120 Iber Road, Suite 103
Ottawa, Ontario K2S 1E9
Tel. (613)836-0856
Fax (613) 836-7183
www.DSEL.ca

SITE SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

CUMMINGS CARON PROPERTY LIMITED
1068-1090 CUMMINGS AVENUE

CITY OF OTTAWA

PROJECT NO.: 19-1104

JULY 2019- REV 1

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1.0 INTRODUCTION

David Schaeffer Engineering Ltd. (DSEL) has been retained by Cummings Caron Property Limited to prepare a Site Servicing and Stormwater Management Report in support of a Zoning By-Law Amendment (ZBLA) for the proposed development at 1068-1090 Cummings Avenue.

The subject property is located within the City of Ottawa urban boundary, in the Beacon Hill-Cyrville ward. As illustrated in ***Figure 1***, below, the subject property is bounded by Cummings Avenue to the east, existing Cummings Park to the north, existing residential lots to the west and existing commercial lot to the south. The subject property measures approximately ***1.52 ha*** and is designated Residential First Density Zone (R1M) under the current City of Ottawa zoning by-law.

Figure 1: Site Location

The proposed development involves the construction of three 6-storey residential buildings connected via two 2-storey podiums consisting altogether of senior apartments and retirement residences. Unground parking is also proposed. A copy of the ***Site Plan*** is included in ***Drawings/Figures***.

The objective of this report is to support the application ZBLA by providing sufficient detail to demonstrate that the proposed development is supported by existing and proposed municipal servicing infrastructure and that the site design conforms to current City of Ottawa design standards.

1.1 Existing Conditions

The subject site currently consists of an existing commercial auto body shop with paved surface and gravel covering the majority of the site area.

Sewer system and watermain distribution mapping collected from the City of Ottawa indicate that the following services exist across the property frontage, within the adjacent municipal road:

Cummings Avenue:

- 300 mm diameter PVC watermain;
- 250 mm diameter AC sanitary sewer; and
- 375 mm diameter concrete storm sewer.

1.2 Required Permits / Approvals

Development of the site is subject to the City of Ottawa Planning and Development Approvals process. The City of Ottawa must approve detailed engineering designs, drawings and reports prepared to support the proposed development plan before the issuing of SPC.

1.3 Pre-consultation

Pre-consultation correspondence and the servicing guidelines checklist are located in ***Appendix A***.

2.0 GUIDELINES, PREVIOUS STUDIES AND REPORTS

2.1 Existing Studies, Guidelines and Reports

The following studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002**,*** October 2012.
  (City Standards)

  - **Technical Bulletin ISDTB-2014-01**
    City of Ottawa, February 5, 2014.
    (ITSB-2014-01)

  - **Technical Bulletin PIEDTB-2016-01**
    City of Ottawa, September 6, 2016.
    (PIEDTB-2016-01)

  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018.
    (ISTB-2018-01)

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, October 2012.
  (Water Supply Guidelines)

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISD-2010-2*)

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (*ISDTB-2014-02*)

  - **Technical Bulletin ISDTB-2018-02**
    City of Ottawa, March 21, 2018.
    (ISDTB-2018-02)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 Update.
  (OBC)

- **Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems**
  National Fire Protection Association
  2016 Edition.
  (NFPA 25)

- **Drainage Management Manual**
  Ministry of Transportation of Ontario (MTO), 1997.
  (MTO Drainage Manual)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 1E pressure zone, as shown by the Pressure Zone map, located in ***Appendix B.*** A 300 mm diameter watermain exists within Cummings Avenue right-of-way.

3.2 Water Supply Servicing Design

The subject property is proposed to be serviced via a 150 mm diameter service lateral connected to the existing 300 mm municipal watermain located within Cummings Avenue.

Table 1, below, summarizes the ***Water Supply Guidelines*** employed in the preparation of the water demand estimate.

Table 1
Water Supply Design Criteria

Design Parameter	Value
Residential Bachelor Apartment	1.4 P/unit
Residential 1 Bedroom Apartment	1.4 P/unit
Residential 2 Bedroom Apartment	2.1 P/unit
Average Daily Demand	280 L/d/per
Boarding	1 P/bed
Commercial Retail	2.5 $L/m^2/d$
Commercial Maximum Daily Demand	1.5 x avg. day
Commercial Maximum Hour Demand	1.8 x max. day
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure shall not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa
*** Table updated to reflect **ISDTB-2018-02***	

Table 2, below, summarizes the anticipated water demand and boundary conditions for the proposed development and was calculated using the ***Water Supply Guidelines.***

Table 2
Proposed Water Demand

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Conditions[2] (m H_2O / kPa)	
Average Daily Demand	78.8	118.0	448.3
Max Day + Fire Flow (per OBC)	229.6 + 4,150 = 4,379.6	111.0	379.6
Peak Hour	346.4	109.8	367.9

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions above for connection to Cummings Avenue assumed ground elevation equal to 97.30 m.

The City of Ottawa was contacted to obtain boundary conditions associated with the estimated water demand, as indicated in the boundary request correspondence included in ***Appendix B***.

For the purpose of estimating fire flow, the short method within the National Fire Protection Association (NFPA) standards was utilized. As indicated by Section 11.2.2 from the ***NFPA Standards***, fire flow requirements are to be determined by combining the required flow rate for the sprinkler system, along with the anticipated hose stream. As indicated by Table 11.2.2.1 and Table 11.2.3.1.2 extracted from the ***NFPA Standards*** and included in ***Appendix B***, the anticipated fire flow requirements for the sprinkler system is ***3,200 L/min*** (850 gpm) and the anticipated internal and external total combined inside and outside hose stream demand is ***950 L/min*** (250 gpm).

As a result, the total fire flow is anticipated to be ***4,150 L/min*** (1,100 gpm), refer to supporting calculation in ***Appendix B***. Based on the boundary conditions provided by the City of Ottawa, sufficient supply is available for fire flow. A certified fire protection system specialist will need to be employed to design the building's fire suppression system and confirm the actual fire flow demand.

There are 3 existing fire hydrants on Cummings Avenue across from the site. The existing hydrants are within 45 m, 152 m and 220 m respectively from the proposed building. Based on ***Table 18.5.4.3*** of **ISTB-2018-02,** the total available fire flow for the hydrants is equal to ***12,300 L/min,*** which is sufficient to provide adequate fire flow for the proposed development.

The City provided both the anticipated minimum and maximum water pressures, as well as, the estimated water pressure during fire flow, as indicated by the correspondence in ***Appendix B***. The minimum and maximum pressures fall within the required range identified in ***Table 2.***

3.3 Water Supply Conclusion

It is proposed to service the subject property via a 150 mm service lateral connected to the existing 300 mm watermain located within Cummings Avenue.

The anticipated water demand was submitted to the City of Ottawa for establishing boundary conditions. The City provided both the anticipated minimum and maximum water pressures. As demonstrated by ***Table 2*** which was based on the City's model, the municipal system is capable of delivering water within the pressure range prescribed in the ***Water Supply Guidelines***.

Fire flow requirements were estimated in accordance with ***NFPA Standards***. Based on the boundary conditions provided by the City of Ottawa, sufficient flow is available to service the development.

It is proposed that the development will be serviced by the existing fire hydrant located on Cummings Avenue, located across from the subject property. Based on ***Table 18.5.4.3*** of **ISTB-2018-02,** the available fire flow for the hydrant is equal to ***5,700 L/min*** sufficient to provide adequate fire flow for the proposed development.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject property lies within the Cyrville Road Collector catchment area, as shown by the ***Trunk Sanitary Sewers and Collection Areas Map,*** included in ***Appendix C***. An existing 250 mm sanitary sewer exists along Cummings Avenue. The local sewer is tributary to the Cyrville Road Collector Trunk at Ogivile Road.

4.2 Wastewater Design

The development is proposed to connect to the 250 mm sanitary sewer within Cummings Avenue via a 200 mm sanitary sewer connection, refer to drawing ***SSP-1*** for sanitary layout and connection points. Wastewater flow from the development is tributary to the Cyrville Road Collector Trunk.

Table 3, below, summarizes the ***City Standards*** employed in the calculation of wastewater flow rates for the proposed development.

Table 3
Wastewater Design Criteria

Design Parameter	Value
Light Industrial	35,000 L/gross ha/day
Commercial Floor Space	5 L/m^2/d
Commercial Peaking Factor	1.5 x Average ICI Flow
Residential Daily Demand	280 L/person/day
Peaking Factor	Harmon's Peaking Factor. Max 3.8
Infiltration and Inflow Allowance	0.33L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sanitary Sewer Lateral	135mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s

Table 4, below, demonstrates the existing wastewater flow from the subject property. Refer to ***Appendix C*** for associated calculations.

Table 4
Summary of Anticipated Wastewater Flows

Design Parameter	Existing Sanitary Flow[1] (L/s)
Average Dry Weather Flow Rate	0.69
Peak Dry Weather Flow Rate	0.69
Peak Wet Weather Flow Rate	1.12
*1) Based on criteria shown in **Table 3***	

Table 5, below, demonstrates the anticipated peak flow from the proposed development, see ***Appendix C*** for associated calculations.

Table 5
Summary of Proposed Wastewater Flows

Design Parameter	Anticipated Sanitary Flow[1] (L/s)
Average Dry Weather Flow Rate	7.81
Peak Dry Weather Flow Rate	10.82
Peak Wet Weather Flow Rate	11.24
*2) Based on criteria shown in **Table 3***	

The estimated peak wet weather sanitary flow, based on the ***Site Plan,*** provided in ***Drawings/Figures,*** is ***11.24 L/s***, which results in a ***10.12 L/s*** increase from the existing flow.

In order to estimate the available capacity of the local municipal sanitary sewers, a sanitary analysis was conducted for the sanitary sewers located across the frontage of the subject property within the Cummings Avenue right-of-way, up to the location where the 250 mm diameter sanitary sewer running within Cummings Avenue discharges to the existing 300 mm diameter sanitary sewer within Ogilvie Road. The catchment area serviced by the Cummings Avenue sanitary sewer was identified and evaluated by reviewing existing developments and zoning within the area. Refer to the sanitary drainage plan in ***Appendix C***, for the extents of the existing sanitary sewer analysis.

Based on the sanitary analysis, the most restrictive section of the local sewer system is located in front of 1081 Cummings Avenue, with a residual capacity of ***13.81 L/s***; detailed calculations are included in ***Appendix C***.

The analysis above indicates that sufficient capacity is available in the local sewers to accommodate the proposed development.

4.3 Wastewater Servicing Conclusions

The site is tributary to the Cyrville Road Collector Trunk. The proposed development is anticipated to generate a peak wet weather flow of ***11.24 L/s,*** to be directed to the local 250 mm sanitary sewer within Cummings Avenue which is tributary to the Cyrville Road Collector Trunk.

Based on the sanitary analysis completed, there is a residual capacity of ***13.81 L/s*** within the most controlling section of sewer, therefore, there is sufficient capacity within the existing infrastructure to accommodate the flow estimated to discharge from the proposed development.

The proposed wastewater design conforms to all relevant ***City Standards.***

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to the City of Ottawa sewer system and is located within Greens Creek sub-watershed. As such, approvals for the proposed development within this area are under the approval authority of the City of Ottawa.

Flows that influence the watershed in which the subject property is located are further reviewed by the principal authority. The subject property is located within the Lower Rideau River watershed and is therefore, subject to review by the Rideau Valley Conservation Authority (RVCA). Consultation with the RVCA is located in ***Appendix A***.

The existing stormwater runoff from the site area generally drains southeast towards existing ditch along the site's boundary. There is an existing ***375 mm*** diameter storm sewer within Cummings Avenue, adjacent to the subject property.

The estimated pre-development peak flows for the 2, 5, and 100-year storm events are summarized in ***Table 6,*** below:

Table 6
Summary of Existing Peak Storm Flow Rates

City of Ottawa Design Storm	Estimated Peak Flow Rate (L/s)
2-year	275.5
5-year	373.7
100-year	753.4

5.2 Post-development Stormwater Management Targets

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa and RVCA and are summarized below:

- Meet an allowable release rate based on the existing Rational Method Coefficient no greater than 0.50, employing the City of Ottawa IDF parameters for a 5-year storm with a calculated time of concentration equal to or greater than 10 minutes;
- Attenuate all storms up to and including the City of Ottawa 100-year design event on site; and
- Include quality controls to an enhanced level of treatment (80% TSS removal) for the site; correspondence with the RVCA is included in ***Appendix A***.

Based on the above criteria, the allowable stormwater release rate is equal to ***199.8 L/s.***

5.3 Proposed Stormwater Management System

The proposed development consists of a 6-storey residential complex, underground parking, associated surface parking and landscaping. It is proposed that the stormwater for the development be serviced through a connection to the ***375 mm*** diameter storm sewer within Cummings Avenue Road.

To achieve the allowable post-development stormwater runoff release rate identified in ***Section 5.2,*** the proposed development will employ flow attenuation using onsite storage through the use of underground storage chambers. Inlet Control Devices (ICDs) are proposed to attenuate flow to the allowable release rate.

Table7, below***,*** estimates post-development flow rates and storage requirements.

Table 7
Stormwater Flow Rate Summary

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Required Storage	100-Year Available Storage
	(L/s)	(m^3)	(L/s)	(m^3)	(m^3)
Unattenuated Areas	14.5	0.0	31.0	0.0	0.0
Building	32.8	50.2	62.3	95.4	96.0
Attenuated Area A103+A104	24.3	63.8	47.2	143.0	170.3
Attenuated Area A105A	11.3	6.2	23.4	13.7	24.5
Attenuated Area A105B	8.6	10.2	33.9	12.2	13.7
Total	**91.5**	**130.3**	**197.8**	**264.3**	**304.5**

It is estimated that a total of ***264.3 m^3*** of on-site storage is required to attenuate flow to a release rate of ***197.8 L/s***. A combination of underground storage chambers and a cistern internal to the building will be required to attenuate runoff to the allowable release rate. Approximately ***96.0 m^3*** of storage is to be provided within the cistern and ***100.0 m^3*** to be provided within underground storage chambers. Detailed calculations are contained within ***Appendix D***.

Quality control to achieve an 80% TSS removal is proposed to be provided by an Oil-Grit Separator (OGS) located at the outlet to the existing storm sewer on Cummings Avenue. The OGS has been sized to accommodate runoff from a *1.49 ha* drainage area, which is equivalent to the total attenuated areas from the subject site. Refer to ***Appendix D*** for a copy of the OGS sizing reports.

5.4 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the allowable release rate for storm events up to and including the 100-year storm, in accordance with City of Ottawa ***City Standards***. The post-development stormwater allowable release rate for the site was calculated to be ***197.4 L/s***. It was determined that ***286.7 m^3*** of storage and the use of Inlet Control Devices (ICDs) will be required to attenuate flows to this release rate.

Based on consultation with the RVCA, quality controls are required to an enhanced level of treatment (80% TSS removal) for the proposed development. Quality controls will be provided by the proposed Oil-Grit Separator (OGS).

The proposed stormwater design conforms to all relevant ***City Standards*** and Policies.

6.0 UTILITIES

Gas, Hydro, Bell and Streetlighting services exist within Cummings Avenue Road right-of-way.

Utility servicing will be coordinated with the individual utility companies prior to site development.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated during construction where vegetation has been removed and the top layer of soil becomes agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catch basins will have SILTSACKs installed under the grate during construction to protect from silt entering the storm sewer system.

A mud mat will be installed at the construction access, in order to prevent mud tracking onto adjacent roads.

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents:

- Limit extent of exposed soils at any given time;
- Re-vegetate exposed areas as soon as possible;
- Minimize the area to be cleared and grubbed;
- Protect exposed slopes with plastic or synthetic mulches;
- Install silt fence to prevent sediment from entering existing ditches;
- No refueling or cleaning of equipment near existing watercourses;
- Provide sediment traps and basins during dewatering;
- Install filter cloth between catch basins and frames;
- Plan construction at proper time to avoid flooding; and
- Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers; and
- Clean and change filter cloth at catch basins.

8.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained by Cummings Caron Property Limited to prepare a Site Servicing and Stormwater Management Report in support of Zoning By-Law Amendment for the proposed development at 1068-1090 Cummings Avenue. The preceding report outlines the following:

- Based on boundary conditions provided by the City, the existing municipal water infrastructure is capable of providing the proposed development with water within the City's required pressure range;
- The proposed development is anticipated to have a peak wet weather flow of ***11.24 L/s*** directed to the 250 mm sanitary sewer within Cummings Avenue, to be ultimately discharged into the Cyrville Road Collector Trunk. The proposed works result in a ***10.12 L/s*** increase from existing sanitary flow;
- Based on the sanitary analysis completed, there is a residual capacity of ***13.81 L/s*** within the most controlling section of sewer, therefore, there is sufficient capacity within the existing infrastructure to accommodate the flow estimated to discharge from the proposed development;
- Based on the consultation with the City, the proposed development is proposed to attenuate flow to a release rate of ***197.8 L/s***;
- It is proposed to attenuate flow through the combined use of underground storage and ICDs. It is anticipated that ***264.3 m^3*** of onsite storage will be required to attenuate flow to the established release rate above; and
- Based on consultation with the RVCA, quality controls are required to an enhanced level of treatment (80% TSS removal) for the proposed development. Quality controls will be provided by the proposed Oil-Grit Separator (OGS).

Prepared by,
David Schaeffer Engineering Ltd.

Per: Brandon Chow

Reviewed by,
David Schaeffer Engineering Ltd.

LICENSED PROFESSIONAL ENGINEER
R. D. FREEL
100163197
2019-07-04
19-1104
PROVINCE OF ONTARIO

Per: Robert Freel, P.Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

19-1104 02/07/2019

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures, EX-1
☒	Plan showing the site and location of all existing services.	Figure 1, EX-1
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0, Section 5.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3, Appendix A
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1, EX-1
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	GP-1
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 2.1
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	Drawings/Figures

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	N/A
☒	Availability of public infrastructure to service proposed development	Section 3.1
☒	Identification of system constraints	Section 3.1
☒	Identify boundary conditions	Section 3.2
☒	Confirmation of adequate domestic supply and pressure	Section 3.2, 3.2.1, 3.3

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2, Appendix B
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.2, 3.2.1, 3.3
☒	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 3.2, SSP-1
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2, Appendix B
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Section 3.2, Appendix B

4.3 Development Servicing Report: Wastewater

☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1, EX-1
☒	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2, Appendix C
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2, SSP-1
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures , SWM-1
☒	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.1, 5.3, Appendix D
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 5.3
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	N/A
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Section 5.4
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☒	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 8.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

Amr Salem

From: Brandon Chow
Sent: July 2, 2019 7:13 PM
To: Amr Salem
Subject: FW: 1068 Cummings Ave - Quality Requirement

Brandon Chow
Project Coordinator / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.532
fax: (613) 836-7183
email: bchow@DSEL.ca

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: May 28, 2019 4:30 PM
To: Brandon Chow <BChow@dsel.ca>
Subject: RE: 1068 Cummings Ave - Quality Requirement

Good Afternoon Brandon,

Based on our understanding of the proposal, 76 surface parking spaces are proposed. The site outlets to an existing municipal storm sewer which is approximately 1725 metres upstream of the direct outlet to a tributary of Green's Creek. No municipal facility provides quality treatment for the stormwater entering the watercourse, which under current standards requires 80% TSS Removal. The RVCA advises that on-site water quality treatment of 80% TSS Removal needs to be incorporated into the stormwater management plan to mitigate the impacts on surface water quality and aquatic habitat in the receiver.

