FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

TRINITY DEVELOPMENT GROUP 2012 OGILVIE ROAD – PHASE 2 - BLOCK B

CITY OF OTTAWA

PROJECT NO.: 13-694

MAY 2016 – REV 1

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
FOR
TRINITY DEVELOPMENT GROUP
2012 OGILVIE ROAD – PHASE 2 - BLOCK B

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1.0 INTRODUCTION

Trinity Development Group has retained David Schaeffer Engineering Ltd. (DSEL) to prepare a Functional Servicing and Stormwater Management Report in support of their Minor Variance and Site Plan Amendment for the proposed redevelopment at 2012 Ogilvie Road.

The subject site is located within the City of Ottawa urban boundary. As illustrated in ***Figure 1***, the site is located approximately 350m northeast of the Blair Road – Ogilvie Road intersection.

Figure 1: Site Location

The subject site measures approximately ***5.79ha*** and will include ***14,980m²*** of commercial floorspace along with associated parking and sidewalks as outlined by the site plan. Refer to the reduced Site Plan prepared by Petroff Partnership Architects in ***Drawings/Figures***.

The objective of this report is to provide sufficient detail with respect to the availability of existing site services, in addition to the proposed servicing strategy, to support the application for site plan amendment.

1.1 Existing Conditions

Stantec Geomatics Ltd. has prepared a detailed topographical survey of the site. A reduced copy of the survey is included in ***Drawings / Figures***.

As described above, the existing site consists of a retail shopping plaza, with associated paved access roads, parking areas, and landscaping as illustrated by the ***EX-1***.

Sewer and watermain mapping, along with as-recorded drawings, collected from the City of Ottawa indicate that the following services exist across the property frontages within the respective adjacent municipal right-of-ways:

Watermains:

- 203mm diameter local ductile iron watermain within Blair Place
- 152mm diameter local watermain within Ogilvie Road
- 406mm diameter cast iron feedermain located within Ogilvie Road
- 900mm diameter feedmain within Ogilvie Road

Storm Sewers:

- 350mm diameter sewer located within Blair Place
- 1350mm diameter sewer located within Ogilvie Road
- 900mm diameter sewer located within Ogilvie Road

Sanitary Sewers:

- 250mm diameter sewer located within Blair Place
- 250mm diameter sewer located within Ogilvie Road

1.2 Required Permits / Approvals

The proposed development is subject to the site plan control approval process.

The City of Ottawa must approve the engineering design drawings and reports prior to the issuance of site plan control and building permits.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

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

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

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010
  (Water Supply Guidelines)

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

  - **Technical Bulletin ISDTD-2014-2**
    City of Ottawa, May 27, 2014.
    (*ISDTD-2014-2*)

- **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)

- **Water Supply for Public Fire Protection**
  Fire Underwriters Survey, 1999.
  (FUS)

- **Costco Wholesale Development Requirements**
  Costco Wholesale, June 2014.
  (CWDR, 2014)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 1E pressure zone. Based on the available information the existing development is serviced from the existing 406mm diameter municipal feedermain located within Ogilvie Road.

Along with the 406mm diameter watermain located within Ogilvie, an existing 203mm diameter municipal watermain is located within the Blair Place right-of-way. The existing servicing available within the municipal right-of-ways adjacent to the site is illustrated by drawing ***EX-1*** included in ***Drawings/Figures***.

Phase 1 contemplates a 300mm watermain within the east access road from Ogilvie, stubbed within the Phase 2 property boundary.

3.2 Water Supply Servicing Design

It is proposed that the development be serviced via an internal 250mm and 300mm diameter watermain network connected to the existing 203mm watermain within Blair Place and the existing 406mm diameter watermain within Ogilvie Road.

The proposed building will be serviced via connection to the internal watermain network. Fire hydrants will be provided internally to provide adequate fire protection coverage, in accordance with the ***OBC***. Detailed layout and sizing is shown by drawing ***SSP-1*** included with this report.

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

Table 1
Water Supply Design Criteria

Design Parameter	Value
Commercial Average Daily Demand (Retail)	2.5 L/m^2/d
Restaurant Average Daily Demand	125 L/seat/day
Commercial Maximum Daily Demand	1.5 x Average Daily
Commercial Maximum Hourly	1.8 x Maximum Daily
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During Peak Hourly Demand desired operating pressure is within	350kPa and 480kPa
During normal operating conditions pressure must not drop below	275kPa
During normal operating conditions pressure must not exceed	552kPa
During fire flow operating pressure must not drop below	140kPa

***Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.*
-Table updated to reflect ISD-2010-2

Table 2 summarizes the anticipated water supply demand and boundary conditions for the proposed development based on the ***Water Supply Guidelines***.

Table 2
Water Demand and Boundary Conditions
Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition Ogilvie Road (m H_2O / kPa)	Boundary Condition Blair Place (m H_2O / kPa)
Average Daily Demand	140.1	116.3 / 400.2	116.3 / 390.4
Max Day + Fire Flow	210.2 + 15,137= 15,347.2	110.7 / 345.3	103.5 / 264.9
Peak Hour	378.4	110.4 / 342.4	110.4 / 332.6

1) Water demand calculation per ***Water Supply Guidelines*** and previous site plan. See ***Appendix B*** for detailed calculations and updated water demands.
2) Boundary conditions supplied by the City of Ottawa. Assumed ground elevation of ***75.5m***.
3) Boundary conditions for both connections assumed to be the same due to close proximity.

EPANet was utilized to determine the availability of pressures throughout the system during average day demand, max day plus fire flow, and peak hour demands. This static model determines pressures based on the available head provided by the City of Ottawa boundary conditions at Ogilvie Road and Blair Place as indicated in ***Table 2***.

The model utilizes the Hazen-Williams equation to determine pressure losses, while the pipe properties have been selected in accordance with ***Water Supply Guidelines***. The model was prepared to assess the available pressure at the finished first floor of the proposed building as well as the pressures at the fire hydrants during fire flow conditions. ***Table 3*** summarizes the model results. ***Appendix B*** contains output reports and model schematics for each scenario.

Table 3
Model Simulation Output Summary

Location	Average Day	Peak Hour	Max Day + Fire Flow
	(kPa)	(kPa)	(kPa)
BLDG	387.9	326.6	260.0
FH3	393.9	336.0	140.3

The modeled pressures during Average Day and Peak Hour scenarios for the proposed building and fire hydrants fall within the required water pressures as outlined by the ***Water Supply Guidelines*** and summarized in ***Table 1***. A pressure check should be conducted at the completion of construction to confirm if pressure controls are required.

Fire servicing for the proposed building is achieved using a maximum fire flow provided by the building tenant of ***15,137L/min***. Minimum pressures as per ***Table 1*** are respected in all fire flow scenarios with the exception of ***FH4***. At ***FH4***, the minimum pressure of 140 kPa is exceeded when modelled using a maximum fire flow of ***11,000L/min***, determined by the FUS method.

The fire flow yielding the lowest pressure was utilized in the analysis shown in ***Table 3***. ***Appendix B*** contains output reports and model schematics for each scenario.

Proposed water servicing, anticipated water demand and estimated fire flow calculations have been completed in accordance with the ***Water Supply Guidelines*** and **ISDTB-2014-02.**

3.3 Water Supply Conclusion

Anticipated water demand under proposed conditions was submitted to the City of Ottawa for establishing boundary conditions. To ensure function of the internal water distribution network a model was generated using the City of Ottawa boundary conditions.

Modeled pressures at the buildings in the Peak Hour and Average Day scenario respect the required pressure range as indicated in the ***Water Supply Guidelines***. During a fire flow scenario the private hydrant used to service the site exceeded minimum pressure of 140 kPa.

The proposed design conforms to the relevant City of Ottawa ***Water Supply Guidelines***.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The local sanitary sewers within Blair Place and Ogilvie Road are tributary to the Green's Creek Collector sewer located approximately 1km to the east, as shown by the sanitary trunk sewer map included in ***Appendix B***.

Based on the available information the site is currently serviced via a connection to the 375mm diameter Ogilvie Road sanitary sewer. The existing site sanitary servicing is illustrated on drawing ***EX-1*** included in ***Drawings/Figures***.

A sanitary analysis was conducted to evaluate the capacity of the existing municipal sewers adjacent to the site. The analysis was conducted from the sanitary sewer within Blair Place to approximately 50m past the intersection of Elmlea Gate and Ogilvie Street, as shown by the sanitary drainage plan ***SAN-1*** in ***Drawings/Figures***. The City of Ottawa was consulted to determine external contributions to the subject sewer. In particular contributions from the federal lands bound by Bathgate Drive, Montreal Road, Blair Road and Ogilvie Road. For this report, these lands were excluded from the analysis. Correspondence is included in ***Appendix A***.

The sanitary analysis conducted indicates that a residual capacity of ***16.3L/s*** is available within the existing municipal sewer system, which includes the existing commercial development.

4.2 Wastewater Design

Table 4 summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

The anticipated the peak wet-weather wastewater flow generated from the proposed site development is ***4.22L/s***, including a 0.28L/s/ha allowance for extraneous flow. Refer to ***Appendix C*** for associated calculations.

Sanitary servicing is provided by private sanitary sewers within Phase 2 connecting to an existing sanitary stub connecting to Phase 1. Sanitary sewers within Phase 1 convey combined peak wet weather flow of ***5.47 L/s***, to the existing 375mm sanitary sewer within Ogilvie Road.

The most restricted sanitary sewer being proposed will be a ***200mm dia*** at ***0.32%*** which has a capacity of ***18.6L/s***. The proposed site wastewater servicing design is illustrated on drawing ***SSP-1***.

Table 4
Wastewater Design Criteria

Design Parameter	Value
Commercial Average Daily Demand (Retail)	5.0 L/m²/d
Restaurant Average Daily Demand	125 L/seat/day
Commercial Average Daily Demand (Office)	75 L/9.3m²/d
Commercial Average Daily Demand (Other)	50,000 L/gross Ha/d
Commercial Peaking Factor	1.5
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	250mm 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
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012.	

The sanitary analysis conducted indicates that a residual capacity of ***16.3L/s*** is available within the existing municipal sewer system, sufficient capacity to convey the anticipated sanitary discharge from the subject site. Detailed calculations are included in ***Appendix C***.

4.3 Wastewater Servicing Conclusions

The proposed wastewater design conforms to all relevant ***City Standards***. Flow from the proposed development is tributary to the Green's Creek Collector sewer; based on the sanitary analysis conducted adequate capacity is available to accommodate the contemplated development.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to Green's Creek located within the Green's Creek sub-watershed.

The site discharges to the local municipally owned sewers within Blair Place and Ogilvie Road, as such, approvals for proposed development 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 Rideau River watershed, and is therefore subject to review by the Rideau Valley Conservation Authority (RVCA).

The existing site does not appear to contain any controls for stormwater runoff. Runoff from the existing site is directed to the existing municipal sewers. Stormwater is tributary to Green's Creek via the municipal storm sewer system.

The development discharges to the existing storm infrastructure on Ogilvie Road and Blair Place drive.

Although the existing storm collections system does not appear to contain controls, it is anticipated that the storm system will attenuate flow to some degree and will restrict 100-year flows from entering the system. As such, it is expected that the majority of 100-year runoff escapes the site to the south and is collected by the existing drainage ditch where it is ultimate conveyed to Green's Creek via an un-named tributary.

5.2 Post-development Stormwater Management Target

Stormwater management requirements for the proposed development have been based on the review of available background material:

- Re-development sites tributary to separated sewers within the City of Ottawa are required to attenuate all storms up to and including a 100-year event.
- The specified release rate for the subject property is based on a 5-year City of Ottawa storm event with an equivalent Ration Method coefficient of 0.50 for a time of concentration of 20 minutes. Time of concentration was calculated using the airport method. Therefore, based on the Rational Method with the above parameters this site will be required to attenuate all storms up to and including a 100-year event to ***564.7L/s***. See ***Appendix D*** for detailed calculation.
- Quality controls are required for the proposed re-development. Runoff is to be treated to 80% Total Suspended Solid removal for runoff directed to either the

Blair Place or Ogilvie Road system. See ***Appendix A*** for communication with RVCA staff.

5.3 Proposed Stormwater Management System

The proposed stormwater management system will include private catch basin and storm sewer system utilizing subsurface storage to achieve the target release rates. Detailed servicing is illustrated by ***SSP-1***.

Onsite storm sewers have been sized to convey greater than the 5-year event in accordance with client requirements. The Rational Method Calculation sheet is included in ***Appendix D,*** as well the associated sub-catchment area plan ***SWM-1*** is included with this report.

Surface runoff from landscaping, sidewalks, access lanes and parking areas will be directed to a private catch basin and storm sewer system. The private storm sewer system will attenuate flow using a ***365mm*** diameter Inlet Control Device (ICD) located on the outlet side of storm maintenance structure ***STM102***. Detailed ICD sizing calculations are provided in ***Appendix D***.

Table 5 presents the estimated release rates, storage requirements and available storage for the proposed development.

Table 5
Summary of Proposed Release Rates and Storage Requirements for Phase 2 – Block B

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	22.9	0.0	48.9	0.0	0.0
Attenutated Areas	234.1	925.5	486.3	1674.0	2106.2
Total	**256.9**	**925.5**	**535.2**	**1674.0**	**2106.2**

As indicated in ***Table 5*** it is anticipated that ***1674m³*** of onsite storage will be required to attenuate stormwater runoff to the allowable release rate of ***564.7L/s.*** Storage provided by storm sewers, structures, underground storm chambers and surface ponding. Contractor to specify product or approved equivalent product at the time of construction.

Stormwater drainage areas and overland flow routes are illustrated by ***SWM-1*** included with this report.

To meet the quality criteria above an oil/grit separator (OGS) will be installed just upstream of the subsurface storage chamber. Storm sewer servicing and oil/grit separator details are illustrated by ***SSP-1*** included with this report. See ***Appendix D*** for OGS details and sizing.

5.4 Stormwater Servicing Conclusions

Post development stormwater runoff will be restricted to the allowable target for storm events up to and including the 1:100 year storm in accordance with the City of Ottawa ***City Standards***. To attenuate stormwater runoff from the 100-year storm to the 5-year release rate of ***564.7 L/s*** approximately ***1674m³*** of storage is required.

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

6.0 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 filter fabric 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.

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.
- Clean and change filter cloth at catch basins.

7.0 UTILITIES

Hydro, telecommunications and gas servicing are currently extended into the site. The proposed site re-development will maintain these existing services to the fullest extent possible, and further extend servicing within the site in cooperation with the appropriate utility companies as required.

8.0 CONCLUSION AND RECOMMENDATIONS

Trinity Development Group has retained David Schaeffer Engineering Ltd. (DSEL) to prepare a Functional Servicing and Stormwater Management Study in support of their Minor Variance and Site Plan Amendment for the proposed redevelopment at 2012 Ogilvie Road. The preceding report outlines the following conclusions:

- The City of Ottawa was contacted to obtain boundary conditions for the demands as indicated in the correspondence in ***Appendix B***, sufficient supply within the desired operating range is available to supply the proposed development;
- The existing 450mm diameter sanitary sewer within Ogilvie Road, has adequate capacity to convey the estimated wastewater generated from the proposed development;
- Approximately, ***1674m³*** of stormwater storage is required to attenuate the stormwater to the established release rate of ***564.7L/s***;
- Hydro, telecommunications and gas servicing are available from the surrounding municipal rights-of-way;
- Erosion and sediment controls will be implemented prior to commencing earthworks operations onsite, and will be maintained throughout construction.

It is recommended that the site servicing design described with this functional servicing study be adopted and approved for site plan control in support of the proposed development.

Prepared by,	Reviewed by,
David Schaeffer Engineering Ltd.	**David Schaeffer Engineering Ltd.**
	LICENSED PROFESSIONAL ENGINEER A. D. FOBERT 100090626 2016-05-16 PROVINCE OF ONTARIO JOB #13-694
Per: Brandon N. Chow	Per: Adam D. Fobert, P.Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

13-694 16/05/2016

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
☒	Plan showing the site and location of all existing services.	Figure 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
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3
☒	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
☐	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 1.4
☒	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	SSP-1

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 3.1, 3.2
☒	Confirmation of adequate domestic supply and pressure	Section 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
☐	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, 3.3
☐	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.	N/A
☐	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
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

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
☒	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
☒	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
☐	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
☒	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
☐	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.	N/A
☐	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

☒	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.	N/A
☒	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

Robert Freel

From: Robert Freel <rfreel@dsel.ca>
Sent: October-10-13 11:40 AM
To: 'Syd.Robertson@ottawa.ca'
Subject: 2012 Ogilvie Rd - Sanitary Sewer Shed
Attachments: DOC101013-10102013112827.pdf

Good morning Syd,

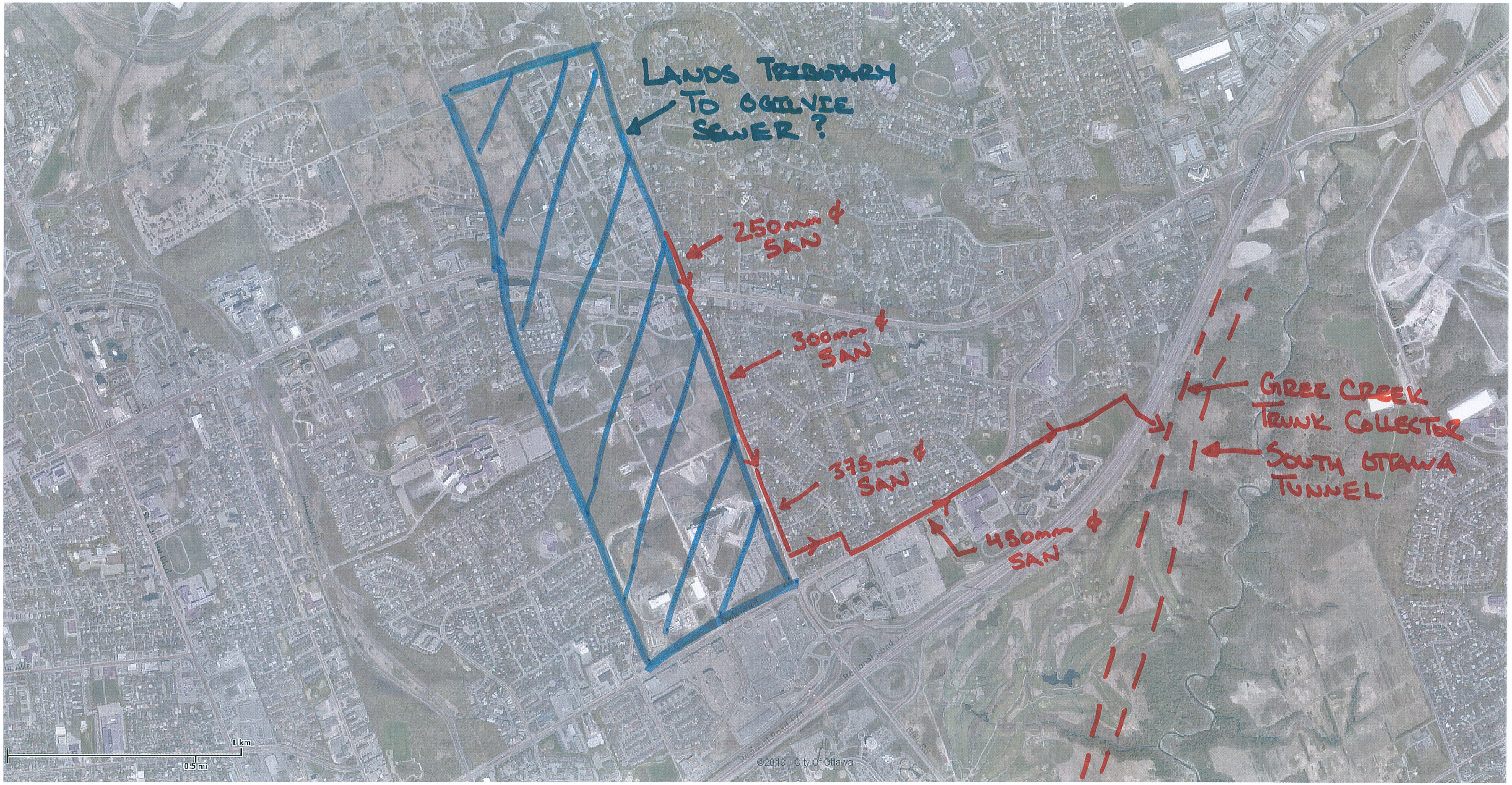
We are completing a sanitary analysis for 2012 Ogilvie Road and wanted to know if you have information on the lands highlighted on the attached sketch. Based on the Sanitary & Storm Collection System mapping provided by the Information Centre it is unclear if these lands are tributary to the adjacent sanitary sewer or if they are serviced internally with an outlet to the Ottawa Outfall to the north or from other adjacent sanitary sewers on Bathgate for example. Any information you might have would be appreciated. Please feel free to call Adam or me if you have any questions.

Regards,

Bobby Freel, EIT.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 203
Stittsville, ON K2S 1E9
Phone: (613) 836-0856 Ext. 258
Fax: (613) 836-7183
Email: rfreel@dsel.ca


LANDS TRIBUTARY TO OGILVIE SEWER ?
250mm ø SAN
300mm ø SAN
375mm ø SAN
450mm ø SAN
GREE CREEK TRUNK COLLECTOR
SOUTH OTTAWA TUNNEL
1 km
0.5 mi
©2013 - City Of Ottawa

Adam Fobert

From: Jocelyn Chandler <jocelyn.chandler@rvca.ca>
Sent: August-30-13 4:15 PM
To: afobert@dsel.ca
Cc: HCI; Syd Robertson
Subject: RE: 2012 Ogilvie Road

Hello Adam, In either scenario, the RVCA would expect the stormwater design for the property to achieve 80% TSS removal for the protection of water quality in Green's Creek (one of the City of Ottawa's most bio diverse watercourses). Quantity would be as per City of Ottawa instructions for their municipal sewers. Thank you for contacting me, Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP
Planner, RVCA
t) 613-692-3571 x1137
f) 613-692-0831
jocelyn.chandler@rvca.ca
www.rvca.ca
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

From: Adam Fobert [mailto:afobert@dsel.ca]
Sent: Monday, August 26, 2013 4:57 PM
To: Jocelyn Chandler
Cc: HCI; Syd Robertson
Subject: 2012 Ogilvie Road

Hello Jocelyn,

Trinity have retained our services to support their proposed re-development of 2012 Ogilvie Road. The site context is illustrated below.

I believe that this site outlets in two locations. Toward Blair Place and Ogilvie Road. Our on-site as-builts are incomplete at this time.

I have sketched below the possible sewer routing. It would appear that the Blair Place sewer outlets to a Green's Creek tributary, while the Ogilvie Road sewers outlet further downstream into Green's Creek.

Could you kindly confirm if the RVCA has any specific discharge requirements for this site?

Please note that our client has an aggressive schedule to submit for SPA mid-September.

Thank you for your help.

Adam Fobert, P.Eng.
Senior Design Engineer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 203
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.231
fax: (613) 836-7183
email: afobert@DSEL.ca

APPENDIX B

Water Supply

Trinity Development Group
2012 Ogilvie Road
Phase 2

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

Institutional / Commercial Demand

			Avg. Daily		Max Day		Peak Hour	
Location	**Unit Rate**	**Units**	**m^3/d**	**L/min**	**m^3/d**	**L/min**	**m^3/d**	**L/min**
Retail B	From Tenant Guidelines	15,282.0	201.74	140.1	302.6	210.2	544.7	378.3
Total Demand			**201.7**	**140.1**	**302.6**	**210.2**	**544.7**	**378.3**

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	15282.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	21757.2 L/min	
	22000.0 L/min	*rounded to the nearest 1,000 L/min*

2. Reduction for Occupancy Type

Combustible	0%
Fire Flow	**22000.0 L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%
Reduction	**-11000 L/min**

4. Increase for Separation Distance

N	>45m	0%	
S	>45m	0%	
E	>45m	0%	
W	>45m	0%	
	% Increase	**0%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**0.0 L/min**	

Total Fire Flow

Fire Flow	11000.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	11000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:

-Calculations based on Fire Underwriters Survey - Part II

Hi Steve:

The following are boundary conditions, HGL, for hydraulic analysis at 2012 Ogilvie – Phase 2 (zone 1E) assumed to be connected to the 406mm on Ogilvie and 203mm on Blair Place (see attached PDF for location).

A 250mm looped connection between Ogilvie Rd and Blair Pl was assumed. Demands were attributed to a node in the middle of the assumed 250mm watermain.

Minimum HGL = 110.4m (same at both connections)

Maximum HGL = 116.3m (same at both connections)

MaxDay (3.51 L/s) + FireFlow (250 L/s) = 110.7m on Ogilvie

MaxDay (3.51 L/s) + FireFlow (250 L/s) = 103.5m on Blair Place

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.

From: Steve Merrick [mailto:smerrick@dsel.ca]
Sent: October 02, 2015 4:02 PM
To: Robertson, Syd
Subject: 2012 Ogilvie Road - Phase 2 - Boundary Conditions

Hi Syd,

We would like to request boundary conditions for the contemplated development of 2012 Ogilvie Road – Phase 2.

We are proposing a 250mm looped connection between the existing 406mm diameter watermain within Ogilvie Road and 203mm watermain within Blair Place. Please see attached sketch showing the proposed connection points. A total required fire flow of 15,137 LPM (Max Day + FF) is required for the proposed building on-site.

The anticipated water demands are summarized below:

	L/min	L/s
Avg. Daily	140.1	2.34
Max Day	210.2	3.51
Peak Hour	378.4	6.31

Thanks in advance,

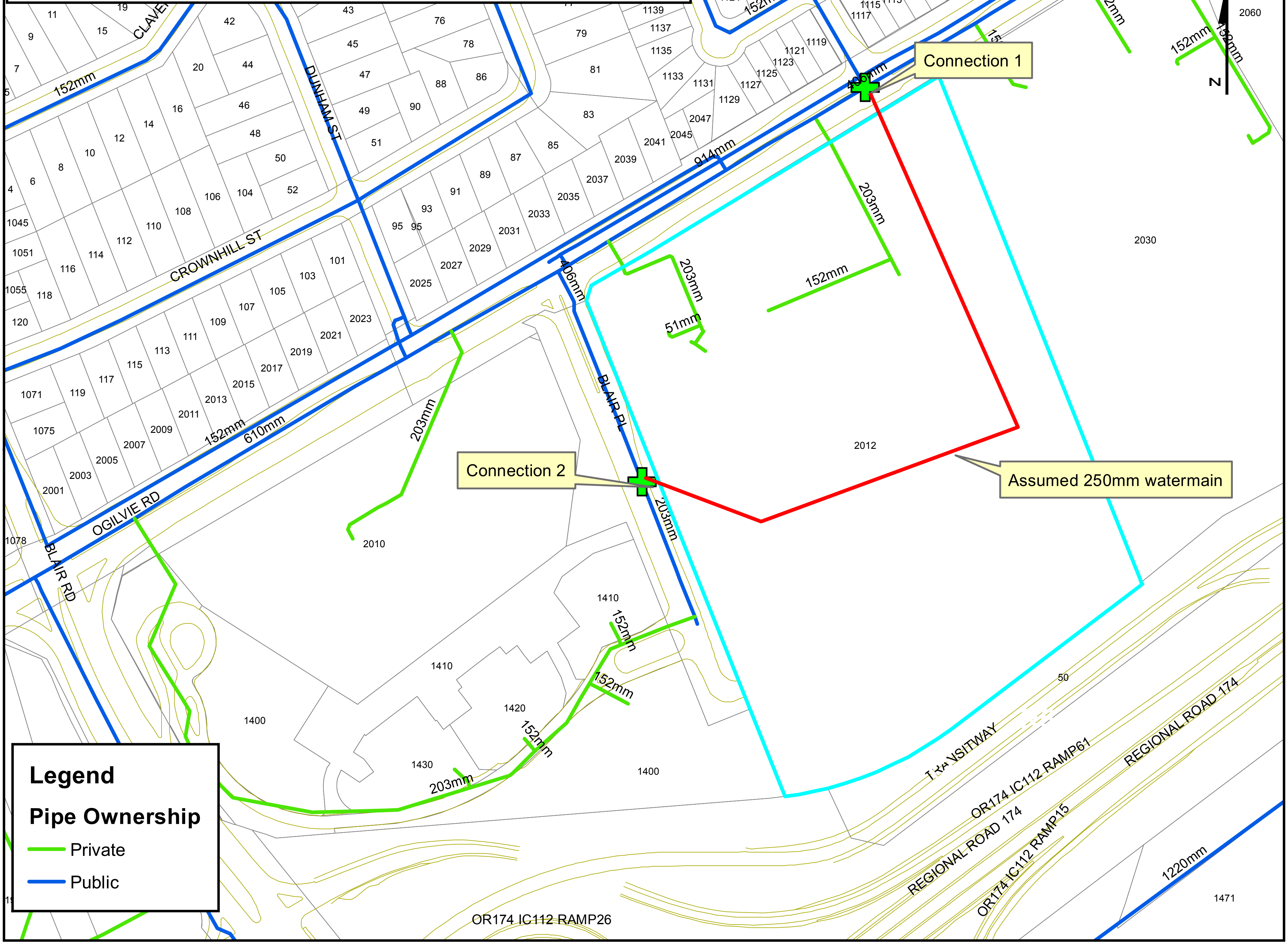
Steve Merrick, EIT.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

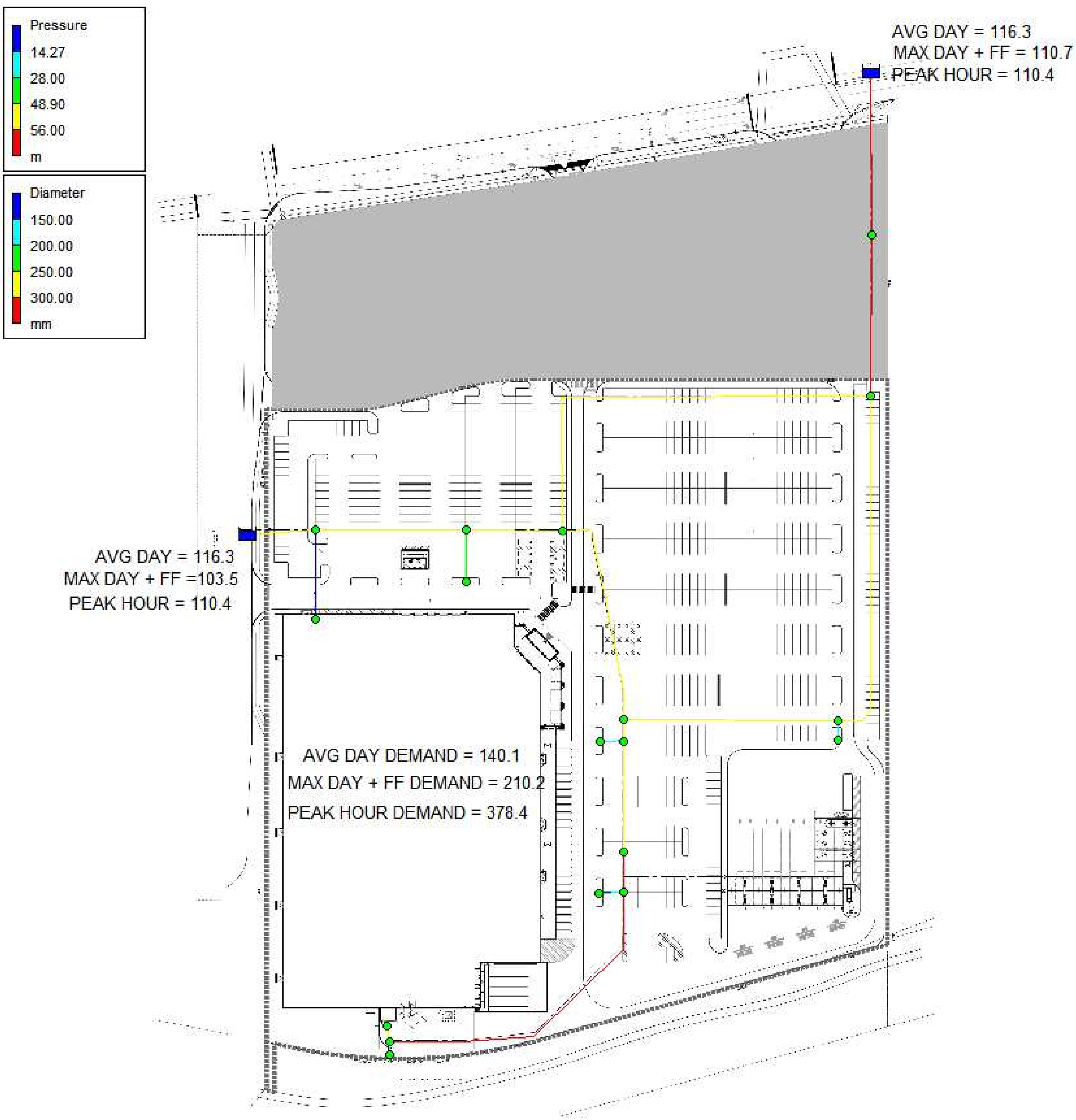
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

Boundary Condition for 2012 Ogilvie - Ph2

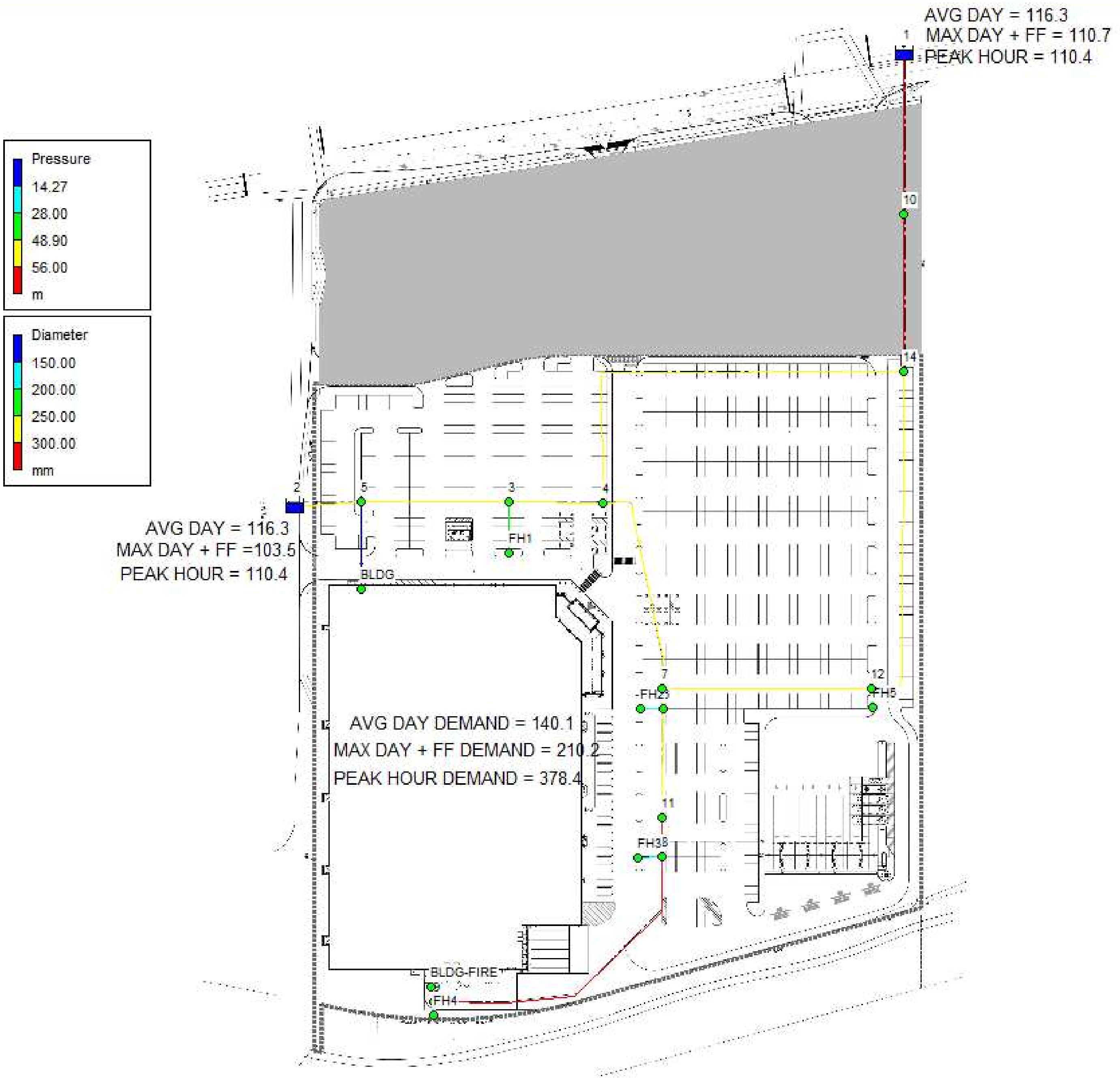


AVERAGE DAY



Pressure
14.27
28.00
48.90
56.00
m
Diameter
150.00
200.00
250.00
300.00
mm
AVG DAY = 116.3
MAX DAY + FF = 110.7
PEAK HOUR = 110.4
AVG DAY = 116.3
MAX DAY + FF =103.5
PEAK HOUR = 110.4
AVG DAY DEMAND = 140.1
MAX DAY + FF DEMAND = 210.2
PEAK HOUR DEMAND = 378.4

AVERAGE DAY



AVG DAY = 116.3
MAX DAY + FF = 110.7
PEAK HOUR = 110.4
Pressure
14.27
28.00
48.90
56.00
m
Diameter
150.00
200.00
250.00
300.00
mm
AVG DAY = 116.3
MAX DAY + FF =103.5
PEAK HOUR = 110.4
AVG DAY DEMAND = 140.1
MAX DAY + FF DEMAND = 210.2
PEAK HOUR DEMAND = 378.4
BLDG
FH1
BLDG-FIRE
FH4
FH5
FH38

```
**********************************************************************
*                              E P A N E T                           *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                           Version 2.0                              *
**********************************************************************
```

Input File: 2016-05-16_694_epanet_bnc.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
2	2	5	28.9	250
3	5	3	58.2	250
4	3	4	37.1	250
5	3	FH1	19.5	200
6	5	BLDG	31.2	100
10	8	FH3	8.6	150
11	6	FH2	8.6	150
13	8	9	130	300
14	9	BLDG-FIRE	5.2	250
15	9	FH4	2.1	150
19	12	FH5	3.5	150
23	1	10	75	300
24	14	4	170.4	250
1	10	14	53	300
7	14	12	132.5	250
8	12	7	89.8	250
9	4	7	87.9	250
12	7	6	4.5	250
16	6	11	46	250
17	11	8	11	300

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality
3	0.00	116.30	40.15	0.00
4	0.00	116.30	42.50	0.00
5	0.00	116.30	42.25	0.00
6	0.00	116.30	40.25	0.00
8	0.00	116.30	40.15	0.00
9	0.00	116.30	40.20	0.00
FH1	0.00	116.30	39.30	0.00
FH2	0.00	116.30	39.53	0.00
FH3	0.00	116.30	39.60	0.00
FH4	0.00	116.30	40.30	0.00
BLDG-FIRE	0.00	116.30	39.60	0.00

♀

Node Results: (continued)

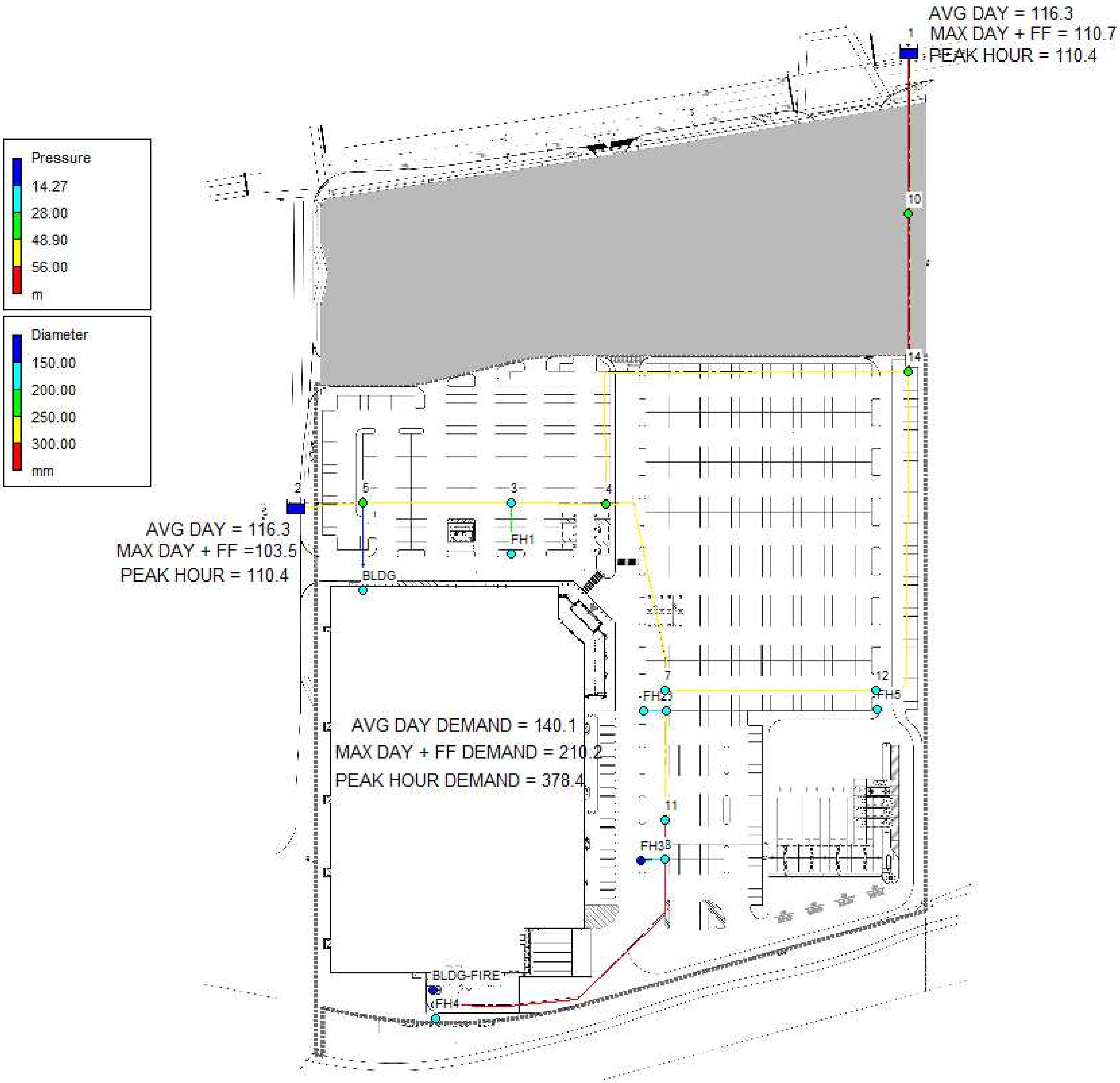
Node ID	Demand LPM	Head m	Pressure m	Quality	
BLDG	140.10	116.24	39.54	0.00	
FH5	0.00	116.30	40.00	0.00	
12	0.00	116.30	40.30	0.00	
14	0.00	116.30	40.30	0.00	
10	0.00	116.30	42.30	0.00	
7	0.00	116.30	42.65	0.00	
11	0.00	116.30	42.60	0.00	
1	-35.82	116.30	0.00	0.00	Reservoir
2	-104.29	116.30	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
2	104.29	0.04	0.01	Open
3	-35.81	0.01	0.00	Open
4	-35.81	0.01	0.00	Open
5	0.00	0.00	0.00	Open

6	140.10	0.30	2.04	Open
10	0.00	0.00	0.00	Open
11	0.00	0.00	0.00	Open
13	0.00	0.00	0.00	Open
14	0.00	0.00	0.00	Open
15	0.00	0.00	0.00	Open
19	0.00	0.00	0.00	Open
23	35.82	0.01	0.00	Open
24	20.73	0.01	0.00	Open
1	35.82	0.01	0.00	Open
7	15.08	0.01	0.00	Open
8	15.08	0.01	0.00	Open
9	-15.08	0.01	0.00	Open
12	0.01	0.00	0.00	Open
16	0.00	0.00	0.00	Open
17	0.00	0.00	0.00	Open

MAX DAY + FIRE FLOW



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*                             E P A N E T                            *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                           Version 2.0                              *
**********************************************************************
```

Input File: 2016-05-16_694_epanet_bnc.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
2	2	5	28.9	250
3	5	3	58.2	250
4	3	4	37.1	250
5	3	FH1	19.5	200
6	5	BLDG	31.2	100
10	8	FH3	8.6	150
11	6	FH2	8.6	150
13	8	9	130	300
14	9	BLDG-FIRE	5.2	250
15	9	FH4	2.1	150
19	12	FH5	3.5	150
23	1	10	75	300
24	14	4	170.4	250
1	10	14	53	300
7	14	12	132.5	250
8	12	7	89.8	250
9	4	7	87.9	250
12	7	6	4.5	250
16	6	11	46	250
17	11	8	11	300

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
3	0.00	103.03	26.88	0.00	
4	0.00	102.83	29.03	0.00	
5	0.00	103.33	29.28	0.00	
6	0.00	97.53	21.48	0.00	
8	15137.00	90.45	14.30	0.00	
9	0.00	90.45	14.35	0.00	
FH1	0.00	103.03	26.03	0.00	
FH2	0.00	97.53	20.76	0.00	
FH3	0.00	90.45	13.75	0.00	
FH4	0.00	90.45	14.45	0.00	
BLDG-FIRE	0.00	90.45	13.75	0.00	

♀

Node Results: (continued)

Node ID	Demand LPM	Head m	Pressure m	Quality	
BLDG	210.15	103.20	26.50	0.00	
FH5	0.00	101.73	25.43	0.00	
12	0.00	101.73	25.73	0.00	
14	0.00	106.11	30.11	0.00	
10	0.00	107.65	33.65	0.00	
7	0.00	98.87	25.22	0.00	
11	0.00	91.29	17.59	0.00	
1	-12480.23	110.70	0.00	0.00	Reservoir
2	-2866.92	103.50	0.00	0.00	Reservoir

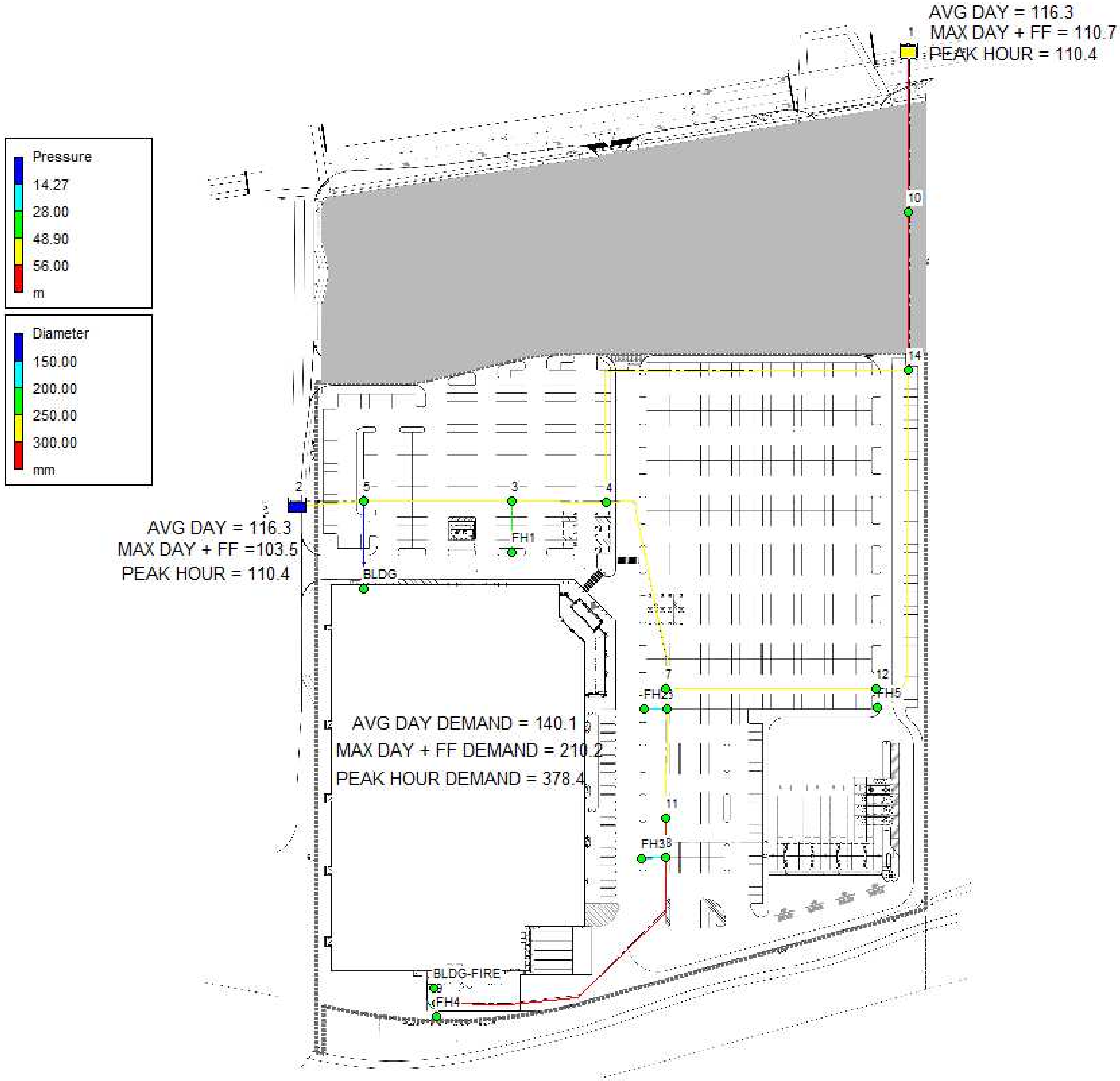
Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
2	2866.92	0.97	5.75	Open
3	2656.77	0.90	5.13	Open
4	2656.77	0.90	5.60	Open
5	0.00	0.00	0.00	Open

MAX DAY + FIRE FLOW

6	210.15	0.45	4.37	Open
10	0.00	0.00	0.00	Open
11	0.00	0.00	0.00	Open
13	0.00	0.00	0.00	Open
14	0.00	0.00	0.00	Open
15	0.00	0.00	0.00	Open
19	0.00	0.00	0.00	Open
23	12480.23	2.94	40.70	Open
24	5279.64	1.79	19.29	Open
1	12480.23	2.94	28.93	Open
7	7200.59	2.44	33.05	Open
8	7200.59	2.44	31.87	Open
9	7936.41	2.69	44.98	Open
12	15137.00	5.14	297.52	Open
16	15137.00	5.14	135.67	Open
17	15137.00	3.57	76.76	Open

PEAK HOUR



AVG DAY = 116.3
MAX DAY + FF = 110.7
PEAK HOUR = 110.4
Pressure
14.27
28.00
48.90
56.00
m
Diameter
150.00
200.00
250.00
300.00
mm
AVG DAY = 116.3
MAX DAY + FF =103.5
PEAK HOUR = 110.4
AVG DAY DEMAND = 140.1
MAX DAY + FF DEMAND = 210.2
PEAK HOUR DEMAND = 378.4
BLDG
BLDG-FIRE
FH1
FH2
FH3
FH4
FH5

```
**********************************************************************
*                            E P A N E T                             *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                          Version 2.0                               *
**********************************************************************
```

Input File: 2016-05-16_694_epanet_bnc.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
2	2	5	28.9	250
3	5	3	58.2	250
4	3	4	37.1	250
5	3	FH1	19.5	200
6	5	BLDG	31.2	100
10	8	FH3	8.6	150
11	6	FH2	8.6	150
13	8	9	130	300
14	9	BLDG-FIRE	5.2	250
15	9	FH4	2.1	150
19	12	FH5	3.5	150
23	1	10	75	300
24	14	4	170.4	250
1	10	14	53	300
7	14	12	132.5	250
8	12	7	89.8	250
9	4	7	87.9	250
12	7	6	4.5	250
16	6	11	46	250
17	11	8	11	300

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality
3	0.00	110.40	34.25	0.00
4	0.00	110.40	36.60	0.00
5	0.00	110.40	36.35	0.00
6	0.00	110.40	34.35	0.00
8	0.00	110.40	34.25	0.00
9	0.00	110.40	34.30	0.00
FH1	0.00	110.40	33.40	0.00
FH2	0.00	110.40	33.63	0.00
FH3	0.00	110.40	33.70	0.00
FH4	0.00	110.40	34.40	0.00
BLDG-FIRE	0.00	110.40	33.70	0.00

♀

Node Results: (continued)

Node ID	Demand LPM	Head m	Pressure m	Quality	
BLDG	378.27	109.99	33.29	0.00	
FH5	0.00	110.40	34.10	0.00	
12	0.00	110.40	34.40	0.00	
14	0.00	110.40	34.40	0.00	
10	0.00	110.40	36.40	0.00	
7	0.00	110.40	36.75	0.00	
11	0.00	110.40	36.70	0.00	
1	-96.50	110.40	0.00	0.00	Reservoir
2	-281.77	110.40	0.00	0.00	Reservoir

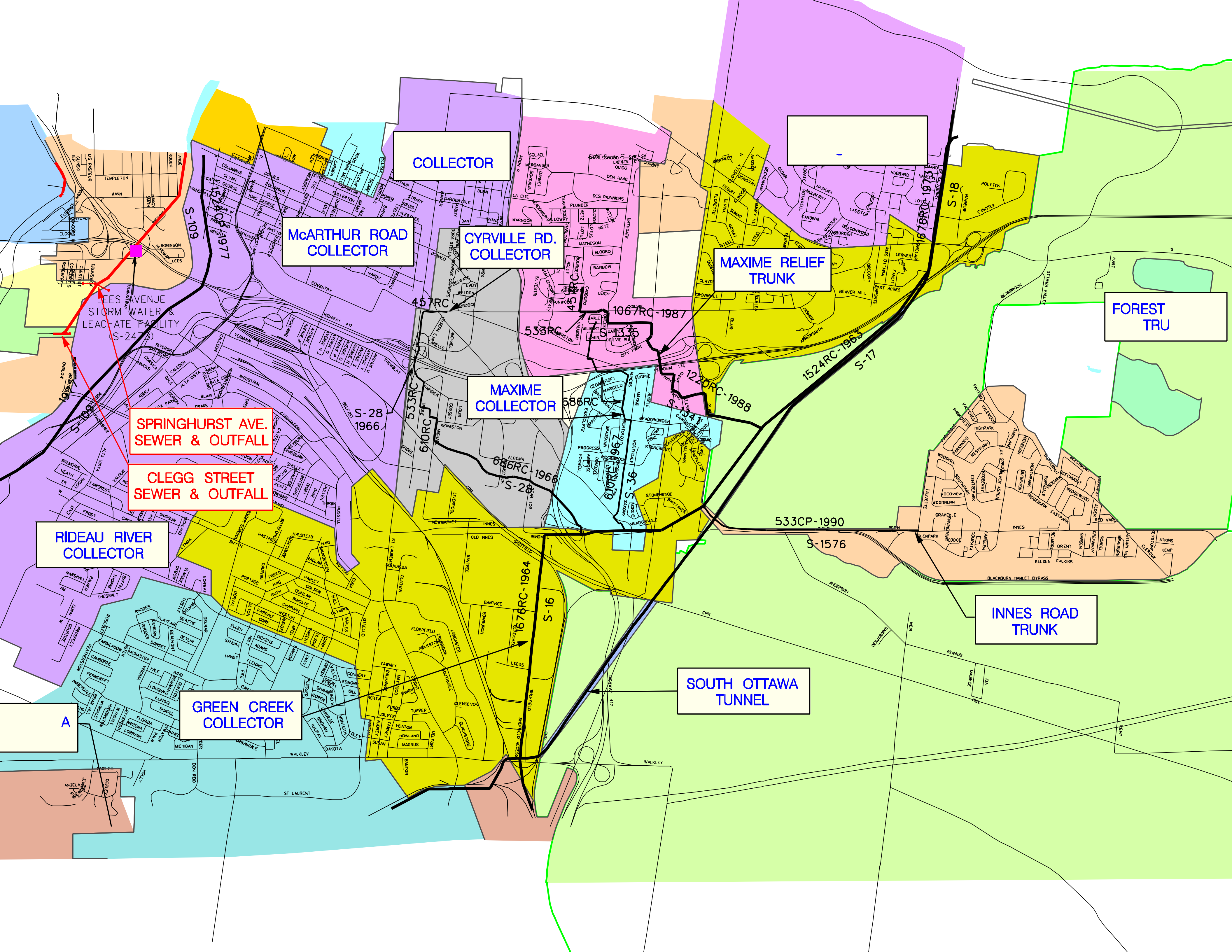
Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
2	281.77	0.10	0.08	Open
3	-96.50	0.03	0.01	Open
4	-96.50	0.03	0.01	Open
5	0.00	0.00	0.00	Open

6	378.27	0.80	13.15	Open
10	0.00	0.00	0.00	Open
11	0.00	0.00	0.00	Open
13	0.00	0.00	0.00	Open
14	0.00	0.00	0.00	Open
15	0.00	0.00	0.00	Open
19	0.00	0.00	0.00	Open
23	96.50	0.02	0.00	Open
24	55.85	0.02	0.00	Open
1	96.50	0.02	0.00	Open
7	40.65	0.01	0.00	Open
8	40.65	0.01	0.00	Open
9	-40.65	0.01	0.00	Open
12	0.01	0.00	0.00	Open
16	0.00	0.00	0.00	Open
17	0.00	0.00	0.00	Open

APPENDIX C

Wastewater Collection


COLLECTOR
McARTHUR ROAD COLLECTOR
CYRVILLE RD. COLLECTOR
MAXIME RELIEF TRUNK
FOREST TRU
MAXIME COLLECTOR
SPRINGHURST AVE. SEWER & OUTFALL
CLEGG STREET SEWER & OUTFALL
RIDEAU RIVER COLLECTOR
INNES ROAD TRUNK
SOUTH OTTAWA TUNNEL
GREEN CREEK COLLECTOR
A
LEES AVENUE STORM WATER & LEACHATE FACILITY (S-2473)
S-109
1514RC-1977
457RC
533RC
1067RC-1987
S-1335
S-28 1966
533RC
610RC
686RC
686RC-1966
S-28
1220RC-1988
S-34
1524RC-1963
S-17
610RC-1967
S-36
533CP-1990
S-1576
1676RC-1964
S-16
1676RC-1973
S-18

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Extraneous Flow Allowances

	Area (ha)	Infiltration / Inflow (L/s)
Site Area	5.790	1.62

Institutional / Commercial Contributions

Location	Unit Rate		Units	Average Flow (L/s)	Peak Flow (L/s)
Block B - Retail B	5.0	L/m²/d	14,980.0	1.73	2.60
Total Institutional / Commerical Contributions				1.73	2.60

Total Peak Wastewater and Extraneous Contributions	**4.22**

Commercial peaking factor: 1.50

***assuming a 12 hour commercial operation*

APPENDIX D

Stormwater Management

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

Target Flow Rate

Total Area	5.79	ha
C	0.50	Rational Method runoff coefficient
t_c	20.0	min
	5-year	
i	70.3	mm/hr
Q	564.7	L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Area ID	U1	
Total Area	0.24	ha
C	0.43	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)**	**(m^3)**	**i (mm/hr)**	**Q_{actual}* (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**
16.0	80.5	22.9	22.9	0.0	0.0	137.5	48.9	48.9	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

Available Sub-surface Storage
Maintenance Structures

ID	STM102	STM103	STM104	STM105	STM106	STM107	STM108	STM109	STM110
Structure Dia./Area (mm/mm^2)	1800	1500	1500	1500	1500	1200	1200	1500	1500
T/L*	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55
INV	72.18	72.38	72.61	72.91	72.99	73.27	73.58	73.72	72.83
Depth	3.37	3.17	2.94	2.64	2.56	2.28	1.97	1.83	2.72
$V_{structure}$ (m^3)	8.6	5.6	5.2	4.7	4.5	2.6	2.2	3.2	4.8

ID	STM111	STM113	STM114	STM115	STM116	STM121	STM122	STM123	STM124
Structure Dia./Area (mm/mm^2)	1200	1200	1200	1200	1200	1800	1200	1200	1200
T/L*	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55
INV	73.22	73.38	73.68	74.06	74.27	72.57	73.92	74.33	73.15
Depth	2.33	2.17	1.87	1.49	1.28	2.98	1.63	1.22	2.40
$V_{structure}$ (m^3)	2.6	2.5	2.1	1.7	1.4	7.6	1.8	1.4	2.7

ID	STM125	STM126	STM127	STM128	STM129	STM130	STM131	STM133	STM134
Structure Dia./Area (mm/mm^2)	1200	1200	1500	1200	1200	1200	1200	1500	1200
T/L*	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55
INV	73.61	73.90	72.97	73.45	73.96	74.16	74.05	74.04	73.90
Depth	1.94	1.65	2.58	2.10	1.59	1.39	1.50	1.51	1.65
$V_{structure}$ (m^3)	2.2	1.9	4.6	2.4	1.8	1.6	1.7	2.3	2.0

ID	STM135	CB101	CB102	CB103	CB104	CB105	CB106	CB107	CB108
Structure Dia./Area (mm/mm^2)	1800	360	360	360	360	360	360	360	360
T/L*	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55
INV	72.31	74.55	74.80	74.45	74.40	73.50	73.55	73.45	73.75
Depth	3.24	1.00	0.75	1.10	1.15	2.05	2.00	2.10	1.80
$V_{structure}$ (m^3)	5.8	0.4	0.3	0.4	0.4	0.7	0.7	0.8	0.6

ID	CB109	CB110	CB111	CB112	CB113	CB114	CB115	CB116	CB117
Structure Dia./Area (mm/mm^2)	360	360	360	360	360	360	360	360	360
T/L*	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55	75.55
INV	73.60	73.70	73.75	73.80	74.60	74.55	74.15	74.27	74.26
Depth	1.95	1.85	1.80	1.75	0.95	1.00	1.40	1.28	1.29
$V_{structure}$ (m^3)	0.7	0.7	0.6	0.6	0.3	0.4	0.5	0.5	0.5

Sewers

ID	250mm	300mm	375mm	450mm	525mm	600mm	675mm	750mm	975mm
Storage Pipe Dia (mm)	250	300	375	450	525	600	675	750	975
L (m)	13.2	421.3	95	119.4	267.2	238	74.2	21.5	33
V_{sewer} (m^3)	0.6	29.8	10.5	19.0	57.8	67.3	26.6	9.5	24.6

Sewers

ID	U/G STORE 1								
Storage Pipe Dia (mm)									
L (m)									
V_{sewer} (m^3)	1300.0								

*Top of lid or max ponding elevation = 75.55

Total U/G Storage (m^3) 1300.0
Total Pipe & Structure Storage (m^3) 346.22

Stage Attenuated Areas Storage Summary

		Surface Storage			Subsurface Storage			
	Stage	A	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	72.15		0.00			0.0	0.0	0.00
Storage Chamber INV	72.31		0.16	0.16	16.3	16.3	105.2	0.04
Storage Chamber OBV	73.51		1.36	1.20	1422.2	1438.5	306.8	1.30
T/L	75.55		3.40	2.04	207.7	1646.2	485.1	0.94
Max Ponding	75.85		3.70	0.30	460.0	2106.2	506.0	1.16

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

Orifice Location **STM102** **Dia** 355
Total Area 5.55 ha
C 0.90 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	104.2	1445.7	234.1	1211.6	727.0	178.6	2752.8	486.3	2266.5	1359.9
15	83.6	1159.4	234.1	925.3	832.8	142.9	2203.0	486.3	1716.6	1545.0
20	70.3	974.7	234.1	740.7	888.8	120.0	1849.2	486.3	1362.9	1635.5
25	60.9	844.9	234.1	610.9	916.3	103.8	1601.0	486.3	1114.7	1672.0
30	53.9	748.2	234.1	514.2	925.5	91.9	1416.3	486.3	930.0	1674.0
35	48.5	673.2	234.1	439.1	922.1	82.6	1273.1	486.3	786.8	1652.2
40	44.2	613.1	234.1	379.0	909.6	75.1	1158.5	486.3	672.2	1613.2
45	40.6	563.7	234.1	329.6	890.0	69.1	1064.5	486.3	578.2	1561.2
50	37.7	522.4	234.1	288.4	865.1	64.0	986.0	486.3	499.6	1498.9
55	35.1	487.3	234.1	253.3	835.8	59.6	919.2	486.3	432.9	1428.5
60	32.9	457.1	234.1	223.0	802.9	55.9	861.7	486.3	375.4	1351.4
65	31.0	430.7	234.1	196.7	767.0	52.6	811.6	486.3	325.3	1268.7
70	29.4	407.5	234.1	173.5	728.5	49.8	767.6	486.3	281.3	1181.4
75	27.9	387.0	234.1	152.9	687.9	47.3	728.5	486.3	242.2	1089.9
80	26.6	368.5	234.1	134.5	645.5	45.0	693.6	486.3	207.3	995.0
85	25.4	352.0	234.1	117.9	601.4	43.0	662.2	486.3	175.9	897.0
90	24.3	337.0	234.1	102.9	555.8	41.1	633.8	486.3	147.5	796.4
95	23.3	323.4	234.1	89.3	508.9	39.4	608.0	486.3	121.6	693.3
100	22.4	310.9	234.1	76.8	460.9	37.9	584.3	486.3	98.0	588.1
105	21.6	299.5	234.1	65.4	411.9	36.5	562.7	486.3	76.4	481.0
110	20.8	288.9	234.1	54.8	361.9	35.2	542.7	486.3	56.4	372.2

5-year $Q_{attenuated}$	**234.07 L/s**	**100-year $Q_{attenuated}$**	**486.31 L/s**
5-year Max. Storage Required	**925.5 m^3**	**100-year Max. Storage Required**	**1674.0 m^3**
Est. 5-year Storage Elevation	**73.08 m**	**Est. 100-year Storage Elevation**	**75.57 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	22.9	0.0	48.9	0.0	0.0
Attenutated Areas	234.1	925.5	486.3	1674.0	2106.2
Total	**256.9**	**925.5**	**535.2**	**1674.0**	**2106.2**

564.7

Trinity Development Group
2012 Ogilvie Road - Block B
Proposed Conditions

													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)**	**(-)**
130	STM130	STM129	0.256	0.90	0.23	0.23	10.0	104.2	66.7	300	0.50	31.5	0.071	0.075	0.97	68.4	0.5	0.98
	STM129	STM128	0.000	0.90	0.00	0.23	10.5	101.4	64.9	375	0.50	35.8	0.110	0.094	1.12	124.0	0.5	0.52
							11.1											
134	STM134	STM128	0.271	0.85	0.23	0.23	10.0	104.2	66.7	375	0.40	11.4	0.110	0.094	1.00	110.9	0.2	0.60
							10.2											
128	STM128	STM127	0.652	0.85	0.55	1.01	11.1	98.8	278.7	600	0.55	87.6	0.283	0.150	1.61	455.4	0.9	0.61
127	STM127	STM121	0.377	0.85	0.32	1.34	12.0	94.8	351.6	675	0.45	74.2	0.358	0.169	1.58	563.9	0.8	0.62
							12.8											
123	STM123	STM122	0.520	0.85	0.44	0.44	10.0	104.2	127.9	450	0.45	57.4	0.159	0.113	1.20	191.3	0.8	0.67
122	STM122	STM121	0.399	0.85	0.34	0.78	10.8	100.2	217.4	600	0.30	56.8	0.283	0.150	1.19	336.3	0.8	0.65
							11.6											
133	STM133	STM126	0.142	0.85	0.12	0.12	10.0	104.2	34.9	300	0.30	22.4	0.071	0.075	0.75	53.0	0.5	0.66
	STM131	STM126	0.000	0.00	0.00	0.00	10.0	104.2	0.0	250	1.00	8.6	0.049	0.063	1.21	59.5	0.1	0.00
	STM126	STM125	0.000	0.85	0.00	0.12	10.5	101.6	34.1	300	0.30	18.7	0.071	0.075	0.75	53.0	0.4	0.64
125	STM125	STM124	0.581	0.85	0.49	0.61	10.9	99.6	170.0	525	0.50	83.5	0.216	0.131	1.40	304.1	1.0	0.56
124	STM124	STM121	0.822	0.85	0.70	1.31	11.9	95.1	346.9	600	0.90	47.9	0.283	0.150	2.06	582.5	0.4	0.60
							12.3											
	STM121	OGS			0.00	3.43	12.8	91.5	872.2	750	1.00	3.1	0.442	0.188	2.52	1113.3	0.0	0.78
	OGS	STM135			0.00	3.43	12.8	91.5	871.4	750	1.00	18.2	0.442	0.188	2.52	1113.3	0.1	0.78
							12.9											
B2	STM116	STM115	0.245	0.90	0.22	0.22	10.0	104.2	63.8	300	0.90	14.8	0.071	0.075	1.30	91.7	0.2	0.70
B2	STM115	STM114	0.123	0.90	0.11	0.33	10.2	103.2	94.8	375	1.00	28.4	0.110	0.094	1.59	175.3	0.3	0.54
B2	STM114	STM113	0.245	0.90	0.22	0.55	10.5	101.7	155.7	450	0.50	38.3	0.159	0.113	1.27	201.6	0.5	0.77
B2	STM113	STM111	0.123	0.90	0.11	0.66	11.0	99.2	182.3	525	0.35	36.4	0.216	0.131	1.18	254.4	0.5	0.72
	STM111	STM110		0.90	0.00	0.66	11.5	96.8	178.0	525	0.35	102.7	0.216	0.131	1.18	254.4	1.5	0.70
B3	STM110	STM104	0.022	0.90	0.02	0.68	13.0	90.8	171.7	525	0.35	47.3	0.216	0.131	1.18	254.4	0.7	0.67
							13.6											
B1	STM109	STM108	0.214	0.90	0.19	0.19	10.0	104.2	55.7	300	0.70	18.6	0.071	0.075	1.14	80.9	0.3	0.69
B1	STM108	STM107	0.107	0.90	0.10	0.29	10.3	102.8	82.4	300	0.80	30	0.071	0.075	1.22	86.5	0.4	0.95
B1	STM107	STM106	0.107	0.90	0.10	0.38	10.7	100.7	107.7	375	1.00	20.8	0.110	0.094	1.59	175.3	0.2	0.61
B1	STM106	STM105	0.321	0.90	0.29	0.67	10.9	99.7	186.5	450	0.80	6.3	0.159	0.113	1.60	255.0	0.1	0.73
B3	STM105	STM104	0.022	0.90	0.02	0.69	11.0	99.4	191.2	450	0.80	21.7	0.159	0.113	1.60	255.0	0.2	0.75
							11.2											
	STM104	STM103			0.00	1.37	13.6	88.2	336.7	600	0.45	33.3	0.283	0.150	1.46	411.9	0.4	0.82
	STM103	STM135			0.00	1.37	14.0	86.9	331.5	600	0.50	14.9	0.283	0.150	1.54	434.2	0.2	0.76
							14.2											
	STM135	STM102			0.00	4.80	14.2	86.3	1151.7	975	0.30	33	0.747	0.244	1.64	1227.5	0.3	0.94
	STM102	STM902			0.00	4.80	14.5	85.2	486.3	675	0.35	55.3	0.358	0.169	1.39	497.3	0.7	0.98
	STM902	STM901			0.00	4.80	15.2	83.0	486.3	675	0.35	30.7	0.358	0.169	1.39	497.3	0.4	0.98
	STM901	EX. STM			0.00	4.80	15.5	81.8	486.3	675	0.35	32.6	0.358	0.169	1.39	497.3	0.4	0.98

*Note: Drainage areas B1, B2 and B3 are divided equally between each storm service lead draining the area as shown on drawing SWM-1.
**Storm pipes between STM102 to EX are sized based on the controlled flow downstream of the ICD.

Project: **Ogilvie**

Chamber Model -	MC-4500	
Units -	**Metric**	Click Here for Imperial
Number of Chambers -	264	
Number of chambers -	12	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	72.31	m
Amount of Stone Above Chambers -	305	mm
Amount of Stone Below Chambers -	229	mm
Area of system -	1022	sq.meters

☑ Include Perimeter Stone in Calculations

Min. Area - 933.042 sq.meters

StormTech MC-4500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
2057	0.00	0.00	0.00	0.00	10.378	10.38	1325.65	74.37
2032	0.00	0.00	0.00	0.00	10.378	10.38	1315.27	74.34
2007	0.00	0.00	0.00	0.00	10.378	10.38	1304.89	74.32
1981	0.00	0.00	0.00	0.00	10.378	10.38	1294.52	74.29
1956	0.00	0.00	0.00	0.00	10.378	10.38	1284.14	74.27
1930	0.00	0.00	0.00	0.00	10.378	10.38	1273.76	74.24
1905	0.00	0.00	0.00	0.00	10.378	10.38	1263.38	74.22
1880	0.00	0.00	0.00	0.00	10.378	10.38	1253.00	74.19
1854	0.00	0.00	0.00	0.00	10.378	10.38	1242.62	74.16
1829	0.00	0.00	0.00	0.00	10.378	10.38	1232.25	74.14
1803	0.00	0.00	0.00	0.00	10.378	10.38	1221.87	74.11
1778	0.00	0.00	0.00	0.00	10.378	10.38	1211.49	74.09
1753	0.00	0.00	0.31	0.00	10.256	10.56	1201.11	74.06
1727	0.00	0.00	0.87	0.00	10.030	10.90	1190.55	74.04
1702	0.00	0.00	1.23	0.01	9.882	11.12	1179.65	74.01
1676	0.01	0.00	1.56	0.02	9.748	11.32	1168.53	73.99
1651	0.01	0.00	2.01	0.02	9.567	11.60	1157.20	73.96
1626	0.01	0.00	3.38	0.03	9.012	12.43	1145.61	73.94
1600	0.02	0.00	4.97	0.04	8.374	13.39	1133.18	73.91
1575	0.02	0.00	5.97	0.05	7.970	13.99	1119.79	73.88
1549	0.03	0.00	6.79	0.06	7.640	14.49	1105.80	73.86
1524	0.03	0.01	7.50	0.07	7.353	14.92	1091.32	73.83
1499	0.03	0.01	8.13	0.07	7.098	15.30	1076.40	73.81
1473	0.03	0.01	8.70	0.08	6.866	15.65	1061.10	73.78
1448	0.03	0.01	9.23	0.09	6.652	15.97	1045.45	73.76
1422	0.04	0.01	9.72	0.10	6.451	16.27	1029.49	73.73
1397	0.04	0.01	10.17	0.11	6.264	16.55	1013.22	73.71
1372	0.04	0.01	10.61	0.12	6.089	16.81	996.67	73.68
1346	0.04	0.01	11.01	0.13	5.922	17.06	979.86	73.66
1321	0.04	0.01	11.40	0.13	5.764	17.30	962.79	73.63
1295	0.04	0.01	11.77	0.14	5.613	17.53	945.49	73.61
1270	0.05	0.01	12.12	0.15	5.470	17.74	927.97	73.58
1245	0.05	0.01	12.46	0.16	5.333	17.95	910.23	73.55
1219	0.05	0.01	12.78	0.16	5.202	18.14	892.28	73.53
1194	0.05	0.01	13.08	0.17	5.076	18.33	874.14	73.50
1168	0.05	0.01	13.38	0.18	4.956	18.51	855.81	73.48
1143	0.05	0.02	13.66	0.19	4.840	18.69	837.30	73.45
1118	0.05	0.02	13.93	0.19	4.729	18.85	818.61	73.43
1092	0.05	0.02	14.19	0.20	4.622	19.01	799.76	73.40
1067	0.05	0.02	14.44	0.20	4.520	19.17	780.75	73.38
1041	0.06	0.02	14.68	0.21	4.421	19.31	761.58	73.35
1016	0.06	0.02	14.91	0.22	4.326	19.46	742.27	73.33
991	0.06	0.02	15.14	0.22	4.234	19.60	722.81	73.30
965	0.06	0.02	15.35	0.23	4.145	19.73	703.21	73.28
940	0.06	0.02	15.56	0.23	4.060	19.86	683.49	73.25
914	0.06	0.02	15.76	0.24	3.978	19.98	663.63	73.22
889	0.06	0.02	15.95	0.25	3.899	20.10	643.65	73.20
864	0.06	0.02	16.14	0.25	3.823	20.21	623.56	73.17
838	0.06	0.02	16.32	0.26	3.749	20.32	603.34	73.15
813	0.06	0.02	16.49	0.26	3.678	20.43	583.02	73.12
787	0.06	0.02	16.65	0.27	3.610	20.53	562.59	73.10
762	0.06	0.02	16.81	0.27	3.545	20.63	542.06	73.07
737	0.06	0.02	16.97	0.28	3.481	20.72	521.43	73.05
711	0.06	0.02	17.11	0.29	3.419	20.82	500.71	73.02
686	0.07	0.02	17.25	0.29	3.362	20.90	479.89	73.00
660	0.07	0.02	17.39	0.29	3.306	20.99	458.99	72.97
635	0.07	0.02	17.52	0.30	3.253	21.07	438.00	72.95
610	0.07	0.03	17.64	0.30	3.201	21.14	416.94	72.92
584	0.07	0.03	17.76	0.31	3.152	21.22	395.79	72.89
559	0.07	0.03	17.87	0.31	3.105	21.29	374.57	72.87
533	0.07	0.03	17.98	0.31	3.060	21.36	353.29	72.84
508	0.07	0.03	18.09	0.32	3.017	21.42	331.93	72.82
483	0.07	0.03	18.18	0.32	2.976	21.48	310.51	72.79
457	0.07	0.03	18.28	0.33	2.937	21.54	289.03	72.77
432	0.07	0.03	18.37	0.33	2.901	21.59	267.49	72.74
406	0.07	0.03	18.45	0.33	2.866	21.65	245.89	72.72
381	0.07	0.03	18.53	0.34	2.833	21.70	224.25	72.69
356	0.07	0.03	18.60	0.34	2.802	21.74	202.55	72.67
330	0.07	0.03	18.67	0.34	2.773	21.79	180.81	72.64
305	0.07	0.03	18.74	0.35	2.745	21.83	159.02	72.61
279	0.07	0.03	18.80	0.35	2.719	21.87	137.19	72.59
254	0.07	0.03	18.89	0.35	2.682	21.92	115.33	72.56
229	0.00	0.00	0.00	0.00	10.378	10.38	93.40	72.54
203	0.00	0.00	0.00	0.00	10.378	10.38	83.03	72.51
178	0.00	0.00	0.00	0.00	10.378	10.38	72.65	72.49
152	0.00	0.00	0.00	0.00	10.378	10.38	62.27	72.46
127	0.00	0.00	0.00	0.00	10.378	10.38	51.89	72.44
