65-71 Agnes Street 29 Storey Condominium

Functional Servicing and Stormwater Management Report

Project Location:

65-71 Agnes Street Mississauga, Ontario

Prepared for:

Intentional Capital
147 Liberty Street Toronto, ON

Prepared by:

MTE Consultants
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Burlington, ON, L7L 6B8

MTE File No.: 51157-100

Submission Date: 29 April, 2022

Engineers, Scientists, Surveyors.

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DRAWING C2.1	Site Grading Plan
DRAWING C2.2	Site Servicing Plan

1.0 Introduction

1.1 Overview

MTE Consultants Inc. was retained by Intentional Capital Real Estate to complete a functional servicing and stormwater management design for a proposed 29-story high-rise residential building with two underground parking levels, located at 64-71 Agnes Street, Mississauga Ontario (see Figure 1 for location plan.)

The site is bounded by Agnes Street to the south, Cook Street to the east, residential houses to the north and an residential building to the west. Under existing conditions, the site consists of grass landscape and two 1-storey residential buildings both with driveways that lead to Agnes Street.

The proponent plans to remove the existing landscape and the two existing residential buildings and construct a new 29-storey condominium with parking located within the underground levels and the first two above ground levels (totaling 4 levels of parking).

This report will outline a functional grading, servicing and stormwater management strategy for the proposed development. Please refer to enclosed engineering drawings, C2.1 and C2.2 prepared by MTE Consultants Inc. and the Site Plan prepared by Sweeny&Co Architect dated March 3rd 2022.

1.2 Background Information

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

Ref. 1:	*Water Supply for Public Fire Protection*, Fire Underwriters Survey (1999).
Ref. 2:	*MOE Stormwater Management Practices Planning and Design Manual* (Ministry of Environment, March 2003).
Ref. 3:	*Erosion & Sediment Control Guideline for Urban Construction* (December, 2006).
Ref. 4:	*Development Requirements Manual*, City of Mississauga Transportation and Works Department (September, 2016).
Ref. 5:	*Design Guidelines for Drinking-Water Systems*, Ministry of the Environment and Climate Change (2008).
Ref. 6:	*Design Guidelines for Sewage Works*, Ministry of the Environment and Climate Change (2008).
Ref. 7:	*Low Impact Development Stormwater Management Planning and Design Guideline,* Credit Valley Conservation & Toronto and Region Conservation for the Living City, Version 1.0 (2012).
Ref. 8:	*Ontario Building Code* (2020).
Ref. 9:	*Public Works Design, Specifications & Procedures Manual – Linear Infrastructure*, Region of Peel (MODIFIED, March 2017)
Ref.10:	*Public Works Stormwater Design Criteria and Procedural Manual*, Region of Peel (Version 2.1 June 2019).
Ref.11:	Stormwater Management Criteria, Credit Valley Conservation (August 2012).
Ref. 12:	*Geotechnical Investigation Proposed High-Rise Development –65-71 Agnes Street, Mississauga, Ontario*, Sirati&Partners. (October 2021).

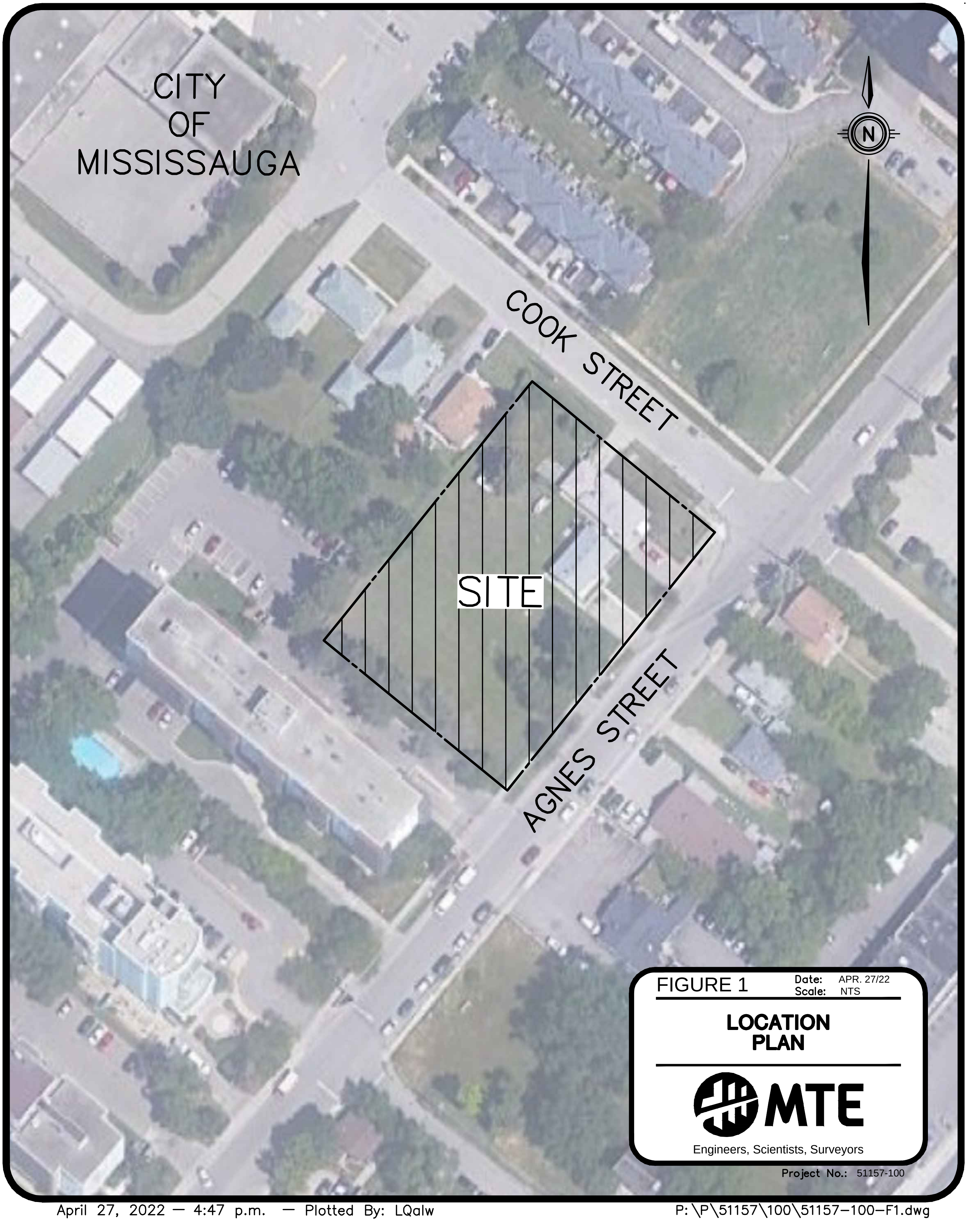

FIGURE 1

Date: APR. 27/22
Scale: NTS

LOCATION PLAN

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Project No.: 51157-100

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1.3 Geotechnical Investigation

A geotechnical investigation was conducted by Sirati & Partners, dated October 27, 2021. Five (5) boreholes were drilled to depths ranging from approximately 4.8m to 21.2m below existing ground surface in the vicinity of the proposed residential building. Layers of fill consisting of top soil, probable fill, sand and bedrock (Georgian Bay Formation) was encountered in all boreholes at depth of approximately 3.2m. Refer to the geotechnical report enclosed for further details on composition and thickness of each layer.

Three (3) ground water monitoring wells were installed within the proposed development site in boreholes (BH1, BH3 and BH4) at the completion of the drilling to support in-situ hydrogeological testing. Approximately a week after installation, ground water was measured at depths of 3.2m and 5.3m below existing grade in boreholes 3 and 1 respectively. The approximate groundwater elevations are 109.7, 109.4, and 108.0 for boreholes 4, 3 and 1 respectively.

2.0 Stormwater Management

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

2.1 Stormwater Management Criteria

The following stormwater management (SWM) criteria will be applied to the site:

Quantity Control

Attenuation of the post-development peak flows for the 2 through 100-year storm events to the 2-year existing conditions peak flow rate.

Quality Control

An enhanced water quality control is to be provided to achieve 80% Total Suspended Solids (TSS) Removal.

Water Retention

Retention of the first 5mm of rainfall event on site via infiltration, reuse or evapotranspiration.

2.2 Existing Conditions

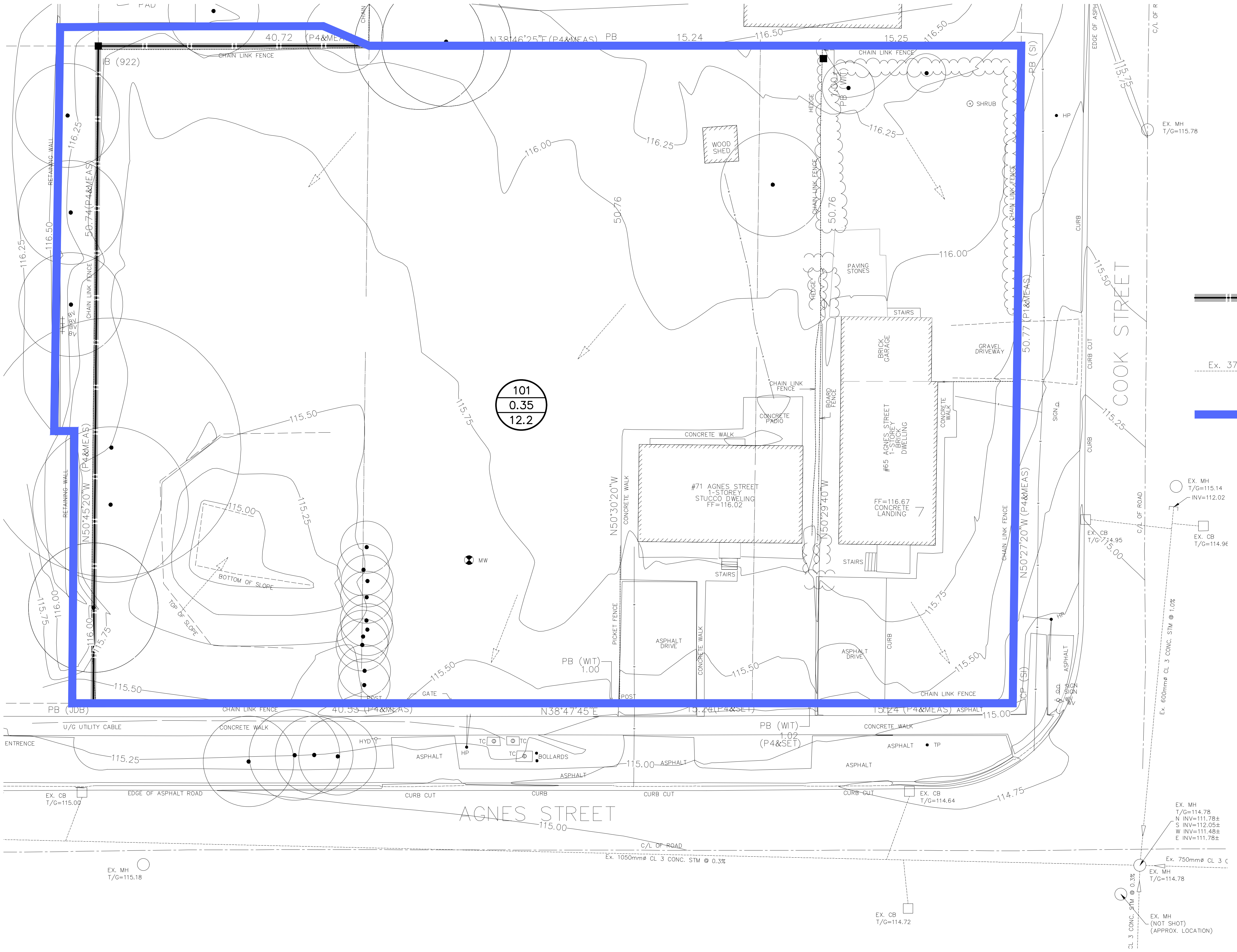
Under existing conditions, the site consists of two 1-storey residential buildings both with driveways leading to Agnes Street and surrounding grass landscape covering a total of 0.35ha.

The overall topography of the site is sloped from the north west corner to south east corner. Under existing conditions, runoff is conveyed by overland sheet flow either south east towards catch basins connected to Agnes Street or south east towards the catch basins connected to Cook Street. The site does not have any known on-site stormwater management quantity or quality controls.

Table 2.1: Catchment Parameters

Catchment ID	Description	Area (ha)	C value [A]	Allowable Peak Discharge Rates (m^3/s)
101	Existing Site Drainage	0.37	0.35	2-year: 0.028
[A] Based on City of Mississauga Design Criteria				

The existing conditions were assessed using rational method. Table 2.1 summarizes the pre-development catchment areas and the allowable flow rate for the design storms. Appendix A contains detailed calculations.



LEGEND

SITE BOUNDARY

EXISTING DIRECTION OF DRAINAGE

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

CATCHMENT 101

101 — ID No.
0.35 — AREA (Ha)
12.2 — % IMP.

FIGURE 2
Date: APR.26/22
Scale: 1:300

PRE DEVELOPMENT CATCHMENTS AREA

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2.3 Proposed Conditions

Under proposed conditions, the proponent plans to construct a 29-story high-rise residential building with two underground parking levels. A majority of the stormwater runoff from the proposed development will be captured on the roof or by area drains located within the site and be directed to a proposed stormwater tank. From there the stormwater will drain by gravity at a constant rate to a new storm lateral connected to the existing storm sewer located on Agnes Street. The stormwater tank will be located in the first level of underground parking on the southeast side of the property. Refer to MTE drawings C2.1 and C2.2 for details. The remaining of the proposed development will drain to Agnes Street and Cook Street and subsequently into the storm sewer system on Agnes Street.

2.4 Proposed Storm Catchment Areas

Two (2) catchments have been delineated to describe the proposed conditions drainage areas. Table 2.2 provides a brief description of each catchment and lists the size and impervious cover associated with each.

The total runoff from Catchments 201 and 202 will meet the quantity control criteria described previously and ultimately discharge from the site via the 250mm diameter pipe. Figure 3.2 provides an illustration of the catchment areas under proposed conditions.

Table 2.2: Proposed Storm Catchment Areas

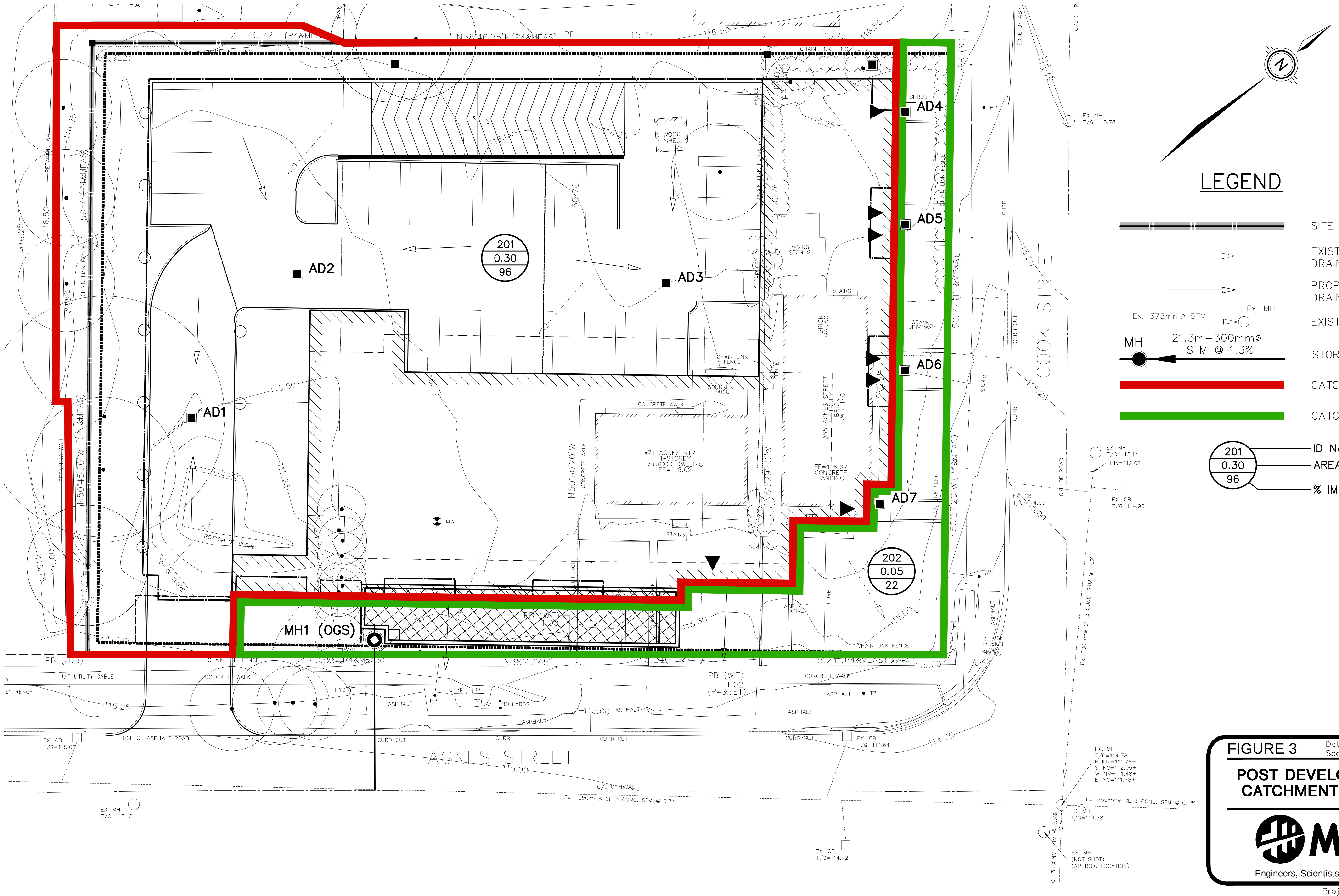
Catchment ID	Description	Area (ha)	% Impervious	Runoff Coefficient "C"	Drains To
201	Proposed residential building (controlled)	0.32	97	0.87	Internal Storm Tank
202	Exterior surrounding surface (uncontrolled)	0.05	22	0.35	Agnes Street and Cook Street

<u>Catchment 201</u>

Catchment 201 represents the 29-storey residential building the drainage captured from the top level of the proposed residential tower and area drains. Stormwater will be conveyed through a 250mmØ storm service out of the south face and into the existing 1050mmØ concrete storm sewer running west along Agnes Street.

<u>Catchment 202</u>

Catchment 202 represents uncontrolled drainage captured from the south and east side of the proposed residential building. Stormwater attenuation within this catchment is proposed in the form of existing curbside catch basins in order to collect runoff along the edges of the roadway on Agnes Street and Cook Street.



LEGEND

	SITE BOUNDARY
	EXISTING DIRECTION OF DRAINAGE
	PROPOSED DIRECTION OF DRAINAGE
Ex. 375mmø STM Ex. MH	EXISTING STORM SEWER
MH 21.3m–300mmø STM @ 1.3%	STORM SEWER
🟥	CATCHMENT 201
🟩	CATCHMENT 202

201 — ID No.
0.30 — AREA (Ha)
96 — % IMP.

FIGURE 3
Date: APR.26/22
Scale: 1:300

POST DEVELOPMENT CATCHMENTS AREA

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2.5 Post-Development Modelling Analysis

The proposed conditions were assessed using the SWMHYMO hydrologic modelling program developed by J.F. Sabourin & Associates for the 2 year to 100-year City of Mississauga design storms. Appendix A contains detailed hydrologic modelling parameters and Appendix B contains input and output printouts of the SYMHYMO model.

Table 2.3 compares the existing peak discharge rates against the proposed peak discharge rates leaving site for the 2-year to 100-year storm events.

Table 2.3: Comparison of Existing and Proposed Peak Discharge Rates leaving Site

Storm Event	Post-Development Conditions			Allowable Site Peak Discharge Rates (m^3/s) [B]
	Controlled Peak Flow (Catchment 201) (m^3/s) [A]	Uncontrolled Peak Flow (Catchment 202) (m^3/s) [A]	Total Peak Discharge Rate from the Site (m^3/s) [A]	
2-yr	0.005	0.004	0.009	**0.028**
100-yr	0.014	0.015	**0.027**	

[A] Discharge rate taken from modified rational method calculations (see Appendix A).
[B] See Table 2.1

Table 2.4 summarizes the stage-storage-discharge relationship of the proposed storm tank and orifice control.

Table 2.4: Stage-Storage-Discharge Calculations for Underground Storm Tank

Elevation (m)	Depth in Tank (m)	Cumulative Storage Volume (m^3)[A]	Discharge Q (m^3/s)[B]	Comments
111.80	0.00	0.0	0.000	Bottom of Tank
111.89	0.09	0.0	0.000	C/L Orifice
113.84	1.95	195.3	0.0172	Top of Tank

[A] Storage volume based on a tank with internal footprint of 100m^2 and an internal height of about 1.95m for an overall internal storage volume of 195.3m^3. See Appendix A and drawing C2.2 for more details.