Jamie Batchelor, MCIP, RPP
Planner, ext. 1191
Jamie.batchelor@rvca.ca

Rideau Valley Conservation Authority

3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca

From: Brandon Chow <BChow@dsel.ca>
Sent: Tuesday, May 28, 2019 2:27 PM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Subject: 1068 Cummings Ave - Quality Requirement

Good afternoon Jamie,

We would like to touch base with you regarding a development we are working on located at 1068 Cummings Avenue.

The proposed development involves the construction of a 6-storey retirement/apartment building with underground parking garage as shown by the attached site plan.
Stormwater collected from the site will outlet to the existing 375mm storm sewer within Cummings Ave and travel approximately 1,725m before discharging to a tributary to Green's Creek.

Can you provide any comments regarding quality controls required for this site?

Thanks,

Brandon Chow

Project Coordinator / Intermediate Designer

DSEL
david schaeffer engineering ltd.

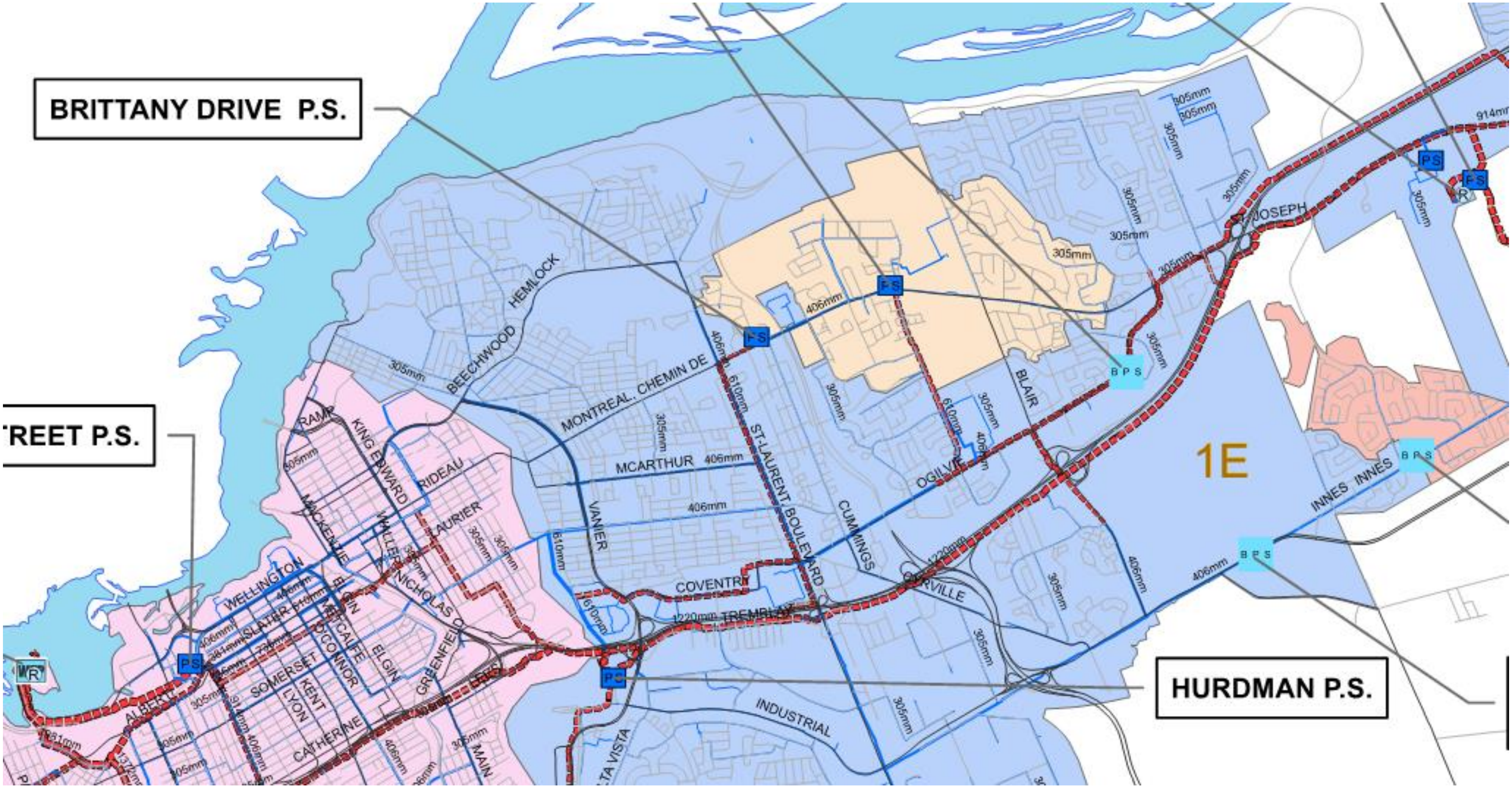
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.532
fax: (613) 836-7183
email: bchow@DSEL.ca

APPENDIX B

Water Supply

City of Ottawa
Water Pressure Zone Map



Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	-	0
Semi-detached	2.7	-	0
Townhouse	2.7	-	0
Apartment			0
Bachelor	1.4	-	0
1 Bedroom	1.4	-	0
2 Bedroom	2.1	-	0
3 Bedroom	3.1	-	0
Average	1.8	-	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	0	0.0	0.0	0.0	0.0	0.0	0.0

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$	-	0.0	0.0	0.0	0.0	0.0	0.0
Office	75	$L/9.3m^2/d$	-	0.0	0.0	0.0	0.0	0.0	0.0
Restaurant*	125	L/seat/d	-	0.0	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000	L/gross ha/d	1.52	53.2	36.9	79.7	55.4	143.5	99.7
Industrial - Heavy	55,000	L/gross ha/d	-	0.0	0.0	0.0	0.0	0.0	0.0
			Total I/CI Demand	53.2	36.9	79.7	55.4	143.5	99.7
			Total Demand	**53.2**	**36.9**	**79.7**	**55.4**	**143.5**	**99.7**

* Estimated number of seats at 1seat per $9.3m^2$

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	**Per / Unit**	**Units**	**Pop**
Single Family	3.4	-	0
Semi-detached	2.7	-	0
Townhouse	2.7	-	0
Apartment			0
Bachelor	1.4	27	38
1 Bedroom	1.4	86	121
2 Bedroom	2.1	18	38
3 Bedroom	3.1	-	0
Average	1.8	-	0
Type of Housing	**Per/Bed**	**Beds**	**Pop**
Boarding †	1	185	185

	Pop	**Avg. Daily**		**Max Day**		**Peak Hour**	
		m^3/d	**L/min**	**m^3/d**	**L/min**	**m^3/d**	**L/min**
Total Domestic Demand	382	107.0	74.3	320.9	222.8	481.3	334.3

Institutional / Commercial / Industrial Demand

			Avg. Daily		**Max Day**		**Peak Hour**	
Property Type	**Unit Rate**	**Units**	**m^3/d**	**L/min**	**m^3/d**	**#VALUE!**	**m^3/d**	**L/min**
Dining room †*	125 L/seat/d	52	6.50	4.5	9.8	6.8	17.6	12.2
Restaurant*	125 L/seat/d	-	0.00	0.0	0.0	0.0	0.0	0.0
		Total I/CI Demand	6.5	4.5	9.8	#VALUE!	17.6	12.2
		Total Demand	**113.5**	**78.8**	**330.6**	**#VALUE!**	**498.9**	**346.4**

† Flow rates per City of Ottawa Sewer Design Guidelins Appendix 4A
* Estimated number of seats at 1 seat per $9.3m^2$

Cummings Caron Property Limited
1068-1090 Cummings Avenue
Boundary Conditions Unit Conversion

Boundary Conditions Unit Conversion

Grnd Elev 72.30

	m H_2O	PSI	kPa
Avg. Day	**118.0**	65.0	448.3
Peak Hour	**109.8**	53.4	367.9
Max Day + FF(69L/s)	**111.0**	55.1	379.6
Max Day + FF(283L/s)	**104.0**	45.1	311.0

Amr Salem

From: Brandon Chow
Sent: June 24, 2019 11:41 AM
To: Amr Salem
Subject: FW: Boundary Conditions Request: 1068 Cummings Ave
Attachments: 1068 Cummings May 2019.pdf

Brandon Chow
Project Coordinator / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.532
fax: (613) 836-7183
email: bchow@DSEL.ca

From: Thivierge, Mike <mike.thivierge@ottawa.ca>
Sent: May 27, 2019 3:57 PM
To: Brandon Chow <BChow@dsel.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Belan, Steve <Steve.Belan@ottawa.ca>
Subject: RE: Boundary Conditions Request: 1068 Cummings Ave

Brandon,

Please see the boundary conditions as requested below:

The following are boundary conditions, HGL, for hydraulic analysis at 1068 Cummings (zone 1E) assumed to be connected to the 305mm on Cummings Ave (see attached PDF for location).

Minimum HGL = 109.8m

Maximum HGL = 118.0m

MaxDay + Fireflow (69L/s) = 111.0m

MaxDay + Fireflow (283L/s) = 104.0m

These are for current conditions and are based on computer model simulation.

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.*

Thanks,

Mike Thivierge P.Eng., PE
Sr. Engineer, Development Review East Branch
City of Ottawa|Ville d'Ottawa
110 Laurier Ave West|110 avenue Laurier Ouest
Ottawa, ON K1P 1J1
Tel.|Tél. 613-580-2424, ext.|poste 22191

From: Thivierge, Mike
Sent: May 22, 2019 1:42 PM
To: 'Brandon Chow' <BChow@dsel.ca>
Cc: Robert Freel <RFreel@dsel.ca>
Subject: RE: Boundary Conditions Request: 1068 Cummings Ave

Hi Brandon,

Thanks for your e-mail.
We will get back to you with these boundary conditions.

Cheers,

Mike Thivierge P.Eng., PE
Sr. Engineer, Development Review East Branch
City of Ottawa|Ville d'Ottawa
110 Laurier Ave West|110 avenue Laurier Ouest
Ottawa, ON K1P 1J1
Tel.|Tél. 613-580-2424, ext.|poste 22191

From: Brandon Chow <BChow@dsel.ca>
Sent: May 22, 2019 12:41 PM
To: Thivierge, Mike <mike.thivierge@ottawa.ca>
Cc: Robert Freel <RFreel@dsel.ca>
Subject: Boundary Conditions Request: 1068 Cummings Ave

Good afternoon Mike,

We would like to kindly request boundary conditions for the proposed development at 1068 Cummings Avenue using the following proposed development demands:

1. Location of Service / Street Number: 1068 Cummings Avenue

2. Type of development:
   - The proposed development is a retirement residence and residential apartment complex, consisting of three six-storey buildings connected via two 2-storey podiums;
   - It is anticipated that the development will be serviced by a connection to the existing 305mm PVC watermain along Cummings Avenue. Connection is proposed to be located between 2 existing water valves for isolation, refer to the figure below for reference
   - The maximum Fire flow demand was estimated to be 17,000 L/min per the attached FUS calculations.

3. Kindly provide boundary conditions at the proposed connection points shown below at the following demands;

	L/min	L/s
Avg. Daily	78.0	1.3
Max Day + OBC	227.3 + 4,150 =4,377.3	3.8 + 69.2 = 73.0
Max Day + FUS	227.3 + 17,000 = 17,227.3	3.8 + 283.3 = 287.1
Peak Hour	342.9	5.7

Thank you,

Brandon Chow
Project Coordinator / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.532
fax: (613) 836-7183
email: bchow@DSEL.ca

Date: 2019-05-22

1068 Cummings Avenue

NFPA Calculations

As indicated by Section 11.2.2 from the ***NFPA***, fire flow requirements are to be determined by combining the required flow rate for the sprinkler system along with the anticipated hose stream. As indicated by Table 11.2.2.1 and Table 11.2.3.1.2 extracted from the ***NFPA***, the anticipated fire flow requirements for the sprinkler system is **4,150 L/min** Since the sprinkler system is proposed to be fully supervised/monitored per section 11.2.2.5 of the ***NFPA,*** the lower flow of ***3,200 L/min*** was selected from Table 11.2.2.1. The anticipated hose stream demand is ***950 L/min*** per Table 11.2.3.1.2. The lower demand was selected as the sprinkler system is proposed to be fully supervised per section 11.2.3.1.3. As a result, the total fire flow is anticipated to be ***4,150 L/min*** .

Table 11.2.2.1 Water Supply Requirements for Pipe Schedule Sprinkler Systems

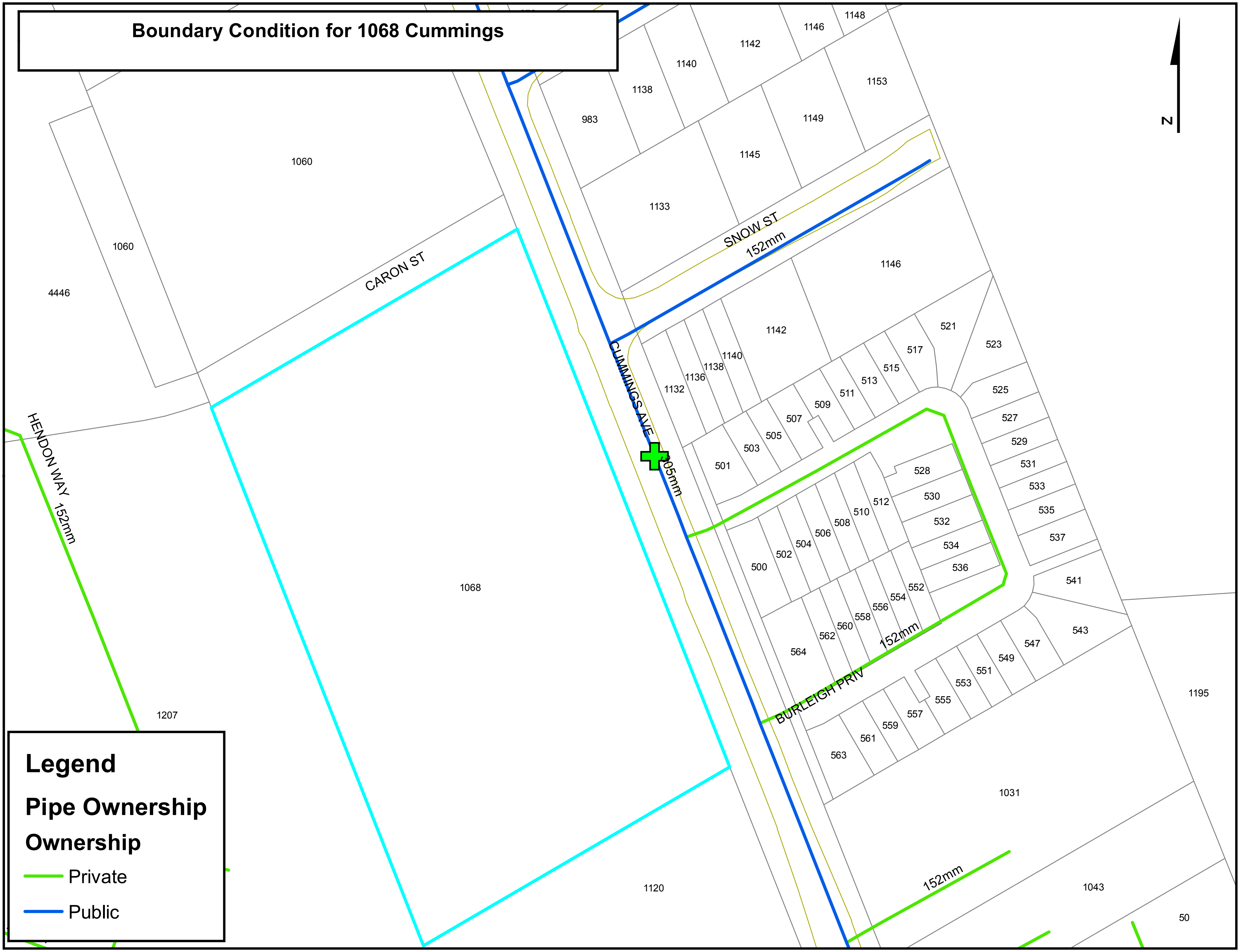
Occupancy Classification	Minimum Residual Pressure Required		Acceptable Flow at Base of Riser (Including Hose Stream Allowance)		Duration (minutes)
	psi	bar	gpm	L/min	
Light hazard	15	1	500–750	1900-2850	30–60
Ordinary hazard	20	1.4	850–1500	3200-5700	60–90

Date: 2019-05-22

Table 11.2.3.1.2 Hose Stream Allowance and Water Supply Duration Requirements for Hydraulically Calculated Systems

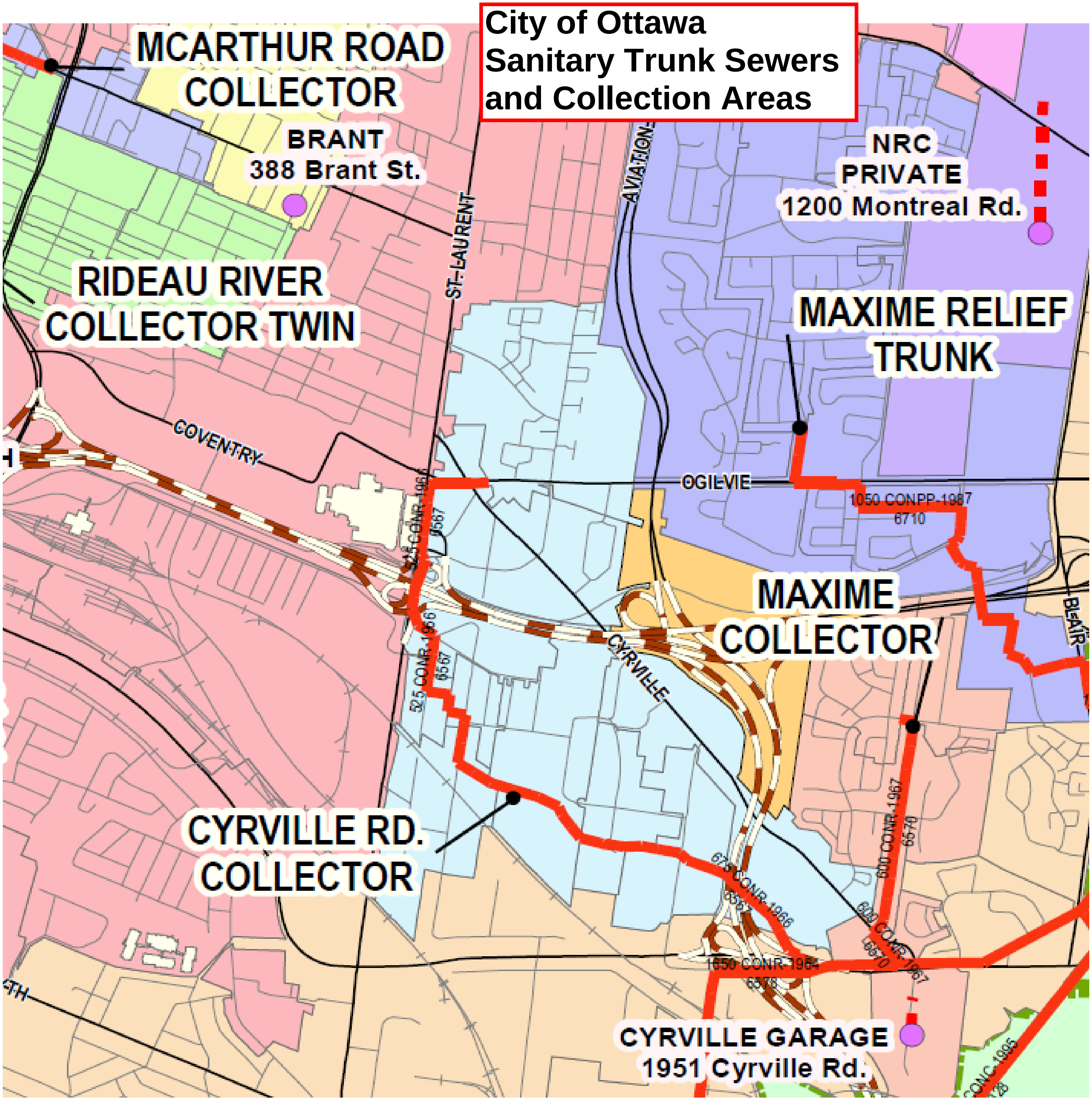
Occupancy	Inside Hose		Total Combined Inside and Outside Hose		Duration (minutes)
	gpm	L/min	gpm	L/min	
Light hazard	0, 50, or 100	0, 190, or 380	100	380	30
Ordinary hazard	0, 50, or 100	0, 190, or 380	250	950	60–90
Extra hazard	0, 50, or 100	0, 190, or 380	500	1900	90–120

