1543-1551 The Queensway Redevelopment

Site Servicing & Stage 1 Stormwater Management Report

Initial Issue: November 25, 2024

Prepared for:
1370443 Ontario Limited

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RVA 236932

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1.0 INTRODUCTION

1370443 Ontario Limited (the Owner) is proposing the redevelopment of 1543, 1545, 1547, 1549, and 1551 The Queensway and 66 and 76 Fordhouse Boulevard (the Site) in the City of Toronto.

R.V. Anderson Associates Limited (RVA) has been retained by the Owner to prepare a Site Servicing and Stage 1 Stormwater Management (SWM) Report in support of an Official Plan Amendment (OPA), and Zoning By-Law Amendment (ZBA) for the proposed site redevelopment. The scope of this report specifically includes outlining the functional servicing for the Site in accordance with City requirements, as well as identification of a conceptual stormwater management plan to meet the City's Wet Weather Flow Management (WWFM) Guidelines for the Site.

2.0 BACKGROUND

2.1 Site Location and Existing Conditions

The subject Site is 2.154 hectares in size and located southwest of The Queensway and Algie Avenue in the City of Toronto. The Site is currently occupied by various commercial and industrial buildings as well as a large asphalt vehicular storage area in the centre of the various buildings. The Site is bound by commercial buildings to the west, The Queensway to the north, residential and commercial buildings to the east, and Fordhouse Boulevard to the south. It's also noted that directly south of Fordhouse Boulevard is the Gardiner Expressway.

Refer to Appendix A for the existing site statistics, and a depiction of the location of the Site.

2.2 Proposed Redevelopment

The concept for the Site redevelopment is to subdivide the lands into four (4) development blocks, three (3) new public right-of-ways (ROW's), and a new public park. The current proposed contents of each of the development blocks, and the park, are outlined below in greater detail:

- Block A is proposed to include a thirty (30) storey mixed use tower (Building A), with a two (2) storey underground structure. Building A will contain community space, retail, and a daycare space on the first three (3) storeys, and residential units on the floors above. The underground structure of Building A will effectively extend to the

developable limits of Block A, apart from a rectangular area at the southeast corner of the block.

- Block B is proposed to include a thirty-five (35) storey residential tower (Building B), with a two (2) storey underground structure. The underground structure of Building B will effectively extend to the developable limits of Block B, apart from a rectangular area at the northeast corner of the block.
- Block C is proposed to include a forty (40) storey residential tower (Building C), with a two (2) storey underground structure. The underground structure of Building C will effectively extend to the developable limits of Block C, apart from a rectangular area at the southeast corner of the block.
- Block D is proposed to include a forty-five (45) storey residential tower (Building D), with a two (2) storey underground structure. The underground structure of Building D will effectively extend to the developable limits of Block D.
- Public Park is located at the southeastern limit of the Site, east of Block D, with frontage on to Fordhouse Boulevard. The Park will be its own development block.

With respect to the proposed public ROW's, the following is a general description of their configuration:

- Street A is a proposed 9 m wide public laneway, which will be located south, and west, of Block A and north of Block B. It will intersect Street C in a "T" intersection and will continue east to the extents of Block A.
- Street B is a proposed 9 m wide public laneway, which will be located south, and west, of Block C and north of Block D. It will intersect Street C in a "T" intersection and will continue east to the extents of Block C.
- Street C is a proposed 19 m wide public ROW, which will be located west of Blocks A, B, C, & D along the Site's western boundary. It will intersect The Queensway in a "T" intersection and then continue south where it will connect to Fordhouse Boulevard and form an "L" intersection.

In addition to the above Blocks, and municipal roadways, a 1.25 m road widening along The Queensway frontage will be conveyed to the City; hereby reducing the effective site area from 2.15 ha to 2.14 ha.

Refer to Appendix A for the proposed site plan and site statistics. Additionally, populations for the proposed development were derived using population densities from the City of Toronto's

Design Criteria for Sewers and Watermains and the aforementioned site statistics. The estimated populations, and derived populations, for the proposed development can also be found in Appendix A.

3.0 WATER SERVICING

3.1 Existing Water Servicing

Based on City record drawings, water atlas maps, and a Sub-Surface Utility Engineering (SUE) investigation completed by 4Sight Utility Engineers in November 2023, the existing municipal watermains surrounding the site can be summarized as follows:

- A 300 mm Ø municipal watermain located on The Queensway from Atomic Avenue, to Algie Avenue (DWG: U-112-16, dated July 1973)
- A 200 mm Ø municipal watermain located on Fordhouse Boulevard from the western extent of Fordhouse Boulevard to Algie Avenue (DWG: R-01D2-1623-1, dated November 2000)

Additionally, servicing cards received from the City of Toronto revealed that the existing buildings on site are serviced by five (5) ± domestic services off of the Queensway, two (2) ± domestic services off of Fordhouse Boulevard, and a fire service off of Fordhouse Boulevard directed to 66 Fordhouse Boulevard. All existing water services from the site are to be disconnected at the City main and decommissioned in the City ROW by City forces at the owner's expense.

Refer to Appendix B for the water atlas map for the area surrounding the Site.

3.2 Proposed Water Servicing

With respect to the new municipal ROW's, a new 300 mm Ø watermain is proposed for the new municipal Street C. The 300 mm Ø watermain will be interconnected with the existing 300 mm Ø watermain on The Queensway and the 200 mm Ø watermain on Fordhouse Boulevard.

It is currently envisioned that there will be one (1) domestic water service connection for each development block; and as each block contains a single tower building configuration, this approach is consistent with the City's "Servicing Requirements for New Developments." Additionally, the OBC requires that buildings that exceed 84 m in height are to be serviced by no fewer than two (2) sources of water supply from the municipal watermain. The current

configuration of the services is outlined below, and the final configuration will be confirmed during the detailed design stage:

- Building A (Block A) is proposed to be serviced by a combined domestic and fire service, in an "h" configuration, connected to the existing 300 mm Ø watermain on the Queensway. Additionally, due to the proposed building heights exceeding 84 m in height, a second fire service will also be connected to the existing watermain on The Queensway. Redundancy between the two (2) proposed fire services will be facilitated by a mainline valve located on the existing 300 mm Ø municipal watermain. In the event Block A construction begins prior to the Street C municipal watermain being operational, Block A is proposed to be serviced solely off of the Queensway.
- Building B, C, & D (Blocks B, C, & D, respectively) are all proposed to be serviced by a separate combined domestic and fire service, in an "h" configuration, each connected to the proposed 300 mm Ø on the proposed Street C. Additionally, due to the proposed building heights exceeding 84 m in height, a second fire service for each will also be connected to the proposed watermain on Street C. Redundancy between the two (2) proposed fire services will be facilitated by mainline valves located on the proposed Street C municipal watermain.
- Public Park is proposed to be serviced by a domestic water service, and a water meter chamber within the property line (as required to fulfill base park conditions), which is proposed to connect to the existing 200 mm Ø watermain on Fordhouse Boulevard.

With respect to hydrant coverage for the development, existing hydrants located within the Fordhouse Boulevard and The Queensway ROWs are located within 45 m ± of contemplated siamese connections to Buildings A and D. Two (2) proposed fire hydrant on Street C will also provide coverage within 45 m ± of contemplated siamese connections to Buildings B and C, and to meet the City's required 90 m minimum spacing for high density residential.

Refer to Appendix E for the Conceptual Servicing Plan.

3.3 Proposed Water Demand

3.3.1 Domestic Water Demand

The City of Toronto's Design Criteria for Sewers and Watermains was used to analyze the water demand from the proposed development. Average domestic demands, and maximum day and peak hour peaking factors were obtained from the aforementioned Design Criteria and can be found in Appendix B of this report. The total water domestic demand for the site can be estimated as follows:

Table 3.1 – Proposed Domestic Water Demand

	Average Day Demand (L/s)	Peak Hour Demand (L/s)	Maximum Day Demand (L/s)
Building A	1.62	3.67	2.05
Building B	1.89	4.73	2.46
Building C	2.09	5.22	2.72
Building D	2.14	5.35	2.78
Public Park	1.50	1.50	1.50
TOTAL	**9.24**	**20.47**	**11.50**

** A provisional peak water demand has been allocated for the park, to account for possible future water features.*

Refer to Appendix B for detailed water demand analysis calculations.

3.3.2 Fire Flow Demand

In accordance with the City of Toronto's Design Criteria for Sewers and Watermains, fire flows were calculated using the method outlined by the Fire Underwriters Survey (FUS).

The City criteria also outline that water supply systems should be designed to satisfy the greater of maximum day plus fire demand or peak hour demand; whichever is greater. The fire flow for the buildings on Site, as well as the total water demand is summarized in Table 3.2 below. As can be seen, the maximum day plus fire flow represents the greater demand for all blocks on site.

Table 3.2 – Proposed Fire & Total Water Demand

	Fire Flow (L/s)	Maximum Day + Fire Flow (L/s)	Peak Hour Demand (L/s)	Total Water Demand (L/s)
Building A	200.00	202.05	3.67	202.05
Building B	200.00	202.46	4.73	202.46
Building C	200.00	202.72	5.22	202.72
Building D	150.00	152.78	5.35	152.78
Public Park	0.00	1.50	1.50	1.50

Refer to Appendix B for detailed water demand analysis calculations.

3.4 Watermain Capacity

Refer to Appendix B for the Watermain Hydraulic Analysis Report prepared by RVA which notes that the existing and proposed municipal infrastructure within, and surrounding, the site is capable of providing sufficient capacity to support the proposed development without any required upgrades to the City's existing water supply network.

4.0 SANITARY SERVICING

4.1 Existing Sanitary Servicing

Based on City record drawings, water atlas maps, and a Sub-Surface Utility Engineering (SUE) investigation completed by 4Sight Utility Engineers in November 2023, the existing municipal sanitary sewers surrounding the site can be summarized as follows:

- A 200 mm Ø municipal sanitary sewer located on The Queensway, flowing west to The East Mall (DWG: PSB-731, dated July 1956)
- A 700 mm Ø municipal sanitary trunk sewer located on Fordhouse Boulevard flowing east (DWG: PDB-1734, dated March 2008)

Additionally, servicing cards received from the City of Toronto revealed that the existing buildings on site are serviced by three (3) ± domestic services off of the Queensway (two (2) of which are double services), and two (2) ± domestic services off of Fordhouse Boulevard. Additionally, no service card was received for 1547 The Queensway, however it is anticipated that an existing sanitary service exists and is being directed to the Queensway. All existing sanitary services from the site are to be disconnected at the City main and decommissioned in the City ROW by City forces at the owner's expense, except for the double service which services 1543 and 1541 The Queensway. This double service is to be disconnected for 1543 The Queensway but remain to the main for 1541 The Queensway, which is not apart of the site.

Refer to Appendix C for the sewer atlas map for the area surrounding the Site.

4.2 Proposed Sanitary Servicing

With respect to the new municipal ROW's, a new 300 mm Ø sanitary sewer is proposed for the new municipal Street C. The 300 mm Ø will flow south on Street C, then east on Fordhouse Boulevard, before connecting to the existing 700 mm Ø trunk sewer via the existing maintenance hole connection for the Algie Avenue municipal sanitary sewer system.

It is currently envisioned that there will be one (1) domestic sanitary service connection for each development block; and as each block contains a single tower building configuration, this approach is consistent with the City's "Servicing Requirements for New Developments." The current configuration of the services is outlined below, and the final configuration will be confirmed during the detailed design stage:

- Building A (Block A) is proposed to be serviced by a sanitary service connected to the existing 300 mm Ø municipal sanitary sewer on the Queensway. In the event Block A construction begins prior to the Street C sanitary sewer system being operational, Block A sanitary discharge has been directed to the Queensway.
- Building B, C, D (Blocks B, C, D) are all proposed to be serviced by separate sanitary services connected to the proposed 300 mm Ø municipal sanitary sewer on Street C.
- Public Park is proposed to be serviced by a sanitary service connected to the proposed 300 mm Ø municipal sanitary sewer on Fordhouse Boulevard, if required, pending programming of the public park.

Refer to Appendix E for the Conceptual Servicing Plan.

4.3 Proposed Sanitary Demand

The City of Toronto's Design Criteria for Sewers and Watermains was used to analyze the sanitary demand from the proposed development. Average residential and commercial flows, infiltration rates, and peaking rates were obtained from the aforementioned Design Criteria and can be found in Appendix C of this report. The total sanitary demand for the site can be estimated as follows:

Table 4.1 – Proposed Sanitary Demand

	Total Sanitary Peak Flow @240 L/cap/day (L/s)	Total Sanitary Peak Flow @ 450 L/cap/day (L/s)
Building A	6.84	11.84
Building B	8.20	15.30
Building C	9.05	16.89
Building D	9.27	17.30
Public Park*	2.56	2.56
Public Roads	0.19	0.19
SITE TOTAL	**36.10**	**64.08**

	Total Sanitary Peak Flow @240 L/cap/day (L/s)	Total Sanitary Peak Flow @ 450 L/cap/day (L/s)
TOTAL (TO THE QUEENSWAY)	6.84	11.84
TOTAL (TO FORDHOUSE BOULEVARD)	29.26	52.24

** A provisional peak sanitary demand has been allocated for the park, to account for provisional above base park programming amenities.*

Refer to Appendix C for detailed sanitary demand calculations.

4.4 Sanitary Sewer Capacity

Refer to Appendix B for the Sanitary Capacity Analysis Report prepared by RVA, which notes that the existing and proposed municipal infrastructure within, and surrounding, the site is capable of providing sufficient capacity to support the proposed development without any required upgrades.

4.5 Foundation Drainage

A Hydrogeological Investigation and Construction Dewatering Assessment by Hydrogeology Consulting Services dated November 2023, was prepared for the subject Site. Based on samples taken and analyzed for water quality, the groundwater is not suitable for discharge during construction to the sanitary sewer or storm sewer systems. Therefore, pre-treatment would be required prior to discharge into the City sewer systems, for construction dewatering. Additionally, the Assessment notes a maximum pumping requirement of 2,539,400 L/day (29.40 L/s) for construction dewatering.

With respect to long-term foundation drainage, the current City Sewer Code and Foundation Drainage Policy prohibits discharge from within the saturated zone of the ground, to a municipal sewer, for new applications submitted after January 2022. Therefore, long-term discharge of groundwater to the municipal sewers. from this development is not being proposed.

5.0 STORM SERVICING

5.1 Existing Storm Servicing

Based on City record drawings, water atlas maps, and a Sub-Surface Utility Engineering (SUE) investigation completed by 4Sight Utility Engineers in November 2023, the existing municipal storm sewers surrounding the site can be summarized as follows:

- A 750 mm Ø and 1200 mm Ø municipal storm sewers located on The Queensway, flowing west prior to discharging into the Etobicoke Creek (DWG: U-112-16, dated July 1973)
- A 975-1050 mm Ø municipal storm sewer located on Fordhouse Boulevard flowing west, before connecting with the storm sewer above west of The Queensway and The East Mall, and the continuing west prior to discharging into the Etobicoke Creek (DWG: PDB-1734, dated March 2008)

Additionally, servicing cards received from the City of Toronto, and a site visit undertaken in October 2023, revealed that 66 Fordhouse Boulevard is serviced by an existing storm drain which discharges to the storm sewer located within the Fordhouse Boulevard ROW. Additionally, 1545 The Queensway has an existing catchbasin at the front of the building which, based on a site visit undertaken in October 2023, is anticipated to connect to an existing storm sewer within The Queensway ROW. All existing storm services from the site are to be disconnected at the City main and decommissioned in the City ROW by City forces at the owner's expense, Refer to Appendix C for the sewer atlas map for the area surrounding the Site.

5.2 Existing Storm Drainage

Based on the Topographic survey prepared by KRCMAR Surveyors Limited dated July 18, 2023, and a site visit undertaken in October 2023, the existing site is made up of largely impervious surfaces, apart from small, grassed areas along The Queensway frontage, and patches of grass within the existing building back lots. The majority of the Site generally slopes from north to south and drainage is picked up by multiple catchbasins within the rear yards of the Fordhouse Boulevard properties, or conveyed overland, to the Fordhouse Boulevard storm sewer and catchbasins.

Apart from this, there are three (3) relatively small areas along The Queensway frontage which ultimately drain out to the storm sewers within the Queensway ROW. The first area at the northwest corner of the site is conveyed via overland flow to The Queensway, the second

is conveyed through a catchbasin within the frontage of 1545 The Queensway, and the third is captured in a rear yard catchbasin in the adjacent property to the east. Lastly, along the eastern and western boundaries of the Site, external drainage currently makes its way through the property to Fordhouse Boulevard. The adjacent properties drainage patterns are proposed to be maintained in the post-development conditions. No existing stormwater management systems are visible on site for any existing drainage.

Refer to Appendix D for Figure D-1 which depicts the existing drainage patterns on site, as well as Table D1 for the corresponding peak flows.

5.3 Proposed Storm Servicing

With respect to the new municipal ROW's, a series of municipal catchbasins and storm sewers will convey drainage to oversized pipes (i.e., "superpipes") and a stormwater treatment unit located with Street C which will be used to meet the stormwater management requirements outlined in Section 6.0 below. The Street C stormwater management system is then proposed to connect to the existing 1050 mm Ø storm sewer within the Fordhouse Boulevard ROW, in a similar manner to the existing site.

With respect to the development blocks, storm service connections are required to meet the Wet Weather Flow Management (WWFM) Guidelines and implemented the required stormwater management (SWM) criteria for the site. The current configuration of the services is outlined below, and the final configuration will be confirmed during the detailed design stage:

- Building A, B, C, & D (Blocks A, B, C, & D) are all proposed to be serviced by four (4) separate storm services connected to the proposed "superpipe" within the Street C ROW. Stormwater will be collected and conveyed to a stormwater management facility located in the underground structure of each development Block/building, prior to discharging to the Street C storm sewer via the service connection. The SWM facilities will be designed to meet the WWFM criteria outlined in Section 6.0 below
- Public Park is proposed to be serviced by a storm service connected to the existing 975 mm Ø municipal storm sewer located on Fordhouse Boulevard. Purposeful SWM could be employed within the park to meet the WWFM criteria, pending programming of the park

Refer to Appendix E for the Conceptual Servicing Plan.

6.0 STORMWATER MANAGEMENT PLAN

6.1 Storm Drainage Criteria

The City of Toronto Wet Weather Flow Management (WWFM) Guidelines (2006) identify performance objects and guide the design and implementation of stormwater management measures at source necessary to achieve the long-term goals of the City' Wet Weather Flow Management Plan. Targets identified in the WWFM Guidelines that are applicable to the subject site redevelopment can be generally summarized as follows:

- Water Quantity: Control the 100-year post-development peak discharge rate to the municipal storm sewer to the 2-year peak pre-development rate (with a maximum allowed runoff coefficient of C=0.50)
- Water Balance: Retain runoff from a small design rainfall event (50% of the total average annual rainfall or approximately a 5 mm rainfall event) and reuse through infiltration, evaporation and rainwater reuse
- Water Quality: 80% long-term average annual removal of Total Suspended Solids (TSS)
- As the site is less than 5 ha in area and doesn't discharge directly or within 100 m of a natural watercourse or the lake, specific requirements for Water Quality Disinfection and Water Quantity Erosion Control do not apply.

6.1.1 Allowable Storm Discharge

Using the Modified Rational Method, the existing peak discharges, and allowable peak discharge rate from the redeveloped Site can be calculated as follows:

Table 6.1 – Existing & Allowable Peak Storm Discharge

	Existing 2-Year Peak Storm Flow (L/s)	Allowable Peak Storm Discharge (L/s) *
To The Queensway	27.30	18.00
To Fordhouse Boulevard	440.70	244.80

** Calculations performed using a maximum runoff coefficient of 0.50.*

Refer to Appendix D Table D1 for detailed calculations.

6.2 Proposed Stormwater Management Plan

The following sections represent a Stage 1 level stormwater management (SWM) plan for the Site. A Stage 2 SWM Report will be submitted under separate cover in support of the detailed design of each of the required components of the Site.

6.2.1 Rate Control

The overall SWM approach for the Site is proposed to be based on the provision of individual SWM systems within each individual building and the municipal roadways.

With respect to each proposed building, a detention tank within the building basement structure will collect and convey controlled runoff on Site to the proposed storm services outlined in Section 5.3 of this report. To meet the peak discharge rate requirements, each SWM detention tank will be equipped with an orifice control device upstream of the storm service.

With respect to the new municipal ROW's, oversized pipes will collect and convey runoff to the existing municipal storm sewer downstream of the site. To meet the Sites overall discharge rate requirements, the oversized pipes will be equipped with an orifice control device at the downstream end.

With respect to the public park, if required, detention storage in the park can be provided via underground storage chambers within the park footprint. Table 6.2 below outlines the preliminary detention characteristics for the site.

Table 6.2 – Preliminary Detention Characteristics

	Preliminary Orifice Size/Device	Maximum Allowable Release Rate (L/s)	Preliminary Storage Volume Required (m^3)	Preliminary Storage Volume Provided (m^3)
Building A	100mm (tube)	42.10	141.00	172.00
Building B	100mm (tube)	55.00	189.00	199.00
Building C	100mm (tube)	52.70	180.00	199.00
Building D	100mm (plate)	31.80	107.00	133.00
Public Park	80mm (plate)	16.20	45.00	62.00
Public Roads	250mm (tube)	(See Total to Fordhouse below)		
Total (to Fordhouse) *		**244.80**		

**Summation of all nodes does not equal total Site discharge, due to multiple SWM systems discharging to the Public Roads oversized pipe SWM system.*

Refer to Appendix D for the preliminary Visual Otthymo model, and Table D3 for further information on the proposed stage storage values, and detention characteristics for the site. Lastly, refer to Appendix E for the Conceptual Site Servicing Plan.

6.2.2 Water Balance

The extent of impervious areas within the Site blocks, and municipal ROWs, will be insufficient to retain 50 % of the total average annual rainfall depth. Therefore, to meet the City's water balance criteria noted in Section 6.0, rainfall will need to be retained on Site and reused within 72-hours through infiltration, infiltration, evaporation and/or rainwater reuse.

With respect to the new municipal ROW's, the primary available means of addressing water balance would be through direct infiltration into the soil below the road. However, further discussions with the City will clarify whether direct infiltration measured will be permitted, or if the associated water balance short fall is to be accommodate within the development blocks. For the purpose of this report, it is assumed that water balance will be achieved by the public road shortfall being designated to the development blocks.

With respect to each proposed building, a rainwater reuse cistern will be situated in the underground structure of each building which will collect rainwater and redirect it to a re-use system (i.e., toilet flushing, irrigation, infiltration etc.) before overflowing into the detention system outlined in Section 6.2.1. The rainwater reuse system will be further detailed in the Stage 2 SWM Report for the Site.

With respect to the public park, if required, Low Impact Development (LID) practises could be implemented to address the City's water balance targets. Refer to Table 6.3 for preliminary water balance volumes for the Site.

Table 6.3 – Preliminary Water Balance Volumes

	Water Balance Volume Required (m^3)
Building A	22.00
Building B	28.00
Building C	27.00
Building D	17.00
Public Park	7.00
Public Roads	0.00*

**Development blocks over-retained to meet overall Site water balance criteria.*

Refer to Appendix D for more detailed preliminary water balance calculations.

6.2.3 Quality Control

In order to meet the City's 80 % TSS removal target outlined the WWFM Guidelines, purposeful stormwater treatment device will be required for each building's SWM system before discharging into the City's storm sewer system. Additionally, the municipal ROW SWM system (i.e., oversized pipe) is envisioned to include a stormwater treatment device downstream of the orifice control device, with a bypass system to reduce the loads on the device. Lastly, the public park can be equipped with a stormwater treatment device if required.

Refer to Appendix E for the Conceptual Site Servicing Plan, which includes designated area for all the aforementioned stormwater treatment devices.

6.3 Interim Condition Stormwater Management Plan

In the ultimate condition, the proposed stormwater management plan results in storm servicing for Blocks A, B, C, and D being served off of Street C. However, in the event Block A and Street A are constructed prior to the construction of Street C, an "interim" condition has been prepared which would result in storm servicing being directed to The Queensway.

The proposed storm service and stormwater management design for Block A would be constructed in the same location as the ultimate condition, however the storm system within the future Street C would be a temporary system until Street C and it's required municipal infrastructure was constructed and conveyed to the City. This interim SWM system be comprised of catchbasins, maintenance holes, and sewers which would direct storm drainage to a buried detention tank at the northwest corner of the site. Refer to Appendix E for a Conceptual Interim Servicing Plan depicting further details.

With respect to meeting the City's SWM criteria, the interim stormwater management plan be designed to achieve the water quantity, water quality and water balance goals set out in the WWFM Guidelines. Water quantity control would be achieved through an orifice installed downstream of the buried detention tank, in conjunction with the buried stormwater detention tank. Water quantity would be achieved through an Isolator Row Plus, or equivalent system, which is designed to achieve 80 % TSS removal. Lastly, water balance would be achieved either through Block A itself, where any shortfalls not achieved in the roads would be met within the Block, or through infiltration below the buried detention tank system.

Table 6.4 – Preliminary Detention Characteristics (Interim Condition)

	Preliminary Orifice Size/Device	Maximum Allowable Release Rate (L/s)	Preliminary Storage Volume Required (m^3)	Preliminary Storage Volume Provided (m^3)
Building A (Same as Table Table 6.2)	100mm (tube)	42.10	141.00	172.00
Interim Street C & Street A	90mm (plate)	18.00	242.00	248.22
Total (to Queensway) *		**18.00**		

**Summation of all nodes does not equal total Site discharge, due to multiple SWM systems discharging to the Public Roads oversized pipe SWM system.*

Refer to Appendix D for further details on the allowable discharge to The Queensway, the stage-storage of the interim detention tank, and the preliminary V0 model for the interim stormwater management design.

7.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

Measures are to be taken during construction to ensure that erosion and/or transportation of sediments off-site is controlled. Mitigation measures include:

- Erection of sediment control fence prior to construction, and maintenance throughout construction activities
- Construction of a clear-stone “mud-mat” at construction site exists to control the tracking of sediments off-site from the tires of vehicles
- Use of watering for dust control
- Application to the City for a permit to discharge construction water, including the testing and sediment removal pre-pumping measures required to meet the City permit requirements and sewer use bylaw

8.0 CONCLUSION

Water: One (1) new domestic and two (2) new fire water service will be proposed for each building. All proposed services will connect to the existing or proposed municipal watermains along their respective frontage. Lastly, a new 300 mm Ø municipal watermain is proposed for Street C.

Based on the Hydraulic Analysis Report, the municipal infrastructure surrounding the Site provides adequate capacity for the proposed development.

Sanitary: One (1) new domestic sanitary service will be proposed for each building, and for the public park. Secondly, a new 300 mm Ø sanitary sewer is proposed for Street C, which will connect to the existing 700 mm Ø trunk sewer on Algie Avenue, via a new sanitary sewer located on Fordhouse Boulevard.

Based on the Sanitary Capacity Analysis Report for the Site, the municipal infrastructure surrounding the Site provides adequate capacity for the proposed development during both dry-weather and wet-weather events.

Storm: One (1) new storm service is proposed for each building, and the public park. The building services will connect to a proposed oversized pipe within Steet C, and the park connection will connect to the existing storm sewer within the City ROW.

In order to meet the requirements of the City's WWFM Guidelines, a SWM Plan will be implemented for each proposed building, the public park and the municipal ROWs to meet the City's rate control, water balance, and water quality targets. This will be detailed further in the Stage 2 Stormwater Management Report submitted under separate cover.

R.V. Anderson Associates Limited

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Project Engineer

APPENDIX A

ARCHITECTURAL PLANS & SITE STATISTICS

The Queensway & Algie St Development - Project Statistics

Project Summary (BY-LAW 569-2013)

Description	Mixed-Use Development		
Municipal Address	1543-1551 The Queensway & Algie Street & 66 & 76 Ford House Blvd., Etobicoke		
Net Site Area (without park, public road & Laneways)	14,767.2 sq.m	158,952 sq.ft.	68.57%
Park Dedication	1,322.6 sq.m	14,236 sq.ft.	6.14%
Public Road & Laneway	5,351.2 sq.m	57,600 sq.ft.	24.85%
Queensway Road widening	95.0 sq.m	1,023 sq.ft.	0.44%
Gross Site Area	21,536.0 sq.m	231,812 sq.ft.	100.00%
Density (Total GFA/ Net Site Area)	8.90		
BUILDING A, B, C & D combined stats			
Residential GFA	126,338 sq.m	1,359,894 sq.ft.	96.13%
Haven GFA	3,755 sq.m	40,421 sq.ft.	2.86%
Re:Store GFA	630 sq.m	6,779 sq.ft.	0.48%
Daycare GFA	700 sq.m	7,538 sq.ft.	0.53%
TOTAL DEVELOPMENT GFA	**131,424 sq.m**	**1,414,631.8 sq.ft.**	100%
Indoor Amenity Area	3,638 sq.m	39,159.1 sq.ft.	2 sqm/ unit
Outdoor Amenity Area	2,584 sq.m	27,816.1 sq.ft.	1.33 sqm/ unit
Total Number of Apartment units	1,796		
Total Number of Townhouse	23		
Total Number of Residential Units (Townhouse + Apartments)	1,819		
Total Number of Vehicular Parking Spaces	548		
Total Number of Short Term Bicycle Parking Spaces	146		
Total Number of Long Term Bicycle Parking Spaces	1,266		
Building A			
Required Loading (with sharing)	2x Type B, 2x Type G combined = Total of 3 spaces		
Proposed Loading	2x Type B, 2x Type G combined = Total of 3 spaces		
Building Heights*	Building	99.2 m	30-storey
* measured from established grade to T.O. Roof Slab	Mechanical Penthouse	6.5 m	1-storey
	Total	105.70 m	
Building B			
Required Loading (with sharing)	1x Type G/B combined = Total of 1 spaces		
Proposed Loading	1x Type G/B combined = Total of 1 spaces		
Building Heights*	Building	114.0 m	35-storey
* measured from established grade to T.O. Roof Slab	Mechanical Penthouse	6.5 m	1-storey
	Total	120.45 m	
Building C			
Required Loading (with sharing)	1x Type C, 1x Type G = Total of 2 spaces		
Proposed Loading	1x Type C, 1x Type G = Total of 2 spaces		
Building Heights*	Building	129.0 m	30-storey
* measured from established grade to T.O. Roof Slab	Mechanical Penthouse	6.5 m	1-storey
	Total	135.45 m	
Building A			
Required Loading (with sharing)	1x Type C, 1x Type G = Total of 2 spaces		
Proposed Loading	1x Type C, 1x Type G = Total of 2 spaces		
Building Heights*	Building	144.0 m	30-storey
* measured from established grade to T.O. Roof Slab	Mechanical Penthouse	6.5 m	1-storey
	Total	150.45 m	

Building A (30 storeys)

Gross Floor Area Summary - By-Law 569-2013 / Unit Mix

By-Law	GBA (sq.m)	DEDUCTIONS (sq.m)	DEDUCTIONS Indoor Amenity(sq.m)	GFA Residential (sq.m)	GFA Haven (sq.m)	GFA ReStore (sq.m)	GFA Daycare (sq.m)	Net Saleable (sq.m)	Town House	Studio	1 BR	2 BR	3 BR
Level 30	836	54		781				700			9	2	1
Level 29	836	54		781				700			9	2	1
Level 28	836	54		781				700			9	2	1
Level 27	836	54		781				700			9	2	1
Level 26	836	54		781				700			9	2	1
Level 25	836	54		781				700			9	2	1
Level 24	836	54		781				700			9	2	1
Level 23	836	54		781				700			9	2	1
Level 22	836	54		781				700			9	2	1
Level 21	836	54		781				700			9	2	1
Level 20	836	54		781				700			9	2	1
Level 19	836	54		781				700			9	2	1
Level 18	836	54		781				700			9	2	1
Level 17	836	54		781				700			9	2	1
Level 16	836	54		781				700			9	2	1
Level 15	836	54		781				700			9	2	1
Level 14	836	54		781				700			9	2	1
Level 13	836	54		781				700			9	2	1
Level 12	836	54		781				700			9	2	1
Level 11	836	54		781				700			9	2	1
Level 10	836	54		781				700			9	2	1
Level 09	836	54		781				700			9	2	1
Level 08	1,087	54	452	581				461			6	1	1
Level 07	1,505	54		1,451				1,128			13	2	4
Level 06	1,505	54		1,451				1,128			13	2	3
Level 05	1,505	54		1,451				1,128			13	2	3
Level 04	1,391	54	232	1,105				862			12	1	3
Level 03	2,105	125		0	1,980								
Level 02	2,285	232		0	1,107	537	359						
Level 01: Mezz													
Level 01: Ground	2,031	387		401	668	112	342						
P1													
	33,715	2,325	684	23,630	3,755	630	700	20,087	0	0	255	52	35

Required Indoor Amenity Space (sq.m) 2 m² / Unit	684 sq.m	7,363 sq.ft
Provided Indoor Amenity Space (sq.m)	684 sq.m	7,363 sq.ft
Indoor Amenity GFA - Above requirement	0 sq.m	0 sq.ft
Provided Outdoor Amenity Space (sq.m)	447 sq.m	4,808 sq.ft
Total Affordable Residential GFA	23,630 sq.m	254,352 sq.ft
Total Haven GFA	3,755 sq.m	40,421 sq.ft
Total ReStore GFA	630 sq.m	6,779 sq.ft
Total Daycare GFA	700 sq.m	7,538 sq.ft
Total Proposed GFA (sq.m)	28,715 sq.m	309,070 sq.ft
Total Residential Unit	342	
Average Apartment unit Size	59 sq.m	633 sq.ft

	Studio	1 BR	2 BR	3 BR
	0.0%	74.6%	15.2%	10.2%
	100%			
Building 01 - Total Town House	0			
Building 01 - Total Apartment Units	342			
Building 01 - Total Residential Units	342			

Building B (35 storeys)

Gross Floor Area Summary - By-Law 569-2013 / Unit Mix

By-Law	GBA (sq.m)	DEDUCTIONS (sq.m)	DEDUCTIONS Indoor Amenity(sq.m)	GFA Residential (sq.m)	GFA Retail (sq.m)	Net Saleable (sq.m)	Town House	Studio	1 BR	2 BR	3 BR
Level 35	836	54		781		700			9	2	1
Level 34	836	54		781		700			9	2	1
Level 33	836	54		781		700			9	2	1
Level 32	836	54		781		700			9	2	1
Level 31	836	54		781		700			9	2	1
Level 30	836	54		781		700			9	2	1
Level 29	836	54		781		700			9	2	1
Level 28	836	54		781		700			9	2	1
Level 27	836	54		781		700			9	2	1
Level 26	836	54		781		700			9	2	1
Level 25	836	54		781		700			9	2	1
Level 24	836	54		781		700			9	2	1
Level 23	836	54		781		700			9	2	1
Level 22	836	54		781		700			9	2	1
Level 21	836	54		781		700			9	2	1
Level 20	836	54		781		700			9	2	1
Level 19	836	54		781		700			9	2	1
Level 18	836	54		781		700			9	2	1
Level 17	836	54		781		700			9	2	1
Level 16	836	54		781		700			9	2	1
Level 15	836	54		781		700			9	2	1
Level 14	836	54		781		700			9	2	1
Level 13	836	54		781		700			9	2	1
Level 12	836	54		781		700			9	2	1
Level 11	836	54		781		700			9	2	1
Level 10	836	54		781		700			9	2	1
Level 09	836	54		781		700			9	2	1
Level 08	836	54		781		700			9	2	1
Level 07	1,088	66	370	651		481		0	6	0	2
Level 06	1,494	66		1,427		1,257		2	9	6	3
Level 05	1,494	66		1,427		1,257		2	9	6	3
Level 04	1,494	66		1,427		1,257		2	9	6	3
Level 03	1,494	66		1,427		1,257		2	9	6	3
Level 02	1,494	66	353	1,074		896		2	4	6	2
Level 01: Mezz	2,040	1,061		979		849					
Level 01: Ground	2,046	490	175	1,381		830	11				
P1											
	36,035	3,465	898	31,671		27,672	11	10	296	88	44

Required Indoor Amenity Space (sq.m) 2 m² / Unit	898 sq.m	9,666 sq.ft
Provided Indoor Amenity Space (sq.m)	898 sq.m	9,666 sq.ft
Indoor Amenity GFA - Above requirement	0 sq.m	0 sq.ft
Provided Outdoor Amenity Space (sq.m)	807 sq.m	8,687 sq.ft
Total Condo Residential GFA	31,671 sq.m	340,909 sq.ft
Total Retail GFA	0 sq.m	0 sq.ft
Total Proposed GFA (sq.m) - inc. Indoor Amenity	31,671 sq.m	359,261 sq.m
Total Residential Unit	449	
Average Apartment unit Size	59 sq.m	639 sq.ft

	Studio	1 BR	2 BR	3 BR
	2.3%	68.0%	19.6%	10.0%
	100%			
Building 01 - Total Town House	11			
Building 01 - Total Apartment Units	438			
Building 01 - Total Residential Units	449			

Building C (40 storeys)

Gross Floor Area Summary - By-Law 569-2013 / Unit Mix

By-Law	GBA (sq.m)	DEDUCTIONS (sq.m)	DEDUCTIONS Indoor Amenity(sq.m)	GFA Residential (sq.m)	GFA Retail (sq.m)	Net Saleable (sq.m)	Town House	Studio	1 BR	2 BR	3 BR
Level 40	836	54		781		700			9	2	1
Level 39	836	54		781		700			9	2	1
Level 38	836	54		781		700			9	2	1
Level 37	836	54		781		700			9	2	1
Level 36	836	54		781		700			9	2	1
Level 35	836	54		781		700			9	2	1
Level 34	836	54		781		700			9	2	1
Level 33	836	54		781		700			9	2	1
Level 32	836	54		781		700			9	2	1
Level 31	836	54		781		700			9	2	1
Level 30	836	54		781		700			9	2	1
Level 29	836	54		781		700			9	2	1
Level 28	836	54		781		700			9	2	1
Level 27	836	54		781		700			9	2	1
Level 26	836	54		781		700			9	2	1
Level 25	836	54		781		700			9	2	1
Level 24	836	54		781		700			9	2	1
Level 23	836	54		781		700			9	2	1
Level 22	836	54		781		700			9	2	1
Level 21	836	54		781		700			9	2	1
Level 20	836	54		781		700			9	2	1
Level 19	836	54		781		700			9	2	1
Level 18	836	54		781		700			9	2	1
Level 17	836	54		781		700			9	2	1
Level 16	836	54		781		700			9	2	1
Level 15	836	54		781		700			9	2	1
Level 14	836	54		781		700			9	2	1
Level 13	836	54		781		700			9	2	1
Level 12	836	54		781		700			9	2	1
Level 11	836	54		781		700			9	2	1
Level 10	836	54		781		700			9	2	1
Level 09	836	54		781		700			9	2	1
Level 08	836	54		781		700			9	2	1
Level 07	1,138	78	489	572		266			0	1	2
Level 06	1,400	58		1,342		1,160		4	10	3	3
Level 05	1,400	58		1,342		1,160		4	10	3	3
Level 04	1,400	58		1,342		1,160		4	10	3	3
Level 03	1,400	58		1,342		1,160		4	10	3	3
Level 02	1,400	58	101	1,241		1,087		3	10	2	3
Level 01: Mezz	1,917	1,301		616		474					
Level 01: Ground	1,942	542	418	982		483	7				
P1											
	39,570	4,009	1,008	34,561	0	30,018	7	19	347	81	50

Required Indoor Amenity Space (sq.m) 2 m² / Unit	1,008 sq.m	10,850 sq.ft
Provided Indoor Amenity Space (sq.m)	1,008 sq.m	10,850 sq.ft
Indoor Amenity GFA - Above requirement	0 sq.m	0 sq.ft
Provided Outdoor Amenity Space (sq.m)	655 sq.m	7,050 sq.ft
Total Condo Residential GFA	34,561 sq.m	372,019 sq.ft
Total Retail GFA	0 sq.m	0 sq.ft
Total Proposed GFA (sq.m) - inc. Indoor Amenity	34,561 sq.m	388,919 sq.m
Total Residential Unit	504	
Average Apartment unit Size	58 sq.m	629 sq.ft

	Studio	1 BR	2 BR	3 BR
	3.8%	69.0%	16.3%	10.1%
	100%			
Building 01 - Total Town House	7			
Building 01 - Total Apartment Units	497			
Building 01 - Total Residential Units	504			

Building D (45 storeys)

Gross Floor Area Summary - By-Law 569-2013 / Unit Mix

By-Law	GBA (sq.m)	DEDUCTIONS (sq.m)	DEDUCTIONS Indoor Amenity(sq.m)	GFA Residential (sq.m)	GFA Retail (sq.m)	Net Saleable (sq.m)	Town House	Studio	1 BR	2 BR	3 BR
Level 45	836	54		781		700			9	2	1
Level 44	836	54		781		700			9	2	1
Level 43	836	54		781		700			9	2	1
Level 42	836	54		781		700			9	2	1
Level 41	836	54		781		700			9	2	1
Level 40	836	54		781		700			9	2	1
Level 39	836	54		781		700			9	2	1
Level 38	836	54		781		700			9	2	1
Level 37	836	54		781		700			9	2	1
Level 36	836	54		781		700			9	2	1
Level 35	836	54		781		700			9	2	1
Level 34	836	54		781		700			9	2	1
Level 33	836	54		781		700			9	2	1
Level 32	836	54		781		700			9	2	1
Level 31	836	54		781		700			9	2	1
Level 30	836	54		781		700			9	2	1
Level 29	836	54		781		700			9	2	1
Level 28	836	54		781		700			9	2	1
Level 27	836	54		781		700			9	2	1
Level 26	836	54		781		700			9	2	1
Level 25	836	54		781		700			9	2	1
Level 24	836	54		781		700			9	2	1
Level 23	836	54		781		700			9	2	1
Level 22	836	54		781		700			9	2	1
Level 21	836	54		781		700			9	2	1
Level 20	836	54		781		700			9	2	1
Level 19	836	54		781		700			9	2	1
Level 18	836	54		781		700			9	2	1
Level 17	836	54		781		700			9	2	1
Level 16	836	54		781		700			9	2	1
Level 15	836	54		781		700			9	2	1
Level 14	836	54		781		700			9	2	1
Level 13	836	54		781		700			9	2	1
Level 12	836	54		781		700			9	2	1
Level 11	836	54		781		700			9	2	1
Level 10	836	54		781		700			9	2	1
Level 09	836	54		781		700			9	2	1
Level 08	836	54		781		700			9	2	1
Level 07	834	54	627	153							
Level 06	1,171	66		1,105		942			8	3	3
Level 05	1,171	66		1,105		942			8	3	3
Level 04	1,171	66		1,105		942			8	3	3
Level 03	1,171	66		1,105		942			8	3	3
Level 02	1,177	66	381	752		516			2	3	2
Level 01: Mezz	1,589	1,008		592		348					
Level 01: Ground	1,589	586	40	933		348	5				
P1											
	41,522	4,039	1,048	36,478	0	31,563	5	0	376	91	52

