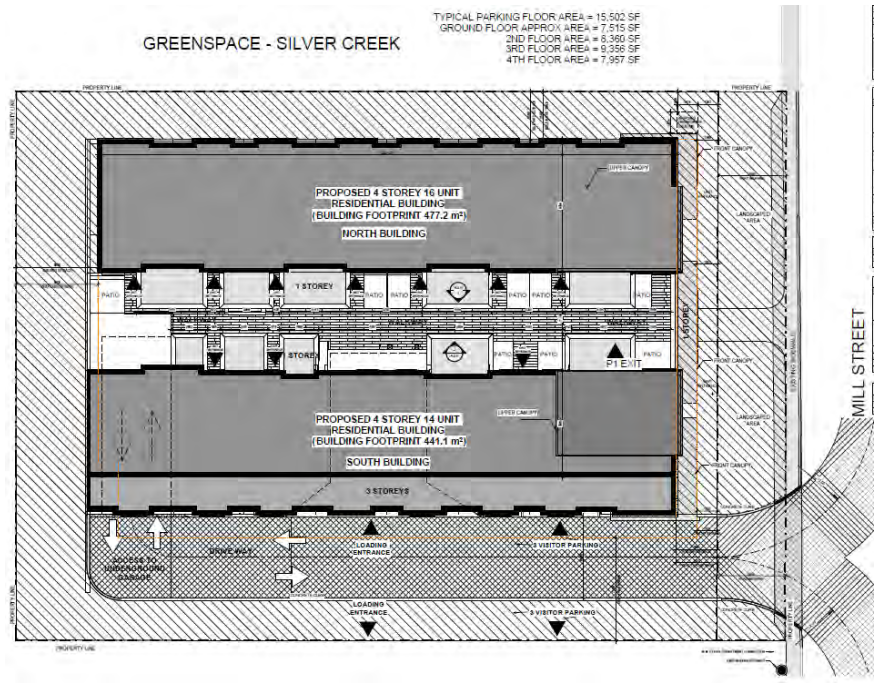

Layout Of Site Proposed, Source Drawing: SRM Architects, File 20052, March 2023

Stormwater Management Report
Rev 8 November 04, 2024
16-18 Mill St, Georgetown, Ontario

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Revision 9

October 31, 2024
EAL Project: 30663J

Table of Contents

1 Introduction

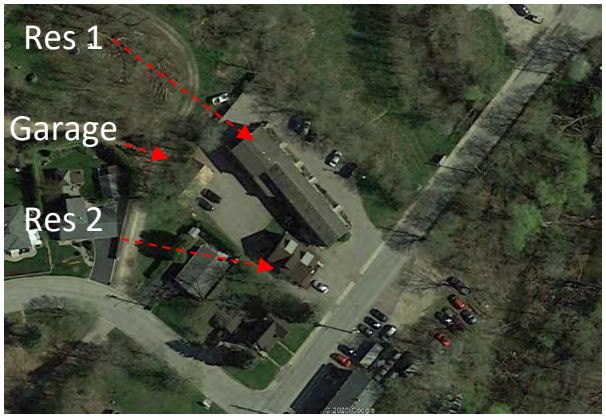
Egmond Associates Ltd (EAL) was retained to prepare a report outlining the preliminary servicing requirements for the re-development of a residential site at 16 to 18 Mill St, Georgetown, Ontario as shown on the cover.

This report fulfils the requirements of the Functional Servicing Report, as well as the Stormwater Management Brief and Water Balance Assessment and references SRM Architects Project Number 20052, Plans A 1.1 to A 3.3 dated February 2023.

The Site, which consists of 16 to 18 Mill St, Georgetown, ON, is located on the North West side of Mill St, between Dayfoot Dr and McNabb St. It is 2272m^2 (0.227 ha) in area. Mill Street is planned to be widened in the future, which will remove 5m from the eastern property frontage, resulting in a future site area of 2071m^2 (0.207ha).

For ease of communication, the Project North is identified in the true North East direction such that Mill Street is on the Project East side of the property (Drawing 1). All following directions will be identified relative to Project North.

There are currently two multi unit residential buildings (Res 1 and 2) and a small outbuilding (Garage) on the Site which are to be demolished for the development of two new structure(s) as shown in the Google Aerial.



A geotechnical investigation was conducted on the Site by EAL in July 2020 (with revisions April 2022), and a Phase I Environmental Assessment was conducted by Watters Environmental Group Inc in September 2019.

A site layout was prepared by SRM Architects Inc. in February 2023, which is used as a basis for the design calculations in this report. The two buildings are expected to be constructed at the same time.

This report is based on the site plans and concepts as understood by EAL up to August 08, 2024.

2 Proposed Development

The proposed two structures as of February, 2023 are to be 4 storey residential buildings with 2 levels of underground parking. The northern building footprint is to be 477.2 m^2 with a gross floor area of 1,673.68 m^2. The southern building footprint is to be 441.1 m^2 with a gross floor area of 1,410.42 m^2. The total buildings footprint is to be 918.3 m^2 with a gross floor area of 3,084.1 m^2. There are planned to be 30 units (20 units North Building 1, 14 units South Building 2), which are to be a mix of 1 and 2 bedroom units. For servicing estimates, it is assumed that the average unit occupancy is to be 3 persons, for a total site occupancy or 102 persons (3 persons per unit*34 units).

The landscaped area is to be 29 % of the total site area, 596.4 m^2.

2.1 Site Grading

Based on the topographic survey by J. R. Finnie, the general slope of the property is from West to East. The highest elevation on the site was 245.5m Above Sea Level (ASL) in the South West corner of the site. The South East corner at Mill St was approximately 244.5 m ASL and the North East corner at Mill St is approximately 242.8 m ASL. The North West corner adjacent to a green space is approximately 244.8 m ASL.

Proposed overland storm water flow routes are overland to Mill St in the East and to the green space on the North side of the site.

On the south side is a proposed 9.2 m building setback (driveway and greenspace area) and a 7.5 m setback from the canopy to the property line.

On the east side is a 5000 mm landscaped area (designated future road widening), is proposed a 1.5 m canopy set back and a 3 m front yard setback.

A 6m deep rear yard is proposed to be on the West side of the property. A 3.5m deep side yard is proposed to be on the North side of the property.

2.2 Access

Access to the site is provided via Mill Street on the north and south parts of the lot. Current driveway and parking area creates a "circular" path surrounding the structures. A small green space is between the existing buildings.

49 Parking residential, 4 barrier free, and 8 visitor parking spaces are to be provided. Residential spaces are mainly below ground. The proposed driveway access is to be near the south east corner of the site at Mill Street (see the Site Plan). Access ramps to the underground parking proposed are at the south west corner southern building.

2.3 Storm Service

There are no known storm drains on the Site. Storm water is discharged by overland sheet flow to Mill St and to the green space to the North.

There is an 850mm diameter storm sewer in Mill St which should be used to discharge post-development flows. Pre-Development and Post Development Drainage Plans are attached in **Appendix 'A'.** The runoff flows are calculated using Halton Town Rainfall Intensity Duration Frequency parameters. Modified Rational formula is used to calculate the flows. The proposed Storm System is shown in the **Appendix 'B'**

3.0 Stormwater Management

3.1 Stormwater Management Criteria

The stormwater management is based on the Town of Halton Hills Subdivision Manual 99-06-23, the Town of Halton Hills, Stormwater Management Policy (March 2009), supplemented by Credit Valley Conservation Stormwater Management Criteria (August 2012), and the MECP Stormwater Management Planning and Design Manual (March 2003)..

The 0.2071 ha site will be treated as a Single Lot Residential Development as it is smaller than 0.5 ha. The quality control shall:

- Have enhanced water quality treatment provided to the discharge of runoff from the site (80% TSS removal)
- Be based on consultation with the Region concerns, the Site is in Well Head Protection Area E which indicates that surface water can easily seep through the soil and influence ground water; and WHPA-Q1/Q2-C, which means that it takes between 2 to 5 years for groundwater at the site to reach a wellhead.

The control for stormwater quantity is to be as follows:

- Control post-development peak flows to the existing/pre-development levels for all storms up to and including the 100 year storm (2, 5, 20, 25, 50, and 100 year design storms).
- Maintain at least 5mm of on-site detention for erosion control protection.

- Major storm flows are to be routed overland to an appropriate outlet.

