340-376R Dufferin Street & 2 Melbourne Avenue Toronto, Ontario

Site Servicing and Stage 2 Stormwater Management Report

Final

July 20, 2022

Prepared for:
Hullmark Sun Life (376 Dufferin) LP

arva

CANADA'S BEST MANAGED COMPANIES Platinum member

340 – 376R Dufferin Street & 2 Melbourne Avenue

Toronto, Ontario

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1.0 INTRODUCTION

Hullmark Sunlife (376 Dufferin) LP (the Owner) is proposing the redevelopment of the existing lands at 340-376R Dufferin Street & 2 Melbourne Avenue, located between Melbourne Street and Milky Way Laneway in the City of Toronto (the Site).

R.V. Anderson Associates Limited (RVA) has been retained to prepare a Site Servicing and Stage 2 Stormwater Management (SWM) report in support of a Zoning By-Law Amendment (ZBA), Official Plan Amendment (OPA) and Site Plan Application (SPA). The scope of this report specifically includes:

- Identification and review of existing municipal storm, sanitary and water services available for the Site.
- Estimate water, sanitary and storm demands that will result from the redevelopment.
- Investigation of the capacity of the existing municipal water mains and sewers.
- Provide a summary of proposed servicing of the site with water, sanitary and storm services.
- Identification of the City of Toronto (City) criteria with respect to sanitary, water and storm servicing including stormwater management (SWM) criteria for the redevelopment of the Site, in accordance with the City of Toronto Wet Weather Flow (WWF) Guideline criteria and targets.
- Calculation of allowable post-development peak storm discharge rates.
- Calculation of WWF water balance target criteria and development of appropriate methods to achieve the criteria.
- Recommendation and description of proposed stormwater management (SWM) system for the site to address water balance, water quality, and discharge rate targets.

2.0 BACKGROUND

2.1 Site Location and Existing Conditions

The Site is approximately 0.75 ha in size and has the current municipal addresses of 340-376R Dufferin Street & 2 Melbourne Avenue. In its existing state, the Site is comprised of multiple buildings that are 1 to 2 storeys in height which are located on both the north and south sides of a centralized paved vehicular courtyard. These buildings generally operate as office/business spaces. Buildings with municipal addresses 350 – 376R Dufferin occupy the north half of the Site (i.e., north of the existing Dufferin Street driveway

entrance) while the buildings with the municipal address 340 Dufferin Street & Melbourne Avenue occupy the South half of the Site (i.e., south of the existing Dufferin Street driveway).

The site has municipal frontage onto Milky Way Laneway to the north, Dufferin Street to the east and Melbourne Avenue to the south. A portion of the west limit of the Site is bounded by an unpaved granular driveway. Furthermore, residential houses fronting Gwynne Avenue are located just west of the Site location. Refer to Figure 2.1 below for the Site's location in context with the surrounding public roadways. Additionally refer to drawing A-002 prepared by Bousfields Inc. in Appendix A for municipal address labelling.

Figure 2.1 - Site Location

2.2 Proposed Redevelopment

The proposed redevelopment is comprised of two (2) point towers known as the "North Tower" and the "South Tower" which will be 25 storeys and 21 storeys in height respectively. These towers will sit atop a common podium that is four (4) to six (6) stories in height. The South Tower built form will also abut and interconnect with an eleven (11) storey tower known as the "South Midrise Tower".

The podium will have a combination of flex/retail/commercial/studio spaces and amenity areas while the towers will be comprised of residential units. Two floors of underground parking are proposed to be shared between the towers and the podium. A common paved courtyard is proposed at grade in between the buildings, in a similar configuration to the existing condition. A portion of the existing building is proposed to remain. This building is located at the southwest corner of the existing courtyard (350 Dufferin Street). This building will be referred to as the "existing courtyard building" in the report. Furthermore, a portion of the existing façade of the building fronting Dufferin Street will also be preserved.

Vehicular access to the Site will be available via a driveway entrance off Milky Way Laneway. A pedestrian walkway will replace the existing Dufferin Street Driveway which will provide pedestrian access to the Courtyard. There will be two vehicular access points from the Milky Way Laneway. The first location will generally be along the mid-frontage of Milky Way Laneway to provide vehicular access to the building loading area. A second Milky Way Laneway vehicular access point will be located near the northwest corner of the building which will provide access to the building underground parking garage. The pedestrian walkway off Melbourne Avenue will generally be located at the southwest corner of the Site and will provide additional pedestrian access to the Courtyard.

Lastly, the Site will likely be developed in two (2) phases. Phase 1 will include all developments north of 340 Dufferin Street which includes the North and South Towers, the four (4) and six (6) storey podium, the courtyard, and the underground parking structure within the northern Site footprint. During Phase 1, the existing building at 340 Dufferin Street site will remain in its current state. This building will be referred to as the "Existing Phase 1 (340 Dufferin & 2 Melbourne) Building" in the report. Phase 2 will include the demolition of the existing Phase 1 (340 Dufferin & 2 Melbourne) building and the construction of the south portion of the Site including the underground parking garage and the South Midrise Tower. It is noted that the entirety of the development will be designed as one single building under the Ontario Building Code (OBC).

Please refer to Appendix A for the Architectural Site plan which shows the 'Phase 1' and 'Phase 2' boundary and detailed statistics for the redeveloped site.

2.3 Resource Information

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

- Hydrant Flow Tests completed by Lozzi Aqua Check dated May 5, 2021.
- City of Toronto provided record drawings:
    - DWG L-2829, dated 1990.

  - DWG M-198, dated 1960.
  - DWG U-557-020 and DWG U-557-021, dated 2013.

- Architectural DWGs of the existing buildings.
- Architectural Drawings and Site statistics of the proposed development, prepared by Sweeny&Co Architects, dated July 15, 2022.
- Utility Circulation responses received from the Toronto Public Utilities Coordinating Committee (TPUCC), dated Feb. to March 2022.
- 'Functional Servicing and Stormwater Management Report' for 340-376 Dufferin Street prepared by Counterpoint Engineering, dated October 2021.
- Sewer and watermain network atlas drawings obtained from the City of Toronto.
- Topographical Survey Prepared by KRCMAR Surveyors Limited, dated April 25, 2021.
- 'Hydrogeological Review Report' prepared by Grounded Engineering Inc. dated December 23, 2021.
- 'Preliminary Geotechnical Engineering Report' prepared by Grounded Engineering Inc. dated December 23, 2021.
- Multiple site visits undertaken in 2022. Site visits included a general examination and photographs of the property to observe surface features that are representative of underground servicing, current surface drainage and to gather additional relevant information.
- Dye Testing Report provided by Aquaflow Technology Inc, dated March 21, 2022, to understand what part of the existing site drains out to either the combined or the storm sewer.
- CCTV and Subsurface Utility Engineering (SUE) performed by T2 in 2017, to understand the existing storm drainage from the site.

3.0 SERVICING INVESTIGATION

3.1 Foundation Drainage

The current (January 2022) City Foundation Drainage Policy prohibits any long-term discharge of foundation drainage (infiltrated or groundwater) to the municipal sanitary sewer and the long-term discharge of groundwater to any municipal sewer from the saturated zone of ground. A Hydrogeological Investigation (Hydro G report) prepared by Grounded Engineering Inc, dated December 23, 2021, has been completed for the Site.

The Hydro G report identifies that a groundwater elevation of 88.7m be used for design purposes

Since the proposed underside of basement structure will be deeper than the groundwater level, the City's Foundation Drainage Policy dictates that the groundwater influencing the basement structure cannot be discharged to the municipal sewers in the long-term scenario. Therefore, to conform to the City's Policy, the Owner will design the proposed building's underground parking structure as a watertight structure which can structurally withstand the hydrostatic forces acting on it. As such, there will be no long-term discharge of foundation drainage to the City sewer.

The existing courtyard building does have an existing groundwater collection system and sump pit in the basement that is connected to the municipal combined sewer. A letter prepared by Pinchin Ltd. (Pinchin) dated August 23, 2021, was prepared to review the existing on-site groundwater collection system(s) and water level monitoring in two existing sump pits (340 Dufferin and 350-358 Dufferin). The results of this investigation concluded that due to waterproofing completed in the existing basements, the foundation drainage discharge from both sump pits was effectively eliminated. Following consultation with the City's Environmental Monitoring and Protection Branch, the Owner will disconnect the groundwater collection systems from the on-site plumbing system so that there is no connection to the municipal sewer system. Furthermore, the Owner will elect to monitor the volume of water collected in the existing sump pits and haul it off-site as necessary by a licensed contractor.

With respect to short-term construction dewatering, groundwater samples were taken and analyzed for water quality. The results of the samples indicate that the groundwater is suitable for short-term discharge to the sanitary or combined sewer but not to storm (i.e., Municipal Code Chapter 681, Table 1, and Table 2 respectively). Therefore, pre-treatment would be required prior to short-term discharge to the storm sewer system. However, pre-treatment would not be required to discharge into the sanitary or combined sewer system in the short-term. The Hydro G report estimates a total short-term construction dewatering groundwater flow rate of 195,000 L/day or 2.26 L/s.

3.2 Sanitary Servicing

3.2.1 Sanitary Servicing Criteria

The City of Toronto's Design Criteria for Sewers and Watermains (Jan 2021) and the City of Toronto's Sewer Capacity Assessment Guidelines (2021) was referenced to estimate existing and proposed sanitary demands from the Site. The criteria are generally summarized as follows:

- Average domestic (residential) sewage flows of 450 litres per capita per day for new sewer design.
- Average domestic (residential) sewage flows of 240 litres per capita per day for analysis of existing systems in fully separated sewer areas with no basement flooding concerns.
- The peak domestic sewage flow to be calculated by utilizing a calculated Harmon Peaking Factor [$M = 1 + 14 / (4+P^{0.5})$].
- Average commercial/industrial/institutional sewage flows of 180,000 litres per floor hectare per day for new local sewers (peaking factor included in average flow).
- Average institutional/commercial/industrial (I/C/I) sewage flows of 240 litres per capita per day for analysis of existing systems in fully separated sewer areas with no basement flooding concerns.
- A peak infiltration allowance of 0.26 L/s/ha is required for analysis of dry weather flow scenarios.
- Population Densities as follows:
    - Bachelor/1-Bedroom – 1.4 persons per unit.
    - 2-Bedroom – 2.1 persons per unit.
    - 3-Bedroom – 3.1 persons per unit.
    - 4-Bedroom – 3.7 persons per unit.

In the case of Zoning By-Law Amendment (ZBA) Applications, the City requires that the applicant demonstrate that there is no negative impact on the existing municipal sewer system and, if there is, identify how it will be mitigated. To undertake this review, the applicant must analyze the municipal system until it reaches a municipal trunk sewer in accordance with the City's Sewer Capacity Assessment Guidelines (2021).

3.2.2 Existing Sanitary Servicing

A review of the City's engineering record drawings, sewer atlas maps, and DMOG files indicate that the Site is located in an area in the City of Toronto that is serviced by combined sewers. The existing combined/sanitary sewers around the Site are:

- Milky Way Laneway: 900mm x 600mm diameter brick combined sewer draining east towards Dufferin Street.
- Dufferin Street: 600mm diameter V.P. combined sewer draining south.

- Melbourne Avenue: 375mm diameter V.P. sanitary sewer draining east towards Dufferin Street.

The Dufferin Street combined sewer conveys flows from both the Milky Way Laneway combined sewer and the Melbourne Avenue sanitary sewer. This combined sewer flows south for approximately 500m where it then discharges into a 1,350mm diameter trunk sewer at the Dufferin Steet and Liberty Street intersection.

Please refer to Appendix A for relevant sewer atlas maps around the Site.

Based on Site observations and the Combined & Storm Sewer Investigation Report Dye Test dated March 21, 2022, by Aquaflow Technology (Dye Test Investigation), there are five (5) service connections to the Dufferin Street combined sewer.

The existing estimated peak sanitary discharge rate from the Site is estimated to be approximately 0.95 L/s. Please refer to Appendix A for the Dye Test Investigation Report and Appendix B for calculations.

With respect to sewer capacity related to the short-term private water discharge, refer to Section 3.2.4 of this report.

3.2.3 Proposed Sanitary Servicing

3.2.3.1 Sanitary Demand Analysis

Based on a per capita demand of 240 L/capita/day for residential and 250 L/capita/day for commercial/retail, the proposed redevelopment will result in an estimated total peak sanitary flow rate of 13.02 L/s. This represents an estimated increase of 12.07 L/s over the existing sanitary flow from the Site. The breakdown of the peak sanitary discharge from the redevelopment is as follows:

Table 3.1 – Proposed Sanitary Demand

	Peak Flow (L/s)
Residential (Phase 1)	10.56
Residential (Phase 2)	2.30
Total Residential*	12.49
Retail/Flex (Phase 1)	0.22
Retail/Flex (Phase 2)	0.02
Total Retail/Flex	0.24
Existing Courtyard Building	0.09

	Peak Flow (L/s)
Dry Weather Flow (DWF) Infiltration Allowance (Phase 1)	0.15
Dry Weather Flow (DWF) Infiltration Allowance (Phase 2)	0.04
Total Infiltration	0.19
TOTAL (Site)	**13.50 (rounded from 13.02)**

** Due to Harmon's Peaking Factor, the total proposed residential peak flows are less than the summation of the two separately.*

Please refer to Appendix B for a breakdown of Sanitary Demand Calculations.

3.2.3.2 Proposed Sanitary Service Connections

As stated in Section 2.2, the Site is proposed to be developed in two (2) phases. It is currently envisioned that each phase will be designed with separate sanitary plumbing systems to capture and convey sanitary flows.

Phase 1

Phase 1 will have three (3) separate sanitary service connections which will service the North Tower, the South Tower, and the Phase 1 podium. These sanitary service connections will each be 200mm Ø and connect to the existing 600mm Ø combined sewer on Dufferin Street.

