37 King Street

Functional Servicing and Stormwater Management Report

Project Location:
37 King Street
Georgetown, Halton Hills, ON

Prepared for:
Habitat for Humanity Halton-Mississauga
1800 Appleby Line, Unit 10
Burlington, ON L7L 6A1

Prepared by:
MTE Consultants
1016 Sutton Drive, Unit A
Burlington, ON L7L 6B8

Revised: February 14, 2025

MTE File No.: 60793_001

Engineers, Scientists, Surveyors.

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1.0 Introduction

1.1 Overview

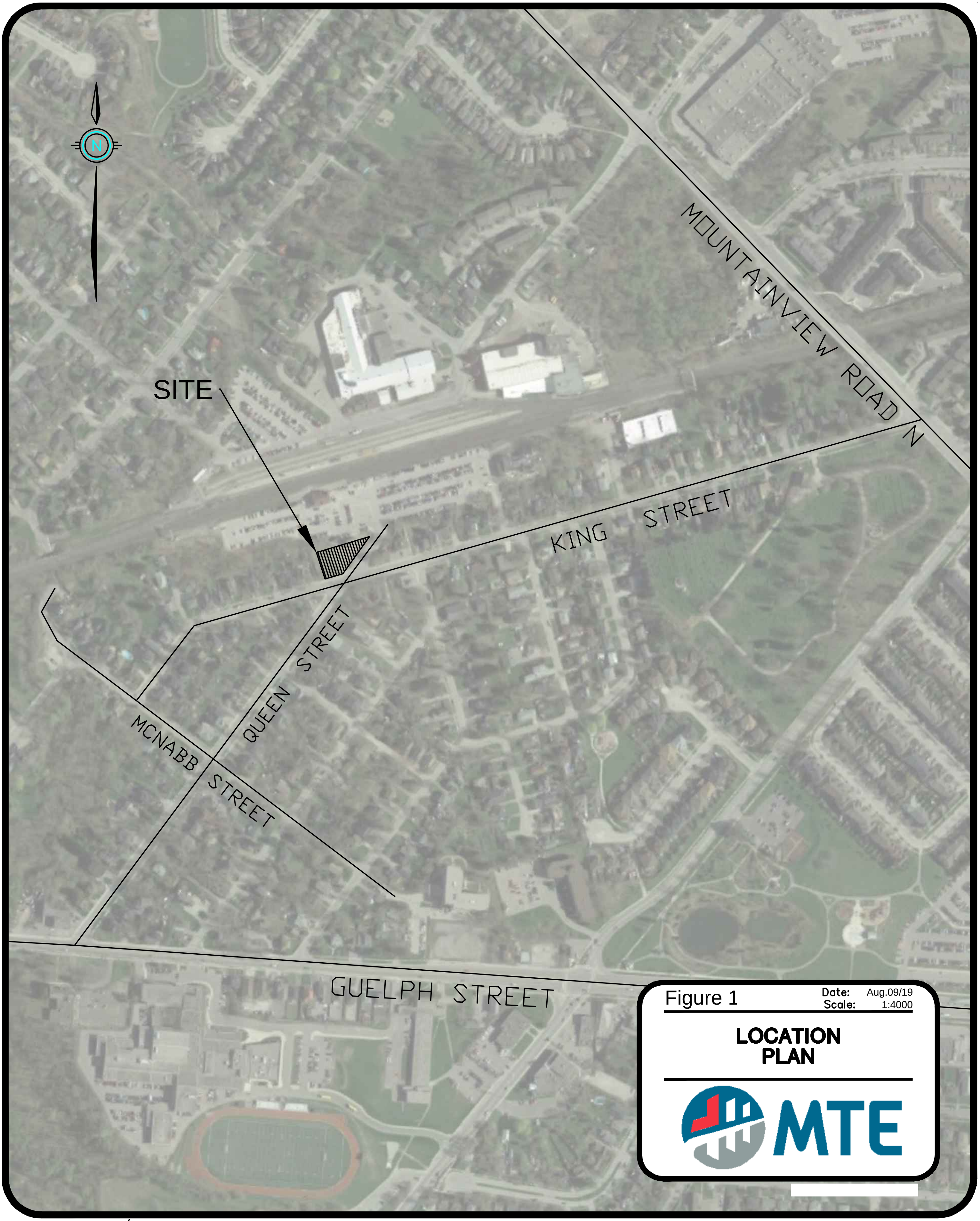
MTE Consultants Inc. was retained by Habitat for Humanity Halton-Mississauga to complete a Functional Servicing & Stormwater Management Report as well as a site grading and servicing design for a new 3-storey multiple unit residential building and associated parking located at 37 King Street in Georgetown, Halton Hills. Refer to Figure 1 for the site location. The site is located on a 0.136 ha parcel of land at the northwest corner of King Street and Queen Street. Existing municipal storm sewers, sanitary sewers and watermain services are located within the abutting right-of-ways that will be utilized to service the proposed development.

The functional servicing and stormwater management strategy described in this report will provide additional detailed information on the proposed servicing scheme for the proposed development for a Zoning By-law Amendment (ZBA). The existing site is currently zoned as a Medium Density Residential Two Exception 107 Holding 1 zone, which permits multiple unit and townhouse dwellings up to a maximum of six units. The proposed development comprises of 15 units, and therefore a ZBA will be required. Please refer to the Architectural Site Plan and the enclosed civil drawings prepared by MTE for additional information.

1.2 Background Information

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

- Ref. 1: *Ontario Building Code* (2024)
- Ref. 2: *Region of Halton Water and Wastewater Linear Design Manual, Contract Specifications, and Standard Drawings* (November 2024)
- Ref. 3: *Water Supply for Public Fire Protection*, Fire Underwriters Survey (2020)
- Ref. 4: *Terraprobe Preliminary Geotechnical Investigation 37 King Street Georgetown, Ontario* (July 2018)
- Ref. 5: *Town of Halton Hills Official Plan* (January 2017)
- Ref. 6: *Credit Valley Conservation Stormwater Management Criteria* (August 2012)
- Ref. 7: *Design Guidelines for Sewage Works*, Ministry of the Environment and Climate Change (2008)
- Ref 8: *Erosion & Sediment Control Guideline for Urban Construction* (December 2006)
- Ref. 9: *MOE Stormwater Management Planning and Design Manual* (Ministry of Environment, March 2003)



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1.3 Geotechnical Investigation

A geotechnical investigation was prepared by Terraprobe dated July 23, 2018 (Ref.4). Four (4) boreholes were drilled; three (3) at depth 6.6 m and one (1) at depth 21.3 m below surface level. Fill was found to be at varying depths of 1.4 to 2.9 m and was made up of silty sand with intermixed topsoil, gravel and occasional pieces of brick. Below the fill and until the bottom of boreholes was found to be compact silty fine sand. Groundwater was measured at a depth of about 20.5 m below ground surface.

Based on this geotechnical information, a value of 78 has been used for the pervious curve number (CN), falling between Hydrologic Soil Groups B & C for crop and other improved land.

2.0 Stormwater Management

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

2.1 Stormwater Management Criteria

Based on the Town of Halton Hills, the following stormwater management (SWM) criteria will be applied to the site:

2.1.1 Quantity Control

Post development peak flows are not to exceed the pre-development levels for storms up to and including the 100-year storm event (Ref. 5).

2.1.2 Quality Control

Enhanced (Level 1) water quality control (80% TSS Removal) is required for all impacted surface runoff prior to discharging to the receiving system (Ref. 9).

2.1.3 Water Balance

Retain 50% of average annual rainfall depth (capturing 5 mm of each storm event through infiltration, evapotranspiration or rainwater reuse is one means of achieving this requirement).

2.2 Existing Conditions

In the former existing condition, the site was previously occupied by an abandoned two-storey, two-unit residential building with associated concrete walkways and landscaped areas. The existing building was dismantled and removed in Fall/Winter 2019. Catchbasins are available within the Queen Street right-of-way that connect to the existing 300mmØ storm sewer on King Street at a 6.9% slope with a capacity of 266 L/s. The existing property does not have any known on-site stormwater management quantity or quality controls.

Based on the topographic survey by Dolliver Surveying Inc. dated August 26, 2015, the existing condition has been defined by two (2) catchment areas (see Table 2.1 and Figure 2).

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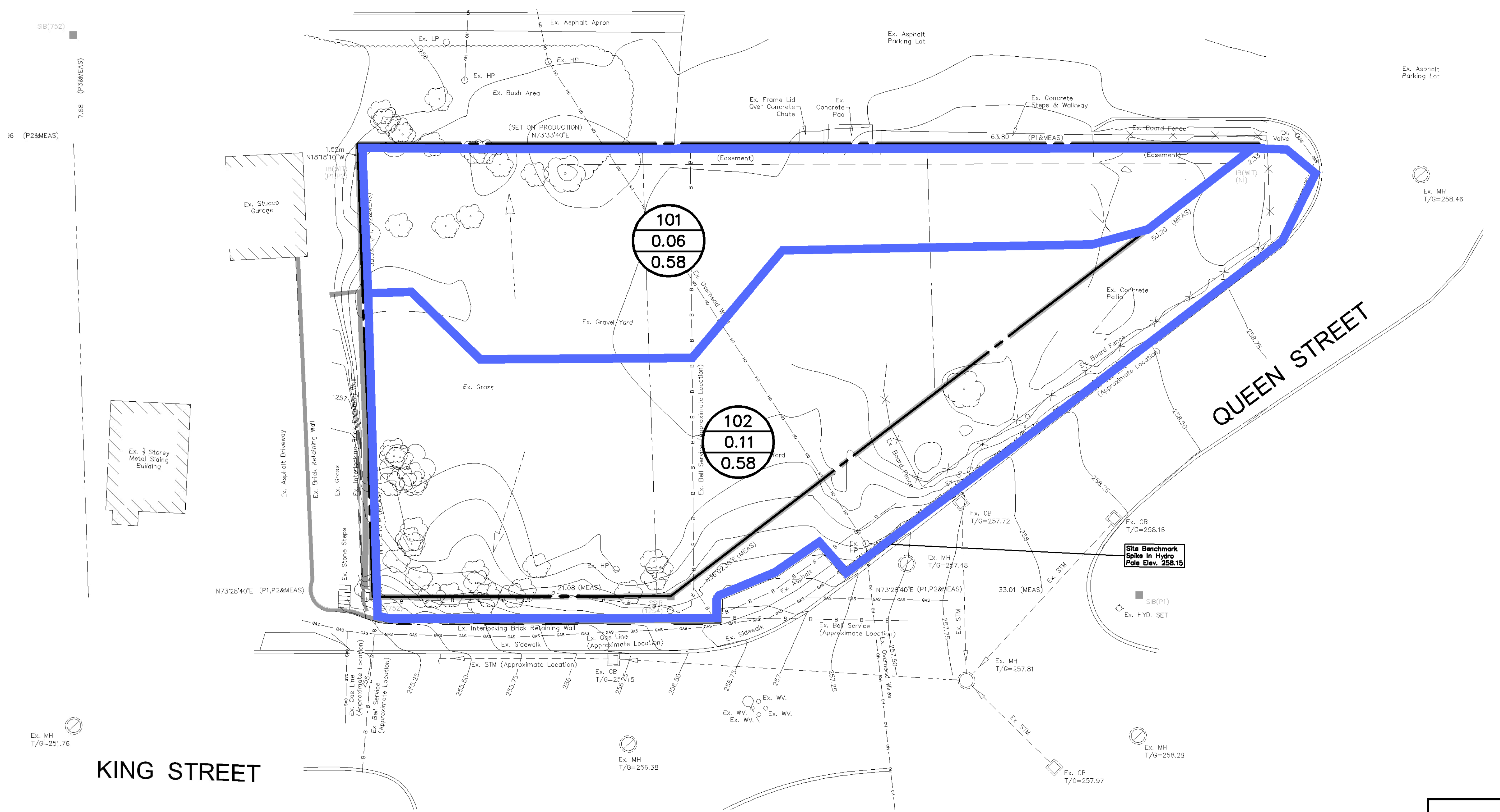

LEGEND

SITE BOUNDARY

CATCHMENT AREA

Ex. 375mmø STM Ex. MH

EXISTING STORM SEWER

326

EXISTING CONTOURS

EXISTING DIRECTION OF DRAINAGE

101 — ID No.
4.45 — AREA (Ha)
0.58 — RUNOFF COEFFICIENT

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PROJECT
37 KING STREET, GEORGETOWN

TITLE
PRE-DEVELOPMENT CATCHMENT AREAS

Drawn	Scale	Figure
AXG	1:300	Figure 2
Checked	Project No.	
RNC	60793_001	
Date (yyyy-mm-dd)	Rev No.	
2025-02-07	0	

Plot Date: February 14, 2025 - 10:44 AM

Table 2.1 – Existing Conditions Catchment Areas & Allowable Release Rates

Catchment ID	Description	Area (ha)	Runoff Coefficient [A]	Allowable Release Rate (L/s) [B]
101	Building and landscaped areas draining to GO Station parking lot. (uncontrolled)	0.06	0.58	2 year storm = 7 5 year storm = 10 10 year storm = 11 25 year storm = 14 50 year storm = 15 100 year storm = 17
102	Building, Sidewalk & Landscaped frontage draining to King Street and Queen Street. (uncontrolled)	0.11	0.58	2 year storm = 13 5 year storm = 18 10 year storm = 21 25 year storm = 25 50 year storm = 28 100 year storm = 30
	TOTAL	**0.17 [C]**	**0.58**	

[A] Calculated for each catchment area shown in Figure 2
[B] Calculated with Rational method (See Appendix B for output report)
[C] Total area is shown greater than the site area (0.136 ha) to include areas outside of property line that are included in the catchment

2.3 Proposed Conditions

In the post development condition the proponent plans to construct a new 3-storey multiple unit residential building complete with paved driveway and parking lot and landscaped areas. The post development condition drainage pattern is delineated by five (5) catchment areas. Table 2.2 provides a brief description of each catchment area as well as the size and the impervious cover associated with each. Figure 3 provides an illustration of the proposed conditions catchment areas.

Catchment 201

Catchment 201 represents the majority of the subject property and is comprised of the paved driveway and parking lot, concrete walkways, building roof, and most of the landscaped areas. All the stormwater runoff within this catchment will be captured by the proposed catch basin manholes and ultimately outlet to the existing 300mmØ storm sewer within the King Street right-of-way. Catchment 201 will be controlled with a 75mm diameter orifice plate downstream of CBMH4.

The site will be graded such that major overland flows (above the 100-year storm) generated within this catchment will be directed to Queen Street. Maximum ponding will be limited to 0.3 m within the driveway and parking areas.

Catchment 202

Catchment 202 represents the southwest perimeter and landscaped area that will drain uncontrolled to King Street and Queen Street due to grading constraints.

Catchment 203

Catchment 203 represents minor perimeter landscaped area at the northwest corner of the site which will continue to drain uncontrolled to the GO parking lot located northwest of the site.

Catchment 204

Catchment 204 represents an external area with proposed works along the south perimeter that will drain uncontrolled to King Street and Queen Street due to grading constraints.

Table 2.2 – Proposed Conditions Catchment Areas

Catchment ID	Description	Area (ha)	%Imp.	Runoff Coef.
201	Parking lot, sidewalks & landscaped area and building roof draining to King Street. (controlled)	0.112	76	0.73
202	Southwest landscaped perimeter draining to King Street. (uncontrolled)	0.022	24	0.37
203	Landscaped areas draining to GO Station parking lot. (uncontrolled)	0.002	0	0.20
204	External area (uncontrolled)	0.034	21	0.35
	Total	**0.170**	**57**	**0.60**

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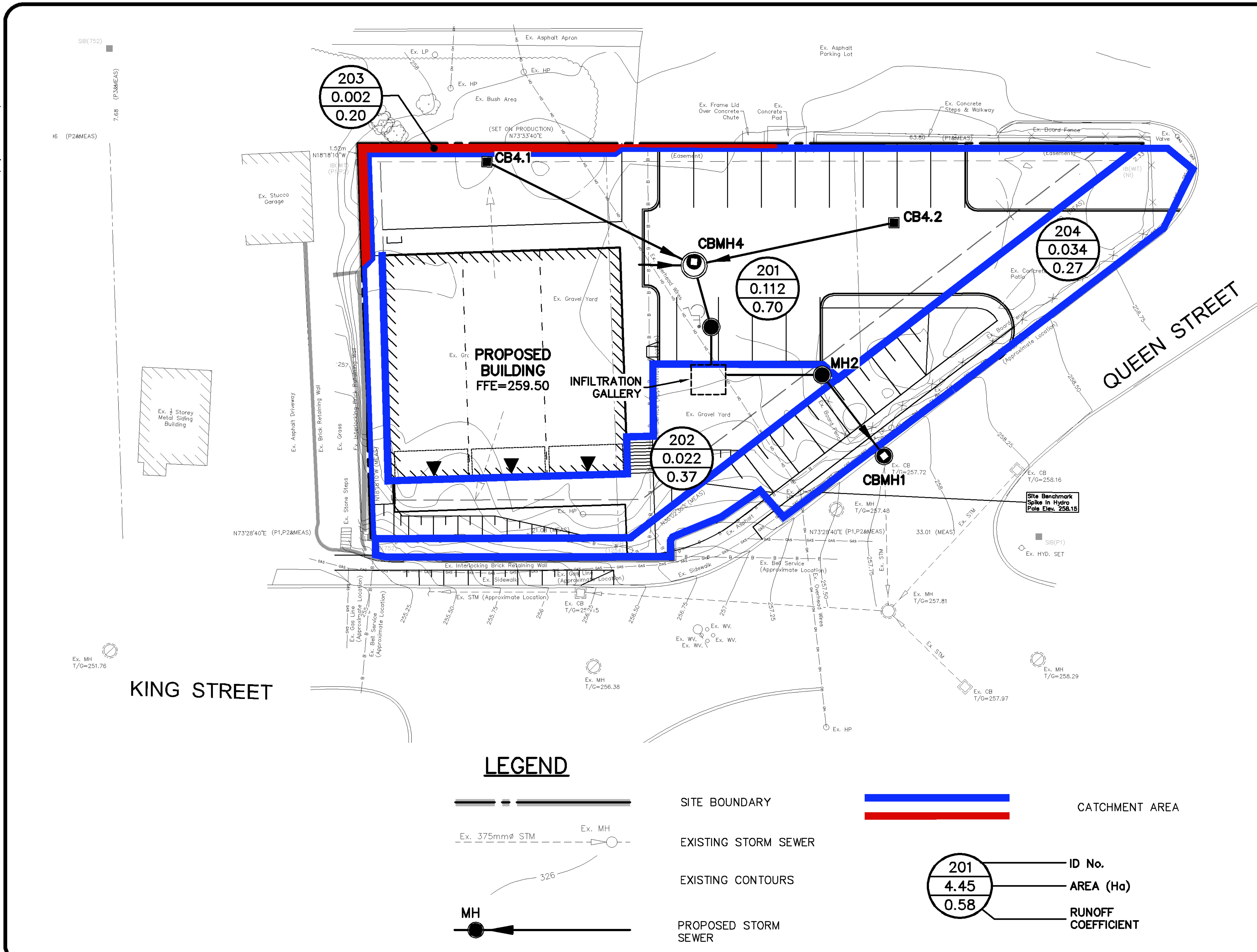

MTE
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PROJECT	37 KING STREET, GEORGETOWN	
TITLE	POST-DEVELOPMENT CATCHMENT AREAS	
Drawn AXG	Scale 1:300	Figure
Checked RNC	Project No. 60793_001	Figure 3
Date (yyyy-mm-dd) 2025-02-07	Rev No. 0	

Plot Date: February 14, 2025 – 10:45 AM

2.4 Proposed Quantity Control

As discussed above, discharge from catchment 201 will be controlled via a 75mm diameter orifice plate. The orifice plate will be placed downstream of CBMH4 at an invert elevation of 257.05 m. A total of 30 m^3 of storage volume will be provided in the form of underground storage (within the storm sewers and structures) as well as surface ponding within the paved and landscaped areas.

Table 2.3 summarizes the stage-storage-discharge characteristics for catchment 201. This information is used in the hydrologic model.

Table 2.3 – Stage-Storage-Discharge Relationship for Catchment 201

Elevation (m)	Cumulative Storage Volume (m^3) [A]	Peak Discharge Rate (m^3/s) [B]	Comments
254.71	0	0.0000	CL of orifice plate
257.00	5	0.0187	Underground storage
258.40	14	0.0237	T/G of Proposed CBMHs
258.50	19	0.0240	0.10 m of ponding on pavement
258.60	38	0.0243	0.20 m of ponding on pavement

[A] Volume includes storage in pipes and structures and surface ponding. See Appendix B for more details.
[B] from orifice equation $Q = CA\,(2gH)^{0.5}$ for a 75mmØ orifice

Where: C = 0.63, A=cross-sectional area, g=9.81, H=pressure head

The proposed conditions were assessed using the SWMHYMO hydrologic modeling program developed by J.F. Sabourin & Associates for the 2-year to 100-year Halton Hills 24-hour Chicago Distribution design storms. Appendix B contains detailed hydrologic modeling parameters and input/output printouts for the proposed conditions.

At the time of this report, Town records containing information about the GO Station's ultimate stormwater connection/drainage route to the municipal sewers was not available. To be conservative, catchment 102 will be used for the allowable discharge rate for the site in the proposed condition. Table 2.4 and 2.5 summarize the proposed condition peak discharge rates for the site. A comparison is then made to the allowable release rates for the 2-year to 100-year storm events.

Table 2.4 – Proposed Condition Site Discharge Rates to King Street and Queen Street

Storm Event	Proposed Conditions				Allowable Release Rate (Catchment 102) (L/s) [C]
	Controlled Site Peak Discharge Rate to King St. Queen St. (Catchment 201) (L/s) [A]	Uncontrolled Site Peak Discharge Rate to King St. and Queen St. (Catchment 202) (L/s) [A]	Uncontrolled External Peak Discharge Rate to ROW (Catchment 204) (L/s) [A]	Total Peak Discharge Rate to King Street and Queen Street (L/s) [B]	
2-yr	14	2	3	19	13
5-yr	15	4	5	24	18
10-yr	15	5	7	26	21
25-yr	15	6	9	30	25
50-yr	15	7	10	32	28
100-yr	15	8	12	35	30

[A] Discharge taken from SYMHYMO Output (see Appendix B)
[B] Total Discharge to Queen Street and King Street (Catchment 201+202+204) taken from SYMHYMO Output (see Appendix B)
[C] See Table 2.1

Table 2.5 – Proposed Conditions Site Discharge Rates to GO Station

Storm Event	Proposed Condition	Allowable Release Rate (Catchment 101) (L/s) [B]
	Uncontrolled Site Peak Discharge Rate to Go Station (Catchment 203) (L/s) [A]	
2-yr	0	7
5-yr	0.1	10
10-yr	0.1	11
25-yr	0.1	14
50-yr	0.1	15
100-yr	0.1	17

[A] Calculated with Rational method
ex. $Q_{5\ yr} = 2.78CiA$
$= 2.78 \times 0.2 \times 101.51 \times 0.002$
$= 0.1$ L/s
[B] See Table 2.1

Due to orifice sizing restrictions, the site discharge rate to King Street and Queen Street will be marginally over the allowable storm release rates. As mentioned above, the allowable release rate used in the analysis is conservative as we are not including Catchment 101 flows. The small amount of increased flow will have a negligible impact on the downstream storm sewer capacity.

Table 2.6 summarizes the proposed conditions storage volume requirements for the site.

Table 2.6 – Proposed Condition Storage Volume Requirements

Storm Event	Storage Volume Required (m^3) A	Storage Volume Provided (m^3) B
2-yr	5.8	31
5-yr	9.6	
10-yr	12.9	
25-yr	17.4	
50-yr	22.0	
100-yr	26.5	
[A] Storage Volume required taken from SYMHYMO Output (see Appendix B) [B] Storage volume within underground storage and surface ponding (see Appendix B)		

2.5 Proposed Water Quality Control

Water quality control for the site will be provided by a Stormceptor oil/grit separator (or approved equivalent) that will be installed at the downstream end of the proposed on-site storm sewer system prior to connecting to the proposed storm sewer on King Street. The following parameters were used to size the oil/grit separator device:

- Upstream Catchment Areas (Area 201) = 0.12 ha
- % Impervious = 76%
- Particle Distribution = Fine
- Target TSS Removal = 80%

The analysis indicates that a Stormceptor EO4 will provide 97% TSS Removal and treats at least 90% of the average annual rainfall. The Stormceptor sizing output information is included in Appendix B.

Stormwater runoff generated from catchment areas 202, 203 and 204 will be draining uncontrolled away from the site. These catchments are comprised of landscaped areas and are therefore considered to be clean.

2.6 Sediment and Erosion Control

The site is located within the Credit Valley Conservation Authority and therefore must adhere to the erosion control criteria (Ref. 6). The site will retain 5 mm of water per event onsite via an underground infiltration gallery tank. The tank is further described in Section 2.7.

During construction, erosion and sedimentation controls will be provided primarily via a sediment control fence to be erected around the perimeter of the construction area wherever runoff has the potential of leaving the site or entering into the storm sewer system.

All proposed on-site catchbasins and catchbasin manholes will be fitted with silt sacks within the structures to mitigate sediment transport during construction. This will minimize the potential for sediments entering into the storm sewer system.

A mud-mat will be constructed at the proposed new driveway access from Queen Street to mitigate the transportation of sediments to the surrounding roads.

All erosion and sediment controls must be inspected and maintained regularly for the full duration of construction until the Engineer or the Town approves removal of the measures. The Contractor shall inspect all erosion and sediment controls weekly and after any rainfall event and rectify any deficiencies immediately. All logs of inspections and modifications must be maintained and shall be available upon request by Town.

