Site Servicing & Stormwater Management Report

Manotick Affordable Seniors Residence

5581 Doctor Leach Drive

Ottawa, Ontario

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1.0 INTRODUCTION

Parsons Inc. was retained by the Rideau Non-Profit Housing Inc. to provide engineering services for a new two-storey apartment building located at 5581 Doctor Leach Dr. in Ottawa, Ontario.

The proposed site will encompass a total area of approximately 0.59 ha and is bordered by residential developments to the north and south, Doctor Leach Drive on the west and a future developable site to the east.

The proposed development includes a new 2-storey apartment building containing 38 units intended for seniors housing. The site will include a 29-vehicle parking, new storm sewers, sanitary services, and new water services.

As shown in the figure below, the existing site at 5581 Doctor Leach Dr. is already partially developed. The existing site in blue will remain with an existing senior residence of 30 units. The proposed area in red is the primary purpose of this project as discussed above. Furthermore, in orange is a future 76 units – 4 story senior resident, which will be taken in consideration for calculation purposes only.

Figure 1 - Site Location

2.0 PURPOSE

This report summarizes the proposed site servicing, grading, and drainage design, documents the proposed method of attenuating stormwater runoff from the subject proposed site, and deals with erosion and sediment control measures to be undertaken during construction.

Stormwater management items addressed include the following:

- establishing the allowable post-development release rate from the site;
- calculating the post-development runoff from the site;
- determining the required on-site stormwater storage volume and storage areas;
- providing a minimum of 80% TSS removal rate at the storm outlet and;

As requested by the City of Ottawa, this report will also review the downstream capacity of both sanitary and storm sewers considering the existing building, proposed site and future site.

3.0 EXISTING CONDITIONS

The subject site is currently vacant with an existing septic system which used to serve the seniors housing to the north of the proposed development. In 2011, a new 150mmØ sanitary sewer pipe was installed to serve the existing building into the 525mmØ main concrete sanitary sewer pie on Eastman Ave. The existing septic bed and tank was therefore abandoned but not removed as per the current property owner. The 150mmØ sanitary sewer has an estimated 130m of pipe from the existing building to Eastman Ave. with no maintenance hole, only long radius elbow. A 150mm watermain runs across the site's frontage on Doctor Leach Ave. Existing site grading is separated in two sections with half of the site draining to the existing ditch along Doctor Leach Drive and the other section draining towards the east end of the property, where stormwater is captured and drains through an elliptical pipe of 1000mmX1500mm. This storm sewer flows east in rear yards of residential properties and ultimately discharges to the Rideau River through an outlet creek along Potter Dr.

4.0 PROPOSED DEVELOPMENT

As shown on the Architectural Site Plan, the proposed development will consist of a new two-story senior housing building with a building footprint of 1302m^2 and 38 units. The proposal will also include parking spaces, concrete sidewalks, concrete curbs, pedestrian pathways, and new vehicle access from Doctor Leach Drive.

The site grading will match the existing conditions along the property lines of the subject site.

The client confirmed there's no timeline for future development on the north side of the site, but a 4-storey building could be foreseen. An estimated 76 units was used as a baseline to evaluate the servicing feasibility which will be discussed further in this report.

5.0 STORMWATER MANAGEMENT PLAN

Drawing C106 and **C107**, appended to this report, depicts the boundaries of the pre- and post-development drainage areas and should be read in conjunction with this report.

The design approach for stormwater management is to ensure that the post-development peak flows do not exceed the existing release rate flow or negatively impact the property's existing storm sewer network.

The proposed development area in red mentioned in **Figure 1** and half of the existing building site will be controlled via on-site control measures and the 100-year and 5-year post-development flows are to be controlled to the 2-year pre-development flow.

The allowable release rate was calculated based on the following:

- Runoff Coefficient (C) = 0.20
- Drainage Area (A) = 0.70 ha
- Time of concentration (Tc) based on the Airport Method equation.

Airport Method equation: $Tc = 3.26 \times (1.1 - C) \times L^{0.5}/S^{0.3}$

Where:

Tc = time of concentration (min)

C = runoff coefficient

L = Length of flow (m)

S = slope of watershed (%)

The time of concentration was calculated for every existing sub-watershed identified on **Drawing C106**.

The average time of concentration for the existing site is **13.56 min**, therefore each watershed existing time of concentration was used instead of assuming 10 min to calculate the allowable release rate.

The Rational Method formula has been used to calculate stormwater runoff and rainfall data is based on the IDF curve equations from the *Ottawa Sewer Design Guidelines, Second Edition, October 2012.*

Q = 2.78 CIA, where:	Q = Flow rate (L/s) C = Runoff coefficient I = Rainfall intensity (mm/hr) A = Area (ha)
Rainfall intensity:	$I_2 = 732.951 / (Tc + 6.199)^{0.810}$

Using the Rational Method formula and the above parameters, the allowable post-development release rate for this site is **25.0 L/s**.

5.1 Pre-Development Conditions

Based on the topographical survey received, the site where the proposed building is located was separated into 6 watersheds with a highpoint directly in the middle of the site where an abandoned septic bed used to be. Four watershed slopes West towards the existing ditch along Doctor Leach Drive and the remaining slopes northeast, where the stormwater is captured by an existing storm sewer system.

The drainage area of 0.70 includes a portion of the existing building roof on 5581 Doctor Leach Dr. As per the topographic survey, the south side of the building is sloped towards the new property as well as the downspout which outlets to the surface. Hence, considering its gable roof style, half of the roof was taken into the pre- and post- development.

5.2 Post-Development Conditions

The following is a description of each drainage area through the site, refer to **Drawing C106** attached to this report for the more details and exact location.

- WS-01 is uncontrolled draining on Doctor Leach Dr. open ditch due to existing trees and grading which need to remain as existing conditions.
- WS-02 is uncontrolled draining Northeast to match proposed back of concrete curb and existing property line.
- WS-03 is the driving entrance and parking lot.
- WS-04 is a portion of the existing building and half of the proposed building draining to multiple rear yard catch basin
- WS-05 is located at the back of the proposed building with a portion of the proposed building roof and two rear yard catch basins.
- WS-06 is located at the back of the proposed building with a portion of the existing building roof and a grass area draining to a rear yard catch basin.
- WS-07 is located west of the parking with a swale draining into a ditch inlet maintenance hole.

Runoff from the proposed sloped roof which has no storage area will be directed into gutters and downspouts connected directly into storm pipe surrounding the building. Runoff on the property from areas outside the boundaries of the drainage areas will continue to drain as they had prior to this development and will undergo no changes.

For the purpose of calculating the average runoff coefficients for the post-development areas, the following guidelines were used:

- Landscaped surfaces (grass, trees, shrubs, etc.) C = 0.20
- Impervious surfaces (asphalt, concrete, pavers, rooftops, etc.) C = 0.90
- The runoff coefficient for 100-year event is increased by 25% based on the Ottawa Sewer Design Guidelines.

Appendix A "Stormwater Management Calculations'" provides a summary of the post-development areas and average runoff coefficients.

An ICD is required to control the flows from the site to the allowable release rate of 22.2 L/s. Due to WS-04 and WS-05 being uncontrolled, their flow generated was removed and the allowable release rate was reduced to 16.4 L/s. Additionally, the allowable release flow rate was reduced by 50% since surface runoff and underground storage were not modelled, hence the ICD will require to control a maximum flow release rate of **8.2L/s**. Based on this controlled release rate, the required storage to attenuate the 5-year and 100-year post-development flow has been calculated to be **108.4 m³** and **248.7 m³**, respectively. The calculations are shown in **Appendix A**.

Storage requirements to attenuate the post-development flow rates are given below:

i. 5-year site storage requirements

The 5-year post-development flow will be captured within the piped storm system and subsurface storage system. Below grade storage will be provided within the on-site storm piping and related storm structures. The design will utilize **114.9 m³** of the subsurface storage. All storm sewer pipes are in free flow condition under the 5-year storm event.

ii. 100-year site storage requirements

The 100-year post-development flow will be captured within the SWM system with use of sub-surface storage. Below grade storage will be provided within the on-site storm piping and related storm structures. The design will require **268.7 m³** of the subsurface storage.

The proposed underground subsurface stormwater management system will be MC-3500 by StormTech or equivalent. The underground storage chamber will provide an equivalent storage capacity of **268.7 m³** or more. See design reference table in **Appendix A**.

As shown in **Appendix B**, during a 100-year event, a few pipes are identified as over capacity. However, these overcharged pipes will not cause surface ponding, as the increase in upstream structure HGL will only range between 0.01m and 0.09m, which is below all top of grate elevation.

To control the total discharge within the piped system to the identified flow rate of **6.1 L/s**, an ICD will be installed on the outlet pipe upstream of the monitoring maintenance hole. The design head was calculated as the delta in height between the center of the ICD and the top of the underground storage chambers which is equivalent to the 100-year storage elevation. See **Appendix A** for detailed pipe outlet calculations and **Drawing C102** for ICD detail.

The **Table 1** lists all the requirements for the manufacturer to design the appropriate ICD.

Table 1: ICD Schedule

ICD ID	Location	Outlet Diameter (mm)	Flow 5-yr/100-yr (l/s)	Head 5-yr/100-yr (m)	Equivalent Diameter (mm)	Model
01	DI-MH-STM-05	375	4.3 / 6.1	0.89 / 1.85	45	VORTEX TYPE

iii. 100-year + 20% Stress Test

The 100-year + 20% stress test event can also be conveyed by the proposed storm sewer system without surface ponding. As shown in **Appendix B**, the sewers that are over capacity only cause an HGL increase of between 0.03 m and 0.23 m in the upstream structures, indicating that water will not pond at the surface based solely on pipe capacity and structure height.

However, due to the restricted flow of 6.1 L/s by the ICD in DI-MH-STM-05 and the underground storage chambers, water will pond at the surface from CB-MH-02 and DI-MH-STM-05 during the 100-year + 20% event.

DI-MH-STM-05 is located in WS-10 where water would pond into the proposed swale and flow northeast once an HGL elevation of 89.89m is reached. This critical elevation of 89.89m is 0.86m below the proposed building finish grade.

CB-MH-02 located in the northeast corner of WS-06 would also overflow and pond in the proposed parking lot until water reach a height of 0.15m and overtop the curb to drain northeast. For water to overtop the curb, HGL in WS-06 must reach and elevation of 89.92m which is 0.83m below the proposed building floor.

Hence, both HGL elevations of 89.89m and 89.92m are below all other top of grate elevations in other watershed on site. Both overland flow route mentioned above are also going north toward the MH-STM-06 and existing MHST05422 which is located on existing property and follow the pre-development overland flow path.

6.0 STORM SEWERS AND SWM SYSTEM

6.1 Storm Sewers

Calculations showing the storm sewer capacities are appended to this report under **Appendix B** "Storm Sewer Computation Forms". The storm sewer design spreadsheet is based on the Rational Method and Manning formula and was used to calculate the design flow and required pipe sizes. Capacity required for proposed storm sewers is based on the 5-year rainfall intensity obtained from the Ottawa Sewer Design Guidelines, where T_c is the time of concentration:

- I_5 (mm/hr) = $998.071/(T_c+6.053)^{0.814}$

Drawing C107 shows the proposed drainage areas. Details including pipe lengths, sizes, materials, inverts elevations and structure types are shown on **Drawing C102**.

6.2 SWM System

As mentioned above, the SWM system includes an ICD in DI-MH-STM-05 that will control the flow to a maximum of **6.1 L/s**. Any additional flow will be store on-site using underground storage chambers. The site stormwater runoff ultimately discharges to the Rideau River. A combination of an oil/grit separator (OGS-01), and the "isolator row" from the underground subsurface stormwater management system chambers will provide the required 80% TSS removal. The underground storage chambers were proposed with an inlet and outlet to obligate runoff water from the asphalt lane & parking lot to filter through the isolator row. ETV Certifications for StromTech Isolator Row Plus (ID: V-2020-10-01) can be found in **Appendix E.**. ETV Certification for the Stormceptor EFO by Imbrium (ID: GPS-ETV_VR2023-11-15_Imbrium-SC) can be found in **Appendix D**.

6.3 Downstream Storm Sewer Capacity & Future Development

As requested by the city of Ottawa, an analysis of the downstream capacity for the existing storm sewer was performed. As per the information collected on site and flows obtained by the City of Ottawa model, the existing main storm sewer will be able to capture the new flows generated by this site without being overcapacity. As shown in **Appendix B** the site outlets into MHST05422 and all next three downstream pipes analyzed still have capacity for the 5-yr and 100-yr storm event. The pipe diameters were confirmed on site by Parsons and where slope was not available from City of Ottawa data, the minimum allowable slope of 0.1% as per the Ottawa Sewer Design Guidelines was assumed to estimate pipe capacity.

Table 2: Existing Downstream Pipe Capacity

Downstream Maintenance Hole ID	Upstream Maintenance Hole ID	Pipe ID	Pipe Capacity (L/s)	Pipe % Full Flow 2-yr Event	Pipe % Full Flow 100-yr Event
MHST05422	MHST05423	STM45741	1286	16 %	21 %
MHST05423	MHST39981	STM45718	1286	16 %	28 %
MHST39981	MHST39982	STM45719	2406	15 %	76 %

As shown in **Drawing C108** the future site will have a new connection onto the city's storm sewer system analyzed above. Currently, all surface water runoff from this site is collected by catch basins connected directly into the city storm sewer system. Hence, this future site will need a stormwater management plan with on-site storage and ICD to control storm water release rate into the existing city storm sewer system. These future modifications would therefore reduce the % of pipe full flow showed above and not overcharge the city storm sewer system.

7.0 SANITARY SEWER

The new residential units and the existing residential building within the proposed development will be served with a new on-site sanitary system. The existing 150mmØ sanitary sewer pipe has an estimated length of 130m with two long radius elbow and no maintenance hole. SAN-MH-03 will be replacing the first long radius elbow near the existing building and connecting the new building as well. The new 150mm sanitary sewer at 1.0% from the new building will continue at a new elevation until it reaches the existing pipe elevation. No long radius elbow shall be used for horizontal bend, maintenance hole will be installed for turning. The peak sanitary flow for the proposed development is calculated to be **1.69 L/s**, including infiltration. The sanitary load calculations can be found in **Appendix C**.

Details concerning pipe length, material, and elevation are shown on **Drawing C102**.

As per previous records, the septic bed which used to serve sanitary flows from the existing senior residence at 5581 Doctor Leach Drive was abandoned but not fully removed. The approximate location is shown on the removal plan **Drawing C101**. The septic will need to be decommissioned as per the Ottawa Septic System Office (OSSO). Any parts of the existing septic bed located within the proposed building will need removed, backfilled, and compacted as per geotechnical & structural engineer specification. Other part of the existing septic that will be in the proposed landscape area can be removed and backfilled aper OSSO requirements.

7.1 Downstream Sanitary Sewer Capacity & Future Development

As mentioned in section 4.0 Proposed Development, the clients are anticipating a future 4-storey building with approximately 76 units in the north portion of the lot. With that being said, an additional maintenance hole would be added downstream while the same connection on the 525mmØ concrete pipe on Eastman Ave. would remain.

As shown in **Appendix C** the resulting peak flow then becomes 3.44 L/s going into the 525mmØ concrete pipe on Eastman Ave. due to an additional four-story residence generating 1.75 L/s. As per the City of Ottawa, the downstream pipe after the 525mmØ (SAN60623) connected to MHSA59271 is a 600mmØ PVC pipe. The city of Ottawa reported that pipe SAN60624 of 600mmØ possess an existing peak flow of 19L/s. The existing building, proposed 2-storey building and future 4-storey building would eventually generate a peak flow of 3.44 L/s which mean the 600mmØ would have a total peak flow of 22.44L/s. As per the city of Ottawa Wastewater Networks Map, this 600mmØ concrete main sanitary sewer pipe has an approximate slope of 0.18% which means the full capacity is 271L/s. Hence, with the full development completed, the sanitary sewer pipe downstream would only be at 8% capacity for peak flow.

However, the downstream Manotick Pumping Station is at capacity and is set to be upgraded in 2029 as part of the City of Ottawa Infrastructure Master Plan. The future development in the north portion of the lot set to generate approximately 1.75 L/s shall not be constructed until the Manotick Pumping Station upgrade is completed.

8.0 WATER SERVICING

The site is to be serviced by a new 50 mm diameter water service line that will connect to the existing 150 mm diameter watermain located on Doctor Leach Drive. The water demands for the proposed building are listed in **Table 3**. The fire flow was calculated using the Fire Underwriters Survey (FUS, 2020) method. Calculation details can be found in **Appendix C** and the boundary conditions received from the City of Ottawa on May 31st, 2023 are shown in **Appendix F**.

Table 3: Building Water Demands and Fire Flow

	Average Daily Demand (L/s)	Max Daily Demand (L/s)	Peak Hourly Demand (L/s)	Fire Flow Demand (L/s)	Max Daily + Fire Flow Demand (L/s)
Senior Residence					
Bachelor	0.03	0.17	0.25		
One Bedroom	0.16	0.78	1.18		
Two Bedroom	0.03	0.17	0.25		
Total	0.23	1.11	1.68	200	201.11

Based on the information received, the average day demand has a pressure in the system over 550 kPa (80 psi) meaning the building water connection will require water pressure reducing valve installed directly downstream of the water meter inside the building.

As per Technical Bulletin ISTB-2018-02, the maximum fire hydrant flow from a class AA hydrant within 75m of the building is 95 L/s and between 75m to 150m, 63 L/s. As shown in the **Figure 2**, there's two hydrants within 75m and two hydrants within 150m of the proposed building. A total of 316 L/s can be provided, which exceeds the 200 L/s fire flow demand calculated in **Table 3.** With that being said, the existing watermain and surrounding fire hydrants will be able to provide domestic and fire flow demands while maintaining adequate pressure in the system.

Figure 2 - Fire Hydrant Location

9.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

To mitigate the impacts due to erosion and sedimentation during construction, erosion and sediment control measures should be installed and maintained throughout the duration of construction.

Measures shall only be removed once the construction activities are complete, and the site has stabilized.

The measures will include:

- Siltsack® shall be installed between the frame and cover of existing and new catchbasins and maintenance holes, to minimize sediments entering the storm drainage system.
- All grassed areas must be completed prior to the removal of the Siltsack® in catch basins and maintenance holes.
- Light Duty Silt Fence Barriers placed around the perimeter of the site where necessary, installed and maintained according to OPSS 577 and OPSD 219.110.
- Straw Bale check dam must be installed in existing open ditch on Doctor Leach Dr. of downstream of the site as per OPSD 219.180.

Location of silksack, silt fence and straw bale check dam are shown in **Drawing C101**.

10.0 CONCLUSIONS

Stormwater flows from the site will be controlled to a flow of **4.3 L/s** for 5-year and **6.1 L/s** for 100-year events. Stormwater storage is provided up to and including the 100-year storm in an underground SWM chamber prior to discharging to the municipal storm sewer system. Stormwater quality treatment will be provided onsite by an oil and grit and isolator row from the underground storage chambers. Existing city downstream storm sewer pipe capacity will also not be overcapacity with these flows mentioned above. The future site development of 76-units will also be connected to the same existing city downstream storm sewer but will need its own site stormwater management plan which will reduce uncontrolled runoff water currently going in the storm sewer.

The water servicing will be provided by a new 50mm water service line from the 150mm watermain on Doctor Leach Drive.

The sanitary service of the proposed building, including the existing building will be provided by constructing a new sewer line north towards Eastman Ave. The peak sanitary flow for the existing and proposed building, including infiltration, is calculated to be **1.69 L/s**. The existing sanitary sewer is adequate to carry the additional sanitary load of the proposed project and future site development which will create a new peak sanitary flow of **3.44 L/s**.

Grading and drainage measures will ensure proper drainage of the site, while erosion and sediment control measures will minimize downstream impacts due to construction activities.

We look forward to receiving approval of this report and the appended plans from the City to proceed with construction of the site.

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Appendix A: Stormwater Management Calculations

TABLE Tc - EXISTING SITE TIME OF CONCENTRATION

Watershed Area No.	Upstream Elev	Downstream Elev	Length "L" (m)	Slope "S" %	Average C factor	Tc	Total Area (m^2)	Total Area (ha)
EWS-01	90.88	88.86	66.30	3.05	0.35	13.87	1910	0.191
EWS-02	91.46	88.92	56.50	4.50	0.20	13.43	1170	0.117
EWS-03	91.46	90.10	46.80	2.91	0.20	14.12	460	0.046
EWS-04	91.46	90.10	50.30	2.70	0.20	14.99	1090	0.109
EWS-05	91.43	90.31	31.70	3.53	0.20	10.89	390	0.039
EWS-06	91.46	90.25	54.00	2.24	0.33	14.09	1950	0.195
					Average Tc =	13.56	Total Area =	0.697

TABLE I - ALLOWABLE RUNOFF CALCULATIONS BASED ON EXISTING CONDITIONS

Area Description	Area (ha)	Time of Conc, Tc (min)	Minor Storm			
				I_2 (mm/hr)	C_{AVG}	Q_{ALLOW} (L/s)
EWS-01	0.19	13.87	Storm = 2 yr	64.56	0.20	**6.9**
EWS-02	0.12	13.43	Storm = 2 yr	65.74	0.20	**4.3**
EWS-03	0.05	14.12	Storm = 2 yr	63.94	0.20	**1.6**
EWS-04	0.11	14.99	Storm = 2 yr	61.80	0.20	**3.7**
EWS-05	0.04	10.89	Storm = 2 yr	73.54	0.20	**1.6**
EWS-06	0.20	14.09	Storm = 2 yr	64.00	0.20	**6.9**
	0.70	13.56				**25.0**

Total property area of 2.09 ha, impacted area of 0.70 ha.

2, 5-year Storm $C_{ASPH/ROOF/CONC}$ = 0.90 C_{GRASS} = 0.20

100-year Storm $C_{ASPH/ROOF/CONC}$ = 1.00 C_{GRASS} = 0.25

TABLE II - POST-DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Watershed Area No.	Impervious Areas (m^2)	A * C_{ASPH}	Pervious Areas (m^2)	A * C_{GRASS}	Sum AC	Total Area (m^2)	$C_{AVG\ (5yr)}$	$C_{AVG(100yr)}$
WS-01*	30.00	27	530.00	106	133	560	0.24	0.30
WS-02*	0.00	0	365.00	73	73	365	0.20	0.25
WS-03	1350.00	1215	247.00	49	1264	1597	0.79	0.99
WS-04	1159.00	1043	447.00	89	1133	1606	0.71	0.88
WS-05	538.00	484	354.00	71	555	892	0.62	0.78
WS-06	540.00	486	873.00	175	661	1413	0.47	0.58
WS-07	18.00	16	519.00	104	120	537	0.22	0.28
Total	3635		3335		3939	6970		

*Uncontrolled Areas

TABLE III - TOTAL RUNOFF COEFFICIENT FOR CONTROLLED AREAS

$C_{AVG(5yr)}$ = Sum AC / Total Area = **3,733 / 6,045** = **0.62** $C_{AVG(100yr)}$ = **0.77**

TABLE IV - SUMMARY OF POST-DEVELOPMENT RUNOFF

		Storm = 5 yr				Storm = 100 yr			
Area No	Area (ha)	I_5 (mm/hr)	$C_{AVG(5yr)}$	Q_{GEN} (L/s)	Q_{CONT} (L/s)	I_{100} (mm/hr)	$C_{AVG(100yr)}$	Q_{GEN} (L/s)	Q_{CONT} (L/s)
WS-01*	0.056	104.19	0.24	3.85	**3.9**	178.56	0.30	8.3	**8.3**
WS-02*	0.037	104.19	0.20	2.11	**2.1**	178.56	0.25	4.5	**4.5**
WS-03	0.160	104.19	0.79	36.62		178.56	0.99	78.5	
WS-04	0.161	104.19	0.71	32.80		178.56	0.88	70.3	
WS-05	0.089	104.19	0.62	16.08	**4.3**	178.56	0.78	34.4	**12.3**
WS-06	0.141	104.19	0.47	19.13		178.56	0.58	41.0	
WS-07	0.054	104.19	0.22	3.48		178.56	0.28	7.4	
Total	0.697			114.08	**10.2**			244.38	**25.0**

*Uncontrolled Areas

$I_5 = 998.071 / (Tc+6.053)^{0.814}$

$I_{100} = 1735.688 / (Tc+6.014)^{0.820}$

Time of concentration (min), Tc = 10 mins

Table V - Storage Volumes (5-Year and 100-Year Storm Events)

Site Storage Requirement

C_{AVG} = 0.62 (5-year)
C_{AVG} = 0.77 (100-year)
Time Interval = 5 (mins)
Drainage Area = 0.605 (hectares)

*Release flow rate reduced to 50% of allowable since surface runoff and underground storage were not modelled

	Release Rate = 4.3 (L/sec)						*Release Rate = 6.1 (L/sec)					
	Return Period = 5 (years)						Return Period = 100 (years)					
	IDF Parameters, A = 998.071 , B = 0.814						IDF Parameters, A = 1735.688 , B = 0.820					
	$I = A/(T_c+6.053)^B$						$I = A/(T_c+6.014)^B$					
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Peak Flow from Roof (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Peak Flow from Roof (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-	-	-
5	141.2	146.5	-	4.3	142.2	42.7	242.7	314.8	-	6.1	308.7	92.6
10	104.2	108.1	-	4.3	103.9	62.3	178.6	231.6	-	6.1	225.5	135.3
15	83.6	86.7	-	4.3	82.5	74.2	142.9	185.3	-	6.1	179.2	161.3
20	70.3	72.9	-	4.3	68.6	82.4	120.0	155.6	-	6.1	149.4	179.3
25	60.9	63.2	-	4.3	58.9	88.4	103.8	134.7	-	6.1	128.6	192.8
30	53.9	56.0	-	4.3	51.7	93.1	91.9	119.2	-	6.1	113.0	203.4
35	48.5	50.3	-	4.3	46.1	96.8	82.6	107.1	-	6.1	101.0	212.0
40	44.2	45.8	-	4.3	41.6	99.8	75.1	97.5	-	6.1	91.3	219.2
45	40.6	42.2	-	4.3	37.9	102.3	69.1	89.6	-	6.1	83.4	225.3
50	37.7	39.1	-	4.3	34.8	104.5	64.0	83.0	-	6.1	76.8	230.5
55	35.1	36.4	-	4.3	32.2	106.2	59.6	77.3	-	6.1	71.2	235.0
60	32.9	34.2	-	4.3	29.9	107.8	55.9	72.5	-	6.1	66.4	238.9
65	31.0	32.2	-	4.3	28.0	109.1	52.6	68.3	-	6.1	62.2	242.4
70	29.4	30.5	-	4.3	26.2	110.2	49.8	64.6	-	6.1	58.4	245.5
75	27.9	28.9	-	4.3	24.7	111.1	47.3	61.3	-	6.1	55.2	248.2
80	26.6	27.6	-	4.3	23.3	111.9	45.0	58.4	-	6.1	52.2	250.7
85	25.4	26.3	-	4.3	22.1	112.6	43.0	55.7	-	6.1	49.6	252.9
90	24.3	25.2	-	4.3	21.0	113.1	41.1	53.3	-	6.1	47.2	254.8
95	23.3	24.2	-	4.3	19.9	113.6	39.4	51.1	-	6.1	45.0	256.6
100	22.4	23.3	-	4.3	19.0	114.0	37.9	49.2	-	6.1	43.0	258.2
105	21.6	22.4	-	4.3	18.1	114.3	36.5	47.3	-	6.1	41.2	259.6
110	20.8	21.6	-	4.3	17.4	114.5	35.2	45.7	-	6.1	39.5	260.9
115	20.1	20.9	-	4.3	16.6	114.7	34.0	44.1	-	6.1	38.0	262.0
120	19.5	20.2	-	4.3	15.9	114.8	32.9	42.7	-	6.1	36.5	263.0
125	18.9	19.6	-	4.3	15.3	114.9	31.9	41.3	-	6.1	35.2	264.0
130	18.3	19.0	-	4.3	14.7	114.9	30.9	40.1	-	6.1	33.9	264.8
135	17.8	18.4	-	4.3	14.2	114.9	30.0	38.9	-	6.1	32.8	265.5
140	17.3	17.9	-	4.3	13.7	114.8	29.2	37.8	-	6.1	31.7	266.1
145	16.8	17.4	-	4.3	13.2	114.7	28.4	36.8	-	6.1	30.6	266.6
150	16.4	17.0	-	4.3	12.7	114.5	27.6	35.8	-	6.1	29.7	267.1
155	15.9	16.5	-	4.3	12.3	114.4	26.9	34.9	-	6.1	28.8	267.5
160	15.6	16.1	-	4.3	11.9	114.1	26.2	34.0	-	6.1	27.9	267.8
165	15.2	15.8	-	4.3	11.5	113.9	25.6	33.2	-	6.1	27.1	268.1
170	14.8	15.4	-	4.3	11.1	113.6	25.0	32.4	-	6.1	26.3	268.3
175	14.5	15.0	-	4.3	10.8	113.3	24.4	31.7	-	6.1	25.6	268.5
180	14.2	14.7	-	4.3	10.5	113.0	23.9	31.0	-	6.1	24.9	268.6
185	13.9	14.4	-	4.3	10.1	112.7	23.4	30.3	-	6.1	24.2	268.7
190	13.6	14.1	-	4.3	9.8	112.3	22.9	29.7	-	6.1	23.6	268.7
195	13.3	13.8	-	4.3	9.6	111.9	22.4	29.1	-	6.1	23.0	268.6
200	13.0	13.5	-	4.3	9.3	111.5	22.0	28.5	-	6.1	22.4	268.6
205	12.8	13.3	-	4.3	9.0	111.0	21.6	28.0	-	6.1	21.8	268.4
210	12.6	13.0	-	4.3	8.8	110.6	21.1	27.4	-	6.1	21.3	268.3
215	12.3	12.8	-	4.3	8.5	110.1	20.8	26.9	-	6.1	20.8	268.1
220	12.1	12.6	-	4.3	8.3	109.6	20.4	26.4	-	6.1	20.3	267.9
225	11.9	12.3	-	4.3	8.1	109.1	20.0	26.0	-	6.1	19.8	267.6
230	11.7	12.1	-	4.3	7.9	108.6	19.7	25.5	-	6.1	19.4	267.3
Max =						**114.8**						**268.7**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I_5 = A/(Tc+6.053)^B$ & $I_{100} = A/(Tc+6.014)^B$
3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximium Storage = Max Storage Over Duration

ICD Design Table - VI

$Q = 0.62 \times A \times [2gh]^{0.5}$ where: g= 9.81

Location	Pipe Outlet Diameter (mm)	Pipe Outlet Invert (m)	HGL (m)		Outlet flow (L/s)		Trial orifice size (mm)	Orifice size (mm)	Orifice Area (sqm)	Head (m)	
			100-year event	5-year event	100-year event	5-year event				100-year event	5-year event
DI-MH-STM-05	375	87.13	89.00	88.04	6.1	4.3	**45**	45.74	0.00164	1.85	0.89

Appendix B: Storm and Sanitary Sewer Computation Forms

STORM SEWER COMPUTATION FORM - CITY DOWNSTREAM CAPACITY

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

City of Ottawa IDF Curve - 2yr

I_2 = 732.951 / (Tc+6.199) ^ 0.810

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Existing Flow Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
	OGS-01	*MHST-05422*								4.25	375	381	1.50	3.4	224.02	1.96	0.73	0.03	0.02	
	MHST-05421	*MHST-05422*							**198.00**	198.00	1200	1219	*0.10*	51.5	1286.19	1.10	0.66	0.78	0.15	Pipe ID: STM 45740
	MHST-05422	*MHST-05423*							**197.00**	201.25	1200	1219	*0.10*	28.5	1286.19	1.10	0.67	0.43	0.16	Pipe ID: STM 45741
	MHST-05423	*MHST-39981*							**197.00**	201.25	1200	1219	*0.10*	19.0	1286.19	1.10	0.67	0.29	0.16	Pipe ID: STM 45718
	MHST-05284	*MHST-39981*							**164.00**	164.00	900	914	0.38	78.5	1164.20	1.77	1.05	0.74	0.14	STM water from subdivision South West of Doctor Leach
	MHST-39981	*MHST-39982*							**361.00**	365.25	1200	1219	0.35	88.5	2406.24	2.06	1.24	0.72	0.15	Pipe ID: STM 45719
	MHST-39982	*MHST-39983*									1200	1219								
	MHST-39983	*MHST-39984*									1200	1219								
	MHST-39984	*OUT-04241*									1200	1219								

Note: "*0.10*" number is assuming worst condition since slope of pipes are not availables.
Existing Flows were obtained by the City of Ottawa models
Peak Flow represent the existing flow + peak flow from site development

Design: P. Charlebois
Check: M. Theiner

Date: Feb-26

Project: Manotick Affordable Seniors Residences
5581 Doctor Leach Dr. Manotick Ontario

Client: CLV Group

STORM SEWER COMPUTATION FORM - CITY DOWNSTREAM CAPACITY

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

City of Ottawa IDF Curve - 100yr

I_{100} = 1735.688/(Tc+6.014) ^ 0.820

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Existing Flow Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
	OGS-01	*MHST-05422*								6.13	375	381	1.50	3.4	224.02	1.96	0.81	0.03	0.03	
	MHST-05421	*MHST-05422*							**287.00**	287.00	1200	1219	*0.10*	51.5	1286.19	1.10	0.74	0.78	0.22	Pipe ID: STM 45740
	MHST-05422	*MHST-05423*							**268.00**	274.13	1200	1219	*0.10*	28.5	1286.19	1.10	0.73	0.43	0.21	Pipe ID: STM 45741
	MHST-05423	*MHST-39981*							**351.00**	357.13	1200	1219	*0.10*	19.0	1286.19	1.10	0.78	0.29	0.28	Pipe ID: STM 45718
	MHST-05284	*MHST-39981*							**1418.00**	1418.00	900	914	0.38	78.5	1164.20	1.77	1.84	0.74	1.22	STM water from subdivision South West of Doctor Leach Dr.
	MHST-39981	*MHST-39982*							**1819.00**	1825.13	1200	1219	0.35	88.5	2406.24	2.06	2.00	0.72	0.76	Pipe ID: STM 45719
	MHST-39982	*MHST-39983*									1200	1219								
	MHST-39983	*MHST-39984*									1200	1219								
	MHST-39984	*OUT-04241*									1200	1219								

Note: "*0.10*" number is assuming worst condition since slope of pipes are not availables.
Existing Flows were obtained by the City of Ottawa models
Peak Flow represent the existing flow + peak flow from site development

Design: P. Charlebois
Check: M. Theiner

Date: Feb-26

Project: Manotick Affordable Seniors Residences
5581 Doctor Leach Dr. Manotick Ontario

Client: CLV Group

STORM SEWER COMPUTATION FORM

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

City of Ottawa IDF Curve - 5yr

I_5 = 998.071 / (Tc+6.053) ^ 0.814

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Roof Flow Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
	RY-CB-01	RY-CB-02	0.030	0.71	0.06	0.06	10.00	104.19		6.13	250	254	0.75	15.4	53.73	1.06	0.59	0.24	0.11	
	RY-CB-02	RY-CB-03	0.030	0.71	0.06	0.12	10.24	102.94		12.11	250	254	0.75	17.8	53.73	1.06	0.72	0.28	0.23	
	RY-CB-03	RY-CB-04	0.017	0.71	0.03	0.15	10.52	101.52		15.28	250	254	0.75	12.4	53.73	1.06	0.75	0.20	0.28	
WS-04	RY-CB-04	RY-CB-05	0.017	0.71	0.03	0.18	10.72	100.54		18.43	250	254	0.75	10.8	53.73	1.06	0.80	0.17	0.34	
	RY-CB-05	RY-CB-06	0.017	0.71	0.03	0.22	10.89	99.72		21.56	250	254	0.75	13.8	53.73	1.06	0.84	0.22	0.40	
	RY-CB-06	RY-CB-07	0.017	0.71	0.03	0.25	11.11	98.67		24.58	250	254	0.75	10.3	53.73	1.06	0.88	0.16	0.46	
	RY-CB-07	RY-CB-08	0.017	0.71	0.03	0.28	11.27	97.93		27.61	250	254	0.75	11.9	53.73	1.06	0.90	0.19	0.51	
	RY-CB-08	CB-MH-01	0.017	0.71	0.03	0.31	11.46	97.07		30.56	250	254	0.85	9.2	57.20	1.13	0.97	0.14	0.53	
WS-05	RY-CB-09	RY-CB-10	0.045	0.62	0.08	0.08	10.00	104.19		8.04	250	254	1.00	21.0	62.04	1.22	0.71	0.29	0.13	
	RY-CB-10	RY-CB-11	0.045	0.62	0.08	0.15	10.29	102.69		15.84	250	254	1.00	17.3	62.04	1.22	0.86	0.24	0.26	
WS-06	RY-CB-11	DI-MH-STM-05	0.141	0.47	0.18	0.34	10.53	101.47		34.29	250	254	1.00	23.1	62.04	1.22	1.07	0.31	0.55	
	CB-01	CB-MH-01	0.064	0.79	0.14	0.14	10.00	104.19		14.59	200	203	2.00	4.9	48.39	1.49	1.07	0.05	0.30	
WS-03	CB-MH-01	CB-MH-02	0.020	0.79	0.04	0.50	11.60	96.44		48.13	300	305	1.00	73.6	100.88	1.38	1.16	0.89	0.48	
	CB-MH-02	MH-STM-03	0.076	0.79	0.17	0.67	12.49	92.65		61.74	375	381	1.00	3.3	182.91	1.60	1.20	0.03	0.34	
	MH-STM-03	MH-STM-04				0.67	12.52	92.53												Chambers are connecting MH-STM-03 to MH-STM-04
	MH-STM-04	DI-MH-STM-05				0.67	12.52	92.53		61.66	375	381	1.00	15.3	182.91	1.60	1.20	0.16	0.34	
WS-07	DI-MH-STM-05	OGS-01	0.054	0.28	0.04	1.05	12.68	91.89		96.11	375	381	1.00	13.0	182.91	1.60	1.38	0.14	0.53	
	OGS-01	MH-STM-06				1.05	12.82	91.33		95.53	375	381	1.00	24.9	182.91	1.60	1.38	0.26	0.52	
	MH-STM-06	*MHST-05422*				1.05	13.08	90.32		94.47	375	381	1.00	3.4	182.91	1.60	1.38	0.04	0.52	