In accordance with the Toronto Municipal Code Chapter 681 (sewer by-law), three (3) sanitary control maintenance holes (MHs) will be provided adjacent to the property line for each service connection. The control MHs will be incorporated into the basement structure where the basement extends out from the building at grade located at the Dufferin Street pedestrian entrance.

Phase 2

Phase 2 will have two (2) separate sanitary service connections which will service the South Midrise Tower and the Phase 2 podium. These sanitary service connections will each be 150mm Ø and connect to the existing 375mm Ø sanitary sewer on Melbourne Avenue.

Similar to Phase 1, two (2) sanitary control maintenance holes (MHs) will be provided adjacent to the property line for each service connection. The control MHs will be

incorporated into the basement structure where the basement extends out from the building at grade located at the Melbourne Avenue pedestrian entrance.

Please refer to Appendix E for Site Servicing drawing C-2.

3.2.3.3 Combined Sewer Capacity Assessment

As mentioned in Section 3.2.2, a Dye Test Investigation was completed to quantify the existing on-site drainage that is directed to both the municipal sanitary/combined and storm sewer systems. Based on the results of the Dye Test Investigation, it was found that:

- A portion of the roof drainage from the existing building located at the northeast corner of 376R Dufferin Street and a portion of the paved driveway entrance from Dufferin Street drains to the 1650mm storm sewer on Dufferin Street (± 0.022 ha drainage area).
- A portion of the roof drainage from the existing building located at the southeast corner of 340 Dufferin Street drains to the 375mm sanitary sewer located on Melbourne Avenue (±.045 ha drainage area).
- A portion of the roof drainage from the existing building located at the southwest corner of 350 Dufferin Street drains via downspouts to the unpaved granular driveway along the west side of the Site (±0.013 ha drainage area).
- The remainder of the Site (an area of about 0.6644 ha) drains to the combined sewer systems located on Milky Way Laneway and Dufferin Street.

It is noted that the unpaved granular driveway located along the west side of the Site has a fairly flat gradient associated with it. In that regard, the majority of this driveway does not have any purposeful drainage during minor events, but during larger events, drainage would be directed towards Milky Way Laneway. Therefore, the 350 Dufferin Street roof drainage directed to this laneway is not considered to contribute any purposeful flows to the existing combined sewer during minor storm events.

Please refer to Appendix A for Aquaflow Technology Inc. report and Appendix D for the Pre-Development Storm Drainage Plan STM-1.

To quantify the flows to the existing combined sewer system, a runoff coefficient of C = 0.9 was used, since the existing Site can be characterized as being entirely impervious with little to no pervious areas. During a 2-year design storm event, the 0.6644 ha combined sewer catchment area contributes 146 L/s of storm runoff to the municipal combined sewer system.

Following the redevelopment of the Site, all storm flows will be redirected to the existing storm sewer on Dufferin Street. Although the redevelopment will inherently increase the domestic flows to the combined sewer system, the removal of the more substantial peak storm flows from the combined sewer will result in a net decrease in flows to the City's combined sewer.

Tables 3.2 and 3.3 summarize the net-reduction in flows to the municipal combined sewer for the scenario when only Phase 1 is complete and the ultimate scenario when both Phase 1 and Phase 2 are complete. This can be further described as:

- Table 3.2: Phase 1 Complete + Existing Phase 1 (340 Dufferin & 2 Melbourne) Building
- Table 3.2: Phase 1 + Phase 2 Complete

Table 3.2 – Pre-Post Combined Sewer Flows (Phase 1)

Flow	Existing (Pre) (L/s)	Proposed (Post) (L/s)	Reduction (L/s)
Storm (2-yr)	146.00	39.30*	-106.7
Sanitary	0.95	11.01	+10.06
TOTAL	**146.95**	**50.31**	**-96.64**

** Typical 2-year storm flows from existing 340 Dufferin Street & 2 Melbourne Avenue building (to remain as part of Phase 1) to the combined sewer system.*

Table 3.3 – Pre-Post Combined Sewer Flows (Phase 1 + 2)

Flow	Existing (Pre) (L/s)	Proposed (Post) (L/s)	Reduction (L/s)
Storm (2-yr)	146.00	5.00*	-141.00
Sanitary	0.95	13.50	+12.55
TOTAL	**146.95**	**18.50**	**-128.45**

** An allowance of 5 L/s has been established to account for any uncontrolled stormwater flows along the perimeter of the Site draining to the Milky Way Laneway.*

Based on the tables above, the redevelopment of the Site will comply with Ministry of the Environment, Conservation and Parks (MECP) Procedure F-5-5, since there will be a 'net-reduction' in the overall flows to the combined sewer system during both the interim (Phase 1) and the final (Phase 1 + Phase 2) conditions. Furthermore, since the redevelopment will result in a net reduction in flows to the combined sewer, further

downstream analysis of the combined sewer system is not required in accordance with the City's Sewer Capacity Assessment Guidelines.

3.2.4 Capacity for Short-Term Private Water Discharge

As indicated in Section 3.1 of this report, the estimated short-term discharge during construction is 195,000 L/day or 2.26 L/s. Since sufficient capacity in the City's sewer system has been established for the ultimate developed peak sanitary demand of 13.50 L/s, it can be concluded that sufficient capacity exists for the much smaller 2.26 L/s short-term private water discharge rate.

3.3 Water Servicing

3.3.1 Water Servicing Criteria

The City of Toronto's Design Criteria for Sewers and Watermains (January 2021) was used to analyze the water demand from the proposed development. The City's criteria are generally summarized as follows:

- Water supply systems should be designed to satisfy the greater of maximum day demand plus fire flow or peak hour demand.
- Average domestic water demands of 190 litres per capita per day for low-rise apartment buildings and condominiums with greater than six (6) units.
- Maximum day and peak hour factors for apartments are 1.30 and 2.50 respectively.
- Maximum day and peak hour factors for office/retail are 1.10 and 1.20 respectively.
- Fire flow requirements for the site shall be based on Fire Underwriters Survey (FUS) (1999) and are to not exceed the available flow in the municipal watermain that the site will connect to at a minimum residual pressure of 140 kPa (20 psi).
- Population Densities as follows:
    - 1-Bedroom – 1.4 persons per unit.
    - 2-Bedroom – 2.1 persons per unit.
    - 3-Bedroom – 3.1 persons per unit.

3.3.2 Existing Water Servicing

Based on City record drawings, water atlas maps, and DMOG files, the following watermains are present around the Site:

- Dufferin Street: 300mm diameter ductile iron watermain located along the west side of the roadway constructed in 2013.
- Melbourne Avenue: 100mm diameter cast iron watermain located along the north side of the roadway constructed in 1887 interconnected with the 300mm diameter Dufferin Street watermain.
- Melbourne Avenue: 150mm diameter cast iron watermain located along the south side of the roadway constructed in 1910 interconnected with the 300mm diameter Dufferin Street watermain.

There are also three (3) existing fire hydrants around the vicinity of the Site as follows:

- In front of 376 Dufferin Street.
- In front of 340 Dufferin Street.
- In front of 9 Melbourne Avenue, about 35m west of 340 Dufferin Street.

Furthermore, the City records indicate that there are four (4) water services connected to the 300mm diameter Dufferin Street watermain that service the existing Site. All existing water services from the Site are to be disconnected at the City main and decommissioned within the City right-of-way by City forces at the Owner's expense.

3.3.3 Proposed Water Servicing

3.3.3.1 Domestic Water Demand Analysis

The total estimated average daily flow rates, maximum day, and peak hour demand required for the proposed development are estimated to be as follows:

Table 3.4 – Proposed Water Demand

	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Residential (Phase 1)	2.20	2.86	5.50
Residential (Phase 2)	0.44	0.57	1.10
Total Residential	**2.64**	**3.43**	**6.60**
Retail/Flex (Phase 1)	0.13	0.15	0.21
Retail/Flex (Phase 2)	0.02	0.02	0.02
Total Retail/Flex	**0.15**	**0.17**	**0.23**

	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Existing Phase 1 (340 Dufferin) Building	**0.07**	**0.04**	**0.04**
TOTAL	**2.83**	**3.64**	**6.93**

Refer to Appendix C for water demand analysis calculations.

3.3.3.2 Fire Flow Analysis

In accordance with the City of Toronto Design Criteria for Sewers and Watermains, fire flows shall not be less than 80 L/s (4,800L/min) for a 2-hour duration in addition to maximum daily domestic demand with a residual pressure of not less than 140 kPa (20 psi).

Since the site will be developed in two (2) phases, the fire flow requirements for the Site during Phase 1 and during final build-out of Phase 1 and Phase 2 should be reviewed. As discussed previously in the report, these two scenarios can be summarized as follows:

- Phase 1 Complete + Existing Phase 1 (340 Dufferin & 2 Melbourne) Building.
- Phase 1 + Phase 2 Complete.

Phase 1

As mentioned earlier, the Existing Courtyard Building will remain following the redevelopment of the Site. At this time, it is assumed that no internal access will be provided from the Existing Courtyard Building into the new proposed buildings. However, for the purposes of the fire demand calculations, it is conservatively assumed that the Existing Courtyard Building will be connected to the proposed building which will increase the floor plate area used in the FUS calculations.

Calculations using the Fire Underwriters Survey (FUS) indicate a maximum required fire flow of approximately 366.70 L/s. This is based on ‘fire-resistive construction’ with the vertical openings and exterior vertical communications properly protected (one-hour rating) with a sprinkler system designed to National Fire Protection Association (NFPA) standards for the proposed Phase 1 building. For the Existing Courtyard Building, it’s assumed to have been constructed to an ‘ordinary construction’ standard and no reductions were assigned for a sprinkler system.

The Existing Phase 1 (340 Dufferin & 2 Melbourne) Building will require a fire flow of approximately 283.30 L/s. This assumes that the building was constructed to an 'ordinary construction' standard. Furthermore, no reductions were assigned for a sprinkler system.

Therefore, the governing Phase 1 fire flow is 366.70 L/s.

Phase 2

Following the demolition of the Existing Phase 1 (340 Dufferin & 2 Melbourne) Building and the construction of Phase 2, the fire demand will be indicative of the overall fire demand for the entire redeveloped Site.

Calculations using the Fire Underwriters Survey (FUS) indicates a maximum required fire flow of approximately 371.80 L/s for the entire redeveloped Site. This is based on 'fire-resistive construction' with the vertical openings and exterior vertical communications properly protected (one-hour rating) with a sprinkler system designed to NFPA standards for the proposed building. Like the Phase 1 scenario, the Existing Courtyard Building is assumed to have been constructed to an 'ordinary construction' standard with no reductions assigned for a sprinkler system.

A breakdown of the governing max day demand + fire flows and the peak hour domestic demand for the Site is as follows:

Table 3.5 – Proposed Governing Water and Fire Demands

	Demand (L/s)
Fire Flow Demand	371.80
Max Day Demand	3.64
TOTAL	**375.43**
Peak Hour Domestic Demand	6.93

Refer to Appendix C for fire flow analysis calculations.

3.3.3.3 Proposed Watermain Service Connections

A total of five (5) domestic service connections are proposed for Phase 1 and Phase 2 and a common fire service is proposed for the entire development.

Phase 1 - Domestic

Similar to sanitary servicing, and in accordance with the City's Servicing Policy, three (3) service connections are proposed for Phase 1 which will service the North Tower, South Tower, and the Phase 1 podium structure. The domestic water service connections are

proposed to be 150mm Ø each and will connect to the existing 300mm Ø watermain located on Dufferin Street.

The services will be located just north of the Dufferin Street pedestrian entrance where they will enter into a mechanical room located in the P1 level of the underground parking structure.

Phase 2 – Domestic

Two (2) service connections are proposed for Phase 2, one (1) for the South Midrise Tower and one (1) for the Phase 2 podium structure. The service connections are proposed to be 150mm Ø each and will connect into the existing 300mm Ø watermain located on Dufferin Street.

The services will be located roughly along the Phase 2 mid-frontage to Dufferin Street, where they will enter into a mechanical room located in the P1 level of the underground parking structure.

Fire Service

One (1) fire service connection is proposed to service the redevelopment. It is noted that although OBC dictates that buildings higher than 84m shall be serviced with two (2) sources of water, OBC clause 3.2.1.1 indicates that the mechanical penthouse shall be excluded from the overall building height. As such, this results in a building height of less than 84m and, therefore, one (1) fire connection satisfies OBC requirements. With respect to fire systems, it is assumed that Phase 1 and Phase 2 fire systems will be interconnected to form a single overall fire system for the combined buildings.

The fire service is proposed to be 200mm Ø and will connect into the existing 300mm Ø watermain located on Dufferin Street. This fire connection will be installed in a “h” configuration in accordance with City standards and will include one of the Phase 1 domestic services branching off this fire service.

A minimum of two (2) Siamese connections will also be provided for the development, which will be located along the frontage of Dufferin Street within 45 m of an existing municipal hydrant in accordance with OBC criteria.

Refer to Appendix E for the Site Servicing drawing C-2.

3.3.4 Capacity of Existing Watermain System

A hydrant flow test was performed by Lozzi Aqua Check on May 5, 2021, on the hydrant located in front of 376 Dufferin Street. The hydrant flow tests were conducted in accordance with NFPA 291 guidelines. The theoretical flow at 20 psi was recorded to be 440.40 L/s. Refer to Appendix C for the hydrant flow test results.

As summarized in Section 3.3.3.2, the governing water demand for the redevelopment will be generated by Max Day Demand plus Fire Flow demand, which is approximately 375 L/s, which is to be delivered with a residual pressure of not less than 20 psi. Based on the hydrant flow test, the watermain can provide 440.40 L/s (6980 US GPM) at 20 psi which is sufficient to support the water demands for the redevelopment.

