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PROJECT PYTHON
222 CITIGATE DRIVE

Servicing and Stormwater Management Report

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222 CITIGATE DRIVE
OTTAWA, ONTARIO

SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared By:

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Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
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Issued: April 9, 2020

Novatech File: 120025
Report Ref: R-2020-044

April 9, 2020

City of Ottawa
Planning Infrastructure and Economic Development Department
110 Laurier Avenue West, 4th Floor
Ottawa, ON
K1P 1J1

Attention: **Jeffrey Shillington**

Reference: **222 CitiGate Drive, Ottawa**
Servicing and Stormwater Management Report
Novatech File No.: 120025

Please find enclosed the 'Servicing and Stormwater Management Report' for the above noted project. This report is prepared in support of the Site Plan Application and is hereby submitted for review and approval.

Should you have any questions or comments, please do not hesitate to contact us.

Sincerely,

NOVATECH

Lee Sheets, C.E.T.

Director | Land Development & Public Sector Engineering

cc:

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General Plan of Services	(120025-GP, GP1, GP2, GP3, GP4)
Grading Plan	(120025-GR, GR1, GR2, GR3, GR4)
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ENCLOSED CD

- Report (pdf)
- Drawings (pdf)
- PCSWMM Packaged Model Files
    - 100-year 3-hour Chicago Storm

1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed development located at 222 CitiGate Drive within Ottawa, Ontario. This report will support a Site Plan Application for the proposed development. **Figure 1** is a Key Plan showing the site location.

This report outlines the site sanitary and water servicing, along with the proposed storm drainage and stormwater management strategy for the proposed development.

1.1 Existing Conditions

The total site area is approximately 26.0 hectares in size and is located within the CitiGate Development southeast of the Highway 416 and Fallowfield Road interchange. The site is registered as Block 13 on the registered Plan 4M-1538 of the CitiGate Development and has a municipal address of 222 CitiGate Drive. The site is bounded by Fallowfield Drive to the north, the O'Keefe Municipal Drain and the future CitiGate Drive extension to the East, vacant land to the South, and Highway 416 to the west. The topography of the site slopes easterly towards the O'Keefe Municipal Drain and the future CitiGate Drive extension. **Figure 2** shows the existing site conditions and **Figure** 3 shows the subject site with respect to the surrounding areas.

It should be noted that the CitiGate Drive extension has received City of Ottawa approval and the works will be constructed prior to the occupancy of this proposed development. The scope of work is for the construction of Systemhouse Street and CitiGate Drive extensions including the underground watermain and storm sewer infrastructure. For the purposes of this report the watermain and storm sewer extensions in CiteGate Drive and Systemhouse Street will be considered as existing.

1.2 Proposed Development

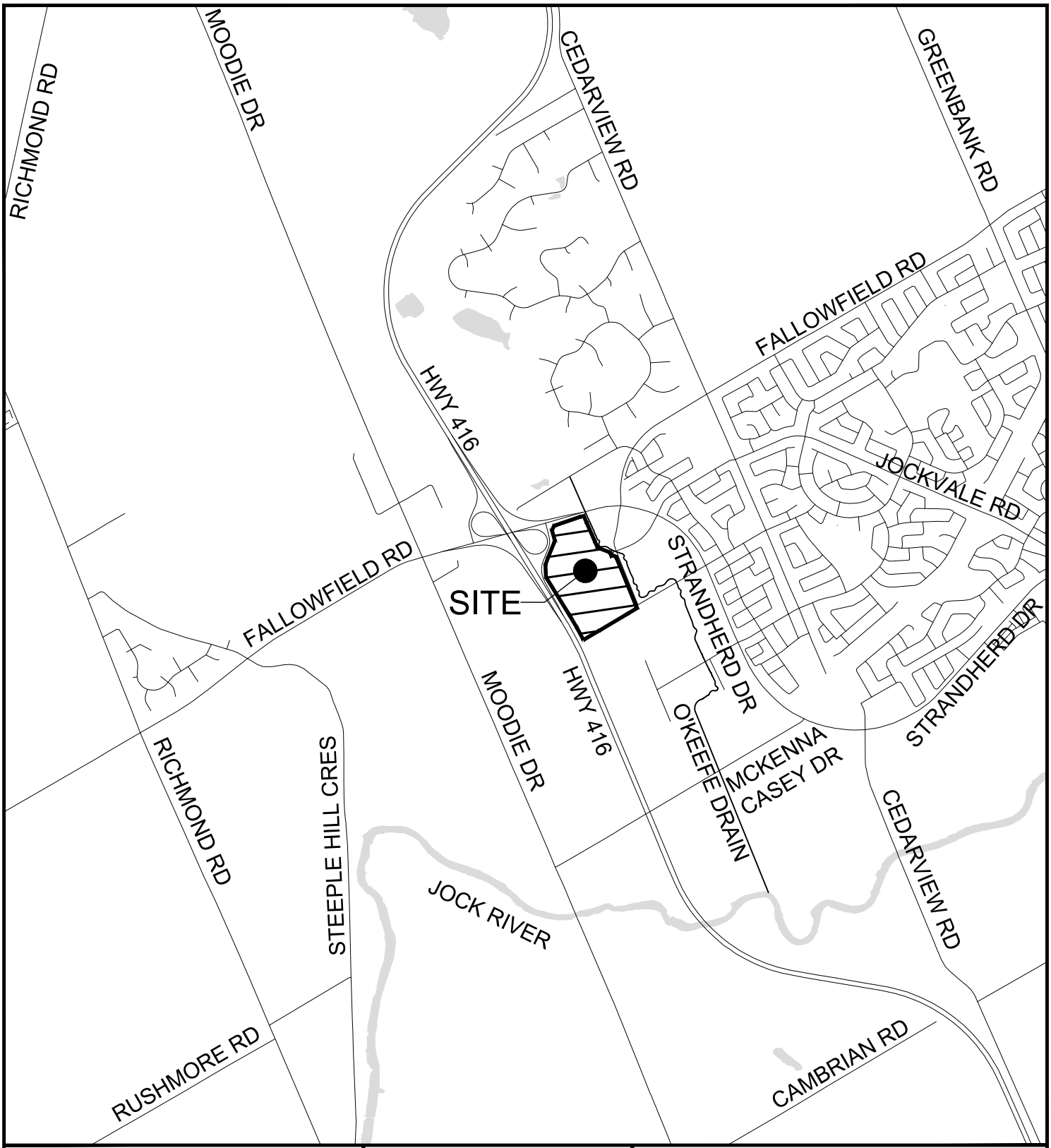
The proposed development consists of a single prestige office/light industrial building, truck and trailer parking and staff parking lots which will cover approximately 23.5 hectares of the 26.0 hectare site. The remaining 2.5 hectares will remain vacant for the time being with the potential of a future development. Access to the site would be provided by 4 separate entrances, two from CitiGate Drive and two from the proposed private roadway extension. **Figure 4** shows the proposed development.

It should be noted that this report should be read in conjunction with the engineering drawing set:

120025-ND	Notes and Details
120025-GP	General Plan of Services
120025-GR	Grading Plan
120025-ESC	Erosion Sediment Control Plan

1.3 Site Design and Constraints

As indicated previously the subject site is part of the CitiGate Development. Design criteria and information for the CitiGate Development is provided in a report entitled '*CitiGate 416 Corporate Campus, Detailed Servicing and Stormwater Management Report (Phase 1)*' prepared by Novatech, dated January 9, 2015 (CitiGate Phase 1 Report). The CitiGate Phase 1 Report provides design criteria for the interior sites and designed the overall servicing systems including sanitary sewers, watermain and stormwater management systems. Each system is discussed in more detail in the appropriate sections of this report.



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PROJECT PYTHON CITIGATE DRIVE

KEYPLAN

SCALE		
N.T.S		
DATE	JOB	FIGURE
APR 2020	120025	FIG-1

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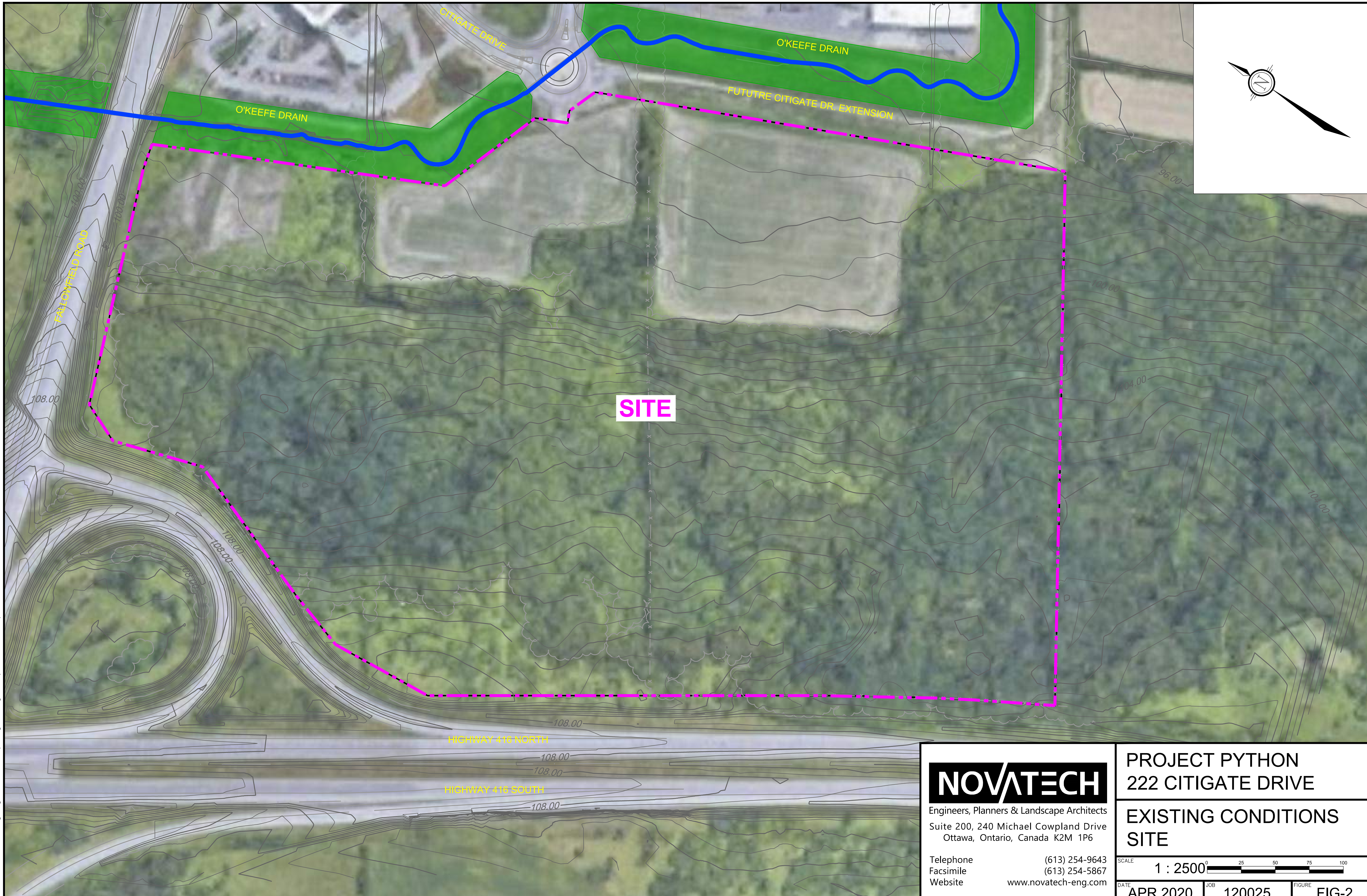

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PROJECT PYTHON
222 CITIGATE DRIVE

EXISTING CONDITIONS
SITE

SCALE 1 : 2500 (0, 25, 50, 75, 100)

DATE APR 2020 | JOB 120025 | FIGURE FIG-2

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STRANDHERD DRIVE
CROSSKEYS PLACE
SYSTEMHOUSE STREET
STRANDHERD DRIVE
TEMPORARY PUMP STATION
O'KEEFE DRAIN
CITIGATE DRIVE
EX SWMF
DEALERSHIP DRIVE
O'KEEFE DRAIN
FUTURE CITIGATE DR. EXTENSION
O'KEEFE DRAIN
FALCONFIELD DRIVE
SITE
HIGHWAY 416 NORTH
HIGHWAY 416 SOUTH

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PROJECT PYTHON
222 CITIGATE DRIVE

EXISTING CONDITIONS OVERALL

SCALE 1 : 5000 (0, 50, 100, 150, 200)

DATE APR 2020 | JOB 120025 | FIGURE FIG-3

SHT11X17.DWG - 279mmX432mm

CITIGATE DR.

O'KEEFE DRAIN

O'KEEFE DRAIN

FUTURE CITIGATE DR. EXTENSION

FALLOWFIELD DRIVE

222 CITIGATE DRIVE
PROPOSED BUILDING

LANDS NOT OWNED BY APPLICANT
(PARKS LANDS)

HIGHWAY 416

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PROJECT PYTHON
CITIGATE DRIVE

PROPOSED SITE PLAN

SCALE 1 : 2500 (0, 25, 50, 75, 100)

DATE APR 2020 | JOB 120025 | FIGURE FIG-4

SHT11X17.DWG - 279mmX432mm

A geotechnical investigation was completed for the subject development and a report provided entitled '*Geotechnical Investigation, Proposed Python Building Complex, CitiGate Drive,* Ottawa, Ontario' prepared by Paterson Group dated March 30, 2020. The following criteria is to be included in the servicing and grading design:

- Groundwater level is estimated to be between 3 to 4 meters below existing grade.
- Bedrock elevation fluctuates over the site and is estimated between 0 to 15 meters below existing grade.
- The report also provides detailed asphalt and concrete compositions along with pipe bedding and foundation cover requirements for the site.
- There is a recommended permissible grade raise restriction for this site of 2 to 3 meters for the access roadways and parking areas on the east side of the proposed building.
- A preloading program for 8 to 12 months should be implemented to eliminate all post construction settlement.
- It should also be noted that an MECP permit to take water category 3 may be required if more than 400,000 L/day of ground and/or surface water is to be pumped during construction.

1.4 Background Reports

This report provides information on the considerations and approach by which Novatech has designed and evaluated the proposed servicing and stormwater management strategies. This report should be read in conjunction with the following:

- *CitiGate 416 Corporate Campus Detailed Servicing and Stormwater Management Report (Phase1), prepared by Novatech revised dated January 9, 2015.*
- *Geotechnical Investigation, Proposed Python Building Complex, CitiGate Drive, Ottawa, ON, prepared by Paterson Group dated March 30,2020.*

2.0 WATER SERVICING

2.1 Existing Water Services

There is an existing 200mm diameter watermain in CitiGate Drive and a 250mm diameter watermain in Crosskey Place that were constructed as part of the Phase 1 CitiGate development. This watermain infrastructure currently terminates at the extents of the CitiGate Drive and Crosskey Place round-a-bout right-of-way limits. There is also an existing 250mm diameter watermain in Systemhouse Street which is capped on the west side of the realigned O'Keefe drain. Each watermain described is connected to the existing 400mm diameter watermain in Strandherd Drive.

As previously mentioned, the existing 250mm diameter watermain in CitiGate Drive is to extend from its termination point at the round-a-bout to the capped 250mm watermain in Systemhouse Street. For the purposes of this report the 250mm diameter watermain extension in CitiGate Drive will be referred to as existing. Refer to **Figure 5** Existing Water Servicing for more details.

2.2 Proposed Water Servicing

It is proposed to service the development by constructing approximately 320 meters of 250mm diameter private watermain on site. The private watermain on site will provide service to both the 100mm diameter domestic building service connection and the fire suppression water storage tank. The proposed 250mm diameter watermain on site will connect to the existing 250mm watermain in CitiGate Drive near the south east corner of the site. As per the City of Ottawa Technical Bulletin ISDTB-2014-02, the proposed development will require two service connections as the average day demand is greater than 50 cubic meters of water. The two services will be separated by an isolation valve on the existing watermain system in the event maintenance on the system is required. A water meter chamber will be required on the private watermain near the property line due to the large quantity of pipe and the potential for leakage. Refer to the General Plan of Services (120025-GP) for water servicing details.

2.2.1 Proposed Domestic Water Demands

Design Criteria from the City of Ottawa Water Distribution Guidelines and Section 8 of the Ontario Building Code were used to calculate the theoretical water demands for proposed development. The demand calculations are based on flow requirements for the proposed different uses on site.

The water demand calculations for the proposed development are calculated based on the following criteria:

- Industrial Water Demand
  - per each water closet = 950L/day
  - per each loading bay = 150L/day (each)
- Commercial Office Water Demand
  - per each 9.3m² floor space = 75L/day
- Peaking Factor
  - Max Day = 1.5
  - Peak Hour = 1.8

The domestic water demands for the proposed development are summarized in **Table 2.1** below.

STRANDHERD DRIVE

FALLOWFIELD ROAD

STRANDHERD DRIVE

CROSSKEYS PLACE

SYSTEMHOUSE STREET

DEALERSHIP DRIVE

CITIGATE DRIVE

O'KEEFE DRAIN

O'KEEFE DRAIN

O'KEEFE DRAIN

O'KEEFE DRAIN

O'KEEFE DRAIN

FUTURE CITIGATE DR. EXTENSION

EXISTING
SWM POND

FALLOWFIELD ROAD

222 CITIGATE DRIVE
PROPOSED BUILDING

HIGHWAY 416

LEGEND

PROPOSED 250mmØ WATERMAIN
(CITIGATE DRIVE EXTENSION)

EXISTING 200mmØ WATERMAIN

EXISTING 250mmØ WATERMAIN

EXISTING 400mmØ WATERMAIN

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PROJECT PYTHON
222 CITIGATE DRIVE

EXISTING WATERMAIN SERVICING

SCALE 1 : 5000 (0, 50, 100, 150, 200)

DATE APR 2020 | JOB 120025 | FIGURE 5

Table 2.1: Domestic Water Demand Summary

Use	Ave. Daily Demand (L/s)	Max. Daily Demand (L/s)	Peak Hour Demand (L/s)
Industrial Flows	1.197	1.795	3.231
Commercial Flows	0.268	0.402	0.723
Total Domestic Demands	**1.46**	**2.20**	**3.95**

2.2.2 Proposed Fire Protection System

The fire flow calculations and fire protection system for this type of development are complex so Civelec Consulting Inc. a specialized fire consulting engineer was retained. They have calculated the required fire flow for the development to be 1750 USGPM. Civelec has also designed the fire protection infrastructure on site which includes the following:

- The proposed 250mm diameter watermain on site provides water to the driving fire pump and provides water as required to fill the 950,000-liter fire suppression water storage tank which provides water to the standby fire pump.
- Two internal fire pump rooms in the southwest corner of the building contains 2 pumps which draw water from the city watermain and from fire suppression storage tank to pressurize the system and to control the fire as required.
- There are approximately 1140 meters of 250mm diameter high pressure fire protection watermain that loops around the building.
- There are eight proposed fire hydrants evenly spaced around the proposed building that are directly connected to the high pressure watermain loop.
- There are multiple connections to the building from the fire loop which supply the internal sprinkler system.
- There are 2 fire hydrants located next to the pump rooms and are connected to the city incoming feed main to allow the firefighter to properly use the siamese connections.

2.3 CitiGate Water Allotment and Hydraulic Analysis

An update to the original CitiGate Phase 1 hydraulic analysis is to be completed as part of the CitiGate Drive and Systemhouse Street watermain extension project. The domestic water demands, and fire flow calculations were revised and resubmitted to the City of Ottawa for updated boundary conditions. The boundary conditions were requested from the existing 400mm watermain on Strandherd Drive.

At the time of this submission the City had not yet provided the new boundary conditions to update the CitiGate hydraulic model. The requested boundary conditions include a domestic demand and fire flow allotment for block 13. This demand allotment was calculated based on overall land use using the following criteria provided in Section 4 of City of Ottawa Design Guidelines – Water Distribution:

- Site Area Block 13 = 25.1ha
- Light Industrial Water Demand = 35,000L/ha/day
- Peaking Factor
    - Max Day = 1.5 ; Peak Hour = 1.8
- Fire Flows = Fire Underwriters Survey

The water demand allotments are summarized below in **Table 2.3**.

Table 2.2: Water Demand Allotment Summary

Model Node ID	Block No.	Fire Flow (L/s)	Avg Day (L/s)	Max Day (L/s)	Peak Hour (L/s)
36	Block 13	267	10.17	15.25	20.70

Once the updated boundary conditions are received the hydraulic model will be updated to include the block 13 allotment. The CitiGate phase 1 hydraulic model was prepared using EPANET software for purposes of analyzing the performance of the proposed and existing watermain systems for three theoretical conditions:

1. High Pressure check under Average Day conditions
2. Peak Hour demand
3. Maximum Day + Fire Flow demand.

The phase 1 model doesn't include block 13 allotment however it does provide a good idea on the available capacity. A summary of the results for node 2 from the CitiGate phase 1 model are provided below in **Table 2.3**.

Table 2.3: Hydraulic Analysis Summary

Condition	Service Connection Location	Node ID	Min/Max Allowable Operating Pressures (psi)	Operating Pressures (psi)
High Pressure	CitiGate Dr	2	80psi (Max)	83.3
Max Day + Fire Flow	CitiGate Dr	2	20psi (Min)	65.1 (Fire at node 16)
Peak Hour	CitiGate Dr	2	40psi (Min)	73.8

The theoretical domestic water demand and fire flows calculated based on the specific building use are much lower than the flows accounted for in the CitiGate watermain extension design. The flows accounted for in CitiGate design are conservative and would allow for future development on the site. Based on the CitiGate Phase 1 hydraulic water model results for node 2 the existing watermain infrastructure can provide adequate pressures for domestic use and flows for fire protection. It is recommended to install a pressure reduction valve on the proposed private water service as pressures exceed 80psi in the average day condition. Once the City has provided updated boundary conditions the hydraulic model will be revised and provided in a subsequent submission prior to final approval.