Boundary Condition for 1068 Cummings



APPENDIX C

Wastewater Collection


City of Ottawa
Sanitary Trunk Sewers
and Collection Areas
MCARTHUR ROAD
COLLECTOR
BRANT
388 Brant St.
NRC
PRIVATE
1200 Montreal Rd.
RIDEAU RIVER
COLLECTOR TWIN
MAXIME RELIEF
TRUNK
MAXIME
COLLECTOR
CYRVILLE RD.
COLLECTOR
CYRVILLE GARAGE
1951 Cyrville Rd.
ST-LAURENT
AVIATION
COVENTRY
OGILVIE
CYRVILLE
BLAIR
1050 CONPP-1987
6710
525 CONR-1966
6567
675 CONR-1966
600 CONR-1967
6570
1650 CONR-1964
6578

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 1.519 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.08**	**L/s**
Infiltration / Inflow (Wet)	**0.43**	**L/s**
Infiltration / Inflow (Total)	**0.50**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**0**	
Average Domestic Flow	**0.00**	**L/s**
Peaking Factor	**3.80**	
Peak Domestic Flow	**0.00**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Dining room	125	L/per/d		0.00
Commercial floor space*	5	L/m^2/d		0.00
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d	1.519	0.62
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.62**
Peak Institutional / Commercial Flow	0.00
Peak Industrial Flow**	0.62
Peak I/C/I Flow	**0.62**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**0.69**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.69**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**1.12**	**L/s**

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 1.519 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.08**	**L/s**
Infiltration / Inflow (Wet)	**0.43**	**L/s**
Infiltration / Inflow (Total)	**0.50**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	27	38
1 Bedroom	1.4	86	121
2 Bedroom	2.1	18	38
3 Bedroom	3.1		0
Average	1.8		0
Type of Housing	**Per/Bed**	**Beds**	**Pop**
Boarding †	1	185	185

Total Pop	**382**	
Average Domestic Flow	**1.24**	**L/s**
Peaking Factor	**3.43**	
Peak Domestic Flow	**4.24**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Dining room †	125	L/per/d	52	6.50
Commercial floor space*	5	$L/m^2/d$		0.00

Average I/C/I Flow	**6.50**
Peak Institutional / Commercial Flow	6.50
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**6.50**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*
† Flow rates per City of Ottawa Sewer Design Guidelins Appendix 4A

Total Estimated Average Dry Weather Flow Rate	**7.81**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**10.82**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**11.24**	**L/s**

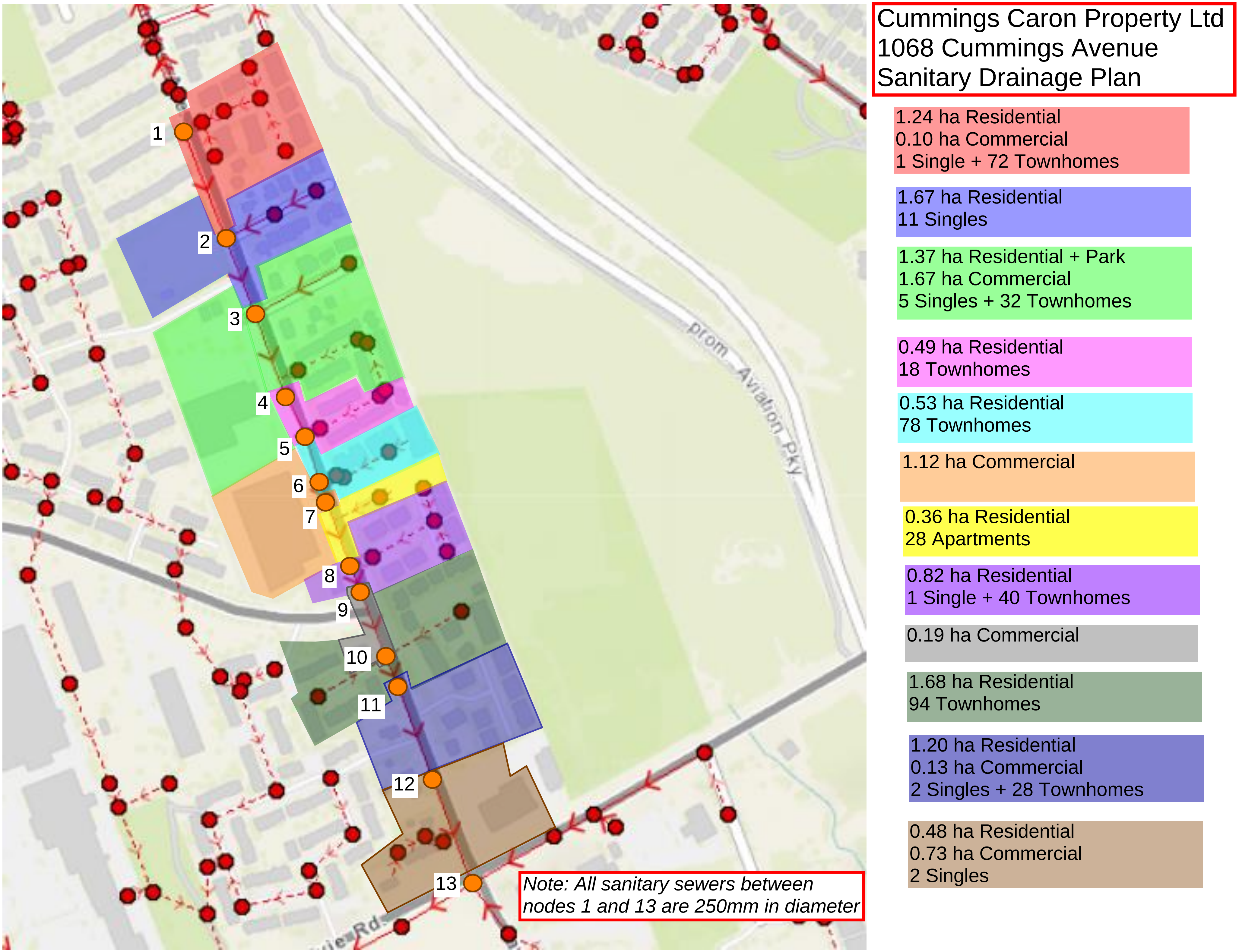
Cummings Caron Property Limited
1068-1090 Cummings Avenue
Calculation Sheet

CLIENT: **Cummings Caron Property Limited**
LOCATION: **1068-1090 Cummings Avenue**
FILE REF: **19-1104**
DATE: **15-May-19**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280 L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.33 L/s/ha
Avg. Daily Flow Comm.	28,000 L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60 m/s full flowing
Avg. Daily Flow Instit.	28,000 L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00 m/s full flowing
Avg. Daily Flow Indust.	35,000 L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013

Location			Residential Area and Population										Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Number of Units by type				Pop.	Cumulative		Peak.	Q_{res}	Area	Accu.	Area	Accu.	Area	Accu.	Q_{C+I+I}	Total	Accu.	Infiltration	Total	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
									Area	Pop.	Fact.			Area		Area		Area		Area	Area	Flow	Flow								
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
RED	1	2	1.24	1		72		198.0	1.240	198.0	4.00	2.57	0.10	0.10		0.00		0.00	0.1	1.340	1.340	0.375	3.03	250	0.26	104.5	0.049	0.063	0.61	30.1	0.10
BLUE	2	3	1.67	11				37.0	2.910	235.0	4.00	3.05		0.10		0.00		0.00	0.1	1.670	3.010	0.843	3.98	250	0.17	75.5	0.049	0.063	0.50	24.7	0.16
GREEN	3	4	1.37	5		32		103.0	4.280	338.0	4.00	4.38	1.67	1.77		0.00		0.00	1.5	3.040	6.050	1.694	7.61	250	0.30	80.5	0.049	0.063	0.66	32.5	0.23
PINK	4	5	0.49			18		49.0	4.770	387.0	4.00	5.02		1.77		0.00		0.00	1.5	0.490	6.540	1.831	8.38	250	0.27	40.5	0.049	0.063	0.63	31.0	0.27
CYAN	5	6	0.53			78		211.0						1.77		0.00		0.00	1.5	0.53	7.070	1.980	3.52	250	0.36	45.0	0.049	0.063	0.72	35.5	0.10
ORANGE	6	7						0.0	0.000	0.0	4.00	0.00	1.12	2.89		0.00		0.00	2.5	1.120	8.190	2.293	4.80	250	0.22	18.5	0.049	0.063	0.57	28.1	0.17
YELLOW	7	8	0.36				28	50.0	0.360	50.0	4.00	0.65		2.89		0.00		0.00	2.5	0.360	8.550	2.394	5.55	250	0.22	65.0	0.049	0.063	0.57	28.1	0.20
PURPLE	8	9	0.82	1		40		111.0	1.180	161.0	4.00	2.09		2.89		0.00		0.00	2.5	0.820	9.370	2.624	7.22	250	0.22	23.0	0.049	0.063	0.57	28.1	0.26
GREY	9	10						0.0	1.180	161.0	4.00	2.09	0.19	3.08		0.00		0.00	2.7	0.190	9.560	2.677	7.44	250	0.39	66.0	0.049	0.063	0.76	37.3	0.20
DARK GREEN	10	11	1.68			94		254.0	2.860	415.0	4.00	5.38		3.08		0.00		0.00	2.7	1.68	11.240	3.147	11.20	250	0.18	28.0	0.049	0.063	0.51	25.1	0.45
NAVY	11	12	1.20	2		28		82.0	4.060	497.0	3.98	6.40	0.13	3.21		0.00		0.00	2.8	1.330	12.570	3.520	12.71	250	0.28	90.5	0.049	0.063	0.64	31.3	0.41
BROWN	12	13	0.48	2				7.0	4.540	504.0	3.97	6.49	0.73	3.94		0.00		0.00	3.4	1.210	13.780	3.858	13.77	250	0.36	104.5	0.049	0.063	0.73	35.9	0.38


Cummings Caron Property Ltd
1068 Cummings Avenue
Sanitary Drainage Plan
1.24 ha Residential
0.10 ha Commercial
1 Single + 72 Townhomes
1.67 ha Residential
11 Singles
1.37 ha Residential + Park
1.67 ha Commercial
5 Singles + 32 Townhomes
0.49 ha Residential
18 Townhomes
0.53 ha Residential
78 Townhomes
1.12 ha Commercial
0.36 ha Residential
28 Apartments
0.82 ha Residential
1 Single + 40 Townhomes
0.19 ha Commercial
1.68 ha Residential
94 Townhomes
1.20 ha Residential
0.13 ha Commercial
2 Singles + 28 Townhomes
0.48 ha Residential
0.73 ha Commercial
2 Singles
1
2
3
4
5
6
7
8
9
10
11
12
13
prom Aviation Pky
Note: All sanitary sewers between nodes 1 and 13 are 250mm in diameter

APPENDIX D

Stormwater Management

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Existing Drainage Charateristics From Internal Site

Area	1.52	ha
C	0.85	Rational Method runoff coefficient
L	103.6	m
Up Elev	71.3	m
Dn Elev	70.96	m
Slope	0.3	%
Tc	12.0	min

1) Time of Concentration per Federal Aviation Administration

$$\boxed{t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	76.8	104.2	178.6	mm/hr
Q	275.5	373.7	753.4	L/s

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area	1.52	ha
C	0.50	Rational Method runoff coefficient
t_c	12.0	min
	5-year	
i	94.7	mm/hr
Q	199.8	L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area	0.11	ha
C	0.45	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10.0	104.2	14.5	14.5	0.0	0.0	178.6	31.0	31.0	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Area ID	BLDG	
Total Area	0.424	ha
C	0.90	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	110.4	32.7	77.7	46.6	178.6	210.3	62.3	148.0	88.8
15	83.6	88.6	32.8	55.8	50.2	142.9	168.3	62.3	106.0	95.4
20	70.3	74.5	32.9	41.6	49.9	120.0	141.3	62.3	78.9	94.7
25	60.9	64.5	32.9	31.7	47.5	103.8	122.3	62.3	60.0	90.0
30	53.9	57.2	32.9	24.2	43.6	91.9	108.2	62.3	45.9	82.6
35	48.5	51.4	33.0	18.5	38.8	82.6	97.3	62.3	34.9	73.4
40	44.2	46.8	33.0	13.9	33.2	75.1	88.5	62.3	26.2	62.8
45	40.6	43.1	33.0	10.1	27.2	69.1	81.3	62.3	19.0	51.3
50	37.7	39.9	33.0	6.9	20.7	64.0	75.3	62.3	13.0	39.0
55	35.1	37.2	33.0	4.2	13.8	59.6	70.2	62.3	7.9	26.0
60	32.9	34.9	33.1	1.9	6.7	55.9	65.8	62.3	3.5	12.6
65	31.0	32.9	33.1	0.0	0.0	52.6	62.0	62.3	0.0	0.0
70	29.4	31.1	33.1	0.0	0.0	49.8	58.6	62.3	0.0	0.0
75	27.9	29.6	33.1	0.0	0.0	47.3	55.7	62.3	0.0	0.0
80	26.6	28.2	33.1	0.0	0.0	45.0	53.0	62.3	0.0	0.0
85	25.4	26.9	33.1	0.0	0.0	43.0	50.6	62.3	0.0	0.0
90	24.3	25.7	33.1	0.0	0.0	41.1	48.4	62.3	0.0	0.0
95	23.3	24.7	33.2	0.0	0.0	39.4	46.4	62.3	0.0	0.0
100	22.4	23.8	33.2	0.0	0.0	37.9	44.6	62.3	0.0	0.0
105	21.6	22.9	33.2	0.0	0.0	36.5	43.0	62.3	0.0	0.0
110	20.8	22.1	33.2	0.0	0.0	35.2	41.5	62.3	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$	**32.80**	**L/s**	**100-year $Q_{attenuated}$**	**62.33**	**L/s**
5-year Max. Storage Required	**50.2**	**m^3**	**100-year Max. Storage Required**	**95.4**	**m^3**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A104 + A103
Available Sub-surface Storage
Maintenance Structures

ID	STM102	STM103	STM104	CB 104C	CB 104B	CB 104A	CB 103B	CB 103A	
Structure Dia./Area (mm/mm^2)	1200	1200	1200	360	360	360	360	360	
T/L*	72.35	72.18	72.45	72.25	72.25	72.25	72.25	72.25	
INV	70.15	70.39	70.71	70.75	70.75	70.75	70.75	70.75	
Depth	2.20	1.79	1.74	1.50	1.50	1.50	1.50	1.50	
$V_{structure}$ (m^3)	2.5	2.0	2.0	0.2	0.2	0.2	0.2	0.2	

Sewers

ID		250mm							U/G STORG.
Storage Pipe Dia (mm)		250							
L (m)		172.4							
V_{sewer} (m^3)		8.5							79.0

*Top of lid or max ponding elevation = 72.45

Total Subsurface Storage (m^3) 94.9

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)	$V_{drawdown}$ (hr)
Orifice INV	70.35		0.00			0.0	0.0	0.00
Storage Pipe SL	70.72		0.37	0.37	47.5	47.5	20.2	0.65
Storage Pipe OBV	71.29		0.94	0.57	47.5	94.9	32.1	0.82
T/L	72.25	1.8	1.90	0.96	0.0	94.9	45.7	1.00
0.20m Ponding	72.45	1085.0	2.10	0.20	75.4	170.3	48.1	0.98

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **STM102** **Dia** 125
Total Area 0.61 ha
C 0.65 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	114.4	24.3	90.1	54.0	178.6	245.0	47.2	197.8	118.7
15	83.6	91.7	24.3	67.4	60.7	142.9	196.1	47.2	148.9	134.0
20	70.3	77.1	24.3	52.8	63.4	120.0	164.6	47.2	117.4	140.9
25	60.9	66.9	24.3	42.5	63.8	103.8	142.5	47.2	95.3	143.0
30	53.9	59.2	24.3	34.9	62.8	91.9	126.1	47.2	78.9	142.0
35	48.5	53.3	24.3	29.0	60.8	82.6	113.3	47.2	66.1	138.8
40	44.2	48.5	24.3	24.2	58.1	75.1	103.1	47.2	55.9	134.2
45	40.6	44.6	24.3	20.3	54.8	69.1	94.8	47.2	47.6	128.4
50	37.7	41.3	24.3	17.0	51.1	64.0	87.8	47.2	40.6	121.7
55	35.1	38.6	24.3	14.3	47.0	59.6	81.8	47.2	34.6	114.2
60	32.9	36.2	24.3	11.9	42.7	55.9	76.7	47.2	29.5	106.2
65	31.0	34.1	24.3	9.8	38.1	52.6	72.2	47.2	25.0	97.7
70	29.4	32.2	24.3	7.9	33.4	49.8	68.3	47.2	21.1	88.7
75	27.9	30.6	24.3	6.3	28.4	47.3	64.8	47.2	17.6	79.4
80	26.6	29.2	24.3	4.9	23.3	45.0	61.7	47.2	14.5	69.8
85	25.4	27.8	24.3	3.5	18.1	43.0	58.9	47.2	11.7	59.9
90	24.3	26.7	24.3	2.4	12.8	41.1	56.4	47.2	9.2	49.8
95	23.3	25.6	24.3	1.3	7.3	39.4	54.1	47.2	6.9	39.4
100	22.4	24.6	24.3	0.3	1.8	37.9	52.0	47.2	4.8	28.9
105	21.6	23.7	23.7	0.0	0.0	36.5	50.1	47.2	2.9	18.2
110	20.8	22.9	22.9	0.0	0.0	35.2	48.3	47.2	1.1	7.3