Required Indoor Amenity Space (sq.m) 2 m² / Unit	1,048 sq.m	11,281 sq.ft
Provided Indoor Amenity Space (sq.m)	1,048 sq.m	11,281 sq.ft
Indoor Amenity GFA - Above requirement	0 sq.m	0 sq.ft
Provided Outdoor Amenity Space (sq.m)	675.50 sq.m	7,271 sq.ft
Total Condo Residential GFA	36,477.70 sq.m	392,646 sq.ft
Total Retail GFA	0.00 sq.m	0 sq.ft
Total Proposed GFA (sq.m) - inc. Indoor Amenity	36,477.70 sq.m	411,198 sq.m
Total Residential Unit	524	
Average Apartment unit Size	59 sq.m	640 sq.ft

	Studio	1 BR	2 BR	3 BR
	0.0%	72.4%	17.5%	10.0%
	100%			
Building 01 - Total Town House	5			
Building 01 - Total Apartment Units	519			
Building 01 - Total Residential Units	524			

Building A

Total GBA	33,715 sq.m	362,907 sq.ft
Total Proposed GFA (sq.m)	28,715 sq.m	309,070 sq.ft
Total Apartment Units	342	
Total Townhouse Units	0	
Total Affordable Residential GFA	23,630 sq.m	254,352 sq.ft
Total Haven GFA	3,755 sq.m	40,421 sq.ft
Total Re:Store GFA	630 sq.m	6,779 sq.ft
Total DayCare GFA	700 sq.m	7,538 sq.ft
Required Indoor Amenity Space (sq.m) 2m² / Unit	684 sq.m	7,363 sq.ft
Provided Indoor Amenity Space (sq.m)	684 sq.m	7,363 sq.ft
Required Outdoor Amenity Space (sq.m) 2m² / Unit	684 sq.m	7,363 sq.ft
Provided Outdoor Amenity Space (sq.m)	447 sq.m	4,808 sq.ft
Provided Outdoor Amenity Ratio	1.31	

Building B

Total GBA	36,035 sq.m	387,880 sq.ft
Total Proposed GFA (sq.m)	31,671 sq.m	340,909 sq.ft
Total Apartment Units	438	
Total Townhouse Units	11	
Total Residential Condo GFA	31,671 sq.m	340,909 sq.ft
Total Retail GFA	0 sq.m	0 sq.ft
Required Indoor Amenity Space (sq.m) 2m² / Unit	898 sq.m	9,666 sq.ft
Provided Indoor Amenity Space (sq.m)	898 sq.m	9,666 sq.ft
Required Outdoor Amenity Space (sq.m) 2m² / Unit	898 sq.m	9,666 sq.ft
Provided Outdoor Amenity Space (sq.m)	807 sq.m	8,687 sq.ft
Provided Outdoor Amenity Ratio	1.80	

Building C

Total GBA	39,570 sq.m	425,930 sq.ft
Total Proposed GFA (sq.m)	34,561 sq.m	372,019 sq.ft
Total Apartment Units	497	
Total Townhouse Units	7	
Total Residential Condo GFA	34,561 sq.m	372,019 sq.ft
Total Retail GFA	0 sq.m	0 sq.ft
Required Indoor Amenity Space (sq.m) 2m² / Unit	1,008 sq.m	10,850 sq.ft
Provided Indoor Amenity Space (sq.m)	1,008 sq.m	10,850 sq.ft
Required Outdoor Amenity Space (sq.m) 2m² / Unit	1,008 sq.m	10,850 sq.ft
Provided Outdoor Amenity Space (sq.m)	655 sq.m	7,050 sq.ft
Provided Outdoor Amenity Ratio	1.31	

Building D

Total GBA	41,522 sq.m	446,944 sq.ft
Total Proposed GFA (sq.m)	36,478 sq.m	392,646 sq.ft
Total Apartment Units	519	
Total Townhouse Units	5	
Total Residential Condo GFA	36,478 sq.m	392,646 sq.ft
Total Retail GFA	0 sq.m	0 sq.ft
Required Indoor Amenity Space (sq.m) 2m² / Unit	1,048 sq.m	11,281 sq.ft
Provided Indoor Amenity Space (sq.m)	1,048 sq.m	11,281 sq.ft
Required Outdoor Amenity Space (sq.m) 2m² / Unit	1,048 sq.m	11,281 sq.ft
Provided Outdoor Amenity Space (sq.m)	676 sq.m	7,271 sq.ft
Provided Outdoor Amenity Ratio	1.30	

Parking Count

BUILDING A	Required	Provided	EV
Total Non Residential/ Visitor Parking	19	19	25%
Total Accessible Parking	13	13	
Total Residential Parking	0	64	
Total Residential Parking (including Accessible)	13	77	100%
Level P1			
Non - Residential Parking		19	
Accessible parking		9	
Residential Parking		1	
Level P2			
Non - Residential Parking		0	
Accessible parking		4	
Residential Parking		63	

BUILDING B	Required	Provided	EV
Total Non Residential/ Visitor Parking	24	8	25%
Total Accessible Parking	13	13	
Total Residential Parking	0	159	
Total Residential Parking (including Accessible)	13	172	100%
Level P1			
Non - Residential Parking		24	
Accessible parking		8	
Residential Parking		58	
Level P2			
Non - Residential Parking		0	
Accessible parking		5	
Residential Parking		101	

BUILDING C	Required	Provided	EV
Total Non Residential/ Visitor Parking	27	27	25%
Total Accessible Parking	14	14	
Total Residential Parking	0	160	
Total Residential Parking (including Accessible)	14	174	100%
Level P1			
Non - Residential Parking		27	
Accessible parking		9	
Residential Parking		58	
Level P2			
Non - Residential Parking		0	
Accessible parking		5	
Residential Parking		102	

BUILDING D	Required	Provided	EV
Total Non Residential/ Visitor Parking	28	9	25%
Total Accessible Parking	14	14	
Total Residential Parking	0	48	
Total Residential Parking (including Accessible)	14	62	100%
Level P1			
Non - Residential Parking		28	
Accessible parking		9	
Residential Parking		2	
Level P2			
Non - Residential Parking		0	
Accessible parking		5	
Residential Parking		46	

Amenity

Amenity Requirements & Provided

Type	Number of Units	Required per Unit (sq.m)	Required (sq.m)	Provided (sq.m)	Proposed Per unit (sq.m)
Building A					
Indoor	342	2.0	684	684 sq.m	2.00
Outdoor	342	2.0	684	447 sq.m	1.31
Building B					
Indoor	449	2.0	898	898 sq.m	2.00
Outdoor	449	2.0	898	807 sq.m	1.80
Building C					
Indoor	504	2.0	1008	1008 sq.m	2.00
Outdoor	504	2.0	1008	600 sq.m	1.19
Building D					
Indoor	524	2.0	1048	1048 sq.m	2.00
Outdoor	524	2.0	1048	676 sq.m	1.29

Bicycle Parking Provided

Level	Building A Short-Term	Building A Long-Term	Building B Short-Term	Building B Long-Term	Building C Short-Term	Building C Long-Term	Building C Short-Term	Building C Long-Term	Sub Total
Level 1 Ground			32		36		38		106
Level 1 Mezz				306		344		358	1,008
P1	40	238							278
Sub Total	40	238	32	306	36	344	38	358	1,392
TOTAL	278		338		380		396		1392

Bicycle Parking Required

Building A		Short-Term	Long-Term
Total Affordable Residential Units	342	24	233
Total Haven GFA	3,755 sq.m	6	3
Total Re:Store GFA	630 sq.m	4	1
Total Daycare GFA	700 sq.m	5	1
Total		39	238

Building B		Short-Term	Long-Term
Total Condo Residential Units	438	31	298
Total Townhouse Units	11	1	8
Total		32	306

Building C		Short-Term	Long-Term
Total Condo Residential Units	497	35	338
Total Townhouse Units	7	1	5
Total		36	343

Building D		Short-Term	Long-Term
Total Condo Residential Units	519	37	353
Total Townhouse Units	5	1	4
Total		38	357

Residential bicycle parking should comply with the following rates:
- 0.68 per unit for residential long term
- 0.07 per unit for residential short term

We recommend the following rates for the Non - Residential use
- 0.06 / 100 sqm for long term
- 3 + 0.06 / 100 sqm for short term

Garbage

Garbage Requirements & Provided

Type	Number of Units	Required (sq.m)	Provided (sq.m)
Building A			
Garbage Room	342	101	107 sq.m
Bulk waste Storage		10	10 sq.m
Building B			
Indoor	438	126	138 sq.m
Outdoor		10	10 sq.m
Building C			
Indoor	497	141	142 sq.m
Outdoor		10	10 sq.m
Building D			
Indoor	519	147	147 sq.m
Outdoor		10	10 sq.m

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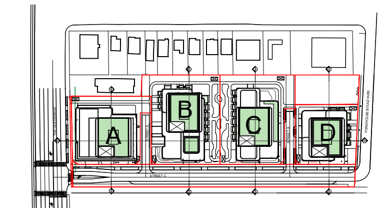
Project North

Key Plan (NTS)



Rev.	Issue / Description	Date
02	ISSUED FOR DESIGN COORDINATION	JAN 12, 2024

Architect of Record:

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Project Title:

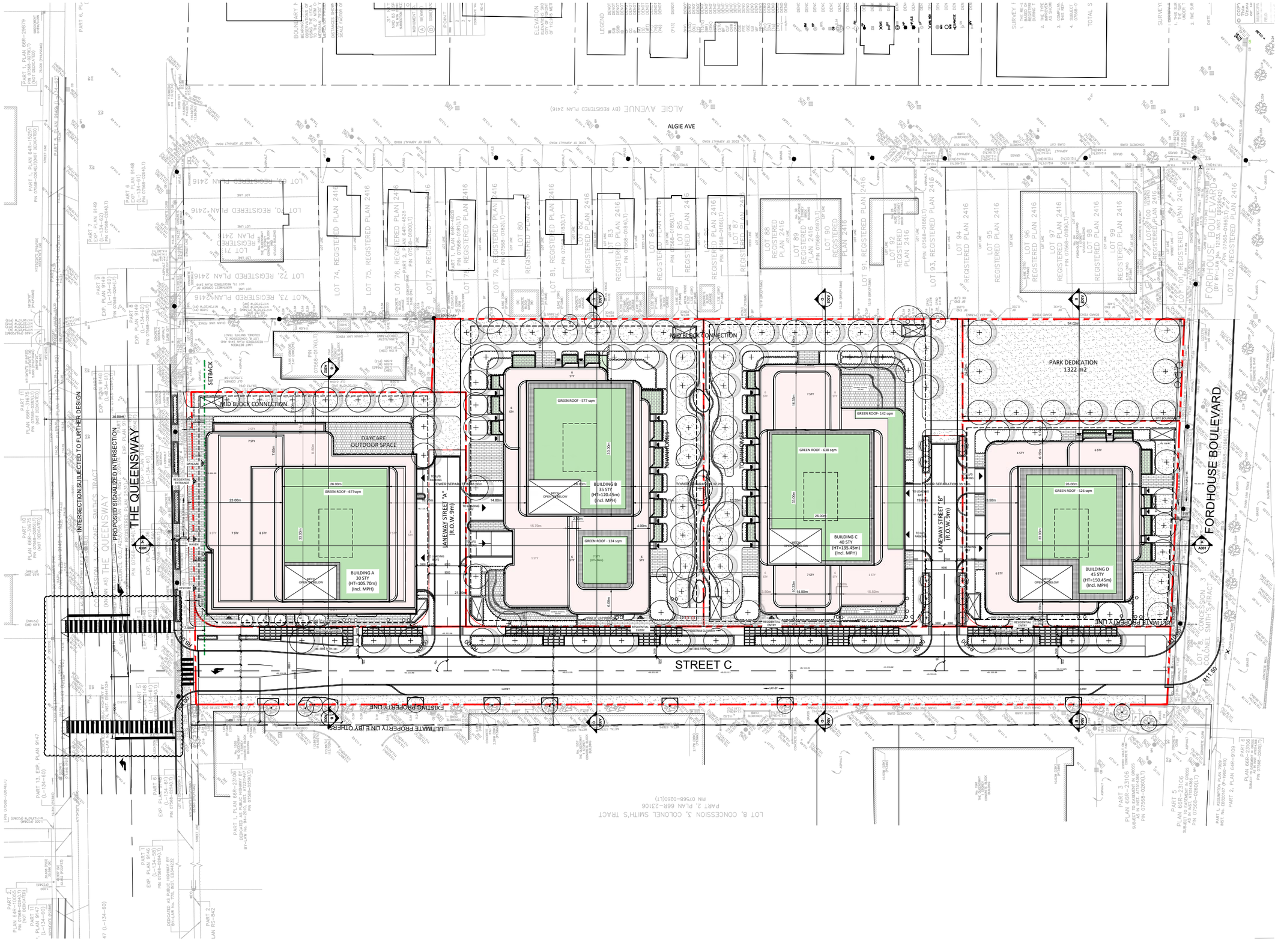
THE QUEENSWAY & ALGIE STREET DEVELOPMENT

Address: 1543-1551 The Queensway & Algie Street & 66 & 76 Ford House Blvd., Etobicoke

PROJECTS STATS

Project number: 2313
Scale:
Date: 2024-11-24
Drawn by: HPA

Drawing No.: A-101
Revision: 01



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Project North

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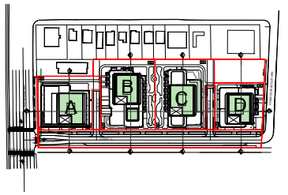

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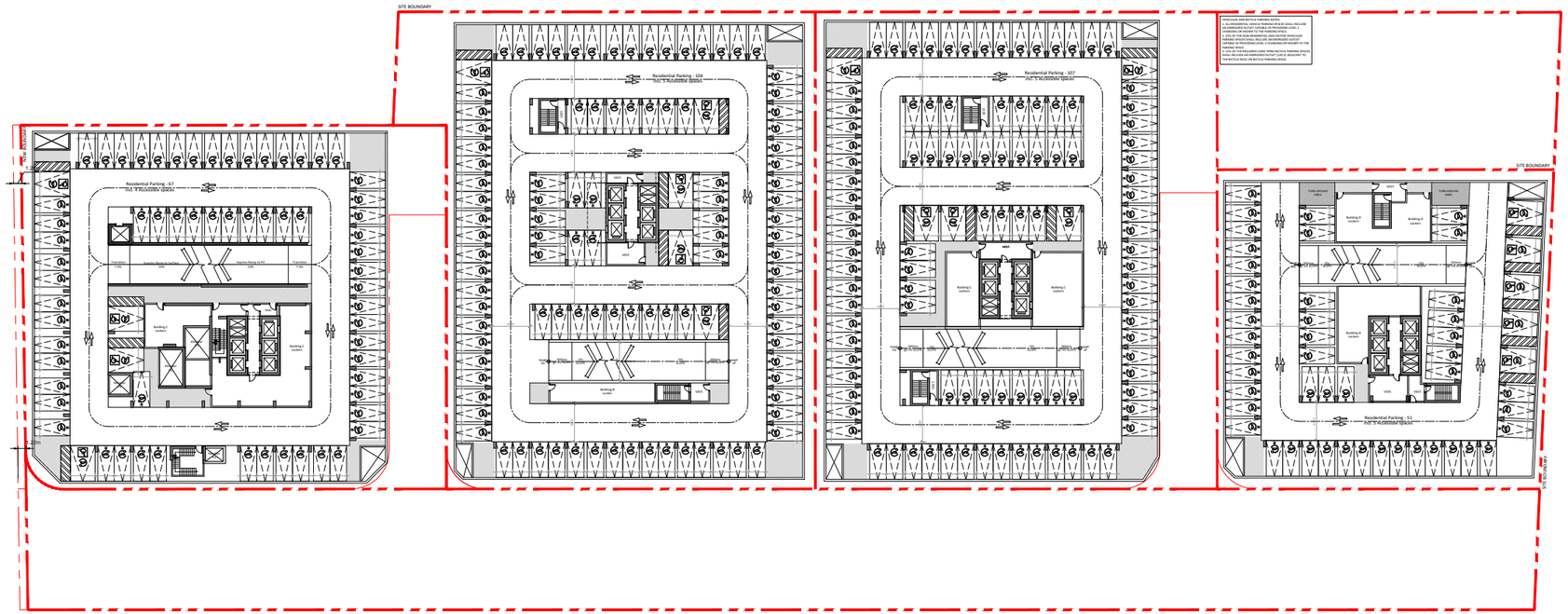
SITE PLAN

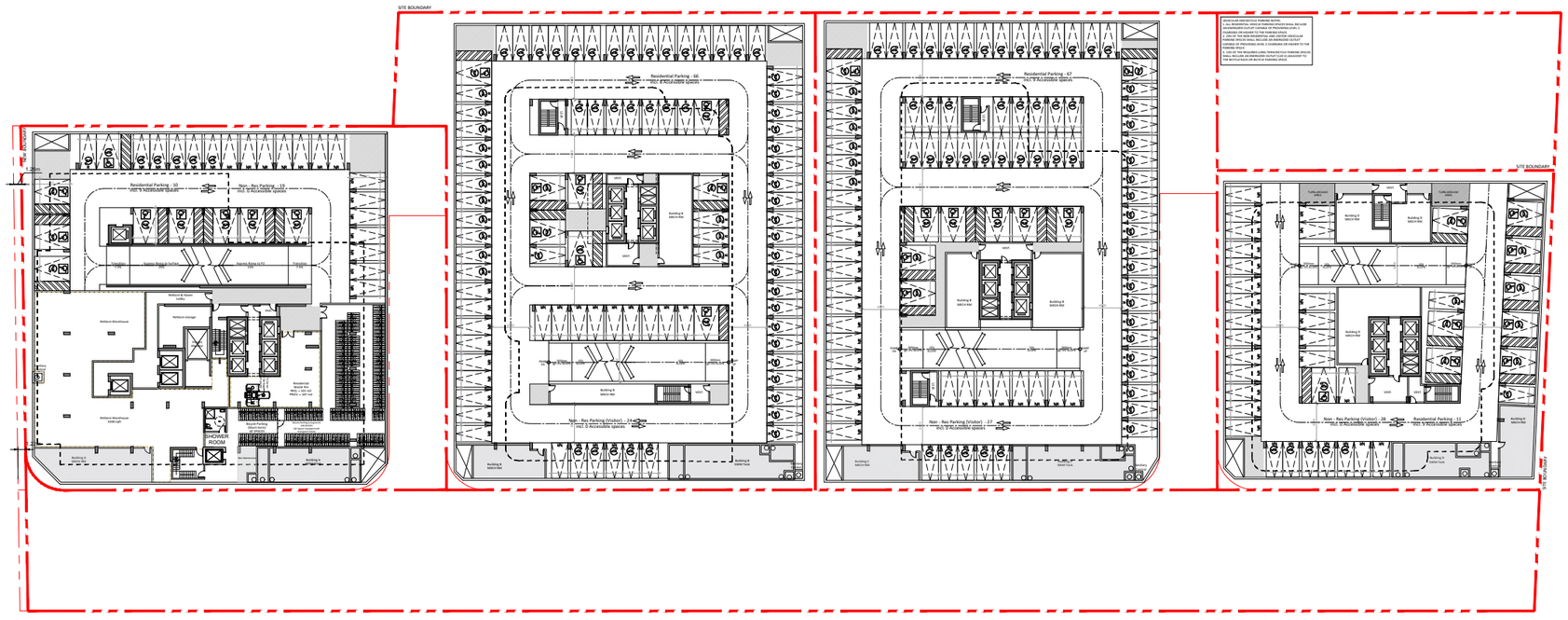
Project number:	2313
Scale:	1:400
Date:	2024-11-24
Drawn by:	HPA

Drawing No.: A-102

Revision: 01



PARKING LEVEL P2



PARKING LEVEL P1

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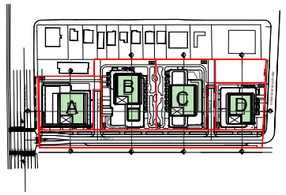
Project North

Key Plan (NTS)



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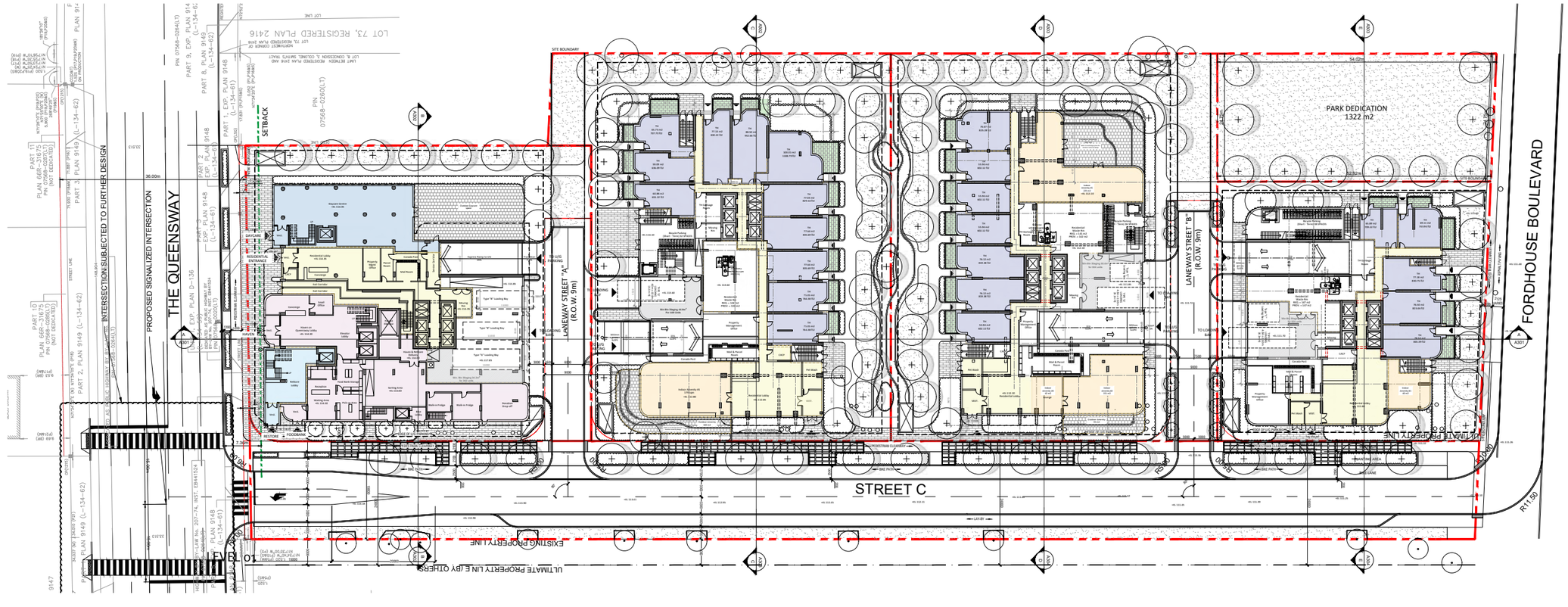
PARKING LEVEL P1 & P2

Project number:	2313
Scale:	1:400
Date:	2024-11-24
Drawn by:	HPA

Drawing No.: A-103

Revision: 01



LEVEL 01 MEZZANINE

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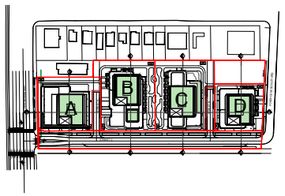
Project North

Key Plan (NTS)



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Project Title:

THE QUEENSWAY & ALGIE STREET DEVELOPMENT

Address: 1543-1551 The Queensway & Algie Street & 66 & 76 Ford House Blvd., Etobicoke

LEVEL 01 & LEVEL 01 MEZZANINE

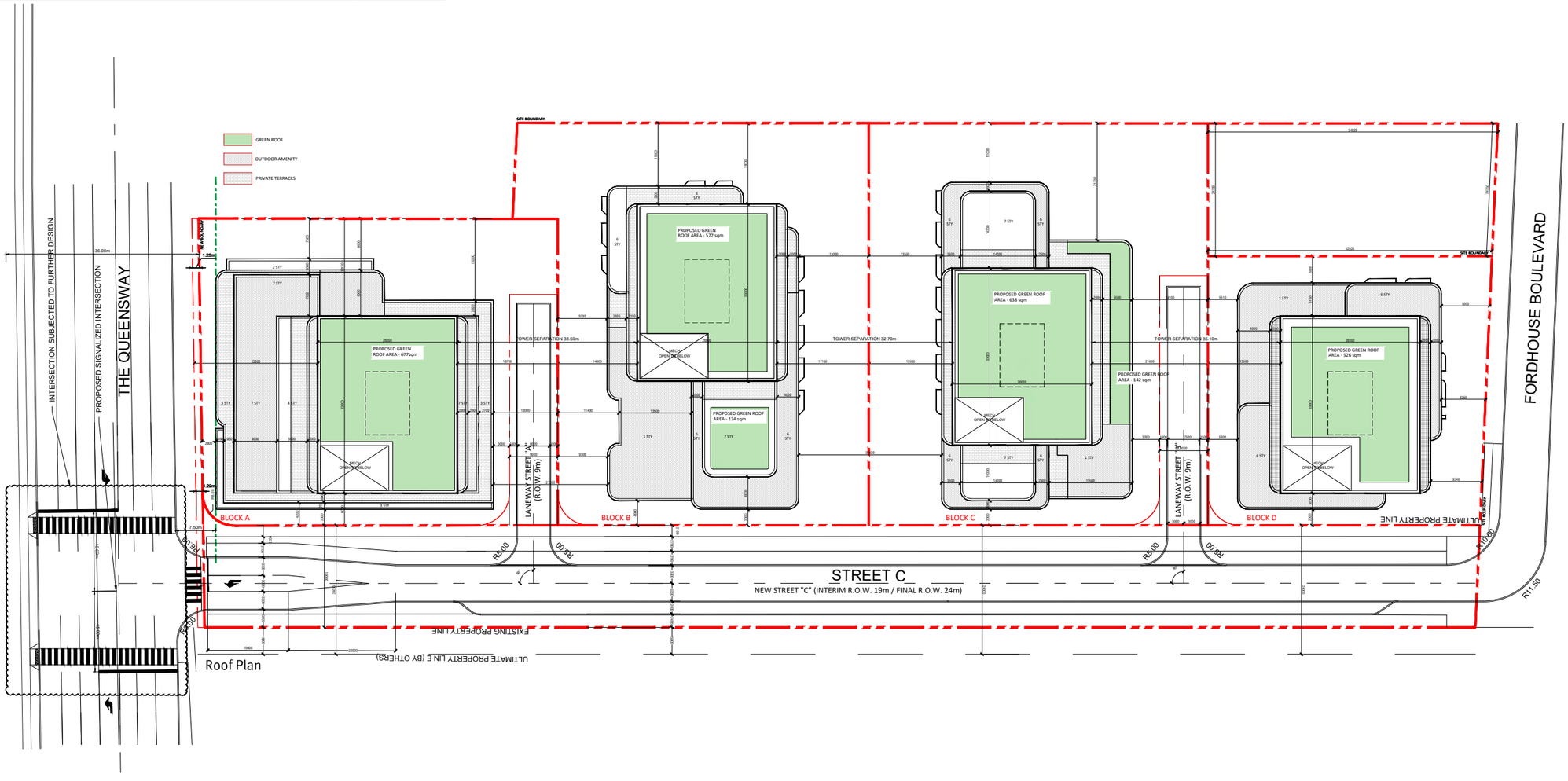
Project number:	2313
Scale:	1:400
Date:	2024-11-24
Drawn by:	HPA

Drawing No.: A-104

Revision: 01

Green Roof Statistics		
Building A		Proposed
Total Gross Floor Area, as defined in Green Roof Bylaw (m^2)		28,713
Total Roof Area (m^2):		2,242
Area of Residential Private Terraces (m^2)		668
Rooftop Outdoor Amenity Space, if in a Residential Building (m^2)		447
Area of Renwable Energy Devices (m^2)		0
Tower(s) Roof Area with floor plate less than 750 m^2		0
Total Available Roof Space (m^2)		1,127
Green Roof Coverage	Required	Proposed
Coverage of Available Roof Space (m^2)	676	677
Coverage of Available Roof Space (%)	60%	60%
Building B		Proposed
Total Gross Floor Area, as defined in Green Roof Bylaw (m^2)		31,671
Total Roof Area (m^2):		2,091
Area of Residential Private Terraces (m^2)		295
Rooftop Outdoor Amenity Space, if in a Residential Building (m^2)		630
Area of Renwable Energy Devices (m^2)		0
Tower(s) Roof Area with floor plate less than 750 m^2		0
Total Available Roof Space (m^2)		1,167
Green Roof Coverage	Required	Proposed
Coverage of Available Roof Space (m^2)	700	701
Coverage of Available Roof Space (%)	60%	60%

Green Roof Statistics		
Building C		Proposed
Total Gross Floor Area, as defined in Green Roof Bylaw (m^2)		34,561
Total Roof Area (m^2):		1,991
Area of Residential Private Terraces (m^2)		336
Rooftop Outdoor Amenity Space, if in a Residential Building (m^2)		358
Area of Renwable Energy Devices (m^2)		0
Tower(s) Roof Area with floor plate less than 750 m^2		0
Total Available Roof Space (m^2)		1,297
Green Roof Coverage	Required	Proposed
Coverage of Available Roof Space (m^2)	778	780
Coverage of Available Roof Space (%)	60%	60%
Building D		Proposed
Total Gross Floor Area, as defined in Green Roof Bylaw (m^2)		36,478
Total Roof Area (m^2):		1,560
Area of Residential Private Terraces (m^2)		129
Rooftop Outdoor Amenity Space, if in a Residential Building (m^2)		556
Area of Renwable Energy Devices (m^2)		0
Tower(s) Roof Area with floor plate less than 750 m^2		0
Total Available Roof Space (m^2)		875
Green Roof Coverage	Required	Proposed
Coverage of Available Roof Space (m^2)	525	526
Coverage of Available Roof Space (%)	60%	60%



Roof Plan

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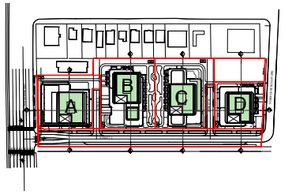
Project North

Key Plan (NTS)



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Project Title:

THE QUEENSWAY & ALGIE STREET DEVELOPMENT

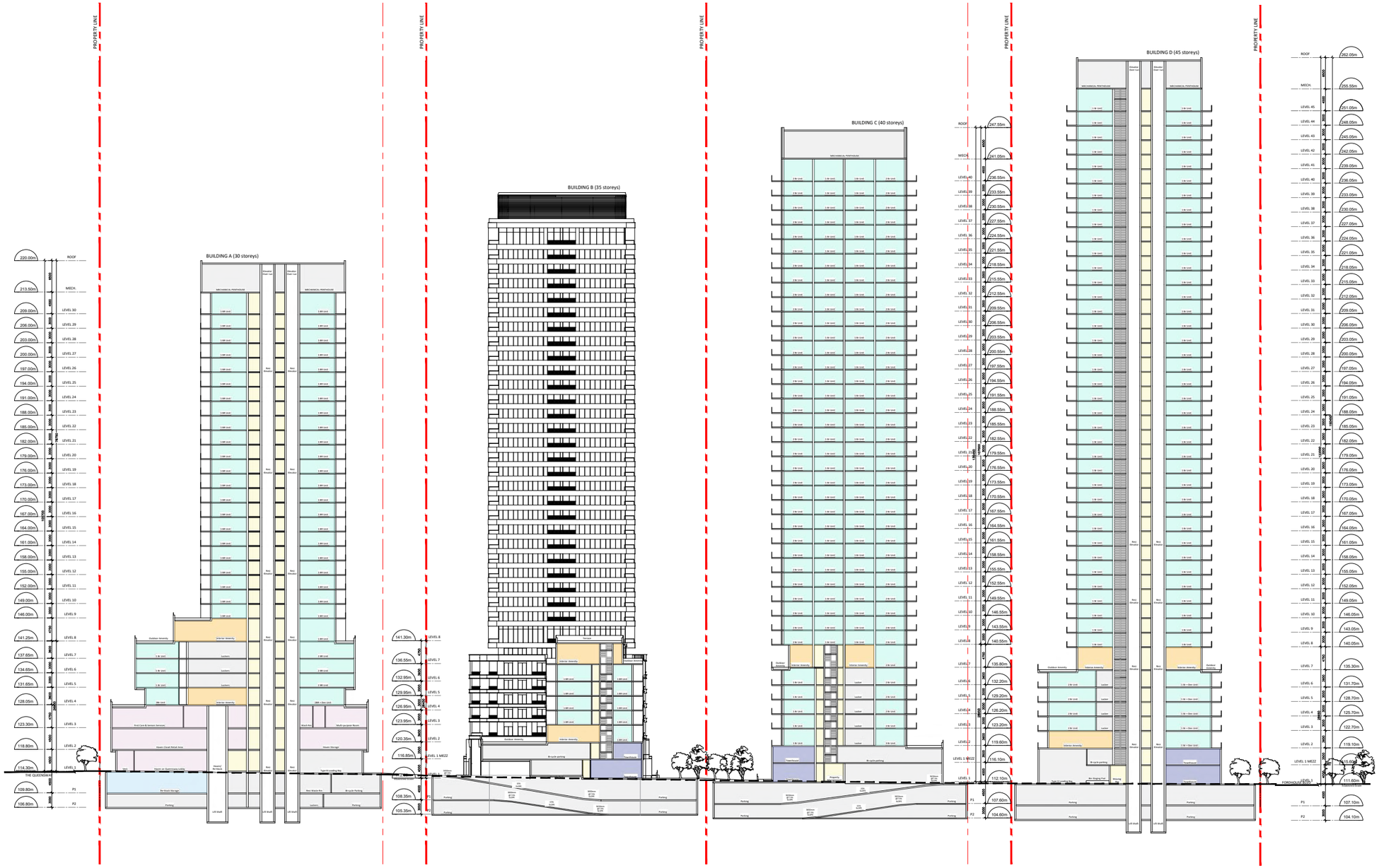
Address: 1543-1551 The Queensway & Algie Street & 66 & 76 Ford House Blvd., Etobicoke

ROOF PLAN

Project number:	2313
Scale:	1:400
Date:	2024-11-25
Drawn by:	HPA

Drawing No.: A-109

Revision: 01



SECTION THROUGH
BUILDING A , B , C & D

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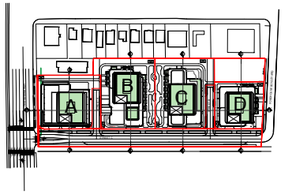

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THE QUEENSWAY & ALGIE STREET DEVELOPMENT

Address: 1543-1551 The Queensway & Algie Street & 66 & 76 Ford House Blvd., Etobicoke

SECTION THROUGH BUILDINGS A , B , C & D

Project number:	2313
Scale:	1:400
Date:	2024-11-25
Drawn by:	HPA

Drawing No.: A-301

Revision: 01

TABLE A1 - EXISTING POPULATION BREAKDOWN

			1543 The Queensway (Jacks Flooring)	1545 The Queensway (Cancore Building Services)	1547 The Queensway (Prince Limousine)	1549-1551 The Queensway (Repo Depo)	66 Fordhouse Boulevard (Repo Depo)	70-76 Fordhouse Boulevard (D+H)	Total Existing
1.0	Total Retail/Commercial GFA*	m^2	123	0	107	1083	2933	0	4246
1.1	Total Retail/Commercial Population (@1.1 persons/100$m^{2)}$**	persons	1	0	1	12	32	0	47
1.2	Total Office/Commercial GFA*	m^2	0	530	0	0	0	2380	2910
1.3	Total Office Population (@3.3 persons/100$m^{2)}$**	persons	0	17	0	0	0	79	96
1.4	**Total Existing Population**	**persons**	1	17	1	12	32	79	143
1.5	**Total Existing Population (Used for Calculation Purposes)*** **	**persons**	**2**	**18**	**2**	**13**	**33**	**80**	**148**

*Existing retail/commercial and office ground floor areas (GFA) taken from Topography, supplemented with Toronto Maps and Google Maps imagery.

** as per City of Toronto Design Criteria for Sewers and Watermains - January 2021

*** Existing Populations rounded up to nearest whole number.

TABLE A2 - PROPOSED POPULATION & AREA BREAKDOWN

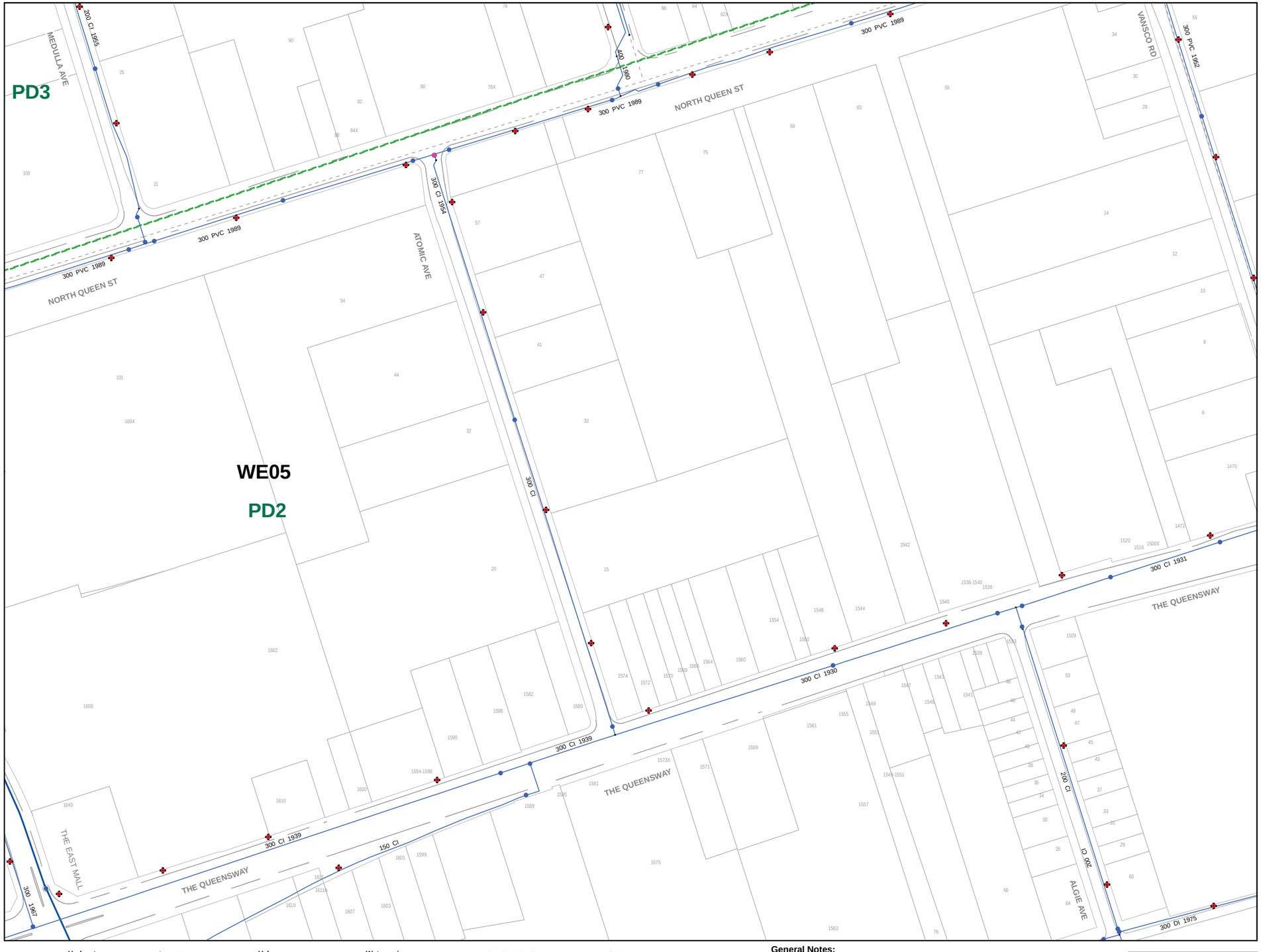
			Building A	Building B	Building C	Building D	Total Proposed
1.0	Total Residential Units *	units	342	449	504	524	1,819
1.1	Total One-Bedroom or One Bedroom + Den Units	%	75%	69%	73%	72%	72%
1.2	Total One-Bedroom or One Bedroom + Den Units	units	255	308	366	376	1,305
1.3	Persons Per Unit **	persons/ unit	1.4	1.4	1.4	1.4	1.4
1.4	Total Two Bedroom Units	%	15%	19%	24%	17%	17%
1.5	Total Two Bedroom Units	units	52	86	81	91	310
1.6	Persons Per Unit **	persons/ unit	2.1	2.1	2.1	2.1	2.1
1.7	Total Three Bedroom Units	%	10%	10%	10%	10%	10%
1.8	Total Three Bedroom Units	units	35	44	50	52	181
1.9	Persons Per Unit **	persons/ unit	3.1	3.1	3.1	3.1	3.1
2.0	Total Townhouse Units	%	0%	2%	1%	1%	1%
2.1	Total Townhouse Units	units	0	11	7	5	23
2.0	Persons Per Unit **	persons/ unit	2.7	2.7	2.7	2.7	2.7
2.0	Total Residential Population	persons	575	778	857	893	3,102
2.1	**Total Residential Population (Used for Calculation Purposes)**	**persons**	**606**	**860**	**950**	**973**	**3,389**
2.2	Total Retail GFA*	m^2	630	0	0	0	630
2.3	Total Retail Population (@1.1 persons/100$m^{2)}$**	persons	7	0	0	0	7
2.4	Total Community & Daycare GFA*	m^2	4455	0	0	0	4,455
2.5	Total Community & Daycare Population (@2.58 persons/100$m^{2)}$**	persons	115	0	0	0	115
2.6	Total ICI Population	persons	122	0	0	0	122
2.7	**Total ICI Population (Used for Calculation Purposes)**	**persons**	**130**	**0**	**0**	**0**	**130**
2.8	**Total Proposed Population (Used for Calculation Purposes)**	**persons**	**736**	**860**	**950**	**973**	**3,519**

*Proposed preliminary unit total, community and retail GFA taken from Architectural statistics prepared by Hariri Pontarini Architects. Proposed unit breakdown taken from internal estimates.