Refer to **Appendix A** for water demand and fire flow calculations, detailed model results from the CitiGate Phase 1 report, model schematics and boundary conditions.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Services

There is an existing 300mm diameter sanitary sewer fronting the site in CitiGate Drive that was constructed as part of the Phase 1 CitiGate development. The conveyance of the existing sanitary sewer is as follows:

- Sanitary flows for this portion of the CitiGate development are conveyed south on CitiGate Drive and east on Systemhouse Street via a 300mm diameter sewer.
- The 300mm diameter sewer then connects to a 525mm diameter sewer in Strandherd Drive where flows are conveyed south to an interim pump station at the corner of Strandherd Drive and Dealership Drive.
- The pump station conveys flows in the interim condition to a gravity sewer which outlets to the Tartan Pump Station.
- In the ultimate condition sanitary flows from the development will be conveyed by the 300mm sewer in CitiGate Drive and Systemhouse Street to the South Nepean Collector Trunk sewer in Strandherd Drive.

Refer to **Figure 6** Existing Sanitary Servicing for more details.

3.2 Proposed Sanitary Services

It is proposed to service the development by constructing approximately 810m of 250mm diameter private sanitary sewer on site. The proposed 250mm diameter sewer will outlet to the existing 300mm diameter sanitary sewer in CitiGate Drive at the far south east corner of the site as recommended in the CitiGate Phase 1 Report. Refer to the General Plan of Services (120025-GP) for details.

3.2.1 Proposed Peak Sanitary Flows

The total theoretical peak sanitary flow for the proposed development was calculated based on the following criteria from Section 4 of the City of Ottawa Sewer Design Guidelines and Section 8 of the Ontario Building Code:

- Site Area Block 13 = 26.01ha
- Industrial Sanitary Flow
  - per each water closet = 950L/day
  - per each loading bay = 150L/day (each)
- Commercia Office Sanitary Flow
  - per each 9.3m² floor space = 75L/day
- Commercial Peaking Factor = 1.5
- Light Industrial Peaking Factor = 3.5 (Appendix 4-B)
- Infiltration Rate = 0.33L/s/ha

The proposed sanitary flows are summarized below in **Table 3.1**.

STRANDHERD DRIVE

SYSTEMHOUSE STREET

CROSSKEYS PLACE

FALLOWFIELD ROAD

STRANDHERD DRIVE

CITIGATE DRIVE

O'KEEFE DRAIN

FUTURE CITIGATE DR. EXTENSION

O'KEEFE DRAIN

222 CITIGATE DRIVE
PROPOSED BUILDING

FALLOWFIELD ROAD

HIGHWAY 416

INTERIM PUMP STATION

ULTIMATE CONNECTION TO SOUTH NEPEAN COLLECTOR

DEALERSHIP DRIVE

O'KEEFE DRAIN

EXISTING SWM POND

O'KEEFE DRAIN

O'KEEFE DRAIN

N

LEGEND

- EXISTING 250mmØ SANITARY SEWER
- EXISTING 300mmØ SANITARY SEWER
- EXISTING 375mmØ SANITARY SEWER
- EXISTING 450mmØ SANITARY SEWER
- EXISTING 525mmØ SANITARY SEWER
- FUTURE 525mmØ TRUNK SANITARY SEWER
- SANITARY MANHOLE

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PROJECT PYTHON
222 CITIGATE DRIVE

EXISTING SANITARY SERVICING

SCALE 1 : 5000 (0, 50, 100, 150, 200)

DATE APR 2020 | JOB 120025 | FIGURE 6

Table 3.1: Peak Sanitary Flow Summary

Proposed Use	Peak Flow (L/s)
Industrial Flows	4.19
Commercial Flows	0.40
Sewer Infiltration Flow	8.58
Total Peak Flows	**13.17**

3.3 CitiGate Sanitary Flow Allotment

The proposed development block 13 was originally designed as block 14 and 15 in the original CitiGate Phase 1 report. The sanitary flow allotment for each block was calculated in CitiGate Phase 1 report using the following criteria provided in Section 4 of City of Ottawa Sewer Design Guidelines:

- Site Area Block 14 = 18.03ha
- Site Area Block 15 = 7.98ha
- Design Sanitary Flow = 50,000L/ha/d (Commercial/Institutional Flow Rate)
- Commercial Peaking Factor =1.5
- Infiltration Rate = 0.28L/s/ha

The sanitary flow allotments are summarized below in **Table 3.2**.

Table 3.2: Sanitary Flow Allotment Summary

Block No.	Peak Flow (L/s)	Infiltration Flow (L/s)	Total Peak Design Flow (L/s)
Block 14	15.65	5.05	20.70
Block 15	6.93	2.23	9.16
Total Allocation for Block 13	**22.58**	**7.28**	**29.86**

The Sanitary Sewer Design Sheet provided in the CitiGate Phase 1 Report shows the total sanitary flow allotment for the Block 13 development area to be 29.86 L/s. A copy of the sanitary drainage area plans and sanitary sewer design sheet from the CitiGate Phase 1 Report are included in **Appendix B** for reference.

The proposed 250mm diameter sanitary sewer on site has a theoretical capacity of 34.1 L/s at the proposed slope of 0.3%. Therefore, there is adequate capacity in the proposed infrastructure to convey the required peak flow of 13.17L/s from the site. Also, based on the total flow allotment of 29.86L/s from CitiGate Phase 1 Report there is capacity in the existing infrastructure for the proposed development. Refer to **Appendix B**, for the proposed detailed sanitary flow calculations and sanitary sewer design sheets from the CitiGate Phase 1 report.

4.0 STORM SERVICING AND STORMWATER MANAGEMENT

The storm servicing and stormwater management strategy for the site is based on the established criteria in the 2015 CitiGate SWM Report.

4.1 Existing Off-Site Storm Infrastructure – CitiGate (Phase 1)

The storm infrastructure servicing the CitiGate (Phase 1) lands includes a stormwater management facility (SWM Facility 'A') and storm sewers with sizes ranging from 1800mm to 1950mm in diameter. The storm sewer system extends from the north outlet to the SWM facility, to the roundabout, along an extension of CitiGate Drive. Currently only the storm infrastructure at the north outlet to the SWM Facility is constructed. The storm sewer will be extended to the roundabout in advance of the development of the site. Refer to **Figure 7** – Existing Storm Servicing.

The CitiGate Drive storm sewer receives drainage from the proposed development, CitiGate Drive storm infrastructure, and existing flows from the Parks lands. The Parks lands are located between the proposed development and the SWM Facility. Flows are currently collected via a ditch-inlet catchbasin (DICB). The future development of the Parks lands will also outlet to the SWM Facility.

The SWM Facility was designed to provide stormwater quality and quantity control before outlettting to the O'Keefe Drain. The facility was sized to accommodate all future development within the tributary drainage area, including Phases 1 & 2, and adjacent lands.

4.2 Stormwater Management Criteria

4.2.1 Stormwater Quality Control

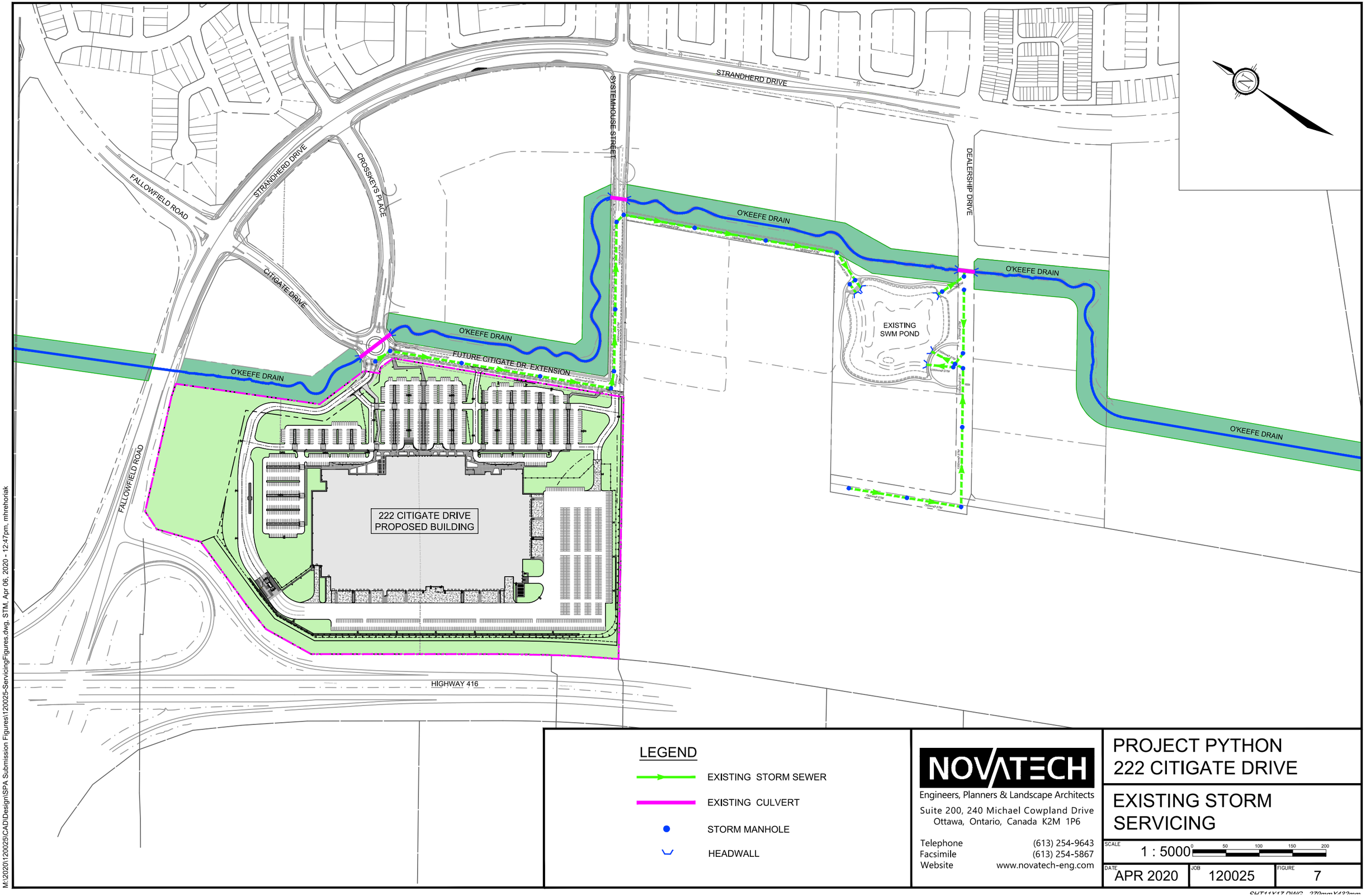
The existing SWM Facility was sized to provide an Enhanced level of stormwater quality control. The permanent pool and extended detention have been sized to provide 80% long-term removal of total suspended solids (TSS).

The future development blocks identified in the 2015 CitiGate SWM Report were estimated to be 85% impervious. The proposed development, including the future development lands to the north, has a total imperviousness of 72.4%. The overall drainage area to the pond will remain unchanged due to the proposed development.

4.2.2 Stormwater Quantity Control – Allowable Release Rate

The 2015 CitiGate SWM Report included the following stormwater management criteria for the future development blocks that drain to SWM Facility 'A' (lands west of the O'Keefe Drain):

- Allowable release rates and storage requirements for individual sites are to be calculated as follows, based on a runoff coefficient of C=0.80:
    - The 5-year peak flow can be released uncontrolled.
- The maximum release rate is not to exceed 120% of the 5-year peak flow for all storms up to and including the 100-year event.
- Ensure no overland flow for all storms up-to and including the 100-year event.



LEGEND

- EXISTING STORM SEWER
- EXISTING CULVERT
- STORM MANHOLE
- HEADWALL

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PROJECT PYTHON
222 CITIGATE DRIVE

EXISTING STORM SERVICING

SCALE 1 : 5000 (0 50 100 150 200)

DATE APR 2020 | JOB 120025 | FIGURE 7

Based on these release rates, it was anticipated that 100 m^3/ha of on-site storage would be enough to prevent major system (overland) flows during the 100-year event.

The proposed development will alter the storm servicing layout that was previously approved as part of the CitiGate (Phase 1). For example, the previous storm servicing layout included a storm sewer for a 'ring-road' that encompassed the entire CitiGate lands. The proposed development includes both the future development blocks and future ring-road; therefore, the allowable release rate specified above would not apply in this case.

The allowable release rate for the proposed development was established using the approved SWMM model that was built for the CitiGate Phase 1 lands using Autodesk Storm and Sanitary Analysis (SSA). Model schematics and output are provided in **Appendix D**.

The proposed development will outlet to storm maintenance holes 208 & 214. Based on the model results, the estimated peak flow (allowable release rate) is as follows:

Structure	Allowable Release Rate
Storm MH208	2,769 L/s
Storm MH214	4,138 L/s

Note that the off-site storm sewer was designed to convey the 5-year peak flow and surcharge during larger storm events. The storm sewer can surcharge as there are no basement connections.

4.3 Proposed On-Site Storm Infrastructure

The on-site storm sewer and stormwater management system will include storm sewers ranging in size from 450mm to 1350mm in diameter. On-site storage will be provided underground using Stormtech MC-3500 & MC-4500 arch-type storage chambers covered in 50mm (D_{50}) clearstone. Peak flows will be attenuated to the allowable release rates specified using orifice plates. Orifice plates will be installed in the following flow control structures:

MH01: 900mm orifice plate
MH11: 900mm orifice plate
MH103: 300mm orifice plate
MH108: 375mm orifice plate
MH118: 250mm orifice plate

The south storm sewer will include two (2) flow control structures connected in series. This is to utilize all of the pipe storage at the higher elevation; instead of providing all of the storage within the chambers at the lower elevation, near the outlet.

No above ground (i.e. surface storage) is accounted for in the storm servicing design. The 100-year peak flow will be attenuated to the allowable release rate via underground storage (at the request of the client).

Refer to the General Plan of Services (Drawing 120025-GP).

4.3.1 Storm Sewer Sizing Criteria

The storm drainage design is based on the principals of dual drainage (i.e. minor and major system). The on-site storm sewers (i.e. minor system) have been designed based on the criteria outlined in the City of Ottawa Sewer Design Guidelines (October 2012) and associated technical bulletins. The design criteria used in sizing the storm sewers are summarized in **Table 4.1**.

Table 4.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Private Roads	5 Year Return Period
Storm Sewer Design	Rational Method
IDF Rainfall Data	Ottawa Sewer Design Guidelines
Initial Time of Concentration (Tc)	10 min
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

Refer to the storm sewer design sheets provided in **Appendix C** and Storm Drainage Area Plan (Drawing 120025-STM).

4.3.2 Overland Flow Sizing Criteria

As previously indicated all flows will be contained underground for all storm events up-to and including the 100-year storm event. Storm events that exceed the 100-year storm will pond on the surface and be conveyed through major system flow pathways. The grading design includes maximum 0.35m of surface ponding before 'spilling' over a high-point. This would happen only in very rare events that exceed the 100-year storm.

Refer to the Grading Plan (Drawing 120025-GR).

4.4 Stormwater Management Modeling

The *City of Ottawa Sewer Design Guidelines* (October 2012) requires hydrologic / hydraulic modeling for all dual drainage systems. The performance of the proposed storm drainage system for the site was evaluated using the PCSWMM hydrologic / hydraulic model.

The PCSWMM model schematics and 100-year model output data are provided in **Appendix D**. Digital copies of the modeling files and model output for all storm events are provided on the enclosed CD.

4.4.1 Design Storms

The hydrologic analysis was completed using the following synthetic design storms that are consistent with the 2015 CitiGate SWM analysis:

- 3-hour Chicago storm distribution
- 12-hour SCS Type II storm distribution

The return periods analyzed include the 5-year & 100-year storm events. The IDF parameters used to generate the design storms were taken from the *City of Ottawa Sewer Design Guidelines* (October 2012).

The 3-hour Chicago distribution generated the highest peak flows for both the minor and major systems and was determined to be the critical storm distribution for the design of the storm drainage system.

The proposed drainage system was also 'stress tested' using a 100-year (+20%) 3-hour Chicago design storm. This design storm has a 20% higher intensity and total volume compared to the 100-year event.

4.4.2 Model Development

The PCSWMM model includes the subcatchment areas to the trunk storm sewer system. Individual drainage areas to each inlet have been lumped together to determine the total area to each pipe run. The purpose of the model is to ensure that the proposed storm drainage and stormwater management system adheres to the allowable release rates specified and that there is no surface ponding during the 100-year storm event.

Infiltration

Infiltration losses for all catchment areas were modeled using Horton's infiltration equation, which defines the infiltration capacity of soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values as specified in the City of Ottawa Sewer Design Guidelines were used for all catchments.

Horton's Equation:

$f(t) = f_c + (f_o - f_c)e^{-k(t)}$

Initial infiltration rate: f_o = 76.2 mm/hr

Final infiltration rate: f_c = 13.2 mm/hr

Decay Coefficient: k = 4.14/hr

Depression Storage

The default values for depression storage in the City of Ottawa were used for all subcatchments.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

The rooftops assumed to provide no depression storage (zero-impervious parameter).

Equivalent Width

'Equivalent Width' refers to the width of the sub-catchment flow path. This parameter (Table 5.1) is calculated as described in Section 5.4.5.6 of the City of Ottawa Sewer Design Guidelines. The flow path lengths are shown on the PCSWMM model schematics provided in **Appendix D**.

Impervious Values

Runoff coefficients for each subcatchment area were determined based on the proposed site plan. Refer to the Storm Drainage Area Plan (120025-SWM) for details. Percent impervious values were calculated using:

$$\%imp = (C - 0.20) / 0.70$$

Storm Drainage Areas

For modeling purposes, the site has been divided into subcatchments based on the drainage areas tributary to each inlet of the proposed storm sewer system. The subcatchment areas are shown on the Storm Drainage Area Plan (120025-SWM).

The hydrologic modeling parameters for each subcatchment were developed based on the Site Plan (**Figure 3**) and Storm Drainage Area Plan specified above. Subcatchment parameters are provided in **Table 4.2**.

Table 4.2: Subcatchment Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	Zero-Imperv. (%)	Equivalent Width (Flow Length) (m)	Average Slope (%)
Controlled Areas						
A-01	0.52	0.55	50.0	0	116 (45)	1.5
A-06	0.57	0.80	85.7	0	143 (40)	1.5
A-07	0.77	0.84	91.4	0	118 (65)	1.5
A-08	0.73	0.87	95.7	0	112 (65)	1.5
A-09	0.87	0.78	82.9	0	145 (60)	1.5
A-10	0.87	0.80	85.7	0	145 (60)	1.5
A-11	0.13	0.49	41.4	0	24 (55)	1.5
A-12	0.49	0.43	32.9	0	75 (65)	1.5
A-13	0.23	0.20	0.0	0	66 (35)	1.5
A-14	0.38	0.34	20.0	90	84 (45)	1.5
A-15	0.70	0.89	98.6	60	233 (30)	1.5
A-16	1.19	0.90	100.0	100	119 (100)	1.5
A-17	0.64	0.90	100.0	70	142 (45)	1.5
A-18	0.19	0.89	98.6	0	95 (20)	1.5
A-19	0.36	0.71	72.9	0	65 (55)	1.5
A-20	0.28	0.53	47.1	0	62 (45)	1.5
A-21	0.52	0.30	14.3	90	104 (50)	1.5
A-22	1.76	0.76	80.0	50	185 (95)	1.5
A-23	2.66	0.62	60.0	40	296 (90)	1.5
A-24	2.22	0.78	82.9	60	234 (95)	1.5
A-25	1.91	0.66	65.7	35	294 (65)	1.5
A-26	1.99	0.86	94.3	35	209 (95)	1.5
A-27	1.55	0.64	62.9	10	172 (90)	1.5
A-28	0.15	0.74	77.1	0	21 (70)	1.5
TOTAL (Controlled)	**21.68**	**0.72**	**74.5**	**-**	**-**	**-**
Uncontrolled / Direct Runoff Areas						
A-02	0.13	0.49	41.4	0	65 (20)	1.5
A-03	0.18	0.43	32.9	0	60 (30)	1.5
A-04	0.10	0.43	32.9	0	40 (25)	1.5
A-05	0.20	0.46	37.1	0	44 (45)	1.5
D-01	0.25	0.20	0.0	0	167 (15)	1.5
D-02	0.62	0.29	12.9	0	155 (40)	1.5
D-03	0.03	0.20	0.0	0	60 (5)	1.5
TOTAL (Uncontrolled)	**1.51**	**0.34**	**19.9**	**-**	**-**	**-**

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	Zero-Imperv. (%)	Equivalent Width (Flow Length) (m)	Average Slope (%)
Future Development Area						
FUT	2.77	0.80	85.0	50	231 (120)	1.5
TOTAL (OVERALL)	**25.96**	**0.71**	**72.4**	**-**	**-**	**-**

4.4.3 Model Results

The on-site storage and conveyance system requirements were refined using the PCSWMM model. The model was used to ensure that peak flows are controlled to the allowable release rates and ensure that the 100-year hydraulic grade line is contained on-site within the storm sewer system.

Storage Requirements

The 2015 CitiGate SWM analysis estimated that 100 m^3/ha of storage would be sufficient to control the 100-year storm event. The 100-year storm event was to be controlled to a 5-year peak flow that is increased by 20%. Storage was assumed to be provided on the surface.

Per the client request, the 100-year storm is to be confined underground in the proposed storm sewer and stormwater management system. Due to the site configurations / building area the PCSWMM model indicates that the storage required is more than the previously estimated 100 m^3/ha. The storage required and storage provided in the storm sewers and stormwater management system is shown in **Table 4.3** below.

