



ALEO ASSOCIATES INC.
CONSULTING ENGINEERS

**STORMWATER MANAGEMENT REPORT
PROPOSED COMMERCIAL DEVELOPMENT
LOCATED ON LAND SOUTH OF 1055 TALBOT ST.
ST. THOMAS, ONTARIO**

FOR:

**ROCK DEVELOPMENTS INC.
19 Amy Croft Drive, Unit 201
Lakeshore, Ontario
N9K 1C7**

BY:

**ALEO ASSOCIATES INC.
325 Devonshire Road, Suite 500
Windsor, Ontario
N8Y 2L3**

DATE: AUGUST 25, 2026

PROJECT No.:8975



ALEO ASSOCIATES INC.

CONSULTING ENGINEERS

August 25, 2026

Corporation of the City of St. Thomas
545 Talbot Street
St. Thomas, ON, N5P 3V7

ATT: MR. SHAYNE REITSMA, P.ENG., MANAGER OF DEVELOPMENT & COMPLIANCE

**RE: STORMWATER MANAGEMENT REPORT FOR THE PROPOSED COMMERCIAL DEVELOPMENT
LOCATED ON LAND IMMEDIATELY SOUTH OF 1055 TALBOT STREET, ST. THOMAS, ONTARIO**

Dear Mr. Reitsma,

We are pleased to submit our stormwater management report for the proposed commercial development located on the lands formerly known as 1055 Talbot Street in the City of St. Thomas. The property is now legally described as Part of Lot 6, Concession 9, Part 1, Plan 11R-11073. The proposed development is located just south of the existing commercial plaza known as St. Thomas Square with municipal address 1055 Talbot Street.

The proposed commercial development has a drainage area of 2.78 hectares, see drainage area plan enclosed. The property is tributary to an existing 600 mm storm sewer located in a 3.0 m wide easement along the west property line. This private storm sewer flows southerly to the existing 1200 mm municipal storm sewer within the Talbot Street right-of-way.

We have carried out storm detention design for a 1:5 year and 1:100 year frequency storm events. The developed runoff coefficient for the stormwater management boundary area was determined to be 0.81 for both the 1:5 year storm and 1:100 year storm. The pre-development (allowable) runoff coefficient is 0.46 in accordance with the Functional Servicing Report prepared by Aleo Associates Inc. dated April 10, 2019. The release rate from the site for both design storms is being restricted to the 1:5 year pre-development discharge rate which is 291.8 L/s by a 300 mm diameter orifice.

Storage has been provided above the catch basins on the surface of the asphalt parking lot, in a depressed grass area and within the storm sewer pipe and structures. Please see the attached calculations for both the 1:5 year and 1:100 year frequency storm events. The 1:5 year and 1:100 year storage elevations are 234.40 m and 234.70 m, respectively. The 1:100 year storage elevation is at least 300mm (0.3 m) below the proposed floor elevations.

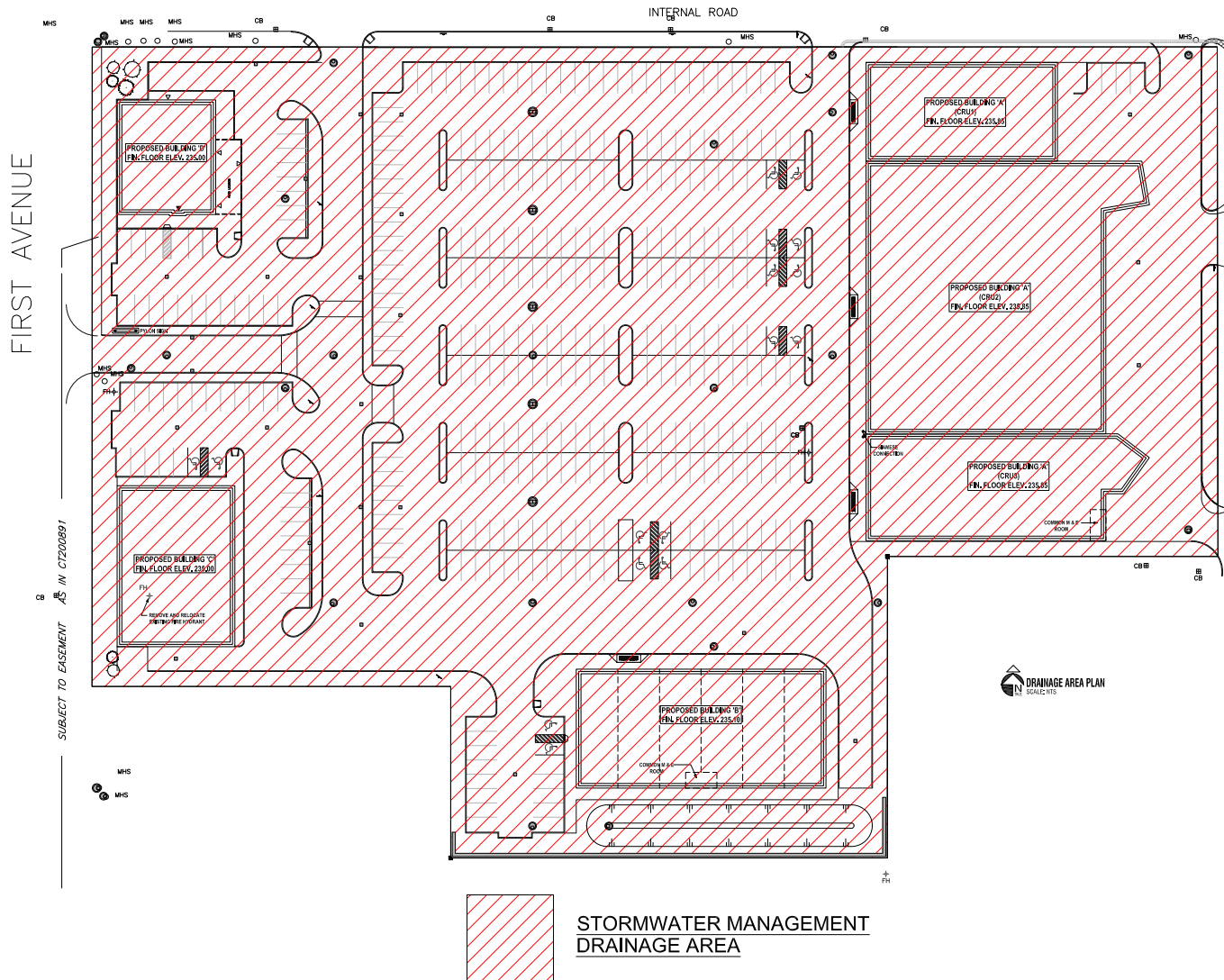
Stormwater quality control is accomplished by a new oil and grit separator unit manufactured by Hydro International. The unit is a 'First Defense High Capacity' model FD-5HC. The level of treatment is Enhanced (82% TSS removal). Attached please find the net annual TSS removal calculation sheet, a typical drawing for the First Defense model FD-5HC OGS unit, and the operation and maintenance manual.