5-year $Q_{attenuated}$	**24.30 L/s**	**100-year $Q_{attenuated}$**	**47.20 L/s**
5-year Max. Storage Required	**63.8 m^3**	**100-year Max. Storage Required**	**143.0 m^3**
Est. 5-year Storage Elevation	**70.92 m**	**Est. 100-year Storage Elevation**	**72.38 m**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A105 A
Available Sub-surface Storage
Maintenance Structures

ID	STM105	CB 105A							
Structure Dia./Area (mm/mm^2)	1200	360							
T/L*	71.28	71.28							
INV	70.16	70.39							
Depth	1.12	0.89							
$V_{structure}$ (m^3)	1.3	0.1							

Sewers

ID	250mm								U/G STORG.
Storage Pipe Dia (mm)	250								
L (m)	44								
V_{sewer} (m^3)	2.2								21.0

*Top of lid or max ponding elevation = 71.28

Total Subsurface Storage (m^3) 24.5

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)	$V_{drawdown}$ (hr)
Orifice INV	70.10		0.00			0.0	0.0	0.00
Storage Pipe SL	70.75		0.65	0.65	12.3	12.3	22.6	0.15
Storage Pipe OBV	71.20		1.10	0.45	12.3	24.5	29.4	0.23

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **STM105** **Dia** 115
Total Area 0.213 ha
C 0.35 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
1	203.5	42.1	11.3	30.8	1.8	351.4	91.0	23.4	67.5	4.1
2	182.7	37.8	11.3	26.5	3.2	315.0	81.5	23.4	58.1	7.0
3	166.1	34.4	11.3	23.1	4.1	286.0	74.0	23.4	50.6	9.1
4	152.5	31.6	11.3	20.2	4.9	262.4	67.9	23.4	44.5	10.7
5	141.2	29.2	11.3	17.9	5.4	242.7	62.8	23.4	39.4	11.8
6	131.6	27.2	11.3	15.9	5.7	226.0	58.5	23.4	35.1	12.6
7	123.3	25.5	11.3	14.2	6.0	211.7	54.8	23.4	31.4	13.2
8	116.1	24.0	11.3	12.7	6.1	199.2	51.6	23.4	28.2	13.5
9	109.8	22.7	11.3	11.4	6.2	188.3	48.7	23.4	25.3	13.7
10	104.2	21.6	11.3	10.2	6.1	178.6	46.2	23.4	22.8	13.7
11	99.2	20.5	11.3	9.2	6.1	169.9	44.0	23.4	20.6	13.6
12	94.7	19.6	11.3	8.3	6.0	162.1	42.0	23.4	18.6	13.4
13	90.6	18.8	11.3	7.4	5.8	155.1	40.2	23.4	16.7	13.1
14	86.9	18.0	11.3	6.7	5.6	148.7	38.5	23.4	15.1	12.7
15	83.6	17.3	11.3	6.0	5.4	142.9	37.0	23.4	13.6	12.2
16	80.5	16.7	11.3	5.3	5.1	137.5	35.6	23.4	12.2	11.7
17	77.6	16.1	11.3	4.7	4.8	132.6	34.3	23.4	10.9	11.1
18	75.0	15.5	11.3	4.2	4.5	128.1	33.2	23.4	9.7	10.5
19	72.5	15.0	11.3	3.7	4.2	123.9	32.1	23.4	8.7	9.9
20	70.3	14.5	11.3	3.2	3.8	120.0	31.0	23.4	7.6	9.2
21	68.1	14.1	11.3	2.8	3.5	116.3	30.1	23.4	6.7	8.4

5-year $Q_{attenuated}$	**11.34 L/s**	**100-year $Q_{attenuated}$**	**23.41 L/s**
5-year Max. Storage Required	**6.2 m^3**	**100-year Max. Storage Required**	**13.7 m^3**
Est. 5-year Storage Elevation	**70.43 m**	**Est. 100-year Storage Elevation**	**70.80 m**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A105 B
Available Sub-surface Storage
Maintenance Structures

ID	CB 105 B								
Structure Dia./Area (mm/mm^2)	360								
T/L*	72.25								
INV	70.15								
Depth	2.10								
$V_{structure}$ (m^3)	0.3								

Sewers

ID									U/G STORG.
Storage Pipe Dia (mm)									
L (m)									
V_{sewer} (m^3)									

*Top of lid or max ponding elevation = 72.45

Total Subsurface Storage (m^3) 0.3

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)	$V_{drawdown}$ (hr)
Orifice INV	70.33		0.00		0	0.0	0.0	0.00
Storage Pipe SL	70.46		0.13	0.13	0.1	0.1	8.4	0.00
Storage Pipe OBV	70.58		0.25	0.12	0.1	0.3	11.7	0.01
T/L	72.25	0.36	1.92	1.67	0	0.3	32.4	0.00
0.20m Ponding	72.45	192.0	2.12	0.20	13.4	13.7	34.1	0.11

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **CB 105 B** **Dia** 105
Total Area 0.132 ha
C 0.65 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
1	203.5	48.5	8.6	39.9	2.4	351.4	104.7	33.9	70.8	4.2
2	182.7	43.5	8.6	34.9	4.2	315.0	93.8	33.9	60.0	7.2
3	166.1	39.6	8.6	31.0	5.6	286.0	85.2	33.9	51.3	9.2
4	152.5	36.3	8.6	27.7	6.7	262.4	78.2	33.9	44.3	10.6
5	141.2	33.6	8.6	25.0	7.5	242.7	72.3	33.9	38.4	11.5
6	131.6	31.4	8.6	22.7	8.2	226.0	67.3	33.9	33.4	12.0
7	123.3	29.4	8.6	20.8	8.7	211.7	63.1	33.9	29.2	12.2
8	116.1	27.7	8.6	19.1	9.1	199.2	59.3	33.9	25.5	12.2
9	109.8	26.2	8.6	17.6	9.5	188.3	56.1	33.9	22.2	12.0
10	104.2	24.8	8.6	16.2	9.7	178.6	53.2	33.9	19.3	11.6
11	99.2	23.6	8.6	15.0	9.9	169.9	50.6	33.9	16.7	11.0
12	94.7	22.6	8.6	14.0	10.0	162.1	48.3	33.9	14.4	10.4
13	90.6	21.6	8.6	13.0	10.1	155.1	46.2	33.9	12.3	9.6
14	86.9	20.7	8.6	12.1	10.2	148.7	44.3	33.9	10.4	8.7
15	83.6	19.9	8.6	11.3	10.2	142.9	42.6	33.9	8.7	7.8
16	80.5	19.2	8.6	10.6	10.1	137.5	41.0	33.9	7.1	6.8
17	77.6	18.5	8.6	9.9	10.1	132.6	39.5	33.9	5.6	5.7
18	75.0	17.9	8.6	9.3	10.0	128.1	38.2	33.9	4.3	4.6
19	72.5	17.3	8.6	8.7	9.9	123.9	36.9	33.9	3.0	3.4
20	70.3	16.7	8.6	8.1	9.8	120.0	35.7	33.9	1.8	2.2
21	68.1	16.2	8.6	7.6	9.6	116.3	34.6	33.9	0.8	0.9

5-year $Q_{attenuated}$	**8.61** L/s		**100-year $Q_{attenuated}$**	**33.89** L/s
5-year Max. Storage Required	**10.2** m^3		**100-year Max. Storage Required**	**12.2** m^3
Est. 5-year Storage Elevation	**72.40** m		**Est. 100-year Storage Elevation**	**72.43** m

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Required Storage (m^3)	100-Year Release Rate (L/s)	100-Year Required Storage (m^3)	100-Year Available Storage (m^3)
Unattenuated Areas	14.5	0.0	31.0	0.0	0.0
Attenuated Area BLDG	32.8	50.2	62.3	95.4	96.0
Attenuated Area A103+A104	24.3	63.8	47.2	143.0	170.3
Attenuated Area A105 A	11.3	6.2	23.4	13.7	24.5
Attenuated Area A105 B	8.6	10.2	33.9	12.2	13.7
Total	**91.5**	**130.3**	**197.8**	**264.3**	**304.5**

Cummings Caron Property Limited
1068-1090 Cummings Avenue
Storm Sewer Calculation Sheet

										Sewer Data								
Area ID	**Up**	**Down**	**Area**	**C**	**Indiv AxC**	**Acc AxC**	**T_C**	**I**	**Q**	**DIA**	**Slope**	**Length**	**$A_{hydraulic}$**	**R**	**Velocity**	**Qcap**	**Time Flow**	**Q / Q full**
			(ha)	**(-)**			**(min)**	**(mm/hr)**	**(L/s)**	**(mm)**	**(%)**	**(m)**	**(m^2)**	**(m)**	**(m/s)**	**(L/s)**	**(min)**	**(-)**
A104	104	103	0.461	0.65	0.30	0.30	10.0	104.2	86.7	375	0.35	75.6	0.110	0.094	0.94	103.7	1.3	0.84
A103	103	102	0.147	0.65	0.10	0.40	11.3	97.6	107.1	375	0.50	59.8	0.110	0.094	1.12	124.0	0.9	0.86
	102	101				0.40	12.2	93.7	102.9	375	0.50	12	0.110	0.094	1.12	124.0	0.2	0.83
	CB 'L'	CB 105 A	0.213	0.35	0.07	0.07	10.0	104.2	21.6	250	0.20	155	0.049	0.063	0.54	26.6	4.8	0.81
A105 A	CB 105 A	105			0.00	0.07	14.8	84.3	17.5	250	0.50	44.5	0.049	0.063	0.86	42.0	0.9	0.42
A105 B	105	101	0.132	0.65	0.09	0.16	15.6	81.6	36.3	300	0.35	26.7	0.071	0.075	0.81	57.2	0.5	0.64
BLDG	Contribution to STM101								61.9									
	101	OGS				0.56	16.2	79.9	185.2	525	0.30	5	0.216	0.131	1.09	235.6	0.1	0.79
A103	OGS	EX				0.56	16.3	79.7	184.9	525	0.30	15.8	0.216	0.131	1.09	235.6	0.2	0.78

ADVANCED DRAINAGE SYSTEMS, INC.

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STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. 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 AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES 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 AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

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 "STORMTECH MC-3500/MC-4500 CONSTRUCTION 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 - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING..
10. 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 "STORMTECH MC-3500/MC-4500 CONSTRUCTION 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 "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

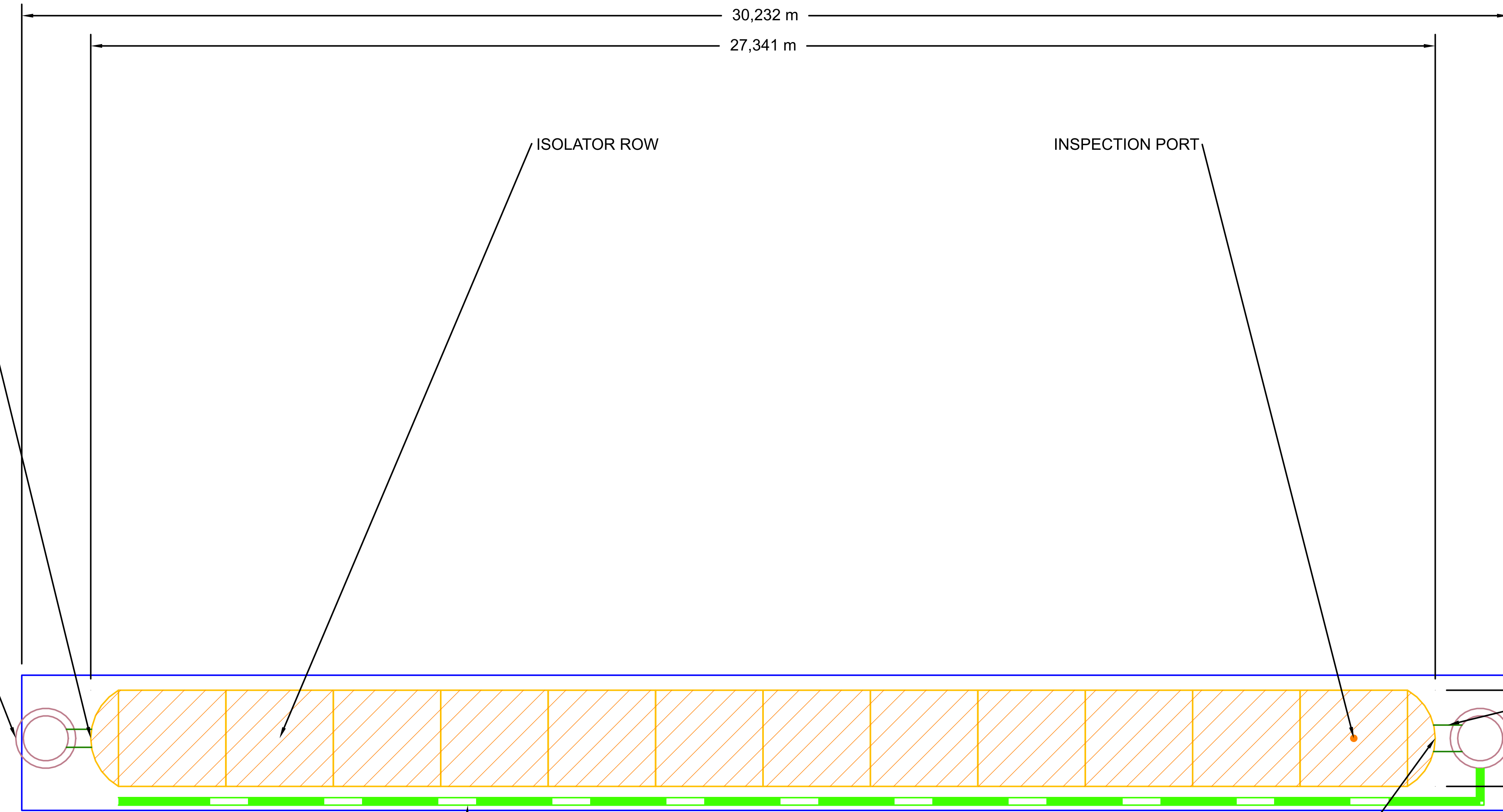
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION

(12) STORMTECH MC-3500 CHAMBERS
(2) STORMTECH MC-3500 END CAPS
INSTALLED WITH 305 mm COVER STONE, 229 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 79 m³
AREA OF SYSTEM: 83 **m²**
PERIMETER OF SYSTEM: 66 **m**



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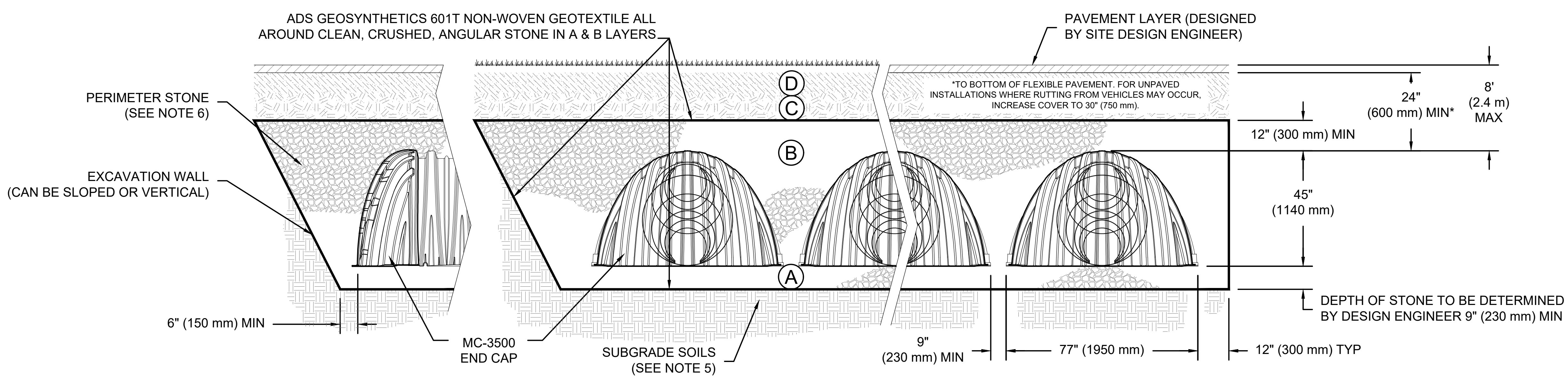
NOT TO SCALE

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, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	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.



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
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. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. 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.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. 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.

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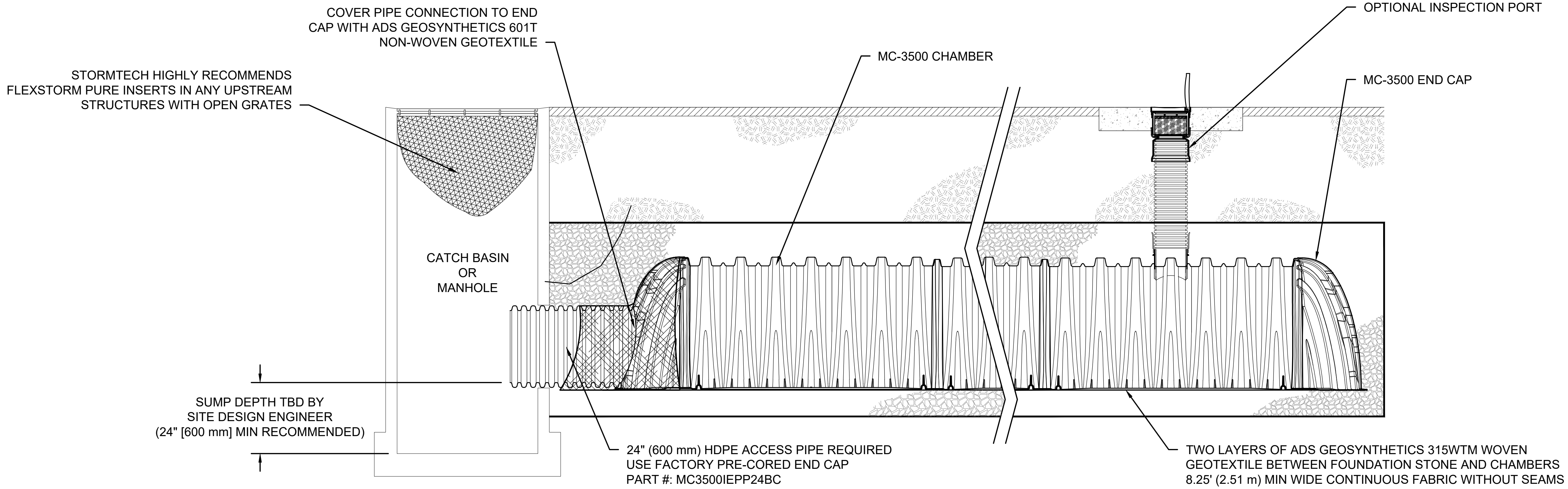


MC-3500 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW 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 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 ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW 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.