Table 2.5: Proposed Conditions Volume Requirements

Storm Event	Underground Storm Tank	
	Storage Volume Req. ^{A} (m^3)	Storage Volume Provided ^{B} (m^3)
100-yr	**149 (Elev.=113.38 m)**	195.3
^{A} Storage volume taken from SSD curve (see Appendix A). ^{B} See Table 2.4		

The analysis indicates the following:

- Under proposed conditions, the post-development flows will be controlled to pre-development flows for all storm events (2-year to 100-year storm events) for the site as shown in Table 2.3.

- Sufficient storage volume is provided within the storm tank to contain stormwater as illustrated within Table 2.5 and Appendix A.

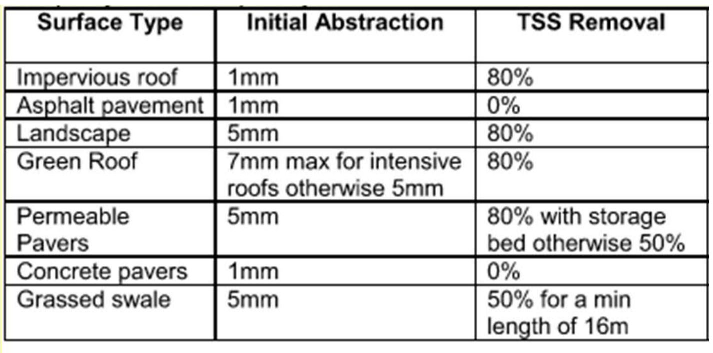
2.6 Water Retention

The City of Mississauga requires the first 5mm of rainfall event be retained on site via infiltration, reuse or evapotranspiration. The total volume of water to be retained on site was found to be 17.5m^3 (3500m^2 x 5mm/1000).

Table 2.6: Water Retention

Surface Type	Area (m^2)	Initial Abstraction (mm)	Volume Achieved via Initial Abstraction (m^3)
Landscape Area	360	5	0.80
Roof Area	3340	1	3.34
Total	**3700**		**4.14**

Table 2.7: Surface Types vs. Initial Abstraction for Stormwater Retention



Surface Type	Initial Abstraction	TSS Removal
Impervious roof	1mm	80%
Asphalt pavement	1mm	0%
Landscape	5mm	80%
Green Roof	7mm max for intensive roofs otherwise 5mm	80%
Permeable Pavers	5mm	80% with storage bed otherwise 50%
Concrete pavers	1mm	0%
Grassed swale	5mm	50% for a min length of 16m

Therefore, after factoring in the volume retained on site via initial abstraction from all surfaces, a total of 4.14m^3 of storage volume is being retained on site via initial abstraction.

The remaining 13.36m^3 of retention can typically be satisfied with the use of an infiltration gallery or tank. However, due to the proposed underground parking an infiltration gallery is not feasible. The remaining 13.36m^3 of volume required to retain onsite will therefore be retained through the use of a cistern and water reuse within the building for water closets. The water reuse system will be designed by a mechanical engineer.

2.7 Proposed Water Quality Controls

Stormwater quality control for the site will be provided by a Stormceptor EF4 oil-grit separator (OGS) unit (or approved equivalent) that will be installed at the outlet of the stormwater tank to treat the runoff produced by the site. The Stormceptor EF4 will be sufficient to achieve the require 80% TSS removal. See report Appendix A for the sizing of the EF4 unit.

3.0 Sediment and Erosion Control

Erosion and sediment control (ESC) measures will be implemented on site during all phases of construction. These measures will include:

- Installation of silt control fencing at strategic locations around the perimeter of the site.

- Preventing silt or sediment laden water from entering inlets (catchbasins / catchbasin manholes) by wrapping the inlet grates with filter fabric or installing silt sacks. Shown on grading plans.

- Maintaining sediment and erosion control structures in good repair (including periodic cleaning as required) until such time that the Engineer approves their removal. Erosion control measures to be inspected weekly and after any rainfall event.

- A mudmat to be constructed at Agnes Street to mitigate the transportation of sediments to the surrounding roads during constriction. The contractor shall clean up and remove any mud or debris tracked onto the surrounding right-of-ways

4.0 Sanitary Sewer Servicing

4.1 Existing Conditions

There is an existing 250mm diameter sanitary sewer flowing north east within Agnes Street Right-of-Way (ROW) at a slope of 0.7%. This sewer has a full flow capacity of approximately 49.7L/s. Additionally, there is an existing 250mm diameter sanitary sewer within Cook Street ROW. All capacities are based on Manning’s Roughness of 0.013.

4.2 Sanitary Demand

The anticipated sanitary discharge from the proposed development was calculated using the Region of Peel and Ontario Building Code design criteria. Table 4.1 provides the expected sanitary discharge from the site. Detailed calculations are found in Appendix B.

Table 4.1: Sanitary Sewer Discharge from Site

Description	Area	Number of Units [A]	Incremental Population [B]	Avg. Flow (L/s) [C]	Peak Flow (L/s) [D]
1 Bedroom	---	270	540	1.89	7.20
2 Bedroom	---	98	392	1.37	5.23
3 Bedroom	---	5	30	0.11	0.40
Townhouse	---	6	20	0.07	0.27
Site	0.35 ha [E]	---	---	---	0.07 [F]
Total Sanitary Demand					**13.17 [G]**

[A] Number of units based on count provided by Architect

[B] Population based on occupant load of 2 persons/unit (OBC Table 3.1.17.1 (b)) and Region of Peel 3.4 persons/unit (townhouses)

[C] Average flow based on 302.8 L/cap/day, as outlined in the Region of Peel Sanitary Sewer Design Criteria (2009).
Avg. Flow = (Population) (302.8 L/cap/day) / (24x60x60)

[D] Peak flow based on a Harmon Peaking Factor (PF) = 1 + [14 / (4 + P0.5)] where P = cumulative population in thousands
Site = 1 + [14 / (4 + $1.032^{0.5}$)] = 3.8

[E] Area reflects site area.

[F] Infiltration Allowance (IA) based on 0.2 L/s/ha, as outlined in the Region of Peel Sanitary Sewer Design Criteria (2009).
IA = (0.2 L/s/ha) x (0.35 ha) = 0.07 L/s

[G] Total Sanitary Demand = Peak Flow + Infiltration Allowance = 13.10 + 0.07 = 13.17 L/s

4.3 Proposed Sanitary Servicing Plan and Capacity Analysis

As calculated in Table 4.1, the total peak sanitary discharge from the site if 13.17 L/s.

Sanitary servicing for the site will be provided by a 250mm diameter sanitary pipe at 2.0% connected to the existing 250mm diameter sanitary sewer on Agnes Street. The full-flow capacity of a 250mm diameter pipe at a 2.0% slope is 59.43 L/s; the expected sanitary demand is below this limit. See Drawing C2.2 for details.

The sanitary demand of 13.17 L/s will result in a contribution of 21% to the full flow capacity of the existing 250mm diameter sewer.

5.0 Domestic and Fire Water Supply Servicing

5.1 Existing Conditions

The existing municipal water distribution system around the site consists of a 400mm diameter watermain on Agnes Street ROW and a 150mm diameter watermain on Cook Street ROW. There is an existing hydrant located at the eastern site limit on Agnes Street.

5.2 Domestic Water Demands

The expected domestic water demand for the proposed development was estimated using the Region of Peel design criteria. Table 5.1 summarizes the domestic water demand requirements for the Average Day, Maximum Day and Peak Hour demand scenarios.

Table 5.1 - Domestic Water Demands

Proposed Residential Demands		
Population:	982 people (see Table 4.1)	
Average Day Demand: [1]	280 L/day/person x 982 people =	***3.182 L/s***
Maximum Day Demand: [1]	2.0 x 3.182 L/s =	***6.364 L/s***
Peak Hour Demand: [1]	3.0 x 3.182 L/s =	***9.546 L/s***
[1] Refer to Appendix C for detailed calculations.		

5.3 Fire Flow Demand

Fire flow demands for the proposed development were determined using the methodology outlined in Water Supply for Public Fire Protection (Fire Underwriters Survey (FUS), 1999). 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 5.2 - FUS Fire Flow Requirements

Building	Fire Underwriters Survey (FUS) Flow Rate
Proposed building	139.7 L/s (8,400 L/min)

5.4 Proposed Water Servicing Plan and Analysis

The water service for the site will connect to the existing 400mm watermain within the Agnes Street ROW. The services for the proposed building will split into a dual 150mm diameter fire service and 100mm diameter domestic service at the eastern property line. At the detailed design stage, the Mechanical consultant will confirm the watermain size requirements. The Region of Peel requires water distribution systems to maintain a minimum residual pressure of 140 kPa (20 psi) when subject to Maximum Day + Fire Flow demands. A hydrant flow test is recommended to be completed to confirm the available system pressures.

6.0 Conclusions and Recommendations

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

- A stormwater storage tank complete with 75mm orifice control to be provided to control proposed conditions stormwater site discharge rates to allowable release rates as described in Section 2.5 of this report.
- A EF4 unit at storm outlet to be provided to achieve the required 80% TSS Removal criteria as described in Section 2.7 of this report
- Erosion and sediment controls be installed and maintained as described in Section 3.0 of this report;
- Sanitary servicing for the development be installed as described in Section 4.3 of this report;
- Water servicing for the development be installed as described in Section 5.4 of this report; and
- The proposed stormwater management plan presented in this report and the site servicing works described in this report and as shown on the grading and servicing Drawings C2.1 and C2.2 be accepted in support of the Site Plan 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,

MTE Consultants Inc.

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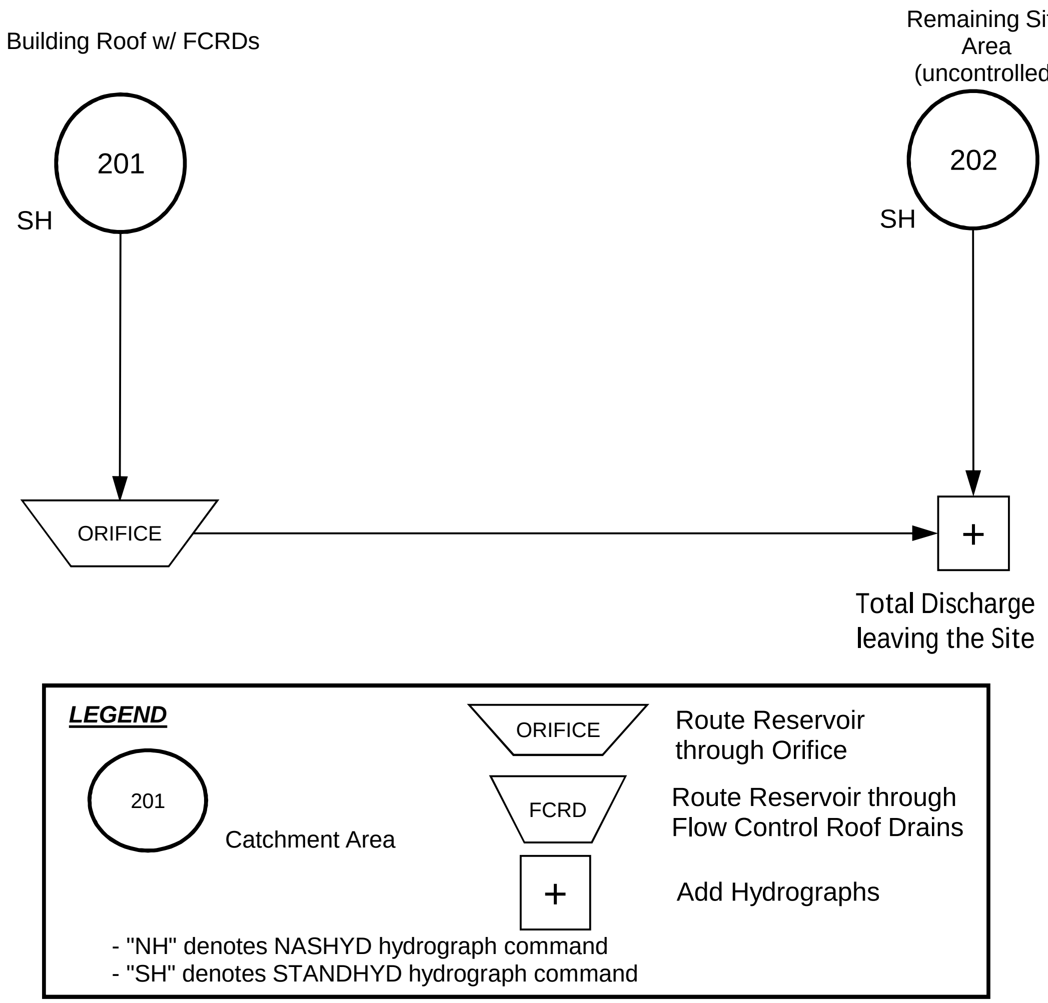
Appendix A

STORMWATER MANAGEMENT CALCULATIONS

65-71 Agnes Street
Mississauga, ONT
STORMWATER MANAGEMENT

POST-DEVELOPMENT CONDITIONS MODEL SCHEMATIC



65-71 Agnes Street
HAMILTON, ONTARIO
STORMWATER MANAGEMENT

Design Storm Information

Design storm information used in the hydrologic modeling was based on Chicago Storm distribution Intensity-Duration-Frequency (IDF) equations for Mount Hope (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.	50-Yr.	100-Yr.
A	**610**	820	1010	1160	1300	1450
B	**4.6**	4.6	4.6	4.6	4.7	4.9
C	**0.78**	0.78	0.78	0.78	0.78	0.78

(A) IDF parameters from City of Mississauga Standard DWG No. 2111.010
Revised: 2016-07-22
(B) IDF equations used to generate rainfall files with Duration (TD) = 4 hours and Time-to-Peak Ratio (TPR) = 0.33

65-71 Agnes Street
Mississauga, ONT
STORMWATER MANAGEMENT

Project Number: 51157-100
Date: April 29th 2022
Design By: TJL
File: Q:\51157\100\SWM\POST\51157-100 SWM Calculations.xlsx

ULATION SHEET
Existing Flows

Existing Flow Rates
Rational Method Q=kCIA (L/s)

k= 2.78
C= runoff coefficient
I= rainfall intensity (mm/hr)
A= contribution area (ha)

Site Area

A= 3,500 m^2
Site Area (A)= ***0.350*** ***ha***

Existing Breakdown	Area	%Imp	C
Existing	3765 m^2	22%	0.35
Total/**Average**=	3,765 m^2	**22.0%**	**0.35**

Rainfall Intensity $I=A(t+B)^{-C}$ (mm/hr)

City of Mississauga, Peel Region

Rainfall Event	A	B	C	t (min)	Intensity (mm/hr)	C (Existing)	Q Existing (L/s)
2-Year	610.0	4.6	0.780	10	75.359	0.35	28
5-Year	820.0	4.6	0.780	10	101.302	0.28	30
10-Year	1010.0	4.6	0.780	10	124.775	0.28	37
25-Year	1160.0	4.6	0.780	10	143.305	0.28	42
50-Year	1300.0	4.7	0.780	10	159.748	0.28	47
100-Year	1450.0	4.9	0.780	10	176.312	0.28	52

65-71 Agnes Street
Mississauga, ONT
STORMWATER MANAGEMENT

POST DEVELOPMENT CONDITIONS HYDROLOGIC MODELING PARAMETERS

Catchment ID	Catchment Description	Hydrograph Method	Area (ha)	Perv. CN	Perv. Ia (mm)	Impervious (%) TIMP	XIMP	Flow Length (m) Perv.	Imperv.	Manning "n" Perv.	Imperv.	Slope (%) Perv.	Imperv.	Time to Peak Tp (hrs)
201	Building Roof and Grade Level Parking	STANDHYD	0.32	90	2.82	97	97	5	5	0.250	0.013	2.0	2.0	
202	Asphalt, Paved and Landscaped	STANDHYD	0.05	90	2.82	22	22	17	17	0.250	0.013	2.0	2.0	
			0.37			**87**								

Notes

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

Stormceptor Sizing

Catchments	Area (ha)	% imp
201+202	0.3740	87

STAGE-STORAGE-DISCHARGE CALCULATIONS FOR SWM TANK

Outlet Device No. 1

Type:	Plate
Diameter (mm)	75
Area (m^2)	0.00442
Invert Elev. (m)	111.85
C/L Elev. (m)	111.89
Disch. Coeff. (C_d)	0.63
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	1
SWM Tank footprint(m^2):	100
Tank Volume (m^3):	195.3