** as per City of Toronto Design Criteria for Sewers and Watermains - January 2021

APPENDIX B

WATER SERVICING ANALYSIS



Toronto Water Atlas

Hydrant
- Other
- City of Toronto
- Private

- PRV
- Meter
- Pressure District Valve

Metro Connection Valve
- Open
- Closed

Valve
- Open
- Closed
- Chamber
- Sanitary Pump Station

Watermain
- Distribution
- Transmission
- Metro Connection
- Encasement
- Abandoned Main
- Forcemain
- Reservoir
- Pressure District Boundary

- River
- Highway
- Curb
- Wards Boundary

0 50 100 150 200 Metres

Third Edition
Date: 01/09/2010

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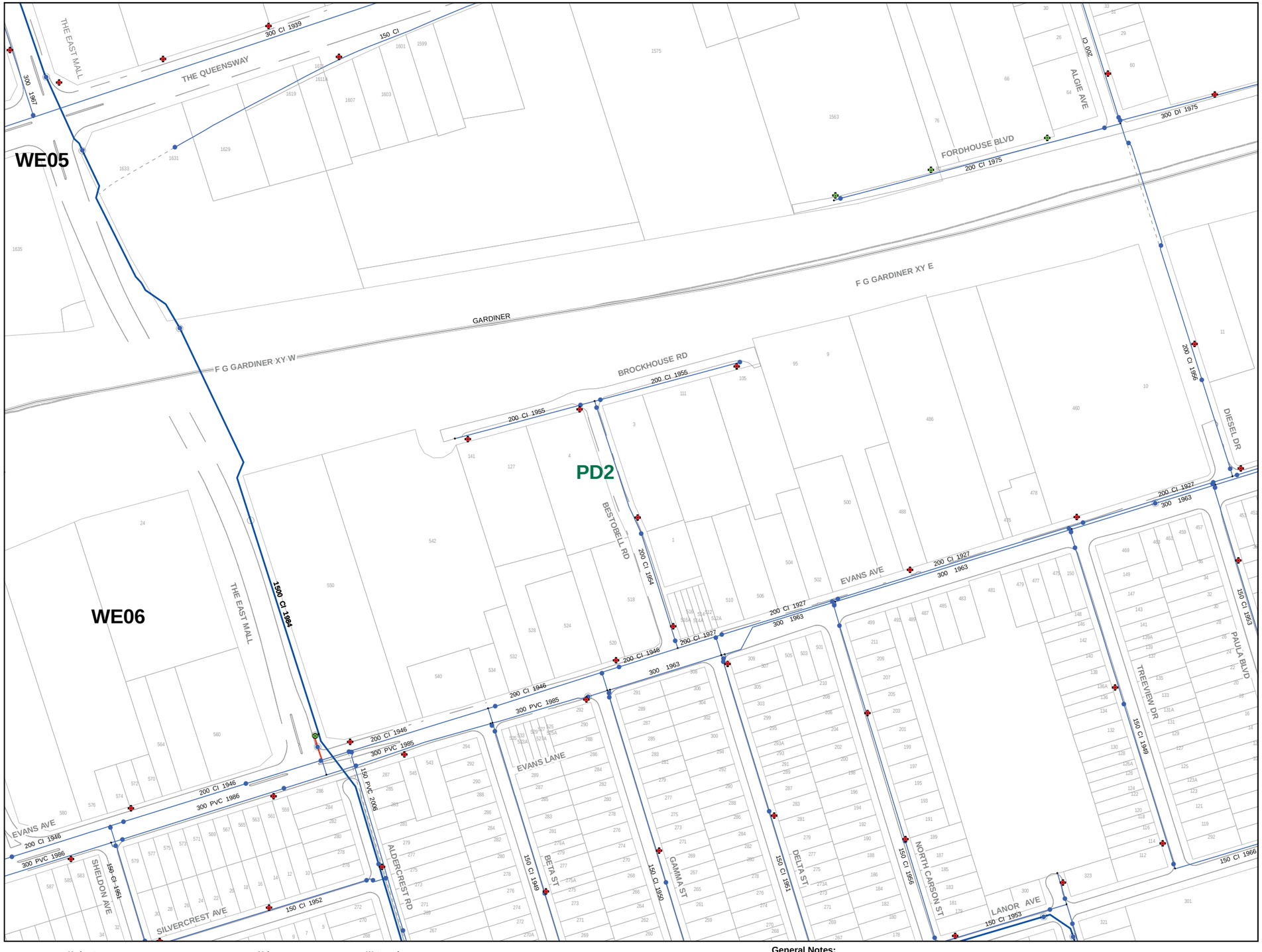
N W E S

165	199	234
166	200	235
167	201	236



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0 50 100 150 200 Metres

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N W E S

166	200	235
167	201	236
168	202	237

TABLE B1 - PROPOSED PEAK WATER DEMAND CALCULATIONS - RESIDENTIAL

			Building A	Building B	Building C	Building D	Park*	Total Proposed
1.0	Total Proposed Population*	persons	606	860	950	973	0	3,100
1.1	Per Capita Demand @ 190 L/person/day**	L/day	115,140	163,400	180,500	184,870	0	589,000
1.2	**Equivalent Population Demand**	**L/s**	**1.33**	**1.89**	**2.09**	**2.14**	**1.50**	**8.95**
1.3	Peak Hour Peaking Factor**		2.50	2.50	2.50	2.50	2.50	2.50
1.4	**Peak Hour Design Demand Rate**	**L/s**	**3.33**	**4.73**	**5.22**	**5.35**	**1.50**	**20.13**
1.5	Maximum Day Peaking Factor**		1.30	1.30	1.30	1.30	1.30	1.30
1.6	**Maximum Day Design Demand Rate**	**L/s**	**1.73**	**2.46**	**2.72**	**2.78**	**1.50**	**11.19**

TABLE B2 - PROPOSED PEAK WATER DEMAND CALCULATIONS - ICI

			Building A	Building B	Building C	Building D	Park	Total Proposed
2.0	Total Proposed Population*	persons	130	0	0	0	0	130
2.1	Per Capita Demand @ 190 L/person/day**	L/day	24,700	0	0	0	0	24,700
2.2	**Equivalent Population Demand**	**L/s**	**0.29**	**0.00**	**0.00**	**0.00**	**0.00**	**0.29**
2.3	Peak Hour Peaking Factor**		1.20	1.20	1.20	1.20	1.20	1.20
2.4	**Peak Hour Design Demand Rate**	**L/s**	**0.34**	**0.00**	**0.00**	**0.00**	**0.00**	**0.34**
2.5	Maximum Day Peaking Factor**		1.10	1.10	1.10	1.10	1.10	1.10
2.6	**Maximum Day Design Demand Rate**	**L/s**	**0.31**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**

TABLE B3 - PROPOSED PEAK WATER DEMAND CALCULATIONS - TOTAL

			Building A	Building B	Building C	Building D	Park	Total Proposed
3.0	Total Proposed Population*	persons	736	860	950	973	0	3,519
3.1	Per Capita Demand @ 190 L/person/day**	L/day	139,840	163,400	180,500	184,870	0	668,610
3.2	**Equivalent Population Demand**	**L/s**	**1.62**	**1.89**	**2.09**	**2.14**	**1.50**	**9.24**
3.3	**Peak Hour Design Demand Rate**	**L/s**	**3.67**	**4.73**	**5.22**	**5.35**	**1.50**	**20.47**
3.4	**Maximum Day Design Demand Rate**	**L/s**	**2.05**	**2.46**	**2.72**	**2.78**	**1.50**	**11.50**

* Refer to Table A2 in Appendix A for the proposed populations of the site.

** as per City of Toronto Design Criteria for Sewers and Watermains - January 2021

*** A provisional peak water demand has been allocated for the park, to account for possible future water features.

TABLE B4 - FIRE DEMAND CALCULATIONS - BASED ON F.U.S. GUIDELINES

		Building A	Building B	Building C	Building D
Coefficient for type of construction*		0.60	0.60	0.60	0.60
Height in Stories		30	35	40	45
Level 1 Floor Area**	m^2	1,542	1,381	980	933
Level 2 Floor Area	m^2	1,983	1,074	1,242	752
Level 3 Floor Area	m^2	1,980	1,427	1,342	1,105
Level 4 Floor Area	m^2	1,105	1,427	1,342	1,105
Level 5 Floor Area	m^2	1,451	1,427	1,342	1,105
Level 6 Floor Area	m^2	1,451	1,427	1,342	1,105
Level 7 Floor Area	m^2	1,451	651	573	781
Level 8 Floor Area	m^2	581	781	781	781
Level 9 Floor Area	m^2	781	781	781	781
Level 10 Floor Area	m^2	781	781	781	781
Stories to Use in Calculation (2 largest floors + 50% of each floor above up to 8)		1 + 2 + (3-10* 50%)	1 + 2 + (3-10* 50%)	1 + 2 + (3-10* 50%)	1 + 2 + (3-10* 50%)
Total Area	m^2	8,316	6,806	6,364	5,457
Fire Flow Required	L/min	12,000	11,000	11,000	10,000
15% Reduction for Occupancy Charge - low fire hazard	L/min	-1,800	-1,650	-1,650	-1,500
Fire Flow Required	L/min	10,200	9,350	9,350	8,500
30% Reduction for Automatic Sprinklers	L/min	-3,060	-2,805	-2,805	-2,550
Charge for Building Separation					
North: Nearest Building	m	0%	15%	15%	15%
West: Nearest Building	m	10%	10%	10%	10%
South: Nearest Building	m	15%	20%	15%	0%
East: Nearest Building	m	20%	10%	15%	0%
Charge for Building Separation	L/min	4,590	5,143	5,143	2,125
Fire Flow Required	L/min	12,000	12,000	12,000	9,000
Fire Flow Required	L/s	200.00	200.00	200.00	150.00

*Please refer to the letter prepared by the Architectural consultant noting the site's construction classification, and sprinkler in Appendix B of the report.

*See Architectural site statsitics provided in Appendix A for individual floor areas.

TABLE B5 - PROPOSED TOTAL WATER DEMAND

As per City of Toronto Design Criteria and MOE design guidelines, water supply systems should be designed to satisfy **the greater** of either of the following demands:

- Maximum Day Domestic Demand plus Fire Flow
- Peak Hour Domestic Demand

MAX DAY & FIRE FLOWS

		Building A	Building B	Building C	Building D	Park	Total/ *Highest*
Max Day	L/s	2.05	2.46	2.72	2.78	1.50	11.50
Fire	L/s	200.00	200.00	200.00	150.00	0.00	*200.00*
Total Max Day & Fire Flow	**L/s**	**202.05**	**202.46**	**202.72**	**152.78**	**1.50**	**211.50**

PEAK HOUR DOMESTIC DEMAND

Peak Rate	**L/s**	**3.67**	**4.73**	**5.22**	**5.35**	**1.50**	**20.47**

THEREFORE, MAX DAY + FIRE FLOW IS GOVERNING REQUIREMENT

WATER DEMAND

Max Day Demand	L/s	2.05	2.46	2.72	2.78	1.50	11.50
	L/min	122.81	147.51	162.95	166.90	90.00	690.18
Fire Flow*	L/s	200.00	200.00	200.00	150.00	0.00	200.00
	L/min	12,000.00	12,000.00	12,000.00	9,000.00	0.00	12,000.00
Total Water Demand Requirement	**L/s**	**202.05**	**202.46**	**202.72**	**152.78**	**1.50**	**211.50**
	L/min	**12,122.81**	**12,147.51**	**12,162.95**	**9,166.90**	**90.00**	**12,690.18**

Note (*): Per City of Toronto's Design Criteria for Sewers and Watermains, in accordance with the Fire Underwriters Survey (FUS), fire flows will not be less than 4,800 L/minute for a 2-hour duration in addition to maximum daily domestic demand, delivered with a residual pressure of

1543-1551 THE QUEENSWAY DEVELOPMENT

Toronto, ON

Watermain Hydraulic Analysis Report

Version 1: November 20, 2024

Prepared for:
1370443 ONTARIO LIMITED C/O RSM

1543-1551 THE QUEENSWAY DEVELOPMENT

Toronto, ON

Watermain Hydraulic Analysis Report

Prepared for:

1370443 ONTARIO LIMITED C/O RSM

RVA

Version 1: November 20, 2024

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APPENDICES

1.0 INTRODUCTION

R.V. Anderson Associates Limited (RVA) has been retained by 1370443 Ontario Limit c/o RSM (RSM) to perform a watermain hydraulic analysis in support of the water servicing requirements and application for the proposed residential redevelopment of 1543-1551 The Queensway and 60, 70, & 76 Fordhouse Boulevard in the City of Toronto.

The proposed redevelopment site has municipal frontage onto The Queensway to the north and Fordhouse Boulevard to the south. The east side of the site is bound by the existing buildings at Algie Avenue.

This report summarizes the water servicing assessment for the proposed development per the City of Toronto's water distribution design criteria, guidelines, and requirements.

1.1 Project Scope

The purpose of the watermain hydraulic analysis is to evaluate the hydraulic capacity of the system in meeting the estimated demands of the proposed development.

The scope of the report includes:

- Identification of the City of Toronto's design criteria for water servicing;
- Identification and review of the existing watermains available near the proposed location;
- Review of the water demands required for the proposed development;
- Identification of the municipal watermains' capacity including the proposed system layout in meeting the required water demands (both institutional and fire flow) and pressures for the proposed development; and,
- Identify the adequacy of the supply capacity in meeting all the water servicing requirements and provide recommendations on how to meet them, if needed.

1.2 Background and Resource Information

In preparation of this report, the following information was obtained and reviewed:

- General Site Servicing Plan prepared by RVA.
- Domestic water demands and fire flow demands calculated by RVA. See Appendix E for details.
- Preliminary street design for proposed watermain within the site provided by RVA.
- Hydrant flow test completed by RVA on June 26, 2023.

2.0 SITE LAYOUT AND DEVELOPMENT INFORMATION

The proposed development is approximately 2.15 hectares and is currently occupied by several commercial/retail businesses along The Queensway & Fordhouse Boulevard frontages.

A site plan for the proposed development is shown in Figure 2.1.

Figure 2.1 – Site Plan

2.1 Water Demands

The proposed development will be comprised of four (4) Blocks, labelled Blocks A through D, respectively. Furthermore, each Block will have a single tower/building within its extents. Building A will be located along the Queensway frontage and will contain residential units as well as community space, and retail space within the podium, Buildings B and C will be located at the center of the site residential use throughout. Lastly, Building D will be located along the Fordhouse Boulevard frontage and will contain residential use throughout. In addition to the aforementioned Blocks, a Public Park is located at the southeastern limit of the Site, east of Block D, with frontage on to Fordhouse Boulevard. The Park will be its own development block. (Refer to Appendix A)

Per the City of Toronto Design Criteria for Sewer and Watermains and MOE Design Guidelines, the average day, maximum day, and peak hour water demands for each block were calculated based on residential and ICI maximum day peaking factors of 1.3 and 1.1, respectively, and peak hour peaking factors of 2.5 and 1.2, respectively. See Appendix E for detail.

A provisional water demand has been allocated for the park to account for possible future water features. They are assumed to be the same in all scenarios.

The water demands were assigned to the new junctions along the proposed watermain looped within the site. The proposed water demands for each new development block are summarized in Table 2.1:

Table 2.1 – Proposed Water Demands – Domestic + Commercial

Junction/Node	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
J 32 (Block A)	1.62	2.05	3.67
J 34 (Block B)	1.89	2.46	4.73
J 36 (Block C)	2.09	2.72	5.22
J 38 (Block D)	2.14	2.78	5.35
J 54 (Park)	1.50	1.50	1.50
Total	9.24	11.51	20.47

2.2 Fire Flow Demand

The required fire flow for the proposed development was calculated by RVA based on F.U.S guidelines. Block C has the highest fire flow requirement of 200 L/s under maximum day demand conditions in the development.

Table 2.2 – Received Required Fire Flow

Junction/Node	Required Fire Flow (L/s)	Maximum Day + Fire Flow (L/s)
J 32 (Block A)	200	202.05
J 34 (Block B)	200	202.46
J 36 (Block C)	200	202.72
J 38 (Block D)	150	152.78

3.0 WATER SERVICING

Figure 3.1 shows the existing watermains (coloured in blue) near the proposed development site and the proposed watermains (coloured in red) within the site. The existing watermains adjacent to the 1543-1551 The Queensway development site are as follows:

- Ø300mm Cast Iron – installed along The Queensway
- Ø200mm Cast Iron – installed along Fordhouse Blvd

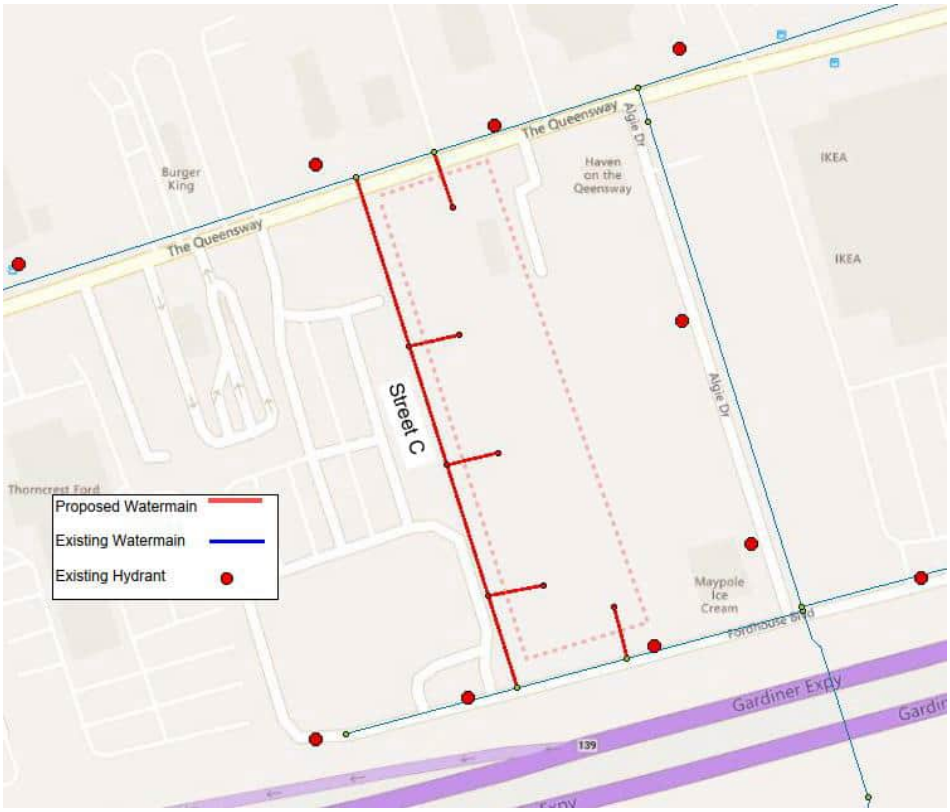


Figure 3.1 Existing and Proposed Watermains within Development Area

The proposed Block A will be serviced by connecting to the existing Ø300mm Cast Iron on The Queensway. The proposed Block B, Block C, and Block D will be serviced by connecting to the proposed Ø300mm watermain on “Street C” according to the proposed site plan. The Park will be serviced by connecting to the existing Ø300mm Cast Iron on Fordhouse Blvd.

Along The Queensway frontage, two (2) existing municipal fire hydrants are located within the vicinity of the site which are connected to the Ø300mm cast iron watermain on The Queensway. Secondly, three (3) existing municipal fire hydrants are located within the vicinity of the site which are connected to the Ø200mm cast iron watermain on Fordhouse Blvd. These hydrants are planned to be used for the development's firefighting purposes.

4.0 WATER DISTRIBUTION NETWORK MODELING

The following sections describe the factors taken into consideration for the hydraulic modeling of the proposed water servicing layout for 1543-1551 The Queensway development.

4.1 Design Criteria and Requirements for Hydraulic Modeling

Based on the City of Toronto design guidelines and requirements for water servicing, the following were considered:

1. The City of Toronto Design Criteria for Sewers and Watermains outlines the acceptable pressures under average day and maximum day conditions between minimum and maximum pressures of 350 kPa (50 psi) and 550 kPa (80 psi), respectively, while the preferred pressure range for minimum hour and peak hour conditions is between 275 kPa (40 psi) and 700 kPa (101 psi).
2. Fire flow requirements for the site shall be based on the FUS guidelines and are not to exceed the available flows from the municipal watermains that the site will connect to under existing (2023) Maximum Day Demand plus Fire Flow (MDD+FF) conditions at a minimum maintaining residual pressure of 140 kPa (20 psi) within the pressure district system.
3. The water supply system should be designed to satisfy the greater of peak hour demand or maximum day demand plus fire flow. In the case of the proposed development, the maximum day plus fire flow is greater than the peak hour demand. Therefore, the total governing demand for the development is 211.50 L/s (11.50 L/s + 200 L/s).

4.2 Water Network Model

The water network modeling was completed using the Innovyze InfoWater software. The model of the proposed water servicing layout and connections was generated by RVA

based on the shape files of the junctions and watermains near the development area under existing conditions provided by the City.

The friction factors used for the proposed new watermains within the development were based on the Ministry of Environment and Climate Change (MECP) design criteria for watermains.

Table 4.1 shows the C-factors assigned for the new watermains that will service the proposed development.

Table 4.1 – Hazen Williams C-Factors for New Watermains
(source: MECP)

Diameter of main (nominal)	C-Factor
150 mm	100
200 mm or 250 mm	110
300 mm to 600 mm	120
Larger than 600 mm	130

4.3 Water Model Calibration

Three hydrant flow tests were performed by RVA in June 2023 and the test locations were preliminarily identified based on the review of the proposed developments' location, presented in Table 4.2.

Table 4.2 – Hydrant Flow Test Location

Flow Hydrant	Residual Hydrant	Purpose
271 Gamma Street	249 Gamma Street	Impact on the existing system
539 Kipling Avenue	550 Kipling Avenue	Impact on the existing system
1509 The Queensway	1540 The Queenway	Supply from existing 300 mm main on The Queensway

The results of the hydrant test were used to calibrate the hydraulic model, minimizing the differences in observed and modelled pressures at the test hydrants. The results

comparison between the hydrant flow test results and the modelled hydrant flow curve are shown in Appendix D. The resulting flow at 20 psi pressure in the model is lower than the extrapolated flows from the hydrant tests which can be considered conservative.

Refer to Appendix D for detailed information about the hydrant test results and model calibration.

The calibrated model used to evaluate the performance of the system under proposed conditions such that the desired level of service for pressures and fire flows is maintained.

5.0 HYDRAULIC ANALYSIS AND RESULTS

5.1 Service Pressures

The modeling results indicate that the expected service pressures range between approximately 562 kPa (81 psi) and 582 kPa (84 psi) within the development area under all simulated scenarios. These results are slightly higher than the City of Toronto standards and requirements for the water distribution system.

Table 5.1 summarizes the modelled pressures within the proposed development at the ground level under existing conditions for Average Day Demand (ADD), Maximum Day Demand (MDD) and Peak Hour Demand (PHD) scenarios.

Table 5.1 - Simulated Pressure within the Proposed Development

	Average Day Demand (kPa)	Maximum Day Demand (kPa)	Peak Hour Demand (kPa)
J 32 (Block A)	567	566	562
J 34 (Block B)	572	571	566
J 36 (Block C)	577	576	571
J 38 (Block D)	582	581	576
J 54 (Park)	582	581	577

The impact of the proposed development on the existing system was evaluated through the case comparison between scenarios with and without the new development. The simulated pressures of the existing nodes along The Queensway and Fordhouse Blvd near the site (see **Figure 5.1** for reference) are summarized in **Table 5.2**.

Table 5.2 - Simulated Pressure within the Proposed Development

	Average Day Demand (kPa)	Maximum Day Demand (kPa)	Peak Hour Demand (kPa)
With Development	556 ~ 585	555 ~ 585	551 ~ 580
Without Development	556 ~ 586	556 ~ 586	554 ~ 584

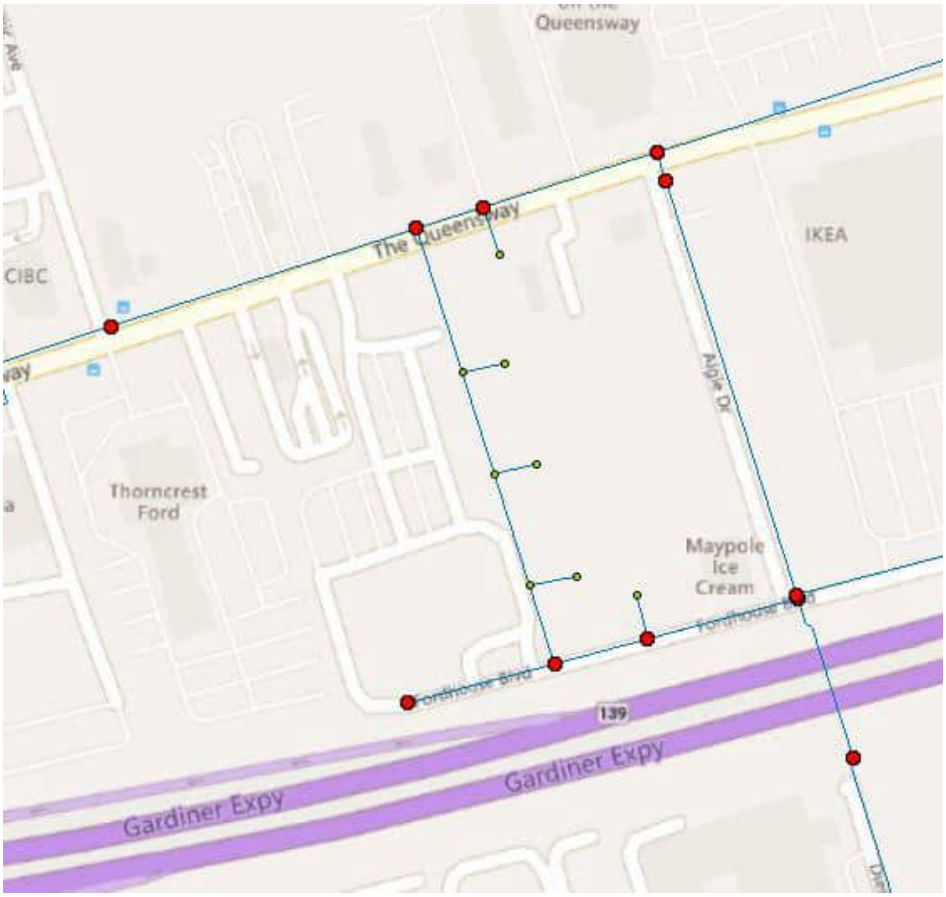


Figure 5.1 Selected Nodes (Red) for Case Comparison

5.2 Fire Flow

The results of the fire flow analysis show that the existing system and the proposed water servicing layout can meet the fire flow requirement under Maximum Day plus Fire Flow

(MDD+FF) scenario with simulated available fire flows ranging from 323 L/s to 337 L/s within the development area.

Table 5.3 shows the fire flow availability comparison between scenarios with and without the proposed development under the existing MDD+FF scenario. The results of the hydraulic modeling show that the fire flow availability would improve in the adjacent area due to the loop connections between The Queenways and Fordhouse Blvd.

Table 5.3 - Modelled Available Fire Flows near the Proposed Development under MDD+FF Scenario

	Available Fire Flow (L/s)
With Development	239 ~ 535
Without Development	170 ~ 510

Detailed results of the fire flow analysis are contained in Appendix C.

6.0 SUMMARY AND CONCLUSIONS

The following summary and conclusions were provided based on the watermain hydraulic analysis of the proposed water servicing layout for 1543-1551 The Queensway development.

1. The modelled service pressures for the proposed development are within the MECP guidelines and the City of Toronto design standards and requirements for watermains ranging from 562 kPa and 582 kPa within the development for all simulated demand scenarios under the existing condition.
2. The results of the fire flow analysis show that the existing system and the proposed water servicing layout can meet the fire flow requirement under Maximum Day plus Fire Flow (MDD+FF) scenario with simulated available fire flows ranging from 323 L/s to 337 L/s within the development area.
3. The modelled pressures show that the proposed Ø300mm watermain looped within the site can provide sufficient capacity to the proposed development to meet their domestic and commercial water demands.

Respectfully submitted,

R.V. Anderson Associates Limited

Daniel Guan

Digitally signed by Daniel Guan
DN: cn=Daniel Guan, c=CA, o=RVAnderson, email=dguan@rvanderson.com
Date: 2024.11.21 14:34:11 -05'00'

Daniel Guan, CET

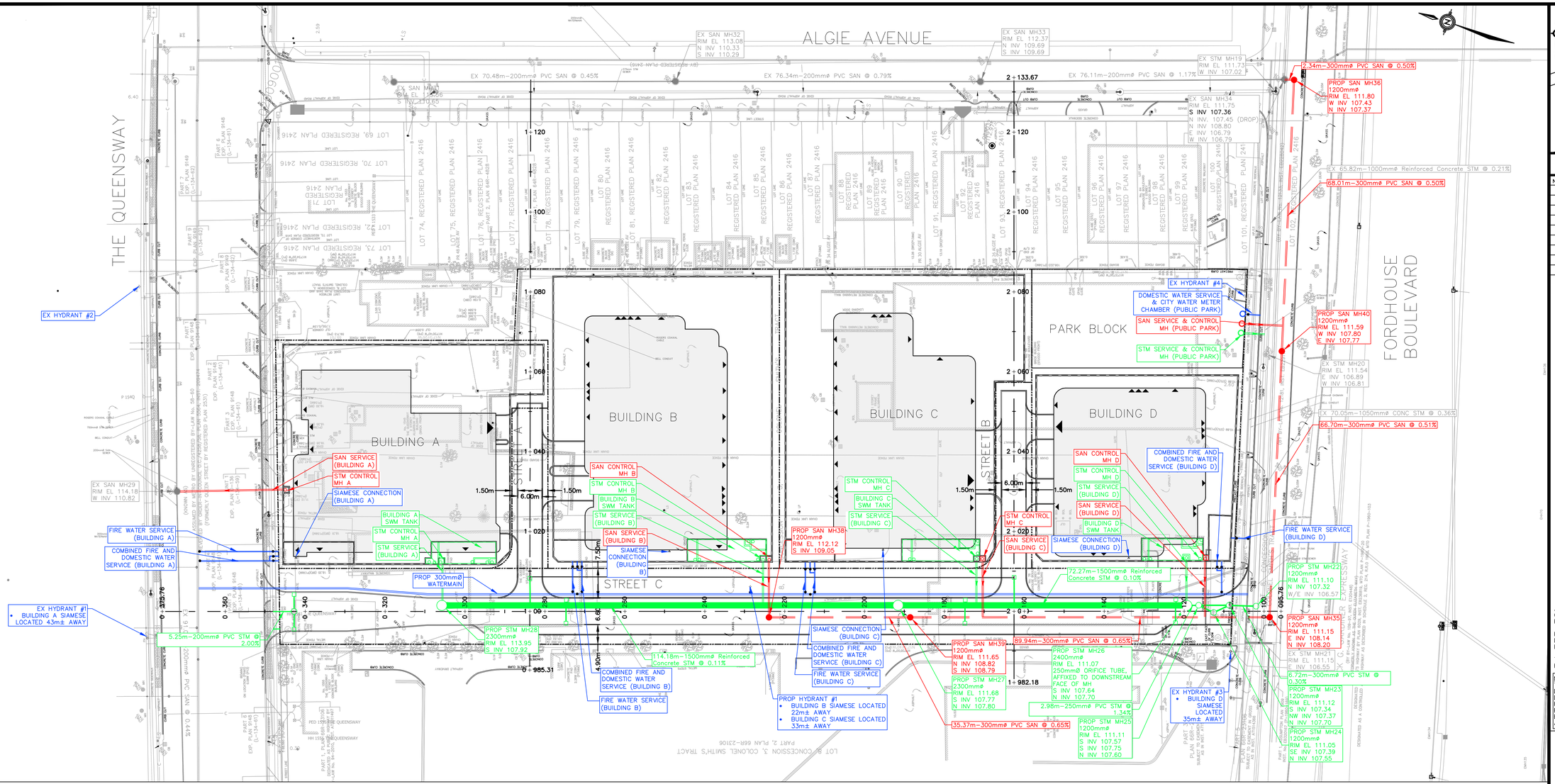
Hydraulic Modeler

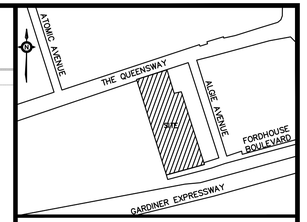
Mukesh Choudhary, P.Eng., P.E., P.M.P.

Hydraulic Specialist/Manager

APPENDIX A

WATER SERVICING LAYOUT





KEY PLAN
N.T.S.

No.	Date	Comments
1	2024/11/29	ISSUED FOR ZBA

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL OTHER RVA DRAWINGS

LEGEND

- PROPOSED PROPERTY LINE
- PROPOSED WATERMAIN
- PROPOSED SEWER AND FLOW DIRECTION
- PROPOSED WATER METER & DOUBLE CHECK VALVE ASSEMBLY AS PER T-1107.04-1 (SEE MECH DWGS FOR DETAILS) (M+B)
- PROPOSED DETECTOR ASSEMBLY (SEE MECH DWGS FOR DETAILS) (D)
- PROPOSED GAS METER (GM)
- PROPOSED VALVE & BOX
- PROPOSED ACCESS OPENING FRAME & GRATE (ACCESSIBLE AT GRADE)
- UNDERGROUND BUILDING STRUCTURE
- PROPOSED BUILDING AT GRADE
- PROPOSED BUILDING ROOF OVERHANG
- PROPOSED CATCH BASIN/AREA DRAIN (CB, CBMH, DA)

This Drawing Is Not To Be Used For Construction Until Signed By The Engineer.

NOTE:
THE INFORMATION DENOTED IN BOXES WITHIN THE DRAWING DETAILS ON THIS SHEET ARE CONSIDERED TO BE PROPOSED DESIGN/SPECIFICATIONS. ALL OTHER INFORMATION IS SHOWN FOR CONTEXT ONLY. REFER TO THE APPROPRIATE DRAWINGS BY THE ARCHITECT, LANDSCAPE ARCHITECT, STRUCTURAL ENGINEER, AND MECHANICAL ENGINEER FOR DETAIL DESIGN AND SPECIFICATION OF OTHER DESIGN ELEMENTS.

FOR SITE SERVICING ONLY

Drawing Prepared By:

R.V. ANDERSON ASSOCIATES LIMITED

Client:
1370443 ONTARIO LIMITED

Project Name:
1543-1551 THE QUEENSWAY & 66-76 FORDHOUSE BOULEVARD

Drawing Title:
CONCEPTUAL GENERAL SERVICING FIGURE

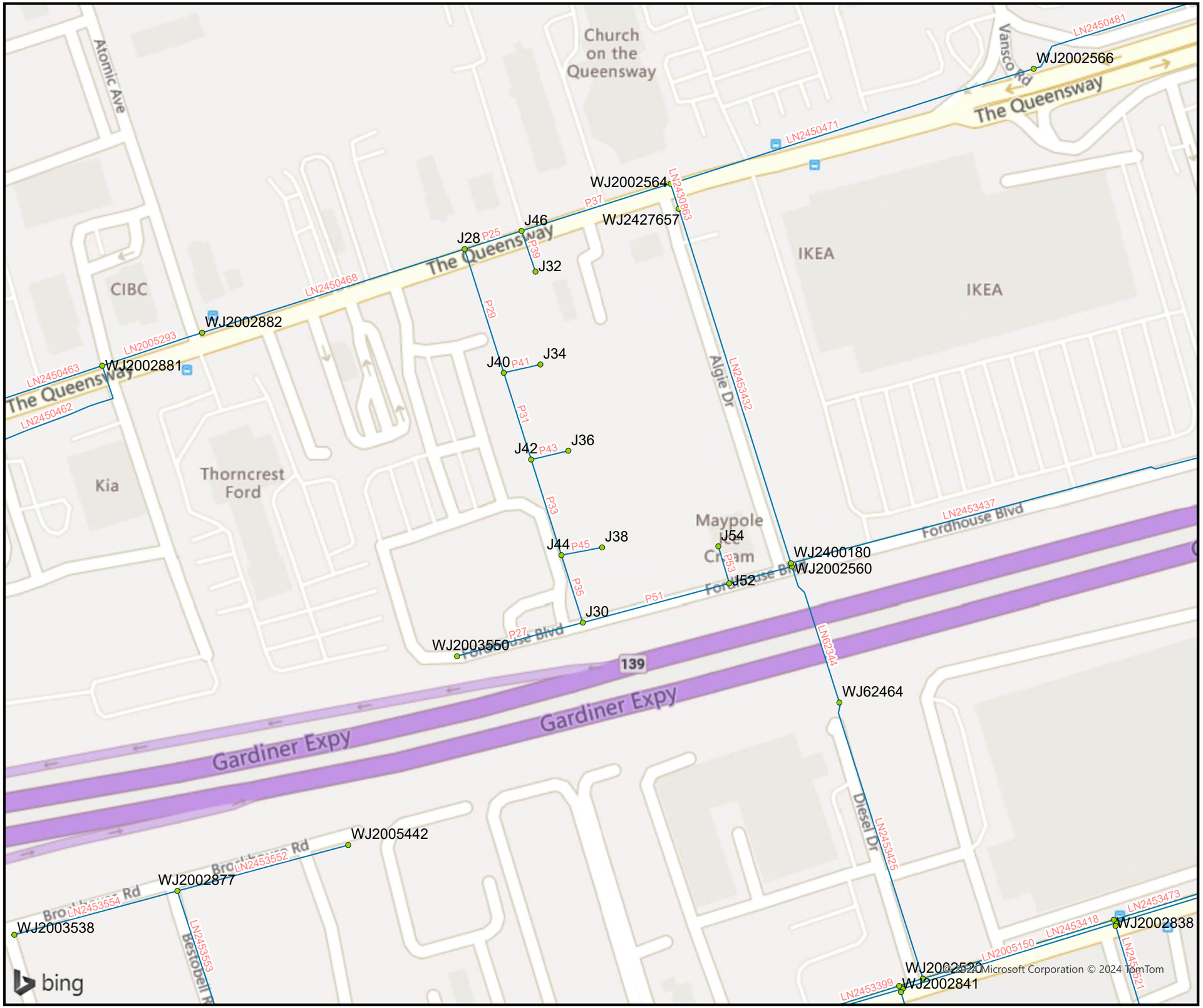
Drawn:	Design:	Date:
S.M.P	S.M.P	AUGUST 2023
Checked:	Approved:	Scale:
A.S.T	S.M.P	1:500
CADD File: 236932-C2-SITE SERVICING.dwg		Dwg. No.: C-2
Project No.: 236932		

THE SIGNED ACCEPTANCE BY ENGINEERING AND CONSTRUCTION SERVICES PERTAINS TO THE PROPOSED SERVICE CONNECTIONS LOCATED WITHIN THE MUNICIPAL RIGHT-OF-WAY. SERVICING ON PRIVATE PROPERTY REQUIRES PLUMBING APPROVAL UNDER THE ONTARIO BUILDING CODE IN CONJUNCTION WITH THE PERMIT APPLICATION PROCESS ADMINISTERED BY THE BUILDING DIVISION.