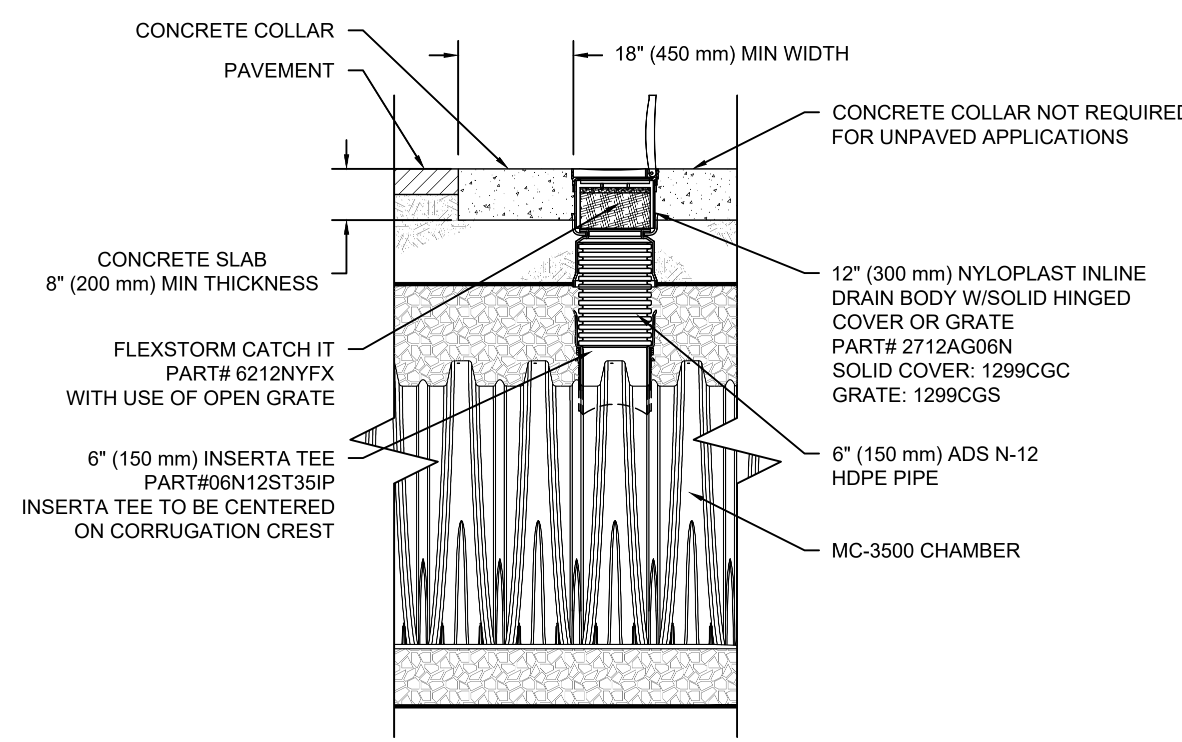
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

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.



MC-3500 6" INSPECTION PORT DETAIL

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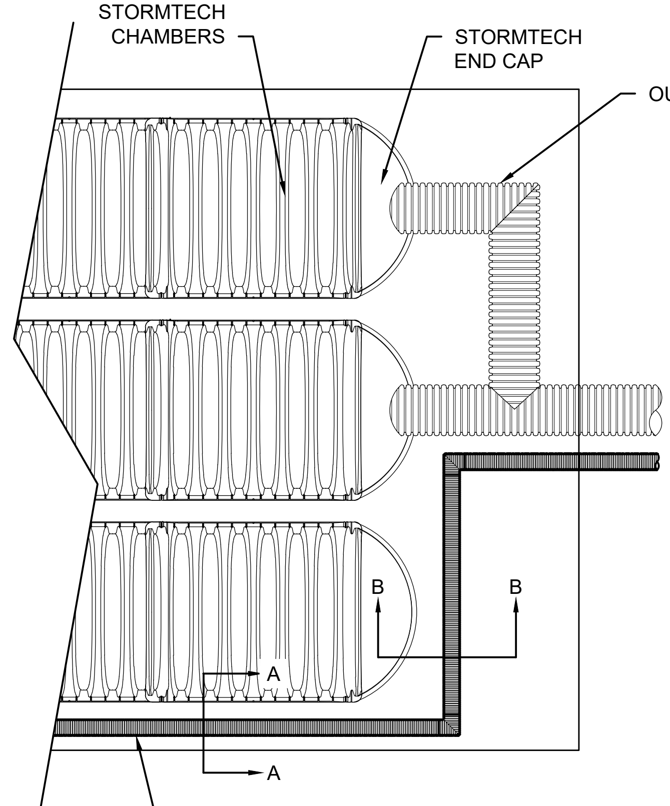
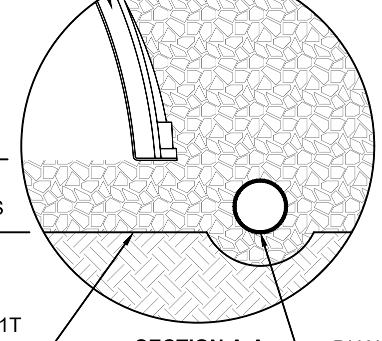
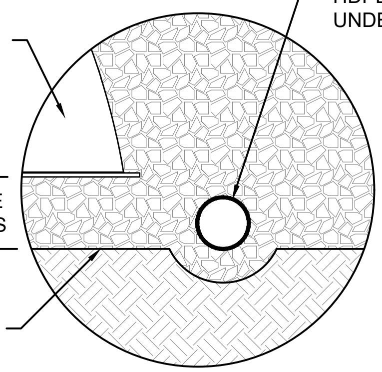


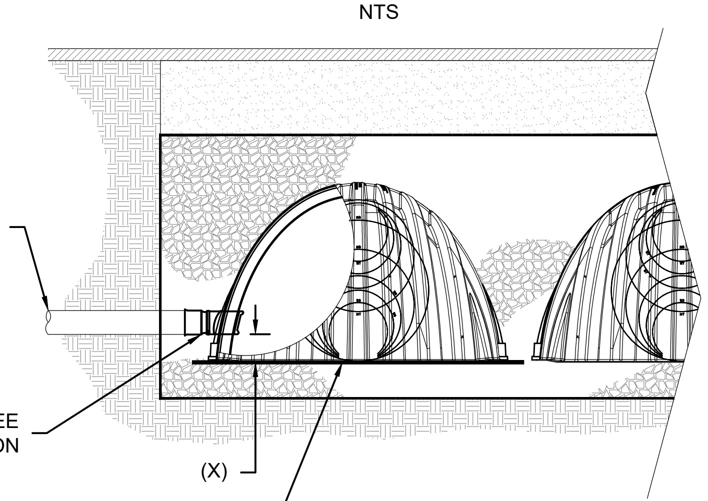


SECTION A-A

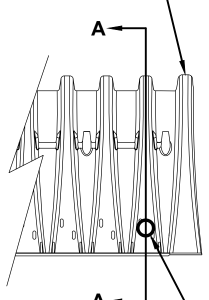


SECTION B-B

INSERTA TEE DETAIL
NTS



SECTION A-A

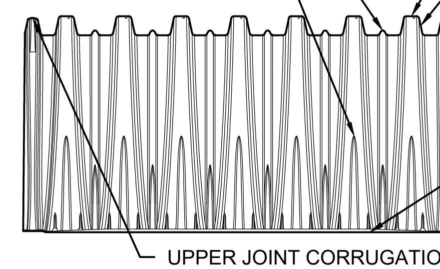


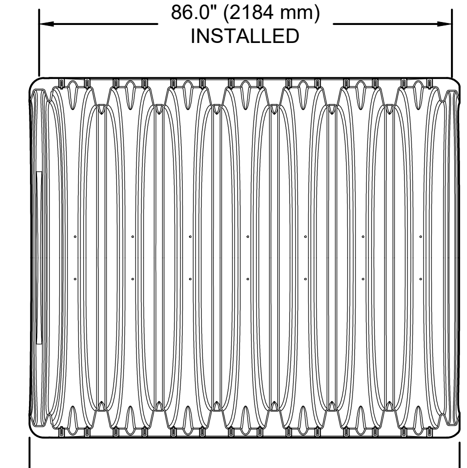
SIDE VIEW

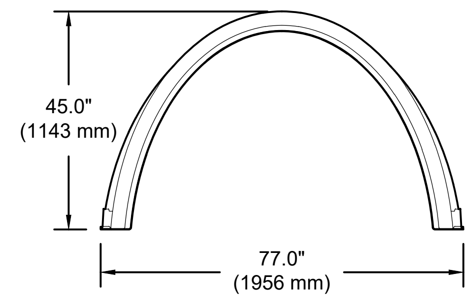
CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

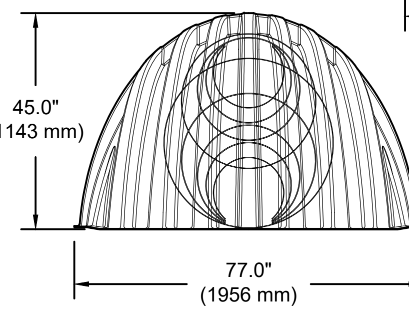
NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

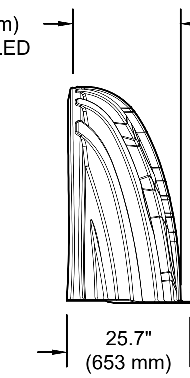
MC-3500 TECHNICAL SPECIFICATION
NTS











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*	178.9 CUBIC FEET	(5.06 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 22.5"	(1956 mm X 1143 mm X 571 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	46.0 CUBIC FEET	(1.30 m³)
WEIGHT	50.0 lbs.	(22.7 kg)

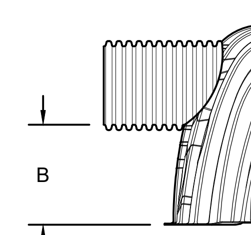
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

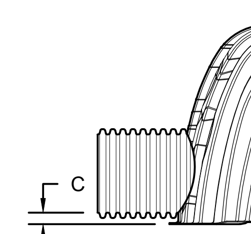
STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

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)	---
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP30BC	30" (750 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 HIGHTEST POSSIBLE FOR THE PIPE SIZE.





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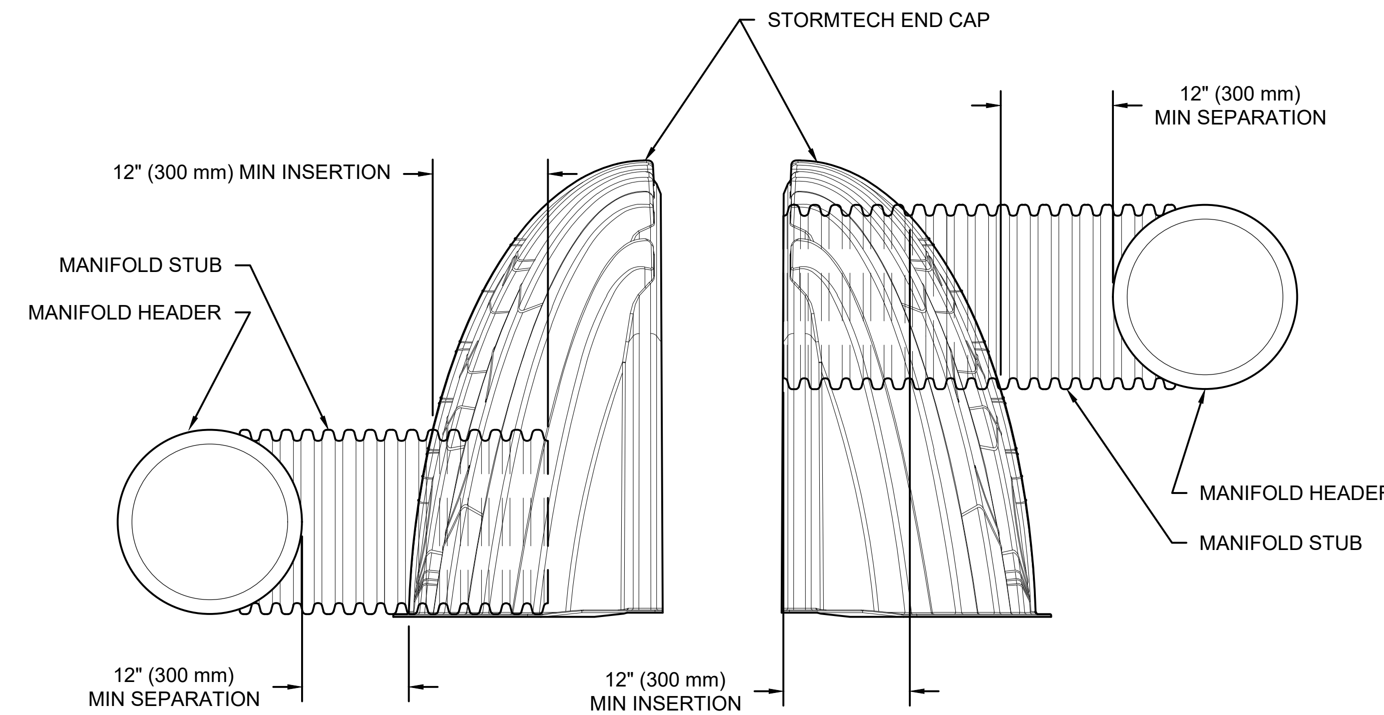
MC-SERIES END CAP INSERTION DETAIL

NTS



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

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PROJECT #: Tool	CHECKED: ---

REV	DRW	CHK	DESCRIPTION

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SiteASSIST by StormTech

FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

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STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. 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 AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES 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 AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION 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 - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. 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 SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

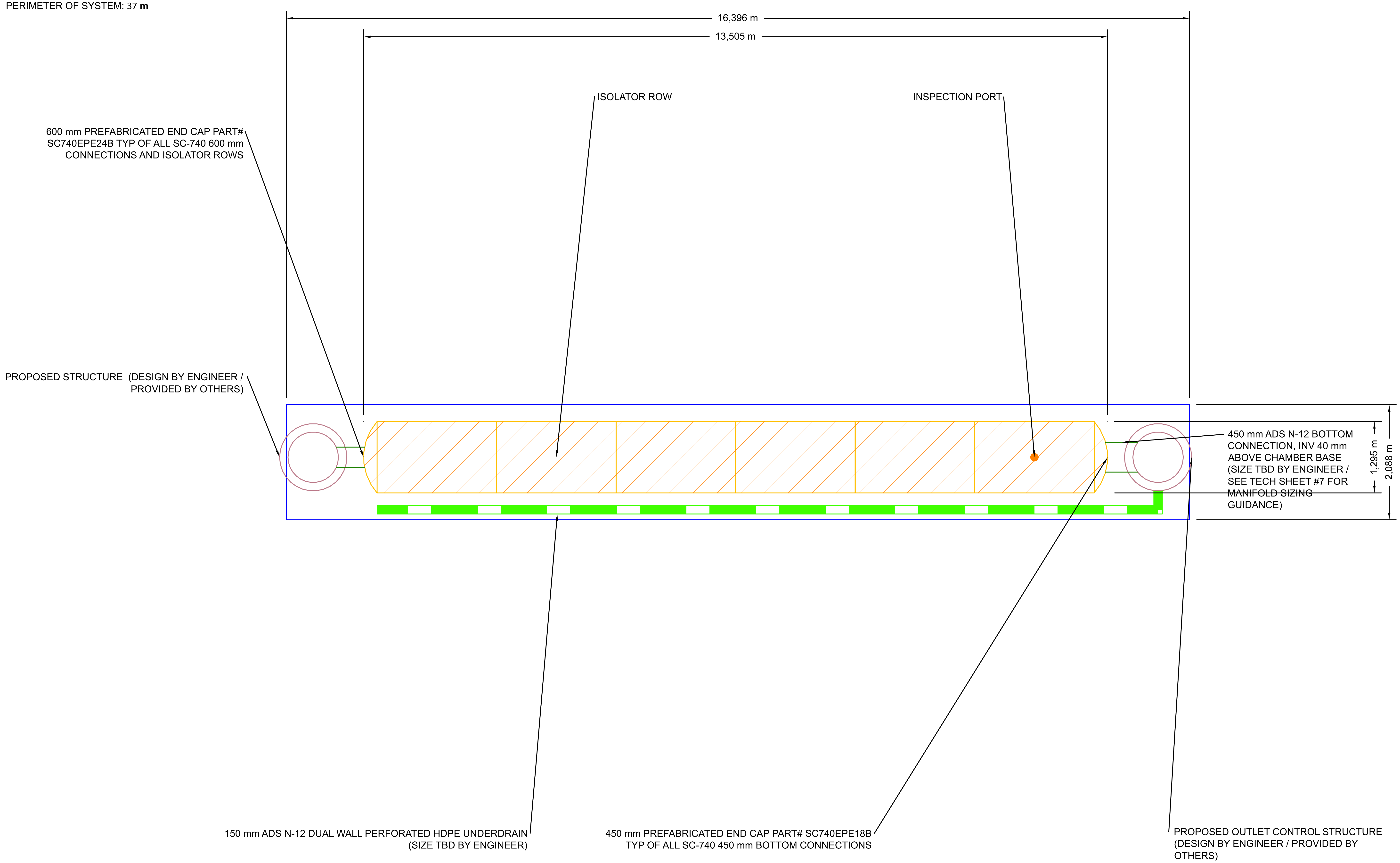
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION

(6) STORMTECH SC-740 CHAMBERS
(2) STORMTECH SC-740 END CAPS
INSTALLED WITH 152 mm COVER STONE, 305 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 21 m³
AREA OF SYSTEM: 34 m²
PERIMETER OF SYSTEM: 37 m



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NOT TO SCALE

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

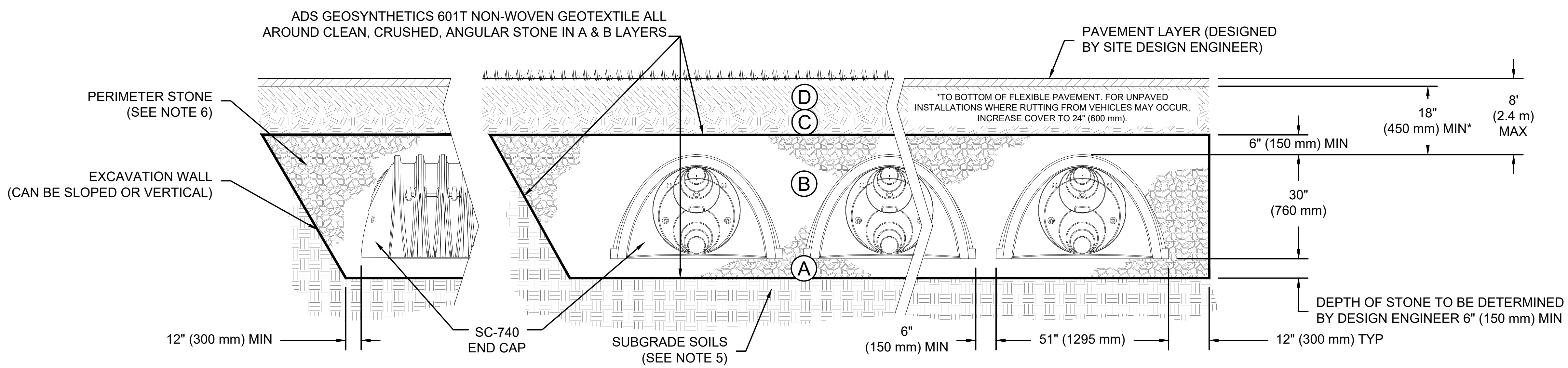
SHEET
2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 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 18" (450 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 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	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, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	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 6" (150 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.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. 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.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. 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.