The post-development peak runoff generated from the site is to be attenuated to the existing/pre-development level, for the range of design storm events from 2 to 100 year storms. Based on the Town of Halton Hills Intensity Duration Frequency Chicago Rainfall Distribution equation. Parameters return periods between 2 and 100 years shown in **Table 4** below:

Table 4
CHICAGO RAINFALL DISTRIBUTION
$I=A(B+t_d)^c$

STORM EVENT	2	5	10	25	50	100
A	586.10	946.46	1173.48	1368.91	1622.45	1777.20
B	6.0	7.0	8.0	8.0	9.0	9.0
C	-0.760	-0.788	-0.794	-0.789	-0.797	-0.795

Rainfall Intensities for 10 minutes time of concentration:

Table 5
Rainfall Intensities

STORM EVENT	2	5	10	25	50	100
INTENSITY	71.26	101.51	118.25	140.95	155.24	171.05

Runoff flow calculations are done using the Rational Formula Q=2.78RIA
Where Q= Runoff flow
R= Runoff Coefficient
I =Rainfall Intensity
A= Catchment Area

3.2 Proposed Minor Drainage Scheme

The proposed storm sewer system within the site has been designed using the 5 Year IDF curve for Halton Hills. The site will be serviced by a minor drainage system consisting of a network of catchbasins connected to on-site storm sewers. The Storm Design Sheet is shown in **Appendix 'B'**.

3.3 Proposed Major Drainage Scheme

According to the Town of Halton Hills, post-development runoff in excess of 2-Year up to (including) 100-Year storm should not exceed the pre-development of the same storm. The flow in excess of the 100 Year Pre-development will be directed by overland flow route towards the east access driveway to Mill Street.

3.4 Existing/Pre-Development Drainage Condition

The site is 2071m^2 (0.207 ha) in area, with an estimated 109m^2 (0.011) ha being permeable landscaped surface, 537m^2(0.054 ha) being roof, and 1425m^2 (0.143 ha) being asphalt pavement and hard surfaces.

Storm water flow routes are overland to Mill St in the East and to the green space on the North side of the site. Water directed towards Mill St sheet flows towards Mill street, which ultimately flows into Silver Creek.

There is an 850 mm diameter storm sewer in Mill St adjacent to the Site which could be used for the re-development. The Pre-Development runoff coefficient of the Site is **0.87**(**See Table-6**)

As shown in Pre-Development Drainage Plan, the surface drainage is divided into two areas, **AREA 101(**draining towards the Creek**)** and **AREA 102 (**draining towards Mill Street). Drainage Plans are shown in **Appendix 'A'**

3.5 Weighted Runoff Coefficient for the Pre-Development Condition(Whole Site)

The predevelopment land use of the site encompasses two multi-unit residential buildings and a small outbuilding-garage which will be demolished for the proposed development

In the table below existing landuse and runoff coefficients have been shown

Table 6

Existing Land Use	Area (m2)	Runoff Coefficient	Area x Runoff Coefficient
Building 1 Roof	**342**	**0.90**	**307.80**
Building 2 Roof	**105**	**0.90**	**94.50**
Sidewalk/Walkway	**67**	**0.90**	**60.30**
Garage	**90**	**0.90**	**81.0**
Asphalt Pavement	**1358**	**0.90**	**1222.2**
Grass	**109**	**0.25**	**27.25**
Total Site	**2071**		**1793.05**

Pre Development Composite Runoff Coefficient = 1793.05/2071
= 0.87

3.5.1 WEIGHTED RUNOFF COEFFICIENT FOR PRE-DEVELOPMENT - AREA 101

The Drainage from this area is discharging towards the creek through sheet flow. Below is the detail of the area.

Table 7

Existing Land Use	Area (m2)	Runoff Coefficient	Area x Runoff Coefficient
Building 1 Roof	**71**	**0.90**	**63.9**
Sidewalk/Walkway	**28**	**0.90**	**25.2**
Asphalt Pavement	**440**	**0.90**	**396**
Grass	**41**	**0.25**	**10.25**
Total Site	**580**		**495.35**

Pre Development Composite Runoff Coefficient = 495.35/580
= 0.85

3.5.2 WEIGHTED RUNOFF COEFFICIENT FOR PRE-DEVELOPMENT - AREA 102

This area is discharging through sheet flow towards Mill Street. Below is the detail of the area.

Table 8

Existing Land Use	Area (m^2)	Runoff Coefficient	Area x Runoff Coefficient
Building 1 Roof	271	0.90	243.90
Building 2	105	0.90	94.50
Walkway	39	0.90	69.3
Garage	90	0.90	81.0
Asphalt Pavement	918	0.90	826.2
Grass	68	0.25	17.0
Total Site	1491		1156.4

Post Development Composite Runoff Coefficient = 1156.4/1491
=**0.77**

The Pre-Development Drainage Plan is shown in **Appendix 'A'**

3.6 WEIGHTED RUNOFF COEFFICIENT FOR THE POST-DEVELOPMENT CONDITION-(WHOLE SITE)

In the table below existing landuse and runoff coefficients have been shown

Table 9

Proposed Land Use	Area (m^2)	Runoff Coefficient	Area x Run Coefficient
North Building Roof	415.00	0.90	429.50
South Building Roof	435.00	0.90	397.00
Sidewalk/Walkway	41.00	0.90	36.90
Central Corridor/One Story entrances	316.00	0.90	288.00
Asphalt Pavement	300.00	0.90	270.00
Grass	564.00	0.25	122.93
Total Site	2071		1544.33

Post- Development Composite Runoff Coefficient= 1544.33/2071=**0.75**

3.6.1 WEIGHTED RUNOFF COEFFICIENT FOR THE POST-DEVELOPMENT(AREAS 201,202,203,204)

Below are the areas detail runoff which is discharging towards Mill Street.

Table 10 (AREA 201)

Proposed Land Use	Area (m^2)	Runoff Coefficient	Area x Run Coefficient
South 3rd Roof	105	0.90	94.50
Central Corridor/One Story entrances	316	0.90	284.40
Asphalt Pavement	300	0.90	270.00
Grass	325	0.25	81.25
Total Site	1046		730.15

Post Development Composite Runoff Coefficient = 730.15/1046=**0.70**

Table 11(AREA 202)

Proposed Land Use	Area (m^2)	Runoff Coefficient	Area x Run Coefficient
North Building Roof	415	0.90	373.50

Table 12(AREA 203)

Proposed Land Use	Area (m^2)	Runoff Coefficient	Area x Run Coefficient
South Building Fourth Story Roof	330	0.90	297.00

Table 13(AREA 204)

Proposed Land Use	Area (m^2)	Runoff Coefficient	Area x Run Coefficient
Front Walkway	42	0.90	37.80
Grass	54	0.25	13.5
Total	96		51.30

Post Development Composite Runoff Coefficient = 51.30/96=**0.53**

3.6.2 WEIGHTED RUNOFF COEFFICIENT FOR THE POST-DEVELOPMENT(AREA 205)

The Drainage from this area is discharging towards the Creek. Below is the detail of the area.

Table 14 (AREA 205)

Land Use	Area (m^2)	Runoff Coefficient	Area x Runoff Coefficient
Grass	185	0.25	46.25
Total	185		46.25

Post-Development Composite Runoff Coefficient(5-Year) = 46.25/185

= **0.25**

The Post-Development Drainage Plan is shown in **Appendix 'A'**

3.7 PRE-DEVELOPMENT/ALLOWABLE FLOW RATES

As identified in Section 2.4, the storm service for the development should be connected to the 850mm diameter storm drain on Mill St, rather than relying on the existing sheet flow(**from Area 101**) down Mill St to a storm drain near Silver Creek. The Pre-Development flows are shown in **Table 15.** The allowable flows should be equal or less than the flows shown in **Table 15** for respective storm events.
The post-development flows generated from the development must not exceed the pre-development flows to the storm drain. Therefore, the flow rates described in **Table 17(Controlled)** above must not be exceeded after development.

Flow rates for pre-development condition, discharging towards Mill Street, are estimated using the Rational Method. The combined runoff coefficient C of the **Area 102** is estimated to be **0.77** as per **Table 8** above.

