6285 & 6289 Main Street Residential Development

Municipal Servicing & Stormwater Management Report

Project Location:

6285 & 6289 Main Street
Niagara Falls

Prepared for:

Zeljko Holdings Limited
4728 Dorchester Road, Unit #11B, Niagara Falls, ON

Prepared by:

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December 15, 2023

MTE File No.: 49810-100

Engineers, Scientists, Surveyors.

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1.0 Introduction

1.1 Overview

MTE Consultants Inc. were retained by Zeljko Holdings Limited to complete the site grading, servicing, stormwater management design as well as the Municipal Servicing Study for the proposed development located in downtown Niagara Falls at the southwest corner of the intersection of Murray Street and Main Street (see Figure 1.0 for Location Plan). This design will be in support of Zoning By-law Amendment (ZBA), Official Plan Amendment (OPA) and Site Plan Approval (SPA). The proposed development is a 20-storey residential building consisting of 188 apartment style units and 5 street fronting townhouse style units at street level. There will be 5 levels of underground parking. The total site is approximately 0.255ha. The site is bounded by a parking lot to the west, commercial development to the north and east, and an open field to the south. The site is a land assembly that includes the former road allowance of Murray Street and four single family lots. Please note that the four residential buildings were demolished in 2023 in preparation for site re-development.

The servicing described in this report will provide additional detailed information on the proposed servicing scheme for the site. Please refer to the enclosed civil drawings prepared by MTE for additional information.

1.2 Background Information

The following documents were referenced in the preparation of this report:

- Ref. 1: *Ontario Building Code* (2023).
- Ref. 2: *Water Supply for Public Fire Protection* (Fire Underwriters Survey, 2020).
- Ref. 3: *Engineering Design Guidelines Manual* (The City of Niagara Falls, April 2016).
- Ref. 4: *Niagara Region Project Design and Technical Specifications Manual*, January 2013).
- Ref. 5: *Design Guidelines for Sewage Works* (Ministry of the Environment, 2008).
- Ref. 6: *Design Guidelines for Drinking-Water Systems* (Ministry of the Environment, 2008).
- Ref. 7: *Erosion & Sediment Control Guideline for Urban Construction (December, 2006).*
- Ref. 8: *MOE Stormwater Management Practices Planning and Design Manual* (Ministry of the Environment, March 2003).

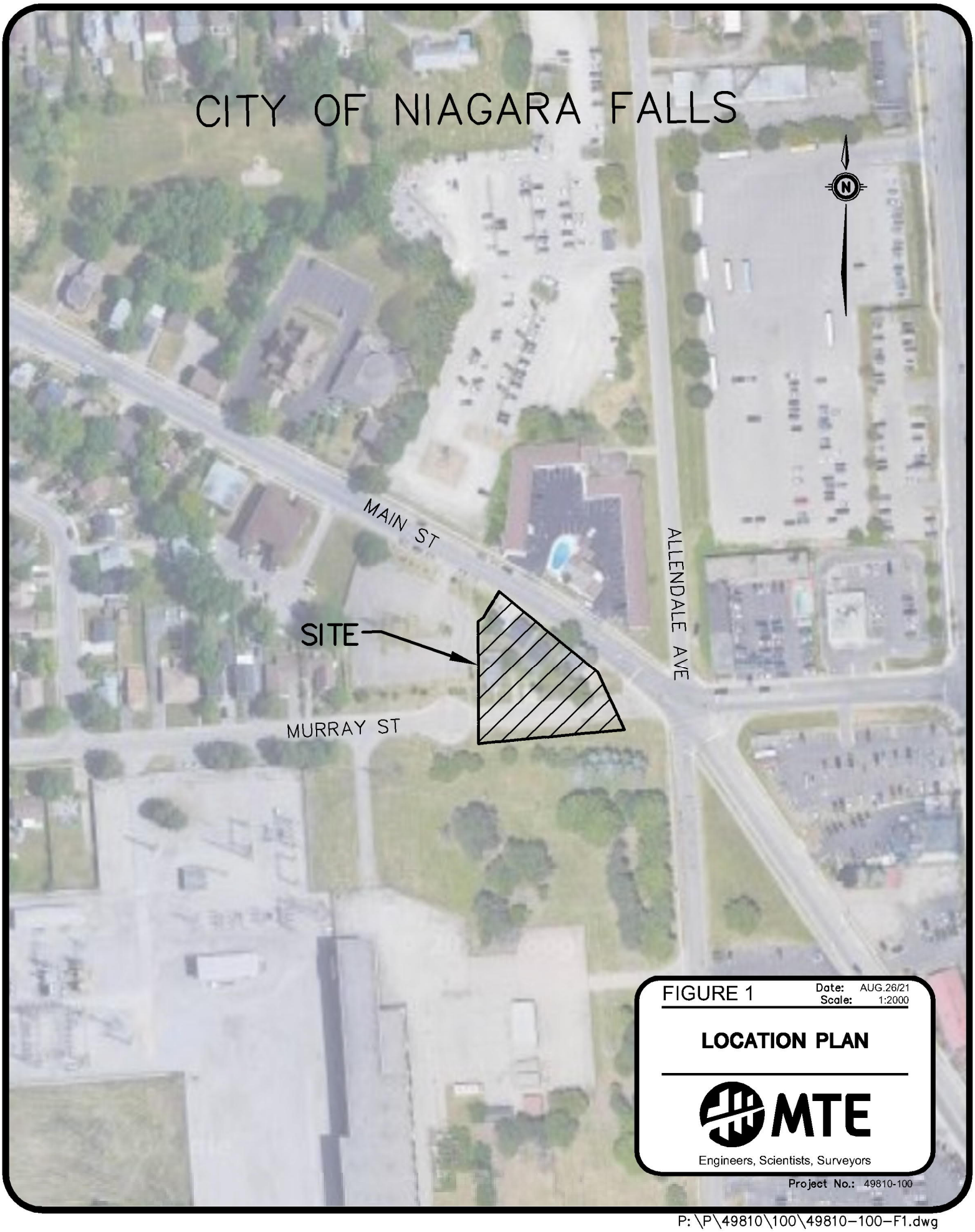

FIGURE 1

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LOCATION PLAN

MTE
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Project No.: 49810-100

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2.0 Stormwater Management

The following sections will describe the proposed stormwater management (SWM) plan for the proposed development.

2.1 Stormwater Management Criteria

The stormwater management design criteria for the subject site as established by the City of Niagara Falls and Niagara Peninsula Conservation Authority (NPCA) are as follows:

2.1.1 Quantity Control

- Attenuation of the proposed condition peak flow rate to the pre-development peak flow rate for the 5-year storm event.

2.1.2 Quality Control

- Achieve “Normal” (70% TSS removal) quality treatment.

2.2 Pre-Development Conditions

The pre-development condition of the site contained four (4) low density homes and associated paved driveways/walkways. There is an existing 450mm diameter storm sewer within the Murray Street Right-of-Way (ROW) and a 375mm diameter storm sewer within the Main Street ROW at slopes of 1.06% and 0.95%, respectively. There are no existing storm infrastructure on site and as such, no existing direct connections to the existing municipal storm system. The existing site drainage is directed to Murray Street via overland sheet flow. There are no known existing stormwater management quantity or quality controls on site. The existing condition has been defined by one (1) catchment area (see Table 2.1 and Figure 2.0).

MAIN STREET

ALLENDALE AVENUE

101
0.255
62
0.63

N 84° 33' 30" E
99.610

145.60m–450mmø STM @ 1.06%

31.10m–375mmø

LEGEND

CATCHMENT 101

Ex. 375mmø STM — Ex. MH — EXISTING STORM SEWER

EXISTING DIRECTION OF DRAINAGE

101 — ID No
0.255 — AREA (ha.)
62 — % IMP
0.63 — RUNOFF COEFFICIENT

FIGURE 2.0

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PRE-DEVELOPMENT CATCHMENT AREA

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Table 2.1 – Pre-development Catchment Area Parameters

Catchment ID	Description	Area (ha)	% Imp.	Runoff Coef.
101	Existing site	0.255	62	0.63
	TOTAL	**0.255**	**62**	**0.63**

The existing condition was assessed using the Rational Method and the 5-year IDF parameters for the City of Niagara Falls design storm event. Table 2.2 summarizes the sites allowable release rate for the 5-year design storm event which was calculated as follows:

$$Q = 0.00278CiA$$

Where:
Q = runoff rate (m^3/s)
C = runoff coefficient; C_{pre} = 0.63
i = rainfall intensity (mm/hr)
A = site area (ha) = 0.255

Table 2.2 – Pre-Development 5-Year Peak Flow Rate

Design Storm Event	IDF Parameters [A]			Allowable Release Rate Q (m^3/s)
	A	B	C	
5-year	720	6.3	0.77	0.037 [B]

[A] IDF parameters from NPCA Stormwater Management Guidelines Table 8.1.2 provided in Appendix C

[B] $i=\frac{a}{(T_c+b)^c}$, T_c= 10 min, Q = 0.00278CiA

2.3 Proposed Conditions

In the proposed condition, the proponent plans to construct a 20 storey residential building as described earlier in this report. The proposed condition drainage pattern is delineated by three (3) catchment areas. Since the proposed building footprint comprises of the majority of the site, stormwater will be collected by an internal storm piping system within the building that will capture and convey flows to the existing 450mm diameter storm sewer along Murray Street. Stormwater management controls proposed include an underground storage tank with orifice controls within the P1 level and one flow control drain (FCRD) on the roof. The FCRD will be implemented upstream on the proposed mechanical penthouse rooftop before discharging into the storage tank. This combination of stormwater management measures will control the proposed condition 5-year discharge rate to the existing condition 5-year discharge rate.

Table 2.3 provides a brief description of each catchment area as well as the size and impervious cover associated with each. Figure 3 provides an illustration of the proposed development catchment areas. Appendix A contains detailed information pertaining to the stormwater management model.

Table 2.3 - Proposed Condition Catchment Areas Parameters

Catchment ID	Description	Area (ha)	%Imp.
201	Rooftop ponding (Controlled)	0.01	99
202	Portion of rooftop, parking lot and driveway (Controlled)	0.22	99
203	Perimeter sidewalk, asphalt and landscape area runoff (Uncontrolled)	0.03	95
	Total	**0.26**	**99**

Catchment 201

Catchment 201 represents the proposed building mechanical penthouse roof where ponding is allowed. One (1) flow control drain (FCRD) is proposed. Stormwater runoff from this area will be collected by an internal storm piping system within the building that will capture and convey flows to the on-site storage tank, prior to out letting to the existing 450mm diameter storm sewer on Murray Street.

Catchment 202

Catchment 202 represents the roof area of the proposed building roof with no ponding, parking lot and driveways.

Catchment 203

Catchment 203 represents the northwest side of the proposed building that has landscaped areas and pedestrian walkways. Stormwater runoff from these areas will drain uncontrolled via overland sheet flow to Main Street ROW. All stormwater runoff draining to the Main Street ROW ultimately discharges to the existing downstream 450mm diameter storm sewer within Murray Street. In addition, this catchment include a small portion of landscaped area along the west property line that drains uncontrolled via overland sheet flow to Murray Street ROW.

Table 2.4 and 2.5 summarizes the stage-storage-discharge relationship for the roof ponding and underground storm tank, respectively. This information was used in the hydrologic model.

Table 2.4 – Stage-Storage-Discharge Calculations for Rooftop Ponding (Catchment 201)

Depth (m)	Storage Volume (m^3) [A]	Discharge, Q (m^3/s)[B]	Comments
0.000	0.0	0.00000	Building Roof
0.050	1.6	0.00074	0.050m (2 inches) ponding
0.100	5.4	0.00149	0.100m (4 inches) ponding
0.150	9.7	0.00223	0.150m (6 inches) ponding

[A] Refer to Appendix A for detailed volume calculations. Roof slope assumed to be 1%.
[B] Discharge based on ***1 roof drain*** with a discharge of 0.378 L/s per inch of head (per notch per drain). Note that FCRD is to have **one (1) notch.**

MAIN STREET

PROP. AIR VENT

PROPOSED UNDERGROUND STORM TANK WITHIN P1 LEVEL. REFER TO C2.2 FOR MORE INFORMATION

MH6-OGS EF04

CBMH5

MH1

MH2

MH3

CB1

MH4

201
0.01
99

202
0.22
99

203
0.03
95

Knights Inn Motel

Asphalt Drive

Concrete Sidewalk

Concrete Curb

Concrete Walk

Curb Cut

Overhead Wires

Property Line

Parking Lot

Board Fence

Asphalt Sidewalk

Bottom of Bank

Ex. CB T/G=205.05

Ex. CB T/G=205.08

Ex. MH T/G=205.19 SE INV=202.925±

Ex. CB T/G=204.99

Ex. CB T/G=205.02

Ex. H MH T/G=204.39

Ex. H MH T/G=204.83

N 84° 33' 30" E 99.610

N 58° 29' 00" E 60.649

N 13° 51' 30" E 14.334

N 45° 02' E 2.52

N 03° 39' 22" E 4.584

N 03° 38' W 17.764

N 05° 26' 30" W 24.369

LEGEND

- EXISTING STORM SEWER (Ex. 375mmø STM — Ex. MH)
- EXISTING BUILDING
- EXISTING TREE
- PROPOSED BUILDING
- OVERHEAD DOOR
- MAN DOOR
- CONCRETE CURB (DROP CURB)
- LIMIT OF UNDERGROUND PARKING
- LIMIT OF TOWER ABOVE
- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- STORM SEWER (MH — 21.3m–300mmø STM @ 1.3%)
- EXISTING DIRECTION OF DRAINAGE
- OVERLAND FLOW ROUTE (MAJOR STORM)

201 — ID No.
0.01 — AREA (ha.)
99 — % IMP

FIGURE 3.0

Date: AUG.31/21
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POST-DEVELOPMENT CATCHMENT AREA

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November 29, 2023 — 2:52 p.m. — Plotted By: CManiya

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Table 2.5 - Stage-Storage-Discharge Calculations for Underground Storm Tank (Catchment 202)

Elevation (m)	Head, H (m)	Cumulative Storage Volume (m^3)[A]	Discharge Q (m^3/s)[B]	Comments
200.30	0.00	0.0	0.0000	Inside Bottom of Tank/Orifice Invert
200.36	0.00	1.7	0.0000	C/L of Orifice
201.00	0.64	21.0	0.0213	
201.70	1.34	42.0	0.0308	Top of Tank

[A] Storage volume based on underground storage tank. See Appendix A for more details.
[B] From orifice equation $Q = CA(2gH)^{0.5}$ for a 110mm diameter orifice plate
Where: C = 0.63, A = cross-sectional area, g = 9.81, H = pressure head

The proposed conditions were assessed using the SWMHYMO hydrologic modeling program developed by J.F. Sabourin & Associates for the 5-year City of Niagara Falls design storm. Appendix A contains detailed hydrologic modeling parameters and input/output printouts for the proposed condition.

Table 2.6 summarizes the proposed condition 5-year peak discharge rate for the site with the aforementioned stormwater management controls and compares it to the 5-year existing condition discharge rate (i.e. allowable discharge rate). Table 2.7 summarizes the proposed condition storage volume requirements and storage volume provided by the underground storm tank and roof ponding. The underground storm tank will provide sufficient storage volume to retain stormwater runoff up to the 5-year storm event prior to being released into the existing 450mm diameter storm sewer within Murray Street. Major flows (over the 5-year event) will be safely conveyed to the Murray Street ROW.

Table 2.6 - Proposed Condition Peak Discharge Rate

Storm Event	Proposed Condition			Allowable 5-Year Existing Condition Peak Discharge Rate (Catchment 101) (m^3/s)[B]
	Peak Discharge Rate - Controlled (Catchment 201+ 202) (m^3/s)[A]	Peak Discharge Rate - Uncontrolled (Catchment 203) (m^3/s)[A]	Total Peak Discharge Rate from Site (m^3/s)[A]	
5-yr	0.025	0.009	**0.032**	**0.037**

[A] Discharge rate taken from SWMHYMO Output (See Appendix A).
[B] See Table 2.2

The 5-year proposed condition peak discharge rate for the site are within the 5-year allowable release rate as illustrated in Table 2.6.

Table 2.7 - Proposed Conditions Storage Volume Requirements Summary (Storm Tank)

Storm Event	Storm Tank (Catchment 201)	
	Storage Volume Req.[A] (m^3)	Total Storage Volume Provided (m^3)[B]
5-yr	30.38	51.70

[A] Storage volume taken from SWMHYMO Output (see Appendix A).
[B] See Table 2.4 & 2.5

The analysis indicates the following:

- The total proposed condition peak discharge rate is less than the existing condition peak discharge rate for the 5-year storm event as illustrated in Table 2.6.
- Sufficient storage volume is provided within the roof ponding and underground storage tank to contain the 5-year storm event for the contributing catchment area 201 and 202.

2.3.1 Private Storm Service Connection

A proposed 250mm diameter private storm service at a slope of 4.0% will outlet into the existing 450mm diameter sewer within the Murray Street ROW. The proposed storm service will have a full flow capacity of approximately 118.9L/s which is greater than the proposed 5-year controlled peak discharge rate of 32L/s from the proposed orifice. Therefore, the proposed storm service will have sufficient capacity to convey the proposed 5-year controlled peak flow rate from the site.

The existing 450mm diameter storm sewer within the Murray Street easement south of the subject site is proposed to be re-aligned due to the footprint of the proposed development.

Refer to MTE Dwg C1.1 for the removals plan and Dwg C2.2 for further site servicing details.

2.3.2 Water Quality Control

Water quality control for the proposed development will be provided by a Stormceptor oil/grit separators (or approved equivalent) that will be installed at the downstream end of the stormwater management system prior to outletting to the 450mm diameter sewer within Murray Street. The following parameters were used to size the oil/grit separators:

- Upstream Catchment Area = 0.23ha (Catchments 201+202);
- % Impervious = 100%; and,
- Particle Distribution = FINE.

The analysis indicates that a Stormceptor EFO4 will provide 93% TSS Removal and treat over 90% of the average annual runoff for the development area, which meets the requirements for an “Enhanced” (Level 1 or 80% TSS removal) level of water quality protection. Stormceptor sizing output information is included in Appendix A.

A maintenance program consisting of periodic inspections and cleaning of the EFO unit is recommended (minimum once per year). A copy of the Owner’s and Technical operation and maintenance manuals for the EFO unit are provided in Appendix A.

Due to grading constraints and the nature of the proposed development with the building consisting of the majority of the subject site, there are limited opportunities for proposed low impact development (LID) features on the site. As such, the proposed OGS units will be the only form of quality control proposed.

2.4 Sediment and Erosion Control

Sediment and erosion control measures will be implemented on site during construction and will conform to the Erosion & Sediment Control Guideline for Urban Construction.

Sediment and erosion control measures will include:

- Installation of silt control fencing at strategic locations around the perimeter of the site where feasible;

- Preventing silt or sediment laden water from entering inlets (catchbasins / catchbasin manholes) by installing silt sacks; and,
- Maintaining sediment and erosion control structures in good repair (including periodic cleaning as required) until such time that the Engineer or City of Niagara Falls approves their removal. Erosion control measures to be inspected daily and after any rainfall event.

Additional details will be provided on the engineering drawings at the time of detailed design.

3.0 Sanitary Sewer Servicing

3.1 Existing Conditions

There is an existing 250mm diameter sanitary sewer flowing west within Murray Street at a slope of 3.41%. This sewer has a full flow capacity of approximately 109.75 L/s. Capacity is based on Manning's Roughness of 0.013.

3.2 Sanitary Demands

The anticipated sanitary discharge rate from the proposed addition was conservatively estimated using the Ontario Building Code (OBC). The estimated population count is summarized in Table 3.1. The estimated population count is used to calculate the peaking factor. The sanitary sewer discharge rates from the development are summarized in Table 3.2 and detailed calculations are found in Appendix B.

Table 3.1 – Population Estimate

Occupancy Types	Total Number of Units [A]	People per unit [B]	Population (people)[C]
Proposed Condo			
1 Bedroom units	114	2	228
2 Bedroom units	74	4	296
Townhouse	5	4	20
		Total Estimated Population	**544**

[A] Number of units provided on Chamberlin Architect site plan dated December 2023.
[B] Population density based on OBC Occupancy Loads Section 3.1.17.1. clause 1b) (2 persons per bedroom)
[C] Population calculated as (Total # of Units) X (Persons per Unit)

Table 3.2 - Sanitary Sewer Discharge from Site

Occupancy Types	Population Estimate [A]	Average Flow (L/s)[B]	Peak Flow (L/s)[C]
Proposed Condo			
1 bedroom units	228	0.726	2.870
2 bedroom units	296	0.942	3.726
Townhouse	20	0.064	0.252
Total Peak Sanitary Demand for Site [E]			6.848 [G]
Total Peak Sanitary Demand for Site (with infiltration allowance) [G]			**6.894 [H]**

[A] Room and population estimate: see Table 3.1
[B] Average flow for residential based on 275 L/d/person. (OBC Table 8.2.1.3.A)
[C] Peak flow = Average Flow*PF, where Harmon Peaking Factor (PF) = 1+(14/(4+P^(1/2))) where P = design population in thousands
Condo Harmon Peaking Factor (PF) = 4.0
[E] Total Peak flow = Peak flow from Condo = 2.870 + 3.726 + 0.252 = 6.848 L/s
[G] Total Peak flow with infiltration = Total Peak flow + infiltration allowance = 6.848 + 0.046 = 6.894 L/s
Where infiltration is based on 0.18 l/s/ha (City of Niagara Falls). Site Area (0.25 ha), I = 0.18*0.255= 0.046 L/s

3.3 Proposed Sanitary Servicing Plan and Capacity Analysis

As calculated in Table 3.2, the total peak sanitary discharge from the site is 6.894 L/s.