	SWM Tank Volumes				Outlet No. 1		
	Elevation m	Area m^2	Incremental Volume m^3	Cumulative Active Volume m^3	H m	Discharge m^3/s	Total Discharge m^3/s
Bottom of Tank	111.80	100	0.0	0	0	0	0
C/L Orifice	111.89	100	0.1	0.0	0.000	0.0000	0.0000
Top of Tank	113.84	100	195.3	195.3	1.953	0.0172	0.0172

```
2     Metric units
*#******************************************************************************
*#  Project Name: 65-71 Agnes STREET   Project Number: 51157-100
*#  Date        : April 29, 2022
*#  Modeller    : TJL
*#  Company     : MTE Consultants Inc.
*#  License #   : 3053466
*#****************************************************************************|
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[002]
                    MISSG002.STM
*
READ STORM          STORM_FILENAME "STORM.001"
*
*#*****************************************************************************|
*##############################################################################|
*#
*#                     POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#                ====================================================
*#
*##############################################################################|
*# CATCHMENT 201 - Controlled Internal Site Drainage (Roof & Surface Parking Area)
*
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                    SCS curve number CN=[93],
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                                         LGP=[5](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.91](mm), SLPI=[2.0](%),
                                         LGI=[5](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  also m/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*# 75mm DIAMETER ORIFICE PLATE
*
ROUTE RESERVOIR     IDout=[2],   NHYD=["TOT-SWM"],  IDin=[1],
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)

 0.00000    0.0000
 0.01724    0.0196



                                       -1       -1   (max twenty pts)
                          IDovf=[3], NHYDovf=["OVF-201"]
*%-----------------|-----------------------------------------------------------|
*# CATCHMENT 202 -  UNCONTROLLED SITE AREA (LANDSCAPED PERIMETER)
*
CALIB STANDHYD      ID=[4], NHYD=["202"], DT=[1](min), AREA=[0.05](ha),
                    XIMP=[0.22], TIMP=[0.22], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[93],
                    Pervious   surfaces: IAper=[1.91](mm), SLPP=[2.0](%),
                                         LGP=[30](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.91](mm), SLPI=[1.0](%),
                                         LGI=[30](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  also m/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*# TOTAL DISCHARGE FROM THE SUBJECT PROPERTY (ALLOWABLE = 0.028 cu.m/s)
ADD HYD             IDsum=[5], NHYD=["TOT"], IDs to add=[2,3,4]
*%-----------------|-----------------------------------------------------------|
*
********************************************************************************
* RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
```

```
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
                    MISSG002.STM
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                    MISSG100.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: 2022-05-03     TIME: 16:18:58     RUN COUNTER: 000131         *
 *******************************************************************************
 * Input   filename: Q:\51157\100\SWM\POST\51157-~1.DAT                        *
 * Output  filename: Q:\51157\100\SWM\POST\51157-~1.out                        *
 * Summary filename: Q:\51157\100\SWM\POST\51157-~1.sum                        *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 *******************************************************************************


-------------------------------------------------------------------------------------
001:0001-----------------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: 65-71 Agnes STREET   Project Number: 51157-100
*#  Date        : April 29, 2022
*#  Modeller    : TJL
*#  Company     : MTE Consultants Inc.
*#  License #   : 3053466
*#***************************************************************************|
*
  ** END OF RUN :   1

*******************************************************************************
```

```
--------------------
| START            |  Project  dir.:
Q:\51157\100\SWM\POST\
--------------------  Rainfall dir.:
Q:\51157\100\SWM\POST\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=MISSG002.STM
--------------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------------
*#*******************************************************************************
*#  Project Name: 65-71 Agnes STREET   Project Number: 51157-100
*#  Date          : April 29, 2022
*#  Modeller      : TJL
*#  Company       : MTE Consultants Inc.
*#  License #     : 3053466
*#*****************************************************************************|
*
--------------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: MISSISSAUGA 2-YR CHICAGO (A=610 B=4.6 C=
| Ptotal=  33.44 mm|    Comments: MISSISSAUGA 2-YR CHICAGO (A=610 B=4.6 C=
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   2.222 |   1.17  16.858 |   2.17   5.202 |   3.17   2.661
               .33   2.538 |   1.33  75.359 |   2.33   4.443 |   3.33   2.476
               .50   2.979 |   1.50  22.169 |   2.50   3.894 |   3.50   2.317
               .67   3.641 |   1.67  11.770 |   2.67   3.476 |   3.67   2.180
               .83   4.766 |   1.83   8.163 |   2.83   3.148 |   3.83   2.060
              1.00   7.163 |   2.00   6.323 |   3.00   2.882 |   4.00   1.954

--------------------------------------------------------------------------------------
002:0003------------------------------------------------------------------------------
*
*#******************************************************************************|
*###############################################################################|
*#
*#                     POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#                ====================================================
*#
*###############################################################################|
*# CATCHMENT 201 - Controlled Internal Site Drainage (Roof & Surface Parking Are
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .32
| 01:201    DT= 1.00 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .01
     Dep. Storage     (mm)=       1.91         1.91
     Average Slope     (%)=       2.00         2.00
     Length            (m)=       5.00         5.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=      75.36        52.25
                over (min)        1.00         3.00
     Storage Coeff.  (min)=        .39 (ii)    3.01 (ii)
```

```
     Unit Hyd. Tpeak (min)=       1.00         3.00
     Unit Hyd. peak  (cms)=       1.57          .37
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .06          .00            .066 (iii)
     TIME TO PEAK    (hrs)=       1.32         1.33           1.333
     RUNOFF VOLUME    (mm)=      31.53        19.63          31.174
     TOTAL RAINFALL   (mm)=      33.44        33.44          33.441
     RUNOFF COEFFICIENT   =        .94          .59            .932

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  93.0     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.

--------------------------------------------------------------------------------------
002:0004------------------------------------------------------------------------------
*# 75mm DIAMETER ORIFICE PLATE
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201   )   |
| OUT<02:(TOT-SW)   |    =========  OUTFLOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)    |    (cms)    (ha.m.)
                            .000  .0000E+00    |     .017  .1960E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201   )        .32      .066     1.333     31.174
     OUTFLOW<02: (TOT-SW)        .32      .006     1.850     31.173
    OVERFLOW<03: (OVF-20)        .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](%)=    8.597
                   TIME SHIFT OF PEAK FLOW         (min)=    31.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.6469E-02

--------------------------------------------------------------------------------------
002:0005------------------------------------------------------------------------------
*# CATCHMENT 202 -  UNCONTROLLED SITE AREA (LANDSCAPED PERIMETER)
*
----------------------
| CALIB STANDHYD      |   Area    (ha)=     .05
| 04:202    DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=   22.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .04
     Dep. Storage     (mm)=       1.91         1.91
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        30.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      75.36        43.76
                over (min)        1.00        10.00
     Storage Coeff.  (min)=       1.39 (ii)    9.66 (ii)
     Unit Hyd. Tpeak (min)=       1.00        10.00
     Unit Hyd. peak  (cms)=        .87          .12
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .00          .00            .004 (iii)
```

```
     TIME TO PEAK    (hrs)=      1.33         1.45          1.333
     RUNOFF VOLUME    (mm)=     31.53        19.63         22.247
     TOTAL RAINFALL   (mm)=     33.44        33.44         33.441
     RUNOFF COEFFICIENT   =       .94          .59           .665

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  93.0    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.

------------------------------------------------------------------------------
002:0006----------------------------------------------------------------------
*# TOTAL DISCHARGE FROM THE SUBJECT PROPERTY (ALLOWABLE = 0.028 cu.m/s)
------------------------
| ADD HYD (TOT       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 02:TOT-SWM         .32      .006    1.85  31.17    .000
                    +ID2 03:OVF-201         .00      .000     .00    .00    .000  **DRY**
                    +ID3 04:202             .05      .004    1.33  22.25    .000
                     =========================================================
                     SUM 05:TOT             .37      .009    1.48  29.97    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
002:0007----------------------------------------------------------------------
*
********************************************************************************
* RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
*
  ** END OF RUN :   4

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





--------------------
| START              |  Project  dir.:
Q:\51157\100\SWM\POST\
--------------------  Rainfall dir.:
Q:\51157\100\SWM\POST\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=MISSG002.STM
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*#******************************************************************************
*#  Project Name: 65-71 Agnes STREET   Project Number: 51157-100
*#  Date         : April 29, 2022
*#  Modeller     : TJL
*#  Company      : MTE Consultants Inc.
*#  License #    : 3053466
*#*****************************************************************************|
*
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*
--------------------
| READ STORM         |    Filename: MISSISSAUGA 2-YR CHICAGO (A=610 B=4.6 C=
```

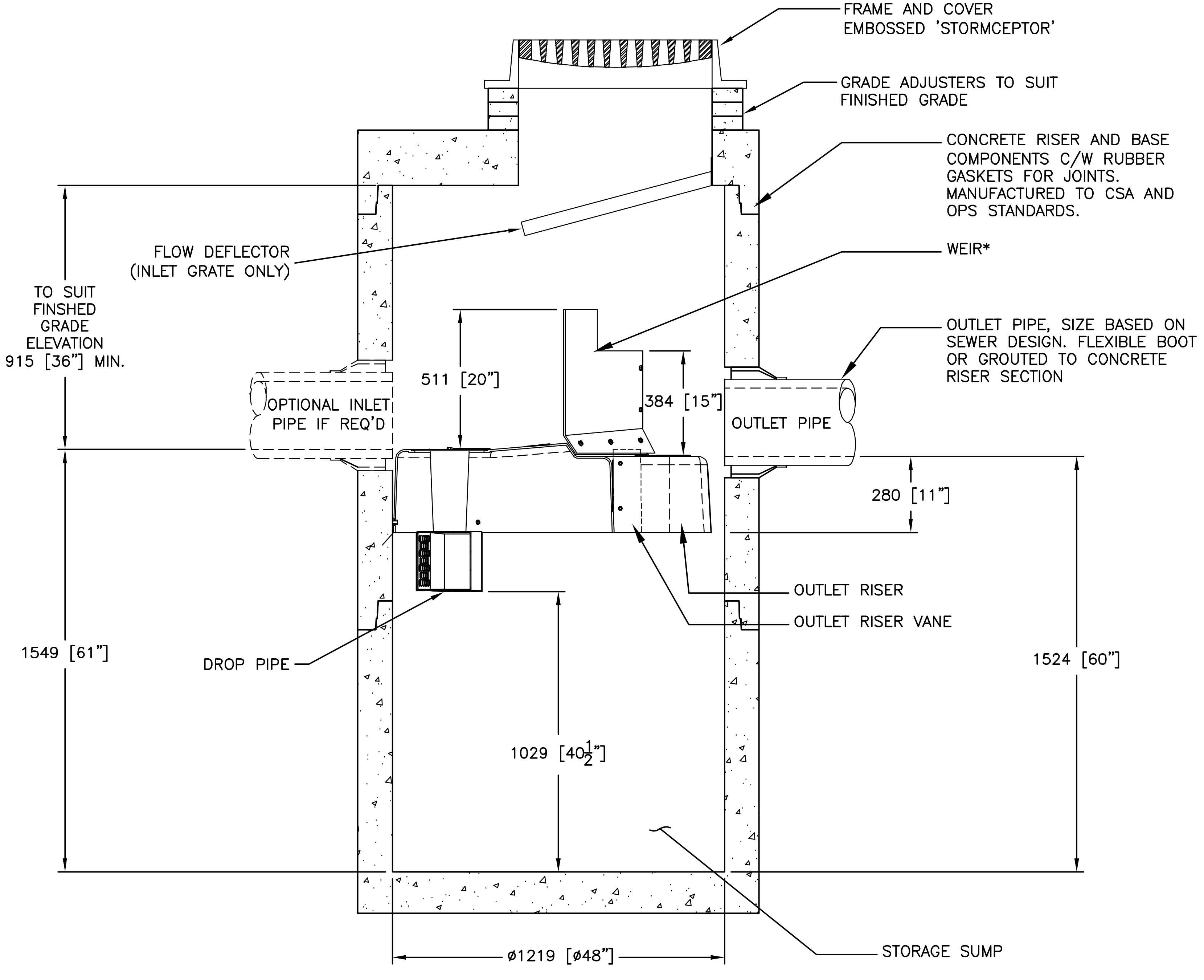
```
| Ptotal=  33.44 mm|    Comments: MISSISSAUGA 2-YR CHICAGO (A=610 B=4.6 C=
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   2.222 |   1.17  16.858 |   2.17   5.202 |   3.17   2.661
               .33   2.538 |   1.33  75.359 |   2.33   4.443 |   3.33   2.476
               .50   2.979 |   1.50  22.169 |   2.50   3.894 |   3.50   2.317
               .67   3.641 |   1.67  11.770 |   2.67   3.476 |   3.67   2.180
               .83   4.766 |   1.83   8.163 |   2.83   3.148 |   3.83   2.060
              1.00   7.163 |   2.00   6.323 |   3.00   2.882 |   4.00   1.954

-------------------------------------------------------------------------------
005:0003-----------------------------------------------------------------------
*
*#***************************************************************************|
*############################################################################|
*#
*#                     POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#                ====================================================
*#
*############################################################################|
*# CATCHMENT 201 - Controlled Internal Site Drainage (Roof & Surface Parking Are
*
----------------------
| CALIB STANDHYD      |   Area    (ha)=     .32
| 01:201    DT= 1.00 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .01
     Dep. Storage     (mm)=       1.91         1.91
     Average Slope     (%)=       2.00         2.00
     Length            (m)=       5.00         5.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      75.36        52.25
                over (min)        1.00         3.00
     Storage Coeff.  (min)=        .39 (ii)    3.01 (ii)
     Unit Hyd. Tpeak (min)=       1.00         3.00
     Unit Hyd. peak  (cms)=       1.57          .37
                                                               *TOTALS*
     PEAK FLOW       (cms)=        .06          .00              .066 (iii)
     TIME TO PEAK    (hrs)=       1.32         1.33             1.333
     RUNOFF VOLUME    (mm)=      31.53        19.63            31.174
     TOTAL RAINFALL   (mm)=      33.44        33.44            33.441
     RUNOFF COEFFICIENT   =        .94          .59              .932

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  93.0    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-----------------------------------------------------------------------
*# 75mm DIAMETER ORIFICE PLATE
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201    )  |
| OUT<02:(TOT-SW)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)    |    (cms)    (ha.m.)
                            .000  .0000E+00    |     .017  .1960E-01

```

```
     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201   )        .32      .066     1.333     31.174
     OUTFLOW<02: (TOT-SW)        .32      .006     1.850     31.173
    OVERFLOW<03: (OVF-20)        .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](%)=    8.597
                   TIME SHIFT OF PEAK FLOW         (min)=    31.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.6469E-02

-------------------------------------------------------------------------------------
005:0005-----------------------------------------------------------------------------
*# CATCHMENT 202 -  UNCONTROLLED SITE AREA (LANDSCAPED PERIMETER)
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .05
| 04:202    DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=   22.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .04
     Dep. Storage     (mm)=       1.91         1.91
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      30.00        30.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      75.36        43.76
                over (min)        1.00        10.00
     Storage Coeff.  (min)=       1.39 (ii)    9.66 (ii)
     Unit Hyd. Tpeak (min)=       1.00        10.00
     Unit Hyd. peak  (cms)=        .87          .12
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .004 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.45          1.333
     RUNOFF VOLUME    (mm)=      31.53        19.63         22.247
     TOTAL RAINFALL   (mm)=      33.44        33.44         33.441
     RUNOFF COEFFICIENT   =        .94          .59           .665

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  93.0    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 DISCHARGE FROM THE SUBJECT PROPERTY (ALLOWABLE = 0.028 cu.m/s)
------------------------
| ADD HYD (TOT       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 02:TOT-SWM         .32     .006    1.85  31.17    .000
                    +ID2 03:OVF-201         .00     .000     .00    .00    .000  **DRY**
                    +ID3 04:202             .05     .004    1.33  22.25    .000
                     ============================================================
                     SUM 05:TOT             .37     .009    1.48  29.97    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------
005:0007-----------------------------------------------------------------------------
```

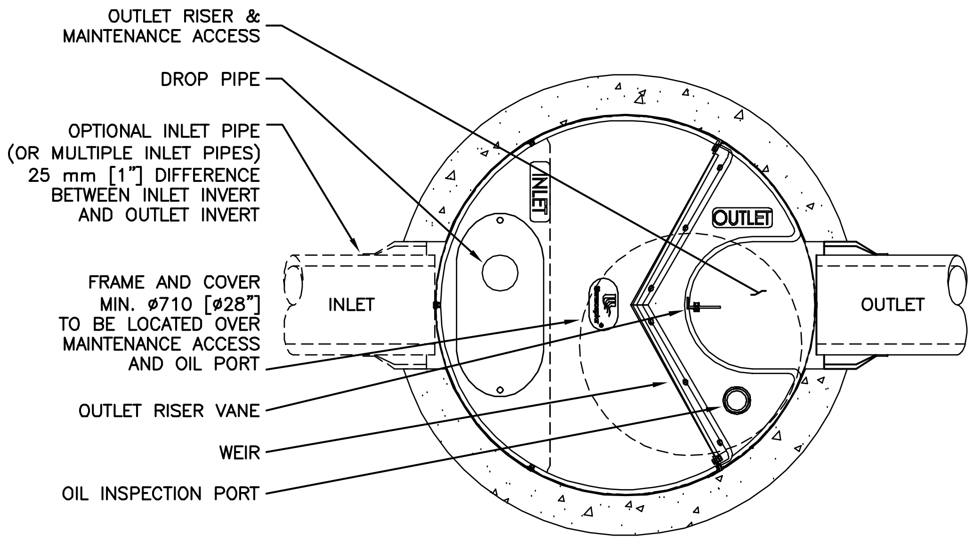
```
*
*********************************************************************************
* RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
*
---------------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------------
*
  ** END OF RUN :  99

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






--------------------
| START             |  Project  dir.: Q:\51157\100\SWM\POST\
--------------------  Rainfall dir.: Q:\51157\100\SWM\POST\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 100
    NSTORM=   1
           #  1=MISSG100.STM
---------------------------------------------------------------------------------------
100:0002------------------------------------------------------------------------------
*#*******************************************************************************
*#  Project Name: 65-71 Agnes STREET   Project Number: 51157-100
*#  Date         : April 29, 2022
*#  Modeller     : TJL
*#  Company      : MTE Consultants Inc.
*#  License #    : 3053466
*#*****************************************************************************|
*
---------------------------------------------------------------------------------------
100:0002------------------------------------------------------------------------------
*
--------------------
| READ STORM        |    Filename: MISSISSAUGA 100-YR(A=1450 B=4.9 C=0.78)
| Ptotal=  74.18 mm|    Comments: MISSISSAUGA 100-YR(A=1450 B=4.9 C=0.78)
--------------------
              TIME    RAIN |    TIME    RAIN |    TIME    RAIN |    TIME    RAIN
               hrs   mm/hr |     hrs   mm/hr |     hrs   mm/hr |     hrs   mm/hr
               .25   6.785 |    1.00  29.140 |    1.75  18.449 |    2.50   8.259
               .50   8.807 |    1.25 140.690 |    2.00  12.841 |    2.75   7.079
               .75  13.024 |    1.50  35.407 |    2.25   9.996 |    3.00   6.223

---------------------------------------------------------------------------------------
100:0003------------------------------------------------------------------------------
*
*#*****************************************************************************|
*#############################################################################|
*#
*#                    POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#                ====================================================
*#
*#############################################################################|
*# CATCHMENT 201 - Controlled Internal Site Drainage (Roof & Surface Parking Are
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .32
| 01:201    DT= 1.00 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .01
     Dep. Storage     (mm)=       1.91         1.91
     Average Slope     (%)=       2.00         2.00
     Length            (m)=       5.00         5.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     140.69       128.30
                over (min)        1.00         2.00
     Storage Coeff.  (min)=        .30 (ii)    2.13 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.64          .54
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .12          .00          .125 (iii)
     TIME TO PEAK    (hrs)=       1.08         1.25         1.250
     RUNOFF VOLUME    (mm)=      72.27        57.15        71.811
     TOTAL RAINFALL   (mm)=      74.18        74.18        74.175
     RUNOFF COEFFICIENT   =        .97          .77          .968

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  93.0    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.

-------------------------------------------------------------------------------------
100:0004-----------------------------------------------------------------------------
*# 75mm DIAMETER ORIFICE PLATE
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201    )  |
| OUT<02:(TOT-SW)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .017  .1960E-01

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201    )        .32      .125     1.250     71.811
     OUTFLOW<02: (TOT-SW)         .32      .014     1.750     71.811
    OVERFLOW<03: (OVF-20)         .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](%)=   11.265
                   TIME SHIFT OF PEAK FLOW         (min)=    30.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1597E-01

-------------------------------------------------------------------------------------
100:0005-----------------------------------------------------------------------------
*# CATCHMENT 202 -  UNCONTROLLED SITE AREA (LANDSCAPED PERIMETER)
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .05
| 04:202    DT= 1.00 |   Total Imp(%)=   22.00   Dir. Conn.(%)=   22.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .04
     Dep. Storage     (mm)=       1.91         1.91
     Average Slope     (%)=       1.00         2.00
```

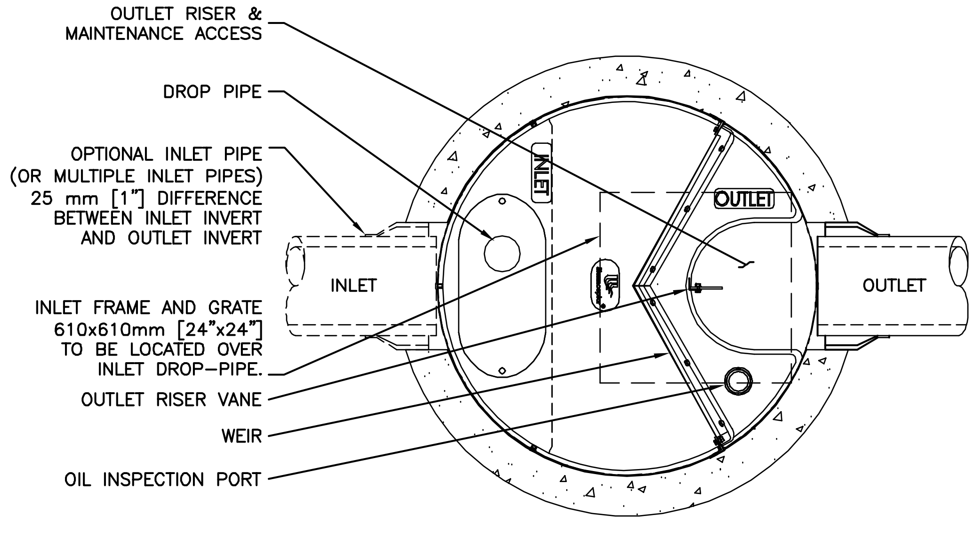
```
     Length            (m)=      30.00        30.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     140.69       125.42
                over (min)        1.00         7.00
     Storage Coeff.  (min)=       1.08 (ii)    6.51 (ii)
     Unit Hyd. Tpeak (min)=       1.00         7.00
     Unit Hyd. peak  (cms)=       1.02          .17
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .00          .01           .015 (iii)
     TIME TO PEAK    (hrs)=       1.18         1.28          1.250
     RUNOFF VOLUME    (mm)=      72.26        57.15         60.472
     TOTAL RAINFALL   (mm)=      74.18        74.18         74.175
     RUNOFF COEFFICIENT   =        .97          .77           .815

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  93.0    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.

-------------------------------------------------------------------------------------
100:0006-----------------------------------------------------------------------------
*# TOTAL DISCHARGE FROM THE SUBJECT PROPERTY (ALLOWABLE = 0.028 cu.m/s)
------------------------
| ADD HYD (TOT       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 02:TOT-SWM         .32     .014    1.75  71.81    .000
                    +ID2 03:OVF-201         .00     .000     .00    .00    .000  **DRY**
                    +ID3 04:202             .05     .015    1.25  60.47    .000
                     ============================================================
                     SUM 05:TOT             .37     .027    1.25  70.28    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------
100:0007-----------------------------------------------------------------------------
*
********************************************************************************
* RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
*
-------------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------------
*
-------------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------------
*
      FINISH
-------------------------------------------------------------------------------------
*************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2022-05-03     at 16:18:59
=====================================================================================
```



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	EF4				
STRUCTURE ID					*
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
0	5/26/17	INITIAL RELEASE	JSK
1	6/8/18	UPDATES	JSK
####	####	####	####
####	####	####	####
####	####	####	####