If you have any questions or concerns, please contact me.

Yours Very Truly,

John-Paul Aleo, P.Eng.
ALEO ASSOCIATES INC.





ALEO ASSOCIATES INC., CONSULTING ENGINEERS

325 DEVONSHIRE RD., SUITE 500, WINDSOR, ONTARIO, CANADA, N8Y 2L3

PROJECT NAME: Proposed Commercial Development
PROJECT No.: 8975
PREPARED BY: J.P.A.
DATE: August 24, 2026
REVISED: -
FILE NAME: 8975_1-5yr_2026.08.24.xlsx

PROPOSED COMMERCIAL DEVELOPMENT 1055 TALBOT STREET, ST. THOMAS, ONTARIO STORM WATER MANAGEMENT CALCULATIONS FOR 1:5 YEAR FREQUENCY STORM

A. PRE-DEVELOPED SITE CONDITIONS:

Total Proposed Drainage Area = 27,790 sq.m. 2.78 ha Cund = 0.46

B. PROPOSED SITE CONDITIONS:

Total Proposed Drainage Area = 27,790 sq.m. 2.78 ha Cdev
Total Proposed Building Roof Area = 6,417 sq.m. 0.64 ha C = 0.95
Total Proposed Asphalt & Concrete Area = 16,302 sq.m. 1.63 ha C = 0.95
Total Proposed Grassed Area = 5,071 sq.m. 0.51 ha C = 0.20

C. RUNOFF COEFFICIENTS:

EXISTING(allowable): Call = 0.46
(As per Functional Servicing Report for 1055 Talbot Street)

PROPOSED SITE: Cdev =
$$\frac{(6,417 \text{ m}^2 \times 0.95) + (16,302 \text{ m}^2 \times 0.95) + (5,071 \text{ m}^2 \times 0.20)}{27,790 \text{ m}^2}$$

Cdev = 0.81

D. PRE-DEVELOPED (ALLOWABLE) DISCHARGE FOR 1:5 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cund = 0.46
Tc = 15 minutes
Intensity, i = 82.0 mm/hr
Intensity, i = 3.23 in/hr

Rainfall intensity is calculated from the equation $i = a(T_c)^b$

Where a & b are parameters derived from the MTO's IDF curve for the City of St. Thomas.

For a 1:5 year frequency storm event, $i = 31.1 * (T/60)^{-0.699}$

$$\begin{aligned} Q_{und} &= C_{und} * i * A \\ &= 2.78 * 0.46 * i * 2.78 \\ &= 3.56 * i \\ &= 291.8 \text{ L/s} \end{aligned}$$

E. PRE-DEVELOPED (ALLOWABLE) DISCHARGE FOR 1:5 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cund = 0.81
Tc = 15 minutes
Intensity, i = 82.0 mm/hr
Intensity, i = 3.23 in/hr

Rainfall intensity is calculated from the equation $i = a(T_c)^b$

Where a & b are parameters derived from the MTO's IDF curve for the City of St. Thomas.

For a 1:5 year frequency storm event, $i = 31.1 * (T/60)^{-0.699}$

$$\begin{aligned} Q_{und} &= C_{und} * i * A \\ &= 2.78 * 0.81 * i * 2.78 \\ &= 6.26 * i \\ &= 513.1 \text{ L/s} \end{aligned}$$

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F. STORM VOLUME CALCULATIONS:

Duration (min.) t	Intensity* (mm/hr) i	Qd=CiA Qd=6.26*i (L/s)	Storm Volume (cu.m.) V1=Qdev t 60	Relief Volume** (cu.m.) V2 = Qund t 60	Storage (cu.m.) V1 - V2	Max ***
5	176.6	1105.8	331.7	87.5	244.2	***
10	108.8	681.2	408.7	175.1	233.6	
15	82.0	513.1	461.8	262.6	199.2	
20	67.0	419.6	503.5	350.1	153.4	
25	57.3	359.0	538.5	437.7	100.8	
30	50.5	316.0	568.9	525.2	43.7	
35	45.3	283.8	595.9	612.7	0.0	

* Where Intensity, I = $29.6 * (T/60)^{-0.699}$, from MTO IDF data for 1:5 year frequency storm in St.Thomas, ON

** Qund = 291.8 L/s

*** Maximum volume to be stored = 244.2 cu.m.

G. STORAGE CALCULATIONS:

Maximum 1:5 year (storage) water surface elev. = 234.40 m

Storage is accommodated entirely underground in storm sewer pipe & structures and in the depressed grass area.