The proposed building will be serviced by a 200mm diameter sanitary service at 2.1% slope with a full flow capacity of 46.36 L/s that will connect to the existing 250mm diameter sanitary sewer within the Murray Street ROW. The calculated sanitary peak discharge rate of 6.894 L/s (per Table 3.2) is less than the capacity of the existing 250mm diameter sewer (109.75 L/s).

4.0 Domestic and Fire Water Supply Servicing

4.1 Existing Condition

The existing municipal water distribution system around the site consists of 200mm diameter watermains within the Main Street ROW. There is also a 150mm diameter and 600mm diameter watermain within Murray Street ROW.

4.2 Domestic Water Demands

The expected domestic water demand for the proposed development was estimated using the Niagara Region design criteria and Ontario Building Code. Table 4.1 summarizes the domestic water demand requirements for the Average Day, Maximum Day and Peak Hour demand scenarios.

Table 4.1 - Domestic Water Demands

Proposed Condo Demands		
Population:	544 people (see Table 3.1)	
Average Day Demand: [1]	0.0027 L/s/person x 544 people =	***1.442 L/s***
Maximum Day Demand: [1]	1.44 x 1.58L/s =	***2.406 L/s***
Peak Hour Demand: [1]	1.44 x 4.00 L/s =	***5.767 L/s***
[1] Refer to Appendix B for detailed calculations.		

4.3 Fire Flow Demands

Fire flow demands for the proposed development were determined using the methodology outlined in Water Supply for Public Fire Protection (Fire Underwriters Survey (FUS), 2020). The fire flow for the proposed building was evaluated. The fire demand is summarized in Table 4.2 and detailed calculations are provided in Appendix C.

Table 4.2 - FUS Fire Flow Requirements

Building	Fire Underwriters Survey (FUS) Flow Rate
Proposed building	125 L/s (7,500 L/min)
Proposed building + max day demand	**127.41 L/s (7,645 L/min)**

4.4 Proposed Water Servicing Plan and Analysis

The water service for the site will connect to the existing 200mm watermain within the Main Street ROW. At the detailed design stage, the Mechanical consultant will confirm the watermain size requirements. The City of Niagara Falls requires water distribution systems to maintain a minimum residual pressure of 140kPa (20psi) when subject to fire flow demands and 275kPa (40psi) when subject to normal operating conditions. A hydrant flow test will be required during detailed design to confirm that the available system pressure meets these requirements.

5.0 Conclusions

Based on the information provided herein, it is concluded that the development can be constructed to meet the requirements of the City of Niagara Falls and Niagara Region. Therefore, it is recommended that:

i. Rooftop storage complete with flow control drains and an underground storm tank to be provided to control the proposed condition stormwater site discharge rate to the allowable release rate as described in Section 2.3 of this report;

ii. Erosion and sediment controls be installed as described in Section 2.4 of this report;

iii. Sanitary servicing for the development be installed as described in Section 3.3 of this report;

iv. Water servicing for the development be installed as described in Section 4.4 of this report; and,

v. The proposed stormwater management plan presented in this report and the site servicing works described in this report and as shown on Drawings C1.1, C2.1, C2.2 and C2.3 be accepted in support of the OPA and Zoning By-law Application.

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.

All of which is respectfully submitted,

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Appendix A

STORMWATER MANAGEMENT CALCULATIONS & MODEL

Main Street & Murray Street
NIAGARA FALLS, ONTARIO
STORMWATER MANAGEMENT

Design Storm Information and Allowable Release Rate

Design storm information used in the hydrologic modeling was based on Chicago Storm distribution Intensity-Duration-Frequency (IDF) equations for the City of Niagara Falls [(A)] in the form:

$$i = \frac{A}{(t+B)^C}$$

Where: i = Rainfall intensity (mm/hr)
t = Time of duration (min)
A, B and C = Constant (see below)

The value of the parameters for the various storm events is provided below:

Constant	2-Yr. [(B)]	5-Yr.	10-Yr.	25-Yr.	100-Yr.
A	522	720	578	1021	1265
B	5.3	6.3	2.5	7.3	7.7
C	0.76	0.77	0.67	0.78	0.78

[(A)] IDF parameters from NPCA Stormwater Management Guidelines Table 8.1.2 provided

[(B)] IDF equations used to generate rainfall files with Duration (TD) = 3 hours

$$Q = 0.002778\,CiA$$

Site Area= 0.255 ha
C = 0.63

Existing Conditions Peak Flow Rates

	2-Yr. [(B)]	5-Yr.	10-Yr.	25-Yr.	100-Yr.
i (mm/hr)	66.08152	84.02411	106.7844	110.073	133.9346
Q (m^3/s)	0.029	0.037	0.048	0.049	0.060

Main Street & Murray Street
NIAGARA FALLS, ONTARIO
STORMWATER MANAGEMENT

PROPOSED CONDITIONS HYDROLOGIC MODELING PARAMETERS

Catchment ID	Catchment Description	Hydrograph Method	Area (ha)	Perv. CN	Perv. Ia (mm)	Impervious (%)		Flow Length (m)		Manning "n"		Slope (%)		Time to Peak Tp (hrs)
						TIMP	XIMP	Perv.	Imperv.	Perv.	Imperv.	Perv.	Imperv.	
201	Rooftop ponding (controlled)	STANDHYD	0.01	74	8.92	99	99	1	10	0.250	0.013	1.0	1.0	
202	Portion of rooftop, parking lot and driveway (controlled)	STANDHYD	0.22	74	8.92	99	99	1	43	0.250	0.013	1.0	8.0	
203	Uncontrolled Area	STANDHYD	0.03	74	8.92	95	95	7	2	0.250	0.013	2.0	2.0	
Total			**0.255**			**99**								

- Pervious Initial Abstraction (Perv. Ia) = 0.1 x S , where S = (25400 / CN) - 254
- Depression Storage over Impervious areas (DPSI) = 1.0 mm

Main Street& Murray Street
NIAGARA FALLS, ONTARIO
STORMWATER MANAGEMENT

Stage-Storage-Discharge Relationship Rooftop Flow Controls

Proposed Building A (Catchment 201)

Total Roof Area = 625.5

Total Roof Area Avail for Ponding= 90 m^2

Number of roof drains = 1 (min. # drains = 1 per 900m^2)

Drain discharge = 0.015 l/s/mm head (0.378 l/s per inch of head per notch) - 1 Notch on ea

Head (mm)	Area (m^2)	Incremental Volume (m^3)	Cumulative Volume (m^3)	Total Discharge (m^3/s)
0	0	0	0.0	0
50	65	1.6	1.6	0.00074
100	84	3.7	5.4	0.00149
150	90	4.4	9.7	0.00223

Notes:
-1% slope was assumed

Main Street & Murray Street
Niagara Falls, Ontario
STORMWATER MANAGEMENT

Project Number: 49810-100
Date: December 7, 2023
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Orifice Calculations for Catchment 202

$Q_o=C_d*A_o*(2*g*H_o)^{0.5}$

	Orifice	Description
C_d	0.63	Orifce Plate
Invert (m)	200.3	
CL elevation (m)	200.36	
Diameter (mm)	110	
Type (H/V)	V	

STAGE-STORAGE-DISCHARGE RELATIONSHIP

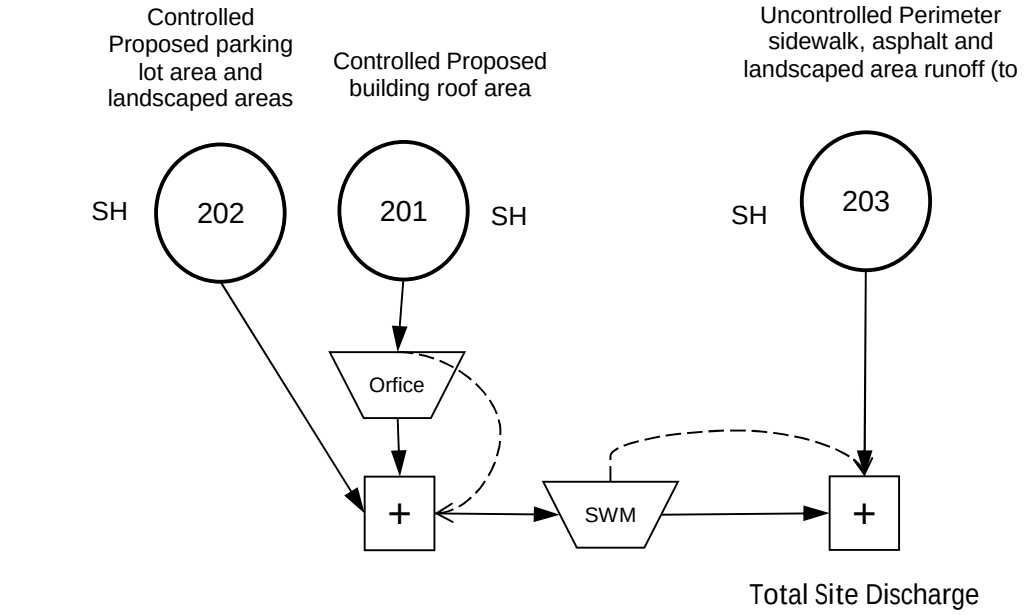
Description	Stage	Incremental Volume	Cumulative Volume	Orifice		
				Orifice Area	H_o	Flow
	m	m^3	m^3	m^2	*m*	m^3/s
Bottom of Tank/Orifice Invert	200.30	0.0	0.0	0.010	0.00	0.0000
C/L of Orifice	200.36	1.7	1.7	0.010	0.00	0.0000
	201.00	19.3	21.0	0.010	0.64	0.0213
Top of Tank	201.70	21.0	42.0	0.010	1.34	0.0308

Stormwater Tank Details	
Inside Dimensions in Tanks	Tank
Surface area (m^2)	30.0
height (m)	1.40
Vol provided (m^3)	42.0

5-year volume required for tank (taken from SWMHYMO)= **28.74**
5-year Water Level (m)= **201.26**
Freeboard (m)= **0.44**

Main Street & Murray Street
Niagara Falls, Ontario
STORMWATER MANAGEMENT

PROPOSED CONDITIONS MODEL SCHEMATIC



LEGEND

201 — Catchment Area

SWM — Route Reservoir

\+ — Add Hydrographs

- "NH" denotes NASHYD hydrograph command
- "SH" denotes STANDHYD hydrograph command

```
2     Metric units
*#*************************************************************************|
*#  Project Name: MURRAY STREET & MAIN STREET
*#               NIAGARA FALLS, ONTARIO
*#  JOB NUMBER  : 49810-100
*#       Date   : SEPT 2021
*#  Modeller    : SAH
*#    Company   : MTE CONSULTANTS INC.
*#       File   : 49810-100.DAT
*
*%-----------------|-------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
                    ["3H_005.stm"]
READ STORM          STORM_FILENAME=["STORM.001"]
*#########################################################################|
*#
*#                     POST DEVELOPMENT HYDROLOGIC MODELING
*#               ================================================
*#
*#########################################################################|
*AREA 201 - Proposed Roof - Controlled
*#*************************************************************************|
CALIB STANDHYD      ID=[1], NHYD=["201"], DT=[1.0](min), AREA=[0.01](ha),
                    XIMP=[0.99], TIMP=[0.99], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[74],
                    Pervious   surfaces: IAper=[8.92](mm), SLPP=[1.0](%),
                                         LGP=[1](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[1.0](%),
                                         LGI=[15](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ , , , , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*# ROUTE THROUGH ROOF STORAGE
*
ROUTE RESERVOIR     IDout=[2],   NHYD=["PONDING"],  IDin=[1],
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                   (cms) - (ha-m)
 0.00000   0.00000
 0.00074   0.00016
 0.00149   0.00054
 0.00223   0.00097
                                    -1       -1   (max twenty pts)
                          IDovf=[3], NHYDovf=["OVERFLOW"]
*%-----------------|-------------------------------------------------------|
*#*************************************************************************|
*# CATCHMENT 202 - Drainage to tank
*#*************************************************************************|
CALIB STANDHYD      ID=[4], NHYD=["202"], DT=[1.0](min), AREA=[0.22](ha),
                    XIMP=[0.99], TIMP=[0.99], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[74],
                    Pervious   surfaces: IAper=[8.92](mm), SLPP=[1.0](%),
                                         LGP=[1](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1](mm), SLPI=[8.0](%),
                                         LGI=[43](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*TOTAL FLOW TO TANK
ADD HYD             IDsum=[5], NHYD=["TANK"], IDs to add=[2,3,4]
*%-----------------|-------------------------------------------------------|
*# ROUTE THROUGH TANK ORIFICE
*
ROUTE RESERVOIR     IDout=[6],   NHYD=["ORIFICE"],  IDin=[5],
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                   (cms) - (ha-m)
 0.00000   0.00000
 0.00000   0.00017
 0.02130   0.00210
 0.03076   0.00420

                                    -1       -1   (max twenty pts)
                          IDovf=[7], NHYDovf=["OVERFLOW"]
*%-----------------|-------------------------------------------------------|
*#*************************************************************************|
*# CATCHMENT 203 - Uncontrolled Drainage
*#*************************************************************************|
CALIB STANDHYD      ID=[8], NHYD=["203"], DT=[1.0](min), AREA=[0.03](ha),
                    XIMP=[0.95], TIMP=[0.95], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[74],
                    Pervious   surfaces: IAper=[8.92](mm), SLPP=[2.0](%),
                                         LGP=[2](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1](mm), SLPI=[2.0](%),
                                         LGI=[2](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*TOTAL FLOW LEAVING THE SITE
ADD HYD             IDsum=[9], NHYD=["SITE"], IDs to add=[6,7,8]
*%-----------------|-------------------------------------------------------|
*
* RUN REMAINING DESIGN STORMS (City of Niagara Falls 3-hour 5 -YR)
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
                    ["3H_005.stm"]

*%-----------------|-------------------------------------------------------|
FINISH
```

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO            9      9   =========
                                                          9   9  9   9   # 3053466
        StormWater Management HYdrologic Model            999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********               OTTHYMO-83 and OTTHYMO-89.                    *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
 +++++++++               Burlington          SERIAL#:3053466         +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
 *********          Maximum value for ID numbers :    10              *********
 *********          Max. number of rainfall points: 105408            *********
 *********          Max. number of flow points    : 105408            *********
 ********************************************************************************


 *********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2023-11-16     TIME: 15:17:05     RUN COUNTER: 000520         *
 ********************************************************************************
 * Input   filename: P:\P\49810\100\WORKING\RNC\2023-0~1\SWMHYMO\49810-~1.DAT  *
 * Output  filename: P:\P\49810\100\WORKING\RNC\2023-0~1\SWMHYMO\49810-~1.out  *
 * Summary filename: P:\P\49810\100\WORKING\RNC\2023-0~1\SWMHYMO\49810-~1.sum  *
 * User comments:                                                             *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

--------------------------------------------------------------------------------
001:0001----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: MURRAY STREET & MAIN STREET
*#               NIAGARA FALLS, ONTARIO
*#  JOB NUMBER  : 49810-100
*#       Date   : SEPT 2021
*#  Modeller    : SAH
*#    Company   : MTE CONSULTANTS INC.
*#       File   : 49810-100.DAT
*
  ** END OF RUN :   4

********************************************************************************




--------------------
| START            |  Project  dir.: P:\P\49810\100\WORKING\RNC\2023-0~1\SWMHYMO
--------------------  Rainfall dir.: P:\P\49810\100\WORKING\RNC\2023-0~1\SWMHYMO
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=3H_005.stm
--------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: MURRAY STREET & MAIN STREET
*#               NIAGARA FALLS, ONTARIO
*#  JOB NUMBER  : 49810-100
*#       Date   : SEPT 2021
*#  Modeller    : SAH
*#    Company   : MTE CONSULTANTS INC.
*#       File   : 49810-100.DAT
*
--------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 3 HOUR 5 YEAR CHICAGO STORM
| Ptotal=  38.81 mm|    Comments: 3 HOUR 5 YEAR CHICAGO STORM
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .08   3.603 |    .83  18.297 |   1.58   9.701 |   2.33   4.686
              .17   3.913 |    .92  40.363 |   1.67   8.605 |   2.42   4.449
              .25   4.289 |   1.00 111.263 |   1.75   7.746 |   2.50   4.237
              .33   4.759 |   1.08  51.420 |   1.83   7.055 |   2.58   4.047
              .42   5.363 |   1.17  29.796 |   1.92   6.486 |   2.67   3.875
              .50   6.170 |   1.25  20.894 |   2.00   6.010 |   2.75   3.719
              .58   7.307 |   1.33  16.119 |   2.08   5.605 |   2.83   3.577
              .67   9.039 |   1.42  13.160 |   2.17   5.256 |   2.92   3.446
              .75  12.007 |   1.50  11.152 |   2.25   4.953 |   3.00   3.325


--------------------------------------------------------------------------------
005:0003----------------------------------------------------------------------
*#############################################################################|
*#
*#                     POST DEVELOPMENT HYDROLOGIC MODELING
*#                ==================================================
*#
*#############################################################################|
*AREA 201 - Proposed Roof - Controlled
*#*****************************************************************************|
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .01
| 01:201    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .01          .00
     Dep. Storage     (mm)=      1.00         8.92
     Average Slope     (%)=      1.00         1.00
     Length            (m)=     15.00         1.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=    111.26        15.84
               over (min)         1.00         3.00
     Storage Coeff.  (min)=       .78 (ii)    2.77 (ii)
     Unit Hyd. Tpeak (min)=      1.00         3.00
     Unit Hyd. peak  (cms)=      1.22          .41
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .00          .00          .003 (iii)
     TIME TO PEAK    (hrs)=      1.00         1.03         1.000
     RUNOFF VOLUME    (mm)=     37.81         7.50        37.503
     TOTAL RAINFALL   (mm)=     38.81        38.81        38.808
     RUNOFF COEFFICIENT   =       .97          .19          .966

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0004----------------------------------------------------------------------
*# ROUTE THROUGH ROOF STORAGE
*
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201    )  |
| OUT<02:(PONDIN)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .001  .5400E-03
                           .001  .1600E-03   |     .002  .9700E-03

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     ---------------           (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201    )      .01      .003     1.000     37.503
     OUTFLOW<02: (PONDIN)       .01      .001     1.167     37.501
    OVERFLOW<03: (OVERFL)       .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   24.479
                    TIME SHIFT OF PEAK FLOW         (min)=    10.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.1647E-03

--------------------------------------------------------------------------------
005:0005----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 202 - Drainage to tank
*#*****************************************************************************|
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .22
| 04:202    DT= 1.00 |   Total Imp(%)=   99.00   Dir. Conn.(%)=   99.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .22          .00
     Dep. Storage     (mm)=      1.00         8.92
     Average Slope     (%)=      8.00         1.00
     Length            (m)=     43.00         1.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=    111.26        15.84
               over (min)         1.00         3.00
     Storage Coeff.  (min)=       .79 (ii)    2.78 (ii)
     Unit Hyd. Tpeak (min)=      1.00         3.00
     Unit Hyd. peak  (cms)=      1.22          .40
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .07          .00          .067 (iii)
     TIME TO PEAK    (hrs)=      1.00         1.03         1.000
     RUNOFF VOLUME    (mm)=     37.81         7.50        37.505
     TOTAL RAINFALL   (mm)=     38.81        38.81        38.808
     RUNOFF COEFFICIENT   =       .97          .19          .966

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0006----------------------------------------------------------------------
*TOTAL FLOW TO TANK
------------------------
| ADD HYD (TANK      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                         ID1 02:PONDING      .01     .001    1.17  37.50    .000
                        +ID2 03:OVERFLOW     .00     .000     .00    .00    .000
                        +ID3 04:202          .22     .067    1.00  37.50    .000
                         ==========================================================
                         SUM 05:TANK         .23     .068    1.00  37.50    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
005:0007----------------------------------------------------------------------
*# ROUTE THROUGH TANK ORIFICE
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>05:(TANK  )   |
| OUT<06:(ORIFIC)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .021  .2100E-02
                            .000  .1700E-03   |     .031  .4200E-02

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     ---------------           (ha)     (cms)     (hrs)       (mm)
     INFLOW >05: (TANK  )       .23      .068     1.000     37.504
     OUTFLOW<06: (ORIFIC)       .23      .025     1.100     36.765
    OVERFLOW<07: (OVERFL)       .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   36.469
                    TIME SHIFT OF PEAK FLOW         (min)=     6.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2874E-02
```

```
      *** WARNING: Outflow volume is less than inflow volume.
-------------------------------------------------------------------------------
005:0008--------------------------------------------------------------------------
*#*************************************************************************|
*# CATCHMENT 203 - Uncontrolled Drainage
*#*************************************************************************|
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .03
| 08:203    DT= 1.00 |   Total Imp(%)=   95.00   Dir. Conn.(%)=   95.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .03          .00
     Dep. Storage     (mm)=       1.00         8.92
     Average Slope     (%)=       2.00         2.00
     Length            (m)=       2.00         2.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     111.26        15.84
               over (min)         1.00         3.00
     Storage Coeff.  (min)=        .19 (ii)    2.63 (ii)
     Unit Hyd. Tpeak (min)=       1.00         3.00
     Unit Hyd. peak  (cms)=       1.69          .41
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .009 (iii)
     TIME TO PEAK    (hrs)=        .97         1.03         1.000
     RUNOFF VOLUME    (mm)=      37.81         7.50        36.292
     TOTAL RAINFALL   (mm)=      38.81        38.81        38.808
     RUNOFF COEFFICIENT   =        .97          .19          .935