Table 4.3: Required (100-year) and Provided Storage Volumes

Storage Node ID	Drainage Area (ha)	Orifice Plate Size (mm)	Required Storage Volume (m^3)	Provided Storage Volume (m^3)		
				Storm Sewers	SWM System	TOTAL
South Outlet						
Storage-S01	10.71	900mm	2,191	360	2,298	2,658
Storage-S02	15.19 (+4.48)	900mm	962	502	460	962
TOTAL (South Outlet)	**15.19**	**-**	**3,153**	**863**	**2,758**	**3,621**
North Outlet						
Storage-N01	0.88	250	143	16	175	191
Storage-N02	3.96	375	864	128	736	864
Storage-N03	1.65	300	388	36	370	406
Storage-NFUT	2.77	600	693	-	693	693
TOTAL (North Outlet)	**9.26**	**-**	**2,088**	**180**	**1,974**	**2,154**
TOTAL (Overall)	**24.45**	**-**	**5,241**	**1,043**	**4,732**	**5,775**

**Based on PCSWMM Model Results for a 100-year, 3-hour Chicago Storm.*

Peak Flows

As shown in Error! Not a valid bookmark self-reference.**,** the overall release rates from the site (both uncontrolled / controlled) will adhere to the allowable release rates specified in **Section 4.2.2**. Peak flows are controlled at storm MH's 208 & 214. The uncontrolled drainage to the future CitiGate Drive extension is accounted for in the overall release rates.

Table 4.4: Summary of Peak Flows

Outfall	Allowable Release Rate (L/s)	Peak Flow (L/s)		
		Uncontrolled / Direct Runoff (Total Runoff)	Controlled (ICD's)	Overall (Outfall)
5-year				
Storm MH208	-	95	824	**842**
Storm MH214	-	41	2,372 (+1,548)	**2,412 (+1,570)**
100-year				
Storm MH208	2,769	269	1,299	**1,430**
Storm MH214	4,138	138	3,770 (+2471)	**3,995 (+2,565)**

**Based on PCSWMM Model Results for a 3-hour Chicago Storm.*

Hydraulic Grade Line (HGL)

The PCSWMM model was used to estimate the hydraulic grade line (HGL) elevation of the of the storm sewer system during the 100-year storm event. **Table 4.5** provides a summary of the 100-year HGL elevation at each storm manhole within the proposed development. The model results indicate that the 100-year HGL elevations will be confined within the storm sewer system.

Table 4.5: Estimated Hydraulic Grade Line (HGL) Elevations

MH ID	Obvert Elevation (m)	T/G Elevation (m)	100-yr HGL Elevation (m)	Surcharge (m)	Clearance from T/G (m)	HGL in Stress Test (m)
CBMH109	98.45	101.85	99.87	1.42	1.98	100.81
CBMH201	98.31	100.55	99.59	1.28	0.96	100.55
CBMH211	97.85	101.14	98.82	0.97	2.32	100.49
MH01	95.92	98.18	97.62	1.70	0.56	98.15
MH02	96.04	99.07	97.71	1.67	1.36	98.25
MH04	97.93	100.92	98.85	0.92	2.07	100.13
MH05	98.76	100.67	99.32	0.56	1.35	100.67
MH06	96.62	101.01	97.89	1.27	3.12	98.44
MH07	97.70	102.11	98.18	0.48	3.93	98.75
MH08	98.80	102.82	99.50	0.70	3.32	100.58
MH09	99.06	102.39	99.87	0.81	2.52	100.97
MH10	100.37	102.47	101.01	0.64	1.46	102.27
MH101	96.78	98.62	96.55	0.00	2.07	96.96
MH102	96.94	99.56	96.72	0.00	2.84	97.23

MH ID	Obvert Elevation (m)	T/G Elevation (m)	100-yr HGL Elevation (m)	Surcharge (m)	Clearance from T/G (m)	HGL in Stress Test (m)
MH103	97.70	101.09	98.82	1.12	2.27	100.49
MH104	98.72	101.88	99.60	0.88	2.28	100.67
MH105	99.23	101.45	100.01	0.78	1.44	101.00
MH106	97.10	100.69	96.85	0.00	3.84	97.51
MH107	97.18	100.84	96.94	0.00	3.90	97.65
MH108	97.90	100.79	99.59	1.69	1.20	100.72
MH11	98.29	101.60	98.81	0.52	2.79	99.65
MH110	98.55	102.17	99.95	1.40	2.22	100.84
MH111	100.58	102.79	101.01	0.43	1.78	102.22
MH113	98.88	102.33	100.12	1.24	2.21	100.93
MH114	99.51	102.48	100.81	1.30	1.67	101.75
MH115	99.79	101.68	100.88	1.09	0.80	101.68
MH116	100.80	103.48	101.27	0.47	2.21	102.47
MH117	97.45	100.00	97.12	0.00	2.88	98.08
MH118	97.89	99.87	98.63	0.74	1.24	99.15
MH119	99.30	101.44	99.21	0.00	2.23	99.84
MH12	98.57	101.53	99.45	0.88	2.08	100.04
MH120	102.09	103.50	102.01	0.00	1.49	102.49
MH13	98.82	101.47	99.86	1.04	1.61	100.50
MH14	99.24	101.51	100.55	1.31	0.96	101.24
MH15	99.60	101.57	100.99	1.39	0.58	101.57
MH16	99.91	102.07	101.19	1.28	0.88	102.07

**Based on PCSWMM Model Results for a 3-hour Chicago Storm.*

Stress Test

Table 4.5 also provides the estimated HGL elevations for the 'stress test' event. The stress test event represents a 20% increase (rainfall intensity and total precipitation) in the 100-year design event. The 'stress test' event will not be confined within the storm sewer system. Ponding will occur within the parking lot sags and may cascade off-site. The major system overland flow will be diverted through overland pathways and spill off-site to the future CitiGate Drive; ultimately discharging to the O'Keefe Drain.

4.4.4 Future Development Area

The PCSWMM model includes the 2.77 ha future development area to the north (adjacent Fallowfield Road). This area is represented in the model based on the following:

Drainage Area: 2.77 ha
Imperviousness: 85% (C=0.80)
100-year Allowable Release Rate: 513.5 L/s (185.4 L/s/ha)
Est. On-Site Storage Requirements: 692.5 m^3 (250 m^3/ha)

The future development of these lands is to adhere to the above release rates. The storage requirements have been estimated as above-ground surface storage in the PCSWMM model.

The 2015 CitiGate SWM Report originally estimated the impervious percentage (85%). This value was used for the future development blocks for the design of the stormwater management facility.

5.0 EROSION AND SEDIMENT CONTROL

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 socks (catchbasin inserts) will be placed in existing and proposed catchbasins and catchbasin manholes, and will remain in place until vegetation has been established and construction is completed;
- Silt fencing will be placed along the surrounding construction limits;
- Mud mats will be installed at the site entrances;
- Strawbale or rock check dams will be installed in swales and ditches;
- The contractor will be required to perform regular street sweeping and cleaning as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site;

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Erosion and Sediment Control Plan (120025-ESC) for additional information.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Watermain

The analysis of the proposed watermain network confirms the following:

- The proposed 250mm diameter watermain that connects to the existing watermain along CitiGate Drive can service the proposed development.
- It is anticipated that there are adequate pressures in the existing watermain infrastructure to meet the required domestic demands for the development.
- It is anticipated that there is adequate flow to service the proposed fire protections system.
- Flows and pressures will be confirmed with an updated hydraulic analysis once the City provides new boundary conditions.

Sanitary Servicing

The analysis of the proposed sanitary servicing confirms the following:

- There is adequate capacity within the existing sanitary infrastructure to service the proposed development.
- The existing sanitary allotment would allow for future expansion or development on site.

Stormwater Management

The following provides a summary of the storm sewer and stormwater management system:

- Proposed storm sewer system is to connect with the existing storm sewer system on the extension of CitiGate Drive.
    - Storm sewers (minor system) have been designed to convey the uncontrolled 5-year peak flow using the Rational Method.
    - Underground storage is be provided within the storm sewers and stormwater management systems, which are to consist of Stormtech MC-3500 / MC-4500 Arch-type Chambers (or approved equivalent).
    - There will be no surface ponding during the 100-year storm event as the 100-year hydraulic grade line (HGL) is contained within the storm sewer system.
- Parking lot graded to ensure that static ponding depths do not exceed 0.35m.
    - Surface ponding would only office for storm events greater than the 100-year event.
    - A major overland flow route is provided to the CitiGate Drive extension and ultimately the O'Keefe Drain.

Erosion and Sediment control

- Erosion and sediment control measures (i.e. filter fabric, catchbasin inserts, silt fences, etc.) will be implemented prior to construction and are to remain in place until vegetation is established.

7.0 CLOSURE

The preceding report is respectfully submitted for review and approval. Please contact the undersigned should you have questions or require additional information.

NOVATECH

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Appendix A

Water Servicing Information

Project No. 120025
Project Name: Python Compex
Project Location: Citigate Drive, Ottawa

Date: April 2020

Detailed Building Use Domestic Water Demands

Daily Demands from OBC Table 8.2.1.3

Establishment	Daily Demand Volume	
Industrial Building:	150	L/day/loading bay
	950	L/day/bathroom
Commercial Office:	75	L/day/9.3m² Floor area

Commercial / Industrial Peaking Factors City of Ottawa Water Distrubution Guidelines

Conditions	Peaking Factor	
Maximum Day	1.5	x avg day
Peak Hour	1.8	x max day

Proposed Development Conditions

	Commercial Office	Industrial Building	Totals
Floor Area	2870	N/A	
No. Bathrooms	N/A	100	
No. Loading Bays	N/A	56	
Total Daily Volume (Liters)	23145.2	103400.0	126545.2
Avg Day Demand (L/s)	0.268	1.197	1.46
Max Day Demand (L/s)	0.402	1.795	2.20
Peak Hour Demand (L/s)	0.723	3.231	3.95

CONNECTION AT JOCKVALE AND CEDARVIEW

JOCKVALE ROAD
MARAVISTA DRIVE
KENNEVALE DRIVE
STRANDHERD DRIVE
CN RAIL LINE
JOCKVALE ROAD
STRANDHERD DRIVE
CROSSKEY PLACE
FALLOWFIELD ROAD
O'KEEFE COURT
SYSTEMHOUSE STREET
DEALERSHIP STREET
PHILSAR STREET
MCKENNA CASEY DRIVE
NORTEL DRIVE
FALLOWFIELD ROAD
FUTURE CROSSKEY PLACE
CN RAIL LINE
VETERANS MEMORIAL HIGHWAY NO. 416

BLOCK 1
BLOCK 2
BLOCK 3
BLOCK 16
BLOCK 17
BLOCK 18
BLOCK 18
FUTURE BLOCK 2
FUTURE BLOCK 1

O'KEEFE DRAIN
O'KEEFE DRAIN
O'KEEFE DRAIN
O'KEEFE DRAIN

STORMWATER MANAGEMENT FACILITY BLOCK 12

FUTURE DEVELOPMENT (BY OTHERS)
FUTURE DEVELOPMENT (BY OTHERS)

STRANDHERD SNOW DISPOSAL FACILITY

PROPOSED WATERMAIN LOOP

PROPOSED BLOCK 13 SITE

LEGEND

- 9 — FEEDERMAIN (250mm dia) AND PIPE NUMBER
- 6 — DISTRIBUTION WATERMAIN (200mm dia) AND PIPE NUMBER
- 5 — EXISTING BACKBONE WATERMAIN (400mm dia) BY OTHERS AND PIPE NUMBER
- 6 — WATERMAIN NODE AND NUMBER
- 2 — RESERVOIR AND NUMBER (BOUNDARY CONDITION LOCATION)
- 3 — EXISTING DISTRIBUTION / FEEDERMAIN (300mm dia) AND PIPE NUMBER
- PHASE LINE (PHASE 1)

REVISED WATER MODEL WAITING FOR UPDATED BOUNDARY CONDITIONS

NOTE: WATERMAIN NODE AND PIPE NUMBERS ARE AS PER APPROVED PHASE 1 REPORT, R-2014-115, DATED JAN. 9, 2015

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CITI GATE
416 CORPORATE CAMPUS

WATER MODEL SCHEMATIC

SCALE N.T.S
DATE APR 2020
JOB 120025
FIGURE FIG A1

M:\2020\120025\DATA\Calculations\Sewer Calcs\Water\20200318 - Land Use Citi Gate Calcs\109203-Figure-D.dwg, FIGURE-D, Mar 18, 2020 - 3:55pm, szorgel

SHT11X17.DWG - 279mmX432mm

Table B1
Block 13
Water Demand

Node	Block #	Area (ha)	Demand (L/s)		
			High Pressure (Average Day)	Max. Daily	Peak Hour
14	16	2.5	1.01	1.52	2.73
15	1	3.5	1.42	2.13	3.83
16	2	12.0	4.86	7.29	13.13
17	3	5.3	2.15	3.22	5.80
36	13	25.1	10.17	15.25	27.45
			19.61	**29.41**	**52.94**

Notes:

1. All water demand calculations based on the City of Ottawa Design Guidelines for Water Distribution Table 4.2.
2. Water Demand is based assuming all lands to be Industrial - Light with a demand of 35,000L/gross ha/d.
3. Peaking Factors: Maximum Daily Demand = 1.5 Average Daily Demand (High Pressure); Peak Hour = 1.8 Max Daily Demand.

Fireflows

Industrial Light Fireflow - Block 13	267	L/s
Industrial Light Fireflow (as per Approved Phase 1 Design Brief dated Sept. 5, 2014)	165	L/s

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 120025
Project Name: Citigate Block 13
Date: 3/18/2020
Input By: Steve Zorgel
Reviewed By: MSP

Legend: Input by User; No Information or Input Required

Building Description: Building to have 5 floors, sprinklered, exposure is >45m all sides.
Fire Resistive Construction

Step			Choose		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	0.6	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)	Yes	0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	37200			
		Number of Floors/Storeys	5			
		Protected Openings (1 hr)	Yes			
		Area of structure considered (m^2)			**55,800**	
	F	**Base fire flow without reductions**				**31,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**31,000**
		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%	**-15,500**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**0**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**0%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**16,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**267**
				or	USGPM	4,227
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3.5
		Required Volume of Fire Flow (m^3)			m^3	3360

CONNECTION AT JOCKVALE AND CEDARVIEW

JOCKVALE ROAD
MARAVISTA DRIVE
KENNEVALE DRIVE
STRANDHERD DRIVE
CN RAIL LINE
MCKENNA CASEY DRIVE
FALLOWFIELD ROAD
O'KEEFE COURT
CROSSKEY PLACE
SYSTEMHOUSE STREET
DEALERSHIP STREET
PHILSAR STREET
NORTEL DRIVE
FUTURE CROSSKEY PLACE
VETERANS MEMORIAL HIGHWAY NO. 416

BLOCK 1
BLOCK 2
BLOCK 3
BLOCK 4
BLOCK 5
BLOCK 6
BLOCK 7
BLOCK 8
BLOCK 9
BLOCK 10
BLOCK 11
BLOCK 12
BLOCK 13
BLOCK 14
BLOCK 16
BLOCK 17
BLOCK 18
BLOCK 19

O'KEEFE DRAIN

STORMWATER MANAGEMENT FACILITY BLOCK 12

FUTURE DEVELOPMENT (BY OTHERS)

FUTURE PHASE (BY OWNER)

STRANDHERD SNOW DISPOSAL FACILITY

LEGEND

- 9 — PROPOSED FEEDERMAIN (250mm dia) AND PIPE NUMBER
- 6 — PROPOSED DISTRIBUTION WATERMAIN (200mm dia) AND PIPE NUMBER
- 5 — PROPOSED BACKBONE WATERMAIN (400mm dia) BY OTHERS AND PIPE NUMBER
- 6 — WATERMAIN NODE AND NUMBER
- 2 — RESERVOIR AND NUMBER (BOUNDARY CONDITION LOCATION)
- 3 — EXISTING DISTRIBUTION / FEEDERMAIN (300mm dia) AND PIPE NUMBER
- PHASE LINE (PHASE 1)

WATER MODEL SCHEMTAIC AND RESULTS FROM CITIGATE PHASE 1 REPORT

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
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CITI GATE
416 CORPORATE CAMPUS

Water Servicing (Phase 1)

SCALE: N.T.S
DATE: AUG 2014
JOB: 109203-CG
FIGURE: FIG D1

SHT11X17.DWG - 279mmX432mm

Large Size Building
Fire Flow Calculations - Citi Gate

As per Fire Underwriter's Survey Guidelines

PROJECT: Citi Gate - 416 Corporate Campus | **DATE: August 8, 2012**
JOB#: 109203 | **Rev: March 31, 2014**

C **Coefficient related to type of construction**

	[yes/no]	
◆ Wood frame		1.5
◆ Ordinary construction	yes	1
◆ Non-combustible construction		0.8
◆ Fire resistive construction (< 2 hrs)		0.7
◆ Fire resistive construction (> 2 hrs)		0.6
◆ Interpolation (Using FUS Tables)		

A **Area of structure considered (m^2)** ***5,600*** <==> 60,278 ft^2

(All floors excluding Basement, under 2-Storeys)

F **Required fire flow (L/min)**

$F = 220\ C\ (A)^{0.5}$ ***16,463 L/min***

Occupancy hazard reduction of surcharge

	[yes/no]	
◆ Non-combustible		-25%
◆ Limited combustible	yes	-15%
◆ Combustible		0%
◆ Free burning		15%
◆ Rapid burning		25%

13,994 L/min **(1)**

Sprinkler Reduction

◆ Non-combustible - Fire Resistive (3) yes 50% ***6,997 L/min*** **(2)**

Exposure surcharge (cumulative (%), 2 sides)

	[yes/no]			
0 - 3 m		25%		
3.1 - 10 m		20%		
10.1 - 20 m		15%		
20.1 - 30 m	yes	10%	1 side	10%
30.1- 45 m	yes	5%	1 side	5%
		Cumulative Total		**15%**

2,099 L/min

Fire Wall Separation

◆ Number of Party Walls * 1000 L/min

(As per City of Ottawa Standard) ***2,099 L/min*** **(3)**

REQUIRED FIRE FLOW [(1) - (2) + (3)]		***9,096 L/min***
(2,000 L/min < Fire Flow < 45,000 L/min)	***or***	***151.6 L/s***
	or	***2,003 IGPM***

Prepared By: *Mark Bowen*

Typical Large Building

Medium Sized Building
Fire Flow Calculations - Citi Gate

As per Fire Underwriter's Survey Guidelines

PROJECT: Citi Gate - 416 Corporate Campus | **DATE: August 8, 2012**

JOB#: 109203 | **Rev: March 31, 2014**

C **Coefficient related to type of construction**

	[yes/no]	
◆ Wood frame		1.5
◆ Ordinary construction	yes	1
◆ Non-combustible construction		0.8
◆ Fire resistive construction (< 2 hrs)		0.7
◆ Fire resistive construction (> 2 hrs)		0.6
◆ Interpolation (Using FUS Tables)		

A **Area of structure considered (m^2)** ***3,750*** <==> 40,365 ft^2

(All floors excluding Basement, under 2-Storeys)

F **Required fire flow (L/min)**

$F = 220\ C\ (A)^{0.5}$ ***13,472 L/min***

Occupancy hazard reduction of surcharge

	[yes/no]		
◆ Non-combustible		-25%	
◆ Limited combustible	yes	-15%	
◆ Combustible		0%	
◆ Free burning		15%	
◆ Rapid burning		25%	
		11,451 L/min	**(1)**

Sprinkler Reduction

◆ Non-combustible - Fire Resistive (3)	yes	50%	***5,726 L/min***	**(2)**

Exposure surcharge (cumulative (%), 2 sides)

	[yes/no]			
0 - 3 m		25%		
3.1 - 10 m		20%		
10.1 - 20 m		15%		
20.1 - 30 m	yes	10%	1 side	10%
30.1- 45 m	yes	5%	1 side	5%
		Cumulative Total		**15%**

1,718 L/min

Fire Wall Separation

◆ Number of Party Walls * 1000 L/min

(As per City of Ottawa Standard) ***1,718 L/min*** **(3)**

REQUIRED FIRE FLOW [(1) - (2) + (3)]		***7,443 L/min***
(2,000 L/min < Fire Flow < 45,000 L/min)	***or***	***124.06 L/s***
	or	***1,639 IGPM***

Prepared By: *Mark Bowen*

Typical Medium Building

Small Sized Building
Fire Flow Calculations - Citi Gate

As per Fire Underwriter's Survey Guidelines

PROJECT: Citi Gate - 416 Corporate Campus | **DATE: August 8, 2012**

JOB#: 109203 | **Rev: March 31, 2014**

C **Coefficient related to type of construction**

	[yes/no]	
◆ Wood frame		1.5
◆ Ordinary construction	yes	1
◆ Non-combustible construction		0.8
◆ Fire resistive construction (< 2 hrs)		0.7
◆ Fire resistive construction (> 2 hrs)		0.6
◆ Interpolation (Using FUS Tables)		

A **Area of structure considered (m^2)** ***2,100*** <==> 22,604 ft^2

(All floors excluding Basement, under 2-Storeys)

F **Required fire flow (L/min)**

$F = 220\ C\ (A)^{0.5}$ ***10,082 L/min***

Occupancy hazard reduction of surcharge

	[yes/no]	
◆ Non-combustible		-25%
◆ Limited combustible	yes	-15%
◆ Combustible		0%
◆ Free burning		15%
◆ Rapid burning		25%

8,569 L/min **(1)**

Sprinkler Reduction

◆ Non-combustible - Fire Resistive (3) n 50% ***0 L/min*** **(2)**

Exposure surcharge (cumulative (%), 2 sides)

	[yes/no]			
0 - 3 m		25%		
3.1 - 10 m		20%		
10.1 - 20 m		15%		
20.1 - 30 m	yes	10%	1 side	10%
30.1- 45 m	yes	5%	1 side	5%
		Cumulative Total		**15%**

1,285 L/min

Fire Wall Separation

◆ Number of Party Walls * 1000 L/min

(As per City of Ottawa Standard) ***1,285 L/min*** **(3)**

REQUIRED FIRE FLOW [(1) - (2) + (3)] ***9,855 L/min***

(2,000 L/min < Fire Flow < 45,000 L/min) ***or*** ***164.25 L/s***

or ***2,170 IGPM***

Prepared By: *Mark Bowen*

Typical Small Building

Table 1
Phase 1
Pipe Data

Pipe	Street Name	Length (m)	Diameter (mm)	Roughness
1	Strandherd	530	400	120
2	Strandherd	450	400	120
3	Strandherd	250	400	120
4	Nortel Drive	100	200	110
5	Nortel Drive	192	200	110
6	Crosskey Place	202	250	110
7	Crosskey Place	160	250	110
8	Systemhouse Street	110	250	110
9	Systemhouse Street	60	250	110
10	Dealership Street	160	250	110
11	Dealership Street	125	250	110
12	Dealership Street	102	250	110
13	Dealership Street	110	250	110
14	Dealership Street	55	250	110
15	Dealership Street	35	250	110
16	Philsar Street	115	250	110
17	Philsar Street	110	250	110
18	Block 8/9/10	430	250	110
19	Block 16	56	200	110
21	Block 1	122	200	110
23	Block 2	160	200	110
24	Block 2	200	200	110
25	Block 3	160	200	110
27	Block 4	100	200	110
29	Blcok 5	80	200	110
31	Blcok 6	80	200	110
33	Block 8	80	200	110
35	Block 9	80	200	110
39	Block 10	80	200	110
37	Block 11	80	200	110

Table 2
Phase 1
Water Demand

Node	Block #	Area (ha)	Demand (L/s)		
			High Pressure (Average Day)	Max. Daily	Peak Hour
14	16	2.2	0.89	1.34	2.41
15	1	3.7	1.50	2.25	4.05
16	2	12.2	4.94	7.41	13.34
17	3	6.2	2.51	3.77	6.78
18	4	3.2	1.30	1.94	3.50
19	5	1.8	0.73	1.09	1.97
20	6	1.6	0.65	0.97	1.75
21	8	1.3	0.53	0.79	1.42
22	9	1.3	0.53	0.79	1.42
23	10	3.0	1.22	1.82	3.28
24	11	3.0	1.22	1.82	3.28
			16.00	24.00	43.20

Notes:

1. All water demand calculations based on the City of Ottawa Design Guidelines for Water Distribution Table 4.2.
2. Water Demand is based assuming all lands to be Industrial - Light with a demand of 35,000L/gross ha/d.
3. Peaking Factors: Maximum Daily Demand = 1.5 average daily demand (High Pressure); Peak Hour = 1.8 Max daily demand.