Storage in storm sewer pipe:

Pipe dia. (mm)	Length (m)	Volume (cu.m.)
150	51.1	0.9
200	223.0	7.0
250	27.0	1.3
300	42.7	3.0
375	243.0	26.8
600	406.8	115.0

Total storage in sewer pipe: 154.1

Storage in storm structures:

25 - catch basins with an average depth of 1.3 m

Volume of storage in cb's = $25 \times 0.60 \text{ m} \times 0.60 \text{ m} \times 1.3 \text{ m} = 11.7 \text{ cu.m.}$

15 - 1.2 m dia. manholes/catchbasin mh's with an average depth of 2.0 m

Volume of storage in mh's = $15 \times 1.13 \text{ m}^2 \times 2.0 \text{ m} = 33.9 \text{ cu.m.}$

5 - 1.5 m dia. manholes/catchbasin mh's with an average depth of 2.0 m

Volume of storage in mh's = $5 \times 1.77 \text{ m}^2 \times 2.0 \text{ m} = 17.7 \text{ cu.m.}$

Total storage in storm structures is 63.3 cu.m.

Storage in shallow depressed grass area:

1:5 year (storage) water surface elevation = 234.40 m

Avg. bottom elev. of pond is 234.00 m

$V = [(0.5 \times 1.6 \text{ m} \times 0.40 \text{ m}) \times 105 \text{ m}] + (50 \text{ m}^2 \times 0.40 \text{ m})$

$V = 53.6 \text{ cu.m.}$

The minimum volume of storage provided is 271.0 cu.m. > max. volume to be stored is 244.2 cu.m.

H. FLOW RESTRICTOR:

Allowable discharge (Qall) = 291.8 L/s

Max. site headwater = 234.70 m (max. potential ponding in parking lot before spillover to R.O.W.)

Min. site headwater = 234.10 m

Avg. site headwater = 234.40 m

Max. tailwater in sewer = 231.97 m (obvert of receiving 600 mm storm sewer)

Min. tailwater in sewer = 231.43 m (invert of site storm outlet in new storm mh#12)

Avg. tailwater in sewer = 231.70 m

Avg. Head = $234.35 \text{ m} - 231.70 \text{ m} = 2.65 \text{ m}$

$Q = 0.60 * A * \sqrt{2 * g * H}$

$A = Q / (0.60 * \sqrt{2 * g * H}) = 0.2918 \text{ m}^3/\text{s} / (0.60 * \sqrt{2 * 9.81 \text{ m/s}^2 * 2.65 \text{ m}}) = 0.0675 \text{ m}^2$

dia. of orifice = $\sqrt{(4 * A) / \pi} = 0.30 \text{ m} (300 \text{ mm})$

Therefore, a 300 mm dia. orifice is required to restrict the flow for a 1:5 year frequency storm event.

ALEO ASSOCIATES INC., CONSULTING ENGINEERS

325 DEVONSHIRE RD., SUITE 500, WINDSOR, ONTARIO, CANADA, N8Y 2L3

PROJECT NAME: Proposed Commercial Development
PROJECT No.: 8975
PREPARED BY: J.P.A.
DATE: August 24, 2026
REVISED: -
FILE NAME: 8975_1-100yr_2026.08.24.xlsx

PROPOSED COMMERCIAL DEVELOPMENT 1055 TALBOT STREET, ST. THOMAS, ONTARIO STORM WATER MANAGEMENT CALCULATIONS FOR 1:100 YEAR FREQUENCY STORM

A. PRE-DEVELOPED SITE CONDITIONS:

Total Proposed Drainage Area =	27,790 sq.m.	2.78 ha	Cund = 0.48
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B. PROPOSED SITE CONDITIONS:

Total Proposed Drainage Area =	27,790 sq.m.	2.78 ha	Cdev
Total Proposed Building Roof Area =	6,417 sq.m.	0.64 ha	C = 0.95
Total Proposed Asphalt & Concrete Area =	16,302 sq.m.	1.63 ha	C = 0.95
Total Proposed Landscape Area =	5,071 sq.m.	0.51 ha	C = 0.20

C. RUNOFF COEFFICIENTS:

EXISTING(allowable): Call = 0.46
(As per Functional Servicing Report for 1055 Talbot Street)

PROPOSED: $C_{dev} = \frac{(6,417 \text{ m}^2 \times 0.95) + (16,302 \text{ m}^2 \times 0.95) + (5,071 \text{ m}^2 \times 0.20)}{27,790 \text{ m}^2}$
Cdev = 0.81

D. PRE-DEVELOPED (ALLOWABLE) DISCHARGE FOR 1:5 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cund =	0.46
Tc =	15 minutes
Intensity, i =	82.0 mm/hr
Intensity, i =	3.23 in/hr

Rainfall intensity is calculated from the equation $i = a(T_c)^b$

Where a & b are parameters derived from the MTO's IDF curve for the City of St. Thomas.

For a 1:5 year frequency storm event, $i = 31.1 * (T/60)^{-0.699}$

$$\begin{aligned} Q_{und} &= C_{und} * i * A \\ &= 2.78 * 0.46 * i * 2.78 \\ &= 3.56 * i \\ &= 291.8 \text{ L/s} \end{aligned}$$

E. POST-DEVELOPMENT DISCHARGE FOR 1:100 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cdev =	0.81
Tc =	15 minutes
Intensity, i =	135.7 mm/hr
Intensity, i =	5.34 in/hr

Rainfall intensity is calculated from the equation $i = a(T_c)^b$

Where a & b are parameters derived from the MTO's IDF curve for the City of St. Thomas.

