JLR No.: 31489-004
Revision: 0

April 28, 2022

Site Servicing Brief

OC Transpo E-bus Parking Garage
1500 St. Laurent Boulevard, Ottawa, ON

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Value through service and commitment

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1.0 Introduction

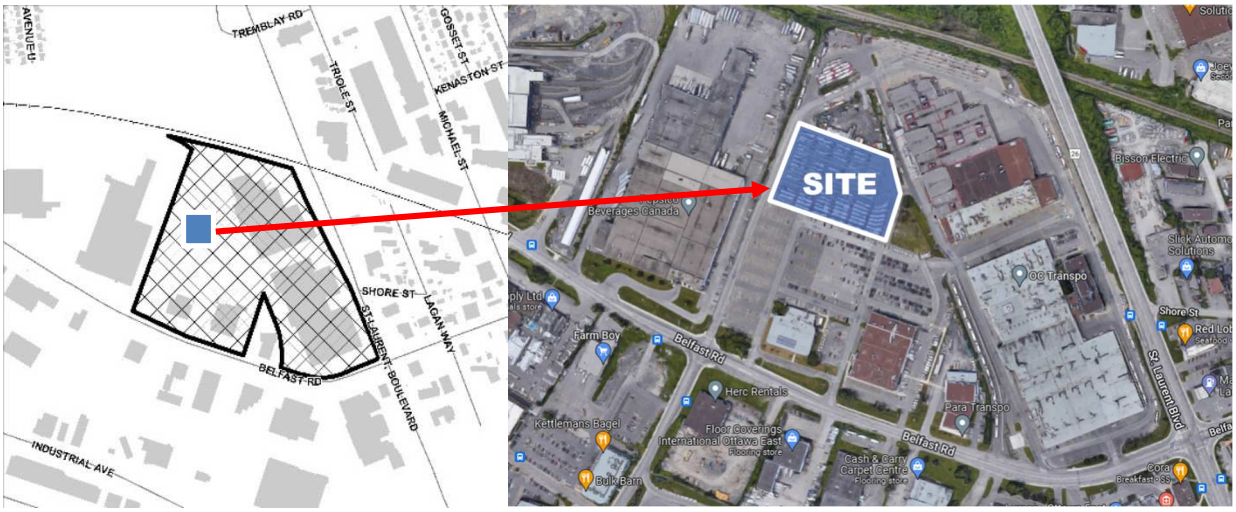
The City of Ottawa (City) owns and operates three (3) adjacent properties in the northwestern quadrant of the St. Laurent Boulevard and Belfast Road intersection; the entire site functions as a single facility with an address of 1500 St-Laurent Boulevard. The site has an area of ±13.59 ha and consists of parking lots, maintenance and administrative buildings that service the City's OC Transpo operations. Part of the site's parking lot (0.78 ha) will be redeveloped with a proposed building (garage) to house the new line of electrical buses (E-bus). This report supports the preliminary design for the garage and the associated project works.

OC Transpo has retained the services of J.L. Richards & Associates Limited (JLR) to prepare a Site Plan Application (SPA) for the development of the E-bus garage located on 1500 St. Laurent Boulevard, Ottawa, Ontario. JLR is responsible for taking the proposed project's development to the initial phase of the Site Plan Application (SPA) process, and subsequent City comments are to be addressed by others. OC Transpo proposes to award the design and construction of this facility to a selected Design-Build Team. The successful proponent of this process will be responsible for finalizing details of the site servicing with the building design

The proposed project replaces part of the north asphalt parking lot with a garage (0.78 ha) to service the E-buses. Figure 1 – Site Location Map depicts the entire lot and provides an aerial view of the proposed parking garage site. This redevelopment will require an amendment to the existing Environmental Compliance Approval (ECA) issued by the Ministry of the Environment (MECP). In 2006 the asphalt parking lot received an MECP ECA amendment. The ECA was amended in 2017 to redevelop a bus access lane, located south of the proposed development area. See Appendices B for approved ECAs.

This report outlines the preliminary design objectives, the design criteria, site servicing constraints and strategies to develop the proposed building with water (domestic and fire protection), wastewater and storm laterals, and a stormwater management system.

Figure 1 – Site Location Map



1.1 Required Approvals

The following section identifies approvals required for this project.

1.1.1 City of Ottawa - Site Plan Approval (SPA)

This Servicing Report is submitted to support a Site Plan Application (SPA) to the City. The design-build team selected by the City will advance the project and will be required to examine documents submitted with this SPA and will need to provide responses per the City's comments of the initial submission package. It will be the responsibility of the design-build team to address the City's SPA review comments (as applicable) and adjust their associated design and documents accordingly.

1.1.2 Rideau Valley Conservation Authority (RVCA)

A pre-consultation was had with the Rideau Valley Conservation Authority (RVCA). The RVCA indicated that replacing surface stormwater storage with rooftop storage would enhance the runoff water quality. No additional measures were deemed required so long as the storage volume originally provided is not reduced. Refer to Appendix A for correspondence from the RVCA.

1.1.3 Ministry of the Environment, Conservation and Parks (MECP)

On April 6, 2022, a pre-consultation was conducted with Mr. Charlie Primeau of the Ministry of the Environment, Conservation and Parks (MECP). A copy of the pre-consultation meeting notes is included in Appendix A. Mr. Primeau confirmed that the proponent would be required to apply for an amendment to the existing Environmental Compliance Approval (ECA) (No. 8368-AGMS3S) for the site. Appendix B presents a copy

of this ECA. During the pre-consultation meeting, the MECP stated that the City is authorized to delegate ECA approvals as granted under the Transfer of Review agreement.

JLR has since consulted with the City's Mr. Charles Warnock to establish the conditions that permit the City to approve the ECA application under the Transfer of Review program. The City is authorized to approve Sewage Works as detailed in Schedule A of the agreement. Refer to Appendix C for a copy of the Schedule A Agreement. Section 2 of the agreement indicates that the City has approval authority for stormwater management works for non-industrial lands. Industrial lands are defined in Section 1 of the Ontario Water Resources Act.

It is noted that although the existing ECA has been approved for onsite stormwater management, it was not issued for an "industrial site." OC Transpo operations and facilities suggest that the site be considered an "industrial site" to administer the ECA amendment application. A direct submission application is recommended to be submitted to the MECP to amend the existing ECA. As part of JLR's scope of work, JLR will initiate the amendment application to the MECP for onsite SWM. It will be noted in the application that the site meets the classification of an industrial development.

It will be the responsibility of the successful design-build proponent to follow up with this ECA application and adjust the submission for the specifics of their detailed design. At the time of preparing this report, an MECP file number was not available. It is planned that a file number will be included in the documents released for the project's Request for Proposals (RFPs).

The estimated time to obtain approval from the MECP (for direct submission) is six to eight months. It is anticipated that the MECP approval may not be available prior to construction's scheduled start date. If this is the case, the ministry did indicate that they can initiate measures to expedite approvals while allowing construction to start. As indicated in item 1.8 of the pre-consultation meeting minutes (see Appendix A). The MECP will assign an Environmental Officer to monitor the construction and ECA approval process. It is recommended that the proponent contact the MECP local office and advise them of the construction schedule once the information is available.

2.0 Water Servicing

2.1 Background and Water Servicing Design Criteria

The drawings provided by the City indicate a private watermain that consists of 150 mm and 200 mm diameter pipes. This private watermain loops around the existing north and south garages and is connected to a 305 mm diameter feeder main along Belfast Road. There is also a 150 mm diameter service stub connected to a 406 mm diameter feeder main along St. Laurent Blvd. The existing private watermain loop will service the proposed building.

A Hydraulic Network Analysis (HNA) was carried out to confirm the proposed watermain size and to demonstrate its compliance with the City of Ottawa Design Guidelines for Water Distribution (July 2010) and subsequent Technical Bulletins ISDTB-2014-02, ISDTB-2018-02, and ISTB-2021-03. These documents are herein referred to as the Design Guidelines and TB-2014-02, TB-2018-02, and TB-2021-03 respectively. Section 4.2.2 of the Design Guidelines require that all new development additions to the public water distribution network be designed such that the minimum and maximum residual pressures, as well as flow rates, comply per following:

- Under maximum hourly demand conditions (peak hour), the residual pressures are not less than 276 kPa (40 psi);
- During periods of maximum day combined to a fire flow demand, the residual pressure at any point in the distribution system shall not be less than 140 kPa (20 psi);
- Per the Ontario Building Code (OBC) in occupied areas, the static pressure at any fixture shall not exceed 552 kPa (80 psi); and
- The maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi).

Supply to the proposed building will be achieved by extending the existing watermain (200 mm diameter) near the west wall of the existing north garage with a proposed 200 mm diameter line. The analysis described in the following sections were completed to satisfy the above demand and pressure criteria.

2.2 Water Demands

The project's mechanical engineer provided the peak hourly demand for the proposed building. The maximum day and average daily demand for the proposed building were determined using peak factors of 1.8 - maximum day to peak hour and 1.5 - average day to maximum day, per the Design Guidelines for industrial development. Refer to Appendix D for the detailed water demand calculations. The total water demand for the site was calculated by combining the demand for the proposed building and the demands for the two existing garages. The demands for the existing garages were estimated based on metered data provided by OC Transpo. The development's required water demands are summarized below in Table 2.1.

Table 2.1: Total Water Demand

	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Proposed Building	1.11	1.67	3.00
Existing 2-Buildings	1.09	1.63	2.94
Total	2.20	3.30	5.94

2.3 Watermain Sizing and Roughness

Watermain roughness coefficients were determined using Section 4.2.12 of the Design Guidelines and summarized in Table 2.2 below. The internal pipe diameters were modelled based on Section 4.3.5 of the Design Guidelines and are summarized below in Table 2.3.

Table 2.2: Watermain Roughness Coefficients

Watermain Diameter (mm)	C-Factor
150	100
200 to 250	110
300 to 600	120

Table 2.3: PVC Watermain Internal Diameters

Nominal Diameter (mm)	Inside Diameter (mm)
150	155
200	204
300	297
400	393

2.4 Fire Flow Requirements

The proposed building was designed to have an automated, fully supervised sprinkler system per the Ontario Building Code (OBC). Assumptions for the proposed building's location of the fire department Siamese connection, mechanical room, as well as water demand calculations, including sprinkler flows, were reviewed with the project's mechanical engineer. As part of the discussion, the fire flow requirement for the sprinkler system, including the hose stream allowance (47 L/s) were also reviewed. See correspondence in Appendix D.

Additionally, the Guidelines entitled "Water Supply for Public Fire Protection (1999)" developed by the Fire Underwriters Survey (FUS) govern fire flow protection in the City of Ottawa. Fire flow requirements for this HNA were calculated following the FUS Guidelines. The proposed building's required fire flow (RFF) was determined to be 11,000 L/min (183 L/s). The corresponding FUS fire flow calculations per TB-2018-02 can be found in Appendix D.

2.5 Proposed Water Servicing

2.5.1 Water Servicing

Per Section 2.1 (above), a private watermain loop exists on the subject site and will be used to service the proposed building. Discussion with the mechanical engineer indicated that the mechanical room would be located near the northeast corner of the proposed building. From the private watermain loop, a service connection will branch off the existing 200 mm diameter watermain located near the west wall of the existing north parking garage. It will connect to the northeast corner of the proposed building. A new hydrant is proposed to be installed east of the proposed building, connected via a hydrant lateral to the existing 200 mm diameter private watermain loop. The hydrant's location is based on current assumptions and is subject to change. The new proposed hydrant will meet the OBC's requirement, which states that it must be located within 45 meters of the building's siamese connection. The mechanical engineer indicated that the siamese connection would be located near the northeast corner of the proposed building.

2.5.2 Hydraulic Water Model

A hydraulic water model was developed for the subject site using the WaterCAD® software platform. The model included the existing private watermain loop between Belfast Road and St-Laurent Boulevard and the proposed water service and hydrant. The model was used to assess the proposed water servicing design for adherence to the design criteria listed in Section 2.1.

2.5.3 Boundary Conditions

A request was made to the City to obtain the supply characteristics at each of the connection points described in Section 2.1. See Appendix D for a copy of the City's email correspondence. The supply elevations are shown in Table 2.4 below.

Table 2.4: Summary of Boundary Conditions Provided by City

	Connection 1 – Belfast	Connection 2 – St-Laurent
Minimum HGL (m)	110.1	110.1
Maximum HGL (m)	118.3	118.3
MaxDay + Fire Flow (47 L/s) (m)	113.5	113.3
MaxDay + Fire Flow (183 L/s) (m)	111.6	109.4

2.6 Simulation Results

2.6.1 Peak Hour

The peak hour demand was distributed throughout the site using the supply characteristics noted in Table 2.4. Under the total peak hour demand from Table 2.1, the simulation results show a minimum residual pressure of 391 kPa (57 psi) at node J-29. According to the Design Guidelines, the simulated pressures exceed the minimum pressure requirement of 276 kPa (40 psi). Appendix D includes the junction and pipe summary reports.

2.6.2 Maximum Day plus Fire Flow

To ensure the proposed building has adequate fire protection, the maximum day demand for the entire site was simultaneously simulated with the sprinkler system flow and FUS fire flow requirements from the water distribution system using the supply heads listed in Table 2.4. As mentioned in Section 2.5.1, a new hydrant will be installed to the east of the proposed building to satisfy the OBC minimum hydrant distance requirement for fully automated sprinkler systems. The RFF for the proposed building using FUS was calculated to be 11,000 L/min (183 L/s), and the mechanical engineer calculated the sprinkler system flow requirement, including the hose stream allowance, to be 2,820 L/min (47 L/s). The sprinkler system flow was deducted from the total calculated FUS fire flow to determine the remaining fire flow required from the distribution system hydrants, which is 8,160 L/min (136 L/s).

Technical Bulletin ISTB-2018-02 limits the amount of flow that can be drawn from a single hydrant to 95 L/s if the hydrant is within 75 m of the structure, and 63 L/s if the hydrant is between 75 m and 150 m of the structure. Hence, two hydrants are required simultaneously to provide the required 136 L/s. The model simulation assigned maximum day demands throughout the site with an additional sprinkler system demand of 47 L/s at the proposed building. 95 L/s was assigned at the new proposed hydrant while the remaining 41 L/s was assigned at the existing hydrant located to the southeast corner of the existing north parking garage. The simulation results (Appendix D) found that the two hydrants and the sprinkler system can provide the total RFF of 183 L/s while maintaining

a minimum pressure of 192 kPa (27.8 psi) throughout the site, which exceeds the minimum residual pressure requirement of 140 kPa (20 psi).

2.6.3 Maximum HGL

The maximum pressure (maximum HGL) scenario was simulated to determine the need, if any, for the implementation of pressure reducing valves (PRVs) to ensure that the pressure in the water distribution system does not exceed the maximum pressure constraint of 552 kPa (80 psi) set by the OBC. The maximum simulated pressure in the system was found to be 482 kPa (70psi). Based on the simulation results (Appendix D), the proposed building will not require the installation of a PRV as the simulated pressures throughout the site are below the maximum pressure constraint of 552 kPa.

2.7 Water Summary and Recommendations

Simulation results under the peak hour condition showed that the proposed building will meet the minimum pressure criterion of 276 kPa (40 psi). Hence, no measures are required to mitigate against low pressures. Under the maximum day plus fire flow conditions, the distribution system and hydrants will satisfy the RFF described in Section 2.6.2. The simulation results under maximum HGL do not exceed the maximum pressure constraint of 552 kPa (80 psi) and will not require the installation of PRVs.

3.0 Wastewater Servicing

3.1 Existing Wastewater Servicing

The existing north and south parking garages are serviced by 200 mm diameter laterals that direct flows south of the property and drain into existing sanitary collector along Belfast Road.

3.2 Proposed Wastewater Servicing

This report assumes that the existing sewer has the available capacity to accommodate the proposed developmental sewage flow. The sewers existing capacity to be confirmed during detailed design. Sewage from the development to drain via a proposed service lateral (200 mm diameter) connected to the southeast corner of the proposed building.

The design sewage peak rates were estimated at 1.05 L/sec (per City of Ottawa Sewer Design Guidelines and Technical Bulletin ISTB-2018-1). The proposed sanitary service lateral to extend off the existing maintenance hole located north of the existing garage and southwest of the site. Sewage flows to ultimately discharge into the collector along Belfast Road. See the proposed sewer design sheet in Appendix E and the site servicing plan in Appendix I.

4.0 Storm and Stormwater Management Servicing

4.1 Existing Storm Servicing

In the existing condition, runoff for the entire 1500 St-Laurent site (13.59 ha) discharges to two distinct outlets, the South Cyrville Drain and the Rideau River. Most of the site's runoff drains to the South Cyrville Drain, with a small portion draining to the Rideau River (tributary).

The existing site's stormwater management (SWM) facility was approved by the MECP in 2006 and later amended in 2017. See approved ECAs in Appendix B. The proposed development falls within drainage Basin 4A, which was approved with 2.55 ha and a runoff coefficient (C-factor) of 0.90. Basin flows are collected via six onsite existing storm structures (i.e. catchbasins and catchbasin-manholes). Four of the structures are located within the bus parking lot (proposed for redevelopment), and two of the structures (CBs) are in the south employee parking lot.

Basin flows are controlled via an onsite inlet-control device (ICD) situated in the storm maintenance hole (MH) downstream of the catchbasins. Per the approved ECA, the ICD controls flow to 180 L/s, with overland 100-year storm event flows going to the adjoining swale at a peak flow rate of 200 L/s. Outlet flows drain via the 600 mm diameter storm sewer, ultimately draining to the South Cyrville Drain. See the existing drainage plan in Appendix I.

Assessment of the current LiDAR topography of the site suggests that the drainage area being controlled by the existing ICD is currently around 2.6 ha.

During the pre-consult meeting with the City, staff indicated no drainage issues associated with the existing SWM facility or ICD configuration.

Due to the land use being an industrial site, there is a risk for chemical compound spillage within the development area. An onsite oil and grit interceptor (installed in 2003) does treat area runoff. When the unit was installed, the MECP had requested OC Transpo develop a spill contingency plan and maintain monitoring records.

4.2 Proposed Storm Servicing and Stormwater Management

The proposed redevelopment site is within drainage Basin 4A (basin) and consists of a proposed building and associated infrastructure services (water, storm and sanitary). The building will be built along the northwest section of the basin, to replace the current asphalt. Refer the pre-post drainage basin map in Appendix I.

A pre consultation meeting with the MECP took place on April 6, 2022. See Appendix A for a copy of the minutes. The proposed development will modify the approved onsite SWM system. The proposed updated SWM system to consist of building roof top controls and an onsite underground storage structure with downstream ICDs to control site runoff. An amendment of the existing MECP ECA is required.

The revised SWM facility to consist of building rooftop controls (Watts RD-100A) and onsite underground storage system (StormTech). The current asphalt bus parking lot will be replaced with a proposed garage.

The proposed building to have rooftop control, restricted flow to drain via the building's foundation and have direct flow connection to the existing storm sewer. The sewer further conveys the water to the downstream oil/grit separator (Stormceptor) which discharges flow into the 600 mm storm sewer. Water quality for site will be improved given that the once parking lot area will now be managed on the building's roof. See the servicing plan in Appendix I.

4.2.1 Existing MECP ECA

The existing approved MECP ECA (5605-6VZS8W) was issued December 5, 2006. It outlined the requirements for a stormwater management facility to serve the northwestern area of the site which was composed onsite surface storage (ponding on the parking lot) for major flows (100-year event) and storm sewer for minor flows. The minor system controlled with an inlet-control-device (orifice) restricted (Basin 4A) to **180** L/s and runoff detention of major storms provided via the surface ponding areas.

The ECA was amended (8368-AGMS3S) in February 3, 2017 for the collection, the treatment, and the disposal of storm runoff from the development of a bus access road. The amended system provided enhanced water quality control, including erosion protection, managing site runoff up to and including the 100-year storm period. Minor system flows are restricted to equal the site's previously approved restricted peak flows.

4.2.2 Proposed MECP ECA Amendment

The existing SWM system is to be amended and will provide enhanced water quality control (rooftop storage), including erosion protection and managed onsite (underground and rooftop) proposed development runoff up to and including the 100-year storm period. Minor system flows to be restricted to equal (or less) the permitted control rate (180 L/s).

4.2.3 Proposed Roof Top Control

To ensure post-development runoff is controlled to the approved flow rate, restrictors will be installed in the building's rooftop drains. These controls will limit the flow to the existing onsite storm sewers. The peak ponding depth was assumed at 150 mm for a the 100-year storm event. The roof's ponding volume was determined using the Modified Rational Method outlined in section 8.3.10.3 of the City of Ottawa's Sewer Guidelines. As ponds generally form the shape of the roof, the extent and depth of ponding resulting from the 100-year storm was determined using the following equation:

$$V = 1/3 \times A \times d$$

Where: V - Storage volume (cu. m.)
A - Ponding surface area (sq.m.)
d - Peak ponding depth (m)

Per the above formula (assumed peak depth of 150 mm) the provided rooftop storage volume is 377 m³ for the 1:100 year and climate change event (CCE). Based on the assumption that 60% of rooftop will be used for storage, the proposed building's roof has sufficient storage capacity (704 m³) to detain the 1:100 year and CCE events. The storm runoff from the building's flat roof will be controlled via roof drain restrictors at an estimated rate of 32 L/sec. Detail rooftop calculations are provided in Appendix F. Refer to Appendix H for the manufacture's roof control specifications.

4.2.4 Proposed Surface Controls

The surrounding development asphalt area has a split flow drainage pattern with a west and an east basin area (4A-2 and 4A-3). See Appendix I for the pre-post development drainage plans. Each basin to discharge restricted flows to the onsite storm system. The total post onsite control rate to be maintained at 180 L/s or less. Table 4.1 (below) summarizes the restricted flows for each of the post catchment areas.

Table 5.1: Restricted Peak Flows for Post Catchment Areas

Basin Area	Restricted Peak Flow Rate (L/sec)
Roof (4A-1)	32
West (4A-2)	54
East (4A-3)	94
TOTAL	180

The required storage volumes were calculated using the modified rational method. Lost pre-development surface ponding storage volumes will now be provided using underground storage chambers. West (StormTech SC-740) and East (StormTech MC-3500) chambers are proposed to be installed underground the pavement (bus access lanes) along three sides of the proposed building (west, north, and east). See Appendix I.

Table 4.2 below sums up the required and provided onsite storage volumes for the 100-year storm period. See Appendix F for the detailed SWM calculations and Appendix G for the proposed underground storage chamber design.

Table 6.2: Required Onsite Storage Volumes

Basin Area	Area (ha)	C-factor	Required Storage Volume (m^3)	Provided Underground Storage Volume (m^3)
West (4A-2)	0.54	0.9	180	192
East (4A-3)	1.24	0.9	454	486

5.0 Conclusions and Recommendations

This Site Servicing Report and the associated Plans describe the infrastructure servicing required for the proposed OC Transpo E-bus parking garage at 1500 St. Laurent Boulevard.

The existing east onsite watermain (200 mm) that services the current north and south garages would also be used to service the proposed building. Two lateral water connections (200 mm in diameter) are proposed, both to extend off the main that runs along the west side of the north garage. One of the laterals is to service the building with domestic and fire (sprinkler) waters, and the other to supply an onsite proposed hydrant. Per the HNA analysis (Section 2.0), the design criteria and required pressure constraints are met.

Proposed development sewage flows are minimal (1.05 L/s). The proposed service (200 mm diameter) connection is assumed to exit the building along the southeast corner. Flows to drain (east) to the existing sanitary MH near the northwest corner of the existing south garage. Site wastewater ultimately discharges to the sanitary collector along Belfast Road. The capacity of the downstream sewers is assumed to be sufficient.

The proposed site modifications will not increase the overall imperviousness (asphalt versus roof) of the site. Runoff under existing conditions is controlled onsite at a rate of 180 L/s. Proposed development runoff will be controlled to 180 L/s or less. Site runoff to be regulated via rooftop restrictors and ICDs installed downstream of the underground storage chambers. The estimated post-development storage volumes (rooftop ponding plus underground) do not exceed the required storage volumes.

This report has been prepared for the exclusive use of the City of Ottawa for the stated purpose, for the named facility. Its discussions and conclusions are summary in nature and cannot be properly used, interpreted or extended to other purposes without a detailed understanding and discussions with the client as to its mandated purpose, scope and limitations. This report was prepared for the sole benefit and use of the City of Ottawa and may not be used or relied on by any other party without the express written consent of J.L. Richards & Associates Limited.

J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:

Gideon Hui, EIT
Civil Engineering Intern

Reviewed by:

Lee Jablonski, P.Eng.
Associate; Senior Civil Engineer

Appendix A

Copy of email correspondences

Marie-France Duthilleul

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: April 14, 2022 2:04 PM
To: Lee Jablonski
Cc: Terry Davidson; Glen McDonald
Subject: RE: RE: OC Transpo E-Bus Facility JLR 31489-004

Follow Up Flag: Follow up
Flag Status: Flagged

Good Afternoon Lee,

I have had a chance to look into your inquiry. The Conservation Authority agrees with your assessment that the rood top drainage would be considered enhances as rooftop drainage is traditionally considered clean for the purposes of water quality for receiving watercourses. Provided the overall storage is not lost, the RVCA would not require any additional onsite measures. Because the stormwater would be directed to municipal services, we would defer the technical review to the City.

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

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

From: Jamie Batchelor
Sent: Tuesday, April 12, 2022 4:08 PM
To: ljablonski@jlrichards.ca
Subject: RE: OC Transpo E-Bus Facility JLR 31489-004

Good Afternoon Lee,

I am writing to let you know that I have received your email and will respond Thursday.

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

Rideau Valley Conservation Authority

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OC Transpo
1500 Saint-Laurent

Pre-Consultation Meeting with MECP
Minutes of Meeting No. 1

Attendance:	Name	Company	Email
	Charlie Primeau (CP)	MECP	charlie.primeau@ontario.ca
	Scott Dupont (SD)	City of Ottawa	Scott.Dupont@ottawa.ca
	Sami Qadan (SQ)	City of Ottawa	Sami.Qadan@ottawa.ca
	Lee Jablonski (LJ)	J.L. Richards & Associates Limited	ljablonski@jlrichards.ca
	Marie-France Duthilleul (MD)	J.L. Richards & Associates Limited	mduthilleul@jlrichards.ca

The meeting commenced at 9:00 a.m. on Wednesday, April 6, 2022 **via TEAMS**.

The following summary of the discussions of this meeting has been prepared to record decisions reached and actions required for the project. Please advise the undersigned of any errors or omissions within the next three business days.