Note:

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Check: M. Theiner

Date: Feb-26

Project: Manotick Affordable Seniors Residences
5581 Doctor Leach Dr. Manotick Ontario

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STORM SEWER COMPUTATION FORM

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

City of Ottawa IDF Curve - 100yr

I_{100} = 1735.688/(Tc+6.014) ^ 0.820

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Roof Flow Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
	RY-CB-01	RY-CB-02	0.030	0.88	0.07	0.07	10.00	178.56		13.13	250	254	0.75	15.4	53.73	1.06	0.72	0.24	0.24	
	RY-CB-02	RY-CB-03	0.030	0.88	0.07	0.15	10.24	176.39		25.93	250	254	0.75	17.8	53.73	1.06	0.89	0.28	0.48	
	RY-CB-03	RY-CB-04	0.017	0.88	0.04	0.19	10.52	173.94		32.72	250	254	0.75	12.4	53.73	1.06	0.95	0.20	0.61	
WS-04	RY-CB-04	RY-CB-05	0.017	0.88	0.04	0.23	10.72	172.23		39.48	250	254	0.75	10.8	53.73	1.06	1.02	0.17	0.73	
	RY-CB-05	RY-CB-06	0.017	0.88	0.04	0.27	10.89	170.81		46.17	250	254	0.75	13.8	53.73	1.06	1.06	0.22	0.86	
	RY-CB-06	RY-CB-07	0.017	0.88	0.04	0.31	11.11	169.01		52.63	250	254	0.75	10.3	53.73	1.06	1.10	0.16	0.98	
	RY-CB-07	RY-CB-08	0.017	0.88	0.04	0.35	11.27	167.73		59.12	250	254	0.75	11.9	53.73	1.06	1.10	0.19	1.10	0.90% - 0.75% = 0.08% * 11.9m = 0.02m increased in HGL
	RY-CB-08	CB-MH-01	0.017	0.88	0.04	0.39	11.46	166.23		65.42	250	254	0.85	9.2	57.20	1.13	1.17	0.14	1.14	1.11% - 0.85% = 0.18% * 9.20m = 0.02m increased in HGL
WS-05	RY-CB-09	RY-CB-10	0.045	0.78	0.10	0.10	10.00	178.56		17.22	250	254	1.00	21.0	62.04	1.22	0.87	0.29	0.28	
	RY-CB-10	RY-CB-11	0.045	0.78	0.10	0.19	10.29	175.95		33.93	250	254	1.00	17.3	62.04	1.22	1.07	0.24	0.55	
WS-06	RY-CB-11	DI-MH-STM-05	0.141	0.58	0.23	0.42	10.53	173.85		73.44	250	254	1.00	23.1	62.04	1.22	1.27	0.31	1.18	1.40% - 1.00% = 0.30% * 23.1m = 0.09m increased in HGL
	CB-01	CB-MH-01	0.064	0.99	0.17	0.17	10.00	178.56		31.24	200	203	2.00	4.9	48.39	1.49	1.37	0.05	0.65	
WS-03	CB-MH-01	CB-MH-02	0.020	0.99	0.06	0.62	11.60	165.15		103.02	300	305	1.00	73.6	100.88	1.38	1.44	0.89	1.02	
	CB-MH-02	MH-STM-03	0.076	0.99	0.21	0.83	12.49	158.60		132.10	375	381	1.00	3.3	182.91	1.60	1.54	0.03	0.72	
	MH-STM-03	MH-STM-04				0.83	12.52	158.39												Chambers are connecting MH-STM-03 to MH-STM-04
	MH-STM-04	DI-MH-STM-05				0.83	12.52	158.39		131.93	375	381	1.00	15.3	182.91	1.60	1.54	0.16	0.72	
WS-07	DI-MH-STM-05	OGS-01	0.054	0.28	0.04	1.30	12.68	157.28		204.00	375	381	1.00	13.0	182.91	1.60	1.67	0.14	1.12	1.24% - 1.00% = 0.15% * 13.0m = 0.03m increased in HGL
	OGS-01	MH-STM-06				1.30	12.82	156.32		202.76	375	381	1.00	24.9	182.91	1.60	1.67	0.26	1.11	1.22% - 1.00% = 0.13% * 24.9m = 0.05m increased in HGL
	MH-STM-06	*MHST-05422*				1.30	13.08	154.57		200.49	375	381	1.00	3.4	182.91	1.60	1.67	0.04	1.10	1.20% - 1.00% = 0.10% * 3.4m = 0.01m increased in HGL

Note:

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STORM SEWER COMPUTATION FORM

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

City of Ottawa IDF Curve - 100yr + 20%

I_{100} = 1735.688/(Tc+6.014) ^ 0.820 + 20%

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Roof Flow Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
WS-04	RY-CB-01	RY-CB-02	0.030	0.88	0.07	0.07	10.00	214.27		15.75	250	254	0.75	15.4	53.73	1.06	0.76	0.24	0.29	
	RY-CB-02	RY-CB-03	0.030	0.88	0.07	0.15	10.24	211.67		31.12	250	254	0.75	17.8	53.73	1.06	0.94	0.28	0.58	
	RY-CB-03	RY-CB-04	0.017	0.88	0.04	0.19	10.52	208.73		39.26	250	254	0.75	12.4	53.73	1.06	1.02	0.20	0.73	
	RY-CB-04	RY-CB-05	0.017	0.88	0.04	0.23	10.72	206.68		47.37	250	254	0.75	10.8	53.73	1.06	1.07	0.17	0.88	
	RY-CB-05	RY-CB-06	0.017	0.88	0.04	0.27	10.89	204.98		55.40	250	254	0.75	13.8	53.73	1.06	1.10	0.22	1.03	
	RY-CB-06	RY-CB-07	0.017	0.88	0.04	0.31	11.11	202.81		63.15	250	254	0.75	10.3	53.73	1.06	1.10	0.16	1.18	1.04% - 0.75% = 0.08% * 10.3m = 0.03m increased in HGL
	RY-CB-07	RY-CB-08	0.017	0.88	0.04	0.35	11.27	201.27		70.94	250	254	0.75	11.9	53.73	1.06	1.10	0.19	1.32	1.30% - 0.75% = 0.08% * 11.9m = 0.07m increased in HGL
	RY-CB-08	CB-MH-01	0.017	0.88	0.04	0.39	11.46	199.48		78.50	250	254	0.85	9.20	57.20	1.13	1.17	0.14	1.37	1.59% - 0.85% = 0.18% * 9.20m = 0.07m increased in HGL
WS-05	RY-CB-09	RY-CB-10	0.045	0.78	0.10	0.10	10.00	214.27		20.66	250	254	1.00	21.0	62.04	1.22	0.91	0.29	0.33	
	RY-CB-10	RY-CB-11	0.045	0.78	0.10	0.19	10.29	211.14		40.72	250	254	1.00	17.3	62.04	1.22	1.14	0.24	0.66	
WS-06	RY-CB-11	DI-MH-STM-05	0.141	0.58	0.23	0.42	10.53	208.63		88.13	250	254	1.00	23.1	62.04	1.22	1.27	0.31	1.42	2.00% - 1.00% = 0.30% * 23.1m = 0.23m increased in HGL
WS-03	CB-01	CB-MH-01	0.064	0.99	0.17	0.17	10.00	214.27		37.49	200	203	2.00	4.9	48.39	1.49	1.45	0.05	0.77	
	CB-MH-01	CB-MH-02	0.020	0.99	0.06	0.62	11.60	198.18		123.63	300	305	1.00	73.6	100.88	1.38	1.44	0.89	1.23	
	CB-MH-02	MH-STM-03	0.076	0.99	0.21	0.83	12.49	190.32		158.53	375	381	1.00	3.3	182.91	1.60	1.62	0.03	0.87	
	MH-STM-03	MH-STM-04				0.83	12.52	190.07												Chambers are connecting MH-STM-03 to MH-STM-04
	MH-STM-04	DI-MH-STM-05				0.83	12.52	190.07		158.32	375	381	1.00	15.3	182.91	1.60	1.62	0.16	0.87	
WS-07	DI-MH-STM-05	OGS-01	0.054	0.28	0.04	1.30	12.68	188.74		244.80	375	381	1.00	13.0	182.91	1.60	1.67	0.14	1.34	1.79% - 1.00% = 0.15% * 13.0m = 0.10m increased in HGL
	OGS-01	MH-STM-06				1.30	12.82	187.59		243.31	375	381	1.00	24.9	182.91	1.60	1.67	0.26	1.33	1.77% - 1.00% = 0.13% * 24.9m = 0.19m increased in HGL
	MH-STM-06	*MHST-05422*				1.30	13.08	185.49		240.59	375	381	1.00	3.4	182.91	1.60	1.67	0.04	1.32	1.74% - 1.00% = 0.10% * 3.4m = 0.03m increased in HGL

Note:

Design: P. Charlebois
Check: M. Theiner

Date: Feb-26

Project: Manotick Affordable Seniors Residences
5581 Doctor Leach Dr. Manotick Ontario

Client: CLV Group

SANITARY SEWER DESIGN SHEET

Drainage Area	From	To	Peak Flow Q (L/sec)	Sewer Data										REMARKS
				Type of Pipe	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	
	Proposed Building	MH-SAN-01	0.91	PVC	150	152.4	1.0	3.6	15.9	0.87	0.44	0.14	0.06	Proposed building connection
	MH-SAN-01	MH-SAN-02	0.91	PVC	150	152.4	1.0	37.4	15.9	0.87	0.44	1.43	0.06	
	MH-SAN-02	MH-SAN-03	0.91	PVC	150	152.4	1.0	10.3	15.9	0.87	0.44	0.39	0.06	
	Existing Building	MH-SAN-03	0.78	PVC	150	152.4	1.0	10.0	15.9	0.87	0.44	0.38	0.05	Existing building connection
	MH-SAN-03	MH-SAN-04	1.69	PVC	150	152.4	1.5	53.2	19.5	1.07	0.60	1.48	0.09	
	MH-SAN-04	MH-SAN-05	1.69	PVC	150	152.4	1.5	68.5	19.5	1.07	0.60	1.91	0.09	
	MH-SAN-05	*Ex. Pipe SAN60623*	1.69	PVC	150	152.4	1.5	8.5	19.5	1.07	0.60	0.24	0.09	Existing connection to sanitary main pipe 525mm on Eastman Avenue

Manning's n = **0.013**

Design:	P.Charlebois
Check:	M. Theiner
Date:	February 2026

Project Name:	Manotick Seinors Residence
Parsons Project #:	478221
Client:	CLV Group
Client Project #:	

SANITARY SEWER DESIGN SHEET - WITH FUTURE DEVELOPMENT

Drainage Area	From	To	Existing Peak Flow Q (L/sec)	New Peak Flow Q (L/sec)	Total Peak Flow Q (L/sec)	Sewer Data											REMARKS
						Type of Pipe	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)		
	Proposed Building	MH-SAN-01		0.91	0.91	PVC	150	152.4	1.0	3.6	15.9	0.87	0.44	0.14	0.06		Proposed building connection
	MH-SAN-01	MH-SAN-02			0.91	PVC	150	152.4	1.0	37.4	15.9	0.87	0.44	1.43	0.06		
	MH-SAN-02	MH-SAN-03			0.91	PVC	150	152.4	1.0	10.3	15.9	0.87	0.44	0.39	0.06		
	Existing Building	MH-SAN-03	0.78		0.78	PVC	150	152.4	1.0	10.0	15.9	0.87	0.44	0.38	0.05		Existing building connection
	MH-SAN-03	MH-SAN-04			1.69	PVC	150	152.4	1.5	53.2	19.5	1.07	0.60	1.48	0.09		
	MH-SAN-04	FUTURE MH			1.69	PVC	150	152.4	1.5	50.0	19.5	1.07	0.60	1.40	0.09		Connection to future MH
	FUTURE BLDG	FUTURE MH A		1.75	1.75	PVC	150	152.4	1.0	35.0	15.9	0.87	0.51	1.15	0.11		
	FUTURE MH A	MH-SAN-05			3.44	PVC	150	152.4	1.5	18.5	19.5	1.07	0.69	0.44	0.18		
	MH-SAN-05	*Ex. Pipe SAN60623*			3.44	PVC	150	152.4	1.5	8.5	19.5	1.07	0.69	0.20	0.18		Existing connection to sanitary main pipe 525mm on Eastman Avenue
	MHSA59271	MHSA59272	19.00		22.44	PVC	600	609.6	0.2	50.0	271.8	0.93	0.50	1.66	0.08		PIPE ID: SAN60624

Manning's n = **0.013**

February P.Charlebois
Check: M. Theiner
Date: February 2026

Project Name: Manotick Seinors Residence
Parsons Project #: 478221
Client: CLV Group
Client Project #:

Appendix C: Sanitary Load and Fire Flow

SANITARY DESIGN FLOWS

Area	RESIDENTIAL POPULATION					TOTAL	INFILTRATION			Total
	Pop.	Cumulative Area (ha)	Cumulative Capita	Peak Factor (per Ottawa)	Peak Flow (L/s)	Peak Flow (L/s)	Site Area (ha)	Infiltration Allowance (L/s/ha)	Infilt. Flow (L/s)	Total Peak Flow (L/s)
Subject Site										
Existing Seniors Residence							0.71	0.33	0.23	0.23
30 Units	42	0.10	42	4.0	0.5444	0.54				0.54
									Total	**0.78**
Proposed Seniors Residence							0.59	0.33	0.19	0.19
38 Units										
First Floor										
4 Bachelor Units	5.6	0.01	6	4.0	0.0726	0.07				0.07
15 One Bedroom Units	21	0.08	21	4.0	0.2722	0.27				0.27
Second Floor										
3 Bachelor Units	4.2	0.01	4	4.0	0.0544	0.05				0.05
13 One Bedroom Units	18.2	0.06	18	4.0	0.2359	0.24				0.24
3 Two Bedroom Units	6.3	0.03	6	4.0	0.0817	0.08				0.08
									Total	**1.69**
Future Seniors Residence							0.80	0.33	0.26	0.26
76 units										
First Floor										
3 Bachelor Units	4.2	0.01	4	4.0	0.0544	0.05				0.05
16 One Bedroom Units	22.4	0.08	22	4.0	0.2904	0.29				0.29
Second Floor										
3 Bachelor Units	4.2	0.01	4	4.0	0.0544	0.05				0.05
12 One Bedroom Units	16.8	0.06	17	4.0	0.2178	0.22				0.22
4 Two Bedroom Units	8.4	0.03	8	4.0	0.1089	0.11				0.11
Third Floor										
3 Bachelor Units	4.2	0.01	4	4.0	0.0544	0.05				0.05
12 One Bedroom Units	16.8	0.06	17	4.0	0.2178	0.22				0.22
4 Two Bedroom Units	8.4	0.03	8	4.0	0.1089	0.11				0.11
Fourth Floor										
3 Bachelor Units	4.2	0.01	4	4.0	0.0544	0.05				0.05
12 One Bedroom Units	16.8	0.06	17	4.0	0.2178	0.22				0.22
4 Two Bedroom Units	8.4	0.03	8	4.0	0.1089	0.11				0.11
									Total	**3.44**

Design:	PC	**Project:**	Manotick Seniors Residence CLV Group
Check :	MT	**Location:**	5581 Doctor leach Dr. Manotick, Ontario
Dwg reference:		**Project # :**	478221
		Date:	February 2026
		Sheet:	1 of 1

Average Daily Demands

(Based on City of Ottawa *Sewer Design Guidelines 2012* and *MOE Water Design Guidelines*)

Average Residential Daily Flow =	280	L/p/d
Institutional Flow =	28,000	L/ha/d
Commercial Flow =	28,000	L/ha/d
Light Industrial Flow =	35,000	L/ha/d
Heavy Industrial Flow =	55,000	L/ha/d
Hotel Daily Flow =	225	L/bed/d
Office/Warehouse Daily Flow =	75	L/empl/d
Shopping Centres =	2,500	L/(1000m^2/d)

Population Densities

Average suburban residential dev.	60	p/ha
Single family	3.4	p./unit
Semi-detached	2.7	p./unit
Duplex	2.3	p./unit
Townhouse	2.7	p./unit
Appartment average	1.8	p./unit
Bachelor	1.4	p./unit
1 Bedroom	1.4	p./unit
2 Bedrooms	2.1	p./unit
3 Bedrooms	3.1	p./unit
Hotel room, 18 m2	1	p./unit
Restaurant, 1 m2	1	p./unit
Office	1	p/25m^2
Warehouse	1	p/90m^2
Automotive Service Centre, per bay	1	p/bay (plus management)

5581 Doctor Leach Drive - Seniors Residence - Estimated Water Demands

Area	Units	Population	Gross Floor Area (m2)	Average Daily Demand (ADD) (L/s)	Maximum Daily Demand (MDD) (L/s)	Peak Hourly Demand (PHD) (L/s)	Fire Flow (FF) (L/s)	MDD + FF (L/s)
Seniors Residence								
Bachelor	7	9.8		0.04	0.19	0.29		
One Bedroom	28	39.2		0.16	0.78	1.18		
Two Bedrooms	3	6.3		0.03	0.13	0.19		
Total	38		2604	0.22	1.10	1.66	200	201.10

Average Daily Demand

Based on Ottawa Design Guidelines - Water Distribution, 2010 and MOE Design Guidelines for Drinking-Water Systems, 2008

Average Residential Daily Flow =	350	L/p/d
Institutional Flow =	28,000	L/gross ha/d
Commercial Flow =	28,000	L/gross ha/d
Light Industrial Flow =	35,000	L/gross ha/d
Heavy Industrial Flow =	55,000	L/gross ha/d
Hotel Daily Flow =	225	L/bed/d
Office/Warehouse Daily Flow =	75	L/person/d
Office/Warehouse Daily Flow =	8.06	L/m2/day
Restaurant (Ordinary not 24 Hours) =	125	L/seat/d
Restaurant (24 Hours) =	200	L/seat/d
Shopping Centres =	2,500	L/(1000m^2/d)
Amenity Area =	5	L/m2/d

Maximum Daily Demand

Residential =	2.5 x Average Daily Demand
	4.9 x Average Daily Demand **
Industrial =	1.5 x Average Daily Demand
Commercial =	1.5 x Average Daily Demand
Institutional =	1.5 x Average Daily Demand

Peak Hourly Demand

Residential =	2.2 x Maximum Daily Demand
	7.4 x Average Daily Demand **
Industrial =	1.8 x Maximum Daily Demand
Commercial =	1.8 x Maximum Daily Demand
Institutional =	1.8 x Maximum Daily Demand

Population Densities

Apartment average	1.8	p./unit
Bachelor	1.4	p./unit
1 Bedroom	1.4	p./unit
2 Bedrooms	2.1	p./unit
3 Bedrooms	3.1	p./unit

**Peaking factor for drinking water system servicing less than 500 people (50 Units) per MOE design guidelines

5581 Doctor Leach Drive - Seniors Residence

Building	Type of Construction C	Total Floor Area (m2) A	Fire Flow (min. 2,000) (L/min) F	Adjusted (nearest 1,000) (L/min)	Occupancy Factor O	Reduction / Increase due to Occupancy	Fire Flow with Occupancy (min. 2,000) (L/min)	Sprinklers Factor S	Reduction due to Sprinklers (L/min)	Exposure Factor % E	Increase due to Exposure (L/min)	Fire Flow (L/min)	Roof Contribution (L/min) R	Required Fire Demand: Adjusted to the nearest 1000 (min. 2,000, max. 45,000) (L/min) F	Required Fire Demand: Minimum 33 (L/s)
Seniors Residence	1.0	2,604	11,226	11,000	-15%	-1,650	9,350	0%	0	30%	2,805	12,000	0	12,000	200

References

Reference: *Water Supply for Public Fire Protection , 2020 by Fire Underwriters Survey (FUS) and Ottawa Design Guidelines - Water Distribution, July 2010* and subsequent Technical Bulletins

C Type of Construction

Wood Frame (Type V)	1.5
Mass Timber (Type IV-A) - Encapsulated Mass Timber	0.8
Mass Timber (Type IV-B) - Rated Mass Timber	0.9
Mass Timber (Type IV-C) - Ordinary Mass Timber	1.0
Mass Timber (Type IV-D) - Unrated Mass Timber	1.5
Ordinary Construction (Type III also known as joisted masonry)	1.0
Non-Combustible Construction (Type II - minimum 1 hour fire resistance rating)	0.8
Fire resistive Construction (Type I - minimum 2 hour fire resistance rating)	0.6

A Total Effective Floor Area (m^2)

Buildings Classified with a Construction Coefficient from 1.0 to 1.5

100% of all Floor Areas

Buildings Classified with a Construction Coefficient below 1.0

Vertical Openings Unprotected

Two (2) Largest Adjoining Floor Areas

Additional Floors (up to eight (8)) at 50%

Vertical Openings Properly Protected

Single Largest Floor

Additional Two (2) Adjoining Floors at 25%

High One Storey Building

When a building has a large single storey space exceeding 3m in height, the number of storeys to be used in determining the total effective area depends upon the use being made of the building.

Subdividing Buildings (Vertical Firewalls)

Minimum two (2) hour fire resistance rating and meets National Building Code requirements.

- Up to 10% can be applied if there is severe risk of fire on the exposed side of the firewall due to hazard conditions.
- An exposure charge of up to 10% can be applied if there are unprotected openings in the firewall

Basement

Basement floor excluded when it is at least 50% below grade.

Open Parking Garages

Use the area of the largest floor.

O Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

- Table 3 provides recommended Occupancy and Contents Adjustment Factors for Example Major Occupancies from the National Building Code of Canada.
- Adjustment factors should be adjusted accordingly to the specific fore loading and situation that exists in the subject building.
- Values can be interpolated from the examples given considering fire loading and expected combustibility of contents if the subject building is not listed.
- Values can be modified by up to 10% (+/-) depending on the extent to which the fire loading is unusual for the building.
- Buildings with multiple major occupancies should use the most restrictive factor or interpolate based on the percentage of each occupancy and its associated fire loading.

Table 3 Values for Subject Building	
Group:	C
Division:	--
Description of Occupancy:	Residential
Occupancy and Contents:	Limited
Adjustment Factor:	-15%

R Roof

Shake Roof	2,000 to 4,000 L/min	additional should be added to the fire flow
Wood Shingle	2,000 to 4,000 L/min	additional should be added to the fire flow

F Fire Flow (L/Min)

220*C*(A^0.5)

S Sprinklers

	Complete Coverage	Partial Coverage
Automatic Sprinklers NFPA Standards	30%	30% * x%
Standard Water Supply	10%	10% * x%
Full Supervision	10%	10% * x%

(x%: percentage of total protected floor area)

Additional Reductions for Community Level Automatic Sprinkler Protection of Area

Buildings located within communities or subdivisions that are completely sprinkler protected may apply up to a maximum additional 25% reduction in required fire flows beyond the normal maximum of 50% reduction for sprinkler protection of an individual building.

Adjustment of Sprinkler Reductions for Community Level Oversight of Sprinkler Maintenance, Testing, and Water Supply Requirements

The reduction in required fire flow for sprinkler protection may be reduced of eliminated if:
- The community does not have a Fire Prevention Program that provides a system of ensuring that the fire sprinkler systems are inspected, tested, and maintained in accordance with NFPA 25
- The community does not maintain the pressure and flow rate requirements for fire sprinkler installations, or otherwise allows the flow rates and pressure levels that were available during sprinkler system design to significantly degrade, increasing the probability of inadequate water supply for effective sprinkler operation.

E Exposure

The maximum exposure adjustment that can be applied to a building is 75% when summing the percentages of all sides of the building

Separation Distance (m)	Maximum Exposure Adjustment	N	E	S	W
0 to 3	25%				
3.1 to 10	20%				
10.1 to 20	15%	Ex seniors res.		Ex house	
20.1 to 30	10%				
Greater than 30	0%				

Table 6: Exposure Adjustment Charges for Subject Building Considering Construction Type of Exposed Building Face

Distance to the Exposure (m)	Length-Height Factor of Exposing Building Face	Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 to 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30m	All Sizes	0%	0%	0%	0%	0%

[2] with unprotected openings
[3] without unprotected openings

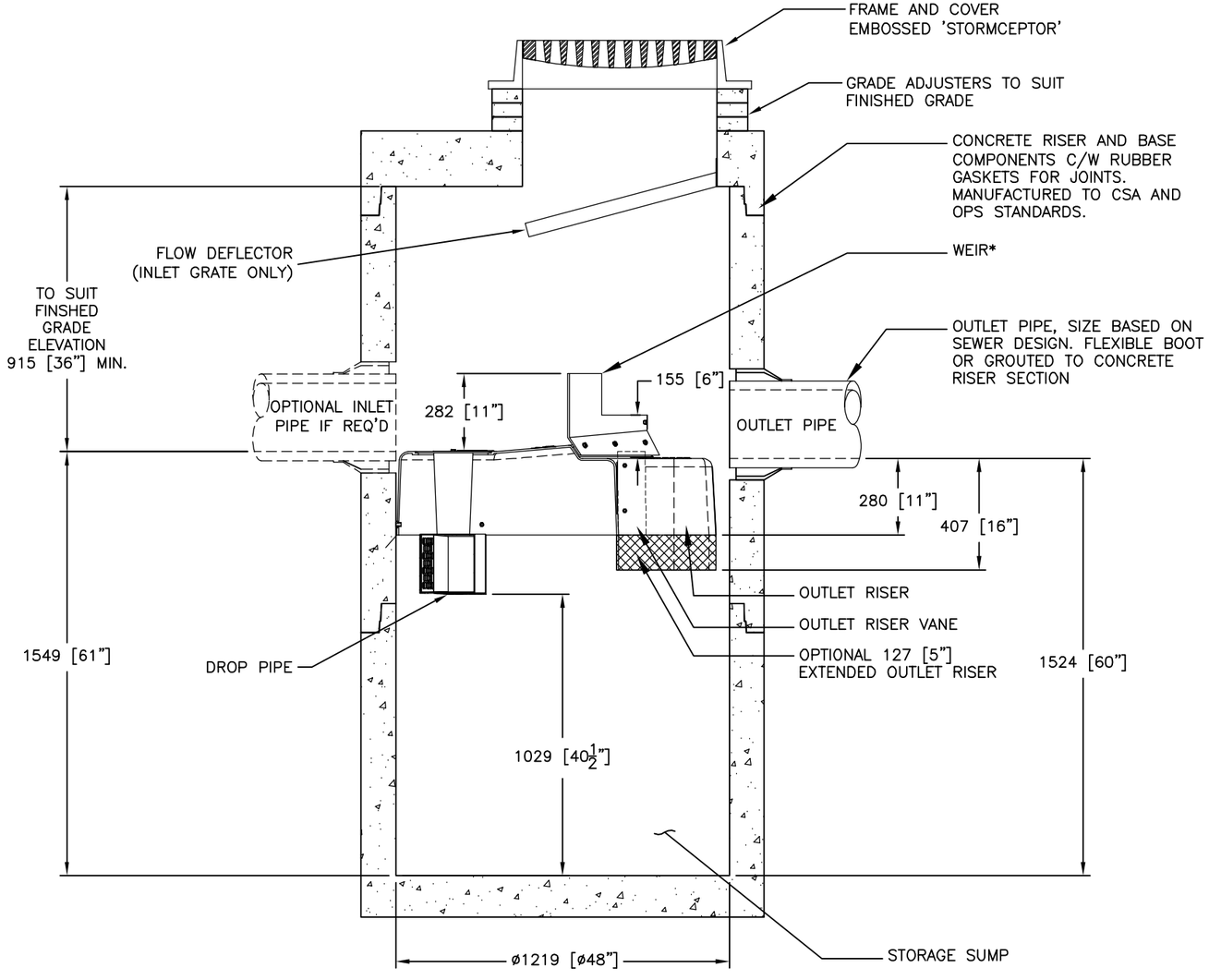
Automatic Sprinkler Protection in Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), the exposure adjustment charge determined from Table 6 may be reduced by up to 50% of the value determined.

Automatic Sprinkler Protection in both Subject and Exposed Buildings
- If both the subject building and the exposed building are fully protected with automatic sprinkler systems (see note Recognition of Automatic Sprinkler), no exposure adjustment charge should be applied.

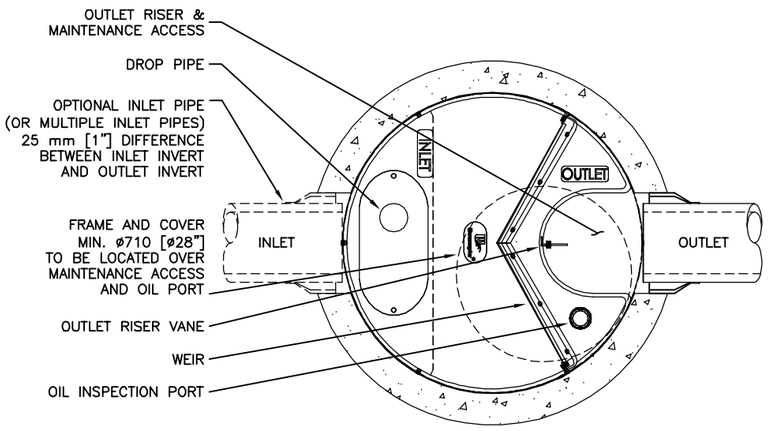
Exposure Protection of Area Between Subject and Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), and the area between the buildings is protected with an exterior automatic sprinkler system, no exposure adjustment charge should be applied.

Reduction of Exposure Charge for Type V Buildings
- If the exposed building face of a Type V building has an exterior cladding assembly with a minimum 1 hour fire resistive rating, then the exposure charge may be treated as a Type III/IV building for the purposes of looking up the appropriate exposure charge in Table 6.

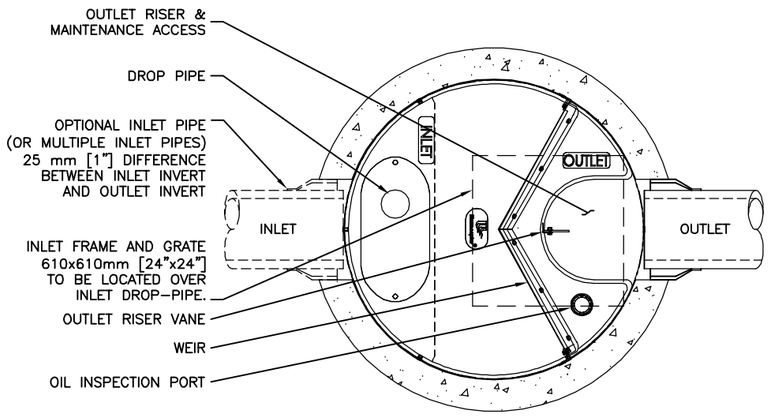
Appendix D: Stormceptor Design and Specifications



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

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

GENERAL NOTES:

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

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

INSTALLATION NOTES

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

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO4
STRUCTURE ID	*
HYDROCARBON STORAGE REQ'D (L)	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON, L1N 9A9
TF 800-565-4501 CA 416-800-8600 INTL +1-416-800-8600

DATE: 10/13/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EFO4	*

SHEET: 1 OF 1

Stormceptor EF Sizing Report

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

02/09/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	Manotick

Drainage Area (ha):	0.60
Runoff Coefficient 'c':	0.62

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	12.01
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	9.90
Peak Conveyance (maximum) Flow Rate (L/s):	16.40
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	348
Estimated Average Annual Sediment Volume (L/yr):	283

Project Name:	CLV Manotick Residence
Project Number:	478221
Designer Name:	Patrick Charlebois
Designer Company:	Parsons
Designer Email:	pchar084@gmail.com
Designer Phone:	647-207-8063
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	88
EFO6	95
EFO8	99
EFO10	100
EFO12	100

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 88

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

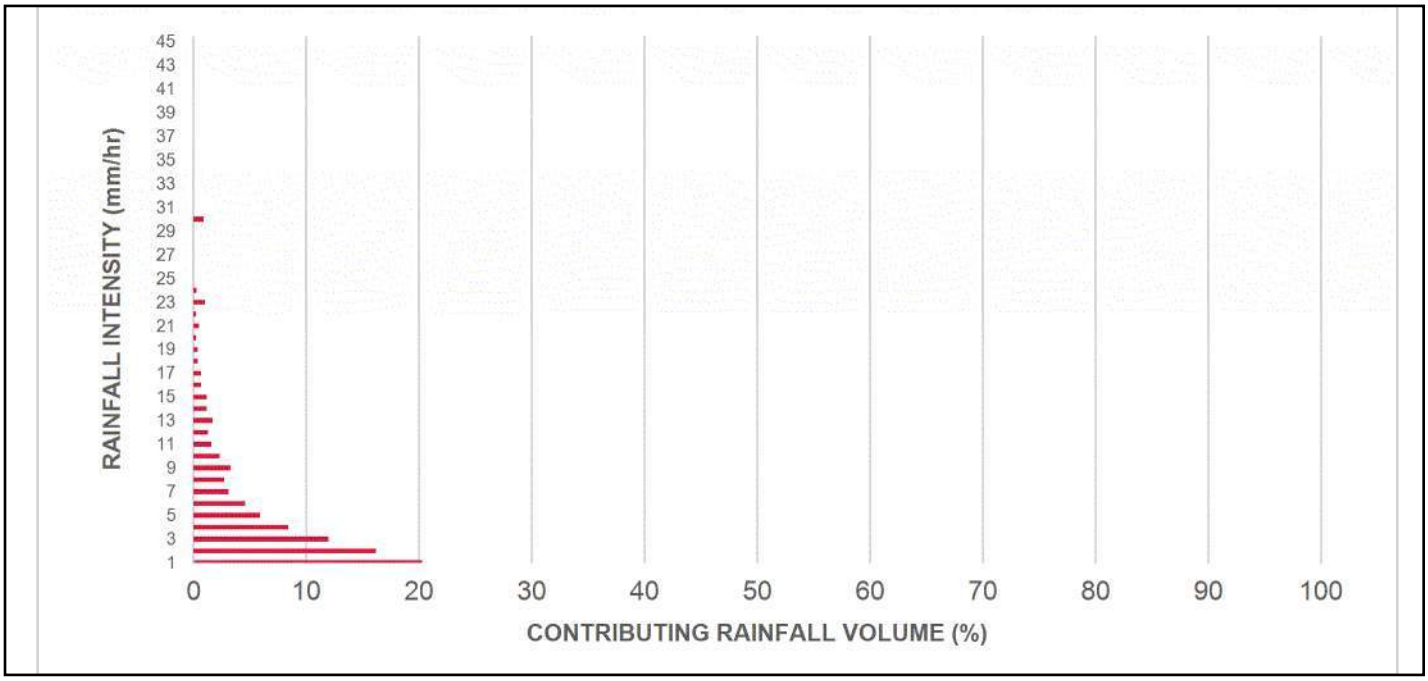
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

