FUNCTIONAL SERVICING &
PRELIMINARY STORMWATER MANAGEMENT REPORT
FOR
150 CEMETERY ROAD

TOWNSHIP OF UXBRIDGE

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1.0 INTRODUCTION

1.1 Background

Politis Engineering Ltd. has been retained by 1093560 Ontario Limited (Coral Creek Homes) to prepare a functional servicing and preliminary stormwater management report in support of the proposed residential subdivision located at 150 Cemetery Road in the Township of Uxbridge.

The purpose of this report is to provide site-specific information for the Township and Region to review with respect to the municipal infrastructure required to support the proposed development regarding sanitary sewers, water supply and storm drainage. More specifically, the report will present the following:

1. Regional sanitary servicing including review of the existing and proposed sanitary flows; impact on the existing sanitary sewer system including determining whether there is capacity in the receiving municipal sewers to accommodate the additional sanitary flows from the proposed development.
2. Regional municipal water system review, including calculating the proposed domestic water and firefighting supply needs; and confirming that it has adequate flow to meet the required domestic and fire flow demands for the proposed development.
3. Preliminary Stormwater Management (SWM) review, including calculate the allowable and proposed runoff rates for the development; provide possible methods for attenuation and treatment of stormwater runoff; on-site control measures and compliance of the proposed stormwater control measures with the Township's, Lake Simcoe Region Conservation Authority (LSRCA), MOECC/MECP and MNR regulations and criteria. A detailed SWM report will be provided as part of the detailed Subdivision application.

The following documents were reviewed and referenced as part of the preparation of this report:

- Draft Plan of Subdivision prepared by H.F. Grander Co. Ltd., OLS dated October 9, 2021 which includes a detailed topographic survey of the property.
- Cemetery Road Plan & Profile – Cemetery Road Sanitary Sewer Extension, drawing number PP-01 prepared by Cole Engineering, dated July 2017, Revision 8 dated June 22, 2018 – Not As-Constructed.
- Cemetery Road Reconstruction "Issued for Tender" drawing set prepared by Chisholm, Fleming and Associates, Revision 3 dated February 2024.
- Report on Geotechnical Investigation – 150 Cemetery Road, Uxbridge, Ontario prepared by Toronto Inspection Limited, dated January 12, 2021.
- Hydrogeological Investigation - 150 Cemetery Road, Uxbridge, Ontario prepared by Toronto Inspection Limited, dated August 7, 2024.
- Summary of Infiltration Testing for Proposed Development at 150 Cemetery Road, Uxbridge, Ontario prepared by prepared by Toronto Inspection Limited, dated October 26, 2021.
- Natural Heritage Evaluation – Plan of Subdivision 150 Cemetery Road, prepared by GHD, dated January 6, 2021.
- Stormwater Management Master Plan – Uxbridge Urban Area and Hamlet of Coppin's Corners prepared by Stantec, May 2016.

1.2 Site Description

The subject property has a total area of approximately 43,765 square meters or 4.38 Ha in size and is located on

the west side of Cemetery Road north of Toronto Street South as shown in **Figure 1**. It is comprised of Part of Lot 27, Concession 6, in the Township of Uxbridge and the Regional Municipality of Durham. The property is occupied by a brick raised bungalow with an integrated double car garage. The existing house is accessed by a paved driveway from Cemetery Road. There is also a paved tennis court, multiple sheds and an inground swimming pool with deck surround.

The Town of Uxbridge has retained the services of Chisholm, Fleming and Associates (CFA) to design the urbanization of Cemetery Road including a storm drainage system, curb and gutter and sidewalk from Toronto Street South to the point where the road was previously urbanized in front of Uxbridge Cemetery.

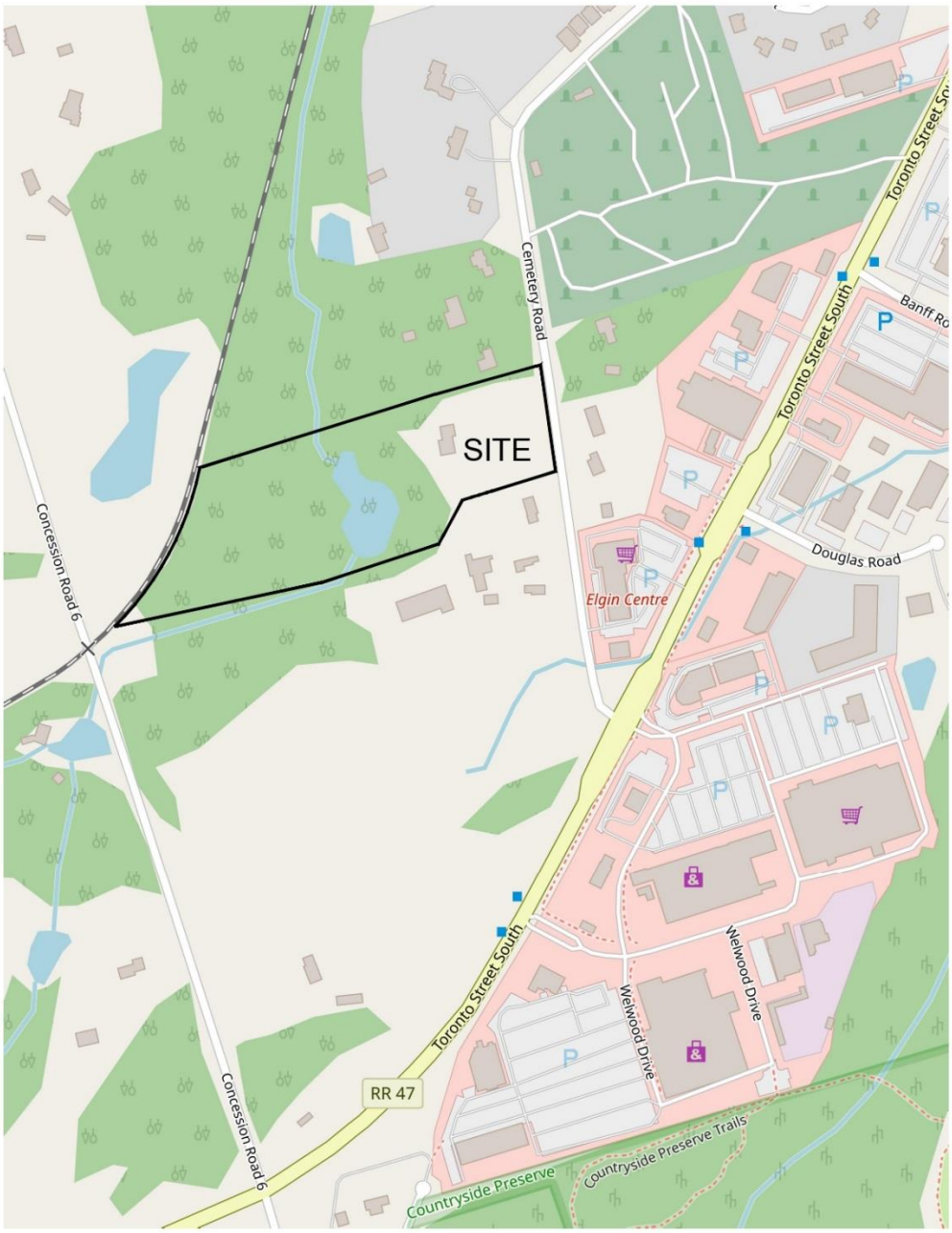


Figure 1 – Key Plan (Not to Scale)

1.3 Proposed Development

The proposed subdivision will occupy approximately 9478 sq.m. or approximately 1.0 Ha of the eastern portion of the property with the balance to remain undisturbed.

The intention is to demolish the existing house to re-develop the property as a residential subdivision with a municipal road extending from Cemetery Road and ending in a cul-de-sac, creating 5 blocks with a total of 23 freehold townhouses and 1 block with a pair of semi-detached units, for a total unit count of 25.

1.4 Existing Topography

A topographic survey prepared by H.F. Grander shows that the property slopes generally in 2 directions with a ridge located more or less where the existing house is located, resulting in a pre-development storm drainage area of 0.736 Ha directed to the Cemetery Road drainage ditch and the balance draining west to Uxbridge Brook which traverses the west end of the property. There is no drainage from neighbouring properties that is directed into the subject site that drains to Cemetery Road.

The existing slope from the existing house to the front property line is approximately 5% while there is an embankment from the property line to the ditch.

2 EXISTING MUNICIPAL INFRASTRUCTURE

Figure 2 shows the existing municipal infrastructure in the vicinity of the subject property on Cemetery Road:

- 200 mm sanitary sewer with a depth of approximately 6.4 m located along the centerline of the pavement of Cemetery Road more or less and terminated at the projection of the south property line
- 300 mm watermain located on the east side of the pavement of Cemetery Road just south of the projection of the south property line.
- Currently there are no storm sewers on Cemetery Road. The Township has retained the services of Chisholm, Fleming & Associates, Consulting Engineers to design a storm sewer system as part of the urbanization of Cemetery Road.

3 SANITARY SEWER SYSTEM

3.1 Existing Sanitary Sewer Drainage System

With the recent development of the property to the south, a 200 mm diameter sanitary sewer was extended on Cemetery Road from Toronto Street South to the north limit of the adjacent development. The Region of Durham has indicated through the Pre-Consultation process that the extension of the 200 mm sanitary sewer on Cemetery Road will be required across the entire frontage of the property and they will review the downstream sanitary system in order to confirm if the system has capacity for this development site. The Region's Pre-Consultation comments are enclosed in **Appendix 1** for reference.

3.2 Existing Sanitary Flows

The subject property does not contribute sanitary drainage to the new sanitary sewer on Cemetery Road nor do the adjacent properties to the north and the east side of Cemetery Road. All the existing houses utilize on-site septic systems.

PROPERTY LINE

EX TENNIS COURT

EX TENNIS COURT

EX HOUSE

2.45

1.00 TOE EROSION ALLOWANCE

EX HOUSE # 150

4.18

EX GARAGE

3.69

EX DRIVEWAY

PS

EX PAVED DRIVEWAY

EX DRIVEWAY

EX DRIVEWAY

EX DRIVEWAY

PROPERTY LINE

PROPERTY LINE

EX EDGE OF PAVEMENT

EX CENTERLINE OF ROAD

EX EDGE OF PAVEMENT

FUTURE CENTERLINE OF ROAD

(PART 2, PLAN 40R - 9382)

(PART 3, PLAN 40R - 9382)

(PART 4, PLAN 40R - 9382)

CEMETERY ROAD

PROP 300 mmØ WATERMAIN

0.5M CSP

FUTURE CENTERLINE OF ROAD

EX EDGE OF PAVEMENT

EX CENTERLINE OF ROAD

EX 250Ø PVC SANITARY

EX EDGE OF PAVEMENT

EX 300 mmØ WATERMAIN

EX HYDRANT

0.5M CSP

0.5M CSP

0.5M CSP

0.5M CSP

BLOCK

7

11

9382)

0 5 10 15 20 25 m

EX 250mmØ SANITARY SEWER

EX 300mmØ WATERMAIN

FIGURE 2 – EXISTING MUNICIPAL INFRASTRUCTURE (SCALE = 1:500)

3.3 Proposed Sanitary Flows

The proposed sanitary design flows generated by the development of the subject property is calculated based on the Region of Durham design criteria which stipulates an average residential flow of 364 litres per person per day. The "equivalent population" is 3.5 persons per semi-detached unit and 3.0 persons per townhouse unit. A peaking factor using the Harmon peaking factor with a maximum of 3.8 is used and an infiltration allowance of 22.5 cu.m. per gross hectare per day is applied where foundation drains are not connected to the sanitary sewer, as is the case for this project.

Table 1 - Equivalent Population			
Dwelling Type	No. Units	P/Unit	Population
Townhouses	23	3.0	69
Semi-Detached	2	3.5	7
	Total Population =		76

Using a maximum peaking factor of 3.8 and applying the average residential flow, the daily sanitary flow is 105,123.2 litres per day. The gross sanitary tributary area is 9414 sq.m. (0.9141 Ha) resulting in an infiltration daily volume of 21.1815 cu.m. or 21,181.5 litres per day for a total sanitary design flow of 126,304.7 litres per day or 1.46 litres per second.

A sanitary sewer main will need to be extended into the site within the proposed road allowance with individual service connections provided to each dwelling per the Region of Durham standards and criteria.

4 WATER DISTRIBUTION SYSTEM

4.1 Existing Water Distribution System

The Region of Durham has indicated through the Pre-Consultation process that the extension of the 300 mm watermain on Cemetery Road will be required across the entire frontage of the property and for security and looping purposes, a secondary watermain feed from the existing 200 mm watermain located approximately 285 m to the north and east will be required. The Region's design criteria requires watermains shall be sized to carry the greater of maximum day plus fire flow or maximum hour demand.

4.2 Proposed Domestic Water Demand

Referring to the equivalent population (76 persons) and average residential flow derived from above (364 L/P/day) the average water demand is 27,664 L/day or 19.2 L/minute.

4.3 Proposed Fire Water Demand

The fire demand is calculated based on the "Water Supply for Fire Protection, A Guide to Recommended Practice" issued by the Fire Underwriters Survey of the Insurance Bureau of Canada. The maximum fire flow required will be for Block 2 which has 6 units and a gross footprint area of 619.1 sq.m. Assuming no fire separation between units and ordinary construction (brick or other masonry walls, combustible floor and interior) the fire flow has been calculated to be 12,500 L/minute. The detailed calculations are in **Appendix 2**.

4.4 Total Water Design Demand

From the MOECC (formerly MOE) "Guidelines for the Design of Water Distribution Systems", peaking factors are recommended for populations between 500 to 1000 as follows:

Maximum Day Factor = 2.75
Peak rate factor (peak hour) = 4.13

Therefore,

Maximum day is 19.2 L/min x 2.75 = 52.8 L/min

Peak hour is 19.2 L/min x 4.13 = 79.3 L/min

The water distribution system will need to be designed to provide maximum day plus fire demand or 12,552.8 L/min or rounded up to 13,000 L/min.

A watermain will need to be extended into the site within the proposed road allowance with individual service connections provided to each dwelling and individual water meters. A fire hydrant will be required at the termination of the watermain per the Region of Durham standards and criteria.

5 STORMWATER MANAGEMENT & STORM DRAINAGE

As required by LSRCA, the Stormwater Management (SWM) is a stand-alone document and a Engineering Summary Checklist has been prepared – see **Appendix 3**.

5.1 Peak Flow and Quantity Control

The LSRCA Technical Guidelines for Stormwater Management (SWM) Submissions requires that peak flow control be implemented to maintain the pre-development peak flow discharge rate for the 2 through 100 year storm events. Drawing 102 is the Pre-Development Storm Drainage Plan and **Tables 2** and **3** show the calculation of the pre-development peak flows directed to Cemetery Road and to the valley to the west, using the Rational Method. The runoff coefficients and rainfall intensities are based on the Township's Design Criteria (2016) – see **Appendix 4**:

Table 2 - Pre-Development Peak Flows to Cemetery Road				
Return Period	Rainfall Intensity (mm/hour)	Runoff Coefficient C	Runoff Coefficient Factor	Peak Flow (L/s)
2	76.76	0.26	1.00	39.8
5	107.01	0.26	1.00	55.5
10	126.06	0.26	1.00	65.4
25	154.64	0.26	1.10	88.2
100	200.63	0.26	1.25	130.1
	Total Area =	7127.7	sq.m.	
	Impervious Area =	589	sq.m.	
	Pervious Area =	6538.7	sq.m.	
	Impervious C =	0.20		
	Pervious C =	0.95		

Table 3 - Pre-Development Peak Flows to Valley				
Return Period	Rainfall Intensity (mm/hour)	Runoff Coefficient C	Runoff Coefficient Factor	Peak Flow (L/s)
2	76.76	0.40	1.00	19.9
5	107.01	0.40	1.00	27.8
10	126.06	0.40	1.00	32.8
25	154.64	0.40	1.10	44.2
100	200.63	0.40	1.25	65.2
	Total Area =	2349.8	sq.m.	
	Impervious Area =	620.4	sq.m.	
	Pervious Area =	1729.4	sq.m.	
	Impervious C =	0.20		
	Pervious C =	0.95		

Drawing 103 is the Post Development Storm Drainage Plan. The breakdown of the post development areas and the runoff coefficients and composite runoff coefficients can be found in **Appendix 5**.

Tables 4 and **5** calculate the uncontrolled post development storm peak flows directed to Cemetery Road and the valley respectfully:

Table 4 - Post Development Uncontrolled Peak Flows to Cemetery Road				
Return Period	Rainfall Intensity (mm/hour)	Runoff Coefficient C	Runoff Coefficient Factor	Peak Flow (L/s)
2	76.76	0.63	1.00	92.9
5	107.01	0.63	1.00	129.5
10	126.06	0.63	1.00	152.6
25	154.64	0.63	1.10	205.9
100	200.63	0.63	1.25	303.6
	Total Area =	6894.4	sq.m.	
	Impervious Area =	3971.6	sq.m.	
	Pervious Area =	2922.8	sq.m.	
	Impervious C =	0.20		
	Pervious C =	0.95		

Table 5 - Post Development Uncontrolled Peak Flows to Valley				
Return Period	Rainfall Intensity (mm/hour)	Runoff Coefficient C	Runoff Coefficient Factor	Peak Flow (L/s)
2	76.76	0.36	1.00	19.7
5	107.01	0.36	1.00	27.5
10	126.06	0.36	1.00	32.4
25	154.64	0.36	1.10	43.7
100	200.63	0.36	1.25	64.5
	Total Area =	2583.3	sq.m.	
	Impervious Area =	545.4	sq.m.	
	Pervious Area =	2037.9	sq.m.	
	Impervious C =	0.20		
	Pervious C =	0.95		

Table 6 compares the uncontrolled pre and post development peak flows:

Table 6 - Comparison of Uncontrolled Pre to Post Development Peak Flows						
	Cemetery Road			Valley		
Storm Event	Pre L/s	Post L/s	Change L/s	Pre L/s	Post L/s	Change L/s
2	39.8	93.1	53.3	19.9	19.7	-0.2
5	55.5	129.7	74.2	27.8	27.5	-0.3
10	65.4	152.9	87.5	32.8	32.4	-0.4
25	88.2	206.2	118.0	44.2	43.7	-0.5
100	130.1	304.1	174.0	65.2	64.5	-0.7

Based on the proposed grading (Dwg. 301), the uncontrolled peak flow directed to the valley is virtually equal to the pre-development and the difference is negligible while the uncontrolled peak flows to Cemetery Road is increased and will require mitigation measures to maintain the pre-development levels. A storm drainage system will be provided as part of the urbanization of Cemetery Road which will provide a storm outlet for the proposed subdivision, subject to controlling the peak flows. The Cemetery Road storm system is designed to convey the 5 year storm event and has been sized to allow for 55.5 L/s from the subject site.

Since the property has relatively steep slopes to contend with and to avoid “short-circuiting” the storm system where major flows could be expelled at the RLCB, it is proposed to connect the rear lot catchbasin at the south-east corner of Block 3 to the proposed Cemetery Road piped system and allow for the tributary area which is comprised of rear yards and roof runoff to discharge uncontrolled. **Table 7** is a summary of the peak flows directed to the RLCB:

Table 7 - Post Development Uncontrolled Peak Flows to RLCB				
Return Period	Rainfall Intensity (mm/hour)	Runoff Coefficient C	Runoff Coefficient Factor	Peak Flow (L/s)
2	76.76	0.48	1.00	11.1
5	107.01	0.48	1.00	15.5
10	126.06	0.48	1.00	18.2
25	154.64	0.48	1.10	24.6
100	200.63	0.48	1.25	36.3
	Total Area =	1093	sq.m.	
	Impervious Area =	402.6	sq.m.	
	Pervious Area =	690.4	sq.m.	
	Impervious C =	0.20		
	Pervious C =	0.95		

Table 8 is a summary of the uncontrolled peak flows from Street ‘A’ directed to Cemetery Road:

Table 8 - Post Development Peak Flows From Street 'A'				
Return Period	Rainfall Intensity (mm/hour)	Runoff Coefficient C	Runoff Coefficient Factor	Peak Flow (L/s)
2	76.76	0.66	1.00	81.8
5	107.01	0.66	1.00	114.1
10	126.06	0.66	1.00	134.4
25	154.64	0.66	1.10	181.3
100	200.63	0.66	1.25	267.3
	Total Area =	5801.4	sq.m.	
	Impervious Area =	3569.05	sq.m.	
	Pervious Area =	2232.4	sq.m.	
	Impervious C =	0.20		
	Pervious C =	0.95		

Since the RLCB will discharge uncontrolled, the allowable discharge rates from the Street 'A' storm system to Cemetery Road will need to be further overcontrolled to maintain the allowable pre-development peak flows. For the 100 year storm event, the maximum piped flow from Street 'A' must not exceed the downstream piped system capacity (55.5 L/s) less the 100 year uncontrolled peak flow from the RLCB (36.3 L/s) or 19.2 L/s. Therefore the peak flow from Street 'A' will be controlled to 19.2 L/s. Overland flow can be accommodated so long as the combined piped flow plus overland flow does not exceed the pre-development levels.

Table 9 is a summary of the detention volumes required to maintain the pre-development peak flows to Cemetery Road while maintaining the pre-development peak flows. The detailed calculations which are based on the Modified Rational Method are found in **Appendix 4**:

Table 9 - Storm Detention Volumes Required					
	Street 'A'		RLCB	Total	Detention
Storm Event	Overland (L/s)	Piped (L/s)	Piped (L/s)	Flow (L/s)	Vol. Req'd. (cu.m.)
2	0	19.2	11.1	30.3	42.6
5	0	19.2	15.5	34.7	70.5
10	0	19.2	18.2	37.4	88.8
25	11.3	19.2	24.6	55.1	107.0
100	73.7	19.2	36.3	129.2	107.0

A vortex flow regulator (also known as a hydro brake or vortex valve) will be used to provide control of the peak flows since sizing for an orifice tube for the required flow will result in an orifice tube with a diameter smaller than 100 mm which is typically not desirable due to the possibility of blockage. The vortex valve is designed to provide the required peak flows while reducing the risk of blockage as compared to standard orifices. It has no moving parts and is manufactured using stainless steel requiring little to no maintenance. It will be installed at the outlet from the proposed concrete box culverts and will require a sump to be provided below it. The required detention storage will be achieved by providing 24.0 m of 3000 x 1500 concrete box culvert as shown on Drawing 101. The actual inside dimensions are 3024 mm x 1524 mm and has a cross sectional waterway area of 4.516 sq.m. and a total available volume of 108.4 cu.m. The stage-storage characteristics are calculated in **Table 10**:

Table 10 - Stage-Storage for 3000 x 1500 Box Culvert Super-Pipe								
		Orifice	END AREA			AVAIL. DET.	STORM	REQ. DET.
INVERT	H	Flow	D/S	U/S	AVG	VOLUME	EVENT	VOLUME
	(m)	(L/s)	(sq.m.)	(sq.m.)	(sq.m.)	(cu.m.)		(cu.m.)
290.44								
290.48	0.04	1.9	0.103	0.000	0.052	0.8	> 2 Year	
290.71	0.27	4.8	0.758	0.578	0.668	16.0	> 2 Year	
291.53	1.09	9.6	3.258	3.075	3.166	76.0	> 2 Year	
292.89	2.45	14.4	4.516	4.516	4.516	108.4	> 2 Year	
294.37	3.93	18.2	4.516	4.516	4.516	108.4	> 2 Year	
294.80	4.36	19.2	4.516	4.516	4.516	108.4	**2 TO 100**	43.1 TO 107.0
	SLOPE =	0.25%						
	LENGTH =	24.0				FLOW CONTROL BY: VORTEX VALVE		
	DS INVERT =	290.44						

5.2 Stormwater Volume Control

The Lake Simcoe Protection Plan requires that "…any new development or redevelopment that results in site disturbance that creates 0.5 hectares or more of new impervious surface, or, fully reconstructs 0.5 hectare or more of impervious surface, should demonstrate how volume control will be provided for the development".

For the subject site, the proposed total impervious surface is 4,517.0 sq.m. or 0.45 Ha. Although the area is less than the 0.5 Ha threshold, volume control will be implemented to provide volume control and water quality benefits.

Drawing 302 is the "LID Systems Plan" and 303 is the "LID Systems Notes and Details Plan". The roofs will be piped to soakaway pits and/or soakaway areas below infiltration trenches while infiltration trenches will be provided where possible below the proposed swales. For Blocks 5 and 6, separate soakaway pits will be provided. The proposed LID systems have been designed based on the in-situ infiltration testing that was done by Toronto Inspection Ltd. on October 1, 2021 (see **Appendix 6**) and will provide for 25 mm retention from the contributing areas for a total volume of 71.1 cu.m. which is equivalent to 15.6 mm per square metre of total impervious area. Refer to **Table 11**:

Table 11 - LID Sizing Calculations							
		Roof Runoff - Piped to Soakaway Pit		Drainage Directed to Infiltration Trench		Total	Total
Block	Factored T (mm/hr)	Roof Area Captured (sq.m.)	Volume Retained (cu.m.)	Area Captured (sq.m.)	Volume Retained (cu.m.)	Volume Retained (cu.m.)	Area Required (sq.m.)
1	16.4	250.8	6.27	253.0	6.33	12.60	40.00
2	16.4	300.5	7.51	462.0	11.55	19.06	60.53
3	45.2	250.8	6.27	354.0	8.85	15.12	17.42
4	45.2	195.0	4.88	250.0	6.25	11.13	12.82
5	45.2			291.0	7.28	7.28	8.38
	10.0	50.9	1.27			1.27	6.63
6	10.0	187.5	4.69	0.0	0.00	4.69	24.41
	Totals	1235.5	30.89	1610.0	40.25	71.14	170.20
Retained Rainfall Depth = 25 mm							

The “Area Required” in **Table 11** is based on “Equation 4.3: Infiltration Trench Bottom Area” from the 2003 M.O.E SWM Planning & Design Manual and drawdown time is 48 hours.

5.3 Safe Conveyance to a Sufficient Outlet

Since the peak flows to the valley will be approximately equal to the pre-development level, the conveyance of flows will not have a dt6erimental effect so long as concentrated discharge points are avoided. Sheet flow is to be provided where drainage is directed to the valley.

For the storm sewer system to outlet to the proposed Cemetery Road storm sewer, the peak flow is controlled to the 5 year pre-development level respecting the minor system on Cemetery Road is designed for up the 5 year level.

There will be no overland flow for all storm events at the RLCB. For the storm system on Street ‘A’ there will be no overland flow for the 2, 5 and 10 year storm events, there will be overland flow at the 25 and 100 year level with the total discharge of piped and overland flow at or below the 100 year pre-development peak flow.

5.4 Inlet Conveyance Efficiency

A detailed analysis has been prepared for the capture at the inlets (CB1 & CB2, DCB1 & DCB2 and RLCB) that shows the 100 year peak flows can be captured including allowing for 50% blockage. Refer to **Appendix 7** for the detailed calculations.

5.5 Water Quality Control - TSS Removal

The requirement is to provide 80% TSS removal as part of an enhanced level treatment. A Hydroworks HydroDome Model HD4 has been sized to provide treatment of the storm runoff prior to discharging to the Cemetery Road storm system. The sizing summary shows it will provide treatment for 96% of the annual runoff and provides 89% annual TSS removal. The HydroDome has received ETV certification for removal of TSS in excess of 80%. The sizing documentation, ETV certificate and maintenance manual are enclosed in **Appendix 8**

5.6 Phosphorus Removal

As part of the hydrogeological report prepared by Toronto Inspection Ltd. (TIL), a Phosphorus loading balance analysis was prepared using Ministry of Environment (MOE) Tool, the summary of which is enclosed in **Appendix 9**. The pre-development annual load is 0.13 kg/year and the post development load is 1.32 kg/year or an increase of 1.20 kg/year. Therefore mitigation measures must be taken to reduce the loading.

Phosphorus loading is typically 50% attached to suspended solids and 50% dissolved in storm runoff. The proposed HydroDome MTD is ETV certified and will provide more than 80% TSS removal which will provide a further reduction of 40% of Phosphorus loading.

The Phosphorus removal efficiencies provided in the MOE Tool allow an analysis of the efficiency of the proposed infiltration trenches (60% P removal) and downspouts piped to exfiltration pipes within soakaway pits for all Blocks (87% P removal).

In order to claim the 60% P removal for the infiltration trenches, Table 3.2 of the MOE guidelines is taken into consideration. For the roof areas which are taken to be 100% impervious, a storage volume of 45 cu.m. per ha is required. From **Table 11**, the total contributing area is 1235.5 sq.m. or 0.1235.5 ha. The volume to be retained to meet Table 3.2 is 5.6 cu.m. which equates to 30.9 cu.m. per ha.

The total landscaped areas directed to the infiltration trenches is 1610.0 sq.m. (0.161 ha). Considering an impervious level of 35% requires 25 cu.m. per ha or 4.0 cu.m. to be retained. The proposed retained volume is 40.25 cu.m. which equates to 250 cu.m. per ha. Therefore the proposed infiltration systems do meet the requirements of Table 3.2.

Table 12 is a summary of the Phosphorus loading and treatment:

Table 12 - Post Development Phosphorus Load Calculations				
Low Intensity Development P =	0.130	kg/ha/year		
High Intensity Development P =	1.320	kg/ha/year		
Tributary	Area (sq.m.)	Removal Rate (%)	P Removed (kg/year)	
To Valley	2583.3			
Roofs to Exfil. Pipe	489.2	87%	0.056	
Landscape to Infil. Trench	253.0	60%	0.020	
Untreated landscaped	1841.1	0%	0.000	
To RLCB	1093.0			
Roofs to Exfil. Pipe	445.8	87%	0.051	
Landscape to Infil. Trench	604.0	60%	0.048	
Untreated	43.2	0%	0.000	
To CB1 & CB2	3165.1			
Roofs to Exfil. Pipe	0.0	87%	0.000	
Landscape to Infil. Trench	0.0	60%	0.000	
Untreated to MTD	3165.1	40%	0.167	
To DCB1 & DCB2	2636.3			
Roofs to Exfil. Pipe	300.5	87%	0.035	
Landscape to Infil. Trench	462.0	60%	0.037	
Untreated to MTD	1873.8	40%	0.099	
Total Development Area	9477.7	sq.m.		
Pre-Dev. P Loading	0.12			
Post Dev. P Loading	1.25	kg/year		
Increase =	1.13	915%	Net increase	
Total Removal (Decrease) =	0.51	kg/year		
Post Dev. With BMP's =	0.74	600%	Net increase	

In order to claim the removal efficiencies Taking the proposed mitigation measures into account reduces the Phosphorus loading but does not satisfy the 80% removal criteria and therefore an offsetting calculation was also prepared which can be found in **Appendix 9**.

5.7 Water Quality - Other Pollutants

As per the 2003 MOE SWM Planning and Design Manual, urban stormwater runoff may contain elevated levels of nutrients, bacteria, heavy metals, oil and grease, and pesticides. A single SWM control will not be effective at mitigating all contaminants. Therefore, multiple SWM controls employed in series, comprising a treatment train become necessary. To this end, infiltration is proposed where possible and the proposed MTD will provide a treatment train in series system which will provide in excess of 80% TSS reduction prior to discharge to the downstream receiving system which in turn will reduce contaminates that are attached to the solid particles as well as providing for storage of floatables and hydrocarbons.

5.8 Water Balance

As part of the hydrogeological report prepared by TIL, a water balance analysis was prepared. The findings show the post development condition will leave the water balance deficient by 490 cu.m. annually. The proposed

infiltration system is designed to capture an average of 25 mm over all the roof areas directed to the exfiltration pipe - soakaway areas (1,235.5 sq.m.) which is equivalent to approximately 95% of the annual precipitation. The annual precipitation for Udora Climate Station is taken to be 886 mm and therefore for the tributary area directed to the proposed infiltration systems, the estimated annual volume of retention and infiltration is 1,040 cu.m. which exceeds the water balance deficiency noted in the TIL Hydrogeological Investigation.

5.9 Stream Erosion Control

LSRCA's stormwater guidelines specify that for sites less than 2 hectares do not normally require erosion control. The area of the property being developed is less than 2 hectares, therefore no specific erosion control is provided, although the infiltration system proposed to treat for Phosphorus load reduction and water balance does reduce the runoff leaving the site.

5.10 Erosion and Sediment Control During Construction

Due to the very nature of construction and development, the potential for erosion and migration of sediment from the site is increased. By implementing “good housekeeping” measures such as providing silt fences around the perimeter of the site, silt filters at catchbasins, temporary tracking control at the construction vehicle entrance to the site, rock check dams with filter cloth in any temporary drainage swale, and stabilizing the site as soon as possible, the potential for erosion and sediment migration can be minimized. Erosion and sediment controls shall be in accordance with the LSRCA’s guidelines as stipulated in Appendix G of the “Technical Guidelines for SWM Submissions (April 2022)” and “TRCA Erosion & Sediment Control Guide for Urban Construction (2019)”.

6 PROPOSED GRADING

The proposed grading will provide for a self-contained storm drainage system except for a small area at the back of Block 5 which will drain to the west. The area that will discharge to the valley results in maintaining the drainage directed to the Uxbridge Brook located to the west.

The proposed grading along Cemetery Road has been designed to suit the new centerline road grades that have been proposed by CFA. The IFT drawings are included in **Appendix 10** for reference.

7 SUMMARY

The total area of the subject property is 4.38 Ha with the proposed development site to occupy an area of less than 1.0 hectares, and the balance of the property to remain undisturbed.

The existing topography of the property slopes generally in 2 directions with a ridge located more or less where the existing house is located, resulting in a pre-development storm drainage area of 0.736 Ha directed to the Cemetery Road drainage ditch and the balance draining west to Uxbridge Brook which traverses the west end of the property. There is no drainage from neighbouring properties that is directed into the subject site that drains to Cemetery Road.

There is a 200 mm sanitary sewer located along the centerline of Cemetery Road more or less at the projection of the south property line and a 300 mm watermain located on the east side of Cemetery Road more or less at the projection of the south property line. There are currently no storm sewers on Cemetery Road. The Township of Uxbridge has undertaken urbanize the road including storm sewers, curb and gutters and sidewalks. As part of the urbanization, the sanitary sewer main and watermain are to be extended to the north limit of the

proposed subdivision.

The intention is to demolish the existing house and re-develop the property as a residential subdivision with a municipal road extending from Cemetery Road running west and ending in a cul-de-sac, creating 5 townhouse blocks with 23 units and 1 semi-detached block with 2 units.

With the recent development of the property to the south, a 200 mm diameter sanitary sewer was extended on Cemetery Road from Toronto Street South to the north limit of the adjacent development. The Region of Durham has indicated through the Pre-Consultation process that the extension of the 200 mm sanitary sewer on Cemetery Road will be required across the entire frontage of the property and they will review the downstream sanitary system in order to confirm if the system has capacity for this development site. The sanitary design flow generated by the proposed development is 1.46 L/s including peaking and infiltration. A sanitary sewer main will be extended into the site within the proposed road allowance with individual service connections provided to each dwelling per the Region of Durham standards and criteria.

The Region of Durham has indicated through the Pre-Consultation process that the extension of the 300 mm watermain on Cemetery Road will be required across the entire frontage of the property and for security and looping purposes, a secondary watermain feed from the existing 200 mm watermain located approximately 285 m to the north and east will be required. The Region's design criteria requires watermains shall be sized to carry the greater of maximum day plus fire flow or maximum hour demand.

The average domestic water demand is 19.2 L/minute and the required fire flow is 12,500 L/minute based on "Water Supply for Fire Protection, A Guide to Recommended Practice" issued by the Fire Underwriters Survey of the Insurance Bureau of Canada. The fire flow is calculated for largest building which is Block 2 and includes 6 units with no fire separation. The water design flow is therefore 13,000 L/minute.