Table 15 shows flow rates for the existing conditions after 10 minutes of the design storms.
(Allowable Flows)

Table 15: Existing conditions/ Pre-development Condition Flow rates						
	2-year	5-year	10-year	25-year	50-year	100-year
Flow L/s (m^3/sec) At 10min	22.74 (0.023)	32.40 (0.032)	37.74(0.038)	44.99(0.045)	49.55(0.050)	54.59(0.055)

3.8 POST-DEVELOPMENT DRAINAGE FLOWS

Post-Development Drainage area is divided into Catchment Areas, **AREA 201 , AREA 202, AREA 203, AREA 204** and **AREA 205.** The areas 201, 202, 203 and 204 are discharging towards Mill Street **AREA 205** discharging towards the Creek.

The post development flows to wards Mill Street without control are as follows:

Table 16: Developed Condition Un-Controlled Flow Rates L/s						
	2-year	5-year	10-year	25-year	50-year	100-year
AREA 201	14.5	20.66	24.07	28.69	31.60	34.81
AREA 202	7.75	11.48	12.87	15.34	17.56	19.34
AREA 203	7.40	10.96	12.28	14.64	16.13	18.46
AREA 204	1.0	1.44	1.67	1.98	2.19	2.41
TOTAL	**30.65**	**44.54**	**50.89**	**60.65**	**67.48**	**75.02**

The post development flow rates are exceeding than the existing allowable release rates, we need to provide some type of quantity control to bring total flow draining towards to be less than the allowable flow rates. We need to provided quantity control to bring the Post-Development flows less or equal to Pre-Development level.
Part of the detention storage required to control the post development peak flows can be obtained by using roof top ponding.
Two controlled flow drains (Zurn-Z-105 with two notch or equivalent) will be installed on north building roof. The calculated storage volume for the North Building Roof is 12.25m^3. The storage calculations are shown in **Appendix 'B'**. The storage provided is 13.7m^3. The maximum depth of ponding will be 110mm.

The south building 4th floor roof is divided into three parts. The central part elevation is higher than the two other parts as shown on the Site Servicing Plan. One Zurn-Z-105 with one notch each, on each section of roof is being proposed. The discharge rate for the west and the east sections is **1.34 l/sec** for each roof drain, the central section roof drain discharge rate will be **1.04Liters/sec**, thus for three roof drains it will **be 3.74 Litres/sec**. The storage calculations are shown in **Appendix B2** and **Appendix B3.**

As the runoff from catchment **AREA 205,** 0.0185 hectares(R=0.25), towards the Creek will be less than the runoff from Pre-Development Drainage **AREA 102,** 0.0580 **h**ectares (R=0.85), we are full filling the Quantity Control requirement for the flows discharging towards the Creek.

The post development flows to wards Mill Street with control are as follows:

Table 17: Developed Condition Controlled Flow Rates L/s						
	2-year	5-year	10-year	25-year	50-year	100-year
AREA 201	14.5	20.66	24.07	28.69	31.60	34.81
AREA 202	3.28	3.28	3.28	3.28	3.28	3.28
AREA 203	3.74	3.74	3.74	3.74	3.74	3.74
AREA 204	1.0	1.44	1.67	1.98	2.19	2.41
TOTAL	**22.52**	**29.12**	**32.76**	**37.74**	**40.81**	**44.24**

3.9 COMPARISION OF PRE-DEVELOPMENT AND POST-DEVELOPMENT FLOWS TO MILL STREET

Table 17: Developed Condition Controlled Flow Rates L/s						
	2-year	5-year	10-year	25-year	50-year	100-year
PRE-DEVELOPMENT FLOWS	**22.74**	**32.40**	**37.74**	**44.99**	**49.55**	**54.59**
POST-DEVELOPMENT FLOWS	**22.52**	**29.12**	**32.76**	**37.74**	**40.81**	**44.24**

It can be seen that the post-development flows discharging to Mill Street are not exceeding the pre-development flows, thus fulfilling the Town's Stormwater Management requirements.

3.10 WATER BALANCE

The primary objective of the water balance Targets/Criteria is to capture and manage annual rainfall on the development site itself to preserve the pre-development hydrology or "water balance", which typically consists of three components: runoff, infiltration and through a combination of infiltration, evapotranspiration, landscaping rainwater reuse or other low impact development practices. To achieve the minimum on-site retention requires proponent to retain all runoff from small design rainfall event-typically 5mm.

Table 18 Water Balance				
Site Area	**Area (m2)**	**Fraction of Total Area(%)**	**Initial Abstraction**	**Initial Abstraction Over Total Site**
Building Roofs	850	41.0	1.00	0.41
Asphalt Pavement	300	14.5	1.00	0.145
Landscape	564	27.2	5.0	0.272
Central Corridor/ One Story Entrances	316	15.3	1.00	1.36
Walkway	41	2.0	1.00	0.02
TOTAL	**2071**	**100.00**	**32.30**	**2.207**

The remaining Water Balance to be captured = 5.0 – 2.207
=**2.793mm**

To fulfil the 5mm of rainwater balancing condition, we are proposing the remaining 2.793mm of water rain water from the new roof will be discharged to an infiltration trench. The rainwater will percolate into native soil, thus reducing the runoff from the site.

The calculations of storage

Storage required for
Water Balancing =2071 x 0.002793
=5.78m^3

We cannot propose infiltration of the rainwater due to proximity of the building foundations to the property line.

As per the Town's comment, both the buildings to have separate storm service connections to the storm system. Due to these two constraints, we can't fulfil water balance requirement.

3.11 QUALITY CONTROL

To address the Town's requirement for quality control, stormceptor or similar are required. To provide stormwater quality control as required by the City and MOE of 80 % TSS removal, the stormceptor unit Model EF04 (or approved equal) has been recommended for the proposed development. This model as per the manufacturer's report is expected to treat 93% TSS removal. It will capture more than 90% of runoff volume. The Stormceptor Design Sheet is attached in **Appendix 'C'**

4.0 Construction Erosion and Sediment Control

Erosion and sediments must be controlled during the construction phase. During site grading, there is a possibility for runoff containing high levels of sediments to be directed towards adjoining properties, Mill St, and the existing storm infrastructure. Therefore, prior to grading, sediment control fences must be installed along the site perimeter where runoff may discharge from the site. Material stockpiles are to be placed in appropriate locations to minimum erosion. The proposed erosion control plan is in Appendix 'A'.

When catchbasins and manholes are installed, they must be protected with inlet sediment control devices such as woven geotextile filter cloth. The inlet protection must be in place until all building and landscaping work has been completed.

Inspection of maintenance of the silt fences and inlet protection shall be carried out weekly while construction is underway, as well as after every rainfall event of at least 13mm (10 minutes of 2-year design storm.

After construction and landscaping is completed, silt fences and inlet protection may be removed along with any accumulated settlement. The Erosion and Sediment Control Plan is shown in Drawing ESC

6.0 Conclusions

The proposed development will see the construction of a new residential building at 16 to 18 Mill St, Georgetown, Ontario. The proposed development can be serviced utilizing the existing and proposed infrastructure. Our conclusions and recommendations for stormwater servicing of the proposed development are summarized as follows:

- The existing storm water flow is via sheet flow to Mill St and to the green space to the North.
- Storm Flow to Mill Street for the Post-Development condition will be increased as more area is draining to Mill Street as compare to the Pre-Development conditions. To reduce or equal the post-development flows to pre-development levels, we are proposing roof control drains on the fourth story of both buildings.
- To fulfil Water balance requirements can't be fully implemented.
- The soil conditions at the site have high potential for infiltration. It is recommended that runoff generated on the landscaped areas be infiltrated on site.
- The Site is in Well Head Protection Area E and WHPA-Q1/Q2-C
- An oil-grit separator, Stormceptor Model EF04, is being proposed which will remove 93% of TSS And will capture more than 90% of runoff volume.
- A diameter minimum pipe should be used for connecting on-site stormwater management facilities to the 850 mm storm sewer on Mill St.
- The existing storm sewer is expected to be capable of handling the flows due to the development.

A proposed layout for utility connections is shown in the Site Servicing Plan SS1.Closure

7.0 Contract

The client authorized EAL to carry out the work set out in the report in accordance with the scope of work as set out herein.