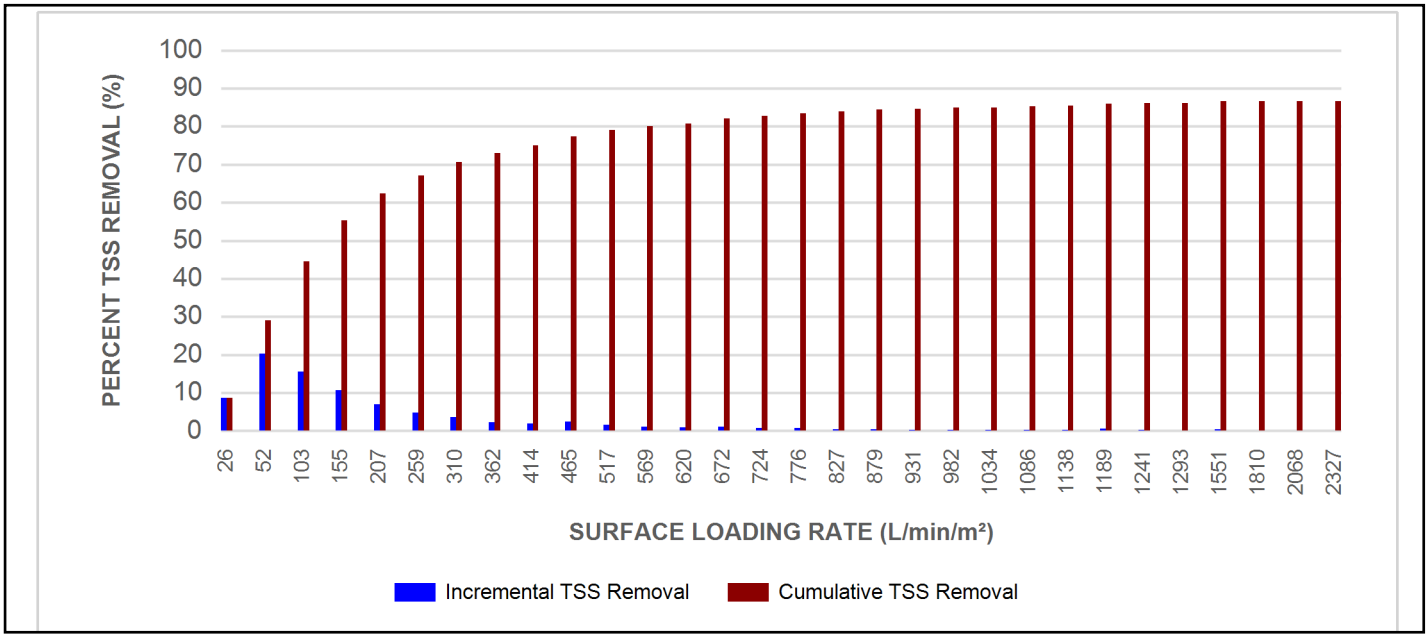
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	0.52	31.0	26.0	100	8.6	8.6
1.00	20.3	29.0	1.03	62.0	52.0	100	20.3	29.0
2.00	16.2	45.2	2.07	124.0	103.0	96	15.6	44.5
3.00	12.0	57.2	3.10	186.0	155.0	89	10.7	55.3
4.00	8.4	65.6	4.14	248.0	207.0	83	7.0	62.3
5.00	5.9	71.6	5.17	310.0	259.0	81	4.8	67.1
6.00	4.6	76.2	6.20	372.0	310.0	78	3.6	70.7
7.00	3.1	79.3	7.24	434.0	362.0	76	2.3	73.0
8.00	2.7	82.0	8.27	496.0	414.0	73	2.0	75.0
9.00	18.0	100.0	9.31	558.0	465.0	71	12.8	87.8
10.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
11.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
12.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
13.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
14.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
15.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
16.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
17.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
18.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
19.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
20.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
21.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
22.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
23.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
24.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
25.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
30.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
35.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
40.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
45.00	0.0	100.0	10.00	600.0	500.0	69	0.0	87.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**88 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

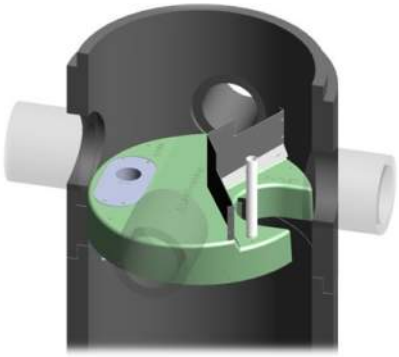
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

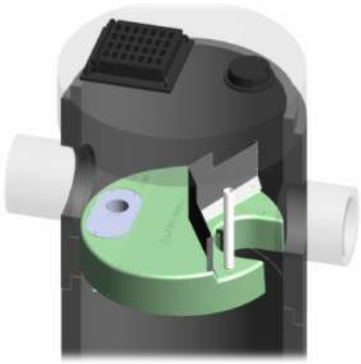
DESIGN FLEXIBILITY

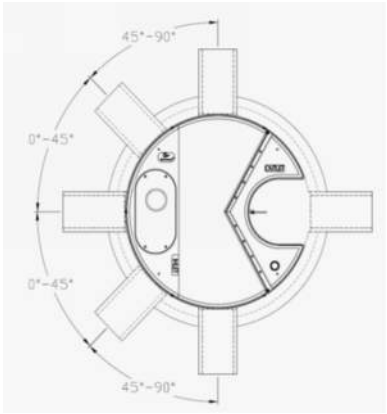
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

HEAD LOSS

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

Pollutant Capacity

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

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF and EFO Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

Registration: GPS-ETV_VR2023-11-15_Imbrium-SC

In accordance with

ISO 14034:2016

Environmental management —
Environmental technology verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

November 15, 2023
Vancouver, BC, Canada

GLOBE PERFORMANCE SOLUTIONS

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Stormceptor® EF and EFO are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

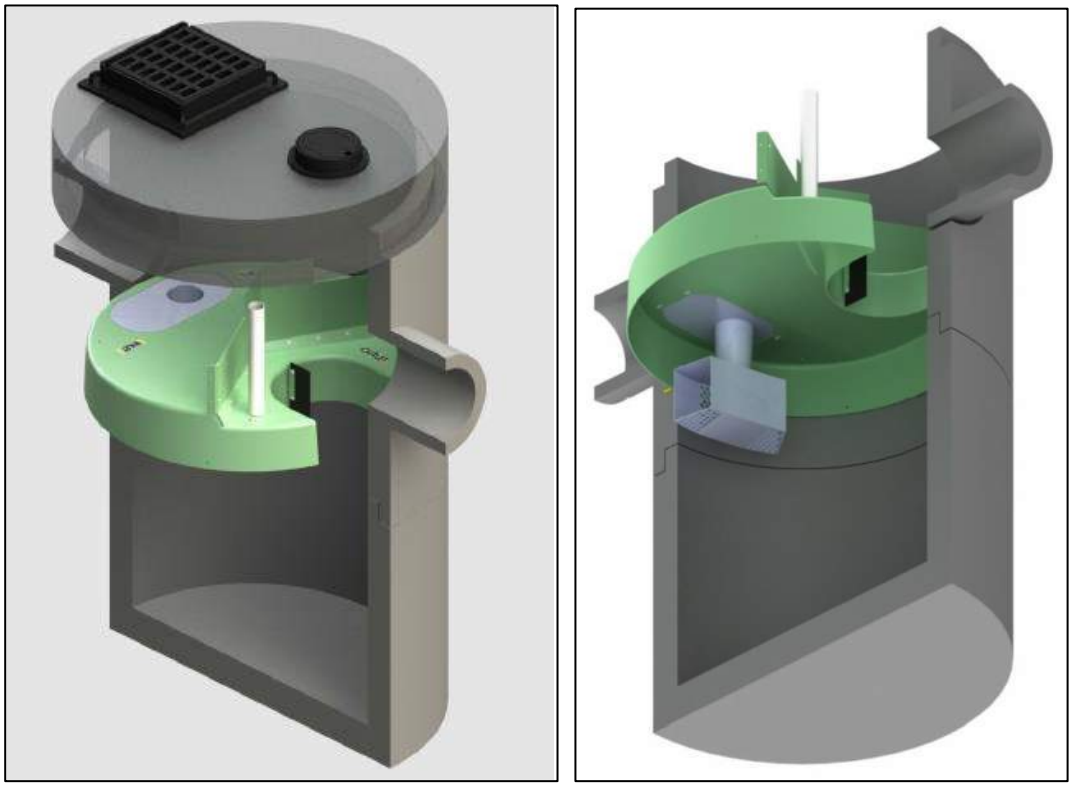


Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m^2 (27.9 gal/min/ft^2) and 535 L/min/m^2 (13.1 gal/min/ft^2) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of

additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® EF4 and EFO4 Oil-Grit Separators, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test[a]:

During the capture test, the Stormceptor® EF4 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, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Stormceptor® EFO4, 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, removes 70, 64, 54, 48, 42, 40, and 34 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[a]:

During the scour test, the Stormceptor® EF4 and Stormceptor® EFO4 OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Stormceptor® EFO4 OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 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.

[a] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

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* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

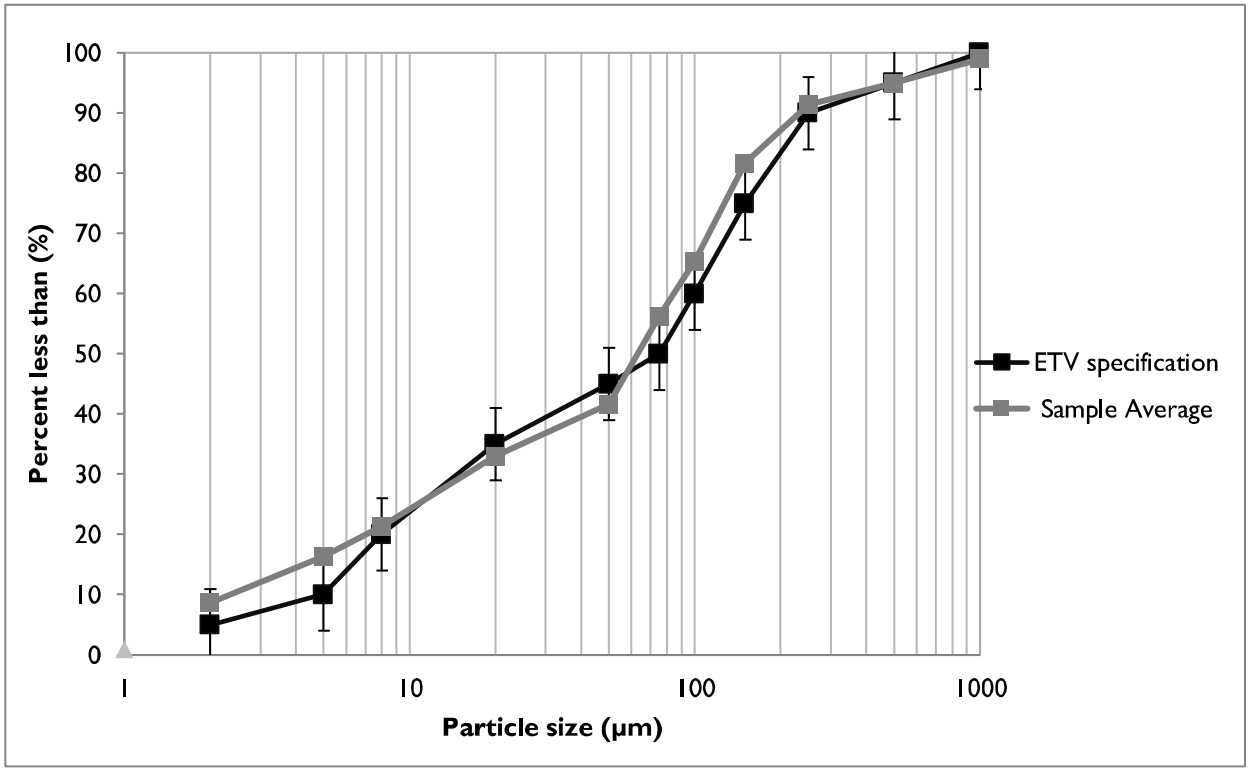


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the 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. 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). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m^2 (13.1 gpm/ft^2), sediment capture tests at surface loading rates from 40 to 400 L/min/m^2 were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m^2 were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

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 may be 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). The results for "all particle sizes by mass balance" (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	Surface loading rate (L/min/m²)						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined [a]	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 – 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	**70.4**	**63.8**	**53.9**	**47.5**	**46.0**	**43.7**	**49.0**

[a] An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.
* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and Bulletin # CETV 2016-11-0001 for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m²

Particle size fraction (µm)	Surface loading rate (L/min/m²)		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 – 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	**41.7**	**39.7**	**34.2**

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and Bulletin # CETV 2016-11-0001 for more information.

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 EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m².

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

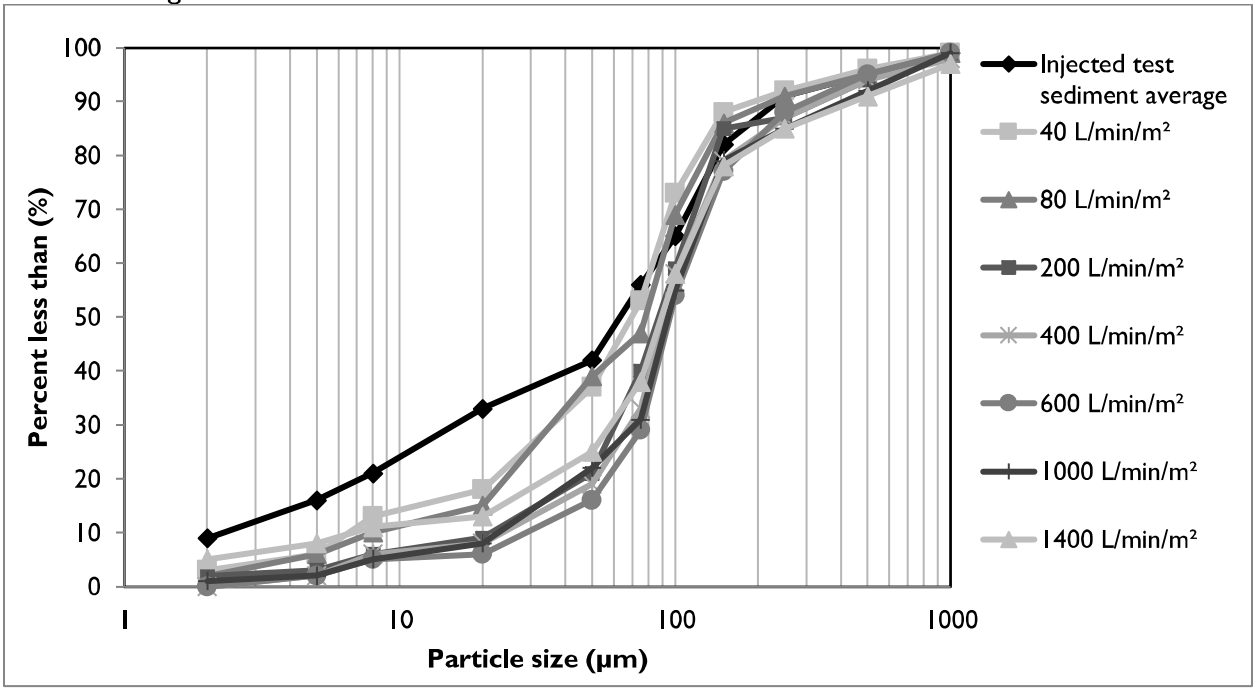


Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

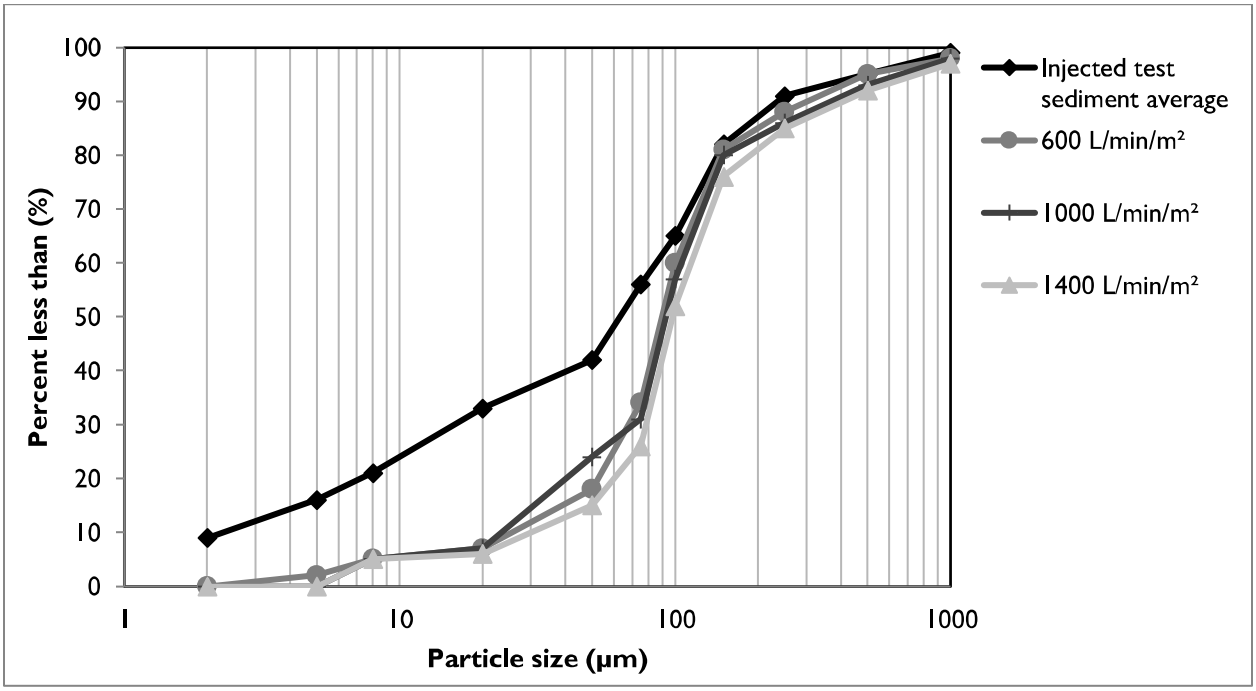


Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m²

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm 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. 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 Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m² sediment capture test is also used to adjust the concentration, as per the method described in Bulletin # CETV 2016-09-0001. However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m², potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) [a]	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	
		24:00		0.4	

5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

[a] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m^2) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m^2). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m2)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)[a]	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

[a] Determined from bead bulk density of 0.56074 g/cm^3

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. During the capture test, the 40 L/min/m^2 and 80 L/min/m^2 surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m^2) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m^2 run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.

3. Due to pressure build up in the filters, the runs at 1000 L/min/m^2 for the Stormceptor® EF4 and 1000 and 1400 L/min/m^2 for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF and EFO OGS please contact:

Imbrium Systems, Inc.
407 Fairview Drive
Whitby, ON
L1N 3A9, Canada
Tel: 416-960-9900
info@imbriumsystems.com

For more information on ISO 14034:2016 / ETV please contact:

GLOBE Performance Solutions
World Trade Centre
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globeperformance.com

Appendix E: Stormwater Storage Chambers Specifications

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

CLV SENIOR RESIDENCE - MC-3500 (270M3)

MANOTICK, ON, CANADA

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 75 mm (3").
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
10. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
11. ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS. TO MINIMIZE THE LEAKAGE POTENTIAL OF LINER SYSTEMS, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTEXTILE PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "MC-3500 & MC-4500 STORMTECH CHAMBER INSTALLATION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE; AASHTO M43 #3, 357, 4, 467, 5, 56, OR 57.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "MC-3500 & MC-4500 STORMTECH CHAMBER INSTALLATION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "MC-3500 & MC-4500 STORMTECH CHAMBER INSTALLATION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "MC-3500 & MC-4500 STORMTECH CHAMBER INSTALLATION GUIDE".
3. FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

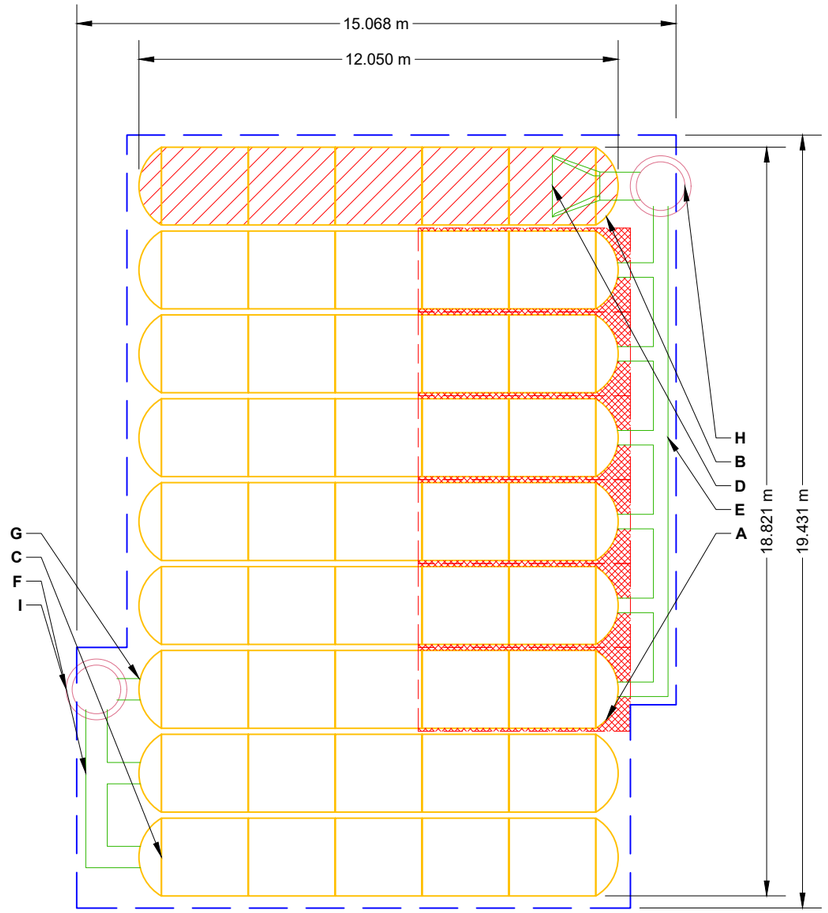
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT ADS WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT		PROPOSED ELEVATIONS	
45	STORMTECH MC-3500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	91.140
18	STORMTECH MC-3500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	89.311
305	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	89.159
229	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	89.159
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	89.159
2.8	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	89.006
		TOP OF MC-3500 CHAMBER:	88.702
		300 mm x 300 mm TOP MANIFOLD INVERT:	88.228
270.7	SYSTEM AREA (m^2)	600 mm ISOLATOR ROW PLUS INVERT:	87.611
69.0	SYSTEM PERIMETER (m)	450 mm x 450 mm BOTTOM MANIFOLD INVERT:	87.604
		450 mm BOTTOM CONNECTION INVERT:	87.604
		BOTTOM OF MC-3500 CHAMBER:	87.559
		BOTTOM OF STONE:	87.330

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	300 mm TOP PRE-CORED END CAP, PART#: MC3500IEPP12T / TYP OF ALL 300 mm TOP CONNECTIONS		
PREFABRICATED END CAP	B	600 mm BOTTOM PRE-CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS		
PREFABRICATED END CAP	C	450 mm BOTTOM PRE-CORED END CAP, PART#: MC3500IEPP18BC / TYP OF ALL 450 mm BOTTOM CONNECTIONS		
FLAMP	D	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	E	300 mm x 300 mm TOP MANIFOLD, ADS N-12	670 mm	
MANIFOLD	F	450 mm x 450 mm BOTTOM MANIFOLD, ADS N-12	45 mm	
PIPE CONNECTION	G	450 mm BOTTOM CONNECTION	45 mm	
CONCRETE STRUCTURE	H	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		192 L/s IN
CONCRETE STRUCTURE	I	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		227 L/s OUT



ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 5.334 m OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- **NOT FOR CONSTRUCTION**: THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

CLV SENIOR RESIDENCE - MC-3500 (270M3)
MANOTICK, ON, CANADA

DRAWN: PP
CHECKED: N/A
DATE: 02/10/2026
PROJECT #:

DATE	DWN	CHK

StormTech®
Chamber System

WWW.ADSPIPE.COM

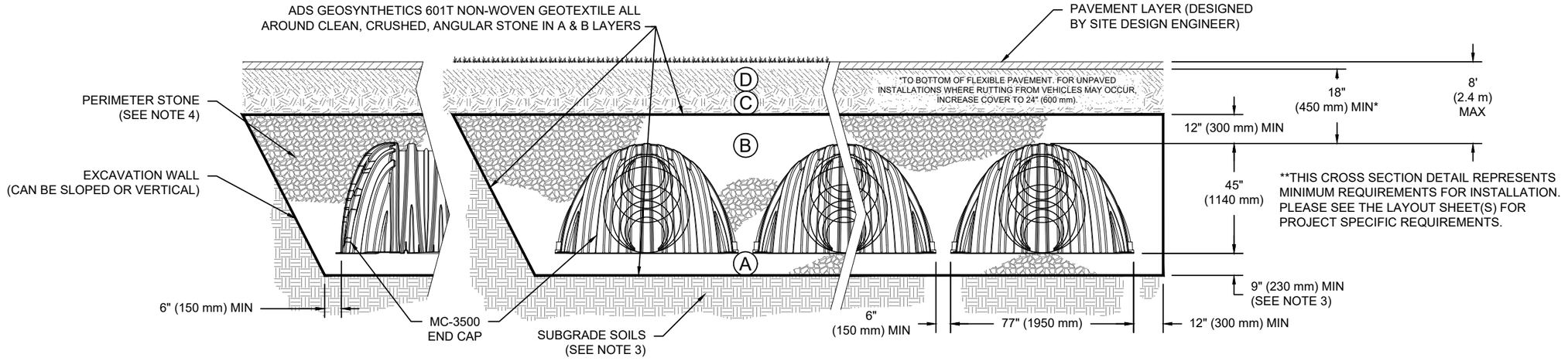
SCALE = 1 : 150

SHEET
2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

CLV SENIOR RESIDENCE - MC-3500 (270M3)
MANOTICK, ON, CANADA
DATE: 02/10/2026 | DRAWN: PP | CHECKED: N/A
PROJECT #:

DATE	DWN	CHK

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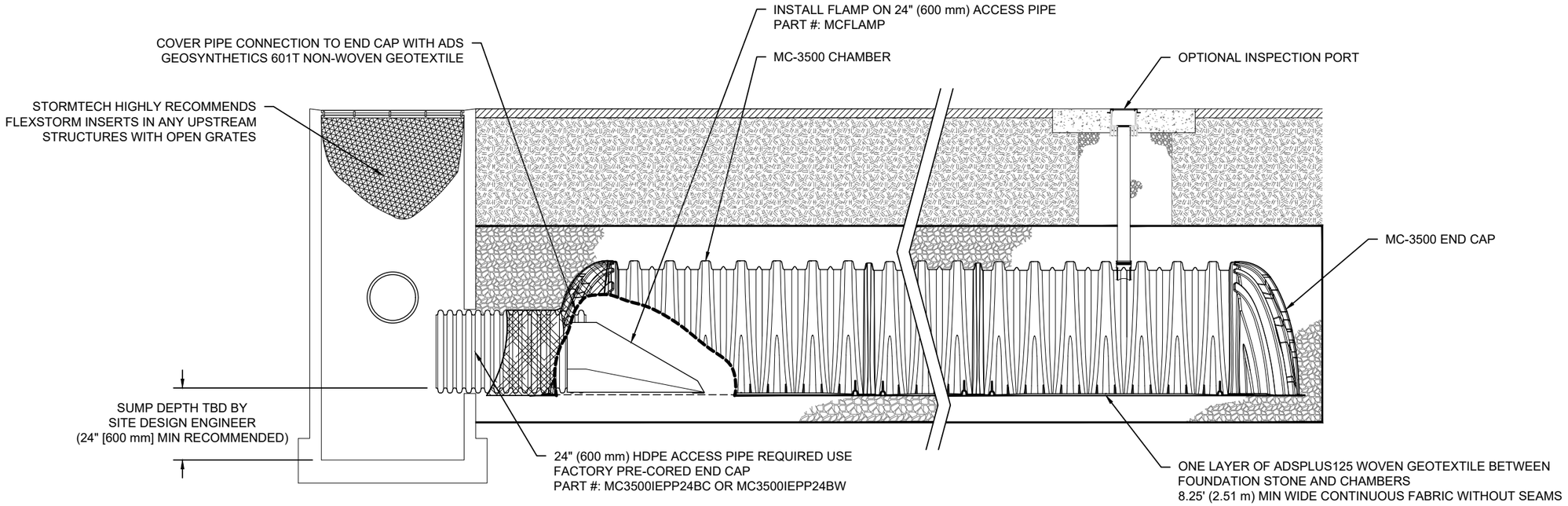

MC-3500 ISOLATOR ROW PLUS DETAIL
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INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

CLV SENIOR RESIDENCE - MC-3500 (270M3)
MANOTICK, ON, CANADA
DATE: 02/10/2026 | DRAWN: PP | CHECKED: N/A
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MC-3500 TECHNICAL SPECIFICATION

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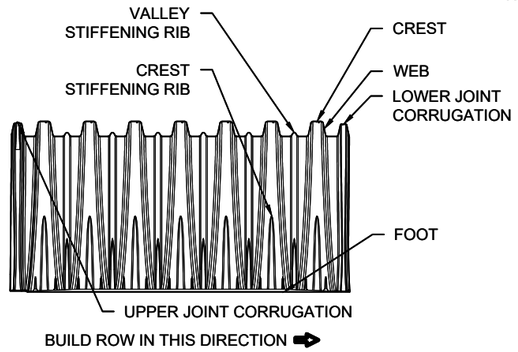
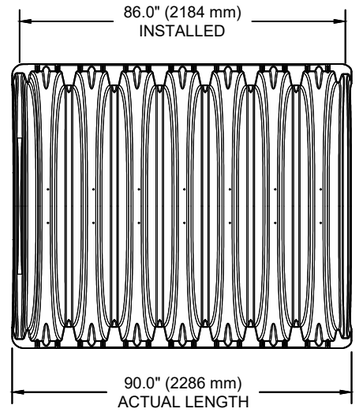
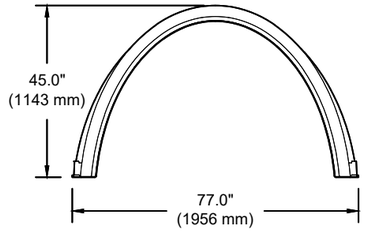
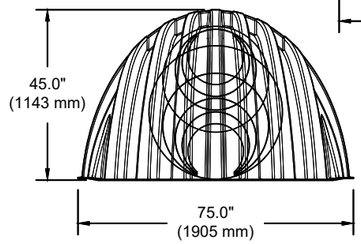
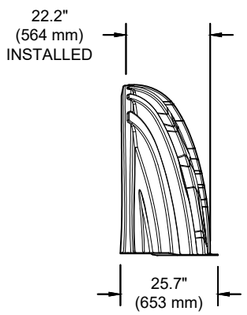










NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

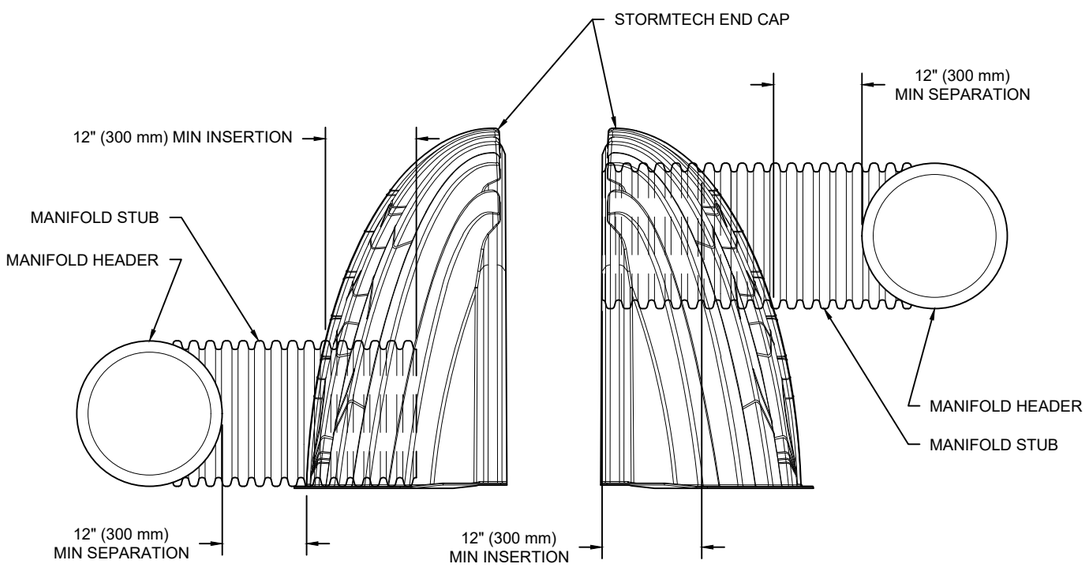
NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

MC-SERIES END CAP INSERTION DETAIL

NTS

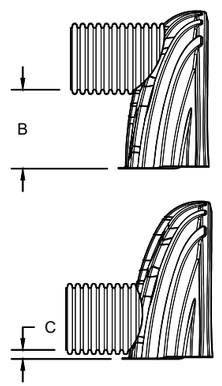


NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

CLV SENIOR RESIDENCE - MC-3500 (270M3)
MANOTICK, ON, CANADA

DATE: 02/10/2026 | DRAWN: PP | CHECKED: N/A
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DATE	DWN	CHK

StormTech® Chamber System

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SHEET 5 OF 5

STM 13.0m - 375mmØ @ 1.00%

CONNECTION
REAM OF ICD

05 (ICD-01)
/G = 89.60
V. = 88.67
. = 87.20
= 87.13

2m - 150mmØ @

STM 23.1m - 250mmØ @ 1.00%

RY-CB-11
T/G = 90.25
SW. INV. = 88.96
E. INV. = 88.90

STM 24.5m -

OGS-01
T/G = 90.12
W. INV. = 87.00
E. INV. = 86.97

STM 3.3m - 375mmØ
@ 1.00%

CB-MH-02
T/G = 89.77
SW. INV. = 87.65
NW. INV. = 87.59

MH-STM-03
T/G = 89.86
SE. INV. = 87.56
SW. INV. = 87.71
NW. INV. = 87.56

BED LIMIT OF UNDERG
STORMWATER STORAG

SEE NOTES: UNDERGROUND STORM
STORAGE FOR DETAILS

SUBDRAIN

MH-STM-04
T/G = 90.40
SUBDRAIN INV. = 87.33
N. INV. = 87.31
SW. INV. = 87.56
SE. INV. = 87.56

PART
LAN

PLAN

Verification Statement

StormTech Isolator® Row PLUS
Registration number: (V-2020-10-01)
Date of issue: (2020-October-27)

Technology type	Stormwater Filtration Device
Application	Stormwater filtration technology to remove sediments, nutrients, heavy metals, and organic contaminants from stormwater runoff
Company	StormTech, LLC.
Address	520 Cromwell Avenue, Rocky Hill, CT 06067 USA **Phone** +1-888-892-2694
Website	www.stormtech.com
E-mail	info@stormtech.com

Verified Performance Claims

The StormTech Isolator® Row PLUS technology was tested at the Mid-Atlantic Storm Water Research Center (MASWRC), under the supervision of Boggs Environmental Consultants, Inc. The performance test results for two overlapping StormTech Isolator® Row PLUS chambers (commercial unit model SC-740) were verified by Good Harbour Laboratories Inc. (GHL), following the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. Based on the laboratory testing conducted, the verified performance claims are as follows:

Total Suspended Solids (TSS) Removal Efficiency - The StormTech Isolator® Row PLUS achieved 82% ± 1% removal efficiency of suspended sediment concentration (SCC) at a 95% confidence level.

Average Loading Rate - Based on the reported flow rate data and the effective sedimentation and filtration treatment area of the test unit, the average loading rate of the test unit was 4.15 ± 0.03 GPM/ft^2 at a 95% confidence level.

Maximum Treatment Flow Rate (MTFR) - Although the MTFR varies among the StormTech Isolator® Row PLUS model sizes and the number of chambers, the design surface loading rate remains the same (4.13 gpm/ ft^2 of treatment surface area). The test unit consisted of two overlapping StormTech SC-740 chambers with a nominal MTFR of 225 GPM (0.501 CFS) and an effective filtration treatment area (EFTA) of approximately 54.5 ft^2.

Detention Time and Volume - The StormTech Isolator Row PLUS detention time and wet volume varies with model size. The unit tested had a wet volume of approximately 65.1 ft^3 and a detention time of 2.2 minutes.

Maximum Sediment Storage Depth and Volume - The sediment storage volume and depth vary according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the maximum sediment storage volume is 2.3 ft^3 at a sediment depth of 0.5 inches.

Effective Sedimentation/Filtration Treatment Areas - The Effective Sedimentation Area (ESA) and the Effective Filtration Treatment Area (EFTA) increase as the size of the system increases. For the two overlapping StormTech SC-740 chambers tested, the ESA and the ratio of ESA/EFTA were 54.5 ft^2 and 1.0, respectively.

Sediment Mass Load Capacity - The sediment mass load capacity varies according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the mass loading capture was 158.4 lbs ± 0.8 lbs (2.91 ±0.01 lbs/ ft^2) following a total sediment loading of 195.2 lbs.