3.4 Storm Servicing

3.4.1 Existing Storm Servicing and Drainage Conditions

Based on City record drawings, sewer atlas maps and DMOG files, the following storm sewers are located in the vicinity of the Site:

- Dufferin Street: 1,650mm diameter brick storm sewer that drains south along Dufferin Street where it ultimately discharges to Lake Ontario.
- Melbourne Avenue: 300mm diameter V.P. storm sewer draining west.

Please refer to Appendix A for relevant sewer atlas maps around the Site.

Based on the Dye Testing Investigation, a portion of the existing rooftop drainage from the building at 376R Dufferin Street (northeast corner of the site) discharges to the existing 1,650mm storm sewer on Dufferin Street via an existing storm service lateral. Furthermore, there is also a small area of uncontrolled drainage from the existing Dufferin Street vehicular entrance that sheet drains onto Dufferin Street. This uncontrolled drainage is captured by the catchbasins on Dufferin Street which are assumed to be connected to the 1,650mm diameter storm sewer. The total storm drainage catchment area from the Site directed to the municipal storm sewer is roughly 0.022 ha. Most of the remaining storm drainage from the Site is directed to the municipal combined sewers as described in Section 3.2.3.3.

The existing Site can be characterized as impervious since the Site is comprised of mostly hardscaped surfaces and rooftop. Therefore, the Site's existing runoff coefficient is C=0.9. Using the rational method equation Q = CiA, the existing 2-year peak storm discharge rate from the Site can be calculated as:

$$Q_{2-Year} = 2.78\ x\ CiA = 2.78\ x\ 0.90\ x\ 88.20\ mm/hr\ x\ 0.7444ha = 164.27\ L/s$$

3.4.2 Proposed Storm Servicing

It is noted that the City Municipal Code, Chapter 681 generally prohibits a storm connection from a site to the municipal sewer. However, in the case of site developments that are not individual single-family lots, a storm service connection is required to meet Wet Weather Flow Management (WWFM) Guidelines (November 2006) and implement

the required SWM. The SWM plan serves as a request through the City of Toronto for a storm service connection and exemption from the associated requirements in the Sewer Code.

As required by the City municipal code with respect to sewers, a new storm service connection will be required.

In accordance with the City Sewer Code, a storm control MH will be provided near the property line for City sampling purposes. This MH will be incorporated into the basement structure where the basement extends out from the finished portion of the above ground building. Refer to Appendix E for Site Servicing drawing C-2 which shows the proposed location for the storm control MH.

The new storm service connection will be 250 mm Ø and will be connected to the existing 1,600 mm Ø storm sewer on Dufferin Street.

The storm service connection will convey controlled drainage from the on-site SWM facility which will be employed to meet the City's stormwater discharge requirements outlined in Section 3.4.3 of this report. This on-site SWM facility will manage stormwater runoff from both Phase 1 and Phase 2. A detailed SWM Plan is presented in Section 4.0 of this report.

3.4.3 Proposed Drainage Conditions

The proposed redevelopment surfaces are comprised of green roof, amenity landscaping, conventional roof, pervious surfaces at grade, and impervious at grade surfaces. As explained above in Section 3.4.2, the on-site SWM facility will be designed to manage stormwater runoff from both Phase 1 and Phase 2. Therefore, the overall Site area will be considered for SWM calculations.

The total site weighted runoff coefficient has been calculated to be 'C'=0.76. Refer to Table 3.6 for the surface and area breakdown and Figure SWM-1 in Appendix D for an illustration of the various surface types.

Table 3.6 – Proposed Surface and Area Breakdown

Surface	Runoff Coefficient ('C')	Area (m^2)	% Area of Site	Weighted 'C' Component
Conventional Flat Roof	0.90	3,184	42.8	0.38
Green Roof	0.50	2,123	28.5	0.14
Landscaping at Grade	0.25	418	5.6	0.03
Impervious at Grade	0.90	1,672	22.5	0.20

Surface	Runoff Coefficient ('C')	Area (m^2)	% Area of Site	Weighted 'C' Component
Uncontrolled Impervious at Grade	0.90	47	0.6	0.006
Uncontrolled Pervious at Grade	0.25	0	0	0
Total		**7,444**	**100%**	**0.76**

Based on the WWFM Guidelines, the allowed peak discharge from the Site is to be based on controlling the discharge rate to the pre-development 2-year storm with a maximum runoff coefficient of C=0.5 or the existing capacity of the receiving storm sewer, whichever is less. Since the existing Site has a runoff coefficient of greater than C=0.5, a runoff coefficient of C=0.5 would therefore apply to the Site and the allowable peak storm discharge from the redeveloped Site can be calculated as follows:

$$Q_{allowable\,(Site)} = 2.78\ x\ CiA = 2.78\ x\ 0.50\ x\ 88.20\ mm/hr\ x\ 0.7444\ ha = 91.26\ L/s$$

4.0 STORMWATER MANAGEMENT PLAN

4.1 Storm Drainage Criteria

The City of Toronto Wet Weather Flow Master Management Plan (WWFMMP) policy encourages the use of a "treatment train" approach to stormwater management that considers storm run-off as a resource. This philosophy considers best management measures that can be undertaken at the source, conveyance, and end of pipe locations. Opportunities to allow stormwater run-off to be infiltrated back into the ground at the source either by directing run-off to pervious surfaces or by way of infiltration/exfiltration techniques are a key component of the City's WWFMMP policy.

Based on the City of Toronto WWFM Guidelines, the following general SWM criteria would apply to the redevelopment of this site:

- Water Balance: Retain stormwater on-site to the extent practicable to achieve the same level of annual volume of overland runoff from the site in the pre-development (existing) condition. The maximum allowable annual volume is 50% of the total average annual rainfall depth (this equates to the capture and retention of approximately 5mm of runoff on a daily event basis).
- Water Quality: Provide long-term average removal of 80% of Total Suspended Solids on an annual loading basis from the post-development site.

- Water Quantity (Rate Control): Control flows from the site during all design storm events (2-year through 100-year design storms) to a rate no greater than the peak run-off rate that would be generated on the predeveloped site in a 2-year storm event with a "C" value of C=0.50, or the existing capacity of the receiving sewer, whichever is less.
- Run-off generated on the entire site, in all storm events, up to and including the 100-year event, shall be contained on-site.
- Maintain existing drainage patterns, ensuring adjacent properties are not adversely affected.

The IDF curve information for the I_2 to I_{100} storms as obtained from the City of Toronto's WWFM Guidelines are as follows:

I_2 (mm/hr) = 21.8 $(T)^{-0.78}$, where T is in hours

I_5 (mm/hr) = 32.0 $(T)^{-0.79}$, where T is in hours

I_{10} (mm/hr) = 38.7 $(T)^{-0.80}$, where T is in hours

I_{25} (mm/hr) = 45.2 $(T)^{-0.80}$, where T is in hours

I_{50} (mm/hr) = 53.5 $(T)^{-0.80}$, where T is in hours

I_{100} (mm/hr) = 59.7 $(T)^{-0.80}$, where T is in hours

These equations can be re-expressed in the traditional IDF format (where T is in minutes) as follows:

I_2 (mm/hr) = 531.391/ $(T + 0)^{0.78}$

I_5 (mm/hr) = 812.623 / $(T + 0)^{0.79}$

I_{10} (mm/hr) = 1023.840 / $(T + 0)^{0.80}$

I_{25} (mm/hr) = 1195.800 / $(T + 0)^{0.80}$

I_{50} (mm/hr) = 1415.390 / $(T + 0)^{0.80}$

I_{100} (mm/hr) = 1579.41 / $(T + 0)^{0.80}$

4.2 Proposed Stormwater Management

4.2.1 General Description of Proposed SWM Plan

As mentioned in Section 3.4.2, Phase 1 and Phase 2 will have a combined SWM facility. The existing gradient of Dufferin Street falls at roughly a 0.5% gradient from south to north

along the frontage of the Site to about the location of the existing Dufferin Street driveway. North of the Dufferin Street driveway, the gradient of Dufferin Street slopes at roughly 5.0% north towards Queen Street. Due to the profile of the Dufferin Street roadway, the north limit of the Site is approximately 2m lower than the vehicular driveway entrance off Dufferin Street.

For this reason, the SWM facility is proposed to be located at the northeast corner of the Site which represents the lowest elevation around the Site. The SWM facility is proposed to be incorporated into the basement structure of the building at an area where a portion of the basement extends beyond the building at grade to permit maintenance access through MH lids at grade. Due to the façade retention of 360 Dufferin Street, the building at grade is proposed to be constructed to the limits of the property line with the exception of a small area at the northeast corner of the Site. Due to the façade retention, this further limits the location of the SWM facility to the northeast corner of the Site where there is a proposed setback of the building at grade from the property line.

The proposed Phase 1 and Phase 2 buildings will both employ green roof surfaces on portions of the rooftop surfaces and amenity areas. These green roof surfaces will serve to reduce the rate and quantity of runoff, as well as provide on-site stormwater quality benefits. In addition to the green roof surfaces, planters will be employed to the extent possible on both the podium amenity areas and at ground level. Refer to Table 3.6 for a breakdown and Figure SWM-1 in Appendix D for an illustration of the various site surface areas.

Studies of extensive green roofs in Toronto and other areas in Canada and the United States have demonstrated that they can effectively reduce annual runoff by as much as 60% through evapotranspiration, with intensive green roofs and planters exceeding that level. At this time, it is anticipated that the green roof selected for this Site will be representative of an intensive green roof system capable of providing at least 7.0 mm (60% annual average rainfall) rainfall/runoff reduction.

The runoff reduction that will result from the “green” surfaces will be insufficient to meet the City’s requirement of capturing a minimum of 5 mm of runoff over the Site. Rainwater harvesting for reuse will be employed by the Owner which will include either irrigation or a greywater toilet flushing system to supplement the pervious “green” surfaces to meet the water balance target.

With respect to stormwater quality, a large portion of the Site is comprised of roof surfaces that are relatively clean in terms of TSS loading. However, the vehicular driveways, and at-grade walkways/courtyard within the Site will be subject to TSS loading from vehicular traffic and/or associated winter sanding etc. The other miscellaneous hardscape surfaces at grade may also present a higher TSS loading due to their use. Consequently, it is

proposed to utilize a stormwater treatment device within the basement level certified for 80% TSS removal efficiency by field performance data (verified under TARP Tier II Testing Protocols used in the NJDEP assessment certification program). The use of a Stormfilter® manufactured by Contech Engineered Solutions LLC is proposed to meet this requirement. The chambers into which the Stormfilter® filtration system will be housed, will be cast into the basement structure. The Stormfilter® chamber will be part of the overall SWM facility and will, as such, be located at the northeast corner of the Site. An access lid for the Stormfilter® chamber will be provided above the chamber to allow for regular maintenance and replacement of the filter cartridges.

All of the captured stormwater on Site will be directed to the Stormfilter® chamber, which, in turn, will discharge to the rainwater harvesting cistern located below the outlet of the detention tank. This cistern will retain stormwater runoff for reuse on-site. This is discussed in greater detail in below.

The SWM detention tank will be designed to capture the 100-year storm from the Site, with the allowable release rate being limited to a 2-year storm with a runoff coefficient C = 0.5. For storm events that exceed the detention tank's capacity (i.e., greater than the 100-year design storm), emergency overland flow will be provided via the at grade MH access opening to the tank (at elevation ±90.40m) to safely convey the excess to Dufferin Street.

The details and configuration of all components regarding the SWM plan are shown on the Site Servicing and SWM drawings in Appendix E. The following section outlines the specific calculations associated with the various SWM targets.

4.2.2 Calculation Methodology

4.2.2.1 Detention Volume

To calculate the proposed discharge rates and required detention volumes, a Visual Otthymo Model (VO2) was created to simulate the storage and discharge characteristics of the site.

The following commands were used to model the site:

-  (1,2) The *StandHyd* command was used to model the at grade portion of the Site. IA values of 7 mm and 1 mm were assigned to the pervious and impervious components, respectively. Furthermore, a CN value of 95 was applied to mimic the high potential for stormwater to be converted to runoff for rainfall events that exceed the assigned IA values in consideration that the ground floor slab is expected to be roughly 300 mm – 1,500 mm below the surface grade.

- (3,4) *StandHyd* commands were used to model the roof areas of the Site. IA values of 7 mm and 1mm were assigned to the green roof components and conventional flat roof portion respectively. Furthermore, a CN value of 98 was applied to mimic the high potential for stormwater to be converted to runoff for rainfall events that exceed the assigned IA values.
- (5) The *AddHyd* command was used to add the individual area catchments.
- (6) The *RouteReservoir* command was used to simulate the detention and discharge characteristics for the Site's combined SWM detention tank.
- (7) *StandHyd* command were used to model the relatively minor perimeter areas that are considered uncontrolled drainage.

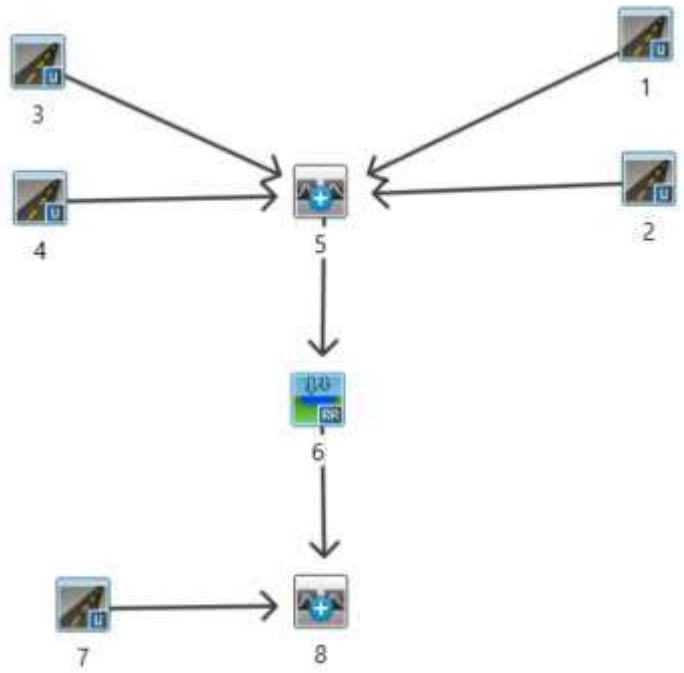


Figure 4.1– V02 Model Schematic

A 155 mm Ø orifice plate will serve to control the peak Site discharge rate. Based on the configuration of the tank and the orifice, a stage storage discharge curve was produced to develop the VO2 route reservoir module. **Table 4.1** summarizes the results for the model simulations for the 2-year to 100-year design storms and **Table 4.2** summarizes the Site stormwater detention storage volumes in the combined detention tank.