For a 1:100 year frequency storm event, $i = 51.5 * (T/60)^{-0.699}$

$$\begin{aligned} Q_{dev} &= C_{dev} * i * A \\ &= 2.78 * 0.81 * i * 2.78 \\ &= 6.26 * i \\ &= 849.6 \text{ L/s} \end{aligned}$$

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F. STORM VOLUME CALCULATIONS:

Duration (min.) t	Intensity* (mm/hr) i	Qd=CiA Qd=6.26*i (L/s)	Storm Volume (cu.m.) V1=Qdev t 60	Relief Volume** (cu.m.) V2 = Qund t 60	Storage (cu.m.) V1 - V2	Max ***
0	0.0	0.0	0.0	0.0	0.0	
5	292.5	1831.2	549.4	71.1	478.3	
10	180.2	1128.0	676.8	142.2	534.6	
15	135.7	849.6	764.7	213.3	551.4	***
20	111.0	694.8	833.8	284.4	549.4	
25	95.0	594.5	891.7	355.5	536.2	
30	83.6	523.4	942.1	426.6	515.5	
35	75.1	469.9	986.8	497.7	489.1	
40	68.4	428.0	1027.3	568.8	458.5	

* Where Intensity, $I = 50.0 * (T/60)^{-0.694}$, from MTO IDF data for 1:100 year frequency storm in St. Thomas, ON

** Qund = 237.0 L/s (Reduced flow through a 300 mm dia. orifice under 1.59 m of head)

*** Maximum volume to be stored = 551.4 cu.m.

G. STORAGE CALCULATIONS:

Maximum 1:100 year (storage) water surface elev. = 234.70 m

Storage is accommodated on the asphalt surface above cb's, in storm sewer pipe & structures, and in the depressed grass area.

Depth above lowest CB in parking lot = 0.30 m (300 mm)

Storage above cb's and cbmh's:

CBMH#2:

$$V = ((435 \text{ m}^2 \times 0.30 \text{ m})/3)$$

$$V = 43.5 \text{ cu.m.}$$

TWIN CB#1:

$$V = ((635 \text{ m}^2 \times 0.30 \text{ m})/3)$$

$$V = 63.5 \text{ cu.m.}$$

TWIN CB#2:

$$V = ((635 \text{ m}^2 \times 0.30 \text{ m})/3)$$

$$V = 63.5 \text{ cu.m.}$$

TWIN CB#3:

$$V = ((635 \text{ m}^2 \times 0.30 \text{ m})/3)$$

$$V = 63.5 \text{ cu.m.}$$

TWIN CB#4:

$$V = ((635 \text{ m}^2 \times 0.30 \text{ m})/3)$$

$$V = 63.5 \text{ cu.m.}$$

TWIN CB#5:

$$V = ((580 \text{ m}^2 \times 0.30 \text{ m})/3)$$

$$V = 58.0 \text{ cu.m.}$$

CB#7:

$$V = ((455 \text{ m}^2 \times 0.30 \text{ m})/3)$$

$$V = 45.5 \text{ cu.m.}$$

CB#14:

$$V = ((335 \text{ m}^2 \times 0.20 \text{ m})/3)$$

$$V = 22 \text{ cu.m.}$$

CB#13:

$$V = ((210 \text{ m}^2 \times 0.20 \text{ m})/3)$$

$$V = 14 \text{ cu.m.}$$

CB#17:

$$V = ((295 \text{ m}^2 \times 0.20 \text{ m})/3)$$

$$V = 20 \text{ cu.m.}$$

CB#18:

$$V = ((250 \text{ m}^2 \times 0.20 \text{ m})/3)$$

$$V = 17 \text{ cu.m.}$$

Total storage above cb's and cbmh's (shown above) to elevation 234.70 m is 474 cu.m. (See Drawing C3.0)

Additional storage is available above cb's #9,10, 15, 16, 19, 22, 23, & 25 but are not included in the total storage provided calculation.

Storage in storm sewer pipe:

Pipe dia. (mm) Length (m) Volume (cu.m.)

150 51.1 0.9

200 223.0 7.0

250 27.0 1.3

300 42.7 3.0

375 243.0 26.8

600 406.8 115.0

Storage in storm structures:

25 - catch basins with an average depth of 1.3 m

Volume of storage in cb's = $25 \times 0.60 \text{ m} \times 0.60 \text{ m} \times 1.3 \text{ m} = 11.7 \text{ cu.m.}$

15 - 1.2 m dia. manholes/catchbasin mh's with an average depth of 2.0 m

Volume of storage in mh's = $15 \times 1.13 \text{ m}^2 \times 2.0 \text{ m} = 33.9 \text{ cu.m.}$

5 - 1.5 m dia. manholes/catchbasin mh's with an average depth of 2.0 m

Volume of storage in mh's = $5 \times 1.77 \text{ m}^2 \times 2.0 \text{ m} = 17.7 \text{ cu.m.}$

Total storage in sewer pipe: 154.1

Total storage in storm structures is 63.3 cu.m.

Storage in shallow depressed grass area:

1:5 year (storage) water surface elevation = 234.70 m

Avg. bottom elev. of pond is 234.00 m

$$V = [(0.5 \times 2.8 \text{ m} \times 0.70 \text{ m}) \times 115 \text{ m}] + (50 \text{ m}^2 \times 0.70 \text{ m})$$

$$V = 147.7 \text{ cu.m.}$$

The minimum volume of storage provided is 839.1 cu.m. > max. volume to be stored is 551.4 cu.m.