Technology Application

The StormTech "Isolator® Row PLUS" is a stormwater treatment technology designed for use under parking lots, roadways and heavy earth loads while providing a superior and durable structural system. The technology comprises a row of chambers covered in a non-woven geotextile fabric with a single layer of proprietary woven fabric at the bottom that serves as a filter strip, providing surface area for infiltration and runoff reduction with enhanced suspended solids and pollutant removal. The following features make the Isolator® Row PLUS effective as a water quality solution:

- Enhanced infiltration Surface Area
- Runoff Volume Reduction
- Peak Flow Reduction
- Sediment/Pollutant Removal
- Internal Water Storage (IWS)
- Water Temperature Cooling (Thermal Buffer).

Technology Description

The Isolator® Row PLUS (shown in Figures 1 and 2) is the first row of StormTech chambers that is surrounded with filter fabric and connected to a closely located manhole for easy access. The Isolator® Row PLUS provides for settling and filtration of sediment as stormwater rises in the chamber and ultimately passes through the filter fabric. The open-bottom chambers allow stormwater to flow out of the chambers, while sediment is captured in the Isolator® Row PLUS.

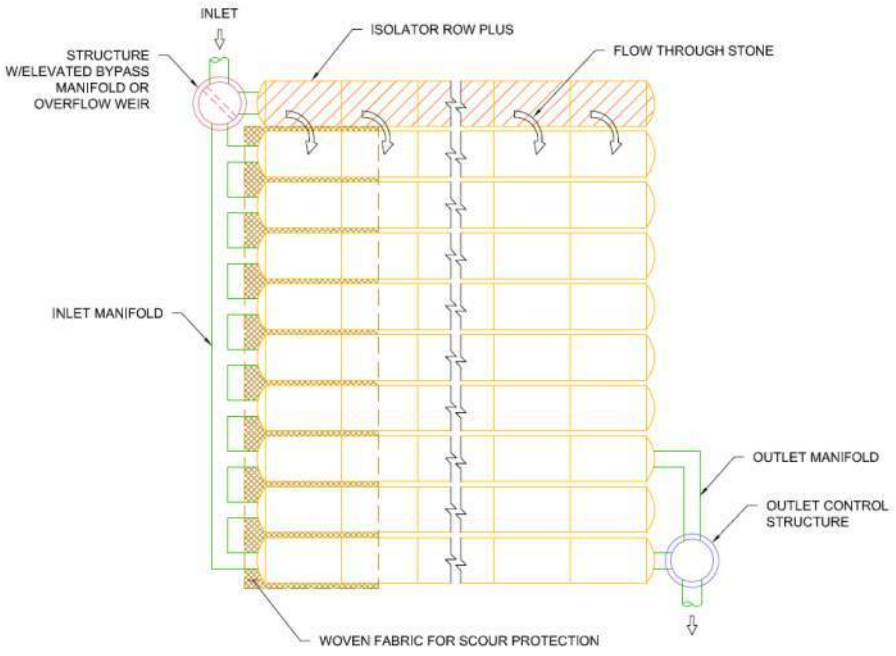

Figure 1: Schematic of the StormTech Isolator® Row PLUS System

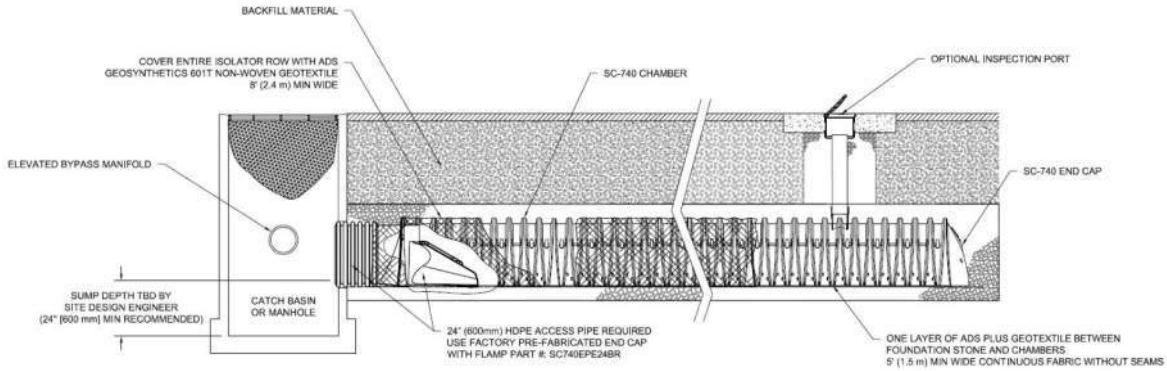

Figure 2: Isolator® Row PLUS Detail

A single layer of proprietary Advanced Drainage Systems (ADS) PLUS fabric is placed between the angular base stone and the Isolator Row PLUS chamber. The geotextile provides the means for stormwater filtration and provides a durable surface for maintenance operations. A 6 oz. non-woven fabric is placed over the chambers.

The Isolator® Row PLUS is designed to capture the “first flush” and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole not only provides access to the Isolator® Row PLUS but includes a high low/concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator® Row PLUS bypass through a manifold to the other chambers. This is achieved with either a high-flow weir or an elevated manifold. This creates a differential between the Isolator® Row PLUS and the manifold, thus allowing for settlement time in the Isolator® Row PLUS. After Stormwater flows through the Isolator® Row PLUS and into the rest of the StormTech chamber system it is either infiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

StormTech developed and owns the Isolator® Row PLUS technology and has filed a number of patent applications relating to the Isolator® Row PLUS system.[1]

Description of Test Procedure for the StormTech Isolator® Row PLUS

In January 2020, two overlapping StormTech SC-740 Isolator® Row PLUS commercial size chambers were installed at the Mid-Atlantic Storm Water Research Center (MASWRC, a subsidiary of BaySaver), in Mount Airy, Maryland, to evaluate the performance of the Isolator® Row PLUS system for Total Suspended Solid (TSS) removal (Figure 3) All testing and data collection procedures were supervised by Boggs Environmental Consultants, Inc. (BEC), who was hired by ADS for third party oversight, and were in accordance with the *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device (January 2013)*.

Prior to the start of testing, a Quality Assurance Project Plan (QAPP), revision dated January 09, 2020, was submitted and approved by the New Jersey Corporation for Advanced Technology (NJCAT), c/o Center for Environmental Systems, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ 07030.

[1] (U.S. Provisional Application No. 62/753,050, filed October 30, 2018; U.S. Non-Provisional Application No. 16/670,628, filed October 31, 2019; International Application No. PCT/US2019/059283, filed October 31, 2019; U.S. Application No. 16/938,482, filed July 24, 2020; U.S. Application No. 16/938,657, filed July 24, 2020; PCT International Application No. PCT/US2020/043543, filed July 24, 2020; PCT International Application No. PCT/US2020/043557, filed July 24, 2020.

Figure 3: StormTech "Isolator® Row PLUS" Test Set-up at MASWRC

Verification Results

The verification process for the StormTech Isolator® Row PLUS technology was conducted by GHL in accordance with the VerifiGlobal Verification Plan for the StormTech "Isolator® Row PLUS" Technology – 2020-09-09. The technology performance claims verified by GHL are summarized at the front of this Verification Statement and in Table 6 on Page 8 under the heading "Verification Summary".

Particle size distribution analysis was performed by ECS Mid-Atlantic, LLC of Frederick, MD in accordance with ASTM D422-63(2007). ECS is accredited by the American Association of State Highways and Transportation Officials (AASHTO).

ASTM D422-63(2007) is a sieve and hydrometer method where the larger particles, > 75 microns, are measured using a standard sieve stack while the smaller particles are measured based on their settling time using a hydrometer.

The PSD meets the requirements of NJDEP, which is generally accepted as representative of the type of particle sizes an OGS would be designed to treat. Actual PSD is site and rainfall event specific, so it was necessary to choose a standard PSD to make testing and comparison manageable.

Table 1 shows the NJDEP PSD specification. Table 2 and Figure 4 show the incoming material PSD as determined by ECS Mid-Atlantic and confirmed by the verifier.

Table 1: NJDEP PSD Specification

Particle Size (µm)	NJDEP Minimum Specification
1000	98
500	93
250	88
150	73
100	58
75	48
50	43
20	33
8	18
5	8
2	3
d_{50}	< 75 µm

Table 2 – Particle Size Distribution (PSD) of Test Sediment

Mesh (mm)	US Sieve Size	Sample ID		
		PSD A	PSD B	PSD C
		Percent Finer		
9.525	0.375	100.0	100.0	100.0
4.750	#4	100.0	100.0	100.0
4.000	#5	100.0	100.0	100.0
2.360	#8	100.0	100.0	100.0
2.000	#10	100.0	100.0	100.0
1.180	#16	100.0	100.0	100.0
1.000	#18	100.0	100.0	100.0
0.500	#35	100.0	100.0	100.0
0.425	#40	93.3	93.0	93.6
0.250	#60	90.3	89.8	90.2
0.150	#100	79.3	78.1	78.1
0.125	#120	73.6	71.7	71.7
0.106	#140	68.4	65.2	64.8
0.090	#170	60.2	58.3	57.5
0.075	#200	52.0	50.9	50.3
0.053	#270	48.0	48.3	47.8
0.045	Hydrometer	46.6	46.7	46.7
0.032		42.8	42.9	41.0
0.021		37.1	37.2	35.3
0.0125		25.7	25.7	25.8
0.0090		20.1	20.1	19.2
0.0064		16.3	16.4	14.5
0.0032		8.8	8.7	7.8
0.0014		3.8	3.7	3.8

The suspended sediment concentration analysis was completed by Fredericktowne Labs Inc., Meyersville, MD. Fredericktown Labs is accredited by the Maryland Department of Environment as Maryland Certified Water Quality Laboratory. The analysis procedure was ASTM D3977-97, Suspended Sediment Concentration. The sampling procedure and submission of samples to the test lab were overseen by the independent observer, Boggs Environmental Consultants, Inc.

All test data and calculations were detailed in the report “NJCAT TECHNOLOGY VERIFICATION Isolator® Row PLUS StormTech, LLC”, July 2020, which was submitted to and verified by the New Jersey Corporation for Advanced Technology (NJCAT).

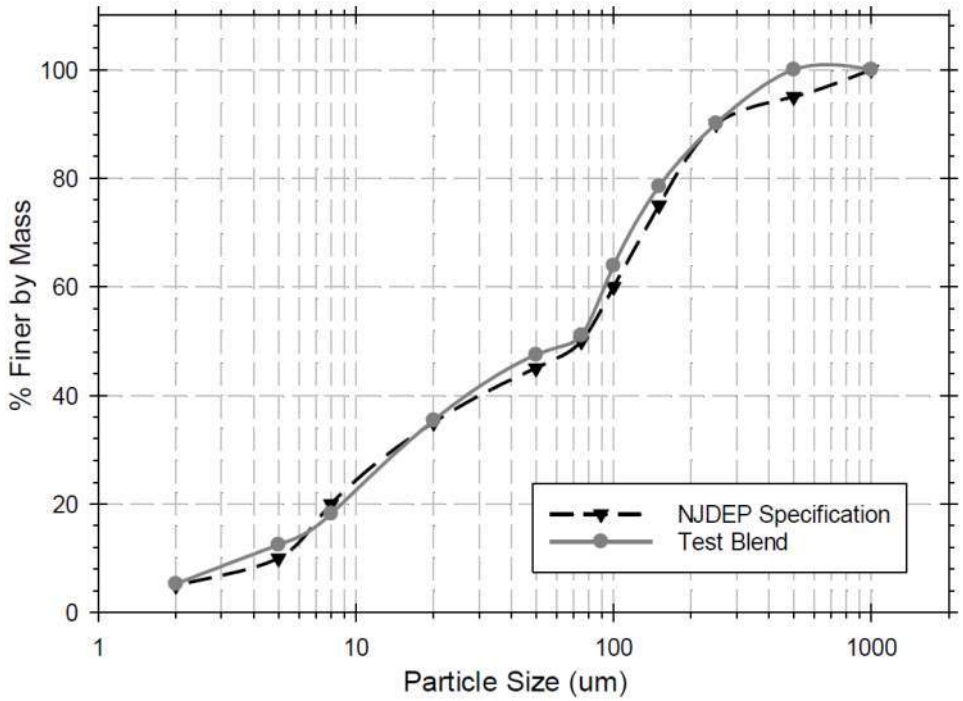

Figure 4– Particle Size Distribution (PSD)

The data in Table 3 (Flow Rate and Temperature) and Table 4 (Removal Efficiency) form the basis for the verified technology performance claim, specifically, flow rate, sediment captured and removal efficiency.

Table 3: Flow Rate and Temperature Summary

Run	Max Flow (gpm)	Min Flow (gpm)	Average Flow (gpm)	Flow COV	Flow Compliance (COV< 0.1)	Maximum Temperature (Fahrenheit)	NJDEP Temperature Compliance (< 80 F)
1	232.8	223.9	226.3	0.0078	Y	48.2	Y
2	228.9	218.6	220.8	0.0104	Y	51.5	Y
3	229.4	220.0	227.2	0.0094	Y	44.7	Y
4	230.2	218.7	223.2	0.0138	Y	40.5	Y
5	228.7	216.9	222.2	0.0103	Y	44.7	Y
6	227.6	217.0	224.2	0.0115	Y	46.7	Y
7	229.7	221.9	226.4	0.0092	Y	44.6	Y
8	230.3	222.2	226.8	0.0089	Y	43.5	Y
9	233.2	218.4	225.6	0.0136	Y	45.5	Y
10	232.2	219.7	228.4	0.0126	Y	44.7	Y
11	226.9	219.2	224.1	0.0088	Y	52.4	Y
12	232.2	222.1	226.9	0.0107	Y	48.5	Y
13	234.7	221.2	226.1	0.0109	Y	48.5	Y
14	231.9	223.4	228.7	0.0103	Y	45.6	Y
15	236.8	224.1	231.4	0.0131	Y	52.2	Y
16	232.5	221.3	229.0	0.0137	Y	47.8	Y

Table 4: Removal Efficiency Results

Run	Average Influent TSS (mg/L)	Influent Water Volume (gal)	Adjusted Average Effluent TSS (mg/L)	Effluent Water Volume (gal)	Adjusted Average Drain Down TSS (mg/L)	Drain Down Water Volume (gal)	Single Run Removal Efficiency (%)	Mass of Captured Sediment (g)	Cumulative Removal Efficiency (%)
1	203	7166	46	6881	34	285	77.8	4282	77.8
2	199	6993	32	6639	27	354	84.0	4415	80.8
3	207	7197	37	6793	27	403	82.6	4654	81.4
4	217	7068	33	6635	29	433	84.9	4923	82.3
5	215	7037	39	6593	29	444	82.2	4705	82.3
6	207	7097	40	6643	31	454	81.2	4504	82.1
7	198	7169	37	6693	30	476	81.6	4386	82.0
8	201	7184	37	6716	32	468	81.6	4473	82.0
9	205	7147	38	6675	30	472	81.8	4539	82.0
10	203	7235	38	6759	31	476	81.4	4523	81.9
11	208	7096	38	6624	30	472	81.8	4567	81.9
12	209	7185	41	6709	30	476	80.7	4584	81.8
13	198	7162	41	6680	32	482	79.7	4277	81.6
14	200	7242	43	6757	34	485	78.8	4318	81.4
15	196	7329	41	6842	32	487	79.5	4320	81.3
16	202	7254	44	6769	31	485	78.9	4384	81.2
Avg.	**204.2**	**7160**	**39**	**6713**	**31**	**447**	**81.2**	**4491**	**N/A**
Cumulative Mass Removed (g)							**71854**		
Cumulative Mass Removed (lb)							**158.4**		
Total Mass Loaded (lb)							**195.2**		
Cumulative Removal Efficiency (%)							**81.2**		

Quality Assurance

Performance verification of the StormTech Isolator® Row PLUS technology was performed in accordance with the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. This included reviewing all data sheets and calculated values, as well as overall management of the test system, quality control and data integrity.

Additional information on quality control measures taken can be found in section 5 of the QAPP for StormTech Isolator Row New Jersey Department of Environmental Protection Testing, Rev. 1/9/2020.

Specific QA/QC measures reviewed by the verifier are summarized in Table 5 below.

Table 5. Validation of QA/QC Procedures

QC Parameter	Acceptance Criteria
Independence of observer	Confirmed in letter from Boggs Environmental Consultants, Inc. to NJCAT
Consistency of procedure	Daily logs confirm proper procedure
Existence of QAPP	Confirmed. “QAPP For StormTech Isolator Row New Jersey Department of Environmental Protection Testing”, Rev. 1/9/2020*)*
Use of appropriate sample analysis method – ASTM D3799	Confirmed by method reference on lab reports from Fredericktowne Labs Inc.
Test method appropriate for the technology	Used industry stakeholder approved protocol: *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids*

	Removal by a Filtration Manufactured Treatment Device (January 2013)
Test parameters stayed within required limits	Confirmed in report "NJCAT TECHNOLOGY VERIFICATION Isolator® Row PLUS StormTech, LLC", July 2020
Third party verified data	All testing was observed and reviewed by Boggs Environmental Consultants, Inc.

Variance

Performance claims regarding structural load limitations were not verified as they are outside the scope of the performance testing that was conducted in accordance with the 'Quality Assurance Project Plan (QAPP) for StormTech Isolator Row, New Jersey Department of Environmental Protection Testing', revision dated January 09, 2020.

Verification Summary

The StormTech "Isolator® Row PLUS" is a stormwater treatment technology designed for use under parking lots, roadways and heavy earth loads while providing a superior and durable structural system. The technology comprises a row of chambers wrapped in woven geotextile fabric with two layers at the bottom that serve as a filter strip, providing surface area for infiltration and runoff reduction with enhanced suspended solids and pollutant removal.

The StormTech Isolator® Row PLUS technology was tested at the Mid-Atlantic Storm Water Research Center (MASWRC), under the supervision of Boggs Environmental Consultants, Inc. The performance test results for two overlapping StormTech Isolator® Row PLUS chambers (commercial unit model SC-740) were verified by Good Harbour Laboratories Inc. (GHL), following the requirements of ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. Table 6 summarizes the verification results in relation to the technology performance parameters that were identified in the Verification Plan to determine the efficacy of the StormTech Isolator® Row PLUS technology.

Table 6 - Summary of Verification Results Against Performance Parameters

Parameters	Verified Claims	Accuracy
Total Suspended Solids (TSS) Removal Efficiency	Based on the laboratory testing conducted, the StormTech Isolator® Row PLUS achieved an average 82% removal efficiency of SSC	± 1% (95% confidence level)
Average Loading Rate	Based on the laboratory testing parameters, the StormTech Isolator® Row PLUS maintained a loading rate of 4.15 GPM/sf	±0.03 GPM/sf (95% confidence level)
Maximum Treatment Flow Rate (MTFR)	Although the MTFR varies among the StormTech Isolator® Row PLUS model sizes and the number of chambers, the design surface loading rate remains the same (4.13 GPM/ft^2 of treatment surface area). The test unit consisted of two overlapping StormTech SC-740 chambers with a nominal MTFR of 225 GPM (0.501 CFS) and an effective filtration treatment area (EFTA) of approximately 54.5 ft^2.	± 1.4 GPM (95% confidence level)
Detention Time and Volume	Detention time and wet volume varies with model size. The unit tested had a wet volume of approximately 65.1 ft^3 (based on	N/A

	physical measurement) and a detention time of 2.2 minutes.	
Maximum Sediment Storage Depth and Volume	The sediment storage volume and depth vary according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the maximum sediment storage volume is 2.3 ft^3 at a sediment depth of 0.5 inches.	N/A
Effective Sedimentation/ Filtration Treatment Area	The effective sedimentation and filtration treatment area increases as the size of the chamber increases. Under the tested conditions using 2 overlapping chambers, the treatment area was 54.5 ft^2	The sedimentation /filtration area was determined from the actual physical dimensions of the test unit*
Sediment Mass Load Capacity	The sediment mass load capacity varies according to the StormTech Isolator® Row PLUS model sizes and system configuration. For the two overlapping StormTech SC-740 chambers tested, the mass loading capture was 158.4 lbs (2.91 lbs/ ft^2) following a total sediment loading of 195.2 lbs	± 0.8 lbs (±0.01 lbs/ft^2) (95% confidence level)

*Note: These numbers are determined based on physical measurement or a dimensional drawing, which is standard practice. Highly accurate measurements are not practical.

In conclusion, the StormTech Isolator® Row PLUS is a viable technology that can be used to remove contaminants from stormwater runoff via filtration. This technology has proven effective at removing suspended sediment from stormwater through in-lab testing using an industry recognized laboratory protocol.

By extension of sediment removal, this technology should also remove particle bound nutrients, heavy metals, and a wide variety of organic contaminants. Performance is a function of pollutant properties, hydraulic retention time, filter media, pre-treatment, and flow rate, such that proper design of the system is critical to achieving the desired results.

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 StormTech "Isolator® Row PLUS" technology, contact:	For more information on VerifiGlobal, contact:
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Signed for StormTech: *Original signed by:* *Greg Spires* Greg Spires, P.E. General Manager	Signed for VerifiGlobal: *Original signed by:* *Thomas Bruun* Thomas Bruun, Managing Director *Original signed by:* *John Neate* 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, Good Harbour Laboratories, 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, Good Harbour Laboratories, 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 F: City Correspondence

Boundary Conditions
5581 Doctor Leach Drive

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	14	0.23
Maximum Daily Demand	67	1.11
Peak Hour	494	1.7
Fire Flow Demand #1	12,000	200.00

Location

Results

Existing Conditions (Pressure Zone 3SW)

Connection 1 – Doctor Leach Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	156.1	93.8
Peak Hour	141.9	73.5
Max Day plus Fire Flow	103.7	19.3

[1] Ground Elevation = 90.2 m

Future Conditions (Pressure Zone SUC)

Connection 1 – Doctor Leach Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	146.6	80.2
Peak Hour	142.8	74.8
Max Day plus Fire Flow	116.7	37.7

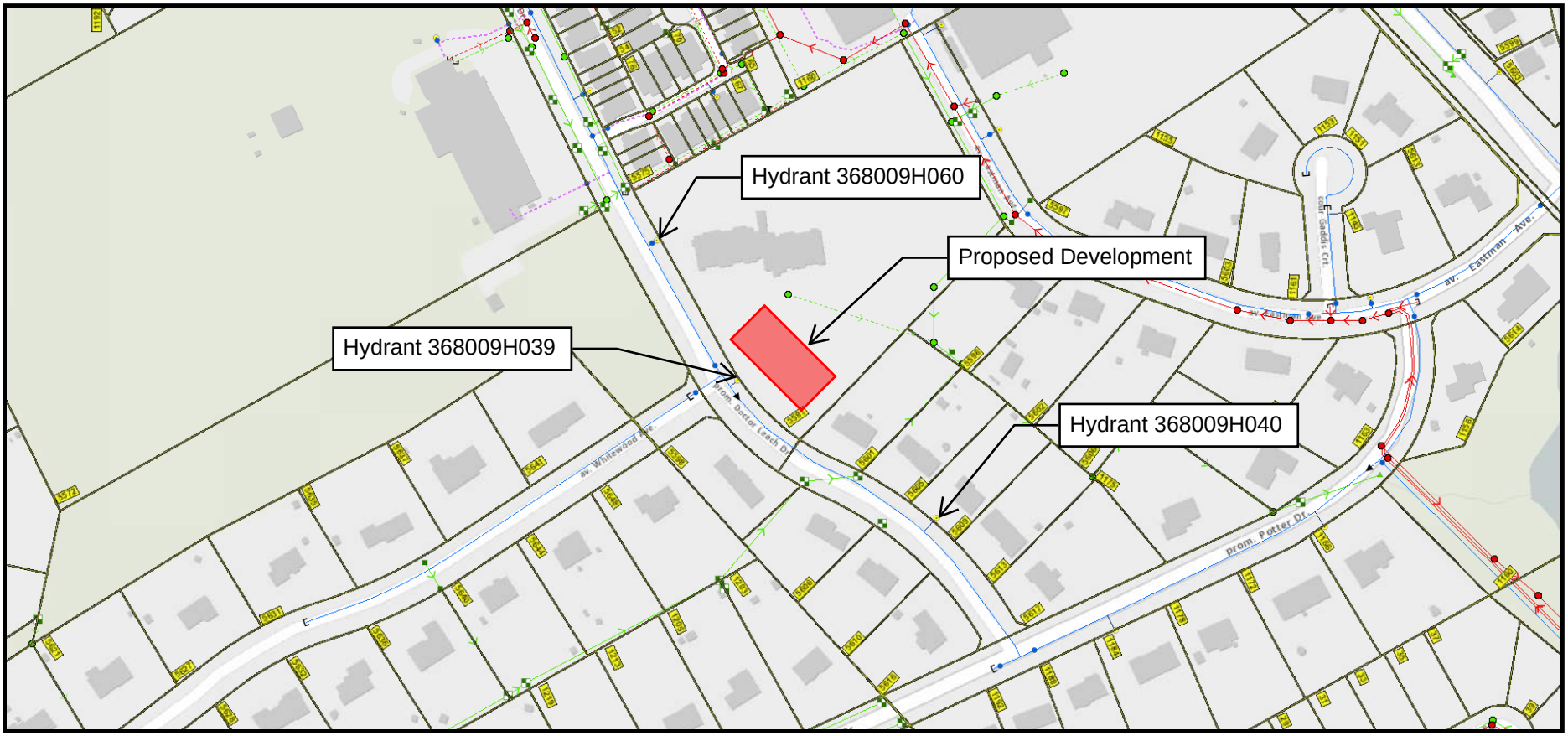
[1] Ground Elevation = 90.2 m

Notes

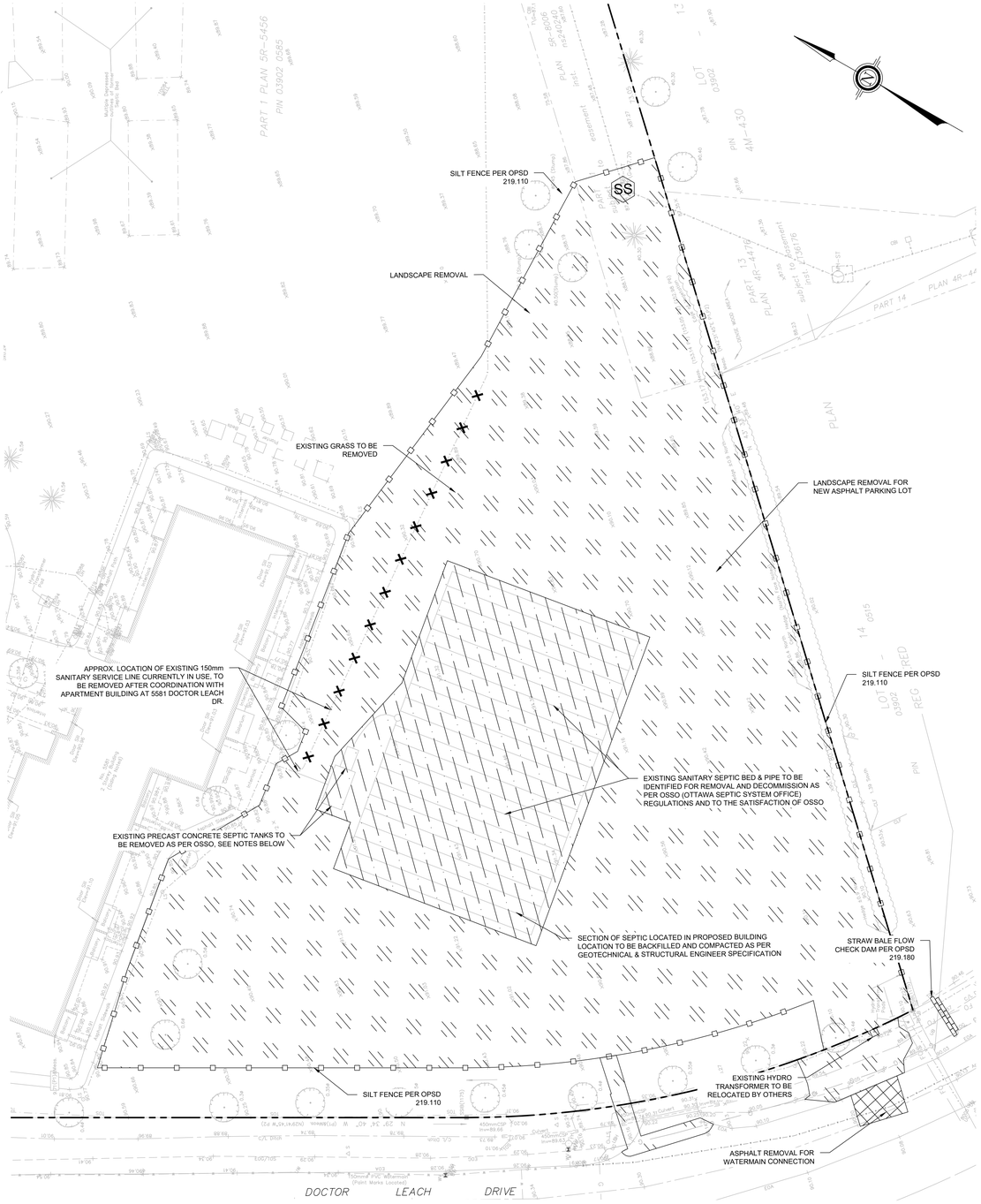
1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.


Hydrant 368009H060
Proposed Development
Hydrant 368009H039
Hydrant 368009H040
av. Eastman Ave.
Prom. Potter Dr.
av. Whitewood Ave.
Prom. Doctor Leach Dr.
Dr. Gaddis Crt.

DRAWINGS



NOTES: SEPTIC DECOMMISSION PROCESS AS PER OTTAWA SEPTIC SYSTEM OFFICE (OSSO)

1. COMPLETE AND SUBMIT THE SEPTIC SYSTEM DECOMMISSIONING FORM ALONG WITH PAYMENT TO THE OTTAWA SEPTIC SYSTEM OFFICE AT LEAST FIVE DAYS PRIOR TO STARTING WORK.
2. LOCATE THE SEPTIC TANK AND UNCOVER THE TOP OF THE TANK (GENERALLY 12–24 INCHES BELOW GROUND LEVEL). DO NOT ENTER THE TANK.
3. HAVE THE SEPTIC TANK WASTEWATER (LIQUID AND SLUDGE) PUMPED OUT BY A LICENSED SEPTIC HAULER. IT IS IMPORTANT TO PUMP THE WASTEWATER, AS IT CONTAINS BACTERIA AND VIRUSES THAT COULD MAKE YOU OR YOUR FAMILY ILL. KEEP THE PUMPING RECEIPT AS IT ACTS AS PROOF-OF-PUMPING AND WILL BE REQUIRED PRIOR TO OTTAWA SEPTIC SYSTEM OFFICE INSPECTION AS PART OF THE APPROVAL PROCESS.
4. FILL IN THE SEPTIC TANK COMPLETELY WITH SAND OR GRAVEL AND PUT THE ACCESS LID(S) BACK IN PLACE, OR DEMOLISH THE TANK AND FILL IN WITH SOIL.
5. REQUEST AN INSPECTION BY FAX, EMAIL OR CALLING THE OTTAWA SEPTIC SYSTEM OFFICE. PLEASE INCLUDE YOUR NAME, THE ADDRESS OF THE DECOMMISSIONING AND FILE NUMBER. AN INSPECTION WILL TAKE PLACE WITHIN 48 HOURS.
6. OSSO WILL PERFORM AN INSPECTION WITHIN 48 HOURS.
7. ONCE YOU RECEIVE PAPERWORK APPROVING THE DECOMMISSIONING OF YOUR SEPTIC TANK, BACKFILL THE SOIL AROUND THE SEPTIC TANK SLIGHTLY HIGHER THAN GROUND LEVEL TO ALLOW FOR SETTLING.
8. BE SURE TO STORE YOUR APPROVED SEPTIC SYSTEM DECOMMISSIONING FORM IN A SAFE PLACE. THIS DOCUMENTATION WILL BE OF VALUE SHOULD YOU CHOOSE TO SELL YOUR HOME IN THE FUTURE.

LEGEND:

- 5581 DOCTOR LEACH DR. - PROPERTY LINE
- FUTURE PROPERTY LINE
- STRUCTURE TO BE REMOVED
- PROPOSED SILT FENCE AS PER OPSD 219.110
- SEWER TO BE REMOVED
- EXISTING SEPTIC SYSTEM REMOVAL AS PER OTTAWA SEPTIC SYSTEM OFFICE
- LANDSCAPE REMOVAL
- ASPHALT REMOVAL AND CURB CONNECTED
- SILT SACK PER DETAIL D1

EROSION AND SEDIMENT CONTROL MEASURES:

- CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURE MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
- SEDIMENT AND EROSION CONTROL PLAN OBJECTIVES:
- PREVENT SOIL EROSION. THIS CAN RESULT FROM STREAMING RAIN WATER OR WIND EROSION DURING CONSTRUCTION,
- PREVENT SEDIMENT DEPOSITS IN THE SEWER PIPES AND NEARBY COLLECTING STREAMS (AS APPLICABLE),
- PREVENT AIR POLLUTION FROM PARTICULATE MATTER AND DUST.

1. PRIOR TO START OF CONSTRUCTION:

PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF SOIL AND CONSTRUCTION:

- INSTALL SILT FENCE (AS PER OPSD 219.110) ALONG DITCHES IMMEDIATELY DOWNSTREAM FROM AREAS TO BE DISTURBED (SEE PLAN FOR LOCATION).
- INSTALL FILTER CLOTH ON DOWNSTREAM MANHOLE COVERS.
- INSTALL SILTSACK FILTERS IN ALL CONCRETE CATCH BASINS STRUCTURES.
- INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.
- THE CONTRACTOR MUST SET UP THE MEASURES INDICATED ON THE PLAN, INSPECT THEM FREQUENTLY AND CLEAN AND REPAIR OR REPLACE THE DETERIORATED STRUCTURES. AT THE END OF THE CONSTRUCTION PERIOD, THE CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF THE TEMPORARY STRUCTURES AND RECONDITIONING THE AFFECTED AREAS

2. DURING CONSTRUCTION:

- SEDIMENT AND EROSION CONTROL MEASURES TO BE CONSTRUCTED AS PER OPSS 805.
- WHEN SEDIMENT AND EROSION CONTROL MEASURES MUST BE REMOVED TO COMPLETE A PORTION OF THE WORK, THE SAME MEASURES MUST BE REINSTATED UPON THE WORK'S COMPLETION.
- WORK TO BE DONE IN THE VICINITY OF MAJOR WATERWAYS TO BE CARRIED OUT FROM JULY AND SEPTEMBER ONLY.
- MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
- PROTECT DISTURBED AREAS FROM RUNOFF.
- PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED SHORTLY.
- INSPECT STRAW BALE FLOW CHECK DAMS, SILT FENCES, SILT SACKS, AND CATCH BASIN SUMPS REGULARLY AND AFTER EVERY MAJOR STORM EVENT. CLEAN AND REPAIR WHEN NECESSARY.
- PLAN TO BE REVIEWED AND REVISED AS REQUIRED DURING CONSTRUCTION.
- EROSION CONTROL FENCING TO BE ALSO INSTALLED AROUND THE BASE OF ALL STOCKPILES.
- DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5m FROM ANY PAVED SURFACE, OR ONE WHICH IS TO BE PAVED BEFORE THE PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON SITE LONG ENOUGH FOR SEEDS TO GROW (LONGER THAN 30 DAYS). WHEN STORING SOIL ON SITE IN PILES THE CONTRACTOR MUST COVER EACH PILE WITH TARPS, STRAW OR A GEOTEXTILE FABRIC TO AVOID FINE PARTICLE TRANSPORT BY WIND AND/OR STREAMING RAIN WATER.
- CONTROL WIND-BLOWN DUST OFF SITE TO ACCEPTABLE LEVELS BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED). FOR DUST CONTROL, CONTRACTOR TO APPLY CALCIUM CHLORIDE (TYPE I – OPSS 2501 AND CAN/CGSB-15-1) AND WATER WITH EQUIPMENT APPROVED BY THE OWNER'S REPRESENTATIVE AT RATE IN ACCORDANCE TO OPSS 506 WHEN DIRECTED BY OWNER'S REPRESENTATIVE.
- ALL EROSION CONTROL STRUCTURE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER. SEDIMENT CAPTURE SILT SACKS MUST BE MAINTAINED AND CANNOT BE REMOVED UNTIL ALL LANDSCAPING AREAS ARE COMPLETED.
- NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVES BY THIS CONSULTING ENGINEER AND THE CITY OF OTTAWA DEPARTMENT OF PUBLIC WORKS.
- CONTRACTOR RESPONSIBLE FOR MUNICIPAL ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING ETC. AT THE END OF EACH WORK DAY.
- DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPED.
- ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
- TAKE ALL NECESSARY STEPS TO PREVENT BUILDING MATERIAL, CONSTRUCTION DEBRIS OR WASTE BEING SPILLED OR TRACKED ONTO ABUTTING PROPERTIES OR PUBLIC STREETS DURING CONSTRUCTION AND PROCEED IMMEDIATELY TO CLEAN UP ANY AREAS SO AFFECTED.
- PROVIDE GRAVEL ENTRANCE WHEREVER EQUIPMENT LEAVES THE SITE TO PROVIDE MUD TRACKING ONTO PAVED SURFACES. GRAVEL BED SHALL BE A MINIMUM OF 10m LONG, 4m WIDE, AND 0.15m DEEP AND SHALL CONSIST OF COARSE MATERIAL. MAINTAIN GRAVEL ENTRANCE IN CLEAN CONDITION.

