
Water Inspector	*roxanne.coghlan@rvca.ca*
613-521-3450 ext. 231	
Chstina.Desrochers@ontario.ca	

Site Plan Submission Requirements for engineering:
*Site Servicing Plan**
*Grading and Drainage Area Plan**
*Erosion and Sediment Control Plan**

**All identified required plans are to be submitted on standard A1 size sheets as per City of Ottawa Servicing and Grading Plan Requirements and note the survey monument used to establish datum on the plans with sufficient information to enable a layperson to locate the monument.*

Report Submission Requirements[1]:

-Site Servicing Report
A plan is required that clearly shows the proposed water service layout.
-Storm Water Management Report
-Erosion and Sediment Control Measures
-Geotechnical Investigation Study
Please note that the area may contain sensitive marine clays. if indicators are found on the site the geotechnical report should include the following analysis (at a minimum) with discussion for proposals in areas containing SMC, and properties carried from the

	geotechnical report to the slope stability report: Atterberg limits, consolidation testing, grade raise restriction, chemical analysis, sensitivity values, density tests, shrinkage tests and vane shear test results. Discussion will be required in the report if sensitive marine clay is found. *The geotechnical consultant will need to provide full copies of any published and peer reviewed papers relied on to determine results and conclusions* *Earthquake analysis is now required to be provided in the report.* *-Slope Stability Study* *Parameters used in the slope stability analysis should be taken directly from the geotechnical investigation and reference such extracted items* *-Phase 1 Environmental Site Assessment (ESA)* *The Phase 1 Environmental Site Assessment (ESA) as per O.Reg. 153/04. Phase 1 ESA documents performed to CSA standards are not acceptable.* *A Site Lighting Memorandum and plan will be required for registration.* *Footnote [1] - All required plans & reports are to be provided on a CD in *.pdf format (at application submission and for any, and all, re-submissions)* *Please find relevant City of Ottawa Links to Preparing Studies and Plans below:* *Guide to preparing drawings for City of Ottawa engineering submissions* *https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-and-grading-plan-requirements* *Guide to preparing City of Ottawa Studies and Plans:* *http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans* *Servicing Study Guidelines for Development Applications:*

	https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-and-grading-plan-requirements *To request City of Ottawa plan(s) or report information please contact the ISD Information Centre:* *Information Centre* *(613) 580-2424 ext. 44455*
Environment **Matthew.Hayley@ottawa.ca** **(613)580-2424 ext. 23358**	The two buildings proposed for demolition may be habitat for species at risk (i.e barn swallows and bats). An Environmental Impact Study will be required as part of the Site Plan Application. In addition, a Tree Conservation Report will also be required.
Traffic **Amira.Shehata@ottawa.ca** **(613)580-2424 ext. 27737**	The following transportation comments were provided as a result of the review of the revised development proposal: • A Transportation Impact Study is not required as part of the application based on the size (number of dwelling units) and location of the proposed development. • The access driveway should be wide enough to accommodate all utilities. • The access should be designed in accordance to the City's Private Approach By-law. • Turning templates is required for the proposed access showing largest vehicle to access the site; required for internal movements and at the access (entering and exiting and going in both directions). • Show all curb radii measurements ; ensure that all curb radii are reduced as much as possible • Provide sight triangles measuring 3m X 3m at the access road. • The plan shows 10m width of Highcroft Road ROW. This should be revised to show 20m. The distance between the property line and centreline of the road is approximately 10m. • Provide turning circle/area to accommodate vehicles using the site.
Rideau Valley Conservation **Eric Lalande** **eric.lalande@rvca.ca** **(613)692-3571 ext. 1137**	Please note that the Conservation authority's comments remain unchanged: The RVCA will be looking for stormwater management report associated with the Site Plan process. The site doesn't currently appear to connect directly to municipal sewers, assuming they connect to the existing system, the project should be providing 80%

	TSS removal. Best management practices and on-site infiltration is encouraged. The RVCA will defer to the City for Water Quantity. The RVCA does not regulate the site from a natural hazard perspective.