Table 3
Phase 1
Peak Hour Check

Node	Block #	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1		95.0	0.0	148.1	53.1	75.2
2		96.0	0.0	148.0	52.0	73.8
3		96.2	0.0	148.0	51.8	73.4
4		95.7	0.0	147.7	52.0	73.7
5		96.1	0.0	147.7	51.6	73.2
6		94.1	0.0	147.5	53.4	75.7
7		93.9	0.0	147.4	53.5	75.9
8		93.5	0.0	147.4	54.0	76.5
9		92.4	0.0	147.4	55.0	78.0
10		94.0	0.0	147.4	53.4	75.7
11		94.0	0.0	147.4	53.4	75.7
12		93.8	0.0	147.4	53.6	76.0
13		94.0	0.0	147.4	53.4	75.7
14	16	96.0	2.4	148.1	52.1	73.8
15	1	96.0	4.1	148.1	52.1	73.8
16	2	97.2	13.3	147.7	50.5	71.6
17	3	97.1	6.8	147.7	50.6	71.8
18	4	95.1	3.5	147.5	52.4	74.3
19	5	94.5	2.0	147.4	52.9	75.0
20	6	93.5	1.8	147.4	53.9	76.4
21	8	95.0	1.4	147.4	52.4	74.3
22	9	95.0	1.4	147.4	52.4	74.3
23	10	95.0	3.3	147.4	52.4	74.3
24	11	95.3	3.3	147.4	52.1	73.8
25*		147.7	28.4	147.7	N/A	N/A
26*		147.6	18.2	147.6	N/A	N/A
27*		148.0	22.8	148.0	N/A	N/A
28*		148.2	-98.2	148.2	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: July 18, 2014
Rev: August 6, 2014
Rev. October 1, 2014

Table 4
Phase 1
High Pressure Check (Average Day)

Node	Block #	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)	Age (hrs)
1		95.0	0.0	154.6	59.6	84.5	1.2
2		96.0	0.0	154.7	58.7	83.3	0.9
3		96.2	0.0	154.7	58.5	82.9	0.3
4		95.7	0.0	154.7	59.0	83.6	0.5
5		96.1	0.0	154.7	58.6	83.2	0.3
6		94.1	0.0	154.7	60.6	85.9	0.4
7		93.9	0.0	154.7	60.8	86.2	0.7
8		93.5	0.0	154.7	61.2	86.8	1.4
9		92.4	0.0	154.7	62.3	88.3	2.4
10		94.0	0.0	154.7	60.7	86.0	1.2
11		94.0	0.0	154.7	60.7	86.0	2.0
12		93.8	0.0	154.7	60.9	86.3	4.8
13		94.0	0.0	154.7	60.7	86.0	5.0
14	16	96.0	0.9	154.6	58.6	83.1	2.3
15	1	96.0	1.5	154.6	58.6	83.1	2.6
16	2	97.2	4.9	154.7	57.5	81.5	1.1
17	3	97.1	2.5	154.7	57.6	81.7	1.4
18	4	95.1	1.3	154.7	59.6	84.5	1.7
19	5	94.5	0.7	154.7	60.2	85.3	3.3
20	6	93.5	0.7	154.7	61.2	86.7	4.5
21	8	95.0	0.5	154.7	59.7	84.6	3.9
22	9	95.0	0.5	154.7	59.7	84.6	4.6
23	10	95.0	1.2	154.7	59.7	84.6	6.2
24	11	95.3	1.2	154.7	59.4	84.2	6.2
25*		154.7	-5.5	154.7	0.0	0.0	N/A
26*		154.7	-6.2	154.7	0.0	0.0	N/A
27*		154.7	-66.9	154.7	0.0	N/A	N/A
28*		154.6	62.6	154.6	0.0	N/A	N/A

*** Boundary Condition**

Maximum Pressure
Maximum Time

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5A
Phase 1
Max Daily Demand and Fire at Node 14 - Block 16

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	137.7	42.7	60.6
2	96.0	0.0	141.8	45.9	65.1
3	96.2	0.0	143.3	47.1	66.8
4	95.7	0.0	143.1	47.4	67.2
5	96.1	0.0	143.1	47.1	66.7
6	94.1	0.0	141.5	47.4	67.2
7	93.9	0.0	141.4	47.5	67.4
8	93.5	0.0	141.4	48.0	68.0
9	92.4	0.0	141.4	49.0	69.5
10	94.0	0.0	141.4	47.4	67.3
11	94.0	0.0	141.4	47.4	67.3
12	93.8	0.0	141.4	47.6	67.5
13	94.0	0.0	141.4	47.4	67.3
14	96.0	165.6	135.2	39.2	55.6
15	96.0	2.3	137.7	41.7	59.1
16	97.2	7.4	143.1	45.9	65.1
17	97.1	3.8	143.1	46.0	65.3
18	95.1	1.9	141.5	46.4	65.7
19	94.5	1.1	141.4	46.9	66.5
20	93.5	1.0	141.4	47.9	68.0
21	95.0	0.8	141.4	46.4	65.8
22	95.0	0.8	141.4	46.4	65.8
23	95.0	1.8	141.4	46.4	65.8
24	95.3	1.8	141.4	46.1	65.4
25*	143.1	21.1	143.1	N/A	N/A
26*	141.5	121.6	141.5	N/A	N/A
27*	144.9	-61.4	144.9	N/A	N/A
28*	145.5	-269.6	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Table 5B
Phase 1
Max Daily Demand and Fire at Node 15 - Block 1

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	137.7	42.7	60.6
2	96.0	0.0	141.8	45.9	65.1
3	96.2	0.0	143.3	47.1	66.8
4	95.7	0.0	143.1	47.4	67.2
5	96.1	0.0	143.1	47.1	66.7
6	94.1	0.0	141.5	47.4	67.2
7	93.9	0.0	141.4	47.5	67.4
8	93.5	0.0	141.4	48.0	68.0
9	92.4	0.0	141.4	49.0	69.5
10	94.0	0.0	141.4	47.4	67.3
11	94.0	0.0	141.4	47.4	67.3
12	93.8	0.0	141.4	47.6	67.5
13	94.0	0.0	141.4	47.4	67.3
14	96.0	1.3	137.7	41.7	59.1
15	96.0	166.6	132.2	36.2	51.4
16	97.2	7.4	143.1	45.9	65.1
17	97.1	3.8	143.1	46.0	65.3
18	95.1	1.9	141.5	46.4	65.7
19	94.5	1.1	141.4	46.9	66.5
20	93.5	1.0	141.4	47.9	68.0
21	95.0	0.8	141.4	46.4	65.8
22	95.0	0.8	141.4	46.4	65.8
23	95.0	1.8	141.4	46.4	65.8
24	95.3	1.8	141.4	46.1	65.4
25*	143.1	21.1	143.1	N/A	N/A
26*	141.5	121.6	141.5	N/A	N/A
27*	144.9	-61.4	144.9	N/A	N/A
28*	145.5	-269.6	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Table 5C
Phase 1
Max Daily Demand and Fire at Node 16 - Block 2

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	144.8	49.8	70.5
2	96.0	0.0	143.6	47.6	67.6
3	96.2	0.0	143.2	47.0	66.6
4	95.7	0.0	140.9	45.2	64.1
5	96.1	0.0	141.6	45.6	64.6
6	94.1	0.0	141.5	47.4	67.2
7	93.9	0.0	141.4	47.5	67.4
8	93.5	0.0	141.4	48.0	68.0
9	92.4	0.0	141.4	49.0	69.5
10	94.0	0.0	141.4	47.4	67.3
11	94.0	0.0	141.4	47.4	67.3
12	93.8	0.0	141.4	47.6	67.5
13	94.0	0.0	141.4	47.4	67.3
14	96.0	1.3	144.8	48.8	69.1
15	96.0	2.3	144.8	48.8	69.1
16	97.2	171.7	133.6	36.4	51.6
17	97.1	3.8	141.6	44.6	63.2
18	95.1	1.9	141.5	46.4	65.7
19	94.5	1.1	141.4	46.9	66.5
20	93.5	1.0	141.4	47.9	68.0
21	95.0	0.8	141.4	46.4	65.8
22	95.0	0.8	141.4	46.4	65.8
23	95.0	1.8	141.4	46.4	65.8
24	95.3	1.8	141.4	46.1	65.4
25*	143.1	-56.7	143.1	N/A	N/A
26*	141.5	121.6	141.5	N/A	N/A
27*	144.9	-63.9	144.9	N/A	N/A
28*	145.5	-189.3	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Table 5D
Phase 1
Max Daily Demand and Fire at Node 17 - Block 3

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.2	50.2	71.1
2	96.0	0.0	144.7	48.7	69.1
3	96.2	0.0	144.5	48.3	68.5
4	95.7	0.0	139.6	43.9	62.3
5	96.1	0.0	139.4	43.4	61.5
6	94.1	0.0	141.5	47.4	67.2
7	93.9	0.0	141.4	47.5	67.4
8	93.5	0.0	141.4	48.0	68.0
9	92.4	0.0	141.4	49.0	69.5
10	94.0	0.0	141.4	47.4	67.3
11	94.0	0.0	141.4	47.4	67.3
12	93.8	0.0	141.4	47.6	67.5
13	94.0	0.0	141.4	47.4	67.3
14	96.0	1.3	145.2	49.2	69.7
15	96.0	2.3	145.2	49.2	69.7
16	97.2	7.4	142.0	44.8	63.5
17	97.1	168.1	132.1	35.0	49.7
18	95.1	1.9	141.5	46.4	65.7
19	94.5	1.1	141.4	46.9	66.5
20	93.5	1.0	141.4	47.9	68.0
21	95.0	0.8	141.4	46.4	65.8
22	95.0	0.8	141.4	46.4	65.8
23	95.0	1.8	141.4	46.4	65.8
24	95.3	1.8	141.4	46.1	65.4
25*	143.1	-106.4	143.1	N/A	N/A
26*	141.5	121.6	141.5	N/A	N/A
27*	144.9	-25.1	144.9	N/A	N/A
28*	145.5	-178.4	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Table 5E
Phase 1
Max Daily Demand and Fire at Node 18 - Block 4

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	132.0	38.1	54.1
8	93.5	0.0	132.0	38.6	54.7
9	92.4	0.0	132.0	39.6	56.2
10	94.0	0.0	132.0	38.0	53.9
11	94.0	0.0	132.0	38.0	53.9
12	93.8	0.0	132.0	38.2	54.2
13	94.0	0.0	132.0	38.0	53.9
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	166.2	127.6	32.5	46.0
19	94.5	1.1	132.0	37.5	53.2
20	93.5	1.0	132.0	38.5	54.6
21	95.0	0.8	132.0	37.0	52.5
22	95.0	0.8	132.0	37.0	52.5
23	95.0	1.8	132.0	37.0	52.5
24	95.3	1.8	132.0	36.7	52.1
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5F
Phase 1
Max Daily Demand and Fire at Node 19 - Block 5

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	124.8	30.9	43.8
8	93.5	0.0	121.2	27.7	39.3
9	92.4	0.0	121.6	29.2	41.4
10	94.0	0.0	124.3	30.3	42.9
11	94.0	0.0	123.7	29.7	42.1
12	93.8	0.0	123.4	29.6	42.0
13	94.0	0.0	123.4	29.4	41.7
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	1.9	132.1	37.0	52.4
19	94.5	165.4	117.6	23.1	32.8
20	93.5	1.0	121.6	28.1	39.8
21	95.0	0.8	124.3	29.3	41.5
22	95.0	0.8	123.7	28.7	40.7
23	95.0	1.8	123.4	28.4	40.3
24	95.3	1.8	123.4	28.1	39.9
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5G
Phase 1
Max Daily Demand and Fire at Node 20 - Block 6

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	124.8	30.9	43.8
8	93.5	0.0	121.9	28.5	40.4
9	92.4	0.0	119.2	26.8	38.1
10	94.0	0.0	123.9	29.9	42.4
11	94.0	0.0	123.0	29.0	41.1
12	93.8	0.0	122.5	28.7	40.7
13	94.0	0.0	122.5	28.5	40.4
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	1.9	132.1	37.0	52.4
19	94.5	1.1	121.9	27.4	38.9
20	93.5	165.3	115.7	22.2	31.5
21	95.0	0.8	123.9	28.9	41.0
22	95.0	0.8	123.0	28.0	39.6
23	95.0	1.8	122.5	27.5	39.0
24	95.3	1.8	122.5	27.2	38.6
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5H
Phase 1
Max Daily Demand and Fire at Node 21 - Block 8

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	124.8	30.9	43.8
8	93.5	0.0	124.3	30.8	43.7
9	92.4	0.0	123.8	31.4	44.5
10	94.0	0.0	121.4	27.4	38.9
11	94.0	0.0	121.8	27.8	39.4
12	93.8	0.0	122.0	28.2	40.0
13	94.0	0.0	122.0	28.0	39.7
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	1.9	132.1	37.0	52.4
19	94.5	1.1	124.3	29.8	42.2
20	93.5	1.0	123.8	30.3	43.0
21	95.0	165.1	117.9	22.9	32.4
22	95.0	0.8	121.8	26.8	38.0
23	95.0	1.8	122.0	27.0	38.3
24	95.3	1.8	122.0	26.7	37.8
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5l
Phase 1
Max Daily Demand and Fire at Node 22 - Block 9

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	124.8	30.9	43.8
8	93.5	0.0	123.9	30.4	43.1
9	92.4	0.0	123.0	30.6	43.4
10	94.0	0.0	122.2	28.2	39.9
11	94.0	0.0	119.3	25.3	35.9
12	93.8	0.0	119.7	25.9	36.7
13	94.0	0.0	119.7	25.7	36.4
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	1.9	132.1	37.0	52.4
19	94.5	1.1	123.9	29.4	41.7
20	93.5	1.0	123.0	29.5	41.8
21	95.0	0.8	122.2	27.2	38.5
22	95.0	165.1	115.8	20.8	29.5
23	95.0	1.8	119.7	24.7	35.0
24	95.3	1.8	119.7	24.4	34.6
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Table 5J
Phase 1
Max Daily Demand and Fire at Node 23 - Block 10

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	124.8	30.9	43.8
8	93.5	0.0	123.7	30.2	42.9
9	92.4	0.0	122.6	30.2	42.9
10	94.0	0.0	122.4	28.4	40.3
11	94.0	0.0	119.9	25.9	36.7
12	93.8	0.0	118.6	24.8	35.2
13	94.0	0.0	116.7	22.7	32.1
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	1.9	132.1	37.0	52.4
19	94.5	1.1	123.7	29.2	41.4
20	93.5	1.0	122.6	29.1	41.3
21	95.0	0.8	122.4	27.4	38.9
22	95.0	0.8	119.9	24.9	35.3
23	95.0	166.1	113.1	18.1	25.7
24	95.3	1.8	116.7	21.4	30.3
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Table 5K
Phase 1
Max Daily Demand and Fire at Node 24 - Block 11

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	124.8	30.9	43.8
8	93.5	0.0	123.7	30.2	42.9
9	92.4	0.0	122.6	30.2	42.9
10	94.0	0.0	122.4	28.4	40.3
11	94.0	0.0	119.9	25.9	36.7
12	93.8	0.0	118.6	24.8	35.2
13	94.0	0.0	116.7	22.7	32.1
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	1.9	132.1	37.0	52.4
19	94.5	1.1	123.7	29.2	41.4
20	93.5	1.0	122.6	29.1	41.3
21	95.0	0.8	122.4	27.4	38.9
22	95.0	0.8	119.9	24.9	35.3
23	95.0	1.8	116.7	21.7	30.7
24	95.3	166.1	113.1	17.8	25.2
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5
Phase 1
Max Daily Demand and Fire Flow Summary

	Node		Fire Flow	Pressure	
Fire Location	Block #	Min Pressure	(LPS)	(m)	(PSI)
14	16	14	164.3	39.2	55.6
15	1	15	164.3	36.2	51.4
16	2	16	164.3	36.4	51.6
17	3	17	164.3	35.0	49.7
18	4	18	164.3	32.5	46.0
19	5	19	164.3	23.1	32.8
20	6	20	164.3	22.2	31.5
21	8	21	164.3	22.9	32.4
22	9	22	164.3	20.8	29.5
23	10	23	164.3	18.1	25.7
24	11	24	164.3	17.8	25.2

Appendix B

Sanitary Servicing Information

Project No. 120025
Project Name: Python Compex
Project Location: Citigate Drive, Ottawa

Date: April 2020

Detailed Building Use Sanitary Flows

Daily Demands from OBC Table 8.2.1.3

Establishment	Daily Demand Volume	
Industrial Building:	150	L/day/loading bay
	950	L/day/bathroom
Commercial Office:	75	L/day/9.3m² Floor area

Commercial / Industrial Peaking Factors City of Ottawa Water Distrubution Guidelines

Building Use	Peaking Factor
Commercial	1.5
Industrial	3.5

Sewer Design Guidelines Appendix 4B

Proposed Building Sanitary Flows

	Commercial Office	Industrial Building	Totals
Floor Area	2870	N/A	
No. Bathrooms	N/A	100	
No. Loading Bays	N/A	56	
Total Daily Volume (Liters)	23145.2	103400.0	126545.2
Peak Building Sanitary Flow (L/s)	0.402	4.189	**4.59**

Extraneous Flows

Total Site Area (ha)	Extraneous Flow Alottment (L/s/ha)	Total Extraneous Flows (L/s)
26.01	0.33	**8.58**

Total Site Peak Sanitary Flows

Total Peak Building Sanitary Flows (L/s)	Total Extraneous Flows (L/s)	Total Site Peak Flows (L/s)
4.59	8.58	**13.17**

LEGEND

- 0.38 / A-A / 305-307 — DRAINAGE AREA (hectares) / AREA ID / MANHOLE TO MANHOLE
- SANITARY DRAINAGE AREA BOUNDARY
- SANITARY SERVICE LOCATION
- 1000 — PROPOSED SANITARY MANHOLE AND PIPE (WITH FLOW DIRECTION)

REFER TO DRAWING 109203-CG-NTB FOR NOTES AND TABLES

JOCKVALE ROAD

STRANDHERD DRIVE

MARAVISTA DRIVE

SANITARY OUTLET A

LIMITS OF CONSTRUCTION

110.1m - 525mmØ SAN @ 0.11%

28.7m-375mmØ SAN @ 0.25%

120.0m - 525mmØ SAN @ 0.11%

0.16 / A-22 / 409-101

24.8m-375mmØ SAN @ 0.25%

0.30 / A-21 / 407-409

BLOCK 3

5.28 / A-20 / 407-409

13.3m-250mmØ SAN @ 1.07%

115.8m-375mmØ SAN @ 0.25%

0.20 / A-18 / 405-407

0.92 / A-9 / 101-207

BLOCK 2

11.95 / A-19 / 407-409

O'KEEFE DRAIN BLOCK 19

SYSTEMHOUSE STREET

81.2m-375mmØ SAN @ 0.14%

0.29 / A-16 / 403-405

118.4m-300mmØ SAN @ 0.25%

FALLOWFIELD ROAD

BLOCK 1

3.49 / A-2 / 201-203

0.40 / A-1 / 201-203

NORTEL DRIVE

CROSSKEY PLACE

36.7m-250mmØ SAN @ 0.24%

BLOCK 16

2.50 / A-3 / 201-203

0.09 / A-4 / 201-203

57.2m-300mmØ SAN @ 0.24%

0.20 / A-7 / 205-101

37.1m-250mmØ SAN @ 0.24%

0.13 / A-5 / 203-205

O'KEEFE DRAIN BLOCK 18

0.21 / A-15 / 401-403

FUTURE DEVELOPMENT (BY OTHERS)

67.7m-300mmØ SAN @ 0.25%

2.29 / A-17 / 405-407

107.1m-300mmØ SAN @ 0.25%

118.3m-300mmØ SAN @ 0.25%

114.4m-300mmØ SAN @ 0.25%

26.4m-300mmØ SAN @ 0.25%

29.5m-300mmØ SAN @ 0.25%

0.07 / A-14 / 213-401

0.30 / A-11 / 207-209

0.31 / A-12 / 209-211

0.31 / A-13 / 211-213

1.17 / A-6 / 205-101

O'KEEFE DRAIN BLOCK 17

18.03 / A-8 / 101-207

FUTURE DEVELOPMENT (BY OWNER)

BLOCK 14

FUTURE DEVELOPMENT (BY OWNER)

BLOCK 15

7.98 / A-10 / 207-209

NORTEL DRIVE

SEE DRAWING No. 109203-CG-SAN2

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.