3. AFTER CONSTRUCTION:

- PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREAS.
- ALL SEDIMENT AND EROSION CONTROL MEASURES TO BE REMOVED BY THE CONTRACTOR FOLLOWING THE COMPLETION OF WORK AND AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED, THIS INCLUDES REMOVE STRAW BALE FLOW CHECK DAMS, SILT FENCES AND FILTER CLOTHS ON CATCH BASINS AND MANHOLE COVERS.
- INSPECT AND CLEAN CATCH BASIN SUMPS AND STORM SEWERS.

NOTES: REMOVALS AND DEMOLITION

1. PRE-REMOVAL, THE CONTRACTOR MUST VISIT THE PREMISES IN ORDER TO BE FULLY AWARE OF EXISTING CONDITIONS ON SITE, INCLUDING ALL ELEMENTS TO BE REMOVED AND DEMOLISHED. NO CLAIM WILL BE ACCEPTED DUE TO A POOR EVALUATION OF THE WORK TO BE COMPLETED.
2. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND THE REQUEST FOR INTERRUPTION OF PUBLIC UTILITY SERVICES, SUCH AS GAS, TELEPHONE, POWER, CABLE, SEWERS, WATERMAIN, ETC. BEFORE PROCEEDING WITH WORK, COORDINATE WITH ALL APPLICABLE UTILITY COMPANIES.
3. FIRE HYDRANTS TO BE TAGGED AND BAGGED AND/OR PROTECTED AS INDICATED ON DRAWING.
4. CURB, ASPHALT, SIDEWALK, AND GRANULAR BASE TO BE EXCAVATED WITHIN LIMITS OF DEMOLITION REMOVAL. THE CONTRACTOR MUST CARRY OUT NECESSARY SAW CUTS.
5. SEWER / WATERMAIN PIPES TO BE ABANDONED MUST BE CUT, FILL WITH UNSHRINKABLE CONCRETE CONFORMING TO OPSS 1359, AND CAPPED.
6. REMOVE AND DISPOSE SEWERS AS INDICATED. PLUG ANY SERVICE LATERALS TO BE ABANDONED.
7. THE CONTRACTOR MUST ENTIRELY REMOVE THE DEMOLITION WRECKAGE FROM THE CONSTRUCTION SITE OFFSITE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINISTRY OF ENVIRONMENT CONSERVATION AND PARKS (MECP).
   a. THE CONTRACTOR MUST DISCARD RECYCLABLE DEMOLITION MATERIALS IN COLLABORATION WITH A REGIONAL RECYCLING COMPANY.
   b. ALL OTHER DEMOLITION MATERIALS MUST BE DISPOSED OFF-SITE AT AUTHORIZED LICENSED LANDFILLS AND IN CONFORMITY WITH THE APPLICABLE LAWS AND REGULATIONS. THE CONTRACTOR MUST BE ABLE TO PROVIDE, UPON REQUEST, COPIES OF THE DISPOSAL TICKETS TO THE OWNER'S REPRESENTATIVE.
8. SURFACES AND WORKS LOCATED OUTSIDE OF THE CONSTRUCTION WORK LIMIT MUST BE REINSTATED AS THEY WERE BEFORE BEGINNING OF WORK. CONTRACTOR IS RESPONSIBLE TO MAKE GOOD ON ANY DAMAGES TO EXISTING CURB AND ASPHALT NOT SCHEDULED FOR REMOVAL.
9. ALL MATERIALS, PRODUCTS AND OTHERS COMING FROM THE DEMOLITION BELONG TO THE CONTRACTOR, UNLESS SPECIFIED OTHERWISE.
10. THE CONTRACTOR MUST COMPLETE ALL REMOVALS AS SHOWN ON THE DRAWINGS AND AS REQUIRED TO MAKE THE WORK COMPLETE.
11. THE CONTRACTOR MUST PROTECT AND MAINTAIN IN SERVICE THE EXISTING WORKS WHICH MUST REMAIN IN PLACE. IF THEY ARE DAMAGED, THE CONTRACTOR MUST IMMEDIATELY MAKE THE REPLACEMENTS AND NECESSARY REPAIRS TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE AND WITHOUT ADDITIONAL EXPENSE TO THE OWNER.
12. THE CONTRACTOR MUST NOT PERFORM ANY TREE CUTTING DURING THE CORE MIGRATORY BIRDS NESTING PERIOD, WHICH IS APRIL 15 TO AUGUST 15.

NOTES: GENERAL

1. THE CONTRACTOR MUST CONFORM TO ALL LAWS, CODES, ORDINANCES, AND REGULATIONS ADOPTED BY FEDERAL, PROVINCIAL OR MUNICIPAL GOVERNMENT COUNCILS AND GOVERNMENT AGENCIES, APPLYING TO WORK TO BE CARRIED OUT. WHEREVER STANDARDS, LAWS AND/OR REGULATIONS ARE MENTIONED THEY REFER TO THEIR CURRENT VERSIONS, MODIFICATIONS INCLUDED.
2. ALL MATERIALS AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND DRAWINGS (OPSS AND OPSD), THE ONTARIO MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE, THE ONTARIO MINISTRY OF NATURAL RESOURCES, APPLICABLE CONSERVATION AUTHORITIES, THE MUNICIPAL STANDARD SPECIFICATIONS AND DRAWINGS, AND ALL OTHER GOVERNING AUTHORITIES AS THEY APPLY, UNLESS OTHERWISE INDICATED.
3. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
4. THE LOCATION OF EXISTING UNDERGROUND MUNICIPAL SERVICES AND PUBLIC UTILITIES AS SHOWN ON THE PLANS ARE APPROXIMATE. THE CONTRACTOR MUST DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES (ON-SITE AND OFF-SITE) PRIOR TO ANY EXCAVATION WORK. DAMAGE TO ANY EXISTING SERVICES AND/OR EXISTING UTILITIES DURING CONSTRUCTION, WHETHER OR NOT SHOWN ON THE DRAWINGS MUST BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE.
5. THE CONTRACTOR SHALL DETERMINE THE EXACT INVERT (GEODETIC ELEVATION), DIAMETER AND CONSTRUCTION MATERIAL OF THE EXISTING CONDUITS AT THE PROPOSED CONNECTIONS. THEY SHALL ALSO CARRY OUT, IF NECESSARY, EXPLORATORY DIGS IN ORDER TO DETERMINE THE EXACT LOCATION AND INVERTS OF EXISTING DUCK BANKS. THIS INFORMATION SHALL IMMEDIATELY BE PROVIDED TO THE CONSULTANT PRIOR TO START UNDERTAKING ANY MUNICIPAL SERVICES WORK AND A 48 HOUR PERIOD MUST BE ALLOCATED TO THE CONSULTANT FOR DESIGN REVIEW.
6. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK.
7. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
8. THE CONTRACTOR IS RESPONSIBLE FOR THE COORDINATION OF ALL WORK AND ACTIVITIES WITH OTHERS TRADES AND CONTRACTORS.
9. THE CONTRACTOR IS THE ONLY PERSON IN CHARGE OF SAFETY ON THE BUILDING SITE. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATE PROTECTION OF THE WORKERS, OTHER PERSONNEL AND THE GENERAL PUBLIC. PROTECTION OF MATERIALS AS WELL AS MAINTAINING IN GOOD CONDITION THE COMPLETED WORKS AND WORKS TO BE COMPLETED. THE CONTRACTOR MUST PROVIDE AT ANY TIME:
   a. A SUFFICIENT NUMBER OF FENCES, BARRIERS, POSTERS, GUARDS AND OTHERS TO ENSURE SAFETY;
   b. NECESSARY CONVENIENCES FOR THE COMPLETION OF WORK SUCH AS HEATING, LIGHTING, VENTILATION ETC.
10. CONTRACTOR IS RESPONSIBLE TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE ALL THE WORKS AND ACTIVITIES AND BEAR COST OF THE SAME, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC, AND THEIR ASSOCIATED COSTS.
11. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
12. JOB BENCH MARK - CONFIRM WITH PARSONS PRIOR TO UTILIZATION. THE CONTRACTOR MUST MAINTAIN BENCHMARKS AND LANDMARK REFERENCES AS IS. OTHERWISE THESE REFERENCES WILL BE REPOSITIONED BY A CERTIFIED LAND SURVEYOR AT THE CONTRACTOR'S EXPENSE.
13. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
14. IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION, DEWATERING OF EXCAVATIONS COULD BE REQUIRED. IT IS ASSUMED THAT GROUNDWATER MAY BE CONTROLLED BY SUMP AND PUMPING METHODS. THE CONTRACTOR SHALL OBTAIN A PERMIT TO TAKE WATER IF SITE CONDITIONS REQUIRE TAKING MORE THAN A TOTAL OF 400 000 L/DAY.
15. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS. SITE PREPARATION INCLUDES CLEARING, GRUBBING, STRIPPING OF TOPSOIL, DEMOLITION, REMOVAL OF UNSUITABLE MATERIALS, CUT, FILL AND ROUGH GRADING OF ALL AREAS TO RECEIVE FINISHED SURFACES.
16. ABUTTING PROPERTY GRADE TO BE MATCHED.
17. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 300mm WIDTH MINIMUM.
18. CURBS TO BE BARRIER, CONSTRUCTED AS PER OPSD 600.110, EXCEPT WHERE INDICATED OTHERWISE. ELEVATION AT TOP OF CONCRETE CURBS TO BE 150 mm ABOVE THE ASPHALT, UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
19. DEPRESSED CURBS TO BE MOUNTABLE, CONSTRUCTED AS PER OPSD 600.100.
20. LIGHT DUTY AND HEAVY DUTY ASPHALT PAVEMENTS TO BE CONSTRUCTED AS PER TABLE ON DRAWING C103.
21. TRANSITION BETWEEN EXISTING AND PROPOSED PAVEMENT SHALL BE CONSTRUCTED AS PER DETAIL D3 ON DRAWING C104.
22. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE CITY AUTHORITIES.
23. CLEANLINESS ON THE SITE, INCLUDES THE CONTRACTOR SHALL CLEAN ROADWAYS AT HIS OWN COST AS DIRECTED BY THE OWNER'S REPRESENTATIVE, MATERIALS AND EQUIPMENT MUST BE LAID OUT IN AN ORGANIZED AND SAFE MANNER, AND ALL MATERIAL, EQUIPMENT AND TEMPORARY STRUCTURES WHICH ARE NO LONGER NECESSARY FOR THE EXECUTION OF THE CONTRACT MUST BE REMOVED FROM THE SITE.
24. CONTRACTOR TO ENSURE MITIGATION MEASURES ARE IMPLEMENTED TO REDUCED THE RISK OF GROUND CONTAMINATION FROM PETROLEUM PRODUCTS.
25. THE CONTRACTOR MUST ENSURE THE FOLLOWING MEASURES ARE IMPLEMENTED REGARDING THE HANDLING OF CONCRETE:
   a. CONCRETE SHOULD EITHER BE MIXED AWAY FROM THE SITE OR SHOULD BE PREPARED ON PAVED SURFACES IF ONLY SMALL QUANTITIES ARE REQUIRED (I.E. MINOR REPAIRS);
   b. EXCESS CONCRETE MUST BE DISPOSED OFF-SITE AT A LOCATION THAT MEETS ALL REGULATORY REQUIREMENTS;
   c. THE WASHING OF CONCRETE TRUCKS AND OTHER EQUIPMENT USED FOR MIXING CONCRETE SHOULD NOT BE CARRIED OUT WITHIN 30 METERS OF A WATERCOURSE OR WETLAND AND SHOULD TAKE PLACE OUTSIDE OF THE WORK SITE;
   d. ALL CONCRETE TRUCKS SHOULD COLLECT THEIR WASH WATER AND RECYCLE IT BACK INTO THEIR TRUCKS FOR DISPOSAL OFF-SITE AT A LOCATION MEETING ALL REGULATORY REQUIREMENTS.
26. THE CONTRACTOR SHALL ENSURE THAT ALL EXCAVATED SURPLUS MATERIALS THAT WILL BE REQUIRED TO BE DISPOSED OFFSITE BE STOCKPILED TEMPORALLY FOR SAMPLING PRIOR BEING LOADED OFFSITE.
27. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
28. TRENCHING, BACKFILLING AND COMPACTING MUST CONFORM TO OPSS 401.
29. DEWATERING OF PIPELINE, UTILITY AND ASSOCIATED STRUCTURE EXCAVATIONS TO BE COMPLETED AS PER OPSS 517.
30. THE CONTRACTOR MUST CONTROL SURFACE RUNOFF FROM PRECIPITATION DURING CONSTRUCTION.
31. FOR ALL GEOTECHNICAL WORK, CONTRACTOR TO REFER TO "GEOTECHNICAL INVESTIGATION, PROPOSED RESIDENTIAL DEVELOPMENT, 5581 DOCTOR LEACH DRIVE, OTTAWA, ONTARIO, BY PINCHIN LTD. DATED OCTOBER 12, 2022
32. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS.
33. THE CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATION, BACKFILL AND REINSTATEMENT OFF ALL AREAS DISTURBED DURING CONSTRUCTION TO EXISTING CONDITIONS OR BETTER AND ALL ASSOCIATED WORKS TO THE SATISFACTION OF THE CONSULTANT AND MUNICIPAL AUTHORITIES. ASPHALT REINSTATEMENT MUST BE IN ACCORDANCE WITH OPSS 310. LANDSCAPE AREAS TO BE REINSTATED WITH 150 mm OF TOPSOIL AND SOD IN ACCORDANCE WITH OPSS 802 AND OPSS 803.
34. DURING THE CONSTRUCTION PERIOD THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING TEMPORARY TRAFFIC SIGNAGE, INCLUDING TRAFFIC SIGNS, TRAFFIC MARKINGS AND TEMPORARY TRAFFIC LIGHTS, AND FLAGMEN, AS REQUIRED BY THE OWNER, THE CONSULTANT, THE MUNICIPALITY, THE MTO, AND OTHER GOVERNING AUTHORITIES.
35. CONSTRUCT SIDEWALK EXPANSION JOINTS & CONTROL JOINTS AS PER OPSD 310.020.
36. CONSTRUCT CONCRETE SIDEWALK AS PER OPSD 310.020 AND OPSS 351. TACTILE WALKING SURFACE INDICATORS PER OPSS 351.
37. DISPOSE OF CONTAMINATED MATERIALS AT APPROPRIATE OFF-SITE FACILITY THAT MEETS ALL REGULATORY REQUIREMENTS.
38. BE PREPARED TO INTERCEPT, CLEAN UP, AND DISPOSE OF SPILLS OR RELEASES THAT MAY OCCUR WHETHER ON LAND OR WATER. MAINTAIN MATERIALS AND EQUIPMENT REQUIRED FOR CLEANUP OF SPILLS OR RELEASES READILY ACCESSIBLE ON SITE.
39. PROMPTLY REPORT SPILLS AND RELEASES POTENTIALLY CAUSING DAMAGE TO ENVIRONMENT TO: AUTHORITY HAVING JURISDICTION OR INTEREST IN SPILL OR RELEASE INCLUDING CONSERVATION AUTHORITY, WATER SUPPLY AUTHORITIES, DRAINAGE AUTHORITY, ROAD AUTHORITY, AND FIRE DEPARTMENT.
40. DECONTAMINATE EQUIPMENT AFTER WORKING IN POTENTIALLY CONTAMINATED WORK AREAS AND PRIOR TO SUBSEQUENT WORK OR TRAVEL ON CLEAN AREAS.
41. DO NOT DISCHARGE DECONTAMINATED WATER, OR SURFACE WATER RUNOFF, OR GROUNDWATER WHICH MAY HAVE COME IN CONTACT WITH POTENTIALLY CONTAMINATED MATERIAL, OFF SITE OR TO MUNICIPAL SEWERS.
42. CONTRACTOR IS TO SUBMIT A TRAFFIC MANAGEMENT PLAN FOR APPROVAL ONE (1) WEEK PRIOR TO ANY WORK WITHIN THE ROW LIMITS TO MEET THE REQUIREMENTS OF MTO BOOK 7. THE CONTRACTOR WILL BE REQUIRED TO IMPLEMENT ALL REQUIREMENTS OF THE MTO BOOK 7.
43. CITY PUBLIC WORKS DEPARTMENT TO BE CONTACTED MINIMUM 7 DAYS PRIOR TO PLANNED DATE FOR CONNECTION TO EXISTING STORM SEWERS, SANITARY SEWERS, AND WATERMAIN. CONNECTION TO EXISTING TO TAKE PLACE IN THE PRESENCE OF APPROPRIATE CITY OF OTTAWA STAFF.

KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

SITE BENCHMARK No.1 LOCATED SOUTH OF CN#5581 ENTRANCE ON DR. LEACH DRIVE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 91.39

SITE BENCHMARK No.2 LOCATED NORTH CN#5598 ENTRANCE ON EASTMAN AVENUE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 88.93

SEE DRAWING C-102 or C-108 TO SEE BOTH BENCMARK ON PLAN VIEW

No.	DATE	DESCRIPTION	BY
03	20/02/2025	RE-ISSUED FOR SPA	M.T.
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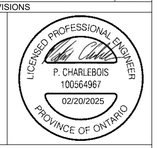
00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS



5m 2 0 5 10m

SCALE: 1:300

PARSONS
1223 Michael St., Suite 100, Ottawa, Ontario, Canada K1J 7T2
Tel: (613) 738-4160

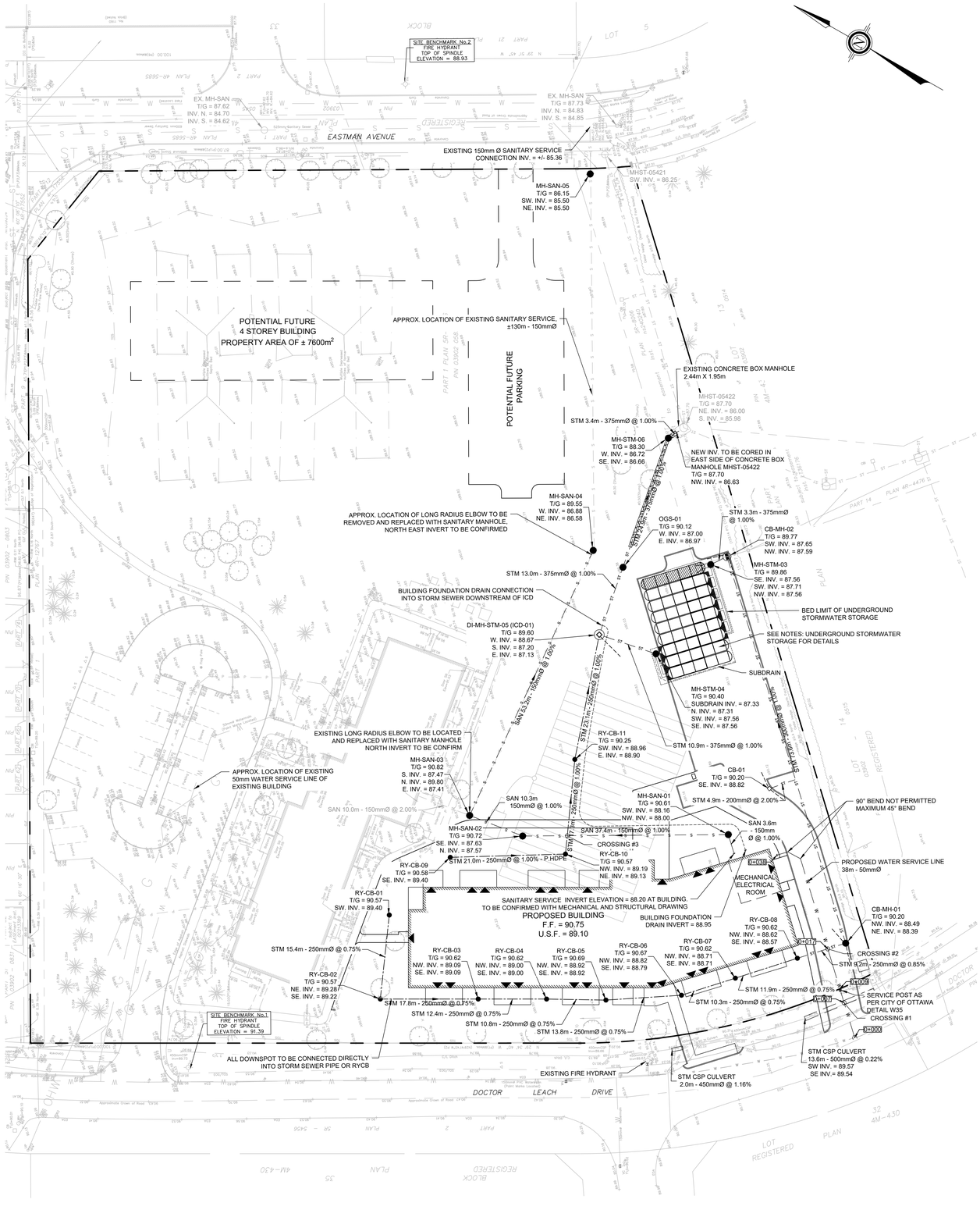
CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

TITLE
EROSION AND SEDIMENT CONTROL & REMOVALS PLAN

DESIGNED BY	P.C.
DRAWN BY	P.C.
CHECKED BY	M.T.
DATE	FEBRUARY 2024
SCALE	1:300
PROJECT NO.	478221
DRAWING NO.	C-101
	REM

FILE # D07-12-23-0048 PLAN #19129



LEGEND:

- 5581 DOCTOR LEACH DR. - PROPERTY LINE
- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- EXISTING V&VB
- EXISTING FIRE HYDRANT
- PROPOSED SERVICE POST LOCATION
- EXISTING SANITARY SEWER AND MAINTENANCE HOLE
- PROPOSED SANITARY SEWER AND MAINTENANCE HOLE
- EXISTING STORM SEWER AND MAINTENANCE HOLE
- PROPOSED STORM SEWER AND MAINTENANCE HOLE
- PROPOSED 150mm SUBDRAIN
- PROPOSED STORM SEWER AND RYCB AS PER CIYT OF OTTAWA STANDARD DETAIL S29
- P.HDPE — PERFORATED HIGH DENSITY POLYETHYLENE PIPE
- PROPOSED DOUBLE CATCH BASIN MAINTENANCE HOLE PER OPSD 703.021
- PROPOSED CATCH BASIN PER OPSD 705.010
- PROPOSED MAINTENANCE HOLE WITH DITCH INLET GRATE
- PIPE INSULATION PER CITY OF OTTAWA DETAIL S35

FUT

NOTES: WATERMAIN

1. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE THE MINIMUM COVER OF 2.4m IS NOT REACHED, THERMAL INSULATION IS REQUIRED AS PER CITY OF OTTAWA DETAIL W22.
2. WATERMAIN PIPE MATERIALS TO BE CLASS PVC DR-18, OR APPROVED EQUIVALENT, UNLESS INDICATED OTHERWISE.
3. WATERMAIN TO BE CONSTRUCTED AS PER OPSS 441 AND OPSD 802.010. WATERMAIN BEDDING AND COVER MATERIAL TO BE OPSS 1010 GRANULAR 'A' CRUSHER-RUN LIMESTONE COMPACTED TO 95% SPMDD.
4. A CONTINUOUS 12 GAUGE COPPER TRACER WIRE MUST BE INSTALLED OVER ALL WATERMAINS. TRACER WIRE SHALL BE TIED TO ALL FIRE HYDRANTS.
5. INSTALLATION OF A WATERMAIN PIPE CROSSING A SEWER PIPE SHALL BE AS PER CITY OF OTTAWA DETAILS W25 AND W25.2.
6. IF WATERMAIN PIPE MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
7. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER OPSD 1109.011.
8. THRUST BLOCKS AND RESTRAINING AS PER OPSD 1103.010 AND OPSD 1103.020
9. HYDRANT INSTALLATION AS PER OPSD 1105.010 AND OPSS 441. HYDRANT TO COMPLY WITH AWWA C502.
   a. HYDRANTS MUST HAVE THREE EXITS (TWO 65.5 mm AND ONE 100.0 mm 'STORZ' OF STAINLESS STEEL) WITH DRAIN. FIRE HYDRANTS MUST BE INSTALLED SUCH THAT THE 'STORZ' EXIT POINTS TOWARDS THE BUILDING IT WILL SERVICE. THE CONTRACTOR MUST ENSURE THAT THE BREAKAWAY FLANGE IS LOCATED ABOVE THE FINISHED GROUND (APPROXIMATELY 150 mm).
   b. FIRE FLOW TESTS FOLLOWED BY COLOUR CODING OF HYDRANTS (AS PER NFPA-291) SHALL BE CARRIED OUT PRIOR TO SUBSTANTIAL COMPLETION OF THE WORK.
10. WATERMAIN AND HYDRANT CONTROL VALVES IN THE 100 – 300 mm RANGE WILL BE RESILIENT SEATING GATE VALVES (AWWA C509) WITH MECHANICAL JOINT CONNECTIONS. VALVES WILL OPERATE COUNTER-CLOCKWISE TO OPEN WITH A NON-RISING STEM. VALVES WILL BE COMPLETE WITH THE STANDARD AWWA 50 mm OPERATING NUT. VALVES TO BE INSTALLED AS PER OPSS 441.
11. PIPE FITTINGS (BENDS, TEES, CROSSES, REDUCERS, ETC.) WILL BE MECHANICAL JOINT (AWWA C-111) WITH CEMENT MORTAR LINING (AWWA C-104).
12. COUPLERS MUST BE COMPRESSION TYPE WITH MINIMUM PRESSURE RATING OF 1035 kPa. COUPLERS MUST BE MUELLER 11-12940.
13. VALVE BOXES MUST BE COMPLETE (FULLY METALLIC) 3 PIECE SLIDING TYPE WITH GUIDE PLATES.
14. WATERMAINS MUST BE THOROUGHLY FLUSHED AND CLEANED TO REMOVE ALL DIRT AND DEBRIS PRIOR TO THE DISINFECTION PROCESS.
15. ALL WATERMAINS SHALL BE HYDROSTATICALLY AND BACTERIOLOGICALLY TESTED AS PER PROVINCIAL AND MUNICIPAL REGULATIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL REQUIREMENTS ARE FOLLOWED.
16. THE DISINFECTION PROCEDURE WHICH FOLLOWS INITIAL FLUSHING AND CLEANING CONSISTS OF CHLORINATION, FINAL FLUSHING AND BACTERIOLOGICAL TESTING. DISINFECTION MUST BE PERFORMED BY THE CONTRACTOR USING METHODS APPROVED BY THE CITY OF OTTAWA AND IN ACCORDANCE WITH MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE GUIDELINES. DOSAGE MUST BE 100 ppm WITH A MINIMUM RESIDUAL OF 25 ppm AFTER 24 HOURS. DISINFECTANT MUST BE SUPPLIED BY THE CONTRACTOR AND MUST BE ANSI APPROVED. TESTING AND TEST RESULTS MUST BE WITNESSED BY CITY OF OTTAWA PERSONNEL.
17. ALL DISINFECTANT WATER IS TO BE REMOVED FROM THE NEW WATERMAINS AND REPLACED WITH DISTRIBUTION SYSTEM WATER PRIOR TO PRESSURE TESTING OF THE WATERMAIN.
18. PRESSURE TESTING OF ALL WATERMAINS AND APPURTENANCES INSTALLED BY THE CONTRACTOR MUST BE PERFORMED BY THE CONTRACTOR USING METHODS MEETING THE APPROVAL OF THE CITY OF OTTAWA. TESTING AND RESULTS MUST BE WITNESSED BY CITY OF OTTAWA PERSONNEL.
19. MAINS AND SERVICES MUST BE PRESSURE TESTED AT 1035 kPa (150 psi) IN ACCORDANCE WITH AWWA C-600-82 (MINIMUM REQUIREMENT).
20. LEAKAGE TESTS MUST BE CONDUCTED AS PER AWWA C-600-82 (MINIMUM REQUIREMENT).
21. ONCE THE DISINFECTION AND PRESSURE TESTING RESULTS HAVE BEEN APPROVED, THE CONTRACTOR MUST ENSURE THAT ALL WATERMAIN PIPES ARE FLUSHED UNTIL THE CHLORINE LEVEL IN THE WATER IS SIMILAR TO THE LEVEL OF CHLORINE IN THE MUNICIPAL WATERMAIN NETWORK IN THE AREA.
22. BACTERIOLOGICAL TESTING MUST CONSIST OF TWO SAMPLINGS TWENTY FOUR HOURS APART. IF BACTERIOLOGICAL SAMPLES ARE SATISFACTORY THE WATERMAIN MAY BE PLACED ON LINE.
23. ALL WATERMAIN VALVES TO BE OPERATED BY THE CITY OF OTTAWA ONLY.

NOTES: SEWER

1. CONTRACTOR TO CONFIRM ELEVATION OF EXISTING STORM AND SANITARY SEWERS AT PROPOSED CONNECTION POINTS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE COMMENCING ANY WORK.
2. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH OPSS 407, AND 410.
3. PIPE MATERIAL TO BE PVC SDR-35 AND CONFORMING TO OPSS 1841, UNLESS INDICATED OTHERWISE. PVC SEWERS TO BE INSTALLED PER OPSD 802.010 (MODIFIED). BEDDING AND COVER MATERIALS TO BE OPSS 1010 GRANULAR 'A' CRUSHER-RUN LIMESTONE BEDDING COMPACTED TO 95% SPMDD.
4. ALL SEWERS WITH LESS THAN 1.8 METERS OF COVER ARE SUBJECTED TO INSULATION DETAIL S35 OF THE CITY OF OTTAWA ON DRAWING C-104
5. PIPE BACKFILL MATERIAL TO BE APPROVED NATIVE MATERIAL OR SELECT SUBGRADE MATERIAL IN CONFORMANCE WITH OPSS 212.
6. ALL MAINTENANCE HOLES AND CATCH BASIN MAINTENANCE HOLES TO BE 1200mmØ AS PER OPSD 701.010, UNLESS INDICATED OTHERWISE. MAINTENANCE HOLES AND CATCH BASIN MAINTENANCE HOLES TO BE INSTALLED PER OPSS 407.
7. ALL CATCH BASINS TO BE 600x600mm AS PER OPSD 705.010, UNLESS INDICATED OTHERWISE. CATCH BASINS TO BE INSTALLED PER OPSS 407.
8. EXCAVATING, BACKFILLING, AND COMPACTING REQUIRED FOR MAINTENANCE HOLES, CATCH BASIN MAINTENANCE HOLES, AND CATCH BASINS TO BE COMPLETED AS PER OPSS 402. THEY ARE TO BE BACKFILLED WITH OPSS GRANULAR 'B' COMPACTED TO 98% SPMDD. JOINTS BETWEEN SECTIONS TO BE WRAPPED WITH NON-WOVEN GEOTEXTILE.
9. FOR SANITARY STRUCTURES: CAST IRON MAINTENANCE HOLE COVER AS PER OPSD 401.010 TYPE 'A'.
10. FOR STORM STRUCTURES: CAST IRON CATCH BASIN MAINTENANCE HOLE COVER AS PER OPSD 401.010 TYPE 'B' AND CAST IRON CATCH BASIN COVER AS PER OPSD 400.020.
11. SANITARY MAINTENANCE HOLES REQUIRE BENCHING AS PER OPSD 701.021.
12. THE CONTRACTOR IS RESPONSIBLE FOR MAKING OR ARRANGING ALL CONNECTIONS TO THE EXISTING SEWERS AS PER MUNICIPAL REQUIREMENTS. PRIOR TO CONNECTION, THE CONTRACTOR MUST PROVIDE, TO THE CONSULTANT / ENGINEER AND THE CITY FOR APPROVAL, ALL TEST RESULTS PERFORMED ON THE INTERNAL SERVICES.
13. ADVISE THE CITY PUBLIC WORKS AT LEAST 72 HOURS IN ADVANCE BEFORE ANY CONNECTION TO THE CITY SERVICES. CO-ORDINATE WITH CITY OF OTTAWA AS REQUIRED.
14. TERMINATE AND PLUG ALL SERVICE CONNECTIONS AT 1.0 m FROM EDGE OF THE BUILDING.
15. ALL SEWERS TO BE C.C.T.V. INSPECTED BY THE CONTRACTOR AS PER OPSS 409. TWO COPIES OF THE INSPECTION REPORT MUST BE PROVIDED TO THE CONSULTANT AND THE C.C.T.V. INSPECTION IN DVD FORMAT ONLY.
16. SUBDRAIN KNOCKOUT (KO) WILL BE PRE-MANUFACTURED WITH CATCH BASINS AND MAINTENANCE HOLES.
17. THE STORMWATER TSS QUALITY REQUIREMENTS WILL BE ACHIEVED BY INSTALLING A STORMCEPTOR EFO4 OR EQUIVALENT TO ACHIEVE 80% TSS REMOVAL. THE OILGRIT SEPARATOR IS TO HAVE A SEDIMENT CAPACITY OF 1190 L, AN OIL CAPACITY OF 265 L, AND FOR A MAXIMUM TREATMENT FLOW RATE OF 12 L/s.
18. OGS WILL REQUIRE PERIODIC MAINTENANCE AND CLEANING AS PER MANUFACTURERS SPECIFICATIONS - TYPICAL CLEANING INTERVAL IS ONCE A YEAR. ANNUAL CLEANING AGREEMENT NEEDS TO BE WITNESSED BY THE CITY.
19. BUILDING SANITARY SERVICE TO BE INSTALLED WITH A BACKWATER VALVE AS PER CITY OF OTTAWA STANDARD DETAIL S14.2
20. BUILDING FOUNDATION DRAIN TO BE INSTALLED WITH A BACKWATER VALVE AS PER CITY OF OTTAWA STANDARD DETAIL 14

NOTES: UNDERGROUND STORMWATER STORAGE

1. UNDERGROUND STORMWATER STORAGE SYSTEM CHAMBER TYPE OR EQUIVALENT STORAGE REQUIREMENT: 248m³
2. CHAMBER TYPE: STORMTECH MC-3500 OR EQUIVALENT
3. BOTTOM OF GRANULAR PAD ELEVATION & PERFORATED SUBDRAIN INVERT: 87.33m
4. BOTTOM OF CHAMBER ELEVATION: 87.56m
5. TOP OF CHAMBER ELEVATION: 88.70m
6. TOP OF SYSTEM TO BE A MINIMUM OF 720mm BELOW PARKING LOT PAVEMENT STRUCTURE.