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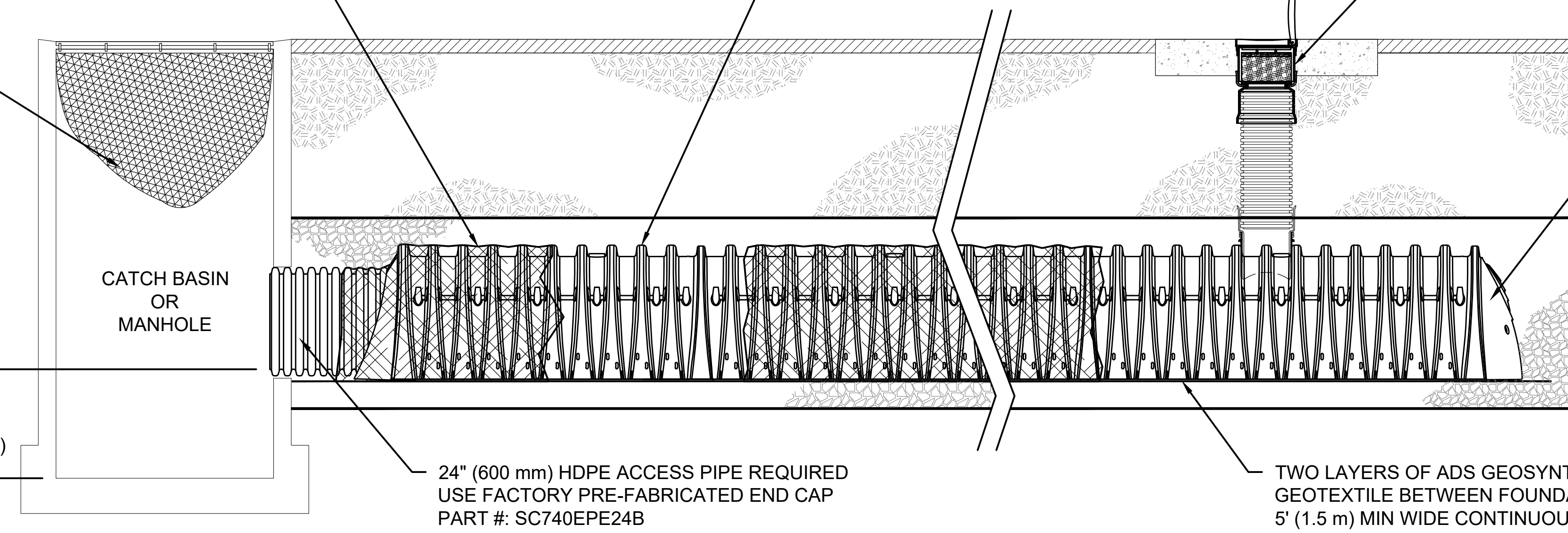


SC-740 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW 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 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 ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW 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.

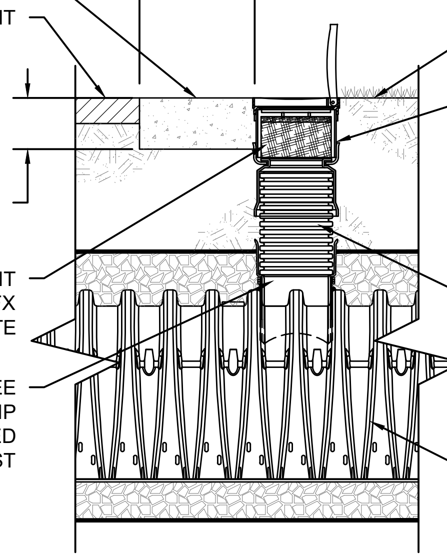
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

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.



SC-740 6" INSPECTION PORT DETAIL

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UNDERDRAIN DETAIL

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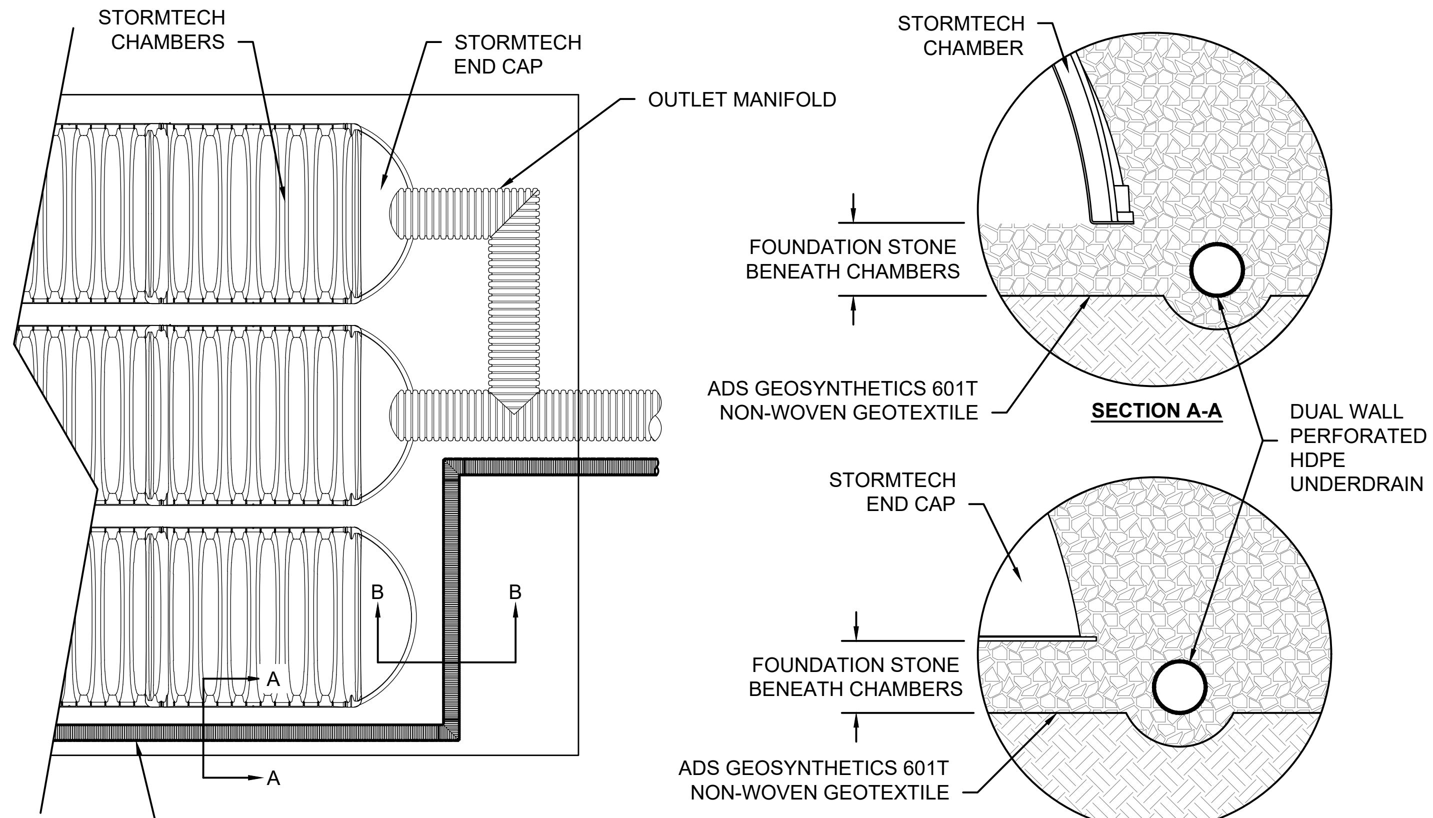
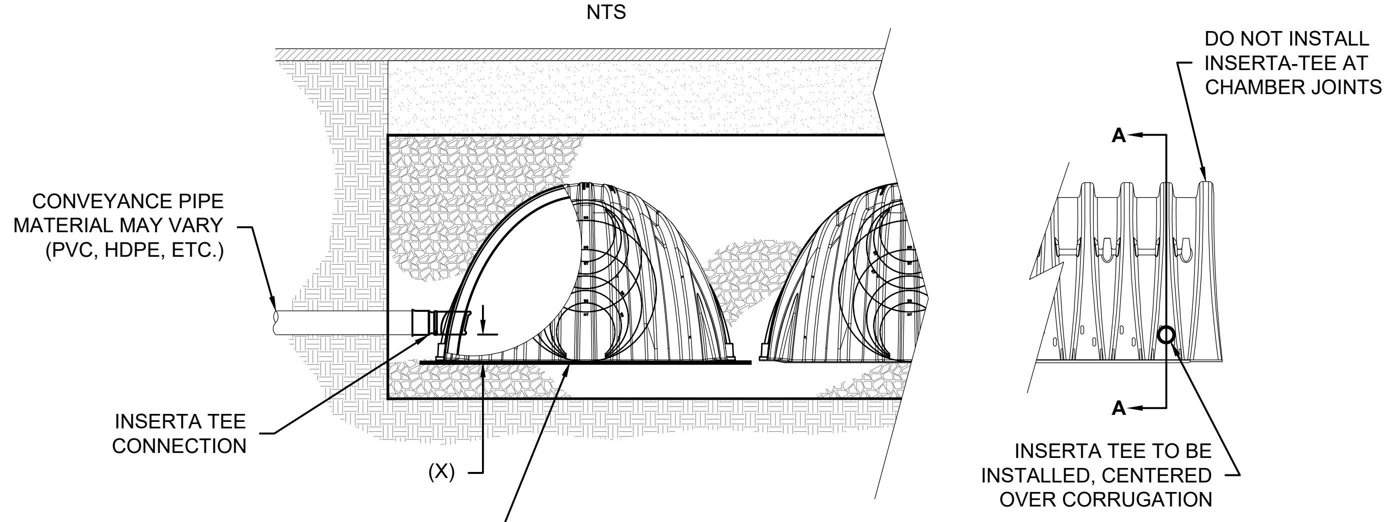


SECTION B-B

NUMBER AND SIZE OF UNDERDRAINS PER SITE DESIGN ENGINEER
4" (100 mm) TYP FOR SC-310 SYSTEMS
6" (150 mm) TYP FOR SC-740, DC-780, MC-3500 & MC-4500 SYSTEMS

INSERTA TEE DETAIL

NTS



SECTION A-A

SIDE VIEW

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

SC-740 TECHNICAL SPECIFICATION

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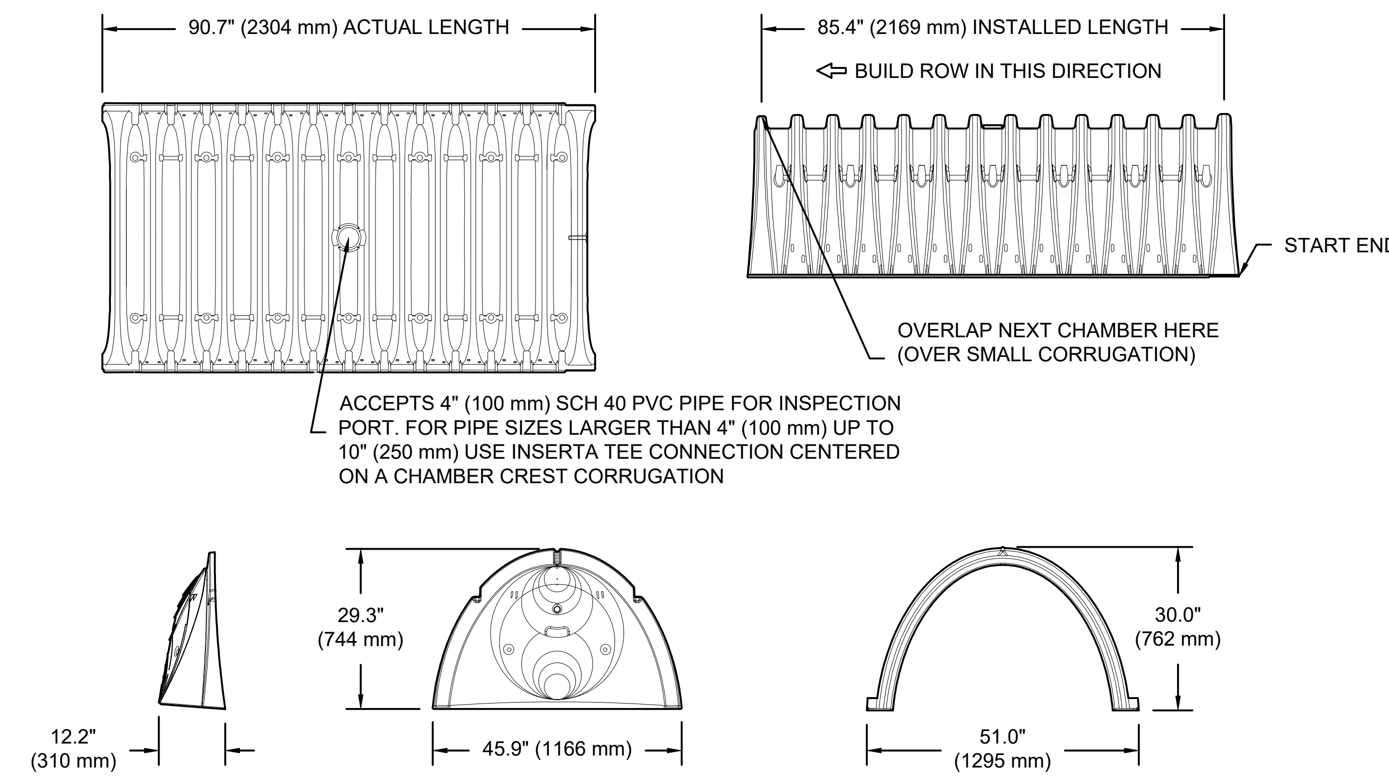
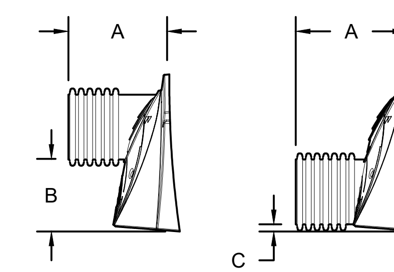


NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

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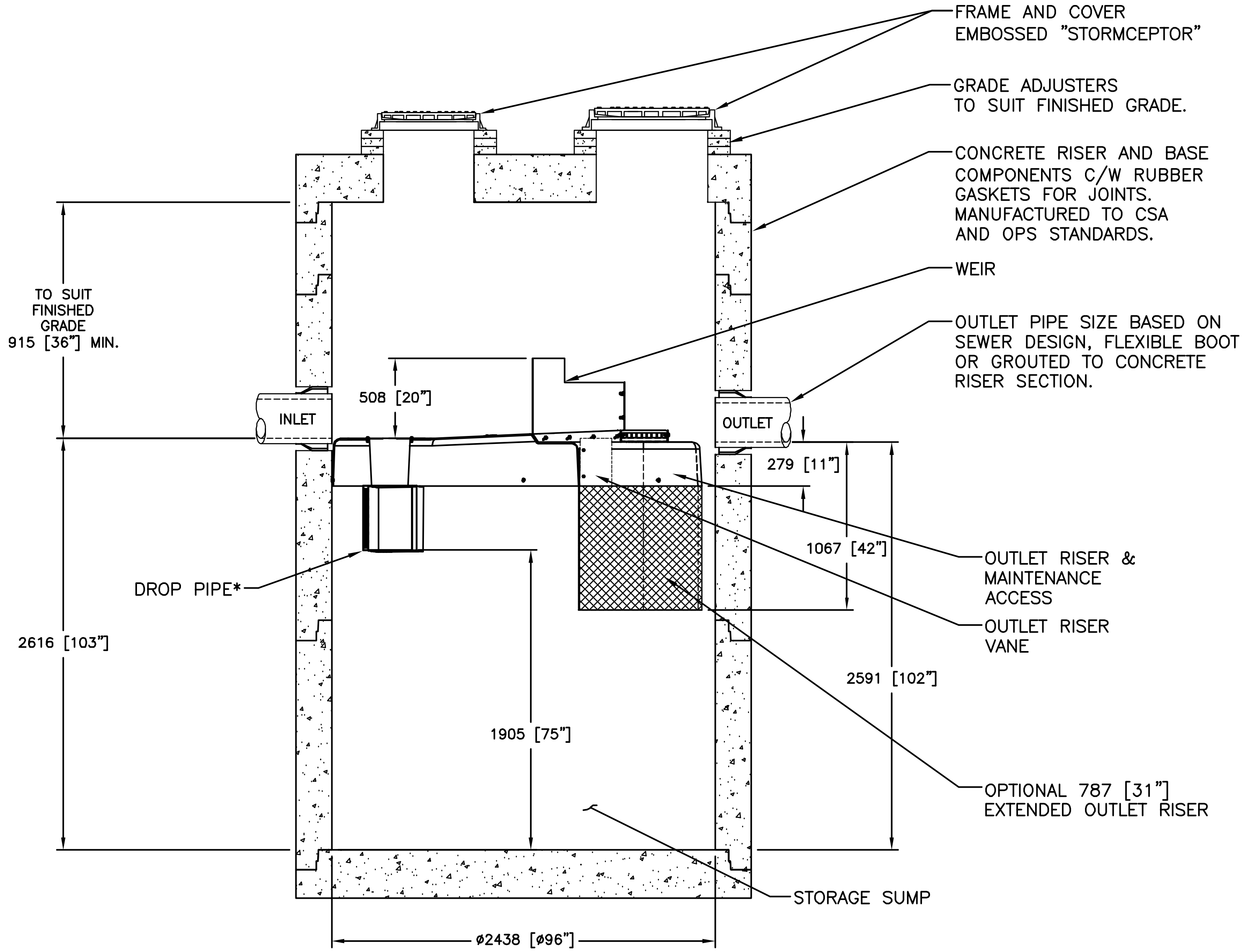
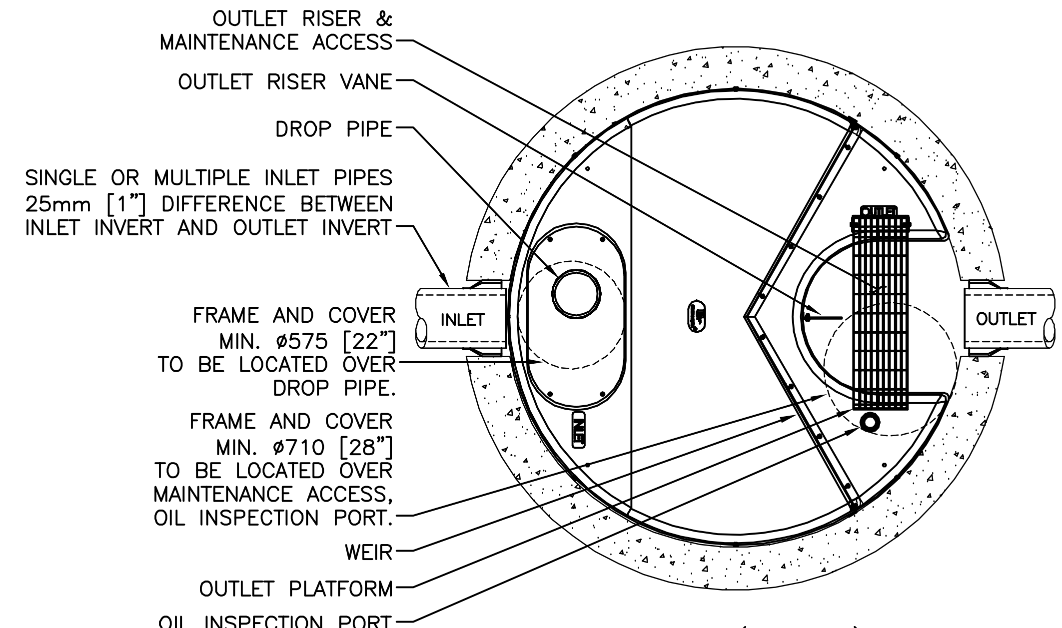
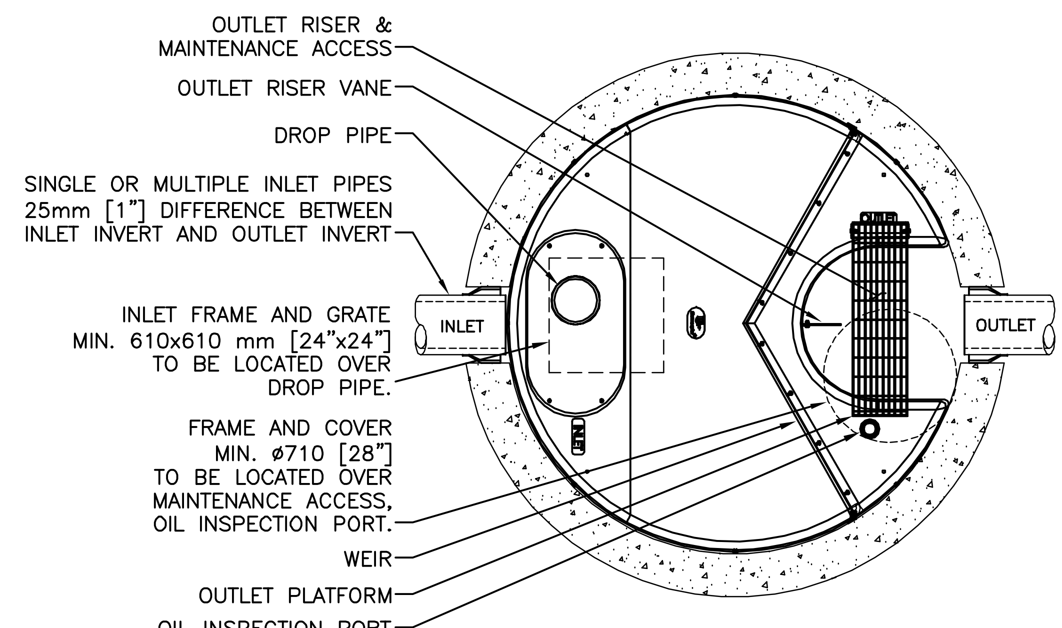
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