8.0 Limitations

The present work is for the sole use of EAL, and the client in the Spring/Summer 2022 Site evaluation. Others with an interest in the Site such as contractors, purchasers, etc., must undertake their own investigations respecting the Site, and are advised that the work is to the terms of reference only. Neither EAL nor the client warrant or represent the report has found, detected or reported on all Site conditions or Site environmental conditions. All documents cited, photos other than taken by EAL, drawings reviewed and reproduced are provided at no markup cost beyond 5% to cover insurances and are provided at original cost only. Copyright belongs to the original source. Refer and obtain to original documents at libraries, publishers, etc. for use of these materials, as the present work using the materials for ease of reference using artistic standards in not intended to negate any commercial use or value of the works by others.

9.0 Thanks

The client is thanked for retaining EAL for the present project. Please call us if you have questions regarding the report.Egmond Associates Ltd Premier Engineering Solutions Inc

Environmental & Geotechnical Engineers
Julie vanderMeulen, B.Eng. MaSc, Project Technical Works
John Van Egmond, P.Eng., P.E.,
Principal

Civil Engineers
Muhammad Ismail P.Eng.
Principal

Egmond Associates Ltd – Terms of Engagement

GENERAL

Egmond Associates Ltd (EAL or The Consultant herein and may include subcontractors shall render the Services, as specified in the attached Scope of Services or set out in the final report to the Client, and agreed by the Client for project in accordance with the following terms of engagement. If required, in EAL's opinion, to respond to a subpoena, EAL, its staff, etc. will be paid at their normal charge out rates by the Client. The Client will pay for the amounts invoiced by the consultant on receipt of the invoice.

COMPENSATION

Charges for the service(s rendered will be made in accordance with the Consultant's Schedule of Fees and Disbursements as the services are rendered. Consultant's current schedule of fees is as published to Clients periodically and available on request or as attached hereto. All Charges will be payable in Canadian Dollars unless specified. Invoices will be due and payable on receipt from the date of the invoice without holdback. Interest on overdue accounts is prime plus 10%, collection fees being extra and payable on collection (where allowed. If the account is not paid the reports may not be used or released, and if released all liabilities are the sole responsibility of the Client and the reader and user of the report and he/she/they shall bear all liability and shall save and hold harmless EAL, its staff, shareholders, suppliers, etc. against any and all costs, claims, etc. EAL's limitations shall apply.

REPRESENTATIVES

Each party shall designate a representative who is able to act on behalf of that party and receive notices under this Agreement (default President, if individual then individual.

TERMINATION

Either party may terminate the contract without cause upon thirty (30 days' notice in writing, the engagement terminating by default after 180 days following the final report, unless extended by ongoing work (storing of samples extends lien rights. Payment is due for all costs and expenses to the consultant immediately upon termination. If either party breaches this contract, the non defaulting party, may terminate the agreement after giving seven (7 days' notice (email, writing, verbal to remedy or begin remediation of the breach. Payment is due for all costs and expenses to the consultant immediately on termination of the contract if the consultant elects to exercises termination under this paragraph.

COOPERATION

The consultant's field, laboratory and other work and engineering do not include herein a duty or duty of care to deal with issues other than those set out in the terms of engagement, or as stated in the final report submitted by the Consultant. The Consultant will co-operate, as the Consultant deems appropriate, with the Client's other team members as applicable during portion of work which coincide.

LIMITATION OF LIABILITY

EAL shall not be responsible for the costs, consequences, etc. of:

(1) the failure of others, retained by the Client, to perform work to the satisfaction of the Client;
(2) the design, use or defects of reports, equipment, etc. supplied by the Client;
(3) interactions of other systems, damage to other systems resulting from investigations;
(4) damages to utilities, which were identified and located, or which were not identified by the Client;
(5) any decisions made by the Client (if for example made contrary to the Consultant's advice;
(6) any consequential loss, injury, or damages suffered by the Client, including but not limited to loss of use,
(7) earnings and or business interruption.
(8) the unauthorized distribution of any confidential document or report prepared by or on behalf of the Consultant for the exclusive use of the Consultant and the Client.
(9) the EAL limitations, general soils terms, and report further set out in the limitations. The total amount of all claims the Client may have against the Consultant or any present or former partner, executive, shareholder, employee, or employee thereof under this engagement, including, but not limited to claims for negligence, negligent misrepresentation and breach of contract, shall be strictly limited to half the amount of any professional or other liability insurance the Consultant may have available for such claims. If the client has no paid its bills in full the limitation shall be the unpaid amount only as at the date of the last invoice. The Client agrees its claims can only be against the Consultant under this contract, and not against the employees, shareholders, executives, etc. No claim may be brought against the Consultant in contract or tort by the Client or those who rely on the report more than (2 years after the services were completed or terminated under this engagement. Those who may not rely on the report have no rights in contract or under tort.

DOCUMENTS

All of the documents prepared by the Consultant or on behalf of the Consultant in connection with the Project are instruments of service for the execution of the Project. The Consultant retains the property and copyright in these documents, whether the Client advances to further projects on the matter of the engineering or not. These documents are not for use on other projects or in ways contrary to the report.

FIELD SERVICES DURING CONSTRUCTION

Where applicable, field services where recommended by the Consultant for the Client's project are the minimum thought necessary by the Consultant, whether the Consultant is retained or not. If not retained, EAL shall have no liability, and those responsible for engaging and or providing the field services shall be responsible. Where the Consultant's services are limited, the extent of such limitations may be in the report, or as set out in the limitations, or as set out herein, or as set out in subsequent correspondence, but in no event shall EAL be liable for field services beyond the extent retained by the Client nor for any actual or other damages if subsequent work shows the material conditions were not as expected or work was done improperly, and EAL shall not be a proximate cause of failure, if others fail to carry out any portion of their work or responsibilities.

DISPUTE RESOLUTION

If requested in writing by either the Client or the Consultant, the Client and the Consultant shall attempt to resolve any dispute between them arising out of or in connection with these Terms of Engagement or other vehicle for services between the Client and the Consultant, by entering into structured non-binding negotiations with a mediating (Peter Wallace, P.Eng. on a without prejudice basis. The mediating party shall be appointed by agreement of the parties. It the matter cannot be settled within a period of thirty (30 calendar days with the mediator, the dispute shall be finally resolved by arbitration under the rules of Ontario or by an arbitrator appointed by agreement of the parties or by reference to a Judge of the Courts in Mississauga, Ontario, Canada.

SCHEDULE OF FEES (Base year is July 2020, rates will be adjusted based on inflation:

Principals - $400/hr
Engineers/Technical Consultants - $220hr
Junior Engineer - $150/hr
Scientists - $220/hr
Technical Staff - $125/hr
Others on Payroll x 3
Expenses - over $10,000 per invoice, payable directly by the Client
Expenses - cost plus 15 % (except as agreed by the Client
Travel Cost (Portal to Portal - regular airline or car (0.5 x price of gasoline x kilometres plus expenses
Court Time Multiply by 4
Minimum Contract $1000
Rates in Canadian Dollars.
Other rates available as needed upon request.

Egmond Associates Ltd – Limitations

This document describes the limitations of the report and contract, which may have impact on the use and reading of the documents provided by Egmond Associates Ltd (EAL herein, regarding interpretations, uses, liabilities, etc. Others than EAL and the Client are notified that use of the EAL reports, etc. by said same others, may be or is subject to the restrictions of use, limitations of liabilities, etc. as set out in the contract and its general conditions.

SECTION 1: RESPONSIBILITIES

1.1 Technical Arbiter - EAL was retained to provide the Professional Services described as outlined in the report. Tests and observations were conducted using standard test procedures and laboratory protocols as defined and applied by EAL or its suppliers. EAL are the sole arbiter of technical matters pertaining to the work undertaken in the contract.

1.2 Terms of Reference - EAL provided the Client with written reports meeting the terms of reference as outlined in the report for the use of EAL and the Client in the period identified in the report, or for six months after completion of the report, whichever is shorter. The normal EAL Terms of Engagement shall apply. Any contract by the Client, which uses absolute terms that would negate insurance coverage, etc., shall be taken to mean "reasonable" as defined by EAL periodically. Contracts written by the Client or almost exclusively, that is where the Client input is over 5% of the document or where absolute terms are used, shall be subject to completion and interpretation as determined solely by EAL periodically for either the contract or the technical matters pertaining thereto, particularly as the contract may include any absolute terms.

1.3 Reference Points - Where reference points are used by EAL, EAL has referenced its data and observations to reference points set as part of surveying or construction staking by others.