2.7 Water Balance Analysis

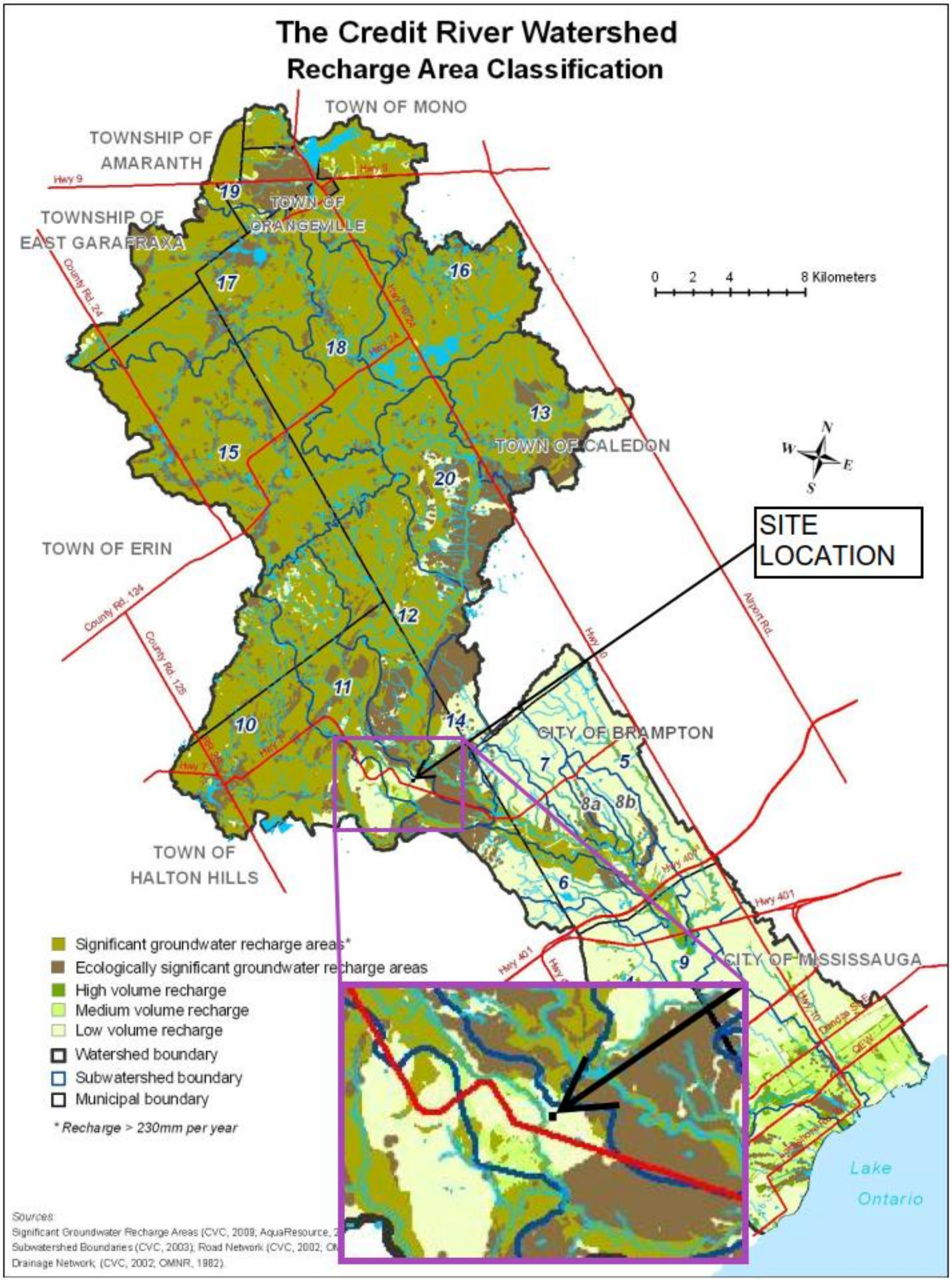
According to Figure 4 (Ref. 6), the site is located within a Low Volume Groundwater Recharge Area (LGRA) in the Credit Valley Conservation Authority (CVC). Table 2.7 below shows the required analysis and criteria for a site located in a LGRA. Although a site specific water balance analysis is not required, a minimum of 3 mm groundwater recharge must be met for each storm event. As the Erosion Control criteria requires 5 mm retention on site, both these criteria will be met via an infiltration tank sized to retain the first 5 mm of rainfall for the site.

Table 2.7 – Recharge Criteria Summary

Recharge Area Type	Level of Required Analysis	Criteria
SGRA (Significant Groundwater Recharge Areas)	Site specific water balance required to identify pre-development groundwater recharge rates and distribution as well as related hydrologic and ecologic functions.	Maintain pre-development groundwater recharge rates and appropriate distribution ensuring the protection of related hydrologic and ecologic functions.
EGRA (Ecologically Significant Groundwater Recharge Areas)		
HGRA (High Volume Groundwater Recharge Areas)		
MGRA (Medium Volume Groundwater Recharge Areas)		
LGRA (Low Volume Groundwater Recharge Areas)	Site specific water balance not required provided the site does not impact a sensitive ecological feature	A minimum of 3 mm of groundwater recharge per event post-development. Otherwise, the proponent may complete their own water balance to establish a groundwater recharge target
All information in this table was taken from Table 6-1 in *Credit Valley Conservation Stormwater Management Criteria* (August 2012)		

For the site area of 0.135 ha, the volume required to retain the first 5 mm of runoff is 6.75m^3. An infiltration gallery with 7 m^3 of available storage will be provided. This tank will sit below landscape area east of the proposed building and the overflow (above 7 m^3) will flow into the proposed MH2. Refer to servicing drawing C2.2 for details.

Figure 4 – Credit Valley Recharge Map



3.0 Sanitary Sewer Servicing

3.1 Existing Conditions

An existing 250mmØ sanitary sewer at 1.6% - 7.0% slope located within the Queen Street right-of-way connects to an existing 250mmØ sanitary sewer at 0.5% - 7.3% slope located within the King Street right-of-way south of the site. The sanitary sewers located on Queen Street and King Street have full flow capacities of 75 L/s and 42 L/s respectively. The sewer on King Street runs from Mountain Rd. N. and eventually connects to the 250mmØ sanitary main on McNabb Street. The invert of the sanitary sewer at the manhole on King Street adjacent to the site is ±253.02m.

3.2 Sanitary Demands

The anticipated sanitary discharge from the proposed development was estimated using Halton Region's Design Criteria (Ref. 2) and conservative population densities calculated by following the OBC Occupancy Loads (section 3.1.17.1 clause (1)(b)) (Ref. 1). Table 3.1 provides an estimate of the proposed development population using OBC criteria.

Table 3.1 – Population Estimate

Unit Types	Total Number of Units	People per unit [A]	Population (people)
Townhouse (3 bedrooms)	12	6.0	72
		Total Population	**72**

[A] OBC section 3.1.17.1 clause (1)(b) states density to be used is 2 persons per sleeping room, therefore People per Unit = (3 bedrooms) x (2 ppl/bed) = 6.0 (Ref. 1)

The sanitary sewer discharge rates from the development are summarized in Table 3.2 and detailed calculations can be found in Appendix C.

Table 3.2 – Sanitary Sewer Discharge from Site

Land Use	Area [A]	Population (people) [B]	Average Flow (L/s) [C]	Infiltration Flow (L/s) [D]	Harmon Peaking Factor	Peak Flow + Infiltration (L/s) [E]
Proposed Residential Units	0.1359 ha	72	0.23	0.0388	4.35	1.02
					Total Sanitary Demand	**1.02**

[A] Area reflects total site area
[B] Population Estimate: see Table 3.1
[C] Average flow based on 275 L/c/day per Halton Region's Design Criteria (Ref.2)
[D] Infiltration based on 0.2860 L/s/ha per Halton Region's Design Criteria (Ref.2)
Ex. 0.1359 ha *0.2680 L/s/ha = 0.0388 L/s
[E] Peak flow = Harmon Peaking Factor (PF) * Average Flow (L/s) + Infiltration Allowance (L/s) per Halton Region's Design Criteria (Ref.2)

3.3 Proposed Sanitary Servicing Plan and Capacity Analysis

For the proposed development, all of the sanitary flows will outlet to the existing 250mmØ sanitary sewer on Queen Street.

The calculated flow rates and capacities of the existing sanitary sewers can be seen in Appendix C. The calculated peak flow to the existing sanitary sewer on Queen Street is 1.02L/s. The peak flow represents 1.36% of the existing sewer capacity of 75L/s on Queen. Table 3.3 shows the First Floor Elevations (FFE) and Underside of Footing Elevations (USF) for the units on site. This information was used to confirm sufficient height to drain the sanitary flows by gravity.

Table 3.3 – Sanitary Connection Height

Unit (s)	FFE (m)	BFE[A] (m)	USF[B] (m)	Max Sanitary Connection Invert (m)
Block A	259.50	256.50	256.25	256.05
Block B	259.50	256.50	256.25	256.05
Block C	259.50	256.50	256.25	256.05

[A] Taken from elevation plans by Chamberlain Architects

[B] USF=BFE-0.25m

4.0 Domestic and Fire Water Supply Servicing

4.1 Existing Condition

The existing municipal water distribution system around the site consists of a 300mmØ watermain within the King Street right-of-way and a 150mmØ watermain within the Queen Street right-of-way. The two watermains are connected by a valve chamber where King Street and Queen Street intersect. An existing municipal hydrant is located in front of 45 Queen Street off the 150mmØ watermain (just south of the subject site). This hydrant is located approximately 43m from the principal entrance of the building. Another existing municipal hydrant is located at the north-east corner of the King Street and Queen Street intersection off the 300mmØ watermain (east of the subject site). Hydrant flow test data for the 150mmØ watermain on Queen Street was completed on October 9th, 2018 by Applied Fire Technology Inc. Please refer to Appendix D for the hydrant flow test results. The existing above hydrant data has been used on a preliminary basis for the purpose of this report and an updated hydrant flow test will be conducted at the time of final design if required.

4.2 Domestic Water Demands

The expected domestic water demand for the proposed development was estimated using Halton Region's Design Criteria (Ref.2). Table 4.1 summarizes the domestic water demand requirements for the Average Day, Maximum Day and Peak Hour demand scenarios and detailed calculations are provided in Appendix D.

Table 4.1 – Domestic Water Demands

Townhouse Water Usage (Residential)		
Population:	72 people (see Table 3.1)	
Average Day Demand:	275 L/c/d x 72 people =	**0.23 L/s**
Max. Day Peaking Factor:	2.25	
Peak Hour Peaking Factor	4.0	
Maximum Day Demand:	2.25 x 0.23 l/s =	**0.52 L/s**
Peak Hour Demand:	4.0 x 0.23 l/s =	**0.92 L/s**

4.3 Fire Flow Demands

Fire flow demands for the proposed development were determined using the methodology outlined in the Fire Underwriters Survey (Ref. 3). The fire demand is summarized in Table 4.2, and detailed calculations are provided in Appendix D.

Table 4.2 – FUS Fire Flow Requirements

Building	Fire Underwriters Survey (FUS) Flow Rate
Proposed Building	100 L/s (6,000 L/min)

There will be no sprinkler system in the proposed building and thus no fire department connection. Existing hydrant (located in front of 45 Queen Street) will be located within 90m horizontally from the furthest main entrance of the proposed building.

4.4 Proposed Water Servicing Plan and Analysis

Based on a Maximum Day + Fire demand of 100.52 L/s (0.52 L/s + 100 L/s from Tables 4.1 and 4.2),the resulting residual system pressure is 66 psi, which exceeds the minimum required residual pressure of 20psi (140kPa) required by the OBC (see worksheet in Appendix D). As well, based on the available hydrant flow test results, achieving a minimum domestic operating pressure of 40psi required by the MECP will not be an issue. At a residual pressure of 20 psi the theoretical flow rate is calculated to be 475 L/s.

5.0 Conclusions and Recommendations

Based on the information provided herein, the development can be constructed to meet the requirements of the Town of Halton Hills, Halton Region, and the Credit Valley Conservation Authority. Therefore, it is concluded and recommended that:

I. Due to orifice sizing restrictions and using a conservative allowable release rate, the site discharge rate to King Street and Queen Street will be marginally over the allowable storm release rates. The small amount of increased flow will have a negligible impact on the downstream storm sewer capacity.

II. Peak flows under post development conditions from Catchment 201 will be directed to the proposed storm sewer on site and will be controlled via an orifice plate with sufficient storage provided in the underground structures and via surface ponding, as discussed in Section 2.3 of this report.

III. The site will be graded such that major overland flows (above the 100-year storm) generated from the site will be directed to the Queen Street and King Street right-of-way.

IV. Quality control will be provided for the site in the form of an oil-grit separator as discussed in Section 2.5.

V. Erosion and sediment controls be installed and maintained as described in Section 2.6 in this report.

VI. An underground infiltration gallery with 7 m^3 of storage will be designed to satisfy water recharge requirements.

VII. The calculated sanitary discharge rate for the site is 1.36% of the capacity of the existing municipal sanitary sewer.

VIII. The Fire Underwriters Survey (2020) fire flow requirements can be met while maintaining the minimum allowable pressure of 140kPa per OBC 2024, based on the available hydrant flow test results. As well, achieving a minimum operating pressure of 40 psi required by the MECP will not be an issue.

IX. The proposed stormwater management plan presented in this report and the site servicing works described in this report are represented on the attached site grading plan (C1.1) and site servicing plan (C1.2).

X. The site should be serviced as described in this report.

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.

60793_001

Rosalee Calogero

Rosie Calogero, P.Eng.
Project Manager
905-639-2552 ext. 2425
rcalogero@mte85.com

Lynn Ingram, P.Eng.
Design Engineer
519-743-6500 ext. 1381
lingram@mte85.com

RNC:rnc

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Appendix A

Geotechnical Report

MTE

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

PRELIMINARY
GEOTECHNICAL INVESTIGATION
37 KING STREET
GEORGETOWN, ONTARIO

Prepared For: **MTE Consultants Inc.**
1016 Sutton Drive, Unit 1A
Burlington, Ontario
L7L 6B8

Attention: Mr. Oshin Gharabegian, P. Geo., Project Manager

File No. 7-18-0031-01
July 23, 2018

Distribution:

1 copy (pdf): MTE Consultants Inc.
1 copy: Terraprobe Inc., Stoney Creek

EXECUTIVE SUMMARY

This report presents the results of a preliminary geotechnical investigation carried out on an approximately 0.14 hectare parcel of land located at the northwest corner of Queen Street and King Street in Georgetown, Ontario. The site was undeveloped at the time of the investigation.

It is proposed to redevelop the site for residential use possibly consisting of two storey townhouses with basements with an internal roadway and surface parking.

The results of four boreholes drilled at the site are reported. The boreholes penetrated fill to depths of about 1.4 to 2.9 m below the existing ground. The fill was underlain by a stratum of compact silty fine sand. Ground water was measured at a depth of 20.5m below ground surface in a monitoring well that was constructed in one of the boreholes.

It is considered feasible to support townhouse buildings on conventionally designed spread or strip footings constructed on engineered fill placed during the pre-grading stage, or on the undisturbed silty fine sand that underlies the site. It has been noted that excavations to depths approaching 3m will be required to fully penetrate the fill in some areas of the site.

Buildings foundations supported on engineered fill should be provided with reinforcing designed to minimize the effects of post construction differential settlement.

The results of the boreholes indicate that Seismic Site Classification "D" is appropriate for the subsurface conditions at this site.

A discussion on the geotechnical engineering aspects of the design of underground services, roadway pavements and house foundations has been provided.

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1.0 INTRODUCTION

Terraprobe Inc. was retained by MTE Consultants Inc. (MTE) to carry out a preliminary geotechnical investigation on an approximately 0.14 hectare parcel of land located at the northwest corner of Queen Street and King Street in Georgetown, Ontario as shown on Figure 1. A proposal and cost estimate to carry out the investigation was provided in our letter of February 23, 2018. Authorization to proceed with the work was provided by MTE on March 14, 2018.

The intents of the work were to investigate and report on the subsurface soil and ground water conditions in a series of boreholes drilled at the site and to provide information and advice on the geotechnical engineering aspects of the design of the proposed site redevelopment. The investigation was carried out in conjunction with an Environmental Site Assessment (ESA) being conducted by MTE.

The site consisted of a relatively flat, irregularly shaped parcel of land. There was an old two storey frame building located in the northeast corner of the site and the remainder of the site was clear at the time of the investigation. The existing ground surface on the property was about 1m above the adjacent grades along King Street and up to about 1.6m higher than the grades on the adjacent property to the west. These grade differences were maintained by stone retaining walls along the south and west property boundaries.

It is proposed to redevelop the site for residential use, possibly consisting of two storey townhouses. Precise details on the nature and scale of the development were not available at the time of the investigation.

The intents of the geotechnical investigation were to document the subsurface soil and ground water conditions in a series of boreholes drilled at the site. Geotechnical information and advice has been provided for conceptual design purposes based on the results of the boreholes.

2.0 PROCEDURE

The field work for this investigation was carried out on March 20, 2018, during which time four (4) boreholes were drilled to depths of about 6.6 to 21.3 metres below the existing ground surface (m BGS). The locations of the boreholes are shown on the Borehole Location Plan, Figure 2. The results of the boreholes are shown on the Log of Borehole sheets presented in Appendix A.

The boreholes were drilled using a track mounted power auger supplied and operated by a specialist drilling contractor. The boreholes were advanced using conventional interval augering and sampling techniques. Soil samples were recovered at regular intervals of depth by split barrel sampling in accordance with ASTM D1586.

Ground water observations were made in each borehole during and upon completion of drilling and the boreholes were backfilled with auger cuttings and bentonite sealant. A ground water monitoring well was constructed in one of the boreholes (MW101-18). As-constructed details on the monitoring well were provided by MTE and are shown on the record of borehole sheet. It was understood that the well was constructed using 50mm diameter PVC well screen and riser pipe protected with an above ground steel casing.

The drilling and sampling was observed throughout by a member of our engineering staff who also logged the boreholes and cared for the samples obtained. MTE arranged for service clearances in advance of the field work, provided the ground surface elevations at the borehole locations and provided the ground water levels in the monitoring well.

All of the samples recovered in the course of the investigation were brought to our Stoney Creek laboratory for further examination and water content determinations. The results of moisture content tests are plotted on the Log of Borehole sheets in Appendix A. No soil chemical analyses were carried out as part of the geotechnical investigation.

3.0 SUBSURFACE CONDITIONS

The subsurface soil and ground water conditions encountered in the boreholes and the results of the field and laboratory testing are shown on the Log of Borehole sheets in Appendix A. A list of abbreviations and symbols are provided to assist in the interpretation of the borehole logs. It should be noted that the boundaries between the strata have been inferred from drilling observations and non-continuous samples. These boundaries generally represent a transition from one soil type to another and should not be inferred to represent exact planes of geological change. The subsurface conditions will vary between and beyond those locations investigated.

3.1 Soil Conditions

The following discussion has been simplified in terms of the major soil strata for the purposes of geotechnical design. In general, the boreholes drilled at the site penetrated fill overlying a stratum of silty fine sand.

3.1.1 Fill

The boreholes penetrated fill to depths of about 1.4 to 2.9m BGS. The fill generally consisted of silty sand with intermixed topsoil, gravel and occasional pieces of brick. The N values determined from the Standard Penetration Testing carried out within the fill ranged from 2 to 56 blows per 0.3m, but were more typically in the range of about 8 to 10 blows per 0.3m inferring a relatively loose state of packing. The in-situ water content of the samples of silty sand fill recovered from the penetration testing ranged from about 5 to 27 percent.

3.1.2 Silty Fine Sand

Silty fine sand was encountered below the fill and to the depths explored in the boreholes. The N values in the silty fine sand were in the range of 10 to 25 blows per 0.3m, with an average N value of about 19 blows per 0.3m inferring a compact relative density. The natural water content of the silty fine sand was in the range of 3 to 6 per cent.

3.2 Ground Water Conditions

All of the boreholes were dry during and on completion of drilling. The ground water level measured in the monitoring well (MW101-18) approximately one week and one month after drilling was at a depth of 20.5m BGS or at elevation 237.3m. These conditions may not necessarily represent stabilized conditions. Fluctuation in the ground water levels will also occur due to seasonal variations and precipitation conditions.

4.0 DISCUSSION

The following discussion is based on our interpretation of the factual data obtained during this investigation and is intended for the use of the design engineer only. Comments made regarding the construction aspects are provided only in as much as they may impact on design considerations. Contractors bidding on or undertaking any work at the site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, equipment capabilities, costs, sequencing and the like.

This report is provided on the assumption that the design features relevant to the geotechnical analyses will be in accordance with applicable codes, standards and guidelines of practice.

It is proposed to redevelop the site for a new townhouse development. Since only conceptual design information was available when this report was undertaken, the information and advice provided in the following discussion must be regarded as preliminary. Further subsurface exploration of the site may be warranted at the final design stage.

4.1 Site Pre-Grading

The grading plan for the site has not yet been developed, however major cutting and/or filling is not expected. Development of the site will typically consist of clearing and grubbing. It is also possible that remnants of former building foundations and underground services may be present on the property and removal of such materials would be best carried out as part of the pre-grading work. Further site investigation possibly by way of test pits, should be carried out in any areas where previous structures were known to exist.

It is noted that fill was encountered to depths of 1.4 to 2.9m below the existing ground surface in the boreholes. As discussed in Section 4.2 of this report, one alternative for supporting the buildings involves the removal of the existing fill and construction of an engineered fill. It is considered preferable that such engineered fill be constructed during the pre-grading stage.

Engineered fill required for supporting building foundations or to achieve the site grading plan must consist of clean earth materials, free of topsoil, rubble, wood, plant materials etc. and at a suitable placement water content to consistently achieve the compaction requirements outlined below. Subject to confirmation during construction, it may be feasible to selectively re-use some of the existing fill as engineered fill. Imported earth for use as engineered fill must meet the corresponding property use standard for the site as established in a Phase 1 ESA, as well as the physical requirements outlined above. Alternatively consideration could be given to using OPSS Granular "B" Type I material from a commercial source.

The engineered fill must be placed and uniformly compacted in 200mm thick lifts to at least 98 percent of standard Proctor maximum dry density. For optimal performance, the placement water content of the fill should be maintained within about 2 percent of the laboratory optimum water content for compaction. The limits of the engineered fill to support buildings can best be determined by the geotechnical engineer during construction. The engineered fill will need to extend a sufficient distance to develop adequate lateral resistance for foundations and pavements.

All aspects of the engineered fill construction including final excavation, material selection, placement and compaction must be verified by the geotechnical engineer. In-situ density testing is required during construction to confirm that each lift has been compacted to the specified degree and that the placement moisture content is within an acceptable range.

4.2 Building Foundations

It is expected that town houses with basements would typically be supported on conventional spread and continuous footings at a nominal depth of about 2m below the finished grade.

The boreholes penetrated fill to depths of about 1.4 to 2.9m with the deepest fill encountered in boreholes 102-18 and 103-18, located on the west side of the property. The fill is not considered competent to support building foundations or slabs on grade. For this reason, it is recommended that the buildings be supported on conventionally designed spread and continuous footings constructed in the native undisturbed silty fine sand or on engineered fill constructed as outlined in Section 4.1 of this report.

Building foundations supported in the native silty fine sand or on engineered fill may be designed using a geotechnical reaction at Serviceability Limit States (SLS) of 150kPa and a factored geotechnical resistance at Ultimate Limit States (ULS) of 225kPa. A minimum footing width of 450 mm is recommended for continuous (strip) footings and a minimum footing width of 900 mm should be considered for spread footings. Settlements of foundations designed as outlined above are not expected to exceed 25mm.

As indicated above, excavations to depths approaching 3m will be required to fully penetrate the fill in some areas of the site. The state of packing of the fill may be loose in some areas and for this reason, use of "trench and pour' techniques to construct the foundations are not recommended for this site.

It is important that all of the foundation excavations be inspected by a geotechnical engineer to confirm that the fill has been fully penetrated and to identify any preparatory work required prior to placing the footing concrete. Where deeper excavations are required, the footings should be lowered in a series of steps with maximum vertical increments of 600 mm and with a rise to run ratio of 1:2.

The foundation walls for units constructed entirely or partially on engineered fill must consist of reinforced concrete designed to minimize the effects of potential post construction differential settlement.

The subgrade soil that underlies the site is considered frost susceptible. Footing foundations exposed to freezing temperatures must be provided with a minimum of 1.2 metres of earth cover for frost protection or alternative equivalent insulation. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided.

4.3 Earthquake Design Parameters

The Ontario Building Code (2012) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification. The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4A of the Ontario Building Code (2012). The classification is based on the determination of the average shear wave velocity in the top 30 meters of the site stratigraphy, where shear wave velocity (v_s) measurements have been taken. Alternatively, the classification is estimated on the basis of rational analysis of undrained shear strength (s_u) or penetration resistance (N-values).

Based on the results of the boreholes, and provided that the foundations are designed as outlined in Section 4.2 of the report, 'Site Class D', as shown in Table 4.1.8.4.A of the Ontario Building Code (2012) can be considered for the purposes of seismic analysis. Tables 4.1.8.4.B and 4.1.8.4.C. of the Code provide the applicable acceleration and velocity based site coefficients.

4.4 Earth Pressure Design Consideration

The parameters used in the determination of earth pressures are defined below.

Parameter	Definition	Units
ϕ	internal angle of friction	degrees
γ	bulk unit weight of soil	kN / m^3
K_a	active earth pressure coefficient (Rankin)	dimensionless
K_o	at-rest earth pressure coefficient (Rankin)	dimensionless
K_p	passive earth pressure coefficient (Rankin)	dimensionless

The appropriate values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

Stratum/Parameter	φ	γ	K_a	K_o	K_p
Fill – common fill	28	19.0	0.36	0.53	2.77
Compact Granular Fill Granular ‘B’ (OPSS 1010)	32	21.0	0.31	0.47	3.25
Silty Fine Sand	28	18.5	0.36	0.53	2.77

Walls subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following equation:

$$\mathbf{P = K\,[\gamma\,(h-h_w) + \gamma' h_w + q] + \gamma_w h_w}$$

where,
P = the horizontal pressure at depth, **h** (m)
K = the earth pressure coefficient,
$\mathbf{h_w}$ = the depth below the ground water level (m)
γ = the bulk unit weight of soil, (kN/m^3)
γ’ = the submerged unit weight of the exterior soil, (γ - 9.8 kN/m^3)
q = the complete surcharge loading (kPa)

Where the wall backfill can be drained effectively to eliminate hydrostatic pressures on the wall, acting in conjunction with the earth pressure, this equation can be simplified to:

$$\mathbf{P = K[\gamma h + q]}$$

Alternatively a hydrostatic pressure equivalent to a ground water level at a depth of 1m below the finished grade should be considered for design purposes.

4.5 Slab on Grade Design Parameters

The lowest basement floor slab can be supported on compact silty sand. The modulus of subgrade reaction appropriate for slab design is 25 MPa/m.

The basement area must be provided with subfloor drainage. Sand and gravel will be exposed at the excavation base. The subgrade must be exposed and assessed by the Geotechnical Engineer to determine the grain size distribution of the subgrade material, so that a geotextile with appropriate filtration properties can be selected. The filtration barrier must be placed continuously over the subgrade before placement of the underfloor drainage layer. Without proper filtration, soil fines may wash into the clear stone, resulting in some loss of ground.

All slabs on grade should be structurally separate from foundation walls and columns. Saw cut control joints should be incorporated into the slabs along column lines and at regular intervals. Interior load bearing walls should not be founded on the slab but on spread footings as outlined above.

4.6 Site Servicing

Prior to constructing underground services, the pre-grading work should be carried out as outlined in Section 4.1 of this report.

It is expected that site services for the development will consist of storm and sanitary sewers and water services with relatively shallow inverts (i.e. ≤ 3m). On this basis and assuming that the pre-grading work is carried out as outlined in Section 4.1, the excavations for the underground services will penetrate fill. Depending on the design invert elevations, the underground services may be located entirely or partially in the existing fill deposits. Provided no significant grade raises are proposed, and that some post construction settlement is tolerable, consideration could be given to supporting the services in the existing fill. Remedial work may be required in areas where the existing fill is found to be in a very loose condition. The need for and nature of such work can best be determined by the geotechnical engineer during construction, but will likely consist of sub-excavation and replacement of loose fill with well compacted bedding material or unshrinkable backfill.

All excavations must be carried out in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. In this context, engineered fill and the native underlying soils at the site can be categorized as “Type 3” soils provided that surface water is directed away from open excavations. Unsupported excavations must be cut to an overall inclination of 1 horizontal to 1 vertical or flatter where localized sloughing occurs.

Where workmen must enter an excavation deeper than 1.2 metres the excavation must be suitably sloped and/or braced in accordance with the regulation requirements. The minimum support system requirements for steeper excavations are stipulated in the Act and include provisions for timbering, shoring and moveable trench boxes. The results of the boreholes indicate that ground water is not likely to be encountered within the range of excavation depths expected.