SCALE = NTS

Stormceptor® EF

imbrium

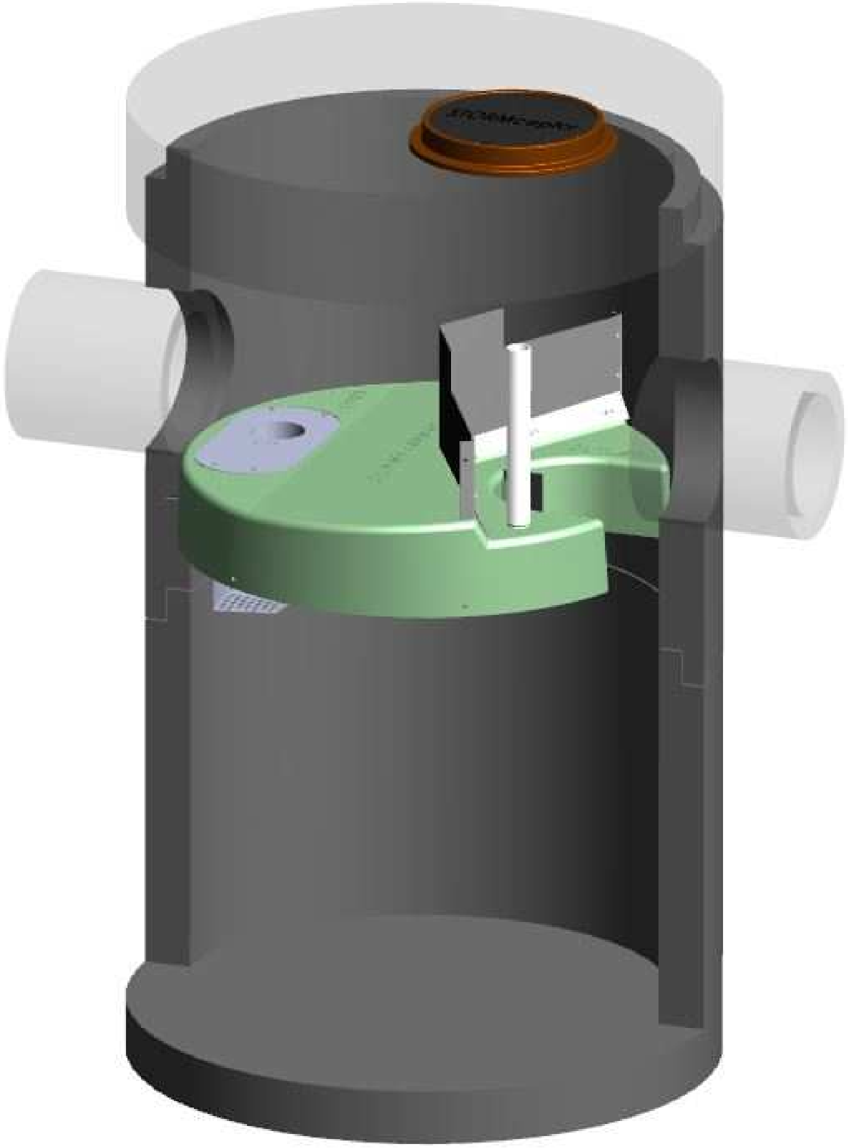
7037 RIDGE ROAD, SUITE 350, HANOVER, MD 21076
USA 888-279-8826 CA 800-565-4801 INTL +1-416-960-9900

DATE:
5/26/2017

DESIGNED: JSK
DRAWN: JSK
CHECKED: BSF
APPROVED: SP
PROJECT No.: EF4
SEQUENCE No.: *
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:

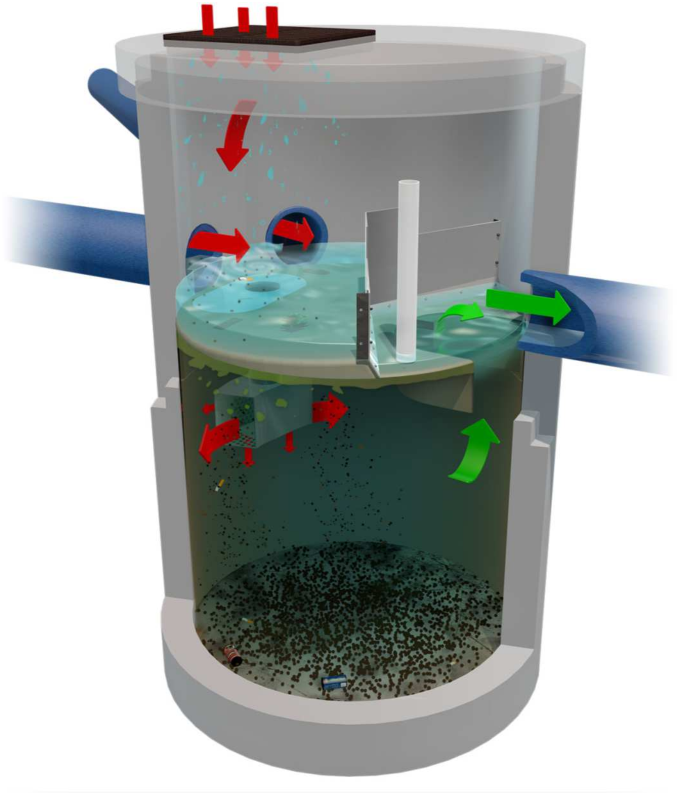
OVERVIEW

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

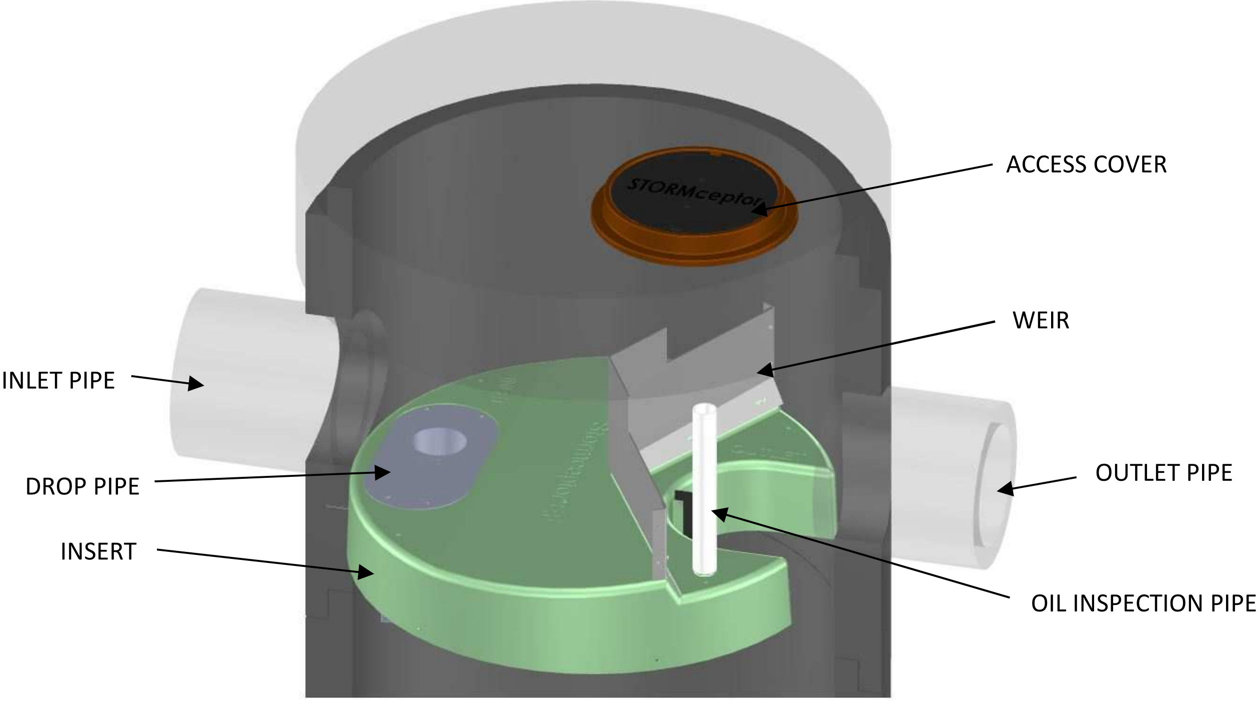


Figure 1

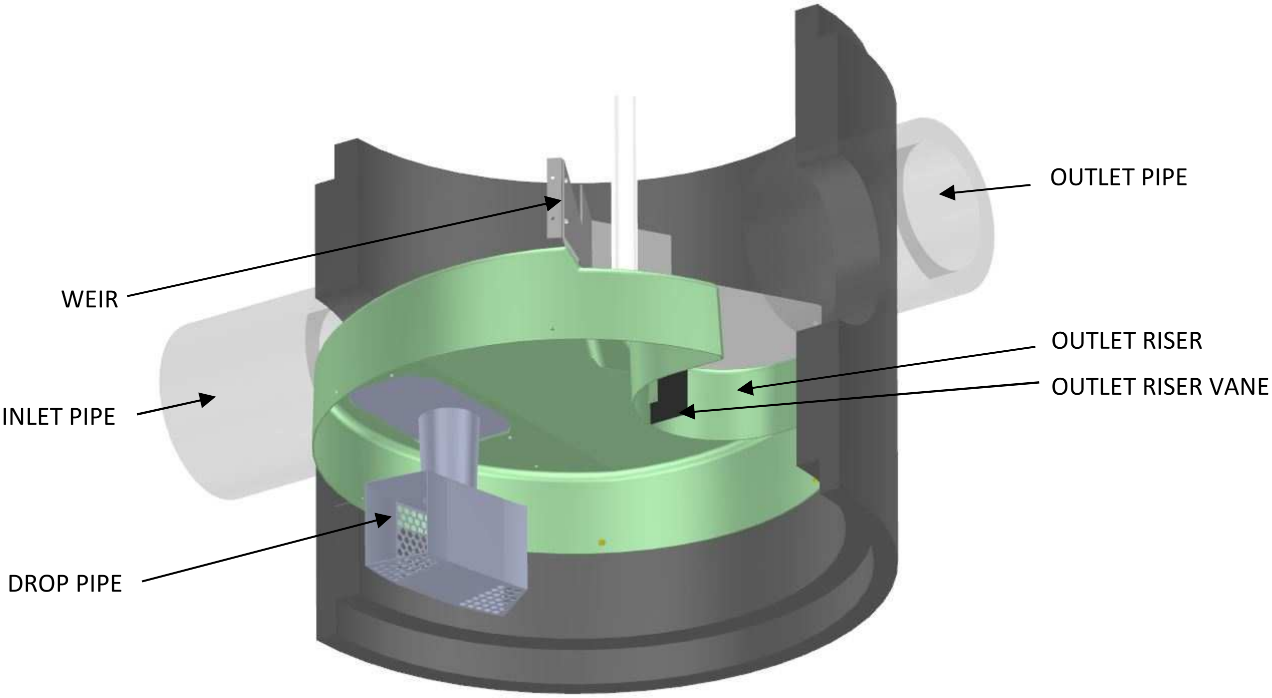


Figure 2

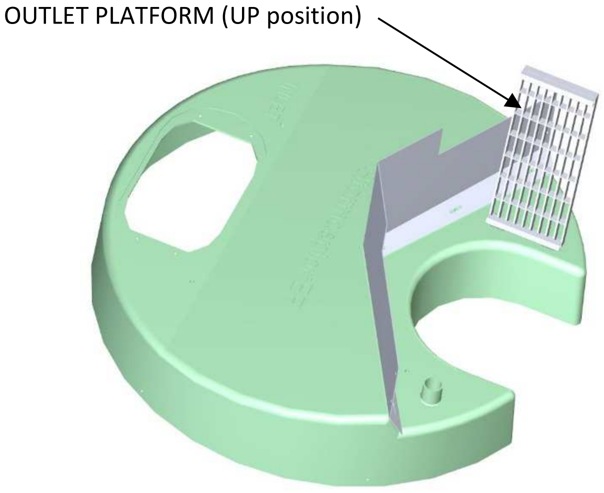


Figure 3A

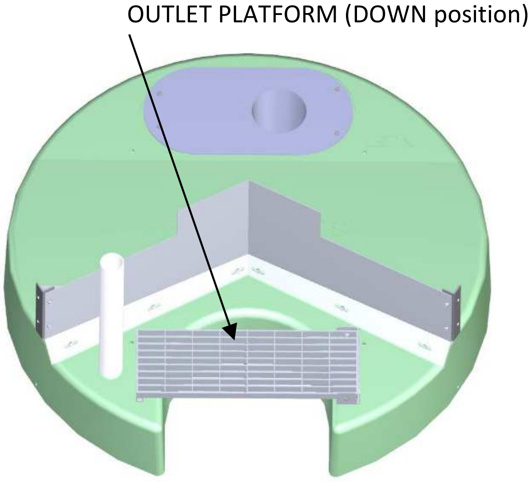


Figure 3B

- **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**.

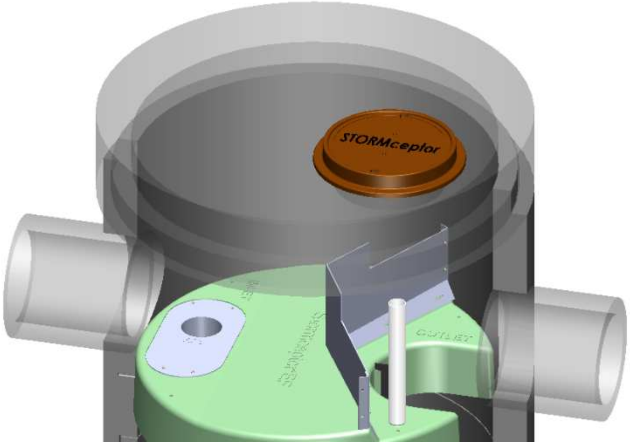


Figure 4

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**.

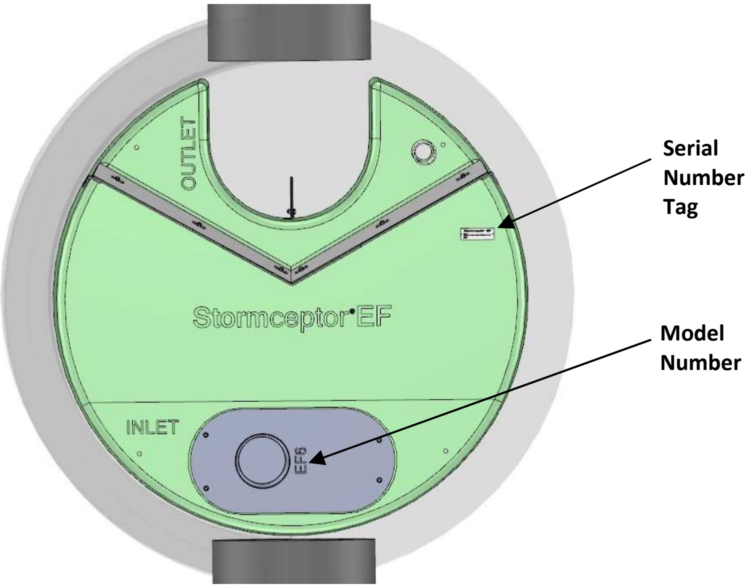


Figure 5

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

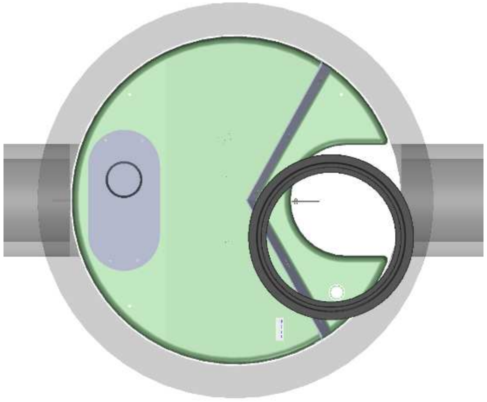


Figure 6

- 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.
- 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.

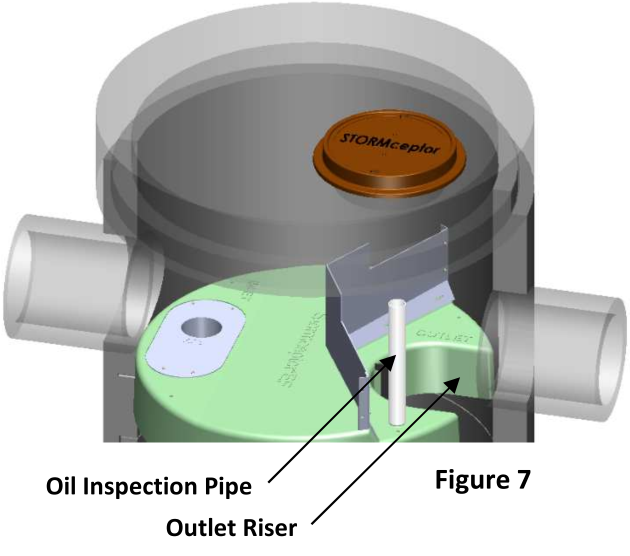


Figure 7

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

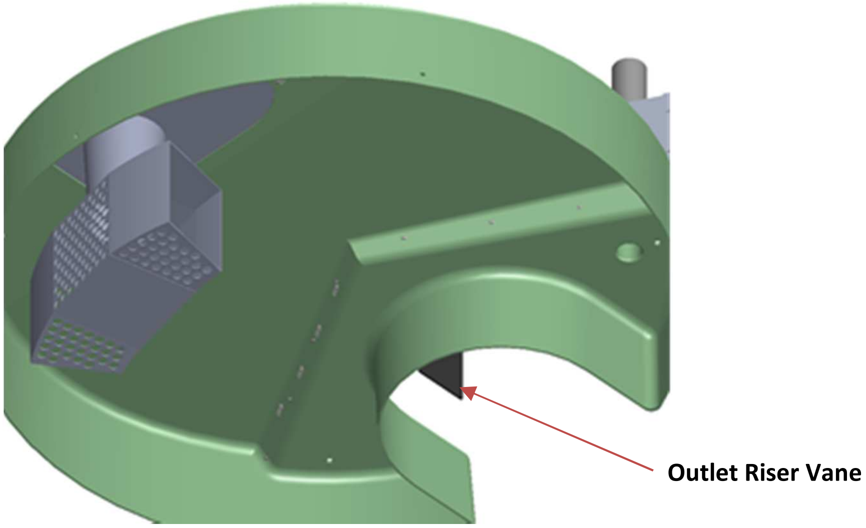


Figure 10

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.

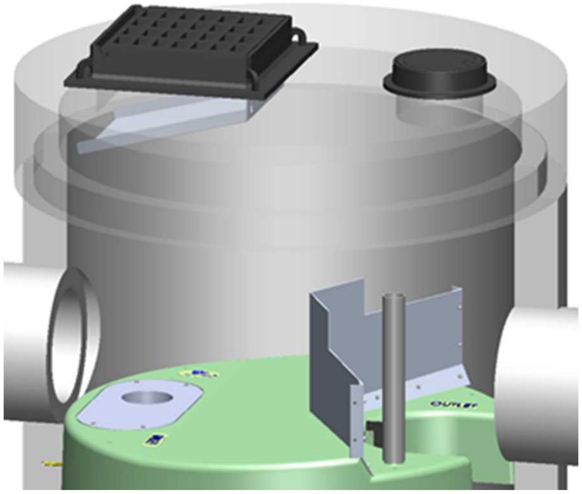
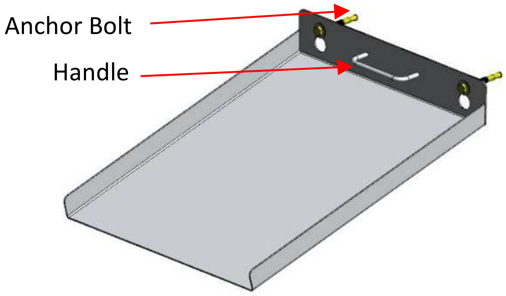


Figure 11

How to Remove:

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



Removable Flow Deflector

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

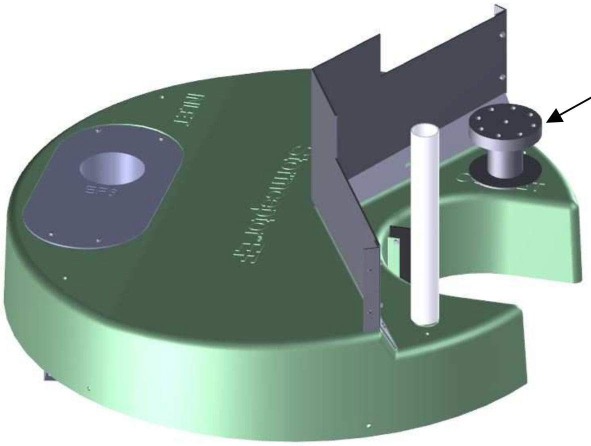
Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

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.



OIL ALARM PROBE INSTALLED ON DOWNSTREAM SIDE OF WEIR.

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

Canada	1-416-960-9900 / 1-800-565-4801
United States	1-301-279-8827 / 1-888-279-8826
International	+1-416-960-9900 / +1-301-279-8827

www.imbriumsystems.com
www.stormceptor.com
info@imbriumsystems.com

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

04/27/2022

Province:	Ontario
City:	Mississauga
Nearest Rainfall Station:	TORONTO INTL AP
Climate Station Id:	6158731
Years of Rainfall Data:	20
Site Name:	Proposed Controlled Area
Drainage Area (ha):	0.30
% Imperviousness:	96.00

Runoff Coefficient 'c': 0.87

Project Name:	65-71 Agnes Street
Project Number:	51157-100
Designer Name:	Laura Galati
Designer Company:	MTE Consultants
Designer Email:	LGalati@mte85.com
Designer Phone:	905-639-2552
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	8.17
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	91
EF6	96
EF8	99
EF10	100
EF12	100

Recommended Stormceptor EF Model: **EF4**

Estimated Net Annual Sediment (TSS) Load Reduction (%): **91**

Water Quality Runoff Volume Capture (%): **> 90**

THIRD-PARTY TESTING AND VERIFICATION

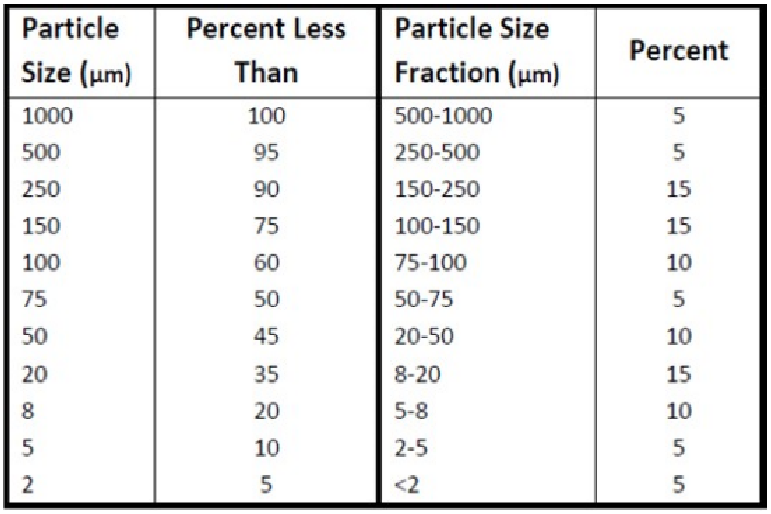
►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

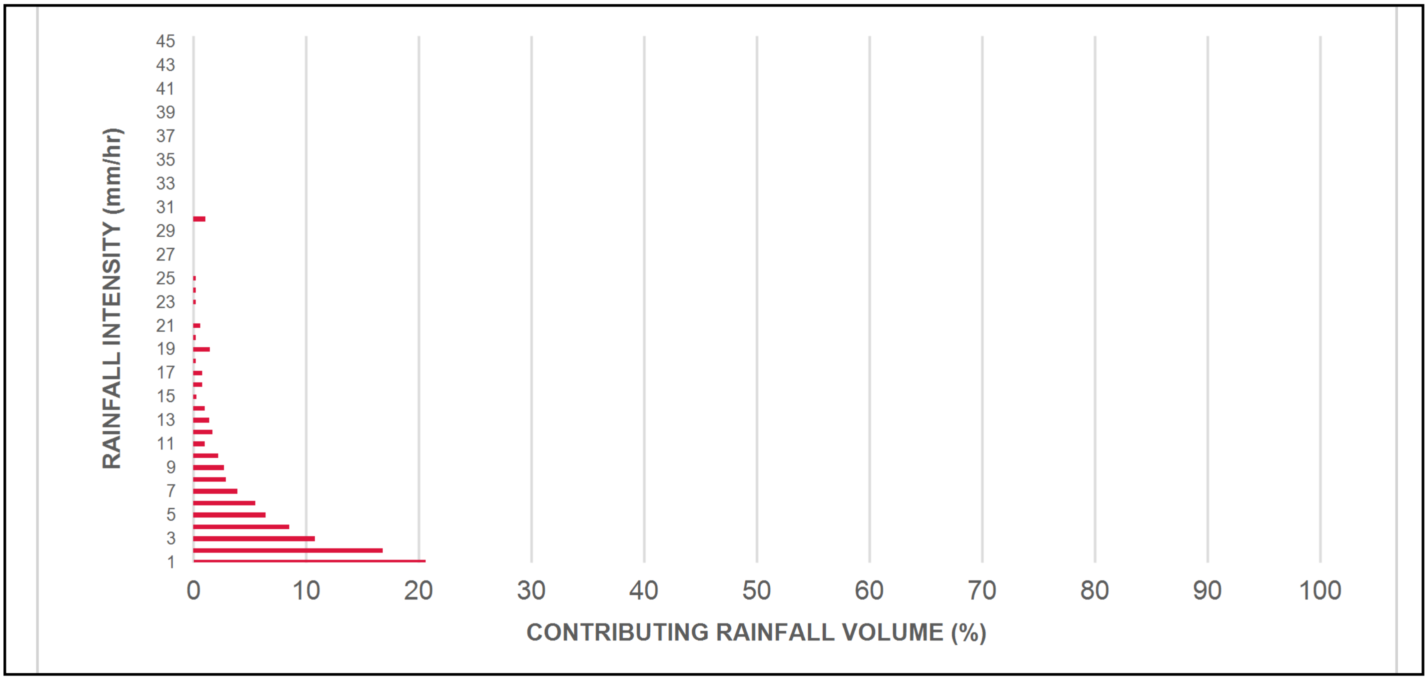


Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

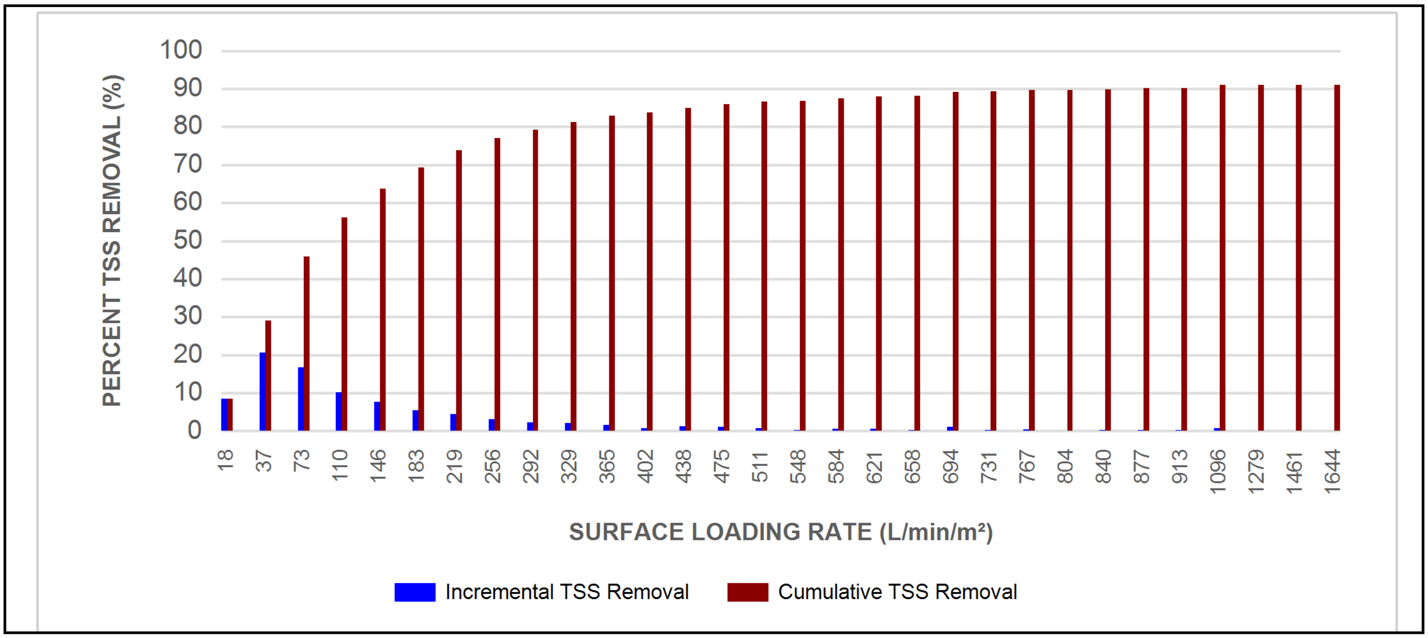
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.37	22.0	18.0	100	8.5	8.5
1	20.6	29.1	0.73	44.0	37.0	100	20.6	29.1
2	16.8	45.9	1.46	88.0	73.0	100	16.8	45.9
3	10.8	56.7	2.19	132.0	110.0	95	10.2	56.1
4	8.5	65.2	2.92	175.0	146.0	91	7.7	63.8
5	6.4	71.6	3.65	219.0	183.0	86	5.5	69.3
6	5.5	77.0	4.38	263.0	219.0	82	4.5	73.8
7	3.9	81.0	5.11	307.0	256.0	81	3.2	77.0
8	2.9	83.9	5.84	351.0	292.0	79	2.3	79.2
9	2.7	86.5	6.58	395.0	329.0	78	2.1	81.3
10	2.2	88.7	7.31	438.0	365.0	76	1.6	83.0
11	1.0	89.7	8.04	482.0	402.0	74	0.7	83.7
12	1.7	91.3	8.77	526.0	438.0	73	1.2	84.9
13	1.4	92.8	9.50	570.0	475.0	73	1.0	85.9
14	1.0	93.7	10.23	614.0	511.0	72	0.7	86.6
15	0.3	94.0	10.96	658.0	548.0	72	0.2	86.8
16	0.8	94.8	11.69	701.0	584.0	71	0.6	87.4
17	0.8	95.7	12.42	745.0	621.0	71	0.6	88.0
18	0.2	95.8	13.15	789.0	658.0	70	0.1	88.1
19	1.5	97.3	13.88	833.0	694.0	70	1.0	89.2
20	0.2	97.5	14.61	877.0	731.0	70	0.1	89.3
21	0.6	98.2	15.34	921.0	767.0	70	0.4	89.7
22	0.0	98.2	16.07	964.0	804.0	69	0.0	89.7
23	0.2	98.4	16.80	1008.0	840.0	69	0.2	89.9
24	0.2	98.6	17.53	1052.0	877.0	69	0.2	90.1
25	0.2	98.9	18.26	1096.0	913.0	68	0.2	90.2
30	1.1	100.0	21.92	1315.0	1096.0	69	0.8	91.0
35	0.0	100.0	25.57	1534.0	1279.0	73	0.0	91.0
40	0.0	100.0	29.22	1753.0	1461.0	72	0.0	91.0
45	0.0	100.0	32.88	1973.0	1644.0	64	0.0	91.0
Estimated Net Annual Sediment (TSS) Load Reduction =								**91 %**

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

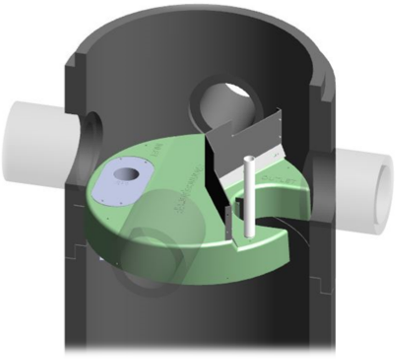
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

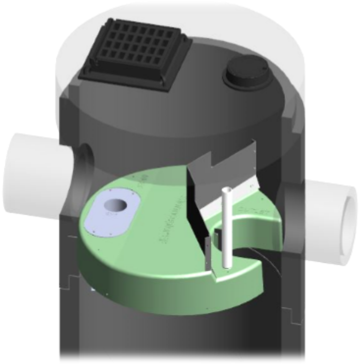
DESIGN FLEXIBILITY

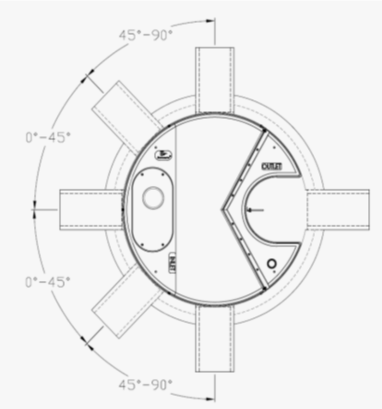
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	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/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 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.

Appendix B

SANITARY DEMAND CALCULATIONS

65-71 Agnes Street
City of Mississauga
MTE Project #: 51157-100
5/5/2022

Sanitary Demand Calculations

Land Use	Residential				Final Demand		
	Units [1]	Population Density [2]	Population (persons)	Demand (L/s)	Total Average Demand (L/s)	Total Peaked Demand (L/s)	Total Peaked Demand + Infiltration (L/s)
Proposed Condo Mix							
1 Bedroom	270	2.0	540	1.893	1.893	7.201	
2 Bedroom	98	4.0	392	1.374	1.374	5.227	
3 Bedroom	5	6.0	30	0.105	0.105	0.400	
Townhouses	6	3.4 [3]	20	0.071	0.071	0.272	
Total	**379**		**982**	**3.371**	**3.443**	**13.100**	**13.170**

Sanitary Demand		
Residential Daily Demands[4]	302.8	L/d/person
	0.0035	L/ca/s
Harmon Peaking Factor (Residential) [5]	3.8	
Site Area	0.35	ha
Infiltration Allowance [6]	0.2	L/s/ha
	0.070	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 (b))
Note 3: Population based on occupant load of 3.4 persons/unit (townhouses)
Note 4: Residential daily demands based on Region of Peel Standards
Note 5: Harmon Peaking Factor Kh = 1+(14/(4+P^(1/2))) where P = population in thousands
Note 6: Infiltration allowance based on Region of Peel Sanitary Sewer Design Criteria (2009)

Appendix C

WATER DEMAND CALCULATIONS & ANALYSIS

65-71 Agnes Street

City of Mississauga
Project No: 51157-100
5/5/2022
By: RNC

Res. Peaking Factors[1]:	
Avg. Day	1.0
Max. Day	2.0
Peak Hour	3

Demand Calculations

Location	Residential				Final Demand		
	Units	Population Density (person/unit)[2]	Population (persons)	Demand (l/s)	Avg Day Demand Qavg (l/s)	Max Day Demand Qmax.day (l/s)	Peak Hour Demand Qpeak (l/s)
Residential							
1 Bedroom	270	2.0	540	1.750	1.750	3.500	5.250
2 Bedroom	98	4.0	392	1.270	1.270	2.541	3.811
3 Bedroom	5	6.0	30	0.097	0.097	0.194	0.292
Townhouses	6	3.4 [4]	20	0.066	0.066	0.132	0.198
Totals	**379**		**982**	**3.184**	**3.184**	**6.367**	**9.551**

Water Demand		
Average Residential Daily Demands	280	l/d/person
	0.0032	l/s/person

Fire Flow[3]		
Fire Flow	8,000	l/min
	133	l/s

Max Day + Fire Flow Demand		
Qmax.day+fire	139.7	l/s

Note 1: Water Demands from Section 2.3 "Water Demands" of the Region of Peel Public Works Watermain Design Criteria (2010).

Note 2: Design population based on 2 people per room (Refer to OBC 3.1.17.1 (b)) for Apartment Buildings (2.7 ppus)

Note 3: Fire flows from FUS (1999) - See attached worksheets

Note 4: Population density based on 3.4 ppu per Region of Peel Standard for Townhouses

65-71 Agnes Street

City of Mississauga
Project No: 51157-100
4/27/2022
By: RNC

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, 1999).

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

$$F = 220C\sqrt{A}$$

where:

F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A = Total floor area in square metres

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"	C	Fire Flow "F"		Occupancy		Sprinkler		Exposure		**Fire Flow**		
	(m^2)		(l/min)	(l/s)	%	Adjusted Fire Flow (L/min)	%	Adjustment (L/min)	%	Adjustment (L/min)	**(L/min)**	**Rounded(L/min)**	**(L/s)**
Residential	6,330.0	0.6	11,000	183.3	-25	8,250	-40	-3,300	35	2,888	7,838	8,000	**133**

(2) Occupancy

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

(3) Sprinkler

40% credit for adequately designed system per NFPA 13. Additional 10% if water supply standard for both the system and fire department hose lines.

(4) Exposure

0 to 3m	25%
3.1 to 10m	20%
10.1 to 20m	15%
20.1 to 30m	10%
30.1 to 45m	5%

Calculate for all sides. Maximum charge shall not exceed 75%

Notes:
1) For Fire-Resistive Construction, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to 8.
For New Building: Two largest adjoining floors are level 5 & 6 (1507m2)
2) Exposure as follows: West -> 20m [10%] East -> >45m [0%]
South -> 45m [5%] North -> 4m [20%]

Appendix D

REFERENCE MATERIAL

REPORT
GEOTECHNICAL INVESTIGATION
PROPOSED HIGH-RISE DEVELOPMENT
65-71 AGNES STREET, MISSISSAUGA, ON

Prepared for

MR. BASHAR GHREIWATI

Prepared by

SIRATI & PARTNERS CONSULTANTS LIMITED

Geotechnical Hydrogeological & Environmental Solutions

Project: SP21-826-10
October 27, 2021

12700 Keele Street, King City
Ontario L7B 1H5
Tel: 905.833.1582
Fax: 905.833.4488

TABLE OF CONTENTS

1. INTRODUCTION

Sirati & Partners Consultants limited (SIRATI) was retained by Mr. Bashar Ghreiwati (the Client) to undertake a geotechnical investigation for the proposed residential development located at 65-71 Agnes Street in Mississauga, Ontario.

A copy of the proposed site plan, prepared by Tregebov Cogan Architecture, dated November 2, 2020, was provided to SIRATI.

It is understood that the Client intends to develop the property to comprise a 28-storey mixed-use building with 3 to 5 levels of underground parking. The proposed site is located on the north side of Agnes Street and west of Cook Street in the City of Mississauga. The property has an approximate area of 3,609 square meters (0.36ha), with 71.0 m of frontage along Agnes Street. The subject lands are currently occupied by two single detached homes.

The purpose of the geotechnical investigation was to obtain information regarding subsurface conditions at borehole locations and provide recommendations pertaining to the followings:

1. Foundation bearing capacity in sound shale;
2. Perimeter shoring and foundation wall;
3. Drainage condition;
4. Seismic site classification.

This report is geotechnical in nature and only deals with geotechnical issues pertinent to the site and proposed development. Hydrogeological and Environmental studies were also conducted by SIRATI and reports are presented under separate covers.

This report is provided based on the terms of reference presented above and, on the assumption, that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for the Client and its architects and designers. Third party use of this report without Sirati & Partners Consultants Limited (SIRATI) consent is prohibited. The limitation conditions presented in **Appendix B** form an integral part of the report and they must be considered in conjunction with this report.

2. FIELD AND LABORATORY WORK

A total of five (5) boreholes (BH 1 through BH 5, see Drawing 1 for the borehole location plan) were drilled by SIRATI between April 26th and 29th, 2020, extending to the depths ranging between 4.8 m (BH5) and 21.1 m (BH 2) below existing ground surface (bgs).

Boreholes were drilled with hollow stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of SIRATI personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method.

Bedrock coring was carried out in selected boreholes (BH1 and BH2), in accordance with the ASTM D 2113 test method. Bedrock was cored using HQ size core barrel to the termination depths of the boreholes. Photographs of the rock cores are presented in **Appendix A**.

The drilling of all boreholes was conducted by a drilling sub-contractor under the direction and supervision of SIRATI staff.

Two (2) soil samples were subjected to grain size and hydrometer analyses and gradation curves are presented in Figure 7.

Monitoring wells were installed at three (3) borehole locations (BH1, BH3, and BH4) for long-term (stabilized) groundwater level monitoring.

The elevations at the borehole locations were surveyed by SIRATI personnel using a differential GPS system and varied from 112.6 m to 114.2 m.

3. SITE AND SUBSURFACE CONDITIONS

The borehole location plan is shown on Drawing 1. Notes on soil descriptions are presented on Drawing 1A. The subsurface conditions in the boreholes are presented in the individual borehole logs (Encl. 2 to 6 inclusive). The soil and groundwater conditions in the boreholes are summarized in the following paragraphs.

3.1 SOIL CONDITIONS

Topsoil: A surficial layer of topsoil was encountered at all boreholes, with the thickness of 100 mm to 300 mm.

It should be noted that the thickness of the topsoil observed at the borehole locations may not be representative for the entire site and should not be relied on to calculate the amount of topsoil that need to be stripped from the site.

Fill/Probable Fill: A layer of fill material was encountered below the topsoil at the location of all boreholes. The fill layers consisted of sand, trace to some silt, and extended to depths ranging between 1.5 m (BH1 and BH4) and 2.3 mbgs (BH2, BH 3, and BH5).

The measured SPT ‘N’ values in the fill material ranged from 4 to 32 blows per 0.3 m penetration, indicating a very loose to dense condition.

The moisture content of the fill/probable fill material was found ranging from 5% to 11%, indicating moist condition.

Grain size and hydrometer analyses of one (1) representative sample of the fill/probable fill layer (BH3/SS3) was conducted, and the results are presented in Figure 7 with the following fractions:

Clay: 4%
Silt: 15%
Sand: 80%
Gravel: 1%

Cohesionless Soil deposit: Cohesionless soil deposit consisting of sand, trace silt or silt was encountered underlying the fill layer at the location of all boreholes, extending to the depth of 3.1 m to 3.3 mbgs.

The measured SPT ‘N’ values in the cohesionless soil deposit varies from 20 to over 50 blows per 0.3 m, indicating compact to very dense condition.

The moisture content of the cohesionless soil deposit ranged between 4% and 21%, indicating moist to wet condition.

Grain size and hydrometer analyses of one (1) representative sample of the cohesionless soil deposit (BH2/SS4) was conducted, and the results are presented in Figure 7 with the following fractions:

Clay: 1%
Silt: 9%
Sand: 89%
Gravel: 1%

SHALE BEDROCK: Inferred weathered shale bedrock was observed upon spoon refusal ranging in Elevations between 109.4 m and 110.9 m (Geodetic). The shale bedrock is of the Georgian Bay Formation. The material is colored grey and features an upper sub-unit. The upper (weak) sub-unit is approximately 1.5 m to 2.0 m thick, highly weathered (W4) to moderately weathered (W3) and fractured, and in a very poor to poor condition. It should be noted that the above indicated depths for the bedrock surface are approximate since the auger/HW casing penetrated the weathered shale, and therefore, the coring performed below the bedrock surface. SPT tests carried out in this sub-unit of the weathered shale bedrock measured N-values of more than 50 blows for less than 300 mm sampler penetration.

The layer is followed by a less weathered sub-unit of rock which is in fair to excellent condition.

Bedrock coring was carried out in less weathered sub-unit of bedrock at boreholes BH1 and BH2 during the intrusive drilling operation to verify the quality of the bedrock. Based on the examination of the rock core samples retrieved, the bedrock in less weathered sub-unit consisted of less weathered shale with interbedded layers of grey limestone/siltstone and occasional horizontal and vertical fractures. Rock core photographs are presented in **Appendix A**.

Approximate depth, length and Rock Quality Designation (R. Q. D.) of the cored samples are presented in the respective borehole logs. Detailed descriptions of the index properties and results of laboratory testing are presented in the following paragraphs.

Total Core Recovery (TCR)

The total core recovery indicates the total length of rock core recovered expressed as a percentage of the actual length of the core run. The total core recovery was generally good which ranged from 95% to 100% with an average value of 99%.

Solid Core Recovery (SCR)

The solid core recovery is the total length of solid, full diameter rock core that was recovered, expressed as a percentage of the length of the core run. Solid core recovery ranged from 48% to 100%.

Rock Quality Designation (RQD)

The rock quality designation index is obtained by measuring the length of intact recovered rock core pieces which are longer than 100 mm and expressing their sum length as a percentage of the length of the core run. RQD is a function of the frequency of joints, bedding plane partings and fractures in the rock cores. The recorded RQD values for the cored runs ranged from 0% to 100%, indicating a “Very Poor” to “Excellent” rock quality, and the average of 80.1% suggests a rock of generally “fair quality”.

Hard Layers

Based on the visual examination of the rock cores, an attempt was made to identify and record the thickness and percentages of the relatively harder limestone layers. The percentage of the “hard layers” per core run ranges between 0% and 37.5%, averaging approximately 10.4%. The thickness of these layers varied but was generally less than 100 mm. This rock formation, however, is known to contain very strong limestone or siltstone layers up to 600 mm in thickness. Encountering such thick layers should be anticipated. It is also common to encounter closely spaced groupings of thin strong limestone/siltstone layers which individually may only be 25 to 50 mm thick but collectively can be 1m in thickness.

3.2 GROUNDWATER CONDITIONS

Table 2 shows the observed stabilized groundwater table on May 10, 2021, measured in the monitoring wells of BH1, BH3, and BH4. Groundwater was also measured in an existing monitoring well (MW2, old), adjacent to BH2. The groundwater was found to vary between 3.2 m and 5.3 m depth, corresponding to geodetic elevations ranging between 109.7 m and 108.0 m. The higher groundwater table was generally observed in shallow monitoring wells.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events. Long-term groundwater monitoring observation is recommended.

Table 2: Groundwater Levels Observed in the monitoring wells.

BH No.	Date of Drilling	Date of Observation	Depth of Groundwater below existing ground (m)	Elevation of Groundwater (m)
BH/MW1	April 29, 2021	May 10, 2021	5.3	108.0
BH/MW3	April 29, 2021	May 10, 2021	3.2	109.4
BH/MW4	April 29, 2021	May 10, 2021	4.1	109.7
MW2 (Old)	N/A	May 10, 2021	4.7	108.1

4. DISCUSSION AND RECOMMENDATIONS

It is understood that the Client intends to develop the property with a 28-storey high-rise building with 3 to 5 levels of underground parking.

The recommendations are based on the subsurface soil and groundwater conditions encountered during the investigation and interpretation of the factual data presented in this report. The soil conditions may vary between and beyond the borehole locations.

At the time of preparing this report, the proposed design grades (i.e. finished floor slab elevation and foundations) were not provided. The following engineering recommendations regarding the geotechnical design aspects of the building foundations should be reviewed once the final design grades and foundations have been finalized.

Where comments are made on construction, they are provided to highlight those aspects which could affect the design of the project, and for which special provision may be required during construction.

Those requiring information on aspects of construction should make their own interpretation of the factual information, provided such interpretation may affect selections, proposed construction methods, scheduling and the like.

The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by SIRATI to validate the information for use during the construction stage.

The following provides limited recommendations regarding foundation condition, drainage, excavation support, earth pressure and seismic site class.

4.1 FOUNDATION CONDITIONS

The tower with three (3) to five (5) levels of underground parking can be supported by spread and strip footings founded on sound shale bedrock, designed for a bearing capacity of 4.0 MPa at the serviceability limit state (SLS) and 6.0 MPa at the ultimate limit state (ULS).

All footing bases should be evaluated by this office at the time of construction. In the event where rubble zones, faults, etc. are encountered in the shale bedrock, the footings would have to be lowered to competent rock. Soft layers were observed in BH1 from 17.8 m to 20.1 m, corresponding to geodetic elevations of 95.5 m and 93.2 m, respectively. No foundation shall be installed at this depth. Once the number of basements is determined, SIRATI shall be consulted to review and finalize the depth of the shallow foundations.

During excavation, care is needed to avoid fracturing, loosening or softening the shale at the foundation level. Loose, broken or remolded shale under the foundation, unless removed, may cause excessive differential settlements. Shale bedrock, immediately above the foundation level should be removed carefully at the latest possible stage before pouring concrete and construction to minimize softening due to weathering.
Footing bases should be protected by a concrete skim coat (~50 mm thick) if concrete placement does not occur on the same day after excavation.

Footings at different elevations should be located such that higher footings are set below a line drawn up at 1 Horizontal to 1 Vertical (1H:1V) from the near edge of the lower footing in bedrock. This concept should also be applied to excavations for new foundations in relation to existing footings or underground services.

The total and differential settlements of footings placed on the bedrock in accordance with the above recommendations, are expected to be small and well within the normally tolerated limits of 25 mm and 19 mm, respectively.

All foundations exposed to freezing conditions must be provided with at least 1.2 m of earth cover or equivalent insulation for frost protection, depending on the final grade requirements.

4.2. FLOOR SLAB AND PERMANENT DRAINAGE

With three (3) to five (5) levels of underground parking at or below the approximate geodetic elevations of 104.4 m and 98.4 m, respectively, the underground floor slab can be supported on grade. It is recommended that the exposed subgrade be inspected and approved by the Geotechnical Engineer prior to the placement of any granular fill or concrete. A granular layer consisting of at least 200 mm of 19 mm Crusher Run Limestone (CRL) or OPSS Granular A should be placed under the floor slab as a bedding layer. The CRL or the OPSS Granular A should be compacted to 100% of its SPMDD.

The base of any floor slab excavation that is left exposed longer than 24 hours or is exposed to frost should be suitably covered to prevent degradation of the exposed founding stratum with the construction of a mud mat.

A perimeter and underfloor drainage system will be required for buildings with basement. The perimeter drainage system in bedrock shall be comprised of vertical drainage board installed on the bedrock surface, overlain by a layer of waterproofing. Typical drainage and backfill recommendations are illustrated on Drawing 8.

5. EXCAVATION SUPPORT

The stratigraphy at the site was found to be comprised of approximately 3.1 m to 3.3 m of overburden, underlain by bedrock of Georgian Bay Formation. The upper 1.5 m to 2.0 m of the bedrock is expected to be weathered. The excavation is expected to pass through fill/native overburden and weathered/sound shale deposits. The groundwater was observed to be at an average depth of 4.3 m.

Given the limited spacing of the development to the property boundaries, excavation support will be required. The excavation in the overburden can be supported by soldier piles and timber lagging, caisson walls, or soil nailing with shotcrete and wire mesh. The excavation support in bedrock can be in the form of rock pins, and where necessary shotcrete. A specialist shoring design contractor shall be retained for temporary excavation support design.

A 75 mm-thick layer of Styrofoam shall be placed between the waterproofing layer and the foundation wall in the bedrock. The layer will eliminate the risk of rock squeeze on the foundation wall in the long-term.

The shoring system must be designed in accordance with the Fourth Edition of the Canadian Foundation Engineering Manual. The soil parameters estimated to be applicable for this design are as follows:

1) Earth Pressure Coefficients

   (a) where movement must be minimal, K_0=0.50
   (b) where minor movement (.002H) can be tolerated, K_a=0.33
   (c) passive earth pressure for soldier piles (unfactored), K_p=3.0 for the very dense soils

2) For stability check
   ϕ= 30°
   c= 0
   γ = 21 kN/m^3
   Surcharge is to be determined by shoring contractor.

3) For earth anchors:

> Bond values of 50 kPa and 600 kPa are suggested in native soil and sound bedrock, respectively; these values depend on anchor installation methods and grouting procedures. Higher bond values can be achieved in pressure grouted anchors.

Safe net bearing value for soldier pile caissons base assuming clean dry hole in sound shale bedrock is q = 1.5 MPa.

Casing will be required during the construction of the tiebacks to prevent caving of soils. The soldier piles should be installed in pre-augered holes taken below the deepest excavation. The holes should be filled with concrete below the excavation level and half bag mix above the base of the excavation. The concrete strength must be specified by the shoring designer. Temporary liners will be required to help prevent the sandy soils from caving during the installation period. Measures will be required to prevent the loss of soil through the spaces between the lagging boards (if used). This could be achieved by installing a geotextile filter cloth behind the lagging boards.

Anchors will be required to support the shoring. The anchors must be of a length that meets the Canadian Foundation Manual recommendations. It is important to note that the minimum length lies beyond the $45 - \phi/2 + .15H$ line drawn from the base of the soldier pile and the overall stability of the system must be checked at each anchor level.

The top anchor must not be placed lower than 3.0 m below the top of level ground surface. Anchors will require casing when penetrating through wet sand and silt layers. The suggested bond values provided above are preliminary since the contractor's installation procedures will determine the actual soil/rock to concrete bond value. Hence, the contractor must decide on a capacity and confirm its availability. All anchors must be tested as indicated in the Foundation Manual, 4th edition.

Movement of the shoring system is inevitable. Vertical movements will result from the vertical load on the soldier piles resulting from the inclined tiebacks and inward horizontal movement results from earth and water pressures. The magnitude of this movement can be controlled by sound construction practices, and it is anticipated that the horizontal movement will be in the range of 0.1 to 0.25% H.

6. EARTH PRESSURES

The lateral earth and water pressure acting within the overburden and weathered bedrock on the underground walls can be calculated by the following formula:

In soils above the groundwater table ($z < d_w$):

$$p = K (z + q)$$

In soils below the groundwater table ($z \geq d_w$):

$$p = K \{d_w + \gamma_1 (z - d_w) + q\} + p_w$$

$$\text{In which, } p_w = \gamma_w (z - d_w)$$

Where,

p = lateral earth and water pressure in kPa acting at a depth of z below ground surface

K = earth pressure coefficient = 0.5

= unit weight of soil/weathered bedrock above groundwater table, assuming = 22.0 kN/m^3

g_1 = submerged unit weight of soil/weathered bedrock below groundwater table, assuming γ_1 = 12.2 kN/m^3

g_w = unit weight of water, assuming γ_w = 9.8 kN/m^3

z = depth below ground surface to point of interest, in meters

d_w = depth of groundwater table below ground surface, in meters

q = value of surcharge in kPa

p_w = hydrostatic water pressure in kPa (to be neglected if effective drainage is installed)

The above lateral earth pressure shall be applied within the overburden and weathered shale depths. This could be assumed from surface to 107.0 m ASL.

Given the relatively high unconfined compressive strength of sound shale, the lateral earth pressure can be assumed to be constant from 107.0 m ASL to the base of the excavation and equal to the design pressure at 108 m ASL.

7. EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed buildings with one level of underground parking can be classified as “Class B” for seismic site response.

8. GENERAL COMMENTS ON REPORT

Sirati & Partners Consultants Limited (SIRATI) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, SIRATI will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The limitation conditions presented in **Appendix B** form an integral part of the report and they must be considered in conjunction with this report.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

SIRATI & PARTNERS CONSULTANTS LIMITED

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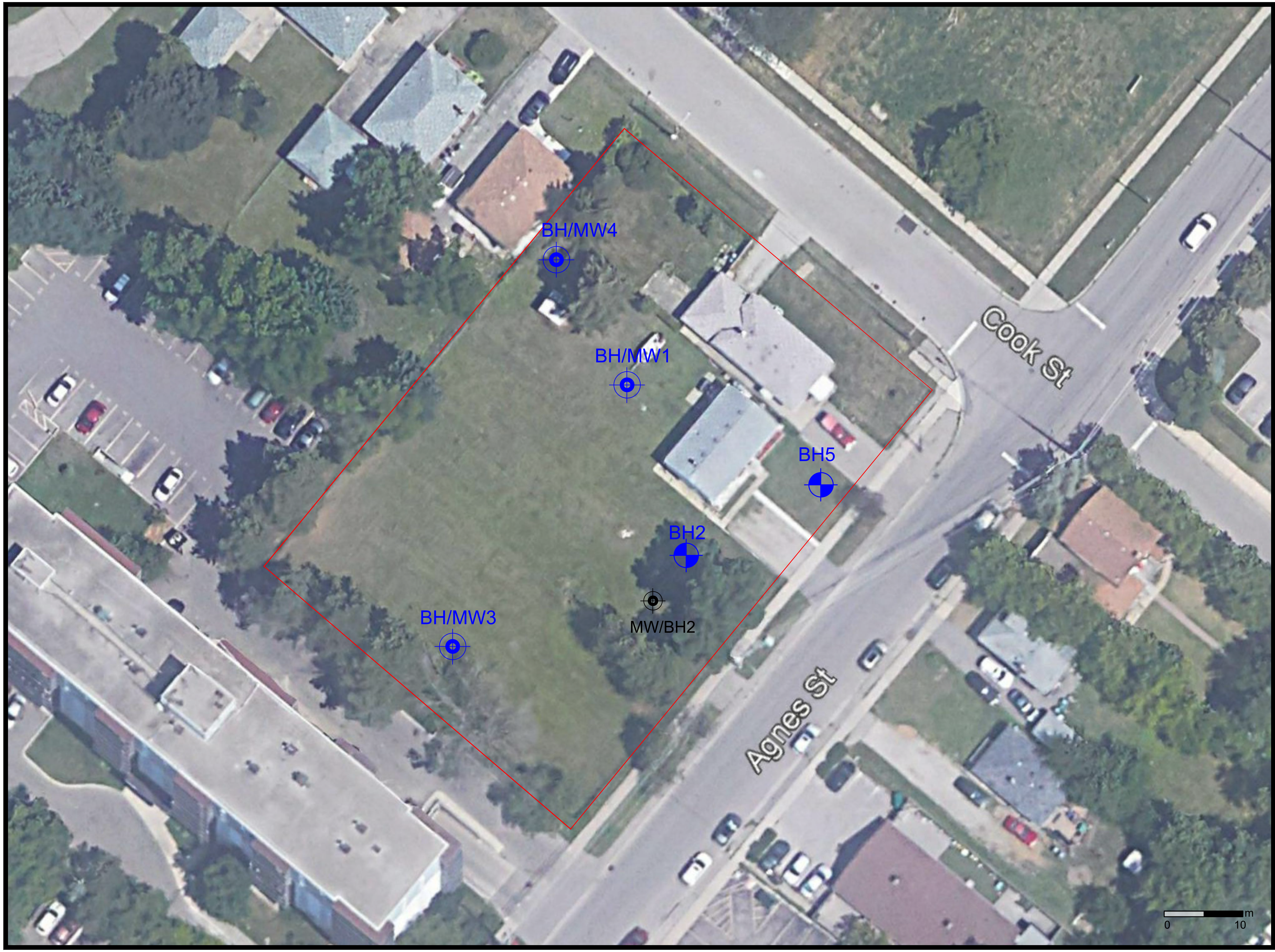
Principal Geotechnical Engineer

Drawings



SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

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Phone# 905 833 1582, Fax#905 833 5360

North:

N

Legend:

- ⊕ Borehole location
- ⊕ Montoring Well location
- ⊕ Montoring Well location (Existing)

Project Title:

Geotechnical Investigations

Site Location:

15 & 17 Agnes Street, Mississauga, ON,

Figure Title:

Borehole Location Plan

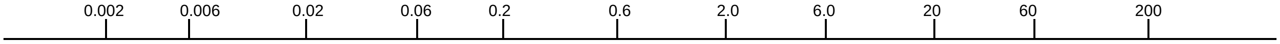
Scale: As Shown	**Project Number:** SP21-826-00
Date: April 2021	**Figure Number:** 1

Drawing 1A: Notes on Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Sirati & Partners Consultants Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

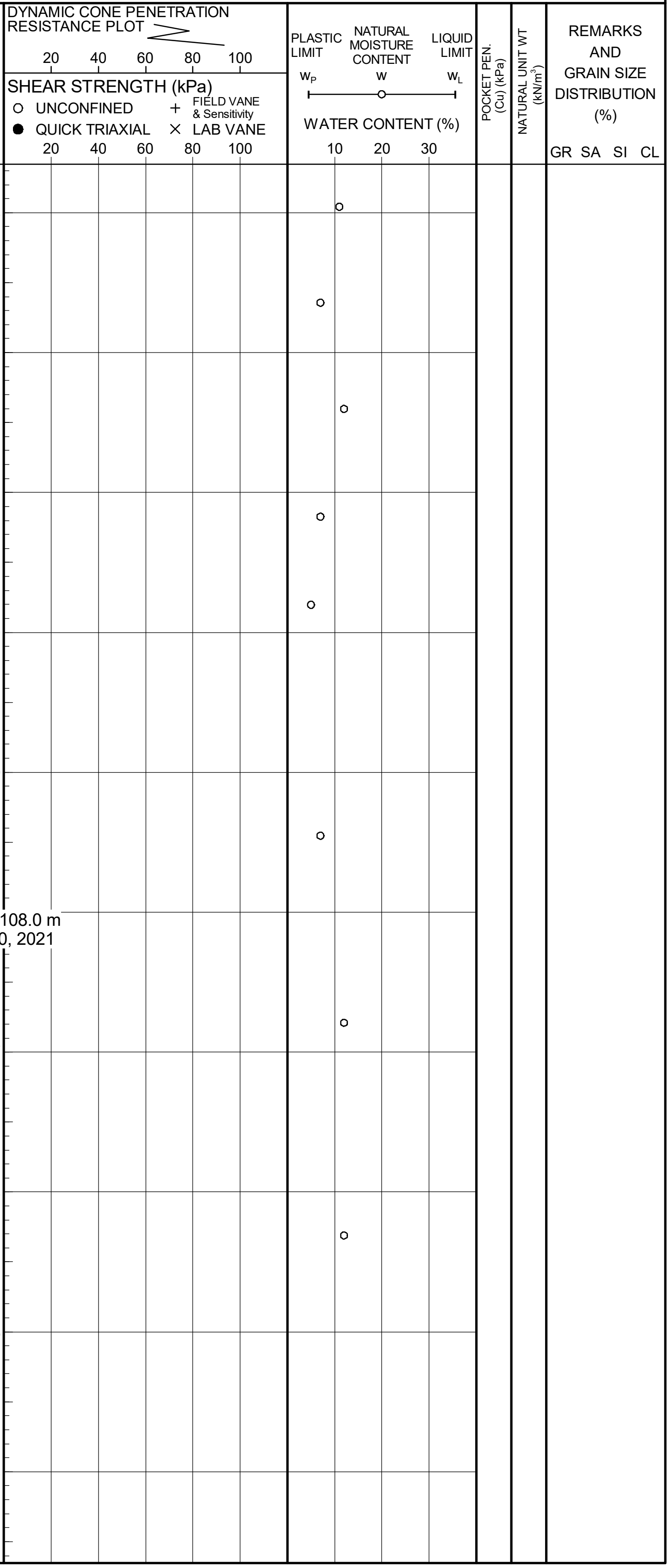
LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826125.23 E 611451.625

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-28-2021 to Apr-29-2021

REF. NO.: SP21-826-00
ENCL NO.: 2

(m) ELEV DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS
113.3 0.0	**TOPSOIL** 300 mm thick				
113.0 0.3	**PROBABLE FILL:** sand, some silt, trace gravel, brown, moist, very loose to loose	1	SS	3	
		2	SS	7	
111.8 1.5	**SAND:** trace silt, greyish brown, moist, dense	3	SS	30	
		4	SS	35	
110.2 3.1	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**	5	SS	50/50mm	
		6	SS	50	
					W. L. 108.0 m May 10, 2021
		7	SS	50/75mm	
	Rock coring started at 7.92m Refer to rock core log for detailed information	8	SS	60/75mm	
		1	CORE		



Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
$+^3, \times^3$: Numbers refer to Sensitivity
○ ^{8}=3% Strain at Failure

LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826125.23 E 611451.625

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-28-2021 to Apr-29-2021

REF. NO.: SP21-826-00
ENCL NO.: 2

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m		
	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**(Continued)		2	CORE			103
11							102
12			3	CORE			101
13			4	CORE			100
14							99
15			5	CORE			98
16			6	CORE			97
17							96
18			7	CORE			95
19			8	CORE			94
20							

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m^3)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES $+^3, \times^3$: Numbers refer to Sensitivity ○ $^{\varepsilon=3\%}$ Strain at Failure

LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826125.23 E 611451.625

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-28-2021 to Apr-29-2021

REF. NO.: SP21-826-00
ENCL NO.: 2

SOIL PROFILE			SAMPLES					DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L / WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION					
92.3	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**(Continued)						93					
21.0	**END OF BOREHOLE:** Note: 1. Monitoring well was installed upon completion of drilling. 2. Groundwater level observations: Date Depth (mbgs) 2021-05-10 5.32											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ 3 =3% Strain at Failure

SIRATI & PARTNERS

LOG OF ROCK CORE BH1

1 OF 2

PROJECT: Geotechnical Investigation	**DRILLING DATA**
CLIENT: Bashar Ghreiwati	Method: Hollow Stem Auger/HQ Coring — REF. NO.: SP21-826-00
LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario	Diameter: 150 mm/63 mm — ENCL NO.: 2
DATUM: Geodetic	Date: Apr-28-2021 to Apr-29-2021
BH LOCATION: N 4826125.23 E 611451.625	

(m) ELEV DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	WEATHERING INDEX	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
110.2	Rock Surface															
3.1	**GEORGIAN BAY FORMATION** Higly weathered (W4) to slightly weathered (W2), laminated to thinly bedded, dark grey to grey, **SHALE** and **LIMY SHALE**, interbedded with thinly laminated to thinly bedded with slightly weathered to fresh, light grey, **SILTSTONE** and **LIMESTONE**. Bedding almost horizontal (θ=90°)	W. L. 108.0 m May 10, 2021														
105.4 7.9	Slightly weathered (W2), **SHALE** and **LIMY SHALE**(68.3% to 98.4%), interbedded with **SILTSTONE** and **LIMESTONE** (1.6% to 31.7%). Bedding almost horizontal (θ=90°) Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths Run 1 hard rock: 11.9%		1		98	78	11.9	78	2 2 1 1 2	Fracture: 8.09m-8.20m, θ=0° Fragmented zone: 8.50m-8.52m	W2					
103.9 9.5	Hard layers (limestone/siltstone) 7.92m (76mm) 8.1m (102mm) Run 2 hard rock: 31.7%, soft layer: 8.6% Hard layer (limestone/siltstone) 9.45m (203mm) 10.26m (89mm) 10.50m (89mm) Soft layers at: 9.65m (25mm) 10.24m (25mm) 10.41m (51mm)		2		97	81	31.7	72	2 1 1 5 2	Soft layer 9.65m ~ 9.68m (W5 to W4) 10.24m ~ 10.26m (W5 to W4) 10.41m ~ 10.46m (W5 to W4)	W2					
102.4 11.0	Run 3 hard rock: 7.6%, soft layer: 1.7% Hard layer (limestone/siltstone) 11.29m (51mm) Soft layer at 11.13m (25mm)		3		98	85	7.6	80	3 2 1 2 1	Fracture: 11.38m-11.40m, θ=0° 11.13m ~ 11.15m (W4 to W3)	W2					
100.8 12.5	Run 4 hard rock: 9.2% Hard layer (limestone/siltstone) 12.78m (76mm)								1 1							

Continued Next Page

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis

E = Modulus of Elasticity

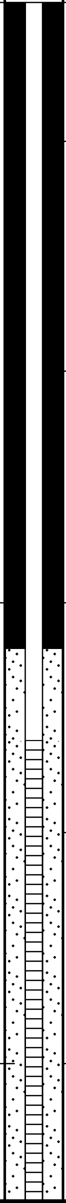
*: UCS [Mpa] ≈ 24 $I_{S(50)}$

LOG OF ROCK CORE BH1

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826125.23 E 611451.625

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-28-2021 to Apr-29-2021

REF. NO.: SP21-826-00
ENCL NO.: 2



(m) ELEV DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	WEATHERING INDEX	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm³) E (GPa)
	Slightly weathered (W2), **SHALE** and **LIMY SHALE**(68.3% to 98.4%), interbedded with **SILTSTONE** and **LIMESTONE** (1.6% to 31.7%). Bedding almost horizontal (θ=90°)		4		98	97	9.2	97	1 1 2		W2					
99.3 14.0	Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths *(continued)* Run 5 hard rock: 15.8% Hard layer (limestone/siltstone) 14.63m (89mm)		5		100	92	15.8	73	0 0 2 0 0	Fracture: 14.63m-14.72m, θ=0°	W2					
97.8 15.5	Run 6 hard rock: 1.6%, soft layer: 5.0% Soft layers at: 16.14m (38mm) 16.47m (38mm)		6		100	85	1.6	85	0 2 0 4 2	16.14m ~ 16.18m (W4) 16.47m ~ 16.51m (W4)	W2				11.06	
96.3 17.1	Highly weathered (W4) to slightly weathered (W3), **SHALE** and **LIMY SHALE**(98.3% to 100%), interbedded with **SILTSTONE** and **LIMESTONE**(0% to 1.7%). Bedding almost horizontal (θ=90°) Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths Run 7 soft layer: 23.8%		7		100	48	0	25	1 0 9 7 20	Fragmented zone: 18.45m-18.49m 18.59m-18.62m 17.81m ~ 17.83m (W4 to W3) 17.86m ~ 17.88m (W4 to W3) 17.96m ~ 18.00m (W4 to W3) 18.21m ~ 18.39m (W4 to W3) 18.47m ~ 18.54m (W4 to W3)	W4 to W3					
94.8 18.6	Soft layers at: 17.81m (25mm) 17.86m (25mm) 17.96m (38mm) 18.21m (178mm) 18.47m (76mm) 18.59m (25mm) Run 8 hard rock: 1.7%, soft layer: 20.0% Soft layers at: 18.59m (51mm) 18.69m (38mm) 18.75m (127mm) 19.20m (13mm) 19.79m (25mm) 19.96m (25mm) 20.09m (25mm)		8		100	48	1.7	40	21 5 5 7 8	Fracture: 19.66m-19.69m, θ=0° Fragmented zone: 19.14m-19.20m 19.76m-19.79m 19.89m-19.93m 18.59m ~ 18.64m (W4 to W3) 18.69m ~ 18.73m (W4 to W3) 18.75m ~ 18.87m (W4 to W3) 19.2m ~ 19.22m (W4 to W3) 19.79m ~ 19.81m (W4 to W3) 19.96m ~ 19.99m (W4 to W3) 20.09m ~ 20.12m (W4 to W3)	W4 to W3					
93.2 20.1	Slightly weathered (W2) **SHALE** and **LIMY SHALE**(86.1%), interbedded with **SILTSTONE** and **LIMESTONE**(13.9%). Bedding almost horizontal (θ=90°) Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths Run 9 hard rock: 13.9%, soft layer: 2.8% Hard layer (limestone/siltstone) 20.27m (76mm)		9		100	86	13.9	86	2 1 1		W2					
92.3 21.0	**END OF BOREHOLE:** Note: 1. Monitoring well was installed upon completion of drilling. 2. Groundwater level observations: Date Depth (mbgs) 2021-05-10 5.32															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis

E = Modulus of Elasticity
*: UCS [Mpa] ≈ 24 $I_{S(50)}$

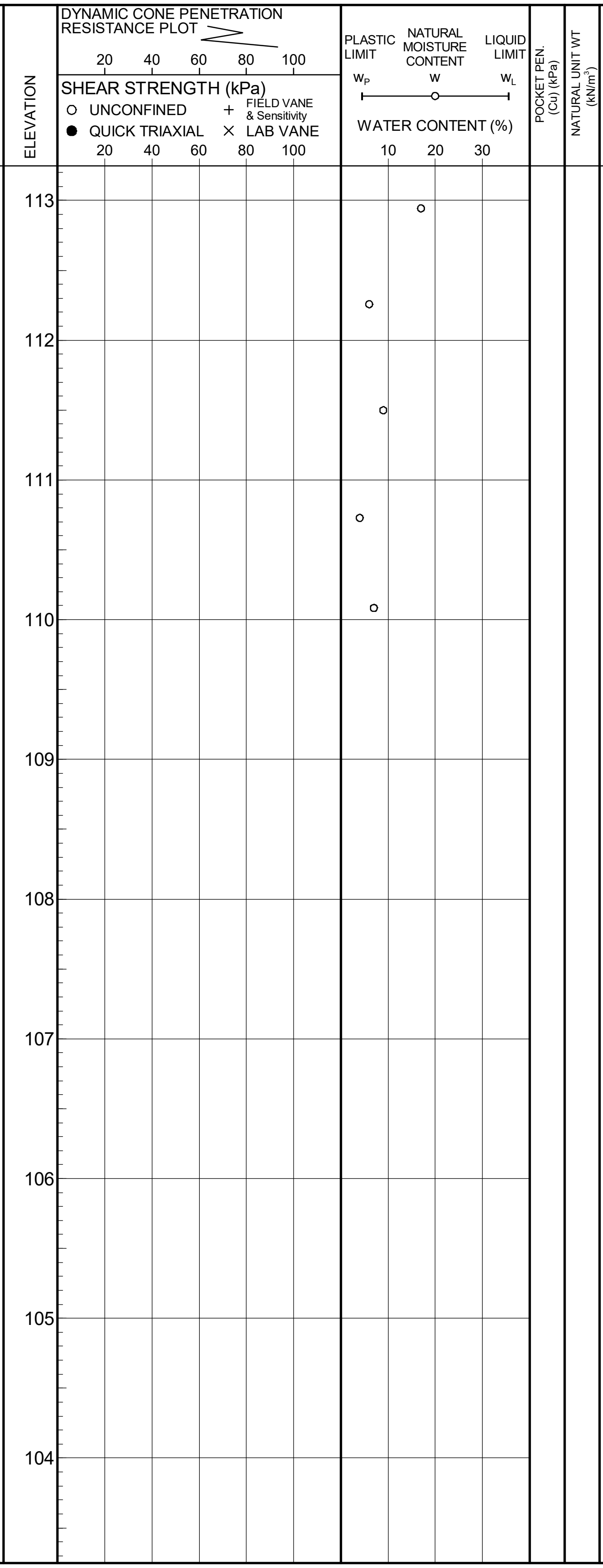
LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826104.229 E 611460.574

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-26-2021 to Apr-27-2021

REF. NO.: SP21-826-00
ENCL NO.: 3

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
113.2							
0.0	**TOPSOIL** 250 mm thick						
113.0 0.3	**PROBABLE FILL:** sand, trace to some silt, brown, moist, loose to compact		1	SS	32		
			2	SS	12		
			3	SS	7		
111.0 2.3	**SAND:** trace silt, greyish brown, moist, dense		4	SS	69		1 89 9 1
			5	SS	50/75mm		
110.0 3.2	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**						
			6	SS	50/75mm		
	Rock coring started at 4.98m Refer to rock core log for detailed information		1	CORE			
			2	CORE			
			3	CORE			
			4	CORE			



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GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
$+^3, \times^3$: Numbers refer to Sensitivity
○ $^{\varepsilon}$=3% Strain at Failure

LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826104.229 E 611460.574

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-26-2021 to Apr-27-2021

REF. NO.: SP21-826-00
ENCL NO.: 3

SOIL PROFILE (m) ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
11	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**(Continued)		5	CORE			103					
12			6	CORE			102 101					
13			7	CORE			100					
14 15			8	CORE			99 98					
16			9	CORE			97					
17 18			10	CORE			96 95					
19 20			11	CORE			94					

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
$+^3, \times^3$: Numbers refer to Sensitivity
○ ^{8}=3% Strain at Failure

LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826104.229 E 611460.574

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-26-2021 to Apr-27-2021

REF. NO.: SP21-826-00
ENCL NO.: 3

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m							
21 92.1	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**(Continued)		12	CORE			93					
21.1	**END OF BOREHOLE**											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES $+^3, \times^3$: Numbers refer to Sensitivity ○ ^{8}=3% Strain at Failure

LOG OF ROCK CORE BH2

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826104.229 E 611460.574

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-26-2021 to Apr-27-2021

REF. NO.: SP21-826-00
ENCL NO.: 3

(m) ELEV DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	WEATHERING INDEX	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
110.0	Rock Surface															
3.2	**GEORGIAN BAY FORMATION** Highly weathered (W4) to moderately weathered (W3), laminated to thinly bedded, dark grey to grey, **SHALE** and **LIMY SHALE**, interbedded with thinly laminated to thinly bedded with slightly weathered to fresh, light grey, **SILTSTONE** and **LIMESTONE**. Bedding almost horizontal (θ=90°) Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths															
108.3 5.0 108.1	Run 1 hard rock: 37.5% Hard layer (limestone/siltstone) 5.05m (57mm)		1		100	54	37.5	0	5	Fragmented zone: 5.01m-5.05m 5.11m-5.13m Soft layer 5.13m ~ 5.16m (W4 to W3)	W4 to W3					
5.1 106.5	Moderately weathered (W3) to slightly weathered (W2) **SHALE** and **LIMY SHALE** (71.7% to 97.6%), interbedded with **SILTSTONE** and **LIMESTONE** (2.4% to 28.3%). Bedding almost horizontal (θ=90°) Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths Run 2 hard rock: 2.4%, soft layer: 1.6% Soft layer at: 5.13m (25mm)		2		100	85	2.4	76	7 0 1 1 6	Fragmented zone: 5.22m-5.27m 6.52m-6.57m	W3 to W2					
6.7 105.0	Run 3 hard rock: 11.7%, soft layer: 17.5% Hard layer (limestone/siltstone) 7.95m (152mm) Soft layers at: 6.78m (51mm) 7.14m (51mm) 7.21m (25mm) 7.77m (127mm)		3		95	67	11.7	52	9 13 1 14 0	Fracture: 6.83m-6.86m, θ=55° Fragmented zone: 6.93m-6.99m 7.16m-7.21m 7.82m-7.85m 6.78m ~ 6.83m (W4 to W3) 7.14m ~ 7.19m (W4 to W3) 7.21m ~ 7.24m (W4 to W3) 7.77m ~ 7.90m (W4 to W3)	W3 to W2					
8.2 103.5	Run 4 hard rock: 13.6%, soft layer: 11.0% Hard layer (limestone/siltstone) 8.23m (76mm) Soft layers at: 8.75m (64mm) 8.92m (64mm) 9.4m (38mm)		4		100	64	13.6	56	3 10 10 4 4	Fragmented zone: 8.88m-8.92m 9.47m-9.50m 8.75m ~ 8.81m (W4) 8.92m ~ 8.98m (W4) 9.4m ~ 9.44m (W4)	W3 to W2					
9.8 102.0	Run 5 hard rock: 28.3%, soft layer: 11.6% Hard layer (limestone/siltstone) 9.83m (51mm) 10.46m (279mm) Soft layers at: 9.96m (89mm) 10.07m (51mm) 10.13m (6mm) 10.16m (25mm)		5		97	72	28.3	63	9 8 1 2 2	Fragmented zone: 10.07m-10.10m 11.05m-11.07m 9.96m ~ 10.05m (W4) 10.07m ~ 10.12m (W4) 10.13m ~ 10.14m (W4) 10.16m ~ 10.19m (W4)	W3 to W2					
11.3 100.4	Run 6 hard rock: 10.0%, soft layer: 15.8% Hard layer (limestone/siltstone) 11.89m (64mm) Soft layers at: 11.54m (76mm) 11.66m (64mm) 12.70m (102mm)		6		98	69	10.0	61	11 7 2 0 11	Fragmented zone: 11.33m-11.38m 12.55m-12.59m 12.67m-12.73m 11.54m ~ 11.62m (W4 to W3) 11.66m ~ 11.72m (W4 to W3) 12.7m ~ 12.80m (W4 to W3)	W3 to W2					
12.8	Run 7 hard rock: 4.2%, soft layer: 10.2% Soft layers at:								10	13m ~ 13.08m (W3)						

Continued Next Page

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis

E = Modulus of Elasticity
*: UCS [Mpa] ≈ 24 $I_{S(50)}$

LOG OF ROCK CORE BH2

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826104.229 E 611460.574

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-26-2021 to Apr-27-2021

REF. NO.: SP21-826-00
ENCL NO.: 3

(m) ELEV DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	WEATHERING INDEX	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
98.9	13.00m (76mm) 14.12m (76mm) Moderately weathered (W3) to slightly weathered (W2) **SHALE** and **LIMY SHALE** (71.7% to 97.6%), interbedded with **SILTSTONE** and **LIMESTONE** (2.4% to 28.3%). Bedding almost		7		98	75	4.2	73	4 1 2 7	Fracture: 13.31m-13.34m, θ=0° Fragmented zone: 13.08m-13.12m *(continued)* 14.12m ~ 14.20m (W3)	W3 to W2					
14.3 97.4	horizontal (θ=90°) Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths *(continued)* Run 8 hard rock: 8.5%, soft layer: 14.4% Hard layer (limestone/siltstone) 14.97m (76mm) Soft layers at: 15.14m (102mm) 15.44m (102mm) 15.56m (13mm)		8		98	67	8.5	62	1 2 11 10 12	Fracture: 14.95m-14.96m, θ=0° Fragmented zone: 15.74m-15.82m 15.14m ~ 15.24m (W3) 15.44m ~ 15.54m (W4 to W3) 15.56m ~ 15.57m (W3)	W3 to W2					
15.9 95.9	Slightly weathered (W2) to fresh (W1) **SHALE** and **LIMY SHALE** (88.9% to 98.3%), interbedded with **SILTSTONE** and **LIMESTONE** (1.7% to 11.1%). Bedding almost horizontal (θ=90°) Hard layers (siltstone and limestone) generally found to be less than 50mm thick except for noted depths		9		100	100	1.7	100	0 0 0 0 0		W2 to W1					
17.4 94.3	Run 9 hard rock: 1.7% Run 10 hard rock: 1.7%		10		97	100	1.7	100	0 0 1 1 0		W2 to W1					
18.9 92.8	Run 11 hard rock: 6.7%		11		100	97	6.7	93	2 0 0 0 2		W2 to W1				10.94	
20.4 92.1	Run 12 hard rock: 11.1%		12		100	100	11.1	100	0 0		W2 to W1					
21.1	**END OF BOREHOLE**															