Table 4.1 – Proposed Peak Discharge Rate from Site

Storm Event	Allowable Peak Discharge Rate [L/s]	Peak Discharge to Municipal Storm Sewer [L/s]	Peak Uncontrolled Discharge [L/s]	Total Peak Site Discharge* (L/s)
2-Year	91.26	44	1	45
5-Year	91.26	58	2	58
10-Year	91.26	67	2	67
25-Year	91.26	74	2	74
50-Year	91.26	83	3	83
100-Year	91.26	89	3	89

**Accounts for time to peak variances in individual hydrographs*

Table 4.2 – Proposed Site Stormwater Storage

Storm Event	Total Storage Required (m^3)	Total Storage Provided (m^3)
2-Year	60	300
5-Year	97	300
10-Year	128	300
25-Year	157	300
50-Year	197	300
100-Year	228	300

The VO2 model output indicates that the post-development peak flow rates for the 2-year through 100-year events are less than the allowable flow rate to the municipal sewer. Refer to Appendix D for Post-Development Controlled Peak Discharge Rate & Storage Calculations for complete VO2 output as well as input parameters.

4.2.2.2 Water Balance

The City of Toronto Wet Weather Flow Management (WWFM) Guidelines target for water balance is to retain stormwater on-site, to the extent practicable, to achieve the same level of annual volume of overland runoff from the Site in the predevelopment (existing) condition, with a maximum allowable annual volume of overland runoff of 50% of the total average annual rainfall depth.

Using Figure 2 from the WWFM Guidelines, greater than 50% of the average annual rainfall depth leaves the Site as runoff. As a result, the maximum allowable volume of overland runoff is 50% of the annual depth of rainfall.

Using Figure 1a from the WWFM Guidelines, it was determined that based on an allowable runoff of 50% of the average annual rainfall depth, 3.5 mm of rainfall from the green roofs and impervious at grade surfaces must be retained on-site. A spreadsheet table was prepared to summarize the daily depth of rain "captured" over the site. The site was divided according to surface condition (column 1), and respective areas of each surface condition (columns 2 and 3). Furthermore, an initial abstraction (I.A.) value (column 4) was derived for each surface condition. The initial abstraction effectively represents the depth of daily rain that falls on the surface and is not converted to runoff. As the initial abstraction values alone are not enough to reduce the volume of runoff to 50% of the total annual average rainfall over the entire site, an additional depth of rainfall will be directed from the roof to the rainwater harvesting cistern (column 5) for rainwater harvesting re-use. The total effective IA (column 6) which is the sum of columns 4 – 5, was compared to Figure 1a of the WWFM guidelines, and a percent of total annual average rainfall was derived for each surface area (column 7). This was then weighted over the total site (column 8) so that a total average annual capture can be totaled.

Refer to Table 4.3 for a summary of the surface conditions, initial abstraction values, corresponding areas, and rainfall capture depths for the site.

Table 4.3 – Water Balance

1	2	3	4	5	6	7	8
Surface	**Area (m^2)**	**% Total Site Area**	**Surface IA (mm)**	**Depth Directed to Cistern (mm)**	**Total Effective IA (mm)**	**% Of Total Annual Average Rainfall (%)**	**% Of Total Annual Average Rainfall Over Site**
Conventional Flat roof	3184	42.8	1.0	3.5	4.5	47	20.1
Green Roof	2123	28.5	7.0*	0.0	7.0	60	17.1
Landscaping at Grade	418	5.6	7.0**	0.0	7.0	60	3.4
Impervious at Grade	1672	22.5	1.0	3.5	4.5	47	10.6
Uncontrolled Impervious at Grade	47	1.2	1.0	0.0	1.0	15	0.1
Uncontrolled Pervious at Grade	0	0	7.0**	0.0	7.0	60	0.0
Total	**7444**	**100%**					**51.2%**

** Intensive Green Roof*

*** Due to the nature of the pervious areas at grade requiring significant soil depths to support the proposed landscaping (450mm – 1,500mm), the areas are being considered intensive green roofs with an IA of 7 mm.*

4.2.2.3 Water Quality

The City of Toronto Wet Weather Flow Management (WWFM) Guidelines water quality target is for the long-term average removal of 80% of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the proposed development site based on the post-development level of imperviousness. The rationale for effective TSS removal rates corresponding to the surfaces on the Site is as follows:

- **Conventional Flat Roofs, Green Roofs, & Amenity Landscaping:** Rooftop areas are subject only to airborne particles and insignificant amounts of sediment transported by foot traffic. As such, an effective removal efficiency of 80% to 90% is often considered to be reasonable on a traditional flat roof or green roof. In this regard, the City of Toronto generally accepts a performance rating of 80% for roof surfaces.
- **Pervious & Impervious at Grade:** Runoff from ground level surfaces will be directed to the Stormfilter® before being directed into the stormwater detention tank. The Stormfilter® has been designed to provide 80% TSS removal from the at grade runoff.
- **Uncontrolled Perimeter Drainage:** There are minor areas around the perimeter of the Site which are uncontrolled. These areas are relatively small and with respect to the overall Site, they are considered insignificant with respect to achieving the stormwater quality target.

In summary, due to most of the site surfaces (>99% of the Site area) receiving TSS removal efficiency rates of 80%, the City's water quality target is met.

4.2.3 Maintenance

The stormwater management and drainage system for the Site does require regular maintenance to ensure that it functions as intended and continues to meet the by-law requirements of the City. Key components of the system and applicable maintenance issues are as follows:

SWM Tanks*:* The SWM detention tank and the rainwater harvesting cistern will receive runoff that is either from a relatively "clean" rooftop source or runoff that has passed through a Stormfilter® system. Nevertheless, the SWM detention tank and rainwater harvesting cistern should be inspected at a minimum annually and cleaned out when sediment accumulates to a greater depth than 25 mm or as prescribed by the

designer/supplier. Any additional requirements set out by the irrigation and or greywater system supplier/manufacturer should also be met.

Stormwater Treatment Unit: The Stormfilter® system will require regular maintenance as well as regular replacement of the individual filter cartridges. The capture and removal of sediment from the stormwater will degrade the filter media to a point where it can no longer function properly and, as a result, regular replacement of the filters will be required. The duration between filter changes will depend on the quality of the runoff entering the system and the frequency of rain events. These units should be maintained in accordance with the manufacturer's recommendations, and it is suggested that a maintenance contract for inspection and required change out of filters be entered into with a qualified contractor.

Area Drains/Catchbasins/Roof Drains: Area drains, and roof drains should be inspected at a minimum semi-annually to ensure that they are free of debris that may clog them.

Pump Systems: The rainwater harvesting cistern will incorporate pumps and control systems specified by the mechanical and/or specialty irrigation/greywater consultants. Specifics of the operations and maintenance required will be identified by the Mechanical Engineer and the irrigation and/or greywater system's supplier /manufacturer(s) once the final system is selected. During annual commissioning of the system prior to turning on the irrigation system, the cistern tanks should be inspected and cleaned of sediment/debris.

Green Roofs: As a living system, the plant material will require periodic maintenance in addition to regular watering until plant material is established. Specifics of the green roof maintenance will be identified by the Architect and Landscape Architect once the final system is selected.

5.0 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.

6.0 CONCLUSION

With respect to the proposed redevelopment at 340-376R Dufferin Street & 2 Melbourne Avenue, the proposed site servicing and stormwater management system will address the requirements of the City of Toronto, as follows:

Foundation Drainage

The Hydrogeological report estimates a short-term discharge rate of 195,000 L/day (2.26 L/s). It is the Owner's intent to design the underground parking structure as a watertight structure which can structurally withstand the hydrostatic forces acting on it. As such, the Owner is not proposing the long-term discharge of foundation drainage to the municipal sewer.

With respect to the 'existing courtyard building' (350 Dufferin Street) which will remain, it was found to have no foundation drainage discharge based on a letter prepared by Pinchin Ltd. (Pinchin) dated August 23, 2021. It was concluded that this was due to recent waterproofing updates done to the existing basement structure. Post development, the groundwater collection system from the building will be disconnected from the on-site plumbing system and the owner will monitor the volume of water collected in the existing sump pits and haul it off site as necessary by a licensed contractor.

Sanitary

'Phase 1' of the development will have three (3) 200mm Ø sanitary services to the 600mm Ø combined sewer on Dufferin Street. 'Phase 2' of the development will have two (2) 150mm Ø sanitary services to the 375mm Ø sanitary sewer on Melbourne Avenue. It is currently envisioned that each phase will be designed with separate sanitary plumbing systems to capture and convey sanitary flows.

There will be a net-reduction in total flows to the combined sewer system, since all existing uncontrolled storm drainage that drains out to the combined sewer system, will instead have controlled discharge out to the 1650mm storm sewer from the redeveloped site. This will result in a net decrease of flows of about 128.45 L/s. Hence, a further downstream analysis of the combined sewer system is not required.

Water

'Phase 1' of the development will have three (3) 150mm Ø domestic water services to the 300mm Ø watermain on Dufferin Street. 'Phase 2' of the development will have two (2)

150mm Ø domestic water services to the 300mm Ø watermain on Dufferin Street. The development will be serviced by one (1) 200mm Ø fire service, which will be installed in a "h" configuration in accordance with City standards and will include one of the Phase 1 domestic services branching off this fire service. A fire flow plus Max day water demand of 375 L/s has been estimated for the proposed development, and a hydrant flow test indicated the existing municipal watermain system has a capacity of 440.40 L/s, which should be sufficient to support the proposed development.

Storm

The development will have one (1) 250 mm Ø storm service connection to the 1,600 mm Ø storm sewer located on Dufferin Street. The service will convey a maximum controlled discharge of less than 91.2 L/s from the proposed site SWM system. A 300 m^3 detention tank with a 155 mm Ø orifice plate will provide the required detention volume for that discharge rate.

The implementation of rainwater harvesting for reuse as irrigation and/or toilet flushing will serve to meet the City's water balance target and limit the total average annual runoff volume to 49% of the annual average rainfall to match pre-development conditions.

Effectively 99% of the proposed site receives a TSS efficiency removal rate of 80% and, as a result, the clean nature of roof runoff and the filtered at grade surfaces will serve to meet the City's 80% TSS removal water quality requirement.

Summary of Key SWM Parameters

- Stormwater Detention Volume: 228 m^3 required, 300 m^3 provided.
- Stormwater discharge control: 155 mm Ø orifice plate.
- Rainwater Harvesting Cistern Volume = ±30 m^3.
- 100-year Water level in SWM Facility = ±89.625m.
- SWM Facility emergency overland flow elevation = ±90.40m.

We trust that this report satisfies the requirements of the City of Toronto with respect to the subject development. Should you have any questions, please do not hesitate to contact the undersigned.

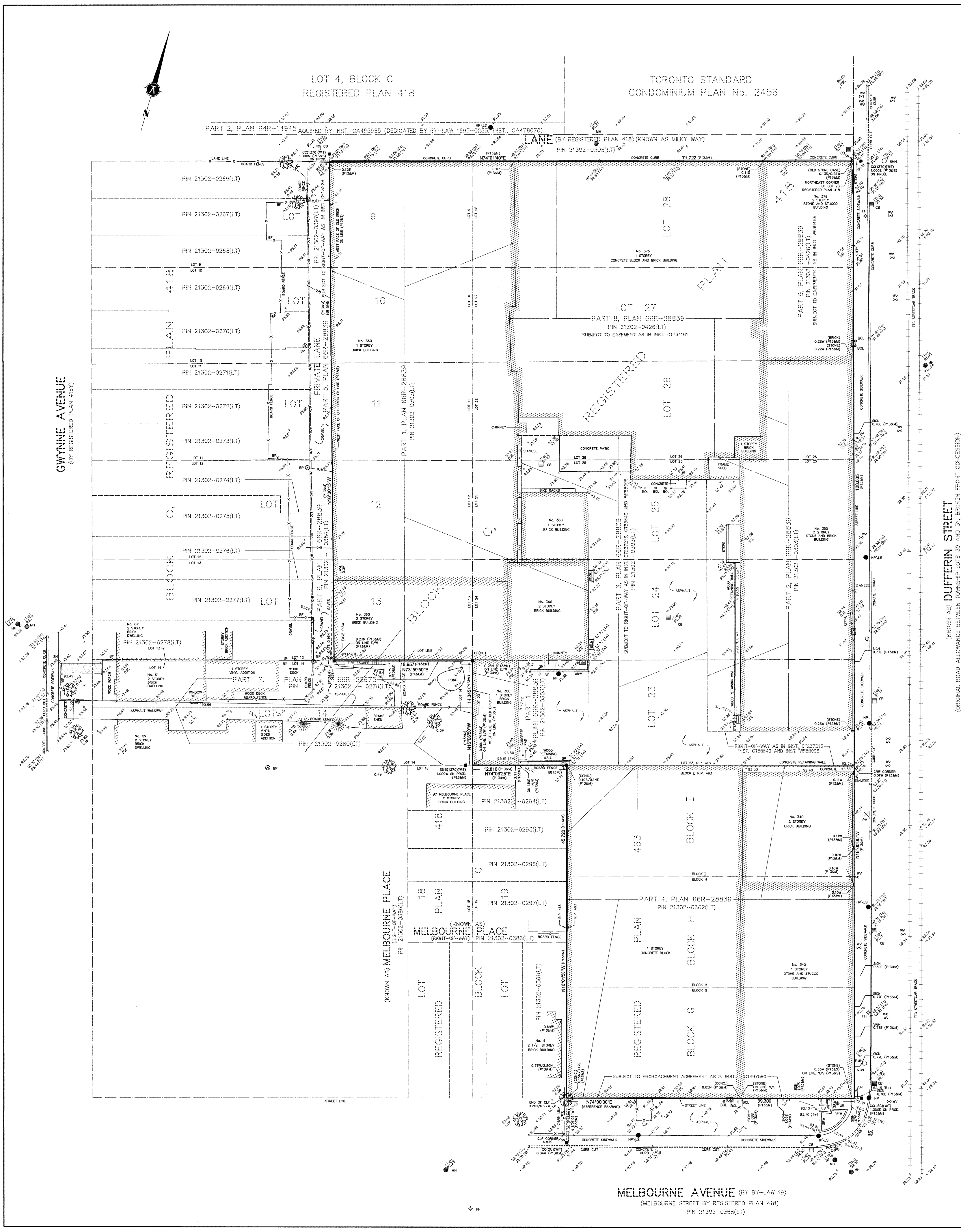
R. V. ANDERSON ASSOCIATES LIMITED

Report Prepared By:

Mufaddal Shabbir, P.Eng.
Project Engineer

APPENDIX A

ARCHITECTURAL PLANS, SITE STATISTIC AND BACKGROUND INFORMATION



PLAN OF SURVEY
SHOWING TOPOGRAPHICAL INFORMATION OF

BLOCKS G, H AND I REGISTERED PLAN 463 AND LOTS 23, 24, 25, 26, 27 AND 28 PART OF LOTS 9, 10, 11, 12, 13 AND 14, IN BLOCK C REGISTERED PLAN 418 CITY OF TORONTO

SCALE 1:200

5 0 5 10 15 20m

KRCMAR SURVEYORS LTD. 2019

METRIC: DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

BEARING

BEARINGS SHOWN HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE NORTHERLY LIMIT OF MELBOURNE STREET (NOW MELBOURNE AVENUE) AS SHOWN ON REGISTERED PLAN 418 HAVING A BEARING OF N74°00'00"E.

BOUNDARY BEARINGS AND DISTANCES SHOWN HEREON ARE IN ACCORDANCE WITH PLAN 66R-28839.

ELEVATION

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO CITY OF TORONTO BENCH MARK No. CT1577 HAVING AN ELEVATION OF 93.128 METRES.

NOTES

ALL BUILDING TIES TAKEN TO BRICK, UNLESS OTHERWISE NOTED.

THE SUBJECT LANDS COMPRISE ALL OF PINS 21302-0302(LT), 21302-0303(LT) AND 21302-0426(LT).

LEGEND

■	DENOTES SURVEY MONUMENT FOUND
□	DENOTES SURVEY MONUMENT PLANTED
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
CP	DENOTES CONCRETE PIN
CC	DENOTES CUT CROSS
(M)	DENOTES MEASURED
(S)	DENOTES SET
(OU)	DENOTES ORIGIN UNKNOWN
(WIT)	DENOTES WITNESS
(P13)	DENOTES PLAN 66R-28839
(1370)	DENOTES KRCMAR SURVEYORS LTD., O.L.S.
(LSG)	DENOTES LAND SURVEY GROUP, O.L.S.
BF	DENOTES BOARD FENCE
CLF	DENOTES CHAIN LINK FENCE
CONC.	DENOTES CONCRETE
CRW	DENOTES CONCRETE RETAINING WALL
DSE	DENOTES DOOR SILL ELEVATION
PROD.	DENOTES PRODUCTION
R.P.	DENOTES REGISTERED PLAN
SRW	DENOTES STONE RETAINING WALL
WRW	DENOTES WOOD RETAINING WALL
TTC	DENOTES TORONTO TRANSIT COMMISSION
(Bc)	DENOTES BOTTOM OF CURB
(Tc)	DENOTES TOP OF CURB
(Tw)	DENOTES TOP OF WALL
—O/B—	DENOTES BELL SERVICE (OVERHEAD)
—x—	DENOTES FENCE
+123.45	DENOTES EXISTING GRADE ELEVATION
Φ	DENOTES BIKE RACK
BMH	DENOTES BELL MANHOLE
BP	DENOTES BELL POLE
BOL	DENOTES BOLLARD
CB	DENOTES CATCH BASIN
0.1ø	DENOTES CONIFEROUS TREE WITH TRUNK DIAMETER
0.1ø	DENOTES DECIDUOUS TREE WITH TRUNK DIAMETER
	DENOTES DOWN GUY ANCHOR
FH	DENOTES FIRE HYDRANT
GM	DENOTES GAS METER
HP	DENOTES HYDRO POLE
HP\LS	DENOTES HYDRO POLE AND LIGHT STANDARD
MH	DENOTES MANHOLE
PM	DENOTES PARKING METER
VP	DENOTES VENT PIPE
SIAMESE	DENOTES SIAMESE CONNECTION
SN	DENOTES SIGN
UB	DENOTES UTILITY BOX
WV	DENOTES WATER VALVE

TOTAL SITE AREA = 7444.6 m^2

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2087911

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29(3).

MUNICIPAL ADDRESSES
Nos. 340, 360 AND 376 DUFFERIN STREET, TORONTO

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 11th DAY OF APRIL, 2019

DATE APRIL 25, 2019

WALDEMAR GOLINSKI
ONTARIO LAND SURVEYOR

PLAN AVAILABLE AT www.ProtectYourBoundaries.ca

FIELD:	D.L.	DRAWN:	C.L.	CHECKED:	W.G.	JOB NO:	15-285
DWG NAME:	15-285BT01	PLOT INFO:	09:58 25/Apr/2019	WORK ORDER NO:	22473		

1137 Centre Street Thornhill ON L4J 3M6 905.738.0053 F 905.738.9221 www.krcmar.ca

KRCMAR

NOTES:

1. "NO PARKING - LOADING ZONE" SIGNS TO BE PROVIDED ADJACENT TO LOADING SPACES.

2. ACCESS DRIVEWAYS USED BY COLLECTION VEHICLES TO BE LEVEL (+/-2%) AND HAVE A MINIMUM VERTICAL CLEARANCE OF 4.4M, A MINIMUM WIDTH OF 4.5M THROUGHOUT, AND A WIDTH OF 6M AT POINT OF INGRESS AND EGRESS.

3. OVERHEAD DOOR FOR THE COLLECTION VEHICLE WILL HAVE A MINIMUM WIDTH OF 4 METRES AND A MINIMUM OVERHEAD CLEARANCE OF 4.4 METRES.

4. TYPE G LOADING AND STAGING AREAS TO BE LEVEL (+-2%) WITH AN UNENCUMBERED VERTICAL CLEARANCE OF 6.1M AND CONSTRUCTED OF A MINIMUM OF 200MM REINFORCED CONCRETE SLAB.

5. TURNING RADII ENTERING, EXITING AND TRAVELLING THROUGHOUT THE SITE AND THE TYPE G LOADING SPACE MUST BE MINIMUM 9.5m INSIDE AND 14m OUTSIDE.

6. GARBAGE COLLECTION STAFF NOTE: A TRAINED ON-SITE STAFF MEMBER WILL BE AVAILABLE TO MANEUVER BINS FOR THE COLLECTION DRIVER AND ALSO ACT AS FLAGMAN BY CONTROLLING THE TRUCK, CYCLING, PEDESTRIAN AND OTHER VEHICLE MOVEMENTS IN THE AREA. THE ON-SITE STAFF WILL MANEUVER THE BINS OUT OF THE WAY FOR THE COLLECTION VEHICLE TO EXIT FORWARD. IN THE EVENT THE ON-SITE STAFF IS UNAVAILABLE AT THE TIME THE CITY COLLECTION VEHICLE ARRIVES AT THE SITE, THE COLLECTION VEHICLE WILL LEAVE THE SITE AND NOT RETURN UNTIL THE NEXT SCHEDULED COLLECTION DAY.

7. A WARNING SYSTEM TO CAUTION MOTORISTS LEAVING THE PARKING GARAGE OF HEAVY VEHICLES WHEN LOADING OPERATION ARE OCCURRING IS TO BE PROVIDED. THIS WARNING SYSTEM TO INCLUDE BOTH LIGHTS AND SIGNS.

8. THE NON-RESIDENTIAL WASTE COMPONENT WILL ONLY SCHEDULE USE OF THE TYPE G LOADING SPACE ON DIFFERENT DAYS FROM THE COLLECTION DAYS OF THE RESIDENTIAL COMPONENT TO ENSURE THAT THE TYPE G LOADING SPACE WILL BE VACANT FOR CITYWASTE COLLECTION.

9. THE BINS THAT WILL BE USED FOR THE NON-RESIDENTIAL WASTE WILL BE LABELLED SEPARATELY FROM THE BINS FOR THE RESIDENTIAL WASTE.

10. IN ALL CASES WHERE A COLLECTION VEHICLES IS REQUIRED TO DRIVE ONTO OR OVER A SUPPORTED STRUCTURE (SUCH AS AN UNDERGROUND PARKING GARAGE, INTAKE/OUTAKE GRILLS, ETC.) THE STRUCTURE MUST BE DESIGNED TO SAFELY SUPPORT A FULLY LOADED COLLECTION VEHICLE (35,000 KG) AND CONFORMS TO THE FOLLOWING:

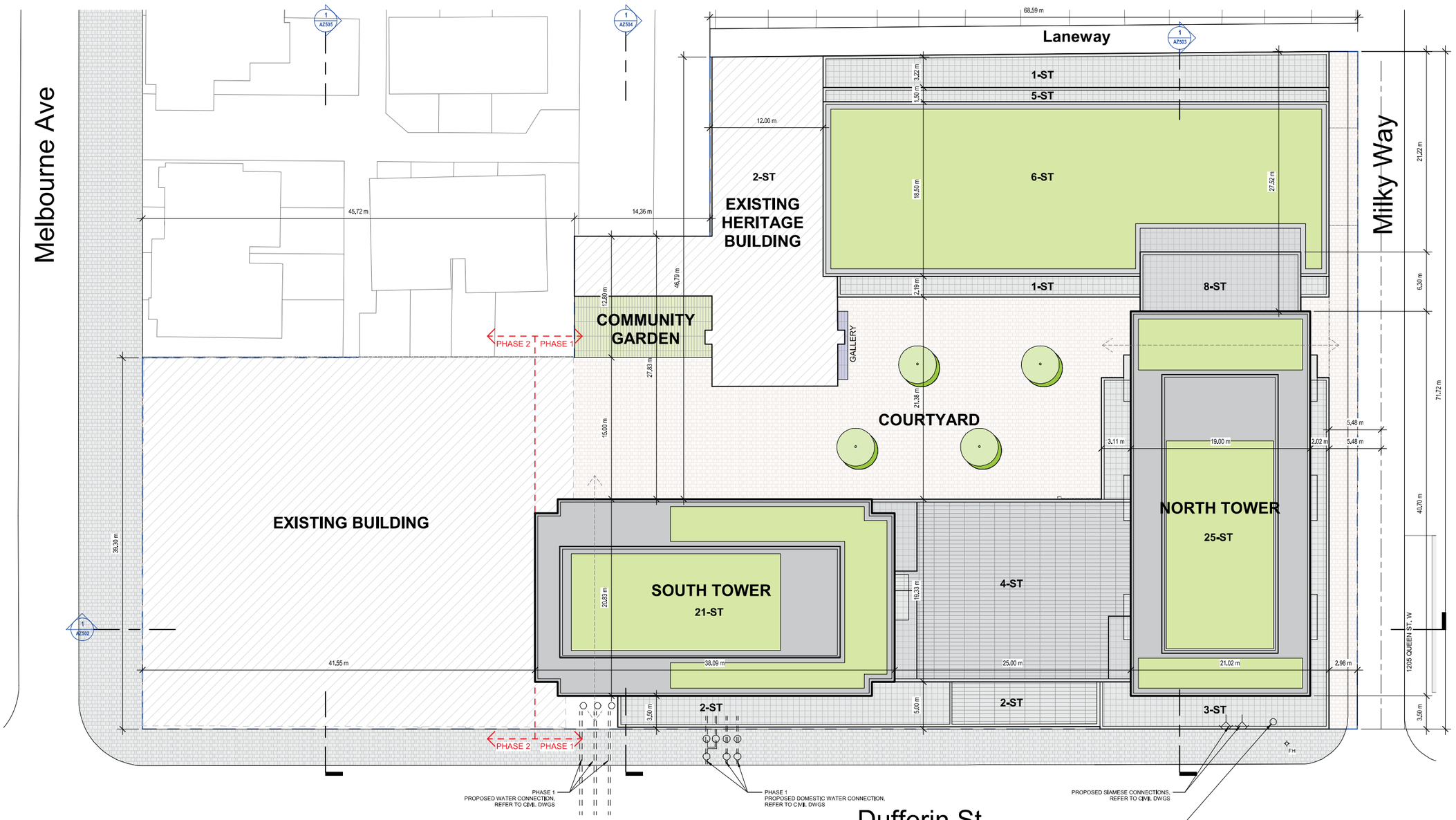
A) DESIGN CODE - ONTARIO BUILDING CODE
B) DESIGN LOAD - CITY BULK LIFT VEHICLE IN ADDITIONAL BUILDING CODE REQUIREMENTS.
C) IMPACT FACTOR - 5% FOR MAXIMUM VEHICULAR SPEEDS TO 15 km/h AND 30% FOR HIGHER SPEED.

11. ALL METAL GRATES TO HAVE MAXIMUM POROSITY OF 40mm x 10mm AT GROUND LEVEL AND MEETING STRUCTURAL REQUIREMENTS OF NOTE 10 ABOVE.