The bedding material for site services should consist of an approved free draining, well graded granular material such as Granular “A”, which is compatible with the size, class, and type of pipe and consistent with local municipal standards as may be applicable. Care will be required to ensure that any loosened or disturbed soil is removed prior to placing pipe bedding. Bedding should be placed and uniformly compacted in 200mm thick lifts to at least 95 percent of standard Proctor maximum dry density.

Provided that the recommended pre-grading work is completed in advance of the site servicing it is expected that the excavated soil from service trenches can be selectively re-used as backfill however any highly organic, excessively wet or frozen soil or any oversized particles should be excluded.

All service trench backfill should be placed in 300mm thick lifts with each lift uniformly compacted to at least 95 percent of standard Proctor Maximum dry density. For best performance and to minimize post construction settlement, the placement water content of the backfill should be maintained with about 2 percent of the laboratory optimum water content for compaction. It may be necessary to condition the backfill to achieve this intent. The upper 1 m of backfill beneath the roadway platform should be uniformly compacted to at least 98 percent of standard Proctor maximum dry density.

4.7 Pavements

4.7.1 Subgrade Preparation

As outlined in Section 4.1 of this report, all highly organic fill and topsoil must be removed and replaced with engineered fill in areas that will be developed as pavements. It should be noted that significant weakening of the subgrade can be expected during wet weather. For this reason it is important that temporary access roads be constructed of an adequate thickness of granular base material to maintain the integrity of the subgrade.

The pavement design recommendations given below are based on the subgrade support capabilities that will be available from the undisturbed subgrade materials or prepared subgrade compacted to a minimum 98 percent Standard Proctor Maximum Dry Density.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures must be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible when fill is placed and that the natural subgrade is not disturbed and weakened after it is exposed.

4.7.2 Pavement Structure

The following pavement component thicknesses are provided for preliminary design consideration.

Minimum Asphaltic Concrete Pavement Structure

Pavement Component	Compaction Requirements	Component Thickness (mm)
Surface Course Asphaltic Concrete HL3 (OPSS 1150)	93% of MRD (OPSS 310)	40
Base Course Asphaltic Concrete HL8 (OPSS 1150)	93% of MRD (OPSS 310)	60
Base Course: Granular "A" (OPSS)	98% Standard Proctor Maximum Dry Density	300

Some adjustments to the thickness of the granular base component may be required depending on the condition of the subgrade at the time of the pavement construction. The need for such adjustments can be best assessed by the geotechnical engineer during construction. Equivalent Super Pave mixes can be used in place of the Marshall designated mixes shown above.

The control of surface water is an important factor in achieving good pavement life. Grading adjacent to the pavement areas should be designed so that water is not allowed to pond adjacent to the outside edges of the pavement. The subgrade must be free of depressions and sloped (preferably at a minimum grade of two percent) to provide effective drainage toward subgrade drains. Effective drainage of the granular base and subbase materials should be achieved by a network continuous perforated sub-drains and catch basins.

5.0 DESIGN CONSIDERATIONS FOR CONSTRUCTABILITY

5.1 Excavations

Excavations must be carried out in accordance with the Occupational Health and Safety Act, Ontario Regulation 213/91 (as amended), Construction Projects, Part III – Excavations, Sections 222 through 242. These regulations designate four (4) broad classifications of soils for specifying appropriate measures for excavation safety. For practical purposes the soil beneath this site must be categorized a Type 3.

Where workers must enter a trench or excavation the soil must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. The regulation stipulates safe slopes of excavation by soil type as follows:

Soil Type	Base of Slope	Steepest Slope Inclination
1	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
2	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
3	from bottom of trench	1 horizontal to 1 vertical
4	from bottom of trench	3 horizontal to 1 vertical

Minimum support system requirements for steeper excavations are stipulated in Sections 235 through 238 and 241 of the Act and Regulations and include provisions for timbering, shoring and moveable trench boxes.

5.2 Ground Water Control

Ground water levels have been measured at the site at a depth of about 20.5m below the existing ground. On this basis it is unlikely that ground water will be encountered within the range of excavation depths required for the construction of the building foundations or services.

5.3 Site Work

The soil at this site is fine-grained and will become weakened when subjected to traffic when wet. If there is site work carried out during periods of wet weather, then it can be expected that the subgrade will be disturbed unless an adequate granular working surface is provided to protect the integrity of the subgrade soils from construction traffic. Subgrade preparation works cannot be adequately accomplished during wet weather and the project must be scheduled accordingly. The disturbance caused by the traffic can result in the removal of disturbed soil and use of fill material for site restoration or underfloor fill that is not intrinsic to the project requirements. Attempting to build slabs and pavements at this site during wet weather could significantly increase earthworks and pavement costs.

The most severe loading conditions on the subgrade may occur during construction. Consequently, special provisions such as end dumping and forward spreading of earth and aggregate fills, restricted construction lanes, and half-loads during paving and other work are required, especially if construction is carried out during unfavourable weather.

If construction proceeds during freezing weather conditions, adequate temporary frost protection for the founding subgrade and concrete must be provided. The soil at this site is highly susceptible to frost damage. Consideration must be given to frost effects, such as heave or softening, on exposed soil surfaces in the context of this particular project development.

5.4 Quality Control

All aspects of the engineered fill construction must be verified by the geotechnical engineer including the final excavation, proof-rolling of the native subgrade, fill selection, placement and compaction. In-situ density testing should be carried out during construction to confirm that each lift has been compacted to the specified degree. Source acceptance testing of materials imported for use as engineered fill must be carried out prior to importation to the site.

The foundation construction must be field reviewed by the geotechnical engineer to confirm that the founding soil exposed is consistent with the intended design bearing resistance. The on-site review of the condition of the foundation soil as the foundations are constructed is an integral part of the geotechnical design function and is required by Section 4.2.2.2 of the Ontario Building Code 2012.

The long term performance of floor slabs and pavements is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible. The design advice in this report is based on an assessment of the subgrade support capabilities as indicated by the boreholes.

The requirements for fill placement on this project have been stipulated relative to standard Proctor maximum dry density. In situ determinations of density during fill and asphaltic placement on site are required to demonstrate that the specified placement density is achieved. Concrete will be specified in accordance with the requirements of CAN3 - CSA A23.1-14.

6.0 LIMITATIONS AND USE OF REPORT

This investigation has been carried out using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by Terraprobe and other engineering practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to this project. The discussions and recommendations that have been presented are based on the factual data obtained from this investigation.

It must be recognized that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions. In particular, caution should be exercised in the consideration of contractual responsibilities as they relate to control of seepage, disturbance of soils, and frost protection.

The design parameters provided and the engineering advice offered are based on the factual data obtained from this investigation made at the site by Terraprobe and are intended for use by the owner and its retained design consultants for preliminary design consideration. Since the project is still in the preliminary design and planning stage, many aspects of the project relative to the subsurface conditions cannot be anticipated. At such time as the project has advanced to the final design stage, the interpretations made of the subsurface information, the geotechnical design parameters, advice and comments relating to constructability issues and quality control should be reviewed and the report updated.

This report was prepared for the express use of MTE and the present property owner and is not intended for use by others. This report is copyright of Terraprobe Inc., and no part of this report may be reproduced by any means, in any form, without the prior written permission of Terraprobe Inc. MTE and the present owner of the property and are authorized users.

It is recognized that the Town of Georgetown, in its capacity as the planning and building authority under Provincial statues, will make use of and rely upon this report, cognizant of the limitations thereof, both as are expressed and implied.

Terraprobe Inc.

LICENSED PROFESSIONAL ENGINEER
P. T. CANNON
July 23/18
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. A. FELICE
100213553
July 23/18
PROVINCE OF ONTARIO

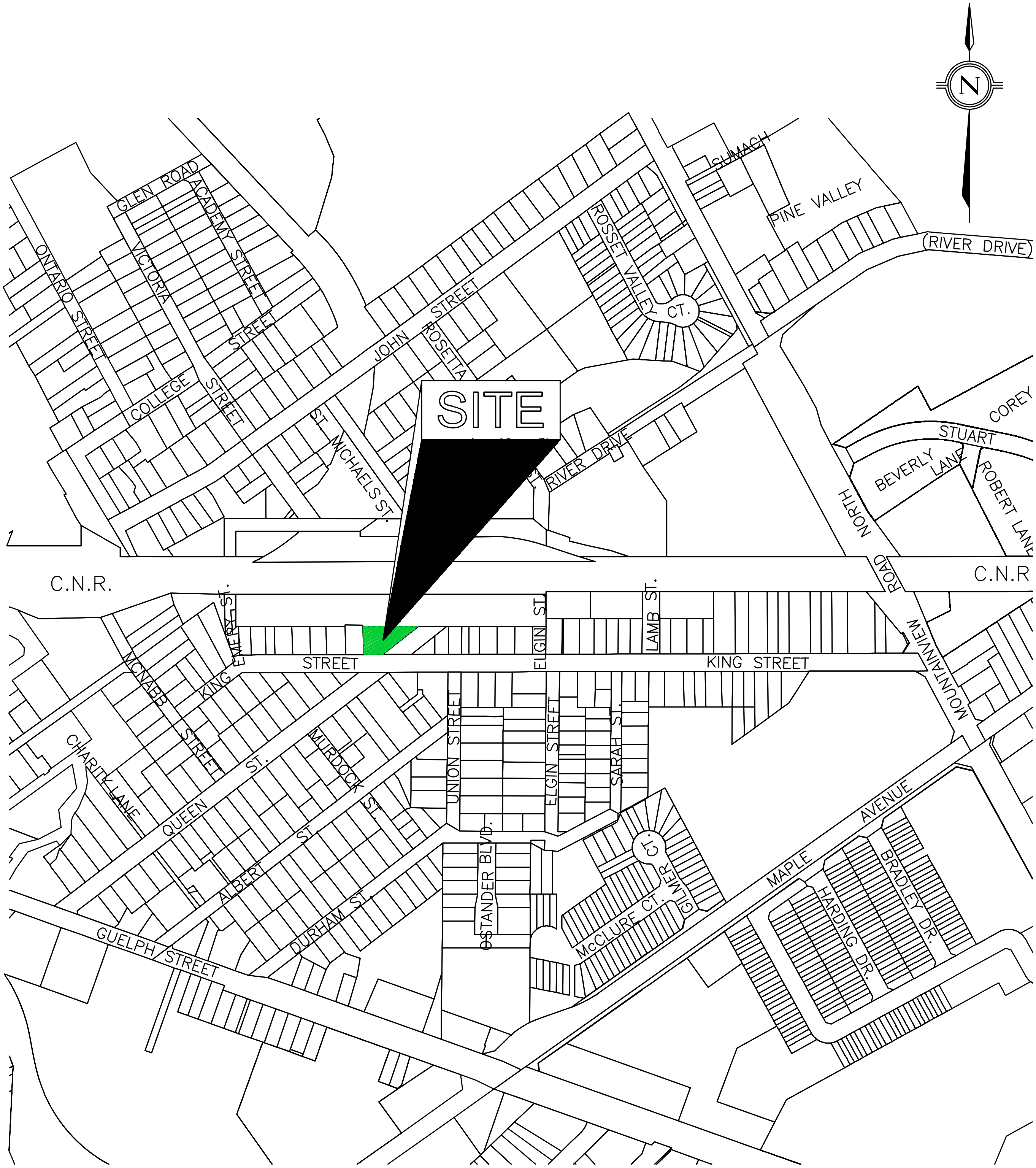
Patrick Cannon, P. Eng.,
Principal

Anthony Felice, P. Eng.
Project Manager, Geotechnical

jgm

FIGURES

Terraprobe Inc.

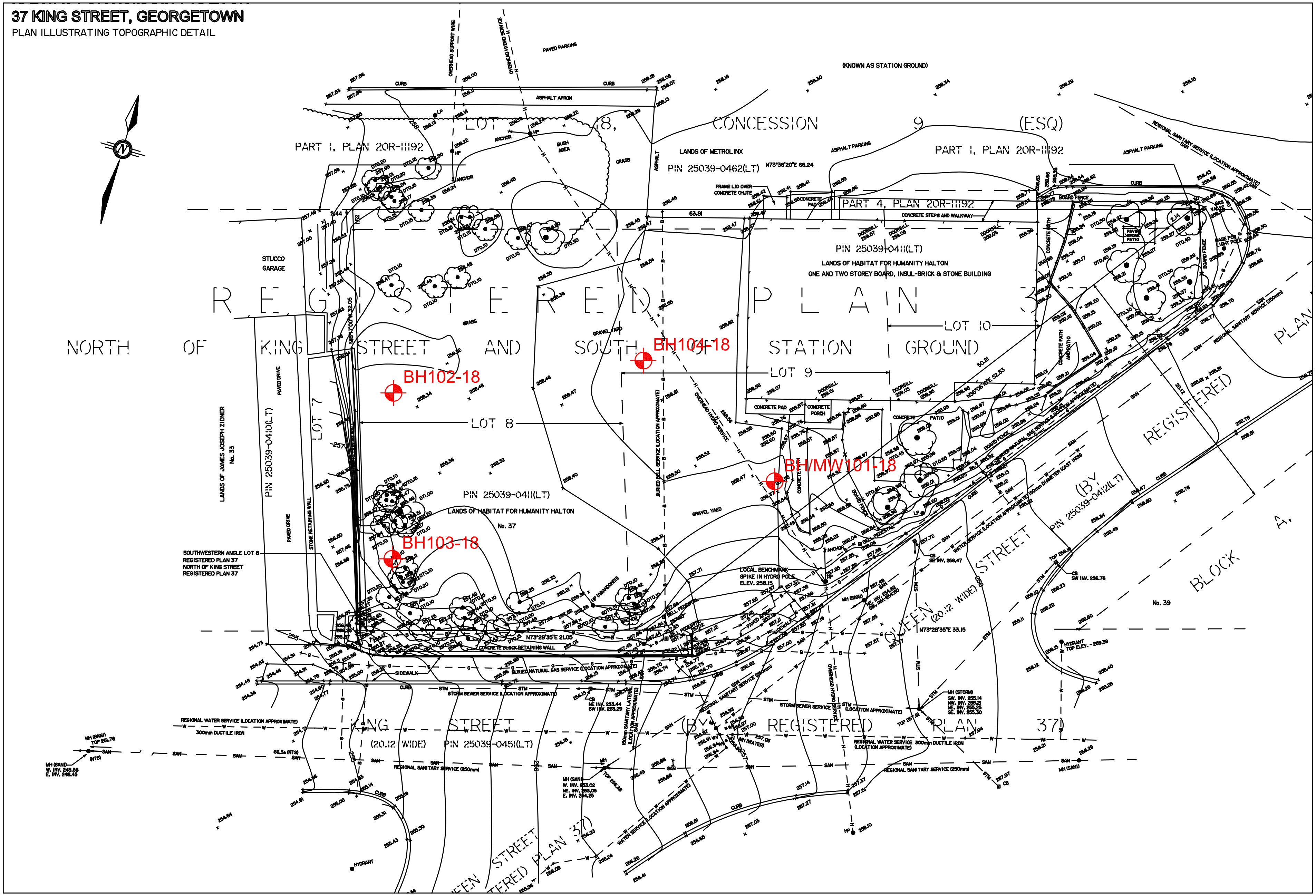


Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: SITE LOCATION PLAN

File No. 7-18-0031-01

FIGURE : 1



LEGEND

BH1 Borehole Location

Terraprobe

903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: BOREHOLE LOCATION PLAN

File No. 7-18-0031-01

FIGURE : 2

LOGS OF BOREHOLES

APPENDIX A

Terraprobe Inc.

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ABBREVIATIONS AND TERMINOLOGY

SAMPLING METHODS

AS	auger sample
CORE	cored sample
DP	direct push
FV	field vane
GS	grab sample
SS	split spoon
ST	shelby tube
WS	wash sample

PENETRATION RESISTANCE

Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).

Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.)."

COHESIONLESS SOILS

Compactness	'N' value
very loose	< 4
loose	4 – 10
compact	10 – 30
dense	30 – 50
very dense	> 50

COHESIVE SOILS

Consistency	'N' value	Undrained Shear Strength (kPa)
very soft	< 2	< 12
soft	2 – 4	12 – 25
firm	4 – 8	25 – 50
stiff	8 – 15	50 – 100
very stiff	15 – 30	100 – 200
hard	> 30	> 200

COMPOSITION

Term (e.g)	% by weight
trace silt	< 10
some silt	10 – 20
silty	20 – 35
sand *and* silt	> 35

TESTS AND SYMBOLS

MH	mechanical sieve and hydrometer analysis
w, w_c	water content
w_L, LL	liquid limit
w_P, PL	plastic limit
I_P, PI	plasticity index
k	coefficient of permeability
γ	soil unit weight, bulk
φ'	internal friction angle
c'	effective cohesion
c_u	undrained shear strength

	Unstabilized water level
	1st water level measurement
	2nd water level measurement
	Most recent water level measurement
3.0 +	Undrained shear strength from field vane (with sensitivity)
C_c	compression index
c_v	coefficient of consolidation
m_v	coefficient of compressibility
e	void ratio

FIELD MOISTURE DESCRIPTIONS

Damp refers to a soil sample that does not exhibit any observable pore water from field/hand inspection.

Moist refers to a soil sample that exhibits evidence of existing pore water (e.g. sample feels cool, cohesive soil is at plastic limit) but does not have visible pore water

Wet refers to a soil sample that has visible pore water

Terraprobe Inc.

Greater Toronto
11 Indell Lane
Brampton, Ontario L6T 3Y3
(905) 796-2650 Fax: 796-2250

Hamilton – Niagara
903 Barton Street, Unit 22
Stoney Creek, Ontario L8E 5P5
(905) 643-7560 Fax: 643-7559

Central Ontario
220 Bayview Drive, Unit 25
Barrie, Ontario L4N 4Y8
(705) 739-8355 Fax: 739-8369

Northern Ontario
1012 Kelly Lake Rd., Unit 1
Sudbury, Ontario P3E 5P4
(705) 670-0460 Fax: 670-0558

www.terraprobe.ca

Terraprobe

LOG OF BOREHOLE 102-18

Project No. : 7-18-0031-01	Client : MTE Consultants Inc.	Originated by : AF
Date started : March 20, 2018	Project : 37 King Street	Compiled by : AF
Sheet No. : 1 of 1	Location : Georgetown, Ontario	Checked by : PC

Position : E: 587165, N: 4834103 (UTM 17T)
Elevation Datum : Geodetic
Rig type : CME 45, track-mounted
Drilling Method : Hollow stem augers

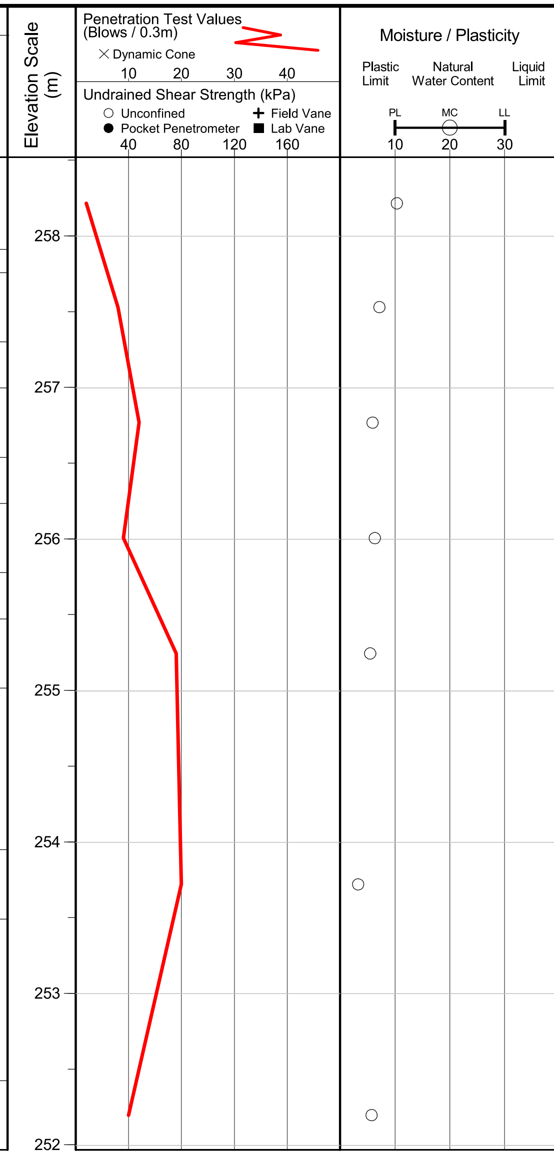
SOIL PROFILE

Elev Depth (m)	Description
258.5	GROUND SURFACE
258.3 / 0.2	150mm **TOPSOIL**
	FILL, silty sand, trace gravel, loose, brown
255.6 / 2.9	**SILTY FINE SAND**, compact, light brown
251.9 / 6.6	

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6

SAMPLES

Number	Type	SPT 'N' Value
1	SS	2
2	SS	8
3	SS	12
4	SS	9
5	SS	19
6	SS	20
7	SS	10



Headspace Vapour (ppm) | Instrument Details | Unstabilized Water Level | Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

file: 7-18-0031-01 37 king street, georgetown.gpj

Terraprobe

LOG OF BOREHOLE 103-18

Project No. : 7-18-0031-01	Client : MTE Consultants Inc.		Originated by : AF
Date started : March 20, 2018	Project : 37 King Street		Compiled by : AF
Sheet No. : 1 of 1	Location : Georgetown, Ontario		Checked by : PC

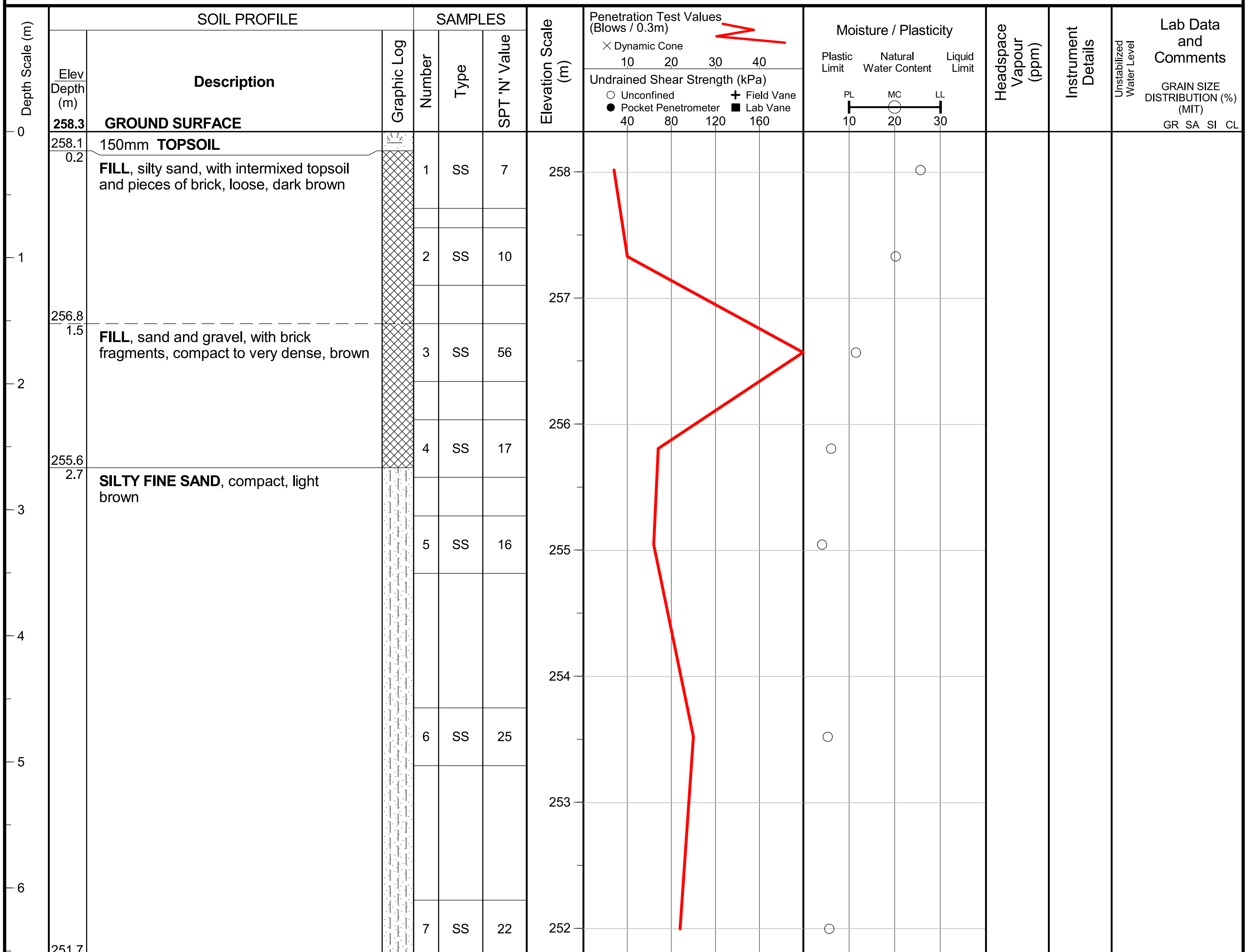
Position : E: 587168, N: 4834103 (UTM 17T)
Elevation Datum : Geodetic
Rig type : CME 45, track-mounted
Drilling Method : Hollow stem augers

SOIL PROFILE

Elev (m)	Depth (m)	Description
258.3	0	**GROUND SURFACE**
258.1	0.2	150mm **TOPSOIL**
		FILL, silty sand, with intermixed topsoil and pieces of brick, loose, dark brown
256.8	1.5	**FILL**, sand and gravel, with brick fragments, compact to very dense, brown
255.6	2.7	**SILTY FINE SAND**, compact, light brown
251.7	6.6	**END OF BOREHOLE**

SAMPLES

Number	Type	SPT 'N' Value
1	SS	7
2	SS	10
3	SS	56
4	SS	17
5	SS	16
6	SS	25
7	SS	22



Borehole was dry and open upon completion of drilling.

