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39 Years

U-Haul of Ottawa
30 Frank Nighbor Place
Development Servicing Study and Stormwater Management Report

PROPOSED U-HAUL DEVELOPMENT
30 FRANK NIGHBOR PLACE

DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT

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May 20, 2022

Ref: R-2022-014
Novatech File No. 121326

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May 20, 2022

U-HAUL Canada
3636 Innes Road
Ottawa, Ontario
K1C 1T1

Attention: Mr. David Pollock

Re: Development Servicing Study and Stormwater Management Report
Proposed U-Haul Development
30 Frank Nighbor Place, Ottawa, ON
Novatech File No.: 121326

Enclosed is a copy of the 'Development Servicing Study and Stormwater Management Report' for the proposed development of the 30 Frank Nighbor property in the City of Ottawa. This report addresses the approach to site servicing and stormwater management, and it is being submitted in support of a Site Plan Control application.

Please contact the undersigned, should you have any questions or require additional information.

Yours truly,

NOVATECH

François Thauvette, P. Eng.
Senior Project Manager

cc: Shika Rathnasooriya (City of Ottawa)
Yazan Bilbeisi (IBI)
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

LIST OF PLANS

1.0 INTRODUCTION

Novatech has been retained by U-HAUL Canada to complete the site servicing, grading, and stormwater management design for the proposed development. This report is being submitted in support of a Site Plan Control application.

1.1 Location and Site Description

The vacant site is located at 30 Frank Nighbor Place in the west end of the City of Ottawa. The site is located immediately south of Highway 417, west of the Camp Mart site and east of the Carp River. The Subject Site is identified on plans 4M-1012 and 4R-30745 and is located within the City of Ottawa.

Figure 1: Aerial view of the site

1.2 Pre-Consultation Information

A pre-consultation meeting was held with the City of Ottawa on January 14, 2022, at which time the client was advised of the general submission requirements. The Mississippi Valley Conservation Authority (MVCA) was also consulted regarding the proposed development. Based on a review of **O. Reg. 525/98: Approval Exemptions**, a Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) will be required for the proposed development. Refer to **Appendix A** for a summary of the correspondence related to the proposed development.

1.3 Proposed Development

The intent is only to develop a portion of the larger (3.82 ha) site. The proposed U-HAUL development (2.16 ha) will consist of two (2) large buildings and two (2) smaller "mini storage" buildings along with associated surface parking and loading areas as well as the extension of the private access road off Frank Nighbor Place. An on-site stormwater management facility (i.e., a dry pond) and landscaped areas around the perimeter of the site are also included in the proposed development. The site will be serviced by the municipal sanitary sewer, storm sewer and watermain located within an existing easement south of the portion of the site to be developed.

1.4 Reference Material

[1] The 'Terry Fox Business Park – Stormwater Design Plan' (Ref. No. 91005-3), prepared by Novatech Engineering Consultants Ltd., on August 9, 1994.

[2] The Proposed Camp Mart Development and Private Access Road 20 & 30 Frank Nighbor Place – Development Servicing Study & Stormwater Management Report (Ref. R-2018-011) dated August 19, 2018.

[3] The Geotechnical Investigation Report (Ref. No. PG6153-1 Revision 1), prepared by Paterson Group on April 28, 2022.

2.0 SITE SERVICING

The objective of the site servicing design is to provide proper sewage outlets, a suitable domestic water supply and to ensure that appropriate fire protection is provided for the proposed development. The servicing criteria, the expected sewage flows, and the water demands are to conform to the requirements of the City of Ottawa municipal design guidelines for sewer and water distribution systems. Refer to the subsequent sections of the report for further details.

The City of Ottawa Servicing Study Guidelines for Development Applications requires that a Development Servicing Study Checklist is be included to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. Enclosed in **Appendix B** of the report is a completed checklist.

2.1 Sanitary Sewage

The subject site is currently undeveloped, other than a portion of the private access road off Frank Nighbor Place that was constructed in 2018/2019 as described in the previous DSS&SWM Report[2]. Under post-development conditions, the proposed site will be serviced by a new 200mm dia. sanitary sewer connected to the municipal 450mm dia. sanitary sewer in the existing easement to the south. Design Criteria from the City of Ottawa Sewer Design Guidelines and section 8 of the Ontario Building Code (OBC) were used to calculate the theoretical sewage flows for the proposed development. The sanitary sewage calculations for the proposed development are based on the following criteria:

- Industrial sanitary sewage flow (for Warehouses)
    - 950 L/day per water closet (OBC Table 8.2.1.3.B)
    - 150 L/day per loading bay (OBC Table 8.2.1.3.B)
- Commercial sanitary sewage flow (Office Space)
    - 75 L/day per employee (Ottawa Sewer Design Guidelines – Appendix 4-A)

- Light Industrial/Commercial Office Space Peaking Factor = 1.5
- Infiltration Allowance: 0.33 L/s/ha

Table 1 identifies the theoretical sanitary flows for the proposed development based on the above design criteria. Provided in **Appendix C** are detailed calculations.

Table 1: **Theoretical Post-Development Sanitary Flows**

Type of Use	Unit Count	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s) *
Building A				
No. Loading Docks/Washrooms	4/2	0.03	1.5	0.04
Number of Employees (Max)	6	<0.01		0.01
Sub-Total A	-	0.03	-	**0.05**
Building B - Mini Storage	-	-	-	-
Building C - Mini Storage	-	-	-	-
Building D				
No. Loading Docks/Washrooms	2/0	<0.01	1.5	0.01
Number of Employees	-	-		-
Sub-Total D	-	<0.01	-	**0.01**
Infiltration (ha)	2.18	0.72	-	0.72
TOTAL	-	**0.75**	-	**0.78**

*Represents rounded values

As indicated in the table above, the calculated post-development average sewage flow is less than the allowable sewage flow calculated based on a rate of 28,000 L/gross ha/day, when excluding the infiltration allowance. A 200mm dia. sanitary sewer at a minimum slope of 1.0% has a full flow conveyance capacity of 34 L/s and will have enough capacity to convey the theoretical sanitary flows for the proposed development.

2.2 Water for Domestic Use and Fire Protection

The subject site is located within the City of Ottawa 3W watermain pressure zone. The proposed development will be serviced by a new 200mm dia. private watermain fed off the existing 300mm dia. watermain in the easement to the south. The two larger buildings will be fully sprinklered and equipped with fire department (siamese) connections located within 45m of one of the new on-site fire hydrants. The smaller 'mini storage' buildings will be non-sprinklered and protected by the on-site hydrants. The proposed water service to Building A will be 150mm dia. in size, while the service to Building D will be a 200mm dia. pipe due to the sprinkler flow requirements. The building services have been sized to provide both the required domestic water demand and fire flow. Shut-off valves will be provided on the proposed watermain at the property line as well as on the individual building services. The water meters will be within the respective mechanical rooms, while the remote meters will be located on the exterior face of the larger buildings.

To determine if the existing 300mm dia. municipal watermain has adequate capacity to accommodate the proposed development a hydraulic analysis was completed based on boundary conditions provided by the City of Ottawa.

2.2.1 Water Demands and Watermain Analysis

The theoretical water demands for the proposed development were based on the design criteria from the City of Ottawa Water Distribution Guidelines and section 8 of the Ontario Building Code (OBC). The Fire Underwriters Survey (FUS) method was used to calculate the fire flows based on general assumptions and information provided by the architect. The water demands are calculated based on the following criteria:

- Industrial sanitary sewage flow (for Warehouses)
  - 950 L/day per water closet (OBC Table 8.2.1.3.B)
  - 150 L/day per loading bay (OBC Table 8.2.1.3.B)
- Commercial water demands (Office Space)
  - 75 L/day per employee (Ottawa Sewer Design Guidelines – Appendix 4-A)
- Maximum Day Demand Peaking Factor = 1.5 x Avg. Day Demand (City Water Table 4.2)
- Peak Hour Demand Peaking Factor = 1.8 x Max. Day Demand (City Water Table 4.2)

Table 2 identifies the theoretical domestic water demands and fire flow requirements for the development based on the above design criteria.

Table 2: **Theoretical Water Demand for Proposed Development**

Type of Use	Unit Count	Avg. Day Demand (L/s)	Max. Day Demand (L/s)	Peak Hour (L/s)	FUS Fire Flow (L/s)
Building A					
No. Loading Docks/Washrooms	4/2	0.03	0.04	0.08	
Number of Employees (Max)	6	<0.01	<0.01	0.01	**250**
Sub-Total A	-	**0.03**	**0.05**	**0.09**	
Building B - Mini Storage	-	-	-	-	**67**
Building C - Mini Storage	-	-	-	-	**67**
Building D					
No. Loading Docks/Washrooms	2/0	<0.01	<0.01	0.01	
Number of Employees	-	-	-	-	**167**
Sub-Total D	-	**<0.01**	**<0.01**	**0.01**	
TOTAL	-	0.04	0.06	**0.10**	**250 (Max)**

*Represents rounded values

The fire flow requirements were calculated using the Fire Underwriters Survey (FUS). Based on information provided by the architect, the fire flow requirements for the buildings are expected to be in the order of 67-250 L/s, including both sprinkler system and hose allowances in accordance with the OBC and NFPA 13. The sprinkler system will be designed by the fire protection (sprinkler) contractor as this process involves detailed hydraulic calculations based on building layout, pipe runs, head losses, fire pump requirements, etc. Booster pumps should

not be required, however, pressure reducing valves will be required as system pressures will exceed 80 psi. Refer to **Appendix D** for detailed calculations and correspondence from the City of Ottawa.

As discussed with the City of Ottawa, a multi-hydrant approach to firefighting is anticipated to be required to achieve the maximum fire flow requirements on-site. A total of three (3) new private fire hydrants are being proposed on-site. Based on the City of Ottawa Technical Bulletin ISTB-2018-02, Class AA (blue bonnet) hydrants within 75m have a maximum capacity 95 L/s while hydrants between 75m and 150m have a maximum capacity 63 L/s (at a pressure of 20 PSI). The combined maximum flow from the private fire hydrants will exceed the Max Day + Fire Flow requirement of the proposed development. This multi-hydrant approach to firefighting is in accordance with the City of Ottawa Technical Bulletin ISTB-2018-02. **Table 2.1** summarizes the total theoretical combined fire flow available from the proposed private fire hydrants and compares it to the fire flow demands based on FUS calculations.

Table 2.1: **Fire Protection Summary Table**

Building ID	Fire Flow Demand (L/s)	Fire Hydrant(s) within 75m (~ 95 L/s each)	Fire Hydrant(s) within 150m (~ 63 L/s each)	Theoretical Combined Available Fire Flow (L/s)
Building A	250	3	-	285
Building B	67	3	-	285
Building C	67	3	-	285
Building D	167	2	1	253

Preliminary domestic water demands, and fire flow requirements were provided to the City of Ottawa. **Table 2.2** summarizes preliminary hydraulic analysis results based on municipal watermain boundary conditions provided by the City of Ottawa.

Table 2.2: Hydraulic Boundary Conditions Provided by the City

Municipal Watermain Boundary Condition	Boundary Condition	Normal Operating Pressure Range (psi)	Anticipated WM Pressure (psi)*
Minimum HGL (Peak Hour Demand)	156.6 m	40 psi (min.)	~ 87.6 psi
Maximum HGL (Max Day Demand)	160.7 m	50 - 70 psi	~ 93.5 psi
HGL Max Day + Fire Flow) (250 L/s)	149.0 m	20 psi (min.)	~ 76.8 psi

*Based on an approximate ground elevation of 95.0m on-site. Design pressure = (HGL – ground elevation) x 1.42197 PSI/m.

The following design criteria were taken from Section 4.2.2 – 'Watermain Pressure and Demand Objectives' of the City of Ottawa Design Guidelines for Water Distribution:

- Normal operating pressures are to range between 345 kPa (50 psi) and 483 kPa (70 psi) under Max Day demands
- Minimum system pressures are to be 276 kPa (40 psi) under Peak Hour demands
- Minimum system pressures are to be 140 kPa (20 psi) under Max Day + Fire Flow demands

The hydraulic model EPANET was used to analyzing the performance of the proposed watermain configuration for three (3) theoretical conditions:

- Peak Hour Demand
- Maximum HGL
- Maximum Day + Fire Flow Demand (250 L/s)

A schematic representation of the hydraulic network depicts the node and pipe numbers used in the model. The model is based on hydraulic boundary conditions provided by the City of Ottawa. **Tables 2.3, 2.4,** and **2.5** summarize the hydraulic model results. Refer to **Appendix D** for City of Ottawa boundary conditions, the hydraulic modeling schematic and modeling results.

Table 2.3: Peak Hour Demand

Operating Condition	Minimum System Pressure	Maximum System Pressure
Peak Hour demands of 0.09 L/s at J5 (Bldg A) and 0.01 L/s at J8 (Bldg D)	Minimum system pressure of 594.5 kPa (86.2 psi) is available at Node J3 (north Hydrant)	Maximum system pressure 628.3 kPa (91.1 psi) is available at Node J13 (on-site watermain near connection to municipal main)

Table 2.4: Maximum HGL

Operating Condition	Minimum System Pressure	Maximum System Pressure
Max Day demands of 0.05 L/s at J5 (Bldg A) and 0.01 L/s at J8 (Bldg D)	Minimum system pressure of 634.7 kPa (92.0 psi) is available at Node J3 (north Hydrant)	Maximum system pressure 668.5 kPa (96.9 psi) is available at Node J13 (on-site watermain near connection to municipal main)

Table 2.5: Maximum Day + Fire Flow Demand

Operating Condition	Minimum System Pressure	Maximum System Pressure
Max Day Demands: 0.05 L/s at J5 (Bldg A) and 0.01 L/s at J8 (Bldg D) **Fire Flow Demand:** 67 L/s at J3, 95 L/s at J9 and 95 L/s at J10 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 148.9 kPa (21.6 psi) is available at Node J3 (north Hydrant)	Maximum system pressure 447.4 kPa (64.9 psi) is available at Node J13 (on-site watermain near connection to municipal main)

The model indicates that the municipal watermain and private on-site watermain will provide adequate fire flow during 'Max Day + Fire Flow' conditions, however, pressure reducing valves will be required as system pressures will exceed 80 psi during both 'Peak Hour' and 'Max Day' conditions.

2.3 Storm Drainage and Stormwater Management

The proposed U-HAUL site will be serviced by connecting the proposed on-site storm sewer system to the existing 1050mm dia. storm sewer in the easement to the south. The approach for the stormwater management design for the site is discussed in the subsequent sections of the report.

On-site stormwater management will include both stormwater quantity and quality control measures (i.e., an Enhanced Level of Treatment equivalent to 80% Total Suspended Solids removal) prior to releasing flows towards the Carp River. This will be achieved by a treatment train of grass swales, an on-site stormwater management facility (dry pond) and the use of an oil/grit separator. Post-development storm flows will be controlled to a maximum release rate of 50 L/s/ha as defined in the 'Terry Fox Business Park – Stormwater Design Plan'[1] by means of a control pipe located within the on-site storm sewer system. The stormwater management design will meet the requirements of the City of Ottawa, the Mississippi Valley Conservation Authority (MVCA), the Ontario Ministry of Transportation (MTO) and the Ministry of the Environment, Conservation and Parks (MECP).

2.3.1 Stormwater Management Criteria and Objectives

The stormwater management (SWM) criteria have been provided during pre-consultation meetings with the City of Ottawa and the MVCA. The SWM criteria and objectives are as follows:

- Maintain existing drainage patterns.
- Provide a dual drainage system (i.e., minor system and emergency overland flow route, for events exceeding the 100-year design storm).
- Maximize the use of surface storage available on site.
- Control the post-development flows from the site to the maximum allowable release rate of 50 L/s/ha for both the 5-year and 100-year design storms, as defined in the 'Terry Fox Business Park – Stormwater Design Plan'[1]. This only applies to the portion of the site to be developed.
- Ensure that no surface ponding will occur on the paved surfaces (i.e., private drive aisles or parking lots) during the 2-year storm event.
- Provide on-site water quality control equivalent to a 'Enhanced' Level of Protection (i.e., minimum 80% TSS removal) as required by the MVCA prior to releasing flows from the site towards the Carp River. This only applies to the portion of the site to be developed, excluding the extended private access road.
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

2.3.2 Pre-Development Conditions and Allowable Release Rate

The uncontrolled pre-development flows from the undeveloped 2.16 ha portion of the site (to be developed) were calculated using the Rational Method to be 125.0 L/s during the 5-year design

event and 267.7 L/s during the 100-year design event. Refer to **Appendix E** for detailed calculations. The allowable release rate for the 2.16 ha portion of the site to be developed, as specified in the 'Terry Fox Business Park – Stormwater Design Plan'[1], was calculated to be 107.9 L/s (50 L/s/ha x 2.16 ha). The site to be developed is located within 'Drainage Basin 1' as defined on Figure 2. Refer to **Appendix E** for excerpts from the 'Terry Fox Business Park– Stormwater Design Plan'[1].

2.3.3 Post-Development Conditions

Stormwater runoff from the proposed buildings roofs will be directed to the surface, via rainwater downspouts. Runoff from the site to be developed will be directed towards the proposed stormwater management (SWM) dry pond via the grass drainage swales and on-site storm sewer system. Flow from the SWM dry pond will outlet to the existing 1050mm dia. storm sewer, which discharges directly to the Carp River, approximately 105m to the west. Due to the elevation difference, it will not be possible to direct stormwater runoff from the private access road into the dry pond. To mitigate the stormwater related impacts due to the increase in imperviousness of the site, stormwater runoff will be attenuated using either a restrictor pipe or an inlet control device (ICD) installed within the proposed on-site storm sewer system. Flows will be attenuated for storms up to and including the 100-year design event. Due to the existing grades, runoff from the remainder of the undeveloped property will continue to sheet drain uncontrolled towards the Carp River.

2.3.3.1 Area A-1 to A-19 – Controlled Site Flow

The post-development flow from the site to be developed (including building roofs, paved areas, SWM dry pond and landscaped areas) will be attenuated using a restrictor pipe installed as the outlet pipe from CBMH 101. Stormwater runoff from this sub-catchment area will be temporarily stored within the grassed areas (i.e., swales and dry pond), underground storm sewer system and on the paved parking lot prior to being discharged into the municipal storm sewer system. The site has been designed to ensure that no stormwater will pond on the private paved surfaces (i.e., drive aisles or parking lots) during the 2-year storm event.

Table 3.0 summarizes the post-development design flow from these sub-catchment areas as well as the size of the restrictor pipe, the anticipated ponding elevations, storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 3.0: Design Flow and Restrictor Pipe Table

Design Event	Sub-Catchment Areas A-1 to A-19				
	Restrictor Pipe (mm)	Design Flow (L/s)	Ponding Elevation (m)	Storage Vol. Required (m^3)	Max Storage Provided (m^3)
2-Year	200mm dia. control pipe	53.8 L/s	93.57 m	486.9 m^3	2,285 m^3
5-Year		61.0 L/s	93.88 m	788.0 m^3	
100-Year		71.1 L/s	94.64 m	1813.0 m^3	

*Note: required and provided volumes are dry pond volumes only.

Refer to **Appendix E** for SWM calculations. As indicated in the table above, this sub-catchment area will provide sufficient storage for the 2-year, 5-year and 100-year design events. As indicated above, no stormwater will pond on the private paved surfaces (i.e., drive aisles or

parking lots) during the 2-year storm event. Furthermore, the site grading design will ensure that surface ponding depths will not touch the building envelope or lowest building openings during the 100-year+20% stress test.

2.3.3.2 Area R-1 – Controlled Flow from Private Access Road

The post-development flow from this sub-catchment area will be attenuated by installing an inlet control device (ICD) within the outlet pipe of CB 08. Stormwater runoff from this sub-catchment area will be temporarily stored on the paved roadway prior to being discharged into the municipal storm sewer. Based on preliminary calculations it is impractical to control flows from this small catchment area using a restrictor pipe, as the size of the pipe required to achieve minimal flows would be too small and would therefore be prone to clogging. As a result, an ICD was chosen to control the flow from this small sub-catchment area.

Table 3.1 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated ponding elevations, storage volumes required and storage volume provided for both the 5-year and the 100-year design events.

Table 3.1: Design Flow and Inlet Control Device Table

Design Event	Sub-Catchment Area R-1				
	ICD Type	Design Flow (L/s)	Ponding Elevation (m)	Storage Vol. Required (m^3)	Max Storage Provided (m^3)
2-Year	Tempest MHF Vortex ICD 'Custom'	17.7 L/s	93.49 m	0.1 m^3	6.7 m^3
5-Year		24.9 L/s	93.96 m	0.3 m^3	
100-Year		31.1 L/s	94.85 m	6.2 m^3	

Refer to **Appendix E** for SWM calculations and to **Appendix F** for ICD information. As indicated in the table above, this sub-catchment area will provide sufficient storage for the 2-year, 5-year and 100-year design events.

2.3.3.3 Summary of Post-Development Flows

Table 3.2 compares the post-development site flows from the proposed development to the uncontrolled pre-development flows and to the maximum allowable release rate specified by the City of Ottawa, for the 2-year, 5-year, and the 100-year design events.

Table 3.2: Stormwater Flow Comparison Table

Design Event	Drainage Areas A-1 to A-19 and R-1					
	Pre-Dev. Conditions		Post-Development Conditions			
	Existing Site Flows (L/s)	Max Release Rate (L/s)	A-1 to A-19 Controlled Flow (L/s)	R-1 Controlled Flow (L/s)	Total Flow (L/s)	Reduction in Flow (L/s or %)*
2-Yr	92.1	**107.9**	53.8	17.7	71.5	20.6 or 22%
5-Yr	125.0		61.0	24.9	85.9	39.0 or 31%
100-Yr	267.7		71.1	31.1	102.2	165.4 or 62%

*Reduced flow compared to pre-development uncontrolled conditions.

As indicated in the table above, the 2-year, 5-year and 100-year post-development flows will be less than the maximum allowable release rate for the site. Furthermore, this represents significant reductions in total site flow rates when compared to the respective pre-development conditions. Refer to **Appendix E** for detailed SWM calculations.

2.3.3.4 Stormwater Quality Control for Areas A-1 to A-19

The subject site is located within the jurisdiction of the Mississippi Valley Conservation Authority (MVCA) and is tributary to the Carp River. Based on preliminary feedback from the MVCA, surface parking lots and drive aisles will require an 'Enhanced' Level of Protection (i.e., 80% TSS removal). Landscaped areas and roof tops are considered clean for the purposes of water quality and aquatic habitat protection.

To achieve this level of quality control protection, a new oil-grit separator unit (CDS Model PMSU 20_20_5) will be installed downstream of CBMH 101 on the storm sewer outlet pipe from the site. Stormwater runoff collected by the on-site storm sewer system (2.06 ha tributary area) will be directed through the proposed treatment unit. The contributing area includes the proposed paved parking lot areas, controlled building roofs and controlled loading dock areas.

As stated above, the proposed oil-grit separator has been sized to provide an 'Enhanced' Level of water quality treatment prior to discharging the stormwater into the municipal storm sewer. Echelon Environmental and Contech Stormwater Solutions Inc. have modeled and analyzed the tributary area to provide a CDS unit capable of meeting the TSS removal requirements. The model parameters for the TSS removal were based on historical rainfall data for Ottawa from the Ontario Climate Centre. It was determined that a CDS Model PMSU 20_20_5 will exceed the target removal rate, providing a net annual 81.1% TSS removal. The CDS unit has a treatment capacity of approximately 31 L/s, a sediment storage capacity of 1.67 m^3; an oil storage capacity of 376 L and will treat a net annual volume of approximately 96.5% for the tributary area. The on-site catchbasins and storm manhole structures will be equipped with sumps to promote additional settling of sediment. The treatment train of grass swales, an on-site stormwater management facility (dry pond) and the use of an oil/grit separator will provide the necessary stormwater quality treatment.

<u>Maintenance and Monitoring of the Storm Sewer and Stormwater Management Systems</u>

It is recommended that the client implement a maintenance and monitoring program for both the on-site storm sewers and the stormwater management systems: The storm drainage system should be inspected routinely (at least annually); the restrictor pipe/ICD should be inspected to ensure they are free of debris; and the oil-grit separator should be inspected at regular intervals and maintained when necessary to ensure optimum performance. Refer to **Appendix G** for the CDS unit design parameters, sizing analysis, operation, design, performance, and maintenance summary parameters as well as the annual TSS removal efficiency data.

3.0 SITE GRADING

The elevation of the existing site varies from approximately 94.50m up to approximately 96.50m. The existing site generally slopes from east to west towards the Carp River, which is located approximately 80m west of the furthest development limit for the subject site.

The finished floor elevation (FFE) of the proposed buildings will be set at an elevation of 95.50m, which corresponds to the FFE of the Home Depot and Camp Mart buildings to the east. The buildings and general site elevations will work well with the grades along the property lines,

the views from Hwy 417 to the north, and the private access road off Frank Nighbor Place to the south. The grade on the adjacent undeveloped portion of the property to the west will remain unchanged.

Any excess fill material generated from the proposed site development is to be reviewed by the geotechnical engineer to determine suitability for use as general fill. Filling on the undeveloped portion of the property is only permitted outside the regulatory floodline as defined by the MVC. Limits of the works are to be established on-site by an OLS.

Refer to the enclosed Grading and ESC Plans (121326-GR1 and 121326-GR2).

3.1 Emergency Overland Flow Route

In the case of a major rainfall event exceeding the design storms provided for, the stormwater located within the subject site will overflow towards the downstream drainage ditch and/or private roadway and ultimately flow towards the Carp River. The finished floor elevation of Buildings A, B, C and D have been set at 95.50m, which represents a minimum of 0.3m above the major system overflow points. The emergency overland flow route is shown on the enclosed Grading and ESC Plans.

4.0 GEOTECHNICAL INVESTIGATIONS

Paterson Group prepared a Geotechnical Investigation Report for the proposed development. Refer to the Geotechnical Report[3] for subsurface conditions, grade raise restrictions, construction recommendations and geotechnical inspection requirements.

5.0 EROSION AND SEDIMENT CONTROL

To mitigate erosion and to prevent sediment from entering the storm sewer system and downstream water course, temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags will be placed under the grates of nearby catchbasins, manholes and will remain in place until vegetation has been established and construction is completed.
- Silt fencing will be placed per OPSS 577 and OPSD 219.110 where appropriate, along the surrounding construction limits.
- Mud mats will be installed at the site entrances.
- Street sweeping and cleaning will be performed, as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site.
- On-site dewatering is to be directed to a sediment trap and/or gravel splash pad and discharged safely to an approved outlet as directed by the engineer.
- Any stockpiled material will be properly managed to prevent those materials from entering the sewer system and/or the downstream watercourse.

The temporary erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken.

In addition, the following measures will provide permanent erosion and sediment control on the proposed site:

- Shallow flat-bottom grass drainage swales as well as within the dry pond (SWM facility).
- A CDS type Oil/Grit Separator will be installed to provide water quality control prior to releasing stormwater from the portion of the site to be developed.

6.0 CONCLUSION

This report has been prepared in support of a Site Plan Control application for the proposed U-HAUL development at 30 Frank Nighbor Place. The conclusions are as follows:

- The proposed development will be serviced by the municipal watermain, sanitary and storm sewers to the south located within an easement along the private access road off Frank Nighbor Place.
- The large buildings will be sprinklered and supplied with fire department (siamese) connections. The siamese connections will be located within 45m of a nearby on-site fire hydrant.
- The proposed design will include on-site stormwater management measures (both quantity and quality control measures) prior to releasing flows from the site.
    - Post-development flow from sub-catchment area A-1 to A-19 will be controlled by a restrictor pipe installed within the on-site storm sewer system, while flows from area R-1 will be attenuated in the access road by an inlet control device (ICD).
    - The total post-development flow to the municipal storm sewer (Carp River) will be approximately 71.5 L/s during the 2-year design event, 85.9 L/s during the 5-year event and 102.2 L/s during the 100-year event, all less than the maximum allowable release rate of 107.9 L/s. The post-development flows are also being significantly reduced when compared to current conditions.
    - Erosion and sediment controls are to be provided both during construction and on a permanent basis. In addition to the grass swales and SWM dry pond, an oil / grit separator unit (CDS Model PMSU 20_20_5) will provide an 'Enhanced' Level of water quality control for the controlled flows from the site discharging into the municipal storm sewer.
- Regular inspection and maintenance of the storm sewer system, including the restrictor pipe/inlet control device and the water quality treatment unit is recommended to ensure that the storm drainage system is clean and operational.

It is recommended that the proposed site servicing and stormwater management design be approved for implementation.

NOVATECH

Prepared by:

Matt Hrehoriak, P, Eng.
Project Manager
Stormwater Management

Prepared by:

François Thauvette, P. Eng.
Senior Project Manager

APPENDIX A

Correspondence

Pre-Consultation Meeting Notes

Site Address: 30 Frank Nighbor Place
Location: Virtual - Microsoft Teams
Meeting Date: January 14, 2022

Attendees: Colette Gorni- Planner (File Lead), City of Ottawa
Shika Rathnasooriya – Infrastructure Project Manager, City of Ottawa
Sami Rehman – Environmental Planner, City of Ottawa
Adrian Van Wyk - Planner (Urban Design), City of Ottawa
Jeff Goettling - Planner (Parks), City of Ottawa
Ashvinya Moorthy - Student Planner, City of Ottawa
Erica Ogden - MVCA
Greg Winters - Novatech
Robert Tran - Novatech
Francois Thauvette - Novatech
Jake Spelic - U-Haul
David Pollock - U-Haul
Thomas Donnelly - U-Haul
Tamrat Meherete - U-Haul

Regrets: Mike Giampa - Transportation, City of Ottawa
Mark Richardson - Forestry, City of Ottawa

Comments from the Applicant

1. The subject site is one of the last parcels in a plan of subdivision that began in 1997.

2. Surrounding uses include Highway 417 to the north, the Carp River to the west, and light industrial uses to the east and south.

3. The site is serviced by existing public services that run along Frank Nighbor Place.

4. The site is technically located within a flood plain; however, the Owner has a fill permit filed with the MVCA which allows them to address related concerns. The fill permit was renewed last year and is valid for two years.

5. The proposed development includes a 5-storey self-storage facility with an associated rental office, as well as a separate warehouse building to be used for U-Haul's operations.

Engineering

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/planning-development-and-

construction/developing-property/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications

2. Servicing and site works shall be in accordance with the following documents:

    - Ottawa Sewer Design Guidelines (October 2012)
    - Ottawa Design Guidelines – Water Distribution (2010)
    - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
    - City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
    - City of Ottawa Environmental Noise Control Guidelines (January 2016)
    - City of Ottawa Park and Pathway Development Manual (2012)
    - City of Ottawa Accessibility Design Standards (2012)
    - Ottawa Standard Tender Documents (latest version)
    - Ontario Provincial Standards for Roads & Public Works (2013)

3. 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).

4. Watermain Infrastructure:

    a. There is an available 305mm diameter PVC watermain located within the proposed extension of Frank Nighbor Place. A water boundary condition request is needed for the proposed water connection to the City main.

    b. As per Section 4.4.7.2 of the Ottawa Design Guidelines – Water Distribution, a DMA (District Metering Area) chamber will be required for private developments serviced by a connection 150mm or larger.

    c. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide an email to Shika Rathnasooriya with the following information:

        i. Location of service

        ii. Type of development and the amount of fire flow required (as per FUS, 1999 – See technical bulletin ISTB 2021-03).

        iii. Average daily demand: ___ l/s.

        iv. Maximum daily demand: ___l/s.

        v. Maximum hourly daily demand: ___ l/s.

5. Sanitary / Storm Infrastructure:

    a. There is an available 450mm diameter concrete sanitary sewer located within a private access road west of Frank Nighbor Place.

    b. There is an available 1050mm diameter concrete storm sewer within a private acess road west of Frank Nighbor Place.

    c. A monitoring maintenance hole will be required for a private sanitary sewer outletting to a public sanitary sewer. The maintenance hole should be located in an accessible location on private property near the property line (ie. Not in a parking area).

    d. All services (STM, SAN, WTR) should be grouped in a common trench to minimize the number of road cuts.

    e. Sewer connections to be made above the springline of the sewermain as per:

        i. Std Dwg S11.1 for flexible main sewers.

        ii. Std Dwg S11 (For rigid main sewers).

        iii. Std Dwg S11.2 (for rigid main sewers using bell end insert method).

        iv. Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.

6. The Stormwater Management Criteria, for the subject site, is to be based on the following:

    a. The 5-yr and 100-yr post development peak flows for the development area are to be controlled to a release rate of 50 L/s/ha based on the ‘Terry Fox Business Park- Stormwater Design Plan’ dated 1994. Onsite storage is to be provided for storm events up to and including the 100-yr storm.

    b. There should be no stormwater ponding in parking areas or drive aisles during the 2-year storm event.

    c. Quality control to be provided as specified by the MVCA.

    d. The design of the storm sewers in the area are based on a 5-yr storm. If discharging to a storm sewer, the SWM criteria is to be based on the following for the development area:

        i. The 5-yr storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.

ii. The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less.

iii. A calculated time of concentration (Cannot be less than 10 minutes).

iv. Flows to the storm sewer in excess of the 5-yr storm release rate, up to and including the 100-year storm event, must be detained on site.

7. MECP ECA Requirements:

- An MECP Environmental Compliance Approval (Private Sewage Works) will be required for the proposed development.

8. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

Should you have any questions or require additional information, please contact me directly at Thakshika.Rathnasooriya@ottawa.ca.

MVCA

1. The Mississippi Valley Conservation Authority (MVCA) confirms that a portion of the subject property is regulated under Ontario Regulation 153/06, *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. Under Ontario Regulation 153/06, written permission is required from the MVCA prior to the initiation of development (which includes construction, site grading and the placement or removal of fill) within an area regulated by the Conservation Authority.

2. MVCA notes that permit W20-176 has been issued to the previous property owner to facility fill placement within the regulated area. This permit must be transferred into the new owner's name and expires on October 19, 2022. The construction of the proposed buildings within the regulated area will also require written permission from MVCA. A new permit is valid for a two year period.

3. An enhanced level of water quality protection is required, 80% TSS Removal.

4. The watercourse setbacks outlined in the Official Plan should be demonstrated on the plans submitted and ensure all buildings are located beyond the required watercourse setbacks.

5. Please note that a small portion of the subject property is zoned O1 and is subject to the holding zone provisions related to the restoration of the Carp River.

Please contact Erica Ogden, MVCA Planner, at eogden@mvc.on.ca for follow-up questions.

Parks

1. How does the applicant propose to meet the Parkland Dedication (By-law No. 2009-95)? Land or cash-in-lieu (CIL) of parkland and associated appraisal fee will be required as a condition of approval as per the Parkland Dedication (By-law No. 2009-95) | City of Ottawa. If required, the value of noted lands to be appraised shall be through a Real Estate Valuation Advisor within the Planning Infrastructure & Economic Development Department. The exact amount will be identified as a condition of site plan approval.

2. For Commercial purposes, the parkland requirement is calculated as 2% of the gross land area of the site being developed.

3. The conveyance of land for purposes or the payment of money in-lieu of accepting the conveyance is not required for development, redevelopment, subdivisions or consents, where it is known, or can be demonstrated that the required parkland conveyance or money in-lieu thereof has been previously satisfied.

4. Parks Planning requests that the existing pedestrian link through the property be formalized. This link shall connect the existing Multi-Use Pathway (MUP) to the existing concrete sidewalk and asphalt roadway (currently located south of 20 Frank Nighbor Place). The proponent shall construct this link to City standards and provide a pedestrian and maintenance access easement over this area. It is anticipated that the MUP extension will terminate at the new site asphalt access roadway, include a P-Gate, TSWI's, and drop/ depressed curb(s) as required.

Please contact Jeff Goettling, Parks Planner, at jeff.goettling@ottawa.ca for follow-up questions.

Environmental Planning

1. An EIS is triggered due to the site being adjacent to Carp River and potential species at risk habitat.

2. Please refer to the New City of Ottawa Official Plan for updated policies regarding setbacks from surface water features and natural heritage protection.

3. Incorporate the findings and recommendations of the Carp River Subwatershed study for this area into the report.

4. Consider ways to soften the landscape with locally appropriate native trees and vegetation along the Carp River.

5. Consult with the MVCA to determine if any permits or approvals are required.

Please contact Sami Rehman, Environmental Planner, at Sami.Rehman@ottawa.ca for follow-up questions.

Urban Design

1. An Urban Design Brief will be required, which can be combined with a Planning Rationale. Please see the attached Terms of Reference.
2. Pedestrian circulation should be considered. It may be desirable to extend the private sidewalk to Frank Nighbor Place.
3. The paving over of the lot should be avoided where possible. Please keep hard surfaces to a minimum.
4. Parking and loading areas should be located at the rear of the buildings to avoid conflicts with pedestrian movement.
5. Please ensure that the site design includes appropriate landscaped buffering.
6. Opportunities for tree planting should be explored.
7. Please carefully consider sustainability and incorporating blue-green infrastructure and on-site stormwater management techniques into the site design.

Please contact Adrian van Wyk, Urban Design Planner, at Adrian.vanWyk@ottawa.ca for follow-up questions.

Transportation

1. No TIA will be required.
2. Warehouse use does not trigger a road noise study.

Please contact Mike Giampa, Transportation Project Manager, at Mike.Giampa@ottawa.ca for follow-up questions.

Forestry

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.
    b. The TCR may be combined with the LP provided all information is supplied.
2. Any removal of privately-owned trees 10cm or larger in diameter, or 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, as well as off-site trees if the CRZ extends into the developed area, 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 that will contribute to the design/function of the site.
10. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

Please contact Mark Richardson, Planning Forester, at Mark.Richardson@ottawa.ca for follow-up questions.

Planning

1. There are two zones on the site – IL6[1414] H(30)-h (Light Industrial, Subzone 6, Exception 1414, height limit of 30m, holding zone) and O1[1932]-h (Parks and Open Space Zone, Exception 1932, with a holding zone).
2. Please note that all storage on site must be concealed or enclosed as per Exception 1414.
3. Please ensure that the proposed development meets the requirements of Section 69 of the Zoning By-law – Setback from Watercourses.
4. Parking is to be provided at the rates specific for Area C in Section 101 of the Zoning By-law:
    - Warehouse: 0.8 per 100 m^2 for the first 5000 m^2 of gross floor area, and 0.4 per 100 m^2 above 5000 m^2 of gross floor area.
    - Automobile Rental Establishment: Sales/showroom area, 2 per 100 m^2 of gross floor area; Service area, 2 per service bay; Other areas, 1 per 100 m^2 of gross floor area.
5. Ensure that bicycle parking is provided at the rates identified in Table 111A of the Zoning By-law:
    - Warehouse: 1 per 2000 m^2 of gross floor area.
    - All other non-residential uses: 1 per 15000 m^2 of gross floor area.
6. Ensure that vehicle loading spaces are provided at the rates specified in Table 113A of the Zoning By-law, and that all provided loading spaces meet the requirements identified in Table 113B.
7. Please consider where and how waste will be handled on the site. If waste collection will be stored outside, ensure the requirements for waste enclosures are met under Section 110(3) of the Zoning By-law.
8. Ensure a 3m landscaped buffer is provided abutting a street (Highway 417), required as per Table 203(i)(ii).
9. Consider opportunities for tree planting and landscaping throughout the site.
10. The proposed development requires a ‘Site Plan Control – Complex’ application. Fees, forms and timelines can be found on the City’s website here.
11. A Lifting Holding By-law application will be required before development can proceed. Fees, forms and timelines can be found on the City’s website here. Refer to Exceptions 1414 and 1932 for the requirements associated with the

holding symbols. Both holding symbols can be lifted through the same application.

Please contact Colette Gorni, Planner, at colette.gorni@ottawa.ca for follow-up questions.

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 the City's Surveyor, Bill Harper, at Bill.Harper@ottawa.ca.

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-consultation 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 contact Colette Gorni, at colette.gorni@ottawa.ca if you have any questions.

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer here:

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	15	1. Site Servicing Plan	2. Site Servicing Study	S	3
S	15	3. Grade Control and Drainage Plan	4. Geotechnical Study / Slope Stability Study	S	3
	2	5. Composite Utility Plan	6. Groundwater Impact Study		3
	3	7. Servicing Options Report	8. Wellhead Protection Study		3
	9	9. Transportation Impact Assessment (TIA)	10.Erosion and Sediment Control Plan / Brief	S	3
S	3	11.Storm water Management Report / Brief	12.Hydro geological and Terrain Analysis		3
	3	13.Hydraulic Water main Analysis	14.Noise / Vibration Study		3
	PDF only	15.Roadway Modification Functional Design	16.Confederation Line Proximity Study		3

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	15	17.Draft Plan of Subdivision	18.Plan Showing Layout of Parking Garage		2
	5	19.Draft Plan of Condominium	20.Planning Rationale	S	3
S	15	21.Site Plan	22.Minimum Distance Separation (MDS)		3
	15	23.Concept Plan Showing Proposed Land Uses and Landscaping	24.Agrology and Soil Capability Study		3
	3	25.Concept Plan Showing Ultimate Use of Land	26.Cultural Heritage Impact Statement		3
S	15	27.Landscape Plan	28.Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo)	S	3
S	2	29.Survey Plan	30.Shadow Analysis		3
S	3	31.Architectural Building Elevation Drawings (dimensioned)	32.Design Brief (may be provided as part of the Planning Rationale)	S	Available online
	3	33.Wind Analysis			

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	3	34.Phase 1 Environmental Site Assessment	35.Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		3
S	3	36.Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37.Assessment of Landform Features		3
	3	38.Record of Site Condition	39.Mineral Resource Impact Assessment		3
S	3	40.Tree Conservation Report	41.Environmental Impact Statement / Impact Assessment of Endangered Species	S	3
	3	42.Mine Hazard Study / Abandoned Pit or Quarry Study	43.Integrated Environmental Review (Draft, as part of Planning Rationale)		3

S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
S	1	44. Applicant's Public Consultation Strategy (may be provided as part of the Planning Rationale)	45.Site Lighting Plan		3
A	1	46. Site Lighting Certification Letter	47.		

Meeting Date: January 14, 2022 Application Type: *Site Plan Control*

File Lead (Assigned Planner): Colette Gorni Infrastructure Approvals Project Manager: Shika Rathnasooriya

Site Address (Municipal Address): 30 Frank Nighbor Pl *Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. **This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.**

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning, Real Estate and Economic Development Department will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning, Real Estate and Economic Development Department.

APPENDIX B

Development Servicing Study Checklist

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☒ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☒ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☒ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.
- ☒ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☒ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).
- ☒ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- ☐ Proposed phasing of the development, if applicable.

☒ Reference to geotechnical studies and recommendations concerning servicing.

☒ All preliminary and formal site plan submissions should have the following information:
- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available
☒ Availability of public infrastructure to service proposed development
☒ Identification of system constraints
☒ Identify boundary conditions
☒ Confirmation of adequate domestic supply and pressure
☒ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
☒ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
☒ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
☒ Address reliability requirements such as appropriate location of shut-off valves
☐ Check on the necessity of a pressure zone boundary modification.
☒ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

- ☒ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- ☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

- ☒ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).
- ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☒ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.
- ☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)
- ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix ‘C’) format.
- ☒ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☒ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

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

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

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

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

4.6 Conclusion Checklist

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

APPENDIX C

Sanitary Sewage Calculations

Project No. 121326
Project Name: 30 Frank Nighbor
Project Location: Ottawa

Date: May 2022

30 Frank Nighbor Place (121326)
Proposed Peak Sanitary Flows

Daily Demands from OBC Table 8.2.1.3

Type of Use	Daily Demand Volume	
Warehouse	150	L/day/loading bay
	950	L/day/washroom

Ottawa Sewer Design Guidelines - Industrial & Commercial Sanitary Demands and Peaking Factors

Employee (Office Space)	75	L/day/Employee
Conditions	**Peaking Factor**	
Office Space/Commercial	1.5	
Light Industrial (warehouse)	1.5	

Proposed Development Conditions

	Bldg A	Bldg B	Bldg C	Bldg D	**Total Site**
No. Loading Bays	4	0	0	2	6
No. Washrooms	2	0	0	0	2
Peak Industrial Flows (L/s)	0.04	0.00	0.00	0.01	0.05
Number of Employees	6	0	0	0	6
Peak Flows (L/s)	0.01	0.00	0.00	0.00	0.01
Site Area (ha)	2.18	0.000	0.000	0.000	2.18
Extraneuos Flows (0.33 L/s/ha)	0.72	0.00	0.00	0.00	0.72
Total Peak Sanitary Flows (L/s)	0.77	0.00	0.00	0.01	0.77

APPENDIX D

Water Demands, Boundary Conditions, Schematic of the Hydraulic Model, Hydraulic Modeling Results and FUS Calculations

Project No. 121326
Project Name: 30 Frank Nighbor Place (U-Haul)
Project Location: Ottawa

Date: April 2022

Domestic Water Demands

Daily Demands from OBC Table 8.2.1.3

Establishment	Daily Demand Volume	
Industrial :	150	L/day/Loading bay
	950	L/day/washroom

Industrial Water Demands and Peaking Factors - Ottawa Water Distrubution Guidelines

Employee (Office Space)	75	L/day/Employee

Conditions	Peaking Factor	
Maximum Day	1.5	x Avg. Day
Peak Hour	1.8	x Max Day

Proposed Development Conditions

	Bldg A	Bldgs B & C	Bldg D	Totals
No. Loading Bays	4	0	2	6
No. Washrooms	2	0	0	2
Number of Employees	6	0	0	6
Total Daily Volume (Liters)	2,950	0	300	3250
Avg Day Demand (L/s)	0.03	0.00	0.00	0.04
Max Day Demand (L/s)	0.05	0.00	0.01	0.06
Peak Hour Demand (L/s)	0.09	0.00	0.01	0.10

Steve Matthews

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: Tuesday, May 17, 2022 9:49 AM
To: Francois Thauvette
Cc: Steve Matthews
Subject: RE: 30 Frank Nighbor Place (Kanata)- Watermain Boundary Conditions Request
Attachments: 30 Frank Nighbor Place_16May2022.docx

Hi Francois,

Please find the boundary conditions attached.

Thanks,
Shika

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: May 16, 2022 11:05 AM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 30 Frank Nighbor Place (Kanata)- Watermain Boundary Conditions Request

Hi Shika,

We are sending this e-mail as a follow-up on the watermain boundary conditions request sent out 3 weeks ago. Have you received any feedback from the City's water modelling group? Our client is very eager to submit for SPC this week and we require the boundary conditions to finalize our servicing design and report. Please follow-up at your end and advise when we can expect to receive the requested information.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
Please note that I am working from home. Email or MS Teams are the best ways to contact me.
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: Tuesday, April 26, 2022 2:50 PM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Subject: RE: 30 Frank Nighbor Place (Kanata)- Watermain Boundary Conditions Request

Hi Francois,

Your boundary conditions request is now being processed. Please note that currently the turnaround time can take up to 3 weeks.

Thank you,
Shika

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: April 22, 2022 4:17 PM
To: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Cc: Steve Matthews <S.Matthews@novatech-eng.com>
Subject: FW: 30 Frank Nighbor Place (Kanata)- Watermain Boundary Conditions Request

Hi Thakshika,

We are sending this e-mail to request watermain boundary conditions for the proposed development of the 30 Frank Nighbor Place property in Kanata. Please see e-mail below and attachments for details.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
Please note that I am working from home. Email or MS Teams are the best ways to contact me.
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Steve Matthews <S.Matthews@novatech-eng.com>
Sent: Friday, April 22, 2022 3:57 PM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Subject: 30 Frank Nighbor Place (Kanata)- Watermain Boundary Conditions Request

Hi François,

Please forward this information to the City of Ottawa as our request for municipal watermain boundary conditions in relation to the proposed commercial development at 30 Frank Nighbor (in the Kanata area). The site development will include a 5-storey commercial storage building (Bldg 'A'), a high 1-storey rack storage building (Bldg 'D') with an external loading dock and two (2) small portable storage buildings (Bldgs 'B' and 'C') off the extension of Frank Nighbor Place. Refer to the attached Site Plan for details.

Please request watermain boundary conditions from the City of Ottawa for the existing 300mm dia. PVC municipal watermain in the easement through the subject site. The architect has confirmed the construction method and that Buildings 'A' and 'D' will be sprinklered. The anticipated water demands for the proposed development (incl. Buildings A, B, C and D) are as follows:

- Average Day Demand = 0.04 L/s
- Maximum Day Demand = 0.06 L/s

- Peak Hour Demand = 0.10 L/s
- Maximum Fire Flow Demand = 250 L/s (Building A)

See the attached PDFs of the architectural Site Plan and the preliminary calculation sheets for details. A multi-hydrant approach to firefighting is anticipated to be required. There will be three (3) new private on-site fire hydrants within 75m of Buildings ‘A’, ‘ B’ and ‘C’. Two of those new hydrants will be within 75m of Building ‘D’ and one will be within 150m of Building ‘D’.

Please review and let me know if you require any additional information.

Regards,
Steve

Stephen Matthews, B.A.(Env), Senior Design Technologist
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 223 | Fax: 613.254.5867

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This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

'

Boundary Conditions
30 Frank Nighbor Place

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	2	0.04
Maximum Daily Demand	4	0.06
Peak Hour	6	0.10
Fire Flow Demand #1	15,000	250.00

Location

Results

Connection 1 – Frank Nighbor Place

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.7	93.5
Peak Hour	156.6	87.6
Max Day plus Fire 1	149.0	76.8

Ground Elevation = 95.0 m

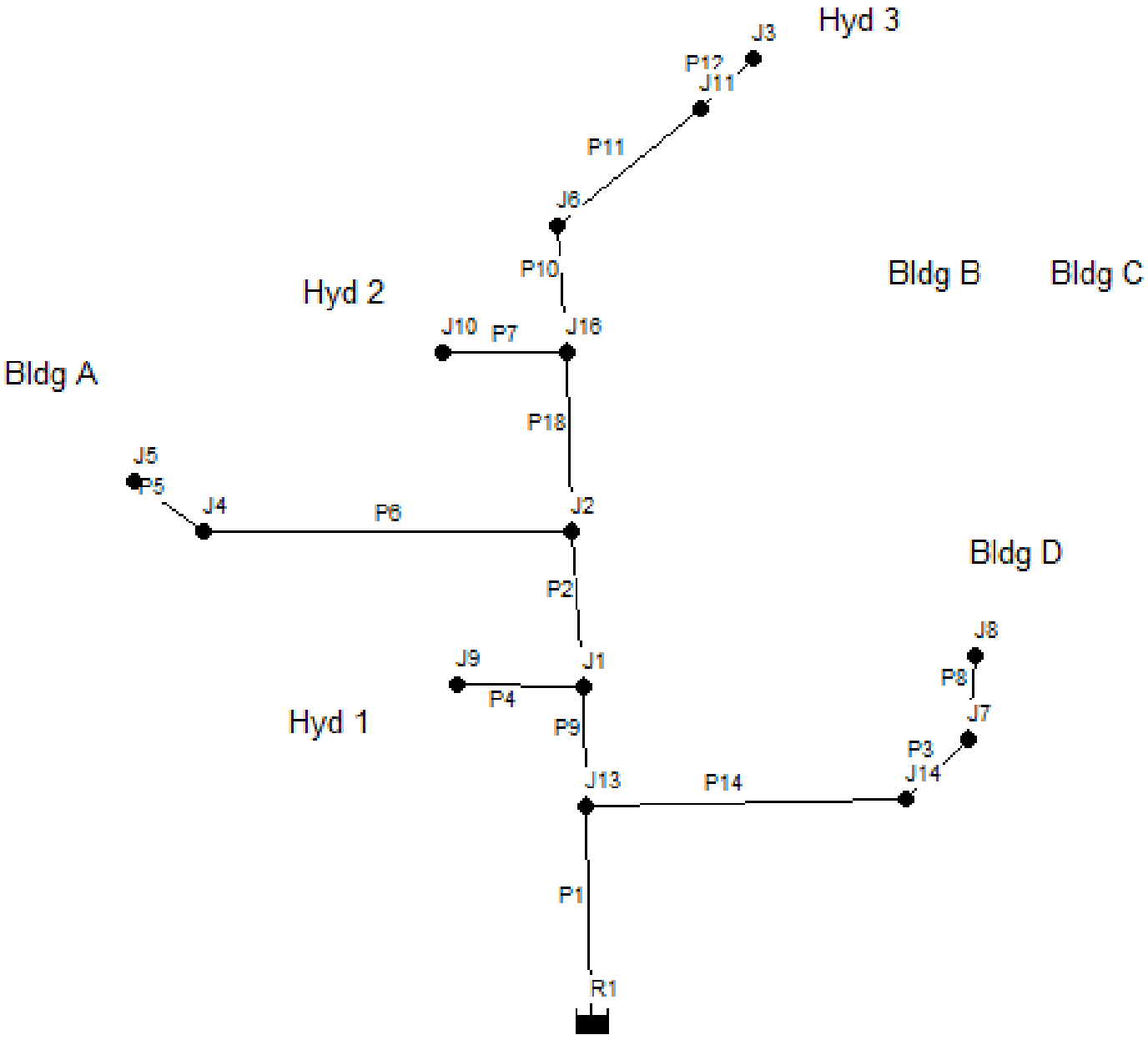
Notes

1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

30 Frank Nighbor Place - U-Haul Development



Private Road Extension

30 Frank Nighbor (U-Haul) - Watermain Analysis

Peak Hour Demand
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	92.75	0	156.6	63.85	626.37	90.85
Junc J2	92.7	0	156.6	63.9	626.86	90.92
Junc J3	96	0	156.6	60.6	594.49	86.22
Junc J4	92.92	0	156.6	63.68	624.70	90.61
Junc J5 (Bldg A)	95.5	0.09	156.6	61.1	599.39	86.93
Junc J7	93.02	0	156.6	63.58	623.72	90.46
Junc J8 (Bldg D)	95.5	0.01	156.6	61.1	599.39	86.93
Junc J13	92.55	0	156.6	64.05	628.33	91.13
Junc J14	92.92	0	156.6	63.68	624.70	90.61
Junc J16	92.73	0	156.6	63.87	626.56	90.88
Junc J6	92.67	0	156.6	63.93	627.15	90.96
Junc J9	95.9	0	156.6	60.7	595.47	86.37
Junc J10	95.9	0	156.6	60.7	595.47	86.37
Junc J11	92.87	0	156.6	63.73	625.19	90.68
Resvr R1	156.6	-0.1	156.6	0	0.00	0.00

Peak Hour Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P2	6.2	200	110	0.09	0	0
Pipe P5	5.9	150	100	0.09	0.01	0
Pipe P8	7	200	110	0.01	0	0
Pipe P1	29.9	200	110	0.1	0	0
Pipe P9	52.6	200	110	0.09	0	0
Pipe P14	33.7	200	110	0.01	0	0
Pipe P18	27.3	200	110	0	0	0
Pipe P3	3.4	200	110	-0.01	0	0
Pipe P4	9.5	150	100	0	0	0
Pipe P6	35.1	150	100	-0.09	0.01	0
Pipe P7	8.7	150	100	0	0	0
Pipe P10	13.7	200	110	0	0	0
Pipe P11	43.6	200	110	0	0	0
Pipe P12	7	150	100	0	0	0

30 Frank Nighbor (U-Haul) - Watermain Analysis

Max HGL check
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	92.75	0	160.7	67.95	666.59	96.68
Junc J2	92.7	0	160.7	68	667.08	96.75
Junc J3	96	0	160.7	64.7	634.71	92.06
Junc J4	92.92	0	160.7	67.78	664.92	96.44
Junc J5 (Bldg A)	95.5	0.05	160.7	65.2	639.61	92.77
Junc J7	93.02	0	160.7	67.68	663.94	96.30
Junc J8 (Bldg D)	95.5	0.01	160.7	65.2	639.61	92.77
Junc J13	92.55	0	160.7	68.15	668.55	96.97
Junc J14	92.92	0	160.7	67.78	664.92	96.44
Junc J16	92.73	0	160.7	67.97	666.79	96.71
Junc J6	92.67	0	160.7	68.03	667.37	96.79
Junc J9	95.9	0	160.7	64.8	635.69	92.20
Junc J10	95.9	0	160.7	64.8	635.69	92.20
Junc J11	92.87	0	160.7	67.83	665.41	96.51
Resvr R1	160.7	-0.06	160.7	0	0.00	0.00

Max HGL check
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P2	6.2	200	110	0.05	0	0
Pipe P5	5.9	150	100	0.05	0	0
Pipe P8	7	200	110	0.01	0	0
Pipe P1	29.9	200	110	0.06	0	0
Pipe P9	52.6	200	110	0.05	0	0
Pipe P14	33.7	200	110	0.01	0	0
Pipe P18	27.3	200	110	0	0	0
Pipe P3	3.4	200	110	-0.01	0	0
Pipe P4	9.5	150	100	0	0	0
Pipe P6	35.1	150	100	-0.05	0	0
Pipe P7	8.7	150	100	0	0	0
Pipe P10	13.7	200	110	0	0	0
Pipe P11	43.6	200	110	0	0	0
Pipe P12	7	150	100	0	0	0

30 Frank Nighbor (U-Haul) - Watermain Analysis

Max Day + Fire Flow Demand (Bldgs A, B, C or D)
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	92.75	0	119.09	26.34	258.40	37.48
Junc J2	92.7	0	118.13	25.43	249.47	36.18
Junc J3 (Hyd)	96	67	111.18	15.18	148.92	21.60
Junc J4	92.92	0	118.13	25.21	247.31	35.87
Junc J5 (Bldg A)	95.5	0.05	118.13	22.63	222.00	32.20
Junc J7	93.02	0	138.16	45.14	442.82	64.23
Junc J8 (Bldg D)	95.5	0.01	138.16	42.66	418.49	60.70
Junc J13	92.55	0	138.16	45.61	447.43	64.89
Junc J14	92.92	0	138.16	45.24	443.80	64.37
Junc J16	92.73	0	113.92	21.19	207.87	30.15
Junc J6	92.67	0	113.51	20.84	204.44	29.65
Junc J9 (Hyd)	95.9	95	116.45	20.55	201.60	29.24
Junc J10 (Hyd)	95.9	95	111.5	15.6	153.04	22.20
Junc J11	92.87	0	112.2	19.33	189.63	27.50
Resvr R1	149	-257.06	149	0	0.00	0.00

Max Day + Fire Flow Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P2	6.2	200	110	162.05	5.16	154.29
Pipe P5	5.9	150	100	0.05	0	0
Pipe P8	7	200	110	0.01	0	0
Pipe P1	29.9	200	110	257.06	8.18	362.61
Pipe P9	52.6	200	110	257.05	8.18	362.58
Pipe P14	33.7	200	110	0.01	0	0
Pipe P18	27.3	200	110	162	5.16	154.2
Pipe P3	3.4	200	110	-0.01	0	0
Pipe P4	9.5	150	100	-95	5.38	277.99
Pipe P6	35.1	150	100	-0.05	0	0
Pipe P7	8.7	150	100	-95	5.38	277.99
Pipe P10	13.7	200	110	67	2.13	30.06
Pipe P11	43.6	200	110	67	2.13	30.06
Pipe P12	7	150	100	67	3.79	145.61

Steve Matthews

From: Yazan Bilbeisi <Yazan.Bilbeisi@ibigroup.com>
Sent: Friday, April 22, 2022 12:05 PM
To: Francois Thauvette
Cc: Steve Matthews; David Pollock; Alvis Chu
Subject: RE: 30 Frank Nighbor Place - Confirmation of Building Construction for FUS Calculations
Attachments: Yazan Bilbeisi.vcf; 2022-04-21_IBI-Arch_Uhaul-Kanata_A-4001-4002v2.pdf

Hi Francois,

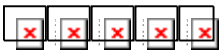
Please see replies below and file attached.

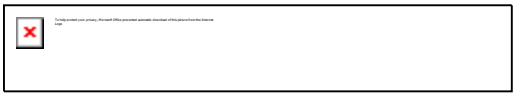
Kind regards,

Yazan Bilbeisi RIBA, PMP, PGDip (Oxon), MArch (UCL), MSc (Cardiff), BSc, MRAIC

Working remotely

IBI GROUP
Suite 400, 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613-241-3300 fax 613-241-1130





From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: Thursday, April 21, 2022 10:22 AM
To: Yazan Bilbeisi <Yazan.Bilbeisi@ibigroup.com>
Cc: Steve Matthews <S.Matthews@novatech-eng.com>
Subject: FW: 30 Frank Nighbor Place - Confirmation of Building Construction for FUS Calculations

Hi Yazan

We are completing the fire flow calculations for the proposed U-Haul development using the Fire Underwriters Survey (FUS) method per City standards and require input from your office. Please review the e-mail below and provide clarification/input, so that we may be able to finalize the calculations and request the municipal watermain boundary conditions to finalize the servicing design.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering

NOVATECH Engineers, Planners & Landscape Architects
Please note that I am working from home. Email or MS Teams are the best ways to contact me.
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Steve Matthews <S.Matthews@novatech-eng.com>
Sent: Thursday, April 21, 2022 10:13 AM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Subject: 30 Frank Nighbor Place - Confirmation of Building Construction for FUS Calculations

Hi François,

The City of Ottawa now requires that we verify building construction via e-mail correspondence with the architect (and include the verification e-mail as supporting documentation in our DSS & SWM Report).
Please confirm the following building design elements with the Architect in regards to the **type of construction**, **occupancy type** and **sprinkler protection** for our use in calculating the FUS fire flow requirements:

- Please confirm the **Building Construction Type** for both Buildings A and D (i.e., **Combustible** (wood frame); **Non-Combustible** (concrete with metal stud infill)***[Yazan Bilbeisi]*** Non-combustible; or **Fire Resistive** construction).
    - If fire resistive, what will it be rated to? (i.e.: 2 hours or 3 hours) and will the openings between floors (Building A) have a 1-hour fire rating, or greater; or will the openings be fully protected?
- Please confirm that the **Occupancy Hazard** will be considered **Combustible*[Yazan Bilbeisi]* confirmed** (given the contents of the storage units are unknown but assumed to be residential type items).
- Please confirm that both Buildings A and D be designed with a **Sprinkler System** for the entire interior space.***[Yazan Bilbeisi]*** confirmed
- Please confirm the height of each storey for both Buildings A and D.***[Yazan Bilbeisi]*** Please see attached.

Refer to the attached FUS Guidelines for clarification on the Building Construction Type Definitions [pages 21, 22 and 23] and for the Occupancy Hazard definitions [pages 25, 26 and 27 for this section specifically].

The OBC fire flow calculations indicate that volume of water required exceeds the 270,000 L limit which triggers the City of Ottawa requirement to provide FUS fire flow calculations for this urban site.
If there are any questions or concerns please do not hesitate to call.

Regards,
Steve

Stephen Matthews, B.A.(Env), Senior Design Technologist
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 223 | Fax: 613.254.5867

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121326
Project Name: 30 Frank Nighbor Place
Date: 4/22/2022
Input By: S.Matthews
Reviewed By: F.Thauvette

Legend: Input by User; No Information or Input Required

Building Description: 5-Storey Building A
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	3383			
		Number of Floors/Storeys	5			
		Area of structure considered (m^2)			**16,915**	
	F	**Base fire flow without reductions**				**23,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**23,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-9,200**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	No	-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**1,150**
		East Side	30.1- 45 m		5%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**5%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**15,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**250**
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121326
Project Name: 30 Frank Nighbor Place
Date: 4/22/2022
Input By: S.Matthews
Reviewed By: F.Thauvette

Legend: Input by User; No Information or Input Required

Building Description: 1-Storey Building B
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	218			
		Number of Floors/Storeys	1			
		Area of structure considered (m^2)			**218**	
	F	**Base fire flow without reductions**				**3,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**3,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)		-30%		**0**
		Standard Water Supply		-10%		
		Fully Supervised System		-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**750**
		East Side	3.1 - 10 m		20%	
		South Side	> 45.1m		0%	
		West Side	30.1- 45 m		5%	
				Cumulative Total	**25%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**4,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**67**
				or	USGPM	1,057
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	1.5
		Required Volume of Fire Flow (m^3)			m^3	360

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121326
Project Name: 30 Frank Nighbor Place
Date: 4/22/2022
Input By: S.Matthews
Reviewed By: F.Thauvette

Legend: Input by User; No Information or Input Required

Building Description: 1-Storey Building C
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	218			
		Number of Floors/Storeys	1			
		Area of structure considered (m^2)			**218**	
	F	**Base fire flow without reductions**				**3,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**3,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)		-30%		**0**
		Standard Water Supply		-10%		
		Fully Supervised System		-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**1,050**
		East Side	10.1 - 20 m		15%	
		South Side	> 45.1m		0%	
		West Side	3.1 - 10 m		20%	
				Cumulative Total	**35%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**4,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**67**
				or	USGPM	1,057
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	1.5
		Required Volume of Fire Flow (m^3)			m^3	360

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 121326
Project Name: 30 Frank Nighbor Place
Date: 4/22/2022
Input By: S.Matthews
Reviewed By: F.Thauvette

Legend: Input by User; No Information or Input Required

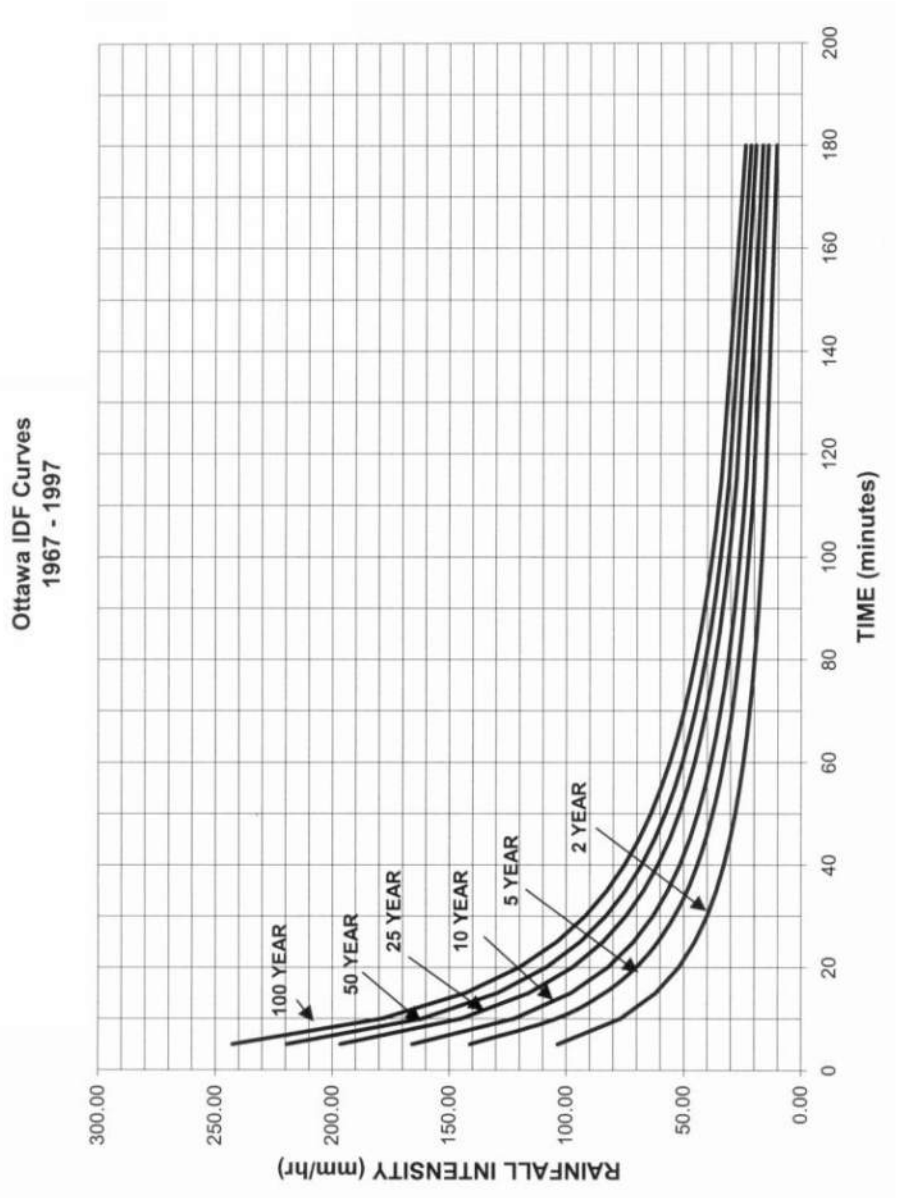
Building Description: High 1-Storey Building D (1=3 Rack Storage per FUS guidelines)
Non-combustible construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1554			
		Number of Floors/Storeys	3			
		Area of structure considered (m^2)			**4,662**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**12,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-4,800**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	No	-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**2,400**
		East Side	10.1 - 20 m		15%	
		South Side	> 45.1m		0%	
		West Side	30.1- 45 m		5%	
				Cumulative Total	**20%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**10,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**167**
				or	USGPM	2,642
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	1200

APPENDIX E

IDF Curves and SWM Modelling Files

APPENDIX 5-A OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



Drainage ID Schematic

Legend

- Junctions
- Outfalls

Storages
- Visible
- CB
- CBMH
- STMH
- POND
- LD

Conduits
- Visible
- Major System

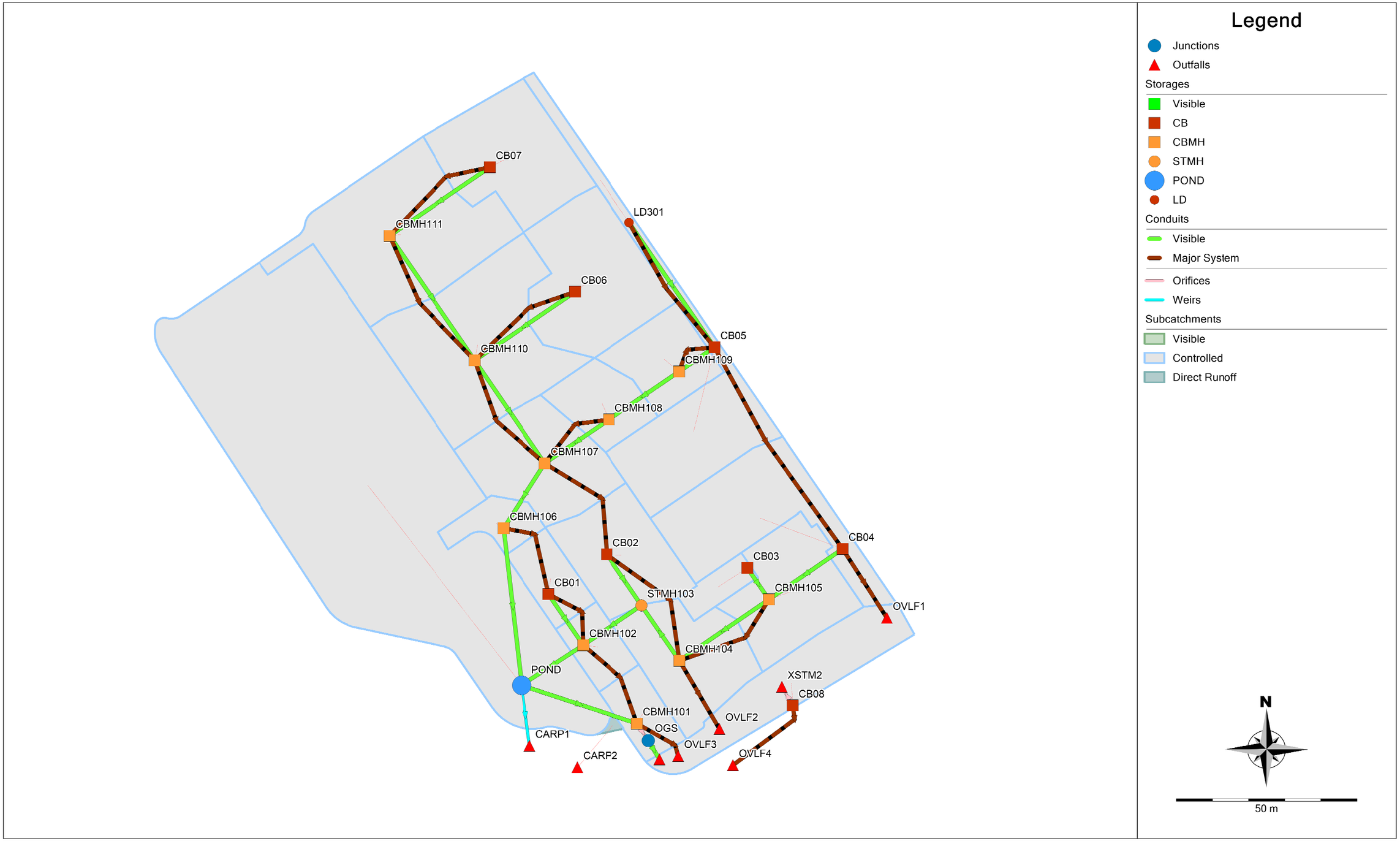
- Orifices
- Weirs

Subcatchments
- Visible
- Controlled
- Direct Runoff

N

50 m

Structure ID Schematic



Chicago 4 Hour 2 Year Event PCSWMM Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 21
Number of nodes 30
Number of links 41
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage1	C4-2	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-0	0.00	5.00	5.00	2.0000	Raingage1	CARP2
A-1	0.03	22.96	100.00	3.0000	Raingage1	CBMH101
A-10	0.03	15.29	100.00	2.5000	Raingage1	CBMH106
A-11	0.10	55.88	100.00	2.0000	Raingage1	CBMH107
A-12	0.04	26.67	100.00	2.0000	Raingage1	CBMH108
A-13	0.05	33.75	100.00	2.0000	Raingage1	CBMH109
A-14	0.10	34.67	72.00	1.0000	Raingage1	CB05
A-15	0.02	5.75	5.00	1.0000	Raingage1	LD301
A-16	0.17	80.95	100.00	1.5000	Raingage1	CBMH110
A-17	0.12	56.28	100.00	1.5000	Raingage1	CB06
A-18	0.17	79.07	100.00	1.5000	Raingage1	CBMH111
A-19	0.11	49.77	100.00	1.5000	Raingage1	CB07
A-2	0.66	41.44	64.00	1.5000	Raingage1	POND
A-3	0.03	21.54	100.00	3.5000	Raingage1	CBMH102
A-4	0.03	21.29	100.00	2.0000	Raingage1	CB01
A-5	0.08	48.23	100.00	2.0000	Raingage1	CB02
A-6	0.09	40.00	100.00	2.0000	Raingage1	CBMH104
A-7	0.09	43.90	99.00	1.5000	Raingage1	CBMH105
A-8	0.02	8.50	100.00	5.0000	Raingage1	CB03
A-9	0.12	39.33	64.00	1.0000	Raingage1	CB04
R-1	0.09	23.00	85.00	2.0000	Raingage1	CB08

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OGS	JUNCTION	92.67	2.26	0.0	
CARP1	OUTFALL	0.00	0.00	0.0	
CARP2	OUTFALL	0.00	0.00	0.0	
OVLF1	OUTFALL	95.19	1.00	0.0	
OVLF2	OUTFALL	0.00	95.99	0.0	
OVLF3	OUTFALL	0.00	96.04	0.0	
OVLF4	OUTFALL	0.00	95.84	0.0	
XSTM1	OUTFALL	92.07	1.04	0.0	
XSTM2	OUTFALL	92.15	0.00	0.0	
CB01	STORAGE	93.02	2.98	0.0	
CB02	STORAGE	93.08	2.92	0.0	
CB03	STORAGE	93.31	1.94	0.0	
CB04	STORAGE	93.29	2.61	0.0	
CB05	STORAGE	93.32	2.68	0.0	
CB06	STORAGE	93.39	2.76	0.0	
CB07	STORAGE	93.50	2.65	0.0	
CB08	STORAGE	93.15	2.55	0.0	
CBMH101	STORAGE	92.76	3.04	0.0	
CBMH102	STORAGE	92.92	2.98	0.0	
CBMH104	STORAGE	93.09	2.71	0.0	
CBMH105	STORAGE	93.22	2.88	0.0	
CBMH106	STORAGE	93.07	3.08	0.0	
CBMH107	STORAGE	93.13	2.87	0.0	

CBMH108	STORAGE	93.21	2.89	0.0
CBMH109	STORAGE	93.28	2.87	0.0
CBMH110	STORAGE	93.25	2.75	0.0
CBMH111	STORAGE	93.36	2.64	0.0
LD301	STORAGE	93.80	2.20	0.0
POND	STORAGE	92.90	3.00	0.0
STMH103	STORAGE	92.98	3.22	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
01-102	CB01	CBMH102	CONDUIT	16.9	0.2360	0.0130
02-103	CB02	STMH103	CONDUIT	17.0	0.2357	0.0130
03-105	CB03	CBMH105	CONDUIT	10.5	0.2855	0.0130
04-105	CB04	CBMH105	CONDUIT	24.7	0.2431	0.0130
05-109	CB05	CBMH109	CONDUIT	11.8	0.2533	0.0130
06-110	CB06	CBMH110	CONDUIT	33.5	0.2391	0.0130
07-111	CB07	CBMH111	CONDUIT	33.5	0.2391	0.0130
101-OGS	CBMH101	OGS	CONDUIT	5.6	0.1786	0.0130
102-POND	CBMH102	POND	CONDUIT	8.9	0.2243	0.0130
103-102	STMH103	CBMH102	CONDUIT	19.5	0.2569	0.0130
104-103	CBMH104	STMH103	CONDUIT	18.4	0.2711	0.0130
105-104	CBMH105	CBMH104	CONDUIT	29.9	0.2344	0.0130
106-POND	CBMH106	POND	CONDUIT	9.3	0.2144	0.0130
107-106	CBMH107	CBMH106	CONDUIT	21.2	0.2360	0.0130
108-107	CBMH108	CBMH107	CONDUIT	21.4	0.2340	0.0130
109-108	CBMH109	CBMH108	CONDUIT	23.4	0.2560	0.0130
110-10	CBMH110	CBMH107	CONDUIT	34.3	0.2623	0.0130
111-110	CBMH111	CBMH110	CONDUIT	41.6	0.2404	0.0130
301-05	LD301	CB05	CONDUIT	41.7	1.0080	0.0130
OGS-XSTM1	OGS	XSTM1	CONDUIT	6.0	0.1667	0.0130
OLFA1	CBMH101	OVLF3	CONDUIT	1.0	1.0001	0.0150
OLFA10	CBMH106	CB01	CONDUIT	1.0	1.0001	0.0150
OLFA11	CBMH107	CB02	CONDUIT	1.0	1.0001	0.0150
OLFA12	CBMH108	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA13	CBMH109	CB05	CONDUIT	1.0	1.0001	0.0150
OLFA14	CB05	CB04	CONDUIT	1.0	1.0001	0.0350
OLFA15	LD301	CB05	CONDUIT	1.0	1.0001	0.0350
OLFA16	CBMH110	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA17	CB06	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA18	CBMH111	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA19	CB07	CBMH111	CONDUIT	1.0	1.0001	0.0150
OLFA3	CBMH102	CBMH101	CONDUIT	1.0	1.0001	0.0150
OLFA4	CB01	CBMH102	CONDUIT	1.0	1.0001	0.0150
OLFA5	CB02	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA6	CBMH104	OVLF2	CONDUIT	1.0	1.0001	0.0150
OLFA7	CBMH105	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA9	CB04	OVLF1	CONDUIT	1.0	1.0001	0.0350
OLFR1	CB08	OVLF4	CONDUIT	1.0	1.0001	0.0150
POND-101	POND	CBMH101	CONDUIT	11.7	0.9442	0.0130
08-XTMS2	CB08	XSTM2	ORIFICE			
OVERFLOW	POND	CARP1	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
01-102	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
02-103	CIRCULAR	0.38	0.11	0.09	0.38	1	85.13
03-105	CIRCULAR	0.38	0.11	0.09	0.38	1	93.69
04-105	CIRCULAR	0.38	0.11	0.09	0.38	1	86.45
05-109	CIRCULAR	0.38	0.11	0.09	0.38	1	88.25
06-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
07-111	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
101-OGS	CIRCULAR	0.20	0.03	0.05	0.20	1	14.42
102-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	83.04
103-102	CIRCULAR	0.38	0.11	0.09	0.38	1	88.87
104-103	CIRCULAR	0.38	0.11	0.09	0.38	1	91.29
105-104	CIRCULAR	0.38	0.11	0.09	0.38	1	84.89
106-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	81.18
107-106	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
108-107	CIRCULAR	0.38	0.11	0.09	0.38	1	84.82
109-108	CIRCULAR	0.38	0.11	0.09	0.38	1	88.72
110-10	CIRCULAR	0.38	0.11	0.09	0.38	1	89.80
111-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.98
301-05	CIRCULAR	0.25	0.05	0.06	0.25	1	59.71

OGS-XSTM1	CIRCULAR	0.45	0.16	0.11	0.45	1	116.40
OLFA1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA10	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA11	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA12	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA13	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA14	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA15	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA16	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA17	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA18	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA19	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA3	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA4	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA5	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA6	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA7	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA9	RECT_OPEN	1.00	3.00	0.60	3.00	1	6098.05
OLFR1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
POND-101	CIRCULAR	0.38	0.11	0.09	0.38	1	170.38

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO

Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 05/11/2022 00:00:00
Ending Date 05/12/2022 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 4
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Initial LID Storage	0.002	1.058
Total Precipitation	0.073	33.885
Evaporation Loss	0.000	0.000
Infiltration Loss	0.011	5.024
Surface Runoff	0.063	29.029
Final Storage	0.002	1.058
Continuity Error (%)	-0.480	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.063	0.627
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.002
External Outflow	0.063	0.629
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.022	0.218

```
  Final Stored Volume ......          0.022         0.218
  Continuity Error (%) .....         -0.019


  ***************************
  Time-Step Critical Elements
  ***************************
  Link 106-POND (9.30%)
  Link POND-101 (8.63%)
  Link 102-POND (4.74%)


  *******************************
  Highest Flow Instability Indexes
  *******************************
  Link 08-XTMS2 (115)


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     4.51 sec
  Maximum Time Step           :     5.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      5.000 -  3.155 sec      :    88.74 %
      3.155 -  1.991 sec      :     6.87 %
      1.991 -  1.256 sec      :     2.64 %
      1.256 -  0.792 sec      :     1.19 %
      0.792 -  0.500 sec      :     0.56 %


  ***************************
  Subcatchment Runoff Summary
  ***************************

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

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-0	33.88	0.00	0.00	27.08	1.69	5.60	7.29	0.00	0.23	0.215
A-1	33.88	0.00	0.00	0.00	33.96	0.00	33.96	0.01	6.61	1.002
A-10	33.88	0.00	0.00	0.00	34.00	0.00	34.00	0.01	5.55	1.003
A-11	33.88	0.00	0.00	0.00	34.01	0.00	34.01	0.03	20.27	1.004
A-12	33.89	0.00	0.00	0.00	34.01	0.00	34.01	0.01	9.39	1.004
A-13	33.88	0.00	0.00	0.00	34.00	0.00	34.00	0.02	11.52	1.004
A-14	33.88	0.00	0.00	8.24	24.54	1.32	25.86	0.03	17.51	0.763
A-15	33.89	0.00	0.00	29.82	1.70	2.43	4.12	0.00	0.55	0.122
A-16	33.88	0.00	0.00	0.00	34.06	0.00	34.06	0.06	36.26	1.005
A-17	33.89	0.00	0.00	0.00	34.06	0.00	34.06	0.04	25.81	1.005
A-18	33.88	0.00	0.00	0.00	34.06	0.00	34.06	0.06	36.26	1.005
A-19	33.88	0.00	0.00	0.00	34.06	0.00	34.06	0.04	22.82	1.005
A-2	33.88	0.00	0.00	11.40	21.84	0.81	22.66	0.15	88.74	0.669
A-3	33.88	0.00	0.00	0.00	33.95	0.00	33.95	0.01	5.97	1.002
A-4	33.88	0.00	0.00	0.00	34.00	0.00	34.00	0.01	7.04	1.003
A-5	33.88	0.00	0.00	0.00	34.01	0.00	34.01	0.03	17.49	1.004
A-6	33.89	0.00	0.00	0.00	34.05	0.00	34.05	0.03	18.77	1.005
A-7	33.89	0.00	0.00	0.28	33.72	0.06	33.78	0.03	19.15	0.997

A-8	33.89	0.00	0.00	0.00	33.98	0.00	33.98	0.01	3.63	1.003
A-9	33.89	0.00	0.00	10.69	21.81	1.57	23.38	0.03	17.95	0.690
R-1	33.89	0.00	0.00	4.32	28.99	0.82	29.81	0.03	17.84	0.880

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
OGS	JUNCTION	0.55	0.56	93.23	0	01:53	0.56
CARP1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
CARP2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OVLF1	OUTFALL	0.00	0.00	95.19	0	00:00	0.00
OVLF2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OVLF3	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OVLF4	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
XSTM1	OUTFALL	1.15	1.15	93.22	0	00:00	1.15
XSTM2	OUTFALL	1.07	1.07	93.22	0	00:00	1.07
CB01	STORAGE	0.24	0.55	93.57	0	01:53	0.55
CB02	STORAGE	0.18	0.49	93.57	0	01:53	0.49
CB03	STORAGE	0.02	0.27	93.58	0	01:50	0.27
CB04	STORAGE	0.03	0.29	93.58	0	01:50	0.29
CB05	STORAGE	0.03	0.48	93.80	0	01:31	0.48
CB06	STORAGE	0.02	0.55	93.94	0	01:31	0.55
CB07	STORAGE	0.01	0.47	93.97	0	01:31	0.47
CB08	STORAGE	0.07	0.34	93.49	0	01:30	0.34
CBMH101	STORAGE	0.50	0.79	93.55	0	01:53	0.79
CBMH102	STORAGE	0.34	0.65	93.57	0	01:53	0.65
CBMH104	STORAGE	0.17	0.48	93.57	0	01:51	0.48
CBMH105	STORAGE	0.04	0.36	93.58	0	01:50	0.36
CBMH106	STORAGE	0.19	0.56	93.63	0	01:32	0.56
CBMH107	STORAGE	0.14	0.66	93.79	0	01:31	0.65
CBMH108	STORAGE	0.06	0.58	93.79	0	01:31	0.58
CBMH109	STORAGE	0.03	0.52	93.80	0	01:31	0.52
CBMH110	STORAGE	0.04	0.68	93.93	0	01:31	0.68
CBMH111	STORAGE	0.03	0.61	93.97	0	01:31	0.61
LD301	STORAGE	0.00	0.02	93.82	0	01:31	0.02
POND	STORAGE	0.36	0.67	93.57	0	01:53	0.67
STMH103	STORAGE	0.28	0.59	93.57	0	01:53	0.59

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
OGS	JUNCTION	0.00	53.76	0	01:53	0	0.602	-0.003	
CARP1	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
CARP2	OUTFALL	0.23	0.23	0	01:30	0.000147	0.000147	0.000	
OVLF1	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
OVLF2	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
OVLF3	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
OVLF4	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
XSTM1	OUTFALL	0.00	53.76	0	01:53	0	0.602	0.000	
XSTM2	OUTFALL	0.00	17.67	0	01:30	0	0.0293	0.000	
CB01	STORAGE	7.04	7.04	0	01:30	0.0112	0.0119	0.002	
CB02	STORAGE	17.49	17.49	0	01:30	0.0279	0.0285	-0.010	
CB03	STORAGE	3.63	3.63	0	01:30	0.00578	0.00578	0.140	
CB04	STORAGE	17.95	17.95	0	01:30	0.0276	0.0276	-0.106	
CB05	STORAGE	17.51	17.97	0	01:30	0.0269	0.0279	-0.017	
CB06	STORAGE	25.81	25.81	0	01:30	0.0413	0.0413	0.211	
CB07	STORAGE	22.82	22.82	0	01:30	0.0365	0.0365	0.464	
CB08	STORAGE	17.84	17.84	0	01:30	0.0275	0.0285	0.828	
CBMH101	STORAGE	6.61	53.76	0	01:53	0.0105	0.603	0.001	
CBMH102	STORAGE	5.97	77.86	0	01:30	0.00952	0.149	0.002	
CBMH104	STORAGE	18.77	52.47	0	01:30	0.03	0.0952	0.019	
CBMH105	STORAGE	19.15	37.99	0	01:30	0.0304	0.0639	0.002	
CBMH106	STORAGE	5.55	156.73	0	01:30	0.00885	0.298	-0.019	
CBMH107	STORAGE	20.27	154.49	0	01:30	0.0324	0.289	0.000	

CBMH108	STORAGE	9.39	32.96	0	01:29	0.015	0.0617	-0.040
CBMH109	STORAGE	11.52	26.33	0	01:30	0.0184	0.0463	-0.037
CBMH110	STORAGE	36.26	111.32	0	01:30	0.058	0.194	-0.040
CBMH111	STORAGE	36.26	56.87	0	01:29	0.058	0.0943	-0.260
LD301	STORAGE	0.55	0.55	0	01:30	0.00095	0.00095	-0.764
POND	STORAGE	88.74	318.36	0	01:30	0.15	0.801	-0.012
STMH103	STORAGE	0.00	67.39	0	01:30	0	0.126	-0.000

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
OGS	JUNCTION	24.00	0.110	1.700

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CB01	0.000	0	0	0	0.000	1	0 01:53	6.49
CB02	0.000	0	0	0	0.000	1	0 01:53	16.89
CB03	0.000	0	0	0	0.000	0	0 01:50	3.03
CB04	0.000	0	0	0	0.000	1	0 01:50	16.17
CB05	0.000	0	0	0	0.000	4	0 01:31	14.91
CB06	0.000	0	0	0	0.000	1	0 01:31	23.66
CB07	0.000	0	0	0	0.000	1	0 01:31	20.63
CB08	0.000	0	0	0	0.000	2	0 01:30	17.67
CBMH101	0.001	4	0	0	0.001	6	0 01:53	53.76
CBMH102	0.000	1	0	0	0.001	2	0 01:53	76.31
CBMH104	0.000	1	0	0	0.001	3	0 01:51	50.70
CBMH105	0.000	1	0	0	0.000	6	0 01:50	34.49
CBMH106	0.000	3	0	0	0.001	10	0 01:32	155.59
CBMH107	0.000	1	0	0	0.001	2	0 01:31	151.76
CBMH108	0.000	1	0	0	0.001	10	0 01:31	31.60
CBMH109	0.000	0	0	0	0.001	7	0 01:31	24.04
CBMH110	0.000	0	0	0	0.001	2	0 01:31	105.00
CBMH111	0.000	0	0	0	0.001	2	0 01:31	51.76
LD301	0.000	0	0	0	0.000	1	0 01:31	0.51
POND	0.237	10	0	0	0.487	21	0 01:53	53.00
STMH103	0.000	9	0	0	0.001	18	0 01:53	65.63

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
CARP1	0.00	0.00	0.00	0.000
CARP2	1.95	0.12	0.23	0.000
OVLF1	0.00	0.00	0.00	0.000
OVLF2	0.00	0.00	0.00	0.000
OVLF3	0.00	0.00	0.00	0.000
OVLF4	0.00	0.00	0.00	0.000
XSTM1	60.93	14.27	53.76	0.602
XSTM2	99.84	0.52	17.67	0.029
System	20.34	14.90	60.29	0.631

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
01-102	CONDUIT	6.49	0	01:27	0.06	0.08	1.00
02-103	CONDUIT	16.89	0	01:27	0.16	0.20	1.00
03-105	CONDUIT	3.03	0	01:31	0.29	0.03	0.75
04-105	CONDUIT	16.17	0	01:30	0.36	0.19	0.84
05-109	CONDUIT	14.91	0	01:30	0.43	0.17	1.00
06-110	CONDUIT	23.66	0	01:29	0.42	0.28	1.00
07-111	CONDUIT	20.63	0	01:29	0.54	0.24	1.00
101-OGS	CONDUIT	53.76	0	01:53	1.66	3.73	1.00
102-POND	CONDUIT	76.31	0	01:30	0.69	0.92	1.00
103-102	CONDUIT	65.63	0	01:30	0.59	0.74	1.00
104-103	CONDUIT	50.70	0	01:30	0.46	0.56	1.00
105-104	CONDUIT	34.49	0	01:30	0.42	0.41	0.97
106-POND	CONDUIT	155.59	0	01:30	1.41	1.92	1.00
107-106	CONDUIT	151.76	0	01:30	1.37	1.78	1.00
108-107	CONDUIT	31.60	0	01:31	0.29	0.37	1.00
109-108	CONDUIT	24.04	0	01:31	0.36	0.27	1.00
110-10	CONDUIT	105.00	0	01:30	0.95	1.17	1.00
111-110	CONDUIT	51.76	0	01:30	0.57	0.60	1.00
301-05	CONDUIT	0.51	0	01:31	0.25	0.01	0.53
OGS-XSTM1	CONDUIT	53.76	0	01:53	0.34	0.46	1.00
OLFA1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA10	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA14	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA15	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA16	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA17	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA18	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA19	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA3	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA4	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA5	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA6	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA7	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA9	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFR1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
POND-101	CONDUIT	53.00	0	01:55	0.48	0.31	1.00
08-XTMS2	ORIFICE	17.67	0	01:30			1.00
OVERFLOW	WEIR	0.00	0	00:00			0.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
01-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
02-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
03-105	1.00	0.00	0.00	0.00	0.18	0.00	0.00	0.82	0.01	0.00
04-105	1.00	0.00	0.00	0.00	0.29	0.00	0.00	0.71	0.08	0.00
05-109	1.00	0.00	0.00	0.00	0.23	0.00	0.00	0.77	0.02	0.00
06-110	1.00	0.00	0.00	0.00	0.17	0.00	0.00	0.83	0.04	0.00
07-111	1.00	0.00	0.00	0.00	0.09	0.00	0.00	0.91	0.03	0.00
101-OGS	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
102-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
103-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
104-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
105-104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.77	0.00
106-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
107-106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
108-107	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.03	0.00
109-108	1.00	0.00	0.00	0.00	0.61	0.00	0.00	0.39	0.48	0.00
110-10	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.84	0.00
111-110	1.00	0.00	0.00	0.00	0.26	0.00	0.00	0.74	0.09	0.00
301-05	1.00	0.00	0.00	0.00	0.13	0.00	0.00	0.87	0.10	0.00
OGS-XSTM1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
OLFA1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OLFA10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA16	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA17	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA18	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA5	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFR1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POND-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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	Hours Full			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
01-102	2.22	2.22	2.63	0.01	0.01
02-103	1.67	1.67	2.05	0.01	0.01
05-109	0.11	0.11	0.13	0.01	0.01
06-110	0.12	0.12	0.16	0.01	0.01
07-111	0.08	0.08	0.12	0.01	0.01
101-OGS	24.00	24.00	24.00	4.08	4.65
102-POND	3.26	3.26	3.51	0.01	0.16
103-102	2.64	2.64	3.15	0.01	0.01
104-103	1.60	1.60	2.05	0.01	0.01
105-104	0.01	0.01	1.02	0.01	0.01
106-POND	1.73	1.81	1.90	0.23	0.21
107-106	1.30	1.31	1.72	0.21	0.19
108-107	0.31	0.31	1.03	0.01	0.01
109-108	0.14	0.14	0.27	0.01	0.01
110-10	0.23	0.23	1.03	0.10	0.13
111-110	0.14	0.14	0.21	0.01	0.01
301-05	0.01	0.01	0.16	0.01	0.01
OGS-XSTM1	24.00	24.00	24.00	0.01	0.01
POND-101	3.51	3.51	24.00	0.01	0.01

Analysis begun on: Mon May 16 10:14:02 2022
Analysis ended on: Mon May 16 10:14:03 2022
Total elapsed time: 00:00:01

Chicago 4 Hour 5 Year Event PCSWMM Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 21
Number of nodes 30
Number of links 41
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage1	C4-5	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-0	0.00	5.00	5.00	2.0000	Raingage1	CARP2
A-1	0.03	22.96	100.00	3.0000	Raingage1	CBMH101
A-10	0.03	15.29	100.00	2.5000	Raingage1	CBMH106
A-11	0.10	55.88	100.00	2.0000	Raingage1	CBMH107
A-12	0.04	26.67	100.00	2.0000	Raingage1	CBMH108
A-13	0.05	33.75	100.00	2.0000	Raingage1	CBMH109
A-14	0.10	34.67	72.00	1.0000	Raingage1	CB05
A-15	0.02	5.75	5.00	1.0000	Raingage1	LD301
A-16	0.17	80.95	100.00	1.5000	Raingage1	CBMH110
A-17	0.12	56.28	100.00	1.5000	Raingage1	CB06
A-18	0.17	79.07	100.00	1.5000	Raingage1	CBMH111
A-19	0.11	49.77	100.00	1.5000	Raingage1	CB07
A-2	0.66	41.44	64.00	1.5000	Raingage1	POND
A-3	0.03	21.54	100.00	3.5000	Raingage1	CBMH102
A-4	0.03	21.29	100.00	2.0000	Raingage1	CB01
A-5	0.08	48.23	100.00	2.0000	Raingage1	CB02
A-6	0.09	40.00	100.00	2.0000	Raingage1	CBMH104
A-7	0.09	43.90	99.00	1.5000	Raingage1	CBMH105
A-8	0.02	8.50	100.00	5.0000	Raingage1	CB03
A-9	0.12	39.33	64.00	1.0000	Raingage1	CB04
R-1	0.09	23.00	85.00	2.0000	Raingage1	CB08

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OGS	JUNCTION	92.67	2.26	0.0	
CARP1	OUTFALL	0.00	0.00	0.0	
CARP2	OUTFALL	0.00	0.00	0.0	
OVLF1	OUTFALL	95.19	1.00	0.0	
OVLF2	OUTFALL	0.00	95.99	0.0	
OVLF3	OUTFALL	0.00	96.04	0.0	
OVLF4	OUTFALL	0.00	95.84	0.0	
XSTM1	OUTFALL	92.07	1.04	0.0	
XSTM2	OUTFALL	92.15	0.00	0.0	
CB01	STORAGE	93.02	2.98	0.0	
CB02	STORAGE	93.08	2.92	0.0	
CB03	STORAGE	93.31	1.94	0.0	
CB04	STORAGE	93.29	2.61	0.0	
CB05	STORAGE	93.32	2.68	0.0	
CB06	STORAGE	93.39	2.76	0.0	
CB07	STORAGE	93.50	2.65	0.0	
CB08	STORAGE	93.15	2.55	0.0	
CBMH101	STORAGE	92.76	3.04	0.0	
CBMH102	STORAGE	92.92	2.98	0.0	
CBMH104	STORAGE	93.09	2.71	0.0	
CBMH105	STORAGE	93.22	2.88	0.0	
CBMH106	STORAGE	93.07	3.08	0.0	
CBMH107	STORAGE	93.13	2.87	0.0	

CBMH108	STORAGE	93.21	2.89	0.0
CBMH109	STORAGE	93.28	2.87	0.0
CBMH110	STORAGE	93.25	2.75	0.0
CBMH111	STORAGE	93.36	2.64	0.0
LD301	STORAGE	93.80	2.20	0.0
POND	STORAGE	92.90	3.00	0.0
STMH103	STORAGE	92.98	3.22	0.0

****
Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
01-102	CB01	CBMH102	CONDUIT	16.9	0.2360	0.0130
02-103	CB02	STMH103	CONDUIT	17.0	0.2357	0.0130
03-105	CB03	CBMH105	CONDUIT	10.5	0.2855	0.0130
04-105	CB04	CBMH105	CONDUIT	24.7	0.2431	0.0130
05-109	CB05	CBMH109	CONDUIT	11.8	0.2533	0.0130
06-110	CB06	CBMH110	CONDUIT	33.5	0.2391	0.0130
07-111	CB07	CBMH111	CONDUIT	33.5	0.2391	0.0130
101-OGS	CBMH101	OGS	CONDUIT	5.6	0.1786	0.0130
102-POND	CBMH102	POND	CONDUIT	8.9	0.2243	0.0130
103-102	STMH103	CBMH102	CONDUIT	19.5	0.2569	0.0130
104-103	CBMH104	STMH103	CONDUIT	18.4	0.2711	0.0130
105-104	CBMH105	CBMH104	CONDUIT	29.9	0.2344	0.0130
106-POND	CBMH106	POND	CONDUIT	9.3	0.2144	0.0130
107-106	CBMH107	CBMH106	CONDUIT	21.2	0.2360	0.0130
108-107	CBMH108	CBMH107	CONDUIT	21.4	0.2340	0.0130
109-108	CBMH109	CBMH108	CONDUIT	23.4	0.2560	0.0130
110-10	CBMH110	CBMH107	CONDUIT	34.3	0.2623	0.0130
111-110	CBMH111	CBMH110	CONDUIT	41.6	0.2404	0.0130
301-05	LD301	CB05	CONDUIT	41.7	1.0080	0.0130
OGS-XSTM1	OGS	XSTM1	CONDUIT	6.0	0.1667	0.0130
OLFA1	CBMH101	OVLF3	CONDUIT	1.0	1.0001	0.0150
OLFA10	CBMH106	CB01	CONDUIT	1.0	1.0001	0.0150
OLFA11	CBMH107	CB02	CONDUIT	1.0	1.0001	0.0150
OLFA12	CBMH108	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA13	CBMH109	CB05	CONDUIT	1.0	1.0001	0.0150
OLFA14	CB05	CB04	CONDUIT	1.0	1.0001	0.0350
OLFA15	LD301	CB05	CONDUIT	1.0	1.0001	0.0350
OLFA16	CBMH110	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA17	CB06	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA18	CBMH111	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA19	CB07	CBMH111	CONDUIT	1.0	1.0001	0.0150
OLFA3	CBMH102	CBMH101	CONDUIT	1.0	1.0001	0.0150
OLFA4	CB01	CBMH102	CONDUIT	1.0	1.0001	0.0150
OLFA5	CB02	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA6	CBMH104	OVLF2	CONDUIT	1.0	1.0001	0.0150
OLFA7	CBMH105	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA9	CB04	OVLF1	CONDUIT	1.0	1.0001	0.0350
OLFR1	CB08	OVLF4	CONDUIT	1.0	1.0001	0.0150
POND-101	POND	CBMH101	CONDUIT	11.7	0.9442	0.0130
08-XTMS2	CB08	XSTM2	ORIFICE			
OVERFLOW	POND	CARP1	WEIR			

****
Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
01-102	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
02-103	CIRCULAR	0.38	0.11	0.09	0.38	1	85.13
03-105	CIRCULAR	0.38	0.11	0.09	0.38	1	93.69
04-105	CIRCULAR	0.38	0.11	0.09	0.38	1	86.45
05-109	CIRCULAR	0.38	0.11	0.09	0.38	1	88.25
06-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
07-111	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
101-OGS	CIRCULAR	0.20	0.03	0.05	0.20	1	14.42
102-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	83.04
103-102	CIRCULAR	0.38	0.11	0.09	0.38	1	88.87
104-103	CIRCULAR	0.38	0.11	0.09	0.38	1	91.29
105-104	CIRCULAR	0.38	0.11	0.09	0.38	1	84.89
106-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	81.18
107-106	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
108-107	CIRCULAR	0.38	0.11	0.09	0.38	1	84.82
109-108	CIRCULAR	0.38	0.11	0.09	0.38	1	88.72
110-10	CIRCULAR	0.38	0.11	0.09	0.38	1	89.80
111-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.98
301-05	CIRCULAR	0.25	0.05	0.06	0.25	1	59.71

OGS-XSTM1	CIRCULAR	0.45	0.16	0.11	0.45	1	116.40
OLFA1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA10	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA11	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA12	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA13	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA14	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA15	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA16	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA17	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA18	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA19	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA3	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA4	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA5	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA6	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA7	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA9	RECT_OPEN	1.00	3.00	0.60	3.00	1	6098.05
OLFR1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
POND-101	CIRCULAR	0.38	0.11	0.09	0.38	1	170.38

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NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO

Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 05/11/2022 00:00:00
Ending Date 05/12/2022 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 4
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Initial LID Storage	0.002	1.058
Total Precipitation	0.097	45.162
Evaporation Loss	0.000	0.000
Infiltration Loss	0.013	5.847
Surface Runoff	0.085	39.542
Final Storage	0.002	1.058
Continuity Error (%)	-0.493	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.085	0.854
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.002
External Outflow	0.086	0.856
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.040	0.397

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  Final Stored Volume ......          0.040         0.397
  Continuity Error (%) .....          0.023


  ***************************
  Time-Step Critical Elements
  ***************************
  Link 106-POND (5.50%)


  *********************************
  Highest Flow Instability Indexes
  *********************************
  Link 08-XTMS2 (121)
  Link 02-103 (2)
  Link 01-102 (1)
  Link 03-105 (1)


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.52 sec
  Average Time Step           :     4.79 sec
  Maximum Time Step           :     5.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      5.000 -  3.155 sec      :    94.29 %
      3.155 -  1.991 sec      :     0.38 %
      1.991 -  1.256 sec      :     3.66 %
      1.256 -  0.792 sec      :     1.66 %
      0.792 -  0.500 sec      :     0.01 %


  ***************************
  Subcatchment Runoff Summary
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Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-0	45.16	0.00	0.00	30.88	2.26	13.13	15.39	0.00	0.44	0.341
A-1	45.16	0.00	0.00	0.00	45.24	0.00	45.24	0.01	8.97	1.002
A-10	45.16	0.00	0.00	0.00	45.28	0.00	45.28	0.01	7.52	1.003
A-11	45.16	0.00	0.00	0.00	45.30	0.00	45.30	0.04	27.49	1.003
A-12	45.16	0.00	0.00	0.00	45.30	0.00	45.30	0.02	12.73	1.003
A-13	45.16	0.00	0.00	0.00	45.29	0.00	45.29	0.02	15.63	1.003
A-14	45.16	0.00	0.00	9.38	32.69	3.42	36.11	0.04	25.70	0.800
A-15	45.16	0.00	0.00	34.72	2.26	8.33	10.59	0.00	1.31	0.234
A-16	45.16	0.00	0.00	0.00	45.36	0.00	45.36	0.08	49.20	1.005
A-17	45.16	0.00	0.00	0.00	45.37	0.00	45.37	0.05	35.02	1.005
A-18	45.16	0.00	0.00	0.00	45.37	0.00	45.37	0.08	49.20	1.005
A-19	45.16	0.00	0.00	0.00	45.37	0.00	45.37	0.05	30.96	1.005
A-2	45.16	0.00	0.00	13.37	29.13	2.93	32.06	0.21	127.54	0.710
A-3	45.16	0.00	0.00	0.00	45.23	0.00	45.23	0.01	8.10	1.002
A-4	45.16	0.00	0.00	0.00	45.29	0.00	45.29	0.01	9.55	1.003
A-5	45.16	0.00	0.00	0.00	45.30	0.00	45.30	0.04	23.73	1.003
A-6	45.16	0.00	0.00	0.00	45.35	0.00	45.35	0.04	25.47	1.004
A-7	45.16	0.00	0.00	0.32	44.90	0.17	45.08	0.04	26.00	0.998

A-8	45.16	0.00	0.00	0.00	45.26	0.00	45.26	0.01	4.92	1.002
A-9	45.16	0.00	0.00	12.18	29.05	4.23	33.28	0.04	26.90	0.737
R-1	45.16	0.00	0.00	4.92	38.61	1.98	40.60	0.04	25.26	0.899

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OGS	JUNCTION	0.76	0.77	93.44	0 01:59	0.77
CARP1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CARP2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF1	OUTFALL	0.00	0.00	95.19	0 00:00	0.00
OVLF2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF3	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF4	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
XSTM1	OUTFALL	1.36	1.36	93.43	0 00:00	1.36
XSTM2	OUTFALL	1.28	1.28	93.43	0 00:00	1.28
CB01	STORAGE	0.46	0.86	93.88	0 01:59	0.86
CB02	STORAGE	0.40	0.81	93.89	0 01:56	0.81
CB03	STORAGE	0.17	0.65	93.96	0 01:30	0.65
CB04	STORAGE	0.19	0.67	93.96	0 01:30	0.67
CB05	STORAGE	0.17	1.02	94.34	0 01:31	1.02
CB06	STORAGE	0.10	1.19	94.58	0 01:31	1.19
CB07	STORAGE	0.05	1.14	94.64	0 01:31	1.14
CB08	STORAGE	0.28	0.81	93.96	0 01:30	0.81
CBMH101	STORAGE	0.72	1.10	93.86	0 01:59	1.10
CBMH102	STORAGE	0.56	0.96	93.88	0 01:59	0.96
CBMH104	STORAGE	0.39	0.83	93.92	0 01:30	0.83
CBMH105	STORAGE	0.26	0.74	93.96	0 01:30	0.74
CBMH106	STORAGE	0.41	0.97	94.04	0 01:32	0.97
CBMH107	STORAGE	0.36	1.18	94.31	0 01:31	1.18
CBMH108	STORAGE	0.28	1.12	94.33	0 01:31	1.12
CBMH109	STORAGE	0.21	1.06	94.34	0 01:31	1.06
CBMH110	STORAGE	0.24	1.32	94.57	0 01:31	1.32
CBMH111	STORAGE	0.13	1.27	94.63	0 01:31	1.27
LD301	STORAGE	0.01	0.54	94.34	0 01:31	0.54
POND	STORAGE	0.58	0.98	93.88	0 01:59	0.98
STMH103	STORAGE	0.50	0.91	93.89	0 01:56	0.91

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
OGS	JUNCTION	0.00	60.96	0 01:59	0	0.819	-0.001	
CARP1	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
CARP2	OUTFALL	0.44	0.44	0 01:30	0.000308	0.000308	0.000	
OVLF1	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF2	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF3	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF4	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
XSTM1	OUTFALL	0.00	60.96	0 02:00	0	0.819	0.000	
XSTM2	OUTFALL	0.00	24.90	0 01:30	0	0.0391	0.000	
CB01	STORAGE	9.55	9.55	0 01:30	0.015	0.0156	-0.003	
CB02	STORAGE	23.73	23.73	0 01:30	0.0372	0.0377	-0.003	
CB03	STORAGE	4.92	4.92	0 01:30	0.0077	0.00818	-0.013	
CB04	STORAGE	26.90	26.90	0 01:30	0.0393	0.0402	-0.007	
CB05	STORAGE	25.70	25.70	0 01:30	0.0376	0.0424	0.040	
CB06	STORAGE	35.02	35.02	0 01:30	0.0549	0.0553	-0.018	
CB07	STORAGE	30.96	30.96	0 01:30	0.0486	0.0486	-0.069	
CB08	STORAGE	25.26	25.26	0 01:30	0.0374	0.0385	0.999	
CBMH101	STORAGE	8.97	60.96	0 01:59	0.014	0.819	0.000	
CBMH102	STORAGE	8.10	113.57	0 01:30	0.0127	0.201	0.002	
CBMH104	STORAGE	25.47	78.45	0 01:30	0.0399	0.134	-0.000	
CBMH105	STORAGE	26.00	56.11	0 01:30	0.0406	0.092	0.003	
CBMH106	STORAGE	7.52	208.22	0 01:31	0.0118	0.402	0.001	
CBMH107	STORAGE	27.49	205.56	0 01:30	0.0431	0.391	-0.002	

CBMH108	STORAGE	12.73	44.52	0	01:30	0.0199	0.0875	0.001
CBMH109	STORAGE	15.63	35.71	0	01:30	0.0245	0.0664	-0.002
CBMH110	STORAGE	49.20	148.71	0	01:30	0.0772	0.261	0.002
CBMH111	STORAGE	49.20	76.49	0	01:30	0.0772	0.127	-0.004
LD301	STORAGE	1.31	13.88	0	01:26	0.00244	0.00418	0.102
POND	STORAGE	127.54	442.48	0	01:30	0.213	1.18	-0.001
STMH103	STORAGE	0.00	99.08	0	01:30	0	0.173	0.000

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
OGS	JUNCTION	24.00	0.323	1.487

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Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CB01	0.000	1	0	0	0.000	1	0 01:59	8.82
CB02	0.000	0	0	0	0.000	1	0 01:56	22.97
CB03	0.000	0	0	0	0.000	1	0 01:30	4.49
CB04	0.000	0	0	0	0.000	1	0 01:30	25.87
CB05	0.000	1	0	0	0.000	9	0 01:31	22.29
CB06	0.000	0	0	0	0.000	3	0 01:31	31.60
CB07	0.000	0	0	0	0.000	3	0 01:31	27.33
CB08	0.000	2	0	0	0.000	4	0 01:30	24.90
CBMH101	0.001	6	0	0	0.001	9	0 01:59	60.96
CBMH102	0.001	2	0	0	0.001	3	0 01:59	111.64
CBMH104	0.000	2	0	0	0.001	5	0 01:30	76.23
CBMH105	0.000	4	0	0	0.001	12	0 01:30	53.26
CBMH106	0.000	7	0	0	0.001	18	0 01:32	206.82
CBMH107	0.000	1	0	0	0.001	4	0 01:31	201.74
CBMH108	0.000	5	0	0	0.001	20	0 01:31	44.15
CBMH109	0.000	3	0	0	0.001	14	0 01:31	33.73
CBMH110	0.000	1	0	0	0.002	5	0 01:31	138.96
CBMH111	0.000	0	0	0	0.001	5	0 01:31	68.51
LD301	0.000	0	0	0	0.001	25	0 01:31	5.61
POND	0.411	18	0	0	0.788	34	0 01:59	60.09
STMH103	0.001	16	0	0	0.001	28	0 01:56	96.87

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
CARP1	0.00	0.00	0.00	0.000
CARP2	2.05	0.16	0.44	0.000
OVLF1	0.00	0.00	0.00	0.000
OVLF2	0.00	0.00	0.00	0.000
OVLF3	0.00	0.00	0.00	0.000
OVLF4	0.00	0.00	0.00	0.000
XSTM1	70.61	13.34	60.96	0.819
XSTM2	99.57	0.48	24.90	0.039
System	21.53	13.97	72.78	0.858

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
01-102	CONDUIT	8.82	0	01:29	0.08	0.10	1.00
02-103	CONDUIT	22.97	0	01:30	0.21	0.27	1.00
03-105	CONDUIT	4.49	0	01:30	0.04	0.05	1.00
04-105	CONDUIT	25.87	0	01:30	0.23	0.30	1.00
05-109	CONDUIT	21.81	0	01:32	0.20	0.25	1.00
06-110	CONDUIT	31.60	0	01:30	0.29	0.37	1.00
07-111	CONDUIT	27.33	0	01:30	0.33	0.32	1.00
101-OGS	CONDUIT	60.96	0	01:59	1.88	4.23	1.00
102-POND	CONDUIT	111.64	0	01:30	1.01	1.34	1.00
103-102	CONDUIT	96.87	0	01:30	0.88	1.09	1.00
104-103	CONDUIT	76.23	0	01:30	0.69	0.84	1.00
105-104	CONDUIT	53.26	0	01:30	0.48	0.63	1.00
106-POND	CONDUIT	206.82	0	01:31	1.87	2.55	1.00
107-106	CONDUIT	201.74	0	01:31	1.83	2.37	1.00
108-107	CONDUIT	44.15	0	01:32	0.40	0.52	1.00
109-108	CONDUIT	33.73	0	01:32	0.31	0.38	1.00
110-10	CONDUIT	138.96	0	01:30	1.26	1.55	1.00
111-110	CONDUIT	68.51	0	01:30	0.62	0.80	1.00
301-05	CONDUIT	13.22	0	01:26	0.33	0.22	1.00
OGS-XSTM1	CONDUIT	60.96	0	02:00	0.38	0.52	1.00
OLFA1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA10	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA14	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA15	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA16	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA17	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA18	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA19	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA3	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA4	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA5	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA6	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA7	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA9	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFR1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
POND-101	CONDUIT	60.09	0	02:04	0.54	0.35	1.00
08-XTMS2	ORIFICE	24.90	0	01:30			1.00
OVERFLOW	WEIR	0.00	0	00:00			0.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
01-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
02-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
03-105	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
04-105	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
05-109	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
06-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
07-111	1.00	0.00	0.19	0.00	0.77	0.00	0.00	0.04	0.80	0.00
101-OGS	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
102-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
103-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
104-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
105-104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
106-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
107-106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
108-107	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
109-108	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
110-10	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
111-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
301-05	1.00	0.00	0.71	0.00	0.29	0.00	0.00	0.00	0.93	0.00
OGS-XSTM1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
OLFA1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OLFA10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA16	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA17	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA18	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA5	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFR1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POND-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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	Hours Full			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
01-102	24.00	24.00	24.00	0.01	0.01
02-103	5.12	5.12	24.00	0.01	0.01
03-105	2.52	2.52	2.79	0.01	0.01
04-105	2.70	2.70	3.18	0.01	0.01
05-109	2.45	2.45	2.72	0.01	0.01
06-110	1.88	1.88	2.55	0.01	0.01
07-111	0.91	0.91	1.63	0.01	0.01
101-OGS	24.00	24.00	24.00	5.10	5.74
102-POND	24.00	24.00	24.00	0.15	0.21
103-102	24.00	24.00	24.00	0.10	0.10
104-103	4.84	4.84	24.00	0.01	0.11
105-104	3.26	3.26	3.90	0.01	0.01
106-POND	5.54	5.54	24.00	0.31	0.41
107-106	4.20	4.20	5.13	0.29	0.29
108-107	3.35	3.35	3.83	0.01	0.01
109-108	2.80	2.80	3.27	0.01	0.01
110-10	3.05	3.05	3.83	0.19	0.21
111-110	2.13	2.13	2.97	0.01	0.01
301-05	0.17	0.17	3.00	0.01	0.01
OGS-XSTM1	24.00	24.00	24.00	0.01	1.48
POND-101	24.00	24.00	24.00	0.01	0.01

Analysis begun on: Mon May 16 10:16:37 2022
Analysis ended on: Mon May 16 10:16:38 2022
Total elapsed time: 00:00:01

Chicago 4 Hour 25mm Event PCSWMM Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

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Element Count
****
Number of rain gages 1
Number of subcatchments ... 21
Number of nodes 30
Number of links 41
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage1	C4-25mm	INTENSITY	10 min.

****
Subcatchment Summary
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Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-0	0.00	5.00	5.00	2.0000	Raingage1	CARP2
A-1	0.03	22.96	100.00	3.0000	Raingage1	CBMH101
A-10	0.03	15.29	100.00	2.5000	Raingage1	CBMH106
A-11	0.10	55.88	100.00	2.0000	Raingage1	CBMH107
A-12	0.04	26.67	100.00	2.0000	Raingage1	CBMH108
A-13	0.05	33.75	100.00	2.0000	Raingage1	CBMH109
A-14	0.10	34.67	72.00	1.0000	Raingage1	CB05
A-15	0.02	5.75	5.00	1.0000	Raingage1	LD301
A-16	0.17	80.95	100.00	1.5000	Raingage1	CBMH110
A-17	0.12	56.28	100.00	1.5000	Raingage1	CB06
A-18	0.17	79.07	100.00	1.5000	Raingage1	CBMH111
A-19	0.11	49.77	100.00	1.5000	Raingage1	CB07
A-2	0.66	41.44	64.00	1.5000	Raingage1	POND
A-3	0.03	21.54	100.00	3.5000	Raingage1	CBMH102
A-4	0.03	21.29	100.00	2.0000	Raingage1	CB01
A-5	0.08	48.23	100.00	2.0000	Raingage1	CB02
A-6	0.09	40.00	100.00	2.0000	Raingage1	CBMH104
A-7	0.09	43.90	99.00	1.5000	Raingage1	CBMH105
A-8	0.02	8.50	100.00	5.0000	Raingage1	CB03
A-9	0.12	39.33	64.00	1.0000	Raingage1	CB04
R-1	0.09	23.00	85.00	2.0000	Raingage1	CB08

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OGS	JUNCTION	92.67	2.26	0.0	
CARP1	OUTFALL	0.00	0.00	0.0	
CARP2	OUTFALL	0.00	0.00	0.0	
OVLF1	OUTFALL	95.19	1.00	0.0	
OVLF2	OUTFALL	0.00	95.99	0.0	
OVLF3	OUTFALL	0.00	96.04	0.0	
OVLF4	OUTFALL	0.00	95.84	0.0	
XSTM1	OUTFALL	92.07	1.04	0.0	
XSTM2	OUTFALL	92.15	0.00	0.0	
CB01	STORAGE	93.02	2.98	0.0	
CB02	STORAGE	93.08	2.92	0.0	
CB03	STORAGE	93.31	1.94	0.0	
CB04	STORAGE	93.29	2.61	0.0	
CB05	STORAGE	93.32	2.68	0.0	
CB06	STORAGE	93.39	2.76	0.0	
CB07	STORAGE	93.50	2.65	0.0	
CB08	STORAGE	93.15	2.55	0.0	
CBMH101	STORAGE	92.76	3.04	0.0	
CBMH102	STORAGE	92.92	2.98	0.0	
CBMH104	STORAGE	93.09	2.71	0.0	
CBMH105	STORAGE	93.22	2.88	0.0	
CBMH106	STORAGE	93.07	3.08	0.0	
CBMH107	STORAGE	93.13	2.87	0.0	

CBMH108	STORAGE	93.21	2.89	0.0
CBMH109	STORAGE	93.28	2.87	0.0
CBMH110	STORAGE	93.25	2.75	0.0
CBMH111	STORAGE	93.36	2.64	0.0
LD301	STORAGE	93.80	2.20	0.0
POND	STORAGE	92.90	3.00	0.0
STMH103	STORAGE	92.98	3.22	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
01-102	CB01	CBMH102	CONDUIT	16.9	0.2360	0.0130
02-103	CB02	STMH103	CONDUIT	17.0	0.2357	0.0130
03-105	CB03	CBMH105	CONDUIT	10.5	0.2855	0.0130
04-105	CB04	CBMH105	CONDUIT	24.7	0.2431	0.0130
05-109	CB05	CBMH109	CONDUIT	11.8	0.2533	0.0130
06-110	CB06	CBMH110	CONDUIT	33.5	0.2391	0.0130
07-111	CB07	CBMH111	CONDUIT	33.5	0.2391	0.0130
101-OGS	CBMH101	OGS	CONDUIT	5.6	0.1786	0.0130
102-POND	CBMH102	POND	CONDUIT	8.9	0.2243	0.0130
103-102	STMH103	CBMH102	CONDUIT	19.5	0.2569	0.0130
104-103	CBMH104	STMH103	CONDUIT	18.4	0.2711	0.0130
105-104	CBMH105	CBMH104	CONDUIT	29.9	0.2344	0.0130
106-POND	CBMH106	POND	CONDUIT	9.3	0.2144	0.0130
107-106	CBMH107	CBMH106	CONDUIT	21.2	0.2360	0.0130
108-107	CBMH108	CBMH107	CONDUIT	21.4	0.2340	0.0130
109-108	CBMH109	CBMH108	CONDUIT	23.4	0.2560	0.0130
110-10	CBMH110	CBMH107	CONDUIT	34.3	0.2623	0.0130
111-110	CBMH111	CBMH110	CONDUIT	41.6	0.2404	0.0130
301-05	LD301	CB05	CONDUIT	41.7	1.0080	0.0130
OGS-XSTM1	OGS	XSTM1	CONDUIT	6.0	0.1667	0.0130
OLFA1	CBMH101	OVLF3	CONDUIT	1.0	1.0001	0.0150
OLFA10	CBMH106	CB01	CONDUIT	1.0	1.0001	0.0150
OLFA11	CBMH107	CB02	CONDUIT	1.0	1.0001	0.0150
OLFA12	CBMH108	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA13	CBMH109	CB05	CONDUIT	1.0	1.0001	0.0150
OLFA14	CB05	CB04	CONDUIT	1.0	1.0001	0.0350
OLFA15	LD301	CB05	CONDUIT	1.0	1.0001	0.0350
OLFA16	CBMH110	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA17	CB06	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA18	CBMH111	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA19	CB07	CBMH111	CONDUIT	1.0	1.0001	0.0150
OLFA3	CBMH102	CBMH101	CONDUIT	1.0	1.0001	0.0150
OLFA4	CB01	CBMH102	CONDUIT	1.0	1.0001	0.0150
OLFA5	CB02	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA6	CBMH104	OVLF2	CONDUIT	1.0	1.0001	0.0150
OLFA7	CBMH105	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA9	CB04	OVLF1	CONDUIT	1.0	1.0001	0.0350
OLFR1	CB08	OVLF4	CONDUIT	1.0	1.0001	0.0150
POND-101	POND	CBMH101	CONDUIT	11.7	0.9442	0.0130
08-XTMS2	CB08	XSTM2	ORIFICE			
OVERFLOW	POND	CARP1	WEIR			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
01-102	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
02-103	CIRCULAR	0.38	0.11	0.09	0.38	1	85.13
03-105	CIRCULAR	0.38	0.11	0.09	0.38	1	93.69
04-105	CIRCULAR	0.38	0.11	0.09	0.38	1	86.45
05-109	CIRCULAR	0.38	0.11	0.09	0.38	1	88.25
06-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
07-111	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
101-OGS	CIRCULAR	0.20	0.03	0.05	0.20	1	14.42
102-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	83.04
103-102	CIRCULAR	0.38	0.11	0.09	0.38	1	88.87
104-103	CIRCULAR	0.38	0.11	0.09	0.38	1	91.29
105-104	CIRCULAR	0.38	0.11	0.09	0.38	1	84.89
106-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	81.18
107-106	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
108-107	CIRCULAR	0.38	0.11	0.09	0.38	1	84.82
109-108	CIRCULAR	0.38	0.11	0.09	0.38	1	88.72
110-10	CIRCULAR	0.38	0.11	0.09	0.38	1	89.80
111-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.98
301-05	CIRCULAR	0.25	0.05	0.06	0.25	1	59.71

OGS-XSTM1	CIRCULAR	0.45	0.16	0.11	0.45	1	116.40
OLFA1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA10	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA11	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA12	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA13	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA14	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA15	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA16	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA17	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA18	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA19	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA3	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA4	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA5	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA6	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA7	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA9	RECT_OPEN	1.00	3.00	0.60	3.00	1	6098.05
OLFR1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
POND-101	CIRCULAR	0.38	0.11	0.09	0.38	1	170.38

```
**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
```

```
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 05/11/2022 00:00:00
Ending Date .............. 05/12/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Initial LID Storage	0.002	1.058
Total Precipitation	0.054	25.003
Evaporation Loss	0.000	0.000
Infiltration Loss	0.009	4.021
Surface Runoff	0.046	21.110
Final Storage	0.002	1.058
Continuity Error (%)	-0.489	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.046	0.455
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.046	0.455
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.003

```
  Final Stored Volume ......          0.000         0.003
  Continuity Error (%) .....          0.019


  **************************
  Time-Step Critical Elements
  **************************
  Link 101-OGS (53.52%)
  Link OGS-XSTM1 (11.40%)


  *******************************
  Highest Flow Instability Indexes
  *******************************
  All links are stable.


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     3.67 sec
  Maximum Time Step           :     5.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      5.000 -  3.155 sec      :    66.92 %
      3.155 -  1.991 sec      :     5.05 %
      1.991 -  1.256 sec      :    20.27 %
      1.256 -  0.792 sec      :     7.73 %
      0.792 -  0.500 sec      :     0.03 %


  **************************
  Subcatchment Runoff Summary
  **************************

  ---------------------------------------------------------------------------------------------------------------
-------------
                          Total      Total      Total      Total     Imperv       Perv      Total       Total
Peak  Runoff
```

```
                          Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff      Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------------------------
-------------
  A-0                      25.00       0.00       0.00      23.27       1.25       0.72       1.97        0.00
0.04   0.079
  A-1                      25.00       0.00       0.00       0.00      25.08       0.00      25.08        0.01
4.88   1.003
  A-10                     25.00       0.00       0.00       0.00      25.11       0.00      25.11        0.01
4.09   1.004
  A-11                     25.00       0.00       0.00       0.00      25.12       0.00      25.12        0.02
14.95   1.005
  A-12                     25.00       0.00       0.00       0.00      25.11       0.00      25.11        0.01
6.93   1.004
  A-13                     25.00       0.00       0.00       0.00      25.11       0.00      25.11        0.01
8.50   1.004
  A-14                     25.00       0.00       0.00       6.92      18.12       0.10      18.22        0.02
11.91   0.729
  A-15                     25.00       0.00       0.00      23.68       1.25       0.09       1.34        0.00
0.20   0.054
  A-16                     25.00       0.00       0.00       0.00      25.15       0.00      25.15        0.04
26.74   1.006
  A-17                     25.00       0.00       0.00       0.00      25.15       0.00      25.15        0.03
19.03   1.006
  A-18                     25.00       0.00       0.00       0.00      25.15       0.00      25.15        0.04
26.74   1.006
  A-19                     25.00       0.00       0.00       0.00      25.15       0.00      25.15        0.03
16.83   1.006
  A-2                      25.00       0.00       0.00       8.98      16.11       0.03      16.14        0.11
62.10   0.645
  A-3                      25.00       0.00       0.00       0.00      25.07       0.00      25.07        0.01
4.41   1.003
  A-4                      25.00       0.00       0.00       0.00      25.11       0.00      25.11        0.01
5.19   1.004
  A-5                      25.00       0.00       0.00       0.00      25.12       0.00      25.12        0.02
12.91   1.005
  A-6                      25.00       0.00       0.00       0.00      25.14       0.00      25.14        0.02
13.85   1.006
  A-7                      25.00       0.00       0.00       0.24      24.90       0.03      24.92        0.02
14.09   0.997
  A-8                      25.00       0.00       0.00       0.00      25.09       0.00      25.09        0.00
2.68   1.003
```

A-9		25.00	0.00	0.00	8.92	16.10	0.10	16.21	0.02
12.03	0.648								
R-1		25.00	0.00	0.00	3.69	21.40	0.08	21.49	0.02
12.40	0.859								

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OGS	JUNCTION	0.19	0.24	92.91	0 01:49	0.24
CARP1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CARP2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF1	OUTFALL	0.00	0.00	95.19	0 00:00	0.00
OVLF2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF3	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF4	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
XSTM1	OUTFALL	0.78	0.78	92.85	0 00:00	0.78
XSTM2	OUTFALL	0.70	0.70	92.85	0 00:00	0.70
CB01	STORAGE	0.03	0.21	93.23	0 01:49	0.21
CB02	STORAGE	0.02	0.15	93.23	0 01:47	0.15
CB03	STORAGE	0.01	0.08	93.39	0 01:30	0.08
CB04	STORAGE	0.01	0.11	93.40	0 01:30	0.11
CB05	STORAGE	0.01	0.24	93.56	0 01:31	0.24
CB06	STORAGE	0.02	0.25	93.64	0 01:30	0.25
CB07	STORAGE	0.01	0.16	93.66	0 01:31	0.16
CB08	STORAGE	0.01	0.19	93.34	0 01:30	0.19
CBMH101	STORAGE	0.17	0.46	93.22	0 01:49	0.46
CBMH102	STORAGE	0.07	0.31	93.23	0 01:49	0.31
CBMH104	STORAGE	0.03	0.21	93.30	0 01:30	0.21
CBMH105	STORAGE	0.02	0.17	93.39	0 01:30	0.17
CBMH106	STORAGE	0.04	0.40	93.47	0 01:30	0.40
CBMH107	STORAGE	0.04	0.43	93.56	0 01:30	0.43
CBMH108	STORAGE	0.02	0.35	93.56	0 01:30	0.35
CBMH109	STORAGE	0.02	0.28	93.56	0 01:30	0.28
CBMH110	STORAGE	0.03	0.39	93.64	0 01:31	0.39
CBMH111	STORAGE	0.02	0.29	93.65	0 01:31	0.29
LD301	STORAGE	0.00	0.01	93.81	0 01:30	0.01
POND	STORAGE	0.08	0.33	93.23	0 01:49	0.33
STMH103	STORAGE	0.05	0.25	93.23	0 01:50	0.25

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
OGS	JUNCTION	0.00	49.54	0 01:49	0	0.435	0.000	
CARP1	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
CARP2	OUTFALL	0.04	0.04	0 01:30	3.94e-05	3.94e-05	0.000	
OVLF1	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF2	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF3	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF4	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
XSTM1	OUTFALL	0.00	49.54	0 01:49	0	0.435	0.000	
XSTM2	OUTFALL	0.00	12.34	0 01:30	0	0.0198	0.000	
CB01	STORAGE	5.19	5.19	0 01:30	0.00828	0.00828	0.048	
CB02	STORAGE	12.91	12.91	0 01:30	0.0206	0.0206	0.318	
CB03	STORAGE	2.68	2.68	0 01:30	0.00426	0.00426	-0.007	
CB04	STORAGE	12.03	12.03	0 01:30	0.0191	0.0191	-0.004	
CB05	STORAGE	11.91	12.10	0 01:30	0.0189	0.0192	-0.004	
CB06	STORAGE	19.03	19.03	0 01:30	0.0304	0.0304	-0.021	
CB07	STORAGE	16.83	16.83	0 01:30	0.0269	0.0269	0.107	
CB08	STORAGE	12.40	12.40	0 01:30	0.0198	0.0198	-0.007	
CBMH101	STORAGE	4.88	49.54	0 01:48	0.00777	0.436	-0.000	
CBMH102	STORAGE	4.41	63.36	0 01:30	0.00701	0.104	-0.045	
CBMH104	STORAGE	13.85	42.40	0 01:30	0.0221	0.0677	0.459	
CBMH105	STORAGE	14.09	28.72	0 01:30	0.0224	0.0458	0.529	
CBMH106	STORAGE	4.09	118.06	0 01:30	0.00652	0.217	0.094	
CBMH107	STORAGE	14.95	114.77	0 01:30	0.0238	0.211	-0.042	
CBMH108	STORAGE	6.93	25.17	0 01:30	0.011	0.0439	-0.038	
CBMH109	STORAGE	8.50	19.38	0 01:30	0.0136	0.0328	-0.012	

CBMH110	STORAGE	26.74	81.29	0	01:27	0.0427	0.143	0.021
CBMH111	STORAGE	26.74	42.88	0	01:26	0.0427	0.0696	-0.129
LD301	STORAGE	0.20	0.20	0	01:30	0.000308	0.000309	-0.922
POND	STORAGE	62.10	240.51	0	01:30	0.107	0.43	-0.032
STMH103	STORAGE	0.00	54.88	0	01:30	0	0.0879	-0.431

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CB01	0.000	0	0	0	0.000	0	0 01:49	4.79
CB02	0.000	0	0	0	0.000	0	0 01:47	12.68
CB03	0.000	0	0	0	0.000	0	0 01:30	2.65
CB04	0.000	0	0	0	0.000	0	0 01:30	11.98
CB05	0.000	0	0	0	0.000	2	0 01:31	11.04
CB06	0.000	0	0	0	0.000	1	0 01:30	16.92
CB07	0.000	0	0	0	0.000	0	0 01:31	16.78
CB08	0.000	0	0	0	0.000	1	0 01:30	12.34
CBMH101	0.000	1	0	0	0.001	4	0 01:49	49.54
CBMH102	0.000	0	0	0	0.000	1	0 01:49	62.36
CBMH104	0.000	0	0	0	0.000	1	0 01:30	42.21
CBMH105	0.000	0	0	0	0.000	3	0 01:30	28.57
CBMH106	0.000	1	0	0	0.000	7	0 01:30	118.03
CBMH107	0.000	0	0	0	0.000	2	0 01:30	114.44
CBMH108	0.000	0	0	0	0.000	6	0 01:30	24.33
CBMH109	0.000	0	0	0	0.000	4	0 01:30	18.53
CBMH110	0.000	0	0	0	0.000	1	0 01:31	77.41
CBMH111	0.000	0	0	0	0.000	1	0 01:31	38.63
LD301	0.000	0	0	0	0.000	0	0 01:30	0.19
POND	0.047	2	0	0	0.215	9	0 01:49	48.79
STMH103	0.000	2	0	0	0.000	8	0 01:50	54.22

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
CARP1	0.00	0.00	0.00	0.000
CARP2	0.98	0.04	0.04	0.000
OVLF1	0.00	0.00	0.00	0.000
OVLF2	0.00	0.00	0.00	0.000
OVLF3	0.00	0.00	0.00	0.000
OVLF4	0.00	0.00	0.00	0.000
XSTM1	100.00	12.10	49.54	0.435
XSTM2	36.64	1.47	12.34	0.020
System	17.20	13.60	52.37	0.455

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth

01-102	CONDUIT	4.79	0	01:30	0.25	0.06	0.62
02-103	CONDUIT	12.68	0	01:30	0.46	0.15	0.46
03-105	CONDUIT	2.65	0	01:30	0.27	0.03	0.25
04-105	CONDUIT	11.98	0	01:30	0.36	0.14	0.36
05-109	CONDUIT	11.04	0	01:30	0.44	0.13	0.68
06-110	CONDUIT	16.92	0	01:30	0.43	0.20	0.77
07-111	CONDUIT	16.78	0	01:25	0.53	0.20	0.53
101-OGS	CONDUIT	49.54	0	01:49	1.56	3.43	0.95
102-POND	CONDUIT	62.36	0	01:30	1.06	0.75	0.86
103-102	CONDUIT	54.22	0	01:30	0.79	0.61	0.74
104-103	CONDUIT	42.21	0	01:30	0.79	0.46	0.51
105-104	CONDUIT	28.57	0	01:30	0.63	0.34	0.43
106-POND	CONDUIT	118.03	0	01:31	1.20	1.45	0.84
107-106	CONDUIT	114.44	0	01:30	1.04	1.34	1.00
108-107	CONDUIT	24.33	0	01:30	0.29	0.29	0.97
109-108	CONDUIT	18.53	0	01:30	0.44	0.21	0.83
110-10	CONDUIT	77.41	0	01:31	0.78	0.86	1.00
111-110	CONDUIT	38.63	0	01:26	0.56	0.45	0.89
301-05	CONDUIT	0.19	0	01:30	0.26	0.00	0.38
OGS-XSTM1	CONDUIT	49.54	0	01:49	0.67	0.43	0.47
OLFA1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA10	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA14	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA15	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA16	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA17	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA18	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA19	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA3	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA4	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA5	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA6	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA7	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA9	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFR1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
POND-101	CONDUIT	48.79	0	01:52	0.60	0.29	0.94
08-XTMS2	ORIFICE	12.34	0	01:30			1.00

OVERFLOW	WEIR	0.00	0	00:00			0.00

****
Flow Classification Summary
****

	Adjusted	Fraction of Time in Flow Class								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
01-102	1.00	0.00	0.00	0.00	0.29	0.00	0.00	0.71	0.02	0.00
02-103	1.00	0.00	0.00	0.00	0.23	0.00	0.00	0.77	0.01	0.00
03-105	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.01	0.00
04-105	1.00	0.00	0.00	0.00	0.38	0.00	0.00	0.62	0.16	0.00
05-109	1.00	0.00	0.00	0.00	0.35	0.00	0.00	0.65	0.02	0.00
06-110	1.00	0.00	0.00	0.00	0.07	0.00	0.00	0.93	0.01	0.00
07-111	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
101-OGS	1.00	0.00	0.00	0.00	0.70	0.00	0.00	0.30	0.00	0.00
102-POND	1.00	0.00	0.05	0.00	0.93	0.02	0.00	0.00	0.74	0.00
103-102	1.00	0.00	0.00	0.00	0.41	0.00	0.00	0.59	0.08	0.00
104-103	1.00	0.00	0.00	0.00	0.21	0.00	0.00	0.79	0.01	0.00
105-104	1.00	0.00	0.00	0.00	0.12	0.00	0.00	0.88	0.02	0.00
106-POND	1.00	0.00	0.00	0.00	0.15	0.00	0.00	0.85	0.00	0.00
107-106	1.00	0.00	0.00	0.00	0.38	0.00	0.00	0.62	0.02	0.00
108-107	1.00	0.00	0.00	0.00	0.34	0.00	0.00	0.66	0.09	0.00
109-108	1.00	0.00	0.00	0.00	0.28	0.00	0.00	0.72	0.02	0.00
110-10	1.00	0.00	0.00	0.00	0.12	0.00	0.00	0.88	0.00	0.00
111-110	1.00	0.00	0.00	0.00	0.38	0.00	0.00	0.62	0.16	0.00
301-05	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.01	0.00
OGS-XSTM1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
OLFA1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA16	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA17	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OLFA18	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA5	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFR1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POND-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.89	0.00

****
Conduit Surcharge Summary
****

	Hours Full			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
101-OGS	0.01	2.61	0.01	2.90	0.01
106-POND	0.01	0.10	0.01	0.20	0.01
107-106	0.06	0.11	0.06	0.18	0.06
108-107	0.01	0.01	0.07	0.01	0.01
110-10	0.04	0.04	0.07	0.01	0.01
111-110	0.01	0.01	0.02	0.01	0.01
POND-101	0.01	0.01	0.83	0.01	0.01

Analysis begun on: Mon May 16 10:17:45 2022
Analysis ended on: Mon May 16 10:17:47 2022
Total elapsed time: 00:00:02

Chicago 4 Hour 100 Year Event PCSWMM Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 21
Number of nodes 30
Number of links 41
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage1	C4-100	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-0	0.00	5.00	5.00	2.0000	Raingage1	CARP2
A-1	0.03	22.96	100.00	3.0000	Raingage1	CBMH101
A-10	0.03	15.29	100.00	2.5000	Raingage1	CBMH106
A-11	0.10	55.88	100.00	2.0000	Raingage1	CBMH107
A-12	0.04	26.67	100.00	2.0000	Raingage1	CBMH108
A-13	0.05	33.75	100.00	2.0000	Raingage1	CBMH109
A-14	0.10	34.67	72.00	1.0000	Raingage1	CB05
A-15	0.02	5.75	5.00	1.0000	Raingage1	LD301
A-16	0.17	80.95	100.00	1.5000	Raingage1	CBMH110
A-17	0.12	56.28	100.00	1.5000	Raingage1	CB06
A-18	0.17	79.07	100.00	1.5000	Raingage1	CBMH111
A-19	0.11	49.77	100.00	1.5000	Raingage1	CB07
A-2	0.66	41.44	64.00	1.5000	Raingage1	POND
A-3	0.03	21.54	100.00	3.5000	Raingage1	CBMH102
A-4	0.03	21.29	100.00	2.0000	Raingage1	CB01
A-5	0.08	48.23	100.00	2.0000	Raingage1	CB02
A-6	0.09	40.00	100.00	2.0000	Raingage1	CBMH104
A-7	0.09	43.90	99.00	1.5000	Raingage1	CBMH105
A-8	0.02	8.50	100.00	5.0000	Raingage1	CB03
A-9	0.12	39.33	64.00	1.0000	Raingage1	CB04
R-1	0.09	23.00	85.00	2.0000	Raingage1	CB08

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OGS	JUNCTION	92.67	2.26	0.0	
CARP1	OUTFALL	0.00	0.00	0.0	
CARP2	OUTFALL	0.00	0.00	0.0	
OVLF1	OUTFALL	95.19	1.00	0.0	
OVLF2	OUTFALL	0.00	95.99	0.0	
OVLF3	OUTFALL	0.00	96.04	0.0	
OVLF4	OUTFALL	0.00	95.84	0.0	
XSTM1	OUTFALL	92.07	1.04	0.0	
XSTM2	OUTFALL	92.15	0.00	0.0	
CB01	STORAGE	93.02	2.98	0.0	
CB02	STORAGE	93.08	2.92	0.0	
CB03	STORAGE	93.31	1.94	0.0	
CB04	STORAGE	93.29	2.61	0.0	
CB05	STORAGE	93.32	2.68	0.0	
CB06	STORAGE	93.39	2.76	0.0	
CB07	STORAGE	93.50	2.65	0.0	
CB08	STORAGE	93.15	2.55	0.0	
CBMH101	STORAGE	92.76	3.04	0.0	
CBMH102	STORAGE	92.92	2.98	0.0	
CBMH104	STORAGE	93.09	2.71	0.0	
CBMH105	STORAGE	93.22	2.88	0.0	
CBMH106	STORAGE	93.07	3.08	0.0	
CBMH107	STORAGE	93.13	2.87	0.0	

CBMH108	STORAGE	93.21	2.89	0.0
CBMH109	STORAGE	93.28	2.87	0.0
CBMH110	STORAGE	93.25	2.75	0.0
CBMH111	STORAGE	93.36	2.64	0.0
LD301	STORAGE	93.80	2.20	0.0
POND	STORAGE	92.90	3.00	0.0
STMH103	STORAGE	92.98	3.22	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
01-102	CB01	CBMH102	CONDUIT	16.9	0.2360	0.0130
02-103	CB02	STMH103	CONDUIT	17.0	0.2357	0.0130
03-105	CB03	CBMH105	CONDUIT	10.5	0.2855	0.0130
04-105	CB04	CBMH105	CONDUIT	24.7	0.2431	0.0130
05-109	CB05	CBMH109	CONDUIT	11.8	0.2533	0.0130
06-110	CB06	CBMH110	CONDUIT	33.5	0.2391	0.0130
07-111	CB07	CBMH111	CONDUIT	33.5	0.2391	0.0130
101-OGS	CBMH101	OGS	CONDUIT	5.6	0.1786	0.0130
102-POND	CBMH102	POND	CONDUIT	8.9	0.2243	0.0130
103-102	STMH103	CBMH102	CONDUIT	19.5	0.2569	0.0130
104-103	CBMH104	STMH103	CONDUIT	18.4	0.2711	0.0130
105-104	CBMH105	CBMH104	CONDUIT	29.9	0.2344	0.0130
106-POND	CBMH106	POND	CONDUIT	9.3	0.2144	0.0130
107-106	CBMH107	CBMH106	CONDUIT	21.2	0.2360	0.0130
108-107	CBMH108	CBMH107	CONDUIT	21.4	0.2340	0.0130
109-108	CBMH109	CBMH108	CONDUIT	23.4	0.2560	0.0130
110-10	CBMH110	CBMH107	CONDUIT	34.3	0.2623	0.0130
111-110	CBMH111	CBMH110	CONDUIT	41.6	0.2404	0.0130
301-05	LD301	CB05	CONDUIT	41.7	1.0080	0.0130
OGS-XSTM1	OGS	XSTM1	CONDUIT	6.0	0.1667	0.0130
OLFA1	CBMH101	OVLF3	CONDUIT	1.0	1.0001	0.0150
OLFA10	CBMH106	CB01	CONDUIT	1.0	1.0001	0.0150
OLFA11	CBMH107	CB02	CONDUIT	1.0	1.0001	0.0150
OLFA12	CBMH108	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA13	CBMH109	CB05	CONDUIT	1.0	1.0001	0.0150
OLFA14	CB05	CB04	CONDUIT	1.0	1.0001	0.0350
OLFA15	LD301	CB05	CONDUIT	1.0	1.0001	0.0350
OLFA16	CBMH110	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA17	CB06	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA18	CBMH111	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA19	CB07	CBMH111	CONDUIT	1.0	1.0001	0.0150
OLFA3	CBMH102	CBMH101	CONDUIT	1.0	1.0001	0.0150
OLFA4	CB01	CBMH102	CONDUIT	1.0	1.0001	0.0150
OLFA5	CB02	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA6	CBMH104	OVLF2	CONDUIT	1.0	1.0001	0.0150
OLFA7	CBMH105	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA9	CB04	OVLF1	CONDUIT	1.0	1.0001	0.0350
OLFR1	CB08	OVLF4	CONDUIT	1.0	1.0001	0.0150
POND-101	POND	CBMH101	CONDUIT	11.7	0.9442	0.0130
08-XTMS2	CB08	XSTM2	ORIFICE			
OVERFLOW	POND	CARP1	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
01-102	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
02-103	CIRCULAR	0.38	0.11	0.09	0.38	1	85.13
03-105	CIRCULAR	0.38	0.11	0.09	0.38	1	93.69
04-105	CIRCULAR	0.38	0.11	0.09	0.38	1	86.45
05-109	CIRCULAR	0.38	0.11	0.09	0.38	1	88.25
06-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
07-111	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
101-OGS	CIRCULAR	0.20	0.03	0.05	0.20	1	14.42
102-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	83.04
103-102	CIRCULAR	0.38	0.11	0.09	0.38	1	88.87
104-103	CIRCULAR	0.38	0.11	0.09	0.38	1	91.29
105-104	CIRCULAR	0.38	0.11	0.09	0.38	1	84.89
106-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	81.18
107-106	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
108-107	CIRCULAR	0.38	0.11	0.09	0.38	1	84.82
109-108	CIRCULAR	0.38	0.11	0.09	0.38	1	88.72
110-10	CIRCULAR	0.38	0.11	0.09	0.38	1	89.80
111-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.98
301-05	CIRCULAR	0.25	0.05	0.06	0.25	1	59.71

OGS-XSTM1	CIRCULAR	0.45	0.16	0.11	0.45	1	116.40
OLFA1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA10	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA11	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA12	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA13	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA14	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA15	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA16	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA17	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA18	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA19	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA3	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA4	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA5	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA6	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA7	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA9	RECT_OPEN	1.00	3.00	0.60	3.00	1	6098.05
OLFR1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
POND-101	CIRCULAR	0.38	0.11	0.09	0.38	1	170.38

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**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
```

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Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 05/11/2022 00:00:00
Ending Date .............. 05/12/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Initial LID Storage	0.002	1.058
Total Precipitation	0.164	76.002
Evaporation Loss	0.000	0.000
Infiltration Loss	0.015	7.164
Surface Runoff	0.149	69.201
Final Storage	0.002	1.058
Continuity Error (%)	-0.472	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.149	1.491
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.002
External Outflow	0.149	1.492
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.100	1.000

Final Stored Volume 0.100 1.000
Continuity Error (%) 0.022

****
Time-Step Critical Elements
****
Link OLFA18 (2.47%)
Link OLFA16 (1.73%)

****
Highest Flow Instability Indexes
****
Link 08-XTMS2 (119)
Link 03-105 (7)
Link 02-103 (3)
Link 01-102 (2)

****
Routing Time Step Summary
****
Minimum Time Step : 0.64 sec
Average Time Step : 4.82 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.01
Time Step Frequencies :
5.000 - 3.155 sec : 95.50 %
3.155 - 1.991 sec : 0.10 %
1.991 - 1.256 sec : 0.79 %
1.256 - 0.792 sec : 1.62 %
0.792 - 0.500 sec : 1.99 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-0	76.00	0.00	0.00	38.41	3.80	35.67	39.47	0.00	0.90	0.519
A-1	76.00	0.00	0.00	0.00	76.09	0.00	76.09	0.02	15.38	1.001
A-10	76.00	0.00	0.00	0.00	76.13	0.00	76.13	0.02	12.90	1.002
A-11	76.00	0.00	0.00	0.00	76.15	0.00	76.15	0.07	47.12	1.002
A-12	76.00	0.00	0.00	0.00	76.15	0.00	76.15	0.03	21.82	1.002
A-13	76.00	0.00	0.00	0.00	76.14	0.00	76.14	0.04	26.78	1.002
A-14	76.00	0.00	0.00	11.54	54.94	10.11	65.06	0.07	48.47	0.856
A-15	76.00	0.00	0.00	42.37	3.80	30.27	34.07	0.01	4.52	0.448
A-16	76.00	0.00	0.00	0.00	76.24	0.00	76.24	0.13	84.32	1.003
A-17	76.00	0.00	0.00	0.00	76.25	0.00	76.25	0.09	60.02	1.003
A-18	76.00	0.00	0.00	0.00	76.25	0.00	76.25	0.13	84.32	1.003
A-19	76.00	0.00	0.00	0.00	76.25	0.00	76.25	0.08	53.07	1.003
A-2	76.00	0.00	0.00	16.36	49.04	11.14	60.17	0.40	244.39	0.792
A-3	76.00	0.00	0.00	0.00	76.08	0.00	76.08	0.02	13.89	1.001
A-4	76.00	0.00	0.00	0.00	76.14	0.00	76.14	0.03	16.37	1.002
A-5	76.00	0.00	0.00	0.00	76.15	0.00	76.15	0.06	40.67	1.002
A-6	76.00	0.00	0.00	0.00	76.21	0.00	76.21	0.07	43.65	1.003

A-7		76.00	0.00	0.00	0.40	75.47	0.37	75.84	0.07
44.60	0.998								
A-8		76.00	0.00	0.00	0.00	76.11	0.00	76.11	0.01
8.43	1.001								
A-9		76.00	0.00	0.00	14.95	48.82	12.82	61.64	0.07
52.75	0.811								
R-1		76.00	0.00	0.00	6.10	64.90	5.57	70.47	0.06
44.83	0.927								

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
OGS	JUNCTION	1.35	1.37	94.04	0	02:12	1.37
CARP1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
CARP2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OVLF1	OUTFALL	0.00	0.00	95.19	0	00:00	0.00
OVLF2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OVLF3	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OVLF4	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
XSTM1	OUTFALL	1.95	1.95	94.02	0	00:00	1.95
XSTM2	OUTFALL	1.87	1.87	94.02	0	00:00	1.87
CB01	STORAGE	1.12	1.62	94.64	0	02:11	1.62
CB02	STORAGE	1.07	1.56	94.64	0	02:11	1.56
CB03	STORAGE	0.84	1.47	94.78	0	01:32	1.47
CB04	STORAGE	0.86	1.50	94.79	0	01:32	1.50
CB05	STORAGE	0.86	1.85	95.17	0	01:31	1.85
CB06	STORAGE	0.79	1.84	95.23	0	01:32	1.84
CB07	STORAGE	0.69	1.75	95.25	0	01:32	1.75
CB08	STORAGE	0.91	1.70	94.85	0	01:32	1.70
CBMH101	STORAGE	1.37	1.84	94.60	0	02:12	1.84
CBMH102	STORAGE	1.22	1.72	94.64	0	02:11	1.72
CBMH104	STORAGE	1.06	1.63	94.72	0	01:31	1.63
CBMH105	STORAGE	0.93	1.56	94.78	0	01:32	1.56
CBMH106	STORAGE	1.09	1.72	94.79	0	01:35	1.72
CBMH107	STORAGE	1.04	2.00	95.13	0	01:33	2.00
CBMH108	STORAGE	0.97	1.94	95.15	0	01:33	1.94
CBMH109	STORAGE	0.90	1.88	95.16	0	01:33	1.88
CBMH110	STORAGE	0.93	1.98	95.23	0	01:32	1.98
CBMH111	STORAGE	0.82	1.87	95.23	0	01:30	1.87
LD301	STORAGE	0.38	1.37	95.17	0	01:30	1.37
POND	STORAGE	1.24	1.74	94.64	0	02:13	1.74
STMH103	STORAGE	1.17	1.66	94.64	0	02:11	1.66

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
OGS	JUNCTION	0.00	71.09	0	02:13	0	1.43	-0.003	
CARP1	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
CARP2	OUTFALL	0.90	0.90	0	01:30	0.000787	0.000787	0.000	
OVLF1	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
OVLF2	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
OVLF3	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
OVLF4	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	ltr
XSTM1	OUTFALL	0.00	71.09	0	02:13	0	1.43	0.000	
XSTM2	OUTFALL	0.00	31.10	0	01:32	0	0.0665	0.000	
CB01	STORAGE	16.37	16.37	0	01:30	0.0251	0.0257	-0.001	
CB02	STORAGE	40.67	40.67	0	01:30	0.0623	0.063	-0.007	
CB03	STORAGE	8.43	53.04	0	01:25	0.0129	0.0359	0.022	
CB04	STORAGE	52.75	52.75	0	01:30	0.0726	0.0734	-0.001	
CB05	STORAGE	48.47	52.04	0	01:30	0.0675	0.08	-0.006	
CB06	STORAGE	60.02	85.66	0	01:31	0.0921	0.0932	0.018	
CB07	STORAGE	53.07	53.07	0	01:30	0.0814	0.082	0.002	
CB08	STORAGE	44.83	44.83	0	01:30	0.0647	0.0661	0.429	
CBMH101	STORAGE	15.38	71.10	0	02:12	0.0235	1.43	0.001	
CBMH102	STORAGE	13.89	157.38	0	01:30	0.0213	0.339	-0.004	
CBMH104	STORAGE	43.65	93.72	0	01:30	0.0669	0.227	-0.001	
CBMH105	STORAGE	44.60	95.97	0	01:30	0.0681	0.18	0.002	

CBMH106	STORAGE	12.90	236.03	0	01:27	0.0198	0.681	-0.002
CBMH107	STORAGE	47.12	297.47	0	01:31	0.0722	0.662	-0.001
CBMH108	STORAGE	21.82	90.69	0	01:30	0.0334	0.154	-0.002
CBMH109	STORAGE	26.78	70.30	0	01:30	0.041	0.12	-0.000
CBMH110	STORAGE	84.32	264.37	0	01:30	0.129	0.437	-0.000
CBMH111	STORAGE	84.32	136.08	0	01:25	0.129	0.213	0.119
LD301	STORAGE	4.52	11.22	0	01:24	0.00783	0.0113	-0.019
POND	STORAGE	244.39	631.22	0	01:30	0.398	2.35	0.002
STMH103	STORAGE	0.00	130.77	0	01:30	0	0.291	0.001

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
OGS	JUNCTION	24.00	0.917	0.893

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Node Flooding Summary
****

No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CB01	0.000	2	0	0	0.001	3	0 02:11	15.58
CB02	0.000	1	0	0	0.001	2	0 02:11	39.80
CB03	0.003	8	0	0	0.025	80	0 01:32	35.32
CB04	0.000	2	0	0	0.000	3	0 01:32	51.47
CB05	0.000	9	0	0	0.003	67	0 01:31	46.34
CB06	0.000	2	0	0	0.004	22	0 01:32	58.22
CB07	0.000	3	0	0	0.004	35	0 01:32	52.05
CB08	0.001	7	0	0	0.006	92	0 01:32	31.10
CBMH101	0.002	11	0	0	0.002	14	0 02:12	71.09
CBMH102	0.001	4	0	0	0.002	6	0 02:11	155.43
CBMH104	0.001	6	0	0	0.002	10	0 01:31	92.58
CBMH105	0.001	15	0	0	0.002	25	0 01:32	92.33
CBMH106	0.001	20	0	0	0.002	31	0 01:35	234.54
CBMH107	0.001	4	0	0	0.011	35	0 01:33	223.14
CBMH108	0.001	17	0	0	0.003	45	0 01:33	87.57
CBMH109	0.001	12	0	0	0.002	26	0 01:33	69.06
CBMH110	0.003	7	0	0	0.034	100	0 01:31	210.00
CBMH111	0.003	8	0	0	0.033	100	0 01:30	128.41
LD301	0.000	17	0	0	0.001	62	0 01:30	7.08
POND	1.098	48	0	0	1.813	79	0 02:13	70.12
STMH103	0.001	36	0	0	0.002	52	0 02:11	128.40

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
CARP1	0.00	0.00	0.00	0.000
CARP2	6.50	0.39	0.90	0.001
OVLF1	0.00	0.00	0.00	0.000
OVLF2	0.00	0.00	0.00	0.000
OVLF3	0.00	0.00	0.00	0.000
OVLF4	0.00	0.00	0.00	0.000
XSTM1	74.02	24.32	71.09	1.427
XSTM2	99.97	1.81	31.10	0.066
System	22.56	26.53	92.17	1.494

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
01-102	CONDUIT	15.58	0	01:30	0.14	0.18	1.00
02-103	CONDUIT	39.80	0	01:30	0.36	0.47	1.00
03-105	CONDUIT	44.61	0	01:25	0.40	0.48	1.00
04-105	CONDUIT	51.47	0	01:30	0.47	0.60	1.00
05-109	CONDUIT	46.34	0	01:31	0.42	0.53	1.00
06-110	CONDUIT	58.22	0	01:25	0.53	0.68	1.00
07-111	CONDUIT	52.05	0	01:25	0.47	0.61	1.00
101-OGS	CONDUIT	71.09	0	02:13	2.20	4.93	1.00
102-POND	CONDUIT	155.43	0	01:30	1.41	1.87	1.00
103-102	CONDUIT	128.40	0	01:30	1.16	1.44	1.00
104-103	CONDUIT	92.58	0	01:32	0.84	1.01	1.00
105-104	CONDUIT	71.23	0	01:35	0.64	0.84	1.00
106-POND	CONDUIT	234.54	0	01:27	2.12	2.89	1.00
107-106	CONDUIT	223.14	0	01:27	2.02	2.62	1.00
108-107	CONDUIT	87.57	0	01:30	0.79	1.03	1.00
109-108	CONDUIT	69.06	0	01:30	0.63	0.78	1.00
110-10	CONDUIT	138.11	0	01:24	1.25	1.54	1.00
111-110	CONDUIT	79.63	0	01:54	0.72	0.93	1.00
301-05	CONDUIT	9.26	0	01:24	0.19	0.16	1.00
OGS-XSTM1	CONDUIT	71.09	0	02:13	0.45	0.61	1.00
OLFA1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA10	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA14	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA15	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA16	CONDUIT	94.83	0	01:32	0.64	0.00	0.03
OLFA17	CONDUIT	36.47	0	01:31	0.32	0.00	0.03
OLFA18	CONDUIT	86.96	0	01:30	0.62	0.00	0.03
OLFA19	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA3	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA4	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA5	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA6	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA7	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA9	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFR1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
POND-101	CONDUIT	70.12	0	02:15	0.63	0.41	1.00
08-XTMS2	ORIFICE	31.10	0	01:32			1.00
OVERFLOW	WEIR	0.00	0	00:00			0.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
01-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
02-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
03-105	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
04-105	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
05-109	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
06-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
07-111	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
101-OGS	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
102-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
103-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
104-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
105-104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
106-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
107-106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
108-107	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
109-108	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
110-10	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
111-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
301-05	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

OGS-XSTM1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
OLFA1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA16	1.00	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
OLFA17	1.00	0.96	0.00	0.00	0.03	0.00	0.00	0.01	0.93	0.00
OLFA18	1.00	0.96	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.00
OLFA19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA5	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFR1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POND-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
01-102	24.00	24.00	24.00	0.01	0.01
02-103	24.00	24.00	24.00	0.01	0.01
03-105	24.00	24.00	24.00	0.01	0.01
04-105	24.00	24.00	24.00	0.01	0.01
05-109	24.00	24.00	24.00	0.01	0.01
06-110	24.00	24.00	24.00	0.01	0.01
07-111	24.00	24.00	24.00	0.01	0.01
101-OGS	24.00	24.00	24.00	7.99	8.68
102-POND	24.00	24.00	24.00	0.30	0.39
103-102	24.00	24.00	24.00	0.23	0.23
104-103	24.00	24.00	24.00	0.05	0.26
105-104	24.00	24.00	24.00	0.01	0.05
106-POND	24.00	24.00	24.00	0.69	0.78
107-106	24.00	24.00	24.00	0.65	0.65
108-107	24.00	24.00	24.00	0.06	0.08
109-108	24.00	24.00	24.00	0.01	0.01
110-10	24.00	24.00	24.00	0.49	0.57
111-110	24.00	24.00	24.00	0.01	0.01
301-05	7.87	7.87	24.00	0.01	0.01
OGS-XSTM1	24.00	24.00	24.00	0.01	3.58
POND-101	24.00	24.00	24.00	0.01	0.01

Analysis begun on: Mon May 16 10:06:55 2022
Analysis ended on: Mon May 16 10:06:56 2022
Total elapsed time: 00:00:01

Chicago 4 Hour 100 Year + 20% Event PCSWMM Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 21
Number of nodes 30
Number of links 41
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage1	C4-100+20%	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-0	0.00	5.00	5.00	2.0000	Raingage1	CARP2
A-1	0.03	22.96	100.00	3.0000	Raingage1	CBMH101
A-10	0.03	15.29	100.00	2.5000	Raingage1	CBMH106
A-11	0.10	55.88	100.00	2.0000	Raingage1	CBMH107
A-12	0.04	26.67	100.00	2.0000	Raingage1	CBMH108
A-13	0.05	33.75	100.00	2.0000	Raingage1	CBMH109
A-14	0.10	34.67	72.00	1.0000	Raingage1	CB05
A-15	0.02	5.75	5.00	1.0000	Raingage1	LD301
A-16	0.17	80.95	100.00	1.5000	Raingage1	CBMH110
A-17	0.12	56.28	100.00	1.5000	Raingage1	CB06
A-18	0.17	79.07	100.00	1.5000	Raingage1	CBMH111
A-19	0.11	49.77	100.00	1.5000	Raingage1	CB07
A-2	0.66	41.44	64.00	1.5000	Raingage1	POND
A-3	0.03	21.54	100.00	3.5000	Raingage1	CBMH102
A-4	0.03	21.29	100.00	2.0000	Raingage1	CB01
A-5	0.08	48.23	100.00	2.0000	Raingage1	CB02
A-6	0.09	40.00	100.00	2.0000	Raingage1	CBMH104
A-7	0.09	43.90	99.00	1.5000	Raingage1	CBMH105
A-8	0.02	8.50	100.00	5.0000	Raingage1	CB03
A-9	0.12	39.33	64.00	1.0000	Raingage1	CB04
R-1	0.09	23.00	85.00	2.0000	Raingage1	CB08

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OGS	JUNCTION	92.67	2.26	0.0	
CARP1	OUTFALL	0.00	0.00	0.0	
CARP2	OUTFALL	0.00	0.00	0.0	
OVLF1	OUTFALL	95.19	1.00	0.0	
OVLF2	OUTFALL	0.00	95.99	0.0	
OVLF3	OUTFALL	0.00	96.04	0.0	
OVLF4	OUTFALL	0.00	95.84	0.0	
XSTM1	OUTFALL	92.07	1.04	0.0	
XSTM2	OUTFALL	92.15	0.00	0.0	
CB01	STORAGE	93.02	2.98	0.0	
CB02	STORAGE	93.08	2.92	0.0	
CB03	STORAGE	93.31	1.94	0.0	
CB04	STORAGE	93.29	2.61	0.0	
CB05	STORAGE	93.32	2.68	0.0	
CB06	STORAGE	93.39	2.76	0.0	
CB07	STORAGE	93.50	2.65	0.0	
CB08	STORAGE	93.15	2.55	0.0	
CBMH101	STORAGE	92.76	3.04	0.0	
CBMH102	STORAGE	92.92	2.98	0.0	
CBMH104	STORAGE	93.09	2.71	0.0	
CBMH105	STORAGE	93.22	2.88	0.0	
CBMH106	STORAGE	93.07	3.08	0.0	
CBMH107	STORAGE	93.13	2.87	0.0	

CBMH108	STORAGE	93.21	2.89	0.0
CBMH109	STORAGE	93.28	2.87	0.0
CBMH110	STORAGE	93.25	2.75	0.0
CBMH111	STORAGE	93.36	2.64	0.0
LD301	STORAGE	93.80	2.20	0.0
POND	STORAGE	92.90	3.00	0.0
STMH103	STORAGE	92.98	3.22	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
01-102	CB01	CBMH102	CONDUIT	16.9	0.2360	0.0130
02-103	CB02	STMH103	CONDUIT	17.0	0.2357	0.0130
03-105	CB03	CBMH105	CONDUIT	10.5	0.2855	0.0130
04-105	CB04	CBMH105	CONDUIT	24.7	0.2431	0.0130
05-109	CB05	CBMH109	CONDUIT	11.8	0.2533	0.0130
06-110	CB06	CBMH110	CONDUIT	33.5	0.2391	0.0130
07-111	CB07	CBMH111	CONDUIT	33.5	0.2391	0.0130
101-OGS	CBMH101	OGS	CONDUIT	5.6	0.1786	0.0130
102-POND	CBMH102	POND	CONDUIT	8.9	0.2243	0.0130
103-102	STMH103	CBMH102	CONDUIT	19.5	0.2569	0.0130
104-103	CBMH104	STMH103	CONDUIT	18.4	0.2711	0.0130
105-104	CBMH105	CBMH104	CONDUIT	29.9	0.2344	0.0130
106-POND	CBMH106	POND	CONDUIT	9.3	0.2144	0.0130
107-106	CBMH107	CBMH106	CONDUIT	21.2	0.2360	0.0130
108-107	CBMH108	CBMH107	CONDUIT	21.4	0.2340	0.0130
109-108	CBMH109	CBMH108	CONDUIT	23.4	0.2560	0.0130
110-10	CBMH110	CBMH107	CONDUIT	34.3	0.2623	0.0130
111-110	CBMH111	CBMH110	CONDUIT	41.6	0.2404	0.0130
301-05	LD301	CB05	CONDUIT	41.7	1.0080	0.0130
OGS-XSTM1	OGS	XSTM1	CONDUIT	6.0	0.1667	0.0130
OLFA1	CBMH101	OVLF3	CONDUIT	1.0	1.0001	0.0150
OLFA10	CBMH106	CB01	CONDUIT	1.0	1.0001	0.0150
OLFA11	CBMH107	CB02	CONDUIT	1.0	1.0001	0.0150
OLFA12	CBMH108	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA13	CBMH109	CB05	CONDUIT	1.0	1.0001	0.0150
OLFA14	CB05	CB04	CONDUIT	1.0	1.0001	0.0350
OLFA15	LD301	CB05	CONDUIT	1.0	1.0001	0.0350
OLFA16	CBMH110	CBMH107	CONDUIT	1.0	1.0001	0.0150
OLFA17	CB06	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA18	CBMH111	CBMH110	CONDUIT	1.0	1.0001	0.0150
OLFA19	CB07	CBMH111	CONDUIT	1.0	1.0001	0.0150
OLFA3	CBMH102	CBMH101	CONDUIT	1.0	1.0001	0.0150
OLFA4	CB01	CBMH102	CONDUIT	1.0	1.0001	0.0150
OLFA5	CB02	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA6	CBMH104	OVLF2	CONDUIT	1.0	1.0001	0.0150
OLFA7	CBMH105	CBMH104	CONDUIT	1.0	1.0001	0.0150
OLFA9	CB04	OVLF1	CONDUIT	1.0	1.0001	0.0350
OLFR1	CB08	OVLF4	CONDUIT	1.0	1.0001	0.0150
POND-101	POND	CBMH101	CONDUIT	11.7	0.9442	0.0130
08-XTMS2	CB08	XSTM2	ORIFICE			
OVERFLOW	POND	CARP1	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
01-102	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
02-103	CIRCULAR	0.38	0.11	0.09	0.38	1	85.13
03-105	CIRCULAR	0.38	0.11	0.09	0.38	1	93.69
04-105	CIRCULAR	0.38	0.11	0.09	0.38	1	86.45
05-109	CIRCULAR	0.38	0.11	0.09	0.38	1	88.25
06-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
07-111	CIRCULAR	0.38	0.11	0.09	0.38	1	85.73
101-OGS	CIRCULAR	0.20	0.03	0.05	0.20	1	14.42
102-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	83.04
103-102	CIRCULAR	0.38	0.11	0.09	0.38	1	88.87
104-103	CIRCULAR	0.38	0.11	0.09	0.38	1	91.29
105-104	CIRCULAR	0.38	0.11	0.09	0.38	1	84.89
106-POND	CIRCULAR	0.38	0.11	0.09	0.38	1	81.18
107-106	CIRCULAR	0.38	0.11	0.09	0.38	1	85.18
108-107	CIRCULAR	0.38	0.11	0.09	0.38	1	84.82
109-108	CIRCULAR	0.38	0.11	0.09	0.38	1	88.72
110-10	CIRCULAR	0.38	0.11	0.09	0.38	1	89.80
111-110	CIRCULAR	0.38	0.11	0.09	0.38	1	85.98
301-05	CIRCULAR	0.25	0.05	0.06	0.25	1	59.71

OGS-XSTM1	CIRCULAR	0.45	0.16	0.11	0.45	1	116.40
OLFA1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA10	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA11	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA12	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA13	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA14	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA15	RECT_OPEN	1.00	1.00	0.33	1.00	1	1373.69
OLFA16	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA17	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA18	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA19	RECT_OPEN	1.00	5.00	0.71	5.00	1	26637.72
OLFA3	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA4	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA5	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA6	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA7	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
OLFA9	RECT_OPEN	1.00	3.00	0.60	3.00	1	6098.05
OLFR1	RECT_OPEN	1.00	3.00	0.60	3.00	1	14228.79
POND-101	CIRCULAR	0.38	0.11	0.09	0.38	1	170.38

```
**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
```

```
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 05/11/2022 00:00:00
Ending Date .............. 05/12/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Initial LID Storage	0.002	1.058
Total Precipitation	0.197	91.202
Evaporation Loss	0.000	0.000
Infiltration Loss	0.017	7.702
Surface Runoff	0.181	83.903
Final Storage	0.002	1.058
Continuity Error (%)	-0.437	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.181	1.807
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.002
External Outflow	0.181	1.808
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.100	1.000

```
  Final Stored Volume ......          0.100         1.000
  Continuity Error (%) .....          0.025


  **************************
  Time-Step Critical Elements
  **************************
  Link OLFA16 (6.91%)
  Link OLFA18 (1.59%)


  ******************************
  Highest Flow Instability Indexes
  ******************************
  Link 08-XTMS2 (114)
  Link 03-105 (8)
  Link 02-103 (3)
  Link 01-102 (1)


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     4.62 sec
  Maximum Time Step           :     5.00 sec
  Percent in Steady State     :    -0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.01
  Time Step Frequencies       :
      5.000 -  3.155 sec      :    91.00 %
      3.155 -  1.991 sec      :     0.21 %
      1.991 -  1.256 sec      :     0.56 %
      1.256 -  0.792 sec      :     1.81 %
      0.792 -  0.500 sec      :     6.42 %


  ***************************
  Subcatchment Runoff Summary
  ***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-0	91.20	0.00	0.00	41.78	4.56	46.27	50.83	0.00	1.11	0.557
A-1	91.20	0.00	0.00	0.00	91.30	0.00	91.30	0.03	18.45	1.001
A-10	91.20	0.00	0.00	0.00	91.34	0.00	91.34	0.02	15.48	1.001
A-11	91.20	0.00	0.00	0.00	91.36	0.00	91.36	0.09	56.54	1.002
A-12	91.20	0.00	0.00	0.00	91.35	0.00	91.35	0.04	26.19	1.002
A-13	91.20	0.00	0.00	0.00	91.35	0.00	91.35	0.05	32.14	1.002
A-14	91.20	0.00	0.00	12.51	65.90	13.41	79.31	0.08	59.17	0.870
A-15	91.20	0.00	0.00	45.48	4.56	41.68	46.25	0.01	6.34	0.507
A-16	91.20	0.00	0.00	0.00	91.45	0.00	91.45	0.16	101.18	1.003
A-17	91.20	0.00	0.00	0.00	91.46	0.00	91.46	0.11	72.02	1.003
A-18	91.20	0.00	0.00	0.00	91.46	0.00	91.46	0.16	101.18	1.003
A-19	91.20	0.00	0.00	0.00	91.46	0.00	91.46	0.10	63.69	1.003
A-2	91.20	0.00	0.00	17.54	58.84	15.46	74.30	0.49	303.39	0.815
A-3	91.20	0.00	0.00	0.00	91.29	0.00	91.29	0.03	16.66	1.001
A-4	91.20	0.00	0.00	0.00	91.34	0.00	91.34	0.03	19.64	1.002
A-5	91.20	0.00	0.00	0.00	91.36	0.00	91.36	0.07	48.81	1.002
A-6	91.20	0.00	0.00	0.00	91.42	0.00	91.42	0.08	52.38	1.002

A-7		91.20	0.00	0.00	0.44	90.52	0.49	91.01	0.08
53.53	0.998								
A-8		91.20	0.00	0.00	0.00	91.31	0.00	91.31	0.02
10.12	1.001								
A-9		91.20	0.00	0.00	16.19	58.55	17.09	75.64	0.09
65.01	0.829								
R-1		91.20	0.00	0.00	6.63	77.83	7.29	85.12	0.08
54.05	0.933								

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OGS	JUNCTION	1.35	1.37	94.04	0 02:00	1.37
CARP1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CARP2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF1	OUTFALL	0.00	0.00	95.19	0 00:00	0.00
OVLF2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF3	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OVLF4	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
XSTM1	OUTFALL	1.95	1.95	94.02	0 00:00	1.95
XSTM2	OUTFALL	1.87	1.87	94.02	0 00:00	1.87
CB01	STORAGE	1.16	1.71	94.73	0 01:32	1.70
CB02	STORAGE	1.11	1.96	95.04	0 01:32	1.96
CB03	STORAGE	0.90	1.79	95.10	0 01:30	1.77
CB04	STORAGE	0.92	1.79	95.08	0 01:33	1.79
CB05	STORAGE	0.92	1.93	95.25	0 01:33	1.93
CB06	STORAGE	0.85	1.86	95.25	0 01:32	1.86
CB07	STORAGE	0.74	1.78	95.28	0 01:32	1.78
CB08	STORAGE	0.94	1.72	94.87	0 01:28	1.72
CBMH101	STORAGE	1.40	1.90	94.66	0 02:00	1.90
CBMH102	STORAGE	1.26	1.80	94.72	0 01:33	1.80
CBMH104	STORAGE	1.11	1.87	94.96	0 01:34	1.87
CBMH105	STORAGE	0.99	1.85	95.07	0 01:33	1.84
CBMH106	STORAGE	1.13	1.83	94.90	0 01:42	1.83
CBMH107	STORAGE	1.10	2.12	95.25	0 01:31	2.11
CBMH108	STORAGE	1.03	2.05	95.26	0 01:31	2.03
CBMH109	STORAGE	0.96	1.97	95.25	0 01:33	1.97
CBMH110	STORAGE	0.99	2.00	95.25	0 01:32	2.00
CBMH111	STORAGE	0.88	1.89	95.25	0 01:32	1.89
LD301	STORAGE	0.44	1.45	95.25	0 01:33	1.45
POND	STORAGE	1.27	1.80	94.70	0 02:00	1.80
STMH103	STORAGE	1.21	1.92	94.90	0 01:33	1.92

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
OGS	JUNCTION	0.00	74.46	0 02:00	0	1.54	-0.005	
CARP1	OUTFALL	0.00	127.67	0 02:00	0	0.192	0.000	
CARP2	OUTFALL	1.11	1.11	0 01:30	0.00101	0.00101	0.000	
OVLF1	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF2	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF3	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OVLF4	OUTFALL	0.00	25.68	0 01:28	0	0.00426	0.000	
XSTM1	OUTFALL	0.00	74.46	0 02:00	0	1.54	0.000	
XSTM2	OUTFALL	0.00	31.57	0 01:28	0	0.0757	0.000	
CB01	STORAGE	19.64	19.64	0 01:30	0.0301	0.0307	-0.002	
CB02	STORAGE	48.81	156.08	0 01:31	0.0747	0.0874	0.020	
CB03	STORAGE	10.12	76.26	0 01:25	0.0155	0.0437	0.129	
CB04	STORAGE	65.01	67.76	0 01:30	0.089	0.0952	0.000	
CB05	STORAGE	59.17	64.82	0 01:30	0.0823	0.0984	0.022	
CB06	STORAGE	72.02	140.96	0 01:28	0.11	0.112	0.031	
CB07	STORAGE	63.69	63.69	0 01:30	0.0976	0.0983	0.008	
CB08	STORAGE	54.05	54.05	0 01:30	0.0781	0.0795	0.339	
CBMH101	STORAGE	18.45	74.46	0 01:59	0.0282	1.54	0.001	
CBMH102	STORAGE	16.66	198.58	0 01:32	0.0255	0.424	-0.004	
CBMH104	STORAGE	52.38	138.78	0 01:30	0.0803	0.278	-0.002	
CBMH105	STORAGE	53.53	154.86	0 01:30	0.0817	0.223	-0.001	

CBMH106	STORAGE	15.48	248.50	0	01:31	0.0237	0.798	-0.001
CBMH107	STORAGE	56.54	412.68	0	01:29	0.0866	0.789	0.002
CBMH108	STORAGE	26.19	103.90	0	01:31	0.0401	0.182	-0.001
CBMH109	STORAGE	32.14	94.39	0	01:29	0.0492	0.141	-0.008
CBMH110	STORAGE	101.18	330.49	0	01:28	0.155	0.524	-0.002
CBMH111	STORAGE	101.18	155.60	0	01:25	0.155	0.255	0.119
LD301	STORAGE	6.34	12.32	0	01:24	0.0106	0.0145	-0.017
POND	STORAGE	303.39	717.40	0	01:30	0.492	2.65	0.002
STMH103	STORAGE	0.00	209.95	0	01:31	0	0.367	-0.000

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Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
OGS	JUNCTION	24.00	0.919	0.891

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CB01	0.000	2	0	0	0.001	3	0 01:32	18.85
CB02	0.000	1	0	0	0.001	4	0 01:32	118.07
CB03	0.004	14	0	0	0.031	100	0 01:30	46.68
CB04	0.000	3	0	0	0.004	27	0 01:33	65.62
CB05	0.001	15	0	0	0.004	100	0 01:28	63.46
CB06	0.001	4	0	0	0.006	35	0 01:32	69.07
CB07	0.001	5	0	0	0.008	67	0 01:32	55.03
CB08	0.001	10	0	0	0.007	100	0 01:28	57.22
CBMH101	0.002	11	0	0	0.002	15	0 02:00	74.46
CBMH102	0.001	4	0	0	0.002	6	0 01:33	194.88
CBMH104	0.002	8	0	0	0.012	62	0 01:34	122.44
CBMH105	0.001	16	0	0	0.002	29	0 01:33	116.58
CBMH106	0.001	21	0	0	0.002	33	0 01:42	244.52
CBMH107	0.003	10	0	0	0.031	100	0 01:31	357.95
CBMH108	0.001	22	0	0	0.007	100	0 01:31	102.55
CBMH109	0.001	16	0	0	0.008	96	0 01:33	73.48
CBMH110	0.004	12	0	0	0.034	100	0 01:28	297.25
CBMH111	0.004	12	0	0	0.033	100	0 01:28	161.13
LD301	0.000	20	0	0	0.001	66	0 01:33	6.33
POND	1.139	50	0	0	1.914	83	0 02:00	200.28
STMH103	0.001	38	0	0	0.002	60	0 01:33	180.48

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
CARP1	3.85	53.92	127.67	0.192
CARP2	10.87	0.50	1.11	0.001
OVLF1	0.00	0.00	0.00	0.000
OVLF2	0.00	0.00	0.00	0.000
OVLF3	0.00	0.00	0.00	0.000
OVLF4	3.13	13.74	25.68	0.004
XSTM1	79.45	26.67	74.46	1.537
XSTM2	99.98	2.96	31.57	0.076
System	24.66	97.79	207.37	1.810

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
01-102	CONDUIT	18.85	0	01:29	0.17	0.22	1.00
02-103	CONDUIT	118.07	0	01:32	1.07	1.39	1.00
03-105	CONDUIT	66.14	0	01:25	0.60	0.71	1.00
04-105	CONDUIT	65.62	0	01:30	0.59	0.76	1.00
05-109	CONDUIT	57.46	0	01:29	0.52	0.65	1.00
06-110	CONDUIT	62.89	0	01:24	0.57	0.73	1.00
07-111	CONDUIT	55.03	0	01:24	0.50	0.64	1.00
101-OGS	CONDUIT	74.46	0	02:00	2.30	5.16	1.00
102-POND	CONDUIT	194.88	0	01:32	1.76	2.35	1.00
103-102	CONDUIT	180.48	0	01:32	1.63	2.03	1.00
104-103	CONDUIT	122.44	0	01:35	1.11	1.34	1.00
105-104	CONDUIT	96.50	0	01:31	0.87	1.14	1.00
106-POND	CONDUIT	244.52	0	01:31	2.21	3.01	1.00
107-106	CONDUIT	236.87	0	01:31	2.14	2.78	1.00
108-107	CONDUIT	92.51	0	01:28	0.84	1.09	1.00
109-108	CONDUIT	73.48	0	01:29	0.67	0.83	1.00
110-10	CONDUIT	136.55	0	01:23	1.24	1.52	1.00
111-110	CONDUIT	67.02	0	02:02	0.61	0.78	1.00
301-05	CONDUIT	9.85	0	01:24	0.20	0.17	1.00
OGS-XSTM1	CONDUIT	74.46	0	02:00	0.47	0.64	1.00
OLFA1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA10	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA11	CONDUIT	119.38	0	01:31	0.87	0.01	0.05
OLFA12	CONDUIT	60.57	0	01:31	0.51	0.00	0.06
OLFA13	CONDUIT	16.49	0	01:31	0.22	0.00	0.05
OLFA14	CONDUIT	20.65	0	01:33	0.50	0.02	0.04
OLFA15	CONDUIT	3.71	0	01:34	0.10	0.00	0.05
OLFA16	CONDUIT	213.97	0	01:30	0.88	0.01	0.05
OLFA17	CONDUIT	68.98	0	01:28	0.40	0.00	0.06
OLFA18	CONDUIT	123.80	0	01:28	0.72	0.00	0.05
OLFA19	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA3	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA4	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA5	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA6	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA7	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFA9	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OLFR1	CONDUIT	25.68	0	01:28	0.47	0.00	0.02
POND-101	CONDUIT	72.84	0	02:04	0.66	0.43	1.00
08-XTMS2	ORIFICE	31.57	0	01:28			1.00
OVERFLOW	WEIR	127.67	0	02:00			0.30

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
01-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
02-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
03-105	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
04-105	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
05-109	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
06-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
07-111	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
101-OGS	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
102-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
103-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
104-103	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
105-104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
106-POND	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
107-106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
108-107	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
109-108	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
110-10	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
111-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
301-05	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

OGS-XSTM1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
OLFA1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA11	1.00	0.98	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
OLFA12	1.00	0.95	0.00	0.00	0.02	0.00	0.00	0.03	0.00	0.00
OLFA13	1.00	0.92	0.01	0.00	0.06	0.00	0.01	0.00	0.00	0.00
OLFA14	1.00	0.93	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00
OLFA15	1.00	0.92	0.00	0.00	0.07	0.00	0.00	0.00	0.93	0.00
OLFA16	1.00	0.92	0.00	0.00	0.00	0.01	0.00	0.07	0.00	0.00
OLFA17	1.00	0.91	0.00	0.00	0.08	0.00	0.00	0.01	0.93	0.00
OLFA18	1.00	0.91	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00
OLFA19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA5	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFA9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OLFR1	1.00	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
POND-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
01-102	24.00	24.00	24.00	0.01	0.01
02-103	24.00	24.00	24.00	0.03	0.04
03-105	24.00	24.00	24.00	0.01	0.02
04-105	24.00	24.00	24.00	0.01	0.01
05-109	24.00	24.00	24.00	0.01	0.01
06-110	24.00	24.00	24.00	0.01	0.01
07-111	24.00	24.00	24.00	0.01	0.01
101-OGS	24.00	24.00	24.00	8.40	9.07
102-POND	24.00	24.00	24.00	0.36	0.47
103-102	24.00	24.00	24.00	0.30	0.30
104-103	24.00	24.00	24.00	0.17	0.31
105-104	24.00	24.00	24.00	0.04	0.10
106-POND	24.00	24.00	24.00	0.85	0.93
107-106	24.00	24.00	24.00	0.83	0.83
108-107	24.00	24.00	24.00	0.06	0.07
109-108	24.00	24.00	24.00	0.01	0.01
110-10	24.00	24.00	24.00	0.38	0.45
111-110	24.00	24.00	24.00	0.01	0.01
301-05	8.31	8.31	24.00	0.01	0.01
OGS-XSTM1	24.00	24.00	24.00	0.01	3.94
POND-101	24.00	24.00	24.00	0.01	0.01

Analysis begun on: Mon May 16 10:09:01 2022
Analysis ended on: Mon May 16 10:09:03 2022
Total elapsed time: 00:00:02

APPENDIX F

Inlet Control Device Information

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function

TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.

TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.

TEMPEST MHF (Medium to High Flow):
The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

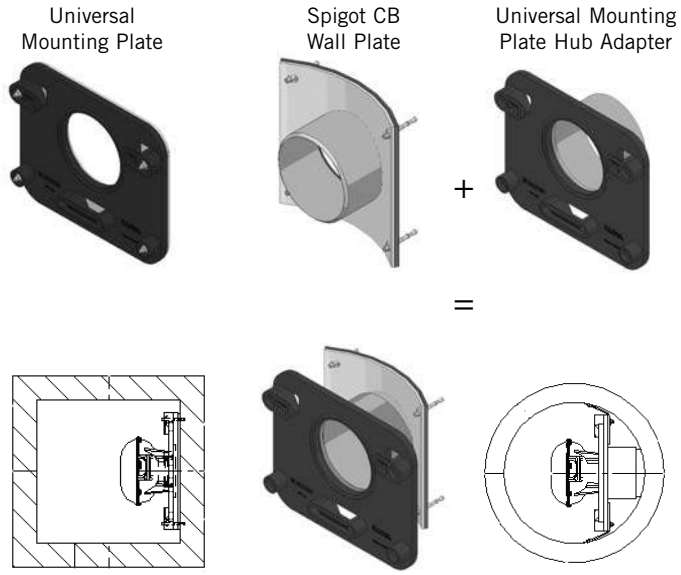
Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:

Square Application **Round Application**



The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:

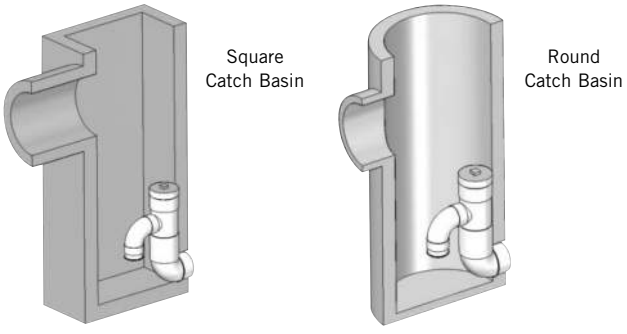
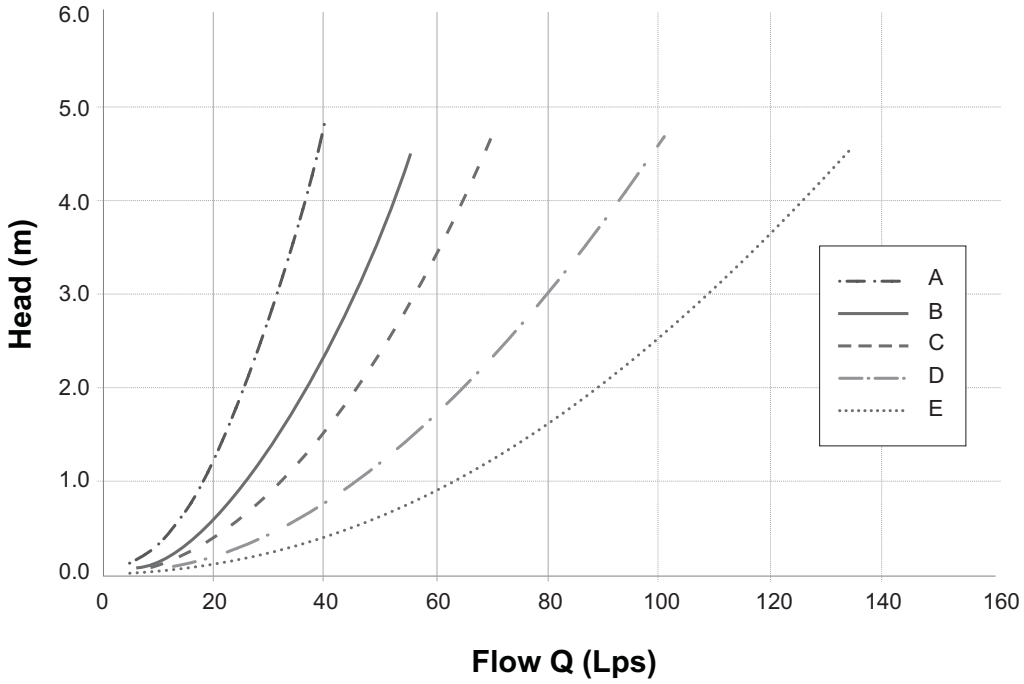


Chart 3: HF & MHF Preset Flow Curves



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST HF or MHF ICD into a Square Catch Basin:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal wall mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal wall mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF or MHF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the round catch basin spigot adaptor to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the spigot CB wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot CB wall plate and the catch basin wall.
6. Put solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF Sump into a Square or Round Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, mastic tape and metal strapping
   - Material: (2) concrete anchor 3/8 x 3-1/2, (2) washers, (2) nuts, HF Sump pieces (2).
2. Apply solvent cement to the spigot end of the top half of the sump. Apply solvent cement to the hub of the bottom half of the sump. Insert the spigot of the top half of the sump into the hub of the bottom half of the sump.
3. Install the 8" spigot of the device into the outlet pipe. Use the mastic tape to seal the device spigot into the outlet pipe. You should use a level to be sure that the fitting is standing at the vertical.
4. Use an impact drill with a 3/8" concrete bit to make a series of 2 holes along each side of the body throat. The depth of the hole should be between 1-1/2" to 2-1/2". Clean the concrete dust from the 2 holes.
5. Install the anchors (2) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you hit the anchors. Remove the nuts from the ends of the anchors.
6. Cut the metal strapping to length and connect each end of the strapping to the anchors. Screw the nuts in place with a maximum torque of 40 N.m (30 lbf-ft). The device should be completely flush with the catch basin wall.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook shall be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above shall not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices shall consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

APPENDIX G

Water Quality Treatment Unit Information

Steve Matthews

From: Patrick <patrick@echelonenvironmental.ca>
Sent: Tuesday, May 17, 2022 9:34 AM
To: Steve Matthews
Cc: Francois Thauvette
Subject: RE: CDS Sizing Request - 30 Frank Nighbor Place (City of Ottawa)
Attachments: CDS TSSR IDF - 30 Frank Nighbour Place - PMSU 2020_5 16-May-22.pdf; CDS Concentric Inline Hydraulics - 30 Frank Nighbour Place - PMSU 2020_5 .pdf

Good afternoon Steve,

I hope everything is going well! Please find attached our CDS IDF TSS calculations as well as our hydraulic analysis. For this site I recommend a CDS PMSU 2020_5 which has a treatment flow rate of 31 L/s and an approximate budget price of $27,500.

Based on the provide tailwater scenario our standard weir height is sufficient to account for the 25mm tailwater. We will provide our CDS with the required cylinder extension to ensure all neutrally buoyant and floatable material remains captured during the peak storm. If you have any questions please give me a call!

Best regards,

Patrick Graham
Project Manager
ECHELON ENVIRONMENTAL
*****Please note our new addresses*****

Echelon Environmental Inc.
55 Albert Street
Suite 200
Markham, ON
L3P 2T4
Phone: 1-905-948-0000
Cell: 416-460-5819
Fax: 1-905-948-0577
email patrick@echelonenvironmental.ca

Mailing Address:
Echelon Environmental Inc.
5694 Hwy #7 East
Suite 354
Markham, ON
L3P 0E3

From: Steve Matthews <S.Matthews@novatech-eng.com>
Sent: Friday, May 13, 2022 4:04 PM

To: Patrick <patrick@echelonenvironmental.ca>
Cc: Francois Thauvette <f.thauvette@novatech-eng.com>
Subject: CDS Sizing Request - 30 Frank Nighbor Place (City of Ottawa)

Hi Patrick,

We are currently working on a project in Ottawa that requires a stormwater quality control unit for a self storage development in Kanata that is adjacent to the Carp River. The project details for this stormwater quality control unit are as follows:

Tributary area = **2.06 ha**
Imperviousness = **84%**
Time of concentration = 10min
IDF Curve = City of Ottawa (104.2mm/hr Intensity for 5yr) (178.6mm/hr Intensity for 100yr)

We have a requirement to provide a level of quality control treatment to meet the **MOE 'Enhanced' Level of Protection** guidelines (i.e. **80% TSS removal** and **90% of annual runoff treated**). The proposed unit will be installed **with a proposed 200mm dia. PVC control pipe** for the inlet and with **177 degrees of separation** through the structure to a **450mm dia. PVC outlet pipe** and approximately **1.8m - 2m cover** on the pipes. A standard particle distribution (**Fines**) is the minimum that is required for the design. Anticipated peak flow should be in the order of **105 L/s** based on the City's requirement to control the site to pre-development runoff levels. As a result, there will be significant upstream attenuation within the paved parking areas and the proposed dry pond for stormwater storage. See attached preliminary servicing plan for a sketch of the site and proposed water quality treatment unit location (highlighted in yellow).

There is also an existing tailwater condition with the invert of the municipal outlet sewer being lower than the normal water level in the Carp River at the outlet headwall immediately to the west of our outlet connection point. I have attached the EE **Information Request Form** for the CDS sizing with the pertinent site information and tailwater conditions completed for your use. Can you please **size a CDS unit** for us and provide the design details as well as an **approximate cost estimate.**

We will also need the following information on the unit for our SWM Report:

- % of net annual TSS removal
- % of net annual treatment volume for the tributary area
- The treatment capacity in L/s
- The sediment storage capacity in m^3
- The oil storage capacity in L
- The total unit storage capacity in L

Thank you for your time and consideration in this matter. If there is any further information you require, please do not hesitate to send me an email as we are currently working from home.

Regards,

Stephen Matthews, B.A.(Env), Senior Design Technologist
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 223 | Fax: 613.254.5867

INFORMATION REQUEST FORM

ECHELON ENVIRONMENTAL

Tel: (905) 948-0000
Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

GENERAL PROJECT DATA

PROJECT NAME: 30 Frank Nighbor Place
CITY: Ottawa
ENGINEER: Novatech
DATE: May 13, 2022

BASIN DATA

A_{TOTAL}: 2.06 ha.
$A_{IMP.}$: 1.73 ha or 84%imp ha.
$C_{RATIONAL}$: 0.79
T_C: 10 MIN.

	PEAK FLOW AT CDS UNIT		PEAK SITE DISCHARGE	
Q:	71.1	L/S	102.2	L/S
RETURN FREQUENCY:	1:100	yr.	1:100	yr.

FOR ORIFICE CONTROLLED SITES

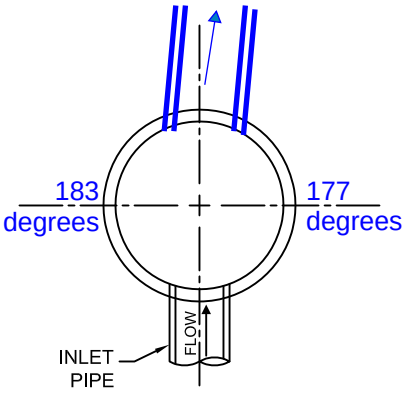
ORIFICE SIZE: 203mm mm
HEAD ON ORIFICE: 1.79m mm
MULTIPLE CONTROL POINTS: YES ☐ NO ☑

STORAGE-DISCHARGE PARAMETERS

DESIGN STORM	Q (L/s)	STORAGE (M^3)
25 mm	49.5	215
2 YEAR	53.8	487
5 YEAR	61.0	788
10 YEAR		
25 YEAR		
50 YEAR		
100 YEAR	71.1	1813

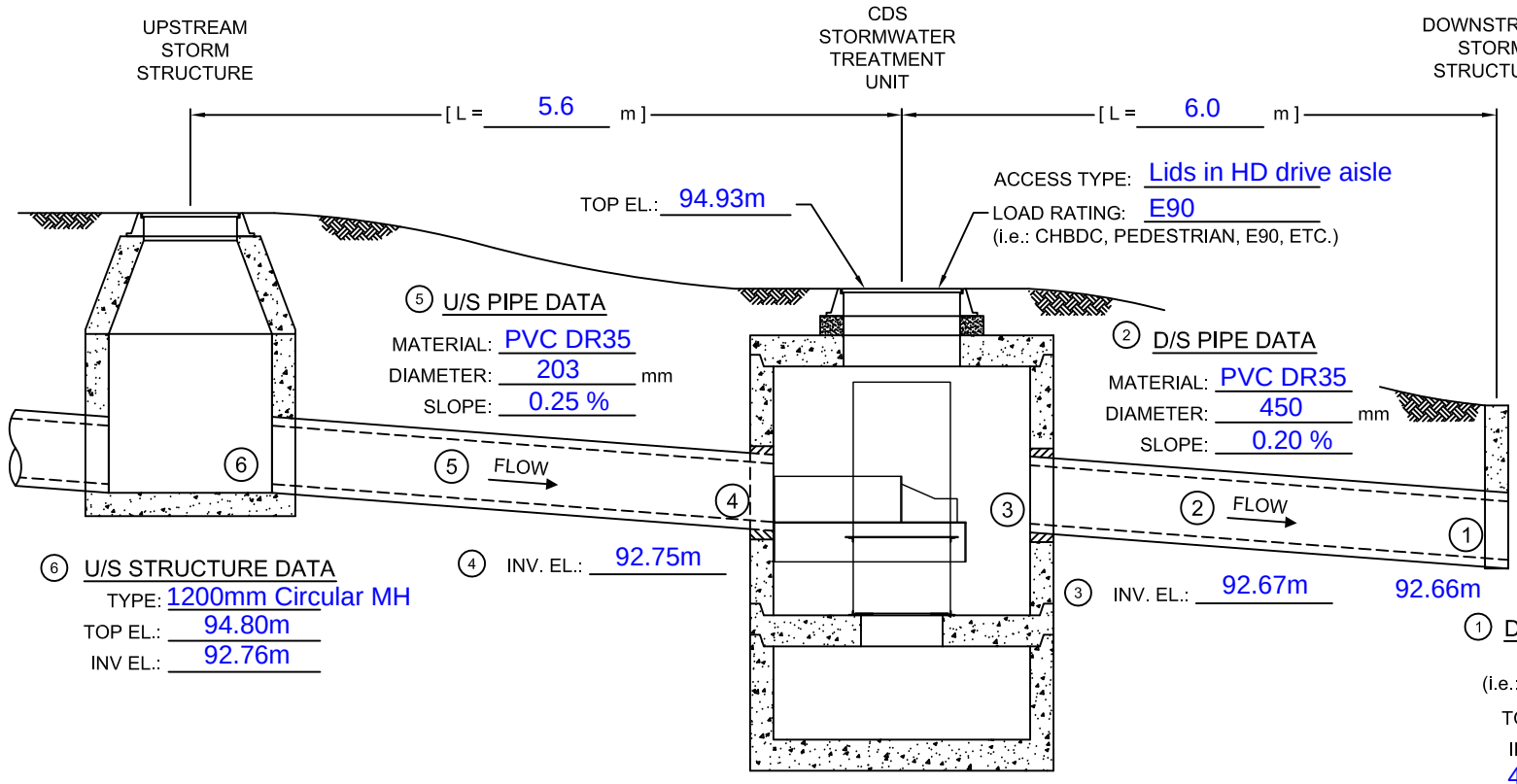
STORAGE TYPE:
Storage is (BEFORE) or AFTER CDS unit (circle)

INLET/OUTLET PIPE ORIENTATION



SKETCH OUTLET PIPE AND PROVIDE ANGLE

COMPLETE SECTION BELOW IF HYDRAULIC CALCULATIONS ARE REQUIRED:



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

Project:	30 Frank Nighbour Place		
Location:	Ottawa, ON		
Date:	5/16/2022		
By:	PG	Site ID:	OGS 1
PSD:	FINE	Area:	2.060 ha
CDS Model:	PMSU2020_5	C-Value	0.79
CDS Design Flow:	31 l/s	IDF Data:	Ottawa, ON

Return Period	Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	4.62	96.06	11180	11180	**100.00**	4.62	4.62	0.00	100.00
2-M	0.17	9.90	92.86	24416	24416	**99.75**	9.90	9.90	0.00	100.00
3-M	0.25	14.25	90.21	35536	35536	**98.17**	14.25	14.25	0.00	100.00
4-M	0.33	18.20	87.81	45733	45733	**95.04**	18.20	18.20	0.00	100.00
5-M	0.42	21.25	85.95	53703	53703	**90.91**	21.25	21.25	0.00	100.00
6-M	0.50	24.29	84.10	61672	61672	**86.47**	24.29	24.29	0.00	100.00
7-M	0.58	26.57	82.71	67731	67731	**82.01**	26.57	26.57	0.00	100.00
8-M	0.67	28.84	81.32	73789	73789	**77.67**	28.84	28.84	0.00	100.00
9-M	0.75	31.12	79.93	79847	79847	**73.64**	31.12	31.12	0.00	100.00
10-M	0.83	37.02	74.79	89425	96088	**69.90**	37.02	31.15	5.87	94.82
11-M	0.92	42.92	69.66	99003	112328	**66.40**	42.92	31.15	11.77	89.64
1-Yr	1	48.82	64.53	108581	128569	**63.21**	48.82	31.15	17.67	84.45
2-Yr	2	51.10	62.83	111397	135063	**39.35**	51.10	31.15	19.95	82.48
5-Yr	5	57.56	58.44	118746	153633	**18.13**	57.56	31.15	26.41	77.29
10-Yr	10	61.07	56.27	122421	163912	**9.52**	61.07	31.15	29.93	74.69
25-Yr	25	63.81	54.68	125164	171993	**3.92**	63.81	31.15	32.66	72.77
50-Yr	50	65.48	53.75	126776	176958	**1.98**	65.48	31.15	34.34	71.64
100-Yr	100	67.51	52.65	128663	183032	**1.00**	67.51	31.15	36.37	70.30

Average Annual TSS Removal Efficiency [%]: **81.1** Ave. Ann. T. Volume [%]: **96.54%**

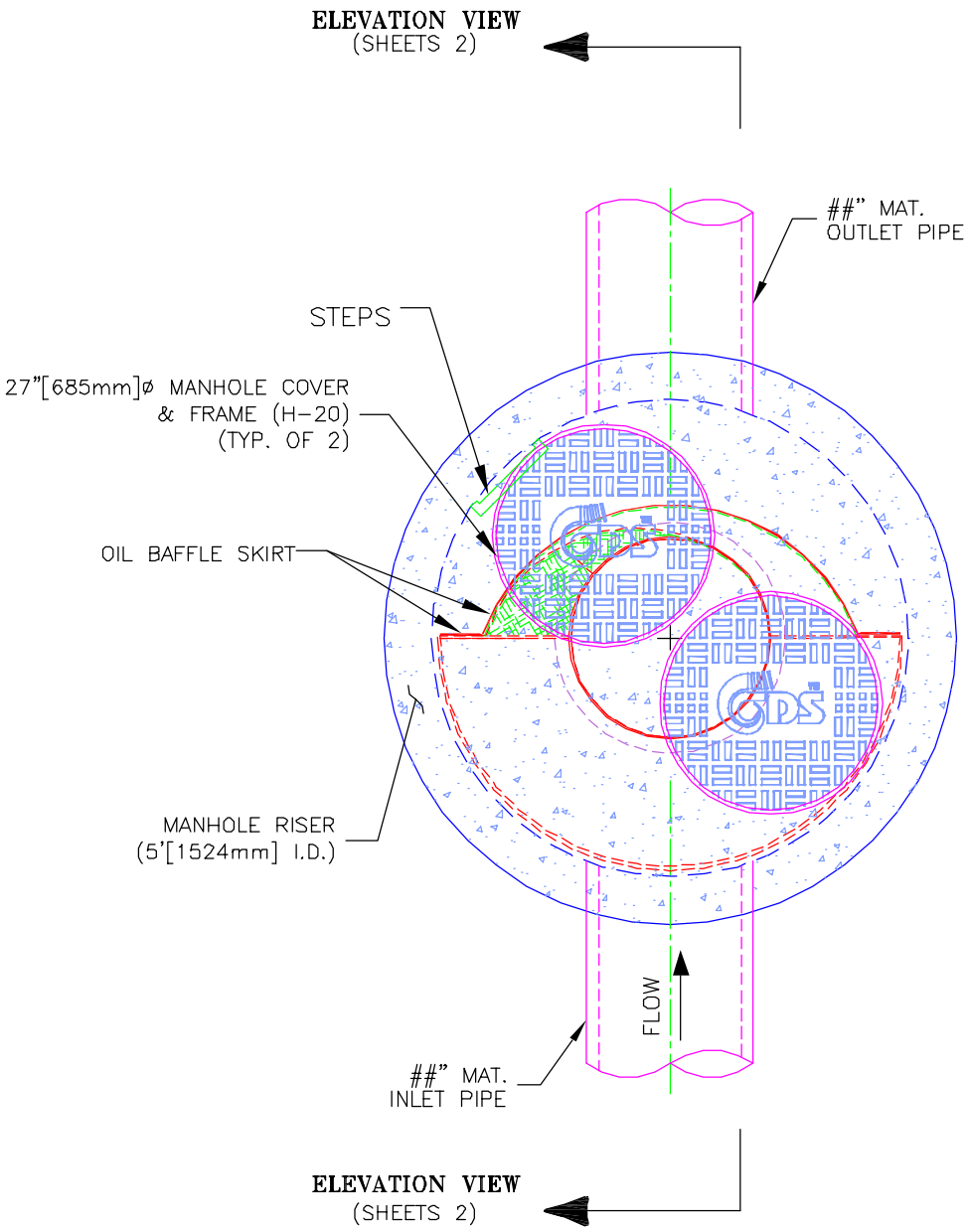
1 - CDS Efficiency based on testing conducted at the University of Central Florida

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

ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES

PLAN VIEW

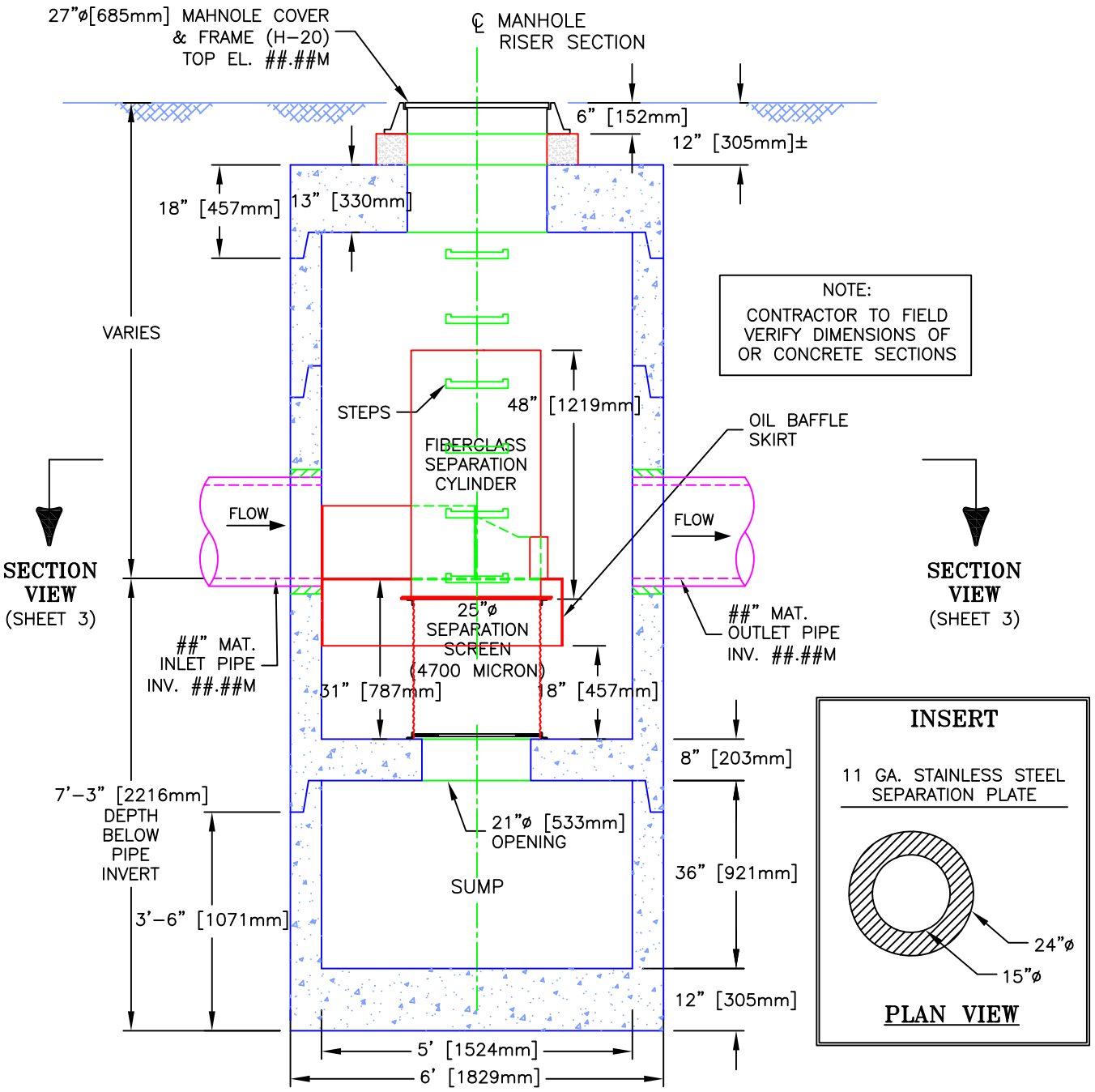


MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY
STORM WATER TREATMENT UNIT

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

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

ELEVATION VIEW



MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2.5'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

INLINE
HYDRAULIC CALCULATIONS

30 Frank Nighbour Place
Ottawa,ON
OGS

DESIGN PARAMETERS

CDS Model No. =	CDS2020-5	
Design Treatment Flow =	1.1	cfs
Peak Design Flow =	2.35	cfs
Peak Design Return Interval =	100	year
Rim Elevation @ US Structure	311.02	ft

DETAILED CALCULATIONS

TREATMENT FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = 304.23 ft (invert plus depth of flow at D/S outlet)

Exit Loss from DownStream Pipe, h_1

$$h_1 = k * [V^2 / (2*g)]$$

where,

k = 1.00

V = Q / A_F

= 2.31 fps

h_1 = 0.08 ft

$EGL_1 = EL_0 + h_1$

= 304.31 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$$h_2 = S_{EGL} * L$$

where,

L = 19.685 ft

$$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$$

where,

Pipe Characteristics

Dia. =	18	in
S_{PIPE} =	0.0020	ft/ft
n =	0.012	

Flow Characteristics

d_F =	0.47	ft
A_F =	0.48	sf
P_W =	1.79	ft
R =	0.27	ft

Head Loss Through Downstream Pipe, h_2 (cont.'d)

S_{EGL} = 0.00201 ft / ft

h_2 = 0.0395 ft

EGL_2' = $EGL_1 + h_2$
= 304.35 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 304.04 ft

d_c = 0.40 ft

EGL_C = $EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$
= 304.57 ft

Identify Controling EGL

Friction based EGL controls.
EGL_2 = 304.35 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,
k = 0.20
V = Q / A
= 2.31 fps (area based on flow depth)

h_3 = 0.02 ft

EGL_3' = $EGL_2 + h_3$
= 304.37 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,
k = 1.00
A_{Baffle} = **3.12** sf
V = Q / Abaffle
= 0.35 fps

h_4 = 0.0019 ft

EGL_4 = $EGL_3 + h_4$
= 304.37 ft

Check Standard Weir Elevation

HL_{CDS} = 0.42 ft

EL_W' = $EGL_4 + HL_{CDS}$
= 304.79 ft

H_W' = $EL_W' - EL_{CDS\ INV.}$
= 0.76 ft, or 9.09 in

Std. Weir Height = 14.0 in
Status **OK**

Use H_W = **14** in, or 1.17 ft

EL_W = $EL_{CDS\ INV.} + H_W$
= 305.21 ft

PEAK CONVEYANCE FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = **308.46** ft (invert plus depth of flow at D/S outlet)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

V = Q / A_F

= 1.33 fps

h_1 = 0.03 ft

$EGL_1 = EL_0 + h_1$

= 308.49 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 19.685 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 18 in

S_{PIPE} = 0.0020 ft/ft

n = 0.012

Flow Characteristics

d_n = 1.50 ft

A_F = 1.77 sf

P_W = 4.71 ft

R = 0.37 ft

S_{EGL} = 0.0004 ft / ft

h_2 = 0.01 ft

$EGL_2' = EGL_1 + h_2$

= 308.50 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 304.04 ft

d_c = 0.58 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 304.83 ft

Identify Controling EGL

Friction based EGL controls.

EGL_2 = 308.50 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

$k =$ 0.20

$V = Q / A_F$

$=$ 1.33 fps (area based on flow depth)

$h_3 =$ 0.01 ft

$EGL_3 = EGL_2 + h_3$

$=$ 308.51 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,

$k =$ 0.00 (Skirted-baffle model)

$A_{Baffle} =$ 3.12 sf

$V = Q / A_{Baffle}$

$=$ 0.75 fps

$h_4 =$ 0.00 ft

$EGL_4 = EGL_3 + h_4$

$=$ 308.51 ft

$HGL_4 = EGL_4 - [V_P^2 / (2*g)]$

$=$ 308.48 ft

Head over Diversion Weir, h_5

Elevation of Weir

$EL_{Weir} =$ 305.21 ft (established above)

Headloss for Free Discharge Condition

$h_{5a} = [Q / (C * L)]^{2/3}$

where,

$C =$ 3.1

$L =$ 2.96 ft

$h_{5a} =$ 0.40 ft

$EGL_{5a} = EL_{Weir} + h_{5a}$

$=$ 305.61 ft

Headloss for Submerged Condition

$d_{Sub} =$ 3.27 ft (depth of submergence)

$h_{5b} =$ 0.00 ft (separate submerged weir calc.)

$EGL_{5b} = EGL_4 + h_{5b}$

$=$ 308.51 ft

Identify EGL U/S of Weir

The discharge condition is Submerged, therefore

$EGL_5 =$ 308.51 ft

Expansion Loss from U/S Pipe, h_6

$h_6 = k * [V^2 / (2*g)]$

where,

$k =$ 0.30

$V = Q / A_F$

$=$ 6.73 fps

$h_6 =$ 0.21 ft

$EGL_6 = EGL_5 + h_6$

$=$ 308.72 ft

Head Loss Through Upstream Pipe, h_7

Friction Losses, h_7

$h_7 = S_{EGL} * L$

where,

$L =$ 18.3727 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 8 in

$S_{PIPE} =$ 0.0025 ft/ft

$n =$ 0.012

Flow Characteristics

$d_n =$ 0.67 ft

$A_F =$ 0.35 sf

$P_W =$ 2.09 ft

$R =$ 0.17 ft

$S_{EGL} =$ 0.0321 ft / ft

$h_7 =$ 0.59 ft

$EGL_7' = EGL_6 + h_7$

$=$ 309.31 ft

Check Entrance Condition for Critical Depth Control

$EL_{U/S\ Inv.} =$ 304.08 ft

$d_c =$ 0.67 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

$=$ 305.50 ft

Identify Controling EGL

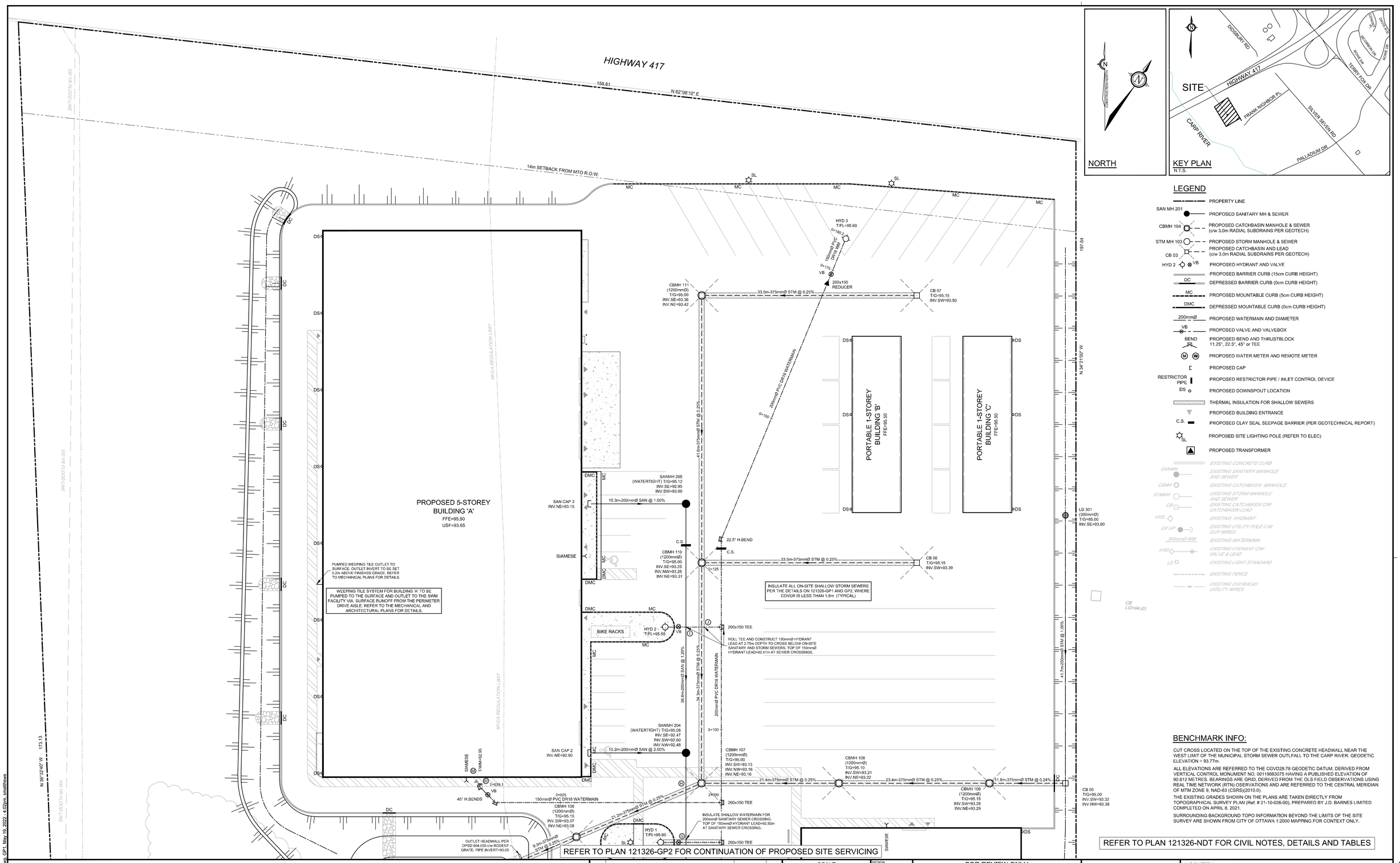
Friction based EGL controls.

$EGL_7 =$ 309.31 ft

$HGL_7 = EGL_7 - [V^2 / (2*g)]$

$=$ 308.60 ft

Freeboard = 2.42 ft (at first upstream structure)



LEGEND

- PROPERTY LINE
- SAN MH 201 — PROPOSED SANITARY MH & SEWER
- CBMH 104 — PROPOSED CATCHBASIN MANHOLE & SEWER (c/w 3.0m RADIAL SUBDRAINS PER GEOTECH)
- STM MH 103 — PROPOSED STORM MANHOLE & SEWER
- CB 03 — PROPOSED CATCHBASIN AND LEAD (c/w 3.0m RADIAL SUBDRAINS PER GEOTECH)
- HYD 2 — VB — PROPOSED HYDRANT AND VALVE
- PROPOSED BARRIER CURB (15cm CURB HEIGHT)
- DC — DEPRESSED BARRIER CURB (0cm CURB HEIGHT)
- MC — PROPOSED MOUNTABLE CURB (5cm CURB HEIGHT)
- DMC — DEPRESSED MOUNTABLE CURB (0cm CURB HEIGHT)
- 200mmØ — PROPOSED WATERMAIN AND DIAMETER
- VB — PROPOSED VALVE AND VALVEBOX
- BEND — PROPOSED BEND AND THRUSTBLOCK 11.25°, 22.5°, 45° or TEE
- M — RM — PROPOSED WATER METER AND REMOTE METER
- PROPOSED CAP
- RESTRICTOR PIPE — PROPOSED RESTRICTOR PIPE / INLET CONTROL DEVICE
- DS — PROPOSED DOWNSPOUT LOCATION
- THERMAL INSULATION FOR SHALLOW SEWERS
- PROPOSED BUILDING ENTRANCE
- C.S. — PROPOSED CLAY SEAL SEEPAGE BARRIER (PER GEOTECHNICAL REPORT)
- SL — PROPOSED SITE LIGHTING POLE (REFER TO ELEC)
- PROPOSED TRANSFORMER
- EXISTING CONCRETE CURB
- SANMH — EXISTING SANITARY MANHOLE AND SEWER
- CBMH — EXISTING CATCHBASIN MANHOLE
- STMMH — EXISTING STORM MANHOLE AND SEWER
- CB — EXISTING CATCHBASIN C/W CATCHBASIN LEAD
- HYD — EXISTING HYDRANT
- EX UP — EXISTING UTILITY POLE C/W GUY WIRES
- 300mmØ WM — EXISTING WATERMAIN
- HYD — EXISTING HYDRANT C/W VALVE & LEAD
- LS — EXISTING LIGHT STANDARD
- EXISTING FENCE
- OHW — EXISTING OVERHEAD UTILITY WIRES

BENCHMARK INFO:

CUT CROSS LOCATED ON THE TOP OF THE EXISTING CONCRETE HEADWALL NEAR THE WEST LIMIT OF THE MUNICIPAL STORM SEWER OUTLFALL TO THE CARP RIVER. GEODETIC ELEVATION = 93.77m.

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REFER TO PLAN 121326-NDT FOR CIVIL NOTES, DETAILS AND TABLES

REFER TO PLAN 121326-GP2 FOR CONTINUATION OF PROPOSED SITE SERVICING

NOTE:
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OWNER INFORMATION
U-HAUL CANADA
3636 INNES ROAD
OTTAWA, ONTARIO, K1C 1T1
DAVID POLLOCK
PHONE: 1-602-263-6555
david_pollock@uhaul.com

No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPROVAL	MAY 20/22	FST

SCALE: 1:250 (1:250, 0 2 4 6 8 10)

DESIGN: SM / FST
CHECKED: FST
DRAWN: SM
CHECKED: SM / FST
APPROVED: FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — F.S. THAUVETTE — 100041399 — MAY 20, 2022 — PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
30 FRANK NIGHBOR PLACE: U-HAUL SITE

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 121326
REV REV # 1
DRAWING No. 121326-GP1

D07-12-22-____

Plan #____

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PLAN24x36.DWG - 914.4mmx609.6mm

BENCHMARK INFO:

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SCALE 1:250

DESIGN	SM / FST
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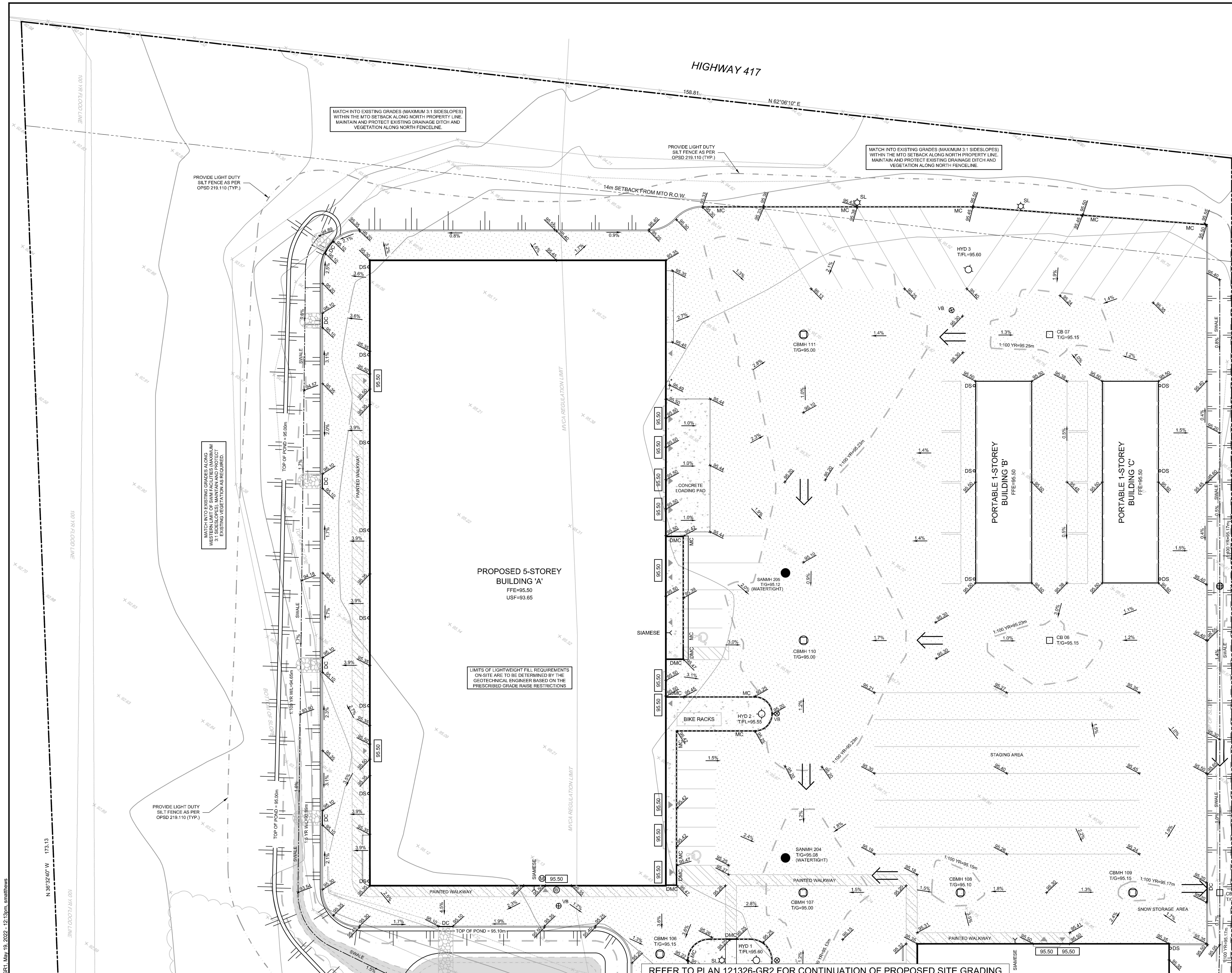
LOCATION
CITY OF OTTAWA
30 FRANK NIGHBOR PLACE: U-HAUL SITE

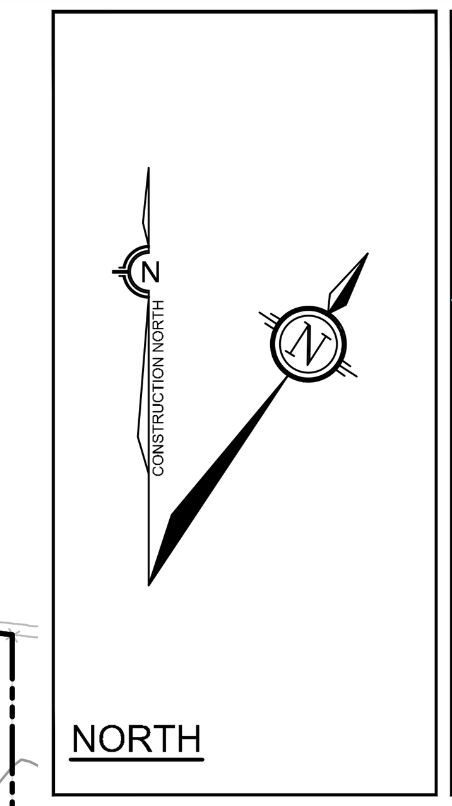
DRAWING NAME
GENERAL PLAN OF SERVICES

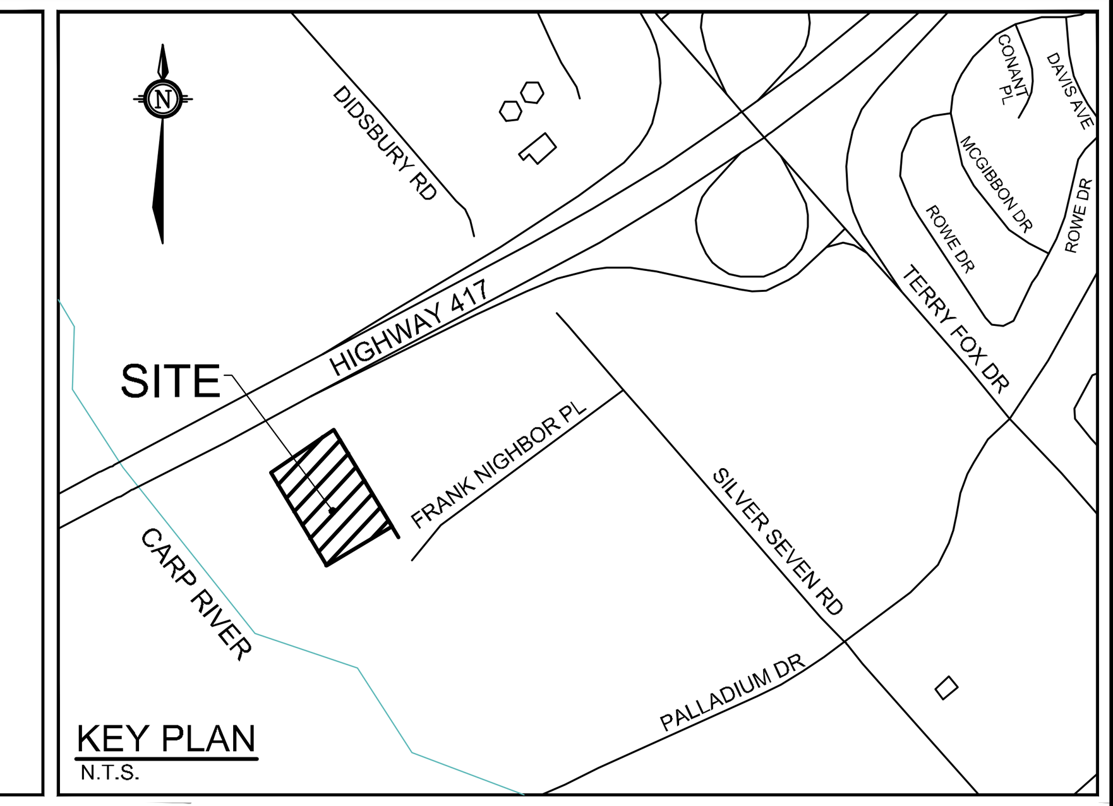
PROJECT No. 121326
REV: REV # 1
DRAWING No. 121326-GP2

D07-12-22-____

Plan #_____







LEGEND

	PROPERTY LINE
95.50 / 95.16	PROPOSED ELEVATION / EXISTING ELEVATION
× 95.28	EXISTING ELEVATION
94.65(S)	PROPOSED SWALE ELEVATION
95.20T/C	PROPOSED TOP OF CURB ELEVATION
95.50	PROPOSED TERRACE ELEVATION
2.0%	GRADE AND DIRECTION
	MAXIMUM 3:1 SIDESLOPE
	EMERGENCY OVERLAND FLOW ROUTE
SAN MH 201	PROPOSED SANITARY MANHOLE
	PROPOSED BUILDING ENTRANCE
	PROPOSED SILT FENCING (OPSD 219.110)
CBMH 104	PROPOSED CATCHBASIN MANHOLE
STM MH 103	PROPOSED STORM MANHOLE
CB 03	PROPOSED CATCHBASIN
HYD 2 VVB	PROPOSED HYDRANT AND VALVE
	PROPOSED BARRIER CURB (15cm CURB HEIGHT)
DC	DEPRESSED BARRIER CURB (0cm CURB HEIGHT)
MC	PROPOSED MOUNTABLE CURB (5cm CURB HEIGHT)
DMC	DEPRESSED MOUNTABLE CURB (0cm CURB HEIGHT)
RESTRICTOR PIPE	RESTRICTOR PIPE / INLET CONTROL DEVICE
DS	PROPOSED DOWNSPOUT LOCATION
FFE=95.50	PROPOSED FINISHED FLOOR ELEVATION
USF=93.65	PROPOSED UNDERSIDE OF FOOTING ELEVATION
SL	PROPOSED SITE LIGHTING POLE (REFER TO ELEC)
M M	PROPOSED MUD MAT / CONSTRUCTION ENTRANCE
1:5 YR / 1:100 YR	APPROXIMATE PONDING LIMITS
	EXISTING CONCRETE CURB
SANMH	EXISTING SANITARY MANHOLE
CBMH	EXISTING CATCHBASIN MANHOLE
STMMH	EXISTING STORM MANHOLE
CB	EXISTING CATCHBASIN
	EXISTING TREES / VEGETATION
EX UP	EXISTING UTILITY POLE C/W GUY WIRES
	EXISTING FENCE
	EXISTING LIGHT STANDARD

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M:\2021\121326\CAD\Design\121326-GR.dwg, GR1, May 19, 2022 - 12:13pm, smathews

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No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPROVAL	MAY 20/22	FST

SCALE 1:250

1:250 — 0 2 4 6 8 10

DESIGN	SM / FST
CHECKED	FST
DRAWN	SM
CHECKED	SM / FST
APPROVED	FST

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LOCATION
CITY OF OTTAWA
30 FRANK NIGHBOR PLACE: U-HAUL SITE

DRAWING NAME
GRADING AND EROSION & SEDIMENT CONTROL PLAN

PROJECT No. 121326
REV REV # 1
DRAWING No. 121326-GR1

D07-12-22-

PLAN24x36.DWG - 914.4mmx609.6mm

Plan #_____

LEGEND

- PROPERTY LINE
- PROPOSED ELEVATION / EXISTING ELEVATION
- EXISTING ELEVATION
- PROPOSED SWALE ELEVATION
- PROPOSED TOP OF CURB ELEVATION
- PROPOSED TERRACE ELEVATION
- GRADE AND DIRECTION
- MAXIMUM 3:1 SIDESLOPE
- EMERGENCY OVERLAND FLOW ROUTE
- SAN MH 201 — PROPOSED SANITARY MANHOLE
- PROPOSED BUILDING ENTRANCE
- PROPOSED SILT FENCING (OPSD 219.110)
- CBMH 104 — PROPOSED CATCHBASIN MANHOLE
- STM MH 103 — PROPOSED STORM MANHOLE
- CB 03 — PROPOSED CATCHBASIN
- HYD 2 VVB — PROPOSED HYDRANT AND VALVE
- PROPOSED BARRIER CURB (15cm CURB HEIGHT)
- DC — DEPRESSED BARRIER CURB (0cm CURB HEIGHT)
- MC — PROPOSED MOUNTABLE CURB (5cm CURB HEIGHT)
- DMC — DEPRESSED MOUNTABLE CURB (0cm CURB HEIGHT)
- RESTRICTOR PIPE — RESTRICTOR PIPE / INLET CONTROL DEVICE
- DS — PROPOSED DOWNSPOUT LOCATION
- FFE=95.50 — PROPOSED FINISHED FLOOR ELEVATION
- USF=93.65 — PROPOSED UNDERSIDE OF FOOTING ELEVATION
- SL — PROPOSED SITE LIGHTING POLE (REFER TO ELEC)
- M M — PROPOSED MUD MAT / CONSTRUCTION ENTRANCE
- 1:5 YR / 1:100 YR — APPROXIMATE PONDING LIMITS
- EXISTING CONCRETE CURB
- SANMH — EXISTING SANITARY MANHOLE
- CBMH — EXISTING CATCHBASIN MANHOLE
- STMMH — EXISTING STORM MANHOLE
- CB — EXISTING CATCHBASIN
- EXISTING TREES / VEGETATION
- EX UP — EXISTING UTILITY POLE C/W GUY WIRES
- EXISTING FENCE
- EXISTING LIGHT STANDARD

BENCHMARK INFO:

CUT CROSS LOCATED ON THE TOP OF THE EXISTING CONCRETE HEADWALL NEAR THE WEST LIMIT OF THE MUNICIPAL STORM SEWER OUTFALL TO THE CARP RIVER. GEODETIC ELEVATION = 93.77m.

ALL ELEVATIONS ARE REFERRED TO THE CGVD28:78 GEODETIC DATUM, DERIVED FROM VERTICAL CONTROL MONUMENT NO. 00119883075 HAVING A PUBLISHED ELEVATION OF 90.612 METRES. BEARINGS ARE GRID, DERIVED FROM THE OLS FIELD OBSERVATIONS USING REAL TIME NETWORK (RTN) OSERVATIONS AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9, NAD-83 (CSRS)(2010.0).

THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM TOPOGRAPHICAL SURVEY PLAN (Ref. # 21-10-026-00), PREPARED BY J.D. BARNES LIMITED COMPLETED ON APRIL 8, 2021.

SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:2000 MAPPING FOR CONTEXT ONLY.

REFER TO PLAN 121326-NDT FOR CIVIL NOTES, DETAILS AND TABLES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

OWNER INFORMATION
U-HAUL CANADA
3636 INNES ROAD
OTTAWA, ONTARIO, K1C 1T1
DAVID POLLOCK
PHONE: 1-602-263-6555
david_pollock@uhaul.com

No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPROVAL	MAY 20/22	FST

SCALE		
1:250	DESIGN	SM / FST
	CHECKED	FST
	DRAWN	SM
1:250 (0 2 4 6 8 10)	CHECKED	SM / FST
	APPROVED	FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
MAY 20, 2022
PROVINCE OF ONTARIO

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Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
30 FRANK NIGHBOR PLACE: U-HAUL SITE

DRAWING NAME
GRADING AND EROSION & SEDIMENT CONTROL PLAN

PROJECT No. 121326
REV: REV # 1
DRAWING No. 121326-GR2

PLAN24x36.DWG - 914.4mmx609.6mm

Plan #_____

D07-12-22-_____

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. COMPLETE ALL WORKS IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS USING THE CURRENT GUIDELINES, BYLAWS AND STANDARDS INCLUDING MATERIALS OF CONSTRUCTION, DISINFECTION AND ALL RELEVANT REFERENCES TO OPSS, OPSD & AWWA GUIDELINES - ALL CURRENT VERSIONS AND 'AS AMENDED'.
6. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
7. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
8. ALL ELEVATIONS ARE GEODETIC.
9. REFER TO GEOTECHNICAL REPORT (NO. PG6153-1 REVISION 1, DATED APRIL 28, 2022), PREPARED BY PATERSON GROUP INC., FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
10. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
11. REFER TO THE DEVELOPMENT SERVICING STUDY & STORMWATER MANAGEMENT REPORT (R-2022-014) PREPARED BY NOVATECH.
12. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
13. PROVIDE LINE / PARKING PAINTING AS REQUIRED PER THE ARCHITECTURAL SITE PLAN.

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED BUILDING PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
7. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
8. CONCRETE BARRIER CURBS ARE TO BE CONSTRUCTED PER CITY OF OTTAWA STANDARDS (SC1.1) AT A HEIGHT OF 150mm AND ALL DEPRESSIONS ARE TO BE CONSTRUCTED FLUSH (AT 0mm HEIGHT).
9. CONCRETE MOUNTABLE CURBS ARE TO BE CONSTRUCTED PER CITY OF OTTAWA STANDARD (SC1.3) AT A HEIGHT OF 50mm AND ALL DEPRESSIONS ARE TO BE CONSTRUCTED FLUSH (AT 0mm HEIGHT).
10. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
11. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN.

EROSION AND SEDIMENT CONTROL NOTES :

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF OTTAWA. THEY ARE TO BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED DURING CONSTRUCTION IN ACCORDANCE WITH THE "GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES" (GOVERNMENT OF ONTARIO, MAY 1987). THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEETING ALL REGULATORY AGENCY REQUIREMENTS.
3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER CLOTH WILL BE PLACED UNDER GRATES OF NEARBY CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. TO LIMIT EROSION: MINIMIZE THE AMOUNT OF EXPOSED SOILS AT ANY GIVEN TIME, RE-VEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE AND PROTECT EXPOSED SLOPES WITH NATURAL OR SYNTHETIC MULCHES.
5. FOR MATERIAL STOCKPILING: MINIMIZE THE AMOUNT OF EXPOSED MATERIALS AT ANY GIVEN TIME; APPLY TEMPORARY SEEDING, TARPS, COMPACTION AND/OR SURFACE ROUGHENING AS REQUIRED TO STABILIZE STOCKPILED MATERIALS THAT WILL NOT BE USED WITHIN 14 DAYS.
6. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY STORM SEWER SYSTEM. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
8. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
9. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE ENGINEER AND/OR THE MUNICIPALITY.
10. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS. MONITOR DUST LEVELS DURING SITE PREPARATION/EXCAVATION, AND CONSTRUCTION ACTIVITIES, AND WHEN DUST LEVELS BECOME VISUALLY APPARENT SPRAY WATER TO MINIMIZE THE RELEASE OF DUST FROM GRAVEL, PAVED AREAS AND EXPOSED SOILS. USE CHEMICAL DUST SUPPRESSANTS ONLY WHERE NECESSARY ON PROBLEM AREAS.

PAVEMENT STRUCTURES:

LIGHT DUTY (NEW PAVEMENT)
50mm HL3 or SUPERPAVE 12.5
150mm GRANULAR "A"
300mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34
*INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY (NEW PAVEMENT)
40mm HL3 or SUPERPAVE 12.5
50mm HL8 or SUPERPAVE 19.0
150mm GRANULAR "A"
450mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34
* INSTALLED PER GEOTECHNICAL REPORT

Erosion and Sediment Control Responsibilities:

	ESC Measure	Symbol	Specification	During Construction: Installation Responsibility	During Construction: Inspection/Maintenance Responsibility	During Construction: Inspection Frequency	After Construction Prior to Final Acceptance: Approval to Remove	After Construction Prior to Final Acceptance: Removal Responsibility	After Final Acceptance: Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence		OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Fabric	Location as Indicated in ESC Note #3	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	MM	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Dust Control	Location as Required Around Site	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Required by Contractor	---	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A

BENCHMARK INFO:

CUT CROSS LOCATED ON THE TOP OF THE EXISTING CONCRETE HEADWALL NEAR THE WEST LIMIT OF THE MUNICIPAL STORM SEWER OUTLFALL TO THE CARP RIVER. GEODETIC ELEVATION = 93.77m.

ALL ELEVATIONS ARE REFERRED TO THE CGVD28:78 GEODETIC DATUM, DERIVED FROM VERTICAL CONTROL MONUMENT NO. 00119883075 HAVING A PUBLISHED ELEVATION OF 90.612 METRES. BEARINGS ARE GRID, DERIVED FROM THE OLS FIELD OBSERVATIONS USING REAL TIME NETWORK (RTN) OBSERVATIONS AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9, NAD-83 (CSRS)(2010.0).

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SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:2000 MAPPING FOR CONTEXT ONLY.

SEWER NOTES:

1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS - ALL CURRENT VERSIONS AND 'AS AMENDED'.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
CATCHBASIN (600x600mm)	705.010	OPSD
STORM / SANITARY MANHOLE (1200mmØ)	701.010	OPSD
CB, FRAME & COVER	400.020	OPSD
SANITARY MH FRAME & COVER	401.010 - TYPE "A"	OPSD
STORM / CBMH MANHOLE FRAME AND COVER	401.010 - TYPE "B"	OPSD
WATERTIGHT MH FRAME AND COVER	401.030	OPSD
LANDSCAPE DRAIN (ELBOW, COVER & PIPE)	S29 / S31	CITY OF OTTAWA
SEWER TRENCH	S6	CITY OF OTTAWA

STORM SEWER PVC DR 35
SANITARY SEWER PVC DR 35
CATCHBASIN LEAD PVC DR 35

3. ALL STORM AND SANITARY SERVICE LATERALS SHALL BE EQUIPPED WITH BACKFLOW PREVENTION DEVICES AS PER THE CITY OF OTTAWA STANDARD DETAILS S14 AND S14.1 OR S14.2.
4. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.8m COVER WITH HI-40 INSULATION PER INSULATION DETAIL FOR SHALLOW SEWERS. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
5. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0%.
6. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
7. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
8. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
9. ALL STORM MANHOLES AND CATCHBASIN MANHOLES ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED. ALL CATCHBASINS ARE TO HAVE 600mm SUMPS.
10. ALL CATCHBASINS, MANHOLES AND/OR CATCHBASIN MANHOLES THAT ARE TO HAVE ICD'S INSTALLED WITHIN THEM ARE TO HAVE 600mm SUMPS.
11. ALL WEEPING TILE SYSTEMS ARE TO BE PUMPED TO THE SURFACE AS INDICATED ON THE GENERAL PLAN OF SERVICES DRAWING. REFER TO MECHANICAL PLANS FOR DETAILS.
12. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES.
13. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, T/WM ELEVATIONS AND ANY ALIGNMENT CHANGES, ETC.

CRITICAL SEWER PIPE CROSSING TABLE

CROSSING	LOWER PIPE	HIGHER PIPE	CLEARANCE	SURFACE ELEVATION
A	300mmØ T/WM=91.24	200mmØ STM INV=93.14	± 1.9m	94.72 m
B	450mmØ SAN OBV=91.65	200mmØ STM INV=93.11	± 1.5m	94.87 m
C	200mmØ SAN OBV=91.51	1050mmØ U/S STM=92.01	± 0.5m	94.96 m
D	200mmØ SAN OBV=92.00	375mmØ STM INV=93.08	± 1.1m	94.82 m
E	200mmØ SAN OBV=92.61	375mmØ STM INV=93.29	± 0.7m	95.12 m
F	200mmØ SAN OBV=92.09	375mmØ STM INV=92.97	± 0.9m	95.18 m
G	200mmØ SAN OBV=92.52	150mmØ U/S WM=92.77	± 0.25m	95.20 m
H	200mmØ SAN OBV=92.61	375mmØ STM INV=93.12	± 0.5m	95.06 m
I	150mmØ T/WM=92.41	375mmØ STM INV=93.23	± 0.8m	95.12 m
J	150mmØ T/WM=92.41	200mmØ SAN INV=92.71	± 0.3m	95.17 m

✱ SEE 121326-GP1 AND 121326-GP2 PLANS FOR SEWER CROSSING LOCATIONS ON-SITE

WATERMAIN NOTES:

1. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS - ALL CURRENT VERSIONS AND 'AS AMENDED'. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY THE CONTRACTOR IN THE PRESENCE CITY OF OTTAWA FORCES.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
HYDRANT INSTALLATION	W19	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
THERMAL INSULATION AT OPEN STRUCTURES	W23	CITY OF OTTAWA
VALVE BOX ASSEMBLY	W24	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER	W25	CITY OF OTTAWA
WATERMAIN CROSSING OVER SEWER	W25.2	CITY OF OTTAWA

WATERMAIN PVC DR 18

3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE, UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.5m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS, UNLESS OTHERWISE INDICATED.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED.

U-HAUL SITE FLOWS & STORMWATER MANAGEMENT TABLE

DESIGN EVENT	PRE-DEVELOPMENT CONDITIONS: UNCONTROLLED FLOW (L/s)	ALLOWABLE RELEASE RATE (L/s)	POST-DEVELOPMENT CONDITIONS: DIRECT RUNOFF (L/s)	A-1 to A-19 FLOW (L/s)	R-1 FLOW (L/s)	TOTAL FLOW (L/s)	REDUCTION IN FLOW (L/s or %)*
1:2 YR	92.1	107.9	0.1	53.8	17.7	71.5	20.6 or 22%
1:5 YR	125.0			61.0	24.9	85.9	39.0 or 31%
1:100 YR	267.7			71.1	31.1	102.2	165.4 or 62%

* REDUCED FLOW COMPARED TO PRE-DEVELOPMENT UNCONTROLLED CONDITIONS

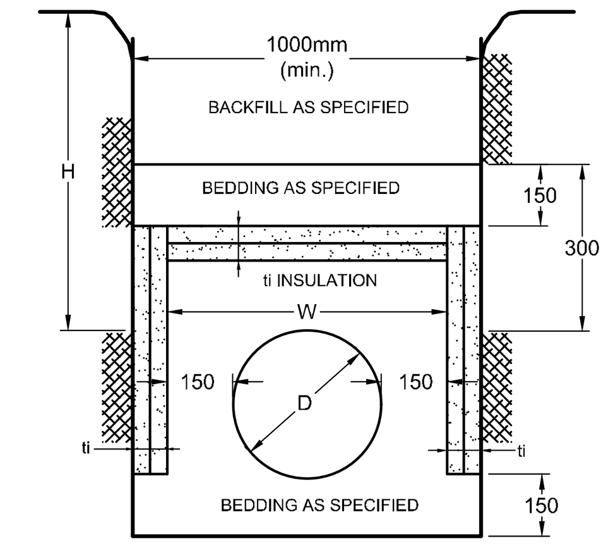
AREA A-1 to A-19: RESTRICTOR PIPE DATA - CBMH 101

DESIGN EVENT	DIAMETER OF RESTRICTOR PIPE (mm)	DIAMETER OF OUTLET PIPE (mm)	DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)
1:2 YR	200mmØ RINGTIGHT (NOMINAL PIPE SIZE)	200	53.8	0.76	93.63	486.9
1:5 YR			61.0	1.02	93.89	788.0
1:100 YR			71.1	1.78	94.65	1813.0

* RESTRICTOR PIPE TO BE IPEX 'RING TIGHT' PVC DR35 PIPE ONLY - SIZE = 8" NOMINAL DIAMETER FOR RESTRICTOR PIPE AS THE OUTLET PIPE FROM CBMH 101.

AREA R-1: ICD TABLE - CB 08

DESIGN EVENT	TYPE OF ICD	DIAMETER OF OUTLET PIPE (mm)	DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER DEPTH (m)	VOLUME (m^3)
1:2 YR	TEMPEST MHF VORTEX 'CUSTOM'	200	17.7	0.24	93.49	0.1
1:5 YR			24.9	0.71	93.96	0.3
1:100 YR			31.1	1.60	94.85	6.2

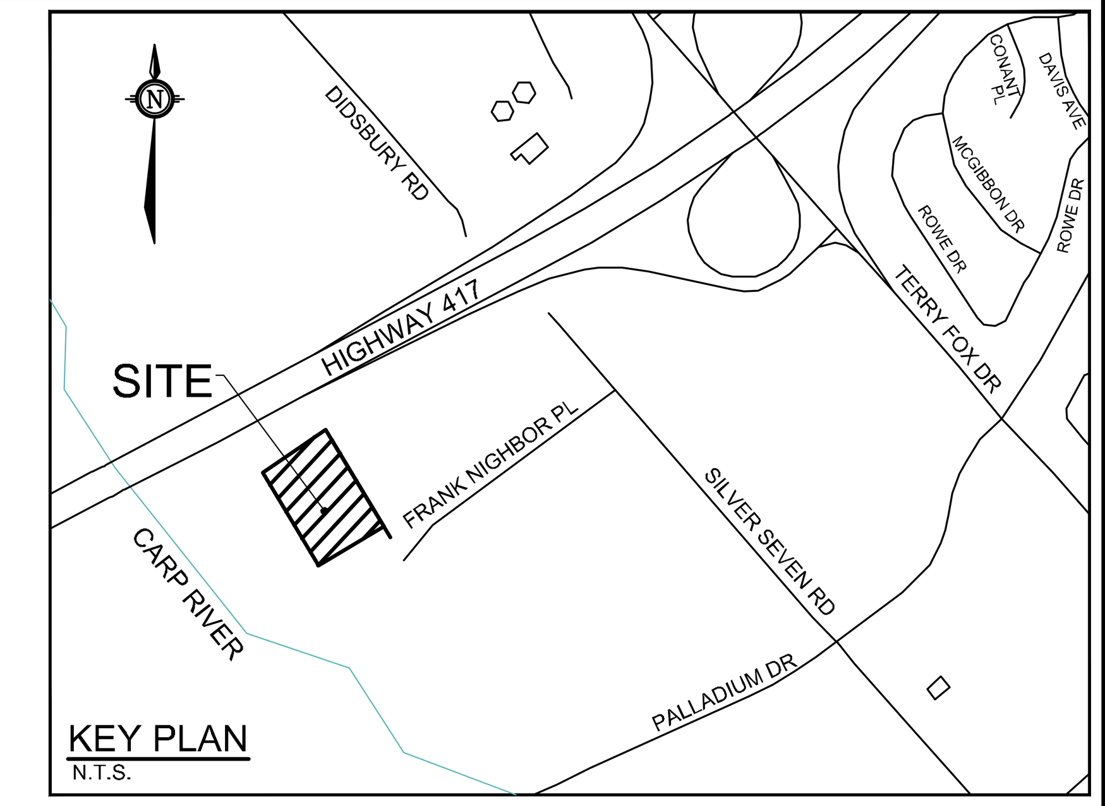


INSULATION DETAIL FOR SHALLOW SEWERS
NOT TO SCALE

INSULATION NOTES:
1. THE THICKNESS OF SEWER INSULATION SHALL BE THE EQUIVALENT OF 25mm FOR EVERY 300mm REDUCTION IN THE REQUIRED DEPTH OF COVER LESS THAN 1800mm (SEE TABLE)

S = THICKNESS OF INSULATION (mm)
H = DEPTH OF COVER
W = D + 300 (1000 min.)
W = WIDTH OF INSULATION (mm)
D = O.D OF PIPE (mm)

COVER (mm)	INSULATION THICKNESS (mm)
1800-1500	50
1500-1200	75
1200-900	100
900-600	125



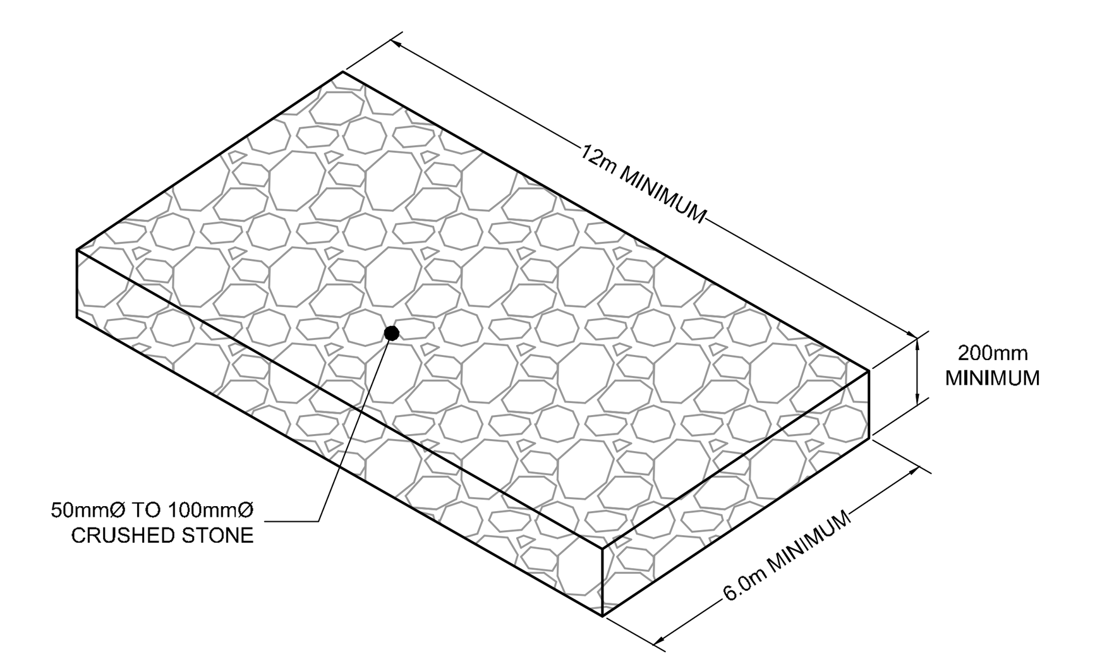
KEY PLAN
N.T.S.

PROPOSED 200mmØ / 150mmØ WATERMAIN TABLE

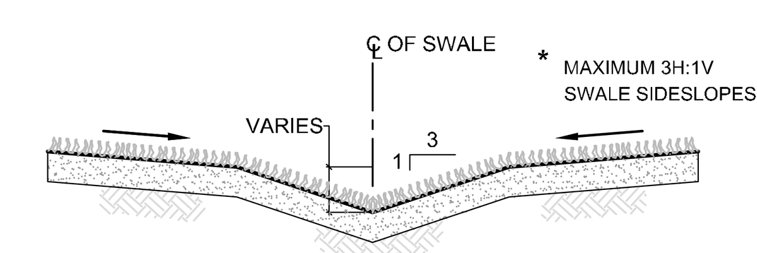
STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
0+000	94.88	91.10± ✱	CONNECTION FROM ABOVE TO EX. 300mmØ WM
0+002.5	94.89	93.64 ✱✱	45° VERTICAL BEND
0+003.3	94.89	93.65 ✱✱	CROSS ABOVE EX. 450Ø SAN (±1.8m CLEARANCE)
0+005.0	94.93	93.67 ✱✱	CROSS BELOW EX. 1050Ø STM (±0.2m CLEARANCE)
0+005.5	94.93	93.67 ✱✱	45° VERTICAL BEND
0+006.1	94.94	93.16 ✱✱	45° VERTICAL BEND
0+006.4	94.95	93.15 ✱✱	200mmØ VALVE AND VALVE BOX
0+007.4	94.96	93.12 ✱✱	11.25° HORIZONTAL BEND
0+025.9	94.86	92.46	CROSS BELOW 375mmØ STM (±0.7m CLEARANCE)
0+027.4	94.90	92.50	CROSS ABOVE 200mmØ SAN (±0.25m CLEARANCE)
0+029.9	94.95	92.55	200 x 200 x 200 TEE FOR BLDG 'D' SERVICE (1+000)
0+050	95.18	92.78	- - -
0+075	95.21	92.81	- - -
0+082.4	95.14	92.74	200 x 200 x 150 TEE FOR HYDRANT No.1
0+088.6	95.08	92.68	200 x 200 x 150 TEE FOR BLDG 'A' SERVICE (2+000)
0+091.6	95.04	92.64	CROSS BELOW 375mmØ STM (±0.5m CLEARANCE)
0+100	95.12	92.62	- - -
0+116.0	95.13	92.41	200 x 200 x 150 TEE FOR HYDRANT No.2
0+126.0	95.04	92.64	CROSS BELOW 375mmØ STM (±0.65m CLEARANCE)
0+129.6	95.07	92.67	22.5° HORIZONTAL BEND
0+150	95.32	92.92	- - -
0+170.7	95.26	92.86	CROSS BELOW 375mmØ STM (±0.6m CLEARANCE)
0+173.2	95.27	92.87	200 x 150 REDUCER
0+174.2	95.30	92.90	150mmØ VALVE AND VALVE BOX
0+180.2	95.41	93.00	FIRE HYDRANT No.3
1+000	94.95	92.55	200 x 200 x 200 TEE FOR BLDG 'D' SERVICE (0+029.9)
1+003.0	95.02	92.62	200mmØ VALVE AND VALVE BOX
1+025	95.27	92.77	- - -
1+026.7	95.29	92.78	CROSS BELOW 375mmØ STM (±0.5m CLEARANCE)
1+033.7	95.33	92.80	45° HORIZONTAL BEND
1+037.1	95.41	92.93	45° HORIZONTAL BEND
1+042.2	95.49	92.95	CAP 1.0m FROM BLDG 'D' FOUNDATION WALL
2+000	95.08	92.68	200 x 200 x 150 TEE FOR BLDG 'A' SERVICE (0+088.6)
2+002.5	95.09	92.67	22.5° VERTICAL BEND
2+004.4	95.10	91.88	22.5° VERTICAL BEND
2+005.5	95.10	91.88	CROSS BELOW 200mmØ SAN (±0.5m CLEARANCE)
2+006.6	95.12	91.88	22.5° VERTICAL BEND
2+008.3	95.18	92.58	22.5° VERTICAL BEND
2+010.1	95.19	92.60	CROSS BELOW 375mmØ STM (±0.5m CLEARANCE)
2+025	95.33	92.93	- - -
2+035.1	95.33	92.93	45° HORIZONTAL BEND
2+036.8	95.35	92.95	150mmØ VALVE AND VALVE BOX
2+038.5	95.45	92.95	45° HORIZONTAL BEND
2+039.1	95.47	92.95	CAP 1.0m FROM BLDG 'A' FOUNDATION WALL

✱ 300mm x 300mm x 200mm CONNECTION TO EXISTING 300mmØ WATERMAIN BY CITY FORCES. EXACT ELEVATION TO BE FIELD DETERMINED.

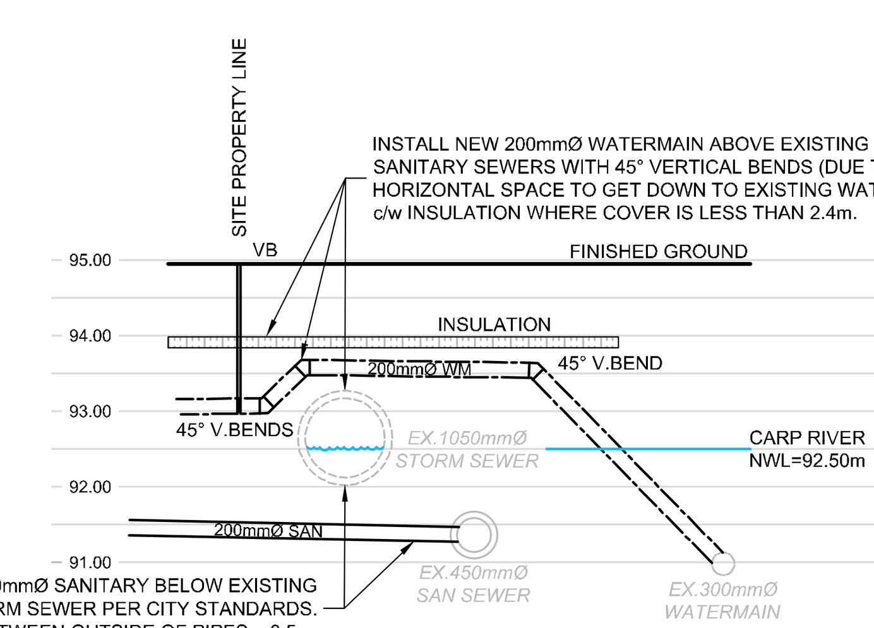
✱✱ PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAIL W22 IN SHALLOW TRENCHES AND/OR CITY OF OTTAWA DETAIL W23 ADJACENT TO OPEN STRUCTURES.



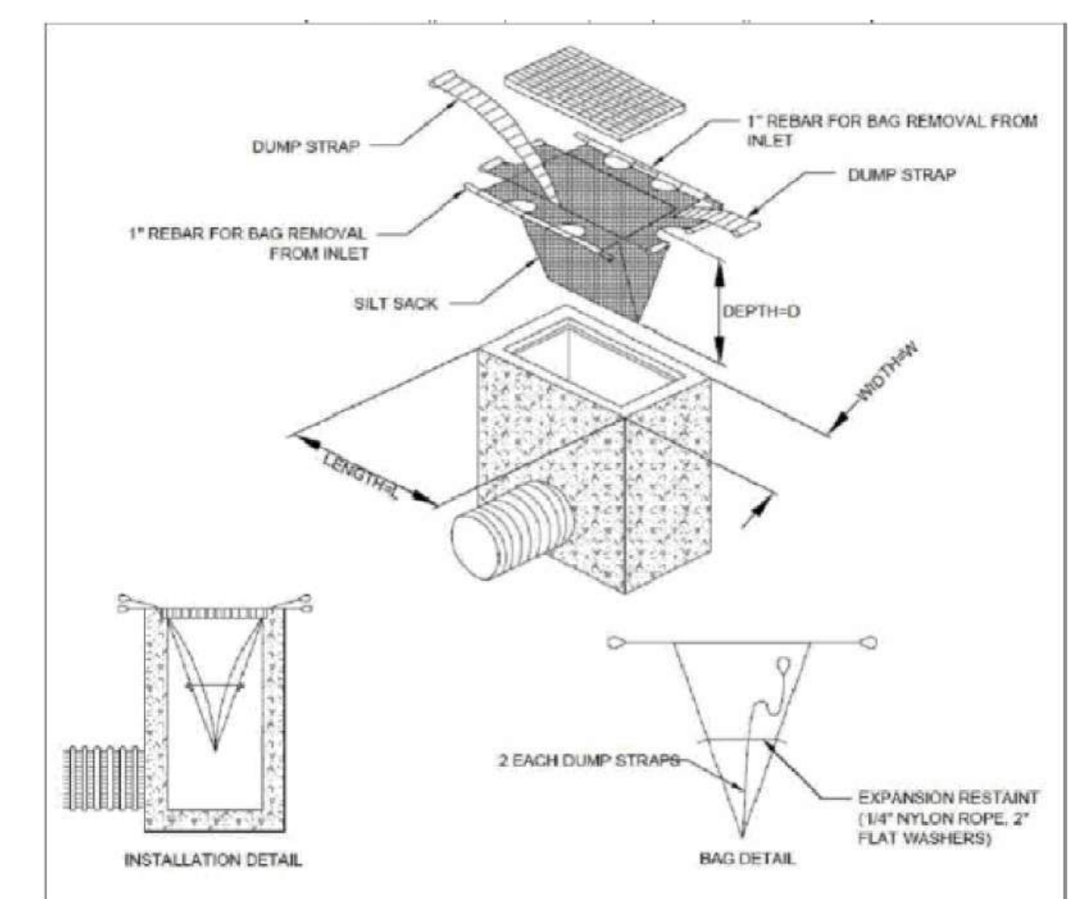
MUD MAT DETAIL
NOT TO SCALE



TYPICAL SWALE SECTION
SCALE : 1:300 (H)
1:150 (V)



WATERMAIN CONNECTION AND CROSSING SECTION
NOT TO SCALE



INLET SEDIMENT CONTROL DEVICE
N.T.S

THIS PLAN IS TO BE READ IN CONJUNCTION WITH THE GRADING AND SERVICING DESIGN DRAWINGS

NOTE:
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OWNER INFORMATION
U-HAUL CANADA
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DAVID POLLOCK
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david_pollock@uhaul.com

No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPROVAL	MAY 20/22	FST

SCALE: AS INDICATED
DESIGN: SM / FST
CHECKED: FST
DRAWN: SM
CHECKED: SM / FST
APPROVED: FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041399 MAY 20, 2022 PROVINCE OF ONTARIO

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Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
30 FRANK NIGHBOR PLACE: U-HAUL SITE

DRAWING NAME
CIVIL NOTES, DETAILS AND TABLES PLAN

PROJECT No. 121326
REV: REV # 1
DRAWING No. 121326-NDT

D07-12-22-
Plan #

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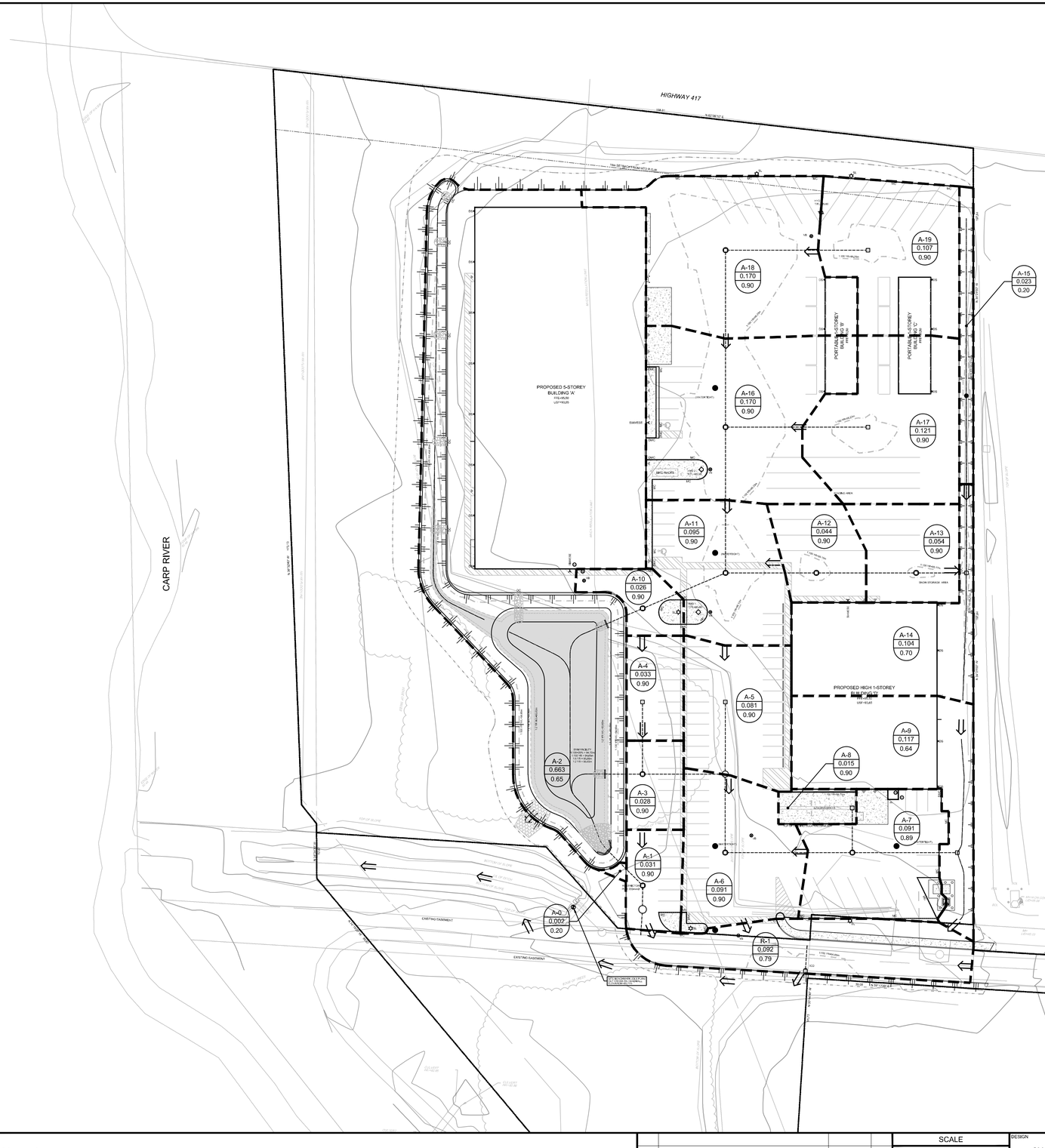

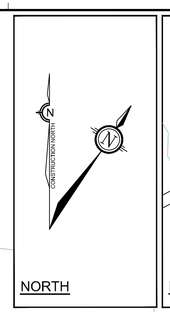

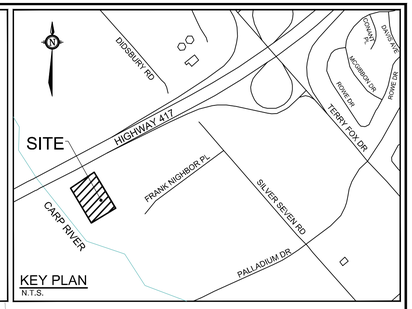

U-HAUL SITE FLOWS & STORMWATER MANAGEMENT TABLE

DESIGN EVENT	PRE-DEVELOPMENT CONDITIONS		POST-DEVELOPMENT CONDITIONS				
	UNCONTROLLED FLOW (L/s)	ALLOWABLE RELEASE RATE (L/s)	DIRECT RUNOFF (L/s)	A-1 to A-19 FLOW (L/s)	R-1 FLOW (L/s)	TOTAL FLOW (L/s)	REDUCTION IN FLOW (L/s or %)*
1:2 YR	92.1	107.9	0.1	53.8	17.7	71.5	20.6 or 22%
1:5 YR	125.0			61.0	24.9	85.9	39.0 or 31%
1:100 YR	267.7			71.1	31.1	102.2	165.4 or 62%

* REDUCED FLOW COMPARED TO PRE-DEVELOPMENT UNCONTROLLED CONDITIONS

AREA A-1 to A-19: RESTRICTOR PIPE DATA - CBMH 101

DESIGN EVENT	DIAMETER OF RESTRICTOR PIPE (mm)	DIAMETER OF OUTLET PIPE (mm)	DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)
1:2 YR	200mmØ RINGTIGHT (NOMINAL PIPE SIZE)	200	53.8	0.76	93.63	486.9
1:5 YR			61.0	1.02	93.89	788.0
1:100 YR			71.1	1.78	94.65	1813.0

* RESTRICTOR PIPE TO BE IPEX 'RING TIGHT' PVC DR35 PIPE ONLY - SIZE = 8" NOMINAL DIAMETER FOR RESTRICTOR PIPE AS THE OUTLET PIPE FROM CBMH 101.

AREA R-1: ICD TABLE - CB 08

DESIGN EVENT	TYPE OF ICD	DIAMETER OF OUTLET PIPE (mm)	DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER DEPTH (m)	VOLUME (m^3)
1:2 YR	TEMPEST MHF VORTEX 'CUSTOM'	200	17.7	0.24	93.49	0.1
1:5 YR			24.9	0.71	93.96	0.3
1:100 YR			31.1	1.60	94.85	6.2

LEGEND

- PROPERTY LINE
- A-11 / 0.95 / 0.90 — POST-DEVELOPMENT AREA ID; POST-DEVELOPMENT DRAINAGE AREA (ha); 1:5 YEAR WEIGHTED RUNOFF COEFICIENT
- DRAINAGE AREA LIMITS
- MAXIMUM 3:1 SIDESLOPE
- EMERGENCY OVERLAND FLOW ROUTE
- SAN MH 201 — PROPOSED SANITARY MANHOLE
- PROPOSED BUILDING ENTRANCE
- PROPOSED SILT FENCING (OPSD 219.110)
- CBMH 104 — PROPOSED CATCHBASIN MANHOLE
- STM MH 103 — PROPOSED STORM MANHOLE
- CB 03 — PROPOSED CATCHBASIN
- HYD 2 / VVB — PROPOSED HYDRANT AND VALVE
- PROPOSED BARRIER CURB (15cm CURB HEIGHT)
- DC — DEPRESSED BARRIER CURB (0cm CURB HEIGHT)
- MC — PROPOSED MOUNTABLE CURB (5cm CURB HEIGHT)
- DMC — DEPRESSED MOUNTABLE CURB (0cm CURB HEIGHT)
- RESTRICTOR PIPE — RESTRICTOR PIPE / INLET CONTROL DEVICE
- DS — PROPOSED DOWNSPOUT LOCATION
- FFE=95.50 — PROPOSED FINISHED FLOOR ELEVATION
- USF=93.65 — PROPOSED UNDERSIDE OF FOOTING ELEVATION
- SL — PROPOSED SITE LIGHTING POLE (REFER TO ELEC)
- M M — PROPOSED MUD MAT / CONSTRUCTION ENTRANCE
- 1:5 YR / 1:100 YR — APPROXIMATE PONDING LIMITS
- EXISTING CONCRETE CURB
- SANMH — EXISTING SANITARY MANHOLE
- CBMH — EXISTING CATCHBASIN MANHOLE
- STMMH — EXISTING STORM MANHOLE
- CB — EXISTING CATCHBASIN
- HYD / VB — EXISTING HYDRANT & VALVE
- EXISTING TREES / VEGETATION
- EX UP — EXISTING UTILITY POLE C/W GUY WIRES
- EXISTING FENCE
- EXISTING LIGHT STANDARD

REFER TO PLAN 121326-NDT FOR CIVIL NOTES, DETAILS AND TABLES

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1	ISSUED FOR SITE PLAN APPROVAL	MAY 20/22	FST

SCALE 1:500 (1:500, 0 5 10 15 20)

DESIGN SM / MH
CHECKED FST
DRAWN SM
CHECKED SM / FST
APPROVED MH

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER M. HREHORIAK 100211256 May 20, 2022 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041399 MAY 20, 2022 PROVINCE OF ONTARIO

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Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
30 FRANK NIGHBOR PLACE: U-HAUL SITE

DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 121326
REV REV # 1
DRAWING No. 121326-SWM

D07-12-22-____

Plan # ____

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