ITEM		**ACTION BY**	**DUE BY**
1.1	L. Jablonski provided a brief introduction to the site and the proposed redevelopment, replacing a portion of the existing asphalt parking lot with a new E-bus storage building.	INFO	
1.2	L. Jablonski stated that the proposed project was split into two parts. The first part concept design, to include support documents for city site plan application and ECA amendment is being led by JLR, currently under contract with the City. The second part is the detailed design to be done by another consulting firm as part of a design-build Team.	INFO	
1.3	L. Jablonski anticipated an end-of-month deadline to submit the site plan application.	INFO	
1.4	C. Primeau stated that the existing approved Feb. 3, 2017 (No. 8368-AGMS3S) ECA would need to be amended. He also mentioned that since 2017 the Ministry is now attempting to consolidate approval conditions. New conditions may or may not be applied to the current ECA amendment request. The MECP reviewer assigned to the application will confirm the additional conditions, if required, to be added to the amendment. A draft ECA template with an outline of various conditions is to be forwarded.	CP	
1.5	S. Dupont stated that the expected completion date for the building is 2025.	INFO	
1.6	C. Primeau mentioned as part of the ECA amendment that a copy of SWM Facility monitoring records (spill control, etc.) would need to be provided by the City as part of the submission package.	CITY	
1.7	C. Primeau stated that the permitting system has been streamlined, and the timeline once a submission package is received is approximately six to eight months. However, the submission can be delayed if the documents are deemed incomplete. Given that this is a city project, the process could be fast-tracked. JLR can review this request with Charles Warnock at the City of Ottawa to determine if the application can be approved	JLR	

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OC Transpo
1500 Saint-Laurent

Pre-Consultation Meeting with MECP
Minutes of Meeting No. 1

ITEM		ACTION BY	DUE BY
	under the Transfer of Review (TOR) program. CP noted that such TOR approvals are not unprecedented. CP also noted that Charles Warnock may call CP directly to discuss among themselves.		
1.8	C. Primeau noted that during construction, the Ministry assigns an Environmental Officer (Angelo Capello) to be onsite. They help address unexpected design-related environmental concerns that may occur during construction and provide direct input on design solutions, so as not to delay works. This approach is currently being done on the LRT project. In the case where ECA approval has not been received for a project and construction is imminent, the Environmental Officer can help expedite approvals within the Ministry.	INFO	
	Meeting adjourned at 09:45 a.m.		
	Next meeting TBD.		

Prepared by: Issued on: April 8, 2022

Marie-France Duthilleul, P.Eng.
Senior Civil Engineer

Distribution: All attendees
Andrew Duncan, JLR
Tim Chadder, JLR
Shahira Jalal, JLR

Appendix B

ECA issued by the Ministry
of the Environment (MECP)

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 8368-AGMS3S
Issue Date: February 3, 2017

City of Ottawa
1500 St. Laurent Boulevard
Ottawa, Ontario
K1G 0Z8

Site Location: 1500 St. Laurent Boulevard
City of Ottawa,
K1G 0Z8

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

an amendment to the stormwater management Works which accommodates service buildings, parking lots and an administrative building for the OC Transpo regional bus service, located at the northwest corner of St. Laurent Boulevard and Belfast Road, within the Ottawa River watershed, in the City of Ottawa, for the collection, treatment and disposal of stormwater run-off from the property, for the reconstruction of the bus storage/access road including stormwater management facilities to service approximately 1.03 hectares of the overall 13.59 hectares site area, providing Enhanced Level water quality control and erosion protection and attenuating post-development peak flows for all storm events up to and including the 100-year storm event to the pre-development peak flows for the 5-year storm event, consisting of the following:

Proposed Works:

infiltration trench (catchment area - 1.03 hectares) : - an approximately 185 m long by 0.5 m wide infiltration trench located along the west side of the bus storage/access road, receiving inflows from employee parking and rooftop from adjacent property located at 925 Belfast Road (ECA#3627-ADUGRU issued September 28, 2016) as well as bus storage/access road at 1500 St.Laurent, consisting of a 0.8 m deep layer of 19 mm diameter clear stone wrapped with non-woven geotextile fabric, having a total infiltration storage volume of approximately 46 m 3 , to store a portion of run-off from the 2-year storm event, providing stormwater infiltration with a design infiltration rate of approximately 60 mm/hr;

grassed swale: -one (1) grassed swale with a length of 185 m, a bottom width of 0.5 m, average depth of 0.85 m, side slopes of 2:1, and slope of 0.18%, located along the west side of the bus storage/access road, on the west side of the light industrial site, having a storage volume of approximately 375 m 3 , to convey up to the 100-year storm event from a small portion of the overall site area (bus storage/access road) and parking lot and adjacent building located at 925 Belfast Road, discharging to the ditch inlet, identified below;

ditch inlet: one (1) swale ditch inlet to be constructed on the north side of Belfast Road, receiving inflows from run-off of grassed swale, identified above, complete with a 235 mm diameter orifice plate to control the discharge to a flow rate of 0.103 m 3 /s, discharging to the storm sewer, identified below;

storm sewer: 300 mm diameter storm sewer to be constructed on the west side of the industrial site, discharging to an existing 375 storm sewer on Belfast Road;

Previous Works under amended Approval 5605-6VZS8W, issued December 5, 2006:

a stormwater management facility serving the northwest area of the site (sub-areas 4A, 4C and 4D) comprising of parking lot storage of 355 cubic metres to a maximum depth of 0.3 metres, with runoff during minor storms discharged to onsite storm sewers system equipped with flow control orifices to restrict flows to 355 Litres per second, and detention of runoff during major storm provided in a swale/dry pond, with storage of 475 cubic metres to a depth of 1.0 metre, with a flow control orifice restricting flows to 40.0 Litres per second, together with one (1) manhole oil/grit separator, having a sediment capacity of 6,150 litres, an oil capacity of 2,945 litres, a total holding capacity of 10,925 litres and a maximum treated flow rate of 30 litres per second, with discharge via a 600 mm diameter storm sewer from the area to an existing open ditch (located along the Canadian Pacific easement) which empties into a 750 mm storm sewer, (which also receives uncontrolled storm discharges from sub-areas 3A, 3B and 4B), then to Cyrville Drain, eventually to Green's Creek.

a stormwater management facility serving the southeastern area of the site (sub-area 1A) comprising of onsite storm sewer system discharging to an existing 6 m x 2.1 m x 3 m high dual chamber cast-in-place oil/grit separator, located at the northwest corner of the intersection of St. Laurent Boulevard and Belfast Road, discharging into the existing municipal storm sewer system (which also receives uncontrolled storm discharges from sub-area 1B),

Previous Works under Approval 6643-5DUSP2, issued September 20, 2002:

stormwater management system collecting up to 100-year storm event runoff from the development of a 1.25 ha parcel of land, consisting of detention storage in the parking lot of 304 cubic metres to a depth of 0.3 metres, with the 1:5 year storms discharging via a manhole, complete with a 295 mm diameter orifice, restricting flows to 240 Litres per second, and with detention of storms up to the 1:100 year event, in a swale/dry pond, with storage of 276 cubic metres to a depth of 0.8 metres, with an inlet control device with a 145 millimetre diameter orifice restricting flows to 42.8 Litres per second, and one (1) manhole oil/grit separator, having a sediment capacity of 6150 litres, an oil capacity of 2,945 litres, a total holding capacity of 10,925 litres and a maximum treated flow rate of 30 litres per second, with eventual discharge to the surface ditch adjacent to the site and to Cyrville Drain, complete with all sewers, catchbasins and manholes,

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted supporting documents listed in Schedule"A" forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

"Approval" means this entire document including the application and any supporting documents listed in any schedules in this Approval;

"Director" means a person appointed by the Minister pursuant to section 5 of the Environmental Protection Act for the purposes of Part II.1 of the Environmental Protection Act;

"Equivalent" means a substituted product that meets the required quality and performance standards of a named product;

"Ministry" means the ministry of the government of Ontario responsible for the Environmental Protection Act and the Ontario Water Resources Act and includes all officials, employees or other persons acting on its behalf;

"Owner" means the City of Ottawa and includes their successors and assignees;

"Previous Works" means those portions of the sewage Works previously approved under an Approval;

"Significant Drinking Water Threat Policies" has the same meaning as in the Clean Water Act , 2006;

"Source Protection Plan" means a drinking water source protection plan prepared under the Clean Water Act , 2006;

"Works" means the sewage works described in the Owner's application(s) and this Approval.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the Conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

(3) Where there is a conflict between a provision of any submitted document referred to in this Approval and the Conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The Conditions of this Approval are severable. If any Condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such Condition to other circumstances and the remainder of this Approval shall not be affected thereby.

(6) The issuance of, and compliance with the Conditions of this Approval does not:

(a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement, including, but not limited to, the obligation to obtain approval from the local conservation authority necessary to construct or operate the sewage Works; or

(b) limit in any way the authority of the Ministry to require certain steps be taken to require the Owner to furnish any further information related to compliance with this Approval.

2. EXPIRY OF APPROVAL

(1) This Approval will cease to apply to those parts of the new Works which have not been constructed within **five (5) years** of the date of this Approval.

3. CHANGE OF OWNER

(1) The Owner shall notify the Director, in writing, of any of the following changes within **thirty (30) days** of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act , R.S.O. 1990, c. B17 shall be included in the notification to the Director;

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act , R.S.O. 1990, c. C39 shall be included in the notification to the Director.

4. OPERATION AND MAINTENANCE

(1) The Owner shall inspect the Works at least **once a year** and, if necessary, clean and maintain the Works to prevent the excessive build-up of sediments and/or vegetation.

(2) The Owner shall maintain a record the results of these inspections and any cleaning and maintenance operations undertaken. The record shall include the following:

(a) the name of the Works; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. MONITORING AND REPORTING

(1) The Owner shall carry out a monitoring program for the inspection and maintenance of the Works as outlined in this Approval, and shall make the information available to the Ministry, upon request.

6. SPILL CONTINGENCY AND POLLUTION PREVENTION PLAN

(1) Upon commencement of operation of the Works, the Owner shall implement a Spill Contingency and Pollution Prevention Plan that outlines procedures as to how to mitigate the impacts of a spill within the area serviced by the Works and/or prevent pollution incidents. The said plan shall include as a minimum, but not limited to:

(a) the name, job title and location (address) of the Owner, person in charge, management or control of the 1500 St. Laurent Boulevard site at 1500 St. Laurent Boulevard;

(b) the name, job title and 24-hour telephone number of the person(s) responsible for activating

the Spill Contingency and Pollution Prevention Plan;

(c) a site plan drawn to scale showing the facility, nearby buildings, streets, catchbasins & manholes, drainage patterns (including direction(s) of flow in storm sewers) and any features which need to be taken into account in terms of potential impacts on access and response (including physical obstructions and location of response and clean-up equipment);

(d) steps to be taken to report, contain, clean up and dispose of contaminants following a spill;

(e) a listing of telephone numbers for: local clean-up companies who may be called upon to assist in responding to spills; local emergency responders including health institution(s); and MOECC Spills Action Centre 1-800-268-6060;

(f) Materials Safety Data Sheets (MSDS) for each and every hazardous material which may be transported or stored within the area serviced by the Works;

(g) the means (internal corporate procedures) by which the Spill Contingency and Pollution Prevention Plan is activated;

(h) a description of the spill response and pollution prevention training provided to employees assigned to work in the area serviced by the Works, the date(s) on which the training was provided and to whom;

(i) an inventory of response and clean-up equipment available to implement the Spill Contingency and Pollution Prevention Plan, location and date of maintenance/replacement if warranted, including testing and calibration of the equipment; and

(j) the date on which the Spill Contingency and Pollution Prevention Plan was prepared and subsequently, amended.

(2) The Spill Contingency and Pollution Prevention Plan shall be kept in a conspicuous place near the reception area on site.

(3) The Spill Contingency and Pollution Prevention Plan will be amended from time to time as needed by changes in the operation of the facility or to reflect updates in the Municipal By-Laws, or improved Best Management Practices by the Owner.

7. TEMPORARY EROSION AND SEDIMENT CONTROL

(1) The Owner shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every **two (2) weeks** and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly .

(2) The Owner shall maintain records of inspections and maintenance which shall be made available for inspection by the Ministry, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures, if any, undertaken to maintain the temporary sediment and erosion control measures.

8. SOURCE WATER PROTECTION

(1) The Owner shall ensure, if applicable, that the design, construction and operation of the Works conforms to any Significant Drinking Water Threat Policies in any Source Protection Plan that applies to the location of the Works.

9. RECORD KEEPING

The Owner shall retain for a minimum of **five (5) years** from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this Approval

Schedule "A"

1. Application for Approval of Municipal and Private Sewage Works dated August 8, 2006 submitted by Jean Lachance, P. Eng., City of Ottawa.

2. Report entitled 'Stormwater Site Management Plan, OC Transpo, City of Ottawa, 1500 St. Laurent Site' dated July 2006 prepared by J.L. Richards & Associates Limited, Consulting Engineers.

3. Application for Environmental Compliance Approval , dated July 4, 2016, received on July 22, 2016, submitted by Morrison Hershfield Limited;

4. SWM Technical Memo to the Ministry of Environment and Climate Change , dated June 20, 2016, prepared by Morrison Hershfield Limited;

5. Set of Engineering Drawings (7 drawings) for OC Transpo- 1500 St-Laurent Access Road Reconstruction, dated June 9, 2016, prepared by Morrison Hershfield Limited;

6. E-mail from Sarah Mitchelson of Morrison Hershfield Limited to the Ministry, dated January 17, 2017;

7. E-mail from Sarah Mitchelson of Morrison Hershfield Limited to the Ministry, dated January 27, 2017; and

8. E-mail from Sarah Mitchelson of Morrison Hershfield Limited to the Ministry, dated February 1, 2017.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This Condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the Works are constructed, the Works will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved Works and to ensure that any subsequent Owner of the Works is made aware of the Approval and continue to operate the Works in compliance with it.

4. Condition 4 is included to require that the Works be properly operated and maintained such that the

environment is protected.

5. Condition 5 is included to enable the Owner to evaluate and demonstrate the performance of the Works on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives specified in the Approval and that the Works do not cause any impairment of the receiving watercourse.

6. Condition 6 is included to ensure that the Ministry is immediately informed of the occurrence of an emergency or otherwise abnormal situation so that appropriate steps are taken to address the immediate concerns regarding the protection of public health and minimizing environmental damage and to be able to devise an overall abatement strategy to prevent long term degradation and the re-occurrence of the situation.

7. Condition 7 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction, until they are no longer required.

8. Condition 8 is included to ensure that the Works conform to the policies of the local Source Water Protection Plan.

9. Condition 9 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 5605-6VZS8W issued on December 5, 2006.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 3rd day of February, 2017

Gregory Zimmer, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

TN/
c: DWMD Supervisor, MOECC Ottawa office
Sarah Mitchelson, Morrison Hershfield Limited

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDED CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 5605-6VZS8W
Issue Date: December 5, 2006

City of Ottawa
1500 St. Laurent Boulevard
Ottawa, Ontario
K1G 0Z8

Site Location: 1500 St. Laurent Boulevard
City of Ottawa

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

A stormwater management system comprising of two (2) existing facilities constructed to serve the 1500 St. Laurent Boulevard site (a 13.59 ha industrial area located at the northwest corner of St. Laurent Boulevard and Belfast Road), which accommodates service buildings, parking lots and an administrative building for the OC Transpo regional bus service, as follows:

- a stormwater management facility serving the northwest area of the site (sub-areas 4A, 4C and 4D) comprising of parking lot storage of 355 cubic metres to a maximum depth of 0.3 metres, with runoff during minor storms discharged to onsite storm sewers system equipped with flow control orifices to restrict flows to 355 Litres per second, and detention of runoff during major storm provided in a swale/dry pond, with storage of 475 cubic metres to a depth of 1.0 metre, with a flow control orifice restricting flows to 40.0 Litres per second, together with one (1) manhole oil/grit separator, having a sediment capacity of 6,150 litres, an oil capacity of 2,945 litres, a total holding capacity of 10,925 litres and a maximum treated flow rate of 30 litres per second, with discharge via a 600 mm diameter storm sewer from the area to an existing open ditch (located along the Canadian Pacific easement) which empties into a 750 mm storm sewer, (which also receives uncontrolled storm discharges from sub-areas 3A, 3B and 4B), then to Cyrville Drain, eventually to Green's Creek.

- a stormwater management facility serving the southeastern area of the site (sub-area 1A) comprising of onsite storm sewer system discharging to an existing 6 m x 2.1 m x 3 m high dual chamber cast-in-place oil/grit separator, located at the northwest corner of the intersection of St. Laurent Boulevard and Belfast Road, discharging into the existing municipal storm sewer system (which also receives uncontrolled storm discharges from sub-area 1B),

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works* ,

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works dated August 8, 2006 submitted by Jean Lachance, P. Eng., City of Ottawa.

2. Report entitled 'Stormwater Site Management Plan, OC Transpo, City of Ottawa, 1500 St. Laurent Site' dated July 2006 prepared by J.L. Richards & Associates Limited, Consulting Engineers.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"*Certificate* " means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

"*Director* " means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

"*District Manager* " means the District Manager of the Ottawa District Office of the *Ministry* ;

"*Ministry* " means the Ontario Ministry of the Environment;

"*Owner* " means City of Ottawa and includes its successors and assignees;

"*Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* .

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate* , the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate* .

(2) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate* , the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(3) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate* .

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director* , in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner* ;

(b) change of address of the *Owner* ;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager* ; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager* .

4. OPERATION AND MAINTENANCE.

(1) The *Owner* shall ensure that the design minimum liquid retention volume(s) is maintained at all times.

(2) The *Owner* shall inspect the *Works* at least once a year and, if necessary, clean and maintain the *Works* to prevent the excessive buildup of sediments, oil/grit and/or vegetation.

(a) The Owner shall design, construct and operate the manhole oil/grit separator(s) with the objective that no visible oil sheens occur in the effluent discharged from the manhole oil/grit separator(s).

(b) The Owner shall carry out and maintain an annual inspection and maintenance program on the operation of the manhole oil/grit separator(s) in accordance with the manufacturer's recommendation.

(c) The District Manager may alter the frequency of inspection of the manhole oil/grit separator(s) if he/she is requested to do so by the Owner and considers it acceptable upon review of information submitted in support of the request.

(3) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook for inspection by the *Ministry* . The logbook shall include the following:

(a) the name of the *Works* ; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate* .

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment..

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the works are made aware of the certificate and continue to operate the works in compliance with it.

4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected.

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works* .

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 6643-5DUSP2 issued on September 20, 2002.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;

5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., Suite 1700
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 5th day of December, 2006

Dec. 7, 2006
DC

Mohamed Dhalla, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

HV/

c: District Manager, MOE Ottawa District Office
Derrick Upton, P. Eng., J.L. Richards & Associates Limited ✓

Appendix C

Schedule A Agreement

SCHEDULE A
SEWAGE WORKS ALLOWED UNDER THE TRANSFER OF REVIEW PROGRAM

Works allowed to be submitted under the TOR program by the Municipality are described in Sections 1 and 2 below. The works must also meet any requirements in the applicable section. Works that are not described in Section 1 or 2, do not meet any applicable requirements or to which Section 3 applies are not allowed to be submitted under the TOR program.

1. Standard Works Allowed

i) Allowed Sanitary Sewage Works

Unless specified in Section 3 of this Schedule, only ECA applications for the following sanitary sewage works are allowed to be submitted by the Municipality under the TOR Program:

a. New or modified, municipal or private sanitary sewers, forcemains or siphons that:

   i. are designed in accordance with the Ministry document *Design Guidelines for Sewage Works, 2008* (PIBS 6879) as amended from time to time;
   ii. are not combined sewers; and
   iii. do not discharge directly to a sewage treatment plant.

b. New or modified, municipal or private sanitary sewage pumping stations that:
   i. are designed in accordance with the Ministry document *Design Guidelines for Sewage Works, 2008* (PIBS 6879) as amended from time to time; and
   ii. do not discharge directly to a sewage treatment plant.

For greater clarity, any sanitary sewage works that provide any treatment of sanitary sewage are not allowed to be submitted under the TOR program.

ii) Allowed Stormwater Works

Unless specified in Section 3 of this Schedule, only ECA applications for the following stormwater works are allowed to be submitted by the Municipality under the TOR Program:

a. New or modified municipal or private storm sewers, ditches, culverts and grassed swales that:

   i. are designed in accordance with the Ministry document *Stormwater Management Planning and Design Manual, 2003* (PIBS 4329e) as amended from time to time;
   ii. are designed primarily for the collection and transmission of stormwater;
   iii. discharge to existing storm sewers, other existing stormwater conveyance works, an approved stormwater management facility, or a Municipal Drain;
   iv. for drainage works under the *Drainage Act,* approval of a petition for the modifications must be obtained under the *Drainage Act* prior to submitting an application for an ECA;
   v. are not combined sewers or superpipes and does not connect to a combined sewer;
   vi. are not located on industrial land or designed to service industrial land;
   vii. do not propose to collect, store or discharge stormwater containing substances or pollutants (other than Total Suspended Solids, or oil and grease) detrimental to the environment or human health; and
   viii. do not require the establishment and monitoring of effluent quality criteria.

b. New or modified, municipal or private oil/grit separators that:

i. are designed in accordance with the Ministry document *Stormwater Management Planning and Design Manual, 2003* (PIBS 4329e) as amended from time to time;
ii. discharge to existing storm sewers, other existing stormwater conveyance, an approved stormwater management facility, or a Municipal Drain;
iii. for drainage works under the *Drainage Act*, approval of a petition for the modifications must be obtained under the *Drainage Act* prior to submitting an application for an ECA;
iv. are not located on industrial land or designed to service industrial land;
v. do not propose to collect, store or discharge stormwater containing substances or pollutants (other than Total Suspended Solids, or oil and grease) detrimental to the environment or human health; and
vi. do not require the establishment and monitoring of effluent quality criteria.

2. Additional Works Allowed

The Municipality may submit ECA applications for sanitary and/or stormwater works other than those allowed in Section 1 as described below and in accordance with any listed requirements.

The Municipality's TOR Program is expanded to include:

a. Combined Sewers

- the rehabilitation of existing combined sewers where there is no increase in combined sewage overflow (CSO).

b. Stormwater Management Facilities (wet ponds, wetlands, hybrid ponds, dry ponds)

- altering, modifying, adding, optimizing or expanding the retention capacity for existing approved stormwater management facilities, including stormwater outfalls, provided that:
  - if the proposed works are required to provide quality control, the works are designed to achieve Enhanced Level water quality control and erosion protection (i.e. 80% TSS removal); and
  - any attenuation design requirements are satisfied;

- installing new stormwater management facilities, including stormwater outfalls, provided that:
  - if the proposed works are required to provide quality control, the works are designed to achieve Enhanced Level water quality control and erosion protection (i.e. 80% TSS removal); and
  - any attenuation design requirements are satisfied;

- stormwater pumping stations.

c. Lot Level and Conveyance Control (Low Impact Development) Measures

- altering, modifying, adding, optimizing or expanding the retention capacity for existing approved low impact development (LID) measures, including stormwater outfalls, provided that:

  - if the proposed works are required to provide quality control, the LID measures are designed to achieve Enhanced Level water quality control and erosion protection (i.e. 80% TSS removal); and
  - any attenuation design requirements are satisfied;

- installing new LID measures, including stormwater outfalls, provided that:
  - if the proposed works are required to provide quality control, the LID measures are designed to achieve Enhanced Level water quality control and erosion protection (i.e. 80% TSS removal);
  - any attenuation design requirements are satisfied; and
  - the design considers corrective and remediation measures in the event of lack of performance of the LID measures;

- rooftop, surface and underground storage with inlet control devices or orifices.

For Works listed in 2a through 2c the following requirements must be met:

- the Works must be designed in accordance with the Ministry documents *Design Guidelines for Sewage Works, 2008* (PIBS 6879) and *Stormwater Management Planning and Design Manual, 2003* (PIBS 4329e), as amended from time to time;

- the Works must receive drainage only from non-industrial lands, where industrial lands are defined by *Ontario Regulation 525/98*;

- any stormwater management pond listed in 2b above shall not be used as a snowmelt facility;

- for Works that are designed to partially infiltrate or exfiltrate into the surrounding soils during high flow conditions:
  - based on the type of works, the vertical separation distance between the highest groundwater table (i.e. spring runoff) and the lowest elevation of the works shall adhere to Table 4.1 of the Ministry document *Stormwater Management Planning and Design Manual, 2003* (PIBS 4329e); and
  - groundwater must not be utilized as a potable water resource anywhere drainage is captured by the stormwater management works;

- infiltration or exfiltration stormwater works include:
  - pervious pipes and catch-basins;
  - filtering systems, and infiltration trenches, such as, soak away pits attached to pervious catch-basins and sand filter beds;
  - infiltration basins;
  - pervious pipes and catch-basins with infiltration trench systems, rainwater and snow melt into the surrounding soils during high flow conditions; and
  - open channels, ditches, swale drainage systems, bio-swales, tree pits, and infiltration trenches on public roads, or right-of-ways, designed to exfiltrate part or all of the stormwater runoff from the adjacent road into the surrounding soils. These types of works are to include vegetative surfaces;

- for stormwater pumping stations, high level alarm systems, appropriate response time during emergency conditions, and redundancy in pumping arrangement must be provided;

- for the rehabilitation of existing combined sewers, the Works must conform to *Ministry Procedure F-5-5, Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems*, as amended from time to time;

- for drainage works under the *Drainage Act*, approval of a petition for the modifications must be obtained under the *Drainage Act* prior to submitting an application for an ECA;

- the description of the works for a new or replacement outfall will identify the receiving watercourse if it discharges into any of the provincially recognized critical receivers and/or their tributaries;

- the applicant has consulted with the local Conservation Authority and obtained necessary clearance as required, if the works discharge to a surface water body;

- as part of the Letter of Recommendation, the Municipality has clearly identified all of the works which fall under this Section of Schedule A;

- the Municipality has notified all applicants for works allowed in this Section that the ECA may contain conditions requiring the development of an operation and maintenance program, including a spill contingency plan for the works; the Municipality shall include in their Letter of Recommendation any other conditions related to operation and maintenance of the works if applicable; and

- the Municipality shall maintain a report with detailed records of all the stormwater management works constructed during the year.

The report and records noted above are to include, but not be limited to, the approval number, date of approval, location, description of the stormwater management works, information about what, how, when, why and who operates and maintains the works.

The report must also include a summary of the operation and maintenance program activities, any trouble shooting activities, reports of any flooding conditions and/or any complaints received from the public. The report must also include a statement concerning the potential for these stormwater management systems to impact groundwater quality, which will be based upon the available evidence from inspection and maintenance activities.

The Ministry may require the submission of this report upon request. Further instructions on where and to whom the report is to be submitted will be provided by the Ministry.

In most cases, private works included in this Section will be subject to the requirements under the Environmental Bill of Rights (EBR), which includes mandatory posting of the project proposal on the Environmental Registry for a minimum of forty-five (45) days prior to the issuance of the Environmental Compliance Approval. Ontario Regulation 681/94 under the EBR sets forth the types of ECAs that are classified as Class I or II proposals which require posting on the Environmental Registry. All private wastewater ECAs are subject to posting on the Environmental Registry unless they relate to a discharge point which is already subject to an ECA approval and the proposed ECA would not permit an increase in the discharge of any specific contaminant from the discharge point. In addition, as per section 30 of the EBR, a proposal may be exempt from EBR requirements if the proposal has been considered in a substantially equivalent process of public participation.