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
005:0009--------------------------------------------------------------------------
*TOTAL FLOW LEAVING THE SITE
-----------------------
| ADD HYD (SITE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 06:ORIFICE         .23     .025    1.10  36.77    .000
                      +ID2 07:OVERFLOW        .00     .000     .00    .00    .000
                      +ID3 08:203             .03     .009    1.00  36.29    .000
                       ==========================================================
                       SUM 09:SITE            .26     .032    1.00  36.71    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
005:0010--------------------------------------------------------------------------
*
* RUN REMAINING DESIGN STORMS (City of Niagara Falls 3-hour 5 -YR)
*
-------------------------------------------------------------------------------
005:0002--------------------------------------------------------------------------
      FINISH
-------------------------------------------------------------------------------
*******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
 005:0007 ROUTE RESERVOIR
      *** WARNING: Outflow volume is less than inflow volume.
   Simulation ended on 2023-11-16     at 15:17:07
===============================================================================
```

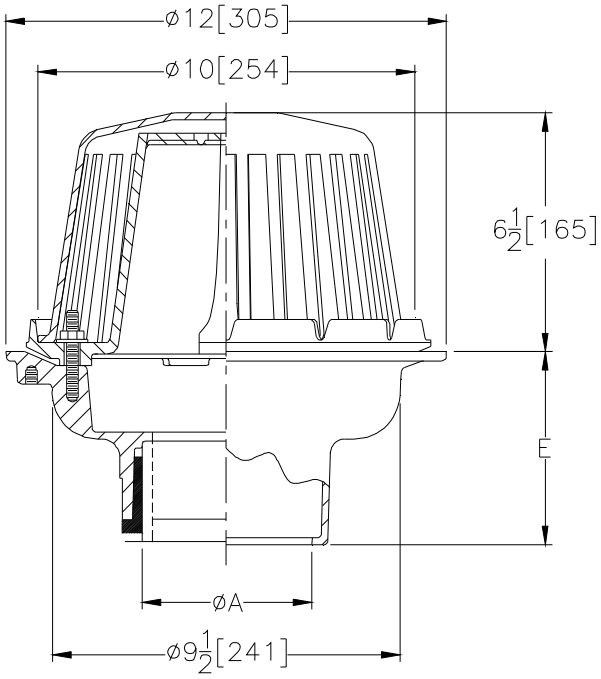
ZCF121

Ø12 [305] CONTROL-FLO ROOF DRAIN

SPECIFICATION SHEET

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



A Pipe Size In. [mm]	Approx. Wt. Lb. [kg]	Dome Open Area Sq. In. [cm²]
2,3,4 [51,76,102]	22 [10]	78 [503]
6 [152]		

ENGINEERING SPECIFICATION: ZURN ZCF121
12" [305mm] diameter "Control-Flo" roof drain for dead-level roof construction, Dura-Coated cast iron body. Combination membrane flashing clamp/gravel guard, aluminum "Control-Flo" weir, and Poly-Dome. "Control-Flo" weir shall be linear functioning with flow rate of 5 GPM [23 LPM] per inch of water buildup above drain. All data shall be verified proportional to flow rates.

OPTIONS (Check/specify appropriate options)

PIPE SIZE

2,3,4,6 [51,76,102,152]
2,3,4,6 [51,76,102,152]
2,3,4,6 [51,76,102,152]
2,3,4 [51,76,102]

(Specify size/type) **OUTLET**

_____ IC Inside Caulk
_____ IP Threaded
_____ NH No-Hub
_____ NL Neo-Loc

E BODY HT. DIM.

5-1/4 [133]
3-3/4 [95]
5-1/4 [133]
4-5/8 [117]

PREFIXES

____ Z D.C.C.I. Body with Poly-Dome*
____ ZA D.C.C.I. Body with Aluminum Dome

SUFFIXES

____ -A Waterproof Flange
____ -AR Acid Resistant Epoxy Coated Finish
____ -C Underdeck Clamp
____ -DP Top Set® Roof Deck Plate (Replaces both the -C and -R)
____ -DR Adjustable Drain Riser Extension Assembly 3-5/8 [92] to 7-1/4 [184]
____ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)
____ -EB Elevating Body Plate
____ -G Galvanized Cast Iron
____ -R Roof Sump Receiver
____ -SC Secondary Clamp Collar
____ -TC Neo-LocTest CapGasket (2,3,4 [51,76,102] NL Bottom Outlet Only)
____ -VP Vandal Proof Secured Top
____ -90 90º Threaded Side Outlet Body (2,3,4 [51,76,102])

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | **Specification Drainage Operation**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

Rev. D
Date: 09/21/2017
C.N. No. 137768
Prod. | Dwg. No. ZCF121

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/29/2023

Province:	Ontario
City:	Niagara
Nearest Rainfall Station:	ST CATHARINES AP
Climate Station Id:	6137287
Years of Rainfall Data:	33

Site Name:	Main & Murray Street

Drainage Area (ha):	0.23
% Imperviousness:	100.00

Runoff Coefficient 'c': 0.90

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	6.44
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	290
Estimated Average Annual Sediment Volume (L/yr):	236

Project Name:	Main & Murray Street
Project Number:	49810-100
Designer Name:	Rosie Calogero
Designer Company:	MTE Consultants
Designer Email:	rcalogero@mte85.com
Designer Phone:	905-580-2133
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	93
EFO6	97
EFO8	99
EFO10	100
EFO12	100

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 93

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 waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

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

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

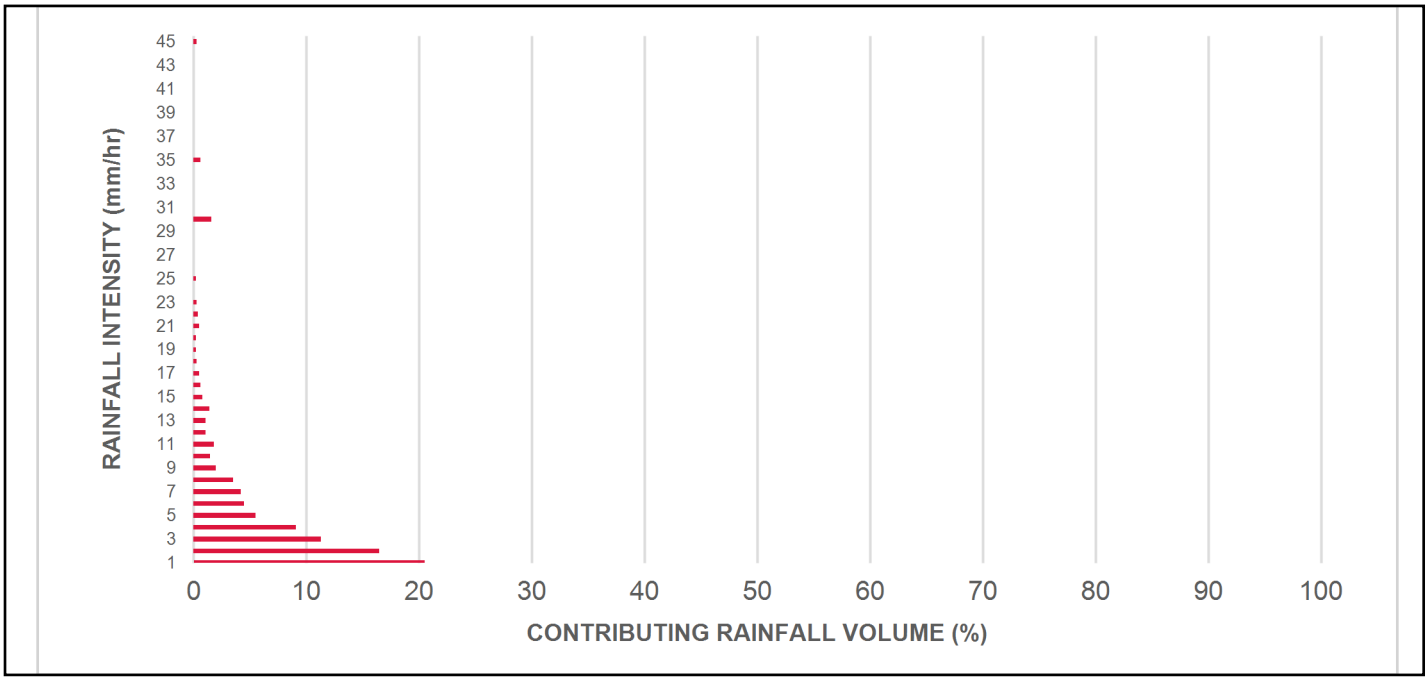
Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	9.2	9.2	0.29	17.0	14.0	100	9.2	9.2
1.00	20.5	29.7	0.58	35.0	29.0	100	20.5	29.7
2.00	16.5	46.2	1.15	69.0	58.0	100	16.5	46.2
3.00	11.3	57.5	1.73	104.0	86.0	98	11.2	57.4
4.00	9.1	66.7	2.30	138.0	115.0	95	8.6	66.0
5.00	5.5	72.2	2.88	173.0	144.0	91	5.0	71.0
6.00	4.5	76.7	3.45	207.0	173.0	87	3.9	74.9
7.00	4.2	80.9	4.03	242.0	201.0	83	3.5	78.4
8.00	3.5	84.4	4.60	276.0	230.0	82	2.9	81.3
9.00	2.0	86.5	5.18	311.0	259.0	81	1.7	83.0
10.00	1.5	88.0	5.75	345.0	288.0	79	1.2	84.1
11.00	1.8	89.8	6.33	380.0	317.0	78	1.4	85.6
12.00	1.1	90.9	6.91	414.0	345.0	77	0.8	86.4
13.00	1.1	92.0	7.48	449.0	374.0	75	0.8	87.2
14.00	1.4	93.4	8.06	483.0	403.0	74	1.1	88.3
15.00	0.8	94.2	8.63	518.0	432.0	72	0.6	88.9
16.00	0.6	94.8	9.21	552.0	460.0	71	0.4	89.3
17.00	0.5	95.3	9.78	587.0	489.0	70	0.4	89.6
18.00	0.3	95.6	10.36	621.0	518.0	69	0.2	89.9
19.00	0.2	95.9	10.93	656.0	547.0	67	0.2	90.0
20.00	0.2	96.1	11.51	691.0	575.0	66	0.2	90.2
21.00	0.5	96.6	12.08	725.0	604.0	65	0.3	90.5
22.00	0.4	97.0	12.66	760.0	633.0	64	0.3	90.8
23.00	0.3	97.3	13.24	794.0	662.0	64	0.2	90.9
24.00	0.0	97.3	13.81	829.0	691.0	64	0.0	90.9
25.00	0.2	97.4	14.39	863.0	719.0	64	0.1	91.0
30.00	1.6	99.1	17.26	1036.0	863.0	63	1.0	92.0
35.00	0.6	99.7	20.14	1208.0	1007.0	62	0.4	92.4
40.00	0.0	99.7	23.02	1381.0	1151.0	58	0.0	92.4
45.00	0.3	100.0	25.90	1554.0	1295.0	55	0.2	92.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**93 %**

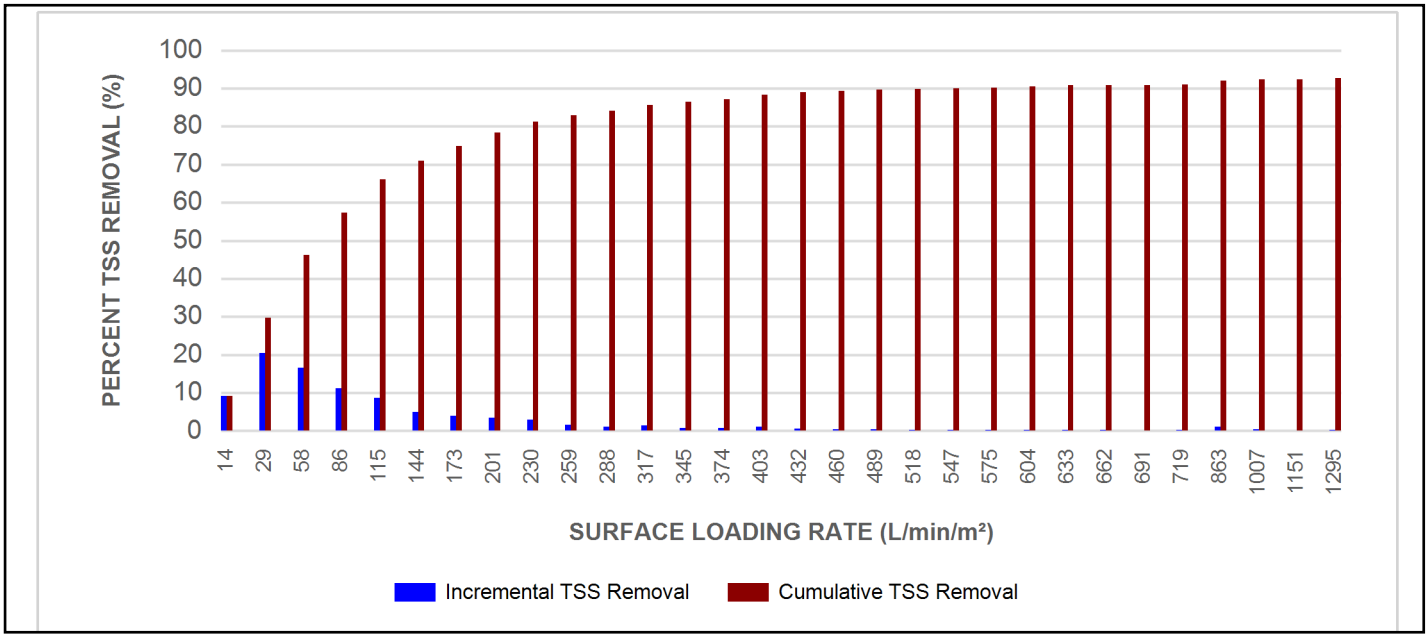
Climate Station ID: 6137287 *Years of Rainfall Data*: 33

imbrium

RAINFALL DATA FROM ST CATHARINES AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

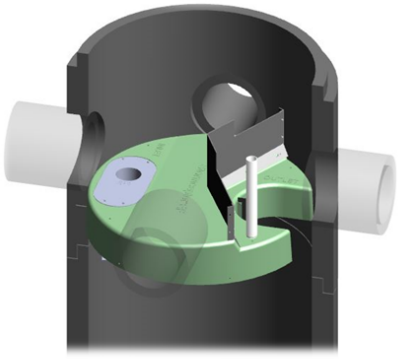
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

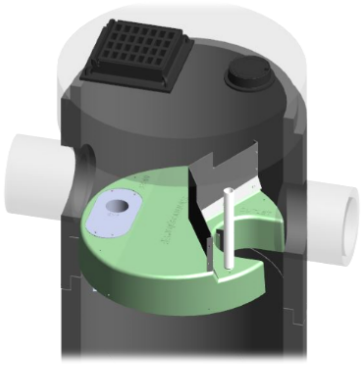
DESIGN FLEXIBILITY

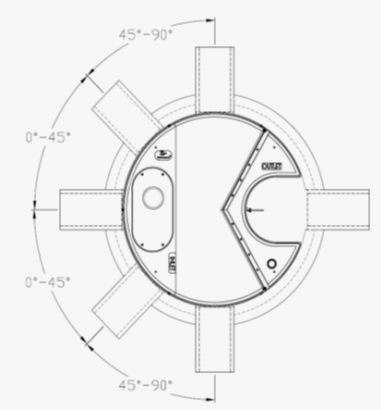
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

HEAD LOSS

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

Pollutant Capacity

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

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

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

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

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

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.**

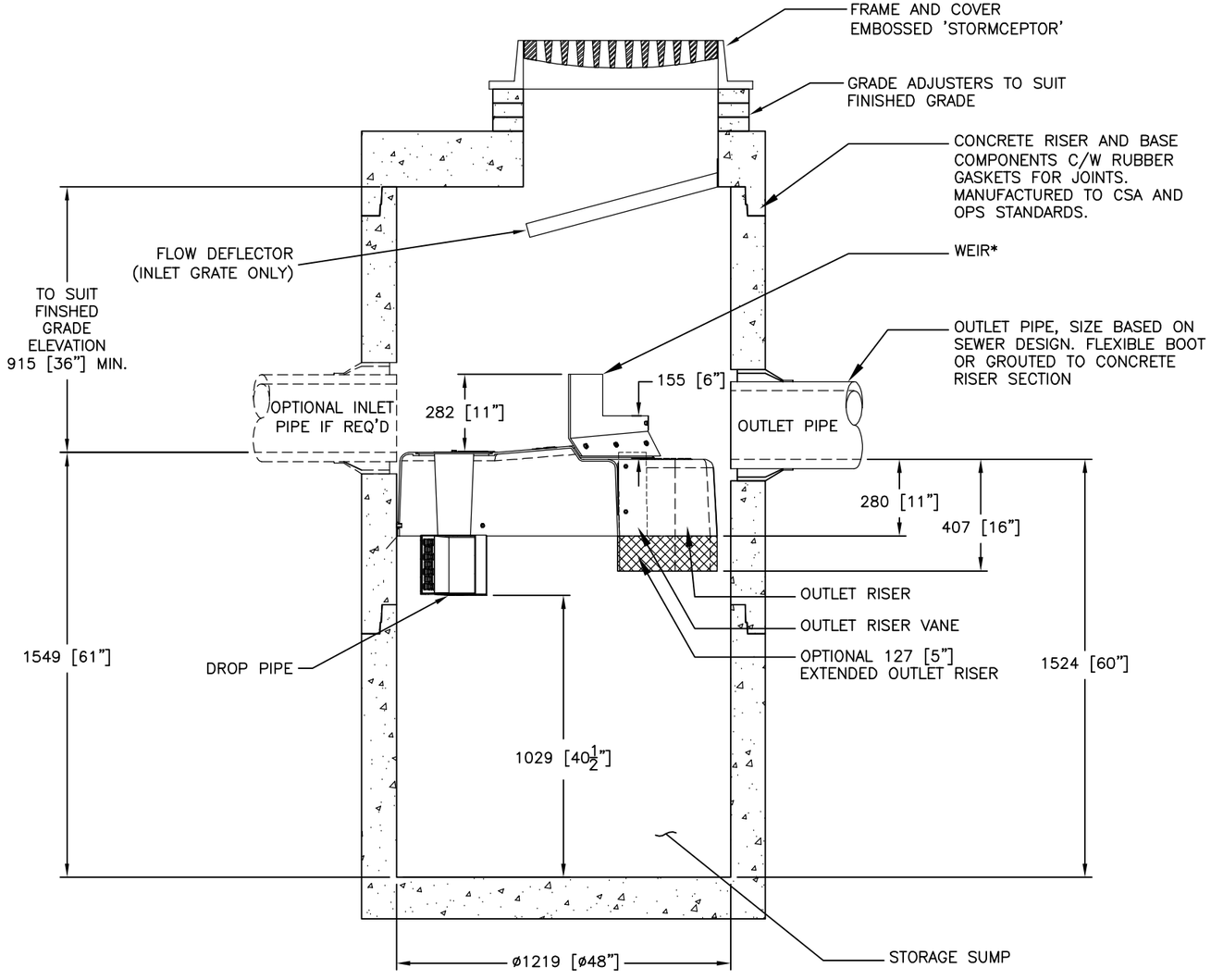
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

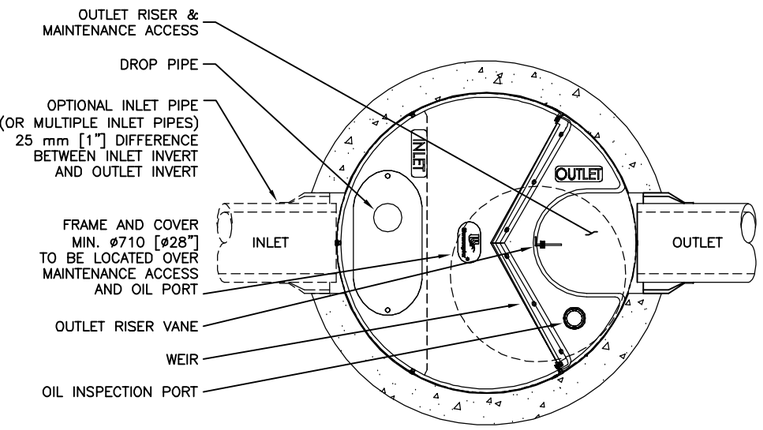
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 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.

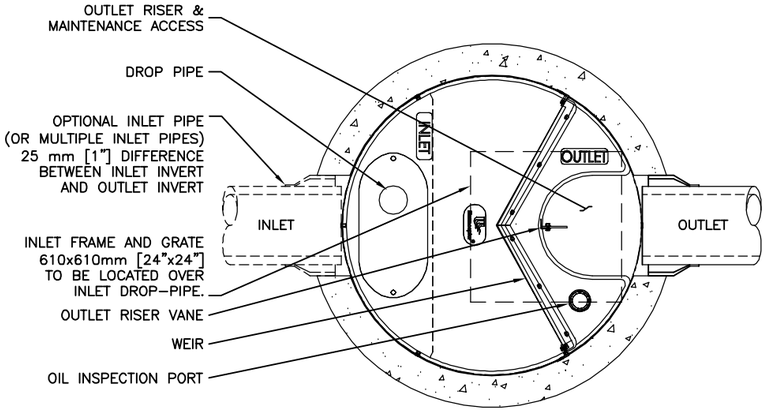
3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five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



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

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

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON, L1N 9A9
TF 800-565-4501 CA 416-800-9000 INTL +1-416-800-9000

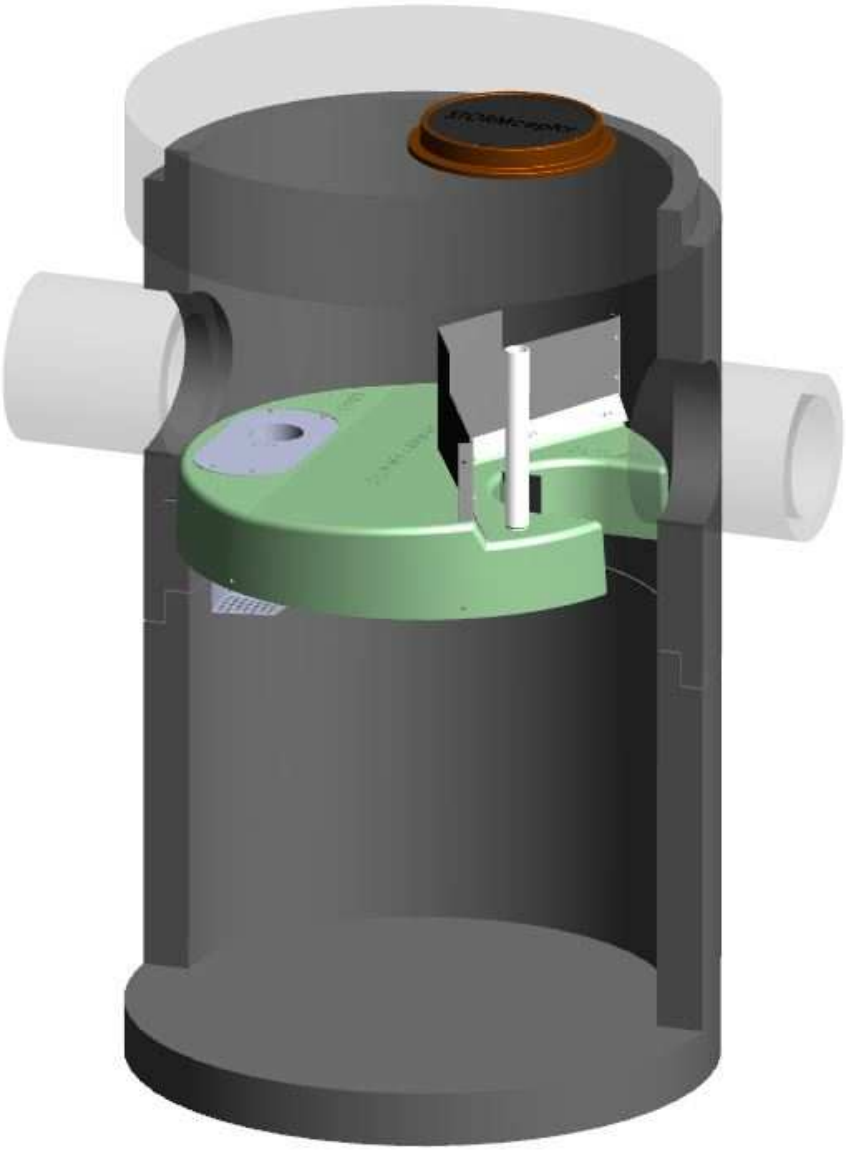
DATE: 10/13/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EFO4	*

SHEET: 1 OF 1

Stormceptor® EF

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

Table of Contents:

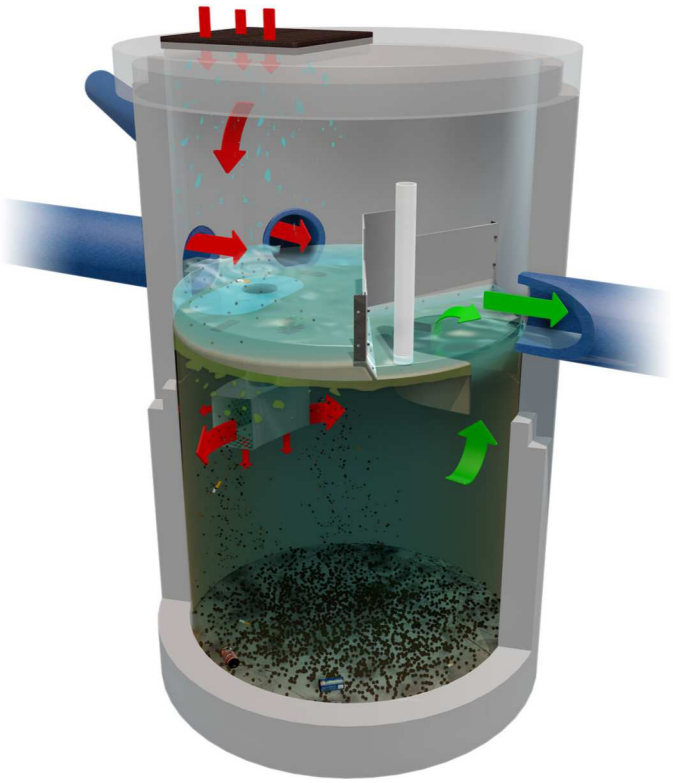
OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



COMPONENTS

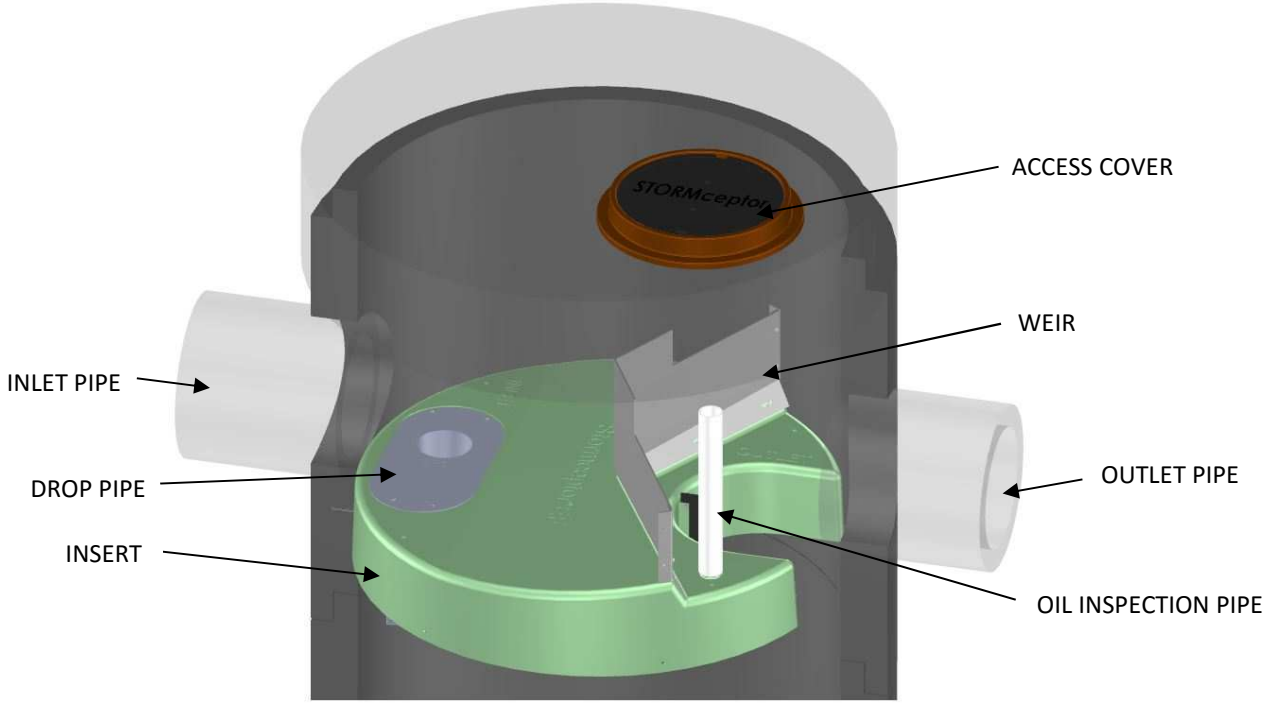


Figure 1

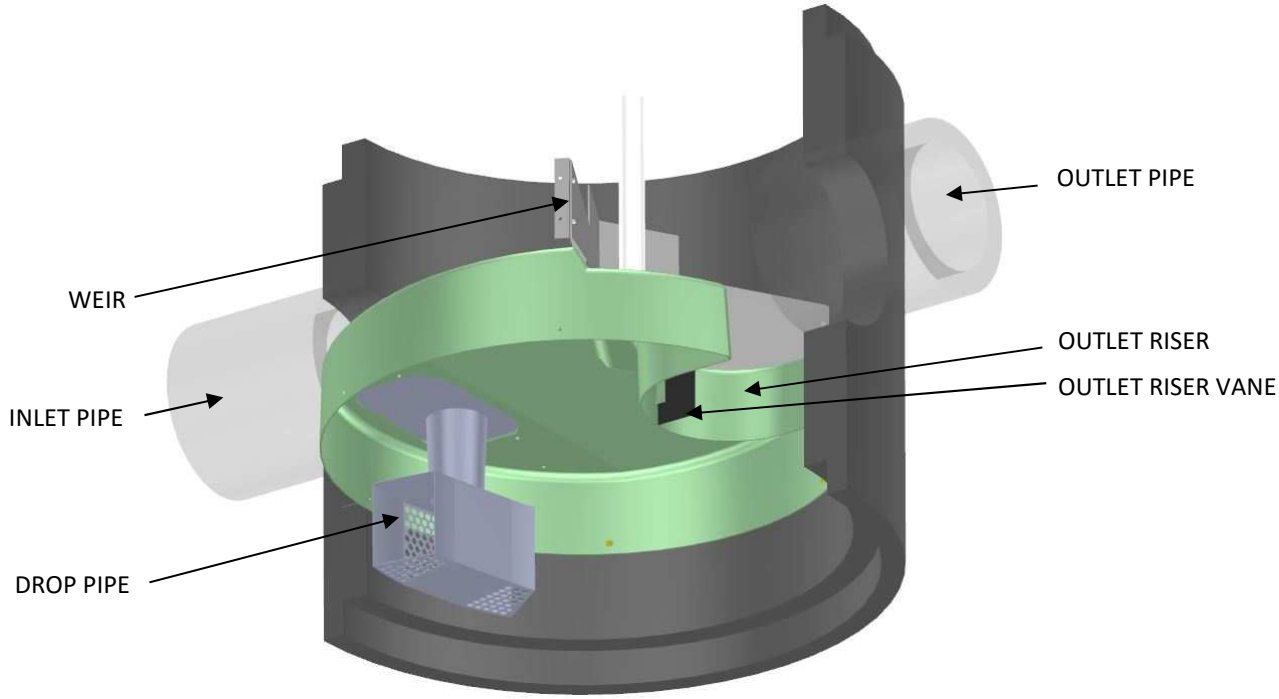


Figure 2

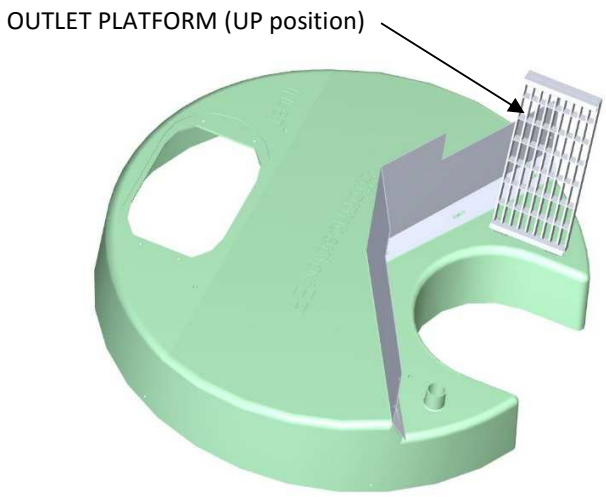


Figure 3A

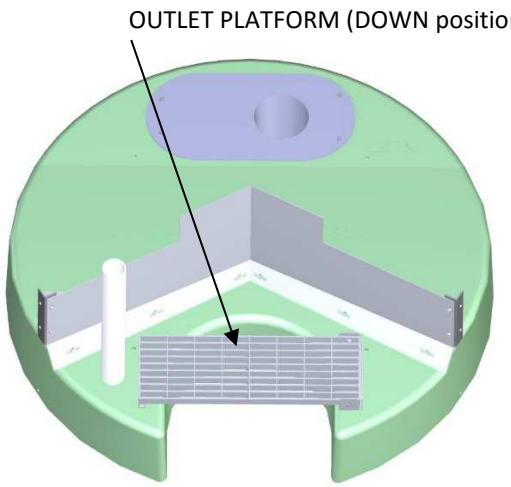


Figure 3B

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Table 1

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity [1] (m^3)	Hydrocarbon Storage Capacity [2] (L)	Maximum Flow Rate into Lower Chamber [3] (L/s)	Peak Conveyance Flow Rate [4] (L/s)
EF4 / EFO4	1.22	915	1524	1780	1.19	265	22.1 / 10.4	425
EF6 / EFO6	1.83	915	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1524	3886	40800	31.22	2475	198.7 / 93.7	2830

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m^2.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Table 2

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity [1] (ft^3)	Hydrocarbon Storage Capacity [2] (gal)	Maximum Flow Rate into Lower Chamber [3] (cfs)	Peak Conveyance Flow Rate [4] (cfs)
EF4 / EFO4	4	36	60	471	42	70	0.78 / 0.37	15
EF6 / EFO6	6	36	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	60	153	10779	1103	655	7.02 / 3.31	100

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft^2.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name ***Stormceptor***® embossed on the access cover at grade as shown in **Figure 3**. The tradename ***Stormceptor***® is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

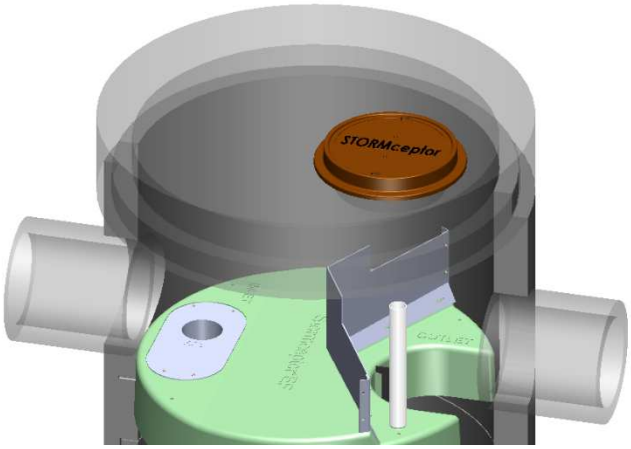


Figure 4

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

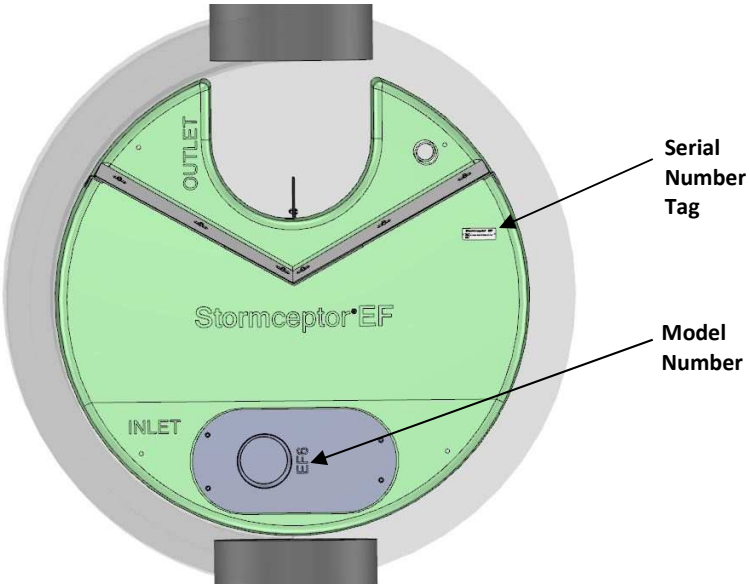


Figure 5

INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
  NOTE: EF4/EFO4 requires the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

Table 3