WATER SERVICE LINE

STATION	SURFACE ELEVATION	W/M DEPTH	TOP OF W/M ELEV.	INV. OF W/M ELEV.	NOTES
0+000	90.18	EXISTING	EXISTING	EXISTING	CONNECTION TO EXISTING WATERMAIN
0+007	90.22	2.40	87.82	87.67	CR-01 REFFER TO CROSSING TABLE
0+009	90.30	2.40	87.90	87.85	SERVICE POST
0+017	90.26	2.40	87.86	87.71	CR-02 REFFER TO CROSSING TABLE
0+038	90.58	2.40	88.18	88.03	WATER CAP WITH CONCRETE THRUST BLOCK

CROSSING TABLE

CROSING NO.	TOP OF PIPE ELEV. AT CROSSING	PIPE INV. ELEV. AT CROSSING	CLEARANCE (m)
CR-01	WM. TOP 87.82	STM. INV 89.56	1.74
CR-02	WM. TOP 87.86	STM. INV 88.52	0.66
CR-03	SAN. TOP 87.68	STM. INV 89.10	1.42

ICD SCHEDULE (ORIFICE)

ICD ID	LOCATION	PIPE OUTLET INVERT (m)	FLOW 5y/100y (L/s)	HEAD 5y/100y (m)	EQUIVALENT DIAMETER (mm)	MODEL
01	DI-MH-STM-05	87.13	4.3 / 6.1	0.89 / 1.85	45	VORTEX FLOW CONTROL

*ICD SHOP DRAWING SHALL BE SUBMITTED TO PARSONS BEFORE COMMENCING ANY WORK
**ICD INSTALLATION AS PER CITY OF OTTAWA DETAIL STANDARD S4.1 (VORTEX ICD INSTALLATION) APPROVED MATERIAL SPECIFICATION AS PER MS-22.15

KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

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REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
100564967
02/20/2025
PROVINCE OF ONTARIO

5m 0 10 20m
SCALE: 1:400

PARSONS
1223 Michael St., Suite 100, Ottawa, Ontario, Canada K1J 7T2
Tel: (613) 738-4160

CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

TITLE
SITE SERVICING PLAN

DESIGNED BY	P.C.
DRAWN BY	P.C.
CHECKED BY	M.T.
DATE	FEBRUARY 2024
SCALE	1:400
PROJECT NO.	478221
DRAWING NO.	C-102
DRAWING	SS

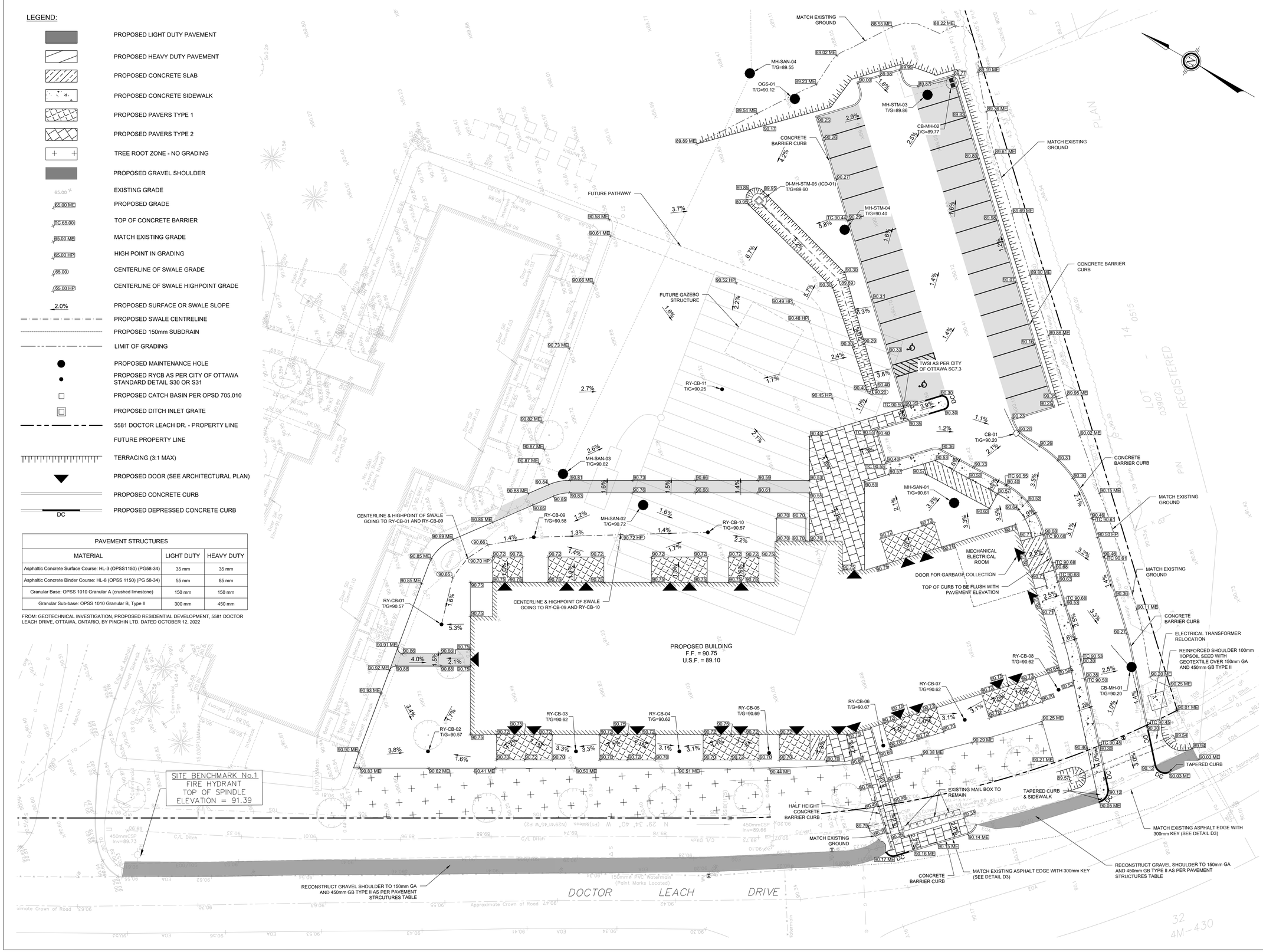
PLAN #19129
FILE # D07-12-23-0048

LEGEND:

- PROPOSED LIGHT DUTY PAVEMENT
- PROPOSED HEAVY DUTY PAVEMENT
- PROPOSED CONCRETE SLAB
- PROPOSED CONCRETE SIDEWALK
- PROPOSED PAVERS TYPE 1
- PROPOSED PAVERS TYPE 2
- TREE ROOT ZONE - NO GRADING
- PROPOSED GRAVEL SHOULDER
- 65.00 EXISTING GRADE
- 65.00 ME PROPOSED GRADE
- TC 65.00 TOP OF CONCRETE BARRIER
- 65.00 ME MATCH EXISTING GRADE
- 65.00 HP HIGH POINT IN GRADING
- (65.00) CENTERLINE OF SWALE GRADE
- (65.00 HP) CENTERLINE OF SWALE HIGHPOINT GRADE
- 2.0% PROPOSED SURFACE OR SWALE SLOPE
- PROPOSED SWALE CENTRELINE
- PROPOSED 150mm SUBDRAIN
- LIMIT OF GRADING
- PROPOSED MAINTENANCE HOLE
- PROPOSED RYCB AS PER CITY OF OTTAWA STANDARD DETAIL S30 OR S31
- PROPOSED CATCH BASIN PER OPSD 705.010
- PROPOSED DITCH INLET GRATE
- 5581 DOCTOR LEACH DR. - PROPERTY LINE
- FUTURE PROPERTY LINE
- TERRACING (3:1 MAX)
- PROPOSED DOOR (SEE ARCHITECTURAL PLAN)
- PROPOSED CONCRETE CURB
- DC PROPOSED DEPRESSED CONCRETE CURB

PAVEMENT STRUCTURES		
MATERIAL	LIGHT DUTY	HEAVY DUTY
Asphaltic Concrete Surface Course: HL-3 (OPSS1150) (PG58-34)	35 mm	35 mm
Asphaltic Concrete Binder Course: HL-8 (OPSS 1150) (PG 58-34)	55 mm	85 mm
Granular Base: OPSS 1010 Granular A (crushed limestone)	150 mm	150 mm
Granular Sub-base: OPSS 1010 Granular B, Type II	300 mm	450 mm

FROM: GEOTECHNICAL INVESTIGATION, PROPOSED RESIDENTIAL DEVELOPMENT, 5581 DOCTOR LEACH DRIVE, OTTAWA, ONTARIO, BY PINCHIN LTD. DATED OCTOBER 12, 2022



KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

SITE BENCHMARK No.1 LOCATED SOUTH OF CN#5581 ENTRANCE ON DR. LEACH DRIVE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 91.39

SITE BENCHMARK No.2 LOCATED NORTH CN#5598 ENTRANCE ON EASTMAN AVENUE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 88.93

SEE DRAWING C-102 or C-108 TO SEE BOTH BENCMARK ON PLAN VIEW

No.	DATE	DESCRIPTION	BY
03	20/02/2025	RE-ISSUED FOR SPA	M.T.
02	28/07/2025	RE-ISSUED FOR SPA	M.T.
01	04/04/2024	ISSUED FOR SPA	M.T.
00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
100564967
02/20/2025
PROVINCE OF ONTARIO

5m 2 0 5m
SCALE: 1:200

PARSONS
1223 Michael St., Suite 100, Ottawa, Ontario, Canada K1J 7T2
Tel: (613) 738-4160

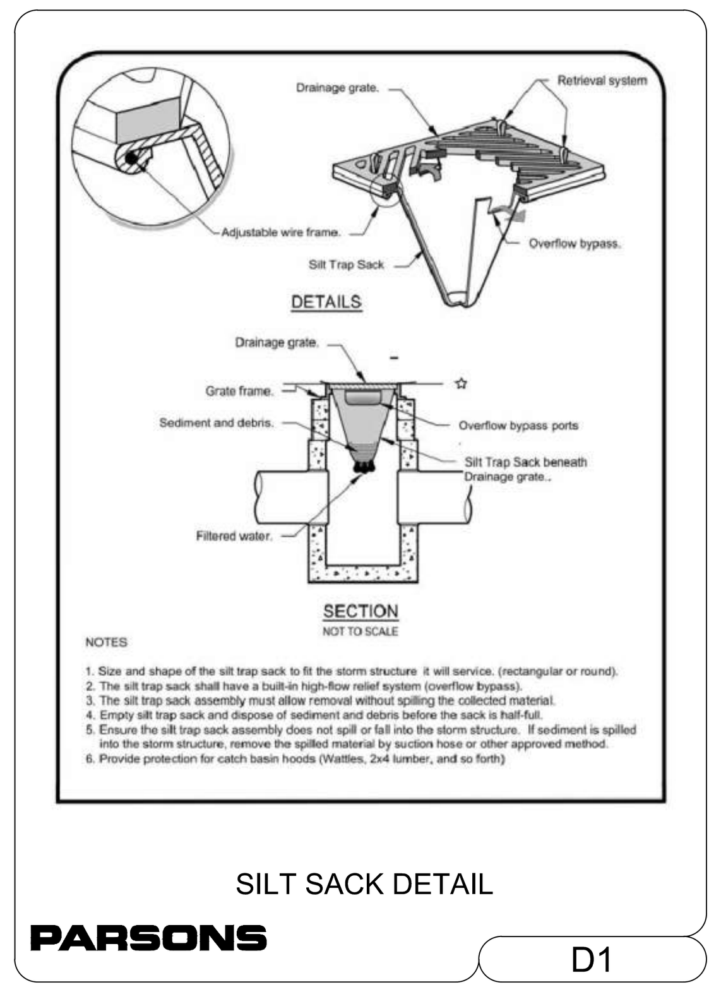
CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

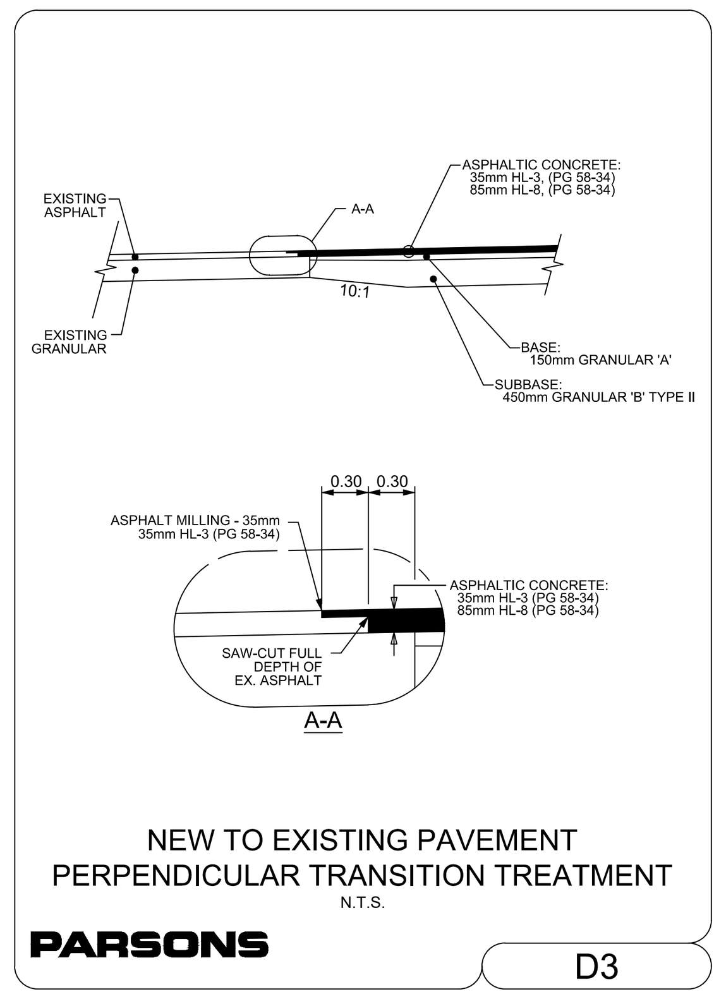
PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

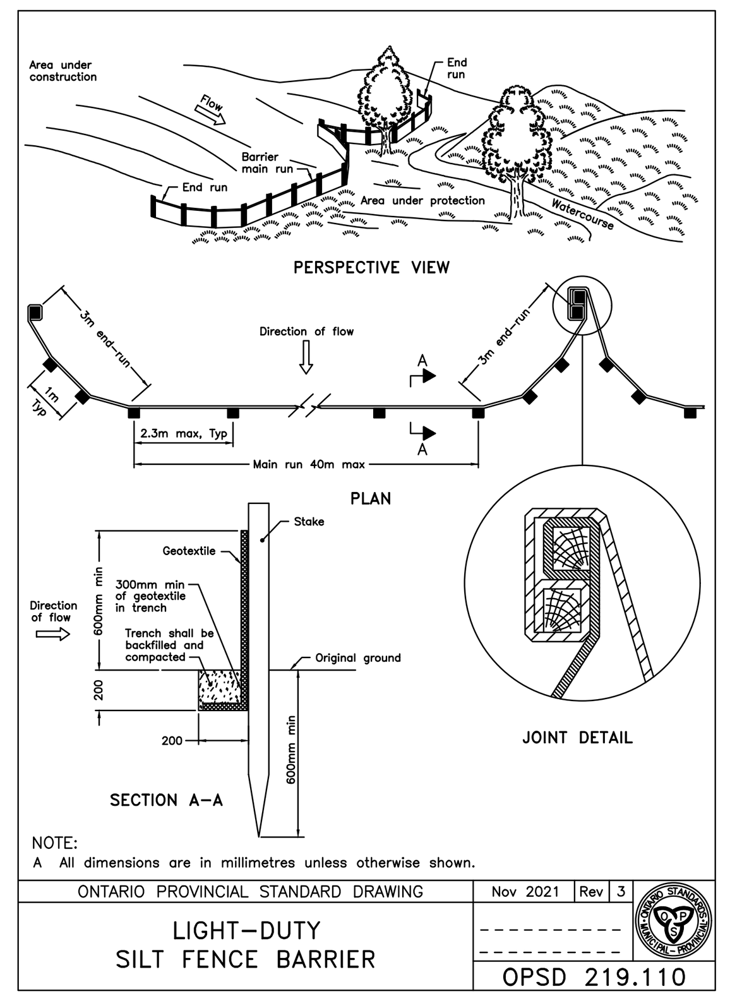
TITLE
GRADING PLAN

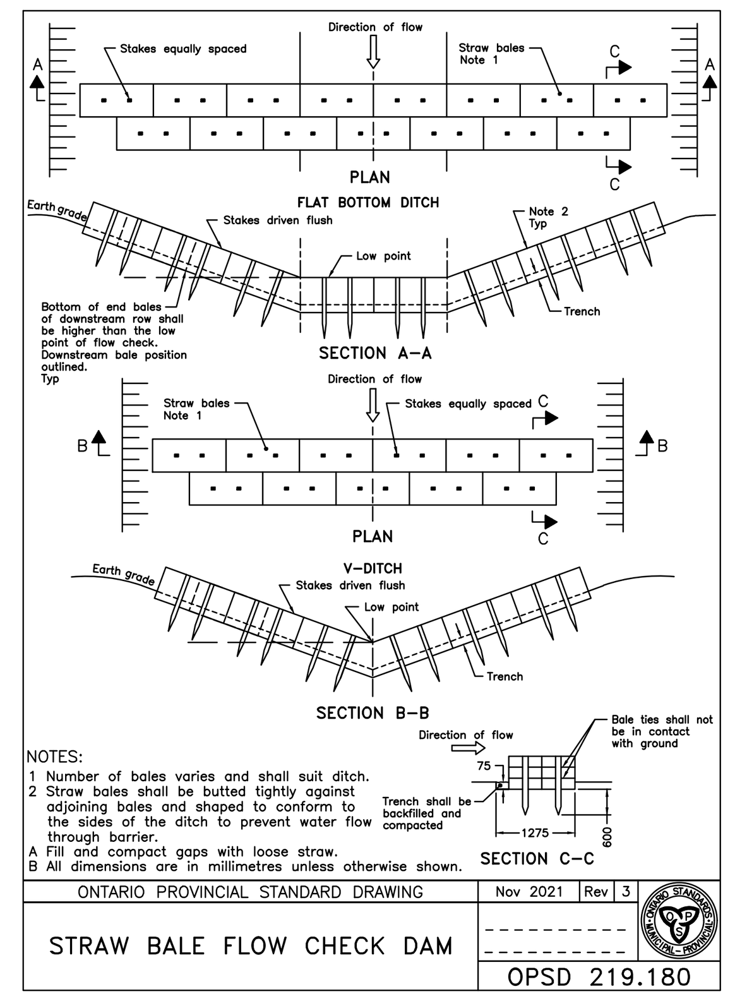
DESIGNED BY	P.C.	PROJECT NO.	478221
DRAWN BY	P.C.		
CHECKED BY	M.T.	C-103	GR
DATE	FEBRUARY 2024	DRAWING NO.	DRAWING
SCALE	1:200		