A watermain will need to be extended into the site within the proposed road allowance with individual service connections provided to each dwelling and individual water meters. A fire hydrant will be required at the termination of the watermain per the Region of Durham standards and criteria.

The LSRC Technical Guidelines for Stormwater Management (SWM) Submissions requires that peak flow control be implemented to maintain the pre-development peak flow discharge rate for the 2 through 100 year storm events.

The proposed grading will result in maintaining the peak flows to the valley lands and an increase to the Cemetery Road storm drainage system. No further action is required for the reduced drainage directed to the valley.

To avoid “short-circuiting” the storm system where major flows could be expelled at the proposed RLCB, it is proposed to connect the rear lot catchbasin at the south-east corner of Block 3 to the proposed Cemetery Road piped system and allow for uncontrolled peak flows from roof and landscaped areas to be directed to the Cemetery Road storm sewer.

By implementing a Vortex Valve and super-pipe in the form of 24.0 m of 3000 x 1500 mm box culvert, the peak flows directed to the future storm system on Cemetery Road will be maintained at pre-development levels for all storm events. There will be overland flow from Street ‘A’ directed to Cemetery Road during the 25 and 100 year events with total discharge maintained at the pre-development levels.

The proposed subdivision has a total impervious area of 4,517 sq.m. and therefore does not meet the threshold where volume control is required by LSRCA. However, LID systems are provided to meet other water quality requirements.

Infiltration trenches have been provided below swales and roof drainage will be piped to soakaway areas located below the infiltration trenches, where possible. Blocks 5 and 6 will have standalone soakaway pits with exfiltration pipes. The LID system has been designed to retain 25 mm from all contributing drainage areas which results in an equivalent 17.2 mm over the total site impervious area.

The proposed inlets (RLCB, CB1 & CB2 and DCB1 & DCB2) have been sized to adequately intercept and convey the contributing 100-year peak flows taking 50% blockage into consideration.

A Hydroworks HydroDome Model HD4 has been sized to provide quality treatment. The HydroDome has received ETV certification for removal of TSS in excess of 80%. The sizing report shows the HD4 will provide treatment for 96% of the annual runoff and provides 89% annual TSS removal.

Based on the MOE Tool, the development will increase the Phosphorus loading from 0.13 kg/year to 1.32 kg/year or 1.12 kg/year with no treatment. The proposed LID infiltration systems will be provided within the private side and will reduce Phosphorus loading by 0.51 kg/year to 0.74 kg/year.

The proposed infiltration systems and HydroDome will act as a treatment train and provide for reductions in other pollutants such as elevated levels of nutrients, bacteria, heavy metals, oil and grease, and pesticides.

The development of the property will result in a reduction in infiltration. The proposed infiltration systems will provide a means of eliminating the water balance deficiency.

The area of the property being developed is less than 2 hectares, therefore no specific erosion control is provided, although the infiltration system proposed to treat for Phosphorus load reduction and water balance does reduce the runoff leaving the site.

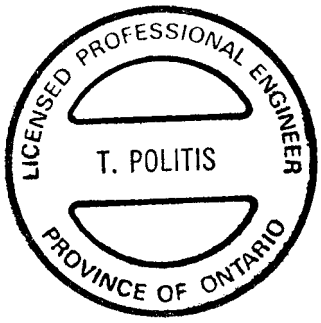
Due to the very nature of construction and development, the potential for erosion and migration of sediment from the site is increased. By implementing “good housekeeping” measures such as providing silt fences around the perimeter of the site, silt filters at catchbasins, temporary tracking control at the construction vehicle entrance to the site, rock check dams with filter cloth in any temporary drainage swale, and stabilizing the site as soon as possible, the potential for erosion and sediment migration can be minimized. Erosion and sediment controls shall be in accordance with the LSRCA’s guidelines as stipulated in Appendix G of the “Technical Guidelines for SWM Submissions (April 2022)” and “TRCA Erosion & Sediment Control Guide for Urban Construction (2019)”.

Respectfully submitted

Politis Engineering Ltd.

Per:

Tim Politis, P.Eng.



APPENDIX 1

Via Email Only

July 13, 2020

The Regional Municipality of Durham

Planning and Economic Development Department

Planning Division

605 ROSSLAND RD. E.
4TH FLOOR
PO BOX 623
WHITBY ON L1N 6A3
CANADA
905-668-7711
1-800-372-1102
Fax: 905-666-6208
Email: planning@durham.ca

www.durham.ca

Brian Bridgeman, MCIP, RPP
Commissioner of Planning and Economic Development

Mr. Fabio Furlan
Email: furlan.fabio@rogers.com

Dear Mr. Furlan:

Re: Record of Pre-consultation for a proposed Draft Plan of Subdivision

Proponent: Fabio Furlan

Property Location: 150 Cemetery Road, Uxbridge

In accordance with By-law 2-2008 of the Regional Municipality of Durham, this letter is to confirm that a pre-consultation meeting was conducted in accordance with the provisions of this By-law.

Pre-consultation Date: Friday, July 10, 2020

Parties in Attendance:

Region of Durham

Lori Riviere-Doersam
Jeff Almeida
Charlotte Pattee

Township of Uxbridge and Consultants

Brian Pigozzo
Liz Howson
Peter Middaugh
Ken Maynard
Emilia Gruyters
Dave Barton
Willie Popp
Gordon Highet

LSRCA

Laura McGinnis

Proponent

Fabio Furlan
Ralph Grander
Tim Politis

"Service Excellence for our Communities"

If this information is required in an accessible format, please contact Planning Reception at 1-800-372-1102, extension 2551.

Site Location/Description:

The site is located at 150 Cemetery Road. The site is located within the Built Boundary for the Uxbridge Urban Area. There is an existing single detached home on the site which would remain. The site is also located within the Settlement Area of the Oak Ridges Moraine.

Purpose of the Application:

The purpose of the applicant's proposal is to develop a 23-unit freehold townhouse subdivision.

Durham Regional Official Plan (ROP) Designation: Living Areas, Oak Ridges Moraine – Settlement Area

Township of Uxbridge Official Plan: Residential and Environmental Constraint

Is the proposal in Conformity with the ROP: Yes

Conformity Details: The Regional Official Plan indicates that Living Areas are to be used predominately for housing purposes. In the consideration of development applications in Living Areas, regard shall be had for the following:

- a compact urban form;
- the use of good urban design principles;
- the provision of convenient pedestrian access to public transit, educational facilities and parks;
- a grid pattern of roads;
- the types and capacities of the existing municipal services, infrastructure and the feasibility of expansion; and
- the balance between energy efficiency and cost.

The Region will circulate the subdivision application to the Township and various agencies for review. The Region also requests that the Township provide Notice for a Complete Application and hold the statutory public meeting.

Information/Studies Required:

The Regional Planning and Economic Development Department will require the following information to be submitted to support the proposed Subdivision application.

- **A Planning Rationale/Justification Report** – prepared by a Registered Professional Planner, the report should address conformity with relevant Provincial Plans and Policies, Regional Official Plan policies, Township of Uxbridge Official Plan and Zoning By-law policies.
- **Neighbourhood Plan –** this study will be prepared by the Township at the cost of the applicant. The Township will prepare a Terms of Reference and budget for the study for the applicant's consideration. The study will examine the surrounding area and assess the implications of development on the surrounding neighbourhood.
- **Archaeological Assessment** – this study should address the potential archaeological resources on the site;
- **A Record of Site Condition Compliant Phase One Environmental Site Assessment (ESA) Report or a Site-Screening Questionnaire** completed and signed by a Qualified Person. If a Phase One ESA is submitted, the Region's Reliance Letter and Certificate of Insurance forms (attached) are required;
- **Noise Study** – address the impact of the railway noise and stationary noise from nearby commercial buildings;
- **Environmental Impact Study/Natural Heritage Evaluation** – this study should be scoped with the LSRCA;
- **Edge Management Plan**
- **Geotechnical Evaluation**
- **Hydrogeological Study, including water balance** – scope with the LSRCA, include in-situ testing of LIDs;
- **Phosphorous Offsetting Study/Phosphorous Reduction Strategy** – contact Jim Teefy at AECOM (jim.teefy@aecom.com) for requirements;
- **Landform Conservation Plan** - as per the policies of the ORMCP;
- **Functional Serving Report** – this study should address municipal services as well as stormwater management. The stormwater management component must be completed to the Township and LSRCA requirements. It should examine the three outlet options for development. As well, the study should examine the condo/freehold options in terms of infrastructure ownership;
- **Draft Subdivision Plan**

The studies should be accompanied with 3 USB sticks containing the studies/plans, for circulation purposes.

Fees

Region of Durham

- Subdivision $5,5000 (plus $100 for each unit over 50)

Township of Uxbridge

- Subdivision $15,650 plus $400.00 per lot/unit in excess of 10 lots.
- External costs including but not limited to legal, engineering, planning, consulting incurred by the Township in connection with the application

Lake Simcoe Region Conservation Authority

- Contact the LSRCA directly

We recommended the fee amounts be confirmed at the time of submission of the applications. Payments should be by Certified Cheque, Money Order, or Bank Draft.

In accordance with our procedures, please advise whether you concur with the above-noted information and study requirements within seven (7) days of receiving this Record of Pre-Consultation. Should you not agree with the above-noted requirements, another pre-consultation meeting may be requested.

Please contact me at (905) 668-4113, ext. 2572, if you have any questions.

Yours truly,

Lori A. Riviere-Doersam

Lori Riviere-Doersam, MCIP, RPP
Principal Planner

cc: Meeting attendees

Encl. LSRCA Pre-consultation Notes
Regional Works Pre-consultation Notes
Reliance Letter and Certificate of Insurance Template

Jo Ann. Merrick

From: Jeff Almeida <Jeff.Almeida@Durham.ca>
Sent: Friday, July 10, 2020 8:51 AM
To: Jo Ann. Merrick
Cc: Charlotte Pattee
Subject: RE: Virtual Pre-Consultation Meeting - 150 Cemetery Rd

Hi Jo Ann,

Our comments for the meeting:

- Water supply to the subject property will require the extension of a 300 mm watermain on Cemetery Road across the entire frontage of the property. For security and looping purposes, we will also require a secondary watermain feed from the existing 200 mm watermain located approximately 285 m northeasterly on Cemetery Road.
- Sanitary servicing to the subject property will require the extension of a 200 mm sanitary sewer on Cemetery Road across the entire frontage of the property. The Region is reviewing the downstream sanitary sewer system in order to confirm if the system has capacity for this site. We will advise if any additional analysis and/or potential downstream improvements are required.
- The Region provides municipal waste and recycling collection service to residential properties within the Township of Uxbridge. In order to receive municipal waste collection service, all roadways must meet the minimum design standards outlined in the Region's Waste By-law.
- Regional development charges will be assessed at the time of building permit issuance. The current medium density multiple (townhomes) rate is $27,135 per unit. The applicant will also receive development charge credit for the demolition of the single detached dwelling unit ($33,693). Please note these rates are valid until June 30, 2021.

Jeff Almeida
Development Approvals Division
Works Department
Regional Municipality of Durham
605 Rossland Road East
Whitby, ON L1R 1W8
Phone: (905) 668-7711 ext. 3721
Fax: (905) 668-2051

From: Jo Ann. Merrick <jmerrick@uxbridge.ca>
Sent: Monday, July 06, 2020 12:43 PM
To: Kristi Honey <khoney@uxbridge.ca>; Dave Barton <dbarton@uxbridge.ca>; Gord Highet <ghighet@uxbridge.ca>; Willie Popp <wpopp@uxbridge.ca>; Brian Pigozzo <bpigozzo@uxbridge.ca>; Emilia Gruyters <egruyters@uxbridge.ca>; Ken Maynard <kmaynard@uxbridge.ca>; Liz Howson (howson@mshplan.ca) <howson@mshplan.ca>; 'Laura McGinnis' <L.McGinnis@lsrca.on.ca>; Lino Trombino <Lino.Trombino@Durham.ca>; Lori Riviere-Doersam <Lori.Riviere-Doersam@Durham.ca>; 'peter.middaugh@aecom.com' <peter.middaugh@aecom.com>; Jeff Almeida <Jeff.Almeida@Durham.ca>
Cc: 'Fabio Furlan' <furlanfabio@rogers.com>
Subject: Virtual Pre-Consultation Meeting - 150 Cemetery Rd

We are looking are having a virtual pre-consultation meeting on Fri. July 10 at 10:30 for rezoning and Plan of Subdivision.

"The current property is located at 150 Cemetery Rd and it comprises of being 10 acres which is in Phase 1 of the Township of Uxbridge Official Plan. The existing house will remain on the property and it will be re-sold with the property behind (Lot 1). All the property between the existing house and Cemetery Rd will be developed with a freehold road comprising 23 - 20 ft townhomes fronting the new cul-de -sac which will be on full municipal services.(Block 2,3,4,5,6). Thus making this location an ideal location for infilling as per the Provincial/Regional Policies.

There will be 23 Townhome units . Each unit will be 6.02 m. (20 ft) each."

Emilia will send out the meeting request.

Jo Ann Merrick
Administrative Assistant
Public Works & Operations/
Development Services
Township of Uxbridge
51 Toronto St. S.
Uxbridge, ON L9P 1T1

(t)905-852-9181 ext 202
(f) 905-852-9674

Email: jmerrick@uxbridge.ca

Lake Simcoe Region
conservation authority

www.LSRCA.on.ca

PLANNING ACT APPLICATION - PRE-CONSULTATION

Date: July 9, 2020
Planner: Laura McGinnis
Contact #: 905.895.1281 ext. 299
Email: l.mcginnis@LSRCA.on.ca

Address: 150 Cemetery Road, Uxbridge **APID:** 218922

Type of Proposal (Please Highlight):

Official Plan Amendment	Plan of Subdivision/Condominium	Consent
Zoning By-law Amendment	Site Plan	Minor Variance

Description of Proposal:

"The current property is located at 150 Cemetery Rd and it comprises of being 10 acres which is in Phase 1 of the Township of Uxbridge Official Plan. The existing house will remain on the property and it will be re-sold with the property behind (Lot 1). All the property between the existing house and Cemetery Rd will be developed with a freehold road comprising 23 - 20 ft townhomes fronting the new cul-de -sac which will be on full municipal services.(Block 2,3,4,5,6).

There will be 23 Townhome units . Each unit will be 6.02 m. (20 ft) each."

Is the site within an area governed by Ontario Regulation 179/06? (Please Highlight)
YES (Permit Required) NO

Regulated Components (Please list):
The subject land is largely within an area that is regulated by the LSRCA under Ontario Regulation 179/06 of the *Conservation Authorities Act* for the following natural hazards and/or features:
-Ministry of Natural Resources and Forestry (MNRF) Provincially Significant Wetland (Uxbridge Brook Headwater Wetland Complex) and its associated 120 metre adjacent lands.
-A stream (permanent and/or intermittent stream) identified as Uxbridge Brook.
-Meander belt erosion hazard associated with Uxbridge Brook.
-Riverine flooding under the Regional Storm Event associated with Uxbridge Brook.
-Apparent valleylands, characterized by steep slopes, associated Uxbridge Brook.

Required Report / Study	Functional Submission	Detailed Design	Required Report / Study	Functional Submission	Detailed Design
Proposed Amendment Documents (OPA/ZBA)			Top of Bank Demarcation Mapping	X	X
Planning Justification Report (inclusive of Provincial Plan Conformity including LSPP)			Floodplain Analysis		
Environmental Impact Study/ Natural Heritage Evaluation	X	X	Geotechnical / Soils Report	X	X
Ecological Offsetting Strategy	X	X	Master Drainage Plan		
Tree Compensation Plan			Slope Stability / Erosion Assessment	X	X
Tree Inventory & Preservation Plan / Arborist Report			Topographic Survey prepared by an OLS	X	X
Watercourse / Shoreline Protection, Enhancement and Restoration Plans			Hydrogeological Analysis including a Water Balance	X	X
Coastal Engineering Study			Phosphorus Budget	X	X
Vegetation Protection, Enhancement and Restoration Plans	X	X	Functional Servicing Report	X	X
Edge Management Plan	X	X	Stormwater Management Report	X	X
Landscape Plan			Erosion and Sediment Control Plan	X	X
LSRCA Review Fee	X	X	Grading and Drainage Plan	X	X
			Site Plan / Draft Plan/R Plan	X	X

Comments:

The proposal includes the construction of a building with the ground floor area cumulatively equal to or greater than 500m2 (5382 sq. ft.), and any other impervious surface. It is noted that this scale of development meets the definition of "Major Development" per the Lake Simcoe Protection Plan (LSPP), the Oak Ridges Moraine Conservation Plan (ORMCP), the Greenbelt Plan (GBP), York Region Official Plan, Lake Simcoe Phosphorus Offsetting Policy (LSPOP), as well as the South Georgian Bay Lake Simcoe Source Protection Plan (SGBLSSPP).

A Stormwater Management Report will be required to satisfy DP-4.8 of the LSPP and in accordance with the LSRCA Technical Guidelines for Stormwater Management (SWM) Submissions, inclusive of a phosphorus budget and water balance. Please refer to the LSRCA Technical Guidelines for SWM Submissions: https://www.lsrca.on.ca/Shared%20Documents/permits/swm_guidelines.pdf.

The application will also be subject to the Lake Simcoe Phosphorus Offsetting Policy (LSPOP): https://www.lsrca.on.ca/watershed-health/phosphorus.

The lands are identified as being within the Recharge Management Area (WHPA Q2) per the South Georgian Bay Lake Simcoe Source Protection Plan. A Hydrogeological Analysis and pre- and post-development water balance assessment will be required in support of the application. Please see Policies LUP-12 / LUP-13 of the Source Protection Plan. The hydrogeological analysis is required to be prepared in accordance with "Hydrogeological Assessment Submissions: Conservation Authority Guidelines for Development Applications"
https://www.lsrca.on.ca/Shared%20Documents/permits/hydrogeological%20_guidelines.pdf?pdf=Hydrogeological-Guidelines

The subject lands are within a Significant Groundwater Recharge Area (SGRA), and therefore the application will be required to be in accordance with the applicable policies of the Oak Ridges Moraine Conservation Plan (ORMCP). This includes an accompanying study which demonstrates that the quality and quantity of groundwater and the function of the recharge area will be maintained. Please contact the LSRCA regarding soils information and scope of pre- and post-development water balance assessment.

Please contact LSRCA staff to delineate the boundary of the Natural Heritage features on the site through a feature staking. Future submissions should include detailed drawings with the location of natural heritage/hydrological features represented including setbacks to the features from the proposed development. Please note that development should be located outside of natural heritage/hydrological features and their associated Minimum Vegetation Protection Zones (MVPZ). All proposed development needs to meet the "no negative impact" test and demonstrate that there will be no negative impacts to the natural features and their ecological functions in accordance with Section 23 of the ORMCP per Section 2.1 of the Provincial Policy Statement (PPS) and Subsection 22(3) of the Oak Ridges Moraine Conservation Plan (ORMCP). A scoped Natural Heritage Evaluation (NHE) will be required to assess these features and determine an appropriate limit of disturbance/development footprint. For clarity regarding the determination/assessment of features, the Technical Definitions and criteria for Identifying Key Natural Heritage Features and Key Hydrologic Features for the Lake Simcoe Protection Plan (MNRF, 2015) document should be referenced. Please contact the LSRCA with a Terms of Reference.

A geotechnical investigation will need to be provided to assess slope stability process at the site to determine the surface, subsurface conditions (e.g., soil, rock, groundwater) and their potential for future slope instability based on the proposed changes in slope configurations, such as steepness or inclination, increases in loading on or near the slope, such as structures or filling, changes in ground water conditions or drainage of the soil, loss of vegetation cover and root systems, etc.

The subject lands are currently within an area that is regulated by the LSRCA under Ontario Regulation 179/06 of the *Conservation Authorities Act*. Accordingly, a permit from the LSRCA under Ontario Regulation 179/06 will be required prior to development or site alteration occurring within the regulated portion of the property.

NOTES AND REFERENCE DOCUMENTS

1. Please contact the LSRCA to scope any required Environmental Impact Study or Natural Heritage Evaluation
2. The stormwater management submission is required to be prepared in accordance with "LSRCA Technical Guidelines for SWM Submissions"
   https://www.lsrca.on.ca/Shared%20Documents/permits/swm_guidelines.pdf
3. Submissions are to be in accordance with the LSRCA Watershed Development Guidelines
   https://www.lsrca.on.ca/Shared%20Documents/permits/watershed-development-guidelines.pdf?pdf=Watershed-Development-Guidelines
4. The hydrogeological analysis is required to be prepared in accordance with "Hydrogeological Assessment Submissions: Conservation Authority Guidelines for Development Applications"

https://www.lsrca.on.ca/Shared%20Documents/permits/hydrogeological%20_guidelines.pdf?pdf=Hydrogeological-Guidelines

5. Where the LSPOP applies, submissions are to be in accordance with the LSPOP found here: https://www.lsrca.on.ca/watershed-health/phosphorus
6. Low Impact Development Treatment Train Tool can be found here: https://www.lsrca.on.ca/Pages/LIDTTTool.aspx
7. Lake Simcoe Protection Plan Water Budget Policy for LSPP 4.8-DP and 6.40-DP can be found here: https://www.lsrca.on.ca/Shared%20Documents/lspp-water-budget-policy.pdf
8. LSRCA Review Fees can be found here: https://www.lsrca.on.ca/permits/permit-fees

SUBMISSION / RESUBMISSION REQUIREMENTS

1. A completed response matrix which includes a detailed response outlining how each of the comments above have been addressed with reference to applicable reports/drawings (i.e. specific sections/pages/details or tab identifiers).
2. The response matrix is to also include a summary of any additional changes to the design (i.e. in addition to those not identified in the detailed response to comments, and includes changes to reports, drawings, details, facility design, etc.).
3. All drawings are to be folded (8.5 x 11).
4. Reports and engineering drawings/details are to be signed and sealed by a Professional Engineer.
5. Reports are to include a digital copy of applicable models on a Data CD or USB Thumb Drive.
6. All submissions/reports are to include applicable technical components which achieve the minimum requirements outlined in the LSRCA Technical Guidelines for Stormwater Management Submissions, September 2016.

LSRCA ENGINEERING SUBMISSION CHECKLIST

Check "Yes", "No" or "N/A (Not Applicable)" for each item. If "No" or "N/A" are checked, please provide an explanation of why the criteria do not apply in a particular instance and note that the submission may be deemed incomplete and that additional consultation with LSRCA will likely be required prior to submission acceptance. The sections noted in this check list refer to those contained within the **LSRCA Technical Guidelines for Stormwater Management Submissions**:

Yes	No	N/A	Item	Comment
			Pre-submission consultation with LSRCA has been completed as per Section 2.0	
			The SWM report has been prepared as per Section 3.4 as a **standalone document** (i.e. all references, calculations and modelling are included within the document or a referenced appendix).	
			Stormwater Quantity **Peak Flow Control** as per Section 2.2.1.	
			Stormwater Quantity **Volume Control** as per Section 2.2.2.	
			Safe conveyance of stormwater to a **sufficient outlet** as per Sections 2.2.3 / 2.2.4.	
			Stormwater Quality Control **(80% TSS removal/Enhanced Level Treatment/Level 1 Treatment)** as per Section 2.3.	
			Stormwater Quality Control **(Phosphorus Removal)** as per Section 2.3.2 and as outlined in the Lake Simcoe Protection Plan.	
			Stormwater Quality Control **(Other Pollutants)** as per Sections 2.3.3 – 2.3.5	
			Stream **Erosion Control** as per Section 2.4.	
			A **Water Balance / Groundwater** analysis as per Section 2.5.	
			Erosion and Sediment Control drawings and details including an applicable section in the SWM report as per Section 2.6.	
			The Lake Simcoe Phosphorus Offsetting Policy (LSPOP) including a **Phosphorous Budget** completed for the site using the MOE PTool or STEP's LID TTT.	
			Natural Hazards including floodplain (hydraulics, hydrology, mapping and cut / fill balance if applicable.)	
			SWM Modelling (hydrology and hydraulics) including digital files and all supporting SWM **calculations**.	
			The general requirements, as per **Appendix A** of the LSRCA Technical Guidelines for SWM Submissions. Please note that this Appendix is not an exhaustive list and that additional site-specific requirements may apply.	

LSRCA HYDROGEOLOGICAL SUBMISSION CHECKLIST

Check "Yes", "No" or "N/A (Not Applicable)" for each item. If "No" or "N/A" are checked, please provide an explanation of why the criteria do not apply in a particular instance and note that the submission may be deemed incomplete and that additional consultation with LSRCA will likely be required prior to submission acceptance. The sections noted in this check list refer to those contained within the **Hydrogeological Assessment Submission Guidelines (2013):**

Yes	No	N/A	Item	Comment
			Pre-submission consultation with LSRCA has been completed as recommended in the Hydrogeological Assessment Submission Guidelines (2013).	
			The hydrogeological report has been prepared as a **standalone document.** (i.e., all references, calculations and drawings are included within the document).	
			Geological Characterization as per Section 3.1	
			Test pits/Boreholes as per Section 3.1.6	
			Monitoring Wells as per Section 3.1.7	
			Private Well Survey as per Section 3.1.8	
			Characterization of the local hydrostratigraphy/hydrogeology as per Section 3.1.9	
			Description of Surface Water Features and Functions as per Section 3.1.10	
			Water Quality as per Section 3.1.12	
			D-5-5 Water Supply (private servicing only) as per Section 3.1.13	
			D-5-4 (OnsiteSewage Systems only) as per Section 3.2.6	
			Groundwater Levels as per Section 3.2.1	
			Pumping Tests as per Section 3.2.2	
			Groundwater Discharge (Baseflow) as per Section 3.2.3	
			Pre- and Post-Development Water Balance Assessment as per Section 3.2.4	
			Infiltration/recharge mitigation plan as per Section 3.3	
			In-situ infiltration testing as per Section 3.3	
			Low impact development design calculations	

APPENDIX 2

FIRE FLOW REQUIREMENTS

Based on "Water Supply for Public Fire Protection - 1999", Fire Underwriters survey

Address	Block 2 - 150 Cemetery Road, Uxbridge
NBC Occupancy	Group C
Construction Class	Ordinary Construction
Notes:	3 storey, 6 unit townhouse block - no fire separation between units

Foot Print Area	619.1	m2

STEP 1 - DETERMINE FIRE FLOW:

REQUIRED FIRE FLOW (F) F = 220 x C x A^0.5

Maximum Floor Area A =	1857.3	m2
C =	1	Wood Frame Construction
F =	10000	L/min (Round up to nearest 1,000 L/min)
STEP 2 - OCCUPANCY FACTOR:	25%	Reduction for Low Hazard Occupancy (Dwellings)
Decrease =	2500	L/min
STEP 3 - AUTO SPRINKLER FACTOR:	0%	No Automatic Sprinkler
Decrease =	0	L/min
STEP 4 - EXPOSURE FACTORS:	Maximum exposure increase is 75%	
Exposure 1	5%	South Exposure
Exposure 2	5%	East Exposure
Exposure 3	15%	North Exposure
Exposure 4	25%	West Exposure
Total	50%	
Increase =	5000	
STEP 5 - TOTAL REQUIRED FIRE FLOW	**12500**	L/min

APPENDIX 3

LSRCA Engineering Submission Checklist (V6 – March 2022) Required to Accompany ALL Engineering Submissions

Yes			No	N/A	Item	Comment
Report Section	Report Page	Drawing/ Appendix				
		Append 1			**Pre-submission consultation** with LSRCA has been completed as per Section 2.1.1.	
5	6				The SWM report has been prepared as per Section 2.1.6 as a **standalone document** (i.e. all references, calculations and modelling are included within the document or a referenced appendix).	
					A **Digital Copy** of all reports and all drawings has been submitted for LSRCA review via a digital submission link.	Submission is through the project planner Gord Mahoney MS Planning
5.1	6				Stormwater Quantity **Peak Flow Control** as per Section 3.2.1.	
5.2	11				Stormwater Quantity **Volume Control** as per Section 3.2.4.	Cannot achieve 25 mm retention from all impervious surfaces.
5.3	12				Safe conveyance of stormwater to a **sufficient outlet** as per Sections 3.2.2 / 3.2.3.	
5.5	12				Stormwater Quality Control **(80% TSS removal/Enhanced Level Treatment/Level 1 Treatment)** as per Section 3.3.1.	
5.6	12	Append 8			Stormwater Quality Control **(Phosphorus Removal)** as per Section 3.3.2 and as outlined in the Lake Simcoe Protection Plan.	Cannot achieve 80% P removal. Cash-in-lieu to be provided.
5.7	13				Stormwater Quality Control **(Other Pollutants)** as per Sections 3.3.3 – 3.3.7	
5.9	13				Stream **Erosion Control** as per Section 3.4.	
5.8	13				A **Water Balance / Groundwater** analysis as per Section 4.0.	
5.6	12	Append 8			The Lake Simcoe Phosphorus Offsetting Policy (LSPOP) including a **Phosphorous Budget** completed for the site using the MOE PTool or STEP's LID TTT as per Section 3.3.2	
				X	**Natural Hazards** including floodplain (hydraulics, hydrology, mapping and cut / fill balance if applicable.)	
				X	**SWM Modelling** (hydrology and hydraulics) including digital files and all supporting SWM **calculations**.	All SW calculations are based on Rational & Modified Rational Method done in Excel spreadsheets.
5.10	14				**Erosion and Sediment Control** as per Section 5.0. (Drawings to be provided at the detailed design stage)	
					The general requirements, as per **Appendix A** of the LSRCA Technical Guidelines for SWM Submissions. Please note that this Appendix is not an exhaustive list and that additional site-specific requirements may apply.	

2 | Page

Figure 3: The Authority Engineering Submission Checklist (Continued)

Submission/Resubmission Requirements:

1. A completed response matrix which includes a detailed response outlining how each of the comments above have been addressed with reference to applicable reports/drawings (i.e. specific sections/pages/details or tab identifiers).
2. The response matrix is to also include a summary of any additional changes to the design (i.e. in addition to those not identified in the detailed response to comments, and includes changes to reports, drawings, details, facility design, etc.).
3. Reports and engineering drawings/details are to be signed and sealed by a Professional Engineer.
4. Reports are to include a digital copy of applicable models within the submission link or on a Data CD or USB Thumb Drive.
5. All submissions/reports are to include applicable technical components which achieve the minimum requirements outlined in the LSRCA Technical Guidelines for Stormwater Management Submissions, March 2022.

Important Notes and References:

1. Please contact the LSRCA to scope any required Environmental Impact Study or Natural Heritage Evaluation
2. The stormwater management submission is required to be prepared in accordance with "LSRCA Technical Guidelines for SWM Submissions" https://www.lsrca.on.ca/Shared%20Documents/permits/swm_guidelines.pdf
3. Submissions are to be in accordance with the LSRCA Ontario Regulation 179/06 Implementation Guidelines https://www.lsrca.on.ca/Shared%20Documents/permits/watershed-development-guidelines.pdf?pdf=Watershed-Development-Guidelines
4. The hydrogeological analysis is required to be prepared in accordance with "Hydrogeological Assessment Submissions: Conservation Authority Guidelines for Development Applications" https://www.lsrca.on.ca/Shared%20Documents/permits/hydrogeological%20_guidelines.pdf?pdf=Hydrogeological-Guidelines
5. Where the LSPOP applies, submissions are to be in accordance with the LSPOP found here: https://www.lsrca.on.ca/watershed-health/phosphorus
6. Low Impact Development Treatment Train Tool can be found here: https://www.lsrca.on.ca/Pages/LIDTTTool.aspx
7. LSRCA Review Fees can be found here: https://www.lsrca.on.ca/permits/permit-fees

Figure 4: The Authority Engineering Submission Checklist (Continued)

APPENDIX 4

C 6.00 STORM SEWER DESIGN

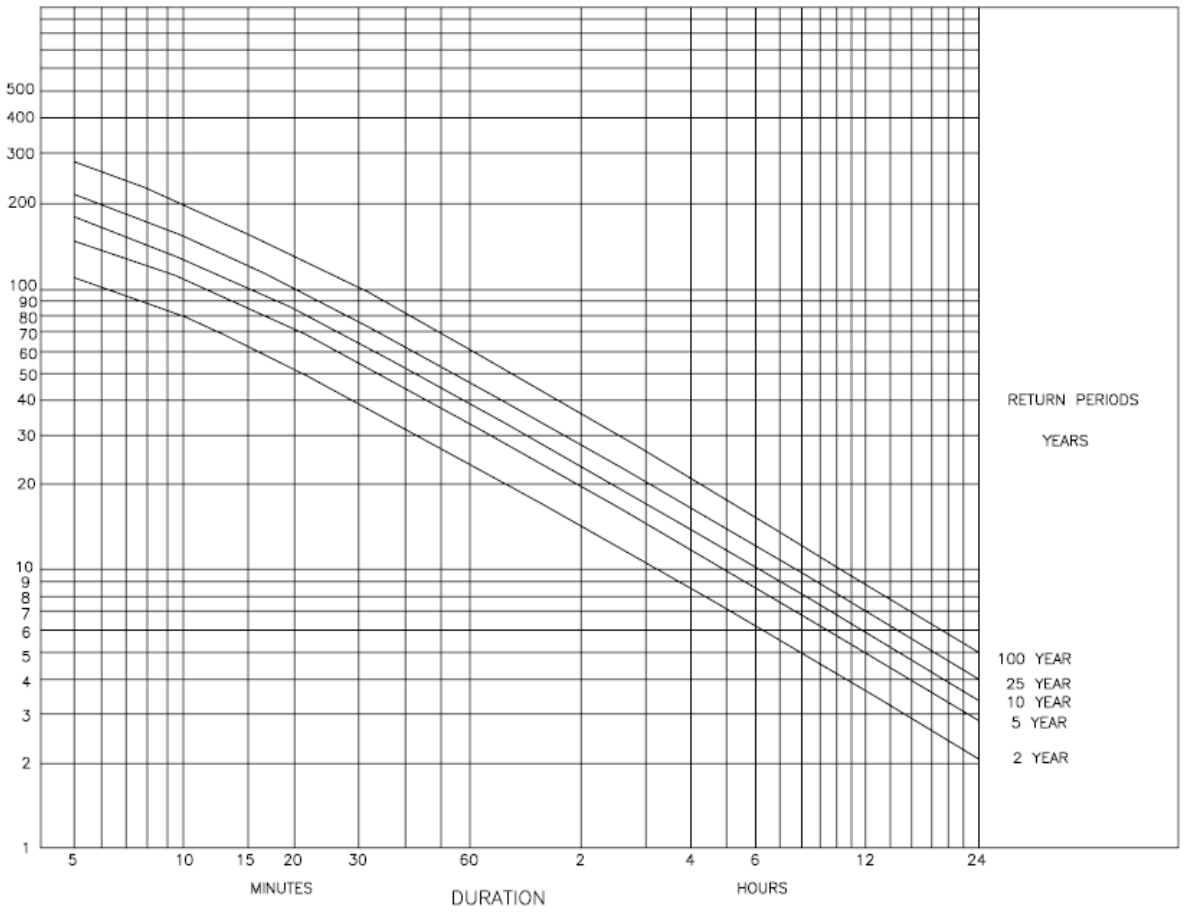
C 6.01 RUN-OFF OR IMPERVIOUSNESS COEFFICIENTS

Run-off coefficients to be used in storm sewer design with the Rational Method shall be as follows:

Parks over 4 hectares	0.20
Parks 4 hectares and under	0.25
Single-family Residential (Urban)	0.45
Single-family Residential (Estate Residential)	0.40
Semi-detached Residential	0.60
Townhouses, Maisonettes, Row Houses, etc.	0.75
Apartments	0.75
Schools and Churches	0.75
Industrial	0.75
Commercial	0.90
Heavily Developed Areas	0.90
Paved Areas	0.95

A 10 minute inlet entry time at the head of the system must be utilized unless large external drainage areas exist.