CITI GATE 416 CORPORATE CAMPUS

REGIONAL THE REGIONAL GROUP

No.	REVISION	DATE	BY
4.	ISSUED FOR SWM APPROVAL	AUG 10/14	MER
3.	ISSUED FOR APPROVAL	JUL 23/14	MER
2.	REV. PER CITY COMMENTS / ISS. FOR MOE APPROVAL	JUNE 27/14	MER
1.	ISSUED FOR CITY REVIEW	MAR 31/14	MER

SCALE 1:1000

1:1000
0 10 20 30 40

DESIGN LAB
CHECKED MER
DRAWN MTM/BET
CHECKED MER
APPROVED JGR

LICENSED PROFESSIONAL ENGINEER M.E. RIDDELL 100040125 PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER J.G. RIDDELL 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
CITI GATE 416 CORPORATE CAMPUS

DRAWING NAME
SANITARY DRAINAGE AREA PLAN (OUTLET A)

PROJECT No. 109203-00
REV REV # 4
DRAWING No. 109203-CG-SAN1

NOVATECH FILE NO.: 109203-0
CITY FILE NO.: D07-16-12-0023
DESIGNED BY: LAB
CHECKED BY: MER/MSP
PREPARED March 31, 2014
REVISED: August 10, 2014
REVISED: September 25, 2015 **AS-BUILT**

SANITARY SEWER DESIGN SHEET

Citi Gate 416 Corporate Campus
Phase 1 - As-Built

CITI GATE 416 CORPORATE CAMPUS

NOVATECH Engineers, Planners & Landscape Architects

Location						Wastewater Flow Q(w)		Extraneous Flow Q(i)		Design Flow Q(d)	Proposed Sanitary Sewer						
Area I.D.	Street	Block Number	From MH	To MH	Area (ha)	Individual Peak Flow Rate 50,000 L/ha/d (L/s)	Cumulative Peak Flow Rate (L/s)	Individual Infiltration Rate 0.28 L/s/ha (L/s)	Cumulative Infiltration Rate (L/s)	Peak Design Flow (L/s)	Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (L/s)	Full Flow Velocity (m/s)	Percentage of Capacity
Sanitary Outlet A to Strandherd Drive at Maravista Drive **Plan Reference: Sanitary Drainage Area Plan (109203-CG-SAN1)**																	
A-1	Nortel Drive		201	203	0.40	0.35	0.35	0.11	0.11	0.46							
A-2	Nortel Drive	Block 1	201	203	3.49	3.03	3.38	0.98	1.09	4.47							
A-3	Nortel Drive	Block 16	201	203	2.50	2.17	5.55	0.70	1.79	7.34							
A-4	Nortel Drive		201	203	0.09	0.08	5.63	0.03	1.81	7.44	***36.0***	250	PVC	***0.53***	45.16	0.89	16%
			BLOCK 13 ALLOTMENT														
A-5	Nortel Drive		203	205	0.13	0.11	5.74	0.04	1.85	7.59	***57.5***	250	PVC	***0.28***	32.83	0.65	23%
A-6	Nortel Drive	Block 17	205	101	1.17	1.02	6.75	0.33	2.18	8.93							
A-7	Nortel Drive		205	101	0.20	0.17	6.93	0.06	2.23	9.16	***37.3***	250	PVC	***0.21***	28.43	0.56	32%
A-9	Crosskey Place		101	207	0.92	0.80	7.73	0.26	7.54	15.27							
A-8	Crosskey Place	Block 14	101	207	18.03	15.65	23.38	5.05	5.05	28.43	***29.0***	300	PVC	***0.17***	41.59	0.57	68%
A-10	Nortel Drive	Block 15	207	209	7.98	6.93	30.30	2.23	9.77	40.08							
A-11	Nortel Drive		207	209	0.30	0.26	30.56	0.08	9.86	40.42	***106.5***	300	PVC	***0.27***	52.42	0.72	77%
A-12	Nortel Drive		209	211	0.31	0.27	30.83	0.09	9.95	40.78	***118.8***	300	PVC	***0.29***	54.33	0.74	75%
A-13	Nortel Drive		211	213	0.31	0.27	31.10	0.09	10.03	41.13	***114.6***	300	PVC	***0.22***	47.32	0.65	87%
A-14	Systemhouse Street		213	401	0.07	0.06	31.16	0.02	10.05	41.22	***26.4***	300	PVC	***0.23***	48.38	0.66	85%
A-15	Systemhouse Street		401	403	0.21	0.18	31.35	0.06	10.11	41.46	***86.8***	300	PVC	***0.28***	53.38	0.73	78%
A-16	Systemhouse Street		403	405	0.29	0.25	31.60	0.08	10.19	41.79	***118.8***	300	PVC	***0.32***	57.07	0.78	73%
A-17	Systemhouse Street	Block 18	405	407	2.29	1.99	33.59	0.64	10.83	44.42							
A-18	Systemhouse Street		405	407	0.20	0.17	33.76	0.06	10.89	44.65	***80.4***	375	PVC	***0.14***	68.44	0.60	65%
A-19	Systemhouse Street	Block 2	407	409	11.95	10.37	44.13	3.35	14.24	58.37							
A-20	Systemhouse Street	Block 3	407	409	5.28	4.58	48.72	1.48	15.71	64.43							
A-21	Systemhouse Street		407	409	0.30	0.26	48.98	0.08	15.80	64.77	***117.2***	375	PVC	***0.25***	91.46	0.80	71%
A-22	Systemhouse Street		409	101	0.16	0.14	49.11	0.04	15.84	64.96	***54.8***	375	PVC	***0.24***	89.61	0.79	72%
					56.58					**64.96**							

Notes:
1. Q(d) = Q(w) + Q(i) , where
2. Q(i) = 0.28 L/s/ha
3. Peaking Factor = 1.5

Q(d) = Design Flow (L/s)
Q(w) = Peak Wastewater Flow (L/s)
Q(i) = Extraneous Flow (L/s)

Legend
0.20 As-built pipe grade (%) or length (m)

REGISTERED PROFESSIONAL ENGINEER
J.G. RIDDELL
25/9/15
PROVINCE OF ONTARIO

NOVATECH FILE NO.: 109203-0
CITY FILE NO.: D07-16-12-0023
DESIGNED BY: LAB
CHECKED BY: MER/MSP
DATE (Issued with report): March 31, 2014
REVISED : August 10, 2014
REVISED : September 25, 2015 **AS-BUILT**

SANITARY SEWER DESIGN SHEET

Citi Gate 416 Corporate Campus
Phase 1 - As-Built

Location						Wastewater Flow Q(w)		Extraneous Flow Q(i)		Design Flow Q(d)	Proposed Sanitary Sewer						
Area I.D.	Street	Block Number	From MH	To MH	Area (ha)	Individual Peak Flow Rate 50,000 L/ha/d (L/s)	Cumulative Peak Flow Rate (L/s)	Individual Infiltration Rate 0.28 L/s/ha (L/s)	Cumulative Infiltration Rate (L/s)	Peak Design Flow (L/s)	Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (L/s)	Full Flow Velocity (m/s)	Percentage of Capacity
Sanitary Outlet B to Strandherd Drive at Kennevale Drive **Plan** **Reference: Sanitary Drainage Area Plan (109203-CG-SAN2)**																	
C-1	Nortel Drive	Lands Owned by Others	Fut	501	22.68	19.69	19.69	6.35	6.35	26.04	***4.0***	300	PVC	***0.20***	45.12	0.62	58%
B-1	Dealership Street	Lands Owned by Others	Fut	501	27.06	23.49	23.49	7.58	7.58	31.07	***12.5***	300	PVC	***0.20***	45.12	0.62	69%
B-2	Dealership Street	Block 11	501	503	2.72	2.36	45.54	0.76	14.69	60.23							
B-3	Dealership Street	Block 10	501	503	2.14	1.86	47.40	0.60	15.29	62.68							
B-4	Dealership Street		501	503	0.28	0.24	47.64	0.08	15.37	63.01	***119.5***	450	PVC	***0.14***	111.29	0.68	57%
B-5	Dealership Street	Block 9	503	505	1.84	1.60	49.24	0.52	15.88	65.12							
B-6	Dealership Street		503	505	0.29	0.25	49.49	0.08	15.96	65.45	***119.2***	450	PVC	***0.16***	118.97	0.72	55%
B-7	Dealership Street	Block 12 (SWM)	505	507	3.20	2.78	52.27	0.90	16.86	69.12							
B-8	Dealership Street	Block 8	505	507	1.64	1.42	53.69	0.46	17.32	71.01							
B-9	Dealership Street		505	507	0.20	0.17	53.86	0.06	17.37	71.24	***85.7***	450	PVC	***0.12***	103.03	0.63	69%
B-10	Dealership Street	Block 19	507	509	2.51	2.18	56.04	0.70	18.08	74.12							
B-11	Dealership Street		507	509	0.13	0.11	56.15	0.04	18.11	74.27	***55.9***	450	PVC	***0.16***	118.97	0.72	62%
B-12	Philsar Street	Block 6	603	601	1.62	1.41	1.41	0.45	0.45	1.86							
B-13	Philsar Street		603	601	0.23	0.20	1.61	0.06	0.52	2.12	***41.2***	250	PVC	***0.19***	27.04	0.53	8%
B-15	Philsar Street		601	509	0.19	0.16	1.77	0.05	0.57	2.34	***101.2***	250	PVC	***0.25***	31.02	0.61	8%
B-16	Dealership Street	Block 4	509	511	3.39	2.94	60.87	0.95	19.63	80.50							
B-17	Dealership Street		509	511	0.24	0.21	61.08	0.07	19.70	80.78	***99.5***	450	PVC	***0.17***	122.63	0.75	66%
B-14	Dealership Street	Block 5	511	513	2.14	1.86	62.93	0.60	20.30	83.23							
B-18	Dealership Street		511	513	0.20	0.17	63.11	0.06	20.36	83.46	***75.9***	450	PVC	***0.20***	133.02	0.81	63%
B-19	Outlet to Lift Station		513	515	0.04	0.03	63.14	0.01	20.37	**83.51**	***35.5***	450	PVC	***0.42***	192.76	1.17	43%
					72.74												

Notes:
1. Q(d) = Q(w) + Q(i) , where
2. Q(i) = 0.28 L/s/ha
3. Peaking Factor = 1.5

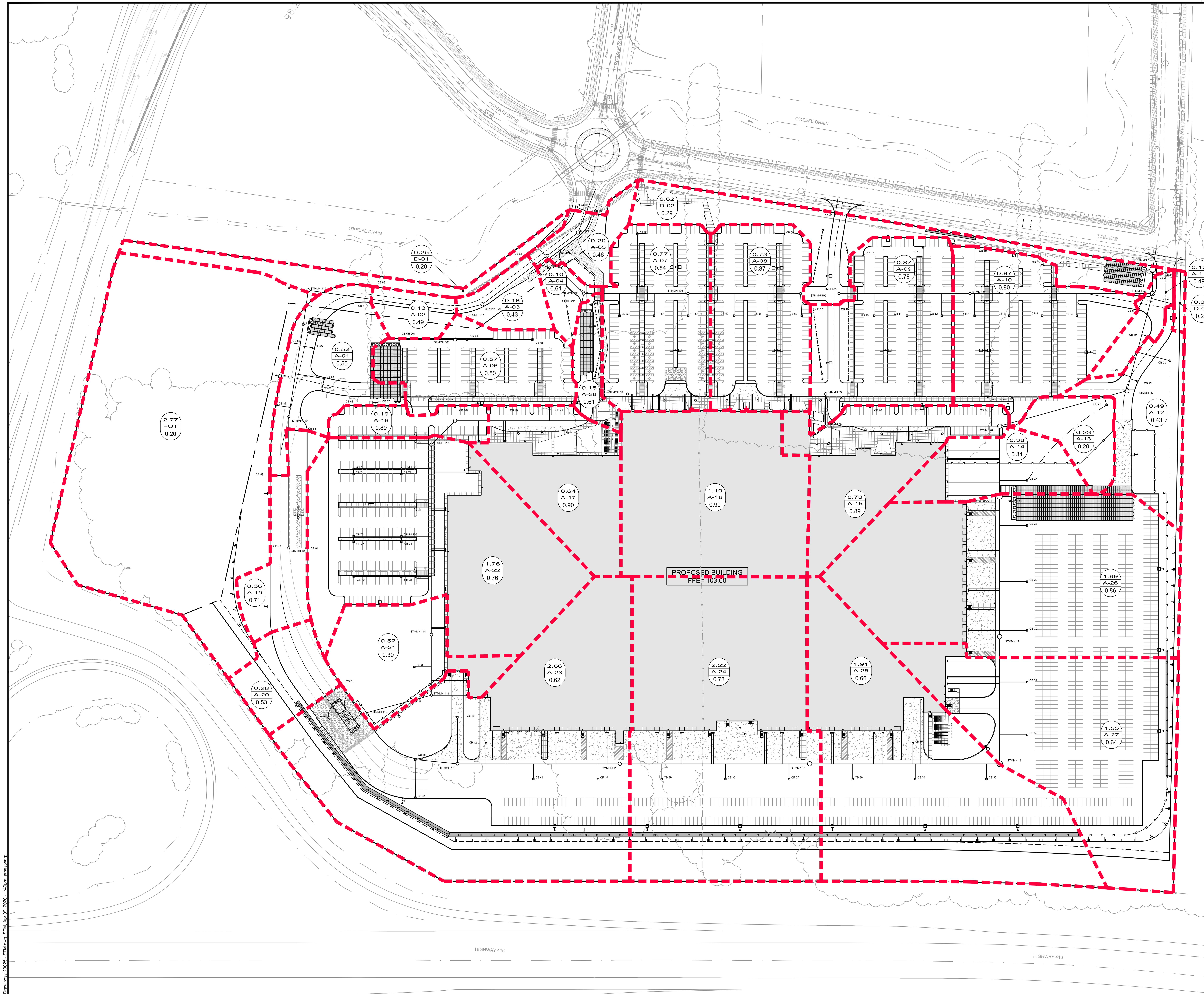
Q(d) = Design Flow (L/s)
Q(w) = Peak Wastewater Flow (L/s)
Q(i) = Extraneous Flow (L/s)

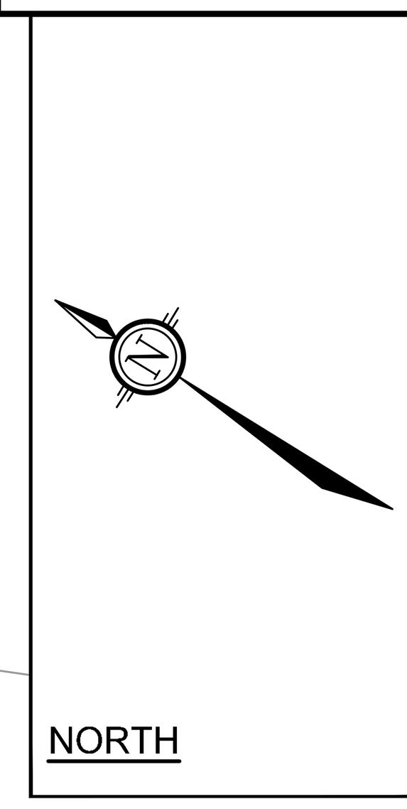
Legend:
0.20 As-built pipe grade (%) or length (m)

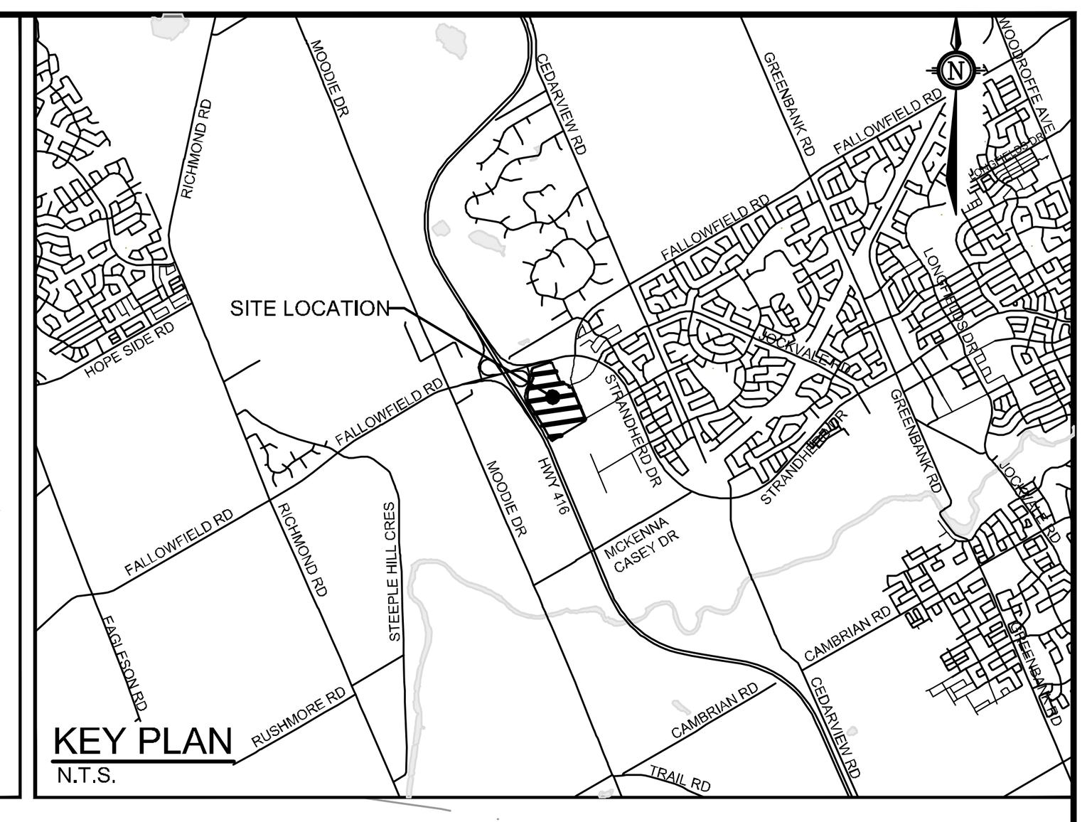
REGISTERED PROFESSIONAL ENGINEER
J.G. RIDDELL
25/9/15
PROVINCE OF ONTARIO

Appendix C

Storm Servicing Information







LEGEND

- PROPERTY LINE
- PROPOSED STORM SEWER AND MANHOLE
- DIRECTION OF FLOW
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- STM MH — EXISTING STORM MANHOLE & SEWER
- CB 1 — EXISTING CATCHBASIN
- STORM SEWER DRAINAGE AREA BOUNDARY
- 0.085 / A-16 / 0.78 — DRAINAGE AREA (ha) / DRAINAGE AREA ID / RUNOFF COEFFICIENT

REFER TO 120025-ND FOR ADDITIONAL NOTES

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.