ALEO ASSOCIATES INC., CONSULTING ENGINEERS

325 DEVONSHIRE RD., SUITE 500, WINDSOR, ONTARIO, N8Y 2L3, TEL.: (519)254-7926

H. FLOW RESTRICTOR:

Allowable discharge (Qall) = 291.8 L/s

Max. site headwater = 234.70 m (max. potential ponding in parking lot before spillover to R.O.W.)

Min. site headwater = 234.40 m (lowest cb elevation in parking lot)

Avg. site headwater = 234.55 m

Max. tailwater in sewer = 233.94 m (low point along municipal roadway edge of road at existing catch basin)

Min. tailwater in sewer = 231.97 m (obvert of receiving 600 mm storm sewer)

Avg. tailwater in sewer = 232.96 m

Avg. Head = 234.55 m - 232.96 m = 1.59 m

$$Q = 0.60 \cdot A \cdot \sqrt{2 \cdot g \cdot H}$$

$$A = Q / (0.60 \cdot \sqrt{2 \cdot g \cdot H}) = 0.2918 \text{ m}^3/\text{s} / (0.60 \cdot \sqrt{2 \cdot 9.81 \text{ m/s}^2 \cdot 1.59 \text{ m}}) = 0.08707 \text{ m}^2$$

$$\text{dia. of orifice} = \sqrt{(4 \cdot A) / 3.1416} = 0.333 \text{ m (333 mm)}$$

Therefore, a 333 mm dia. orifice is required to restrict the flow for a 1:100 year frequency storm event.

However, a 300 mm dia. orifice will be used to restrict the flow for the 1:5 year frequency storm event.

The flow through a 300 mm dia. orifice with 1.59 m of head is calculated as follows:

$$\text{dia. of orifice} = \sqrt{(4 \cdot A) / 3.1416}$$

$$A = (\pi \times d^2) / 4 = (3.1416 \times 0.30^2) / 4 = 0.07069 \text{ m}^2$$

$$Q = 0.60 \cdot A \cdot \sqrt{2 \cdot g \cdot H}$$

$$Q = 0.60 \cdot 0.07069 \text{ m}^2 \cdot \sqrt{2 \cdot 9.81 \text{ m/s}^2 \cdot 1.59 \text{ m}} = 0.237 \text{ cms (237 L/s)}$$

The flow through a 300 mm dia. orifice under 1.59 m of head is 0.237 cms (237 L/s).

The required storage is based on this reduced flow rate.

See the flow restrictor detail on drawing C1.0.



ADS OGS Sizing Summary

Project Name:	1055 Talbot Street
Consulting Engineer:	Aleo Associates Inc
Location:	St. Thomas
Sizing Completed By:	Kyle Robinson
Email:	kyle.robinson@adspipe.com

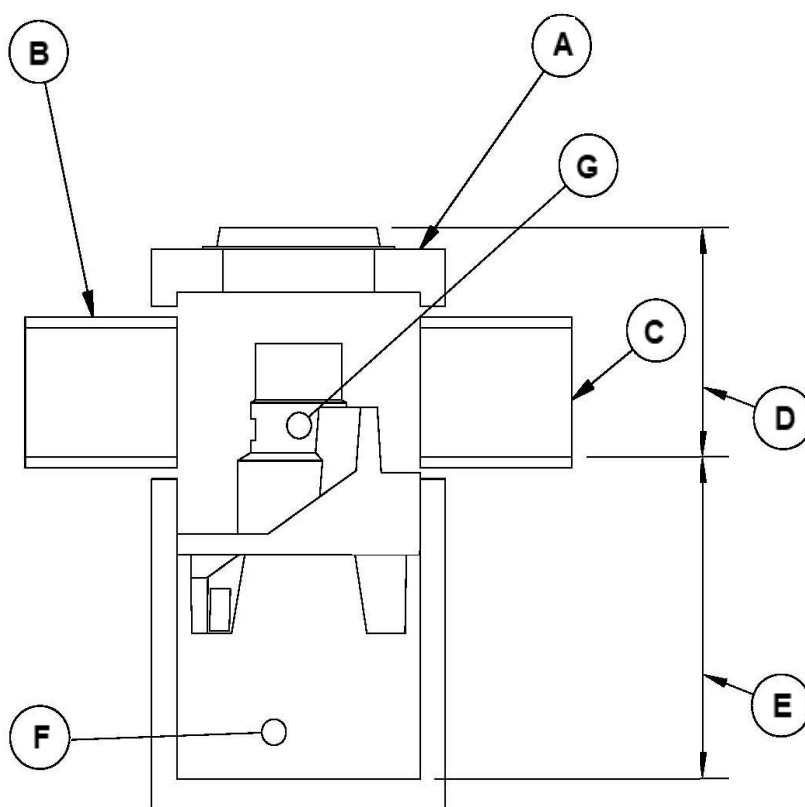
Treatment Requirements		
Treatment Goal:	Enhanced (MOE)	
Selected Parameters:	80% TSS	90% Volume
Selected Unit:	FD-5HC	

Summary of Results		
Model	TSS Removal	Volume Treated
FD-4HC	78.0%	>90%
FD-5HC	82.0%	>90%
FD-6HC	84.0%	>90%
FD-8HC	89.0%	>90%
FD-10HC	92.0%	>90%

FD-5HC Specification	
Unit Diameter (A):	1,500 mm
Inlet Pipe Diameter (B):	600 mm
Outlet Pipe Diameter (C):	600 mm
Height, T/G to Outlet Invert (D):	3290 mm
Height, Outlet Invert to Sump (E):	1783 mm
Sediment Storage Capacity (F):	0.84 m³
Oil Storage Capacity (G):	1,135 L
Max. Pipe Diameter:	600 mm
Peak Flow Capacity:	566 L/s

Site Elevations:	
Rim Elevation:	234.700
Inlet Pipe Elevation:	231.410
Outlet Pipe Elevation:	231.410

Site Details	
Site Area:	2.78 ha
% Impervious:	82%
Rational C:	0.81
Rainfall Station:	London Intl Airport, ON
Particle Size Distribution:	Fine
Peak Flowrate:	291.8 L/s



Notes:

Removal efficiencies are based on NJDEP Test Protocols and independently verified.