Town of Uxbridge Design Criateria



1. EQUATION FOR TYPICAL INTENSITY–DURATION–FREQUENCY CURVES: T–TIME(MINUTES)
   I – INTENSITY (mm/hr)

$$I_2 \quad \frac{645}{(T+5)^{0.786}} \qquad I_5 \quad \frac{904}{(T+5)^{0.788}} \qquad I_{10} \quad \frac{1065}{(T+5)^{0.788}} \qquad I_{25} \quad \frac{1234}{(T+4)^{0.787}} \qquad I_{100} \quad \frac{1799}{(T+5)^{0.810}}$$

2. THE ABOVE EQUATION ARE ONLY VALID FOR T=10 MINUTES TO 1440 MINUTES

Design Chart 1.07: Runoff Coefficients

- Urban for 5 to 10-Year Storms

Land Use		Runoff Coefficient	
		Min.	Max.
Pavement	- asphalt or concrete	0.80	0.95
- brick		0.70	0.85
Gravel roads and shoulders		0.40	0.60
Roofs		0.70	0.95
Business	- downtown	0.70	0.95
- neighbourhood		0.50	0.70
- light		0.50	0.80
- heavy		0.60	0.90
Residential	- single family urban	0.30	0.50
- multiple, detached		0.40	0.60
- multiple, attached		0.60	0.75
- suburban		0.25	0.40
Industrial	- light	0.50	0.80
- heavy		0.60	0.90
Apartments		0.50	0.70
Parks, cemeteries		0.10	0.25
Playgrounds (unpaved)		0.20	0.35
Railroad yards		0.20	0.35
Unimproved areas		0.10	0.30
Lawns	- Sandy soil		
- flat, to 2%		0.05	0.10
- average, 2 to 7%		0.10	0.15
- steep, over 7%		0.15	0.20
- Clayey soil			
- flat, to 2%		0.13	0.17
- average, 2 to 7%		0.18	0.22
- steep, over 7%		0.25	0.35

For flat or permeable surfaces, use the lower values. For steeper or more impervious surfaces, use the higher values. For return period of more than 10 years, increase above values as 25-year - add 10%, 50-year - add 20%, 100-year - add 25%.

The coefficients listed above are for unfrozen ground.

Design Chart 1.07: Runoff Coefficients (Continued)

- Rural

Land Use & Topography[3]	Soil Texture		
	Open Sand Loam	Loam or Silt Loam	Clay Loam or Clay
CULTIVATED			
Flat 0 - 5% Slopes	0.22	0.35	0.55
Rolling 5 - 10% Slopes	0.30	0.45	0.60
Hilly 10- 30% Slopes	0.40	0.65	0.70
PASTURE			
Flat 0 - 5% Slopes	0.10	0.28	0.40
Rolling 5 - 10% Slopes	0.15	0.35	0.45
Hilly 10- 30% Slopes	0.22	0.40	0.55
WOODLAND OR CUTOVER			
Flat 0 - 5% Slopes	0.08	0.25	0.35
Rolling 5 - 10% Slopes	0.12	0.30	0.42
Hilly 10- 30% Slopes	0.18	0.35	0.52
BARE ROCK	COVERAGE[3]		
	30%	50%	70%
Flat 0 - 5% Slopes	0.40	0.55	0.75
Rolling 5 - 10% Slopes	0.50	0.65	0.80
Hilly 10- 30% Slopes	0.55	0.70	0.85
LAKES AND WETLANDS	0.05		

[2] Terrain Slopes

[3] Interpolate for other values of % imperviousness

Sources: American Society of Civil Engineers - ASCE (1960)
U.S. Department of Agriculture (1972)

APPENDIX 5

Pre-Development Runoff Coefficients

Pre-Development to Valley

		C	C x A
Impervious =	620.4	0.95	589.38
Pervious =	1729.6	0.20	345.92
Total Area =	2350	0.398	935.3
Composite C =	0.40		

Pre-Development to Cemetery Road

		C	C x A
Impervious =	589	0.95	559.55
Pervious =	6538.7	0.2	1307.74
Total Area =	7127.7	0.261977	1867.29
Composite C =	0.26		
	9477.7		

Post Development Runoff Coefficient to Cemetery Road

	Area	C	C x A
Roofs	1951.5	0.95	1853.925
Driveways	550.8	0.95	523.26
Aprons	409.8	0.95	389.31
Roadway	1000	0.95	950
Sidewalk	59.5	0.95	56.525
Landscaped	2922.8	0.20	584.56
Total	6894.4		4357.58
	Composite C =	0.63	

Post Development Runoff Coefficient to Valley

	Area	C	C x A
Roofs	545.4	0.95	518.13
Driveways	0	0.95	0
Aprons	0	0.95	0
Roadway	0	0.95	0
Sidewalk	0	0.95	0
Landscaped	2037.9	0.20	407.58
Total	2583.3		925.71
	Composite C =	0.36	

Tributary Area 3 - RLCB

	Area	C	C x A
Roofs	402.55	0.95	382.4225
Driveways	0	0.95	0
Aprons	0	0.95	0
Roadway	0	0.95	0
Sidewalk	0	0.95	0
Landscaped	690.45	0.20	138.09
Total	1093		520.5125
	Composite C =	0.48	

Street 'A' Tributary to Cemetery Road

	Area	C	C x A
Roofs	1548.95	0.95	1471.503
Driveways	550.8	0.95	523.26
Aprons	409.8	0.95	389.31
Roadway	1000	0.95	950
Sidewalk	59.5	0.95	56.525
Landscaped	2232.35	0.20	446.47
Total	5801.4		3837.068
	Composite C =	0.66	

2 YEAR STORAGE REQUIREMENTS

SUBJECT SITE DATA
AREA (ha) = 0.58014
C = 0.66
Ca = 1.00

ALLOWABLE DISCHARGE RATE (m3/s) = 0.0192

RAINFALL INTENSITY

I = A / (C + T) ^ B

Where A= 645
B= 0.786
C= 5

REQUIRED STORAGE VOLUME (m3) = 42.6

TIME (min)	INTENSITY (mm/hr)	PEAK FLOW (m3/s)	RUNOFF VOLUME (m3)	DISCHARGE VOLUME (m3)	STORAGE VOLUME (m3)
10.0	76.76	0.082	49.0	11.5	37.5
11.0	72.97	0.078	51.2	12.7	38.5
12.0	69.57	0.074	53.3	13.8	39.5
13.0	66.51	0.071	55.2	15.0	40.2
14.0	63.75	0.068	57.0	16.1	40.8
15.0	61.23	0.065	58.6	17.3	41.3
16.0	58.92	0.063	60.2	18.4	41.7
17.0	56.81	0.060	61.6	19.6	42.0
18.0	54.86	0.058	63.0	20.7	42.3
19.0	53.05	0.056	64.3	21.9	42.4
20.0	51.38	0.055	65.6	23.0	42.5
21.0	49.82	0.053	66.8	24.2	42.6
22.0	48.36	0.051	67.9	25.3	42.6
23.0	47.00	0.050	69.0	26.5	42.5
24.0	45.72	0.049	70.0	27.6	42.4
25.0	44.52	0.047	71.0	28.8	42.2
26.0	43.39	0.046	72.0	30.0	42.0
27.0	42.32	0.045	72.9	31.1	41.8
28.0	41.31	0.044	73.8	32.3	41.5

5 YEAR STORAGE REQUIREMENTS

SUBJECT SITE DATA
AREA (ha) = 0.58014
C = 0.66
Ca = 1.00

ALLOWABLE DISCHARGE RATE (m3/s) = 0.0192

RAINFALL INTENSITY

I = A / (C + T) ^ B

Where A= 904
B= 0.788
C= 5

REQUIRED STORAGE VOLUME (m3) = 70.5

TIME (min)	INTENSITY (mm/hr)	PEAK FLOW (m3/s)	RUNOFF VOLUME (m3)	DISCHARGE VOLUME (m3)	STORAGE VOLUME (m3)
10.0	107.01	0.114	68.3	11.5	56.8
11.0	101.70	0.108	71.4	12.7	58.7
12.0	96.96	0.103	74.2	13.8	60.4
13.0	92.69	0.099	76.9	15.0	61.9
14.0	88.82	0.094	79.4	16.1	63.2
15.0	85.30	0.091	81.7	17.3	64.4
16.0	82.08	0.087	83.8	18.4	65.4
17.0	79.13	0.084	85.8	19.6	66.3
18.0	76.41	0.081	87.8	20.7	67.0
19.0	73.89	0.079	89.6	21.9	67.7
20.0	71.55	0.076	91.3	23.0	68.3
21.0	69.37	0.074	93.0	24.2	68.8
22.0	67.34	0.072	94.5	25.3	69.2
23.0	65.43	0.070	96.0	26.5	69.5
24.0	63.65	0.068	97.5	27.6	69.8
25.0	61.97	0.066	98.9	28.8	70.1
26.0	60.39	0.064	100.2	30.0	70.2
27.0	58.90	0.063	101.5	31.1	70.4
28.0	57.49	0.061	102.7	32.3	70.5

10 YEAR STORAGE REQUIREMENTS

SUBJECT SITE DATA
AREA (ha) = 0.58014
C = 0.66
Ca = 1.00
Ca = 1.0

ALLOWABLE DISCHARGE RATE (m3/s) = 0.0192

RAINFALL INTENSITY

I = A / (C + T) ^ B

Where A= 1065
B= 0.788
C= 5

REQUIRED STORAGE VOLUME (m3) = 88.8

TIME (min)	INTENSITY (mm/hr)	PEAK FLOW (m3/s)	RUNOFF VOLUME (m3)	DISCHARGE VOLUME (m3)	STORAGE VOLUME (m3)
10.0	126.06	0.134	80.4	11.5	68.9
11.0	119.81	0.127	84.1	12.7	71.4
12.0	114.22	0.121	87.5	13.8	73.6
13.0	109.19	0.116	90.6	15.0	75.6
14.0	104.64	0.111	93.5	16.1	77.4
15.0	100.49	0.107	96.2	17.3	78.9
16.0	96.70	0.103	98.7	18.4	80.3
17.0	93.22	0.099	101.1	19.6	81.5
18.0	90.01	0.096	103.4	20.7	82.7
19.0	87.04	0.093	105.5	21.9	83.7
20.0	84.29	0.090	107.6	23.0	84.5
21.0	81.72	0.087	109.5	24.2	85.3
22.0	79.33	0.084	111.4	25.3	86.0
23.0	77.09	0.082	113.1	26.5	86.7
24.0	74.99	0.080	114.8	27.6	87.2
25.0	73.01	0.078	116.5	28.8	87.7
26.0	71.15	0.076	118.0	30.0	88.1
27.0	69.39	0.074	119.6	31.1	88.5
28.0	67.73	0.072	121.0	32.3	88.8

25 YEAR STORAGE REQUIREMENTS

SUBJECT SITE DATA
AREA (ha) = 0.58014
C = 0.66
Ca = 1.1

PIPE DISCHARGE RATE (m3/s) = 0.0192
MAX. OVERLAND DISCHARGE RATE (m3/s) = 0.0113
TOTAL DISCHARGE RATE (m3/s) = 0.0305

RAINFALL INTENSITY

I = A / (C + T) ^ B

Where A= 1234
B= 0.787
C= 4

REQUIRED STORAGE VOLUME (m3) = 107.0

TIME (min)	INTENSITY (mm/hr)	PEAK FLOW (m3/s)	RUNOFF VOLUME (m3)	PIPE DISCHARGE VOLUME (m3)	OVERLAND DISCHARGE VOLUME (m3)	TOTAL DISCHARGE VOLUME (m3)	REQUIRED STORAGE VOLUME (m3)	OVERLAND DISCHARGE RATE (m3/s)
10.0	154.64	0.181	108.6	11.5	0.0	11.5	97.0	0.0000
11.0	146.46	0.171	113.1	12.7	0.0	12.7	100.4	0.000
12.0	139.21	0.163	117.3	13.8	0.0	13.8	103.4	0.000
13.0	132.72	0.155	121.1	15.0	0.0	15.0	106.1	0.000
14.0	126.89	0.148	124.7	16.1	1.6	17.7	107.0	0.002
15.0	121.60	0.142	128.0	17.3	3.8	21.0	107.0	0.004
16.0	116.79	0.137	131.2	18.4	5.7	24.2	107.0	0.006
17.0	112.39	0.131	134.1	19.6	7.5	27.1	107.0	0.007
18.0	108.35	0.127	136.9	20.7	9.2	29.9	107.0	0.008
19.0	104.62	0.122	139.5	21.9	10.7	32.5	107.0	0.009
20.0	101.18	0.118	142.0	23.0	12.0	35.0	107.0	0.010
30.0	76.92	0.090	162.0	34.6	20.4	55.0	107.0	0.011
40.0	62.79	0.073	176.3	46.1	23.2	69.3	107.0	0.010
50.0	53.45	0.063	187.6	57.6	23.0	80.6	107.0	0.008
60.0	46.76	0.055	196.9	69.1	20.8	89.9	107.0	0.006
70.0	41.71	0.049	204.9	80.6	17.3	97.9	107.0	0.004
80.0	37.75	0.044	212.0	92.2	12.8	105.0	107.0	0.003
90.0	34.55	0.040	218.3	103.7	7.6	111.3	107.0	0.001
100.0	31.91	0.037	224.0	115.2	1.8	117.0	107.0	0.000
150.0	23.43	0.027	246.7	172.8	0.0	172.8	73.9	0.000
200.0	18.78	0.022	263.6	230.4	0.0	230.4	33.2	0.000
250.0	15.80	0.018	277.3	288.0	0.0	288.0	0.0	0.000
260.0	15.33	0.018	279.8	299.5	0.0	299.5	0.0	0.000
270.0	14.89	0.017	282.2	311.0	0.0	311.0	0.0	0.000
280.0	14.47	0.017	284.5	322.6	0.0	322.6	0.0	0.000
290.0	14.08	0.016	286.7	334.1	0.0	334.1	0.0	0.000
300.0	13.72	0.016	288.9	345.6	0.0	345.6	0.0	0.000
310.0	13.37	0.016	291.0	357.1	0.0	357.1	0.0	0.000
320.0	13.05	0.015	293.1	368.6	0.0	368.6	0.0	0.000
330.0	12.74	0.015	295.1	380.2	0.0	380.2	0.0	0.000
340.0	12.45	0.015	297.1	391.7	0.0	391.7	0.0	0.000

100 YEAR STORAGE REQUIREMENTS

SUBJECT SITE DATA
AREA (ha) = 0.58014
C = 0.66
Ca = 1.25

PIPE DISCHARGE RATE (m3/s) = 0.0192
MAX. OVERLAND DISCHARGE RATE (m3/s) = 0.0737
TOTAL DISCHARGE RATE (m3/s) = 0.0929

RAINFALL INTENSITY

I = A / (C + T) ^ B

Where A= 1799
B= 0.81
C= 5

REQUIRED STORAGE VOLUME (m3) = 107.0

TIME (min)	INTENSITY (mm/hr)	PEAK FLOW (m3/s)	RUNOFF VOLUME (m3)	PIPE DISCHARGE VOLUME (m3)	OVERLAND DISCHARGE VOLUME (m3)	TOTAL DISCHARGE VOLUME (m3)	REQUIRED STORAGE VOLUME (m3)	OVERLAND DISCHARGE RATE (m3/s)
10.0	200.63	0.267	160.0	11.5	41.5	53.0	107.0	0.0692
11.0	190.41	0.253	167.1	12.7	47.4	60.1	107.0	0.072
12.0	181.29	0.241	173.5	13.8	52.7	66.5	107.0	0.073
13.0	173.09	0.230	179.5	15.0	57.5	72.5	107.0	0.074
14.0	165.67	0.220	185.0	16.1	61.9	78.0	107.0	0.074
15.0	158.93	0.211	190.2	17.3	65.9	83.2	107.0	0.073
16.0	152.77	0.203	195.0	18.4	69.5	88.0	107.0	0.072
17.0	147.12	0.196	199.5	19.6	72.9	92.5	107.0	0.071
18.0	141.92	0.189	203.8	20.7	76.0	96.8	107.0	0.070
19.0	137.11	0.182	207.8	21.9	78.9	100.8	107.0	0.069
20.0	132.65	0.176	211.6	23.0	81.6	104.6	107.0	0.068
30.0	101.00	0.134	241.7	34.6	100.1	134.7	107.0	0.056
40.0	82.40	0.110	262.9	46.1	109.8	155.9	107.0	0.046
50.0	70.04	0.093	279.3	57.6	114.7	172.3	107.0	0.038
60.0	61.17	0.081	292.8	69.1	116.7	185.8	107.0	0.032
70.0	54.48	0.072	304.2	80.6	116.6	197.2	107.0	0.028
80.0	49.23	0.065	314.1	92.2	115.0	207.1	107.0	0.024
90.0	44.99	0.060	323.0	103.7	112.3	216.0	107.0	0.021
100.0	41.48	0.055	330.9	115.2	108.7	223.9	107.0	0.018
150.0	30.26	0.040	362.1	172.8	82.3	255.1	107.0	0.009
200.0	24.13	0.032	384.9	230.4	47.5	277.9	107.0	0.004
250.0	20.22	0.027	403.2	288.0	8.2	296.2	107.0	0.001
260.0	19.60	0.026	406.5	299.5	0.0	299.5	106.9	0.000
270.0	19.02	0.025	409.6	311.0	0.0	311.0	98.6	0.000
280.0	18.48	0.025	412.7	322.6	0.0	322.6	90.1	0.000
290.0	17.97	0.024	415.6	334.1	0.0	334.1	81.6	0.000
300.0	17.49	0.023	418.5	345.6	0.0	345.6	72.9	0.000
310.0	17.04	0.023	421.3	357.1	0.0	357.1	64.2	0.000
320.0	16.61	0.022	424.0	368.6	0.0	368.6	55.4	0.000
330.0	16.21	0.022	426.7	380.2	0.0	380.2	46.5	0.000
340.0	15.83	0.021	429.3	391.7	0.0	391.7	37.6	0.000

APPENDIX 6

TIL Toronto Inspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS
110 KONRAD CRESCENT,
UNIT 16
MARKHAM, ONTARIO
L3R 9X2
TEL.: 905-940-8509
FAX : 905-940-8192

Date: October 26, 2021
Project No.: 5431W-21-HB

Coral Creek Homes
145 Joicey Boulevard
Toronto, Ontario
M5M 2V1

Attn: Mr. Fabio Furlan

Re: Summary of Infiltration Testing for Proposed Development at 150 Cemetery Road, Uxbridge, Ontario

Toronto Inspection Ltd. (TIL) was retained by Coral Creek Homes (Client) to carry out an infiltration testing program to assess the infiltration rate of the underlying soil material for the infiltration Low Impact Developments (LIDs) to be proposed by consulting engineer, Tim Politis, from Politis Engineering Ltd at 150 Cemetery Road, Uxbridge, Ontario (Site).

The testing locations were provided and confirmed on-site by Tim Politis. The location of the Site and testing locations are attached as **Figure 1**.

1 Background

There are in total three LIDs proposed: one near the southeast corner of the Site, one near the northeast corner of the Site, and one on the west of the existing driveway. Test depths of approximately 2.0 m below ground surface(mbgs) and 3.5 mbgs were tested as requested by Tim Politis.

2 Work Program and Results

2.1 Test Pits

Three test pits, 21TP-1, 21TP-2 and 21TP-3 were conducted on October 1, 2021 to facilitate in-situ infiltration testing, soil logging and sampling of grain size analysis. The test pits remained open and dry for two hours. No groundwater seepage was observed at any test pit location. Further, seasonal groundwater level monitoring from the Hydrogeological Investigation[1] at the Site indicated dry conditions up to 6.1 mbgs at 20BH-3 (MW), 20BH-4 (MW) and 20BH-5 (MW), locations shown on Figure 1.

The visual observations from the two test pits are summarized in **Table 2-1**.

[1] Toronto Inspection Ltd.. 2021. Hydrogeological Investigation 150 Cemetery Road, Uxbridge, Ontario.

Table 2-1 Test Pit Observations

Test Hole ID	Depth of Investigation (mbgs)	Soil Conditions	Water Seepage Observations
21TP-1	3.5	0 - 0.45 m -- topsoil 0.45 - 3.0 m -- silty sand, brown, very moist (top 1 m) to moist 3.0 – 3.5 – coarse silt, brown, very moist	No seepage observed
21TP-2	3.5	0 - 0.3 m -- topsoil 0.3 - 1.3 m -- silty sand, brown, very moist 1.3 - 3.5 m -- silt, brown, very moist	No seepage observed
21TP-3	3.5	0 - 0.25 m -- topsoil 0.25 - 1.3 m -- silty sand, brown, very moist 1.3 - 3.5 m -- silt, brown, moist	No seepage observed

2.2 Laboratory Grain Size Analyses

Grain size analyses for soil samples were completed in the laboratory using sieve and hydrometer methods. The purpose of completing the grain size analyses was to determine the particle size distribution of the soil samples collected.

The Hazen Permeability is directly proportional to the infiltration rate, indicating lower values are likely to exhibit lower infiltration rates relative to higher values.

Grain size analysis were conducted at depths of 2.0 mbgs and 3.5 mbgs at 21TP-1, 21TP-2 and 21TP-3 to assess the particle size distribution at the location of the in-situ infiltration testing. The grain size distribution curves are appended. To determine the corresponding soil infiltration rate, the conversion discussed in **Section 3.2** was used. A summary of the results from the analyses are provided in **Table 2-2**.

Table 2-2 Hazen Permeability Summary

Test ID	Test Depth (mbgs)	Soil Description	Hazen Permeability (cm/s)	Laboratory Infiltration Rate (mm/hr)
21TP-1	2.0	Silty Sand	2.8×10^{-3}	113
	3.5	Silt (coarse)	3.3×10^{-3}	118
21TP-2	2.0	Silt	1.0×10^{-5}	25
	3.5	Silt	3.4×10^{-5}	35
21TP-3	2.0	Silt	6.4×10^{-5}	41
	3.5	Silt	2.1×10^{-5}	30

2.3 In-situ Infiltration Test

Infiltration testing was carried out using a Guelph Permeameter in accordance with the equipment's operating instructions (Soilmoisture Equipment Corp., 2012)[2]. For the tests, a 6 cm diameter holes were hand-augured to depths of approximately 2.0 mbgs and 3.5 mbgs at all test pit locations.

The infiltration test details are summarized in **Table 2-3**. The approximate infiltration test locations are shown on **Figure 1** and the field Guelph Permeameter data tables documenting stabilization of drawdown rates are appended.

Table 2-3 Infiltration Test Summary

Test ID	Test Depth (mbgs)	Well Hole Soil Description	Water Column Height (cm)	Reservoir Used	Method
21TP-1	2.0	Silty Sand	5, 10	Combined	Average of Single Head
	3.5	Silt (coarse)	5, 10	Combined	Average of Single Head
21TP-2	2.0	Silt	5, 10	Combined	Average of Single Head
	3.5	Silt	5, 10	Combined	Average of Single Head
21TP-3	2.0	Silt	5, 10	Combined	Average of Single Head
	3.5	Silt	5, 10	Combined	Average of Single Head

[2] Soilmoisture Equipment Corp.. 2012. 2800 Guelph Permeameter Operating Instructions dated December 2012

3 Discussion

3.1 Soil Condition

Based on the field logging of soil samples, the subsoil within the anticipated operating depth of proposed LIDs at the Site is primarily silty sand to silt at 21TP-1, and silt at 21TP-2 and 21TP-3. The calculation of infiltration rates associated with this soil condition is discussed in the sections below.

3.2 Estimated Field Saturated Hydraulic Conductivity and Infiltration Rate

The field saturated hydraulic conductivity (Kfs) was calculated using the Single Head Method via "Guelph Permeameter Calculator" prepared by Soilmoisture Equipment Corp (Soilmoisture Equipment Corp., 2012)[1]. This method is expressed by the following equation:

$$K_{fs} = \frac{C_1 Q_1}{2\pi {H_1}^2 + \pi\alpha^2 C_1 + 2\pi\left({H_1}/{\alpha}\right)}$$

Where:
Kfs =Field saturated hydraulic conductivity (entrapped air present) (cm/sec)
C1 = Shape factor
Q1 = Discharge from combined reservoir (cm^3/min)
H1 = Well height (cm)
a = Well radius (cm)
α = Soil texture (cm^{-1})

Based on the output from the Guelph Permeameter Calculator using the appended inputs, the estimate of Kfs for the silty sand deposit at 21TP-1 was 1.62×10^{-3} cm/s at depth 2.0 mbgs and 1.49×10^{-2} cm/s at depth 3.5 mbgs. The estimate of Kfs for the silt deposit at 21TP-2 was 1.17×10^{-4} cm/s at depth 2.0 mbgs and 4.58×10^{-4} cm/s at depth 3.5 mbgs. The estimate of Kfs for the silt deposit at 21TP-3 was 5.85×10^{-5} cm/s at depth 2.0 mbgs and 1.44×10^{-4} cm/s at depth 3.5 mbgs.

To determine the corresponding soil infiltration rate, the Kfs must be converted to a rate of infiltration (T). The approximate relationship between Kfs and T is provided in the Toronto and Region Conservation Authority (TRCA) Stormwater Management Criteria (TRCA, 2012)[3] to complete this conversion.

Based on the measured saturated hydraulic conductivity, the corresponding unfactored infiltration rate calculated for the silty sand deposit at 21TP-1 was 181 mm/hr at depth 2.0 mbgs and 177 mm/hr at depth 3.5 mbgs. The unfactored infiltration rate calculated for the silt deposit at 21TP-2 was 48 at depth 2.0 mbgs and 70 at depth 3.5 mbgs. The unfactored infiltration rate calculated for the silt deposit at 21TP-3 was 40 mm/hr at depth 2.0 mbgs and 51 mm/hr at depth 3.5 mbgs.

[3] Toronto and Region Conversation Authority (TRCA). 2012. Stormwater Management Criteria August 2012 Version 1.0.

A summary of the Kfs from the current investigation is presented in **Table 3-1.**

Table 3-1 Unfactored Infiltration Rate from In-situ Testing

Location	Depth mbgs	Soil Unit	Kfs (cm/s)	Unfactored Infiltration Rate (mm/hour)
21TP-1	2.0	Silty Sand	1.62×10^{-2}	181
	3.5	Silt (coarse)	1.49×10^{-2}	177
21TP-2	2.0	Silt	1.17×10^{-4}	48
	3.5	Silt	4.58×10^{-4}	70
21TP-3	2.0	Silt	5.85×10^{-5}	40
	3.5	Silt	1.44×10^{-4}	51

4 Recommendations

Through field logging and laboratory testing the soil condition at the proposed bases of the infiltration trenches was identified to be a continuous silty sand to silt deposit. Based on the grain size analysis and in-situ Guelph Permeameter infiltration testing completed, at the locations of the proposed bases of the LIDs, an unfactored infiltration rate of 110 mm/hr was determined for 21TP-1, an unfactored infiltration rate of 35 mm/hr was determined for 21TP-2 and 21TP-3.

It will be at the discretion of the designer to select a factor of safety to applied to the unfactored infiltration rates calculated.

It should be noted that the field infiltration rates are specific to the areas tested at the Site, at the point in time when the tests were conducted. Test results may therefore not be applicable to other areas of the Site where subsurface conditions are not consistent with those at the test locations.

We trust that the findings from this investigation will meet your needs. Should you have any questions or comments, please do not hesitate to contact the undersigned.

Yours truly,

Toronto Inspection Ltd.

Peining Guan, M.Sc
Junior Environmental Scientist

Simran Panesar, P.Geo.
Project Manager

Appended:

Figure 1 Test Pit Location and Monitoring Well Location Plan
Grain Size Distribution Curves
Field Data and Kfs Calculation

Source: Durham Region Interactive Map

LEGEND:

Borehole and Monitoring Well Location

Test Pit Location

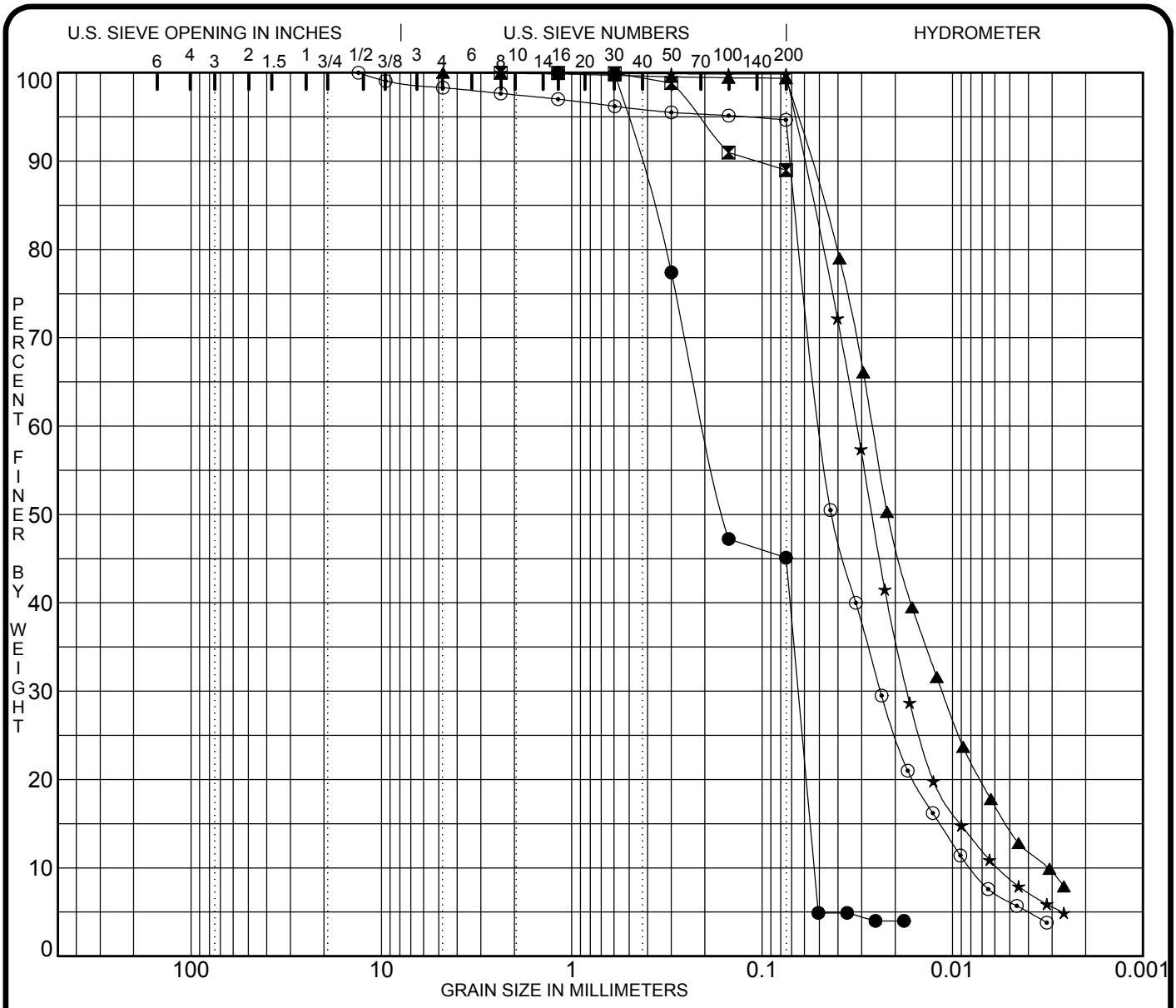
Site Boundary

TorontoInspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS

110 Konrad Crescent,
Unit 16
Markham, Ontario
L3R 9X2

Tel: 905-940 8509 Fax: 905-940 8192 Email : TIL@torontoinspection.com

TITLE:	Test Pit and Monitoring Well Location Plan
LOCATION:	150 Cemetery Road, Uxbridge, Ontario
PROJECT NO.	5431W-20-HB
DATE :	October 2021
FIGURE NO :	1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	21TP-1	2.0						0.39	3.8
⊠	21TP-1	3.5							
▲	21TP-2	2.0						1.56	8.4
★	21TP-2	3.5						1.64	5.5
⊙	21TP-3	2.0						1.45	6.1

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	21TP-1	2.0	1.18	0.20	0.065	0.0533	0.0	54.9	45.1	
⊠	21TP-1	3.5	2.36				0.0	11.0	89.0	
▲	21TP-2	2.0	4.75	0.03	0.011	0.0031	0.0	0.6	85.0	14.4
★	21TP-2	3.5	2.36	0.03	0.017	0.0058	0.0	0.1	91.1	8.8
⊙	21TP-3	2.0	13.20	0.05	0.024	0.0080	1.7	3.6	88.5	6.2

PROJECT **Geotechnical Investigation - 150 Cemetery Road, Uxbridge, Ontario**

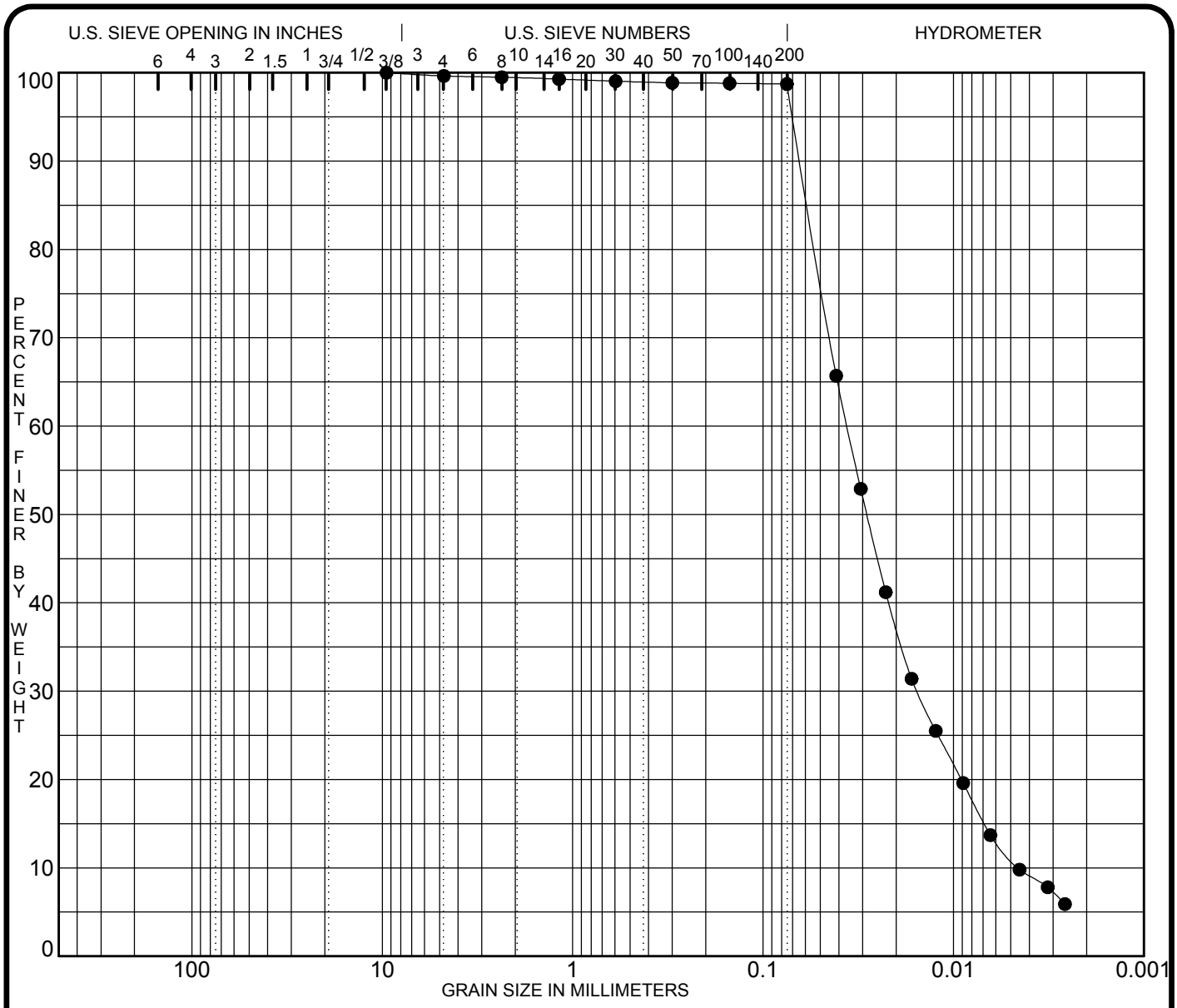
JOB NO. **5431W-20-HB**

DATE **10/15/21**

GRADATION CURVES

Toronto Inspection Ltd.