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
1	APPLICATION FOR SITE PLAN APPROVAL	APR 9/2020	MJH

SCALE 1:1000

DESIGN MJH/ARM · CHECKED JLS · DRAWN MJH/ARM · CHECKED JLS · APPROVED JLS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER A. R. MESTWARP 100201604 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER M. J. HREHORIAK 100211256 APR 9/2020 PROVINCE OF ONTARIO

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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
PROJECT PYTHON
222 CITIGATE DRIVE, CITY OF OTTAWA

DRAWING NAME
STORM DRAINAGE AREA PLAN

PROJECT No. 120025
REV #1
DRAWING No. 120025 - STM

Project Python
222 CitiGate Drive
Project No.: 120025

STORM SEWER DESIGN SHEET
(222 CITIGATE DR)
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			AREA (ha)					FLOW							TOTAL FLOW	SEWER DATA							
AREA ID	From Manhole	To Manhole	Total Area (ha)	C = 0.20	C = 0.90	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
NORTH PARKING SYSTEM (1:5 YEAR STORM EVENT)																							
							0.00	0.000	0.000	10.00													
A-19	STMMH 120	STMMH 119	0.360	0.098	0.262	0.71	0.26	0.710	0.710	10.00		104.19		74.0	74.0	0.305	300	PVC	3.00	82.9	174.6	2.39	0.58	42%
							0.00	0.000	0.000	10.00													
							0.00	0.000	0.000	10.58													
A-01	STMMH 119	STMMH 118	0.520	0.260	0.260	0.55	0.29	0.795	1.505	10.58		101.24		152.4	152.4	0.457	450	Conc	2.00	59.1	420.3	2.56	0.38	36%
							0.00	0.000	0.000	10.58													
							0.00	0.000	0.000	10.96													
	STMMH 118	STMMH 117					0.00	0.000	1.505	10.96		99.37		149.6	149.6	0.457	450	Conc	2.00	21.8	420.3	2.56	0.14	36%
							0.00	0.000	0.000	10.96													
							0.00	0.000	0.000	10.00													
FUT	STUB	STMMH 117	2.770	2.770	0.000	0.20	0.55	1.540	1.540	10.00		104.19		160.5	160.5	0.914	900	Conc	0.30	12.5	1,033.9	1.57	0.13	16%
							0.00	0.000	0.000	10.00													
							0.00	0.000	0.000	11.10													
A-02	STMMH 117	STMMH 107	0.130	0.076	0.054	0.49	0.06	0.177	3.223	11.10		98.70		318.1	318.1	0.914	900	Conc	0.30	93.7	1,033.9	1.57	0.99	31%
							0.00	0.000	0.000	11.10													
							0.00	0.000	0.000	10.00													
A-20	STMMH 116	STMMH 115	0.280	0.148	0.132	0.53	0.15	0.413	0.413	10.00		104.19		43.0	43.0	0.305	300	PVC	2.00	45.8	142.5	1.95	0.39	30%
							0.00	0.000	0.000	10.00													
							0.00	0.000	0.000	10.39													
A-21	STMMH 115	STMMH 114	0.520	0.446	0.074	0.30	0.16	0.433	0.846	10.39		102.17		86.4	86.4	0.533	525	Conc	0.70	38.3	375.1	1.68	0.38	23%
							0.00	0.000	0.000	10.39													
							0.00	0.000	0.000	10.77													
A-22	STMMH 114	STMMH 113	1.760	0.352	1.408	0.76	1.34	3.719	4.564	10.77		100.29		457.7	457.7	0.762	750	Conc	0.50	120.0	820.8	1.80	1.11	56%
							0.00	0.000	0.000	10.77													
							0.00	0.000	0.000	11.88													
	STMMH 113	STMMH 110	0.000	0.000	0.000		0.00	0.000	4.564	11.88		95.20		434.5	434.5	0.762	750	Conc	0.50	21.4	820.8	1.80	0.20	53%
							0.00	0.000	0.000	11.88													
							0.00	0.000	0.000	10.00													
A-17	STMMH 111	STMMH 110	0.640	0.000	0.640	0.90	0.58	1.601	1.601	10.00		104.19		166.8	166.8	0.457	450	Conc	1.37	95.5	347.9	2.12	0.75	48%
							0.00	0.000	0.000	10.00													
							0.00	0.000	0.000	12.08													
	STMMH 110	STMMH 109	0.000	0.000	0.000		0.00	0.000	6.165	12.08		94.35		581.7	581.7	0.762	750	Conc	1.00	8.8	1,160.8	2.55	0.06	50%
							0.00	0.000	0.000	12.08													
							0.00	0.000	0.000	12.14													
A-18	STMMH 109	STMMH 108	0.190	0.003	0.187	0.89	0.17	0.470	6.635	12.14		94.11		624.4	624.4	0.762	750	Conc	1.00	42.5	1,160.8	2.55	0.28	54%
							0.00	0.000	0.000	12.14													
							0.00	0.000	0.000	12.42													
A-06	STMMH 108	STMMH 107	0.570	0.081	0.489	0.80	0.46	1.269	7.904	12.42		92.95		734.7	734.7	0.762	750	Conc	1.00	17.9	1,160.8	2.55	0.12	63%
							0.00	0.000	0.000	12.42													
							0.00	0.000	0.000	12.53													
	STMMH 107	STMMH 106	0.000	0.000	0.000		0.00	0.000	11.126	12.53		92.48		1,028.9	1,028.9	0.991	975	Conc	0.30	17.8	1,280.0	1.66	0.18	80%
							0.00	0.000	0.000	12.53													

Project Python
222 CitiGate Drive
Project No.: 120025

STORM SEWER DESIGN SHEET
(222 CITIGATE DR)
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			AREA (ha)					FLOW							TOTAL FLOW	SEWER DATA							
AREA ID	From Manhole	To Manhole	Total Area (ha)	C = 0.20	C = 0.90	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
A-03	STMMH 106	STMMH 102	0.180	0.121	0.059	0.43	0.00	0.000	0.000	12.71					1,040.7	0.991	975	Conc	0.30	50.7	1,280.0	1.66	0.51	81%
							0.08	0.215	11.341	12.71		91.76		1,040.7										
							0.00	0.000	0.000	12.71														
A-08	STMMH 105	STMMH 104	0.730	0.031	0.699	0.87	0.00	0.000	0.000	10.00					184.0	0.533	525	Conc	0.70	70.9	375.1	1.68	0.70	49%
							0.64	1.766	1.766	10.00		104.19		184.0										
							0.00	0.000	0.000	10.00														
A-07	STMMH 104	STMMH 103	0.770	0.066	0.704	0.84	0.00	0.000	0.000	10.70					358.6	0.610	600	Conc	1.50	66.0	784.0	2.69	0.41	46%
							0.65	1.798	3.564	10.70		100.62		358.6										
							0.00	0.000	0.000	10.70														
A-04, A-28	STMMH 103	STMMH 102	0.250	0.104	0.146	0.61	0.00	0.000	0.000	11.11					393.4	0.610	600	Conc	1.50	33.4	784.0	2.69	0.21	50%
							0.15	0.423	3.987	11.11		98.66		393.4										
							0.00	0.000	0.000	11.11														
	STMMH 102	STMMH 101	0.000	0.000	0.000		0.00	0.000	0.000	13.22					1,376.2	0.991	975	Conc	0.50	24.8	1,652.4	2.14	0.19	83%
							0.00	0.000	15.328	13.22		89.78		1,376.2										
							0.00	0.000	0.000	13.22														
A-05	STMMH 101	EX STMMH	0.170	0.107	0.063	0.46	0.00	0.000	0.000	13.41					1,384.5	0.991	975	Conc	0.50	31.1	1,652.4	2.14	0.24	84%
							0.08	0.217	15.545	13.41		89.06		1,384.5										
							0.00	0.000	0.000	13.41														
SOUTH PARKING SYSTEM (1:5 YEAR STORM EVENT)																								
A-23	STMMH 16	STMMH 15	2.660	1.064	1.596	0.62	0.00	0.000	0.000	10.00					477.7	0.914	900	Conc	0.30	102.5	1,033.9	1.57	1.09	46%
							1.65	4.585	4.585	10.00		104.19		477.7										
							0.00	0.000	0.000	10.00														
A-24	STMMH 15	STMMH 14	2.220	0.381	1.839	0.78	0.00	0.000	0.000	11.09					928.4	1.067	1050	Conc	0.30	120.0	1,559.7	1.74	1.15	60%
							1.73	4.813	9.398	11.09		98.79		928.4										
							0.00	0.000	0.000	11.09														
A-25	STMMH 14	STMMH 13	1.910	0.655	1.255	0.66	0.00	0.000	0.000	12.23					1,209.2	1.219	1200	Conc	0.30	120.0	2,226.9	1.91	1.05	54%
							1.26	3.504	12.902	12.23		93.72		1,209.2										
							0.00	0.000	0.000	12.23														
A-27	STMMH 13	STMMH 12	1.550	0.576	0.974	0.64	0.00	0.000	0.000	13.28					1,402.5	1.219	1200	Conc	0.30	80.4	2,226.9	1.91	0.70	63%
							0.99	2.757	15.659	13.28		89.56		1,402.5										
							0.00	0.000	0.000	13.28														
A-26	STMMH 12	STMMH 11	1.990	0.114	1.876	0.86	0.00	0.000	0.000	13.98					1,776.1	1.219	1200	Conc	0.30	88.6	2,226.9	1.91	0.77	80%
							1.71	4.757	20.416	13.98		87.00		1,776.1										
							0.00	0.000	0.000	13.98														
A-14	STMMH 11	STMMH 07	0.380	0.304	0.076	0.34	0.00	0.000	0.000	14.76					1,752.5	1.219	1200	Conc	0.30	44.5	2,226.9	1.91	0.39	79%
							0.13	0.359	20.775	14.76		84.35		1,752.5										
							0.00	0.000	0.000	14.76														
A-16	STMMH 10	STMMH 09	1.190	0.000	1.190	0.90	0.00	0.000	0.000	10.00					310.2	0.610	600	Conc	1.00	125.0	640.2	2.19	0.95	48%
							1.07	2.977	2.977	10.00		104.19		310.2										
							0.00	0.000	0.000	10.00														
	STMMH 09	STMMH 08	0.000	0.000	0.000		0.00	0.000	0.000	10.95					296.0	0.610	600	Conc	1.00	20.3	640.2	2.19	0.15	46%
							0.00	0.000	2.977	10.95		99.43		296.0										
							0.00	0.000	0.000	10.95														
A-15	STMMH 08	STMMH 07	0.700	0.010	0.690	0.89	0.00	0.000	0.000	11.10					464.8	0.610	600	Conc	1.00	110.0	640.2	2.19	0.84	73%
							0.62	1.732	4.709	11.10		98.70		464.8										
							0.00	0.000	0.000	11.10														

Project Python
222 CitiGate Drive
Project No.: 120025

STORM SEWER DESIGN SHEET
(222 CITIGATE DR)
FLOW RATES BASED ON RATIONAL METHOD

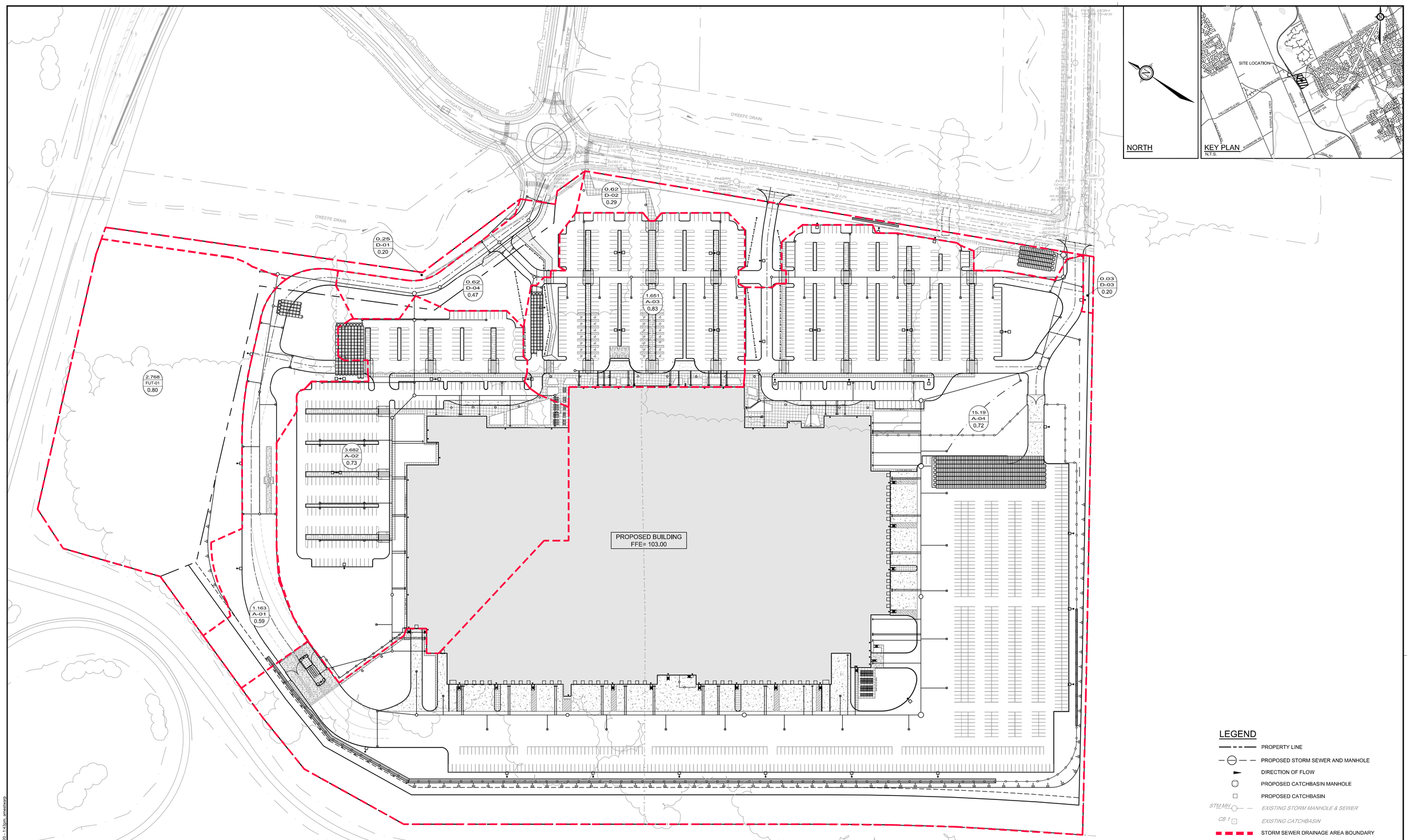
NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			AREA (ha)					FLOW							TOTAL FLOW	SEWER DATA							
AREA ID	From Manhole	To Manhole	Total Area (ha)	C = 0.20	C = 0.90	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
							0.00	0.000	0.000	15.15													
A-13	STMMH 07	STMMH 06	0.230	0.230	0.000	0.20	0.05	0.128	25.613	15.15		83.09		2,128.2	2,128.2	1.219	1200	Conc	0.70	83.5	3,401.6	2.91	0.48	63%
							0.00	0.000	0.000	15.15													
							0.00	0.000	0.000	15.62													
A-12	STMMH 06	STMMH 02	0.490	0.329	0.161	0.43	0.21	0.586	26.198	15.62		81.60		2,137.7	2,137.7	1.219	1200	Conc	0.70	63.6	3,401.6	2.91	0.36	63%
							0.00	0.000	0.000	15.62													
							0.00	0.000	0.000	10.00													
A-09	STMMH 05	STMMH 04	0.870	0.149	0.721	0.78	0.68	1.887	1.887	10.00		104.19		196.6	196.6	0.533	525	Conc	1.00	82.9	448.4	2.01	0.69	44%
							0.00	0.000	0.000	10.00													
							0.00	0.000	0.000	10.69													
A-10	STMMH 04	STMMH 02	0.870	0.124	0.746	0.80	0.70	1.935	3.822	10.69		100.69		384.9	384.9	0.610	600	Conc	1.50	115.3	784.0	2.69	0.72	49%
							0.00	0.000	0.000	10.69													
							0.00	0.000	0.000	15.99													
A-11	STMMH 02	STMMH 01	0.130	0.076	0.054	0.49	0.06	0.177	30.198	15.99		80.50		2,430.9	2,430.9	1.219	1200	Conc	0.60	15.3	3,149.3	2.70	0.09	77%
							0.00	0.000	0.000	15.99													
							0.00	0.000	0.000	16.08													
	STMMH 01	EX STMMH	0.000	0.000	0.000		0.00	0.000	30.198	16.08		80.22		2,422.5	2,422.5	1.219	1200	Conc	0.60	12.0	3,149.3	2.70	0.07	77%
							0.00	0.000	0.000	16.08													

Q = 2.78 AIC, where	**Consultant:**		**Novatech**
Q = Peak Flow in Litres per Second (L/s)	**Date:**		April 2, 2020
A = Area in hectares (ha)	**Design By:**		Matthew Hrehoriak
I = Rainfall Intensity (mm/hr), 5 year storm	**Client:**	**Dwg. Reference:**	**Checked By:**
C = Runoff Coefficient		120025-STM	LS

Appendix D

Stormwater Management Modeling



REFER TO 120025-ND FOR ADDITIONAL NOTES

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.

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
1	APPLICATION FOR SITE PLAN APPROVAL	APR 9/2020	MJH

SCALE
1:1000
1:1000
0 10 20 30 40

DESIGN MJH/ARM
CHECKED JLS
DRAWN MJH/ARM
CHECKED JLS
APPROVED JLS

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
A.R. MESTWARP
100201604
PROVINCE OF ONTARIO
ISSUED FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
M.J. HISCHKAK
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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
PROJECT PYTHON
222 CITIGATE DRIVE, CITY OF OTTAWA

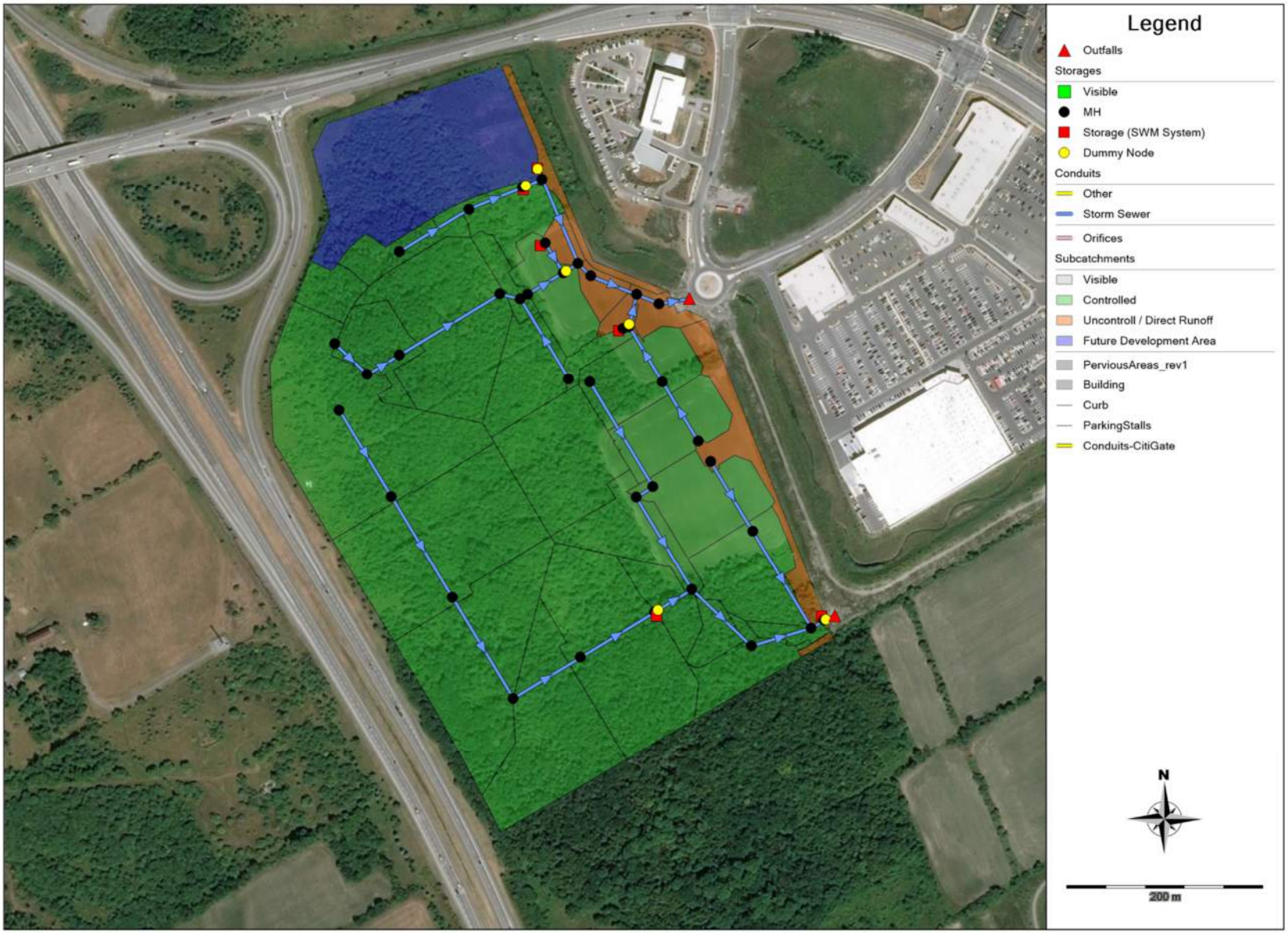
DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 120025
REV REV #1
DRAWING No. 120025 - SWM

222 CitiGate Drive – Project Python (120025)
PCSWMM Model Schematics

NOVATECH
Engineers, Planners & Landscape Architects

Overall Model Schematic

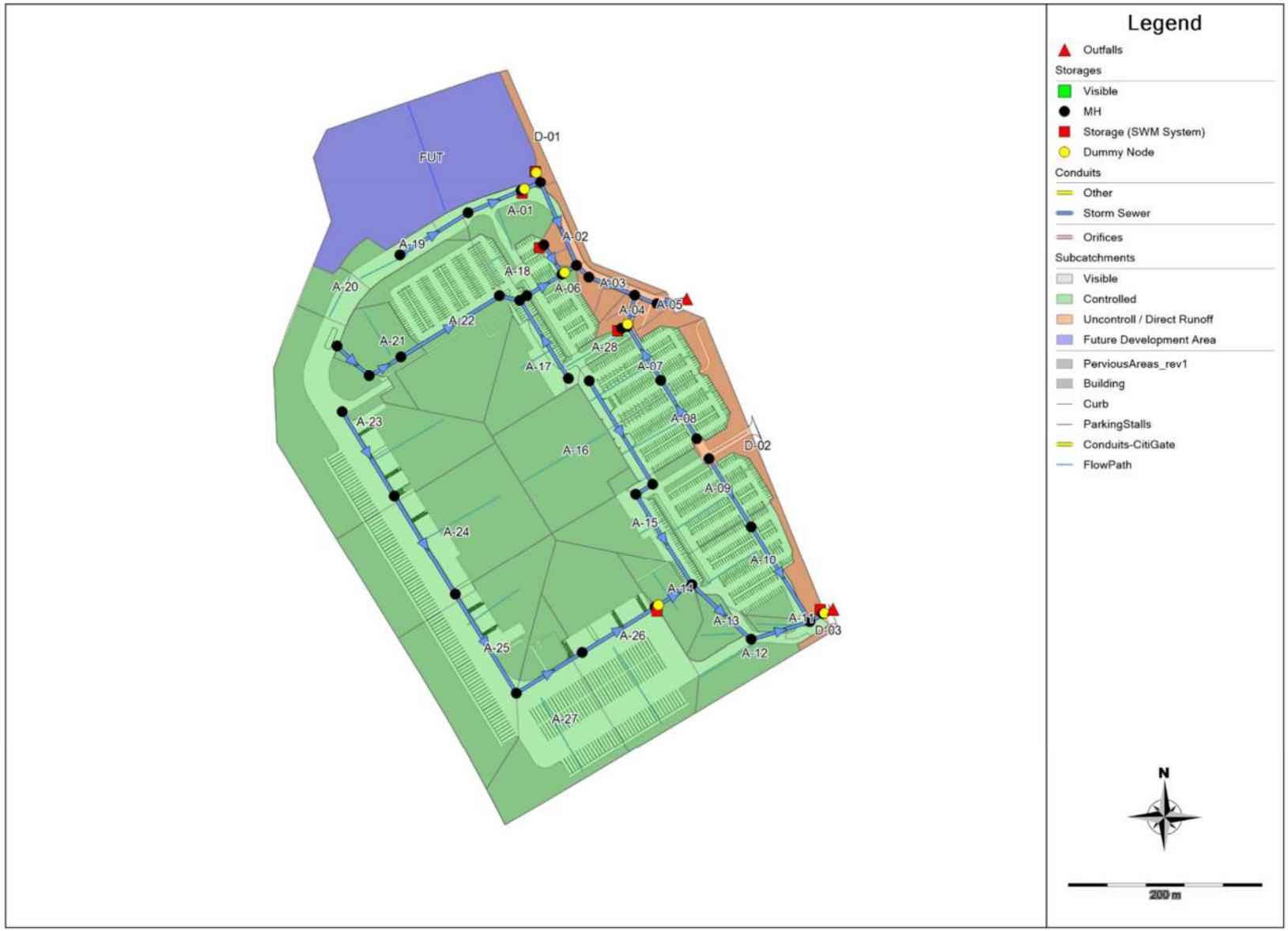


Date: 2020-04-05

222 CitiGate Drive – Project Python (120025)
PCSWMM Model Schematics

NOVATECH
Engineers, Planners & Landscape Architects

Subcatchments and Flow Paths



Date: 2020-04-05

222 CitiGate Drive – Project Python (120025)
PCSWMM Model Schematics

NOVATECH
Engineers, Planners & Landscape Architects

Maintenance Holes (Storage Nodes)