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 EF8 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO8 (OIL CAPTURE CONFIGURATION).

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.

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).

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	EFO8				
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

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Imbrium Systems ("Imbrium"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Imbrium. Failure to comply is done at the user's own risk and Imbrium expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Imbrium immediately for re-evaluation of the design. Imbrium accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

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

Stormceptor® EF

SCALE = NTS

imbrium

407 FAIRVIEW DRIVE, WHITBY, ON L1N 3A9 TF 800-565-4801 CA 416-960-9900 INTL +1-416-960-9900

DATE: 10/13/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: *
PROJECT No.: EFO8	SEQUENCE No.: *
SHEET: 1 OF 1	

I:\IMBRIUM\PRODUCTS\STORMCEPTOR EF\40 DRAWINGS & DETAILS\STANDARD DETAILS\EFO STANDARD DETAILS\EFO8-DETAIL.DWG 4/12/2019 11:07 AM

Detailed Stormceptor Sizing Report – 1068 Cummings Ave.

Project Information & Location			
Project Name	1068 Cummings Ave.	**Project Number**	-
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	7/2/2019
Designer Information		**EOR Information (optional)**	
Name	Brandon O'Leary	**Name**	Amr Salem
Company	Forterra	**Company**	David Schaeffer Engineering Ltd.
Phone #	905-630-0359	**Phone #**	
Email	brandon.oleary@forterrabp.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	1068 Cummings Ave.
Recommended Stormceptor Model	EFO8
TSS Removal (%) Provided	82
Particle Size Distribution (PSD)	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

EFO Sizing Summary

EFO Model	% TSS Removal Provided	% Runoff Volume Captured Provided	Standard EFO Hydrocarbon Storage Capacity
EFO4	65	78	265 L (70 gal)
EFO6	77	91	610 L (160 gal)
EFO8	82	96	1070 L (280 gal)
EFO10	87	98	1670 L (440 gal)
EFO12	89	99	2475 L (655 gal)
Parallel Units / MAX	Custom	Custom	Custom

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

OVERVIEW

Stormceptor ® EF is a continuation and evolution of the most globally recognized oil-grit separator (OGS) stormwater treatment technology - **Stormceptor ®.** Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil-grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at higher flow rates as compared to the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention technology and internal bypass ensures sediment is retained during all rainfall events.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	4093
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	1264.3
Elevation (ft)	370	**Total Infiltration (mm)**	7468.8
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	12245.0

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

ONLINE APPLICATION

Stormceptor EF's internal bypass and patent-pending scour prevention technology has demonstrated very effective retention of pollutants in third-party testing and verification following the Canadian ETV's **Procedure for Laboratory Testing of Oil-Grit Separators.** Sediment scour prevention demonstrated an effluent concentration of less than 10 mg/L for sediment particles ranging from 1 to 1,000 microns, even during peak influent flow rates associated with infrequent high intensity storm events. While Stormceptor EF will capture oil, only the Stormceptor EFO configuration has been third-party tested and verified to retain greater than 99% of captured oil. Based on these verified performance attributes, the most efficient and widely accepted application of Stormceptor EF is an online configuration, which allows all upstream conveyance flows to enter and exit the unit. The online application eliminates the need for costly additional bypass structures, piping and installation expense.

FLOW ENTRANCE OPTIONS

Single Inlet Pipe – A common design which includes one inlet pipe and one outlet pipe. A 90-degree (maximum) bend is also accepted with this configuration.

Inlet Grate – Allows surface runoff to enter the unit from grade. The inlet grate option can also be used in conjunction with one inlet pipe or multiple inlet pipes. A removable flow deflector is added in the Stormceptor EF4/EFO4.

Maximum Pipe Diameter		
Model	Inlet (in/mm)	Outlet (in/mm)
EF4 / EFO4	24 / 610	24 / 610
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

Multiple Inlet Pipe – Allows for multiple inlet pipes of various diameters to enter the unit.

Maximum Pipe Diameter		
Model	Inlet (in/mm)	Outlet (in/mm)
EF4 / EFO4	18 / 457	24 / 610
EF6 / EFO6	30 / 762	36 / 915
EF8 / EFO8	42 / 1067	48 / 1220
EF10 / EFO10	60 / 1524	72 / 1828
EF12 / EFO12	60 / 1524	72 / 1828

Drainage Area	
Total Area (ha)	1.49
Imperviousness %	64

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	1068 Cummings Ave.

Site Details

Drainage Area	
Total Area (ha)	1.49
Imperviousness %	64
Oil Spill Capture Volume (L)	

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Surface Characteristics	
Width (m)	244.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (L/s)	0

Maintenance Frequency	
Maintenance Frequency (months) >	12

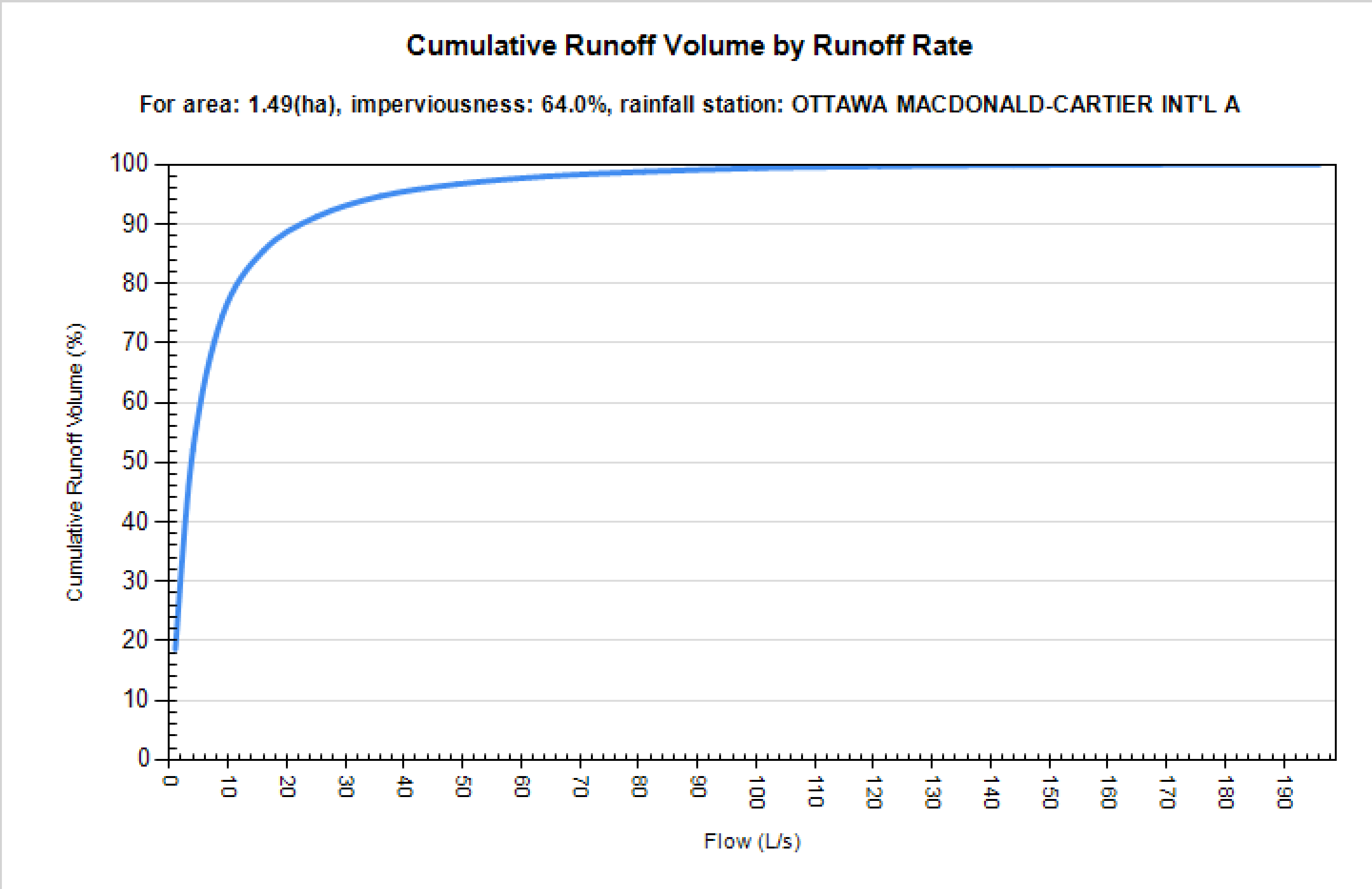
Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	Build Up/ Wash-off

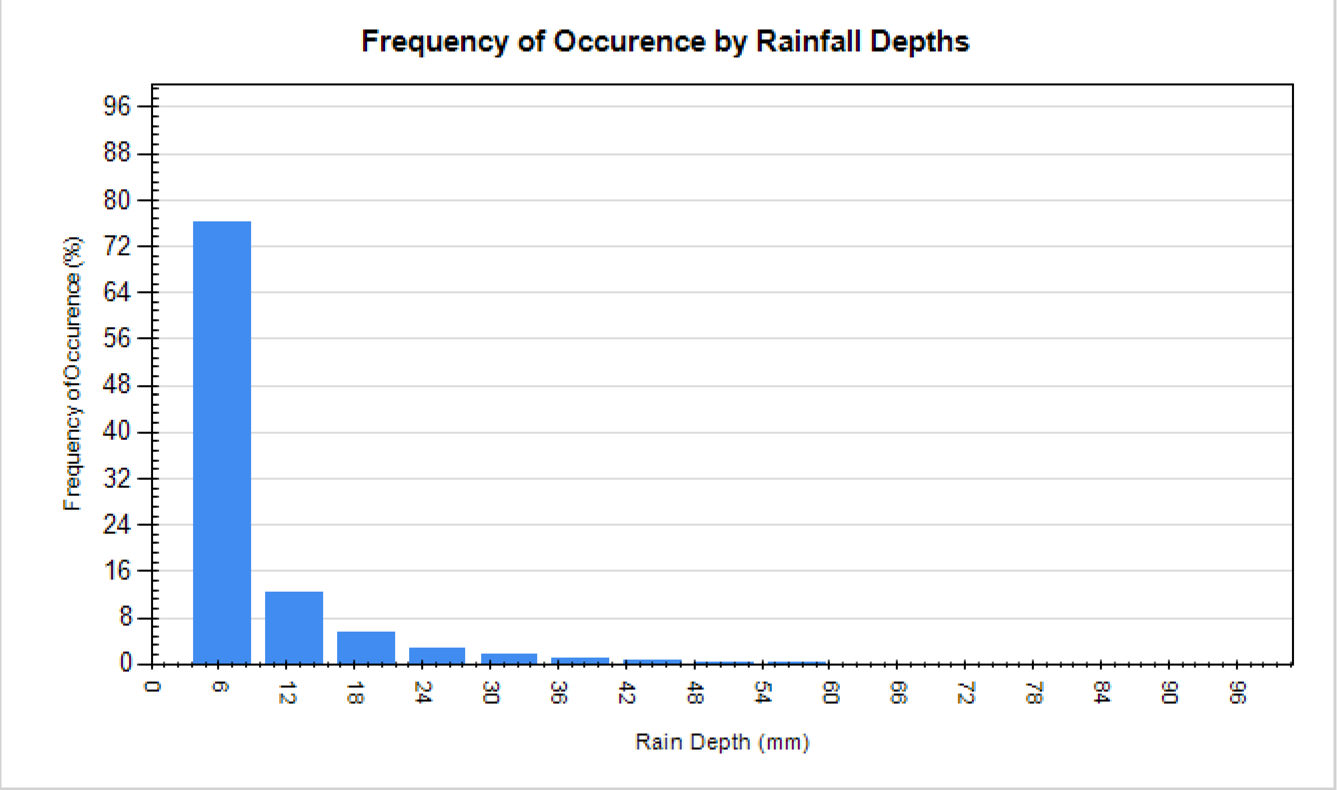
Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	125
Exponential Buildup Power	0.40
Exponential Washoff Exponent	0.20

TSS Availability Parameters	
Availability Constant A	0.057
Availability Factor B	0.04
Availability Exponent C	1.10
Min. Particle Size Affected by Availability (micron)	400

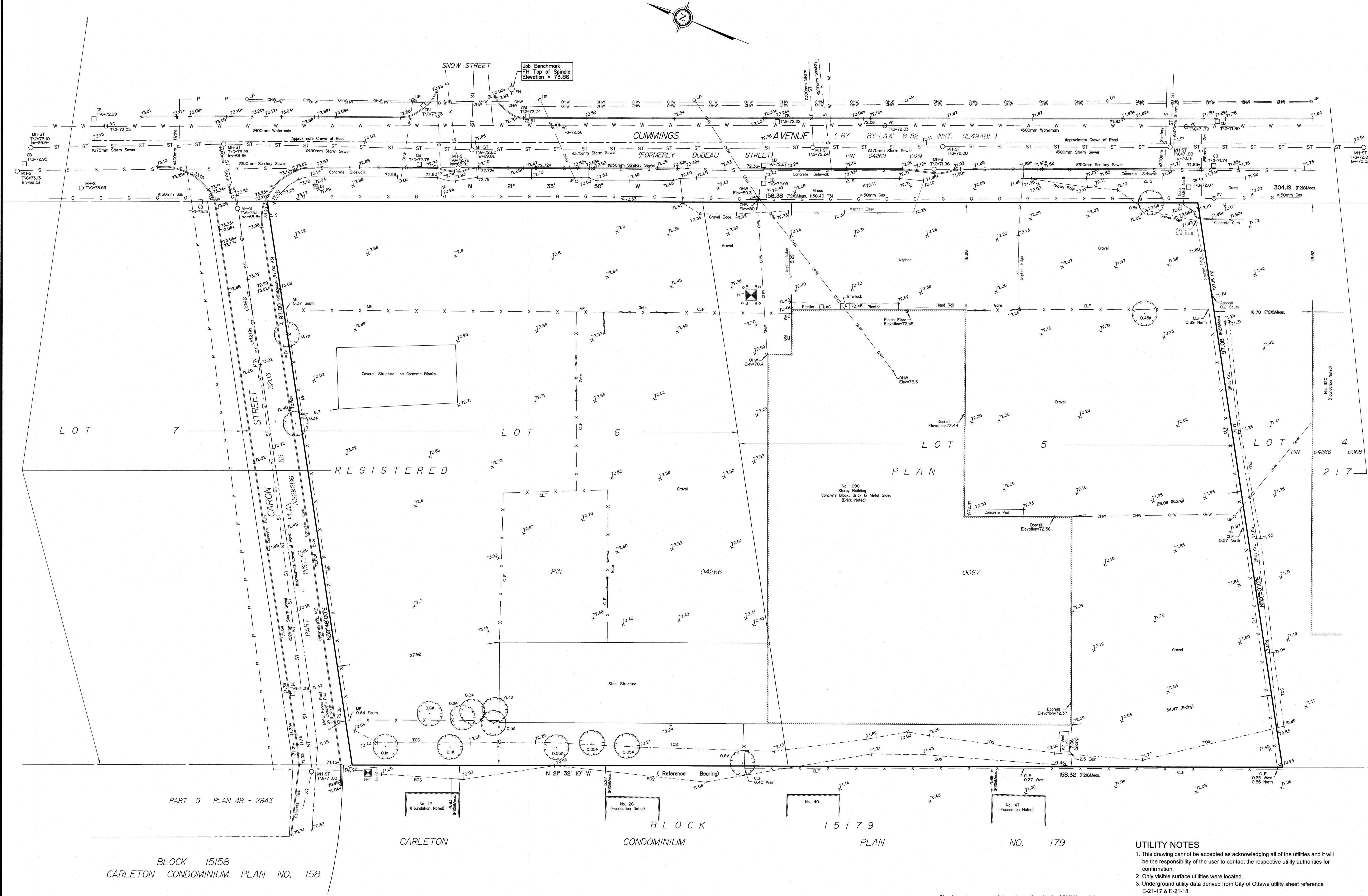
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	**Runoff Volume (m^3)**	**Volume Over (m^3)**	**Cumulative Runoff Volume (%)**
1	34150	149418	18.6
4	95627	87960	52.1
9	136702	46916	74.5
16	156895	26686	85.5
25	167478	16103	91.2
36	173809	9765	94.7
49	177517	6058	96.7
64	179899	3672	98.0
81	181386	2185	98.8
100	182432	1139	99.4
121	183044	527	99.7
144	183363	207	99.9
169	183507	64	100.0
196	183568	3	100.0


Cumulative Runoff Volume by Runoff Rate
For area: 1.49(ha), imperviousness: 64.0%, rainfall station: OTTAWA MACDONALD-CARTIER INT'L A
Cumulative Runoff Volume (%)
0
10
20
30
40
50
60
70
80
90
100
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
Flow (L/s)

Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	3113	76.1	5230	24.9
12.70	501	12.2	4497	21.4
19.05	225	5.5	3469	16.5
25.40	105	2.6	2317	11.0
31.75	62	1.5	1765	8.4
38.10	35	0.9	1206	5.8
44.45	28	0.7	1163	5.5
50.80	12	0.3	557	2.7
57.15	7	0.2	378	1.8
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0



DRAWINGS / FIGURES



SURVEYOR'S REAL PROPERTY REPORT

PART 1 Plan of

LOT 5 AND PART OF LOT 6 REGISTERED PLAN 217 CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 300

12 9 6 3 0 6 12 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the Land Titles Act and the regulations made under them.
2. The survey was completed on the 3rd day of April, 2019.