3. Works Not Allowed To Be Submitted

Under no circumstances are the following applications for Works identified in either Section 1 or 2 to be submitted under the TOR program:

a. applications that are identified by the local Ministry District Office as being proposed within the zone of influence of a landfill area;

b. applications for sanitary sewage works that provide any treatment of sanitary sewage;

c. applications for Regional Stormwater Control Facilities or Regional Flood Control Facilities consisting of storm water management ponds that are designed to provide quality control or contain floods **greater than** the 100 year flood event;

d. applications that are for airports or airparks;

e. applications that are for pumping stations that service combined sewer systems;

f. applications for projects that have received a Part II Order request, until the request has been decided;

g. applications for projects that have undertaken an individual Environmental Assessment; and

h. applications that are likely to trigger the Duty to Consult.

In addition, if the Municipality determines that the works listed in an application have been constructed or are being constructed before an Environmental Compliance Approval has been issued, the Municipality shall:

i. immediately notify the local Ministry District Office; and

ii. confirm with the Supervisor, Transfer of Review Program (Supervisor) that the application must be submitted directly to the Ministry for review. Once this confirmation is obtained, the municipality shall return the application and all associated documents and fees to the applicant and advise them that the application will not be reviewed under the TOR program. With written permission from the Supervisor, the municipality may be allowed to proceed with the review of the application.

4. 2020 Program Update: Proposed Consolidated Linear Infrastructure Approach

In view of the Ministry's plan to move to a consolidated permissions approach to linear infrastructure in the near future and subject to the written permission of the Supervisor, the municipality may be allowed in the interim to review additional works currently not listed in this schedule (including private works that may not be covered at the time of the application by an agreement pursuant to the Planning Act under section 1 of this Agreement).

Appendix D

Water HNA Analysis

Gideon Hui

From: Lucas Busch
Sent: April 13, 2022 2:33 PM
To: Gideon Hui
Cc: Annie Williams
Subject: RE: 31489-004 OC Transpo - Water Demands

Gideon,

Looks good to me.

Lucas

From: Gideon Hui <ghui@jlrichards.ca>
Sent: Wednesday, April 13, 2022 1:48 PM
To: Lucas Busch <lbusch@jlrichards.ca>
Cc: Annie Williams <awilliams@jlrichards.ca>
Subject: RE: 31489-004 OC Transpo - Water Demands

Hi Lucas,

As per our call, we will use the following assumptions for now:

1. Connecting the water lateral of the proposed building to the east wall (number 2)
2. Peak hour demand of 3.0 L/s to include the washing of the buses
3. We will assume finished floor elevations are similar to the existing MH T/G elevations as discussed with Lee

Regards,
Gideon

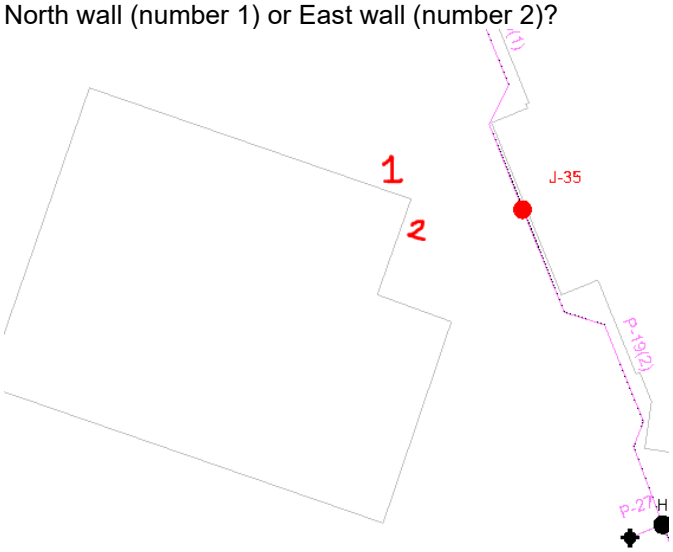
From: Gideon Hui
Sent: April 12, 2022 10:58 AM
To: Lucas Busch <lbusch@jlrichards.ca>
Cc: Annie Williams <awilliams@jlrichards.ca>
Subject: RE: 31489-004 OC Transpo - Water Demands

Hi Lucas,

A few questions for you:

1. Any suggestions on where to connect the new watermain to the new building? We had a discussion to assume it will connect at the North-East corner for the proposed building. In this case, would it be better to connect on the

North wall (number 1) or East wall (number 2)?



2. There was talk about having additional demands for the proposed building due to washing of the buses. Do you know how much more demand the proposed building will need for this?

3. Do you have any existing grading or finished floor elevations for the two existing buildings that you could send to me?

Thanks,
Gideon

From: Lucas Busch <lbusch@jlrichards.ca>
Sent: April 1, 2022 3:30 PM
To: Annie Williams <awilliams@jlrichards.ca>; Andrew Duncan <aduncan@jlrichards.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>; Gideon Hui <ghui@jlrichards.ca>; Toby Barton <tbarton@jlrichards.ca>
Subject: RE: 31489-004 OC Transpo - Water Demands

These are getting pretty specific for a building I know very little about😊!

The airport vehicle storage building was Ordinary Group 2. Seems like a similar application.

It is safe to assume that the hose allowance is in this value. The actual demand when we dive into design will likely drop to 550gpm (including hose allowance) but at this stage of design, I feel like 750gpm or 47L/s gives some breathing room in the design. If this isn't achievable from the City supply, we can take a closer look.

Let me know if I can be of further assistance.
.
Lucas

From: Annie Williams <awilliams@jlrichards.ca>
Sent: Friday, April 1, 2022 10:18 AM
To: Andrew Duncan <aduncan@jlrichards.ca>; Lucas Busch <lbusch@jlrichards.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>; Gideon Hui <ghui@jlrichards.ca>
Subject: RE: 31489-004 OC Transpo - Water Demands

Hi all,

Thank you. Also just want to confirm whether the 750 gpm for the bus storage sprinkler includes the hose stream allowance? And if so, we are considering this building a "light hazard" occupancy per NFPA 13?

Annie

From: Andrew Duncan <aduncan@jlrichards.ca>
Sent: Friday, April 1, 2022 9:58 AM
To: Lucas Busch <lbusch@jlrichards.ca>; Annie Williams <awilliams@jlrichards.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>; Gideon Hui <ghui@jlrichards.ca>
Subject: RE: 31489-004 OC Transpo - Water Demands

All,

Agree that the fire protection system will be automatic and supervised.

Andrew

From: Lucas Busch <lbusch@jlrichards.ca>
Sent: Friday, April 1, 2022 9:42 AM
To: Annie Williams <awilliams@jlrichards.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>; Andrew Duncan <aduncan@jlrichards.ca>; Gideon Hui <ghui@jlrichards.ca>
Subject: Re: 31489-004 OC Transpo - Water Demands

Hi,

We can likely confirm with electrical whether a fire alarm is required by code but, regardless of code, I expect the City will want some form of fire alarm. It is reasonable to assume that the fire protection system will be automatic and fully supervised.

Lucas

From: Annie Williams <awilliams@jlrichards.ca>
Sent: Friday, April 1, 2022 9:24:22 AM
To: Lucas Busch <lbusch@jlrichards.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>; Andrew Duncan <aduncan@jlrichards.ca>; Gideon Hui <ghui@jlrichards.ca>
Subject: RE: 31489-004 OC Transpo - Water Demands

Hi Lucas,

Thanks so much, this is very helpful. I will take 1.5 L/s as the peak hour demand. I can absolutely back calculate average and max day, not a problem.

The conservative sprinkler assumption is great, 47 L/s is reasonable and should be attainable. Can you confirm that the sprinkler system will be complete automatic and fully supervised?

Thank you,
Annie

From: Lucas Busch <lbusch@jlrichards.ca>
Sent: Thursday, March 31, 2022 10:52 AM
To: Annie Williams <awilliams@jlrichards.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>; Andrew Duncan <aduncan@jlrichards.ca>
Subject: RE: 31489-004 OC Transpo - Water Demands

Annie,

My understanding is that we are trying to avoid washrooms but code may require. Either way domestic demand is expected to be small. If we conservatively use 40 fixture units that results in a peak instantaneous demand of 1.5L/s. Assuming this peak flow only happens over 10min in the peak hour period; PHD=900L. You should be able to use the City of Ottawa peaking factor to back calculate the ADD. Sorry, we size fixtures on peak instantaneous flow rather than average daily consumption.

Conservative assumption for sprinkler demand is 47L/s (750 gpm) but this may be 500gpm depending on building occupancy classification.

Give me a call if you have any questions.

Lucas

From: Annie Williams <awilliams@jlrichards.ca>
Sent: Thursday, March 31, 2022 8:50 AM
To: Andrew Duncan <aduncan@jlrichards.ca>; Lucas Busch <lbusch@jlrichards.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>
Subject: 31489-004 OC Transpo - Water Demands

Hi Andrew, Lucas,

Lee suggested I reach out to you about the OC Transpo site at 1500 St. Laurent.

In support of the water servicing design, I am looking for the anticipated water demands (average day, max day, peak hour) for the new building. Even if you just have an average day flow based on fixture count, I can apply max day and peak hour peaking factors to it.

Will the new building have a sprinkler system and if so, what will be its water demand?

If you can provide this information today I would much appreciate.

Thank you,
Annie

Water Demand Calculations OC Transpo - Electrical Bus Parking Garage (JLR 31489-004)		
Demand Breakdown	**No.**	**Unit**
Peak Hour Demand (Based on Fixture Count & Washing Buses)	**3.00**	**L/s**
Peak Hour Peaking Factor	1.80	
Maximum Day Demand	**1.67**	**L/s**
Maximum Day Peaking Factor	1.50	
Average Day Demand	**1.11**	**L/s**
Total Demands for Storage Facility		
Average Day Demand	**1.11**	**L/s**
Maximum Day Demand	**1.67**	**L/s**
Peak Hour Demand	**3.00**	**L/s**

Peaking factors based on City of Ottawa Water Design Guidelines

FUS Fire Flow Calculations

OC Transpo - Electrical Bus Storage Facility - Industrial Building
(JLR 31489-004)

Step	Parameter	Value		Note
A	Type of Construction	Non-combustible		Critical Fire Area (E-Bus Storage Facility)
	Coefficient (C)	0.8		
B	Ground Floor Area	7643	m^2	
C	Height in storeys	1	storeys	Basements are excluded.
	Total Floor Area	7643	m^2	
D	Fire Flow Formula	$F=220C\sqrt{A}$		
	Fire Flow	15387	L/min	
	Rounded Fire Flow	15000	L/min	Flow rounded to nearest 1000 L/min.
E	Occupancy Class	Free Burning		Municipal storage building has a combustible occupancy class
	Occupancy Charge	15%		
	Occupancy Increase or Decrease	2250		
	Fire Flow	17250	L/min	No rounding applied.
F	Sprinkler Protection	Automatic Fully Supervised		Sprinkler to be installed
	Sprinkler Credit	-50%		
	Decrease for Sprinkler	-8625	L/min	
G	*North Side Exposure*			
	Exposing Wall:	Non-combustible		Electrical bus storage facility
	Exposed Wall:	Non-combustible		No building within 45m
	Length of Exposed Wall:	0.0	m	
	Height of Exposed Wall:	1	storeys	
	Length-Height Factor	0.0	m-storeys	
	Separation Distance	50	m	
	North Side Exposure Charge	0%		
	East Side Exposure			
	Exposing Wall:	Non-combustible		Electrical bus storage facility
	Exposed Wall:	Non-combustible		Existing bus facility
	Length of Exposed Wall:	124.0	m	
	Height of Exposed Wall:	1	storeys	
	Length-Height Factor	124.0	m-storeys	
	Separation Distance	27	m	Additional 3m seperation due to diagonal
	East Side Exposure Charge	10%		
	South Side Exposure			
	Exposing Wall:	Non-combustible		Electrical bus storage facility
	Exposed Wall:	Non-combustible		No building within 50m
	Length of Exposed Wall:	0.0	m	
	Height of Exposed Wall:	0	storeys	
	Length-Height Factor	0.0	m-storeys	
	Separation Distance	50	m	
	South Side Exposure Charge	0%		
	West Side Exposure			
	Exposing Wall:	Non-combustible		Electrical bus storage facility
	Exposed Wall:	Non-combustible		Existing industrial building
	Length of Exposed Wall:	10.0	m	
	Height of Exposed Wall:	1	storeys	
	Length-Height Factor	10.0	m-storeys	
	Separation Distance	40	m	
	West Side Exposure Charge	5%		
	Total Exposure Charge	15%		The total exposure charge is below the maximum value of 75%.
	Increase for Exposures	2588	L/min	
H	Fire Flow	11213	L/min	
	Rounded Fire Flow	11000	L/min	Flow rounded to nearest 1000 L/min.
City Cap	**Required Fire Flow (RFF)**	**11000**	**L/min**	City Cap Does Not Apply
		183	**L/s**	

Fire Underwriters Survey (FUS) Fire Flow Calculations
In accordance with City of Ottawa Technical Bulletin ISTB-2018-02 dated March 21, 2018

Annie Williams

From: Bramah, Bruce <bruce.bramah@ottawa.ca>
Sent: Friday, April 8, 2022 1:45 PM
To: Annie Williams
Cc: Lee Jablonski; Dupont, Scott; Qadan, Sami; Morphet, Katie
Subject: RE: OC Transpo E-Bus Facility JLR 31489-004 - Request for Hydraulic Boundary Conditions
Attachments: OC Transpo E-Bus Facility March 2022.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon,

The following are boundary conditions, HGL, for hydraulic analysis at OC Transpo E-Bus Facility at 1500 St. Laurent Boulevard (zone 1E) assumed to be a private looped network connected to the 305 mm on Belfast Road and the 152 mm on St-Laurent Boulevard. (see attached PDF for location).

	Connection 1 - Belfast	Connection 2 – St-Laurent
Minimum HGL	110.1 m	110.1 m
Maximum HGL	118.3 m	118.3 m
MaxDay + Fire Flow (47 L/s)	113.5 m	113.3 m
MaxDay + Fire Flow (183 L/s)	111.6 m	109.4 m

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

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Have a good weekend,

Bruce Bramah, EIT

Project Manager

Planning, Real Estate and Economic Development

Development Review South

110 Laurier Avenue
Ottawa, ON K1P 1J1
Bruce.Bramah@ottawa.ca
Tel: (613) 580-2424 ext. 29686

From: Annie Williams <awilliams@jlrichards.ca>
Sent: April 04, 2022 3:50 PM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>
Cc: Lee Jablonski <ljablonski@jlrichards.ca>; Dupont, Scott <Scott.Dupont@ottawa.ca>; Qadan, Sami <Sami.Qadan@ottawa.ca>; Morphet, Katie <katie.morphet@ottawa.ca>
Subject: OC Transpo E-Bus Facility JLR 31489-004 - Request for Hydraulic Boundary Conditions

Hi Bruce,

We would like to obtain hydraulic boundary conditions for OC Transpo's industrial site located at 1500 Saint Laurent Boulevard.

The proposed building will be used for bus storage. The site has an existing private watermain loop to service the two (2) existing buildings shown on the attached figure.

We are requesting the boundary conditions at the two (2) existing private watermain connection locations to the municipal distribution system, located on St. Laurent Boulevard and Belfast Road (see attached figure).

For the proposed building, a peak hour demand of 1.50 L/s was calculated by the mechanical engineer based on an assumed fixture count. The maximum day and average day demands for the proposed building were then calculated using the City of Ottawa Water Design Guidelines. The water demands for the two existing buildings were calculated based on metered data provided by OC Transpo. The total water demands are summarized in the table below:

	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Proposed Building	0.56	0.83	1.50
Two Existing Buildings	1.09	1.63	2.94
Total	**1.65**	**2.46**	**4.44**

Water Demands
Average Day = 1.65 L/s
Maximum Day = 2.46 L/s
Peak Hour = 4.44 L/s
Fire Flow 1 (OBC Sprinkler) = 47 L/s
Fire Flow 2 (FUS) = 183 L/s

The OBC fire flow requirement is based on the flow requirement for the sprinkler system including hose stream allowance, provided by the mechanical engineer.
The FUS fire flow requirement is based on the Fire Underwriters Survey method and the City's Technical Bulletin ISTB-2018-02. Calculations are included in the attachment.

We kindly request hydraulic boundary conditions under the typical scenarios and under both fire flow conditions.

If we could receive the requested boundary conditions at your earliest convenience it would be much appreciated.

Should you have any questions or require any further information, please do not hesitate to contact me.

Thank you,
Annie

Annie Williams, P.Eng.
Civil Engineer

J.L. Richards & Associates Limited
700 - 1565 Carling Avenue, Ottawa, ON K1Z 8R1
Direct: 343-803-4523

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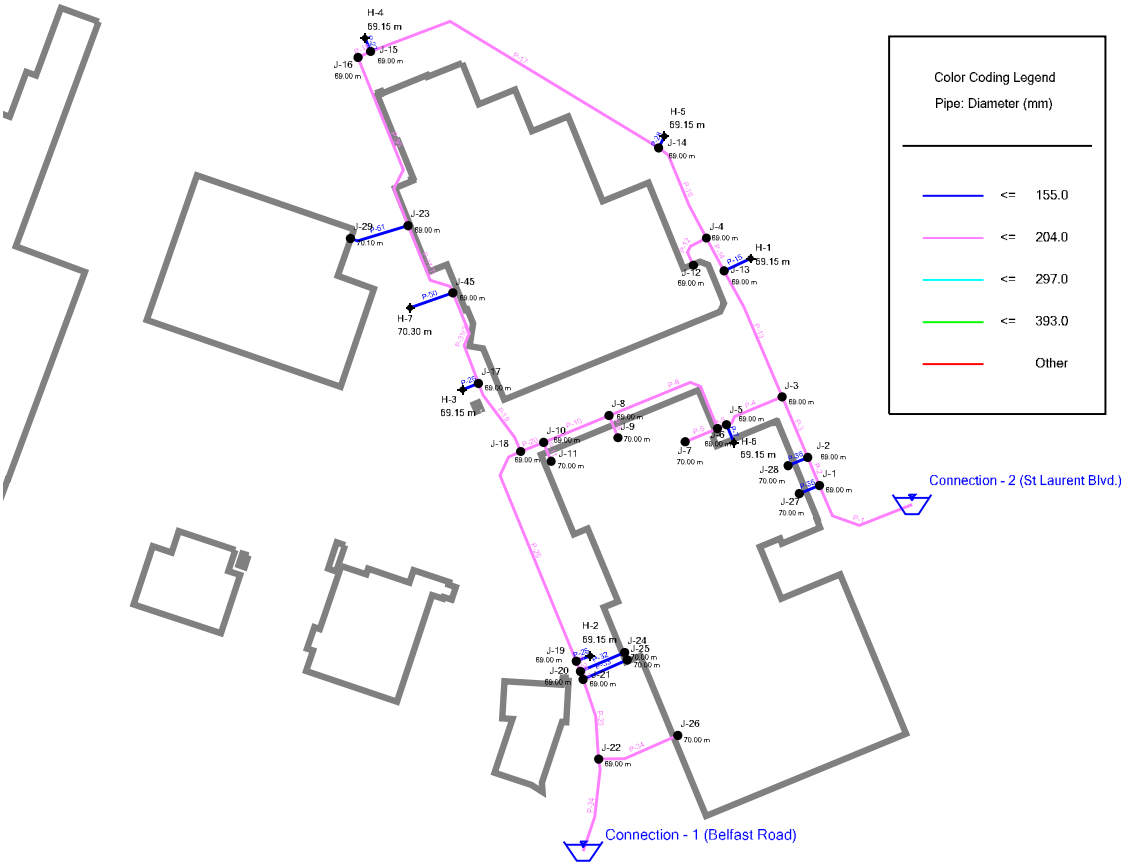
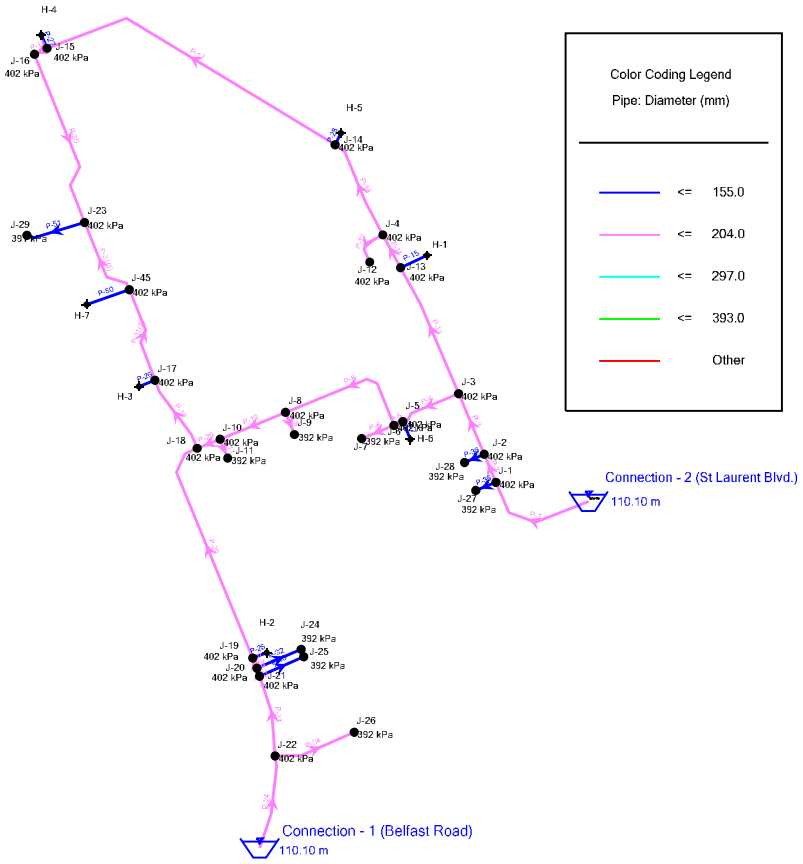
'

OC Transpo - 1500 St. Laurent Boulevard
Overall Schematic



OC Transpo - 1500 St. Laurent Boulevard
Peak Hour Demand



OC Transpo - 1500 St. Laurent Boulevard

Peak Hour Demand

Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	69.00	0.00	110.09	402
J-2	69.00	0.00	110.09	402
J-3	69.00	0.00	110.09	402
J-4	69.00	0.00	110.09	402
J-5	69.00	0.00	110.09	402
J-6	69.00	0.00	110.09	402
J-7	70.00	0.33	110.09	392
J-8	69.00	0.00	110.09	402
J-9	70.00	0.33	110.09	392
J-10	69.00	0.00	110.09	402
J-11	70.00	0.33	110.09	392
J-12	69.00	0.33	110.09	402
J-13	69.00	0.00	110.09	402
J-14	69.00	0.00	110.09	402
J-15	69.00	0.00	110.09	402
J-16	69.00	0.00	110.09	402
J-17	69.00	0.00	110.09	402
J-18	69.00	0.00	110.09	402
J-19	69.00	0.00	110.09	402
J-20	69.00	0.00	110.09	402
J-21	69.00	0.00	110.09	402
J-22	69.00	0.00	110.10	402
J-23	69.00	0.00	110.08	402
J-24	70.00	0.33	110.09	392
J-25	70.00	0.33	110.09	392
J-26	70.00	0.33	110.10	392
J-27	70.00	0.33	110.09	392
J-28	70.00	0.33	110.09	392
J-29	70.10	3.00	110.07	391
J-45	69.00	0.00	110.09	402

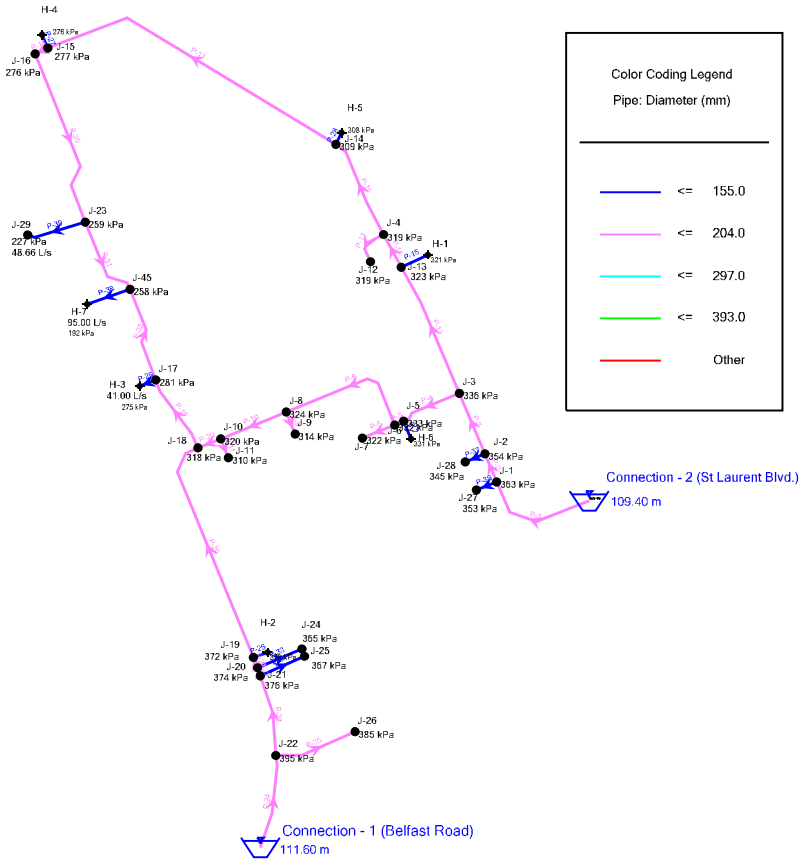
OC Transpo - 1500 St. Laurent Boulevard

Peak Hour Demand

Pipe Table

Label	Diameter (mm)	Length (m)	Material	Hazen-Williams C	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)	Velocity (m/s)	Flow (L/s)
P-1	204.0	60.8	PVC	110.0	110.10	110.09	0.10	3.19
P-2	204.0	15.7	PVC	110.0	110.09	110.09	0.09	2.86
P-3	204.0	33.9	PVC	110.0	110.09	110.09	0.08	2.53
P-4	204.0	32.9	PVC	110.0	110.09	110.09	0.03	1.11
P-5	204.0	5.0	PVC	110.0	110.09	110.09	0.03	1.11
P-6	204.0	18.0	PVC	110.0	110.09	110.09	0.01	0.33
P-7	155.0	9.9	PVC	100.0	110.09	110.09	0.00	0.00
P-8	204.0	74.3	PVC	110.0	110.09	110.09	0.02	0.79
P-9	204.0	12.3	PVC	110.0	110.09	110.09	0.01	0.33
P-10	204.0	36.4	PVC	110.0	110.09	110.09	0.01	0.46
P-11	204.0	10.5	PVC	110.0	110.09	110.09	0.01	0.33
P-12	204.0	20.1	PVC	110.0	110.09	110.09	0.01	0.33
P-13	204.0	71.6	PVC	110.0	110.09	110.09	0.04	1.42
P-14	204.0	19.2	PVC	110.0	110.09	110.09	0.04	1.42
P-15	155.0	15.1	PVC	100.0	110.09	110.09	0.00	0.00
P-16	204.0	53.3	PVC	110.0	110.09	110.09	0.03	1.09
P-17	204.0	169.3	PVC	110.0	110.09	110.09	0.03	1.09
P-18	204.0	7.2	PVC	110.0	110.09	110.09	0.03	1.09
P-19	204.0	41.6	PVC	110.0	110.09	110.09	0.06	-1.91
P-20	204.0	12.7	PVC	110.0	110.09	110.09	0.00	0.13
P-21	204.0	5.7	PVC	110.0	110.09	110.09	0.05	-1.78
P-22	204.0	4.4	PVC	110.0	110.09	110.09	0.06	-2.10
P-23	204.0	42.2	PVC	110.0	110.09	110.10	0.07	-2.43
P-24	204.0	48.7	PVC	110.0	110.10	110.10	0.08	-2.76
P-25	155.0	7.7	PVC	100.0	110.09	110.09	0.00	0.00
P-26	155.0	8.8	PVC	100.0	110.09	110.09	0.00	0.00
P-27	155.0	7.5	PVC	100.0	110.09	110.09	0.00	0.00
P-28	155.0	6.7	PVC	100.0	110.09	110.09	0.00	0.00
P-29	204.0	120.8	PVC	110.0	110.09	110.09	0.05	-1.78
P-30	204.0	93.8	PVC	110.0	110.09	110.08	0.03	1.09
P-31	204.0	44.6	PVC	110.0	110.08	110.09	0.06	-1.91
P-32	204.0	50.2	PVC	110.0	110.09	110.09	0.06	-1.91
P-33	155.0	24.8	PVC	100.0	110.09	110.09	0.02	0.33
P-34	155.0	24.9	PVC	100.0	110.09	110.09	0.02	0.33
P-35	204.0	43.3	PVC	110.0	110.10	110.10	0.01	0.33
P-36	155.0	11.2	PVC	100.0	110.09	110.09	0.02	0.33
P-37	155.0	10.9	PVC	100.0	110.09	110.09	0.02	0.33
P-38	155.0	23.3	PVC	100.0	110.09	110.09	0.00	0.00
P-39	155.0	31.1	PVC	100.0	110.07	110.08	0.16	-3.00

OC Transpo - 1500 St. Laurent Boulevard
Max Day Demand + Fire Flow Requirement (11,000 L/min)
With Sprinkler System



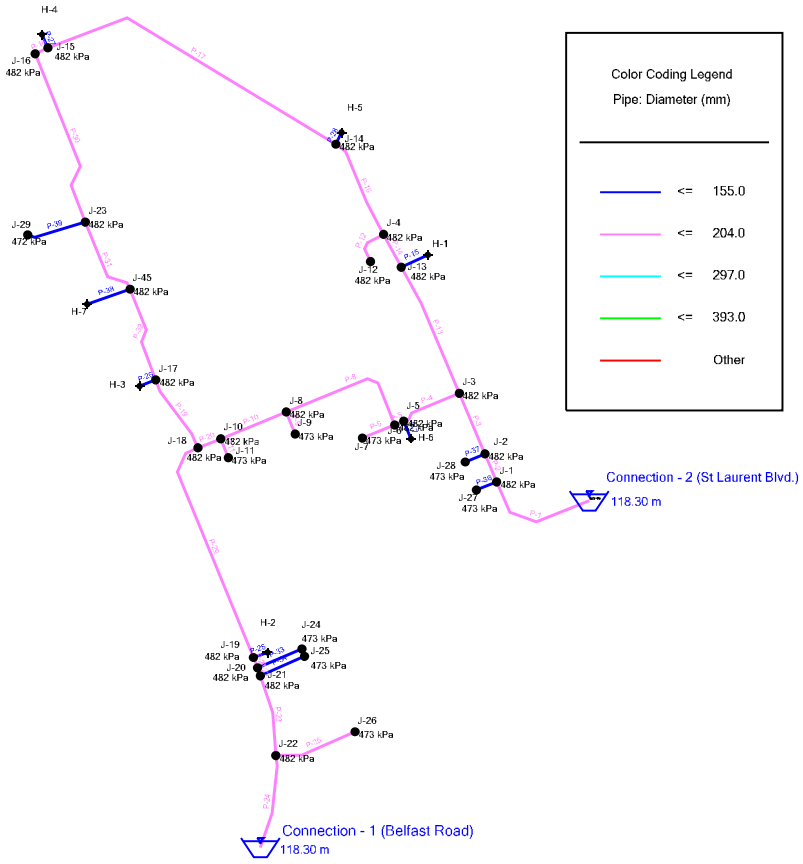
OC Transpo - 1500 St. Laurent Boulevard
Max Day Demand + Fire Flow Requirement (11,000 L/min)
With Sprinkler System
Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	69.00	0.00	106.06	363
J-2	69.00	0.00	105.20	354
J-3	69.00	0.00	103.35	336
J-4	69.00	0.00	101.61	319
J-5	69.00	0.00	102.98	333
J-6	69.00	0.00	102.92	332
J-7	70.00	0.18	102.92	322
J-8	69.00	0.00	102.08	324
J-9	70.00	0.18	102.08	314
J-10	69.00	0.00	101.67	320
J-11	70.00	0.18	101.67	310
J-12	69.00	0.18	101.61	319
J-13	69.00	0.00	101.98	323
J-14	69.00	0.00	100.59	309
J-15	69.00	0.00	97.35	277
J-16	69.00	0.00	97.21	276
J-17	69.00	0.00	97.69	281
J-18	69.00	0.00	101.53	318
J-19	69.00	0.00	106.99	372
J-20	69.00	0.00	107.25	374
J-21	69.00	0.00	107.45	376
J-22	69.00	0.00	109.37	395
J-23	69.00	0.00	95.42	259
J-24	70.00	0.18	107.25	365
J-25	70.00	0.18	107.45	367
J-26	70.00	0.18	109.37	385
J-27	70.00	0.18	106.06	353
J-28	70.00	0.18	105.20	345
J-29	70.10	48.66	93.29	227
J-45	69.00	0.00	95.40	258

OC Transpo - 1500 St. Laurent Boulevard
Max Day Demand + Fire Flow Requirement (11,000 L/min)
With Sprinkler System
Hydrant Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
H-1	69.15	0.00	101.98	321
H-2	69.15	0.00	106.99	370
H-3	69.15	41.00	97.25	275
H-4	69.15	0.00	97.35	276
H-5	69.15	0.00	100.59	308
H-6	69.15	0.00	102.98	331
H-7	70.30	95.00	89.87	192

OC Transpo - 1500 St. Laurent Boulevard
Maximum Pressure Analysis



OC Transpo - 1500 St. Laurent Boulevard

Maximum Pressure Analysis

Junction Table

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-29	70.10	0.00	118.30	472
J-7	70.00	0.00	118.30	473
J-9	70.00	0.00	118.30	473
J-11	70.00	0.00	118.30	473
J-24	70.00	0.00	118.30	473
J-25	70.00	0.00	118.30	473
J-26	70.00	0.00	118.30	473
J-27	70.00	0.00	118.30	473
J-28	70.00	0.00	118.30	473
J-1	69.00	0.00	118.30	482
J-2	69.00	0.00	118.30	482
J-3	69.00	0.00	118.30	482
J-4	69.00	0.00	118.30	482
J-5	69.00	0.00	118.30	482
J-6	69.00	0.00	118.30	482
J-8	69.00	0.00	118.30	482
J-10	69.00	0.00	118.30	482
J-12	69.00	0.00	118.30	482
J-13	69.00	0.00	118.30	482
J-14	69.00	0.00	118.30	482
J-15	69.00	0.00	118.30	482
J-16	69.00	0.00	118.30	482
J-17	69.00	0.00	118.30	482
J-18	69.00	0.00	118.30	482
J-19	69.00	0.00	118.30	482
J-20	69.00	0.00	118.30	482
J-21	69.00	0.00	118.30	482
J-22	69.00	0.00	118.30	482
J-23	69.00	0.00	118.30	482
J-45	69.00	0.00	118.30	482

OC Transpo - 1500 St. Laurent Boulevard

Maximum Pressure Analysis

Pipe Table

Label	Diameter (mm)	Length (m)	Material	Hazen-Williams C	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)	Velocity (m/s)	Flow (L/s)
P-1	204.0	60.8	PVC	110.0	118.30	118.30	0.00	0.00
P-2	204.0	15.7	PVC	110.0	118.30	118.30	0.00	0.00
P-3	204.0	33.9	PVC	110.0	118.30	118.30	0.00	0.00
P-4	204.0	32.9	PVC	110.0	118.30	118.30	0.00	0.00
P-5	204.0	5.0	PVC	110.0	118.30	118.30	0.00	0.00
P-6	204.0	18.0	PVC	110.0	118.30	118.30	0.00	0.00
P-7	155.0	9.9	PVC	100.0	118.30	118.30	0.00	0.00
P-8	204.0	74.3	PVC	110.0	118.30	118.30	0.00	0.00
P-9	204.0	12.3	PVC	110.0	118.30	118.30	0.00	0.00
P-10	204.0	36.4	PVC	110.0	118.30	118.30	0.00	0.00
P-11	204.0	10.5	PVC	110.0	118.30	118.30	0.00	0.00
P-12	204.0	20.1	PVC	110.0	118.30	118.30	0.00	0.00
P-13	204.0	71.6	PVC	110.0	118.30	118.30	0.00	0.00
P-14	204.0	19.2	PVC	110.0	118.30	118.30	0.00	0.00
P-15	155.0	15.1	PVC	100.0	118.30	118.30	0.00	0.00
P-16	204.0	53.3	PVC	110.0	118.30	118.30	0.00	0.00
P-17	204.0	169.3	PVC	110.0	118.30	118.30	0.00	0.00
P-18	204.0	7.2	PVC	110.0	118.30	118.30	0.00	0.00
P-19	204.0	41.6	PVC	110.0	118.30	118.30	0.00	0.00
P-20	204.0	12.7	PVC	110.0	118.30	118.30	0.00	0.00
P-21	204.0	5.7	PVC	110.0	118.30	118.30	0.00	0.00
P-22	204.0	4.4	PVC	110.0	118.30	118.30	0.00	0.00
P-23	204.0	42.2	PVC	110.0	118.30	118.30	0.00	0.00
P-24	204.0	48.7	PVC	110.0	118.30	118.30	0.00	0.00
P-25	155.0	7.7	PVC	100.0	118.30	118.30	0.00	0.00
P-26	155.0	8.8	PVC	100.0	118.30	118.30	0.00	0.00
P-27	155.0	7.5	PVC	100.0	118.30	118.30	0.00	0.00
P-28	155.0	6.7	PVC	100.0	118.30	118.30	0.00	0.00
P-29	204.0	120.8	PVC	110.0	118.30	118.30	0.00	0.00
P-30	204.0	93.8	PVC	110.0	118.30	118.30	0.00	0.00
P-31	204.0	44.6	PVC	110.0	118.30	118.30	0.00	0.00
P-32	204.0	50.2	PVC	110.0	118.30	118.30	0.00	0.00
P-33	155.0	24.8	PVC	100.0	118.30	118.30	0.00	0.00
P-34	155.0	24.9	PVC	100.0	118.30	118.30	0.00	0.00
P-35	204.0	43.3	PVC	110.0	118.30	118.30	0.00	0.00
P-36	155.0	11.2	PVC	100.0	118.30	118.30	0.00	0.00
P-37	155.0	10.9	PVC	100.0	118.30	118.30	0.00	0.00
P-38	155.0	23.3	PVC	100.0	118.30	118.30	0.00	0.00
P-39	155.0	31.1	PVC	100.0	118.30	118.30	0.00	0.00

Appendix E

Sanitary and Storm Sewer
Design Sheets

TABLE
SANITARY SEWER CALCULATION SHEET

LOCATION					COMMERCIAL		INDUST			INST		C+I+I	INFILTRATION				SEWER DATA					
Location	From	To	Area No.	Area (ha)	Area (ha)	Acc. Area (ha)	Area (ha)	Acc. Area (ha)	Peak Factor	Area (ha)	Acc. Area (ha)	Peak Flow (L/sec)	Area (ha)	Acc. Area (ha)	Infilt. Flow (L/sec)	Total Flow (L/sec)	Dia. (mm)	Dia. actual	Slope (%)	Length (m)	Capacity (L/sec)	Full Velocity (m/s)
1500 St Laurent	Bldg	MH100	A1	0.79			0.79	0.79				0.79	0.79	0.79	0.22	1.01	200	201.16	1.00	18.2	33.31	1.05
South Parking	MH100	MH101	A2	0.07				0.79				0.79	0.07	0.85	0.24	1.03	200	201.16	0.40	63.0	21.07	0.66
South Parking	MH101	EX. MH	A3	0.07				0.79				0.79	0.07	0.92	0.26	1.05	200	201.16	0.71	43.0	28.07	0.88

			Q(p) = Peak Population Flow = PqM/86.4 + Iac	L/sec	Designed:
Average Daily Flow (L/p/day) =	350	L/person/day	Q(i) = Peak Extraneous Flow = I * Ac	L/sec	GH, EIT
Commercial Flow (L/s/ha) =	50,000	L/gross ha/day	A_i = Individual; Area (hectares)	hectares	Checked:
	0.579	or L/gross ha/sec	A_c = Cumulative Area (hectares)	hectares	M.F. Duthilleul, P.Eng.
Industrial Flow (L/s/ha) =	35,000	L/gross ha/day	M = Peaking Factor = 1 + (14/(4+P^0.5))		Date:
	0.405	or L/gross ha/sec	P = Population (thousands)	persons	April 27, 2022
Max Res Peak Factor =	4.0		Qcap, (Manning) = $1/n\ S^{1/2}\ R^{2/3}\ A_c$	L/sec	Dwg Reference:
Commercial / Inst Peak Factor =	1.5		Manning N =	0.013	Site Servicing Plan
			I = Peak extraneous flow (L/s/ha) =	0.28	

Project:	
OCT St Laurent E-Bus Bldg SPA	
Location:	
Ottawa, Ontario	
File Ref:	Sheet No:
31489-004	1 of 1

TABLE
5-YEAR STORM SEWER CALCULATION

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Return Period Storm = **5** years
Default Inlet Time= 10 (minutes) Frontyards
15 (minutes) Backyards
Manning Coefficient = 0.013 (dimensionless)

LOCATION			AREA				FLOW							SEWER DATA									
Location	From Node	To Node	Area No.	Area (ha)	∑ Area (ha)	Average C	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q_S (L/sec)	Nominal Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Q_S/Q_{cap}	Hydraulic Ratios Va/Vf
Parking Lot West	CB1	CB2	A1	0.111	0.111	0.69	0.212	0.212	10.00	104.19	22.12	5.00	22.1	375	PVC	0.15	27.9	63.8	0.61	0.43	1.08	0.3	0.7
Parking Lot West	CB2	CB3	A2	0.044	0.155	0.69	0.084	0.084	10.00	104.19	8.79	5.00	8.8	375	PVC	0.15	27.9	63.8	0.61	0.36	1.30	0.1	0.6
Parking Lot West	CB3	MH-CB4	A3	0.045	0.200	0.69	0.086	0.086	10.00	104.19	8.95	5.00	9.0	375	PVC	0.15	30.3	63.8	0.61	0.36	1.39	0.1	0.6
Parking Lot West	MH-CB4	CB5	A4	0.304	0.504	0.69	0.584	0.584	10.00	104.19	60.82	5.00	60.8	450	PVC	0.12	41.9	97.5	0.62	0.57	1.24	0.6	0.9
Parking Lot West	CB5	CB6	A5	0.043	0.547	0.69	0.082	0.082	10.00	104.19	8.59	5.00	8.6	450	PVC	0.12	44.5	97.5	0.62	0.32	2.30	0.1	0.5
Parking Lot West	CB6	**EX. MH**	A6	0.001	0.548	0.69	0.002	0.002	10.00	104.19	0.20	5.00	0.2	525	PVC	0.10	16.2	141.6	0.63			0.0	
Parking Lot East	CB7	CB8	A7	0.500	0.500	0.69	0.959	0.959	10.00	104.19	99.93	5.00	99.9	450	PVC	0.15	17.3	109.0	0.69	0.69	0.42	0.9	1.0
Parking Lot East	CB8	CB9	A8	0.076	0.576	0.69	0.146	0.146	10.00	104.19	15.17	5.00	15.2	450	PVC	0.12	17.3	97.5	0.62	0.37	0.79	0.2	0.6
Parking Lot East	CB9	MH-CB10	A9	0.047	0.623	0.69	0.090	0.090	10.00	104.19	9.37	5.00	9.4	450	PVC	0.12	31.3	97.5	0.62	0.33	1.59	0.1	0.5
Parking Lot East	MH-CB10	**EX. MH**	A10	0.070	0.693	0.69	0.135	0.135	10.00	104.19	14.03	5.00	14.0	450	PVC	0.12	18.9	97.5	0.62	0.37	0.86	0.1	0.6
Parking Lot (north)	**EX. MH**	EX. 600 mm	A11	0.001	1.242	0.69	0.002	0.002	10.00	104.19	0.20	5.00	0.2	600	PVC	0.08	31.3	181.5	0.61			0.0	
Total				1.242			2.38										304.8						

Definitions:
Q = 2.78*AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Watershed Area (hectares)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficients (dimensionless)

Notes:

		5yr	100yr
Ottawa Rainfall Intensity Values:	a =	998.071	1735.688
From Sewer Desing Guidelines, 20	b=	0.814	0.820
	c =	6.053	6.014

Appendix F

Stormwater Management Calculations

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

OC TRANSPO

Allowable Peak Flow & SWM Calculations

BUILDING ROOF (BASIN 4A-1)

Post-Development Drainage Areas

Type of Area	Area (m^2)	C-Factor
Builing	7822	0.90
Total =	7822	0.90

SWM Calcs for Areas Tributary to 600 mm diam. storm sewer:

QED.1 - Controlled Roof	
Roof (m2)	7822
C =	0.90
Sum of Roof Drains =	32
Storage Volume (m3)	704

Assuming Watts RD-100A Ajustable Accutrol Weir (weir fully closed at 6" depth)
No. of Drains 17
Flow/drain: 1.89 L/s

Time (min)	Intensity 1:100 Yr (mm/hr)	Qp 1:100 Yr (L/s)	Qp Rooftop ICD (L/s)	Qp stored (L/s)	Max Volume Requirement (m^3)	Qp CCE (L/s)	Qp stored (L/s)	Volume CCE Requirement (m^3)	Qp CCE - Qp100yr (L/s)
30	91.87	179.79	32.13	147.66	265.79	224.74	192.61	347	44.95
35	82.58	161.61	32.13	129.48	271.91	202.01	169.88	357	40.40
40	75.15	147.06	32.13	114.93	275.84	183.83	151.70	364	36.77
45	69.05	135.14	32.13	103.01	278.12	168.92	136.79	369	33.78
50	63.95	125.16	32.13	93.03	279.10	156.45	124.32	373	31.29
55	59.62	116.69	32.13	84.56	279.04	145.86	113.73	375	29.17
60	55.89	109.39	32.13	77.26	278.13	136.74	104.61	377	27.35
65	52.65	103.03	32.13	70.90	276.52	128.79	96.66	377	25.76
70	49.79	97.44	32.13	65.31	274.31	121.80	89.67	377	24.36
75	47.26	92.48	32.13	60.35	271.58	115.60	83.47	376	23.12
80	44.99	88.05	32.13	55.92	268.42	110.06	77.93	374	22.01
85	42.95	84.06	32.13	51.93	264.86	105.08	72.95	372	21.02
90	41.11	80.46	32.13	48.33	260.96	100.57	68.44	370	20.11

The following assumptions were made in regard to rooftop configuration:

9th Floor	
Rooftop flow =	32 L/s
Area of Roof	7 822 m2
60% of roof for storage =	4 693 m2
Vol. @ 6" ponding =	704 m3

ROOF DRAIN TYPE:	Watts RD-100A					
Head (mm)	25	50	75	100	125	150
Number Weir Slots	0	0	0	0	0	0
Flow per Weir	5	10	15	20	25	30
Flow Rate (uspgm)	5	10	15	20	25	30
Flow Rate (L/sec)	0.32	0.63	0.95	1.26	1.58	1.89
Eqn for Flow, Q at depth, d			Q = 0.0126 * d			

Per the above SWM calculations the provided rooftop storage volume is 277 m3 and 372 m3 for the 1:100 year and climate change event (CCE)

Based on the assumption that 60% of rooftop will be used for storage, the proposed rooftop has sufficient storage capacity (704 m3) to detain the 1:100 year and CCE events.

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

STORMWATER MANAGEMENT CALCULATIONS

WATER STORAGE DESIGN

31489-004-OCTranspo-1500 St Laurent E-Bus Bldg SPA

WEST BASIN (4A-2)

On-Site Storage Requirement: Post-Development Flow Condition

(Total Drainage Area A= 0.540)

	Area	
	5 year	**100 year**
Area (impervious) =	0.540	0.540
C-Factor =	0.900	0.900
Area (gravel) =	0.000	0.000
C-Factor =	0.700	0.875
Area (Pervious) =	0.000	0.000
C-Factor =	0.450	0.560
(AxC)pav + (AxC)land =	0.486	0.486
C-Factor (overall) =	0.900	0.900

Time (min)	Intensity 1:5 Yr (mm/hr)	Qp 1:5 Yr (L/s)	Qp ICD (L/s)	Qp stored (L/s)	Max Volume Requirement (m^3)	Intensity 1:100 Yr (mm/hr)	Qp 1:100 Yr (L/s)	Qp ICD (L/s)	Qp stored (L/s)	Max Volume Requirement (m^3)
10	104.19	140.77	27	114.13	68.48	178.56	241.25	27	214.61	128.76
20	70.25	94.91	27	68.27	81.93	119.95	162.06	27	135.42	162.51
30	53.93	72.86	27	46.22	83.20	91.87	124.12	27	97.48	175.47
40	44.18	59.70	27	33.06	79.34	75.15	101.53	27	74.89	179.73
50	37.65	50.87	27	24.23	72.70	63.95	86.41	27	59.77	179.30
60	32.94	44.51	27	17.87	64.33	55.89	75.52	27	48.88	175.96
70	29.37	39.68	27	13.04	54.78	49.79	67.27	27	40.63	170.65
75	27.89	37.68	27	11.04	49.68	47.26	63.85	27	37.21	167.43

Minimum storage volume requirement for the 1:5 year retrun period = 83 m^3
Minimum storage volume requirement for the 1:100 year retrun period = 180 m^{3*}
Storage volume provided by designed onsite underground storage chambe 182 m^3

*** No spill-over volume is expected for the 1:100 year storm.**

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

STORMWATER MANAGEMENT CALCULATIONS

WATER STORAGE DESIGN

31489-004-OCTranspo-1500 St Laurent E-Bus Bldg SPA

EAST BASIN (4A-3)

On-Site Storage Requirement: Post-Development Flow Condition

(Total Drainage Area A= 1.240)

	Area	
	5 year	**100 year**
Area (impervious) =	1.240	1.240
C-Factor =	0.900	0.900
Area (gravel) =	0.000	0.000
C-Factor =	0.700	0.875
Area (Pervious) =	0.000	0.000
C-Factor =	0.450	0.560
(AxC)pav + (AxC)land =	1.116	1.116
C-Factor (overall) =	0.900	0.900

Time (min)	Intensity 1:5 Yr (mm/hr)	Qp 1:5 Yr (L/s)	Qp ICD (L/s)	Qp stored (L/s)	Max Volume Requirement (m^3)	Intensity 1:100 Yr (mm/hr)	Qp 1:100 Yr (L/s)	Qp ICD 3504.64	Qp stored (L/s)	Max Volume Requirement (m^3)
10	104.19	323.26	47	275.90	165.54	178.56	553.98	47	506.62	303.97
20	70.25	217.95	47	170.59	204.71	119.95	372.14	47	324.78	389.74
30	53.93	167.31	47	119.95	215.91	91.87	285.02	47	237.66	427.79
40	44.18	137.08	47	89.72	215.33	75.15	233.14	47	185.78	445.86
50	37.65	116.82	47	69.46	208.37	63.95	198.42	47	151.06	453.17
60	32.94	102.21	47	54.85	197.45	55.89	173.41	47	126.05	453.79
70	29.37	91.13	47	43.77	183.82	49.79	154.47	47	107.11	449.87
80	26.56	82.41	47	35.05	168.23	44.99	139.58	47	92.22	442.67
90	24.29	75.35	47	27.99	151.17	41.11	127.55	47	80.19	433.00
100	22.41	69.52	47	22.16	132.95	37.90	117.59	47	70.23	421.40
110	20.82	64.60	47	17.24	113.79	35.20	109.21	47	61.85	408.24
120	19.47	60.40	47	13.04	93.87	32.89	102.06	47	54.70	393.81
130	18.29	56.76	47	9.40	73.31	30.90	95.86	47	48.50	378.31
140	17.27	53.57	47	6.21	52.20	29.15	90.44	47	43.08	361.90
145	16.80	52.13	47	4.77	41.47	28.36	87.98	47	40.62	353.40

Minimum storage volume requirement for the 1:5 year retrun period= 216 m^3
Minimum storage volume requirement for the 1:100 year retrun period= 454 m^{3*}
Storage volume provided by designed onsite underground storage chambe 486 m^3

*** No spill-over volume is expected for the 1:100 year storm.**

Appendix G

StormTech Underground
Storage Chamber Design
(West & East)

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

1500 SAINT-LAURENT - WEST AREA 1

OTTAWA, CANADA

SC-740 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 50 mm (2").
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

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

1. STORMTECH SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 20-50 mm (3/4-2").
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

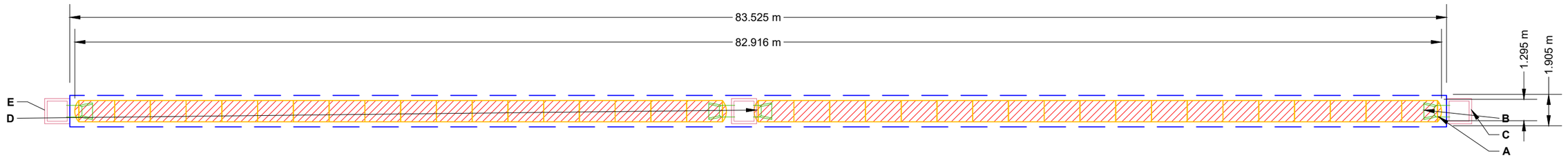
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

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

PROPOSED LAYOUT		PROPOSED ELEVATIONS	
37	STORMTECH SC-740 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	70.907
4	STORMTECH SC-740 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	69.078
152	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	68.926
152	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	68.926
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	68.926
96.8	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	68.621
		TOP OF SC-740 CHAMBER:	68.468
		600 mm ISOLATOR ROW PLUS INVERT:	67.709
159.1	SYSTEM AREA (m^2)	600 mm ISOLATOR ROW PLUS INVERT:	67.709
170.9	SYSTEM PERIMETER (m)	BOTTOM OF SC-740 CHAMBER:	67.706
		BOTTOM OF STONE:	67.554

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED EZ END CAP	A	600 mm BOTTOM PREFABRICATED EZ END CAP, PART#: SC740ECEZ / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	3 mm	
FLAMP	B	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: SC74024RAMP (TYP 4 PLACES)		
CONCRETE STRUCTURE	C	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN
CONCRETE STRUCTURE	D	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN
CONCRETE STRUCTURE	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN



ISOLATOR ROW PLUS
(SEE DETAIL/TYP 2 PLACES)

NO WOVEN GEOTEXTILE

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

1500 SAINT-LAURENT - WEST
AREA 1
OTTAWA, CANADA

DATE: | DRAWN: HN | CHECKED: N/A
PROJECT #:

DESCRIPTION	CHK	DRW	DATE

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

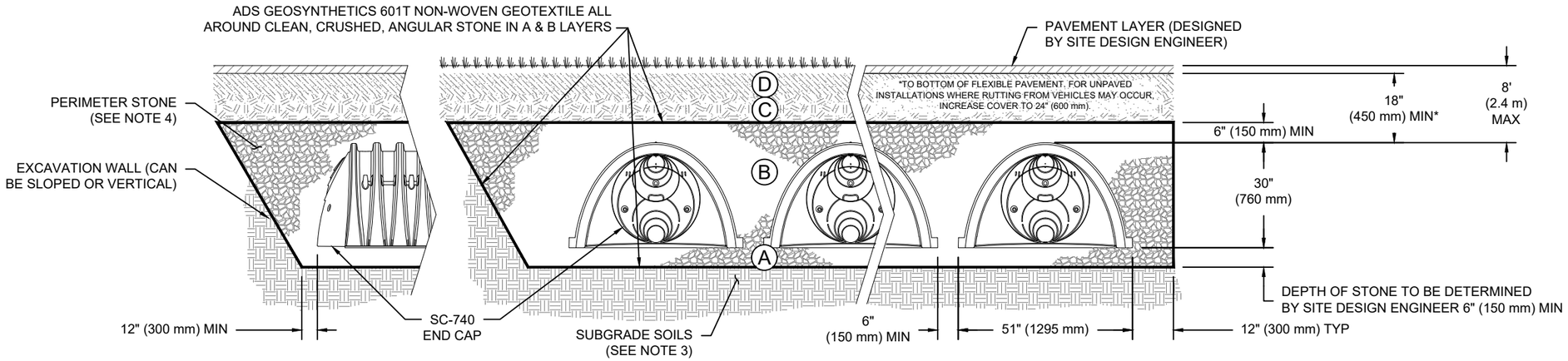
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 250

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

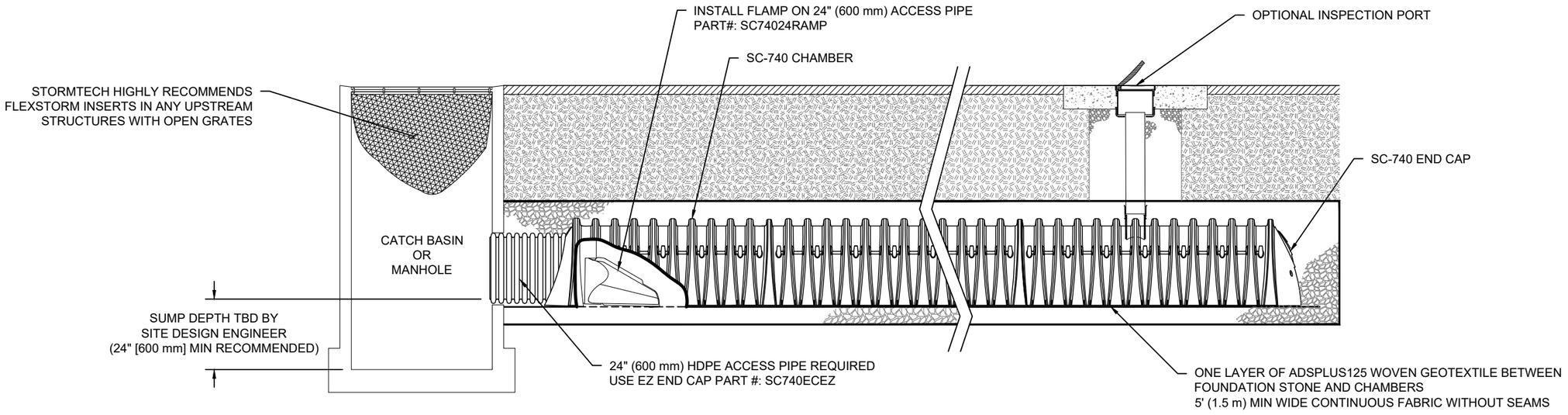
1500 SAINT-LAURENT - WEST
AREA 1
OTTAWA, CANADA

DATE: | DRAWN: HN | CHECKED: N/A
PROJECT #:

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473



SC-740 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

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

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

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

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

NOTES

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

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

1500 SAINT-LAURENT - WEST
AREA 1
OTTAWA, CANADA

DATE: | DRAWN: HN | PROJECT #: | CHECKED: N/A

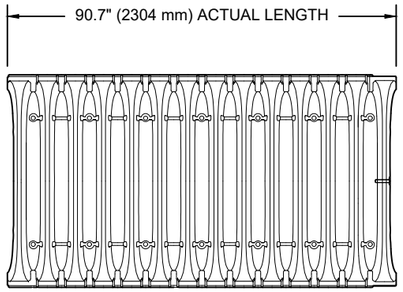
DATE	DRW	CHK	DESCRIPTION

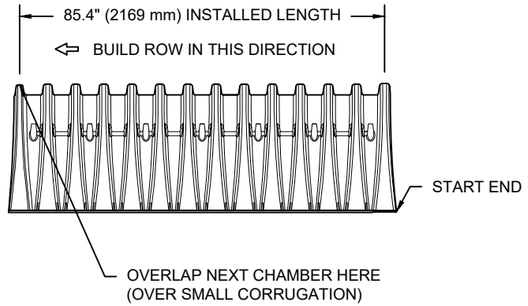
StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

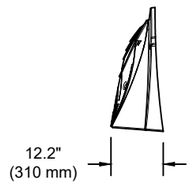
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

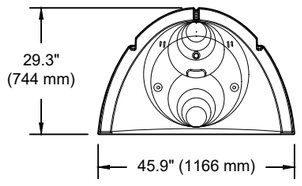
SC-740 TECHNICAL SPECIFICATION

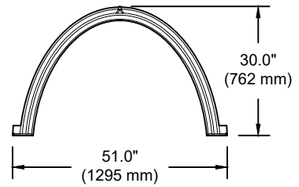
NTS







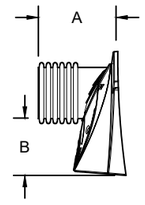


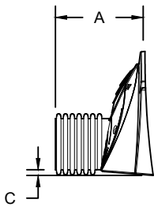


NOMINAL CHAMBER SPECIFICATIONS

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

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





PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH "BR"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740ECEZ*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740ECEZ ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740ECEZ THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

1500 SAINT-LAURENT - WEST
AREA 1
OTTAWA, CANADA

DATE: | DRAWN: HN | CHECKED: N/A | PROJECT #:

DATE	DRW	CHK	DESCRIPTION

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Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

EX. 9.5m-600mmØ CONC. CL. 65-D STORM @ 0.20%

EX. 68m - 600mmØ ST @ 0.15%

INV.S= 67.66

EX. 10.5m-3
STM @ 0.8

EX. 375mmØ STM

MH-CB4
T/G=69.65
INV. S&E 67.89

CB5
T/G=69.75
INV. W&E 67.84

CB6 W/ ICD
T/G=69.70
INV. W&E 67.71

44.5m - 450mmØ ST @ 0.12%

30.3m - 375mmØ ST @ 0.15%

CB3
T/G 69.80
INV. 68.01

16.2 m - 450 mm DIA. STM @ 0.10%

1+030

PROPOSED
BUILDING
70.10

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
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1500 SAINT-LAURENT - WEST AREA 2

OTTAWA, CANADA

SC-740 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 50 mm (2").
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

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

1. STORMTECH SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 20-50 mm (3/4-2").
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

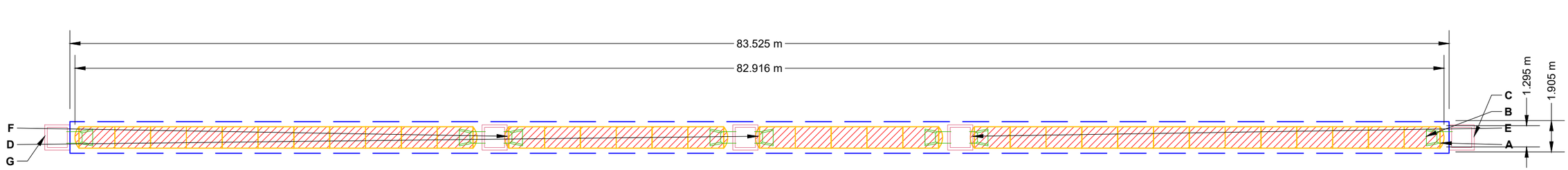
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

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

PROPOSED LAYOUT		PROPOSED ELEVATIONS	
35	STORMTECH SC-740 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	70.726
8	STORMTECH SC-740 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	68.897
152	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	68.745
152	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	68.745
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	68.745
95.2	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	68.440
		TOP OF SC-740 CHAMBER:	68.287
		600 mm ISOLATOR ROW PLUS INVERT:	67.528
		600 mm ISOLATOR ROW PLUS INVERT:	67.528
159.1	SYSTEM AREA (m^2)	600 mm ISOLATOR ROW PLUS INVERT:	67.528
170.9	SYSTEM PERIMETER (m)	600 mm ISOLATOR ROW PLUS INVERT:	67.528
		600 mm ISOLATOR ROW PLUS INVERT:	67.528
		BOTTOM OF SC-740 CHAMBER:	67.525
		BOTTOM OF STONE:	67.373

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED EZ END CAP	A	600 mm BOTTOM PREFABRICATED EZ END CAP, PART#: SC740ECEZ / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	3 mm	
FLAMP	B	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: SC74024RAMP (TYP 8 PLACES)		
CONCRETE STRUCTURE	C	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN
CONCRETE STRUCTURE	D	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN
CONCRETE STRUCTURE	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN
CONCRETE STRUCTURE	F	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		79 L/s IN



ISOLATOR ROW PLUS
(SEE DETAIL/TYP 4 PLACES)

NO WOVEN GEOTEXTILE

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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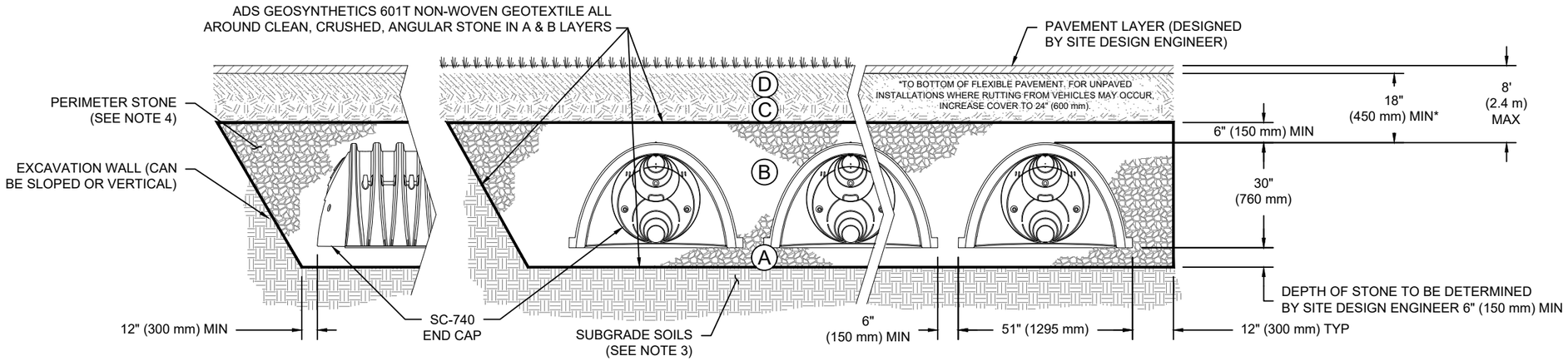
HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 250

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1500 SAINT-LAURENT - WEST
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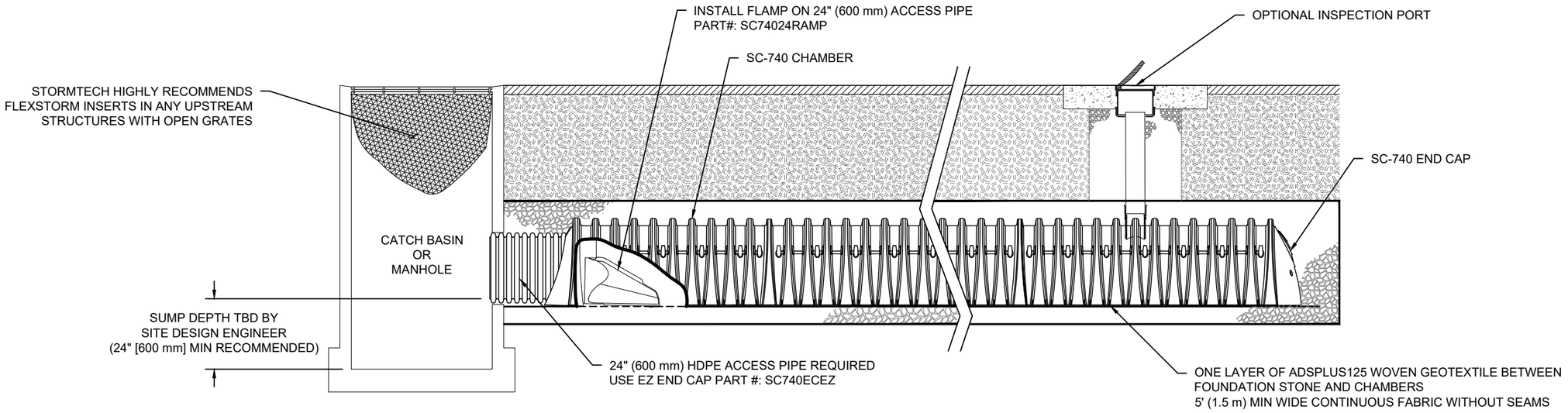

SC-740 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

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

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

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

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

NOTES

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

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

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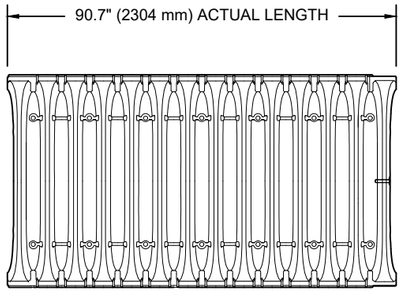
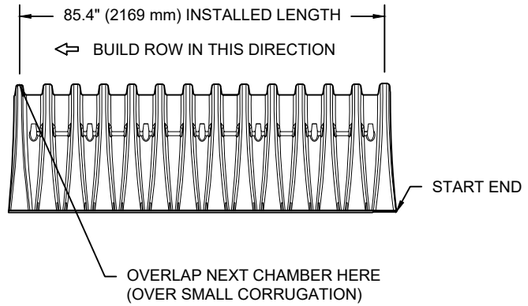
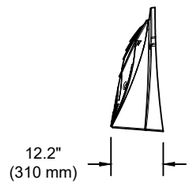
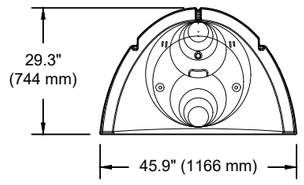
SC-740 TECHNICAL SPECIFICATION

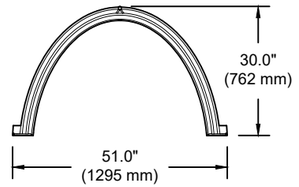
NTS







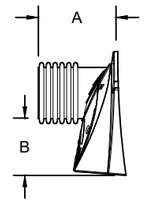


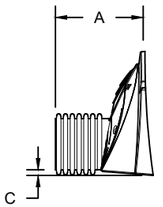


NOMINAL CHAMBER SPECIFICATIONS

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

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





PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH "BR"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740ECEZ*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740ECEZ ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740ECEZ THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

1500 SAINT-LAURENT - WEST
AREA 2
OTTAWA, CANADA

DATE: | DRAWN: HN | CHECKED: N/A | PROJECT #:

DATE	DRW	CHK	DESCRIPTION

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Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
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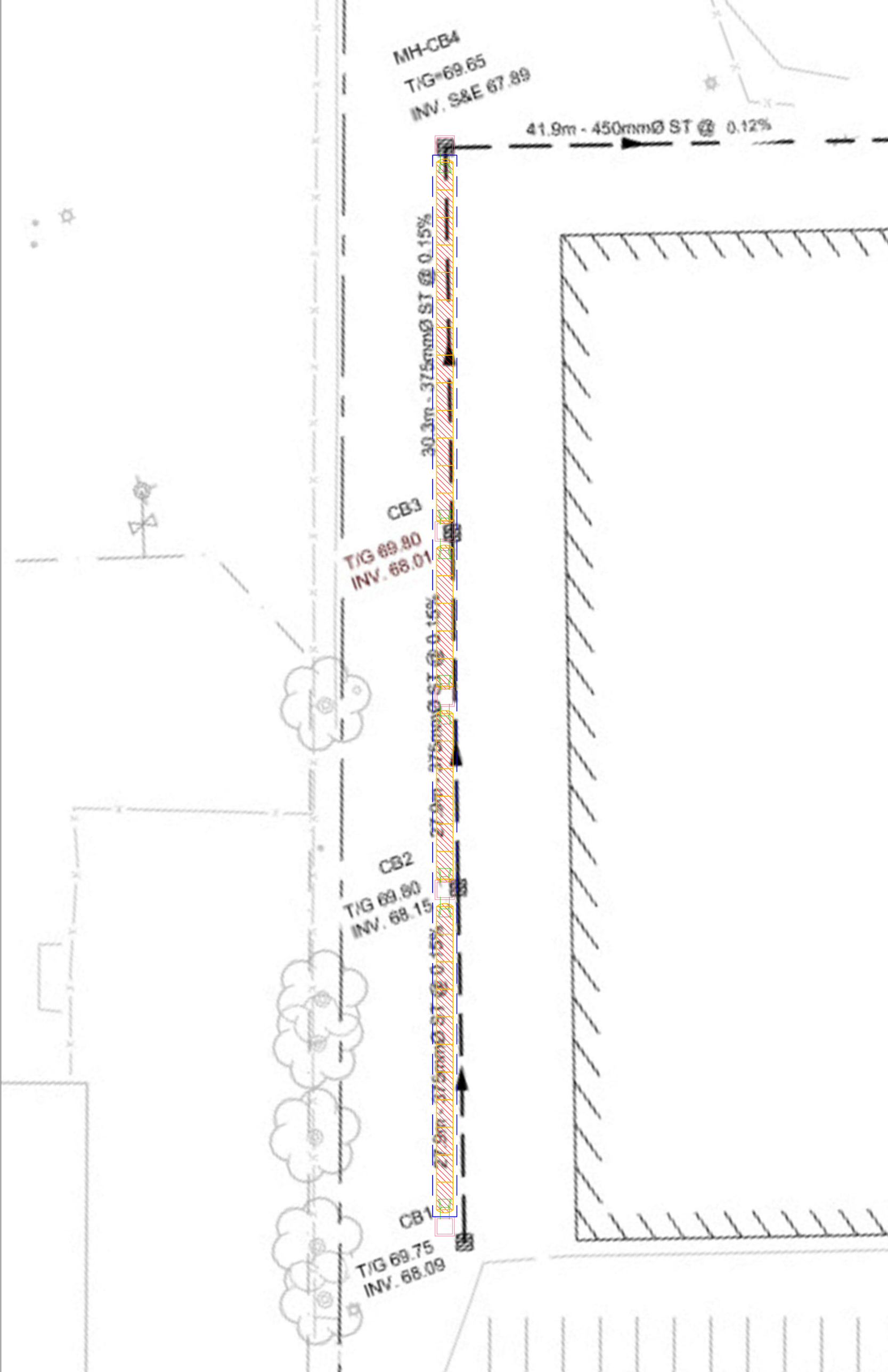

MH-CB4
T/G=69.65
INV. S&E 67.89
41.9m - 450mmØ ST @ 0.12%
30.3m - 375mmØ ST @ 0.15%
CB3
T/G 69.80
INV. 68.01
CB2
T/G 69.80
INV. 68.15
CB1
T/G 69.75
INV. 68.09

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

1500 SAINT-LAURENT - EAST AREA

OTTAWA, CANADA

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 75 mm (3").
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

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

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm)..
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

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

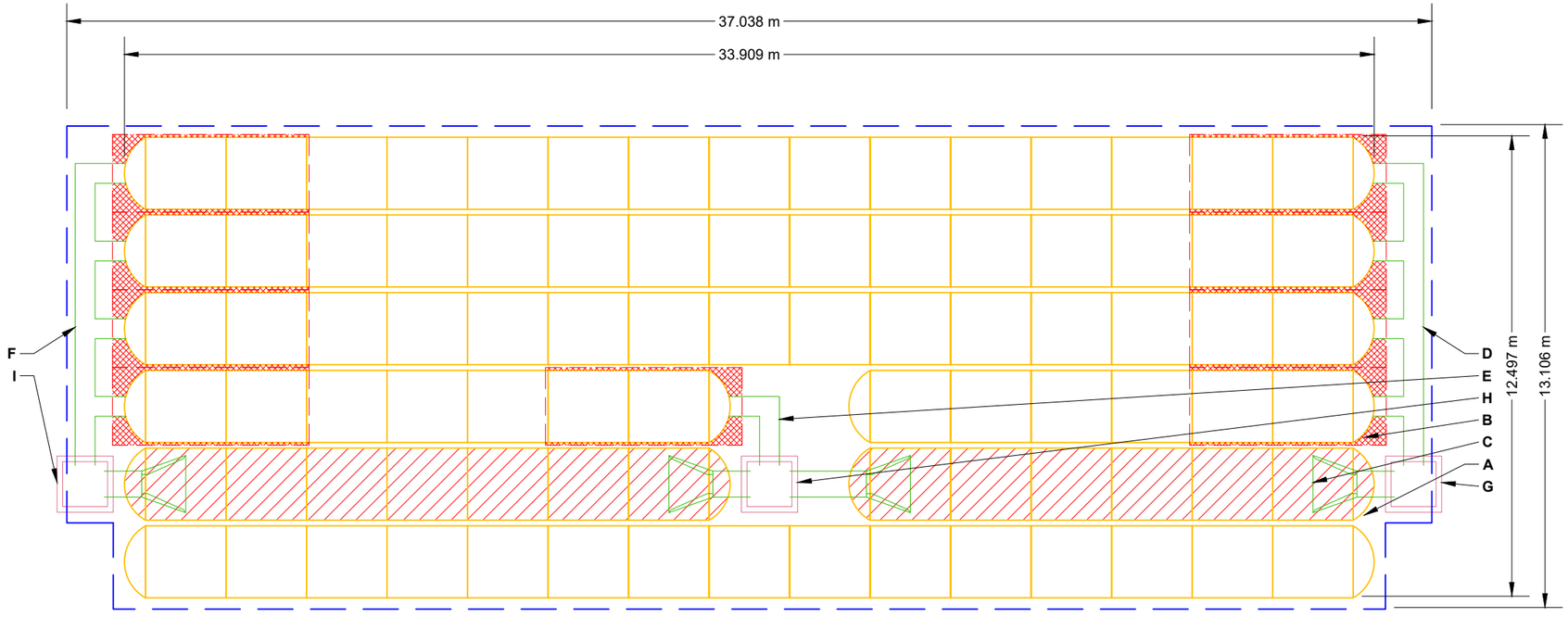
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

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

PROPOSED LAYOUT		PROPOSED ELEVATIONS	
86	STORMTECH MC-3500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	71.364
16	STORMTECH MC-3500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	69.535
305	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	69.383
229	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	69.383
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	69.383
486.3	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	69.230
		TOP OF MC-3500 CHAMBER:	68.926
		450 mm x 450 mm TOP MANIFOLD INVERT:	68.291
479.5	SYSTEM AREA (m^2)	450 mm x 450 mm TOP MANIFOLD INVERT:	68.291
100.3	SYSTEM PERIMETER (m)	600 mm ISOLATOR ROW PLUS INVERT:	67.835
		600 mm ISOLATOR ROW PLUS INVERT:	67.835
		600 mm ISOLATOR ROW PLUS INVERT:	67.835
		BOTTOM OF MC-3500 CHAMBER:	67.783
		BOTTOM OF STONE:	67.554

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	52 mm	
PREFABRICATED END CAP	B	450 mm TOP CORED END CAP, PART#: MC3500IEPP18TC / TYP OF ALL 450 mm TOP CONNECTIONS	509 mm	
FLAMP	C	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MC350024RAMP (TYP 4 PLACES)		
MANIFOLD	D	450 mm x 450 mm TOP MANIFOLD, ADS N-12	509 mm	
MANIFOLD	E	450 mm x 450 mm TOP MANIFOLD, ADS N-12	509 mm	
MANIFOLD	F	450 mm x 450 mm TOP MANIFOLD, ADS N-12	509 mm	
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		460 L/s IN
CONCRETE STRUCTURE	H	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		156 L/s IN
CONCRETE STRUCTURE	I	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		460 L/s IN



ISOLATOR ROW PLUS
(SEE DETAIL/TYP 2 PLACES)

PLACE MINIMUM 5.334 m OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

1500 SAINT-LAURENT - EAST AREA
OTTAWA, CANADA

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DATE: | PROJECT #:

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HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 150

StormTech® Chamber System
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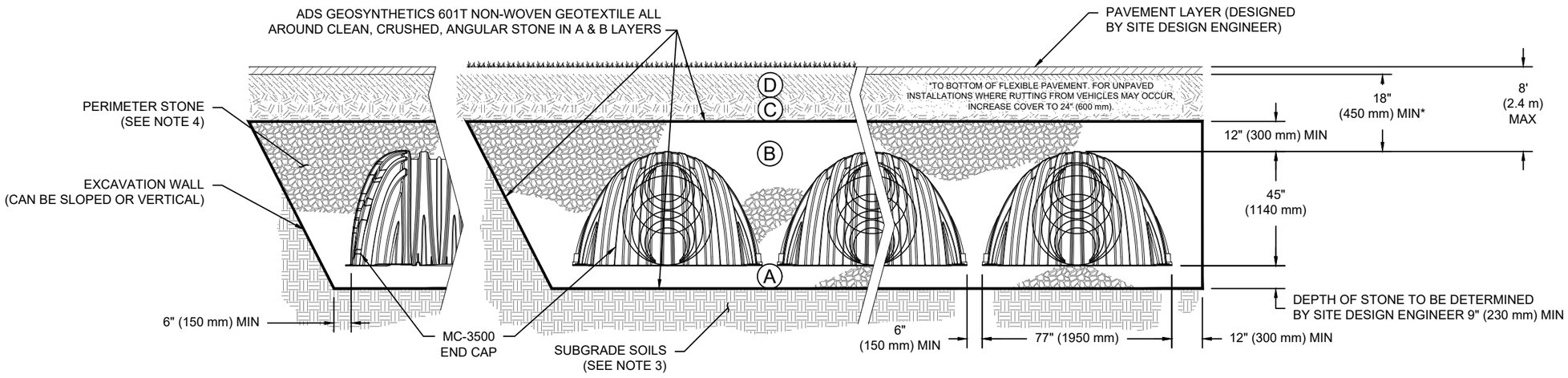
ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

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

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



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1500 SAINT-LAURENT - EAST AREA
OTTAWA, CANADA
DATE: DRAWN: HN CHECKED: N/A
PROJECT #:

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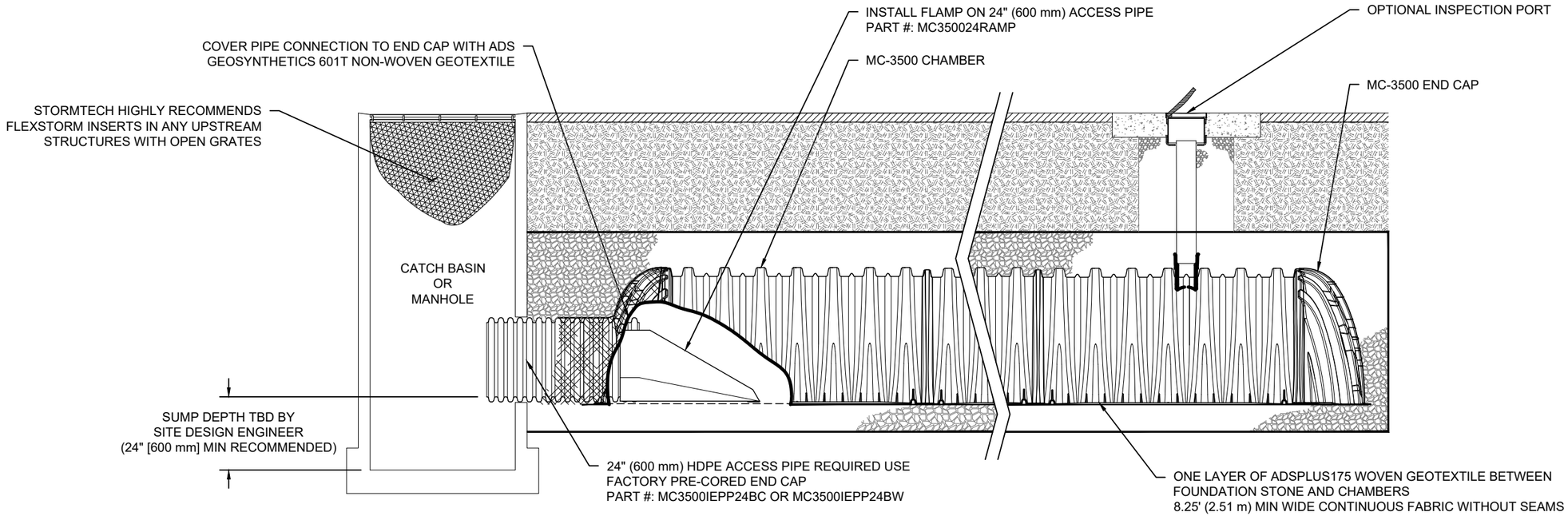

MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

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

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

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

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

NOTES

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

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

1500 SAINT-LAURENT - EAST AREA
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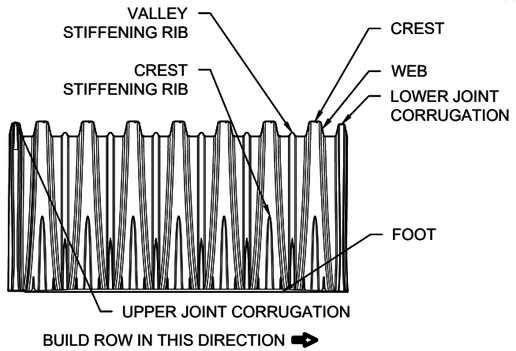
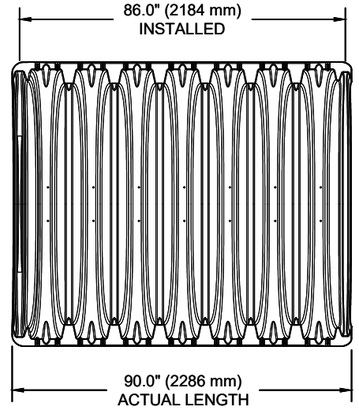
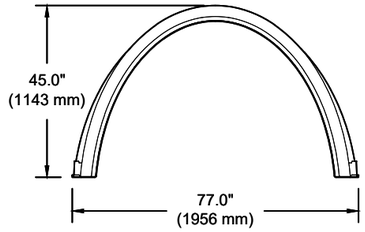
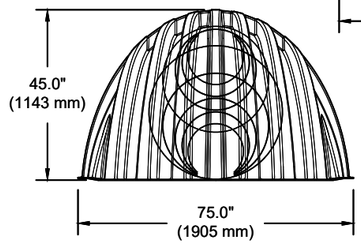
MC-3500 TECHNICAL SPECIFICATION

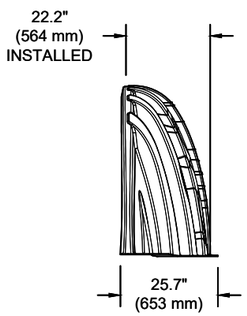
NTS











NOMINAL CHAMBER SPECIFICATIONS

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

NOMINAL END CAP SPECIFICATIONS

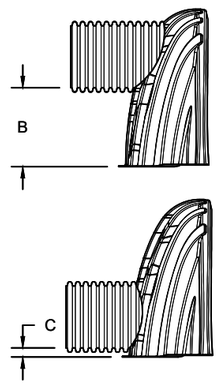
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

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

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

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

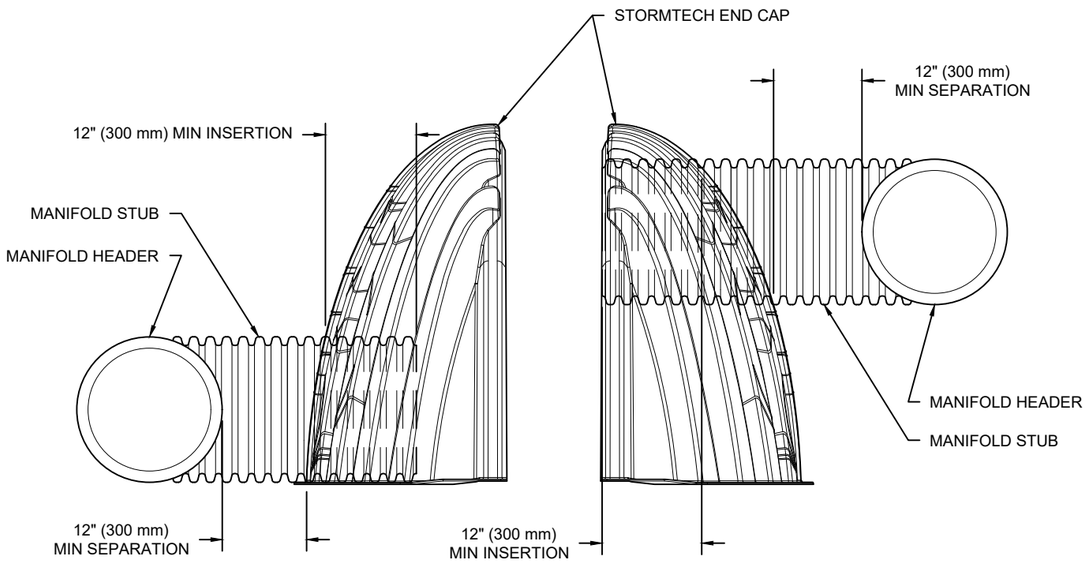
NOTE: ALL DIMENSIONS ARE NOMINAL



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

MC-SERIES END CAP INSERTION DETAIL

NTS



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

1500 SAINT-LAURENT - EAST AREA
OTTAWA, CANADA

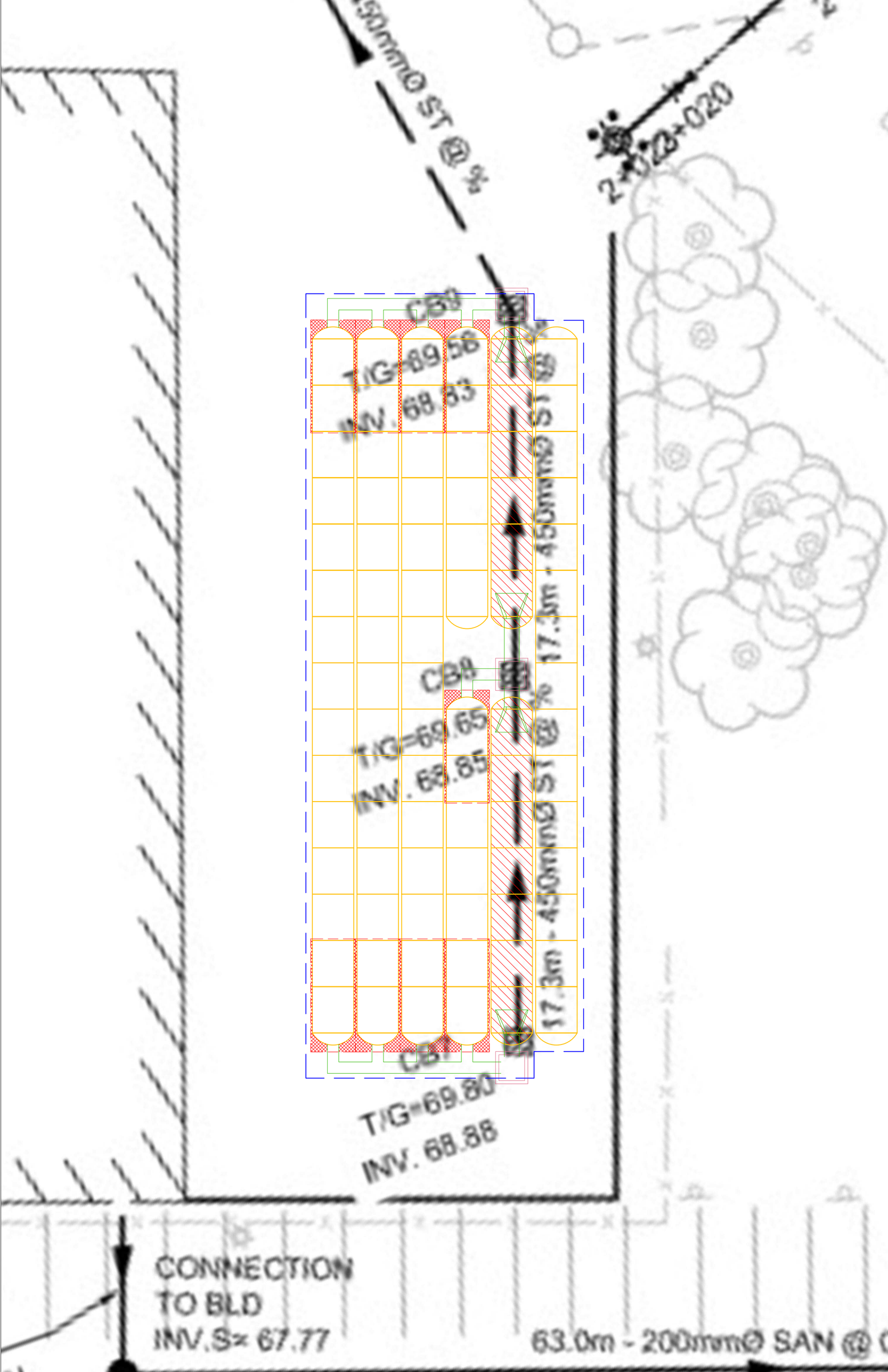
DATE: | DRAWN: HN | PROJECT #: | CHECKED: N/A

DESCRIPTION	CHK	DRW	DATE

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

ADS.


CB8
T/G=69.56
INV. 68.83
17.3m - 450mmØ ST @ 1%
CB8
T/G=69.65
INV. 68.85
17.3m - 450mmØ ST @ 1%
CB7
T/G=69.80
INV. 68.88
CONNECTION
TO BLD
INV.S= 67.77
63.0m - 200mmØ SAN @

Appendix H

Manufacture's Roof Control Specifications

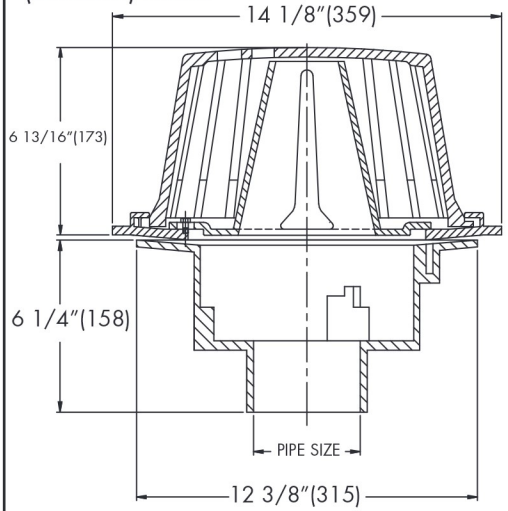
RD-100-A

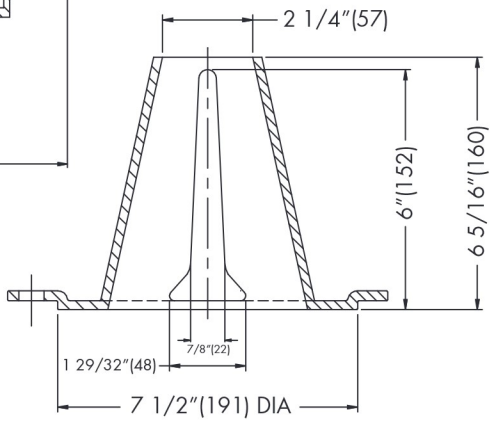
Tag: _____

Large Capacity Roof Drain

Components:

SPECIFICATION: Watts Drainage Products RD-100 epoxy coated cast iron roof drain with deep sump, wide serrated flashing flange, flashing clamp device with integral gravel stop, accutrol weir and self-locking polyethylene (standard) dome.





Free Area Sq. In.
137

Deck opening 10" (254) with sump receiver 13-1/4" (337)

** Side Outlet (-SO) option only available in 2"(51), 3"(76), 4"(102) pipe sizes. Underdeck Clamp (-BED and -D options) are not available when -SO is selected.

Order Code: RD-10☐-A☐-☐-☐

Ex. RD-102P-K

Pipe Sizing (Select One)		
Suffix	Description	
2	2"(51) Pipe Size	☐
3	3"(76) Pipe Size	☐
4	4"(102) Pipe Size	☐
5	5"(127) Pipe Size	☐
6	6"(152) Pipe Size	☐
8	8"(203) Pipe Size	☐

Outlet Type (Select One)		
Suffix	Description	
NH	No Hub (MJ)	☐
P	Push On	☐
T	Threaded Outlet	☐
X	Inside Caulk	☐

Options (Select One or More)		
Suffix	Description	
-B	Sump Receiver Flange	☐
-BED	Sump Receiver, Adj Ext., Deck Clamp	☐
-C	Secondary Membrane Clamp	☐
-D	Underdeck Clamp	☐
-E	Adjustable Extension	☐
-GSS	Stainless Steel Ballast Guard	☐
-H	Adj. to 6" IRMA Ballast Guard	☐
-K	Ductile Iron Dome	☐
-K80	Aluminum Dome	☐
-L	Vandal Proof Dome	☐
-R	2" High External Water Dam	☐
-SO	Side Outlet**	☐
-V	Fixed Extension (1-1/2",2",3",4"	☐
-W	Adj. Water Level Regulator	☐
-W-1	Waterproofing Flange	☐
-Z	Extended Integral Wide Flange	☐
-5	Sediment Bucket	☐
-6	Vandal Proof Top	☐
-12	Galvanized Dome	☐
-13	All Galvanized	☐
-83	Mesh Covered Dome	☐
-113M	Special Epoxy from 3M Range	☐

Optional Body Material (NH Only)		
Suffix	Description	
-60	PVC Body w/Socket Outlet	☐
-61	ABS Body w/Socket Outlet	☐

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

USA: Tel: (800) 338-2581 • Fax: (828) 248-3929 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

A Watts Water Technologies Company

Roof Drains

Product Recommendations

APPLICATION	PRODUCT
Balcony or Canopy	RD-230, RD-240
Deck Receptor	RD-400, RD-410
Downspout Nozzle/Cover	RD-940, RD-950
Downspout Boot	RD-970, RD-980
Primary Roof Area	RD-300, RD-300-F
Primary Roof Overflow	RD-300-R, RD-300-W
Promenade or Patio	RD-100-CP, RD-200-CP, RD-300-CP15
Scupper or Parapet	RD-270, RD-290
Secondary Roof Area	RD-100, RD-100-F, RD-200, RD-200-F
Secondary Roof Overflow	RD-100-R, RD-100-W, RD-200-R, RD-200-W

Roof Drain Selection Factors

SIZING

1. Calculate roof area (sq. ft.) to be drained.
2. Determine average hourly rainfall rate at roof location (Chart A).
3. Approximate leader (drain pipe) size. In general, increasing leader size will decrease the number of drains required.
4. Reference leader size with hourly rainfall rate, to determine roof area drained by each leader (Chart B).
5. Divide roof area (1.) by area per leader (4.) to determine the number of drains required.

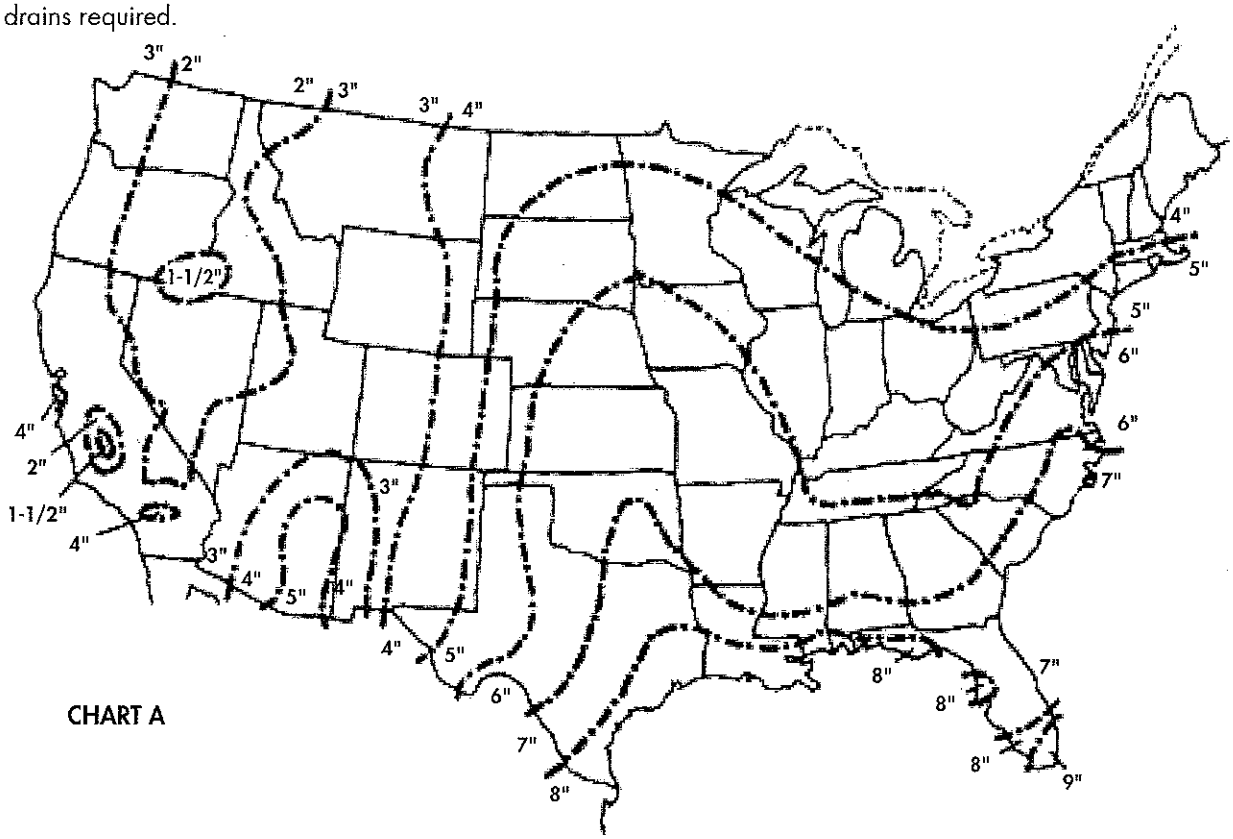


CHART A

Roof Drain Selection Factors (continued)

CHART B

Rainfall Rate (inches/hour)	Vertical Leader Sizing in Inches					
	2	3	4	5	6	8
	Roof Area in Square Footage					
1	2,880	8,800	18,400	34,600	54,000	116,000
2	1,440	4,400	9,200	17,300	27,000	58,000
3	960	2,930	6,130	11,530	17,995	38,660
4	720	2,200	4,600	8,650	13,500	29,000
5	575	1,760	3,680	6,920	10,800	23,200
6	480	1,470	3,070	5,765	9,000	19,315
7	410	1,260	2,630	4,945	7,715	16,570
8	360	1,100	2,300	4,325	6,750	14,500

Maximum tributary areas which can be drained by Roof Drains, Vertical Rainwater Leaders, or Storm-Water Conductors for Various Rainfall Rates. Source: ASPE Practical Plumbing Engineering (c) 1998

PLACEMENT

For most efficient drainage, roof drains, to the extent possible, should be equally spaced. A roof drain must also be located in any potential water collection area.

MATERIAL & CHARACTERISTICS

Bodies – Industrial grade cast iron, finished with Watts standard gray acid resistant epoxy coating. Many Watts roof drains can be specified with PVC (-60) or ABS (-61) bodies, for direct solvent weld connection.

Combination Flashing Clamp/Gravel Guard – Standard acid resistant coated cast iron. Watts securing stud design helps spot flashing clamp bolt holes, which might otherwise be covered or filled during membrane application.

Poly Dome – UV stabilized high density polyethylene, high resistance to breakage and weathering.proofing membranes or liners, generally in above grade applications.

PIPE CONNECTION

No Hub (Standard) – Butt connection using no hub or neoprene coupling, suitable for cast iron, plastic, and most other piping applications.

Push-On (P) – Gasket connection ASTM C-564, with pipe stop. Suitable for no hub or service weight cast iron, Sch. 40 plastic, and steel pipe. Recommended for below grade use only.

Threaded (T) – Female IPS thread in drain outlet.

Inside Caulk (X) – Caulk ring on drain outlet, pipe is inserted and joint sealed with lead & oakum.

PVC Socket (-60) – Sch. 40 PVC solvent weld female socket.

ABS Socket (-61) – ABS solvent weld female socket.

Side Outlet (-SO) – No Hub (see above) side outlet.

WATTS®

Roof Drains

Accutrol Area Selection Table

To select the discharge flow rate, draindown time, maximum head (roof load) you require, refer to any one of the four area ratings that best suit your requirements.

LOCALITY	Roof rise (in.)	ROOF AREA TO BE DRAINED BY (1) WEIR OPENING											
		2500 sq.ft.			5000 sq.ft.			7500 sq.ft.			10,000 sq.ft.		
		Max. flow G.P.M.	Draindown time (hrs.)	Max. head (in.)	Max. flow G.P.M.	Draindown time (hrs.)	Max. head (in.)	Max. flow G.P.M.	Draindown time (hrs.)	Max. head (in.)	Max. flow G.P.M.	Draindown time (hrs.)	Max. head (in.)
	0	12.75	8.5	2.55	15.00	19.00	3.00	16.75	30.00	3.35	17.75	41.00	3.55
Halifax, N.S.	2	16.00	7.5	3.2	18.25	17.00	3.65	19.25	26.00	3.85	20.00	34.00	4.00
Hamilton, Ont.	3	17.50	6.0	3.5	20.00	13.50	4.00	21.25	21.00	4.25	22.00	28.00	4.40
London, Ont.	4	19.75	5.0	3.95	22.50	11.50	4.50	23.50	19.00	4.70	25.00	26.00	5.00
Toronto, Ont.	5	21.75	4.2	4.35	25.00	10.00	5.00	26.50	16.00	5.30	28.00	23.00	5.60
Windsor, Ont.	6	23.50	4.0	4.7	26.50	9.50	5.30	28.50	15.00	5.70	29.75	21.00	5.95
Calgary, Alta.	0	10.50	7.5	2.10	13.50	18.00	2.70	15.25	27.00	3.05	17.00	40.00	3.40
Edmonton, Alta.	2	13.50	6.5	2.70	16.50	16.00	3.30	18.25	25.00	3.65	19.50	34.00	3.90
Regina, Sask.	3	14.25	5.0	2.85	17.75	12.00	3.55	20.00	20.00	4.00	21.25	28.00	4.25
Moncton, N.B.	4	16.25	4.0	3.25	19.75	10.00	3.95	21.75	17.00	4.35	23.25	24.00	4.65
St. John's, Nfld.	5	17.50	3.5	3.50	21.00	8.20	4.20	23.25	14.00	4.65	25.00	21.00	5.00
Saskatoon, Sask.	6	18.50	3.0	3.70	22.50	7.80	4.50	25.00	13.00	5.00	26.50	19.00	5.30
Montreal, Que.	0	13.50	9.0	2.70	16.00	20.00	3.20	17.50	32.00	3.50	19.00	42.00	3.80
Quebec, Que.	2	17.00	8.0	3.40	19.25	17.00	3.85	20.50	27.00	4.10	21.50	38.00	4.30
Kingston, Ont.	3	18.00	6.0	3.60	20.50	14.00	4.10	21.75	22.00	4.35	22.50	29.00	4.50
Saint John, N.B.	4	20.25	5.0	4.05	22.75	12.00	4.55	24.25	19.00	4.85	25.50	27.00	5.10
	5	22.50	4.5	4.50	22.50	10.00	5.10	27.25	17.00	5.45	28.00	23.00	5.60
	6	24.00	4.0	4.80	27.00	9.50	5.40	28.75	15.00	5.75	30.00	21.00	6.00
Vancouver, B.C.	0	7.25	5.5	1.45	8.50	13.00	1.70	9.50	22.00	1.90	10.00	29.00	2.00
	2	8.25	4.0	1.65	10.00	10.00	2.00	11.00	16.00	2.20	11.50	23.00	2.30
Victoria, B.C.	3	8.75	3.0	1.75	10.50	7.50	2.10	11.75	12.00	2.35	12.50	17.00	2.50
	4	9.50	2.5	1.90	11.50	6.00	2.30	13.00	10.00	2.60	14.00	14.00	2.80
	5	10.75	2.1	2.15	13.25	5.30	2.65	14.75	9.00	2.95	15.75	13.00	3.15
	6	12.25	2.0	2.45	15.00	5.00	3.00	16.50	8.50	3.30	17.50	12.00	3.50
Ottawa, Ont.	0	10.50	7.5	2.10	13.00	17.00	2.60	14.25	28.00	2.85	15.00	39.00	3.00
Winnipeg, Man.	2	13.25	6.5	2.65	15.50	15.00	3.10	17.25	24.00	3.45	18.25	32.00	3.65
Thunder Bay, Ont.	3	15.00	5.0	3.00	17.50	12.00	3.50	18.75	19.00	3.75	20.00	26.00	4.00
	4	16.25	4.0	3.25	18.75	10.00	3.75	20.25	16.00	4.05	21.50	22.00	4.30
	5	18.25	3.8	3.65	21.25	8.50	4.25	23.00	14.00	4.60	24.25	20.00	4.85
	6	19.50	3.3	3.90	22.50	8.0	4.50	24.25	12.50	4.85	25.50	18.00	5.10
	0	12.00	8.0	2.40	14.00	19.00	2.80	15.00	29.00	3.00	16.25	40.00	3.25
Guelph, Ont.	2	15.00	7.0	3.00	17.00	16.00	3.40	18.25	25.00	3.65	19.00	33.00	3.80
St. Thomas, Ont.	3	16.75	5.8	3.35	19.00	13.00	3.80	20.00	20.00	4.00	21.00	27.00	4.20
North Bay, Ont.	4	18.75	4.8	3.75	21.25	11.00	4.25	22.50	17.00	4.50	23.50	24.00	4.70
	5	20.75	4.1	4.15	23.50	9.50	4.70	25.00	15.50	5.00	26.00	21.00	5.20
	6	22.75	3.8	4.55	26.00	9.00	5.20	27.50	14.00	5.50	29.00	20.00	5.80

Accutrol Area Selection Table (continued)

LOCALITY	Area Factor	Roof Rise (in.)	ROOF AREA TO BE DRAINED BY ONE WEIR OPENING											
			2500 sq. ft.			5000 sq. ft.			7500 sq. ft.			10,000 sq. ft.		
			Max. flow G.P.M.	Draindown time (hrs.)	Max head (in.)	Max. flow G.R.M.	Draindown time (hrs.)	Max. head (in.)	Max. flow G.R.M.	Draindown time (hrs.)	Max. head (in.)	Max. flow G.R.M.	Draindown time (hrs.)	Max. head (in.)
		0	10.50	7.50	2.10	13.50	18.00	2.70	15.25	27.00	3.05	17.00	40.00	3.40
Halifax, N.S.	3500	2	13.50	6.50	2.70	16.50	16.00	3.30	18.25	25.00	3.65	19.50	34.00	3.90
Hamilton, Ont.	6700	3	14.25	5.00	2.85	17.75	12.00	3.55	20.00	20.00	4.00	21.25	28.00	4.25
London, Ont.	6700	4	16.25	4.00	3.25	19.75	10.00	3.95	21.75	17.00	4.35	23.25	24.00	4.65
Toronto, Ont.	6700	5	17.50	3.50	3.50	21.00	8.20	4.20	23.25	14.00	4.65	25.00	21.00	5.00
Windsor, Ont.	6700	6	18.50	3.00	3.70	22.50	7.80	4.50	25.00	13.00	5.00	26.50	19.00	5.30
Calgary, Alta.	6700	0	10.50	7.50	2.10	13.50	18.00	2.70	15.25	27.00	3.05	17.00	40.00	3.40
Edmonton, Alta.	8000	2	13.50	6.50	2.70	16.50	16.00	3.30	18.25	25.00	3.65	19.50	34.00	3.90
Regina, Sask.	6700	3	14.25	5.00	2.85	17.75	12.00	3.55	20.00	20.00	4.00	21.25	28.00	4.25
Moncton, N.B.	3500	4	16.25	4.00	3.25	19.75	10.00	3.95	21.75	17.00	4.35	23.25	24.00	4.65
St. John's, Nfld.	5000	5	17.50	3.50	3.50	21.00	8.20	4.20	23.25	14.00	4.65	25.00	21.00	5.00
Saskatoon, Sask.	6700	6	18.50	3.00	3.70	22.50	7.80	4.50	25.00	13.00	5.00	26.50	19.00	5.30
Montreal, Que.	6700	0	13.50	9.00	2.70	16.00	20.00	3.20	17.50	32.00	3.50	19.00	42.00	3.80
Quebec, Que.	5000	2	17.00	8.00	3.40	19.25	17.00	3.85	20.50	27.00	4.10	21.50	38.00	4.30
Kingston, Ont.	6700	3	18.00	6.00	3,60	20.50	14.00	4.10	21.75	22.00	4.35	22.50	29.00	4.50
Saint John, N.B.	3500	4	20.25	5,00	4.05	22.75	12.00	4.55	24.25	19.00	4.85	25.50	27.00	5.10
		5	22.50	4.50	4.50	22.50	10.00	5.10	27.25	17.00	5.45	28.00	23.00	5.60
		6	24.00	4.00	4.80	27.00	9.50	5.40	28.75	15.00	5.75	30.00	21.00	6.00
Vancouver, B.C.	6700	0	7.25	5.50	1.45	8.50	13.00	1.70	9.50	22.00	1.90	10.00	29.00	2.00
		2	8.25	4.00	1.65	10.00	10.00	2.00	11.00	16.00	2.20	11.50	23.00	2.30
Victoria, B.C.	6700	3	8.75	3.00	1.75	10.50	7.50	2.10	11.75	12.00	2.35	12.50	17.00	2.50
		4	9.50	2.50	1.90	11.50	6.00	2.30	13.00	10.00	2.60	14.00	14.00	2.80
		5	10.75	2.10	2.15	13.25	5.30	2.65	14.75	9.00	2.95	15.75	13.00	3.15
		6	12.25	2.00	2.45	15.00	5.00	3.00	16.50	8.50	3.30	17.50	12.00	3.50
Ottawa, Ont.	8300	0	10.50	7.50	2.10	13.00	17.00	2.60	14.25	28.00	2.85	15.00	39.00	3.00
Winnipeg, Man.	6700	2	13.25	6.50	2.65	15.50	15.00	3.10	17.25	24.00	3.45	18.25	32.00	3.65
Thunder Bay, Ont.	6700	3	15.00	5.00	3.00	17.50	12.00	3.50	18.75	19.00	3.75	20.00	26.00	4.00
		4	16.25	4.00	3.25	18.75	10.00	3.75	20.25	16.00	4.05	21.50	22.00	4.30
		5	18.25	3.80	3.65	21.25	8.50	4.25	23.00	14.00	4.60	24.25	20.00	4.85
		6	19.50	3.30	3.90	22.50	8.00	4.50	24.25	12.50	4.85	25.50	18.00	5.10
		0	12.00	8.00	2.40	14.00	19.00	2.80	15.00	29.00	3.00	16.25	40.00	3.25
Guelph, Ont.	6700	2	15.00	7.00	3.00	17.00	16.00	3.40	18.25	25.00	3.65	19.00	33.00	3.80
St. Thomas, Ont.	6700	3	16.75	5.80	3.35	19.00	13.00	3.80	20.00	20.00	4.00	21.00	27.00	4.20
North Bay, Ont.	6700	4	18.75	4.80	3.75	21.25	11.00	4.25	22.50	17.00	4.50	23.50	24.00	4.70
		5	20.75	4.10	4.15	23.50	9.50	4.70	25.00	15.50	5.00	26.00	21.00	5.20
		6	22.75	3.80	4.55	26.00	9.00	5.20	27.50	14.00	5.50	29.00	20.00	5.80

Controlled Flow Roof Drainage: Example.

80,000 sq. ft. (200 x 400) flat roof building in Ottawa, Ontario, no appreciable vertical surface additions.

Conventional sizing places 8 drains on the roof (see conventional sizing and placement). The area factor for Ottawa is 8300 (80,000÷8300=9.63) or 10 weirs; size 1-weir roof drains and two 2-weir drains. From the Area selection table, we see that the maximum expected flow will be 15 GPM per weir or 150 GPM for the whole roof Using Chart A on pg viii, a **4" vertical leader** is required (192 GPM capacity) and a **5" storm sewer pipe** (at 1/4" slope. See Chart B on pg. ix). Compare this to the conventional system which requires **8" vertical leaders and a 15" storm drain** for the same size roof. In this way, controlled flow systems are more economical, requiring overall reduced pipe sizes compared to conventional roof drain systems.

WATTS®

Roof Drains

Accutrol Design and Sizing Procedure

DESIGN

A. Where roof area to be drained is adjacent to one or more vertical walls projecting above the roof, then a percentage of the area of the walls must be added to the roof area in determining total roof area to be drained.

These may be computed as follows:

(1) One wall – add 50% of wall area

(2) Two walls – add 35% of total wall area

(3) Two walls opposite of differing heights – add 50% of wall area above top of lower wall

(4) Two walls opposite of same height – no add

(5) Walls on three sides – add 50% of inner wall area, below top of lowest wall plus allowance for area of walls above top of lowest wall as in (2) (4)

(6) Walls on four sides – no allowance for areas below top of lowest wall as in (1) (2) (3) (5).

B. Scupper or overflow drains should be installed at a level equal to or slightly higher than the designed maximum head level or at the maximum roof load level.

C. (1) Drains should be located as close as possible to the downwind end of roof area

(2) Drains should not be located at columns or other high points

(3) Provide parapets or cant strips above roof level to reduce possibility of spillage in high wind conditions.

SIZING PROCEDURE

I Determine total roof area(s) (individual areas when roof is divided by expansion joints, parapet walls, peaks of sloping roofs, control joints etc. – see Design A.

II Calculate number of roof drains required:

(1) Maximum spacing 100 feet

(2) No more than 50 feet from roof edge

(3) 10,000 sq. ft. maximum area per drain

(4) See C (1) & (2) (Local bylaws prevail)

III Calculate number of weirs

(1) See Accutrol area selection table – page 120

(2) Determine roof slope

(3) Choose area table (2500, 5000, 7500, or 10,000 sq. ft.) which best meets your design requirements

(4) Divide total roof area by area rating to determine number of weirs

(5) If number of weirs is greater than drains, locate additional weirs beginning with those drains nearest edge of roof (downwind first)

(6) If number of weirs is fractional, add one weir

(7) If number of weirs is less than number of drains, add one for each drain.

IV Calculate weir maximum flow rating – see table page 120

Accutrol Design and Sizing Procedure (continued)

V Size vertical leaders – see Table "A" – Note: Local bylaw prevails.

VI Size horizontal drains – See Table "B" – Note: Local bylaw prevails.

TABLE A

Flow capacity of vertical leaders G.P.M.

PIPE SIZE	MAXIMUM CAPACITY G.P.M.
2"	30
3"	90
4"	190
†5"	348

TABLE B

FLOW CAPACITY OF HORIZONTAL STORM SEWERS

(U.S. Gallons Per Minute)*

Pipe Size	Slope (Inches Per Foot)			
	1/16"	1/8"	1/4"	1/2"
3"	25	36	51	72
4"	55	78	111	157
†5"	100	142	201	284
6"	163	231	327	462
8"	352	498	705	996
10"	638	902	1275	1804
12"	1035	1467	2076	2934
15"	1880	2666	3774	5332
18"	3050	4210	6000	—
21"	4760	6670	9500	—
24"	6520	9140	13000	—
30"	11800	16500	23500	—
36"	19550	27400	39000	—

Calculations made using Manning's formula for uniform flow in sloping drains using a value of 0.0145 for "N" up to and including 15". Over 15" a value of 0.016 for "N".

* To convert gallons per minute to cubic feet per second multiply gpm by 2.228×10^{3}

† In some areas 5" drainage pipe may not be available.

STANDARD ROOF DRAIN SIZING

There are some general rules to roof drain sizing that make the selection easier. By employing these principles, it is an elementary process in most cases. To eliminate ponding and ensure adequate drainage, it is recommended that two roof drains be installed on roofs with a total area of ten thousand square feet or less. For larger roof areas, the ratio of one drain per every ten thousand square feet should be viewed as the minimum requirement. **Always be sure to check with local codes for minimum number of drains and required spacing.** The placement of roof drains is also determined by such things as the location of internal structural members, the locations of roof-mounted machinery, and the placement of vertical pipe leaders. Other factors must also be factored into the design, most importantly is of course, the rate of rainfall. The type of roof construction, the height of the parapets, and the slope of the roof all have to be accounted for as well. As a rule of thumb, the roof loading should not exceed 40lbs per square foot. The acceptable safety limit for standing water depth on a roof is three inches. Since our metered flow drainage designs are set up for a three inch maximum, this means roof loading will not exceed 15lbs per square foot.

CONVENTIONAL ROOF DRAIN SIZING

The following procedure will allow one to specify the size and number of roof drains required. The following information must be known before hand:

- local building code requirements
- available rate of drainage through existing drainage system
- locations available for drain placement
- expected rate of rainfall

METHOD FOR DETERMINING SIZE AND NUMBER OF ROOF DRAINS

1) Calculate the total area of the roof in square feet.
2) Determine the maximum hourly rainfall that can be expected. This information can be found from several sources, including the local building code or meteorological office.
3) Select a leader size to start, this can be revised later if design or practical concerns make it necessary.
4) From table 1, determine the square footage that can be drained by each vertical leader based on the local maximum expected rainfall.
5) Divide the total roof area by the area that one drain is able to handle this will determine the total number of drains required. Note- always round up to the next whole number (e.g. 22.15 drains becomes 23 drains).

TABLE 1

Vertical Leader Sizing In Inches/(mm)	Hourly Rainfall in Inches/(mm)					
	1(25)	2(51)	3(76)	4(102)	5(127)	6(152)
	Roof Area In Square Footage (Square Meters)					
2(51)	2,880 (268)	1,440 (134)	960 (89)	720 (67)	575 (53)	480 (45)
3(76)	8,800 (818)	4,400 (409)	2,930 (272)	2,200 (204)	1,760 (154)	1,470 (137)
4(102)	18,400 (1709)	9,200 (855)	6,130 (569)	4,600 (427)	3,680 (342)	3,070 (285)
6(152)	54,000 (5017)	27,000 (2508)	17,995 (1672)	13,500 (1254)	10,800 (1003)	9,000 (836)
8(203)	116,000 (10777)	58,000 (5388)	38,660 (3592)	29,000 (2694)	23,200 (2155)	19,315 (1794)

Sizing (continued)

Example 1:

A building is 500' x 500', and is located where the maximum hourly rainfall is 5-inches. The initial plan calls for 6-inch outlet drains and vertical leaders.

1) Calculate total roof area: (500 x 500 = 250,000 sq ft).
2) From table 1, determine the roof area that one drain can safely handle: (with a 5-inch rainfall a 6-inch leader will safely handle 10,800 sq ft).
3) Divide the total roof area by the area that one drain will safely handle: (250,000 / 10,800 = 23.14, round up to 24 drains required).

Note: If 4-inch leaders were selected, each drain could safely handle 3,680 square feet of roof area as shown in table one. Our new calculation would then be (250,000 / 3,680 = 67.93, round up to 68 drains required).

DETERMINING ROOF DRAINAGE REQUIREMENTS BY FLOW RATE IN GALLONS PER MINUTE

The expected flow rate can be calculated by the following formula:
Hourly rainfall in inches x (0.0104) x total roof area in square feet = Flow rate in GPM.

From Example 1: 5-inches x 0.0104 x 250,000 = 13,000 GPM
This calculation should be made for every application to ensure the flow from the roof does not exceed the capacity of the existing infrastructure, i.e storm sewer system. Reference table 2 to aid in determining flow capacities.

TABLE 2

Pipe Size in Inches (mm)	Roof Drain And Vertical Pipe Capacity In GPM (L/s)	Horizontal Piping Slope in/ft (mm/m)		
		1/8(10)	1/4(21)	1/2(42)
		Capacity in GPM (L/s)		
3(76)	92(5.8)	34(2.1)	48(3.0)	69(4.3)
4(102)	192(12.1)	78(4.9)	110(6.9)	157(9.9)
6(152)	563(35.5)	223(14.1)	315(19.9)	446(28.1)
8(203)	1,208(76.2)	479(30.2)	679(42.8)	958(60.4)
10(254)		863(54.4)	1217(76.8)	1725(108.8)
12(305)		1,388(87.6)	1,958(123.5)	2,775(175.1)
15(381)		2,479(156.4)	3,500(220.8)	4,958(312.8)

CONTROLLED FLOW ROOF DRAINAGE SYSTEMS

If conventional, full flow roof drains are used, care must be taken not to over tax the capacity of the existing sewer system If this is a possibility, then a controlled flow roof drain system should be used. In such a system, the roof acts as a reservoir to allow extended drain down times, thus sparing the existing infrastructure from being overloaded in the event of a twenty five or fifty year rain. The Watts Drainage controlled flow rate system (Accutrol) uses proportional weirs to control the rate of flow from the roof. The Accutrol weirs are designed to allow a flow of 5 GPM per inch of standing water per weir slot. This means that with 4-inches of standing water a one-slot weir would allow a flow of 20 GPM. The specially designed weir slots allow a linear increase of flow rate versus water head increase to aid in determination of the flow requirements.

Appendix I

Site Development Plans

PROPOSED LIMITS OF CONSTRUCTION (TYP.)

PROPOSED LIMITS OF CONSTRUCTION (TYP.)

ELECTRICAL PLUG-IN AND CONDUIT REMOVALS (TYP.)

EX. LIGHT STANDARDS TO BE REMOVED (TYP.) CONTRACTOR TO CONFIRM LOCATION OF BURIED ELECTRICAL UTILITIES

EXISTING NORTH GARAGE

EXISTING SOUTH GARAGE

EXISTING BUILDING (PEPSI)

EXISTING ASPHALT PARKING LOT

EXISTING SEWER TO BE PROTECTED

EXISTING BUS SHELTER TO BE PROTECTED

EXISTING TREES TO BE PROTECTED (TYP.)

EXISTING STRUCTURES

CANADIAN PACIFIC RAILWAY/DITCH

EX. CB/MH 1 1200mmØ T/G 68.75 INV.E 67.925 INV.S 67.85

EX. STORMCEPTOR STC 2000 T/G 69.00 INV(W) 67.50 INV(E) 67.47

EX. MH 11 1500mmØ T/G 68.90 INV(E) 67.62 INV(W) 67.74 INV(S) 67.82

EX. ST/MH 1 1500mmØ T/G 69.05 INV.N 67.545 INV.S 67.545 INV.W 67.545

EX. ST/MH 2 1500mmØ T/G 69.00 INV. 67.44 INV. 67.44

EX. CB/MH 2 1500mmØ T/G 68.80 INV.N 67.79 INV.S 67.645 INV.W 67.565

EX. CB/MH 3 1200mmØ T/G 68.80 INV.N 67.66 INV.S 67.66

EX. MH 10 2400mmØ T/G 69.68 EX. INV.N 67.62 EX. INV.S 67.70 EX. INV.W 67.77

EX. 23m²-975mmØ CONC. CL. 100-D STORM @ 0.29%

EX. 42m-375mmØ CONC. CL. 100-D STORM @ 0.30%

EX. 23m-300mmØ CONC. CL. 100-D STORM @ 0.29%

EX. 45.5m-150mmØ PERFORATED STORM SUBDRAIN @ 0.50%

EX. 72.4m-600mmØ PVC UNDERDRAIN @ 0.50%

EX. 9.5m-600mmØ CONC. CL. 65-D STORM @ 0.20%

EX. 19m-525mmØ CONC. CL. 65-D STORM @ 0.10%

EX. 10.5m-375mmØ STM @ 0.85%

EX. 8m-450mmØ ST @ 0.15%

EX. 200mmØ WM

EX. 450mm STM

EX. 200mm SAN

EX. 203mmØ WM

EX. CB MH 1 T/G 69.40 INV(N) 67.56 INV(S) 67.03

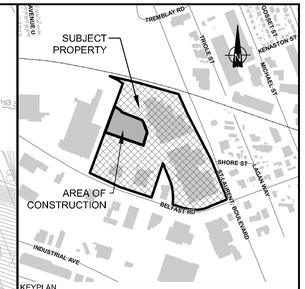
EX. CB 2 T/G 69.40 INV. 66.42

EX. CB MH 3 T/G 69.50 INV.(N&S) 67.74

EX. CB MH T/G 70.24 INV. 67.71 INV. E. 67.67

EX. CB MH T/G 69.50 INV.(N&S) 67.74

SAN MH T/G 68.85 INV.N 67.2 INV.S 67.16 INV.E 67.36



KEYPLAN

LEGEND

- LIMITS OF CONSTRUCTION
- EX SIGN
- EX LIGHT STANDARD
- EX STM MAINTENANCE HOLE
- EX STM CATCHBASIN
- EX STM CATCHBASIN MAINTENANCE HOLE
- EX STM SEWER
- EX BOLLARD
- EX SAN SEWER
- EX WATERMAIN / FIRE HYDRANT AND VALVE
- BURIED ELECTRICAL CONDUIT
- PROPERTY LIMITS
- SILT FENCE BARRIER AS PER OPSD 219.110

No.	ISSUE / REVISION	DD/MM/YY
01	ISSUED FOR CITY SITE PLAN CONTROL	28/04/22

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:500

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

LICENSED PROFESSIONAL ENGINEER L.J.A. JABLONSKI 2022-04-28 PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT:

OC TRANSPO E-BUS BUILDING SITE PLAN APPLICATION

1500 ST. LAURENT BOULEVARD, OTTAWA, ONTARIO

DRAWING:

EXISTING CONDITIONS & REMOVALS PLAN

DESIGN:	MD
DRAWN:	TB
CHECKED:	MD/LJ
JLR #:	31489-004

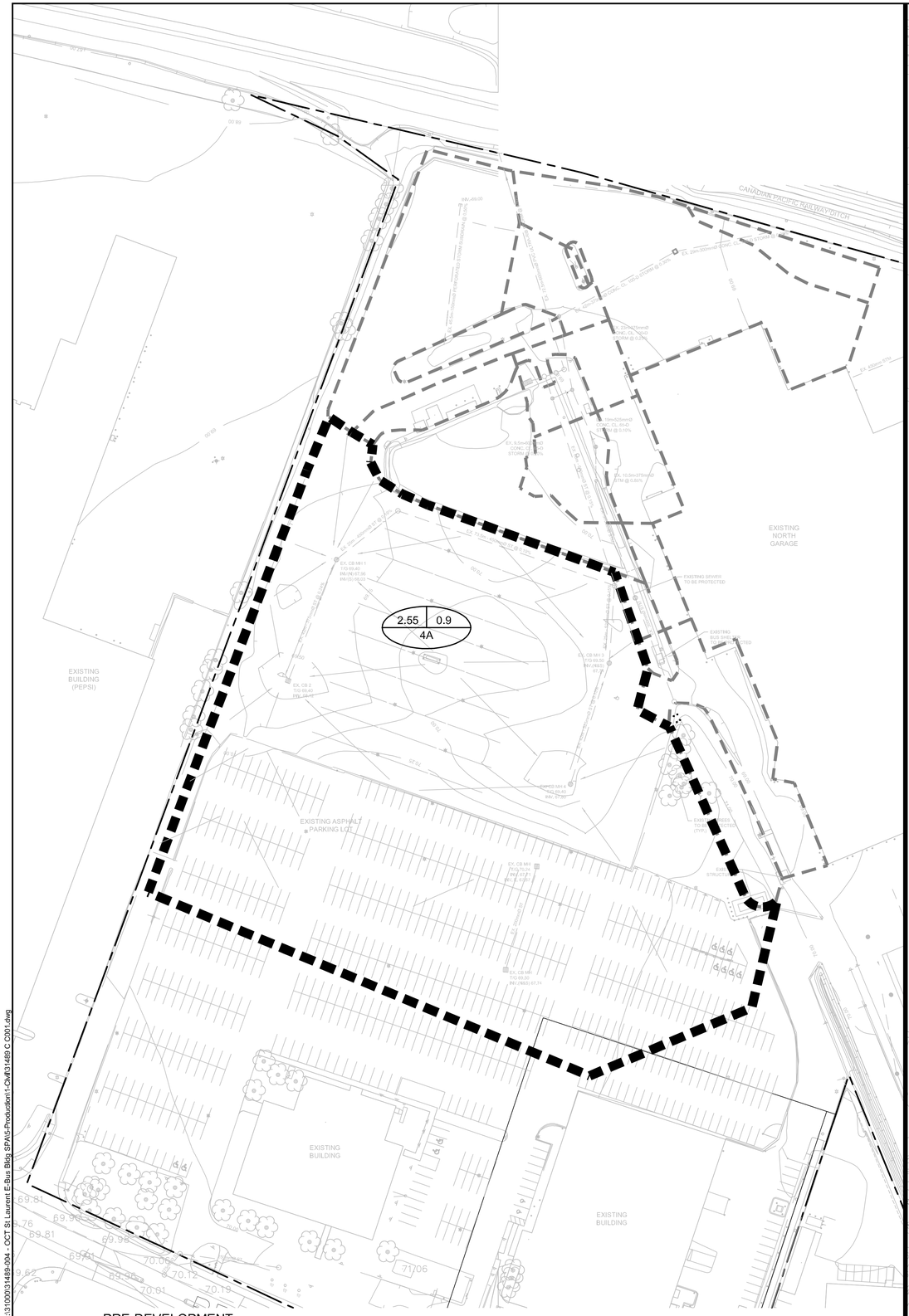
DRAWING #: C000

Plan No:

City File No:

PLOT DATE: Thursday, April 28, 2022 3:29:30 PM

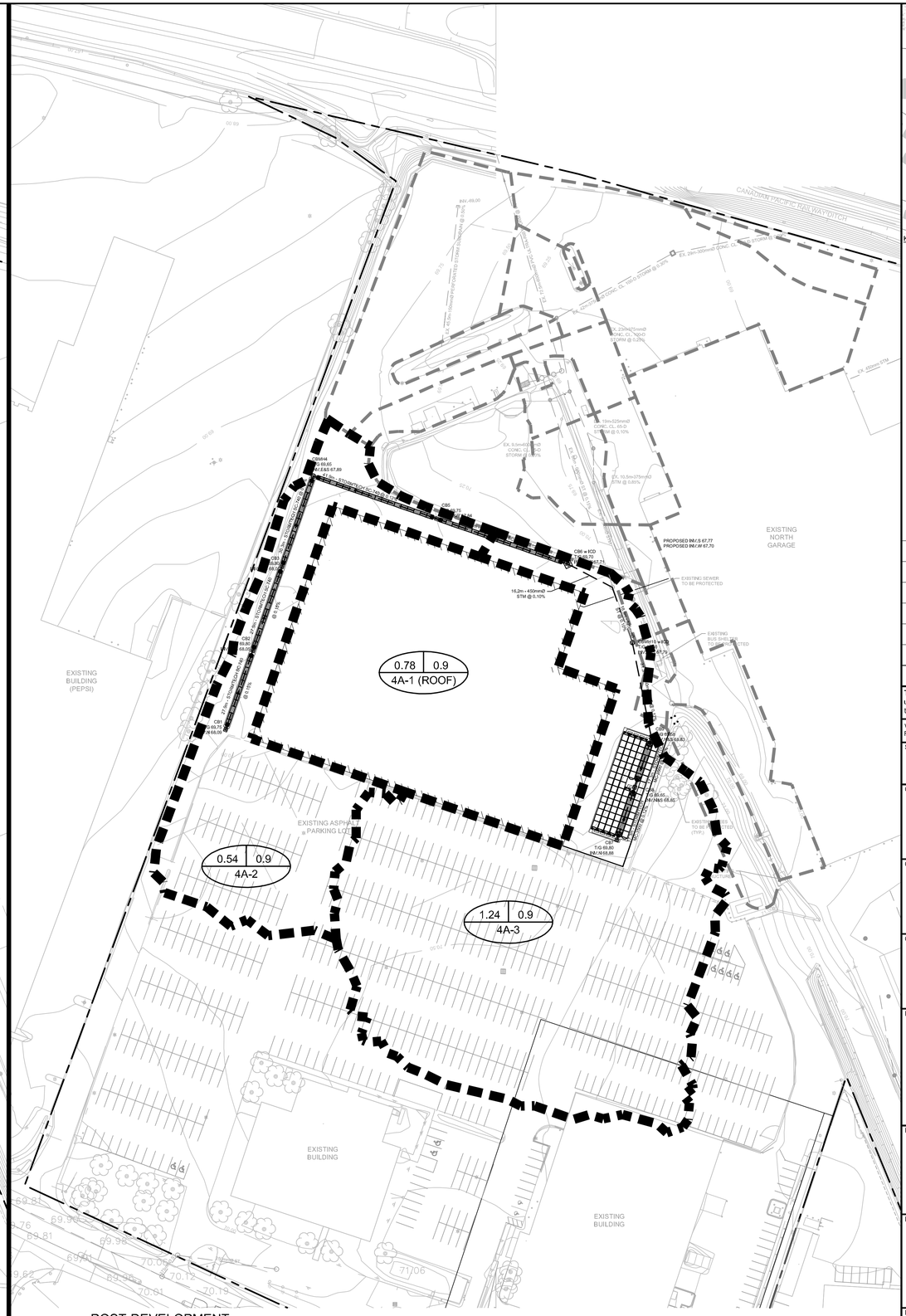
File Location: P:\31000\31489-004 - OCT St Laurent E-Bus Bldg SPA\5-Production\1-Civil\31489 C C000.dwg



1 C001

PRE-DEVELOPMENT DRAINAGE BASINS

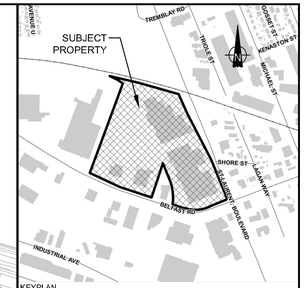
SCALE: AS-NOTED



2 C001

POST-DEVELOPMENT DRAINAGE BASINS

SCALE: AS-NOTED



KEYPLAN

LEGEND

- AREA IN HECTARES
- RUNOFF COEFFICIENT
- AREA ID (e.g. 0.21 | 0.66 / 104-710)
- EXISTING DRAINAGE DIRECTION
- DRAINAGE BOUNDARY

No.	ISSUE / REVISION	DD/MM/YY
01	ISSUED FOR CITY SITE PLAN CONTROL	28/04/22

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:750

CLIENT:

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J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

LICENSED PROFESSIONAL ENGINEER
L.J.A. JABLONSKI
2022-04-28
PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT:

OC TRANSPO E-BUS BUILDING
SITE PLAN APPLICATION

1500 ST. LAURENT BOULEVARD, OTTAWA, ONTARIO

DRAWING:

PRE & POST DEVELOPMENT DRAINAGE PLAN

DESIGN: MD	
DRAWN: TB	DRAWING #: C001
CHECKED: MD/LJ	
JLR #: 31489-004	

Plan No:

City File No:

PLOT DATE: Thursday, April 28, 2022 3:28:02 PM

File Location: P:\31000\31489-004 - OCT St Laurent E-Bus Bldg SPA\5-Production\1-Civil\31489 C C001.dwg

GENERAL CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL UTILITIES AND SERVICES. ALL UTILITIES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING LOCATES FROM ALL UTILITY COMPANIES TO LOCATE EXISTING UTILITIES PRIOR TO EXCAVATION.
2. **SITE BENCHMARK:** SW CORNER CONCRETE LIGHT STAND BASE - ELEVATION 69.72
3. THE CONTRACTOR RESPONSIBLE FOR VERIFYING THAT THE SITE BENCHMARK(S) HAVE NOT BEEN ALTERED OR DISTURBED AND THAT THEIR RELATIVE ELEVATION(S) AND DESCRIPTION(S) AGREE WITH THE INFORMATION DEPICTED ON THE PLAN.
4. THE CONTRACTOR TO CARRY OUT WORKS PER THE CURRENT CITY OF OTTAWA STANDARD DRAWINGS AND SPECIFICATIONS AND PER THE ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS.
5. THE CONTRACTOR TO READ THE SITE'S SERVICING DESIGN PLAN IN CONJUNCTION WITH THE LATEST SITE SERVICING REPORT AND GEOTECHNICAL REPORT.
6. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY NECESSARY PERMITS BEFORE CONSTRUCTION.
7. THE CONTRACTOR TO COMPLY WITH THE CITY OF OTTAWA AND OC TRANSPO REQUIREMENTS FOR TRAFFIC CONTROL.
8. THE CONTRACTOR TO REFER TO THE ARCHITECT'S PLANS FOR BUILDING DIMENSIONS AND SITE LAYOUT DIMENSIONS AND LAYOUT INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
9. THE CONTRACTOR RESPONSIBLE FOR ALL EXCAVATION, BACKFILL AND REINSTATEMENT OF ALL AREAS DISTURBED DURING CONSTRUCTION AND ANY ASSOCIATED WORKS TO THE SATISFACTION OF THE ENGINEER AND CITY OF OTTAWA.
10. THE CONTRACTOR TO MATCH EXISTING ELEVATIONS AT PROPERTY LIMITS AND ENSURE POSITIVE DRAINAGE TOWARDS A SUITABLE OUTLET, WHETHER INDICATED OR NOT ON THE PLANS.
11. THE CONTRACTOR TO INSTALL THE PAVEMENT STRUCTURE PER THE SITE'S GEOTECHNICAL INVESTIGATION REPORT RECOMMENDATIONS.
12. THE CONTRACTOR TO PROVIDE ALL PAVEMENT MARKINGS AS SHOWN, INCLUDING HANDICAPPED PARKING SYMBOLS WHERE APPLICABLE.

SERVICING NOTES

13. ALL GROUNDWATER PUMPED FROM THE SITE TO BE METERED, AND A PERMIT TO TAKE WATER OBTAINED BY THE CONTRACTOR AS APPLICABLE.
14. THE NOMINAL DIAMETER OF PIPES IS REFERRED TO IN THE PLAN VIEW.
15. SERVICES TO BE TERMINATED 1.0m FROM BUILDING WALL (TYPICAL).
16. THE CONSTRACTOR TO INSULATE ALL STORM SEWERS THAT HAVE LESS THAN 1.5 m OF COVER WITH 50 mm X 1200 mm HI-40 INSULATION AND PROVIDE 100 MM CLEARANCE BETWEEN PIPE AND INSULATION.
17. ALL MAINTENANCE HOLES TO BE 1200 mm DIAMETER UNLESS OTHERWISE INDICATED AS PER OPSD 701.010 o/w FRAME AND COVERS AS PER CITY STANDARD DRAWINGS 24 AND 24.1.
18. CATCH BASINS SHALL BE PER OPSD 705.010. FRAME AND GRATES PER OPSD 400.10. STORM SEWER MATERIAL AS SPECIFIED.
19. THE CONTRACTOR TO INSPECT THE INSTALLED SEWERS USING CCTV AS REQUIRED BY THE CITY.
20. FOR ALL PROPOSED CONNECTION POINTS (IF ANY), THE CONTRACTOR IS RESPONSIBLE FOR THE REINSTATEMENT OF ALL SURFACES TO EXISTING CONDITIONS OR BETTER. PAVEMENT STRUCTURE RESTORATION SHALL BE PER CITY OF OTTAWA STANDARDS. THE THICKNESS OF GRANULAR AND ASPHALT LAYERS SHALL MATCH EXISTING.
21. SUPPLY AND INSTALL ADS MC-3500 STORMTECH CHAMBERS COMPLETE WITH END UNITS, GEOTEXTILE AND GRANULAR BEDDING/BACKFILL AS PER MANUFACTURER'S INSTRUCTIONS. INSTALLED STORAGE VOLUME SHALL BE 100 METERS CUBED MINIMUM.
22. ALL WATERMAINS SHALL CONFORM TO THE LATEST REVISIONS OF THE CITY OF OTTAWA AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
23. WATERMAINS TO BE PVC DR 18.
24. HYDRANT SHALL BE INSTALLED AS PER CITY STANDARD DRAWING W19.
25. WATERMAINS CROSSING BELOW OR OVER A SEWER SHALL BE IN ACCORDANCE WITH CITY STANDARD DRAWING W25 AND W25.2.
26. ALL CONNECTIONS TO THE EXISTING WATERMAIN TO BE PER THE CITY OF OTTAWA DESIGN GUIDELINES. CONTRACTOR TO PROVIDE EXCAVATION BACKFILLING, COMPACTION AND REINSTATEMENTS PER THE LATEST GEOTECHNICAL INVESTIGATION REPORT FOR THE SITE.
27. THE WATERMAIN CONNECTION, WATER METER AND REMOTE RECEPTACLE BY CITY FORCES EXCAVATION AND REINSTATEMENT BY THE CONTRACTOR.
28. WATER SERVICE DISINFECTION AND INSPECTION BY CITY FORCES, ALL DEFLECTIONS AS PER MANUFACTURER'S SPECIFICATIONS MINIMUM COVER TO BE 2.4 M (IF NOT ACHIEVED, PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD DRAWING W22).
29. REFER TO MECHANICAL DRAWING FOR INTERNAL WATER, SPRINKLER AND SANITARY SERVICE CONNECTIONS.

WATERMAIN TABLE- STA 1+000 to 1+030
EXISTING WM TO BLDG
PVC DR-18 CL.150

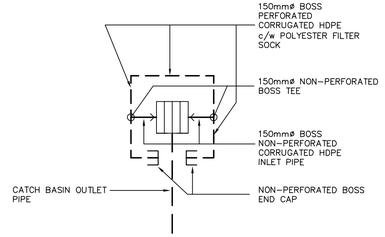
SIZE	STATION	DETAIL	FINISHED GRADE	TOP OF WM
150mmØ	1+000	CONNECT TO EX. WM	69.07	66.67
	1+010		69.41	67.01
	1+020		69.74	67.34
	1+029	SERVICE AT BLDG	70.04	67.64

NOTE: ALL WM CONSTRUCTED AT LESS THAN 2.4m BELOW FINISHED GRADE SHALL BE INSULATED IN ACCORDANCE WITH THE CITY OF OTTAWA'S REQUIREMENTS AS SET OUT IN THE CITY OF OTTAWA SPECIFICATION (F-4415).

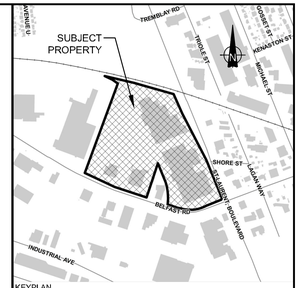
WATERMAIN TABLE- STA 2+000 to 2+023
EXISTING WM TO HYDRANT
PVC DR-18 CL.150

SIZE	STATION	DETAIL	FINISHED GRADE	TOP OF WM
150mmØ	2+000	CONNECT TO EX. WM	69.00	66.60
	2+010		69.28	66.88
	2+019	HYDRANT VALVE & VALVE BOX	69.56	67.16
	2+023	HYDRANT	70.15	67.75

NOTE: ALL WM CONSTRUCTED AT LESS THAN 2.4m BELOW FINISHED GRADE SHALL BE INSULATED IN ACCORDANCE WITH THE CITY OF OTTAWA'S REQUIREMENTS AS SET OUT IN THE CITY OF OTTAWA SPECIFICATION (F-4415).



TYPICAL CATCH BASIN / STORM MANHOLE STRUCTURE SUB-DRAIN DETAIL
N.T.S



KEYPLAN

LEGEND

- EX SIGN
- EX LIGHT STANDARD
- EX STM CATCHBASIN
- EX STM CATCHBASIN /MAINTENANCE HOLE
- EX STM SEWER AND MAINTENANCE HOLE
- EX BOLLARD
- EX SAN SEWER AND MAINTENANCE HOLE
- EX WATERMAIN / FIRE HYDRANT AND VALVE
- BURIED ELECTRICAL CONDUIT
- APPROX. PROPERTY LIMITS
- 70.00 PROPOSED ELEVATION
- PROPOSED CATCH BASIN
- STORM SEWER
- SAN SEWER AND MAINTENANCE HOLE
- WATERMAIN / FIRE HYDRANT AND VALVE
- PROPOSED BOLLARD
- PROPOSED SPRINKLER CONNECTION

No.	ISSUE / REVISION	DD/MM/YY
01	ISSUED FOR CITY SITE PLAN CONTROL	28/04/22

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:500

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

LICENSED PROFESSIONAL ENGINEER L.J.A. JABLONSKI 2022-04-28 PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT:

OC TRANSPO E-BUS BUILDING SITE PLAN APPLICATION

1500 ST. LAURENT BOULEVARD, OTTAWA, ONTARIO

DRAWING:

SITE SERVICING PLAN

DESIGN: MD	
DRAWN: TB	DRAWING #: C002
CHECKED: MD/LJ	
JLR #: 31489-004	

Plan No:

City File No:

File Location: P:\31000\31489-004 - OCT St Laurent E-Bus Bldg SPA\5-Production\1-Civil\31489 C C002.dwg

PLOT DATE: Thursday, April 28, 2022 3:26:16 PM

CANADIAN PACIFIC RAILWAY DITCH

EXISTING NORTH GARAGE

EXISTING SEWER TO BE PROTECTED

PROPOSED BUILDING FF 70.10

EXISTING BUS SHELTER TO BE PROTECTED

EXISTING BUILDING (PEPSI)

BUILDING FOUNDATION WALL DESIGN TO INCLUDE CONCRETE WALL ALONG FLOOR SLAB ALONG SOUTH SIDE AT APPROXIMATELY 0.15m ABOVE EXISTING SOUTH SIDE ELEVATION, MINIMUM

EXISTING ASPHALT PARKING AREA

REGRADE EXISTING PARKING SURFACE TO PROVIDE POSITIVE DRAINAGE FROM SOUTH BUILDING FACE

EXISTING TREES TO BE PROTECTED (TYP.)

EXISTING STRUCTURES

EXISTING SOUTH GARAGE

GENERAL GRADING NOTES

1. CONTRACTOR TO CARRY OUT WORKS PER THE CURRENT CITY OF OTTAWA STANDARD DRAWINGS AND SPECIFICATIONS AND PER THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS (OPSS) AND DRAWINGS (OPSD).

2. CONTRACTOR TO READ THE SITE'S SERVICING PLAN IN CONJUNCTION WITH THE LATEST PROJECT'S SITE SERVICING REPORT, PREPARED BY J.L. RICHARDS & ASSOCIATES LIMITED THE PROPOSED CONSTRUCTION.

4. CONTRACTOR RESPONSIBLE FOR ALL EXCAVATION, BACKFILL AND REINSTATEMENT OF ALL AREAS DISTURBED DURING CONSTRUCTION AND ANY ASSOCIATED WORKS TO THE SATISFACTION OF THE ENGINEER AND CITY.

5. CONTRACTOR TO PROVIDE EXCAVATION BACKFILLING, COMPACTION AND REINSTATEMENTS, PER THE LATEST PROJECT'S GEOTECHNICAL INVESTIGATION PREPARED FOR THE SITE.

7. FOR ALL PROPOSED CONNECTION POINTS (IF ANY), THE CONTRACTOR IS RESPONSIBLE FOR REINSTATING ALL SURFACES TO EXISTING CONDITIONS OR BETTER. PAVEMENT STRUCTURE RESTORATION SHALL BE PER CITY OF OTTAWA STANDARDS. THE THICKNESS OF GRANULAR AND ASPHALT LAYERS SHALL MATCH EXISTING OR THE FOLLOWING AS A MINIMUM

50 mm SP 12
100 mm SP 18.5
150 mm GRAN A
450 mm GRAN B, TYPE II

10. CONTRACTOR RESPONSIBLE FOR VERIFYING THAT THE SITE BENCHMARK(S) HAVE NOT BEEN ALTERED OR DISTURBED AND THAT THEIR RELATIVE ELEVATION(S) AND DESCRIPTION(S) AGREE WITH THE INFORMATION DEPICTED ON THE PLAN.

11. CONTRACTOR TO MATCH EXISTING ELEVATIONS AT WORK LIMITS AND ENSURE POSITIVE DRAINAGE TOWARDS A SUITABLE OUTLET, WHETHER INDICATED OR NOT ON THE PLANS.

12. CONTRACTOR TO PROVIDE ALL PAVEMENT MARKINGS, INCLUDING HANDICAPPED PARKING SYMBOLS AS APPLICABLE.

13. CONTRACTOR TO ENSURE THE PROPOSED PAVEMENT STRUCTURE IS CONSTRUCTED PER THE PROJECT'S GEOTECHNICAL INVESTIGATION REPORT, OC TRANSPO PARKING AREA IMPROVEMENTS, PREPARED BY JACQUES WHITFORD AND ASSOCIATES LIMITED, JULY 24, 2002..

15. CONTRACTOR TO ENSURE ALL PROPOSED PAVEMENT AREAS ARE PREPARED PER THE SITE'S GEOTECHNICAL INVESTIGATION RECOMMENDATIONS AND ALL TOPSOIL AND OTHER UNSUITABLE FILL EXCAVATED FROM THESE SURFACES.

16. REQUIREMENT FOR ADDITIONAL GRANULAR 'B' AND/OR GEOTEXTILE TO BE CONFIRMED ON-SITE BY THE PROJECT'S GEOTECHNICAL ENGINEER

EROSION AND SEDIMENT CONTROL NOTES

17. ALL SEDIMENTATION CONTROL MEASURES MUST BE IMPLEMENTED PER OPSS AND OPSD. SILT FENCE BARRIER PER OPSD 219.110.

18. CONTRACTOR TO ENSURE ALL SEDIMENT AND EROSION CONTROL MEASURES ARE IMPLEMENTED BEFORE WORK AND MAINTAINED DURING THE WORK PHASE TO PREVENT ENTRY OF SEDIMENT INTO THE RECEIVING WATERCOURSES.

19. CONTRACTOR TO ENSURE ALL SEDIMENT AND EROSION CONTROL (ESC) MEASURES TO BE INSPECTED DAILY, ARE FUNCTIONING, ARE BEING MAINTAINED AND/OR UPGRADED AS REQUIRED. IF THE ESC MEASURES ARE NOT FUNCTIONING PROPERLY, NO WORKS TO TAKE PLACE UNTIL THE ISSUE HAS BEEN ADDRESSED AND RECTIFIED.

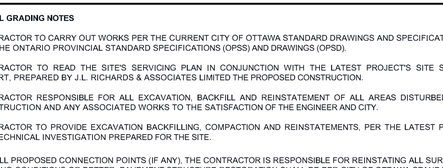
20. HYDROSEEDING OF ALL DITCHES IS PROVIDED IMMEDIATELY AFTER FINAL SHAPING/GRADING.

21. CONTRACTOR TO ENCLOSE ALL BORROW AND STOCKPILE AREAS RESULTING FROM TOPSOIL STRIPPING OR ANY EXCAVATING ACTIVITIES.

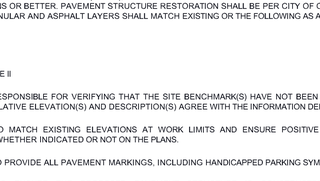
22. CONTRACTOR TO ENSURE ALL STOCKPILED MATERIALS ARE STORED ON A FLAT AREA ARE STABILIZED AND AWAY FROM ANY FLOW PATHS.

23. IF A STOCKPILE IS PLACED IN AREAS WITH THE POTENTIAL WASH OFF TO A CONVEYANCE SYSTEM, THE CONTRACTOR TO INSTALL SILT FENCE BARRIERS PER OPSD 219.110 TO ENCLOSE THE MATERIALS AND PREVENT ANY WASH OFF.

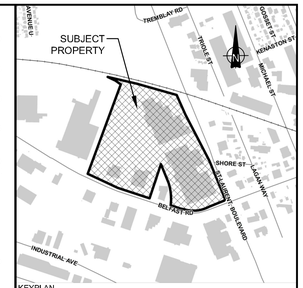
24. CONTRACTOR TO ENSURE ANY VEHICLE AND EQUIPMENT RE-FUELLING AND MAINTENANCE TO BE CONDUCTED AWAY FROM DRAINAGE CHANNELS AND ANY PART OF EQUIPMENT ENTERING A CHANNEL TO BE FREE OF FLUID LEAKS AND EXTERNALLY CLEANED/DEGREASED TO PREVENT ANY DELETERIOUS SUBSTANCES FROM ENTERING ANY RECEIVING WATERCOURSE.



SECTION 'A-A'
N.T.S.



ASPHALT TIE-IN DETAIL
N.T.S.



KEYPLAN LEGEND

- EX SIGN
- EX LIGHT STANDARD
- EX STM CATCHBASIN
- EX STM CATCHBASIN /MAINTENANCE HOLE
- EX STM SEWER AND MAINTENANCE HOLE
- EX BOLLARD
- EX SAN SEWER AND MAINTENANCE HOLE
- EX WATERMAIN / FIRE HYDRANT AND VALVE
- BURIED ELECTRICAL CONDUIT
- APPROX. PROPERTY LIMITS
- EX STM CATCHBASIN FILTER FABRIC TO BE INTALLED BETWEEN FRAME AND COVER
- SILT FENCE BARRIER AS PER OPSD 219.110
- 69.50 PROPOSED ELEVATION
- 70.20 EX ELEVATION
- BOLLARD
- PROPOSED CATCH BASIN
- STORM SEWER
- SAN SEWER AND MAINTENANCE HOLE
- WATERMAIN / FIRE HYDRANT AND VALVE
- HEAVY DUTY ASPHALT (TYP.)
- PONDING AREA MAXIMUM WATER LEVEL (STATIC)

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L.J.A. JABLONSKI
2022-04-28
PROVINCE OF ONTARIO

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OC TRANSPO E-BUS BUILDING
SITE PLAN APPLICATION

1500 ST. LAURENT BOULEVARD, OTTAWA, ONTARIO

DRAWING:

GRADING PLAN

DESIGN: MD	
DRAWN: TB	DRAWING #: C003
CHECKED: MD/LJ	
JLR #: 31489-004	

Plan No:

City File No:

PLOT DATE: Thursday, April 28, 2022 3:25:02 PM

File Location: P:\31000\31489-004 - OCT St Laurent E-Bus Bldg SPA\5-Production\1-Civil\31489 C C003.dwg

Appendix J

Servicing Study Checklist

OC Transpo E-Bus Parking Garage

1500 St. Laurent Boulevard, Ottawa, ON

DEVELOPMENT SERVICING STUDY CHECKLIST

REFERENCED STUDIES AND REPORTS	REFERENCE
Site Servicing Brief for OC Transpo E-Bus Parking Garage, 1500 St. Laurent Boulevard, Ottawa, ON (J.L. Richards & Associates Limited, April 28, 2022)	SSB

4.1	GENERAL CONTENT	REFERENCE
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	SSB (Title Page)
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	SSB (Figure 1) Site Development Plans
☒	Plan showing the site and location of all existing services.	Site Development Plans
☒	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.	SSB (Section 1.0)
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	SSB (Section 1.0, Appendix 'A')
☐	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	N/A
☒	Statement of objectives and servicing criteria.	SSB (Section 1.0, 2.0, 3.0, 4.0, 5.0)
☒	Identification of existing and proposed infrastructure available in the immediate area.	SSB (Section 1.0, 2.0, 3.0, 4.0) Site Development Plans
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Site Development Plans

☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Geotechnical report by Jacques Whitford dated July 24, 2002
☒	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	Site Development Plans

4.2	**DEVELOPMENT SERVICING REPORT: WATER**	**REFERENCE**
☐	Confirm consistency with Master Servicing Study, if available.	N/A
☒	Availability of public infrastructure to service proposed development.	SSB (Section 1.0, 2.0) Site Development Plans
☒	Identification of system constraints.	SSB (Section 2.0)
☒	Identify boundary conditions.	SSB (Section 2.0, Appendix 'D')
☒	Confirmation of adequate domestic supply and pressure.	SSB (Section 2.0)
☒	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.	SSB (Section 2.0, Appendix 'D')
☒	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.	SSB (Section 2.0)
☐	Definition of phasing constraints. Hydraulic modelling is required to confirm servicing for all defined phases of the project, including the ultimate design.	N/A
☒	Address reliability requirements, such as appropriate location of shutoff valves.	SSB (Section 2.0)
☐	Check on the necessity of a pressure zone boundary modification.	N/A

☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range.	SSB (Section 2.0, Appendix 'D')
☒	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.	SSB (Section 2.0)
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	SSB (Section 2.0)
☒	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	SSB (Appendix 'D')

4.3	DEVELOPMENT SERVICING REPORT: WASTEWATER	REFERENCE
☒	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).	SSB (Section 3.0, Appendix 'E')
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the Guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	SSB (Section 1.0, 3.0) Site Development Plans
☒	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.)	SSB (Section 3.0, Appendix 'E')
☒	Calculations related to dry weather and wet weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	SSB (Appendix 'E')
☒	Description of proposed sewer network, including sewers, pumping stations and forcemains.	SSB (Section 3.0) Site Development Plans

☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations, such as contamination, corrosive environment, etc.	N/A

4.4	DEVELOPMENT SERVICING REPORT: STORMWATER	REFERENCE
☒	Description of drainage outlets and downstream constraints, including legality of outlets (i.e., municipal drain, right-of-way, watercourse, or private property).	SSB (Section 1.0, 4.0)
☒	Analysis of available capacity in existing public infrastructure.	SSB (Section 4.0)
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Site Development Plans
☒	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.	SSB (Section 4.0)
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	SSB (Section 4.0)
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	SSB (Section 4.0) Site Development Plans
☐	Setback from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	SSB (Appendix 'A' and 'B')

☐	Confirm consistency with subwatershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:2 year return period) and major events (1:100 year return period).	SSB (Section 4.0)
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	Calculate pre- and post-development peak flow rates, including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	SSB (Section 4.0)
☒	Any proposed diversion of drainage catchment areas from one outlet to another.	SSB (Section 4.0)
☒	Proposed minor and major systems, including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Site Development Plans
☒	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.	Quantity control proposed per SSB (Section 4.0)
☐	Identification of potential impacts to receiving watercourses.	N/A
☐	Identification of municipal drains and related approval requirements.	N/A
☒	Description of how the conveyance and storage capacity will be achieved for the development.	SSB (Section 4.0)
☒	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	SSB (Section 4.0), Site Development Plans
☒	Inclusion of hydraulic analysis, including hydraulic grade line elevations.	SSB (Section 4.0)
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Site Development Plans
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5	APPROVAL AND PERMIT REQUIREMENTS	REFERENCE
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 such 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.	N/A
☐	Application for Environmental Compliance Approval (ECA) under the Ontario Water Resources Act.	Direct submission for amendment for ECA
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation, etc.).	N/A

4.6	CONCLUSION CHECKLIST	REFERENCE
☒	Clearly stated conclusions and recommendations.	SSB (Section 2.7,5.0)
☒	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.	RVCA
☒	All draft and final reports shall be signed and stamped by a Professional Engineer registered in Ontario.	SSB Site Development Plans

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