SERVICING AND STORMWATER MANAGEMENT REPORT

125 COLONNADE ROAD
INDUSTRIAL WAREHOUSE DEVELOPMENT

CITY OF OTTAWA

PREPARED FOR:

ACCESS PROPERTY DEVELOPMENT INC.

PREPARED BY:

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JANUARY 10, 2023

CFCA FILE NO. 2112-6218

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Revision Number	Date	Comments
Rev. 0	May 2022	Issued for 1st Submission (SPA)
Rev. 1	October 2022	Issued for 2nd Submission (SPA)
Rev. 2	January 2023	Issued for 3rd Submission (SPA) per Final City Comments

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Access Property Development Inc. (Owner) to prepare a Servicing and Stormwater Management Report in support of the Site Plan Application for the industrial warehouse development located at 125 Colonnade Road South (the site) in the City of Ottawa. The purpose of this report is to demonstrate that the proposed development is feasible from a servicing and stormwater management perspective and conforms with the requirements of the City of Ottawa (City) and the Rideau Valley Conservation Authority (Conservation Authority).

This report has been completed in accordance with the guidelines and pre-consultation notes outlined by the City of Ottawa. The relevant background studies and reports include:

- City of Ottawa Design Guidelines – Water Distribution (July 2010)
- City of Ottawa Sewer Design Guidelines (October 2012)
- City of Ottawa As-Constructed Drawing (7446-Z-015) (March 1975)
- Ministry of Environment Stormwater Management Planning and Design Manual (March 2003)
- Ministry of the Environment Design Guidelines for Drinking-Water Systems (2008)
- 125 Colonnade Road Pre-Consultation Meeting Notes (City of Ottawa, August 12, 2021)
- Sanitary and Storm Main Sewer CCTV Inspections (Drain-All, April 8th, 2022)

This report has been prepared to address the second submission comments received from the reviewing agencies and to support the third submission of the Site Plan Application for the proposed development.

2.0 Site Description

The site encompasses an area of 3.46 ha with a development area of approximately 1.76 ha. The site currently consists of a 5,000 m^2 industrial warehouse building, a 300 m^2 storage building, internal paved and gravel parking areas, landscaped areas, and three paved entrances from Colonnade Road South and Colonnade Road. The site, located in an industrial area (IG5) within the City of Ottawa, is bounded by Colonnade Road South to the west, Colonnade Road to the north, Prince of Wales Drive to the east, and a CN Rail Line to the south.

According to the Site Plan prepared by Architecture 49 (December 2022), it is understood the proposed development is an expansion/addition which will consist of the following elements:

- Retention of the existing 2-storey industrial warehouse building (5,000 m^2) and associated paved parking areas.
- A 2-storey industrial building (Building A) with a total ground floor area of 512 m^2, attached to the existing building and the proposed 3-storey building
- A 3-storey industrial building (Building A) with a total ground floor area of 2,677 m^2
- A 1-storey industrial building (Building B) with a total ground floor area of 3,747 m^2

- A total of 127 parking spaces to serve the combined site.

- Retention of the existing three full-move site accesses along Colonnade Road and Colonnade Road South to serve the entire site.

The existing 300 m^2 metal sided storage building and gravel parking will be demolished and re-graded to accommodate the proposed industrial warehouse development.

3.0 Water Servicing

The City of Ottawa is responsible for the operation and maintenance of the municipal watermain network surrounding the property. The existing and proposed water servicing are discussed in the following sections.

3.1 Existing Water Servicing

The existing water servicing infrastructure close to the site include:

- A 400 mm diameter ductile iron watermain located on the west side of Colonnade Road South (City of Ottawa As-Constructed Drawing (7446-Z-015), March 1975)

- Review of the City of Ottawa's Water and Wastewater Infrastructure Geographic Information System show there are two existing private hydrants located within the western extents of the site. The most northern hydrant is serviced via a direct connection to the existing 250 mm diameter water service connection while the southern hydrant is serviced through a 150 mm diameter watermain connection to the existing 250 mm diameter service connection. Additionally, there is a third municipal hydrant along the northern extent of the property which connects directly to the 400 mm diameter ductile iron watermain on Colonnade Road.

According to the City of Ottawa's Pre-Consultation notes (August 12, 2021), and the City of Ottawa's Water and Wastewater Infrastructure Geographic Information System, the property is currently serviced by a 250 mm diameter water service connection from the 400 mm diameter ductile iron watermain on Colonnade Road South. The as-constructed drawings for Colonnade Road South can be referenced in Appendix A.

3.2 Water Demand Calculations

The water demand for the proposed industrial development was calculated with reference to the City of Ottawa Design Guidelines – Water Distribution (July 2010) guidelines. The City of Ottawa design criteria requires an average daily water demand of 35,000 L/ha/day for light industrial uses. A site area of 3.46 ha, per the Site Plan prepared by Architecture 49 (December 2022), was used along with the peaking factors outlined in the City of Ottawa design criteria to obtain the estimated maximum daily demand and peak hourly demand for the proposed development.

Table 1 summarizes the overall water demand for the site. Appendix B contains the detailed water demand calculations.

Table 1: Proposed Water Demand

Standard	Type	Average Daily Water Demand (L/s)	Maximum Daily Water Demand (L/s)	Peak Hourly Water Demand (L/s)
City of Ottawa	Light Industrial	1.4	2.1	3.8

Note: References to design guidelines are provided in Appendix B.

Using the City of Ottawa design criteria for domestic water demand, the estimated average daily demand and peak hourly demand for the proposed development are 1.4 L/s and 3.8 L/s, respectively. It should be noted that this calculation was complete using the entire site area due to the development being serviced by one service connection from the municipal watermain on Colonnade Road South.

3.3 Fire Flow Calculations

The Fire Underwriters Survey (FUS) method was used to estimate the fire flow requirements for the proposed development. This calculation is based on the building type assumption of non-combustible construction and sprinklered per email correspondence with the Architect (April 11, 2022). The estimated fire flow requirements are used to estimate the watermain size required to service the development. The building Architect and Mechanical Engineer will confirm the required fire flow demand during the Site Plan Approval and Building Permit stage.

Table 2 summarizes the estimated fire flow demand and duration necessary to meet fire protection for the proposed development. Appendix B contains the Fire Underwriters Survey calculations.

Table 2: Proposed Fire Flow Demand

Method	GFA (m^2)	Fire Flow (L/s)	Duration (hrs)
Fire Underwriters Survey	4,656	183.3	2.5

Based on the fire flow calculations and a gross floor area of 4,656 m^2 (building 'A'), the required fire flow for the development was calculated to be 183.3 L/s for a duration of 2.5-hours.

It should be noted that the fire flows determined from the FUS method is a conservative estimate for comparison purposes only. The Mechanical Engineer for this development will complete the required analysis for fire protection and the Architect will design fire separation methods per the determined fire flow rate to meet municipally available flows and pressures. Based on the estimated domestic peak hourly water demand (3.8 L/s) and fire flow demand (183.3 L/s) summarized in Table 1 and Table 2, the total design flow for the internal water distribution system is approximately 187.1 L/s.

Crozier contacted the City of Ottawa to confirm the water boundary conditions along the frontage of the site. These results will be used to confirm the existing municipal watermain network surrounding the site has capacity to service the proposed development. The boundary conditions were not available at the time of this report; however, correspondence with City Staff indicate there are no immediate concerns of the municipal system providing the anticipated peak flow and fire flow to the site. All email correspondence to date regarding the boundary conditions is included in Appendix B.

3.4 Proposed Water Servicing

The proposed warehouse buildings will be serviced by a 200 mm diameter PVC water service, connecting to the existing 250 mm diameter water service using a tapping sleeve and valve connection. The Site Servicing Plan (Drawing C103) illustrates the location and design of the proposed water services.

The proposed 200 mm diameter watermain will split into a 200 mm diameter fire line and a 100 mm diameter domestic water service to service each warehouse building individually. The water services will enter a servicing room within the proposed buildings with each servicing room housing an internal water meter and backflow preventor.

A private hydrant is proposed near the building entrances in accordance with the Ontario Building Code 3.2.5.8. The internal water system of the building will be designed per the Mechanical Engineer's details and specifications. The water boundary conditions will be reviewed to confirm if there is available water flow and pressure to service the proposed development.

3.5 Site Boundary Conditions

The hydraulic boundary conditions for the site were obtained from the City of Ottawa's water distribution system model under current operating conditions. Per email correspondence with the City (October 27, 2022), it is understood that the boundary conditions for the development include:

- Minimum Hydraulic Grade Line (HGL): 124.4 m
- Maximum HGL: 133.5 m
- Max Day + Fire Flow (183 L/s): 124.0 m

Based on the above boundary conditions and elevation where the boundary conditions were taken from (approximately 84.8 m) the approximate pressures at 125 Colonnade South are as follows:

- Minimum Pressure - 39.6 m (56 psi)
- Maximum Pressure - 48.7 m (69.2 psi)
- Max Day + Fire Flow - 39.2 m (55.7 psi)

Based on the Ottawa Design Guidelines – Water Distribution (July 2010) during periods of maximum day and fire flow demand the residual pressure at any point in the distribution system shall not be less than 140 kPa (20 psi.). The maximum day plus fire flow pressure will exceed the minimum requirement of 20 psi. Therefore, the available pressures and flows for the proposed development are sufficient based on the boundary conditions provided. Additional email correspondence regarding the site boundary conditions can be referenced in Appendix B.

4.0 Sanitary Servicing

The City of Ottawa is responsible for the operation and maintenance of the public sanitary sewage system. The existing and proposed sanitary servicing are discussed in the following sections.

4.1 Existing Sanitary Servicing

The existing sanitary servicing infrastructure close to the site includes:

- A 300 mm diameter clay sanitary sewer on Colonnade Road South running south to north at a slope of approximately 0.12% (City of Ottawa As-Constructed Drawing (7446-Z-015), March 1975).
- A 1650 mm diameter concrete trunk sanitary sewer bisecting the south, west, and east extents of the site (City of Ottawa – Water and Wastewater GIS Mapping).
- A 250 mm ductile iron sanitary sewer on Prince of Whales Drive running south to north (City of Ottawa – Water and Wastewater GIS Mapping).

According to the Topographic Survey prepared by Farley, Smith & Dennis Surveying Ltd. (March 9, 2021) the property is currently serviced by a 150 mm diameter sanitary service connection from the 300 mm diameter clay sanitary sewer on Colonnade Road South. The as-constructed drawings for Colonnade Road South can be referenced in Appendix A.

4.2 Sanitary Design Calculations

The City of Ottawa Sewer Design Guidelines (October 2012) were referenced to estimate the sanitary design flows for the proposed light industrial development. Per the design standards, an average sewage design flow of 35,000 L/ha/day (Light Industrial) was used for the proposed development. A site area of 3.46 ha, based on the Site Plan prepared by Architecture 49 (December 2022), was used along with a peaking factor of 5.25, to obtain the estimated peak design flow.

Infiltration flow into the sanitary sewer and a peaking factor were applied to the average flow to obtain the total estimated design sewage flows. Table 3 summarizes the results and Appendix C contains the detailed calculations.

Table 3: Proposed Sanitary Design Flows

Standard[1]	Type	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration Flow (L/s)	Total Peak Flow[2] (L/s)
City of Ottawa	Light Industrial	1.4	5.25	7.4	1.0	8.3

Note: [1] References to design guidelines are provided in Appendix C
[2] Peak flow includes infiltration flow

As shown in Table 3, it is estimated that the total sanitary peak flow for the proposed development is 8.3 L/s which includes the existing and proposed industrial warehouse buildings.

4.3 Proposed Sanitary Servicing

The development is proposed to be serviced by the existing 150 mm diameter service, connecting to the 300 mm diameter clay sanitary sewer on Colonnade Road South. Individual 150 mm diameter PVC sanitary services are proposed for each proposed warehouse building. Based on a minimum pipe slope of 1%, the existing 150 mm diameter sanitary sewer will have sufficient capacity to convey the internal sanitary flows for the proposed development to the existing 300 mm sewer on Colonnade Road South.

Crozier contacted the City of Ottawa to confirm the sanitary boundary conditions along the frontage of the site. City Staff indicated there are no immediate concerns of the available capacity within the external sanitary sewer network. Refer to Appendix C for the sanitary design sheet which outlines the internal sanitary flows of the development.

The Site Servicing Plan (Drawing C103) illustrates the location of the sanitary sewer and connections to the proposed buildings. The internal sanitary system of each building will be designed per the Mechanical Engineer's details and specifications.

5.0 Drainage Conditions

The drainage conditions for the site in both pre-development and post-development conditions are outlined in the following sections.

5.1 Existing Drainage Conditions

According to the topographic survey (Farley, Smith & Denis Surveying Ltd., March 9, 2021), the site currently consists of a 5,000 m^2 industrial building, a 300 m^2 metal sided storage building, internal paved and gravel parking areas, landscaped areas, and three paved site entrances from Colonnade Road South and Colonnade Road. The site generally slopes from east to west and drains from back to front.

Most of the stormwater runoff from the site drains towards the internal paved parking area where it is captured in catchbasins and directed to the municipal storm sewer network on Colonnade Road South (Catchment 101 and 103). The southern portion of the site consists of the landscaped areas and drains uncontrolled to the Prince of Whales Drive and CN railway lands right-of-way (Catchment 102) via sheet flow. The ultimate receiver of the stormwater from the site is the Rideau River which is located approximately 250 meters east of the site.

There are two outlets for the major overland flow route based on the existing site topographic survey (Farley, Smith & Denis Surveying Ltd., March 9, 2021).

The main overland flow outlet discharges through the existing parking lot towards Colonnade Road. The secondary overland flow outlet is at the southeast corner of the site where runoff is direct east towards Prince of Whales Drive and the CN railway lands. These overland flow outlets are proposed to remain under the post-development conditions.

Table 4 summarizes the pre-development catchment areas and the percent impervious. Figure 1 illustrates the Pre-Development Drainage Plan.

Table 4: Pre-Development Catchment Areas and Percent Impervious

Catchment ID	Land-Use Description	Impervious Area (m^2)	Pervious Area (m^2)	Percent Impervious (%)	Outlet
101	Existing gravel and paved areas	7,589	2,191	78*	Colonnade Road South Storm Sewer
102	Existing landscaped areas	-	7,869	0	Prince of Whales Drive right-of-way
103	Existing building, paved and landscaped areas	9,680	7,387	57	Colonnade Road South Storm Sewer

*Percent impervious value adjusted from actual 78 to 38 percent adjusted for modelling purposes to meet the City of Ottawa's maximum pre-development runoff coefficient of 0.50 for infill sites. A percent impervious of 38 correlates to a runoff coefficient of 0.50.

Note that based on the City of Ottawa's guidelines, a maximum pre-development runoff coefficient of 0.50 (or 38 percent impervious) must be used for in-fill developments. The percent impervious area of Catchment 101 has been adjusted for a runoff coefficient of 0.50 to set the pre-development peak flows. Refer to Pre-Development Drainage Plan (Figure 1) which details the existing drainage conditions on the site.

5.2 Proposed Drainage Conditions

Based on the Site Plan prepared by Architecture 49 (December 2022), the proposed development will consist of two industrial warehouse buildings, associated paved surface parking areas, and landscaped areas. The existing warehouse building and paved parking area will be retained under post-development conditions. Access to the site will be provided from the existing entrance on Colonnade Road South.

The proposed site grading divides the site into three post-development drainage catchment areas consistent with the existing conditions, as shown on the Post-Development Drainage Plan (Figure 2):

- Catchment 201 (A = 1.42 ha) consists of drainage from the proposed building footprints, and paved areas. The minor system stormwater will be collected and conveyed to a proposed underground stormwater management chamber through the internal storm sewer system. The major system stormwater will be conveyed overland to the Colonnade Road right-of-way and ultimately drains towards the Rideau River. The proposed buildings will provide rooftop storage to reduce the overall footprint of the underground storage chamber.

  It should be noted that Catchment 201 has been subdivided into three catchments including 201 A, B, and C to account for Catchment 201 B and C being rooftop controlled prior to collecting in the proposed underground storage chamber.

- Catchment 202 (A = 0.34 ha) consists of uncontrolled drainage from the south and east limits of the site along the Prince of Whales Drive and the CN railway lands. All storm events from this catchment are conveyed overland via sheet flow to the Prince of Whales Drive right-of-way and CN railway lands, mimicking the pre-development drainage outlet conditions.

- Catchment 203 (A = 1.71 ha) consists of drainage from the existing industrial warehouse building, paved parking areas, and associated landscaped areas. The minor system stormwater runoff is collected and conveyed to the storm sewer on Colonnade Road South and Colonnade Road by the existing internal storm sewer system. The major system stormwater runoff is conveyed north via overland flow to the Colonnade Road right-of-way and ultimately drains towards the Rideau River.

Upon development, the minor events for Catchment 201 will be conveyed to the proposed stormwater management chamber through the internal storm sewer network consisting of storm sewers and catchbasins. A combination of the stormwater management chamber and rooftop storage will provide stormwater quantity control prior to being treated by the proposed oil-grit separator located downstream of the underground storage chamber. Following quantity and quality control, minor system stormwater will be conveyed through the existing 525 mm diameter storm lateral to the existing 1050 mm storm sewer within Colonnade Road South, consistent with the existing site conditions. The proposed emergency overland flow route for the site mimics the flow direction and patterns of the existing conditions, discharging north towards Colonnade Road right-of-way.

Table 5 provides details of the catchment areas and runoff coefficients for the post-development conditions.

Table 5: Post-Development Catchment Areas and Runoff Coefficients

Catchment ID	Description	Impervious Area (m^2)	Pervious Area (m^2)	Percent Impervious (%)	Outlet
201 A	Proposed paved areas	7,331	-	100	Colonnade Road South Storm Sewer
201 B	Proposed Building "A"	3,189			
201 C	Proposed Building "B"	3,747			
202	Existing landscaped areas	-	3,410	0	Prince of Whales Drive right-of-way
203	Existing building, paved, and landscaped areas	9,680	7,387	57	Colonnade Road South Storm Sewer

Refer to the Site Grading Plan and Site Servicing Plan (Drawing C102 and Drawing C103, respectively) that illustrate the proposed site drainage and stormwater servicing. Additionally, the Post-Development Drainage Plan (Figure 2) has been prepared to detail the proposed drainage conditions.

6.0 Stormwater Management

Stormwater management and site drainage for the proposed development must adhere to the policies and standards of the City of Ottawa, Rideau Valley Conservation Authority, and Ministry of Environment, Conservation and Parks (MECP).

The stormwater management criteria for the development have been summarized below:

Water Quantity Control

According to the City of Ottawa Pre-Consultation Meeting Notes (August 12, 2021), water quantity controls are required for the site. The pre-consultation requirements include controlling the post-development events up to and including the 100-year event to the 5-year storm pre-development event.

Water Quality Control

At least 80% removal of Total Suspended Solids will be provided with "enhanced protection" as outlined by the Rideau Valley Conservation Authority in the Pre-consultation Meeting Notes dated August 12, 2021. Additionally, correspondence with the Rideau Valley Conservation Authority on March 15, 2022, has been included in Appendix D confirming that enhance "enhanced protection" will be required for the development.

6.1 Stormwater Quantity Control

The Rideau Valley Conservation Authority and City of Ottawa guidelines were referenced to determine the hydrologic parameters for the various catchment areas within the site. The topographic survey prepared by Farley, Smith & Denis Surveying Ltd. (March 2021) was referenced to confirm the land cover and drainage patterns under the existing site conditions. The Geotechnical Report prepared by WSP (January 2022) was reviewed to determine the on-site soil conditions.

Based on the above, the hydrologic parameters for pre-development and post-development conditions were determined and are summarized in Tables 6 and Table 7 below. The detailed hydrologic parameter sheets for each catchment area are included in Appendix D.

Table 6: Pre-Development Hydrologic Parameters

Catchment Description	101	102	103
Drainage Area (ha)	0.98	0.79	1.71
Total Imperviousness (%)	78	-	57
Directly Connected Imperviousness (%)	75	-	27
Curve Number (CN)[1]	86	74	74
Time to peak (hrs)	-	0.10	-

1. Curve number presented as utilized in VO modeling. CN reflects composite curve number for rural catchments modeled using NASHYD routine and curve number for pervious areas only for urban catchments using STANDHYD routine.

Table 7: Post-Development Hydrologic Parameters

Catchment Description	201 A	201 B	201 C	202	203
Drainage Area (ha)	0.73	0.32	0.37	0.34	1.71
Total Imperviousness (%)	100	100	100	-	57
Directly Connected Imperviousness (%)	100	100	100	-	27
Curve Number (CN)[1]	-	-	-	74	74
Time to peak (hrs)	-	-	-	0.07	-

1. Curve number presented as utilized in VO modeling. CN reflects composite curve number for rural catchments modeled using NASHYD routine and curve number for pervious areas only for urban catchments using STANDHYD routine.

Colonnade Road South Storm Sewer Outlet (Catchment 101 & Catchment 201 A,B,C)

As discussed in Section 6.0, stormwater quantity control requirements for the site include controlling all storm events up to and including the 100-year storm event to the 5-year pre-development event.

Visual OTTHYMO (VO) was used to create pre-development and post-development model scenarios for the hydrology of the existing and proposed site drainage based on the City of Ottawa intensity-duration-frequency (IDF) data and hydrologic parameters outlined in Table 6 and 7. The pre-development and post-development flow rates for Catchment 201 (developable area), and storage requirements are summarized below in Table 8. The VO model schematics, full modelling results, and output files are included in Appendix D.

Table 8: Peak Flows and Target Flows Summary (Discharge towards Colonnade Road South Sewer)

Storm (yr)	Pre-Dev. Peak Flow Rate (m^3/s)	Post-Dev. Uncontrolled Peak Flow Rate (m^3/s)	Post-Dev. Controlled Peak Flow Rate (m^3/s)				[1]Max. Volume Required (m^3)	[2]Max. Storage Volume Provided (m^3)
	Catchment							
	101	201 A, B, C	201 A	201 B	201 C	201 A, B, C[3]		
5-yr	0.140	0.407	0.086	0.032	0.032	0.086	585	635
100-yr	0.294	0.700	0.137	0.054	0.053	0.137		

1. Storage required to control 100-year post development flows to the 5-year pre-development flows for Catchments 201 per the VO Model.
2. Storage to be provided by a combination of rooftop storage and underground stormwater chamber.
3. The rooftops will outlet directly to the underground storage tank via roof leaders. This stormwater runoff will be captured in the underground storage unit; therefore, double controlling the runoff. Due to this the cumulative runoff from Catchment 201 A, B, and C is equal to the controlled flows from Catchment 201 A.

The results above indicate that water quantity controls are required to control the 100-year post-development peak flows to the 5-year pre-development target flows. A total storage volume of 585 m^3 of on-site storage is provided through a combination of rooftop and underground storage. An underground storage chamber is proposed to provide 404 m^3 of storage and Building 'A' and Building 'B' will provide 106 m^3 and 125 m^3 of storage, respectively.

A 300 mm diameter orifice tube was sized to meet the required stormwater management peak flow controls, located downstream of the proposed Cupolex Storage System. The Cupolex Storage System is proposed for the site to provide the required stormwater storage, beyond what can be provided on the building rooftops. Preliminary design drawings of the Cupolex System are included in Appendix D.

Zurn roof drains (Model ZCF121-1W-X1-Z-105-10-77 (double notch) or approved equivalent), are proposed to provide the required flow control for each rooftop. Each drain should be designed to provide an overall release rate of 29.8 L/s/meter of head. The roof drains have been designed to provide maximum rooftop storage while maintaining a maximum ponding depth of 0.15 meters. The VO modelling and detailed roof storage calculations can be referenced in Appendix D.

Prince of Whales and CN Railway Lands Drainage Outlet (Catchment 102 & Catchment 202)

The drainage from Catchment 202 consists of landscape runoff from the south and east extents of the development. Stormwater runoff from Catchment 202 will drain uncontrolled to Prince of Whales Drive and the CN railway lands consistent with the pre-development runoff conditions. VO was used to determine the pre-development and post-development flows.

The pre-development and post-development uncontrolled flows comparison is outlined in Table 9.

Table 9: Peak Flow Summary
(Discharge towards Prince of Whales Drive and CN Railway Lands)

Storm Event	Pre-Development 102 (L/s)	Post-Development 202 (L/s)	Difference (%)
5-yr	39	21	-46
100-yr	114	58	-49
*Flow reduction due to a decreased catchment area being direct to Prince of Whales Drive and CN railway lands under post-development conditions (0.79 ha pre-development to 0.34 ha post-development).			

The VO modelling results outlined in Table 9 indicate the uncontrolled flows to Prince of Whales Drive and CN railway lands from the site are reduced for all storm events up to and including the 100-year storm event. The overall peak flow reduction was due to a drainage area reduction of 0.45 ha under post-development conditions directed to Prince of Whales Drive and the CN railway lands. Overall, quantity controls have not been provided for Catchment 202 due to the reduction in overall flows under post-development conditions.

Quantity controls have not been proposed for Catchment 203 as the catchment will remain unchanged under post-development conditions. Therefore, the flows will remain unchanged under post-development conditions.

6.2 Stormwater Quality Control

Stormwater quality controls for the site must incorporate measures to provide "enhanced protection" as outlined by the Rideau Valley Conservation Authority in the Pre-consultation Meeting Notes dated August 12, 2021. Enhanced water quality protection involves the removal of at least 80% of the total suspended solids (TSS) from 90% of the annual runoff volume.

Water quality control for Catchment 201 will be provided using an oil-grit separator (Stormceptor EFO6 or approved equivalent). The oil-grit-separator, located downstream of the underground stormwater storage unit, will provide quality control for runoff before discharging towards the Colonnade Road South storm sewer network.

Catchbasin Shields are also proposed within the proposed catchbasins and the catchbasin maintenance holes, up and downstream of the underground storage chamber. The Catchbasin Shields will provide pre-treatment for the underground storage chamber and downstream receiving sewers. Details of the proposed oil-grit separator and Catchbasin Shields can be referenced in Appendix D.

Catchment 202 will discharge uncontrolled towards Prince of Whales Drive and the CN railway lands, mimicking the existing overland flow conditions. The uncontrolled flows from this catchment are deemed minor and primarily consists of clean runoff (i.e., landscaped areas), therefore quality controls have not been provided for this catchment.

Catchment 203 will remain unchanged between pre-development and post-development conditions. Therefore, quality controls have not been provided for this catchment.

7.0 Erosion and Sediment Controls During Construction

Erosion and sediment controls will be implemented prior to the commencement of any site servicing works for the development and will be maintained throughout construction until the site is stabilized or as directed by the Site Engineer and/or City of Ottawa.

Controls will be inspected after each significant rainfall event and maintained in proper working condition. The Erosion, Removals and Sediment Control Plan (Drawing C101) has been prepared for the development. This plan includes silt fencing, a mud mat, and silt sacks within catchbasins.

Further details on the erosion and control measures have been summarized below:

Sediment Control Silt Fence

Sediment Control Silt Fence will be installed on the perimeter of the site to intercept sheet flow. Additional Sediment Control Silt Fence may be added based on field decisions by the Site Engineer and Owner prior to, during, and following construction.

Mud Mat

A rock mud mat will be installed at the entrance to the site off Colonnade Road South. The rock mud mat will help to prevent mud tracking. All construction traffic will be restricted to the construction entrance as indicated on Drawing C101.

Silt sacks in Catchbasins

A silt sack will be installed in each new catchbasin as they are installed. The silt sack will provide sediment control to prevent silt and sediment from entering the stormwater system. Silt sacks will also be installed on the existing catchbasins during construction to prevent sediment from entering the existing storm sewer pipe.

8.0 Conclusions & Recommendations

This report was prepared in support of the Site Plan Application for the property located at 125 Colonnade Road in the City of Ottawa. The proposed development can be serviced for water, sanitary, and stormwater management in accordance with the City of Ottawa and Rideau Valley Conservation Authority requirements and standards. Our conclusions and recommendations include:

Proposed Water Services

1. The domestic peak hourly water demand for the proposed development is 3.8 L/s. The design fire flow is 183.3 L/s for 2.5 hours.

2. Water demand for the proposed development will be met by connecting a 200 mm diameter PVC water service to the existing 250 mm diameter water service that services the property. The proposed watermain will split into a 200 mm diameter fire line and 100 mm diameter domestic line to service each proposed warehouse building individually.

Proposed Sanitary Services

1. Total peak sanitary flow for the proposed development is 8.3 L/s.

2. Sanitary conveyance for the proposed development will be provided using a 150 mm diameter PVC sanitary sewer which will connect to the existing 150mm sanitary service that services the property. A 150 mm diameter sanitary service lateral is provided for both proposed warehouse buildings.

Stormwater Management

1. The site's stormwater runoff will be collected in catchbasins and conveyed through the storm sewer system for events up to and including the 100-year storm event. The proposed storm sewer system will control the flows to the 5-year pre-development event prior to discharging into the existing sewer on Colonnade Road South. Stormwater runoff from the south and east extents of the site will flow uncontrolled towards Prince of Whales Drive and the CN Railway Lands.

2. Stormwater quantity controls are required to provide on-site storage and conveyance of the 100-year post-development storm event to the 5-year pre-development event. A combination of underground and rooftop storage is proposed to provide the required stormwater quantity controls. Storm events larger than the 100-year event will flow uncontrolled to the Colonnade Road right-of-way.

3. Stormwater quality controls for the site will be provided by an in-line-oil-grit separator (Stormceptor EFO6 or approved equivalent) unit, installed downstream of the proposed underground stormwater storage chamber.

Based on the above conclusions, we recommend the approval of the Site Plan Application from the perspective of servicing and stormwater management.

Respectfully submitted,

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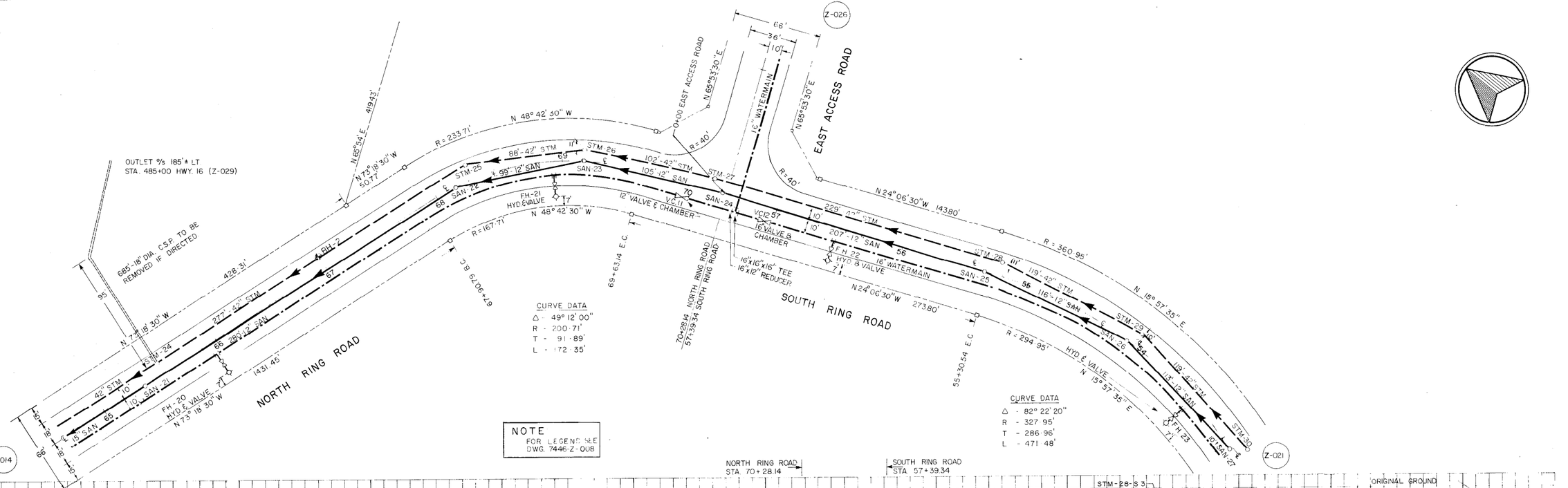
Project Manager

BP/cj

N:\2112- Access Property Dev. Inc\6218- 125 Colonnade Rd\Reports\1st 2nd and 3rd Submission Civil\FSR\2023.01.10_(2112-6218)_FSRSWM.docx

APPENDIX A

As-Constructed Drawings & Background Material



PRINT RECORD		
NO.	FOR	DATE

DATE: Apr 1. 1975

APPROVED:
E.J. COLE, P. ENG.
COMMISSIONER OF WORKS
TOWNSHIP OF NEPEAN

DAMAS AND SMITH LIMITED
CONSULTING ENGINEERS
TORONTO · LONDON · WINNIPEG

REV.	BY	DATE	DESCRIPTION
1	R.D.P	FEB/76	AS-BUILT

TOWNSHIP OF NEPEAN

MERIVALE ACRES INDUSTRIAL COLONY

NORTH RING ROAD STA. 65+60 TO STA. 70+28.14
SOUTH RING ROAD STA. 53+00 TO STA. 57+39.34

DRAWN R.C. | CHECK M.A.
DATE MARCH '75 | ACTIVITY 070
SCALE: 1"= 40' HOR. 1"= 4' VER.
DRAWING No. 7446-Z-015

From: Christie, Nathan <Nathan.Christie@wsp.com>
Sent: Thursday, September 29, 2022 3:13 PM
To: Brett Pond
Cc: Brendan Walton; Ash, Steve
Subject: RE: 125 Colonnade Road - Geotechnical Report (permissible grade)

Categories: Filed to Sharepoint

Hi Brett,

Thanks for chatting just now. Further to our phone conversation, we understand the swale was cut from existing ground to its current elevation; filling it in will therefore likely not exceed the preconsolidation pressure of the underlying silty clay soil. The >1.5 m fill proposed in the swale area is acceptable from a geotechnical perspective.

Please let me know if there are any other questions.

Regards,

Nathan Christie, *(he | him)*
Geotechnical Engineer, P.Eng.

T+ 1 343-961-2911

WSP GOLDER

2611 Queensview Drive, Suite 300, Ottawa, Ontario K2B 8K2

wsp.com | **golder.com**

From: Brett Pond <bpond@cfcrozier.ca>
Sent: September 28, 2022 9:45 AM
To: Christie, Nathan <Nathan.Christie@wsp.com>
Cc: Brendan Walton <bwalton@cfcrozier.ca>
Subject: 125 Colonnade Road - Geotechnical Report (permissible grade)

Good morning Nathan,

I hope all is well! We received the following comment from the City of Ottawa pertaining to the geotechnical report and our grading plan.

“Discuss permissible grade raise restrictions in the geotechnical section of the report. Confirm that the 1.5m grade raise identified in the WSP report are met in the grading design.”

There is an existing swale that will require fill in excess of the 1.5m permissible fill as outlined in your geotechnical report (see attached markup). Can you please confirm if this is acceptable and/or whether

you have any issues with filling in the existing swale with >1.5m of fill? Please do not hesitate to give me a call if you would like to discuss.

Thanks,
Brett

Brett Pond | Engineering Intern
2800 High Point Drive, Suite 100 | Milton, ON L9T 6P4
T: 905.875.0026

Crozier Connections:

Read our latest news and announcements here.

-LAEmHhHzdJzBITWfa4Hgs7pbKI

File No: PC2021-0251

August 12, 2021

Pre-Consultation Meeting Notes

Site Address: 125 Colonnade Road
Location: Virtual – Microsoft Teams
Meeting Date: July 21, 2021

Attendees: Colette Gorni – Planner, City of Ottawa
Jessica Valic – Project Manager (Infrastructure), City of Ottawa
Louise Cerveny – Planner (Parks), City of Ottawa
Patrick McMahon – Project Manager (Transportation), City of Ottawa
Mark Richardson – Planning Forester, City of Ottawa
Jeffrey Ren – Co-op Student, City of Ottawa
Nick Wood – Corbett Land Strategies

Regrets: Mark Young – Planner (Urban Design), City of Ottawa
Sami Rehman – Planner (Environmental), City of Ottawa
Eric Lalande – Rideau Valley Conservation Authority
Jonabelle Ceremuga – Corbett Land Strategies
Frank Abrantes – Property Owner

Applicant's Comments:

1. Access Storage is a self-storage company intends to operate a self-storage facility at this site.
2. The existing building was recently renovated and will be retained – the proposed development will add a new three-storey building connected to the existing building with a two-storey transition building and a new one-storey building connected to the three-storey addition.
3. The proposed building will have sprinklers.
4. 58 parking spaces will be provided.