FIGURE NO.1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● **21TP-3**	**3.5**						**1.45**	**7.9**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **21TP-3**	**3.5**	**9.50**	**0.04**	**0.015**	**0.0046**	**0.4**	**0.9**	**87.7**	**11.0**

PROJECT **Geotechnical Investigation - 150 Cemetery Road, Uxbridge, Ontario**

JOB NO. **5431W-20-HB**

DATE **10/15/21**

GRADATION CURVES

Toronto Inspection Ltd.

Guelph Permeameter

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^2

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 5

Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.1500

Res Type 35.22
H 5
a 3
H/a 1.667
a* 0.12
C0.01 0.809
C0.04 0.842
C0.12 0.803
C0.36 0.803
C 0.803
R 0.150
Q 0.088
pi 3.142

α^*= 0.12 cm^{-1}

C = 0.803154

Q = 0.08805

K_{fs} = 1.60E-04 cm/sec
9.61E-03 cm/min
1.60E-06 m/sec
3.78E-03 inch/min
6.31E-05 inch/sec

Φ_m = 1.33E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^2

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 10

Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.2000

Res Type 35.22
H 10
a 3
H/a 3.33333
a* 0.12
C0.01 1.21841
C0.04 1.29023
C0.12 1.28754
C0.36 1.28754
C 1.28754
R 0.200
Q 0.1174
pi 3.1415

α^*= 0.12 cm^{-1}

C = 1.287543

Q = 0.1174

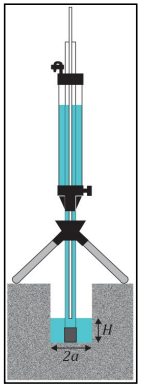
K_{fs} = 1.27E-04 cm/sec
7.63E-03 cm/min
1.27E-06 m/ses
3.00E-03 inch/min
5.01E-05 inch/sec

Φ_m = 1.06E-03 cm^2/min

Average

K_{fs} = 1.44E-04 cm/sec
8.62E-03 cm/min
1.44E-06 m/s
3.39E-03 inch/min
5.66E-05 inch/sec

Φ_m = 1.20E-03 cm^2/min



Double Head Method

Reservoir Cross-sectional area in cm^2

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter the first water Head Height ("H1" in cm): 5

Enter the second water Head Height ("H2" in cm): 10

Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

α^*= 0.12 cm^{-1}

α= 0.0154

Steady State Rate of Water Level Change ("R1" in cm/min): 0.1500

Steady State Rate of Water Level Change ("R2" in cm/min): 0.2000

Q_1 = 0.08805

Q_2 = 0.1174

Res Type: 35.22
H1/a: 1.666667
H2/a: 3.333333
C1-0.01: 0.809485
C2-0.01: 1.21841
C1-0.04: 0.842059
C2-0.04: 1.290234
C1-0.12: 0.803154
C2-0.12: 1.287543
C1-0.36: 0.803154
C2-0.36: 1.287543
G-Denominator: 1525.687

C_1 = 0.803154

C_2 = 1.287543

G_1 = 0.005264

G_2 = 0.00422

G_3 = 0.055692

G_4 = 0.024148

K_{fs} = 3.19E-05 cm/sec
1.91E-03 cm/min
3.19E-07 m/sec
7.53E-04 inch/min
1.25E-05 inch/sec

Φ_m = 2.07E-03 cm^2/min

Θ_{fs} = cm^3/cm^3

Θ_i = cm^3/cm^3

Sorptivity 0.0000 $(cm\ min^{-\frac{1}{2}})$

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121\left(H_2/a\right)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

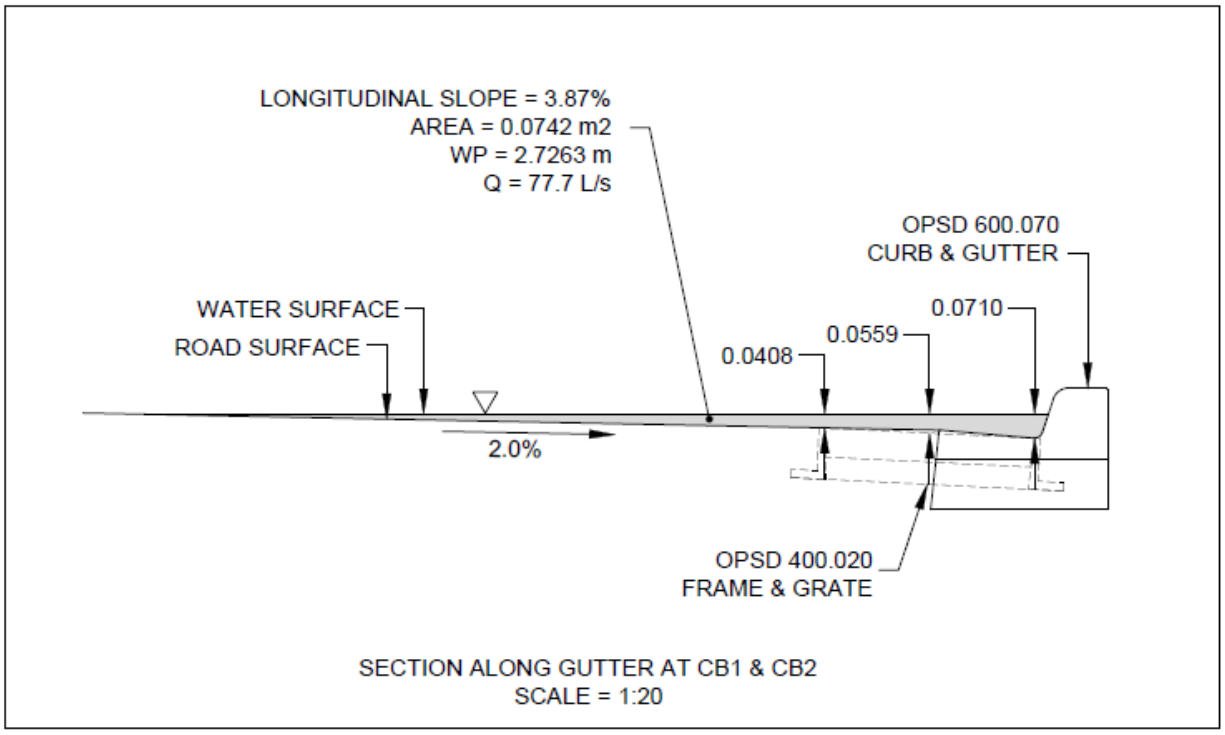
Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

APPENDIX 7

Analysis of Flow Capture at CB1 & CB2:

For the 2 single catchbasins located on Street 'A', an analysis of the depth of flow during the 100 year event needs to be considered to determine the capture. The total 100 year peak flow for the tributary area (A = 0.3165 Ha & C = 0.70) is 154.5 L/s with approximately 50% or 77.2 L/s will be directed to each inlet, the runoff flow along the gutter to CB1 and CB2 can be analyzed as a channel using Manning's Formula as shown below:



Calculate flow in open channel using Manning Equation:

$Q = (R^{\frac{2}{3}} x S^{\frac{1}{2}})/n,$
Where,
R = Hydraulic Radius (m)
$R = A/WP$
A = Cross sectional area of channel (m^2)
WP = Wetted Perimeter (m)
S = Channel Slope (m/m)
n = Manning n is a roughness coefficient (unitless)
n = 0.013 for pavement

Taking the average depth of flow at the CB grate the flow captured can be calculated using the following orifice formula:

Flow through an orifice plate is calculated as follows:

$$Q = CA\sqrt{2gh}$$

Where,

Q=Flow (m^3/second)

C=Orifice Coefficient (Unitless)

A=Cross-sectional area of orifice (m^2)

g=Acceleration due to gravity (9.81 m/s^2)

h=Head acting on orifice (m)

For an orifice plate, C is 0.61. The OPSD 400.020 grate has an opening area of 203 sq.in. or 0.13097 sq.m.

Therefore, the peak flow captured is:

Q = 0.61 x 0.13097 x (2 x 9.81 x 0.0559)^0.5 = 0.0837 cms or 83.7 L/s

Considering 50% blockage, the maximum capture is 41.9 L/s per CB and therefore 70.7 L/s will be directed downstream via overland flow to the low point on Street 'A' at DCB1 and DCB2.

For DCB1 and DCB2, the total flow directed from the tributary area (A = 0.2636 Ha & C = 0.61) is 112.1 L/s plus the potential 70.7 L/s from the overflow at CB1 and CB2 resulted in a total 100 year flow of 182.9 L/s. Overland flow will occur when the water level exceeds elevation 294.80 in the gutter on the south side of the road and spills to Cemetery Road. The depth at that point will be 0.075 m above DCB2, while water will need to spill over the crown of the road from DCB1 (0.085 m). Taking DCB2 to be the controlling factor, the capacity for each grate is:

Q = 0.61 x 0.13097 x (2 x 9.81 x 0.075)^0.5 = 0.0969 cms or 96.9 L/s

There will be a total of 4 grates at the two DCB's with a total capacity of 387.6 L/s or 193.8 L/s when considering 50% blockage which exceeds the total 100 year flow of 182.9 L/s directed to them.

Therefore CB1, CB2, DCB1 and DCB2 have enough capacity to intercept the total 100 year peak flow from the contributing areas.

<u>RLCB Capture:</u>

For the RLCB (A = 0.1093 & C = 0.48), the 100 year flow is 36.3 L/s. The depth of flow required to convey 2 times the 100 year peak flow is:

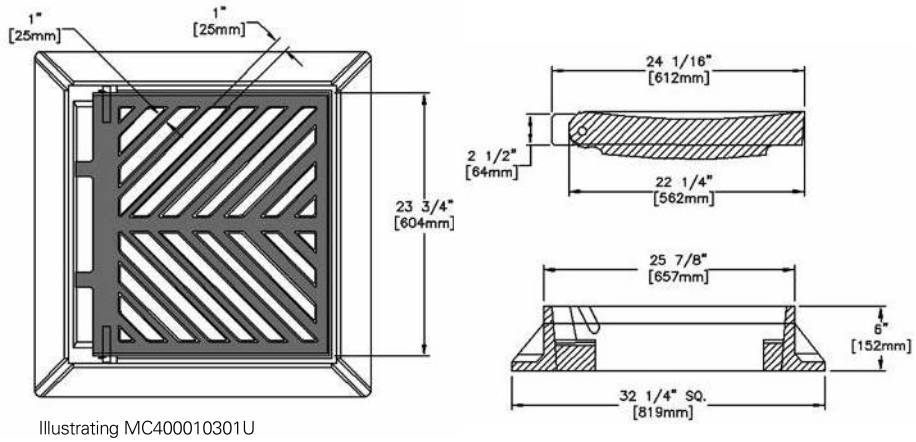
0.0726 = 0.61 x 0.13097 x (2 x 9.81 xH)^0.5
H = 0.0421 m or 42.1 mm

Therefore the 100 year peak flow will be contained within the swale.

400.01 CATCH BASIN FRAME WITH SQUARE DISHED GRATE

Heavy duty
Square frame with square overflow-type dished grate for catch basins, MC400010301U
Herringbone openings
Approximate 242 sq. in. open area

Frame also accepts:
400.11 flat grate perforated openings, MC400110300U

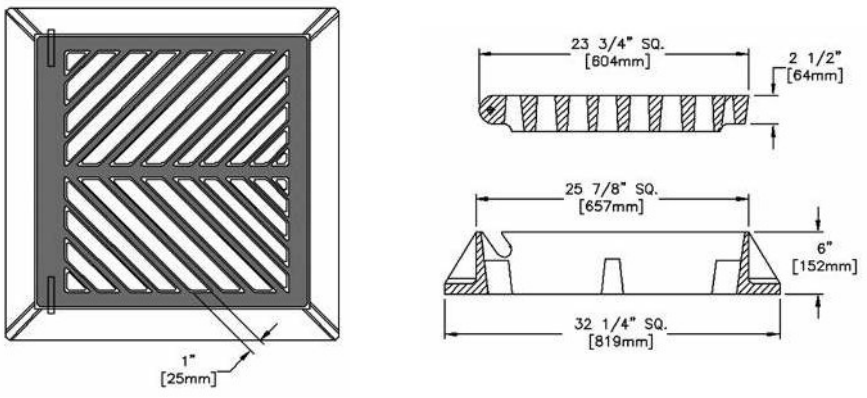


Illustrating MC400010301U

400.02 CATCH BASIN FRAME WITH SQUARE FLAT GRATE

Heavy duty
Square frame with square flat grate for catch basins, MC400020301U
Herringbone openings
Approximate 203 sq. in. open area

Frame also accepts:
400.10 flat grate perforated openings, MC400100300U
Beehive grate, MC400020800U
401.081 fish grate, MC400020310U
Walmart grate, MC400020700U
400.12 birdcage grate, MC400120300U

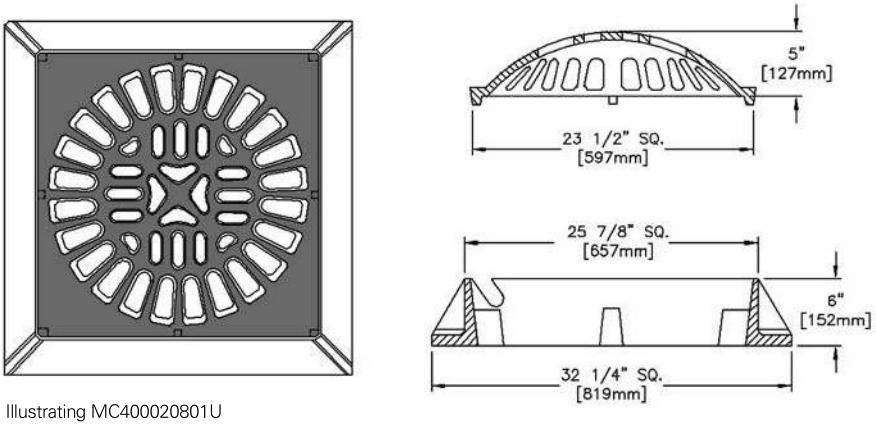


Illustrating MC400020301U

400.02 CATCH BASIN FRAME WITH BEEHIVE GRATE

Heavy duty
Square frame with beehive style catch basin, MC400020801U
Approximate 155 sq. in open area

Frame also accepts:
400.02 flat grate herringbone openings, MC400020300U
400.10 flat grate perforated openings, MC400100300U
401.081 fish grate, MC400020310U
Walmart grate, MC400020700U
400.12 birdcage grate, MC400120300U



Illustrating MC400020801U

APPENDIX 8

Hydroworks Sizing Summary

150 Cemetery Road
Uxbridge, Ontario

05-23-2024

Recommended Size: HydroDome HD 4

A HydroDome HD 4 is recommended to provide 80 % annual TSS removal based on a drainage area of .58014 (ha) with an imperviousness of 61.5 % and Toronto Central, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroDome HD 4 treats 96 % of the annual runoff and provides 89 % annual TSS removal for the Toronto Central rainfall records and 20 um to 2000 um particle size distribution.

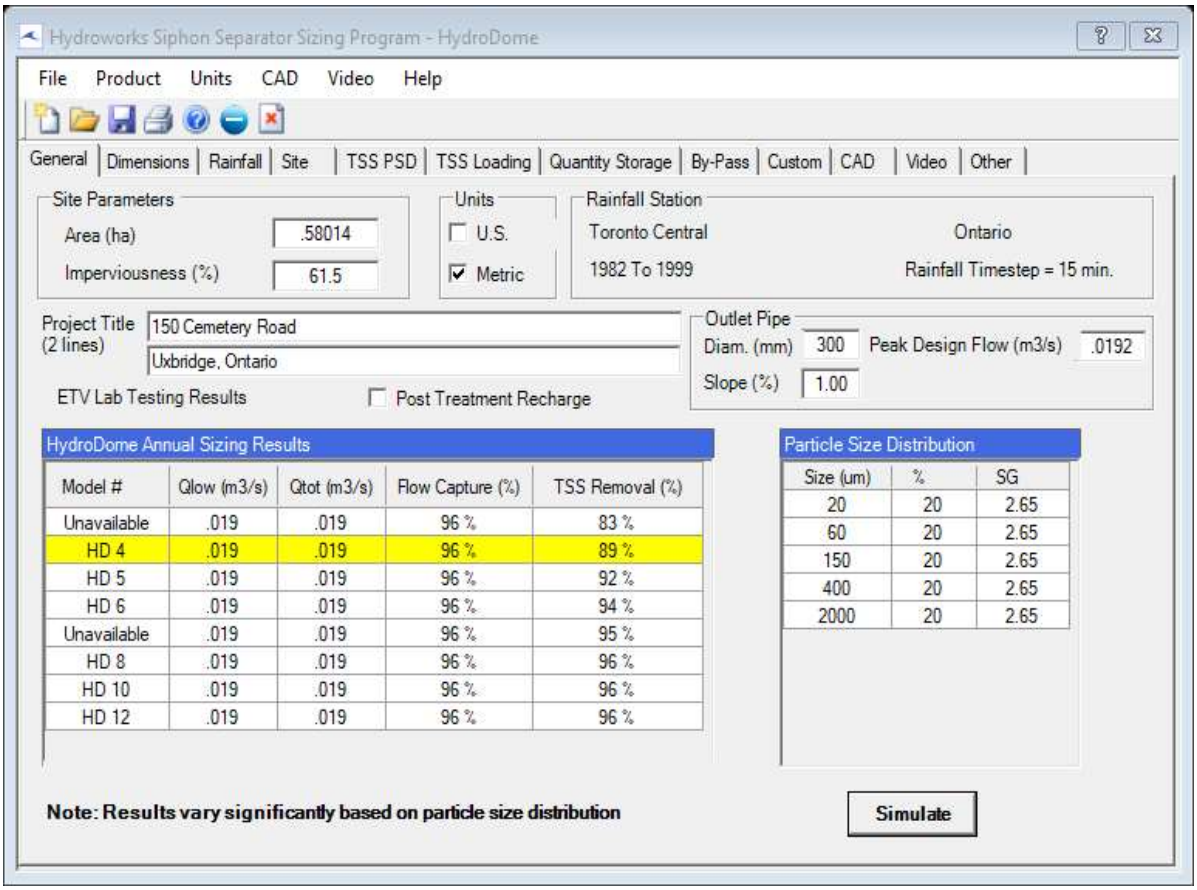
The HydroDome has a siphon which creates a discontinuity in headloss. The given peak flow of .019 (m3/s) Is less than the full pipe flow of .1 (m3/s) indicating free flow in the pipe during the peak flow assuming no tailwater condition. Partial pipe flow was assumed for the headloss calculations. The headloss was calculated to be 207 (mm) above the crown of the 300 (mm) outlet pipe.

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

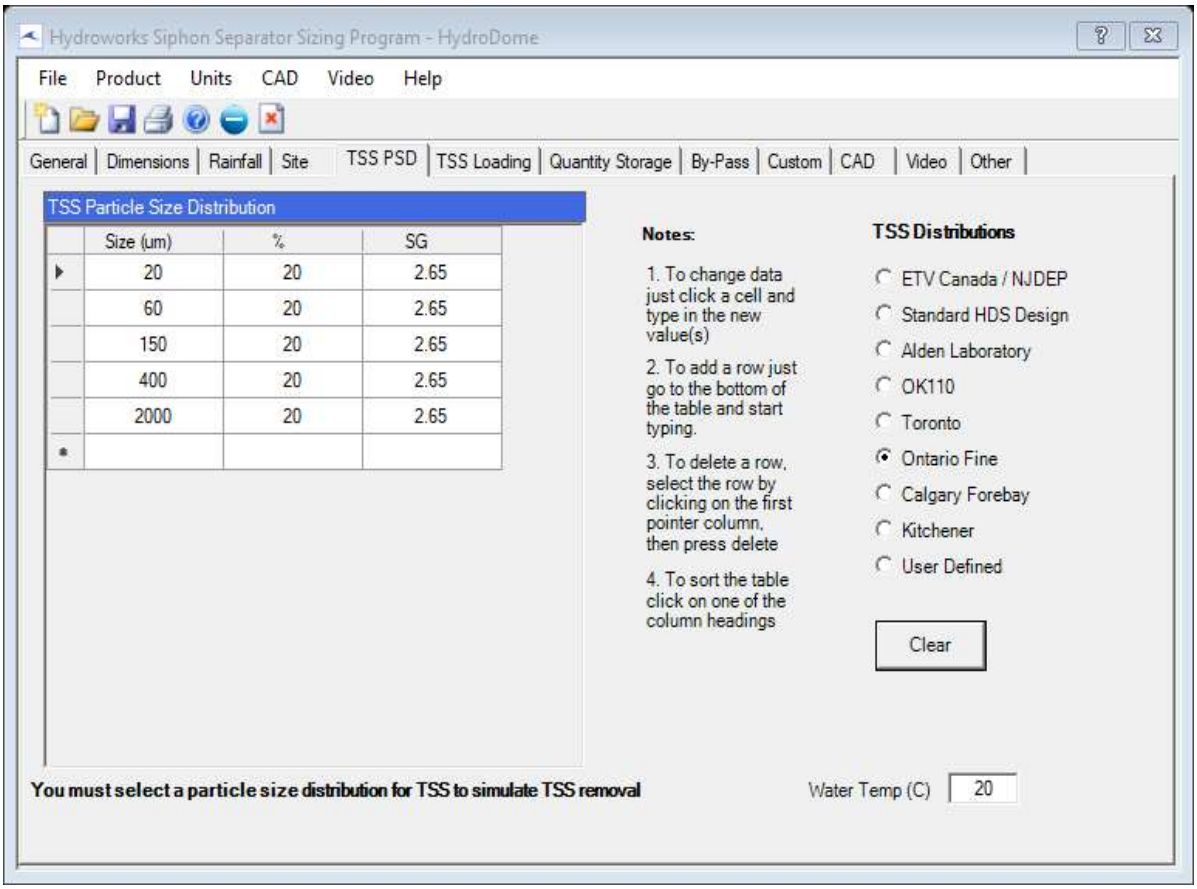
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroDome .

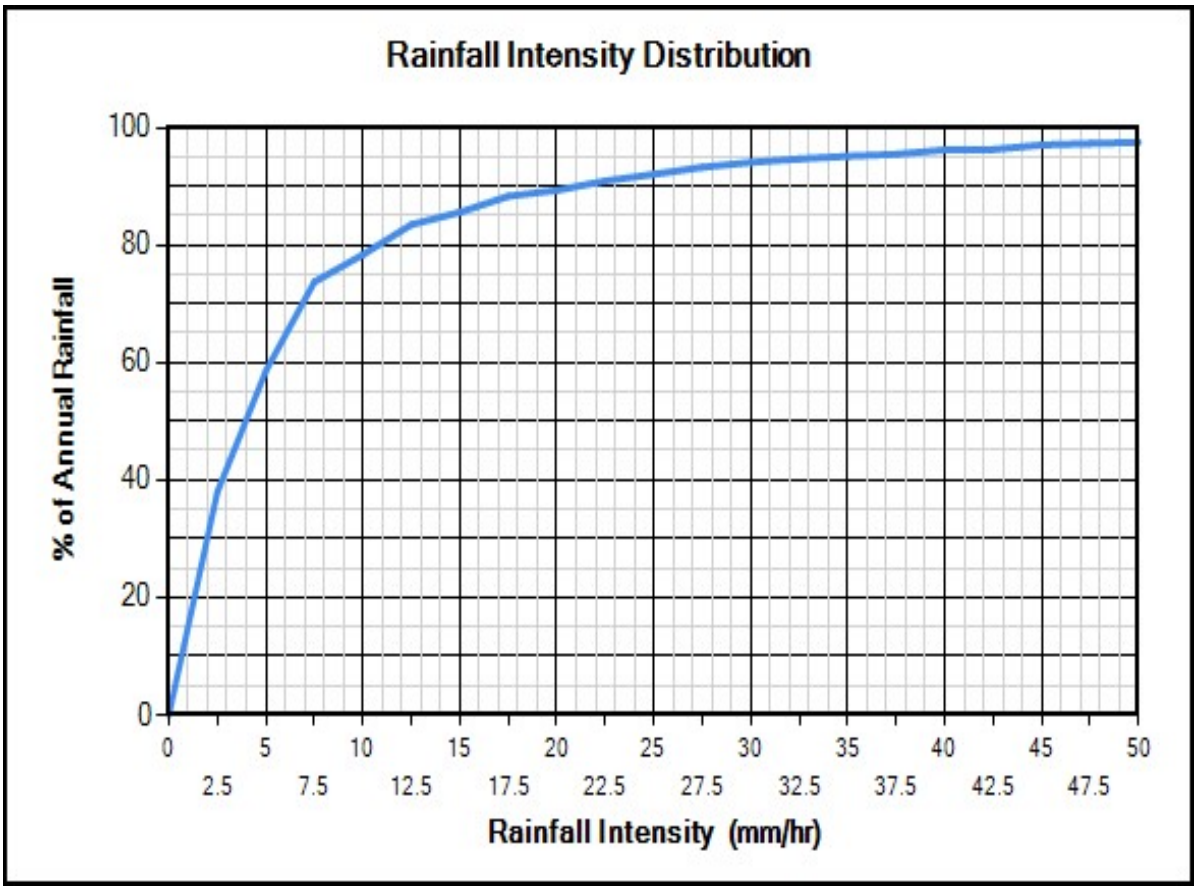
TSS Removal Sizing Summary



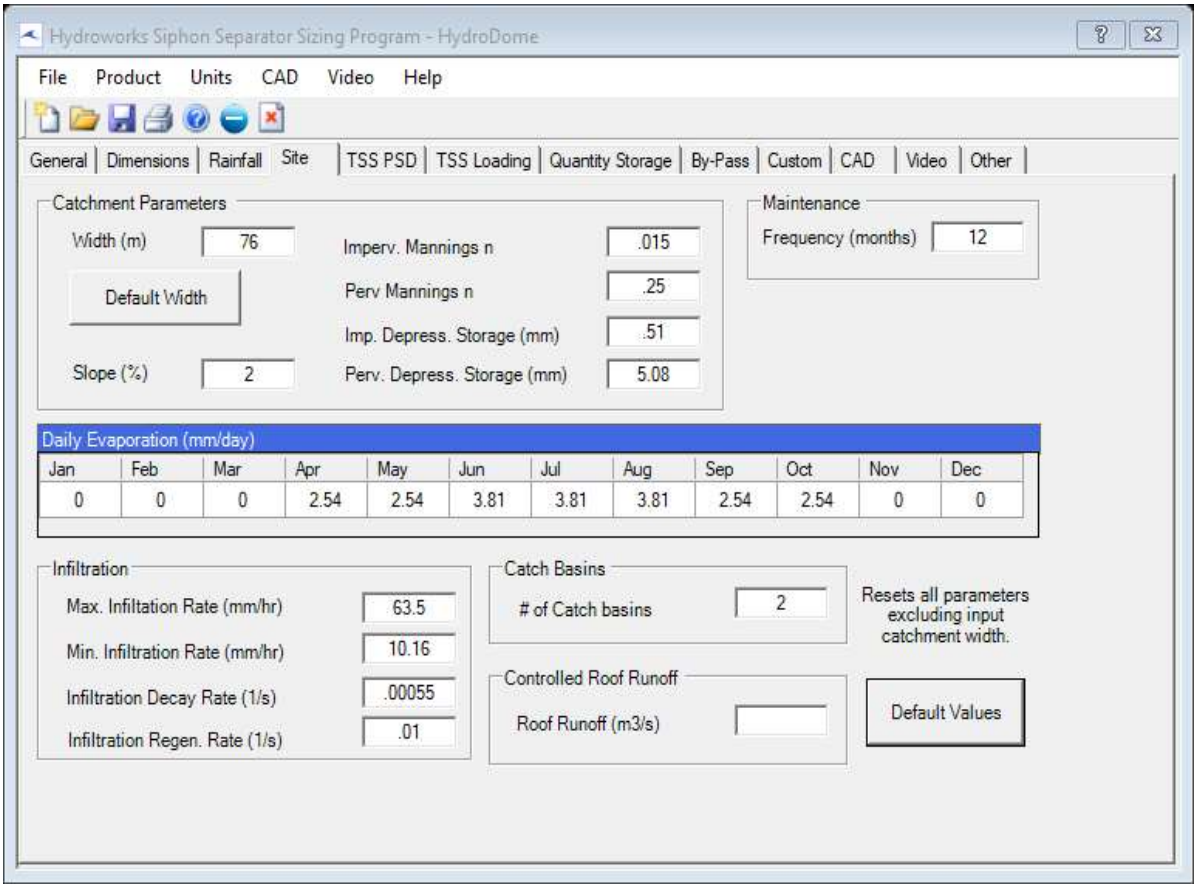
TSS Particle Size Distribution



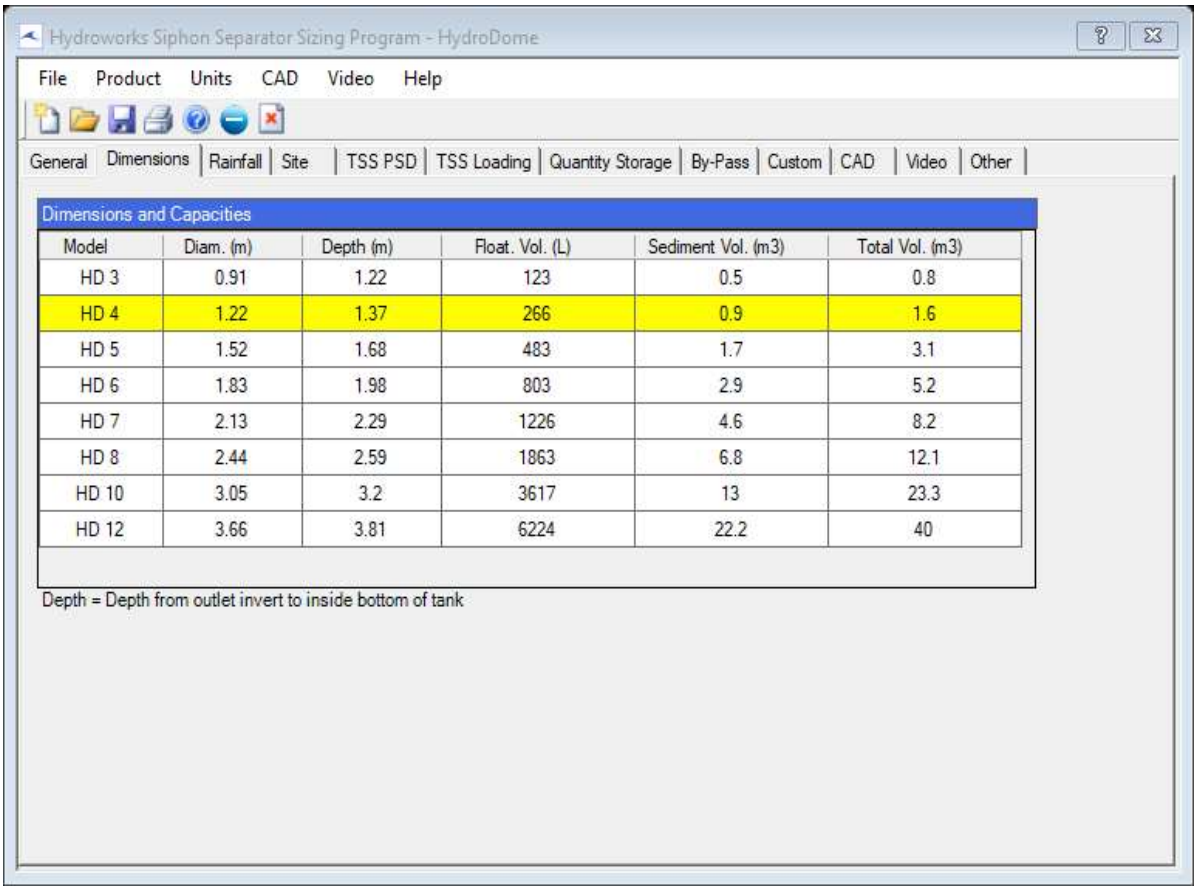
Rainfall Station - Toronto Central, Ontario(1982 To 1999)