TORONTO ENGINEERING & CONSTRUCTION SERVICES
ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS.
THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

GRACE TESA, P. ENG., MANAGER, DEVELOPMENT ENGINEERING — DATE

R:\2023\236932 - 1543-1551 The Queensway\10 CADdwg\01 Linear\04 Sheets


Church on the Queensway
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Vansco Rd
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WJ2002566
The Queensway
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LN2430863
WJ2427657
P37
J46
J28
P25
P39
J32
IKEA
IKEA
CIBC
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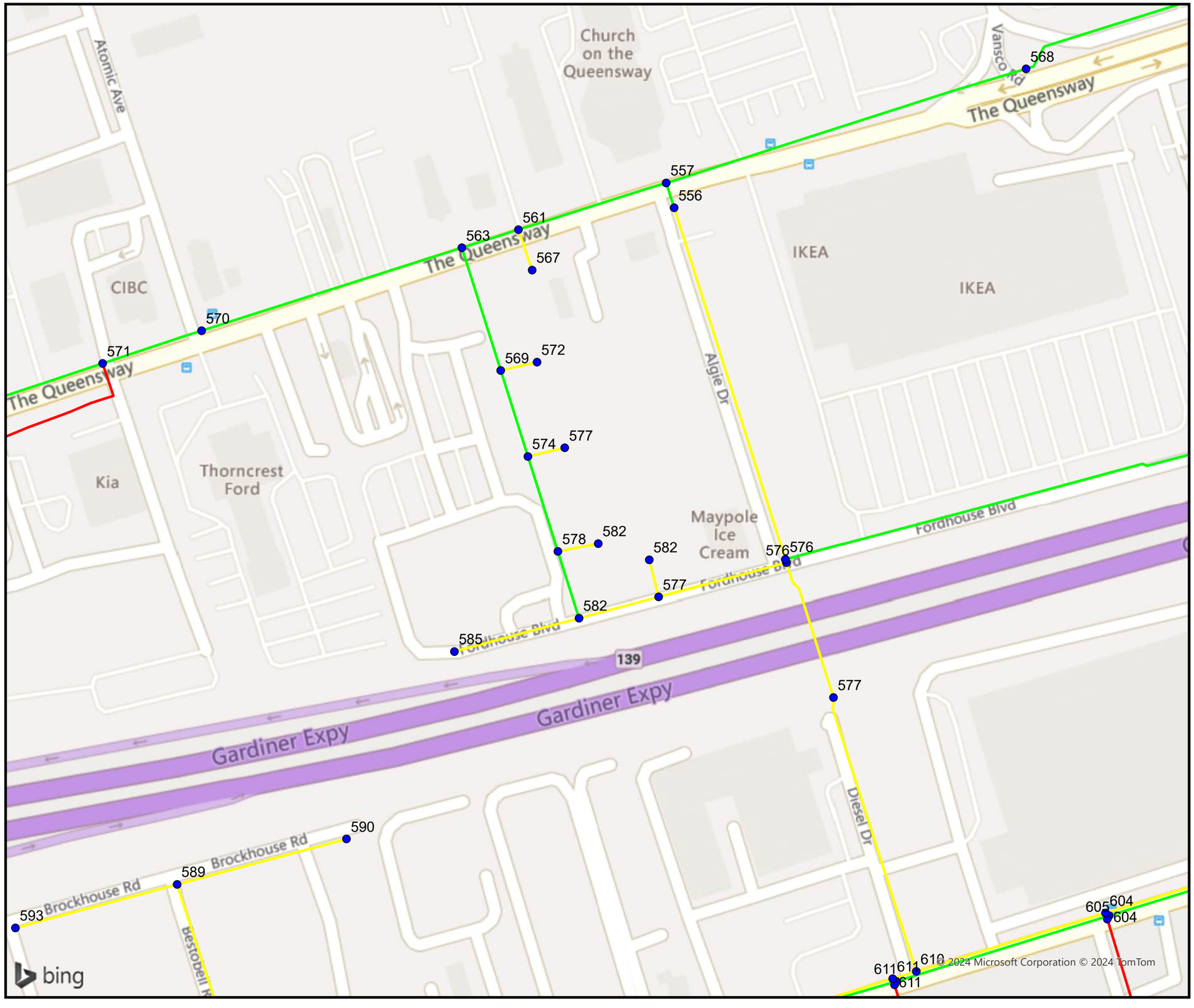
Meters

APPENDIX B

SERVICE PRESSURES & PIPE VELOCITIES



1543-1551 The Queensway Development
Pressure during ADD

Legend

Pressure kPa / (psi)

- < 275 (40)
- 275 (40) ~ 414 (60)
- 414 (60) ~ 552 (80)
- 552 (80) ~ 689 (100)
- > 689 (100)

Watermains (mm)

- =<150
- 200 ~ 250
- 300 ~ 600
- >600

RVA

RVA Project Number: 236932

40 20 0 40 80 120 160

Meters

Junction Table

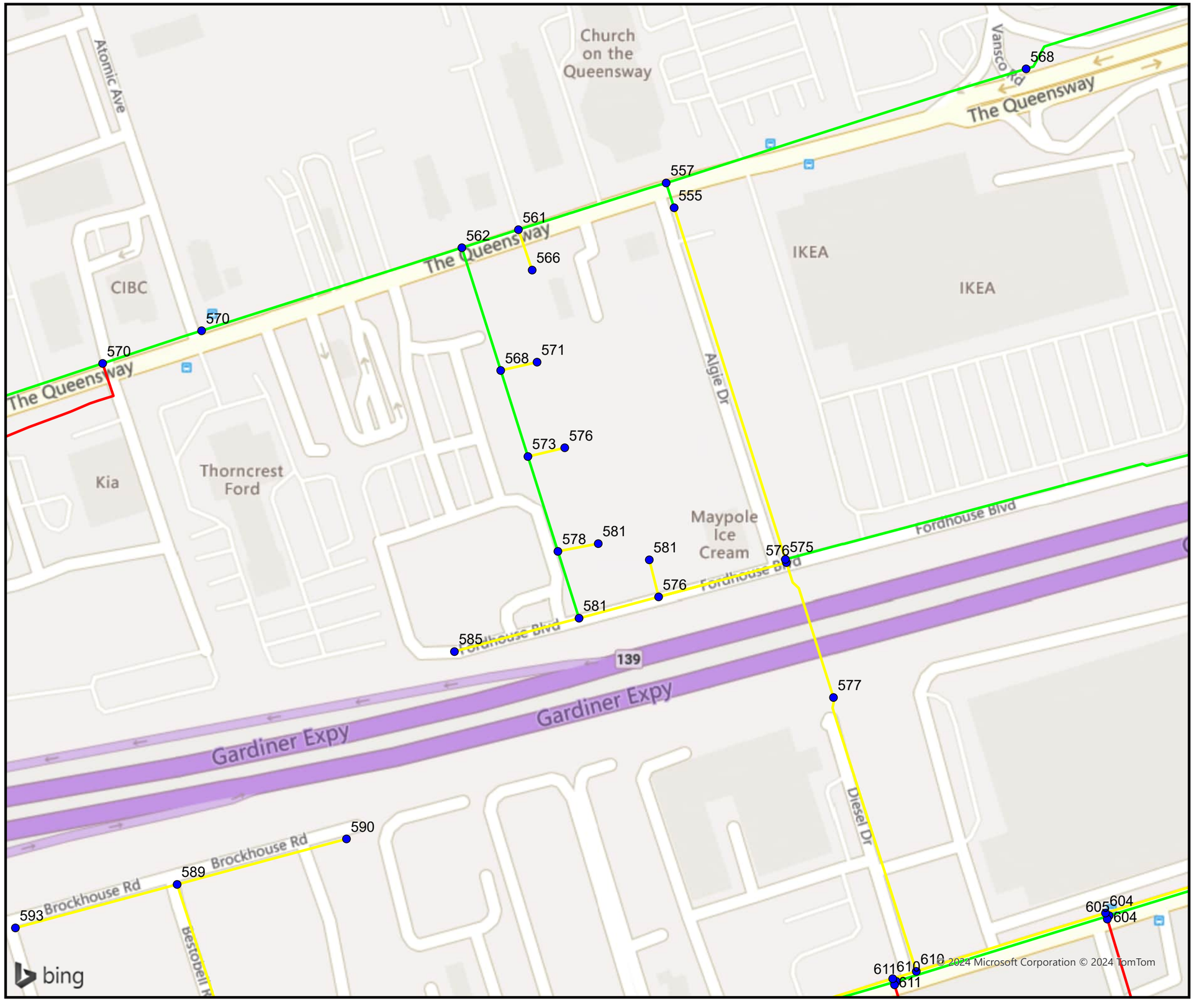
Average Day Demand Pressure

ID	Demand (L/s)	Demand (m3/d)	Elevation (m)	Head (m)	Pressure (kPa)	Pressure (psi)
WJ2002564	0.09	7.8	110.0	166.9	557.4	80.8
WJ62464	0.03	2.6	108.0	166.9	577.2	83.7
WJ2427657	0.70	60.5	110.2	166.9	555.6	80.6
WJ2002882	0.69	59.6	108.6	166.9	570.4	82.7
WJ2002560	0.00	0.0	108.1	166.9	576.1	83.6
WJ2400180	0.06	5.2	108.1	166.9	575.9	83.5
J28	0.00	0.0	109.4	166.9	563.1	81.7
J46	0.00	0.0	109.6	166.9	561.5	81.4
J52	0.00	0.0	108.1	166.9	576.5	83.6
WJ2003550	0	0.0	107.1	166.9	585.4	84.9
J30	0	0.0	107.5	166.9	581.8	84.4
J32	1.62	140.0	109.0	166.9	567.0	82.2
J34	1.89	163.3	108.5	166.9	571.9	82.9
J36	2.09	180.6	108.0	166.9	576.8	83.7
J38	2.14	184.9	107.5	166.9	581.7	84.4
J40	0	0.0	108.8	166.9	569.2	82.6
J42	0	0.0	108.3	166.9	573.6	83.2
J44	0	0.0	107.8	166.9	578.4	83.9
J54	1.5	129.6	107.5	166.9	581.9	84.4

Pipes Table

Average Day Demand Pressure

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness C-factor	Flow (L/s)	Velocity (m/s)	Headloss Gradient (m/k-m)
P39	J46	J32	28.8	200	110	1.620	0.0500	0.0300
P41	J40	J34	25.17	200	110	1.890	0.0600	0.0300
P29	J28	J40	86.86	300	120	3.110	0.0400	0.0100
P31	J40	J42	60.88	300	120	1.220	0.0200	0.0000
P33	J42	J44	67.13	300	120	0.870	0.0100	0.0000
P35	J44	J30	47.29	300	120	3.010	0.0400	0.0100
P43	J42	J36	25.55	200	110	2.090	0.0700	0.0400
P45	J44	J38	27.73	200	110	2.140	0.0700	0.0400
P53	J52	J54	25.77	200	110	1.500	0.0500	0.0200



1543-1551 The Queensway Development
Pressure during MDD

Legend

Pressure kPa / (psi)

- < 275 (40)
- 275 (40) ~ 414 (60)
- 414 (60) ~ 552 (80)
- 552 (80) ~ 689 (100)
- > 689 (100)

Watermains (mm)

- =<150
- 200 ~ 250
- 300 ~ 600
- >600

RVA

RVA Project Number: 236932

40 20 0 40 80 120 160

Meters

Junction Table

Maximum Day Demand Pressure

ID	Demand (L/s)	Demand (m3/d)	Elevation (m)	Head (m)	Pressure (kPa)	Pressure (psi)
WJ2002564	0.12	10.4	110.0	166.8	556.7	80.7
WJ62464	0.04	3.5	108.0	166.9	576.7	83.6
WJ2427657	0.90	77.8	110.2	166.8	554.9	80.5
WJ2002882	0.90	77.8	108.6	166.8	569.6	82.6
WJ2002560	0.00	0.0	108.1	166.8	575.6	83.5
WJ2400180	0.08	6.9	108.1	166.8	575.3	83.4
J28	0.00	0.0	109.4	166.8	562.3	81.6
J46	0.00	0.0	109.6	166.8	560.7	81.3
J52	0.00	0.0	108.1	166.8	575.9	83.5
WJ2003550	0	0.0	107.1	166.8	584.6	84.8
J30	0	0.0	107.5	166.8	581.0	84.3
J32	2.05	177.1	109.0	166.8	566.3	82.1
J34	2.46	212.5	108.5	166.8	571.1	82.8
J36	2.72	235.0	108.0	166.8	576.0	83.5
J38	2.78	240.2	107.5	166.8	580.9	84.3
J40	0	0.0	108.8	166.8	568.5	82.4
J42	0	0.0	108.3	166.8	572.8	83.1
J44	0	0.0	107.8	166.8	577.6	83.8
J54	1.5	129.6	107.5	166.8	581.2	84.3

Pipes Table

Maximum Day Demand Pressure

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness C-factor	Flow (L/s)	Velocity (m/s)	Headloss Gradient (m/k-m)
P39	J46	J32	28.8	200	110	2.050	0.070	0.040
P41	J40	J34	25.17	200	110	2.460	0.080	0.060
P29	J28	J40	86.86	300	120	3.930	0.060	0.020
P31	J40	J42	60.88	300	120	1.470	0.020	0.000
P33	J42	J44	67.13	300	120	1.250	0.020	0.000
P35	J44	J30	47.29	300	120	4.030	0.060	0.020
P43	J42	J36	25.55	200	110	2.720	0.090	0.070
P45	J44	J38	27.73	200	110	2.780	0.090	0.070
P53	J52	J54	25.77	200	110	1.500	0.050	0.020

1543-1551 The Queensway Development
Pressure during PHD

Legend

Pressure kPa / (psi)

- < 275 (40)
- 275 (40) ~ 414 (60)
- 414 (60) ~ 552 (80)
- 552 (80) ~ 689 (100)
- > 689 (100)

Watermains (mm)

- =<150
- 200 ~ 250
- 300 ~ 600
- >600

RVA Project Number: 236932

40 20 0 40 80 120 160
Meters

Junction Table

Peak Hour Demand Pressure

ID	Demand (L/s)	Demand (m3/d)	Elevation (m)	Head (m)	Pressure (kPa)	Pressure (psi)
WJ2002564	0.22	19.0	110.0	166.4	552.5	80.1
WJ62464	0.07	6.0	108.0	166.5	573.5	83.2
WJ2427657	1.74	150.3	110.2	166.4	550.8	79.9
WJ2002882	1.73	149.5	108.6	166.3	564.7	81.9
WJ2002560	0.00	0.0	108.1	166.5	572.1	83.0
WJ2400180	0.15	13.0	108.1	166.5	571.9	82.9
J28	0.00	0.0	109.4	166.3	557.6	80.9
J46	0.00	0.0	109.6	166.3	556.1	80.7
J52	0.00	0.0	108.1	166.4	572.0	83.0
WJ2003550	0.00	0.0	107.1	166.3	579.9	84.1
J30	0.00	0.0	107.5	166.3	576.3	83.6
J32	3.67	317.1	109.0	166.3	561.7	81.5
J34	4.73	408.7	108.5	166.3	566.4	82.1
J36	5.22	451.0	108.0	166.3	571.2	82.9
J38	5.35	462.2	107.5	166.3	576.1	83.6
J40	0.00	0.0	108.8	166.3	563.8	81.8
J42	0.00	0.0	108.3	166.3	568.1	82.4
J44	0.00	0.0	107.8	166.3	572.9	83.1
J54	1.50	129.6	107.5	166.4	577.4	83.7

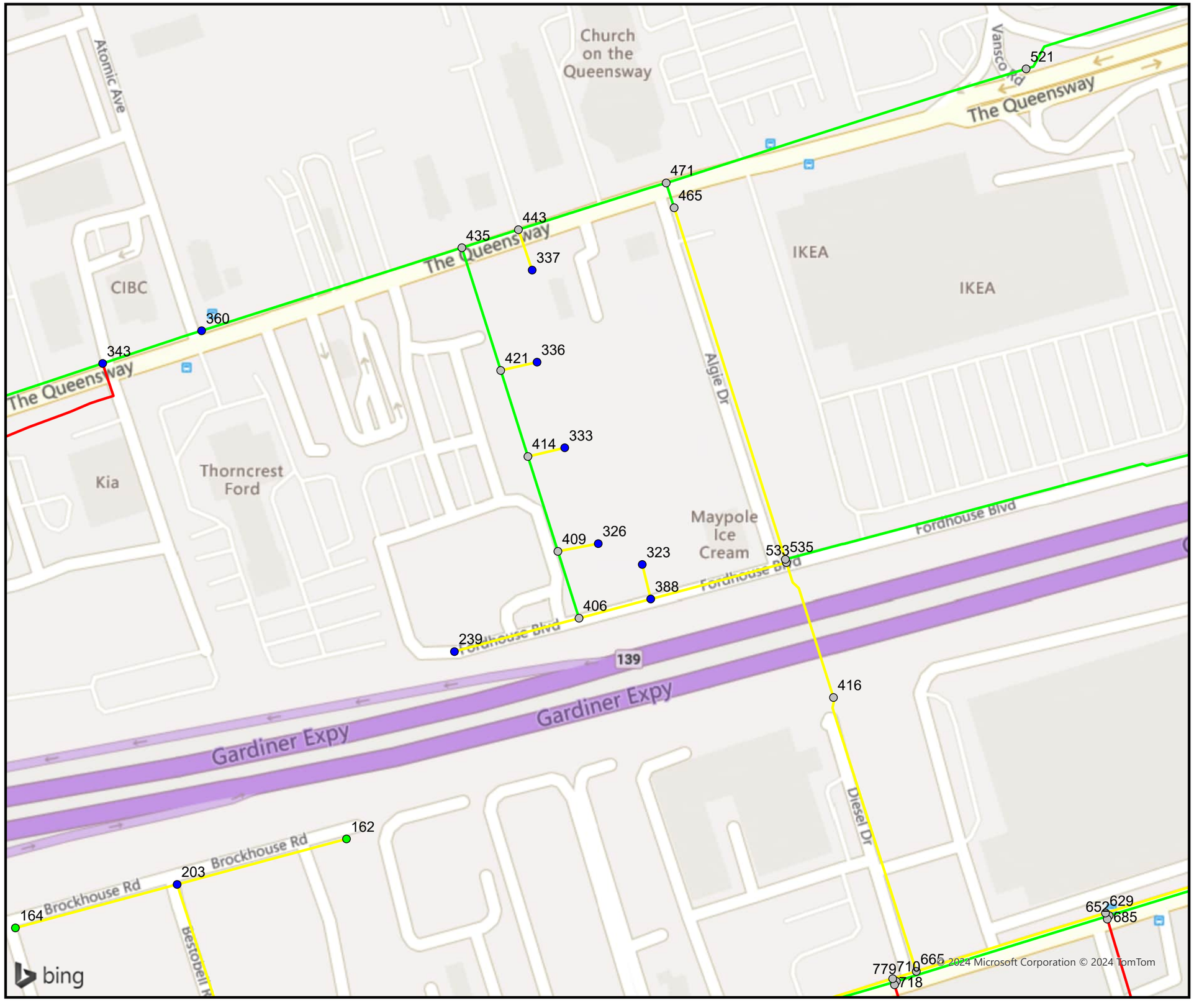
Pipes Table

Peak Hour Demand Pressure

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness C-factor	Flow (L/s)	Velocity (m/s)	Headloss Gradient (m/k-m)
P39	J46	J32	28.8	200	110	3.670	0.120	0.120
P41	J40	J34	25.17	200	110	4.730	0.150	0.190
P29	J28	J40	86.86	300	120	7.230	0.100	0.060
P31	J40	J42	60.88	300	120	2.500	0.040	0.010
P33	J42	J44	67.13	300	120	2.720	0.040	0.010
P35	J44	J30	47.29	300	120	8.070	0.110	0.070
P43	J42	J36	25.55	200	110	5.220	0.170	0.230
P45	J44	J38	27.73	200	110	5.350	0.170	0.240
P53	J52	J54	25.77	200	110	1.500	0.050	0.020

APPENDIX C

FIRE FLOW ANALYSIS



1543-1551 The Queensway
Development
Available FF with MDD

Legend

Available Fire Flow (L/s)

- < 75
- 75 ~ 150
- 150 ~ 200
- 200 ~ 400
- > 400

Watermains (mm)

- =<150
- 200 ~ 250
- 300 ~ 600
- >600

RVA Project Number: 236932

40 20 0 40 80 120 160
Meters

Fire Flow Report

Maximum Day Demand Plus Fire Flow

ID	Static Demand (L/s)	Static Pressure (kPa)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (kPa)	Hydrant Available Flow (L/s)	Hydrant Pressure at Available Flow (kPa)
WJ2002882	0.90	569.65	166.78	1.00	569.48	359.77	137.9
WJ2427657	0.90	554.96	166.81	1.00	554.84	464.73	137.9
J28	0.00	562.33	166.79	1.00	562.18	434.91	137.9
J32	2.05	566.32	166.79	1.00	566.17	337.18	137.9
J46	0.00	560.75	166.79	1.00	560.62	442.91	137.9
WJ2002564	0.12	556.70	166.81	1.00	556.57	470.76	137.9
J30	0.00	581.05	166.79	1.00	580.90	406.02	137.9
J34	2.46	571.16	166.79	1.00	571.00	336.28	137.9
J36	2.72	576.06	166.79	1	575.89	332.86	137.9
J38	2.78	580.96	166.79	1	580.79	325.73	137.9
J40	0	568.52	166.79	1	568.37	421.2	137.9
J42	0	572.86	166.79	1	572.72	414.32	137.9
J44	0	577.66	166.79	1	577.51	408.8	137.9
J52	0	575.74	166.8	1	575.58	388.31	137.9
J54	1.5	581.09	166.8	1	580.93	323.01	137.9
WJ2003550	0	584.64	166.79	1	584.48	239.37	137.9
WJ2002560	0	575.53	166.84	1	575.42	532.51	137.9
WJ2400180	0.08	575.33	166.84	1	575.22	534.68	137.9
WJ62464	0.04	576.68	166.85	1	576.55	415.91	137.9

APPENDIX D

MODEL CALIBRATION

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

Date: 26-Jun-23
Time: 11:48 AM
Location: 271 Gamma Street, Etobicoke
Municipality: City of Toronto
Municipal Operator(s): Tony
RVA Personnel: A. Bhutani & H. Zu

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant: HY2010159
Residual Hydrant: HY2010163
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 150 mm
Pipe Material: Cast Iron

NOTES

HYDRANT FLOW TEST 03

RESIDUAL HYDRANT

Hydrant No.	HY2010163	
N.F.P.A. Colour Code	BLUE	
Static Pressure	91.0	psi
Residual Pressure (1 Port)	86.5	psi
Residual Pressure (2 Ports)	79.5	psi
Pressure Drop	11.5	psi
Pressure Drop Percentage	12.6	% of psi
Flow At Test Hydrant at 20 psi	4168.86	usgpm

FLOW HYDRANT(S)

Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	HY2010159	1	2.5	SWIVEL BELL	0.90	62.9	1108.9
		2	2.5		0.90	31.1	1557.5
2nd							
						Total Discharge Flow (USGPM)	2666

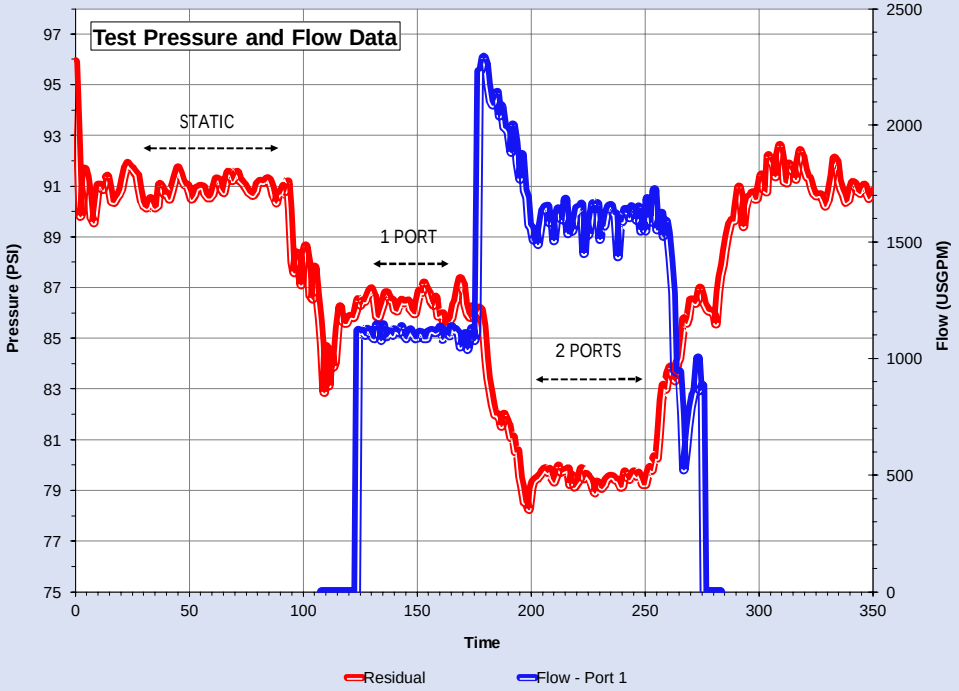
RESULTS SUMMARY

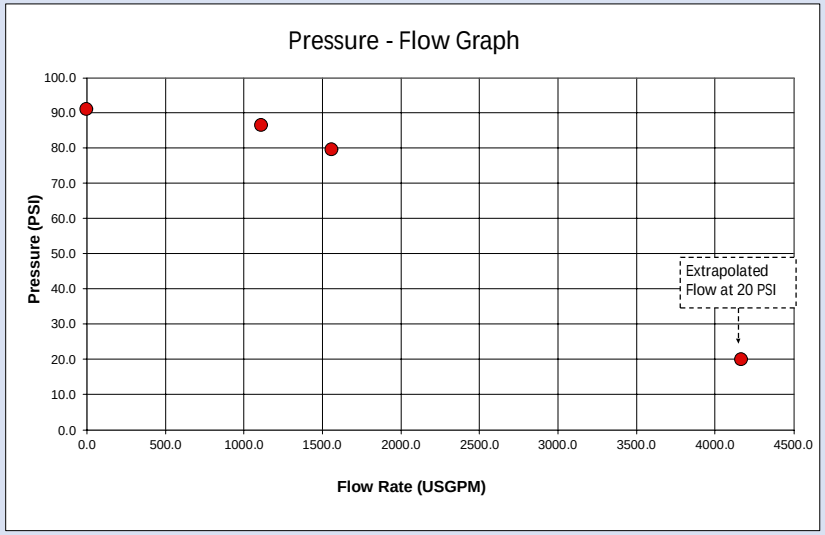
NO. OF PORTS OPEN	RESIDUAL (PSI)	FLOW (USGPM)
STATIC	90.95	0.00
1	86.49	1108.85
2	79.49	1557.50
EXTRAPOLATED	20.00	4168.86

98.2

263.0

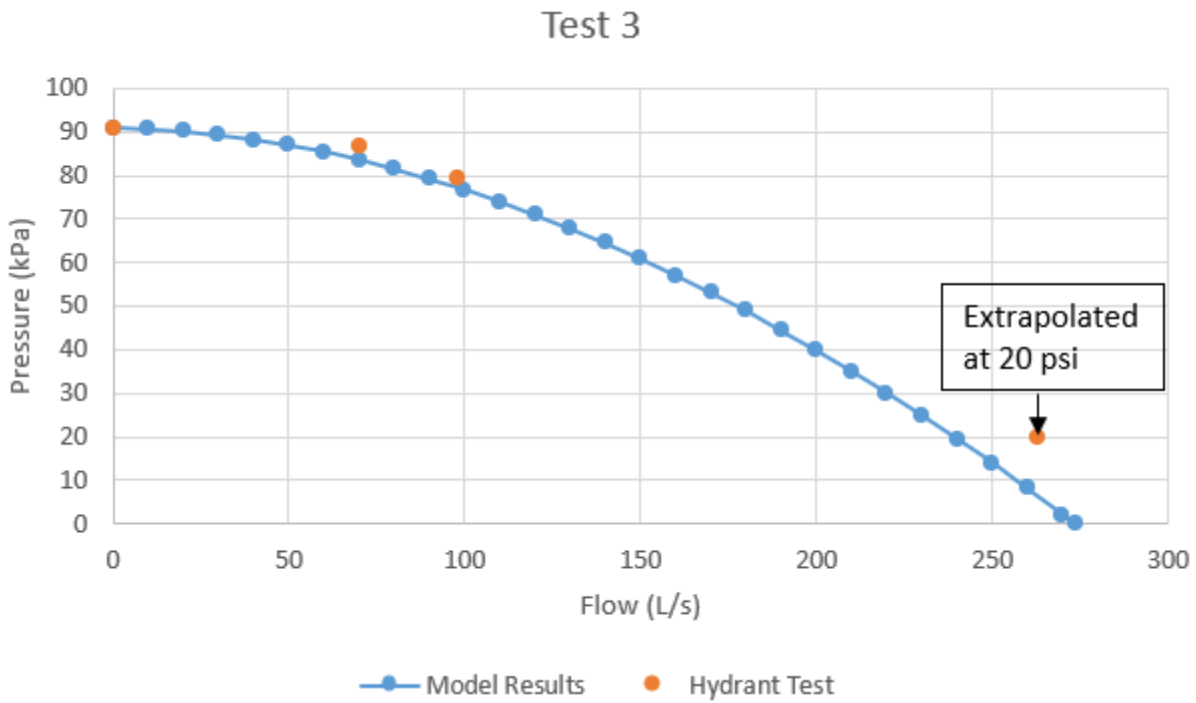
N.F.P.A. 291 HYDRANT CLASSIFICATION: AA | BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)


Test 3
Pressure (kPa)
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
Flow (L/s)
Extrapolated at 20 psi
Model Results
Hydrant Test

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

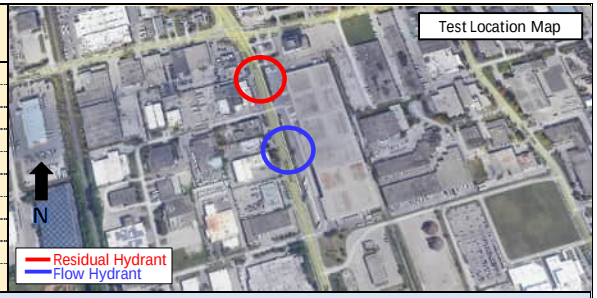
Date: 26-Jun-23
Time: 11:20 AM
Location: 549 Kipling Avenue, Etobicoke
Municipality: City of Toronto
Municipal Operator(s): Tony
RVA Personnel: A. Bhutani & H. Zu

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant: HY2010240
Residual Hydrant: HY2010471
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 300 mm
Pipe Material: Cast Iron

NOTES

HYDRANT FLOW TEST 04



RESIDUAL HYDRANT

Hydrant No.	HY2010471	
N.F.P.A. Colour Code	BLUE	
Static Pressure	93.0	psi
Residual Pressure (1 Port)	88.1	psi
Residual Pressure (2 Ports)	82.8	psi
Pressure Drop	10.2	psi
Pressure Drop Percentage	11.0	% of psi
Flow At Test Hydrant at 20 psi	5193.87	usgpm

FLOW HYDRANT(S)

Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	HY2010240	1	2.5	SWIVEL BELL	0.90	67.5	1149.1
		2	2.5		0.90	41.3	1795.2
2nd							
						Total Discharge Flow (USGPM)	2944

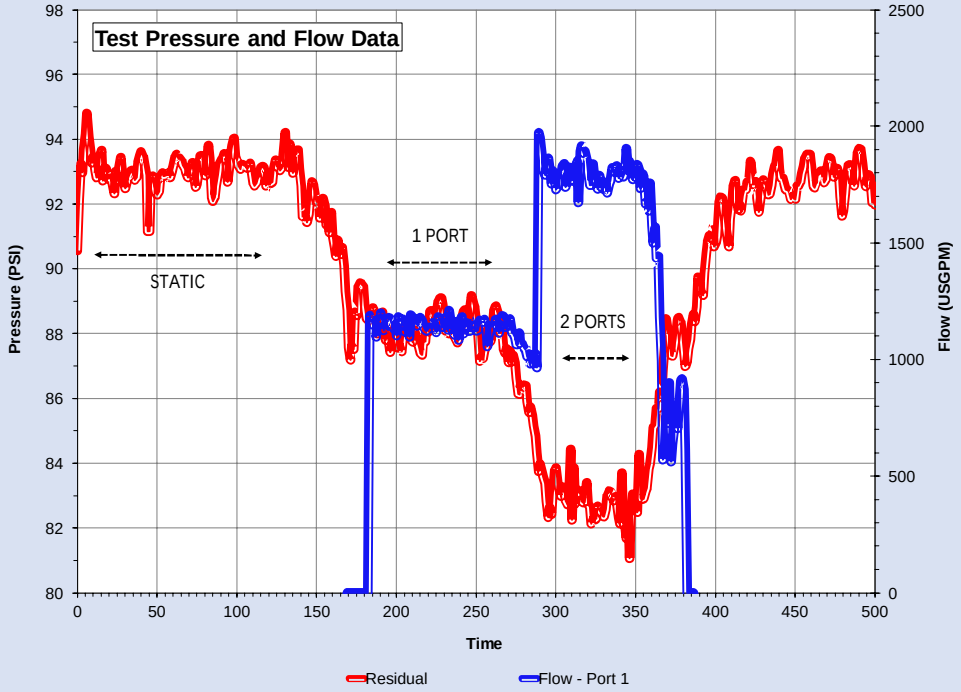
RESULTS SUMMARY

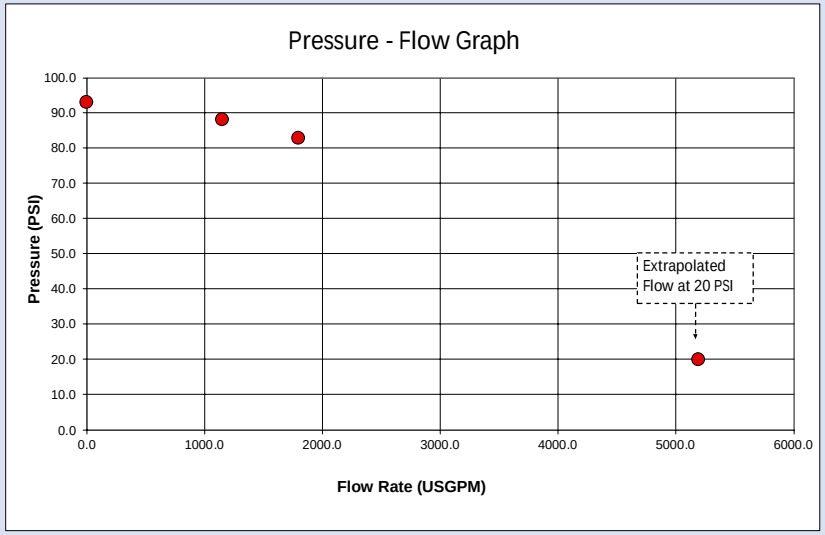
NO. OF PORTS OPEN	RESIDUAL (PSI)	FLOW (USGPM)
STATIC	93.02	0.00
1	88.09	1149.05
2	82.81	1795.20
EXTRAPOLATED	20.00	5193.87

N.F.P.A. 291 HYDRANT CLASSIFICATION: AA | BLUE

113.2

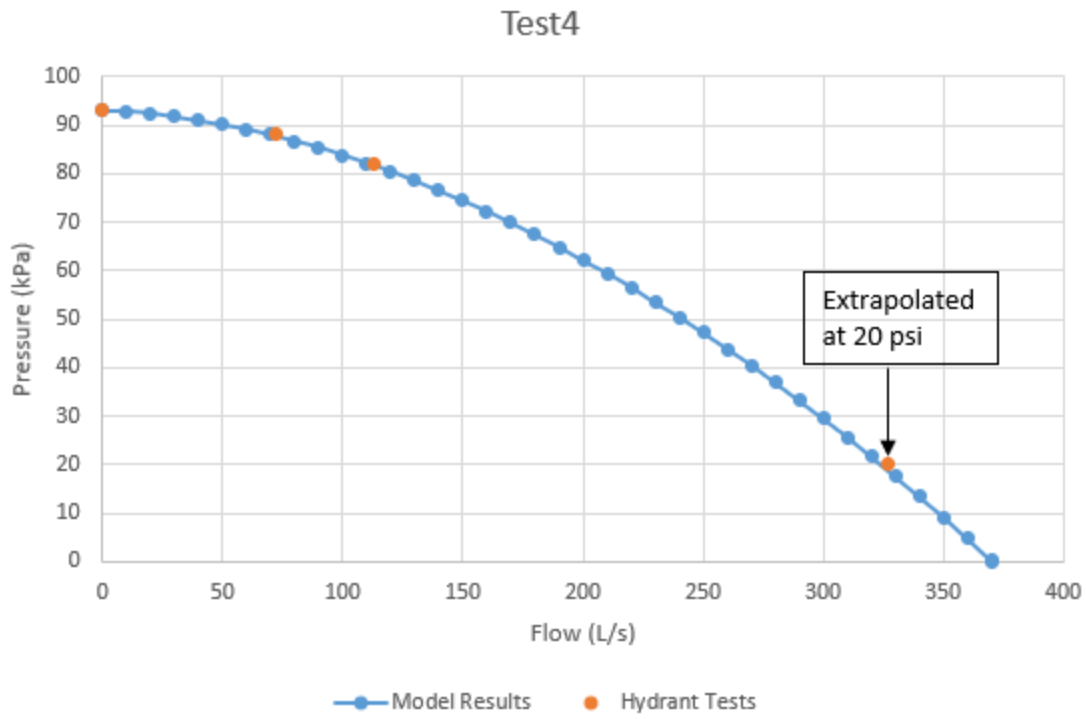
327.6





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)


Test4
Pressure (kPa)
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
Flow (L/s)
Extrapolated at 20 psi
Model Results
Hydrant Tests

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

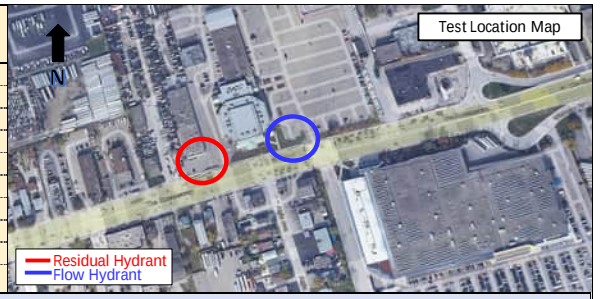
Date: 26-Jun-23
Time: 9:20 AM
Location: 1520 The Queensway, Etobicoke
Municipality: City of Toronto
Municipal Operator(s): Tony
RVA Personnel: A. Bhutani & H. Zu

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant: HY2010317
Residual Hydrant: HY2010479
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 300 mm
Pipe Material: Cast Iron

NOTES

HYDRANT FLOW TEST 05



RESIDUAL HYDRANT

Hydrant No.	HY2010479	
N.F.P.A. Colour Code	BLUE	
Static Pressure	80.7	psi
Residual Pressure (1 Port)	79.0	psi
Residual Pressure (2 Ports)	76.6	psi
Pressure Drop	4.2	psi
Pressure Drop Percentage	5.2	% of psi
Flow At Test Hydrant at 20 psi	7446.52	usgpm

FLOW HYDRANT(S)

Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	HY2010317	1	2.5	SWIVEL BELL	0.90	55.0	1037.3
		2	2.5		0.90	39.3	1751.2
2nd							
						Total Discharge Flow (USGPM)	2789

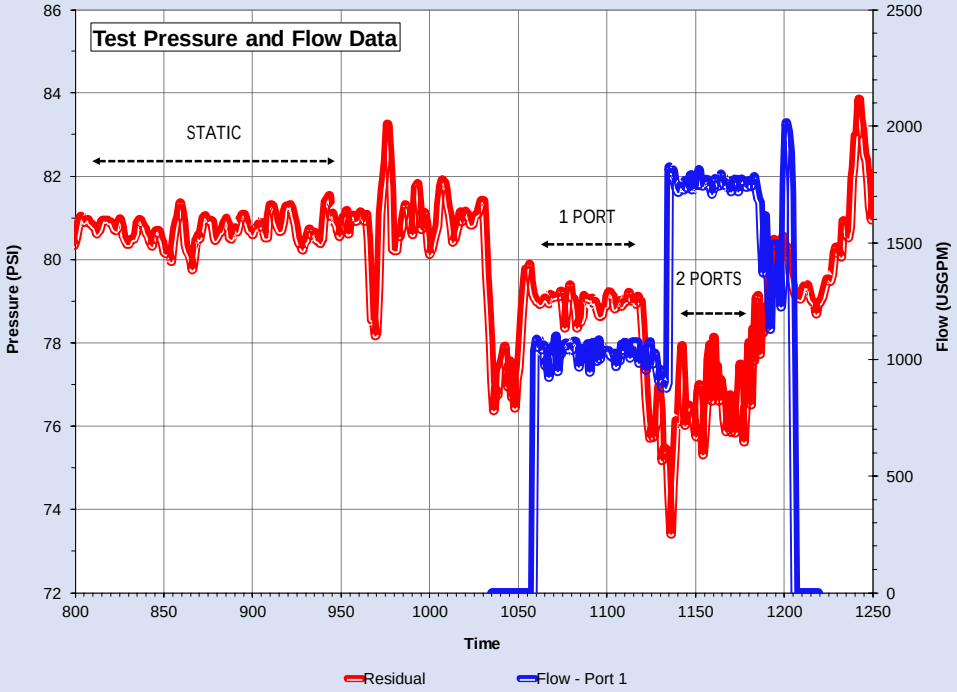
RESULTS SUMMARY

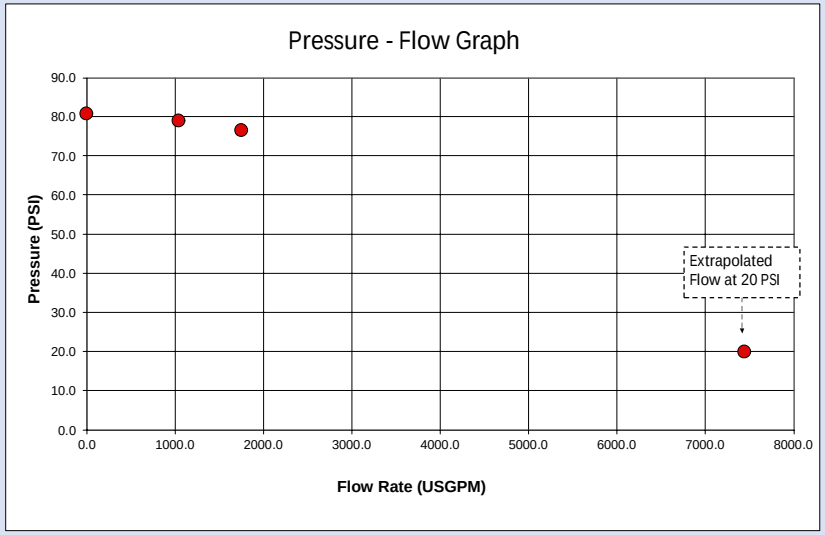
NO. OF PORTS OPEN	RESIDUAL (PSI)	FLOW (USGPM)
STATIC	80.74	0.00
1	78.97	1037.30
2	76.58	1751.23
EXTRAPOLATED	20.00	7446.52

110.5

N.F.P.A. 291 HYDRANT CLASSIFICATION 469.8

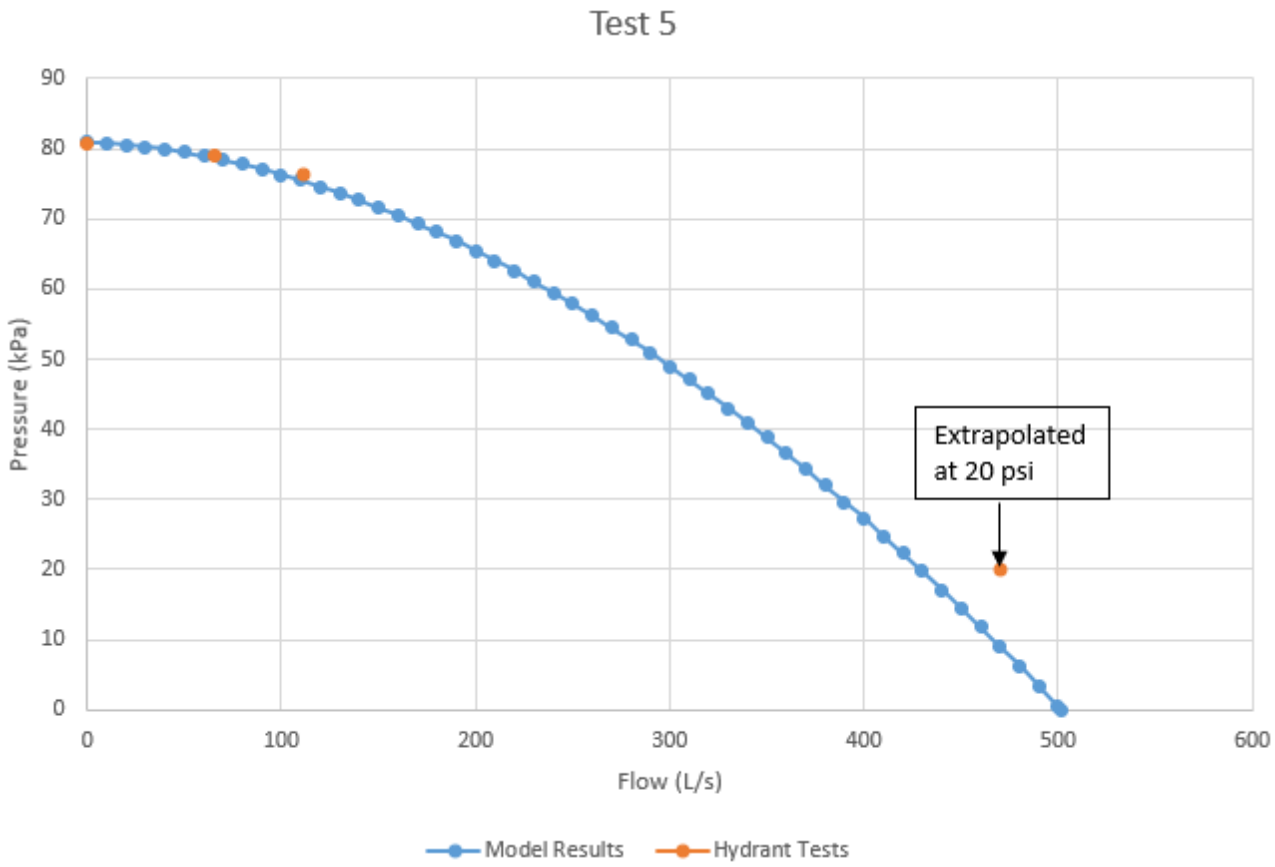
AA	BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)


Test 5
90
80
70
60
50
40
30
20
10
0
Pressure (kPa)
0
100
200
300
400
500
600
Flow (L/s)
Extrapolated
at 20 psi
Model Results
Hydrant Tests

APPENDIX E

WATER DEMANDS & FIRE FLOW

TABLE B1 - PROPOSED PEAK WATER DEMAND CALCULATIONS - RESIDENTIAL

			Building A	Building B	Building C	Building D	Park*	Total Proposed
1.0	Total Proposed Population*	persons	606	860	950	973	0	3,100
1.1	Per Capita Demand @ 190 L/person/day**	L/day	115,140	163,400	180,500	184,870	0	589,000
1.2	**Equivalent Population Demand**	**L/s**	**1.33**	**1.89**	**2.09**	**2.14**	**1.50**	**8.95**
1.3	Peak Hour Peaking Factor**		2.50	2.50	2.50	2.50	2.50	2.50
1.4	**Peak Hour Design Demand Rate**	**L/s**	**3.33**	**4.73**	**5.22**	**5.35**	**1.50**	**20.13**
1.5	Maximum Day Peaking Factor**		1.30	1.30	1.30	1.30	1.30	1.30
1.6	**Maximum Day Design Demand Rate**	**L/s**	**1.73**	**2.46**	**2.72**	**2.78**	**1.50**	**11.19**

TABLE B2 - PROPOSED PEAK WATER DEMAND CALCULATIONS - ICI

			Building A	Building B	Building C	Building D	Park	Total Proposed
2.0	Total Proposed Population*	persons	130	0	0	0	0	130
2.1	Per Capita Demand @ 190 L/person/day**	L/day	24,700	0	0	0	0	24,700
2.2	**Equivalent Population Demand**	**L/s**	**0.29**	**0.00**	**0.00**	**0.00**	**0.00**	**0.29**
2.3	Peak Hour Peaking Factor**		1.20	1.20	1.20	1.20	1.20	1.20
2.4	**Peak Hour Design Demand Rate**	**L/s**	**0.34**	**0.00**	**0.00**	**0.00**	**0.00**	**0.34**
2.5	Maximum Day Peaking Factor**		1.10	1.10	1.10	1.10	1.10	1.10
2.6	**Maximum Day Design Demand Rate**	**L/s**	**0.31**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**

TABLE B3 - PROPOSED PEAK WATER DEMAND CALCULATIONS - TOTAL

			Building A	Building B	Building C	Building D	Park	Total Proposed
3.0	Total Proposed Population*	persons	736	860	950	973	0	3,519
3.1	Per Capita Demand @ 190 L/person/day**	L/day	139,840	163,400	180,500	184,870	0	668,610
3.2	**Equivalent Population Demand**	**L/s**	**1.62**	**1.89**	**2.09**	**2.14**	**1.50**	**9.24**
3.3	**Peak Hour Design Demand Rate**	**L/s**	**3.67**	**4.73**	**5.22**	**5.35**	**1.50**	**20.47**
3.4	**Maximum Day Design Demand Rate**	**L/s**	**2.05**	**2.46**	**2.72**	**2.78**	**1.50**	**11.50**

* Refer to Table A2 in Appendix A for the proposed populations of the site.