All units supplied by ADS have numerous local, provincial, and international certifications (copies of which can be provided upon request). The design engineer is responsible for ensuring compliance with applicable regulations.



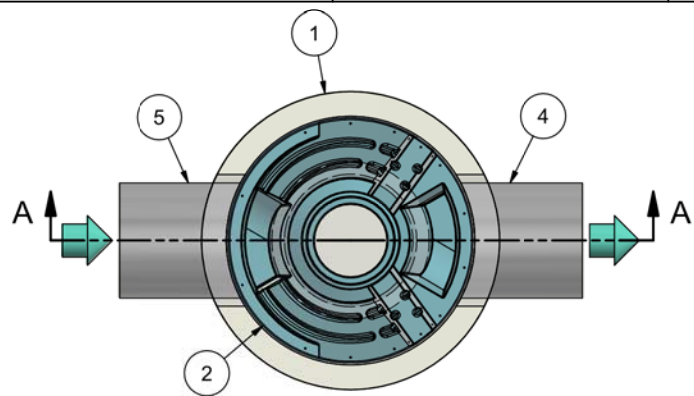
Project Name: 1055 Talbot Street
 Consulting Engineer: Aleo Associates Inc
 Location: St. Thomas

Net Annual Removal Efficiency Summary: FD-5HC

Rainfall Intensity⁽¹⁾	Fraction of Rainfall⁽¹⁾	FD-5HC Removal Efficiency⁽²⁾	Weighted Net-Annual Removal Efficiency
mm/hr	%	%	%
0.50	0.2%	97.9%	0.2%
1.00	13.7%	91.8%	12.6%
1.50	17.3%	88.4%	15.3%
2.00	13.5%	86.1%	11.6%
2.50	2.7%	84.3%	2.3%
3.00	2.3%	82.9%	1.9%
3.50	8.5%	81.7%	7.0%
4.00	4.7%	80.7%	3.8%
4.50	1.5%	79.8%	1.2%
5.00	5.2%	79.1%	4.1%
6.00	4.1%	77.7%	3.2%
7.00	4.4%	76.6%	3.4%
8.00	3.3%	75.7%	2.5%
9.00	2.4%	74.9%	1.8%
10.00	2.3%	74.1%	1.7%
20.00	9.2%	69.5%	6.4%
30.00	2.5%	66.9%	1.7%
40.00	1.1%	65.2%	0.7%
50.00	0.4%	63.8%	0.3%
Total Net Annual Removal Efficiency:			82.0%
Total Runoff Volume Treated:			99.9%

Notes:

- (1) Rainfall Data: 1960:2002, HLY03, London AP, ONT, 6144475.
- (2) Based on third party verified data and approximating the removal of a PSD similar to the STC Fine distribution
- (3) Rainfall adjusted to 5 min peak intensity based on hourly average.

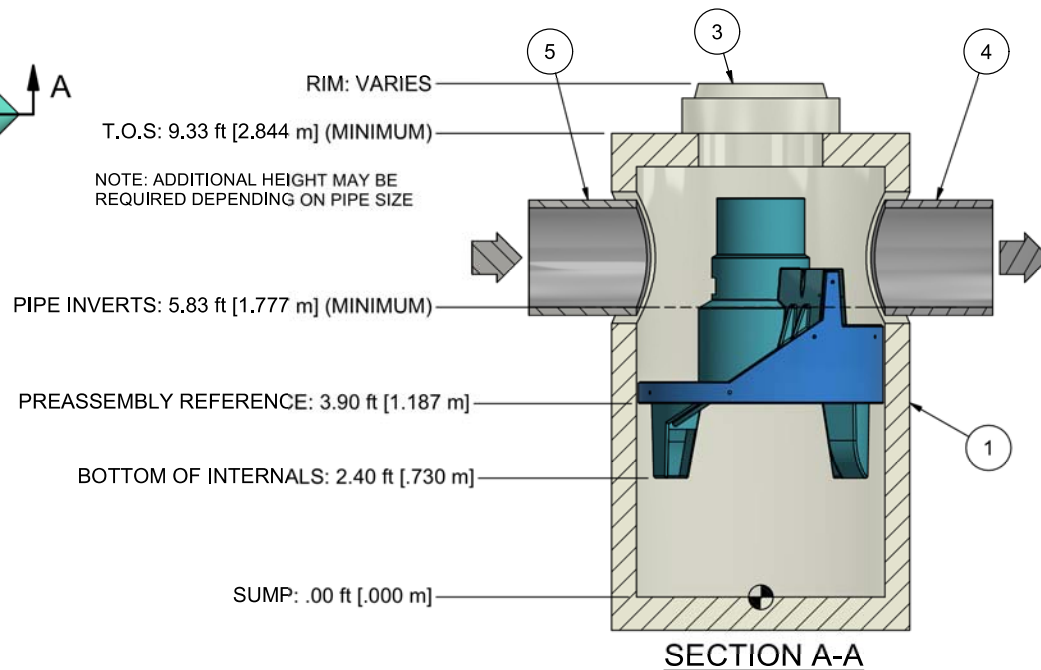


PLAN VIEW



HYDRO FRAME AND COVER (INCLUDED)

GRADE RINGS BY OTHERS
AS REQUIRED



SECTION A-A

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING FIRST DEFENSE MANHOLE.
3. CONTRACTOR TO CONFIRM RIM, PIPE INVERTS, PIPE DIA. AND PIPE ORIENTATION PRIOR TO RELEASE OF UNIT TO FABRICATION.