Terraprobe

LOG OF BOREHOLE 104-18

Project No. : 7-18-0031-01	Client : MTE Consultants Inc.	Originated by : AF
Date started : March 20, 2018	Project : 37 King Street	Compiled by : AF
Sheet No. : 1 of 1	Location : Georgetown, Ontario	Checked by : PC

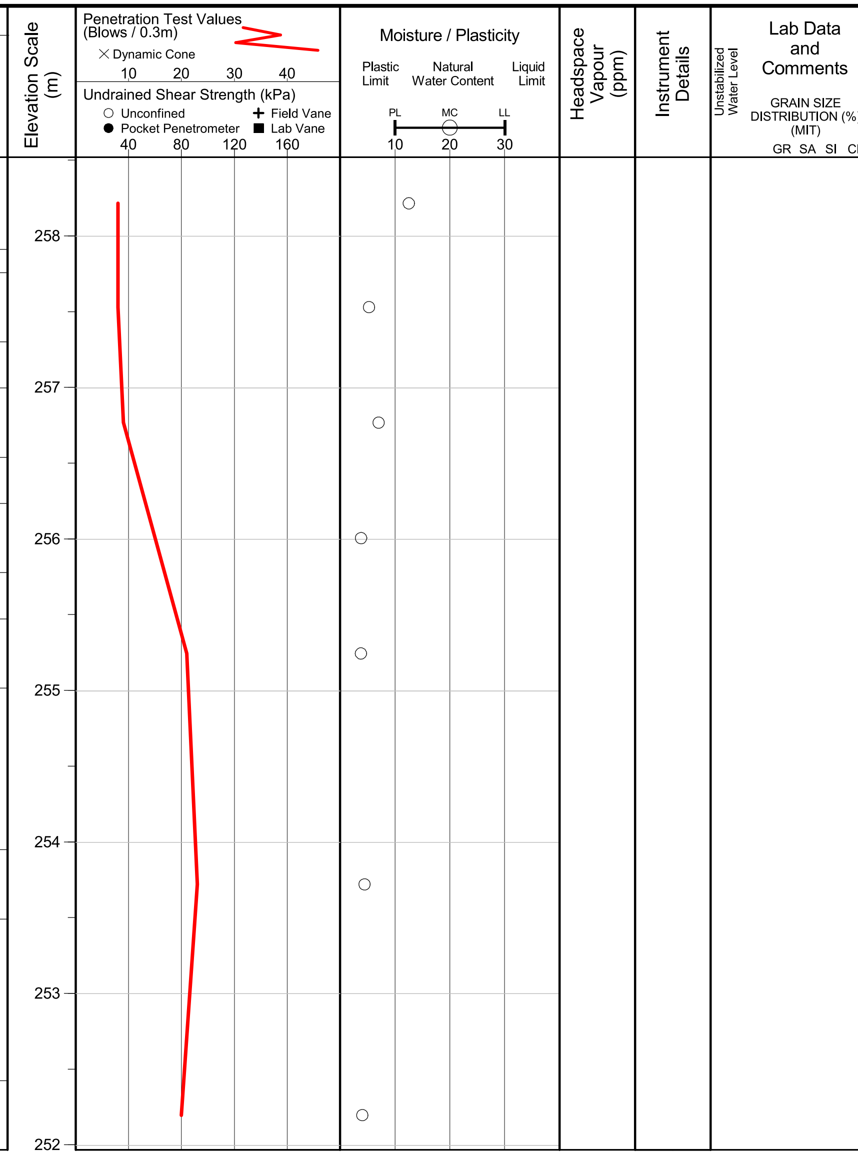
Position : E: 587174, N: 4834109 (UTM 17T)
Elevation Datum : Geodetic
Rig type : CME 45, track-mounted
Drilling Method : Hollow stem augers

SOIL PROFILE

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log
0	258.5	**GROUND SURFACE**	
0		**FILL**, silty sand, trace gravel, loose, brown	
2.1	256.4 2.1	**SILTY FINE SAND**, compact, light brown	
6.6	251.9 6.6		

SAMPLES

Number	Type	SPT 'N' Value
1	SS	8
2	SS	8
3	SS	9
4	SS	15
5	SS	21
6	SS	23
7	SS	20



END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

file: 7-18-0031-01 37 king street, georgetown.gpj

LOG OF BOREHOLE MW101-18

Terraprobe

Project No.	: 7-18-0031-01	Client	: MTE Consultants Inc.	Originated by	: AF
Date started	: March 20, 2018	Project	: 37 King Street	Compiled by	: AF
Sheet No.	: 1 of 1	Location	: Georgetown, Ontario	Checked by	: PC

Position : E: 587179, N: 4834126 (UTM 17T)
Elevation Datum : Geodetic
Rig type : CME 45, track-mounted
Drilling Method : Hollow stem augers

SOIL PROFILE

Elev / Depth (m)	Description
257.8	GROUND SURFACE
0	**FILL**, silty sand, trace gravel, loose, brown
256.4 / 1.4	**SILTY FINE SAND**, compact, light brown
	...augered to 21.3m depth for well installation per MTE
236.5 / 21.3	

SAMPLES

Number	Type	SPT 'N' Value
1	SS	6
2	SS	9
3	SS	12
4	SS	20
5	SS	19
6	SS	13
7	SS	22
8	SS	20
9	SS	23

Depth Scale (m): 0–21
Elevation Scale (m): 257–237

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10, 20, 30, 40
Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40, 80, 120, 160

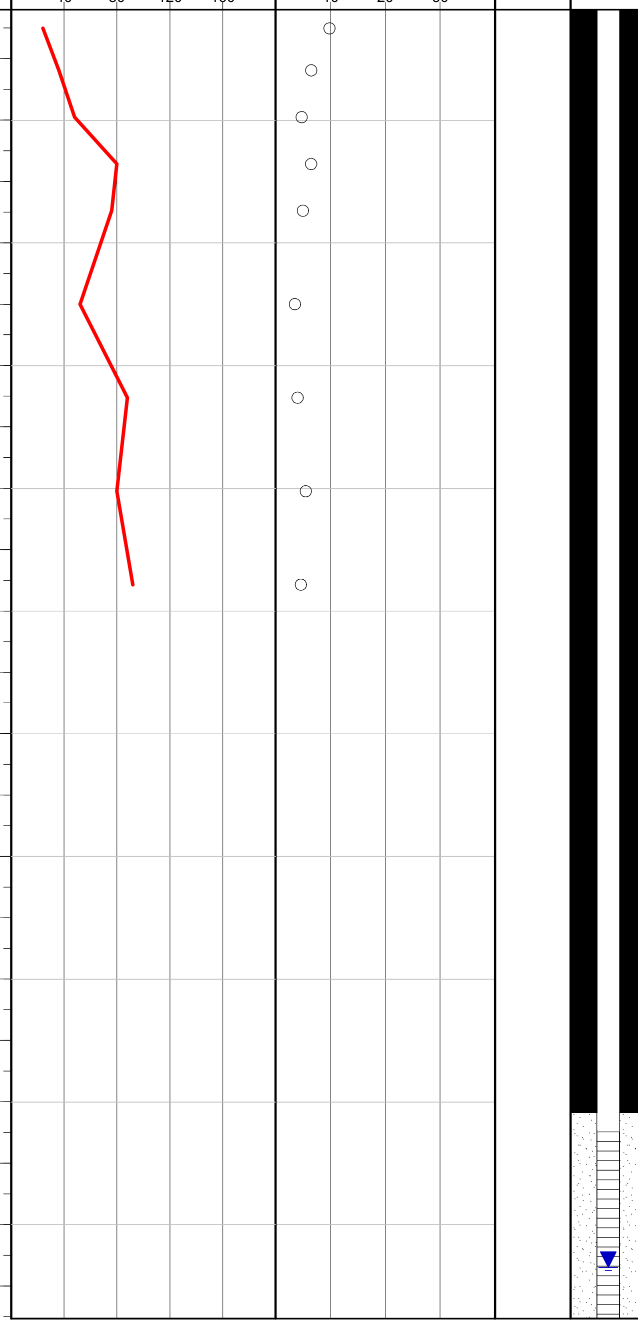
Moisture / Plasticity — Plastic Limit (PL), Natural Water Content (MC), Liquid Limit (LL): 10, 20, 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT): GR SA SI CL



END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Mar 28, 2018	20.5	237.3
Apr 18, 2018	20.5	237.3

Appendix B

Stormwater Management

MTE

C8 STORMWATER MANAGEMENT

All commercial, industrial, institutional, recreational and residential development proposals shall be supported by a Stormwater Management (SWM) report unless waived by the Town through a preconsultation process in accordance with Section G12 of this Plan. The content and scope of the SWM report shall be determined when the development is proposed or through the completion of an EIR where required by an approved Subwatershed Plan.

The SWM Report shall be prepared to the satisfaction of the Town and the appropriate agencies and be prepared in accordance with The Ministry of Environment Stormwater Management Planning and Design Manual, 2003, or its successor, or through the completion of an EIR where required by an approved Subwatershed Study, and shall:

a) provide recommendations on a stormwater quantity system that ensures that post-development peak flow will not be greater than the pre-development levels for storms up to and including the Regional storm and the 1:100 year storm event;

b) document the possible impacts of development on watershed flow regimes including their interconnection with groundwater resources;

c) provide recommendations on how to maintain post-development water quality and improve run-off where appropriate;

d) document the means by which stormwater volume control will be provided;

e) determine and describe the necessary site management measures required to be undertaken during construction to mitigate the potential negative impact of development; and,

f) where applicable, describe how the requirements of the Watershed and/or Subwatershed Plan, or EIR will be implemented in the stormwater management plan.

All stormwater management facilities in a Plan of Subdivision shall be placed in an appropriate Environmental Zone in the implementing Zoning By-law to reflect the potential for these lands to be flooded and to ensure that their intended use is recognized. Stormwater management facilities for condominium developments and other large single uses may be privately owned and maintained. Agreements with the Town shall be required as a condition of approval, to provide for their continued maintenance.

Habitat for Humanity
37 King Street, Georgetown, Ontario
STORMWATER MANAGEMENT

MTE

YDROLOGIC 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	Driveway/Parking Lot/ Building Roof	STANDHYD	0.1120	78	5.00	76	76	2.8	9	0.250	0.013	4.4	2	
202	Uncontrolled flow to Queen Street	STANDHYD	0.0220	78	5.00	24	24	3	2	0.25	0.013	20	2	
203	Uncontrolled flow to GO Parking	NASHYD	0.0020	78	5.00	0	0	3.4	0	0.25	0.013	33	0	0.05
204	Uncontrolled external flow to ROW	STANDHYD	0.0343	78	5.00	21	21	4.5	6.5	0.25	0.013	5	2	
TOTAL			**0.170**			**57**								

Notes
- Pervious Initial Abstraction (Perv. Ia) = 5.00 mm
- Depression Storage over Impervious areas (DPSI) = 1.0 mm
- CN based on BC Soil Group (Crop and other improved land) per Geotech Report

Habitat for Humanity
37 King Street, Georgetown, Ontario
Pre-Development Flows

Design Storm Information

Design storm information used in the hydrologic modeling was based on Chicago Storm distribution Intensity-Duration-Frequency (IDF) equations for the Town of Halton Hills

$$i = a / (t + b)^c$$

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

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

Constant [(A)]	2-Yr. [(B)]	5-Yr.	10-Yr.	25-Yr.	50-Yr.	100-Yr.
A	586.1	946.46	1173.48	1368.91	1622.45	1777.2
B	6.0	7.0	8.0	8.0	9.0	9.0
C	0.760	0.788	0.794	0.789	0.797	0.795

Catchment 101 **Existing Site** 0.060 C = 0.58
t= 10 min

[(A)] IDF parameters from Std No. 108 - "Intensity-Duration-Frequency, Town of Halton Hills"

[(B)] IDF equations used to generate rainfall files with Duration (TD) = 24 hours and Time-to-Peak Ratio (TPR) = 0.333

Storm	2-Yr.	5-Yr.	10-Yr.	25-Yr.	50-Yr.	100-Yr.
I (mm/hr)	71.26	101.51	118.25	139.95	155.24	171.05
Allowable Flow (m^3/s)	0.007	0.010	0.011	0.014	0.015	0.017

Catchment 102 **Existing Site** 0.110 C = 0.58
t= 10 min

[(A)] IDF parameters from Std No. 108 - "Intensity-Duration-Frequency, Town of Halton Hills"

[(B)] IDF equations used to generate rainfall files with Duration (TD) = 24 hours and Time-to-Peak Ratio (TPR) = 0.333

Storm	2-Yr.	5-Yr.	10-Yr.	25-Yr.	50-Yr.	100-Yr.
I (mm/hr)	71.26	101.51	118.25	139.95	155.24	171.05
Allowable Flow (m^3/s)	0.013	0.018	0.021	0.025	0.028	0.030

Time to Peak Calculations - Post-Development Conditions

Time to peak (Tp) values derived from time of concentration (Tc) calculations based on the Airport Method Equation:

$$T_c = \frac{3.26\,(1.1 - C)\,L^{0.5}}{S_W^{\;0.33}}$$

(MTO Drainage Manual Design Chart 1.12)

T_c = Overland flow time of concentration (min)
L = Flow travel length (m)
S = Basin slope (%)
C = Runoff coefficient

The time to peak values used in the NASHYD command for the proposed conditions hydrologic modeling are shown below.

Catchment ID	Area (ha)	Length (m)	"C"	Slope (m/m)	Tc (min)	**Tp**	
						(min)	**(hrs)**
203	0.0020	1	0.20	0.33	4.23	2.83	**0.05**

Habitat for Humanity
37 King Street, Georgetown, Ontario
STORMWATER MANAGEMENT

STAGE-STORAGE-DISCHARGE CALCULATIONS FOR CATCHMENT 201

Outlet Device No. 1 (Quantity) - CBMH4

Type:	Orifice Plate	
Diameter (mm)	75	
Area (m^2)	0.00442	
Invert Elev. (m)	257.05	(outlet of CBMH4)
C/L Elev. (m)	257.09	
Disch. Coeff. (C_d)	0.63	
Discharge (Q) =	$C_d A (2 g H)^{0.5}$	
Number of Orifices:	1	

Depth	Catchment 201					
	Elevation m	Total Ponding Area m^2	Incremental Volume m^3	Cumulative Volume m^3	Head (H) m	Discharge (Q) m^3/s
C/L of 75mm diameter orifice	257.09	0	0	0	0.00	0.0000
	257.45	0	2	2	0.36	0.0074
T/G of lowest CB	258.42	0	4	6	1.33	0.0142
0.10m depth of ponding	258.52	101	5	11	1.43	0.0148
0.20 m depth of ponding	258.62	295	20	31	1.53	0.0153

Habitat for Humanity
37 King Street, Georgetown, Ontario
STORMWATER MANAGEMENT

UNDERGROUND STORAGE VOLUME CALCULATIONS FOR CATCHMENT 201

Storm Sewer Storage				
Storm Sewers	Diameter	Area	Length	Volume
	(mm)	(m^2)	(m)	(m^3)
	250	0.05	35.40	1.7
Total				**1.7**

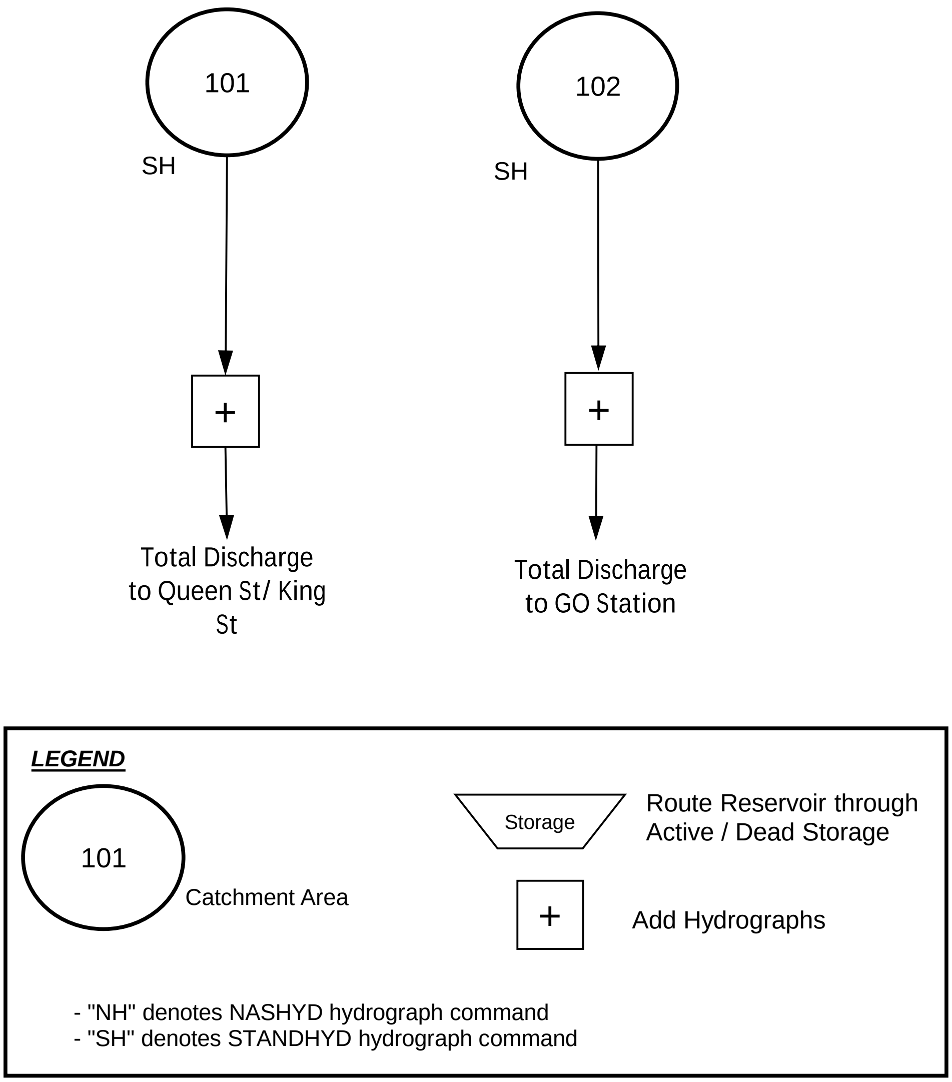
Structure Storage						
Structure	Diameter	Area	T/G (HWL)	@258.42	Outlet Invert	Volume @ 258.42
	(mm)	(m^2)	(m)		(m)	(m^3)
CBMH 4	1800	2.5	258.42	258.42	257.05	3.5
CB4.2	600	0.3	258.50	258.42	257.19	0.3
CB4.1	600	0.3	258.45	258.42	257.20	0.3
Total						**4.2**

Volume at top of CBMH

Total Underground Volume (Pipes + Structures): 5.9 m^3

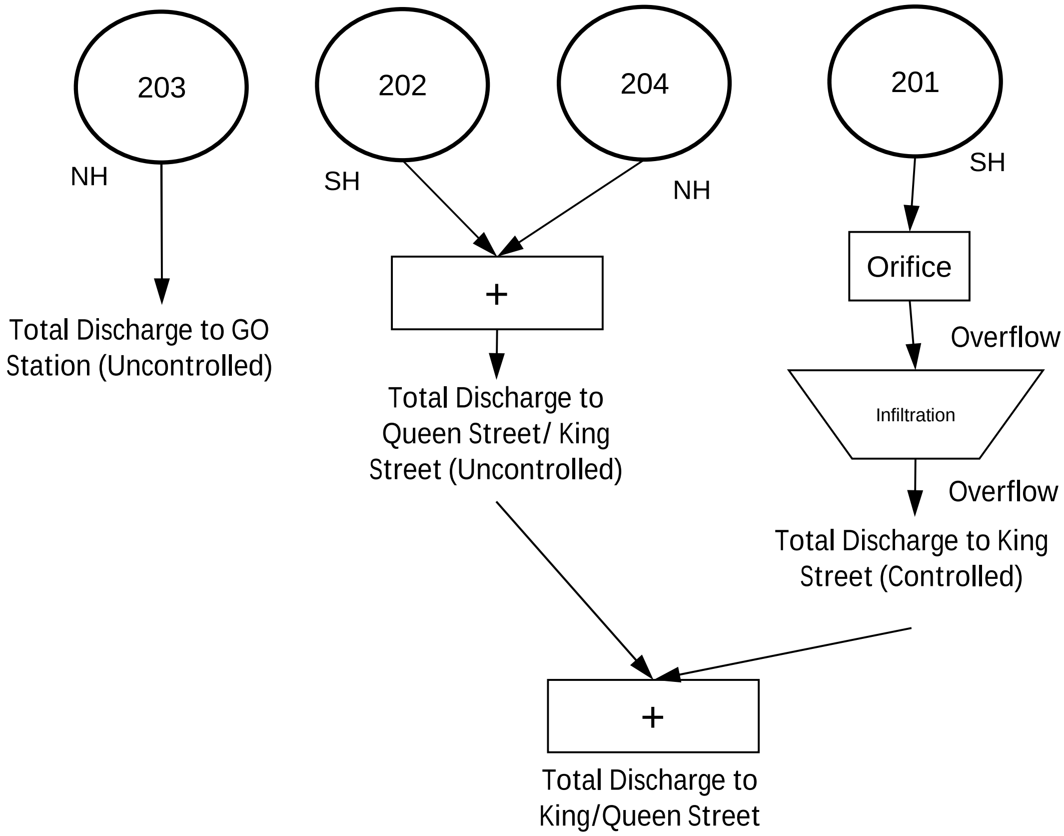
Habitat for Humanity
37 King Street, Georgetown, Ontario
STORMWATER MANAGEMENT

