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# 2740 Queensview Drive

## Granite Curling Club of West Ottawa

## Development Servicing Study and Stormwater Management Report

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# PROPOSED GRANITE CURLING CLUB
# 2740 QUEENSVIEW DRIVE

# DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT

Prepared by:

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July 26, 2021

Ref: R-2021-066
Novatech File No. 121127

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July 26, 2021

Morley Hoppner Inc.
1818 Bradley Side Road,
Ottawa, Ontario
K0A 1L0

**Attention: Mr. Brian Morley**

Dear Sir:

**Re: Development Servicing Study and Stormwater Management Report**
**Proposed Granite Curling Club of West Ottawa**
**2740 Queensview Drive, Ottawa, ON**
**Novatech File No.: 121127**

Enclosed is a copy of the 'Development Servicing Study and Stormwater Management Report' for the proposed development of the new Granite Curling Club of West Ottawa located at 2740 Queensview Drive in the City of Ottawa. This report addresses the approach to site servicing and stormwater management and is 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

FT/sm

cc: Santhosh Kuruvilla (City of Ottawa)
Keith Dickie (n45)
Rob Lefebvre (GWAL)



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Stormwater Management Plan (121127-SWM)

# 1.0 INTRODUCTION

Novatech has been retained by Morley Hoppner Limited to complete the site servicing, grading and stormwater management design for the new Granite Curling Club of West Ottawa. This report is being submitted in support of a Site Plan Control application.

## 1.1 Location and Site Description

The 0.52 ha site is located at 2740 Queensview Drive and is currently occupied by an existing light industrial building, loading dock and associated surface parking lot. The subject site is surrounded by commercial/industrial properties to the north, All Saints Lutheran Church to the west and the Highway 417 off-ramp to the south. The legal description of the subject site is designated as Part of Lot 330, Registered Plan 372212 and Part of Lot 21, Concession 2 (Ottawa Front), 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 February 17, 2021, at which time the client was advised of the general submission requirements. The Rideau Valley Conservation Authority (RVCA) and Ministry of Transportation - Ontario (MTO) were 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 is not anticipated to be required. Refer to **Appendix A** for a summary of the correspondence related to the proposed development.

### 1.3 Proposed Development

The proposed development will consist of a new curling club, including an ice shed viewing gallery, four sheets of ice, a bar/lounge, office space and associated surface parking lots and a loading area. The proposed building will be serviced by extending new laterals to the municipal sanitary sewer, storm sewer and watermain in Queensview Drive.

### 1.4 Reference Material

[1] The 'Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area – Final Draft Report' (Ref. No. 741(02)-11), prepared by J.F. Sabourin and Associates Inc., in April 2019.

[2] The Geotechnical Investigation (Report No.: PG4353-2), prepared by Paterson Group Inc., on May 19th, 2021.

## 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 and are to be consistent with the approach described in the 'Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area – Final Draft Report'[1]. Refer to the subsequent sections of the report for further details. Given the proximity of the site to Highway 417, the proposed SWM design will also have to meet the requirements of the Ministry of Transportation of Ontario (MTO).

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

### 2.1 Sanitary Sewage

The existing building is currently being serviced by the existing 300mm dia. concrete sanitary sewer in Queensview Drive. Under post-development conditions, the proposed development will continue to be serviced by the municipal sanitary sewer in Queensview Drive.

The City of Ottawa design criteria were used to calculate the theoretical sanitary flows for the proposed development. The following design criteria were provided by the Granite Curling Club and/or taken from Section 4 – 'Sanitary Sewer Systems' and Appendix 4-A - 'Daily Sewage Flow for Various Types of Establishments' of the City of Ottawa Sewer Design Guidelines:

- Hours of Operation 9:00am-11:00pm (7 x 2-hr blocks)
- 4 sheets of ice (max. 8 curlers per sheet for a total of 32 curlers per 2-hr block)
- Design Population (Typical Day): 224 curlers + 40 max. spectators + 3 staff
- Special Event (Playoffs/Catered Banquet): 128-200 people + 3 staff
- Average Daily Sewage Flows (Bar/Lounge): 125 L/person/day
- Average Daily Sewage Flows (Employees): 75 L/person/day
- Commercial Peaking Factor = 1.5
- Infiltration Allowance: 0.33 L/s/ha x 0.52 ha site = 0.17 L/s

**Table 1** identifies the theoretical sanitary flows for the proposed development based on the above design criteria and information provided by the Granite Curling Club.

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

| Type of Use | Design Population | Average Flow (L/s) | Peaking Factor | Peak Flow (L/s) | Total Flow (L/s) |
|---|---|---|---|---|---|
| **Typical Day (Weekdays & Weekends)** | | | | | |
| Curlers | 224 | 0.32 | 1.5 | 0.49 | 0.49 |
| Spectators | 40 | 0.06 | | 0.09 | 0.09 |
| Kitchen Staff | 3 | <0.01 | | <0.01 | <0.01 |
| **Total Typical use** | **-** | **0.38** | | **0.58** | **0.75*** |
| **Special Event (League Playoffs & Catered Banquet)** | | | | | |
| Curlers | Max 200 | 0.29 | 1.5 | 0.43 | 0.43 |
| Spectators | - | - | | - | - |
| Kitchen Staff | 3 | <0.01 | | <0.01 | <0.01 |
| **Total Typical use** | **-** | **0.29** | | **0.56** | **0.60*** |

*Incl. an infiltration allowance of 0.33 L/s/ha

A 200mm dia. sanitary gravity sewer at a minimum slope of 1.0% has a full flow conveyance capacity of 34.2 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 existing building is currently being serviced by the existing 300mm dia. CI watermain in Queensview Drive. Under post-development conditions, the proposed development will continue to be serviced by the municipal watermain in Queensview Drive. The building will be fully sprinklered and the fire department (siamese) connection will be located on the west side of the building, within 45m of the proposed on-site fire hydrant. The water meter will be located within the water entry room, with a remote meter on the exterior face of the building.

### *2.2.1 Water Demands and Watermain Analysis*

Preliminary water demand and fire flow calculations were based on criteria in the City of Ottawa Design Guidelines. The fire flows are calculated using the Fire Underwriters Survey (FUS) method, based on general assumptions and information provided by the architect. The following design criteria were taken from Section 4 – 'Water Distribution Systems' of the Ottawa Design Guidelines – Water Distribution:

- Hours of Operation 9:00am-11:00pm (7 x 2-hr blocks)
- 4 sheets of ice (max. 8 curlers per sheet for a total of 32 curlers per 2-hr block)
- Design Population (Typical Day): 224 curlers + 40 max. spectators + 3 staff
- Special Event (Playoffs/Catered Banquet): 128-200 people + 3 staff
- Average Daily Sewage Flows (Bar/Lounge): 125 L/person/day
- Average Daily Sewage Flows (Employees): 75 L/person/day

- 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 2.1** identifies the theoretical domestic water demands and fire flow requirements for the development based on the above design criteria.

**Table 2.1**: **Theoretical Water Demand for Proposed Development**

| Type of Use | Design Population | Avg. Day Demand (L/s | Max. Day Demand (L/s) | Peak Hour Demand (L/s) | Fire Flow (L/s) |
|---|---|---|---|---|---|
| **Typical Day (Weekdays & Weekends)** | | | | | |
| Curlers | 224 | 0.32 | 0.49 | 0.88 | **133** |
| Spectators | 40 | 0.06 | 0.09 | 0.16 | |
| Kitchen Staff | 3 | <0.01 | <0.01 | 0.01 | |
| **Total Typical use** | **-** | **0.38** | **0.58** | **1.05** | |
| **Special Event (League Playoffs & Catered Banquet)** | | | | | |
| Curlers | Max 200 | 0.29 | 0.43 | 0.78 | **133** |
| Spectators | - | - | - | - | |
| Kitchen Staff | 3 | <0.01 | <0.01 | 0.01 | |
| **Total Typical use** | **-** | **0.29** | **0.43** | **0.79** | |

The Fire Underwriters Survey (FUS) was used to estimate fire flow requirements for the proposed building. Based on information provided by the architect, the fire flow requirements for are expected to be in the order of 2,114 USGPM (or 8,000 L/min), 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. Refer to **Appendix C** for detailed calculations and correspondence from the City of Ottawa.

The Granite Curling Club provided water billing records (2017-2019) for our review and use. The values calculated in Table 2.1 are conservative when compared to actual water consumption use for the existing Granite Curling Club. The hydraulic analysis is based on the conservative theoretical water demands calculated for the proposed development.

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) | 107.7 m | 40 psi (min.) | ~ 52 psi |
| Maximum HGL (Max Day Demand) | 115.2 m | 50 - 70 psi | ~ 63 psi |
| HGL (Max Day + Fire Flow) | 106.9 m | 20 psi (min.) | ~ 51 psi |

*Based on an approximate roadway elevation of 70.5m in Queensview Drive at the service connection. Design pressure = (HGL – watermain 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

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. The model indicates that adequate pressure will exist throughout the watermain system under the specified design conditions. **Table 2A, Table 2B** and **Table 2C** summarize the hydraulic model results. Refer to **Appendix C** for City of Ottawa boundary conditions, the hydraulic modeling schematic and modeling results.

**Table 2A: Peak Hour Demand**

| Operating Condition | Minimum System Pressure | Maximum System Pressure |
|---|---|---|
| A Peak Hour demand of 1.05 L/s at Node J3 (Building) | A minimum system pressure of 357.1 kPa (51.8 psi) is available at Node J3 (Building) | A maximum system pressure of 387.5 kPa (56.2 psi) is available at Nodes J1 and J2 (on-site WM) |

**Table 2B: Maximum HGL**

| Operating Condition | Minimum System Pressure | Maximum System Pressure |
|---|---|---|
| A Max Day demand of 0.58 L/s at Node J3 (Building) | A minimum system pressure of 430.7 kPa (62.5 psi) is available at Node J3 (Building) | A maximum system pressure of 461.1 kPa (66.9 psi) is available at Nodes J1 and J2 (on-site WM) |

**Table 2C: Maximum Day + Fire Flow Demand**

| Operating Condition | Minimum System Pressure | Maximum System Pressure |
|---|---|---|
| A Max Day demand of 0.6 L/s at Node J3 (Building) + a Fire Flow of 133 L/s at Node J4 (Hydrant) | A minimum system pressure of 331.0 kPa (48.0 psi) is available at Node J4 (Hydrant) | A maximum system pressure of 370.1 kPa (53.7 psi) is available at Nodes J1 and J2 (on-site WM) |

The model indicates that the proposed 150mm/200mm dia. watermain will provide adequate fire flow and system pressures for both 'Max Day + Fire Flow' and 'Peak Hour' conditions.

## 2.3 Storm Drainage and Stormwater Management

The proposed site will be serviced by connecting the proposed on-site storm sewer system to the existing 750mm dia. storm sewer within the municipal right-of-way for Queensview Drive. The approach for the stormwater management design for the site is discussed in the subsequent sections of the report.

### *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 MTO. The SWM (quantity control) criteria and objectives are as follows:

- Maintain existing drainage patterns.
- Control the post-development flows from the site to the maximum allowable release rate of 33.5 L/s/ha for storms up to and including the 100-year design event, as defined in the 'Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area – Final Draft Report'[1].
- Maximize the use of surface and underground storage available on site, while ensuring that no surface ponding will occur on the paved surfaces (i.e.: private drive aisles or parking lots) during the 2-year storm event.
- Maximum 100-year ponding depths cannot exceed 350mm and there is to be no major system flows offsite during 100-year events, while meeting minimum building elevations (MBE) requirements to protect the building per City standards.
- Provide on-site water quality controls equivalent to an 'Enhanced' Level of Protection corresponding to a minimum 80% long-term TSS removal.
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

Due to the proposed site layout and imperviousness of the building roof and paved areas, there is no viable means of capturing and infiltrating stormwater on site.

The subject site is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA). Based on preliminary feedback from the RVCA, surface parking lots and drive aisles require an 'Enhanced' Level of Protection (i.e.: 80% TSS removal), which is consistent wit the requirements of the 'Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area – Final Draft Report'[1]. Landscaped areas and roof tops are considered clean for the purposes of water quality and aquatic habitat protection.

Refer to **Appendix A** for correspondence from the City of Ottawa and the RVCA.

### *2.3.2 Pre-Development Conditions and Target Control Rate*

The uncontrolled pre-development flows from the 0.52 ha site were calculated using the Rational Method to be 81.6 L/s during the 2-year design event, 110.8 L/s during the 5-year design event and 212.6 L/s during the 100-year design event. Refer to **Appendix D** for detailed calculations.

The target control rate for the site has been determined in accordance with the 'Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area – Final Draft Report'[1] and was calculated to be 17.4 L/s (33.5 L/s/ha x 0.519 ha). The site to be developed is located within the 'Area Draining to the Ottawa River Parkway (ORP) Pipe' as defined on Figure 3.3 of the report[1].

### *2.3.3 Post-Development Conditions*

The proposed development will be serviced by extending a new 300mm dia. storm service from the on-site storm sewer system. The on-site storm sewer system will outlet to the existing 750mm dia. concrete storm sewer in Queensview Drive. Stormwater runoff from the site will be directed to various catchbasins and catch basin manholes located within the paved areas. To mitigate the stormwater related impacts due to the increase in imperviousness of the site, stormwater runoff will be attenuated using control flow ICDs installed within the on-site storm sewer system as well as control flow drains on the proposed building roof. Flows will be attenuated for storms up to and including the 100-year design event. Due to the existing grades, runoff from a small portion of the site will sheet drain uncontrolled off site.

### *2.3.4 Hydrologic and Hydraulic Modelling*

The performance of the proposed stormwater management system was evaluated using a dual-drainage model created in PCSWMM. The PCSWMM model simulates the storage and routing of flows through the proposed storm drainage network. The results of the analysis were used to:

- Calculate the storage volumes and release rates for the building rooftop.
- Calculate the storm sewer hydraulic grade line and ponding elevations for the 2-year, 5-year, and 100-year storm events.
- Determine the allowable release rate from the east drive aisle and size the proposed ICD in STM MH 03.

- Determine the allowable release rate from the west parking lot and size the proposed ICD in STM MH 05.
- Calculate the modelled runoff from the controlled portions of the site under post-development conditions.

The design storms used in the hydrologic analysis model include the 3-hour Chicago distribution and the 12-hour SCS Type II distribution for return periods of 1:2 years, 1:5 years and 1:100 years. IDF data was taken from the *City of Ottawa Sewer Design Guidelines* (OSDG) (October 2012). The 3-hour Chicago storm distribution was found to generate the highest peak flows and the model results from this distribution are documented in the following tables. The model schematic, system parameters and output files are provided in **Appendix D**.

### *2.3.5 Model Results*

The following sections outline the stormwater management scheme for each area of the proposed site, and provide post-development peak flow results from the controlled flow areas.

#### 2.3.5.1 Area A-0 – Uncontrolled Direct Runoff

The uncontrolled post-development flow from this sub-catchment area was calculated using the Rational Method to be approximately 2.9 L/s during the 2-year design event, 4.0 L/s during the 5-year design event and 8.1 L/s during the 100-year design event. Refer to **Appendix D** for SWM calculations. In order to maintain drainage patterns, this sub-catchment includes runoff from small areas at both the front and back of the property.

#### 2.3.5.2 Area A-1 – Controlled Flow from East Drive Aisle

The post-development flow from this sub-catchment area will be attenuated using a plug type ICD (IPEX Tempest Vortex LMF), installed in the outlet pipe of STM MH 03. Stormwater runoff from this sub-catchment area will be temporarily stored underground within the storm sewer system and on the paved parking lot prior to being discharged into the on-site storm sewer system. The site has been designed to ensure that no stormwater will pond on the private paved surfaces during the 2-year storm event (as a minimum).

**Table 3A** summarizes the post-development design flow from this sub-catchment area as well as the ICD specifications, the anticipated ponding elevations, storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

**Table 3A: Design Flow and ICD Table**

| Design Event | Sub-Catchment Area A-1 | | | | |
|---|---|---|---|---|---|
| | ICD Type | Design Flow (L/s) | Ponding Elevation (m) | Storage Vol. Required ($m^3$) | Max Storage Provided ($m^3$) |
| 2-Year | Ipex Tempest Vortex LMF 65 | 2.8 L/s | 68.90 m | 17.4 $m^3$ | 69.9 $m^3$ |
| 5-Year | | 3.3 L/s | 69.15 m | 23.8 $m^3$ | |
| 100-Year | | 5.5 L/s | 70.51 m | 37.0 $m^3$ | |

Refer to **Appendix D** for SWM calculations and to **Appendix E** for detailed 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. Furthermore, no stormwater will pond on the private paved surfaces will occur during the 2-year or 5-year storm events and surface ponding depths will not touch the building envelope or lowest openings even under the 100-year+20% stress test. Refer to **Appendix D** for specific modelling results and stress test levels.

#### 2.3.5.3 Area A-2 – Controlled Flow from West Parking Lot

The post-development flow from this sub-catchment area will be attenuated using a plug type ICD (IPEX Tempest Vortex LMF), installed in the outlet pipe of STM MH 05. Stormwater runoff from this sub-catchment area will be temporarily stored underground within the storm sewer system and on the paved parking lot prior to being discharged into the on-site storm sewer system. The site has been designed to ensure that no stormwater will pond on the private paved surfaces during the 2-year storm event (as a minimum).

**Table 3B** summarizes the post-development design flow from this sub-catchment area as well as the ICD specifications, the anticipated ponding elevations, storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

**Table 3B: Design Flow and ICD Table**

| Design Event | Sub-Catchment Area A-2 | | | | |
|---|---|---|---|---|---|
| | ICD Type | Design Flow (L/s) | Ponding Elevation (m) | Storage Vol. Required ($m^3$) | Max Storage Provided ($m^3$) |
| 2-Year | Ipex Tempest Vortex LMF 85 | 5.1 L/s | 69.00 m | 26.0 $m^3$ | 66.1 $m^3$ |
| 5-Year | | 6.8 L/s | 69.48 m | 31.0 $m^3$ | |
| 100-Year | | 9.5 L/s | 70.57 m | 52.6 $m^3$ | |

Refer to **Appendix D** for SWM calculations and to **Appendix E** for detailed 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. Furthermore, no stormwater will pond on the private paved surfaces during the 2-year or 5-year storm events surface ponding depths will not touch the building envelope or lowest openings even under the 100-year+20% stress test. Refer to **Appendix D** for specific modelling results and stress test levels.

#### 2.3.5.4 Area R-1 – Controlled Flow from Building Roof

The post-development flow from this sub-catchment area will be attenuated using seven (7) Watts adjustable 'Accutrol' control flow roof drains (model number RD-100-A-ADJ: all set to have fully closed weirs) prior to being directed to the proposed storm service.

**Table 3C** summarizes the post-development design flows from this sub-catchment area as well as the type of roof drains, the maximum anticipated ponding depths, storage volumes required and storage volumes provided for both the 5-year and the 100-year design events.

**Table 3C: Controlled Flow Roof Drains**

| Roof Drain ID & Drainage Area (ha) | Number of Roof Drains | Watts Roof Drain Model ID (Weir Opening) | Controlled Flow per Drain (L/s) | | Approximate Ponding Depth Above Drains (m) | | Storage Volume Required ($m^3$) | | Max. Storage Available ($m^3$) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1:5 Year | 1:100 Year | 1:5 Year | 1:100 Year | 1:5 Year | 1:100 Year | |
| RD 1 (0.010 ha) | 1 | RD-100-A-ADJ (Fully Closed) | 0.32 | 0.32 | 0.09 | 0.13 | 1.9 | 4.5 | 5.9 |
| RD 2 (0.006 ha) | 1 | RD-100-A-ADJ (Fully Closed) | 0.32 | 0.32 | 0.08 | 0.12 | 0.9 | 2.2 | 3.8 |
| RD 3 & 4 (0.050 ha) | 2 | RD-100-A-ADJ (Fully Closed) | 0.32 | 0.32 | 0.11 | 0.15 | 13.0 | 29.0 | 29.2 |
| RD 5 (0.034 ha) | 1 | RD-100-A-ADJ (Fully Closed) | 0.32 | 0.32 | 0.11 | 0.15 | 9.7 | 21.3 | 22.0 |
| RD 6 (0.034 ha) | 1 | RD-100-A-ADJ (Fully Closed) | 0.32 | 0.32 | 0.11 | 0.15 | 9.7 | 21.3 | 22.7 |
| RD 7 (0.035 ha) | 1 | RD-100-A-ADJ (Fully Closed) | 0.32 | 0.32 | 0.10 | 0.14 | 10.0 | 22.1 | 23.4 |
| **Total Roof (0.169 ha)** | **7** | **-** | **2.24** | **2.24** | **-** | **-** | **45.2** | **100.4** | **107.0** |

Refer to **Appendix D** for detailed SWM calculations and to **Appendix F** for detailed roof drain information. As indicated in the table above, the building roof will provide sufficient storage for both the 5-year and 100-year design events.

**Table 3D** compares the post-development site flows from the proposed development to the uncontrolled pre-development flows and to the target control rate specified by the City of Ottawa, for the 2-year, 5-year and the 100-year design events. Due to the differences in the time to peak, the direct runoff from A-0 will sheet drain off-site much faster than the combined controlled flow from the remainder of the site (A-1, A-2 and R-1).

**Table 3D: Stormwater Flow Comparison Table**

| Design Event | Drainage Areas A-0, A-1, A-2 and R-1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pre-Development Conditions | | Post-Development Conditions | | | | | | |
| | Ex. Site Flows (L/s) | Target Control Rate (L/s) | A-0 Flow (L/s) | A-1 Flow (L/s) | A-2 Flow (L/s) | R-1 Flow (L/s) | Controlled Site Flow (L/s) | Total Site Flow (L/s) | Reduction in Total Flow (L/s or %) ** |
| 2-Yr | 81.6 | **17.4** | 2.9 | 2.8* | 5.1* | 2.2* | **10.1*** | 13.0 | 68.6 or 84% |
| 5-Yr | 110.8 | | 4.0 | 3.3* | 6.8* | | **12.3*** | 16.3 | 94.5 or 85% |
| 100-Yr | 212.6 | | 8.1 | 5.5* | 9.5* | | **17.2*** | 25.3 | 187.3 or 88% |

*Total Controlled flow is less than the target control rate (which excludes A-0 flow due to differences in time to peak)

**Significant reduction in total site flow (including all post-development areas A-0, A-1, A-2 and R-1) when compared to uncontrolled pre-development conditions

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

#### 2.3.5.5 Stormwater Quality Control

As stated above, the subject site is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA). Based on preliminary feedback from the RVCA, 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_15_4) will be installed downstream of STM MH 03 and STM MH 05 on the storm sewer outlet pipes from the site. Stormwater runoff collected by the on-site storm sewer system (0.31 ha tributary area) will be directed through the proposed treatment unit. The contributing area includes the proposed paved parking areas as well as some adjacent landscaped 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_15_4 will exceed the target removal rate, providing a net annual 86.6% TSS removal. The CDS unit has a treatment capacity of approximately 20 L/s, a sediment storage capacity of 0.84m$^3$; an oil storage capacity of 232 L and will treat a net annual volume of approximately 99.0% for the tributary area. The on-site catchbasins and storm manhole structures will be equipped with sumps to promote additional settling of sediment.

Maintenance and Monitoring of the Storm Sewer and Stormwater Management Systems

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 ICDs 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 existing site generally slopes from south-west to north-east, from an approximate elevation of 73.35m along the south portion of the west property line and at the SW property corner down to approximately 70.35m near the NE property corner. The finished floor elevation (FFE) of the proposed building will be set at an elevation varying between 70.90m (for the ice house viewing level) and 71.28m (main floor). The ice sheets will 0.15m below the viewing area per the curling club requirements. The building and general site elevations will work well with the main site entrance and parking lot on the west side of the building. The grades along the property lines will need to be maintained and no parking lot runoff will be directed toward the MTO Right-of-

Way (Highway 417). Due to the significant elevation difference with the neighbouring property, a structural retaining wall will be required along a portion of the west property line.

### 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 lower downstream sub-catchment areas and ultimately flow towards Queensview Drive. The lowest building opening elevation (70.90m) has been set a minimum of 0.3m above the major system overflow points. The ice surface is only lower within the building footprint and does not affect the exterior grading around the perimeter of the building. The emergency overland flow route is shown on the enclosed Grading and Erosion & Sediment Control Plan (121127-GR).

## 4.0 GEOTECHNICAL INVESTIGATIONS

A Geotechnical Investigation Report has been prepared by Paterson Group Inc. for the proposed project. Refer to the Geotechnical Report[2] for subsurface conditions, 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, 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.

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:

- A CDS type Oil/Grit Separator will be installed to provide water quality control prior to releasing stormwater from sub-catchment areas A-1 and A-2.

## 6.0 CONCLUSION

This report has been prepared in support of Site Plan Control application for the proposed Granite Curling Club. The conclusions are as follows:

- The proposed building will be serviced by the municipal watermain, sanitary and storm sewers within the right-of-way for Queensview Drive.
- The building will be sprinklered and supplied with a fire department siamese connection. The siamese connection will be located within 45m of the proposed on-site fire hydrant.
- The site flows from sub-catchment areas A-1 and A-2 will be controlled by Ipex Tempest vortex ICDs, installed within the outlet pipes of structures STM MH 03 and STM MH 05.
- The post-development site flow (from Areas A-1, A-2 and R-1) will be approximately 10.1 L/s during the 2-year design, 12.3 L/s during the 5-year design event and 17.2 L/s during the 100-year event, all less than the target control rate of 17.4 L/s. Post-development flows are being reduced by 68.6 L/s (or 84%) during the 2-year event, 94.5 L/s (or 85%) during the 5-year event and by as much as 187.3 L/s (or 88%) during the 100-year design event, when compared to current conditions for the entire site development area.
- An oil / grit separator unit (CDS Model PMSU 20_15_4) will provide an 'Enhanced' Level of water quality control for the portion of the site discharging to the 750mm dia. municipal storm sewer.
- Regular inspection and maintenance of the storm sewer system, including the ICDs and CDS treatment unit is recommended to ensure that the storm drainage system is clean and operational.
- Erosion and sediment controls are to be provided both during construction and on a permanent basis.

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

**NOVATECH**

Prepared by:

Stephen Matthews, B.A. (Env.)
Senior Design Technologist

Reviewed by:

François Thauvette, P. Eng.
Senior Project Manager

# APPENDIX A

## Correspondence

## Francois Thauvette

**From:** Ken Hoppner <khoppner@morleyhoppner.com>
**Sent:** Thursday, March 11, 2021 11:37 AM
**To:** Lee Sheets
**Cc:** David Derouin
**Subject:** FW: Pre-Consultation Follow-Up: 2740 Queensview Drive
**Attachments:** Plans & Study List.pdf; 2740 Queensview Drive_design_brief_submission requirements.pdf

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Lee,

Can you markup which studies you (Novatech) can do for this file, plan is to start end of March and submit June 1
Thx

Ken

---

**From:** McCreight, Laurel <Laurel.McCreight@ottawa.ca>
**Sent:** March 11, 2021 10:39 AM
**To:** Ken Hoppner <khoppner@morleyhoppner.com>
**Subject:** Pre-Consultation Follow-Up: 2740 Queensview Drive

Hi Ken,

Please refer to the below regarding the Pre-Application for 2740 Queensview Drive for a Site Plan Control Application for the Granite Curling Club. I have also attached the required Plans & Study List for application submission.

Below are staff's preliminary comments based on the information available at the time of the pre-consultation meeting:

**Planning / Urban Design**

- A Design Brief is required for the site plan control application. The Terms of Reference is attached for convenience.
- Cash-in-lieu of Parkland will be required.
- Please consult the new Draft Official Plan for emerging directions.
- You are encouraged to contact the Ward Councillor, Councillor Theresa Kavanagh, about the proposal.

**Engineering**

- The Servicing Study Guidelines for Development Applications are available at the following link: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans
- Record drawings and utility plans are available for purchase from the City's Information Centre. Contact the City's Information Centre by email at informationcentre@ottawa.ca or by phone at (613) 580-2424 x44455
- Stormwater quantity control criteria – control the 100-year flow to 5-year. The release rate is to be computed using the lesser of C=0.5 or existing and the Tc computed but no less than 10 minutes.
- Existing sanitary sewer is available on Queensview Drive to make service connection.
- Existing storm sewer is available on Queensview Drive to make service connection.
- Existing watermain is available on Queensview Drive to make service connection.

- Stormwater quality control criteria– Consult with the Conservation Authority (RVCA) for their requirements. Include the correspondence with RVCA in the stormwater/site servicing report.
- As per the City of Ottawa Slope Stability Guidelines for Development Applications an engineering report is required for any retaining walls proposed 1.0 m or greater in height within the subject site that addresses the global stability of the wall and provides structural details. A Retaining Wall Stability Analysis Report and Retaining Wall Structural Details are required to be provided from a Professional Engineer licensed in the Province of Ontario that demonstrates the proposed retaining wall structure has been assessed for global instability as per City standards. Please ensure the analysis and required documentation are provided as part of the submission to address this comment.
- Emergency routes will need to be satisfactory to Fire Services. Please show fire routes on the site plan. For information regarding fire route provisions, please consult with Kevin Heiss at kevin.heiss@ottawa.ca.
- Clearly show and label the property lines on all sides of the property.
- Clearly show and label all the easements (if any) on the property, on all plans.
- When calculating the post development composite runoff coefficient (C), please provide a drawing showing the individual drainage area and its runoff coefficient.
- When using the modified rational method to calculate the storage requirements for the site, the underground storage should not be included in the overall available storage. The modified rational method assumes that the restricted flow rate is constant throughout the storm which, in this case, underestimates the storage requirement prior to the 1:100-year head elevation being reached. Alternately, if you wish to include the underground storage, you may use an assumed average release rate equal to 50% of the peak allowable rate. Otherwise, disregard the underground storage as available storage or provide modeling to support the design.
- Engineering plans are to be submitted on standard A1 size (594mm x 841mm) sheets.
- Phase 1 ESA and Phase 2 ESA must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.
- Provide the following information for water main boundary conditions:
    1. Location map with water service connection location(s).
    2. Average daily demand (l/s).
    3. Maximum daily demand (l/s).
    4. Maximum hourly demand (l/s).
    5. Fire flow demand (provide detailed fire flow calculations based on Fire Underwriters survey (FUS) Water Supply for Public Fire Protection). Exposure separation distances shall be defined on a figure to support the FUS calculation and required fire flow (RFF).
    6. Hydrant capacity shall be assessed to demonstrate the RFF can be achieved. Please identify which hydrants are being considered to meet the RFF on a fire hydrant coverage plan as part of the boundary conditions request.
- If you are proposing any exterior light fixtures, all must be included and approved as part of the site plan approval. Therefore, the lights must be clearly identified by make, model and part number. All external light fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). In order to satisfy these criteria, the applicant must provide certification from an acceptable professional engineer. The location of all exterior fixtures, a table showing the fixture types (including make, model, part number), and the mounting heights must be included on a plan.
- As per Ottawa Sewer Design Guideline section 4.4.4.7, a monitoring maintenance hole shall be required just inside the property line for all non-residential and multi residential buildings connections from a private sewer to a public sewer. See the sewer use By-law 2003-514(14) monitoring devices for details.

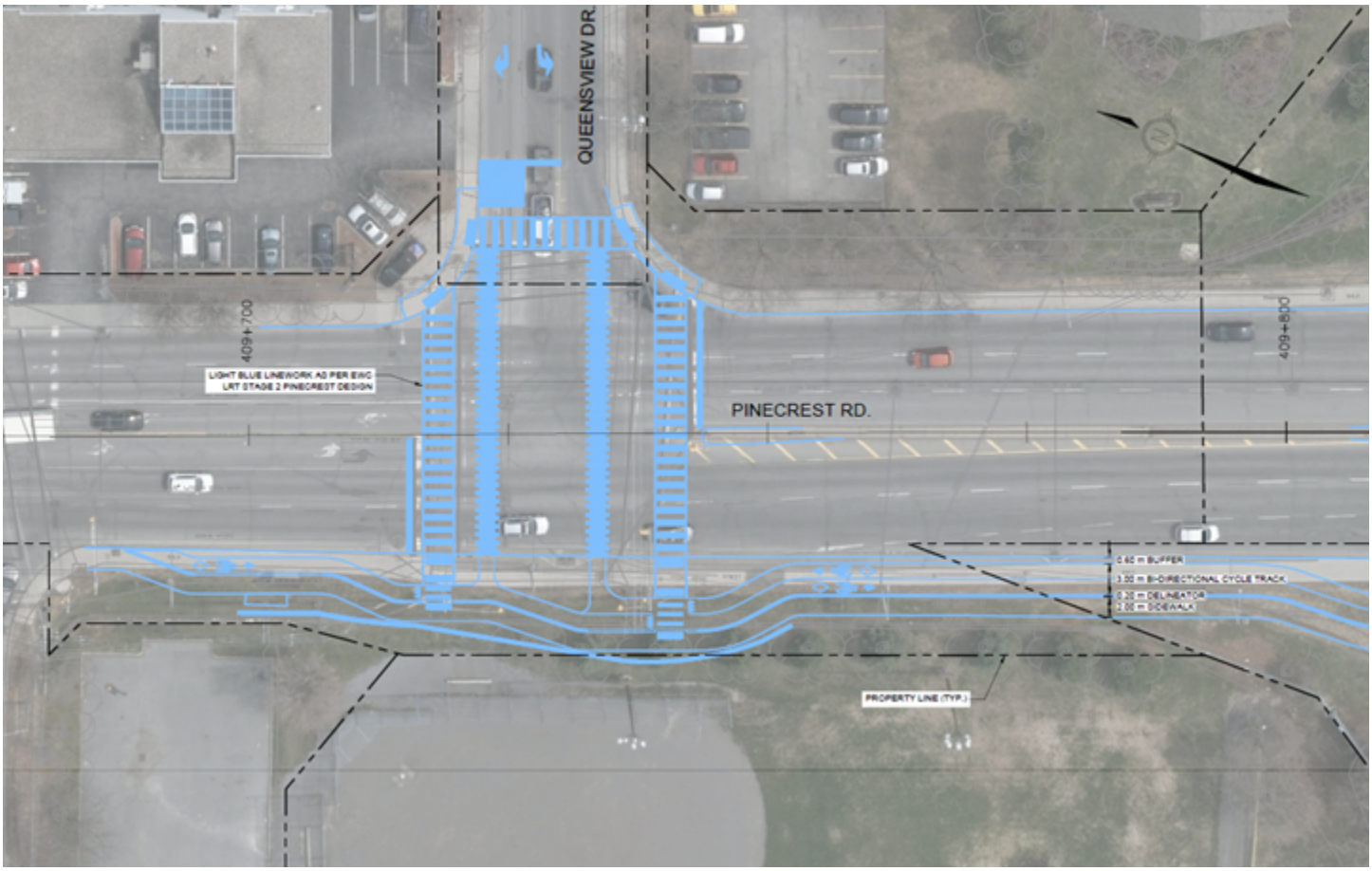
Please contact Infrastructure Project Manager Santhosh Kuruvilla for follow-up questions.

**Transportation**

- Follow Traffic Impact Assessment Guidelines:
    - A TIA is required.
    - Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
    - Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
- Site is within 400m of future Pinecrest LRT Station. To achieve target mode shares within zones near LRT stations, we highly recommend developments to provide as many TDM measures as possible and to provide only the minimum number of required parking.
- As part of LRT connectivity study, there are planned changes to the Pinecrest Corridor and specifically at the Queensview intersection – namely the addition of cycling tracks, cross-rides and pedestrian infrastructure. These changes will affect the signal timing available for vehicular movements. LRT station anticipated to be in service by 2025.
- Consider extending the pedestrian pathway all the way to the rear of the site to reach the parking area.
- On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
    - Turning movement diagrams required for internal movements (loading areas, garbage).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
    - Sidewalk is to be continuous across access as per City Specification 7.1.
    - Grey out any area that will not be impacted by this application.
- As the proposed site is for general public use, AODA legislation applies.
- Consider using the City's Accessibility Design Standards.
- Stationary Noise Impact Studies, due to the proximity to neighboring noise sensitive land uses.

LRT Station Connectivity Study:
https://ottawa.ca/en/city-hall/public-engagement/projects/stage-2-lrt-station-connectivity-enhancement-study#stage-2-confederation-line-west-extension-connectivity-review

Modifications to Pinecrest Rd/Queensview Dr intersection:




Please contact Transportation Project Manager, Josiane Gervais for follow-up questions.

**Other**

Please refer to the links to "Guide to preparing studies and plans" and fees for general 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 me if you have any questions.

Regards,
Laurel

**Laurel McCreight MCIP, RPP**
Planner
Development Review West
Urbaniste
Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

## 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 | 3 | 1. Site Servicing Plan | 2. Site Servicing Study | S | 3 |
| S | 3 | 3. Grade Control and Drainage Plan | 4. Geotechnical Study | S | 3 |
| | 2 | 5. Composite Utility Plan | 6. Groundwater Impact Study | | 3 |
| | 3 | 7. Servicing Options Report | 8. Wellhead Protection Study | | 3 |
| S | 4 | 9. Transportation Impact Assessment (TIA) | 10.Erosion and Sediment Control Plan | S | 3 |
| S | 3 | 11.Storm water Management Report | 12.Hydro geological and Terrain Analysis | | 3 |
| S | 3 | 13.Water Main Protection and Contingency Plan | 14.Noise and vibration Study | S | 3 |
| | PDF only | 15.Roadway Modification Functional Design | 16.LRT 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 | 10 | 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 | 3 | 27.Landscape Plan | 28.Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo) | | 3 |
| S | 1 | 29.Survey Plan | 30.Shadow Analysis | | 3 |
| S | 3 | 31.Architectural Building Elevation Drawings (dimensioned) | 32.Design Brief (includes the Design Review Panel Submission Requirements) | 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 |
| S | 3 | 38.Record of Site Condition (condition of Site Plan) | 39.Mineral Resource Impact Assessment | | 3 |
| | 3 | 40.Tree Conservation Report | 41.Environmental Impact Statement / Impact Assessment of Endangered Species | | 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 & Certificate | S | 1 |

Meeting Date: February 17, 2021 Application Type: *Site Plan Control*

File Lead (Assigned Planner): Laurel McCreight Infrastructure Approvals PM: Ahmed Elsayed

Site Address (Municipal Address): 100 Bayshore Drive *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, Infrastructure 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, Infrastructure and Economic Development Department.***

## Steve Matthews

**From:** Francois Thauvette
**Sent:** Tuesday, June 29, 2021 4:07 PM
**To:** Lee Sheets
**Cc:** Steve Matthews; Matthew Hrehoriak
**Subject:** FW: 2740 Queensview Dr. - Ottawa

Lee,

Good news… I spoke with Stephen Kapusta (MTO) and he will let us provide SWM storage within the 14m setback (i.e. on the surface and/or UG) with the understanding that if this setback was taken back that the SWM design (remaining storage available on-site) would still work. In other words we could store stormwater from the 14m setback (tributary area) within the 14m setback.

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
The information contained in this email message is confidential and is for exclusive use of the addressee.

---

**From:** Kapusta, Stephen (MTO) <Stephen.Kapusta@ontario.ca>
**Sent:** Tuesday, June 29, 2021 12:03 PM
**To:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Subject:** Re: 2740 Queensview Dr. - Ottawa

Good Afternoon Francois,

I do have some time this afternoon after 130pm if you have time to talk. Sorry about the delay.

**Stephen Kapusta MCIP, RPP**
Senior Project Manager
Highway Corridor Management
Ministry of Transportation - Eastern Region
1355 John Counter Boulevard
Postal Bag 4000
Kingston, ON K7L 5A3
Phone (613)545-4834
Mobile (613)539-7068
Fax (613)540-5106
Toll Free 1(800)267-0295
Stephen.Kapusta@Ontario.ca

*Coronavirus Note: I will be working from home for the foreseeable future. Please contact me by mobile phone 613-539-7068.

**From:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Sent:** June 25, 2021 11:28 AM
**To:** Kapusta, Stephen (MTO) <Stephen.Kapusta@ontario.ca>
**Subject:** RE: 2740 Queensview Dr. - Ottawa

**CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.**

Hi Stephen,

Would you have a few minutes for a brief Teams call? I would like to discuss our SWM strategy with you before advancing the detailed design too far.

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
The information contained in this email message is confidential and is for exclusive use of the addressee.

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**From:** Kapusta, Stephen (MTO) <Stephen.Kapusta@ontario.ca>
**Sent:** Friday, May 14, 2021 12:25 PM
**To:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Subject:** Re: 2740 Queensview Dr. - Ottawa

Good Afternoon Francois,

Yes, that will be fine. Please provide us with a photometric plan for the site illustrating that the light will not escape the site onto our right of way.

Steve

---

**From:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Sent:** May 14, 2021 10:51 AM
**To:** Kapusta, Stephen (MTO) <Stephen.Kapusta@ontario.ca>
**Subject:** RE: 2740 Queensview Dr. - Ottawa

**CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.**

Hi Stephen,

Will the Curling Club be able to install light standards (for the rear parking lot area) within the MTO's 14m setback? Not certain wall packs will work. If the MTO expropriates the 14m, then the rear parking lot and light standards can be removed. Please review and advise.

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
The information contained in this email message is confidential and is for exclusive use of the addressee.

**From:** Kapusta, Stephen (MTO) <Stephen.Kapusta@ontario.ca>
**Sent:** Wednesday, May 12, 2021 6:24 AM
**To:** Lee Sheets <l.sheets@novatech-eng.com>
**Cc:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Subject:** Re: 2740 Queensview Dr. - Ottawa

Good Morning Lee,

I can meet this morning after 10am if you want to talk for 15 minutes. It should be straight forward.

Feel free to send me a teams meeting.

Thank you,

**Stephen Kapusta MCIP, RPP**
Senior Project Manager
Highway Corridor Management
Ministry of Transportation - Eastern Region
1355 John Counter Boulevard
Postal Bag 4000
Kingston, ON K7L 5A3
Phone (613)545-4834
Mobile (613)539-7068
Fax (613)540-5106
Toll Free 1(800)267-0295
Stephen.Kapusta@Ontario.ca

*Coronavirus Note: I will be working from home for the foreseeable future. Please contact me by mobile phone 613-539-7068.

---

**From:** Lee Sheets <l.sheets@novatech-eng.com>
**Sent:** May 11, 2021 3:58 PM
**To:** Kapusta, Stephen (MTO) <Stephen.Kapusta@ontario.ca>
**Cc:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Subject:** 2740 Queensview Dr. - Ottawa

**CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.**

Hi Stephen
We are ramping up our civil design for the attached Site Plan along the 417 corridor in Ottawa. We would like to discuss the SWM strategy in light of the fact that the storm drainage will drain away from the 417 in an existing storm sewer system that drains north to the Ottawa River. I have attached a mark-up sketch illustrating the ex. storm sewer and the location of our site.
Would you have availability for a 15 min. Teams call to discuss?
Lee

**J. Lee Sheets**, C.E.T., Director | Land Development & Public Sector Infrastructure
**NOVATECH** Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 209 | Cell: 613.262.3121 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

## Steve Matthews

**From:** Eric Lalande <eric.lalande@rvca.ca>
**Sent:** Monday, July 26, 2021 9:55 AM
**To:** Francois Thauvette
**Subject:** Re: 2740 Queensview Drive - Granite Curling Club - RVCA pre-consultation

Hi Francois,

You are correct that the RVCA will require enhanced water quality protection (80% TSS Removal).

Thanks,

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

---

**From:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Sent:** July 21, 2021 3:39 PM
**To:** Eric Lalande <eric.lalande@rvca.ca>
**Cc:** Steve Matthews <S.Matthews@novatech-eng.com>
**Subject:** 2740 Queensview Drive - Granite Curling Club - RVCA pre-consultation

Hi Eric,

We are working on the proposed Granite Curling Club project at 2740 Queensview Drive in the City of Ottawa. The site will include a 2-storey building and associated surface parking lots, loading and landscaped areas. Based on a review of the 'SWM Guidelines for the Pinecrest Creek/Westboro Area' Report (April 2019) by JFSA the water quality target for the subject site (i.e. for the paved parking lot and loading areas, excl. the building roof and landscaped areas) would be 80% TSS Removal. Please confirm this approach meets the RVCA's requirements.

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
The information contained in this email message is confidential and is for exclusive use of the addressee.

# 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

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

## Steve Matthews

**From:** Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>
**Sent:** Friday, May 21, 2021 2:53 PM
**To:** Francois Thauvette
**Cc:** Steve Matthews
**Subject:** RE: 2740 Queensview Drive - Granite Curling Club - Watermain Boundary Conditions Request
**Attachments:** 2740 Queensview Drive May 2021.pdf

Hello Francois,

The following are boundary conditions, HGL, for hydraulic analysis at 2740 Queensview (zone 1W) assumed to be connected to the 305 mm on 2740 Queenview Drive (see attached PDF for location).

Minimum HGL = 107.7 m

Maximum HGL = 115.2 m

Max Day + Fire Flow (133 L/s) = 106.9 m

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

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

Thanks,

**Santhosh**

---

**From:** Kuruvilla, Santhosh
**Sent:** May 18, 2021 8:46 AM
**To:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Cc:** Steve Matthews <S.Matthews@novatech-eng.com>
**Subject:** RE: 2740 Queensview Drive - Granite Curling Club - Watermain Boundary Conditions Request

Hello Francois,

I forwarded your request to our Infrastructure Planning Unit for the boundary conditions. As soon as I get it, I will send it to you.

Thanks,

**Santhosh**

**From:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Sent:** May 14, 2021 3:45 PM
**To:** Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>
**Cc:** Steve Matthews <S.Matthews@novatech-eng.com>
**Subject:** FW: 2740 Queensview Drive - Granite Curling Club - Watermain Boundary Conditions Request

**CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.**

**ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.**

Hi Santhosh,

We are sending this e-mail to request municipal watermain boundary conditions. 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
The information contained in this email message is confidential and is for exclusive use of the addressee.

**From:** Steve Matthews <S.Matthews@novatech-eng.com>
**Sent:** Friday, May 14, 2021 2:29 PM
**To:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Subject:** 2740 Queensview Drive - Granite Curling Club - Watermain Boundary Conditions Request

Hi François,

The proposed re-development of the 2740 Queensview Drive site will include a new commercial development for the Granite Curling Club. Refer to the attached Concept Plan for details.

Please request watermain boundary conditions from the City of Ottawa for the 300mm dia. Cast Iron Watermain in Queensview Drive(as shown on geoOttawa). We anticipate requiring an on-site private fire hydrant off the new water service connection to the proposed building. The anticipated water demands for the proposed development are as follows:

- Average Day Demand = 0.38 L/s
- Maximum Day Demand = 0.58 L/s
- Peak Hour Demand = 1.05 L/s
- Maximum Fire Flow Demand = 133 L/s

See attached calculation sheets for details.

A multi-hydrant approach to firefighting is anticipated to be required. As indicated on the geoOttawa website, there is one blue bonnet municipal hydrant within 75m (east of site), and one blue bonnet municipal hydrant within 150m of the subject site (at the SE corner of Pinecrest and Queensview) that could be used, in addition to the new private hydrant on-site, for firefighting purposes. See attached Boundary Conditions Request Sketch for details.

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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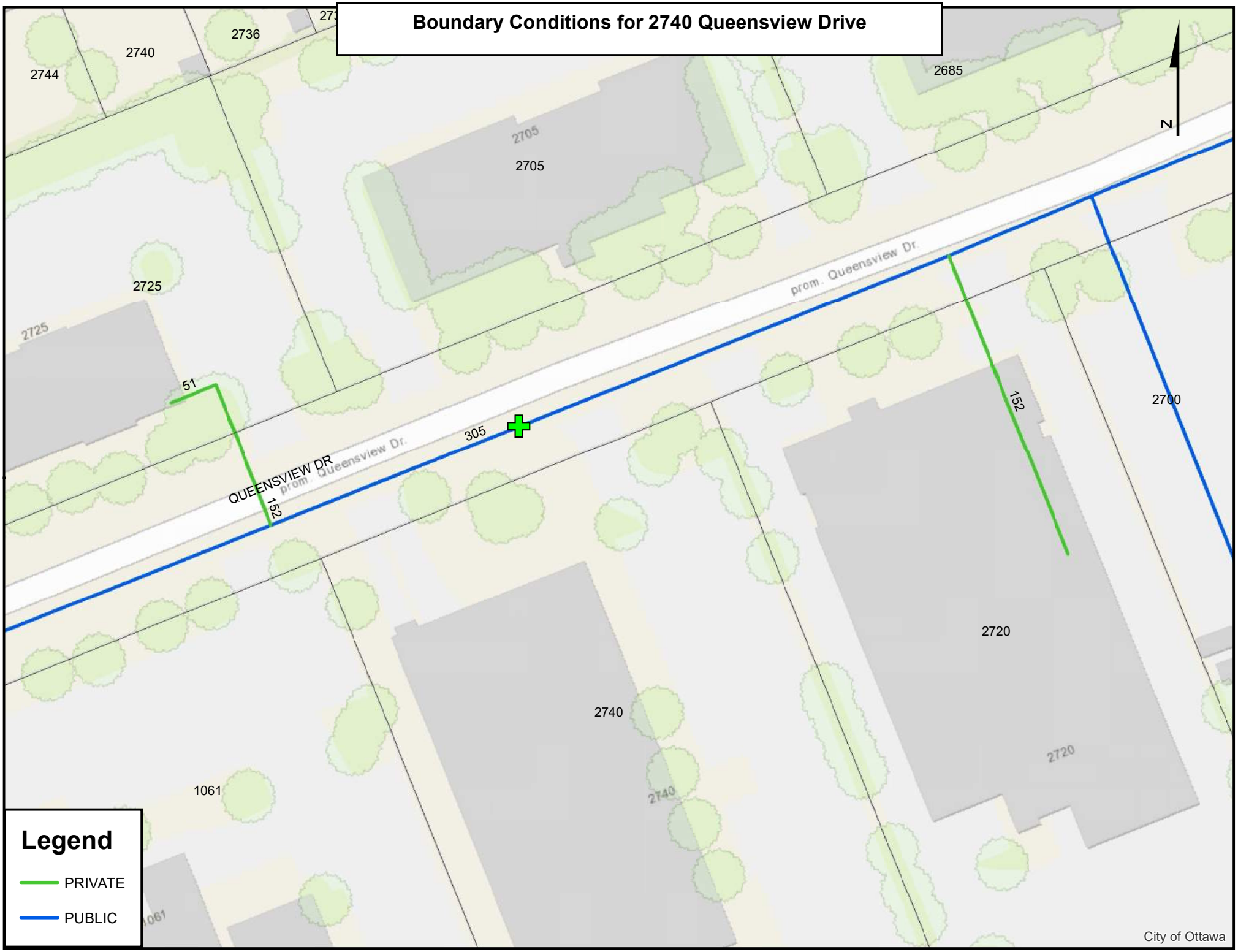
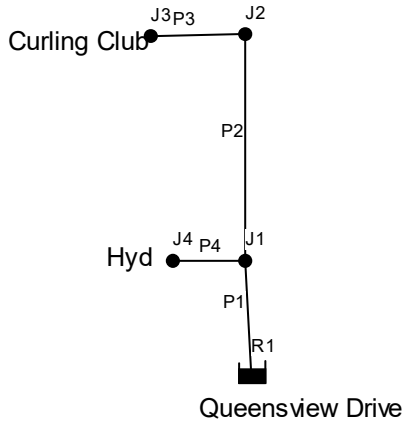
'

# Boundary Conditions for 2740 Queensview Drive



2740 Queensview Drive - Granite Curling Club
Project No.121127



**Granite Curling Club - 2740 Queensview Drive**

Peak Hour Demand
Network Table - Nodes

| Node ID | Elevation m | Demand L/s | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc J1 | 68.2 | 0 | 107.7 | 39.5 | 387.50 | 56.20 |
| Junc J2 | 68.2 | 0 | 107.7 | 39.5 | 387.50 | 56.20 |
| Junc J3 | 71.3 | 1.05 | 107.7 | 36.4 | 357.08 | 51.79 |
| Junc J4 | 71 | 0 | 107.7 | 36.7 | 360.03 | 52.22 |
| Resvr R1 | 107.7 | -1.05 | 107.7 | 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 P1 | 9 | 200 | 110 | 1.05 | 0.03 | 0.01 |
| Pipe P2 | 29.4 | 150 | 100 | 1.05 | 0.06 | 0.07 |
| Pipe P3 | 7.7 | 150 | 100 | 1.05 | 0.06 | 0.07 |
| Pipe P4 | 2.3 | 150 | 100 | 0 | 0 | 0 |

**Granite Curling Club - 2740 Queensview Drive**

Max HGL check
Network Table - Nodes

| Node ID | Elevation m | Demand L/s | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc J1 | 68.2 | 0 | 115.2 | 47 | 461.07 | 66.87 |
| Junc J2 | 68.2 | 0 | 115.2 | 47 | 461.07 | 66.87 |
| Junc J3 | 71.3 | 0.58 | 115.2 | 43.9 | 430.66 | 62.46 |
| Junc J4 | 71 | 0 | 115.2 | 44.2 | 433.60 | 62.89 |
| Resvr R1 | 115.2 | -0.58 | 115.2 | 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 P1 | 9 | 200 | 110 | 0.58 | 0.02 | 0 |
| Pipe P2 | 29.4 | 150 | 100 | 0.58 | 0.03 | 0.02 |
| Pipe P3 | 7.7 | 150 | 100 | 0.58 | 0.03 | 0.02 |
| Pipe P4 | 2.3 | 150 | 100 | 0 | 0 | 0 |

**Granite Curling Club - 2740 Queensview Drive**

Max Day + Fire Flow Demand
Network Table - Nodes

| Node ID | Elevation m | Demand L/s | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc J1 | 68.2 | 0 | 105.93 | 37.73 | 370.13 | 53.68 |
| Junc J2 | 68.2 | 0 | 105.93 | 37.73 | 370.13 | 53.68 |
| Junc J3 | 71.3 | 0.58 | 105.93 | 34.63 | 339.72 | 49.27 |
| Junc J4 | 71 | 133 | 104.74 | 33.74 | 330.99 | 48.01 |
| Resvr R1 | 106.9 | -133.58 | 106.9 | 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 P1 | 9 | 200 | 110 | 133.58 | 4.25 | 107.88 |
| Pipe P2 | 29.4 | 150 | 100 | 0.58 | 0.03 | 0.02 |
| Pipe P3 | 7.7 | 150 | 100 | 0.58 | 0.03 | 0.02 |
| Pipe P4 | 2.3 | 150 | 100 | 133 | 7.53 | 518.4 |

# FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

**Novatech Project #:** 121127
**Project Name:** 2740 Queensview Drive
**Date:** 5/5/2021
**Input By:** S.Matthews
**Reviewed By:** F.Thauvette

Legend: Input by User; No Information or Input Required

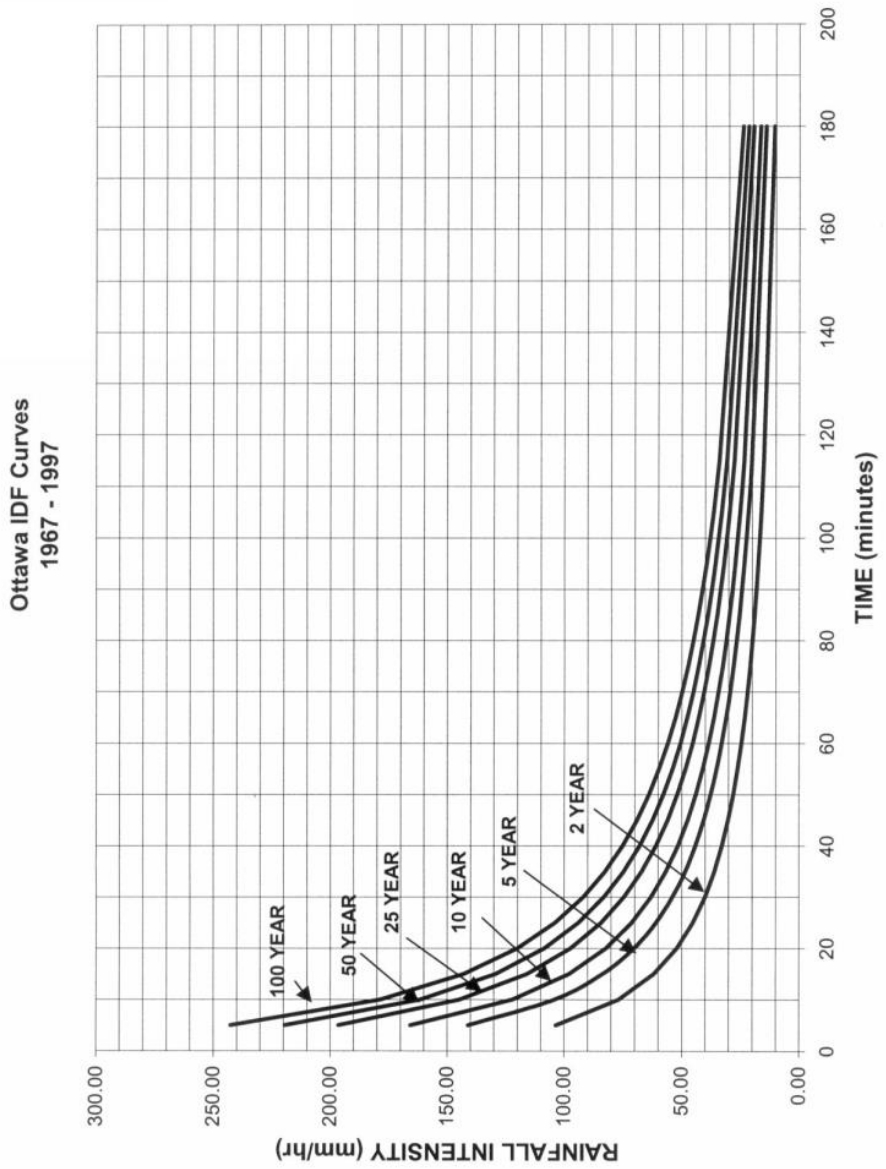
**Building Description:** Commercial Development
**Non-combustible construction**

| 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 ($m^2$) | 1693 | | | |
| | | Number of Floors/Storeys | 1.4 | | | |
| | | Area of structure considered ($m^2$) | | | **2,384** | |
| | F | **Base fire flow without reductions** | | | | **9,000** |
| | | $F = 220\ C\ (A)^{0.5}$ | | | | |
| **Reductions or Surcharges** | | | | | | |
| 3 | **Occupancy hazard reduction or surcharge** | | | **Reduction/Surcharge** | | |
| | (1) | Non-combustible | | -25% | 0% | **9,000** |
| | | 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% | **-3,600** |
| | | Standard Water Supply | Yes | -10% | -10% | |
| | | Fully Supervised System | | -10% | | |
| | | | | **Cumulative Total** | **-40%** | |
| 5 | **Exposure Surcharge (cumulative %)** | | | | **Surcharge** | |
| | (3) | North Side | 30.1- 45 m | | 5% | **2,700** |
| | | East Side | 10.1 - 20 m | | 15% | |
| | | South Side | > 45.1m | | 0% | |
| | | West Side | 20.1 - 30 m | | 10% | |
| | | | | **Cumulative Total** | **30%** | |
| **Results** | | | | | | |
| 6 | (1) + (2) + (3) | **Total Required Fire Flow, rounded to nearest 1000L/min** | | | **L/min** | **8,000** |
| | | (2,000 L/min < Fire Flow < 45,000 L/min) | | or | L/s | **133** |
| | | | | or | USGPM | 2,114 |
| 7 | **Storage Volume** | Required Duration of Fire Flow (hours) | | | Hours | 2 |
| | | Required Volume of Fire Flow ($m^3$) | | | $m^3$ | 960 |

# APPENDIX D

## IDF Curves and SWM Calculations, PCSWMM Modelling Schematic + Results

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



NOVATECH
Engineers, Planners & Landscape Architects

# Proposed Granite Curling Club
# 2740 Queensview Drive

| Pre - Development : Site Flows | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Description | Area (ha) | $A_{impervious}$ (ha) C=0.9 | $A_{gravel}$ (ha) C=0.6 | $A_{pervious}$ (ha) C=0.2 | Weighted $C_{W5}$ | Weighted $C_{W100}$ | 1:2 Year Flow (L/s) | 1:5 Year Flow (L/s) | 1:100 Year Flow (L/s) | Target Control Rate Pinecrest Creek 33.5 (L/s/ha) |
| Total Site Area | 0.519 | 0.398 | 0.000 | 0.121 | 0.74 | 0.83 | 81.6 | 110.8 | 212.6 | 17.4 |

| Post - Development : Site Flows | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | Description | Area (ha) | $A_{imp}$ (ha) C=0.9 | $A_{perv}$ (ha) C=0.2 | $C_{W5}$ | $C_{W100}$ | Uncontrolled Flow (L/s) | | | Controlled Flow (L/s) | | | Storage Required ($m^3$) | | | Provided |
| | | | | | | | 2 year | 5 year | 100 year | 2 year | 5 year | 100 year | 2 year | 5 year | 100 year | ($m^3$) |
| **A-0** | **Direct Runoff** | **0.044** | **0.007** | **0.037** | **0.31** | **0.37** | **2.9** | **4.0** | **8.1** | - | - | - | - | - | - | - |
| **A-1** | **Controlled East Drive Aisle** | **0.114** | **0.098** | **0.016** | **0.80** | **0.89** | - | - | - | **2.8** | **3.3** | **5.5** | **17.4** | **23.8** | **37.0** | **69.9** |
| | A-1.1 | 0.012 | 0.011 | 0.001 | 0.84 | 0.94 | - | - | - | - | - | - | - | - | - | - |
| | A-1.2 | 0.020 | 0.019 | 0.001 | 0.87 | 0.96 | - | - | - | - | - | - | - | - | - | - |
| | A-1.3 | 0.016 | 0.015 | 0.001 | 0.86 | 0.95 | - | - | - | - | - | - | - | - | - | - |
| | A-1.4 | 0.066 | 0.055 | 0.011 | 0.78 | 0.88 | - | - | - | - | - | - | - | - | - | - |
| **A-2** | **Controlled West Parking Lot** | **0.192** | **0.157** | **0.035** | **0.77** | **0.86** | - | - | - | **5.1** | **6.8** | **9.5** | **26.0** | **31.0** | **52.6** | **66.1** |
| | A-2.1 | 0.040 | 0.037 | 0.003 | 0.85 | 0.94 | - | - | - | - | - | - | - | - | - | - |
| | A-2.2 | 0.053 | 0.052 | 0.001 | 0.89 | 0.99 | - | - | - | - | - | - | - | - | - | - |
| | A-2.3 | 0.099 | 0.068 | 0.031 | 0.68 | 0.77 | - | - | - | - | - | - | - | - | - | - |
| **R-1** | **Controlled Flow Roof Drains** | **0.169** | **0.169** | **0.000** | **0.90** | **1.00** | - | - | - | **2.2** | **2.2** | **2.2** | **30.7** | **45.1** | **100.4** | **107.0** |
| | Summed Area Check: | 0.519 | | | | | | $T_c$ = 10mins | **Totals:** | **10.1** | **12.3** | **17.2** | **74.1** | **99.9** | **190.0** | **243.0** |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**Uncontrolled Runoff - 1:2 YEAR EVENT**
**AREA A-0**

OTTAWA IDF CURVE

Area = 0.044 ha  Qallow = 2.9 L/s
C = 0.31  Vol(max) = 0.0 m3

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 103.57 | 3.94 | 1.02 | 0.31 |
| 10 | 76.81 | 2.93 | 0.00 | 0.00 |
| 15 | 61.77 | 2.35 | -0.57 | -0.52 |
| 20 | 52.03 | 1.98 | -0.94 | -1.13 |
| 25 | 45.17 | 1.72 | -1.20 | -1.81 |
| 30 | 40.04 | 1.53 | -1.40 | -2.52 |
| 35 | 36.06 | 1.37 | -1.55 | -3.26 |
| 40 | 32.86 | 1.25 | -1.67 | -4.02 |
| 45 | 30.24 | 1.15 | -1.77 | -4.79 |
| 50 | 28.04 | 1.07 | -1.86 | -5.57 |
| 55 | 26.17 | 1.00 | -1.93 | -6.36 |
| 60 | 24.56 | 0.94 | -1.99 | -7.16 |
| 65 | 23.15 | 0.88 | -2.04 | -7.97 |
| 70 | 21.91 | 0.83 | -2.09 | -8.78 |
| 75 | 20.81 | 0.79 | -2.13 | -9.60 |
| 90 | 18.14 | 0.69 | -2.23 | -12.06 |
| 105 | 16.13 | 0.61 | -2.31 | -14.56 |
| 120 | 14.56 | 0.55 | -2.37 | -17.07 |
| 135 | 13.30 | 0.51 | -2.42 | -19.59 |
| 150 | 12.25 | 0.47 | -2.46 | -22.13 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**Uncontrolled Runoff - 1:5 YEAR EVENT**
**AREA A-0**

OTTAWA IDF CURVE

Area = 0.044 ha  Qallow = 4.0 L/s
C = 0.31  Vol(max) = 0.0 m3

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 141.18 | 5.38 | 1.41 | 0.42 |
| 10 | 104.19 | 3.97 | 0.00 | 0.00 |
| 15 | 83.56 | 3.18 | -0.79 | -0.71 |
| 20 | 70.25 | 2.68 | -1.29 | -1.55 |
| 25 | 60.90 | 2.32 | -1.65 | -2.47 |
| 30 | 53.93 | 2.05 | -1.91 | -3.45 |
| 35 | 48.52 | 1.85 | -2.12 | -4.45 |
| 40 | 44.18 | 1.68 | -2.29 | -5.49 |
| 45 | 40.63 | 1.55 | -2.42 | -6.54 |
| 50 | 37.65 | 1.43 | -2.53 | -7.60 |
| 55 | 35.12 | 1.34 | -2.63 | -8.68 |
| 60 | 32.94 | 1.25 | -2.71 | -9.77 |
| 65 | 31.04 | 1.18 | -2.79 | -10.87 |
| 70 | 29.37 | 1.12 | -2.85 | -11.97 |
| 75 | 27.89 | 1.06 | -2.91 | -13.08 |
| 90 | 24.29 | 0.93 | -3.04 | -16.43 |
| 105 | 21.58 | 0.82 | -3.15 | -19.82 |
| 120 | 19.47 | 0.74 | -3.23 | -23.23 |
| 135 | 17.76 | 0.68 | -3.29 | -26.66 |
| 150 | 16.36 | 0.62 | -3.35 | -30.11 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**Uncontrolled Runoff - 1:100 YEAR EVENT**
**AREA A-0**

OTTAWA IDF CURVE

Area = 0.044 ha  Qallow = 8.1 L/s
C = 0.37  Vol(max) = 0.0 m3

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 242.70 | 10.96 | 2.90 | 0.87 |
| 10 | 178.56 | 8.07 | 0.00 | 0.00 |
| 15 | 142.89 | 6.46 | -1.61 | -1.45 |
| 20 | 119.95 | 5.42 | -2.65 | -3.18 |
| 25 | 103.85 | 4.69 | -3.38 | -5.06 |
| 30 | 91.87 | 4.15 | -3.92 | -7.05 |
| 35 | 82.58 | 3.73 | -4.34 | -9.11 |
| 40 | 75.15 | 3.39 | -4.67 | -11.21 |
| 45 | 69.05 | 3.12 | -4.95 | -13.36 |
| 50 | 63.95 | 2.89 | -5.18 | -15.53 |
| 55 | 59.62 | 2.69 | -5.37 | -17.73 |
| 60 | 55.89 | 2.53 | -5.54 | -19.95 |
| 65 | 52.65 | 2.38 | -5.69 | -22.18 |
| 70 | 49.79 | 2.25 | -5.82 | -24.43 |
| 75 | 47.26 | 2.13 | -5.93 | -26.69 |
| 90 | 41.11 | 1.86 | -6.21 | -33.53 |
| 105 | 36.50 | 1.65 | -6.42 | -40.43 |
| 120 | 32.89 | 1.49 | -6.58 | -47.38 |
| 135 | 30.00 | 1.36 | -6.71 | -54.36 |
| 150 | 27.61 | 1.25 | -6.82 | -61.37 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**Uncontrolled Runoff - 1:100 YR + 20% IDF Increase**
**AREA A-0**

OTTAWA IDF CURVE

Area = 0.044 ha  Qallow = 9.7 L/s
C = 0.37  Vol(max) = 0.0 m3

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 291.24 | 13.16 | 3.48 | 1.04 |
| 10 | 214.27 | 9.68 | 0.00 | 0.00 |
| 15 | 171.47 | 7.75 | -1.93 | -1.74 |
| 20 | 143.94 | 6.50 | -3.18 | -3.81 |
| 25 | 124.62 | 5.63 | -4.05 | -6.08 |
| 30 | 110.24 | 4.98 | -4.70 | -8.46 |
| 35 | 99.09 | 4.48 | -5.20 | -10.93 |
| 40 | 90.17 | 4.07 | -5.61 | -13.45 |
| 45 | 82.86 | 3.74 | -5.94 | -16.03 |
| 50 | 76.74 | 3.47 | -6.21 | -18.64 |
| 55 | 71.55 | 3.23 | -6.45 | -21.28 |
| 60 | 67.07 | 3.03 | -6.65 | -23.94 |
| 65 | 63.18 | 2.85 | -6.83 | -26.62 |
| 70 | 59.75 | 2.70 | -6.98 | -29.32 |
| 75 | 56.71 | 2.56 | -7.12 | -32.03 |
| 90 | 49.33 | 2.23 | -7.45 | -40.24 |
| 105 | 43.80 | 1.98 | -7.70 | -48.52 |
| 120 | 39.47 | 1.78 | -7.90 | -56.85 |
| 135 | 36.00 | 1.63 | -8.05 | -65.23 |
| 150 | 33.13 | 1.50 | -8.18 | -73.65 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:2 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #1**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.010 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 1.2 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 103.57 | 2.59 | 2.27 | 0.68 |
| 10 | 76.81 | 1.92 | 1.60 | 0.96 |
| 15 | 61.77 | 1.55 | 1.23 | 1.10 |
| 20 | 52.03 | 1.30 | 0.98 | 1.18 |
| 25 | 45.17 | 1.13 | 0.81 | 1.22 |
| 30 | 40.04 | 1.00 | 0.68 | 1.23 |
| 35 | 36.06 | 0.90 | 0.58 | 1.22 |
| 40 | 32.86 | 0.82 | 0.50 | 1.21 |
| 45 | 30.24 | 0.76 | 0.44 | 1.18 |
| 50 | 28.04 | 0.70 | 0.38 | 1.14 |
| 55 | 26.17 | 0.65 | 0.33 | 1.10 |
| 60 | 24.56 | 0.61 | 0.29 | 1.06 |
| 65 | 23.15 | 0.58 | 0.26 | 1.01 |
| 70 | 21.91 | 0.55 | 0.23 | 0.96 |
| 75 | 20.81 | 0.52 | 0.20 | 0.90 |
| 90 | 18.14 | 0.45 | 0.13 | 0.72 |
| 105 | 16.13 | 0.40 | 0.08 | 0.53 |
| 120 | 14.56 | 0.36 | 0.04 | 0.32 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:5 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #1**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.010 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 1.9 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 141.18 | 3.53 | 3.21 | 0.96 |
| 10 | 104.19 | 2.61 | 2.29 | 1.37 |
| 15 | 83.56 | 2.09 | 1.77 | 1.59 |
| 20 | 70.25 | 1.76 | 1.44 | 1.73 |
| 25 | 60.90 | 1.52 | 1.20 | 1.81 |
| 30 | 53.93 | 1.35 | 1.03 | 1.85 |
| 35 | 48.52 | 1.21 | 0.89 | 1.88 |
| 40 | 44.18 | 1.11 | 0.79 | 1.89 |
| 45 | 40.63 | 1.02 | 0.70 | 1.88 |
| 50 | 37.65 | 0.94 | 0.62 | 1.87 |
| 55 | 35.12 | 0.88 | 0.56 | 1.84 |
| 60 | 32.94 | 0.82 | 0.50 | 1.82 |
| 65 | 31.04 | 0.78 | 0.46 | 1.78 |
| 70 | 29.37 | 0.73 | 0.41 | 1.74 |
| 75 | 27.89 | 0.70 | 0.38 | 1.70 |
| 90 | 24.29 | 0.61 | 0.29 | 1.55 |
| 105 | 21.58 | 0.54 | 0.22 | 1.39 |
| 120 | 19.47 | 0.49 | 0.17 | 1.20 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #1**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.010 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 4.5 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 242.70 | 6.75 | 6.43 | 1.93 |
| 10 | 178.56 | 4.96 | 4.64 | 2.79 |
| 15 | 142.89 | 3.97 | 3.65 | 3.29 |
| 20 | 119.95 | 3.33 | 3.01 | 3.62 |
| 25 | 103.85 | 2.89 | 2.57 | 3.85 |
| 30 | 91.87 | 2.55 | 2.23 | 4.02 |
| 35 | 82.58 | 2.30 | 1.98 | 4.15 |
| 40 | 75.15 | 2.09 | 1.77 | 4.25 |
| 45 | 69.05 | 1.92 | 1.60 | 4.32 |
| 50 | 63.95 | 1.78 | 1.46 | 4.37 |
| 55 | 59.62 | 1.66 | 1.34 | 4.41 |
| 60 | 55.89 | 1.55 | 1.23 | 4.44 |
| 65 | 52.65 | 1.46 | 1.14 | 4.46 |
| 70 | 49.79 | 1.38 | 1.06 | 4.47 |
| 75 | 47.26 | 1.31 | 0.99 | 4.47 |
| 90 | 41.11 | 1.14 | 0.82 | 4.44 |
| 105 | 36.50 | 1.01 | 0.69 | 4.38 |
| 120 | 32.89 | 0.91 | 0.59 | 4.28 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR + 20%**
**AREA R-1** **Controlled Roof Drain #1**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.010 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 5.7 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 291.24 | 8.10 | 7.78 | 2.33 |
| 10 | 214.27 | 5.96 | 5.64 | 3.38 |
| 15 | 171.47 | 4.77 | 4.45 | 4.00 |
| 20 | 143.94 | 4.00 | 3.68 | 4.42 |
| 25 | 124.62 | 3.46 | 3.14 | 4.72 |
| 30 | 110.24 | 3.06 | 2.74 | 4.94 |
| 35 | 99.09 | 2.75 | 2.43 | 5.11 |
| 40 | 90.17 | 2.51 | 2.19 | 5.25 |
| 45 | 82.86 | 2.30 | 1.98 | 5.36 |
| 50 | 76.74 | 2.13 | 1.81 | 5.44 |
| 55 | 71.55 | 1.99 | 1.67 | 5.51 |
| 60 | 67.07 | 1.86 | 1.54 | 5.56 |
| 65 | 63.18 | 1.76 | 1.44 | 5.60 |
| 70 | 59.75 | 1.66 | 1.34 | 5.63 |
| 75 | 56.71 | 1.58 | 1.26 | 5.65 |
| 90 | 49.33 | 1.37 | 1.05 | 5.68 |
| 105 | 43.80 | 1.22 | 0.90 | 5.65 |
| 120 | 39.47 | 1.10 | 0.78 | 5.60 |

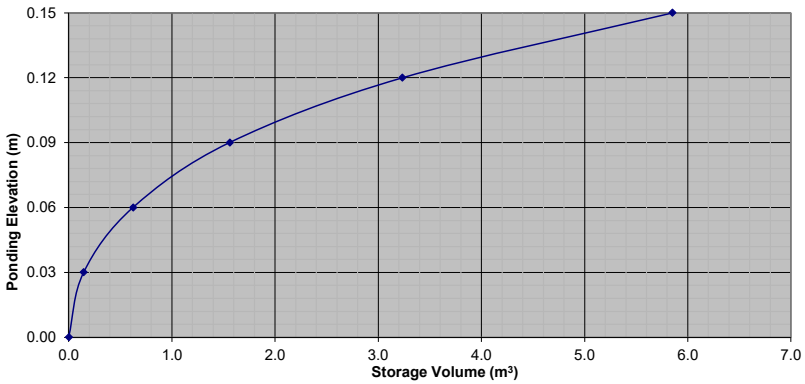
**Watts Accutrol Flow Control Roof Drains:** RD-100-A-ADJ set to Closed

| Design Event | Flow/Drain (L/s) | Total Flow (L/s) | Ponding (cm) | Storage ($m^3$) Required | Storage ($m^3$) Provided |
|---|---|---|---|---|---|
| 1:2 Year | 0.32 | 0.32 | 8 | 1.2 | 3.2 |
| 1:5 Year | 0.32 | 0.32 | 9 | 1.9 | 5.9 |
| 1:100 Year | 0.32 | 0.32 | 13 | 4.5 | 5.9 |

**Roof Drain Storage Table for Area RD 1**

| Elevation | Area RD 1 | Total Volume |
|---|---|---|
| m | $m^2$ | $m^3$ |
| 0.00 | 0 | 0 |
| 0.03 | 9.6 | 0.1 |
| 0.06 | 22.42 | 0.6 |
| 0.09 | 39.95 | 1.6 |
| 0.12 | 71.54 | 3.2 |
| 0.15 | 103.13 | 5.9 |

**Stage Storage Curve: Area R-1**
**Controlled Roof Drain #1**



**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:2 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #2**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.006 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 0.6 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 103.57 | 1.55 | 1.23 | 0.37 |
| 10 | 76.81 | 1.15 | 0.83 | 0.50 |
| 15 | 61.77 | 0.93 | 0.61 | 0.55 |
| 20 | 52.03 | 0.78 | 0.46 | 0.55 |
| 25 | 45.17 | 0.68 | 0.36 | 0.54 |
| 30 | 40.04 | 0.60 | 0.28 | 0.51 |
| 35 | 36.06 | 0.54 | 0.22 | 0.46 |
| 40 | 32.86 | 0.49 | 0.17 | 0.42 |
| 45 | 30.24 | 0.45 | 0.13 | 0.36 |
| 50 | 28.04 | 0.42 | 0.10 | 0.30 |
| 55 | 26.17 | 0.39 | 0.07 | 0.24 |
| 60 | 24.56 | 0.37 | 0.05 | 0.18 |
| 65 | 23.15 | 0.35 | 0.03 | 0.11 |
| 70 | 21.91 | 0.33 | 0.01 | 0.04 |
| 75 | 20.81 | 0.31 | -0.01 | -0.03 |
| 90 | 18.14 | 0.27 | -0.05 | -0.26 |
| 105 | 16.13 | 0.24 | -0.08 | -0.49 |
| 120 | 14.56 | 0.22 | -0.10 | -0.73 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:5 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #2**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.006 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 0.9 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 141.18 | 2.12 | 1.80 | 0.54 |
| 10 | 104.19 | 1.56 | 1.24 | 0.75 |
| 15 | 83.56 | 1.25 | 0.93 | 0.84 |
| 20 | 70.25 | 1.05 | 0.73 | 0.88 |
| 25 | 60.90 | 0.91 | 0.59 | 0.89 |
| 30 | 53.93 | 0.81 | 0.49 | 0.88 |
| 35 | 48.52 | 0.73 | 0.41 | 0.86 |
| 40 | 44.18 | 0.66 | 0.34 | 0.82 |
| 45 | 40.63 | 0.61 | 0.29 | 0.78 |
| 50 | 37.65 | 0.57 | 0.25 | 0.74 |
| 55 | 35.12 | 0.53 | 0.21 | 0.68 |
| 60 | 32.94 | 0.49 | 0.17 | 0.63 |
| 65 | 31.04 | 0.47 | 0.15 | 0.57 |
| 70 | 29.37 | 0.44 | 0.12 | 0.51 |
| 75 | 27.89 | 0.42 | 0.10 | 0.44 |
| 90 | 24.29 | 0.36 | 0.04 | 0.24 |
| 105 | 21.58 | 0.32 | 0.00 | 0.03 |
| 120 | 19.47 | 0.29 | -0.03 | -0.20 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #2**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.006 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 2.2 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 242.70 | 4.05 | 3.73 | 1.12 |
| 10 | 178.56 | 2.98 | 2.66 | 1.60 |
| 15 | 142.89 | 2.38 | 2.06 | 1.86 |
| 20 | 119.95 | 2.00 | 1.68 | 2.02 |
| 25 | 103.85 | 1.73 | 1.41 | 2.12 |
| 30 | 91.87 | 1.53 | 1.21 | 2.18 |
| 35 | 82.58 | 1.38 | 1.06 | 2.22 |
| 40 | 75.15 | 1.25 | 0.93 | 2.24 |
| 45 | 69.05 | 1.15 | 0.83 | 2.25 |
| 50 | 63.95 | 1.07 | 0.75 | 2.24 |
| 55 | 59.62 | 0.99 | 0.67 | 2.23 |
| 60 | 55.89 | 0.93 | 0.61 | 2.20 |
| 65 | 52.65 | 0.88 | 0.56 | 2.18 |
| 70 | 49.79 | 0.83 | 0.51 | 2.14 |
| 75 | 47.26 | 0.79 | 0.47 | 2.11 |
| 90 | 41.11 | 0.69 | 0.37 | 1.97 |
| 105 | 36.50 | 0.61 | 0.29 | 1.82 |
| 120 | 32.89 | 0.55 | 0.23 | 1.65 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR + 20%**
**AREA R-1** **Controlled Roof Drain #2**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.006 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 2.9 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 291.24 | 4.86 | 4.54 | 1.36 |
| 10 | 214.27 | 3.57 | 3.25 | 1.95 |
| 15 | 171.47 | 2.86 | 2.54 | 2.29 |
| 20 | 143.94 | 2.40 | 2.08 | 2.50 |
| 25 | 124.62 | 2.08 | 1.76 | 2.64 |
| 30 | 110.24 | 1.84 | 1.52 | 2.73 |
| 35 | 99.09 | 1.65 | 1.33 | 2.80 |
| 40 | 90.17 | 1.50 | 1.18 | 2.84 |
| 45 | 82.86 | 1.38 | 1.06 | 2.87 |
| 50 | 76.74 | 1.28 | 0.96 | 2.88 |
| 55 | 71.55 | 1.19 | 0.87 | 2.88 |
| 60 | 67.07 | 1.12 | 0.80 | 2.88 |
| 65 | 63.18 | 1.05 | 0.73 | 2.86 |
| 70 | 59.75 | 1.00 | 0.68 | 2.84 |
| 75 | 56.71 | 0.95 | 0.63 | 2.82 |
| 90 | 49.33 | 0.82 | 0.50 | 2.72 |
| 105 | 43.80 | 0.73 | 0.41 | 2.59 |
| 120 | 39.47 | 0.66 | 0.34 | 2.44 |

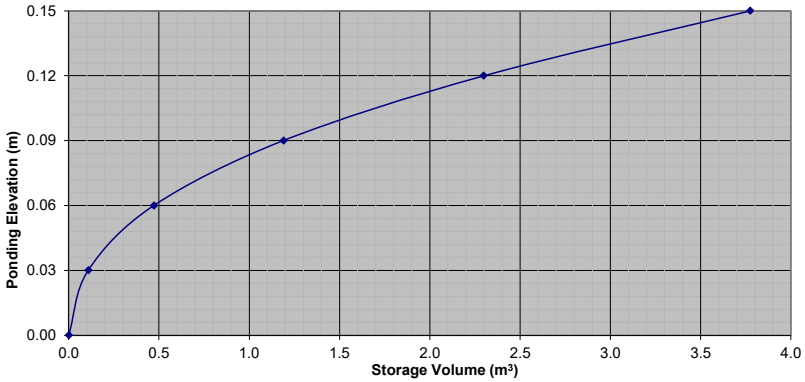
**Watts Accutrol Flow Control Roof Drains:** RD-100-A-ADJ set to Closed

| Design Event | Flow/Drain (L/s) | Total Flow (L/s) | Ponding (cm) | Storage ($m^3$) Required | Storage ($m^3$) Provided |
|---|---|---|---|---|---|
| 1:2 Year | 0.32 | 0.32 | 7 | 0.6 | 2.3 |
| 1:5 Year | 0.32 | 0.32 | 8 | 0.9 | 3.8 |
| 1:100 Year | 0.32 | 0.32 | 12 | 2.2 | 3.8 |

**Roof Drain Storage Table for Area RD 2**

| Elevation | Area RD 2 | Total Volume |
|---|---|---|
| m | $m^2$ | $m^3$ |
| 0.00 | 0 | 0 |
| 0.03 | 7.23 | 0.1 |
| 0.06 | 17.01 | 0.5 |
| 0.09 | 30.83 | 1.2 |
| 0.12 | 43.08 | 2.3 |
| 0.15 | 55.32 | 3.8 |

**Stage Storage Curve: Area R-1**
**Controlled Roof Drain #2**



**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:2 YEAR EVENT**
**AREA R-1** **Controlled Roof Drains 3+4**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.050 | ha | Qallow = | 0.64 | L/s |
| C = | 0.90 | | Vol(max) = | 8.8 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 103.57 | 12.96 | 12.32 | 3.70 |
| 10 | 76.81 | 9.61 | 8.97 | 5.38 |
| 15 | 61.77 | 7.73 | 7.09 | 6.38 |
| 20 | 52.03 | 6.51 | 5.87 | 7.04 |
| 25 | 45.17 | 5.65 | 5.01 | 7.52 |
| 40 | 32.86 | 4.11 | 3.47 | 8.33 |
| 55 | 26.17 | 3.27 | 2.63 | 8.69 |
| 70 | 21.91 | 2.74 | 2.10 | 8.83 |
| 85 | 18.94 | 2.37 | 1.73 | 8.82 |
| 100 | 16.75 | 2.09 | 1.45 | 8.73 |
| 120 | 14.56 | 1.82 | 1.18 | 8.51 |
| 140 | 12.93 | 1.62 | 0.98 | 8.21 |
| 160 | 11.65 | 1.46 | 0.82 | 7.85 |
| 180 | 10.63 | 1.33 | 0.69 | 7.45 |
| 200 | 9.78 | 1.22 | 0.58 | 7.01 |
| 220 | 9.08 | 1.14 | 0.50 | 6.54 |
| 240 | 8.47 | 1.06 | 0.42 | 6.05 |
| 260 | 7.96 | 1.00 | 0.36 | 5.54 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:5 YEAR EVENT**
**AREA R-1** **Controlled Roof Drains 3+4**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.050 | ha | Qallow = | 0.64 | L/s |
| C = | 0.90 | | Vol(max) = | 13.0 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 141.18 | 17.66 | 17.02 | 5.11 |
| 10 | 104.19 | 13.03 | 12.39 | 7.44 |
| 15 | 83.56 | 10.45 | 9.81 | 8.83 |
| 20 | 70.25 | 8.79 | 8.15 | 9.78 |
| 25 | 60.90 | 7.62 | 6.98 | 10.47 |
| 40 | 44.18 | 5.53 | 4.89 | 11.73 |
| 55 | 35.12 | 4.39 | 3.75 | 12.39 |
| 70 | 29.37 | 3.67 | 3.03 | 12.74 |
| 85 | 25.37 | 3.17 | 2.53 | 12.92 |
| 100 | 22.41 | 2.80 | 2.16 | 12.98 |
| 120 | 19.47 | 2.44 | 1.80 | 12.93 |
| 140 | 17.27 | 2.16 | 1.52 | 12.77 |
| 160 | 15.56 | 1.95 | 1.31 | 12.54 |
| 180 | 14.18 | 1.77 | 1.13 | 12.25 |
| 200 | 13.05 | 1.63 | 0.99 | 11.91 |
| 220 | 12.10 | 1.51 | 0.87 | 11.54 |
| 240 | 11.29 | 1.41 | 0.77 | 11.13 |
| 260 | 10.60 | 1.33 | 0.69 | 10.70 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR EVENT**
**AREA R-1** **Controlled Roof Drains 3+4**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.050 | ha | Qallow = | 0.64 | L/s |
| C = | 1.00 | | Vol(max) = | 29.0 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 242.70 | 33.74 | 33.10 | 9.93 |
| 10 | 178.56 | 24.82 | 24.18 | 14.51 |
| 15 | 142.89 | 19.86 | 19.22 | 17.30 |
| 25 | 103.85 | 14.43 | 13.79 | 20.69 |
| 35 | 82.58 | 11.48 | 10.84 | 22.76 |
| 50 | 63.95 | 8.89 | 8.25 | 24.75 |
| 65 | 52.65 | 7.32 | 6.68 | 26.04 |
| 80 | 44.99 | 6.25 | 5.61 | 26.95 |
| 100 | 37.90 | 5.27 | 4.63 | 27.77 |
| 120 | 32.89 | 4.57 | 3.93 | 28.31 |
| 140 | 29.15 | 4.05 | 3.41 | 28.66 |
| 170 | 25.01 | 3.48 | 2.84 | 28.93 |
| 200 | 21.98 | 3.06 | 2.42 | 28.99 |
| 230 | 19.66 | 2.73 | 2.09 | 28.89 |
| 260 | 17.83 | 2.48 | 1.84 | 28.67 |
| 290 | 16.33 | 2.27 | 1.63 | 28.36 |
| 330 | 14.72 | 2.05 | 1.41 | 27.84 |
| 380 | 13.14 | 1.83 | 1.19 | 27.04 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR + 20%**
**AREA R-1** **Controlled Roof Drains 3+4**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.050 | ha | Qallow = | 0.64 | L/s |
| C = | 1.00 | | Vol(max) = | 36.4 | m3 |

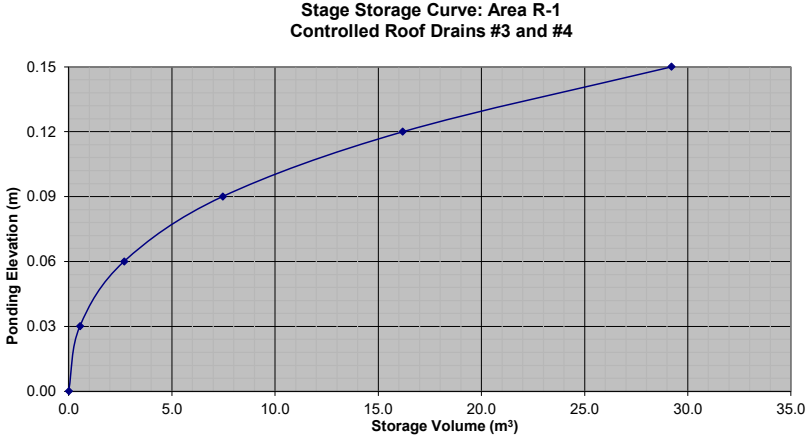
| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 291.24 | 40.48 | 39.84 | 11.95 |
| 10 | 214.27 | 29.78 | 29.14 | 17.49 |
| 15 | 171.47 | 23.83 | 23.19 | 20.88 |
| 25 | 124.62 | 17.32 | 16.68 | 25.02 |
| 35 | 99.09 | 13.77 | 13.13 | 27.58 |
| 50 | 76.74 | 10.67 | 10.03 | 30.08 |
| 65 | 63.18 | 8.78 | 8.14 | 31.75 |
| 80 | 53.99 | 7.50 | 6.86 | 32.95 |
| 100 | 45.48 | 6.32 | 5.68 | 34.09 |
| 120 | 39.47 | 5.49 | 4.85 | 34.90 |
| 140 | 34.98 | 4.86 | 4.22 | 35.47 |
| 170 | 30.01 | 4.17 | 3.53 | 36.02 |
| 200 | 26.38 | 3.67 | 3.03 | 36.32 |
| 230 | 23.60 | 3.28 | 2.64 | 36.43 |
| 260 | 21.39 | 2.97 | 2.33 | 36.40 |
| 290 | 19.60 | 2.72 | 2.08 | 36.26 |
| 330 | 17.66 | 2.46 | 1.82 | 35.94 |
| 380 | 15.76 | 2.19 | 1.55 | 35.36 |

**Watts Accutrol Flow Control Roof Drains:** RD-100-A-ADJ set to Closed

| Design Event | Flow/Drain (L/s) | Total Flow (L/s) | Ponding (cm) | Storage ($m^3$) Required | Storage ($m^3$) Provided |
|---|---|---|---|---|---|
| 1:2 Year | 0.32 | 0.64 | 10 | 8.8 | 16.2 |
| 1:5 Year | 0.32 | 0.64 | 11 | 13.0 | 29.2 |
| 1:100 Year | 0.32 | 0.64 | 15 | 29.0 | 29.2 |

**Roof Drain Storage Table for Area RDs 3+4**

| Elevation | Area RDs 3+4 | Total Volume |
|---|---|---|
| m | $m^2$ | $m^3$ |
| 0.00 | 0 | 0 |
| 0.03 | 36.26 | 0.5 |
| 0.06 | 106.26 | 2.7 |
| 0.09 | 212.36 | 7.5 |
| 0.12 | 368.74 | 16.2 |
| 0.15 | 499.8 | 29.2 |



**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:2 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #5**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 6.6 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 103.57 | 8.81 | 8.49 | 2.55 |
| 10 | 76.81 | 6.53 | 6.21 | 3.73 |
| 15 | 61.77 | 5.25 | 4.93 | 4.44 |
| 20 | 52.03 | 4.43 | 4.11 | 4.93 |
| 25 | 45.17 | 3.84 | 3.52 | 5.28 |
| 40 | 32.86 | 2.80 | 2.48 | 5.94 |
| 55 | 26.17 | 2.23 | 1.91 | 6.29 |
| 70 | 21.91 | 1.86 | 1.54 | 6.49 |
| 85 | 18.94 | 1.61 | 1.29 | 6.59 |
| 100 | 16.75 | 1.42 | 1.10 | 6.63 |
| 120 | 14.56 | 1.24 | 0.92 | 6.62 |
| 140 | 12.93 | 1.10 | 0.78 | 6.55 |
| 160 | 11.65 | 0.99 | 0.67 | 6.44 |
| 180 | 10.63 | 0.90 | 0.58 | 6.31 |
| 200 | 9.78 | 0.83 | 0.51 | 6.15 |
| 220 | 9.08 | 0.77 | 0.45 | 5.97 |
| 240 | 8.47 | 0.72 | 0.40 | 5.77 |
| 260 | 7.96 | 0.68 | 0.36 | 5.57 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:5 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #5**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 9.7 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 141.18 | 12.01 | 11.69 | 3.51 |
| 10 | 104.19 | 8.86 | 8.54 | 5.13 |
| 15 | 83.56 | 7.11 | 6.79 | 6.11 |
| 20 | 70.25 | 5.98 | 5.66 | 6.79 |
| 25 | 60.90 | 5.18 | 4.86 | 7.29 |
| 40 | 44.18 | 3.76 | 3.44 | 8.25 |
| 55 | 35.12 | 2.99 | 2.67 | 8.80 |
| 70 | 29.37 | 2.50 | 2.18 | 9.15 |
| 85 | 25.37 | 2.16 | 1.84 | 9.37 |
| 100 | 22.41 | 1.91 | 1.59 | 9.52 |
| 120 | 19.47 | 1.66 | 1.34 | 9.62 |
| 140 | 17.27 | 1.47 | 1.15 | 9.65 |
| 160 | 15.56 | 1.32 | 1.00 | 9.63 |
| 180 | 14.18 | 1.21 | 0.89 | 9.57 |
| 200 | 13.05 | 1.11 | 0.79 | 9.48 |
| 220 | 12.10 | 1.03 | 0.71 | 9.36 |
| 240 | 11.29 | 0.96 | 0.64 | 9.23 |
| 260 | 10.60 | 0.90 | 0.58 | 9.07 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #5**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 21.3 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 242.70 | 22.94 | 22.62 | 6.79 |
| 10 | 178.56 | 16.88 | 16.56 | 9.93 |
| 15 | 142.89 | 13.51 | 13.19 | 11.87 |
| 25 | 103.85 | 9.82 | 9.50 | 14.24 |
| 35 | 82.58 | 7.81 | 7.49 | 15.72 |
| 50 | 63.95 | 6.04 | 5.72 | 17.17 |
| 65 | 52.65 | 4.98 | 4.66 | 18.16 |
| 80 | 44.99 | 4.25 | 3.93 | 18.88 |
| 100 | 37.90 | 3.58 | 3.26 | 19.58 |
| 120 | 32.89 | 3.11 | 2.79 | 20.08 |
| 140 | 29.15 | 2.76 | 2.44 | 20.46 |
| 170 | 25.01 | 2.36 | 2.04 | 20.85 |
| 200 | 21.98 | 2.08 | 1.76 | 21.09 |
| 230 | 19.66 | 1.86 | 1.54 | 21.23 |
| 260 | 17.83 | 1.68 | 1.36 | 21.29 |
| 290 | 16.33 | 1.54 | 1.22 | 21.29 |
| 330 | 14.72 | 1.39 | 1.07 | 21.21 |
| 380 | 13.14 | 1.24 | 0.92 | 21.01 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR + 20%**
**AREA R-1** **Controlled Roof Drain #5**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 26.7 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 291.24 | 27.53 | 27.21 | 8.16 |
| 10 | 214.27 | 20.25 | 19.93 | 11.96 |
| 15 | 171.47 | 16.21 | 15.89 | 14.30 |
| 25 | 124.62 | 11.78 | 11.46 | 17.19 |
| 35 | 99.09 | 9.37 | 9.05 | 19.00 |
| 50 | 76.74 | 7.25 | 6.93 | 20.80 |
| 65 | 63.18 | 5.97 | 5.65 | 22.04 |
| 80 | 53.99 | 5.10 | 4.78 | 22.96 |
| 100 | 45.48 | 4.30 | 3.98 | 23.87 |
| 120 | 39.47 | 3.73 | 3.41 | 24.56 |
| 140 | 34.98 | 3.31 | 2.99 | 25.09 |
| 170 | 30.01 | 2.84 | 2.52 | 25.67 |
| 200 | 26.38 | 2.49 | 2.17 | 26.08 |
| 230 | 23.60 | 2.23 | 1.91 | 26.36 |
| 260 | 21.39 | 2.02 | 1.70 | 26.55 |
| 290 | 19.60 | 1.85 | 1.53 | 26.66 |
| 330 | 17.66 | 1.67 | 1.35 | 26.72 |
| 380 | 15.76 | 1.49 | 1.17 | 26.67 |

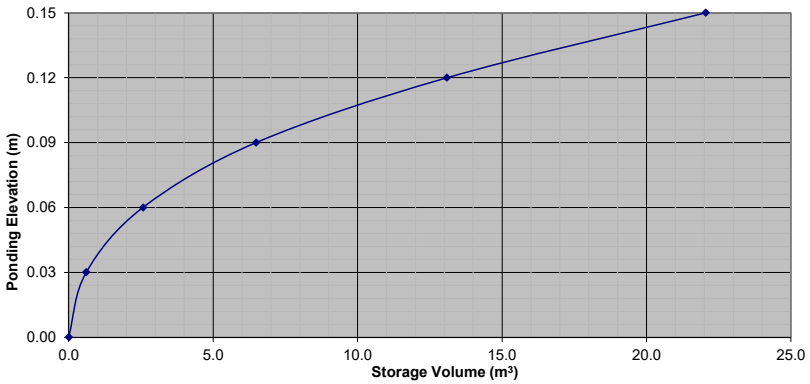
**Watts Accutrol Flow Control Roof Drains:** RD-100-A-ADJ set to Closed

| Design Event | Flow/Drain (L/s) | Total Flow (L/s) | Ponding (cm) | Storage ($m^3$) Required | Storage ($m^3$) Provided |
|---|---|---|---|---|---|
| 1:2 Year | 0.32 | 0.32 | 10 | 6.6 | 13.1 |
| 1:5 Year | 0.32 | 0.32 | 11 | 9.7 | 22.0 |
| 1:100 Year | 0.32 | 0.32 | 15 | 21.3 | 22.0 |

**Roof Drain Storage Table for Area RD 5**

| Elevation | Area RD 5 | Total Volume |
|---|---|---|
| m | $m^2$ | $m^3$ |
| 0.00 | 0 | 0 |
| 0.03 | 40.49 | 0.6 |
| 0.06 | 90.4 | 2.6 |
| 0.09 | 170.66 | 6.5 |
| 0.12 | 269.26 | 13.1 |
| 0.15 | 328.23 | 22.0 |

**Stage Storage Curve: Area R-1**
**Controlled Roof Drain #5**



**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:2 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #6**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 6.6 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 103.57 | 8.81 | 8.49 | 2.55 |
| 10 | 76.81 | 6.53 | 6.21 | 3.73 |
| 15 | 61.77 | 5.25 | 4.93 | 4.44 |
| 20 | 52.03 | 4.43 | 4.11 | 4.93 |
| 25 | 45.17 | 3.84 | 3.52 | 5.28 |
| 40 | 32.86 | 2.80 | 2.48 | 5.94 |
| 55 | 26.17 | 2.23 | 1.91 | 6.29 |
| 70 | 21.91 | 1.86 | 1.54 | 6.49 |
| 85 | 18.94 | 1.61 | 1.29 | 6.59 |
| 100 | 16.75 | 1.42 | 1.10 | 6.63 |
| 120 | 14.56 | 1.24 | 0.92 | 6.62 |
| 140 | 12.93 | 1.10 | 0.78 | 6.55 |
| 160 | 11.65 | 0.99 | 0.67 | 6.44 |
| 180 | 10.63 | 0.90 | 0.58 | 6.31 |
| 200 | 9.78 | 0.83 | 0.51 | 6.15 |
| 220 | 9.08 | 0.77 | 0.45 | 5.97 |
| 240 | 8.47 | 0.72 | 0.40 | 5.77 |
| 260 | 7.96 | 0.68 | 0.36 | 5.57 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:5 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #6**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 9.7 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 141.18 | 12.01 | 11.69 | 3.51 |
| 10 | 104.19 | 8.86 | 8.54 | 5.13 |
| 15 | 83.56 | 7.11 | 6.79 | 6.11 |
| 20 | 70.25 | 5.98 | 5.66 | 6.79 |
| 25 | 60.90 | 5.18 | 4.86 | 7.29 |
| 40 | 44.18 | 3.76 | 3.44 | 8.25 |
| 55 | 35.12 | 2.99 | 2.67 | 8.80 |
| 70 | 29.37 | 2.50 | 2.18 | 9.15 |
| 85 | 25.37 | 2.16 | 1.84 | 9.37 |
| 100 | 22.41 | 1.91 | 1.59 | 9.52 |
| 120 | 19.47 | 1.66 | 1.34 | 9.62 |
| 140 | 17.27 | 1.47 | 1.15 | 9.65 |
| 160 | 15.56 | 1.32 | 1.00 | 9.63 |
| 180 | 14.18 | 1.21 | 0.89 | 9.57 |
| 200 | 13.05 | 1.11 | 0.79 | 9.48 |
| 220 | 12.10 | 1.03 | 0.71 | 9.36 |
| 240 | 11.29 | 0.96 | 0.64 | 9.23 |
| 260 | 10.60 | 0.90 | 0.58 | 9.07 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #6**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 21.3 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 242.70 | 22.94 | 22.62 | 6.79 |
| 10 | 178.56 | 16.88 | 16.56 | 9.93 |
| 15 | 142.89 | 13.51 | 13.19 | 11.87 |
| 25 | 103.85 | 9.82 | 9.50 | 14.24 |
| 35 | 82.58 | 7.81 | 7.49 | 15.72 |
| 50 | 63.95 | 6.04 | 5.72 | 17.17 |
| 65 | 52.65 | 4.98 | 4.66 | 18.16 |
| 80 | 44.99 | 4.25 | 3.93 | 18.88 |
| 100 | 37.90 | 3.58 | 3.26 | 19.58 |
| 120 | 32.89 | 3.11 | 2.79 | 20.08 |
| 140 | 29.15 | 2.76 | 2.44 | 20.46 |
| 170 | 25.01 | 2.36 | 2.04 | 20.85 |
| 200 | 21.98 | 2.08 | 1.76 | 21.09 |
| 230 | 19.66 | 1.86 | 1.54 | 21.23 |
| 260 | 17.83 | 1.68 | 1.36 | 21.29 |
| 290 | 16.33 | 1.54 | 1.22 | 21.29 |
| 330 | 14.72 | 1.39 | 1.07 | 21.21 |
| 380 | 13.14 | 1.24 | 0.92 | 21.01 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR + 20%**
**AREA R-1** **Controlled Roof Drain #6**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.034 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 26.7 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 291.24 | 27.53 | 27.21 | 8.16 |
| 10 | 214.27 | 20.25 | 19.93 | 11.96 |
| 15 | 171.47 | 16.21 | 15.89 | 14.30 |
| 25 | 124.62 | 11.78 | 11.46 | 17.19 |
| 35 | 99.09 | 9.37 | 9.05 | 19.00 |
| 50 | 76.74 | 7.25 | 6.93 | 20.80 |
| 65 | 63.18 | 5.97 | 5.65 | 22.04 |
| 80 | 53.99 | 5.10 | 4.78 | 22.96 |
| 100 | 45.48 | 4.30 | 3.98 | 23.87 |
| 120 | 39.47 | 3.73 | 3.41 | 24.56 |
| 140 | 34.98 | 3.31 | 2.99 | 25.09 |
| 170 | 30.01 | 2.84 | 2.52 | 25.67 |
| 200 | 26.38 | 2.49 | 2.17 | 26.08 |
| 230 | 23.60 | 2.23 | 1.91 | 26.36 |
| 260 | 21.39 | 2.02 | 1.70 | 26.55 |
| 290 | 19.60 | 1.85 | 1.53 | 26.66 |
| 330 | 17.66 | 1.67 | 1.35 | 26.72 |
| 380 | 15.76 | 1.49 | 1.17 | 26.67 |

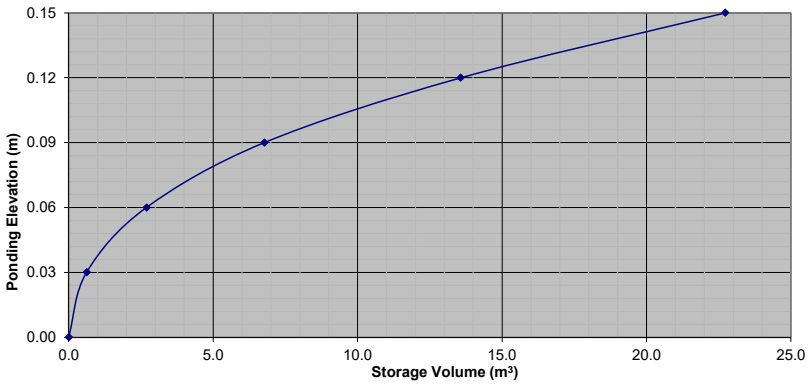
**Watts Accutrol Flow Control Roof Drains:** RD-100-A-ADJ set to Closed

| Design Event | Flow/Drain (L/s) | Total Flow (L/s) | Ponding (cm) | Storage ($m^3$) Required | Storage ($m^3$) Provided |
|---|---|---|---|---|---|
| 1:2 Year | 0.32 | 0.32 | 10 | 6.6 | 13.6 |
| 1:5 Year | 0.32 | 0.32 | 11 | 9.7 | 22.7 |
| 1:100 Year | 0.32 | 0.32 | 15 | 21.3 | 22.7 |

**Roof Drain Storage Table for Area RD 6**

| Elevation | Area RD 6 | Total Volume |
|---|---|---|
| m | $m^2$ | $m^3$ |
| 0.00 | 0 | 0 |
| 0.03 | 41.28 | 0.6 |
| 0.06 | 96.8 | 2.7 |
| 0.09 | 175.49 | 6.8 |
| 0.12 | 277.35 | 13.6 |
| 0.15 | 333.33 | 22.7 |

**Stage Storage Curve: Area R-1**
**Controlled Roof Drain #6**



**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:2 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #7**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.035 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 6.9 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 103.57 | 9.07 | 8.75 | 2.62 |
| 10 | 76.81 | 6.73 | 6.41 | 3.84 |
| 15 | 61.77 | 5.41 | 5.09 | 4.58 |
| 20 | 52.03 | 4.56 | 4.24 | 5.08 |
| 25 | 45.17 | 3.96 | 3.64 | 5.45 |
| 40 | 32.86 | 2.88 | 2.56 | 6.14 |
| 55 | 26.17 | 2.29 | 1.97 | 6.51 |
| 70 | 21.91 | 1.92 | 1.60 | 6.72 |
| 85 | 18.94 | 1.66 | 1.34 | 6.83 |
| 100 | 16.75 | 1.47 | 1.15 | 6.88 |
| 120 | 14.56 | 1.28 | 0.96 | 6.88 |
| 140 | 12.93 | 1.13 | 0.81 | 6.82 |
| 160 | 11.65 | 1.02 | 0.70 | 6.72 |
| 180 | 10.63 | 0.93 | 0.61 | 6.59 |
| 200 | 9.78 | 0.86 | 0.54 | 6.44 |
| 220 | 9.08 | 0.79 | 0.47 | 6.27 |
| 240 | 8.47 | 0.74 | 0.42 | 6.08 |
| 260 | 7.96 | 0.70 | 0.38 | 5.88 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:5 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #7**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.035 | ha | Qallow = | 0.32 | L/s |
| C = | 0.90 | | Vol(max) = | 10.0 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 141.18 | 12.36 | 12.04 | 3.61 |
| 10 | 104.19 | 9.12 | 8.80 | 5.28 |
| 15 | 83.56 | 7.32 | 7.00 | 6.30 |
| 20 | 70.25 | 6.15 | 5.83 | 7.00 |
| 25 | 60.90 | 5.33 | 5.01 | 7.52 |
| 40 | 44.18 | 3.87 | 3.55 | 8.52 |
| 55 | 35.12 | 3.08 | 2.76 | 9.09 |
| 70 | 29.37 | 2.57 | 2.25 | 9.46 |
| 85 | 25.37 | 2.22 | 1.90 | 9.70 |
| 100 | 22.41 | 1.96 | 1.64 | 9.85 |
| 120 | 19.47 | 1.70 | 1.38 | 9.97 |
| 140 | 17.27 | 1.51 | 1.19 | 10.01 |
| 160 | 15.56 | 1.36 | 1.04 | 10.00 |
| 180 | 14.18 | 1.24 | 0.92 | 9.95 |
| 200 | 13.05 | 1.14 | 0.82 | 9.87 |
| 220 | 12.10 | 1.06 | 0.74 | 9.76 |
| 240 | 11.29 | 0.99 | 0.67 | 9.63 |
| 260 | 10.60 | 0.93 | 0.61 | 9.49 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR EVENT**
**AREA R-1** **Controlled Roof Drain #7**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.035 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 22.1 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 242.70 | 23.62 | 23.30 | 6.99 |
| 10 | 178.56 | 17.37 | 17.05 | 10.23 |
| 15 | 142.89 | 13.90 | 13.58 | 12.23 |
| 25 | 103.85 | 10.10 | 9.78 | 14.68 |
| 35 | 82.58 | 8.03 | 7.71 | 16.20 |
| 50 | 63.95 | 6.22 | 5.90 | 17.71 |
| 65 | 52.65 | 5.12 | 4.80 | 18.73 |
| 80 | 44.99 | 4.38 | 4.06 | 19.48 |
| 100 | 37.90 | 3.69 | 3.37 | 20.21 |
| 120 | 32.89 | 3.20 | 2.88 | 20.74 |
| 140 | 29.15 | 2.84 | 2.52 | 21.14 |
| 170 | 25.01 | 2.43 | 2.11 | 21.56 |
| 200 | 21.98 | 2.14 | 1.82 | 21.83 |
| 230 | 19.66 | 1.91 | 1.59 | 21.99 |
| 260 | 17.83 | 1.73 | 1.41 | 22.07 |
| 290 | 16.33 | 1.59 | 1.27 | 22.08 |
| 330 | 14.72 | 1.43 | 1.11 | 22.02 |
| 380 | 13.14 | 1.28 | 0.96 | 21.85 |

**Proposed Commercial Development**
**Novatech Project No. 121127**
**REQUIRED STORAGE - 1:100 YEAR + 20%**
**AREA R-1** **Controlled Roof Drain #7**

OTTAWA IDF CURVE

| | | | | | |
|---|---|---|---|---|---|
| Area = | 0.035 | ha | Qallow = | 0.32 | L/s |
| C = | 1.00 | | Vol(max) = | 27.7 | m3 |

| Time (min) | Intensity (mm/hr) | Q (L/s) | Qnet (L/s) | Vol (m3) |
|---|---|---|---|---|
| 5 | 291.24 | 28.34 | 28.02 | 8.41 |
| 10 | 214.27 | 20.85 | 20.53 | 12.32 |
| 15 | 171.47 | 16.68 | 16.36 | 14.73 |
| 25 | 124.62 | 12.13 | 11.81 | 17.71 |
| 35 | 99.09 | 9.64 | 9.32 | 19.58 |
| 50 | 76.74 | 7.47 | 7.15 | 21.44 |
| 65 | 63.18 | 6.15 | 5.83 | 22.73 |
| 80 | 53.99 | 5.25 | 4.93 | 23.68 |
| 100 | 45.48 | 4.43 | 4.11 | 24.63 |
| 120 | 39.47 | 3.84 | 3.52 | 25.35 |
| 140 | 34.98 | 3.40 | 3.08 | 25.90 |
| 170 | 30.01 | 2.92 | 2.60 | 26.52 |
| 200 | 26.38 | 2.57 | 2.25 | 26.96 |
| 230 | 23.60 | 2.30 | 1.98 | 27.27 |
| 260 | 21.39 | 2.08 | 1.76 | 27.48 |
| 290 | 19.60 | 1.91 | 1.59 | 27.61 |
| 330 | 17.66 | 1.72 | 1.40 | 27.69 |
| 380 | 15.76 | 1.53 | 1.21 | 27.67 |

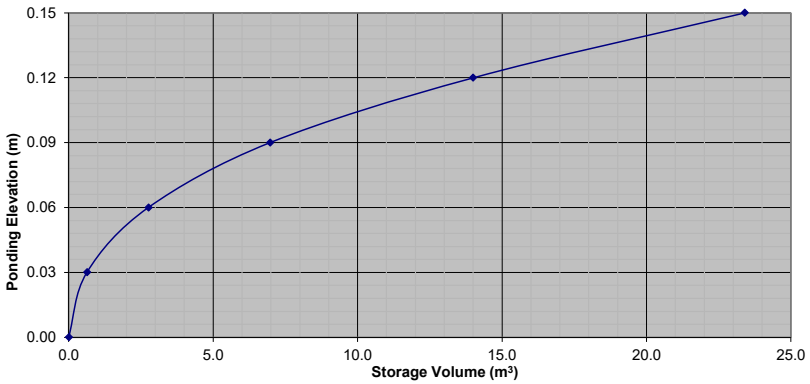
**Watts Accutrol Flow Control Roof Drains:** RD-100-A-ADJ set to Closed

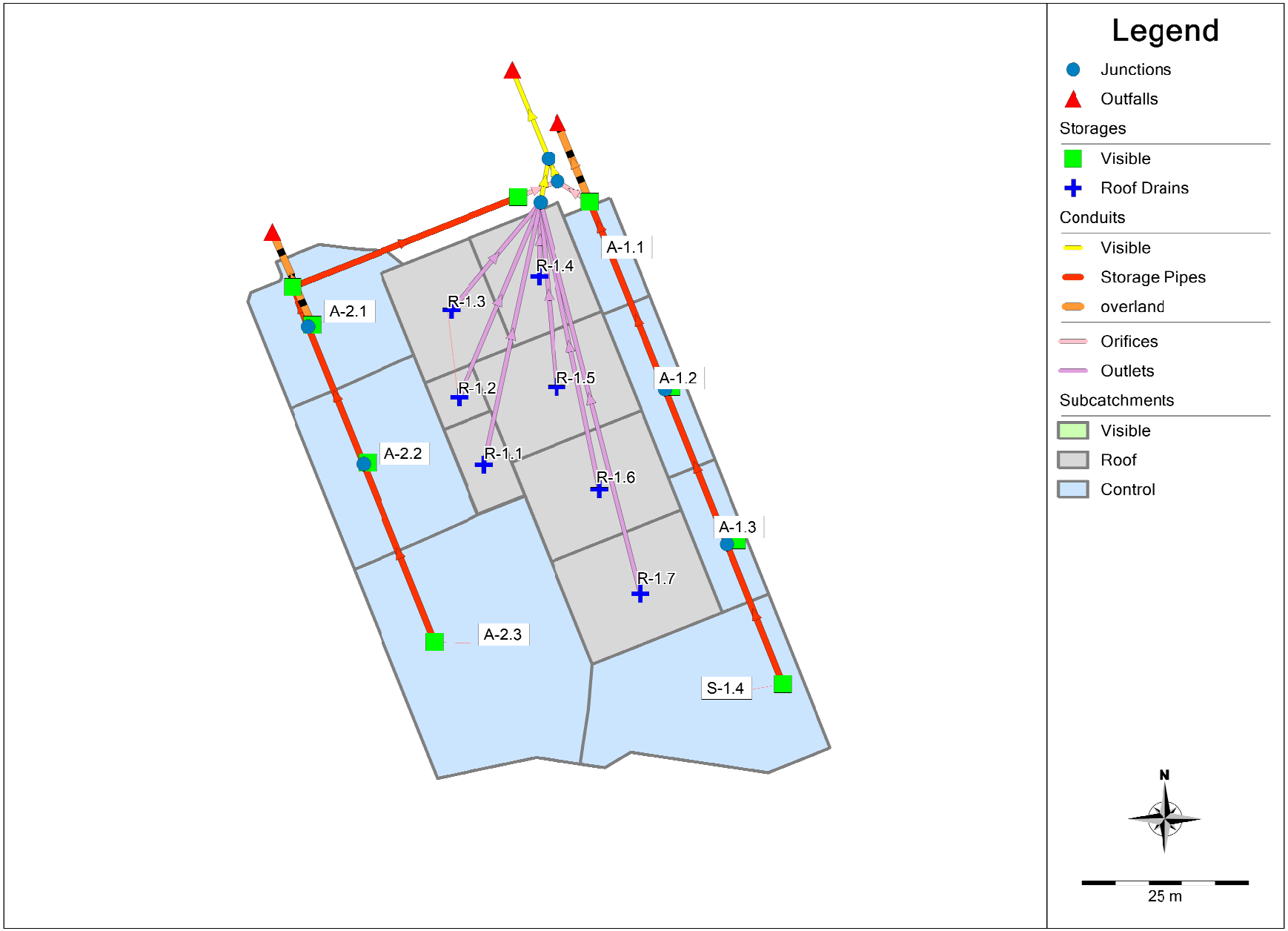
| Design Event | Flow/Drain (L/s) | Total Flow (L/s) | Ponding (cm) | Storage ($m^3$) Required | Storage ($m^3$) Provided |
|---|---|---|---|---|---|
| 1:2 Year | 0.32 | 0.32 | 9 | 6.9 | 14.0 |
| 1:5 Year | 0.32 | 0.32 | 10 | 10.0 | 23.4 |
| 1:100 Year | 0.32 | 0.32 | 14 | 22.1 | 23.4 |

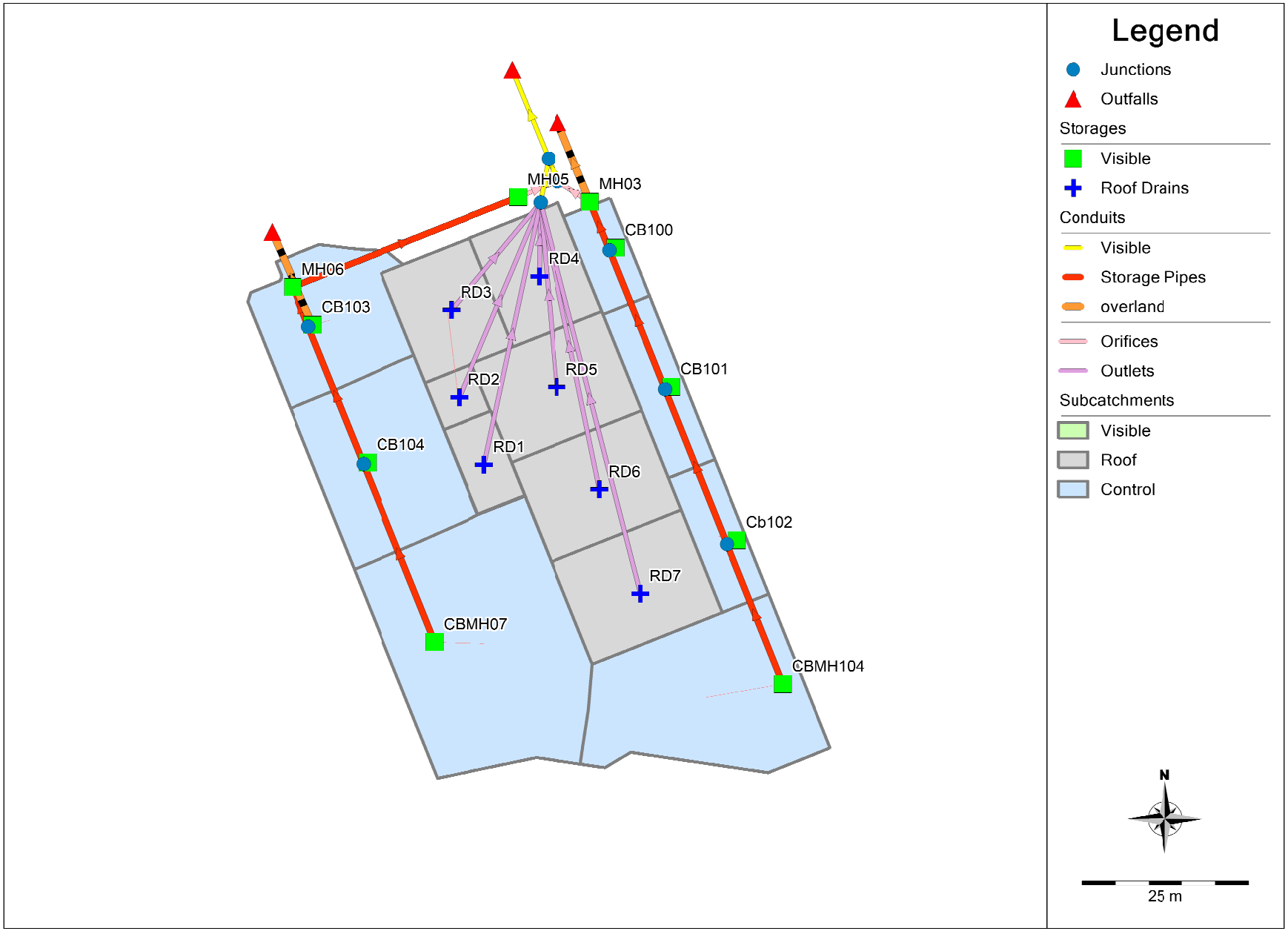
**Roof Drain Storage Table for Area RD 7**

| Elevation | Area RD 7 | Total Volume |
|---|---|---|
| m | $m^2$ | $m^3$ |
| 0.00 | 0 | 0 |
| 0.03 | 42.21 | 0.6 |
| 0.06 | 99.64 | 2.8 |
| 0.09 | 181.22 | 7.0 |
| 0.12 | 286.96 | 14.0 |
| 0.15 | 340.12 | 23.4 |

**Stage Storage Curve: Area R-1**
**Controlled Roof Drain #7**




A-1.1
R-1.4
R-1.3
A-2.1
R-1.5
A-1.2
R-1.2
A-2.2
R-1.1
R-1.6
A-1.3
R-1.7
A-2.3
S-1.4
Legend
Junctions
Outfalls
Storages
Visible
Roof Drains
Conduits
Visible
Storage Pipes
overland
Orifices
Outlets
Subcatchments
Visible
Roof
Control
N
25 m


MH05
MH03
CB100
MH06
CB103
RD4
RD3
RD2
RD5
CB101
CB104
RD1
RD6
Cb102
RD7
CBMH07
CBMH104
Legend
Junctions
Outfalls
Storages
Visible
Roof Drains
Conduits
Visible
Storage Pipes
overland
Orifices
Outlets
Subcatchments
Visible
Roof
Control
N
25 m

# PCSWMM Model Output - Post-Development (2yr, 3-hour Chicago Storm)

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


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 28
Number of links ........... 27
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                   Data       Recording
Name                 Data Source                   Type       Interval
-----------------------------------------------------------------------
Raingage1            C3hr-2yr                      INTENSITY   10 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-1.1                       0.01     21.82     91.00    2.0000 Raingage1            CB100
A-1.2                       0.02     36.36     96.00    2.0000 Raingage1            CB101
A-1.3                       0.02     29.09     94.00    2.0000 Raingage1            Cb102
A-2.1                       0.04     33.33     93.00    2.0000 Raingage1            CB103
A-2.2                       0.05     44.17     99.00    2.0000 Raingage1            CB104
A-2.3                       0.10     49.50     69.00    2.0000 Raingage1            CBMH07
R-1.1                       0.01     14.29    100.00    1.5000 Raingage1            RD1
R-1.2                       0.01     16.22    100.00    1.5000 Raingage1            R-1.3
R-1.3                       0.03     26.32    100.00    1.5000 Raingage1            R-1.2
R-1.4                       0.03     26.32    100.00    1.5000 Raingage1            RD4
R-1.5                       0.03     31.78    100.00    1.5000 Raingage1            RD5
R-1.6                       0.03     31.78    100.00    1.5000 Raingage1            RD6
R-1.7                       0.04     32.71    100.00    1.5000 Raingage1            R-1.7
S-1.4                       0.07     55.00     83.00    2.0000 Raingage1            CBMH104


************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------
03a                  JUNCTION             68.45      2.15       0.0
03b                  JUNCTION             68.47      2.13       0.0
03c                  JUNCTION             68.50      2.10       0.0
06a                  JUNCTION             68.50      2.10       0.0
06b                  JUNCTION             68.52      2.08       0.0
BLDG                 JUNCTION             68.83      0.25       0.0
MH01                 JUNCTION             68.18      2.07       0.0
OGS                  JUNCTION             68.22      2.23       0.0
EXSTM                OUTFALL              66.24      2.10       0.0
OF1                  OUTFALL              70.14      0.15       0.0
OF2                  OUTFALL              70.40      0.15       0.0
CB100                STORAGE              69.10      1.50       0.0
CB101                STORAGE              69.00      1.60       0.0
Cb102                STORAGE              69.00      1.60       0.0
CB103                STORAGE              69.05      1.55       0.0
CB104                STORAGE              69.05      1.55       0.0
CBMH07               STORAGE              68.55      2.05       0.0
CBMH104              STORAGE              68.52      2.08       0.0
MH03                 STORAGE              68.34      2.26       0.0
MH05                 STORAGE              68.34      2.41       0.0
MH06                 STORAGE              68.48      2.15       0.0
RD1                  STORAGE              73.35      0.15       0.0
RD2                  STORAGE              73.35      0.15       0.0
RD3                  STORAGE              73.35      0.15       0.0
RD4                  STORAGE              73.35      0.15       0.0
RD5                  STORAGE              73.35      0.15       0.0
RD6                  STORAGE              73.35      0.15       0.0
RD7                  STORAGE              73.35      0.15       0.0
```

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
  Ending Date ............. 03/19/2020 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 ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  *********************
  Control Actions Taken
  *********************


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.015        31.857
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.002         3.210
  Surface Runoff ...........         0.012        25.843
  Final Storage ............         0.001         1.068
  Continuity Error (%) .....         5.446


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.011         0.112
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.011         0.112
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
```

```
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.000


  ***************************
  Time-Step Critical Elements
  ***************************
  Link 06b-104 (28.53%)


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


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     1.64 sec
  Maximum Time Step           :     2.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      2.000 -  1.516 sec      :    72.58 %
      1.516 -  1.149 sec      :     0.81 %
      1.149 -  0.871 sec      :     1.75 %
      0.871 -  0.660 sec      :    12.27 %
      0.660 -  0.500 sec      :    12.59 %


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

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

| Subcatchment | Precip mm | Runon mm | Evap mm | Infil mm | Runoff mm | Runoff mm | Runoff mm | Runoff 10^6 ltr | Runoff LPS | Coeff |
|---|---|---|---|---|---|---|---|---|---|---|
| A-1.1 | 31.86 | 0.00 | 0.00 | 2.83 | 27.67 | 0.14 | 27.81 | 0.00 | 2.38 | 0.873 |
| A-1.2 | 31.86 | 0.00 | 0.00 | 1.26 | 29.19 | 0.09 | 29.28 | 0.01 | 4.16 | 0.919 |
| A-1.3 | 31.86 | 0.00 | 0.00 | 1.90 | 28.58 | 0.12 | 28.70 | 0.00 | 3.27 | 0.901 |
| A-2.1 | 31.86 | 0.00 | 0.00 | 2.21 | 28.29 | 0.07 | 28.36 | 0.01 | 8.03 | 0.890 |
| A-2.2 | 31.86 | 0.00 | 0.00 | 0.31 | 30.12 | 0.03 | 30.15 | 0.02 | 11.24 | 0.946 |
| A-2.3 | 31.86 | 0.00 | 0.00 | 9.85 | 21.00 | 0.05 | 21.06 | 0.02 | 14.75 | 0.661 |
| R-1.1 | 31.86 | 0.00 | 0.00 | 0.00 | 31.92 | 0.00 | 31.92 | 0.00 | 2.13 | 1.002 |
| R-1.2 | 31.86 | 22280.87 | 0.00 | 0.00 | 22312.61 | 0.00 | 22312.61 | 1.34 | 16.41 | 1.000 |
| R-1.3 | 31.86 | 5335.38 | 0.00 | 0.00 | 5367.06 | 0.00 | 5367.06 | 1.34 | 16.41 | 1.000 |
| R-1.4 | 31.86 | 0.00 | 0.00 | 0.00 | 31.94 | 0.00 | 31.94 | 0.01 | 5.33 | 1.003 |
| R-1.5 | 31.86 | 0.00 | 0.00 | 0.00 | 31.95 | 0.00 | 31.95 | 0.01 | 7.25 | 1.003 |
| R-1.6 | 31.86 | 0.00 | 0.00 | 0.00 | 31.95 | 0.00 | 31.95 | 0.01 | 7.25 | 1.003 |
| R-1.7 | 31.86 | 0.00 | 0.00 | 0.00 | 31.95 | 0.00 | 31.95 | 0.01 | 7.47 | 1.003 |
| S-1.4 | 31.86 | 0.00 | 0.00 | 5.38 | 25.24 | 0.08 | 25.33 | 0.02 | 11.87 | 0.795 |

**********
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 |
|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.09 | 0.45 | 68.90 | 0 01:33 | 0.45 |
| 03b | JUNCTION | 0.09 | 0.43 | 68.90 | 0 01:33 | 0.42 |
| 03c | JUNCTION | 0.08 | 0.40 | 68.90 | 0 01:33 | 0.40 |
| 06a | JUNCTION | 0.09 | 0.51 | 69.00 | 0 01:30 | 0.51 |
| 06b | JUNCTION | 0.09 | 0.48 | 69.00 | 0 01:31 | 0.48 |
| BLDG | JUNCTION | 0.01 | 0.03 | 68.86 | 0 00:59 | 0.03 |
| MH01 | JUNCTION | 0.02 | 0.06 | 68.24 | 0 01:30 | 0.06 |
| OGS | JUNCTION | 0.02 | 0.06 | 68.28 | 0 01:30 | 0.06 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 00:00 | 0.00 |
| CB100 | STORAGE | 0.00 | 0.04 | 69.14 | 0 01:10 | 0.04 |
| CB101 | STORAGE | 0.01 | 0.05 | 69.05 | 0 01:10 | 0.05 |
| Cb102 | STORAGE | 0.01 | 0.04 | 69.04 | 0 01:10 | 0.04 |
| CB103 | STORAGE | 0.01 | 0.06 | 69.11 | 0 01:10 | 0.06 |
| CB104 | STORAGE | 0.01 | 0.08 | 69.13 | 0 01:10 | 0.08 |
| CBMH07 | STORAGE | 0.08 | 0.45 | 69.00 | 0 01:31 | 0.45 |
| CBMH104 | STORAGE | 0.07 | 0.38 | 68.90 | 0 01:33 | 0.38 |
| MH03 | STORAGE | 0.13 | 0.56 | 68.90 | 0 01:33 | 0.56 |
| MH05 | STORAGE | 0.14 | 0.66 | 69.00 | 0 01:30 | 0.66 |
| MH06 | STORAGE | 0.10 | 0.52 | 69.00 | 0 01:30 | 0.52 |
| RD1 | STORAGE | 0.02 | 0.09 | 73.44 | 0 01:31 | 0.09 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD4 | STORAGE | 0.03 | 0.10 | 73.45 | 0 02:03 | 0.10 |
| RD5 | STORAGE | 0.04 | 0.10 | 73.45 | 0 02:27 | 0.10 |
| RD6 | STORAGE | 0.04 | 0.10 | 73.45 | 0 02:27 | 0.10 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |

**********
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 |
|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 7.71 | 0 | 01:05 | 0 | 0.0305 | 0.090 | |
| 03b | JUNCTION | 0.00 | 11.32 | 0 | 01:09 | 0 | 0.0272 | 0.023 | |
| 03c | JUNCTION | 0.00 | 12.51 | 0 | 01:10 | 0 | 0.0213 | 0.024 | |
| 06a | JUNCTION | 0.00 | 22.63 | 0 | 01:05 | 0 | 0.0482 | 0.068 | |
| 06b | JUNCTION | 0.00 | 21.66 | 0 | 01:05 | 0 | 0.0368 | 0.028 | |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 | 00:57 | 0 | 0.0329 | 0.003 | |
| MH01 | JUNCTION | 0.00 | 9.12 | 0 | 01:30 | 0 | 0.112 | 0.000 | |
| OGS | JUNCTION | 0.00 | 7.86 | 0 | 01:30 | 0 | 0.0787 | -0.001 | |
| EXSTM | OUTFALL | 0.00 | 9.12 | 0 | 01:32 | 0 | 0.112 | 0.000 | |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| CB100 | STORAGE | 2.38 | 2.38 | 0 | 01:10 | 0.00334 | 0.00334 | 0.024 | |
| CB101 | STORAGE | 4.16 | 4.16 | 0 | 01:10 | 0.00586 | 0.00586 | 0.014 | |
| Cb102 | STORAGE | 3.27 | 3.27 | 0 | 01:10 | 0.00459 | 0.00459 | 0.017 | |
| CB103 | STORAGE | 8.03 | 8.03 | 0 | 01:10 | 0.0113 | 0.0113 | 0.005 | |
| CB104 | STORAGE | 11.24 | 11.24 | 0 | 01:10 | 0.016 | 0.016 | 0.004 | |
| CBMH07 | STORAGE | 14.75 | 14.75 | 0 | 01:10 | 0.0208 | 0.0208 | -0.113 | |
| CBMH104 | STORAGE | 11.87 | 11.87 | 0 | 01:10 | 0.0167 | 0.0167 | -0.125 | |
| MH03 | STORAGE | 0.00 | 3.87 | 0 | 01:10 | 0 | 0.0305 | -0.050 | |
| MH05 | STORAGE | 0.00 | 10.62 | 0 | 01:10 | 0 | 0.048 | -0.254 | |
| MH06 | STORAGE | 0.00 | 18.40 | 0 | 01:05 | 0 | 0.0481 | 0.215 | |
| RD1 | STORAGE | 2.13 | 2.13 | 0 | 01:10 | 0.00319 | 0.00319 | -0.001 | |
| RD2 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| RD4 | STORAGE | 5.33 | 5.33 | 0 | 01:10 | 0.00798 | 0.00798 | -0.000 | |
| RD5 | STORAGE | 7.25 | 7.25 | 0 | 01:10 | 0.0109 | 0.0109 | 0.000 | |
| RD6 | STORAGE | 7.25 | 7.25 | 0 | 01:10 | 0.0109 | 0.0109 | 0.000 | |
| RD7 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |

**********
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 |
|---|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 0 | 0 | 0 | 0.000 | 1 | 0 | 01:10 | 2.38 |
| CB101 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 01:10 | 4.16 |
| Cb102 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 01:10 | 3.27 |
| CB103 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 01:10 | 8.03 |
| CB104 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 01:10 | 11.24 |
| CBMH07 | 0.000 | 1 | 0 | 0 | 0.001 | 3 | 0 | 01:31 | 10.48 |
| CBMH104 | 0.000 | 0 | 0 | 0 | 0.000 | 2 | 0 | 01:33 | 9.24 |
| MH03 | 0.000 | 6 | 0 | 0 | 0.001 | 25 | 0 | 01:33 | 2.75 |
| MH05 | 0.000 | 6 | 0 | 0 | 0.001 | 28 | 0 | 01:30 | 5.12 |
| MH06 | 0.000 | 5 | 0 | 0 | 0.001 | 24 | 0 | 01:30 | 10.62 |
| RD1 | 0.000 | 4 | 0 | 0 | 0.001 | 25 | 0 | 01:31 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD4 | 0.001 | 10 | 0 | 0 | 0.005 | 36 | 0 | 02:03 | 0.32 |
| RD5 | 0.003 | 11 | 0 | 0 | 0.008 | 36 | 0 | 02:27 | 0.32 |
| RD6 | 0.003 | 11 | 0 | 0 | 0.008 | 35 | 0 | 02:27 | 0.32 |
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| EXSTM | 52.93 | 4.60 | 9.12 | 0.112 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 17.64 | 4.60 | 9.12 | 0.112 |

**********
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-BLDG | CONDUIT | 1.26 | 0 | 01:00 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 7.86 | 0 | 01:30 | 0.84 | 0.13 | 0.25 |
| 03-03a | CONDUIT | 3.87 | 0 | 01:10 | 0.27 | 0.02 | 0.75 |
| 03a-03b | CONDUIT | 5.38 | 0 | 01:05 | 0.20 | 0.03 | 0.73 |
| 03a-100 | CONDUIT | 2.38 | 0 | 01:10 | 0.59 | 0.17 | 0.28 |
| 03b-03c | CONDUIT | 7.20 | 0 | 01:05 | 0.22 | 0.04 | 0.69 |
| 03b-101 | CONDUIT | 4.16 | 0 | 01:10 | 0.71 | 0.28 | 0.37 |
| 03c-04 | CONDUIT | 9.24 | 0 | 01:10 | 0.23 | 0.05 | 0.65 |
| 03c-102 | CONDUIT | 3.27 | 0 | 01:10 | 0.73 | 0.20 | 0.30 |
| 05-06 | CONDUIT | 10.62 | 0 | 01:10 | 0.29 | 0.05 | 0.91 |
| 06-06a | CONDUIT | 18.40 | 0 | 01:05 | 0.36 | 0.09 | 0.85 |
| 06a-06b | CONDUIT | 14.70 | 0 | 01:05 | 0.26 | 0.07 | 0.82 |
| 06a-103 | CONDUIT | 8.03 | 0 | 01:10 | 0.92 | 0.22 | 0.32 |
| 06b-104 | CONDUIT | 11.24 | 0 | 01:10 | 1.04 | 0.30 | 0.38 |
| 06c-07 | CONDUIT | 10.48 | 0 | 01:05 | 0.21 | 0.05 | 0.78 |
| C1 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 9.12 | 0 | 01:32 | 0.86 | 0.09 | 0.21 |
| OR1 | ORIFICE | 5.12 | 0 | 01:30 | | | 1.00 |
| OR2 | ORIFICE | 2.75 | 0 | 01:33 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 | 00:47 | | | |
| OL3 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 | 00:57 | | | |
| OL5 | DUMMY | 0.32 | 0 | 00:49 | | | |
| OL6 | DUMMY | 0.32 | 0 | 00:49 | | | |
| OL7 | DUMMY | 0.00 | 0 | 00:00 | | | |

**********
Flow Classification Summary
**********

| 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-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.02 | 0.00 | 0.68 | 0.30 | 0.00 | 0.00 | 0.82 | 0.00 |
| 03-03a | 1.00 | 0.02 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.68 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.02 | 0.27 | 0.00 | 0.71 | 0.00 | 0.00 | 0.00 | 0.82 | 0.00 |
| 03a-100 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.02 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 |
| 03b-101 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 |
| 03c-04 | 1.00 | 0.02 | 0.02 | 0.00 | 0.96 | 0.00 | 0.00 | 0.00 | 0.82 | 0.00 |
| 03c-102 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 |
| 05-06 | 1.00 | 0.02 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 |
| 06-06a | 1.00 | 0.02 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.68 | 0.01 | 0.00 |
| 06a-06b | 1.00 | 0.02 | 0.38 | 0.00 | 0.60 | 0.00 | 0.00 | 0.00 | 0.84 | 0.00 |
| 06a-103 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.02 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 0.12 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EX-01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |

**********
Conduit Surcharge Summary
**********

No conduits were surcharged.

Analysis begun on: Thu Jul 22 12:58:54 2021

```
Analysis ended on:  Thu Jul 22 12:58:56 2021
Total elapsed time: 00:00:02
```

# PCSWMM Model Output - Post-Development (5yr, 3-hour Chicago Storm)

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

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 28
Number of links ........... 27
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
-----------------------------------------------------------------------
Raingage1            C3hr-5yr                     INTENSITY   10 min.

********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-1.1                       0.01     21.82     91.00    2.0000 Raingage1            CB100
A-1.2                       0.02     36.36     96.00    2.0000 Raingage1            CB101
A-1.3                       0.02     29.09     94.00    2.0000 Raingage1            Cb102
A-2.1                       0.04     33.33     93.00    2.0000 Raingage1            CB103
A-2.2                       0.05     44.17     99.00    2.0000 Raingage1            CB104
A-2.3                       0.10     49.50     69.00    2.0000 Raingage1            CBMH07
R-1.1                       0.01     14.29    100.00    1.5000 Raingage1            RD1
R-1.2                       0.01     16.22    100.00    1.5000 Raingage1            R-1.3
R-1.3                       0.03     26.32    100.00    1.5000 Raingage1            R-1.2
R-1.4                       0.03     26.32    100.00    1.5000 Raingage1            RD4
R-1.5                       0.03     31.78    100.00    1.5000 Raingage1            RD5
R-1.6                       0.03     31.78    100.00    1.5000 Raingage1            RD6
R-1.7                       0.04     32.71    100.00    1.5000 Raingage1            R-1.7
S-1.4                       0.07     55.00     83.00    2.0000 Raingage1            CBMH104

************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
03a                  JUNCTION             68.45      2.15       0.0
03b                  JUNCTION             68.47      2.13       0.0
03c                  JUNCTION             68.50      2.10       0.0
06a                  JUNCTION             68.50      2.10       0.0
06b                  JUNCTION             68.52      2.08       0.0
BLDG                 JUNCTION             68.83      0.25       0.0
MH01                 JUNCTION             68.18      2.07       0.0
OGS                  JUNCTION             68.22      2.23       0.0
EXSTM                OUTFALL              66.24      2.10       0.0
OF1                  OUTFALL              70.14      0.15       0.0
OF2                  OUTFALL              70.40      0.15       0.0
CB100                STORAGE              69.10      1.50       0.0
CB101                STORAGE              69.00      1.60       0.0
Cb102                STORAGE              69.00      1.60       0.0
CB103                STORAGE              69.05      1.55       0.0
CB104                STORAGE              69.05      1.55       0.0
CBMH07               STORAGE              68.55      2.05       0.0
CBMH104              STORAGE              68.52      2.08       0.0
MH03                 STORAGE              68.34      2.26       0.0
MH05                 STORAGE              68.34      2.41       0.0
MH06                 STORAGE              68.48      2.15       0.0
RD1                  STORAGE              73.35      0.15       0.0
RD2                  STORAGE              73.35      0.15       0.0
RD3                  STORAGE              73.35      0.15       0.0
RD4                  STORAGE              73.35      0.15       0.0
RD5                  STORAGE              73.35      0.15       0.0
RD6                  STORAGE              73.35      0.15       0.0
RD7                  STORAGE              73.35      0.15       0.0
```

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
  Ending Date ............. 03/19/2020 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 ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  *********************
  Control Actions Taken
  *********************


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.020        42.512
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.002         3.694
  Surface Runoff ...........         0.017        35.361
  Final Storage ............         0.001         1.109
  Continuity Error (%) .....         5.522


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.015         0.153
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.015         0.153
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
```

```
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.000


  ***************************
  Time-Step Critical Elements
  ***************************
  Link 06b-104 (21.57%)
  Link 03b-101 (6.40%)
  Link 01-OGS (1.15%)


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


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     1.63 sec
  Maximum Time Step           :     2.00 sec
  Percent in Steady State     :    -0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      2.000 -  1.516 sec      :    71.92 %
      1.516 -  1.149 sec      :     1.55 %
      1.149 -  0.871 sec      :     1.51 %
      0.871 -  0.660 sec      :    11.13 %
      0.660 -  0.500 sec      :    13.88 %


  ***************************
  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-1.1 | 42.51 | 0.00 | 0.00 | 3.23 | 37.41 | 0.65 | 38.06 | 0.00 | 3.37 | 0.895 |
| A-1.2 | 42.51 | 0.00 | 0.00 | 1.43 | 39.46 | 0.31 | 39.77 | 0.01 | 5.71 | 0.936 |
| A-1.3 | 42.51 | 0.00 | 0.00 | 2.15 | 38.64 | 0.44 | 39.09 | 0.01 | 4.54 | 0.919 |
| A-2.1 | 42.51 | 0.00 | 0.00 | 2.51 | 38.22 | 0.50 | 38.73 | 0.02 | 11.30 | 0.911 |
| A-2.2 | 42.51 | 0.00 | 0.00 | 0.36 | 40.69 | 0.08 | 40.78 | 0.02 | 15.29 | 0.959 |
| A-2.3 | 42.51 | 0.00 | 0.00 | 11.40 | 28.37 | 1.92 | 30.29 | 0.03 | 23.17 | 0.713 |
| R-1.1 | 42.51 | 0.00 | 0.00 | 0.00 | 42.58 | 0.00 | 42.58 | 0.00 | 2.89 | 1.002 |
| R-1.2 | 42.51 | 29738.64 | 0.00 | 0.00 | 29781.19 | 0.00 | 29781.19 | 1.79 | 21.91 | 1.000 |
| R-1.3 | 42.51 | 7121.30 | 0.00 | 0.00 | 7163.46 | 0.00 | 7163.46 | 1.79 | 21.91 | 1.000 |
| R-1.4 | 42.51 | 0.00 | 0.00 | 0.00 | 42.60 | 0.00 | 42.60 | 0.01 | 7.24 | 1.002 |
| R-1.5 | 42.51 | 0.00 | 0.00 | 0.00 | 42.61 | 0.00 | 42.61 | 0.01 | 9.84 | 1.002 |
| R-1.6 | 42.51 | 0.00 | 0.00 | 0.00 | 42.61 | 0.00 | 42.61 | 0.01 | 9.84 | 1.002 |
| R-1.7 | 42.51 | 0.00 | 0.00 | 0.00 | 42.61 | 0.00 | 42.61 | 0.01 | 10.13 | 1.002 |
| S-1.4 | 42.51 | 0.00 | 0.00 | 6.14 | 34.11 | 1.19 | 35.30 | 0.02 | 17.78 | 0.830 |

**********
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 |
|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.14 | 0.71 | 69.15 | 0 | 01:34 | 0.71 |
| 03b | JUNCTION | 0.14 | 0.68 | 69.15 | 0 | 01:34 | 0.68 |
| 03c | JUNCTION | 0.13 | 0.66 | 69.16 | 0 | 01:34 | 0.66 |
| 06a | JUNCTION | 0.16 | 0.98 | 69.48 | 0 | 01:31 | 0.98 |
| 06b | JUNCTION | 0.15 | 0.96 | 69.48 | 0 | 01:31 | 0.96 |
| BLDG | JUNCTION | 0.01 | 0.03 | 68.86 | 0 | 00:57 | 0.03 |
| MH01 | JUNCTION | 0.03 | 0.07 | 68.25 | 0 | 01:31 | 0.07 |
| OGS | JUNCTION | 0.02 | 0.07 | 68.29 | 0 | 01:31 | 0.07 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 | 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 | 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 | 00:00 | 0.00 |
| CB100 | STORAGE | 0.01 | 0.06 | 69.16 | 0 | 01:32 | 0.05 |
| CB101 | STORAGE | 0.02 | 0.15 | 69.15 | 0 | 01:34 | 0.15 |
| Cb102 | STORAGE | 0.01 | 0.16 | 69.16 | 0 | 01:34 | 0.16 |
| CB103 | STORAGE | 0.04 | 0.43 | 69.48 | 0 | 01:31 | 0.43 |
| CB104 | STORAGE | 0.04 | 0.43 | 69.48 | 0 | 01:31 | 0.43 |
| CBMH07 | STORAGE | 0.14 | 0.93 | 69.48 | 0 | 01:31 | 0.93 |
| CBMH104 | STORAGE | 0.12 | 0.63 | 69.15 | 0 | 01:33 | 0.63 |
| MH03 | STORAGE | 0.18 | 0.82 | 69.15 | 0 | 01:34 | 0.82 |
| MH05 | STORAGE | 0.20 | 1.14 | 69.48 | 0 | 01:30 | 1.14 |
| MH06 | STORAGE | 0.16 | 1.00 | 69.48 | 0 | 01:30 | 1.00 |
| RD1 | STORAGE | 0.02 | 0.10 | 73.45 | 0 | 01:34 | 0.10 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 | 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 | 00:00 | 0.00 |
| RD4 | STORAGE | 0.05 | 0.12 | 73.47 | 0 | 02:23 | 0.12 |
| RD5 | STORAGE | 0.05 | 0.11 | 73.46 | 0 | 02:53 | 0.11 |
| RD6 | STORAGE | 0.05 | 0.11 | 73.46 | 0 | 02:53 | 0.11 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 | 00:00 | 0.00 |

**********
Node Inflow Summary
**********

| | Maximum Lateral | Maximum Total | Time of Max | Lateral Inflow | Total Inflow | Flow Balance |
|---|---|---|---|---|---|---|

| Node | Type | Inflow LPS | Inflow LPS | Occurrence days | hr:min | Volume 10^6 ltr | Volume 10^6 ltr | Error Percent |
|---|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 10.37 | 0 | 01:09 | 0 | 0.0421 | 0.064 |
| 03b | JUNCTION | 0.00 | 15.20 | 0 | 01:08 | 0 | 0.0375 | 0.018 |
| 03c | JUNCTION | 0.00 | 17.58 | 0 | 01:10 | 0 | 0.0296 | 0.026 |
| 06a | JUNCTION | 0.00 | 30.51 | 0 | 01:07 | 0 | 0.0671 | 0.034 |
| 06b | JUNCTION | 0.00 | 30.70 | 0 | 01:09 | 0 | 0.0516 | 0.008 |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 | 00:54 | 0 | 0.0439 | 0.002 |
| MH01 | JUNCTION | 0.00 | 11.37 | 0 | 01:31 | 0 | 0.153 | 0.000 |
| OGS | JUNCTION | 0.00 | 10.11 | 0 | 01:31 | 0 | 0.109 | -0.001 |
| EXSTM | OUTFALL | 0.00 | 11.37 | 0 | 01:32 | 0 | 0.153 | 0.000 |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 ltr |
| CB100 | STORAGE | 3.37 | 3.37 | 0 | 01:10 | 0.00457 | 0.00458 | 0.010 |
| CB101 | STORAGE | 5.71 | 5.71 | 0 | 01:10 | 0.00795 | 0.00796 | -0.000 |
| Cb102 | STORAGE | 4.54 | 4.54 | 0 | 01:10 | 0.00625 | 0.00631 | 0.008 |
| CB103 | STORAGE | 11.30 | 11.30 | 0 | 01:10 | 0.0155 | 0.0155 | 0.004 |
| CB104 | STORAGE | 15.29 | 15.29 | 0 | 01:10 | 0.0216 | 0.0216 | 0.003 |
| CBMH07 | STORAGE | 23.17 | 23.17 | 0 | 01:10 | 0.03 | 0.03 | -0.082 |
| CBMH104 | STORAGE | 17.78 | 17.78 | 0 | 01:10 | 0.0233 | 0.0233 | -0.092 |
| MH03 | STORAGE | 0.00 | 5.03 | 0 | 01:20 | 0 | 0.0421 | -0.037 |
| MH05 | STORAGE | 0.00 | 13.46 | 0 | 01:09 | 0 | 0.067 | -0.194 |
| MH06 | STORAGE | 0.00 | 24.12 | 0 | 01:07 | 0 | 0.0671 | 0.162 |
| RD1 | STORAGE | 2.89 | 2.89 | 0 | 01:10 | 0.00426 | 0.00426 | -0.000 |
| RD2 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 ltr |
| RD4 | STORAGE | 7.24 | 7.24 | 0 | 01:10 | 0.0107 | 0.0107 | 0.000 |
| RD5 | STORAGE | 9.84 | 9.84 | 0 | 01:10 | 0.0145 | 0.0145 | 0.000 |
| RD6 | STORAGE | 9.84 | 9.84 | 0 | 01:10 | 0.0145 | 0.0145 | 0.000 |
| RD7 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 ltr |

**********
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 |
|---|---|---|---|---|
| 03b | JUNCTION | 0.26 | 0.015 | 1.445 |
| 03c | JUNCTION | 0.37 | 0.025 | 1.445 |
| 06a | JUNCTION | 0.83 | 0.240 | 1.120 |
| 06b | JUNCTION | 0.83 | 0.241 | 1.119 |

**********
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 |
|---|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 0 | 0 | 0 | 0.000 | 1 | 0 | 01:32 | 3.36 |
| CB101 | 0.000 | 0 | 0 | 0 | 0.000 | 1 | 0 | 01:34 | 5.71 |
| Cb102 | 0.000 | 0 | 0 | 0 | 0.000 | 1 | 0 | 01:34 | 4.53 |
| CB103 | 0.000 | 0 | 0 | 0 | 0.000 | 2 | 0 | 01:31 | 11.29 |
| CB104 | 0.000 | 0 | 0 | 0 | 0.000 | 2 | 0 | 01:31 | 15.29 |
| CBMH07 | 0.000 | 1 | 0 | 0 | 0.001 | 6 | 0 | 01:31 | 15.43 |
| CBMH104 | 0.000 | 1 | 0 | 0 | 0.001 | 3 | 0 | 01:33 | 13.12 |
| MH03 | 0.000 | 8 | 0 | 0 | 0.001 | 36 | 0 | 01:34 | 3.34 |
| MH05 | 0.000 | 8 | 0 | 0 | 0.001 | 47 | 0 | 01:30 | 6.77 |
| MH06 | 0.000 | 8 | 0 | 0 | 0.002 | 47 | 0 | 01:30 | 13.46 |
| RD1 | 0.000 | 7 | 0 | 0 | 0.002 | 38 | 0 | 01:34 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD4 | 0.002 | 16 | 0 | 0 | 0.008 | 52 | 0 | 02:23 | 0.32 |
| RD5 | 0.004 | 19 | 0 | 0 | 0.011 | 51 | 0 | 02:53 | 0.32 |
| RD6 | 0.004 | 18 | 0 | 0 | 0.011 | 50 | 0 | 02:53 | 0.32 |
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|
| EXSTM | 63.86 | 4.78 | 11.37 | 0.153 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 21.29 | 4.78 | 11.37 | 0.153 |

**********
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-BLDG | CONDUIT | 1.26 | 0 | 00:57 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 10.11 | 0 | 01:31 | 0.92 | 0.16 | 0.28 |
| 03-03a | CONDUIT | 5.03 | 0 | 01:20 | 0.27 | 0.03 | 1.00 |
| 03a-03b | CONDUIT | 7.04 | 0 | 01:09 | 0.21 | 0.04 | 1.00 |
| 03a-100 | CONDUIT | 3.36 | 0 | 01:10 | 0.65 | 0.24 | 0.40 |
| 03b-03c | CONDUIT | 9.52 | 0 | 01:10 | 0.20 | 0.05 | 1.00 |
| 03b-101 | CONDUIT | 5.71 | 0 | 01:10 | 0.78 | 0.39 | 1.00 |
| 03c-04 | CONDUIT | 13.12 | 0 | 01:10 | 0.23 | 0.07 | 1.00 |
| 03c-102 | CONDUIT | 4.53 | 0 | 01:10 | 0.80 | 0.27 | 1.00 |
| 05-06 | CONDUIT | 13.46 | 0 | 01:09 | 0.30 | 0.07 | 1.00 |
| 06-06a | CONDUIT | 24.12 | 0 | 01:07 | 0.31 | 0.12 | 1.00 |
| 06a-06b | CONDUIT | 19.47 | 0 | 01:07 | 0.25 | 0.10 | 1.00 |
| 06a-103 | CONDUIT | 11.29 | 0 | 01:10 | 1.01 | 0.32 | 1.00 |
| 06b-104 | CONDUIT | 15.29 | 0 | 01:10 | 1.12 | 0.41 | 1.00 |
| 06c-07 | CONDUIT | 15.43 | 0 | 01:09 | 0.21 | 0.08 | 1.00 |
| C1 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 11.37 | 0 | 01:32 | 0.92 | 0.12 | 0.23 |
| OR1 | ORIFICE | 6.77 | 0 | 01:30 | | | 1.00 |
| OR2 | ORIFICE | 3.34 | 0 | 01:34 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 | 00:41 | | | |
| OL3 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 | 00:54 | | | |
| OL5 | DUMMY | 0.32 | 0 | 00:42 | | | |
| OL6 | DUMMY | 0.32 | 0 | 00:43 | | | |
| OL7 | DUMMY | 0.00 | 0 | 00:00 | | | |

**********
Flow Classification Summary
**********

| Conduit | Adjusted /Actual Length | Dry | Up Dry | Down Dry | Sub Crit | Sup Crit | Up Crit | Down Crit | Norm Ltd | Inlet Ctrl |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ---------- Fraction of Time in Flow Class ---------- | | | | | | | | |
| 01-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.06 | 0.00 | 0.60 | 0.33 | 0.00 | 0.00 | 0.78 | 0.00 |
| 03-03a | 1.00 | 0.02 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.65 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.02 | 0.25 | 0.00 | 0.73 | 0.00 | 0.00 | 0.00 | 0.78 | 0.00 |
| 03a-100 | 1.00 | 0.02 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.93 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.02 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 |
| 03b-101 | 1.00 | 0.02 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.87 | 0.00 | 0.00 |
| 03c-04 | 1.00 | 0.02 | 0.02 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.79 | 0.00 |
| 03c-102 | 1.00 | 0.02 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.86 | 0.01 | 0.00 |
| 05-06 | 1.00 | 0.02 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | 0.68 | 0.00 | 0.00 |
| 06-06a | 1.00 | 0.02 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.65 | 0.01 | 0.00 |
| 06a-06b | 1.00 | 0.02 | 0.42 | 0.00 | 0.57 | 0.00 | 0.00 | 0.00 | 0.82 | 0.00 |
| 06a-103 | 1.00 | 0.02 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.85 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.02 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.85 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.02 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 0.09 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

```
EX-01                   1.00   0.01  0.00  0.00  0.00  0.00  0.00  0.99  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 |
|---|---|---|---|---|---|
| 03-03a | 0.91 | 0.91 | 0.95 | 0.01 | 0.01 |
| 03a-03b | 0.77 | 0.77 | 0.91 | 0.01 | 0.01 |
| 03b-03c | 0.63 | 0.63 | 0.77 | 0.01 | 0.01 |
| 03b-101 | 0.12 | 0.12 | 0.26 | 0.01 | 0.01 |
| 03c-04 | 0.47 | 0.47 | 0.63 | 0.01 | 0.01 |
| 03c-102 | 0.12 | 0.12 | 0.37 | 0.01 | 0.01 |
| 05-06 | 1.25 | 1.25 | 1.37 | 0.01 | 0.01 |
| 06-06a | 1.20 | 1.20 | 1.22 | 0.01 | 0.01 |
| 06a-06b | 1.14 | 1.14 | 1.20 | 0.01 | 0.01 |
| 06a-103 | 0.80 | 0.80 | 0.83 | 0.01 | 0.01 |
| 06b-104 | 0.80 | 0.80 | 0.83 | 0.01 | 0.01 |
| 06c-07 | 1.07 | 1.07 | 1.14 | 0.01 | 0.01 |

Analysis begun on: Thu Jul 22 12:58:01 2021
Analysis ended on: Thu Jul 22 12:58:03 2021
Total elapsed time: 00:00:02

# PCSWMM Model Output - Post-Development (100yr, 3-hour Chicago Storm)

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

**********
Element Count
**********
Number of rain gages ..... 1
Number of subcatchments ... 14
Number of nodes ..... 28
Number of links ..... 27
Number of pollutants ..... 0
Number of land uses ..... 0

**********
Raingage Summary
**********

| Name | Data Source | Data Type | Recording Interval |
|---|---|---|---|
| Raingage1 | C3hr-100yr | INTENSITY | 10 min. |

**********
Subcatchment Summary
**********

| Name | Area | Width | %Imperv | %Slope | Rain Gage | Outlet |
|---|---|---|---|---|---|---|
| A-1.1 | 0.01 | 21.82 | 91.00 | 2.0000 | Raingage1 | CB100 |
| A-1.2 | 0.02 | 36.36 | 96.00 | 2.0000 | Raingage1 | CB101 |
| A-1.3 | 0.02 | 29.09 | 94.00 | 2.0000 | Raingage1 | Cb102 |
| A-2.1 | 0.04 | 33.33 | 93.00 | 2.0000 | Raingage1 | CB103 |
| A-2.2 | 0.05 | 44.17 | 99.00 | 2.0000 | Raingage1 | CB104 |
| A-2.3 | 0.10 | 49.50 | 69.00 | 2.0000 | Raingage1 | CBMH07 |
| R-1.1 | 0.01 | 14.29 | 100.00 | 1.5000 | Raingage1 | RD1 |
| R-1.2 | 0.01 | 16.22 | 100.00 | 1.5000 | Raingage1 | R-1.3 |
| R-1.3 | 0.03 | 26.32 | 100.00 | 1.5000 | Raingage1 | R-1.2 |
| R-1.4 | 0.03 | 26.32 | 100.00 | 1.5000 | Raingage1 | RD4 |
| R-1.5 | 0.03 | 31.78 | 100.00 | 1.5000 | Raingage1 | RD5 |
| R-1.6 | 0.03 | 31.78 | 100.00 | 1.5000 | Raingage1 | RD6 |
| R-1.7 | 0.04 | 32.71 | 100.00 | 1.5000 | Raingage1 | R-1.7 |
| S-1.4 | 0.07 | 55.00 | 83.00 | 2.0000 | Raingage1 | CBMH104 |

**********
Node Summary
**********

| Name | Type | Invert Elev. | Max. Depth | Ponded Area | External Inflow |
|---|---|---|---|---|---|
| 03a | JUNCTION | 68.45 | 2.15 | 0.0 | |
| 03b | JUNCTION | 68.47 | 2.13 | 0.0 | |
| 03c | JUNCTION | 68.50 | 2.10 | 0.0 | |
| 06a | JUNCTION | 68.50 | 2.10 | 0.0 | |
| 06b | JUNCTION | 68.52 | 2.08 | 0.0 | |
| BLDG | JUNCTION | 68.83 | 0.25 | 0.0 | |
| MH01 | JUNCTION | 68.18 | 2.07 | 0.0 | |
| OGS | JUNCTION | 68.22 | 2.23 | 0.0 | |
| EXSTM | OUTFALL | 66.24 | 2.10 | 0.0 | |
| OF1 | OUTFALL | 70.14 | 0.15 | 0.0 | |
| OF2 | OUTFALL | 70.40 | 0.15 | 0.0 | |
| CB100 | STORAGE | 69.10 | 1.50 | 0.0 | |
| CB101 | STORAGE | 69.00 | 1.60 | 0.0 | |
| Cb102 | STORAGE | 69.00 | 1.60 | 0.0 | |
| CB103 | STORAGE | 69.05 | 1.55 | 0.0 | |
| CB104 | STORAGE | 69.05 | 1.55 | 0.0 | |
| CBMH07 | STORAGE | 68.55 | 2.05 | 0.0 | |
| CBMH104 | STORAGE | 68.52 | 2.08 | 0.0 | |
| MH03 | STORAGE | 68.34 | 2.26 | 0.0 | |
| MH05 | STORAGE | 68.34 | 2.41 | 0.0 | |
| MH06 | STORAGE | 68.48 | 2.15 | 0.0 | |
| RD1 | STORAGE | 73.35 | 0.15 | 0.0 | |
| RD2 | STORAGE | 73.35 | 0.15 | 0.0 | |
| RD3 | STORAGE | 73.35 | 0.15 | 0.0 | |
| RD4 | STORAGE | 73.35 | 0.15 | 0.0 | |
| RD5 | STORAGE | 73.35 | 0.15 | 0.0 | |
| RD6 | STORAGE | 73.35 | 0.15 | 0.0 | |
| RD7 | STORAGE | 73.35 | 0.15 | 0.0 | |

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
Ending Date ............. 03/19/2020 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 ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


********************
Control Actions Taken
********************


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.034        71.667
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.002         4.469
Surface Runoff ...........         0.029        62.053
Final Storage ............         0.001         1.202
Continuity Error (%) .....         5.501


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.027         0.270
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.027         0.274
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
```

```
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -1.514


************************
Highest Continuity Errors
************************
Node 03a (-1.33%)
Node 06a (-1.25%)
Node 06b (-1.13%)
Node 03c (-1.02%)


***************************
Time-Step Critical Elements
***************************
Link 01-OGS (16.72%)
Link 06b-104 (11.03%)
Link 03a-100 (1.20%)


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.77 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.02
Percent Not Converging      :     0.02
Time Step Frequencies       :
    2.000 -  1.516 sec      :    80.86 %
    1.516 -  1.149 sec      :     7.01 %
    1.149 -  0.871 sec      :     0.95 %
```

```
     0.871 -  0.660 sec      :     1.58 %
     0.660 -  0.500 sec      :     9.59 %
```

**********
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-1.1 | 71.67 | 0.00 | 0.00 | 3.94 | 63.86 | 2.94 | 66.80 | 0.01 | 5.87 | 0.932 |
| A-1.2 | 71.67 | 0.00 | 0.00 | 1.75 | 67.36 | 1.30 | 68.66 | 0.01 | 9.86 | 0.958 |
| A-1.3 | 71.67 | 0.00 | 0.00 | 2.62 | 65.96 | 1.96 | 67.92 | 0.01 | 7.87 | 0.948 |
| A-2.1 | 71.67 | 0.00 | 0.00 | 3.06 | 65.29 | 2.28 | 67.58 | 0.03 | 19.63 | 0.943 |
| A-2.2 | 71.67 | 0.00 | 0.00 | 0.44 | 69.51 | 0.33 | 69.84 | 0.04 | 26.25 | 0.974 |
| A-2.3 | 71.67 | 0.00 | 0.00 | 13.74 | 48.46 | 9.14 | 57.61 | 0.06 | 45.75 | 0.804 |
| R-1.1 | 71.67 | 0.00 | 0.00 | 0.00 | 71.75 | 0.00 | 71.75 | 0.01 | 4.96 | 1.001 |
| R-1.2 | 71.67 | 50163.99 | 0.00 | 0.00 | 50240.66 | 0.00 | 50240.66 | 3.01 | 36.93 | 1.000 |
| R-1.3 | 71.67 | 12013.65 | 0.00 | 0.00 | 12083.46 | 0.00 | 12083.46 | 3.02 | 36.93 | 1.000 |
| R-1.4 | 71.67 | 0.00 | 0.00 | 0.00 | 71.77 | 0.00 | 71.77 | 0.02 | 12.40 | 1.001 |
| R-1.5 | 71.67 | 0.00 | 0.00 | 0.00 | 71.78 | 0.00 | 71.78 | 0.02 | 16.86 | 1.002 |
| R-1.6 | 71.67 | 0.00 | 0.00 | 0.00 | 71.78 | 0.00 | 71.78 | 0.02 | 16.86 | 1.002 |
| R-1.7 | 71.67 | 0.00 | 0.00 | 0.00 | 71.78 | 0.00 | 71.78 | 0.03 | | |
| S-1.4 | 71.67 | 0.00 | 0.00 | 7.47 | 58.26 | 5.38 | 63.65 | 0.04 | 31.90 | 0.888 |

**********
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 |
|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.28 | 2.06 | 70.51 | 0 01:35 | 2.06 |
| 03b | JUNCTION | 0.27 | 2.04 | 70.51 | 0 01:35 | 2.04 |
| 03c | JUNCTION | 0.26 | 2.01 | 70.51 | 0 01:34 | 2.01 |
| 06a | JUNCTION | 0.28 | 2.07 | 70.57 | 0 01:32 | 2.07 |
| 06b | JUNCTION | 0.27 | 2.05 | 70.57 | 0 01:35 | 2.05 |
| BLDG | JUNCTION | 0.02 | 0.03 | 68.86 | 0 00:49 | 0.03 |
| MH01 | JUNCTION | 0.03 | 0.08 | 68.26 | 0 01:32 | 0.08 |
| OGS | JUNCTION | 0.02 | 0.08 | 68.30 | 0 01:32 | 0.08 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 00:00 | 0.00 |
| CB100 | STORAGE | 0.14 | 1.41 | 70.51 | 0 01:35 | 1.41 |
| CB101 | STORAGE | 0.15 | 1.51 | 70.51 | 0 01:35 | 1.51 |
| Cb102 | STORAGE | 0.15 | 1.51 | 70.51 | 0 01:34 | 1.51 |
| CB103 | STORAGE | 0.16 | 1.52 | 70.57 | 0 01:36 | 1.52 |
| CB104 | STORAGE | 0.16 | 1.52 | 70.57 | 0 01:35 | 1.52 |
| CBMH07 | STORAGE | 0.26 | 2.02 | 70.57 | 0 01:34 | 2.02 |
| CBMH104 | STORAGE | 0.26 | 1.99 | 70.51 | 0 01:34 | 1.99 |
| MH03 | STORAGE | 0.32 | 2.17 | 70.51 | 0 01:35 | 2.17 |
| MH05 | STORAGE | 0.32 | 2.23 | 70.57 | 0 01:32 | 2.23 |
| MH06 | STORAGE | 0.28 | 2.09 | 70.57 | 0 01:32 | 2.09 |
| RD1 | STORAGE | 0.03 | 0.14 | 73.49 | 0 01:54 | 0.14 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD4 | STORAGE | 0.08 | 0.15 | 73.50 | 0 03:10 | 0.15 |
| RD5 | STORAGE | 0.09 | 0.15 | 73.50 | 0 03:12 | 0.15 |
| RD6 | STORAGE | 0.09 | 0.14 | 73.49 | 0 03:12 | 0.14 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |

**********
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 |
|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 30.19 | 0 01:08 | 0 | 0.0758 | -1.316 |
| 03b | JUNCTION | 0.00 | 28.33 | 0 01:07 | 0 | 0.0672 | -0.835 |
| 03c | JUNCTION | 0.00 | 32.75 | 0 01:07 | 0 | 0.053 | -1.009 |
| 06a | JUNCTION | 0.00 | 68.21 | 0 01:07 | 0 | 0.122 | -1.235 |
| 06b | JUNCTION | 0.00 | 60.28 | 0 01:06 | 0 | 0.0941 | -1.118 |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 00:46 | 0 | 0.074 | 0.001 |
| MH01 | JUNCTION | 0.00 | 16.28 | 0 01:32 | 0 | 0.274 | 0.000 |
| OGS | JUNCTION | 0.00 | 15.02 | 0 01:32 | 0 | 0.2 | -0.001 |
| EXSTM | OUTFALL | 0.00 | 16.28 | 0 01:32 | 0 | 0.274 | 0.000 |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| CB100 | STORAGE | 5.87 | 12.51 | 0 01:08 | 0.00802 | 0.00816 | 0.541 |
| CB101 | STORAGE | 9.86 | 11.50 | 0 01:07 | 0.0137 | 0.0138 | 0.387 |
| Cb102 | STORAGE | 7.87 | 8.23 | 0 01:08 | 0.0109 | 0.0111 | 0.274 |
| CB103 | STORAGE | 19.63 | 19.63 | 0 01:10 | 0.027 | 0.0273 | 0.461 |
| CB104 | STORAGE | 26.25 | 26.25 | 0 01:10 | 0.037 | 0.0371 | 0.354 |
| CBMH07 | STORAGE | 45.75 | 45.75 | 0 01:10 | 0.0571 | 0.0572 | 0.035 |
| CBMH104 | STORAGE | 31.90 | 31.90 | 0 01:10 | 0.042 | 0.042 | 0.040 |
| MH03 | STORAGE | 0.00 | 26.99 | 0 01:08 | 0 | 0.0766 | 0.117 |
| MH05 | STORAGE | 0.00 | 37.78 | 0 01:08 | 0 | 0.123 | -0.112 |
| MH06 | STORAGE | 0.00 | 67.29 | 0 01:07 | 0 | 0.123 | 0.200 |
| RD1 | STORAGE | 4.96 | 4.96 | 0 01:05 | 0.00718 | 0.00718 | 0.013 |
| RD2 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD4 | STORAGE | 12.40 | 12.40 | 0 01:10 | 0.018 | 0.018 | 0.010 |
| RD5 | STORAGE | 16.86 | 16.86 | 0 01:10 | 0.0244 | 0.0244 | 0.010 |
| RD6 | STORAGE | 16.86 | 16.86 | 0 01:10 | 0.0244 | 0.0244 | 0.010 |
| RD7 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |

**********
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 |
|---|---|---|---|---|
| 03a | JUNCTION | 2.51 | 1.271 | 0.089 |
| 03b | JUNCTION | 2.65 | 1.371 | 0.089 |
| 03c | JUNCTION | 2.67 | 1.381 | 0.089 |
| 06a | JUNCTION | 2.66 | 1.330 | 0.030 |
| 06b | JUNCTION | 2.66 | 1.330 | 0.030 |

**********
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 |
|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 2 | 0 | 0 | 0.001 | 18 | 0 01:35 | 5.95 |
| CB101 | 0.000 | 2 | 0 | 0 | 0.002 | 27 | 0 01:35 | 12.08 |
| Cb102 | 0.000 | 2 | 0 | 0 | 0.003 | 28 | 0 01:34 | 7.86 |
| CB103 | 0.000 | 3 | 0 | 0 | 0.004 | 58 | 0 01:36 | 19.57 |
| CB104 | 0.000 | 3 | 0 | 0 | 0.005 | 56 | 0 01:35 | 30.24 |
| CBMH07 | 0.001 | 4 | 0 | 0 | 0.010 | 61 | 0 01:34 | 35.36 |
| CBMH104 | 0.000 | 2 | 0 | 0 | 0.007 | 29 | 0 01:34 | 27.94 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MH03 | 0.000 | 14 | 0 | 0 | 0.002 | 96 | 0 | 01:35 | 5.49 |
| MH05 | 0.000 | 13 | 0 | 0 | 0.003 | 93 | 0 | 01:32 | 9.53 |
| MH06 | 0.001 | 13 | 0 | 0 | 0.004 | 97 | 0 | 01:32 | 37.78 |
| RD1 | 0.001 | 14 | 0 | 0 | 0.005 | 78 | 0 | 01:54 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD4 | 0.005 | 36 | 0 | 0 | 0.015 | 100 | 0 | 03:10 | 0.32 |
| RD5 | 0.010 | 45 | 0 | 0 | 0.021 | 96 | 0 | 03:12 | 0.32 |
| RD6 | 0.010 | 43 | 0 | 0 | 0.021 | 93 | 0 | 03:12 | 0.32 |
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|
| EXSTM | 92.76 | 4.13 | 16.28 | 0.274 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 30.92 | 4.13 | 16.28 | 0.274 |

**********
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-BLDG | CONDUIT | 1.26 | 0 00:49 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 15.02 | 0 01:32 | 1.05 | 0.24 | 0.33 |
| 03-03a | CONDUIT | 26.99 | 0 01:08 | 0.29 | 0.14 | 1.00 |
| 03a-03b | CONDUIT | 25.00 | 0 01:08 | 0.22 | 0.13 | 1.00 |
| 03a-100 | CONDUIT | 6.65 | 0 01:08 | 0.76 | 0.47 | 1.00 |
| 03b-03c | CONDUIT | 21.71 | 0 01:08 | 0.21 | 0.11 | 1.00 |
| 03b-101 | CONDUIT | 12.08 | 0 01:07 | 0.89 | 0.83 | 1.00 |
| 03c-04 | CONDUIT | 27.94 | 0 01:07 | 0.20 | 0.14 | 1.00 |
| 03c-102 | CONDUIT | 7.86 | 0 01:07 | 0.93 | 0.47 | 1.00 |
| 05-06 | CONDUIT | 37.78 | 0 01:08 | 0.31 | 0.19 | 1.00 |
| 06-06a | CONDUIT | 67.29 | 0 01:07 | 0.32 | 0.33 | 1.00 |
| 06a-06b | CONDUIT | 53.28 | 0 01:07 | 0.23 | 0.27 | 1.00 |
| 06a-103 | CONDUIT | 19.57 | 0 01:06 | 1.16 | 0.55 | 1.00 |
| 06b-104 | CONDUIT | 30.24 | 0 01:06 | 1.28 | 0.81 | 1.00 |
| 06c-07 | CONDUIT | 35.36 | 0 01:07 | 0.19 | 0.18 | 1.00 |
| C1 | CONDUIT | 0.00 | 0 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 16.28 | 0 01:32 | 1.02 | 0.17 | 0.28 |
| OR1 | ORIFICE | 9.53 | 0 01:32 | | | 1.00 |
| OR2 | ORIFICE | 5.49 | 0 01:35 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 00:28 | | | |
| OL3 | DUMMY | 0.00 | 0 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 00:46 | | | |
| OL5 | DUMMY | 0.32 | 0 00:31 | | | |
| OL6 | DUMMY | 0.32 | 0 00:31 | | | |
| OL7 | DUMMY | 0.00 | 0 00:00 | | | |

**********
Flow Classification Summary
**********

| 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-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.29 | 0.00 | 0.39 | 0.32 | 0.00 | 0.00 | 0.81 | 0.00 |
| 03-03a | 1.00 | 0.01 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.65 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.01 | 0.37 | 0.00 | 0.61 | 0.00 | 0.00 | 0.00 | 0.72 | 0.00 |
| 03a-100 | 1.00 | 0.01 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 0.85 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.01 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 |
| 03b-101 | 1.00 | 0.01 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 03c-04 | 1.00 | 0.01 | 0.02 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.73 | 0.00 |
| 03c-102 | 1.00 | 0.01 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 |
| 05-06 | 1.00 | 0.02 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.68 | 0.00 | 0.00 |
| 06-06a | 1.00 | 0.01 | 0.00 | 0.00 | 0.32 | 0.00 | 0.00 | 0.66 | 0.01 | 0.00 |
| 06a-06b | 1.00 | 0.01 | 0.33 | 0.00 | 0.66 | 0.00 | 0.00 | 0.00 | 0.76 | 0.00 |
| 06a-103 | 1.00 | 0.01 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.01 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.83 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.01 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EX-01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 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 |
|---|---|---|---|---|---|
| 03-03a | 2.85 | 2.85 | 2.87 | 0.01 | 0.01 |
| 03a-03b | 2.79 | 2.79 | 2.85 | 0.01 | 0.01 |
| 03a-100 | 2.50 | 2.50 | 2.51 | 0.01 | 0.01 |
| 03b-03c | 2.74 | 2.74 | 2.79 | 0.01 | 0.01 |
| 03b-101 | 2.63 | 2.63 | 2.65 | 0.01 | 0.01 |
| 03c-04 | 2.69 | 2.69 | 2.74 | 0.01 | 0.01 |
| 03c-102 | 2.63 | 2.63 | 2.67 | 0.01 | 0.01 |
| 05-06 | 2.90 | 2.90 | 2.98 | 0.01 | 0.01 |
| 06-06a | 2.87 | 2.87 | 2.88 | 0.01 | 0.01 |
| 06a-06b | 2.84 | 2.84 | 2.87 | 0.01 | 0.01 |
| 06a-103 | 2.65 | 2.65 | 2.66 | 0.01 | 0.01 |
| 06b-104 | 2.65 | 2.65 | 2.66 | 0.01 | 0.01 |
| 06c-07 | 2.79 | 2.79 | 2.84 | 0.01 | 0.01 |

Analysis begun on: Thu Jul 22 12:45:47 2021
Analysis ended on: Thu Jul 22 12:45:49 2021
Total elapsed time: 00:00:02

# PCSWMM Model Output - Post-Development (100yr+20%, 3-hour Chicago Storm)

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

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 28
Number of links ........... 27
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
-----------------------------------------------------------------------
Raingage1            C3hr-100yr+20%               INTENSITY   10 min.

********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-1.1                       0.01     21.82     91.00    2.0000 Raingage1            CB100
A-1.2                       0.02     36.36     96.00    2.0000 Raingage1            CB101
A-1.3                       0.02     29.09     94.00    2.0000 Raingage1            Cb102
A-2.1                       0.04     33.33     93.00    2.0000 Raingage1            CB103
A-2.2                       0.05     44.17     99.00    2.0000 Raingage1            CB104
A-2.3                       0.10     49.50     69.00    2.0000 Raingage1            CBMH07
R-1.1                       0.01     14.29    100.00    1.5000 Raingage1            RD1
R-1.2                       0.01     16.22    100.00    1.5000 Raingage1            R-1.3
R-1.3                       0.03     26.32    100.00    1.5000 Raingage1            R-1.2
R-1.4                       0.03     26.32    100.00    1.5000 Raingage1            RD4
R-1.5                       0.03     31.78    100.00    1.5000 Raingage1            RD5
R-1.6                       0.03     31.78    100.00    1.5000 Raingage1            RD6
R-1.7                       0.04     32.71    100.00    1.5000 Raingage1            R-1.7
S-1.4                       0.07     55.00     83.00    2.0000 Raingage1            CBMH104

************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
03a                  JUNCTION             68.45      2.15       0.0
03b                  JUNCTION             68.47      2.13       0.0
03c                  JUNCTION             68.50      2.10       0.0
06a                  JUNCTION             68.50      2.10       0.0
06b                  JUNCTION             68.52      2.08       0.0
BLDG                 JUNCTION             68.83      0.25       0.0
MH01                 JUNCTION             68.18      2.07       0.0
OGS                  JUNCTION             68.22      2.23       0.0
EXSTM                OUTFALL              66.24      2.10       0.0
OF1                  OUTFALL              70.14      0.15       0.0
OF2                  OUTFALL              70.40      0.15       0.0
CB100                STORAGE              69.10      1.50       0.0
CB101                STORAGE              69.00      1.60       0.0
Cb102                STORAGE              69.00      1.60       0.0
CB103                STORAGE              69.05      1.55       0.0
CB104                STORAGE              69.05      1.55       0.0
CBMH07               STORAGE              68.55      2.05       0.0
CBMH104              STORAGE              68.52      2.08       0.0
MH03                 STORAGE              68.34      2.26       0.0
MH05                 STORAGE              68.34      2.41       0.0
MH06                 STORAGE              68.48      2.15       0.0
RD1                  STORAGE              73.35      0.15       0.0
RD2                  STORAGE              73.35      0.15       0.0
RD3                  STORAGE              73.35      0.15       0.0
RD4                  STORAGE              73.35      0.15       0.0
RD5                  STORAGE              73.35      0.15       0.0
RD6                  STORAGE              73.35      0.15       0.0
RD7                  STORAGE              73.35      0.15       0.0
```

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
Ending Date ............. 03/19/2020 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 ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


********************
Control Actions Taken
********************


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.041        86.000
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.002         4.721
Surface Runoff ...........         0.036        75.286
Final Storage ............         0.001         1.244
Continuity Error (%) .....         5.523


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.033         0.328
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.031         0.315
Flooding Loss ............         0.002         0.017
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
```

```
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -1.364


*************************
Highest Continuity Errors
*************************
Node 06a (-1.19%)
Node 03a (-1.18%)
Node 06b (-1.05%)


***************************
Time-Step Critical Elements
***************************
Link 01-OGS (19.61%)
Link 06b-104 (11.16%)
Link 03b-101 (1.65%)


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


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.75 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.02
Percent Not Converging      :     0.03
Time Step Frequencies       :
    2.000 -  1.516 sec      :    76.55 %
    1.516 -  1.149 sec      :    11.00 %
    1.149 -  0.871 sec      :     1.08 %
    0.871 -  0.660 sec      :     1.65 %
```

0.660 - 0.500 sec : 9.73 %

**********
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-1.1 | 86.00 | 0.00 | 0.00 | 4.16 | 77.09 | 3.89 | 80.98 | 0.01 | 7.07 | 0.942 |
| A-1.2 | 86.00 | 0.00 | 0.00 | 1.85 | 81.32 | 1.72 | 83.04 | 0.02 | 11.85 | 0.966 |
| A-1.3 | 86.00 | 0.00 | 0.00 | 2.77 | 79.63 | 2.59 | 82.21 | 0.01 | 9.46 | 0.956 |
| A-2.1 | 86.00 | 0.00 | 0.00 | 3.24 | 78.72 | 3.03 | 81.76 | 0.03 | 23.62 | 0.951 |
| A-2.2 | 86.00 | 0.00 | 0.00 | 0.46 | 83.80 | 0.43 | 84.23 | 0.04 | 31.51 | 0.979 |
| A-2.3 | 86.00 | 0.00 | 0.00 | 14.51 | 58.41 | 13.00 | 71.41 | 0.07 | 56.14 | 0.830 |
| R-1.1 | 86.00 | 0.00 | 0.00 | 0.00 | 86.09 | 0.00 | 86.09 | 0.01 | 5.95 | 1.001 |
| R-1.2 | 86.00 | 60338.41 | 0.00 | 0.00 | 60423.76 | 0.00 | 60423.76 | 3.63 | 44.33 | 1.000 |
| R-1.3 | 86.00 | 14448.52 | 0.00 | 0.00 | 14534.40 | 0.00 | 14534.40 | 3.63 | 44.33 | 1.000 |
| R-1.4 | 86.00 | 0.00 | 0.00 | 0.00 | 86.11 | 0.00 | 86.11 | 0.02 | 14.88 | 1.001 |
| R-1.5 | 86.00 | 0.00 | 0.00 | 0.00 | 86.12 | 0.00 | 86.12 | 0.03 | 20.24 | 1.001 |
| R-1.6 | 86.00 | 0.00 | 0.00 | 0.00 | 86.12 | 0.00 | 86.12 | 0.03 | 20.24 | 1.001 |
| R-1.7 | 86.00 | 0.00 | 0.00 | 0.00 | 86.12 | 0.00 | 86.12 | 0.03 | 20.83 | 1.001 |
| S-1.4 | 86.00 | 0.00 | 0.00 | 7.89 | 70.26 | 7.37 | 77.63 | 0.05 | 38.52 | 0.903 |

**********
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 |
|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.36 | 2.11 | 70.56 | 0 01:41 | 2.11 |
| 03b | JUNCTION | 0.35 | 2.08 | 70.56 | 0 01:41 | 2.08 |
| 03c | JUNCTION | 0.34 | 2.06 | 70.56 | 0 01:42 | 2.06 |
| 06a | JUNCTION | 0.33 | 2.10 | 70.60 | 0 01:23 | 2.10 |
| 06b | JUNCTION | 0.33 | 2.08 | 70.60 | 0 01:22 | 2.08 |
| BLDG | JUNCTION | 0.02 | 0.03 | 68.86 | 0 00:45 | 0.03 |
| MH01 | JUNCTION | 0.04 | 0.08 | 68.26 | 0 01:41 | 0.08 |
| OGS | JUNCTION | 0.02 | 0.08 | 68.30 | 0 01:41 | 0.08 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 00:00 | 0.00 |
| CB100 | STORAGE | 0.20 | 1.46 | 70.56 | 0 01:41 | 1.46 |
| CB101 | STORAGE | 0.22 | 1.56 | 70.56 | 0 01:41 | 1.56 |
| Cb102 | STORAGE | 0.22 | 1.56 | 70.56 | 0 01:42 | 1.56 |
| CB103 | STORAGE | 0.20 | 1.55 | 70.60 | 0 01:21 | 1.55 |
| CB104 | STORAGE | 0.20 | 1.55 | 70.60 | 0 01:21 | 1.55 |
| CBMH07 | STORAGE | 0.32 | 2.05 | 70.60 | 0 01:21 | 2.05 |
| CBMH104 | STORAGE | 0.34 | 2.04 | 70.56 | 0 01:43 | 2.04 |
| MH03 | STORAGE | 0.40 | 2.22 | 70.56 | 0 01:41 | 2.22 |
| MH05 | STORAGE | 0.39 | 2.26 | 70.60 | 0 01:21 | 2.26 |
| MH06 | STORAGE | 0.34 | 2.12 | 70.60 | 0 01:22 | 2.12 |
| RD1 | STORAGE | 0.04 | 0.15 | 73.50 | 0 02:04 | 0.15 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD4 | STORAGE | 0.08 | 0.15 | 73.50 | 0 01:24 | 0.15 |
| RD5 | STORAGE | 0.10 | 0.15 | 73.50 | 0 01:35 | 0.15 |
| RD6 | STORAGE | 0.10 | 0.15 | 73.50 | 0 01:42 | 0.15 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |

**********
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 |
|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 37.37 | 0 01:06 | 0 | 0.0921 | -1.168 |
| 03b | JUNCTION | 0.00 | 34.59 | 0 01:06 | 0 | 0.0821 | -0.787 |
| 03c | JUNCTION | 0.00 | 36.53 | 0 01:05 | 0 | 0.0652 | -0.906 |
| 06a | JUNCTION | 0.00 | 77.95 | 0 01:06 | 0 | 0.143 | -1.176 |
| 06b | JUNCTION | 0.00 | 71.34 | 0 01:05 | 0 | 0.111 | -1.036 |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 00:42 | 0 | 0.0782 | 0.001 |
| MH01 | JUNCTION | 0.00 | 16.40 | 0 01:41 | 0 | 0.315 | 0.000 |
| OGS | JUNCTION | 0.00 | 15.14 | 0 01:41 | 0 | 0.237 | -0.001 |
| EXSTM | OUTFALL | 0.00 | 16.40 | 0 01:41 | 0 | 0.315 | 0.000 |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| CB100 | STORAGE | 7.07 | 12.80 | 0 01:06 | 0.00972 | 0.00986 | 0.455 |
| CB101 | STORAGE | 11.85 | 19.97 | 0 01:09 | 0.0166 | 0.017 | 0.421 |
| Cb102 | STORAGE | 9.46 | 14.89 | 0 01:10 | 0.0132 | 0.0139 | 0.301 |
| CB103 | STORAGE | 23.62 | 33.26 | 0 01:09 | 0.0327 | 0.0336 | 0.433 |
| CB104 | STORAGE | 31.51 | 34.43 | 0 01:09 | 0.0447 | 0.0448 | 0.321 |
| CBMH07 | STORAGE | 56.14 | 61.71 | 0 01:10 | 0.0707 | 0.0712 | 0.049 |
| CBMH104 | STORAGE | 38.52 | 38.52 | 0 01:10 | 0.0513 | 0.0513 | 0.083 |
| MH03 | STORAGE | 0.00 | 24.27 | 0 01:06 | 0 | 0.0929 | 0.101 |
| MH05 | STORAGE | 0.00 | 39.85 | 0 01:06 | 0 | 0.144 | -0.095 |
| MH06 | STORAGE | 0.00 | 77.50 | 0 01:06 | 0 | 0.144 | 0.171 |
| RD1 | STORAGE | 5.95 | 5.95 | 0 01:05 | 0.00861 | 0.00861 | 0.016 |
| RD2 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD4 | STORAGE | 14.88 | 14.88 | 0 01:10 | 0.0215 | 0.0215 | 0.010 |
| RD5 | STORAGE | 20.24 | 20.24 | 0 01:10 | 0.0293 | 0.0293 | 0.007 |
| RD6 | STORAGE | 20.24 | 20.24 | 0 01:10 | 0.0293 | 0.0293 | 0.010 |
| RD7 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |

**********
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 |
|---|---|---|---|---|
| 03a | JUNCTION | 3.29 | 1.315 | 0.045 |
| 03b | JUNCTION | 3.42 | 1.415 | 0.045 |
| 03c | JUNCTION | 3.44 | 1.425 | 0.045 |
| 06a | JUNCTION | 3.22 | 1.360 | 0.000 |
| 06b | JUNCTION | 3.22 | 1.360 | 0.000 |

**********
Node Flooding Summary
**********

Flooding refers to all water that overflows a node, whether it ponds or not.

| Node | Hours Flooded | Maximum Rate LPS | Time of Max Occurrence days hr:min | Total Flood Volume 10^6 ltr | Maximum Ponded Depth Meters |
|---|---|---|---|---|---|
| 06b | 0.05 | 0.12 | 0 01:23 | 0.000 | 0.000 |
| CB103 | 0.24 | 7.89 | 0 01:21 | 0.002 | 0.000 |
| CB104 | 0.35 | 6.64 | 0 01:21 | 0.003 | 0.000 |
| CBMH07 | 0.23 | 6.75 | 0 01:21 | 0.002 | 0.000 |
| RD4 | 1.78 | 2.19 | 0 01:24 | 0.004 | 0.000 |
| RD5 | 1.61 | 1.77 | 0 01:35 | 0.004 | 0.000 |
| RD6 | 1.50 | 1.50 | 0 01:42 | 0.003 | 0.000 |

**********
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 |
|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 4 | 0 | 0 | 0.001 | 42 | 0 01:41 | 8.83 |
| CB101 | 0.000 | 5 | 0 | 0 | 0.005 | 55 | 0 01:41 | 12.72 |
| Cb102 | 0.000 | 5 | 0 | 0 | 0.005 | 56 | 0 01:42 | 9.45 |
| CB103 | 0.001 | 7 | 0 | 0 | 0.007 | 100 | 0 01:21 | 24.78 |
| CB104 | 0.001 | 7 | 0 | 0 | 0.009 | 100 | 0 01:21 | 35.57 |
| CBMH07 | 0.001 | 8 | 0 | 0 | 0.017 | 100 | 0 01:21 | 40.87 |
| CBMH104 | 0.001 | 5 | 0 | 0 | 0.013 | 57 | 0 01:43 | 32.38 |
| MH03 | 0.000 | 18 | 0 | 0 | 0.003 | 98 | 0 01:41 | 5.55 |
| MH05 | 0.000 | 16 | 0 | 0 | 0.003 | 94 | 0 01:21 | 9.60 |
| MH06 | 0.001 | 16 | 0 | 0 | 0.004 | 99 | 0 01:22 | 39.85 |
| RD1 | 0.001 | 20 | 0 | 0 | 0.006 | 99 | 0 02:04 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD4 | 0.005 | 37 | 0 | 0 | 0.015 | 100 | 0 01:24 | 0.32 |
| RD5 | 0.011 | 49 | 0 | 0 | 0.022 | 100 | 0 01:35 | 0.32 |
| RD6 | 0.011 | 50 | 0 | 0 | 0.023 | 100 | 0 01:42 | 0.32 |
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|
| EXSTM | 98.10 | 4.44 | 16.40 | 0.315 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 32.70 | 4.44 | 16.40 | 0.315 |

**********
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-BLDG | CONDUIT | 1.26 | 0 00:45 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 15.14 | 0 01:41 | 1.05 | 0.24 | 0.34 |
| 03-03a | CONDUIT | 24.27 | 0 01:06 | 0.29 | 0.12 | 1.00 |
| 03a-03b | CONDUIT | 32.35 | 0 01:06 | 0.22 | 0.16 | 1.00 |
| 03a-100 | CONDUIT | 8.83 | 0 01:10 | 0.80 | 0.63 | 1.00 |
| 03b-03c | CONDUIT | 27.60 | 0 01:06 | 0.21 | 0.14 | 1.00 |
| 03b-101 | CONDUIT | 12.72 | 0 01:06 | 0.94 | 0.87 | 1.00 |
| 03c-04 | CONDUIT | 32.38 | 0 01:06 | 0.20 | 0.17 | 1.00 |
| 03c-102 | CONDUIT | 9.45 | 0 01:05 | 0.97 | 0.57 | 1.00 |
| 05-06 | CONDUIT | 39.85 | 0 01:06 | 0.31 | 0.20 | 1.00 |
| 06-06a | CONDUIT | 77.50 | 0 01:06 | 0.33 | 0.38 | 1.00 |
| 06a-06b | CONDUIT | 59.71 | 0 01:06 | 0.24 | 0.30 | 1.00 |
| 06a-103 | CONDUIT | 24.78 | 0 01:10 | 1.21 | 0.69 | 1.00 |
| 06b-104 | CONDUIT | 35.57 | 0 01:05 | 1.32 | 0.96 | 1.00 |
| 06c-07 | CONDUIT | 40.87 | 0 01:05 | 0.19 | 0.21 | 1.00 |
| C1 | CONDUIT | 0.00 | 0 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 16.40 | 0 01:41 | 1.02 | 0.17 | 0.28 |
| OR1 | ORIFICE | 9.60 | 0 01:21 | | | 1.00 |
| OR2 | ORIFICE | 5.55 | 0 01:41 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 00:24 | | | |
| OL3 | DUMMY | 0.00 | 0 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 00:42 | | | |
| OL5 | DUMMY | 0.32 | 0 00:27 | | | |
| OL6 | DUMMY | 0.32 | 0 00:27 | | | |
| OL7 | DUMMY | 0.00 | 0 00:00 | | | |

**********
Flow Classification Summary
**********

| Conduit | Adjusted /Actual Length | Dry | Up Dry | Down Dry | Sub Crit | Sup Crit | Up Crit | Down Crit | Norm Ltd | Inlet Ctrl |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ---------- Fraction of Time in Flow Class ---------- | | | | | | | | |
| 01-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.33 | 0.00 | 0.31 | 0.35 | 0.00 | 0.00 | 0.81 | 0.00 |
| 03-03a | 1.00 | 0.01 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 | 0.62 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.01 | 0.39 | 0.00 | 0.60 | 0.00 | 0.00 | 0.00 | 0.69 | 0.00 |
| 03a-100 | 1.00 | 0.01 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.01 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 |
| 03b-101 | 1.00 | 0.01 | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.80 | 0.00 | 0.00 |
| 03c-04 | 1.00 | 0.01 | 0.02 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 |
| 03c-102 | 1.00 | 0.01 | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.79 | 0.00 | 0.00 |
| 05-06 | 1.00 | 0.01 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.65 | 0.00 | 0.00 |
| 06-06a | 1.00 | 0.01 | 0.00 | 0.00 | 0.35 | 0.00 | 0.00 | 0.63 | 0.01 | 0.00 |
| 06a-06b | 1.00 | 0.01 | 0.17 | 0.00 | 0.82 | 0.00 | 0.00 | 0.00 | 0.74 | 0.00 |
| 06a-103 | 1.00 | 0.01 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.01 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.01 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EX-01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 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 |
|---|---|---|---|---|---|
| 03-03a | 3.62 | 3.62 | 3.64 | 0.01 | 0.01 |
| 03a-03b | 3.56 | 3.56 | 3.62 | 0.01 | 0.01 |
| 03a-100 | 3.28 | 3.28 | 3.29 | 0.01 | 0.01 |
| 03b-03c | 3.51 | 3.51 | 3.56 | 0.01 | 0.01 |
| 03b-101 | 3.40 | 3.40 | 3.42 | 0.01 | 0.01 |
| 03c-04 | 3.46 | 3.46 | 3.51 | 0.01 | 0.01 |
| 03c-102 | 3.40 | 3.40 | 3.44 | 0.01 | 0.01 |
| 05-06 | 3.46 | 3.46 | 3.53 | 0.01 | 0.01 |
| 06-06a | 3.43 | 3.43 | 3.44 | 0.01 | 0.05 |
| 06a-06b | 3.39 | 3.39 | 3.43 | 0.01 | 0.01 |
| 06a-103 | 3.21 | 3.21 | 3.22 | 0.01 | 0.01 |
| 06b-104 | 3.21 | 3.21 | 3.22 | 0.01 | 0.01 |
| 06c-07 | 3.35 | 3.35 | 3.39 | 0.01 | 0.01 |

Analysis begun on: Thu Jul 22 12:55:14 2021
Analysis ended on: Thu Jul 22 12:55:16 2021
Total elapsed time: 00:00:02

# PCSWMM Model Output - Post-Development (2yr, 12-hour SCS Storm)

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


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 28
Number of links ........... 27
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
-----------------------------------------------------------------------
Raingage1            S12hr-2yr                    INTENSITY   30 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-1.1                       0.01     21.82     91.00    2.0000 Raingage1            CB100
A-1.2                       0.02     36.36     96.00    2.0000 Raingage1            CB101
A-1.3                       0.02     29.09     94.00    2.0000 Raingage1            Cb102
A-2.1                       0.04     33.33     93.00    2.0000 Raingage1            CB103
A-2.2                       0.05     44.17     99.00    2.0000 Raingage1            CB104
A-2.3                       0.10     49.50     69.00    2.0000 Raingage1            CBMH07
R-1.1                       0.01     14.29    100.00    1.5000 Raingage1            RD1
R-1.2                       0.01     16.22    100.00    1.5000 Raingage1            R-1.3
R-1.3                       0.03     26.32    100.00    1.5000 Raingage1            R-1.2
R-1.4                       0.03     26.32    100.00    1.5000 Raingage1            RD4
R-1.5                       0.03     31.78    100.00    1.5000 Raingage1            RD5
R-1.6                       0.03     31.78    100.00    1.5000 Raingage1            RD6
R-1.7                       0.04     32.71    100.00    1.5000 Raingage1            R-1.7
S-1.4                       0.07     55.00     83.00    2.0000 Raingage1            CBMH104


************
Node Summary
************
                                        Invert      Max.    Ponded    External
Name                 Type                Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
03a                  JUNCTION            68.45      2.15       0.0
03b                  JUNCTION            68.47      2.13       0.0
03c                  JUNCTION            68.50      2.10       0.0
06a                  JUNCTION            68.50      2.10       0.0
06b                  JUNCTION            68.52      2.08       0.0
BLDG                 JUNCTION            68.83      0.25       0.0
MH01                 JUNCTION            68.18      2.07       0.0
OGS                  JUNCTION            68.22      2.23       0.0
EXSTM                OUTFALL             66.24      2.10       0.0
OF1                  OUTFALL             70.14      0.15       0.0
OF2                  OUTFALL             70.40      0.15       0.0
CB100                STORAGE             69.10      1.50       0.0
CB101                STORAGE             69.00      1.60       0.0
Cb102                STORAGE             69.00      1.60       0.0
CB103                STORAGE             69.05      1.55       0.0
CB104                STORAGE             69.05      1.55       0.0
CBMH07               STORAGE             68.55      2.05       0.0
CBMH104              STORAGE             68.52      2.08       0.0
MH03                 STORAGE             68.34      2.26       0.0
MH05                 STORAGE             68.34      2.41       0.0
MH06                 STORAGE             68.48      2.15       0.0
RD1                  STORAGE             73.35      0.15       0.0
RD2                  STORAGE             73.35      0.15       0.0
RD3                  STORAGE             73.35      0.15       0.0
RD4                  STORAGE             73.35      0.15       0.0
RD5                  STORAGE             73.35      0.15       0.0
RD6                  STORAGE             73.35      0.15       0.0
RD7                  STORAGE             73.35      0.15       0.0
```

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
  Ending Date ............. 03/19/2020 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 ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  *********************
  Control Actions Taken
  *********************


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.020        42.335
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.002         4.283
  Surface Runoff ...........         0.016        34.522
  Final Storage ............         0.001         1.108
  Continuity Error (%) .....         5.720


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.015         0.149
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.015         0.149
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
```

```
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....        -0.074


  ***************************
  Time-Step Critical Elements
  ***************************
  Link 06b-104 (64.59%)


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


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.48 sec
  Average Time Step           :     1.29 sec
  Maximum Time Step           :     2.00 sec
  Percent in Steady State     :    -0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      2.000 -  1.516 sec      :    36.33 %
      1.516 -  1.149 sec      :     5.08 %
      1.149 -  0.871 sec      :    33.66 %
      0.871 -  0.660 sec      :    14.61 %
      0.660 -  0.500 sec      :    10.32 %


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

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

| Subcatchment | Precip mm | Runon mm | Evap mm | Infil mm | Runoff mm | Runoff mm | Runoff mm | Runoff 10^6 ltr | Runoff LPS | Coeff |
|---|---|---|---|---|---|---|---|---|---|---|
| A-1.1 | 42.34 | 0.00 | 0.00 | 3.80 | 37.12 | 0.05 | 37.18 | 0.00 | 1.12 | 0.878 |
| A-1.2 | 42.34 | 0.00 | 0.00 | 1.69 | 39.17 | 0.04 | 39.21 | 0.01 | 1.96 | 0.926 |
| A-1.3 | 42.34 | 0.00 | 0.00 | 2.53 | 38.35 | 0.05 | 38.40 | 0.01 | 1.54 | 0.907 |
| A-2.1 | 42.34 | 0.00 | 0.00 | 2.96 | 37.99 | 0.03 | 38.02 | 0.02 | 3.78 | 0.898 |
| A-2.2 | 42.33 | 0.00 | 0.00 | 0.42 | 40.45 | 0.01 | 40.46 | 0.02 | 5.30 | 0.956 |
| A-2.3 | 42.33 | 0.00 | 0.00 | 13.12 | 28.20 | 0.02 | 28.22 | 0.03 | 6.94 | 0.667 |
| R-1.1 | 42.34 | 0.00 | 0.00 | 0.00 | 42.40 | 0.00 | 42.40 | 0.00 | 1.01 | 1.001 |
| R-1.2 | 42.34 | 22874.35 | 0.00 | 0.00 | 22916.34 | 0.00 | 22916.34 | 1.37 | 21.72 | 1.000 |
| R-1.3 | 42.34 | 5473.89 | 0.00 | 0.00 | 5515.87 | 0.00 | 5515.87 | 1.38 | 21.72 | 1.000 |
| R-1.4 | 42.34 | 0.00 | 0.00 | 0.00 | 42.42 | 0.00 | 42.42 | 0.01 | 2.52 | 1.002 |
| R-1.5 | 42.34 | 0.00 | 0.00 | 0.00 | 42.43 | 0.00 | 42.43 | 0.01 | 3.42 | 1.002 |
| R-1.6 | 42.34 | 0.00 | 0.00 | 0.00 | 42.43 | 0.00 | 42.43 | 0.01 | 3.42 | 1.002 |
| R-1.7 | 42.33 | 0.00 | 0.00 | 0.00 | 42.43 | 0.00 | 42.43 | 0.01 | 3.52 | 1.002 |
| S-1.4 | 42.34 | 0.00 | 0.00 | 7.19 | 33.90 | 0.03 | 33.93 | 0.02 | 5.58 | 0.801 |

**********
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 |
|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.08 | 0.40 | 68.84 | 0 06:38 | 0.40 |
| 03b | JUNCTION | 0.07 | 0.37 | 68.84 | 0 06:36 | 0.37 |
| 03c | JUNCTION | 0.07 | 0.35 | 68.84 | 0 06:37 | 0.35 |
| 06a | JUNCTION | 0.08 | 0.44 | 68.94 | 0 06:34 | 0.44 |
| 06b | JUNCTION | 0.07 | 0.42 | 68.94 | 0 06:35 | 0.42 |
| BLDG | JUNCTION | 0.02 | 0.03 | 68.86 | 0 06:07 | 0.03 |
| MH01 | JUNCTION | 0.03 | 0.06 | 68.24 | 0 06:35 | 0.06 |
| OGS | JUNCTION | 0.02 | 0.06 | 68.28 | 0 06:34 | 0.06 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 00:00 | 0.00 |
| CB100 | STORAGE | 0.01 | 0.03 | 69.13 | 0 06:30 | 0.03 |
| CB101 | STORAGE | 0.01 | 0.04 | 69.04 | 0 06:30 | 0.04 |
| Cb102 | STORAGE | 0.01 | 0.03 | 69.03 | 0 06:30 | 0.03 |
| CB103 | STORAGE | 0.01 | 0.04 | 69.09 | 0 06:30 | 0.04 |
| CB104 | STORAGE | 0.01 | 0.05 | 69.10 | 0 06:30 | 0.05 |
| CBMH07 | STORAGE | 0.06 | 0.39 | 68.94 | 0 06:35 | 0.39 |
| CBMH104 | STORAGE | 0.06 | 0.32 | 68.84 | 0 06:39 | 0.32 |
| MH03 | STORAGE | 0.12 | 0.51 | 68.84 | 0 06:38 | 0.51 |
| MH05 | STORAGE | 0.12 | 0.60 | 68.94 | 0 06:34 | 0.60 |
| MH06 | STORAGE | 0.08 | 0.46 | 68.94 | 0 06:34 | 0.46 |
| RD1 | STORAGE | 0.01 | 0.08 | 73.43 | 0 06:34 | 0.08 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD4 | STORAGE | 0.04 | 0.10 | 73.45 | 0 07:05 | 0.10 |
| RD5 | STORAGE | 0.04 | 0.09 | 73.44 | 0 07:33 | 0.09 |
| RD6 | STORAGE | 0.04 | 0.09 | 73.44 | 0 07:33 | 0.09 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |

**********
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 |
|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 5.67 | 0 | 06:05 | 0 | 0.0408 | 0.047 | |
| 03b | JUNCTION | 0.00 | 7.90 | 0 | 06:05 | 0 | 0.0364 | 0.014 | |
| 03c | JUNCTION | 0.00 | 6.90 | 0 | 06:06 | 0 | 0.0286 | 0.005 | |
| 06a | JUNCTION | 0.00 | 14.38 | 0 | 06:06 | 0 | 0.0646 | 0.017 | |
| 06b | JUNCTION | 0.00 | 11.67 | 0 | 06:07 | 0 | 0.0494 | 0.012 | |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 | 06:04 | 0 | 0.0437 | 0.003 | |
| MH01 | JUNCTION | 0.00 | 8.71 | 0 | 06:34 | 0 | 0.149 | 0.000 | |
| OGS | JUNCTION | 0.00 | 7.45 | 0 | 06:34 | 0 | 0.106 | -0.000 | |
| EXSTM | OUTFALL | 0.00 | 8.71 | 0 | 06:35 | 0 | 0.149 | 0.000 | |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| CB100 | STORAGE | 1.12 | 1.12 | 0 | 06:30 | 0.00446 | 0.00446 | 0.018 | |
| CB101 | STORAGE | 1.96 | 1.96 | 0 | 06:30 | 0.00784 | 0.00784 | 0.010 | |
| Cb102 | STORAGE | 1.54 | 1.54 | 0 | 06:30 | 0.00614 | 0.00614 | 0.012 | |
| CB103 | STORAGE | 3.78 | 3.78 | 0 | 06:30 | 0.0152 | 0.0152 | 0.004 | |
| CB104 | STORAGE | 5.30 | 5.30 | 0 | 06:30 | 0.0214 | 0.0214 | 0.003 | |
| CBMH07 | STORAGE | 6.94 | 6.94 | 0 | 06:30 | 0.0279 | 0.0279 | -0.057 | |
| CBMH104 | STORAGE | 5.58 | 5.58 | 0 | 06:30 | 0.0224 | 0.0224 | -0.072 | |
| MH03 | STORAGE | 0.00 | 3.10 | 0 | 06:29 | 0 | 0.0408 | -0.021 | |
| MH05 | STORAGE | 0.00 | 9.18 | 0 | 06:05 | 0 | 0.0646 | -0.200 | |
| MH06 | STORAGE | 0.00 | 13.16 | 0 | 06:06 | 0 | 0.0646 | 0.021 | |
| RD1 | STORAGE | 1.01 | 1.01 | 0 | 06:30 | 0.00424 | 0.00424 | -0.001 | |
| RD2 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| RD4 | STORAGE | 2.52 | 2.52 | 0 | 06:25 | 0.0106 | 0.0106 | -0.001 | |
| RD5 | STORAGE | 3.42 | 3.42 | 0 | 06:15 | 0.0144 | 0.0144 | -0.000 | |
| RD6 | STORAGE | 3.42 | 3.42 | 0 | 06:15 | 0.0144 | 0.0144 | -0.000 | |
| RD7 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |

**********
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 |
|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 06:30 | 1.12 |
| CB101 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 06:30 | 1.96 |
| Cb102 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 06:30 | 1.54 |
| CB103 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 06:30 | 3.78 |
| CB104 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 06:30 | 5.30 |
| CBMH07 | 0.000 | 0 | 0 | 0 | 0.000 | 3 | 0 06:35 | 6.43 |
| CBMH104 | 0.000 | 0 | 0 | 0 | 0.000 | 2 | 0 06:39 | 5.39 |
| MH03 | 0.000 | 5 | 0 | 0 | 0.001 | 22 | 0 06:38 | 2.61 |
| MH05 | 0.000 | 5 | 0 | 0 | 0.001 | 25 | 0 06:34 | 4.84 |
| MH06 | 0.000 | 4 | 0 | 0 | 0.001 | 21 | 0 06:34 | 9.18 |
| RD1 | 0.000 | 3 | 0 | 0 | 0.001 | 21 | 0 06:34 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD4 | 0.001 | 9 | 0 | 0 | 0.005 | 32 | 0 07:05 | 0.32 |
| RD5 | 0.003 | 12 | 0 | 0 | 0.007 | 33 | 0 07:33 | 0.32 |
| RD6 | 0.003 | 12 | 0 | 0 | 0.007 | 32 | 0 07:33 | 0.32 |
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| EXSTM | 78.74 | 3.45 | 8.71 | 0.149 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 26.25 | 3.45 | 8.71 | 0.149 |

**********
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-BLDG | CONDUIT | 1.26 | 0 | 06:07 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 7.45 | 0 | 06:34 | 0.83 | 0.12 | 0.24 |
| 03-03a | CONDUIT | 3.10 | 0 | 06:29 | 0.25 | 0.02 | 0.67 |
| 03a-03b | CONDUIT | 4.60 | 0 | 06:05 | 0.24 | 0.02 | 0.64 |
| 03a-100 | CONDUIT | 1.12 | 0 | 06:30 | 0.48 | 0.08 | 0.19 |
| 03b-03c | CONDUIT | 5.96 | 0 | 06:05 | 0.29 | 0.03 | 0.60 |
| 03b-101 | CONDUIT | 1.96 | 0 | 06:30 | 0.58 | 0.13 | 0.25 |
| 03c-04 | CONDUIT | 5.39 | 0 | 06:06 | 0.29 | 0.03 | 0.56 |
| 03c-102 | CONDUIT | 1.54 | 0 | 06:30 | 0.59 | 0.09 | 0.20 |
| 05-06 | CONDUIT | 9.18 | 0 | 06:05 | 0.35 | 0.05 | 0.79 |
| 06-06a | CONDUIT | 13.16 | 0 | 06:06 | 0.43 | 0.06 | 0.74 |
| 06a-06b | CONDUIT | 10.67 | 0 | 06:06 | 0.31 | 0.05 | 0.71 |
| 06a-103 | CONDUIT | 3.78 | 0 | 06:30 | 0.74 | 0.11 | 0.22 |
| 06b-104 | CONDUIT | 5.30 | 0 | 06:30 | 0.84 | 0.14 | 0.26 |
| 06c-07 | CONDUIT | 6.43 | 0 | 06:07 | 0.24 | 0.03 | 0.67 |
| C1 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 8.71 | 0 | 06:35 | 0.85 | 0.09 | 0.20 |
| OR1 | ORIFICE | 4.84 | 0 | 06:34 | | | 1.00 |
| OR2 | ORIFICE | 2.61 | 0 | 06:38 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 | 06:01 | | | |
| OL3 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 | 06:04 | | | |
| OL5 | DUMMY | 0.32 | 0 | 05:53 | | | |
| OL6 | DUMMY | 0.32 | 0 | 05:54 | | | |
| OL7 | DUMMY | 0.00 | 0 | 00:00 | | | |

**********
Flow Classification Summary
**********

| Conduit | Adjusted /Actual Length | Dry | Up Dry | Down Dry | Sub Crit | Sup Crit | Up Crit | Down Crit | Norm Ltd | Inlet Ctrl |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ---------- Fraction of Time in Flow Class ---------- | | | | | | | | |
| 01-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.05 | 0.00 | 0.45 | 0.49 | 0.00 | 0.00 | 0.69 | 0.00 |
| 03-03a | 1.00 | 0.06 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.64 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.06 | 0.10 | 0.00 | 0.84 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 |
| 03a-100 | 1.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.06 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 | 0.00 | 0.37 | 0.00 |
| 03b-101 | 1.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 |
| 03c-04 | 1.00 | 0.06 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 |
| 03c-102 | 1.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 |
| 05-06 | 1.00 | 0.06 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 |
| 06-06a | 1.00 | 0.06 | 0.00 | 0.00 | 0.65 | 0.00 | 0.00 | 0.30 | 0.01 | 0.00 |
| 06a-06b | 1.00 | 0.06 | 0.08 | 0.00 | 0.86 | 0.00 | 0.00 | 0.00 | 0.78 | 0.00 |
| 06a-103 | 1.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.06 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 | 0.00 | 0.44 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EX-01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |

**********
Conduit Surcharge Summary
**********

No conduits were surcharged.

Analysis begun on: Thu Jul 22 13:00:53 2021

```
Analysis ended on:  Thu Jul 22 13:00:56 2021
Total elapsed time: 00:00:03
```

# PCSWMM Model Output - Post-Development (5yr, 12-hour SCS Storm)

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

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 28
Number of links ........... 27
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
-----------------------------------------------------------------------
Raingage1            S12hr-5yr                    INTENSITY   30 min.

********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-1.1                       0.01     21.82     91.00    2.0000 Raingage1            CB100
A-1.2                       0.02     36.36     96.00    2.0000 Raingage1            CB101
A-1.3                       0.02     29.09     94.00    2.0000 Raingage1            Cb102
A-2.1                       0.04     33.33     93.00    2.0000 Raingage1            CB103
A-2.2                       0.05     44.17     99.00    2.0000 Raingage1            CB104
A-2.3                       0.10     49.50     69.00    2.0000 Raingage1            CBMH07
R-1.1                       0.01     14.29    100.00    1.5000 Raingage1            RD1
R-1.2                       0.01     16.22    100.00    1.5000 Raingage1            R-1.3
R-1.3                       0.03     26.32    100.00    1.5000 Raingage1            R-1.2
R-1.4                       0.03     26.32    100.00    1.5000 Raingage1            RD4
R-1.5                       0.03     31.78    100.00    1.5000 Raingage1            RD5
R-1.6                       0.03     31.78    100.00    1.5000 Raingage1            RD6
R-1.7                       0.04     32.71    100.00    1.5000 Raingage1            R-1.7
S-1.4                       0.07     55.00     83.00    2.0000 Raingage1            CBMH104

************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
03a                  JUNCTION             68.45      2.15       0.0
03b                  JUNCTION             68.47      2.13       0.0
03c                  JUNCTION             68.50      2.10       0.0
06a                  JUNCTION             68.50      2.10       0.0
06b                  JUNCTION             68.52      2.08       0.0
BLDG                 JUNCTION             68.83      0.25       0.0
MH01                 JUNCTION             68.18      2.07       0.0
OGS                  JUNCTION             68.22      2.23       0.0
EXSTM                OUTFALL              66.24      2.10       0.0
OF1                  OUTFALL              70.14      0.15       0.0
OF2                  OUTFALL              70.40      0.15       0.0
CB100                STORAGE              69.10      1.50       0.0
CB101                STORAGE              69.00      1.60       0.0
Cb102                STORAGE              69.00      1.60       0.0
CB103                STORAGE              69.05      1.55       0.0
CB104                STORAGE              69.05      1.55       0.0
CBMH07               STORAGE              68.55      2.05       0.0
CBMH104              STORAGE              68.52      2.08       0.0
MH03                 STORAGE              68.34      2.26       0.0
MH05                 STORAGE              68.34      2.41       0.0
MH06                 STORAGE              68.48      2.15       0.0
RD1                  STORAGE              73.35      0.15       0.0
RD2                  STORAGE              73.35      0.15       0.0
RD3                  STORAGE              73.35      0.15       0.0
RD4                  STORAGE              73.35      0.15       0.0
RD5                  STORAGE              73.35      0.15       0.0
RD6                  STORAGE              73.35      0.15       0.0
RD7                  STORAGE              73.35      0.15       0.0
```

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
  Ending Date ............. 03/19/2020 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 ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  *********************
  Control Actions Taken
  *********************


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.027        56.185
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.002         4.966
  Surface Runoff ...........         0.022        46.810
  Final Storage ............         0.001         1.155
  Continuity Error (%) .....         5.792


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.020         0.203
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.020         0.203
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
```

```
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....        -0.023


  **************************
  Time-Step Critical Elements
  **************************
  Link 06b-104 (66.71%)


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


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.28 sec
  Average Time Step           :     1.22 sec
  Maximum Time Step           :     2.00 sec
  Percent in Steady State     :    -0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      2.000 -  1.516 sec      :    33.42 %
      1.516 -  1.149 sec      :     0.76 %
      1.149 -  0.871 sec      :    30.48 %
      0.871 -  0.660 sec      :    24.26 %
      0.660 -  0.500 sec      :    11.08 %


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

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

| Subcatchment | Precip mm | Runon mm | Evap mm | Infil mm | Runoff mm | Runoff mm | Runoff mm | Runoff 10^6 ltr | Runoff LPS | Coeff |
|---|---|---|---|---|---|---|---|---|---|---|
| A-1.1 | 56.19 | 0.00 | 0.00 | 4.36 | 49.73 | 0.77 | 50.49 | 0.01 | 1.55 | 0.899 |
| A-1.2 | 56.19 | 0.00 | 0.00 | 1.93 | 52.47 | 0.36 | 52.83 | 0.01 | 2.63 | 0.940 |
| A-1.3 | 56.19 | 0.00 | 0.00 | 2.90 | 51.37 | 0.53 | 51.90 | 0.01 | 2.09 | 0.924 |
| A-2.1 | 56.19 | 0.00 | 0.00 | 3.40 | 50.88 | 0.57 | 51.45 | 0.02 | 5.21 | 0.916 |
| A-2.2 | 56.18 | 0.00 | 0.00 | 0.48 | 54.17 | 0.09 | 54.26 | 0.03 | 7.05 | 0.966 |
| A-2.3 | 56.19 | 0.00 | 0.00 | 15.28 | 37.77 | 2.20 | 39.96 | 0.04 | 11.57 | 0.711 |
| R-1.1 | 56.19 | 0.00 | 0.00 | 0.00 | 56.25 | 0.00 | 56.25 | 0.01 | 1.34 | 1.001 |
| R-1.2 | 56.19 | 30400.89 | 0.00 | 0.00 | 30455.52 | 0.00 | 30455.52 | 1.83 | 28.86 | 1.000 |
| R-1.3 | 56.19 | 7274.75 | 0.00 | 0.00 | 7330.79 | 0.00 | 7330.79 | 1.83 | 28.85 | 1.000 |
| R-1.4 | 56.19 | 0.00 | 0.00 | 0.00 | 56.28 | 0.00 | 56.28 | 0.01 | 3.34 | 1.002 |
| R-1.5 | 56.18 | 0.00 | 0.00 | 0.00 | 56.30 | 0.00 | 56.30 | 0.02 | 4.54 | 1.002 |
| R-1.6 | 56.18 | 0.00 | 0.00 | 0.00 | 56.30 | 0.00 | 56.30 | 0.02 | 4.54 | 1.002 |
| R-1.7 | 56.18 | 0.00 | 0.00 | 0.00 | 56.30 | 0.00 | 56.30 | 0.02 | 4.67 | 1.002 |
| S-1.4 | 56.19 | 0.00 | 0.00 | 8.29 | 45.40 | 1.32 | 46.72 | 0.03 | 8.29 | 0.831 |

**********
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 |
|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.13 | 0.59 | 69.03 | 0 07:00 | 0.59 |
| 03b | JUNCTION | 0.12 | 0.56 | 69.03 | 0 07:01 | 0.56 |
| 03c | JUNCTION | 0.11 | 0.54 | 69.03 | 0 07:00 | 0.54 |
| 06a | JUNCTION | 0.13 | 0.76 | 69.25 | 0 06:38 | 0.76 |
| 06b | JUNCTION | 0.12 | 0.73 | 69.25 | 0 06:38 | 0.73 |
| BLDG | JUNCTION | 0.02 | 0.03 | 68.86 | 0 06:06 | 0.03 |
| MH01 | JUNCTION | 0.03 | 0.07 | 68.25 | 0 06:40 | 0.07 |
| OGS | JUNCTION | 0.03 | 0.06 | 68.28 | 0 06:40 | 0.06 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 00:00 | 0.00 |
| CB100 | STORAGE | 0.01 | 0.03 | 69.13 | 0 06:30 | 0.03 |
| CB101 | STORAGE | 0.01 | 0.04 | 69.04 | 0 06:30 | 0.04 |
| Cb102 | STORAGE | 0.01 | 0.04 | 69.04 | 0 07:01 | 0.04 |
| CB103 | STORAGE | 0.02 | 0.20 | 69.25 | 0 06:38 | 0.20 |
| CB104 | STORAGE | 0.02 | 0.20 | 69.25 | 0 06:38 | 0.20 |
| CBMH07 | STORAGE | 0.11 | 0.70 | 69.25 | 0 06:38 | 0.70 |
| CBMH104 | STORAGE | 0.10 | 0.51 | 69.03 | 0 07:00 | 0.51 |
| MH03 | STORAGE | 0.18 | 0.70 | 69.03 | 0 07:00 | 0.70 |
| MH05 | STORAGE | 0.19 | 0.91 | 69.25 | 0 06:38 | 0.91 |
| MH06 | STORAGE | 0.14 | 0.77 | 69.25 | 0 06:38 | 0.77 |
| RD1 | STORAGE | 0.02 | 0.10 | 73.45 | 0 07:00 | 0.10 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD4 | STORAGE | 0.05 | 0.11 | 73.46 | 0 07:32 | 0.11 |
| RD5 | STORAGE | 0.06 | 0.11 | 73.46 | 0 08:03 | 0.11 |
| RD6 | STORAGE | 0.06 | 0.11 | 73.46 | 0 08:03 | 0.11 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |

**********
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 |
|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 5.95 | 0 | 06:28 | 0 | 0.0558 | 0.029 | |
| 03b | JUNCTION | 0.00 | 8.57 | 0 | 06:05 | 0 | 0.0497 | 0.008 | |
| 03c | JUNCTION | 0.00 | 8.83 | 0 | 06:05 | 0 | 0.0393 | 0.012 | |
| 06a | JUNCTION | 0.00 | 17.91 | 0 | 06:05 | 0 | 0.0889 | 0.012 | |
| 06b | JUNCTION | 0.00 | 15.43 | 0 | 06:29 | 0 | 0.0683 | 0.007 | |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 | 06:03 | 0 | 0.058 | 0.002 | |
| MH01 | JUNCTION | 0.00 | 10.34 | 0 | 06:40 | 0 | 0.203 | 0.000 | |
| OGS | JUNCTION | 0.00 | 9.08 | 0 | 06:40 | 0 | 0.145 | -0.000 | |
| EXSTM | OUTFALL | 0.00 | 10.34 | 0 | 06:40 | 0 | 0.203 | 0.000 | |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| CB100 | STORAGE | 1.55 | 1.55 | 0 | 06:30 | 0.00606 | 0.00606 | 0.013 | |
| CB101 | STORAGE | 2.63 | 2.63 | 0 | 06:30 | 0.0106 | 0.0106 | 0.008 | |
| Cb102 | STORAGE | 2.09 | 2.09 | 0 | 06:30 | 0.0083 | 0.00841 | 0.019 | |
| CB103 | STORAGE | 5.21 | 5.21 | 0 | 06:30 | 0.0206 | 0.0206 | 0.001 | |
| CB104 | STORAGE | 7.05 | 7.05 | 0 | 06:30 | 0.0288 | 0.0288 | 0.001 | |
| CBMH07 | STORAGE | 11.57 | 11.57 | 0 | 06:30 | 0.0396 | 0.0396 | -0.046 | |
| CBMH104 | STORAGE | 8.29 | 8.29 | 0 | 06:30 | 0.0308 | 0.0308 | -0.056 | |
| MH03 | STORAGE | 0.00 | 3.80 | 0 | 06:30 | 0 | 0.0558 | -0.015 | |
| MH05 | STORAGE | 0.00 | 9.50 | 0 | 06:29 | 0 | 0.0889 | -0.099 | |
| MH06 | STORAGE | 0.00 | 15.64 | 0 | 06:05 | 0 | 0.0889 | 0.047 | |
| RD1 | STORAGE | 1.34 | 1.34 | 0 | 06:20 | 0.00562 | 0.00562 | -0.001 | |
| RD2 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |
| RD4 | STORAGE | 3.34 | 3.34 | 0 | 06:30 | 0.0141 | 0.0141 | -0.000 | |
| RD5 | STORAGE | 4.54 | 4.54 | 0 | 06:30 | 0.0191 | 0.0191 | 0.000 | |
| RD6 | STORAGE | 4.54 | 4.54 | 0 | 06:30 | 0.0191 | 0.0191 | 0.000 | |
| RD7 | STORAGE | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0.000 | ltr |

**********
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 |
|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 06a | JUNCTION | 0.28 | 0.013 | 1.347 |
| 06b | JUNCTION | 0.28 | 0.013 | 1.347 |

**********
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 |
|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 06:30 | 1.55 |
| CB101 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 06:30 | 2.63 |
| Cb102 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 07:01 | 2.09 |
| CB103 | 0.000 | 0 | 0 | 0 | 0.000 | 1 | 0 06:38 | 5.21 |
| CB104 | 0.000 | 0 | 0 | 0 | 0.000 | 1 | 0 06:38 | 7.05 |
| CBMH07 | 0.000 | 1 | 0 | 0 | 0.001 | 5 | 0 06:38 | 8.96 |
| CBMH104 | 0.000 | 0 | 0 | 0 | 0.001 | 2 | 0 07:00 | 6.83 |
| MH03 | 0.000 | 8 | 0 | 0 | 0.001 | 31 | 0 07:00 | 3.08 |
| MH05 | 0.000 | 8 | 0 | 0 | 0.001 | 38 | 0 06:38 | 6.04 |
| MH06 | 0.000 | 6 | 0 | 0 | 0.001 | 36 | 0 06:38 | 9.50 |
| RD1 | 0.000 | 5 | 0 | 0 | 0.002 | 33 | 0 07:00 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD4 | 0.002 | 17 | 0 | 0 | 0.007 | 47 | 0 07:32 | 0.32 |
| RD5 | 0.005 | 21 | 0 | 0 | 0.010 | 47 | 0 08:03 | 0.32 |
| RD6 | 0.005 | 20 | 0 | 0 | 0.010 | 46 | 0 08:03 | 0.32 |
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |

**********
Outfall Loading Summary

**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|
| EXSTM | 88.81 | 3.99 | 10.34 | 0.203 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 29.60 | 3.99 | 10.34 | 0.203 |

**********
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-BLDG | CONDUIT | 1.26 | 0 | 06:06 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 9.08 | 0 | 06:40 | 0.88 | 0.15 | 0.26 |
| 03-03a | CONDUIT | 3.80 | 0 | 06:30 | 0.26 | 0.02 | 0.98 |
| 03a-03b | CONDUIT | 4.44 | 0 | 06:05 | 0.19 | 0.02 | 0.96 |
| 03a-100 | CONDUIT | 1.55 | 0 | 06:30 | 0.52 | 0.11 | 0.22 |
| 03b-03c | CONDUIT | 6.02 | 0 | 06:05 | 0.24 | 0.03 | 0.92 |
| 03b-101 | CONDUIT | 2.63 | 0 | 06:30 | 0.63 | 0.18 | 0.29 |
| 03c-04 | CONDUIT | 6.83 | 0 | 06:05 | 0.30 | 0.03 | 0.88 |
| 03c-102 | CONDUIT | 2.09 | 0 | 06:30 | 0.65 | 0.13 | 0.30 |
| 05-06 | CONDUIT | 9.50 | 0 | 06:29 | 0.28 | 0.05 | 1.00 |
| 06-06a | CONDUIT | 15.64 | 0 | 06:05 | 0.42 | 0.08 | 1.00 |
| 06a-06b | CONDUIT | 12.97 | 0 | 06:05 | 0.32 | 0.07 | 1.00 |
| 06a-103 | CONDUIT | 5.21 | 0 | 06:28 | 0.81 | 0.15 | 1.00 |
| 06b-104 | CONDUIT | 7.05 | 0 | 06:28 | 0.91 | 0.19 | 1.00 |
| 06c-07 | CONDUIT | 8.96 | 0 | 06:30 | 0.25 | 0.05 | 1.00 |
| C1 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 10.34 | 0 | 06:40 | 0.89 | 0.11 | 0.22 |
| OR1 | ORIFICE | 6.04 | 0 | 06:38 | | | 1.00 |
| OR2 | ORIFICE | 3.08 | 0 | 07:00 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 | 05:41 | | | |
| OL3 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 | 06:03 | | | |
| OL5 | DUMMY | 0.32 | 0 | 05:33 | | | |
| OL6 | DUMMY | 0.32 | 0 | 05:34 | | | |
| OL7 | DUMMY | 0.00 | 0 | 00:00 | | | |

**********
Flow Classification Summary
**********

| 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-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.04 | 0.00 | 0.37 | 0.58 | 0.00 | 0.00 | 0.61 | 0.00 |
| 03-03a | 1.00 | 0.04 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 | 0.58 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.04 | 0.09 | 0.00 | 0.86 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 |
| 03a-100 | 1.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.96 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.04 | 0.00 | 0.00 | 0.96 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00 |
| 03b-101 | 1.00 | 0.04 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.90 | 0.00 | 0.00 |
| 03c-04 | 1.00 | 0.04 | 0.00 | 0.00 | 0.95 | 0.00 | 0.00 | 0.00 | 0.72 | 0.00 |
| 03c-102 | 1.00 | 0.04 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.89 | 0.01 | 0.00 |
| 05-06 | 1.00 | 0.05 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.63 | 0.01 | 0.00 |
| 06-06a | 1.00 | 0.04 | 0.00 | 0.00 | 0.68 | 0.00 | 0.00 | 0.28 | 0.01 | 0.00 |
| 06a-06b | 1.00 | 0.04 | 0.12 | 0.00 | 0.84 | 0.00 | 0.00 | 0.00 | 0.75 | 0.00 |
| 06a-103 | 1.00 | 0.04 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 | 0.87 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.04 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 | 0.87 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.04 | 0.00 | 0.00 | 0.96 | 0.00 | 0.00 | 0.00 | 0.42 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EX-01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 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 |
|---|---|---|---|---|---|
| 05-06 | 0.93 | 0.93 | 1.08 | 0.01 | 0.01 |
| 06-06a | 0.88 | 0.88 | 0.90 | 0.01 | 0.01 |
| 06a-06b | 0.81 | 0.81 | 0.88 | 0.01 | 0.01 |
| 06a-103 | 0.12 | 0.12 | 0.28 | 0.01 | 0.01 |
| 06b-104 | 0.12 | 0.12 | 0.28 | 0.01 | 0.01 |
| 06c-07 | 0.72 | 0.72 | 0.81 | 0.01 | 0.01 |

Analysis begun on: Thu Jul 22 13:02:27 2021
Analysis ended on: Thu Jul 22 13:02:30 2021
Total elapsed time: 00:00:03

# PCSWMM Model Output - Post-Development (100yr, 12-hour SCS Storm)

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

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 28
Number of links ........... 27
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
-----------------------------------------------------------------------
Raingage1            S12hr-100yr                  INTENSITY   30 min.

********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-1.1                       0.01     21.82     91.00    2.0000 Raingage1            CB100
A-1.2                       0.02     36.36     96.00    2.0000 Raingage1            CB101
A-1.3                       0.02     29.09     94.00    2.0000 Raingage1            Cb102
A-2.1                       0.04     33.33     93.00    2.0000 Raingage1            CB103
A-2.2                       0.05     44.17     99.00    2.0000 Raingage1            CB104
A-2.3                       0.10     49.50     69.00    2.0000 Raingage1            CBMH07
R-1.1                       0.01     14.29    100.00    1.5000 Raingage1            RD1
R-1.2                       0.01     16.22    100.00    1.5000 Raingage1            R-1.3
R-1.3                       0.03     26.32    100.00    1.5000 Raingage1            R-1.2
R-1.4                       0.03     26.32    100.00    1.5000 Raingage1            RD4
R-1.5                       0.03     31.78    100.00    1.5000 Raingage1            RD5
R-1.6                       0.03     31.78    100.00    1.5000 Raingage1            RD6
R-1.7                       0.04     32.71    100.00    1.5000 Raingage1            R-1.7
S-1.4                       0.07     55.00     83.00    2.0000 Raingage1            CBMH104

************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
03a                  JUNCTION             68.45      2.15       0.0
03b                  JUNCTION             68.47      2.13       0.0
03c                  JUNCTION             68.50      2.10       0.0
06a                  JUNCTION             68.50      2.10       0.0
06b                  JUNCTION             68.52      2.08       0.0
BLDG                 JUNCTION             68.83      0.25       0.0
MH01                 JUNCTION             68.18      2.07       0.0
OGS                  JUNCTION             68.22      2.23       0.0
EXSTM                OUTFALL              66.24      2.10       0.0
OF1                  OUTFALL              70.14      0.15       0.0
OF2                  OUTFALL              70.40      0.15       0.0
CB100                STORAGE              69.10      1.50       0.0
CB101                STORAGE              69.00      1.60       0.0
Cb102                STORAGE              69.00      1.60       0.0
CB103                STORAGE              69.05      1.55       0.0
CB104                STORAGE              69.05      1.55       0.0
CBMH07               STORAGE              68.55      2.05       0.0
CBMH104              STORAGE              68.52      2.08       0.0
MH03                 STORAGE              68.34      2.26       0.0
MH05                 STORAGE              68.34      2.41       0.0
MH06                 STORAGE              68.48      2.15       0.0
RD1                  STORAGE              73.35      0.15       0.0
RD2                  STORAGE              73.35      0.15       0.0
RD3                  STORAGE              73.35      0.15       0.0
RD4                  STORAGE              73.35      0.15       0.0
RD5                  STORAGE              73.35      0.15       0.0
RD6                  STORAGE              73.35      0.15       0.0
RD7                  STORAGE              73.35      0.15       0.0
```

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
  Ending Date ............. 03/19/2020 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 ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  ********************
  Control Actions Taken
  ********************


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.045        93.910
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.003         6.419
  Surface Runoff ...........         0.038        80.654
  Final Storage ............         0.001         1.264
  Continuity Error (%) .....         5.934


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.035         0.350
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.034         0.340
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
```

```
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.001         0.013
  Continuity Error (%) .....        -0.778


  ***************************
  Time-Step Critical Elements
  ***************************
  Link 06b-104 (59.57%)
  Link 01-OGS (7.69%)
  Link 03a-100 (1.05%)


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


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     1.23 sec
  Maximum Time Step           :     2.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.01
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      2.000 -  1.516 sec      :    37.16 %
      1.516 -  1.149 sec      :     3.64 %
      1.149 -  0.871 sec      :    13.46 %
      0.871 -  0.660 sec      :    36.04 %
      0.660 -  0.500 sec      :     9.71 %


  ***************************
  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-1.1 | 93.91 | 0.00 | 0.00 | 5.66 | 84.06 | 2.88 | 86.95 | 0.01 | 2.64 | 0.926 |
| A-1.2 | 93.91 | 0.00 | 0.00 | 2.51 | 88.68 | 1.32 | 90.00 | 0.02 | 4.43 | 0.958 |
| A-1.3 | 93.91 | 0.00 | 0.00 | 3.77 | 86.84 | 1.95 | 88.78 | 0.01 | 3.53 | 0.945 |
| A-2.1 | 93.91 | 0.00 | 0.00 | 4.40 | 85.97 | 2.22 | 88.19 | 0.04 | 8.82 | 0.939 |
| A-2.2 | 93.91 | 0.00 | 0.00 | 0.63 | 91.52 | 0.34 | 91.86 | 0.05 | 11.81 | 0.978 |
| A-2.3 | 93.91 | 0.00 | 0.00 | 19.73 | 63.80 | 9.53 | 73.33 | 0.07 | 20.90 | 0.781 |
| R-1.1 | 93.91 | 0.00 | 0.00 | 0.00 | 93.98 | 0.00 | 93.98 | 0.01 | 2.23 | 1.001 |
| R-1.2 | 93.91 | 50774.05 | 0.00 | 0.00 | 50866.81 | 0.00 | 50866.81 | 3.05 | 48.14 | 1.000 |
| R-1.3 | 93.91 | 12150.28 | 0.00 | 0.00 | 12243.53 | 0.00 | 12243.53 | 3.06 | 48.14 | 1.000 |
| R-1.4 | 93.91 | 0.00 | 0.00 | 0.00 | 94.01 | 0.00 | 94.01 | 0.02 | 5.58 | 1.001 |
| R-1.5 | 93.91 | 0.00 | 0.00 | 0.00 | 94.03 | 0.00 | 94.03 | 0.03 | 7.59 | 1.001 |
| R-1.6 | 93.91 | 0.00 | 0.00 | 0.00 | 94.03 | 0.00 | 94.03 | 0.03 | 7.59 | 1.001 |
| R-1.7 | 93.91 | 0.00 | 0.00 | 0.00 | 94.03 | 0.00 | 94.03 | 0.03 | 7.81 | 1.001 |
| S-1.4 | 93.91 | 0.00 | 0.00 | 10.73 | 76.71 | 5.34 | 82.05 | 0.05 | 14.30 | 0.874 |

**********
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 |
|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.25 | 2.02 | 70.47 | 0 | 07:01 | 2.02 |
| 03b | JUNCTION | 0.24 | 2.00 | 70.47 | 0 | 07:01 | 2.00 |
| 03c | JUNCTION | 0.22 | 1.97 | 70.47 | 0 | 07:00 | 1.97 |
| 06a | JUNCTION | 0.23 | 2.04 | 70.53 | 0 | 07:00 | 2.04 |
| 06b | JUNCTION | 0.22 | 2.01 | 70.53 | 0 | 07:00 | 2.01 |
| BLDG | JUNCTION | 0.02 | 0.03 | 68.86 | 0 | 06:04 | 0.03 |
| MH01 | JUNCTION | 0.04 | 0.08 | 68.26 | 0 | 07:00 | 0.08 |
| OGS | JUNCTION | 0.03 | 0.08 | 68.30 | 0 | 07:00 | 0.08 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 | 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 | 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 | 00:00 | 0.00 |
| CB100 | STORAGE | 0.08 | 1.37 | 70.47 | 0 | 07:01 | 1.37 |
| CB101 | STORAGE | 0.09 | 1.47 | 70.47 | 0 | 07:01 | 1.47 |
| Cb102 | STORAGE | 0.09 | 1.47 | 70.47 | 0 | 07:00 | 1.47 |
| CB103 | STORAGE | 0.10 | 1.48 | 70.53 | 0 | 07:00 | 1.48 |
| CB104 | STORAGE | 0.10 | 1.48 | 70.53 | 0 | 07:00 | 1.48 |
| CBMH07 | STORAGE | 0.21 | 1.98 | 70.53 | 0 | 06:58 | 1.98 |
| CBMH104 | STORAGE | 0.22 | 1.95 | 70.47 | 0 | 07:00 | 1.95 |
| MH03 | STORAGE | 0.31 | 2.13 | 70.47 | 0 | 07:01 | 2.13 |
| MH05 | STORAGE | 0.30 | 2.19 | 70.53 | 0 | 07:00 | 2.19 |
| MH06 | STORAGE | 0.24 | 2.05 | 70.53 | 0 | 07:00 | 2.05 |
| RD1 | STORAGE | 0.04 | 0.13 | 73.48 | 0 | 07:04 | 0.13 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 | 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 | 00:00 | 0.00 |
| RD4 | STORAGE | 0.08 | 0.15 | 73.50 | 0 | 08:33 | 0.15 |
| RD5 | STORAGE | 0.09 | 0.15 | 73.50 | 0 | 09:33 | 0.15 |
| RD6 | STORAGE | 0.09 | 0.14 | 73.49 | 0 | 09:33 | 0.14 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 | 00:00 | 0.00 |

**********
Node Inflow Summary
**********

| | Maximum Lateral | Maximum Total | Time of Max | Lateral Inflow | Total Inflow | Flow Balance |
|---|---|---|---|---|---|---|

| Node | Type | Inflow LPS | Inflow LPS | Occurrence days hr:min | Volume 10^6 ltr | Volume 10^6 ltr | Error Percent |
|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 16.06 | 0 06:20 | 0 | 0.0975 | -0.662 |
| 03b | JUNCTION | 0.00 | 14.18 | 0 06:19 | 0 | 0.0867 | -0.363 |
| 03c | JUNCTION | 0.00 | 14.69 | 0 06:18 | 0 | 0.0684 | -0.443 |
| 06a | JUNCTION | 0.00 | 30.95 | 0 06:17 | 0 | 0.157 | -0.599 |
| 06b | JUNCTION | 0.00 | 26.59 | 0 06:15 | 0 | 0.121 | -0.503 |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 06:01 | 0 | 0.0836 | 0.026 |
| MH01 | JUNCTION | 0.00 | 16.15 | 0 07:00 | 0 | 0.34 | 0.008 |
| OGS | JUNCTION | 0.00 | 14.89 | 0 07:00 | 0 | 0.256 | -0.000 |
| EXSTM | OUTFALL | 0.00 | 16.15 | 0 07:00 | 0 | 0.34 | 0.000 |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| CB100 | STORAGE | 2.64 | 5.13 | 0 06:20 | 0.0104 | 0.0106 | 0.095 |
| CB101 | STORAGE | 4.43 | 5.39 | 0 06:31 | 0.018 | 0.018 | 0.101 |
| Cb102 | STORAGE | 3.53 | 3.77 | 0 06:30 | 0.0142 | 0.0143 | 0.065 |
| CB103 | STORAGE | 8.82 | 8.82 | 0 06:30 | 0.0353 | 0.0353 | 0.050 |
| CB104 | STORAGE | 11.81 | 11.81 | 0 06:30 | 0.0487 | 0.0487 | 0.041 |
| CBMH07 | STORAGE | 20.90 | 20.90 | 0 06:30 | 0.0726 | 0.0726 | -0.001 |
| CBMH104 | STORAGE | 14.30 | 14.30 | 0 06:30 | 0.0542 | 0.0542 | -0.011 |
| MH03 | STORAGE | 0.00 | 10.88 | 0 06:29 | 0 | 0.0981 | 0.009 |
| MH05 | STORAGE | 0.00 | 18.24 | 0 06:27 | 0 | 0.158 | -0.045 |
| MH06 | STORAGE | 0.00 | 30.11 | 0 06:19 | 0 | 0.158 | 0.052 |
| RD1 | STORAGE | 2.23 | 2.23 | 0 06:10 | 0.0094 | 0.0094 | 0.002 |
| RD2 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD4 | STORAGE | 5.58 | 5.58 | 0 06:20 | 0.0235 | 0.0235 | 0.002 |
| RD5 | STORAGE | 7.59 | 7.59 | 0 06:10 | 0.032 | 0.032 | 0.005 |
| RD6 | STORAGE | 7.59 | 7.59 | 0 06:10 | 0.032 | 0.032 | 0.005 |
| RD7 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |

**********
Node Surcharge Summary
**********

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

| | Hours | Max. Height Above Crown | Min. Depth Below Rim |
|---|---|---|---|

| Node | Type | Surcharged | Meters | Meters |
|---|---|---|---|---|
| 03a | JUNCTION | 2.35 | 1.231 | 0.129 |
| 03b | JUNCTION | 2.55 | 1.331 | 0.129 |
| 03c | JUNCTION | 2.58 | 1.341 | 0.129 |
| 06a | JUNCTION | 2.56 | 1.294 | 0.066 |
| 06b | JUNCTION | 2.56 | 1.294 | 0.066 |

**********
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 |
|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 1 | 0 | 0 | 0.000 | 17 | 0 07:01 | 3.34 |
| CB101 | 0.000 | 1 | 0 | 0 | 0.001 | 13 | 0 07:01 | 4.73 |
| Cb102 | 0.000 | 1 | 0 | 0 | 0.001 | 13 | 0 07:00 | 3.53 |
| CB103 | 0.000 | 1 | 0 | 0 | 0.002 | 28 | 0 07:00 | 8.81 |
| CB104 | 0.000 | 1 | 0 | 0 | 0.002 | 26 | 0 07:00 | 11.81 |
| CBMH07 | 0.000 | 2 | 0 | 0 | 0.005 | 32 | 0 06:58 | 15.64 |
| CBMH104 | 0.000 | 1 | 0 | 0 | 0.004 | 16 | 0 07:00 | 12.37 |
| MH03 | 0.000 | 14 | 0 | 0 | 0.002 | 94 | 0 07:01 | 5.44 |
| MH05 | 0.000 | 13 | 0 | 0 | 0.002 | 91 | 0 07:00 | 9.45 |
| MH06 | 0.000 | 11 | 0 | 0 | 0.004 | 96 | 0 07:00 | 18.24 |
| RD1 | 0.001 | 13 | 0 | 0 | 0.004 | 68 | 0 07:04 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 00:00 | 0.00 |
| RD4 | 0.006 | 40 | 0 | 0 | 0.013 | 92 | 0 08:33 | 0.32 |
| RD5 | 0.011 | 48 | 0 | 0 | 0.021 | 93 | 0 09:33 | 0.32 |
| RD6 | 0.011 | 47 | 0 | 0 | 0.021 | 90 | 0 09:33 | 0.32 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|
| EXSTM | 98.55 | 4.80 | 16.15 | 0.340 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 32.85 | 4.80 | 16.15 | 0.340 |

**********
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-BLDG | CONDUIT | 1.26 | 0 | 06:04 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 14.89 | 0 | 07:00 | 1.04 | 0.24 | 0.33 |
| 03-03a | CONDUIT | 10.88 | 0 | 06:29 | 0.26 | 0.06 | 1.00 |
| 03a-03b | CONDUIT | 13.03 | 0 | 06:20 | 0.18 | 0.07 | 1.00 |
| 03a-100 | CONDUIT | 3.34 | 0 | 06:20 | 0.61 | 0.24 | 1.00 |
| 03b-03c | CONDUIT | 11.96 | 0 | 06:19 | 0.18 | 0.06 | 1.00 |
| 03b-101 | CONDUIT | 4.73 | 0 | 06:19 | 0.72 | 0.32 | 1.00 |
| 03c-04 | CONDUIT | 12.37 | 0 | 06:18 | 0.18 | 0.06 | 1.00 |
| 03c-102 | CONDUIT | 3.53 | 0 | 06:17 | 0.75 | 0.21 | 1.00 |
| 05-06 | CONDUIT | 18.24 | 0 | 06:27 | 0.27 | 0.09 | 1.00 |
| 06-06a | CONDUIT | 30.11 | 0 | 06:19 | 0.29 | 0.15 | 1.00 |
| 06a-06b | CONDUIT | 24.00 | 0 | 06:17 | 0.22 | 0.12 | 1.00 |
| 06a-103 | CONDUIT | 8.81 | 0 | 06:15 | 0.94 | 0.25 | 1.00 |
| 06b-104 | CONDUIT | 11.81 | 0 | 06:10 | 1.05 | 0.32 | 1.00 |
| 06c-07 | CONDUIT | 15.64 | 0 | 06:15 | 0.19 | 0.08 | 1.00 |
| C1 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 | 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 16.15 | 0 | 07:00 | 1.01 | 0.17 | 0.28 |
| OR1 | ORIFICE | 9.45 | 0 | 07:00 | | | 1.00 |
| OR2 | ORIFICE | 5.44 | 0 | 07:01 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 | 04:50 | | | |
| OL3 | DUMMY | 0.00 | 0 | 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 | 06:01 | | | |
| OL5 | DUMMY | 0.32 | 0 | 04:07 | | | |
| OL6 | DUMMY | 0.32 | 0 | 04:08 | | | |
| OL7 | DUMMY | 0.00 | 0 | 00:00 | | | |

**********
Flow Classification Summary
**********

| 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-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.06 | 0.00 | 0.26 | 0.67 | 0.00 | 0.00 | 0.53 | 0.00 |
| 03-03a | 1.00 | 0.03 | 0.00 | 0.00 | 0.47 | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.03 | 0.10 | 0.00 | 0.87 | 0.00 | 0.00 | 0.00 | 0.62 | 0.00 |
| 03a-100 | 1.00 | 0.03 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.87 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.03 | 0.00 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.26 | 0.00 |
| 03b-101 | 1.00 | 0.03 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.84 | 0.00 | 0.00 |
| 03c-04 | 1.00 | 0.03 | 0.00 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.64 | 0.00 |
| 03c-102 | 1.00 | 0.03 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 0.83 | 0.01 | 0.00 |
| 05-06 | 1.00 | 0.03 | 0.00 | 0.00 | 0.43 | 0.00 | 0.00 | 0.54 | 0.02 | 0.00 |
| 06-06a | 1.00 | 0.03 | 0.00 | 0.00 | 0.69 | 0.00 | 0.00 | 0.28 | 0.01 | 0.00 |
| 06a-06b | 1.00 | 0.03 | 0.12 | 0.00 | 0.85 | 0.00 | 0.00 | 0.00 | 0.67 | 0.00 |
| 06a-103 | 1.00 | 0.03 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.84 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.03 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.85 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.03 | 0.00 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.36 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EX-01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 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 |
|---|---|---|---|---|---|
| 03-03a | 2.88 | 2.88 | 2.91 | 0.01 | 0.01 |
| 03a-03b | 2.79 | 2.79 | 2.88 | 0.01 | 0.01 |
| 03a-100 | 2.33 | 2.33 | 2.35 | 0.01 | 0.01 |
| 03b-03c | 2.69 | 2.69 | 2.79 | 0.01 | 0.01 |
| 03b-101 | 2.53 | 2.53 | 2.55 | 0.01 | 0.01 |
| 03c-04 | 2.61 | 2.61 | 2.69 | 0.01 | 0.01 |
| 03c-102 | 2.53 | 2.53 | 2.58 | 0.01 | 0.01 |
| 05-06 | 2.93 | 2.93 | 3.05 | 0.01 | 0.01 |
| 06-06a | 2.89 | 2.89 | 2.91 | 0.01 | 0.01 |
| 06a-06b | 2.83 | 2.83 | 2.89 | 0.01 | 0.01 |
| 06a-103 | 2.55 | 2.55 | 2.56 | 0.01 | 0.01 |
| 06b-104 | 2.55 | 2.55 | 2.56 | 0.01 | 0.01 |
| 06c-07 | 2.76 | 2.76 | 2.83 | 0.01 | 0.01 |

Analysis begun on: Thu Jul 22 13:03:23 2021
Analysis ended on: Thu Jul 22 13:03:26 2021
Total elapsed time: 00:00:03

# PCSWMM Model Output - Post-Development (100yr+20%, 12-hour SCS Storm)

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

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 28
Number of links ........... 27
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
-----------------------------------------------------------------------
Raingage1            S12hr-100yr+20%              INTENSITY   30 min.

********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A-1.1                       0.01     21.82     91.00    2.0000 Raingage1            CB100
A-1.2                       0.02     36.36     96.00    2.0000 Raingage1            CB101
A-1.3                       0.02     29.09     94.00    2.0000 Raingage1            Cb102
A-2.1                       0.04     33.33     93.00    2.0000 Raingage1            CB103
A-2.2                       0.05     44.17     99.00    2.0000 Raingage1            CB104
A-2.3                       0.10     49.50     69.00    2.0000 Raingage1            CBMH07
R-1.1                       0.01     14.29    100.00    1.5000 Raingage1            RD1
R-1.2                       0.01     16.22    100.00    1.5000 Raingage1            R-1.3
R-1.3                       0.03     26.32    100.00    1.5000 Raingage1            R-1.2
R-1.4                       0.03     26.32    100.00    1.5000 Raingage1            RD4
R-1.5                       0.03     31.78    100.00    1.5000 Raingage1            RD5
R-1.6                       0.03     31.78    100.00    1.5000 Raingage1            RD6
R-1.7                       0.04     32.71    100.00    1.5000 Raingage1            R-1.7
S-1.4                       0.07     55.00     83.00    2.0000 Raingage1            CBMH104

************
Node Summary
************
                                        Invert      Max.    Ponded    External
Name                 Type                Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
03a                  JUNCTION            68.45      2.15       0.0
03b                  JUNCTION            68.47      2.13       0.0
03c                  JUNCTION            68.50      2.10       0.0
06a                  JUNCTION            68.50      2.10       0.0
06b                  JUNCTION            68.52      2.08       0.0
BLDG                 JUNCTION            68.83      0.25       0.0
MH01                 JUNCTION            68.18      2.07       0.0
OGS                  JUNCTION            68.22      2.23       0.0
EXSTM                OUTFALL             66.24      2.10       0.0
OF1                  OUTFALL             70.14      0.15       0.0
OF2                  OUTFALL             70.40      0.15       0.0
CB100                STORAGE             69.10      1.50       0.0
CB101                STORAGE             69.00      1.60       0.0
Cb102                STORAGE             69.00      1.60       0.0
CB103                STORAGE             69.05      1.55       0.0
CB104                STORAGE             69.05      1.55       0.0
CBMH07               STORAGE             68.55      2.05       0.0
CBMH104              STORAGE             68.52      2.08       0.0
MH03                 STORAGE             68.34      2.26       0.0
MH05                 STORAGE             68.34      2.41       0.0
MH06                 STORAGE             68.48      2.15       0.0
RD1                  STORAGE             73.35      0.15       0.0
RD2                  STORAGE             73.35      0.15       0.0
RD3                  STORAGE             73.35      0.15       0.0
RD4                  STORAGE             73.35      0.15       0.0
RD5                  STORAGE             73.35      0.15       0.0
RD6                  STORAGE             73.35      0.15       0.0
RD7                  STORAGE             73.35      0.15       0.0
```

**********
Link Summary
**********

| Name | From Node | To Node | Type | Length | %Slope | Roughness |
|---|---|---|---|---|---|---|
| 01-BLDG | BLDG | MH01 | CONDUIT | 3.2 | 0.9311 | 0.0130 |
| 01-OGS | OGS | MH01 | CONDUIT | 3.7 | 1.0933 | 0.0130 |
| 03-03a | 03a | MH03 | CONDUIT | 7.8 | 0.1023 | 0.0130 |
| 03a-03b | 03b | 03a | CONDUIT | 22.4 | 0.1024 | 0.0130 |
| 03a-100 | CB100 | 03a | CONDUIT | 1.2 | 0.8533 | 0.0130 |
| 03b-03c | 03c | 03b | CONDUIT | 25.0 | 0.1040 | 0.0130 |
| 03b-101 | CB101 | 03b | CONDUIT | 1.1 | 0.9200 | 0.0130 |
| 03c-04 | CBMH104 | 03c | CONDUIT | 22.6 | 0.1016 | 0.0130 |
| 03c-102 | Cb102 | 03c | CONDUIT | 1.7 | 1.2035 | 0.0130 |
| 05-06 | MH06 | MH05 | CONDUIT | 36.4 | 0.1098 | 0.0130 |
| 06-06a | 06a | MH06 | CONDUIT | 6.4 | 0.1099 | 0.0130 |
| 06a-06b | 06b | 06a | CONDUIT | 22.2 | 0.1036 | 0.0130 |
| 06a-103 | CB103 | 06a | CONDUIT | 0.8 | 1.1906 | 0.0130 |
| 06b-104 | CB104 | 06b | CONDUIT | 0.8 | 1.2805 | 0.0130 |
| 06c-07 | CBMH07 | 06b | CONDUIT | 28.7 | 0.1044 | 0.0130 |
| C1 | CB103 | OF2 | CONDUIT | 10.0 | 2.0004 | 0.0130 |
| C2 | MH03 | OF1 | CONDUIT | 9.0 | 5.0063 | 0.0130 |
| EX-01 | MH01 | EXSTM | CONDUIT | 14.0 | 1.0001 | 0.0130 |
| OR1 | MH05 | OGS | ORIFICE | | | |
| OR2 | MH03 | OGS | ORIFICE | | | |
| OL1 | RD3 | BLDG | OUTLET | | | |
| OL2 | RD4 | BLDG | OUTLET | | | |
| OL3 | RD2 | BLDG | OUTLET | | | |
| OL4 | RD1 | BLDG | OUTLET | | | |
| OL5 | RD5 | BLDG | OUTLET | | | |
| OL6 | RD6 | BLDG | OUTLET | | | |
| OL7 | RD7 | BLDG | OUTLET | | | |

**********
Cross Section Summary
**********

| Conduit | Shape | Full Depth | Full Area | Hyd. Rad. | Max. Width | No. of Barrels | Full Flow |
|---|---|---|---|---|---|---|---|
| 01-BLDG | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 57.39 |
| 01-OGS | CIRCULAR | 0.25 | 0.05 | 0.06 | 0.25 | 1 | 62.18 |
| 03-03a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.36 |
| 03a-03b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 196.54 |
| 03a-100 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.07 |
| 03b-03c | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.04 |
| 03b-101 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 14.61 |
| 03c-04 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 195.72 |
| 03c-102 | CIRCULAR | 0.15 | 0.02 | 0.04 | 0.15 | 1 | 16.71 |
| 05-06 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.44 |
| 06-06a | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 203.57 |
| 06a-06b | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 197.67 |
| 06a-103 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 35.79 |
| 06b-104 | CIRCULAR | 0.20 | 0.03 | 0.05 | 0.20 | 1 | 37.12 |
| 06c-07 | CIRCULAR | 0.60 | 0.28 | 0.15 | 0.60 | 1 | 198.39 |
| C1 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 1687.31 |
| C2 | RECT_OPEN | 0.15 | 0.58 | 0.14 | 3.85 | 1 | 2669.28 |
| EX-01 | CIRCULAR | 0.30 | 0.07 | 0.07 | 0.30 | 1 | 96.71 |

**********
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 ........... 03/18/2020 00:00:00
Ending Date ............. 03/19/2020 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 ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


********************
Control Actions Taken
********************


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.054       112.685
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.003         7.210
Surface Runoff ...........         0.046        97.495
Final Storage ............         0.001         1.315
Continuity Error (%) .....         5.915


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.042         0.424
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.040         0.399
Flooding Loss ............         0.001         0.010
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
```

```
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.002         0.018
Continuity Error (%) .....        -0.825


***************************
Time-Step Critical Elements
***************************
Link 06b-104 (56.72%)
Link 01-OGS (11.33%)


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


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.24 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :    36.47 %
    1.516 -  1.149 sec      :     7.33 %
    1.149 -  0.871 sec      :     9.29 %
    0.871 -  0.660 sec      :    33.86 %
    0.660 -  0.500 sec      :    13.04 %


***************************
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-1.1 | 112.69 | 0.00 | 0.00 | 6.36 | 101.21 | 4.09 | 105.30 | 0.01 | 3.17 | 0.934 |
| A-1.2 | 112.69 | 0.00 | 0.00 | 2.82 | 106.74 | 1.86 | 108.60 | 0.02 | 5.33 | 0.964 |
| A-1.3 | 112.68 | 0.00 | 0.00 | 4.24 | 104.52 | 2.77 | 107.29 | 0.02 | 4.25 | 0.952 |
| A-2.1 | 112.69 | 0.00 | 0.00 | 4.95 | 103.49 | 3.12 | 106.61 | 0.04 | 10.61 | 0.946 |
| A-2.2 | 112.68 | 0.00 | 0.00 | 0.71 | 110.13 | 0.47 | 110.59 | 0.06 | 14.18 | 0.981 |
| A-2.3 | 112.69 | 0.00 | 0.00 | 22.15 | 76.77 | 13.02 | 89.79 | 0.09 | 25.37 | 0.797 |
| R-1.1 | 112.69 | 0.00 | 0.00 | 0.00 | 112.76 | 0.00 | 112.76 | 0.01 | 2.68 | 1.001 |
| R-1.2 | 112.69 | 61673.92 | 0.00 | 0.00 | 61786.33 | 0.00 | 61786.33 | 3.71 | 58.64 | 1.000 |
| R-1.3 | 112.68 | 14758.61 | 0.00 | 0.00 | 14871.85 | 0.00 | 14871.85 | 3.72 | 58.65 | 1.000 |
| R-1.4 | 112.68 | 0.00 | 0.00 | 0.00 | 112.79 | 0.00 | 112.79 | 0.03 | 6.70 | 1.001 |
| R-1.5 | 112.69 | 0.00 | 0.00 | 0.00 | 112.81 | 0.00 | 112.81 | 0.04 | 9.11 | 1.001 |
| R-1.6 | 112.69 | 0.00 | 0.00 | 0.00 | 112.81 | 0.00 | 112.81 | 0.04 | 9.11 | 1.001 |
| R-1.7 | 112.68 | 0.00 | 0.00 | 0.00 | 112.81 | 0.00 | 112.81 | 0.04 | 9.38 | 1.001 |
| S-1.4 | 112.68 | 0.00 | 0.00 | 12.06 | 92.31 | 7.33 | 99.64 | 0.07 | 17.26 | 0.884 |

**********
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 |
|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.32 | 2.09 | 70.54 | 0 07:01 | 2.09 |
| 03b | JUNCTION | 0.31 | 2.07 | 70.54 | 0 07:01 | 2.07 |
| 03c | JUNCTION | 0.30 | 2.04 | 70.54 | 0 07:02 | 2.04 |
| 06a | JUNCTION | 0.30 | 2.09 | 70.59 | 0 07:02 | 2.09 |
| 06b | JUNCTION | 0.29 | 2.07 | 70.59 | 0 07:02 | 2.07 |
| BLDG | JUNCTION | 0.02 | 0.03 | 68.86 | 0 05:51 | 0.03 |
| MH01 | JUNCTION | 0.04 | 0.08 | 68.26 | 0 07:02 | 0.08 |
| OGS | JUNCTION | 0.04 | 0.08 | 68.30 | 0 07:02 | 0.08 |
| EXSTM | OUTFALL | 0.76 | 0.76 | 67.00 | 0 00:00 | 0.76 |
| OF1 | OUTFALL | 0.00 | 0.00 | 70.14 | 0 00:00 | 0.00 |
| OF2 | OUTFALL | 0.00 | 0.00 | 70.40 | 0 00:00 | 0.00 |
| CB100 | STORAGE | 0.14 | 1.44 | 70.54 | 0 07:01 | 1.44 |
| CB101 | STORAGE | 0.15 | 1.54 | 70.54 | 0 07:01 | 1.54 |
| Cb102 | STORAGE | 0.15 | 1.54 | 70.54 | 0 07:02 | 1.54 |
| CB103 | STORAGE | 0.16 | 1.54 | 70.59 | 0 07:02 | 1.54 |
| CB104 | STORAGE | 0.16 | 1.54 | 70.59 | 0 07:02 | 1.54 |
| CBMH07 | STORAGE | 0.28 | 2.04 | 70.59 | 0 07:01 | 2.04 |
| CBMH104 | STORAGE | 0.29 | 2.02 | 70.54 | 0 07:02 | 2.02 |
| MH03 | STORAGE | 0.38 | 2.20 | 70.54 | 0 07:01 | 2.20 |
| MH05 | STORAGE | 0.38 | 2.25 | 70.59 | 0 07:02 | 2.25 |
| MH06 | STORAGE | 0.31 | 2.11 | 70.59 | 0 07:02 | 2.11 |
| RD1 | STORAGE | 0.04 | 0.14 | 73.49 | 0 07:04 | 0.14 |
| RD2 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD3 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |
| RD4 | STORAGE | 0.09 | 0.15 | 73.50 | 0 06:49 | 0.15 |
| RD5 | STORAGE | 0.10 | 0.15 | 73.50 | 0 06:54 | 0.15 |
| RD6 | STORAGE | 0.10 | 0.15 | 73.50 | 0 07:00 | 0.15 |
| RD7 | STORAGE | 0.00 | 0.00 | 73.35 | 0 00:00 | 0.00 |

**********
Node Inflow Summary
**********

| | Maximum Lateral | Maximum Total | Time of Max | Lateral Inflow | Total Inflow | Flow Balance |
|---|---|---|---|---|---|---|

| Node | Type | Inflow LPS | Inflow LPS | Occurrence days hr:min | Volume 10^6 ltr | Volume 10^6 ltr | Error Percent |
|---|---|---|---|---|---|---|---|
| 03a | JUNCTION | 0.00 | 17.06 | 0 06:15 | 0 | 0.118 | -0.727 |
| 03b | JUNCTION | 0.00 | 16.25 | 0 06:15 | 0 | 0.105 | -0.410 |
| 03c | JUNCTION | 0.00 | 17.56 | 0 06:14 | 0 | 0.0834 | -0.451 |
| 06a | JUNCTION | 0.00 | 36.47 | 0 06:20 | 0 | 0.191 | -0.636 |
| 06b | JUNCTION | 0.00 | 32.13 | 0 06:12 | 0 | 0.148 | -0.533 |
| BLDG | JUNCTION | 0.00 | 1.26 | 0 05:49 | 0 | 0.0881 | 0.030 |
| MH01 | JUNCTION | 0.00 | 16.36 | 0 07:02 | 0 | 0.399 | 0.009 |
| OGS | JUNCTION | 0.00 | 15.10 | 0 07:02 | 0 | 0.311 | -0.000 |
| EXSTM | OUTFALL | 0.00 | 16.36 | 0 07:02 | 0 | 0.399 | 0.000 |
| OF1 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| OF2 | OUTFALL | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| CB100 | STORAGE | 3.17 | 5.99 | 0 06:16 | 0.0126 | 0.0127 | 0.202 |
| CB101 | STORAGE | 5.33 | 7.36 | 0 06:24 | 0.0217 | 0.0219 | 0.146 |
| Cb102 | STORAGE | 4.25 | 6.13 | 0 06:25 | 0.0172 | 0.0176 | 0.046 |
| CB103 | STORAGE | 10.61 | 12.18 | 0 06:25 | 0.0427 | 0.0427 | 0.060 |
| CB104 | STORAGE | 14.18 | 14.18 | 0 06:30 | 0.0586 | 0.0586 | 0.060 |
| CBMH07 | STORAGE | 25.37 | 26.06 | 0 06:23 | 0.0889 | 0.0889 | 0.003 |
| CBMH104 | STORAGE | 17.26 | 17.26 | 0 06:30 | 0.0658 | 0.0658 | -0.006 |
| MH03 | STORAGE | 0.00 | 10.99 | 0 06:22 | 0 | 0.119 | 0.016 |
| MH05 | STORAGE | 0.00 | 21.44 | 0 06:22 | 0 | 0.192 | -0.051 |
| MH06 | STORAGE | 0.00 | 35.65 | 0 06:15 | 0 | 0.192 | 0.065 |
| RD1 | STORAGE | 2.68 | 2.68 | 0 06:10 | 0.0113 | 0.0113 | 0.002 |
| RD2 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD3 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |
| RD4 | STORAGE | 6.70 | 6.70 | 0 06:10 | 0.0282 | 0.0282 | 0.004 |
| RD5 | STORAGE | 9.11 | 9.11 | 0 06:20 | 0.0384 | 0.0384 | 0.001 |
| RD6 | STORAGE | 9.11 | 9.11 | 0 06:20 | 0.0384 | 0.0384 | 0.001 |
| RD7 | STORAGE | 0.00 | 0.00 | 0 00:00 | 0 | 0 | 0.000 ltr |

**********
Node Surcharge Summary
**********

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

| Node | Type | Surcharged Hours | Max. Height Above Crown Meters | Min. Depth Below Rim Meters |
|---|---|---|---|---|
| 03a | JUNCTION | 3.39 | 1.297 | 0.063 |
| 03b | JUNCTION | 3.58 | 1.397 | 0.063 |
| 03c | JUNCTION | 3.61 | 1.407 | 0.063 |
| 06a | JUNCTION | 3.52 | 1.352 | 0.008 |
| 06b | JUNCTION | 3.52 | 1.352 | 0.008 |

**********
Node Flooding Summary
**********

Flooding refers to all water that overflows a node, whether it ponds or not.

| Node | Hours Flooded | Maximum Rate LPS | Time of Max Occurrence days hr:min | Total Flood Volume 10^6 ltr | Maximum Ponded Depth Meters |
|---|---|---|---|---|---|
| RD4 | 2.71 | 1.39 | 0 06:55 | 0.003 | 0.000 |
| RD5 | 3.09 | 2.01 | 0 07:00 | 0.004 | 0.000 |
| RD6 | 3.00 | 1.92 | 0 07:00 | 0.003 | 0.000 |

**********
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 |
|---|---|---|---|---|---|---|---|---|
| CB100 | 0.000 | 2 | 0 | 0 | 0.001 | 28 | 0 07:01 | 3.42 |
| CB101 | 0.000 | 2 | 0 | 0 | 0.004 | 42 | 0 07:01 | 5.33 |
| Cb102 | 0.000 | 2 | 0 | 0 | 0.004 | 43 | 0 07:02 | 4.25 |
| CB103 | 0.000 | 4 | 0 | 0 | 0.006 | 87 | 0 07:02 | 10.61 |
| CB104 | 0.000 | 4 | 0 | 0 | 0.008 | 86 | 0 07:02 | 14.18 |
| CBMH07 | 0.001 | 5 | 0 | 0 | 0.015 | 88 | 0 07:01 | 18.60 |
| CBMH104 | 0.001 | 3 | 0 | 0 | 0.010 | 43 | 0 07:02 | 14.65 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MH03 | 0.000 | 17 | 0 | 0 | 0.002 | 97 | 0 | 07:01 | 5.53 |
| MH05 | 0.000 | 16 | 0 | 0 | 0.003 | 93 | 0 | 07:02 | 9.58 |
| MH06 | 0.001 | 14 | 0 | 0 | 0.004 | 98 | 0 | 07:02 | 21.44 |
| RD1 | 0.001 | 18 | 0 | 0 | 0.005 | 86 | 0 | 07:04 | 0.32 |
| RD2 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD3 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |
| RD4 | 0.006 | 44 | 0 | 0 | 0.015 | 100 | 0 | 06:49 | 0.32 |
| RD5 | 0.011 | 52 | 0 | 0 | 0.022 | 100 | 0 | 06:54 | 0.32 |
| RD6 | 0.012 | 52 | 0 | 0 | 0.023 | 100 | 0 | 07:00 | 0.32 |
| RD7 | 0.000 | 0 | 0 | 0 | 0.000 | 0 | 0 | 00:00 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow LPS | Max Flow LPS | Total Volume 10^6 ltr |
|---|---|---|---|---|
| EXSTM | 98.56 | 5.37 | 16.36 | 0.399 |
| OF1 | 0.00 | 0.00 | 0.00 | 0.000 |
| OF2 | 0.00 | 0.00 | 0.00 | 0.000 |
| System | 32.85 | 5.37 | 16.36 | 0.399 |

**********
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-BLDG | CONDUIT | 1.26 | 0 05:51 | 0.48 | 0.02 | 0.10 |
| 01-OGS | CONDUIT | 15.10 | 0 07:02 | 1.05 | 0.24 | 0.33 |
| 03-03a | CONDUIT | 10.99 | 0 06:22 | 0.25 | 0.06 | 1.00 |
| 03a-03b | CONDUIT | 14.28 | 0 06:15 | 0.19 | 0.07 | 1.00 |
| 03a-100 | CONDUIT | 3.42 | 0 06:16 | 0.64 | 0.24 | 1.00 |
| 03b-03c | CONDUIT | 12.74 | 0 06:15 | 0.18 | 0.06 | 1.00 |
| 03b-101 | CONDUIT | 5.33 | 0 06:13 | 0.76 | 0.36 | 1.00 |
| 03c-04 | CONDUIT | 14.65 | 0 06:14 | 0.17 | 0.07 | 1.00 |
| 03c-102 | CONDUIT | 4.25 | 0 06:13 | 0.79 | 0.25 | 1.00 |
| 05-06 | CONDUIT | 21.44 | 0 06:22 | 0.28 | 0.11 | 1.00 |
| 06-06a | CONDUIT | 35.65 | 0 06:15 | 0.28 | 0.18 | 1.00 |
| 06a-06b | CONDUIT | 27.99 | 0 06:15 | 0.21 | 0.14 | 1.00 |
| 06a-103 | CONDUIT | 10.61 | 0 06:10 | 0.99 | 0.30 | 1.00 |
| 06b-104 | CONDUIT | 14.18 | 0 06:10 | 1.10 | 0.38 | 1.00 |
| 06c-07 | CONDUIT | 18.60 | 0 06:13 | 0.16 | 0.09 | 1.00 |
| C1 | CONDUIT | 0.00 | 0 00:00 | 0.00 | 0.00 | 0.00 |
| C2 | CONDUIT | 0.00 | 0 00:00 | 0.00 | 0.00 | 0.00 |
| EX-01 | CONDUIT | 16.36 | 0 07:02 | 1.02 | 0.17 | 0.28 |
| OR1 | ORIFICE | 9.58 | 0 07:02 | | | 1.00 |
| OR2 | ORIFICE | 5.53 | 0 07:01 | | | 1.00 |
| OL1 | DUMMY | 0.00 | 0 00:00 | | | |
| OL2 | DUMMY | 0.32 | 0 04:33 | | | |
| OL3 | DUMMY | 0.00 | 0 00:00 | | | |
| OL4 | DUMMY | 0.32 | 0 05:49 | | | |
| OL5 | DUMMY | 0.32 | 0 03:29 | | | |
| OL6 | DUMMY | 0.32 | 0 03:31 | | | |
| OL7 | DUMMY | 0.00 | 0 00:00 | | | |

**********
Flow Classification Summary
**********

| 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-BLDG | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.00 | 0.00 |
| 01-OGS | 1.00 | 0.01 | 0.05 | 0.00 | 0.26 | 0.68 | 0.00 | 0.00 | 0.56 | 0.00 |
| 03-03a | 1.00 | 0.02 | 0.00 | 0.00 | 0.53 | 0.00 | 0.00 | 0.44 | 0.00 | 0.00 |
| 03a-03b | 1.00 | 0.02 | 0.08 | 0.00 | 0.89 | 0.00 | 0.00 | 0.00 | 0.59 | 0.00 |
| 03a-100 | 1.00 | 0.02 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 0.84 | 0.00 | 0.00 |
| 03b-03c | 1.00 | 0.02 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 0.23 | 0.00 |
| 03b-101 | 1.00 | 0.02 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 03c-04 | 1.00 | 0.02 | 0.00 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.61 | 0.00 |
| 03c-102 | 1.00 | 0.02 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 |
| 05-06 | 1.00 | 0.03 | 0.00 | 0.00 | 0.45 | 0.00 | 0.00 | 0.52 | 0.01 | 0.00 |
| 06-06a | 1.00 | 0.02 | 0.00 | 0.00 | 0.69 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 |
| 06a-06b | 1.00 | 0.02 | 0.05 | 0.00 | 0.93 | 0.00 | 0.00 | 0.00 | 0.64 | 0.00 |
| 06a-103 | 1.00 | 0.02 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.82 | 0.00 | 0.00 |
| 06b-104 | 1.00 | 0.02 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.82 | 0.00 | 0.00 |
| 06c-07 | 1.00 | 0.02 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 0.32 | 0.00 |
| C1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C2 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EX-01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 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 |
|---|---|---|---|---|---|
| 03-03a | 3.87 | 3.87 | 3.90 | 0.01 | 0.01 |
| 03a-03b | 3.79 | 3.79 | 3.87 | 0.01 | 0.01 |
| 03a-100 | 3.38 | 3.38 | 3.39 | 0.01 | 0.01 |
| 03b-03c | 3.71 | 3.71 | 3.79 | 0.01 | 0.01 |
| 03b-101 | 3.56 | 3.56 | 3.58 | 0.01 | 0.01 |
| 03c-04 | 3.64 | 3.64 | 3.71 | 0.01 | 0.01 |
| 03c-102 | 3.56 | 3.56 | 3.61 | 0.01 | 0.01 |
| 05-06 | 3.86 | 3.86 | 3.96 | 0.01 | 0.01 |
| 06-06a | 3.82 | 3.82 | 3.83 | 0.01 | 0.01 |
| 06a-06b | 3.77 | 3.77 | 3.82 | 0.01 | 0.01 |
| 06a-103 | 3.51 | 3.51 | 3.52 | 0.01 | 0.01 |
| 06b-104 | 3.51 | 3.51 | 3.52 | 0.01 | 0.01 |
| 06c-07 | 3.70 | 3.70 | 3.77 | 0.01 | 0.01 |

Analysis begun on: Thu Jul 22 13:04:11 2021
Analysis ended on: Thu Jul 22 13:04:14 2021
Total elapsed time: 00:00:03

# APPENDIX E

## Inlet Control Device (ICD) Information

# IPEX Tempest™ Inlet Control Devices

## Municipal Technical Manual Series

## Vol. I, 2nd Edition

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## PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

### Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

### Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and 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 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

### Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

### Product Construction

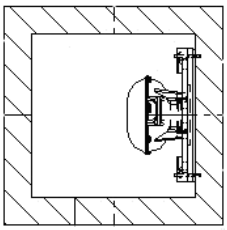
Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

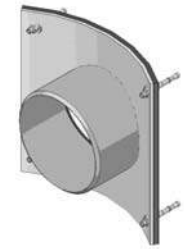
### Product Applications

Will accommodate both square and round applications:

**Square Application** **Round Application**

Universal
Mounting Plate



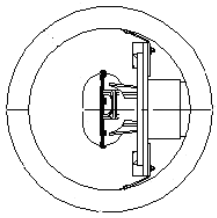


+

Spigot CB
Wall Plate

=

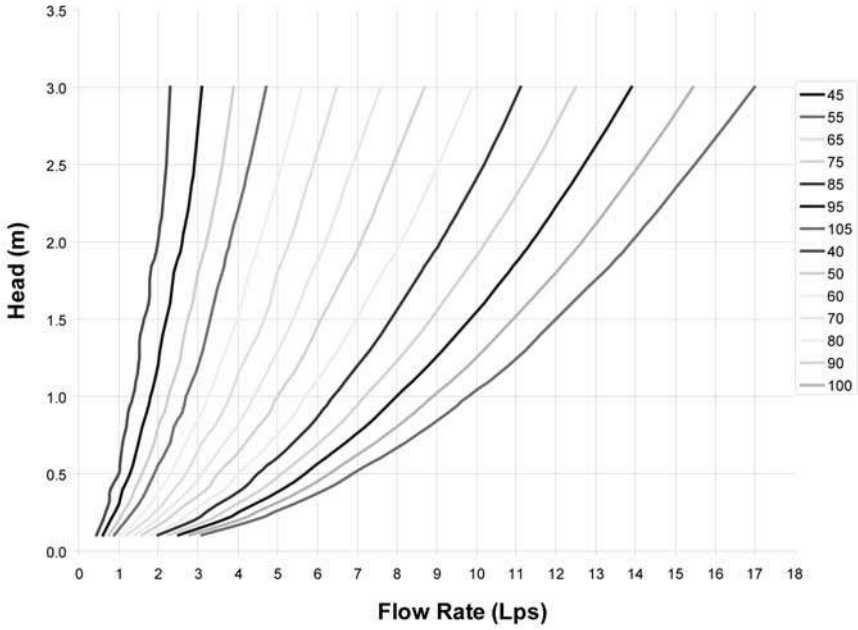
Universal
Mounting
Plate Hub
Adapter



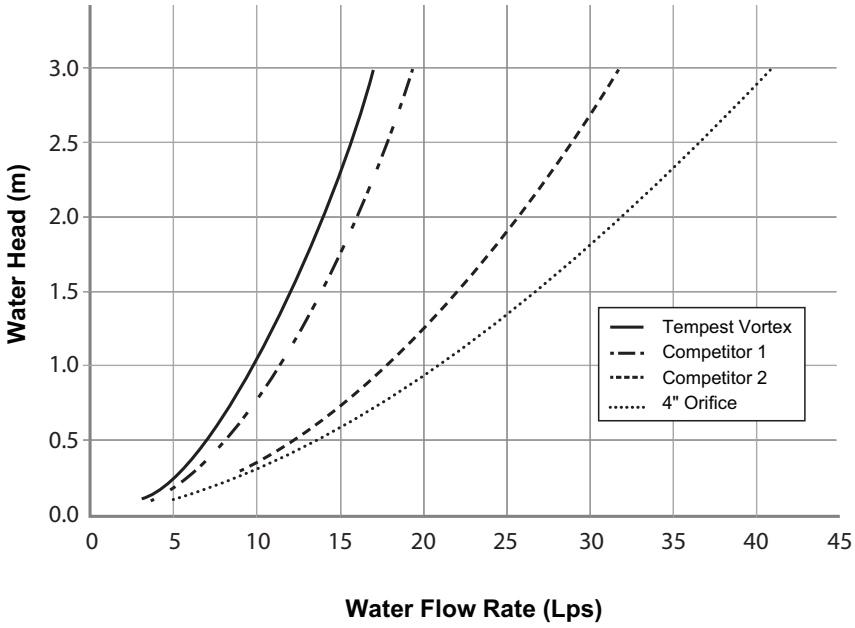


NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

## Chart 1: LMF 14 Preset Flow Curves




## Chart 2: LMF Flow vs. ICD Alternatives






NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

## PRODUCT INSTALLATION

### Instructions to assemble a TEMPEST LMF ICD into a Square 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, (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 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 ICD 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 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 LMF 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 spigot catch basin 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 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 CB spigot 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 wall plate and the catch basin wall.
6. Apply 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 universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD 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 mounting plate and has created a seal.

**WARNING**

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back 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. 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

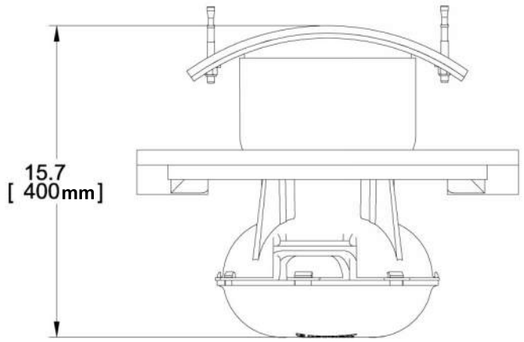
The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

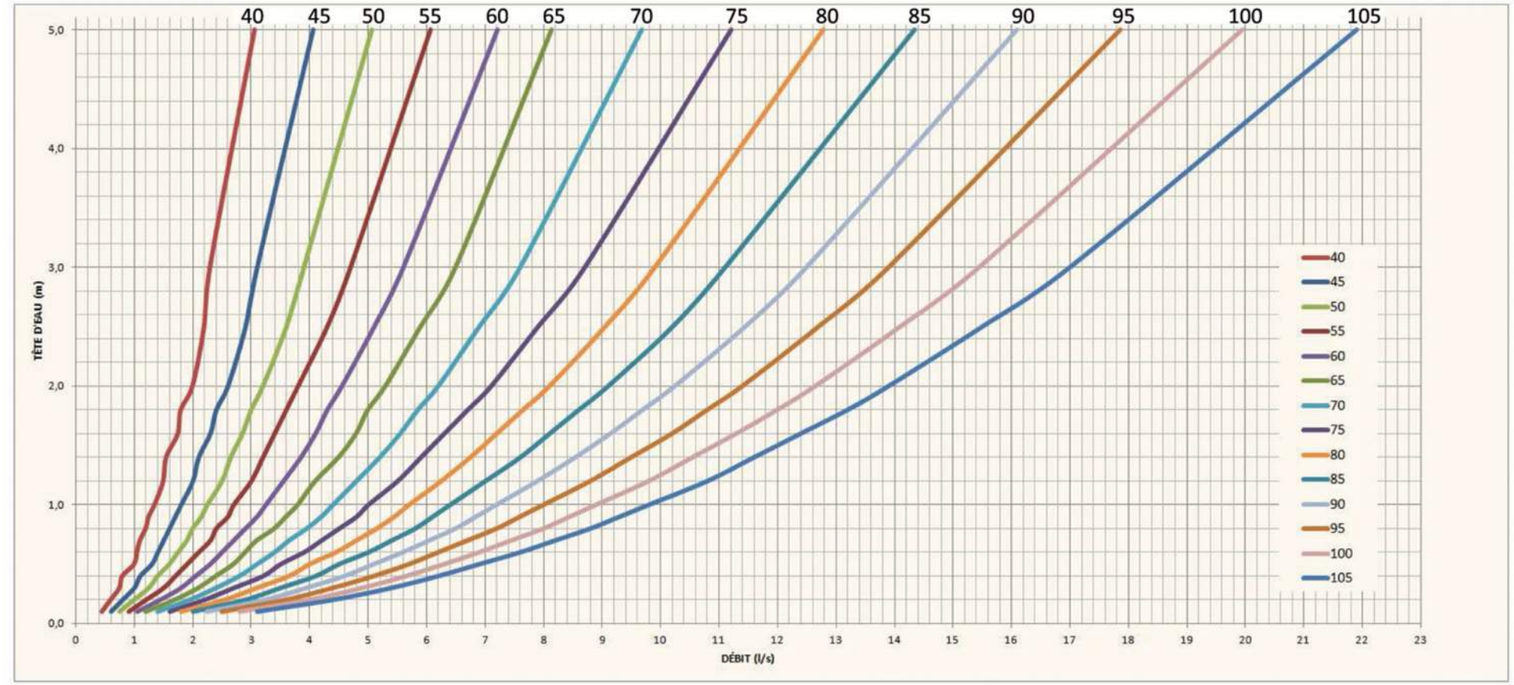
### Installation

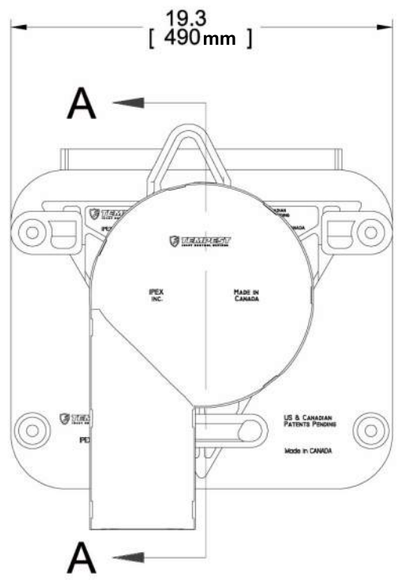
Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

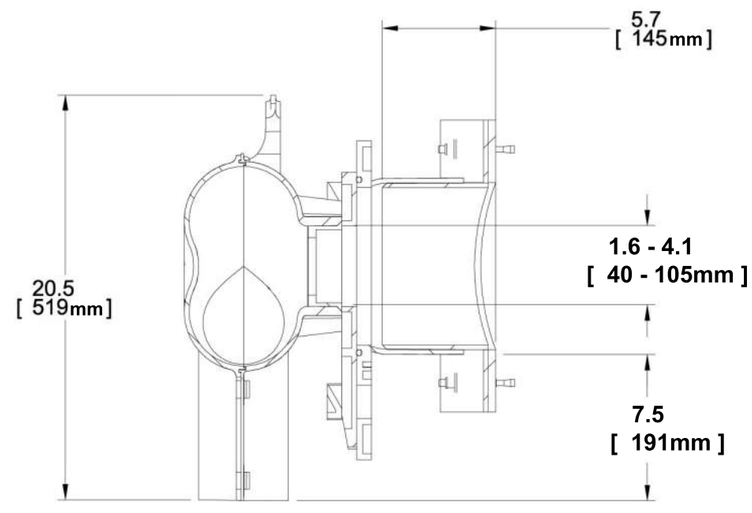


NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

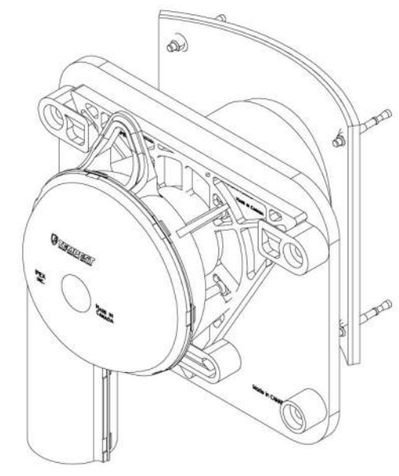



SECTION A-A



IPEX

Product development engineering
3 Place du commerce, Suite 101
Ile des Soeurs, Montréal, QC, H3E 1H7
Canada Tel 514 769 2200
www.ipexna.com

| PROJECTION | UNITS | TITLE | | | |
|---|---|---|---|---|---|
| | in [ mm ] | Tempest LMF round CB assembly [VORTEX] | SIZE B | SCALE(S) 1/8 | 1-2014 |

# APPENDIX F

## Flow Control Roof Drain Information

| WATTS® | Adjustable Accutrol Weir<br>Tag: RD-100-A-ADJ | Adjustable Flow Control for Roof Drains |
|---|---|---|

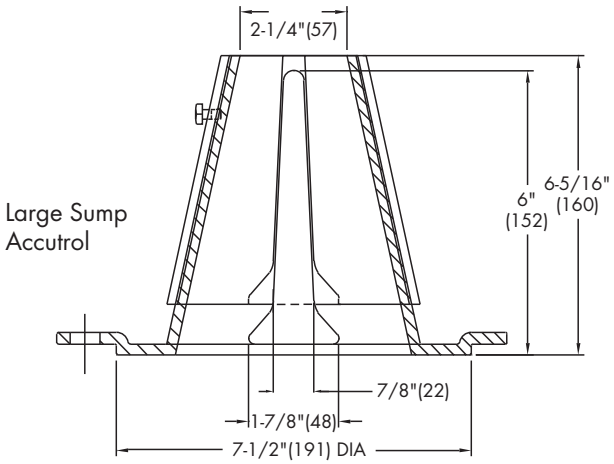
**ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)**

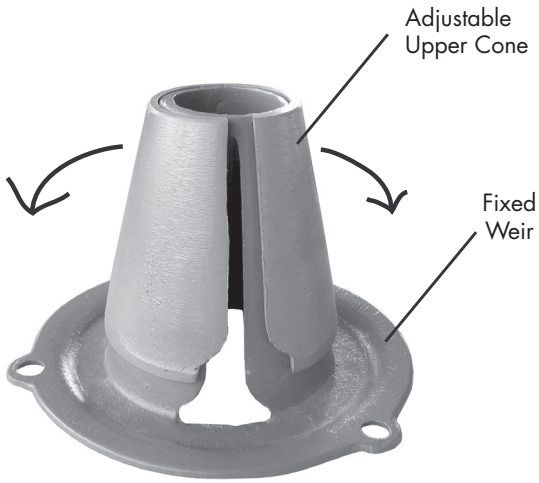
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

**EXAMPLE:**

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head ] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.




1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

| Weir Opening Exposed | 1" | 2" | 3" | 4" | 5" | 6" |
|---|---|---|---|---|---|---|
| | Flow Rate (gallons per minute) | | | | | |
| Fully Exposed | 5 | 10 | 15 | 20 | 25 | 30 |
| 3/4 | 5 | 10 | 13.75 | 17.5 | 21.25 | 25 |
| 1/2 | 5 | 10 | 12.5 | 15 | 17.5 | 20 |
| 1/4 | 5 | 10 | 11.25 | 12.5 | 13.75 | 15 |
| Closed | 5 | 5 | 5 | 5 | 5 | 5 |

Job Name _____ Contractor _____

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

Engineer _____ Representative _____

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

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



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# APPENDIX G

## Water Quality Treatment Unit Information

## Steve Matthews

**From:** Patrick <patrick@echelonenvironmental.ca>
**Sent:** Thursday, July 15, 2021 11:25 AM
**To:** Steve Matthews
**Cc:** Francois Thauvette
**Subject:** RE: CDS Sizing Request - Granite Curling Club in Ottawa
**Attachments:** CDS TSSR - 2740 Queensview Drive - PMSU 2015_4.pdf

Good morning Steve,

I hope everything is going well! For this site we recommend a CDS PMSU 2015_4, this unit has a budget price of approximately $17,500. All relevant information is noted below, I see no issues with the proposed orientation.

- **% of net annual TSS removal – See report**
- **% of net annual treatment volume for the tributary area – See report**
- **The treatment capacity in L/s – 20 L/s**
- **The sediment storage capacity in m3 – 838 L**
- **The oil storage capacity in L – 232 L**
- **The total unit storage capacity in L – 1590 L**

Best regards,

Patrick Graham
Project Manager

ECHELON ENVIRONMENTAL

505 Hood Road, Unit #26
Markham, ON.
L3R 5V6

Ph. 905-948-0000 ext. 223
Cell: 416-460-5819
Fax 905-948-0577
Email patrick@echelonenvironmental.ca

---

**From:** Steve Matthews <S.Matthews@novatech-eng.com>
**Sent:** Wednesday, July 14, 2021 10:02 AM
**To:** Patrick <patrick@echelonenvironmental.ca>
**Cc:** Francois Thauvette <f.thauvette@novatech-eng.com>
**Subject:** CDS Sizing Request - Granite Curling Club in Ottawa

Hi Patrick,

We are currently working on a project that requires a stormwater quality control unit to treat water from the parking lot and drive aisle areas only.
The project is for the Granite Curling Club and is located at 2740 Queensview Drive in the City of Ottawa.

The project details are as follows:

Tributary area = **0.31 ha**
Imperviousness = **84% or $C_w$=0.79**
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 on a new 250mm dia. PVC outlet pipe with one 200mm dia. PVC inlet pipe at 141 degrees of separation through the structure, and a second input from a 200mm dia. PVC pipe at 90 degrees to the outlet pipe and approximately 2.0m cover on all the pipes. A standard particle distribution (**Fines**) should be adequate for the design. Anticipated peak flow should be in the order of 16 L/s based on the City's requirement to control the site to a restrictive level of 33.5 L/s/ha. As a result, there will be a significant amount upstream attenuation due to ICDs within the paved drive aisle and storm structures. See attached excerpt from the proposed site servicing plan for a sketch of the area and proposed water quality treatment unit location (highlighted in yellow).

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 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
The information contained in this email message is confidential and is for exclusive use of the addressee.

# CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
# BASED ON THE RATIONAL RAINFALL METHOD
# BASED ON A FINE PARTICLE SIZE DISTRIBUTION

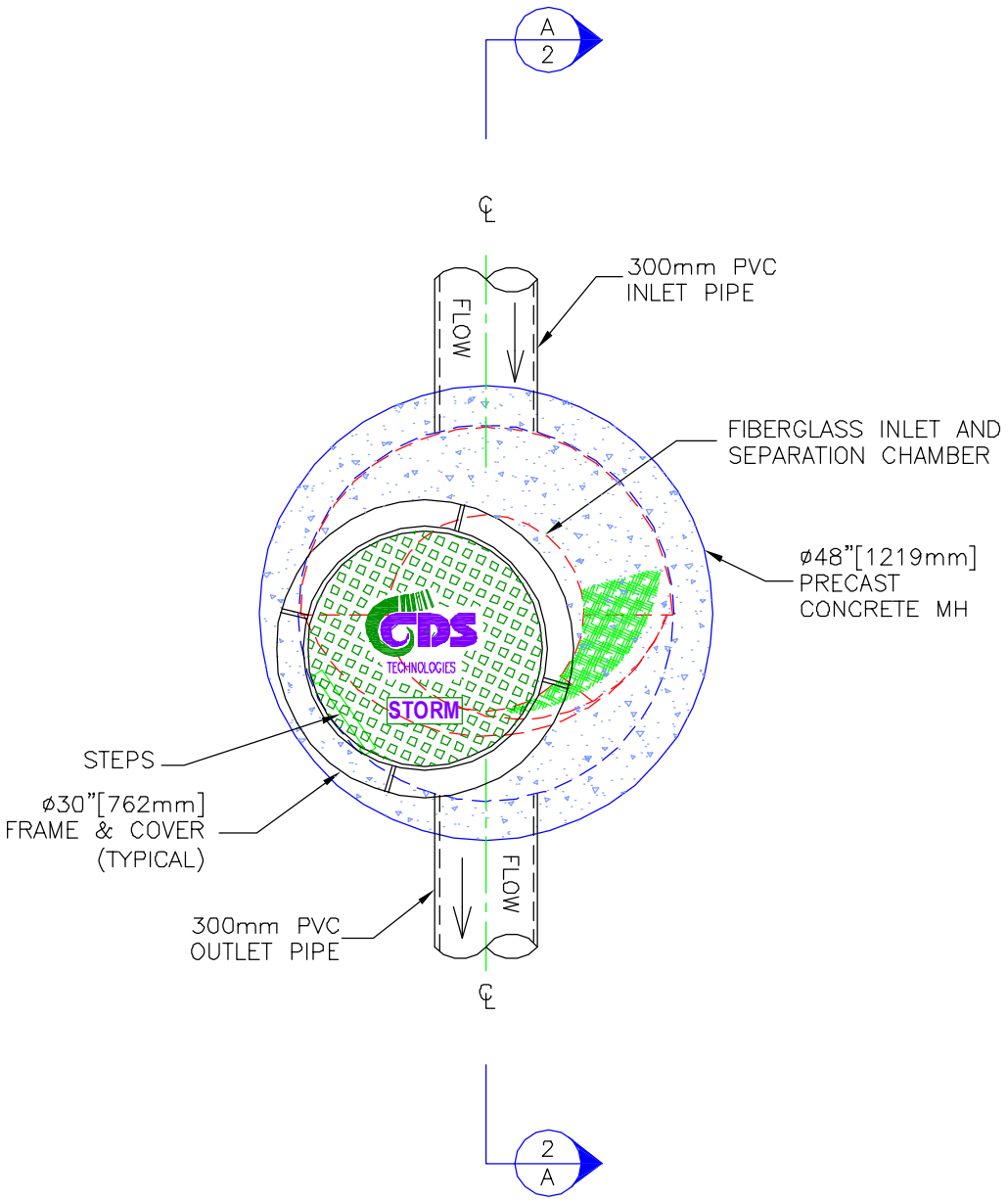
| | | | |
|---|---|---|---|
| **Project Name:** | 2740 Queensview Drive | **Engineer:** | **Novatech** |
| **Location:** | Ottawa, ON | **Contact:** | Stephen Matthews, B.A.(Env |
| **OGS #:** | 1 | **Report Date:** | 15-Jul-21 |

| | | | | | |
|---|---|---|---|---|---|
| **Area** | 0.310 | ha | **Rainfall Station #** | 215 | |
| **Weighted C** | 0.79 | | **Particle Size Distribution** | FINE | |
| **CDS Model** | 2015-4 | | **CDS Treatment Capacity** | 20 | l/s |

| Rainfall Intensity[1] (mm/hr) | Percent Rainfall Volume[1] | Cumulative Rainfall Volume | Total Flowrate (l/s) | Treated Flowrate (l/s) | Operating Rate (%) | Removal Efficiency (%) | Incremental Removal (%) |
|---|---|---|---|---|---|---|---|
| 1.0 | 10.6% | 19.8% | 0.7 | 0.7 | 3.4 | 97.9 | 10.4 |
| 1.5 | 9.9% | 29.7% | 1.0 | 1.0 | 5.2 | 97.4 | 9.6 |
| 2.0 | 8.4% | 38.1% | 1.4 | 1.4 | 6.9 | 96.9 | 8.1 |
| 2.5 | 7.7% | 45.8% | 1.7 | 1.7 | 8.6 | 96.4 | 7.4 |
| 3.0 | 5.9% | 51.7% | 2.0 | 2.0 | 10.3 | 95.9 | 5.7 |
| 3.5 | 4.4% | 56.1% | 2.4 | 2.4 | 12.0 | 95.4 | 4.2 |
| 4.0 | 4.7% | 60.7% | 2.7 | 2.7 | 13.7 | 94.9 | 4.4 |
| 4.5 | 3.3% | 64.0% | 3.1 | 3.1 | 15.5 | 94.4 | 3.1 |
| 5.0 | 3.0% | 67.1% | 3.4 | 3.4 | 17.2 | 93.9 | 2.8 |
| 6.0 | 5.4% | 72.4% | 4.1 | 4.1 | 20.6 | 93.0 | 5.0 |
| 7.0 | 4.4% | 76.8% | 4.8 | 4.8 | 24.0 | 92.0 | 4.0 |
| 8.0 | 3.5% | 80.3% | 5.4 | 5.4 | 27.5 | 91.0 | 3.2 |
| 9.0 | 2.8% | 83.2% | 6.1 | 6.1 | 30.9 | 90.0 | 2.5 |
| 10.0 | 2.2% | 85.3% | 6.8 | 6.8 | 34.3 | 89.0 | 1.9 |
| 15.0 | 7.0% | 92.3% | 10.2 | 10.2 | 51.5 | 84.1 | 5.9 |
| 20.0 | 4.5% | 96.9% | 13.6 | 13.6 | 68.7 | 79.2 | 3.6 |
| 25.0 | 1.4% | 98.3% | 17.0 | 17.0 | 85.9 | 74.2 | 1.1 |
| 30.0 | 0.7% | 99.0% | 20.4 | 19.8 | 100.0 | 68.1 | 0.5 |
| 35.0 | 0.5% | 99.5% | 23.8 | 19.8 | 100.0 | 58.4 | 0.3 |
| 40.0 | 0.5% | 100.0% | 27.2 | 19.8 | 100.0 | 51.1 | 0.3 |
| 45.0 | 0.0% | 100.0% | 30.6 | 19.8 | 100.0 | 45.4 | 0.0 |
| 50.0 | 0.0% | 100.0% | 34.0 | 19.8 | 100.0 | 40.9 | 0.0 |
| | | | | | | | 93.1 |
| | | | | | | Removal Efficiency Adjustment[2] = | 6.5% |
| | | | | | | **Predicted Net Annual Load Removal Efficiency =** | **86.6%** |
| | | | | | | **Predicted Annual Rainfall Treated =** | **99.0%** |

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

# PLAN VIEW

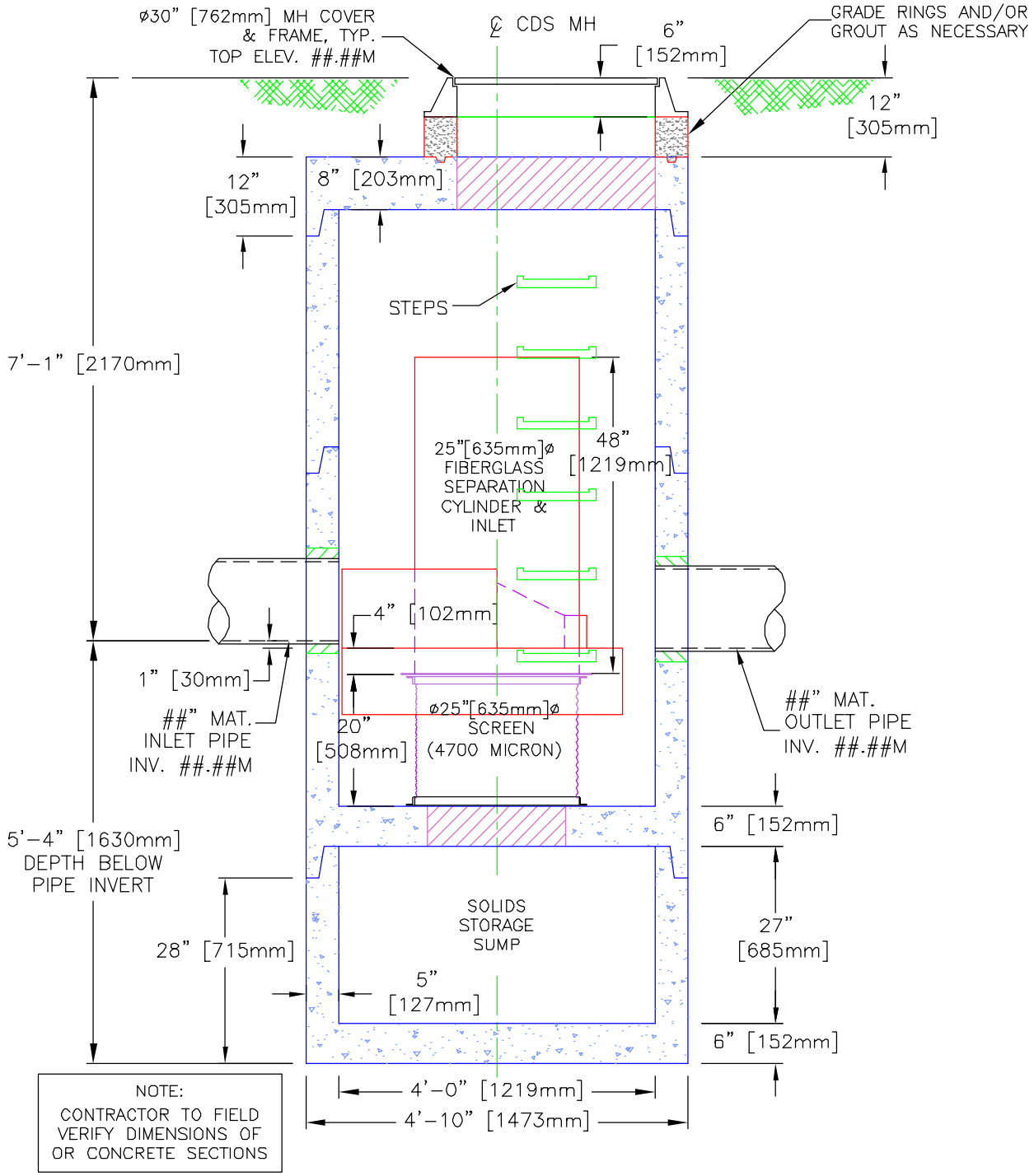



## CDS MODEL PMSU20_15_4m
## STORMWATER TREATMENT UNIT

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

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

# SECTION A–A
## ELEVATION VIEW




NOTE:
CONTRACTOR TO FIELD VERIFY DIMENSIONS OF OR CONCRETE SECTIONS

# CDS MODEL PMSU20_15_4m
## STORMWATER TREATMENT UNIT

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

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

## LEGEND

- PROPERTY LINE
- SAN MH 01 — PROPOSED SANITARY MH & SEWER
- CBMH 03 — PROPOSED CATCHBASIN MH & SEWER
- STM MH 01 — PROPOSED STORM MH & SEWER
- CB 02 — PROPOSED CATCHBASIN & LEAD
- HYD — VB — PROPOSED HYDRANT c/w VALVE & VALVE BOX
- ICD — PROPOSED INLET CONTROL DEVICE
- RD — CONTROLLED FLOW ROOF DRAIN
- M RM — PROPOSED WATER METER AND REMOTE METER
- PROPOSED BARRIER CURB
- DC — PROPOSED DEPRESSED CURB
- 150mmØ — PROPOSED WATER SERVICE AND DIAMETER
- VB — PROPOSED VALVE & VALVE BOX
- BEND — PROPOSED BEND AND THRUSTBLOCK 11.25°, 22.5°, 45° or TEE
- PROPOSED CAP
- PROPOSED BUILDING ENTRANCE
- X — REMOVALS
- THERMAL INSULATION FOR SHALLOW SEWERS
- OHW — EXISTING OVERHEAD WIRES
- EXISTING CONCRETE CURB
- SANMH — EXISTING SANITARY MANHOLE & SEWER
- CBMH — EXISTING CATCHBASIN MANHOLE
- STMMH — EXISTING STORM MANHOLE & SEWER
- CB — V&VB — EXISTING CATCHBASIN C/W CATCHBASIN LEAD
- HYD — EXISTING HYDRANT & VALVE
- EXISTING TREES / VEGETATION
- EX UP — EXISTING UTILITY POLE
- EXISTING FENCE
- 300mmØ WM — EXISTING WATERMAIN
- HYD — EXISTING HYDRANT C/W VALVE & LEAD
- FFE — FINISHED FLOOR ELEVATION
- T/FND — TOP OF FOUNDATION WALL ELEVATION
- USF — UNDERSIDE OF FOOTING ELEVATION
- PROPOSED HYDRO TRANSFORMER

## GENERAL NOTES:

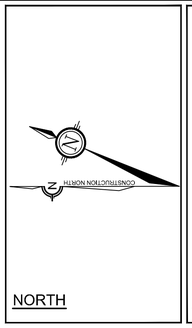
1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN 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 MUNICIPAL AUTHORITIES.
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 INVESTIGATION REPORT (Ref.No.: PG4353-2, DATED MAY 19, 2021) 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 SURFACED AREAS AND DIMENSIONS.
11. REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' (R-2021-066) PREPARED BY NOVATECH.
12. SAW CUT AND KEYGRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE-IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).

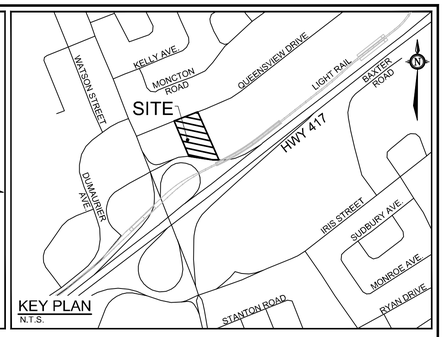
## SEWER NOTES:

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 |
|---|---|---|
| STORM/SANITARY MANHOLE (1200Ø) | 701.010 | OPSD |
| STORM/CATCHBASIN MANHOLE (1500Ø) | 701.011 | OPSD |
| STORM/CBMH FRAME AND COVER | 401.010 - TYPE 'B' | OPSD |
| SANITARY MANHOLE FRAME AND COVER | 401.010 - TYPE 'A' | OPSD |
| WATERTIGHT MANHOLE FRAME AND COVER | 401.030 | OPSD |
| CATCHBASIN MH FRAME & COVER | 401.010 Type 'B' | OPSD |
| CATCHBASIN (600x600) | 705.010 | OPSD |
| CATCHBASIN FRAME & COVER | S19 | CITY OF OTTAWA |
| SEWER TRENCH | S6 | CITY OF OTTAWA |
| STORM SEWER | PVC DR 35 (450mmØ PIPE AND SMALLER) | |
| STORM SEWER | HDPE BOSS 2000 (600mmØ PIPE AND LARGER) | |
| SANITARY SEWER | PVC DR 35 | |

3. THE SANITARY SERVICE LATERAL SHALL BE EQUIPPED WITH BACKFLOW PREVENTERS WITHIN THE BUILDING FOOTPRINT AS PER CITY OF OTTAWA STANDARD DETAILS S14.1 OR S14.2. REFER TO MECHANICAL PLANS FOR DETAILS.
4. THE STORM SERVICE LATERAL SHALL BE EQUIPPED WITH A BACKFLOW PREVENTER WITHIN THE BUILDING FOOTPRINT AS PER CITY OF OTTAWA STANDARD DETAILS S14. REFER TO MECHANICAL PLANS FOR DETAILS.
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. INSULATE ALL PIPES (SAN / STM) THAT HAVE LESS THAN 1.5m COVER WITH HI-40 INSULATION PER INSULATION DETAIL FOR SHALLOW SEWERS. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
8. CONCRETE MANHOLES ARE TO BE 1200mmØ STRUCTURES UNLESS OTHERWISE NOTED ON THE DRAWING. 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.
9. TYPICAL STORM MANHOLES AND CATCHBASIN MANHOLES ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED.
10. THE CONTRACTOR IS 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. PROVIDE A COPY OF ALL CCTV INSPECTION REPORTS TO THE ENGINEER FOR REVIEW.
11. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL APPLICABLE 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 AND ANY ALIGNMENT CHANGES, ETC.
12. 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.




## 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'.
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 BY OPEN STRUCTURES | W23 | CITY OF OTTAWA |
| VALVE BOX ASSEMBLY | W24 | CITY OF OTTAWA |
| WATERMAIN CROSSING BELOW SEWERS | W25 | CITY OF OTTAWA |
| CATHODIC PROTECTION FOR PVC WATERMAINS | W40 | CITY OF OTTAWA |
| WATERMAIN MATERIAL | PVC DR 18 (100mm AND LARGER) | |

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

### PROPOSED 200mmØ / 150mmØ WATER SERVICE TABLE

| STATION | SURFACE ELEVATION | T/WM ELEVATION | COMMENTS |
|---|---|---|---|
| 0+00 | 70.52± | 68.18± * | 200mmØ WM CONNECTION TO EX. 300mmØ CI WM |
| 0+06.7 | 70.60 | 68.00 | PROPERTY LINE / 200mmØ V&VB |
| 0+08.0 | 70.59 | 68.00 | HYDRANT LEAD |
| 0+09.0 | 70.58 | 68.00 | 200x150mmØ REDUCER |
| 0+11.2 | 70.56 | 67.95 | CROSS BELOW 600mmØ STORM (CLEARANCE = 0.5m±) |
| 0+20 | 70.68 | 68.08 | - - - |
| 0+30 | 70.80 | 68.20 | - - - |
| 0+37.6 | 70.65 | 68.25 | 45° HORIZONTAL BEND |
| 0+40.2 | 70.73 | 68.30 | 45° HORIZONTAL BEND |
| 0+45.1 | 70.95 | 68.35 | CAP 1.0m FROM FOUNDATION WALL |

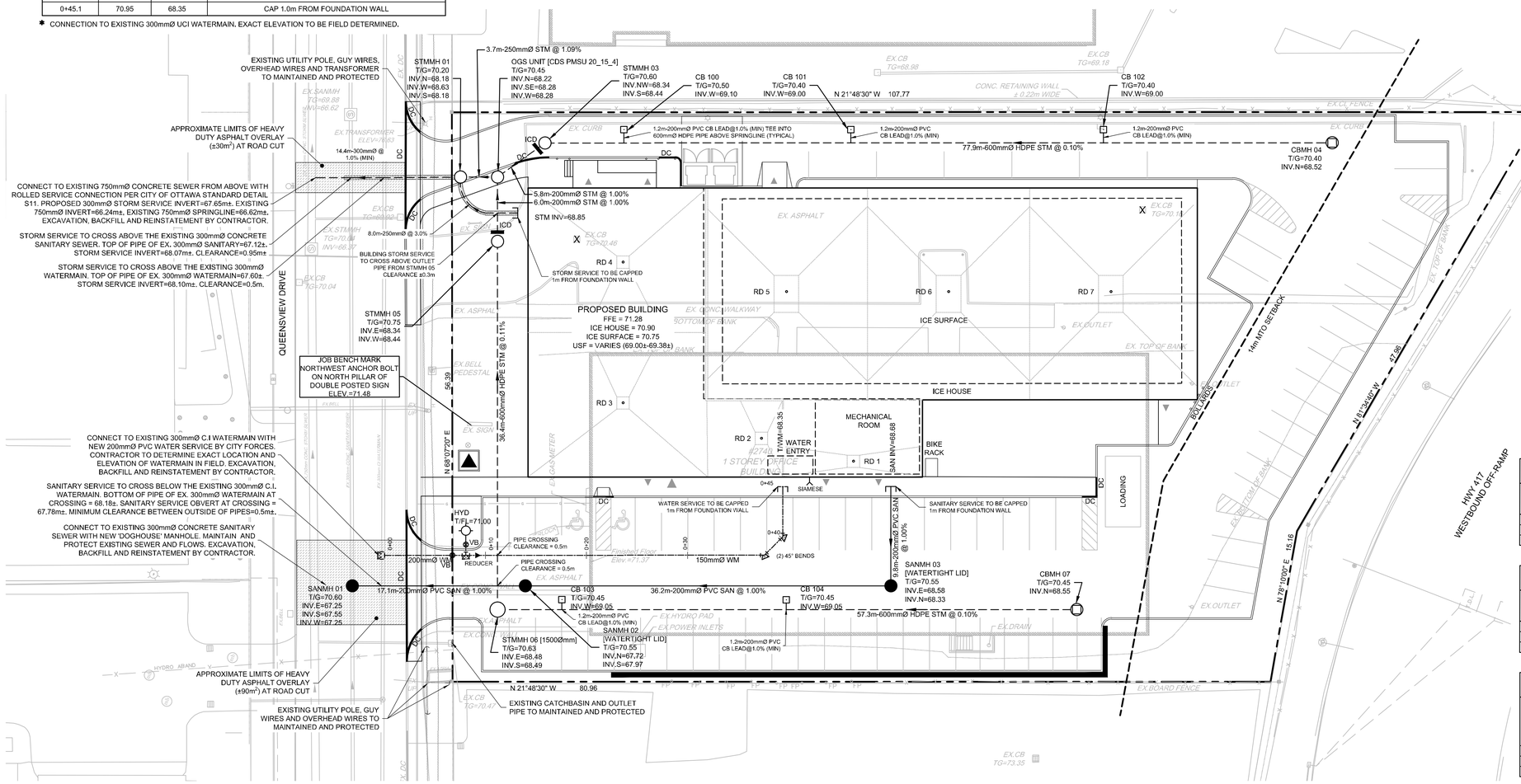
* CONNECTION TO EXISTING 300mmØ UCI WATERMAIN. EXACT ELEVATION TO BE FIELD DETERMINED.

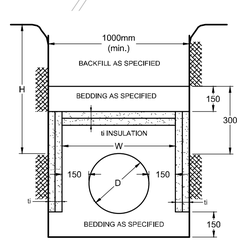
### PROPOSED ROOF DRAIN TABLE: AREA R-1 (ROOF DRAINS 1 to 7)

| AREA ID * | ROOF DRAIN No. (WATTS MODEL) | ROOF DRAIN OPENING SETTING | 1:5 YEAR RELEASE RATE | APPROX. 5-YR PONDING DEPTH | 1:100 YEAR RELEASE RATE | APPROX. 100-YR PONDING DEPTH |
|---|---|---|---|---|---|---|
| R-1 | RD 1 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 9 cm | 0.32 L/s | 13 cm |
| R-1 | RD 2 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 8 cm | 0.32 L/s | 12 cm |
| R-1 | RD 3 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 4 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 5 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 6 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 7 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 10 cm | 0.32 L/s | 14 cm |

* REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' (R-2021-066) PREPARED BY NOVATECH FOR DRAINAGE AREA IDENTIFIERS AND STORMWATER MANAGEMENT DETAILS.

**ALL CONTROLLED FLOW ROOF DRAINS FOR THE PROPOSED BUILDINGS TO BE WATTS 'ADJUSTABLE ACCUTROL' ROOF DRAINS.




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

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

NOTES:

1. INSULATE ALL SEWER PIPES THAT ARE LESS THAN 600mmØ AND HAVE LESS THAN 1.8m COVER WITH EXPANDED POLYSTYRENE INSULATION AS SHOWN.
2. THE THICKNESS OF INSULATION SHALL BE THE EQUIVALENT OF 25mm FOR EVERY 300mm REDUCTION IN THE REQUIRED DEPTH OF COVER (SEE TABLE)

INSULATION DETAIL FOR SHALLOW SEWERS ONLY
NOT TO SCALE

### INLET CONTROL DEVICE DATA TABLE - AREA A-1

| DESIGN EVENT | ICD TYPE (PLUG TYPE) | OUTLET STRUCTURE | DIAMETER OF OUTLET PIPE (mm) | PEAK DESIGN FLOW (L/s) | DESIGN HEAD (m) | WATER ELEVATION (m) | VOLUME ($m^3$) | AVAILABLE STORAGE |
|---|---|---|---|---|---|---|---|---|
| 1:2 YR | IPEX TEMPEST VORTEX LMF 65 | 1200mmØ STM MH 03 | 200mmØ PVC | 2.8 | 0.46 | 68.90 | 17.4 | 69.9 $m^3$ |
| 1:5 YR | | | | 3.3 | 0.71 | 69.15 | 23.8 | |
| 1:100 YR | | | | 5.5 | 2.07 | 70.51 | 37.0 | |

### INLET CONTROL DEVICE DATA TABLE - AREA A-2

| DESIGN EVENT | ICD TYPE (PLUG TYPE) | OUTLET STRUCTURE | DIAMETER OF OUTLET PIPE (mm) | PEAK DESIGN FLOW (L/s) | DESIGN HEAD (m) | WATER ELEVATION (m) | VOLUME ($m^3$) | AVAILABLE STORAGE |
|---|---|---|---|---|---|---|---|---|
| 1:2 YR | IPEX TEMPEST VORTEX LMF 85 | 1200mmØ STM MH 05 | 200mmØ PVC | 5.1 | 0.56 | 69.00 | 26.0 | 66.1 $m^3$ |
| 1:5 YR | | | | 6.8 | 1.04 | 69.48 | 31.0 | |
| 1:100 YR | | | | 9.5 | 2.13 | 70.57 | 52.6 | |

### PROPOSED SITE FLOWS & STORMWATER MANAGEMENT TABLE

| DESIGN EVENT | PRE-DEVELOPMENT CONDITIONS | | POST-DEVELOPMENT CONDITIONS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | SITE FLOWS (L/s) | TARGET CONTROL RATE (L/s) | A-0 FLOW (L/s) | A-1 FLOW (L/s) | A-2 FLOW (L/s) | R-1 FLOW (L/s) | CONTROL FLOW (L/s) | TOTAL FLOW (L/s) | REDUCTION IN FLOW (L/s or %)** |
| 1:2 YR | 81.6 | 17.4 [33.5 L/s/ha] | 2.9 | 2.8* | 5.1* | 2.2* | 10.1* | 13.0 | 68.6 or 84% |
| 1:5 YR | 110.8 | | 4.0 | 3.3* | 6.8* | | 12.3* | 16.3 | 94.5 or 85% |
| 1:100 YR | 212.6 | | 8.1 | 5.5* | 9.5* | | 17.2* | 25.3 | 187.3 or 88% |

* TOTAL CONTROLLED FLOW IS LESS THAN THE TARGET CONTROL RATE (EXCLUDING A-0 DUE TO DIFFERENT TIMES TO PEAK)
**REDUCED FLOW COMPARED TO PRE-DEVELOPMENT UNCONTROLLED CONDITIONS

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.

Granite Curling Club of West Ottawa

MORLEY HOPPNER


OWNER INFORMATION
GRANITE CURLING CLUB of WEST OTTAWA
2026 SCOTT STREET, OTTAWA, ON K1Z 6T1
TELEPHONE: 613-722-1843
manager@OttawaGranite.com

DESIGN BUILDER INFORMATION
MORLEY HOPPNER INC.
1818 BRADLEY SIDE ROAD, OTTAWA, ON K0A 1L0
CONTACT: KEN HOPPNER, CEO
TELEPHONE: 613-831-5490
khoppner@morleyhoppner.com


| No. | REVISION | DATE | BY |
|---|---|---|---|
| 1 | ISSUED FOR SITE PLAN APPROVAL | JUL 26/21 | FST |

SCALE 1:250

DESIGN DWM
CHECKED FST
DRAWN DWM
CHECKED FST
APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041399 JULY 26, 2021 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
2740 QUEENSVIEW DRIVE

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 121127-00
REV 1
DRAWING No. 121127-GP

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## LEGEND

| | |
|---|---|
| 70.60 | PROPOSED ELEVATION |
| + 70.65 | EXISTING ELEVATION |
| 2.0% | GRADE AND DIRECTION |
| | MAXIMUM 3:1 SIDESLOPE |
| 70.90 | PROPOSED TERRACE ELEVATION |
| SAN MH 01 | PROPOSED SANITARY MANHOLE |
| STM MH 03 | PROPOSED STORM MANHOLE |
| HYD VB | PROPOSED HYDRANT AND VALVE |
| CBMH 01 | PROPOSED CATCHBASIN MANHOLE |
| CB 02 | PROPOSED CATCHBASIN |
| | PROPOSED SILT FENCING (OPSD 219.110) |
| | EMERGENCY OVERLAND FLOW ROUTE |
| | PROPERTY LINE |
| FFE | FINISHED FLOOR ELEVATION |
| T/FND | TOP OF FOUNDATION WALL ELEVATION |
| USF | UNDERSIDE OF FOOTING ELEVATION |
| | BUILDING ENTRANCE / EXIT |

| | |
|---|---|
| | EXISTING CONCRETE CURB |
| V&VB | EXISTING VALVE & VALVE BOX |
| SP | EXISTING SERVICE POST |
| HYD | EXISTING HYDRANT |
| COMB MH | EXISTING COMBINED MH |
| CBMH | EXISTING CATCHBASIN |
| CB | EXISTING CATCHBASIN MH |
| EX UP | EXISTING UTILITY POLE C/W GUY WIRES |
| | EXISTING FENCE |
| O/H WIRES | EXISTING OVERHEAD WIRES |
| 1:5 YR / 1:100 YR | APPROXIMATE PONDING LIMITS |
| | PROPOSED HYDRO TRANSFORMER |

## GENERAL NOTES:

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10. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARD SURFACED AREAS AND DIMENSIONS.
11. REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' (R-2021-066) 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).

## GRADING NOTES:

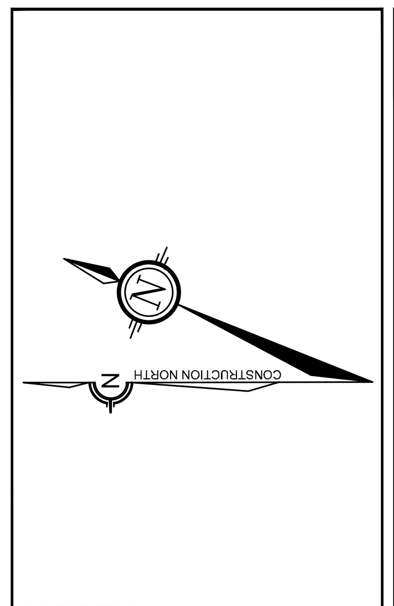
1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL 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 99% 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. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
9. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
10. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING THE AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN.

## PAVEMENT STRUCTURE:

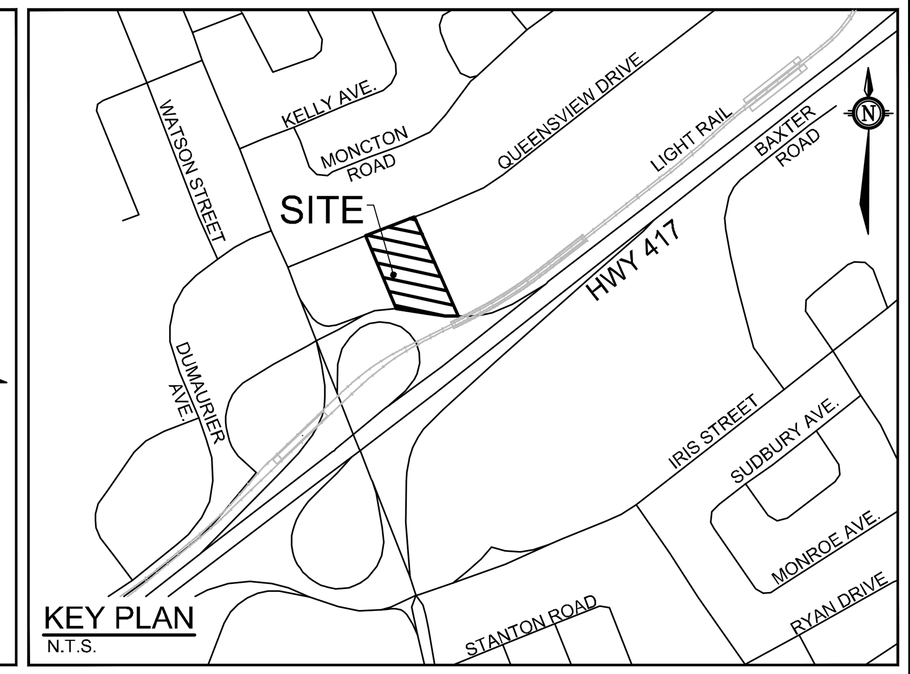
NEW LIGHT DUTY PAVEMENT
50mm SUPERPAVE 12.5
150mm GRANULAR "A"
300mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34

NEW HEAVY DUTY PAVEMENT
40mm SUPERPAVE 12.5
50mm SUPERPAVE 19.0
150mm GRANULAR "A"
450mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34

HEAVY DUTY PAVEMENT - ROADWAY RE-INSTATEMENT
MATCH EXISTING GRANULAR STRUCTURE OF ROADWAY
MATCH EXISTING ASPHALT THICKNESSES
NEW ASPHALT GRADE: PG 58-34



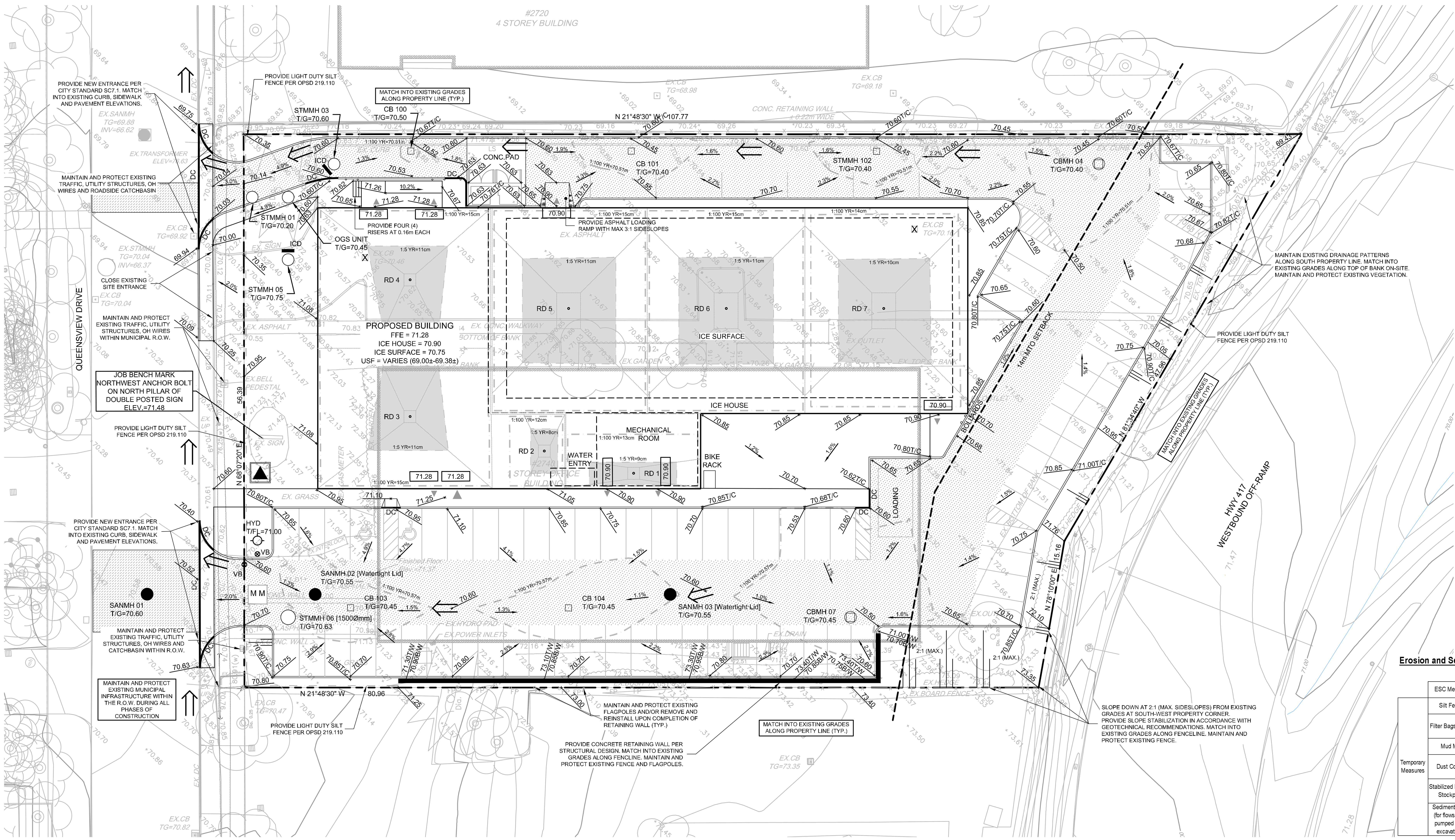

NORTH

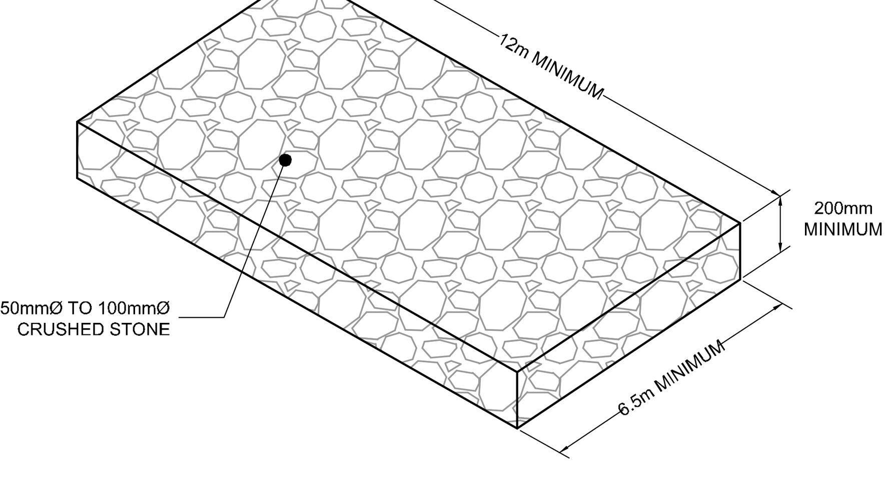



KEY PLAN
N.T.S.

## EROSION AND SEDIMENT CONTROL NOTES :

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. 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.
3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER BAGS WILL BE PLACED UNDER GRATES OF NEARBY SURFACE CATCHBASINS AND MANHOLE STRUCTURES. TERRAFIX 8" ULTRA SILT SOCK (FILTER SOCK) IS TO BE USED AT THE OPENING OF ALL CURB INLET CATACHBASINS. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED (PER OPSD 219.110) AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). IN AREAS WHERE SILT FENCING CANNOT BE INSTALLED PER OPSD 219.110 (i.e. HARD SURFACES), A FILTER SOCK SHALL BE SUBSTITUTED. THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. 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.
5. 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.
6. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
7. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE ENGINEER AND/OR MUNICIPALITY.
8. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS.




MUD MAT DETAIL
NOT TO SCALE

**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 Bags/Socks | 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 |

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.


Granite Curling Club of West Ottawa

MORLEY HOPPNER

OWNER INFORMATION
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manager@OttawaGranite.com

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khoppner@morleyhoppner.com


| No. | REVISION | DATE | BY |
|---|---|---|---|
| 1 | ISSUED FOR SITE PLAN APPROVAL | JUL 26/21 | FST |

SCALE 1:250

1:250
0 2 4 6 8 10

DESIGN DWM
CHECKED FST
DRAWN DWM
CHECKED FST
APPROVED FST

**FOR REVIEW ONLY**

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
JULY 26, 2021
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
2740 QUEENSVIEW DRIVE

DRAWING NAME
GRADING AND EROSION & SEDIMENT CONTROL PLAN

PROJECT No. 121127-00
REV REV 1
DRAWING No. 121127-GR


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## LEGEND

- PROPOSED BARRIER CURB
- DC — PROPOSED DEPRESSED CURB
- DRAINAGE AREA LIMITS
- A-1 / 0.114 / 0.80 — POST-DEVELOPMENT AREA ID; POST-DEVELOPMENT DRAINAGE AREA (ha); 1:5 YEAR WEIGHTED RUNOFF COEFICIENT
- CBMH 01 — PROPOSED CATCHBASIN MANHOLE
- CB 02 — PROPOSED CATCHBASIN
- FFE — FINISHED FLOOR ELEVATION
- T/FND — TOP OF FOUNDATION WALL ELEVATION
- USF — UNDERSIDE OF FOOTING ELEVATION
- PROPOSED STORM SEWER AND FLOW DIRECTION
- EMERGENCY OVERLAND FLOW ROUTE
- PROPOSED BUILDING ENTRANCE / EXIT
- STM MH — EXISTING STORM MH & SEWER
- CB — EXISTING CATCHBASIN C/W CATCHBASIN LEAD
- 1:5 YR / 1:100 YR — APPROXIMATE PONDING LIMITS
- PROPOSED HYDRO TRANSFORMER

## 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 INVESTIGATION REPORT (Ref.No.: PG4353-2, DATED MAY 19, 2021), 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 HARDSURFACE AREAS AND DIMENSIONS.
11. REFER TO THE DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT(R-2021-066) 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).

### INLET CONTROL DEVICE DATA TABLE - AREA A-1

| DESIGN EVENT | ICD TYPE (PLUG TYPE) | OUTLET STRUCTURE | DIAMETER OF OUTLET PIPE (mm) | PEAK DESIGN FLOW (L/s) | DESIGN HEAD (m) | WATER ELEVATION (m) | VOLUME ($m^3$) | AVAILABLE STORAGE |
|---|---|---|---|---|---|---|---|---|
| 1:2 YR | IPEX TEMPEST VORTEX LMF 65 | 1200mmØ STM MH 03 | 200mmØ PVC | 2.8 | 0.46 | 68.90 | 17.4 | 69.9 $m^3$ |
| 1:5 YR | | | | 3.3 | 0.71 | 69.15 | 23.8 | |
| 1:100 YR | | | | 5.5 | 2.07 | 70.51 | 37.0 | |

### INLET CONTROL DEVICE DATA TABLE - AREA A-2

| DESIGN EVENT | ICD TYPE (PLUG TYPE) | OUTLET STRUCTURE | DIAMETER OF OUTLET PIPE (mm) | PEAK DESIGN FLOW (L/s) | DESIGN HEAD (m) | WATER ELEVATION (m) | VOLUME ($m^3$) | AVAILABLE STORAGE |
|---|---|---|---|---|---|---|---|---|
| 1:2 YR | IPEX TEMPEST VORTEX LMF 85 | 1200mmØ STM MH 05 | 200mmØ PVC | 5.1 | 0.56 | 69.00 | 26.0 | 66.1 $m^3$ |
| 1:5 YR | | | | 6.8 | 1.04 | 69.48 | 31.0 | |
| 1:100 YR | | | | 9.5 | 2.13 | 70.57 | 52.6 | |

### PROPOSED SITE FLOWS & STORMWATER MANAGEMENT TABLE

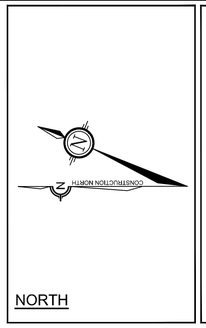
| DESIGN EVENT | PRE-DEVELOPMENT CONDITIONS | | POST-DEVELOPMENT CONDITIONS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | SITE FLOWS (L/s) | TARGET CONTROL RATE (L/s) | A-0 FLOW (L/s) | A-1 FLOW (L/s) | A-2 FLOW (L/s) | R-1 FLOW (L/s) | CONTROL FLOW (L/s) | TOTAL FLOW (L/s) | REDUCTION IN FLOW (L/s or %)** |
| 1:2 YR | 81.6 | 17.4 [33.5 L/s/ha] | 2.9 | 2.8* | 5.1* | 2.2* | 10.1* | 13.0 | 68.6 or 84% |
| 1:5 YR | 110.8 | | 4.0 | 3.3* | 6.8* | | 12.3* | 16.3 | 94.5 or 85% |
| 1:100 YR | 212.6 | | 8.1 | 5.5* | 9.5* | | 17.2* | 25.3 | 187.3 or 88% |

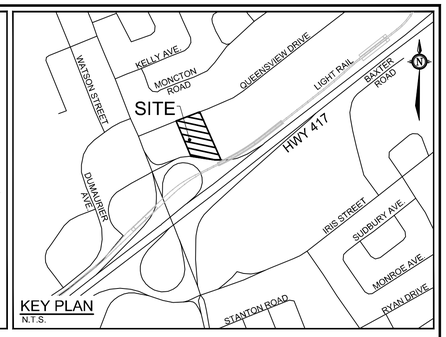
* TOTAL CONTROLLED FLOW IS LESS THAN THE TARGET CONTROL RATE (EXCLUDING A-0 DUE TO DIFFERENT TIMES TO PEAK)
**REDUCED FLOW COMPARED TO PRE-DEVELOPMENT UNCONTROLLED CONDITIONS

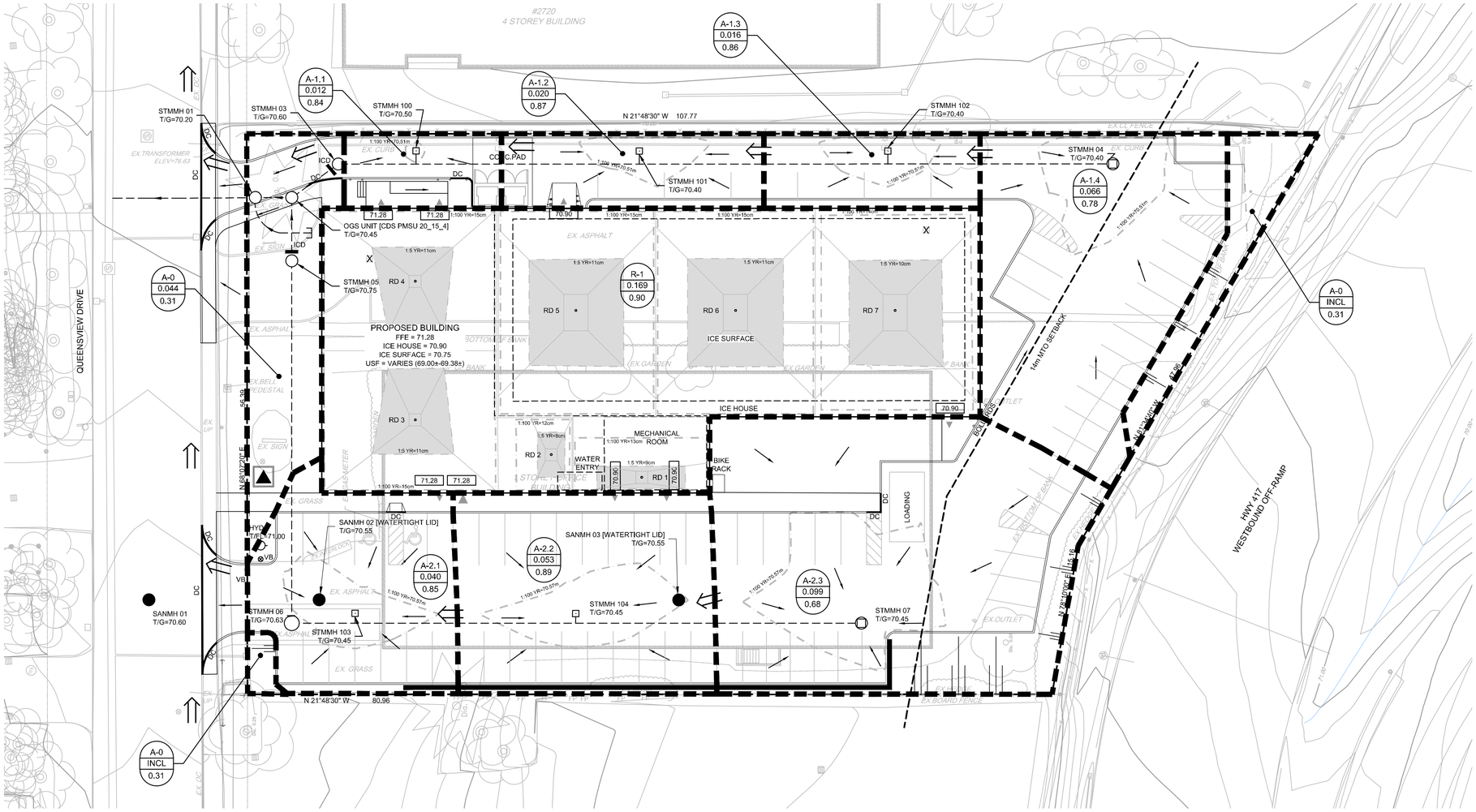
### PROPOSED ROOF DRAIN TABLE: AREA R-1 (ROOF DRAINS 1 to 7)

| AREA ID * | ROOF DRAIN No. (WATTS MODEL) | ROOF DRAIN OPENING SETTING | 1:5 YEAR RELEASE RATE | APPROX. 5-YR PONDING DEPTH | 1:100 YEAR RELEASE RATE | APPROX. 100-YR PONDING DEPTH |
|---|---|---|---|---|---|---|
| R-1 | RD 1 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 9 cm | 0.32 L/s | 13 cm |
| R-1 | RD 2 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 8 cm | 0.32 L/s | 12 cm |
| R-1 | RD 3 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 4 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 5 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 6 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 11 cm | 0.32 L/s | 15 cm |
| R-1 | RD 7 (RD-100-A-ADJ) | CLOSED | 0.32 L/s | 10 cm | 0.32 L/s | 14 cm |

* REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' (R-2021-066) PREPARED BY NOVATECH FOR DRAINAGE AREA IDENTIFIERS AND STORMWATER MANAGEMENT DETAILS.
**ALL CONTROLLED FLOW ROOF DRAINS FOR THE PROPOSED BUILDINGS TO BE WATTS 'ADJUSTABLE ACCUTROL' ROOF DRAINS.

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Granite Curling Club of West Ottawa

MORLEY HOPPNER

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manager@OttawaGranite.com

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khoppner@morleyhoppner.com

| No. | REVISION | DATE | BY |
|---|---|---|---|
| 1 | ISSUED FOR SITE PLAN APPROVAL | JUL 26/21 | FST |

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| CHECKED | FST |
| APPROVED | FST |

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041399 JULY 26, 2021 PROVINCE OF ONTARIO


NOVATECH
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Website www.novatech-eng.com


LOCATION
CITY OF OTTAWA
2740 QUEENSVIEW DRIVE

DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 121127-00
REV REV 1
DRAWING No. 121127-SWM

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