PROJECTION

IF IN DOUBT ASK

DATE: 11/2/2021 SCALE: 1:30
DRAWN BY: ER CHECKED BY: MRJ APPROVED BY:

Title
5-ft DIAMETER
FIRST DEFENSE

GENERAL ARRANGEMENT

Hydro International
hydro-int.com
HYDRO INTERNATIONAL

WEIGHT: MATERIAL:

STOCK NUMBER:

DRAWING NO.: FD GA-5

SHEET SIZE: B SHEET: 1 OF 1 Rev: -

PRODUCT SPECIFICATION:

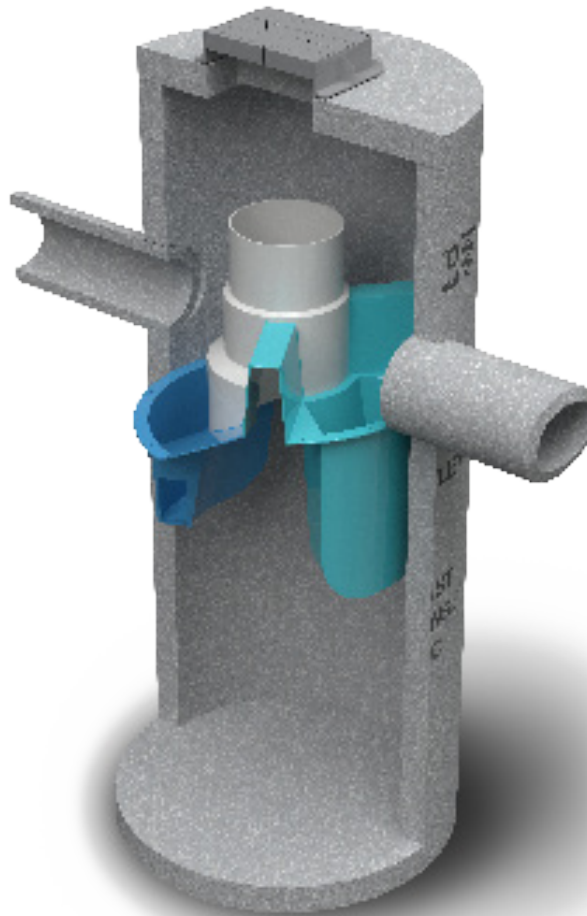
1. Peak Hydraulic Flow: 20.0 cfs (566 l/s)
2. Min Sediment Storage Capacity: 1.1 cu. yd. (0.8 cu. m.)
3. Maximum Inlet/Outlet Pipe Diameters: 24 in. (600 mm)
4. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
5. For more product information including regulatory acceptances, please visit <https://hydro-int.com/en/products/first-defense>

GENERAL NOTES:

1. General Arrangement drawings only. Contact Hydro International for site specific drawings.
2. The diameter of the inlet and outlet pipes may be no more than 24".
3. Multiple inlet pipes possible (refer to project plan).
4. Inlet/outlet pipe angle can vary to align with drainage network (refer to project plans).
5. Peak flow rate and minimum height limited by available cover and pipe diameter.
6. Larger sediment storage capacity may be provided with a deeper sump depth.

PARTS LIST

ITEM	QTY	SIZE (in)	SIZE (mm)	DESCRIPTION
1	1	60	1500	I.D. PRECAST MANHOLE
2	1			INTERNAL COMPONENTS (PRE-INSTALLED)
3	1	30	750	FRAME AND COVER (ROUND)
4	1	24 (MAX)	600 (MAX)	OUTLET PIPE (BY OTHERS)
5	1	24 (MAX)	600 (MAX)	INLET PIPE (BY OTHERS)



Operation and Maintenance Manual

First Defense® High Capacity and First Defense® Optimum

Vortex Separator for Stormwater Treatment

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's First Defense®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc has a policy of continuous product development and reserves the right to amend specifications without notice.

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig. 1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

