CANDEVCON EAST LIMITED
CONSULTING ENGINEERS & PLANNERS

377 William Street

Functional Servicing and Stormwater Management Report

Joshani Homes Ltd.

Project #E19012

April 2020

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1.0 Introduction and Background

CANDEVCON EAST LIMITED has been retained by Joshani Homes Ltd. to provide a functional servicing and grading design and a stormwater management (SWM) strategy for the proposed residential development in the Town of Cobourg. The subject site is bounded by residential lots to the north, south and west, and William Street to the east. The location of the site, which has a total area of 0.67 hectares (ha), is shown on **Figure 1**. The proposed development will consist of 14 townhouse units, a parking lot area and laneway.

The following documents were reviewed in preparation of this FSSR:

- Technical and Engineering Guidelines for Stormwater Management Submissions, prepared by Ganaraska Region Conservation Authority, December 2014
- Design Guidelines for the Corporation of the Town of Cobourg, revised April 2015
- Stormwater Management Planning and Design Manual (SWMP Manual) prepared by the Ministry of Environment (March 2003)

SUBJECT SITE

N

377 WILLIAM STREET

TOWN OF COBOURG

KEY PLAN

CANDEVCON LIMITED
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Drawn By:	K.D.	Checked By:	A.W.	Proj. No.	E19012
Designed By:	K.D.	Checked By:		DWG. No.	FIG.1
Scale:	NTS	Date:	Apr. 10, 2019		

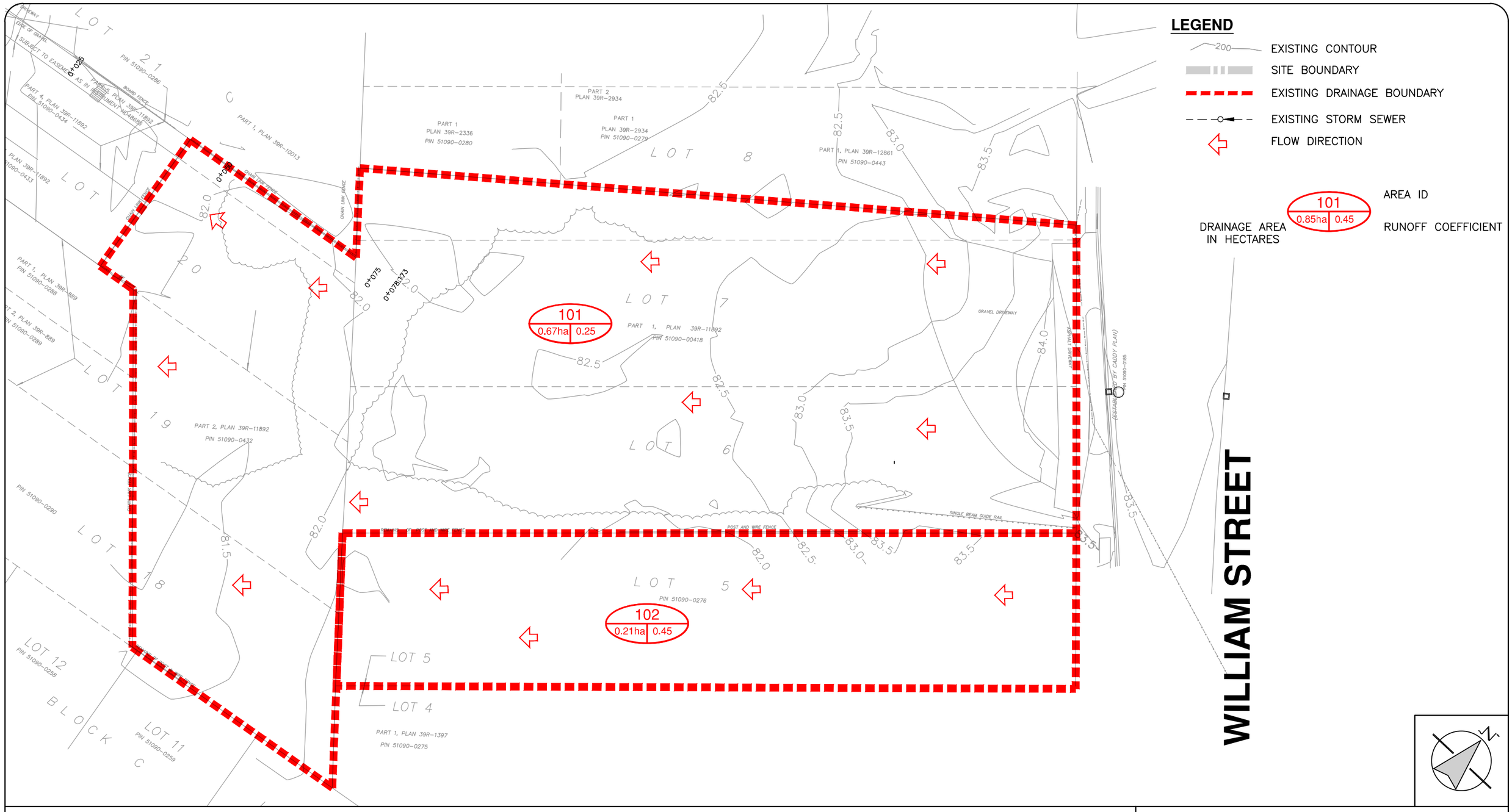
2.0 Site Topography and Grading

2.1 Existing Conditions

Based on the topographical survey prepared by Ivan B. Wallace Ontario Land Surveyor Ltd. (2018), the existing area for the proposed development site gently slopes towards Margaret Street through existing private residences. An external 0.21 ha drainage area to the east drains through the subject property as well. The existing drainage conditions are illustrated on **Figure 2.** The existing site consists of a vacant field with sparse trees.

2.2 Proposed Conditions

Site grades at key points within the proposed development are provided on **Drawing SG**. These target elevations provide guidance for detailed design to ensure the overall grading and major drainage function.



377 WILLIAM STREET

TOWN OF COBOURG

PRE DEVELOPMENT DRAINAGE

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Drawn By: K.D.	Checked By: A.W.	Proj. No. E19012
Designed By: K.D.	Checked By:	DWG. No. FIG.2
Scale: 1:500	Date: Apr. 10, 2019	

3.0 Storm Drainage

3.1 Existing Conditions

The subject site, approximately 0.67 ha, is located within the Cobourg Creek watershed. The lands are currently a vacant field with sparse trees. Based on the topographical survey prepared by Ivan B. Wallace Ontario Land Surveyor Ltd. (2018), the existing area for the proposed development site gently slopes west towards Margaret Street through existing private residences. An external 0.21 ha area to the east drains through the subject site towards Margaret Street.

Flows captured by a storm sewer system on Margaret Street are conveyed north to University Avenue West, and discharged to Cobourg Creek through a concrete headwall, approximately 130m from the site. The existing drainage patterns are illustrated on **Figure 2**.

3.2 Proposed Conditions

3.2.1 Minor System

The minor system for the proposed development will be designed to comply with the Design Guidelines for the Town of Cobourg (2015). The storm sewers are proposed to drain towards the existing Margaret Street storm sewer.

The routing and preliminary sizing of the storm sewer to service the development are shown on the Site Servicing Plan (**Drawing SS**) in the rear pocket. Storm Sewer Design Sheets are included in **Appendix A**.

3.2.2 Major System

Major system flows will be captured and detained on-site. Portions of the storm sewer system will be over-sized to store and release the major system flows (100 year peak flow) to the 5 year pre-development level. Refer to Section 4.5 for details on the stormwater management strategy. Capture calculations are included in **Appendix B**.

Should the storm sewer become 100% blocked or an event in excess of the 100 year storm occurs, the major system flows will pond and spill towards Margaret Street to the west via the overland flow route as depicted on **Drawing SG**. Overland flow calculations are included in **Appendix B**.

4.0 Stormwater Management

4.1 Design Criteria

The criteria for stormwater management (SWM) for the subject site are as follows:

Quantity Control - Post-development peak flow levels must not exceed pre-development peak flow levels for all storm events up to and including, the 100 year return period event. Sufficient storage is to be provided on-site to accommodate the post-development 100 year storm flow.

Quality Control - An "Enhanced" level of protection for the minor system drainage as per Ministry of Environment guidelines is required (minimum 80% total suspended solids removal).

Erosion Control - Runoff from the 25mm storm event be stored and released over 24-hours.

4.2 Existing Conditions

As outlined in Section 3.1, the subject site, approximately 0.67 ha, is located within the Cobourg Creek watershed. Flows captured by the Margaret Street storm sewer are conveyed north to University Avenue West, and discharged to Cobourg Creek through a concrete headwall, approximately 130m from the site. The existing drainage patterns are illustrated on **Figure 2**.

The pre-development peak flow for the 100 year storm event for the total drainage area of 0.67 ha (Area 101 on **Figure 2**) and 0.21 ha external area (Area 102 on **Figure 2**) was determined using the Rational Method and the Town of Cobourg rainfall intensities. The Uplands Flow Method was used to calculate a time of concentration of 10.6 minutes; however, a value of 11 minutes was utilized to be conservative. Based on the above, the 100 year pre-development peak flow rate was determined to be 0.123m^3/s. The calculations are presented in **Appendix C.**

4.3 Proposed Conditions

4.3.1 Quantity Control

Since the total 100 year post-development peak flow (0.212m^3/s) from the site (Areas 201, 202, 102 – see **Figure 3**) exceeds the 100 year pre-development level (0.123m^3/s), on-site detention of stormwater flows is required. Due to minimal available space for a stormwater management facility, site storage will be provided underground. The design of graduated controls to match post-development release rates to pre-development levels for all storm events is complex within a storm sewer system. As such, for

simplification it is proposed to control the 100 year post-development release rate to an allowable release rate equal to the 5 year post-development flow.

The pre-development peak flow rate for the 5 year storm event for the total existing drainage area of 0.88 ha (Areas 101, 102 – see **Figure 2**) was determined using the Rational Method along with Town of Cobourg rainfall intensities and an 11 minute time of concentration to be 0.078m^3/s. Refer to **Appendix C** for the 5 year pre-development flow calculation.

An orifice will be utilized to ensure that the total site release rate is less than the allowable release rate. As per the GRCA Technical and Engineering Guidelines for Stormwater, an orifice tube is preferred over orifice plates within private sites. A 150mm orifice tube will control flows from Area 201 and Area 102 (refer to **Figure 3**) to 0.077m^3/s. Area 202 will continue to drain uncontrolled towards Margaret Street through the private residences. Since the area has been significantly reduced, these flows will be less than pre-development.

The total release rate from the site will therefore be 0.078m^3/s during the 100 year storm event. **Table 2**, below, outlines the release rates and storage requirements for the various drainage areas. Calculations for the sizing of orifice controls and storage requirements have been included in **Appendix D**. All required storage is to be accommodated underground within the storm sewer.

Table 2: 100 Year Post-Development Release Rates and Storage Volumes[1]

Description	Area (ha)	Control Type	Release Rate (m^3/s)	Storage Required (m^3)	Storage Provided (m^3)
201 + 102	0.86	150mm Orifice Tube	0.077	140	141
202	0.02	Uncontrolled	0.001	-	-
Total	**0.67**	**-**	**0.078**	**140**	**141**

[1] Refer to **Appendix D**

4.3.2 Quality Control

Low Impact Development (LID) measures have been considered in order to provide a treatment train approach and aid in erosion control. There is the opportunity to include lot level and end-of-pipe controls as listed below.

Lot Level Controls

Lot level controls present an opportunity to reduce runoff and promote infiltration at the source. Incorporating controls that do not require maintenance can be an effective method in the treatment train approach to stormwater management and will help

achieve a recommended retention of the runoff from the 25mm storm event. Potential locations of the permeable pavement and infiltration trenches will be investigated further during the Site Plan Application phase of design.

Permeable Pavement - It is proposed that portions of the parking areas can potentially be constructed with permeable pavement to encourage infiltration and retention of stormwater at the source. This lot level control will contribute to water quality and quantity control, while encouraging at-source infiltration.

Extra Topsoil Depth – Increasing the typical topsoil depth of 0.15m to 0.30m will minimize local runoff while promoting increased infiltration.

Soak Away Pits – Depending on detailed lot grading and house sitings there is the potential to install soak away pits for additional infiltration. Front and/or rear roof leaders could be connected to soak-away pits which will be constructed in the rear and/or front yard of each lot to infiltrate runoff from the 25mm event.