12. CONCRETE CURB, CONCRETE SIDEWALK AND ALL RESTORATION ALONG FRONTING ROADWAYS TO THE SITE TO COMPLY WITH CITY OF TORONTO STANDARDS. SEE LANDSCAPE DRAWINGS.

13. DARK SKY COMPLIANT EXTERIOR LIGHT FIXTURES TO BE SPECIFIED.

14. PEDESTRIAN-SCALED LIGHTING TO BE SPECIFIED.



DRAWING NOT TO BE SCALED

Contractor must check and verify all dimensions on the job and report any discrepancies to the architect before proceeding with the work.

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ISSUED

2022-07-15	Issued for OPA/ZBA/SPA

Sweeny&Co Architects

134 PETER STREET | SUITE 1601
TORONTO, ONTARIO | M5V 2H2 | CANADA
P: 416-971-6252 | F: 416-971-5420
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PROJ. NAME
340-376 Dufferin St.
Toronto, Ontario

OWNER
Hullmark

DWG TITLE
Site Plan
Phase 1

DATE : 2022-07-15
SCALE : 1 : 200
DRAWN : AR, MDL
CHECKED : HH
PROJ. No. : 2102
DWG No.
AZ101-A

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NOTES:

1. "NO PARKING - LOADING ZONE" SIGNS TO BE PROVIDED ADJACENT TO LOADING SPACES.

2. ACCESS DRIVEWAYS USED BY COLLECTION VEHICLES TO BE LEVEL (+/-2%) AND HAVE A MINIMUM VERTICAL CLEARANCE OF 4.4M, A MINIMUM WIDTH OF 4.5M THROUGHOUT, AND A WIDTH OF 6M AT POINT OF INGRESS AND EGRESS.

3. OVERHEAD DOOR FOR THE COLLECTION VEHICLE WILL HAVE A MINIMUM WIDTH OF 4 METRES AND A MINIMUM OVERHEAD CLEARANCE OF 4.4 METRES.

4. TYPE G LOADING AND STAGING AREAS TO BE LEVEL (+-2%) WITH AN UNENCUMBERED VERTICAL CLEARANCE OF 6.1M AND CONSTRUCTED OF A MINIMUM OF 200MM REINFORCED CONCRETE SLAB.

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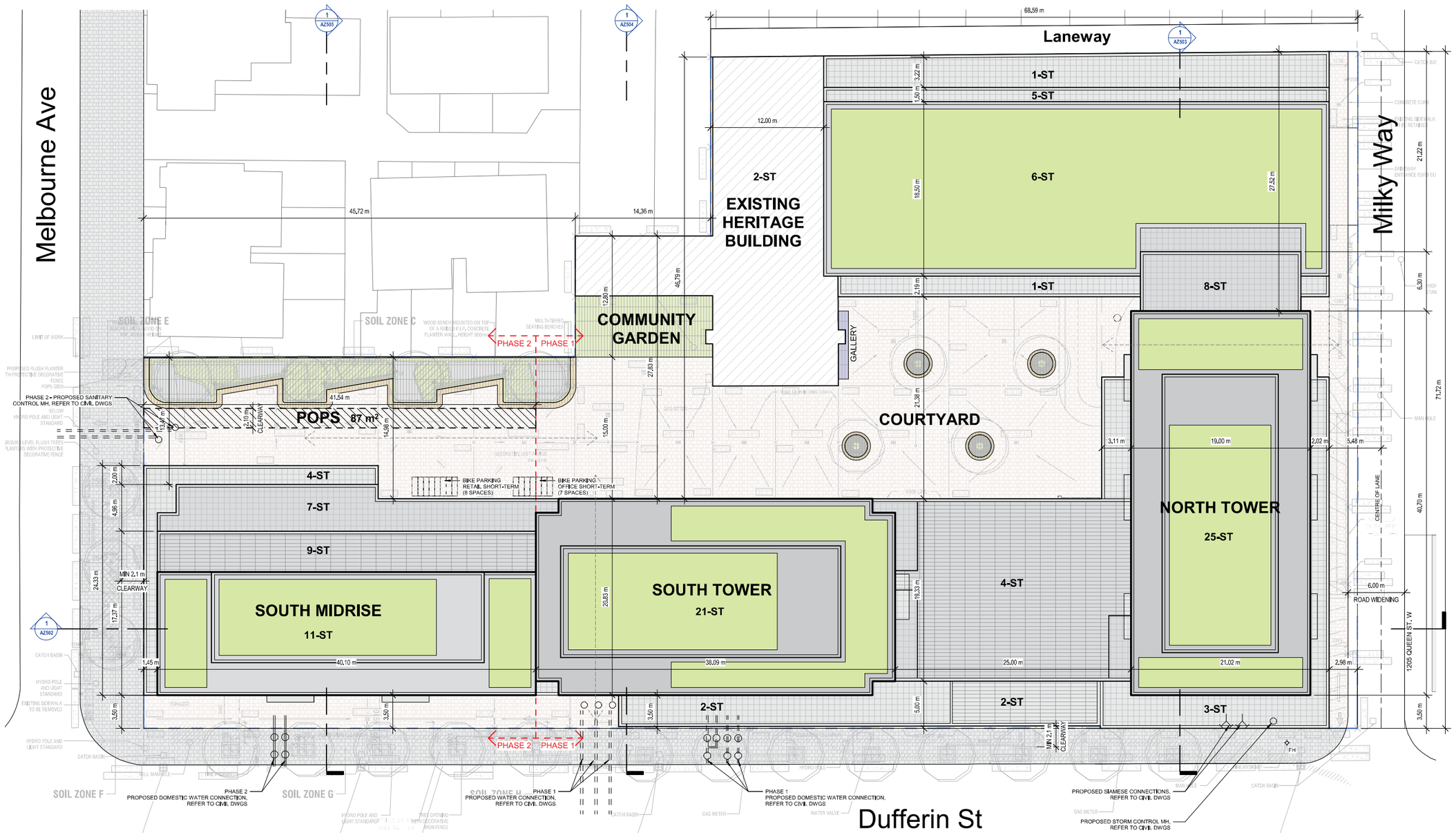

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ISSUED

2022-07-15	Issued for OPA/ZBA/SPA

Sweeny&Co Architects

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PROJ. NAME
340-376 Dufferin St.
Toronto, Ontario

OWNER
Hullmark

DWG TITLE
Site Plan
Phase 2

DATE : 2022-07-15
SCALE : 1 : 200
DRAWN : AR, MDL
CHECKED : HH
PROJ. No. : 2102
DWG No.
AZ101-B

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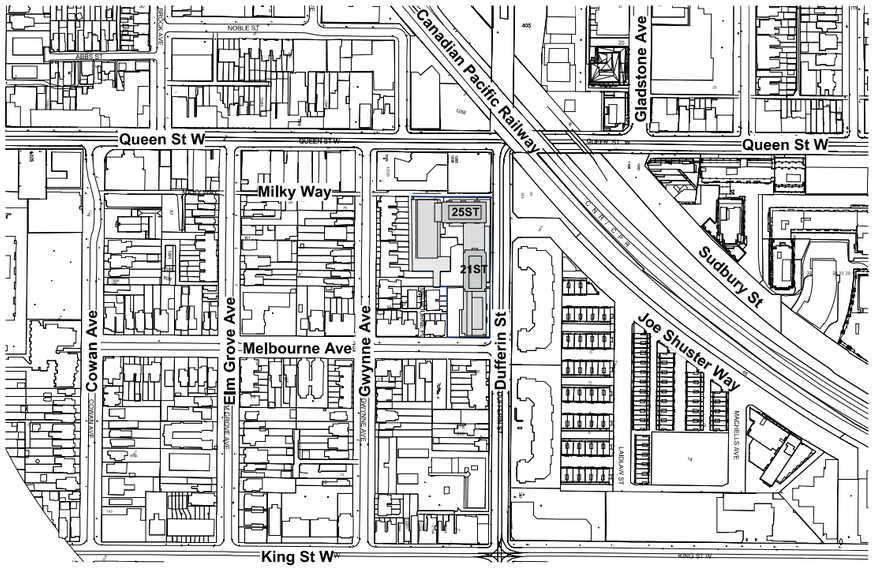
GENERAL	
Project:	The Radiator
Address :	340-370 Dufferin St.
District:	Toronto, Ontario
Site Area :	7,444 m² 80,122 SF
Parking spaces:	330

ZONING	
By-law :	City of Toronto Zoning By-Law 569-2013
Height limit :	14.0 m
Gross Floor Area :	44,470 m²
Density :	5.97
Building height :	82.50 m (incl. MPH)

	HEIGHT		TFA		GFA - City of Toronto Zoning By-Law 569-2013												SALEABLE / RENTABLE					
					RESIDENTIAL		FLEX		COMMERCIAL		GFA TOTAL		INDOOR AMENITY		OUTDOOR AMENITY		RESIDENTIAL		FLEX		COMMERCIAL	
UNDERGROUND	Storeys	Metres	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF
PARKING																						
Level -1	1	4.00 m	1,230.04 m²	13,240 SF	967.71 m²	10,416 SF	--	--	--	--	967.71 m²	10,416 SF	--	--	--	--	--	--	--	--	--	--
Level -2	1	4.00 m	417.33 m²	4,492 SF	218.75 m²	2,355 SF	--	--	--	--	218.75 m²	2,355 SF	--	--	--	--	--	--	--	--	--	--
PARKING TOTAL	*2*	*8.00 m*	*1,647.37 m²*	*17,732 SF*	*1,186.46 m²*	*12,771 SF*	*--*	*--*	*--*	*--*	*1,186.46 m²*	*12,771 SF*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
U/G TOTAL	**2**	**8.00 m**	**1,647.37 m²**	**17,732 SF**	**1,186.46 m²**	**12,771 SF**	**--**	**--**	**--**	**--**	**1,186.46 m²**	**12,771 SF**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**