Recommended Sediment Depths for Maintenance Service*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF6 / EFO6	12 /305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

Maintenance Procedures

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.

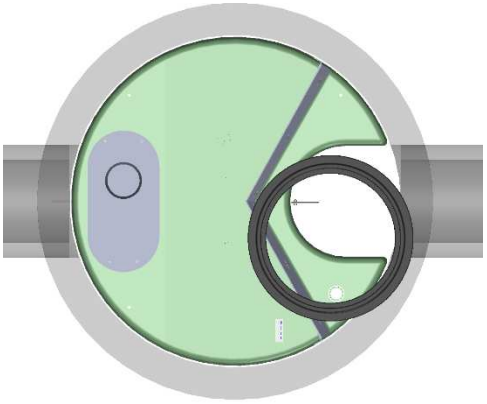


Figure 6

- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

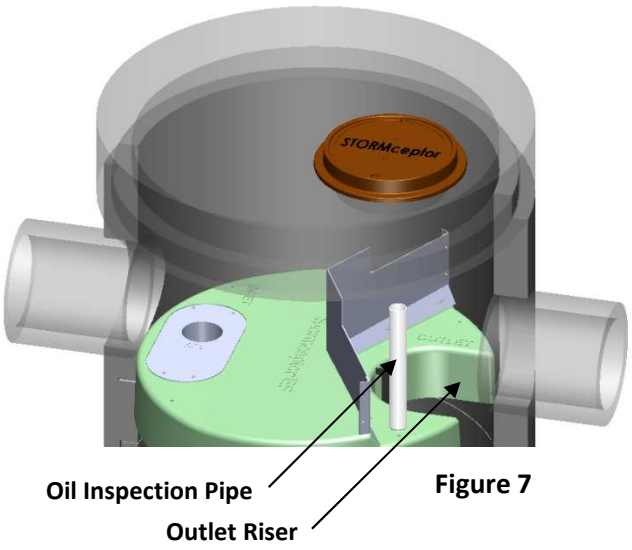


Figure 7

Figure 8

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.

Figure 9

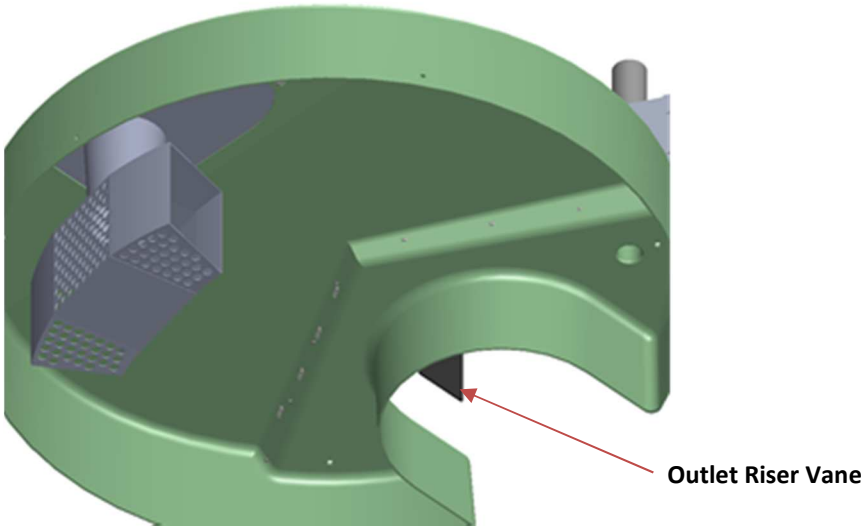
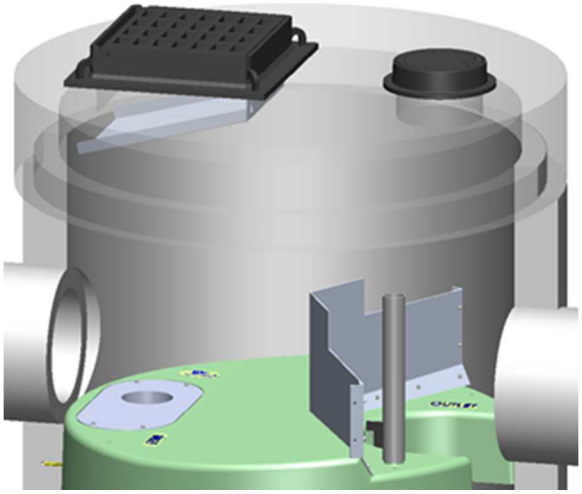


Figure 10

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

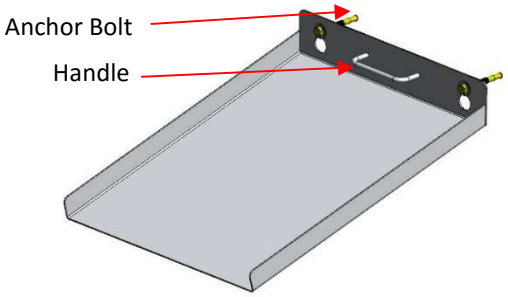
Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 model requires a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.



How to Remove:

1. Loosen anchor bolts
2. Pull up and out using the handle



Removable Flow Deflector

Figure 11

Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems.

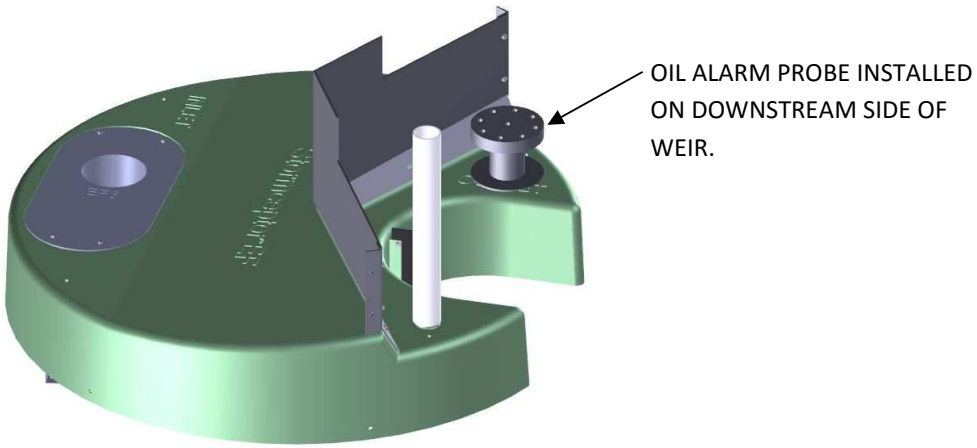


Figure 12

Replacement Parts

Stormceptor has no moving parts to wear out. Therefore inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Recommended Sediment Maintenance Depth: _____

DATE	SEDIMENT DEPTH (inch or mm)	OIL DEPTH (inch or mm)	SERVICE REQUIRED (Yes / No)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments:

Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Stormceptor representative or by visiting our website at **www.stormceptor.com.**

Imbrium Systems Inc. & Imbrium Systems LLC

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United States	1-301-279-8827 / 1-888-279-8826
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www.imbriumsystems.com
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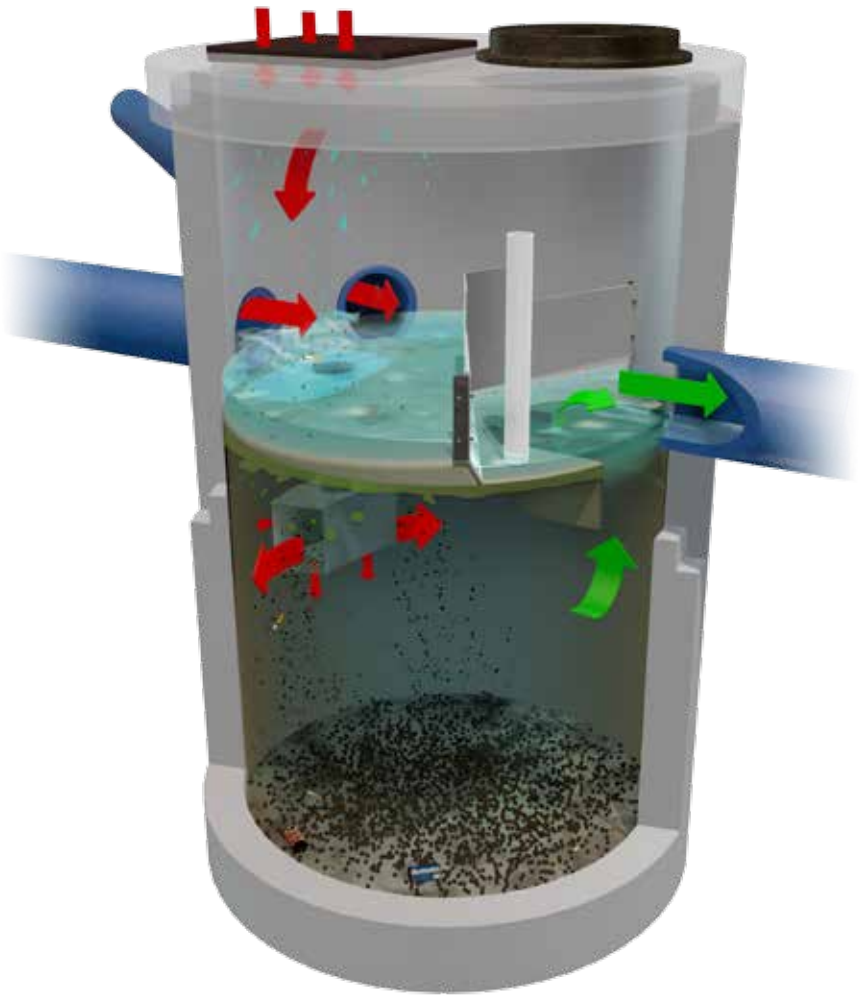
Stormceptor® EF

Technical Manual



imbrium®

OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil-grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil-grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at higher flow rates as compared to the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention technology and internal bypass ensures sediment is retained during all rainfall events..

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention technology and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for online installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.
- **Refer to components identified in Figures 1 and 2 to understand the Stormceptor EF operation.**

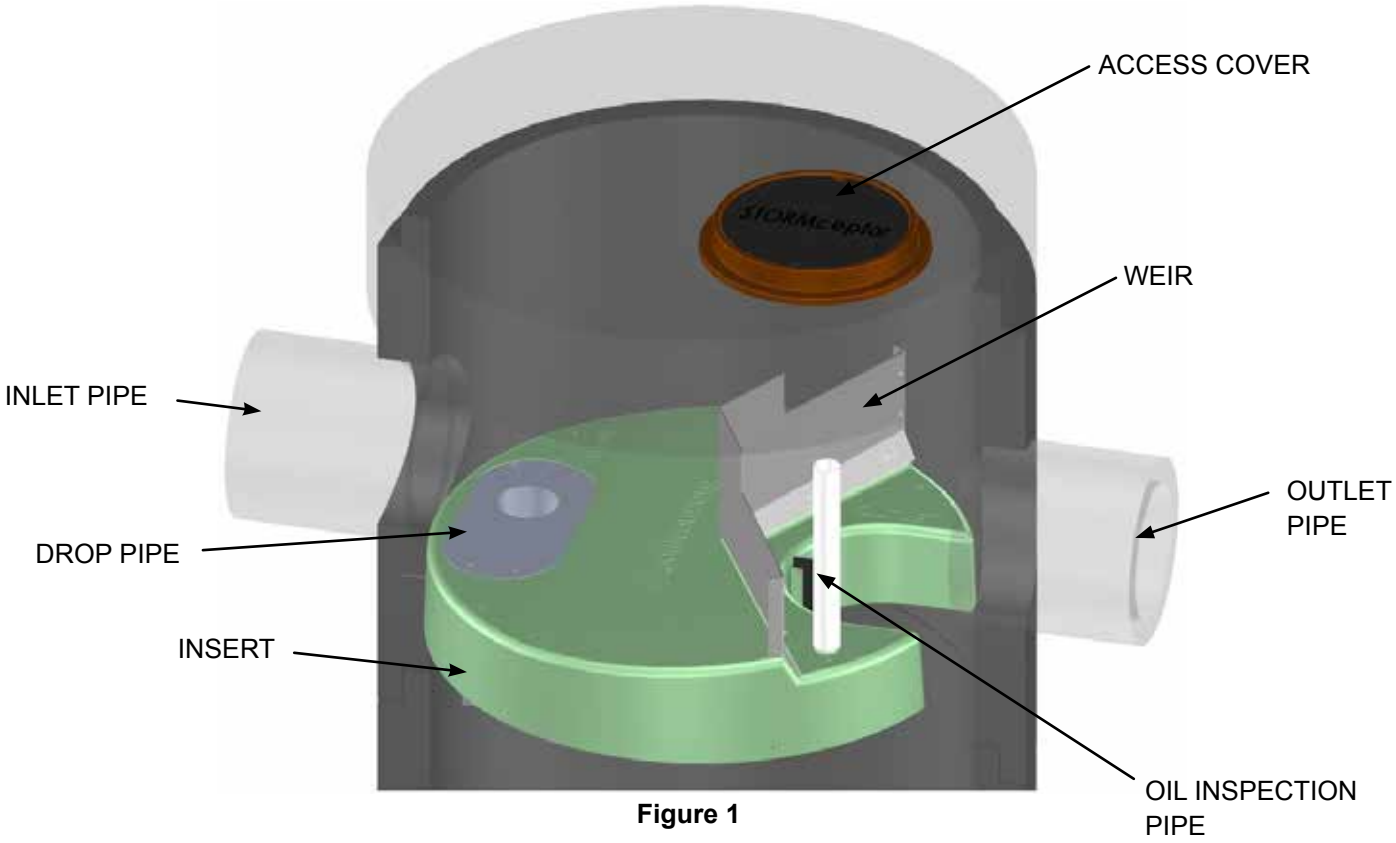


Figure 1

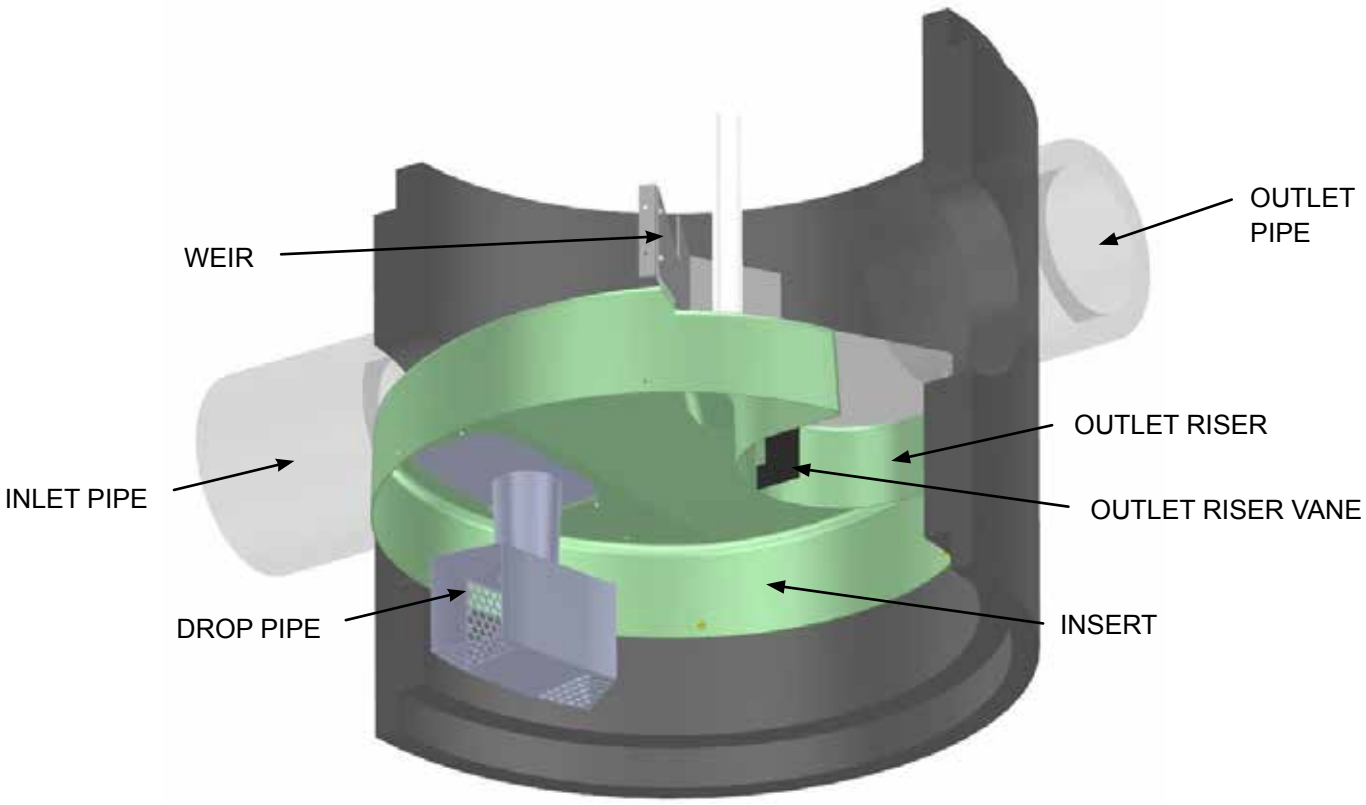


Figure 2

FEATURES AND BENEFITS

FEATURE	BENEFITS
Patent-pending enhanced flow, TSS treatment technology	Superior, verified third-party performance
Scour prevention with an internal bypass	Validated online installation and cost savings
Third-party verified light liquid capture (oil) and retention (Stormceptor EFO)	Proven performance for fuel/oil hotspot locations
Functions as bend, junction or inlet structure	Cost savings & design flexibility
Minimal drop between inlet and outlet	Site installation ease
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade

APPLICATIONS

Stormceptor EF is designed as an 'at source' solution for commercial and industrial sites, urban environments, and residential developments. Stormceptor EF is ideal for:

- Pretreatment of wet ponds, filters, infiltration systems, bioretention, and other Low Impact Development (LID) applications
- Commercial sites
- Manufacturing/Industrial sites
- Residential developments
- Fueling stations, convenience stores, fast food restaurants
- Roads and highways
- Airports, seaports, and military bases
- Hydrocarbon spill, high pollutant load hotspots (Stormceptor EFO)

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES								
Stormceptor Model	Inside Diameter	Minimum Surface to Outlet Invert Depth	Depth Below Outlet Pipe Invert	Wet Volume	Sediment Capacity[1]	Hydrocarbon Storage Capacity[2]	Maximum Flow Rate into Lower Chamber[3]	Peak Conveyance Flow Rate[4]
	(m)	(mm)	(mm)	(L)	(m^3)	(L)	(L/s)	(L/s)
EF4 / EFO4	1.22	915	1524	1780	1.19	265	22.1 / 10.4	425
EF6 / EFO6	1.83	915	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1524	3886	40800	31.22	2475	198.7 / 93.7	2830

U.S. DIMENSIONS AND CAPACITIES								
Stormceptor Model	Inside Diameter	Minimum Surface to Outlet Invert Depth	Depth Below Outlet Pipe Invert	Wet Volume	Sediment Capacity[1]	Hydrocarbon Storage Capacity[2]	Maximum Flow Rate into Lower Chamber[3]	Peak Conveyance Flow Rate[4]
	(ft)	(in)	(in)	(gal)	(ft^3)	(gal)	(cfs)	(cfs)
EF4 / EFO4	4	36	60	471	42	70	0.78 / 0.37	15
EF6 / EFO6	6	36	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	60	153	10779	1103	655	7.02 / 3.31	100

1. Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
2. Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
3. EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m^2 (27.9 gpm/ft^2). EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m^2 (13.1 gpm/ft^2).
4. Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s (5 fps).

UNIT DESIGN

Sizing Methodology

Stormceptor® EF and Stormceptor® EFO are sized using local historical rainfall data for the site of interest, specific site parameters, and a performance curve for TSS removal derived from third-party testing conducted in accordance with the Canadian Environmental Technology Verification (ETV) Program's ***Procedure for Laboratory Testing of Oil-Grit Separators***. Every Stormceptor unit is designed to achieve the specified target TSS removal, however, for sites where oil/fuel capture and retention is an additional specified water quality objective Stormceptor EFO is the proper selection. The sizing methodology includes various considerations, including:

- Site parameters
- Local historical rainfall data
- Capture of the Canadian ETV particle size distribution
- Requirements for oil/fuel capture and retention
- Performance results from third-party testing and verification

State, provincial, and local regulatory agencies and municipalities may have specific sizing and design criteria for stormwater treatment systems such as OGS devices. To ensure proper sizing and design, contact your local Stormceptor representative for sizing and design assistance or visit www.imbriumsystems.com for more information.

ONLINE APPLICATION

Stormceptor EF's internal bypass and patent-pending scour prevention technology has demonstrated very effective retention of pollutants in third-party testing and verification following the Canadian ETV's ***Procedure for Laboratory Testing of Oil-Grit Separators***. Sediment scour prevention demonstrated an effluent concentration of less than 10 mg/L for sediment particles ranging from 1 to 1,000 microns, even during peak influent flow rates associated with infrequent high intensity storm events. While Stormceptor EF will capture oil, only the Stormceptor EFO configuration has been third-party tested and verified to retain greater than 99% of captured oil.

Based on these verified performance attributes, the most efficient and widely accepted application of Stormceptor EF is an online configuration, which allows all upstream conveyance flows to enter and exit the unit. The online application eliminates the need for costly additional bypass structures, piping and installation expense.

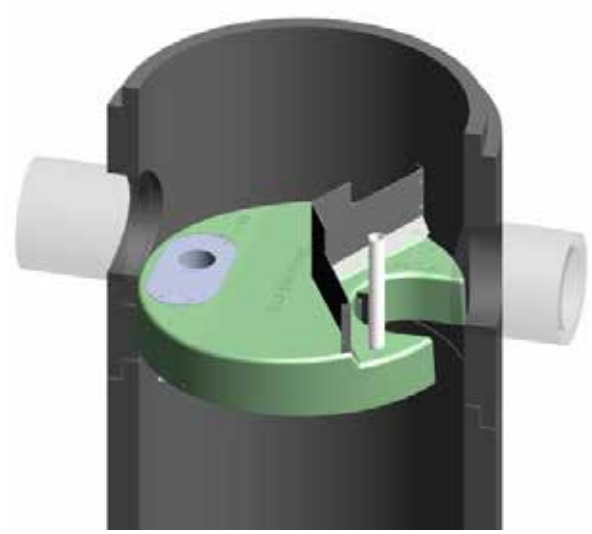


Figure 3

FLOW ENTRANCE OPTIONS

Single Inlet Pipe – A common design which includes one inlet pipe and one outlet pipe. A 90-degree (maximum) bend is also accepted with this configuration. **Example seen in Figure 3**.

MAXIMUM PIPE DIAMETER		
MODEL	INLET	OUTLET
	(in / mm)	(in / mm)
EF4 / EFO4	24 / 610	24 / 610
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

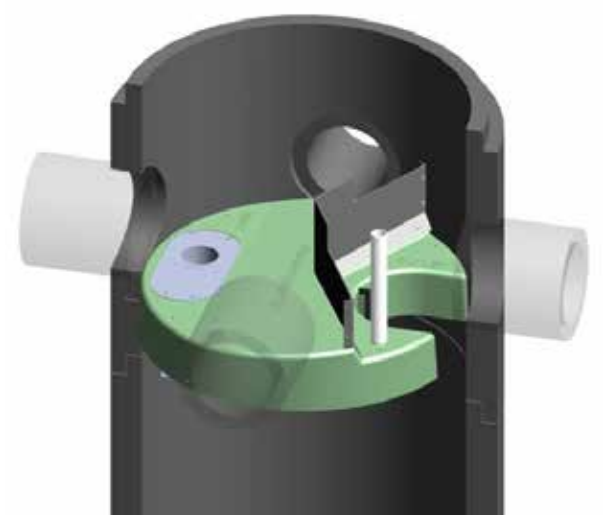


Figure 4

Multiple Inlet Pipes – Allows for multiple inlet pipes of various diameters to enter the unit. **Example seen in Figure 4**.

MAXIMUM PIPE DIAMETER		
MODEL	INLET	OUTLET
	(in / mm)	(in / mm)
EF4 / EFO4	18 / 457	24 / 610
EF6 / EFO6	30 / 762	36 / 915
EF8 / EFO8	42 / 1067	48 / 1220
EF10 / EFO10	60 / 1524	72 / 1828
EF12 / EFO12	60 / 1524	72 / 1828

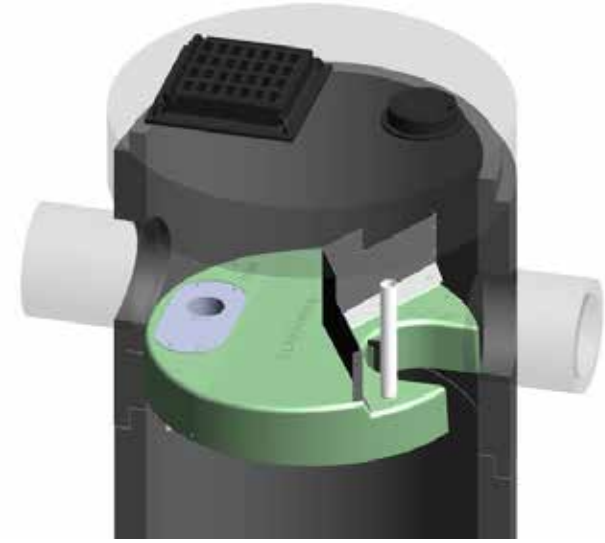


Figure 5

Inlet Grate – Allows surface runoff to enter the unit from grade. The inlet grate option can also be used in conjunction with one inlet pipe or multiple inlet pipes. A removable flow deflector is added in the Stormceptor EF4/EFO4. **Example seen in Figure 5**.

MAXIMUM PIPE DIAMETER		
MODEL	INLET	OUTLET
	(in / mm)	(in / mm)
EF4 / EFO4	24 / 610	24 / 610
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

INLET-TO-OUTLET DROP

Elevation differential between the inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit (**illustration seen in Figure 6**).

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.

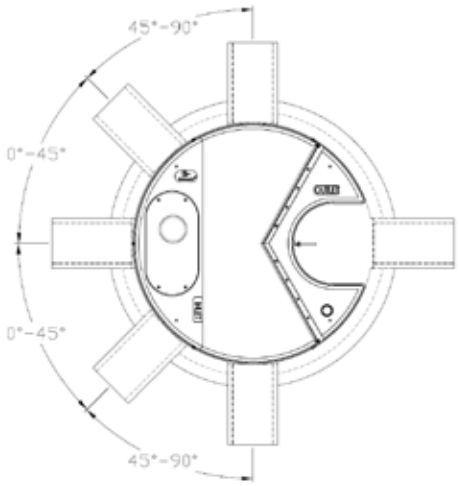


Figure 6

SUBMERGED (TAILWATER) DESIGN

Submerged or tailwater conditions are defined as standing water above the insert elevation during zero-runoff conditions. A weir height modification allows Stormceptor EF to operate under submerged conditions. The following information is necessary to properly design Stormceptor EF for the submerged condition:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

NOTE: The maximum weir height for Stormceptor EF is 48 inches (1200 mm). Contact your local Stormceptor representative for design assistance.

LIVE LOAD