Passive Landscaping to Promote Infiltration – Planting of gardens and other vegetation designed to minimize local runoff or the use of rainwater as a watering source can be used to reduce rainwater runoff by increasing evaporation, transpiration and infiltration. By promoting infiltration through passive landscaping within the landscape areas, stormwater management is provided for the volume of water infiltrated. Passive landscaping can provide significant stormwater management benefits as part of the overall treatment train approach for the subject development.

End of Pipe Controls

Oil Grit Separator - Runoff from the 'first flush' or 25mm storm event is required to be treated prior to discharging to the existing storm sewer network. In addition to the previously mentioned passive treatment methods, an end of pipe Oil & Grit Separator (OGS) is proposed.

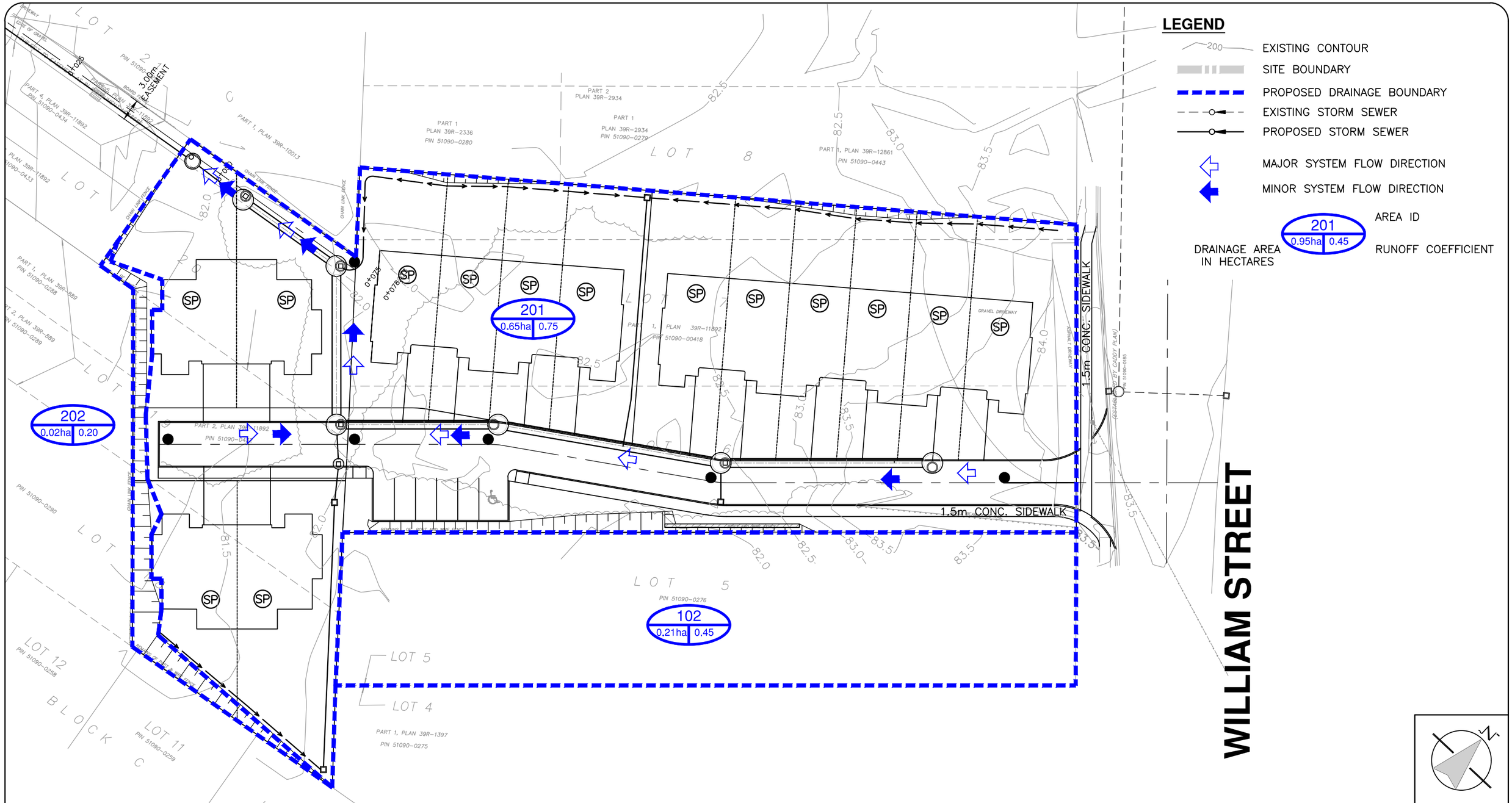
As noted above, an "Enhanced" level of protection as presented in Table 3.2 of the MOE Stormwater Management Planning and Design Manual (SWMP Manual, March 2003) is required for the proposed development. It is proposed to install an oil/grit separator to provide the necessary quality control. An oil and grit separator unit was sized utilizing online PCSWMM for Stormceptor© sizing tool based on a drainage area of 0.86 ha at an imperviousness of 0.68. A Stormceptor© EF4 model (or approved equivalent) is proposed which will remove up to 80% of total suspended solids from the site runoff (refer to **Appendix E**). The unit will be located at the outlet from the site, at MH3 (refer to **Drawing SS**).

4.3.3 Erosion Control

As noted above, the erosion control criteria for the site is the retention of runoff from the 25mm storm event for 24 hours. Due to the nature of the grading and spatial

constraints, it is not feasible to provide the detention of the runoff from the 25mm storm event across the entire site. The implementation of LID techniques, such as soak-away pits, permeable pavement, increased topsoil depth and passive landscape features can be investigated to aid in providing erosion controls.

As noted in **Section 4.3.1,** an oversized storm sewer is proposed to provide quantity control volumes. There is the potential to include an extended detention orifice in addition to the quantity control orifice within a control manhole to maximize the extended detention time within the sewer system during a 25mm rainfall event. This in combination with the LID techniques listed above, are proposed to provide the erosion controls for the site.



377 WILLIAM STREET

TOWN OF COBOURG

POST DEVELOPMENT DRAINAGE

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Designed By: K.D.	Checked By:	DWG. No. FIG.3	
Scale: 1:500	Date: Nov. 20, 2019		

5.0 Sanitary Drainage System

5.1 Existing Conditions

The existing sanitary sewer system is located on Margaret Street and is comprised of a 200mm diameter sewer. The existing sanitary sewer system is illustrated on **Drawing SS**. The existing 200mm diameter sewer on Margaret Road discharges to King Street West, and is then conveyed westerly to the Cobourg Waste Treatment Plant.

5.2 Proposed Conditions

The development will be serviced through a 200mm sanitary sewer system. The sanitary sewer is designed to service 14 units, with a density of 2.7 persons per unit, resulting in a total population of 38 people. The flows from the development will be conveyed via gravity to the existing 200mm diameter sewer within Margaret Street.

The routing and preliminary sizing of the sanitary sewer to service this development is shown on the Site Servicing Plan (**Drawing SS**) in the rear pocket.

6.0 Watermain Distribution System

6.1 Existing Conditions

The existing watermain system located adjacent to the subject site is illustrated on **Drawing SS** and comprises of a 200mm diameter watermain on William Street.

6.2 Proposed Conditions

The water distribution network for the development will consist of a 200mm watermain located within the right-of-way. The watermain will connect into the existing 200mm diameter watermain on William Street.

The routing and preliminary sizing of the watermain to service the development is shown on the Site Servicing Plan (**Drawing SS**) in the rear pocket.

7.0 Sediment and Erosion Control

Sediment and erosion control practices during construction will include, but not be limited to, standard devices such as silt fences, mud mats and catchbasin buffers. Detailed Sediment and Erosion Control Plans will be prepared in conjunction with the detailed engineering design for this development.

8.0 Conclusions

The servicing and stormwater management for the 377 William Street development can be accomplished by the following:

- The storm sewer system will be designed to convey the 5 year post-development flows to the existing storm sewer system on Margaret Road.
- The 100 year post-development flow from the site exceeds the target release rate based on the 5 year allowable storm sewer capacity and as such quantity controls are required.
- Quantity control will be provided through the use of an orifice tube. The required storage will be provided in the form of underground storage provided within the storm sewers.
- A Stormceptor© EF4 model (or approved equivalent) is proposed at the outlet from the site to provide an "Enhanced" protection level as required for quality control.
- An extended detention orifice will be implemented to provide erosion controls during the 25mm storm event.
- Sediment and Erosion Control practices will be implemented during construction.
- The proposed development is to be serviced through a 200mm sanitary sewer connecting into the existing 200mm diameter sanitary sewer on Margaret Road.
- The watermain distribution system for the proposed development will consist of a 200mm connecting into the existing 200mm diameter watermain on William Street.

Report prepared by:

CANDEVCON EAST LIMITED

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RB/AK/br

cc: Joshani Homes Ltd., Attn: Mr. Bernard Farber
R.W. Bruynson Inc., Attn: Mr. Rick Bruynson

Appendix A

Storm Sewer Design Sheet

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COMPUTED BY : K.D.
CHECKED BY : A.W.
DATE: Nov. 20, 2019
STATUS: 1st SPA Submission

TOWN OF COBOURG

STORM SEWER DESIGN SHEET

PROJECT NAME: 377 WILLIAM STREET

DESIGN CRITERIA:

Q = 2.778 AIR
Q=5 YEAR RETURN STORM
A= AREA IN HECTARES(ha)
R=RUNOFF COEFFICIENT
I=RAINFALL INTENSITY (mm/hr)

Coeffecient of Friction in pipe, n =0.013
Time of Concentration (Tc) min = 15
5 Year Intensity = 2464/Tc + 16
25 Year Intensity = 3886/Tc + 18
100 Year Intensity = 5588/Tc + 28

PROJECT No. : E19012
5 YEAR DESIGN STORM

LOCATION				FLOWS							SEWER DESIGN							CRITICAL SLOPE		REMARKS	
STREET	AREA ID	MANHOLE NO.		"A" AREA (ha)	"R" RUNOFF COEFF.	AR	ACCUM. AR	TIME OF CONC. (min)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (L/s)	LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	PIPE CAPACITY (L/s)	FULL VELOCITY (m/s)	TIME IN SECTION (min)	TOTAL TIME (min)	CRITIAL SLOPE (%)	CAPACITY AT CRITIAL SLOPE	CAPACITY FROM	PEAK FLOW / PIPE CAP. (%)
		U/S	D/S																		
SITE	0	MH9	CBMH8	0.00	0.00			15.00	79.5	0	29.1	1200	0.50	2758	2.44	0.20	15.20	0.85	3589	ACTUAL	0.0
SITE	1	CBMH8	MH7	0.12	0.75	0.090	0.090	15.20	79.0	20	31.0	1200	0.50	2758	2.44	0.21	15.41	0.85	3589	ACTUAL	0.7
SITE	3	MH7	CBMH6	0.22	0.75	0.165	0.255	15.41	78.4	56	22.2	1200	0.50	2758	2.44	0.15	15.56	0.85	3589	ACTUAL	2.0
SITE	2	RLCB1	MH8	0.16	0.75	0.124	0.124	15.00	79.5	27	34.3	300	1.00	97	1.37	0.42	15.42	1.34	112	ACTUAL	28.2
SITE	4	RLCB2	CB2	0.05	0.75	0.036	0.036	15.00	79.5	8	36.7	300	1.00	97	1.37	0.45	15.45	1.34	112	ACTUAL	8.3
SITE	5	CB2	CBMH10	0.00	0.75	0.004	0.040	15.45	78.4	9	5.3	300	1.03	98	1.39	0.06	15.51	1.34	112	ACTUAL	8.9
SITE		CBMH10	CBMH6	0.00	0.00		0.040	15.51	78.2	9	5.4	300	2.05	139	1.96	0.05	15.56	1.34	112	CRITICAL	7.7
SITE	6	CBMH6	CBMH5	0.05	0.75	0.038	0.333	15.56	78.1	72	21.8	1200	0.20	1744	1.54	0.24	15.79	0.85	3589	ACTUAL	4.1
SITE	7	CBMH5	CBMH4	0.03	0.75	0.023	0.356	15.79	77.5	77	15.7	1200	0.20	1744	1.54	0.17	15.96	0.85	3589	ACTUAL	4.4
SITE		CBMH4	MH3	0.00	0.00		0.356	15.96	77.1	78	8.7	300	3.33	177	2.50	0.06	16.02	1.34	112	CRITICAL	69.5
SITE		MH3	MH2	0.00	0.00		0.356	16.02	77.0	78	49.3	300	0.50	68	0.97	0.85	16.87	1.34	112	ACTUAL	113.9
MARGARET STREET		MH2	CBMH1	0.00	0.00		0.356	16.87	75.0	78	19.4	300	0.50	68	0.97	0.33	17.20	1.34	112	ACTUAL	113.9

Note: Orifice tube installed in CBMH4 to limit peak flow to 78 L/s. See SWMF Brief for 377 William Street.