** as per City of Toronto Design Criteria for Sewers and Watermains - January 2021

*** A provisional peak water demand has been allocated for the park, to account for possible future water features.

TABLE B4 - FIRE DEMAND CALCULATIONS - BASED ON F.U.S. GUIDELINES

		Building A	Building B	Building C	Building D
Coefficient for type of construction*		0.60	0.60	0.60	0.60
Height in Stories		30	35	40	45
Level 1 Floor Area**	m^2	1,542	1,381	980	933
Level 2 Floor Area	m^2	1,983	1,074	1,242	752
Level 3 Floor Area	m^2	1,980	1,427	1,342	1,105
Level 4 Floor Area	m^2	1,105	1,427	1,342	1,105
Level 5 Floor Area	m^2	1,451	1,427	1,342	1,105
Level 6 Floor Area	m^2	1,451	1,427	1,342	1,105
Level 7 Floor Area	m^2	1,451	651	573	781
Level 8 Floor Area	m^2	581	781	781	781
Level 9 Floor Area	m^2	781	781	781	781
Level 10 Floor Area	m^2	781	781	781	781
Stories to Use in Calculation (2 largest floors + 50% of each floor above up to 8)		1 + 2 + (3-10* 50%)	1 + 2 + (3-10* 50%)	1 + 2 + (3-10* 50%)	1 + 2 + (3-10* 50%)
Total Area	m^2	8,316	6,806	6,364	5,457
Fire Flow Required	L/min	12,000	11,000	11,000	10,000
15% Reduction for Occupancy Charge - low fire hazard	L/min	-1,800	-1,650	-1,650	-1,500
Fire Flow Required	L/min	10,200	9,350	9,350	8,500
30% Reduction for Automatic Sprinklers	L/min	-3,060	-2,805	-2,805	-2,550
Charge for Building Separation					
North: Nearest Building	m	0%	15%	15%	15%
West: Nearest Building	m	10%	10%	10%	10%
South: Nearest Building	m	15%	20%	15%	0%
East: Nearest Building	m	20%	10%	15%	0%
Charge for Building Separation	L/min	4,590	5,143	5,143	2,125
Fire Flow Required	L/min	12,000	12,000	12,000	9,000
Fire Flow Required	L/s	200.00	200.00	200.00	150.00

*Please refer to the letter prepared by the Architectural consultant noting the site's construction classification, and sprinkler in Appendix B of the report.

*See Architectural site statsitics provided in Appendix A for individual floor areas.

TABLE B5 - PROPOSED TOTAL WATER DEMAND

As per City of Toronto Design Criteria and MOE design guidelines, water supply systems should be designed to satisfy **the greater** of either of the following demands:

- Maximum Day Domestic Demand plus Fire Flow
- Peak Hour Domestic Demand

MAX DAY & FIRE FLOWS

		Building A	Building B	Building C	Building D	Park	Total/ *Highest*
Max Day	L/s	2.05	2.46	2.72	2.78	1.50	11.50
Fire	L/s	200.00	200.00	200.00	150.00	0.00	*200.00*
Total Max Day & Fire Flow	**L/s**	**202.05**	**202.46**	**202.72**	**152.78**	**1.50**	**211.50**

PEAK HOUR DOMESTIC DEMAND

Peak Rate	**L/s**	**3.67**	**4.73**	**5.22**	**5.35**	**1.50**	**20.47**

THEREFORE, MAX DAY + FIRE FLOW IS GOVERNING REQUIREMENT

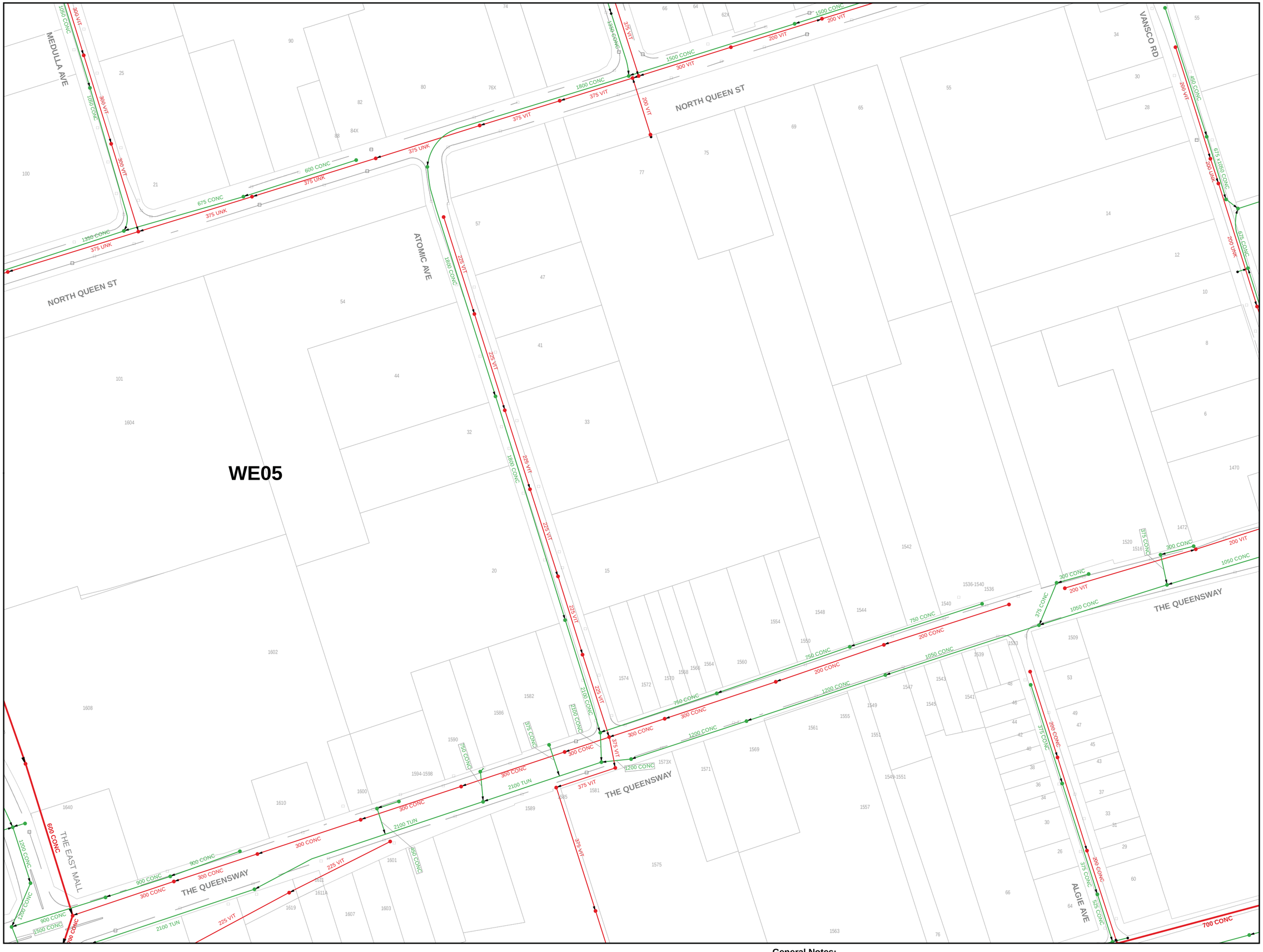
WATER DEMAND

Max Day Demand	L/s	2.05	2.46	2.72	2.78	1.50	11.50
	L/min	122.81	147.51	162.95	166.90	90.00	690.18
Fire Flow*	L/s	200.00	200.00	200.00	150.00	0.00	200.00
	L/min	12,000.00	12,000.00	12,000.00	9,000.00	0.00	12,000.00
Total Water Demand Requirement	**L/s**	**202.05**	**202.46**	**202.72**	**152.78**	**1.50**	**211.50**
	L/min	**12,122.81**	**12,147.51**	**12,162.95**	**9,166.90**	**90.00**	**12,690.18**

Note (*): Per City of Toronto's Design Criteria for Sewers and Watermains, in accordance with the Fire Underwriters Survey (FUS), fire flows will not be less than 4,800 L/minute for a 2-hour duration in addition to maximum daily domestic demand, delivered with a residual pressure of

APPENDIX C

SANITARY SERVICING ANALYSIS



Toronto Sewer Atlas

Large Chamber

Manhole
- Combined
- Dual
- Sanitary
- Storm
- Foundation

Control Manhole
- Combined
- Dual
- Sanitary
- Storm

Outfall
- Outfall

Sewer Pump Station
- Sewer Pump Station

Catchbasin
- Other
- Twin Inlet Catchbasin

Sewer
- Foundation Drain
- Combined
- Sanitary
- Storm
- Combined Trunk
- Sanitary Trunk
- Storm Trunk
- Abandoned Sewer
- River
- Highway
- Curb
- Wards Boundary

0 50 100 150 200 Metres

Third Edition
Date: 01/09/2010

General Notes:
- The maps were prepared based on the most current data available to Toronto Water as of the Map Source Date.
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N W E S

165	199	234
166	200	235
167	201	236

Toronto Sewer Atlas

Large Chamber

Manhole
- Combined
- Dual
- Sanitary
- Storm
- Foundation

Control Manhole
- Combined
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Sewer
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0 50 100 150 200 Metres

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N W E S

166	200	235
167	201	236
168	202	237

TABLE C1 - EXISTING TOTAL SANITARY PEAK FLOW

			1543 The Queensway	1545 The Queensway	1547 The Queensway	1549-1551 The Queensway	66 Fordhouse Boulevard	70-76 Fordhouse Boulevard	Total Existing
1.0	Total Existing ICI GFA*	m^2	123	530	107	1,083	2,933	2,380	7,156
1.1	Total ICI Flow @180,000 L/ha/day**	L/day	2214	9540	1926	19494	52794	42840	128,808
1.2	**Total ICI Flow @180,000 L/ha/day**	**L/s**	**0.03**	**0.11**	**0.02**	**0.23**	**0.00**	**0.00**	**0.38**
1.3	Total Site Area	m^2	761	817	1,337	1,953	8,063	8,605	21,536
1.4	**Total Infiltration Peak Flow (@ 0.26 L/s/ha)****	**L/s**	**0.02**	**0.02**	**0.03**	**0.05**	**0.21**	**0.22**	**0.56**
1.5	**Total Existing Sanitary Peak Flow**	**L/s**	**0.05**	**0.13**	**0.06**	**0.28**	**0.21**	**0.22**	**0.94**
1.6	**Total Existing Sanitary Peak Flow (per Outlet)**	**L/s**	**0.51**				**0.43**		**0.94**

TABLE C2 - PROPOSED TOTAL SANITARY PEAK FLOW

			Building A	Building B	Building C	Building D	Park****	Public Roads	Total Proposed
2.0	Total Proposed Residential Population*	persons	606	860	950	973	0	0	3,389
2.1	Peaking Factor***		3.40	3.40	3.40	3.40	3.40	3.40	3.40
2.2	Total Residential Flow @ 240 L/cap/day**	L/day	494,042	701,116	774,489	793,240	0.00	0.00	2,762,887
2.3	Total Residential Flow @ 450 L/cap/day**	L/day	926,329	1,314,593	1,452,167	1,487,324	0.00	0.00	5,180,414
2.4	**Total Residential Flow @ 240 L/cap/day**	**L/s**	**5.72**	**8.11**	**8.96**	**9.18**	**2.50**	**0.00**	**34.48**
2.5	**Total Residential Flow @ 450 L/cap/day**	**L/s**	**10.72**	**15.22**	**16.81**	**17.21**	**2.50**	**0.00**	**62.46**
2.6	Site Area	m^2	2,245	3,283	3,283	3,400	2,156	7,170	21,536
2.7	**Total Infiltration Peak Flow (@ 0.26 L/s/ha)****	**L/s**	**0.06**	**0.09**	**0.09**	**0.09**	**0.06**	**0.19**	**0.56**
2.8	Total ICI GFA*	m^2	5085	0	0	0	0	0	5,085
2.9	Total ICI Flow @180,000 L/ha/day**	L/day	91530	0	0	0	0	0	91,530
3.0	**Total ICI Flow @180,000 L/ha/day**	**L/s**	**1.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.06**
3.1	**Total Sanitary Peak Flow (Res @ 240 L/cap/day)**	**L/s**	**6.84**	**8.20**	**9.05**	**9.27**	**2.56**	**0.19**	**36.10**
3.2	**Total Sanitary Peak Flow (Res @ 450 L/cap/day)**	**L/s**	**11.84**	**15.30**	**16.89**	**17.30**	**2.56**	**0.19**	**64.08**
3.3	**Total Sanitary Peak Flow (Res @ 240 L/cap/day) (Per Outlet)**	**L/s**	**6.84**	**29.26**					**36.10**
3.4	**Total Sanitary Peak Flow (Res @ 450 L/cap/day) (Per Outlet)**	**L/s**	**11.84**	**52.24**					**64.08**

* Refer to Table A1 and Table A2 in Appendix A for the existing and proposed populations/GFA's for the site.

** As per City of Toronto Design Criteria for Sewers and Watermains - January 2021

*** Peaking Factor calculated by using Harmon's Formula (1+ 14/(4 + P^0.5)) using the total proposed population.

**** A provisional peak sanitary demand has been allocated for the park, to account for possible future plumbing fixtures.

1543-1551 The Queensway

Sanitary Capacity Assessment Report

Prepared for:
1370443 Ontario Limited

RVA 236932

November 14, 2024

1543 THE QUEENSWAY
SANITARY CAPACITY ASSESSMENT REPORT

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APPENDICES

1.0 Introduction

R.V. Anderson Associates Limited (RVA) has been retained to prepare a Sanitary Sewer Capacity Assessment Report in support of a development application for the proposed development at 1543-1551 The Queensway, Toronto.

The report summarizes the findings of the sanitary sewer capacity assessment under pre-development and post-development conditions to ensure compliance with the requirements stipulated within the City of Toronto's Sanitary Sewer Capacity Assessment Guidelines (July 2021). The pre-development condition includes the wastewater flows generated from the existing and other development applications (planned/in progress). The post-development condition includes the additional wastewater flows generated from the proposed development at 1543-1551 The Queensway.

1.1 Project Scope

The purpose of the capacity assessment was to determine the impact of the proposed development on the downstream sanitary sewers (within the limits of the study) and identify any improvements required to mitigate the capacity limitations.

The study involved the following key tasks:

- Review the applicable guidelines and development planned within the study area.
- Update the existing InfoWorks ICM model (provided by the City) to include planned/in progress development applications within the study area.
- Review flow and rainfall monitoring data (provided by the City) to determine dry weather and wet weather flows experienced at the monitoring locations.
- Calibrate the model based on the flow and rainfall data to accurately simulate the downstream flows.
- Assess the downstream sewers capacity under pre-development and post development flow conditions based on applicable guidelines.
- Identify improvements required, if any, to mitigate capacity limitations caused by the proposed development.

1.2 Background Review

The following information was obtained and reviewed for this study:

- Sewer Capacity Assessment Guidelines - City of Toronto (July 2021).
- Design Criteria for Sewers and Watermains - City of Toronto (January 2021).
- Development Applications - City of Toronto (https://secure.toronto.ca/AIC/index.do).
- The existing InfoWorks ICM model (The proposed development is located within the Basement Flooding Area 54 and the Class EA of this area was completed in 2022).
- Available flow monitoring and rainfall data (Two flow monitoring data were reviewed for this study).

2.0 Proposed Development

2.1 Site Location

Figure 1 shows the location of the proposed development planned at 1543-1551 The Queensway highlighted in red.

Majority of the sanitary flows from the proposed development will be discharged to the proposed 300 mm sanitary sewer along Fordhouse Boulevard and the remaining portion of flows will be discharged to the existing 200 mm sanitary sewer along The Queensway. The flow ultimately discharges to the Mendota Sanitary Trunk sewer. The sewers upstream and downstream of the proposed development and flow monitoring locations are shown in **Figure 1.**

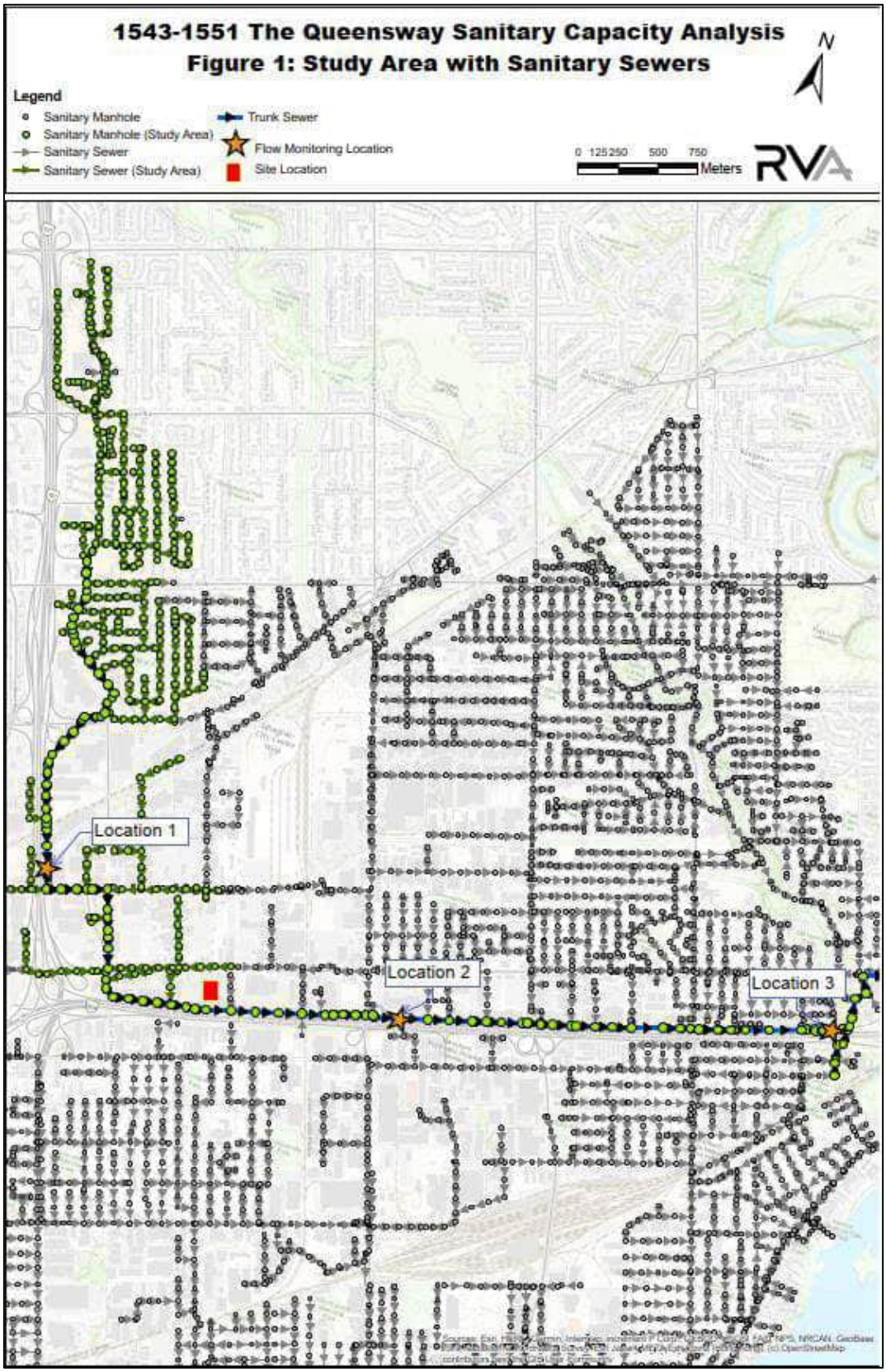


Figure 1 – Study Area with Sanitary Sewers

2.2 Sanitary Flows

The estimated sanitary flows for the proposed development based on the City of Toronto's design Criteria guidelines are presented in **Table 1** below.

Table 1- Flow from Proposed Development

Development	Peak Residential DWF (L/s)[1]	ICI Flow (L/s)[2]	Inflow & Infiltration (L/s)[3]	Total Sanitary Peak Flow (L/s)
1543-1551 The Queensway	34.49	1.05	0.56	36.10

[1] Residential flow at 240 L/cap/day
[2] ICI Flow at 180,000 L/ha/day
[3] Infiltration Allowance at 0.26 L/s/ha

As shown in **Table 1**, total sanitary flow of 36.10 L/s is estimated from the proposed development, out of which 6.84 L/s will be discharged to the existing sewer along The Queensway and the remaining 29.26 L/s will be conveyed through the proposed sanitary sewer. The flow ultimately discharges to the Mendota Sanitary Trunk sewer.

3.0 Model Calibration

3.1 Model Calibration

The proposed development is located within the Basement Flooding Area 54. The class EA study for this area was completed in 2022.

The flow monitoring locations are shown in **Figure 1** and presented in **Table 2**:

Table 2- Summary of Flow Monitoring Data

Flow Monitoring ID / Location ID	Start Date	Finish Date
323-064 (Location 1)	January 01, 2022	January 01, 2023
323-030 (Location 2)	January 01, 2023	December 31, 2023
323-003 (Location 3)	January 01, 2022	March 01, 2023

The flow monitoring data provided by the City included the headings QFINAL (L/s), DFINAL (mm), VFINAL (m/s), and Rainfall (mm). As shown in **Figure 1**, flow monitoring location 3 is further downstream of flow monitoring location 2 along the Mendota Sanitary Trunk sewer. Per City's Sewer Capacity Assessment Guidelines, trunk sewers are beyond the scope of capacity assessment and hence flow monitoring data for location 3 was not used in further analysis.

The remaining two locations were used as a basis to calibrate the model to accurately mimic the existing conditions of the system. The adjustment of model parameters and inputs was performed to align the simulated results with observed data, in an attempt to accurately simulate the system performance.

3.1.1 Dry Weather Calibration

Dry weather model calibration was performed to reasonably match the average dry weather flow and flow diurnal pattern that were estimated based on the flow monitoring data. The results of the dry weather calibration for location 1 and location 2 are depicted in **Figure 2** and **Figure 3**, respectively.

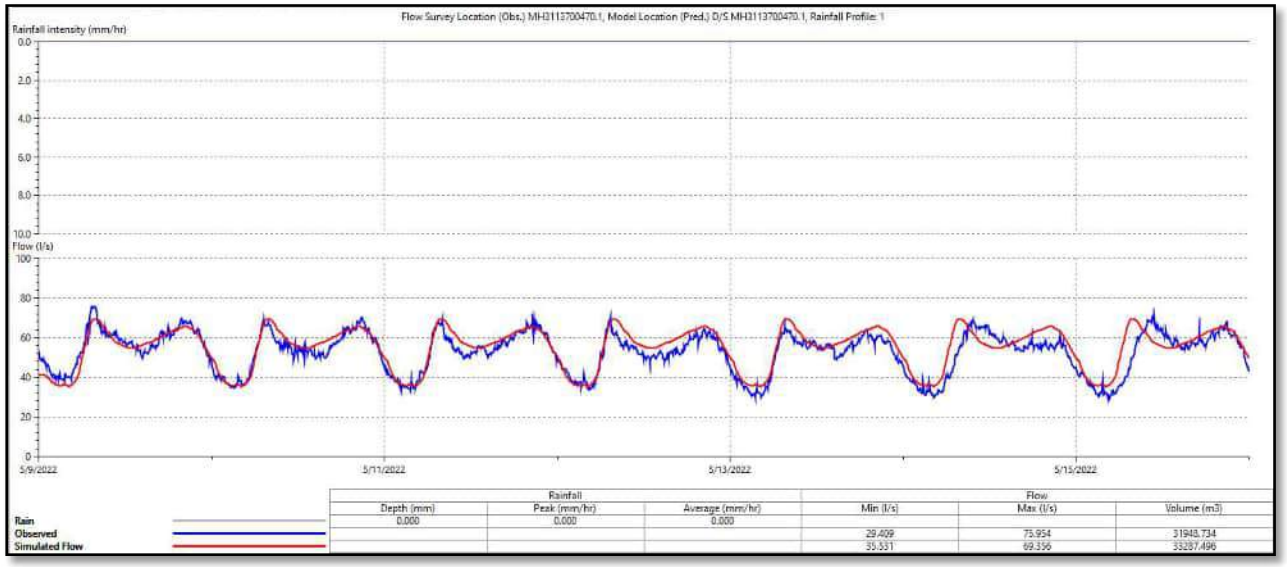


Figure 2 - Dry Weather Calibration Results- Location 1 (353-064)

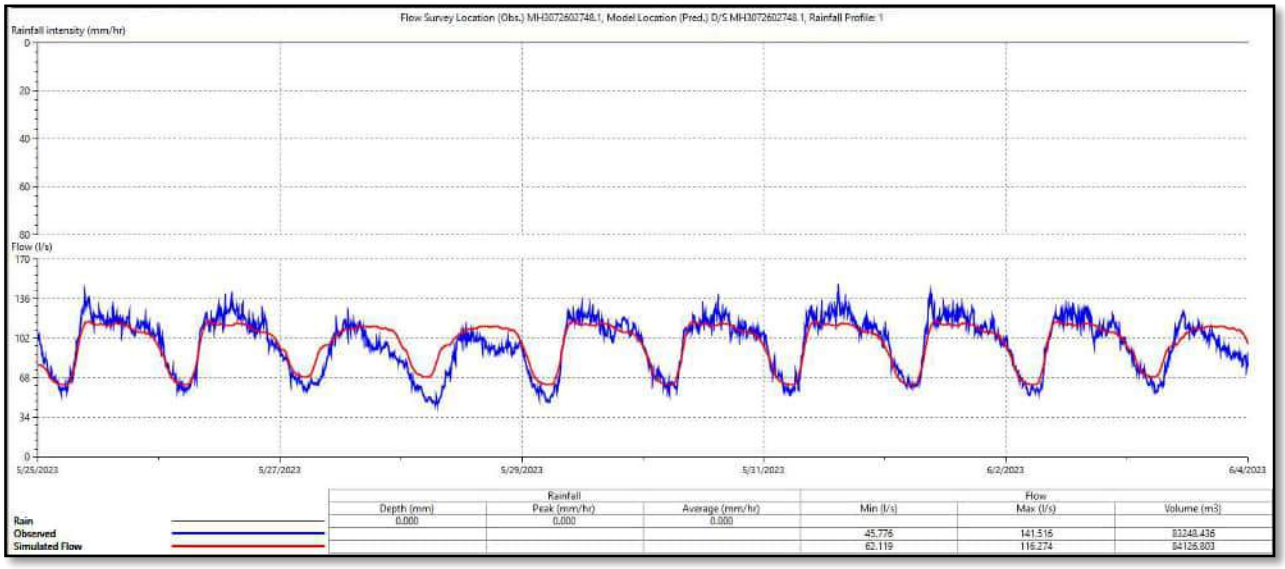


Figure 3 - Dry Weather Calibration Results- Location 2 (353-030)

3.1.2 Wet Weather Calibration

In wet weather flow conditions, the sanitary system encounters the inflow of additional water due to storm events, which is referred to as Rainfall-Derived Inflow and Infiltration (RDII). The wet weather model calibration was performed using the RTK method. In this method, the shape and volume of runoff entering the sanitary sewer is described by the following three parameters:

- "R" is the fraction of rainfall volume that enters the sewer system.
- "T" is the time from the onset of rainfall to the peak of the hydrograph.
- "K" is the ratio of time to recession of the unit hydrograph to the time to peak.

The review of flow monitoring data for location 1 shows that the rainfall data is not available from May 22 to November 08, 2022, and for the remaining period, data does not show correlation between storm event and the system response. Therefore, the flow monitoring data could not be used for the wet weather calibration. Furthermore, since flow and rainfall monitoring data for location 2 (downstream of location 1) already captured the upstream flows, wet weather calibration for location 2 was sufficient for the intended objective.

For flow monitoring location 2, three (3) isolated rainfall events were identified for the wet weather model calibration. **Table 3** present the details on the magnitude and intensity of these events for location 2.

Table 3- Selected Rainfall Events for the Model Calibration - Location 2 (323-030)

Event Date	Rainfall	
	Rainfall (mm)	Intensity (mm/hr)
May 20, 2023	20.4	14.7
July 13, 2023	28.3	70.6
September 07, 2023	15.6	63.5

Table 4 summarize the calibration results for these three events for location 2. Wet weather calibration results graphs are included in Appendix A.

Table 4- Model Calibration Results – Location 2 (323-030)

Event Date	Peak Flow (L/s)			Volume (m^3)		
	Observed	Simulated	Diff (%)	Observed	Simulated	Diff (%)
May 20, 2023	152	151	-1%	9736	9543	-2%
July 13, 2023	241	244	1%	11467	10075	-12%
September 07, 2023	277	287	3%	7945	7842	-1%

Table 4 shows that, the percentage change between observed flow monitoring data and simulated results for the peak flow and volume.

4.0 Capacity Analysis Criteria

The Sewer Capacity Assessment Guidelines published by the City of Toronto were reviewed and utilized for the capacity analysis. These criteria, as outlined in Table 5, form the basis for this analysis.

Table 5- Capacity Criteria for Sanitary and Combined Sewers

Criteria	Discharge to Sewer System	
	Sanitary Sewer	Combined Sewer
Criterion 1 "Design Function"	Under proposed design flow conditions, there will be no surcharge[1] in the sewer system.	Under proposed design flow conditions, plus contributing peak stormwater flows under the 2-yr design storm event, there shall be no surcharge in the sewer systems.
Criterion 2 "Basement Flooding Protection"	Under proposed extreme WWF conditions, which includes I&I generated under the May 12, 2000 storm event[2], the HGL in the sewer will be at least 1.8 m below grade.	[Not applicable if Criterion 3 is met] Under proposed extreme WWF conditions, which includes I&I generated under the 100-yr design storm event, the HGL in the sewer will be at least 1.8 m below grade.
Criterion 3 "WWF Mitigation"	[Not applicable if Criterion 2 is met] Under proposed extreme WWF conditions, WWF mitigation measures will ensure that the proposed HGL will be no higher than the existing HGL. The proposed peak flow rate will be no greater than existing peak flow rate at the connection to the trunk sewer or pumping station.	Under the 2-yr design storm event, off-site WWF and I&I mitigation measures will offset two times the proposed increase from on-site discharges to the system. For systems containing CSO points for CSO control, ensure there will be no increase in peak overflow rate at the CSO point.

1. No surcharge deemed when HGL is under pipe obvert.
2. Estimate equivalent 25-yr design storm, where no WWF I&I for May 12, 2000, storm event is available from BFPP studies.

5.0 Pre-Development Analysis

To determine the impact of the proposed development on the system performance, a pre-development scenario was created and analyzed to establish the baseline conditions. The pre-development conditions included the existing flows and development applications from the upstream drainage areas which are either planned or in approval stage.

5.1 Existing Land Use at the Proposed Site

At present, the proposed development site at 1543-1551 The Queensway consists of commercial establishments.

5.2 Development Applications

The City of Toronto Development Applications website was reviewed to determine the developments within the sewershed that are either planned or in approval stage by the City. It was assumed that these development applications are further along in the approval process than the subject site and thus would be completed before the proposed development.

The development applications submitted 2019 onwards were considered for the purpose of this analysis. A total of thirteen (13) development applications were identified from the city's website that are located within the sewershed. For these developments, the functional servicing reports (FSRs) were reviewed for information regarding the proposed peak sanitary design flows. Table 6 shows a summary of the development applications, peak sanitary design flows, and the asset ID of the nearest existing sanitary manhole at which they are loaded to in the model.

Table 6- Summary of Development Applications

Development Application Address	Peak DWF (L/s)	Peak WWF (L/s)	Connecting Sanitary Manhole Asset ID
1572 & 1574 The Queensway	1.01	1.09	MH3067001527
1599-1603 The Queensway	1.15	1.29	MH3057401313
1611 A The Queensway	0.49	0.64	MH3053401234
1640 The Queensway	2.24	2.36	MH3051601065
111-127 Shorncliffe Rd.	1.94	2.18	MH3003643
85 Vickers Rd.	1.84	2.90	MH3150300361
2 & 10 The East Mall	9.90	10.14	MH3203300688
2 Gibbs Rd - Phase 2	31.9	33.93	MH3294100138
300-304 The East Mall	12.63	14.80	MH3278000212
417 & 419 Burnhamthorpe Rd	0.20	0.20	MH3381699973

Development Application Address	Peak DWF (L/s)	Peak WWF (L/s)	Connecting Sanitary Manhole Asset ID
530 The East Mall	22.71	23.09	MH3440899713
5 Capri Rd	23.62	24.43	MH3449499613
580 The East Mall	4.83	5.05	MH3471299628

In the FSRs, the design flows for "2 & 10 The East Mall", "5 Capri Road", and "580 The East Mall" were estimated based on 450 L/cap/day. However, for the purpose of this project, we have re-calculated the flows for these three developments based on 240 L/cap/day following the City's Sewer Capacity Assessment Guidelines. The flow values shown in **Table 6** are based on 240 L/cap/day for all the applications listed.

5.3 Criterion 1 (Design Function)

The system analysis was conducted using design flow for development applications (shown in Table 6) in addition to the existing sanitary flows. The simulation results for the pre-development scenario during dry weather conditions indicate that the existing sanitary sewer system operates in compliance with the City of Toronto's required level of service. The results further indicate that the downstream sanitary sewer system operates without surcharging and therefore meets criterion 1. **Figure 7** and **Figure 8** in Appendix B present the plan view and maximum simulated hydraulic grade line (HGL) in sewers within the study area, respectively.

5.4 Criterion 2 (Basement Flooding Protection)

Extreme WWF simulation was performed to verify if the downstream sanitary system meets Criterion 2 as per the City of Toronto Design Criteria for Sewers and Watermains, January 2021.

The extreme WWF simulation involved the following steps:

1. Utilized calibrated DWF scenario for the existing condition
2. Assigned wastewater flow for the development applications based on 240 L/cap/day
3. May 12, 2000 storm event was applied to simulate extreme WWF conditions

The simulation results for the pre-development scenario during wet weather conditions indicate that the existing sanitary sewer system operates in compliance with the City of Toronto's required level of service, however, at one location (Manhole ID MH3052001473) freeboard was estimated to be 1.78 m, which is below the 1.8 m freeboard criteria. Please note that this lower freeboard is a result of an elevated hydraulic grade line (HGL) within the Mendota Trunk Sewer. It is also noted that the subject manhole location is within an easement

and therefore would not represent a location where a service connection would be made at some point in the future. Furthermore, as can be seen in the HGL profile, the surface elevation at this manhole is a localized low point that is not representative of the general surrounding ground elevations.

Figure 9 and **Figure 10** in Appendix B present the plan view and maximum simulated hydraulic grade line (HGL) in sewers within the study area, respectively.

6.0 Post-Development Analysis

In order to simulate post-development condition, additional wastewater flow generated from the proposed development was added to the pre-development scenario. The sanitary design flow of 6.84 L/s is assigned to Manhole MH3072801698, which drains to The Queensway and a flow of 29.26 L/s is assigned to a proposed Manhole Prop_SANMH38, which drains to the Ford house.

6.1 Criterion 1 (Design Function)

The simulation results for the post-development scenario during dry weather conditions indicate that the existing sanitary sewers downstream of the proposed development operate in compliance with the City of Toronto's required level of service. The results further indicate that the downstream sanitary sewer system operates without surcharging and therefore meets criterion 1. **Figure 11** in Appendix B shows the plan view results for the study area. **Figure 12** presents the maximum simulated hydraulic grade line (HGL) in sewers from the discharge location on the Queensway to the Mendota Trunk Sewer. **Figure 13** presents the maximum simulated hydraulic grade line (HGL) in the proposed sewers within the site of the Mendota Trunk Sewer.

6.2 Criterion 2 (Basement Flooding Protection)

Extreme WWF simulation was performed to verify if the downstream sanitary system meets Criterion 2 as per the City of Toronto Design Criteria for Sewers and Watermains, January 2021.

The extreme WWF simulation involved the following steps:

1. Utilized pre-development scenario and assigned wastewater flow for the proposed development based on 240 L/c/d
2. May 12, 2000 storm event was applied to simulate extreme WWF conditions

The simulation results for the post-development scenario during wet weather conditions indicate that the sanitary sewer system operates in compliance with the City of Toronto's required level of service, however, at one location (Manhole ID MH3052001473) freeboard was estimated to be 1.23 m, which is below the 1.8 m freeboard criteria. This manhole did not meet freeboard criteria under the pre-development scenario as well and as mentioned earlier, this lower freeboard is a result of an elevated hydraulic grade line (HGL) in the Mendota Trunk Sewer. Any future improvements by the City to reduce the hydraulic grade

line (HGL) in the Mendota Trunk Sewer will improve the condition of the subject manhole. Furthermore, as indicated previously, this manhole location is within an easement where no future interconnections are likely to be made and the surface elevation is a localized low point that is not generally representative of the surrounding ground elevations.

Figure 14 shows the plan view results for the study area. **Figure 15** presents the maximum simulated hydraulic grade line (HGL) in sewers from the discharge location on the Queensway to the Mendota Trunk Sewer. **Figure 16** presents the maximum simulated hydraulic grade line (HGL) in the proposed sewers within site to the Mendota Trunk Sewer.

7.0 Conclusion

The results of the capacity analysis indicate that under the pre-development and post-development conditions, the existing sanitary sewer system is capable of handling the maximum peak flow generated during dry and wet weather flow conditions and meets the City's criteria 1 and 2. One manhole (ID MH3052001473) did not meet City's freeboard criteria under pre-development and post-development conditions as a result of elevated hydraulic grade line (HGL) in the Mendota Trunk Sewer, however as this manhole is within an easement which would represent a condition where no future service connections are to be made in the vicinity of the manhole, and it's a localized surface ground low point in the system it would be considered an acceptable condition.