Date: 2020-04-05

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 32
Number of nodes ........... 50
Number of links ........... 48
Number of pollutants ...... 0
Number of land uses ....... 0


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


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
------------------------------------------------------------------------------------------
A-01                        0.52    115.56     50.00    1.5000 Raingage1            MH119
A-02                        0.13     65.00     41.40    1.5000 Raingage1            MH117
A-03                        0.18     60.00     32.90    1.5000 Raingage1            MH106
A-04                        0.10     40.00     32.90    1.5000 Raingage1            MH102
A-05                        0.20     44.44     37.10    1.5000 Raingage1            MH101
A-06                        0.57    142.50     85.70    1.5000 Raingage1            MH108
A-07                        0.77    118.46     91.40    1.5000 Raingage1            MH104
A-08                        0.73    112.31     95.70    1.5000 Raingage1            MH105
A-09                        0.87    145.00     82.90    1.5000 Raingage1            MH05
A-10                        0.87    145.00     85.70    1.5000 Raingage1            MH04
A-11                        0.13     23.64     41.40    1.5000 Raingage1            MH02
A-12                        0.49     75.39     32.90    1.5000 Raingage1            MH06
A-13                        0.23     65.71      0.00    1.5000 Raingage1            MH07
A-14                        0.38     84.44     20.00    1.5000 Raingage1            MH11
A-15                        0.70    233.33     98.60    1.5000 Raingage1            MH08
A-16                        1.19    119.00    100.00    1.5000 Raingage1            MH10
A-17                        0.64    142.22    100.00    1.5000 Raingage1            MH111
A-18                        0.19     95.00     98.60    1.5000 Raingage1            CBMH109
A-19                        0.36     65.45     72.90    1.5000 Raingage1            MH120
A-20                        0.28     62.22     47.10    1.5000 Raingage1            MH116
A-21                        0.52    104.00     14.30    1.5000 Raingage1            MH115
A-22                        1.76    185.26     80.00    1.5000 Raingage1            MH114
A-23                        2.66    295.56     60.00    1.5000 Raingage1            MH16
A-24                        2.22    233.68     82.90    1.5000 Raingage1            MH15
A-25                        1.91    293.85     65.70    1.5000 Raingage1            MH14
A-26                        1.99    209.47     94.30    1.5000 Raingage1            MH12
A-27                        1.55    172.22     62.90    1.5000 Raingage1            MH13
A-28                        0.15     21.43     77.10    1.5000 Raingage1            MH103
D-01                        0.25    166.67      0.00    1.5000 Raingage1            EX-MH208
D-02                        0.62    155.00     12.90    1.5000 Raingage1            EX-MH214
D-03                        0.03     60.00      0.00    1.5000 Raingage1            EX-MH214
FUT                         2.77    230.83     85.00    1.5000 Raingage1            Storage-NFUT


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------
EX-MH208             OUTFALL         95.64      0.97       0.0
EX-MH214             OUTFALL         94.65      1.20       0.0
CBMH109              STORAGE         97.70      4.15       0.0
CBMH201              STORAGE         97.56      2.99       0.0
CBMH211              STORAGE         97.32      3.82       0.0
FUT-Dummy            STORAGE         96.60      3.40       0.0
MH01                 STORAGE         94.72      3.46       0.0
MH01-Dummy           STORAGE         94.72      3.46       0.0
MH02                 STORAGE         94.84      4.23       0.0
MH04                 STORAGE         97.33      3.59       0.0
MH05                 STORAGE         98.23      2.44       0.0
MH06                 STORAGE         95.42      5.59       0.0
MH07                 STORAGE         96.50      5.61       0.0
MH08                 STORAGE         98.20      4.62       0.0
MH09                 STORAGE         98.46      3.93       0.0
MH10                 STORAGE         99.77      2.70       0.0
MH101                STORAGE         95.80      2.82       0.0
MH102                STORAGE         95.96      3.60       0.0
MH103                STORAGE         97.10      3.99       0.0
MH103-Dummy          STORAGE         97.10      3.99       0.0
MH104                STORAGE         98.12      3.76       0.0
MH105                STORAGE         98.70      2.75       0.0
```

MH106	STORAGE	96.12	4.57	0.0
MH107	STORAGE	96.20	4.64	0.0
MH108	STORAGE	97.15	3.64	0.0
MH108-Dummy	STORAGE	97.15	3.64	0.0
MH11	STORAGE	97.09	4.51	0.0
MH110	STORAGE	97.80	4.37	0.0
MH111	STORAGE	100.13	2.66	0.0
MH113	STORAGE	98.13	4.20	0.0
MH114	STORAGE	98.76	3.72	0.0
MH115	STORAGE	99.26	2.42	0.0
MH116	STORAGE	100.50	2.98	0.0
MH117	STORAGE	96.55	3.45	0.0
MH118	STORAGE	97.44	2.43	0.0
MH118-Dummy	STORAGE	97.44	2.43	0.0
MH119	STORAGE	98.85	2.59	0.0
MH11-Dummy	STORAGE	97.09	4.51	0.0
MH12	STORAGE	97.37	4.16	0.0
MH120	STORAGE	101.78	1.72	0.0
MH13	STORAGE	97.62	3.85	0.0
MH14	STORAGE	98.04	3.47	0.0
MH15	STORAGE	98.55	3.02	0.0
MH16	STORAGE	99.01	3.06	0.0
Storage-N01	STORAGE	97.56	2.38	0.0
Storage-N02	STORAGE	97.66	3.01	0.0
Storage-N03	STORAGE	97.45	3.79	0.0
Storage-NFUT	STORAGE	96.60	3.40	0.0
Storage-S01	STORAGE	97.33	4.27	0.0
Storage-S02	STORAGE	95.03	3.19	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
CBMH109-MH108	CBMH109	MH108	CONDUIT	42.5	1.0008	0.0130
CBMH201-MH108	CBMH201	MH108	CONDUIT	35.4	0.9899	0.0130
CBMH211-MH103	CBMH211	MH103	CONDUIT	6.1	1.9612	0.0130
FUT-MH117	FUT-Dummy	MH117	CONDUIT	12.5	0.3205	0.0130
MH01-MH214	MH01-Dummy	EX-MH214	CONDUIT	12.2	0.5738	0.0130
MH02-MH01	MH02	MH01	CONDUIT	15.3	0.5886	0.0130
MH04-MH02	MH04	MH02	CONDUIT	115.4	1.4998	0.0130
MH05-MH04	MH05	MH04	CONDUIT	82.9	1.0014	0.0130
Mh06-MH02	MH06	MH02	CONDUIT	63.6	0.7076	0.0130
MH07-MH06	MH07	MH06	CONDUIT	83.5	0.6943	0.0130
MH08-MH07	MH08	MH07	CONDUIT	110.0	1.0002	0.0130
MH09-MH08	MH09	MH08	CONDUIT	20.3	0.9843	0.0130
MH101-MH100	MH101	EX-MH208	CONDUIT	31.1	0.5143	0.0130
MH102-MH101	MH102	MH101	CONDUIT	24.8	0.4841	0.0130
MH103-Dummy	MH103-Dummy	MH102	CONDUIT	33.4	1.4972	0.0130
MH104-MH103	MH104	MH103	CONDUIT	66.0	1.5006	0.0130
MH105-MH104	MH105	MH104	CONDUIT	70.9	0.7049	0.0130
MH106-MH102	MH106	MH102	CONDUIT	50.6	0.3159	0.0130
MH107-MH106	MH107	MH106	CONDUIT	17.8	0.3375	0.0130
MH108-MH107	MH108-Dummy	MH107	CONDUIT	17.9	1.0040	0.0130
MH10-MH09	MH10	MH09	CONDUIT	125.0	1.0001	0.0130
MH110-CBMH109	MH110	CBMH109	CONDUIT	8.8	0.9978	0.0130
MH111-MH110	MH111	MH110	CONDUIT	95.5	1.3932	0.0130
MH113-MH110	MH113	MH110	CONDUIT	21.4	0.5131	0.0130
MH114-MH113	MH114	MH113	CONDUIT	120.0	0.5000	0.0130
MH115-MH114	MH115	MH114	CONDUIT	38.3	0.6783	0.0130
MH116-MH115	MH116	MH115	CONDUIT	45.8	2.0008	0.0130
MH117-MH107	MH117	MH107	CONDUIT	93.7	0.2988	0.0130
MH118-MH117	MH118-Dummy	MH117	CONDUIT	21.8	2.0178	0.0130
MH119-MH118	MH119	MH118	CONDUIT	59.1	1.9967	0.0130
MH11-MH07	MH11-Dummy	MH07	CONDUIT	44.5	0.2921	0.0130
MH120-MH119	MH120	MH119	CONDUIT	82.9	2.9933	0.0130
MH12-MH11	MH12	MH11	CONDUIT	88.6	0.3047	0.0130
MH13-MH12	MH13	MH12	CONDUIT	80.4	0.2986	0.0130
MH14-MH13	MH14	MH13	CONDUIT	120.0	0.3000	0.0130
MH15-MH14	MH15	MH14	CONDUIT	120.0	0.3000	0.0130
MH16-MH15	MH16	MH15	CONDUIT	102.5	0.3025	0.0130
Storage-N01-MH118	Storage-N01	MH118	CONDUIT	3.0	2.0004	0.0130
Storage-N02-CBMH201	Storage-N02	CBMH201	CONDUIT	2.0	2.0004	0.0130
Storage-N03-CBMH211	Storage-N03	CBMH211	CONDUIT	4.0	2.5008	0.0130
Storage-S01-MH11	Storage-S01	MH11	CONDUIT	7.5	1.0667	0.0130
Storage-S02-MH01	Storage-S02	MH01	CONDUIT	4.0	2.0004	0.0130
FUT-ICD	Storage-NFUT	FUT-Dummy	ORIFICE			
MH01-ICD	MH01	MH01-Dummy	ORIFICE			
MH103-ICD	MH103	MH103-Dummy	ORIFICE			
MH108-ICD	MH108	MH108-Dummy	ORIFICE			
MH118-ICD	MH118	MH118-Dummy	ORIFICE			
MH11-ICD	MH11	MH11-Dummy	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
CBMH109-MH108	CIRCULAR	0.75	0.44	0.19	0.75	1	1113.77

CBMH201-MH108	CIRCULAR	0.75	0.44	0.19	0.75	1	1107.69
CBMH211-MH103	CIRCULAR	0.53	0.22	0.13	0.53	1	602.30
FUT-MH117	CIRCULAR	0.90	0.64	0.23	0.90	1	1024.95
MH01-MH214	CIRCULAR	1.20	1.13	0.30	1.20	1	2953.40
MH02-MH01	CIRCULAR	1.20	1.13	0.30	1.20	1	2991.37
MH04-MH02	CIRCULAR	0.60	0.28	0.15	0.60	1	752.01
MH05-MH04	CIRCULAR	0.53	0.22	0.13	0.53	1	430.38
Mh06-MH02	CIRCULAR	1.20	1.13	0.30	1.20	1	3279.69
MH07-MH06	CIRCULAR	1.20	1.13	0.30	1.20	1	3248.79
MH08-MH07	CIRCULAR	0.60	0.28	0.15	0.60	1	614.12
MH09-MH08	CIRCULAR	0.60	0.28	0.15	0.60	1	609.21
MH101-MH100	CIRCULAR	0.97	0.75	0.24	0.97	1	1607.28
MH102-MH101	CIRCULAR	0.97	0.75	0.24	0.97	1	1559.31
MH103-Dummy	CIRCULAR	0.60	0.28	0.15	0.60	1	751.34
MH104-MH103	CIRCULAR	0.60	0.28	0.15	0.60	1	752.21
MH105-MH104	CIRCULAR	0.53	0.22	0.13	0.53	1	361.10
MH106-MH102	CIRCULAR	0.97	0.75	0.24	0.97	1	1259.65
MH107-MH106	CIRCULAR	0.97	0.75	0.24	0.97	1	1301.94
MH108-MH107	CIRCULAR	0.75	0.44	0.19	0.75	1	1115.54
MH10-MH09	CIRCULAR	0.60	0.28	0.15	0.60	1	614.06
MH110-CBMH109	CIRCULAR	0.75	0.44	0.19	0.75	1	1112.11
MH111-MH110	CIRCULAR	0.45	0.16	0.11	0.45	1	336.55
MH113-MH110	CIRCULAR	0.75	0.44	0.19	0.75	1	797.47
MH114-MH113	CIRCULAR	0.75	0.44	0.19	0.75	1	787.26
MH115-MH114	CIRCULAR	0.53	0.22	0.13	0.53	1	354.23
MH116-MH115	CIRCULAR	0.30	0.07	0.07	0.30	1	136.79
MH117-MH107	CIRCULAR	0.90	0.64	0.23	0.90	1	989.67
MH118-MH117	CIRCULAR	0.45	0.16	0.11	0.45	1	405.02
MH119-MH118	CIRCULAR	0.45	0.16	0.11	0.45	1	402.89
MH11-MH07	CIRCULAR	1.20	1.13	0.30	1.20	1	2107.38
MH120-MH119	CIRCULAR	0.30	0.07	0.07	0.30	1	167.31
MH12-MH11	CIRCULAR	1.20	1.13	0.30	1.20	1	2152.36
MH13-MH12	CIRCULAR	1.20	1.13	0.30	1.20	1	2130.63
MH14-MH13	CIRCULAR	1.20	1.13	0.30	1.20	1	2135.56
MH15-MH14	CIRCULAR	1.05	0.87	0.26	1.05	1	1495.77
MH16-MH15	CIRCULAR	0.90	0.64	0.23	0.90	1	995.73
Storage-N01-MH118	CIRCULAR	0.45	0.16	0.11	0.45	1	403.27
Storage-N02-CBMH201	CIRCULAR	0.75	0.44	0.19	0.75	1	1574.66
Storage-N03-CBMH211	CIRCULAR	0.53	0.22	0.13	0.53	1	680.14
Storage-S01-MH11	CIRCULAR	1.05	0.87	0.26	1.05	1	2820.53
Storage-S02-MH01	CIRCULAR	1.05	0.87	0.26	1.05	1	3862.45