1.4 Directing Work - Except as specifically provided for in the contract, the Client has not made EAL responsible for directing the work of contractors or others.

1.5 Safety - Nothing in EAL's responsibilities or work shall construe to make EAL responsible for job or site safety after the EAL field work or for other than its own activities when on site. Site safety is the sole responsibility of others, for example the contractor controlling the site. Where EAL makes recommendations for safety in the case of imminent danger as determined by EAL, others than EAL shall pay for such actions as may be required and agree to hold and save harmless the Client and EAL against any and all costs, etc.

1.6 Performance - EAL was not, is not, and will not be responsible for the failure of others to perform in accordance with their particular contract documents. EAL services shall in no way relieve others of their (i.e. the others responsibilities.

1.7 Change in Information - The Client (and others using the EAL report was and is responsible to provide EAL with all known information regarding existing and proposed conditions of the site and undertaking. Any new information, which becomes available to the Client (and others, which differs materially from that used to prepare any reports and information by EAL, in the EAL report and documents it prepared will also be provided. The Client holds harmless EAL, its affiliates, and the respective directors, officers, employees, agents and subcontractors, from all claims, damages, losses, related expenses, etc., involving subterranean structures, movements, contamination, etc. which were not called to EAL's attention, that were not shown on plans, or that were shown in documents not provided to EAL.

1.8 Agreements with Contractors - EAL must be a beneficiary in any hold harmless or indemnity agreements, etc. between the Client and its contractors.

1.9 Approvals - The Client agreed that public officials and authorities and even codes may be interpreted differently by public officials etc., than interpreted by EAL or the Client, and that this difference is neither predictable or within responsibility of EAL and shall not be cause for claim or extras.

1.10 Tender Period - Contractors bidding work shall normally be given not less than 45 days for carrying out their own investigations on matters pertaining to the site, and when changed in the contract, shall notify the contractors and EAL.

1.11 Valid Reports - Valid EAL reports are embossed and signed and stamped as original, and other reports are not valid for any purpose.

1.12 Error - The Client and EAL agreed that design professionals strive to be correct when developing reports, plans and designs, and that even so errors, etc. may arise where there is no negligence, etc., and as such no error is actionable in that circumstance. Others, by making use of EAL reports outside of the contract accept this agreement as binding and valid. Others using the report do so then at their sole risk. The reader of our reports, acknowledge that engineering judgment, based on given data, may vary from individual to individual, and may change with time, and that changing engineering judgment and opinion and that varied engineering judgment and opinion can be different without implying error. Also, that an engineering judgment or opinion is defined facts, which like judicial judgment, is a weighing of facts and reaching a conclusion, and that such EAL judgments and opinions and resultant impacts on schedules, costs, etc. are not actionable.

SECTION 2: REPORTS AND RECORDS

2.1 Copies - As agreed, EAL furnished copies of each report to the Client. If no comments were received from the Client within 15 days of the issuing of a report, it was agreed and understood, without further comment, that the report was entirely satisfactory for the Client's use and for its intended purpose, and this limits comments in any post completion phase without further engineering consideration and investigation.

2.2 Use of Report in Event of Non Payment - The Client and EAL agreed, if the Client does not pay for EAL services as agreed (in whole and in part, that the Client would return all reports and other work to EAL on demand, and that reports and other work will not be used by the Client or its suppliers or others for any purpose whatsoever. Use of these materials by others than EAL in the event of non payment, are at the sole and total risk of the user.

2.3 Reports - The Client and EAL agreed that the reports, notes, and other documents, as instruments of service, remain the property of EAL.

2.4 Disclosure Required by Law - Nothing in this project shall make EAL liable in law to report any or all conditions, except those conditions which EAL believes in capacity pertains to items of imminent danger.

SECTION 3: CONTINUITY OF SERVICES, DISPUTES, CARE

3.1 Continuity - It is customary for the consultant, EAL in this case, who provides recommendations to be retained, to provide observation and related services during further, construction, etc. If EAL is not retained to provide continuing services the Client agreed to hold EAL harmless from all claims, damages, losses and expenses, including attorneys' fees, arising out of any interpretations, clarifications, substitutions or modifications provided by the Client or others. Others using the report do so at their total and sole liability, and by using the report agree to save and hold harmless EAL and the Client against all and any consequences of the use of the report, etc.

3.2 ADR - The Client and EAL agree that the Client will use Alternative Dispute Resolution (ADR in its contracts and disputes with contractors on the project. When disputes result, due to use by others, the dispute shall be submitted to EAL and its legal provider for binding resolution using their prevailing rates.

3.3 Care - The Client and EAL agreed that EAL used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession, as interpreted and determined by EAL periodically, and that this standard is determined solely by EAL for this project.

3.4 Risk - The Client and EAL agreed, many risks potentially affect EAL by virtue of entering into an agreement to provide services on behalf of the Client. For the Client to obtain the benefit of a fee, which included a reasonable allowance for dealing with EAL liability, the Client agreed to limit the liability as fully as allowed by law of EAL to the Client and to all others for claims arising out of the services. Further, others than the Client and EAL, by making use of the report accept all risks, liabilities, etc. that may arise from that use.
3.5 Contractor - The Client and EAL agreed, that if EAL are retained to provide for job site services during construction, the Client agreed that it is good practice that the contractor (subcontractor is completely and solely responsible for maintaining and implementing legal working conditions methods, means, techniques sequences, procedures, acts, etc., as the contractor controls the site. EAL's work is not intended to be, nor is it, a review of the safety practices or compliance to any particular code. EAL's presence does not relieve the contractor from adhering to all applicable laws, codes and good practice.
3.6 Life - The Client and EAL agreed that if imminently hazardous or potentially hazardous conditions or chemical conditions are found or interpreted by EAL during the provision of EAL services, EAL shall be entitled, without liability and without concern for claims by the Client or others for damages, to take all steps it solely deems reasonable to protect human life first, and the environment second, and will be reimbursed for such activities as needed. Others using the report by that non allowed use agree to fully protect and save harmless EAL and the Client.
3.7 Extras and Extra Work - For work in excess of the contract, the EAL standard Fee Schedule in the Terms of Engagement will apply (prices subject to change.

SECTION 4: WORK INCLUDED

4.1 Work included shall be as set out by EAL in the report or proposal, and shall be as interpreted by EAL. Not covered are moulds, asbestos, soils, environmental matters, structural matters, etc. unless specifically part of the project. Further, some issues which are specifically part of the project may be costly or intractable to resolution and the client shall not hold EAL responsible for the successful resolution.