Appendix B

Overland Flow Calculations

Project Name	377 William Street	**Prepared By**	R.B.
Project No.	E19012	**Checked By**	A.K.
Subject	Overland Flow		

Location: Country Lane at Taunton Road

Drainage Area (A) =	0.86	ha
Runoff Coeff (R) =	0.67	
Tc =	15.00	min

Flow (Q) = 2.778 AIR

Major Flow:

100 Year Intensity =	129.95	mm/hr
100 Year Flow =	0.208	m^3/s

Major Flow = 1.25 x Q

Major Flow (Q_{100}) =	0.260	m^3/s

Minor Flow (captured by pipe system):

5 Year Intensity =	79.48	mm/hr
5 Year Flow (Q_5) =	0.127	m^3/s

Minor Flow (Q_5) =	0.127	m^3/s

Overland Flow = Q100-Q5 =	**0.133**	m^3/s

Appendix C

Pre-Development Release Rates

Project Name	377 William Street	Prepared By	KD
Project No.	E19012	Checked By	AK
Subject	Time to Peak Design Sheet		

				Uplands Method											
				Forest & Meadow		Woodland		Pasture		Straight Row		Bare Soil		Grassed Waterway		Paved Areas	
Area ID	Area (ha)	Length (m)	Slope (%)	Tp (hr)	Tc (min)	Tp (hr)	Tc (min)	Tp (hr)	Tc (min)	Tp (hr)	Tc (min)	Tp (hr)	Tc (min)	Tp (hr)	Tc (min)	Tp (hr)	Tc (min)
101	0.67	135.00	1.00	0.333	29.859	0.170	15.194	0.119	10.656	0.094	8.462	0.085	7.631	0.056	5.029	0.042	3.738

CANDEVCON LIMITED
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Project Name	377 William Street	Prepared By	KD
Project No.	E19012	Checked By	AK
Subject	Allowable Release Rate		

100 year post development flows from the site must be controlled to the 5 year pre-development flow the Cobourg Creek

Utilizing the rational method, the allowable release rate can be determined:

Q = C I A where,

Q =	Allowable Release Rate	
C =	Runoff Coefficient =	0.35
I =	Intensity (mm/hr)	
A =	Area (ha) =	0.88

	Area(ha)	C
Asphalt	0.01	0.95
Gravel	0.04	0.95
Grass	0.83	0.2
External	0.21	0.45
Average C		0.35

The Intensity for: Cobourg can be calculated as:

I = a / (b + t)^c where,

		2 Year	**5 Year**	**10 Year**	**25 Year**	**100 Year**
I =	Intensity (mm/hr)					
a =	Constant =	1778	2464	2819	3886	5588
b =	Constant =	13	16	16	18	28
c =	Constant =	1	1	1	1	1
t =	Time of Concentration (min) =	11	11	11	11	11
I =	Intensity (mm/hr)	74.08	91.26	104.41	134.00	143.28
Q =	**Allowable Release Rate**	**0.063**	**0.078**	**0.089**	**0.115**	**0.123**

Therefore the 100 year post development flows must be controlled to 0.078 m^3/s.

Appendix D

Stormwater Management Calculations

CANDEVCON LIMITED
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Project Name	377 William Street	Prepared By	RB
Project No.	E19012	Checked By	AK
Subject	Post Development Uncontrolled Release Rate		

Utilizing the rational method, the post development release rate can be determined:

Q = C I A where,

Q = Flow rate (cms)
C = Runoff Coefficient
I = Intensity (mm/hr)
A = Area (ha)

The Intensity for: Cobourg can be calculated as:

I = a / (b + t)^c where,

		2 Year	**5 Year**	**10 Year**	**25 Year**	**100 Year**
I =	Intensity (mm/hr)					
a =	Constant =	1778	2464	2819	3886	5588
b =	Constant =	13	16	16	18	28
c =	Constant =	1	1	1	1	1
t =	Time of Concentration (min) =	15	15	15	15	15
I =		63.50	79.48	90.94	117.76	129.95

Based on the proposed land use the post development flow rates are:

Area ID	**Area Description**	**Area (ha)**	**Runoff Coefficient**	**Flow Rates (m^3/s)**				
				2 Year	**5 Year**	**10 Year**	**25 Year**	**100 Year**
201	Site	0.65	0.75	0.086	0.108	0.123	0.159	0.176
202	Uncontrolled	0.02	0.20	0.001	0.001	0.001	0.001	0.001
102	External Area	0.21	0.45	0.017	0.021	0.024	0.031	0.034
Total		0.88	0.67	0.103	0.129	0.148	0.192	0.212

CANDEVCON LIMITED
CONSULTING ENGINEERS & PLANNERS

Project Name	377 William Street	Prepared By	KD
Project No.	E19012	Checked By	AK
Subject	Orifice Release Rate		

Catchment ID =	201 & 102	
Orifice Location =	MH3	
Orifice Type =	Tube	
Invert Elevation =	79.68	m
Ground Elevation =	81.25	m
Diameter of Orifice =	150	mm
Area of Orifice (A)=	0.018	m^2
Orifice Coefficient (C_d) =	0.800	

	5 Year	100 Year	
Ponding Depth =	0.00	0.00	
Water Elevation =	81.25	81.25	m
Upstream Head[a], H =	1.495	1.495	m

$Q_o = C_d A (2 g h)^{1/2}$			
Total Discharge, Q_o=	0.077	0.077	m^3/sec
Discharge Vel.[b], V=	4.333	4.333	m/sec

[a]Head is based on depth of water above orifice midpoint

[b]Velocity based on orifice area @ orifice face not Vena Contracta

CANDEVCON LIMITED
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Project Name	377 William Street
Project No.	E19012
Subject	Modified Rational Storage Calculations

100 Year

Catchment ID =	201 + 102	
Time of Concentration (t_c) =	15	minutes
Time Step (t_1) =	10	minutes
Runoff Coefficient (C) =	0.68	
Catchment Area (A) =	0.86	ha

Target Release Rate (Q_o) =	0.077	m^3/s

Time $t = t_c + t_1$ (min.)	Intensity $I=a/(t_c+b)^c$ (mm/hr)	Runoff $Q=CIA$ (m^3/s)	Storage Rate $Q_s = Q - Q_o$ (m^3/s)	Required Storage $V = Q_s t$ (m^3)
15	130	0.210	0.133	120
25	105	0.170	0.093	140
35	89	0.143	0.066	139
45	77	0.124	0.047	126
55	67	0.109	0.032	105
65	60	0.097	0.020	79
75	54	0.088	0.011	48
85	49	0.080	0.003	15
95	45	0.073	-0.004	-20
105	42	0.068	-0.009	-57
115	39	0.063	-0.014	-95
125	37	0.059	-0.018	-135
135	34	0.055	-0.022	-175
145	32	0.052	-0.025	-216
155	31	0.049	-0.028	-257
165	29	0.047	-0.030	-299
175	28	0.045	-0.032	-341
185	26	0.042	-0.035	-384
195	25	0.041	-0.036	-427
205	24	0.039	-0.038	-470
215	23	0.037	-0.040	-514
225	22	0.036	-0.041	-557
235	21	0.034	-0.043	-601
245	20	0.033	-0.044	-645
255	20	0.032	-0.045	-690
265	19	0.031	-0.046	-734
275	18	0.030	-0.047	-779
285	18	0.029	-0.048	-823
295	17	0.028	-0.049	-868
305	17	0.027	-0.050	-913
315	16	0.026	-0.051	-958
325	16	0.026	-0.051	-1002
335	15	0.025	-0.052	-1047
345	15	0.024	-0.053	-1093
355	15	0.024	-0.053	-1138
365	14	0.023	-0.054	-1183
375	14	0.022	-0.055	-1228
385	14	0.022	-0.055	-1273

100 Year Storage Required =	140	m^3

CANDEVCON LIMITED
CONSULTING ENGINEERS & PLANNERS

Project Name	377 William Street	Prepared By	RB
Project No.	E19012	Checked By	AK
Subject	Post Development Avalable Storage		

Area ID	Orifice Invert m	Ground Elevation m	100 Year			Underground Storage Vu/g m^3	Storage Available Va = Vs+Vp m^3	Length per Pipe Diameter (mm)													
			Ponding Depth m	Surface Area m^2	Surface Storage m^3			Underground Storage													
								150	250	300	375	450	525	600	675	750	825	900	1050	1200
201 & 102	79.68	81.25	0.00	0	0	141	141			81.7										120

CANDEVCON LIMITED
CONSULTING ENGINEERS & PLANNERS

Project Name	377 William Street	Prepared By	RB
Project No.	E19012	Checked By	AK
Subject	Post Development Controlled Flow Rate Summary		

100 Year														
Catchment Characteristics					Storage Details					Control Details				
Area ID	Area Description	Area A (ha)	Runoff Coefficient C	Runoff Q (m^3/s)	Storage Required Vr (m^3)	Maximum Ponding Depth (m)	Surface Storage Vs (m^3)	Underground Storage Vu/g (m^3)	Storage Available Va = Vs+Vp (m^3)	Location	Size (mm)	Type	Orifice Release Rate Qo (m^3/s)	Area Release Rate Qa (m^3/s)
201 & 102	Site + External	0.86	0.68	0.210	140	0.00	0	141	141	MH3	150	Tube	0.077	0.077
202	Uncontrolled	0.02	0.20	0.001	-	-	-	-	-	-	-	Uncontrolled	0.001	0.001
Total	-	0.88	0.67	0.212	**140**	-	0	141	**141**	-	-	-		**0.078**

Appendix E

Oil/Grit Separator Sizing Calculations

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION STORMCEPTOR®

04/14/2020

Province:	Ontario
City:	Cobourg
Nearest Rainfall Station:	TORONTO CENTRAL
NCDC Rainfall Station Id:	0100
Years of Rainfall Data:	18
Site Name:	
Drainage Area (ha):	0.86
Runoff Coefficient 'c':	0.68
Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Require Hydrocarbon Spill Capture?	No
Upstream Flow Control?	No
Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	377 William Street
Project Number:	E19012
Designer Name:	Ryan Brockie
Designer Company:	Candevcon East Ltd.
Designer Email/Phone:	rbrockie@candevcon.com
EOR Name:	
EOR Company:	
EOR Email/Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	80
EF6	87
EF8	90
EF10	92
EF12	92

Recommended Stormceptor EF Model: EF4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 80

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

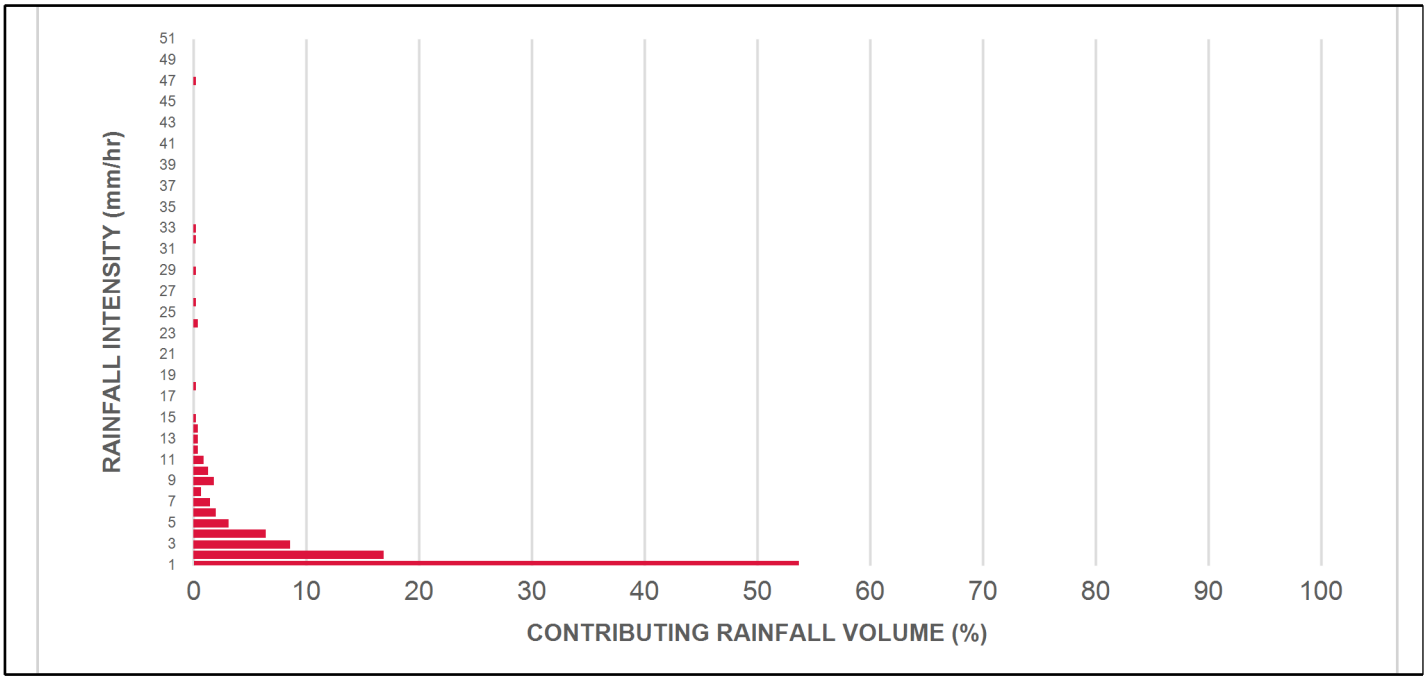
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a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