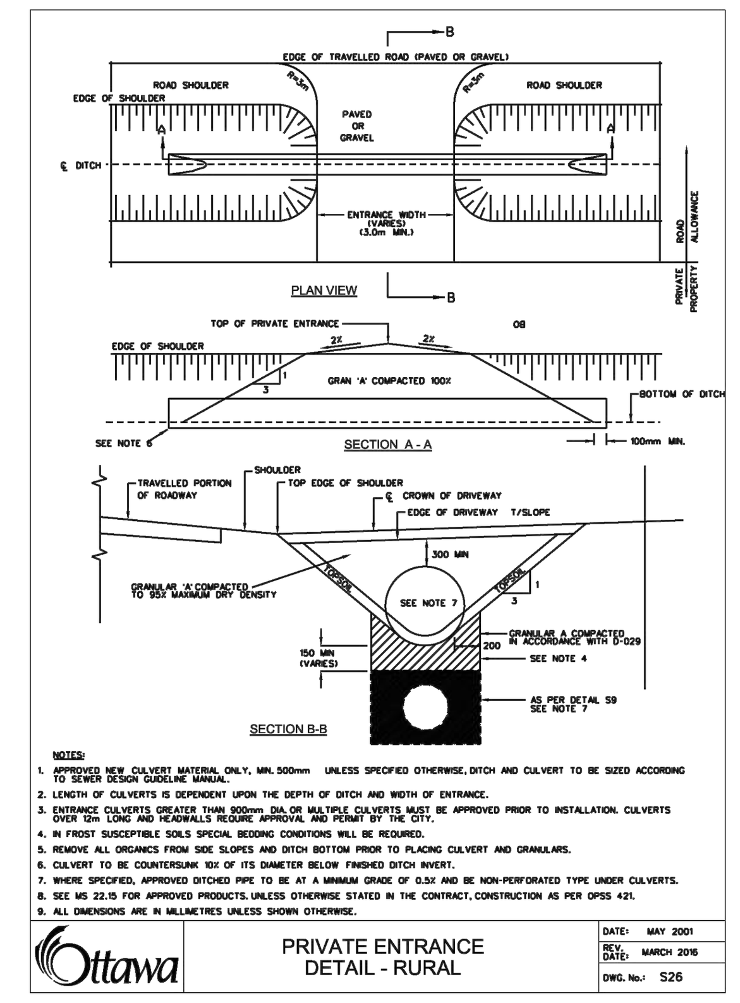
FILE # D07-12-23-0048 PLAN #19129

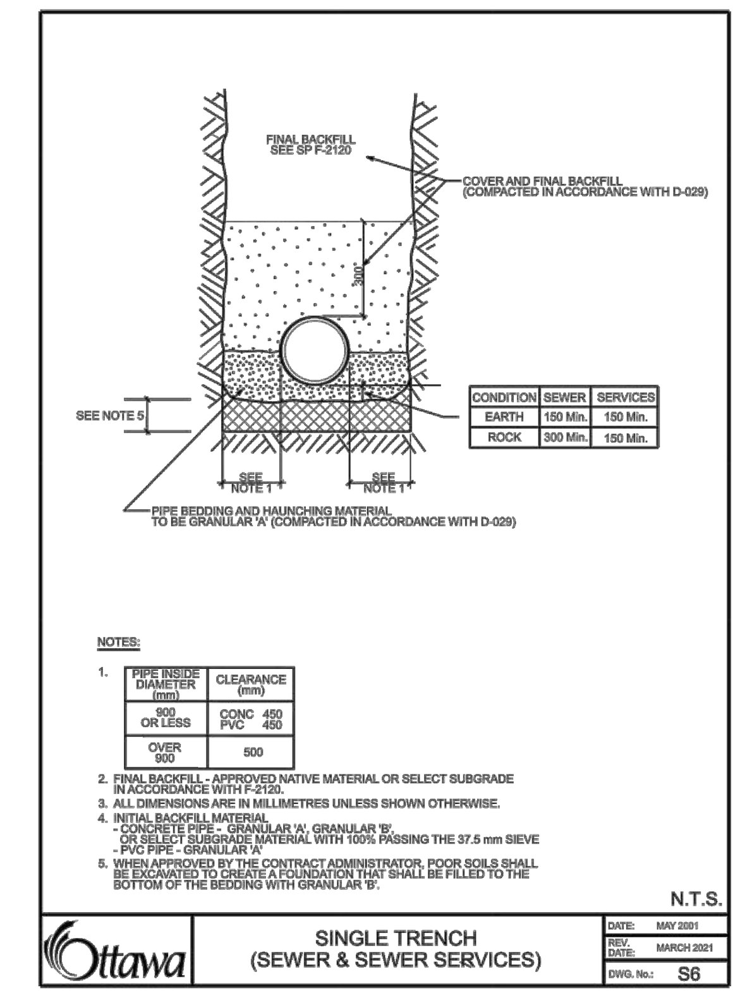


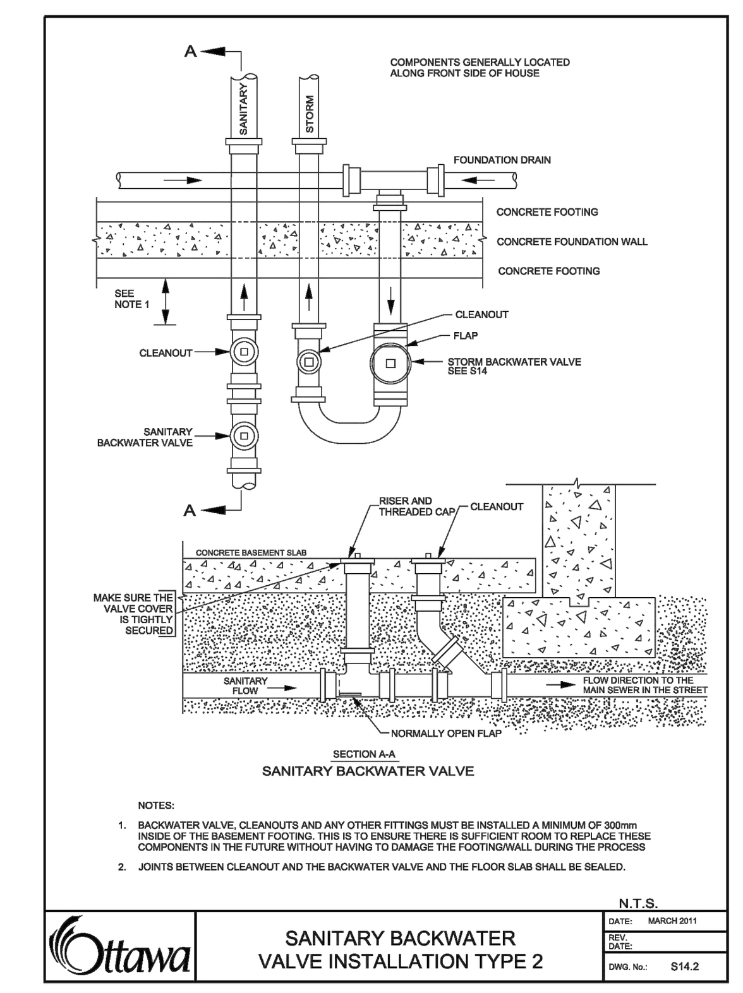


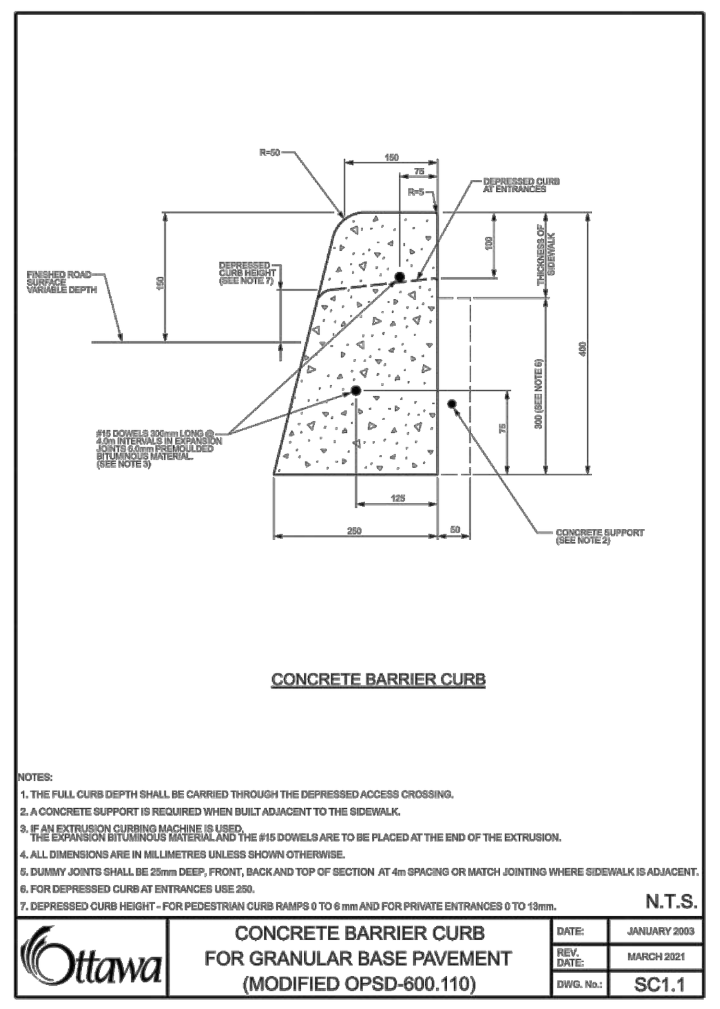


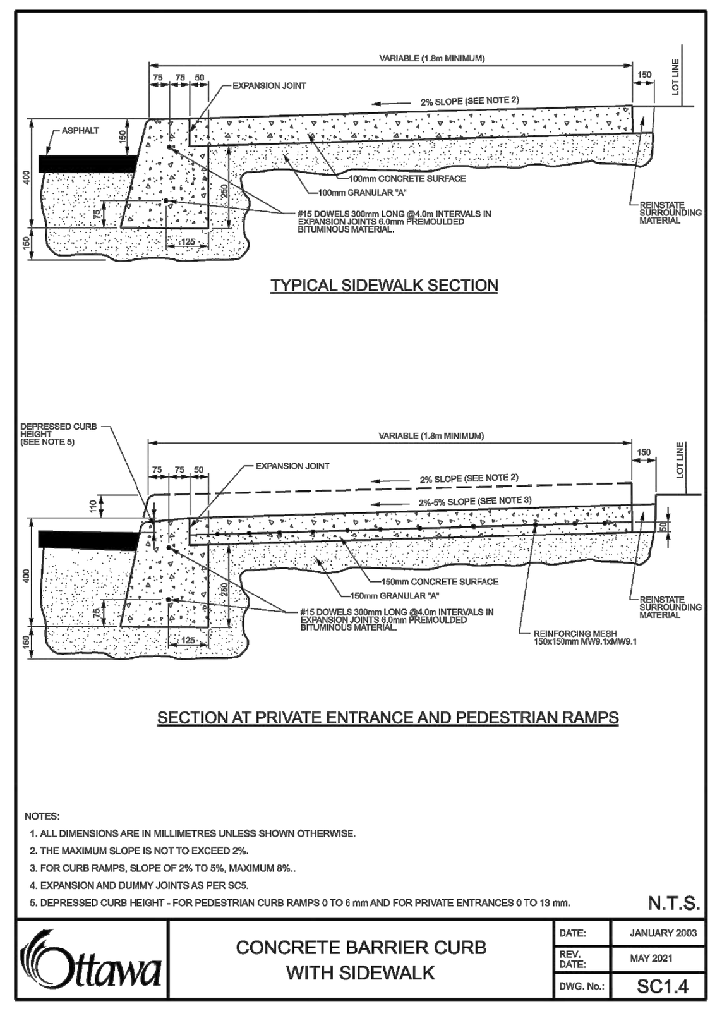


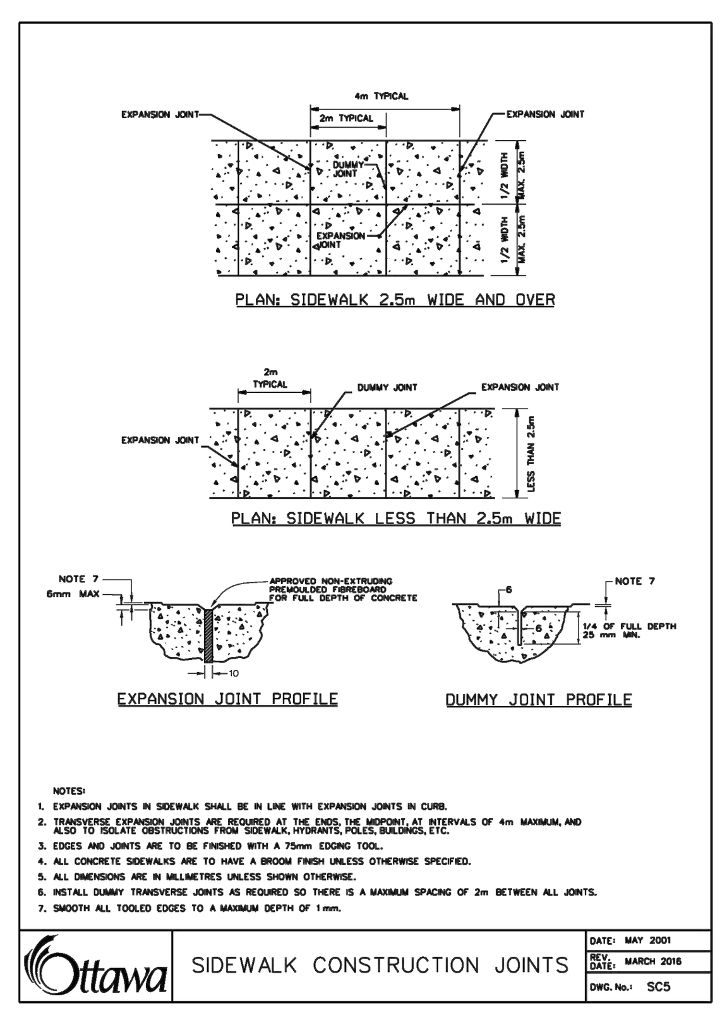


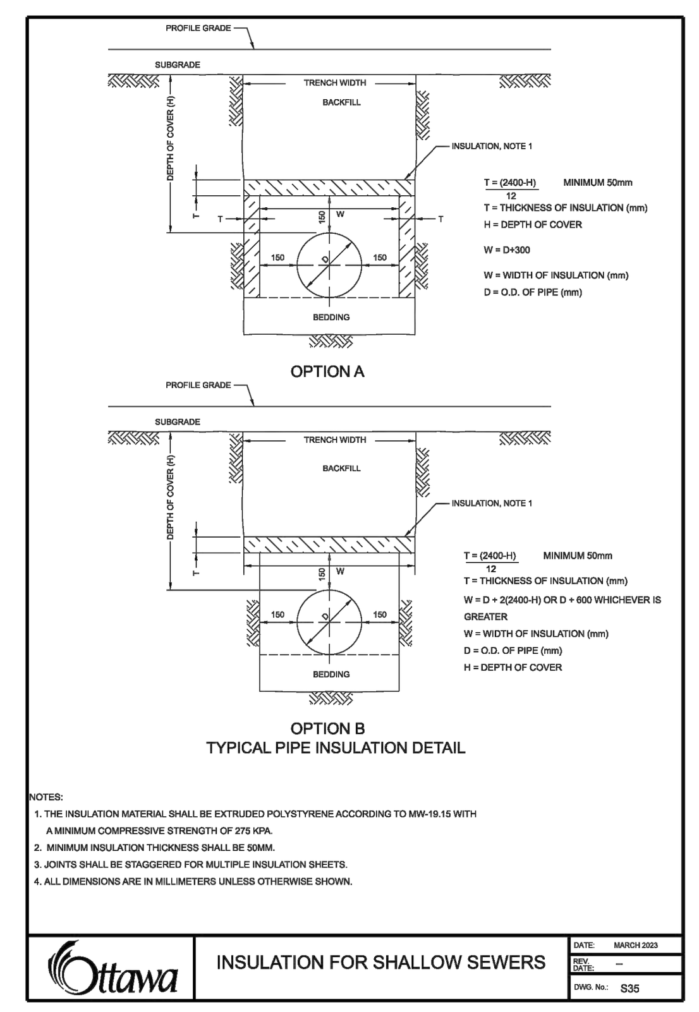


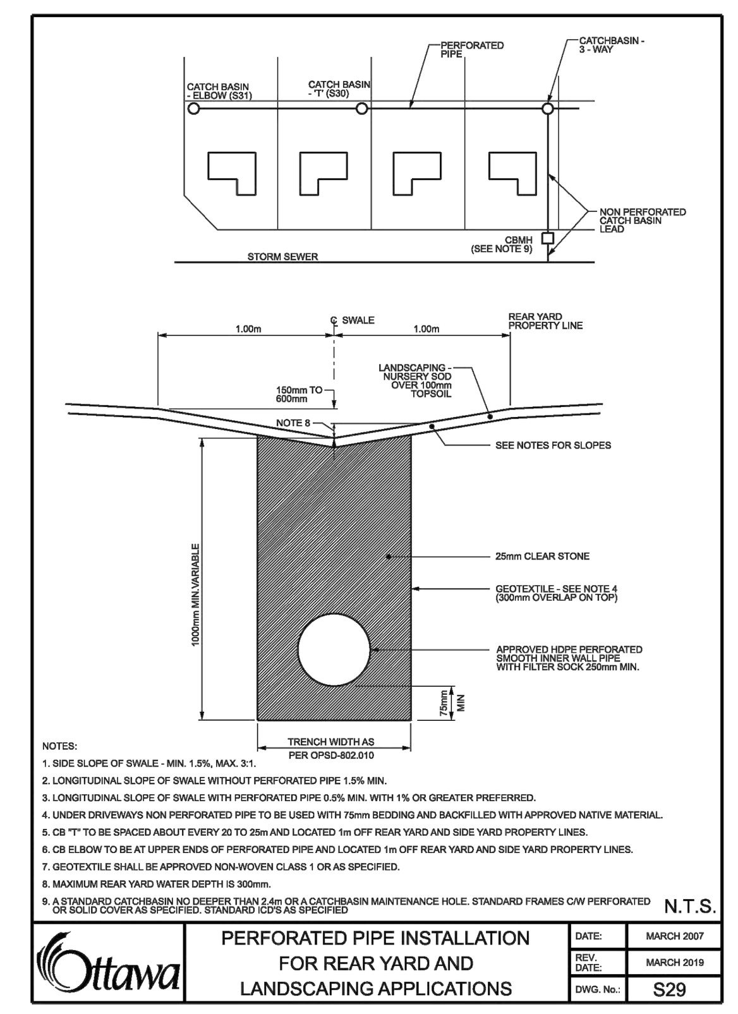


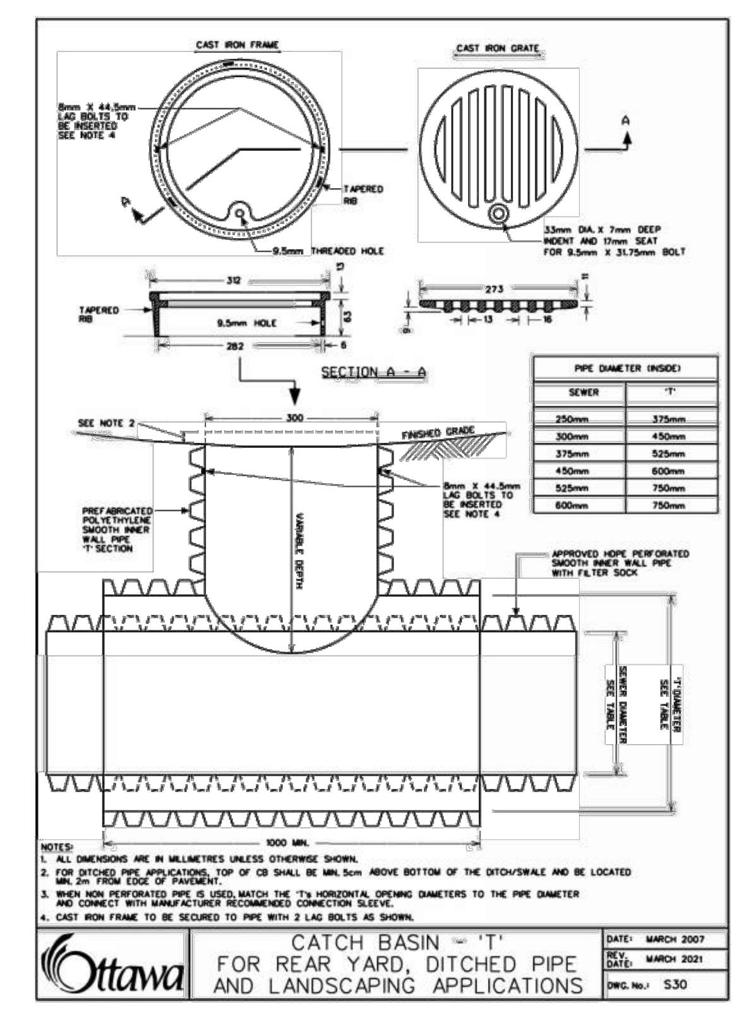


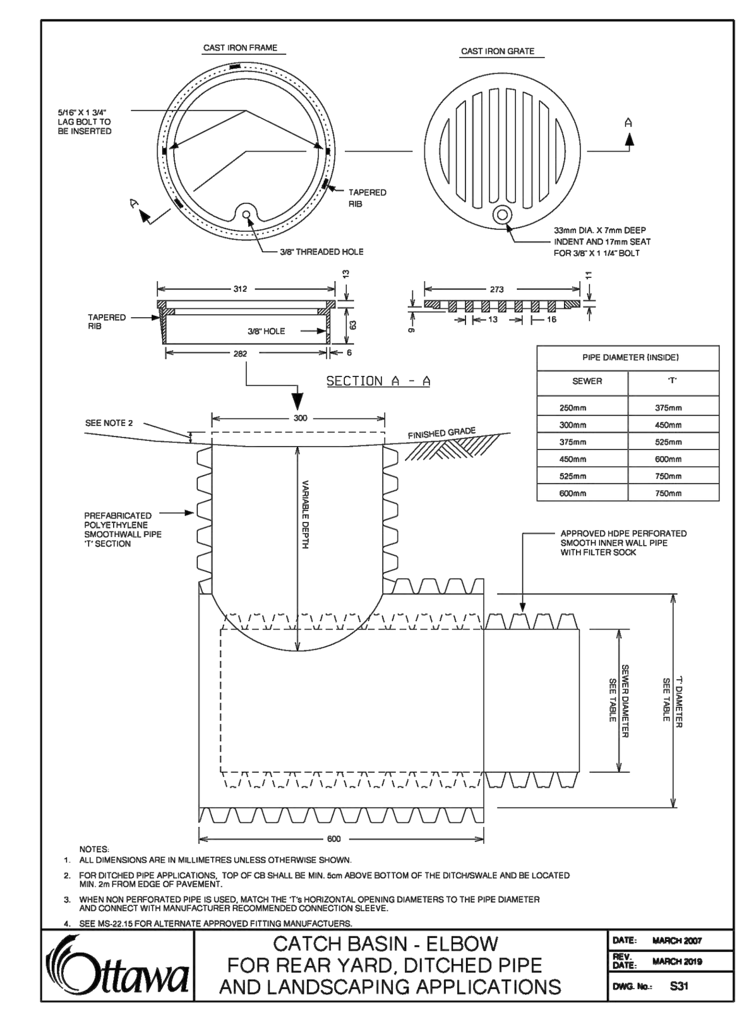


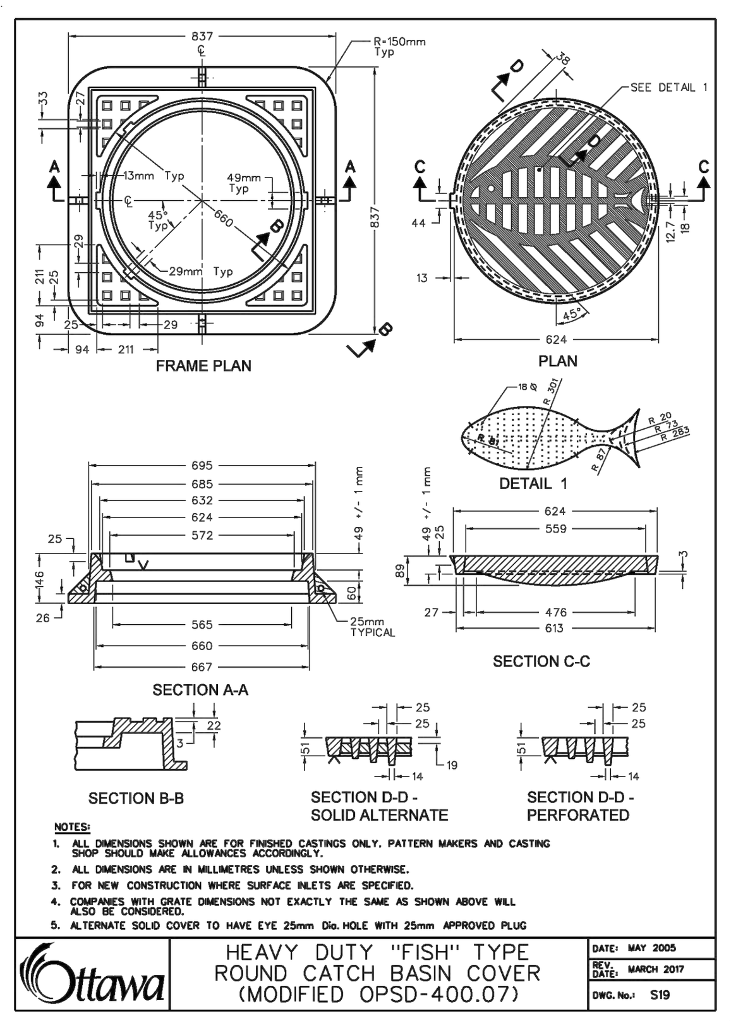


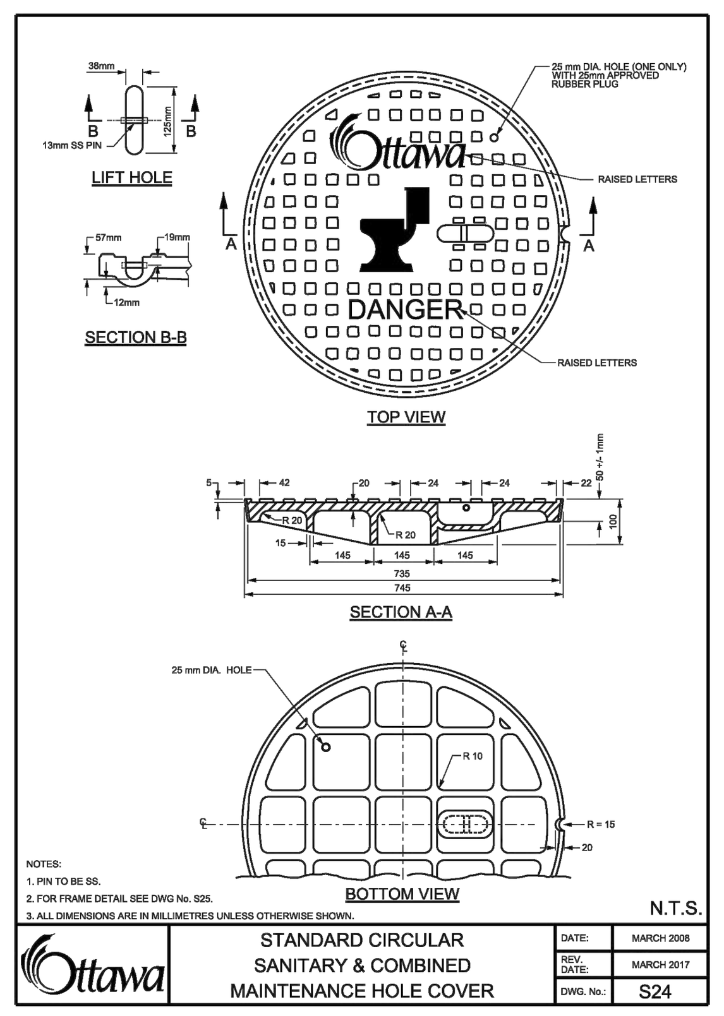


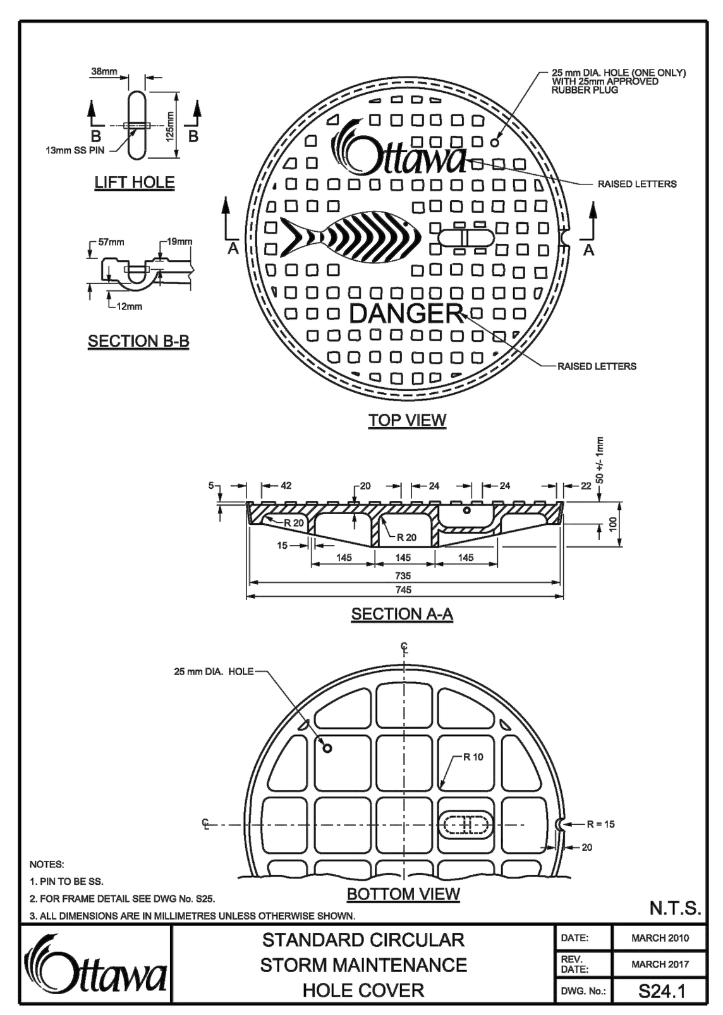


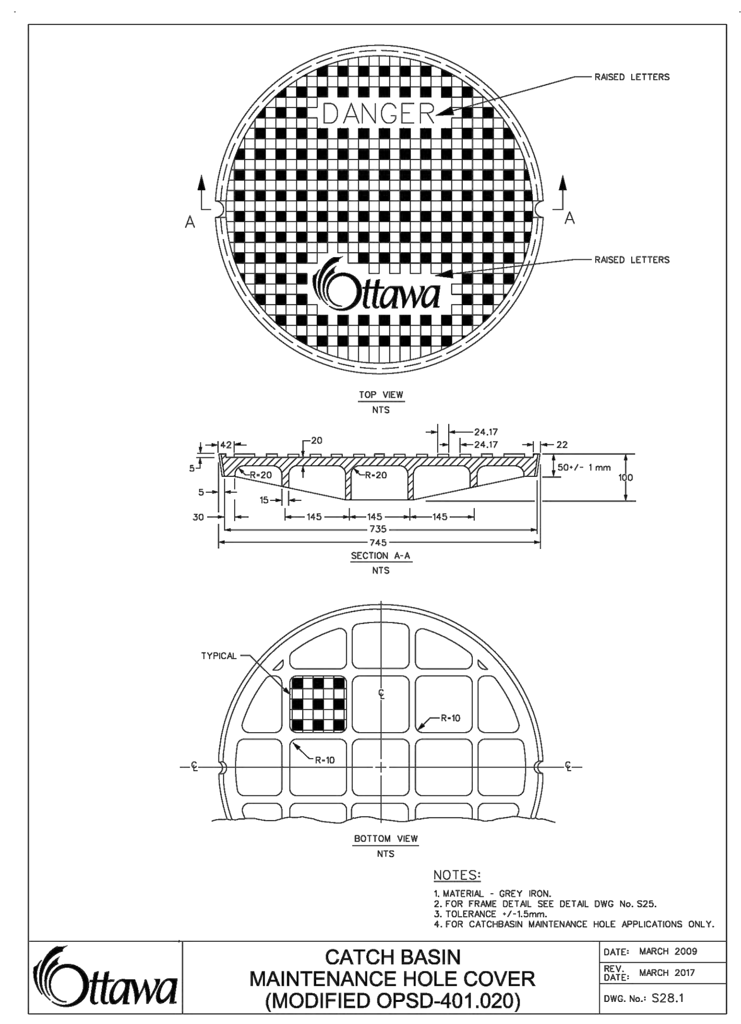


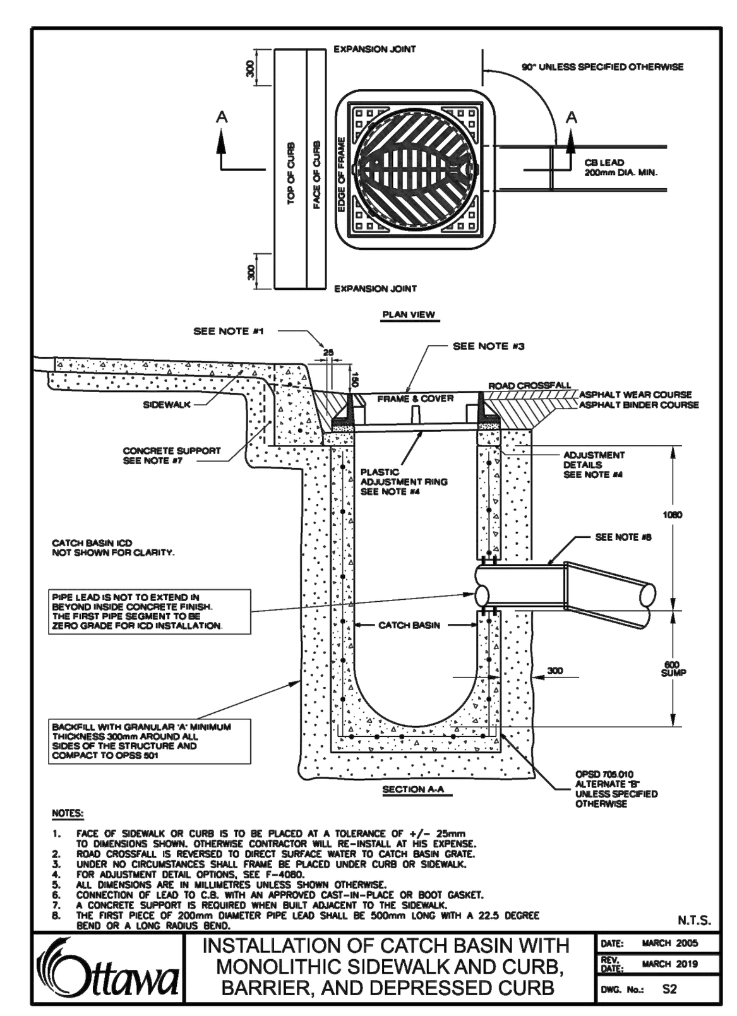


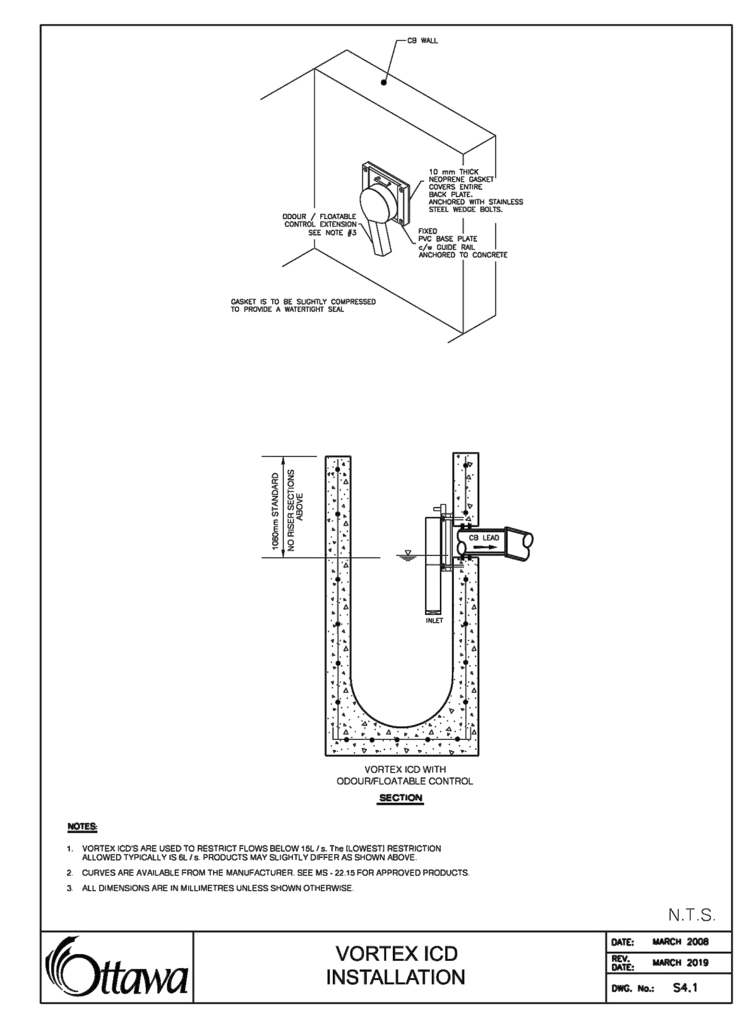


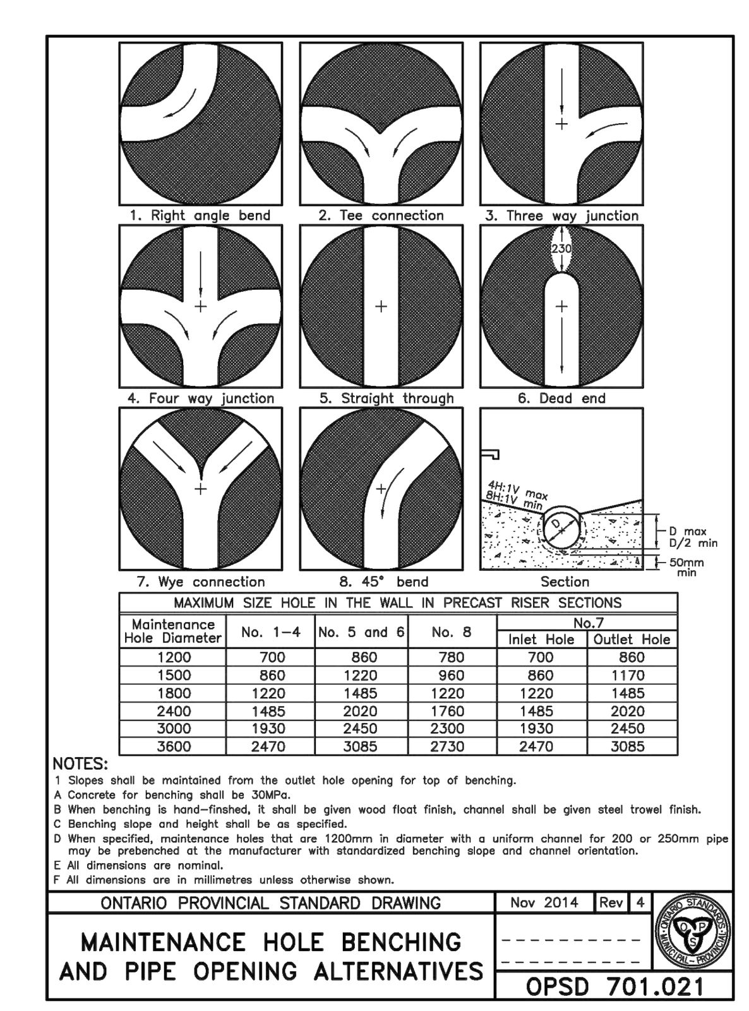




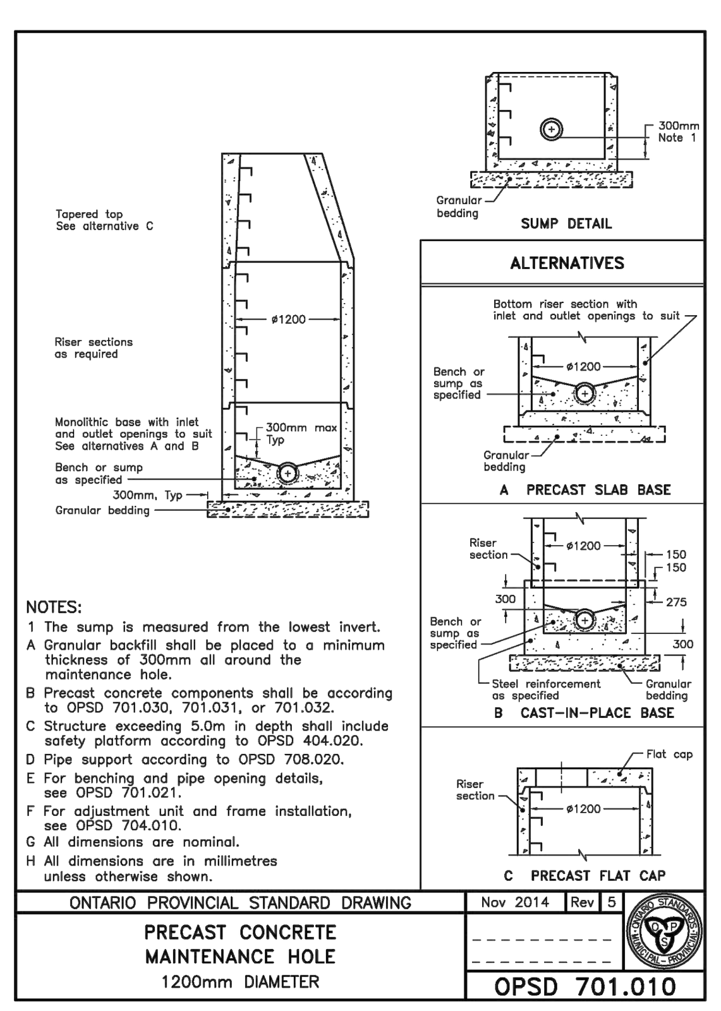


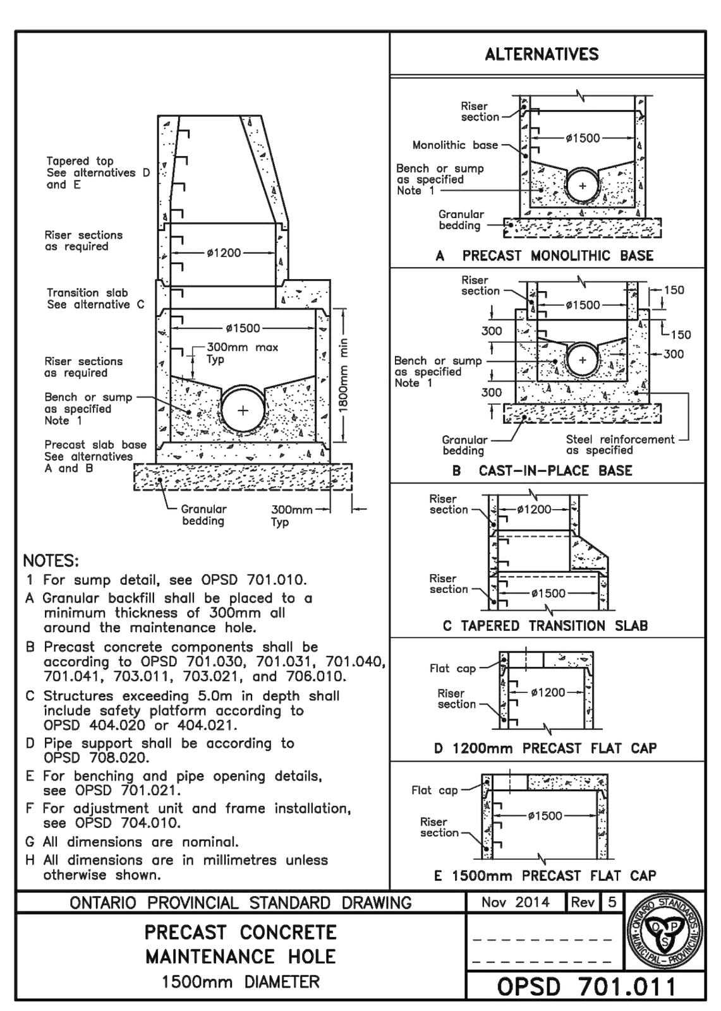


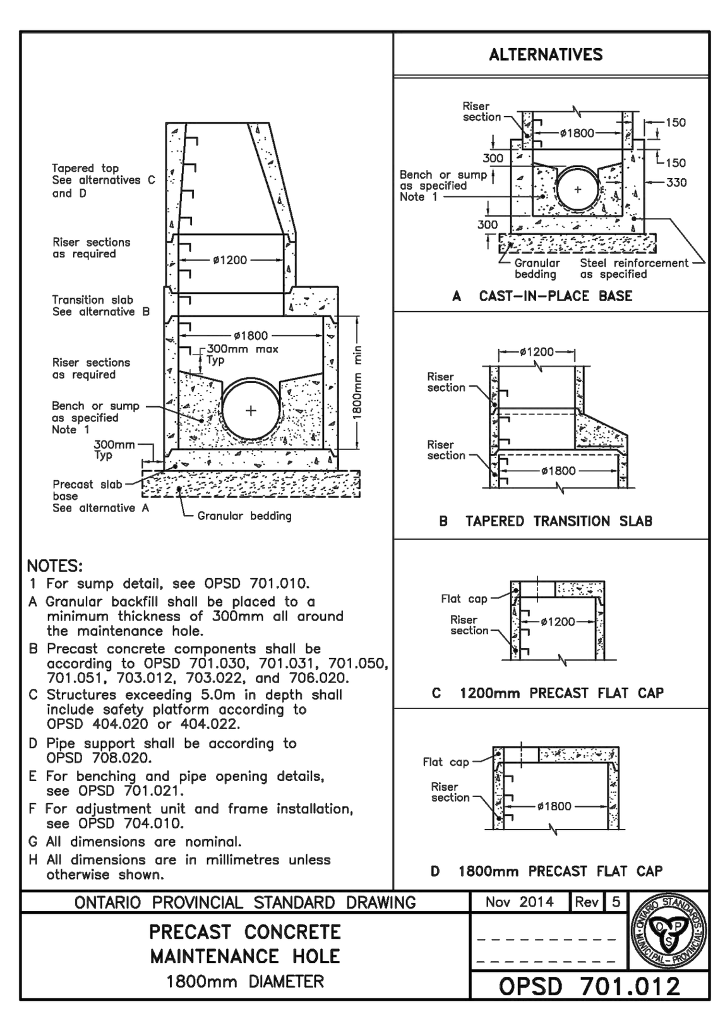


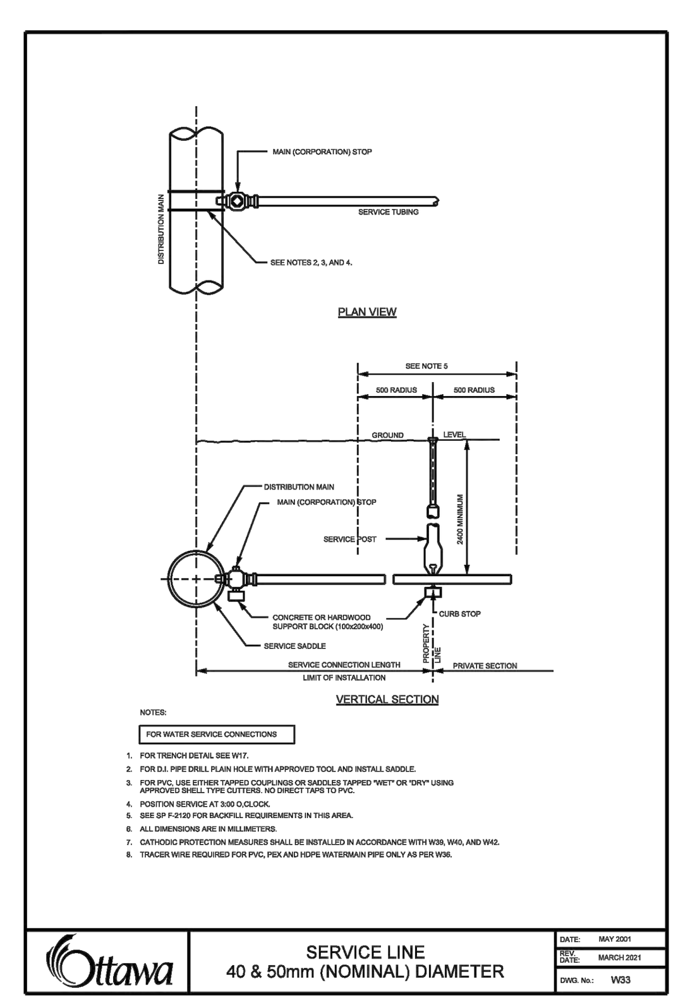


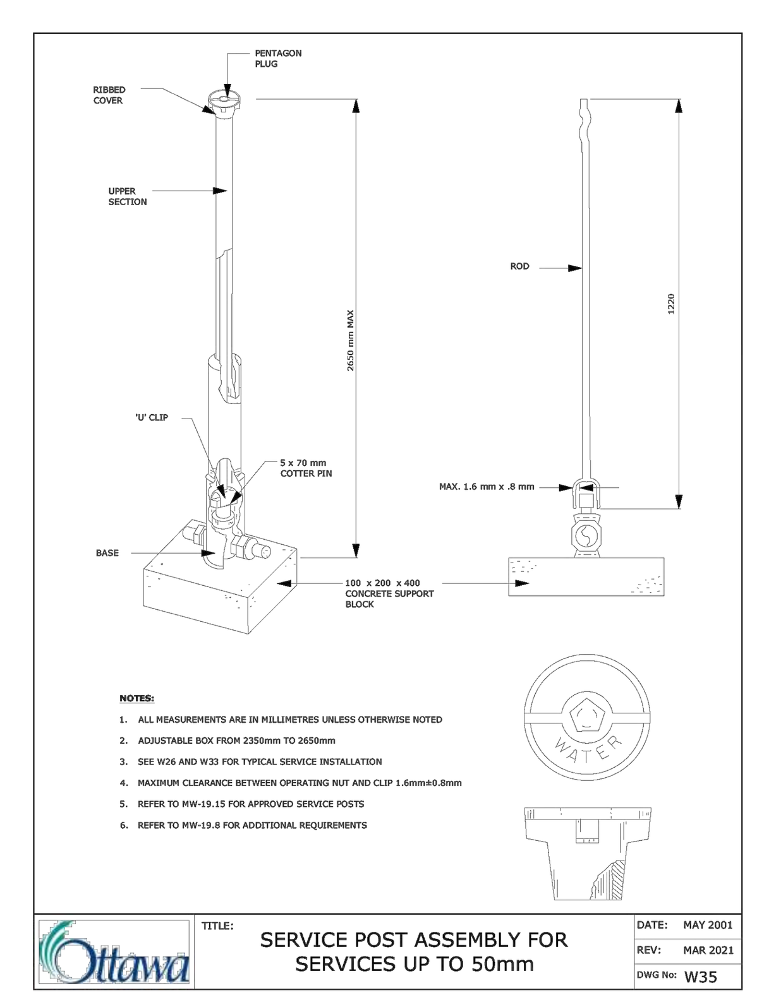
Maintenance Hole Diameter	No. 1–4	No. 5 and 6	No. 8	No.7 Inlet Hole	No.7 Outlet Hole
1200	700	860	780	700	860
1500	860	1220	960	860	1170
1800	1220	1485	1220	1220	1485
2400	1485	2020	1760	1485	2020
3000	1930	2450	2300	1930	2450
3600	2470	3085	2730	2470	3085

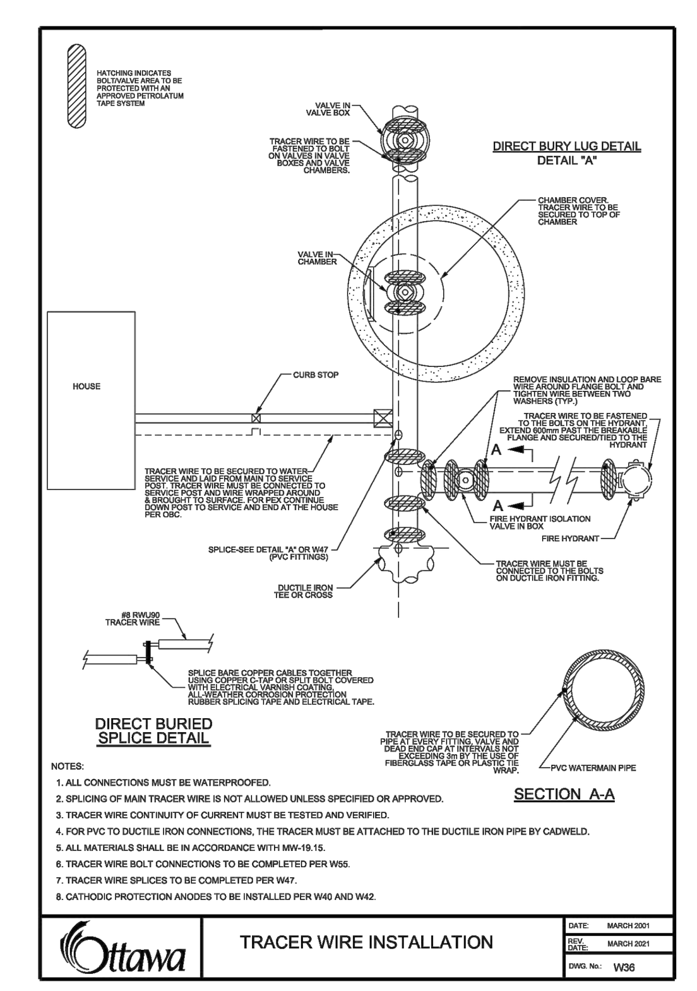


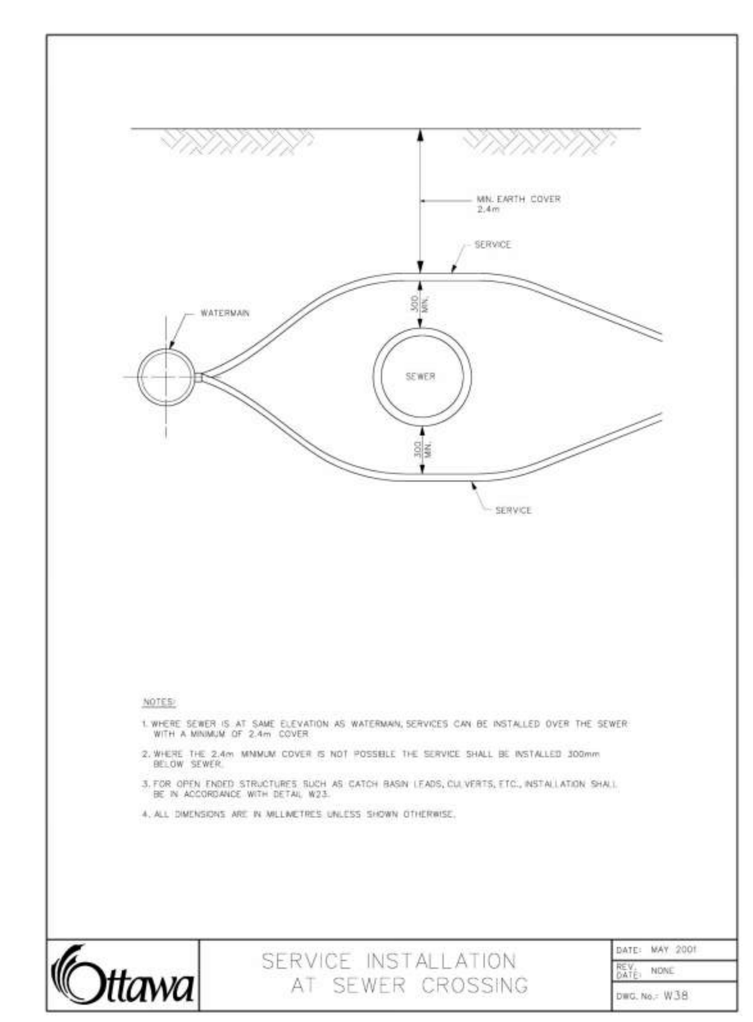


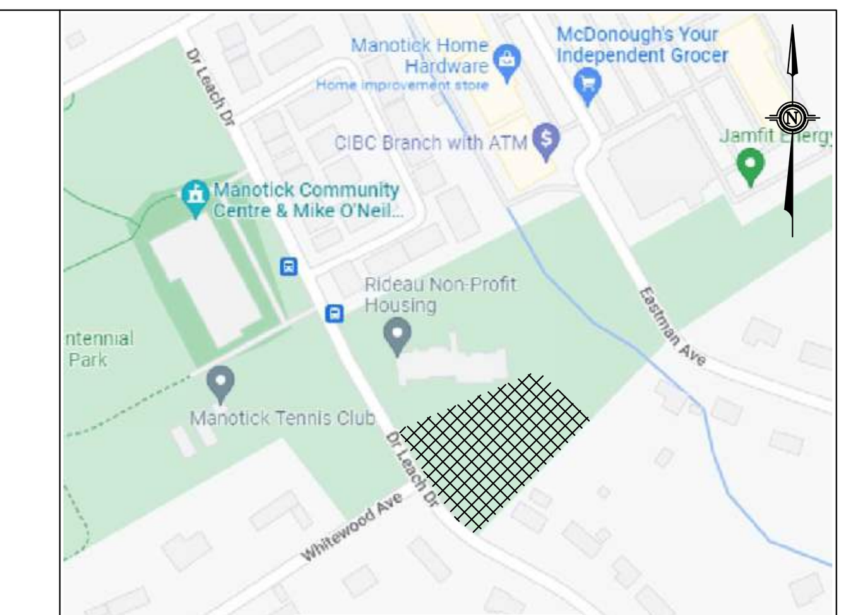












KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

SITE BENCHMARK No.1 LOCATED SOUTH OF CN#5581 ENTRANCE ON DR. LEACH DRIVE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 91.39