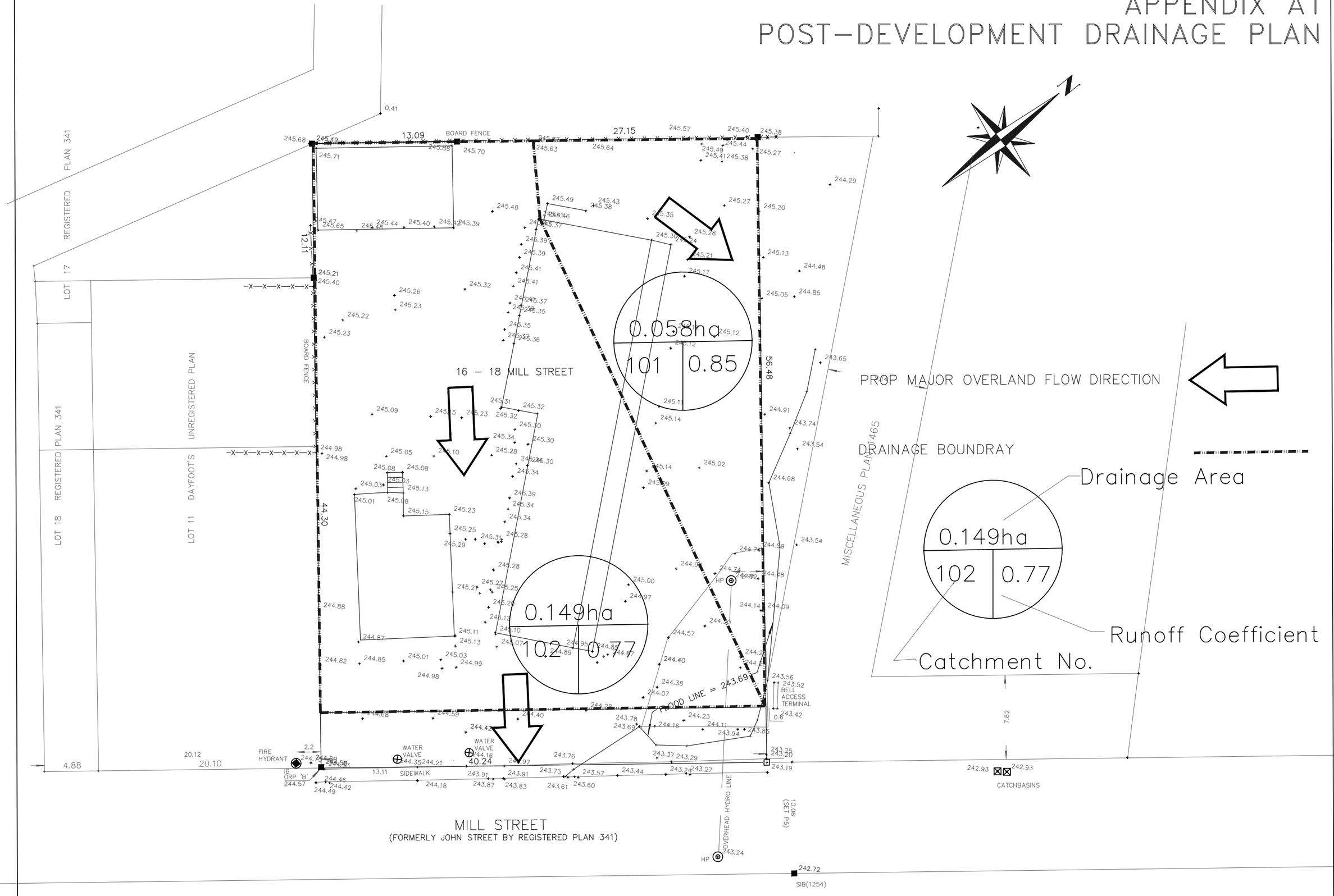
SECTION 5: SUMMARY OF LIMITATIONS

5.1 The user/reader of the EAL report is warned that the Client and EAL have agreed to specific limitations on liabilities, etc. Others than EAL and the Client, agree their use or release of the report is at their sole risk, cost, etc. In general the Client and EAL agreed that EAL is the sole arbitrator of technical matters pertaining to the project and methods for the purpose of the report. The report may set out further limitations. Any clauses found non enforceable in the contract or above, may be severed without impacting the applicability of the rest of the contract or the above by EAL at its discretion.

Appendix A

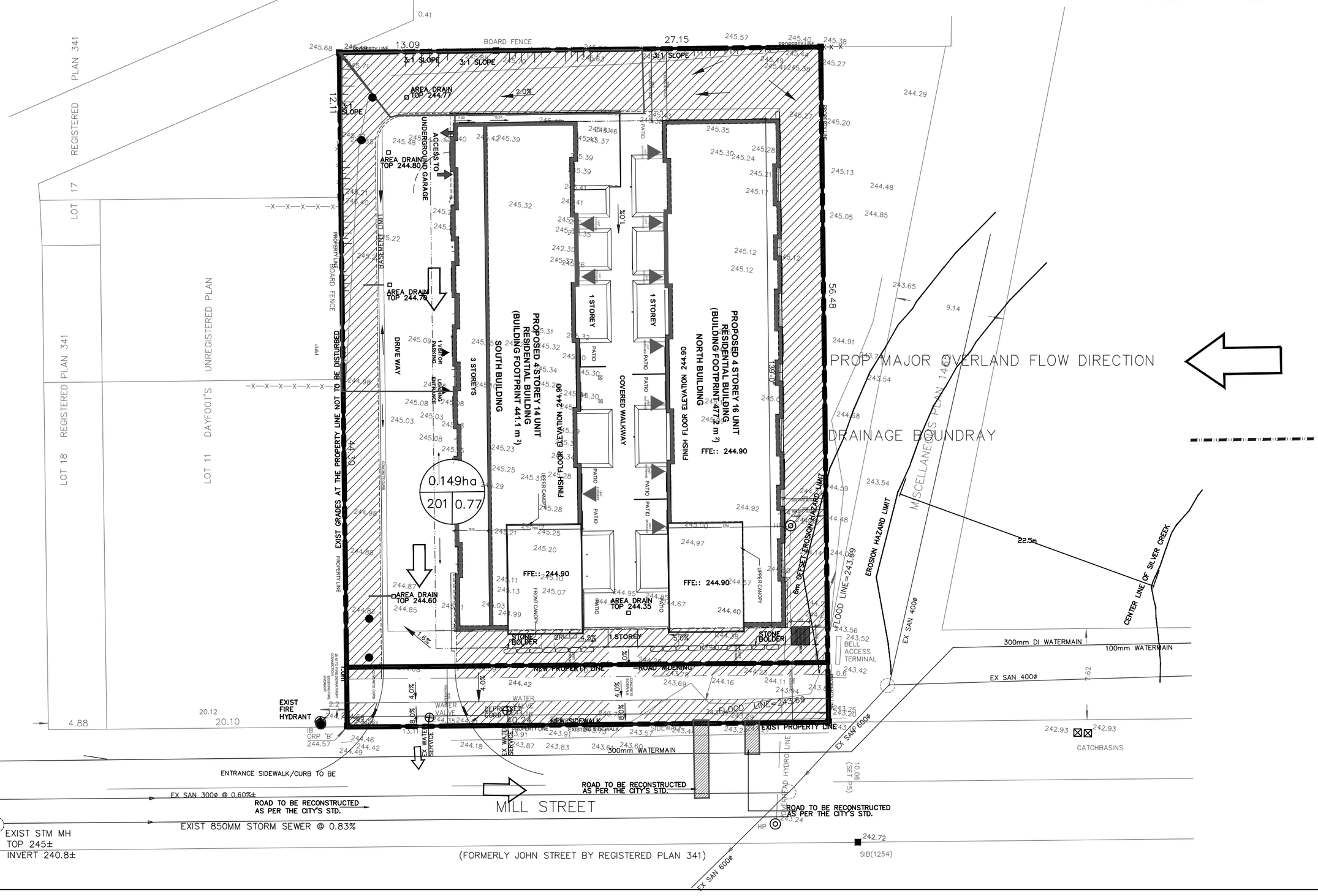
(i) Pre-Development Drainage Plan
(ii) Post-Development Drainage Plans

APPENDIX A1
POST-DEVELOPMENT DRAINAGE PLAN



APPENDIX A2

POST-DEVELOPMENT DRAINAGE PLAN



Appendix B

B1 Storm System Design Calculations
B2 Storage Calculations North Building
B3 Storage Calculations South Building

Appendix B1
STORM SEWER DESIGN SHEET

Q= 2.78AIR

Where Q peak flow in litres per second (L/s)

A area in hectares

I rainfall in millimetres per hour (mm/hr)

= $946.46/(tc+7)^{0.788}$ 5 Year Storm

where : tc is in minutes

R runoff coefficient

STREET			AREAS (ha)						Rainfall	Peak	SEWER DATA						
STREET	FROM	TO	R= 0.25	R= 0.5	R= 0.9	Indivi. 2.78AR	Accum 2.78AR	Time of Conc.	Intensity I	Flow Q (L/s)	Diameter (mm)	Slope %	Length (m)	Capacity (L/s) n= .013	Velocity (m/s) m/s	Time of Flow (minutes)	Remarks
Private	PROP CB 1	PROP STM	0.012			0.01	0.01	10.00	101.5	3.83	200	2.00	3.00	47.00	1.50	0.03	
Private	PROP STM MH1	PROP STORMCEPTOR			0.11	0.28	0.29	10.03	101.4	29.02	250	2.00	43.50	85.28	1.74	0.42	
Private	Building	PROP STORMCEPTOR			0.09	0.21	0.21	10.00	101.5	21.59	200	1.00	1.50	33.23	1.06	0.02	
Private	PROP STORMCEPTOR	PROP STM MH2			0.00	0.00	0.50	10.45	99.4	52.60	300	2.00	3.00	138.76	1.96	0.03	
Mill Street	PROP STM MH2	EX STM			0.00	0.00	0.50	10.48	99.3	52.54	250	2.00	14.00	85.28	1.74	0.13	