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

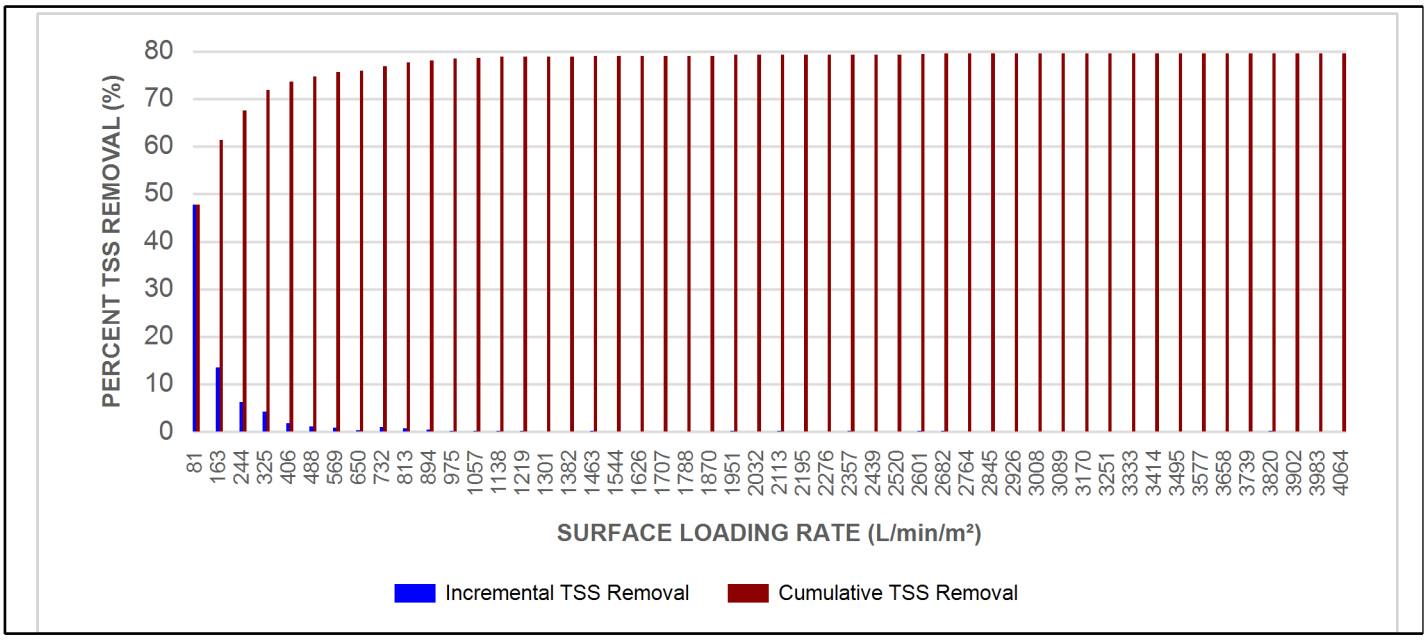
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	53.7	53.7	1.63	98.0	81.0	89	47.8	47.8
2	16.9	70.6	3.25	195.0	163.0	80	13.6	61.4
3	8.6	79.2	4.88	293.0	244.0	72	6.2	67.6
4	6.4	85.6	6.50	390.0	325.0	65	4.2	71.8
5	3.1	88.7	8.13	488.0	406.0	58	1.8	73.6
6	2.0	90.7	9.75	585.0	488.0	57	1.1	74.7
7	1.5	92.2	11.38	683.0	569.0	56	0.8	75.6
8	0.7	92.9	13.01	780.0	650.0	56	0.4	75.9
9	1.8	94.7	14.63	878.0	732.0	55	1.0	76.9
10	1.3	96.0	16.26	975.0	813.0	55	0.7	77.7
11	0.9	96.9	17.88	1073.0	894.0	55	0.5	78.1
12	0.4	97.3	19.51	1171.0	975.0	54	0.2	78.4
13	0.4	97.7	21.13	1268.0	1057.0	55	0.2	78.6
14	0.4	98.1	22.76	1366.0	1138.0	56	0.2	78.8
15	0.2	98.3	24.39	1463.0	1219.0	57	0.1	78.9
16	0.0	98.3	26.01	1561.0	1301.0	58	0.0	78.9
17	0.0	98.3	27.64	1658.0	1382.0	59	0.0	78.9
18	0.2	98.5	29.26	1756.0	1463.0	57	0.1	79.0
19	0.0	98.5	30.89	1853.0	1544.0	54	0.0	79.0
20	0.0	98.5	32.51	1951.0	1626.0	51	0.0	79.0
21	0.0	98.5	34.14	2048.0	1707.0	49	0.0	79.0
22	0.0	98.5	35.77	2146.0	1788.0	46	0.0	79.0
23	0.0	98.5	37.39	2244.0	1870.0	44	0.0	79.0
24	0.4	98.9	39.02	2341.0	1951.0	42	0.2	79.2
25	0.0	98.9	40.64	2439.0	2032.0	41	0.0	79.2

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 (%)
26	0.2	99.1	42.27	2536.0	2113.0	39	0.1	79.3
27	0.0	99.1	43.90	2634.0	2195.0	38	0.0	79.3
28	0.0	99.1	45.52	2731.0	2276.0	36	0.0	79.3
29	0.2	99.3	47.15	2829.0	2357.0	35	0.1	79.3
30	0.0	99.3	48.77	2926.0	2439.0	34	0.0	79.3
31	0.0	99.3	50.40	3024.0	2520.0	33	0.0	79.3
32	0.2	99.5	52.02	3121.0	2601.0	32	0.1	79.4
33	0.2	99.7	53.65	3219.0	2682.0	32	0.1	79.5
34	0.0	99.7	55.28	3317.0	2764.0	31	0.0	79.5
35	0.0	99.7	56.90	3414.0	2845.0	30	0.0	79.5
36	0.0	99.7	58.53	3512.0	2926.0	28	0.0	79.5
37	0.0	99.7	60.15	3609.0	3008.0	28	0.0	79.5
38	0.0	99.7	61.78	3707.0	3089.0	28	0.0	79.5
39	0.0	99.7	63.40	3804.0	3170.0	27	0.0	79.5
40	0.0	99.7	65.03	3902.0	3251.0	26	0.0	79.5
41	0.0	99.7	66.66	3999.0	3333.0	25	0.0	79.5
42	0.0	99.7	68.28	4097.0	3414.0	24	0.0	79.5
43	0.0	99.7	69.91	4194.0	3495.0	24	0.0	79.5
44	0.0	99.7	71.53	4292.0	3577.0	24	0.0	79.5
45	0.0	99.7	73.16	4390.0	3658.0	23	0.0	79.5
46	0.0	99.7	74.78	4487.0	3739.0	22	0.0	79.5
47	0.2	99.9	76.41	4585.0	3820.0	22	0.0	79.5
48	0.0	99.9	78.04	4682.0	3902.0	21	0.0	79.5
49	0.0	99.9	79.66	4780.0	3983.0	21	0.0	79.5
50	0.0	99.9	81.29	4877.0	4064.0	21	0.0	79.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**80 %**

RAINFALL DATA FROM TORONTO CENTRAL RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

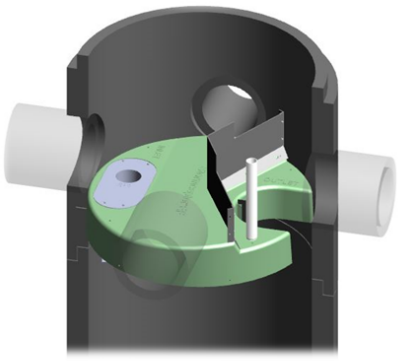
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

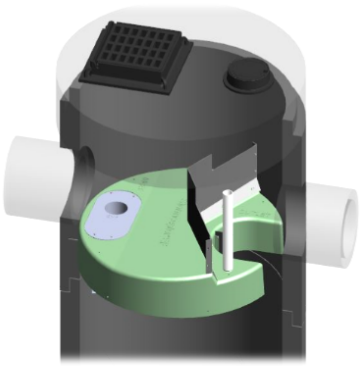
DESIGN FLEXIBILITY

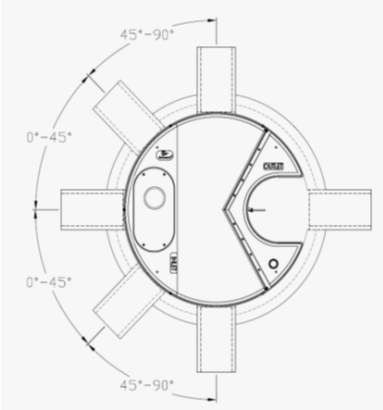
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	197	52	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	348	92	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	545	144	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	874	231	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	1219	322	610	24	31220	1103	49952	137875

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

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

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

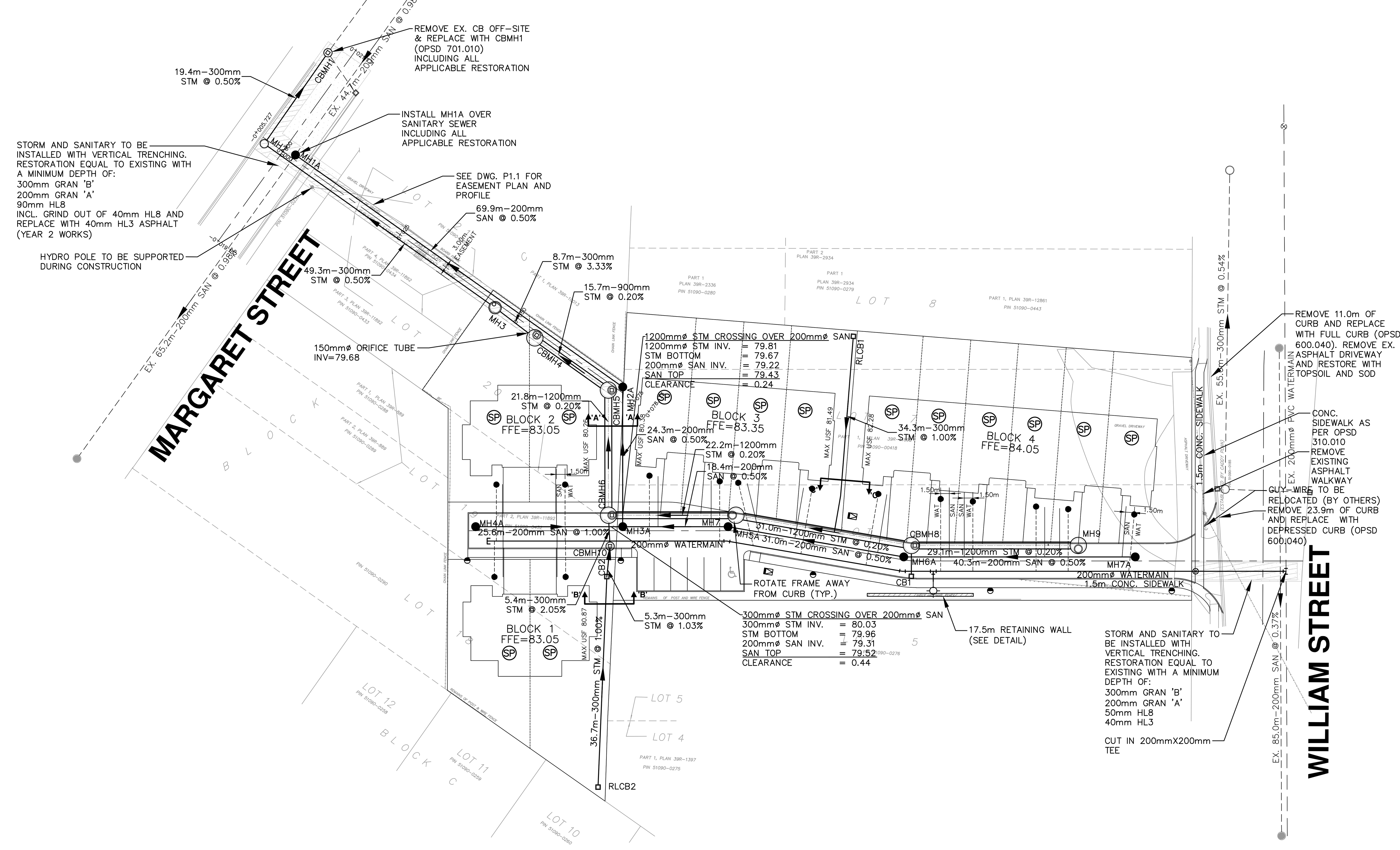
3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