Site Physical Characteristics



Dimensions And Capacities

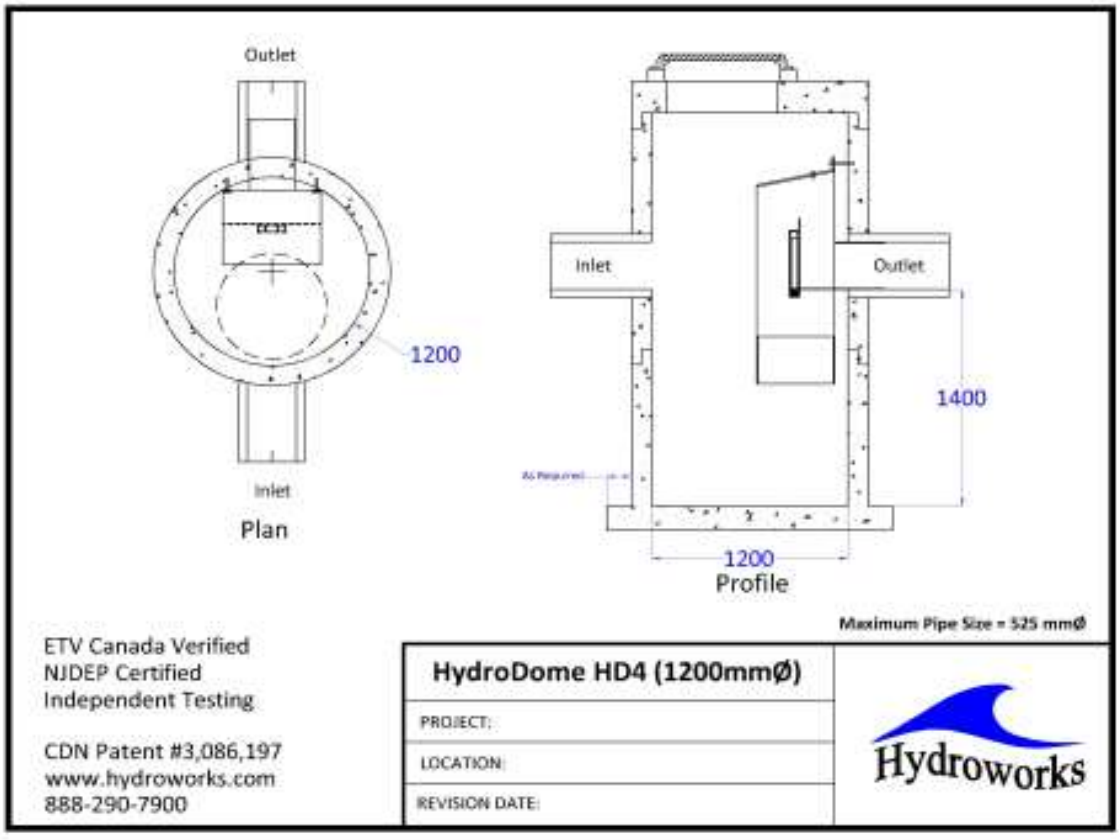


Dimensions and Capacities

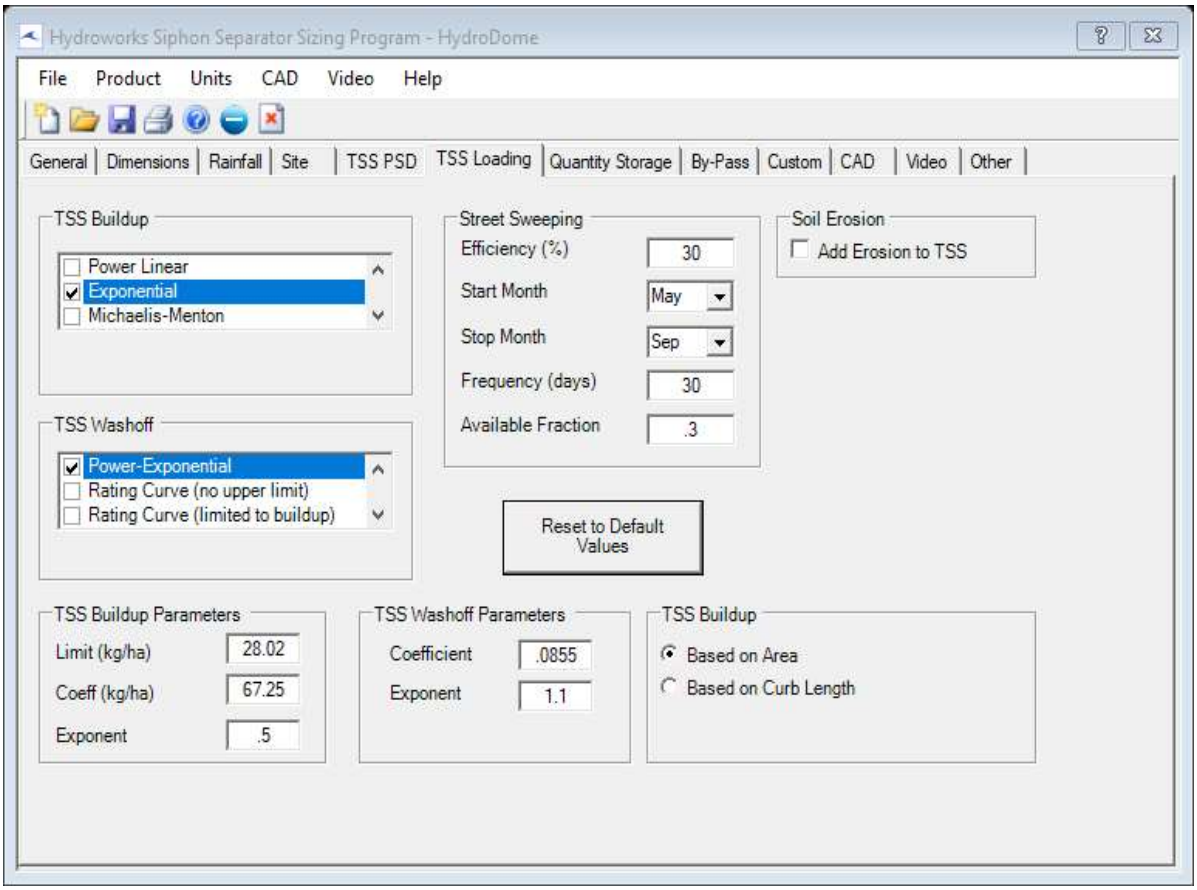
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HD 3	0.91	1.22	123	0.5	0.8
HD 4	1.22	1.37	266	0.9	1.6
HD 5	1.52	1.68	483	1.7	3.1
HD 6	1.83	1.98	803	2.9	5.2
HD 7	2.13	2.29	1226	4.6	8.2
HD 8	2.44	2.59	1863	6.8	12.1
HD 10	3.05	3.2	3617	13	23.3
HD 12	3.66	3.81	6224	22.2	40

Depth = Depth from outlet invert to inside bottom of tank

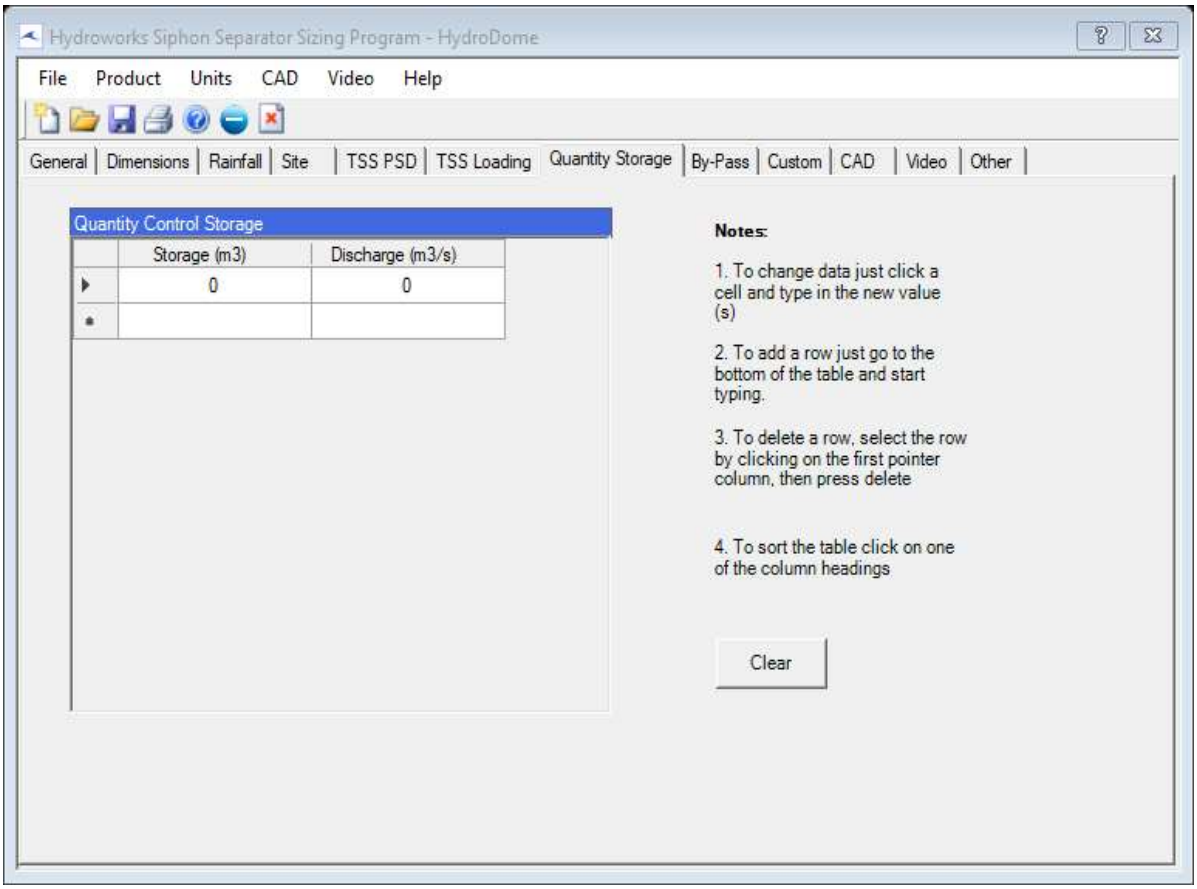
Generic HD 4 CAD Drawing



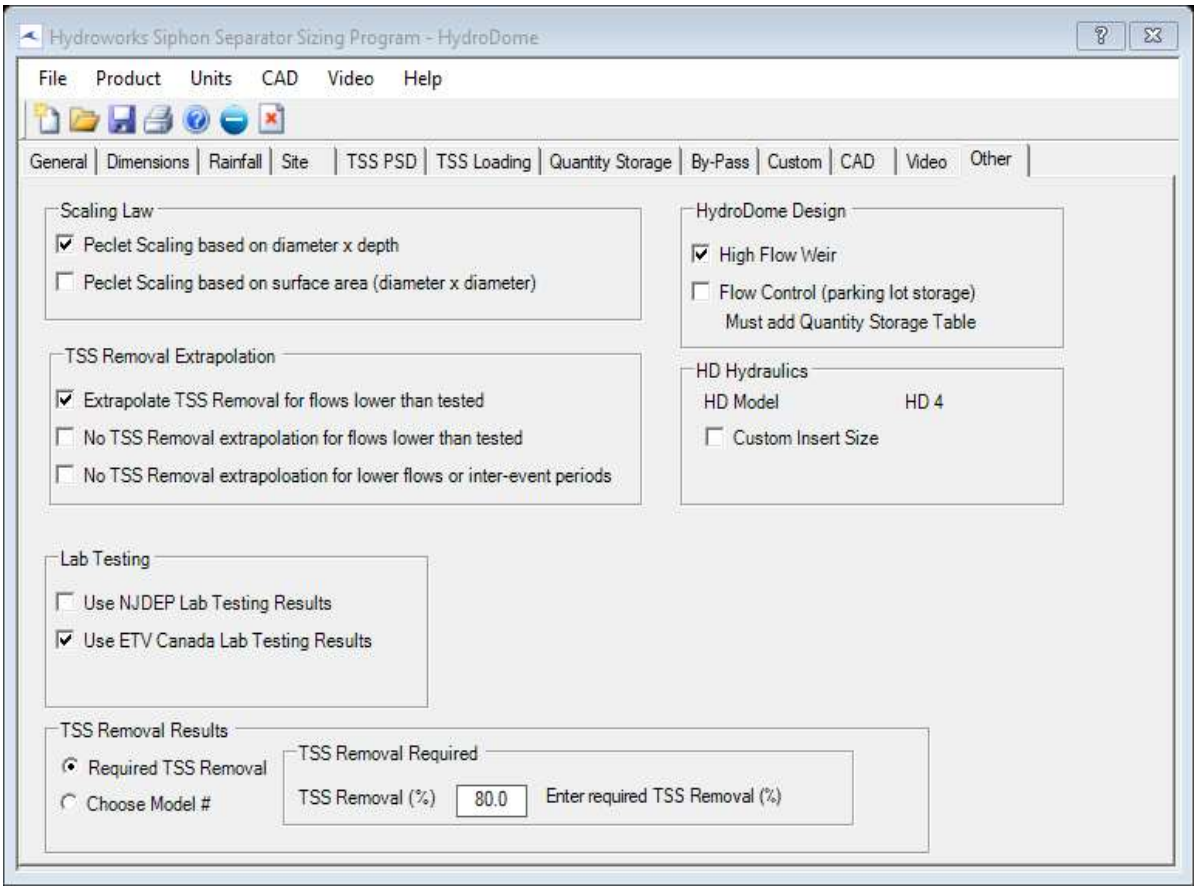
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Flagged Issues

If there is underground detention storage upstream of the HydroDome please contact Hydroworks to ensure it has been modeled correctly.

Hydroworks Sizing Program - Version 5.7

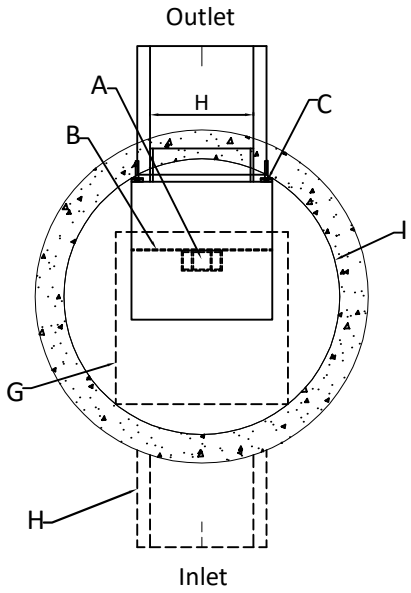
1-800-290-7900
www.hydroworks.com

Specifications

1. The separator must be designed based on the following criteria:

Flow Criteria	
Water Quality FLow cfs (L/s)	
Peak Design Flow cfs (L/s)	

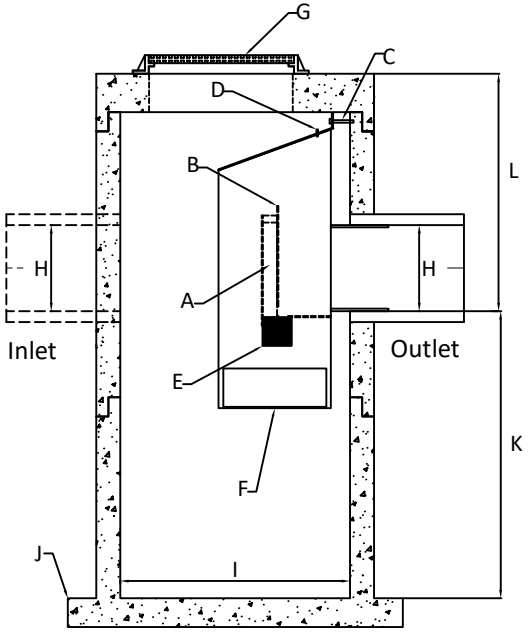
TSS Removal Criteria	
Annual TSS Removal (%)	
NJDEP/ETV Canada TSS	
OK110 Sand	
F95 Sand	
Other	



Plan

HydroDome Components

A. Siphon
B. Overflow Weir
C. Wall Anchor
D. Air Check Valve
E. Coarse Foam Debris Screen
F. Perforated Bottom
G. Grate or Cover
H. Inlet and Outlet Pipes
I. Structure Diameter
J. Base Extension
K. Sump Depth
L. Invert to Top of Structure



Profile

2. The separator must be independently tested and verified to the 2013 NJDEP separator protocol and 2014 ETV Canada Separator protocol

3. Vendor testing and/or field testing is not acceptable to determine an alternate equal due to the lack of repeatability.

Notes:

1. Sump depths shown are typical. Additional depth can be added as required.

2. Single or multiple inlet pipes allowed.

3. Drops allowed.

4. Inlet Grate Shown. HydroDome can be desiged with a closed cover if required.

5. Oil capacities given are spill capacities.

6. Sediment depths are maximum holding capacities and not recommended capacities for regular maintenance.

7. Capacities are rounded down to nearest 5 gal or ft3 (5L or 0.1 m3 for metric units)

8. Minimum rim to top of structure [L] required may vary for HydroDome. Please call Hydroworks for site-specific design questions.

9. Hydraulics vary with pipe size and model number. Please call Hydroworks for site-specific headloss calculations.

HydroDome by Hydroworks, LLC
U.S. Patent # 10,801,196
www.hydroworks.com
888-290-7900

HydroDome Dimensions / Capacities *						
Model	Diameter ft (m) I	Sump Depth ft (m) K	Max. Pipe in (mm) H	Total Volume gal (L)	Oil Spill Volume gal (L)	Sediment Volume ft3 (m3)
HD 3	3 (0.9)	4 (1.2)	18 (450)	210 (800)	30 (120)	15 (0.5)
HD 4	4 (1.2)	4.5 (1.4)	21 (525)	420 (1600)	70 (265)	30 (0.9)
HD 5	5 (1.5)	5.5 (1.7)	27 (675)	805 (3055)	125 (480)	60 (1.7)
HD 6	6 (1.8)	6.5 (2.0)	33 (825)	1375 (5200)	210 (800)	100 (2.9)
HD 7	7 (2.1)	7.5 (2.3)	39 (975)	2155 (8170)	320 (1225)	160 (4.6)
HD 8	8 (2.4)	8.5 (2.6)	42 (1050)	3195 (12095)	490 (1860)	235 (6.8)
HD 10	10 (3.0)	10.5 (3.2)	54 (1350)	6165 (23350)	955 (3615)	455 (13.0)
HD 12	12 (3.6)	12.5 (3.8)	66 (1650)	10575 (40030)	1640 (6220)	780 (22.2)

* HD dimensions can be customized to provide custom oil or sediment volumes

Hydroworks HydroDome

PROJECT:

LOCATION:

REVISION DATE: 01/24/2022

Hydroworks

Hydroworks® HydroDome

Operations & Maintenance Manual

Version 1.0

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please email a copy of the completed checklist to Hydroworks at support@hydroworks.com for our records.

Introduction

The HydroDome (Figure 1) is a state-of-the-art hydrodynamic separator. HydroDome can be used for water quality and quantity flow control if desired.

Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroDome is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroDome.

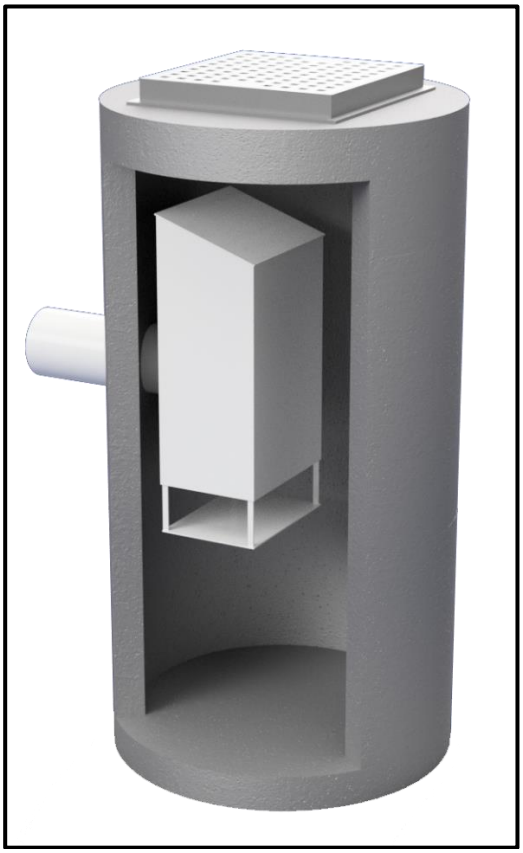


Figure 1. Hydroworks HydroDome

Hydroworks

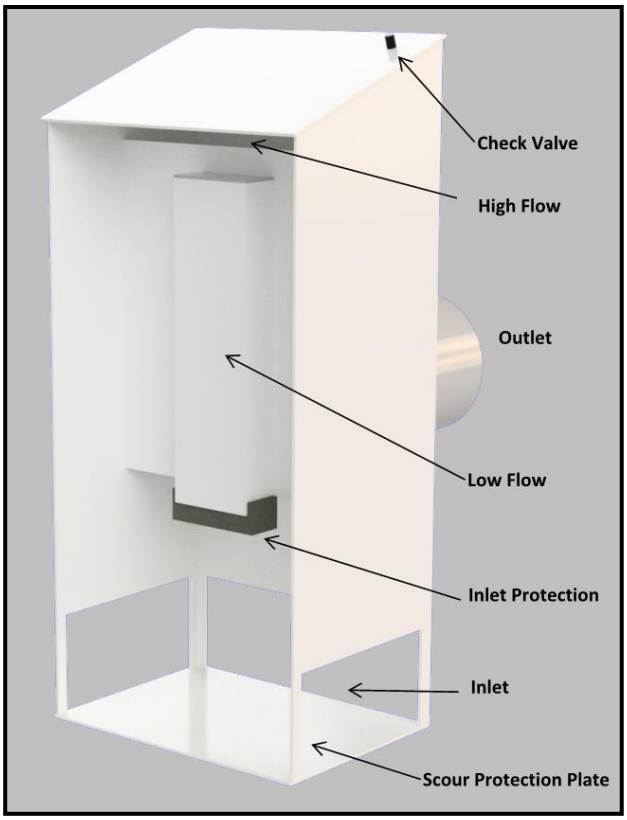


Figure 2 HydroDome Internal Components

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the cover/grate and looking down into the separator.

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. Several readings (2 or 3) should be made at different locations of the structure to ensure that an accurate TSS depth measurement is recorded.

Operation

The water level during periods without rain should be near the outlet invert of the structure. If the water level remains near the top of the HydroDome this may suggest that there is an obstruction downstream of the HydroDome or that the inlet protection at the HydroDome may need to be cleaned.

Frequency

Construction Period

The HydroDome separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroDome separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized areas (storage piles, exposed soils), the HydroDome separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, elevated water level)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroDome unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroDome separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

The area around the HydroDome provides clear access to the bottom of the structure (Figure 3). This is the area where a vacuum hose would be lowered to clean the unit.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature.

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Maintenance of a Hydroworks HydroDome unit will typically take 1 to 2 hours depending on size of unit and using a vacuum truck. Cleaning may take longer for other cleaning methods (i.e. clamshell bucket).

Inlet protection (Figure 2) is located at the inlet to the low flow opening in the HydroDome to ensure the opening does not become clogged. Although it is not anticipated that the inlet protection will have to be replaced on a regular (i.e. annual) basis since the inlet protection is protected by the submerged entrance to the HydroDome , the inlet protection should be checked each time the HydroDome is inspected or maintained. The inlet protection is removable and should be rinsed with water to ensure any debris caught on the protection is discarded. Unless damaged, the inlet protection can be reinstalled. A replacement piece can be bought through Hydroworks and/or retail stores. Hydroworks can provide information on the inlet protection and where it can be bought. A sign that the inlet protection needs cleaning/replacement would be a water level near the crown of the outlet pipe in the structure during periods with no flow.

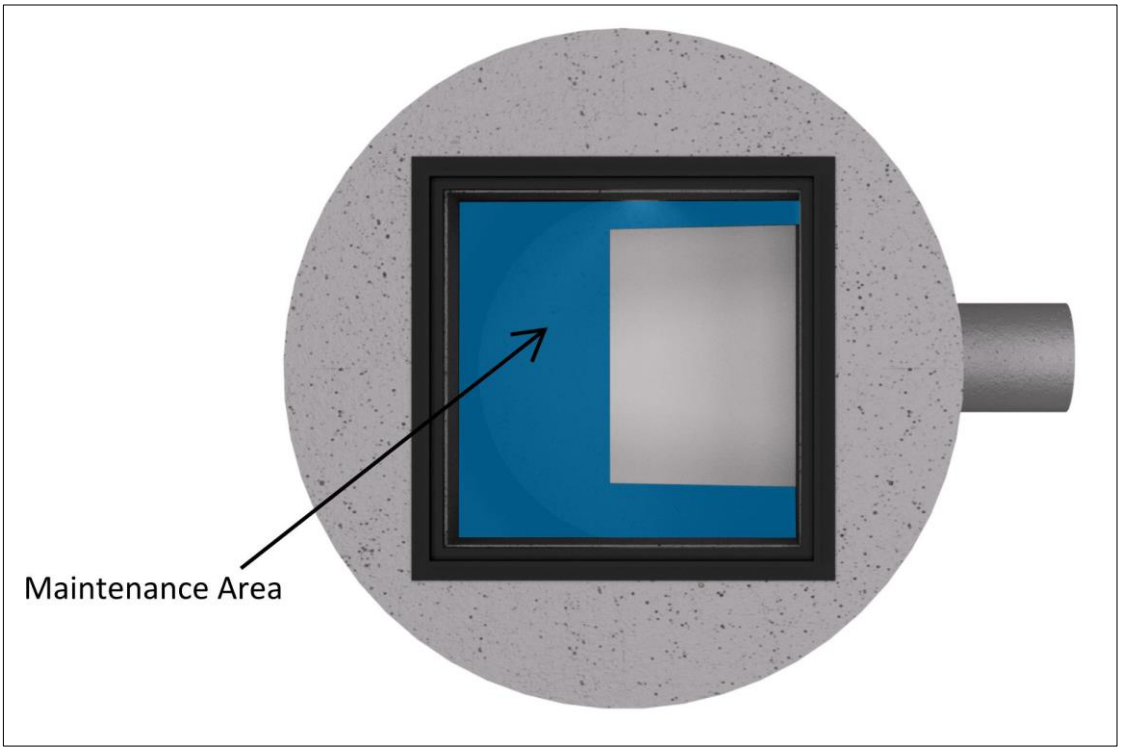


Figure 3. HydroDome Maintenance Access

Frequency

Construction Period

A HydroDome separator can fill with construction sediment quickly during the construction period. The HydroDome must be maintained during the construction period when the depth of TSS/sediment reaches 24” (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroDome separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. Please contact Hydroworks at 888-290-7900 to inquire whether your HydroDome was designed with extra sump depth to extend the frequency of maintenance.

The HydroDome separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 75% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroDome Models

Model	Diameter ft (mm)	Maintenance Sediment Depth in (mm)
HD 3	3 (900)	12 (300)
HD 4	4 (1200)	12 (300)
HD 5	5 (1500)	12 (300)
HD 6	6 (1800)	12 (300)
HD 7	7 (2100)	12 (300)
HD 8	8 (2400)	12 (300)
HD 10	10 (3000)	12 (300)
HD 12	12 (3600	12 (300)

HYDRODOME INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroDome	**Yes**	**No**
Obstructions in the inlet	☐ *	☐
Damage to HydroDome (cracked, broken, loose pieces)	☐ **	☐
Improperly installed outlet pipe	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Raised water level (water level close to top of HydroDome)	☐ ***	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____“

Routine Measurements

Floating debris depth	**< 0.5” (13mm)**	☐	**>0.5” 13mm)**	☐ *
Floating debris coverage	**< 75% of surface area**	☐	**> 75% surface area**	☐ *
Sludge depth	**< 12” (300mm)**	☐	**> 12” (300mm)**	☐ *****

* Maintenance required
** Repairs required
*** Further investigation is required

Note: Inspections should not be made within 24 hours of a storm to allow the water to drain from the structure to assess a raised water level or water level seepage

Hydroworks

Other Comments:

Hydroworks

Hydroworks® HydroDome

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroDome to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroDome are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroDome, or the cost of other goods or services related to the purchase and installation of the HydroDome. For this Limited Warranty to apply, the HydroDome must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroDome arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroDome, whether the claim is based upon contract, tort, or other legal basis.

Verification Statement

Hydroworks HydroDome HD3 Oil-Grit Separator
Registration number: (V-2021-09-02)
Date of issue: 2021-October-04

Technology type	Oil-Grit Separator		
Application	Technology to remove oil, sediment, trash and debris from storm-water and snowmelt runoff as well as other pollutants that attach to sediment particles, such as nutrients and metals.		
Company	Hydroworks, LLC.		
Address	257 Cox St., Roselle, NJ 07203 USA	**Phone**	+1-888-290-7900
Website	https://hydroworks.com	**E-mail**	gbryant@hydroworks.com

Verified Performance Claims

The Hydroworks HydroDome HD3 Oil-Grit Separator (OGS) was tested by Alden Research Laboratory, Holden, Massachusetts, USA in 2021. The performance test results were verified by 'The Sir Sandford Fleming College of Applied Arts and Technology's Centre for Advancement of Water and Wastewater Technologies' (CAWT) following the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. The following performance claims were verified:

Sediment removal test: The Hydroworks HydroDome HD3 OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L and particle size distribution of 1-1000 µm, removed 83.9, 77.6, 68.4, 66.9, 59.4, 52.4, and 46.0 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2 respectively.

Scour test: The Hydroworks HydroDome HD3 OGS device with 15.2 cm (6 inch) of test sediment preloaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment sump storage depth, generated corrected effluent sediment concentrations on average of 0.54, 0.70, 0.0, 0.0, and 0.11 mg/L at 5-min duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test: The Hydroworks HydroDome HD3 OGS with surrogate low-density polyethylene beads preloaded within the inner chamber, representing a floating light-liquid volume equal to a depth of 50.8 mm (2 inch) over the sedimentation area, retained 100, 100, 100, 100, and 99.7 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

The above verified claims can be applied to other units smaller or larger than the tested unit, provided that the untested units meet the scaling rule specified in the Procedure for Laboratory Testing of Oil Grit Separators (Version 3.0, June 2014)

Technology Application

HydroDome is a hydrodynamic separator that provides benefits for both water quality and water quantity (i.e., flow control). HydroDome combines the function of separator, hood, and flow control with active storage to provide a multi-purpose stormwater management solution in one structure. HydroDome also functions as an oil separator due to the submerged inlet design and the fact that the design raises the water level with flow to maximize the distance between any floatables (oil, trash) and the discharge entrance to the HydroDome.

Technology Description

HydroDome comes complete and slides into the outlet pipe from a drainage structure and is secured to the wall with anchor bolts. It consists of a siphon with flow control, that regulates the water level in the structure and the flow rate in the outflow, and an optional high flow weir. A schematic of the Hydroworks HydroDone OGS is shown in Figure 1.

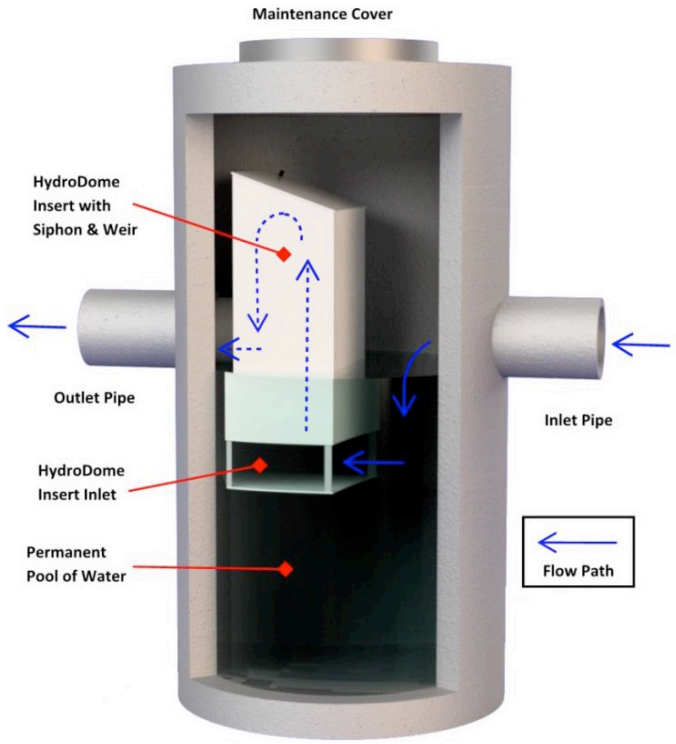


Figure 1: Schematic of the Hydroworks HydroDome Oil-Grit Separator

The siphon raises the water level to a pre-determined level without allowing water to exit the structure. The raised water level provides:
- Greater time for initial total suspended solids (TSS) removal and for floatables to prevent re-entrainment in the flow,
- Additional dilution to reduce effluent concentrations of any pollutants, and
- A greater volume, or buffer, of water to prevent scour of previously settled solids.

Water flows into the device through horizontal openings at the bottom of the HydroDome. Water then must travel upwards through the siphon. A foam filter is located at the entrance to the siphon inlet to provide secondary protection from its clogging (the outer housing of the HydroDome and submerged inlet provide primary protection). Once the water level reaches a pre-determined height, the siphon begins to engage, and water flows out of the structure downstream. The siphon flow is controlled by an orifice, whose size can be changed to provide the desired flow control. The water level continues to rise or begins to lower depending on the rate of flow from the orifice compared to the inflow of water to the structure.

An optional weir above the siphon provides a high flow path to prevent the system from surcharging. In cases where parking lot storage is desired, there would not be a high flow weir. A scour protection plate minimizes scour by preventing upward velocities/flow from the structure floor during periods of peak flow. Therefore, HydroDome combines the function of separator, hood, and flow control with active storage to provide a multi-purpose stormwater management solution in one structure.

Description of Test Procedure

For the purposes of this verification, a Hydroworks HydroDome 3-ft diameter (HD3) stormwater treatment unit was tested. The HD3 test unit was a full-scale 3 ft (0.91 m) diameter tank with an internal treatment hood that included a high flow weir. The test tank was fabricated from plastic and included 18-inch (457 mm) diameter inlet and outlet pipes, oriented along the center-line of the tank. The pipe inverts were located 48 inches (1.22 m) above the sump floor and were set with 1% slopes. The 100% and 50% sediment sump storage depths were 12 inches (0.305 m) and 6 inches (0.152 m), respectively. The effective treatment sedimentation area was 7.07 ft^2 (0.656 m^2).

The test data and results for this verification were obtained from independent testing conducted at Alden Research Laboratory in accordance with the *Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014)*[1]. Use of this procedure is intended to ensure that technologies in this category are subjected to stringent requirements in generating verifiable performance test data.

The verification plan was followed with one minor variance from the *Procedure*. This variance includes the required minimum amount of test sediment to be fed into the test unit for each tested surface loading rate (SLR). Although the *Procedure* requires a minimum of 11.3 kg of test sediment, during the 40 L/min/m^2 SLR test, only 6.45 kg was fed into the unit, which is 4.85 kg less than the specified minimum. This variance to the *Procedure* was agreed to by Toronto and Region Conservation Authority (TRCA), the author of the *Procedure*, based on previous conversations with Alden Labs, noting that the length of time to conduct the test with 11.3 kg of sediment at 40 L/min/m^2 would be over 36 hours.

Verification Results

CAWT verified the performance test data and other information pertaining to the HydroDome HD3 Oil-Grit Separator. A Verification Plan was prepared to guide the verification process based on the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol.

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure.

The "*Procedure for Laboratory Testing of Oil Grit Separators"* (TRCA, 2014) requires that the three-sample average of the test sediment particle size distribution (PSD) meet the specified PSD. The allowable tolerance of 6% variation from the specified PSD curve was met at each discrete particle size tested and the d50 was finer than 75 µm.

Comparison of the individual sample and average test sediment PSD to the specified PSD is shown in Figure 2. This figure indicates that the test sediment used for the removal and scour tests met the above-mentioned criteria. The median particle size was 64 µm.

Samples from test sediment batches used for each run met the specified PSD within the required tolerance thresholds.

The capacity of the HydroDome HD3 device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run.

[1] The *Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014)* was originally prepared by the Toronto and Region Conservation Authority (TRCA) in association with a 31 member advisory committee from various stakeholder groups.

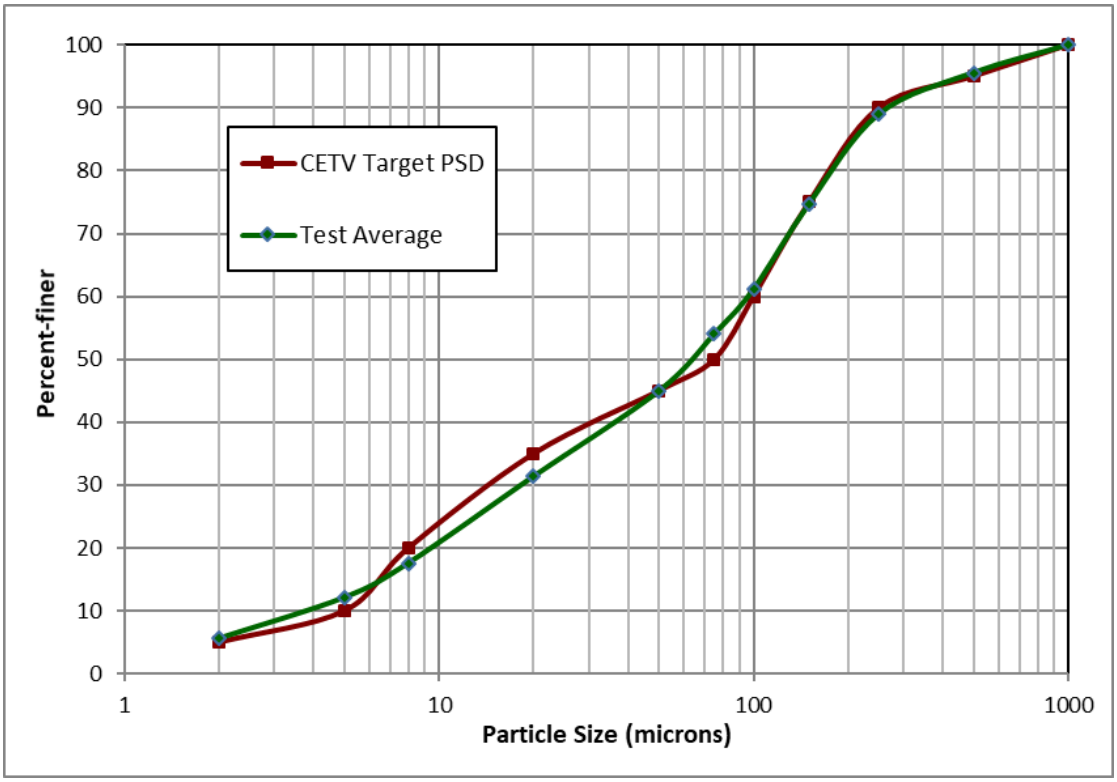


Figure 2 - Average particle size distribution (PSD) of the test sediment used for the sediment removal and scour test compared to the specified PSD

Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment, as a whole, were determined for each of the tested surface loading rates (Table 1).