Stormceptor EF is typically designed for local highway truck loading. In instances where other live loads are required, Stormceptor EF can be customized to meet the necessary structural requirements. Contact your local Stormceptor representative for design assistance.

SHALLOW COVER

Stormceptor EF is typically designed with a minimum depth of burial to the outlet invert based on the diameter of the inlet and outlet pipes. A common minimum burial depth to the outlet invert is 48 inches (1.2 meters). In instances where there may be site constraints to the depth of burial contact your local Stormceptor representative for design assistance.

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.

ABOVE-GROUND INSTALLATIONS

Stormceptor EF can be designed as a free-standing above-ground unit, constructed of fiberglass as illustrated in **Figure 7**. These customized units are lightweight and can be installed within a building footprint, providing structural support and installation advantages. Contact your local Stormceptor representative for design assistance.

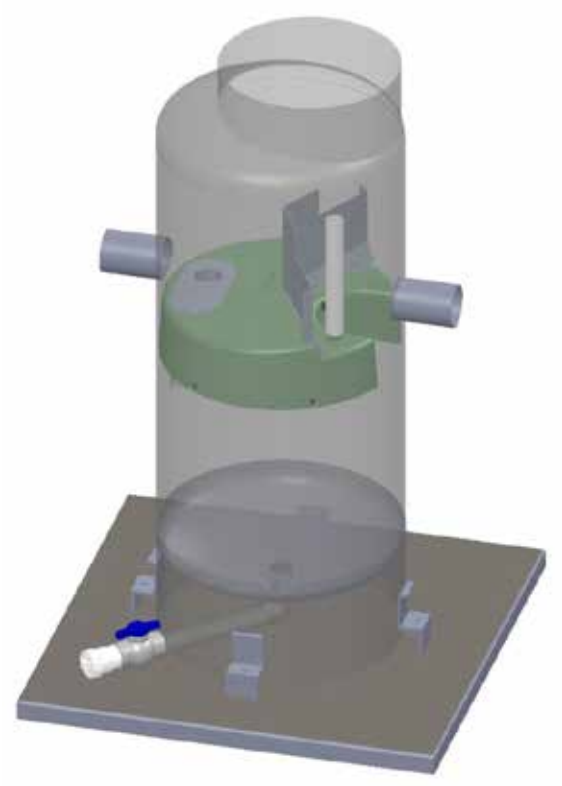


Figure 7

PERFORMANCE VERIFICATION TESTING

Stormceptor EF has been third-party performance tested according to the Canadian Environmental Technical Verification (ETV) Procedure for ***Laboratory Testing of Oil-Grit Separators***, and has received ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

For more information, please visit www.imbriumsystems.com or contact your local Stormceptor representative.

INSTALLATION

For installation details, please visit www.imbriumsystems.com and refer to the Stormceptor EF Installation Guideline or contact your local Stormceptor representative.

INSPECTION AND MAINTENANCE

As with any stormwater treatment device, periodic inspection and maintenance of Stormceptor EF is required for long-term performance.

Inspection and maintenance is performed from grade without entering the unit. Sediment depth inspections are performed through the outlet riser, and oil presence can be determined through the oil inspection pipe. Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths. Visual inspections of the insert can be performed to ensure there is no damage or blockages. A beneficial feature of Stormceptor EF in comparison to many other treatment practices is that once it is maintained, Stormceptor EF is functionally restored to its original condition.

When maintenance is required, a standard vacuum truck is used to remove the pollutants (sediment and floatables) from the lower chamber of the unit through the outlet riser. When an appreciable amount of oil or other hydrocarbons is present, these floatable pollutants can be removed by hydrovac from the water surface. Should an oil/fuel spill occur, or presence of oil/fuel be identified within the unit, it should be cleaned immediately by a licensed liquid waste hauler.

RECOMMENDED SEDIMENT DEPTHS FOR MAINTENANCE SERVICE*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF6 / EFO6	12 /305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed.

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, location, and transportation distance(s).

For more details on inspection and maintenance refer to the Stormceptor EF Owner's Manual at www.imbriumsystems.com.

HYDROCARBON CAPTURE AND RETENTION

Stormceptor EFO
Stormceptor is often installed on high-traffic pollutant hotspots where hydrocarbon spill potential exists.

The technology platform of Stormceptor EFO is the same as Stormceptor EF, however the maximum surface loading rate into the lower chamber is restricted to a lower value with Stormceptor EFO, thereby ensuring excellent oil retention. Third-party testing in accordance with the Light Liquid Re-entrainment testing provisions within the Canadian ETV protocol ***Procedure for Laboratory Testing of Oil-Grit Separators*** demonstrated greater than 99% oil retention. Stormceptor EFO is engineered to capture and retain free floating oil/chemical/fuel spills, not emulsified hydrocarbons.

Oil Sheen

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EFO may still be functioning as intended.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of hydrocarbons.

Oil Level Alarm

As an added safeguard, an oil level alarm is available as an optional feature for Stormceptor EFO. This is an electronic monitoring system designed to trigger a visual and audible alarm when a preset level of oil is captured in the lower chamber. The oil level alarm is installed as illustrated in **Figure 8**.

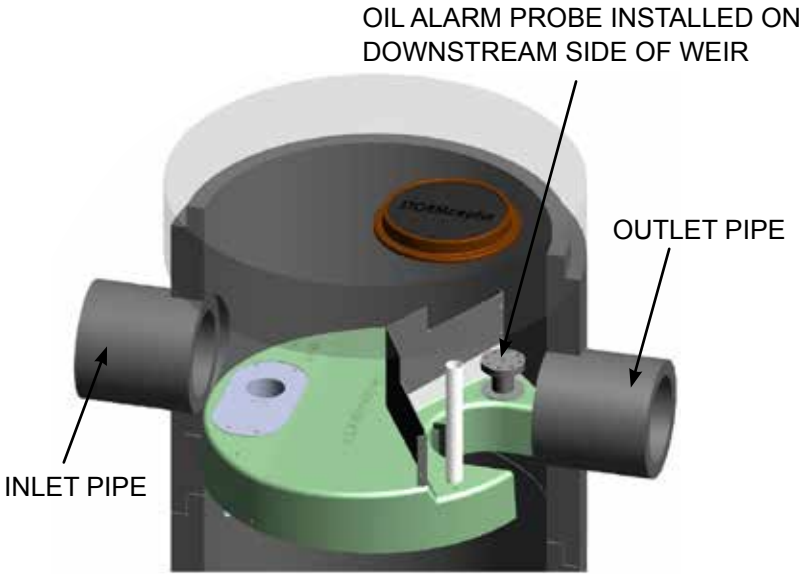


Figure 8

ADDITIONAL POLLUTANT STORAGE CAPACITY

Stormceptor EF/EFO can be easily modified to increase sediment storage capacity by extending the depth of the lower chamber. Stormceptor EFO can be modified to increase hydrocarbon storage capacity by extending the outlet riser, thereby providing the storage volumes depicted in the table below.

STORMCEPTOR EFO STORAGE VOLUME		
Stormceptor EFO Model	**Standard Hydrocarbon Storage Capacity [1]**	**Extended Hydrocarbon Storage Capacity [1,2]**
	(L / gal)	**(L / gal)**
EFO4	265 / 70	395 / 105
EFO6	610 / 160	1615 / 425
EFO8	1070 / 280	4340 / 1145
EFO10	1670 / 440	NA
EFO12	2475 / 655	NA

1. Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert.
2. Distance from bottom of the extended outlet riser to top of the sediment maintenance depth is 914 mm (36 in).
   NA –Not available in these model sizes

Additional hydrocarbon storage capacity can be added with a draw off tank.

Contact your local Stormceptor representative for additional information and design assistance.

HEALTH AND SAFETY

For all aspects of installation and inspection/maintenance, OSHA and appropriate local regulations should be followed to ensure safe practice.

Contact

888-279-8826 / 416-960-9900

info@imbriumsystems.com

www.imbriumsystems.com

Appendix B

SANITARY DEMAND CALCULATIONS

5616 & 5643 Murray Street Mixed Used Development
Niagara Falls, Ontario
MTE Project #: 49810-100
11/29/2023

Sanitary Demand Calculations

Land Use	Residential					Commercial		Totals (Residential + Commercial		
	Units [1]	Population Density [2]	Occupancy	Population (persons)	Demand (L/s)	Floor Area (ha)	Demand (L/s)	Total Average Demand (L/s)	Total Peaked Demand (L/s)	Total Peaked Demand + Infiltration (L/s)
Proposed Condo										
1 Bedroom	114	2.0	-	228	0.726			0.726	2.870	
2 Bedroom	74	4.0	-	296	0.942			0.942	3.726	
Townhouse	5	4.0	-	20	0.064			0.064	0.252	
Total				**544**	**1.668**		**0.000**	**1.731**	**6.848**	**6.894**

Sanitary Demand		
Residential Daily Demands[3]	275	L/d/person
	0.0032	L/ca/s
Harmon Peaking Factor (Residential) [4]	4.0	
Site Area	0.255	ha
Infiltration Allowance [5]	0.18	L/s/ha
	0.046	L/s

Note 1: Room/Unit count breakdown provided by architect
Note 2: Design population based on the occupant load (Refer to OBC Table 3.1.17.1)
Note 3: Residential daily demands based on 2023 OBC, Table 8.2.1.3.A, Apartments, condominiums, other multi-family dwellings, per person
Note 4: Harmon Peaking Factor Kh = 1+(14/(4+P^(1/2))) where P = Condo Mix population in thousands
Note 5: Infiltration allowance based on City of Niagara Falls Design Standards Ch. 2 Sanitary Sewers

Appendix C

WATER DEMAND CALCULATIONS & ANALYSIS

5616 & 5643 Murray Street Mixed Used Development

Niagara Falls, Ontario

MTE Project #: 49810-100

12/6/2023

Residential Peaking Factors[2]:	
Avg. Day	1.0
Max. Day	1.58
Peak Hour	4.00

Water Demand Calculations

	Residential					Commercial				Final (Residential + Commercial + Hotel)		
Location	Units (ea)	Population Density (persons/unit) [3]	Occupancy	Population (persons)	Demand (L/s)	Floor Area (ha)	Population Density (person/ha)	Population (persons)	Demand (L/s)	Avg Day Demand Qavg (L/s)	Max Day Demand Qmax.day (L/s)	Peak Hour Demand Qpeak (L/s)
Proposed Condo												
1 Bedroom	114	2.0	-	228	0.604					0.604	0.955	2.417
2 Bedroom	74	4.0	-	296	0.785					0.785	1.240	3.138
Townhouse	5	4.0	-	20	0.053					0.053	0.212	0.212
Total				**544**	**1.442**					**1.442**	**2.406**	**5.767**

Water Demand		
Average Residential Daily Demands [4]	0.229	m3/day/person
	0.0027	L/s/person

Max Day + Fire Flow Demand		
Qmax.day+fire	127.41	L/s

Note 1: Fire flows calculated using FUS (2020) guidelines - See attached worksheet

Note 2: Peaking factor for Residential based on Niagara Region Design criteria (Section 4.2.4 Design Factors)

Note 3: Design population based on 2 people per room (Refer to OBC 3.1.17.1 (b)

Note 4: Residential demands based on Niagara Region Design Criteria (Section 4.2.4 Design Factors)

Fire Flow [1]		
Fire Flow	125	L/s

5616 & 5643 Murray Street Mixed Used Development
PRELIMINARY FIRE FLOW ANALYSIS

Project Number: 49810-100
Date: 12/6/2023

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 2020).

An estimate of the fire flow required is given by the following formula:

where:

RFF = the required fire flow in litres per minute

C = coefficient related to the type of construction
- = 1.5 for **Type V** Wood Frame Construction
- = 0.8 for **Type IV-A** Mass Timber Construction
- = 0.9 for **Type IV-B** Mass Timber Construction
- = 1.0 for **Type IV-C** Mass Timber Construction
- = 1.5 for **Type IV-D** Mass Timber Construction
- = 1.0 for **Type III** Ordinary Construction
- = 0.8 for **Type II** Noncombustible Costruction
- = 0.6 for **Type I** Fire Resistive Construction