May 6, 2019
Date

E. H. Herweyer
Ontario Land Surveyor

PART 26 PLAN 5R - 331 | PART 4
LOT 3

PART 2
THIS PLAN MUST BE READ IN CONJUNCTION WITH SURVEY REPORT DATED: May 6, 2019

ANNIS, O'SULLIVAN, VOLLEBEKK LTD. grants to Cummings Caron Property Limited ("The Client"), their solicitors, mortgagees, and other related parties, permission to use original, signed, sealed copies of the Surveyor's Real Property Report in transactions involving The Client.

Notes & Legend

	Denotes	
	"	Survey Monument Planted
	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
(WIT)	"	Witness
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Registered Plan 217
(P2)	"	(1692) Plan November 15, 2007
(P3)	"	Plan 5R-3203
FH	"	Fire Hydrant
MH-ST	"	Maintenance Hole (Storm Sewer)
MH-S	"	Maintenance Hole (Sanitary)
VC	"	Valve Chamber (Watermain)
CB	"	Catch Basin
DI	"	Ditch Inlet
ST	"	Underground Storm Sewer
S	"	Underground Sanitary Sewer
W	"	Underground Water
P	"	Underground Power
G	"	Underground Gas
OHW	"	Overhead Wires
GV	"	Gas Valve
GM	"	Gas Meter
B	"	Bollard
S	"	Sign
H-T	"	Hydro Transformer
AC	"	Air Conditioner
CLF	"	Chain Link Fence
MF	"	Metal Fence
UP	"	Utility Pole
BOS	"	Bottom of Slope
TOS	"	Top of Slope

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2086192
THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29 (3).

Elevations shown are geodetic and are referred to the CGVD28 geodetic datum, derived from City of Ottawa Vertical Control monument No. G-148 Index No. 404 having an elevation of 74.952 metres.

Topographic data was collected under Winter Conditions. Snow cover and ice preclude determining location and elevation of some topographical data that is otherwise visible.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. Underground utility data derived from City of Ottawa utility sheet reference E-21-17 & E-21-18.
4. Sanitary and storm sewer grades and inverts were derived from City of Ottawa Plan Contract No. ISB03-3004, DWG No. 03-3004-2, Sheet 2 of 15 & Contract No. ISB03-3004, DWG No. 03-3004-4, Sheet 4 of 15
5. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

Bearing are Grid and are referred to easterly limit of Carleton Condominium Plan No. 179, having a bearing of N 21°32'10" W and are referred to the Central Meridian of MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. 17722-19 Lt5&Pt Lt6 PL217 T F | FS

SITE PLAN APPLICATION No.:

SURVEY INFORMATION TAKEN FROM:

TOPOGRAPHICAL PLAN OF SURVEY, LOT 5 AND PART OF LOT 6 WEST OF CUMMINGS AVENUE, REGISTERED PLAN 217, CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SITE SUMMARY:

CIVIL ADDRESS :	1068 CUMMINGS AVENUE, OTTAWA, ONTARIO
ZONING :	RIM
SITE AREA :	1,963.03m²
PROPOSED USE :	RETIREMENT HOME & SENIORS APARTMENT 1 LEVEL OF UNDERGROUND PARKING GARAGE
BUILDING FOOTPRINT: **(ABOVE GRADE)**	4,296.00m²

ZONING SUMMARY:	REQUIRED	PROVIDED
MIN. LOT AREA:	450m²	15,190.94m²
MIN. LOT WIDTH:	15m	158.366m
BUILDING HEIGHT:	11m MAX.	20.69m (excl. penthouse)

YARDS: AS PER TABLE 156A ZONING BY-LAW No. 2008-250	REQUIRED	PROVIDED
MIN. FRONT YARD SETBACK	4.5m	13.844m
MIN. CORNER SIDE YARD SETBACK	4.5m	9.923m
MIN. REAR YARD SETBACK	7.5m	8.300m
MIN. INTERIOR SIDE YARD SETBACK	1.0m	25.251m

AMENITY	REQUIRED	PROVIDED
RETIREMENT HOME (186 ROOMING UNITS) **AS PER SECTION 137, TABLE 137(8);**		
AMENITY AREA: **6m² PER DWELLING UNIT, AND 10% OF THE GFA OF EACH ROOMING UNIT =(6m² x 0 DWELLING UNITS) + (0.10 X 6,749.24m²)** **NOTE: NO DWELLING UNITS**	674.92m²	677.53m²
COMMUNAL AMENITY AREA **50% OF REQ.'D TOTAL AMENITY AREA**	337.46m²	624.26m²
SENIORS APARTMENT (130 DWELLING UNITS) **AS PER SECTION 137, TABLE 137(5);**		
AMENITY AREA: **6m² PER DWELLING UNIT, AND 10% OF THE GFA OF EACH ROOMING UNIT =(6m² X 130 DWELLING UNITS) + 0.10 X 0m²)** **NOTE: NO ROOMING UNITS**	780.00m²	780.00m²
COMMUNAL AMENITY AREA: **50% OF REQ.'D TOTAL AMENITY AREA**	390.00m²	772.87m²

VEHICULAR PARKING:	REQUIRED	PROVIDED
RETIREMENT HOME (186 ROOMING UNITS) **AS PER SECTION 101(4)(b); WITHIN AREA X NO OFF-STREET MOTOR VEHICLE PARKING IS REQUIRED TO BE PROVIDED FOR THE FIRST 12 RESIDENTIAL UNITS (SPLIT 50/50 w/ SENIOR APART.) (186 ROOMING UNITS - 6 = 180 UNITS) AS PER TABLE 101;**		
• 0.25 SPACES/ROOMING UNIT)	45	45
• + 1 SPACE PER 100m² OF GFA USED FOR MEDICAL, HEALTH OR PERSONAL SERVICES (722.43m²/100m²)	7	7
SENIORS APARTMENT (130 DWELLING UNITS) **AS PER SECTION 101(4)(b); WITHIN AREA X NO OFF-STREET MOTOR VEHICLE PARKING IS REQUIRED TO BE PROVIDED FOR THE FIRST 12 RESIDENTIAL UNITS (SPLIT 50/50 w/ RETIREMENT HOME) (130 DWELLING UNITS - 6 = 124 UNITS) AS PER TABLE 101; 0.5 SPACES PER DWELLING UNIT**	62	100
VISITOR PARKING (130 DWELLING UNITS) **AS PER SECTION 102(2); WITHIN AREA X, NO VISITORS PARKING SPACES ARE REQUIRED FOR THE FIRST 12 DWELLING UNITS (130 DWELLING UNITS - 12 = 118) AS PER SECTION 102, TABLE 102; 0.1 PARKING SPACES/DWELLING UNIT** ***NOTE: SECTION 102 DOES NOT LIST "RETIREMENT HOME" AS A LAND USE THAT REQUIRES VISITOR PARKING**	12	12
TOTAL VEHICULAR PARKING	126	164
ACCESSIBLE PARKING (INCL. IN TOTAL PARKING COUNT) **AS PER SECTION 106(2) DISABLED PARKING SPACES MUST COMPLY WITH TRAFFIC AND PARKING BY-LAW, PART C.** **NOTE: THIS IS NOT A PUBLIC PARKING AREA, THEREFORE NO SPACES ARE REQ'D FOR PERSONS WITH DISABILITIES**	0	6 (3 TYPE A & (3 TYPE B)

BICYCLE PARKING	REQUIRED	PROVIDED
RETIREMENT HOME (186 ROOMING UNITS) **AS PER SECTION 111, TABLE 111A 0.25 PER DWELLING UNIT OR ROOMING**	47	47
APARTMENT DWELLING, HIGH RISE (130 UNITS) **AS PER SECTION 111, TABLE 111A 0.50 PER DWELLING UNIT**	65	65
TOTAL BICYCLE PARKING	112	112

BUILDING SUMMARY:

	GROSS FLOOR AREA (ZONING BY-LAW)	UNIT COUNT
LEVEL P1 PARKING	150.45m²	0
GROUND FLOOR (Amenities + IL + Apartments)	1,982.80m²	37
LEVEL 2 (Assisted Living + Apartments)	2,687.70m²	63
LEVEL 3-6 (IL + Apartments) **GFA: 2,307.01m²/FLOOR X 4 FLOORS** **UNITS: 54 UNITS/FLOOR X 4 FLOORS**	9,228.04m²	216
	14,048.99m²	316

Owner
HPG itf Cummings Caron JV
Huntington Property Group Inc.
1306 Wellington Street West, Suite 200
Ottawa, ON K1Y 3B2

Contact:
Derek D. Noble & Lisa Westphal
voice: (613) 592-1818 - ext. 26 (Derek), ext. 27 (Lisa)
email: dnoble@huntingtonproperties.ca
email: lwestphal@huntingtonproperties.ca

Architect
Hobin Architecture Incorporated
63 Pamilla Street
Ottawa, ON K1S 3K7

Contact:
Wendy Brawley email: wbrawley@hobinarc.com
voice: (613) 238-7200 fax: (613) 235-2005

Planning
Fotenn
223 McLeod Street
Ottawa, ON K2P 0Z8

Contact:
Matthew McElligott email: mcelligott@fotenn.com
voice: (613) 730-5709 ext. 232

Civil Engineer
David Schaeffer Engineering Ltd.
120 Iber Road, Suite 103
Ottawa ON K2S 1E9

Contact:
Robert Freel email: rfreel@dsel.ca
voice: (613) 836-0856

Surveyor
Annis, O'Sullivan, Vollebekk Ltd.
14 Concourse Gate, Suite 500
Nepean, ON K2E 7S6

Contact:
Ed Herweyer email: EdH@aovltd.com
voice: (613) 727-0850

Geotechnical
Paterson Group Inc.
154 Colonnade Road South
Ottawa, ON K2E 7J5

Contact:
Carlos Da Silva email: carlosd@patersongroup.ca
voice: (613) 226-7381

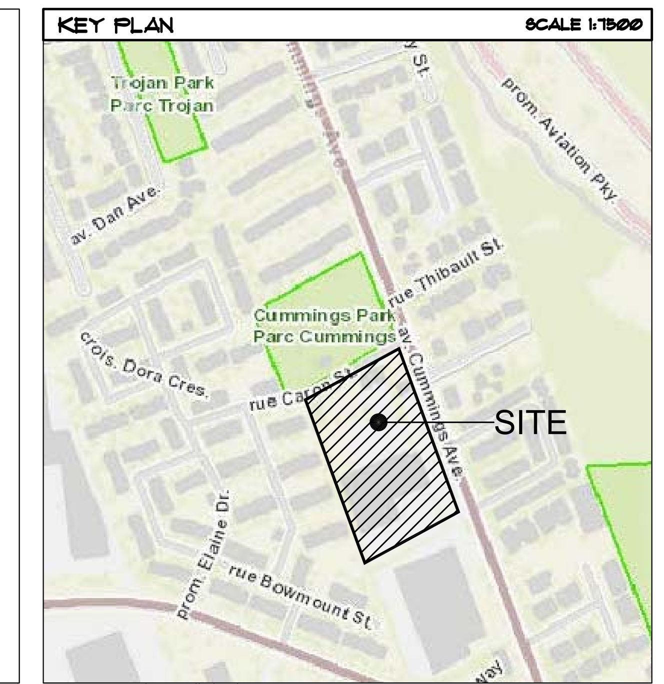
Landscape
James B. Lennox & Associates Inc.
Landscape Architects
3332 Carling Ave.
Ottawa, Ontario K2H 5A8

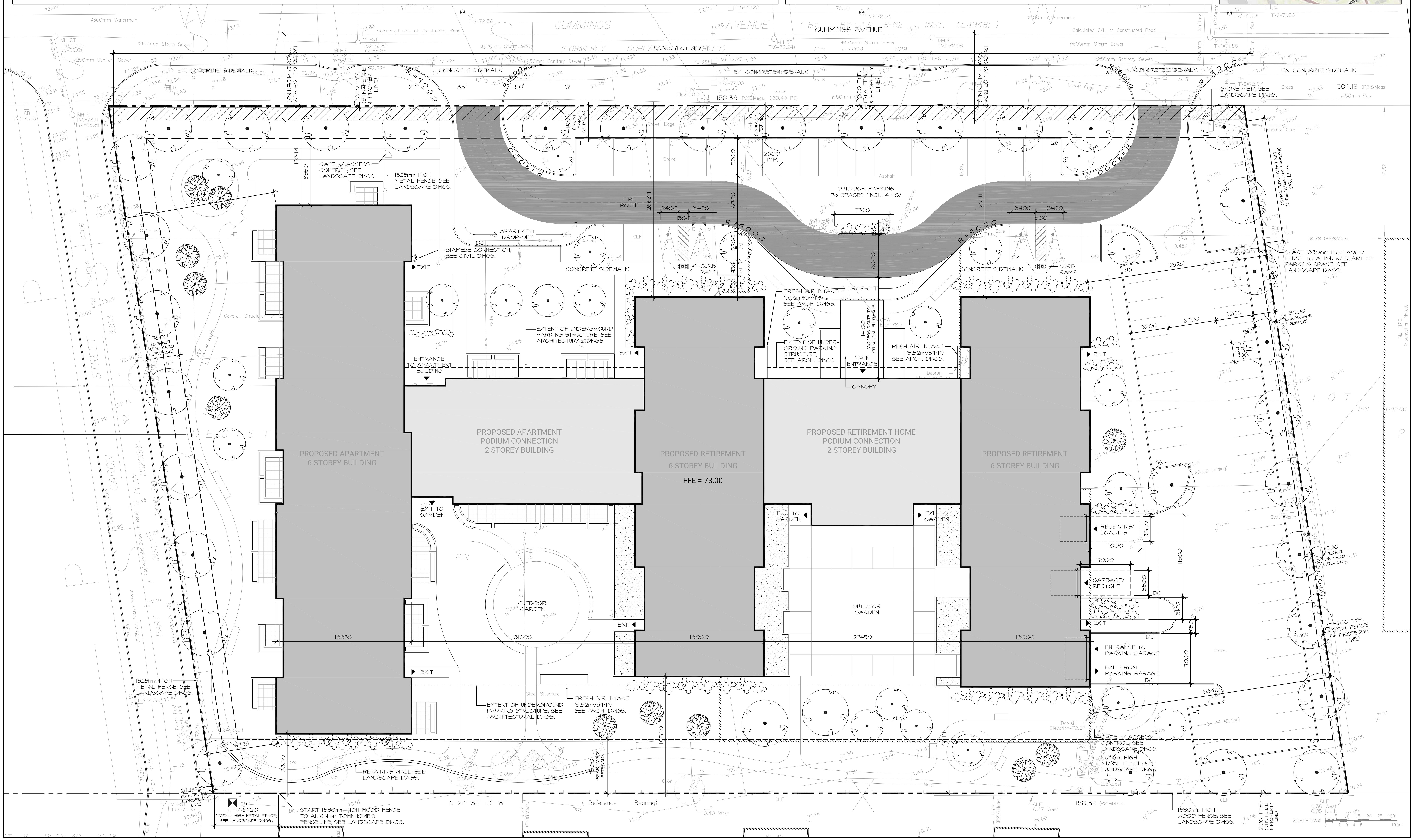
Contact:
Lu Chen
(613) 722-5168 email: lc@jbla.ca

Transportation
CGH Transportation Inc.
13 Markham Avenue
Ottawa, ON K2G 3Z1

Contact:
Christopher Gordon & Andrew Harte
voice: (343) 999-9117
email: christopher.gordon@cghtransportation.com
email: andrew.harte@cghtransportation.com

KEY PLAN SCALE 1:7500





SITE PLAN LEGEND:

- INDICATES TREE PLANTING; SEE LANDSCAPE DWGS.
- INDICATES SHRUB PLANTING; SEE LANDSCAPE DWGS.
- INDICATES SHRUB PLANTING; SEE LANDSCAPE DWGS.
- INDICATES UNIT PAVING; SEE LANDSCAPE DWGS.
- INDICATES FENCE; SEE LANDSCAPE DWGS.
- INDICATES PROPERTY LINE
- INDICATES PROPERTY SETBACK

no.	date	revision
1	07/04/2019	ISSUED FOR SITE PLAN CONTROL

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/ or omissions to the architect.

All contractors must comply with all pertinent codes and by-laws.

Do not scale drawings.

This drawing may not be used for construction until signed.

ONTARIO ASSOCIATION OF ARCHITECTS
BARRY J. HOBIN
LICENCE
3049

Hobin Architecture Incorporated
63 Pamilla Street
Ottawa, Ontario
Canada K1S 3K7
T: 613-238-7200
F: 613-235-2005
E: mail@hobinarc.com
hobinarc.com

PROJECT/LOCATION:
CUMMINGS AVENUE SENIORS RESIDENCE
1068 Cummings, Ottawa ON

DRAWING TITLE:
SITE PLAN

DRAWN BY:	DATE:	SCALE:
ML	JULY 4, 2019	1:250

PROJECT NORTH
TRUE NORTH

PROJECT: 1910

DRAWING NO.: A1.01

REVISION NO.: