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SERVICING AND STORMWATER MANAGEMENT REPORT

5536 MANOTICK MAIN STREET
MANOTICK, ONTARIO

Prepared For:
Royal LePage Realty
101 - 555 Legget Drive
Ottawa, Ontario
K2K 2X3

PROJECT #: 190117

DISTRIBUTION
6 copies – City of Ottawa
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Rev 0 – Issued for Site Plan Approval July 4, 2019

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1 INTRODUCTION

Kollaard Associates was retained by Royal LePage Realty to complete a Site Servicing and Stormwater Management Report for redevelopment of a commercial establishment in Manotick, within the limits of City of Ottawa, Ontario.

This report will address the serviceability of the proposed site, specifically relating to the adequacy of the existing municipal storm sewer, sanitary sewer, and watermains to hydraulically convey the necessary storm runoff, sanitary sewage and water demands that will be placed on the existing system as a result of the proposed redevelopment located at 5536 Manotick Main Street, Ottawa, Ontario. The report shall also summarize the stormwater management (SWM) design requirements and proposed works that will address stormwater flows arising from the site under post-development conditions and will identify any stormwater servicing concerns and also describe any measures to be taken during construction to minimize erosion and sedimentation.

The development being proposed by Royal LePage Realty is located along the west side of Manotick Main Street at the intersection of Mill Street West and Manotick Main Street.

The site has a total area of 0.148 hectares and is currently occupied by a two storey building with a restaurant on the ground floor and an asphalt surfaced parking area. The parking area is accessed from Ann Street west of the building. It is understood that the current owner of the subject property intends to demolish the existing building and replace it with an office building. The proposed development is to consist of a 2 storey office building with a plan area of about 450 m^2 and an associated parking lot with an area of about 600 m^2. The entrance to the parking area will remain from Ann Street.

1.1 Pre-consultation Meeting

A pre-consultation meeting was held at the City of Ottawa. The meeting was attended by the property owner as well as representatives of the City of Ottawa and Rideau Valley Conservation Authority. Minutes of this pre-consultation meeting is provided in Appendix F. A summary of the design requirements are provided in an email in Appendix F.

2 STORMWATER DESIGN

2.1 Stormwater Management Design Criteria

Design of the storm sewer system was completed in conformance with the City of Ottawa Design Guidelines (October 2012) and technical bulletins ISTDB 2012-01, 2014-01, 2016-01 & 2018-01 all as amended.

In accordance with the SWM design criteria provided by the City, 100 year post development flow from the proposed development will be restricted to 5 year pre-development flow assuming a maximum pre-development runoff coefficient of C = 0.5. A time of concentration is to be calculated and to be no less than 10 minutes.

2.1.1 Minor System Design Criteria

The storm sewers have been designed and sized based on the rational formula and the Manning's Equation under free flow conditions for the 5-year storm using a 10-minute inlet time.

2.1.2 Major System Design Criteria

The major system has been designed to accommodate on-site detention with sufficient capacity to attenuate the runoff generated onsite during a 100-year design storm. Excess runoff above the 100 year event will flow overland to the west of the site and ultimately into the roadside catch basins along Ann Street.

On site storage is provided and calculated for up to the 100-year design storm. Calculations of the required storage volumes have been prepared based on the Rational Method as identified in Section 8.3.10.3 of the City's Sewer Guidelines and have been provided in Appendix A.

2.1.3 Quality Control

For quality protection, the Rideau Valley Conservation Authority (RVCA) requires an enhanced treatment level which corresponds to 80% total suspended solids removal for this site. Before discharging into the City of Ottawa's stormwater system, stormwater from the site will be directed through a hydrodynamic vortex grit and oil separator. In addition, best management practices will be incorporated at the site to reduce potential suspended solid contamination. Snow and ice control management practices will be incorporated to reduce contamination from winter snow and ice removal.

2.2 Stormwater Quantity Control

Peak Flow for runoff quantities for the Pre-Development and Post-Development stages of the project were calculated using the rational method. The rational method is a common and straightforward calculation, which assumes that the entire drainage area is subject to uniformly distributed rainfall. The formula is:

$$Q = \frac{CiA}{360}$$

Where
Q is the Peak runoff measured in ***m^3/s***
C is the Runoff Coefficient, **Dimensionless**
A is the runoff area in ***hectares***
i is the storm intensity measure in ***mm/hr***

All values for intensity, i, for this project were derived from IDF curves provided by the City of Ottawa for data collected at the Ottawa International airport. For this project two return periods were considered, 5 and 100-year events. The formulas for each are:

5-Year Event

$$i = \frac{998.071}{(t_c + 6.053)^{0.814}}$$

100-Year Event

$$i = \frac{1735.688}{(t_c + 6.014)^{0.82}}$$

where t_c is time of concentration

2.2.1 Runoff Coefficients

Runoff coefficients for impervious surfaces (roofs, asphalt, and concrete) were taken as 0.90, gravel and paver areas were taken as 0.70 and pervious surfaces (grass) were taken as 0.30.

A 25% increase for the post development 100-year runoff coefficients was used as per City of Ottawa guidelines as amended. Refer to Appendix A for pre-development and post development runoff coefficients.

2.2.2 Time of Concentration

The time of concentration for pre-development was determined using the City of Ottawa Guidelines (as amended) Appendix 5-D to be about 5 minutes. Therefore, a pre-development time of concentration of 10 minutes was used as per the design criteria provided by the City.

2.2.3 Pre-development Site Conditions

As previously indicated, the site is located at the intersection of Manotick Main Street and Mill Street West in Manotick, within the limits of City of Ottawa. The site has a total area of about 0.148 hectares which is fully developed. The site is currently occupied by a graveled parking lot, an asphalt driveway and a two-storey commercial building. The existing building has a foot print of about 228 square metres (0.023 hectares). The combined asphalt area for the driveway and patio is 558 square metres (0.056 hectares). The existing gravel parking lot has an area of about 591 square metres (0.059 hectares). The remaining areas are grassed (0.004 hectares) and paved (0.006 hectares). It is understood that pre-development conditions will be considered as lesser of current conditions or conditions resulting in a runoff coefficient of 0.5.

Based on the existing ground cover the pre-development runoff coefficient was calculated to be 0.79. The predevelopment runoff coefficient used for the purpose of this stormwater management design was C = 0.5. The predevelopment catchment area is shown in Figure 1 included in Appendix E.

2.2.3.1 Pre-development Site Drainage Patterns

Existing stormwater runoff from the entire site in general consists of uncontrolled sheet flow towards Ann Street on the west side of the property, where it is ultimately directed to catch basins. Part of the runoff from the building front is directed on Manotick Main Street.

2.2.3.2 Pre-development Runoff Rate

Using the Rational Method with a time of concentration of 10 minutes, the previously calculated runoff coefficients and a storm intensity of 104.19 mm/hr, the pre-development runoff rate for the 5-year design storm is:

5 year = (0.5 x 104.19 x 0.148 / 360) x 1,000 = 21.4 L/s

2.2.4 Controlled and Uncontrolled Areas

For the purposes of this storm water management design, the site has been divided into uncontrolled and controlled areas as outlined on Figure 2. The controlled area is defined as area CA1 and uncontrolled area is defined as UA1. CA1 consists of the roof area of the building, the parking lot, access ramp and staircase area attached to the parking lot, and parts of the landscaped/grassed area. UA1 consists of landscaped areas on the front of the building, a

portion of the building roof/canopy in the front and the paved area in the front including access ramp and staircase.

Controlled and uncontrolled areas for the site are listed in Appendix A and are shown in Figure 2 included in Appendix E.

Run-off from the roof will be directed by means of a combination of eaves troughs and downspouts to swales along the north and south sides of the site. The flow along the swales will be directed from east to west and will discharge to separate catch basins adjacent the parking area near Ann Street. These catch basins will discharge, by means of 250 mm diameter PVC storm pipe, into catch basin manhole MH-CB1 located at the lowest elevation of the parking area about 8.5 metres east of the west property line. Runoff from the parking lot will be directed to the catch basin manhole.

The release rate from the catch basin manhole will be controlled by means of a HYDROVEX 125SVHV-2 ICD or equivalent. An underground storage tank is connected to the catch basin manhole for storing runoff in excess of the allowable discharge during a storm event. The outlet from catch basin manhole MH-CB1 will be directed through a CDS storm interceptor to the City of Ottawa storm sewer along Ann Street.

Storm flows from the uncontrolled areas collectively referred to as UA1 will drain or be discharged un-controlled towards Manotick Main Street.

Since run-off from this area UA1 is uncontrolled, the allowable release rate from the controlled area equals the pre-development runoff rate for the 5 year storm event minus the 5-year and 100-year release rates respectively from the uncontrolled portion of the site.

A post-development time of concentration of 10 minutes corresponds to a storm intensity of 104.19 mm/hr and 178.56 mm/hr on the 5-year and 100-year storm IDF curves respectively. The runoff rate from the uncontrolled areas was therefore calculated to be:

UA1 5 year = (0.49 x 104.19 x 0.015 / 360) x 1,000 = 2.2 L/s
100 year = (0.57 x 178.56 x 0.015 / 360) x 1,000 = 4.3 L/s

Total uncontrolled flow
5 year = 2.2 L/s
100 year = 4.3 L/s

2.2.5 Allowable Release Rate

As previously indicated, the stormwater management criteria provided by the City of Ottawa requires that maximum runoff rate from the site during a 100 year storm is to be restricted to that of the 5 year predevelopment storm conditions. To control runoff from the site it will be necessary to limit post-development flows for all storm return periods up to the 100-year event using onsite inlet controls. The maximum allowable runoff rate from the site was determined to be 21.4 L/s based on the 5 Year predevelopment flows, as per the design criteria provided by the City of Ottawa.

$$Q_{controlled} = Q_{total\ allowable} - Q_{uncontrolled}$$

For the 5-year Storm event

$$Q_{controlled} = 21.4 – 2.2 = 19.2\ L/s$$

For the 100-year Storm event

$$Q_{controlled} = 21.4 – 4.3\ L/s = 17.1\ L/s$$

The allowable controlled area release rate for the site is calculated in the attached spreadsheets provided in Appendix A.

2.2.6 Post Development Restricted Flow and Storage

In order to meet the stormwater quantity control restriction, the post development runoff rate cannot exceed the 5 year predevelopment runoff rate. Runoff generated on site in excess of the allowable release rate will be temporarily stored within underground storage tank. The stored water will be released at a controlled rate during and following the storm event.

In order to achieve the allowable controlled area storm water release rate, storm water runoff from the roof will be guided via eaves trough to downspouts which direct the flow to swales along the north and south sides of the site. Runoff from the downspouts along the north side of the building should be directed below the sidewalk surface to the swale adjacent the sidewalk. Runoff from the sidewalk along the north side of the building will be directed by means of sheet flow to the adjacent swale. The portion of this swale between the sidewalk and the north property line will be sub-drained using a 100 mm diameter perforated pipe with filter sock and clearstone. The swales will be used for conveyance of stormwater and not for storage. As previously indicated, the swales will be directed to catch basins (CB1 and CB2) located at the corners of the parking lot near Ann Street. The eaves trough can be located by the Architect and Mechanical Engineer to meet the Architectural requirements for roof drainage. The proposed locations of the downspouts are shown in Kollaard Drawing No. 190117 - SER. There is no proposed roof top storage.

The runoff originating from parking lot will be directed by sheet flow to a 1200 mm diameter stormwater catch basin manhole MH-CB1 near the entrance of the parking lot. The manhole will have a grated cover. As previously indicated, catch basins CB1 and CB2 will also discharge into MH-CB1. Catch basin manhole MH-CB1 will be fitted with an inlet control device which will allow the release the stormwater runoff at a controlled rate to the City of Ottawa storm sewer. A CDS stormceptor unit or equivalent will be placed between catch basin manhole MH-CB1 and the City storm sewer to provide storm water treatment.

An underground stormwater storage tank will be located in the parking lot connected to catch basin manhole MH-CB1 and will provide temporary storage for runoff generated in excess of the allowable release rate. The ICD located on the outlet pipe for catch basin manhole MH-CB1 will restrict the runoff rate from the controlled areas of the site and cause the access flow volume to backup into the storage tank. The underground stormwater storage tank will be connected to the catch basin manhole through a 250 mm diameter pipe. Details of this arrangement for storage and discharge of stormwater is shown on Kollaard Drawing No. 190117 – SER.

The inlet control device (ICD) that is to be installed in catch basin manhole MH-CB1 was designed to achieve a maximum allowable release rate of 8.8 L/s during a 5 year storm event and 17.1 L/s for the 100 year rainfall event.

The ICD will consist of a Hydrovex 125-SVHV-2 vertical vortex flow regulator or approved alternative. The Hydrovex ICD should be ordered for the following parameters;

- Model number 125-SVHV-2
- Outlet pipe specification: 250 mm diameter PVC SDR35
- Discharge: 17.1 L/s
- Upstream Head: 0.87 m
- Manhole diameter: 1.20 m
- Clearance to bottom of sump: 0.60 m

The ICD was selected in order to ensure that the allowable maximum release rate for the 100 year storm events is not exceeded.

The above outlet restriction from the underground storage tank results in the storage requirements as summarized the following Table 2.1.

Table 2.1 – Summary of Post-Development Release Rates and Storage Requirements

Return period	Allowable Release Rate	Actual Release rate	Required Storage	Available Storage	Required Storage Depth	Available Storage Depth
(years)	(L/s)	(L/s)	(m^3)	(m^3)	(m)	(m)
Catchment Areas CA1						
5	19.2	8.8	14.0	26.4	0.53	1.0
100	17.1	17.1	25.8	26.4	0.97	1.0

2.2.7 Roof Drainage

For the section of the building roof that is sloped, drainage will be provided by eaves trough and downspouts, located and detailed by the Architect. For the flat section of the building roof, drainage will be provided with a low slope towards roof top drains, located by the Architect, by means of a Tapered Roofing System Product. Alternatively, the roof could be sloped to scuppers located at the edge of the roof. The minimum slope on the roof will be 1 percent and will be as much as 2 percent. The flat roof section will be fitted with overflow scuppers at not greater than 0.15 metres above the lowest point on the roof. The flow through the downspouts and from the roof drains will be unrestricted.

2.2.8 Underground Storage Tank

The underground storage tank will be constructed using Brentwood Storm Tank HDPE modular units (ST 36) or equivalent. The modular components of the tank will consist of platens, columns and side panels. An initial configuration of the storage tank is provided in Kollaard Drawing No. 190117 - SER. The anticipated volume occupied by the columns has been accounted for in the volume calculation. Ports will be provided at the top of the tank for inspection, cleaning and venting purposes. This tank will be connected to the catch basin manhole by a 250 mm diameter pipe.

The tank will be wrapped with a geotextile membrane. Clear stone surround having a thickness of 300mm will be provided around the tank.

The tank will have a storage volume of 24.98 cubic meters. The catch basin manhole having a diameter of 1200 mm will provide storage of 2.9 cubic meters. The total available storage therefore shall be 27.9 cubic meters. To be on the conservative side, storage within the clear stone surround has not been considered. The required volume of clear stone surround is

estimated to be 25 m^3. For an assumed void ratio of 0.4, the volume of available storage in clear stone is 10.0 m^3. This available storage has not been included in the design and provides a factor of safety in the design. The 5 year storm will have a ponding depth of 0.50 m in the tank and the 100 year storm will have a ponding depth of 0.92 m.
The tank will be built with the following elevations:

- Top of the tank - 87.70 m.
- The underside of the lid - 87.62 m.
- The bottom of the tank – 86.70 m.
- The outlet invert – 86.70 m.
- Outlet Pipe diameter – 250 mm.

2.3 Stormwater Quality Control

Based on the stormwater management criteria for quality control provided by The Rideau Valley Conservation Authority (RVCA) and enhanced level of treatment is required for the site. This corresponds to an average removal of 80% to the total suspended solids from the stormwater runoff from this site.

Major part of the runoff generated on the site during post development conditions originates from the roof of the building and the parking area. The runoff from the parking lot is the major source of contamination. The targeted TSS removal will be achieved with the use of a Continuous Deflective System (CDS) Unit (Model: PMSU20_15_4). The CDS is a patented system designed by Contech Engineered Solutions to provide stormwater treatment. The CDS technology uses a combination of swirl concentration and indirect screening to screen, separate and trap debris, sediment, and hydrocarbons from stormwater runoff.

A CDS unit will be placed in a manhole downstream of catch basin manhole MH-CB1. The ICD and stormwater storage provide upstream attenuation for the CDS treatment unit. The location of the unit is shown on Kollaard Associates Inc. Drawing #190117-SER. The preliminary design and sizing information of the CDS unit is attached in Appendix B.

The CDS treatment unit will discharge to the City of Ottawa sewer system along Ann Street by means of a 200 mm diameter PVC storm pipe.

It should be noted that the CDS Unit has an average annual total suspended solids removal rate of 89.8 percent which is in excess of the RVCA's enhanced protection requirement rate of 80 percent total suspended solids removal.

During winter, proper timing of the application of salt and sand on the parking lot will help reduce the quantity of required salt/sand thereby reducing the TSS load on the stormwater.

2.4 Stormwater System Operation and Maintenance

2.4.1 Inlet Control Device (ICD) and Eaves trough / Downspouts

The inlet control device (ICD) should be inspected on a semi-annual basis and following major storm events. Any blockages, trash or debris should be removed. If surface ponding occurs, the ICD should be inspected and cleaned.

The eaves trough and downspouts should be inspected before winter to ensure they have not been clogged with leafs.

2.4.2 CDS Treatment Unit

The CDS hydrodynamic separator should be inspected and cleaned in accordance with the manufacturers recommendations. At minimum:

Inspection:

- The treatment unit should be inspected at regular intervals. At minimum inspections should be performed twice per year.
- Inspections should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen.
- Inspections should also quantify the accumulation of hydrocarbons, trash and sediment in the system.

Maintenance:

- The CDS system should be cleaned when the level of sediment has reached 75% of capacity or when an appreciable level of hydrocarbons and trash have accumulated.

2.4.3 Catchbasin/ Manhole and Sump

The catchbasin / manhole and sump should be cleaned with a hydrovac excavation truck following completion of construction, paving of the asphaltic surface and establishment of adequate grass cover on the landscaped areas.

Following the initial cleaning these structures should be inspected on a semi-annual basis and following major storm events. Any blockages, trash or debris should be removed. Once the sediment accumulation in the catchbasin / manhole has reached a level equal to 0.30 metres below the outlet invert of the structure, or a thickness of 0.3 metres in the sediment traps, the sediment should be removed by hydro excavation.

2.4.4 Underground Stormwater Storage Tank

In general maintenance procedures consist of inspection and cleaning as follows:

Inspection:

- Inspect all observation ports, inflow and outflow connections, and the discharge area.
- Identify and log any sediment and debris accumulation, system backup, or discharge rate changes.
- If there is a sufficient need for cleanout, contact a local hydro excavation company for assistance.

Cleaning:

- If a pre-treatment device is installed, follow manufacturer recommendations.
- Using a vacuum pump truck, evacuate debris from the inflow and outflow points.
- Flush the system with clean water, forcing debris from the system.
- Repeat steps 2 and 3 until no debris is evident.

2.5 Storm Sewer Design

The on-site storm sewers were designed to be in general conformance with the City of Ottawa Sewer Design Guidelines (October 2012) as amended. Specifically, storm sewers were sized using Manning's Equation, assuming a roughness coefficient N = 0.013, to accommodate the uncontrolled runoff from the 5-year storm, under 'open-channel' conditions. The uncontrolled runoff was determined using the rational method and the City of Ottawa IDF curve for a 10-minute time of concentration. Refer to Storm Sewer Design Sheets in Appendix A.

The proposed storm sewer pipes between the catch basins (CB1 and CB2) and the catch basin manhole MH-CB1 as well as between the storage tank, MH-CB1 and the manhole containing the CDS treatment unit have a diameter of 250 mm and are sloped in excess of the minimal slope specified in Table 6.1 of City of Ottawa Sewer Design Guidelines. The pipe diameter is reduced to 200 mm diameter between the CDS treatment unit and the 450 mm diameter concrete storm sewer along Ann Street to facilitate a connection without a manhole.

It is noted that: Although the 200 mm diameter storm sewer service does not have sufficient capacity to convey the peak unrestricted flow of 30 L/s generated during a 5-year storm event, it has sufficient capacity to convey the maximum release rates of 8.8 L/s and 17.1 L/s from 5-year and 100-year storms respectively.

It is recognized that it is policy that the storm service be designed to convey the unrestricted runoff rate generated during a 5 year storm event. It is however considered that the unrestricted flow would only occur if the ICD was removed or failed to perform. In this event, the reduced capacity of the 200 mm diameter pipe will allow a lower discharge rate of 23 L/s as compared to a discharge rate of 41 L/s for a 250 mm diameter pipe restricting the flow rate to closer to the maximum allowable release rate.

3 SANITARY SEWER DESIGN

Initial site investigations indicate that the existing residential sanitary service is connected to a septic system. This existing septic system is to be decommissioned and the proposed building is to be connected to the City of Ottawa's sanitary sewer on Manotick Main Street.

Sewage discharges will be domestic in type and in compliance with the City of Ottawa Sewer Use By-law. The anticipated peak sanitary flow from the site will be a total of approximately 0.30 L/s.

The sanitary sewage flow for the proposed building was calculated based on the City of Ottawa Sewer Design Guidelines (Section 4.4.1.2) and incorporated Technical Bulletin ISTB-2018-01 as amended.

3.1 Design Flows

Commercial

Commercial Average Flow: 28,000 L/gross ha/d
Gross Area: 0.148 ha

Assuming 8-hr occupancy of the building:
$Q_{Average}$ = 0.148 x 28,000 L/gross ha/day x (1/28,800 sec/working day) = 0.14 L/sec

Peaking Factor = 1.5

$Q_{Peak\ Commercial}$ = 0.14 L/sec x 1.5 = 0.21 L/sec

Alternatively As per O.B.C 8.2.1.3:
Maximum Daily Flow – Office Building: 75 Litres / day per 9.3 m^2 of floor space

2 storey office building with a footprint of 450 m^2.
Q = 450 m^2 x 2 floors x 75 L / 9.3 m^2 / day = 7258 L/day or 0.25 L/sec

There for Q peak = 0.25 L/sec

Infiltration

$Q_{Infiltration}$ = 0.33 L/ha/sec x 0.148 ha = 0.05 L/sec

Total Peak Sanitary Flow = 0.25 + 0.05 = 0.30 L/sec

3.2 Sanitary Service Lateral

The Ontario Building Code (as amended) specifies minimum pipe size and maximum hydraulic loading for sanitary sewer pipe. OBC 7.4.10.8 (2) states "Horizontal sanitary drainage pipe shall be designed to carry no more than 65% of its full capacity." A 135 mm diameter sanitary service with a minimum slope of 1.0% has a capacity of 11.51 Litres per second.

The maximum peak sanitary flows for the site is 0.30 L/sec. Since 0.30 L/sec is much less than 0.65 x 11.51 = 7.48 L/s, the sanitary service would be properly sized if greater than or equal to 135 mm in diameter.

Table 3.1 Fixture Unit Consideration

Commercial Building	Number of fixture (estimated)	Total number of Fixture Units.
• Ground Floor Suite 1	16.5	16.5
• Ground Floor Suite 2 **	13.5	13.5
• Ground Floor Suite 3 **	13.5	13.5
• Second Floor **	16.5	16.5
• Total fixtures		60

** Estimated

From Table 7.4.10.8, the allowable number of fixture units for a 135 mm diameter sanitary service pipe at 1.0% slope is 390. There are approximately 60 fixtures in the building. As such the analysis indicates that a 135 mm diameter sanitary service is adequate for the proposed sanitary flow.

City of Ottawa sewer design guidelines require that a service pipe connecting to a rigid sewer main without the use of a manhole must be equal to or less than 50% of the diameter of the rigid sewer main. The sewer design guidelines also indicates that the minimum recommended sanitary sewer service diameter for a multiple use building is 200 mm to decrease the risk of plugging. There is approximately 4 metres of sanitary sewer service between the cleanout in the building and the monitoring manhole. There is approximately 8 metres of sanitary service between the monitoring manhole and the sanitary sewer main. The sanitary service will have minimum slope of 2 percent.

The sanitary service will be increased from 135 to 150 mm to reduce the risk of plugging and still facilitate a connection to the existing sanitary main without the use of a manhole. Taking

into account the minimal distances, between the inspection port and manhole and between the manhole and sanitary main, and the proposed minimum slope of 2 %, plugging of the sanitary sewer is unlikely. Should plugging occur, the situation could be easily remedied.

The existing sanitary sewer along Manotick Main Street in front of the site consists of a 300 mm diameter concrete pipe which has a capacity of 62.7 Litres per second. This sewer discharges into the 600 mm diameter sewer main at the intersection of Maple Avenue and Bridge Street about 150 meters downstream of the proposed development. The proposed sanitary demand from the development is 0.30 L/sec. Since the proposed additional sanitary sewer capacity requirement is about 0.5 percent of the capacity of the existing 300 mm diameter concrete sanitary sewer there will be sufficient capacity within the existing sanitary network for the proposed sanitary demand.

4 WATER DESIGN

4.1 Water Demand

The water demand for the proposed development was calculated based on the City of Ottawa Water Distribution Design Guidelines as follows:

Commercial

Avg. Flow = 28,000 L/ha/day
Assuming 8-hr occupancy of the building:
Q_{comm} Average Day = 0.148 ha x 28,000 L/ha/day x (1/28,800 sec/day) = 0.14 L/sec

- Maximum daily demand (factor of 1.5) is 0.14 x 1.5 = 0.21 L/s
- Peak hourly demand (factor of 1.8) is 0.21 x 1.8 = 0.38 L/s

Total Water Demand

Average Daily demand = 0.14 L/s
Maximum Daily demand = 0.21 L/s
Peak Hourly demand = 0.38 L/s

4.2 Fire Flow Demand and Boundary Conditions

Fire flow protection requirements were calculated as per the Fire Underwriter's Survey (FUS) taking into account the methodology provided in Technical Bulletin ISTB-2018-02 (as amended). Calculations of the fire flow required are provided in Appendix C.

The calculated residential water supply requirement and Fire Fighting Requirement were provided to the City of Ottawa for boundary conditions. The correspondence is attached in Appendix D. These requirements consisted of a average daily demand of 0.14 L/sec, a maximum daily demand of 0.21 L/s and a Maximum hourly demand of 0.38 L/sec. The fire flow requirement was 133.3 L/s.

The existing water services main on Manotick Main Street is a 305 mm diameter ductile iron (DI) pipe. The City of Ottawa has plans to upgrade the existing water services system on Manotick Main Street that is likely to go in to construction in 2019. Based on this scenario two different sets of boundary conditions were provided by the City, namely a) Pre-Connection Boundary Conditions and b) Post Connection Boundary Conditions.

The following are boundary conditions, HGL, for hydraulic analysis at 5536 Manotick Main Street assumed to be connected to the 305 mm DI main on Manotick Main were based on the

above requirements. The pressure zone in this area is identified for upcoming configuration based on City construction with an approximate start time in 2019. As a result, there are two sets of boundary conditions provided – pre-connection and post-connection.

Pre-Connection

Peak Hour = 126.2 m

Maximum HGL = 131.6 m

Max Day (0.21 L/s) + Fire Flow (8,000 L/min) = 114.9 m

Post-Connection

Peak Hour = 144.7 m

Maximum HGL = 147.7 m

Max Day (0.21 L/s) + Fire Flow (8,000 L/min) = 130.2 m

4.3 Fire Protection

Fire protection will be provided from the following existing fire hydrants: a fire hydrant just opposite to the proposed development located on the intersection of Manotick Main Street and Mill Street about 17.5 m from the entrance to the building:; a fire hydrant at the rear side of the proposed development along Ann Street adjacent the south property line of the site approximately 40 m from the rear of the proposed building; two additional hydrants slightly more than 75 metres from the site north and south of the site along Manotick Main.

The fire hydrant coverage in accordance with Technical Bulletin ISTB-2018-02 is summarized in the following table 4.1:

Table 4.1 Fire Hydrant Coverage

Building	Fire Flow Demand (L/min)	Fire Hydrants within 75 m	Fire Hydrants within 150 m	Combined Fire Flow (L/min)
5536 Manotick Main	8,330	2 (x 5,700)	2 (x 3,800)	19,000

The Ministry of Environment, Conservation and Parks requires that the minimum residual water pressure at the ground level under maximum day plus fire flow conditions is 140 kPa. With the

existing Ductile Iron watermain, the minimum water pressure at the Hydrants will be 240 kPa. Therefore there is sufficient water flow and pressure available for firefighting purposes.

4.4 Sufficiency of Existing Services

The City of Ottawa Design Guidelines for water as amended requires that if possible, systems are to be designed to residual pressures of 345 to 552 kPa in all occupied areas outside of the public right of way.

The pressure loss to the second floor of the proposed building was calculated using Bernoulli's Equation in Combination with the Darcy – Weisbach Equation and the Colebrook Equation maximum hourly flow conditions with both the existing 305mm DI watermain and the proposed upgraded watermain.

$$H_P + Z_1 - Z_2 + \frac{P_1 - P_2}{S} + \frac{V_1^2 - V_2^2}{2g} = h_f + h_m \quad \text{where:}$$

$$h_m = K_m \frac{V^2}{2g} \qquad \mathrm{Re} = \frac{VD}{\nu} \qquad Q = VA \qquad A = \frac{\pi}{4} D^2$$

$$\text{Darcy – Weisbach Equation: } h_f = f \frac{L}{D} \frac{V^2}{2g} \quad \text{where:}$$

$$\text{If laminar flow } \left(\mathrm{Re} < 4000 \text{ and any } \frac{e}{D}\right), \quad f = \frac{64}{\mathrm{Re}}$$

$$\text{If turbulent flow } \left(4000 \le \mathrm{Re} \le 10^8 \text{ and } 0 \le \frac{e}{D} < 0.05\right), \text{ then}$$

$$\text{Colebrook Equation: } \frac{1}{\sqrt{f}} = -2.0 \log\left(\frac{e/D}{3.7} + \frac{2.51}{\mathrm{Re}\sqrt{f}}\right)$$

The results of the calculations are provided in the following table 4.2:

Table 4.2 Available Water Pressure

Senario	Elevation m		HGL m		Pressure kPa		Flow L/s	Service dia. mm
	Street	1st Floor	Street	2nd Floor	Street	2nd Floor		
Connection to Exiting 305mm DI watermain								
Peak Hr	89.2	94.5	126.2	126.2	363	310	0.38	50
Min HGL	89.2	94.5	114.9	114.9	252	200	0.38	50
Max HGL	89.2	94.5	131.6	131.6	416	363	0.38	50
Peak Hr	89.2	94.5	144.7	144.7	544	481	0.38	50
Min HGL	89.2	94.5	130.2	130.2	402	339	0.38	50

Max HGL	89.2	94.5	147.7	147.6	573	510	0.38	50
	Street	1st Floor	Street	1st Floor	Street	1st Floor		
Max HGL	89.2	89.5	147.7	147.6	573	570	0.38	50

Based on the results of the analysis as presented in the above table, when using a 50 mm diameter service, the residual pressure on the second floor of the proposed building is a function of the initial HGL and the losses due to elevation change. There are no significant minor losses. The minimum HGL occurs at maximum day plus fire flow and will result in a pressure below the recommended minimum if the services were connected to the existing 305 mm diameter DI watermain. Since the replacement of the watermain is scheduled to potentially start in 2019 and the proposed development of the lot has not started as of July 2019, it is unlikely that there will be fire while the proposed water service is connected to the 305mm DI water main. As such it is considered that a 50 mm diameter service will be sufficient to meet the commercial water demand for the building.

A review of the residual pressure on the first floor assuming the service is connected to the proposed new watermain indicates that the maximum recommended pressure of 552 kPa. In accordance with sentence 2 of section 4.2.7 of the City of Ottawa Water Guidelines, a pressure reducing valve is to be installed immediately downstream of the isolation valve in the proposed building, downstream of the meter so it is owner maintained.

It is understood that the building will be equipped with an automatic sprinkler system. The flow demand for the automatic sprinkler system is not known at this time and is typically calculated by the Mechanical Engineer based on sprinkler head type, location and number.

The size of the service may need to be increased based on the requirements of the automatic sprinkler system.

The existing water service for the building at 5536 Manotick Main Street is to be inspected during development. If the diameter of the pipe is less than 50 mm and/or not in good condition, the existing service shall be blanked and capped at the main in accordance with City of Ottawa requirements to the satisfaction of City of Ottawa Services.

5 EROSION AND SEDIMENT CONTROL

The owner (and/or contractor) agrees to prepare and implement an erosion and sediment control plan at least equal to the stated minimum requirements and to the satisfaction of the City of Ottawa, appropriate to the site conditions, prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and during all phases of site preparation and construction in accordance with the current best management practices for erosion and sediment control. It is considered to be the owners and/or contractors responsibility to ensure that the erosion control measures are implemented and maintained.

In order to limit the amount of sediment carried in stormwater runoff from the site during construction, it is recommended to install a silt fence along the property, as shown in Kollaard Associates Inc. Drawing #190117-ESC (Erosion and Sediment Control Plan). The silt fence may be polypropylene, nylon, and polyester or ethylene yarn.

If a standard filter fabric is used, it must be backed by a wire fence supported on posts not over 2.0 m apart. Extra strength filter fabric may be used without a wire fence backing if posts are not over 1.0 m apart. Fabric joints should be lapped at least 150 mm (6") and stapled. The bottom edge of the filter fabric should be anchored in a 300 mm (1 ft) deep trench, to prevent flow under the fence. Sections of fence should be cleaned, if blocked with sediment and replaced if torn.

Filter socks should be installed across existing storm manhole and catch basin lids. As well, filter socks should be installed across the proposed catch basin lids immediately after the catch basins are placed. The filter socks should only be removed once the asphaltic concrete is installed and the site is cleaned.

A mud mat or trackout control mat is to be installed at the construction access and egress point from the site to minimize sediment transfer or track-out by construction traffic to the adjacent streets. The mud mat or trackout control mat should span the width of the access. A manufactured construction site track-out plate (also known as: construction entrance & exit grid, rumble plate or construction shaker plate) system may be used in place of a traditional riprap mud mat. The trackout control mat should be maintained throughout the construction period by removing accumulated sediment in order to maintain its effectiveness.

The proposed landscaping works should be completed as soon as possible. The proposed granular and asphaltic concrete surfaced areas should be surfaced as soon as possible. The silt fences should only be removed once the site is stabilized and landscaping is completed.

These measures will reduce the amount of sediment carried from the site during storm events that may occur during construction.

6 CONCLUSIONS

This report addresses the adequacy of the existing municipal storm and sanitary sewer system and watermains to service the proposed development of a commercial building on Manotick Main Street. Based on the analysis provided in this report, the conclusions are as follows:

SWM for the proposed development will be achieved by restricting the 100 year post development flow to the 5 year pre-development flow.

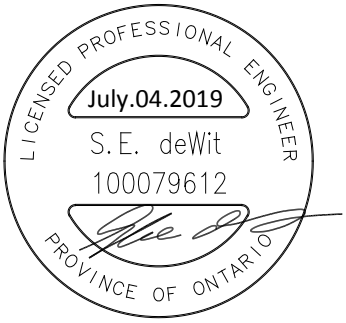
The peak sewage flow rate from the proposed development will be 0.26 L/sec. The existing municipal sanitary sewer should have adequate capacity to accommodate the minimal increase in peak flow. The City has not identified any capacity issues in the existing sanitary sewer system.

The existing municipal watermain along Manotick Main Street is prposed for an upgrade in 2019 and will have adequate capacity to service the proposed development for both domestic and fire protection. It is recommended that water service connections are installed once City of Ottawa completes the proposed upgrade to water mains.

During all construction activities, erosion and sedimentation shall be controlled.

We trust that this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we can be of any further assistance to you on this project, please do not hesitate to contact our office.

Sincerely,
Kollaard Associates, Inc.



Steven deWit, P.Eng.

Appendix A: Storm Design Information

- Pre-Development Flow and SWM Summary
- Uncontrolled Area Runoff Calculations
- Required Storage Vs Release Rate
- Storage Volume Provided
- Stage Storage Curve
- Sewer Design Sheet

APPENDIX A: STORMWATER MANAGEMENT MODEL
ALLOWABLE RELEASE RATE AND SWM SUMMARY

Client: Royal LePage
Job No.: 190117
Location: 5536 Manotick Main
Date: July 4, 2019

PRE DEVELOPMENT FLOW

Runoff Coefficient Equation

$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{tot}$

Pre Dev run-off Coefficient "C"

Area	Surface	Ha	"C"	C_{avg}
Total	Asphalt	0.056	0.90	**0.79**
0.148	Building	0.023	0.90	
	Gravel	0.059	0.70	
	Paver	0.006	0.70	
	Grass	0.004	0.30	

5 Year Event			
Pre Dev.	**C**	**Intensity**	**Area**
5 Year	0.50	104.19	0.148
2.78CIA= 21.41			
21.4 L/s			

**Use a 10 minute time of concentration for 5 year

Total Allowable Runoff Rate: **21.4 L/s**

Pre Dev Time of Concentration "t_c"

From City of Ottawa Sewer Design Guidelines - Appendix 5 - D

Slope of Site = 3.2%
Distance Across Site = 50
Runoff Coefficient = 0.79

Inlet Time = 5 min < 10 min
Therefore use a minimum Time of Concentration of 10 min

STORMWATER MANAGEMENT SUMMARY

Sub Area I.D.	Sub Area (ha)	Run-off Coefficient C		Outlet Location	5 Year Controlled Release (L/s)	Required 5 year Storage (m^3)	100 Year Controlled Release (L/s)	Required 100 year Storage (m^3)
UA1	0.015	0.49		OFFSITE	2.2	0.0	4.3	0.0
				(Manotick)				
Total UA	0.015				2.2		4.3	
Maximum Allowable Release Rate					19.2		17.1	
Actual Release Rate								
CA1	0.132	0.79		STM MH-1	8.8	14.0	17.1	25.8
TOTAL	**0.148**				**11.0**	**14.0**	**21.4**	**25.8**

APPENDIX A: STORMWATER MANAGEMENT MODEL

Uncontrolled Area Runoff Rate Calculation

Client: Royal LePage
Job No.: 190117
Location: 5536 Manotick Main
Date: July 4, 2019

UA1 - UNCONTROLLED AREA

Post Dev run-off Coefficient "C"

			5 Year Event		100 Year Event	
Area	**Surface**	**Ha**	**"C"**	**C_{avg}**	**"C"**	**C_{avg}**
Total	Buildings	0.005	0.90	**0.49**	0.99	**0.57**
0.015	Landscape/Grass	0.011	0.30		0.38	
	Asphalt	0.000	0.90		0.99	

Post Dev Free Flow
5 Year Event

	C	Intensity	Area
5 Year	0.49	104.19	0.015
2.78CIA=	2.18		
2.2 L/S			

**Use a 10 minute time of concentration for 5 year

100 Year Event

	C*	Intensity	Area
100 Year	0.57	178.56	0.015
2.78CIA=	4.35		
4.3 L/S			

**Use a 10 minute time of concentration for 100 year

Equations:

Flow Equation

Q = 2.78 x C x I x A

Where:

C is the runoff coefficient

I is the intensity of rainfall, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{tot}$

APPENDIX A: STORMWATER MANAGEMENT MODEL
REQUIRED STORAGE VS. RELEASE RATE

Client: Royal LePage
Job No.: 190117
Location: 5536 Manotick Main
Date: July 4, 2019

Post Dev run-off Coefficient "C" - CA1

			5 Year Event		100 Year Event	
Area (ha)	Surface	Area (ha)	"C"	C_{avg}	"C" x 1.25	$C_{100\ avg}$
Total	Roof	0.040	0.90	**0.79**	0.99	**0.87**
0.132	Asphalt/Concr	0.067	0.90		0.99	
	Landscape	0.025	0.30		0.38	

Maximum Allowable Release Rates:
5 year Storm event: 19.2 L/s
100 year Storm event: 17.1 L/s

REQUIRED STORAGE VERSUS RELEASE RATE FOR 100 YEAR STORM

Runoff Coeffcient, C = **0.87** Duration Interval (min) = **5**
Drainage Area (ha) = **0.132** Release Rate Start (L/s) = **0**
Return Period (yrs) = **100** Release Rate Interval (L/s) = **5**

		Release Rate -->	0	5	10	15	20	25	30	35	40	45
Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Storage Required (m^3)									
0	398.6	127.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	242.7	77.8	23.3	21.8	20.3	18.8	17.3	15.8	14.3	12.8	11.3	9.8
10	178.6	57.2	34.3	31.3	28.3	25.3	22.3	19.3	16.3	13.3	10.3	7.3
15	142.9	45.8	41.2	36.7	32.2	27.7	23.2	18.7	14.2	9.7	5.2	0.7
20	120.0	38.4	46.1	40.1	34.1	28.1	22.1	16.1	10.1	4.1	-1.9	-7.9
25	103.8	33.3	49.9	42.4	34.9	27.4	19.9	12.4	4.9	-2.6	-10.1	-17.6
30	91.9	29.4	53.0	44.0	35.0	26.0	17.0	8.0	-1.0	-10.0	-19.0	-28.0
35	82.6	26.5	55.6	45.1	34.6	24.1	13.6	3.1	-7.4	-17.9	-28.4	-38.9
40	75.1	24.1	57.8	45.8	33.8	21.8	9.8	-2.2	-14.2	-26.2	-38.2	-50.2
45	69.1	22.1	59.7	46.2	32.7	19.2	5.7	-7.8	-21.3	-34.8	-48.3	-61.8
50	64.0	20.5	61.5	46.5	31.5	16.5	1.5	-13.5	-28.5	-43.5	-58.5	-73.5
55	59.6	19.1	63.0	46.5	30.0	13.5	-3.0	-19.5	-36.0	-52.5	-69.0	-85.5
60	55.9	17.9	64.5	46.5	28.5	10.5	-7.5	-25.5	-43.5	-61.5	-79.5	-97.5
65	52.6	16.9	65.8	46.3	26.8	7.3	-12.2	-31.7	-51.2	-70.7	-90.2	-109.7
70	49.8	16.0	67.0	46.0	25.0	4.0	-17.0	-38.0	-59.0	-80.0	-101.0	-122.0
75	47.3	15.1	68.1	45.6	23.1	0.6	-21.9	-44.4	-66.9	-89.4	-111.9	-134.4
80	45.0	14.4	69.2	45.2	21.2	-2.8	-26.8	-50.8	-74.8	-98.8	-122.8	-146.8
85	43.0	13.8	70.2	44.7	19.2	-6.3	-31.8	-57.3	-82.8	-108.3	-133.8	-159.3
90	41.1	13.2	71.1	44.1	17.1	-9.9	-36.9	-63.9	-90.9	-117.9	-144.9	-171.9
95	39.4	12.6	72.0	43.5	15.0	-13.5	-42.0	-70.5	-99.0	-127.5	-156.0	-184.5
100	37.9	12.1	72.9	42.9	12.9	-17.1	-47.1	-77.1	-107.1	-137.1	-167.1	-197.1
Maximum Storage Rate =			72.9	46.5	35.0	28.1	23.2	19.3	16.3	13.3	11.3	9.8

REQUIRED STORAGE VERSUS RELEASE RATE FOR 5 YEAR STORM

Runoff Coeffcient, C = **0.79** Duration Interval (min) = **5**
Drainage Area (ha) = **0.132** Release Rate Start (L/s) = **0**
Return Period (yrs) = **5** Release Rate Interval (L/s) = **5**

		Release Rate -->	0	5	10	15	20	25	30	35	40	45
Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Storage Required (m^3)									
0	230.5	67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	141.2	41.1	12.3	10.8	9.3	7.8	6.3	4.8	3.3	1.8	0.3	-1.2
10	104.2	30.3	18.2	15.2	12.2	9.2	6.2	3.2	0.2	-2.8	-5.8	-8.8
15	83.6	24.3	21.9	17.4	12.9	8.4	3.9	-0.6	-5.1	-9.6	-14.1	-18.6
20	70.3	20.4	24.5	18.5	12.5	6.5	0.5	-5.5	-11.5	-17.5	-23.5	-29.5
25	60.9	17.7	26.6	19.1	11.6	4.1	-3.4	-10.9	-18.4	-25.9	-33.4	-40.9
30	53.9	15.7	28.2	19.2	10.2	1.2	-7.8	-16.8	-25.8	-34.8	-43.8	-52.8
35	48.5	14.1	29.6	19.1	8.6	-1.9	-12.4	-22.9	-33.4	-43.9	-54.4	-64.9
40	44.2	12.9	30.8	18.8	6.8	-5.2	-17.2	-29.2	-41.2	-53.2	-65.2	-77.2
45	40.6	11.8	31.9	18.4	4.9	-8.6	-22.1	-35.6	-49.1	-62.6	-76.1	-89.6
50	37.7	11.0	32.9	17.9	2.9	-12.1	-27.1	-42.1	-57.1	-72.1	-87.1	-102.1
55	35.1	10.2	33.7	17.2	0.7	-15.8	-32.3	-48.8	-65.3	-81.8	-98.3	-114.8
60	32.9	9.6	34.5	16.5	-1.5	-19.5	-37.5	-55.5	-73.5	-91.5	-109.5	-127.5
65	31.0	9.0	35.2	15.7	-3.8	-23.3	-42.8	-62.3	-81.8	-101.3	-120.8	-140.3
70	29.4	8.5	35.9	14.9	-6.1	-27.1	-48.1	-69.1	-90.1	-111.1	-132.1	-153.1
75	27.9	8.1	36.5	14.0	-8.5	-31.0	-53.5	-76.0	-98.5	-121.0	-143.5	-166.0
80	26.6	7.7	37.1	13.1	-10.9	-34.9	-58.9	-82.9	-106.9	-130.9	-154.9	-178.9
85	25.4	7.4	37.6	12.1	-13.4	-38.9	-64.4	-89.9	-115.4	-140.9	-166.4	-191.9
90	24.3	7.1	38.2	11.2	-15.8	-42.8	-69.8	-96.8	-123.8	-150.8	-177.8	-204.8
95	23.3	6.8	38.6	10.1	-18.4	-46.9	-75.4	-103.9	-132.4	-160.9	-189.4	-217.9
Maximum Storage Rate =			38.6	19.2	12.9	9.2	6.3	4.8	3.3	1.8	0.3	0.0

APPENDIX A: STORMWATER MANAGEMENT MODEL

STORAGE VOLUME PROVIDED

Client: **Royal LePage**
Job No.: **190117**
Location: **5536 Manotick Main**
Date: **July 4, 2019**

Catchment Areas CA1

Maximum Storage required for the 5 year Storm Event	7.9	(m^3)
Maximum Storage required for the 100 year Storm Event	25.6	(m^3)

Storage Provided in Tank

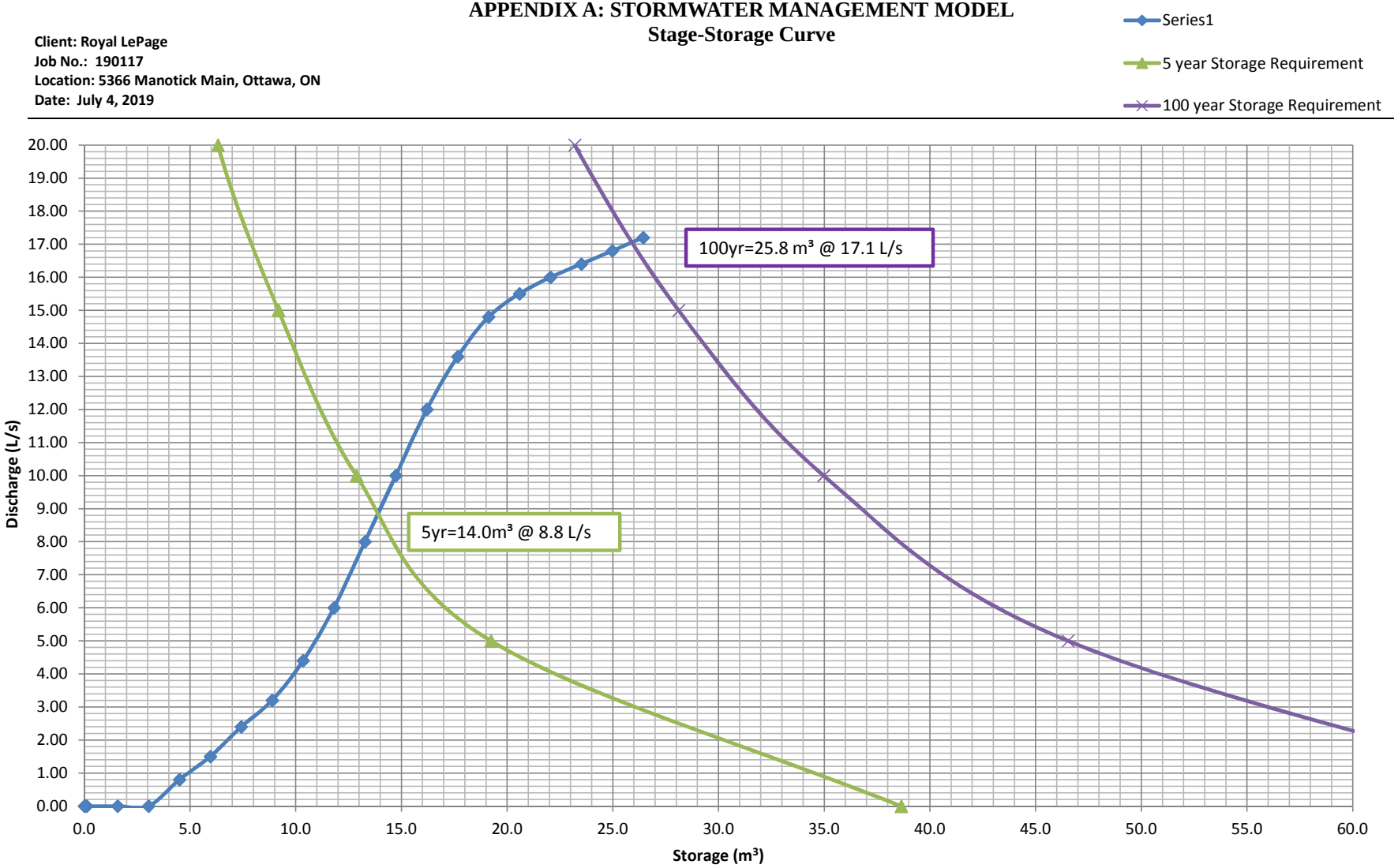
Top of Tank	87.70	m	Underside of Lid To Invert	0.92	m
Underside of Lid	87.62		Width of Cistern	0.9144	m
Outlet Invert Elevation	86.70	m	Length of Cistern	30.8	m
Bottom of Tank	86.70	m	Total Volume	25.86838	m^3

Inlet Control Device = Hydrovex 125SVHV-2
Invert of Outlet Pipe = 86.70

Elevation	Tank Depth	Layer Thickness	Layer Area (Tank)	Layer Area (Manhole)	Layer Volume	Cum. Storage Volume	Head on ICD	Release Rate
m	m	m	m^2	m^2	m^3	m^3	m	L/s
87.70	1.00	0.05	28.12	1.13	1.46	26.4	0.87	17.20
87.65	0.95	0.05	28.12	1.13	1.46	25.0	0.82	16.80
87.60	0.90	0.05	28.12	1.13	1.46	23.5	0.77	16.40
87.55	0.85	0.05	28.12	1.13	1.46	22.0	0.72	16.00
87.50	0.80	0.05	28.12	1.13	1.46	20.6	0.67	15.50
87.45	0.75	0.05	28.12	1.13	1.46	19.1	0.62	14.80
87.40	0.70	0.05	28.12	1.13	1.46	17.7	0.57	13.60
87.35	0.65	0.05	28.12	1.13	1.46	16.2	0.52	12.00
87.30	0.60	0.05	28.12	1.13	1.46	14.7	0.47	10.00
87.25	0.55	0.05	28.12	1.13	1.46	13.3	0.42	8.00
87.20	0.50	0.05	28.12	1.13	1.46	11.8	0.37	6.00
87.15	0.45	0.05	28.12	1.13	1.46	10.4	0.32	4.40
87.10	0.40	0.05	28.12	1.13	1.46	8.9	0.27	3.20
87.05	0.35	0.05	28.12	1.13	1.46	7.4	0.22	2.40
87.00	0.30	0.05	28.12	1.13	1.46	6.0	0.17	1.50
86.95	0.25	0.05	28.12	1.13	1.46	4.5	0.12	0.80
86.90	0.20	0.05	28.12	1.13	1.46	3.0	0.07	0.00
86.85	0.15	0.05	28.12	1.13	1.46	1.6	0.02	0.00
86.80	0.10	0.05	0.00	1.13	0.06	0.1	-0.03	0.00
86.75	0.05	0.05	0.00	1.13	0.06	0.1	-0.08	0.00
86.70	0	0	0.00	0.00	0.00	0.0	0	0.00

APPENDIX A: STORMWATER MANAGEMENT MODEL
Stage-Storage Curve

Client: Royal LePage
Job No.: 190117
Location: 5366 Manotick Main, Ottawa, ON
Date: July 4, 2019



APPENDIX A: STORM SEWER DESIGN SHEET

Client: Royal LePage
Job No.: 190117
Location: 5536 Manotick Main
Date: July 4, 1019

Storm Sewer Design Sheet (5-yr storm)

LOCATION											PROPOSED SEWER								
								TIME	RAINFALL	PEAK	TYPE	PIPE	PIPE			FULL FLOW	TIME OF	EXCESS	
FROM	TO	Total Area	C	C	Actual R	INDIV	ACCUM	OF	INTENSITY	FLOW	OF	SIZE	SLOPE	LENGTH	CAPACITY	VELOCITY	FLOW	CAPACITY	Q/Qfull
		(ha)	0.30	0.90	('C')	2.78 AR	2.78 AR	CONC.	I	Q (l/s)	PIPE	(mm)	(%)	(m)	(l/s)	(m/s)	(min.)	(l/s)	
CB1	MH-CB1	0.038	0.013	0.025	0.70	0.07	0.07	10.00	104.19	7.60	PVC	250.00	1.00	10.6	59.53	1.21	0.15	51.92	0.13
CB2	MH-CB1	0.033	0.013	0.020	0.67	0.06	0.06	10.00	104.19	6.30	PVC	250.00	1.00	10.6	59.53	1.21	0.15	53.23	0.11
MH-CB1	STM-MH2	0.062	0.000	0.062	0.90	0.16	0.29	10.00	104.19	30.07	PVC	250.00	0.50	4.3	42.09	0.86	0.08	12.03	0.71
STM-MH2	MAIN						0.29	10.00	104.19	30.07	PVC	200.0	0.50	4.1	23.22	0.74	0.09	-6.85	1.30
(CDS)																			

Rainfall Intensity = $998.071/(T+6.053)^{\wedge -0.814}$ T= time in minutes
(City of Ottawa, 5 year storm)

Appendix B: Product Information

- Hydrovex Selection Chart
- CDS Storm Interceptor
- Brentwood Storage Tanks

HYDROVEX®

VHV Vertical Vortex Flow Regulator

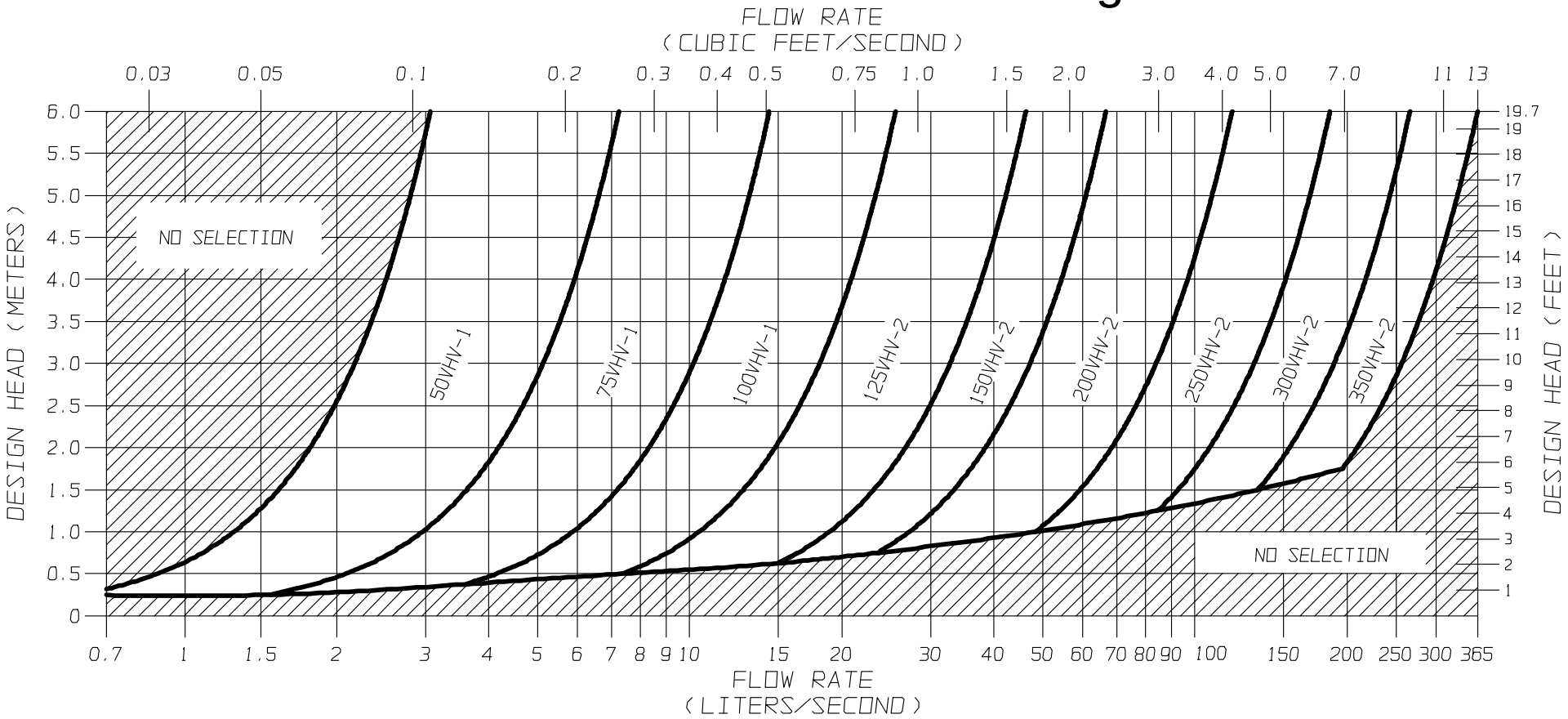


FIGURE 3 - VHV

JOHN MEUNIER

HYDROVEX®

SVHV Vertical Vortex Flow Regulator

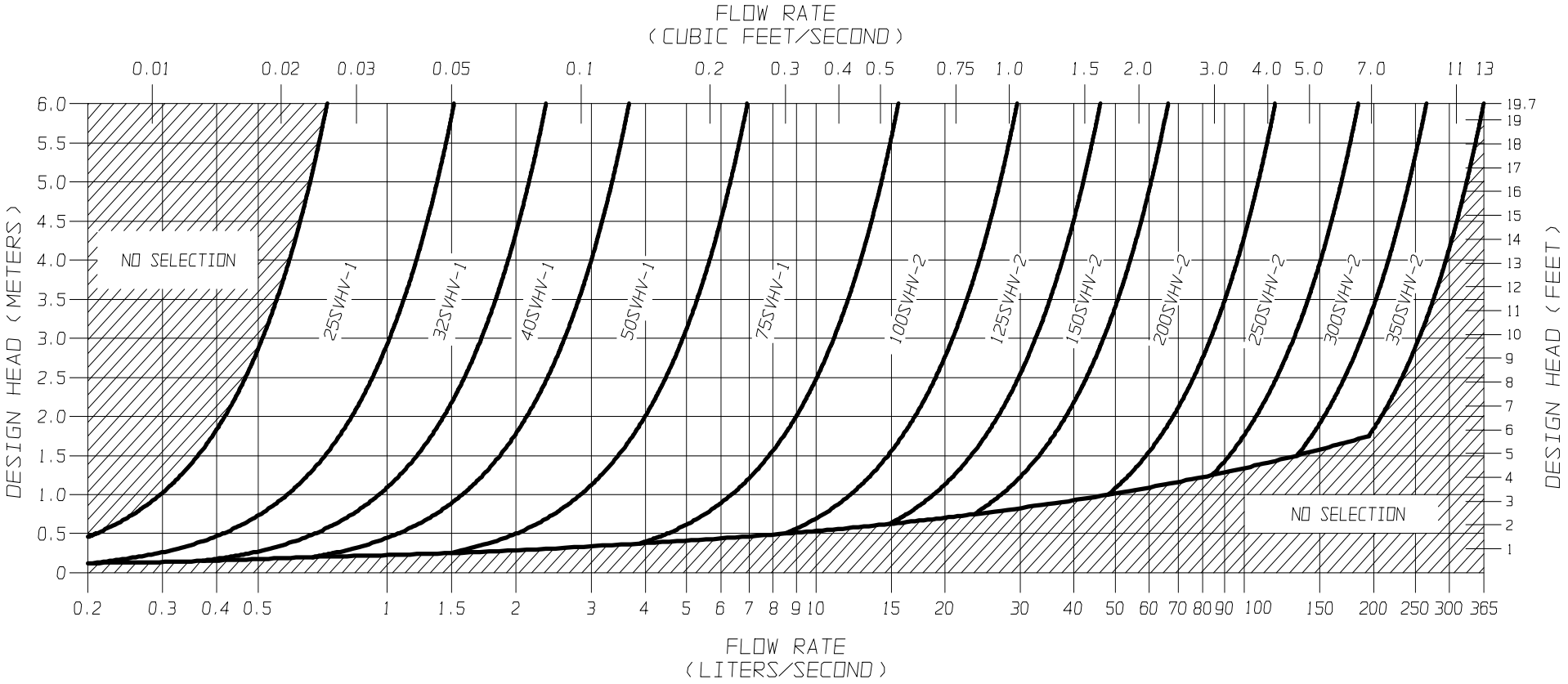


FIGURE 3 - SVHV

JOHN MEUNIER

CDS Average Annual Efficiency For TSS Removal & Total Annual Volume Treated

Project:	**5536 Manotick Main**			
Location:	**Ottawa, ON**			
Date:	**4/15/2019**			
By:	**PG**	**Upstream Storage:**	25	m3
PSD:	**Fine**	**Area:**	0.150	ha
CDS Model:	**PMSU20_15_4**	**C-Value**	0.90	
CDS Design Flow:	**20 l/s**	**IDF Data:**	Ottawa, ON	

Return Period		Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	3.13	95.82	3365	3365	**100.00**	3.13	3.13	0.00	100.00
2-M	0.17	4.90	94.27	5054	5054	**99.75**	4.90	4.90	0.00	100.00
3-M	0.25	4.17	94.93	4351	4351	**98.17**	4.17	4.17	0.00	100.00
4-M	0.33	5.63	93.61	5755	5755	**95.04**	5.63	5.63	0.00	100.00
5-M	0.42	6.22	93.08	6314	6314	**90.91**	6.22	6.22	0.00	100.00
6-M	0.50	6.80	92.54	6873	6873	**86.47**	6.80	6.80	0.00	100.00
7-M	0.58	7.26	92.13	7308	7308	**82.01**	7.26	7.26	0.00	100.00
8-M	0.67	7.71	91.71	7743	7743	**77.67**	7.71	7.71	0.00	100.00
9-M	0.75	8.16	91.29	8178	8178	**73.64**	8.16	8.16	0.00	100.00
10-M	0.83	9.81	89.73	9802	9802	**69.90**	9.81	9.81	0.00	100.00
11-M	0.92	11.45	88.18	11427	11427	**66.40**	11.45	11.45	0.00	100.00
1-Yr	1	13.10	86.62	13051	13051	**63.21**	13.10	13.10	0.00	100.00
2-Yr	2	19.41	80.53	19525	19525	**39.35**	19.41	19.41	0.00	100.00
5-Yr	5	27.49	69.28	25695	28346	**18.13**	27.49	19.82	7.67	90.65
10-Yr	10	30.20	65.44	27181	31459	**9.52**	30.20	19.82	10.38	86.40
25-Yr	25	34.56	59.73	29191	36598	**3.92**	34.56	19.82	14.74	79.76
50-Yr	50	38.78	54.78	30776	41716	**1.98**	38.78	19.82	18.96	73.77
100-Yr	100	40.97	52.43	31487	44447	**1.00**	40.97	19.82	21.15	70.84

Average Annual TSS Removal Efficiency [%]: **89.8** Ave. Ann. T. Volume [%]: **99.41%**

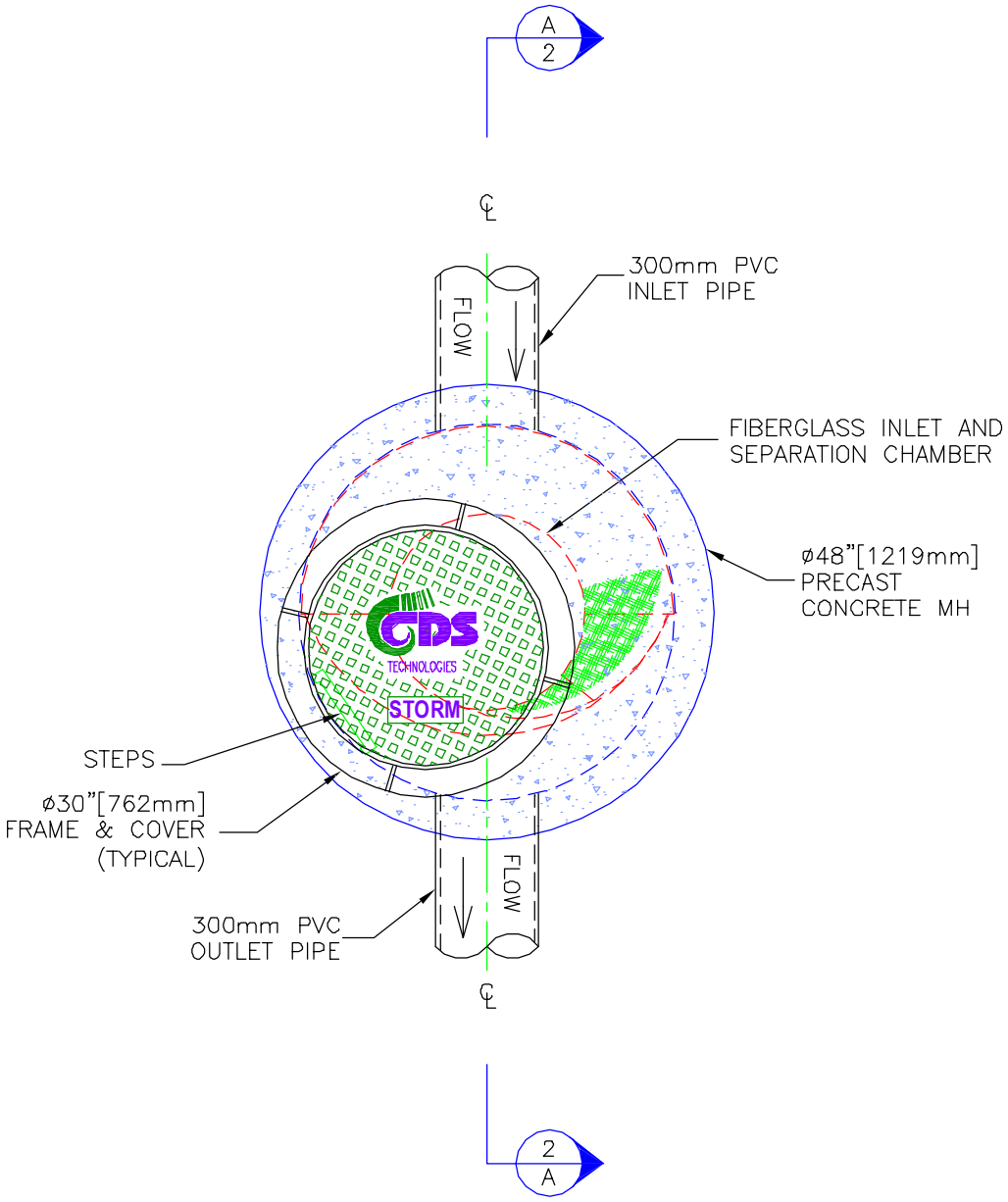
1 - CDS Efficiency based on testing conducted at the University of Central Florida

2 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES

PLAN VIEW

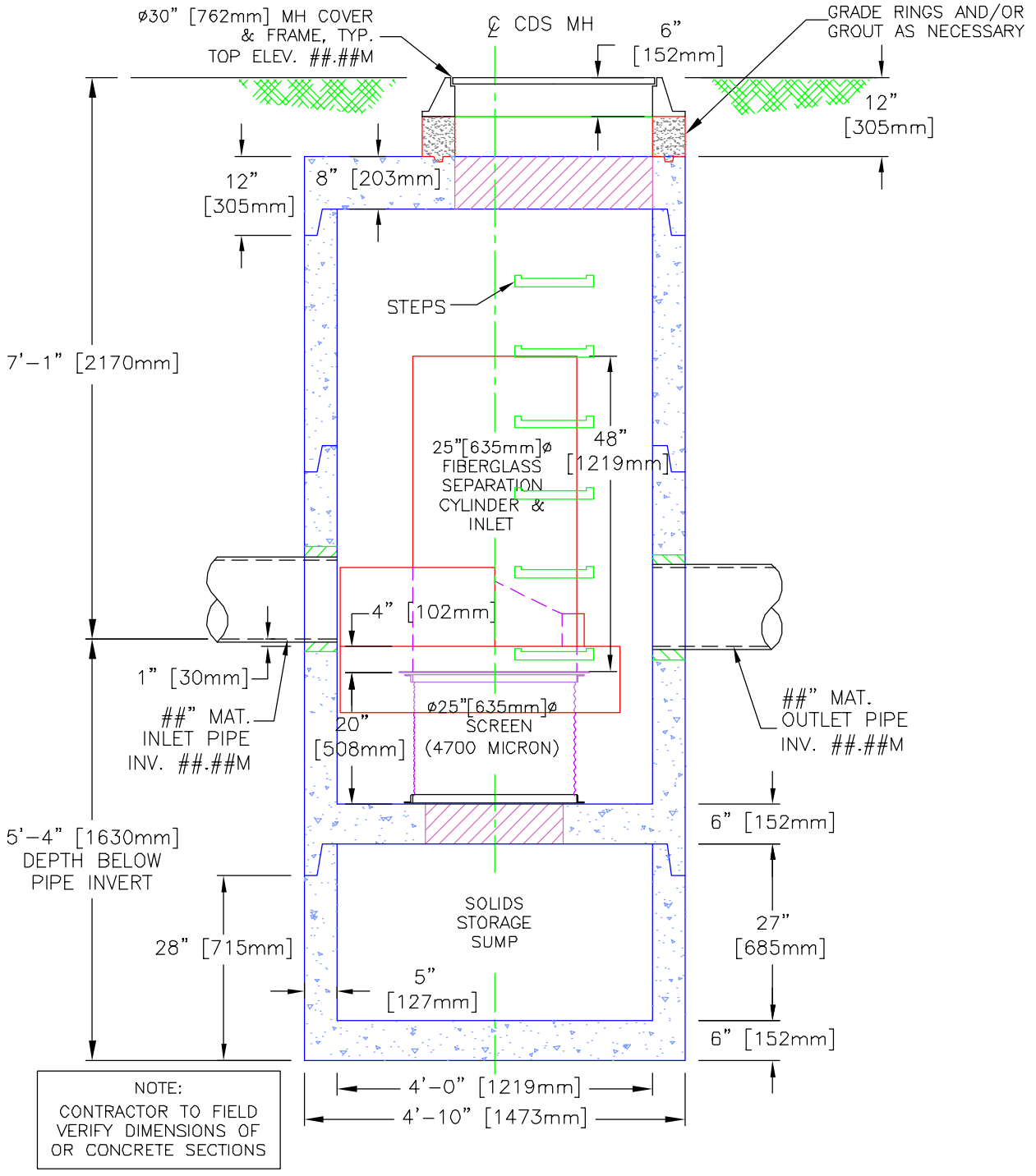


CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

SECTION A–A
ELEVATION VIEW



NOTE:
CONTRACTOR TO FIELD VERIFY DIMENSIONS OF OR CONCRETE SECTIONS

CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX–##–###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

DESIGN GUIDE

STORMTANK® Module

BRENTWOOD®

Contents

General Notes

1. Brentwood recommends that the installing contractor contact either Brentwood or the local distributor prior to installation of the system to schedule a pre-construction meeting. This meeting will ensure that the installing contractor has a firm understanding of the installation instructions.
2. All systems must be designed and installed to meet or exceed Brentwood's minimum requirements. Although Brentwood offers support during the design, review, and construction phases of the Module system, it is the ultimate responsibility of the Engineer of Record to design the system in full compliance with all applicable engineering practices, laws, and regulations.
3. Brentwood requires a minimum cover of 24" (610 mm) and/or a maximum Module invert of 11' (3.35 m). Additionally, a minimum 6" (152 mm) leveling bed, 12" (305 mm) side backfill, and 12" (305 mm) top backfill are required on every system.
4. Brentwood recommends a minimum bearing capacity and subgrade compaction for all installations. If site conditions are found not to meet any design requirements during installation, the Engineer of Record must be contacted immediately.
5. All installations require a minimum two layers of geotextile fabric. One layer is to be installed around the Modules, and another layer is to be installed between the stone/soil interfaces.
6. Stone backfilling is to follow all requirements of the most current installation instructions.
7. The installing contractor must apply all protective measures to prevent sediment from entering the system during and after installation per local, state, and federal regulations.
8. The StormTank® Module carries a Limited Warranty, which can be accessed at www.brentwoodindustries.com.

1.0 Introduction

About Brentwood

Brentwood is a global manufacturer of custom and proprietary products and systems for the construction, consumer, medical, power, transportation, and water industries. A focus on plastics innovation, coupled with diverse production capabilities and engineering expertise, has allowed Brentwood to build a strong reputation for thermoplastic molding and solutions development.

Brentwood's product and service offerings continue to grow with an ever-increasing manufacturing presence. By emphasizing customer service and working closely with clients throughout the design, engineering, and manufacturing phases of each project, Brentwood develops forward-thinking strategies to create targeted, tailored solutions.

StormTank® Module

The StormTank Module is a strong, yet lightweight, alternative to other subsurface systems and offers the largest void space (up to 97%) of any subsurface stormwater storage unit on the market. The Modules are simple to assemble on site, limiting shipping costs, installation time, and labor. Their structural PVC columns pressure fit into the polypropylene top/bottom platens, with side panels inserted around the perimeter of the system. This open design and lack of internal walls make the Module system easy to clean compared to other subsurface box structures. When properly designed, applied, installed, and maintained, the Module system has been engineered to achieve a 50-year lifespan.

Technical Support

Brentwood's knowledgeable distributor network and in-house associates emphasize customer service and support by parterning with customers to extend the process beyond physical material supply. These trained specialists are available to assist in the review of proposed systems, conversions of alternatively designed systems, or to resolve any potential concerns before, during, and after the design process. To provide the best assistance, it is recommended that associates be provided with a site plan and cross-sections that include grading, drainage structures, dimensions, etc.

2.0 Product Information

Applications

The Module system can be utilized for detention, infiltration, capture and reuse, and specialty applications across a wide range of industries, including the commercial, residential, and recreational segments. The product's modular design allows the system to be configured in almost any shape (even around utilities) and to be located under almost any pervious or impervious surface.

Module Selection

Brentwood manufactures the Module in five different heights (Table 1) that can be stacked uniformly up to two Modules high. This allows for numerous height configurations up to 6' (1.83 m) tall. The Modules can be buried up to a maximum invert of 11' (3.35 m) and require a minimum cover of 24" (610 mm) for load rating. When selecting the proper Module, it is important to consider the minimum required cover, any groundwater or limiting zone restrictions, footprint requirements, and all local, state, and federal regulations.

Table 1: Nominal StormTank® Module Specificiations

	ST-18	ST-24	ST-30	ST-33	ST-36
Height	18" (457 mm)	24" (610 mm)	30" (762 mm)	33" (838 mm)	36" (914 mm)
Void Space	95.5%	96.0%	96.5%	96.9%	97.0%
Module Storage Capacity	6.54 ft^3 (0.18 m^3)	8.64 ft^3 (0.24 m^3)	10.86 ft^3 (0.31 m^3)	11.99 ft^3 (0.34 m^3)	13.10 ft^3 (0.37 m^3)
Min. Installed Capacity*	9.15 ft^3 (0.26 m^3)	11.34 ft^3 (0.32 m^3)	13.56 ft^3 (0.38 m^3)	14.69 ft^3 (0.42 m^3)	15.80 ft^3 (0.45 m^3)
Weight	22.70 lbs (10.30 kg)	26.30 lbs (11.93 kg)	29.50 lbs (13.38 kg)	31.3 lbs (14.20 kg)	33.10 lbs (15.01 kg)

Min. Installed Capacity includes the leveling bed, Module, and top backfill storage capacity for one Module. Stone storage capacity is based on 40% void space.* ***Side backfill storage is not included.*

3.0 Manufacturing Standards

Brentwood selects material based on long-term performance needs. To ensure long-term performance and limit component deflection over time (creep), Brentwood selected polyvinyl chloride (PVC) for the Module's structural columns and a virgin polypropylene (PP) blend for the top/bottom and side panels. PVC provides the largest creep resistance of commonly available plastics, and therefore, provides the best performance under loading conditions. Materials like polyethylene (HDPE) and recycled PP have lower creep resistance and are not recommended for load-bearing products and applications.

Materials:

Brentwood's proprietary PVC and PP copolymer resins have been chosen specifically for utilization in the StormTank® Module. The PVC is blended in house by experts and is a 100% blend of post-manuacturing/pre-consumer recycled material. Both materials exhibit structural resilience and naturally resist the chemicals typically found in stormwater runoff.

Methods:

Injection Molding

The Module's top/bottom platens and side panels are injection molded, using proprietary molds and materials. This allows Brentwood to manufacture a product that meets structural requirements while maintaining dimensional control, molded-in traceability, and quality control.

Extrusion

Brentwood's expertise in PVC extrusion allows the structural columns to be manufactured in house. The column extrusion includes the internal structural ribs required for lateral support.

Quality Control

Brentwood maintains strict quality control in order to ensure that materials and the final product meet design requirments. This quality assurance program includes full material property testing in accordance with American Society for Testing and Materials (ASTM) standards, full-part testing, and process testing in order to quantify product performance during manufacturing. Additionally, Brentwood conducts secondary finshed-part testing to verify that design requirements continue to be met post-manufacturing.

All Module parts are marked with traceability information that allows for tracking of manufacturing. Brentwood maintains equipment at all manufacturing locations, as well as at its corporate testing lab, to ensure all materials and products meet all requirements.

4.0 Structural Response

Structural Design

The Module has been designed to resist loads calculated in accordance with the American Association of State Highway and Transportation Official's (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design manual. This fully factored load includes a multiple presence factor, dynamic load allowance, and live load factor to account for real-world situations. This loading was considered when Brentwood developed both the product and installation requirements. The developed minimum cover ensures the system maintains an adequate resistance factor for the design truck (HS-20) and HS-25 loads.

Full-Scale Product Testing

Engineers at Brentwood's in-house testing facility have completed full-scale vertical and lateral tests on the Module to evaluate product response. To date, Brentwood continues in-house testing in order to evaluate long-term creep effects.

Fully Installed System Testing

Brentwood's dedication to providing a premier product extends to fully installed testing. Through a partnership with Queen's University's GeoEngineering Centre in Kingston, Ontario, Brentwood has conducted full-scale installation tests of single- and double-stacked Module systems to analyze short- and long-term performance. Testing includes short-term ultimate limit state testing under fully factored AASHTO loads and minimum installation cover, lateral load testing, long-term performance and lifecycle testing utilizing time-temperature superposition, and load resistance development. Side backfill material tests were also performed to compare the usage of sand, compacted stone, and uncompacted stone.

5.0 Foundation

The foundation (subgrade) of the subsurface storage structure may be the most important part of the Module system installation as this is the location where the system applies the load generated at the surface. If the subgrade lacks adequate support or encounters potential settlement, the entire system could be adversely affected. Therefore, when implementing an underground storage solution, it is imperative that a geotechnical investigation be performed to ensure a strong foundation.

Considerations & Requirements:

Bearing Capacity

The bearing capacity is the ability of the soil to resist settlement. In other words, it is the amount of weight the soil can support. This is important versus the native condition because the system is replacing earth, and even though the system weighs less than the earth, the additional load displacement of the earth is not offset by the difference in weight.

Using the Loading and Resistance Factor Design (LRFD) calculation for bearing capacity, Brentwood has developed a conservative minimum bearing capacity table (see Appendix). The Engineer of Record shall reference this table to assess actual cover versus the soil bearing required for each unit system.

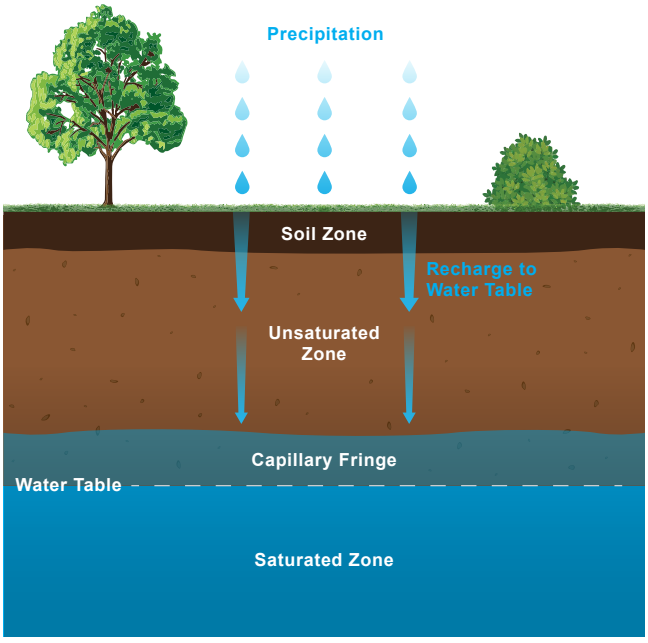
Soil Profile

Limiting Zones

Limiting zones are conditions in the underlying soils that can affect the maximum available depth for installation and can reduce the strength and stability of the underlying subgrade. The three main forms of limiting zones are water tables, bedrock, and karst topography. It is recommended that a system be offset a minimum of 12" (305 mm) from any limiting zones.

Compaction

Soil compaction occurs as the soil particles are pressed together and pore space is eliminated. By compacting the soils to 95% (as recommended by Brentwood), the subgrade strength will increase, in turn limiting both the potential for the soil to move once installed and for differential settlement to occur throughout the system. If designing the specific compaction requirement, settlement should be limited to less than 1" (25 mm) through the entire subgrade and should not exceed a 1/2" (13 mm) of differential settlement between any two adjacent units within the system over time.



Water Table Zones

Mitigation

If a minimum subgrade bearing capacity cannot be achieved because of weak soil, a suitable design will need to be completed by a Geotechnical Engineer. This design may include the over-excavation of the subgrade and an engineered fill or slurry being placed. Additional material such as geogrid or other products may also be required. Please contact a Geotechnical Engineer prior to selecting products or designing the subgrade.

6.0 System Materials

Geotextile Fabric

The 6-ounce geotextile fabric is recommended to be installed between the soil and stone interfaces around the Modules to prevent soil migration.

Leveling Bed

The leveling bed is constructed of 6”-thick (152 mm) angular stone (Table 2). The bed has not been designed as a structural element but is utilized to provide a level surface for the installation of the system and provide an even distribution of load to the subgrade.

Stone Backfill

The stone backfill is designed to limit the strain on the product through displacement of load and ensure the product’s longevity. Therefore, a minimum of 12”-wide (305 mm) angular stone must be placed around all sides of the system. In addition, a minimum layer of 12” (305 mm) angular stone is required on top of the system. All material is to be placed evenly in 12” (305 mm) lifts around and on top of the system and aligned with a vibratory plate compactor.

Table 2: Approved Backfill Material

Material Location	Description	AASHTO M43 Designation	ASTM D2321 Class	Compaction/Density
Finished Surface	Topsoil, hardscape, stone, concrete, or asphalt per Engineer of Record	N/A	N/A	Prepare per engineered plans
Suitable Compactable Fill	Well-graded granular soil/aggregate, typically road base or earthen fill (maximum 4" particle size)	56, 57, 6, 67, 68	I & II III (Earth Only)	Place in maximum 12" lifts to a minimum 90% standard proctor density
Top Backfill	Crushed angular stone placed between Modules and road base or earthen fill	56, 57, 6, 67, 68	I & II	Plate vibrate to provide evenly distributed layers
Side Backfill	Crushed angular stone placed between earthen wall and Modules	56, 57, 6, 67, 68	I & II	Place and plate vibrate in uniform 12" lifts around the system
Leveling Bed	Crushed angular stone placed to provide level surface for installation of Modules	56, 57, 6, 67, 68	I & II	Plate vibrate to achieve level surface

Impermeable Liner

In designs that prevent runoff from infiltrating into the surrounding soil (detention or reuse applications) or groundwater from entering the system, an impermeable liner is required. When incorporating a liner as part of the system, Brentwood recommends using a manufactured product such as a PVC liner. This can be installed around the Modules themselves or installed around the excavation (to gain the benefit of the void space in the stone) and should include an underdrain system to ensure the basin fully drains. This liner is installed with a layer of geotextile fabric on both sides to prevent puncture, in accordance with manufacturer recommendations.

7.0 Connections

Stormwater runoff must be able to move readily in and out of the StormTank® Module system. Brentwood has developed numerous means of connecting to the system, including inlet/outlet ports and direct abutment to a catch basin or endwall. All methods of connection should be evaluated as each one may offer a different solution. Brentwood has developed drawings to assist with specific installation methods, and these are available at www.brentwoodindustries.com.

Inlet/Outlet and Pipe Connections

To facilitate easy connection to the system, Brentwood manufactures two inlet/outlet ports. They are 12" (305 mm) and 14" (356 mm), respectfully, and utilize a flexible coupling connection to the adjoining pipe.

Another common installation method is to directly connect the pipe to the system. In order to do this, an opening is cut into the side panels, the pipe is inserted, and then the system is wrapped in geotextile fabric. When utilizing this connection method, the pipe must be located a minimum of 3" (76 mm) from the bottom of the system. This provides adequate clearance for the bottom platen and the required strength in the remaining side panel. To maintain the required clearances or reduce pipe size, it may be necessary to connect utilizing a manifold system.

Direct Abutment

The system can also be connected by directly abutting Modules to a concrete catch basin or endwall. This allows for a seamless connection of structures in close proximity to the system and eliminates the need for numerous pipe connections. When directly abutting one of these structures, remove any side panels that fully abut the structure, and make sure it is flush with the system to prevent material migration into the structure.

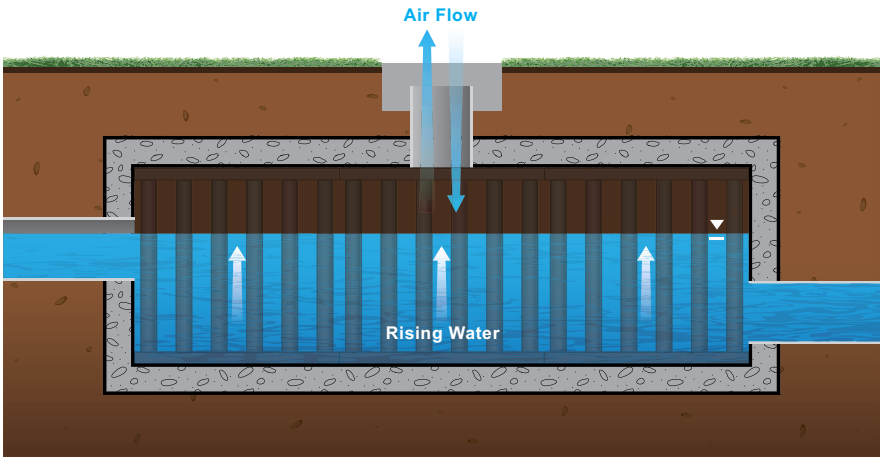
Underdrain

Underdrains are typically utilized in detention applications to ensure the system fully drains since infiltration is limited or prohibited. The incorporation of an underdrain in a detention application will require an impermeable liner between the stone-soil interface.

Cleanout Ports

Brentwood understands the necessity to inspect and clean a subsurface system and has designed the Module without any walls to allow full access. Brentwood offers three different cleanout/observation ports for utilization with the system. The ports are made from PVC, provide an easy means of connection, and are available in 6" (152 mm), 8" (203 mm) and 10" (254 mm) diameters. The 10" (254 mm) port is sized to allow access to the system by a vacuum truck suction hose for easy debris removal.

It is recommended that ports be located a maximum of 30' (9.14 m) on center to provide adequate access, ensure proper airflow, and allow the system to completely fill.



Ventilation and Air Flow

8.0 Pretreatment

Removing pollutants from stormwater runoff is an important component of any stormwater management plan. Pretreatment works to prevent water quality deterioration and also plays an integral part in allowing the system to maintain performance over time and increase longevity. Treatment products vary in complexity, design, and effectiveness, and therefore, should be selected based on specific project requirements.

Typical Stormwater System

StormTank® Shield

Brentwood's StormTank Shield provides a low-cost solution for stormwater pretreatment. Designed to improve sumped inlet treatment, the Shield reduces pollutant discharge through gross sediment removal and oil/water separation. For more information, please visit www.brentwoodindustries.com.

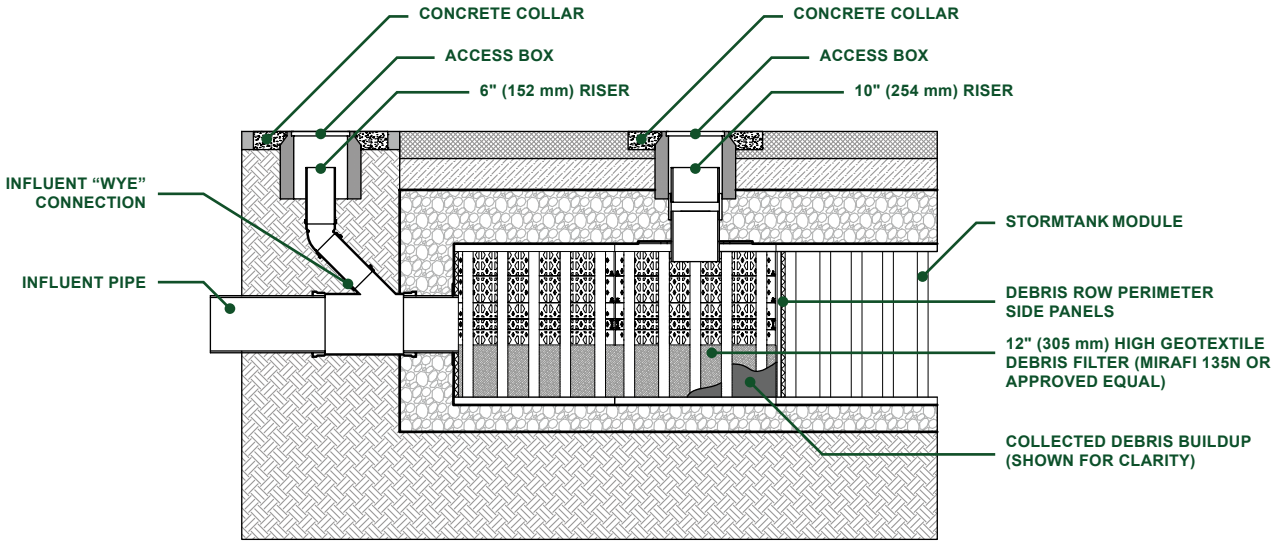
Debris Row (Easy Cleanout)

An essential step of designing, installing, and maintaining a subsurface system is preventing debris from entering the storage. This can be done by incorporating debris rows (or bays) at the inlets of the system to prevent debris from entering the rest of the system.

The debris row is built into the system utilizing side panels with a 12" (305 mm) segment of geotextile fabric. This allows for the full basin capacity to be utilized while storing any debris in an easy-to-remove location. To calculate the number of side panels required to prevent backing up, the opening area of the side panels on the area above the geotextile fabric has been calculated and compared to the inflow pipe diameter.

Debris row cleanout is made easy by including 10" (254 mm) suction ports, based on the length of the row, and a 6" (152 mm) saddle connection to the inflow pipe. If the system is directly abutting a catch basin, the saddle connection is not required, and the flush hose can be inserted through the catch basin. Debris is then flushed from the inlet toward the suction ports and removed.

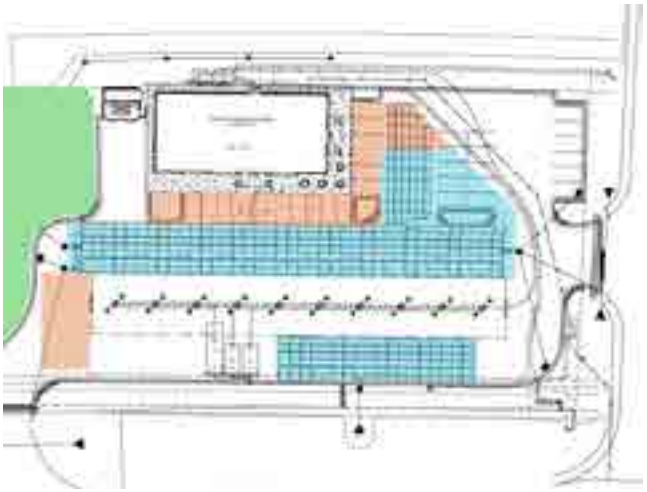
Brentwood has developed drawings and specifications that are available at www.brentwoodindustries.com to illustrate the debris row configuration and layouts.



Debris Row Section Detail

9.0 Additional Considerations

Many variable factors, such as the examples below, must be taken into consideration when designing a StormTank® Module system. As these considerations require complex calculations and proper planning, please contact Brentwood or your local distributor to discuss project-specific requirements.



Site Plan Module Layout Adaptability
(StormTank Modules shown in blue)

Adaptability

The Modules can be arranged in custom configurations to meet tight site constraints and to provide different horizontal and edge configurations. Modules can also be stacked, to a maximum 2 units tall, to meet capacity needs and can be buried to a maximum invert of 11' (3.35 m) to allow for a stacked system or deeper burial.

Adjacent Structures

The location of adjacent structures, especially the location of footings and foundations, must be taken into consideration as part of system design. The foundation of a building or retaining wall produces a load that is transmitted to a footing and then applied to the surface below. The footing is intended to distribute the line load of the wall over a larger area without increasing the larger wall's thickness. The reason this is important is because the load the footing is applying to the earth is distributed through the earth and could potentially affect a subsurface system as either a vertical load to the top of the Module or a lateral load to the side of the Module.

Based on this increased loading, it is recommended that the subsurface system either maintain a distance away from the foundation, footing equal to the height between the Module invert and structure invert of the system, or the foundation or footing extend at a minimum to the invert of the subsurface system. By locating the foundation away from the system or equal to the invert, the loading generated by the structure does not get transferred onto the system. It is recommended that all adjacent structures be completed prior to the installation of the Modules to prevent construction loads from being imparted on the system.

Adjacent Excavation

The subsurface system must be protected before, during, and after the installation. Once a system is installed, it is important to remember that excavation adjacent to the system could potentially cause the system to become unstable. The uniform backfilling will evenly distribute the lateral loads to the system and prohibit the system from becoming unstable and racking from unequal loads. However, it is recommended that any excavation adjacent to a system remain a minimum distance away from the system equal to the invert. This will provide a soil load that is equal to the load applied by the opposite side of the installation. If the excavation is to exceed the invert of the system, additional analysis may be necessary.

Sloped Finished Grade

Much like adjacent excavation, a finished grade with a differential cover could potentially cause a subsurface system to become disproportionately loaded. For example, if one side of the system has 10' (3.05 m) of cover and the adjacent side has 24" (610 mm) of cover, the taller side will generate a higher lateral load, and the opposite side may not have an equal amount of resistance to prevent a racking of the system. Additional evaluation may be required when working on sites where the final grade around a system exceeds 5%.

10.0 Inspection & Maintenance

Description

Proper inspection and maintenance of a subsurface stormwater storage system are vital to ensuring proper product functioning and system longevity. It is recommended that during construction the contractor takes the necessary steps to prevent sediment from entering the subsurface system. This may include the installation of a bypass pipe around the system until the site is stabilized. The contractor should install and maintain all site erosion and sediment per Best Management Practices (BMP) and local, state, and federal regulations.

Once the site is stabilized, the contractor should remove and properly dispose of erosion and sediment per BMP and all local, state, and federal regulations. Care should be taken during removal to prevent collected sediment or debris from entering the stormwater system. Once the controls are removed, the system should be flushed to remove any sediment or construction debris by following the maintenance procedure outlined below.

During the first service year, a visual inspection should be completed during and after each major rainfall event, in addition to semi-annual inspections, to establish a pattern of sediment and debris buildup. Each stormwater system is unique, and multiple criteria can affect maintenance frequency. For example, whether or not a system design includes inlet protection or a pretreatment device has a substantial effect on the system's need for maintenance. Other factors include where the runoff is coming from (hardscape, gravel, soil, etc.) and seasonal changes like autumn leaves and winter salt.

During and after the second year of service, an established annual inspection frequency, based on the information collected during the first year, should be followed. At a minimum, an inspection should be performed semi-annually. Additional inspections may be required at the change of seasons for regions that experience adverse conditions (leaves, cinders, salt, sand, etc).

Maintenance Procedures

Inspection:

1. Inspect all observation ports, inflow and outflow connections, and the discharge area.
2. Identify and log any sediment and debris accumulation, system backup, or discharge rate changes.
3. If there is a sufficient need for cleanout, contact a local cleaning company for assistance.

Cleaning:

1. If a pretreatment device is installed, follow manufacturer recommendations.
2. Using a vacuum pump truck, evacuate debris from the inflow and outflow points.
3. Flush the system with clean water, forcing debris from the system.
4. Repeat steps 2 and 3 until no debris is evident.

11.0 System Sizing

System Sizing Calculation

This section provides a brief description of the process required to size the StormTank® Module system. If you need additional assistance in determining the required number of Modules or assistance with the proposed configuration, it is recommended that you contact Brentwood or your local distributor. Additionally, Brentwood's volume calculator can help you to estimate the available storage volumes with and without stone storage. This tool is available at www.brentwoodindustries.com.

1. Determine the required storage volume (Vs):
It is the sole responsibility of the Engineer of Record to calculate the storage volume in accordance with all local, state, and federal regulations.

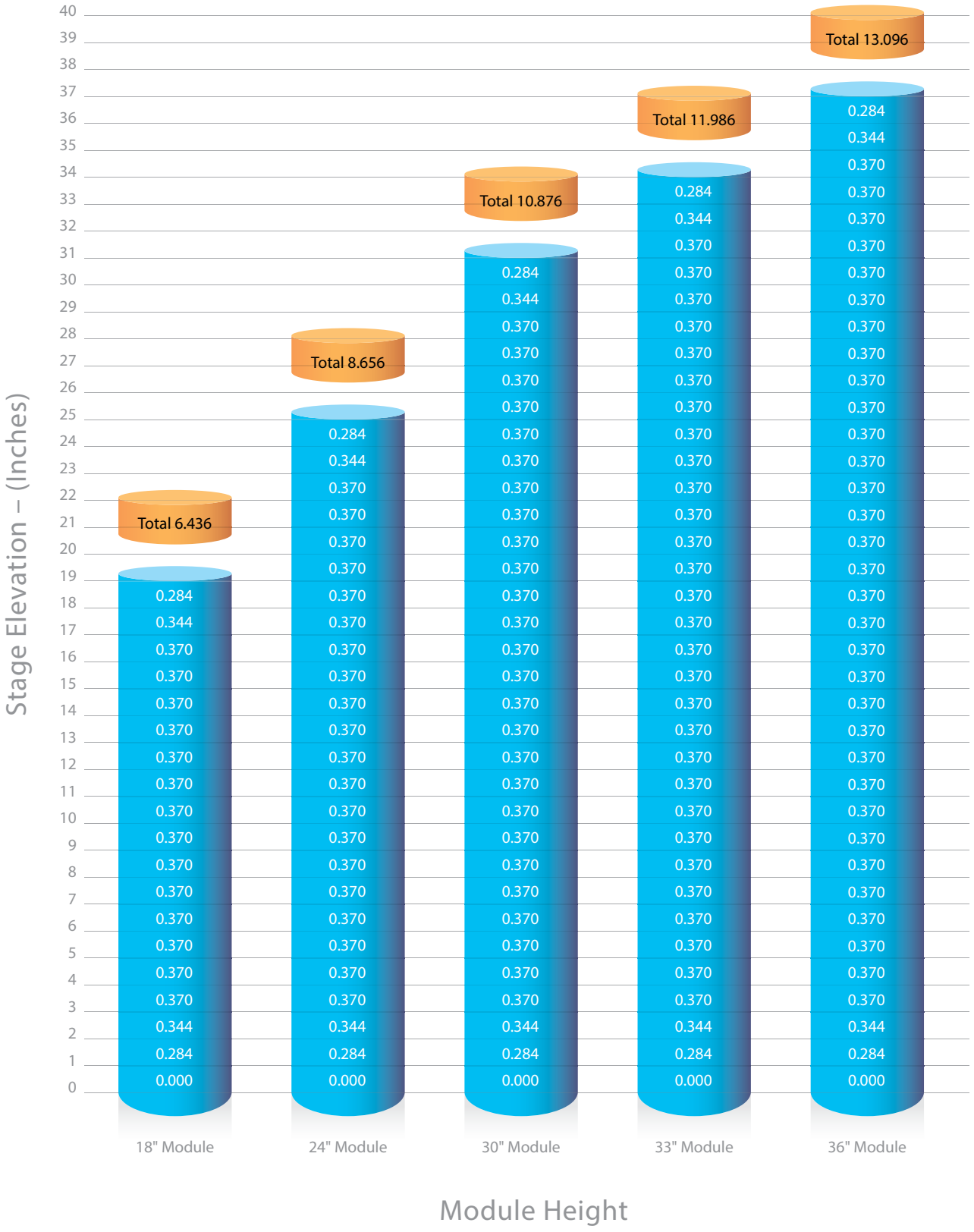
2. Determine the required number of Modules (N):
If the storage volume does not include stone storage, take the total volume divided by the selected Module storage volume. If the stone storage is to be included, additional calculations will be required to determine the available stone storage for each configuration.

3. Determine the required volume of stone (Vstone):
The system requires a minimum 6" (152 mm) leveling bed, 12" (305 mm) backfill around the system, and 12" (305 mm) top backfill utilizing 3/4" (19 mm) angular clean stone. Therefore, take the area of the system times the leveling bed and the top backfill. Once that value is determined, add the volume based on the side backfill width times the height from the invert of the Modules to the top of the Modules.

4. Determine the required excavation volume (Vexcv):
Utilizing the area of the system, including the side backfill, multiply by the depth of the system including the leveling bed. It is noted that this calculation should also include any necessary side pitch or benching that is required for local, state, or federal safety standards.

5. Determine the required amount of geotextile (G):
The system utilizes a multiple layer system of geotextile fabric. Therefore, two calculations are required to determine the necessary amount of geotextile. The first layer surrounds the entire system (including all backfill), and the second layer surrounds the Module system only. It is recommended that an additional 20% be included for waste and overlap.

11.1 Storage Volume



11.2 Material Quantity Worksheet

Project Name: | By:

Location: | Date:

System Requirements

Required Storage		ft^3 (m^3)
Number of Modules		Each
Module Storage		ft^3 (m^3)
Stone Storage		ft^3 (m^3)
Module Footprint		ft^2 (m^2) Number of Modules x 4.5 ft^2 (0.42 m^2)
System Footprint w/ Stone		ft^2 (m^2) Module Footprint + 1 ft (0.3048 m) to each edge
Stone		Tons (kg) Leveling Bed + Side Backfill + Top Backfill
Volume of Excavation		yd^3 (m^3) System Footprint w/ Stone x Total Height
Area of Geotextile		yd^2 (m^2) Wrap around Modules + Wrap around Stone/Soil Interface

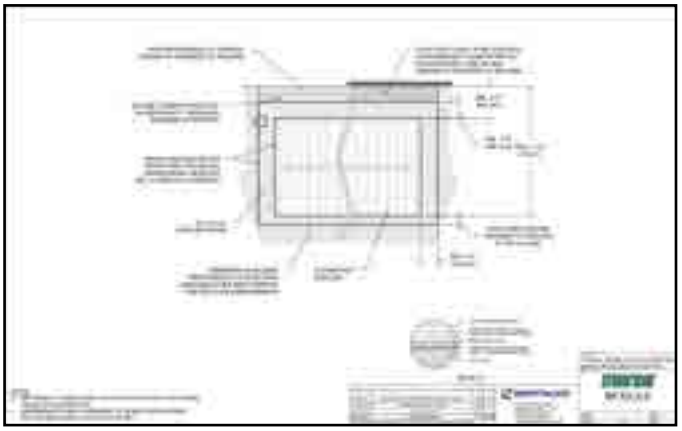
System Cost

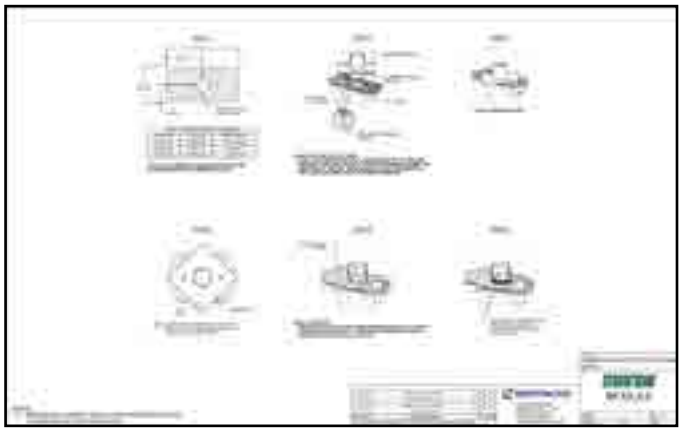
	Quantity			Unit Price			Total
Modules		ft^3 (m^3)	X	$	ft^3 (m^3)	=	$
Stone		Tons (kg)	X	$	Tons (kg)	=	$
Excavation		yd^3 (m^3)	X	$	yd^3 (m^3)	=	$
Geotextile		yd^2 (m^2)	X	$	yd^2 (m^2)	=	$
					Subtotal =		$
					Tons =		$

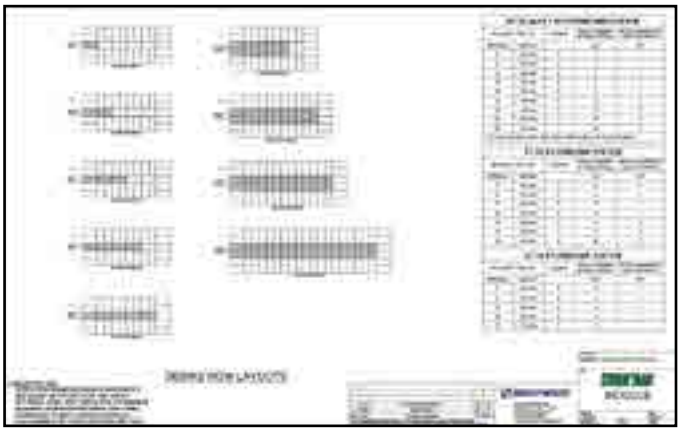
Material costs may not include freight.
Please contact Brentwood or your local distributor for this information.

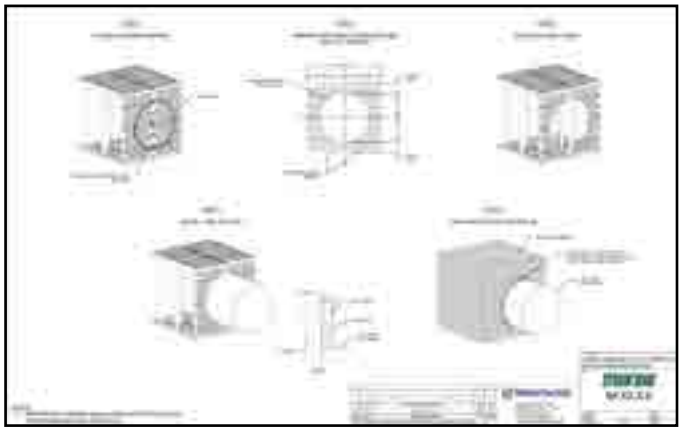
12.0 Detail Drawings

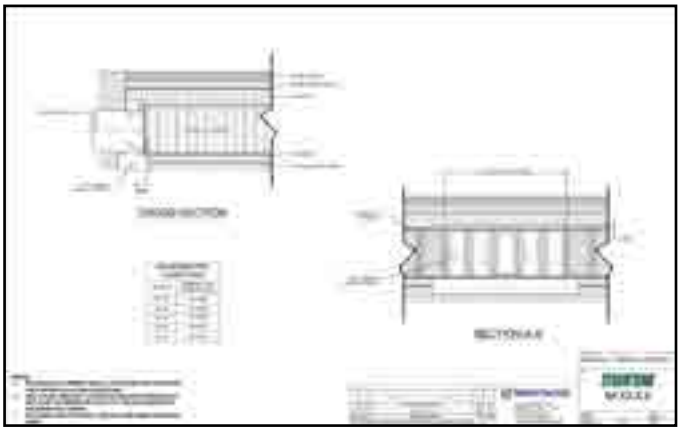
Brentwood has developed numerous drawings for utilization when specifying a StormTank® Module system. Below are some examples of drawings available at [www.brentwoodindustries.com.](http://www.brentwoodindustries.com)











13.0 Specifications

1) General

a) This specification shall govern the implementation, performance, material, and fabrication pertaining to the subsurface stormwater storage system. The subsurface stormwater storage system shall be manufactured by Brentwood Industries, Inc., 500 Spring Ridge Drive, Reading, PA 19610 (610.374.5109), and shall adhere to the following specification at the required storage capacities.

b) All work is to be completed per the design requirements of the Engineer of Record and to meet or exceed the manufacturer's design and installation requirements.

2) Subsurface Stormwater Storage System Modules

a) The subsurface stormwater storage system shall be constructed from virgin polypropylene and 100% recycled PVC to meet the following requirements:

i) High-Impact Polypropylene Copolymer Material

(1) Injection molded, polypropylene, top/bottom platens and side panels formed to a dimension of 36" (914 mm) long by 18" (457 mm) wide [nominal].

ii) 100% Recycled PVC Material

(1) PVC conforming to ASTM D-1784 Cell Classification 12344 b-12454 B.

(2) Extruded, rigid, and 100% recycled PVC columns sized for applicable loads as defined by Section 3 of the AASHTO LRFD Bridge Design Specifications and manufactured to the required length per engineer-approved drawings.

iii) Platens and columns are assembled on site to create Modules, which can be uniformly stacked up to two Modules high, in vertical structures of variable height (custom for each project).

iv) Modular stormwater storage units must have a minimum 95% void space and be continuously open in both length and width, with no internal walls or partitions.

3) Submittals

a) Only systems that are approved by the engineer will be allowed.

b) At least 10 days prior to bid, submit the following to the engineer to be considered for pre-qualification to bid:

i) A list of materials to be provided for work under this article, including the name and address of the materials producer and the location from which the materials are to be obtained.

ii) Three hard copies of the following:

(1) Shop drawings.

(2) Specification sheets.

(3) Installation instructions.

(4) Maintenance guidelines.

c) Subsurface Stormwater Storage System Component Samples for review:

i) Subsurface stormwater storage system Modules provide a single 36" (914 mm) long by 18" (457 mm) wide, height as specified, unit of the product for review.

ii) Sample to be retained by owner.

d) Manufacturers named as acceptable herein are not required to submit samples.

4) Structural Design

a) The structural design, backfill, and installation requirements shall ensure the loads and load factors specified in the AASHTO LRFD Bridge Design Specifications, Section 3 are met.

b) Product shall be tested under minimum installation criteria for short-duration live loads that are calculated to include a 20% increase over the AASHTO Design Truck standard with consideration for impact, multiple vehicle presences, and live load factor.

c) Product shall be tested under maximum burial criteria for long-term dead loads.

d) The engineer may require submission of third-party test data and results in accordance with items 4b and 4c to ensure adequate structural design and performance.

14.0 Appendix - Bearing Capacity Tables

Cover		HS-25 (Unfactored)		HS-25 (Factored)	
English (in)	Metric (mm)	English (ksf)	Metric (kPa)	English (ksf)	Metric (kPa)
24	610	1.89	90.45	4.75	227.43
25	635	1.82	86.96	4.53	216.90
26	660	1.75	83.78	4.34	207.80
27	686	1.69	80.88	4.16	199.18
28	711	1.63	78.24	3.99	191.04
29	737	1.58	75.82	3.84	183.86
30	762	1.54	73.62	3.70	177.16
31	787	1.50	71.60	3.57	170.93
32	813	1.46	69.75	3.45	165.19
33	838	1.42	68.06	3.34	159.92
34	864	1.39	66.51	3.24	155.13
35	889	1.36	65.10	3.14	150.34
36	914	1.33	63.80	3.05	146.03
37	940	1.31	62.62	2.97	142.20
38	965	1.29	61.54	2.90	138.85
39	991	1.26	60.55	2.83	135.50
40	1,016	1.25	59.65	2.76	132.15
41	1,041	1.23	58.54	2.70	129.28
42	1,067	1.21	58.09	2.67	127.84
43	1,092	1.20	57.42	2.60	124.49
44	1,118	1.19	56.81	2.55	122.09
45	1,143	1.18	56.26	2.50	119.70
46	1,168	1.16	55.77	2.46	117.79
47	1,194	1.16	55.33	2.42	115.87
48	1,219	1.15	54.94	2.39	114.43
49	1,245	1.14	54.59	2.36	113.00
50	1,270	1.13	54.29	2.33	111.56
51	1,295	1.13	54.03	2.30	110.12
52	1,321	1.12	53.80	2.27	108.69
53	1,346	1.12	53.62	2.25	107.73
54	1,372	1.12	53.46	2.23	106.77
55	1,397	1.11	53.34	2.21	105.82
56	1,422	1.11	53.24	2.19	104.86
57	1,448	1.11	53.18	2.17	103.90
58	1,473	1.11	53.14	2.16	103.42
59	1,499	1.11	53.12	2.14	102.46
60	1,524	1.11	53.13	2.13	101.98
61	1,549	1.11	53.16	2.12	101.51
62	1,575	1.11	53.21	2.11	101.03
63	1,600	1.11	53.28	2.10	100.55
64	1,626	1.11	53.37	2.09	100.07
65	1,651	1.12	53.48	2.08	99.59
66	1,676	1.12	53.61	2.08	99.59
67	1,702	1.12	53.75	2.07	99.11
68	1,727	1.13	53.91	2.07	99.11
69	1,753	1.13	54.08	2.06	98.63

Cover		HS-25 (Unfactored)		HS-25 (Factored)	
English (in)	Metric (mm)	English (ksf)	Metric (kPa)	English (ksf)	Metric (kPa)
70	1,778	1.13	54.26	2.06	98.63
71	1,803	1.14	54.46	2.06	98.63
72	1,829	1.14	54.67	2.06	98.63
73	1,854	1.15	54.90	2.06	98.63
74	1,880	1.15	55.13	2.06	98.63
75	1,905	1.16	55.38	2.06	98.63
76	1,930	1.16	55.64	2.06	98.63
77	1,956	1.17	55.90	2.06	98.63
78	1,981	1.17	56.18	2.06	98.63
79	2,007	1.18	56.46	2.07	99.11
80	2,032	1.19	56.76	2.07	99.11
81	2,057	1.19	57.06	2.07	99.11
82	2,083	1.20	57.37	2.08	99.59
83	2,108	1.20	57.69	2.08	99.59
84	2,134	1.21	58.02	2.09	100.07
85	2,159	1.22	58.35	2.09	100.07
86	2,184	1.23	58.69	2.10	100.55
87	2,210	1.23	59.04	2.11	101.03
88	2,235	1.24	59.39	2.11	101.03
89	2,261	1.25	59.75	2.12	101.51
90	2,286	1.26	60.11	2.13	101.98
91	2,311	1.26	60.48	2.13	101.98
92	2,337	1.27	60.86	2.14	102.46
93	2,362	1.28	61.24	2.15	102.94
94	2,388	1.29	61.62	2.16	103.42
95	2,413	1.30	62.01	2.17	103.90
96	2,438	1.30	62.41	2.18	104.38
97	2,464	1.31	62.81	2.19	104.86
98	2,489	1.32	63.21	2.20	105.34
99	2,515	1.33	63.62	2.21	105.82
100	2,540	1.34	64.03	2.22	106.29
101	2,565	1.35	64.45	2.23	106.77
102	2,591	1.35	64.87	2.24	107.25
103	2,616	1.36	65.29	2.25	107.73
104	2,642	1.37	65.72	2.27	108.69
105	2,667	1.38	66.15	2.28	109.17
106	2,692	1.39	66.58	2.29	109.65
107	2,718	1.40	67.02	2.30	110.12
108	2,743	1.41	67.45	2.31	110.60
109	2,769	1.42	67.90	2.33	111.56
110	2,794	1.43	68.34	2.34	112.04
111	2,819	1.44	68.79	2.35	112.52
112	2,845	1.45	69.24	2.36	113.00
113	2,870	1.46	69.69	2.38	113.96
114	2,896	1.47	70.15	2.39	114.43

BRENTWOOD®

BRENTWOOD INDUSTRIES, INC.
brentwoodindustries.com
stormtank@brentw.com
+1.610.374.5109

Appendix C: Fire Flow Calculations

- Fire Flow Requirements – FUS (Technical Bulletin ISTB-2018-02)

Kollaard Associates
Engineers

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology

210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

(613) 860-0923
FAX: (613) 258-0475

APPENDIX C: CALCULATION OF FIRE FLOW REQUIREMENTS

Calculation Based on Fire Underwriters Survey, 1999

1) An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 \times C \times \sqrt{A}$$

where F = required fire flow in litres per minute

A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)

C = coefficient related to the type of construction:

1.5	for wood construction (structure essentially combustible)
1.0	for ordinary construction (brick or other masonry walls, combustible floor and interior)
0.8	for noncombustible construction (unprotected metal structural components, masonary or metal walls)
0.6	for fire-resistive construction (fully protected frame, floors, roof)

No. of Floors = 2

Area (Main) = 453.9 m^2 2nd floor 453.9 m^2

A = 907.8 m^2

C = 1.0

F = 6,629 L/min ----------> Rounded to nearest 1000 = **7,000** L/min

2) The value obtained in 1. may be reduced by as much as 25% for occupancies having a low contents fire

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

Reduction due to low occupancy hazard = -15% x 7,000 = = **5,950** L/min

3) The value above may be reduced by up to 50% for automatic sprinlker system

Reduction due to automatic sprinker system = -25% x 5,950 = **4,463**

4) The value obtained in 2. may be increased for structures exposed within 45 metres by the fire area under

Separation (metres)	Condition	Charge
0m to 3.0m	1	25%
3.1m to 10.0m	2	20%
10.1m to 20.0m	3	15%
20.1m to 30.0m	4	10%
30.1m to 45.0m	5	5%
45.1m to	6	0%

Exposures	Distance(m)	Condition		Charge
Side 1	1.2	1	-------->	25%
Side 2	1.2	1	-------->	25%
Front	18.5	3	-------->	15%
Back	50.0	6	-------->	0%
				65%

L/min

Increase due to separation = 65% x 5,950 = **3,868** L/min

The fire flow requirement is = **4,463**

Increase due to Separation = 3,868

8,330

or **138.8** **L/sec**

Appendix D: Boundary Conditions

Subject: 5536 Manotick Main Boundary Conditions
From: "Rasool, Rubina" <Rubina.Rasool@ottawa.ca>
Date: 18/03/2019, 2:23 p.m.
To: "steve@kollaard.ca" <steve@kollaard.ca>, "malou@kollaard.ca" <malou@kollaard.ca>, 'Sumon Ghosh' <sumon@kollaard.ca>
CC: "Whittaker, Damien" <Damien.Whittaker@ottawa.ca>, "McCormick, Sarah" <sarah.mccormick@ottawa.ca>

Good afternoon,

Please find attached the boundary conditions based on the information provided.

The pressure zone in this area is identified for upcoming configuration based on City construction with an approximate start time in 2019. As a result, there are two sets of boundary conditions provided pre-configuration and post-configuration.

The appropriate boundary conditions should be used based on the anticipated construction start time for the development application.

Please do not hesitate to contact me if you have any questions.

Regards,

Rubina

Rubina Rasool, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - Rural Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 24221, rubina.rasool@ottawa.ca

'

'

Attachments:

5536 Manotick Main BC.docx 168 KB

BOUNDARY CONDITIONS

Boundary Conditions For: 5536 Manotick Main

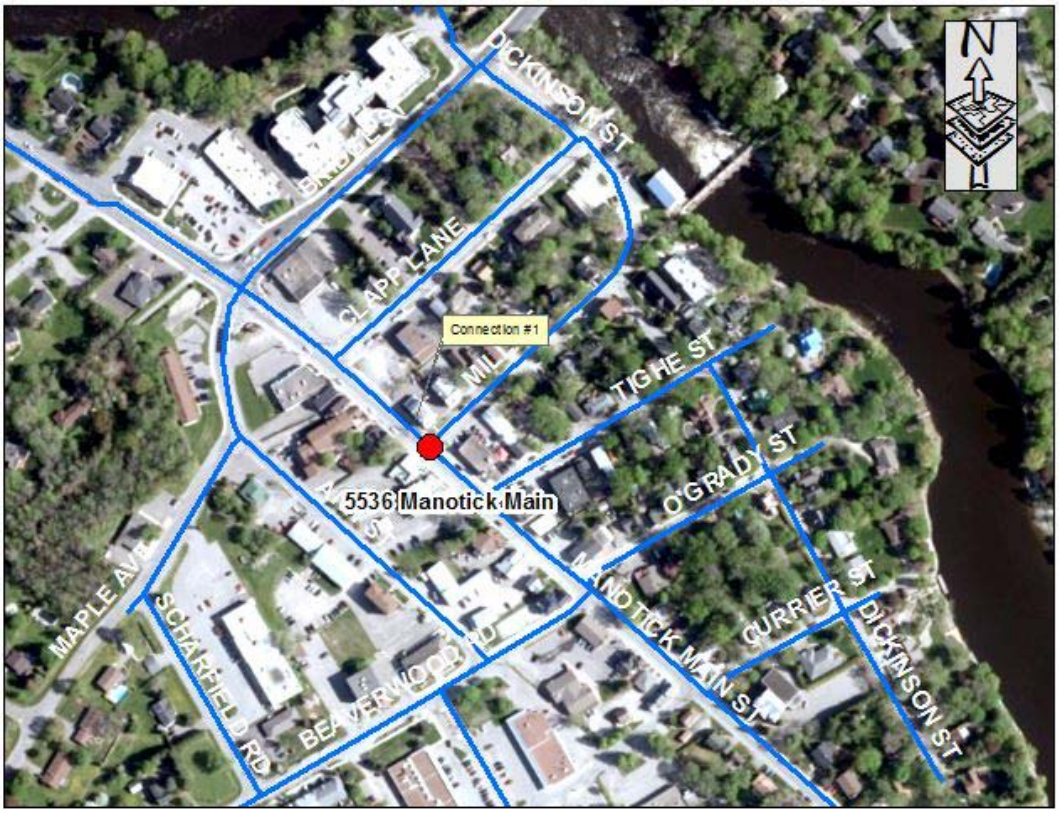
Date of Boundary Conditions: 2019-Mar-18

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	8.4	0.1
Maximum Daily Demand	12.6	0.2
Peak Hour	22.8	0.4
Fire Flow #1 Demand	8,000	133.3

Number Of Connections: 1

Location:



BOUNDARY CONDITIONS

Results:

Pre-Configuration

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	131.6	52.6
Peak Hour	126.2	44.8
Max Day Plus Fire (8,000) L/min	114.9	36.7

[1]Elevation: **89.110 m**

Post-Configuration

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.7	83.4
Peak Hour	144.7	79.1
Max Day Plus Fire (8,000) L/min	130.2	58.4

[1]Elevation: **89.110 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

Appendix E: Drawings

190117– Figure 1 – Pre-Development Catchment Areas
190117– Figure 2 – Post-Development Catchment Areas
190117– SER – Site Servicing Plan
190117– GRD – Grading and Drainage Plan
190117– ESC – Erosion and Sediment Control Plan

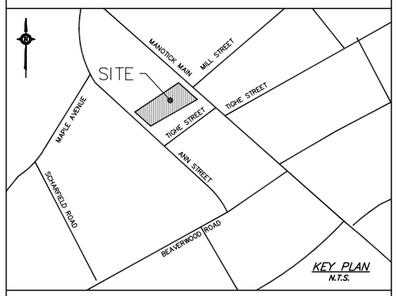
PRE–DEVELOPMENT CATCHMENT AREAS

NOT TO SCALE

DRAWING NUMBER:

FIGURE 1

PRE–DEVELOPMENT CATCHMENT AREAS



LEGEND (STORM WATER MANAGEMENT)

- CONTROLLED — CATCHMENT LABEL
- 0.39 / 0.34 — CATCHMENT AREA (HECTARES) / IMPERVIOUS RATIO
- CATCHMENT AREA BOUNDARY
- DIRECTION OF FLOW
- PROPERTY LINE
- TOP OF SLOPE
- CONTROLLED AREA
- UNCONTROLLED AREA
- PRE–DEVELOPMENT DRAINAGE PATTERN

REV	BY	DATE	DESCRIPTION
1	ML	2019/07/23	ISSUED FOR SUBMISSION

Kollaard Associates
Engineers

P.O. BOX 189, 210 PRESCOTT ST
KEMPTVILLE, ONTARIO
K0G 1J0 FAX (613) 258–0475
http://www.kollaard.ca

(613) 860–0923
info@kollaard.ca

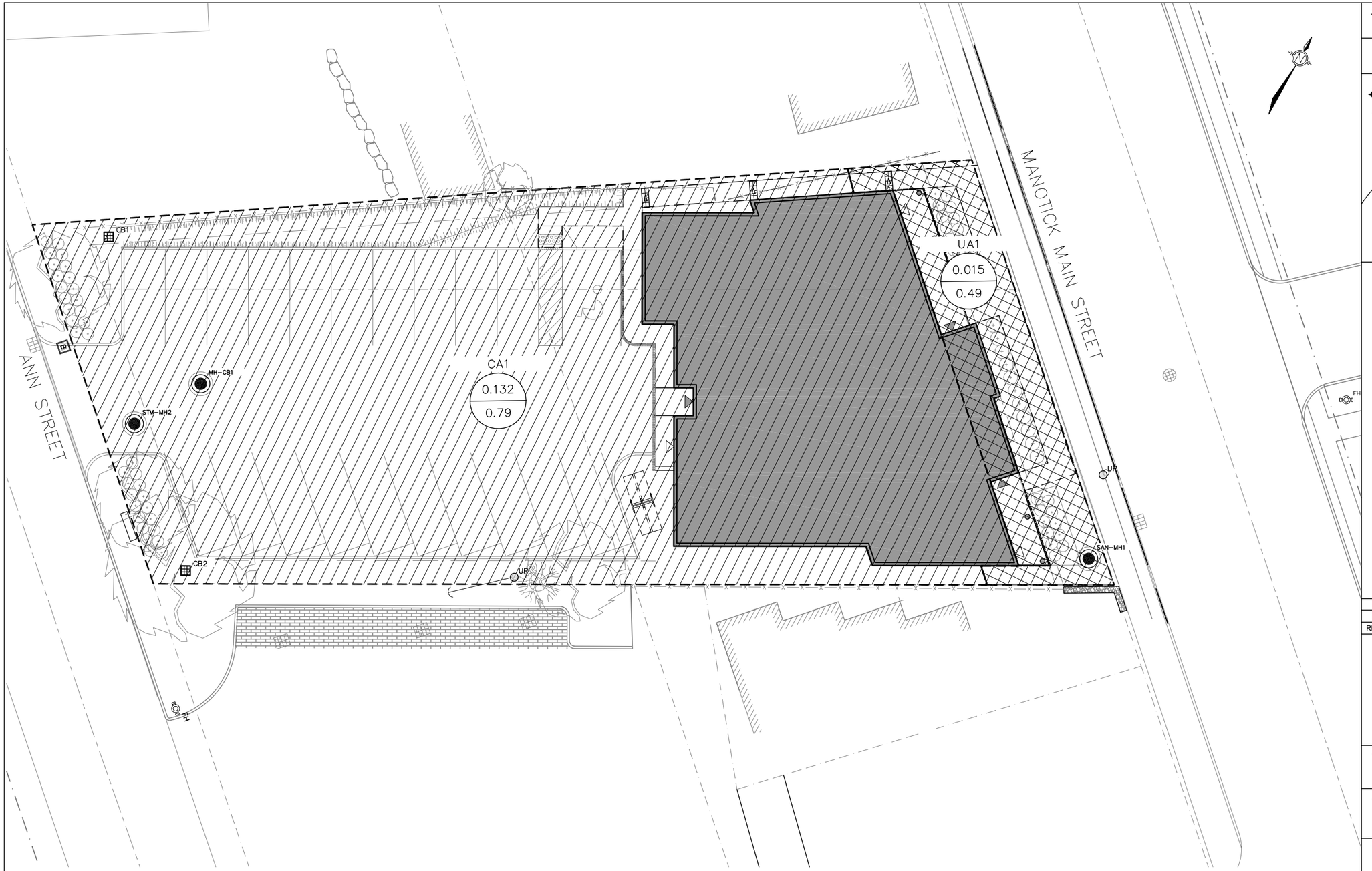
CLIENT:
ROYAL LEPAGE TEAM REALTY
101–555 LEGGET DRIVE
KANATA ON K2K 2X3
ATTN: JASON RALPH

PROJECT:
PROPOSED COMMERCIAL BUILDING

LOCATION:
5536 MANOTICK MAIN STREET
CITY OF OTTAWA,
ONTARIO

DESIGNED BY:	*DATE:*
––	MAR. 22, 2019
DRAWN BY:	*SCALE:*
ML	N.T.S.

KOLLAARD FILE NUMBER: 190117



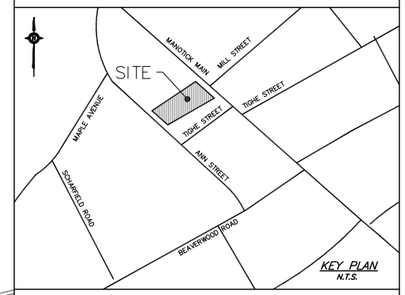
POST-DEVELOPMENT CATCHMENT AREAS

NOT TO SCALE

DRAWING NUMBER:

FIGURE 2

POST-DEVELOPMENT CATCHMENT AREAS



LEGEND (STORM WATER MANAGEMENT)

- CONTROLLED
- 0.39 / 0.34 — CATCHMENT LABEL; CATCHMENT AREA (HECTARES); IMPERVIOUS RATIO
- CATCHMENT AREA BOUNDARY
- DIRECTION OF FLOW
- PROPERTY LINE
- TOP OF SLOPE
- CONTROLLED AREA
- UNCONTROLLED AREA
- PRE-DEVELOPMENT DRAINAGE PATTERN

REV	BY	DATE	DESCRIPTION
1	ML	2019/07/23	ISSUED FOR SUBMISSION

Kollaard Associates
Engineers

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KEMPTVILLE, ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca

(613) 860-0923
info@kollaard.ca

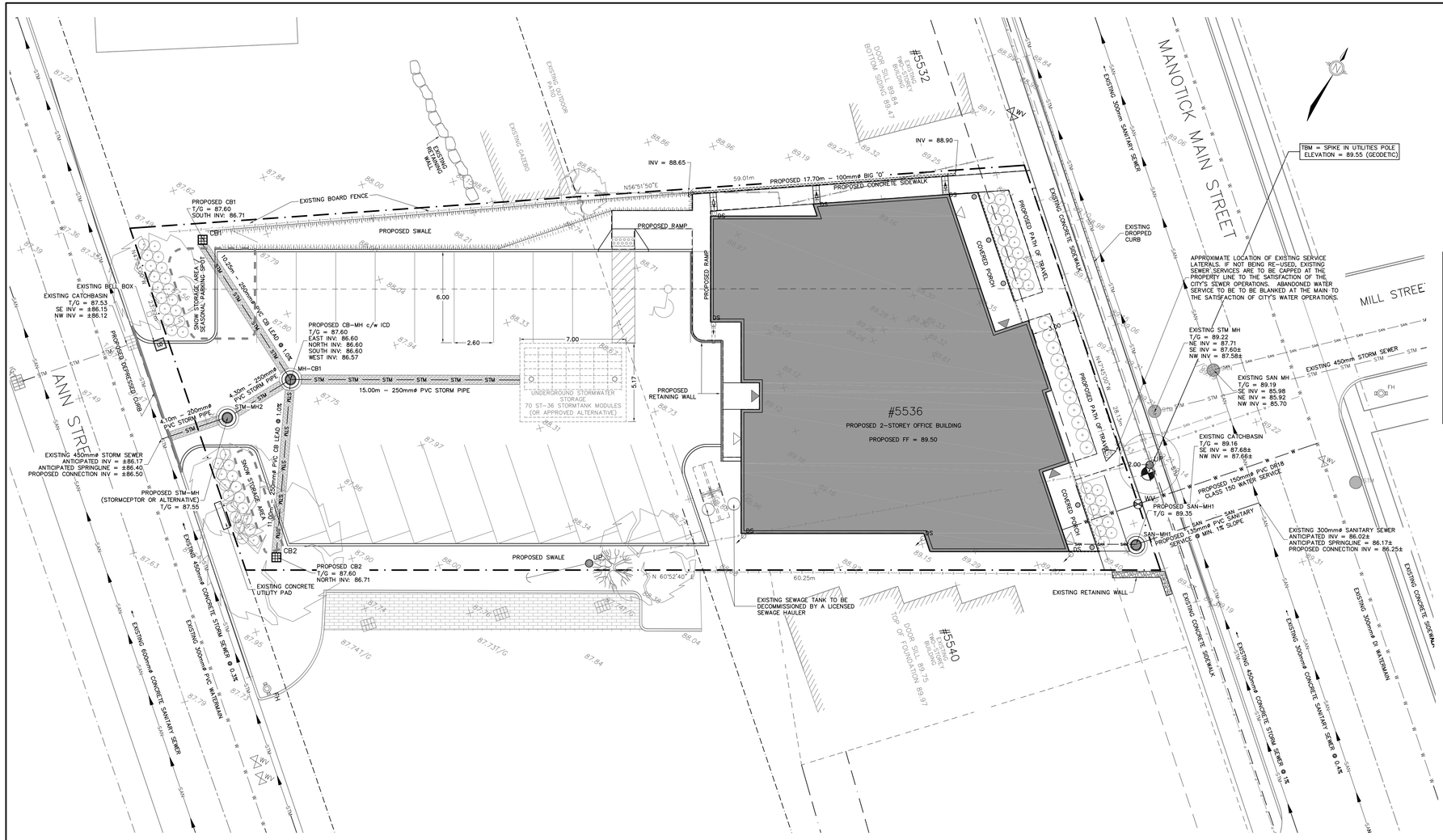
CLIENT:
ROYAL LEPAGE TEAM REALTY
101-555 LEGGET DRIVE
KANATA ON K2K 2X3
ATTN: JASON RALPH

PROJECT:
PROPOSED COMMERCIAL BUILDING

LOCATION:
5536 MANOTICK MAIN STREET
CITY OF OTTAWA,
ONTARIO

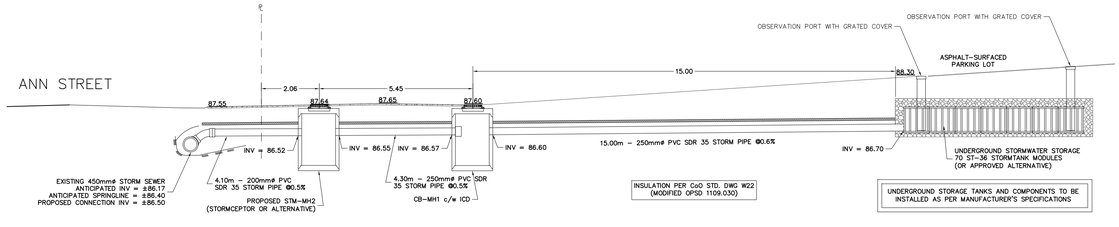
DESIGNED BY:	*DATE:*
SD	MAR. 22, 2019
DRAWN BY:	*SCALE:*
ML	N.T.S.

KOLLAARD FILE NUMBER: 190117



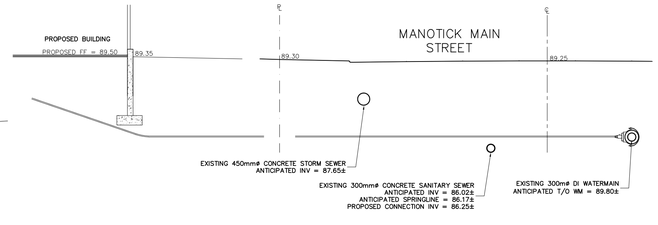
SITE SERVICING PLAN

SCALE 1:200



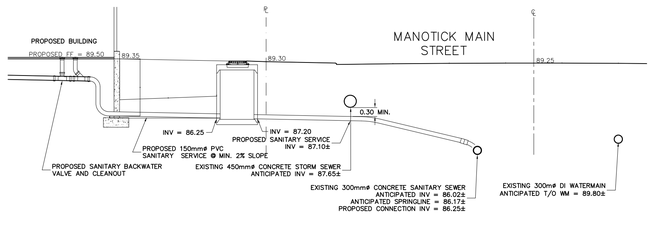
STORM SERVICE CONNECTION DETAIL

NOT TO SCALE



WATER SERVICE CONNECTION DETAIL

NOT TO SCALE



SANITARY SERVICE CONNECTION DETAIL

NOT TO SCALE

LEGEND

- EXISTING ELEVATION
- PROPOSED/EXISTING ELEVATION
- DRAINAGE SLOPE
- WATER SERVICES
- SANITARY SEWER
- STORM SEWER
- CENTRELINE OF ROAD
- PROPERTY LINE
- PROPOSED SILT FENCE
- EXISTING BELL PEDESTAL
- EXISTING UTILITY POLE
- APPROXIMATE LOCATION OF EXISTING SERVICE LATERALS
- TEMPORARY BENCHMARK
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING CATCH BASIN
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- PROPOSED DOWNSPOUT LOCATION
- PROPOSED GAP AND GRATE IN CONCRETE SIDEWALK AT DOWNSPOUT LOCATION
- PROPOSED WATER VALVE
- PROPOSED CATCH BASIN
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE

SERVICING NOTES:

1. A 0.3-METRE CLEARANCE BETWEEN WATERMAIN AND THE SANITARY AND STORM LATERALS IS TO BE PROVIDED.
2. ALL SERVICES ARE TO BE INSTALLED AT CURRENT CITY OF OTTAWA STANDARDS.
3. SERVICE LATERALS ARE TO HAVE A MINIMUM CLEARANCE OF 2 METRES FROM EXISTING UTILITIES POLES.
4. ALL BENDS IN THE SERVICE LATERALS ARE TO BE A MAXIMUM OF 2 @ 22.5° AND WITHIN THE PROPERTY.
5. EXACT LOCATION AND STATUS OF EXISTING LATERALS ARE UNKNOWN. IF SERVICE LATERALS ARE TO BE RE-USED, IT IS RECOMMENDED THAT THEY BE EXCAVATED AND INSPECTED. IF NOT BEING RE-USED, EXISTING SEWER SERVICES ARE TO BE CAPPED AT THE PROPERTY LINE TO THE SATISFACTION OF THE CITY'S SEWER OPERATIONS. ABANDONED WATER SERVICE TO BE TO BE BLANKED AT THE MAIN TO THE SATISFACTION OF CITY'S WATER OPERATIONS.

SEWER NOTES:

1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS AND ONTARIO PROVINCIAL STANDARDS FOR ROADS AND PUBLIC WORKS.
2. SPECIFICATIONS:

ITEM	SPEC. NO.	CITY STD DWG No.
SEWER SERVICE CONNECTION		S11 & S11.1
SEWER TRENCH		S6 & S7
SANITARY BENCHING	OPSD 701.021	
INSULATION	OPSD 1109.030	

3. INSULATE SEWER SERVICE CONNECTIONS THAT HAVE LESS THAN 2m COVER WITH THERMAL INSULATION. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
4. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
5. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTION PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). SANITARY RUBBER GASKET TYPE JOINTS SHALL CONFORM TO CSA (B-182.2,3,4).
6. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
7. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmø OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES TO MUNICIPAL SATISFACTION.
8. WHERE THE SANITARY SEWER CROSSES ABOVE THE WATERMAIN, THE CONTRACTOR IS TO PROVIDE A MINIMUM OF 0.50m VERTICAL SEPARATION, ADEQUATE STRUCTURAL SUPPORT OF THE SEWER TO PREVENT SETTLING AND EXCESSIVE JOINT DEFLECTION AND ENSURE THAT THE LENGTH OF THE WATER PIPE BE CENTERED AT THE POINT OF CROSSING SO THAT THE JOINTS ARE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

WATERMAIN NOTES:

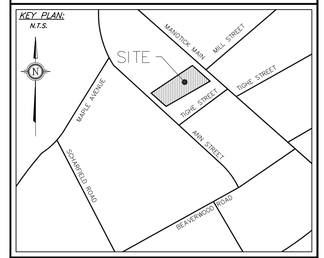
1. CITY TO SUPPLY, INSTALL & DISINFECT THE WATER SERVICE; CONTRACTOR TO EXCAVATE, BACKFILL AND REINSTATE THE ROADWAY AS PER STD DWG R10.
2. SPECIFICATIONS:

ITEM	SPEC. No.	City Std Dwg No.
WATERMAIN BEDDING AND BACKFILL	OPSD 802.010/802.031	W17 (trench detail)
CATHODIC PROTECTION	OPSD 1109.010	W40
PRESSURE TESTING	AWWA C-605-5	
CHLORINATION	AWWA C-651-05	
WATERMAIN MATERIAL	PVC DR18 (CLASS 150)	

3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED. WHERE LESS THAN 2.4m COVER, THERMAL INSULATION IS TO BE PROVIDED AS PER CITY STD DWG W22 (IN SHALLOW TRENCHES), W23 (AT OPEN STRUCTURES).
4. A MINIMUM OF 0.5m VERTICAL CLEARANCE IS REQUIRED BETWEEN THE WATERMAINS AND ALL UTILITIES AND SEWERS. IN LOCATIONS WHERE THIS IS NOT ACHIEVABLE, MUST FOLLOW PROCEDURE F-6-1 SEC. 5.2 OF THE ONTARIO DRINKING WATER RESOURCES ACT.
5. METALLIC WARNING TAPE SHALL BE USED OVER ALL WATERMAINS.
6. INSTALL AND TEST TRACER WIRE FOR ALL PROPOSED WATERMAIN IN ACCORDANCE WITH THE CITY OF OTTAWA DESIGN STANDARDS AS SPECIFIED IN SECTION 8.28.
7. EXISTING WATERMAIN INFORMATION SHOWN ON THORNCLIFF PLACE IS BASED ON BEST CURRENT INFORMATION. CONTRACTOR TO VERIFY EXACT LOCATION OF WATERMAIN AND REPORT ANY DISCREPANCIES TO KOLLAARD ASSOCIATES INC.
8. WATER SHUTOFF VALVE AND VALVE BOX TO BE WITHIN THE ROAD ALLOWANCE AND LOCATED A MINIMUM OF 1.0 METRES FROM THE BUILDING FOUNDATION. TYPICAL PRIVATE SERVICE AS PER STD. DWG. W50 (with the exception that the V&VB are to be located 1.0 m minimum from the foundation wall); VALVE BOX ASSEMBLY AS PER STD. DWG. W24.
9. CONNECTIONS AT ELBOWS AND TEEs IN WATER MAINS SHOULD BE MADE WITH THE USE OF JOINT RESTRAINERS DESIGNED FOR WATERMAIN APPLICATION. JOINT AND PIPE RESTRAINERS SHOULD MEET THE REQUIREMENTS OF AWWA C900, C905 AND C907 AND ASTM F1674-11. JOINT RETRAINERS SHOULD BE INSTALLED AS PER MANUFACTURERS RECOMMENDATIONS.
10. ALL CONNECTORS, RODS AND VALVE BOLTS SHALL BE STAINLESS STEEL.
11. VALVES ARE TO BE OPERATED BY CITY OF OTTAWA STAFF ONLY.
12. NO CONNECTION TO EXISTING WATER NETWORK SHALL BE COMPLETED UNTIL A WATER PERMIT IS OBTAINED FROM THE CITY OF OTTAWA AND CITY OF OTTAWA FORCES ARE ON HAND TO MAKE THE CONNECTION.

DRAWING No: 190117-SER

KEY PLAN: N.T.S.



0 1 2 3 4 5 10 15 20

SCALE 1:200 METRES

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5. All dimensions to be verified on site by contractor prior to construction.
6. Any changes made to this plan must be verified and approved by Kollaard Associates Inc.
7. Client is responsible for acquiring all necessary permits. This drawing is not for construction until a building permit has been granted.
8. Existing services shown are based on best current information. Contractor to verify exact location of services and report any discrepancies to Kollaard Associates Inc.
9. The owner agrees to prepare and implement an erosion and sediment control plan to the satisfaction of the City of Ottawa, appropriate to the site conditions, prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and during all phases of site preparation and construction in accordance with the current Best Management Practices for Erosion and Sediment Control such as, and not limited to installing filter cloths across manhole/catchbasin lids to prevent sediments from entering structures and install and maintain a light duty silt fence barrier as required.
10. The contractor shall implement best management practices, to provide for protection of the area drainage system and the receiving watercourse, during construction activities. The contractor acknowledges that failure to implement appropriate erosion and sediment control measures may be subject to penalties imposed by any applicable regulatory agency.
11. All materials and construction to be in accordance with City of Ottawa standards and Ontario Provincial Standards and Specifications.
12. Reference to Kollaard File #190117 for Storm Water Management Design, Servicing Brief Report and Geotechnical Report.

No.	REVISION	DATE	BY
0	ISSUED FOR SITE PLAN CONTROL APPROVAL	JULY 23, 2019	ML

Kollaard Associates
Engineers
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info@kollaard.ca
P.O. BOX 189, 210 PRESCOTT ST.
KEMPTVILLE, ONTARIO
KOG 1J0 FAX (613) 258-0475
http://www.kollaard.ca

CLIENT:
ROYAL LEPAGE TEAM REALTY
101-555 LEGGET DRIVE
KANATA ON K2K 2X3
ATTN: JASON RALPH

PROJECT:
PROPOSED COMMERCIAL BUILDING

LOCATION:
5536 MANOTICK MAIN STREET
CITY OF OTTAWA,
ONTARIO

LICENSED PROFESSIONAL ENGINEER
JULY 23, 2019
S.E. deWit
100079612
PROVINCE OF ONTARIO

DESIGNED BY:	CHECKED BY:
SD	SD
DRAWN BY:	APPROVED BY:
ML	SD

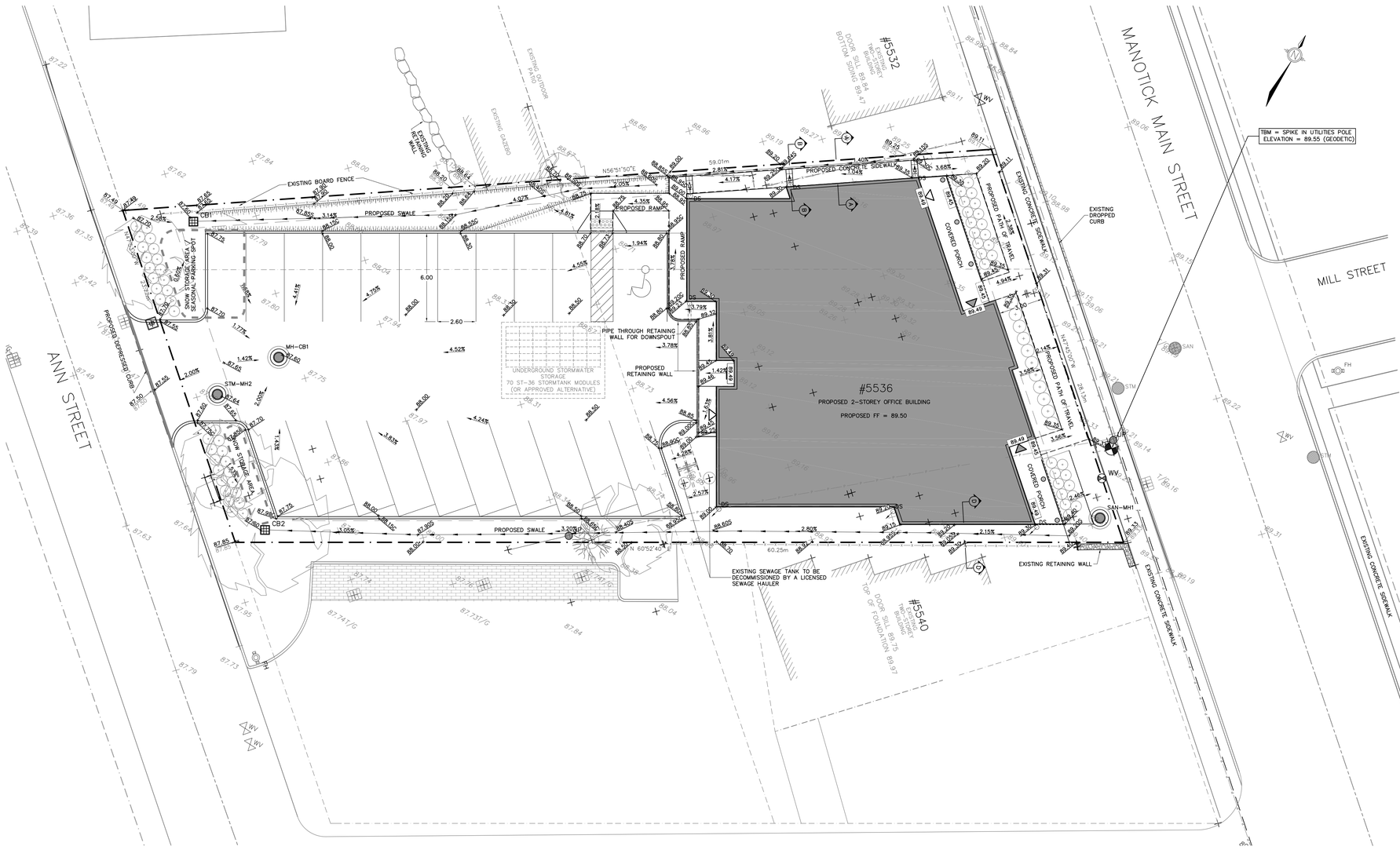
DATE: MARCH 22, 2019

PROJECT NUMBER: 190117

DRAWING No: 190117-SER

DRAWING NAME: SITE SERVICING PLAN

ARCH D



GRADING AND DRAINAGE PLAN

SCALE 1:200

LEGEND

- EXISTING ELEVATION
- PROPOSED/EXISTING ELEVATION
- DRAINAGE SLOPE
- WATER SERVICES
- SANITARY SEWER
- STORM SEWER
- CENTRELINE OF ROAD
- PROPERTY LINE
- PROPOSED SILT FENCE
- EXISTING BELL PEDESTAL
- EXISTING UTILITY POLE
- APPROXIMATE LOCATION OF EXISTING SERVICE LATERALS
- TEMPORARY BENCHMARK
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- PROPOSED STORM MANHOLE
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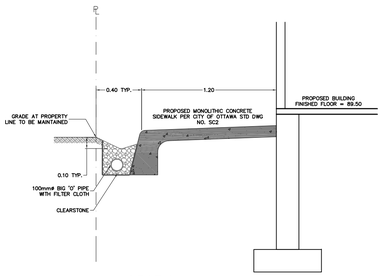

SECTION A–A

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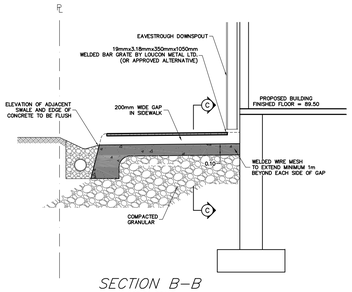

SECTION B–B

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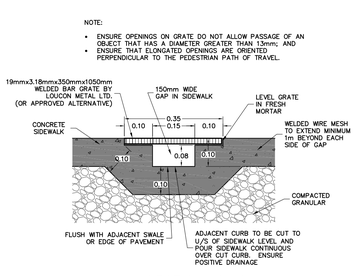

SECTION C–C

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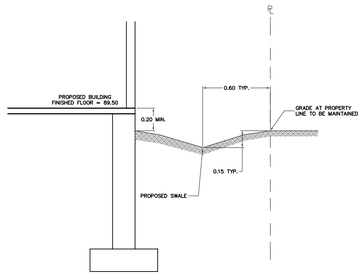

SECTION D–D

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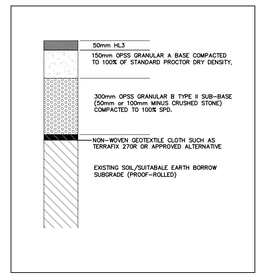
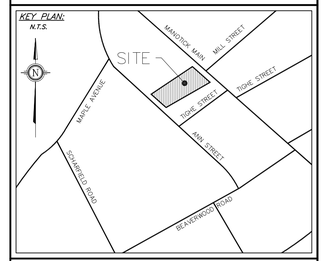


PAVEMENT STRUCTURE DETAIL

NOT TO SCALE

DRAWING No: 190117–GRD

KEY PLAN: N.T.S.



0 1 2 3 4 5 10 15 20

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10. The contractor shall implement best management practices, to provide for protection of the area drainage system and the receiving watercourse, during construction activities. The contractor acknowledges that failure to implement appropriate erosion and sediment control measures may be subject to penalties imposed by any applicable regulatory agency.
11. All materials and construction to be in accordance with City of Ottawa standards and Ontario Provincial Standards and Specifications.
12. Reference to Kollaard File #190117 for Storm Water Management Design, Servicing Brief Report and Geotechnical Report.

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LICENSED PROFESSIONAL ENGINEER
JULY 23, 2019
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100079612
PROVINCE OF ONTARIO

DESIGNED BY:	CHECKED BY:
SD	SD
DRAWN BY:	APPROVED BY:
ML	SD

DATE: MARCH 22, 2019

PROJECT NUMBER: 190117

DRAWING No: 190117–GRD

DRAWING NAME: GRADING AND DRAINAGE PLAN

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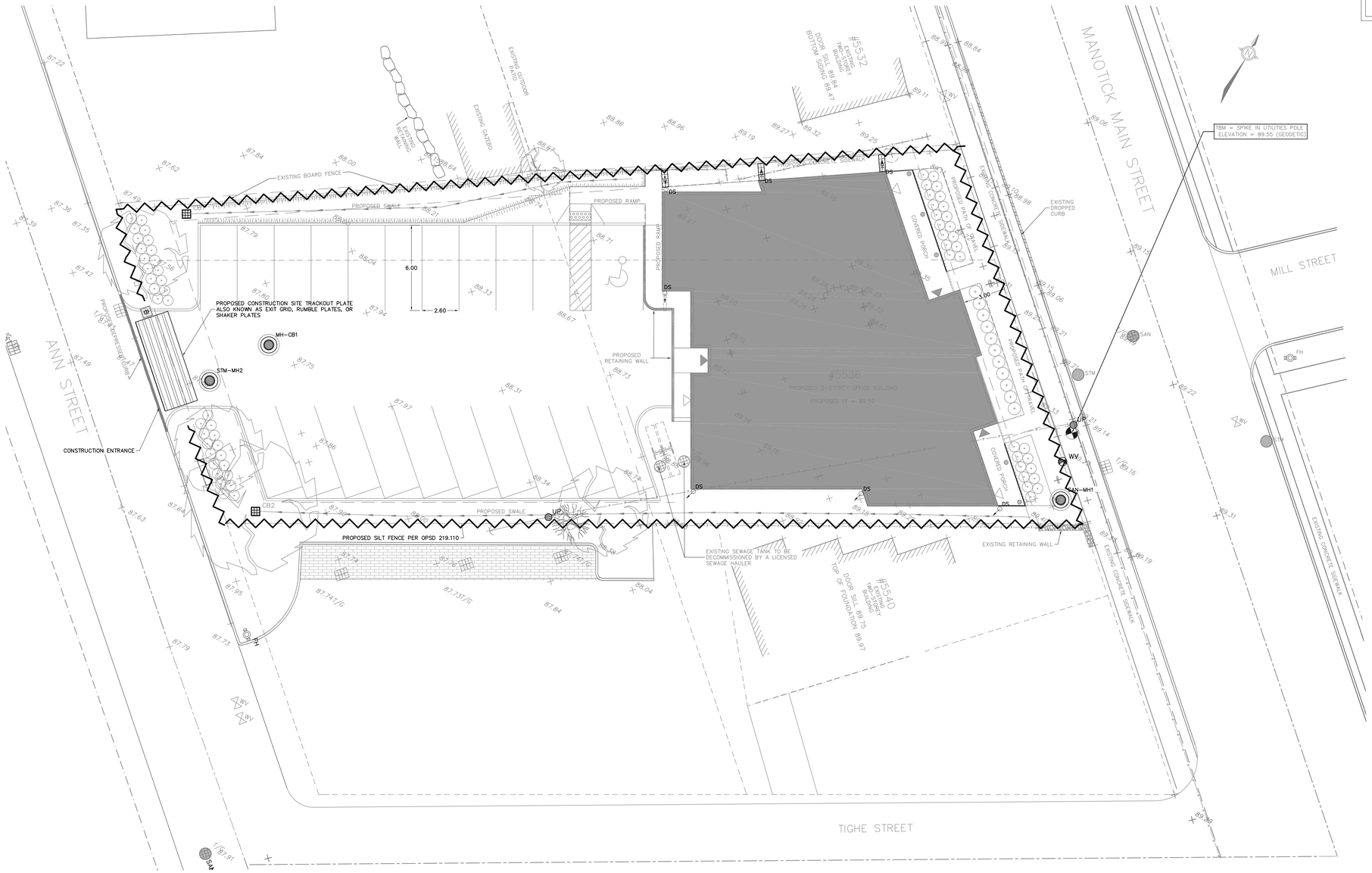

EROSION & SEDIMENT CONTROL PLAN

SCALE 1:200

LEGEND

- EXISTING ELEVATION
- PROPOSED/EXISTING ELEVATION
- DRAINAGE SLOPE
- WATER SERVICES
- SANITARY SEWER
- STORM SEWER
- CENTRELINE OF ROAD
- PROPERTY LINE
- PROPOSED SILT FENCE
- EXISTING BELL PEDESTAL
- EXISTING UTILITY POLE
- APPROXIMATE LOCATION OF EXISTING SERVICE LATERALS
- TEMPORARY BENCHMARK
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING CATCH BASIN
- EXISTING WATER VALVE
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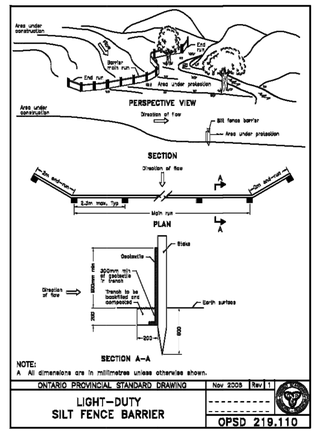
- PROPOSED WATER VALVE
- PROPOSED CATCH BASIN
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE

EROSION AND SEDIMENT CONTROL NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
2. THE OWNER (AND/OR CONTRACTOR) AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN AT LEAST EQUAL TO THE STATED MINIMUM REQUIREMENTS AND TO THE SATISFACTION OF THE CITY OF OTTAWA, APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL.
3. THE CONTRACTOR IS TO ENSURE THAT THE SITE ACCESS POINTS AND ADJACENT STREETS TO THE ACCESS POINTS ARE MAINTAINED AND KEPT CLEAN OF CONSTRUCTION MATERIALS SUCH AS, BUT NOT LIMITED TO MUD, DIRT, CLAY AND GRANULARS ON A DAILY BASIS OR AS NECESSARY, TO THE SATISFACTION OF THE CITY OF OTTAWA.
4. PRIOR TO CONSTRUCTION, SILT FENCE BARRIERS (OPSD 219.110) WILL BE PLACED ALONG THE LIMIT OF DEVELOPMENT FOR THE SITE AS SHOWN ON THE DRAWING. THE SILT FENCE IS TO BE MAINTAINED THROUGHOUT CONSTRUCTION.
5. EVERY EFFORT WILL BE MADE TO ENSURE THAT ALL DISTURBED AREAS ARE TOPSOILED AND SEEDED AS SOON AS REASONABLY POSSIBLE.
6. THE SEDIMENT AND EROSION CONTROL PLAN IS A LIVING DOCUMENT WHICH MAY BE AMENDED BY ONSITE REQUIREMENTS AT THE APPROVAL OF THE MUNICIPALITY AND THE CONSERVATION AUTHORITY.

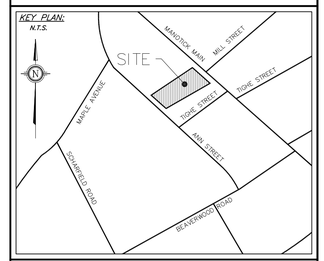
MINIMUM EROSION AND SEDIMENT CONTROL PLAN REQUIREMENTS:

- TIME THE DEMOLITION AND EXCAVATION ACTIVITIES SO THAT THEY OCCUR NO SOONER THAN IS NECESSARY FOR SUBSEQUENT CONSTRUCTION ACTIVITIES.
- LANDSCAPE THE SITE AS SOON AS PRACTICALLY POSSIBLE.
- USE SILT FENCES AROUND ANY STOCKPILES OF SOIL.
- PRIOR TO CONSTRUCTION, SILT FENCE BARRIERS (OPSD 219.110) WILL BE PLACED ALONG THE PROPERTY LINES AS ON THE DRAWING.
- THE SILT FENCE SHOULD BE REMOVED ONLY WHEN THE SITE IS STABILIZED.
- INSTALL FILTER CLOTH ACROSS ALL EXISTING AND PROPOSED CATCH BASINS AND CATCH BASIN MANHOLES PRIOR TO CONSTRUCTION.



DRAWING No: 190117-ESC

KEY PLAN: N.T.S.



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CLIENT:
ROYAL LEPAGE TEAM REALTY
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ATTN: JASON RALPH

PROJECT:
PROPOSED COMMERCIAL BUILDING

LOCATION:
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CITY OF OTTAWA,
ONTARIO

LICENSED PROFESSIONAL ENGINEER
JULY 23, 2019
S.E. deWit
100079612
PROVINCE OF ONTARIO

DESIGNED BY:	CHECKED BY:
SD	SD
DRAWN BY:	APPROVED BY:
ML	SD

DATE: MARCH 22, 2019

PROJECT NUMBER: 190117

DRAWING No: 190117-ESC

DRAWING NAME: EROSION AND SEDIMENT CONTROL PLAN

ARCH D

Appendix F: Correspondence

- City of Ottawa
- RVCA
- MECP

Pre-Application Consultation Notes

Date:	January 23, 2018
Subject Address:	5536 Manotick Main Street
Attendees:	Jason Ralph – Property Owner Sarah McCormick – City of Ottawa, Planner Rubina Rasool – City of Ottawa, Engineering Intern Mark Young – City of Ottawa, Urban Design David Maloney – City of Ottawa, Heritage Eric Lalande – RVCA, Planner
Existing Use:	Restaurant
Existing Policies:	
Zoning:	Village Mixed-Use, subzone 9 (VM9)
Official Plan:	Village (Manotick)
Proposed Use:	Mixed Use building (café on main floor and office on the second floor)
Comments:	
Planning **Sarah.McCormick@ottawa.ca** **(613) 580-2424 Ext. 24487**	The proposed use is permitted under the current VM9 zoning of the property. The Manotick Secondary Plan identifies the property as Village Core, therefore there are higher level of design expected, while maintaining the rural character of the village. The building must also be street oriented, and staff would recommend that the entrance to Manotick Main is closed and access to the parking area occur only by the Ann Street access. The parking area, and property boundaries should screen and delineated by landscaping. There is a Heritage building located on the adjacent property, triggering the requirement of a Cultural Heritage Impact Statement. The Planning Rationale must discuss how the proposal meets the requirements of the Secondary Plan. An updated Phase 1 ESA will be required as part of the application. The Phase 1 must be completed as per the guide to preparing plans and studies. The Phase 2 ESA has not been fully reviewed, however it is noted that this document must outline mitigation measures for the proposal, and how that will be achieved in the design. For additional information, please contact Rubina Rasool. The application required is a Site Plan, Manager approved, with public notification/Consultation.

Infrastructure **Rubina.Rasool@ottawa.ca** **(613) 580-2424** **Ext. 24221**	Water/Sanitary/Storm Servicing:  Blue: Watermain Red: Sanitary Sewer Green: Storm Sewer Water: - Existing watermains are located on Manotick Main St and Ann St. - A watermain frontage charge are not applicable; however, once a proposed service connection point has been identified confirmation from Right-of-Way Approvals Infrastructure Services Department will be requested. A charge of $190/m would be applied to the water permit if watermain frontage charges are applicable. - Please reference City of Ottawa Water Distribution District Plan No. 368-009 - The site is located within the City of Ottawa Barr Pressure Zone. - Please provide the following information to the City of Ottawa via email at your engineering consultant's earliest convenience to request water distribution network boundary conditions for the site. Please note that once this information has been received, it may take at 5 business days to receive boundary condition results for hydraulic analysis. • Type of Development • Site Address • A plan clearly showing the proposed water service connection location • **Average Daily Demand** (L/s) • **Maximum Daily Demand** (L/s) • **Peak Hour Demand** (L/s) • **Fire Flow** (L/s) o Fire flow demand requirements shall be based on Fire

	Underwiters Survey (FUS) Water Supply for Public Fire Protection 1999 as per the *Ottawa Design Guidelines – Water Distribution*, First Edition, Document WDG001, July 2010, City of Ottawa Clause 4.2.11. Sanitary Sewers: - Existing sanitary sewer(s) are located within the right-of-way on Manotick Main St and Ann St. A service connection directly to a maintenance hole is not permitted. - A sanitary sewer monitoring maintenance hole is required to be installed at the property line (inside the property) as per City of Ottawa Sewer-Use By-Law 2003-514 (14) *Monitoring Devices*. Storm Sewers: - Existing storm sewer(s) are located within the right-of-way on Manotick Main St and Ann St. A service connection directly to a maintenance hole is not permitted. - A storm sewer monitoring maintenance hole is required to be installed at the property line (inside the property) as per City of Ottawa Sewer-Use By-Law 2003-514 (14) *Monitoring Devices.* - It is understood from the Phase II ESA report that there were exceedances. Discharge of contaminants into the City storm water sewer is not permitted. Limited concentrations of solvents discharge would be permitted to the sanitary sewer if a ground water remediation system is in place prior to discharge. The applicant would enter into a Sanitary Sewer (Groundwater Remediation) Agreement (SSA) with the City to discharge. - It was discussed during the meeting the proposed dwelling will not have foundation drainage in order to eliminate the need for a permanent connection to City services. - During evacuation it is anticipated that groundwater and accumulated rainwater will be drained from the site. A Sanitary Sewer (Groundwater Remediation) Agreement (SSA) with the City will be required to discharge should elevated levels of solvents be present. Stormwater Management: - The consultant should determine a stormwater management regime for the application and, generally, maintain post-development flows to pre-development levels by way of providing storage to offset increased impervious areas. - Overland flows should be directed to the Right-of-Way. - The site is located within the Rideau Valley Conservation Authority boundary and within the Mud Creek Subwatershed. The Conservation Authority should be contacted for the stormwater quality requirements, such as total suspended solid removal and any additional requirements. - All stormwater management determinations shall have supporting rationale.

	Fire Protection: - The applicant should have their consultant contact Ottawa Fire Services to determine if fire protection is required and, if so, how protection is provided. Contact Information: Allan Evans Fire Protection Engineer City of Ottawa 613-580-2424 x24119 Allan.Evans@ottawa.ca Exterior Site Lighting: - -Any exterior lighting proposed for the site is required by the City of Ottawa to be certified by an appropriately experienced, licensed Professional engineer conforming the design complies with the following criteria: - It must be designed using only fixtures that meet the criteria for Full-Cut-Off (Sharp cut-off) Classification, as recognized by the illuminating Engineering Society of North America (IESNA or IES). - It must result in minimal light spillage onto adjacent properties. As a guide, 0.5 foot-candle is normally the maximum allowable spillage. - The location of the fixtures, fixture types (make, model, and part number) and the mounting heights must be provided. Snow Storage: - Any portion of the subject property which is intended to be used of permanent or temporary snow storage shall be as shown on the approved site plan and grading plan. Snow storage shall not interfere with approved grading and drainage patterns or servicing. Snow storage areas shall be setback from the property lines, foundations, fencing or landscaping a minimum of 1.5m. Snow storage areas shall not occupy driveways, aisles, required parking spaces or any portion of a road allowance. Permits and Approvals: Please contact the Ministry of the Environment and Climate Change (MOECC) and the Mississippi Valley Conservation Authority (MVCA), amongst other federal and provincial departments/agencies, to identify all the necessary permits and approvals required to facilitate the development: responsibility rests with the developer and their consultant for obtaining all external agency approvals. The address shall be in good standing with all approval agencies, for example the RVCA, prior to approval. Copies of confirmation of correspondence will be required by the City of Ottawa from all approval agencies that a form of assent is given. An MOECC ECA application is not submitted until after Site Plan Approval. No construction shall commence until after a commence work notification is given by the City's project manager.

Ministry of the Environment and
Climate Change

Contact Information:

Emily Diamond

Environmental Officer

613-521-3450 ext. 238

emily.diamond@ontario.ca

Site Plan submission requirements for engineering:

- Grading and Drainage Area Plan*
- Site Servicing Plan*
- Erosion and Sediment Control Plan*
    - The Erosion and Sediment Control Plan should manage all loose material from being transporting into adjacent properties and waterways. The appropriate Conservation Authority should be consulted to determine any additional measures that may be required.

*All identified required plans are to be submitted on standard A1 size sheets as per City of Ottawa Servicing and Grading Plan Requirements: title blocks are to be placed on the right of the sheets and not along the bottom.

Report Submission Requirements[1]:

- Site Servicing Report
- Storm Water Management Report
- Erosion and Sediment Control Measures
- Geotechnical Investigation Study
    - The site is located in a geological area that may have various subsurface soils and may limit the developable area of the lot. In addition, a geotechnical report will be required to provide geological background.
    - Please note that the area may contain sensitive marine clays. Atterberg limits, consolidation testing, shear testing, grade raise restriction, and sieve analysis and discussion thereof will be required in the report if sensitive marine clay is found.
    - The geotechnical consultant will need to provide full copies of any published and peer reviewed papers relied on to determine results and conclusions.
    - Earthquake analysis must be provided.
- Phase 1 Environmental Site Assessment
    - The Phase 1 Environmental Site Assessment (ESA) must be prepared as per O.Reg. 153/04. Phase 1 ESA documents performed to CSA standards are not acceptable. Please note

	the report "Screening Level Risk Assessment" provided following the meeting would not be admissible. o The Phase 1 ESA will demonstrate sources of potential contamination and other concerns impacting the development of the site. The Phase 2 ESA will provide further investigation and recommendations. o Please note the Phase 2 ESA provided following the meeting may be accepted as it meets the minimum preparation requirements for circulation; however, at this time the City cannot provide a technical review or comment on potential development issues. The applicant's consultant must discuss the elevated counts found in the investigation and discuss mitigation measures related to the limits of the proposed development and the controls in place by the City of groundwater for collection of groundwater with elevated counts. o Please ensure all ESAs are prepared for the purpose of land development for the specific property. - A Site Lighting Memorandum and plan will be required for registration. Footnote [1] - All required plans & reports are to be provided in .pdf format (at application submission and for any, and all, re-submissions) Please find relevant City of Ottawa Links to Preparing Studies and Plans below: Guide to preparing City of Ottawa Studies and Plans: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#standards-policies-and-guidelines To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre: InformationCentre@ottawa.ca<mailto:InformationCentre@ottawa.ca> (613) 580-2424 ext. 44455 Reports required for different submissions can be used for both. As per section 53 of the Professional Engineers Act, O. Reg 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal. The same requirement is likely to apply to documents prepared by a Professional Geoscientist.
Traffic **Amira.Shehata@ottawa.ca**	Manotick Main is an arterial road in this section with a ROW protection of 23m per the City's OP - Village Arterial (from Bankfield Rd to Century Rd) Based on the proposed land use and size of the development there is no

(613) 580-2424 Ext. 27737	requirement for a Transportation Impact Study. We would recommend the closing of the access off of Main St as there is a secondary access off of Ann St. They should build and maintain the side walk on the Main St per City standards. The Manotick Main street is the main pedestrian friendly, and commercial road, as such attention should be given to maintain the street and Village character (i.e. landscape, sidewalk, etc) The access from Ann st. should be designed per the City's Private Approach By-law.
Design **Mark.Young@ottawa.ca** **(613) 580-2424 Ext. 41396**	The property is location within a Design Priority Area, therefore a higher level of design is expected. The design should respect the main street context and incorporated the parking at the rear of the property. The property is subject to the policies in the Manotick Secondary Plan. These policies should be addressed in the Planning Rationale. The Secondary Plan also requires that a Cultural Heritage Impact Statement is required.
Heritage **David.Maloney@ottawa.ca** **(613) 580-2424 Ext. 14057**	A Cultural Heritage Impact Statement (CHIS) will be required as per the Village Core Section of the Manotick Secondary Plan (Section 2.2(3)). Please see this guide to preparing a CHIS, and contact me if there are any questions. A heritage permit is not required for this development.
Other Agencies **Eric Lalande – RVCA** **eric.lalande@rvca.ca** **(613) 692-3571 Ext. 1137**	The Rideau Valley Conservation Authority notes that they will be looking to see how water quality protection is intended to be addressed on site, through the Site Servicing and Stormwater Management reports.
Submission Requirements	Please see accompanying Plans and Studies List.

Subject: Re: Proposed Development at 5536 Manotick Main
From: Eric Lalande <eric.lalande@rvca.ca>
Date: 28/02/2019, 9:12 a.m.
To: Sumon Ghosh <sumon@kollaard.ca>

Hi Sumon,

The RVCA will be looking for 80% TSS removal for the site for quality protection. The quantity control requirement is deferred to the City of Ottawa for comment.

Thank you,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Sumon Ghosh <sumon@kollaard.ca>
Sent: February 27, 2019 9:25 AM
To: Eric Lalande
Subject: Proposed Development at 5536 Manotick Main

Good morning Eric,
I refer to the pre-application consultation meeting held on 23rd January 2018 with regards to the proposed development for Royal Lepage at 5536 Manotick Main. I have attached the the meeting minutes for your ready reference.
Could you please advise on the quantity and quality requirements for the post development stormwater runoff? I am particularly looking for the pre to post runoff matching and percentage suspended solids removal that is required.
Thanks in advance.
Regards,
Sumon
--

Sumon Ghosh

Appendix G: Servicing Guidelines Checklist

4.1 General Content

☒ Executive Summary (for larger reports only).

Comments: *N/A*

☒ Date and revision number of the report.

Comments: *Refer to cover page of the Servicing & Stormwater Management Report- Dated Rev 0 July 4, 2019 (SSMR).*

☒ Location map and plan showing municipal address, boundary, and layout of proposed development.

Comments: *Refer to drawings190117-SER and 190117-GRD in Appendix E of the SSMR*

☒ Plan showing the site and location of all existing services.

Comments: *Refer to drawing 190117-SER in Appendix E.*

☒ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.

Comments: *Refer to Architectural Site plan by Vandenberg & Wildeboer Architects. This drawing is included in Appendix E*

☒ Summary of Pre-consultation Meetings with City and other approval agencies.

Comments: *Pre-Consultation Meeting with City had taken place January 23, 2018 Included in Appendix F*

☒ 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.

Comments: *Conformance to City of Ottawa Guidelines, No higher level studies applicable*

☒ Statement of objectives and servicing criteria.

Comments: *Refer to section 2.0 for Storm, Section 3 for Sanitary and Section 4 for Water.*

☒ Identification of existing and proposed infrastructure available in the immediate area.

Comments: *Refer to drawing 180902-SER for location, size and depth. Drawing located in Appendix E.*

☒ 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).

Comments: *N/A Discharge to City of Ottawa Storm Sewer System*

☒ 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.

Comments: *There is no Master Grading Plan - Refer to grading plan180902-GRD located in Appendix E.*

☒ 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.

Comments: *N/A*

☒ Proposed phasing of the development, if applicable.

Comments: *N/A*

☒ Reference to geotechnical studies and recommendations concerning servicing.

Comments: *Reference Geotechnical Investigation Report Prepared for 5536 Manotick Main by Kollaard Associates Inc dated June 11, 2019*

☒ 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

Comments: *Refer to drawings in Appendix E*

4.2 Development Servicing Report: Water

☒ Confirm consistency with Master Servicing Study, if available

Comments: *N/A*

☒ Availability of public infrastructure to service proposed development

Comments: *Refer to Section 3 and 4 of the SSMR .*

☒ Identification of system constraints

Comments: *Yes - boundary conditions were received. Boundary Conditions can be found in appendix D of of the SSMR - Also response from City including System Constraints*

☒ Identify boundary conditions

Comments: *Refer to Appendix D*

☒ Confirmation of adequate domestic supply and pressure

Comments: *Refer to Section 4.0 - Watermain Design.*

☒ 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.

Comments: *Refer to Appendix C and Section 4.0*

☒ 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.

Comments: *Pressure Reducing Valve is Required. See section 4.0*

☒ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

Comments: *No phasing involved with this project*

☒ Address reliability requirements such as appropriate location of shut-off valves

Comments: *N/A*

☒ Check on the necessity of a pressure zone boundary modification.

Comments: *The water pressure available at the site is above the minimum residual pressure at the ground floor level - Section 4.0*

☒ 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

Comments: *Refer to Section 4.0 - Watermain Design and Appendix D Boundary Conditions*

☒ 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.

Comments: *2 Storey Commercial building serviced by 50mm water service, refer to Drawing 190117-SER in Appendix E*

☒ 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.

Comments: *N/A*

☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

Comments: *Refer to Section 4.0 - Watermain Design*

☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

Comments: *Refer to Appendix D*

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).

Comments: *Refer to Section 3.0*

☒ Confirm consistency with Master Servicing Study and/or justifications for deviations.

Comments: *No Master Servicing Study, Design Conformance with Ottawa Sewer Design Guidelines.*

☒ 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.

Comments: *There are no local conditions of this nature. Refer to Section 3.0*

☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

Comments: *Refer to drawing 190117-SER in Appendix E.*

☒ 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)

Comments: *Refer to Section 3.0*

☒ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

Comments: *N/A*

☒ Special considerations such as contamination, corrosive environment etc.

Comments: *N/A*

4.4 Development Servicing Report: Stormwater

☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

Comments: *Refer to Section 2.0*

☒ Analysis of available capacity in existing public infrastructure.

Comments: *Refer to Section 2.0 - Stormwater Quantity Control Requirements established by the City of Ottawa.*

☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

Comments: *Refer to drawings Figure 1 - Pre-Development and Figure 2 Post Development Catchment Areas in Appendix E.*

☒ 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.

Comments: *Refer to Section 2.0*

☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

Comments: *Refer to Section 2.0*

☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

Comments: *Refer to Section 2.0 and Appendix A and B*

☒ Set-back from private sewage disposal systems.

Comments: *N/A*

☒ Watercourse and hazard lands setbacks.

Comments: *N/A*

☒ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

Comments: *Pre-consultation with Ministry of Environment needs to be initiated. Correspondence from RVCA included in Appendix F*

☒ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

Comments: *N/A - no master servicing study avaiable*

☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).

Comments: *Refer to Appendix A of the SSMR and Section 2*

☒ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

Comments: *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.

Comments: *Refer to Appendix A of the SSMR and Section 2*

☒ Any proposed diversion of drainage catchment areas from one outlet to another.

Comments: *N/A*

☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

Comments: *N/A - Refer to Drawing 190117 - SER - Appendix E*

☒ 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.

Comments: *Quantity control is provided. Refer to section 2*

☒ Identification of potential impacts to receiving watercourses

Comments: *No Potential Impacts*

☒ Identification of municipal drains and related approval requirements.

Comments: *No municipal drains*

☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.

Comments: *Refer to section 2*

☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

Comments: *100 year flood levels and major flow routing is shown on drawing190117-GRD in appendix E.*

☒ Inclusion of hydraulic analysis including hydraulic grade line elevations.

Comments: *N/A*

☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

Comments: *Refer to Section 5.0*

☒ 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.

Comments: *N/A*

☒ Identification of fill constraints related to floodplain and geotechnical investigation.

Comments: *N/A*

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

☒ 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 Act. 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.

Comments: *Consultation with RVCA is included in Appendix F*

☒ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

Comments: *Pre-consultation with MECP is ongoing*

☒ Changes to Municipal Drains.

Comments: *N/A*

☒ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

Comments: *N/A*

4.6 Conclusion Checklist

☒ Clearly stated conclusions and recommendations

Comments: *Refer to Section 6.0*

☒ 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.

Comments: *-comments are to be received from review agencies and will be addressed item by item in response letters.*

☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

Comments: *Signed and Stamped.*