```
************************************************************
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 .....          1.860        71.667
Evaporation Loss .....             0.000         0.000
Infiltration Loss .....            0.332        12.804
Surface Runoff .....               1.527        58.818
Final Storage .....                0.019         0.715
Continuity Error (%) .....       -0.936
```

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.527	15.275
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.529	15.294
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	0.012
Continuity Error (%)	-0.201	

Highest Continuity Errors

Node MH08 (1.60%)
Node MH113 (-1.06%)
Node MH114 (1.01%)

Time-Step Critical Elements

Link Storage-N02-CBMH201 (25.09%)
Link Storage-S02-MH01 (2.08%)
Link MH01-MH214 (1.95%)
Link Storage-N03-CBMH211 (1.16%)
Link Storage-S01-MH11 (1.10%)

Highest Flow Instability Indexes

Link MH11-ICD (30)
Link MH118-ICD (2)

Routing Time Step Summary

Minimum Time Step	:	0.11 sec
Average Time Step	:	1.70 sec
Maximum Time Step	:	2.00 sec
Percent in Steady State	:	-0.00
Average Iterations per Step	:	2.03
Percent Not Converging	:	0.02

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-01	71.67	0.00	0.00	23.05	35.21	13.17	48.38	0.25	185.21	0.675
A-02	71.67	0.00	0.00	26.38	29.07	16.36	45.42	0.06	50.00	0.634
A-03	71.67	0.00	0.00	30.78	23.11	17.87	40.98	0.07	57.35	0.572
A-04	71.67	0.00	0.00	30.55	23.10	18.18	41.28	0.04	33.57	0.576
A-05	71.67	0.00	0.00	29.33	26.09	16.15	42.24	0.08	60.20	0.589
A-06	71.67	0.00	0.00	6.34	60.47	4.20	64.67	0.37	273.34	0.902
A-07	71.67	0.00	0.00	3.81	64.62	2.53	67.15	0.52	373.13	0.937
A-08	71.67	0.00	0.00	1.89	67.66	1.32	68.99	0.50	357.97	0.963
A-09	71.67	0.00	0.00	7.67	58.58	4.82	63.40	0.55	405.04	0.885
A-10	71.67	0.00	0.00	6.39	60.56	4.08	64.65	0.56	411.75	0.902
A-11	71.67	0.00	0.00	27.52	29.16	14.80	43.96	0.06	39.62	0.613
A-12	71.67	0.00	0.00	32.14	23.16	16.24	39.41	0.19	124.40	0.550
A-13	71.67	0.00	0.00	47.21	0.00	24.99	24.99	0.06	36.76	0.349
A-14	71.67	0.00	0.00	37.83	14.32	19.92	34.24	0.13	85.27	0.478
A-15	71.67	0.00	0.00	0.61	70.45	0.46	70.91	0.50	346.42	0.989
A-16	71.67	0.00	0.00	0.00	72.29	0.00	72.29	0.86	579.20	1.009
A-17	71.67	0.00	0.00	0.00	71.73	0.00	71.73	0.46	317.01	1.001
A-18	71.67	0.00	0.00	0.61	69.40	0.46	69.86	0.13	94.04	0.975
A-19	71.67	0.00	0.00	12.29	51.47	7.42	58.89	0.21	156.74	0.822
A-20	71.67	0.00	0.00	24.45	33.16	13.85	47.01	0.13	96.33	0.656
A-21	71.67	0.00	0.00	41.00	10.24	20.80	31.04	0.16	97.96	0.433
A-22	71.67	0.00	0.00	9.15	57.20	5.36	62.56	1.10	776.68	0.873
A-23	71.67	0.00	0.00	18.92	43.18	9.96	53.13	1.41	957.56	0.741
A-24	71.67	0.00	0.00	7.78	59.41	4.65	64.05	1.42	1003.30	0.894
A-25	71.67	0.00	0.00	15.80	46.76	9.04	55.80	1.07	764.31	0.779
A-26	71.67	0.00	0.00	2.53	67.22	1.68	68.90	1.37	961.59	0.961
A-27	71.67	0.00	0.00	17.46	44.56	9.33	53.89	0.84	577.12	0.752
A-28	71.67	0.00	0.00	10.41	55.00	6.23	61.23	0.09	66.37	0.854

D-01	71.67	0.00	0.00	45.35	0.00	27.36	27.36	0.07	68.15	0.382
D-02	71.67	0.00	0.00	41.11	9.05	21.78	30.83	0.19	126.26	0.430
D-03	71.67	0.00	0.00	44.28	0.00	29.64	29.64	0.01	11.75	0.414
FUT	71.67	0.00	0.00	6.85	60.78	4.04	64.82	1.80	1247.55	0.904

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
EX-MH208	OUTFALL	0.10	0.70	96.34	0 01:13	0.70
EX-MH214	OUTFALL	0.11	0.84	95.49	0 01:14	0.84
CBMH109	STORAGE	0.15	2.17	99.87	0 01:12	2.17
CBMH201	STORAGE	0.15	2.03	99.59	0 01:23	2.03
CBMH211	STORAGE	0.09	1.50	98.82	0 01:21	1.50
FUT-Dummy	STORAGE	0.07	0.54	97.14	0 01:14	0.54
MH01	STORAGE	0.21	2.91	97.63	0 01:14	2.90
MH01-Dummy	STORAGE	0.11	0.84	95.56	0 01:14	0.84
MH02	STORAGE	0.19	2.87	97.71	0 01:14	2.86
MH04	STORAGE	0.05	1.52	98.85	0 01:12	1.51
MH05	STORAGE	0.03	1.09	99.32	0 01:11	1.09
MH06	STORAGE	0.13	2.47	97.89	0 01:14	2.46
MH07	STORAGE	0.11	1.68	98.18	0 01:14	1.67
MH08	STORAGE	0.05	1.30	99.50	0 01:11	1.30
MH09	STORAGE	0.05	1.41	99.87	0 01:11	1.40
MH10	STORAGE	0.04	1.24	101.01	0 01:10	1.23
MH101	STORAGE	0.11	0.75	96.55	0 01:13	0.75
MH102	STORAGE	0.11	0.76	96.72	0 01:13	0.76
MH103	STORAGE	0.14	1.72	98.82	0 01:21	1.72
MH103-Dummy	STORAGE	0.04	0.23	97.33	0 01:21	0.23
MH104	STORAGE	0.05	1.48	99.60	0 01:10	1.47
MH105	STORAGE	0.04	1.31	100.01	0 01:10	1.29
MH106	STORAGE	0.10	0.73	96.85	0 01:13	0.73
MH107	STORAGE	0.11	0.74	96.94	0 01:14	0.74
MH108	STORAGE	0.25	2.44	99.59	0 01:23	2.43
MH108-Dummy	STORAGE	0.08	0.45	97.60	0 01:23	0.45
MH11	STORAGE	0.18	1.72	98.81	0 01:14	1.72
MH110	STORAGE	0.13	2.15	99.95	0 01:12	2.15
MH111	STORAGE	0.03	0.88	101.01	0 01:10	0.88
MH113	STORAGE	0.10	1.99	100.12	0 01:12	1.99
MH114	STORAGE	0.07	2.05	100.81	0 01:11	2.04
MH115	STORAGE	0.04	1.62	100.88	0 01:11	1.61
MH116	STORAGE	0.02	0.77	101.27	0 01:11	0.76
MH117	STORAGE	0.08	0.57	97.12	0 01:14	0.57
MH118	STORAGE	0.07	1.19	98.63	0 01:18	1.19
MH118-Dummy	STORAGE	0.02	0.22	97.66	0 01:18	0.22
MH119	STORAGE	0.02	0.36	99.21	0 01:10	0.36
MH11-Dummy	STORAGE	0.13	1.19	98.28	0 01:14	1.19
MH12	STORAGE	0.13	2.08	99.45	0 01:11	2.08
MH120	STORAGE	0.02	0.23	102.01	0 01:10	0.23
MH13	STORAGE	0.11	2.24	99.86	0 01:11	2.23
MH14	STORAGE	0.10	2.51	100.55	0 01:11	2.49
MH15	STORAGE	0.09	2.44	100.99	0 01:11	2.43
MH16	STORAGE	0.07	2.18	101.19	0 01:11	2.17
Storage-N01	STORAGE	0.05	1.07	98.63	0 01:18	1.07
Storage-N02	STORAGE	0.13	1.93	99.59	0 01:23	1.93
Storage-N03	STORAGE	0.07	1.37	98.82	0 01:21	1.37
Storage-NFUT	STORAGE	0.10	0.99	97.59	0 01:17	0.99
Storage-S01	STORAGE	0.11	1.45	98.78	0 01:22	1.45
Storage-S02	STORAGE	0.13	2.60	97.63	0 01:14	2.59

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
EX-MH208	OUTFALL	68.15	1429.64	0 01:13	0.0685	6.06	0.000
EX-MH214	OUTFALL	138.00	2564.85	0 01:14	0.2	9.23	0.000
CBMH109	STORAGE	94.04	1137.74	0 01:11	0.133	1.99	-0.026
CBMH201	STORAGE	0.00	945.89	0 01:10	0	1.5	0.003
CBMH211	STORAGE	0.00	493.16	0 01:10	0	0.71	0.011
FUT-Dummy	STORAGE	0.00	513.41	0 01:17	0	1.79	0.001
MH01	STORAGE	0.00	2842.50	0 01:11	0	9.5	-0.005
MH01-Dummy	STORAGE	0.00	2470.79	0 01:14	0	9.03	0.004
MH02	STORAGE	39.62	2898.66	0 01:10	0.0572	9.01	-0.289
MH04	STORAGE	411.75	775.71	0 01:10	0.563	1.11	1.009
MH05	STORAGE	405.04	405.04	0 01:10	0.552	0.552	0.324
MH06	STORAGE	124.40	2296.01	0 01:10	0.193	7.84	-0.086
MH07	STORAGE	36.76	2334.65	0 01:11	0.0575	7.65	-0.049
MH08	STORAGE	346.42	834.58	0 01:10	0.496	1.36	1.624
MH09	STORAGE	0.00	530.89	0 01:10	0	0.858	-0.771

MH10	STORAGE	579.20	579.20	0	01:10	0.861	0.861	0.289
MH101	STORAGE	60.20	1380.91	0	01:13	0.0845	5.99	0.023
MH102	STORAGE	33.57	1343.81	0	01:13	0.0413	5.91	-0.021
MH103	STORAGE	66.37	732.05	0	01:10	0.0919	1.47	-0.236
MH103-Dummy	STORAGE	0.00	233.14	0	01:21	0	1.12	0.000
MH104	STORAGE	373.13	707.02	0	01:10	0.517	1.02	-0.510
MH105	STORAGE	357.97	357.97	0	01:10	0.504	0.504	0.857
MH106	STORAGE	57.35	1093.45	0	01:14	0.0738	4.75	0.018
MH107	STORAGE	0.00	1068.69	0	01:19	0	4.68	0.042
MH108	STORAGE	273.34	1362.34	0	01:10	0.369	3.12	0.007
MH108-Dummy	STORAGE	0.00	421.33	0	01:23	0	2.36	0.001
MH11	STORAGE	85.27	3623.48	0	01:11	0.13	8.07	-0.131
MH110	STORAGE	0.00	1078.22	0	01:11	0	1.85	-0.563
MH111	STORAGE	317.01	317.01	0	01:10	0.459	0.459	1.414
MH113	STORAGE	0.00	839.76	0	01:10	0	1.38	-1.051
MH114	STORAGE	776.68	919.25	0	01:10	1.1	1.39	1.016
MH115	STORAGE	97.96	174.42	0	01:10	0.161	0.293	-0.181
MH116	STORAGE	96.33	96.33	0	01:10	0.132	0.132	0.471
MH117	STORAGE	50.00	663.47	0	01:17	0.0591	2.32	-0.118
MH118	STORAGE	0.00	335.10	0	01:10	0	0.593	-0.591
MH118-Dummy	STORAGE	0.00	130.81	0	01:18	0	0.465	-0.000
MH119	STORAGE	185.21	339.78	0	01:10	0.252	0.464	0.450
MH11-Dummy	STORAGE	0.00	1505.66	0	01:24	0	6.25	-0.020
MH12	STORAGE	961.59	3587.52	0	01:10	1.37	6.11	0.008
MH120	STORAGE	156.74	156.74	0	01:10	0.212	0.212	0.000
MH13	STORAGE	577.12	2790.80	0	01:10	0.836	4.73	-0.283
MH14	STORAGE	764.31	2427.24	0	01:10	1.07	3.89	0.042
MH15	STORAGE	1003.30	1864.33	0	01:10	1.42	2.84	0.280
MH16	STORAGE	957.56	957.56	0	01:10	1.41	1.41	0.100
Storage-N01	STORAGE	0.00	202.82	0	01:10	0	0.131	0.015
Storage-N02	STORAGE	0.00	933.72	0	01:10	0	0.74	-0.025
Storage-N03	STORAGE	0.00	489.06	0	01:10	0	0.353	-0.005
Storage-NFUT	STORAGE	1247.55	1247.55	0	01:10	1.8	1.8	0.001
Storage-S01	STORAGE	0.00	2137.35	0	01:11	0	1.83	-0.003
Storage-S02	STORAGE	0.00	878.44	0	01:06	0	0.466	0.061

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Node Surcharge Summary
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No nodes were surcharged.

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CBMH109	0.000	4	0	0	0.002	52	0 01:12	1129.08
CBMH201	0.000	5	0	0	0.002	68	0 01:23	933.72
CBMH211	0.000	2	0	0	0.002	39	0 01:21	489.06
FUT-Dummy	0.000	2	0	0	0.001	16	0 01:14	513.51
MH01	0.000	6	0	0	0.003	84	0 01:14	2794.38
MH01-Dummy	0.000	3	0	0	0.001	24	0 01:14	2470.87
MH02	0.000	4	0	0	0.003	68	0 01:14	2809.26
MH04	0.000	1	0	0	0.002	42	0 01:12	698.16
MH05	0.000	1	0	0	0.001	45	0 01:11	372.12
MH06	0.000	2	0	0	0.003	44	0 01:14	2179.82
MH07	0.000	2	0	0	0.002	30	0 01:14	2176.56
MH08	0.000	1	0	0	0.001	28	0 01:11	806.43
MH09	0.000	1	0	0	0.002	36	0 01:11	520.90
MH10	0.000	2	0	0	0.001	46	0 01:10	530.89
MH101	0.000	4	0	0	0.001	26	0 01:13	1380.97
MH102	0.000	3	0	0	0.001	21	0 01:13	1344.60
MH103	0.000	4	0	0	0.002	43	0 01:21	715.35
MH103-Dummy	0.000	1	0	0	0.000	6	0 01:21	233.14
MH104	0.000	1	0	0	0.002	39	0 01:10	668.03
MH105	0.000	1	0	0	0.001	48	0 01:10	334.84
MH106	0.000	2	0	0	0.001	16	0 01:13	1094.20
MH107	0.000	2	0	0	0.001	16	0 01:14	1066.06
MH108	0.000	7	0	0	0.003	67	0 01:23	1342.18
MH108-Dummy	0.000	2	0	0	0.000	12	0 01:23	420.91
MH11	0.000	4	0	0	0.002	38	0 01:14	3604.61
MH110	0.000	3	0	0	0.002	49	0 01:12	1062.27
MH111	0.000	1	0	0	0.001	33	0 01:10	315.05
MH113	0.000	2	0	0	0.002	47	0 01:12	802.50
MH114	0.000	2	0	0	0.002	55	0 01:11	839.76
MH115	0.000	1	0	0	0.002	67	0 01:11	180.25
MH116	0.000	1	0	0	0.001	26	0 01:11	86.52
MH117	0.000	2	0	0	0.001	17	0 01:14	664.22

MH118	0.000	3	0	0	0.001	49	0	01:18	322.40
MH118-Dummy	0.000	1	0	0	0.000	9	0	01:18	130.81
MH119	0.000	1	0	0	0.000	14	0	01:10	335.10
MH11-Dummy	0.000	3	0	0	0.001	26	0	01:14	1519.84
MH12	0.000	3	0	0	0.002	50	0	01:11	3546.77
MH120	0.000	1	0	0	0.000	13	0	01:10	155.05
MH13	0.000	3	0	0	0.003	58	0	01:11	2769.65
MH14	0.000	3	0	0	0.003	72	0	01:11	2295.71
MH15	0.000	3	0	0	0.003	81	0	01:11	1686.24
MH16	0.000	2	0	0	0.002	71	0	01:11	869.11
Storage-N01	0.006	3	0	0	0.131	74	0	01:18	57.96
Storage-N02	0.064	9	0	0	0.738	100	0	01:18	177.93
Storage-N03	0.019	5	0	0	0.352	95	0	01:21	113.52
Storage-NFUT	0.067	10	0	0	0.684	98	0	01:17	513.41
Storage-S01	0.136	6	0	0	1.829	79	0	01:22	554.92
Storage-S02	0.030	7	0	0	0.462	100	0	01:11	212.03

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
EX-MH208	98.86	129.97	1429.64	6.060
EX-MH214	99.08	191.79	2564.85	9.233
System	98.97	321.75	2564.85	15.294

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
CBMH109-MH108	CONDUIT	1129.08	0 01:11	2.56	1.01	1.00
CBMH201-MH108	CONDUIT	945.89	0 01:10	2.14	0.85	1.00
CBMH211-MH103	CONDUIT	493.16	0 01:10	2.28	0.82	1.00
FUT-MH117	CONDUIT	513.51	0 01:17	1.27	0.50	0.61
MH01-MH214	CONDUIT	2470.87	0 01:14	2.92	0.84	0.70
MH02-MH01	CONDUIT	2809.26	0 01:10	2.48	0.94	1.00
MH04-MH02	CONDUIT	698.16	0 01:06	2.69	0.93	1.00
MH05-MH04	CONDUIT	372.12	0 01:06	2.00	0.86	1.00
Mh06-MH02	CONDUIT	2179.82	0 01:10	1.99	0.66	1.00
MH07-MH06	CONDUIT	2176.56	0 01:10	2.74	0.67	1.00
MH08-MH07	CONDUIT	806.43	0 01:11	2.87	1.31	1.00
MH09-MH08	CONDUIT	520.90	0 01:11	1.84	0.86	1.00
MH101-MH100	CONDUIT	1380.97	0 01:13	2.33	0.86	0.74
MH102-MH101	CONDUIT	1344.60	0 01:14	2.26	0.86	0.75
MH103-Dummy	CONDUIT	233.14	0 01:21	2.34	0.31	0.38
MH104-MH103	CONDUIT	668.03	0 01:10	2.36	0.89	1.00
MH105-MH104	CONDUIT	334.84	0 01:10	1.78	0.93	1.00
MH106-MH102	CONDUIT	1094.20	0 01:14	1.81	0.87	0.76
MH107-MH106	CONDUIT	1066.06	0 01:22	1.81	0.82	0.74
MH108-MH107	CONDUIT	420.91	0 01:23	1.85	0.38	0.51
MH10-MH09	CONDUIT	530.89	0 01:10	1.99	0.86	1.00
MH110-CBMH109	CONDUIT	1062.27	0 01:11	2.40	0.96	1.00
MH111-MH110	CONDUIT	315.05	0 01:07	2.20	0.94	1.00
MH113-MH110	CONDUIT	802.50	0 01:11	1.82	1.01	1.00
MH114-MH113	CONDUIT	839.76	0 01:10	1.90	1.07	1.00
MH115-MH114	CONDUIT	180.25	0 01:14	1.21	0.51	1.00
MH116-MH115	CONDUIT	86.52	0 01:06	1.90	0.63	1.00
MH117-MH107	CONDUIT	664.22	0 01:17	1.44	0.67	0.69
MH118-MH117	CONDUIT	130.81	0 01:19	1.94	0.32	0.44
MH119-MH118	CONDUIT	335.10	0 01:10	2.56	0.83	0.90
MH11-MH07	CONDUIT	1519.84	0 01:24	1.92	0.72	1.00
MH120-MH119	CONDUIT	155.05	0 01:10	2.68	0.93	0.76
MH12-MH11	CONDUIT	3546.77	0 01:11	3.14	1.65	1.00
MH13-MH12	CONDUIT	2769.65	0 01:11	2.45	1.30	1.00
MH14-MH13	CONDUIT	2295.71	0 01:11	2.03	1.07	1.00
MH15-MH14	CONDUIT	1686.24	0 01:10	1.95	1.13	1.00
MH16-MH15	CONDUIT	869.11	0 01:10	1.54	0.87	1.00
Storage-N01-MH118	CONDUIT	202.82	0 01:10	1.30	0.50	1.00
Storage-N02-CBMH201	CONDUIT	933.72	0 01:10	2.70	0.59	1.00
Storage-N03-CBMH211	CONDUIT	489.06	0 01:10	2.76	0.72	1.00
Storage-S01-MH11	CONDUIT	2137.35	0 01:11	3.18	0.76	1.00
Storage-S02-MH01	CONDUIT	878.44	0 01:06	1.09	0.23	1.00
FUT-ICD	ORIFICE	513.41	0 01:17			1.00
MH01-ICD	ORIFICE	2470.79	0 01:14			1.00
MH103-ICD	ORIFICE	233.14	0 01:21			1.00
MH108-ICD	ORIFICE	421.33	0 01:23			1.00
MH118-ICD	ORIFICE	130.81	0 01:18			1.00
MH11-ICD	ORIFICE	1505.66	0 01:24			1.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
CBMH109-MH108	1.00	0.01	0.00	0.00	0.21	0.01	0.00	0.77	0.04	0.00
CBMH201-MH108	1.00	0.01	0.02	0.00	0.22	0.01	0.00	0.74	0.03	0.00
CBMH211-MH103	1.00	0.02	0.01	0.00	0.21	0.00	0.00	0.76	0.04	0.00
FUT-MH117	1.00	0.01	0.00	0.00	0.75	0.00	0.00	0.24	0.01	0.00
MH01-MH214	1.00	0.01	0.00	0.00	0.67	0.32	0.00	0.00	0.87	0.00
MH02-MH01	1.00	0.01	0.00	0.00	0.24	0.01	0.00	0.74	0.00	0.00
MH04-MH02	1.00	0.01	0.00	0.00	0.06	0.00	0.00	0.93	0.02	0.00
MH05-MH04	1.00	0.01	0.00	0.00	0.02	0.01	0.00	0.96	0.01	0.00
Mh06-MH02	1.00	0.01	0.00	0.00	0.09	0.06	0.00	0.85	0.00	0.00
MH07-MH06	1.00	0.01	0.00	0.00	0.03	0.00	0.00	0.96	0.00	0.00
MH08-MH07	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.01	0.00
MH09-MH08	1.00	0.01	0.00	0.00	0.03	0.01	0.00	0.96	0.00	0.00
MH101-MH100	1.00	0.01	0.00	0.00	0.73	0.26	0.00	0.00	0.62	0.00
MH102-MH101	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
MH103-Dummy	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH104-MH103	1.00	0.01	0.00	0.00	0.22	0.01	0.00	0.75	0.09	0.00
MH105-MH104	1.00	0.01	0.00	0.00	0.04	0.00	0.00	0.94	0.02	0.00
MH106-MH102	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.74	0.00
MH107-MH106	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.00	0.00
MH108-MH107	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH10-MH09	1.00	0.01	0.00	0.00	0.02	0.01	0.00	0.96	0.00	0.00
MH110-CBMH109	1.00	0.01	0.00	0.00	0.14	0.01	0.00	0.85	0.00	0.00
MH111-MH110	1.00	0.01	0.00	0.00	0.04	0.00	0.00	0.95	0.02	0.00
MH113-MH110	1.00	0.01	0.00	0.00	0.11	0.00	0.00	0.88	0.00	0.00
MH114-MH113	1.00	0.01	0.00	0.00	0.09	0.00	0.00	0.90	0.02	0.00
MH115-MH114	1.00	0.01	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
MH116-MH115	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
MH117-MH107	1.00	0.01	0.00	0.00	0.22	0.00	0.00	0.77	0.07	0.00
MH118-MH117	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH119-MH118	1.00	0.01	0.00	0.00	0.05	0.02	0.00	0.92	0.03	0.00
MH11-MH07	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
MH120-MH119	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH12-MH11	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.91	0.00
MH13-MH12	1.00	0.01	0.00	0.00	0.36	0.00	0.00	0.63	0.07	0.00
MH14-MH13	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.01	0.00
MH15-MH14	1.00	0.01	0.00	0.00	0.04	0.00	0.00	0.95	0.01	0.00
MH16-MH15	1.00	0.01	0.00	0.00	0.03	0.00	0.00	0.96	0.00	0.00
Storage-N01-MH118	1.00	0.02	0.01	0.00	0.21	0.01	0.00	0.76	0.04	0.00
Storage-N02-CBMH201	1.00	0.03	0.00	0.00	0.13	0.03	0.00	0.81	0.00	0.00
Storage-N03-CBMH211	1.00	0.03	0.00	0.00	0.10	0.03	0.00	0.84	0.00	0.00
Storage-S01-MH11	1.00	0.02	0.00	0.00	0.19	0.04	0.00	0.76	0.00	0.00
Storage-S02-MH01	1.00	0.02	0.00	0.00	0.22	0.01	0.00	0.75	0.01	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
CBMH109-MH108	1.08	1.08	1.47	0.03	0.03
CBMH201-MH108	1.18	1.18	1.54	0.01	0.01
CBMH211-MH103	1.02	1.02	1.17	0.01	0.01
MH02-MH01	0.72	0.72	0.75	0.01	0.05
MH04-MH02	0.20	0.20	0.64	0.01	0.08
MH05-MH04	0.10	0.10	0.20	0.01	0.01
Mh06-MH02	0.49	0.49	0.65	0.01	0.01
MH07-MH06	0.19	0.19	0.28	0.01	0.01
MH08-MH07	0.09	0.20	0.19	0.17	0.05
MH09-MH08	0.19	0.19	0.19	0.01	0.18
MH104-MH103	0.41	0.41	1.16	0.01	0.01
MH105-MH104	0.13	0.13	0.41	0.01	0.01
MH10-MH09	0.10	0.10	0.18	0.01	0.01
MH110-CBMH109	1.00	1.00	1.07	0.01	0.01
MH111-MH110	0.08	0.08	0.43	0.01	0.01
MH113-MH110	0.72	0.72	0.80	0.02	0.15
MH114-MH113	0.37	0.37	0.69	0.06	0.09
MH115-MH114	0.17	0.17	0.36	0.01	0.01
MH116-MH115	0.08	0.08	0.16	0.01	0.01
MH119-MH118	0.01	0.01	0.59	0.01	0.01
MH11-MH07	0.01	0.01	0.02	0.01	0.01
MH12-MH11	0.45	0.48	0.61	0.21	0.16
MH13-MH12	0.34	0.34	0.48	0.16	0.16
MH14-MH13	0.23	0.23	0.32	0.08	0.17
MH15-MH14	0.18	0.18	0.23	0.10	0.10
MH16-MH15	0.15	0.15	0.18	0.01	0.01
Storage-N01-MH118	0.67	0.67	0.74	0.01	0.01
Storage-N02-CBMH201	1.03	1.03	1.11	0.01	0.01
Storage-N03-CBMH211	0.89	0.89	0.99	0.01	0.01
Storage-S01-MH11	0.47	0.47	0.61	0.01	0.01

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Storage-S02-MH01            0.68      0.68      0.73      0.01         0.01


Analysis begun on:  Sun Apr  5 10:04:52 2020
Analysis ended on:  Sun Apr  5 10:05:00 2020
Total elapsed time: 00:00:08
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Appendix E

Development Servicing Checklist

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

N/A ☐ 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.

N/A ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.

N/A ☐ Proposed phasing of the development, if applicable.

☒ 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

N/A ☐ 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.

N/A ☐ 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

N/A ☐ 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.

N/A ☐ 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.

N/A ☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.

☒ 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.

N/A ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).

N/A ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.

N/A ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.

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

☐ 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)

N/A ☐ 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.

N/A ☐ Set-back from private sewage disposal systems.

☒ Watercourse and hazard lands setbacks.

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

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

- [X] Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- [X] Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- [X] 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.
- N/A [ ] Any proposed diversion of drainage catchment areas from one outlet to another.
- [X] Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- N/A [ ] 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.
- [X] 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.
- N/A [ ] Inclusion of hydraulic analysis including hydraulic grade line elevations.
- [X] Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- N/A [ ] Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- N/A [ ] Identification of fill constraints related to floodplain and geotechnical investigation.

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.

N/A ☐ Changes to Municipal Drains.

N/A ☐ 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

N/A ☐ 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 F

Drawings