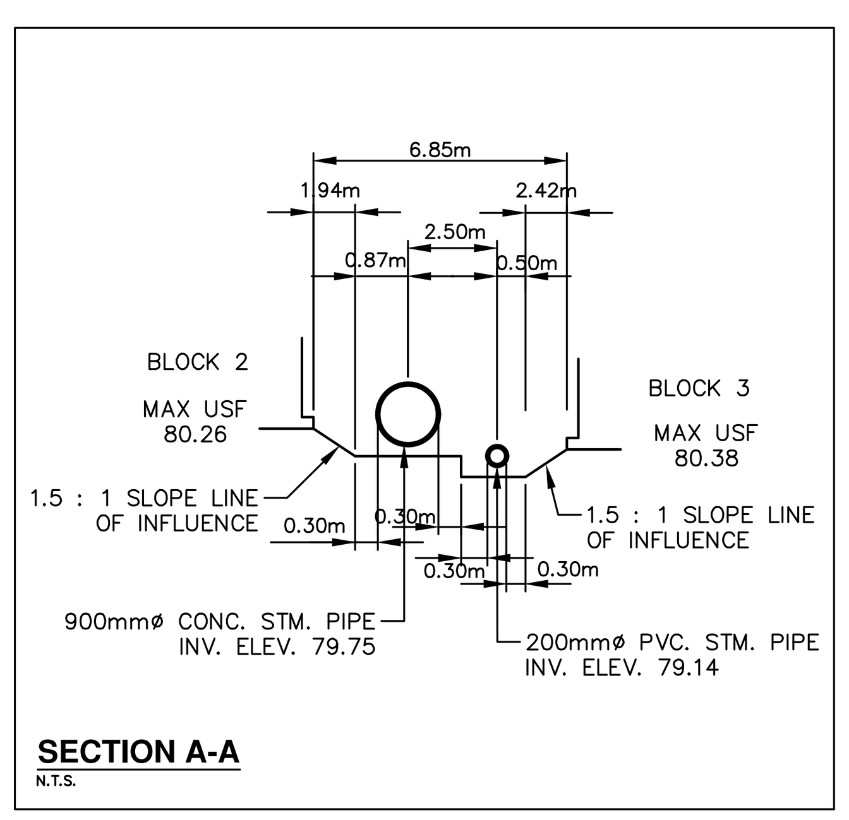
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

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.

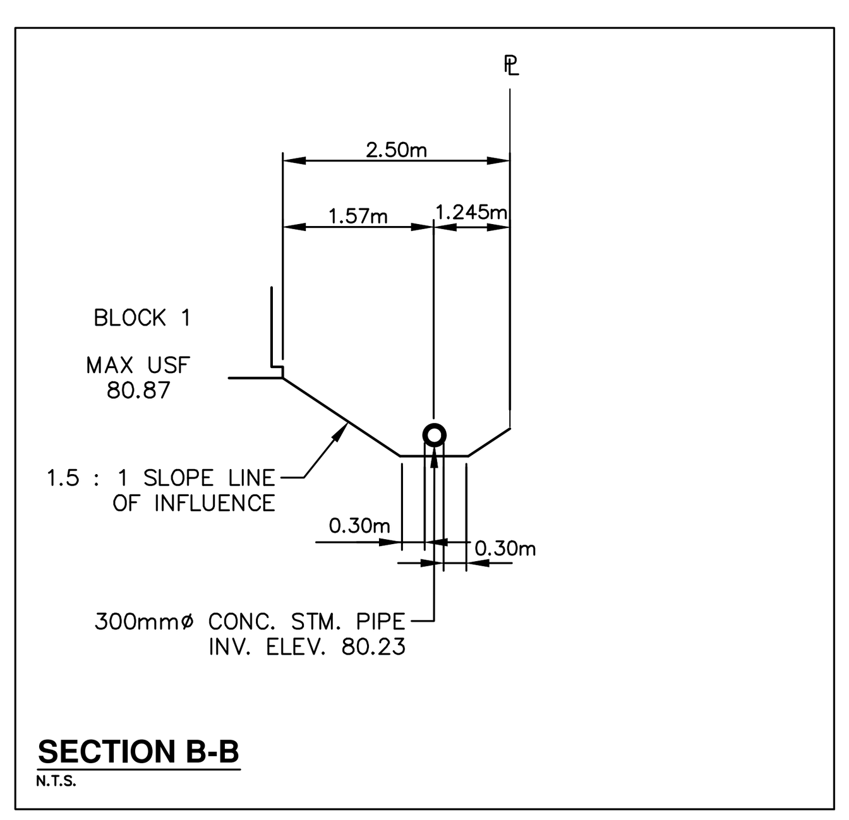
STORM SEWER DATA TABLE					
STRUCTURE No.	SIZE	RIM ELEV.	INVERT ELEVATIONS IN	INVERT ELEVATIONS OUT	NOTES
CBMH1	1200mm	80.50	E 79.07 S 78.92	N 78.89	CONNECT TO EX. SEWER
MH2	1200mm	80.40	E 79.08	N 79.02	
MH3	1219mm	82.28	E 79.36	W 79.33	(STC 750)
CBMH4	2400mm	81.90	E 79.68	W 79.65	
CBMH5	2400mm	82.01	SE 79.74	W 79.71	
CBMH6	2400mm	82.13	NE 79.80 SE 79.99	NW 79.78	
MH7	2400mm	81.49	NE 79.87	SW 79.84	
CBMH8	2400mm	82.87	NE 79.96 SE 81.32	SW 79.93	
MH9	2400mm	82.87		SW 80.02	
CBMH10	1200mm	82.13	SE 80.13	NW 80.10	
CB1		82.87		NW 81.37	
CB2		81.95	SE 80.18	NW 80.18	
RLCB1		82.02		SE 80.52	TEE INV. 80.18
RLCB2		82.05		NW 80.55	

SANITARY SEWER DATA TABLE					
STRUCTURE No.	SIZE	RIM ELEV.	INVERT ELEVATIONS IN	INVERT ELEVATIONS OUT	NOTES
MH1A	1200mm	80.42	N 78.66 E 78.70	S 78.66	CONNECT TO EX. SEWER
MH2A	1200mm	82.10	SE 79.11	W 79.05	
MH3A	1200mm	82.19	SW 79.29 NE 79.29	NW 79.23	
MH4A	1200mm	82.44		NE 79.55	
MH5A	1200mm	82.48	NE 79.42	SW 79.38	
MH6A	1200mm	82.90	NE 79.61	SW 79.58	
MH7A	1200mm	83.46		SW 79.81	





SECTION A-A
N.T.S.



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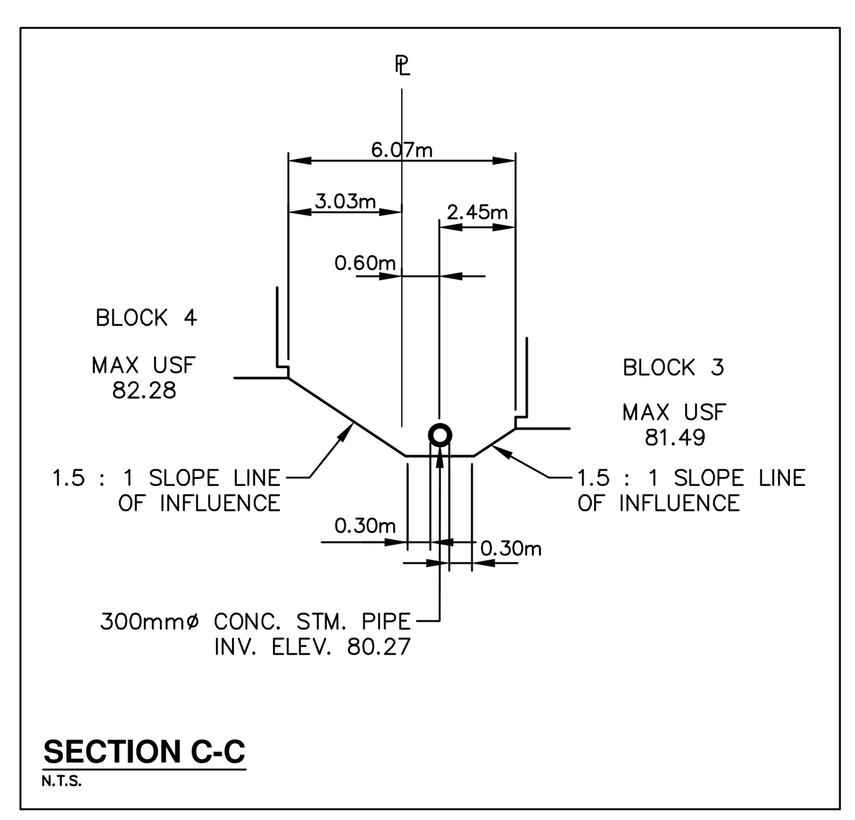
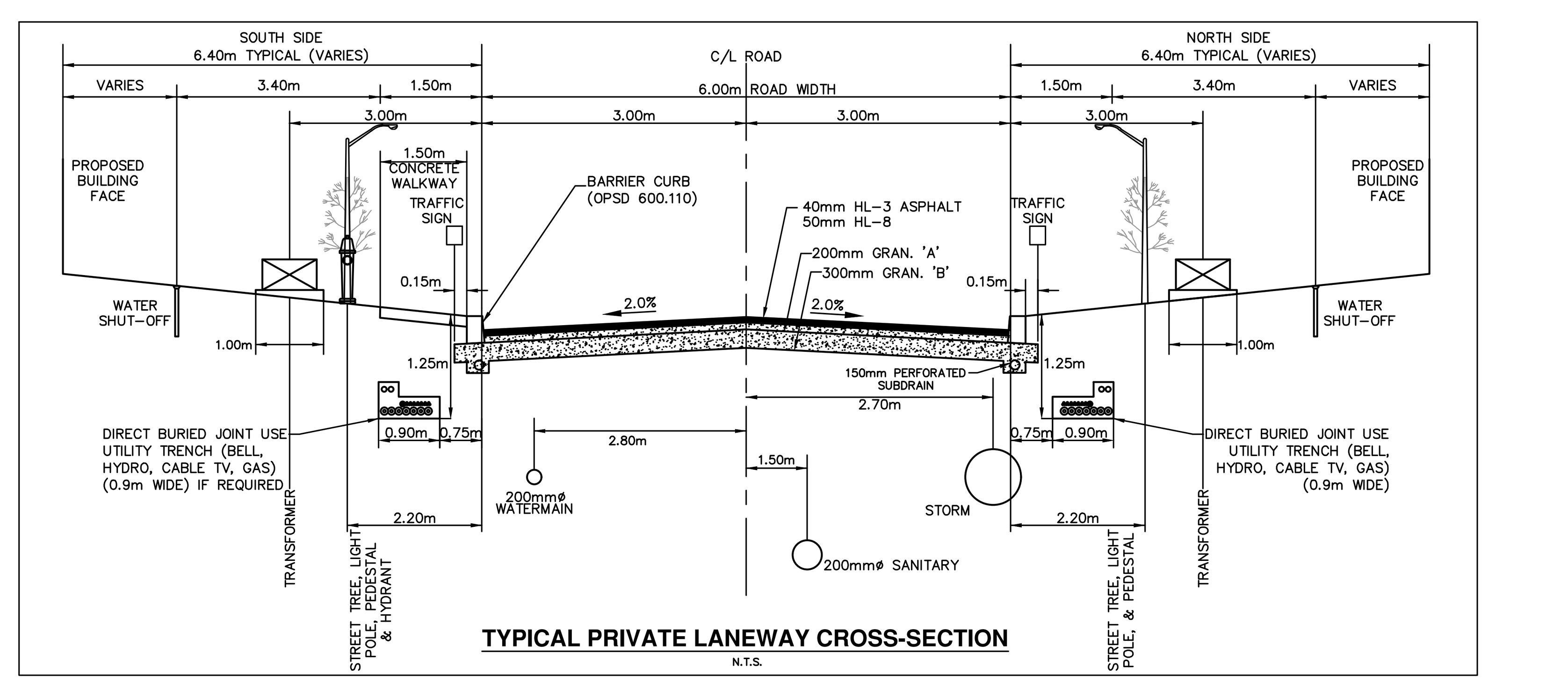


SECTION C-C
N.T.S.