	HEIGHT		TFA		GFA - City of Toronto Zoning By-Law 569-2013												SALEABLE / RENTABLE					
					RESIDENTIAL		FLEX		COMMERCIAL		GFA TOTAL		INDOOR AMENITY		OUTDOOR AMENITY		RESIDENTIAL		FLEX		COMMERCIAL	
ABOVE GRADE	Storeys	Metres	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF
PHASE 1 - GROUND FLOOR																						
Level 1	1	4.50 m	3,578.82 m²	38,522 SF	776.39 m²	8,357 SF	1,400.21 m²	15,072 SF	833.57 m²	8,972 SF	3,010.18 m²	32,401 SF	--	--	--	--	--	--	1,400.21 m²	15,072 SF	833.57 m²	8,972 SF
Level 2	1	4.00 m	2,533.96 m²	27,275 SF	123.83 m²	1,333 SF	528.70 m²	5,691 SF	--	--	652.53 m²	7,024 SF	1,327.80 m²	14,292 SF	--	--	--	--	528.70 m²	5,691 SF	--	--
SUBTOTAL	*2*	*8.50 m*	*6,112.78 m²*	*65,797 SF*	*900.22 m²*	*9,690 SF*	*1,928.92 m²*	*20,763 SF*	*833.57 m²*	*8,972 SF*	*3,662.71 m²*	*39,425 SF*	*1,327.80 m²*	*14,292 SF*	*--*	*--*	*--*	*--*	*1,928.92 m²*	*20,763 SF*	*833.57 m²*	*8,972 SF*
PHASE 1 - PODIUM + TOWERS																						
Level 3	1	3.00 m	3,266.35 m²	35,159 SF	2,507.53 m²	26,991 SF	--	--	--	--	2,507.53 m²	26,991 SF	552.06 m²	5,942 SF	68.61 m²	739 SF	2,320.90 m²	24,982 SF	--	--	--	--
Level 4	1	3.00 m	3,048.01 m²	32,808 SF	2,795.22 m²	30,088 SF	--	--	--	--	2,795.22 m²	30,088 SF	--	--	--	--	2,497.64 m²	26,884 SF	--	--	--	--
Level 5	1	3.00 m	2,639.14 m²	28,407 SF	2,368.11 m²	25,490 SF	--	--	--	--	2,368.11 m²	25,490 SF	77.56 m²	835 SF	413.82 m²	4,454 SF	2,141.79 m²	23,054 SF	--	--	--	--
Level 6	1	3.00 m	2,553.30 m²	27,483 SF	2,362.29 m²	25,428 SF	--	--	--	--	2,362.29 m²	25,428 SF	--	--	--	--	2,159.52 m²	23,245 SF	--	--	--	--
Level 7	1	3.00 m	1,608.12 m²	17,310 SF	1,489.58 m²	16,034 SF	--	--	--	--	1,489.58 m²	16,034 SF	--	--	--	--	1,383.08 m²	14,887 SF	--	--	--	--
Level 8	1	3.00 m	1,608.12 m²	17,310 SF	1,489.58 m²	16,034 SF	--	--	--	--	1,489.58 m²	16,034 SF	--	--	--	--	1,383.08 m²	14,887 SF	--	--	--	--
Level 9	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 10	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 11	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 12	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 13	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 14	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 15	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 16	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 17	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 18	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 19	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 20	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 21	1	3.00 m	1,501.04 m²	16,157 SF	1,385.62 m²	14,915 SF	--	--	--	--	1,385.62 m²	14,915 SF	--	--	--	--	1,283.74 m²	13,818 SF	--	--	--	--
Level 22 / MPH South	1	3.00 m	1,102.09 m²	11,863 SF	694.81 m²	7,479 SF	--	--	--	--	694.81 m²	7,479 SF	--	--	--	--	636.41 m²	6,850 SF	--	--	--	--
Level 23	1	3.00 m	750.80 m²	8,082 SF	691.20 m²	7,440 SF	--	--	--	--	691.20 m²	7,440 SF	--	--	--	--	636.41 m²	6,850 SF	--	--	--	--
Level 24	1	3.00 m	750.80 m²	8,082 SF	691.20 m²	7,440 SF	--	--	--	--	691.20 m²	7,440 SF	--	--	--	--	636.41 m²	6,850 SF	--	--	--	--
Level 25	1	3.00 m	750.80 m²	8,082 SF	691.20 m²	7,440 SF	--	--	--	--	691.20 m²	7,440 SF	--	--	--	--	636.41 m²	6,850 SF	--	--	--	--
MPH North	-	5.00 m	364.02 m²	3,918 SF	--	--	--	--	--	--	6.84 m²	74 SF	--	--	--	--	--	--	--	--	--	--
SUBTOTAL	*23*	*74.00 m*	*37,955.00 m²*	*408,544 SF*	*33,800.57 m²*	*363,826 SF*	*--*	*--*	*--*	*--*	*33,800.57 m²*	*363,826 SF*	*629.62 m²*	*6,777 SF*	*482.43 m²*	*5,193 SF*	*31,120.32 m²*	*334,976 SF*	*--*	*--*	*--*	*--*
TOTAL PHASE 1	*23*	*74.00 m*	*44,067.79 m²*	*474,342 SF*	*34,700.79 m²*	*373,516 SF*	*1,928.92 m²*	*20,763 SF*	*833.57 m²*	*8,972 SF*	*37,463.28 m²*	*403,251 SF*	*1,957.43 m²*	*21,070 SF*	*482.43 m²*	*5,193 SF*	*31,120.32 m²*	*334,976 SF*	*1,928.92 m²*	*20,763 SF*	*833.57 m²*	*8,972 SF*
PHASE 2 - GROUND FLOOR																						
Level 1	1	4.50 m	1,021.51 m²	10,995 SF	245.36 m²	2,641 SF	--	--	687.85 m²	7,404 SF	933.22 m²	10,045 SF	--	--	--	--	--	--	--	--	687.85 m²	7,404 SF
Level 2	1	4.00 m	55.42 m²	597 SF	7.97 m²	86 SF	--	--	--	--	7.97 m²	86 SF	--	--	--	--	--	--	--	--	--	--
SUBTOTAL	*2*	*8.50 m*	*1,076.93 m²*	*11,592 SF*	*253.33 m²*	*2,727 SF*	*--*	*--*	*687.85 m²*	*7,404 SF*	*941.19 m²*	*10,131 SF*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*687.85 m²*	*7,404 SF*
PHASE 2 - PODIUM																						
Level 3	1	3.00 m	911.40 m²	9,810 SF	861.04 m²	9,268 SF	--	--	--	--	861.04 m²	9,268 SF	--	--	--	--	804.87 m²	8,664 SF	--	--	--	--
Level 4	1	3.00 m	911.29 m²	9,809 SF	860.93 m²	9,267 SF	--	--	--	--	860.93 m²	9,267 SF	--	--	--	--	804.80 m²	8,663 SF	--	--	--	--
Level 5	1	3.00 m	820.52 m²	8,832 SF	770.17 m²	8,290 SF	--	--	--	--	770.17 m²	8,290 SF	--	--	--	--	711.92 m²	7,663 SF	--	--	--	--
Level 6	1	3.00 m	822.27 m²	8,851 SF	771.92 m²	8,309 SF	--	--	--	--	771.92 m²	8,309 SF	--	--	--	--	711.92 m²	7,663 SF	--	--	--	--
Level 7	1	3.00 m	820.52 m²	8,832 SF	770.17 m²	8,290 SF	--	--	--	--	770.17 m²	8,290 SF	--	--	--	--	711.92 m²	7,663 SF	--	--	--	--
Level 8	1	3.00 m	651.28 m²	7,010 SF	600.93 m²	6,468 SF	--	--	--	--	600.93 m²	6,468 SF	--	--	--	--	542.68 m²	5,841 SF	--	--	--	--
Level 9	1	3.00 m	651.28 m²	7,010 SF	600.93 m²	6,468 SF	--	--	--	--	600.93 m²	6,468 SF	--	--	--	--	542.68 m²	5,841 SF	--	--	--	--
Level 10	1	3.00 m	504.56 m²	5,431 SF	412.85 m²	4,444 SF	--	--	--	--	412.85 m²	4,444 SF	34.06 m²	367 SF	159.44 m²	1,716 SF	361.32 m²	3,889 SF	--	--	--	--
Level 11	1	3.00 m	504.71 m²	5,433 SF	413.00 m²	4,445 SF	--	--	--	--	413.00 m²	4,445 SF	--	--	--	--	361.47 m²	3,891 SF	--	--	--	--
MPH Midrise	-	5.00 m	278.60 m²	2,999 SF	3.63 m²	39 SF	--	--	--	--	3.63 m²	39 SF	--	--	--	--	--	--	--	--	--	--
SUBTOTAL	*9*	*32.00 m*	*6,876.43 m²*	*74,017 SF*	*6,065.56 m²*	*65,289 SF*	*--*	*--*	*--*	*--*	*6,065.56 m²*	*65,289 SF*	*34.06 m²*	*367 SF*	*159 SF*	*1,716 SF*	*5,553.57 m²*	*59,778 SF*	*--*	*--*	*--*	*--*
TOTAL PHASE 2	*9*	*32.00 m*	*7,953.36 m²*	*85,609 SF*	*6,318.89 m²*	*68,016 SF*	*--*	*--*	*687.85 m²*	*7,404 SF*	*7,006.74 m²*	*75,420 SF*	*34.06 m²*	*367 SF*	*159.44 m²*	*1,716 SF*	*5,553.57 m²*	*59,778 SF*	*--*	*--*	*687.85 m²*	*7,404 SF*
A/G TOTAL	**25**	**82.5 m**	**52,021.14 m²**	**559,951 SF**	**41,019.68 m²**	**441,532 SF**	**1,928.92 m²**	**20,763 SF**	**1,521.42 m²**	**16,376 SF**	**44,470.02 m²**	**478,671 SF**	**1,991.49 m²**	**21,436 SF**	**641.87 m²**	**6,909 SF**	**36,673.89 m²**	**394,755 SF**	**1,928.92 m²**	**20,763 SF**	**1,521.42 m²**	**16,376 SF**
	HEIGHT		TFA		RESIDENTIAL		FLEX		COMMERCIAL		GFA TOTAL		INDOOR AMENITY		OUTDOOR AMENITY		RESIDENTIAL		FLEX		COMMERCIAL	

TOTAL RESIDENTIAL UNIT COUNT							
BACH	1BD	1BD+D	2BD	2BD+D	3BD	3BD+D	TOTAL
-	-	-	-	-	-	-	-
2	12	27	6	-	4	-	51
9	8	4	7	1	2	-	31
-	17	-	9	-	8	-	34
1	17	1	10	-	7	-	36
-	18	-	6	-	2	-	26
-	18	-	6	-	2	-	26
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	17	-	5	-	2	-	24
-	8	-	3	-	1	-	12
-	8	-	3	-	1	-	12
-	8	-	3	-	1	-	12
-	8	-	3	-	1	-	12
-	-	-	-	-	-	-	-
12	*343*	*32*	*121*	*1*	*55*	*-*	*564*
2.1%	60.8%	5.7%	21.5%	0.2%	9.8%		
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	4	-	3	-	4	-	11
-	4	-	3	-	4	-	11
-	5	-	6	-	1	-	12
-	5	-	6	-	1	-	12
-	5	-	6	-	1	-	12
-	6	-	4	-	-	-	10
-	6	-	4	-	-	-	10
-	8	-	-	-	-	-	8
-	8	-	-	-	-	-	8
-	-	-	-	-	-	-	-
-	*51*	-	*32*	-	*11*	-	*94*
-	54.3%	-	34.0%	-	11.7%	-	
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
12	*394*	*32*	*153*	*1*	*66*	-	*658*
1.8%	59.7%		23.4%		10.0%		



1 Context Plan
1 : 2500

RESIDENTIAL AMENITY AREA					
REQUIRED by Zoning By-law 569-2013	INDOOR AMENITY		OUTDOOR AMENITY		TOTAL
	2.0 Area m²	m² / unit Area SF	No requirement		4.0 Area m²	m² / unit Area SF
	1316.0	14165.3			2632.0	28330.6
PROVIDED	Area m²	Area SF	Area m²	Area SF	Area m²	Area SF
Level 2	1327.8	14292.4	0.0	0.0	1327.8	14292.4
Level 3	552.1	5942.3	68.6	738.6	620.7	6680.9
Level 5	77.6	834.9	413.8	4454.3	491.4	5289.1
Level 10	34.1	366.7	159.4	1716.2	193.5	2082.9
TOTAL PROVIDED	1991.5	21436.2	641.9	6909.1	2633.4	28345.3
	3.0	m² / unit	1.0	m² / unit	4.0	m² / unit

PARKING			
CAR			
PROVIDED	SHORT TERM	LONG TERM	TOTAL
Level -1	62	31	93
Level -2	0	139	139
TOTAL PROVIDED	62	170	232
RATIO	0.09 Space/Unit	0.26 Space/Unit	0.35 Space/Unit
BICYCLE			
REQUIRED	SHORT TERM (0.1 SPACES / UNIT)	LONG TERM (0.9 SPACES / UNIT)	TOTAL
Total Required	66	593	659
PROVIDED			
Level -1	48	304	352
Level 1	18	30	48
Level 2	0	259	259
TOTAL PROVIDED	66	593	659
COMMERCIAL			
	SHORT TERM		LONG TERM
Commercial area	1521.42		1521.42
100 m2	15		15
3 + 0.3 every 100 m2	7.5/6	0.2 every 100 m2	3.06
REQUIRED	8	REQUIRED	4
PROVIDED	8	PROVIDED	4
FLEX			
	SHORT TERM		LONG TERM
Flex area	1928.92		1928.92
100 m2	19		19
3 + 0.2 every 100 m2	6.86	0.2 every 100 m2	3.86
REQUIRED	7	REQUIRED	4
PROVIDED	7	PROVIDED	4

TORONTO

Statistics Template - Toronto Green Standard Version 4.0

Mid to High Rise Residential and all New Non-Residential Development

The Toronto Green Standard Version 4.0 Statistics Template is submitted with Site Plan Control Applications and stand-alone Zoning Bylaw Amendment applications. Complete the table and copy it directly onto the Site Plan submitted as part of the application.

For Zoning Bylaw Amendment applications: complete General Project Description and Section 1.
For Site Plan Control applications: complete General Project Description, Section 1 and Section 2.
For further information, please visit www.toronto.ca/greendevelopment

General Project Description	Proposed
Total Gross Floor Area	44,470 m²
Breakdown of project components (m²):	
Residential	41,020 m²
Retail	N/A
Commercial	1,521 m²
Industrial	N/A
Institutional/Other	1,929 m²
Total number of residential units	658

Section 1: For Stand Alone Zoning Bylaw Amendment Applications and Site Plan Control Applications

Low Emissions Transportation	Required	Proposed	Proposed %
Number of Parking Spaces		232	100%
Number of parking spaces with EVSE (residential)	232	232	100%
Number of parking spaces with EVSE (non-residential)	16	16	100%

Cycling Infrastructure	Required	Proposed	Proposed %
Number of long-term bicycle parking spaces (all-uses)	601	601	100%
Number of long-term bicycle parking located on:			
a) first storey of building	N/A	30	-
b) second storey of building	N/A	259	-
c) first level below-ground	N/A	312	-
d) second level below-ground	N/A	N/A	N/A
e) other levels below-ground	N/A	N/A	N/A

TORONTO

Statistics Template - Toronto Green Standard Version 4.0

Mid to High Rise Residential and all New Non-Residential Development

Cycling Infrastructure	Required	Proposed	Proposed %
Number of short-term bicycle parking spaces	66	66	100%
Number of shower and change facilities (non-residential)	N/A	N/A	N/A

Tree Canopy	Required	Proposed	Proposed %
Total Soil Volume (40% of the site area x 66 m2 x 30 m³)	1354	820	
Soil volume provided within the site area (m³)		513	
Soil Volume provided within the public boulevard (m³)		257	

DRAWING NOT TO BE SCALED

Contractor must check and verify all dimensions on the job and report any discrepancies to the architect before proceeding with the work.