A = Total floor area includes two largest adjoining floor areas plus 50% of all floors immediately above them up to a maximum of eight (for a building classified with a Construction Coefficient below 1.0:

Floor	Res. GFA
P1-P5	0.0
GF	618.80
2	950.81
3	692.15
4	692.15
5	692.15
6	692.15
7	692.15
8	692.15
9	692.15
10	692.15
TOTAL	**7106.81**

Adjustments to the calculated fire flow can be made based on occupancy, sprinkler protection and exposure to other structures. The table below summarizes the adjustments made to the basic fire flow demand.

			(1)		(2)		(3)		(4)		**Final Adjusted**		
Building	Area "A" (m^2)	C (Type I)	Fire Flow "RFF" (l/min)	(l/s)	Occupancy %	Adjusted Fire Flow (L/min)	Sprinkler %	Adjustment (L/min)	Exposure %	Adjustment (L/min)	**Fire Flow (L/min)**	**Rounded (L/min)**	**(L/s)**
Proposed Building	7,106.8	0.6	11,100	185.0	-15	9,435	-30	-2,831	10	944	7,548	7,500	**125.0**

(2) Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

-30% - Automatic sprinkler protection designed and installed in accordance with NFPA 13

-10% - Water supply is standard for both the system and Fire Department hose line

-10% - Fully supervised system

(4) Exposure

0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
>30	0%	exceed 75%

Building A

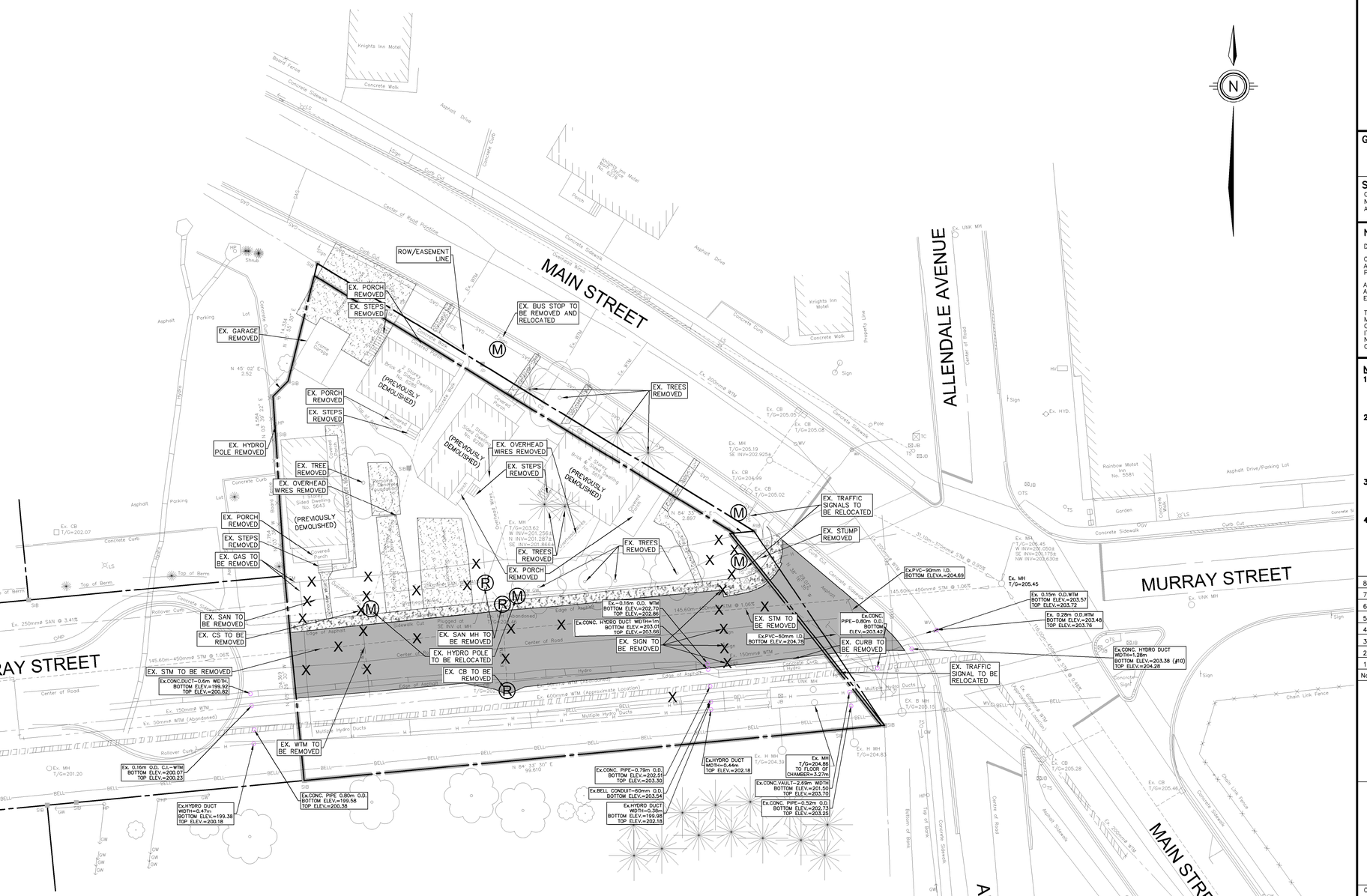
Direction	**Distance**	**%**
N	25.0	10
E	>30m	0
S	>30m	0
W	>30m	0
	Total	10

Appendix D

Drawings

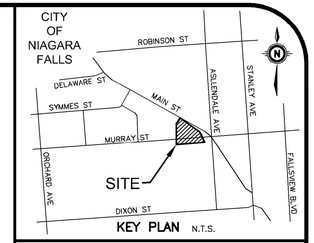
LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING DIRECTION OF DRAINAGE
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- EXISTING CURB
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING RETAINING WALL
- EXISTING BELL LINE
- EXISTING HYDRO DUCT
- EXISTING GAS LINE
- EXISTING TREES
- EXISTING JUNCTION BOX
- REMOVALS
- RELOCATE
- CONCRETE SURFACE PREVIOUSLY REMOVED
- CONCRETE SURFACE REMOVALS
- ASPHALT SURFACE REMOVALS
- TEST PIT LOCATIONS (REFER TO SUDA & MALESZYK SURVEYING INC. DATED JUNE 2022)



SCALE 1 : 250

5 0 5 10 15 metres



KEY PLAN N.T.S.

GEODETIC BM ELEV. = m

SITE BENCHMARK ELEV. = 204.81m

CONTROL MONUMENT 0126 IN CONCRETE SIDEWALK AT THE NORTHWESTERLY CORNER OF MAIN STREET AND MURRAY STREET AT MUNICIPAL ADDRESS 5619 MURRAY STREET.

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

NOTE:

1. **EXISTING LEGAL AND TOPOGRAPHICAL INFORMATION PROVIDED BY SUDA AND MALESZYK SURVEYING INC DATED 2018.**
2. **INVERTS DENOTED WITH "±" ARE TAKEN FROM AS-RECORDED PLAN AND PROFILE DRAWINGS COMPLETED BY THE CITY OF NIAGARA FALLS AND ARE CONSIDERED APPROXIMATE ONLY. CONTRACTOR TO FIELD VERIFY AND REPORT ANY DISCREPANCIES TO ENGINEER.**
3. **THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF THE FOLLOWING: C1.1, C2.1, C2.2, C2.3, AND THE SWM REPORT.**
4. **DAYLIGHTING COMPLETED BY SUDA AND MALESZYK DATED JUNE 2022.**

No.	REVISION	BY	YYYY-MM-DD
8.			
7.			
6.			
5.			
4.			
3.			
2.			
1.	ISSUED FOR OPA & ZBA	KRR	2023-12-15

MTE
Engineers, Scientists, Surveyors
905-639-2552

NOT FOR CONSTRUCTION

CLIENT

ZELJKO HOLDINGS LIMITED

4728 DORCHESTER RD NIAGARA FALLS, ON

PROJECT

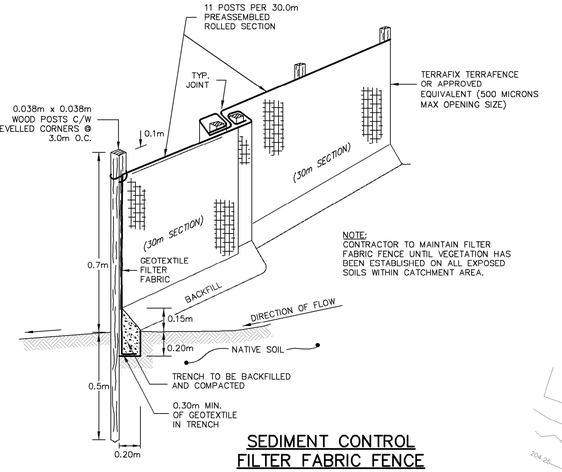
6285 & 6289 MAIN STREET

6285 & 6289 MAIN STREET NIAGARA FALLS, ON

DRAWING

EXISTING CONDITIONS & REMOVALS PLAN

Project Manager: R.CALOGERO	Project No.: 49810-100
Design By: CNF	Checked By: RNC/KRR
Drawn By: DXC/LXQ	Checked By: CNF
Surveyed By: OTHERS	Drawing No.: C1.1
Date: Sep.30/21	
Scale: 1:250	Sheet 1 of 4



NOTE:
CONTRACTOR TO MAINTAIN FILTER FABRIC FENCE UNTIL VEGETATION HAS BEEN ESTABLISHED ON ALL EXPOSED SOILS WITHIN CATCHMENT AREA.

SEDIMENT CONTROL FILTER FABRIC FENCE
N.T.S.

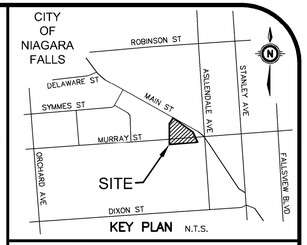
SCALE 1 : 250
5 0 5 10 15 metres

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING DIRECTION OF DRAINAGE
- EXISTING CURB
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING TREES
- EXISTING JUNCTION BOX

LEGEND OF PROPOSED FEATURES

- PROPOSED SPOT ELEVATIONS (EX =MAINTAIN EXISTING, T/G =TOP OF CASTING/GRATE, INV =INVERT ELEVATION, FFE =FINISHED FLOOR ELEVATION)
- DIRECTION OF DRAINAGE
- EMBANKMENT (SLOPE AS NOTED)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- CONCRETE CURB
- LIMIT OF UNDERGROUND PARKING
- LIMIT OF TOWER ABOVE
- OVERLAND FLOW ROUTE (MAJOR STORM)
- SEDIMENT CONTROL FENCE (SEE DETAIL)
- SILT SACK (SEE DETAIL ON C2.3)
- STAGING AREA (LINE PAINTING)
- RETAINING WALL
- TOE WALL
- SAW CUT/ASPHALT LAP JOINT (SEE DETAIL ON C2.3)
- ASPHALT RESTORATION AREA
- GEOFABRIC REINFORCING
- FCRD — FLOW CONTROL ROOF DRAIN REFER TO C2.2 FOR MORE DETAILS
- 12.0m SERVICING EASEMENT



KEY PLAN N.T.S.

GEODETIC BM ELEV. = m

SITE BENCHMARK ELEV. = 204.81m
CONTROL MONUMENT G126 IN CONCRETE SIDEWALK AT THE NORTHWESTERLY CORNER OF MAIN STREET AND MURRAY STREET AT MUNICIPAL ADDRESS 5619 MURRAY STREET.

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4. **DAYLIGHTING COMPLETED BY SUDA AND MALESZYK DATED JUNE 2022.**

No.	REVISION	BY	YYYY-MM-DD
8.			
7.			
6.			
5.			
4.			
3.			
2.			
1.	ISSUED FOR OPA & ZBA	KRR	2023-12-15

MTE
Engineers, Scientists, Surveyors
905-639-2552

NOT FOR CONSTRUCTION

CLIENT
ZELJKO HOLDINGS LIMITED
4728 DORCHESTER RD NIAGARA FALLS, ON

PROJECT
6285 & 6289 MAIN STREET
6285 & 6289 MAIN STREET NIAGARA FALLS, ON

DRAWING
SITE GRADING PLAN AND ESC PLAN

Project Manager R.CALOGERO	Project No. 49810-100
Design By CNF	Checked By RNC/KRR
Drawn By DXC/LXQ	Checked By CNF
Surveyed By OTHERS	Drawing No. C2.1
Date Aug.27/21	
Scale 1:250	Sheet 2 of 4

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MTE FILE PATH:

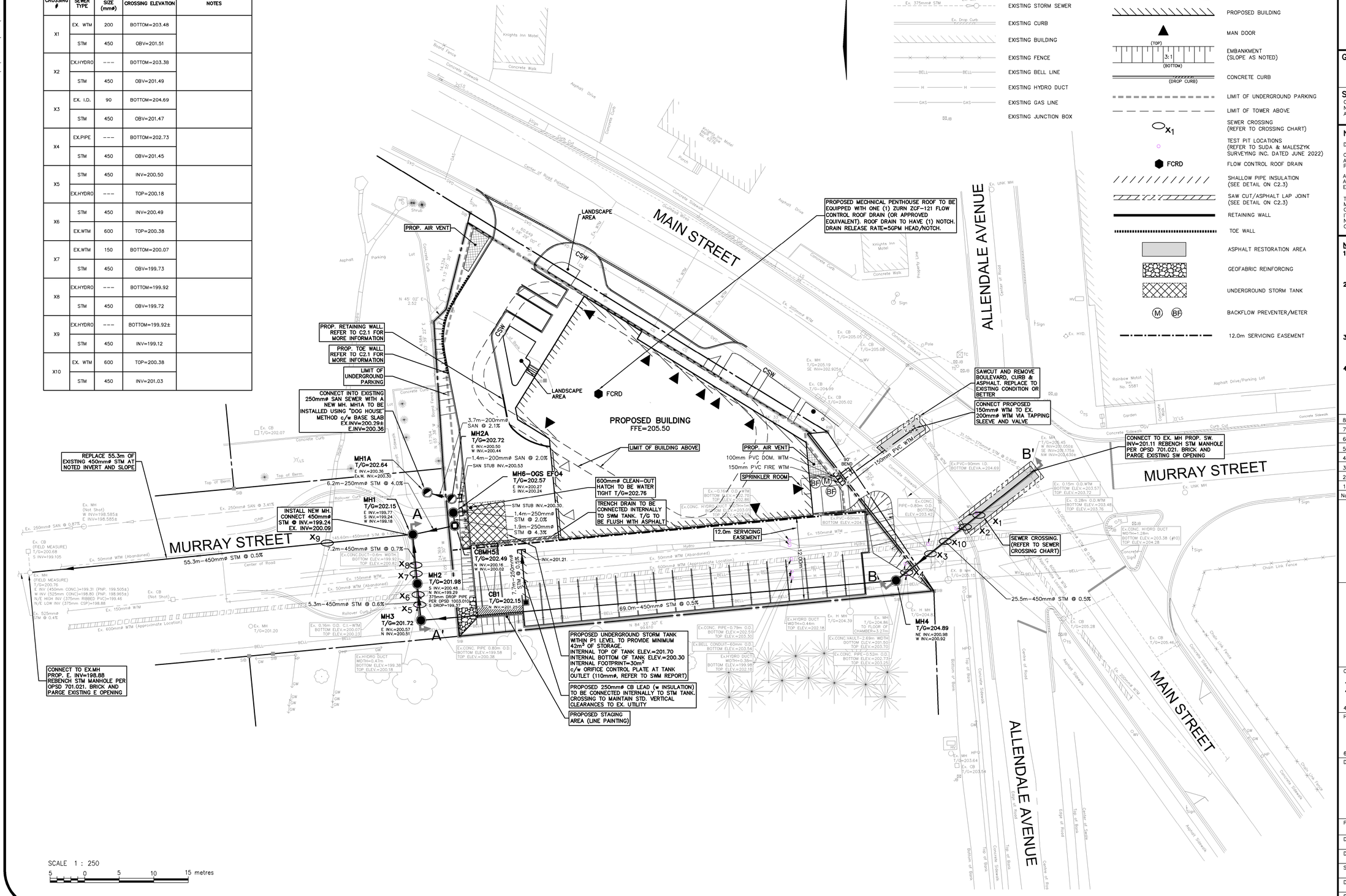
December 15, 2023 - 3:15:20 PM - Plotted By: Chirag Maniya

MTE FILE PATH: P:\P\49810\100\49810-100-C2

SEWER CROSSING CHART

NOTE:
1) Maintain minimum 0.5m vertical clearance between all watermains and sewers. Where watermain is deflected, ensure 2.0m cover is achieved or watermain is insulated.
2) Maintain vertical clearance at all other crossings.
3) Existing and proposed watermain depths are approximate only. Notify Design Engineer of any discrepancies.
4) Contractor to verify all existing inverts prior to product ordering. Notify Design Engineer of any discrepancies.

CROSSING #	SEWER TYPE	SEWER SIZE (mmø)	CROSSING ELEVATION	NOTES
X1	EX. WTM	200	BOTTOM=203.48	
	STM	450	OBV=201.51	
X2	EX.HYDRO	---	BOTTOM=203.38	
	STM	450	OBV=201.49	
X3	EX. I.D.	90	BOTTOM=204.69	
	STM	450	OBV=201.47	
X4	EX.PIPE	---	BOTTOM=202.73	
	STM	450	OBV=201.45	
X5	STM	450	INV=200.50	
	EX.HYDRO	---	TOP=200.18	
X6	STM	450	INV=200.49	
	EX.WTM	600	TOP=200.38	
X7	EX.WTM	150	BOTTOM=200.07	
	STM	450	OBV=199.73	
X8	EX.HYDRO	---	BOTTOM=199.92	
	STM	450	OBV=199.72	
X9	EX.HYDRO	---	BOTTOM=199.92±	
	STM	450	INV=199.12	
X10	EX. WTM	600	TOP=200.38	
	STM	450	INV=201.03	



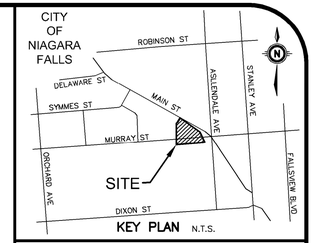
SCALE 1 : 250
5 0 5 10 15 metres

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING SANITARY SEWER (Ex. 300mmø SAN, Ex. MH)
- EXISTING WATERMAIN (Ex. 200mmø WTM, Ex. HYD. SET)
- EXISTING STORM SEWER (Ex. 375mmø STM, Ex. MH)
- EXISTING CURB (Ex. Drop Curb)
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING BELL LINE (BELL)
- EXISTING HYDRO DUCT (H)
- EXISTING GAS LINE (GAS)
- EXISTING JUNCTION BOX (JB)

LEGEND OF PROPOSED FEATURES

- SANITARY SEWER (MH, 14.6m-200mmø SAN @ 1.5%)
- STORM SEWER (MH, 21.3m-300mmø STM @ 1.3%)
- WATERMAIN (HYD. SET, 200mmø WTM, V, TEE)
- PROPOSED BUILDING
- MAN DOOR
- EMBANKMENT (SLOPE AS NOTED) (TOP, 3:1, BOTTOM)
- CONCRETE CURB (DROP CURB)
- LIMIT OF UNDERGROUND PARKING
- LIMIT OF TOWER ABOVE
- SEWER CROSSING (REFER TO CROSSING CHART) (X_1)
- TEST PIT LOCATIONS (REFER TO SUDA & MALESZYK SURVEYING INC. DATED JUNE 2022)
- FLOW CONTROL ROOF DRAIN (FCRD)
- SHALLOW PIPE INSULATION (SEE DETAIL ON C2.3)
- SAW CUT/ASPHALT LAP JOINT (SEE DETAIL ON C2.3)
- RETAINING WALL
- TOE WALL
- ASPHALT RESTORATION AREA
- GEOFABRIC REINFORCING
- UNDERGROUND STORM TANK
- BACKFLOW PREVENTER/METER (M) (BF)
- 12.0m SERVICING EASEMENT



KEY PLAN N.T.S.

GEODETIC BM ELEV. = m

SITE BENCHMARK ELEV. = 204.81m
CONTROL MONUMENT 0126 IN CONCRETE SIDEWALK AT THE NORTHWESTERLY CORNER OF MAIN STREET AND MURRAY STREET AT MUNICIPAL ADDRESS 5619 MURRAY STREET.

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

NOTE:

1. **EXISTING LEGAL AND TOPOGRAPHICAL INFORMATION PROVIDED BY SUDA AND MALESZYK SURVEYING INC DATED 2018.**
2. **INVERTS DENOTED WITH "±" ARE TAKEN FROM AS-RECORDED PLAN AND PROFILE DRAWINGS COMPLETED BY THE CITY OF NIAGARA FALLS AND ARE CONSIDERED APPROXIMATE ONLY. CONTRACTOR TO FIELD VERIFY AND REPORT ANY DISCREPANCIES TO ENGINEER.**
3. **THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF THE FOLLOWING: C1.1, C2.1, C2.2, C2.3, AND THE SWM REPORT.**
4. **DAYLIGHTING COMPLETED BY SUDA AND MALESZYK DATED JUNE 2022.**

No.	REVISION	BY	YYYY-MM-DD
8.			
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1.	ISSUED FOR OPA & ZBA	KRR	2023-12-15

MTE
Engineers, Scientists, Surveyors
905-639-2552

NOT FOR CONSTRUCTION

CLIENT
ZELJKO HOLDINGS LIMITED
4728 DORCHESTER RD NIAGARA FALLS, ON

PROJECT
6285 & 6289 MAIN STREET
6285 & 6289 MAIN STREET NIAGARA FALLS, ON

DRAWING
SITE SERVICING PLAN

Project Manager R.CALOGERO	Project No. 49810-100
Design By CNF	Checked By RNC/KRR
Drawn By DXC/LXQ	Checked By CNF
Surveyed By OTHERS	Drawing No. C2.2
Date Aug.27/21	
Scale 1:250	Sheet 3 of 4

December 15, 2023 - 3:15:51 PM - Plotted By: Chirag Maniya

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MTE FILE PATH:

December 15, 2023 - 3:16:04 PM - Plotted By: Chirag Mariya