SITE BENCHMARK No.2 LOCATED NORTH CN#5598 ENTRANCE ON EASTMAN AVENUE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 88.93

SEE DRAWING C-102 or C-108 TO SEE BOTH BENCMARK ON PLAN VIEW

No.	DATE	DESCRIPTION	BY
03	20/02/2025	RE-ISSUED FOR SPA	M.T.
02	28/07/2025	RE-ISSUED FOR SPA	M.T.
01	04/04/2024	ISSUED FOR SPA	M.T.
00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
100564967
02/20/2025
PROVINCE OF ONTARIO

PARSONS
1223 Michael St., Suite 100, Ottawa, Ontario, Canada K1J 7T2
Tel: (613) 738-4160

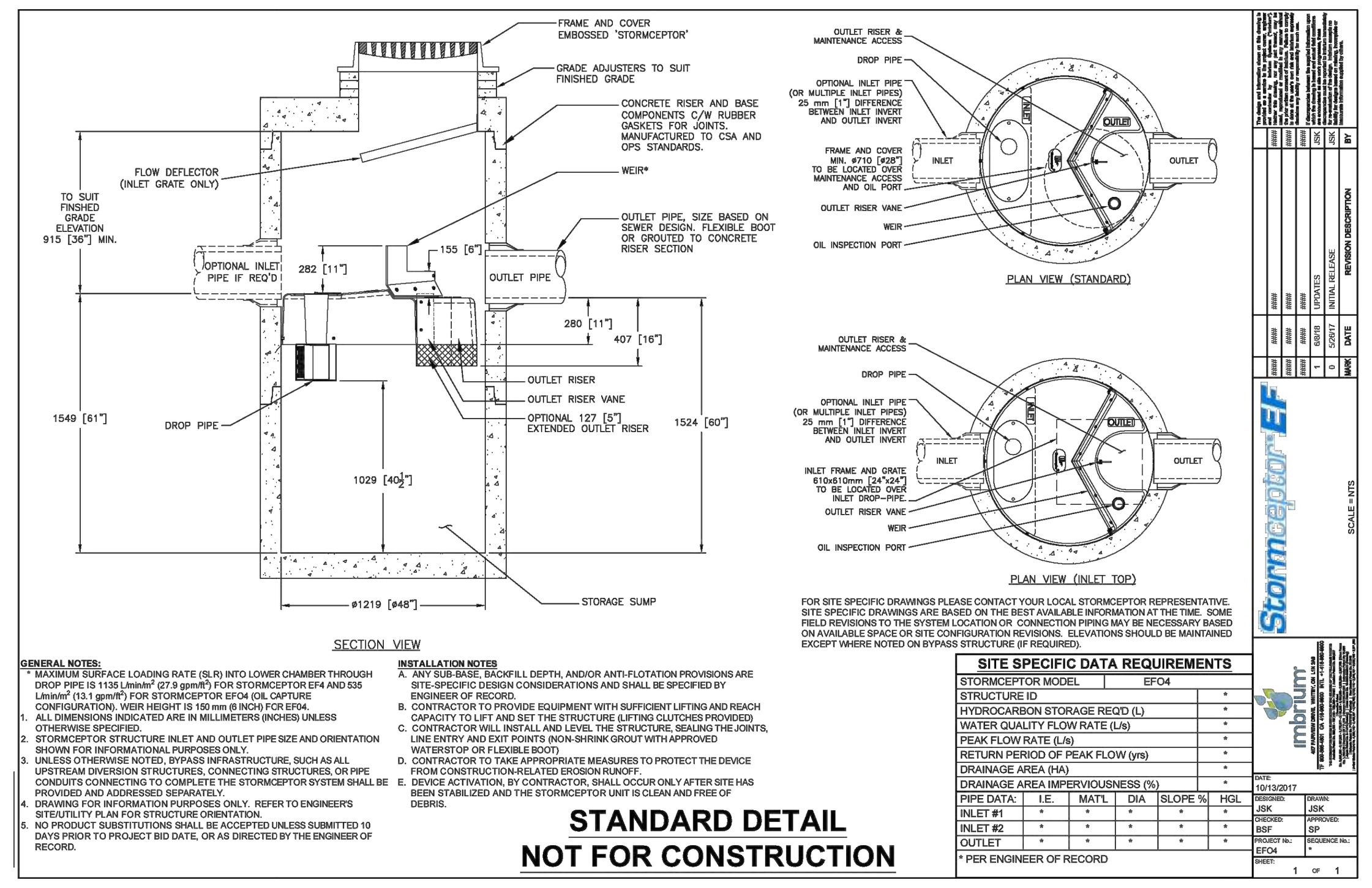
CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

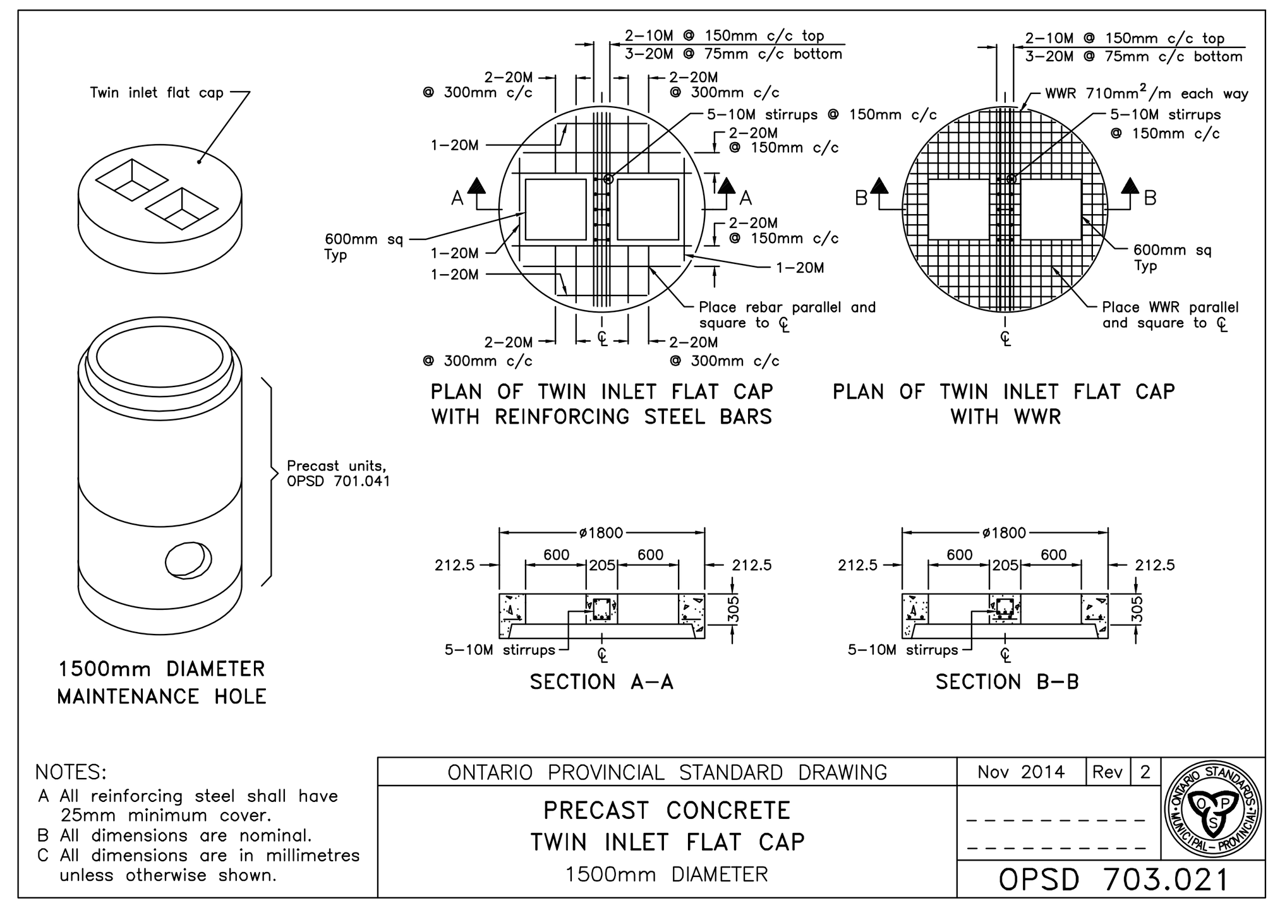
PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

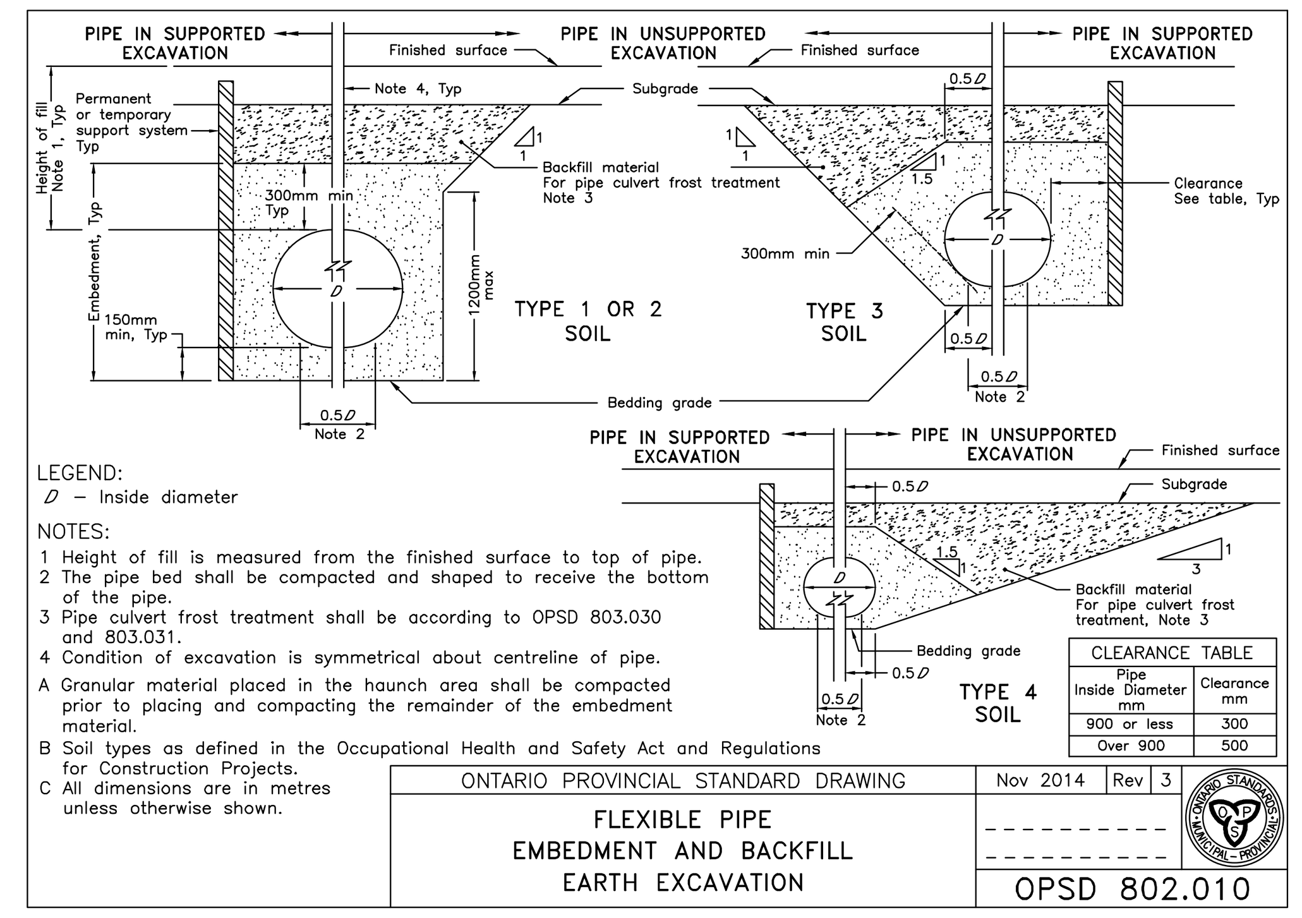
TITLE
DETAILS

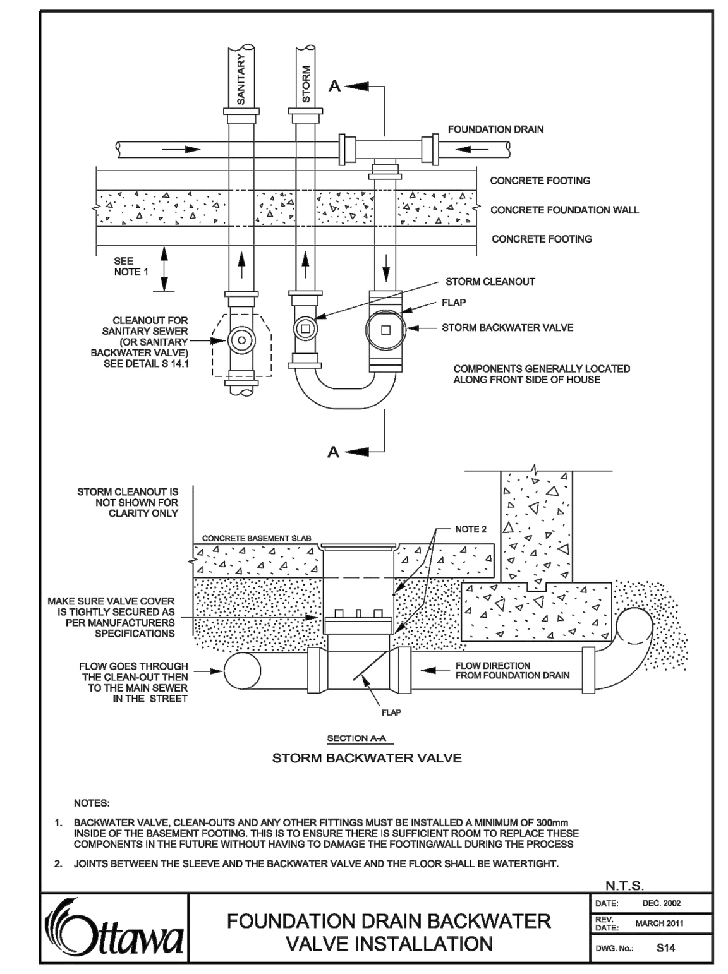
DESIGNED BY: P.C.	PROJECT NO.: 478221
DRAWN BY: P.C.	DRAWING NO.: C-104
CHECKED BY: M.T.	DRAWING: DET
DATE: FEBRUARY 2024	
SCALE: N.T.S	

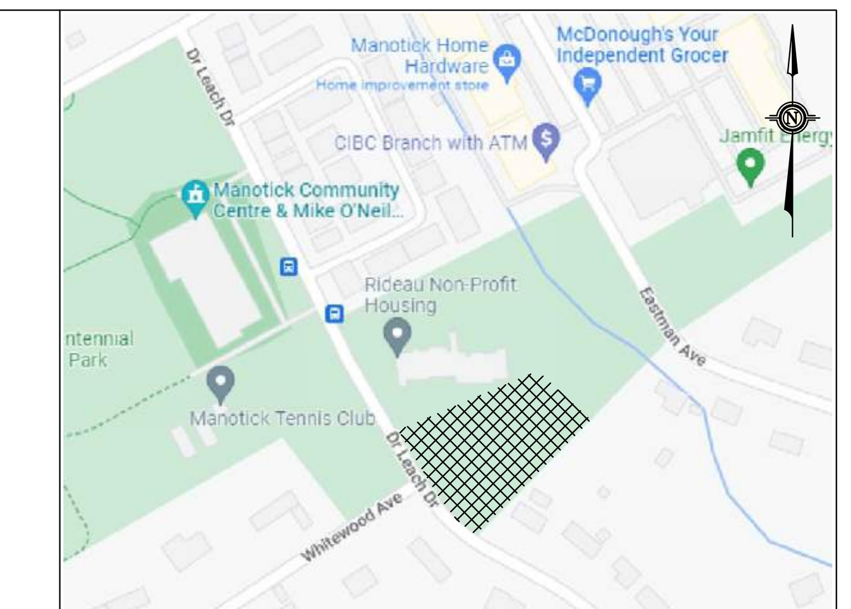
FILE # D07-12-23-0048 PLAN #19129











KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

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SEE DRAWING C-102 or C-108 TO SEE BOTH BENCMARK ON PLAN VIEW

No.	DATE	DESCRIPTION	BY
03	20/02/2025	RE-ISSUED FOR SPA	M.T.
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01	04/04/2024	ISSUED FOR SPA	M.T.
00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
100564967
02/20/2025
PROVINCE OF ONTARIO

PARSONS

1223 Michael St., Suite 100, Ottawa, Ontario, Canada K1J 7T2
Tel: (613) 738-4160

CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

TITLE
DETAILS

DESIGNED BY	P.C.
PROJECT NO.	478221
DRAWN BY	P.C.
CHECKED BY	M.T.
DATE	FEBRUARY 2024
SCALE	N.T.S
DRAWING NO.	C-105
DRAWING	DET

FILE # D07-12-23-0048 PLAN #19129

LEGEND:

- PROPERTY LINE
- EXISTING WATERSHED BOUNDARY
- WS-XX — WATERSHED NAME
- 0.00 | 0.00 — RUNOFF COEFFICIENT
- AREA IN HECTARES

KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

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SEE DRAWING C-102 or C-108 TO SEE BOTH BENCMARK ON PLAN VIEW

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00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
100564967
02/20/2025
PROVINCE OF ONTARIO

5m 2 0 5 10m
SCALE: 1:300

PARSONS
1223 Michael St., Suite 100, Ottawa, Ontario, Canada K1J 7T2
Tel: (613) 738-4160

CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

TITLE
PRE-DEVELOPMENT DRAINAGE PLAN

DESIGNED BY	P.C.
DRAWN BY	P.C.
CHECKED BY	M.T.
DATE	FEBRUARY 2024
SCALE	1:300
PROJECT NO.	478221
DRAWING NO.	C-106
DRAWING	PRE

PLAN #19129
FILE # D07-12-23-0048

POTENTIAL FUTURE
4 STOREY BUILDING
PROPERTY AREA OF ± 7600m²

POTENTIAL FUTURE
PARKING

MHST-05422
T/G = 87.70
NE. INV. = 86.00
S. INV. = 85.98

MH-STM-06
T/G=88.30

WS-02*
0.04 | 0.20

OGS-01
T/G=90.12

MH-STM-03
T/G=89.86

CB-MH-02
T/G=89.77

WS-07
0.05 | 0.22

DI-MH-STM-04 (ICD-01)
T/G=89.60

MH-STM-04
T/G=90.40

WS-06
0.14 | 0.47

RY-CB-11
T/G=90.25

WS-03
0.16 | 0.80

CB-01
T/G=90.20

RY-CB-09
T/G=90.58

RY-CB-10
T/G=90.57

WS-05
0.09 | 0.62

MECHANICAL
ELECTRICAL
ROOM

RY-CB-01
T/G=90.57

PROPOSED BUILDING
F.F. = 90.75
U.S.F. = 89.10

RY-CB-08
T/G=90.62

RY-CB-07
T/G=90.62

CB-MH-01
T/G=90.20

WS-04
0.16 | 0.70

RY-CB-06
T/G=90.67

RY-CB-03
T/G=90.62

RY-CB-04
T/G=90.62

RY-CB-02
T/G=90.57

WS-01*
0.06 | 0.24

SITE BENCHMARK No.1
FIRE HYDRANT
TOP OF SPINDLE
ELEVATION = 91.39

DOCTOR LEACH DRIVE

LEGEND:

- PROPERTY LINE
- WATERSHED BOUNDARY
- WATERSHED NAME (WS-XX)
- RUNOFF COEFFICIENT (0.00 | 0.00)
- AREA IN HECTARES
- SURFACE PONDING LIMIT
- MAXIMUM PONDING ELEVATION (99.99)

KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

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00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
100564967
02/20/2025
PROVINCE OF ONTARIO

5m 2 0 5 10m
SCALE: 1:300

PARSONS
1223 Michael St., Suite 100, Ottawa, Ontario, Canada K1J 7T2
Tel: (613) 738-4160

CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

TITLE
POST DEVELOPMENT DRAINAGE PLAN

DESIGNED BY	P.C.
DRAWN BY	P.C.
CHECKED BY	M.T.
DATE	FEBRUARY 2024
SCALE	1:300
PROJECT NO.	478221
DRAWING NO.	C-107
DRAWING	POST

PLAN #19129
FILE # D07-12-23-0048

EASTMAN AVENUE

DOCTOR LEACH DRIVE

3rd LOT FUTURE RESIDENTIAL APARTMENT BUILDING OF 76 UNITS

POTENTIAL FUTURE
4 STOREY BUILDING
PROPERTY AREA OF ± 7600m²

POTENTIAL FUTURE PARKING

PROPOSED BUILDING

LEGEND:

- EXISTING PROPERTY LINE
- EXISTING SITE PROPERTY LINE
- EXISTING EASEMENT
- EXISTING WATERMAIN
- EXISTING PUBLIC STORM
- EXISTING PRIVATE STORM
- PROPOSE NEW STORM & MANHOLE
- EXISTING PUBLIC SANITARY
- EXISTING PRIVATE SANITARY
- PROPOSED NEW SANITARY & MANHOLE

NOTES:

1. WATERMAIN, SANITARY AND STORM SEWER WERE IDENTIFIED AS PUBLIC OR PRIVATE AS PER GEO OTTAWA
2. PROPERTY LINE AND EASEMENT AS PER ANNIS, O'SULLIVAN VOLLEBEKK LTD. SURVEY PLAN. SEE TOPOGRAPHICAL PLAN OF SURVEY OF PART OF LOT 3 CONCESSION A (BROKEN FRONT) GEOGRAPHIC TOWNSHIP OF NORTH GOWER CITY OF OTTAWA FOR REGISTERED PLAN NUMBER OF EASEMENT AND PROPERTY

KEY PLAN

TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

SITE BENCHMARK No.1 LOCATED SOUTH OF CN#5581 ENTRANCE ON DR. LEACH DRIVE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 91.39

SITE BENCHMARK No.2 LOCATED NORTH CN#5598 ENTRANCE ON EASTMAN AVENUE. FIRE HYDRANT TOP OF SPINDLE. ELEVATION = 88.93

SEE DRAWING C-102 or C-108 TO SEE BOTH BENCMARK ON PLAN VIEW

No.	DATE	DESCRIPTION	BY
03	20/02/2025	RE-ISSUED FOR SPA	M.T.
02	28/07/2025	RE-ISSUED FOR SPA	M.T.
01	04/04/2024	ISSUED FOR SPA	M.T.
00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
10056496
02/20/2025
PROVINCE OF ONTARIO

5m 0 10 20m
SCALE: 1:400

PARSONS
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Tel: (613) 738-4160

CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

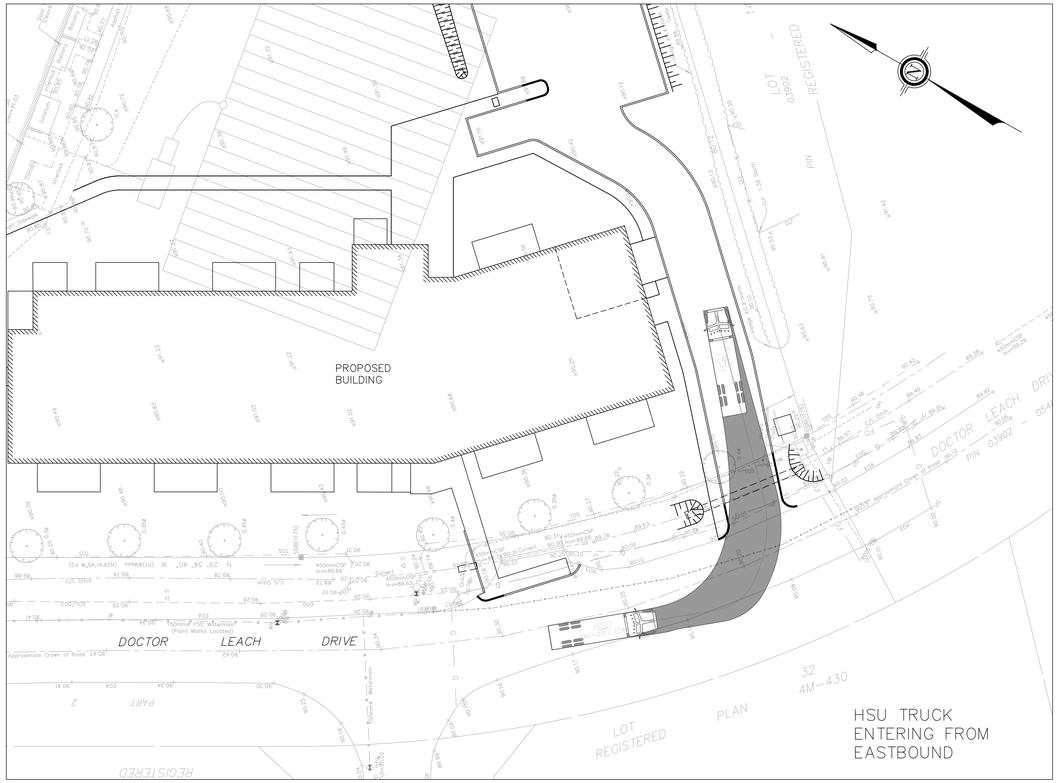
PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

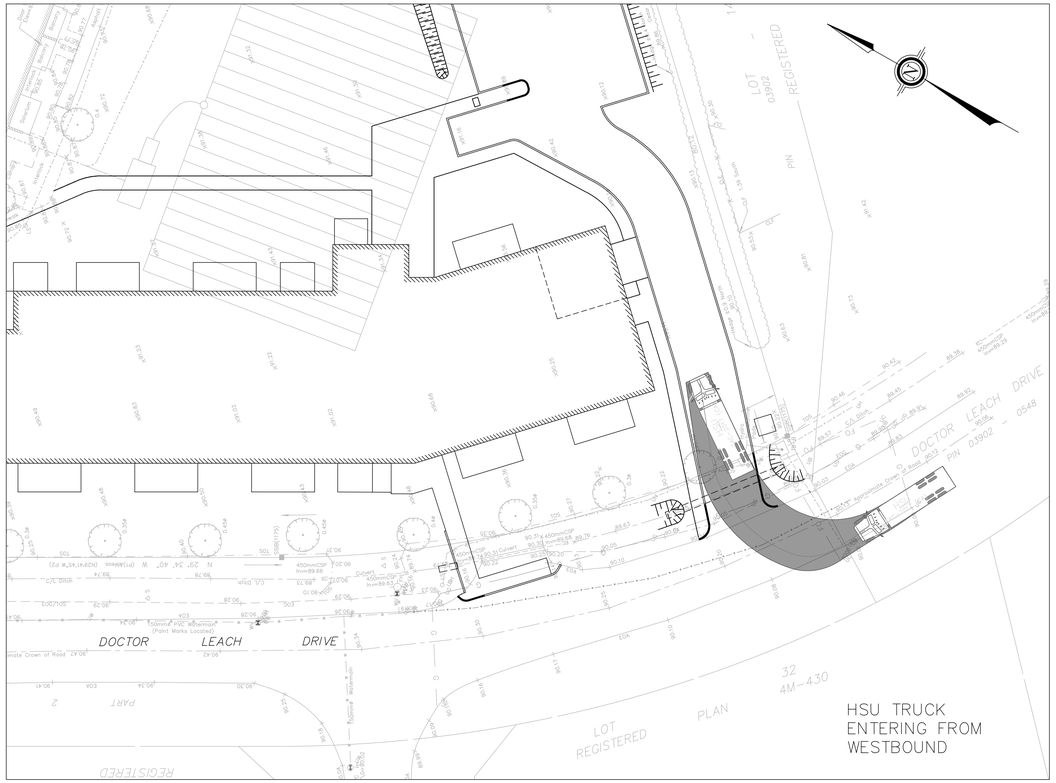
TITLE
SERVICING SITE PLAN

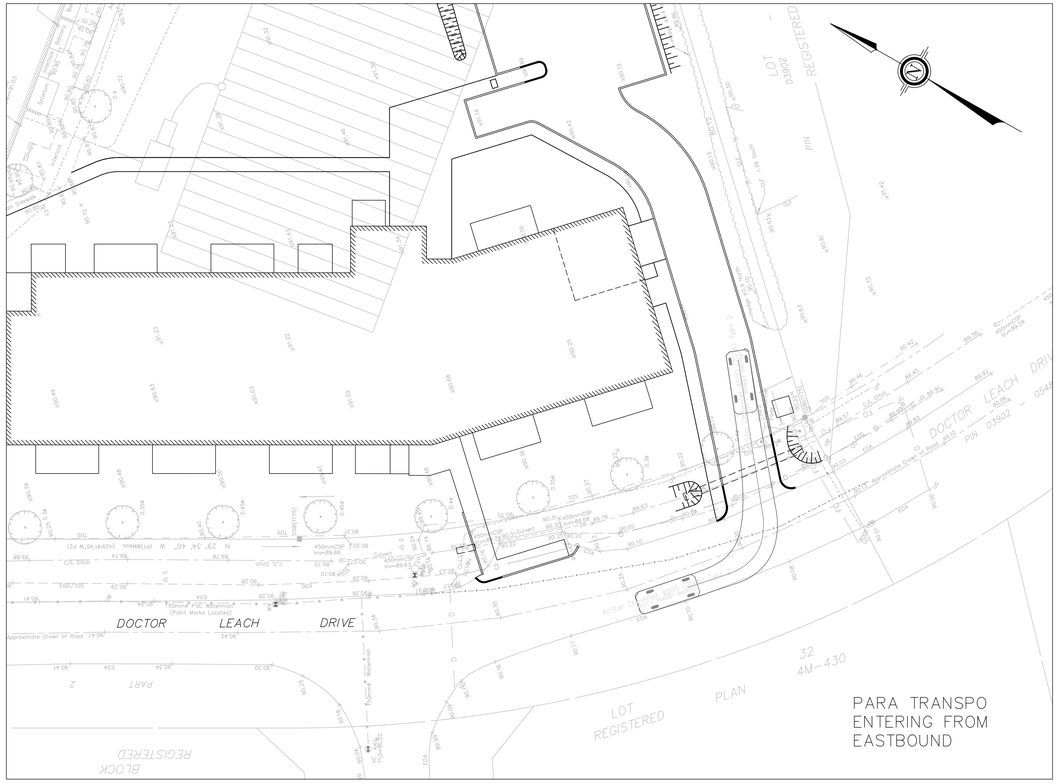
DESIGNED BY	P.C.	PROJECT NO.	478221
DRAWN BY	P.C.		
CHECKED BY	M.T.	C-108	SS.SP
DATE	FEBRUARY 2024		
SCALE	1:400	DRAWING NO.	DRAWING

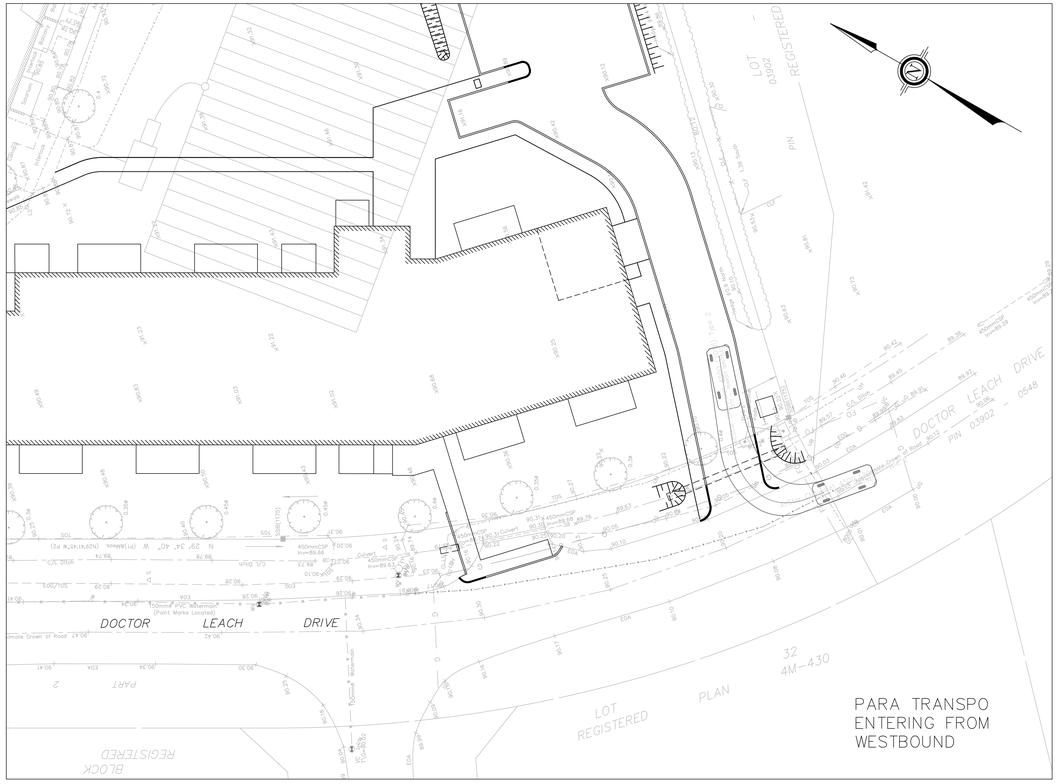
PLAN #19129

FILE # D07-12-23-0048









TOPOGRAPHIC INFORMATION & BENCHMARK

SURVEY COMPLETED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ON JUNE 16TH, 2022. ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM. BEARINGS ARE GRID, MTM ZONE 9 NAD-83 ORIGINAL.

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No.	DATE	DESCRIPTION	BY
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01	04/04/2024	ISSUED FOR SPA	M.T.
00	12/02/2024	ISSUED FOR CIRCULATION	M.T.

REVISIONS

LICENSED PROFESSIONAL ENGINEER
P. CHARLEBOIS
100564967
02/20/2025
PROVINCE OF ONTARIO

5m 0 10 20m
SCALE: 1:400

PARSONS
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Tel: (613) 738-4160

CLIENT
CLV GROUP
485 BANK STREET, SUITE 200
OTTAWA, ON K2P 1Z2

PROJECT
MANOTICK AFFORDABLE SENIORS RESIDENCE - 5581 DR. LEACH DRIVE, MANOTICK, ON

TITLE
TRUCK TURNING MOVEMENTS

DESIGNED BY	P.C.	PROJECT NO.	478221
DRAWN BY	P.C.		
CHECKED BY	M.T.	C-109	TTM
DATE	FEBRUARY 2024		
SCALE	1:400	DRAWING NO.	DRAWING

FILE # D07-12-23-0048 PLAN #19129