Respectfully submitted,

R.V. Anderson Associates Limited

Gaurav Jadhav

Gaurav Jadhav, B.Eng., M.Sc.
Senior Hydraulic Modeller

Mukesh Choudhary, P.Eng., PMP
Manager, Hydraulic Modeling

APPENDIX A

WWF Model Calibration Results

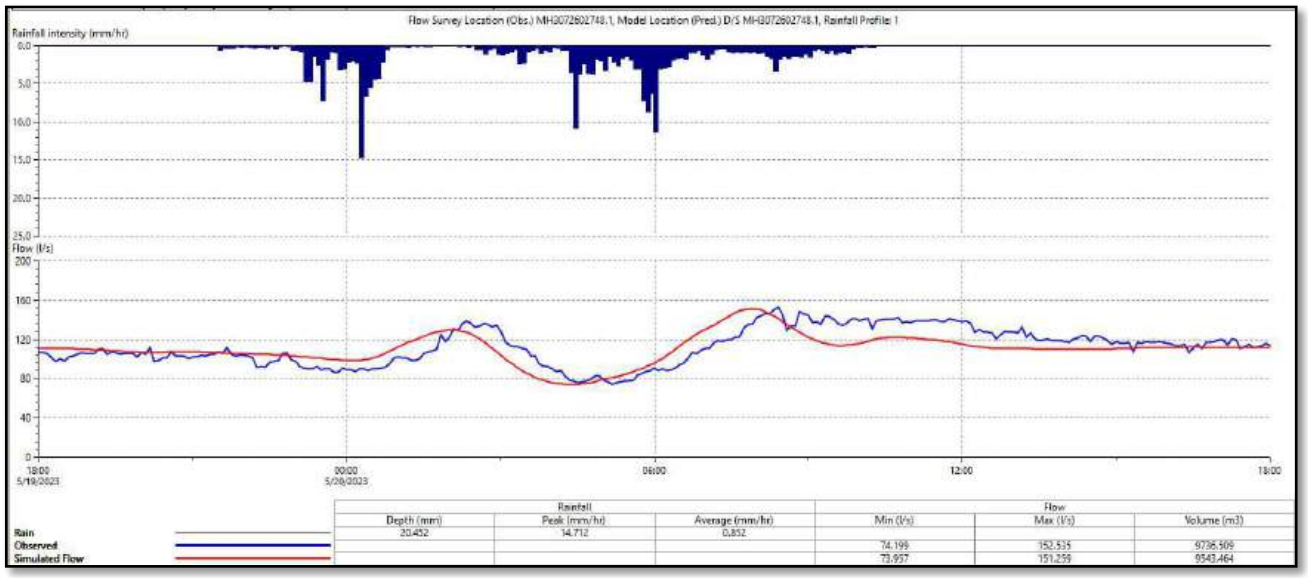


Figure 4 - May 20, 2023 - Calibration Results – Location 2 (323-030)

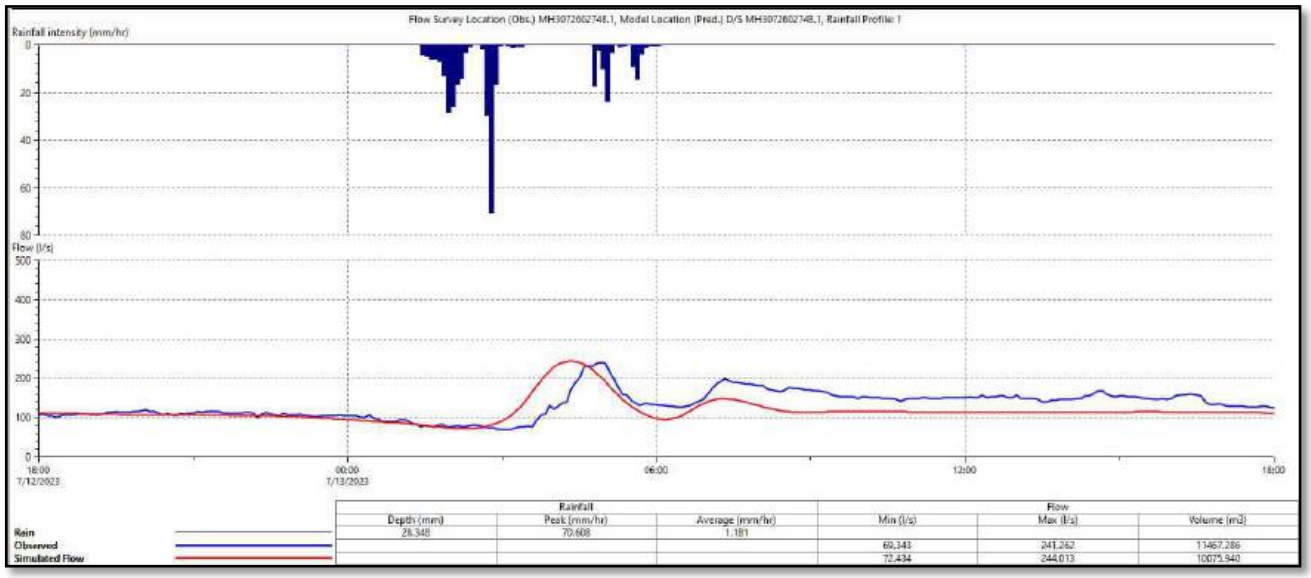


Figure 5 - July 13, 2023 - Calibration Results – Location 2 (323-030)

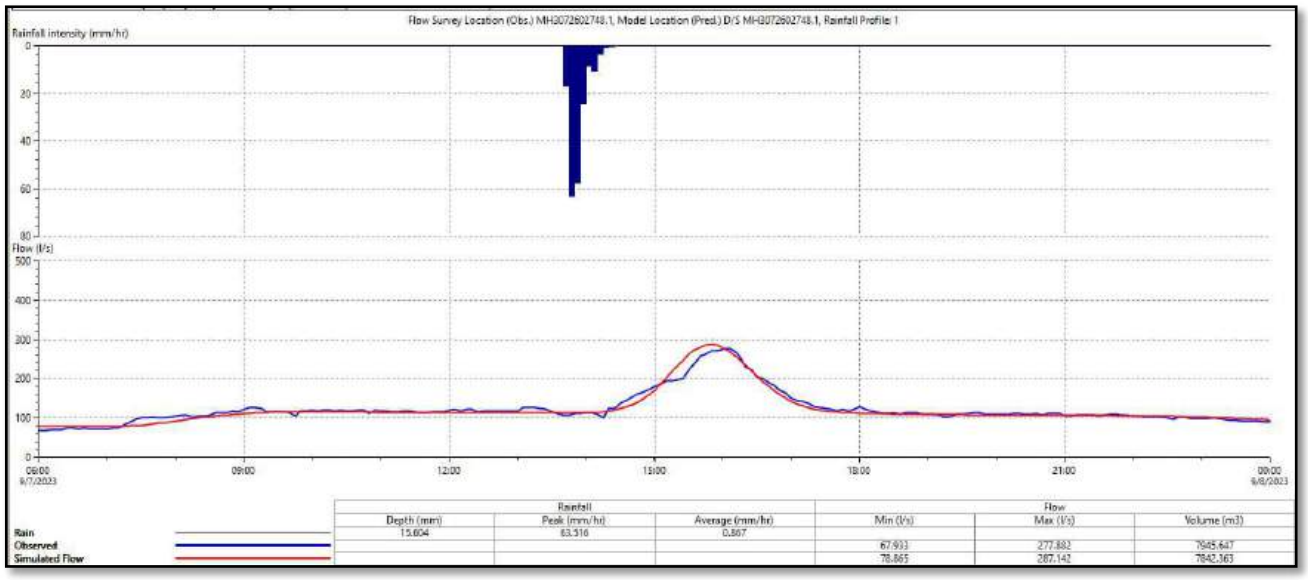
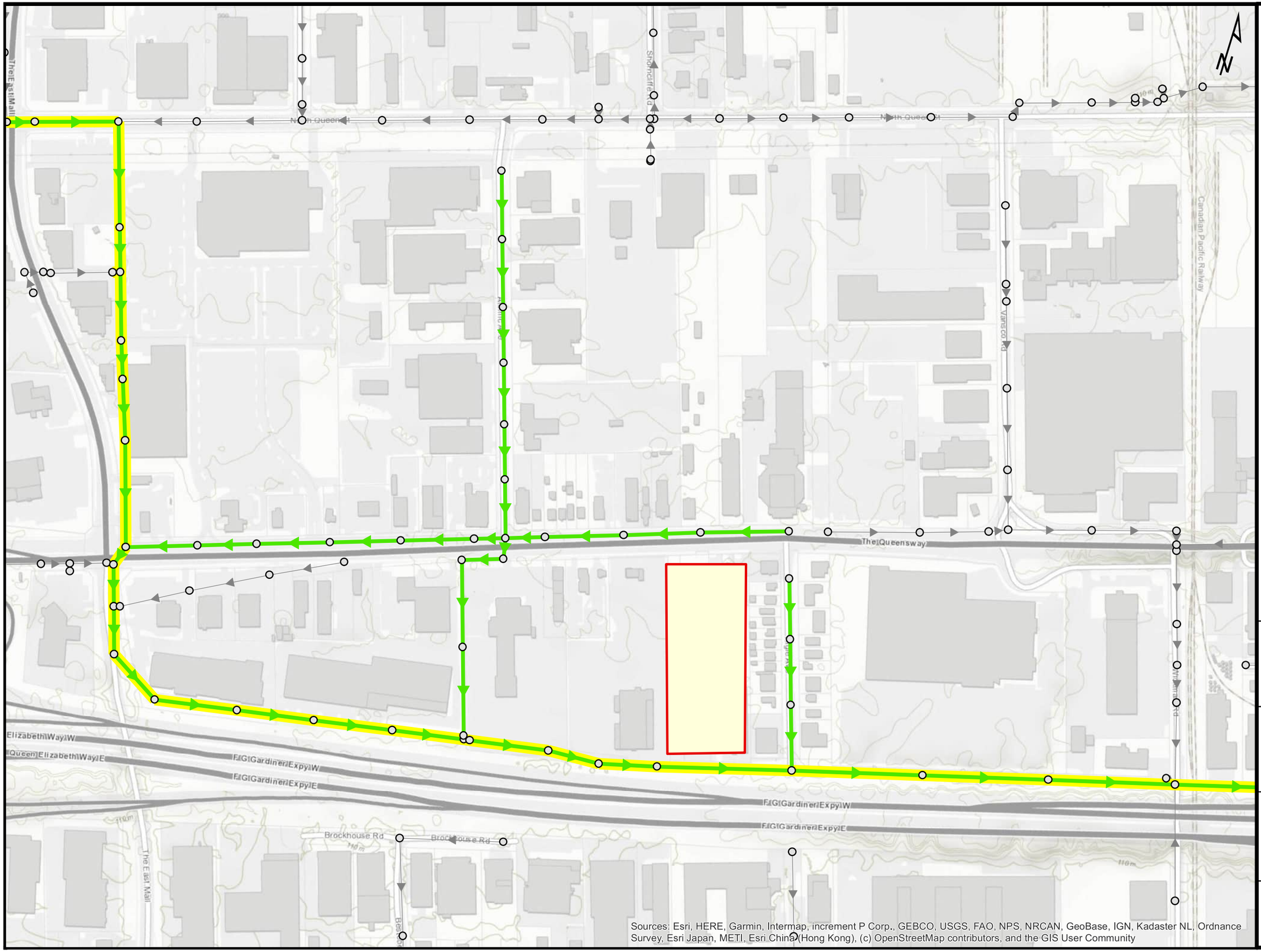


Figure 6 - September 07, 2023 - Calibration Results – Location 2 (323-030)

APPENDIX B

Profiles and Plan Views



Legend

- Sanitary Manhole
- Sanitary Sewer
- Trunk Sewer
- Site Location

Sanitary Sewer (Study Area)

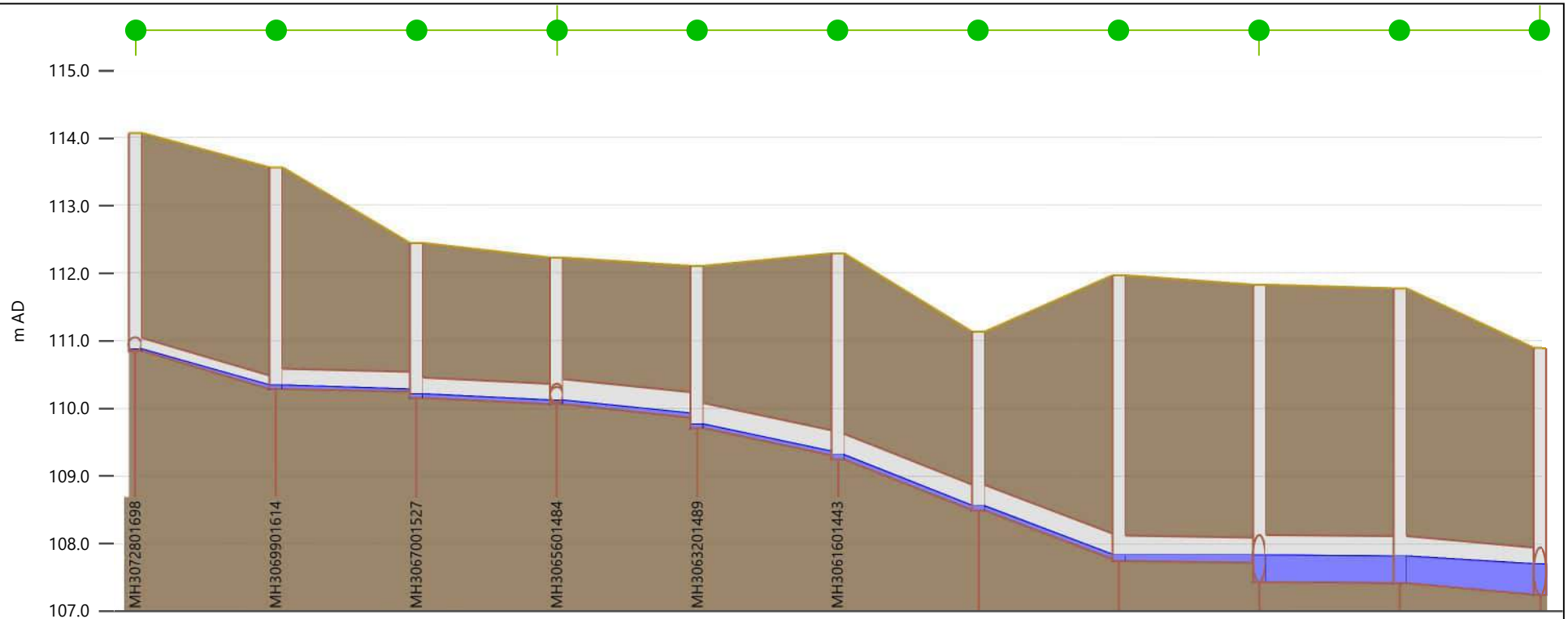
- No Surcharge
- Surcharge State = 1 (Backup)
- Surcharge State = 2 (Bottleneck)

RVA

1543-1551 The Queensway Sanitary Capacity Analysis

Figure 7
Pre-Development Condition DWF Results

0 0.075 0.15 Kilometers



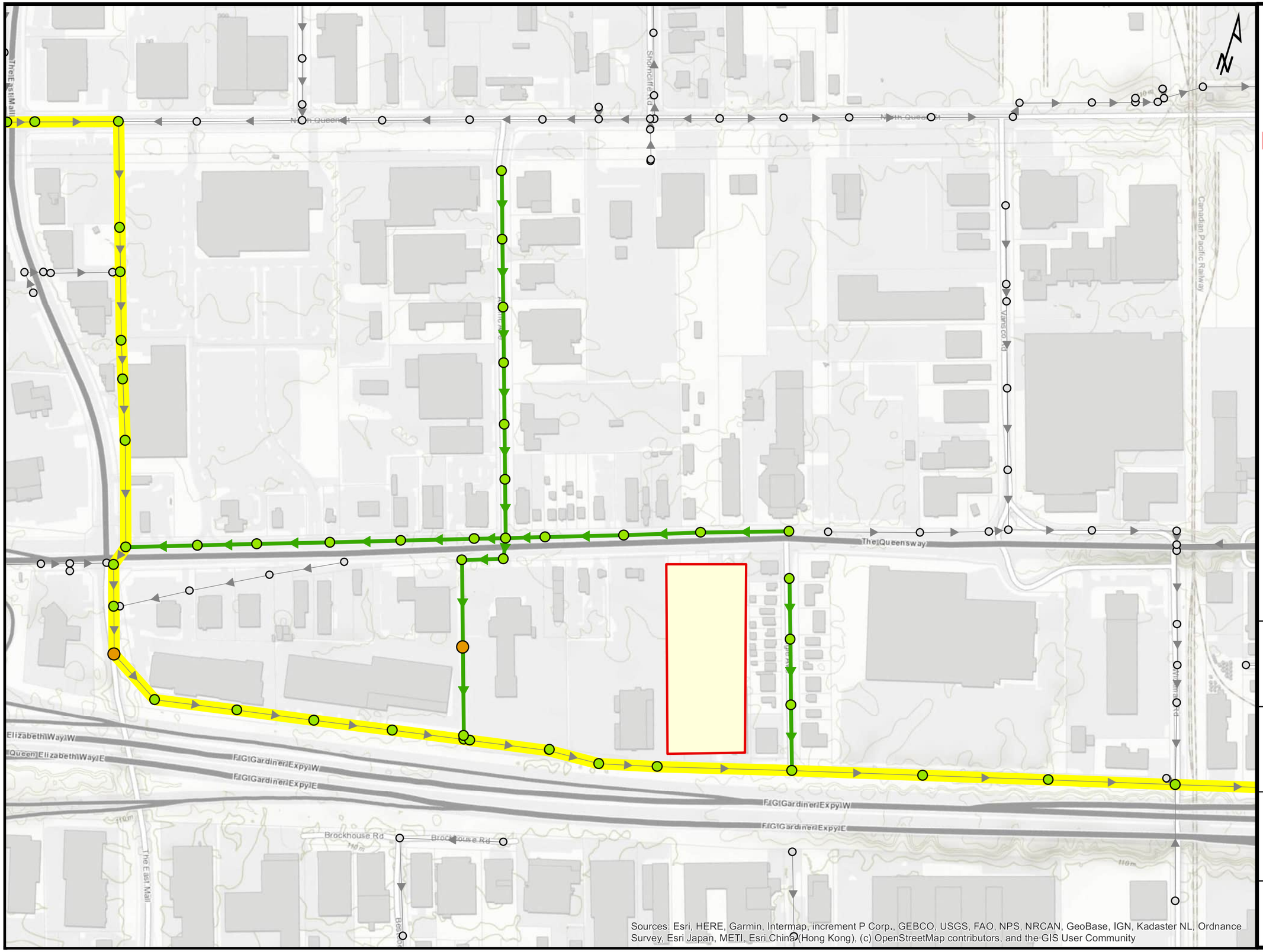
Link	-	-	-	-	-	-	-	-	CN4170.1	-
US node ID	MH3072801698	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513
ds node	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513	MH3043401603
width (mm)	200	300	300	375	375	375	375	375	700	700
height (mm)	200	300	300	375	375	375	375	375	700	700
length (m)	89.2	91.4	45.7	24.4	48.4	101.1	102.7	4.7	6.9	91.9
grad (%)	0.629	0.044	0.194	0.800	0.826	0.741	0.697	0.529	0.189	0.186
us inv (m AD)	110.841	110.280	110.149	110.057	109.701	109.243	108.487	107.738	107.423	107.407
ds inv (m AD)	110.280	110.240	110.060	109.862	109.301	108.494	107.771	107.713	107.410	107.236
surc	0.29	0.20	0.18	0.15	0.15	0.16	0.16	0.29	0.57	0.65
DS flow (l/s)	0.33	1.55	2.64	7.17	7.17	7.17	7.71	7.70	231.02	231.01

Node	-	-	-	-	-	-	-	-	CN4170	-	-
ground (m AD)	-	113.558	112.440	112.222	112.102	112.284	111.128	111.965	111.827	111.772	-
level (m AD)	-	110.339	110.203	110.115	109.758	109.302	108.548	107.826	107.823	107.811	-
expr:Freeboard	-	3.219070	2.237639	2.107410	2.343577	2.981712	2.579671	4.139003	4.004040	3.960597	-

RVA

1543-1551 The Queensway
Sanitary Sewer Capacity
Assessment

Figure 8
Pre-Development Condition - DWF HGL Profile
From the discharge location on The Queensway
to the Mendota Trunk Sewer



Legend

- Sanitary Manhole
- Sanitary Sewer
- Trunk Sewer
- Site Location
- Sanitary Sewer (Study Area)

Sanitary Manhole (Study Area)

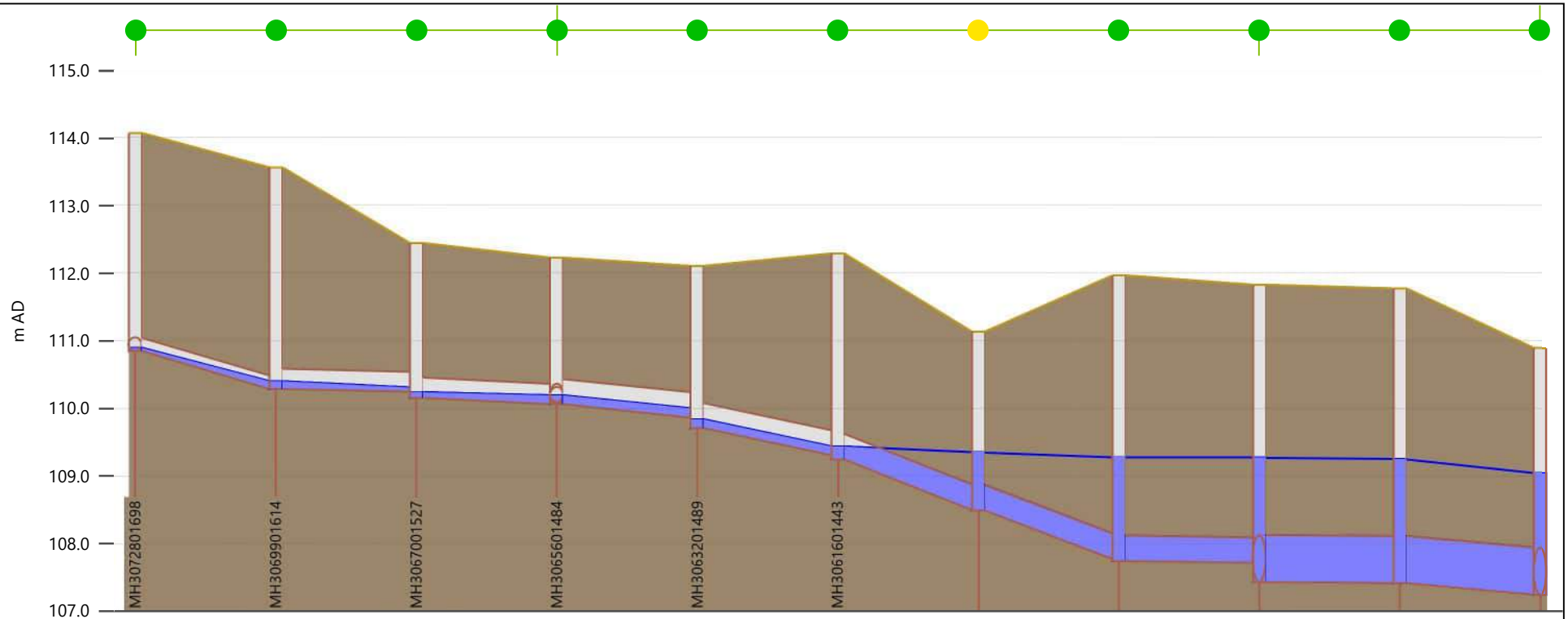
- HGL<=1.8m Below the Ground Elevation
- HGL>=1.8m Below the Ground Elevation

RVA

1543-1551 The Queensway
Sanitary Capacity Analysis

Figure 9
Pre-Development Condition
WWF Results

0 0.075 0.15
Kilometers



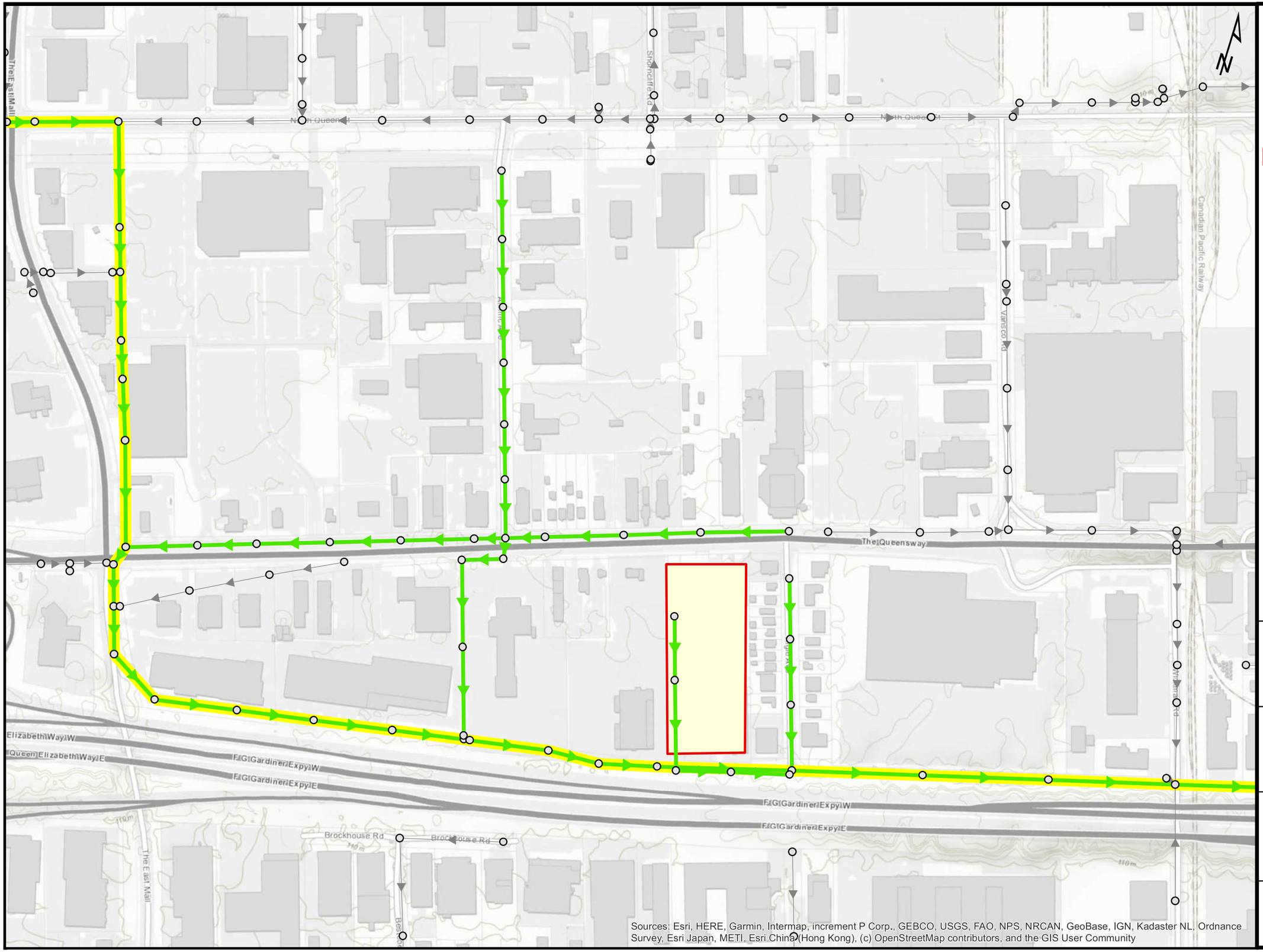
Link	-	-	-	-	-	-	-	-	CN4170.1	-
US node ID	MH3072801698	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513
ds node	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513	MH3043401603
width (mm)	200	300	300	375	375	375	375	375	700	700
height (mm)	200	300	300	375	375	375	375	375	700	700
length (m)	89.2	91.4	45.7	24.4	48.4	101.1	102.7	4.7	6.9	91.9
grad (%)	0.629	0.044	0.194	0.800	0.826	0.741	0.697	0.529	0.189	0.186
us inv (m AD)	110.841	110.280	110.149	110.057	109.701	109.243	108.487	107.738	107.423	107.407
ds inv (m AD)	110.280	110.240	110.060	109.862	109.301	108.494	107.771	107.713	107.410	107.236
surc	0.57	0.38	0.44	0.36	0.36	1.00	1.00	1.00	2.00	2.00
DS flow (l/s)	3.02	6.78	8.05	43.12	43.17	43.01	44.76	44.74	431.24	431.46

Node	-	-	-	-	-	-	-	-	CN4170	-	-
ground (m AD)	-	113.558	112.440	112.222	112.102	112.284	111.128	111.965	111.827	111.772	-
level (m AD)	-	110.394	110.239	110.193	109.836	109.431	109.346	109.276	109.272	109.247	-
expr:Freeboard	-	3.163422	2.201498	2.028942	2.265772	2.852287	1.782056	2.689456	2.555447	2.524486	-

RVA

1543-1551 The Queensway
Sanitary Sewer Capacity
Assessment

Figure 10
Pre-Development Condition - WWF HGL Profile
From the discharge location on The Queensway
to the Mendota Trunk Sewer



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Sanitary Manhole
- Sanitary Sewer
- Trunk Sewer
- Site Location

Sanitary Sewer (Study Area)

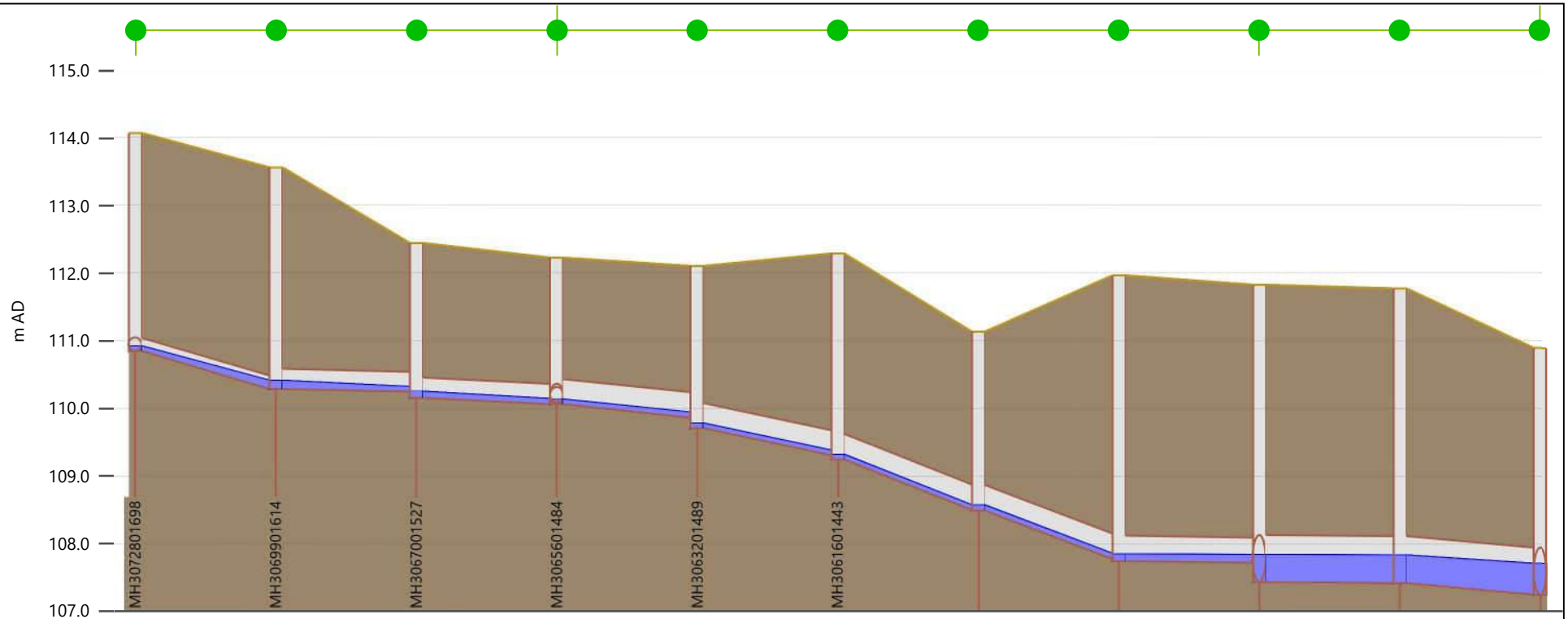
- No Surcharge
- Surcharge State = 1 (Backup)
- Surcharge State = 2 (Bottleneck)

RVA

1543-1551 The Queensway
Sanitary Capacity Analysis

Figure 11
Post-Development Condition
DWF Results

0 0.075 0.15
Kilometers



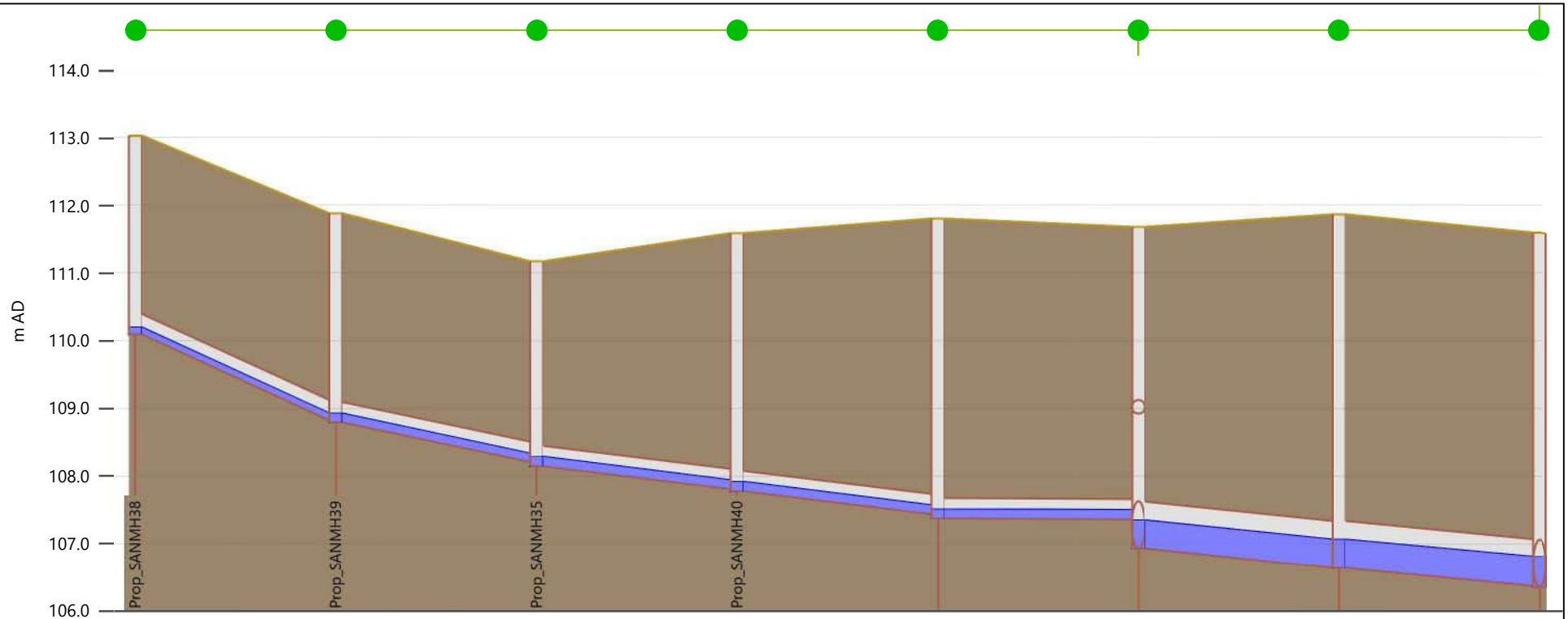
Link	-	-	-	-	-	-	-	-	CN4170.1	-
US node ID	MH3072801698	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513
ds node	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513	MH3043401603
width (mm)	200	300	300	375	375	375	375	375	700	700
height (mm)	200	300	300	375	375	375	375	375	700	700
length (m)	89.2	91.4	45.7	24.4	48.4	101.1	102.7	4.7	6.9	91.9
grad (%)	0.629	0.044	0.194	0.800	0.826	0.741	0.697	0.529	0.189	0.186
us inv (m AD)	110.841	110.280	110.149	110.057	109.701	109.243	108.487	107.738	107.423	107.407
ds inv (m AD)	110.280	110.240	110.060	109.862	109.301	108.494	107.771	107.713	107.410	107.236
surc	0.63	0.42	0.33	0.19	0.19	0.19	0.20	0.32	0.59	0.67
DS flow (l/s)	7.17	8.39	9.48	11.10	11.10	11.10	11.64	11.64	237.89	237.87

Node	-	-	-	-	-	-	-	-	CN4170	-	-
ground (m AD)	-	113.558	112.440	112.222	112.102	112.284	111.128	111.965	111.827	111.772	-
level (m AD)	-	110.406	110.246	110.127	109.771	109.315	108.561	107.838	107.832	107.821	-
expr:Freeboard	-	3.151138	2.194014	2.094982	2.331263	2.969017	2.567121	4.127613	3.994618	3.951137	-

RVA

1543-1551 The Queensway
Sanitary Sewer Capacity
Assessment

Figure 12
Post-Development Condition - DWF HGL Profile
From the discharge location on The Queensway
to the Mendota Trunk Sewer



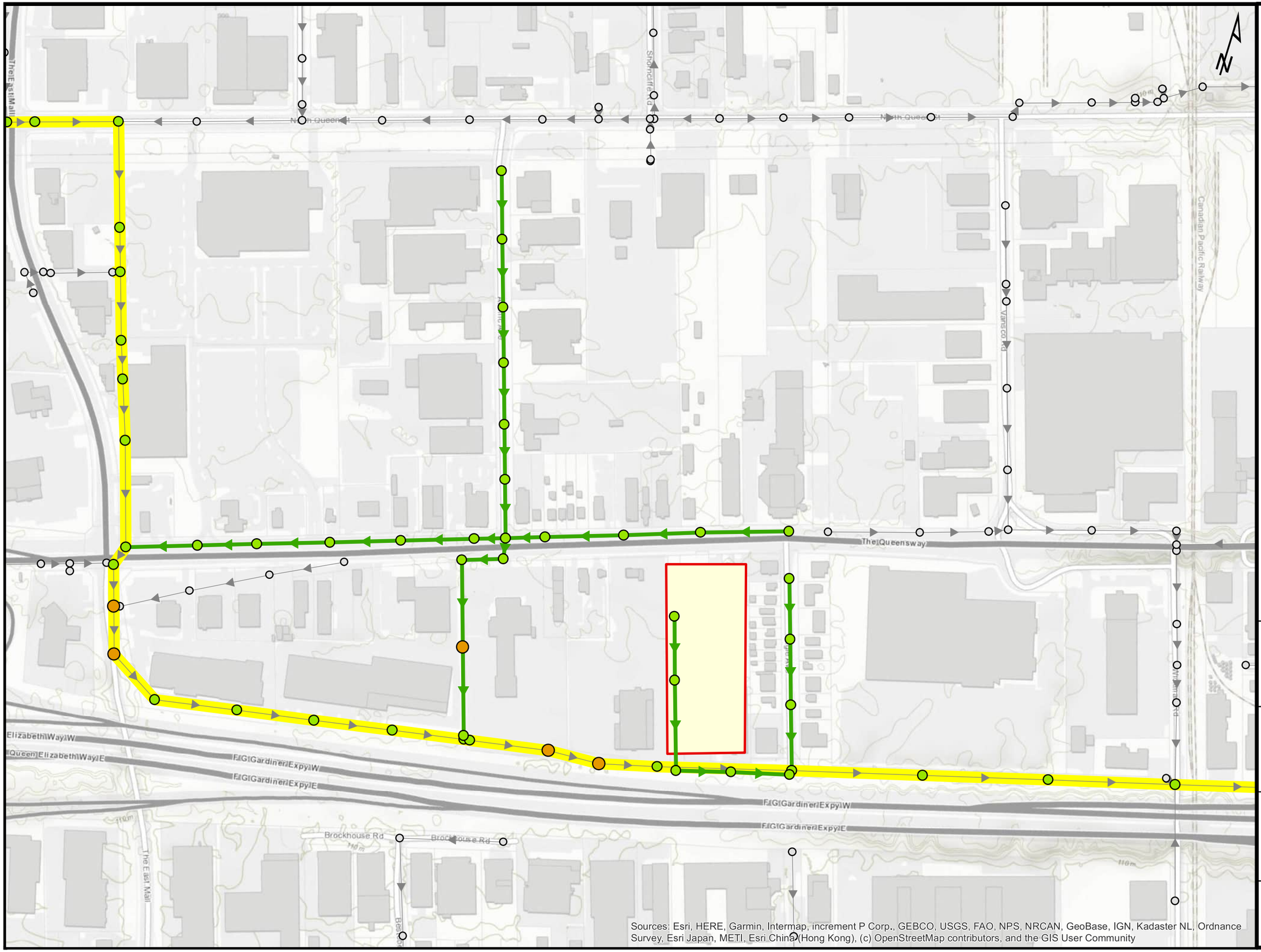
Link	Prop_SANMH38.1	Prop_SANMH39.1	Prop_SANMH35.1	Prop_SANMH40.1	Prop_SANMH36.1	MH3049501880.1	MH3053402028.1
US node ID	Prop_SANMH38	Prop_SANMH39	Prop_SANMH35	Prop_SANMH40	Prop_SANMH36	MH3049501880	MH3053402028
ds node	Prop_SANMH39	Prop_SANMH35	Prop_SANMH40	Prop_SANMH36	MH3049501880	MH3053402028	MH3057102169
width (mm)	300	300	300	300	300	700	700
height (mm)	300	300	300	300	300	700	700
length (m)	63.7	89.9	67.9	68.0	2.3	152.2	145.9
grad (%)	1.994	0.656	0.501	0.500	0.513	0.189	0.181
us inv (m AD)	110.090	108.790	108.140	107.770	107.370	106.920	106.630
ds inv (m AD)	108.820	108.200	107.800	107.430	107.358	106.632	106.366
surc	0.33	0.43	0.46	0.46	0.45	0.61	0.62
DS flow (l/s)	29.26	29.26	29.26	29.26	29.26	267.39	267.38

Node	-	Prop_SANMH39	Prop_SANMH35	Prop_SANMH40	Prop_SANMH36	MH3049501880	MH3053402028	-
ground (m AD)	113.030	111.880	111.170	111.590	111.800	111.678	111.863	111.594
level (m AD)	110.189	108.919	108.279	107.909	107.504	107.341	107.057	106.801
expr:Freeboard	2.840905	2.961268	2.891321	3.681263	4.296170	4.337046	4.805924	4.792516

RVA

1543-1551 The Queensway
Sanitary Sewer Capacity
Assessment

Figure 13
Post-Development Condition - DWF HGL Profile
From the discharge location on proposed sewer
to the Mendota Trunk Sewer



Legend

- Sanitary Manhole
- Sanitary Sewer
- Trunk Sewer
- Site Location
- Sanitary Sewer (Study Area)

Sanitary Manhole (Study Area)