TYPICAL PRIVATE LANEWAY CROSS-SECTION
N.T.S.

GENERAL NOTES

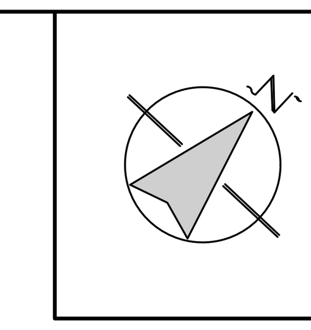
1. MEASUREMENTS IN METRES AND/OR MILLIMETRES, UNLESS OTHERWISE SHOWN.
2. ALL DIMENSIONS AND ELEVATIONS TO BE CHECKED AND VERIFIED ON SITE BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED PRIOR TO THE START OF WORK.
3. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE FOR LOCATES, EXPOSING, SUPPORTING AND PROTECTING OF ALL UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES EXISTING AT THE TIME OF CONSTRUCTION IN THE AREA OF THEIR WORK. WHETHER SHOWN ON THE PLANS OR NOT AND FOR ALL REPAIRS AND CONSEQUENCES RESULTING FROM DAMAGE TO SAME.
4. ALL TRENCHING TO BE DONE IN ACCORDANCE WITH THE CONSTRUCTION SAFETY ACT.
5. ALL INTERNAL WORK TO BE DONE IN ACCORDANCE WITH THE ONTARIO BUILDING CODE AND ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND DRAWINGS, UNLESS OTHERWISE NOTED.
6. A ROAD OCCUPANCY PERMIT WILL BE REQUIRED FROM THE MUNICIPAL ROAD AUTHORITY FOR ALL WORKS WITHIN THE PUBLIC ROAD ALLOWANCE. THE CONTRACTOR IS RESPONSIBLE FOR ACQUIRING THE ROAD OCCUPANCY PERMIT(S), INCLUDING PROVIDING ALL REQUIRED SUPPORTING DOCUMENTATION.
7. REFER TO THE SITE PLAN FOR THE DIMENSIONING OF BUILDINGS, INTERIOR SIDEWALKS, DRIVEWAYS, PARKING AREAS AND CURBING.
8. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER ONE (1) SET OF AS-CONSTRUCTED SITE SERVICING, GRADING AND SITE ELECTRICAL DRAWINGS.

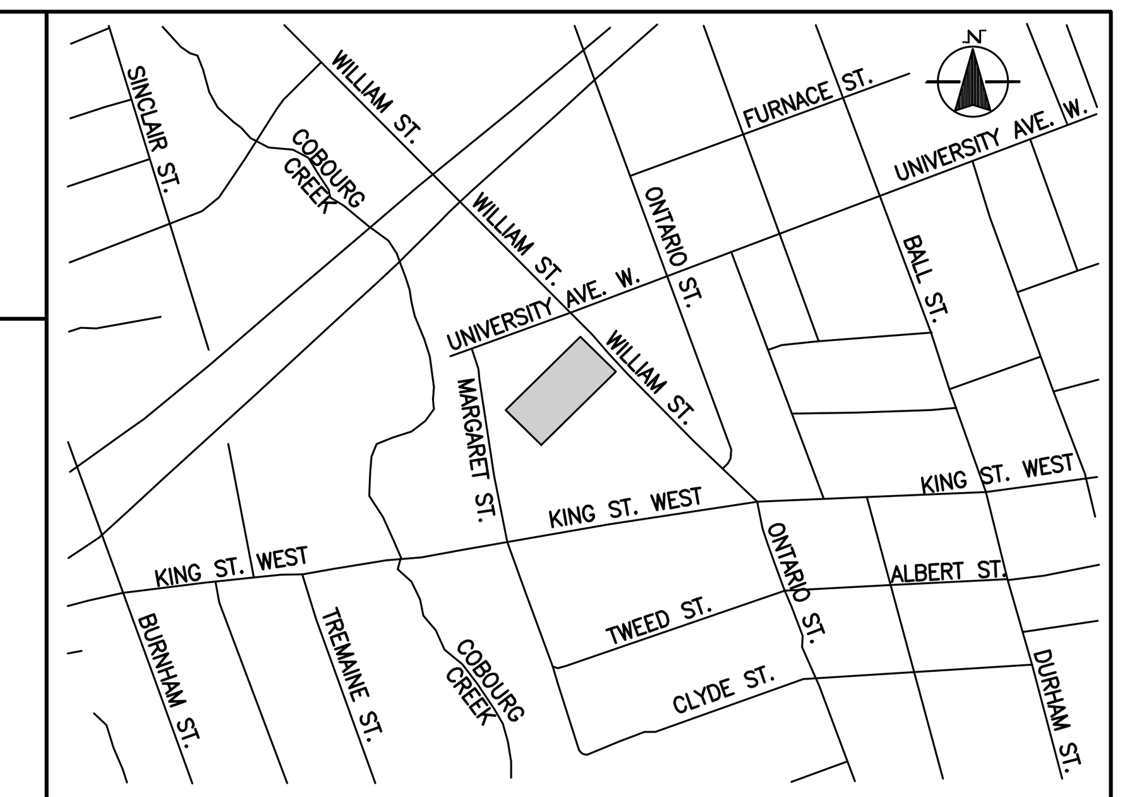
WATERMAINS AND FIREMAINS

1. ALL WATERMAINS AND FIREMAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE ONTARIO PROVINCIAL STANDARD SPECIFICATION OPSS 701 AND PART VII OF THE ONTARIO BUILDING CODE, UNLESS OTHERWISE SHOWN.
2. WATERMAINS SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 0.50m OVER AND UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING. THE LENGTH OF WATER PIPE SHALL BE CENTRED AT THE POINT OF CROSSING SO THAT JOINTS WILL BE EQUIDISTANT AND AS FAR AWAY AS POSSIBLE FROM THE SEWER.
3. ALL WATERMAINS AND SERVICES SHALL HAVE 1.8m MINIMUM COVER AND HORIZONTAL SPACING OF 2.44m FROM ALL SEWER LINES.
4. 100mm TO 300mm DIAMETER WATERMAINS AND FIREMAINS SHALL BE PVC SDR-18, C-900, CLASS 150 UNLESS OTHERWISE SHOWN.
5. PIPE BEDDING AND BACKFILL FOR WATERMAINS SHALL BE AS PER OPSD 802.010 FOR FLEXIBLE PIPE UNLESS OTHERWISE SHOWN.
6. ALL CURB STOPS TO BE 3.0m OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED.
7. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING FROM EXISTING SYSTEMS PRIOR TO CONNECTION, USING TEST POINT BY-PASS AS REQUIRED.
8. EITHER CONCRETE THRUST BLOCKS AS PER OPSD 1103.010 AND 1103.020 OR MECHANICALLY RESTRAINED JOINTS SHALL BE USED. MECHANICAL JOINT RESTRAINT SHALL BE UNI-FLANGE SERIES 1350 OR APPROVED.
9. PROVISIONS FOR FLUSHING WATERMAINS MUST BE PROVIDED WITH AT LEAST A 50mm OUTLET ON 100mm AND LARGER LINES. COPPER LINES ARE TO HAVE FLUSHING POINTS AT THE END, THE SAME SIZE AS THE LINE. FIREMAINS FLUSHING OUTLET TO BE 100mm DIAMETER MINIMUM OR A HYDRANT. FLUSHING POINTS MUST BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN.
10. FIRE HYDRANTS SHALL CONFORM TO AWWA C502 OR LATEST REVISION AND BE PROVIDED WITH A STORZ PUMPER CONNECTION. HYDRANTS SHALL BE INSTALLED IN ACCORDANCE WITH OPSD 1105.010. HYDRANT FLANGE ELEVATIONS TO BE INSTALLED 0.15m ABOVE THE PROPOSED FINISHED GRADE AT HYDRANT.
11. TRACER WIRE SHALL BE ATTACHED TO EVERY NON-METALLIC WATERMAIN, FIREMAIN AND SERVICE CONNECTION.
12. ALL WATERMAIN STUBS SHALL BE TERMINATED WITH A PLUG AND 50mm BLOW-OFF UNLESS OTHERWISE NOTED.
13. ALL NEW WATERMAINS AND SERVICES TO BE PRESSURE TESTED TO 1379kPa (200 psi) FOR AT LEAST ONE (1) HOUR WITHOUT LEAKAGE.
14. THE CONTRACTOR SHALL SUCCESSFULLY SWAB AND CHLORINATE WATERMAINS AND SERVICES PRIOR TO CONNECTING TO EXTERNAL WATERMAINS. CONNECTION TO MUNICIPAL WATERMAIN SHALL NOT BE GRANTED UNTIL A POSITIVE LABORATORY TEST RESULT IS PROVIDED AND ACCEPTED.
15. ALL HYDRANTS ON PRIVATE PROPERTY TO BE PAINTED RED AND THE STORZ PAINTED BLACK.
16. PRIVATE WATER SUPPLY LINES HAVE BEEN DESIGNED IN ACCORDANCE WITH M.O.E.C.C. GUIDELINES AS PER 7.1.6.5 OF THE O.B.C.
17. UNLESS OTHERWISE NOTED ALL WATERMAIN CROSSINGS ARE TO BE ACCOMMODATED USING VERTICAL PIPE DEFLECTIONS.
18. ALL TRENCHES ARE TO BE BACKFILLED TO THE STANDARD PROCTOR DENSITY AS SPECIFIED BY THE GEOTECHNICAL CONSULTANT.
19. BUILDING SERVICE VALVES TO BE 3.0m OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED AND MUST BE RESTRAINED A MINIMUM OF 12.0m BACK FROM STUB.

STORM AND SANITARY SEWERS

1. ALL STORM AND SANITARY SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE ONTARIO PROVINCIAL STANDARD SPECIFICATION OPSS 410 AND PART VII OF THE ONTARIO BUILDING CODE, UNLESS OTHERWISE SHOWN.
2. SANITARY SEWER PIPES 375mm AND SMALLER SHALL BE PVC SDR-35 CONFORMING TO CSA B182.2 AND B182.4, UNLESS OTHERWISE NOTED. PIPES SHALL BE JOINTED BY MEANS OF APPROVED RUBBER GASKETS.
3. STORM SEWER PIPES 375mm AND SMALLER SHALL BE RIBBED PVC CONFORMING TO CSA B182.2 AND B182.4, UNLESS OTHERWISE NOTED. PIPES SHALL BE JOINTED BY MEANS OF APPROVED RUBBER GASKETS.
4. STORM SEWER PIPES 450mm AND LARGER SHALL BE STEEL REINFORCED CONCRETE PIPE CLASS 65-D, CONFORMING TO SPECIFICATION CSA A257.1, A257.3, UNLESS OTHERWISE NOTED PIPES SHALL BE JOINTED BY MEANS OF APPROVED RUBBER GASKETS.
5. PIPE BEDDING AND BACKFILL SHALL BE AS PER OPSD 802.010 FOR FLEXIBLE PIPE AND OPSD 802.030 AND 802.031 FOR RIGID PIPE, UNLESS OTHERWISE SHOWN.
6. MANHOLES SHALL BE AS PER OPSD 701.010, 701.011, 701.012, 701.013, 701.014 AND 701.015. FRAMES AND COVERS AS PER OPSD 401.010. DROP STRUCTURES AS PER OPSD 1003.01. MANHOLES SHALL BE 1200mm IN DIAMETER, UNLESS OTHERWISE SHOWN.
7. SINGLE CATCHBASINS SHALL BE AS PER OPSD 705.010, DOUBLE CATCHBASINS SHALL BE AS PER OPSD 705.020. FRAMES AND COVERS AS PER OPSD 400.010 WHEN ADJACENT TO CURBS AND OPSD 400.020 IN OTHER AREAS. CATCHBASIN LEADS SHALL BE 200mm AT MINIMUM 1.0% GRADE, UNLESS OTHERWISE NOTED.
8. STORM AND SANITARY SEWERS AND APPURTENANCES WITHIN A PUBLIC ROAD ALLOWANCE SHALL BE CONSTRUCTED IN ACCORDANCE WITH LOCAL MUNICIPAL AUTHORITY STANDARDS.
9. THE CONTRACTOR SHALL SUBMIT A VIDEO INSPECTION REPORT OF ALL INSTALLED STORM AND SANITARY MAINS, INCLUDING CATCHBASIN LEADS AND SERVICES PRIOR TO ACCEPTANCE.
10. SERVICE CONNECTIONS SHALL TERMINATE 1.5m FROM THE FACE OF THE BUILDING, UNLESS OTHERWISE NOTED.
11. ALL DOWNSPOUTS SHALL BE DISCONNECTED AND DISCHARGE DIRECTLY TO THE SURFACE
12. MINIMUM DEPTH OF COVER OF 1.4m FOR STORM SEWERS AND 1.8m FOR SANITARY SEWERS, UNLESS OTHERWISE SHOWN.
13. PRIVATE SEWERS HAVE BEEN DESIGNED IN ACCORDANCE WITH M.O.E.C.C. GUIDELINES AS PER 7.1.6.5 OF THE O.B.C.
14. MINIMUM PIPE CROSSING CLEARANCE FOR STORM AND SANITARY SEWERS IS TO BE 0.15m.
15. SANITARY SERVICE CONNECTIONS MUST BE INSTALLED USING WYE CONNECTIONS.