EXISTING DEVELOPMENT CONDITIONS MODEL SCHEMATIC

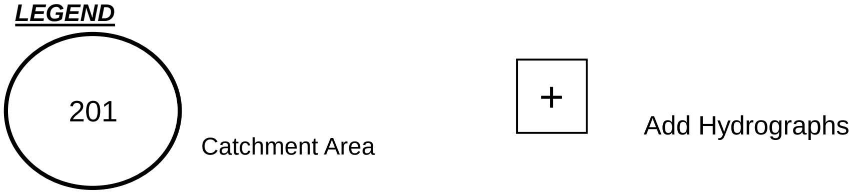


Habitat for Humanity
37 King Street, Georgetown, Ontario
STORMWATER MANAGEMENT

PROPOSED DEVELOPMENT CONDITIONS MODEL SCHEMATIC



LEGEND



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

```
2     Metric units
*#*****************************************************************************
*#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number:
60793_001
                                        8412-142
*#  Date        : January 2025
*#  Modeller    : ASB
*#  Company     : MTE Consultants Inc.
*#  License #   : 3053466
*#***************************************************************************|
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[002]
                    HH_002.STM
*
READ STORM          STORM_FILENAME "STORM.001"
*
*#############################################################################|
*#
*#                       POST CONDITIONS HYDROLOGIC MODELING
*#                 ====================================================
*#
*#############################################################################|
*%-----------------|-----------------------------------------------------------|
*# CATCHMENT 201 - Roof Asphalt and Landscape area draining to KING STREET (controlled
via orfice)
*
CALIB STANDHYD      ID=[1], NHYD=["201"], DT=[1](min), AREA=[0.1122](ha),
                    XIMP=[0.76], TIMP=[0.76], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[78],
                    Pervious   surfaces: IAper=[5.00](mm), SLPP=[4.4](%),
                                         LGP=[2.8](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[2.0](%),
                                         LGI=[7.2](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*# ROUTE PARKING AND ROOF THROUGH ORIFICE WITH SURFACE PONDING
*
ROUTE RESERVOIR     IDout=[2],   NHYD=["ORFFLOW-SWM"],  IDin=[1],
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
 0.0000 0.0000
 0.0074 0.0002
 0.0142 0.0006
 0.0148 0.0011
 0.0153 0.0031
                                      -1       -1   (max twenty pts)
                          IDovf=[3], NHYDovf=["ORFFLOW-OVF"]

*%-----------------|-------*%-----------------|-----------------------------------------
-----------------|
*# CATCHMENT 202 -  To streets (uncontrolled)
*
CALIB STANDHYD      ID=[7], NHYD=["202"], DT=[1](min), AREA=[0.022](ha),
                    XIMP=[0.24], TIMP=[0.24], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[78],
                    Pervious   surfaces: IAper=[5.00](mm), SLPP=[20.0](%),
                                         LGP=[3.0](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[1.0](%),
                                         LGI=[2.0](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*# Total Peak Flow to King St (from internal site)
ADD HYD             IDsum=[8], NHYD=["SITE"], IDs to add=[7,2,3]
*%-----------------|-----------------------------------------------------------|
*# CATCHMENT 203 - BEHIND RETAINING WALL FLOWING TO GO
*
CALIB NASHYD        ID=[1], NHYD=["203"], DT=[1]min, AREA=[0.002](ha),
                    DWF=[0](cms),  CN/C=[78], IA=[5.0](mm),
                    N=[3], TP=[0.05]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*# CATCHMENT 204 - EXTERNAL AREAS uncontrolled
*
CALIB STANDHYD      ID=[3], NHYD=["204"], DT=[1](min), AREA=[0.0343](ha),
                    XIMP=[0.21], TIMP=[0.21], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[78],
                    Pervious   surfaces: IAper=[5.00](mm), SLPP=[5.0](%),
                                         LGP=[4.5](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[2.0](%),
                                         LGI=[6.5](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*# Total FLOW to King St (Internal + external)
ADD HYD             IDsum=[6], NHYD=["PropSite"], IDs to add=[3,8]
*%-----------------|-----------------------------------------------------------|
******************************************************************************
* RUN REMAINING DESIGN STORMS (TOWN OF HALTON HILLS 5 TO 100-YR)
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
                    HH_005.STM
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[010]
                    HH_010.STM
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[025]
                    HH_025.STM
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[050]
                    HH_050.STM
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                    HH_100.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: 2025-02-13     TIME: 11:04:32     RUN COUNTER: 000131        *
 *****************************************************************************
 * Input   filename: Q:\60793_001\SWM\SWMHYMO\38412-142.dat                   *
 * Output  filename: Q:\60793_001\SWM\SWMHYMO\38412-~1.out                    *
 * Summary filename: Q:\60793_001\SWM\SWMHYMO\38412-~1.sum                    *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 *****************************************************************************

--------------------------------------------------------------------------------
001:0001------------------------------------------------------------------------
*#****************************************************************************
*#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number: 60793_001
*#  Date         : January 2025
*#  Modeller     : ASB
*#  Company      : MTE Consultants Inc.
*#  License #    : 3053466
*#***************************************************************************|
*

  ** END OF RUN :    1

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




-------------------
| START            |  Project  dir.: Q:\60793_001\SWM\SWMHYMO\

-------------------  Rainfall dir.: Q:\60793_001\SWM\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
            #  1=HH_002.STM
--------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
*#****************************************************************************
*#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number: 60793_001
*#  Date         : January 2025
*#  Modeller     : ASB
*#  Company      : MTE Consultants Inc.
*#  License #    : 3053466
*#***************************************************************************|
*
--------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
*
-------------------
| READ STORM       |    Filename: 2-YR Halton Hill CHI STM
| Ptotal=  55.78 mm|    Comments: 2-YR Halton Hill CHI STM
-------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17    .572 |   6.17   1.796 |  12.17   1.612 |  18.17    .803
               .33    .581 |   6.33   1.941 |  12.33   1.562 |  18.33    .793
               .50    .591 |   6.50   2.116 |  12.50   1.517 |  18.50    .784
               .67    .601 |   6.67   2.333 |  12.67   1.474 |  18.67    .774
               .83    .612 |   6.83   2.608 |  12.83   1.434 |  18.83    .765
              1.00    .623 |   7.00   2.973 |  13.00   1.396 |  19.00    .756
              1.17    .635 |   7.17   3.479 |  13.17   1.361 |  19.17    .747
              1.33    .647 |   7.33   4.239 |  13.33   1.327 |  19.33    .739
              1.50    .660 |   7.50   5.523 |  13.50   1.296 |  19.50    .731
              1.67    .674 |   7.67   8.237 |  13.67   1.266 |  19.67    .722
              1.83    .688 |   7.83  18.747 |  13.83   1.237 |  19.83    .715
              2.00    .703 |   8.00  71.259 |  14.00   1.210 |  20.00    .707
              2.17    .718 |   8.17  24.375 |  14.17   1.185 |  20.17    .699
              2.33    .735 |   8.33  13.360 |  14.33   1.160 |  20.33    .692
              2.50    .752 |   8.50   9.363 |  14.50   1.137 |  20.50    .685
              2.67    .770 |   8.67   7.292 |  14.67   1.115 |  20.67    .678
              2.83    .789 |   8.83   6.019 |  14.83   1.094 |  20.83    .671
              3.00    .810 |   9.00   5.155 |  15.00   1.073 |  21.00    .665
              3.17    .831 |   9.17   4.528 |  15.17   1.054 |  21.17    .658
              3.33    .855 |   9.33   4.050 |  15.33   1.035 |  21.33    .652
              3.50    .879 |   9.50   3.673 |  15.50   1.017 |  21.50    .646
              3.67    .906 |   9.67   3.367 |  15.67   1.000 |  21.67    .640
              3.83    .934 |   9.83   3.114 |  15.83    .983 |  21.83    .634
              4.00    .964 |  10.00   2.901 |  16.00    .967 |  22.00    .628
              4.17    .997 |  10.17   2.718 |  16.17    .952 |  22.17    .622
              4.33   1.032 |  10.33   2.560 |  16.33    .937 |  22.33    .617
              4.50   1.071 |  10.50   2.421 |  16.50    .923 |  22.50    .611
              4.67   1.113 |  10.67   2.299 |  16.67    .909 |  22.67    .606
              4.83   1.159 |  10.83   2.190 |  16.83    .896 |  22.83    .600
              5.00   1.210 |  11.00   2.092 |  17.00    .883 |  23.00    .595
              5.17   1.266 |  11.17   2.004 |  17.17    .870 |  23.17    .590
              5.33   1.328 |  11.33   1.923 |  17.33    .858 |  23.33    .585
              5.50   1.399 |  11.50   1.850 |  17.50    .847 |  23.50    .580
              5.67   1.478 |  11.67   1.783 |  17.67    .835 |  23.67    .576
              5.83   1.569 |  11.83   1.721 |  17.83    .824 |  23.83    .571
              6.00   1.673 |  12.00   1.664 |  18.00    .814 |  24.00    .567

--------------------------------------------------------------------------------
002:0003------------------------------------------------------------------------
*
*#########################################################################|
*#
*#                     POST CONDITIONS HYDROLOGIC MODELING
*#                ==================================================
*#
*#########################################################################|
*# CATCHMENT 201 - Roof Asphalt and Landscape area draining to KING STREET (cont
*
---------------------
| CALIB STANDHYD      |   Area    (ha)=     .11
| 01:201    DT= 1.00  |   Total Imp(%)=   76.00   Dir. Conn.(%)=   76.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         4.40
     Length            (m)=       7.20         2.80
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=      71.26        27.85
               over (min)        1.00         2.00
     Storage Coeff.  (min)=        .49 (ii)    2.37 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.48          .50
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .02          .00            .019 (iii)
     TIME TO PEAK    (hrs)=       7.95         8.00           8.000
     RUNOFF VOLUME    (mm)=      54.78        21.06          46.685
     TOTAL RAINFALL   (mm)=      55.78        55.78          55.777
     RUNOFF COEFFICIENT   =        .98          .38            .837

          (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
              CN* =   78.0    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------------------------------------------------------------------------
*# ROUTE PARKING AND ROOF THROUGH ORIFICE WITH SURFACE PONDING
*
---------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>01:(201    )   |
| OUT<02:(ORFFLO)    |    =========  OUTFLOW STORAGE TABLE  =========
---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00   |     .015  .1100E-02
                             .007  .2000E-03   |     .015  .3100E-02
                             .014  .6000E-03   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201    )        .11      .019     8.000     46.685
     OUTFLOW<02: (ORFFLO)         .11      .014     8.017     46.685
    OVERFLOW<03: (ORFFLO)         .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](%)=   72.478
                    TIME SHIFT OF PEAK FLOW          (min)=     1.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.5787E-03

--------------------------------------------------------------------------------
002:0005------------------------------------------------------------------------
*# CATCHMENT 202 -  To streets (uncontrolled)
*
---------------------
| CALIB STANDHYD      |   Area    (ha)=     .02
| 07:202    DT= 1.00  |   Total Imp(%)=   24.00   Dir. Conn.(%)=   24.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00        20.00
     Length            (m)=       2.00         3.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=      71.26        27.85
               over (min)        1.00         2.00
     Storage Coeff.  (min)=        .28 (ii)    1.53 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.65          .66
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .00          .00            .002 (iii)
     TIME TO PEAK    (hrs)=       7.90         8.00           8.000
     RUNOFF VOLUME    (mm)=      54.78        21.06          29.153
     TOTAL RAINFALL   (mm)=      55.78        55.78          55.777
     RUNOFF COEFFICIENT   =        .98          .38            .523

          (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
              CN* =   78.0    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 Peak Flow to King St (from internal site)
-----------------------
| ADD HYD (SITE      ) | ID: NHYD         AREA     QPEAK    TPEAK   R.V.     DWF
-----------------------                   (ha)     (cms)    (hrs)   (mm)    (cms)
                        ID1 07:202          .02      .002     8.00  29.15    .000
                       +ID2 02:ORFFLOW-SW   .11      .014     8.02  46.69    .000
                       +ID3 03:ORFFLOW-OV   .00      .000      .00    .00    .000  **DRY**
                        ========================================================
                        SUM 08:SITE         .13      .016     8.00  43.81    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0007------------------------------------------------------------------------
*# CATCHMENT 203 - BEHIND RETAINING WALL FLOWING TO GO
*
---------------------
| CALIB NASHYD        |   Area    (ha)=     .00   Curve Number    (CN)=78.00
| 01:203    DT= 1.00  |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
---------------------     U.H. Tp(hrs)=    .050
```

```
     Unit Hyd Qpeak  (cms)=     .002

     PEAK FLOW       (cms)=     .000 (i)
     TIME TO PEAK    (hrs)=    8.000
     RUNOFF VOLUME    (mm)=   21.040
     TOTAL RAINFALL   (mm)=   55.777
     RUNOFF COEFFICIENT   =     .377

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
002:0008----------------------------------------------------------------------------
*# CATCHMENT 204 - EXTERNAL AREAS uncontrolled
*

---------------------
| CALIB STANDHYD      |   Area    (ha)=     .03
| 03:204    DT= 1.00 |   Total Imp(%)=   21.00   Dir. Conn.(%)=   21.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=       6.50         4.50
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.26        27.28
                over (min)        1.00         3.00
     Storage Coeff.  (min)=        .46 (ii)    2.89 (ii)
     Unit Hyd. Tpeak (min)=       1.00         3.00
     Unit Hyd. peak  (cms)=       1.50          .38
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .003 (iii)
     TIME TO PEAK    (hrs)=       7.93         8.00          8.000
     RUNOFF VOLUME    (mm)=      54.78        21.06         28.142
     TOTAL RAINFALL   (mm)=      55.78        55.78         55.777
     RUNOFF COEFFICIENT   =        .98          .38           .505

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  78.0    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.

------------------------------------------------------------------------------------
002:0009----------------------------------------------------------------------------
*# Total FLOW to King St (Internal + external)
------------------------
| ADD HYD (PropSite  ) | ID: NHYD         AREA     QPEAK    TPEAK    R.V.    DWF
------------------------                  (ha)     (cms)    (hrs)    (mm)   (cms)
                     ID1 03:204            .03      .003     8.00   28.14    .000
                    +ID2 08:SITE           .13      .016     8.00   43.81    .000
                     ==========================================================
                     SUM 06:PropSite       .17      .019     8.00   40.62    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------
002:0010----------------------------------------------------------------------------
*******************************************************************************
* RUN REMAINING DESIGN STORMS (TOWN OF HALTON HILLS 5 TO 100-YR)
*
  ** END OF RUN :    4

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





-------------------
| START            |  Project  dir.: Q:\60793_001\SWM\SWMHYMO\
-------------------   Rainfall dir.: Q:\60793_001\SWM\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
          #  1=HH_005.STM
------------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------------
*#******************************************************************************
*#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number: 60793_001
*#  Date        : January 2025
*#  Modeller    : ASB
*#  Company     : MTE Consultants Inc.
*#  License #   : 3053466
*#*****************************************************************************|
*
------------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------------
*
-------------------
| READ STORM       |    Filename: 5-YR Halton Hill CHI STM
| Ptotal=  73.43 mm|    Comments: 5-YR Halton Hill CHI STM
-------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17    .668 |   6.17   2.214 |  12.17   1.976 |  18.17    .953
               .33    .680 |   6.33   2.403 |  12.33   1.913 |  18.33    .941
               .50    .692 |   6.50   2.633 |  12.50   1.854 |  18.50    .929
               .67    .705 |   6.67   2.919 |  12.67   1.799 |  18.67    .917
               .83    .718 |   6.83   3.286 |  12.83   1.747 |  18.83    .905
              1.00    .731 |   7.00   3.774 |  13.00   1.699 |  19.00    .894
              1.17    .746 |   7.17   4.462 |  13.17   1.654 |  19.17    .884
              1.33    .761 |   7.33   5.508 |  13.33   1.611 |  19.33    .873
              1.50    .777 |   7.50   7.309 |  13.50   1.571 |  19.50    .863
              1.67    .793 |   7.67  11.210 |  13.67   1.533 |  19.67    .853
              1.83    .810 |   7.83  26.777 |  13.83   1.497 |  19.83    .843
              2.00    .829 |   8.00 101.510 |  14.00   1.463 |  20.00    .834
              2.17    .848 |   8.17  35.160 |  14.17   1.430 |  20.17    .825
              2.33    .868 |   8.33  18.752 |  14.33   1.400 |  20.33    .816
              2.50    .889 |   8.50  12.849 |  14.50   1.370 |  20.50    .807
              2.67    .912 |   8.67   9.836 |  14.67   1.342 |  20.67    .798
              2.83    .935 |   8.83   8.011 |  14.83   1.315 |  20.83    .790
              3.00    .961 |   9.00   6.788 |  15.00   1.290 |  21.00    .782
              3.17    .988 |   9.17   5.908 |  15.17   1.265 |  21.17    .774
              3.33   1.016 |   9.33   5.245 |  15.33   1.242 |  21.33    .766
              3.50   1.047 |   9.50   4.727 |  15.50   1.219 |  21.50    .759
              3.67   1.080 |   9.67   4.309 |  15.67   1.198 |  21.67    .751
              3.83   1.115 |   9.83   3.966 |  15.83   1.177 |  21.83    .744
              4.00   1.153 |  10.00   3.678 |  16.00   1.157 |  22.00    .737
              4.17   1.194 |  10.17   3.432 |  16.17   1.138 |  22.17    .730
              4.33   1.238 |  10.33   3.221 |  16.33   1.119 |  22.33    .723
              4.50   1.287 |  10.50   3.037 |  16.50   1.102 |  22.50    .716
              4.67   1.340 |  10.67   2.874 |  16.67   1.084 |  22.67    .710
              4.83   1.398 |  10.83   2.730 |  16.83   1.068 |  22.83    .703
              5.00   1.462 |  11.00   2.601 |  17.00   1.052 |  23.00    .697
              5.17   1.533 |  11.17   2.486 |  17.17   1.036 |  23.17    .691
              5.33   1.613 |  11.33   2.381 |  17.33   1.021 |  23.33    .685
              5.50   1.702 |  11.50   2.285 |  17.50   1.007 |  23.50    .679
              5.67   1.804 |  11.67   2.198 |  17.67    .993 |  23.67    .673
              5.83   1.921 |  11.83   2.118 |  17.83    .979 |  23.83    .668
              6.00   2.056 |  12.00   2.044 |  18.00    .966 |  24.00    .662

------------------------------------------------------------------------------------
005:0003----------------------------------------------------------------------------
*
*#############################################################################|
*#
*#                    POST CONDITIONS HYDROLOGIC MODELING
*#               ===================================================
*#
*#############################################################################|
*# CATCHMENT 201 - Roof Asphalt and Landscape area draining to KING STREET (cont
*

---------------------
| CALIB STANDHYD      |   Area    (ha)=     .11
| 01:201    DT= 1.00 |   Total Imp(%)=   76.00   Dir. Conn.(%)=   76.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         4.40
     Length            (m)=       7.20         2.80
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     101.51        49.91
                over (min)        1.00         2.00
     Storage Coeff.  (min)=        .43 (ii)    1.92 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.54          .57
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .00           .028 (iii)
     TIME TO PEAK    (hrs)=       7.95         8.00          8.000
     RUNOFF VOLUME    (mm)=      72.43        33.43         63.069
     TOTAL RAINFALL   (mm)=      73.43        73.43         73.429
     RUNOFF COEFFICIENT   =        .99          .46           .859

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  78.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
005:0004----------------------------------------------------------------------------
*# ROUTE PARKING AND ROOF THROUGH ORIFICE WITH SURFACE PONDING
*
--------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>01:(201    )   |
| OUT<02:(ORFFLO)    |    =========  OUTFLOW STORAGE TABLE  =========
--------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |    .015  .1100E-02
                            .007  .2000E-03    |    .015  .3100E-02
                            .014  .6000E-03    |    .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201   )        .11      .028     8.000     63.069
     OUTFLOW<02: (ORFFLO)        .11      .015     8.017     63.069
    OVERFLOW<03: (ORFFLO)        .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](%)=   53.255
                   TIME SHIFT OF PEAK FLOW         (min)=     1.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.9958E-03

------------------------------------------------------------------------------------
005:0005----------------------------------------------------------------------------
*# CATCHMENT 202 -  To streets (uncontrolled)
*

---------------------
| CALIB STANDHYD      |   Area    (ha)=     .02
| 07:202    DT= 1.00 |   Total Imp(%)=   24.00   Dir. Conn.(%)=   24.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00        20.00
     Length            (m)=       2.00         3.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     101.51        50.78
                over (min)        1.00         1.00
     Storage Coeff.  (min)=        .24 (ii)    1.22 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.67          .95
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .004 (iii)
     TIME TO PEAK    (hrs)=       7.92         8.00          8.000
     RUNOFF VOLUME    (mm)=      72.43        33.43         42.789
     TOTAL RAINFALL   (mm)=      73.43        73.43         73.429
     RUNOFF COEFFICIENT   =        .99          .46           .583

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  78.0    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 Peak Flow to King St (from internal site)
------------------------
| ADD HYD (SITE      ) | ID: NHYD         AREA     QPEAK    TPEAK    R.V.    DWF
------------------------                  (ha)     (cms)    (hrs)    (mm)   (cms)
                     ID1 07:202            .02      .004     8.00   42.79    .000
                    +ID2 02:ORFFLOW-SW     .11      .015     8.02   63.07    .000
                    +ID3 03:ORFFLOW-OV     .00      .000      .00     .00    .000  **DRY**
                     ==========================================================
                     SUM 08:SITE           .13      .018     8.00   59.74    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------
005:0007----------------------------------------------------------------------------
*# CATCHMENT 203 - BEHIND RETAINING WALL FLOWING TO GO
*
```

```
 ---------------------
 | CALIB NASHYD      |   Area    (ha)=     .00   Curve Number   (CN)=78.00
 | 01:203    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
 ---------------------   U.H. Tp(hrs)=    .050

      Unit Hyd Qpeak  (cms)=     .002

      PEAK FLOW       (cms)=     .000 (i)
      TIME TO PEAK    (hrs)=    8.000
      RUNOFF VOLUME    (mm)=   33.401
      TOTAL RAINFALL   (mm)=   73.429
      RUNOFF COEFFICIENT   =     .455

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 -----------------------------------------------------------------------------------------
 005:0008---------------------------------------------------------------------------------
 *# CATCHMENT 204 - EXTERNAL AREAS uncontrolled
 *
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=     .03
 | 03:204    DT= 1.00 |   Total Imp(%)=   21.00   Dir. Conn.(%)=   21.00
 ---------------------
                           IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       .01          .03
      Dep. Storage     (mm)=      1.00         5.00
      Average Slope     (%)=      2.00         5.00
      Length            (m)=      6.50         4.50
      Mannings n          =       .013         .250

      Max.eff.Inten.(mm/hr)=    101.51        49.91
                 over (min)       1.00         2.00
      Storage Coeff.  (min)=       .40 (ii)    2.31 (ii)
      Unit Hyd. Tpeak (min)=      1.00         2.00
      Unit Hyd. peak  (cms)=      1.56          .51
                                                          *TOTALS*
      PEAK FLOW       (cms)=       .00          .00          .005 (iii)
      TIME TO PEAK    (hrs)=      7.92         8.00         8.000
      RUNOFF VOLUME    (mm)=     72.43        33.43        41.619
      TOTAL RAINFALL   (mm)=     73.43        73.43        73.429
      RUNOFF COEFFICIENT   =       .99          .46          .567

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  78.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 -----------------------------------------------------------------------------------------
 005:0009---------------------------------------------------------------------------------
 *# Total FLOW to King St (Internal + external)
 -----------------------
 | ADD HYD (PropSite  ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
 -----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 03:204            .03      .005    8.00  41.62    .000
                      +ID2 08:SITE           .13      .018    8.00  59.74    .000
                       ==========================================================
                       SUM 06:PropSite       .17      .024    8.00  56.05    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------------------
 005:0010---------------------------------------------------------------------------------
 ********************************************************************************


 * RUN REMAINING DESIGN STORMS (TOWN OF HALTON HILLS 5 TO 100-YR)
 *
 -----------------------------------------------------------------------------------------
 005:0002---------------------------------------------------------------------------------
 *
   ** END OF RUN :   9

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





 --------------------
 | START             |  Project  dir.: Q:\60793_001\SWM\SWMHYMO\

 --------------------    Rainfall dir.: Q:\60793_001\SWM\SWMHYMO\

     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 010
     NSTORM=   1
           #  1=HH_010.STM
 -----------------------------------------------------------------------------------------
 010:0002---------------------------------------------------------------------------------
 *#*****************************************************************************
 *#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number: 60793_001
 *#  Date        : January 2025
 *#  Modeller    : ASB
 *#  Company     : MTE Consultants Inc.
 *#  License #   : 3053466
 *#****************************************************************************|
 *
 -----------------------------------------------------------------------------------------
 010:0002---------------------------------------------------------------------------------
 *
 --------------------
 | READ STORM        |    Filename: 10-YR Halton Hill CHI STM
 | Ptotal=  87.10 mm|    Comments: 10-YR Halton Hill CHI STM
 --------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .17    .773 |   6.17   2.604 |  12.17   2.319 |  18.17   1.107
                .33    .786 |   6.33   2.830 |  12.33   2.243 |  18.33   1.092
                .50    .801 |   6.50   3.106 |  12.50   2.173 |  18.50   1.078
                .67    .815 |   6.67   3.451 |  12.67   2.108 |  18.67   1.064
                .83    .831 |   6.83   3.893 |  12.83   2.047 |  18.83   1.051
               1.00    .847 |   7.00   4.486 |  13.00   1.989 |  19.00   1.038
               1.17    .864 |   7.17   5.323 |  13.17   1.935 |  19.17   1.025
               1.33    .881 |   7.33   6.603 |  13.33   1.885 |  19.33   1.013
               1.50    .900 |   7.50   8.820 |  13.50   1.837 |  19.50   1.001
               1.67    .919 |   7.67  13.654 |  13.67   1.792 |  19.67    .989
               1.83    .939 |   7.83  32.800 |  13.83   1.749 |  19.83    .978
               2.00    .961 |   8.00 118.247 |  14.00   1.709 |  20.00    .967
               2.17    .983 |   8.17  43.031 |  14.17   1.670 |  20.17    .956
               2.33   1.007 |   8.33  23.006 |  14.33   1.634 |  20.33    .945
               2.50   1.032 |   8.50  15.688 |  14.50   1.599 |  20.50    .935
               2.67   1.058 |   8.67  11.948 |  14.67   1.566 |  20.67    .925
               2.83   1.086 |   8.83   9.688 |  14.83   1.534 |  20.83    .915
               3.00   1.116 |   9.00   8.177 |  15.00   1.504 |  21.00    .906
               3.17   1.147 |   9.17   7.095 |  15.17   1.475 |  21.17    .897
               3.33   1.181 |   9.33   6.281 |  15.33   1.447 |  21.33    .887
               3.50   1.217 |   9.50   5.646 |  15.50   1.421 |  21.50    .879
               3.67   1.256 |   9.67   5.137 |  15.67   1.395 |  21.67    .870
               3.83   1.297 |   9.83   4.718 |  15.83   1.371 |  21.83    .861
               4.00   1.342 |  10.00   4.368 |  16.00   1.347 |  22.00    .853
               4.17   1.391 |  10.17   4.071 |  16.17   1.324 |  22.17    .845
               4.33   1.443 |  10.33   3.815 |  16.33   1.303 |  22.33    .837
               4.50   1.500 |  10.50   3.592 |  16.50   1.282 |  22.50    .829
               4.67   1.563 |  10.67   3.397 |  16.67   1.261 |  22.67    .821
               4.83   1.632 |  10.83   3.223 |  16.83   1.242 |  22.83    .814
               5.00   1.708 |  11.00   3.068 |  17.00   1.223 |  23.00    .807
               5.17   1.792 |  11.17   2.929 |  17.17   1.205 |  23.17    .799
               5.33   1.887 |  11.33   2.803 |  17.33   1.187 |  23.33    .792
               5.50   1.993 |  11.50   2.689 |  17.50   1.170 |  23.50    .785
               5.67   2.114 |  11.67   2.584 |  17.67   1.153 |  23.67    .779
               5.83   2.253 |  11.83   2.489 |  17.83   1.137 |  23.83    .772
               6.00   2.414 |  12.00   2.400 |  18.00   1.122 |  24.00    .766

 -----------------------------------------------------------------------------------------
 010:0003---------------------------------------------------------------------------------
 *
 *#################################################################################|
 *#
 *#                     POST CONDITIONS HYDROLOGIC MODELING
 *#                ===================================================
 *#
 *#################################################################################|
 *# CATCHMENT 201 - Roof Asphalt and Landscape area draining to KING STREET (cont
 *
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=     .11
 | 01:201    DT= 1.00 |   Total Imp(%)=   76.00   Dir. Conn.(%)=   76.00
 ---------------------
                           IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       .09          .03
      Dep. Storage     (mm)=      1.00         5.00
      Average Slope     (%)=      2.00         4.40
      Length            (m)=      7.20         2.80
      Mannings n          =       .013         .250

      Max.eff.Inten.(mm/hr)=    118.25        64.82
                 over (min)       1.00         2.00
      Storage Coeff.  (min)=       .40 (ii)    1.74 (ii)
      Unit Hyd. Tpeak (min)=      1.00         2.00
      Unit Hyd. peak  (cms)=      1.56          .61
                                                          *TOTALS*
      PEAK FLOW       (cms)=       .03          .00          .033 (iii)
      TIME TO PEAK    (hrs)=      7.93         8.00         8.000
      RUNOFF VOLUME    (mm)=     86.10        43.84        75.962
      TOTAL RAINFALL   (mm)=     87.10        87.10        87.104
      RUNOFF COEFFICIENT   =       .99          .50          .872

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  78.0    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.

 -----------------------------------------------------------------------------------------
 010:0004---------------------------------------------------------------------------------
 *# ROUTE PARKING AND ROOF THROUGH ORIFICE WITH SURFACE PONDING
 *
 --------------------
 | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
 |  IN>01:(201    )   |
 | OUT<02:(ORFFLO)    |    =========  OUTFLOW STORAGE TABLE  =========
 --------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)    |   (cms)    (ha.m.)
                             .000  .0000E+00    |    .015  .1100E-02
                             .007  .2000E-03    |    .015  .3100E-02
                             .014  .6000E-03    |    .000  .0000E+00

      ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
      --------------------        (ha)     (cms)     (hrs)       (mm)
      INFLOW >01: (201    )        .11      .033     8.000     75.962
      OUTFLOW<02: (ORFFLO)         .11      .015     8.017     75.962
     OVERFLOW<03: (ORFFLO)         .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](%)=   45.515
                    TIME SHIFT OF PEAK FLOW         (min)=     1.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.1294E-02

 -----------------------------------------------------------------------------------------
 010:0005---------------------------------------------------------------------------------
 *# CATCHMENT 202 -  To streets (uncontrolled)
 *
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=     .02
 | 07:202    DT= 1.00 |   Total Imp(%)=   24.00   Dir. Conn.(%)=   24.00
 ---------------------
                           IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       .01          .02
      Dep. Storage     (mm)=      1.00         5.00
      Average Slope     (%)=      1.00        20.00
      Length            (m)=      2.00         3.00
      Mannings n          =       .013         .250

      Max.eff.Inten.(mm/hr)=    118.25        65.80
                 over (min)       1.00         1.00
      Storage Coeff.  (min)=       .23 (ii)    1.11 (ii)
      Unit Hyd. Tpeak (min)=      1.00         1.00
      Unit Hyd. peak  (cms)=      1.68         1.01
                                                          *TOTALS*
      PEAK FLOW       (cms)=       .00          .00          .005 (iii)
      TIME TO PEAK    (hrs)=      7.90         8.00         8.000
      RUNOFF VOLUME    (mm)=     86.10        43.84        53.987
      TOTAL RAINFALL   (mm)=     87.10        87.10        87.104
      RUNOFF COEFFICIENT   =       .99          .50          .620

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  78.0    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.

 -----------------------------------------------------------------------------------------
 010:0006---------------------------------------------------------------------------------
 *# Total Peak Flow to King St (from internal site)
 -----------------------
 | ADD HYD (SITE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
 -----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 07:202            .02      .005    8.00  53.99    .000
                      +ID2 02:ORFFLOW-SW     .11      .015    8.02  75.96    .000
                      +ID3 03:ORFFLOW-OV     .00      .000     .00    .00    .000  **DRY**
                       ==========================================================
                       SUM 08:SITE           .13      .020    8.00  72.36    .000
```

```
   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
010:0007------------------------------------------------------------------------
*# CATCHMENT 203 - BEHIND RETAINING WALL FLOWING TO GO
*
---------------------
| CALIB NASHYD       |   Area    (ha)=     .00   Curve Number   (CN)=78.00
| 01:203    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .050

     Unit Hyd Qpeak  (cms)=     .002

     PEAK FLOW       (cms)=     .000 (i)
     TIME TO PEAK    (hrs)=    8.000
     RUNOFF VOLUME    (mm)=   43.810
     TOTAL RAINFALL   (mm)=   87.104
     RUNOFF COEFFICIENT   =     .503

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
010:0008------------------------------------------------------------------------
*# CATCHMENT 204 - EXTERNAL AREAS uncontrolled
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .03
| 03:204    DT= 1.00 |   Total Imp(%)=   21.00   Dir. Conn.(%)=   21.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=       6.50         4.50
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     118.25        64.82
                over (min)        1.00         2.00
     Storage Coeff.  (min)=        .38 (ii)    2.10 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.58          .54
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .007 (iii)
     TIME TO PEAK    (hrs)=       7.92         8.00          8.000
     RUNOFF VOLUME    (mm)=      86.10        43.84         52.720
     TOTAL RAINFALL   (mm)=      87.10        87.10         87.104
     RUNOFF COEFFICIENT   =        .99          .50           .605

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.

--------------------------------------------------------------------------------
010:0009------------------------------------------------------------------------
*# Total FLOW to King St (Internal + external)
-----------------------
| ADD HYD (PropSite  ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 03:204            .03      .007    8.00  52.72    .000
                    +ID2 08:SITE           .13      .020    8.00  72.36    .000
                     ==========================================================
                     SUM 06:PropSite       .17      .026    8.00  68.36    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
010:0010------------------------------------------------------------------------
**************************************************************************
* RUN REMAINING DESIGN STORMS (TOWN OF HALTON HILLS 5 TO 100-YR)
*
--------------------------------------------------------------------------------
010:0002------------------------------------------------------------------------
*
--------------------------------------------------------------------------------
010:0002------------------------------------------------------------------------
*
  ** END OF RUN :  24

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





--------------------
| START            |  Project  dir.: Q:\60793_001\SWM\SWMHYMO\

--------------------  Rainfall dir.: Q:\60793_001\SWM\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 025
    NSTORM=   1
          #  1=HH_025.STM
--------------------------------------------------------------------------------
025:0002------------------------------------------------------------------------
*#************************************************************************
*#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number: 60793_001
*#  Date         : January 2025
*#  Modeller     : ASB
*#  Company      : MTE Consultants Inc.
*#  License #    : 3053466
*#***********************************************************************|
*
--------------------------------------------------------------------------------
025:0002------------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 25-YR Halton Hill CHI STM
| Ptotal= 105.38 mm|    Comments: 25-YR Halton Hill CHI STM
--------------------
                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                  .17    .957 |   6.17   3.195 |  12.17   2.848 |  18.17   1.367
                  .33    .974 |   6.33   3.470 |  12.33   2.756 |  18.33   1.349
                  .50    .991 |   6.50   3.806 |  12.50   2.671 |  18.50   1.332
                  .67   1.009 |   6.67   4.224 |  12.67   2.591 |  18.67   1.315
                  .83   1.028 |   6.83   4.761 |  12.83   2.516 |  18.83   1.298
                 1.00   1.048 |   7.00   5.478 |  13.00   2.446 |  19.00   1.282
                 1.17   1.069 |   7.17   6.490 |  13.17   2.381 |  19.17   1.267
                 1.33   1.090 |   7.33   8.033 |  13.33   2.319 |  19.33   1.252
                 1.50   1.113 |   7.50  10.700 |  13.50   2.260 |  19.50   1.237
                 1.67   1.137 |   7.67  16.488 |  13.67   2.205 |  19.67   1.223
                 1.83   1.161 |   7.83  39.240 |  13.83   2.153 |  19.83   1.209
                 2.00   1.188 |   8.00 139.947 |  14.00   2.104 |  20.00   1.195
                 2.17   1.215 |   8.17  51.366 |  14.17   2.057 |  20.17   1.182
                 2.33   1.244 |   8.33  27.633 |  14.33   2.012 |  20.33   1.169
                 2.50   1.275 |   8.50  18.918 |  14.50   1.969 |  20.50   1.156
                 2.67   1.307 |   8.67  14.449 |  14.67   1.929 |  20.67   1.144
                 2.83   1.342 |   8.83  11.742 |  14.83   1.890 |  20.83   1.132
                 3.00   1.378 |   9.00   9.927 |  15.00   1.853 |  21.00   1.120
                 3.17   1.417 |   9.17   8.625 |  15.17   1.818 |  21.17   1.109
                 3.33   1.458 |   9.33   7.645 |  15.33   1.784 |  21.33   1.098
                 3.50   1.502 |   9.50   6.880 |  15.50   1.751 |  21.50   1.087
                 3.67   1.550 |   9.67   6.265 |  15.67   1.720 |  21.67   1.076
                 3.83   1.601 |   9.83   5.759 |  15.83   1.690 |  21.83   1.066
                 4.00   1.655 |  10.00   5.336 |  16.00   1.661 |  22.00   1.056
                 4.17   1.715 |  10.17   4.976 |  16.17   1.634 |  22.17   1.046
                 4.33   1.779 |  10.33   4.666 |  16.33   1.607 |  22.33   1.036
                 4.50   1.849 |  10.50   4.396 |  16.50   1.581 |  22.50   1.026
                 4.67   1.926 |  10.67   4.158 |  16.67   1.556 |  22.67   1.017
                 4.83   2.010 |  10.83   3.948 |  16.83   1.532 |  22.83   1.008
                 5.00   2.102 |  11.00   3.760 |  17.00   1.509 |  23.00    .999
                 5.17   2.206 |  11.17   3.590 |  17.17   1.487 |  23.17    .990
                 5.33   2.321 |  11.33   3.437 |  17.33   1.465 |  23.33    .981
                 5.50   2.451 |  11.50   3.298 |  17.50   1.444 |  23.50    .973
                 5.67   2.599 |  11.67   3.171 |  17.67   1.424 |  23.67    .964
                 5.83   2.768 |  11.83   3.055 |  17.83   1.404 |  23.83    .956
                 6.00   2.964 |  12.00   2.947 |  18.00   1.385 |  24.00    .948

--------------------------------------------------------------------------------
025:0003------------------------------------------------------------------------
*
*#########################################################################|
*#
*#                   POST CONDITIONS HYDROLOGIC MODELING
*#                 ==================================================
*#
*#########################################################################|
*# CATCHMENT 201 - Roof Asphalt and Landscape area draining to KING STREET (cont
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .11
| 01:201    DT= 1.00 |   Total Imp(%)=   76.00   Dir. Conn.(%)=   76.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         4.40
     Length            (m)=       7.20         2.80
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.95        85.31
                over (min)        1.00         2.00
     Storage Coeff.  (min)=        .37 (ii)    1.58 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.58          .65
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .03          .01           .039 (iii)
     TIME TO PEAK    (hrs)=       7.93         8.00          8.000
     RUNOFF VOLUME    (mm)=     104.38        58.57         93.383
     TOTAL RAINFALL   (mm)=     105.38       105.38        105.376
     RUNOFF COEFFICIENT   =        .99          .56           .886

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.


--------------------------------------------------------------------------------
025:0004------------------------------------------------------------------------
*# ROUTE PARKING AND ROOF THROUGH ORIFICE WITH SURFACE PONDING
*
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201    )  |
| OUT<02:(ORFFLO)   |    =========  OUTFLOW STORAGE TABLE  =========
--------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)    |   (cms)    (ha.m.)
                           .000  .0000E+00    |     .015  .1100E-02
                           .007  .2000E-03    |     .015  .3100E-02
                           .014  .6000E-03    |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201    )       .11      .039     8.000     93.383
     OUTFLOW<02: (ORFFLO)        .11      .015     8.083     93.383
    OVERFLOW<03: (ORFFLO)        .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](%)=   38.070
                   TIME SHIFT OF PEAK FLOW         (min)=     5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1741E-02

--------------------------------------------------------------------------------
025:0005------------------------------------------------------------------------
*# CATCHMENT 202 -  To streets (uncontrolled)
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .02
| 07:202    DT= 1.00 |   Total Imp(%)=   24.00   Dir. Conn.(%)=   24.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00        20.00
     Length            (m)=       2.00         3.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.95        86.42
                over (min)        1.00         1.00
     Storage Coeff.  (min)=        .21 (ii)    1.01 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.68         1.07
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .006 (iii)
     TIME TO PEAK    (hrs)=       7.88         8.00          8.000
     RUNOFF VOLUME    (mm)=     104.37        58.57         69.564
     TOTAL RAINFALL   (mm)=     105.38       105.38        105.376
     RUNOFF COEFFICIENT   =        .99          .56           .660

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.

--------------------------------------------------------------------------------
```