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and are attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001).

Particle Range (µm)	**40** L/min/m^2	**80** L/min/m^2	**200** L/min/m^2	**400** L/min/m^2	**600** L/min/m^2	**1000** L/min/m^2	**1400** L/min/m^2	**Average**
>500	100%	125%	140%	140%	200%	200%	180%	155%
250-500	114%	129%	150%	143%	143%	183%	217%	154%
150-250	150%	136%	157%	153%	179%	221%	220%	174%
100-150	116%	126%	129%	148%	157%	162%	139%	140%
75-100	136%	155%	178%	190%	180%	170%	133%	163%
50-75	91%	100%	128%	270%	126%	82%	75%	125%
20-50	111%	97%	93%	51%	58%	42%	73%	75%
8-20	75%	79%	38%	34%	29%	17%	26%	42%
5-8	53%	34%	16%	7%	0%	0%	23%	19%
2-5	37%	29%	14%	0%	0%	0%	1%	12%

Table 1 - Removal efficiencies (%) of the HydroDome HD3 Oil-Grit Separator for individual particle size classes at specified surface loading rates

Figure 3 compares the particle size distribution (PSD) of the three-sample average of the test sediment to the PSD of the sediment retained by the HydroDome HD3 OGS device at each of the tested surface loading rates. As expected, the capture efficiency for fine particles was generally found to decrease as surface loading rates increased, particularly in the 400 to 1400 L/min/m^2 range.

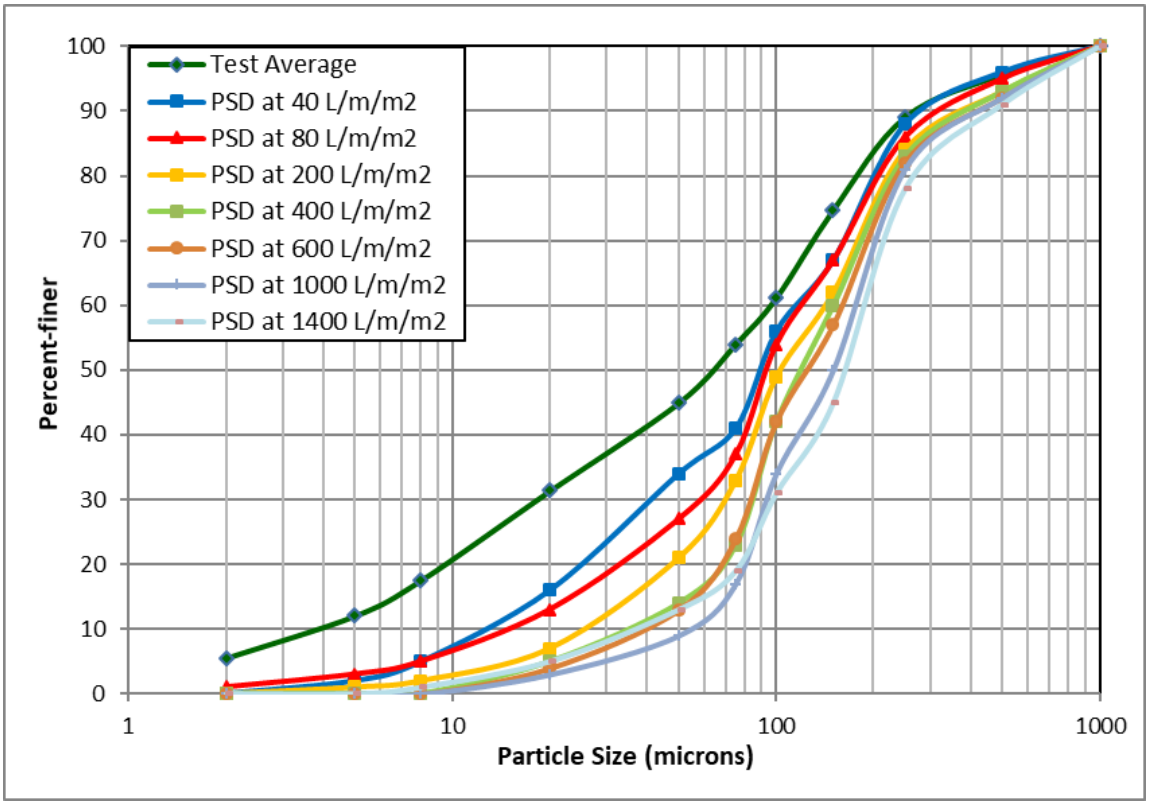


Figure 3 - Particle size distribution of sediment retained in the HydroDome HD3 Oil-Grit Separator in relation to the injected test sediment average

Table 2 shows the results of the sediment scour and re-suspension test for the HydroDome HD3 Oil-Grit Separator unit. The scour test involved preloading 15.2 cm (6 inches) of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth.

Measured Concentration at Each surface Loading Rate					
Effluent Sample No.	200 L/min/m^2	800 L/min/m^2	1400 L/min/m^2	2000 L/min/m^2	2600 L/min/m^2
1	1.2	0.3	0.0	0.0	0.0
2	0.7	0.0	0.0	0.0	0.0
3	0.5	0.0	0.0	0.0	0.5
4	0.1	3.2	0.0	0.0	0.0
5	0.3	0.0	0.0	0.0	0.0
Average	**0.5**	**0.7**	**0.0**	**0.0**	**0.1**

Table 2 - Scour test adjusted effluent sediment concentration at each surface loading rate

Clean water was run through the device at five surface loading rates over a 30-minute period. Each flow rate was maintained for 5 minutes with a one-minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for suspended solids concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water.

Results showed average adjusted effluent sediment concentrations below 0.7 mg/L at all surface loading rates. The magnitude of scour is dependent on the internal flow patterns (velocity and turbulence) and water volume within the unit, which is related to the depth below the inlet and outlet. The HD3 possessed a large water volume in the sump and consequently, low velocity, which prevented incipient motion of the sediment of sufficient magnitude for scour to occur.

The average measured effluent scour sediment concentrations (adjusted for background) for each tested SLR were not adjusted for particle size based on the D5 of particles captured for the 40 L/min/m^2 removal efficiency test since there was negligible scour.

The capacity of the device to retain light liquid was determined at five surface loading rates in a range between 200 and 2600 L/min/m^2 using low-density polyethylene beads, Dow Chemical Dowlex^{tm} 2517, with a density of 0.917 g/cm^3. This material was specified as the acceptable surrogate to represent floating liquid for a qualitative assessment of liquid behaviour during operation.

Performance was evaluated with a total of 32.8 litres (18.94 kg) of pellets preloaded into the treatment vault by introducing them into the crown of the influent pipe, to a volume equal to a depth of 50.8 mm (2 inch) over the sedimentation area of 0.66 m^2. The effluent was collected in flow-designated nets to allow for quantification of any re-entrained pellets for each test SLR. The collected pellets were dried and the mass of collected pellets was quantified for each SLR, as well as the overall test.

The recorded average flow data, as well as quantified volume and mass of collected pellets for each target SLR and overall test, is shown in Table 3. The maximum re-entrainment of 0.3% occurred at 2600 L/min/m^2. The total retention rate was 99.7%.

Light-liquid Re-Suspension Data				**Starting Volume**	(Liters) **32.8**	**Starting Mass**	(grams) **18938**
Action	**Time Stamp** (minutes)	**Meter**	**Target Flow** (L/min/m^2)	**Recorded Flow** (L/min/m^2)	**COV**	**Collected Mass** (grams)	**Retained Mass**
Start D.A. Recording	0.0						
Flow set	1.0	4"	200	**207**	0.057	0	**100.0%**
Stop Collection	6.0			3.4%			
Flow set	7.0	4"	800	**826**	0.008	0	**100.0%**
Stop Collection	12.0			3.2%			
Flow set	13.0	6"	1400	**1407**	0.009	0	**100.0%**
Stop Collection	18.0			0.5%			
Flow set	19.0	6"	2000	**2022**	0.004	0.3	**100.0%**
Stop Collection	24.0			1.1%			
Flow set	25.0	6"	2600	**2599**	0.003	54.9	**99.7%**
Stop Collection	30.0			-0.1%			
Hydroworks HD 3				Interim Collection Net		1.3	
					Total	**56.5**	**99.7%**

Table 3 - Light-liquid recorded flow and re-entrainment data

Quality assurance

Performance testing and verification of the HydroDome HD3 Oil Grit Separator were performed in accordance with the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. The verifier, CAWT, has confirmed that quality assurance requirements were addressed throughout the performance testing process and in the generation of performance test results. This includes reviewing all data sheets and data downloads, as well as overall management of the test system, quality control and data integrity.

In addition, QA/QC measures are documented in the *"Procedure for Laboratory Testing of Oil-Grit Separators"* (TRCA, 2014) to ensure results are accurate and precise, and that testing conducted by multiple vendors of the same category of technology are employing the same test method. The QA/QC measures include the use of certified laboratories, established test methods, calibration of equipment, tolerance limits for results variation, data checks during testing, and stringent documentation requirements.

Table 4 provides a summary of the acceptance criteria for particle size distribution, solids concentration in test water, water temperature, flow measurement equipment, flow rate variation, sediment feed, sediment moisture content, and sample analysis.

QC Parameter	Acceptance Criteria
Particle Size Distribution	Analyzed by a certified laboratory in accordance with ASTM D422-63(2007)e1. Percentages for size ranges vary by <6%, median < 75 um. PSD in water determined by ASTM D422-63(2007)e1 upon prior drying in designated pre-weighed nonferrous trays in compliance with ASTM D4959-07.
Solids concentration in test water	Suspended solids concentration (SSC) concentration of test water of less than 20 mg/L.
Water temperature	Temperature of water less than 25ºC.
Flow measurement equipment	Equipment calibration reports submitted to confirm that reported flow rate match actual flow rate. Flow rates from calibrated flow instruments recorded at no longer than 30 second intervals over the duration of the test.
Flow rate variation	Flow rates have COV < 0.04; maintained with ±10% of target flow rate.
Sediment feed	TSS concentration target = 200 mg/L with a tolerance limit of ±25 mg/L. Injection location is 5 pipe diameters upstream of the inlet to the device, as per the *Procedure*. Six calibration samples taken over duration of each test run. The allowed Coefficient of Variance (COV) for the measured samples was 0.10.
Sediment moisture content	Determined by ASTM D4959-07 "Standard Test Method for Determination of Water (Moisture) Content of Soil By Direct Heating".
Sample analysis	Conducted by qualified laboratories using standard methods and meeting the requirements of ISO.

Table 4. Validation of QA/QC procedures

Summary of Verification Results and Verified Performance Claim for Hydroworks HydroDome HD3 Oil-Grit Separator (OGS)

In summary, the HydroDome HD3 Oil Grit Separator is designed to remove oil, sediment, trash and debris from stormwater and snowmelt runoff as well as other pollutants that attach to sediment particles, such as nutrients and metals. Verification of performance claims for the Hydroworks HydroDome HD3 Oil Grit Separator was conducted by CAWT based on independent third-party performance test results provided by Alden Research Laboratory, as well as additional information provided by Hydroworks.

Table 5 summarizes the verification results in relation to the technology performance parameters that were identified to determine the efficacy of the HydroDome HD3 Oil Grit Separator. The claims stated in Table 5 were verified using the modified mass balance method for sediment removal by measuring the total mass of sediment entering the unit and retained by the unit at prescribed surface loading rates. Effluent sampling was conducted every minute over a 30-minute duration for the scour test, using approved sampling methods as per the verification procedure. The light liquid re-entrainment test was conducted using a mass balance methodology which accounted for all the beads input, captured, and scoured from the separator.

Parameters	Verified Claims	Accuracy
Sediment Removal	During the sediment removal test, the Hydroworks HydroDome HD3 OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L and particle size distribution of 1-1000 µm, removed 83.9, 77.6, 68.4, 66.9, 59.4, 52.4, and 46.0 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2 respectively	The sediment removal characteristics were quantified at various surface loading rates (SLRs), including particle size fractions, using a modified mass balance methodology. Performance results are presented as the true values.
Sediment Scour	During the scour test, the Hydroworks HydroDome HD3 OGS device with 15.2 cm (6 inch) of test sediment preloaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment sump storage depth, generated corrected effluent sediment concentrations on average of 0.54, 0.70, 0.0, 0.0, and 0.11 mg/L at 5-min duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m2, respectively.	5 samples analyzed for sediment (n=5) at each flow rate There was negligible scour once corrected for background concentrations.
Light Liquid Re-entrainment	During the light-liquid re-entrainment test, the Hydroworks HydroDome HD3 OGS with surrogate low-density polyethylene beads preloaded within the inner chamber, representing a floating light-liquid volume equal to a depth of 50.8 mm (2 inch) over the sedimentation area, retained 100, 100, 100, 100, and 99.7 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.	Performance results are presented as the true values. Under the "Procedure for Laboratory Testing of Oil-Grit Separators" (TRCA, 2014), the light-liquid re-entrainment test is also not amenable to statistical analysis as the tests were only conducted once at various flow rates following a mass balance procedure.

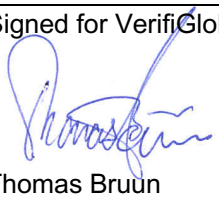
Table 5. Verified performance claims

What is ISO 14034?

The purpose of environmental technology verification is to provide a credible and impartial account of the performance of environmental technologies. Environmental technology verification is based on a number of principles to ensure that verifications are performed and reported accurately, clearly, unambiguously and objectively. The International Organization for Standardization (ISO) standard for environmental technology verification (ETV) is ISO 14034, which was published in November 2016.

Benefits of ETV

ETV contributes to protection and conservation of the environment by promoting and facilitating market uptake of innovative environmental technologies, especially those that perform better than relevant alternatives. ETV is particularly applicable to those environmental technologies whose innovative features or performance cannot be fully assessed using existing standards. Through the provision of objective evidence, ETV provides an independent and impartial confirmation of the performance of an environmental technology based on reliable test data. ETV aims to strengthen the credibility of new, innovative technologies by supporting informed decision-making among interested parties.

For more information on the HydroDome Oil Grit Separator, contact:	For more information on VerifiGlobal, contact:
Hydroworks LLC. 257 Cox St., Roselle, NJ 07203 USA T: +1-888-290-7900 E: gbryant@hydroworks.com W: https://hydroworks.com	VerifiGlobal c/o ETA-Danmark A/S Göteborg Plads 1, DK-2150 Nordhaven T: +45 7224 5900 E: info@verifiglobal.com W: www.verifiglobal.com
Signed for Hydroworks:  Graham Bryant Owner	Signed for VerifiGlobal:  Thomas Bruun Managing Director  John Neate Managing Director

NOTICE: Verifications are based on an evaluation of technology performance under specific, predetermined operational conditions and parameters and the appropriate quality assurance procedures. VerifiGlobal and the Verification Expert, CAWT, make no expressed or implied warranties as to the performance of the technology and do not certify that a technology will always operate as verified. The end user is solely responsible for complying with any and all applicable regulatory requirements. Mention of commercial product names does not imply endorsement.

VerifiGlobal and the Verification Expert, CAWT, provide the verification services solely on the basis of the information supplied by the applicant or vendor and assume no liability thereafter. The responsibility for the information supplied remains solely with the applicant or vendor and the liability for the purchase, installation, and operation (whether consequential or otherwise) is not transferred to any other party as a result of the verification.

APPENDIX 9

Ontario
MINISTRY OF THE ENVIRONMENT

Database Version: V 2.0 Release Update
Update Date: 30-Mar-12

Project DEVELOPMENT Summary

DEVELOPMENT: Residential Subdivision 150 Cemetery Road, Uxbridge, ON
Subwatershed: Pefferlaw-Uxbridge Brook

Total Pre-Development Area (ha):	0.8870	Total Pre-Development Phosphorus Load (kg/yr):	0.12

Pre-Development Land Use	Area (ha)	P coeff. (kg/ha)	P Load (kg/yr)
Low Intensity Development	0.887	0.13	0.12

POST-DEVELOPMENT LOAD

Post-Development Land Use	Area (ha)	P coeff. (kg/ha)	Best Management Practice applied with P Removal Efficiency		P Load (kg/yr)
High Intensity - Residential	0.887	1.32	NONE	0%	1.17

High density residential subdivision - without mitigation

Post-Development Area Altered:	0.89
Total Pre-Development Area:	0.89
Unaffected Area:	0

	P Load (kg/yr)
Pre-Development:	0.12
Post-Development:	1.17
Change (Pre - Post):	-1.06
915% Net Increase in Load	
Post-Development (with BMPs):	1.17
Change (Pre - Post):	-1.06
915.38% Net Increase in Load	

Phosphorus Offsetting Fee Calculation
Site: 150 Cemetery Road, Uxbridge, ON
Date: July 30, 2024

Pre-Development Loading		0.12	kg/year (P Tool Estimate)
Post-Development Loading with Mititgation		0.74	kg/year (PEI, 2024[1])
Calculation of Phosphorus Offsetting Fee (LSRCA Phosphorus Offsetting Policy, May 2023)			
Total Phosphorus Load Increase (Post-Treament - Pre-Treatment)		0.62	kg/year
Offset Ratio		2.5	
Offset Value		35,770.00	$/kg/year
Phosphorus Offset Calculation	$	55,443.50	
15% Administration Fee	$	8,316.53	
Total Offsetting Fee	$	63,760.03	

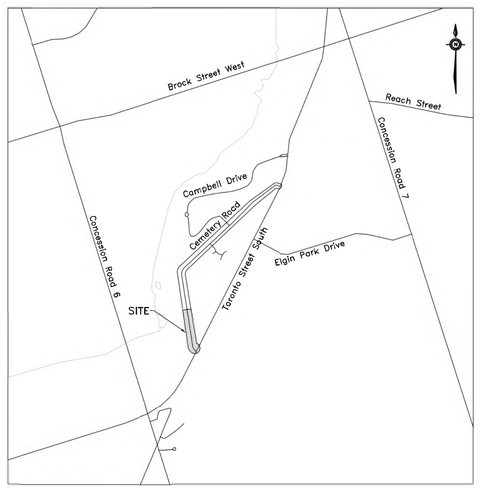
Note: [1] Data obtained from Table 12 of Functional Servicing & Preliminary Stormwater Management Report (PEI, 2024)

APPENDIX 10

The Corporation of the
Township of Uxbridge

Contract No. U24-08

CEMETERY ROAD RECONSTRUCTION
STA 0+000 TO 0+340



TOWNSHIP OF UXBRIDGE
N.T.S.

INDEX TO DRAWING NUMBERS

DRAWING No.	DESCRIPTION
----	COVER SHEET / DRAWING INDEX
GN-1	GENERAL NOTES AND DETAILS
TS-1	TYPICAL SECTIONS
REM-1	REMOVALS (STA. 0+000 TO STA. 0+220)
REM-2	REMOVALS (STA. 0+220 TO STA. 0+340)
PP-1	PROPOSED CONSTRUCTION (STA. 0+000 TO STA. 0+100)
PP-2	PROPOSED CONSTRUCTION (STA. 0+100 TO STA. 0+220)
PP-3	PROPOSED CONSTRUCTION (STA. 0+220 TO STA. 0+340)
PM-1	PAVEMENT MARKINGS (STA. 0+000 TO STA. 0+220)
PM-2	PAVEMENT MARKINGS (STA. 0+220 TO STA. 0+340)
PP-3A	SANITARY SEWER AND WATERMAIN (STA. 0+220 TO STA. 0+350)

Chisholm, Fleming and Associates
consulting engineers

Y:\244-31 Cemetery Road Recon\3-CAD\SHEETS\244-31 Cover_EH_2024-02-20.dwg

GENERAL NOTES:

1. PRIOR TO COMMENCING CONSTRUCTION, THE CONTRACTOR SHALL SURVEY EXISTING ROAD CENTER LINE, EDGE OF PAVEMENT, & EDGE OF SHOULDERS AT 20m INTERVALS AND AT ALL BREAK POINTS OF ALL ROADS WITHIN THE CONTRACT LIMITS. ALL LOCATIONS WITH SUPERELEVATION SHALL BE REINSTATED TO MATCH EXISTING SLOPES. A COPY OF THE SURVEY SHALL BE PROVIDED IN AUTOCAD TO THE CONTRACT ADMINISTRATOR PRIOR TO COMMENCING CONSTRUCTION.
2. PRIOR TO COMMENCEMENT OF WORK, ALL EROSION AND SEDIMENT CONTROLS SHALL BE IN PLACE TO THE SATISFACTION OF THE TOWNSHIP, LAKE SIMCOE REGION CONSERVATION AUTHORITY (LSRCA), AND THE CONTRACT ADMINISTRATOR.
3. ENTIRE CONSTRUCTION SITE IS TO BE MONITORED DAILY FOR EROSION AND SEDIMENT CONTROLS, AND IF SO MODIFIED TO ENSURE SEDIMENT IS CONTAINED WITHIN THE WORK AREAS.
4. UNDER NO CIRCUMSTANCES SHALL RUNOFF FROM UNVEGETATED AREAS OR CULVERT CLEAN-OUTS BE DISCHARGED OFF-SITE OR DIRECTLY INTO ACTIVE OR INACTIVE WATERCOURSES (DITCHES).
5. WHEN FEASIBLE ALL EXCAVATION/GRADING IS TO BE DONE IN THE DRY.
6. ALL ACCUMULATED SEDIMENT MUST BE REMOVED PRIOR TO THE REMOVAL OF ALL SEDIMENT CONTROLS TO PERMIT THE RE-VEGETATION OF AFFECTED AREAS.
7. SITE RE-VEGETATION IS TO BE COMPLETED IMMEDIATELY FOLLOWING CONSTRUCTION COMPLETION.
8. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND APPROPRIATE UTILITY COMPANIES. THE CONTRACTOR SHALL PROVE THE LOCATION OF ALL UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.
9. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
10. CONTRACT ADMINISTRATOR TO INSPECT ASPHALT SURFACE AFTER MILLING TO CONFIRM SUITABILITY AND TO MARK UP ANY AREA FOR PROVISIONAL REPAIR WORK.
11. CONTRACTOR TO FOLLOW OTM BOOK 7 AT ALL TIMES.
12. ONE LANE OF TRAFFIC MUST REMAIN OPEN AT ALL TIMES.

EROSION AND SEDIMENT CONTROL

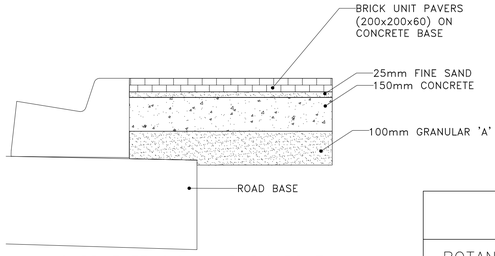
1. ALL SEDIMENT CONTROL MEASURES SUCH AS SEDIMENT CONTROL FENCE, TEMPORARY PONDS, CONSTRUCTION ACCESS MATS, SEDIMENT TRAPS, SWALES AND CHECK DAMS MUST BE INSTALLED PRIOR TO THE COMMENCEMENT OF SITE WORKS.
2. SEDIMENT CONTROLS SHOULD BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY SIGNIFICANT RAINFALL EVENT. REPAIRS TO ESC MEASURES MUST BE COMPLETED IN A TIMELY MANNER TO PREVENT SEDIMENT MIGRATION.
3. ADDITIONAL MATERIALS SUCH AS CLEAR STONE, FILTER FABRIC, PUMPS, HOSES, AND SILTSOXX TO BE KEPT ONSITE AT ALL TIMES FOR CONDUCTING REPAIRS TO SEDIMENT CONTROL MEASURES.
4. ALL DISTRIBUTED AREAS LEFT INACTIVE FOR MORE THAN THIRTY DAYS ARE TO BE STABILIZED.
5. THE STABILIZATION SEED MIXTURE IS TO BE AS SPECIFIED ON THE EROSION AND SEDIMENT CONTROL PLAN
6. THE STABILIZATION SEED MIXTURE IS TO BE APPLIED AT A MINIMUM RATE OF 25kg/ha.
7. ENGINEERED CHANGES TO THE ESC MEASURES MAY BE NEEDED AS SITE CONDITIONS CHANGE THROUGHOUT THE CONSTRUCTION PROCESS. THESE UPDATES MUST REFLECT BEST MANAGEMENT PRACTICES TO CONTROL SEDIMENT AND EROSION ONSITE AND SHOULD BE COMPLETED BASED ON DIRECTION FROM THE SITE ENGINEER. ADDITIONAL MEASURES MAY BE REQUIRED AS DIRECTED BY AN ENGINEER THROUGHOUT THE CONSTRUCTION PROCESS.
8. THE CONSTRUCTION ENTRANCE MAT IS TO BE INSTALLED AS THE FIRST STEP IN THE SITE ALTERATION PROCESS.
9. SEDIMENT CONTROL FENCE IS TO BE INSTALLED DOWNSLOPE OF ALL DISTURBED AREAS. A DOUBLE ROW SILT FENCE IS TO BE INSTALLED SURROUNDING ALL NATURAL HERITAGE FEATURES AND AS DIRECTED BY THE SITE ENGINEER. SEDIMENT CONTROL FENCE IS TO BE AS PER LSRCA STANDARD ESC-4 OR ESC-5 AS A MINIMUM. LIGHT DUTY SEDIMENT CONTROL FENCE IS NOT ACCEPTABLE.
10. CUT-OFF SWALES OR DITCHES ARE TO BE INSTALLED AS SHOWN ON THE ESC PLANS AND AS NECESSARY BASED ON CHANGING SITE CONDITIONS TO DIRECT OVERLAND FLOW TO THE APPROPRIATE SEDIMENT TRAP OR TEMPORARY SEDIMENT POND.
11. CHECK DAMS ARE TO BE INSTALLED IN ALL SWALES AND DITCHES IN ACCORDANCE WITH DRAWING LSRCA ESC-2, AS A MINIMUM.
12. TEMPORARY SEDIMENT TRAP(S) ARE TO BE CONSTRUCTED AT THE BEGINNING OF SITE GRADING AND IF THE SITE DRAINAGE CHANGES DURING CONSTRUCTION. IT MAY BE NECESSARY FOR TEMPORARY SWALES TO BE CONSTRUCTED TO DIRECT SITE FLOWS TO THE TEMPORARY SEDIMENT TRAP(S) DURING ROUGH GRADING AND AS CONSTRUCTION PROGRESSES.
13. TEMPORARY SEDIMENT POND(S) ARE TO BE CONSTRUCTED AT THE BEGINNING OF SITE GRADING AND IF THE SITE DRAINAGE CHANGES DURING CONSTRUCTION. IT MAY BE NECESSARY FOR TEMPORARY SWALES TO BE CONSTRUCTED TO DIRECT SITE FLOWS TO THE TEMPORARY SEDIMENT POND(S) DURING ROUGH GRADING AND AS CONSTRUCTION PROGRESSES.
14. FILTREXX SILTSOXX OR APPROVED EQUIVALENT TO BE INSTALLED DOWNSTREAM FROM SEDIMENT TRAP AND TEMPORARY SEDIMENT POND OUTLETS TO A MINIMUM HEIGHT OF 300mm.
15. IF STOCKPILES ARE USED ON-SITE FOR THE STORAGE OF EXCESS MATERIAL, THEY ARE TO BE IN ACCORDANCE WITH DETAIL DRAWING LSRCA ESC-6 OR BETTER
16. ANY DEWATERING OCCURRING ONSITE MUST BE IN ACCORDANCE WITH AN APPROVED DEWATERING PLAN. ADDITIONAL DEWATERING REQUIREMENTS MAY BE DEEMED NECESSARY AND SHALL BE IMPLEMENTED AS DIRECTED BY THE ENGINEER, CONTRACT ADMINISTRATOR OR LOCAL MUNICIPALITY.
17. THE SITE TRAILER IS TO BE LOCATED ONLY AT THE DESIGNATED LOCATION SHOWN ON THE PLANS.
18. EQUIPMENT AND HYDROCARBON STORAGE IS TO OCCUR ONLY WITHIN THE DESIGNATED AREA SHOWN ON THE PLANS.
19. REFUELING IS TO TAKE PLACE ONLY WITHIN THE DESIGNATED AREA SHOWN ON THE PLANS AND SHALL BE A MINIMUM OF THIRTY METRES FROM ANY WATERCOURSE OR ENVIRONMENTALLY SENSITIVE AREA.
20. AN APPROVED SPILLS MANAGEMENT PLAN IS TO BE KEPT ONSITE.
21. SPILL CLEANUP EQUIPMENT SUCH AS ABSORPTIVE MEDIA IS TO BE MAINTAINED ONSITE FOR IMMEDIATE USE IN THE EVENT OF A SPILL
22. SPILLS ARE TO BE REPORTED IMMEDIATELY TO THE MOECC SPILLS ACTION CENTRE AT 1-800-268-6060
23. THE CONTRACTOR WILL BE RESPONSIBLE FOR CLEAN-UP AND RESTORATION, INCLUDING ALL COSTS, DUE TO THE RELEASE OF SEDIMENT FROM THE SITE.
24. LOW IMPACT DEVELOPMENT (LID) MEASURES ARE NOT TO BE USED AS SEDIMENT CONTROL DEVICES.
25. ADDITIONAL SEDIMENT CONTROL DEVICES MAY BE DEEMED NECESSARY AND AS SITE CONDITIONS CHANGE AND SHALL BE INSTALLED AS DIRECTED BY THE SITE ENGINEER, CONTRACT ADMINISTRATOR OR LOCAL MUNICIPALITY.
26. THE NOTED SILT CONTROL MEASURES ARE MINIMUM, ADDITIONAL MEASURES TO BE IMPLEMENTED AS DIRECTED BY THE CONTRACT ADMINISTRATOR. CONTRACTOR SHALL ENSURE TO INSTALLED SILTSOXX AT CULVERT REPLACEMENT LOCATIONS AS DIRECTED BY THE CONTRACT ADMINISTRATORS AND MAINTAINED UNTIL THE COMPLETION OF THE LANDSCAPING.
27. CATCHBASIN SILT TRAP ARE TO BE INSTALLED AT ALL CATCHBASINS AND CATCHBASIN MANHOLE LOCATIONS WITHIN THE PROJECT AREA PRIOR TO EXCAVATION.
28. ACCUMULATED SILT TO BE REMOVED OFF SITE PRIOR TO REMOVAL OF SILTSOXX.
29. CONTRACTOR TO CLEAN ADJACENT ROADS ON A REGULAR BASIS TO THE SATISFACTION OF THE TOWNSHIP AND THE REGION OF DURHAM. THE ROAD SHALL BE AT A MINIMUM SCRAPED DAILY AND FLUSHED ON FRIDAY EVENING OR SATURDAY MORNING, OR AS DIRECTED BY THE CONTRACT ADMINISTRATOR.
30. ESC MEASURES MUST BE INSPECTED WEEKLY AND IMMEDIATELY AFTER RAINFALL EVENTS FOR RIPS OR TEARS, BROKEN STAKES, BLOW OUTS (STRUCTURAL FAILURE) AND ACCUMULATION OF SEDIMENT. THE ESC MUST BE FIXED AND/OR REPLACED WITHIN 48HRS OF THE INSPECTION. SEDIMENT MUST BE REMOVED FROM SILTSOXX WHEN ACCUMULATION REACHES 50% OF THE HEIGHT OF THE BARRIER.
31. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED ONCE THE RESTORED AREAS HAVE BEEN STABILIZED.
32. IF THE CONSTRUCTION SITE SHALL BE SHUT DOWN DURING THE WINTER, INSPECT AND REPAIR ESC MEASURES OR INSTALL NEW ESC BEFORE WINTER SHUTDOWN AND IMMEDIATELY FOLLOWING SNOWMELT, INCLUDING COVERING THE SEEDING AREA AND THE DISTURBED AREAS WITH EROSION CONTROL BLANKETS (GENERALLY BIODEGRADABLE AND TEMPORARY).

ENVIRONMENTAL PROTECTION NOTES

1. DISTURBED AREAS SHALL BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.
2. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED IN THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS. IF THE PRESCRIBED MEASURES ON THE PLANS ARE NOT EFFECTIVE IN PREVENTING THE RELEASE OF A DELETERIOUS SUBSTANCE, INCLUDING SEDIMENT, THEN ALTERNATIVE MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS. LSRCA ENFORCEMENT OFFICER SHOULD BE IMMEDIATELY CONTACTED.
3. AN ENVIRONMENTAL MONITOR SHALL ATTEND THE SITE TO INSPECT ALL NEW CONTROLS, AS WELL AS ON A REGULAR BASIS, OR FOLLOWING RAIN/SNOWMELT EVENT, TO MONITOR ALL WORKS, AND IN PARTICULAR WORKS RELATED TO EROSION AND SEDIMENT CONTROLS, DEWATERING OR UNWATERING, RESTORATION AND IN- OR NEAR-WATER WORKS. SHOULD CONCERNS ARISE ON SITE THE ENVIRONMENTAL MONITOR SHALL CONTACT THE LSRCA ENFORCEMENT OFFICER AS WELL AS THE PROPONENT.
4. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, SHALL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE SHALL BE CONDUCTED A MINIMUM OF 30 METRES FROM THE WATER.
5. ALL GRADES WITHIN THE REGULATORY FLOOD PLAIN SHALL BE MAINTAINED OR MATCHED.
6. THE PROPONENT/CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS SHALL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR SHALL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAIN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.G., FUEL TANKS, PORTABLE TOILETS, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC.
7. WASHDOWN OF ASPHALT/CONCRETE SUPPLY TRUCKS, AFTER DELIVERY, SHALL BE AT A LOCATION AS DIRECTED BY THE CONTRACT ADMINISTRATOR TO AVOID SPILLING INTO THE EXISTING VEGETATION AND DRAINAGE CHANNELS. ANY WASHDOWN WORKS SHALL BE COMPLETED OUTSIDE OF LSRCA REGULATED AREAS.
8. GRADING OF LSRCA PERMIT DOES NOT ABSOLVE THE PROPONENT/ APPLICANT AND ITS ASSIGNED AGENTS FROM ITS/ THEIR RESPONSIBILITIES TO COMPLY WITH ALL APPLICABLE MUNICIPAL BY-LAWS AND PART X SPILLS) OF THE ENVIRONMENTAL PROTECTION ACT, R.S.O., 1990.
9. IT IS EVERYONE'S RESPONSIBILITY TO PREVENT CONSTRUCTION RELATED SEDIMENT FROM IMPACTING AQUATIC RESOURCES AND OTHER NATURAL FEATURES.
10. NO PUMPING OF SEDIMENT LADEN RUNOFF FROM CONSTRUCTION AREA TO THE WETLAND/ REGULATED FEATURE IS ALLOWED AT ANY TIME.
11. AN AFTER-HOURS CONTACT NUMBER IS TO BE VISIBLY POSTED ON-SITE FOR EMERGENCIES. ALL THE PLANS SHOULD HAVE NAME AND CONTACT INFO OF THE PERSON RESPONSIBLE FOR ESC MEASURES.
12. ANY SEDIMENT SPILL FROM THE SITE SHOULD BE REPORTED TO MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS.