102	0.00	0.00	0.00	0.00	10.378	10.38	41.51	72.41
76	0.00	0.00	0.00	0.00	10.378	10.38	31.13	72.39
51	0.00	0.00	0.00	0.00	10.378	10.38	20.76	72.36
25	0.00	0.00	0.00	0.00	10.378	10.38	10.38	72.34

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	VIVEK SHARMA 647-463-9803 VIVEK.SHARMA@ADS-PIPE.COM
ADS SALES REP:	HASSAN ELMI 416.985-9757 HASSAN.ELMI@ADS-PIPE.COM
PROJECT NO:	104969

ADVANCED DRAINAGE SYSTEMS, INC.

2012 OGILVIE SITE WORKS

OTTAWA, ONTARIO

STORMWATER CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED 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-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 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 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 SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. 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-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 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 CONSTRUCTION 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.

PROPOSED LAYOUT

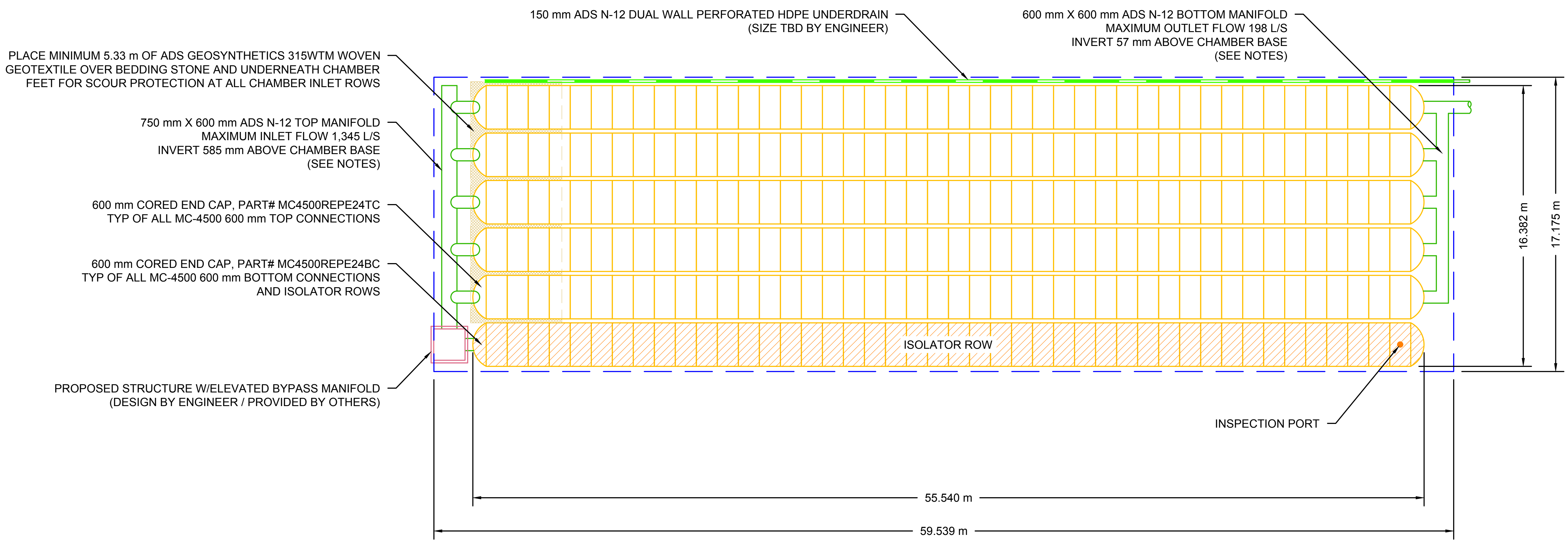
(264) STORMTECH MC-4500 CHAMBERS
(12) STORMTECH MC-4500 END CAPS
INSTALLED WITH 300 mm COVER STONE, 230 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 1,325 m³ **(PERIMETER STONE INCLUDED)**
AREA OF SYSTEM: 1,022 m²
PERIMETER OF SYSTEM: 153 m

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH SHEET #7 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.

PROPOSED ELEVATIONS

MAXIMUM GRADE (TOP OF PAVEMENT/UNPAVED):	76.20
MINIMUM GRADE (UNPAVED WITH TRAFFIC):	74.82
MINIMUM GRADE (UNPAVED NO TRAFFIC):	74.67
MINIMUM GRADE (BASE OF FLEXIBLE PAVEMENT)	74.67
MINIMUM GRADE (TOP OF RIGID CONCRETE PAVEMENT):	74.67
TOP OF STONE:	74.37
TOP OF CHAMBER:	74.06
600 mm TOP MANIFOLD INVERT:	73.13
600 mm BOTTOM MANIFOLD INVERT:	72.60
600 mm ISOLATOR ROW INVERT:	72.60
BOTTOM OF CHAMBER:	72.54
UNDERDRAIN INVERT:	72.31
BOTTOM OF STONE:	72.31



2012 OGILVIE SITE WORKS
OTTAWA, ONTARIO

DATE: 10-15-15
DRAWN: AJD
PROJECT #: 104969
CHECKED: KMS

REV	DRW	CHK	DESCRIPTION

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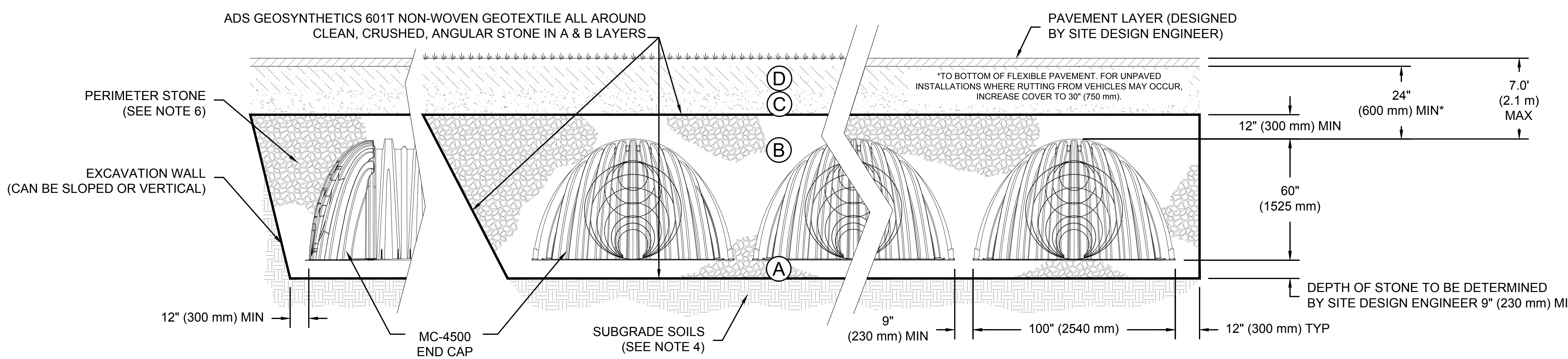
HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 250

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 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	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	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-4500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-4500 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 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.
5. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
6. 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.

2012 OGILVIE SITE WORKS
OTTAWA, ONTARIO

DATE: 10-15-15	DRAWN: AJD
PROJECT #: 104969	CHECKED: KMS

REV	DRW	CHK	DESCRIPTION

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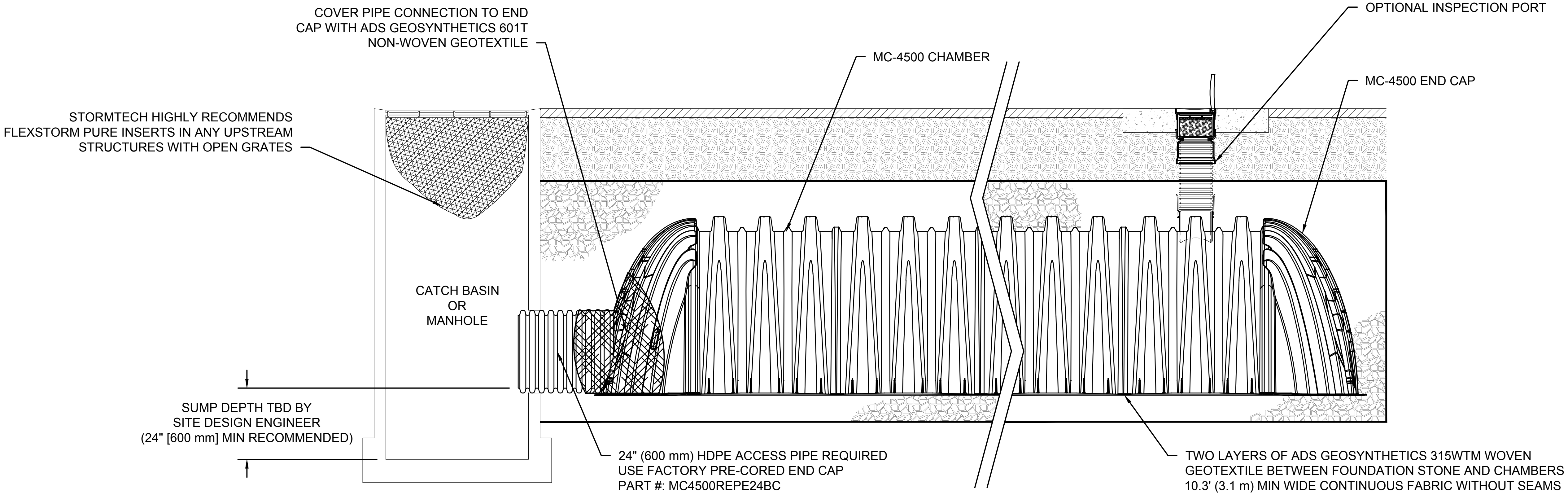


MC-4500 ISOLATOR ROW DETAIL

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.

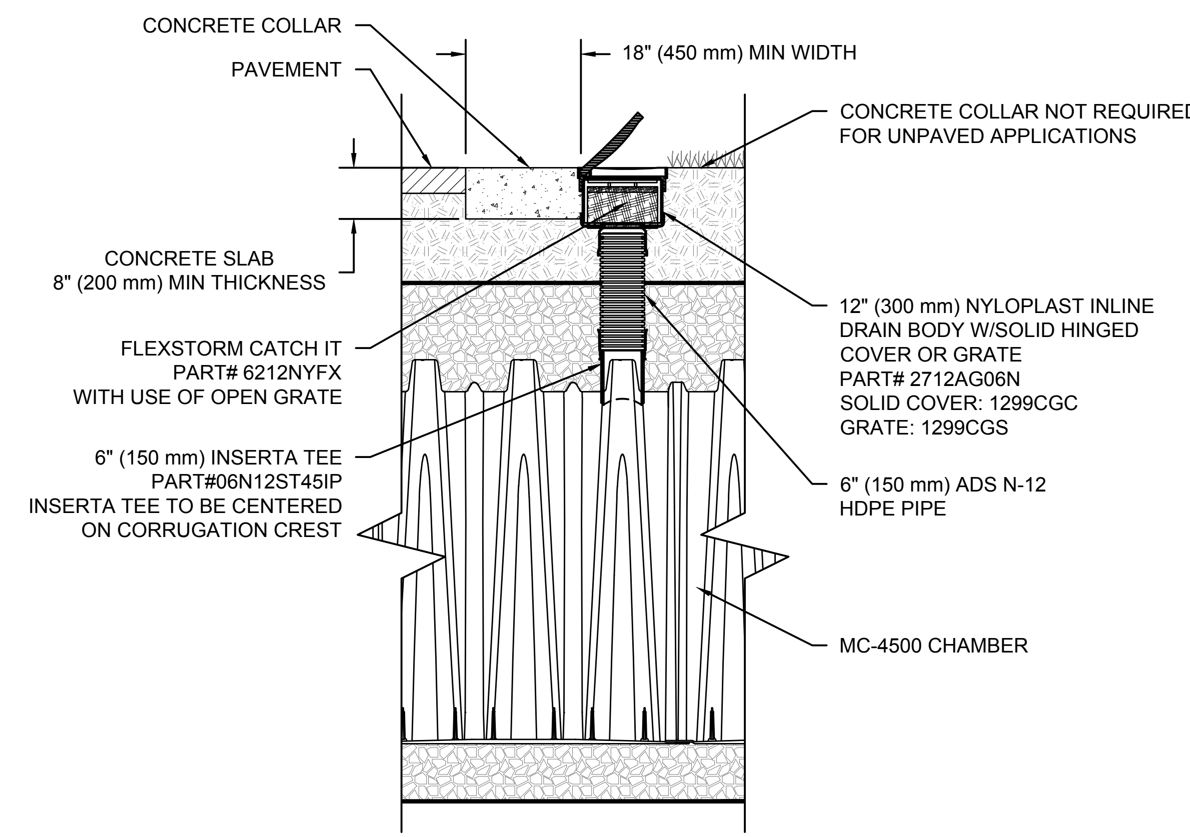
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

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-4500 6" INSPECTION PORT DETAIL

NTS

2012 OGILVIE SITE WORKS
OTTAWA, ONTARIO

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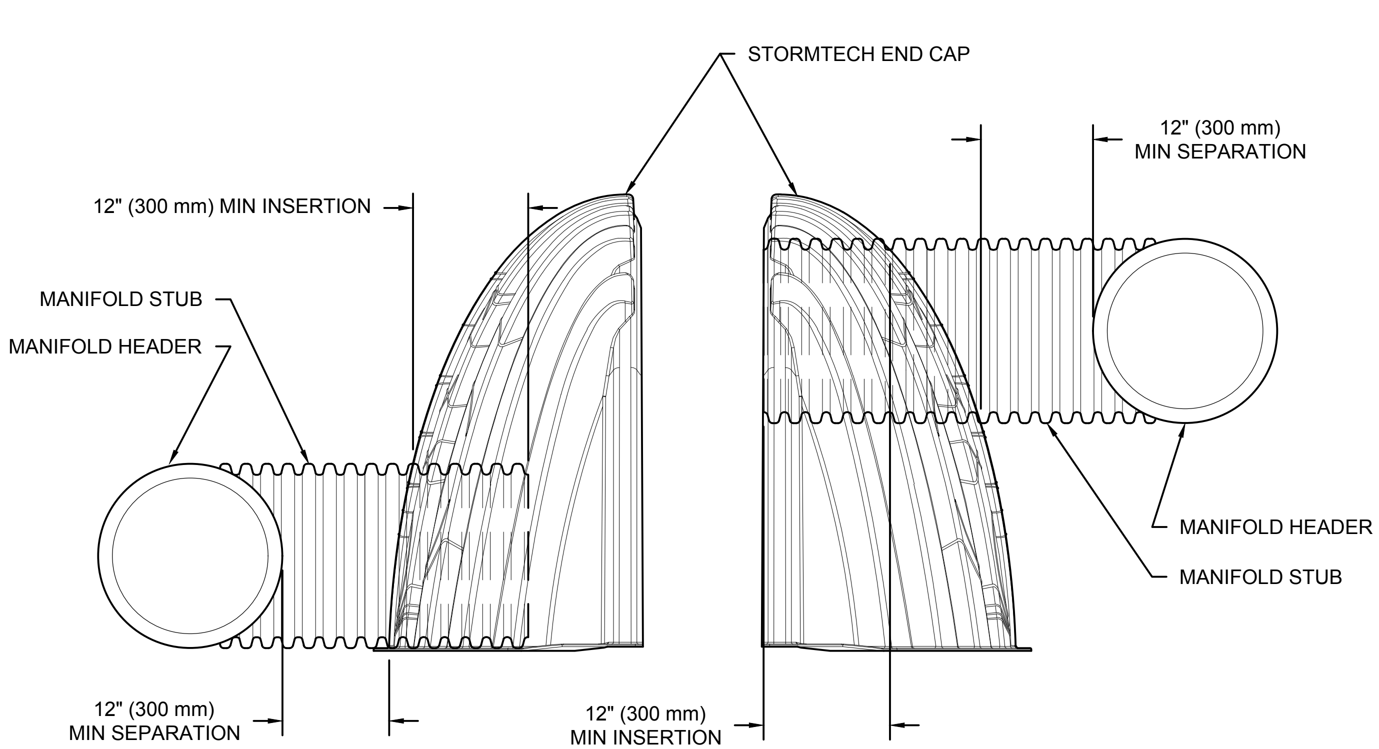
MC-SERIES END CAP INSERTION DETAIL

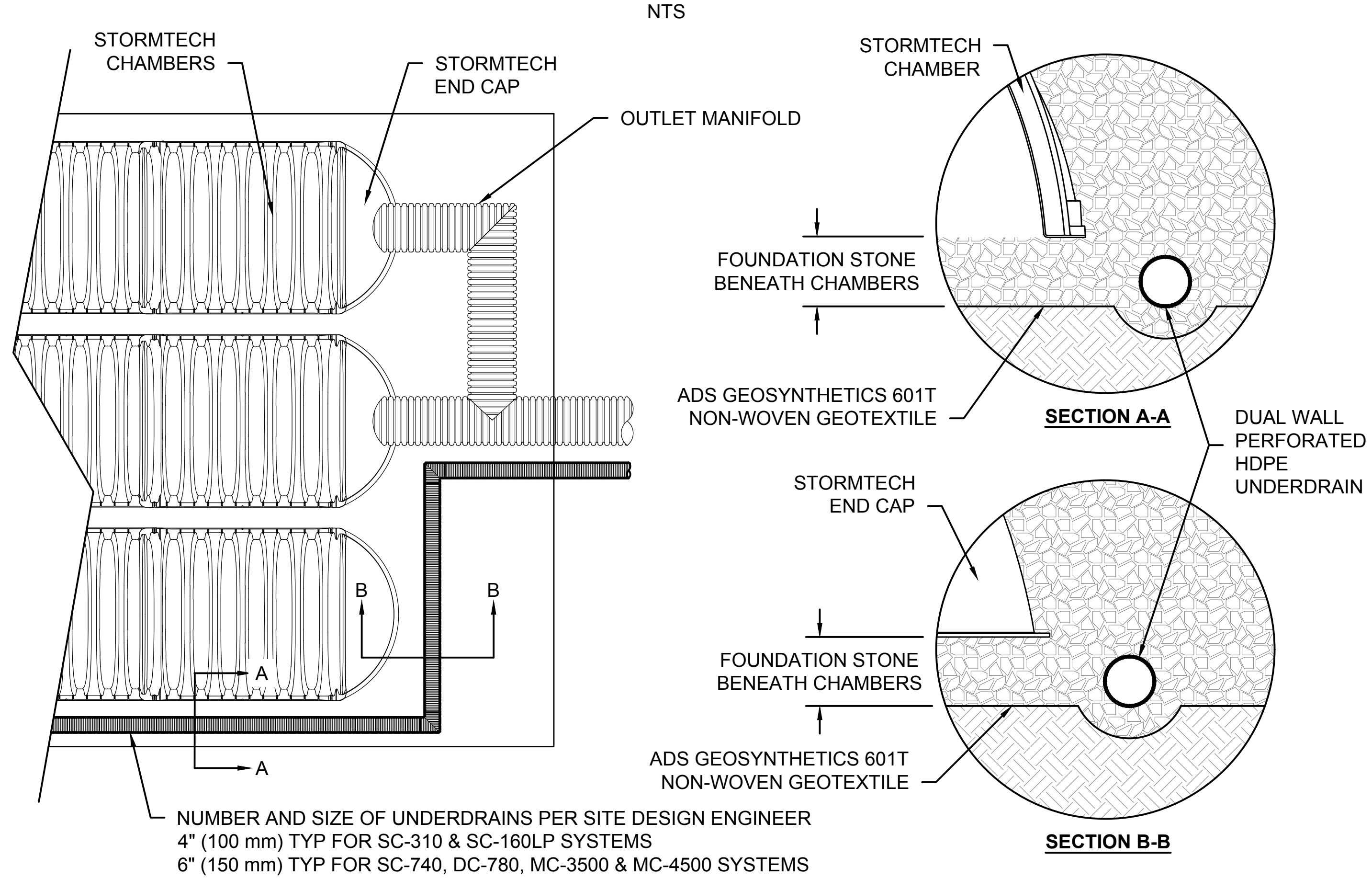
NTS



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

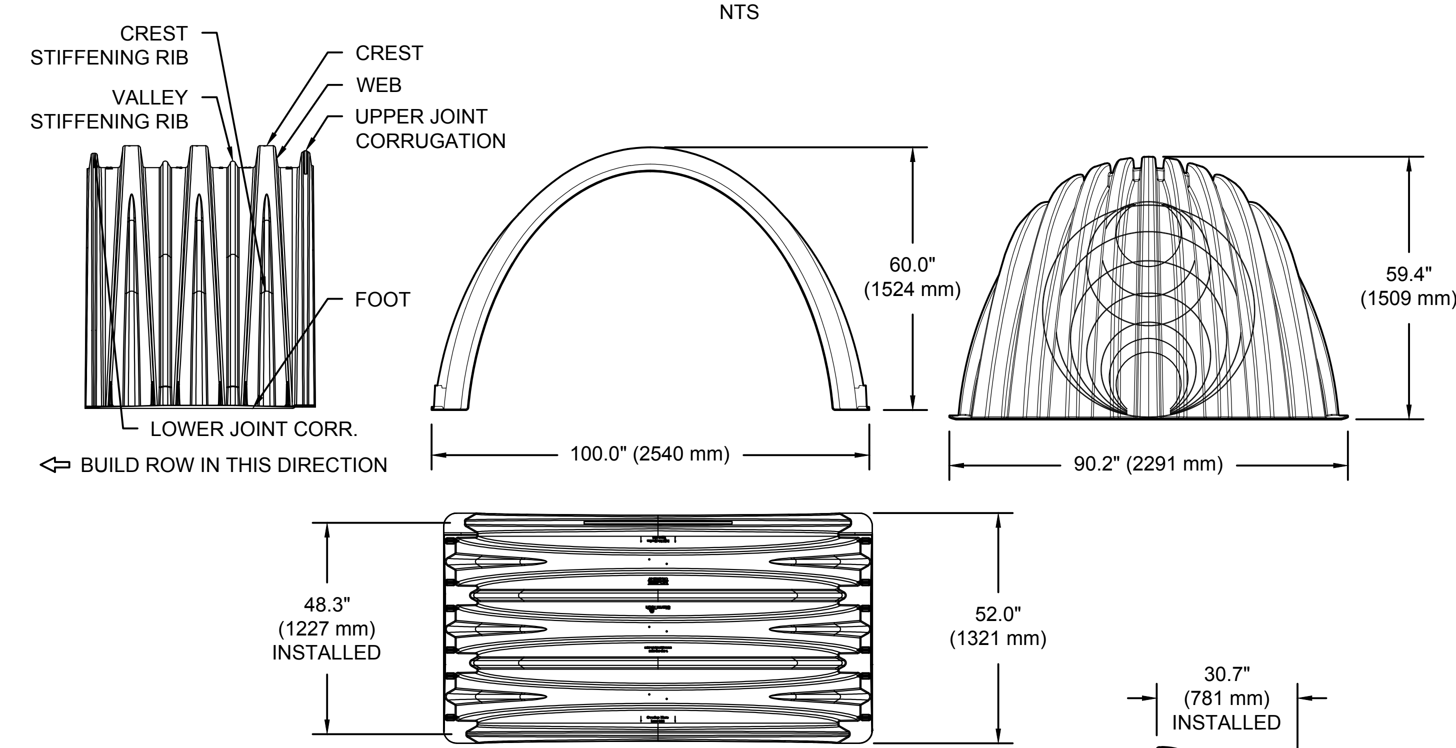
UNDERDRAIN DETAIL

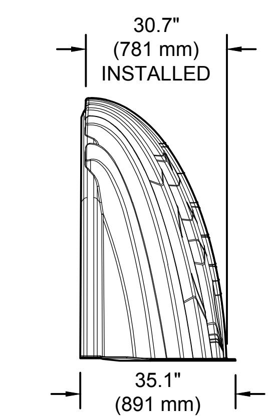
NTS



MC-4500 TECHNICAL SPECIFICATION

NTS





NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT	130.0 lbs.	(59.0 kg)

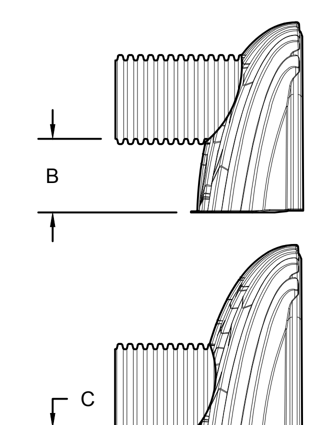
NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	90.2" X 59.4" X 30.7"	(2291 mm X 1509 mm X 781 mm)
END CAP STORAGE	35.7 CUBIC FEET	(1.01 m³)
MINIMUM INSTALLED STORAGE*	108.7 CUBIC FEET	(3.08 m³)
WEIGHT	135.0 lbs.	(61.2 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
MC4500REPE06T	6" (150 mm)	42.54" (1.081 m)	---
MC4500REPE06B		---	0.86" (22 mm)
MC4500REPE08T	8" (200 mm)	40.50" (1.029 m)	---
MC4500REPE08B		---	1.01" (26 mm)
MC4500REPE10T	10" (250 mm)	38.37" (975 mm)	---
MC4500REPE10B		---	1.33" (34 mm)
MC4500REPE12T	12" (300 mm)	35.69" (907 mm)	---
MC4500REPE12B		---	1.55" (39 mm)
MC4500REPE15T	15" (375 mm)	32.72" (831 mm)	---
MC4500REPE15B		---	1.70" (43 mm)
MC4500REPE18TC	18" (450 mm)	29.36" (746 mm)	---
MC4500REPE18BC		---	1.97" (50 mm)
MC4500REPE24TC	24" (600 mm)	23.05" (585 mm)	---
MC4500REPE24BC		---	2.26" (57 mm)
MC4500REPE30BC	30" (750 mm)	---	2.95" (75 mm)
MC4500REPE36BC	36" (900 mm)	---	3.25" (83 mm)
MC4500REPE42BC	42" (1050 mm)	---	3.55" (90 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-4500 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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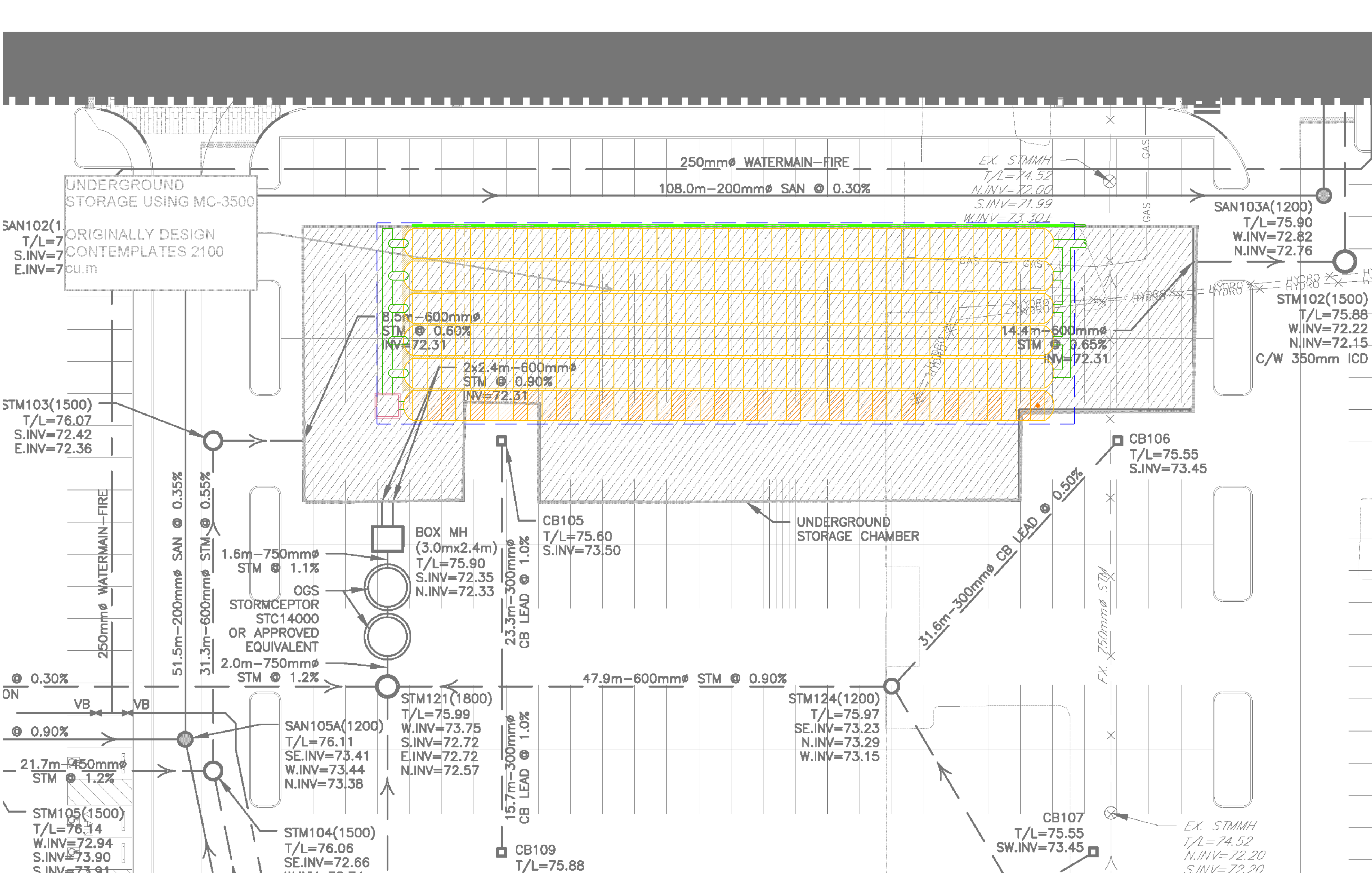
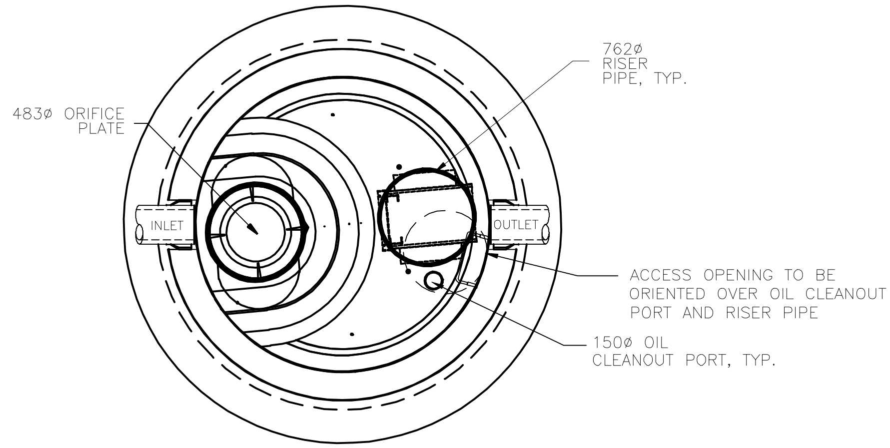
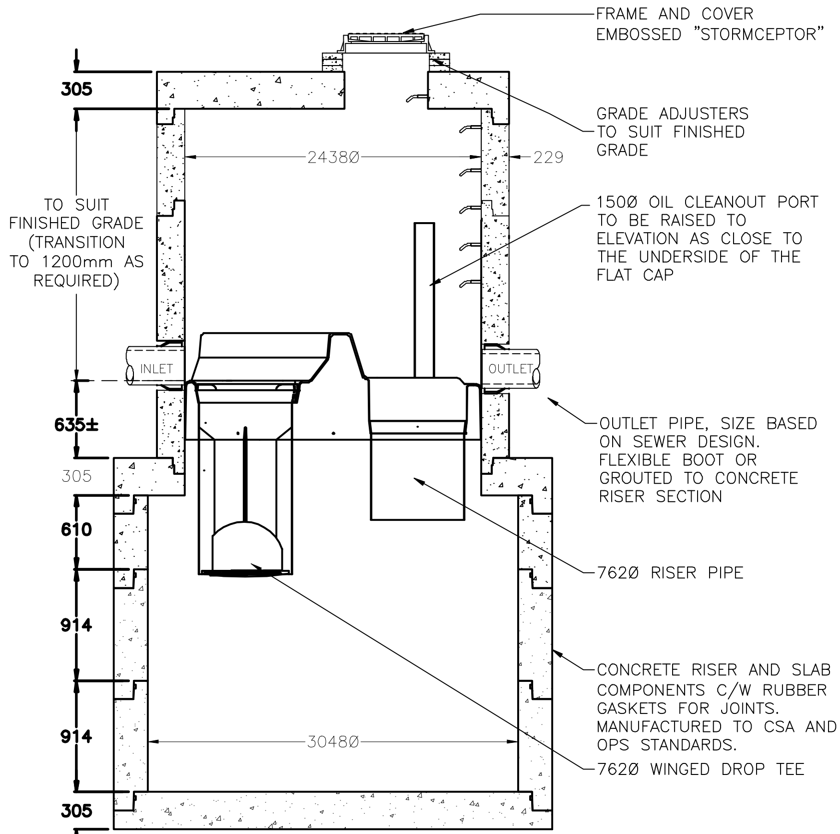


UNDERGROUND STORAGE USING MC-3500
ORIGINALLY DESIGN CONTEMPLATES 2100 cu.m
250mmø WATERMAIN-FIRE
108.0m-200mmø SAN @ 0.30%
EX. STMMH T/L=74.52 N.INV=72.00 S.INV=71.99 W.INV=73.30±
SAN103A(1200) T/L=75.90 W.INV=72.82 N.INV=72.76
STM102(1500) T/L=75.88 W.INV=72.22 N.INV=72.15 C/W 350mm ICD
8.5m-600mmø STM @ 0.60% INV=72.31
14.4m-600mmø STM @ 0.65% INV=72.31
2x2.4m-600mmø STM @ 0.90% INV=72.31
STM103(1500) T/L=76.07 S.INV=72.42 E.INV=72.36
CB106 T/L=75.55 S.INV=73.45
CB105 T/L=75.60 S.INV=73.50
UNDERGROUND STORAGE CHAMBER
BOX MH (3.0mx2.4m) T/L=75.90 S.INV=72.35 N.INV=72.33
1.6m-750mmø STM @ 1.1%
OGS STORMCEPTOR STC14000 OR APPROVED EQUIVALENT
2.0m-750mmø STM @ 1.2%
250mmø WATERMAIN-FIRE
51.5m-200mmø SAN @ 0.35%
31.3m-600mmø STM @ 0.55%
23.3m-300mmø CB LEAD @ 1.0%
31.6m-300mmø CB LEAD @ 0.50%
47.9m-600mmø STM @ 0.90%
EX. 750mmø STM
STM121(1800) T/L=75.99 W.INV=73.75 S.INV=72.72 E.INV=72.72 N.INV=72.57
STM124(1200) T/L=75.97 SE.INV=73.23 N.INV=73.29 W.INV=73.15
@ 0.30%
@ 0.90%
VB
VB
SAN105A(1200) T/L=76.11 SE.INV=73.41 W.INV=73.44 N.INV=73.38
21.7m-450mmø STM @ 1.2%
15.7m-300mmø CB LEAD @ 1.0%
STM105(1500) T/L=76.14 W.INV=72.94 S.INV=73.90 S.INV=73.91
STM104(1500) T/L=76.06 SE.INV=72.66 W.INV=72.74
CB109 T/L=75.88 W.INV=75.70
CB107 T/L=75.55 SW.INV=73.45
EX. STMMH T/L=74.52 N.INV=72.20 S.INV=72.20
GAS
HYDRO

NOT FOR CONSTRUCTION



PLAN VIEW



SECTION VIEW

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:

CANADIAN PATENT NO. 2,009,208
CANADIAN PATENT NO. 2,137,942
CANADIAN PATENT NO. 2,175,277
CANADIAN PATENT NO. 2,180,305
CANADIAN PATENT NO. 2,180,383
CANADIAN PATENT NO. 2,206,338

Hanson
Stormceptor®
R.R. 2, CAMBRIDGE, ONTARIO NIR 5S3
TEL. 519-622-7574
1-888-888-3222
FAX 519-621-8233 MAIN OFFICE
519-621-7750 TECHNICAL SERVICES

STORMCEPTOR OSR INLINE MODEL OSR 4000

DATE	D.B.	UNITS	DWG No.
10 NOV 08	F. MENG	METRIC	G-4 OSR

Stormceptor® OSR

Project Information

Date	Thursday, October 15, 2015
Project Name	2012 Oglivie Rd
Project Number	
Location	Ottawa

Stormwater Quality Objective

This report outlines how StormceptorOSR System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the StormceptorOSR Sizing Summary.

StormceptorOSR System Recommendation

The StormceptorOSR System Model OSR 4000 removes 86% TSS distribution and 94% runoff volume.

The StormceptorOSR System

Stormceptor® was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. Stormceptor targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminates through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants. Through research and field application, the Stormceptor technology has been refined to successfully separate oil and sediment from stormwater runoff as well as capture oil spills. The Stormceptor Oil and Sand Removal (OSR) system has been modified from the original Stormceptor STC platform to specifically target the removal of fine sand-sized particles.

The Stormceptor OSR was developed by Imbrium Systems to maximize the treatment flow rate through the lower chamber and resulted from computational fluid dynamics (CFD) analyses and a series of physical tests. Patent pending modifications to the existing Stormceptor STC platform, which define the Stormceptor OSR include:

- Offset weir
- Increase weir height
- Use of enhanced orifice plate
- Incorporation of a series of vertical vanes in the drop tee
- Incorporation of a wing at the base and back wall extenstions on the drop tee

The Stormceptor OSR is a new, differentiated water quality treatment product focused on addressing the removal of fine sand-sized sediment. It is designed to efficiently address regional stormwater quality regulatory requirements when utilized in pre-treatment, redevelopment or retrofit projects. The Stormceptor OSR differs from the original Stormceptor STC platform, which is the core product focused on the removal and retention of very fine sediment particles.

Stormceptor® OSR

Small storms dominate hydrologic activity, US EPA reports

"Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control."

"Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall)."

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each StormceptorOSR system is sized using rainfall information from PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date 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. StormceptorOSR's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribtution, peaks (Figure 1)
- Interevent Periods
- Particle size distribution
- Particle settling velocities (Stoke's law corrected for drag)
- Detention time in the system

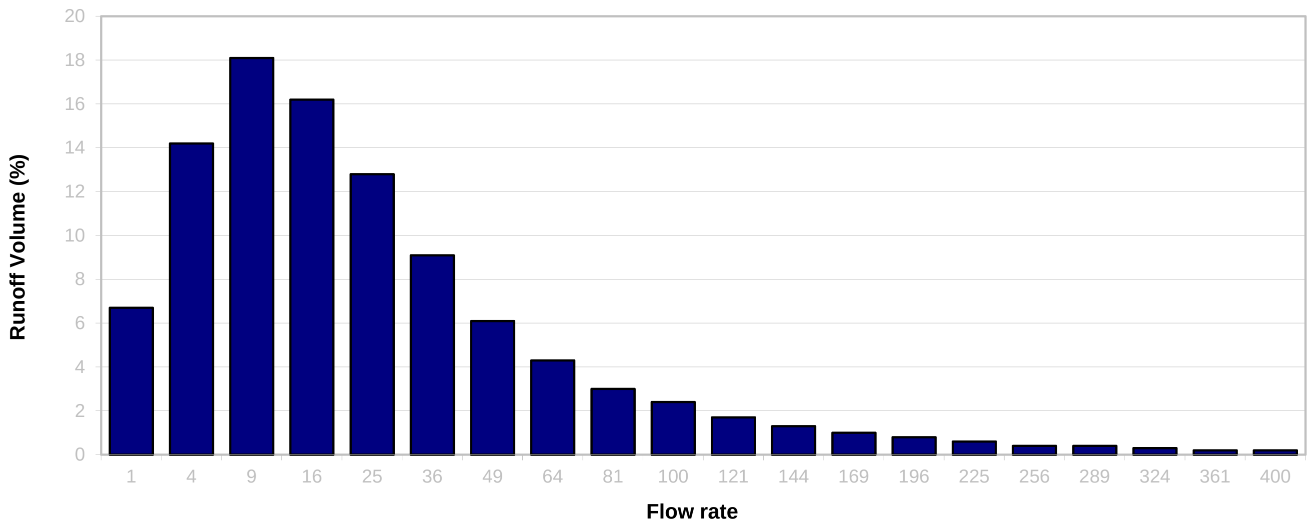


Figure 1. Runoff Volume by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A, 1967 to 2003 for 4.02 ha, 93% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

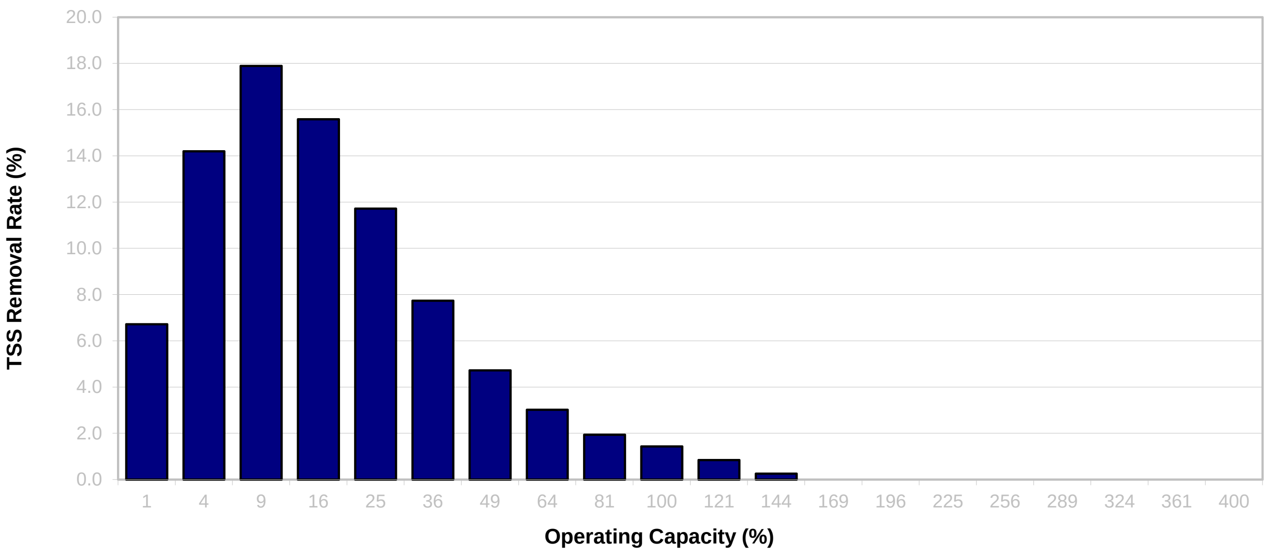


Figure 2. Weighted TSS removal by flow rate for OTTAWA MACDONALD-CARTIER INT'L A, 1967 to 2003 for 4.02 ha, 93% impervious. The bulk of material removed is captured during the most frequent, less intense rainfall events. The larger storms do not contribute as much to the overall TSS removal.

Stormceptor OSR

Appendix 1
StormceptorOSR Design Summary

Project Information

Date	####################
Project Name	2012 Oglivie Rd
Project Number	
Location	Ottawa

Designer Information

Company	
Contact	Steve M

Drainage Area

Total Area (ha)	4.02
Imperviousness (%)	93

Rainfall

Name	OTTAWA M/
State	Ontario
ID	ON6000
Years of Record	36
Coordinates	45°19'N, 75°

Water Quality Objective

TSS Removal (%)	80
Runoff Volume (%)	90

The StormceptorOSR System model OSR 4000 removes 86.1% TSS and 93.7% runoff volume.

OSR Model	TSS Removal %	Runoff Capture %
OSR 300	43	58
OSR 750	66	79
OSR 2000	79	89
OSR 4000	**86**	**94**
OSR 6000	91	97
OSR 9000	94	98
OSR 14000	96	99

OSR Model: 4000

StormceptorOSR Treatment Capacity (l/s):
StormceptorOSR Hydraulic Capacity (l/s): 729

Runoff Rate (L/s)	Runoff Volume Treated (cu.m)	Runoff Volume Overflowed (cu.m)	Percent Rainfall Volume (%)	Cumulative Runoff Volume (%)	Treated Flow Rate (L/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
1	47285	659141	6.7	6.7	1	1	100	6.7
4	147276	559106	14.2	20.9	4	4	100	14.2
9	275162	431452	18.1	39	9	8	99	17.9
16	390022	316367	16.2	55.2	16	14	96	15.6
25	480256	226024	12.8	68	25	23	92	11.7
36	544234	162232	9.1	77.1	36	33	85	7.7
49	587799	118527	6.1	83.2	49	44	77	4.7
64	617824	88525	4.3	87.5	64	58	70	3
81	639398	66947	3	90.5	81	73	65	1.9
100	655836	50526	2.4	92.9	100	91	60	1.4
121	668358	37976	1.7	94.6	110.4	110	50	0.8
144	677704	28638	1.3	95.9	110.4	130	20	0.3
169	684590	21748	1	96.9	110.4	153	0	0
196	690066	16277	0.8	97.7	110.4	178	0	0
225	694227	12113	0.6	98.3	110.4	204	0	0
256	697438	8902	0.4	98.7	110.4	232	0	0
289	699899	6441	0.4	99.1	110.4	262	0	0
324	701917	4423	0.3	99.4	110.4	293	0	0
361	703466	2872	0.2	99.6	110.4	327	0	0
400	704585	1753	0.2	99.8	110.4	362	0	0
				redicted Net Annual Removal Efficiency =				**86.1**

Stormceptor® OSR

Particle Size Distribution

Removing particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the StormceptorOSR System.

OK-110

Particle Size (um)	Mass Fraction (%)	Specific Gravity	Settling Velocity Vs (m/s)		Particle Size (um)	Mass Fraction (%)	Specific Gravity	Settling Velocity Vs (m/s)
1	0.2	2.65	0.00115					
53	3	2.65	0.00672					
75	15	2.65	0.01312					
88	25	2.65	0.01775					
106	40.8	2.65	0.02511					
125	15	2.65	0.03391					
150	1	2.65	0.04688					
0	0	0	0.00000					

StormceptorOSR Design Notes

- StormceptorOSR performance estimates are based on full-scale lab evaluation.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) Removal.
- Only the OSR 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Ask your local StormceptorOSR representative about multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows.

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	OSR 300	OSR 750 to OSR 6000	OSR 9000 to
Single inlet pipe	75mm	25 mm	75mm

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local StormceptorOSR representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801

Stormceptor OSR

Appendix 2
Summary of Design Assumptions

Site Drainage Area

Total Area (ha)	4.02	Imperviosness (%)

Surface Characteristics

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

Infiltration Parameters

Horton's eq'n is used to estimate infiltration	
Max Infiltration Rate (mm/hr)	
Min Infiltration Rate (mm/hr)	
Decay Rate (/s)	
Regeneration rate (/s)	

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal.

Maintenance Frequency (months)	12

Evaporation

Daily Evaporation Rate (mm/day)	

Dry Weather Flow

Dry Weather Flow	N

Winter Months

Winter Infiltration	

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the StormceptorOSR System is identified in the table below.

Storage ha-m	Discharge L/s
0	0

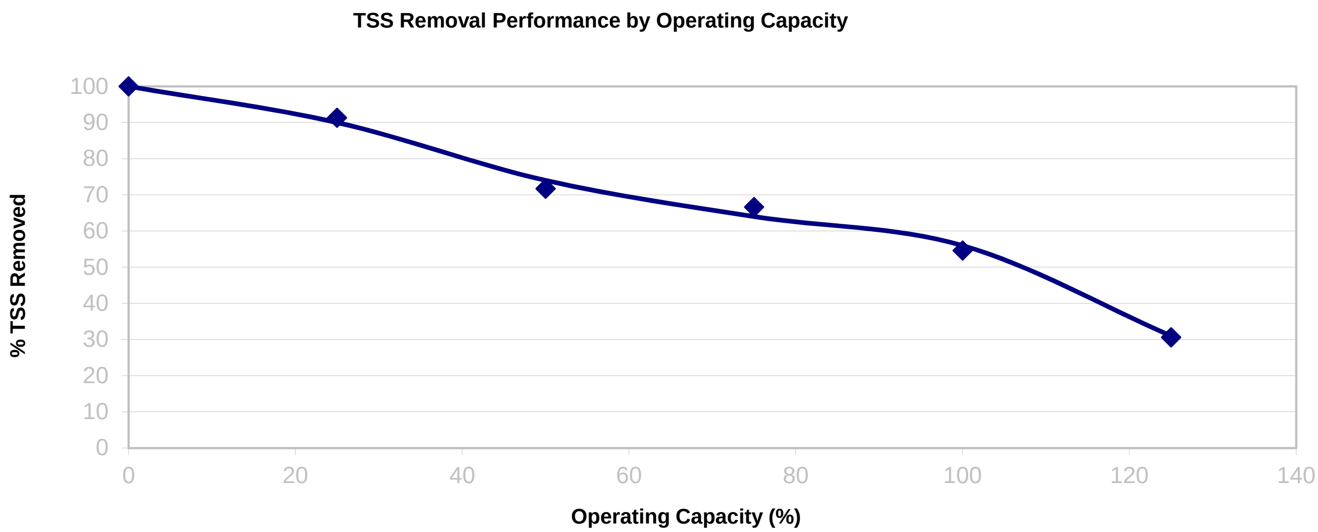
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the StormceptorOSR System are based on the average annual removal of TSS for the selected site parameters.

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

Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A		
Rainfall File Name	ON6000.ndc	Beginning Year	1967
Coordinates	45°19'N, 75°40'W	Ending Year	2003
Elevation	370		
Rainfall period of record (y)	36		
Total rainfall period (y)	36		

TSS Removal Performance Curve



Cumulative Runoff Volume by Runoff Rate

Runoff Rate l/s	Runoff Volume m3	Volume Overflowed m3	Cumulative Runoff Volume %
1	47285	659141	6.7
4	147276	559106	20.9
9	275162	431452	39
16	390022	316367	55.2
25	480256	226024	68
36	544234	162232	77.1
49	587799	118527	83.2
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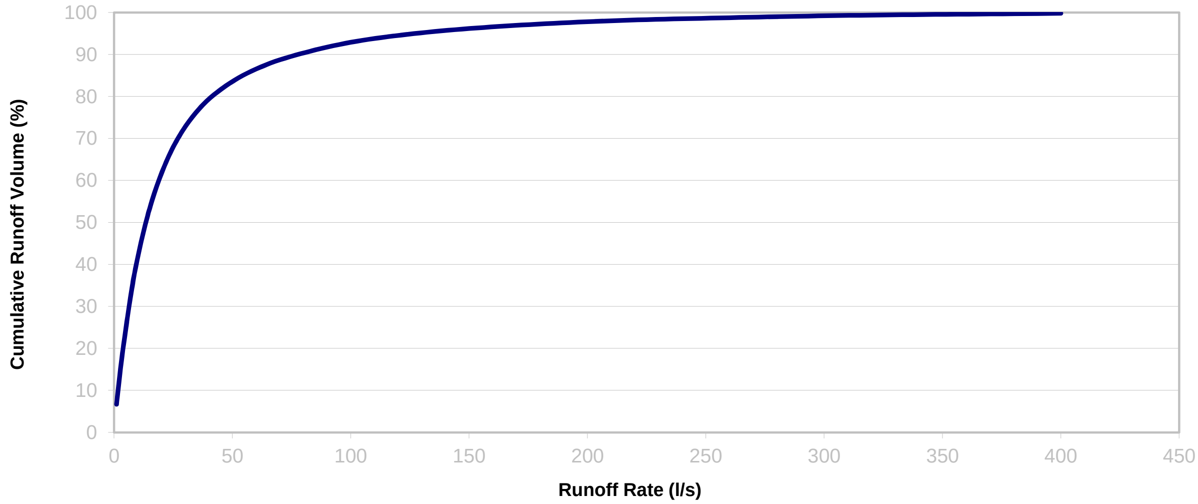
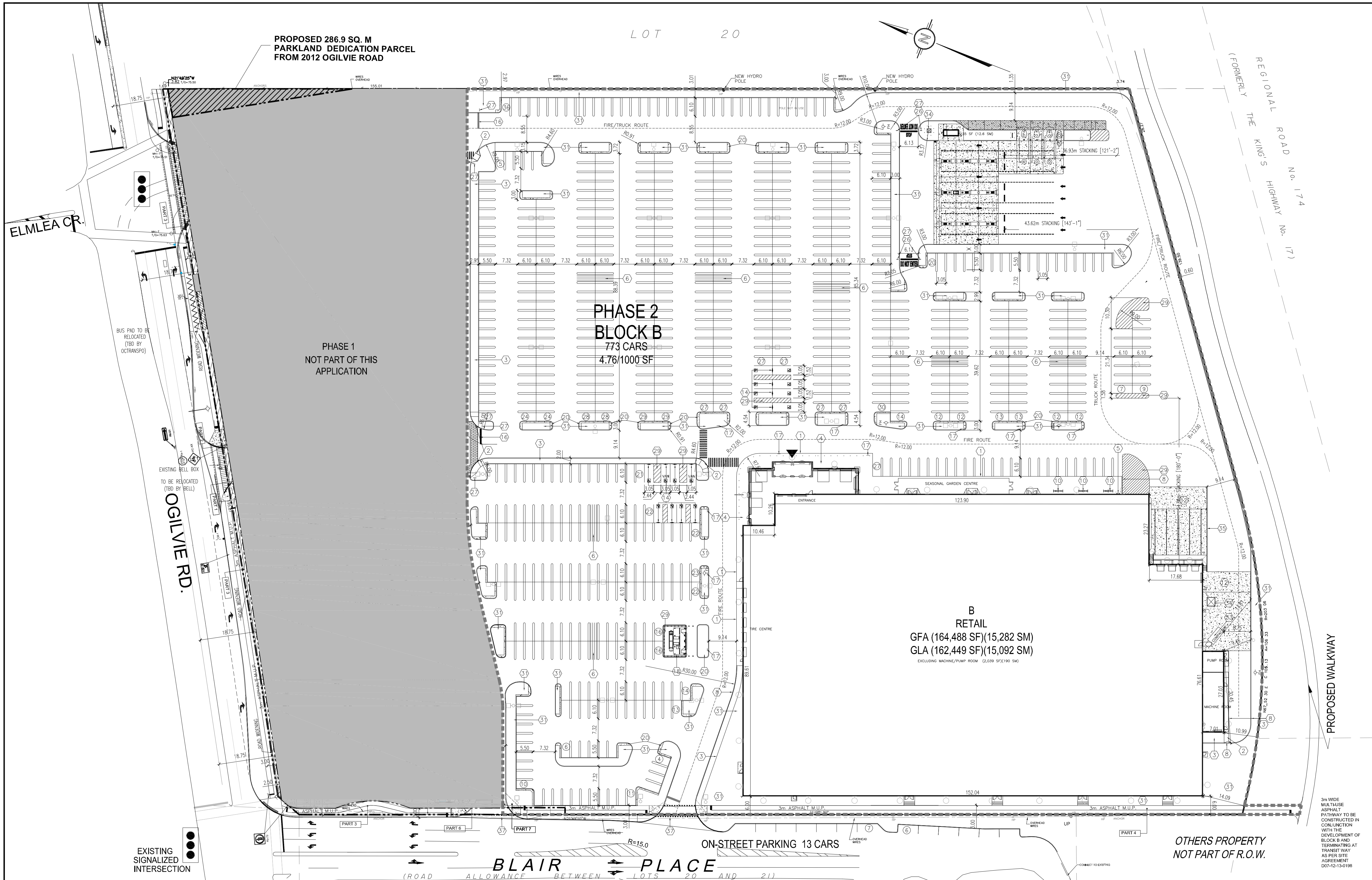
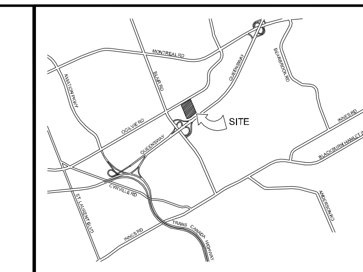
144	677704	28638	95.9
169	684590	21748	96.9
196	690066	16277	97.7
225	694227	12113	98.3
256	697438	8902	98.7
289	699899	6441	99.1
324	701917	4423	99.4
361	703466	2872	99.6
400	704585	1753	99.8
441	705288	1050	99.9
484	705634	704	99.9
529	705918	420	99.9
576	706104	233	100
625	706210	127	100
676	706282	55	100
729	706322	15	100
784	706337	0	100
841	706337	0	100
900	706337	0	100

Cumulative Runoff Rate by Runoff Volume



DRAWINGS / FIGURES





KEY PLAN

NTS

GENERAL NOTES :

1. DEPRESSED CONCRETE CURB FLUSH WITH ASPHALT
2. DEPRESSED CONCRETE CURB AND RAMP MAX.1 to 10 SLOPE WITH MIN 0.61 M TACTILE WARNING SURFACE
3. CONCRETE SIDEWALK
4. CONCRETE SIDEWALK AT BUILDING SHALL BE CONSTRUCTED BY BUILDING CONTRACTOR REFER TO ARCH. DWGS. FOR EXTENT
5. SIAMESE CONNECTION
6. RETAINING WALL WITH GUARD RAIL
7. TEMPORARY ASPHALT CURB
8. CONCRETE CURB
9. CONCRETE CROSSWALK
10. BIKE RACKS
11. PLANTERS REFER TO LANDSCAPE DWG
12. HEAVY DUTY CONCRETE PAVING
14. ACCESSABLE PARKING SPACE AND SIGN (TYP.)
15. TRAFFIC ARROWS
16. STOP BAR
17. FIRE LANE MARKING SIGN AS CITY'S LATEST BYLAW
18. PROPANE STATION
19. RAILINGS/STAIRS WITH TACTILE WARNING SURFACE
20. CONCRETE ISLAND
26. DO NOT ENTER SIGN
27. STOP SIGN (RA-1)
28. COMMUNITY MAIL BOX
29. PAINTED ISLAND
30. NO EXIT SIGN
31. LANDSCAPED ISLAND (TYP.) AS SHOWN
32. ILLUMINATED THANKS /DO NOT ENTER SIGN
33. CONCRETE TRASH COMPACTOR/ENCLOSURE PAD
34. TRANSFORMER PAD/SWITCH BOARD REFER TO ELEC DWG