Calc by	MFI	Project:		Sheet No. 1 of 1
Checked	MFI	RESIDENTIAL DEVELOPMENT		
Date	21-Feb-23	16-18 MILL STREET, HALTON HILLS		

Appendix B3-2

North Building Roof Storage Calculations (Four Story Roof)

16-18 Mill Street

Halton Hills, Ontario

Formula Used for Runoff Calculations:	Modified Rational Formula	
Runoff Flow=	2.78CIA	
Return Period	100 Year	
Rainfall Intensity:	$1777.20/(tc + 9)^{0.795}$	where t_c is in hours
Roof Area	0.0415	ha
Available Roof are for Storage=	85%	
Roof area for storage=	0.0353	ha
Runoff Coefficient	0.9	
No. of Roof Drains	2	
Number of Notches/Drain	1	
Max Water Depth	110	mm
Flow per/mm depth	0.0149	Litres/sec
Discharge per drain	1.64	l/s (two notch)
Discharge from three Roof Drains	3.28	l/s
Time of Concentration	10	min

Time (min.)	Rainfall Intensity mm/hr	Storm Runoff (l/s)	Runoff Volume (m^3)	Release Volume (m^3)	Storage Volume (m^3)
10	171.05	17.76	10.66	1.97	8.69
12	157.97	16.40	11.81	2.36	9.45
14	146.95	15.26	12.82	2.75	10.06
16	137.52	14.28	13.71	3.15	10.56
18	129.36	13.43	14.51	3.54	10.97
20	122.22	12.69	15.23	3.93	11.29
22	115.91	12.03	15.89	4.33	11.56
24	110.29	11.45	16.49	4.72	11.77
26	105.25	10.93	17.05	5.11	11.93
28	100.70	10.46	17.57	5.51	12.06
30	96.57	10.03	18.05	5.90	12.15
32	92.81	9.64	18.50	6.29	12.21
34	89.36	9.28	18.93	6.69	12.24
36	**86.19**	**8.95**	**19.33**	**7.08**	**12.25**
38	83.26	8.64	19.71	7.47	12.24
40	80.54	8.36	20.07	7.87	12.20
42	78.02	8.10	20.42	8.26	12.15

Storage Provided = (353x.11/3)

= **12.9 > 12.25 m^3** **O.K.**

Appendix B3-1

South Building Roof Storage Calculations (Three Story Roof)

16-18 Mill Street

Halton Hills, Ontario

Formula Used for Runoff Calculations:	Modified Rational Formula	
Runoff Flow=	2.78CIA	
Return Period	100 Year	
Rainfall Intensity:	$1777.20/(tc + 9)^{0.795}$	where t_c is in hours
Roof Area	0.0415	ha
Available Roof are for Storage=	85%	
Roof area for storage=	0.0353	ha
Runoff Coefficient	0.9	
No. of Roof Drains	2	
Number of Notches/Drain	1	
Max Water Depth	110	mm
Flow per/mm depth	0.0149	Litres/sec
Discharge per drain	1.64	l/s (two notch)
Discharge from three Roof Drains	3.28	l/s
Time of Concentration	10	min

Time (min.)	Rainfall Intensity mm/hr	Storm Runoff (l/s)	Runoff Volume (m^3)	Release Volume (m^3)	Storage Volume (m^3)
10	171.05	17.76	10.66	1.97	8.69
12	157.97	16.40	11.81	2.36	9.45
14	146.95	15.26	12.82	2.75	10.06
16	137.52	14.28	13.71	3.15	10.56
18	129.36	13.43	14.51	3.54	10.97
20	122.22	12.69	15.23	3.93	11.29
22	115.91	12.03	15.89	4.33	11.56
24	110.29	11.45	16.49	4.72	11.77
26	105.25	10.93	17.05	5.11	11.93
28	100.70	10.46	17.57	5.51	12.06
30	96.57	10.03	18.05	5.90	12.15
32	92.81	9.64	18.50	6.29	12.21
34	89.36	9.28	18.93	6.69	12.24
36	**86.19**	**8.95**	**19.33**	**7.08**	**12.25**
38	83.26	8.64	19.71	7.47	12.24
40	80.54	8.36	20.07	7.87	12.20
42	78.02	8.10	20.42	8.26	12.15

Storage Provided = (353x.11/3)

= **12.9 > 12.25 m^3** **O.K.**

Appendix B3-2

South Building Roof Storage Calculations (Four Story Roof-West and East parts)

16-18 Mill Street

Halton Hills, Ontario

Formula Used for Runoff Calculations:	Modified Rational Formula	
Runoff Flow=	2.78CIA	
Return Period	100 Year	
Rainfall Intensity:	$1777.20/(tc + 9)^{0.795}$	where t_c is in hours
Roof Area	0.0122	ha
Available Roof are for Storage=	85%	
Roof area for storage=	0.0104	ha
Runoff Coefficient	0.9	
No. of Roof Drains	1	
Number of Notches/Drain	1	
Max Water Depth	110	mm
Flow per/mm depth	0.0149	Litres/sec
Discharge per drain	1.64	l/s (one notch)
Discharge from three Roof Drains	1.64	l/s
Time of Concentration	10	min

Time (min.)	Rainfall Intensity mm/hr	Storm Runoff (l/s)	Runoff Volume (m^3)	Release Volume (m^3)	Storage Volume (m^3)
10	171.05	5.22	3.13	0.98	2.15
12	157.97	4.82	3.47	1.18	2.29
14	146.95	4.49	3.77	1.38	2.39
16	137.52	4.20	4.03	1.57	2.46
18	129.36	3.95	4.26	1.77	2.49
20	122.22	3.73	4.48	1.97	2.51
22	**115.91**	**3.54**	**4.67**	**2.16**	**2.51**
24	110.29	3.37	4.85	2.36	2.49
26	105.25	3.21	5.01	2.56	2.45
28	100.70	3.07	5.16	2.75	2.41
30	96.57	2.95	5.31	2.95	2.36
32	92.81	2.83	5.44	3.15	2.29

Storage Provided = (104x0.110/3)

= **2.7 > 2.51 m^3** **O.K.**

Appendix C

Stormceptor Design Sheet

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

02/16/2023

Province:	Ontario
City:	Georgetown
Nearest Rainfall Station:	TORONTO INTL AP
Climate Station Id:	6158731
Years of Rainfall Data:	20

Site Name:	EFO

Drainage Area (ha):	0.21
% 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):	5.88
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	16-18 Mill St
Project Number:	60754
Designer Name:	Kent Campbell
Designer Company:	Forterra Pipe & Products
Designer Email:	kent.campbell@forterrabp.com
Designer Phone:	519-622-7574
EOR Name:	Muhammad is
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	93
EFO6	98
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 waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

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

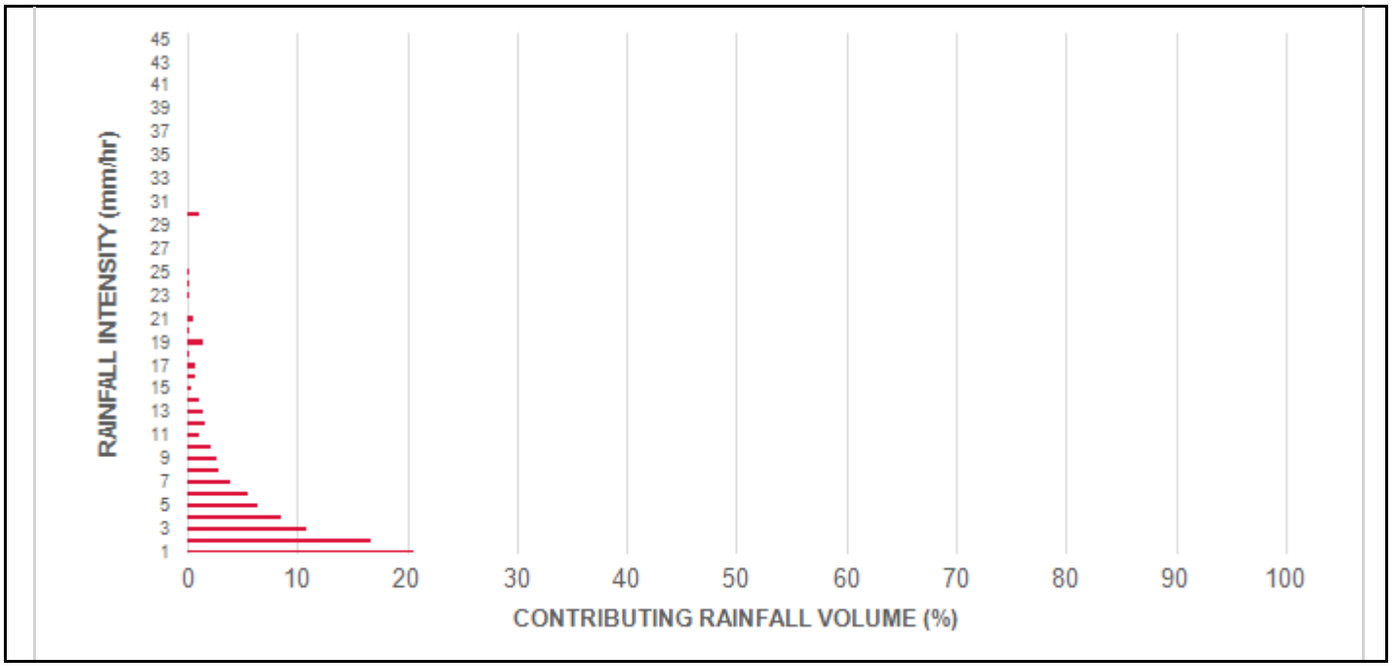
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