KEY PLAN
N.T.S.

LEGEND

- SANITARY MANHOLE
- STORM MANHOLE
- CATCHBASIN MANHOLE
- DOUBLE CATCHBASIN MANHOLE
- CATCHBASIN
- DOUBLE CATCHBASIN
- FIRE HYDRANT & VALVE BOX
- WATER VALVE & BOX
- STREET LIGHT
- TRANSFORMER
- BELL PLANT
- ROGERS PLANT
- LIMIT OF DEVELOPMENT
- LIMIT OF CONSTRUCTION
- FF=100.00 FINISHED FLOOR ELEVATION
- PROPOSED 125mmø DOUBLE SANITARY CONNECTION WITH 100mmø WYES
- PROPOSED 125mmø (SINGLE) SANITARY CONNECTION
- PROPOSED 150mmø DOUBLE STORM CONNECTION WITH 125mmø WYES
- PROPOSED 150mmø (SINGLE) STORM CONNECTION
- PROPOSED 25mmø WATER SERVICE CONNECTION
- VERTICAL TRENCHING. FULL DEPTH PERMANENT ROAD RESTORATION RESTORE WITH: 90mm HL8 ASPHALT 200mm GRAN 'A' 300mm GRAN 'B' INCL. GRIND OUT OF 40mm HL8 AND REPLACE WITH 40mm HL3 ASPHALT (YEAR 2 WORKS)
- EXTENT OF REQUIRED PAVEMENT AND/OR BOULEVARD RESTORATION. FULL WIDTH, HL8 TO SURFACE & SURFACE PAVEMENT JOINT TREATMENT. RESTORATION DURING YEAR 2, GRIND OUT OF 40mm HL8 AND REPLACE WITH 40mm HL3 ASPHALT
- SP SUMP PUMP REQUIRED

LEGAL DESCRIPTION:

LOTS 6, 7, & PART OF LOT 8-BLOCK B
LOT 20 & PART OF LOTS 18, 19, & 21-BLOCK C
CADDY PLAN
TOWN OF COBOURG
COUNTY OF NORTHUMBERLAND

REFERENCE DRAWINGS:

FOR SITE PLAN INFORMATION REFER TO DRAWING A1.00, DATED OCTOBER 2014, PROJECT No. 14020 BY PEARCE McCLUSKEY ARCHITECTS.

SURVEY INFORMATION:

SURVEY INFORMATION TAKEN FROM DRAWING No. 0 16, FILE No. 4-5003-TOPOBASE_V2, PREPARED BY IVAN B. WALLACE O.L.S. LTD. DATED 23rd. DAY OF AUGUST 2018.

BENCHMARK INFO:

ELEVATIONS ARE REFERRED TO THE TOWN OF COBOURG BENCHMARK No. 9, HAVING AN ELEVATION OF 80.475m.

REVISIONS				
No.	BY	DATE	DESCRIPTION	APPROVED
1	A.W.	11.20.19	FIRST SPA SUBMISSION	

TOWN OF COBOURG
ENGINEERING AND ENVIRONMENTAL SERVICES

377 WILLIAM STREET

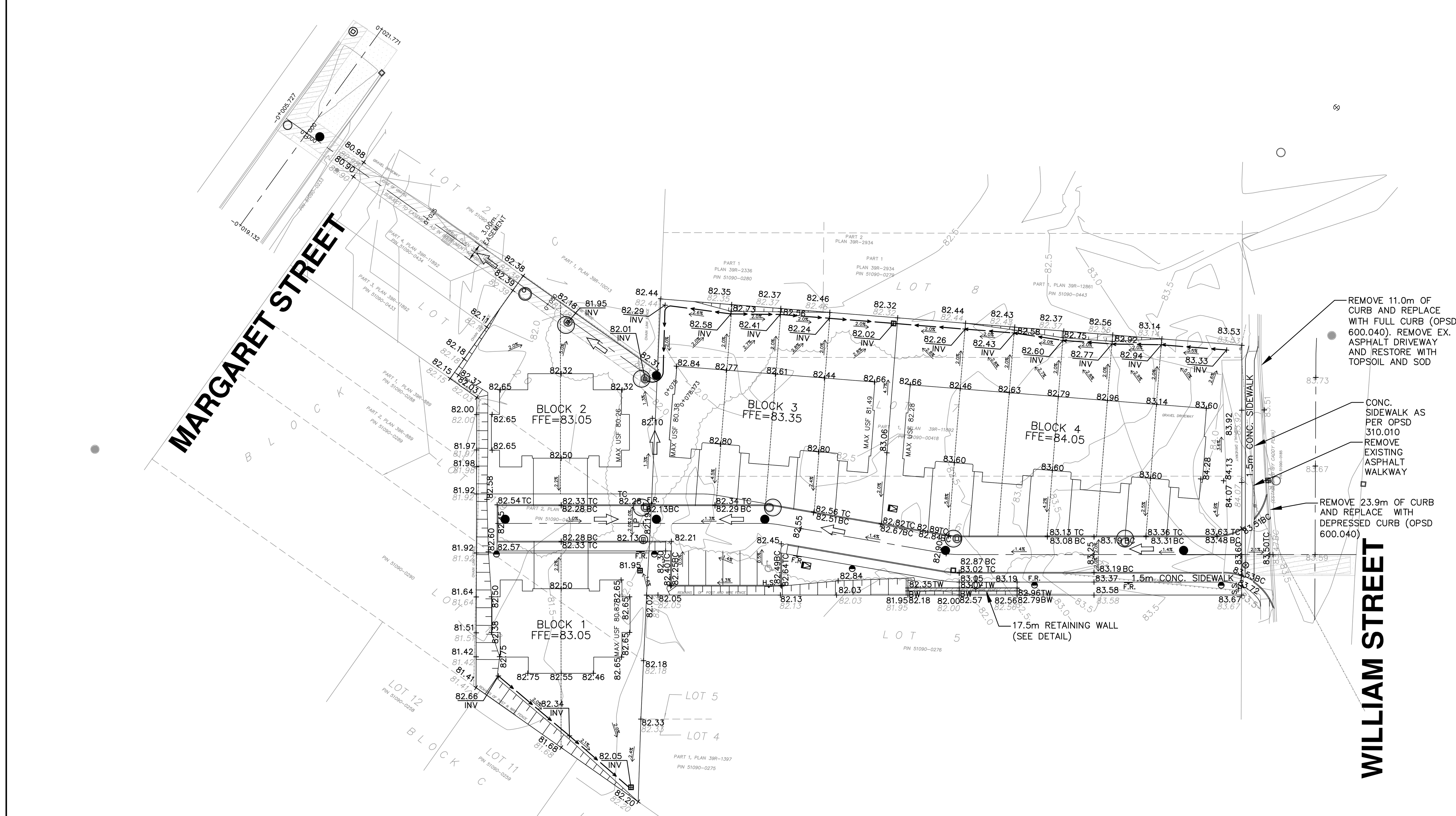
SITE SERVICING PLAN

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
1600 CHAMPLAIN AVE., SUITE 402 WHITBY, ONTARIO L1N 9B2
TEL. (289) 315-3680 FAX (905) 794-0611

LICENSED PROFESSIONAL ENGINEER
A.P.B. WATSON
100089398
NOV 20/19
PROVINCE OF ONTARIO

SCALE : 1:500	PROJECT No. E19012
DRAWN BY : K.D.	
DESIGNED BY : K.D.	DRAWING No. SS
CHECKED BY : A.W.	
REVISION DATE: April 23, 2019	

FILE: E19012-SS-SG.dwg



MARGARET STREET
WILLIAM STREET
BLOCK 1
FFE=83.05
BLOCK 2
FFE=83.05
BLOCK 3
FFE=83.35
BLOCK 4
FFE=84.05
REMOVE 11.0m OF CURB AND REPLACE WITH FULL CURB (OPSD 600.040). REMOVE EX. ASPHALT DRIVEWAY AND RESTORE WITH TOPSOIL AND SOD
CONC. SIDEWALK AS PER OPSD 310.010
REMOVE EXISTING ASPHALT WALKWAY
REMOVE 23.9m OF CURB AND REPLACE WITH DEPRESSED CURB (OPSD 600.040)
1.5m CONC. SIDEWALK
17.5m RETAINING WALL (SEE DETAIL)

SITE GRADING NOTES

1. ALL GRANULAR BASE AND SUB-BASE MATERIALS SHALL BE GRADED AND COMPACTED TO 98% STD. PROCTOR DENSITY, FREE OF DEPRESSIONS AS PER THE GEOTECHNICAL REPORT.
2. ALL DISTURBED GRASS AREAS SHALL BE RESTORED WITH TOPSOIL AND SOD TO ORIGINAL CONDITION OR BETTER.
3. ALL DISTURBED SIDEWALKS AND CURBS TO BE REMOVED AND REINSTATED TO ORIGINAL CONDITION OR BETTER.
4. ALL ASPHALT PAVEMENT AND ALL CONCRETE SIDEWALK AND CURB AND GUTTER SHALL BE SAWCUT PRIOR TO REMOVAL.
5. ALL CURBS TO BE OPSD 600.110, BARRIER CURB, UNLESS OTHERWISE SHOWN.
6. ALL CONCRETE SIDEWALKS WITHIN THE LIMITS OF THE SITE SHALL BE CONSTRUCTED IN ACCORDANCE WITH OPSS 351, OPSD 310.010, OPSD 310.020 AND OPSD 310.030, UNLESS OTHERWISE SHOWN, AND BE CONSTRUCTED TO A WIDTH AS SPECIFIED ON THE SITE PLAN.
7. DEPRESSED CURBS AND CURB RAMPS SHALL CONFORM TO O.B.C. SECTION 3.8, UNLESS OTHERWISE NOTED.
8. EXISTING MANHOLES AND VALVES TO BE ADJUSTED AS REQUIRED TO SUIT NEW GRADES.
9. WHEN CATCHBASINS ARE LOCATED ADJACENT TO THE CURBS, SUBDRAINS SHALL BE INSTALLED CONTINUOUSLY UNDER THE CURBS. WHEN CATHCHBASINS ARE NOT LOCATED ADJACENT TO CURBS, PROVIDE MINIMUM LENGTH OF 3.0m EXTENDING FROM ALL CATCHBASINS AND CATCHBASIN MANHOLES AS PER THE DETAIL PROVIDED.
10. WHERE APPLICABLE, THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS FOR RETAINING WALLS (INCLUDING RAILING AND/OR FENCING IF APPLICABLE) TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SHOP DRAWINGS MUST BE SITE SPECIFIC, SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER. THE CONTRACTOR WILL ALSO BE REQUIRED TO SUPPLY STRUCTURAL AND GEOTECHNICAL CERTIFICATION OF THE AS-CONSTRUCTED RETAINING WALL TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.
11. PAVEMENT DESIGN AS FOLLOWS OR AS SPECIFIED IN THE GEOTECHNICAL REPORT PREPARED BY THE GEOTECHNICAL CONSULTANT, WHICHEVER IS GREATER:

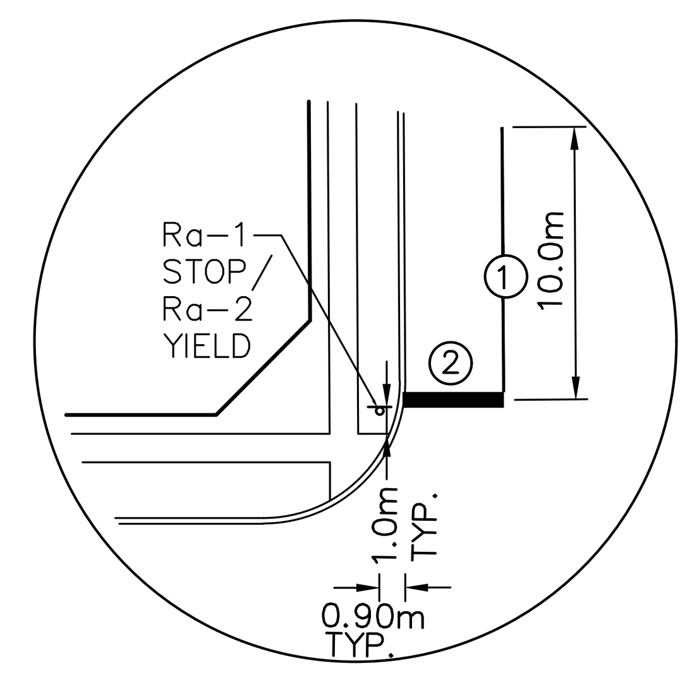
MATERIAL	DEPTH (mm)
ASPHALT CONCRETE HL3	40
ASPHALT BINDER HL8	60
GRANULAR A	150
GRANULAR B	350

TRAFFIC MANAGEMENT NOTES:

1. ALL MARKINGS AND SIGNS SHALL CONFORM WITH THE ONTARIO TRAFFIC MANUAL.
2. FINAL LOCATION OF ALL SIGNS SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
3. FINAL PAVEMENT MARKINGS BY THE DEVELOPER.
4. PERMANENT PAVEMENT MARKINGS APPLIED TO SURFACE COURSE ASPHALT SHALL BE TWO COMPONENT COLD CURING PLASTIC TYPE OR APPROVED EQUIVALENT.
5. DAYLIGHTING 4.5m x 4.5m UNLESS OTHERWISE SHOWN.

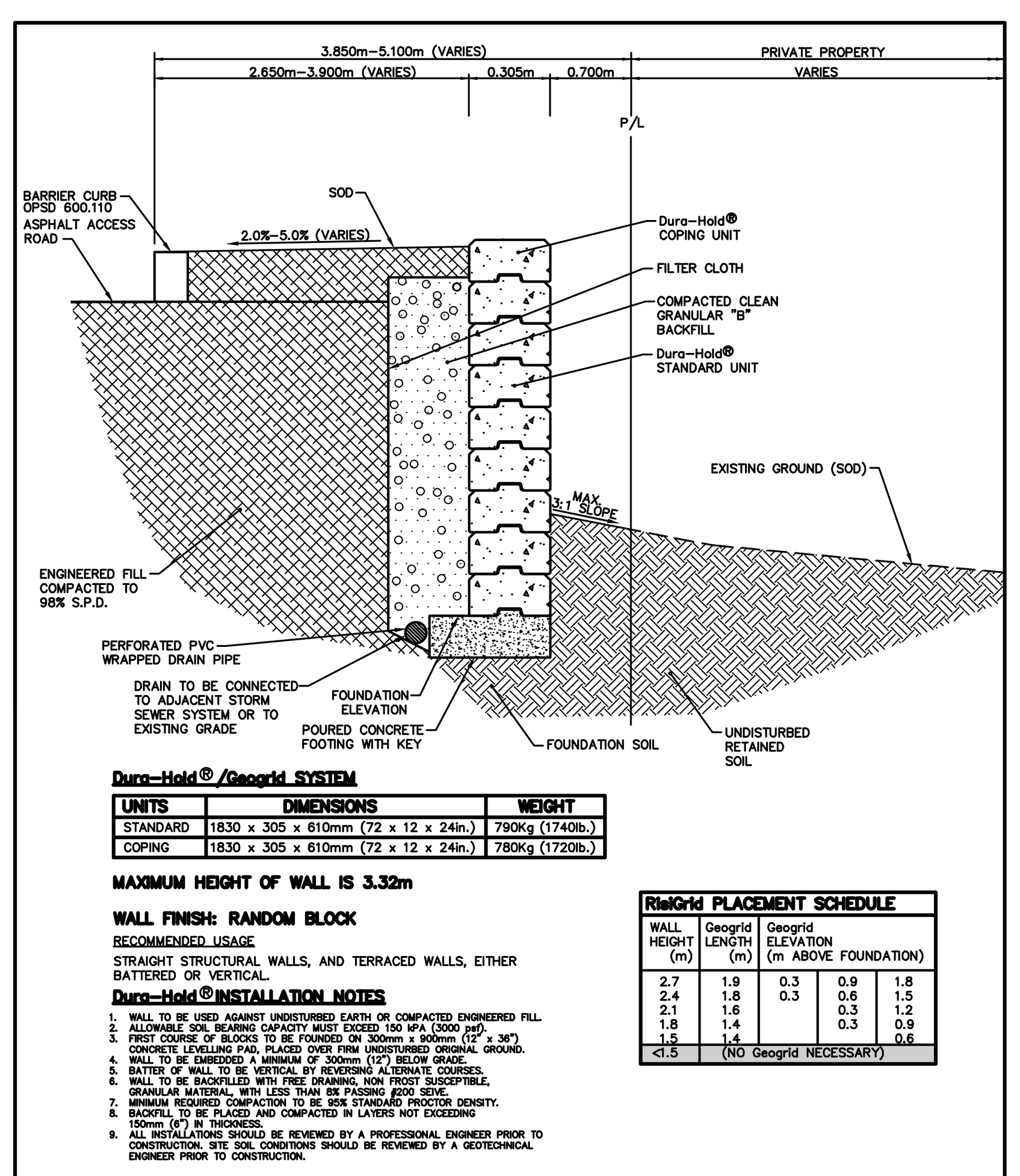
PAVEMENT MARKING LEGEND

①	SOLID	YELLOW	10cm
②	SOLID	WHITE	45cm



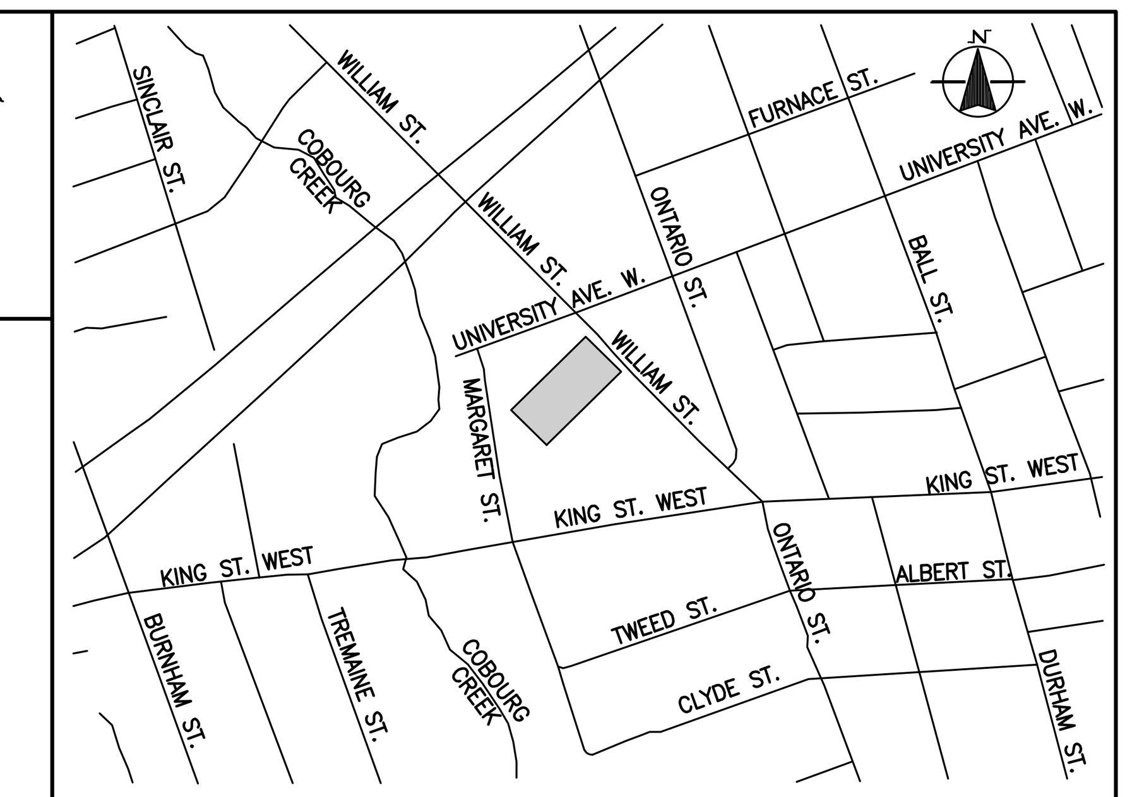
TYPICAL STOP SIGN LOCATION AT INTERSECTIONS

TRAFFIC SIGN SCHEDULE			
SIGN DESCRIPTION	MESSAGE	QUANTITY	COMMENTS
Ra-1	STOP	1	
	ACCESSIBILITY SIGNAGE	1	
	FIRE ROUTE	3	



PRIVATE PROPERTY
BARRIER CURB OPSD 600.110 ASPHALT ACCESS ROAD
FILTER CLOTH
EXISTING GROUND (500)
ENGINEERED FILL COMPACTED TO 98% S.P.D.
PERFORATED PVC WRAPPED DRAIN PIPE
FOUNDATION SOIL
UNDISTURBED RETAINED SOIL
Dura-Hold® /Geogrid SYSTEM
MAXIMUM HEIGHT OF WALL IS 3.32m
WALL FINISH: RANDOM BLOCK

DETAIL - DETAIL B DURA-HOLD/RISIGRID RETAINING WALL (TYPICAL)
SCALE = N.T.S.



KEY PLAN

N.T.S.

LEGEND

- SANITARY MANHOLE
- STORM MANHOLE
- CATCHBASIN MANHOLE
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- CATCHBASIN
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- FIRE HYDRANT & VALVE BOX
- WATER VALVE & BOX
- STREET LIGHT
- TRANSFORMER
- BELL PLANT
- ROGERS PLANT
- LIMIT OF DEVELOPMENT
- LIMIT OF CONSTRUCTION
- FF=100.00 — FINISHED FLOOR ELEVATION
- 82.5 — EXISTING GROUND CONTOUR
- +123.45 — PROPOSED FINISHED GRADE
- 123.45 — EXISTING GROUND GRADE
- 2.0% — SLOPE LABEL
- TC — TOP OF CURB ELEVATION
- BC — BOTTOM OF CURB ELEVATION
- TW — TOP OF WALL ELEVATION
- BW — BOTTOM OF WALL ELEVATION
- S.S. — STOP SIGN
- F.R. — FIRE ROUTE SIGN
- H.S. — ACCESSIBILITY SIGN
- OVERLAND FLOW ROUTE
- VERTICAL TRENCHING. FULL DEPTH PERMANENT ROAD RESTORATION
  RESTORE WITH:
  90mm HL8 ASPHALT
  200mm GRAN 'A'
  300mm GRAN 'B'
  INCL. GRIND OUT OF 40mm HL8 AND REPLACE WITH 40mm HL3 ASPHALT (YEAR 2 WORKS)
- EXTENT OF REQUIRED PAVEMENT AND/OR BOULEVARD RESTORATION. FULL WIDTH, HL8 TO SURFACE & SURFACE PAVEMENT JOINT TREATMENT. RESTORATION DURING YEAR 2, GRIND OUT OF 40mm HL8 AND REPLACE WITH 40mm HL3 ASPHALT

LEGAL DESCRIPTION:

LOTS 6, 7, & PART OF LOT 8-BLOCK B
LOT 20 & PART OF LOTS 18, 19, & 21-BLOCK C
CADDY PLAN
TOWN OF COBOURG
COUNTY OF NORTHUMBERLAND

REFERENCE DRAWINGS:

FOR SITE PLAN INFORMATION REFER TO DRAWING A1.00, DATED OCTOBER 2014, PROJECT No. 14020 BY PEARCE McCLUSKEY ARCHITECTS.

SURVEY INFORMATION:

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LICENSED PROFESSIONAL ENGINEER A.P.B. WATSON 100089398 PROVINCE OF ONTARIO

SCALE : 1:500	PROJECT No. E19012
DRAWN BY : K.D.	
DESIGNED BY : K.D.	DRAWING No. SG
CHECKED BY : A.W.	
REVISION DATE: April 23, 2019	

FILE: E19012-SS-SG.dwg