35. RETAINING WALL REFER TO ARCHITECTURAL DWG
36. SCREEN WALL
37. ENTRANCES AS PER STD DWG SC7.1
38. 115mm SINGLE SOLID YELLOW LINE AS PER MUNICIPAL STANDARDS

LEGENDS :

- CONCRETE /LANDSCAPED ISLAND
- PHASE LINE
- ▼ PROPOSED MAIN BUILDING ENTRANCE
- FIRE HYDRANT

SITE STATISTICS	
TOTAL SITE AREA:	845,890.59 SF (78,583.23 SM) 19.41 ACRES
ROAD WIDENING AREA PART 5:	3,997.02 SF (371.32 SM) 0.09 ACRE
ROAD WIDENING AREA PART 3:	2,610.51 SF (298.73 SM) 0.07 ACRE
DAY LIGHT TRIANGLES PART 3 & 4:	269 SF (25 SM) 0.01 ACRE
PROPOSED PARKLAND DEDICATION	
PARCEL FROM 2012 OGILVIE ROAD :	3,088.27 SF (286.9 SM) 0.07 ACRE
TOTAL NET SITE AREA:	835,320.7 SF (77,601.28 SM) 19.17 ACRES
TOTAL BUILDING AREA (GFA):	207,334 SF (19,261.3 SM) 24.73 %
TOTAL BUILDING AREA (GLA):	204,004 SF (18,947.6 SM)
TOTAL PARKING REQUIRED :	683 CARS (3.34/1000 SF-3.60/100 SM)
TOTAL PARKING PROVIDED :	947 CARS (4.64/1,000 SF-5.00/100 SM)
TOTAL PARKING PROVIDED	
INCLUDING ON-STREET PARKING	
	960 CARS (4.71/1000 SF-5.07/100 SM)
TOTAL PAVED AREA :	517,661.12 SF (48,089.46 SM)
TOTAL LANDSCAPED AREA:	114,427.55 SF (10,630.32 SM) 22.11%
TOTAL BIKE SPACES REQUIRED :	39 SPACES (1/500 SM OF GFA)
TOTAL BIKE SPACES PROVIDED :	41 SPACES (1/470 SM OF GFA)
PARKING SIZE REQUIRED :	2.6M X 5.2M
PARKING SIZE PROVIDED :	2.6M X 5.2M AND 2.75M X 5.8M AND 2.74M X 5.49M
	AND 3.05M X 6.10M
TOTAL NUMBER OF LOADING SPACES PROVIDED:	6 SPACES

PHASE 1 (BLOCK A)	
BLOCK AREA :	181,305.69 SF (16,843.29 SM)(4.16 ACRES)
PHASE 1 AREA :	217,502.36 SF (20,205.97 SM)(4.99 ACRES)
RETAIL AREA (GFA):	42,711 SF (3,966.7 SM)
RETAIL AREA (GLA):	41,515 SF (3,855.6 SM)
TOTAL PARKING REQUIRED (GLA) :	139 CARS (3.34/1000 SF-3.60/100 SM)
TOTAL PARKING PROVIDED :	174 CARS (4.19/1000 SF-4.51/100 SM)
TOTAL PAVED AREA :	127,507.67 SF (11,845.27 SM)
TOTAL LANDSCAPED AREA:	47,502.69 SF (4,413 SM) 37.25%
TOTAL BIKE SPACES REQUIRED :	8 SPACES (1/500 SM OF GFA)
TOTAL BIKE SPACES PROVIDED :	10 SPACES (1/388 SM OF GFA)
TOTAL NUMBER OF LOADING SPACES PROVIDED:	2 SPACES
LOT COVERAGE	19.54 %
PHASE 2 (BLOCK B)	
BLOCK AREA :	654,015.01 SF (60,757.99 SM)(15.02 ACRES)
PHASE 2 AREA :	621,566.31 SF (57,743.51 SM)(14.27 ACRES)
TOTAL BUILDING AREA (GFA):	164,488 SF (15,282 SM)
GAS BAR STORAGE /STRUCTURE AREA :	135 SF (12.6 SM)
TOTAL BUILDING AREA (GFA):	164,623 SF (15,294 SM) 26.49%
TOTAL BUILDING AREA (GLA):	162,449 SF (15,092 SM)
TOTAL PARKING REQUIRED (GLA) :	544 CARS (3.34/1000 SF-3.60/100 SM)
COSTCO PARKING :	773 CARS (4.76/1000 SF-5.12/100 SM)
ON-STREET PARKING:	13 CARS
TOTAL COSTCO PARKING :	786 CARS (4.84/1000 SF-5.21/100 SM)
TOTAL PAVED AREA :	390,153.45 SF (36,244.19 SM)
TOTAL LANDSCAPED AREA:	63,836.59 SF (5,930.42 SM) 16.36%
TOTAL BIKE SPACES REQUIRED :	31 SPACES (1/500 SM OF GFA)
TOTAL BIKE SPACES PROVIDED :	31 SPACES (1/500 SM OF GFA)
TOTAL NUMBER OF LOADING SPACES PROVIDED:	4 SPACES

FORESTRY SERVICES BRANCH IS TO CONTACTED TO ARRANGE A SITE VISIT TO INSPECT THE TREE PROTECTION MEASURES ALONG BLAIR PLACE ONCE THEY ARE FULLY INSTALLED. ALL TREE PROTECTION MEASURES MUST BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY TREE REMOVAL AND/OR ON-SITE WORKS AND MAINTAINED FOR THE DURATION OF CONSTRUCTION.

DRAFT PLAN OF SURVEY of

PART OF LOT 20
CONCESSION 2 (OTTAWA FRONT)
GEOGRAPHIC TOWNSHIP OF
CITY OF OTTAWA

PROVIDED BY STANTEC

TRINITY

No.	REVISIONS	DATE	BY
10	UPDATED ACCESS ON OGILVIE ROAD	MAY 11, 2016	DR
9	UPDATED BLAIR PLACE	MAY 10, 2016	DR
8	UPDATED ROAD DESIGN	APR. 29, 2016	DR
7	UPDATED BLDG B AREA	APR. 19, 2016	DR
6	REVISED BLDG B PARKING	APR. 14, 2016	DR
5	REISSUED FOR SITE PLAN APPROVAL	APR. 11, 2016	DR
4	REISSUED FOR SITE PLAN APPROVAL	FEB. 09, 2016	DR
3	REISSUED FOR SITE PLAN APPROVAL	OCT. 29, 2015	DR
2	REISSUED FOR SITE PLAN APPROVAL	SEP. 14, 2015	DR
1	REVISED AS PER CITY'S COMMENTS	AUG. 31, 2015	DR
A	ISSUED FOR SITE PLAN APPROVAL	AUG. 11, 2015	DR

MARK VOID ALL COPIES PREVIOUS FINAL DATE

SITE PLAN - PHASE 2

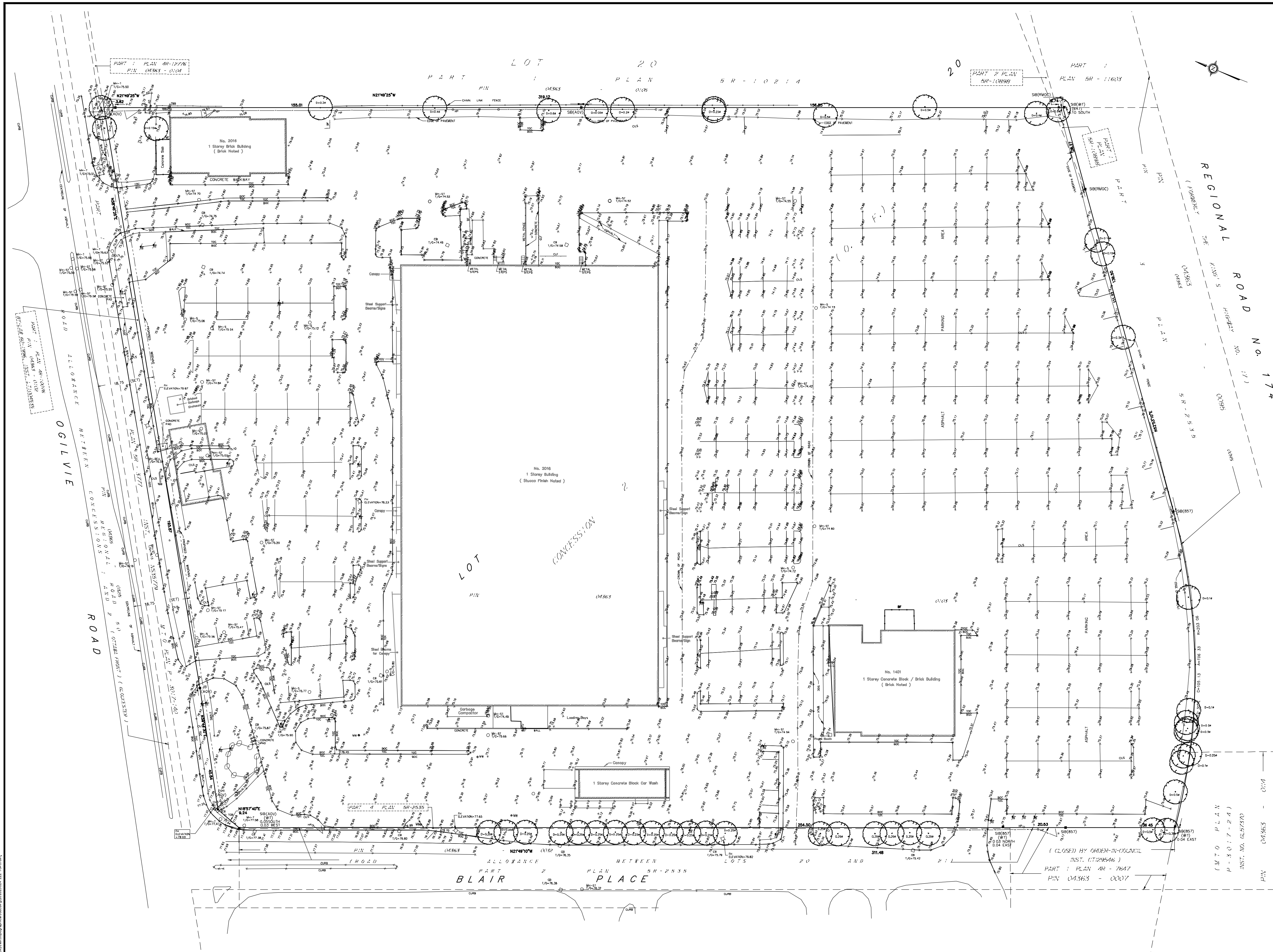
SCALE: 1:500

COMMERCIAL DEVELOPMENT
CITY CENTRE EAST
2012 OGILVIE ROAD – GLOUCESTER
OTTAWA, ON

PETROFF PARTNERSHIP ARCHITECTS
PETROFF
260 TOWN CENTRE BLVD. SUITE 300
MARKHAM ONTARIO CANADA L3R 8H8
TEL 905. 470. 7000 FAX 905. 470. 2500

ONTARIO ASSOCIATION OF ARCHITECTS
MICHAELA WEINER
LICENCE
3636

DRAWN BY	DR	PROJECT No.	13151
CHECKED BY	MW		
DATE	AUGUST 28, 2013	DWG. No.	SA-001
ISSUED	MAY 11, 2016		



TOPOGRAPHIC PLAN of

PART OF LOT 20
CONCESSION 2 (OTTAWA FRONT)
GEOGRAPHIC TOWNSHIP OF
CITY OF OTTAWA

Stantec Geomatics Ltd.

Scale 1 : 400

16 12 8 4 0 8 16 Metres

METRIC CONVERSION

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

GRID SCALE CONVERSION

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999954.

BEARING NOTE

BEARINGS HEREON ARE GRID BEARINGS DERIVED FROM THE CAN-NET VRS NETWORK AND ARE REFERRED TO THE CENTRAL MERIDIAN 76° 30' WEST LONGITUDE OF THE 3° MTM ONTARIO COORDINATE SYSTEM, NAD83 (ORIGINAL) ZONE 9.

ELEVATION NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE DERIVED FROM THE NATIONAL CAPITAL COMMISSION MONUMENT NO. 019680135, LOCATED 4TH LIGHT POST WEST OF THE BLAIR ROAD OVERPASS NORTH OF THE QUEENSWAY, HAVING AN ELEVATION OF 74.381 METERS.

SHEET 1 OF

LEGEND & NOTES: (IF APPLICABLE)

■	DENOTES FOUND MONUMENTS
□	DENOTES SET MONUMENTS
IB	DENOTES IRON BAR
SIB	DENOTES STANDARD IRON BAR
SSIB	DENOTES SHORT STANDARD IRON BAR
CC	DENOTES CUT CROSS
N&W	DENOTES NAIL & WASHER
PL	DENOTES REGISTERED PLAN
OU	DENOTES ORIGIN UNKNOWN
MEAS.	DENOTES MEASURED
SG	DENOTES STANTEC GEOMATICS LTD.
BF	DENOTES BOARD FENCE
CLF	DENOTES CHAIN LINK FENCE
MF	DENOTES METAL FENCE
AO	DENOTES ASPHALT OUTLINE
TBB	DENOTES BELL PEDESTAL
AOV	DENOTES ANNIS, O'SULLVAN, VOLLEBEKK LTD.
RMOC	DENOTES REGIONAL MUNICIPALITY OF OTTAWA-CARLETON
857	DENOTES FAILHALL, MOFFATT, WOODLAND SURVEYING LTD.
PROP	DENOTES PROPORTIONED
WIT	DENOTES WITNESS
BM	DENOTES BENCHMARK
	DENOTES TREELINE
INV	DENOTES INVERT
VCM	DENOTES VERTICAL CONTROL MONUMENT
BPED	DENOTES BELL PEDESTAL
FL	DENOTES FLOOD LIGHT
	DENOTES TRAFFIC SIGN
AC	DENOTES AIR CONDITIONER
GMRK	DENOTES GAS MARKER
CUL	DENOTES CULVERT
CB	DENOTES DOUBLE CATCH BASIN
CBMH	DENOTES CATCH BASIN MANHOLE
CB	DENOTES CATCH BASIN
DCBMH	DENOTES DOUBLE CATCH BASIN MANHOLE
DICB	DENOTES DITCH INLET CATCH BASIN
MH-ST	DENOTES STORM MANHOLE
MH-F	DENOTES FIBER OPTIC MANHOLE
MH-S	DENOTES SANITARY MANHOLE
MH-B	DENOTES BELL MANHOLE
MH-H	DENOTES HYDRO MANHOLE
MH-T	DENOTES TRAFFIC MANHOLE
VC	DENOTES VALVE CHAMBER
DRN	DENOTES DRAIN
WELL	DENOTES WATER WELL
FH	DENOTES FIRE HYDRANT
HGUY	DENOTES HYDRO GUIDE WIRE
UP	DENOTES UTILITY POLE
HP	DENOTES HYDRO POLE
LS	DENOTES LIGHT STANDARD
HLS	DENOTES HYDRO LIGHT STANDARD
FP	DENOTES FLAG POLE
HH	DENOTES HAND HOLE
SN	DENOTES SIGN
MB	DENOTES MAIL BOX
BP	DENOTES BELL POLE
BLRD	DENOTES BOLLARD
OW	DENOTES OBSERVATION WELL
TL	DENOTES TRAFFIC LIGHT
MP	DENOTES MONITORING PIN
CS	DENOTES CURB STOP VALVE
RXS	DENOTES RAILWAY SIGN
RSB	DENOTES RAILWAY SIGNAL CONTROL BOX
BGUY	DENOTES BELL GUIDE WIRE
CP	DENOTES CABLE PEDESTAL
TCB	DENOTES TRAFFIC CONTROL BOX
WV	DENOTES WATER VALVE
DP	DENOTES DECORATIVE POLE
GV	DENOTES GAS VALVE
PLR	DENOTES PILLAR
GP	DENOTES GUARD POST
IP	DENOTES IRON PIPE
IS	DENOTES SPRINKLER HEAD
OFC	DENOTES OIL FILLER CAP
HW	DENOTES HAND WELL
HTRAN	DENOTES HYDRO TRANSFORMER
PS	DENOTES POWER SUPPLY
PKM	DENOTES PARKING METER
TH	DENOTES TEST HOLE
BH	DENOTES BOREHOLE
MW	DENOTES MONITORING WELL
BMRK	DENOTES BELL MARKER
VB	DENOTES VALVE BOX
CMRK	DENOTES CABLE TV MARKER
EP	DENOTES ELECTRICAL POST
	DENOTES DECIDUOUS TREE
STMP	DENOTES TREE STUMP
PO-M	DENOTES METAL POST
PO-W	DENOTES WOOD POST
	DENOTES CONIFEROUS TREE
	DENOTES SHRUB
	DENOTES UNDERGROUND SERVICE LOCATE - BELL
	DENOTES UNDERGROUND SERVICE LOCATE - CABLE TV
	DENOTES UNDERGROUND SERVICE LOCATE - FIBER OPTIC
	DENOTES UNDERGROUND SERVICE LOCATE - HYDRO
	DENOTES UNDERGROUND SERVICE LOCATE - GAS
	DENOTES OVERHEAD WIRES
	DENOTES PROPERTY LINE

THE SURVEY REPRESENTED BY THIS PLAN WAS COMPLETED ON THE 13th DAY OF SEPTEMBER, 2013.

DATED: ____________ ____________________

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

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