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025:0006----------------------------------------------------------------------------
*# Total Peak Flow to King St (from internal site)
-----------------------
| ADD HYD (SITE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 07:202             .02      .006    8.00  69.56    .000
                    +ID2 02:ORFFLOW-SW      .11      .015    8.08  93.38    .000
                    +ID3 03:ORFFLOW-OV      .00      .000     .00    .00    .000  **DRY**
                     ===========================================================
                     SUM 08:SITE            .13      .021    8.00  89.48    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
025:0007----------------------------------------------------------------------------
*# CATCHMENT 203 - BEHIND RETAINING WALL FLOWING TO GO
*
---------------------
| CALIB NASHYD      |   Area    (ha)=     .00   Curve Number   (CN)=78.00
| 01:203    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .050

     Unit Hyd Qpeak  (cms)=     .002

     PEAK FLOW       (cms)=     .000 (i)
     TIME TO PEAK    (hrs)=    8.000
     RUNOFF VOLUME    (mm)=   58.526
     TOTAL RAINFALL   (mm)=  105.376
     RUNOFF COEFFICIENT   =     .555

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------
025:0008----------------------------------------------------------------------------
*# CATCHMENT 204 - EXTERNAL AREAS uncontrolled
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .03
| 03:204    DT= 1.00 |   Total Imp(%)=   21.00   Dir. Conn.(%)=   21.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=       6.50         4.50
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.95        85.31
                over (min)       1.00         2.00
     Storage Coeff.  (min)=        .35 (ii)    1.89 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.60          .58
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .00          .01            .009 (iii)
     TIME TO PEAK    (hrs)=       7.92         8.00           8.000
     RUNOFF VOLUME    (mm)=     104.37        58.57          68.190
     TOTAL RAINFALL   (mm)=     105.38       105.38         105.376
     RUNOFF COEFFICIENT   =        .99          .56            .647

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.



----------------------------------------------------------------------------
025:0009----------------------------------------------------------------------------
*# Total FLOW to King St (Internal + external)
-----------------------
| ADD HYD (PropSite  ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 03:204             .03      .009    8.00  68.19    .000
                    +ID2 08:SITE            .13      .021    8.00  89.48    .000
                     ===========================================================
                     SUM 06:PropSite        .17      .030    8.00  85.14    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
025:0010----------------------------------------------------------------------------
*****************************************************************************
* RUN REMAINING DESIGN STORMS (TOWN OF HALTON HILLS 5 TO 100-YR)
*
----------------------------------------------------------------------------
025:0002----------------------------------------------------------------------------
*
----------------------------------------------------------------------------
025:0002----------------------------------------------------------------------------
*
----------------------------------------------------------------------------
025:0002----------------------------------------------------------------------------
*
  ** END OF RUN :  49

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






-------------------
| START            |  Project  dir.: Q:\60793_001\SWM\SWMHYMO\

-------------------  Rainfall dir.: Q:\60793_001\SWM\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 050
    NSTORM=   1
           #  1=HH_050.STM
----------------------------------------------------------------------------
050:0002----------------------------------------------------------------------------
*#***************************************************************************
*#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number: 60793_001
*#  Date        : January 2025
*#  Modeller    : ASB
*#  Company     : MTE Consultants Inc.
*#  License #   : 3053466
*#**************************************************************************|
*
----------------------------------------------------------------------------
050:0002----------------------------------------------------------------------------
*
-------------------
| READ STORM       |    Filename: 50-YR Halton Hill CHI STM
| Ptotal= 117.76 mm|    Comments: 50-YR Halton Hill CHI STM
-------------------
                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                 .17   1.033 |   6.17   3.520 |  12.17   3.130 |  18.17   1.483
                 .33   1.051 |   6.33   3.830 |  12.33   3.027 |  18.33   1.463
                 .50   1.070 |   6.50   4.209 |  12.50   2.931 |  18.50   1.444
                 .67   1.090 |   6.67   4.682 |  12.67   2.842 |  18.67   1.426
                 .83   1.111 |   6.83   5.292 |  12.83   2.759 |  18.83   1.407
                1.00   1.132 |   7.00   6.111 |  13.00   2.680 |  19.00   1.390
                1.17   1.155 |   7.17   7.271 |  13.17   2.607 |  19.17   1.373
                1.33   1.179 |   7.33   9.051 |  13.33   2.538 |  19.33   1.356
                1.50   1.204 |   7.50  12.147 |  13.50   2.473 |  19.50   1.340
                1.67   1.230 |   7.67  18.910 |  13.67   2.412 |  19.67   1.324
                1.83   1.257 |   7.83  45.332 |  13.83   2.354 |  19.83   1.309
                2.00   1.286 |   8.00 155.240 |  14.00   2.298 |  20.00   1.294
                2.17   1.316 |   8.17  59.317 |  14.17   2.246 |  20.17   1.280
                2.33   1.348 |   8.33  31.950 |  14.33   2.197 |  20.33   1.265
                2.50   1.382 |   8.50  21.755 |  14.50   2.149 |  20.50   1.252
                2.67   1.417 |   8.67  16.523 |  14.67   2.104 |  20.67   1.238
                2.83   1.455 |   8.83  13.360 |  14.83   2.061 |  20.83   1.225
                3.00   1.495 |   9.00  11.247 |  15.00   2.020 |  21.00   1.212
                3.17   1.538 |   9.17   9.736 |  15.17   1.981 |  21.17   1.199
                3.33   1.584 |   9.33   8.603 |  15.33   1.943 |  21.33   1.187
                3.50   1.632 |   9.50   7.720 |  15.50   1.907 |  21.50   1.175
                3.67   1.685 |   9.67   7.013 |  15.67   1.873 |  21.67   1.163
                3.83   1.741 |   9.83   6.433 |  15.83   1.840 |  21.83   1.152
                4.00   1.801 |  10.00   5.948 |  16.00   1.808 |  22.00   1.141
                4.17   1.867 |  10.17   5.538 |  16.17   1.777 |  22.17   1.130
                4.33   1.938 |  10.33   5.184 |  16.33   1.748 |  22.33   1.119
                4.50   2.016 |  10.50   4.877 |  16.50   1.719 |  22.50   1.109
                4.67   2.101 |  10.67   4.608 |  16.67   1.692 |  22.67   1.098
                4.83   2.194 |  10.83   4.369 |  16.83   1.665 |  22.83   1.088
                5.00   2.297 |  11.00   4.156 |  17.00   1.640 |  23.00   1.078
                5.17   2.412 |  11.17   3.965 |  17.17   1.615 |  23.17   1.069
                5.33   2.541 |  11.33   3.793 |  17.33   1.591 |  23.33   1.059
                5.50   2.686 |  11.50   3.636 |  17.50   1.568 |  23.50   1.050
                5.67   2.851 |  11.67   3.493 |  17.67   1.546 |  23.67   1.041
                5.83   3.040 |  11.83   3.362 |  17.83   1.524 |  23.83   1.032
                6.00   3.260 |  12.00   3.241 |  18.00   1.503 |  24.00   1.023

----------------------------------------------------------------------------
050:0003----------------------------------------------------------------------------
*
*###########################################################################|
*#
*#                       POST CONDITIONS HYDROLOGIC MODELING
*#                  ====================================================
*#
*###########################################################################|
*# CATCHMENT 201 - Roof Asphalt and Landscape area draining to KING STREET (cont
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .11
| 01:201    DT= 1.00 |   Total Imp(%)=   76.00   Dir. Conn.(%)=   76.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         4.40
     Length            (m)=       7.20         2.80
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     155.24       101.27
                over (min)       1.00         1.00
     Storage Coeff.  (min)=        .36 (ii)    1.48 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00



     Unit Hyd. peak  (cms)=       1.59          .83
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .04          .01            .044 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.00           8.000
     RUNOFF VOLUME    (mm)=     116.76        68.95         105.289
     TOTAL RAINFALL   (mm)=     117.76       117.76         117.764
     RUNOFF COEFFICIENT   =        .99          .59            .894

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.

----------------------------------------------------------------------------
050:0004----------------------------------------------------------------------------
*# ROUTE PARKING AND ROOF THROUGH ORIFICE WITH SURFACE PONDING
*
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201    )  |
| OUT<02:(ORFFLO)   |     =========  OUTFLOW STORAGE TABLE  =========
--------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)  |    (cms)     (ha.m.)
                            .000  .0000E+00    |     .015  .1100E-02
                            .007  .2000E-03    |     .015  .3100E-02
                            .014  .6000E-03    |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201    )       .11      .044     8.000    105.289
     OUTFLOW<02: (ORFFLO)        .11      .015     8.167    105.289
    OVERFLOW<03: (ORFFLO)        .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](%)=   34.147
                    TIME SHIFT OF PEAK FLOW          (min)=    10.00
                    MAXIMUM  STORAGE   USED        (ha.m.)=.2202E-02

----------------------------------------------------------------------------
050:0005----------------------------------------------------------------------------
*# CATCHMENT 202 -  To streets (uncontrolled)
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .02
| 07:202    DT= 1.00 |   Total Imp(%)=   24.00   Dir. Conn.(%)=   24.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00        20.00
     Length            (m)=       2.00         3.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     155.24       101.27
                over (min)       1.00         1.00
     Storage Coeff.  (min)=        .20 (ii)     .95 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.69         1.11
                                                            *TOTALS*
```

```
     PEAK FLOW        (cms)=        .00          .00           .007 (iii)
     TIME TO PEAK     (hrs)=       7.98         8.00          8.000
     RUNOFF VOLUME     (mm)=     116.76        68.95         80.429
     TOTAL RAINFALL    (mm)=     117.76       117.76        117.764
     RUNOFF COEFFICIENT   =         .99          .59           .683

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.

-------------------------------------------------------------------------------
050:0006-----------------------------------------------------------------------
*# Total Peak Flow to King St (from internal site)
------------------------
| ADD HYD (SITE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 07:202             .02      .007    8.00  80.43    .000
                    +ID2 02:ORFFLOW-SW      .11      .015    8.17 105.29    .000
                    +ID3 03:ORFFLOW-OV      .00      .000     .00    .00    .000  **DRY**
                     =============================================================
                     SUM 08:SITE            .13      .022    8.00 101.21    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
050:0007-----------------------------------------------------------------------
*# CATCHMENT 203 - BEHIND RETAINING WALL FLOWING TO GO
*
---------------------
| CALIB NASHYD       |   Area    (ha)=     .00   Curve Number   (CN)=78.00
| 01:203    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
---------------------    U.H. Tp(hrs)=    .050

     Unit Hyd Qpeak  (cms)=     .002

     PEAK FLOW       (cms)=     .001 (i)
     TIME TO PEAK    (hrs)=    8.000
     RUNOFF VOLUME    (mm)=   68.904
     TOTAL RAINFALL   (mm)=  117.764
     RUNOFF COEFFICIENT   =     .585

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
050:0008-----------------------------------------------------------------------
*# CATCHMENT 204 - EXTERNAL AREAS uncontrolled
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .03
| 03:204    DT= 1.00 |   Total Imp(%)=   21.00   Dir. Conn.(%)=   21.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=       6.50         4.50
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     155.24       100.09
                over (min)        1.00         2.00
     Storage Coeff.  (min)=        .34 (ii)    1.78 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.61          .60
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .00          .01           .010 (iii)
     TIME TO PEAK     (hrs)=       8.00         8.00          8.000
     RUNOFF VOLUME     (mm)=     116.76        68.95         78.995
     TOTAL RAINFALL    (mm)=     117.76       117.76        117.764
     RUNOFF COEFFICIENT   =         .99          .59           .671

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.

-------------------------------------------------------------------------------
050:0009-----------------------------------------------------------------------
*# Total FLOW to King St (Internal + external)
------------------------
| ADD HYD (PropSite  ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 03:204             .03      .010    8.00  78.99    .000
                    +ID2 08:SITE            .13      .022    8.00 101.21    .000
                     =============================================================
                     SUM 06:PropSite        .17      .032    8.00  96.69    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
050:0010-----------------------------------------------------------------------
*******************************************************************************
* RUN REMAINING DESIGN STORMS (TOWN OF HALTON HILLS 5 TO 100-YR)
*
-------------------------------------------------------------------------------
050:0002-----------------------------------------------------------------------
*
-------------------------------------------------------------------------------
050:0002-----------------------------------------------------------------------
*
-------------------------------------------------------------------------------
050:0002-----------------------------------------------------------------------
*
-------------------------------------------------------------------------------
050:0002-----------------------------------------------------------------------
*
  ** END OF RUN :  99

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--------------------
| START            |  Project  dir.: Q:\60793_001\SWM\SWMHYMO\
--------------------  Rainfall dir.: Q:\60793_001\SWM\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 100
    NSTORM=   1
          #  1=HH_100.STM
-------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: HABITAT FOR HUMANITY 37 KING ST.    Project Number: 60793_001
*#  Date        : January 2025
*#  Modeller    : ASB
*#  Company     : MTE Consultants Inc.
*#  License #   : 3053466
*#****************************************************************************|
*
-------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 100-YR Halton Hill CHI STM
| Ptotal= 130.89 mm|    Comments: 100-YR Halton Hill CHI STM
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   1.159 |   6.17   3.934 |  12.17   3.500 |  18.17   1.662
               .33   1.179 |   6.33   4.280 |  12.33   3.385 |  18.33   1.640
               .50   1.201 |   6.50   4.702 |  12.50   3.279 |  18.50   1.619
               .67   1.223 |   6.67   5.229 |  12.67   3.179 |  18.67   1.598
               .83   1.246 |   6.83   5.907 |  12.83   3.086 |  18.83   1.578
              1.00   1.270 |   7.00   6.817 |  13.00   2.999 |  19.00   1.558
              1.17   1.296 |   7.17   8.106 |  13.17   2.917 |  19.17   1.539
              1.33   1.322 |   7.33  10.082 |  13.33   2.840 |  19.33   1.521
              1.50   1.350 |   7.50  13.513 |  13.50   2.768 |  19.50   1.502
              1.67   1.379 |   7.67  20.998 |  13.67   2.699 |  19.67   1.485
              1.83   1.410 |   7.83  50.152 |  13.83   2.634 |  19.83   1.468
              2.00   1.442 |   8.00 171.052 |  14.00   2.573 |  20.00   1.451
              2.17   1.476 |   8.17  65.567 |  14.17   2.515 |  20.17   1.435
              2.33   1.511 |   8.33  35.402 |  14.33   2.459 |  20.33   1.419
              2.50   1.549 |   8.50  24.144 |  14.50   2.406 |  20.50   1.403
              2.67   1.589 |   8.67  18.358 |  14.67   2.356 |  20.67   1.388
              2.83   1.631 |   8.83  14.857 |  14.83   2.308 |  20.83   1.374
              3.00   1.676 |   9.00  12.517 |  15.00   2.262 |  21.00   1.359
              3.17   1.724 |   9.17  10.842 |  15.17   2.219 |  21.17   1.345
              3.33   1.775 |   9.33   9.584 |  15.33   2.177 |  21.33   1.331
              3.50   1.829 |   9.50   8.604 |  15.50   2.136 |  21.50   1.318
              3.67   1.888 |   9.67   7.819 |  15.67   2.098 |  21.67   1.305
              3.83   1.950 |   9.83   7.175 |  15.83   2.061 |  21.83   1.292
              4.00   2.018 |  10.00   6.637 |  16.00   2.025 |  22.00   1.280
              4.17   2.091 |  10.17   6.180 |  16.17   1.991 |  22.17   1.267
              4.33   2.171 |  10.33   5.787 |  16.33   1.958 |  22.33   1.255
              4.50   2.257 |  10.50   5.446 |  16.50   1.926 |  22.50   1.244
              4.67   2.352 |  10.67   5.146 |  16.67   1.896 |  22.67   1.232
              4.83   2.456 |  10.83   4.880 |  16.83   1.866 |  22.83   1.221
              5.00   2.571 |  11.00   4.643 |  17.00   1.838 |  23.00   1.210
              5.17   2.700 |  11.17   4.431 |  17.17   1.810 |  23.17   1.199
              5.33   2.843 |  11.33   4.239 |  17.33   1.783 |  23.33   1.188
              5.50   3.005 |  11.50   4.064 |  17.50   1.757 |  23.50   1.178
              5.67   3.189 |  11.67   3.905 |  17.67   1.733 |  23.67   1.168
              5.83   3.400 |  11.83   3.759 |  17.83   1.708 |  23.83   1.158
              6.00   3.645 |  12.00   3.624 |  18.00   1.685 |  24.00   1.148

-------------------------------------------------------------------------------
100:0003-----------------------------------------------------------------------
*
*#############################################################################|
*#
*#                       POST CONDITIONS HYDROLOGIC MODELING
*#                  ====================================================
*#
*#############################################################################|
*# CATCHMENT 201 - Roof Asphalt and Landscape area draining to KING STREET (cont
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .11
| 01:201    DT= 1.00 |   Total Imp(%)=   76.00   Dir. Conn.(%)=   76.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         4.40
     Length            (m)=       7.20         2.80
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     171.05       117.02
                over (min)        1.00         1.00
     Storage Coeff.  (min)=        .35 (ii)    1.41 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.61          .86
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .04          .01           .049 (iii)
     TIME TO PEAK     (hrs)=       7.93         8.00          8.000
     RUNOFF VOLUME     (mm)=     129.89        80.23        117.970
     TOTAL RAINFALL    (mm)=     130.89       130.89        130.888
     RUNOFF COEFFICIENT   =         .99          .61           .901

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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-----------------------------------------------------------------------
*# ROUTE PARKING AND ROOF THROUGH ORIFICE WITH SURFACE PONDING
*
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201    )  |
| OUT<02:(ORFFLO)   |    =========  OUTFLOW STORAGE TABLE  =========
--------------------     OUTFLOW    STORAGE  |  OUTFLOW    STORAGE
                          (cms)     (ha.m.)  |   (cms)     (ha.m.)
                           .000  .0000E+00   |     .015  .1100E-02
                           .007  .2000E-03   |     .015  .3100E-02
                           .014  .6000E-03   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201    )        .11      .049     8.000    117.970
     OUTFLOW<02: (ORFFLO)         .11      .015     8.183    117.969
    OVERFLOW<03: (ORFFLO)         .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](%)=   30.943
                   TIME SHIFT OF PEAK FLOW          (min)=    11.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2649E-02

-------------------------------------------------------------------------------
100:0005-----------------------------------------------------------------------
*# CATCHMENT 202 -  To streets (uncontrolled)
*
---------------------
```

```
| CALIB STANDHYD     |   Area    (ha)=     .02
| 07:202    DT= 1.00 |   Total Imp(%)=   24.00   Dir. Conn.(%)=   24.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00        20.00
     Length            (m)=       2.00         3.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     171.05       117.02
                over (min)        1.00         1.00
     Storage Coeff.  (min)=        .20 (ii)     .90 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.69         1.14
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .00          .01           .008 (iii)
     TIME TO PEAK    (hrs)=       7.88         8.00          8.000
     RUNOFF VOLUME    (mm)=     129.89        80.23         92.147
     TOTAL RAINFALL   (mm)=     130.89       130.89        130.888
     RUNOFF COEFFICIENT   =        .99          .61           .704

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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 Peak Flow to King St (from internal site)
-----------------------
| ADD HYD (SITE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 07:202             .02     .008    8.00  92.15    .000
                    +ID2 02:ORFFLOW-SW      .11     .015    8.18 117.97    .000
                    +ID3 03:ORFFLOW-OV      .00     .000     .00    .00    .000  **DRY**
                     ==========================================================
                     SUM 08:SITE            .13     .023    8.00 113.74    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------
100:0007-----------------------------------------------------------------------------
*# CATCHMENT 203 - BEHIND RETAINING WALL FLOWING TO GO
*
---------------------
| CALIB NASHYD       |   Area    (ha)=     .00   Curve Number   (CN)=78.00
| 01:203    DT= 1.00 |   Ia      (mm)=   5.000   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .050

     Unit Hyd Qpeak  (cms)=     .002

     PEAK FLOW       (cms)=     .001 (i)
     TIME TO PEAK    (hrs)=    8.000
     RUNOFF VOLUME    (mm)=   80.171
     TOTAL RAINFALL   (mm)=  130.888
     RUNOFF COEFFICIENT   =     .613

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------------
100:0008-----------------------------------------------------------------------------
*# CATCHMENT 204 - EXTERNAL AREAS uncontrolled
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .03
| 03:204    DT= 1.00 |   Total Imp(%)=   21.00   Dir. Conn.(%)=   21.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          .03
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=       6.50         4.50
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     171.05       115.77
                over (min)        1.00         2.00
     Storage Coeff.  (min)=        .32 (ii)    1.69 (ii)
     Unit Hyd. Tpeak (min)=       1.00         2.00
     Unit Hyd. peak  (cms)=       1.62          .62
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .00          .01           .012 (iii)
     TIME TO PEAK    (hrs)=       7.92         8.00          8.000
     RUNOFF VOLUME    (mm)=     129.89        80.23         90.658
     TOTAL RAINFALL   (mm)=     130.89       130.89        130.888
     RUNOFF COEFFICIENT   =        .99          .61           .693

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  78.0    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.

-------------------------------------------------------------------------------------
100:0009-----------------------------------------------------------------------------
*# Total FLOW to King St (Internal + external)
-----------------------
| ADD HYD (PropSite  ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 03:204             .03     .012    8.00  90.66    .000
                    +ID2 08:SITE            .13     .023    8.00 113.74    .000
                     ==========================================================
                     SUM 06:PropSite        .17     .035    8.00 109.04    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------
100:0010-----------------------------------------------------------------------------
*****************************************************************************
* RUN REMAINING DESIGN STORMS (TOWN OF HALTON HILLS 5 TO 100-YR)
*
-------------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------------
*
-------------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------------
*
-------------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------------
*
-------------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------------
*
-------------------------------------------------------------------------------------
100:0002-----------------------------------------------------------------------------
      FINISH
-------------------------------------------------------------------------------------
*************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2025-02-13     at 11:04:37
=====================================================================================
```

The multi-disciplinary nature of successful SWM systems within the context of urban development requires integrated and collaborative design teams with expertise and credentials in the fields of engineering, planning/architecture, hydrogeology, water quality, geomorphology, ecology, fisheries, landscape architecture and others.

2.5 Summary of Stormwater Management Design Criteria

A summary of SWM design criteria is provided in Table 2-2. Further information is provided in subsequent sections and their respective appendices.

Table 2-2: Summary of Stormwater Management Design Criteria

Stormwater Management Design Criteria	Additional Information / Comments
FLOODING (Section 3) • Post to Pre control of peak flows to the appropriate Watershed Flood Control Criteria as shown in Table 3.1 and on Figure 3.2. • For Cooksville Creek watershed, all new, redeveloped, and intensified land developments are required to control post-developed storm runoff rates from all storm events up to the 100-year design storm to the 2-year pre-development condition. • For remaining tributaries draining to Lake Ontario refer to Table 3.2 and on and Figure 3.3. • Consult CVC staff about requirements for on-site controls to confirm recommendations of earlier studies (i.e. Credit River Water Management Strategy study report (Triton Engineering Services, 1990) and Credit River Flow Management study (Philips Engineering Ltd., 2007)	1. Development defined by latest approved watershed hydrology model 2. Hydrologic study may be required to update approved hydrology for lands beyond current Official Plans 3. Have regard for Natural Hazard and drainage density requirements. 4. Downstream assessment is required for large sites with multiple SWM facilities or developments that will have a potential to dramatically impact downstream areas;
EROSION (Section 4) • At a minimum detain 5 mm on site where conditions do not warrant the detailed analyses described in Section 4.3. • If a site drains to a sensitive creek, or a subwatershed study or EIR is required, then the proponent must complete a geomorphologic assessment study to determine the site appropriate erosion threshold (refer to Figure 4-1). • For sites with SWM ponds, 25mm-48hr detention may also be required, depending on the results of the erosion assessment.	• At the subwatershed study or EIR scale, or for sites discharging to sensitive watercourse reaches, detailed erosion analyses are required to establish suitable erosion criteria • Consultation with CVC staff is required to establish erosion methodologies and criteria, particularly where more detailed erosion analyses are required per Figure 4-1. • Appendix A provides detailed guidance on the evaluation of stormwater management criteria pertaining to erosion

Stormwater Management Design Criteria	Additional Information / Comments
WATER QUALITY (Section 5) • Enhanced Level of Protection (80% TSS removal) as per the latest MOE SWMPD Manual is required. • Where applicable, water quality controls should be further informed by goals and objectives arising out of applicable subwatershed studies and source water protection plans. • To minimize thermal impacts, preventative measures (i.e. LID practices) and mitigation measures should be applied.	• Refer to CVC/TRCA's LID Guide (2011) for LID design guidance • For stormwater management facility design, planting plan and outfall design guidance are provided in Appendix D. • Refer to CVC Study Report: Thermal Impacts of Urbanization including Preventative and Mitigation Techniques (2011) • Designers should consult with MNR for development adjacent to species at risk or their habitats. • Planning for stormwater pollution prevention is essential to achieve stormwater quality targets. Refer to CVC website: *www.creditvalleyca.ca* for factsheets on pollution prevention opportunities.
WATER BALANCE (Section 6) • For Significant, Ecologically Significant, High and Medium Volume Groundwater Recharge Areas (SGRA, EGRA, HGRA and MGRA), site specific water balance analyses and maintenance of recharge are required. • For Low Volume Groundwater Recharge Areas (LGRA), provided the site does not impact a sensitive ecological feature, or require a subwatershed study, or EIR, the proponent has the option to provide a minimum post-development recharge of the first 3 mm for any precipitation event; or complete a site-specific water balance to identify pre-development groundwater recharge rates to be maintained post-development. • For natural features (woodlands, wetlands, watercourses) maintain hydrologic regimes and hydroperiods to avoid adverse effects on the features.	• At the subwatershed study or EIR scale, site specific water balance analyses are required, and maintenance of recharge may be required pending the outcome of the analyses, per Figure 6-1. • Regardless of the Recharge Area Type (SGRA, etc.), presence of a sensitive ecological feature that may be impacted by development triggers the need for a site specific water balance analysis and maintenance of recharge, per Section 6.2.2. • Planning and design of infiltration facilities must consider soil conditions, depth to water table, and the presence of vulnerable areas such as Wellhead Protection Areas (WHPA's, Appendix B). • Consultation with CVC is required to establish water balance methodologies and criteria, particularly for sensitive ecological features where baseline monitoring is necessary to establish appropriate criteria, per Figure 6-2.

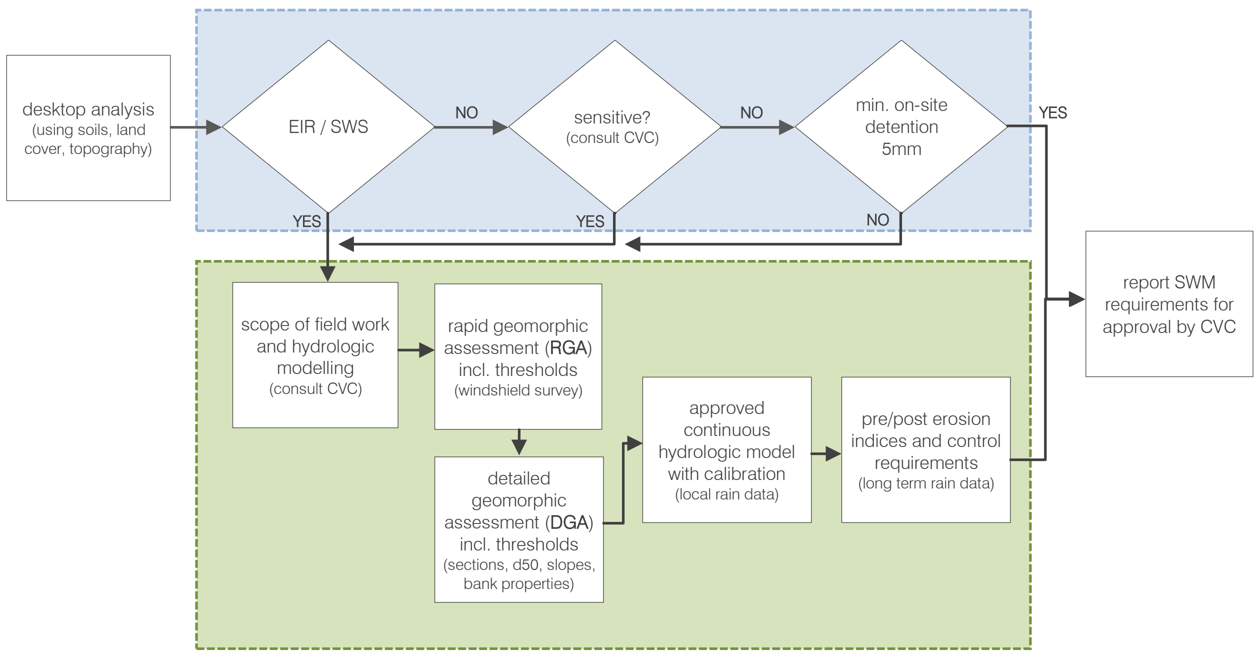
It is important to note that the criteria outlined in Table 2-2 represent a minimum requirement that may be superseded by the results of further studies and local constraints, proponents should consult with CVC staff to confirm the criteria and discuss variances if necessary. In addition, some proposed SWM approaches may address multiple criteria simultaneously. For example, an erosion target of 5mm and a water balance target of 12mm are not cumulative – a site target of 12mm will address both the erosion and water balance criteria.

uses, crossings, etc.). In all cases, proponents should consult with CVC staff to confirm the criteria to be applied. Please refer to **Appendix A** for more information.

4.3 Erosion Control Methodology of Analysis

The overall methodology of defining erosion mitigation practices for a proposed development or project is summarized in **Figure 4-1**, illustrating the minimum 5mm on-site detention requirement where comprehensive studies have not been completed, and where the sensitivity of the receiving watercourses do not warrant a more comprehensive analysis of the erosion potential associated with urban development. In cases where the detailed analysis is required, **Figure 4-1** summarizes the required methodology, with more detailed information provided in **Appendix A**.

Figure 4-1: Erosion Scope of Analysis



Note: The noted minimum 5 mm detention volume requirements should be above the initial abstraction.

In general the detailed methodology yields the discretization of a watershed into relatively homogeneous river reaches, the rapid assessment of the geomorphic stability of a reach, and determination of the erosion threshold of a watercourse. Together these elements provide the information necessary to compare pre- and post-development scenarios, and define the measures required to effectively mitigate the erosion related impacts of development. Continuous hydrologic modelling, with calibration, is necessary to establish the pre- and post-development erosion indices and associated SWM requirements. Modelling guidance is provided in **Section 2.3** and **Appendix A**.

Stormceptor® EF Sizing Report

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

02/10/2025

Province:	Ontario
City:	georgetown
Nearest Rainfall Station:	TORONTO INTL AP
Climate Station Id:	6158731
Years of Rainfall Data:	20
Site Name:	
Drainage Area (ha):	0.12
% Imperviousness:	76.00

Runoff Coefficient 'c': 0.75

Project Name:	37 king st
Project Number:	60793_001
Designer Name:	Anisa Bhatti
Designer Company:	MTE
Designer Email:	ABhatti@mte85.com
Designer Phone:	647-804-1862
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):	2.82
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	110
Estimated Average Annual Sediment Volume (L/yr):	89

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	98
EFO5	99
EFO6	100
EFO8	100
EFO10	100
EFO12	100

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 98

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.

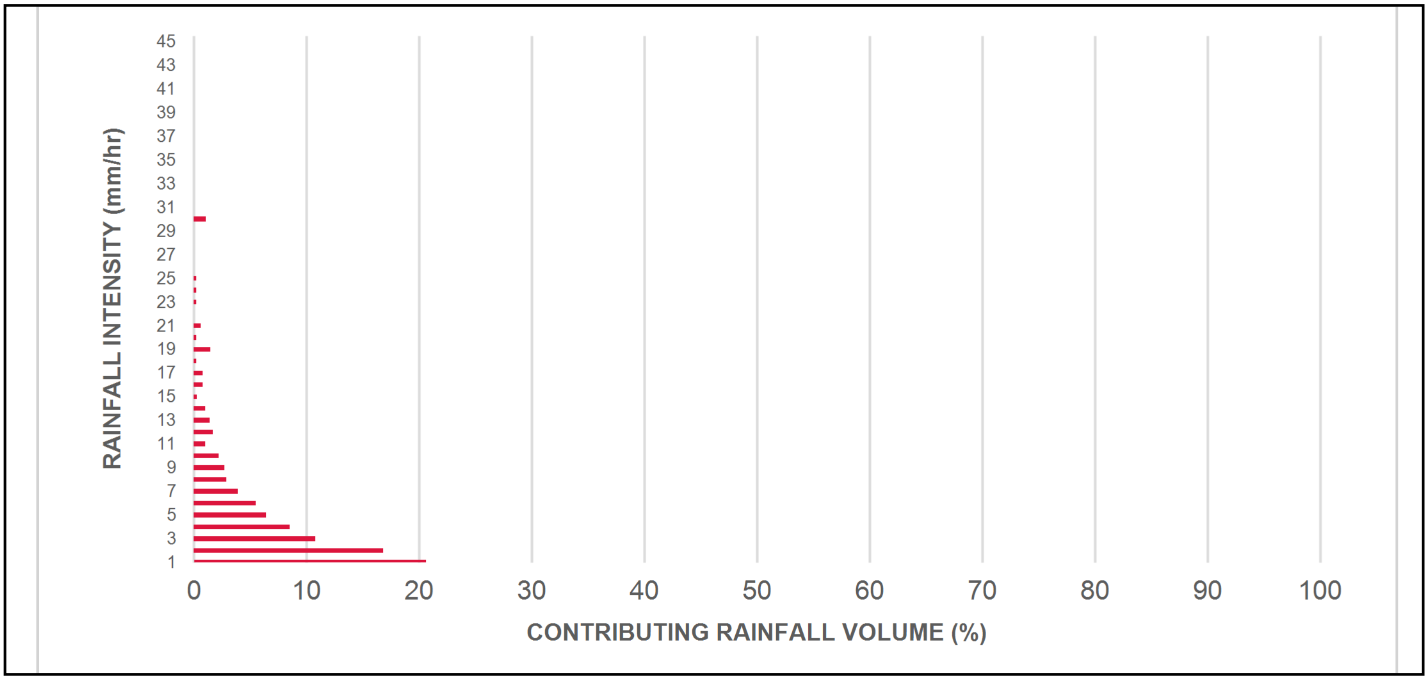
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

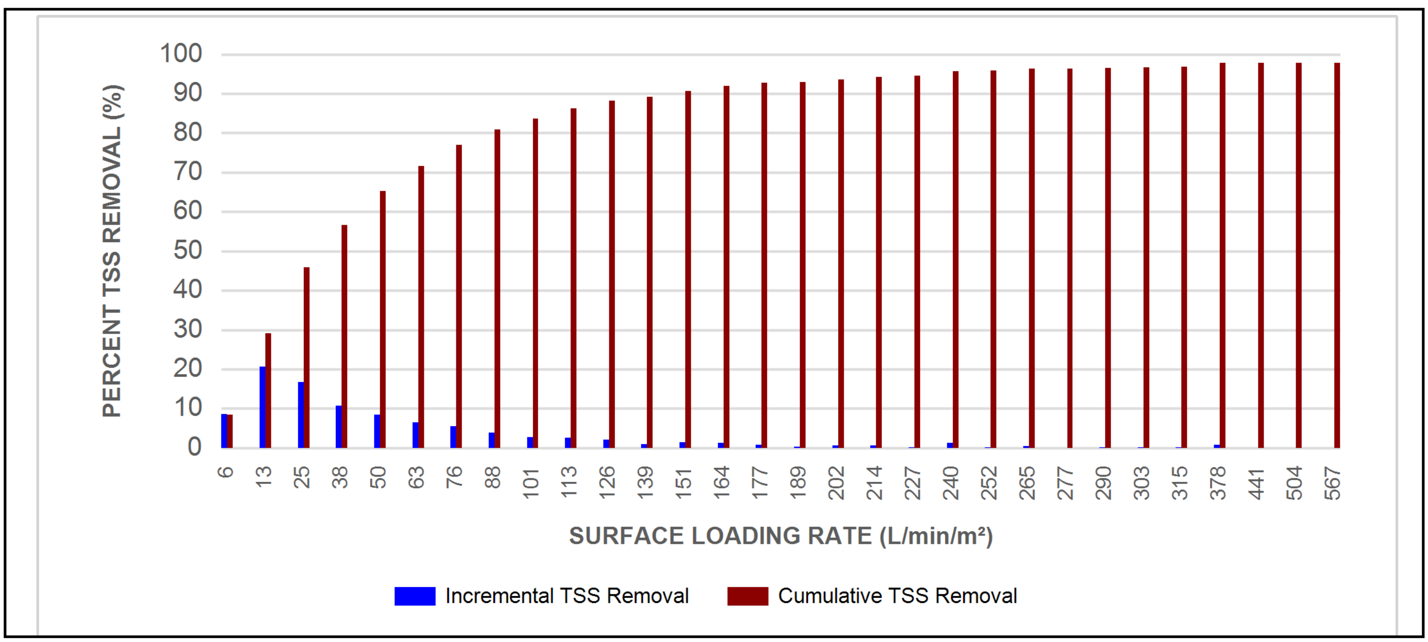
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	0.13	8.0	6.0	100	8.5	8.5
1.00	20.6	29.1	0.25	15.0	13.0	100	20.6	29.1
2.00	16.8	45.9	0.50	30.0	25.0	100	16.8	45.9
3.00	10.8	56.7	0.76	45.0	38.0	100	10.8	56.7
4.00	8.5	65.2	1.01	61.0	50.0	100	8.5	65.2
5.00	6.4	71.6	1.26	76.0	63.0	100	6.4	71.6
6.00	5.5	77.0	1.51	91.0	76.0	100	5.5	77.0
7.00	3.9	81.0	1.77	106.0	88.0	98	3.9	80.9
8.00	2.9	83.9	2.02	121.0	101.0	96	2.8	83.7
9.00	2.7	86.5	2.27	136.0	113.0	95	2.5	86.2
10.00	2.2	88.7	2.52	151.0	126.0	93	2.0	88.2
11.00	1.0	89.7	2.77	166.0	139.0	92	0.9	89.1
12.00	1.7	91.3	3.03	182.0	151.0	89	1.5	90.6
13.00	1.4	92.8	3.28	197.0	164.0	88	1.3	91.9
14.00	1.0	93.7	3.53	212.0	177.0	87	0.8	92.7
15.00	0.3	94.0	3.78	227.0	189.0	84	0.3	93.0
16.00	0.8	94.8	4.04	242.0	202.0	83	0.7	93.6
17.00	0.8	95.7	4.29	257.0	214.0	83	0.7	94.3
18.00	0.2	95.8	4.54	272.0	227.0	82	0.2	94.5
19.00	1.5	97.3	4.79	288.0	240.0	81	1.2	95.7
20.00	0.2	97.5	5.04	303.0	252.0	81	0.2	95.8
21.00	0.6	98.2	5.30	318.0	265.0	80	0.5	96.3
22.00	0.0	98.2	5.55	333.0	277.0	80	0.0	96.3
23.00	0.2	98.4	5.80	348.0	290.0	79	0.2	96.5
24.00	0.2	98.6	6.05	363.0	303.0	78	0.2	96.7
25.00	0.2	98.9	6.31	378.0	315.0	78	0.2	96.9
30.00	1.1	100.0	7.57	454.0	378.0	75	0.9	97.8
35.00	0.0	100.0	8.83	530.0	441.0	72	0.0	97.8
40.00	0.0	100.0	10.09	605.0	504.0	69	0.0	97.8
45.00	0.0	100.0	11.35	681.0	567.0	66	0.0	97.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**98 %**

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
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

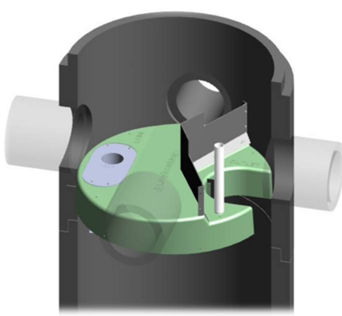
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

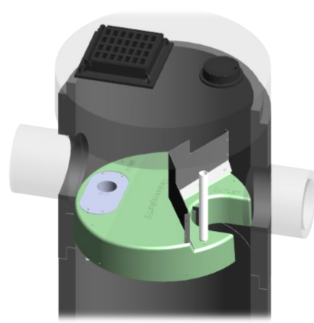
DESIGN FLEXIBILITY

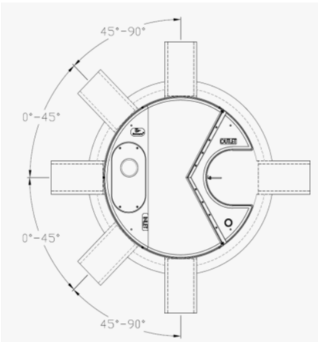
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

STANDARD PERFORMANCE SPECIFICATION FOR
"OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT 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
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

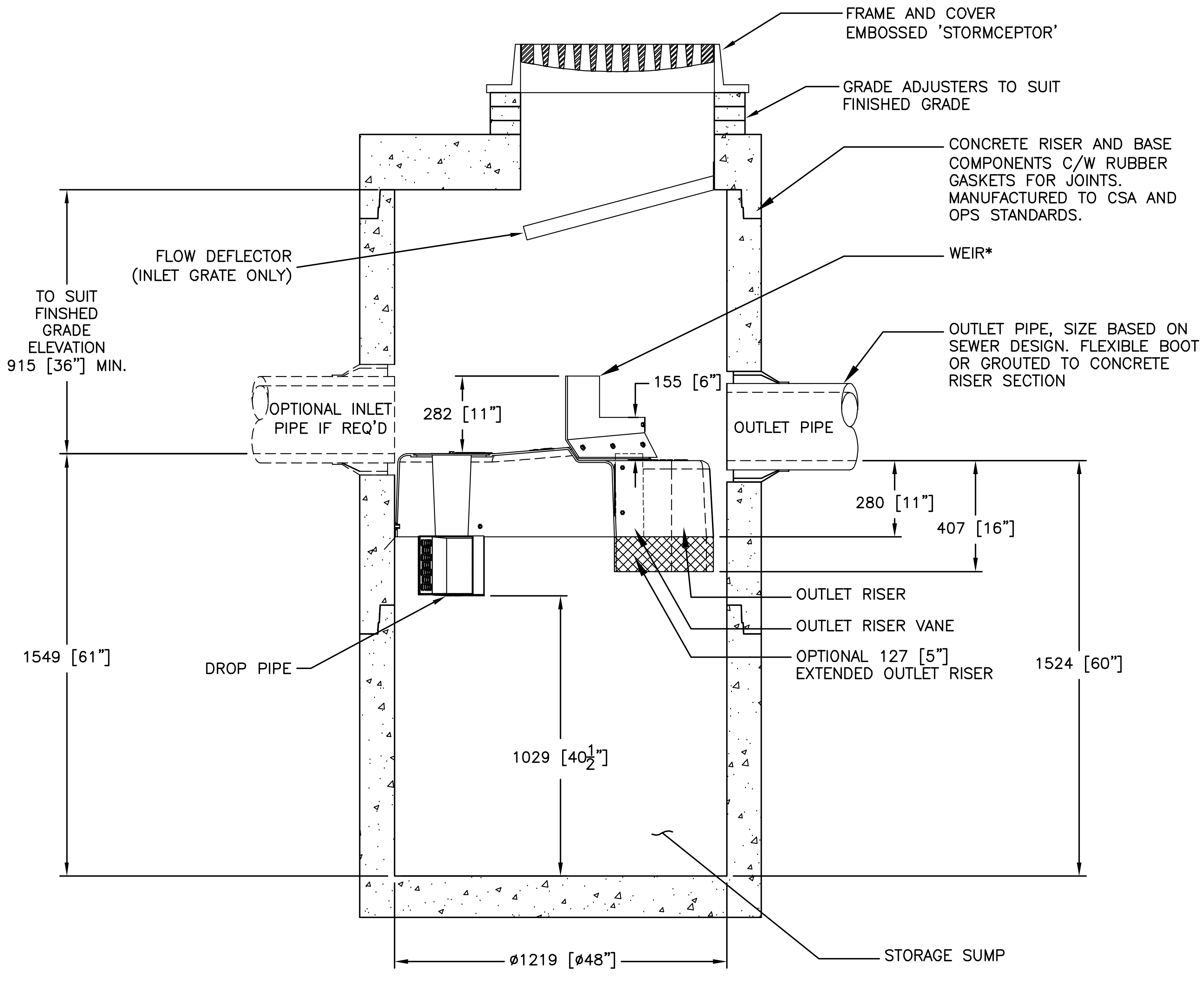
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

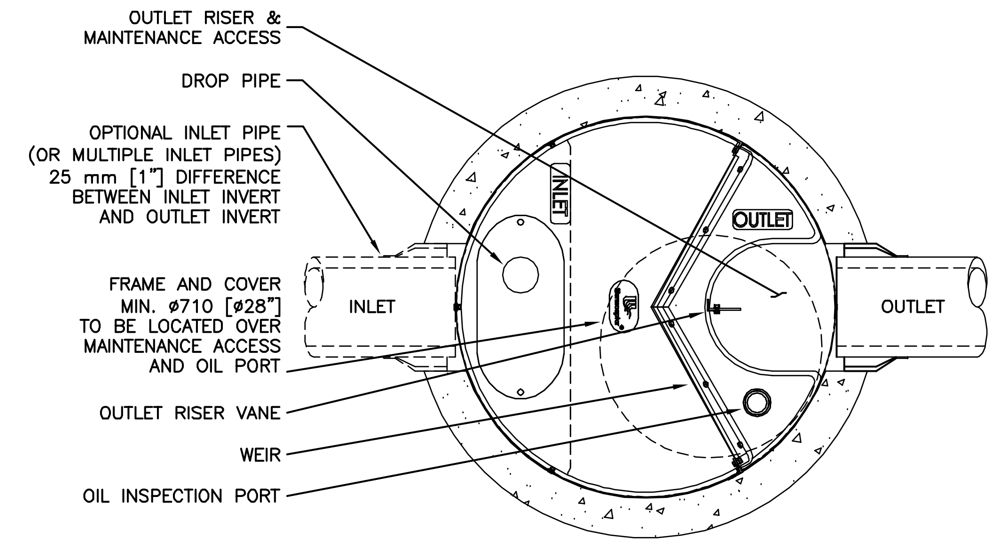
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

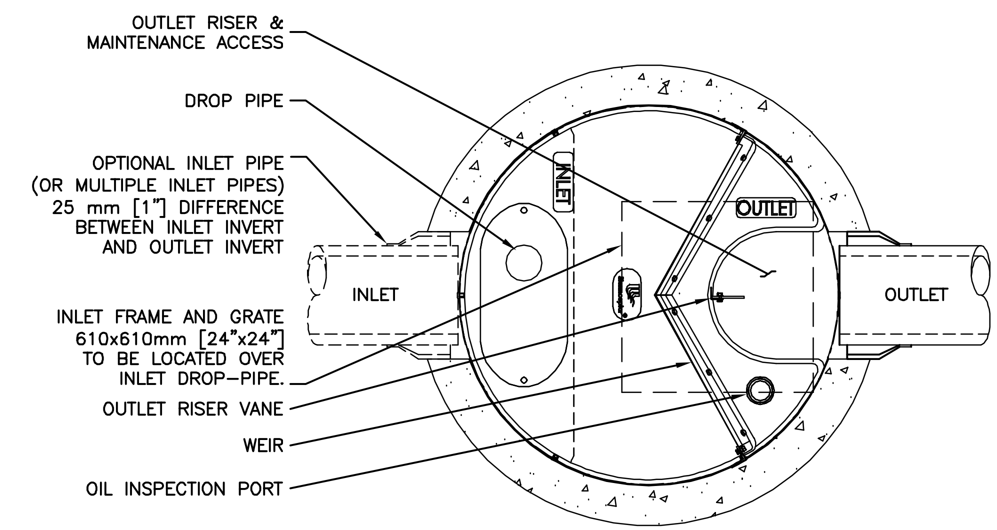
3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five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