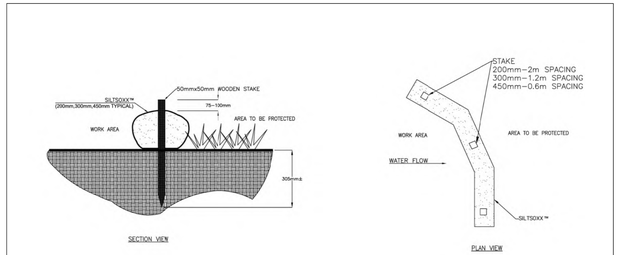
ENVIRONMENTAL COMPLIANCE

1. PLEASE NOTIFY LSRCA ENFORCEMENT OFFICER 48 HOURS PRIOR TO COMMENCING CONSTRUCTION. LSRCA ENFORCEMENT OFFICER CONTACT AS IDENTIFIED ON THE RESPECTIVE PERMIT(S).
2. AN ENVIRONMENTAL MONITOR SHALL BE ON SITE, AND PROVIDE ADVICE, TO ENSURE THAT ACTIVITIES THAT COULD HAVE A NEGATIVE IMPACT TO THE NATURAL ENVIRONMENT ARE EFFECTIVELY MITIGATED AS CONSTRUCTION PROCEEDS. THE ENVIRONMENTAL MONITOR SHALL NOTIFY THE LSRCA ENFORCEMENT OFFICER AND PROJECT MANAGER IF AN ISSUE ARISES.

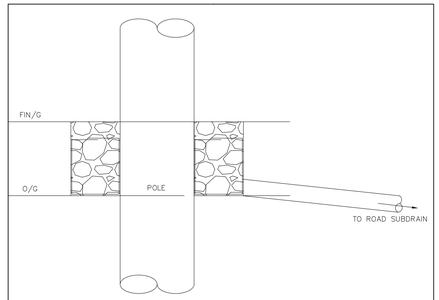


CURB EXTENSION AND BUMPOUT
N.T.S

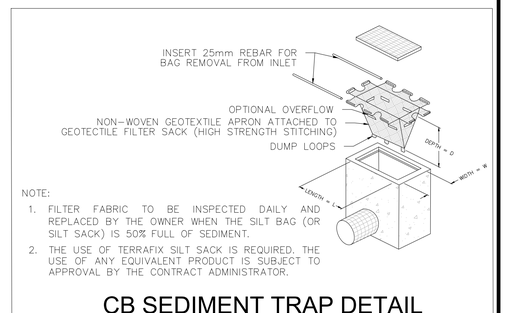
PLANTING SCHEDULE – PP1				
BOTANICAL NAME	COMMON NAME	COUNT	CALIPER /HEIGHT	CONDITION
CORNUS RACEMOSA	GREY DOGWOOD	20	500	BARE ROOT
SPIREA ALBA	NARROW LEAVED MEADOWSWEET	20	500	BARE ROOT



SILTSOXX DETAIL

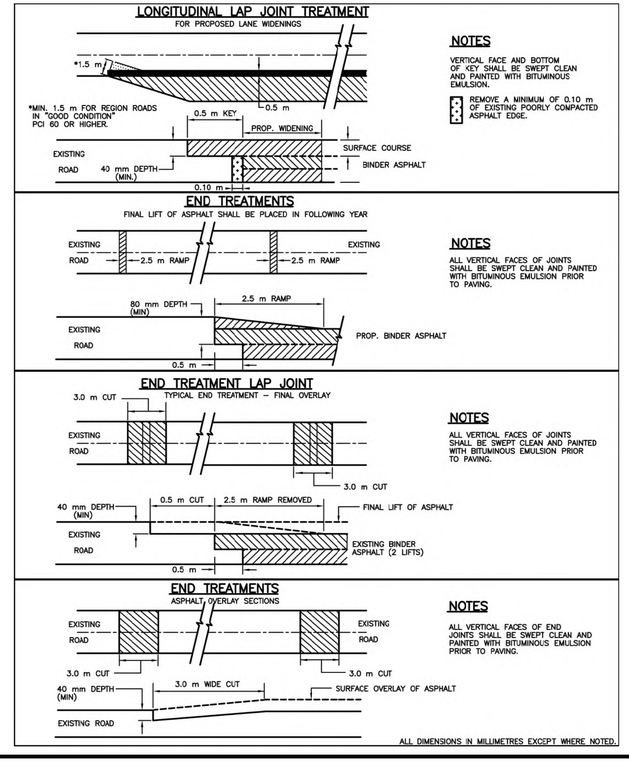


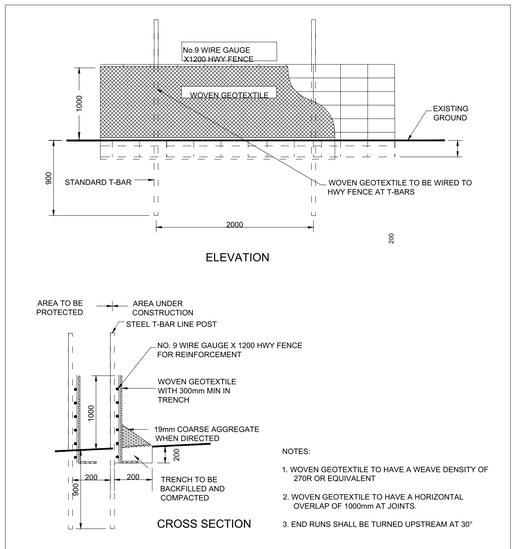
DETAIL STONE DRAIN AT UTILITY POLES
WITH GRADE RAISE
N.T.S.



NOTE:
1. FILTER FABRIC TO BE INSPECTED DAILY AND REPLACED BY THE OWNER WHEN THE SILT BAG (OR SILT SACK) IS 50% FULL OF SEDIMENT.
2. THE USE OF TERRAFIX SILT SACK IS REQUIRED. THE USE OF ANY EQUIVALENT PRODUCT IS SUBJECT TO APPROVAL BY THE CONTRACT ADMINISTRATOR.

CB SEDIMENT TRAP DETAIL





DOUBLE SEDIMENT CONTROL FENCE

NO.	DATE	NAME	REVISIONS
3	FEB/24	EH	IFT SUBMISSION
2	DEC/22	MS	90% DESIGN SUBMISSION
1	MAY/21	JC	PRELIMINARY DESIGN

UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE TOWNSHIP ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

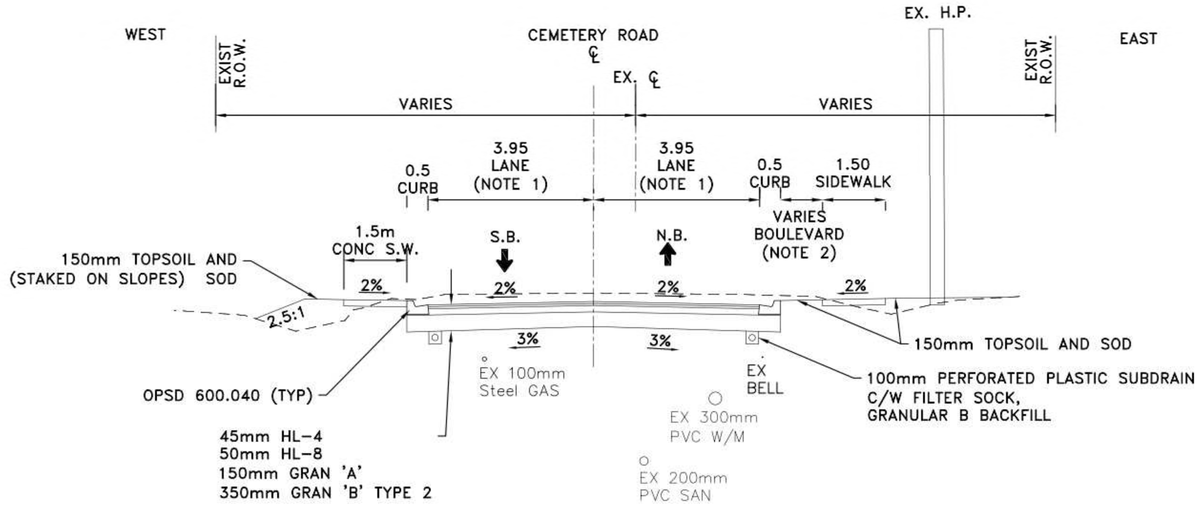
SCALE
HORIZONTAL 10m 0 10m
VERTICAL 2m 0 2m

DRAWN:	S. IBRAHIM	DATE:	2021 09
DESIGN:	W. WOOLNOUGH	DATE:	2021 09
CHECKED:	T. CAMPBELL	DATE:	2021 09
APPROVED:	P. LaPALME	DATE:	2021 09

Township of Uxbridge
COMMUNITY SERVICES

GENERAL NOTES & DETAILS

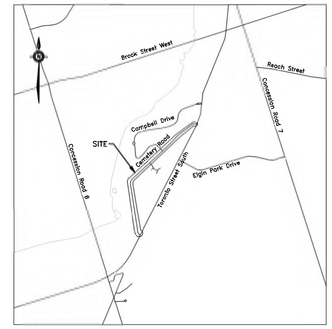
DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
GN-1	U24-08	1 OF 10



TYPICAL SECTION
N.T.S

NOTES

1. VARIES N OF STA 0+255



KEY PLAN
N.T.S.

NO.	REVISIONS	BY	APP.	DATE
4	IFT SUBMISSION	EH		FEB/24
3	100% DESIGN SUBMISSION	MS		APR/23
2	90% DESIGN SUBMISSION	MS		DEC/22
1	PRELIMINARY DESIGN	JC		MAY/21

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES CONCERNED TO BE GIVEN REQUIRED ADVANCE NOTICE PRIOR TO ANY DIGGING, FOR STAKE OUT. THE CONSULTANT ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER
P.M. LaPalme
100071096
04/30/2024
PROVINCE OF ONTARIO

SURVEY DATA DATE

SCALE
N.T.S

DRAWN:	M. SAWICKI	DATE: 2021 10
DESIGN:	M. SAWICKI	DATE: 2021 10
CHECKED:	P. LAPALME	DATE: 2021 10
APPROVED:	T. CAMPBELL	DATE: 2021 10

Dillon Consulting Limited

consulting engineers

Township of Uxbridge

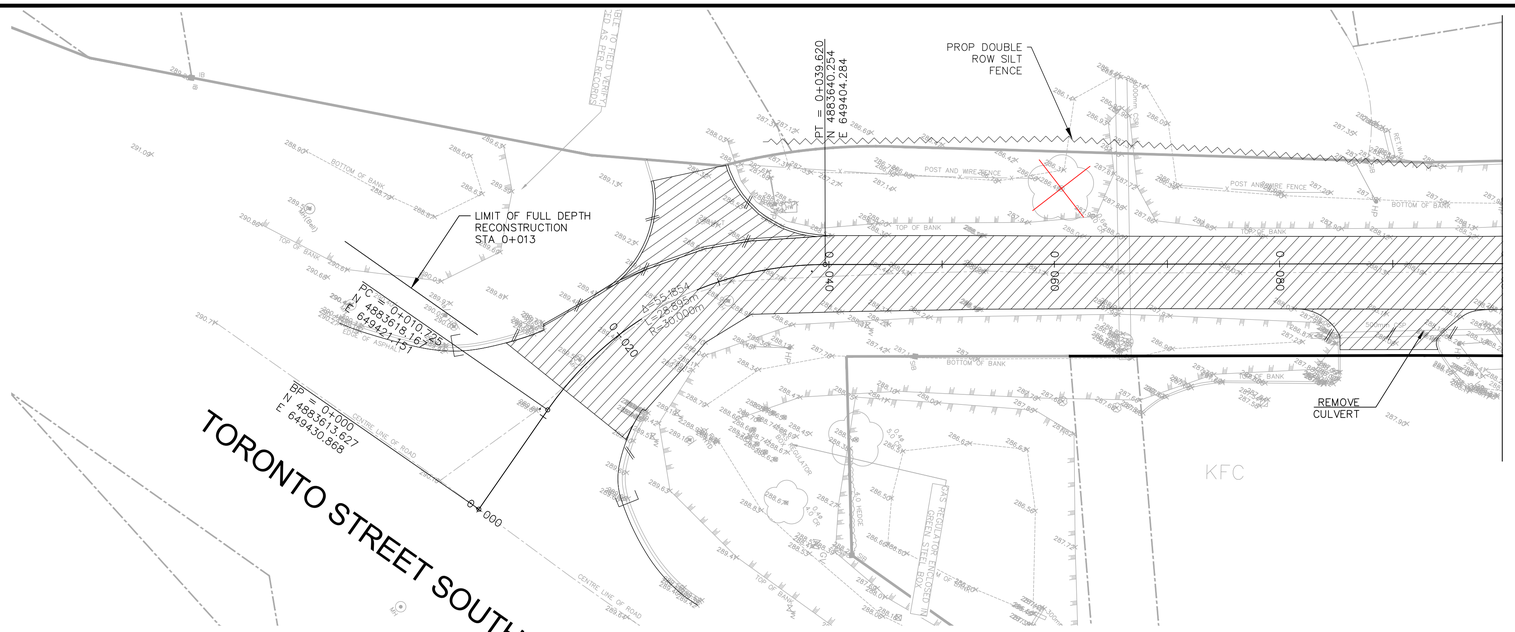
CEMETERY ROAD

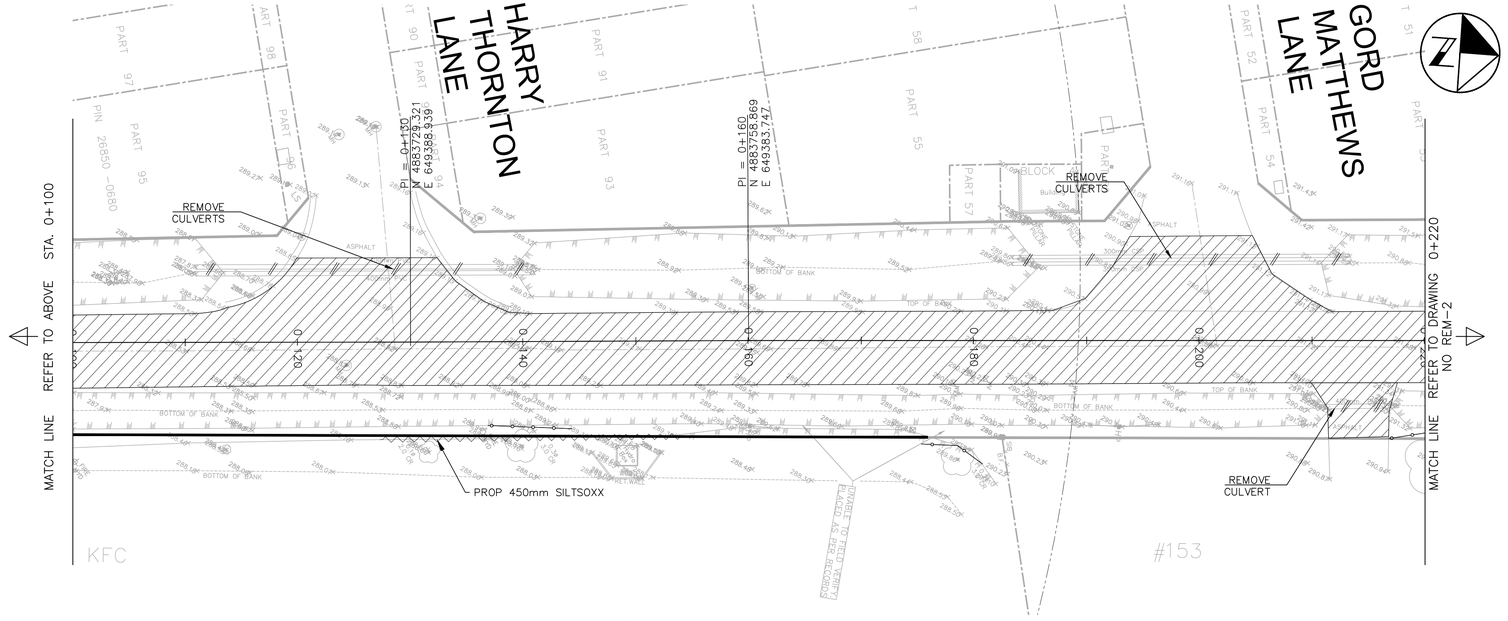
TORONTO STREET TO TORONTO STREET

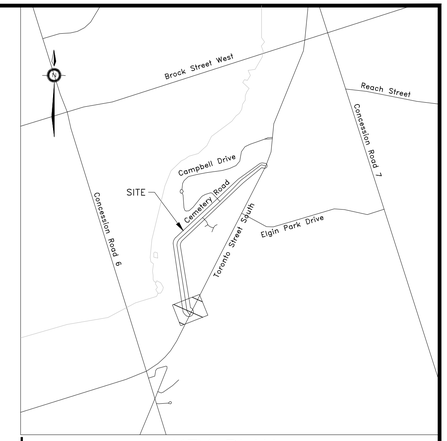
TYPICAL SECTIONS

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
TS-1	U24-08	2 OF 10

Y:\244-31 Cemetery Road Recon\3-CAD\SHEETS\244-31 Typical Section_EH_2024-20-20.dwg







KEY PLAN
N.T.S

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NO.	DATE	NAME	REVISIONS
4	FEB/24	EH	IFT SUBMISSION
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2	DEC/22	MS	90% DESIGN SUBMISSION
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THE TOWNSHIP ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENCED PROFESSIONAL ENGINEER
P.M LaPalme
100071696
04/30/2024
PROVINCE OF ONTARIO

SURVEY DATA DATE
2021 01 17

SCALE
HORIZONTAL
5m 0 5m

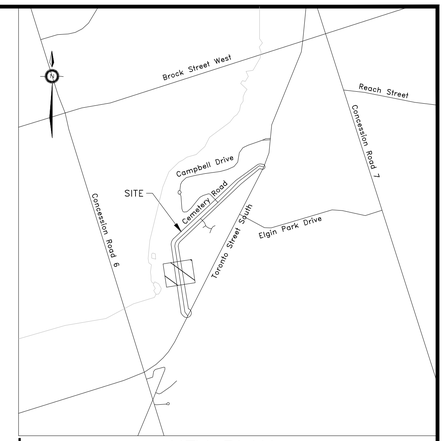
DRAWN:	M. SAWICKI	DATE: 2022 12
DESIGN:	M. SAWICKI	DATE: 2022 12
CHECKED:	P. LAPALME	DATE: 2022 12
APPROVED:	T. CAMPBELL	DATE: 2022 12

Township of Uxbridge

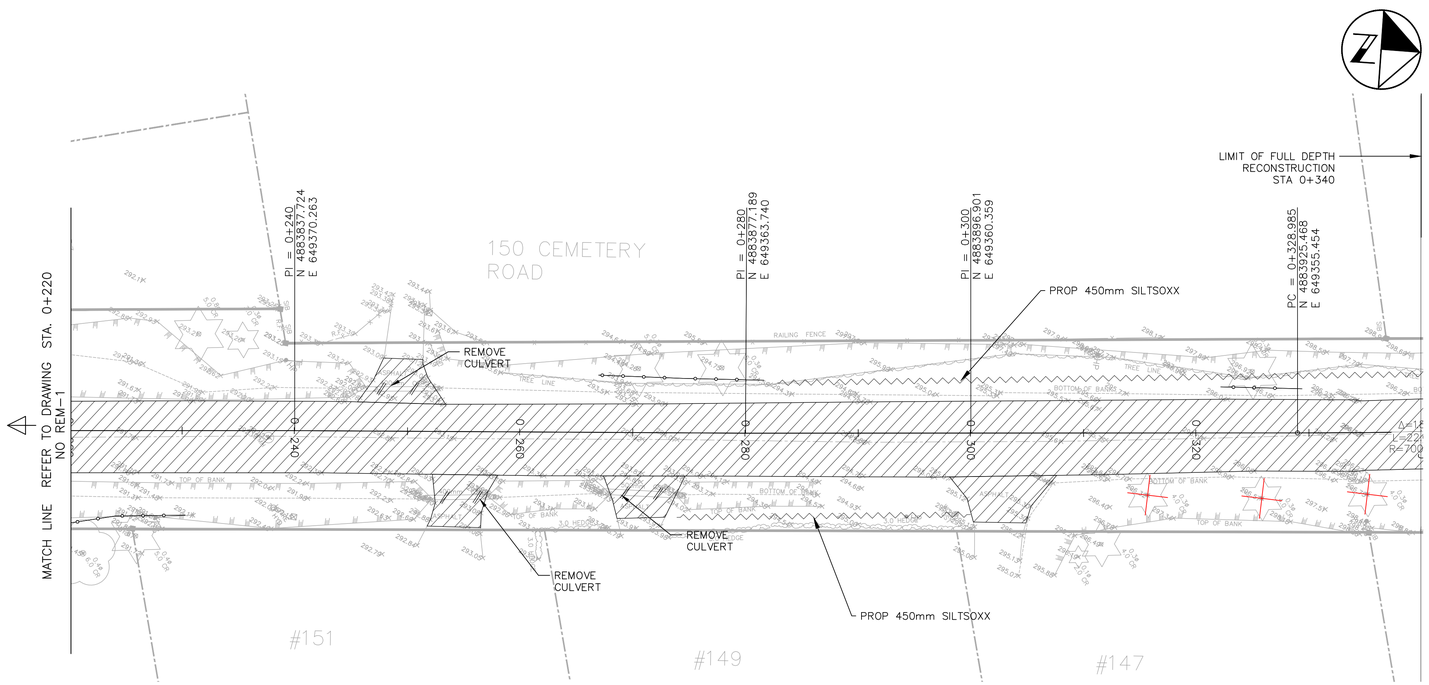
COMMUNITY SERVICES

CEMETERY ROAD
TORONTO ST. SOUTH TO 140m NORTH OF GORD MATTHEWS LN
REMOVALS AND ESC
FROM STA. 0+000 TO STA. 0+220

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
REM-1	U24-08	3 OF 10



KEY PLAN
N.T.S



CEMETERY ROAD

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NO.	DATE	NAME	REVISIONS
4	FEB/24	EH	IFT SUBMISSION
3	APR/23	MS	100% DESIGN SUBMISSION
2	DEC/22	MS	90% DESIGN SUBMISSION
1	MAY/21	JC	PRELIMINARY DESIGN

UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE TOWNSHIP ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER
P.M. LaPalme
100071896
04/30/2024
PROVINCE OF ONTARIO

SURVEY DATA DATE
2021 01 17

SCALE
HORIZONTAL
5m 0 5m

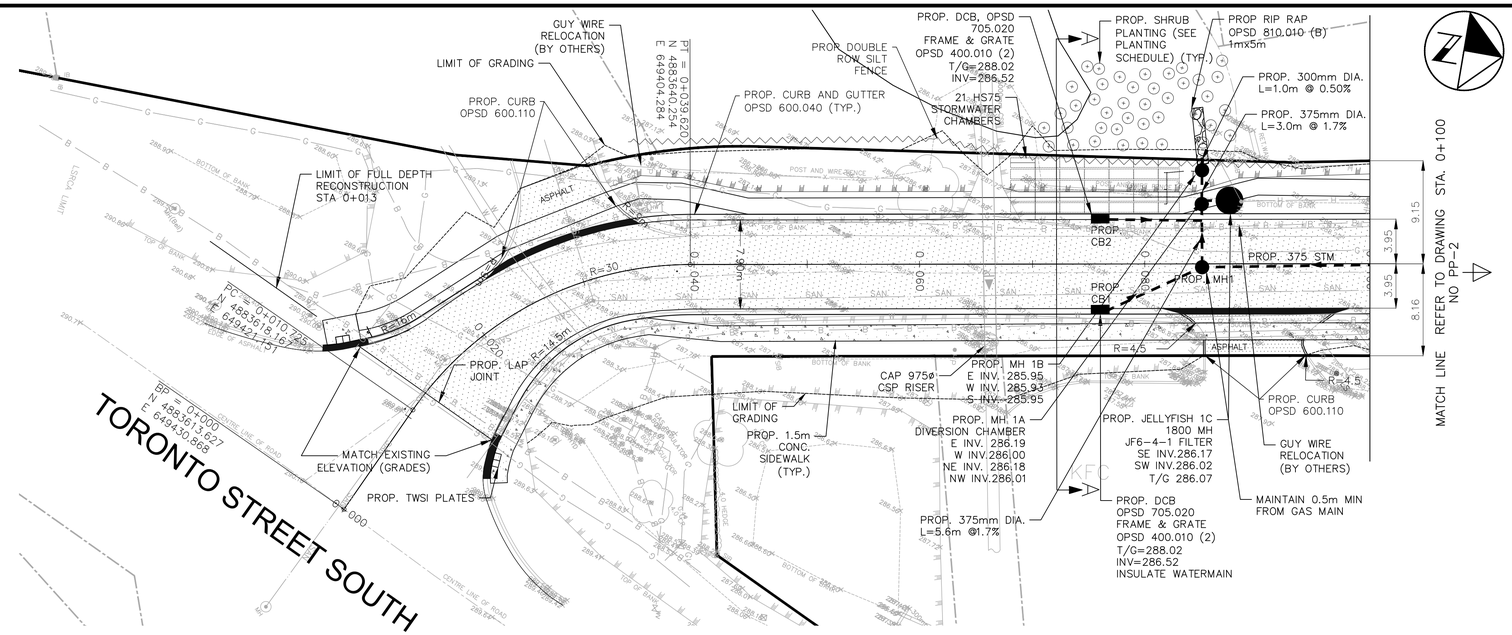
DRAWN:	M. SAWICKI	DATE: 2022 12
DESIGN:	M. SAWICKI	DATE: 2022 12
CHECKED:	P. LAPALME	DATE: 2022 12
APPROVED:	T. CAMPBELL	DATE: 2022 12

Township of Uxbridge

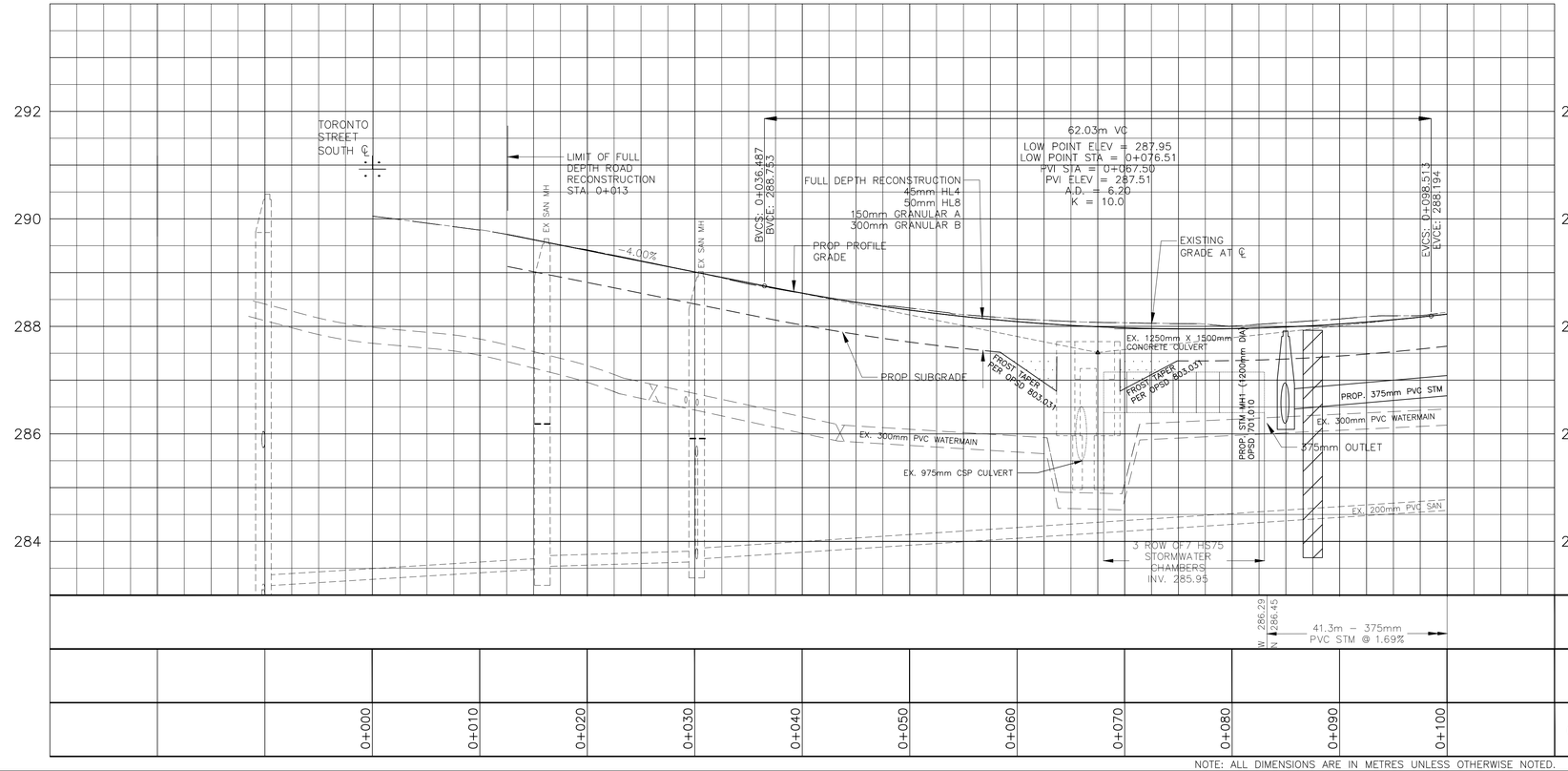
COMMUNITY SERVICES

CEMETERY ROAD
TORONTO ST. SOUTH TO 140m NORTH OF GORD
MATTHEWS LN
REMOVALS AND ESC
FROM STA. 0+220 TO STA. 0+340

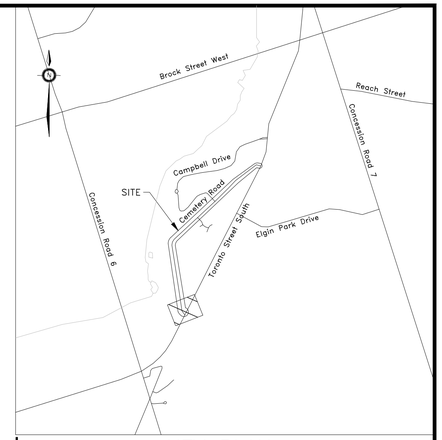
DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
REM-2	U24-08	4 OF 10



CEMETERY ROAD



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.



KEY PLAN
N.T.S

LEGEND

- SINGLE CATCH BASIN
- DOUBLE CATCH BASIN
- STORM MAINTENANCE HOLE
- ASPHALT PAVING
- CONCRETE SIDEWALK

NO.	DATE	NAME	REVISIONS
5	FEB/24	EH	IFT SUBMISSION
4	JULY/23	MS	SUBMISSION TO MECP
3	APR/23	MS	100% DESIGN SUBMISSION
2	DEC/22	MS	90% DESIGN SUBMISSION
1	MAY/21	JC	PRELIMINARY DESIGN

UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

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LICENSED PROFESSIONAL ENGINEER P.M. LaPalme 100071896 04/30/2024 PROVINCE OF ONTARIO

SURVEY DATA DATE 2021 01 17

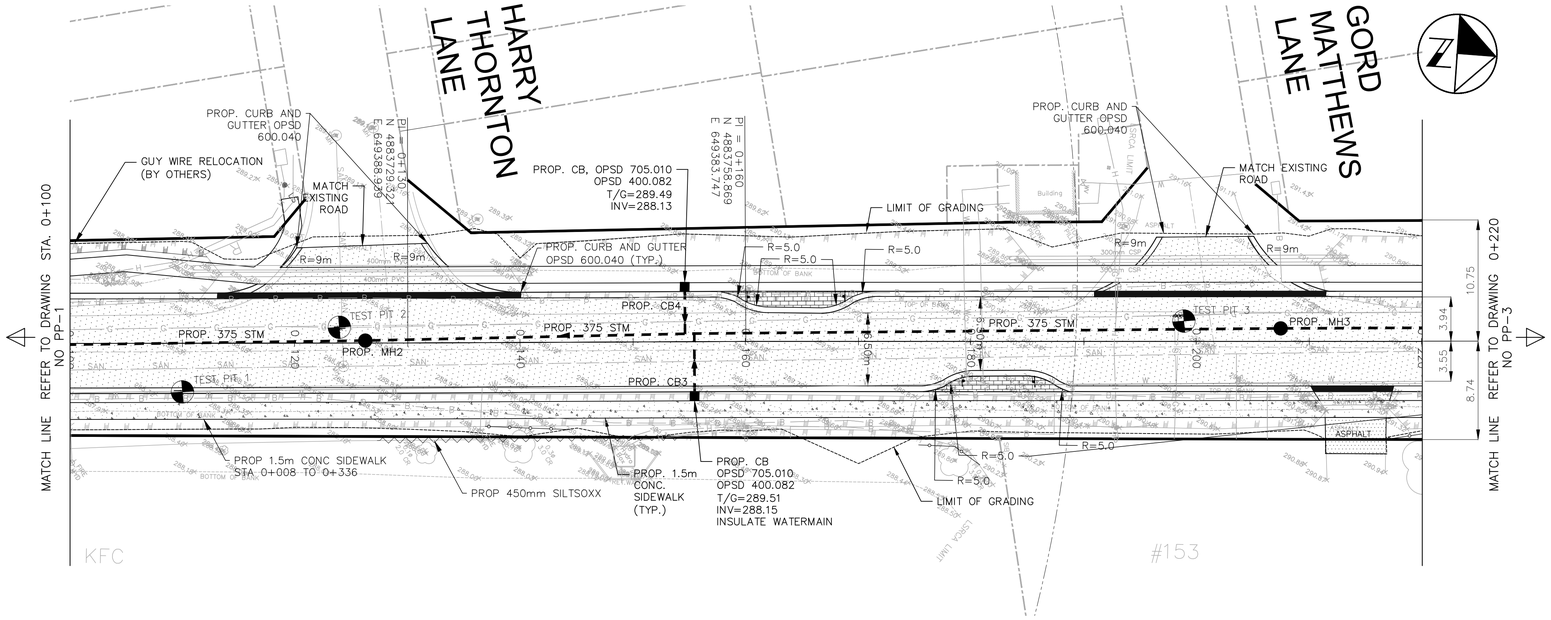
SCALE
HORIZONTAL 5m 0 5m
VERTICAL 1m 0 1m

DRAWN:	M. SAWICKI	DATE: 2022 12
DESIGN:	M. SAWICKI	DATE: 2022 12
CHECKED:	P. LAPALME	DATE: 2022 12
APPROVED:	T. CAMPBELL	DATE: 2022 12

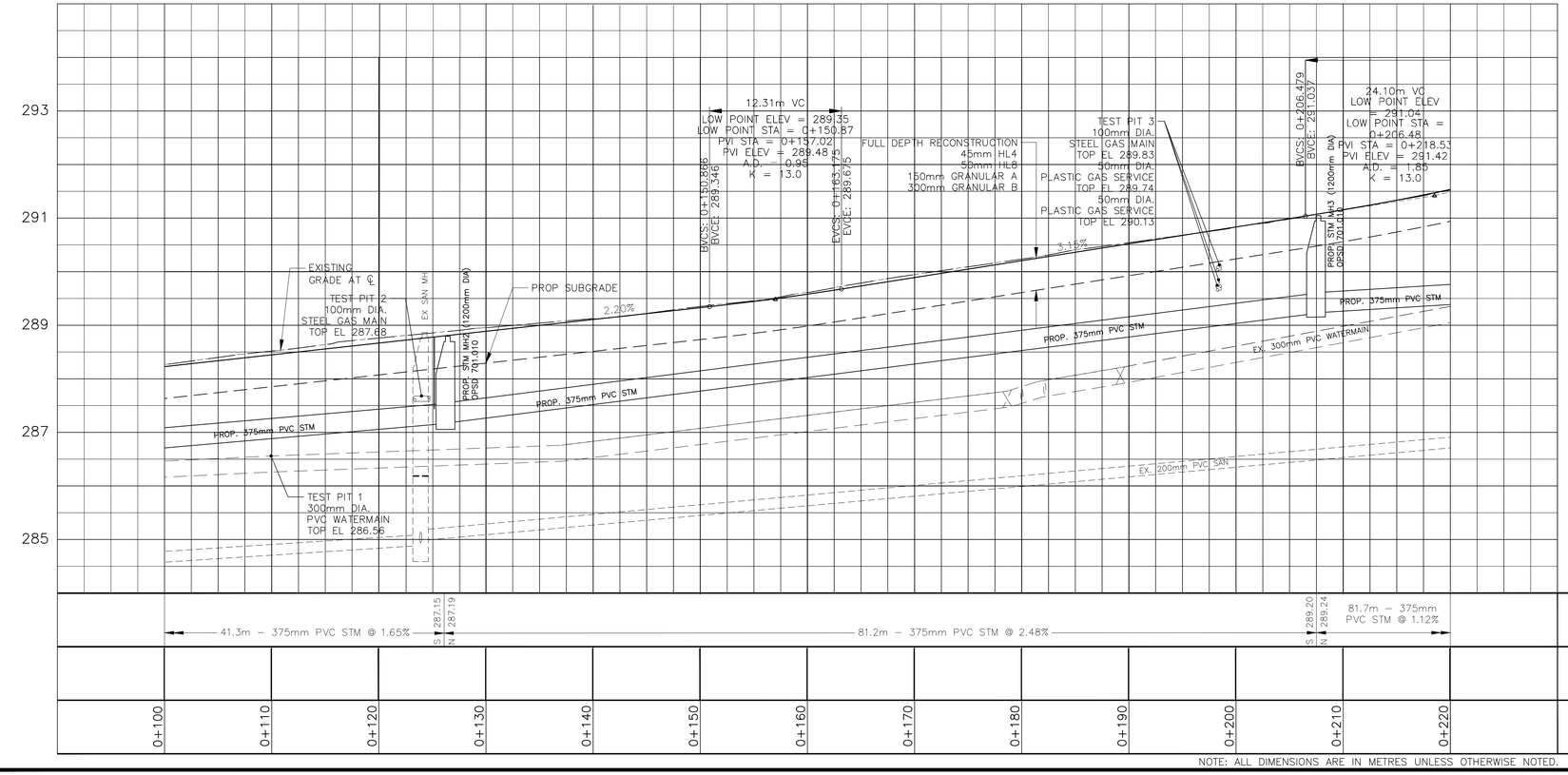
Township of Uxbridge
COMMUNITY SERVICES

CEMETERY ROAD
TORONTO ST. SOUTH TO 140m NORTH OF GORD MATTHEWS LN
PLAN AND PROFILE
FROM STA. 0+008 TO STA. 0+100

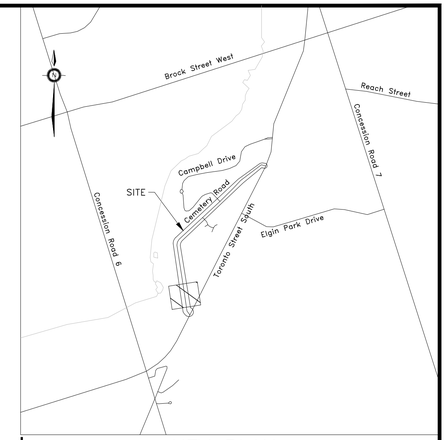
DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
PP-1	U24-08	5 OF 10



CEMETERY ROAD



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.