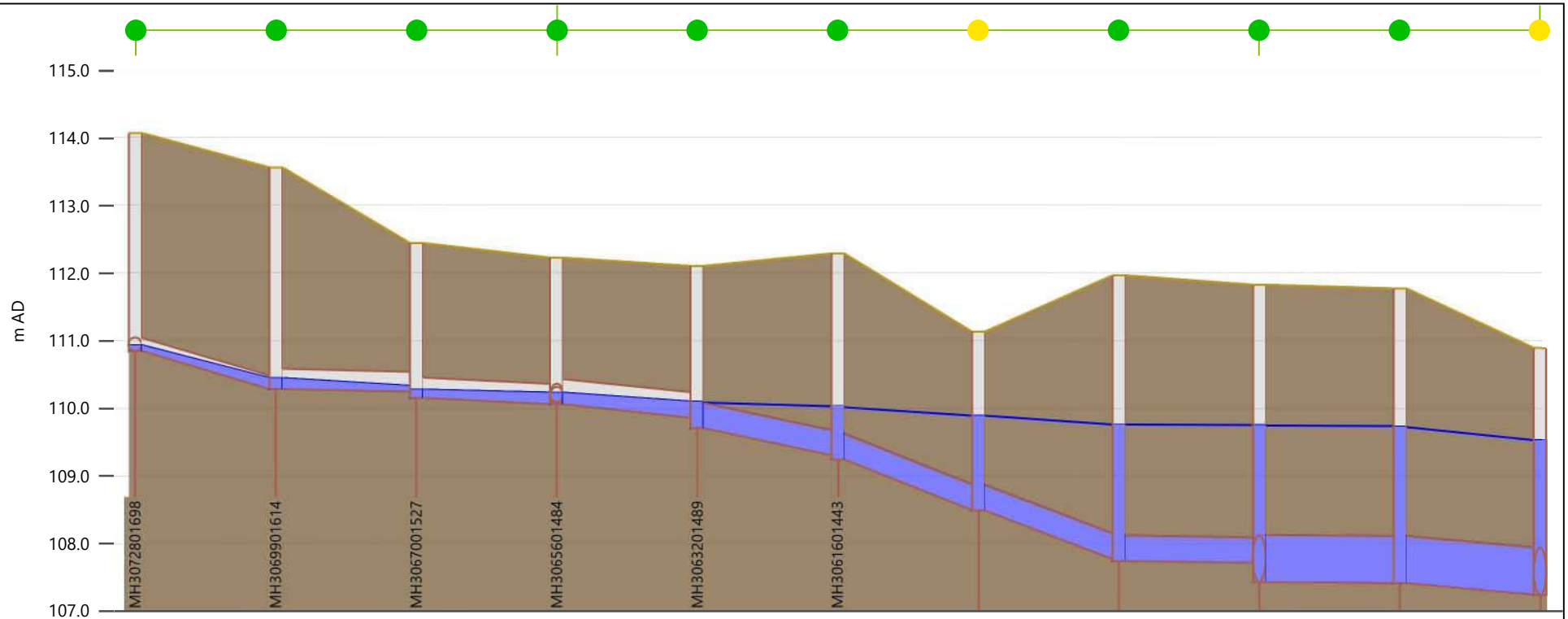
- HGL<=1.8m Below the Ground Elevation
- HGL>=1.8m Below the Ground Elevation

RVA

1543-1551 The Queensway Sanitary Capacity Analysis

Figure 14 Post-Development Condition WWF Results

0 0.075 0.15 Kilometers



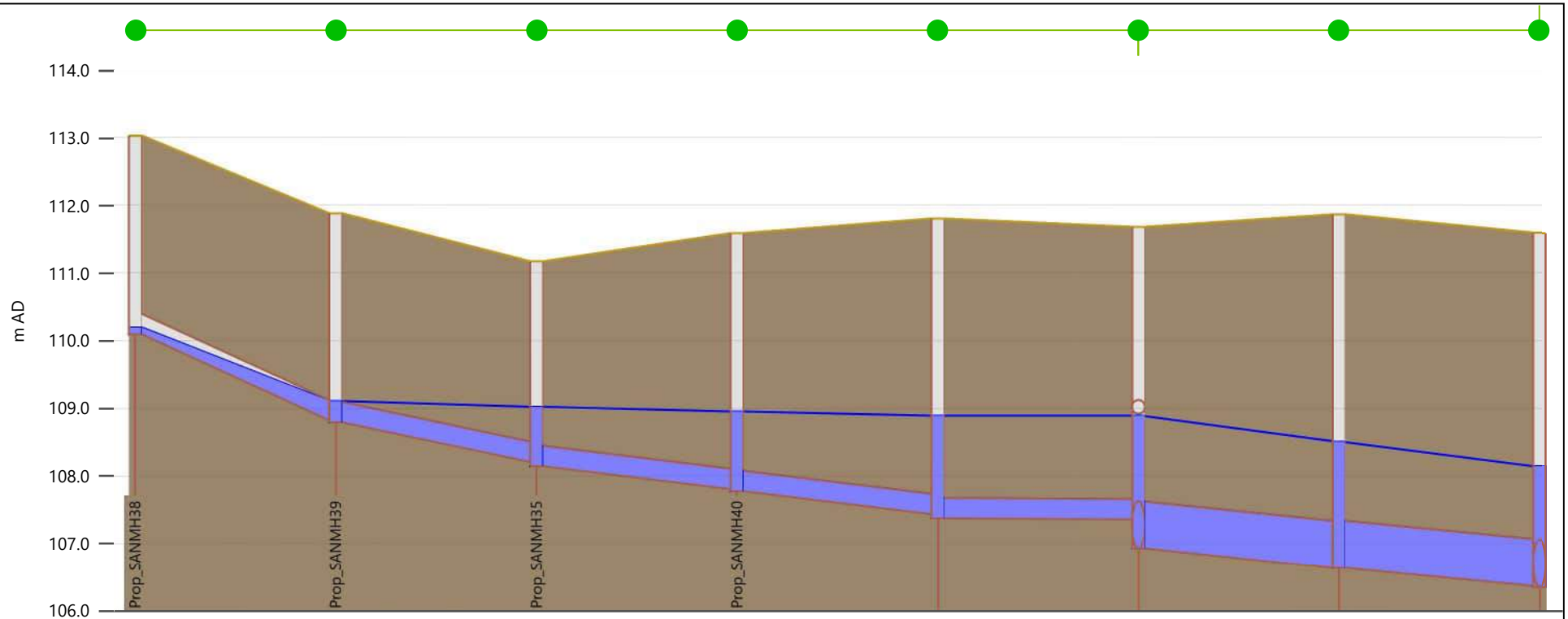
Link	-	-	-	-	-	-	-	-	CN4170.1	-
US node ID	MH3072801698	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513
ds node	MH3069901614	MH3067001527	MH3065601484	MH3063201489	MH3061601443	MH3052001473	MH3042201504	CN4170	MH3041901513	MH3043401603
width (mm)	200	300	300	375	375	375	375	375	700	700
height (mm)	200	300	300	375	375	375	375	375	700	700
length (m)	89.2	91.4	45.7	24.4	48.4	101.1	102.7	4.7	6.9	91.9
grad (%)	0.629	0.044	0.194	0.800	0.826	0.741	0.697	0.529	0.189	0.186
us inv (m AD)	110.841	110.280	110.149	110.057	109.701	109.243	108.487	107.738	107.423	107.407
ds inv (m AD)	110.280	110.240	110.060	109.862	109.301	108.494	107.771	107.713	107.410	107.236
surc	0.80	0.53	0.55	0.62	1.00	1.00	1.00	1.00	2.00	2.00
DS flow (l/s)	9.80	13.57	14.84	59.88	59.50	59.43	60.94	60.85	428.51	428.97

Node	-	-	-	-	-	-	-	-	CN4170	-	-
ground (m AD)	-	113.558	112.440	112.222	112.102	112.284	111.128	111.965	111.827	111.772	-
level (m AD)	-	110.440	110.273	110.225	110.094	110.024	109.890	109.761	109.754	109.730	-
expr:Freeboard	-	3.117172	2.167669	1.997051	2.007914	2.259109	1.238401	2.203967	2.073422	2.041492	-

RVA

1543-1551 The Queensway
Sanitary Sewer Capacity
Assessment

Figure 15
Post-Development Condition - WWF HGL Profile
From the discharge location on The Queensway
to the Mendota Trunk Sewer



Link	Prop_SANMH38.1	Prop_SANMH39.1	Prop_SANMH35.1	Prop_SANMH40.1	Prop_SANMH36.1	MH3049501880.1	MH3053402028.1
US node ID	Prop_SANMH38	Prop_SANMH39	Prop_SANMH35	Prop_SANMH40	Prop_SANMH36	MH3049501880	MH3053402028
ds node	Prop_SANMH39	Prop_SANMH35	Prop_SANMH40	Prop_SANMH36	MH3049501880	MH3053402028	MH3057102169
width (mm)	300	300	300	300	300	700	700
height (mm)	300	300	300	300	300	700	700
length (m)	63.7	89.9	67.9	68.0	2.3	152.2	145.9
grad (%)	1.994	0.656	0.501	0.500	0.513	0.189	0.181
us inv (m AD)	110.090	108.790	108.140	107.770	107.370	106.920	106.630
ds inv (m AD)	108.820	108.200	107.800	107.430	107.358	106.632	106.366
surc	0.94	1.00	1.00	1.00	1.00	2.00	2.00
DS flow (l/s)	29.01	30.72	31.30	32.62	32.99	463.05	463.72

Node	-	Prop_SANMH39	Prop_SANMH35	Prop_SANMH40	Prop_SANMH36	MH3049501880	MH3053402028	-
ground (m AD)	113.030	111.880	111.170	111.590	111.800	111.678	111.863	111.594
level (m AD)	110.188	109.102	109.018	108.954	108.891	108.888	108.507	108.143
expr:Freeboard	2.841729	2.778079	2.152384	2.635792	2.909192	2.790057	3.356110	3.450704

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1543-1551 The Queensway
Sanitary Sewer Capacity
Assessment

Figure 16
Post-Development Condition - WWF HGL Profile
From the discharge location on proposed sewer
to the Mendota Trunk Sewer

APPENDIX D

STORM SERVICING ANALYSIS

LEGEND

- STM1 — 41m² | 0.5 — PLAN ID / RUNOFF COEFFICIENT / AREA
- EXISTING SITE PROPERTY LINE (PRIOR TO 1.25m THE QUEENSWAY CONVEYANCE) (TOTAL SITE AREA=21,536 m²)
- PROPOSED SITE PROPERTY LINE (TOTAL SITE AREA=21,441 m²)
- EXISTING MUNICIPAL STORM SYSTEM
- EXISTING MAJOR OVERLAND FLOW ROUTE

ALGIE AVENUE

THE QUEENSWAY

FORDHOUSE BOULEVARD

GARDINER EXPRESSWAY

AUKLAND ROAD

ASSUMED EX. CATCHBASIN LEAD ALIGNMENT

STM QWAY #1 — 43m² | 0.90

STM QWAY #2 — 486m² | 0.75

STM QWAY #3 — 943m² | 0.90

STM WIDENING — 95m² | 0.90

STM FORD #1 — 19,969 m² | 0.90

STM EXTRNL #1 — 2,985m² | 0.88

STM EXTRNL #2 — 321m² | 0.90

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TABLE D1 - EXISTING SITE CHARACTERISTICS

	Area (m2)	Area (ha)	% Area of Catchment	Runoff Coefficient	Percent Impervious	Q2 (L/s)	Q100 (L/s)	Predev 'Allowable' Peak Rate @ C=0.50 & i=88.2mm/hr by Outlet (L/s)
STM WIDENING	95	0.01	0.4%	0.90	100.0%	2.1	5.9	
STM QWAY #1	43	0.00	0.2%	0.90	100.0%	0.9	2.7	
STM QWAY #2	486	0.05	2.3%	0.90	100.0%	10.7	30.4	
STM QWAY #3	943	0.09	4.4%	0.75	76.9%	17.3	49.2	
Total Site to The Queensway	*1567*	*0.16*	*7.3%*	*0.76*	*77.7%*	*29.0*	*82.3*	19.2
Total Site to The Queensway (After Widening)	*1472*	*0.15*	*6.8%*	*0.76*	*77.7%*	*27.3*	*77.3*	18.0
STM FORD #1	19969	2.00	92.7%	0.90	100.0%	440.7	1250.6	
Total Site to Fordhouse Boulevard	*19969*	*2.00*	*92.7%*	*0.90*	*100.0%*	*440.7*	*1250.6*	244.8
Site Total	**21536**	**2.15**	**100%**	**0.89**	**98.4%**	**469.7**	**1332.9**	**264.0**
STM EXTRNL #1	2985	0.30	90.3%	0.90	100.0%	65.9	186.9	
STM EXTRNL #2	321	0.03	9.7%	0.90	100.0%	7.1	20.1	
Total to Fordhouse (External)	*3306*	*0.33*	*100.0%*	*0.90*	*100.0%*	*73.0*	*207.0*	**207.0**
Site + External Total	**24842**	**2.48**	**100%**	**0.89**	**98.6%**	**542.6**	**1539.9**	**471.1**

100.00 The proposed stormwater management system for the site will capture and convey external drainage from the adjacent properties in a similar manner to the existing conditions. The external area peak flows will be conveyed through the site at their existing peak flow rates for a given storm, as "pass through" flows, and not at the allowable release rate for the given area.

LEGEND

STM1 — 41m² | 0.5
PLAN ID
RUNOFF COEFFICIENT
AREA

EXISTING SITE PROPERTY LINE (PRIOR TO 1.25m THE QUEENSWAY CONVEYANCE) (TOTAL SITE AREA=21,536 m²)

PROPOSED SITE PROPERTY LINE (TOTAL SITE AREA=21,441 m²)

EXISTING MUNICIPAL STORM SYSTEM

PROPOSED MAJOR OVERLAND FLOW ROUTE

ALGIE AVENUE

THE QUEENSWAY

FORDHOUSE BOULEVARD

GARDINER EXPRESSWAY

STM STRT A — 369m² | 0.85

STM EXTRNL #1 — 2,985m² | 0.90

STM STRT B — 427m² | 0.85

STM PARK — 1,321m² | 0.50

STM BLDG A — 3430m² | 0.80

STM BLDG B — 4,487m² | 0.80

STM BLDG C — 4,300m² | 0.80

STM BLDG D — 2,597m² | 0.80

STM WIDENING — 95m² | 0.90

STM STRT C (NORTH) — 1,253m² | 0.85

STM STRT C (SOUTH) — 3,257m² | 0.85

STM EXTRNL #2 — 321m² | 0.90

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R.V. ANDERSON ASSOCIATES LIMITED
Innovative solutions for complex challenges

1543-1551 THE QUEENSWAY
CITY OF TORONTO
226401

POST-DEVELOPMENT DRAINAGE
NTS

D-2

TABLE D2 - PROPOSED SITE CHARACTERISTICS

	Area (m2)	Area (ha)	% Area of Postdev Site	Runoff Coefficient	Percent Impervious	Q2 (L/s) Uncontrolled	Q100 (L/s) Uncontrolled
BLDG A	3430	0.34	16.0%	0.80	84.6%	67.3	190.9
BLDG B	4487	0.45	20.9%	0.80	84.6%	88.0	249.8
BDLG C	4300	0.43	20.1%	0.80	84.6%	84.3	239.4
BLDG D	2597	0.26	12.1%	0.80	84.6%	50.9	144.6
Total Private Blocks	*14814*	*1.48*	*69.1%*	*0.80*	*84.6%*	*290.6*	*824.6*
STRT A	369	0.04	1.7%	0.85	92.3%	7.7	21.8
STRT B	427	0.04	2.0%	0.85	92.3%	8.9	25.3
STRT C (NORTH)	1253	0.13	5.8%	0.85	92.3%	26.1	74.1
STRT C (SOUTH)	3257	0.33	15.2%	0.85	92.3%	67.9	192.6
Total Public ROWs	*5306*	*0.53*	24.7%	*0.85*	*92.3%*	*110.6*	*313.8*
PARK	1321	0.13	6.2%	0.50	38.5%	16.2	46.0
Total Park Space	*1321*	*0.13*	6.2%	*0.50*	*38.5%*	*16.2*	*46.0*
Site Total	**21441**	**2.14**	**100.0%**	**0.79**	**83.7%**	**417.37**	**1184.43**
STM WIDENING	95	0.01	100.0%	0.90	100.0%	2.1	5.9
Total to Fordhouse (External)	*95*	*0.01*	*100.0%*	*0.90*	*100.0%*	*2.1*	*5.9*
STM EXTRNL #1	2985	0.30	90.3%	0.90	100.0%	65.9	186.9
STM EXTRNL #2	321	0.03	9.7%	0.90	100.0%	7.1	20.1
Total to Fordhouse (External)	*3306*	*0.33*	100.0%	*0.90*	*100.0%*	*73.0*	*207.0*
Site + External Total	**24842**	**2.48**	**100%**	**0.80**	**85.4%**	**490.3**	**1391.5**

TABLE D3.1 - WATER QUANTITY CALCULATIONS

Building A Gravity Tank

Rating Cuve

Orifice Size =	100.00	mm
Coefficient =	0.82	Tube
Area Provided =	65	m2

Tank D (m)	Orifice Head (m)	**Discharge (m^3/s)**	**Storage (ha-m)**
0	0	0.0000	0.0000
0.75	0.70	0.0239	0.0046
1.25	1.20	0.0312	0.0078
1.50	1.45	0.0344	0.0094
1.80	1.75	0.0377	0.0114
2.70	2.65	0.0464	0.0172

Building B Gravity Tank

Rating Cuve

Orifice Size =	100.00	mm
Coefficient =	0.82	Tube
Area Provided =	75	m2

Tank D (m)	Orifice Head (m)	**Discharge (m^3/s)**	**Storage (ha-m)**
0	0	0.0000	0.0000
0.50	0.45	0.0191	0.0034
1.00	0.95	0.0278	0.0071
1.50	1.45	0.0344	0.0109
2.00	1.95	0.0398	0.0146
2.70	2.65	0.0464	0.0199

Building C Gravity Tank

Rating Cuve

Orifice Size =	100.00	mm
Coefficient =	0.82	Tube
Area Provided =	75	m2

Tank D (m)	Orifice Head (m)	**Discharge (m^3/s)**	**Storage (ha-m)**
0	0	0.0000	0.0000
0.50	0.45	0.0191	0.0034
1.00	0.95	0.0278	0.0071
1.50	1.45	0.0344	0.0109
2.00	1.95	0.0398	0.0146
2.70	2.65	0.0464	0.0199

Building D Gravity Tank

Rating Cuve

Orifice Size =	100.00	mm
Coefficient =	0.63	Plate
Area Provided =	50	m2

Tank D (m)	Orifice Head (m)	**Discharge (m^3/s)**	**Storage (ha-m)**
0	0	0.0000	0.0000
0.75	0.70	0.0183	0.0035
1.50	1.45	0.0264	0.0073
2.25	2.20	0.0325	0.0110
2.50	2.45	0.0343	0.0123
2.70	2.65	0.0357	0.0133

Park Gravity Tank

Rating Cuve

Orifice Size =	80.00	mm
Coefficient =	0.63	Plate
Area Provided =	65	m2

Tank D (m)	Orifice Head (m)	**Discharge (m^3/s)**	**Storage (ha-m)**
0	0	0.0000	0.0000
0.20	0.15	0.0054	0.0010
0.40	0.35	0.0083	0.0023
0.60	0.55	0.0104	0.0036
0.80	0.75	0.0121	0.0049
1.00	0.95	0.0137	0.0062

Road A, B, C

Orifice Control Rating Curve

Orifice Size =	251.46	mm
Coefficient =	0.82	tube
Superpipe Dia =	1524	mm
Superpipe Length =	186	m

Elevation (m)	Head (m)	**Discharge (m^3/s)**	**Storage (ha-m)**
0.00	0.00	0.0000	0.0000
0.30	0.30	0.0996	0.0068
0.61	0.61	0.1408	0.0136
0.91	0.91	0.1725	0.0204
1.22	1.22	0.1992	0.0271
1.52	1.52	0.2227	0.0339

Interim Street C

Rating Cuve

Orifice Size =	90.00	mm
Coefficient =	0.63	Plate
Area Provided =	280	m2

Tank D (m)	Orifice Head (m)	**Discharge (m^3/s)**	**Storage (ha-m)**
0	0	0.0000	0.0000
0.11	0.11	0.0059	0.0031
0.65	0.65	0.0143	0.0182
0.80	0.80	0.0159	0.0224
1.00	1.00	0.0178	0.0280

TABLE D3.2 - STORAGE SITE CHARACTERISTICS

	Area (m2)	Area (ha)	Runoff Coefficient	100-Year Peak Rate (V0 Output)	Storage Volume Required (V0 Output) (m3)	Storage Volume Provided (m3)
BLDG A	3430	0.34	0.80	42.0	141.0	172.0
BLDG B	4487	0.45	0.80	45.0	189.0	199.0
BLDG C	4300	0.43	0.80	44.0	180.0	199.0
BLDG D	2597	0.26	0.80	32.0	107.0	133.0
Total Private Blocks	*14814*	*1.48*	*0.80*	*163.0*	*617.0*	*703.0*
STRT A	369	0.04	0.85	(See Total Public ROWs)		
STRT B	427	0.04	0.85	(See Total Public ROWs)		
STRT C	1253	0.13	0.85	(See Total Public ROWs)		
Total Public ROWs	*5306*	*0.53*	*0.85*	*194.0*	*260.0*	*339.0*
PARK	1321	0.13	0.50	12.0	45.0	62.0
Total Park Space	*1321*	*0.13*	*0.50*	*12.0*	*45.0*	*62.0*
Site Total	**21441**	**2.14**	**0.79**	**369.0**	**922.00**	**1104.00**

TABLE D3.3 - PEAK DISCHARGE SITE CHARACTERISTICS

	Area (m2)	Area (ha)	Runoff Coefficient	'Allowable' Peak Rate @ C=0.50 & i=88.2mm/hr (L/s)	100-Year Peak Rate (V0 Output)
BLDG A	3430	0.34	0.80	42.1	42.0
BLDG B	4487	0.45	0.80	55.0	45.0
BLDG C	4300	0.43	0.80	52.7	44.0
BLDG D	2597	0.26	0.80	31.8	32.0
Total Private Blocks	*14814*	*1.48*	*0.80*	*181.6*	*163.0*
PRIVATE BLOCKS	14814	1.48	(Upstream of STREET A, B, C System)		
PARK	1321	0.13	0.50	16.2	12.0
STREET A, B, C	5306	0.53	0.85	65.1	194.0
Total Fordhouse Outlet	*21441*	*2.14*	*0.79*	*244.8*	*206.0*

100 Refer to Table D1 for allowable discharge to Fordhouse storm outlet

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO
6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\12e563bb-4ce5-4512-8d12-5597c157ba3f\sc
  Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\12e563bb-4ce5-4512-8d12-5597c157ba3f\sc


DATE: 11-12-2024                          TIME: 01:00:33

USER:



COMMENTS: _____________________________________________________________


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  ********************************************
  ** SIMULATION : #1 - Toronto 6-hr (2-Year)    **
  ********************************************

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| CHICAGO STORM    |    IDF curve parameters: A= 531.391
| Ptotal= 32.33 mm |                          B=   0.000
--------------------                          C=   0.780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.38

                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                 0.00    1.24 |  1.50    3.18 |  3.00    3.75 |  4.50
1.69
                 0.17    1.32 |  1.67    4.03 |  3.17    3.26 |  4.67
1.61
                 0.33    1.42 |  1.83    5.67 |  3.33    2.89 |  4.83
1.53
                 0.50    1.53 |  2.00   10.99 |  3.50    2.61 |  5.00
1.46
                 0.67    1.66 |  2.17   88.19 |  3.67    2.38 |  5.17
1.40
                 0.83    1.82 |  2.33   12.86 |  3.83    2.20 |  5.33
1.34
                 1.00    2.03 |  2.50    7.53 |  4.00    2.04 |  5.50
1.29
                 1.17    2.29 |  2.67    5.53 |  4.17    1.91 |  5.67
1.24
                 1.33    2.66 |  2.83    4.44 |  4.33    1.79 |  5.83
1.19


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--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------

                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=          0.29          0.05
     Dep. Storage     (mm)=          1.00          5.00
     Average Slope     (%)=          1.00          2.00
     Length            (m)=         47.82         40.00
     Mannings n           =         0.013         0.250

     Max.Eff.Inten.(mm/hr)=         88.19         52.84
               over (min)           10.00         20.00
     Storage Coeff.  (min)=          1.73 (ii)    10.83 (ii)
     Unit Hyd. Tpeak (min)=         10.00         20.00
     Unit Hyd. peak  (cms)=          0.17          0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=          0.07          0.00          0.073 (iii)
     TIME TO PEAK    (hrs)=          2.33          2.50           2.33
     RUNOFF VOLUME    (mm)=         31.33         18.35          29.32
     TOTAL RAINFALL   (mm)=         32.33         32.33          32.33
     RUNOFF COEFFICIENT   =          0.97          0.57           0.91

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
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(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0006)| IN= 2---> OUT= 1 | DT= 10.0 min		OVERFLOW IS OFF			
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0344	0.0094	
	0.0239	0.0046	0.0377	0.0114	
	0.0312	0.0078	0.0464	0.0172	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0001)	0.343	0.073	2.33	29.32
OUTFLOW: ID= 1 (0006)	0.343	0.022	2.50	29.20

PEAK FLOW REDUCTION [Qout/Qin](%)= 29.87
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0044

CALIB STANDHYD (0002) | ID= 1 DT=10.0 min |	Area (ha)= 0.45	Total Imp(%)= 84.60	Dir. Conn.(%)= 84.60	
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.38	0.07		
Dep. Storage (mm)=	1.00	5.00		
Average Slope (%)=	1.00	2.00		
Length (m)=	54.69	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	88.19	52.84		
over (min)	10.00	20.00		
Storage Coeff. (min)=	1.87 (ii)	10.98 (ii)		
Unit Hyd. Tpeak (min)=	10.00	20.00		
Unit Hyd. peak (cms)=	0.17	0.08		
			TOTALS	
PEAK FLOW (cms)=	0.09	0.01	0.095 (iii)	
TIME TO PEAK (hrs)=	2.33	2.50	2.33	
RUNOFF VOLUME (mm)=	31.33	18.35	29.32	
TOTAL RAINFALL (mm)=	32.33	32.33	32.33	
RUNOFF COEFFICIENT =	0.97	0.57	0.91	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 95.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0007)| IN= 2---> OUT= 1 | DT= 10.0 min		OVERFLOW IS OFF			
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0344	0.0109	
	0.0191	0.0034	0.0398	0.0146	
	0.0278	0.0071	0.0464	0.0199	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	0.449	0.095	2.33	29.32
OUTFLOW: ID= 1 (0007)	0.449	0.024	2.50	29.26

PEAK FLOW REDUCTION [Qout/Qin](%)= 25.28
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0056

CALIB STANDHYD (0003) | ID= 1 DT=10.0 min |	Area (ha)= 0.43	Total Imp(%)= 84.60	Dir. Conn.(%)= 84.60	
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.36	0.07		
Dep. Storage (mm)=	1.00	5.00		
Average Slope (%)=	1.00	2.00		
Length (m)=	53.54	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	88.19	52.84		
over (min)	10.00	20.00		
Storage Coeff. (min)=	1.85 (ii)	10.96 (ii)		
Unit Hyd. Tpeak (min)=	10.00	20.00		
Unit Hyd. peak (cms)=	0.17	0.08		
			TOTALS	
PEAK FLOW (cms)=	0.09	0.00	0.091 (iii)	
TIME TO PEAK (hrs)=	2.33	2.50	2.33	
RUNOFF VOLUME (mm)=	31.33	18.35	29.32	
TOTAL RAINFALL (mm)=	32.33	32.33	32.33	
RUNOFF COEFFICIENT =	0.97	0.57	0.91	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 95.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0008)| IN= 2---> OUT= 1 | DT= 10.0 min		OVERFLOW IS OFF			
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0344	0.0109	
	0.0191	0.0034	0.0398	0.0146	
	0.0278	0.0071	0.0464	0.0199	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0003)	0.430	0.091	2.33	29.32
OUTFLOW: ID= 1 (0008)	0.430	0.023	2.50	29.26

PEAK FLOW REDUCTION [Qout/Qin](%)= 25.75
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0054

CALIB | STANDHYD (0004)| ID= 1 DT=10.0 min |	Area (ha)= 0.26	Total Imp(%)= 84.60	Dir. Conn.(%)= 84.60	
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.22	0.04		
Dep. Storage (mm)=	1.00	5.00		
Average Slope (%)=	1.00	2.00		
Length (m)=	41.61	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	88.19	52.84		
over (min)	10.00	20.00		
Storage Coeff. (min)=	1.59 (ii)	10.70 (ii)		
Unit Hyd. Tpeak (min)=	10.00	20.00		
Unit Hyd. peak (cms)=	0.17	0.08		
			TOTALS	
PEAK FLOW (cms)=	0.05	0.00	0.055 (iii)	
TIME TO PEAK (hrs)=	2.33	2.50	2.33	
RUNOFF VOLUME (mm)=	31.33	18.35	29.30	
TOTAL RAINFALL (mm)=	32.33	32.33	32.33	
RUNOFF COEFFICIENT =	0.97	0.57	0.91	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 95.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0009)| IN= 2---> OUT= 1 | DT= 10.0 min		OVERFLOW IS OFF			
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0325	0.0110	
	0.0183	0.0035	0.0343	0.0123	
	0.0264	0.0073	0.0357	0.0133	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0004)	0.260	0.055	2.33	29.30
OUTFLOW: ID= 1 (0009)	0.260	0.017	2.50	29.15

PEAK FLOW REDUCTION [Qout/Qin](%)= 29.98
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0033

CALIB | STANDHYD (0012)| ID= 1 DT=10.0 min |	Area (ha)= 0.53	Total Imp(%)= 92.00	Dir. Conn.(%)= 92.00	
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.49	0.04		
Dep. Storage (mm)=	1.00	5.00		
Average Slope (%)=	1.00	2.00		
Length (m)=	59.48	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	88.19	21.67		
over (min)	10.00	20.00		
Storage Coeff. (min)=	1.97 (ii)	14.98 (ii)		
Unit Hyd. Tpeak (min)=	10.00	20.00		
Unit Hyd. peak (cms)=	0.17	0.07		
			TOTALS	
PEAK FLOW (cms)=	0.12	0.00	0.120 (iii)	
TIME TO PEAK (hrs)=	2.33	2.50	2.33	
RUNOFF VOLUME (mm)=	31.33	13.45	29.88	
TOTAL RAINFALL (mm)=	32.33	32.33	32.33	
RUNOFF COEFFICIENT =	0.97	0.42	0.92	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 90.0 Ia = Dep. Storage (Above)

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      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.53   0.120     2.33    29.88
     + ID2= 2 (  0006):     0.34   0.022     2.50    29.20
       ================================================
       ID = 3 (  0011):     0.87   0.133     2.33    29.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0011):     0.87   0.133     2.33    29.61
     + ID2= 2 (  0007):     0.45   0.024     2.50    29.26
       ================================================
       ID = 1 (  0011):     1.32   0.152     2.33    29.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0011):     1.32   0.152     2.33    29.49
     + ID2= 2 (  0008):     0.43   0.023     2.50    29.26
       ================================================
       ID = 3 (  0011):     1.75   0.170     2.33    29.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0011):     1.75   0.170     2.33    29.43
     + ID2= 2 (  0009):     0.26   0.017     2.50    29.15
       ================================================
       ID = 1 (  0011):     2.01   0.181     2.33    29.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
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--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1725     0.0204
                          0.0996     0.0068   |   0.1992     0.0271
                          0.1408     0.0136   |   0.2227     0.0339

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      2.012      0.181      2.33      29.40
   OUTFLOW: ID= 1 (  0013)      2.012      0.108      2.50      29.39

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 59.59
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0082

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--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.13
|ID= 1 DT=10.0 min |   Total Imp(%)=  38.50   Dir. Conn.(%)=  38.50
--------------------

                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      29.68        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      88.19        21.67
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.30 (ii)   14.31 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.014 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.50           2.33
     RUNOFF VOLUME    (mm)=      31.33        13.45          20.26
     TOTAL RAINFALL   (mm)=      32.33        32.33          32.33
     RUNOFF COEFFICIENT   =       0.97         0.42           0.63

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

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

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--------------------
| RESERVOIR(  0010)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0104      0.0036
                          0.0054     0.0010   |   0.0121      0.0049
                          0.0083     0.0023   |   0.0137      0.0062

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)     0.132      0.014      2.33      20.26
   OUTFLOW: ID= 1 (  0010)     0.132      0.005      2.50      20.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 32.86
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0009

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--------------------
| ADD HYD  (  0015)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):     0.13   0.005     2.50    20.00
     + ID2= 2 (  0013):     2.01   0.108     2.50    29.39
       ================================================
       ID = 3 (  0015):     2.14   0.112     2.50    28.81

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** D E T A I L E D O U T P U T *****

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO
6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\0b180642-f250-47f9-a3fe-49e8cf2f17a8\sc
  Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\0b180642-f250-47f9-a3fe-49e8cf2f17a8\sc


DATE: 11-12-2024                          TIME: 01:00:33

USER:



COMMENTS: _____________________________________________________________

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  ************************************************
  ** SIMULATION : #2 - Toronto 6-hr (5-Year)    **
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 812.623
| Ptotal= 46.62 mm |                          B=   0.000
--------------------                          C=   0.790
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                0.00    1.71 |  1.50    4.43 |  3.00    5.23 |  4.50
2.34
                0.17    1.82 |  1.67    5.63 |  3.17    4.54 |  4.67
2.22
                0.33    1.96 |  1.83    7.96 |  3.33    4.03 |  4.83
2.11
                0.50    2.11 |  2.00   15.58 |  3.50    3.63 |  5.00
2.01
                0.67    2.30 |  2.17  131.79 |  3.67    3.31 |  5.17
1.92
                0.83    2.53 |  2.33   18.26 |  3.83    3.05 |  5.33
1.84
```

```
                1.00    2.81 |  2.50   10.62 |  4.00    2.83 |  5.50
1.77
                1.17    3.18 |  2.67    7.77 |  4.17    2.64 |  5.67
1.70
                1.33    3.69 |  2.83    6.22 |  4.33    2.48 |  5.83
1.64


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--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.79        98.12
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.47 (ii)    8.58 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.01          0.116 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        31.50          43.42
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.68           0.93

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0094
                          0.0239     0.0046   |   0.0377      0.0114
                          0.0312     0.0078   |   0.0464      0.0172

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.343      0.116      2.33      43.42
   OUTFLOW: ID= 1 (  0006)      0.343      0.029      2.50      43.31

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 24.62
                TIME SHIFT OF PEAK FLOW         (min)= 10.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0069

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--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.45
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.38         0.07
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      54.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.79        98.12
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.59 (ii)    8.70 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.01          0.152 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        31.50          43.42
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.68           0.93

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0007)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0109
                          0.0191     0.0034   |   0.0398      0.0146
                          0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
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```
                              (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0002)      0.449      0.152      2.33      43.42
   OUTFLOW: ID= 1 (  0007)      0.449      0.031      2.50      43.36

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.57
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0092

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--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.43
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.07
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.79        98.12
                over (min)       10.00        10.00
     Storage Coeff.  (min)=        1.57 (ii)    8.68 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.01          0.146 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        31.50          43.42
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.68           0.93

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0008)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0109
                          0.0191     0.0034   |   0.0398      0.0146
                          0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
```

```
                              (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0003)      0.430      0.146      2.33      43.42
   OUTFLOW: ID= 1 (  0008)      0.430      0.031      2.50      43.34

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.96
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0088

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------
--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.26
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.22         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      41.61        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.79        98.12
                over (min)       10.00        10.00
     Storage Coeff.  (min)=        1.35 (ii)    8.46 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.01          0.088 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        31.50          43.43
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.68           0.93

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0009)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0325      0.0110
                          0.0183     0.0035   |   0.0343      0.0123
                          0.0264     0.0073   |   0.0357      0.0133

                                AREA     QPEAK     TPEAK       R.V.
```

```
                              (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0004)      0.260      0.088      2.33      43.43
   OUTFLOW: ID= 1 (  0009)      0.260      0.022      2.50      43.27

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 24.52
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0052

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--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.53
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.49         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      59.48        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.79        72.51
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.67 (ii)    9.70 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.11
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.01          0.184 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        24.80          43.94
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.53           0.94

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.53   0.184     2.33    43.94
      + ID2= 2 (  0006):     0.34   0.029     2.50    43.31
        ================================================
        ID = 3 (  0011):     0.87   0.205     2.33    43.69

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0011):     0.87   0.205     2.33    43.69
      + ID2= 2 (  0007):     0.45   0.031     2.50    43.36
        ================================================
        ID = 1 (  0011):     1.32   0.229     2.33    43.58

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.32   0.229     2.33    43.58
      + ID2= 2 (  0008):     0.43   0.031     2.50    43.34
        ================================================
        ID = 3 (  0011):     1.75   0.252     2.33    43.52

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0011):     1.75   0.252     2.33    43.52
      + ID2= 2 (  0009):     0.26   0.022     2.50    43.27
        ================================================
        ID = 1 (  0011):     2.01   0.268     2.33    43.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1725      0.0204
                          0.0996     0.0068   |   0.1992      0.0271
                          0.1408     0.0136   |   0.2227      0.0339

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      2.012      0.268      2.33      43.49
```

```
   OUTFLOW: ID= 1 (  0013)      2.012      0.134      2.50      43.49

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 50.06
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0127

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--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.13
|ID= 1 DT=10.0 min |   Total Imp(%)=  38.50   Dir. Conn.(%)=  38.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      29.68        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.79        72.51
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.10 (ii)    9.13 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.030 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        24.80          32.79
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.53           0.70

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0010)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0104      0.0036
                          0.0054     0.0010   |   0.0121      0.0049
                          0.0083     0.0023   |   0.0137      0.0062

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      0.132      0.030      2.33      32.79
```

```
   OUTFLOW: ID= 1 (  0010)      0.132      0.007      2.50      32.54

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.76
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0018

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

--------------------
| ADD HYD  (  0015)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):      0.13   0.007     2.50    32.54
     + ID2= 2 (  0013):      2.01   0.134     2.50    43.49
       ================================================
       ID = 3 (  0015):      2.14   0.141     2.50    42.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO
6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\b6aae1e8-5792-4851-b564-05bfabec485f\sc
  Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
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DATE: 11-12-2024                          TIME: 01:00:35

USER:
```

COMMENTS: _____

```
  ***********************************************
  ** SIMULATION : #3 - Toronto 6-hr (10-Year)   **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1023.840
| Ptotal= 55.38 mm |                          B=   0.000
--------------------                          C=   0.800
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                0.00    1.94 |  1.50    5.08 |  3.00    6.01 |  4.50
2.66
                0.17    2.07 |  1.67    6.47 |  3.17    5.21 |  4.67
2.52
                0.33    2.22 |  1.83    9.19 |  3.33    4.61 |  4.83
2.40
                0.50    2.40 |  2.00   18.14 |  3.50    4.15 |  5.00
2.28
                0.67    2.61 |  2.17  162.27 |  3.67    3.78 |  5.17
2.18
                0.83    2.87 |  2.33   21.31 |  3.83    3.48 |  5.33
2.09
                1.00    3.20 |  2.50   12.30 |  4.00    3.22 |  5.50
2.01
                1.17    3.63 |  2.67    8.97 |  4.17    3.01 |  5.67
1.93
                1.33    4.22 |  2.83    7.16 |  4.33    2.82 |  5.83
1.86
```

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------
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     162.27       129.22
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.35 (ii)    7.72 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.01          0.145 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      54.38        39.81          52.12
     TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
     RUNOFF COEFFICIENT   =       0.98         0.72           0.94

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344     0.0094
                          0.0239     0.0046   |   0.0377     0.0114
                          0.0312     0.0078   |   0.0464     0.0172

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.343     0.145      2.33      52.12
   OUTFLOW: ID= 1 (  0006)      0.343     0.032      2.50      52.02

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.34
                TIME SHIFT OF PEAK FLOW         (min)= 10.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0086
```

```
------
--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.45
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.38         0.07
```

```
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      54.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     162.27       129.22
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.47 (ii)    7.84 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.17         0.02          0.189 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      54.38        39.81          52.12
     TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
     RUNOFF COEFFICIENT   =       0.98         0.72           0.94

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0007)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0109
                          0.0191     0.0034   |   0.0398      0.0146
                          0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0002)      0.449      0.189      2.33      52.12
   OUTFLOW: ID= 1 (  0007)      0.449      0.035      2.50      52.05

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.59
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0116

--------------------------------------------------------------------------------
------
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.43
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.07
```

```
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     162.27       129.22
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.45 (ii)    7.82 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.02          0.181 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      54.38        39.81          52.12
     TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
     RUNOFF COEFFICIENT   =       0.98         0.72           0.94

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0008)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0109
                          0.0191     0.0034   |   0.0398      0.0146
                          0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0003)      0.430      0.181      2.33      52.12
   OUTFLOW: ID= 1 (  0008)      0.430      0.034      2.50      52.05

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.98
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0111

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------
--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.26
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.22         0.04
```

```
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      41.61        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     162.27       129.22
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.24 (ii)    7.61 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.01          0.110 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      54.38        39.81          52.12
     TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
     RUNOFF COEFFICIENT   =       0.98         0.72           0.94

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0009)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0325     0.0110
                          0.0183     0.0035   |   0.0343     0.0123
                          0.0264     0.0073   |   0.0357     0.0133

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0004)      0.260      0.110      2.33      52.12
   OUTFLOW: ID= 1 (  0009)      0.260      0.024      2.50      51.99

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.19
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0065

--------------------------------------------------------------------------------
------
--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.53
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.49         0.04
```

```
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      59.48        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     162.27        99.70
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.54 (ii)    8.61 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.01          0.228 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      54.38        32.29          52.60
     TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
     RUNOFF COEFFICIENT   =       0.98         0.58           0.95

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):      0.53   0.228     2.33    52.60
     + ID2= 2 (  0006):      0.34   0.032     2.50    52.02
       ================================================
       ID = 3 (  0011):      0.87   0.253     2.33    52.37

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0011):      0.87   0.253     2.33    52.37
     + ID2= 2 (  0007):      0.45   0.035     2.50    52.05
       ================================================
       ID = 1 (  0011):      1.32   0.280     2.33    52.26

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

```
--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0011):     1.32   0.280     2.33    52.26
     + ID2= 2 (  0008):     0.43   0.034     2.50    52.05
       ================================================
       ID = 3 (  0011):     1.75   0.306     2.33    52.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0011):     1.75   0.306     2.33    52.21
     + ID2= 2 (  0009):     0.26   0.024     2.50    51.99
       ================================================
       ID = 1 (  0011):     2.01   0.325     2.33    52.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1725      0.0204
                          0.0996     0.0068   |   0.1992      0.0271
                          0.1408     0.0136   |   0.2227      0.0339