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

GENERAL NOTES:

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

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

INSTALLATION NOTES

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

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL		EFO4			
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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

Stormceptor® EF

SCALE = NTS

imbrium

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

Appendix C

Sanitary Demand Calculations

FOR PIPES FLOWING FULL

GRADE	150 mm		200 mm		250 mm		300 mm		375 mm	
%	V	Q	V	Q	V	Q	V	Q	V	Q
6.00	2.134	.039	2.585	.084	2.999	.152	3.387	.247	3.930	.448
5.00	1.948	.036	2.359	.077	2.738	.139	3.092	.226	3.587	.409
4.00	1.742	.032	2.110	.068	2.449	.124	2.765	.202	3.209	.366
3.50	1.630	.030	1.974	.064	2.291	.116	2.587	.189	3.002	.342
3.00	1.509	.028	1.828	.059	2.121	.108	2.395	.175	2.779	.317
2.50	1.377	.025	1.668	.054	1.936	.098	2.186	.160	2.537	.289
2.00	1.232	.023	1.492	.048	1.732	.088	1.955	.143	2.269	.259
1.80	1.169	.021	1.416	.046	1.643	.083	1.855	.136	2.153	.246
1.60	1.102	.020	1.335	.043	1.549	.079	1.749	.128	2.029	.231
1.50	1.067	.020	1.292	.042	1.500	.076	1.693	.124	1.965	.224
1.40	1.031	.019	1.248	.041	1.449	.073	1.636	.119	1.898	.216
1.30	0.993	.018	1.203	.039	1.396	.071	1.576	.115	1.829	.209
1.20	0.954	.017	1.156	.038	1.341	.068	1.515	.111	1.758	.200
1.10	0.914	.017	1.107	.036	1.284	.065	1.450	.106	1.683	.192
1.00	0.871	.016	1.056	.034	1.224	.062	1.383	.101	1.604	.183
0.98	0.862	.016	1.045	.034	1.212	.061	1.369	.100	1.588	.181
0.96	0.853	.016	1.034	.034	1.200	.061	1.355	.099	1.572	.179
0.94	0.844	.015	1.023	.033	1.187	.060	1.341	.098	1.556	.177
0.92	0.835	.015	1.012	.033	1.174	.060	1.326	.097	1.539	.176
0.90	0.826	.015	1.001	.033	1.162	.059	1.312	.096	1.522	.174
0.88	0.817	.015	0.990	.032	1.149	.058	1.297	.095	1.505	.172
0.86	0.808	.015	0.979	.032	1.135	.058	1.282	.094	1.488	.170
0.84	0.798	.015	0.967	.031	1.122	.057	1.267	.093	1.470	.168
0.82	0.789	.014	0.956	.031	1.109	.056	1.252	.091	1.453	.166

Diameters shown in table are nominal. Q and V are based on imperial I.D.s

1 m^3/s = 1000 litres per second

V = Metre per second

Q = $Metre^3$ per second

n = 0.013

To obtain V and Q if n = 0.010, multiply values in the table by 1.300

THE REGIONAL MUNICIPALITY OF HALTON PLANNING AND PUBLIC WORKS DEPARTMENT	Date FEBRUARY 2001	Rev.	NTS
VELOCITY AND DISCHARGE FOR 150mm TO 375mm CIRCULAR PIPE	APPROVED Mar. 12/01 DIRECTOR, ENGINEERING SERVICES		
	REGION STANDARD RH 2000.01		

FOR PIPES FLOWING FULL

GRADE %	150 mm V	150 mm Q	200 mm V	200 mm Q	250 mm V	250 mm Q	300 mm V	300 mm Q	375 mm V	375 mm Q
0.80	0.779	.014	0.944	.031	1.095	.056	1.237	.090	1.435	.164
0.78	0.769	.014	0.932	.030	1.081	.055	1.221	.089	1.417	.162
0.76	0.759	.014	0.920	.030	1.067	.054	1.205	.088	1.399	.160
0.74	0.749	.014	0.908	.030	1.053	.053	1.189	.087	1.380	.157
0.72	0.739	.014	0.895	.029	1.039	.053	1.173	.086	1.361	.155
0.70	0.729	.013	0.883	.029	1.024	.052	1.157	.084	1.342	.153
0.68	0.718	.013	0.870	.028	1.010	.051	1.140	.083	1.323	.151
0.66	0.706	.013	0.857	.028	0.995	.050	1.123	.082	1.303	.149
0.64	0.697	.013	0.844	.027	0.980	.050	1.106	.081	1.284	.146
0.62	0.686	.013	0.831	.027	0.964	.049	1.089	.080	1.263	.144
0.60	0.675	.012	0.817	.027	0.948	.048	1.071	.078	1.243	.142
0.58	0.663	.012	0.804	.026	0.932	.047	1.053	.077	1.222	.139
0.56	0.652	.012	0.790	.026	0.916	.046	1.035	.076	1.201	.137
0.54	0.640	.012	0.775	.025	0.900	.046	1.016	.074	1.179	.134
0.52	0.628	.012	0.761	.025	0.883	.045	0.997	.073	1.157	.132
0.50	0.616	.011	0.746	.024	0.866	.044	0.978	.071	1.135	.129
0.48	0.603	.011	0.731	.024	0.848	.043	0.958	.070	1.112	.127
0.46	0.591	.011	0.716	.023	0.830	.042	0.938	.068	1.088	.124
0.44	0.578	.011	0.700	.023	0.812	.041	0.917	.067	1.064	.121
0.42	0.565	.010	0.684	.022	0.794	.040	0.896	.065	1.040	.119
0.40	0.551	.010	0.667	.022	0.774	.039	0.874	.064	1.015	.116
0.35	0.515	.009	0.624	.020	0.724	.037	0.818	.060	0.949	.108
0.30	0.477	.009	0.578	.019	0.671	.034	0.757	.055	0.879	.100
0.25	0.436	.008	0.528	.017	0.612	.031	0.691	.050	0.802	.091
0.20	0.390	.007	0.472	.015	0.548	.028	0.618	.045	0.718	.082

Diameters shown in table are nominal. Q and V are based on imperial I.D.s

1 m^3 /s = 1000 litres per second

V = Metre per second

Q = $Metre^3$ per second

n = 0.013

To obtain V and Q if n = 0.010, multiply values in the table by 1.300

THE REGIONAL MUNICIPALITY OF HALTON PLANNING AND PUBLIC WORKS DEPARTMENT	Date FEBRUARY 2001	Rev.	NTS
VELOCITY AND DISCHARGE FOR 150mm TO 375mm CIRCULAR PIPE	APPROVED Mar. 12/01 DIRECTOR, ENGINEERING SERVICES		
	REGION STANDARD RH 2000.02		

B.9. CONNECTIONS FROM MAIN TO STREET LINE

a) Single family and semi-detached dwellings in residential areas shall have a minimum 125 mm diameter street line connection. All other connections shall be a minimum 150 mm in diameter. Where a single service serves two homes, a minimum pipe diameter shall be 150 mm.

Where the diameter of the lateral connection is greater than or equal to half the diameter of the wastewater main, the connection shall be made with a tee-wye or wye connection.

b) The minimum and maximum cover at property line shall be 2.15 m and 2.75 m respectively. A 2% minimum grade for lateral connections shall be maintained.

c) In multiple family blocks in residential areas, the lateral connections shall meet the following requirements:

TABLE B.9.1 Connection Size and Grade

Diameter of Drain (mm)	Slope of Drain	
	2.0 %	4.0 %
	Maximum No. of Fixture Units Per Connection	
125	480	575
150	840	1000
200	1920	2300
250	3500	4200
300	5600	6700
375	10000	12000

PROPOSED RESIDENTIAL DEVELOPMENT
37 King Street
Georgetown, Halton Hills
Project No: 60793_001
Date: February 2025
By: ASB

$$M = 1 + \frac{14}{4 + p^{0.5}}$$

where: M = ratio of peak flow to average flow
P = the tributary equivalent population in thousands

Total Site Area	**0.1357**	**ha**
Area of towntomes	0.0246	ha
Area of semi-detached homes	0.0088	ha

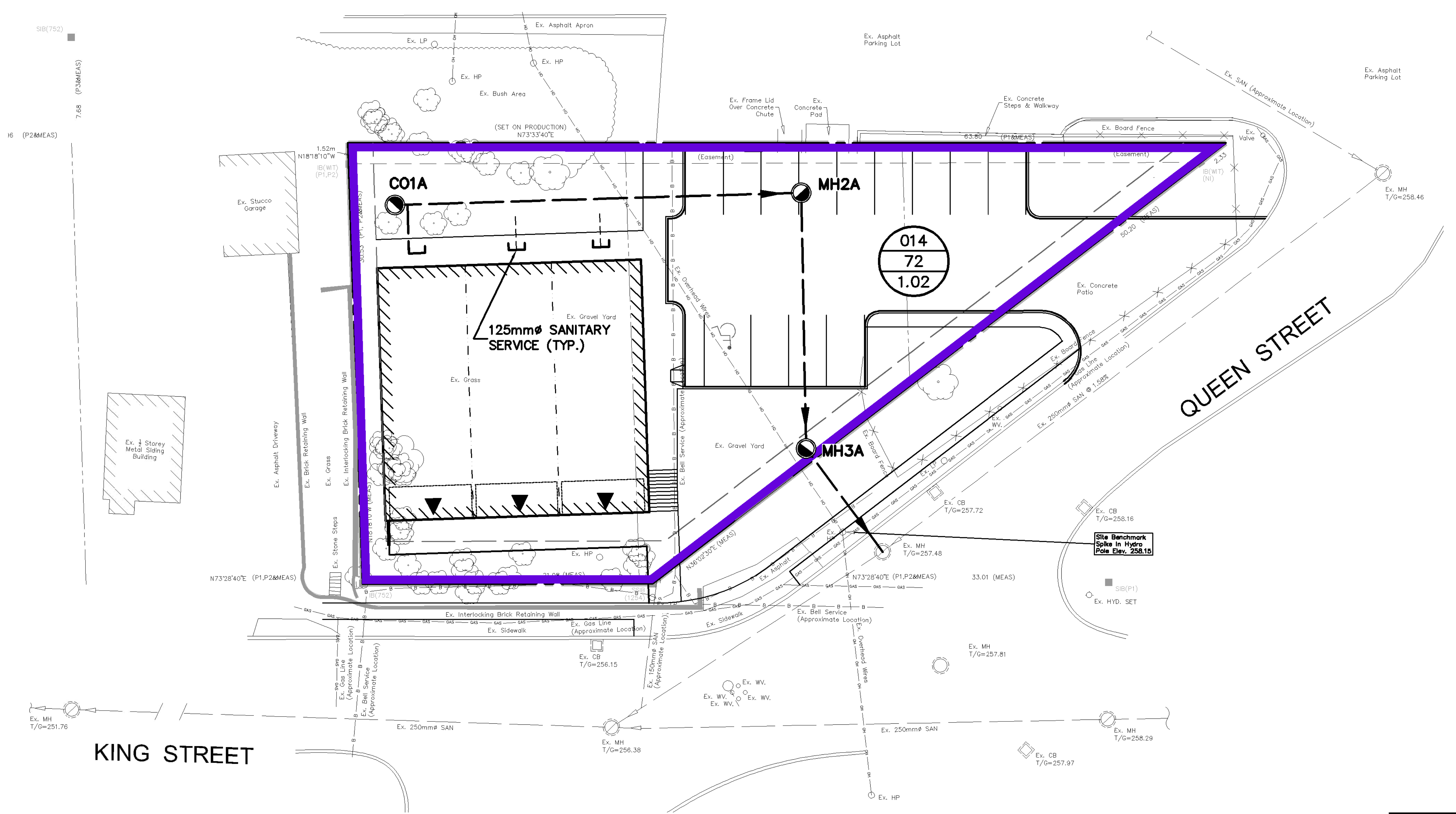
	Number of Blocks	Population Density (ppu)[A]	Population	Equivalent Population Density (ppha)	Peel Region Standard Population Density (ppha)	Worst-Case Population
Proposed Development	12	6	72	2927	135	72
Total	**12**		**72**			**72**

	Design Population	Litres/Capita/ Day[B]	Total Flow (L/day)	Average Dry Weather Flow (L/s)	Harmon Peaking Factor (M)	Peak Flow (L/s)	Peak Flow (m^3/s)	With infiltration allowance[C]	Peak flow (L/s)
Proposed Development	72	275.0	19,800	0.23	4.28	0.98	0.00098		0.98
Total	**72**	**275.0**	**19,800**	**0.23**	**4.28**	**0.98**	**0.000981**	0.00102	**1.02**

[A] Population Density based on *OBC Section 3.1.17.1, Clause 1(b)* . 2 persons per bedroom

[B]Domestic sewage flows are based upon a unit sewage flow of 275Lpcd according to *Halton Design Criteria, Contract Specifications and Standard Drawings Manual*

[C]Infiltration allowance is 0.000286 m^3/s/ha according to *Halton Design Criteria, Contract Specifications and Standard Drawings Manual*



LEGEND

	SITE BOUNDARY		SANITARY CATCHMENT AREA
Ex. 300mmø SAN — Ex. MH	EXISTING SANITARY SEWER	0.14 / 50 / 0.5	AREA (Ha) / ESTIMATED POPULATION / PEAK SANITARY FLOW (l/s)
MH	PROPOSED SANITARY SEWER		

MTE
Engineers, Scientists, Surveyors

PROJECT
37 KING STREET, GEORGETOWN

TITLE
SANITARY CATCHMENT AREAS

Drawn	Scale	Figure
AXG	1:300	**Figure 4**
Checked: RNC	Project No.: 60793_001	
Date (yyyy-mm-dd): 2025-02-07	Rev No.: 0	

CAD: P:\P\60793_001\60793_001-F3.DWG

Plot Date: February 14, 2025 – 10:45 AM

PROJECT NO. : 60793_001

LOCATION: 37 King Street, Georgetown
Halton Hills, Ontario

THE REGIONAL MUNICIPALITY OF HALTON
SANITARY SEWER DESIGN

pvc n = 0.013

DATE: February 4, 2025

DESIGNED BY: ASB

CHECKED BY:

STREET	MANHOLE		LENGTH (m)	TRIBUTARY AREA (Ha)		POPULATION		AVERAGE (L/s)	AVERAGE (L/s)	PEAK FACTOR	MAX (L/s)	INFILTRATION (L/s)	MAX FLOW EXPECT. (L/s)	SEWER							PIPE		REMARKS
	FROM	TO		Increment Res	TOTAL	Increment Res	TOTAL	Increment	Total					SIZE (mm)	SLOPE (%)	Q (L/s)	Q (L/s) (Full)	V (m/s) FULL FLOW	V (m/s) ACTUAL FLOW	% Full	TYPE	CLASS	
On Site	MH3A	MH2A	28.3	0.035		72	72	0.23	0.23	4.28	0.98	0.010	0.991	200	1.0%	0.99	32.80	1.04	0.0315	3.02%	PVC		
	MH2A	MH1A	15.8	0.101								0.029	1.020	200	1.0%	1.02	32.80	1.04	0.0325	3.11%	PVC		
	MH1A	Ex Sewer	9.2	0.034								0.000	1.020	200	1.4%	1.02	38.81	1.24	0.0325	2.63%	PVC		
Queen St	EXMH	EXMH	45.5										1.020	250	1.58%	1.02	74.75	1.52	0.0208	1.36%	PVC		

Appendix D

Water Demand Calculations

STATIC: 70 PSI

(1) 657 USGPM@ 69 PSI

(2) 1001 USGPM@ 68 PSI

(3) 1957 USGPM@ 65 PSI

NAME OF RISK: FILE NO.:

STREET: 37 KING STREET.

CITY: GEORGETOWN. ONT.

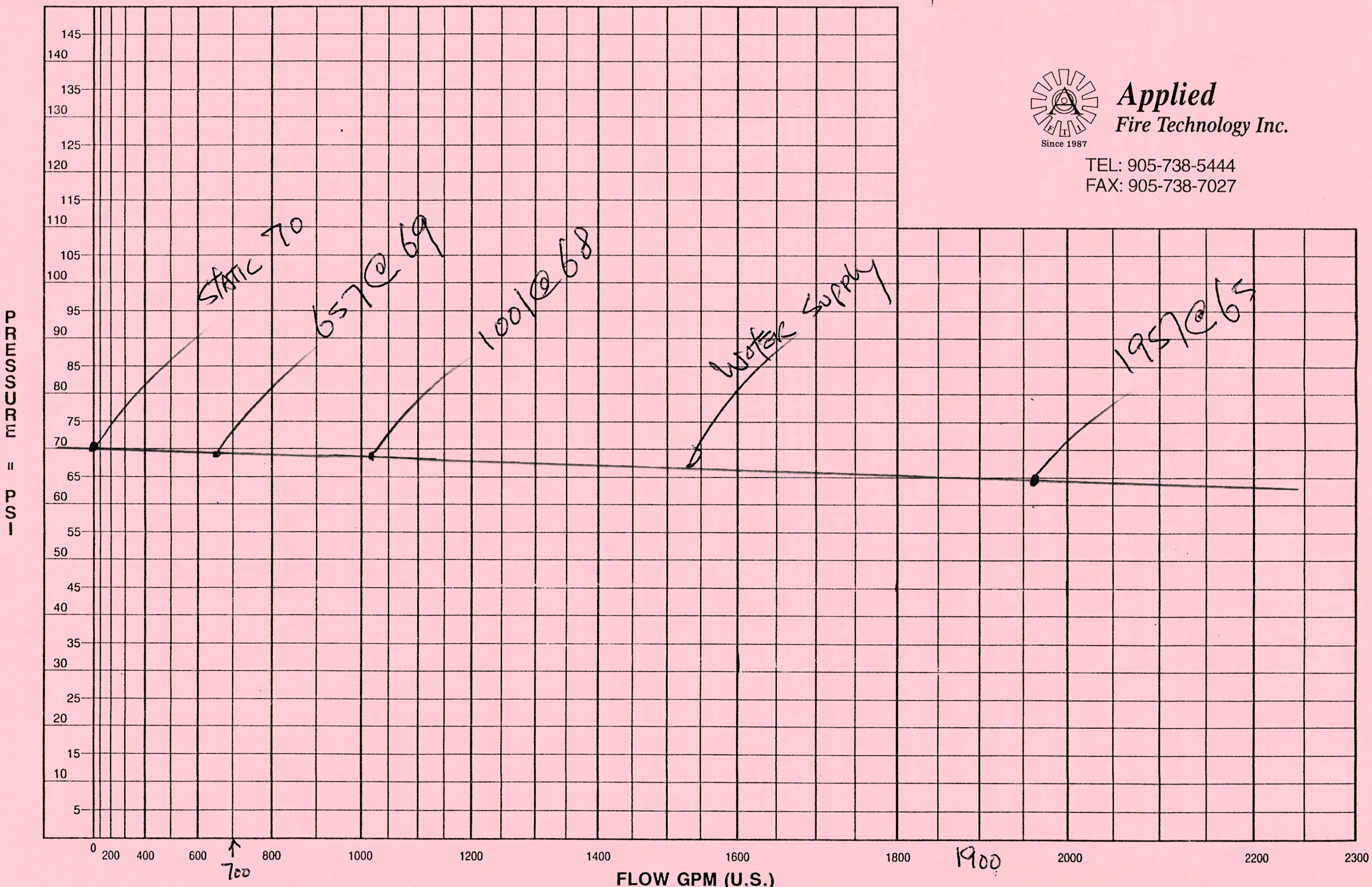
DATE: OCT 9, 2018 BY: AFTI

Applied Fire Technology Inc.

Since 1987

TEL: 905-738-5444

FAX: 905-738-7027



LCED (H.O.) 102

Applied
Fire Technology Inc.
Since 1987
Design • Consulting • Testing • Inspection

WATER SUPPLY TEST

Name of risk: .... File No.: ....

Address: 37 KING STREET. Test by: AFTI

Municipality: GEORGETOWN, ONT. Date: OCT. 9. 2018

SYSTEM DATA:

Size of Main: 6" Dead End: .... Two Ways: ✓ Loop: ....

Source Reliable: YES If not explain: ....

Comments: ....

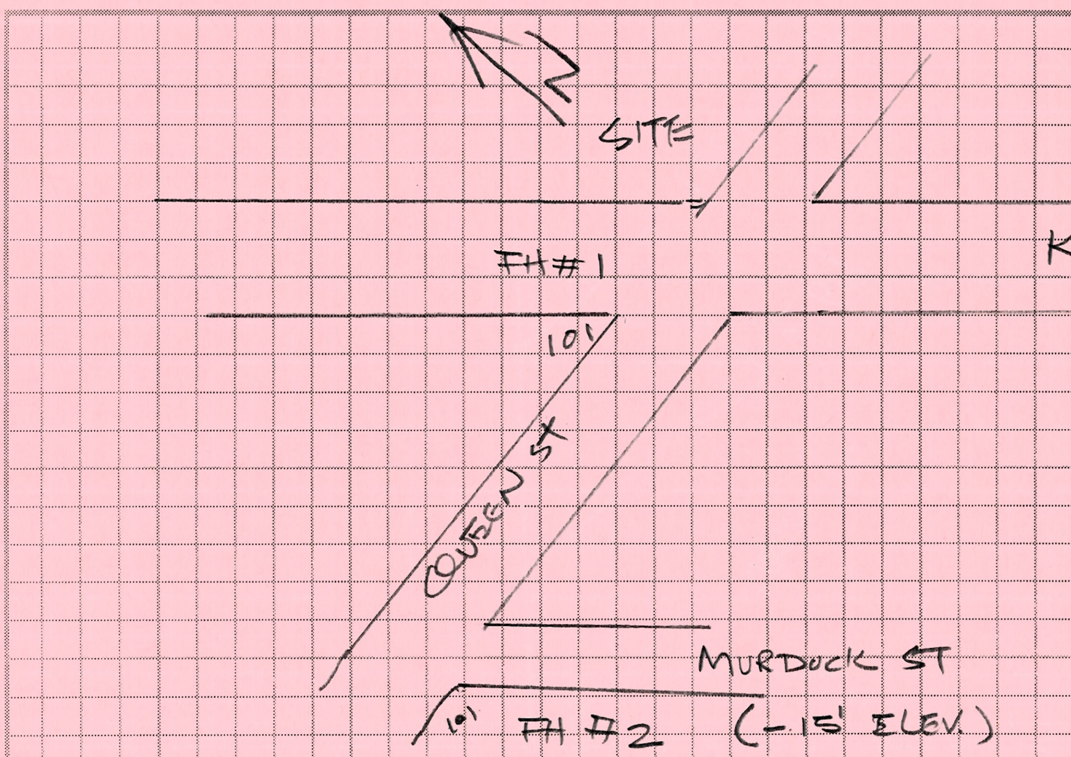
TEST DATA:

Location of test fire hydrants; Residual: #1 45 QUEEN ST AT KING STREET, GEORGETOWN

Flow: #2 46 QUEEN ST. AT MURDUCK STREET, GEORGETOWN.

Static pressure 70 psi Time: 11^00 A.M. — P.M.

Test No.	No. of Outlets	Orifice Size (in.)	Pitot Reading (psi)	Equivalent Flow gpm (U.S.)	Total Flow gpm (U.S.)	Residual Pressure (psi)	Comments
1	1	1¾	52	657	657	69	0.997
2	1	2½	45	1251.5	1001	68	0.8
3	2	2½	43, 43	2446	1957	65	0.8
4							0.8



Sketch by: RW
Scale: NTS

Name and address of municipal authority who should receive a copy.

PUC

37 King Street
Georgetown, Halton Hills
Project No: 60793_001
Date: February 2025
By: ASB

Peaking Factors[1]:	
Avg. Day	1.0
Max. Day	2.25
Peak Hour	4.0

Water Demand Calculations

	Residential				Commercial				Final Demand		
Unit type	Units (ea)	persons per unit[2]	Population (persons)	Demand (L/s)	Floor Area (m^2)	Population Density (m^2/person)	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 Units											
Townhomes	12	6	72	0.2292					0.23	0.52	0.92
Totals	**12**		**72**	**0.23**					**0.23**	**0.52**	**0.92**

Water Demand[3]		
Average Residential Daily Demands	275	L/d/person
	0.0032	L/s/person

Max Day + Fire Flow Demand (FUS)		
Qmax.day+fire	117	L/s
	10124.5	m^3/d

Fire Flow[4]		
Fire Flow (FUS)	7,000	L/min
	117	L/s

Note 1: Peaking factors based on Halton Design Criteria, Contract Specifications and Standard Drawings Manual
Note 2: Population Density based on OBC Section 3.1.17.1, Clause 1(b). 2 persons per bedroom
Note 3: Water Demands based on Halton Design Criteria, Contract Specifications and Standard Drawings Manual
Note 4: Fire flows from FUS (2020) - See attached worksheet

37 King Street
Georgetown, Halton Hills
Project No: 60793_001
Date: February 2025
By: ASB

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

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

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

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

where:

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" (m^2)	C	Fire Flow "F"		Occupancy		Sprinkler		Exposure		Fire Flow		
			(l/min)	(l/s)	%	Adjusted Fire Flow (L/min)	%	Adjustment (L/min)	%	Adjustment (L/min)	**(L/min)**	**Rounded(L/min)**	**(L/s)**
Townhouse Block	352	1.5	6,000	100.0	-15	5,100	0	0	15	765	5,865	6,000	**100**

(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%
>30m	0%

Exposure Calculations

Townhouse Block		
Direction	Distance of closest building	% increase
N	none within 30 m	0
S	none within 30 m	0
E	none within 30 m	0
W	14.5	15
	Total Exposure:	15

37 King Street
Georgetown, Halton Hills
Project No: 60793_001
Date: January 2021
By: AXB

File: Q:\60793_001\WTM\38412-142-Water Calculations - Domestic and FUS Fire Flow.xlsx

CALCULATION OF RESIDUAL PRESSURE

1. Boundary Conditions (Based on Fire Flow Test Results):					
	Metric		Imperial		
P0 - Starting Pressure	49.23	*meter of head*	70	*psi*	
Required Flow	6031	*L/min*	*1593*	*U.S. gal/min*	(Maximum Day + Fire Flow)
P2 - Residual Pressure	**46.54**	***meter of head***	**66.17**	***psi***	(extrapolated from Hydrant Flow Test)

37 King Street

Georgetown, Halton Hills
Project No: 38412-142
Date: March 2021
By: LFG

LICENSED PROFESSIONAL ENGINEER
G.P. BERENYI
100058712
2021-03-23
Digital Original
PROVINCE OF ONTARIO
38412-142

Hydrant Flow Test Results

Flow (USGPM)	Presure (psi)
0	70
657	69
1001	68
1957	65
7529	20

Max Day + Fire Flow Demand (FUS) =	475	L/s
=	7529	US GPM
Residual Pressure=	20.56	psi