KEY PLAN
N.T.S

LEGEND

- SINGLE CATCH BASIN
- DOUBLE CATCH BASIN
- STORM MAINTENANCE HOLE
- ASPHALT PAVING
- CONCRETE SIDEWALK

NO.	DATE	NAME	REVISIONS
5	FEB/24	EH	IFT SUBMISSION
4	JULY/23	MS	SUBMISSION TO MECP
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UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

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LICENSED PROFESSIONAL ENGINEER P.M. LaPalme 100071896 04/30/2024 PROVINCE OF ONTARIO

SURVEY DATA DATE 2021 01 17

SCALE
HORIZONTAL 5m 0 5m
VERTICAL 1m 0 1m

DRAWN:	M. SAWICKI	DATE: 2022 12
DESIGN:	M. SAWICKI	DATE: 2022 12
CHECKED:	P. LAPALME	DATE: 2022 12
APPROVED:	T. CAMPBELL	DATE: 2022 12

Township of Uxbridge

COMMUNITY SERVICES

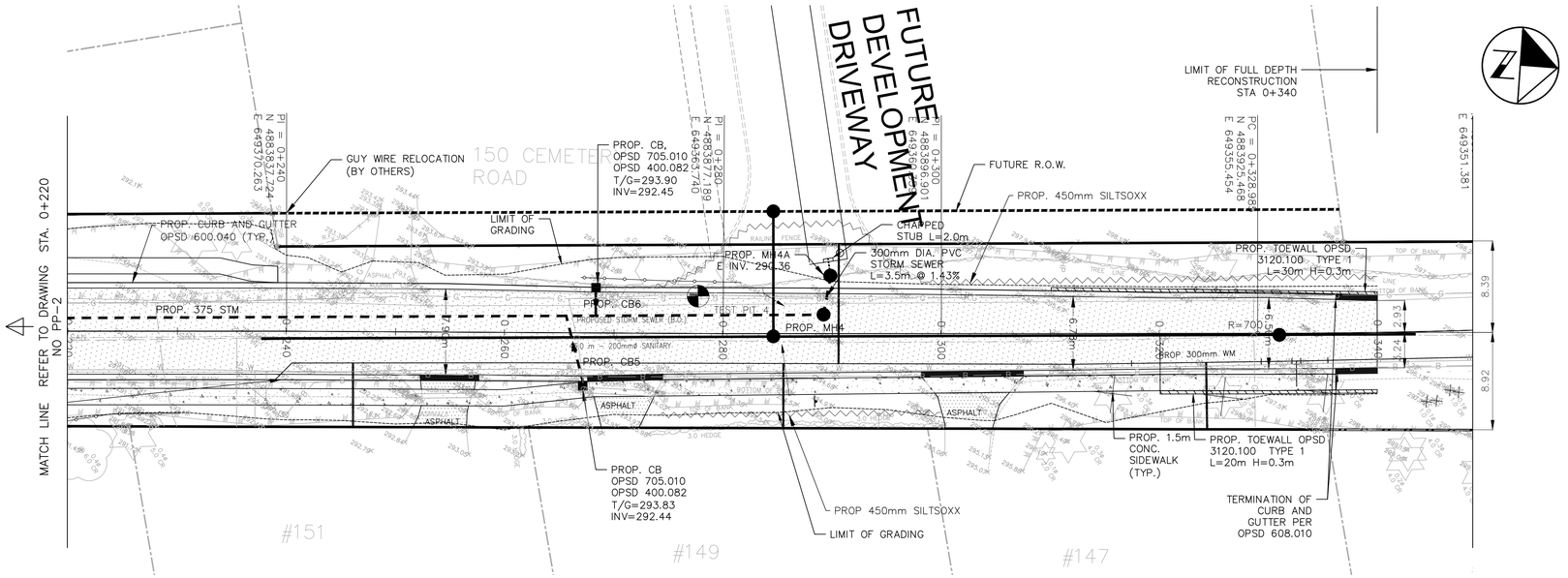
CEMETERY ROAD

TORONTO ST. SOUTH TO 140m NORTH OF GORD MATTHEWS LN

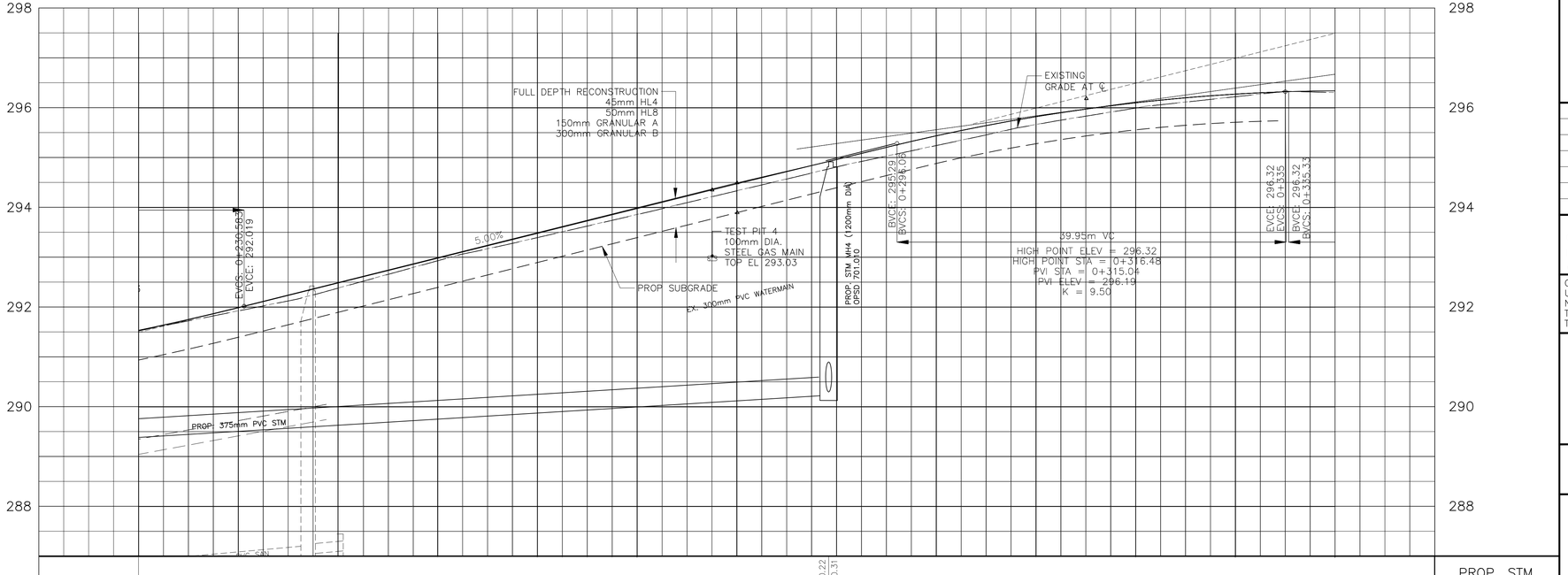
PLAN AND PROFILE

FROM STA. 0+100 TO STA. 0+220

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
PP-2	U24-08	6 OF 10



CEMETERY ROAD

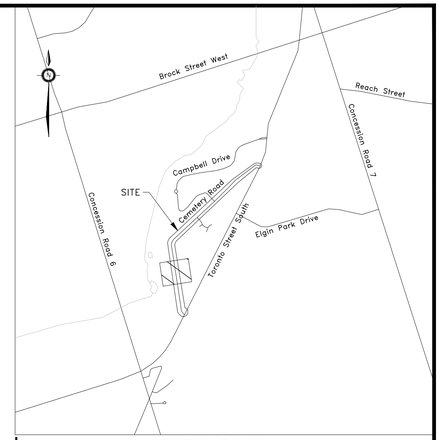


PROP. STM SEWER

℄ ELEVATION

℄ OF CONSTRUCTION CHAINAGE

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.



KEY PLAN
N.T.S

LEGEND

- SINGLE CATCH BASIN
- DOUBLE CATCH BASIN
- STORM MAINTENANCE HOLE
- ASPHALT PAVING
- CONCRETE SIDEWALK

NO.	DATE	NAME	REVISIONS
5	FEB/24	EH	IFT SUBMISSION
4	JULY/23	MS	SUBMISSION TO MECP
3	APR/23	MS	100% DESIGN SUBMISSION
2	DEC/22	MS	90% DESIGN SUBMISSION
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UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

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LICENSED PROFESSIONAL ENGINEER
P.M. LaPalme
100071896
04/30/2024
PROVINCE OF ONTARIO

SURVEY DATA DATE
2021 01 17

SCALE
HORIZONTAL
5m 0 5m
VERTICAL
1m 0 1m

DRAWN:	M. SAWICKI	DATE: 2022 12
DESIGN:	M. SAWICKI	DATE: 2022 12
CHECKED:	P. LAPALME	DATE: 2022 12
APPROVED:	T. CAMPBELL	DATE: 2022 12

Township of Uxbridge

COMMUNITY SERVICES

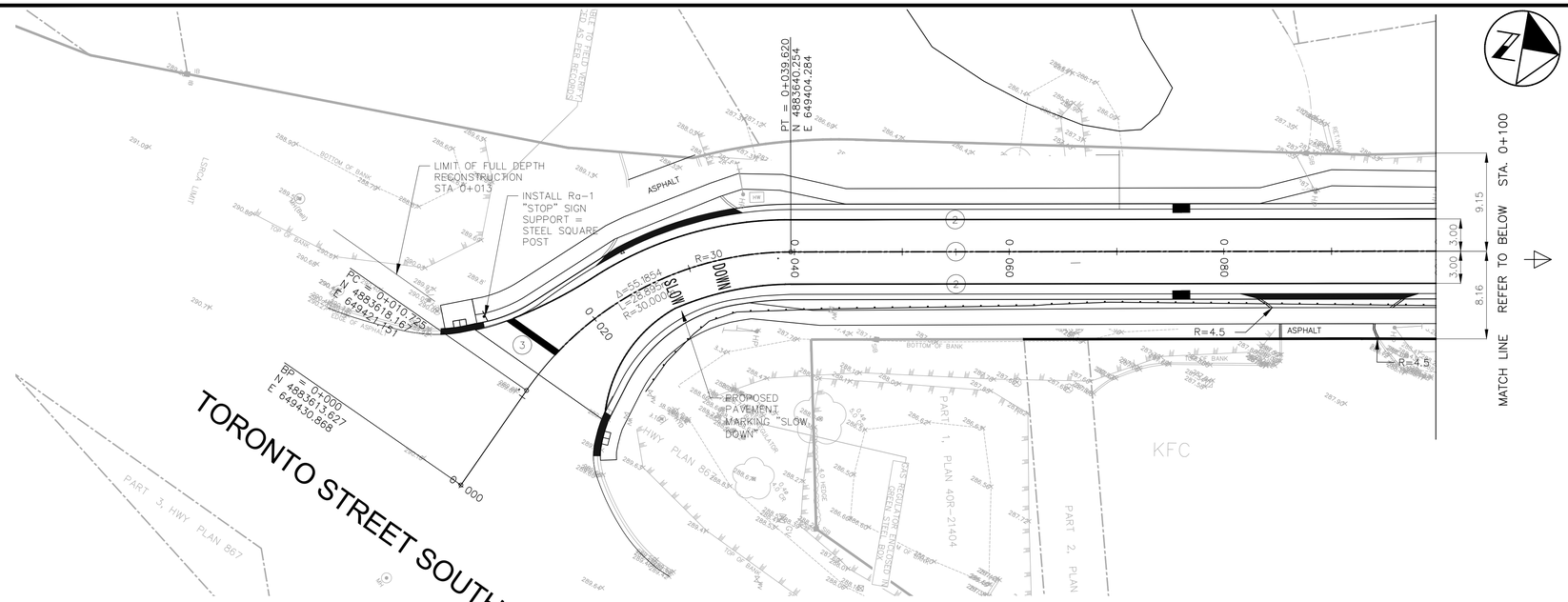
CEMETERY ROAD

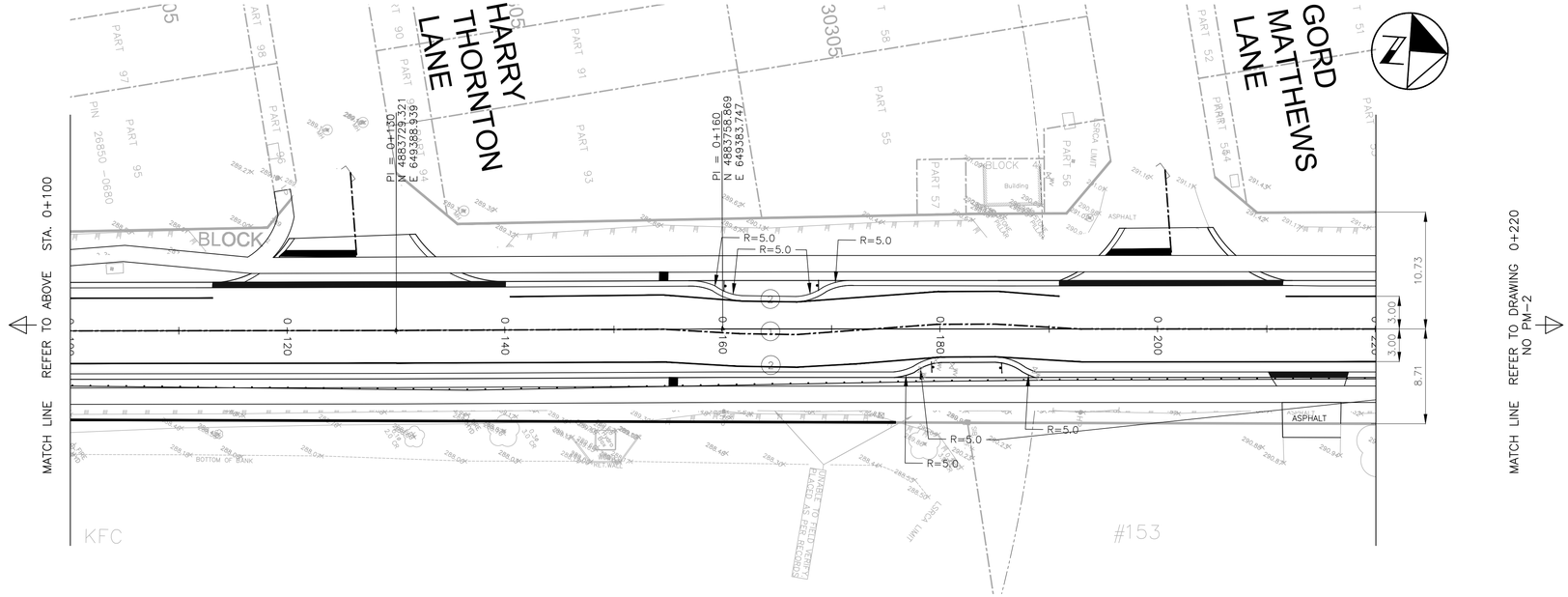
TORONTO ST. SOUTH TO 140m NORTH OF GORD MATTHEWS LN

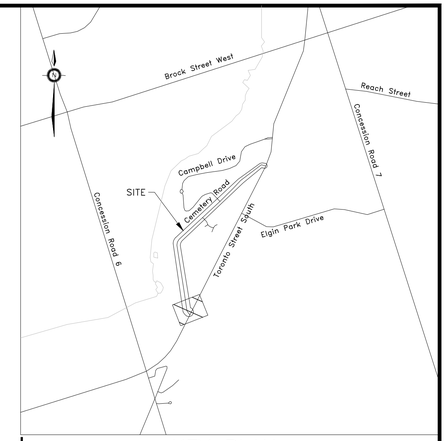
PLAN AND PROFILE

FROM STA. 0+220 TO STA. 0+340

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
PP-3	U24-08	7 OF 10







KEY PLAN
N.T.S

1. 10cm SOLID YELLOW
2. 10cm SOLID WHITE
3. 45cm SOLID WHITE

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NO.	DATE	NAME	REVISIONS
4	FEB/24	EH	IFT SUBMISSION
3	APR/23	MS	100% DESIGN SUBMISSION
2	DEC/22	MS	90% DESIGN SUBMISSION
1	MAY/21	JC	PRELIMINARY DESIGN

UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

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LICENSED PROFESSIONAL ENGINEER
P.M. LaPalme
100071896
04/30/2024
PROVINCE OF ONTARIO

SURVEY DATA DATE
2021 01 17

SCALE
HORIZONTAL
5m 0 5m

DRAWN:	M. SAWICKI	DATE:	2022 12
DESIGN:	M. SAWICKI	DATE:	2022 12
CHECKED:	P. LAPALME	DATE:	2022 12
APPROVED:	T. CAMPBELL	DATE:	2022 12

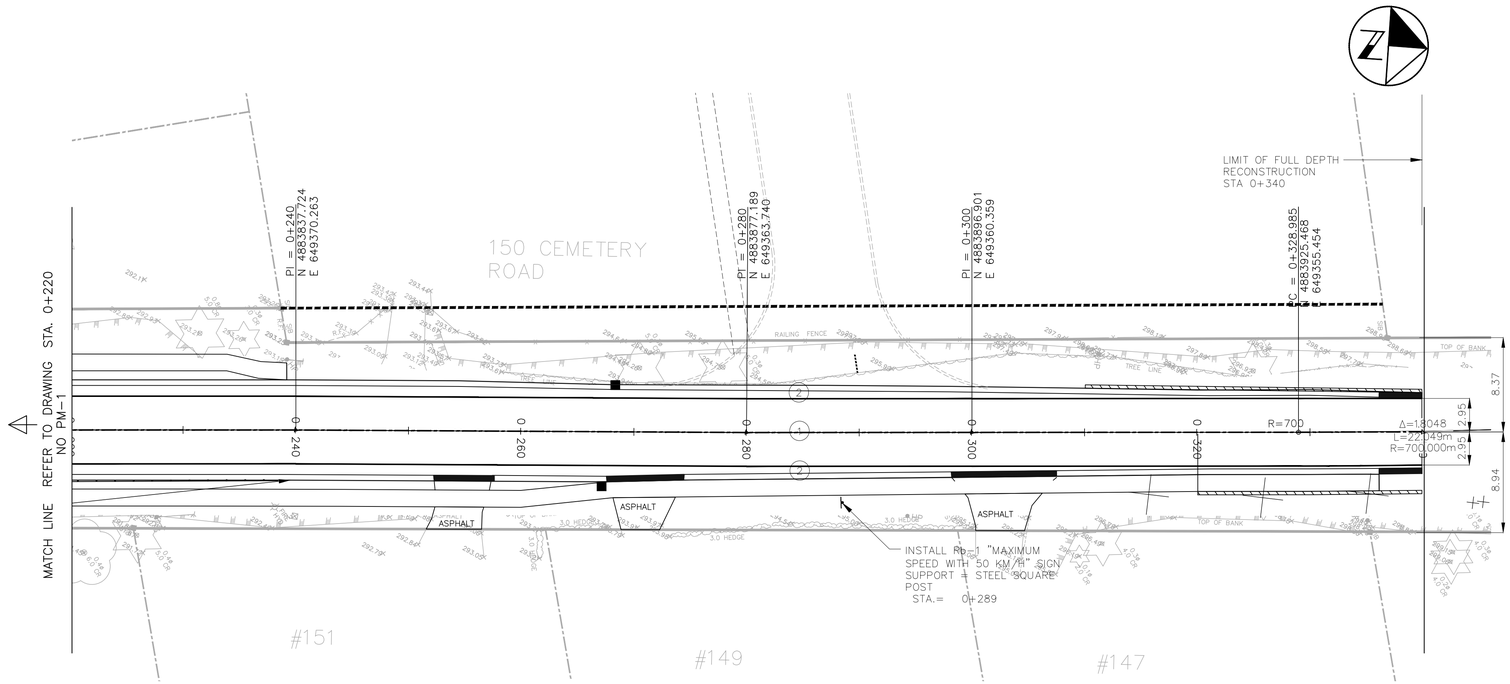
Township of Uxbridge

COMMUNITY SERVICES

CEMETERY ROAD

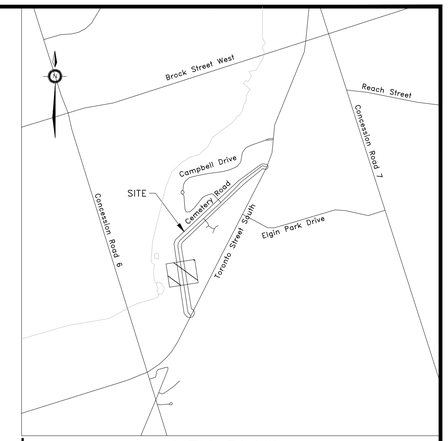
TORONTO ST. SOUTH TO 140m NORTH OF GORD MATTHEWS LN.
PAVEMENT MARKINGS & SIGNAGE
FROM STA. 0+000 TO STA. 0+220

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
PM-1	U24-08	8 OF 10



CEMETERY ROAD

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.



KEY PLAN
N.T.S

(1) 10cm SOLID YELLOW

(2) 10cm SOLID WHITE

NO.	DATE	NAME	REVISIONS
4	FEB/24	EH	IFT SUBMISSION
3	APR/23	MS	100% DESIGN SUBMISSION
2	DEC/22	MS	90% DESIGN SUBMISSION
1	MAY/21	JC	PRELIMINARY DESIGN

UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

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LICENSED PROFESSIONAL ENGINEER
P.M. LaPalme
100071696
04/30/2024
PROVINCE OF ONTARIO

SURVEY DATA DATE
2021 01 17

SCALE
HORIZONTAL
5m 0 5m

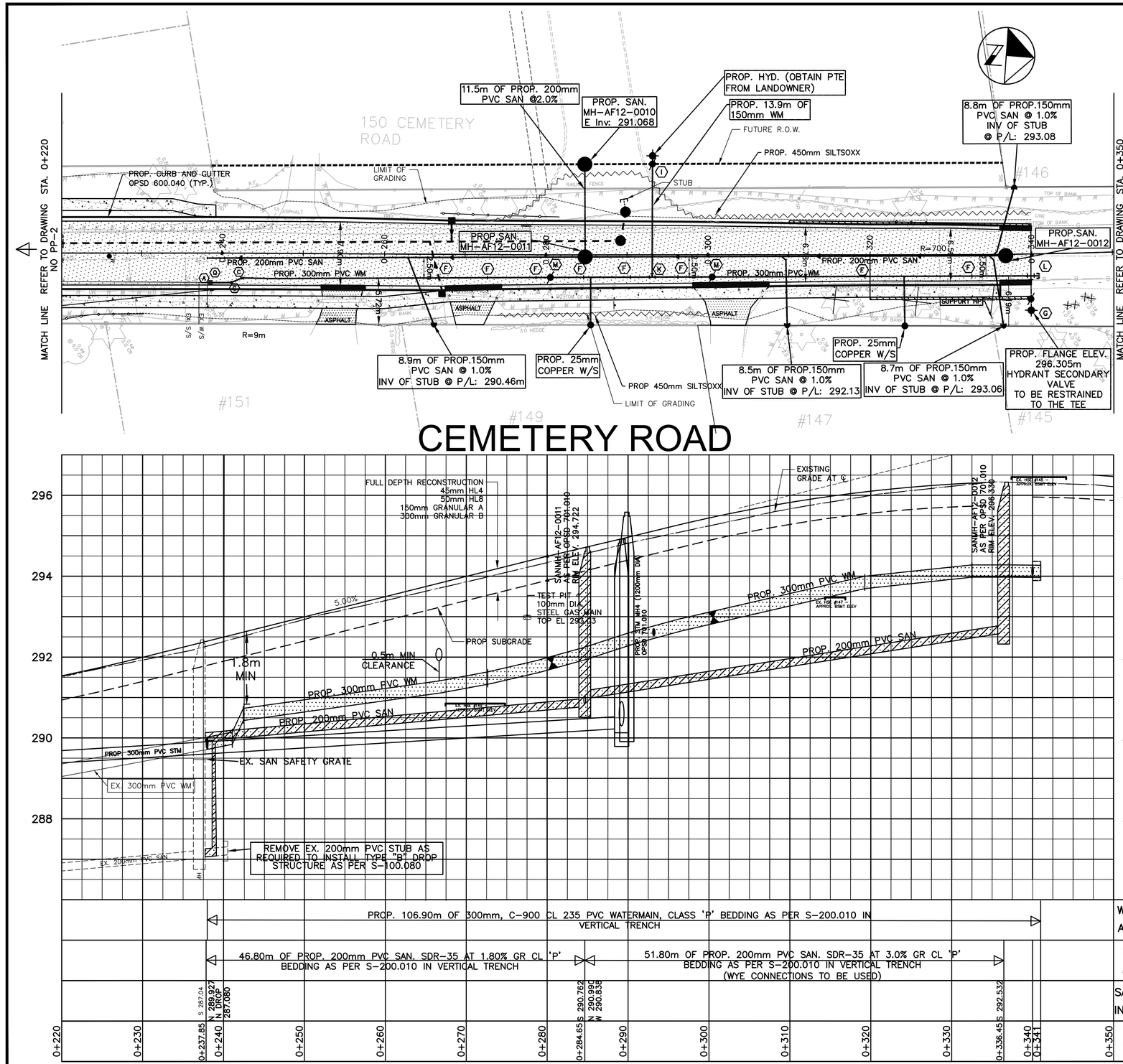
DRAWN:	M. SAWICKI	DATE: 2022 12
DESIGN:	M. SAWICKI	DATE: 2022 12
CHECKED:	P. LAPALME	DATE: 2022 12
APPROVED:	T. CAMPBELL	DATE: 2022 12

Township of Uxbridge

COMMUNITY SERVICES

CEMETERY ROAD
TORONTO ST. SOUTH TO 140m NORTH OF GORD MATTHEWS LN
PAVEMENT MARKINGS & SIGNAGE
FROM STA. 0+220 TO STA. 0+460

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
PM-2	U24-08	9 OF 10



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

PROPOSED WATERMAIN DATA

MK.	DESCRIPTION	STATION	TOP OF WM ELEV.
A	CONNECT TO EX. 300mm PVC WM WITH TRANSITION COUPLING	0+237.85	290.02
C	PROP. 22.5° HORIZONTAL BEND (ROTATED)	0+240.96 0+242.29	290.15 290.73
F	PROP. VERTICAL DEFLECTION	0+266.65 0+272.65 0+278.60 0+284.47 0+290.27 0+296.16 0+319.25 0+332.50	291.40 291.63 291.90 292.38 292.75 292.93 294.00 294.28
I	PROP. 150mm GATE VALVE	0+293.17	292.85
K	PROP. 300mmX150mm TEE	0+288.07	292.85
G	PROP. HYDRANT WITH ANCHOR TEE AND VALVE	0+340.00	294.30
L	PROP. 300mm MECHANICAL PLUG	0+341.00	294.30
M	PROP. 300mm GATE VALVE	0+280.40 0+300.40	292.01 293.13
Q	TEST POINT/100mm BYPASS AS PER S-210.040.	- -	- -

SANITARY SEWER NOTES

1. ALL EXISTING SANITARY LATERALS TO BE RECONNECTED TO THE PROPOSED SANITARY SEWER WITH MIN. 100 mm PVC SDR-28 PIPE AT MIN. 2.0% GRADE, BEDDING AS PER S-100.010 AS SHOWN ON DRAWINGS.
2. EXISTING SEWER LATERALS ALIGNMENT ARE BASED ON CCTV OF MAINLINE AND CCTV LATERAL LOCATE SHEETS AND ARE APPROXIMATE.
3. ALL SANITARY SEWER LATERALS TO BE DYE TESTED AND CCTV INSPECTED PRIOR TO CONNECTING TO THE PROPOSED SANITARY SEWER TO ENSURE EXISTING LATERAL IS IN SERVICE. DO NOT INSTALL TEE'S FOR ABANDONED SERVICES.
4. MANUFACTURED TEES OR WYES TO BE USED TO CONNECT SANITARY SEWER LATERALS TO THE PROPOSED MAIN LINE SEWER.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EXISTING SEWAGE FLOWS AT ALL TIMES DURING CONSTRUCTION AND PROVIDE TEMP. SEWAGE BY-PASS WHERE APPLICABLE.
6. LATERAL RELINING IS TO BE COMPLETED AFTER MAINLINE SEWER INSTALLATION. EXISTING LIVE LATERALS TO BE RECONNECTED TO SEWER TO MAINTAIN SERVICE.
7. UTILITY CROSSINGS TO BE SUPPORTED AS PER. S-200.030.
8. ALL EDGES OF EXCAVATION WITHIN ASPHALT SHALL BE SAW CUT IN STRAIGHT PARALLEL LINES.
9. ALL CONSTRUCTION TO BE COMPLETED IN VERTICAL TRENCH

WATERMAIN NOTES:

1. **TRACE AND CATHODICALLY PROTECT PROPOSED WATERMAIN AS PER S-201.030.**
2. **NEW WATERMAIN TO BE SWABBED, PRESSURE TESTED, FLUSHED AND CHLORINATED PRIOR TO CONNECTING TO EXISTING WM.**
3. **ALL ABANDONED WATER VALVES TO BE TURNED TO THE "OFF" POSITION, UPPER SECTION OF SLIDE VALVE BOXES TO BE REMOVED AND SAND FILL THE REMAINDER.**
4. **RESTRAINED FITTINGS AND GRANULAR THRUST BLOCKS TO BE USED AS PER REGIONAL STANDARDS. EXACT LOCATION AND ELEVATION OF EXISTING WATERMAIN**
5. **TO BE FIELD DETERMINED BY THE CONTRACTOR. PROPOSED WATERMAIN TO BE CONSTRUCTED USING**
6. **VERTICAL TRENCH UNLESS OTHERWISE NOTED. PROPOSED WATERMAIN TO HAVE A MINIMUM OF 1.80 m**
7. **DEPTH OF COVER. CONTRACTOR TO MAINTAIN WATER SERVICE TO ALL**
8. **CUSTOMERS AT ALL TIMES DURING CONSTRUCTION.**
9. **ALL OPEN ENDS ON ABANDONED WATERMAIN ARE TO BE PLUGGED WITH 20 MPa CONCRETE.**
10. **HYDRANTS ON ABANDONED WATERMAIN ARE TO BE SALVAGED AND DELIVERED TO THE OSHAWA DEPOT. EXISTING WATER SERVICES TO BE REPLACED TO**
11. **PROPERTY LINE WITH 19mm TYPE 'K' COPPER C/W CURB STOP, SERVICE BOX, ROD AND MAIN STOP AS PER S-230.020, UNLESS OTHERWISE NOTED**

NO.	DATE	NAME	REVISIONS
3	MAR/22	WW	ISSUED FOR TENDER
2	SEPT/21	WW	90% DESIGN SUBMISSION
1	MAY/21	JC	PRELIMINARY DESIGN

UTILITIES VERIFIED

CABLE TV	2021-05	HYDRO	2021-05
BELL CANADA	2021-05		
CONSUMERS GAS	2021-05		

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LICENSED PROFESSIONAL ENGINEER N. P. ANDRES 100126452 MAR 01/24 2024-03 PROVINCE OF ONTARIO

SURVEY DATA DATE 2021 01 17

SCALE
HORIZONTAL 10m 0 10m
VERTICAL 2m 0 2m

DRAWN:	J. AKERS	DATE: 2023 02
DESIGN:	J. AKERS	DATE: 2023 02
CHECKED:	K. JOHNSTON	DATE: 2024 03
APPROVED:	N. ANDRES	DATE: 2024 03

Township of Uxbridge
COMMUNITY SERVICES

CEMETERY ROAD
TORONTO STREET SOUTH TO TORONTO STREET SOUTH
PLAN AND PROFILE
FROM STA. 0+220 TO STA. 0+350

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
PP-3A	U24/08	10 OF 10