From: Bill Ritcey <britcey@hobinarc.com>
Date: June 10, 2019 at 4:12:08 PM EDT
To: Alison Stirling <alison@thestirlinggroup.ca>
Subject: Fwd: RE: 1164-1166 Highcroft Road Manotick
Reply-To: britcey@hobinarc.com

Alison
Our private access road meets the OBC Access route design criteria referenced below by the City of Ottawa's Fire Protection Engineer
There are no other OBC references(including Part 9)
We could provide however a small 3m wide hammerhead at the bottom of the road to facilitate service vehicles without the use of private driveways.
See you tomorrow
Bill

-------- Forwarded Message --------

Subject:RE: 1164-1166 Highcroft Road Manotick
Date: Mon, 10 Jun 2019 19:58:46 +0000
From: Evans, Allan <Allan.Evans@ottawa.ca>
To:britcey@hobinarc.com <britcey@hobinarc.com>

I'm assuming it is the 6 homes at the bottom that runs off Highcroft?

I don't know of any other sections of the OBC that talks about Access Routes, but 3.2.5.6.(1)(f) specifies turnarounds for > 90m only. These aren't part 3 buildings, so maybe there is something in Part 9 that talks about roadways like this.

Ultimately I have no authority under OBC, I can only make recommendations, but this is what I can see.

3.2.5.6. Access Route Design

(1) A portion of a roadway or yard provided as a required access route for fire department use shall,

(a) have a clear width not less than 6 m, unless it can be shown that lesser widths are satisfactory,

(b) have a centreline radius not less than 12 m,

(c) have an overhead clearance not less than 5 m,

(d) have a change of gradient not more than 1 in 12.5 over a minimum distance of 15 m,

(e) be designed to support the expected loads imposed by firefighting equipment and be surfaced with concrete, asphalt or other material designed to permit accessibility under all climatic conditions,

(f) have turnaround facilities for any dead-end portion of the access route more than 90 m long, and

(g) be connected with a public thoroughfare.

(2) A *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. shall have no portion of the required access route more than 20 m below the floor level of the uppermost *storey* or *mezzanine* that is not a rooftop enclosure provided for elevator machinery, a stairway or a *service room* used for no purpose other than for service to the *building*.

Allan Evans

Fire Protection Engineer / Ingénieur de Protection d'Incendies

Prevention Division / Prévention des Incendies

Ottawa Fire Services / Service des Incendies d'Ottawa

1445 Carling Avenue / 1445 Avenue Carling

Ottawa, ON K1Z 7L9

Allan.Evans @Ottawa.ca

☎ (613) 913-2747|☎ (613) 580-2424 x24119|6 (613) 580-2866 |✉ Mail Code: 25-102|@FFSnack

From: Bill Ritcey <britcey@hobinarc.com>
Sent: Monday, June 10, 2019 11:07 AM
To: Evans, Allan <Allan.Evans@ottawa.ca>
Subject: 1164-1166 Highcroft Road Manotick

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Allan
As briefly discussed attached is a preliminary site plan for a private road servicing 6 single family homes.
The length of this road is less than 90 m from the public ROW.
It is of interest to note that staff representing traffic,Infrastructure,and planning departments at a pre-consultation meeting indicated that there is a requirement for service vehicles to turn around.
A fire hydrant will be incorporated into the design.
Your input would be appreciated.

Thank you
Bill Ritcey

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City of Ottawa Servicing Study Checklist

General Content

Executive Summary (for large reports only): not applicable

Date and revision number of the report: see page 1 of Servicing Brief and Stormwater Management Report

Location map and plan showing municipal address, boundary, and layout of proposed development: see drawings C-1 to C-8

Plan showing the site and location of all existing services: see drawings C-1 to C-8

Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere: not applicable

Summary of Pre-consultation Meetings with City and other approval agencies: not available

Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria: not applicable

Statement of objectives and servicing criteria: see page 1 of Servicing Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-8

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available). see drawings C-1 to C-8

Concept level master grading plan to confirm existing and proposed grades in the development and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths: not applicable

Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts: not applicable

Proposed phasing of the development, if applicable: not applicable

Reference to geotechnical studies and recommendations concerning servicing: see note 1.5 on drawing C-1

All preliminary and formal site plan submissions should have the following information:

- **Metric scale:** included
- **North arrow:** included
    - **(including construction North):** not included
- **Key Plan:** included

- **Name and contact information of applicant and property owner:** not available
- **Property limits**: included
    - **including bearings and dimensions:** not included
- **Existing and proposed structures and parking areas:** included
- **Easements, road widening and rights-of-way:** included
- **Adjacent street names:** included

Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available: not applicable

Availability of public infrastructure to service proposed development: see page 2 of Servicing Brief

Identification of system constraints: see page 2 of Servicing Brief

Confirmation of adequate domestic supply and pressure: see page 2 of Servicing Brief

Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow locations throughout the development: see page 2 of Servicing Brief

Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves: see page 2 of Servicing Brief

Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design: not applicable

Address reliability requirements such as appropriate location of shut-off valves: not applicable

Check on the necessity of a pressure zone boundary modification:. not applicable

Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range: not applicable

Description of the proposed water distribution network, including locations of proposed connections to the existing systems, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions: not applicable

Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation: not applicable

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines: see page 2 of Servicing Brief

Provision of a model schematic showing the boundary conditions locations, streets , parcels, and building locations for reference: not applicable

Development Servicing Report: Wastewater

Summary of proposed design criteria: see page 3 of Servicing Brief

(Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure): not applicable

Confirm consistency with Master Servicing Study and /or justification for deviations: not applicable

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and conditions of sewers: not applicable

Descriptions of existing sanitary sewer available for discharge of wastewater from proposed development: see page 3 of Servicing Brief

Verify available capacity in downstream sanitary sewer and / or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable): not applicable

Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix C) format. see page 15 of Servicing Brief

Description of proposed sewer network including sewers, pumping stations, and forcemains: see page 3 of Servicing Brief

Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality): not applicable

Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development: not applicable

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity: not applicable

Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding: not applicable

Special considerations such as contamination, corrosive environment etc: not applicable

Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property): see page 4 of Servicing Brief and Stormwater Management Report

Analysis of available capacity in existing public infrastructure. not applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern: see drawing C-4

Water quality control objective (e/g/ controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects: see Stormwater Management Report Servicing Brief and Stormwater Management Report

Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements: Servicing Brief and Stormwater Management Report

Descriptions of the references and supporting information.
Set-back from private sewage disposal systems. not applicable

Watercourse and hazard lands setbacks: not applicable

Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed: the pre-application consultation record is not yet been issued

Confirm consistency with sub-waterched and Master Servicing Study, if applicable study exists: not applicable

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period). see drawings C-1 to C-8 and Servicing Brief and Stormwater Management Report

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. see drawings C-1 to C-8 and Servicing Brief and Stormwater Management Report

Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions: see Servicing Brief and Stormwater Management Report

Any proposed diversion of drainage catchment areas from one outlet to another. : not applicable

Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. : not applicable

If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event: not applicable

Identification of potential impacts to receiving watercourses: Servicing Brief and Stormwater Management Report

Identification of municipal drains and related approval requirements. : not applicable

Descriptions of how the conveyance and storage capacity will be achieved for the development: see page 3 of Servicing Brief and Stormwater Management Report

100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading:

Inclusion of hydraulic analysis including hydraulic grade line elevations. : not applicable

Description of approach to erosion and sediment control during construction for the protection of receiving watercourses of drainage corridors: see notes 2.1 to 2.7 on drawing C-3

Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplains elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current: not applicable

Identification of fill constraints related to floodplain and geotechnical investigation. : not applicable

Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act: see page 19 of Servicing Brief and Stormwater Management Report

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act:

Changes to Municipal Drains. : not applicable

Other permits (National Capital commission, Parks Canada, public Works and Government Services Canada, Ministry of transportation etc.) : not applicable

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 7 of Servicing Brief

Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario: included