Staff Comments:

Planning

1. Official Plan (OP) Desigantion – Urban Employment Area (Section 3.6.5)
2. Zoning – IG5 – General Industrial, Subzone 5 (Sections 199 and 200)
    a. Self-storage is considered a "warehouse" use in the Zoning By-law, which is permitted under the current zoning.
    b. The maximum permitted lot coverage is 65% as per Table 199(c).
3. Parking is to be provided at the rates specified for Area C per Schedule 1A:

a. Warehouse – 0.8 per 100 m2 for the first 5000 m2 of gross floor area, and 0.4 per 100 m2 above 5000 m2 of gross floor area.

4. Bicycle parking is to be provided at the rates specified Table 111A of the Zoning By-law:

    a. Warehouse – 1 per 2000 m^2 of gross floor area.

5. Please note that the site is located within an active rail corridor – mainly the Beachburg Rail Corridor, and a small portion of the Smith Falls Rail Corridor. Both are currently being operated by VIA Rail. You are encouraged to consult with VIA Rail while the proposal is still in the early design stages.
    a. Beachburg Rail Corridor – Owned by CN Rail, operated by VIA Rail - Proximity@cn.ca
    b. Smith Falls Rail Corridor – Owned and operated by VIA Rail - Allan Fisher (514) 871-6337
6. Should relief be required from the Zoning By-law for the minimum number of required spaces, or any other provision, please consult with staff prior to submitting a Minor Variance or Zoning By-law Amendment application.

    a. Also, please note that Minor Variances are handled by the Committee of Adjustment. The Planning Department provides comments on Committee of Adjustment applications; however, the Committee of Adjustment makes the decision. For more information on the Committee of Adjustment, including application forms and fees, please visit: https://ottawa.ca/en/city-hall/planning-and development/committee-adjustment. For questions pertaining to forms and fees, please contact the Committee of Adjustment directly at cofa@ottawa.ca.

7. Provide more information on how snow storage will be handled on site. If being stored on site, please show snow storage areas on the site plan.

8. Provide more information on how waste management will be handled on site. Please refer to Section 110(3) of the Zoning By-law for provisions related to outdoor refuse collection and loading areas contained within or accessed via a parking lot.
9. Please retain as many trees as possible

10. Additional tree planting and landscaping is encouraged.

11. Clearly define the on-site circulation with appropriate walkways from the adjacent streets with depressed curbing for accessibility.

12. Staff are concerned with scale of the proposed buildings. Please consider reducing the size of the proposed buildings to provide a more appropriate setback from the adjacent rail corridor.

13. The proposed development is subject to Site Plan Control and will be a “New – Site Plan Control – Complex” application. Application, timeline and fees can be found here.

    a. If the scale of the proposed development is reduced as the design is refined, please confirm the required application type with staff prior to submitting a formal application. For your reference, the general thresholds for different types of Site Plan Control applications can be found here.

Please contact the Planner, Colette Gorni, at Colette.Gorni@ottawa.ca if you have any questions or require additional information relating to the comments above.

Urban Design

1. A design brief is required. A terms of reference is attached.
2. Prince of Wales Drive is scenic entry route, as identified in the Official Plan. The exterior of the building facing Prince of Wales should be designed to recognize the importance of this frontage.
3. Please ensure that landscaping and tree planting is utilized throughout the site.

Please contact the Urban Design Planner, Mark Young, at Mark.Young@ottawa.ca if you have any questions or require additional information relating to the comments above.

Forestry

TCR requirements:

1. A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City

    a. An approved TCR is a requirement of Site Plan approval.

2. As of January 1 2021, any removal of privately-owned trees 10cm or larger in diameter, or publicly (City) owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.

3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR

    a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester

    b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit

4. The TCR must list all trees on site by species, diameter and health condition

5. Please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)

6. The TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site

7. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained

8. All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca

    a. the location of tree protection fencing must be shown on a plan

    b. Show the critical root zone of the retained trees

    c. If excavation will occur within the critical root zone, please show the limits of excavation

9. The City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees.

For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

LP tree planting requirements:

10. Minimum Setbacks:

    a. Maintain 1.5m from sidewalk or MUP/cycle track.

    b. Maintain 2.5m from curb.

    c. Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.

    d. Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.

    e. Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

11. Tree specifications:

    a. Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.

b. Maximize the use of large deciduous species wherever possible to maximize future canopy coverage.

c. Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).

d. Plant native trees whenever possible.

e. No root barriers, dead-man anchor systems, or planters are permitted.

f. No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree).

12. Hard surface planting:

    a. Curb style planter is highly recommended.

    b. No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.

    c. Trees are to be planted at grade.

13. Soil volume:

    a. Adequate soil volumes are met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

*Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

14. Sensitive marine clay:

    a. Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines.

For additional information on the LP tree planting requirements, please contact adam.palmer@Ottawa.ca.

Transportation

1. Ensure that a Transportation Impact Assessment (TIA) Screening form is included prior to preconsultation meetings.

2. It appears that a TIA will be required based on preliminary trip generation estimates.

3. Synchro files are required at Step 4, but it is appreciated if they can be included at step 3. Although a full review of the TIA Strategy report (Step 4) is not required prior to an application, it is strongly recommended.

4. Noise Impact Studies required for the following:

    a. Stationary (if there will be any exposed mechanical equipment due to the proximity to neighbouring noise sensitive land uses).

5. Clear throat requirements for light industrial that is greater than 10,000 m^2 on a collector is 15 m.

6. The protected right of way for the boundary streets should be shown on the site plan and are as follows:

    a. 26m for Colonnade;

    b. 24m for Colonnade South; and,

    c. 40m for Prince of Wales.

7. On site plan:

    a. Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.

    b. Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).

    c. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible

    d. Show lane/aisle widths.

    e. Sidewalk is to be continuous across access as per City Specification 7.1.

8. Ensure that bicycle parking requirements are also met.

9. An update to the TRANS Trip Generation Manual has been completed (October 2020). This manual and trip calculator are to be utilized for this TIA and are available upon request.

10. As the proposed site is commercial/institutional/industrial and for general public use, AODA legislation applies.

Please contact the Transportation Project Manager, Patrick McMahon, at Patrick.McMahon@ottawa.ca if you have any questions or require additional information relating to the comments above.

Engineering

Water

1. Available Watermain: 406mm (DI) – Colonnade Rd S (existing 250mm service is located off this main); 406mmmm (DI) – Colonnade Rd.
    a. Per WDG 4.3.1, where basic demand is greater than 50 m^3/day, there shall be a minimum of two water services, separated by an isolation valve, to avoid creation of vulnerable service area.
    b. Per WDG 4.4.7.2, District Meter Area (DMA) Chamber is required for services greater than 150mm in diameter.
    c. Only one water service is permitted per parcel. If the intent is to provide water service to the proposed storage locker, this must be achieved by branching off the existing water service after the existing water meter. Alternatively, a new service can be installed if required, and existing service blanked at the main. Please demonstrate that the existing water service is adequately sized for increased water use.
    d. Demonstrate that adequate fire flow from fire hydrants and required pressures per City of Ottawa Water Design Guidelines
2. Request Boundary Conditions prior to first submission. Contact assigned City Infrastructure Project Manager with the following information:
    a. Location of service(s)
    b. Type of development
    c. Fire flow (per FUS method – include FUS calculation sheet with boundary condition request – boundary conditions will not be requested without fire flow calculations)
    d. Average Daily Demand (l/s)
    e. Maximum Hourly Demand (l/s)
    f. Maximum Daily Demand (l/s)

Sanitary

3. Available Sanitary Sewer: 300mm (Clay) – Colonnade Rd S

    a. **IMPORTANT**: The West Rideau Trunk Collector (1650mm CONC) traverses this parcel, running along the Southern and Eastern boundaries of the site. No permanent structures are permitted within a 10m easement for this sewer.

    b. Demonstrate that the existing sanitary service is adequately sized for the proposed addition.

    c. Provided the existing service is adequately sized, please CCTV existing lateral to determine the condition of the lateral and submit CCTV video and report with application. If lateral is in poor condition, repair/replacement will be required.

Storm

4. Available Storm Sewer: 1050mm (CONC) – Colonnade Rd S; 450mm (CONC) – Colonnade Rd.

5. Stormwater Management

    a. Quantity Control

        i. Required for the site up to and including the 100-yr storm event.

        ii. Control to the 5-year storm event.

        iii. Time of Concentration (Tc): pre-development or maximum=10min.

        iv. Allowable runoff coefficient(c): Lesser of pre-development or c=0.5.

        v. If underground/inline stormwater storage is proposed, an average release rate equal to 50% of the determined peak allowable rate must be used. Otherwise, disregard the underground/inline storage as available storage or provide modeling to support the proposed design. The reasoning for this restriction is that the discharge rate at full storage is not representative of the discharge rate for more frequent storm events. Halving the discharge rate compensates for the inaccuracies of the modified rational method when underground storage is used.

        vi. Provide both pre and post development stormwater management plans, showing individual drainage areas and their respective coefficient.

        vii. If roof storage is proposed, please provide a roof drainage plan showing the 5 and 100-year storm ponding levels. Include the roof drain type, opening settings, and flow rate.

        viii. Per Technical Bulletin PIEDTB-2016-01 section 8.3.11.1 there shall be no surface ponding on private parking areas during the 2-year storm rainfall event.

ix. Please note that the minimum orifice dia. for a plug style ICD is 83mm and the minimum flow rate from a vortex ICD is 6 L/s in order to reduce the likelihood of plugging.

b. Quality Control: Please consult with the Rideau Valley Conservation Authority (RVCA) regarding water quality control restrictions for the subject site. Include correspondence in servicing report.

c. Ministry of Environment, Conservation, and Parks (MECP): Designer to determine if approval for sewage works under Section 53 of OWRA is required and to determine the type of application required. Reviews will be done through Transfer of Review or Direct Submission.

Phase I and Phase II ESA

6. Phase I ESA is a requirement; Phase II ESA requirement will be dependent on the result of the Phase I ESA.
7. As per the Ministry of the Environment, Guide for Completing Phase One Environmental Site Assessments under Ontario Regulation 153/04, dated June 2011, the date the last work was done on the records review, interviews and site reconnaissance for a Phase I Environmental Site Assessment (ESA) can be no more than 18 months old or an update is required.
8. Phase I ESA must include Ecolog ERIS Report.
9. Phase I ESAs and Phase II ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

Geotechnical Investigation

10. Geotechnical Report is required for this development proposal.
11. If buildings will be slab on grade, Geotechnical Investigation can be tailored appropriately.
12. The Geotechnical Report shall also speak to any proposed underground stormwater storage and provide confirmation that the site subsurface characteristics (groundwater table elevation, soil type) are appropriate. Of note, the high groundwater table must be 1.0m above the bottom of any proposed storage system per MECP requirements.

Exterior Lighting

13. If exterior light fixtures are proposed, provide a plan showing the location of all exterior fixtures and include a table providing fixture details (make, model, mounting heights). All external light fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), resulting in minimal light spillage onto adjacent

properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). Provide certification letter from a relevant Professional Engineer.

Requirements

14. Reports:
    a. Servicing/Stormwater Management Report (Submit completed Servicing Study Checklist with Servicing Report)
    b. Geotechnical Investigation
    c. Phase I ESA
    d. Phase II ESA (depends on outcome of Phase I)
15. Plans:
    a. Site Servicing Plan
    b. Grade Control and Drainage Plan (Show major overland flow route)
    c. Erosion and Sediment Control Plan (Can be combined with grading plan)
    d. Existing Conditions and Removals Plan
    e. SWM Plans

Other

16. A hydro easement may be located in the south western portion of the property. Please contact Hydro Ottawa regarding this easement and any development limitations within the easement.

General Information

17. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications
18. Servicing and site works shall be in accordance with the following documents:
    a. Ottawa Sewer Design Guidelines (October 2012) (including subsequent Technical Bulletins)
    b. Ottawa Design Guidelines – Water Distribution (2010) (including subsequent Technical Bulletins)
    c. Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
    d. Ottawa Standard Tender Documents (latest version)

19. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).
20. Any proposed work in utility easements requires written consent of easement owner.
21. **All submitted report and plan pdf documents to be flattened and unsecured to allow for editing and ease of use.**
22. All documents prepared by Engineers shall be signed and dated on the seal.

Parks

1. There is a large park on Colonnade Road and the area is characterized by large, mature trees.
2. Parks will take cash-in-lieu of parkland equivalent to the value of 2% of the gross land area of the site being developed. The applicant will also be required to pay the $565 appraisal fee.
3. Please consider retaining the trees along Prince of Wales Drive.

Please contact the Parks Planner, Louise Cerveny, at Louise.Cerveny@ottawa.ca if you have any questions or require additional information relating to the comments above.

Environmental

1. No environmental concerns.
2. Please look for opportunities to conserve energy and water through design, as per Section 4.9 of the Official Plan.

Please contact Environmental Planner, Sami Rehman, at Sami.Rehman@ottawa.ca if you have any questions or require additional information relating to the comments above.

City Surveyor

1. The determination of property boundaries, minimum setbacks and other regulatory constraints are a critical component of development. An Ontario Land Surveyor (O.L.S.) needs to be consulted at the outset of a project to ensure properties are properly defined and can be used as the geospatial framework for the development.
2. Topographic details may also be required for a project and should be either carried out by the O.L.S. that has provided the Legal Survey or done in consultation with the O.L.S. to ensure that the project is integrated to the appropriate control network.

Questions regarding the above requirements can be directed to City Surveyor Bill Harper, at Bill.Harper@ottawa.ca.

Corporate Real Estate Office (CREO)

1. REPDO has adopted the Guidelines for New Development in Proximity to Rail Operations, created by the Railway Association of Canada and the Federation of Canadian Municipalities, see: http://proximityissue.wpengine.com/wp-content/uploads/2017/09/2013_05_29_Guidelines_NewDevelopment_E.pdf
    - The main objective is to mitigate railway-oriented impacts such as noise, vibration, and safety hazards, to ensure that the quality of life of a building's occupants and users are not negatively affected and to the maintain the long-term integrity and viability of the corridor.
2. The guidelines are intended to be applied primarily to new residential development but are applicable to other sensitive/occupied dwellings.
3. According the guidelines, a 30-metre setback from the property line to the face of the building is recommended combined with an earthen berm 2 meters above grade (2.5:1) (see page 27 & 38). It is also recommended that a noise and vibration study should be conducted according to page 28 of the guidelines.
4. Appropriate uses within the 30-metre setback area include public and private roads; landscaping, parking spaces/structures; and storage sheds.
5. Consideration to reducing the stated set-back is possible subject to engineered mitigation measures. (such as a crash wall, larger berm etc.)
6. In addition, the guidelines recommended that the future potential and the existence of the rail corridor be registered on title. The following clause should be inserted in all developments, offers to purchase, and agreements of Purchase and Sale or Lease for all developments within 300 meters of the railway right-of-way:

Warning: The City of Ottawa or its assigns or successors in interest has or have a right-of-way within 300 metres from the land subject hereof. There may be alteration to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the environment of the occupants in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwellings. The City of Ottawa will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way

RVCA

1. The RVCA will require enhanced water quality protection for redevelopment, unless water quality is being captured downstream prior to outletting to the Rideau. Please confirm with the RVCA.
2. The site is outside of any identified natural hazards, and is not regulated by the RVCA.

Please contact Eric Lalande, at Eric.Lalande@rvca.ca if you have any questions or require additional information relating to the comments above.

Next Steps:

Please refer to the links to "Guide to preparing studies and plans" and fees for further information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-con comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please do not hesitate to Colette Gorni, at Colette.Gorni@ottawa.ca, if you have any questions.

APPENDIX B

Water Servicing Calculations

Project: 125 Colonnade Road | **Created By:** BP | **Date:** 10/3/2022
Project No.: 2112-6218 | **Checked By:** BW | **Updated:** 1/5/2023

Proposed Domestic Water Demand

Notes & References

Site Area:	3.46	ha
Developable Site Area:	1.76	ha

Site area per Site Plan prepared by Architecture 49 dated December 2022

Design Parameters (Light Industrial)

Average Demand (L/ha/d)
35000

Average Demand from Table 4.2 - Consumption Rates for Subdivisions from Ottawa Design Guidelines - Water Distribution (July 2010)

Average Daily Demand =	121,100	L/day
=	**1.4**	**L/s**

Peaking Factors (Industrial)

Max Day =	1.50
Peak Hour =	1.80

Peaking Factors from Table 4.2 - Consumption Rates for Subdivisions from Ottawa Design Guidelines - Water Distribution (July 2010)

Average Day Flow =	1.4	L/s
Max Day Flow =	**2.1**	**L/s**
Peak Hour Flow =	**3.8**	**L/s**

Max Day = Average Day Demand * Max Day
Peak Hour = Max. Day Demand * Peak Hour

Municipality	Average Daily Water Demand (L/s)	Max Day Demand (L/s)	Peak Hourly Demand (L/s)
City of Ottawa	1.4	2.1	3.8

125 Colonnade Road
Fire Protection Volume Calculation
CFCA File: 2112-6218

Date: 2022.10.04
Designed By: BP
Checked By: BW

Water Supply for Public Fire Protection (2020)
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

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

Where:

F = the required fire flow in litres per minute

C = coefficient related to the type of construction:

=	1.5	for wood frame construction (structure essentially all combustible)
=	0.8	for type IV-A mass timber construction
=	0.9	for type IV-B mass timber construction
=	1.0	for type IV-C mass timber construction
=	1.5	for type IV-D mass timber construction
=	1.0	for ordinary construction (brick or other masonry walls, combustible floor and interior)
=	0.8	for non-combustible construction (unprotected metal structural components)
=	0.6	for fire-resistive construction (fully protected frame, floors, roof)

A = The largest floor area in square meters (plus the following percentages of the total areas of the other floors).

For Construction Coefficient from 1.0 to 1.5:
= 100% of ALL Floor Areas
For Construction Coefficient below 1.0:
- Floors With Any Unprotected Vertical Openings in the Building
= two largest adjoining floors + 50% all floors immediately above (max 8 floors)
- Floors With Any Protected Vertical Openings and Protected Exterior Vertical Communications
= 25% each of two immediately adjoining floors

Proposed Buildings

Area: 3,189 sq.m

A= 4,656 sq.m - Gross floor area (G.F.A) for Building "A" per Site Plan prepared by 49 Architecture dated December 2022
- G.F.A. of largest floor + 25% of each of the two immediately adjoining floors.

C= 0.8 - non-combustible construction (unprotected metal structural components) per email correspondence with Architecture49 dated April 11, 2022.

Therefore RFF = 12,009 L/min

Fire flow determined above shall not exceed:
30,000 L/min for wood frame construction
30,000 L/min for ordinary construction
25,000 L/min for non-combustible construction
25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

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

Occupancy Type: Low Hazard Industrial (F3) Reduction %: -15% - Limited combustible

1,801 L/min reduction
Subtotal = 10,207 L/min

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above may be reduced by up to 50% for complete automatic sprinkler protection.

Automatic Sprinkler Design System	Credit to part of building with coverage
Automatic sprinkler protection designed and installed in accordance with NFPA 13.	30%
Water supply is standard for both the system and Fire Department hose lines.	10%
Fully supervised system.	10%

Reduction %: 50% - Buildings to be sprinklered per email correspondence with Architecture49 dated April 11, 2022.

6,004 L/min reduction
Subtotal = 4,203 L/min

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 30 meters by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	>30 m	0%
10.1 to 20 m	15%		

Exposed buildings

Direction	Distance (m)	Charge	Surcharge (L/min)
North	0	25%	3,002
South	9	20%	2,402
East	>30	0%	0
West	>30	0%	0
Total Surcharge			**5404**

- Building separations per Architecture49 Site Plan dated December 2022.

- Existing one-storey building
- Distance to Proposed Building B

Determine Required Fire Flow

No.1	12,009			
No. 2	1,801 reduction			
No. 3	6,004 reduction			
No. 4	5,404 surcharge			
Required Flow:	**9,607**	**L/min**		
Rounded to nearest 1000 L/min:	**10,000**	**L/min**	or	**167 L/s**
				2,640 USGPM

Note: USGPM = 0.264*(L/min)

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	**2.00**
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

Brett Pond

From: Brett Pond
Sent: Wednesday, November 23, 2022 9:55 AM
To: Rathnasooriya, Shika
Cc: Brendan Walton
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Good morning Shika,

I hope all is well! Thank you for providing the boundary conditions at 125 Colonnade Road (zone 2W2C). We have reviewed the boundary conditions provided on October 27, 2022. The elevation where the boundary conditions are taken from is approximately 84.8 m. Based on this elevation the approximate pressures at 125 Colonnade Road are as follows.

- Minimum Pressure - 39.6 m (56 psi)
- Maximum Pressure - 48.7 m (69.2 psi)
- Max Day + Fire Flow - 39.2 m (55.7 psi)

Based on the Ottawa Design Guidelines – Water Distribution (July 2010) during periods of maximum day and fire flow demand the residual pressure at any point in the distribution system shall not be less than 140 kPa (20 psi.). Per our review the maximum day plus fire flow pressure will exceed the required 20 psi: therefore, we do not see any issues with the available pressures/flows for the proposed development based on the boundary conditions provided.

Kindest regards,
Brett

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: October 27, 2022 1:41 PM
To: Brendan Walton <bwalton@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Brendan,

The following are boundary conditions, HGL, for hydraulic analysis at 125 Colonnade Road (zone 2W2C) assumed to be a dual connection to the 254 mm off Colonnade Road South (see attached PDF for location).

Minimum HGL: 124.4 m

Maximum HGL: 133.5 m

Max Day + FF (183 L/s): 124.0 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.

Regards,

Shika

From: Brendan Walton <bwalton@cfcrozier.ca>
Sent: October 04, 2022 12:13 PM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Brett Pond <bpond@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Shika,

Please see attached updated FUS calculations using the 2020 FUS guidelines. It slightly reduced the calculated flow from 183 L/s to 167 L/s.

Kind regards,

Brendan

Brendan Walton, P.Eng. | Project Manager
2800 High Point Drive, Suite 100 | Milton, ON L9T 6P4
T: 905.875.0026

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: October 4, 2022 11:33 AM
To: Brendan Walton <bwalton@cfcrozier.ca>
Cc: Brett Pond <bpond@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Brendan,

I just received a note from the water department asking that you resubmit using 2020 FUS guidelines. The FUS calculations show that you used 1999 FUS guidelines.

Thank you,
Shika

From: Brendan Walton <bwalton@cfcrozier.ca>
Sent: October 03, 2022 1:27 PM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Brett Pond <bpond@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Shika,

Thank you, understood. We look forward to receiving the boundary conditions.

Kind regards,

Brendan

Brendan Walton, P.Eng. | Project Manager
2800 High Point Drive, Suite 100 | Milton, ON L9T 6P4
T: 905.875.0026

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: October 3, 2022 9:24 AM
To: Brendan Walton <bwalton@cfcrozier.ca>
Cc: Brett Pond <bpond@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Brendan,

I will confirm once I receive the boundary conditions but at this time I don't anticipate any concerns.

Thanks,
Shika

From: Brendan Walton <bwalton@cfcrozier.ca>
Sent: September 29, 2022 9:02 AM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Brett Pond <bpond@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Shika,

Thank you for confirming and for the update. Are there any foreseen concerns with the anticipated water and fire demand calculations?

Kind regards,

Brendan

Brendan Walton, P.Eng. | Project Manager
2800 High Point Drive, Suite 100 | Milton, ON L9T 6P4
T: 905.875.0026

Crozier Connections:

Read our latest news and announcements here.

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: September 28, 2022 8:28 AM
To: Brett Pond <bpond@cfcrozier.ca>
Cc: Brendan Walton <bwalton@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Brett,

The current turnaround time for boundary conditions is 3 weeks. Once I receive them I will send them your way.

I can however confirm that there are no concerns with the proposed sanitary flow.

Thank you,
Shika

From: Brett Pond <bpond@cfcrozier.ca>
Sent: September 27, 2022 10:16 AM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Brendan Walton <bwalton@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Shika,

I hope all is well. I just wanted to follow up on the watermain boundary conditions and sanitary downstream capacity for 125 Colonnade. Can you please confirm if you are able to provide the requested information as we are required to include it in our second submission package.

Thanks,
Brett

Brett Pond | Engineering Intern
2800 High Point Drive, Suite 100 | Milton, ON L9T 6P4
T: 905.875.0026

Crozier Connections:

Read our latest news and announcements here.

From: Brett Pond
Sent: Wednesday, September 14, 2022 9:47 AM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Brendan Walton <bwalton@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Shika,

Please see the attached FUS calculations for 125 Colonnade Road. Please let me know if you require any additional information.

Thanks,
Brett

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: Wednesday, September 14, 2022 8:31 AM
To: Brett Pond <bpond@cfcrozier.ca>
Cc: Brendan Walton <bwalton@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Hi Brett,

Can you please send along a PDF of the latest FUS calculations that was completed to result in 183 L/s.

Thank you,
Shika

From: Brett Pond <bpond@cfcrozier.ca>
Sent: September 13, 2022 10:01 AM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Brendan Walton <bwalton@cfcrozier.ca>
Subject: RE: D07-12-22-0095 - 125 Colonnade Road - Infrastructure Boundary Conditions

Good morning Shika,

I would like to request information regarding the sanitary sewer and watermain fronting the site located at 125 Colonnade Road. Please see the most up to date Site Plan (attached) and the proposed water and sanitary demands for the proposed development below.

Sanitary – Peak Development Sanitary Flow = 7.9 L/s

Can you please confirm if the receiving sewer on Colonnade Road South and the downstream sewer network can accommodate the proposed site flows? Note that light industrial flows are calculated on an area basis, so the pre-development and post-development design flows are the "same".

Watermain – Average Day Demand = 1.4 L/s
Max Day Demand = 2.1 L/s
Peak Hour Demand = 3.8 L/s
Fire Flow = 183.3 L/s for 2.5 hours

Can you please provide the boundary conditions for the watermain on Colonnade Road South fronting the property?

APPENDIX C

Sanitary Servicing Calculations

Proposed Sanitary Design Flow

Site Area: 3.46 ha

Site area per Site Plan prepared by Architecture 49 dated December 2022

Design Parameters (Light Industrial)

Average Flow (L/ha/d)
35000

Average Flow from Section 4.4.1.3 - Industrial Flows of City of Ottawa Sewer Design Guidelines (October 2012)

Sanitary Design Flow:

Average Daily Flow = 121100 L/d
= **1.40** **L/s**

Peak Factor: 5.25 (light industrial)

Peak Flow: **7.36** **L/s**

Peaking Factor from Appendix 4-B - Peaking Factors for Industrial Areas of City of Ottawa Sewer Design Guidelines (October 2012)

Infiltration Flow:

Infiltration = 0.280 L/s/ha
Total Infiltration = **0.97** **L/s**

Infiltration Allowance from Section 4.4.1.4 of City of Ottawa Sewer Design Guidelines (October 2012)

Municipality	**Peak Flow** (L/s)	**Infiltration Flow** (L/s)	**Overall Peak Development Flow** (L/s)
City of Ottawa	7.4	1.0	8.3

Total Design Flow = Industrial Peak Flow + Total Infiltration

Notes & References

125 Colonnade Road South

2112-6218

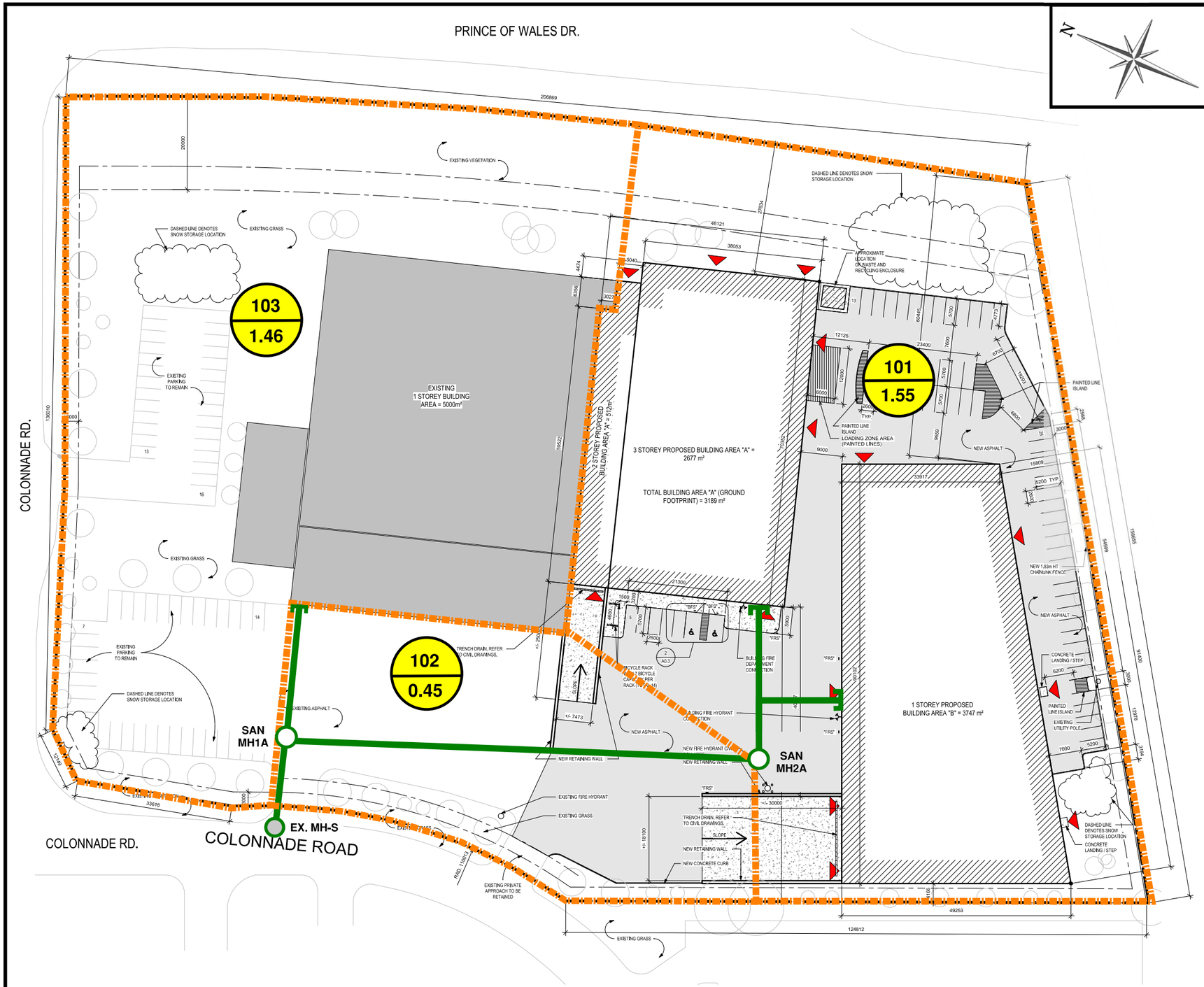
SANITARY SEWER DESIGN SHEET

CROZIER CONSULTING ENGINEERS

Mannings "n":	0.013
Peak Factor (M):	1+(14/4+(P/1000)^0.5)
Industrial Avg. Daily/Capita Flow (m3/ha.d):	35.0
Infiltration Q (L/s/ha):	0.280

DESIGNED BY: BP
CHECKED BY: BW
DATE: 2022.09.28
REVISION NO.: 0
REVISED BY: N/A
DATE: N/A

CATCHMENT ID	FROM MH NO	TO MH NO	AREA (Ha)	INDUSTRIAL BUILDING AREA	INDUSTRIAL PEAK FACTOR	INDUSTRIAL AVG. FLOW (l/s)	INDUSTRIAL MAX. FLOW (l/s)	MAX FLOW (l/s)	INFILT. (l/s)	TOTAL INFILT. (l/s)	TOTAL FLOW (l/s)	LENGTH (m)	PIPE DIAM. (mm)	UPPER INV. EL.	LOWER INV. EL.	UPPER OBV. EL.	LOWER OBV. EL.	SLOPE (%)	CAP. (l/s)	CAP. (%)	FULL FLOW VELOCITY (m/s)	(q/Q)	(d/D) From HEG	(v/V) From HEG	ACT. VEL. (m/s)
101	Building A & B	MH2A	1.55	1.55	5.25	0.63	3.30	3.30	0.43	0.01	**3.3**	31.0	150	83.70	83.39	83.85	83.54	1.0%	**15.23**	**21.7%**	0.86	0.22	0.32	0.80	0.69
102	MH2A	MH1A	0.45	0.45	5.25	0.18	0.96	0.96	0.13	0.56	**4.8**	100.0	150	83.33	82.33	83.48	82.48	1.0%	**15.23**	**31.6%**	0.86	0.06	0.16	0.54	0.47
103	MH1A	MH-S	1.46	1.46	5.25	0.59	3.11	3.11	0.41	0.97	**8.3**	19.5	150	82.27	81.90	82.42	82.05	0.4%	**9.51**	**87.6%**	0.54	0.33	0.40	0.90	0.48



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CROZIER CONSULTING ENGINEERS

LEGEND

ID / A — ID = Catchment ID; A = Catchment Area (Ha)

Existing Sanitary MH

Proposed Sanitary MH

PROPOSED SANITARY CATCHMENT AREAS

125 COLONNADE ROAD SOUTH

2022-10-14
Project No.: 2112-6218
Created: KIR
Checked: BP/BW

APPENDIX D

Stormwater Servicing Calculations

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **101**
D.A. AREA (ha) **0.98**

Hydrologic Parameters: CALIB STANDHYD Command
Pre Development Drainage Area: Catchment 101

Curve Number Calculation

Soil Types Present per Soil Map of Carleton County				
Type	ID	Hydrologic	% Area	Area
Rideau Clay	Rc	C	100	0.98
				0
				0
				0
Total Area Check				0.98

Note: CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012) per Table 5.9 - CN Values for Various Soil Groups

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	98	0.24	89	0.49	98	0.03	98	0.00	98	0.76	72.2
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.00		0.24		0.49		0.03		0.00		0.76	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00		0.00		0.00		0.22	86	0.00		0.22	18.8
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
Subtotal Area	0.00		0.00		0.00		0.22		0.00			

Pervious Area Calculations	Total Pervious Area	0.22	
	Composite Pervious Curve Number	86	
Impervious Area Calculations	Total Directly Connected Area	0.73	
	Total Indirectly Connected Area	0.03	
	Total Impervious Area	0.76	
	% X imp	74.5	
	% T imp	77.6	
	Total Area Check	0.98	

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.22	1.10
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	5.00%	28	0.25
Impervious	2.0	0.75%	80	0.013

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **102**
D.A. AREA (ha) **0.79**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment 102

Curve Number Calculation

Soil Types Present per Carleton County Soils Map (1963):				
Type	ID	Hydrologic Group	% Area	Area
Rideau Clay	Rc	C	100	0.79
				0.00
				0
				0
Total Area				0.79

Note: RC and CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012)

Impervious Landuses Present:														
	Gravel		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	85	0.00	98	0.00	98	0.00	98	0.00	98	0.00	0.00
0		85		98		98		98		98	0	0
0		85		98		98		98		98	0	0
0		85		98		98		98		98	0	0
Subtotal	0.00		0.00		0.00		0.00		0.00			

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00		0.00		0.00		0.79	74	0.00		0.79	58.23
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal	0.00		0.00		0.00		0.79		0.00			

Composite Area Calculations		
	Total Pervious Area	0.79
	Total Impervious Area	0.00
	% Impervious	0.00%
	Composite Curve Number	74.0
	Total Area Check	0.79

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
				Rideau Clay								
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0	0		0		0		0		0	0
Meadow	8	0	0		0		0		0		0	0
Wetland	16	0	0		0		0		0		0	0
Lawn	5	0.7869	3.9345	0.25	0.79		0		0		0	0.19673
Cultivated	7	0.00	0.00		0		0		0		0	0.00
Impervious	2	0.00	0.00		0		0		0		0	0.00
Composite		0.79	5.00	Composite Runoff Coefficient								0.25

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Sheet Flow	43	3.59	8.35%	2.7	0.78	0.02	0.01	0.01	0.03	0.02	0.15	0.10

Appropriate calculated time to peak:	0.10	Appropriate Method:	Airport

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **103**
D.A. AREA (ha) **1.71**

Hydrologic Parameters: CALIB STANDHYD Command
Pre Development Drainage Area: Catchment 103

Curve Number Calculation

Soil Types Present per Soil Map of Carleton County				
Type	ID	Hydrologic	% Area	Area
Rideau Clay	Rc	C	100	1.71
				0
				0
				0
Total Area Check				1.71

Note: CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012) per Table 5.9 - CN Values for Various Soil Groups

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	98	0.00	76	0.47	98	0.50	98	0.00	98	0.97	94.9
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.00		0.00		0.47		0.50		0.00		0.97	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00		0.00		0.00		0.74	74	0.00		0.74	54.7
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
Subtotal Area	0.00		0.00		0.00		0.74		0.00			

Pervious Area Calculations	Total Pervious Area	0.74
	Composite Pervious Curve Number	74
Impervious Area Calculations	Total Directly Connected Area	0.47
	Total Indirectly Connected Area	0.50
	Total Impervious Area	0.97
	% X imp	27.3
	% T imp	56.7
	Total Area Check	1.71

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.74	3.69
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	4.00%	55	0.25
Impervious	2.0	0.75%	80	0.013

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **201A**
D.A. AREA (ha) **0.73**

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment 201A (Paved Parking Areas)

Curve Number Calculation

Soil Types Present per Soil Map of Carleton County				
Type	ID	Hydrologic	% Area	Area
Rideau Clay	Rc	C	100	0.73
				0
				0
				0
Total Area Check				0.73

Note: CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012) per Table 5.9 - CN Values for Various Soil Groups

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	98	0.00	76	0.73	98	0.00	98	0.00	98	0.73	71.8
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.00		0.00		0.73		0.00		0.00		0.73	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00		0.00		0.00		0.00		0.00		0.00	0.0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
Subtotal Area	0.00		0.00		0.00		0.00		0.00			

Pervious Area Calculations	Total Pervious Area	0.00	
	Composite Pervious Curve Number	NA	
Impervious Area Calculations	Total Directly Connected Area	0.73	
	Total Indirectly Connected Area	0.00	
	Total Impervious Area	0.73	
	% X imp	100.0	
	% T imp	100.0	
	Total Area Check	0.73	

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.00	0.00
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	NA	NA	NA	0.25
Impervious	2.0	0.50%	50	0.013

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **201B**
D.A. AREA (ha) **0.32**

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment 201B (Building A)

Curve Number Calculation

Soil Types Present per Soil Map of Carleton County				
Type	ID	Hydrologic	% Area	Area
Rideau Clay	Rc	C	100	0.32
				0
				0
				0
Total Area Check				0.32

Note: CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012) per Table 5.9 - CN Values for Various Soil Groups

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	98	0.00	76	0.00	98	0.32	98	0.00	98	0.32	31.3
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.00		0.00		0.00		0.32		0.00		0.32	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00		0.00		0.00		0.00		0.00		0.00	0.0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
Subtotal Area	0.00		0.00		0.00		0.00		0.00			

	Pervious Area Calculations	Total Pervious Area	0.00
		Composite Pervious Curve Number	NA
	Impervious Area Calculations	Total Directly Connected Area	0.32
		Total Indirectly Connected Area	0.00
		Total Impervious Area	0.32
		% X imp	100.0
		% T imp	100.0
		Total Area Check	0.32

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.00	0.00
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	NA	NA	NA	0.25
Impervious	2.0	2.00%	10	0.013

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **201C**
D.A. AREA (ha) **0.37**

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment 201C (Building B)

Curve Number Calculation

Soil Types Present per Soil Map of Carleton County				
Type	ID	Hydrologic	% Area	Area
Rideau Clay	Rc	C	100	0.37
				0
				0
				0
Total Area Check				0.37

Note: CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012) per Table 5.9 - CN Values for Various Soil Groups

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	98	0.00	76	0.00	98	0.37	98	0.00	98	0.37	36.7
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.00		0.00		0.00		0.37		0.00		0.37	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00		0.00		0.00		0.00		0.00		0.00	0.0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
Subtotal Area	0.00		0.00		0.00		0.00		0.00			

	Pervious Area Calculations	Total Pervious Area	0.00
		Composite Pervious Curve Number	NA
	Impervious Area Calculations	Total Directly Connected Area	0.37
		Total Indirectly Connected Area	0.00
		Total Impervious Area	0.37
		% X imp	100.0
		% T imp	100.0
		Total Area Check	0.37

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.00	0.00
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	NA	NA	NA	0.25
Impervious	2.0	2.00%	10	0.013

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **202**
D.A. AREA (ha) **0.34**

Hydrologic Parameters: CALIB NASHYD Command
Post Development Drainage Area: Catchment 202

Curve Number Calculation

Soil Types Present per Carleton County Soils Map (1963):				
Type	ID	Hydrologic Group	% Area	Area
Rideau Clay	Rc	C	100	0.34
				0.00
				0
				0
Total Area				0.34

Note: RC and CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012)

Impervious Landuses Present:														
	Gravel		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	85	0.00	98	0.00	98	0.00	98	0.00	98	0.00	0.00
0		85		98		98		98		98	0	0
0		85		98		98		98		98	0	0
0		85		98		98		98		98	0	0
Subtotal	0.00		0.00		0.00		0.00		0.00			

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	49	0.00		0.00		0.34	74	0.00		0.34	25.23
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal	0.00		0.00		0.00		0.34		0.00			

Composite Area Calculations		
	Total Pervious Area	0.34
	Total Impervious Area	0.00
	% Impervious	0.00%
	Composite Curve Number	74.0
	Total Area Check	0.34

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
				Rideau Clay								
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0	0		0		0		0		0	0
Meadow	8	0	0		0		0		0		0	0
Wetland	16	0	0		0		0		0		0	0
Lawn	5	0.34	1.71	0.25	0.34		0		0		0	0.08525
Cultivated	7	0.00	0.00		0		0		0		0	0.00
Impervious	2	0.00	0.00		0		0		0		0	0.00
Composite		0.34	5.00	Composite Runoff Coefficient								0.25

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Sheet Flow	30	3.60	12.00%	2.7	0.94	0.01	0.01	0.01	0.02	0.01	0.11	0.07

Appropriate calculated time to peak:	0.07	Appropriate Method:	Airport

Project Name: 125 Colonnade Road
Project Number: 2112-6218
Date: 3/16/2022
By: BP

D.A. NAME **203**
D.A. AREA (ha) **1.71**

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment 203

Curve Number Calculation

Soil Types Present per Soil Map of Carleton County				
Type	ID	Hydrologic	% Area	Area
Rideau Clay	Rc	C	100	1.71
				0
				0
				0
Total Area Check				1.71

Note: CN values obtained from City of Ottawa Sewer Design Guidelines (October 2012) per Table 5.9 - CN Values for Various Soil Groups

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00	98	0.00	76	0.47	98	0.50	98	0.00	98	0.97	94.9
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.00		0.00		0.47		0.50		0.00		0.97	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Rc	0.00		0.00		0.00		0.74	74	0.00		0.74	54.7
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
0	0.00		0.00		0.00		0.00		0.00		0	0
Subtotal Area	0.00		0.00		0.00		0.74		0.00			

Pervious Area Calculations	Total Pervious Area	0.74
	Composite Pervious Curve Number	74
Impervious Area Calculations	Total Directly Connected Area	0.47
	Total Indirectly Connected Area	0.50
	Total Impervious Area	0.97
	% X imp	27.3
	% T imp	56.7
	Total Area Check	1.71

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.74	3.69
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	4.00%	55	0.25
Impervious	2.0	0.75%	80	0.013

CROZIER
CONSULTING ENGINEERS

Project: 125 Colonnade Road
Project No.: 2112-6218
Created By: BP
Checked By: BW
Date: 10/11/2022
Updated: 10/11/2022

Underground Storage Rating Curve

Underground Storage Tank Specifications

Depth =	0.7	m
Volume Required =	351.00	m^3
Volume Provided =	404.17	m^3
Diameter of Orifice =	300	mm
Orifice Plate Coefficient =	0.64	

Underground Storage Rating Curve

Depth (m)	Flow Rate (m^3/s)	*Storage (ha.m)
0	0.0000	0.0000
0.2	0.0448	0.0118
0.4	0.1002	0.0237
0.6	0.1344	0.0352
0.7	0.1486	0.0404

*Storage volume per Cuplox Stage Storage (2022.10.11)

Notes

Based on VO Model (October 2022)
Per Cupolex Stage Storage (2022.10.11)

Flow rate per orifice head calculations. Assumed square tank. Rating curve to be confirmed by manufacturer during detailed design.

CROZIER
CONSULTING ENGINEERS

Project: 125 Colonnade Road
Project No.: 2112-6218
Created By: BP
Checked By: BW
Date: 10/11/2022
Updated: 10/11/2022

Orifice Plate Design Summary

Orifice Type =	Orifice Plate		**Notes**
Invert Elevation =	82.77	m	Based on underground storage tank invert.
Diameter of Orifice =	300	mm	
Area of Orifice (A) =	0.07	sq.m	
Orifice Coefficient (Cd) =	0.64		
Calculation of Head			
Centroid Elevation =	82.92	m	
Water Elevation =	83.47	m	Based on obvert of underground storage tank.
Upstream Head (h) =	0.55	m	
Q_a =	**(Cd)(A)(2gh)^0.5**		
Actual Controlled Discharge, Q_a =	**0.15**	**cms**	
Actual Controlled Discharge, Q_a =	**148.61**	**L/s**	

CROZIER CONSULTING ENGINEERS

125 Colonnade Road South
STORM SEWER DESIGN SHEET

5 YEAR DESIGN STORM - City of Ottawa
A 998.071 **B** 0.814 **C** 6.053

PROJECT: 125 Colonnade Road
PROJECT No.: 2112-6218
FILE: Storm Sewer Design
DATE: 2022/09/28
Revised: 2022/10/17
Design: BP
Check: BW

INITIAL TIME OF CONCENTRATION (min) 10.00 MANNINGS "n" 0.013

Catchment ID	FROM MH NO	TO MH NO	AREA (A) Ha	RUN-OFF COEFF	A x C	Cummul. A x C	TIME OF CONC. min	I mm/hr	Q[1] l/sec (per VO)	Q l/sec	SLOPE %	PIPE DIA. mm	Area m2	VEL. m/sec	Q/A m/s	Hv m	LENGTH m	TIME OF FLOW min	CAPACITY l/sec	% CAPACITY
103	STM DCB 5	STM MH 4	0.26	0.90	0.23	0.23	10.00	104.19	-	**67.78**	1.00	375	0.11	1.59	0.61	0.02	21.0	0.22	**175.33**	39
	STM MH 4	STM MH 3	0.00	0.90	0.00	0.23	10.22	103.04	-	**67.03**	0.50	375	0.11	1.12	0.61	0.02	43.6	0.65	**123.98**	54
	STM MH 3	U/S Tank	0.00	0.90	0.00	0.23	10.87	99.82	-	**64.94**	0.50	375	0.11	1.12	0.59	0.02	14.0	0.21	**123.98**	52
104	STM DCB 1	STM MH 2	0.39	0.90	0.35	0.35	10.00	104.19	-	**101.33**	1.00	375	0.11	1.59	0.92	0.04	15.0	0.16	**175.33**	58
105	Trench Drain	STM MH 2	0.06	0.90	0.05	0.05	10.00	104.19	-	**14.58**	1.40	150	0.02	1.02	0.83	0.03	31.0	0.51	**18.02**	81
	STM MH 2	U/S Tank	0.00	0.90	0.00	0.40	10.51	101.59	-	**115.91**	1.00	375	0.11	1.59	1.05	0.06	14.5	0.15	**175.33**	66
106	Trench Drain	U/S Tank	0.02	0.90	0.02	0.02	10.00	104.19	-	**4.98**	2.00	150	0.02	1.22	0.28	0.00	6.0	0.08	**21.54**	23
101	Building 'B'	U/S Tank	0.32	0.90	-	-	-	-	**32.00**	**-**	-	-	-	-	-	-	-	-	**-**	
102	Building 'A'	U/S Tank	0.37	0.90	-	-	-	-	**32.00**	**-**	-	-	-	-	-	-	-	-	**-**	
	U/S Tank	STM OGS	0.00	0.90	0.00	0.65	11.08	98.83	**92.00**	**-**	1.00	375	0.11	1.59	0.83	0.04	2.1	0.02	**175.33**	52
107	Ex STM CB	Ex STM MH	0.24	0.90	0.22	0.22	10.00	104.19	-	**62.46**	22.10	200	0.03	4.91	1.99	0.20	2.3	0.01	**154.19**	41
	STM OGS	Ex STM MH	0.00	0.90	0.00	0.65	11.10	98.73	**-**	**154.46**	0.20	525	0.22	0.89	0.71	0.03	100.0	1.88	**192.33**	80
108	Ex STM CB	Ex STM MH	0.20	0.90	0.18	0.18	10.00	104.19	-	**52.68**	2.00	200	0.03	1.48	1.68	0.14	22.1	0.25	**46.38**	114
	Ex STM MH	STM MH-ST	0.00	0.00	0.00	1.05	12.97	90.73	-	**207.14**	0.30	525	0.22	1.09	0.96	0.05	22.3	0.34	**235.55**	88

Notes: 1. The flow from all building will be controlled via. rooftop controls. Therefore, the fixed flow rate from the VisualOtthymo model has been included as the flow for these areas.
2. All sewers are designed for 5-year controlled flow from the development.
3. The flow from the underground storage tank will be controlled via. an orifice. Therefore, the fixed flow rate from the VisualOtthymo model has been included as the outflow from the underground tank.
4. All existing pipe inverts to be confirmed prior to construction.

CROZIER CONSULTING ENGINEERS

125 Colonnade Road South
STORM SEWER DESIGN SHEET

100 YEAR DESIGN STORM - City of Ottawa
A 1735.688 **B** 0.82 **C** 6.014

PROJECT: 125 Colonnade Road
PROJECT No.: 2112-6218
FILE: Storm Sewer Design
DATE: 2022/09/28
Revised: 2022/10/17
Design: BP
Check: BW

INITIAL TIME OF CONCENTRATION (min) 10.00 MANNINGS "n" 0.013

Catchment ID	FROM MH NO	TO MH NO	AREA (A) Ha	RUN-OFF COEFF	A x C	Cummul. A x C	TIME OF CONC. min	I mm/hr	Q[1] l/sec (per VO)	Q l/sec	SLOPE %	PIPE DIA. mm	Area m2	VEL. m/sec	Q/A m/s	Hv m	LENGTH m	TIME OF FLOW min	CAPACITY l/sec	% CAPACITY
103	STM DCB 5	STM MH 4	0.26	0.90	0.23	0.23	10.00	178.56	-	**116.16**	1.00	375	0.11	1.59	1.05	0.06	21.0	0.22	**175.33**	66
	STM MH 4	STM MH 3	0.00	0.90	0.00	0.23	10.22	176.57	-	**114.86**	0.50	375	0.11	1.12	1.04	0.06	43.6	0.65	**123.98**	93
	STM MH 3	U/S Tank	0.00	0.90	0.00	0.23	10.87	171.00	-	**111.24**	0.50	375	0.11	1.12	1.01	0.05	14.0	0.21	**123.98**	90
104	STM DCB 1	STM MH 2	0.39	0.90	0.35	0.35	10.00	178.56	-	**173.65**	1.00	375	0.11	1.59	1.57	0.13	15.0	0.16	**175.33**	99
105	Trench Drain	STM MH 2	0.06	0.90	0.05	0.05	10.00	178.56	-	**24.99**	1.40	150	0.02	1.02	1.41	0.10	31.0	0.51	**18.02**	139
	STM MH 2	U/S Tank	0.00	0.90	0.00	0.40	10.51	174.06	-	**198.63**	1.00	375	0.11	1.59	1.80	0.16	14.5	0.15	**175.33**	113
106	Trench Drain	U/S Tank	0.02	0.90	0.02	0.02	10.00	178.56	-	**8.53**	2.00	150	0.02	1.22	0.48	0.01	6.0	0.08	**21.54**	40
101	Building 'B'	U/S Tank	0.37	0.90	-	-	-	-	**54.00**	**-**	-	-	-	-	-	-	-	-	**-**	
102	Building 'A'	U/S Tank	0.32	0.90	-	-	-	-	**53.00**	**-**	-	-	-	-	-	-	-	-	**-**	
	U/S Tank	STM OGS	0.00	0.90	0.00	0.65	11.08	169.29	**137.00**	**-**	1.00	375	0.11	1.59	1.24	0.08	2.1	0.02	**175.33**	78
107	Ex STM CB	Ex STM MH	0.24	0.90	0.22	0.22	10.00	178.56	-	**107.04**	22.10	200	0.03	4.91	3.41	0.59	2.3	0.01	**154.19**	69
	STM OGS	Ex STM MH	0.00	0.90	0.00	0.65	11.10	169.11	**-**	**244.04**	0.20	525	0.22	0.89	1.13	0.06	100.0	1.88	**192.33**	127
108	Ex STM CB	Ex STM MH	0.20	0.90	0.18	0.18	10.00	178.56	-	**90.27**	2.00	200	0.03	1.48	2.87	0.42	22.1	0.25	**46.38**	195
	Ex STM MH	STM MH-ST	0.00	0.00	0.00	1.05	12.97	155.28	-	**334.32**	0.30	525	0.22	1.09	1.54	0.12	22.3	0.34	**235.55**	142

Notes: 1. The flow from all building will be controlled via. rooftop controls. Therefore, the fixed flow rate from the VisualOtthymo model has been included as the flow for these areas.
2. All sewers are designed for 5-year controlled flow from the development.
3. The flow from the underground storage tank will be controlled via. an orifice. Therefore, the fixed flow rate from the VisualOtthymo model has been included as the outflow from the underground tank.
4. All existing pipe inverts to be confirmed prior to construction.

CROZIER CONSULTING ENGINEERS

Project	125 Colonnade Road South
Project Number:	2112-6218
Date:	10/17/2022
Revised:	

Manhole Loss

Upstream MH	Diameters (mm) U/S MH	Pipe In	Pipe Out	Bend Angle	K_O	C_D	C_d	C_Q	C_B	K_{tot}	HL_{MH} (m)
STM MH 3	1200	375.00	375.00	90.00	1.67	1.00	0.64	1.00	1.00	1.06	0.05
STM MH 4	1200	375.00	375.00	45.00	1.27	1.00	0.52	1.00	1.00	0.66	0.03
STM DCB 5	0	0.00	375.00	0.00	1.00	1.00	0.32	1.00	1.00	0.32	0.02

Manhole Loss

Upstream MH	Diameters (mm) U/S MH	Pipe In	Pipe Out	Bend Angle	K_O	C_D	C_d	C_Q	C_B	K_{tot}	HL_{MH} (m)
STM MH 2	1200	375.00	375.00	90.00	1.67	1.00	0.68	1.08	1.00	1.22	0.19
STM DCB 1	0	0.00	375.00	0.00	0.00	1.00	0.50	1.00	1.00	0.00	0.00
Trench Drain	0	0.00	150.00	0.00	0.00	1.00	0.79	1.00	1.00	0.00	0.00

DESIGN PARAMETERS

Cq = correction factor for relative flow (more than one inlet pipe to structure)
$Cq = (1-2\sin\theta) * (1-(Qi/Qo))^{0.75} + 1$
θ = angle between inflow and outlfow pipes (degrees)

Qi = flow in the inflet pipe
Qo = flow in the outlet pipe

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CONSULTING ENGINEERS

LOCATION	MANHOLE		INVERT ELEVATION		OBVERT ELEVATION		GROUND ELEVATION	COVER	MAX WSE	PIPE PARAMETERS					*TOTAL FLOW	Q_{cap}	Q_{pk}/Q_{cap}	COMPUTATIONAL COLUMNS					HEAD LOSS	SURCHARGE	HGL			PIPE SLOPE
	Upstream	Downstream	U/S (m)	D/S (m)	U/S (m)	D/S (m)	Upstream (m)	Upstream (m)	Upstream (m)	Dia (mm)			Length (m)	'n'	(m^3/s)	(m^3/s)		Pipe Area (m^2)	L/D	Friction Factor (f)	Velocity V (m/s)	$V^2/2g$	HL (m)	Upstream (m)	U/S (m)	D/S (m)	SLOPE (%)	(%)
STM DCB 5 Capture Analysis																								**84.47**	**100yr water level, U/S Tank**			
	STM MH 3	U/S Tank	83.96	83.87	84.34	84.25	85.88	1.55	85.88	375			14.00	0.013	0.111	0.147	0.76	0.114	37	0.0290	0.98	0.05	0.10	0.24	84.57	84.47	0.74	0.50
	STM MH 4	STM MH 3	84.24	84.02	84.62	84.40	86.05	1.44	86.05	375			43.60	0.013	0.115	0.130	0.88	0.114	114	0.0290	1.01	0.05	0.21	0.16	84.78	84.57	0.47	0.50
125 Colonnade Road South	STM DCB 5	STM MH 4	84.48	84.27	84.86	84.65	85.80	0.94	86.05	375			21.00	0.013	0.116	0.183	0.64	0.114	55	0.0290	1.02	0.05	0.10	0.03	84.88	84.78	0.48	1.00

LOCATION	MANHOLE		INVERT ELEVATION		OBVERT ELEVATION		GROUND ELEVATION	COVER	MAX WSE	PIPE PARAMETERS					*TOTAL FLOW	Q_{cap}	Q_{pk}/Q_{cap}	COMPUTATIONAL COLUMNS					HEAD LOSS	SURCHARGE	HGL			PIPE SLOPE
	Upstream	Downstream	U/S (m)	D/S (m)	U/S (m)	D/S (m)	Upstream (m)	Upstream (m)	Upstream (m)	Dia (mm)			Length (m)	'n'	(m^3/s)	(m^3/s)		Pipe Area (m^2)	L/D	Friction Factor (f)	Velocity V (m/s)	$V^2/2g$	HL (m)	Upstream (m)	U/S (m)	D/S (m)	SLOPE (%)	(%)
STM DCB 1 Capture Analysis																								**100yr water level, U/S Tank**		**84.47**		
	STM MH 2	U/S Tank	84.02	83.87	84.40	84.25	85.47	1.08	85.47	375			14.50	0.013	0.199	0.186	1.07	0.114	38	0.0290	1.74	0.15	0.36	0.44	84.83	84.47	2.48	1.00
	STM DCB 1	STM MH 2	84.23	84.08	84.61	84.46	85.23	0.63	85.40	375			15.00	0.013	0.174	0.183	0.95	0.114	39	0.0290	1.52	0.12	0.14	0.36	84.97	84.83	0.90	1.00
125 Colonnade Road South	Trench Drain	STM MH 2	84.60	84.18	84.75	84.33	84.90	0.15	85.20	150			31.00	0.013	0.009	0.018	0.46	0.018	203	0.0394	0.47	0.01	0.09	0.30	**85.05**	84.97	0.29	1.40

DESIGN PARAMETERS

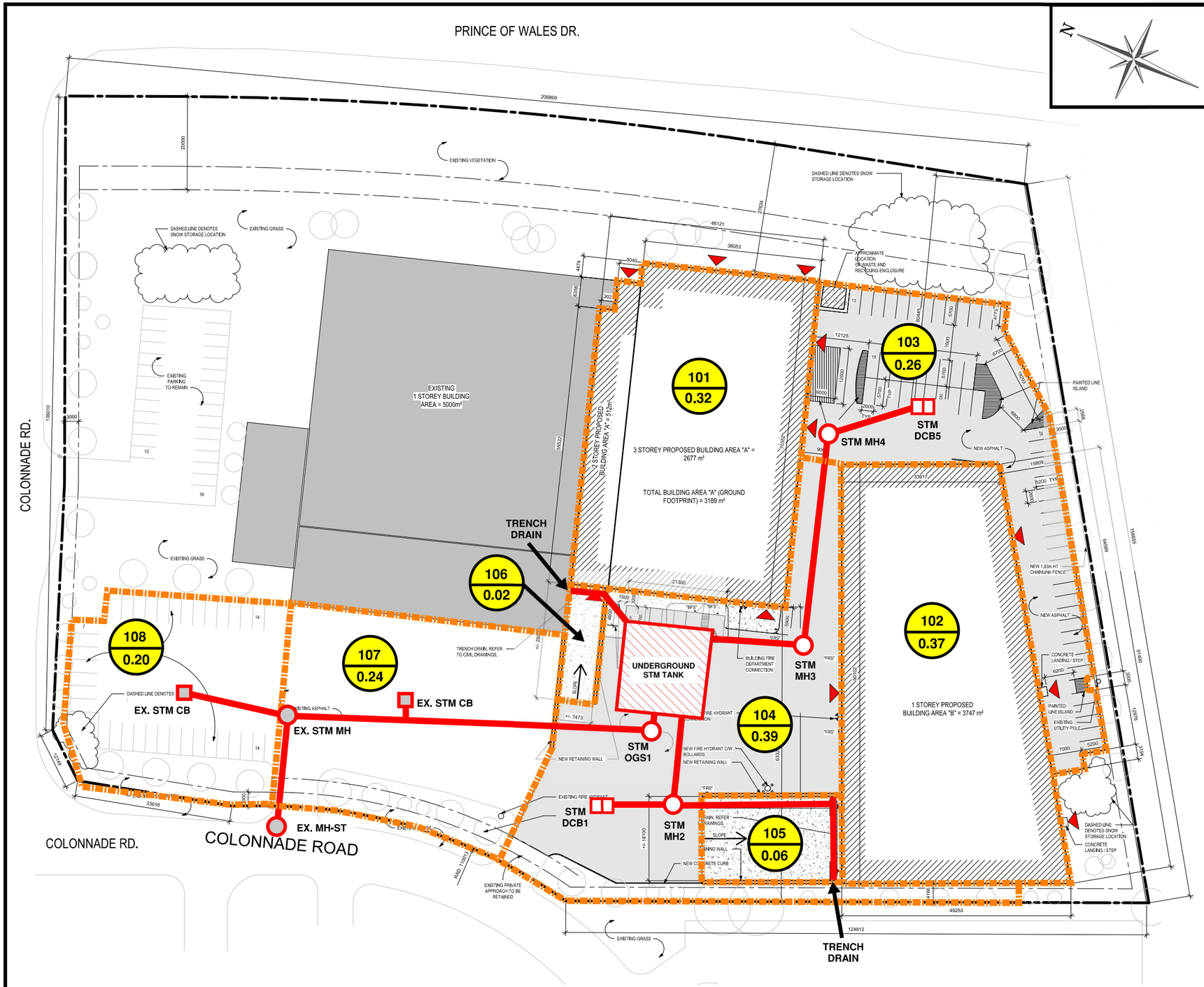
RETURN FREQUENCY = 100 YEARS
MANNING'S n= 0.013
MIN. HGL CLEARANCE = 0.30m

HGL=Major + Minor Losses
Major Loss= Pipe Friction (Darcy-Weisbach)
Minor Loss= Head loss correction for flow through MH, changes in pipe size, and pipe bends
Friction Factor= 8g/c^2, where c=(1/n)*(D/4)^1/6

NOTE: 1 - Max water surface elevation (Max WSE) indicates the maximum elevation attained in the ditch before runoff cascades over a downstream high point
2 - U/S HGL Elevation Cells with values in bold, indicate that surcharge levels reach or exceed the maximum water surface elevation
* Total Flow per 100-year storm design sheet.

HGL=Major + Minor Losses

PROJECT:	125 Colonnade Road South	Complete by:	B.P.
PROJECT NUMBER:	2112-6218		
		Checked:	R.S.A
Date:	10/17/2022		
Revised:			



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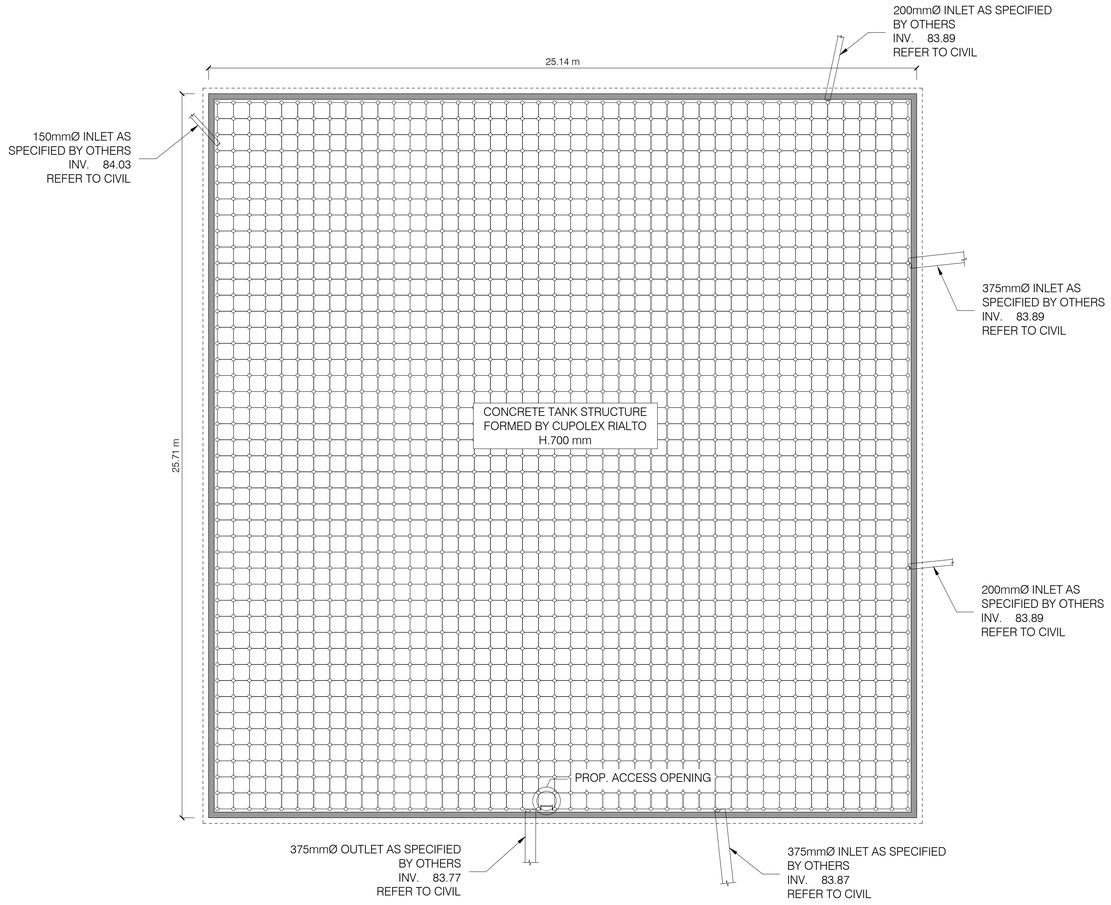
LEGEND

- ID / A — ID = Catchment ID; A = Catchment Area (Ha)
- Existing Storm MH
- Proposed Storm MH
- Existing Storm CB/DCB
- Proposed Storm CB/DCB

PROPOSED STORM CATCHMENT AREAS

125 COLONNADE ROAD SOUTH

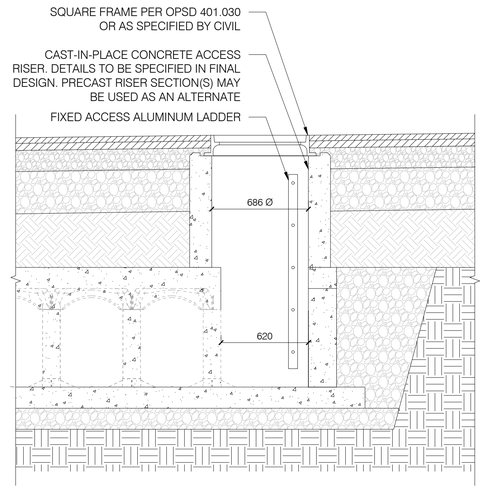
2022-10-14
Project No.: 2112-6218
Created: KIR
Checked: BP/BW



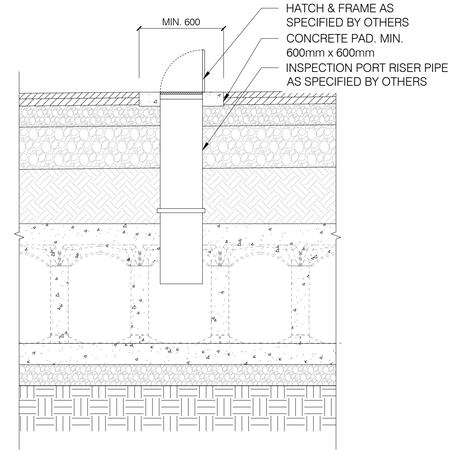
1 / C1 CUPOLEX FORMING PLAN
SCALE 1:100

CONTRACTOR TO CONTACT CUPOLEX ENGINEERING SOLUTIONS INC. FOR ENGINEER STAMPED DESIGN DRAWINGS. UNDERGROUND CONCRETE TANK STRUCTURE CAN BE DESIGNED TO SUPPORT ANY LOADING. CIVIL ENGINEER TO SPECIFY LOADING CRITERIA

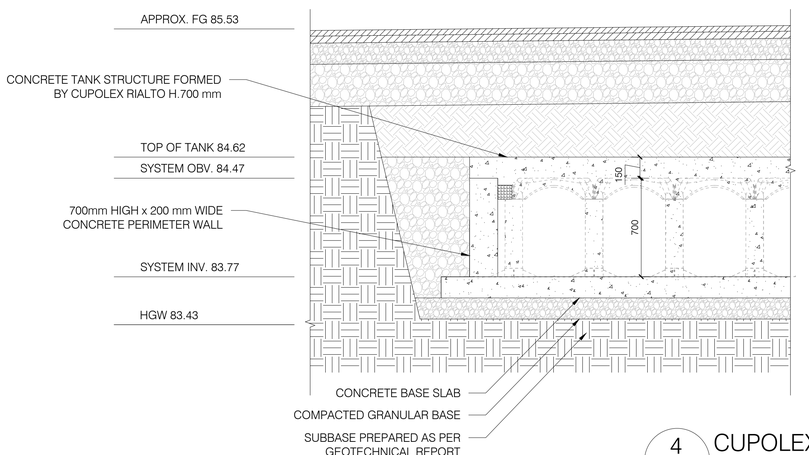
TANK PROPERTIES	
APPROX. FG.	85.53
TOP OF TANK	84.62
SYSTEM OBVERT	84.47
SYSTEM INVERT	83.77
SYSTEM DEPTH	700 mm
INSIDE TANK PERIMETER	100 m
OUTSIDE TANK PERIMETER	102 m
INSIDE TANK AREA	626 m^2
OUTSIDE TANK AREA	646 m^2
STORAGE VOLUME	404.9 m^3

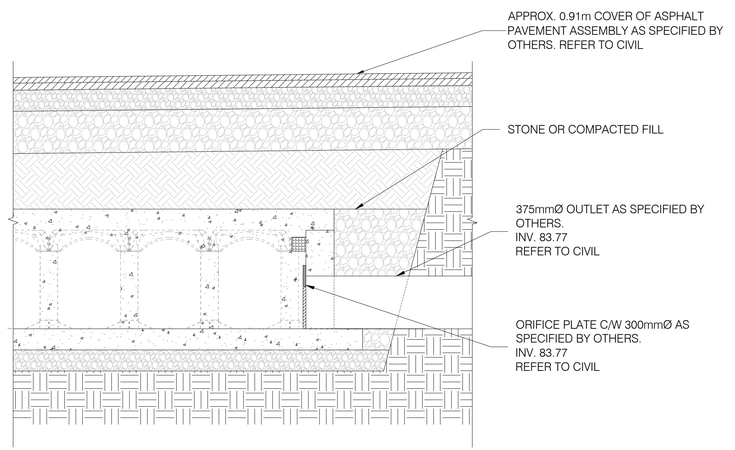


2 / C1 TYPICAL ACCESS OPENING
SCALE 1:20

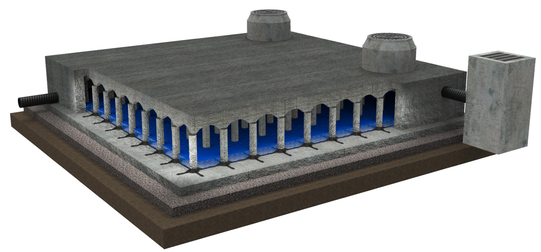


3 / C1 TYPICAL INSPECTION PORT
SCALE 1:20





4 / C1 CUPOLEX TANK SECTION
SCALE 1:20



PRELIMINARY
NOT FOR CONSTRUCTION

CUPOLEX®
ENGINEERING SOLUTIONS INC.
55 Administration Rd, Unit 6
Vaughan, ON, Canada L4K 4G9
1-905-669-8190
info@cupolex.ca
www.cupolex.ca

125 Colonnade Rd
Ottawa, ON

NO.	DATE	DESCRIPTION	DRW.	CHK.
1	26/04/22	CONCEPTUAL DESIGN	IT	AD
2	12/05/22	REVISED CONCEPTUAL DESIGN	IT	AD
3	14/10/22	REVISED CONCEPTUAL DESIGN	IT	AD

DATE: 26 April, 2022
DRAWN BY: IT
CHECKED BY: AD
SCALE: As Noted
PROJECT No.: 22-64604

CUPOLEX PLAN & SECTIONS

C1

CROZIER
CONSULTING ENGINEERS

Project:	125 Colonnade Road
Project No.:	2112-6218
Date:	3/17/2022
Revised:	1/10/2023
Designed By:	BP
Checked By:	BW

ROOFTOP PONDING CALCULATIONS

ROOFTOP PONDING VOLUME CALCULATIONS

Roof Name	Roof Area (ha)	Roof Area Per Drain (ha)	Drain Ponding Area (ha)	Max. Allowable Rooftop Ponding Depth (m)	Max. Rooftop Ponding Volume per Drain (m^3)	Max. Rooftop Ponding Volume Available (m^3)	Max. Rooftop Ponding Volume Required (m^3)
BLDG A (3 storey)	0.27	0.03	0.02	0.15	10.7	85.5	-
BLDG A (2 storey)	0.05	0.02	0.01	0.15	0.8	20.6	-
BLDG A (total)	0.32	-	-	0.15	-	106.2	100
BLDG B	0.37	0.03	0.02	0.15	2.6	124.9	123

Note: Maximum required rooftop ponding per VO Model prepared by Crozier.

ZURN ROOF DRAIN FLOW RATING

Opening	G.P.M. Per Inch of Head	L.P.M. Per Inch of Head	L/s Per Meter of Head	L/s Per 0.05 m of Head	L/s Per 0.10 m of Head	L/s Per 0.15 m of Head
X_1	5.00	22.73	14.91	0.75	1.49	2.24
X_2	3.75	17.05	11.19	0.56	1.12	1.68
X_3	2.50	11.37	7.46	0.37	0.75	1.12
X_4	1.25	5.68	3.73	0.19	0.37	0.56

Note: Zurn control flow rates obtained from Drawing No. P-13521 - Adjustable Weir for Sloped-Roof "Control-Flo" Roof Drain

CONTROLLED ROOFTOP RELEASE RATE CALCULATIONS

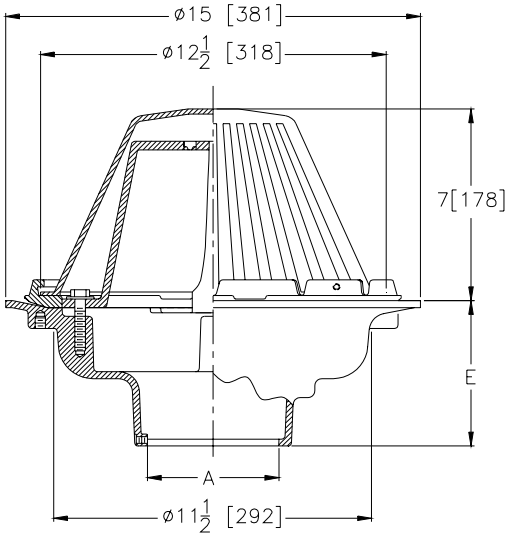
Roof Name	Control System	Zurn Model Number	Release Rate per Drain (L/s per meter of head)	Proposed # of Zurn Drains	# of Notches per Zurn Drain	Total Release Rate from Roof (L/s)
BLDG A (3 storey)	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	10	2	44.7
BLDG A (2 storey)	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	3	2	13.4
BLDG A (total)	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	13	2	58.2
BLDG B	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	12	2	53.7

Z-105
CONTROL-FLO ROOF DRAIN
w/ Parabolic Weir

SPECIFICATION SHEET

TAG_____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



A Pipe Size Inches / [mm]	Approx. Wt. Lbs. / [kg]	Dome Open Area Sq. In. / [sq cm]
2 - 3 - 4 [51 - 76 - 102]	34 [15]	148 [955]

ENGINEERING SPECIFICATION: ZURN Z-105 "Control-Flo" roof drain for dead -level roof construction, Dura-Coated cast iron body. "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates.

OPTIONS (Check/specify appropriate options)

PIPE SIZE

2,3,4 [50,75,100]
2,3,4 [50,75,100]
2,3,4 [50,75,100]
2,3,4 [50,75,100]

(Specify size/type) **OUTLET**

_____ IC Inside Caulk
_____ IP Threaded
_____ NH No-Hub
_____ NL Neo-Loc

E BODY HT. DIM.

5 1/4 [133]
3 3/4 [95]
5 1/4 [133]
4 5/8 [117]

PREFIXES

____ Z- D.C.C.I. Body with Poly-Dome*
____ ZA- D.C.C.I. Body with Aluminum Dome

SUFFIXES

____ -A Waterproof Flange
____ -AR Acid Resistant Epoxy Coated Finish
____ -C Underdeck Clamp
____ -DP Top Set® Roof Deck Plate (Replaces both the -C and -R)
____ -DR Adjustable Drain Riser Extension Assembly 3-5/8" [92] to 7-1/4" [184]
____ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)
____ -EA Adjustable Extension Assembly 1 3/4 [44] thru 3 1/2 [89]
____ -EB Elevating Body Plate
____ -G Galvanized Cast Iron
____ -R Roof Sump Receiver
____ -VP Vandal Proof Secured Top
____ -90 90º Threaded Side Outlet Body

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV. A DATE: 09/14/05 C.N. NO. 89837

DWG. NO. 63601 PRODUCT NO. Z-105

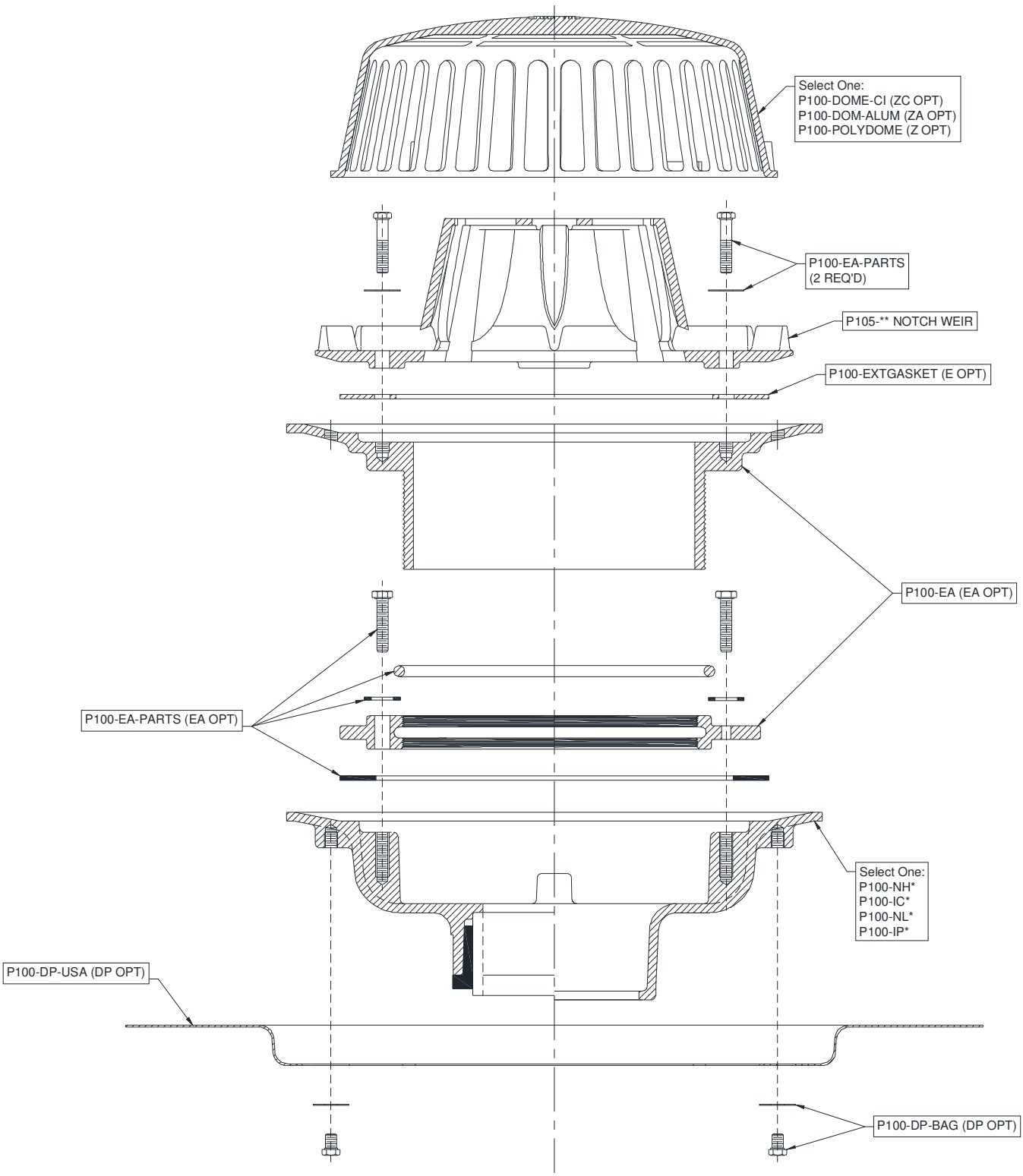
ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V 1L2 ♦ Phone: 905/405-8272 Fax: 905/405-1292
In the U.S.: ZURN INDUSTRIES, INC. ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514
Phone: 814/455-0921 ♦ Fax: 814/454-7929 ♦ World Wide Web: www.zurn.com

COMMON COMPONENTS

Z/ZA/ZC105-DP-EA

CONTROL-FLO ROOF DRAIN W/ POLY/ALUMINUM/CAST IRON DOME, TOP-SET ROOF DECK PLATE, PARABOLIC WEIR AND ADJUSTABLE EXTENSION.

Dimensional data (inches and [mm]) are subject to manufacturing tolerances and change without notice.



* Size determined by Customer.
** Material and Strainer type determined by Customer

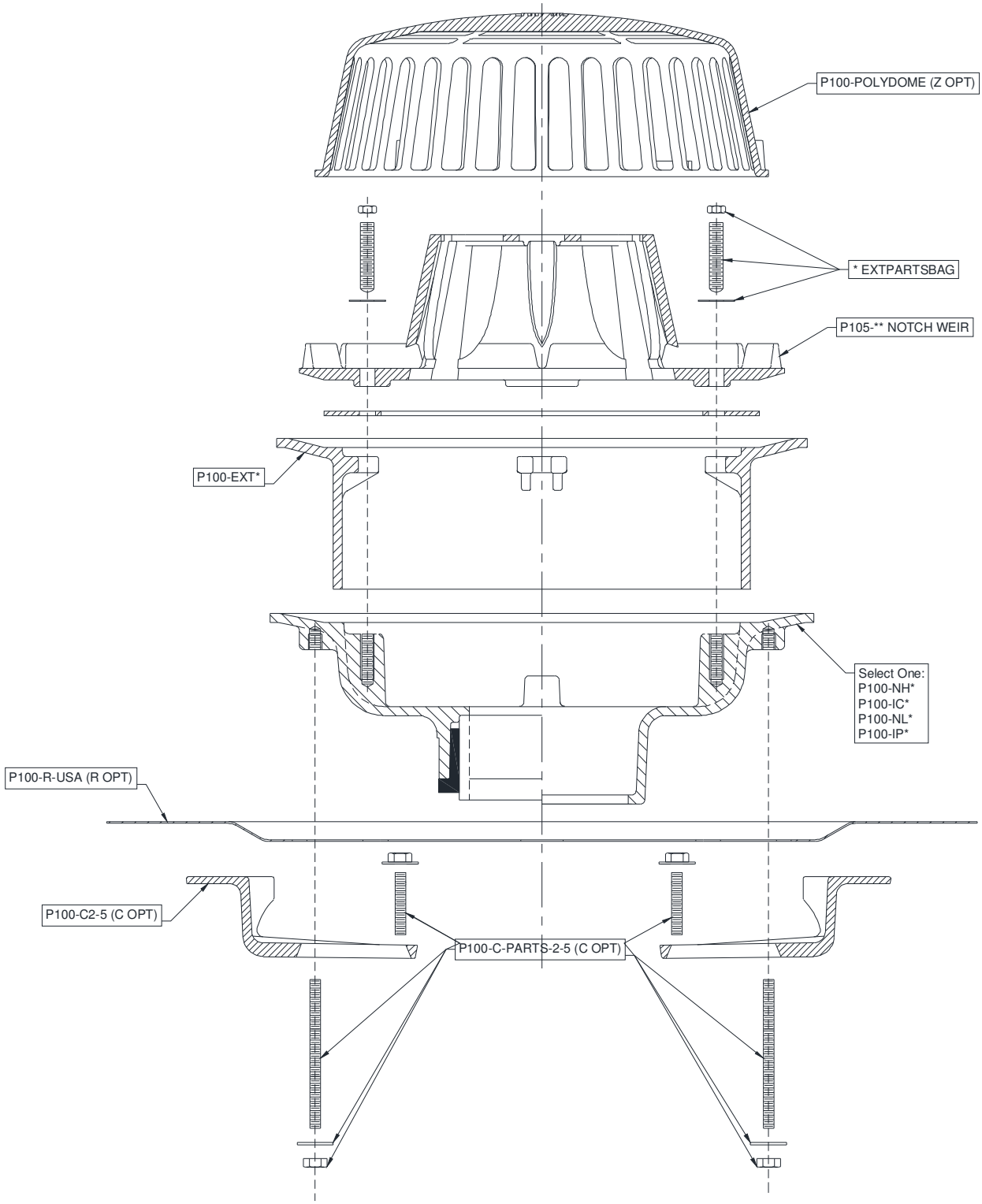
Zurn Industries, LLC | **Light Commercial Plumbing Products**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

Rev. A
Date: 08/09/18
C.N. No. 140397
Form # RD114

Z105-C-E-R

CONTROL FLO ROOF DRAIN W/ PARAPOLIC WEIR, UNDERDECK CLAMP, EXTENSION AND ROOF SUMP RECEIVER

Dimensional data (inches and [mm]) are subject to manufacturing tolerances and change without notice.



* Size determined by Customer.
** Material and Strainer type determined by Customer

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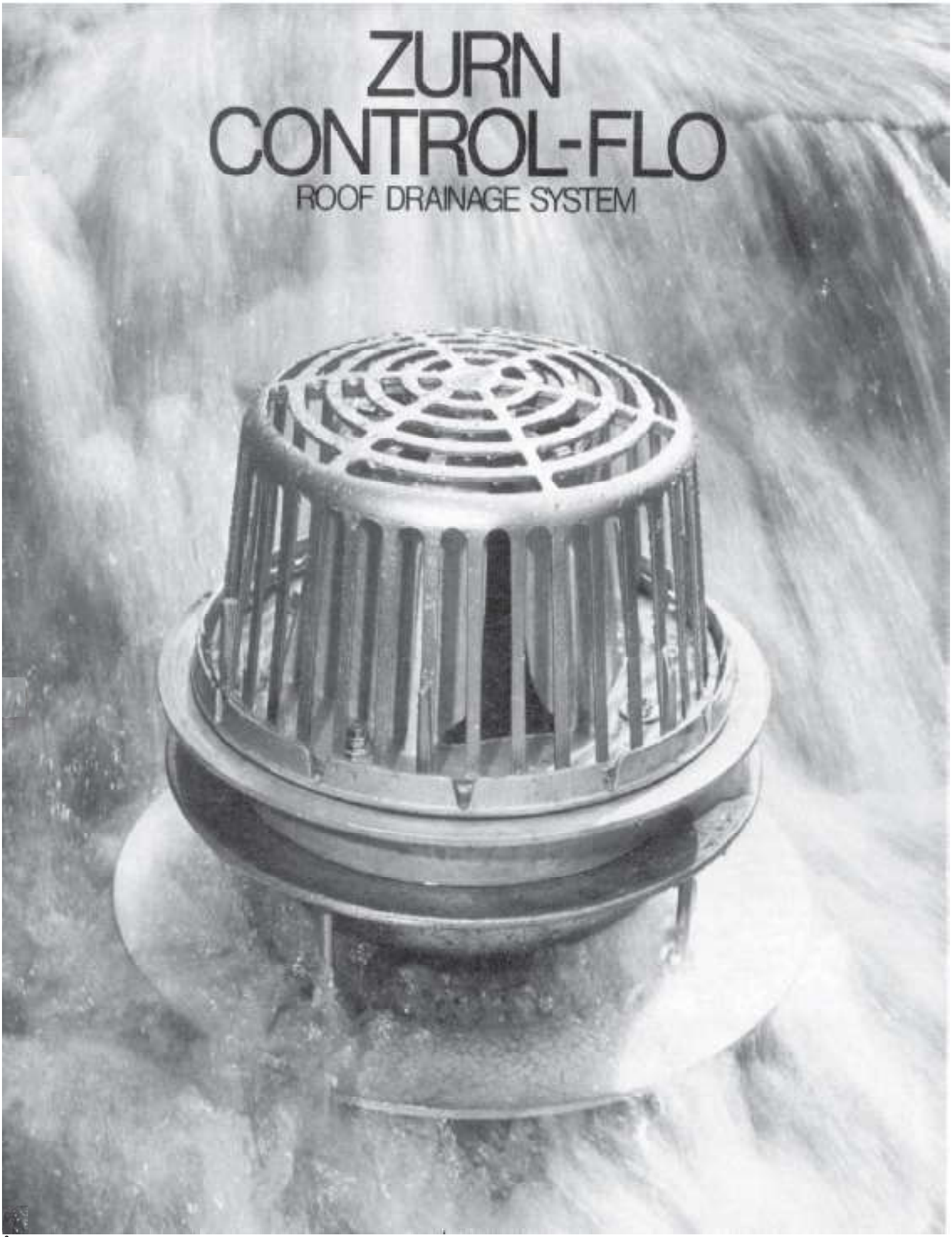
Rev. A
Date: 08/09/18
C.N. No. 140397
Form # RD114

ZURN CONTROL-FLO

ROOF DRAINAGE SYSTEM



⚠**WARNING**: Cancer and Reproductive Harm - www.P65Warnings.ca.gov
⚠**ADVERTENCIA:** Cáncer y daño reproductivo - www.P65Warnings.ca.gov
⚠**AVERTISSEMENT:** Cancer et effets néfastes sur la reproduction - www.P65Warnings.ca.gov

Zurn Industries, LLC | **Specification Drainage Operation**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

Rev. A
Date: 05/14/2018
C.N. No. 139851
Form No. RD72

ZURN Control-Flo . . . Today's Successful Answer to More

THE ZURN "CONTROL-FLO CONCEPT"

Originally, Zurn introduced the scientifically- advanced "Control-Flo" drainage principle for dead-level roofs. Today, after thousands of successful applications in modern, large dead-level roof areas, Zurn engineers have adapted the comprehensive "Control-Flo" data to **sloped roof** areas.

WHAT IS "CONTROL-FLO"?

It is an advanced method of removing rain water off dead-level or sloped roofs. As contrasted with conventional drainage practices, which attempt to drain off storm water as quickly as it falls on the roof's surface, "Control- Flo" drains the roof at a controlled rate. Excess water accumulates on the roof under controlled conditions... then drains off at a lower rate after a storm abates.

CUTS DRAINAGE COSTS

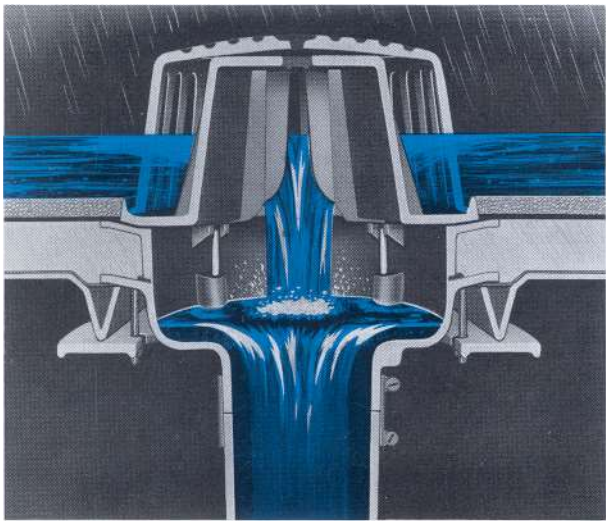
Fewer roof drains, smaller diameter piping, smaller sewer sizes, and lower installation costs are possible with a "Control-Flo" drainage system because roof areas are utilized as temporary storage reservoirs.

REDUCES PROBABILITY OF STORM DAMAGE

Lightens load on combination sewers by reducing rate of water drain from roof tops during severe storms thereby reducing probability of flooded sewers, and consequent backflow into basements and other low areas.

THANKS TO EXCLUSIVE ZURN "AQUA-WEIR" ACTION

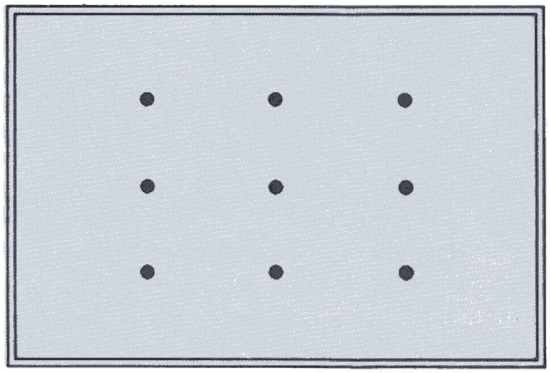
Key to successful "Control-Flo" drainage is a unique, scientifically-designed weir containing accurately calibrated notches with sides formed by parabolic curves which provide flow rates directly proportional to the head. Shape and size of notches are based on pre- determined flow rates, and all factors involved in roof drainage to assure permanent regulation of drainage flow rates for specific geographic locations and rainfall intensities.



DEFINITION

DEAD LEVEL ROOFS

A dead-level roof for purposes of applying the Zurn "Control-Flo" drainage principle is one which has been designed for zero slope across its entire surface.



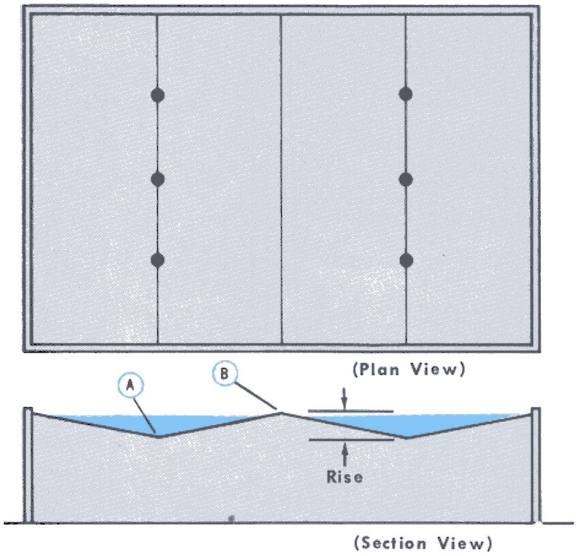
(Plan View)

(Section View)

SLOPED ROOFS

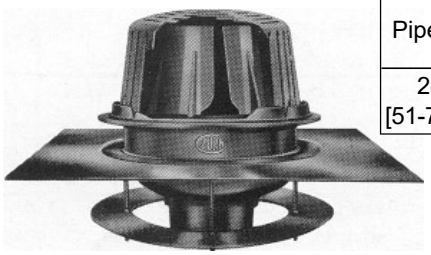
A sloped roof is one designed commonly with a shallow slope. The Zurn "Control-Flo" drainage system can be applied to any slope which results in a total rise up to 6"... and data can be calculated for rises exceeding 6".

The total rise of a roof as calculated for "Control-Flo" application is defined as the vertical increase in height in inches, from the low point or valley of a sloping roof (A) to the top of the sloping section (B). (Example: a roof that slopes 1/8" per foot having a 24-foot span would have a rise of 24 x 1/8 or 3")

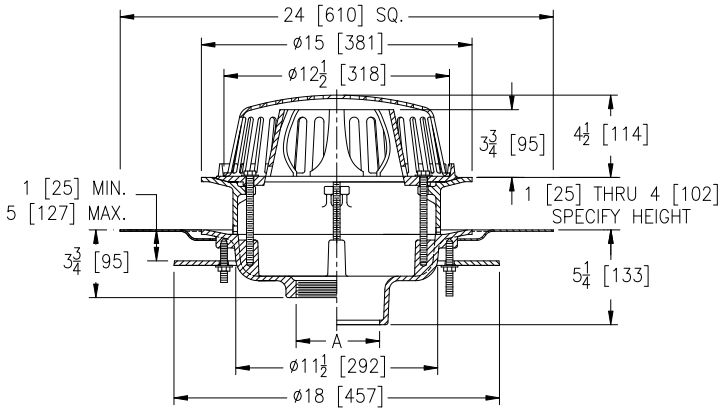


Economical Roof Drainage Installation

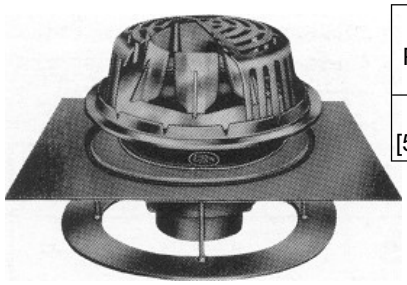
SPECIFICATION DATA



A Pipe Size	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm²]
2-3-4 [51-76-102]	56 [25]	103 [665]



ENGINEERING SPECIFICATION: ZURN Z105-C-E-R 15" Diameter "Control-Flo" roof drain for dead-level roof construction, Dura-Coated cast iron body, "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard, static extension, secondary clamping collar with O-ring, Poly-Dome, roof sump receiver and underdeck clamp. All data shall be verified proportional to flow rates.



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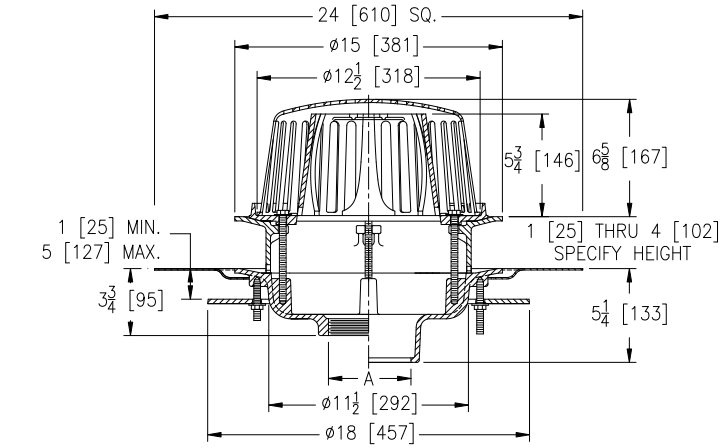
2-3-4 [51-76-102]	60 [27]	148 [955]



ENGINEERING SPECIFICATION: ZURN Z105-C-E-R-10 "Control-Flo" roof drain for Sloped Roof construction, Dura-Coated cast iron body, "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard and 6 5/8 [168] high Aluminum dome. All data shall be verified proportional to flow rates.

ROOF DESIGN RECOMMENDATIONS

Basic roofing design should incorporate protection that will prevent roof overloading by installing adequate overflow scuppers in parapet walls.

GENERAL RECOMMENDATIONS

On dead-level roofs, our general recommendations are to design for a 3" depth for the 10-year storm. In this case, even the 100-year storm will not result in a maximum depth of 6". A 6" depth represents a roof load of 31.2 pounds per square foot which approximates the 30 pound per square foot factor commonly used in roof design.

NOTE: A more conservative practice used by a few engineers in the past, depending upon other design considerations, has been to design for the 3" depth with the 25, 50, or even 100-year storm . . . and to also lower scuppers to 5" or 4" above roof level. In either case, the final determination rests with the engineering personnel responsible for this phase of the design.

GENERAL RECOMMENDATIONS

On sloping roofs, we again recommend a 3" design depth for the l0-year storm, but by 3" we refer to an equivalent depth of 3". An equivalent depth is the depth of water attained at the drains that results in the same roof stresses as those realized on a dead-level roof. In all cases this equivalent depth is almost equal to that attained by using the same notch area rating for the different rises to 6". With the same depth of water at the drain the roof stresses will decrease with increasing total rise. Therefore, it would be possible to have a depth in excess of 6" at the drain on a sloping roof without exceeding stresses normally encountered in a 6" depth on a dead-level roof. However, it is recommended that scuppers be placed to limit the maximum water depth on any roof to 6" to prevent the over flow of the weirs on the drains and consequent overloading of drain piping.

NOTE: An equivalent depth is that depth of water attained at the drains at the lowest line or valley of the roof with all other conditions such as notch area and rainfall intensity being equal. For Galveston, Texas a notch area of 1800 square feet results in a 3" depth on a **dead-level** roof for a 10-year storm. For the same notch area and a 10-year storm, equivalent depths for a 2", 4", and 6" rise respectively on a **sloped roof** would be 3.4", 3.8", and 4.6". Roof stresses will be approximately equal in all cases.

Control-Flo Drain Selection is Quick and Easy . .

The exclusive Zurn “Selecta-Drain”. Chart (pages 6, 7, 8, 9) tabulates recommended selection data for several hundred localities in the United States. It constitutes your best assurance of sure, safe, economical additional data for your Zurn “Control-Flo” systems for your specific geographical area.

If the “Selecta-Drain” Chart doesn’t not suit your specific design criteria, write directly to Zurn Industries, Inc. Field Service Engineering, Specification Drainage Operations, Erie, Pa for additional date for your locality. Listed below is additional information pertinent to proper engineering of the “Control-Flo” system.

ROOF USED AS TEMPORARY RETENTION

The key to economical “Control-Flo” drainage is the utilization of large roof areas to temporarily store the maximum amount of water without overloading average roofs or creating excessive drain down time during periods of heavy rainfall.

The data shown in the “Selecta-Drain” Chart, which takes all these factors into consideration, represents only one point on a series of curves prepared for each locality and was determined after careful study and research as imparting optimum economy in design.

ROOF LOADING AND RUN-OFF RATES

The values for notch areas selected from the design curves were based on a 3" head on a dead-level roof for the 10-year storm. In low rainfall localities the area per notch was limited to 25,000 square feet to keep the drain down time within reasonable limits. The same area for each respective locality was used for the various roof rises for sloping roofs.

Extensive studies show that stresses due to water load on a sloping roof for any fixed set of conditions are very nearly the same as those on a dead-level roof. A sloping roof tends to concentrate more water in the valleys and increase the water depth at this point. The greater depth around the drain leads to a faster run-off rate, particularly a faster early run-off rate. As a result, the total volume of water stored on the roof is less, and the total load on the sloping roof is less. By using the same area on the sloping roof as on the dead-level roof the increase in roof stresses due to increased water depth in the valleys is offset by the decrease in the total load due to less water stored. The net result is the maximum roof stresses are approximately the same for single span, rise and fixed set of conditions. A fixed set of conditions would be the same notch area, the same frequency storm, and the same locality.

NOTCH FLOW AND WATER DEPTH

The flow through each notch of the “Control-Flo” weir is 10 GPM per inch of head. To compute the depth of water in inches at the drain, obtain the total flow for any fixed set of conditions and locale from the “Selecta-Drain” Chart and divide by 10. For example, for Anniston, Alabama the discharge rates are 30, 35, 39 and 43 GPM for the 10, 25, 50 and 100-year storms respectively on a dead-level roof.

Since the possibility of exceeding 4.3" of water exists only once every 100 years, the drains can be sized to carry 43 GPM per notch and scuppers can be set at a height of 4.3" above the roof to prevent overloading the drains if a worse than 100-year storm occurs. On a similar basis, drain pipe sizes and scupper heights can be selected for various roof slopes and storm frequencies.

ADDITIONAL NOTCH RATINGS

The “Selecta-Drain” Chart along with Tables I and II enables the engineer to select “Control-Flo” Drains and drain pipe sizes for most applications. The “Selecta-Drain” Chart and Tables I and II are computed for a proportional flow weir that is sized to give a flow of 10 GPM per inch of head. However, this data can be applied to other sizes of proportional flow weirs by simple multiplication or division. For example, if a similar weir that is sized to give a flow of 5 GPM per inch is substituted for the 10 GPM per inch weir, the notch area and discharge in GPM would be divided by two, and this opening would be given a 7’2 notch area rating.

PROPER DRAIN LOCATION

The following good design practice is recommended for selecting the proper number of “Control-Flo” drains for a given area.

On dead-level roofs, drains should be located no further than 50 feet from each edge of the roof to assure good run-off regardless of wind direction. Weir should be flush with roof surface, not recessed.
On sloping roofs, drains should be located in the valleys at a distance no greater than 50 feet from each end of the valleys. Weir should be flush with the valley roof surface, not recessed.
On large roof areas, drains should not be spaced at a distance greater than 200 feet.

. Saves Specification Time, Assures Proper Application

QUICK EASY SELECTION

Using the "Selecta-Drain" Chart (pages 6, 7, 8, 9) in combination with the steps and examples appearing below, should save you countless hours in engineering specification time. This vast compilation of data is related to the proper selection of drains for over 200 cities. If a specific city does not appear in this tabulation, choose the city, nearest your area and select the proper drain using these factors.

3 EASY STEPS AND 3 TYPICAL EXAMPLES FOR APPLICATION OF SURE, SCIENTIFIC CONTROL OF DRAINAGE FROM DEAD-LEVEL AND SLOPING ROOFS WITH THE ZURN CONCEPT

WASHINGTON, D. C.	DEAD-LEVEL ROOF	4 INCH RISE	6 INCH RISE
1 Determine total roof area or individual areas when roofis divided by expansion joints or peaks in the case of sloping roof.	Roof Area: 192 ft. x 500 ft. = 96,000 sq. ft.	3 Individual Roof Areas: 64 ft. x 500 ft. = 32,000 sq. ft. Valleys 500 ft. long 3 x 32,000 = 96,000 sq. ft.	2 Individual Roof Areas: 98 ft. x 500 ft. = 48,000 sq. ft. Valleys 500 ft. long 2 x 48,000 = 96,000 sq. ft.
2 Divide roof area or individual areas by Zurn Notch Area Rating to obtain the total number of notches required.	Zurn Notch Area Rating for Washington, D. C. = 13,300 "Selecta-Drain" Chart Total Notches Required = **96,000 sq. ft** 13,300 sq. ft. notch area = 7.2 notches-USE 8 PER AREA	Zurn Notch Area Rating for Washington, D.C. = 13,000 from "Selecta-Drain" Chart Total Notches Required = **32,000 sq. ft.** 13,300 sq. ft. notch area = 2.4 notches - USE 8 PER AREA	Zurn Notch Area Rating for Washington, D.C. = 13,000 from "Selecta-Drain" Chart Total Notches Required = **48,000 sq. ft.** 13,300 sq. ft. notch area = 3.6 notches - USE 4 PER AREA
3 Determine total number of drains required by not exceeding maximum spacing dimensions in the preceding instructions. Divide total number of notches required to determine the number of notches per drain. Note flow rate for the 100-year storm and divide by 10 to determine maximum water depth at drain and use this dimension to determine scupper height. Maximum scupper height to be used is 6". Use this flowrate to size leaders and drain lines.	6 drains required. 3 along each side within 50 ft. of the side with a spacing of 50 ft. - 200 ft. 200 ft. - 50 ft. Two drains must have two notches for a total of eight notches. Located at diagonally opposite corners. Flow rate for the 100-year storm is 44 GPM. Maximum water depth and scupper height equals 4.4". Size leaders from single notch drains for 44 GPM and leaders from double notch drains for 88 GPM.	3 drains per area required in the valleys 50 ft. from each end with one in the middle. All drains will have one notch. Flow rate for the 100-year storm s 59 GPM maximum. Water depth and scupper height equals 5.9". Size leaders for 59 GPM.	3 drains per area required in the valleys 50 ft. from each end with one in the middle. 4 notches are required there fore one drain must have tow notches. Locate this one in the middle. Flow rate for the 100-year storm is 64 GPM. Locate scuppers at 6" and use 60 GPM as max mum flow rate and 6" max. mum depth. The probability of water flowing out suppers is now less than once every 50 years instead of every 100 years. Size leaders for 60 GPM

SPECIAL CONSIDERATIONS

The 3" design water level for the 10-year storm represents a roof load of approximately 15 lbs. per sq. ft. This is only half the usual minimum design roof load rating of 30 lbs. per sq. ft. and so presents no problem from that aspect. However, since it is desirable to contain the design depth of water on the roof and to prevent spillage over the roof in high wind condition, it is recommended that any roof construction, parapets, flashing and curves should be high enough to prevent flooding over them.

Another special case applies to water cooled roofs and here the "Control-Flo" principle can still be used. An adjustable collar on the drain body will retain a pool of water 0 to 3" deep on the roof and a 3" high "Control-Flo" Weir on top of the adjustable collar will control storm water falling on this pool. This restricts maximum depth on the roof to 6" and scuppers should be located at this height. Since the weirs are only 3" high on this drain, they should be selected for a 3" head based on the 100-year frequency storm.

Select Proper Vertical Storm Drain Piping

Roof Drainage Data

While the flow rate for any design condition can be easily computed from the data contained on the preceding pages, the tabulations shown below (and on page 14) can be used to simplify selection of drain line sizes.

TABLE I - Suggested Relation of Drain Outlet and Vertical Leader Size to of the six Z105-10 Zum Control-Flo Roof Drains (Based on National Plumbing Code ASA-A40.8 Data on Vertical Leaders).

No. of Notches in Drain	Max. Flow per Notch in GPM			
	Pipe Size			
	2	3	4	5
1	30	60*	-	-
2	15	45	60*	-
3	-	31	60*	-
4	-	23	48	60*
5	-	18	38	60*
6	-	15	32	60*

* Maximum flow obtainable from 1 notch.

Table I illustrates gallons per minute from each notch of the six Z105-10 drains that can be carried off by various leader sizes. Once the drains are selected for a given roof per this manual, simply read the GPM flow per notch from the chart, refer to **Table I** and select the smallest drain line that will accommodate that flow. Drain pipes should be sized for the 100-year storm unless scuppers are located at a height that will not permit a depth of water to accumulate on the roof that is predicted for the 100-year storm. For example, if your installation is Anniston, Alabama, on a dead-level roof the data for the 100-year storm shows a discharge of 43 GPM per notch. For this application scuppers would be located at a 4.3” height. Using Table I a 3” drain pipe or vertical leader would be used for a drain with 1- or 2- notches. A 4” leader would be used with a 3- or 4-notch drain and a 5” leader with a 5- or 6-notch drain. For Anniston, Alabama, and a roof with a 2” rise, the 100-year storm shows a flow rate of 50 GPM. In this case scuppers should be located at a height of 5.0”. A 3” leader would be used with a single notch drain, a 4” leader with a 2- and 3-notch drain, and a 5” leader with a 4-, 5- or 6-notch drain. The same type of selection would be made for a roof with a 4” rise. For Anniston, Alabama, the flow rate for the 100-year storm would be located at a height of 5.9”.

For the roof with a 6” rise, the data for Anniston, Alabama, as well as several other localities, for the 100-year storm, shows a flow rate greater than 60 GPM. In these cases the scuppers will be located at the maximum recommended height of 6” and the vertical leaders will be sized for a maximum flow rate of 60 GPM per notch.

In the few cases where the data shows a flow rate in excess of 60 GPM for the 100-year storm, and if all drains and drain lines are sized according to recommendations, the only consequence will be a brief flow through the scuppers more often than once every 100 years.

EXAMPLE

		DEAD-LEVEL				2-INCH RISE				4-INCH RISE				6-INCH RISE			
	Notch Area	Discharge GPM Draindown Time Hrs.				Discharge GPM Draindown Time Hrs.				Discharge GPM Draindown Time Hrs.				Discharge GPM Draindown Time Hrs.			
LOCATION	Rating	10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.	10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.	10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.	10 Yrs.	25 Yrs.	50 Yrs.	100 Yrs.
La Crosse, WI	25,000	23 42	31 45	35 48	39 51	35 38	40 43	48 45	46 47	43 26	48 30	32 32	56 35	51 21	56 24	39 25	62 26
Madison, WI	25,000	29 43	36 49	40 52	44 54	37 40	43 45	47 47	50 50	46 28	51 32	55 34	60 38	54 23	60 25	62 26	65 28
Milwaukee, WI	25,000	25 40	30 44	35 48	39 51	34 38	38 41	42 45	45 46	41 25	45 28	49 31	53 32	49 20	54 23	57 24	60 25
Cheyenne, WY	25,000	17 32	19 33	21 35	23 37	24 27	27 31	30 34	33 37	32 20	36 23	38 24	40 25	39 16	44 18	47 19	50 21

Select Proper Horizontal Storm Drain Piping

Table II is similar to **Table I** but is used in determining the size of the building storm drain. Use the same flow rate established for sizing the vertical leaders to size the storm drain. Count the total number of notches feeding any one drain or branch to the drain. Enter the Table at the total number of notches and under the proper storm drain slope select the column that gives a flow rate equal to or larger than the established notch flow rate. Read the storm drain size required at the top of this column.

TABLE II - Suggested Relation of Horizontal Storm Drain Size to Zurn Control-Flo Roof Drainage (Based on National Plumbing Code ASA-A40.8 Data on Horizontal Storm Drains w/ 1/8", 1/4" and 1/2" per foot slope).

Total No. of Notches Discharging to Storm Drain	MAX. FLOW PER NOTCH IN GPM — Storm Drain Size ⅛" per ft. slope							
	3	4	5	6	8	10	12	15
1	34	60*	—	—	—	—	—	—
2	17	39	60*					
3	11	26	46	60*	—	—	—	—
4	8	19	34	53	60*	—	—	—
5	—	15	28	44	60*	—	—	—
6	—	13	23	37	60*	—	—	—
7	—	11	20	32	60*	—	—	—
8	—	—	17	28	60*	—	—	
9	—	—	15	25	53	60*	—	—
10	—	—	14	22	48	60*	—	—
11	—	—	12	20	43	60*	—	—
12	—	—	—	18	40	60*	—	—
13	—	—	—	17	37	60*	—	—
14	—	—	—	15	34	60*	—	—
15	—	—	—	15	32	57	60*	—
16	—	—	—	14	30	54	60*	—
17	—	—	—	13	28	51	60*	—
18	—	—	—	12	26	48	60*	—
19	—	—	—	—	25	45	60*	—
20	—	—	—	—	24	43	60*	—
23	—	—	—	—	20	37	60*	—
25	—	—	—	—	19	34	55*	60*
30	—	—	—	—	16	28	46	60*
35	—	—	—	—	13	24	39	60*
40	—	—	—	—	12	21	34	60*
45	—	—	—	—	—	19	31	55*
50	—	—	—	—	—	17	27	49*
55	—	—	—	—	—	15	25	45*
60						14	23	41*
65	—	—	—	—	—	13	21	38*
70						12	20	35*

Total No. of Notches Discharging to Storm Drain	MAX. FLOW PER NOTCH IN GPM — Storm Drain Size ¼" per ft. slope							
	3	4	5	6	8	10	12	15
1	48	60*	—	—	—	—	—	—
2	24	55*	60*	—	—	—	—	—
3	16	37	60*	—	—	—	—	—
4	12	28	48	60*	—	—	—	—
5		22	39	60*	—	—	—	—
6		18	33	52*	60*	—	—	—
7	—	16	28	45	60*			
8		14	25	39	60*			
9	—	12	22	35	60*	—	—	—
10	—	—	20	31	60*	—	—	—
11	—	—	18	29	60*	—	—	—
12	—	—	16	26	56	60*	—	—
13	—	—	15	24	52*	60*	—	—
14	—	—	14	22	48	60*	—	—
15	—	—	13	21	45	60*	—	—
16	—	—	—	20	42	60*	—	—
17	—	—	—	18	40	60*	—	—
18	—	—	—	17	37	60*	—	—
19	—	—	—	16	35	60*	—	—
20	—	—	—	16	34	60*	—	—
23	—	—	—	14	29	53*	60*	—
25	—	—	—	13	27	49	60*	—
30	—	—	—	—	22	40	60*	—
35	—	—	—	—	19	35	56	60*
40	—	—	—	—	17	30	49	60*
45	—	—	—	—	15	27	44	60*
50	—	—	—	—	13	24	39	60*
55	—	—	—	—	—	22	35	60*
60						20	32	58*
65	—	—	—	—	—	18	30	54*
70						17	28	50*

Total No. of Notches Discharging to Storm Drain	MAX. FLOW PER NOTCH IN GPM — Storm Drain Size ½" per ft. slope							
	3	4	5	6	8	10	12	15
1	60*	—	—	—	—	—	—	—
2	34	60*	—	—	—	—	—	—
3	22	52*	60*	—	—	—	—	—
4	17	39	60*	—	—	—	—	—
5	13	31	50*	—	—	—	—	—
6	11	26	46	60*	—	—	—	—
7	—	22	39	60*	—	—	—	—
8		19	36	55*	60*	—	—	—
9	—	17	30	49	60*	—	—	—
10	—	15	27	44	60*	—	—	—
11	—	14	25	40	60*	—	—	—
12	—	13	23	37	60*	—	—	—
13	—	12	21	34	60*	—	—	—
14			19	31	60*	—	—	—
15			18	29	60*	—	—	—
16	—	—	17	27	60*	—	—	—
17	—	—	16	26	56	60*	—	—
18	—	—	15	24	53	60*	—	
19	—	—	14	23	50	60*	—	—
20	—	—	13	22	47	60*	—	—
23	—	—	12	19	41	60*	—	—
25	—	—	—	17	38	60*	—	—
30	—	—	—	14	31	57	60*	—
35	—	—	—	12	27	49	60*	—
40	—	—	—	—	23	43	60*	—
45	—	—	—	—	21	38	60*	—
50	—	—	—	—	19	34	55	60*
55	—	—	—	—	17	31	50	60*
60	—	—	—	—	15	28	46	60*
65	—	—	—	—	14	26	42	60*
70					13	24	39	60*

* Maximum flow obtainable from 1 notch.

Special Considerations for Structural Safety Rigid Roof Design

Normal Practice of Roof Design is Based on 30-lbs. Per Sq. Ft. ... therefore this factor should definitely be kept in mind as a prime requirement for assuring a structurally sound roof. Otherwise, roof deflection may minimize the advantages of a well-designed roof drainage system.

Failure to recognize the adverse effects of roof deflection, even with conventional roof drainage, may lead to roof failure. With the new concept of "Control-Flo" Roof Drainage, the design condition of deflection is equally important. If severe deflection is permitted, rain water will simply seek low areas, thus intensifying the degree of deflection. Thus it is extremely important that flat roofs are designed in accordance with normal load factors so that deflection will be slight enough in any bay to prevent progressive deflection which could cause water depths to load the roof beyond its desIgn limits.

SCUPPERS AND OVERFLOW DRAINS

Roofing members and understructures, weakened by seepage and rot sesulting from improper drainage and roof construction can give away under the wieght of rapidly accumulated water during flash storms. Thus, it is recommended, and often required by building codes, to install scuppers and overflow drains in parapet-type roofs. Properly selected and sized scuppers and overflow drains are vital to a well-engineered drainage system to prevent excessive loading, erosion, seepage and rottting.

Control-Flo Roof Drains

the most advanced drainage control available,
lets you design roof drainage systems with confidence

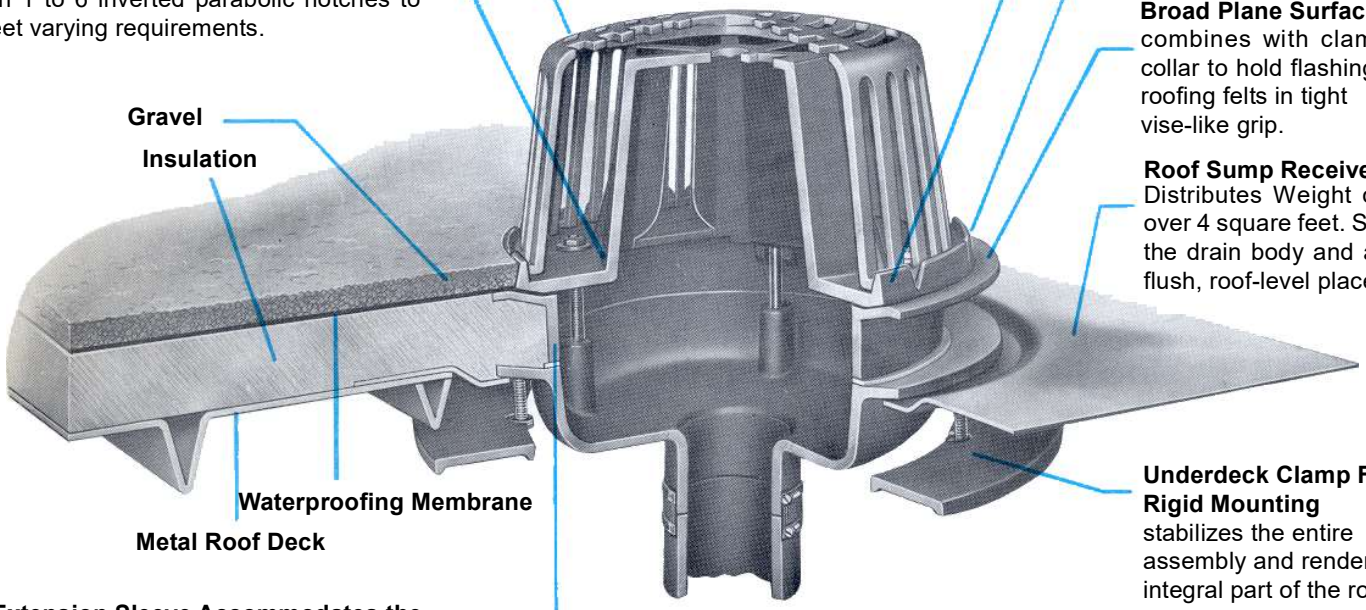
Check These Years Ahead Engineered Features

Large 148 Square-Inch Open Area Dome permits unobstructed flow. Dome is made of lightweight, shock-resistant aluminum and is bayonet-locked to gravel guard on weir.

Multi-Weir Barrier provides flow rates directly propor- tional to the head. Available with 1 to 6 inverted parabolic notches to meet varying requirements.

Gravel

Insulation



Waterproofing Membrane

Metal Roof Deck

Extension Sleeve Accommodates the Addition of Insulation to a roof deck. Height as required by thickness of insulation.

Integral Clamping Collar at bottom of weir provides positive clamping action without puncturing roof or flashing. Also provides integral gravel guard.

Bayonet-type Locking Device on dome holds dome firmly in place with weir yet allows dome to be easily removed.

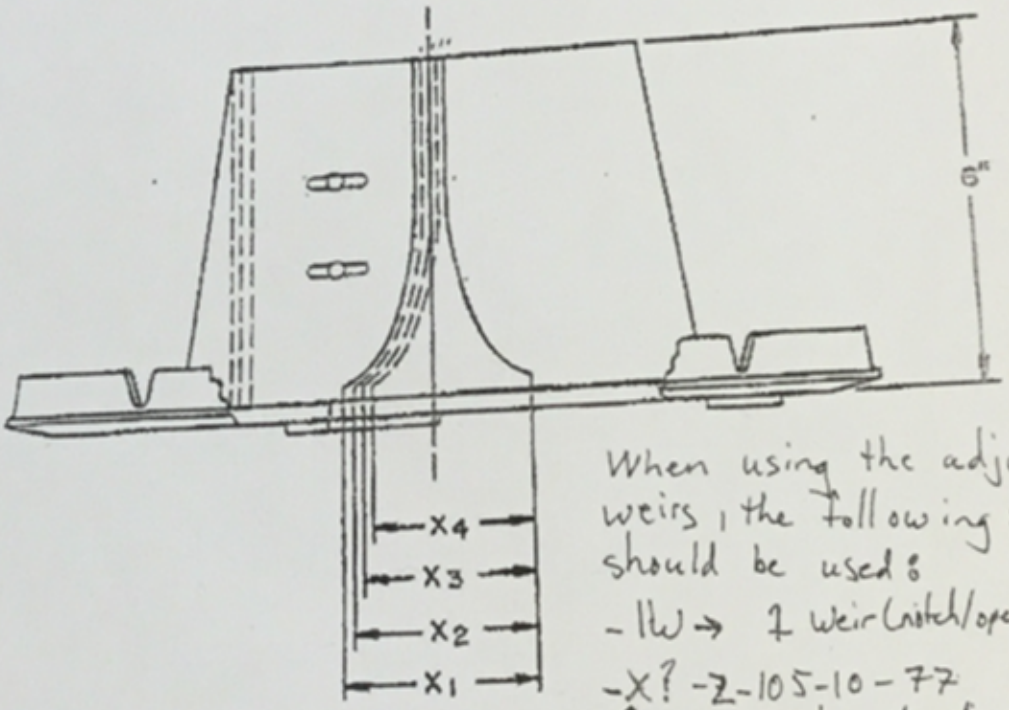
Broad Plane Surface combines with clamping collar to hold flashing and roofing felts in tight vise-like grip.

Roof Sump Receiver Distributes Weight of drain over 4 square feet. Supports the drain body and assures flush, roof-level placement.

Underdeck Clamp For Rigid Mounting stabilizes the entire assembly and renders it an integral part of the roof structure.

Threaded, caulk or No-Hub outlet connections available.
(Z105-C-E-R-10 Illustrated)

NOTE:
ADJUSTABLE WEIR CAN BE ADJUSTED TO FLOW AT VARIOUS RATES. FOR SIZING CONTACT ZURN IND., INC.



When using the adjustable weirs, the following suffix should be used:
-1W → 1 weir (notch/opening)
-X? -Z-105-10-77
↳ product number

OPENING	G.P.M. PER INCH OF HEAD		MAX FLOW G.P.M.	
X_1	10	5	60	30
X_2	7.5	3.75	45	22.5
X_3	5.0	2.5	30	15
X_4	2.5	1.25	15	7.5

Example: ZCF121-1W-X3-Z-105-10-77 → 12" Diameter Roof Drain with 1 notch and allows 2.5 GPM per inch of head.

ADJUSTABLE WEIR FOR SLOPED-ROOF "CONTROL-FLO" ROOF DRAIN

PRODUCT NUMBER
Z-105-10-77

ZURN a step ahead of tomorrow

ZURN INDUSTRIES, INC.
ERIE, PA. U.S.A. 16512

DRAWING NUMBER
P-13521

Pre-Development Visual OTTHYMO Schematic

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        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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DATE: 10/11/2022                          TIME: 09:53:53

USER:



COMMENTS: _____________________________________________________________


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  **********************************************
  ** SIMULATION : 5-year Chicago                **
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| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 42.51 mm |                          B=   6.053
--------------------                          C=   0.814
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	3.68	1.00	104.19	1.83	6.69	2.67	3.51
0.33	4.58	1.17	32.04	2.00	5.63	2.83	3.22
0.50	6.15	1.33	16.34	2.17	4.87	3.00	2.98
0.67	9.61	1.50	10.96	2.33	4.30		
0.83	24.17	1.67	8.29	2.50	3.86		

CALIB
STANDHYD (0101)
ID= 1 DT= 5.0 min

Area (ha)= 0.98
Total Imp(%)= 38.00 Dir. Conn.(%)= 38.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.37	0.61
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.75	5.00
Length	(m)=	80.00	28.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.68	0.833	24.17	1.583	8.29	2.33	4.30
0.167	3.68	0.917	104.19	1.667	8.29	2.42	3.86
0.250	4.58	1.000	104.19	1.750	6.69	2.50	3.86
0.333	4.58	1.083	32.04	1.833	6.69	2.58	3.51
0.417	6.15	1.167	32.04	1.917	5.63	2.67	3.51
0.500	6.15	1.250	16.34	2.000	5.63	2.75	3.22
0.583	9.61	1.333	16.34	2.083	4.87	2.83	3.22
0.667	9.61	1.417	10.96	2.167	4.87	2.92	2.98
0.750	24.17	1.500	10.96	2.250	4.30	3.00	2.98

Max.Eff.Inten.(mm/hr)=		104.19	39.19
over (min)		5.00	10.00
Storage Coeff. (min)=		2.40 (ii)	8.69 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.30	0.12
			TOTALS

```
     PEAK FLOW       (cms)=       0.11         0.05          0.140 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08           1.00
     RUNOFF VOLUME    (mm)=      40.51        17.85          26.45
     TOTAL RAINFALL   (mm)=      42.51        42.51          42.51
     RUNOFF COEFFICIENT   =       0.95         0.42           0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  86.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   0.79   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.68 | 0.833   24.17 | 1.583    8.29 |  2.33    4.30
              0.167    3.68 | 0.917  104.19 | 1.667    8.29 |  2.42    3.86
              0.250    4.58 | 1.000  104.19 | 1.750    6.69 |  2.50    3.86
              0.333    4.58 | 1.083   32.04 | 1.833    6.69 |  2.58    3.51
              0.417    6.15 | 1.167   32.04 | 1.917    5.63 |  2.67    3.51
              0.500    6.15 | 1.250   16.34 | 2.000    5.63 |  2.75    3.22
              0.583    9.61 | 1.333   16.34 | 2.083    4.87 |  2.83    3.22
              0.667    9.61 | 1.417   10.96 | 2.167    4.87 |  2.92    2.98
              0.750   24.17 | 1.500   10.96 | 2.250    4.30 |  3.00    2.98

     Unit Hyd Qpeak  (cms)=   0.302

     PEAK FLOW       (cms)=   0.039 (i)
     TIME TO PEAK    (hrs)=   1.000
     RUNOFF VOLUME    (mm)=  10.814
     TOTAL RAINFALL   (mm)=  42.514
     RUNOFF COEFFICIENT   =   0.254

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
```

| STANDHYD (0103)| Area (ha)= 1.71
|ID= 1 DT= 5.0 min | Total Imp(%)= 57.00 Dir. Conn.(%)= 28.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.97	0.74
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.75	4.00
Length	(m)=	80.00	55.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.68	0.833	24.17	1.583	8.29	2.33	4.30
0.167	3.68	0.917	104.19	1.667	8.29	2.42	3.86
0.250	4.58	1.000	104.19	1.750	6.69	2.50	3.86
0.333	4.58	1.083	32.04	1.833	6.69	2.58	3.51
0.417	6.15	1.167	32.04	1.917	5.63	2.67	3.51
0.500	6.15	1.250	16.34	2.000	5.63	2.75	3.22
0.583	9.61	1.333	16.34	2.083	4.87	2.83	3.22
0.667	9.61	1.417	10.96	2.167	4.87	2.92	2.98
0.750	24.17	1.500	10.96	2.250	4.30	3.00	2.98

Max.Eff.Inten.(mm/hr)=	104.19	62.27	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.40 (ii)	10.78 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.30	0.09	
			TOTALS
PEAK FLOW (cms)=	0.14	0.08	0.173 (iii)
TIME TO PEAK (hrs)=	1.00	1.17	1.00
RUNOFF VOLUME (mm)=	40.51	16.83	23.46
TOTAL RAINFALL (mm)=	42.51	42.51	42.51
RUNOFF COEFFICIENT =	0.95	0.40	0.55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 74.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2005)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


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DATE: 10/11/2022                          TIME: 09:53:53

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 100-year Chicago              **
  ***********************************************

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| CHICAGO STORM    |    IDF curve parameters: A=1735.688
| Ptotal= 71.66 mm |                          B=   6.014
--------------------                          C=   0.820
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	6.05	1.00	178.56	1.83	11.06	2.67	5.76
0.33	7.54	1.17	54.05	2.00	9.29	2.83	5.28
0.50	10.16	1.33	27.32	2.17	8.02	3.00	4.88
0.67	15.97	1.50	18.24	2.33	7.08		
0.83	40.65	1.67	13.74	2.50	6.35		

CALIB
STANDHYD (0101)
ID= 1 DT= 5.0 min

Area (ha)= 0.98
Total Imp(%)= 38.00 Dir. Conn.(%)= 38.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.37	0.61
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.75	5.00
Length	(m)=	80.00	28.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.05	0.833	40.65	1.583	13.74	2.33	7.08
0.167	6.05	0.917	178.56	1.667	13.74	2.42	6.35
0.250	7.54	1.000	178.56	1.750	11.06	2.50	6.35
0.333	7.54	1.083	54.05	1.833	11.06	2.58	5.76
0.417	10.16	1.167	54.05	1.917	9.29	2.67	5.76
0.500	10.16	1.250	27.32	2.000	9.29	2.75	5.28
0.583	15.97	1.333	27.32	2.083	8.02	2.83	5.28
0.667	15.97	1.417	18.24	2.167	8.02	2.92	4.88
0.750	40.65	1.500	18.24	2.250	7.08	3.00	4.88

Max.Eff.Inten.(mm/hr)=		178.56	101.37
over (min)		5.00	10.00
Storage Coeff. (min)=		1.93 (ii)	6.11 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.31	0.15
			TOTALS

```
     PEAK FLOW       (cms)=       0.18         0.13          0.294 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08           1.00
     RUNOFF VOLUME    (mm)=      69.66        41.14          51.98
     TOTAL RAINFALL   (mm)=      71.66        71.66          71.66
     RUNOFF COEFFICIENT   =       0.97         0.57           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  86.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   0.79   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.05 | 0.833   40.65 | 1.583   13.74 |  2.33    7.08
               0.167    6.05 | 0.917  178.56 | 1.667   13.74 |  2.42    6.35
               0.250    7.54 | 1.000  178.56 | 1.750   11.06 |  2.50    6.35
               0.333    7.54 | 1.083   54.05 | 1.833   11.06 |  2.58    5.76
               0.417   10.16 | 1.167   54.05 | 1.917    9.29 |  2.67    5.76
               0.500   10.16 | 1.250   27.32 | 2.000    9.29 |  2.75    5.28
               0.583   15.97 | 1.333   27.32 | 2.083    8.02 |  2.83    5.28
               0.667   15.97 | 1.417   18.24 | 2.167    8.02 |  2.92    4.88
               0.750   40.65 | 1.500   18.24 | 2.250    7.08 |  3.00    4.88

     Unit Hyd Qpeak  (cms)=   0.302

     PEAK FLOW       (cms)=   0.114 (i)
     TIME TO PEAK    (hrs)=   1.000
     RUNOFF VOLUME    (mm)=  27.764
     TOTAL RAINFALL   (mm)=  71.665
     RUNOFF COEFFICIENT   =   0.387

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
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```
| STANDHYD (  0103)|   Area    (ha)=   1.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  57.00   Dir. Conn.(%)=  28.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.97         0.74
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       0.75         4.00
     Length            (m)=      80.00        55.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.05 | 0.833   40.65 | 1.583   13.74 |  2.33    7.08
              0.167    6.05 | 0.917  178.56 | 1.667   13.74 |  2.42    6.35
              0.250    7.54 | 1.000  178.56 | 1.750   11.06 |  2.50    6.35
              0.333    7.54 | 1.083   54.05 | 1.833   11.06 |  2.58    5.76
              0.417   10.16 | 1.167   54.05 | 1.917    9.29 |  2.67    5.76
              0.500   10.16 | 1.250   27.32 | 2.000    9.29 |  2.75    5.28
              0.583   15.97 | 1.333   27.32 | 2.083    8.02 |  2.83    5.28
              0.667   15.97 | 1.417   18.24 | 2.167    8.02 |  2.92    4.88
              0.750   40.65 | 1.500   18.24 | 2.250    7.08 |  3.00    4.88

     Max.Eff.Inten.(mm/hr)=     178.56       156.35
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.93 (ii)    7.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.23          0.420 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08           1.00
     RUNOFF VOLUME    (mm)=      69.66        38.67          47.35
     TOTAL RAINFALL   (mm)=      71.66        71.66          71.66
     RUNOFF COEFFICIENT   =       0.97         0.54           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 FINISH
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Post-Development Visual OTTHYMO Schematic

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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2005)
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        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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DATE: 10/12/2022                          TIME: 12:23:16

USER:



COMMENTS: _____________________________________________________________


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  ********************************************
  ** SIMULATION : 5-yr Chicago                **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 42.51 mm |                          B=   6.053
--------------------                          C=   0.814
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	3.68	1.00	104.19	1.83	6.69	2.67	3.51
0.33	4.58	1.17	32.04	2.00	5.63	2.83	3.22
0.50	6.15	1.33	16.34	2.17	4.87	3.00	2.98
0.67	9.61	1.50	10.96	2.33	4.30		
0.83	24.17	1.67	8.29	2.50	3.86		

CALIB			
NASHYD (0202)	Area (ha)=	0.34	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.07	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.68	0.833	24.17	1.583	8.29	2.33	4.30
0.167	3.68	0.917	104.19	1.667	8.29	2.42	3.86
0.250	4.58	1.000	104.19	1.750	6.69	2.50	3.86
0.333	4.58	1.083	32.04	1.833	6.69	2.58	3.51
0.417	6.15	1.167	32.04	1.917	5.63	2.67	3.51
0.500	6.15	1.250	16.34	2.000	5.63	2.75	3.22
0.583	9.61	1.333	16.34	2.083	4.87	2.83	3.22
0.667	9.61	1.417	10.96	2.167	4.87	2.92	2.98
0.750	24.17	1.500	10.96	2.250	4.30	3.00	2.98

Unit Hyd Qpeak (cms)= 0.186

PEAK FLOW (cms)= 0.021 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 10.125
TOTAL RAINFALL (mm)= 42.514
RUNOFF COEFFICIENT = 0.238

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  57.00   Dir. Conn.(%)=  28.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.97         0.74
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       0.75         4.00
     Length            (m)=      80.00        55.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.68 | 0.833   24.17 | 1.583    8.29 |  2.33    4.30
              0.167    3.68 | 0.917  104.19 | 1.667    8.29 |  2.42    3.86
              0.250    4.58 | 1.000  104.19 | 1.750    6.69 |  2.50    3.86
              0.333    4.58 | 1.083   32.04 | 1.833    6.69 |  2.58    3.51
              0.417    6.15 | 1.167   32.04 | 1.917    5.63 |  2.67    3.51
              0.500    6.15 | 1.250   16.34 | 2.000    5.63 |  2.75    3.22
              0.583    9.61 | 1.333   16.34 | 2.083    4.87 |  2.83    3.22
              0.667    9.61 | 1.417   10.96 | 2.167    4.87 |  2.92    2.98
              0.750   24.17 | 1.500   10.96 | 2.250    4.30 |  3.00    2.98

     Max.Eff.Inten.(mm/hr)=     104.19        62.27
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       2.40 (ii)   10.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.08          0.173 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.17           1.00
     RUNOFF VOLUME    (mm)=      40.51        16.83          23.46
     TOTAL RAINFALL   (mm)=      42.51        42.51          42.51
     RUNOFF COEFFICIENT   =       0.95         0.40           0.55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
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| STANDHYD (  0205)|   Area    (ha)=   0.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.37         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      10.00        20.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.68 | 0.833   24.17 | 1.583    8.29 |  2.33    4.30
              0.167    3.68 | 0.917  104.19 | 1.667    8.29 |  2.42    3.86
              0.250    4.58 | 1.000  104.19 | 1.750    6.69 |  2.50    3.86
              0.333    4.58 | 1.083   32.04 | 1.833    6.69 |  2.58    3.51
              0.417    6.15 | 1.167   32.04 | 1.917    5.63 |  2.67    3.51
              0.500    6.15 | 1.250   16.34 | 2.000    5.63 |  2.75    3.22
              0.583    9.61 | 1.333   16.34 | 2.083    4.87 |  2.83    3.22
              0.667    9.61 | 1.417   10.96 | 2.167    4.87 |  2.92    2.98
              0.750   24.17 | 1.500   10.96 | 2.250    4.30 |  3.00    2.98

     Max.Eff.Inten.(mm/hr)=     104.19        22.17
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.51 (ii)    1.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.33
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.00          0.106 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00           1.00
     RUNOFF VOLUME    (mm)=      41.51        11.10          41.21
     TOTAL RAINFALL   (mm)=      42.51        42.51          42.51
     RUNOFF COEFFICIENT   =       0.98         0.26           0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
```

DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0360	0.0080
	0.0180	0.0040	0.0540	0.0125

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0205)	0.370	0.106	1.00	41.21
OUTFLOW: ID= 1 (0013)	0.370	0.032	1.17	41.08

PEAK FLOW REDUCTION [Qout/Qin](%)= 30.09
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0071

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 0.73 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.72	0.01
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.50	2.00
Length	(m)=	50.00	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.68	0.833	24.17	1.583	8.29	2.33	4.30
0.167	3.68	0.917	104.19	1.667	8.29	2.42	3.86
0.250	4.58	1.000	104.19	1.750	6.69	2.50	3.86
0.333	4.58	1.083	32.04	1.833	6.69	2.58	3.51
0.417	6.15	1.167	32.04	1.917	5.63	2.67	3.51
0.500	6.15	1.250	16.34	2.000	5.63	2.75	3.22
0.583	9.61	1.333	16.34	2.083	4.87	2.83	3.22
0.667	9.61	1.417	10.96	2.167	4.87	2.92	2.98
0.750	24.17	1.500	10.96	2.250	4.30	3.00	2.98

Max.Eff.Inten.(mm/hr)=		104.19	22.17	
over (min)		5.00	5.00	
Storage Coeff. (min)=		2.04 (ii)	3.15 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.31	0.27	
				TOTALS
PEAK FLOW	(cms)=	0.21	0.00	0.208 (iii)

```
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      40.51        11.10         40.22
     TOTAL RAINFALL   (mm)=      42.51        42.51         42.51
     RUNOFF COEFFICIENT   =       0.95         0.26          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      10.00        40.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.68 | 0.833   24.17 | 1.583    8.29 |  2.33    4.30
              0.167    3.68 | 0.917  104.19 | 1.667    8.29 |  2.42    3.86
              0.250    4.58 | 1.000  104.19 | 1.750    6.69 |  2.50    3.86
              0.333    4.58 | 1.083   32.04 | 1.833    6.69 |  2.58    3.51
              0.417    6.15 | 1.167   32.04 | 1.917    5.63 |  2.67    3.51
              0.500    6.15 | 1.250   16.34 | 2.000    5.63 |  2.75    3.22
              0.583    9.61 | 1.333   16.34 | 2.083    4.87 |  2.83    3.22
              0.667    9.61 | 1.417   10.96 | 2.167    4.87 |  2.92    2.98
              0.750   24.17 | 1.500   10.96 | 2.250    4.30 |  3.00    2.98

     Max.Eff.Inten.(mm/hr)=     104.19        22.17
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       0.51 (ii)    1.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.00          0.092 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00           1.00
```

```
     RUNOFF VOLUME    (mm)=      41.51        11.10          41.21
     TOTAL RAINFALL   (mm)=      42.51        42.51          42.51
     RUNOFF COEFFICIENT   =       0.98         0.26           0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0014)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0390      0.0071
                          0.0190     0.0035   |   0.0580      0.0106

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0204)      0.320      0.092      1.00       41.21
   OUTFLOW: ID= 1 (  0014)      0.320      0.032      1.08       41.08

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 34.59
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0059

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--------------------
| ADD HYD  (  0008)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0013):     0.37   0.032     1.17    41.08
      + ID2= 2 (  0014):     0.32   0.032     1.08    41.08
        ================================================
        ID = 3 (  0008):     0.69   0.064     1.08    41.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0008)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0008):     0.69   0.064     1.08    41.08
      + ID2= 2 (  0201):     0.73   0.208     1.00    40.22
```

```
        ==================================================
        ID = 1 (  0008):     1.42   0.262     1.00    40.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0018)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1344      0.0352
                          0.0448     0.0118   |   0.1486      0.0404
                          0.1002     0.0237   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0008)      1.420      0.262      1.00      40.64
   OUTFLOW: ID= 1 (  0018)      1.420      0.086      1.33      40.59

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 32.81
                   TIME SHIFT OF PEAK FLOW         (min)= 20.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0207

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 FINISH
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2005)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
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9c5-a4f1-4b87-b66d-a2077f6a0e99\scenar
  Summary filename:
C:\Users\bpond\AppData\Local\Civica\VH5\8b881089-ce4e-4435-8f19-92abc6f18a39\a0d41
9c5-a4f1-4b87-b66d-a2077f6a0e99\scenar


DATE: 10/12/2022                          TIME: 12:23:16

USER:



COMMENTS: _____________________________________________________________


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  **********************************************
  ** SIMULATION : 100-year Chicago             **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1735.688
| Ptotal= 71.66 mm |                          B=   6.014
--------------------                          C=   0.820
```

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	6.05	1.00	178.56	1.83	11.06	2.67	5.76
0.33	7.54	1.17	54.05	2.00	9.29	2.83	5.28
0.50	10.16	1.33	27.32	2.17	8.02	3.00	4.88
0.67	15.97	1.50	18.24	2.33	7.08		
0.83	40.65	1.67	13.74	2.50	6.35		

CALIB			
NASHYD (0202)	Area (ha)=	0.34	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.07	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.05	0.833	40.65	1.583	13.74	2.33	7.08
0.167	6.05	0.917	178.56	1.667	13.74	2.42	6.35
0.250	7.54	1.000	178.56	1.750	11.06	2.50	6.35
0.333	7.54	1.083	54.05	1.833	11.06	2.58	5.76
0.417	10.16	1.167	54.05	1.917	9.29	2.67	5.76
0.500	10.16	1.250	27.32	2.000	9.29	2.75	5.28
0.583	15.97	1.333	27.32	2.083	8.02	2.83	5.28
0.667	15.97	1.417	18.24	2.167	8.02	2.92	4.88
0.750	40.65	1.500	18.24	2.250	7.08	3.00	4.88

Unit Hyd Qpeak (cms)= 0.186

PEAK FLOW (cms)= 0.058 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 25.997
TOTAL RAINFALL (mm)= 71.665
RUNOFF COEFFICIENT = 0.363

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  57.00   Dir. Conn.(%)=  28.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.97         0.74
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       0.75         4.00
     Length            (m)=      80.00        55.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.05 | 0.833   40.65 | 1.583   13.74 |  2.33    7.08
              0.167    6.05 | 0.917  178.56 | 1.667   13.74 |  2.42    6.35
              0.250    7.54 | 1.000  178.56 | 1.750   11.06 |  2.50    6.35
              0.333    7.54 | 1.083   54.05 | 1.833   11.06 |  2.58    5.76
              0.417   10.16 | 1.167   54.05 | 1.917    9.29 |  2.67    5.76
              0.500   10.16 | 1.250   27.32 | 2.000    9.29 |  2.75    5.28
              0.583   15.97 | 1.333   27.32 | 2.083    8.02 |  2.83    5.28
              0.667   15.97 | 1.417   18.24 | 2.167    8.02 |  2.92    4.88
              0.750   40.65 | 1.500   18.24 | 2.250    7.08 |  3.00    4.88

     Max.Eff.Inten.(mm/hr)=     178.56       156.35
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.93 (ii)    7.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.23          0.420 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08           1.00
     RUNOFF VOLUME    (mm)=      69.66        38.67          47.35
     TOTAL RAINFALL   (mm)=      71.66        71.66          71.66
     RUNOFF COEFFICIENT   =       0.97         0.54           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
```

```
| STANDHYD (  0205)|   Area    (ha)=   0.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.37         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      10.00        20.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.05 | 0.833   40.65 | 1.583   13.74 |  2.33    7.08
              0.167    6.05 | 0.917  178.56 | 1.667   13.74 |  2.42    6.35
              0.250    7.54 | 1.000  178.56 | 1.750   11.06 |  2.50    6.35
              0.333    7.54 | 1.083   54.05 | 1.833   11.06 |  2.58    5.76
              0.417   10.16 | 1.167   54.05 | 1.917    9.29 |  2.67    5.76
              0.500   10.16 | 1.250   27.32 | 2.000    9.29 |  2.75    5.28
              0.583   15.97 | 1.333   27.32 | 2.083    8.02 |  2.83    5.28
              0.667   15.97 | 1.417   18.24 | 2.167    8.02 |  2.92    4.88
              0.750   40.65 | 1.500   18.24 | 2.250    7.08 |  3.00    4.88

     Max.Eff.Inten.(mm/hr)=     178.56        64.23
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.41 (ii)    1.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.34
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.00          0.182 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00           1.00
     RUNOFF VOLUME    (mm)=      70.66        28.51          70.24
     TOTAL RAINFALL   (mm)=      71.66        71.66          71.66
     RUNOFF COEFFICIENT   =       0.99         0.40           0.98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
```

DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0360	0.0080
	0.0180	0.0040	0.0540	0.0125

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0205)	0.370	0.182	1.00	70.24
OUTFLOW: ID= 1 (0013)	0.370	0.053	1.17	70.11

PEAK FLOW REDUCTION [Qout/Qin](%)= 29.10
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0123

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 0.73 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.72	0.01
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.50	2.00
Length	(m)=	50.00	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.05	0.833	40.65	1.583	13.74	2.33	7.08
0.167	6.05	0.917	178.56	1.667	13.74	2.42	6.35
0.250	7.54	1.000	178.56	1.750	11.06	2.50	6.35
0.333	7.54	1.083	54.05	1.833	11.06	2.58	5.76
0.417	10.16	1.167	54.05	1.917	9.29	2.67	5.76
0.500	10.16	1.250	27.32	2.000	9.29	2.75	5.28
0.583	15.97	1.333	27.32	2.083	8.02	2.83	5.28
0.667	15.97	1.417	18.24	2.167	8.02	2.92	4.88
0.750	40.65	1.500	18.24	2.250	7.08	3.00	4.88

Max.Eff.Inten.(mm/hr)=		178.56	64.23	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.65 (ii)	2.54 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.32	0.29	
				TOTALS
PEAK FLOW	(cms)=	0.36	0.00	0.359 (iii)

```
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      69.66        28.51         69.25
     TOTAL RAINFALL   (mm)=      71.66        71.66         71.66
     RUNOFF COEFFICIENT   =       0.97         0.40          0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      10.00        40.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.05 | 0.833   40.65 | 1.583   13.74 |  2.33    7.08
              0.167    6.05 | 0.917  178.56 | 1.667   13.74 |  2.42    6.35
              0.250    7.54 | 1.000  178.56 | 1.750   11.06 |  2.50    6.35
              0.333    7.54 | 1.083   54.05 | 1.833   11.06 |  2.58    5.76
              0.417   10.16 | 1.167   54.05 | 1.917    9.29 |  2.67    5.76
              0.500   10.16 | 1.250   27.32 | 2.000    9.29 |  2.75    5.28
              0.583   15.97 | 1.333   27.32 | 2.083    8.02 |  2.83    5.28
              0.667   15.97 | 1.417   18.24 | 2.167    8.02 |  2.92    4.88
              0.750   40.65 | 1.500   18.24 | 2.250    7.08 |  3.00    4.88

     Max.Eff.Inten.(mm/hr)=     178.56        64.23
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       0.41 (ii)    1.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.33
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.00          0.158 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00           1.00
```

```
     RUNOFF VOLUME    (mm)=      70.66        28.51          70.24
     TOTAL RAINFALL   (mm)=      71.66        71.66          71.66
     RUNOFF COEFFICIENT   =       0.99         0.40           0.98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0014)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0390      0.0071
                          0.0190     0.0035   |   0.0580      0.0106

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0204)      0.320      0.158      1.00       70.24
   OUTFLOW: ID= 1 (  0014)      0.320      0.054      1.08       70.11

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 34.48
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0100

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0008)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0013):     0.37   0.053     1.17    70.11
      + ID2= 2 (  0014):     0.32   0.054     1.08    70.11
        ================================================
        ID = 3 (  0008):     0.69   0.107     1.08    70.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0008)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0008):     0.69   0.107     1.08    70.11
      + ID2= 2 (  0201):     0.73   0.359     1.00    69.25
```

```
        ==================================================
        ID = 1 (  0008):     1.42   0.450     1.00    69.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0018)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1344      0.0352
                          0.0448     0.0118   |   0.1486      0.0404
                          0.1002     0.0237   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0008)      1.420      0.450      1.00      69.67
   OUTFLOW: ID= 1 (  0018)      1.420      0.137      1.42      69.63

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 30.39
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0362

--------------------------------------------------------------------------------
```

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Tuesday, March 15, 2022 9:47 AM
To: Brett Pond
Subject: RE: 125 Colonnade Road - Stormwater Quality Criteria (2112-6218)

Categories: Filed to Sharepoint

Hi Brett,

Hi Brett,

The RVCA will require enhanced water quality protection (80% TSS removal) based on the distance to the direct outlet to the Rideau along with the propose site plan design and the amount of impervious surface area on site.

Thank you,

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

From: Brett Pond <bpond@cfcrozier.ca>
Sent: Tuesday, February 1, 2022 9:21 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Brendan Walton <bwalton@cfcrozier.ca>
Subject: 125 Colonnade Road - Stormwater Quality Criteria (2112-6218)

Good morning Eric,

Our office was obtained to complete civil engineering design work on the property located at 125 Colonnade Road in Nepean. We have reviewed the pre-consultation meeting notes (attached) dated August 12, 2021. Per the pre-consultation meeting notes we are required to reach out to yourself (the RCVA) regarding the water quality control restrictions for the subject site. This email correspondence will be required to support the Functional Servicing and Stormwater Management Report for the development.

Per the pre-consultations notes “the RVCA will require enhanced water quality protection for redevelopment unless water quality is being captured downstream prior to outletting to the Rideau”. We have reviewed the City’s Infrastructure GIS and the stormwater from the site in conveyed to a stormwater management facility approximately 300 meters north of the site before outletting to the Rideau. At your earliest convince can you please confirm if the subject property will require enhanced water quality or whether the downstream stormwater management facility has been designed to provide the required quantity controls for the subject site if all quantity controls are met?

Please see the attached image of the downstream stormwater management facility for your reference. Please let me know if you have any questions or require any additional information.

Thanks,

Brett

Brett Pond | Engineering Intern
2800 High Point Drive, Suite 100 | Milton, ON L9T 6P4
T: 905.875.0026

Crozier Connections:

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Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/10/2022

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

Site Name:	125 Colonnade Road

Drainage Area (ha):	1.43
% Imperviousness:	100.00

Runoff Coefficient 'c': 0.90

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

Project Name:	125 Colonnade Road
Project Number:	2112-6218
Designer Name:	Brett Pond
Designer Company:	C.F. Crozier & Associates
Designer Email:	bpond@cfcrozier.ca
Designer Phone:	905-875-0026
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	41.54
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	146.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	67
EFO6	81
EFO8	88
EFO10	92
EFO12	96

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 81

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

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

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Upstream Flow Controlled Results

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.6	8.6	1.79	107.0	41.0	100	8.6	8.6
1	20.3	29.0	3.58	215.0	82.0	98	20.0	28.6
2	16.2	45.2	7.16	429.0	163.0	88	14.3	43.0
3	12.0	57.2	10.73	644.0	245.0	81	9.7	52.7
4	8.4	65.6	14.31	859.0	326.0	78	6.5	59.2
5	5.9	71.6	17.89	1073.0	408.0	74	4.4	63.6
6	4.6	76.2	21.47	1288.0	490.0	70	3.2	66.9
7	3.1	79.3	25.05	1503.0	571.0	66	2.0	68.9
8	2.7	82.0	28.62	1717.0	653.0	64	1.8	70.6
9	3.3	85.3	32.20	1932.0	735.0	64	2.1	72.8
10	2.3	87.6	35.78	2147.0	816.0	63	1.4	74.2
11	1.6	89.2	39.36	2361.0	898.0	62	1.0	75.2
12	1.3	90.5	42.93	2576.0	979.0	62	0.8	76.0
13	1.7	92.2	46.51	2791.0	1061.0	60	1.0	77.0
14	1.2	93.5	50.09	3005.0	1143.0	58	0.7	77.8
15	1.2	94.6	53.67	3220.0	1224.0	56	0.7	78.4
16	0.7	95.3	57.25	3435.0	1306.0	55	0.4	78.8
17	0.7	96.1	60.82	3649.0	1388.0	53	0.4	79.2
18	0.4	96.5	64.40	3864.0	1469.0	50	0.2	79.4
19	0.4	96.9	67.98	4079.0	1551.0	47	0.2	79.6
20	0.2	97.1	71.56	4293.0	1632.0	45	0.1	79.7
21	0.5	97.5	75.14	4508.0	1714.0	43	0.2	79.9
22	0.2	97.8	78.71	4723.0	1796.0	41	0.1	80.0
23	1.0	98.8	82.29	4937.0	1877.0	39	0.4	80.4
24	0.3	99.1	85.87	5152.0	1959.0	38	0.1	80.5
25	0.9	100.0	89.45	5367.0	2041.0	36	0.3	80.8
30	0.9	100.9	107.34	6440.0	2449.0	30	0.3	81.1
35	-0.9	100.0	125.23	7514.0	2857.0	26	N/A	80.8
40	0.0	100.0	143.11	8587.0	3265.0	23	0.0	80.8
45	0.0	100.0	146.00	8760.0	3331.0	22	0.0	80.8
							Estimated Net Annual Sediment (TSS) Load Reduction =	**81 %**

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

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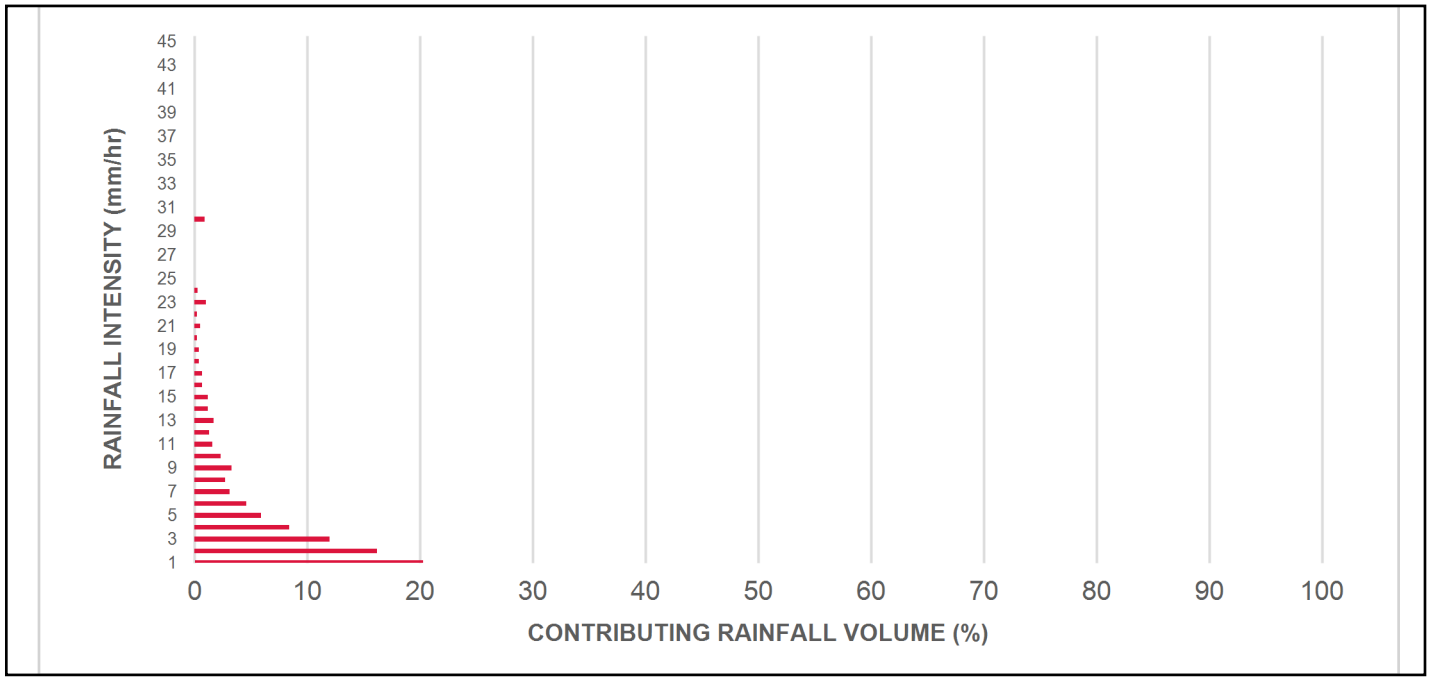
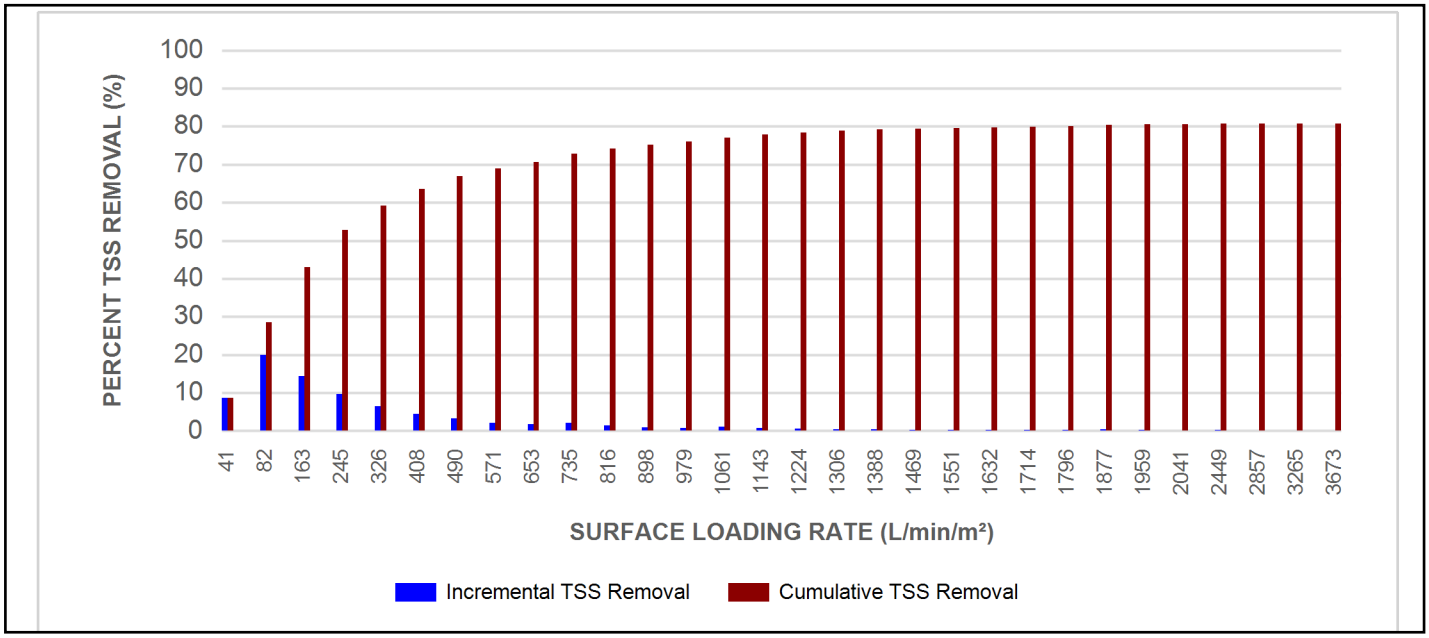
RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

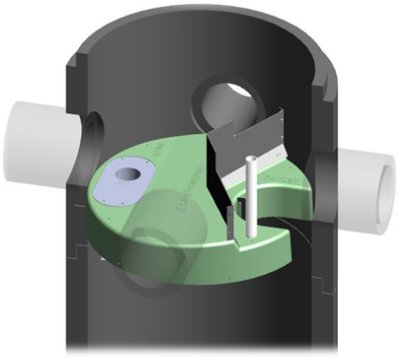
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

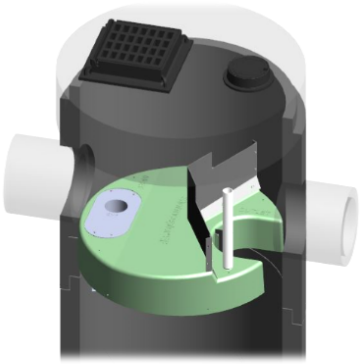
DESIGN FLEXIBILITY

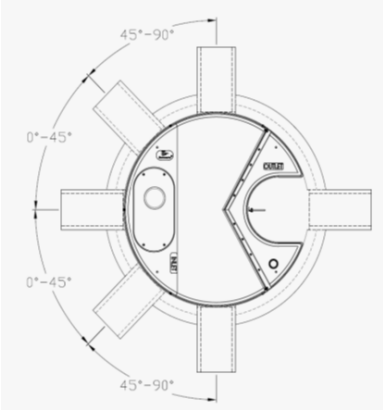
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

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

Pollutant Capacity

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

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

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

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

From: Brandon O'Leary <Brandon.OLeary@forterrabp.com>
Sent: Friday, September 16, 2022 12:24 PM
To: Brett Pond
Cc: Kent Campbell
Subject: RE: 125 Colonnade Road - OGS Unit Inquiry

Categories: Filed to Sharepoint

Hello Brett,

Great to hear from you as always. There are some technologies that have issues with this angle, which is where I believe the City of Ottawa may be coming from with this comment. The Stormceptor EFO can accommodate an inlet pipe at 90 degrees and still provide the level of water quality specified in the sizing report. When that inlet pipe is at 90 degrees, the inlet invert should be a minimum of 50 mm above the outlet invert. The Stormceptor EFO can also accommodate a single inlet grate. If you need anything else, please let me know.

Best Regards,

Brandon O'Leary, P.Eng., B.A.Sc.
Stormwater Specialist
Bowmanville/Cambridge Plant
Cell (905) 630-0359

We are excited to announce that Forterra is now Rinker Materials
Stormceptor
Protecting the water for future generations

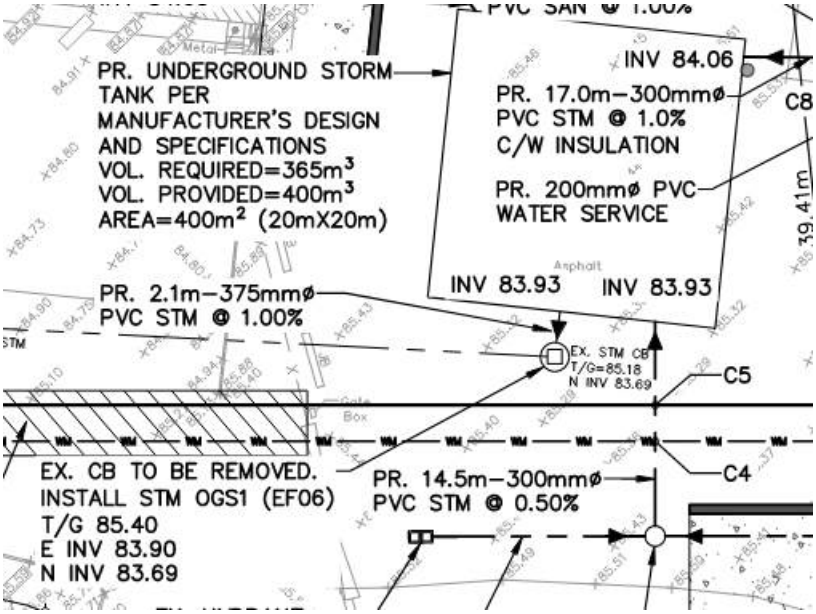
From: Brett Pond <bpond@cfcrozier.ca>
Sent: Wednesday, September 14, 2022 1:25 PM
To: Brandon O'Leary <Brandon.OLeary@forterrabp.com>
Subject: RE: 125 Colonnade Road - OGS Unit Inquiry

Good afternoon Brandon,

I hope all is well! I was hoping that you could clarify a comment that we received from the City of Ottawa regarding an OGS unit which we have proposed to provide quality control for a development. Please see the Town's comment below in **Blue**.

"Confirm the OGS system specified can meet the quality control requirement if the separation between the inlet and outlet are 90 degrees."

The OGS unit that is being proposed for the development is an EF06 and the inlet and outlet sewer of the unit meet at a 90-degree angle. Can an OGS unit meet the quality control requirements with the outlet and inlet at 90 degrees or do the sewers need to be inline (180 degrees)? I have included a snippet below showing our proposed design. Should this not be feasible we will simply add another manhole to the servicing plan.



Thanks,
Brett

Brett Pond | Engineering Intern
2800 High Point Drive, Suite 100 | Milton, ON L9T 6P4
T: 905.875.0026

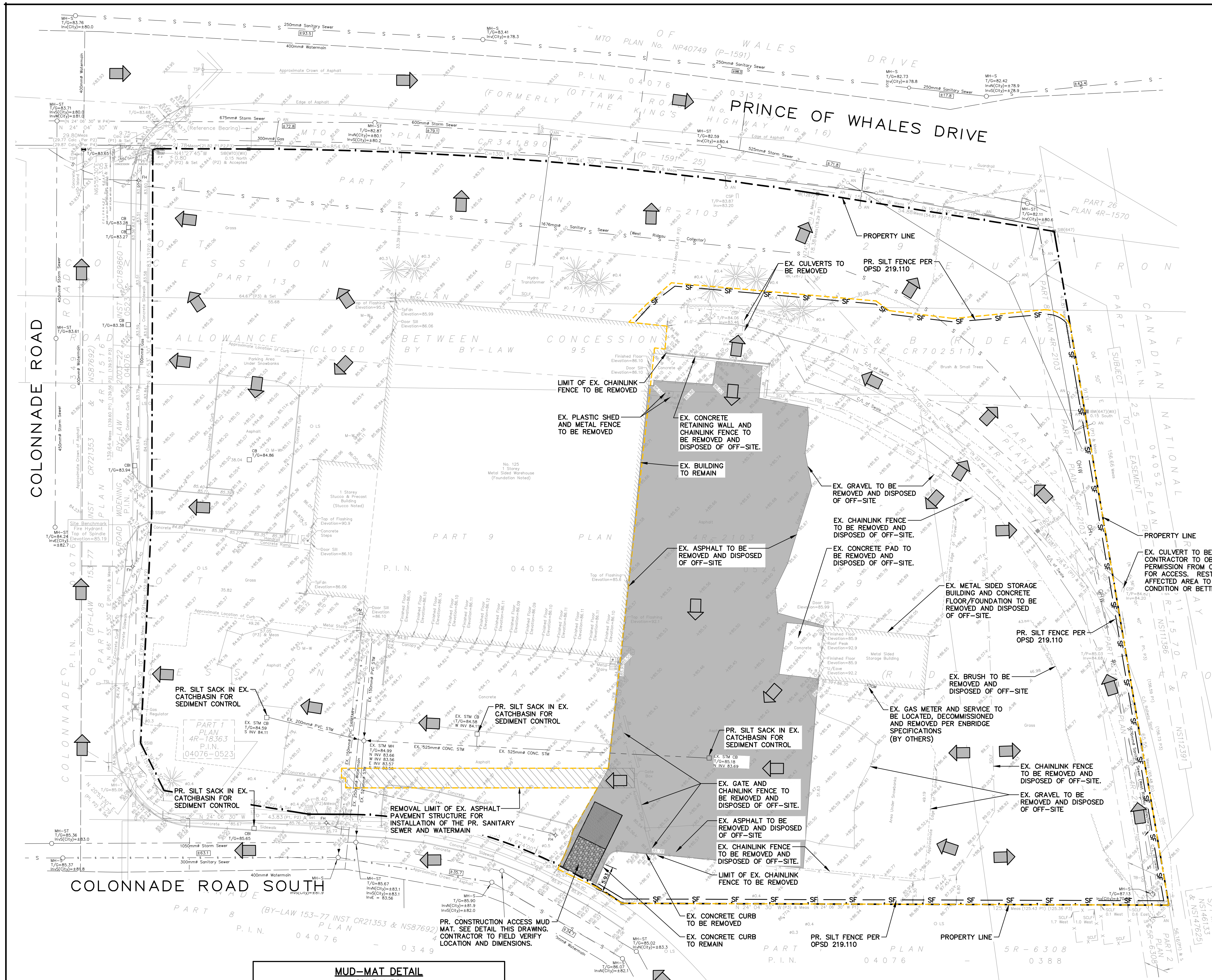
CROZIER
CONSULTING ENGINEERS

Crozier Connections:

Read our latest news and announcements here.

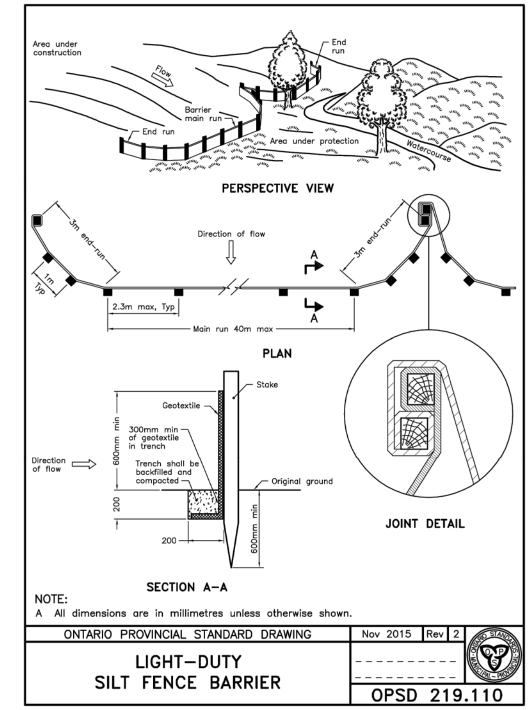
From: Brandon O'Leary <Brandon.OLeary@forterrabp.com>
Sent: Thursday, November 4, 2021 10:07 PM

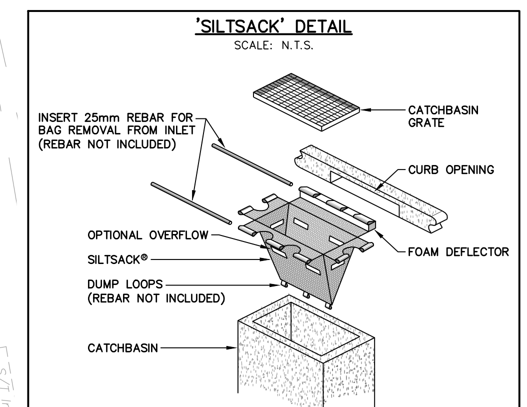
DRAWINGS



LEGEND

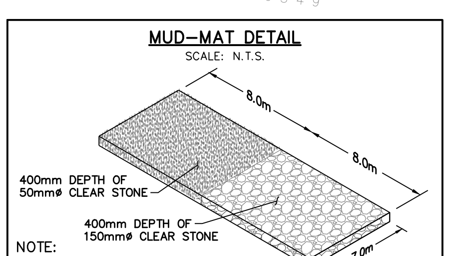
- PROPERTY LINE
- EXISTING DITCH
- EXISTING FENCE
- x 215.00 EXISTING GRADE
- EXISTING OVERLAND FLOW DIRECTION
- MUD-MAT; SEE DETAIL
- — SF — SF — TEMPORARY SILT FENCE; (OPSD 219.110)
- PROPOSED CONSTRUCTION LIMITS
- PROPOSED LIMIT OF ASPHALT REMOVAL





NOTES:

1. INSTALL TERRAFIX 'SILTSACK' IN ALL CATCHBASINS & CATCHBASIN MANHOLES AFFECTED BY CONSTRUCTION.
2. INSTALL TERRAFIX 'SILTSACK' IN ALL NEW CATCHBASINS & CATCHBASIN MANHOLES.



NOTE:
GEOTEXTILE (TERRAFIX 270R OR APPROVED EQUAL) TO BE PLACED AS SEPARATION BARRIER BETWEEN EXISTING GROUND AND CLEAR STONE.

NOTE:
CONTRACTOR TO OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FOR PROPOSED WORKS IN MUNICIPAL ROAD ALLOWANCE

EROSION & SEDIMENT CONTROL NOTES:

1. EROSION & SEDIMENT CONTROL MEASURES MUST BE INSTALLED PRIOR TO THE COMMENCEMENT OF SITE WORKS.
2. EROSION & SEDIMENT CONTROLS MUST BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAIN FALL EVENT, AND MUST BE MAINTAINED AND REPAIRED IN A TIMELY MANNER TO PREVENT SEDIMENT FROM LEAVING THE SITE.
3. IT IS REQUIRED TO STABILIZE ALL AREAS THAT WILL REMAIN DISTURBED FOR MORE THAN 30 DAYS.
4. MUD MAT AND SILT FENCE, AND ARE NOT TO BE REMOVED UNTIL COMPLETION OF CONSTRUCTION.

NOT FOR CONSTRUCTION

No.	ISSUE / REVISION	YYYY/MMM/DD
2	RE-ISSUED FOR SPA PER CITY COMMENTS	2023/JAN/10
1	RE-ISSUED FOR SPA PER CITY COMMENTS	2022/OCT/17
0	ISSUED FOR SITE PLAN APPLICATION	2022/MAY/17

ELEVATION NOTE:

ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO GEODETIC DATUM CGVD-1928:1978. (SEE FSD FILE No. 531-20)

IT IS THE RESPONSIBILITY OF THE SER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCHMARK HAS NOT BEEN ALTERED OR DISTURBED AND THAT IT'S RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON THIS DRAWING.

LOCAL BENCHMARK:

TOP SPINDLE OF FIRE HYDRANT LOCATED ON SOUTH SIDE OF COLANNADE ROAD, APPROXIMATELY 95.0m WEST OF PRINCE OF WHALES DRIVE.

ELEVATION = 85.19m

SURVEY NOTES:

SURVEY COMPLETED BY FARLEY, SMITH, & DENIS SURVEYING LTD. (2022/MAR/09)
FILE No.: 101-21
BEARINGS ARE GRID AND ARE REFERRED TO THE WESTERLY LIMIT OF PRINCE OF WHALES DRIVE HAVING A BEARING OF N 24° 04' 30" W, AS SHOWN ON PLAN 4R-18363.

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY ARCHITECTURE 49.
DRAWING No.: A0.2 WITH REVISION DATED (2022/SEP/23)
PROJECT No.: 219-00058-00

DRAWING NOTES:

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project
125 COLONNADE ROAD SOUTH
CITY OF OTTAWA

Drawing
EROSION, REMOVALS AND SEDIMENT CONTROL PLAN

Stamp: LICENSED PROFESSIONAL ENGINEER — B. G. D. WALTON — 100503737 — PROVINCE OF ONTARIO

Stamp: LICENSED PROFESSIONAL ENGINEER — N. CONSTANTIN — 100073636 — 2023.01.10 — PR.2112-6218 — PROVINCE OF ONTARIO

CROZIER CONSULTING ENGINEERS
2800 High Point Drive
Suite 100
Milton, ON L9T 6P4
905-875-0026 T
905-875-4915 F
www.cfcrozier.ca

Drawn	Design	Project No.	
M.I.M.	B.P.	2112-6218	
Check: B.W.	Check: B.W.	Scale: 1:500	Dwg. C101

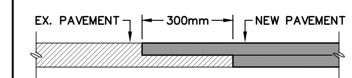
D07-12-22-0095

#18809

KEY PLAN
SCALE: N.T.S.

ASPHALT LAP JOINT DETAIL

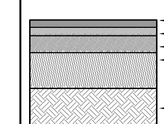
SCALE: N.T.S.



NOTE:
SAWCUT & COLD PLANE 300mm WIDE & 40mm DEEP WHERE NEW PAVEMENT MEETS EXISTING PAVEMENT, GROUT & SEAL WITH HOT RUBBERIZED ASPHALT.

HEAVY DUTY PAVEMENT STRUCTURE

SCALE: N.T.S.



NOTE:
REFER TO CONSTRUCTION NOTES FOR DETAILS ON COMPACTION. PAVEMENT STRUCTURE PER THE WSP GEOTECHNICAL REPORT (MAY 2022)

NOTE:
UNDERSIDE OF FOOTING (USF) TO BE CONFIRMED WITH PROJECT STRUCTURAL ENGINEER. STRUCTURAL ENGINEER TO NOTIFY C.F. CROZIER AND ASSOCIATES OF ANY CHANGES TO THE USF FOR EACH BUILDING.

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING FENCE
- ×215.00 EXISTING GRADE
- ×215.00 PROPOSED GRADE
- ×215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- 2.0% PROPOSED GRASSED SWALE
- PROPOSED SLOPE (3:1 MAX.)
- PROPOSED OVERLAND FLOW DIRECTION
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED RETAINING WALL
- PROPOSED CONSTRUCTION LIMITS

No.	ISSUE / REVISION	YYYY/MMM/DD
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TOP SPINDLE OF FIRE HYDRANT LOCATED ON SOUTH SIDE OF COLANNADE ROAD, APPROXIMATELY 95.0m WEST OF PRINCE OF WHALES DRIVE.

ELEVATION = 85.19m

SURVEY NOTES:

SURVEY COMPLETED BY FARLEY, SMITH, & DENIS SURVEYING LTD. (2022/MAR/09)
FILE No.: 101-21
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SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY ARCHITECTURE 49.
DRAWING No.: A0.2 WITH REVISION DATED (2022/SEP/23)
PROJECT No.: 219-00058-00

DRAWING NOTES:

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ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

125 COLONNADE ROAD SOUTH CITY OF OTTAWA

Drawing

SITE GRADING PLAN

NOT FOR CONSTRUCTION

Stamp: LICENSED PROFESSIONAL ENGINEER B. G. D. WALTON 100503737 JAN 10 2023 2112-6218 PROVINCE OF ONTARIO

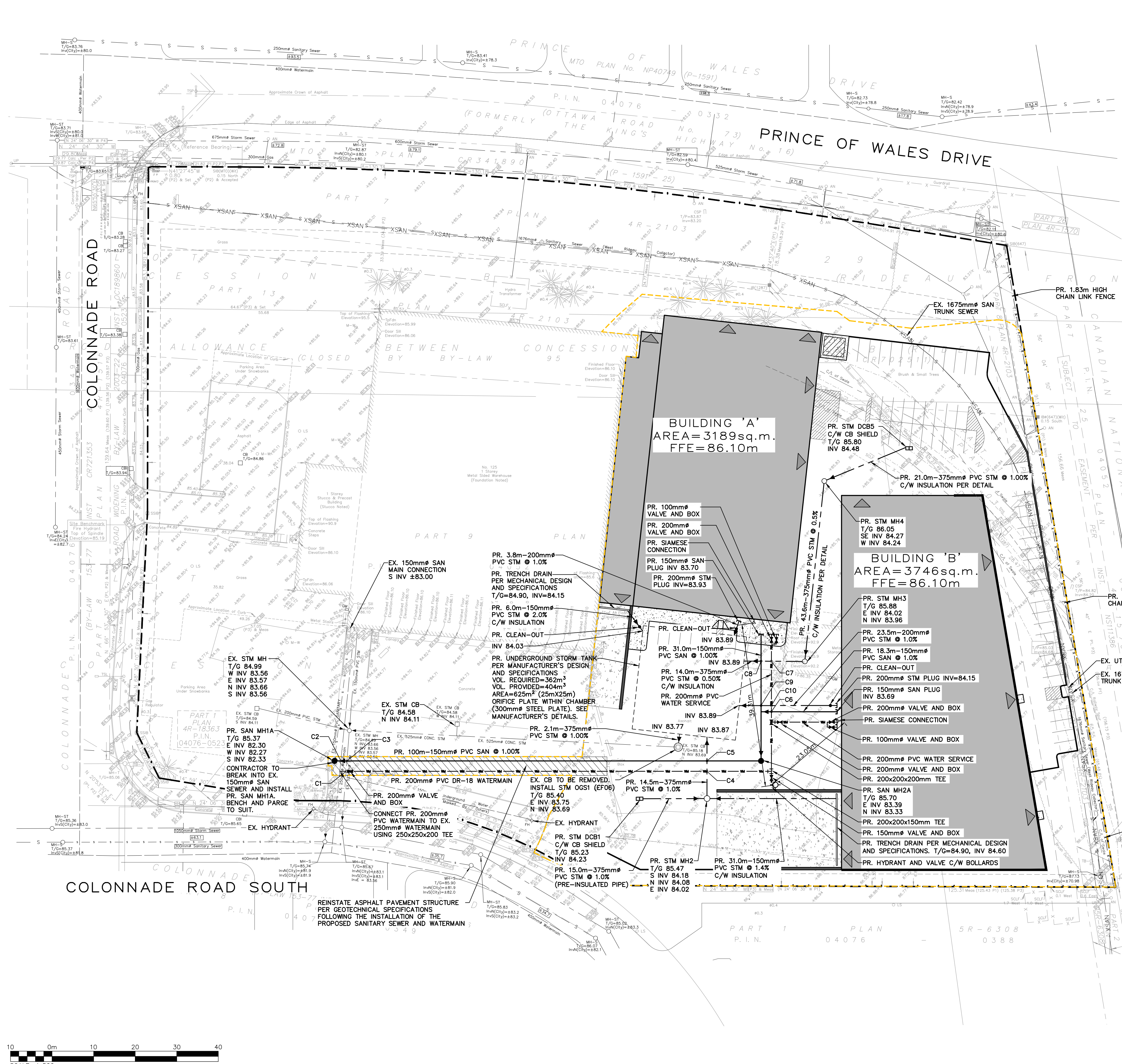
Stamp: LICENSED PROFESSIONAL ENGINEER N. CONSTANTIN 100073636 2023.01.10 PR.2112-6218 PROVINCE OF ONTARIO

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA

Drawn	M.I.M.	Design	B.P.	Project No.	2112-6218
Check	B.W.	Check	B.W.	Scale 1:500	Dwg. C102

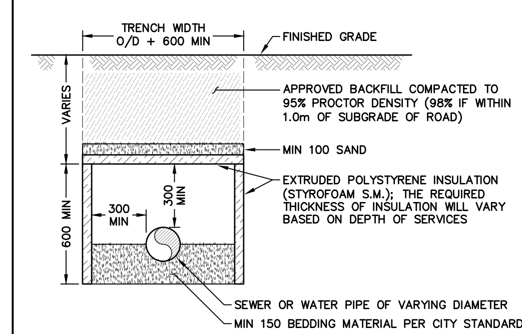
D07-12-22-0095

#18809



INSULATION FOR SHALLOW MUNICIPAL SERVICES

SCALE: N.T.S.



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. 50mm OF INSULATION IS REQUIRED FOR EVERY 600mm OF COVER DEFICIENCY.
3. MINIMUM COVER REQUIREMENTS;
   - STORM SEWER 2.0m
   - WATERMAIN 2.4m
   - SANITARY SEWER 2.0m

LEGEND

- PROPERTY LINE
- EXISTING WATERMAIN & GATE VALVE
- EXISTING STORM SEWER & MANHOLE
- EXISTING SINGLE / DOUBLE CATCHBASIN
- EXISTING SANITARY SEWER & MANHOLE
- PROPOSED WATERMAIN & GATE VALVE
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED SIAMESE CONNECTION
- PROPOSED WATER METER
- PROPOSED BACKFLOW PREVENTOR
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SINGLE / DOUBLE CATCHBASIN
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED CONSTRUCTION LIMITS

CROSSING TABLE

CROSSING I.D.	UPPER	LOWER
C1	EX STM INV 83.56±	W/M OBV 83.26
C2	EX W/M INV 83.09±	SAN OBV 82.50
C3	EX STM INV 83.57±	SAN OBV 82.52
C4	STM INV 83.97	W/M OBV 83.47
C5	STM INV 83.96	SAN OBV 83.35
C6	SAN INV 83.54	W/M OBV 83.04
C7	STM INV 84.16	W/M OBV 83.66
C8	STM INV 84.13	SAN OBV 83.73
C9	STM INV 83.97	SAN OBV 83.67
C10	STM INV 83.98	W/M OBV 83.04

NOTE:

1. CONTRACTOR TO ENSURE A MINIMUM 0.50m VERTICAL SEPARATION BETWEEN THE WATERMAIN AND ALL SEWER CROSSINGS DURING CONSTRUCTION. IN CASE OF CONFLICT BETWEEN SEWERS AND WATERMAIN, CONTRACTOR TO LOWER THE WATERMAIN CROSSING THE SEWER, ENSURING THE MINIMUM 0.50m VERTICAL CLEARANCE.
2. TRENCH DRAIN INVERTS AND ROOF DRAINS/DOWNSPOUTS PER MECHANICAL DESIGN AND SPECIFICATIONS.
3. CONTRACTOR TO VERIFY EXISTING WATERMAIN, SANITARY AND STORM SEWER LOCATIONS AND ELEVATIONS PRIOR TO CONSTRUCTION. DAYLIGHT THESE SERVICES TO VERIFY CROSSINGS.

NOTE:

BUILDING "A"
THIRTEEN (13) ROOF DRAINS REQUIRED. ALL DRAINS TO BE ZURN MODEL ZCF121–1W–X1–Z–105–10–77 OR CERTIFIED EQUIVALENT. THE DRAINS ARE TO BE INSTALLED WITH TWO NOTCHES OPEN AND AN OVERALL RELEASE RATE OF 29.8 L/s/m OF HEAD.

BUILDING "B"
TWELVE (12) ROOF DRAINS REQUIRED. ALL DRAINS TO BE ZURN MODEL ZCF121–1W–X1–Z–105–10–77 OR CERTIFIED EQUIVALENT. THE DRAINS ARE TO BE INSTALLED WITH TWO NOTCHES OPEN AND AN OVERALL RELEASE RATE OF 29.8 L/s/m OF HEAD.

* FOR ROOFTOP PONDING VOLUME CALCULATIONS AND CONTROLLED ROOFTOP RELEASE RATE CALCULATIONS SEE DWG. C104.

No.	ISSUE / REVISION	YYYY/MMM/DD
2	RE–ISSUED FOR SPA PER CITY COMMENTS	2023/JAN/10
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0	ISSUED FOR SITE PLAN APPLICATION	2022/MAY/17

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LOCAL BENCHMARK:

TOP SPINDLE OF FIRE HYDRANT LOCATED ON SOUTH SIDE OF COLANNADE ROAD, APPROXIMATELY 95.0m WEST OF PRINCE OF WHALES DRIVE.

ELEVATION = 85.19m

SURVEY NOTES:

SURVEY COMPLETED BY FARLEY, SMITH, & DENIS SURVEYING LTD. (2022/MAR/09)
FILE No.: 101–21
BEARINGS ARE GRID AND ARE REFERRED TO THE WESTERLY LIMIT OF PRINCE OF WHALES DRIVE HAVING A BEARING OF N 24° 04' 30" W, AS SHOWN ON PLAN 4R–18363.

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY ARCHITECTURE 49.
DRAWING No.: A0.2 WITH REVISION DATED (2022/SEP/23)
PROJECT No.: 219–00058–00

DRAWING NOTES:

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ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

125 COLONNADE ROAD SOUTH
CITY OF OTTAWA

Drawing

SITE SERVICING PLAN

NOT FOR CONSTRUCTION

Stamp: LICENSED PROFESSIONAL ENGINEER B. G. D. WALTON 100503737 PROVINCE OF ONTARIO

Stamp: LICENSED PROFESSIONAL ENGINEER N. CONSTANTIN 100073636 2023.01.10 PROVINCE OF ONTARIO

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905.875.0026 T
905.875.4915 F
WWW.CFCROZIER.CA

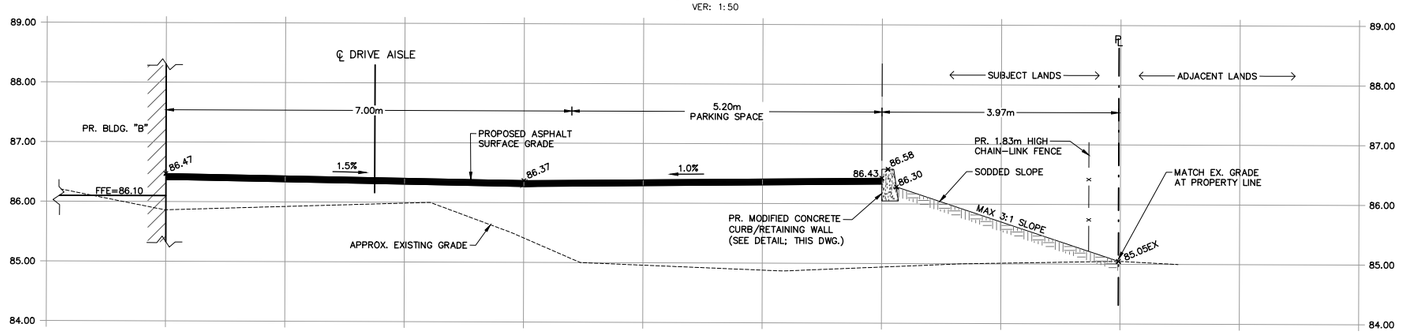
Drawn	M.I.M.	Design	B.P.	Project No.	2112–6218
Check	B.W.	Check	B.W.	Scale 1:500	Dwg. C103

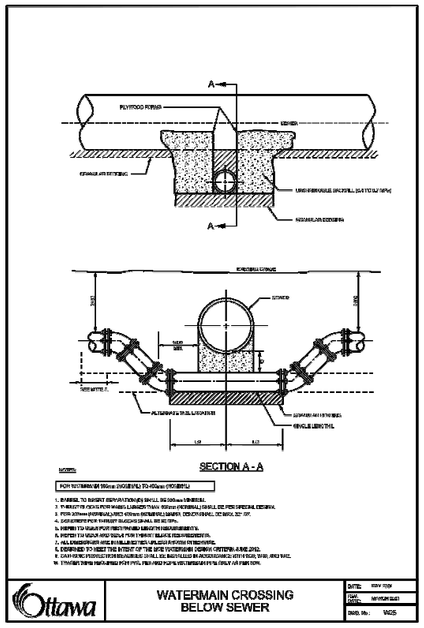
D07–12–22–0095

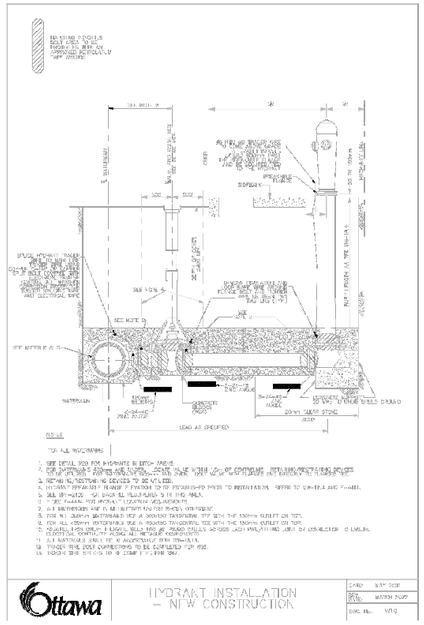
#18809

SECTION A–A

SCALE: HOR: 1:50
VER: 1:50







ROOFTOP PONDING CALCULATIONS

ROOFTOP PONDING VOLUME CALCULATIONS

Roof Name	Roof Area (ha)	Roof Area Per Drain (ha)	Drain Ponding Area (ha)	Max. Allowable Rooftop Ponding Depth (m)	Max. Rooftop Ponding Volume per Drain (m^3)	Max. Rooftop Ponding Volume Available (m^3)	Max. Rooftop Ponding Volume Required (m^3)
BLDG A (3 storey)	0.27	0.03	0.02	0.15	10.7	85.5	-
BLDG A (2 storey)	0.05	0.02	0.01	0.15	0.8	20.6	-
BLDG A (total)	0.32	-	-	0.15	-	106.2	100
BLDG B	0.37	0.03	0.02	0.15	2.6	124.9	123

Note: Maximum required rooftop ponding per VO Model prepared by Crozier.

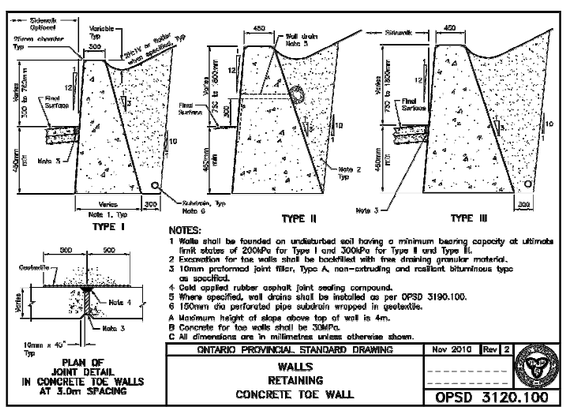
ZURN ROOF DRAIN FLOW RATING

Opening	G.P.M. Per Inch of Head	L.P.M. Per Inch of Head	L/s Per Meter of Head	L/s Per 0.05 m of Head	L/s Per 0.10 m of Head	L/s Per 0.15 m of Head
X_1	5.00	22.73	14.91	0.75	1.49	2.24
X_2	3.75	17.05	11.19	0.56	1.12	1.68
X_3	2.50	11.37	7.46	0.37	0.75	1.12
X_4	1.25	5.68	3.73	0.19	0.37	0.56

Note: Zurn control flow rates obtained from Drawing No. P-13521 - Adjustable Weir for Sloped-Roof "Control-Flo" Roof Drain

CONTROLLED ROOFTOP RELEASE RATE CALCULATIONS

Roof Name	Control System	Zurn Model Number	Release Rate per Drain (L/s per meter of head)	Proposed # of Zurn Drains	# of Notches per Zurn Drain	Total Release Rate from Roof (L/s)
BLDG A (3 storey)	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	10	2	44.7
BLDG A (2 storey)	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	3	2	13.4
BLDG A (total)	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	13	2	58.2
BLDG B	Zurn Roof Drain	ZCF121-1W-X1-Z-105-10-77	14.92	12	2	53.7



No.	ISSUE / REVISION	YYYY/MMM/DD
2	RE–ISSUED FOR SPA PER CITY COMMENTS	2023/JAN/10
1	RE–ISSUED FOR SPA PER CITY COMMENTS	2022/OCT/17
0	ISSUED FOR SITE PLAN APPLICATION	2022/MAY/17

ELEVATION NOTE:

ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO GEODETIC DATUM COVD–1928: 1978. (SEE FSD FILE No. 531–20)

IT IS THE RESPONSIBILITY OF THE SER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCHMARK HAS NOT BEEN ALTERED OR DISTURBED AND THAT IT'S RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON THIS DRAWING.

LOCAL BENCHMARK:

TOP SPINDLE OF FIRE HYDRANT LOCATED ON SOUTH SIDE OF COLANNADE ROAD, APPROXIMATELY 95.0m WEST OF PRINCE OF WHALES DRIVE.

ELEVATION = 85.19m

SURVEY NOTES:

SURVEY COMPLETED BY FARLEY, SMITH, & DENIS SURVEYING LTD. (2022/MAR/09)
FILE No.: 101–21
BEARINGS ARE GRID AND ARE REFERRED TO THE WESTERLY LIMIT OF PRINCE OF WHALES DRIVE HAVING A BEARING OF N 24° 04' 30" W, AS SHOWN ON PLAN 4R–18363.

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY ARCHITECTURE 49.
DRAWING No.: A0.2 WITH REVISION DATED (2022/SEP/23)
PROJECT No.: 219–00058–00

DRAWING NOTES:

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

125 COLONNADE ROAD SOUTH
CITY OF OTTAWA

Drawing

CONSTRUCTION DETAILS

NOT FOR CONSTRUCTION

Stamp

LICENSED PROFESSIONAL ENGINEER
B. G. D. WALTON
100503737
PROVINCE OF ONTARIO

Stamp

LICENSED PROFESSIONAL ENGINEER
N. CONSTANTIN
100073636
PROVINCE OF ONTARIO

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905875-0026 T
905875-4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M.	B.P.		2112–6218
Check	Check	Scale	Dwg.
B.W.	B.W.	N.T.S.	C104

D07–12–22–0095
#18809

CONSTRUCTION NOTES:

1.0 EROSION & SEDIMENT CONTROL INSTALLATION

1.1 NO MAINTENANCE OR REPAIR WORK ON CONSTRUCTION EQUIPMENT IS ALLOWED WITHIN 30m OF AN EXISTING WATER COURSE OR DITCH.
1.2 ALL EROSION AND SEDIMENT CONTROL FACILITIES AND WORKS ARE TO BE CONSTRUCTED AND IN PLACE TO THE APPROVAL OF THE SITE ENGINEER PRIOR TO ANY GRADING OPERATIONS COMMENCING. TYPICAL WORKS INCLUDE SILT FENCES AND SILT SACKS ON CATCHBASIN GRATES.
1.3 ALL TEMPORARY SOIL OR DIRT STOCKPILES ARE TO BE PROVIDED WITH THE NECESSARY SEDIMENT AND EROSION CONTROL FEATURES. IF STOCKPILES ARE TO REMAIN FOR A PERIOD LONGER THAN 180 DAYS, STOCKPILES SHALL BE HYDROSEEDED AND SURROUNDED WITH SILT FENCE.
1.4 ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES (I.E. SILT FENCE, STRAW BALES, CLEARSTONE ETC.) ARE TO BE KEPT ON SITE FOR EMERGENCIES AND REPAIRS.
1.5 EROSION AND SEDIMENT CONTROL METHODS ARE TO BE CONTINUOUSLY EVALUATED AND, WHERE NECESSARY, UPGRADES ARE TO BE IMPLEMENTED.
1.6 AN AFTER HOURS CONTACT NUMBER IS TO BE VISIBLY POSTED ON-SITE FOR EMERGENCIES.
1.7 ALL CATCHBASINS WITHIN LANDSCAPED AREAS TO HAVE SILT SACK ERECTED IMMEDIATELY AFTER CATCHBASIN INSTALLATION. SILT SACK TO BE MAINTAINED ON A REGULAR BASIS OR TO THE SATISFACTION OF THE CITY OF OTTAWA.
1.8 ALL ROADSIDE CATCHBASINS TO HAVE SILT SACK INSTALLED IMMEDIATELY AFTER CATCHBASIN INSTALLATION. SILT SACK TO BE MAINTAINED ON A REGULAR BASIS OR TO THE SATISFACTION OF THE CITY OF OTTAWA.
1.9 CONSTRUCTION SEQUENCE:
- INITIAL SEDIMENT CONTROL INSTALLATION
- SITE GRADING OPERATIONS
- UNDERGROUND SERVICING OPERATIONS
- BUILDING CONSTRUCTION
- FINAL GRADING OPERATIONS

1.10 IF SITE CONSTRUCTION ACTIVITIES ARE INTERRUPTED AND/OR INACTIVITY EXCEEDS 30 DAYS, ALL STRIPPED AND/OR BARE SOIL AREAS ARE TO BE STABILIZED BY SODDING/SEEDING/MULCHING OR OTHER APPROVED METHOD, TO THE SATISFACTION OF THE CITY OF OTTAWA.
1.11 ALL EROSION AND SEDIMENT CONTROL MEASURE ARE TO BE REGULARLY INSPECTED AND MAINTAINED, AS REQUIRED, TO THE SATISFACTION OF THE CITY OF OTTAWA.
1.12 DURING ALL CONSTRUCTION PHASES, MUD TRACKING CONTROL, CONSISTING OF FLUSHING AND SWEEPING ROADS, IS TO BE PROVIDED FOR ALL ROADS.

A) PRE CONSTRUCTION

1.13 CONTRACTOR TO ADVISE CITY WHAT STAFF IS RESPONSIBLE FOR SITE SEDIMENT CONTROL SUPERVISION, INSPECTION AND MAINTENANCE, INCLUDING AFTER HOUR CONTACTS.
1.14 CONTRACTOR TO PROVIDE WRITTEN INSPECTION AND MAINTENANCE SCHEDULE OF SEDIMENT CONTROL DEVICES.
1.15 CONTRACTOR TO INSTALL ALL SEDIMENT CONTROL DEVICES AS IDENTIFIED ON THE APPROVED EROSION CONTROL PLAN PRIOR TO IMPLEMENTATION OF TOPSOIL STRIPPING OR EARTHWORKS OPERATIONS.

B) DURING CONSTRUCTION (SITE & BUILDING WORKS)

1.16 CONTRACTOR TO ENSURE TOPSOIL, STRIPPING, GRADING AND UNDERGROUND WORKS CONFORM TO APPROVED GRADING, SERVICING AND EROSION CONTROL PLANS.
1.17 SITE ENGINEER TO CONDUCT REQUIRED WEEKLY INSPECTION, MAINTENANCE AND REPORTING OF SEDIMENT CONTROLS TO THE CITY STAFF.
1.18 CONTRACTOR TO STABILIZE SITE AS REQUIRED THROUGHOUT SITE CONSTRUCTION SCHEDULE.

C) POST CONSTRUCTION (INCLUDING BUILDING CONSTRUCTION)

1.19 CONTRACTOR TO COMPLETE FINAL SITE STABILIZATION AND REVEGETATION WORKS.
1.20 CONTRACTOR TO REMOVE ALL SEDIMENT CONTROL DEVICES AFTER THE SITE IS STABILIZED TO A CONDITION EQUAL TO, OR BETTER THAN, PRE-CONSTRUCTION.
1.21 FOLLOWING COMPLETION OF CONSTRUCTION AND AS DIRECTED BY SITE ENGINEER, ALL EROSION AND SEDIMENT CONTROL WORKS ARE TO BE REMOVED INCLUDING ANY ACCUMULATED SEDIMENT.
1.22 ALL WORKS LOCATED ON LANDS OUTSIDE THE PROPOSED DEVELOPMENT AREA ARE TO BE GRADED TO MATCH EXISTING SURROUNDING GROUND AND HYDROSEEDED.

2.0 EROSION & SEDIMENT CONTROL MAINTENANCE

2.1 SILT FENCE TO BE PER OPSD 219.110
2.2 SILT FENCE MUST BE INSPECTED WEEKLY FOR RIPS OR TEARS, BROKEN STAKES, BLOW-OUTSAND ACCUMULATION OF SEDIMENT.
2.3 SILT FENCE MUST BE INSPECTED IMMEDIATELY AFTER EVERY RAIN STORM EVENT OR AS DIRECTED BY SITE ENGINEER.
2.4 SEDIMENT MUST BE REMOVED FROM SILT FENCE WHEN ACCUMULATION REACHES 50% OF THE HEIGHT OF THE FENCE.
2.5 ALL SILT FENCES MUST BE REMOVED ONLY WHEN THE ENTIRE SITE IS STABILIZED AND AS DIRECTED BY THE SITE ENGINEER.
2.6 ALL SILT FENCES INSTALLED AT THE LIMIT OF THE DEVELOPMENT ARE TO BE PLACED DIRECTLY ON THE PROPERTY LINE OR AS DIRECTED BY SITE ENGINEER.

3.0 GENERAL

3.1 ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS, OPSD & OPSS. WHERE CONFLICT OCCURS, CITY OF OTTAWA STANDARDS TO GOVERN.
3.2 ALL TOPSOIL & EARTH EXCAVATION TO BE REMOVED TO AN APPROVED SITE.
3.3 THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DETAILED LAYOUT OF THE WORK. THE ENGINEER WILL CONFIRM ALL BENCH MARK ELEVATIONS AND HORIZONTAL ALIGNMENT.
3.4 ALL PROPERTY BARS TO BE PRESERVED AND REPLACED BY O.L.S. AT CONTRACTOR'S EXPENSE IF REMOVED DURING CONSTRUCTION.
3.5 THE CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS FOR THE SUPPLY OF TEMPORARY WATER & POWER.
3.6 IF REQUIRED, DEWATERING TO BE CARRIED OUT IN ACCORDANCE WITH OPSS-517 & 518 TO MAINTAIN ALL TRENCHES IN A DRY CONDITION. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING M.O.E.C.C. PERMIT IF REQUIRED.
3.7 THE UTILITIES SHOWN ON PLANS ARE APPROXIMATE ONLY & CONTRACTOR TO CONFIRM LOCATIONS IN ADVANCE OF CONSTRUCTION.
3.8 THE CONTRACTOR IS RESPONSIBLE TO NOTIFY ALL UTILITY COMPANIES PRIOR TO COMMENCING WORK & CO-ORDINATE CONSTRUCTION ACCORDINGLY.
3.9 THE LOCATION AND ELEVATION OF ALL EXISTING SERVICES AND UTILITIES ARE TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE RESTORATION AND/OR REPAIR OF EXISTING UTILITIES DISTURBED DURING CONSTRUCTION.
3.10 ALL AREAS BEYOND THE SITE PLAN WHICH ARE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE EXPENSE OF THE CONTRACTOR.
3.11 ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
3.12 ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
3.13 ALL DISTURBED AREAS WITHIN MUNICIPAL RIGHT-OF-WAY TO BE RESTORED TO EXISTING CONDITIONS OR BETTER.
3.14 THE GEOTECHNICAL SUITABILITY OF ALL THE FILL MATERIAL WILL BE ASSESSED BY THE GEOTECHNICAL ENGINEER.
3.15 GEOTECHNICAL ENGINEER TO CONFIRM SUITABILITY OF ROAD MATERIAL DEPTHS BASED ON SUB-BASE MATERIAL.
3.16 MONITORING WELLS TO BE DECOMMISSIONED PER GEOTECHNICAL ENGINEER.
3.17 ALL EXISTING UNDERGROUND UTILITIES AND SERVICES TO BE LOCATED AND VERIFIED IN THE FIELD BY THE CONTRACTOR. CONTRACTOR IS TO CONTACT ENGINEER WITH ANY DISCREPANCIES PRIOR TO REMOVAL.

4.0 OPEN CUT & RESTORATION

4.1 BACKFILL MATERIALS SHALL BE OPSS GRANULAR 'A', GRANULAR 'B' & UNSHRINKABLE FILL PLACED AT THE SPECIFIED DEPTHS. ALL GRANULAR MATERIAL SHALL CONFORM WITH OPSS 1010 & THE UNSHRINKABLE FILL SHALL CONFORM TO CURRENT CITY OF OTTAWA STANDARDS. ALL GRANULAR MATERIAL SHALL BE PLACED IN 150mm LIFTS AND COMPACTED TO 100% STANDARD PROCTOR DENSITY.
4.2 AFTER BACKFILLING THE UTILITY TRENCH, A MIN. 300mm TOTAL ASPHALT REMOVAL SHALL BE CUT ON ALL SIDES OF THE TRENCH INTO THE EXISTING PAVEMENT STRUCTURE. THE PAVEMENT STRUCTURE MATERIALS SHALL MATCH THE EXISTING PAVEMENT MATERIAL.
4.3 ASPHALT RESTORATION SHALL BE A MINIMUM OF 40mm HL-3 & 50mm HL-8 & SHALL MATCH THE EXISTING PAVEMENT STRUCTURE. ALL ASPHALT RESTORATION SHALL BE IN COMPLIANCE WITH OPSS 310. ALL HOT-MIX MATERIAL SHALL CONFORM TO OPSS 1149, 1150 AND/OR 1154. EXPOSED ASPHALT AND CONCRETE FACES SHALL BE CLEANED AND COATED WITH AN RS-1 (OR EQUIVALENT) ASPHALT EMULSION & ALLOW TO 'BREAK' PRIOR TO COMMENCING ASPHALT PLACEMENT.
4.4 WHEN THE REMAINING ASPHALT, FROM THE EDGE OF PAVEMENT TO THE SAWCUT IS 1.3m OR LESS, THE EXISTING ASPHALT WILL BE REMOVED FULL DEPTH & REPAVED AS PER NOTE 3. WHEN TWO OR MORE ROAD CUTS ARE REQUIRED AT A GIVEN SITE AND THE CUTS ARE LESS THAN 2.5m APART THE ENTIRE AREA MUST HAVE FULL DEPTH ASPHALT RESTORATION FROM THE OUTER LIMITS OF ALL REPAIRS.
4.5 SIDEWALK RESTORATION SHALL BE A MINIMUM OF 1 FULL BAY INCLUDING EXPANSION JOINT MATERIAL. ALL CONCRETE SHALL BE AS PER OPSS 351. ALL SIDEWALKS SHALL BE 130mm THICK.
4.6 SUB-DRAINS UNDER THE CURB SHALL BE RESTORED TO ENSURE THEIR OPERATION AND SHALL BE PLACED AS PER CITY OF OTTAWA STANDARDS.
4.7 WHERE THE CURB HAS BEEN UNDERMINED TO FACILITATE WATERMAIN INSTALLATION THE CURB SHALL BE REMOVED AND REPLACED. CURB RESTORATION SHALL BE MINIMUM OF 2.0m OR SHALL EXTEND 0.5m BEYOND THE OUTER TRENCH EDGES WHICH EVER IS GREATER, ALL CONCRETE SHALL BE AS PER OPSD 600.11
4.8 ALL GRASSED BOULEVARDS SHALL BE RE-INSTATED WITH NUMBER 1 NURSERY SOD PLACED ON TOP OF 100mm OF TOPSOIL. ALL SOD SHALL BE PLACED WITH STAGGERED JOINTS, BE ROLLED, AND WHERE APPLICABLE, STAKED INTO THE GROUND.

5.0 DRIVEWAY & PARKING LOT

5.1 GRANULAR 'A' & 'B' BASE TO BE COMPACTED TO 98% OF THE MATERIAL'S RESPECTIVE SPMDD OR AS APPROVED BY GEOTECHNICAL ENGINEER.
5.2 THE TOP 1.0m OF THE SUB-BASE SHALL BE COMPACTED TO A MINIMUM OF 98% OF STANDARD PROCTOR DENSITY WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
5.3 SUBGRADE TO BE PROOF ROLLED & CERTIFIED BY GEOTECHNICAL ENGINEER PRIOR TO PLACING GRANULAR MATERIAL.
5.4 DRIVEWAYS & PARKING LOT TO BE CONSTRUCTED AS PER RECOMMENDATIONS OF GEOTECHNICAL ENGINEER.
5.5 ALL GRANULAR AND ASPHALT MATERIAL PLACEMENT TO BE IN ACCORDANCE WITH OPSS 314 & OPSS 310.
5.6 ALL CONCRETE SIDEWALKS TO BE CONSTRUCTED IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
5.7 ALL PEDESTRIAN SIDEWALK ENTRANCES AT INTERSECTIONS TO BE CONSTRUCTED IN ACCORDANCE WITH OPSD 350.010.

6.0 SANITARY SERVICE

6.1 BEDDING & EMBEDMENT TO OPSD - 802.010, GRANULAR 'A' BEDDING.
6.2 TRENCH BACKFILL TO SELECT NATIVE MATERIAL AS APPROVED BY ENGINEER OR IMPORTED GRANULAR MATERIAL.
6.3 BEDDING & EMBEDMENT MATERIAL TO BE COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD).
6.4 CLEAR STONE WRAPPED WITH FILTER FABRIC CAN BE SUBSTITUTED FOR EMBEDMENT MATERIAL IF APPROVED BY THE GEOTECHNICAL ENGINEER.
6.5 SANITARY SEWER; SDR 35 PVC WITH MINIMUM PIPE STIFFNESS OF 320kPa - MANUFACTURED TO C.S.A. STANDARD B182.2 (A.S.T.M. SPECIFICATION D 3034) WITH RUBBER GASKETTED BELL AND SPIGOT JOINTS.
6.6 ALL SEWERS CONSTRUCTED WITH GRADES 0.5% OR LESS, SHALL BE INSTALLED USING A LASER AND CHECKED PRIOR TO BACKFILL AT THE CONTRACTORS EXPENSE.
6.7 ALL INTERNAL DROP STRUCTURES FOR MANHOLES SHALL CONFORM TO LATEST VERSION OF CITY OF OTTAWA STANDARDS.

7.0 WATER SERVICE

7.1 BEDDING & EMBEDMENT TO CITY OF OTTAWA STANDARDS.
7.2 BEDDING & EMBEDMENT MATERIAL TO BE COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THE MATERIAL'S SPMDD.
7.3 TRENCH BACKFILL TO BE SELECT NATIVE MATERIAL AS APPROVED BY ENGINEER OR IMPORTED GRANULAR MATERIAL.
7.4 SERVICE CONNECTIONS TO CITY OF OTTAWA STANDARDS.
7.5 MINIMUM COVER ON WATERMAIN AND SERVICES TO BE 1.7m BELOW FINISHED GRADE.
7.6 CLEARANCE BETWEEN WATERMAIN AND SEWERS TO BE A MINIMUM OF 0.5m VERTICAL WHERE WATER MAIN IS ABOVE SEWER OR 2.5m MINIMUM HORIZONTAL SEPARATION.
7.7 FOLLOWING TESTING, CONTRACTOR SHALL OPERATE EACH WATER SERVICE TO VERIFY FULL FLOW AND PRESSURE AT THE CURB STOP TO THE SATISFACTION OF THE ENGINEER.
7.8 VALVE IN BOXES TO BE INSTALLED PER CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
7.9 MECHANICAL JOINT FITTINGS - ANSI A21.53 (A.W.W.A C153) SPECIFICATIONS; HYPROTEC FITTING SHALL BE USED WITH HYPROTEC PIPE INSTALLATION.
7.10 ALL PVC WATERMAIN SHALL BE EQUAL TO AWWA C-900 CLASS 150, DR 18,
7.11 TRACER WIRE IS TO BE INSTALLED ON ALL NEW INSTALLATIONS OF PVC WATERMAIN PIPE FOR LOCATING PURPOSES. A SOLID 10 GAUGE TWU COPPER WIRE IS TO BE INSTALLED ALONG THE PIPE STRAPPED TO THE PIPE AT 6M INTERVALS. JOINTS IN THE WIRE BETWEEN VALES ARE NOT PERMITTED.
7.12 THE INSPECTOR MAY TEST THE TRACING WIRE FOR CONDUCTIVITY. IF THE TRACING WIRE IS NOT CONTINUOUS FROM VALVE TO VALVE, THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, REPLACE OR REPAIR THE WIRE.
7.13 CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS AS PER CITY OF OTTAWA STANDARDS.
7.14 THE OPERATION OF EXISTING WATERMAIN VALVES SHALL BE CONDUCTED AS REQUIRED BY THE CITY OF OTTAWA.
7.15 WATERMAIN AND/OR WATER SERVICE MATERIALS 100mm OR LARGER MUST BE PVC CLASS 150 / AWWA C900. SIZE 50mm AND SMALLER TO BE TYPE K SOFT COPPER ASTM B88-49.
7.16 WATERMAINS AND/OR WATER SERVICE TO HAVE MINIMUM COVER OF 1.7m WITH MINIMUM HORIZONTAL SPACING OF 1.2m FROM THEMSELVES AND ALL OTHER UTILITIES.
7.17 PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED WITH AT LEAST A 50mm OUTLET ON 100mm AND LARGER LINES. COPPER LINES ARE TO HAVE FLUSHING POINTS AT END, THE SAME SIZE AS THE LINE. THEY MUST ALSO BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN ONTO A PARKING LOT OR DOWN A DRAIN. ON FIRE LINES, FLUSHING OUTLET TO BE 100mm DIAMETER MINIMUM ON A HYDRANT.
7.18 ALL CURB STOPS TO BE 3.0m OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED.
7.19 WATERMAINS TO BE INSTALLED TO GRADES AS SHOWN ON APPROVED SITE PLAN. COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHERE REQUESTED BY INSPECTOR.
7.20 WATERMAINS MUST HAVE MINIMUM VERTICAL CLEARANCE OF 0.3m OVER / 0.5m UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
7.21 ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING FROM EXISTING SYSTEM.

8.0 STORM SERVICE

8.1 BEDDING & EMBEDMENT MATERIAL TO BE COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THE MATERIAL'S SPMDD.
8.2 BEDDING & EMBEDMENT TO OPSD 802.010 (FLEXIBLE PIPE) GRANULAR 'A' EMBEDMENT.
8.3 STORM SEWERS; PVC PIPE (OPSS 410), MIN. PIPE STIFFNESS SHALL BE 320kPa. ALL PIPE TO BE JOINED WITH A GASKETTED BELL AND SPIGOT SYSTEM.
8.4 WHERE COVER OVER THE SPRING LINE OF THE SEWER IS LESS THAN 1.50m, INSTALL 50mm THICKNESS OF STYROFOAM SM INSULATION MATERIAL, FOR EACH 300mm COVER DEFICIT.
8.5 ALL INTERNAL DROP STRUCTURES FOR MANHOLES SHALL CONFORM TO LATEST VERSION OF CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.

GENERAL

1. ALL EXISTING UNDERGROUND UTILITIES AND SERVICES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. ANY SITE ILLUMINATION TO BE DIRECTED DOWNWARD AND INTERNAL TO SITE ONLY.
3. DETAILS ON PROPOSED PLANTING, LANDSCAPE FEATURES, RETAINING WALLS & SITE TREATMENTS ARE PREPARED BY LANDSCAPE ARCHITECT.
4. NATIVE SITE SOILS ARE CONSIDERED TYPE 3 SOILS AS PER OCCUPATIONAL HEALTH & SAFETY ACT; HOWEVER, WHERE SEEPAGE OCCURS AND/OR IF THE SOILS ARE BELOW THE WATER TABLE, THEN TYPE 4 SOIL CONDITIONS APPLY.
5. ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE TOWN PRIOR TO ANY WORKS COMPLETED WITHIN THE MUNICIPAL RIGHT OF WAY (ROW). CONTRACTOR IS RESPONSIBLE TO RETAIN PERMIT.
6. ALL BOULEVARDS & DISTURBED ARES ARE TO BE RESTORED TO EXISTING CONDITIONS OR BETTER, 75mm TOPSOIL & SEED UNLESS OTHERWISE NOTED.
7. CLEAR STONE WRAPPED IN FILTER CLOTH CAN BE SUBSTITUTED FOR BEDDING MATERIAL IF APPROVED BY THE GEOTECHNICAL ENGINEER.
8. ALL PROPERTY BARS TO BE PROTECTED DURING CONSTRUCTION. BARS ARE TO BE PLACED BY O.L.S. AT CONTRACTOR'S EXPENSE IF DAMAGED OR REMOVED.
9. DEWATERING TO BE CARRIED OUT IN ACCORDANCE WITH OPSS-517 & 518 TO MAINTAIN ALL TRENCHES IN A DRY CONDITION. CONTRACTOR IS RESPONSIBLE FOR OBTAINING M.O.E. PERMIT IF REQUIRED.

ROADS

1. ALL EXCAVATION SHALL CONFORM TO THE CURRENT ONTARIO PROVINCIAL SPECIFICATION FOR GRADING OPSS 206.
2. THE DEVELOPER SHALL RETAIN A QUALIFIED SOILS CONSULTANT TO CARRY OUT COMPACTION TESTS ON THE COMPLETED SUBGRADE AND SUBSEQUENT LIFTS OF GRANULAR BASE MATERIAL BEFORE PLACEMENT OF NEXT GRANULAR OR ASPHALT LIFT.
3. ALL VEGETATION, BOULDERS OVER 150mmø, TOPSOIL AND ORGANIC OR FROST-SUSCEPTIBLE MATERIALS, SHALL BE REMOVED FROM THE ROAD BASE TO A DEPTH OF AT LEAST 1.20m BELOW FINISHED GRADE AND REPLACED WITH SUITABLE MATERIAL.
4. ALL UNSUITABLE EXCAVATED MATERIAL SHALL BE REMOVED FROM THE ENTIRE "ROAD CORRIDOR" AND DEPOSITED OFF THE SITE TO A DISPOSAL AREA APPROVED BY THE SITE ENGINEER.
5. THE SUB-GRADE SHALL BE SHAPED TO CONFORM TO THE REQUIRED LONGITUDINAL GRADE AND CROSS-SECTION AND SHALL HAVE A CROSSFALL OF 3% FROM THE CENTRELINE OF THE ROADWAY TO EACH SIDE. IF CONSIDERED NECESSARY BY THE TOWN ENGINEER AND QUALIFIED SOILS CONSULTANT, THE SUB-GRADE SHALL BE COMPACTED WITH SUITABLE MECHANICAL COMPACTION EQUIPMENT AS REQUIRED TO PRODUCE A SOLID BASE FOR THE ROAD GRAVEL. ALL IDENTIFIED SOFT AND WEAK SPOTS SHALL BE EXCAVATED AND BACKFILLED WITH A GRANULAR BASE MATERIAL.
6. NATIVE SUB-GRADE TO BE GRADED, COMPACTED AND PROOF-ROLLED PRIOR TO PLACEMENT OF GRANULARS. COMPACTION TO BE MINIMUM 98% STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD).
7. THE GRANULAR BASE SHALL BE LAID ON DRY, SMOOTH, PROPERLY GRADED SUB-GRADE, AND SHALL BE SPREAD FOR THE REQUIRED WIDTH TO MEET THE EDGE OF SUB-GRADE. THE GRANULAR ROAD BASE SHALL CONSIST OF A BOTTOM COURSE OF 300mm MIN. CONSOLIDATED GRANULAR 'B" MATERIAL FULL WIDTH ACROSS THE ROADWAY AND A TOP COURSE OF 150mm GRANULAR 'A' MATERIAL FULL WIDTH ACROSS THE ROADWAY AND CONFORMING IN ALL RESPECTS TO THE MINISTRY OF TRANSPORTATION ONTARIO PROVINCIAL STANDARD SPECIFICATIONS OPSS 1010.
8. THE GRANULAR MATERIAL SHALL BE SPREAD IN LAYERS OF 150mm MAXIMUM COMPACTED DEPTHS, AND EACH LAYER SHALL BE THOROUGHLY COMPACTED TO 100% SPMDD.
9. NO GRANULAR BASE SHALL BE PLACED UNTIL THE GRADE ON WHICH IT IS TO BE LAID HAS BEEN INSPECTED AND APPROVED BY THE SOILS CONSULTANT.
10. ALL GRANULAR CONSTRUCTION SHALL CONFORM IN ALL RESPECTS TO ONTARIO PROVINCIAL STANDARD SPECIFICATION OPSS 314.
11. AS SOON AS THE GRANULAR BASE HAS BEEN COMPLETED IT SHALL BE THOROUGHLY COMPACTED AND SHAPED AND THE BASE COURSE ASPHALT PLACED. THE BASE COURSE SHALL CONSIST OF 40mm MIN. THICKNESS OF HL4 BASE COURSE ASPHALT. THE SURFACE COURSE SHALL CONSIST OF 40mm MIN. THICKNESS OF HL3 SURFACE COURSE ASPHALT. ASPHALT WORK SHALL CONFORM IN ALL RESPECTS TO ONTARIO PROVINCIAL STANDARD SPECIFICATIONS OPSS 310.
10. THE ASPHALT COMPONENTS SHOULD BE COMPACTED TO 92% TO 96.5% OF MAXIMUM RELATIVE DENSITY IN ACCORDANCE WITH OPSS 310.
11. DURING AND BETWEEN CONSTRUCTION SEASONS, THE GRANULAR BASE SHALL BE MAINTAINED SUITABLE FOR VEHICLE AND PEDESTRIAN TRAFFIC INCLUDING DUST CONTROL BY CALCIUM CHLORIDE AND RENEWED IF REQUIRED TO THE SATISFACTION OF THE SITE ENGINEER.
14. PERFORATED SUBDRAIN (100mmø) TO BE PLACED ALONG BOTH SIDES OF ROADWAY BELOW LEVEL OF GRANULAR 'B' AND TERMINATED IN STORM SEWER SYSTEM WHERE APPROPRIATE.
15. CONCRETE CURB AND GUTTER SHALL CONFORM TO OPSD 600.100 AND SHALL BE INSTALLED IN CONFORMANCE WITH OPSS 353.
16. ALL SERVICES, MANHOLES, VALVES, ETC. ARE TO BE INSTALLED TO MATCH GRADE OF BASE COURSE OF ASPHALT AND/OR LANDSCAPING. UPON PLACEMENT OF SURFACE COURSE OF ASPHALT. ALL APPURTENANCES LOCATED IN ROADWAY SHALL BE RAISED TO MATCH FINISHED GRADE.

SIDEWALKS

1. ALL SIDEWALKS ARE TO BE CONSTRUCTED AS PER OPSD 310.010. ALL INTERSECTIONS OF ROAD AND SIDEWALK SHALL BE AS PER OPSD 310.030.

STORM SEWER

1. MAIN SEWERS SHALL BE PVC PIPE (OPSS 410), MIN. PIPE STIFFNESS SHALL BE 320kPa. ALL PIPE TO BE JOINED WITH A GASKETTED BELL & SPIGOT SYSTEM.
2. MINIMUM PIPE SIZE, INCLUDING CATCHBASIN LEADS, SHALL BE 300mmø.
3. STORM SEWER EMBEDMENT SHALL CONFORM WITH OPSD 802.010 USING GRANULAR 'A'.
4. PRECAST STORM MANHOLES SHALL BE PER OPSD 701.010 (1200mmø), 701.011 (1500mmø) OR 700.012 (1800mmø) WITH FRAME AND GRATE PER OPSD 401.010 TYPE 'A' AND HOLLOW RECTANGULAR LADDER RUNGS OPSD 405.010. CATCHBASIN MANHOLE FRAME AND GRATE PER OPSD 400.020. BENCHING SHALL BE PROVIDED IN ALL MANHOLES.
5. PRECAST CATCHBASINS ARE TO BE OPSD 705.010 (SINGLE) OR 705.020 (DOUBLE) WITH FRAME AND GRATE OPSD 400.020. ALL CATCHBASIN AND CATCHBASIN MANHOLES SHALL HAVE SUMPS.
6. FROST STRAPS REQUIRED ON ALL MANHOLES AS PER OPSD 701.100.

WATERMAIN

A) PIPING

1. ALL CONSTRUCTION TO CONFORM TO AWWA C605-94 AND AWWA C600-99 STANDARDS.
2. WATERMAIN PIPE SHALL BE PVC DR18 (SIZES UP TO 300mmø), CONFORMING TO AWWA C900. A DIFFERENT PIPE STRENGTH OR TYPE MAY BE REQUIRED BY THE MUNICIPALITY FOR SPECIAL CONDITIONS.
3. WATERMAIN SHALL BE BEDDED IN ACCORDANCE WITH OPSD 802.010 WITH UNIFORM FINE SAND.
4. WATERMAIN TO BE TESTED AND APPROVED PER THE TOWN OF THE BLUE MOUNTAINS - WATERMAIN COMMISSIONING PROTOCOL STANDARD (MAY 2007).
5. ALL TESTING REQUIRED NOTIFICATION IN WRITING, 48 HOURS PRIOR TO ALL TESTING.
6. ALL CONNECTIONS TO EXISTING MUNICIPAL SUPPLY MAINS MUST BE INSPECTED BY THE MUNICIPALITY OR REPRESENTATIVE AND GIVING 48 HOURS NOTICE PRIOR TO BACKFILLING OPERATIONS.
7. THE PVC PIPE INSTALLATION SHALL INCLUDE A 12 AWG TWH SOLID PLASTIC COVERED TRACER WIRE, TW4 75AC 600V OR APPROVED EQUAL. MUNICIPALITY MUST BE ON SITE DURING ANY TRACER WIRE CONTINUITY TESTING.
8. THE MINIMUM COVER ON WATERMAINS SHALL BE 1.7m. WHEN COVER IS LESS THAN 1.70m, CONTRACTOR TO PROVIDE INSULATION PER DETAIL ON DWG XXX.

B) SERVICES

1. EACH HOUSING UNIT SHALL HAVE A SEPARATE 19mmø MIN. TYPE 'K' COPPER OR SERIES 160 POLYETHYLENE WATER SERVICE. A CURB STOP AND EXTENSION SERVICE BOX AND MAIN STOP MUST BE INSTALLED ON EACH SERVICE USING COMPRESSION JOINT FITTINGS. TRACER WIRE SHALL BE PLACED ALONG THE ENTIRE LENGTH OF EACH SERVICE LINE.
2. WATER SERVICE FITTINGS SHALL BE AS FOLLOWS:
   - MAIN STOPS ARE TO BE MUELLER H15008.
   - CURB STOPS ARE TO BE SELF DRAINING, MUELLER H15209.
   - SERVICE BOXES ARE TO BE OF ALL IRON/STEEL CONSTRUCTION, MUELLER A-726 OR EQUIVALENT.
3. CURB STOPS SHALL BE LOCATED 300mm FROM STREET LINE.
4. SERVICE CONNECTIONS TO WATERMAINS SHALL BE MADE BY DIRECT TAPPING OR WITH BROAD BAND STAINLESS STEEL SADDLES.

C) HYDRANT INSTALLATION

1. HYDRANTS SHALL BE LOCATED 300mm FROM STREET LINE AND INSTALLED AS SPECIFIED IN TOWN OF THE BLUE MOUNTAINS STANDARDS. CENTER OF PUMPER NOZZLE SHALL BE LOCATED A MINIMUM OF 632mm ABOVE FINISHED GRADE.
2. ALL HYDRANTS SHALL BE PAINTED CHROME YELLOW. ALL HYDRANTS SHALL HAVE A FLEX STAKE HYDRANT MARKER MODEL FHV804, 48" LONG, COLOUR YELLOW WITH REFLECTIVE HYDRANT GRAPHIC ON BOTH SIDES AT THE TOP OF THE MARKER. THE HYDRANT MARKER IS TO BE POSITIONED ON THE RIGHT PORT AS VIEWED FROM THE STREET.
3. VALVES SHALL BE RESILIENT SEAT GATE VALVES WITH MECHANICAL JOINTS, OPENING LEFT, CLOW OR MUELLER. VALVE BOXES SHALL BE 5-SL-48 SLIDING OR APPROVED EQUAL WITH 125mmø LIDS, PAINTED BLUE.
4. ALL VALVES AT POINTS OF TERMINATION OF A STAGE OF CONSTRUCTION SHALL BE BRACED WITH ONE ADDITIONAL LENGTH OF WATERMAIN PIPE BEYOND THE GATE VALVE. WATERMAIN PIPE TERMINATION SHALL BE PLUGGED AND THRUST RESTRAINED.

SANITARY SEWERS

1. MAIN SEWERS SHALL BE PVC SDR 35 WITH RUBBER GASKET CONNECTIONS WITH A MIN. SIZE OF 200mmø.
2. SANITARY SEWER EMBEDMENT SHALL CONFORM WITH OPSD 802.010 USING GRANULAR 'A'.
3. PRECAST SANITARY MANHOLES SHALL CONFORM WITH OPSD 701.010 (1200mmø) WITH HOLLOW RECTANGULAR LADDER RUNGS OPSD 405.010. BENCHING SHALL BE PROVIDED IN ALL MANHOLES.
4. MANHOLE COVERS SHALL BE CAMRON DS579 (OR APPROVED EQUAL) AND INSTALLED AS PER MUNICIPAL STANDARD.
5. HOUSE SERVICE CONNECTIONS SHALL BE PVC SDR 28 WITH RUBBER GASKET CONNECTIONS AND SHALL BE 125mmø MIN.
6. SHOP MANUFACTURED "TEE" CONNECTIONS SHALL BE USED FOR HOUSE SERVICE CONNECTIONS ON 200mm AND 250mm SEWERS.
7. ALL 125mmø SERVICE CONNECTIONS SHALL BE TERMINATED AT THE PROPERTY LINE WITH A 125mmX125mmX100mm TEE, AND A 100mm INSPECTION PIPE TO THE SURFACE, CAPPED.
8. CONNECTION TO MANHOLES SHALL ENTER THE MANHOLE NO HIGHER THAN 600mm ABOVE THE LOWEST INVERT EXCEPT AS OTHERWISE APPROVED BY THE MUNICIPALITY.
9. FROST STRAPS REQUIRED ON ALL MANHOLES AS PER OPSD 701.100.

AS-BUILT SURVEY

1. THE CONTRACTOR IS TO SUPPLY ALL AS-BUILT INFORMATION TO THE ENGINEER UPON COMPLETION OF WORKS. AS-BUILT INFORMATION TO INCLUDE A FULL TOPOGRAPHIC SURVEY OF THE SITE. THE AS-BUILT TO ALSO INCLUDE BUT NOT LIMITED TO: LAYOUT OF ALL SEWERS AND WATERMAIN, INVERTS AND TOP OF COVER/GRATE AT STRUCTURES, HEADWALLS AND ANY STORMWATER MANAGEMENT FEATURES.
2. THE AS-BUILT SURVEY TO ALSO INCLUDE BUT NOT LIMITED TO CURBS, SIDEWALKS LONGITUDINAL AND CROSS-FALL SLOPES, CENTERLINE OF ROADS AND EDGE OF PAVEMENT TO CHECK CROSS-FALLS AND ROAD/PARKING LOT GRADES, BARRIER FREE RAMPS ETC. ANY DEVIATIONS FROM THE ORIGINAL DESIGN ARE TO BE INCLUDED IN THE AS-BUILT DRAWINGS. INFORMATION IS TO BE SUPPLIED TO THE CONTRACT ADMINISTRATOR IN BOTH PDF AND CAD FORMATS.
3. THE AS-BUILT INFORMATION WILL BE REQUIRED ONCE AT BASE ASPHALT PLACEMENT COMPLETION AND AGAIN AFTER THE COMPLETION OF TOP ASPHALT AND LANDSCAPING.
4. THE CONTRACTOR TO INCLUDE IN THEIR SCOPE TO CONFIRM CONDITIONS OF ANY WATERMAIN ELEMENTS (HYDRANTS, VALVE BOXES, WATER CHAMBERS ETC.) A MINIMUM THREE TIES INTO EXISTING ABOVE GROUND VISIBLE PERMANENT REPERS. (IE. EXISTING POLES, CATCHBASINS ETC.)

PERMITS

1. THE CONTRACTOR IS RESPONSIBLE FOR APPLYING, RECEIVING AND PAYING FOR ALL PERMITS REQUIRED TO CONSTRUCT THE WORKS INCLUDED IN THE CONTRACT. THE CONTRACTOR SHALL ALSO COMPLY WITH ALL CONDITIONS DICTATED BY SUCH PERMITS AT NO EXTRA COST TO THE OWNER.
2. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVALS PRIOR TO COMMENCING CONSTRUCTION. ALL PERMITS AND ASSOCIATED DRAWINGS AND CONDITIONS MUST BE ON-SITE AND AVAILABLE UPON REQUEST.

THE CONTRACTOR IS RESPONSIBLE FOR ALL REQUIRED TESTING BY THE MUNICIPALITY AND/OR ENGINEER AS APPLICABLE WHICH INCLUDES BUT NOT LIMITED TO:

STORM AND SANITARY SEWERS

1. PRECONSTRUCTION FLUSH AND VIDEO OF EXISTING PRIVATE OR MUNICIPAL SEWERS TO CONFIRM CONDITIONS OF ANY SEWER TIE-INS, TO THE SATISFACTION OF THE ENGINEER/MUNICIPALITY AS APPLICABLE.
2. FLUSH AND VIDEO ALL STORM AND SANITARY SEWERS AND PROVIDE THREE PHYSICAL COPIES OF REPORTS AND VIDEOS. THIS INCLUDES MAINLINE SEWERS, LATERALS, LEADS AND SERVICES UP TO THE STUB. THE CCTV INSPECTION, INCLUDING FLUSHING AND CLEANING, IS TO BE CARRIED OUT AS DETAILED IN OPSS 409. ONE FLUSH AND CCTV VIDEO ROUND IS TO BE COMPLETED AFTER THE PLACEMENT OF BASE ASPHALT. SECOND ROUND OF FLUSH AND CCTV TO BE COMPLETED AFTER THE PLACEMENT OF TOP ASPHALT AND COMPLETION OF ALL LANDSCAPING. THIS ITEM TO ALSO INCLUDE THE CLEANING OF ALL STRUCTURES.
3. MANDREL TESTING PER THE OPSS FOR ALL FLEXIBLE SANITARY AND STORM PIPES AFTER INSTALLATION, PRIOR TO BASE ASPHALT PLACEMENT.
4. AIR TESTING FOR SANITARY SEWERS AND STRUCTURES PRIOR TO BASE ASPHALT PLACEMENT, IF REQUESTED BY THE MUNICIPALITY.

WATERMAIN

1. THE CONTRACTOR TO INCLUDE IN THEIR SCOPE, THIRD PARTY TESTING, INCLUDING REPORTS, FOR ALL APPLICABLE WATERMAIN TESTING INCLUDING BUT NOT LIMITED TO FLUSHING, SWABBING, PRESSURE TESTING, CHLORINATION, BACKFLOW PREVENTOR TESTING, CONTINUITY TESTING AND HYDRANT FLOW TESTING.

No.	ISSUE / REVISION	YYYY/MMM/DD
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1	RE-ISSUED FOR SPA PER CITY COMMENTS	2022/OCT/17
0	ISSUED FOR SITE PLAN APPLICATION	2022/MAY/17

ELEVATION NOTE:

ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO GEODETIC DATUM CGVD-1928:1978. (SEE FSD FILE No. 531-20)

IT IS THE RESPONSIBILITY OF THE SER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCHMARK HAS NOT BEEN ALTERED OR DISTURBED AND THAT IT'S RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON THIS DRAWING.

LOCAL BENCHMARK:

TOP SPINDLE OF FIRE HYDRANT LOCATED ON SOUTH SIDE OF COLANNADE ROAD, APPROXIMATELY 95.0m WEST OF PRINCE OF WHALES DRIVE.

ELEVATION = 85.19m

SURVEY NOTES:

SURVEY COMPLETED BY FARLEY, SMITH, & DENIS SURVEYING LTD. (2022/MAR/09)
FILE No.: 101-21
BEARINGS ARE GRID AND ARE REFERRED TO THE WESTERLY LIMIT OF PRINCE OF WHALES DRIVE HAVING A BEARING OF N 24° 04' 30" W, AS SHOWN ON PLAN 4R-18363.

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY ARCHITECTURE 49.
DRAWING No.: A0.2 WITH REVISION DATED (2022/SEP/23)
PROJECT No.: 219-00058-00

DRAWING NOTES:

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

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ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

125 COLONNADE ROAD SOUTH
CITY OF OTTAWA

Drawing

CONSTRUCTION NOTES

NOT FOR CONSTRUCTION

Stamp: LICENSED PROFESSIONAL ENGINEER — B. G. D. WALTON — 100503737 — JAN 10 2023 — 2112-6218 — PROVINCE OF ONTARIO

Stamp: LICENSED PROFESSIONAL ENGINEER — N. CONSTANTIN — 100073636 — 2023.01.10 — PR.2112-6218 — PROVINCE OF ONTARIO

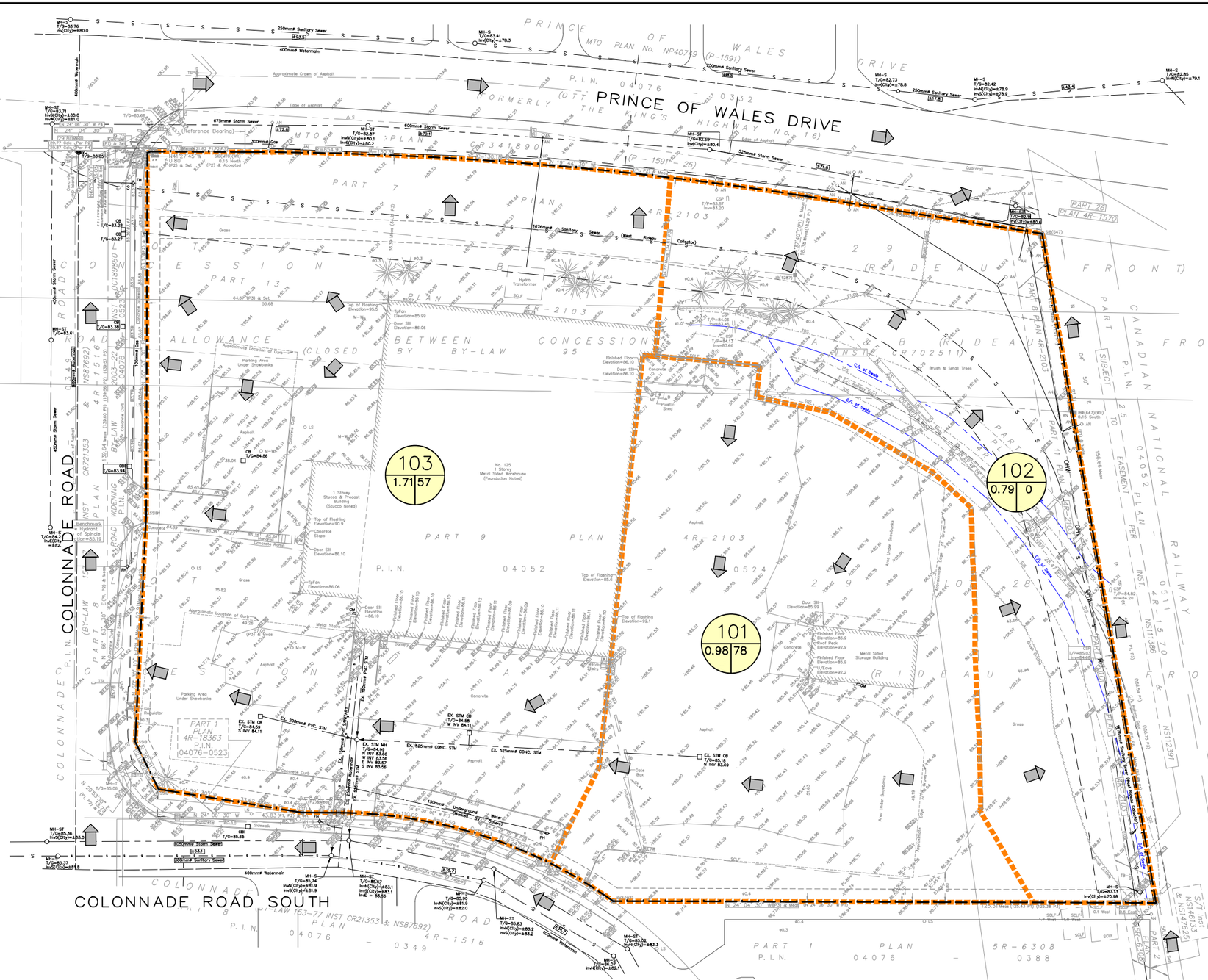
CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA

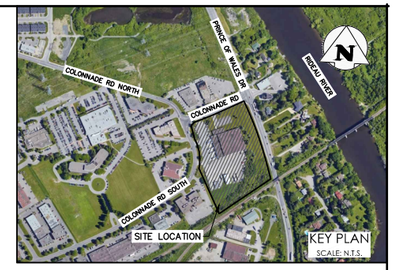
Drawn	M.I.M.	Design	B.P.	Project No.	2112-6218
Check	B.W.	Check	B.W.	Scale N.T.S.	Dwg. C105

D07-12-22-0095

#18809

FIGURES





LEGEND

- PROPERTY LINE
- EXISTING DITCH
- x 215.00 — EXISTING GRADE
- EXISTING OVERLAND FLOW DIRECTION
- STORM DRAINAGE CATCHMENT
- ID / A (ha) | %IMP — CATCHMENT I.D. / AREA (ha) | PERCENT IMPERVIOUS (%)

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PROJECT No.: 219-00058-00

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Project

125 COLONNADE ROAD SOUTH CITY OF OTTAWA

Drawing

PRE-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

Stamp: LICENSED PROFESSIONAL ENGINEER — B. G. D. WALTON — 100503737 — 2023 JAN 10 — PROVINCE OF ONTARIO

Stamp: LICENSED PROFESSIONAL ENGINEER — N. CONSTANTIN — 100073636 — 2023.01.10 — PROVINCE OF ONTARIO

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA

Drawn	M.I.M.	Design	B.P.	Project No.	2112-6218
Check	B.W.	Check	B.W.	Scale	1:500
				Dwg.	FIG 1

D07-12-22-0095

#18809

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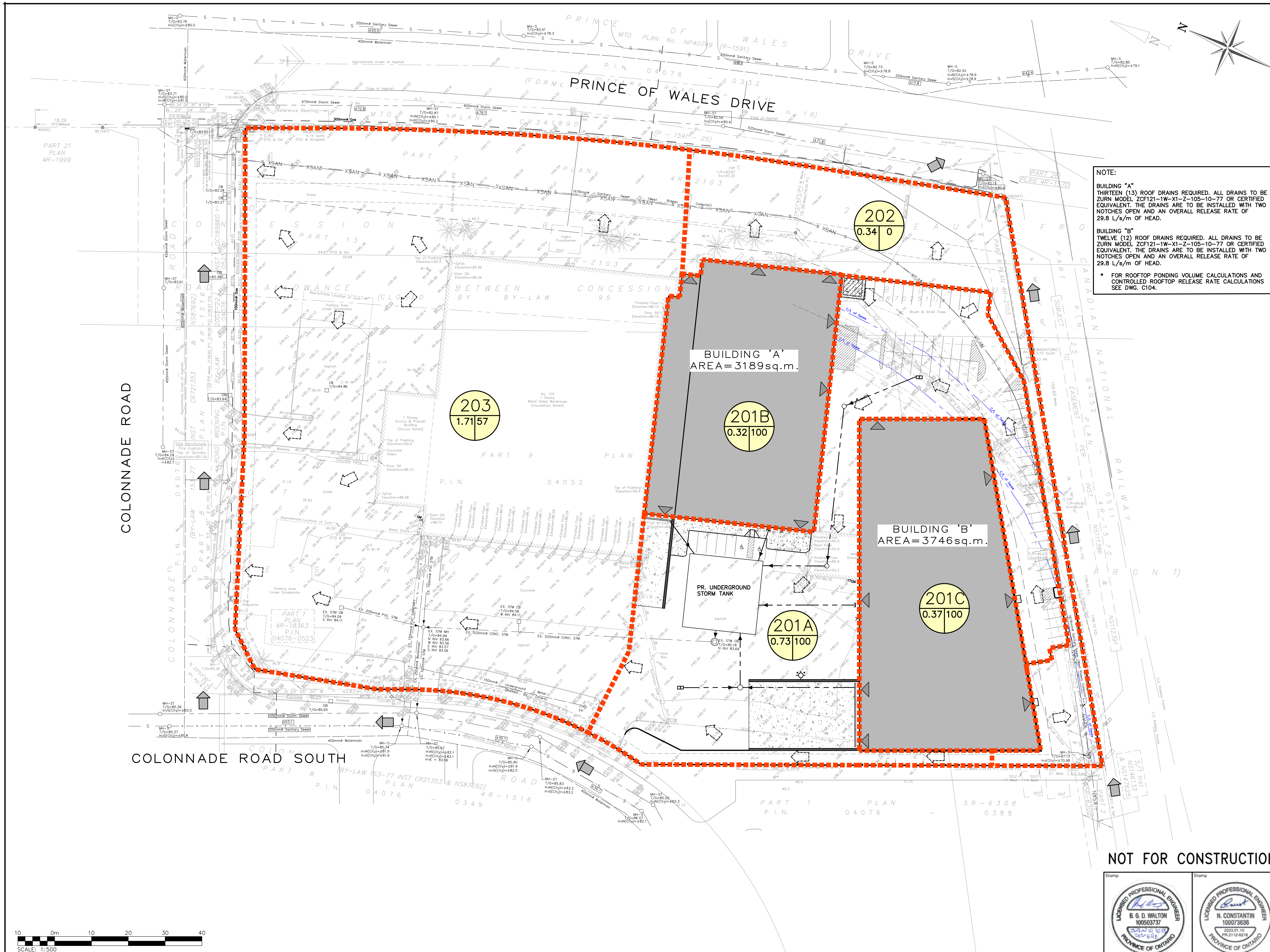
SCALE: 1:500



NOTE:

BUILDING "A"
THIRTEEN (13) ROOF DRAINS REQUIRED. ALL DRAINS TO BE ZURN MODEL ZCF121–1W–X1–Z–105–10–77 OR CERTIFIED EQUIVALENT. THE DRAINS ARE TO BE INSTALLED WITH TWO NOTCHES OPEN AND AN OVERALL RELEASE RATE OF 29.8 L/s/m OF HEAD.

BUILDING "B"
TWELVE (12) ROOF DRAINS REQUIRED. ALL DRAINS TO BE ZURN MODEL ZCF121–1W–X1–Z–105–10–77 OR CERTIFIED EQUIVALENT. THE DRAINS ARE TO BE INSTALLED WITH TWO NOTCHES OPEN AND AN OVERALL RELEASE RATE OF 29.8 L/s/m OF HEAD.

- * FOR ROOFTOP PONDING VOLUME CALCULATIONS AND CONTROLLED ROOFTOP RELEASE RATE CALCULATIONS SEE DWG. C104.

LEGEND

- PROPERTY LINE
- EXISTING DITCH
- EXISTING GRADE
- EXISTING MAJOR OVERLAND FLOW DIRECTION
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- STORM DRAINAGE CATCHMENT
- CATCHMENT I.D. — AREA (ha) | PERCENT IMPERVIOUS (%)

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Project

125 COLONNADE ROAD SOUTH
CITY OF OTTAWA

Drawing

POST–DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

Stamp
LICENSED PROFESSIONAL ENGINEER
B. G. D. WALTON
100503737
PROVINCE OF ONTARIO

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Drawn	Design	Project No.	
M.I.M.	B.P.	2112–6218	
Check B.W.	Check B.W.	Scale 1:500	Dwg. FIG 2

D07–12–22–0095

#18809