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      2.012      0.325      2.33      52.18
   OUTFLOW: ID= 1 (  0013)      2.012      0.151      2.50      52.18

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 46.45
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0160

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------
--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.13
|ID= 1 DT=10.0 min |   Total Imp(%)=  38.50   Dir. Conn.(%)=  38.50
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      29.68        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     162.27        99.70
               over (min)       10.00        10.00
     Storage Coeff.  (min)=      1.02 (ii)    8.08 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02          0.039 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      54.38        32.29          40.77
     TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
     RUNOFF COEFFICIENT   =       0.98         0.58           0.74

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0010)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0104      0.0036
                          0.0054     0.0010   |   0.0121      0.0049
                          0.0083     0.0023   |   0.0137      0.0062

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      0.132      0.039      2.33      40.77
   OUTFLOW: ID= 1 (  0010)      0.132      0.008      2.50      40.48

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.36
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0024

-------------------------------------------------------------------------------
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--------------------
| ADD HYD  (  0015)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):     0.13   0.008     2.50    40.48
     + ID2= 2 (  0013):     2.01   0.151     2.50    52.18
       ================================================
       ID = 3 (  0015):     2.14   0.159     2.50    51.45
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 FINISH
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================================================================================
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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO
6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\43c7eb5e-929d-4484-9c4c-c2045829b934\sc
  Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\43c7eb5e-929d-4484-9c4c-c2045829b934\sc


DATE: 11-12-2024                          TIME: 01:00:34

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : #4 - Toronto 6-hr (25-Year)   **
  ***********************************************

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| CHICAGO STORM    |    IDF curve parameters: A=1195.800
| Ptotal= 64.68 mm |                          B=   0.000
--------------------                          C=   0.800
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                0.00    2.26 |  1.50    5.93 |  3.00    7.02 |  4.50
3.11
                0.17    2.41 |  1.67    7.55 |  3.17    6.08 |  4.67
2.94
                0.33    2.59 |  1.83   10.73 |  3.33    5.38 |  4.83
2.80
                0.50    2.80 |  2.00   21.19 |  3.50    4.85 |  5.00
2.67
                0.67    3.05 |  2.17  189.52 |  3.67    4.41 |  5.17
2.55
                0.83    3.36 |  2.33   24.89 |  3.83    4.06 |  5.33
2.44
                1.00    3.74 |  2.50   14.37 |  4.00    3.77 |  5.50
2.34
                1.17    4.24 |  2.67   10.47 |  4.17    3.52 |  5.67
2.25
                1.33    4.93 |  2.83    8.36 |  4.33    3.30 |  5.83
2.17


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--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       158.51
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.27 (ii)    7.14 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.02         0.171 (iii)
```

```
     TIME TO PEAK    (hrs)=       2.33         2.33          2.33
     RUNOFF VOLUME    (mm)=      63.68        48.76         61.36
     TOTAL RAINFALL   (mm)=      64.68        64.68         64.68
     RUNOFF COEFFICIENT   =       0.98         0.75          0.95

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0094
                          0.0239     0.0046   |   0.0377      0.0114
                          0.0312     0.0078   |   0.0464      0.0172

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.343      0.171      2.33      61.36
   OUTFLOW: ID= 1 (  0006)      0.343      0.036      2.50      61.25

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.82
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0103

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--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.45
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.38         0.07
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      54.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       158.51
                over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.38 (ii)    7.25 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.02          0.223 (iii)
```

```
     TIME TO PEAK    (hrs)=       2.33         2.33          2.33
     RUNOFF VOLUME    (mm)=      63.68        48.76         61.38
     TOTAL RAINFALL   (mm)=      64.68        64.68         64.68
     RUNOFF COEFFICIENT   =       0.98         0.75          0.95

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0007)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0109
                          0.0191     0.0034   |   0.0398      0.0146
                          0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0002)      0.449      0.223      2.33      61.38
   OUTFLOW: ID= 1 (  0007)      0.449      0.038      2.50      61.31

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.26
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0138

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--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.43
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.07
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       158.51
                over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.36 (ii)    7.23 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.02          0.214 (iii)
```

```
     TIME TO PEAK    (hrs)=       2.33         2.33          2.33
     RUNOFF VOLUME    (mm)=      63.68        48.76         61.36
     TOTAL RAINFALL   (mm)=      64.68        64.68         64.68
     RUNOFF COEFFICIENT   =       0.98         0.75          0.95

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0008)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0109
                          0.0191     0.0034   |   0.0398      0.0146
                          0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0003)      0.430      0.214      2.33      61.36
   OUTFLOW: ID= 1 (  0008)      0.430      0.038      2.50      61.28

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.58
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0132

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--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.26
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.22         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      41.61        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       158.51
                over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.17 (ii)    7.04 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.01          0.129 (iii)
```

```
     TIME TO PEAK    (hrs)=       2.33         2.33          2.33
     RUNOFF VOLUME    (mm)=      63.68        48.76         61.36
     TOTAL RAINFALL   (mm)=      64.68        64.68         64.68
     RUNOFF COEFFICIENT   =       0.98         0.75          0.95

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0009)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0325      0.0110
                          0.0183     0.0035   |   0.0343      0.0123
                          0.0264     0.0073   |   0.0357      0.0133

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0004)      0.260      0.129      2.33      61.36
   OUTFLOW: ID= 1 (  0009)      0.260      0.027      2.50      61.21

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.84
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0078

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--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.53
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.49         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      59.48        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       126.65
                over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.45 (ii)    7.87 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.26         0.01          0.268 (iii)
```

```
     TIME TO PEAK    (hrs)=       2.33         2.33          2.33
     RUNOFF VOLUME    (mm)=      63.68        40.52         61.81
     TOTAL RAINFALL   (mm)=      64.68        64.68         64.68
     RUNOFF COEFFICIENT   =       0.98         0.63          0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.53   0.268     2.33    61.81
      + ID2= 2 (  0006):     0.34   0.036     2.50    61.25
        ================================================
        ID = 3 (  0011):     0.87   0.295     2.33    61.59

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0011):     0.87   0.295     2.33    61.59
      + ID2= 2 (  0007):     0.45   0.038     2.50    61.31
        ================================================
        ID = 1 (  0011):     1.32   0.324     2.33    61.50

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.32   0.324     2.33    61.50
      + ID2= 2 (  0008):     0.43   0.038     2.50    61.28
        ================================================
        ID = 3 (  0011):     1.75   0.353     2.33    61.44

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0011):     1.75   0.353     2.33    61.44
      + ID2= 2 (  0009):     0.26   0.027     2.50    61.21
        ================================================
        ID = 1 (  0011):     2.01   0.373     2.33    61.41

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

--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1725      0.0204
                          0.0996     0.0068   |   0.1992      0.0271
                          0.1408     0.0136   |   0.2227      0.0339

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      2.012      0.373      2.33      61.41
   OUTFLOW: ID= 1 (  0013)      2.012      0.165      2.67      61.41

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 44.22
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0191

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------

--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.13
|ID= 1 DT=10.0 min |   Total Imp(%)=  38.50   Dir. Conn.(%)=  38.50
--------------------

                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      29.68        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       126.65
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       0.95 (ii)    7.38 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.02          0.048 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      63.68        40.52          49.42
```

```
     TOTAL RAINFALL   (mm)=      64.68        64.68          64.68
     RUNOFF COEFFICIENT   =       0.98         0.63           0.76

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0010)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0104      0.0036
                          0.0054     0.0010   |   0.0121      0.0049
                          0.0083     0.0023   |   0.0137      0.0062

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)     0.132      0.048      2.33      49.42
   OUTFLOW: ID= 1 (  0010)     0.132      0.009      2.67      49.16

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.38
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0030

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

--------------------
| ADD HYD  (  0015)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):     0.13   0.009     2.67    49.16
      + ID2= 2 (  0013):     2.01   0.165     2.67    61.41
        ================================================
        ID = 3 (  0015):     2.14   0.174     2.67    60.66

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL
```

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

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO
6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\811e0c34-25a3-4165-8bbe-6cf1f7e5d991\sc
  Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\811e0c34-25a3-4165-8bbe-6cf1f7e5d991\sc

DATE: 11-12-2024                          TIME: 01:00:34

USER:


COMMENTS: _____

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  *********************************************
  ** SIMULATION : #5 - Toronto 6-hr (50-Year)   **
  *********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1415.390
| Ptotal= 76.56 mm |                          B=   0.000
--------------------                          C=   0.800
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  6.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                0.00    2.68 |  1.50    7.02 |  3.00    8.31 |  4.50
3.68
                0.17    2.86 |  1.67    8.94 |  3.17    7.20 |  4.67
3.49
```

```
                0.33    3.07 |  1.83   12.71 |  3.33    6.37 |  4.83
3.31
                0.50    3.31 |  2.00   25.08 |  3.50    5.74 |  5.00
3.16
                0.67    3.61 |  2.17  224.32 |  3.67    5.23 |  5.17
3.02
                0.83    3.97 |  2.33   29.45 |  3.83    4.81 |  5.33
2.89
                1.00    4.43 |  2.50   17.01 |  4.00    4.46 |  5.50
2.77
                1.17    5.02 |  2.67   12.39 |  4.17    4.16 |  5.67
2.67
                1.33    5.84 |  2.83    9.90 |  4.33    3.91 |  5.83
2.57
```

```
| CALIB           |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.05	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	47.82	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		224.32	195.67	
over (min)		10.00	10.00	
Storage Coeff. (min)=		1.19 (ii)	6.58 (ii)	
Unit Hyd. Tpeak (min)=		10.00	10.00	
Unit Hyd. peak (cms)=		0.17	0.13	
				TOTALS
PEAK FLOW	(cms)=	0.18	0.02	0.204 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	75.56	60.29	73.19
TOTAL RAINFALL	(mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT	=	0.99	0.79	0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
| RESERVOIR(  0006)|     OVERFLOW IS OFF
```

```
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0344      0.0094
                         0.0239     0.0046   |   0.0377      0.0114
                         0.0312     0.0078   |   0.0464      0.0172

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.343      0.204      2.33      73.19
   OUTFLOW: ID= 1 (  0006)      0.343      0.039      2.50      73.09

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.16
                TIME SHIFT OF PEAK FLOW         (min)= 10.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0125
```

```
| CALIB           |
| STANDHYD (  0002)|   Area    (ha)=   0.45
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.38	0.07	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	54.69	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		224.32	195.67	
over (min)		10.00	10.00	
Storage Coeff. (min)=		1.29 (ii)	6.68 (ii)	
Unit Hyd. Tpeak (min)=		10.00	10.00	
Unit Hyd. peak (cms)=		0.17	0.13	
				TOTALS
PEAK FLOW	(cms)=	0.24	0.03	0.266 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	75.56	60.29	73.20
TOTAL RAINFALL	(mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT	=	0.99	0.79	0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
| RESERVOIR(  0007)|     OVERFLOW IS OFF
```

```
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0344      0.0109
                         0.0191     0.0034   |   0.0398      0.0146
                         0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0002)      0.449      0.266      2.33      73.20
   OUTFLOW: ID= 1 (  0007)      0.449      0.042      2.50      73.13

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.91
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0166

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------
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.43
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.07
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     224.32       195.67
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.27 (ii)    6.67 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.03          0.255 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56        60.29          73.20
     TOTAL RAINFALL   (mm)=      76.56        76.56          76.56
     RUNOFF COEFFICIENT   =       0.99         0.79           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0008)|     OVERFLOW IS OFF
```

```
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0344      0.0109
                         0.0191     0.0034   |   0.0398      0.0146
                         0.0278     0.0071   |   0.0464      0.0199

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0003)      0.430      0.255      2.33      73.20
   OUTFLOW: ID= 1 (  0008)      0.430      0.041      2.50      73.13

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 16.23
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0159

--------------------------------------------------------------------------------
------
--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.26
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.22         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      41.61        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     224.32       195.67
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.09 (ii)    6.49 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.02          0.154 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56        60.29          73.19
     TOTAL RAINFALL   (mm)=      76.56        76.56          76.56
     RUNOFF COEFFICIENT   =       0.99         0.79           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0009)|     OVERFLOW IS OFF
```

```
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0325      0.0110
                         0.0183     0.0035   |   0.0343      0.0123
                         0.0264     0.0073   |   0.0357      0.0133

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0004)     0.260      0.154      2.33      73.19
   OUTFLOW: ID= 1 (  0009)     0.260      0.030      2.50      73.06

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.25
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0095

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--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.53
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.49         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      59.48        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     224.32       161.90
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.35 (ii)    7.17 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.30         0.01          0.319 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56        51.32          73.61
     TOTAL RAINFALL   (mm)=      76.56        76.56          76.56
     RUNOFF COEFFICIENT   =       0.99         0.67           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.53   0.319     2.33    73.61
     + ID2= 2 (  0006):     0.34   0.039     2.50    73.09
       ================================================
       ID = 3 (  0011):     0.87   0.349     2.33    73.40

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0011):     0.87   0.349     2.33    73.40
     + ID2= 2 (  0007):     0.45   0.042     2.50    73.13
       ================================================
       ID = 1 (  0011):     1.32   0.381     2.33    73.31

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0011):     1.32   0.381     2.33    73.31
     + ID2= 2 (  0008):     0.43   0.041     2.50    73.13
       ================================================
       ID = 3 (  0011):     1.75   0.412     2.33    73.26

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0011):     1.75   0.412     2.33    73.26
     + ID2= 2 (  0009):     0.26   0.030     2.50    73.06
       ================================================
       ID = 1 (  0011):     2.01   0.435     2.33    73.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1725      0.0204
                          0.0996     0.0068   |   0.1992      0.0271
                          0.1408     0.0136   |   0.2227      0.0339

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      2.012     0.435      2.33      73.24
   OUTFLOW: ID= 1 (  0013)      2.012     0.182      2.67      73.24

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 41.83
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0230

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--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.13
|ID= 1 DT=10.0 min |   Total Imp(%)=  38.50   Dir. Conn.(%)=  38.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05        0.08
     Dep. Storage     (mm)=       1.00        5.00
     Average Slope     (%)=       1.00        2.00
     Length            (m)=      29.68       40.00
     Mannings n           =      0.013       0.250

     Max.Eff.Inten.(mm/hr)=     224.32      161.90
               over (min)       10.00       10.00
     Storage Coeff.  (min)=       0.89 (ii)    6.71 (ii)
     Unit Hyd. Tpeak (min)=      10.00       10.00
     Unit Hyd. peak  (cms)=       0.17        0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03        0.03          0.060 (iii)
     TIME TO PEAK    (hrs)=       2.33        2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56       51.32          60.63
     TOTAL RAINFALL   (mm)=      76.56       76.56          76.56
     RUNOFF COEFFICIENT   =       0.99        0.67           0.79

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0010)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0104      0.0036
                          0.0054     0.0010   |   0.0121      0.0049
                          0.0083     0.0023   |   0.0137      0.0062

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      0.132     0.060      2.33      60.63
   OUTFLOW: ID= 1 (  0010)      0.132     0.011      2.67      60.41

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.64
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0039

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--------------------
| ADD HYD  (  0015)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):     0.13    0.011     2.67    60.41
     + ID2= 2 (  0013):     2.01    0.182     2.67    73.24
       ================================================
       ID = 3 (  0015):     2.14    0.193     2.67    72.45

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

      V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

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

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO
6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\997ec3c0-41aa-44ca-a688-84afaf282367\sc
```

Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-c3a8-4981-ad81-d3d1f7857440\997ec3c0-41aa-44ca-a688-84afaf282367\sc

DATE: 11-12-2024 TIME: 01:00:35

USER:

COMMENTS: _____

****
** SIMULATION : #6 - Toronto 6-hr (100-Year) **
****

CHICAGO STORM
Ptotal= 85.43 mm

IDF curve parameters: A=1579.410
B= 0.000
C= 0.800
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.99	1.50	7.83	3.00	9.27	4.50	4.11
0.17	3.19	1.67	9.98	3.17	8.03	4.67	3.89
0.33	3.42	1.83	14.18	3.33	7.11	4.83	3.70
0.50	3.70	2.00	27.99	3.50	6.40	5.00	3.52
0.67	4.03	2.17	250.32	3.67	5.83	5.17	3.37
0.83	4.43	2.33	32.87	3.83	5.36	5.33	3.22
1.00	4.94	2.50	18.98	4.00	4.97	5.50	3.09
1.17	5.61	2.67	13.83	4.17	4.64	5.67	2.98
1.33	6.51	2.83	11.04	4.33	4.36	5.83	2.87

CALIB STANDHYD (0001) ID= 1 DT=10.0 min	Area (ha)= 0.34 Total Imp(%)= 84.60 Dir. Conn.(%)= 84.60

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.05	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	47.82	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		250.32	223.25	
over (min)		10.00	10.00	
Storage Coeff. (min)=		1.14 (ii)	6.26 (ii)	
Unit Hyd. Tpeak (min)=		10.00	10.00	
Unit Hyd. peak (cms)=		0.17	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.20	0.03	0.228 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	84.43	68.96	82.03
TOTAL RAINFALL	(mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT	=	0.99	0.81	0.96

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 95.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0006) IN= 2---> OUT= 1 DT= 10.0 min	OVERFLOW IS OFF

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0344	0.0094
0.0239	0.0046	0.0377	0.0114
0.0312	0.0078	0.0464	0.0172

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0001)	0.343	0.228	2.33	82.03
OUTFLOW: ID= 1 (0006)	0.343	0.042	2.50	81.92

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.18
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0141

```
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.45
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.38	0.07	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	54.69	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		250.32	223.25	
over (min)		10.00	10.00	
Storage Coeff. (min)=		1.23 (ii)	6.35 (ii)	
Unit Hyd. Tpeak (min)=		10.00	10.00	
Unit Hyd. peak (cms)=		0.17	0.13	
				TOTALS
PEAK FLOW	(cms)=	0.26	0.03	0.298 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	84.43	68.96	82.04
TOTAL RAINFALL	(mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT	=	0.99	0.81	0.96

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 95.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| RESERVOIR(  0007)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0344	0.0109
0.0191	0.0034	0.0398	0.0146
0.0278	0.0071	0.0464	0.0199

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (	0002)	0.449	0.298	2.33	82.04
OUTFLOW: ID= 1 (	0007)	0.449	0.045	2.50	81.98

PEAK FLOW REDUCTION [Qout/Qin](%)= 15.10
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0189

```
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.43
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.36	0.07	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	53.54	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		250.32	223.25	
over (min)		10.00	10.00	
Storage Coeff. (min)=		1.22 (ii)	6.34 (ii)	
Unit Hyd. Tpeak (min)=		10.00	10.00	
Unit Hyd. peak (cms)=		0.17	0.13	
				TOTALS
PEAK FLOW	(cms)=	0.25	0.03	0.286 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	84.43	68.96	82.04
TOTAL RAINFALL	(mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT	=	0.99	0.81	0.96

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 95.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| RESERVOIR(  0008)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0344	0.0109
0.0191	0.0034	0.0398	0.0146
0.0278	0.0071	0.0464	0.0199

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (	0003)	0.430	0.286	2.33	82.04
OUTFLOW: ID= 1 (	0008)	0.430	0.044	2.50	81.96

PEAK FLOW REDUCTION [Qout/Qin](%)= 15.39
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0180

```
--------------------------------------------------------------------------
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--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.26
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.22         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      41.61        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     250.32       223.25
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.05 (ii)    6.16 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.02          0.173 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      84.43        68.96          82.03
     TOTAL RAINFALL   (mm)=      85.43        85.43          85.43
     RUNOFF COEFFICIENT   =       0.99         0.81           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0009)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0325     0.0110
                          0.0183     0.0035   |   0.0343     0.0123
                          0.0264     0.0073   |   0.0357     0.0133

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0004)      0.260      0.173      2.33      82.03
   OUTFLOW: ID= 1 (  0009)      0.260      0.032      2.50      81.88

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.36
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0107
```

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--------------------------------------------------------------------------
------
--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.53
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.49         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      59.48        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     250.32       188.61
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.30 (ii)    6.77 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.02          0.357 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      84.43        59.54          82.42
     TOTAL RAINFALL   (mm)=      85.43        85.43          85.43
     RUNOFF COEFFICIENT   =       0.99         0.70           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.53   0.357     2.33    82.42
     + ID2= 2 (  0006):     0.34   0.042     2.50    81.92
       ================================================
       ID = 3 (  0011):     0.87   0.389     2.33    82.23

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

--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 3 (  0011):     0.87   0.389     2.33    82.23
      + ID2= 2 (  0007):     0.45   0.045     2.50    81.98
        ==================================================
        ID = 1 (  0011):     1.32   0.423     2.33    82.14

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):     1.32   0.423     2.33    82.14
      + ID2= 2 (  0008):     0.43   0.044     2.50    81.96
        ==================================================
        ID = 3 (  0011):     1.75   0.457     2.33    82.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0011)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0011):     1.75   0.457     2.33    82.10
      + ID2= 2 (  0009):     0.26   0.032     2.50    81.88
        ==================================================
        ID = 1 (  0011):     2.01   0.481     2.33    82.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1725     0.0204
                          0.0996     0.0068   |   0.1992     0.0271
                          0.1408     0.0136   |   0.2227     0.0339

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     2.012      0.481      2.33      82.07
   OUTFLOW: ID= 1 (  0013)     2.012      0.194      2.67      82.07

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 40.34
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0260

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--------------------
| CALIB            |
| STANDHYD (  0005)|   Area    (ha)=   0.13
|ID= 1 DT=10.0 min |   Total Imp(%)=  38.50   Dir. Conn.(%)=  38.50
--------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      29.68        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     250.32       188.61
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       0.85 (ii)    6.33 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.03          0.070 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      84.43        59.53          69.10
     TOTAL RAINFALL   (mm)=      85.43        85.43          85.43
     RUNOFF COEFFICIENT   =       0.99         0.70           0.81

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0010)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0104     0.0036
                          0.0054     0.0010   |   0.0121     0.0049
                          0.0083     0.0023   |   0.0137     0.0062

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)     0.132      0.070      2.33      69.10
   OUTFLOW: ID= 1 (  0010)     0.132      0.012      2.67      68.84

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 16.52
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0045

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```

```
--------------------
| ADD HYD  (  0015)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):     0.13   0.012     2.67    68.84
      + ID2= 2 (  0013):     2.01   0.194     2.67    82.07
        ================================================
        ID = 3 (  0015):     2.14   0.205     2.67    81.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO
6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
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c3a8-4981-ad81-d3d1f7857440\e3642ff3-a4e1-4953-a616-3950d0a97c3e\sc


DATE: 11-12-2024                          TIME: 01:30:57

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : Run 01                       **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 531.391
| Ptotal= 32.33 mm |                          B=   0.000
--------------------                          C=   0.780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.38

                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                  0.00    1.24 |  1.50    3.18 |  3.00    3.75 |  4.50
1.69
                  0.17    1.32 |  1.67    4.03 |  3.17    3.26 |  4.67
1.61
                  0.33    1.42 |  1.83    5.67 |  3.33    2.89 |  4.83
1.53
                  0.50    1.53 |  2.00   10.99 |  3.50    2.61 |  5.00
1.46
                  0.67    1.66 |  2.17   88.19 |  3.67    2.38 |  5.17
1.40
                  0.83    1.82 |  2.33   12.86 |  3.83    2.20 |  5.33
1.34
                  1.00    2.03 |  2.50    7.53 |  4.00    2.04 |  5.50
1.29
                  1.17    2.29 |  2.67    5.53 |  4.17    1.91 |  5.67
1.24
                  1.33    2.66 |  2.83    4.44 |  4.33    1.79 |  5.83
1.19


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--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.16
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.15          0.01
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      32.88         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      88.19         21.67
               over (min)        10.00         20.00
     Storage Coeff.  (min)=       1.38 (ii)    14.39 (ii)
     Unit Hyd. Tpeak (min)=      10.00         20.00
     Unit Hyd. peak  (cms)=       0.17          0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04          0.00          0.037 (iii)
     TIME TO PEAK    (hrs)=       2.33          2.50           2.33
     RUNOFF VOLUME    (mm)=      31.33         13.45          29.88
     TOTAL RAINFALL   (mm)=      32.33         32.33          32.33
     RUNOFF COEFFICIENT   =       0.97          0.42           0.92

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
```

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      88.19        52.84
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.73 (ii)   10.83 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.00          0.073 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.50           2.33
     RUNOFF VOLUME    (mm)=      31.33        18.35          29.32
     TOTAL RAINFALL   (mm)=      32.33        32.33          32.33
     RUNOFF COEFFICIENT   =       0.97         0.57           0.91

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  95.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
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--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344     0.0094
                          0.0239     0.0046   |   0.0377     0.0114
                          0.0312     0.0078   |   0.0464     0.0172

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     0.343     0.073      2.33      29.32
   OUTFLOW: ID= 1 (  0006)     0.343     0.022      2.50      29.20

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 29.87
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0044

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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.16   0.037     2.33    29.88
     + ID2= 2 (  0006):     0.34   0.022     2.50    29.20
       ================================================
       ID = 3 (  0011):     0.51   0.050     2.33    29.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0159     0.0224
                          0.0059     0.0031   |   0.0178     0.0280
                          0.0143     0.0182   |   0.0000     0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     0.505     0.050      2.33      29.42
   OUTFLOW: ID= 1 (  0013)     0.505     0.008      3.50      29.18

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 16.57
                  TIME SHIFT OF PEAK FLOW         (min)= 70.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0075

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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** D E T A I L E D O U T P U T *****

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Output filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-c3a8-4981-ad81-d3d1f7857440\327de7ff-2f03-461d-8d2f-eac49b8644cd\sc
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DATE: 11-12-2024 TIME: 01:30:57

USER:

COMMENTS: _____

** SIMULATION : Run 02 **

| CHICAGO STORM | Ptotal= 46.62 mm |

IDF curve parameters: A= 812.623
B= 0.000
C= 0.790
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.71	1.50	4.43	3.00	5.23	4.50	2.34
0.17	1.82	1.67	5.63	3.17	4.54	4.67	2.22
0.33	1.96	1.83	7.96	3.33	4.03	4.83	2.11
0.50	2.11	2.00	15.58	3.50	3.63	5.00	2.01
0.67	2.30	2.17	131.79	3.67	3.31	5.17	1.92
0.83	2.53	2.33	18.26	3.83	3.05	5.33	1.84
1.00	2.81	2.50	10.62	4.00	2.83	5.50	1.77
1.17	3.18	2.67	7.77	4.17	2.64	5.67	1.70
1.33	3.69	2.83	6.22	4.33	2.48	5.83	1.64

| CALIB | STANDHYD (0012) | ID= 1 DT=10.0 min |

Area (ha)= 0.16
Total Imp(%)= 92.00 Dir. Conn.(%)= 92.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.15	0.01
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	32.88	40.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	131.79	72.51
over (min)	10.00	10.00
Storage Coeff. (min)=	1.17 (ii)	9.20 (ii)
Unit Hyd. Tpeak (min)=	10.00	10.00
Unit Hyd. peak (cms)=	0.17	0.11

			TOTALS
PEAK FLOW (cms)=	0.05	0.00	0.056 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	45.62	24.80	43.94
TOTAL RAINFALL (mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT =	0.98	0.53	0.94

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 90.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD (0001) | ID= 1 DT=10.0 min |

Area (ha)= 0.34
Total Imp(%)= 84.60 Dir. Conn.(%)= 84.60

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.05
Dep. Storage (mm)=	1.00	5.00

```
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.79        98.12
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.47 (ii)    8.58 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.01          0.116 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        31.50          43.42
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.68           0.93

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0344      0.0094
                         0.0239     0.0046   |   0.0377      0.0114
                         0.0312     0.0078   |   0.0464      0.0172

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     0.343      0.116      2.33      43.42
   OUTFLOW: ID= 1 (  0006)     0.343      0.029      2.50      43.31

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)= 24.62
                 TIME SHIFT OF PEAK FLOW         (min)= 10.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.0069

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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):     0.16   0.056     2.33    43.94
      + ID2= 2 (  0006):     0.34   0.029     2.50    43.31
        ================================================

        ID = 3 (  0011):     0.51   0.078     2.33    43.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0159      0.0224
                         0.0059     0.0031   |   0.0178      0.0280
                         0.0143     0.0182   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     0.505      0.078      2.33      43.51
   OUTFLOW: ID= 1 (  0013)     0.505      0.011      3.67      43.28

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.98
                 TIME SHIFT OF PEAK FLOW         (min)= 80.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.0120

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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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6.2\VO2\voin.dat
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  Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
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```

DATE: 11-12-2024 TIME: 01:30:57

USER:

COMMENTS: _____

** SIMULATION : Run 03 **

| CHICAGO STORM | Ptotal= 55.38 mm |

IDF curve parameters: A=1023.840
B= 0.000
C= 0.800
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.94	1.50	5.08	3.00	6.01	4.50	2.66
0.17	2.07	1.67	6.47	3.17	5.21	4.67	2.52
0.33	2.22	1.83	9.19	3.33	4.61	4.83	2.40
0.50	2.40	2.00	18.14	3.50	4.15	5.00	2.28
0.67	2.61	2.17	162.27	3.67	3.78	5.17	2.18
0.83	2.87	2.33	21.31	3.83	3.48	5.33	2.09
1.00	3.20	2.50	12.30	4.00	3.22	5.50	2.01
1.17	3.63	2.67	8.97	4.17	3.01	5.67	1.93
1.33	4.22	2.83	7.16	4.33	2.82	5.83	1.86

CALIB	STANDHYD (0012)	Area (ha)= 0.16
ID= 1 DT=10.0 min	Total Imp(%)= 92.00	Dir. Conn.(%)= 92.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.15	0.01	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	32.88	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	over (min)	162.27	99.70	
	over (min)	10.00	10.00	
Storage Coeff.	(min)=	1.08 (ii)	8.15 (ii)	
Unit Hyd. Tpeak	(min)=	10.00	10.00	
Unit Hyd. peak	(cms)=	0.17	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.00	0.070 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	54.38	32.29	52.60
TOTAL RAINFALL	(mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT	=	0.98	0.58	0.95

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 90.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	STANDHYD (0001)	Area (ha)= 0.34
ID= 1 DT=10.0 min	Total Imp(%)= 84.60	Dir. Conn.(%)= 84.60

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.05	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	47.82	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	over (min)	162.27	129.22	
	over (min)	10.00	10.00	
Storage Coeff.	(min)=	1.35 (ii)	7.72 (ii)	
Unit Hyd. Tpeak	(min)=	10.00	10.00	
Unit Hyd. peak	(cms)=	0.17	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.13	0.01	0.145 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	54.38	39.81	52.12
TOTAL RAINFALL	(mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT	=	0.98	0.72	0.94

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0094
                          0.0239     0.0046   |   0.0377      0.0114
                          0.0312     0.0078   |   0.0464      0.0172

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.343      0.145      2.33      52.12
   OUTFLOW: ID= 1 (  0006)      0.343      0.032      2.50      52.02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.34
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0086

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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.16   0.070     2.33    52.60
     + ID2= 2 (  0006):     0.34   0.032     2.50    52.02
       ================================================
       ID = 3 (  0011):     0.51   0.095     2.33    52.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0159      0.0224
                          0.0059     0.0031   |   0.0178      0.0280
                          0.0143     0.0182   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      0.505      0.095      2.33      52.21
   OUTFLOW: ID= 1 (  0013)      0.505      0.012      3.67      51.97

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.11
                  TIME SHIFT OF PEAK FLOW         (min)= 80.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0148

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      V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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6.2\VO2\voin.dat
  Output  filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\f27e880f-68e4-4a19-ba43-91b93c7f983e\sc
  Summary filename: C:\Users\Pignataro\AppData\Local\Civica\VH5\d77ab7eb-
c3a8-4981-ad81-d3d1f7857440\f27e880f-68e4-4a19-ba43-91b93c7f983e\sc


DATE: 11-12-2024                          TIME: 01:30:58

USER:


COMMENTS: _____

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  ******************************************
  ** SIMULATION : Run 04                   **
  ******************************************
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--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1195.800
| Ptotal= 64.68 mm |                          B=   0.000
--------------------                          C=   0.800
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  6.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                0.00    2.26 |  1.50    5.93 |  3.00    7.02 |  4.50
3.11
                0.17    2.41 |  1.67    7.55 |  3.17    6.08 |  4.67
2.94
                0.33    2.59 |  1.83   10.73 |  3.33    5.38 |  4.83
2.80
                0.50    2.80 |  2.00   21.19 |  3.50    4.85 |  5.00
2.67
                0.67    3.05 |  2.17  189.52 |  3.67    4.41 |  5.17
2.55
                0.83    3.36 |  2.33   24.89 |  3.83    4.06 |  5.33
2.44
                1.00    3.74 |  2.50   14.37 |  4.00    3.77 |  5.50
2.34
                1.17    4.24 |  2.67   10.47 |  4.17    3.52 |  5.67
2.25
                1.33    4.93 |  2.83    8.36 |  4.33    3.30 |  5.83
2.17


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--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.16
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.15         0.01
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      32.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       126.65
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.01 (ii)    7.44 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.00          0.082 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      63.68        40.52          61.82
     TOTAL RAINFALL   (mm)=      64.68        64.68          64.68
     RUNOFF COEFFICIENT   =       0.98         0.63           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     189.52       158.51
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.27 (ii)    7.14 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.02          0.171 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      63.68        48.76          61.36
     TOTAL RAINFALL   (mm)=      64.68        64.68          64.68
     RUNOFF COEFFICIENT   =       0.98         0.75           0.95

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0344      0.0094
                         0.0239     0.0046   |   0.0377      0.0114
                         0.0312     0.0078   |   0.0464      0.0172

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     0.343      0.171      2.33      61.36
   OUTFLOW: ID= 1 (  0006)     0.343      0.036      2.50      61.25

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.82
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0103

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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.16   0.082     2.33    61.82
     + ID2= 2 (  0006):     0.34   0.036     2.50    61.25
       ================================================
       ID = 3 (  0011):     0.51   0.109     2.33    61.43

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------
------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0159      0.0224
                         0.0059     0.0031   |   0.0178      0.0280
                         0.0143     0.0182   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     0.505      0.109      2.33      61.43
   OUTFLOW: ID= 1 (  0013)     0.505      0.014      3.83      61.19

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.84
                  TIME SHIFT OF PEAK FLOW         (min)= 90.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0177

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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c3a8-4981-ad81-d3d1f7857440\ba035e11-8bac-4b0a-9cb8-223423729f0c\sc


DATE: 11-12-2024                          TIME: 01:30:58

USER:



COMMENTS: _____________________________________________________________


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  ********************************************
  ** SIMULATION : Run 05                     **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1415.390
| Ptotal= 76.56 mm |                          B=   0.000
--------------------                          C=   0.800
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  6.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =  0.38

                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
```

```
                0.00    2.68 |  1.50    7.02 |  3.00    8.31 |  4.50
3.68
                0.17    2.86 |  1.67    8.94 |  3.17    7.20 |  4.67
3.49
                0.33    3.07 |  1.83   12.71 |  3.33    6.37 |  4.83
3.31
                0.50    3.31 |  2.00   25.08 |  3.50    5.74 |  5.00
3.16
                0.67    3.61 |  2.17  224.32 |  3.67    5.23 |  5.17
3.02
                0.83    3.97 |  2.33   29.45 |  3.83    4.81 |  5.33
2.89
                1.00    4.43 |  2.50   17.01 |  4.00    4.46 |  5.50
2.77
                1.17    5.02 |  2.67   12.39 |  4.17    4.16 |  5.67
2.67
                1.33    5.84 |  2.83    9.90 |  4.33    3.91 |  5.83
2.57


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--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.16
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.15         0.01
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      32.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     224.32       161.90
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       0.95 (ii)    6.77 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.00          0.098 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56        51.32          73.61
     TOTAL RAINFALL   (mm)=      76.56        76.56          76.56
     RUNOFF COEFFICIENT   =       0.99         0.67           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     224.32       195.67
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.19 (ii)    6.58 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.02          0.204 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56        60.29          73.19
     TOTAL RAINFALL   (mm)=      76.56        76.56          76.56
     RUNOFF COEFFICIENT   =       0.99         0.79           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344     0.0094
                          0.0239     0.0046   |   0.0377     0.0114
                          0.0312     0.0078   |   0.0464     0.0172

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     0.343     0.204      2.33      73.19
   OUTFLOW: ID= 1 (  0006)     0.343     0.039      2.50      73.09

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.16
                TIME SHIFT OF PEAK FLOW         (min)= 10.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0125
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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.16   0.098     2.33    73.61
     + ID2= 2 (  0006):     0.34   0.039     2.50    73.09
       ================================================
       ID = 3 (  0011):     0.51   0.128     2.33    73.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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------
--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0159     0.0224
                          0.0059     0.0031   |   0.0178     0.0280
                          0.0143     0.0182   |   0.0000     0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     0.505      0.128      2.33      73.26
   OUTFLOW: ID= 1 (  0013)     0.505      0.016      4.00      73.02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.16
                  TIME SHIFT OF PEAK FLOW         (min)=100.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0214

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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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

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6.2\VO2\voin.dat
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DATE: 11-12-2024                          TIME: 01:30:58

USER:


COMMENTS: _____

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  ***********************************************
  ** SIMULATION : Run 06                       **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1579.410
| Ptotal= 85.43 mm |                          B=   0.000
--------------------                          C=   0.800
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  6.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME
RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs
mm/hr
                0.00    2.99 |  1.50    7.83 |  3.00    9.27 |  4.50
4.11
                0.17    3.19 |  1.67    9.98 |  3.17    8.03 |  4.67
3.89
                0.33    3.42 |  1.83   14.18 |  3.33    7.11 |  4.83
3.70
                0.50    3.70 |  2.00   27.99 |  3.50    6.40 |  5.00
3.52
                0.67    4.03 |  2.17  250.32 |  3.67    5.83 |  5.17
3.37
                0.83    4.43 |  2.33   32.87 |  3.83    5.36 |  5.33
3.22
                1.00    4.94 |  2.50   18.98 |  4.00    4.97 |  5.50
3.09
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                1.17    5.61 |  2.67   13.83 |  4.17    4.64 |  5.67
2.98
                1.33    6.51 |  2.83   11.04 |  4.33    4.36 |  5.83
2.87


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--------------------
| CALIB            |
| STANDHYD (  0012)|   Area    (ha)=   0.16
|ID= 1 DT=10.0 min |   Total Imp(%)=  92.00   Dir. Conn.(%)=  92.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.15         0.01
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      32.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     250.32       188.61
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       0.91 (ii)    6.38 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.01          0.109 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      84.43        59.54          82.43
     TOTAL RAINFALL   (mm)=      85.43        85.43          85.43
     RUNOFF COEFFICIENT   =       0.99         0.70           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  90.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.34
|ID= 1 DT=10.0 min |   Total Imp(%)=  84.60   Dir. Conn.(%)=  84.60
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.82        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     250.32       223.25
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.14 (ii)    6.26 (ii)
     Unit Hyd. Tpeak (min)=      10.00        10.00
     Unit Hyd. peak  (cms)=       0.17         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.03          0.228 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      84.43        68.96          82.03
     TOTAL RAINFALL   (mm)=      85.43        85.43          85.43
     RUNOFF COEFFICIENT   =       0.99         0.81           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  95.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0344      0.0094
                          0.0239     0.0046   |   0.0377      0.0114
                          0.0312     0.0078   |   0.0464      0.0172

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)      0.343      0.228      2.33      82.03
   OUTFLOW: ID= 1 (  0006)      0.343      0.042      2.50      81.92

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.18
                TIME SHIFT OF PEAK FLOW         (min)= 10.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0141

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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0012):     0.16   0.109     2.33    82.43
     + ID2= 2 (  0006):     0.34   0.042     2.50    81.92
       ================================================
       ID = 3 (  0011):     0.51   0.141     2.33    82.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| RESERVOIR(  0013)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 10.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0159      0.0224
                          0.0059     0.0031   |   0.0178      0.0280
                          0.0143     0.0182   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      0.505      0.141      2.33      82.08
   OUTFLOW: ID= 1 (  0013)      0.505      0.017      4.17      81.83

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.68
                  TIME SHIFT OF PEAK FLOW         (min)=110.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0242

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TABLE D4 - WATER BALANCE SITE CHARACTERISTICS

	Area (ha)	% Area of Predev Site	% Area of Postdev Site	Runoff Coefficient	Percent Impervious	Approximate Surface IA	% of Average Annual Rain Capture based on Surface IA	% of Total Annual Average Rainfall Depth Weighted Over Entire Site Based on Surface IA	Depth to Cistern (mm)	Total Effective IA (mm)	% of Total Annual Average Rainfall Depth	Total Annual Average Rainfall Depth weighted over entire	Cistern Size (m3)
BLDG A	3430	0.34	16.00%	0.80	84.62%	1.80	13.00%	2.08%	6.20	8.00	64.00%	10.24%	21.27
BLDG B	4487	0.45	20.93%	0.80	84.62%	1.80	13.00%	2.72%	6.20	8.00	64.00%	13.39%	27.82
BLDG C	4300	0.43	20.06%	0.80	84.62%	1.80	13.00%	2.61%	6.20	8.00	64.00%	12.84%	26.66
BLDG D	2597	0.26	12.11%	0.80	84.62%	1.80	13.00%	1.57%	6.20	8.00	64.00%	7.75%	16.10
Total Private Blocks	*14814*	*1.48*	*69.09%*	*0.80*	*84.62%*	*1.80*	*13.00%*	*8.98%*	*6.20*	*8.00*	*64.00%*	*44.22%*	*91.85*
STRT A	369	0.04	1.72%	0.85	92.31%	1.60	14.00%	0.24%	0.00	1.60	22.00%	0.38%	0.00
STRT B	427	0.04	1.99%	0.85	92.31%	1.60	14.00%	0.28%	0.00	1.60	22.00%	0.44%	0.00
STRT C	1253	0.13	5.84%	0.85	92.31%	1.60	14.00%	0.82%	0.00	1.60	22.00%	1.29%	0.00
Total Public ROWs	*5306*	*0.53*	24.75%	*0.33*	*12.04%*	*3.69*	*2.00%*	*0.49%*	*0.00*	*1.60*	*22.00%*	*5.44%*	*0.00*
PARK	1321	0.13	6.16%	0.50	38.46%	3.00	6.00%	0.37%	5.00	8.00	64.00%	3.94%	6.61
Total Park Space	*1321*	*0.13*	6.16%	*0.50*	*38.46%*	*3.00*	*6.00%*	*0.37%*	*5.00*	*8.00*	*64.00%*	*3.94%*	*6.61*
Site Total	**21441**	**2.14**	**100.00%**	**0.66**	**63.81%**	**2.34**		**9.85%**				**53.61%**	**98.45**