CONSTRUCTION NOTES AND SPECIFICATIONS

1. GENERAL

1.1. THESE PLANS ARE NOT FOR CONSTRUCTION UNTIL SIGNED AND SEALED BY ENGINEER AND APPROVED BY THE LOCAL MUNICIPALITY.

1.2. THESE PLANS ARE TO BE USED FOR SERVICING AND GRADING ONLY. ANY OTHER INFORMATION SHOWN IS FOR ILLUSTRATION PURPOSES ONLY. THESE PLANS MUST NOT BE USED TO SITE THE PROPOSED BUILDING.

1.3. NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.

1.4. THESE PLANS ARE NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF MTE CONSULTANTS INC.

1.5. PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST:

1.5.1. CHECK AND VERIFY ALL EXISTING CONDITIONS, LOCATIONS AND ELEVATIONS WHICH INCLUDES BUT IS NOT LIMITED TO THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS AND EXISTING INVERTS. REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO PROCEEDING.

1.5.2. OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.

1.5.3. VERIFY THAT THE FINISHED FLOOR ELEVATIONS AND BASEMENT FLOOR ELEVATIONS (WHICH MAY APPEAR ON THIS PLAN) COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.

1.5.4. CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION.

1.6. THE CONTRACTOR SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO EXISTING WORKS. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY TO LOCAL MUNICIPALITY STANDARDS

1.7. ALL WORKS ON A MUNICIPAL RIGHT-OF-WAY WITH THE EXCEPTION OF WATERMAIN TAPPING, TO BE INSTALLED BY THE OWNER'S CONTRACTOR AT OWNER'S EXPENSE IN ACCORDANCE WITH THE LOCAL MUNICIPALITY'S "PROCEDURE FOR OFF-SITE WORKS BY PRIVATE CONTRACTOR". THE OWNER AND CONTRACTOR ARE TO ENSURE OFF-SITE WORKS PERMIT IS IN PLACE PRIOR TO CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL AFFECTED PROPERTY TO ORIGINAL CONDITION. ALL BOULEVARD AREAS SHALL BE RESTORED WITH 150mm TOPSOIL AND SOD.

1.8. ALL UNDERGROUND SERVICES ARE TO BE CONSTRUCTED IN FULL COMPLIANCE WITH THE ONTARIO PROVINCIAL BUILDING CODE (PART 7, PLUMBING), THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS (OPSS) AND THE REQUIREMENTS OF CITY OF NIAGARA FALLS; WHICH CODES AND REGULATIONS SHALL SUPERSEDE ALL OTHERS.

1.9. CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE, DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.

1.10. SANITARY AND STORM SEWERS AND SERVICES TO HAVE A MINIMUM 1.2m COVER TO TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED PIPE IN ACCORDANCE WITH APPLICABLE "SEWER PIPE INSULATION DETAIL" INDICATED IN DRAWING DETAILS. CONTACT DESIGN ENGINEER FOR "SEWER PIPE INSULATION DETAIL" IF REQUIRED.

1.11. PLAN TO BE READ IN CONJUNCTION WITH SWM REPORT AND DRAWINGS C1.1, C2.1, C2.2, AND C2.3 PREPARED BY MTE CONSULTANTS INC..

1.12. SITE PLAN INFORMATION TAKEN FROM PLAN PREPARED BY CHAMBERLAIN ARCHITECTS CONSTRUCTIONS MANAGERS DATED DECEMBER, 2023

1.13. EXISTING TOPOGRAPHIC AND LEGAL INFORMATION TAKEN FROM PLAN PREPARED BY SUDA AND MALESZYK SURVEYING INC., RECEIVED AUGUST, 2021. MTE ASSUMES THAT ALL TOPOGRAPHICAL INFORMATION IS AN ACCURATE REPRESENTATION OF CURRENT CONDITIONS.

1.14. CONTRACTOR TO OBTAIN WRITTEN PERMISSION FROM ADJACENT PROPERTY OWNER PRIOR TO ENTERING UPON NEIGHBOURING LANDS TO UNDERTAKE ANY WORK. COPIES OF THESE LETTERS OF CONSENT SHALL BE SUBMITTED TO THE DEPARTMENT OF PUBLIC WORKS FOR APPROVAL PRIOR TO ANY WORK BEING PERFORMED. FAILURE TO COMPLY WITH THE ABOVE IS AT CONTRACTOR'S OWN RISK.

1.15. RETAINING WALLS TO BE DESIGNED BY OTHERS. FOR WALLS EXCEEDING 1.0m IN HEIGHT, SHOP DRAWINGS MUST BE SUBMITTED FOR REVIEW AND APPROVAL AND BUILDING PERMIT MUST BE OBTAINED. WALLS OVER 0.6m IN HEIGHT REQUIRE HIGH SIDE OF RETAINING WALLS TO BE BACKFILLED WITH FREE DRAINING MATERIAL.

1.16. SITE SERVICING CONTRACTOR TO TERMINATE ALL SERVICES 1 METRE FROM FOUNDATION WALL.

1.17. FILTER FABRIC TO BE TERRAFIX 200R OR APPROVED EQUAL.

1.18. MAXIMUM GRASSED SLOPE TO BE 3:1. SLOPES GREATER THAN 3:1 TO BE LANDSCAPED WITH LOW MAINTENANCE GROUND COVER.

1.19. SIDE SLOPES OF ALL STOCKPILES OR EXTRACTION FACES TO BE MAINTAINED AT 70 DEGREES OR LESS BETWEEN EARLY APRIL AND LATE AUGUST TO DETER BANK SWALLOWS FROM NESTING.

1.20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD INCLUDING THE SUPPLY, INSTALLATION AND REMOVAL OF ALL NECESSARY SIGNALS, DELINEATORS, MARKERS, AND BARRIERS. ALL SIGNS, ETC. SHALL CONFORM TO THE STANDARDS OF THE LOCAL MUNICIPALITY AND THE MTO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

1.21. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

1.22. CONTRACTOR TO MAINTAIN A 'CONFINED TRENCH CONDITION' IN ALL SEWER AND SERVICE TRENCHES.

1.23. FOLLOWING COMPLETION OF PROPOSED WORKS AND PRIOR TO OCCUPANCY INSPECTION, ALL STORM AND SANITARY SEWERS ARE TO BE FLUSHED, AND ALL CATCHBASIN AND CATCHBASIN MANHOLE SUMPS ARE TO BE CLEANED OF DEBRIS AND SILT.

2. STORM SEWERS

2.1. PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD 802.030, 802.031, OR 802.032. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD 802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRANULAR "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

2.2. STORM SEWERS, 150mmø AND SMALLER, SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR28 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

2.3. STORM SEWERS 200mmø TO 375mmø SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR35 ASTM-D3034 OR RIBBED PVC SEWER PIPE CSA B182.4-M90 ASTM-F794 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS. RIBBED PVC NOT TO BE USED WITHIN RIGHT-OF-WAY.

2.4. STORM SEWERS, 450mmø AND LARGER, SHALL BE CONCRETE PIPE, CSA-A257.2 65-D WITH RUBBER GASKET JOINT OR RIBBED PVC SEWER PIPE CSA B182.4-M90 ASTM-F794 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC RIBBED PVC NOT TO BE USED WITHIN RIGHT-OF-WAY.

2.5. MANHOLES AND MANHOLE CATCHBASINS TO BE 1200mmø PRECAST WITH ALUMINUM STEPS AT 300mm CENTRES AS PER OPSD 701.010 UNLESS OTHERWISE SPECIFIED.

2.6. CATCHBASINS TO BE 600mm SQUARE PRECAST AS PER OPSD 705.010.

2.7. ALL STORM STRUCTURES TO HAVE A MINIMUM 600mm DEEP SUMP. WHEN THE STRUCTURE INCLUDES THE INSTALLATION OF A SNOUT (OR APPROVED EQUIVALENT) THE SUMP DEPTH TO BE MIN 2.5 TIMES THE OUTLET PIPE DIAMETER SIZE.

2.8. MANHOLE AND CATCHBASIN, FRAMES, GRATES, CASTINGS AND LIDS TO BE QUALITY GREY IRON ASTM A48 CLASS 30B.

2.9. STORM MANHOLE LIDS TO BE PER OPSD 401.010 – TYPE 'B' CATCHBASIN AND CATCHBASIN MANHOLE GRATES TO BE PER OPSD 400.100. DITCH INLET CATCHBASIN GRATES TO BE PER OPSD 403.010.

2.10. ADJUSTMENT UNITS FOR STORM STRUCTURES TO BE IN ACCORDANCE WITH OPSD 704.010 OR 704.011.

2.11. STORM SEWERS AND SERVICES TO HAVE MINIMUM 1.2m COVER TO TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED SEWER PIPE IN ACCORDANCE WITH APPLICABLE "SEWER PIPE INSULATION DETAIL" INDICATED IN DRAWING DETAILS. INSULATION SHALL BE RIGID EXTRUDED POLYSTYRENE (EPS) BOARD, WITH A THICKNESS SUFFICIENT TO PROVIDE AN RSI-1.76 (R10) INSULATING FACTOR (TYPICALLY 50-65mm). INSULATION BOARD WIDTH SHALL BE 1.8m FOR UP TO 200mm NOMINAL PIPE DIAMETER, 2.4m FOR 201mm-800mm DIAMETER AND 3.0m FOR 801mm-1400mm. ALL JOINTS SHALL BE TIGHTLY BUTTED TOGETHER (TAPE OR OTHERWISE SECURE JOINTS TO RESIST MOVEMENT DURING BACKFILL COVER). RIGID EPS BOARD SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 140kPa (20psi), AND A MAXIMUM WATER ABSORPTION RATE OF 2.0% BY VOLUME. ACCEPTABLE PRODUCTS ARE DOW STYROFOAM-SM OR -HI (FULL LINE), OWENS CORNING FOAMULAR (200, 250, OR HIGHER), PLASTISPAN HD-M28 OR OTHER ENGINEER-APPROVED EQUIVALENT.

2.12. UNDER NO CIRCUMSTANCES SHALL THE BUILDING FOUNDATION DRAINS BE CONNECTED DIRECTLY TO THE STORM SEWER SYSTEM.

2.13. ALL WEEPING TILE DRAINAGE TO BE PUMPED TO THE STORM SEWER SYSTEM.

2.14. FLOW CONTROL ROOF DRAINS TO BE ZURN MODEL ZCF-121 – SINGLE NOTCH (5gpm head/notch of head) OR APPROVED EQUIVALENT.

2.15. CONTRACTOR RESPONSIBLE FOR TESTING OF SANITARY SEWERS IN ACCORDANCE WITH OPSS 410.

3. SANITARY SEWERS

3.1. PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD 802.030. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD 802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRANULAR "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

3.2. SANITARY SEWERS 150mmø AND SMALLER SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR28 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

3.3. SANITARY SEWERS 200mmø TO 600mmø INCLUSIVE SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR35 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

3.4. SANITARY SEWERS GREATER THAN 600mmø SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR35 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

3.5. MANHOLES TO BE 1200mmø PRECAST WITH ALUMINIUM STEPS AT 300mm CENTRES AS PER OPSD 701.010 UNLESS OTHERWISE SPECIFIED.

3.6. MANHOLES TO BE BENCHED PER OPSD 701.021.

3.7. SANITARY MANHOLE LIDS TO BE PER OPSD 401.010 –TYPE 'A'.

3.8. MANHOLE FRAMES, CASTINGS AND LIDS TO BE QUALITY GREY IRON ASTM A48 CLASS 30B.

3.9. ADJUSTMENT UNITS FOR SANITARY STRUCTURES TO BE IN ACCORDANCE WITH OPSD 704.010 OR 704.011.