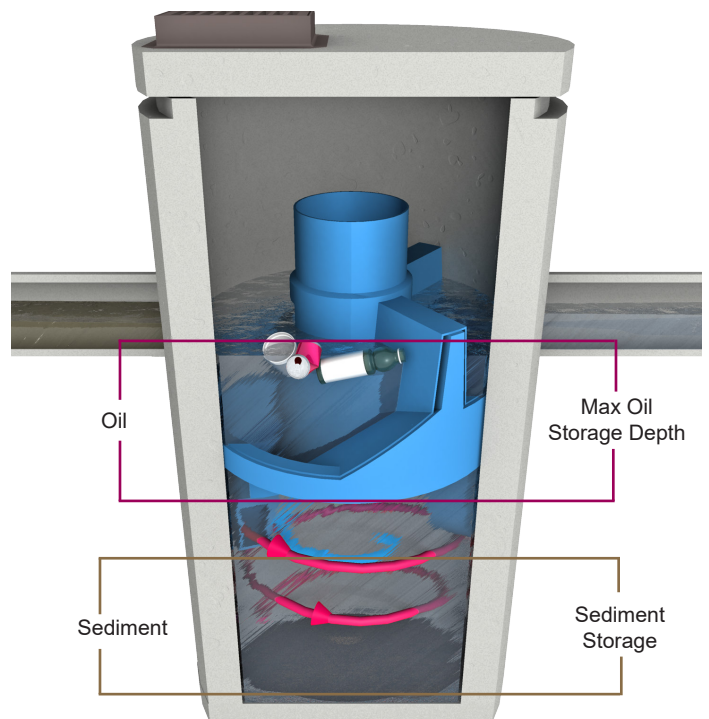


Fig. 1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

First Defense® Components

1. Built-In Bypass

2. Inlet Pipe

3. Inlet Chute
4. Floatables Draw-off Port

5. Outlet Pipe

6. Floatables Storage
7. Sediment Storage

8. Inlet Grate or Cover

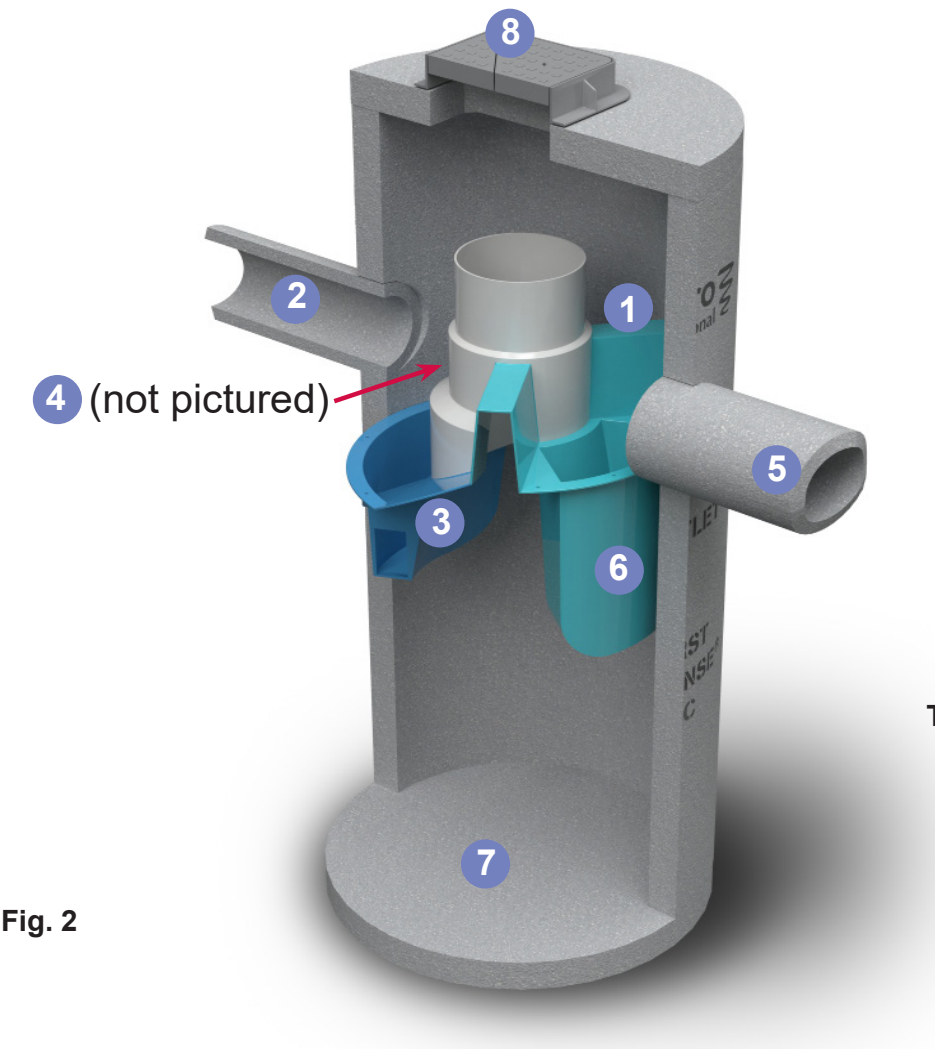


Table 1

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
7 / 2.1
8 / 2.4
10 / 3.0

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense® have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

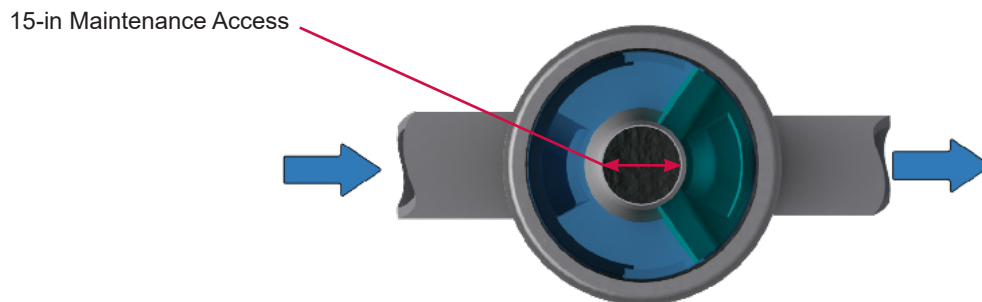


Fig.3 The central opening to the sump of the First Defense® is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / floatables removal, for First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.
6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
7. Securely replace the grate or lid.
8. Take down safety equipment.
9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.4).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vector hose to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.
- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.



Fig.4 Floatables are removed with a vector hose

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vector truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Remove oil and floatables stored on the surface of the water with the vactor hose or with the skimmer or net
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor
7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.
9. Securely replace the grate or lid.

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area

NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.



First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): [3-FT] [4-FT] [5-FT] [6-FT] [7-FT] [8-FT] [10-FT]

INLET (CIRCLE ALL THAT APPLY): GRATED INLET (CATCH BASIN) INLET PIPE (FLOW THROUGH)

First Defense® Inspection and Maintenance Log

[illegible]

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