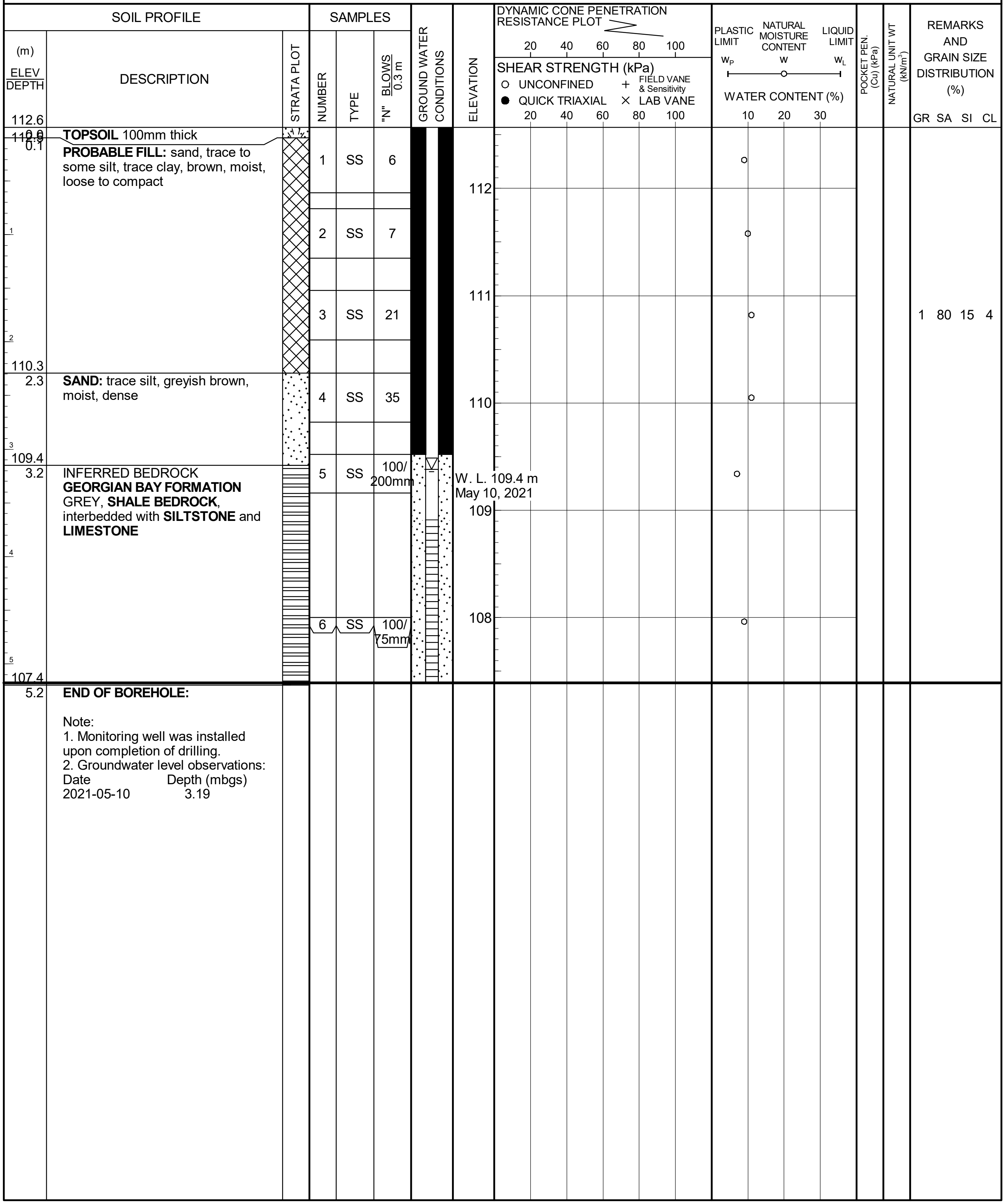
Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis

E = Modulus of Elasticity
*: UCS [Mpa] ≈ 24 $I_{S(50)}$

LOG OF BOREHOLE BH3

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826091.036 E 611429.998

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-29-2021 to Apr-29-2021
REF. NO.: SP21-826-00
ENCL NO.: 4



(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
112.6					
112.5 0.1	**TOPSOIL** 100mm thick				
	PROBABLE FILL: sand, trace to some silt, trace clay, brown, moist, loose to compact	1	SS	6	
		2	SS	7	
		3	SS	21	1 80 15 4
110.3 2.3	**SAND:** trace silt, greyish brown, moist, dense	4	SS	35	
109.4 3.2	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**	5	SS	100/ 200mm	
		6	SS	100/ 75mm	
107.4 5.2	**END OF BOREHOLE:**				

Note:
1. Monitoring well was installed upon completion of drilling.
2. Groundwater level observations:

Date	Depth (mbgs)
2021-05-10	3.19

SPCL SOIL LOG-DRAFT SP20-826-00.GPJ SPCL.GDT 21-5-27

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

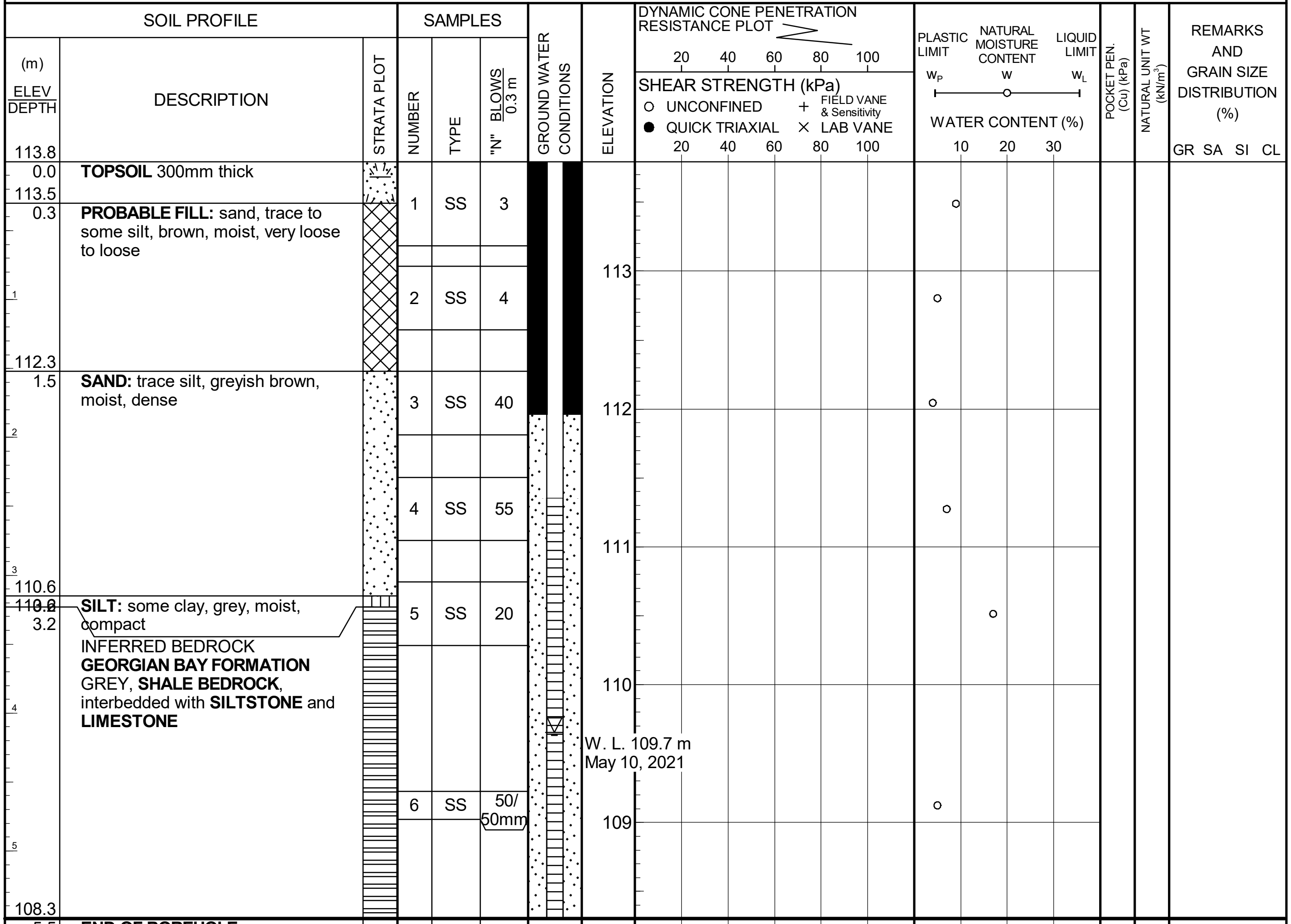
GRAPH NOTES $+^3, \times^3$: Numbers refer to Sensitivity ○ ^{8}=3% Strain at Failure

LOG OF BOREHOLE BH4

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826140.981 E 611442.558

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-29-2021 to Apr-29-2021

REF. NO.: SP21-826-00
ENCL NO.: 5



(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS / 0.3 m
113.8				
0.0	**TOPSOIL** 300mm thick			
113.5 0.3	**PROBABLE FILL:** sand, trace to some silt, brown, moist, very loose to loose	1	SS	3
		2	SS	4
112.3 1.5	**SAND:** trace silt, greyish brown, moist, dense	3	SS	40
		4	SS	55
110.6 110.6	**SILT:** some clay, grey, moist, compact	5	SS	20
3.2	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**			
		6	SS	50/ 50mm
108.3 5.5	**END OF BOREHOLE:**			

Note:
1. Monitoring well was installed upon completion of drilling.
2. Groundwater level observations:

Date	Depth (mbgs)
2021-05-10	4.14

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+³, ×³: Numbers refer to Sensitivity
○ ³=3% Strain at Failure

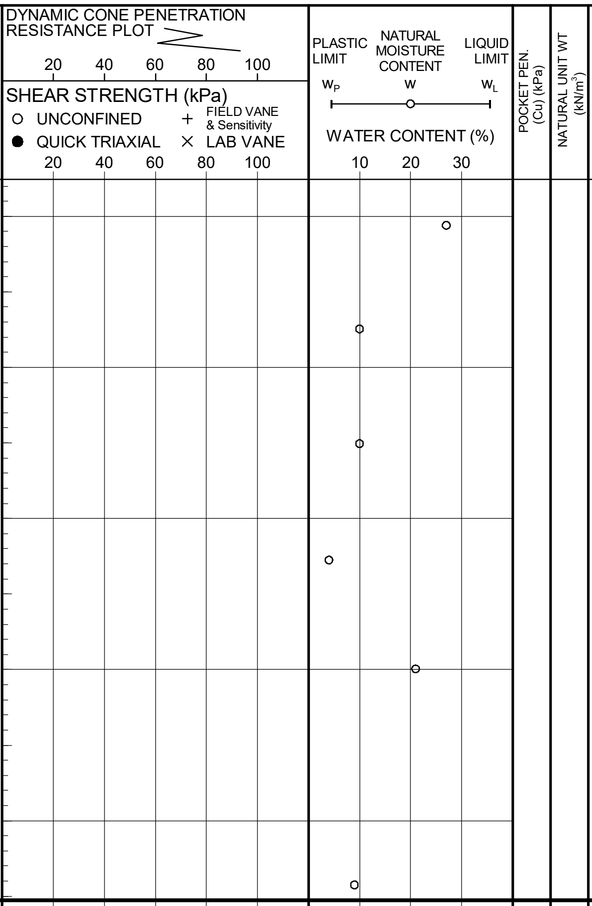
LOG OF BOREHOLE BH5

PROJECT: Geotechnical Investigation
CLIENT: Bashar Ghreiwati
PROJECT LOCATION: 65 and 71 Agnes Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4826112.461 E 611476.665

DRILLING DATA
Method: Hollow Stem Auger/HQ Coring
Diameter: 150 mm/63 mm
Date: Apr-29-2021 to Apr-29-2021

REF. NO.: SP21-826-00
ENCL NO.: 6

(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
114.2 0.0	**TOPSOIL** 300mm thick					
113.9 0.3	**PROBABLE FILL:** sand, trace to some silt, brown, moist, very loose to loose	1	SS	2		
		2	SS	4		
		3	SS	10		
112.0 2.3	**SAND:** trace silt, greyish brown, moist to wet, dense	4	SS	31		
111.1 3.0	**SILT:** trace clay, trace sand, grey, moist, compact	5	SS	60/ 225mm		
111.0 3.3	INFERRED BEDROCK **GEORGIAN BAY FORMATION** GREY, **SHALE BEDROCK**, interbedded with **SILTSTONE** and **LIMESTONE**	6	SS	50/ 50mm		
109.5 4.8	**END OF BOREHOLE**					

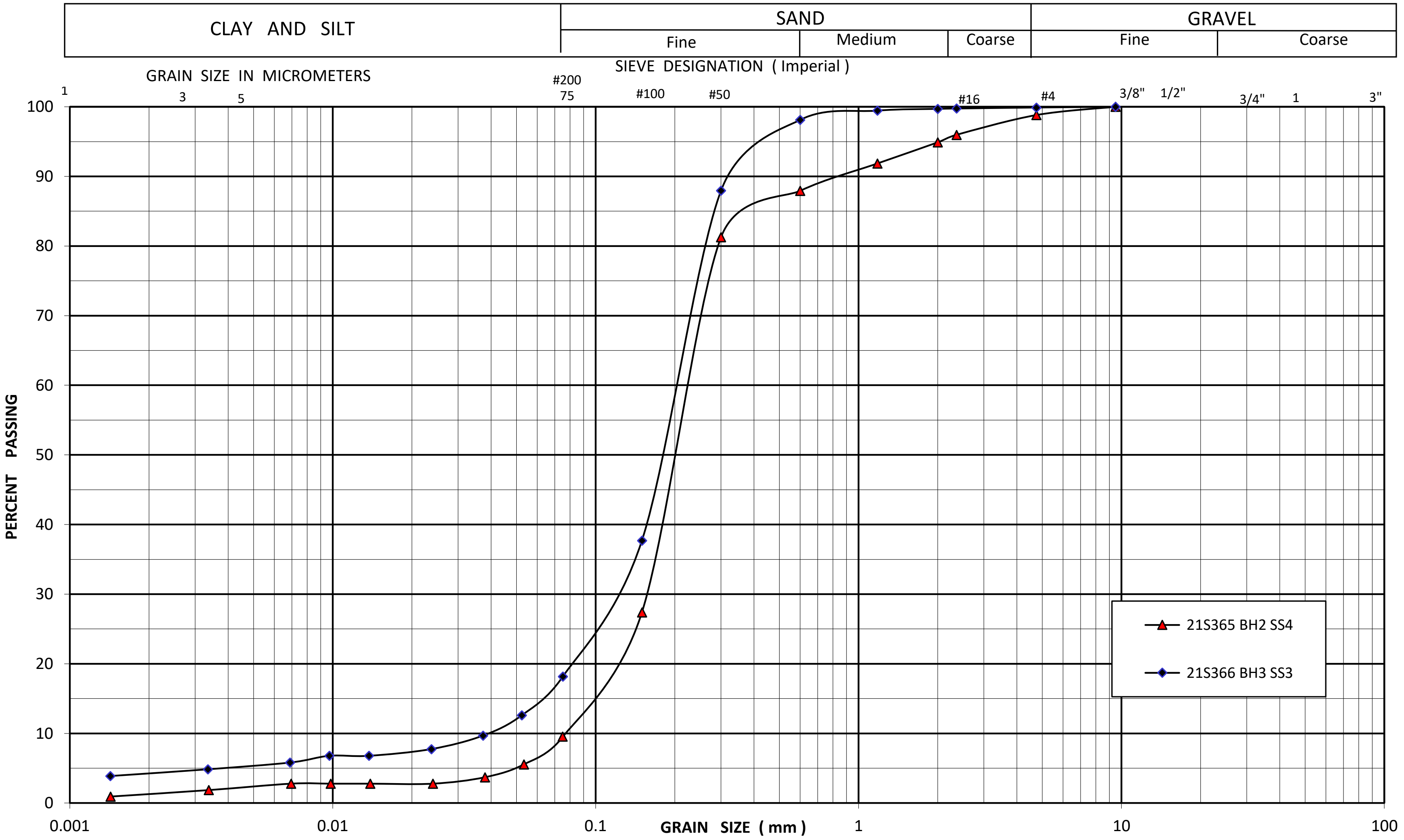


GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

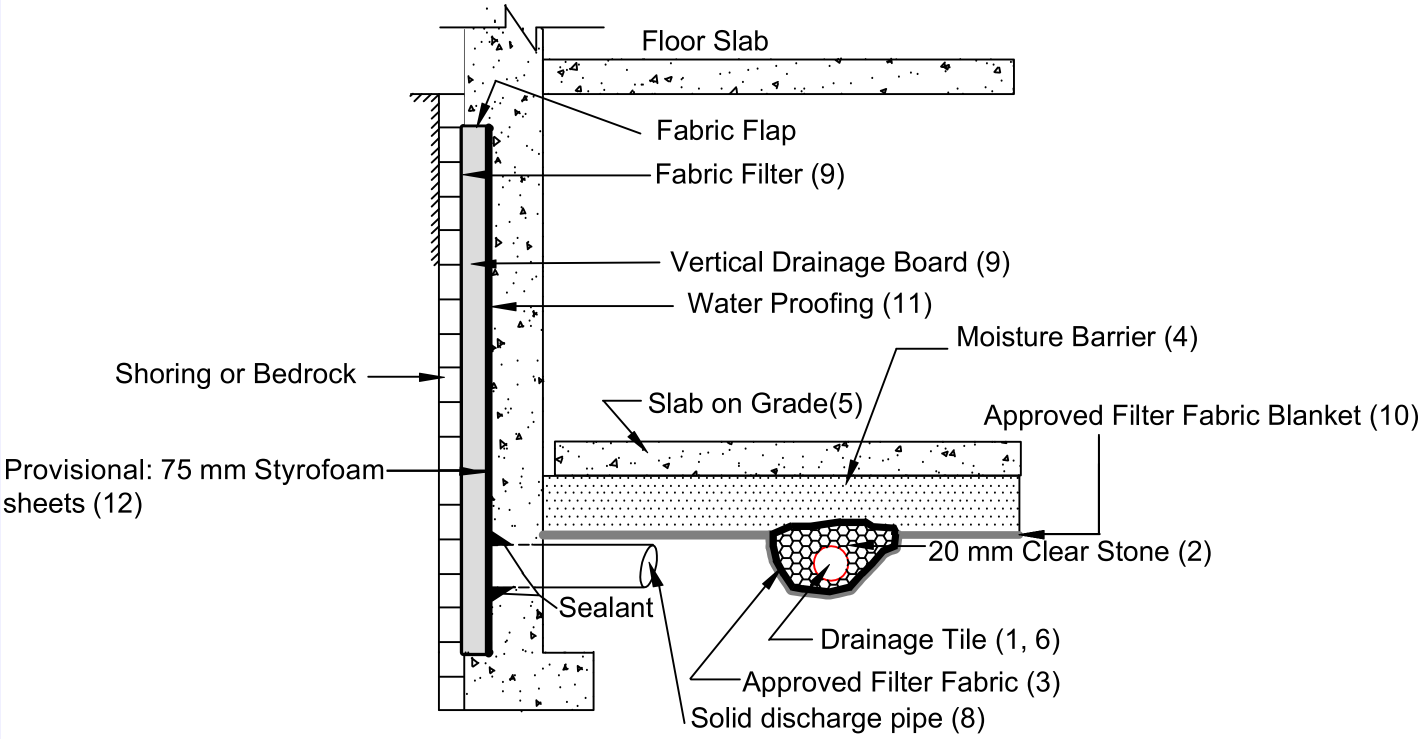
GRAPH NOTES $+^3, \times^3$: Numbers refer to Sensitivity ○ ^{8}=3% Strain at Failure

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM



Project No.	**:**	SP21-826-00
Date	**:**	17 May 2021
Figure No.	**:**	7



EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board with filter cloth should be kept a minium of 1.2 m below exterior finished grade.
10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
11. The basement walls should be water proofed using bentonite or equivalent water-proofing system.
12. Where in bedrock, a 75 mm-thick layer of Styrofoam shall be placed between the foundation wall and the waterproofing to avoid long-term rock squeeze to the foundation wall.
13. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS

Basement wall with Underfloor Drainage System

(not to scale)

APPENDIX A

PHOTOGRAPHS OF THE ROCK CORES

BH1 (Run 1): 7.9 m – 9.5 m

BH1 (Run 2): 9.5 m – 11.0 m

BH1 (Run 3): 11.0 m – 12.5 m

BH1 (Run 4): 12.5 m – 14.0 m

BH1 (Run 5): 14.0 m – 15.5 m
BH1 (Run 6): 15.5 m – 17.1 m

BH1 (Run 7): 17.1 m – 18.6 m

BH1 (Run 8): 18.6 m – 20.1 m

BH1 (Run 9): 20.1 m – 21.0 m

BH2 (Run 1): 5.0 m – 5.1m

BH2 (Run 2): 5.1 m – 6.7 m

BH2 (Run 3): 6.7 m – 8.0 m

BH2 (Run 3): 8.0 m – 8.2 m

BH2 (Run 4): 8.2 m – 9.8 m

BH2 (Run 5): 9.8 m – 11.3 m

BH2 (Run 6): 11.3 m – 12.8 m

BH2 (Run 7): 12.8 m – 14.3 m

BH2 (Run 8): 14.3 m – 15.9 m

BH2 (Run 9): 15.9 m – 17.4 m

BH2 (Run 10): 17.4 m – 18.9 m

BH2 (Run 11): 18.9 m – 20.4 m

BH2 (Run 12): 20.4 m – 21.1 m

Appendix B: Limitation and Use of the Report

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to Sirati & Partners Consultants Limited (SIRATI) at the time of preparation. Unless otherwise agreed in writing by SIRATI, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the borehole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the borehole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc. Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

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