3.10. SANITARY SEWERS AND SERVICES TO HAVE MINIMUM 1.2m COVER ON TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED PIPE IN ACCORDANCE WITH APPLICABLE "SEWER PIPE INSULATION DETAIL" INDICATED IN DRAWING DETAILS. INSULATION SHALL BE RIGID EXTRUDED POLYSTYRENE (EPS) BOARD, WITH A THICKNESS SUFFICIENT TO PROVIDE AN RSI-1.76 (R10) INSULATING FACTOR (TYPICALLY 50-65mm). INSULATION BOARD WIDTH SHALL BE 1.8m FOR UP TO 200mm NOMINAL PIPE DIAMETER, 2.4m FOR 201mm-800mm DIAMETER AND 3.0m FOR 801mm-1400mm. ALL JOINTS SHALL BE TIGHTLY BUTTED TOGETHER (TAPE OR OTHERWISE SECURE JOINTS TO RESIST MOVEMENT DURING BACKFILL PLACEMENT). RIGID EPS BOARD SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 140kPa (20psi), AND A MAXIMUM WATER ABSORPTION RATE OF 2.0% BY VOLUME. ACCEPTABLE PRODUCTS ARE DOW STYROFOAM-SM OR -HI (FULL LINE), OWENS CORNING FOAMULAR (200, 250, OR HIGHER), PLASTISPAN HD-M28 OR OTHER ENGINEER-APPROVED EQUIVALENT.

3.11. CONTRACTOR RESPONSIBLE FOR TESTING OF SANITARY SEWERS IN ACCORDANCE WITH OPSS 410.

4. WATERMAINS

4.1. PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD 802.030. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD 802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRANULAR "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

4.2. WATER SERVICE CONNECTIONS 50mmø AND SMALLER, SHALL BE TYPE "K" SOFT COPPER ASTM B88, ALUMINIUM COMPOSITE CSA B137.10, OR HDPE SERIES 160 AWWA C 901 WITH SERVICE SADDLE. COPPER SERVICE SHALL HAVE 5.5Kg ANODE.

4.3. WATERMAINS 100mmø AND LARGER SHALL BE PVC C900 CLASS 150 INSTALLED WITH MINIMUM 2.0 METRES OF COVER. FITTINGS 100mmø AND LARGER SHALL BE PVC CLASS 150 (DR18) CSA B137.3.

4.4. WATERMAIN FITTINGS TO BE SUPPLIED WITH MECHANICAL JOINT RESTRAINTS. FOR WATERMAIN PIPE SIZES 150mmø OR LESS ALL PIPE JOINTS TO BE RESTRAINED WITHIN 5.0m FROM ALL FITTINGS, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. FOR WATERMAIN PIPE SIZES GREATER THAN 150mmø ALL PIPE JOINTS TO BE RESTRAINED WITHIN 10.0m FROM ALL FITTINGS, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. ALL TEES TO HAVE MINIMUM 2.0m SOLID PIPE LENGTH ON EACH RUN OF THE TEE, OR PROVIDE A THRUST BLOCK PER OPSD 1103.010.

4.5. ALL METALLIC FITTINGS (EXCLUDING CURB/MAIN STOP AND BRASS FITTINGS) AND APPURTENANCES INCLUDING SADDLES, VALVES, TEES, BENDS ETC ARE TO BE WRAPPED WITH AN APPROVED PETROLATUM SYSTEM CONSISTING OF PASTE, MASTIC AND TAPE. PARTICULAR ATTENTION SHALL BE PAID TO ANODE INSTALLATION. CONTRACTOR TO REFER TO THE MOST RECENT EDITION OF THE LOCAL MUNICIPALITY AND AREA MUNICIPALITIES DESIGN GUIDELINES AND SUPPLEMENTAL SPECIFICATIONS FOR MUNICIPAL SERVICES.

4.6. WATERMAIN VALVES 100mmø AND LARGER SHALL BE AS PER AWWA C509 – MUELLER A2360-23 OR APPROVED EQUIVALENT (OPEN LEFT) INCLUDING VALVE BOX AND 2.3Kg ANODE INCLUDING ANODE PROTECTION INSTALLED PER LOCAL MUNICIPALITY STANDARDS.

4.7. PVC WATERMAIN SHALL HAVE TWU STRANDED COPPER, AWG8 TRACER WIRE STRAPPED TO TOP AT 5 METRE INTERVALS. TRACER WIRE SHALL BE BROUGHT TO THE SURFACE AT ALL HYDRANTS AND CAD WELDED TO THE LOWER FLANGE OF THE HYDRANT.

4.8. HYDRANTS SHALL BE CANADA VALVE "CENTURY" OR APPROVED EQUIVALENT WITH 2-64mm HOSE CONNECTIONS INCLUDING 5.5Kg ANODE.

4.9. MAIN STOPS, CURB STOPS AND COUPLINGS SHALL BE AWWA C-800 COPPER TO COPPER FLANGED OR COMPRESSION CONNECTION OR APPROVED EQUIVALENT.

4.10. SERVICE BOXES TO BE FERGUSON ECLIPSE TYPE FIGURE 222 SIZE NO. 9 OR APPROVED EQUIVALENT COMPLETE WITH ROD AND PLUG.

4.11. WATER CONNECTIONS MAY BE PLACED IN THE SAME TRENCH WITH A STORM OR SANITARY CONNECTION ONLY IF A MINIMUM VERTICAL SEPARATION OF 500mm IS MAINTAINED BETWEEN THE WATER SERVICE AND ANY OTHER PIPE, IN ACCORDANCE WITH SECTION 7.3.5.7.(2)(a)(i) OF THE ONTARIO BUILDING CODE.

4.12. ALL WATERMAINS AND SERVICES TO HAVE MINIMUM 2.0m COVER ON TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL CONTACT DESIGN ENGINEER FOR "WATER PIPE INSULATION DETAIL".

4.13. ALL WATERMAIN TO BE PRESSURE TESTED IN ACCORDANCE WITH OPSS 441. DISINFECT ALL WATERMAIN IN ACCORDANCE WITH AWWA C 651-99 INCLUDING CHLORINATION, BACKFLOW PREVENTOR AND 24 HOUR DUPLICATE SAMPLING. ALL TESTING AND DISINFECTION TO BE COMPLETED UNDER THE SUPERVISION OF THE ENGINEER.

5. EROSION AND SEDIMENT CONTROL

5.1. CONTRACTOR TO INSTALL EROSION CONTROL MEASURES AS SHOWN PRIOR TO CONSTRUCTION AND MAINTAIN IN GOOD CONDITION UNTIL CONSTRUCTION IS COMPLETED AND ALL DISTURBED GROUND SURFACES HAVE BEEN RESTABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE COVER.

5.2. ALL SEDIMENT CONTROL FENCING TO BE INSTALLED PRIOR TO ANY AREA GRADING, EXCAVATING OR DEMOLITION COMMENCING.

5.3. EROSION CONTROL FENCING TO BE INSTALLED AROUND BASE OF ALL STOCKPILES. ALL STOCKPILES TO BE KEPT 2.5m MINIMUM FROM PROPERTY LINE.

5.4. EROSION PROTECTION TO BE PROVIDED AROUND ALL STORM AND SANITARY MHs AND CBs.

5.5. CONSTRUCTION ACCESS (MUD MAT) TO BE PROVIDED ON-SITE AT ALL LOCATIONS WHERE CONSTRUCTION VEHICLES EXIT THE SITE. CONSTRUCTION ACCESS (MUD MAT) SHALL BE A MINIMUM OF 3.0m WIDE, 15.0m LONG (LENGTH MAY VARY DEPENDING ON SITE LAYOUT) AND 0.3m DEEP AND SHALL CONSIST OF 200mm CLEAR STONE MATERIAL OR APPROVED EQUIVALENT. PROPOSED EROSION FENCING TO TIE INTO MUD MAT. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MAT IS MAINTAINED IN A MANNER TO MAXIMIZE EFFECTIVENESS AT ALL TIMES.

5.6. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES. CONTRACTOR TO PROVIDE ALL ADDITIONAL EROSION CONTROL STRUCTURES.

5.7. EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RESTABILIZED.

5.8. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE ENGINEER AND THE LOCAL MUNICIPALITY'S DEPARTMENT OF PUBLIC WORKS.

5.9. CONTRACTOR TO CLEAN ROADWAY AND SIDEWALKS OF SEDIMENTS RESULTING FROM CONSTRUCTION TRAFFIC FROM THE SITE EACH DAY.

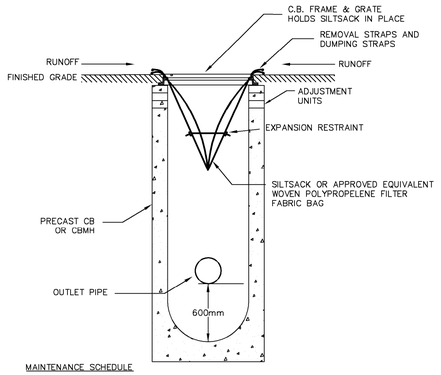
5.10. CONTRACTOR MUST REMOVE EROSION AND SEDIMENTATION FENCING PRIOR TO COMPLETION OF PROJECT. CONTRACTOR TO HAVE EROSION AND SEDIMENTATION FENCE INSPECTED WHEN VEGETATION HAS ESTABLISHED, BUT PRIOR TO FENCE BECOMING OVERGROWN. ENGINEER'S REPRESENTATIVE TO DETERMINE IF VEGETATION HAS REACHED THE CRITICAL POINT AND WILL THEN INSTRUCT CONTRACTOR TO REMOVE FENCE.

6. MAINTENANCE RECOMMENDATIONS

6.1. DURING THE COURSE OF CONSTRUCTION CONTRACTOR TO REMOVE SEDIMENT AND CONTAMINANTS FROM STORMWATER MANAGEMENT FACILITIES MONTHLY. FOLLOWING CONSTRUCTION CONTRACT COMPLETION, OWNER TO HIRE QUALIFIED CONTRACTOR TO REMOVE SEDIMENT AND CONTAMINANTS ANNUALLY AND REINSTATE STORMWATER MANAGEMENT FACILITIES ACCORDING TO THE DESIGN OUTLINED ON THIS PLAN, AS REQUIRED.

6.2. EROSION CONTROL STRUCTURES TO BE MONITORED REGULARLY AND ANY DAMAGE REPAIRED IMMEDIATELY. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF 1/3 THE HEIGHT OF THE FENCE.

6.3. OWNER'S REPRESENTATIVE TO MONITOR EROSION CONTROL STRUCTURES TO ENSURE FENCING IS INSTALLED AND MAINTENANCE IS PERFORMED TO CITY REQUIREMENTS.

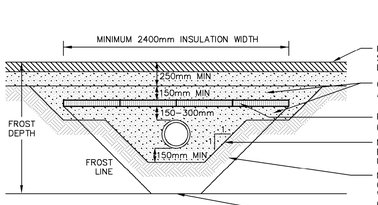


MAINTENANCE SCHEDULE

- INSPECT AFTER EVERY MAJOR RAIN EVENT.
- INSPECT EVERY 3 WEEKS MINIMUM.
- SILTSACK SHOULD NEVER BE OVER HALF FULL.
- FULL BAG CAN BE REMOVED, DUMPED, CLEANED AND REUSED (TO REMOVE INSERT 25mm REBAR INTO REMOVAL FLAP POCKETS) (TO DUMP INSERT 25mm REBAR INTO BOTH DUMPING STRAPS)

TEMPORARY SILTSACK SILTATION CONTROL IN CB

N.T.S.



PAVEMENT STRUCTURE (ASPHALT AND/OR GRANULAR), OR SELECT NATIVE MATERIAL AND TOPSOIL, AS SPECIFIED ON DRAWINGS

GRANULAR 'A' BEDDING & BACK FILL BELOW AND ABOVE PIPE AND INSULATION BOARD, COMPACTED TO MINIMUM 95% SPMDD

RIGID EPS-INSULATION BOARD PER SPECIFICATION NOTES (MINIMUM R10-THICKNESS, TYPICALLY 50-65mm)

NOTE: TRENCH SIDE-SLOPES IN AREAS OF PIPE INSULATION TO BE MAXIMUM 1:1 SLOPE, NO VERTICAL SECTIONS ALLOWED UNLESS INDICATED IN DETAIL

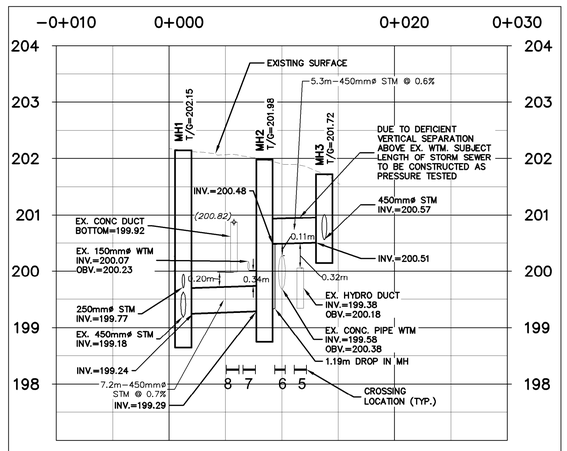
NATIVE SOILS – WHERE NATIVE SOIL IS SOFT AND/OR OF ORGANIC CONTENT, REMOVE TO DEPTH OF SUITABLE SOILS AND REPLACE WITH GRANULAR-B2 MATERIAL COMPACTED TO 95% SPMDD, OR CONSTRUCT IN ACCORDANCE WITH WRITTEN DIRECTION FROM GEOTECHNICAL CONSULTANT

FROST DEPTH – PROTECT SOIL ZONE UNDER PIPE FROM FREEZING REFER TO OPSD 3400.011 FOR SPECIFIC LOCAL FROST DEPTH

SEWER PIPE INSULATION DETAIL

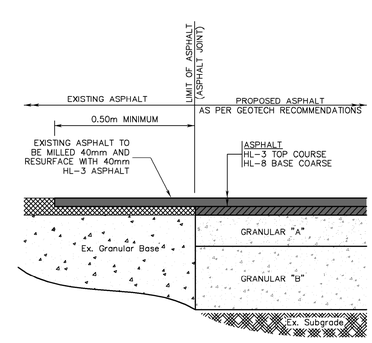
FOR SEWER PIPES HAVING LESS THAN 1200mm COVER AND MINIMUM 615mm COVER

N.T.S.



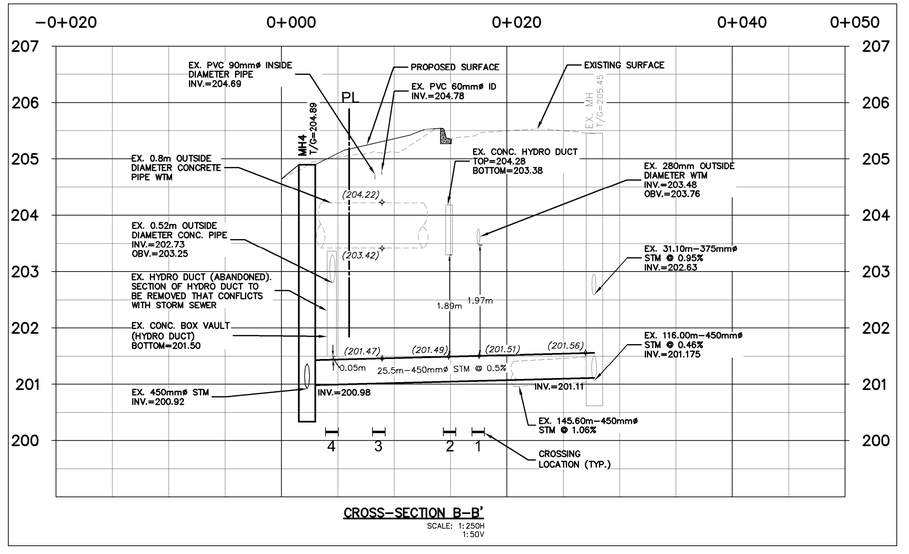
CROSS-SECTION A-A'

SCALE: 1:250H 1:50V



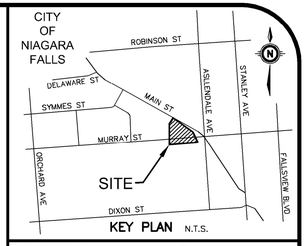
ASPHALT LAP JOINT DETAIL

N.T.S.



CROSS-SECTION B-B'

SCALE: 1:250H 1:50V



KEY PLAN N.T.S.

GEODETIC BM ELEV. = m

SITE BENCHMARK ELEV. = 204.81m

CONTROL MONUMENT 0126 IN CONCRETE SIDEWALK AT THE NORTHWESTERLY CORNER OF MAIN STREET AND MURRAY STREET AT MUNICIPAL ADDRESS 5619 MURRAY STREET.

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

NOTE:

1. **EXISTING LEGAL AND TOPOGRAPHICAL INFORMATION PROVIDED BY SUDA AND MALESZYK SURVEYING INC DATED 2018.**
2. **INVERTS DENOTED WITH "±" ARE TAKEN FROM AS-RECORDED PLAN AND PROFILE DRAWINGS COMPLETED BY THE CITY OF NIAGARA FALLS AND ARE CONSIDERED APPROXIMATE ONLY. CONTRACTOR TO FIELD VERIFY AND REPORT ANY DISCREPANCIES TO ENGINEER.**
3. **THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF THE FOLLOWING: C1.1, C2.1, C2.2, C2.3, AND THE SWM REPORT.**
4. **DAYLIGHTING COMPLETED BY SUDA AND MALESZYK DATED JUNE 2022.**

No.	REVISION	BY	YYYY-MM-DD
8.			
7.			
6.			
5.			
4.			
3.			
2.			
1.	ISSUED FOR OPA & ZBA	KRR	2023-12-15

MTE
Engineers, Scientists, Surveyors
905-639-2552

NOT FOR CONSTRUCTION

CLIENT
ZELJKO HOLDINGS LIMITED
4728 DORCHESTER RD NIAGARA FALLS, ON

PROJECT
6285 & 6289 MAIN STREET
6285 & 6289 MAIN STREET NIAGARA FALLS, ON

DRAWING
NOTES AND DETAILS PLAN

Project Manager R.CALOGERO	Project No. 49810-100
Design By CNF	Checked By RNC/KRR
Drawn By DXC/LXQ	Checked By CNF
Surveyed By OTHERS	Drawing No. C2.3
Date Aug.27/21	
Scale AS SHOWN	Sheet 4 of 4