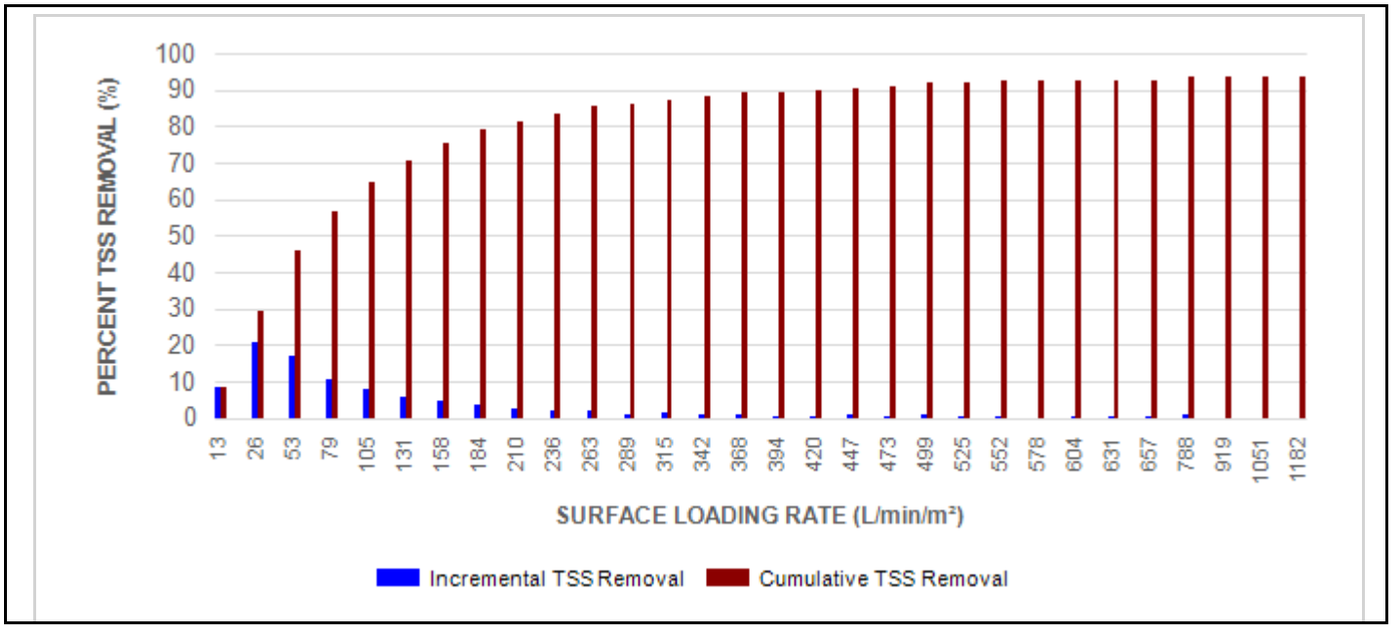
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.26	16.0	13.0	100	8.5	8.5
1	20.6	29.1	0.53	32.0	26.0	100	20.6	29.1
2	16.8	45.9	1.05	63.0	53.0	100	16.8	45.9
3	10.8	56.7	1.58	95.0	79.0	100	10.8	56.7
4	8.5	65.2	2.10	126.0	105.0	96	8.1	64.8
5	6.4	71.6	2.63	158.0	131.0	92	5.9	70.7
6	5.5	77.0	3.15	189.0	158.0	89	4.9	75.6
7	3.9	81.0	3.68	221.0	184.0	86	3.4	79.0
8	2.9	83.9	4.20	252.0	210.0	83	2.4	81.4
9	2.7	86.5	4.73	284.0	236.0	82	2.2	83.5
10	2.2	88.7	5.25	315.0	263.0	80	1.7	85.3
11	1.0	89.7	5.78	347.0	289.0	79	0.8	86.1
12	1.7	91.3	6.31	378.0	315.0	78	1.3	87.4
13	1.4	92.8	6.83	410.0	342.0	77	1.1	88.4
14	1.0	93.7	7.36	441.0	368.0	76	0.7	89.2
15	0.3	94.0	7.88	473.0	394.0	74	0.2	89.4
16	0.8	94.8	8.41	504.0	420.0	73	0.6	90.0
17	0.8	95.7	8.93	536.0	447.0	72	0.6	90.6
18	0.2	95.8	9.46	567.0	473.0	71	0.1	90.7
19	1.5	97.3	9.98	599.0	499.0	69	1.0	91.7
20	0.2	97.5	10.51	631.0	525.0	68	0.1	91.9
21	0.6	98.2	11.03	662.0	552.0	67	0.4	92.3
22	0.0	98.2	11.56	694.0	578.0	66	0.0	92.3
23	0.2	98.4	12.08	725.0	604.0	65	0.1	92.4
24	0.2	98.6	12.61	757.0	631.0	64	0.2	92.6
25	0.2	98.9	13.14	788.0	657.0	64	0.2	92.7
30	1.1	100.0	15.76	946.0	788.0	63	0.7	93.5
35	0.0	100.0	18.39	1103.0	919.0	62	0.0	93.5
40	0.0	100.0	21.02	1261.0	1051.0	60	0.0	93.5
45	0.0	100.0	23.64	1419.0	1182.0	57	0.0	93.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**93 %**

Climate Station ID: 6158731 *Years of Rainfall Data*: 20

RAINFALL DATA FROM TORONTO INTL AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

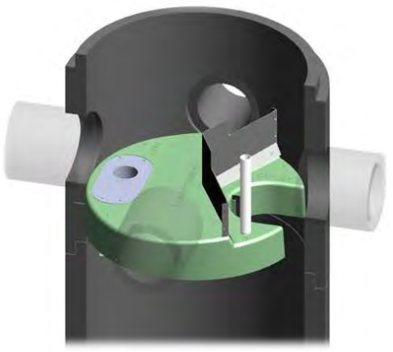
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

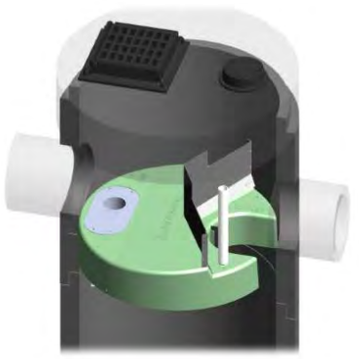
DESIGN FLEXIBILITY

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

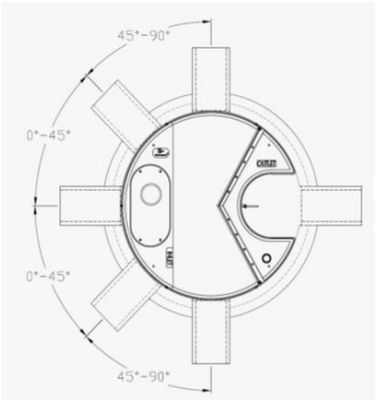
OIL CAPTURE AND RETENTION

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





Stormceptor® EF Sizing Report



INLET-TO-OUTLET DROP

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

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(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 Separators**

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

3.2 SIZING METHODOLOGY

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