ISSUED

2022-07-15 Issued for OPA/ZBA/SPA

Sweeny&Co Architects

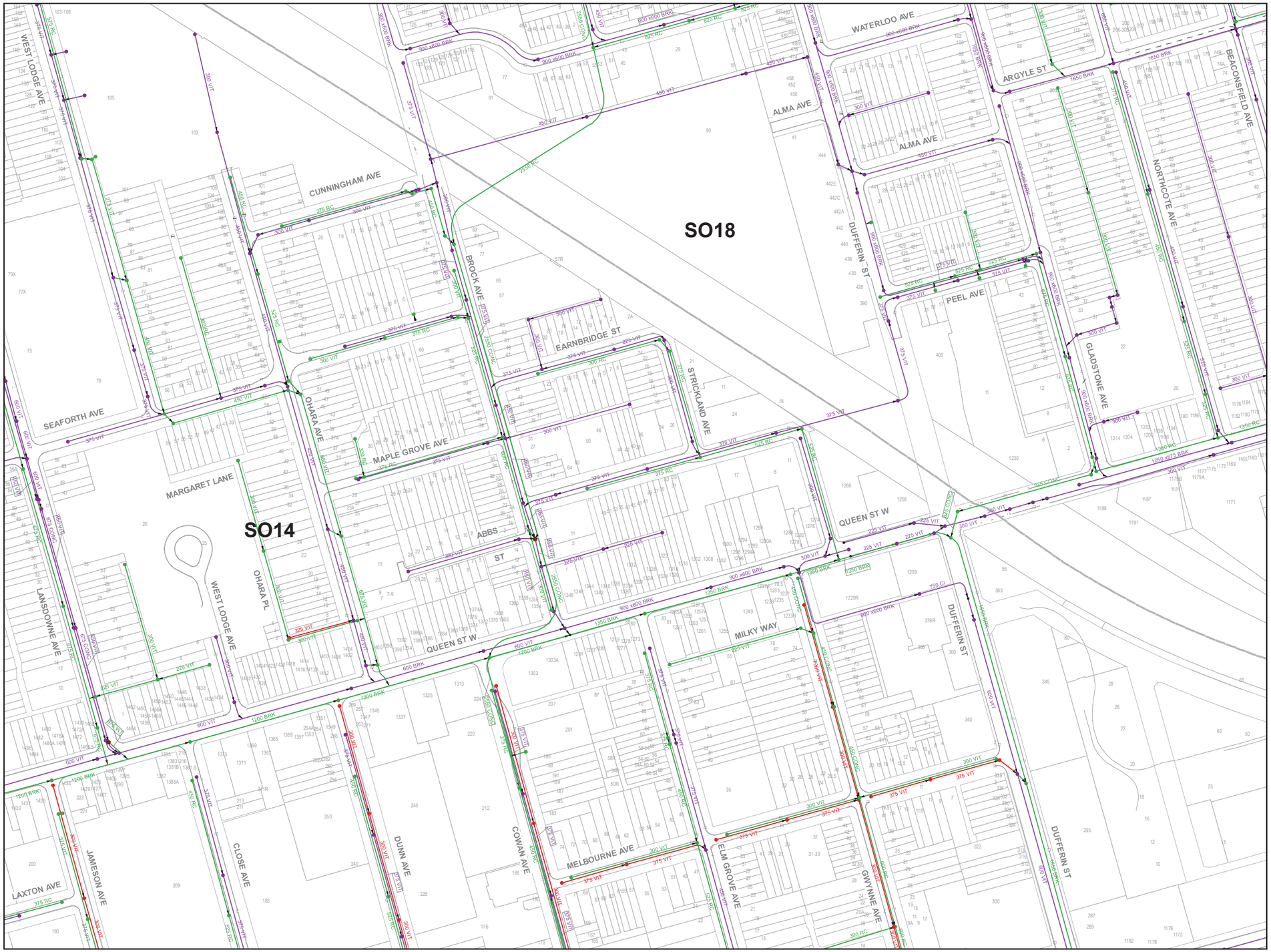
134 PETER STREET | SUITE 1601
TORONTO, ONTARIO | M5V 2H2 | CANADA
P: 416-971-6252 | F: 416-971-5420
E: info@andco.com | www.sweenyandco.com

PROJ. NAME
340-376 Dufferin St.
Toronto, Ontario

OWNER
Hullmark

DWG TITLE
Context Plan & Project Statistics

DATE : 2022-07-15
SCALE : 1 : 2500
DRAWN : AR
CHECKED : AG
PROJ. No. : 2102
DWG No. **AZ001**



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.
- These maps are for planning purpose only and must not be used for construction, or as a replacement for a utility locate.
- This drawing is not to be reproduced in whole or in part without the express written permission of the City.
- Any discrepancies, inaccuracies, errors and/or omissions in the maps should be reported to Toronto Water, Water Infrastructure Management. (18th Floor, Metro Hall, 55 John St, Toronto, ON, M5V 3C6) (Tel: 416-392-3957)

N W E S

494	524	554
495	525	555
496	526	556

Toronto Sewer Atlas

Large Chamber

Manhole
- Combined
- Dual
- Sanitary
- Storm
- Foundation

Control Manhole
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Outfall
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N W E S

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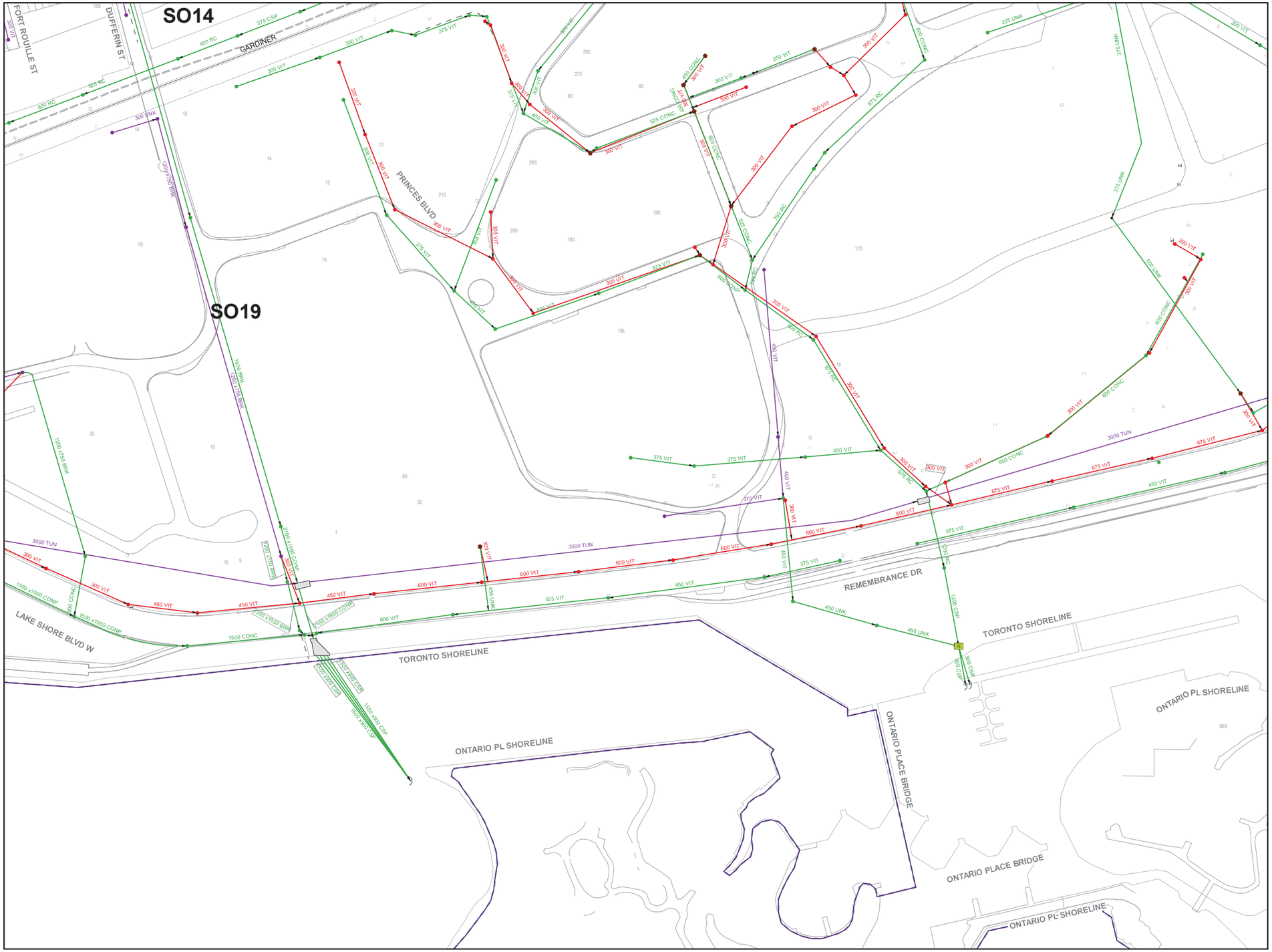

Toronto Sewer Atlas

Manhole
- Combined
- Dual
- Sanitary
- Storm
- Foundation
- Large Chamber

Control Manhole
- Combined
- Dual
- Sanitary
- Storm

Outfall
- Outfall

Sewer Pump Station
- Sewer Pump Station

Catchbasin
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Sewer
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- Storm
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- Storm Trunk
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N W E S

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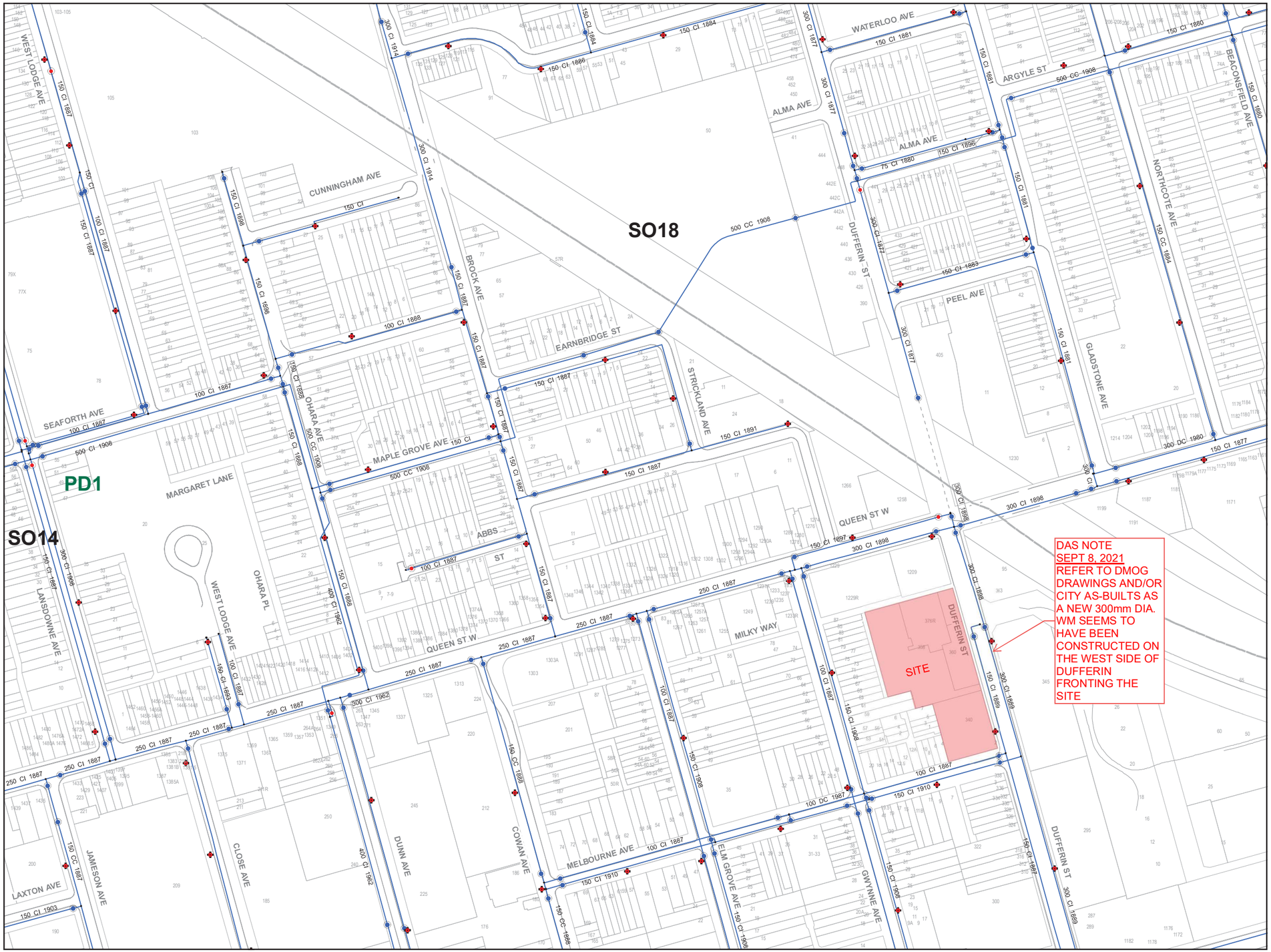
527	557	589
		590



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

494	524	554
495	525	555
496	526	556

AQUAFLOW TECHNOLOGY INC

226 WILKINSON ROAD, BRAMPTON, ONTARIO L6T 4N7
(905) 792-8169

COMBINED & STORM SEWER INVESTIGATION REPORT
DYE TEST

100 MM - 600 MM COMBINED SEWERS
&
100 MM - 1650 MM DIAMETER STORM SEWERS

FOR

340 - 376 DUFFERIN STREET
(RADIATOR)

CITY OF TORONTO

CONSULTING ENGINEER: R.V. ANDERSON
CONSULTING ENGINEER'S REPRESENTATIVE: DAVID STAFFORD
OWNER: HULLMARK

MONDAY, MARCH 21ST, 2022

INDEX:

2. SUMMARY REPORT AND CONCLUSIONS:

The investigation of the combined & storm sewers at 340 - 376 Dufferin Street was carried out by Steven Lostracco, P.Eng. of Aquaflow Technology, and was authorized by David Stafford of R.V. Anderson. The investigation was carried out on Monday March, 21st, 2022.

The purpose of this report was to determine which municipal sewer the storm drains connect to.

1. Two small areas connect to the 1650 mm storm sewer on Dufferin Street:
a) North East corner of the Uberflip roof at #370 Dufferin St (area shaded in green), Two roof drains.
b) Paved driveway at entrance to parking lot, overland flow drains toward Dufferin Street catchbasins (area shaded in green).

2. One roof drain at #340 Dufferin Street connects to the sanitary sewer on Melbourne Avenue (drain highlighted in yellow)

3. The remainder of the site connects to the 600 mm dia. combined sewer on Dufferin Street and the 900x600 combined sewer on Milky Way. This includes roof drains, overland flow and parking lot catchbasins.

1,2. Uberflip, #370 Dufferin

3.Uberflip, #370 Dufferin (storm)

4. Uberflip, #370- Roof drains

5. Uberflip, #370- Roof drains

6. Uberflip, #370- Roof drains

7. Uberflip, #370- Roof drains

8. Uberflip, #370- Roof drains

9. Uberflip, #370- Roof drains

10. #350- Roof drains


11. #350- Roof drains

12. #358- Roof drains


13. #358- Roof drains


14. #358- Roof drains


15. #358- Roof drains

16. #358- Roof drains


17. #358- Roof drains

18. #360- Roof drains


19. #360- Roof drains

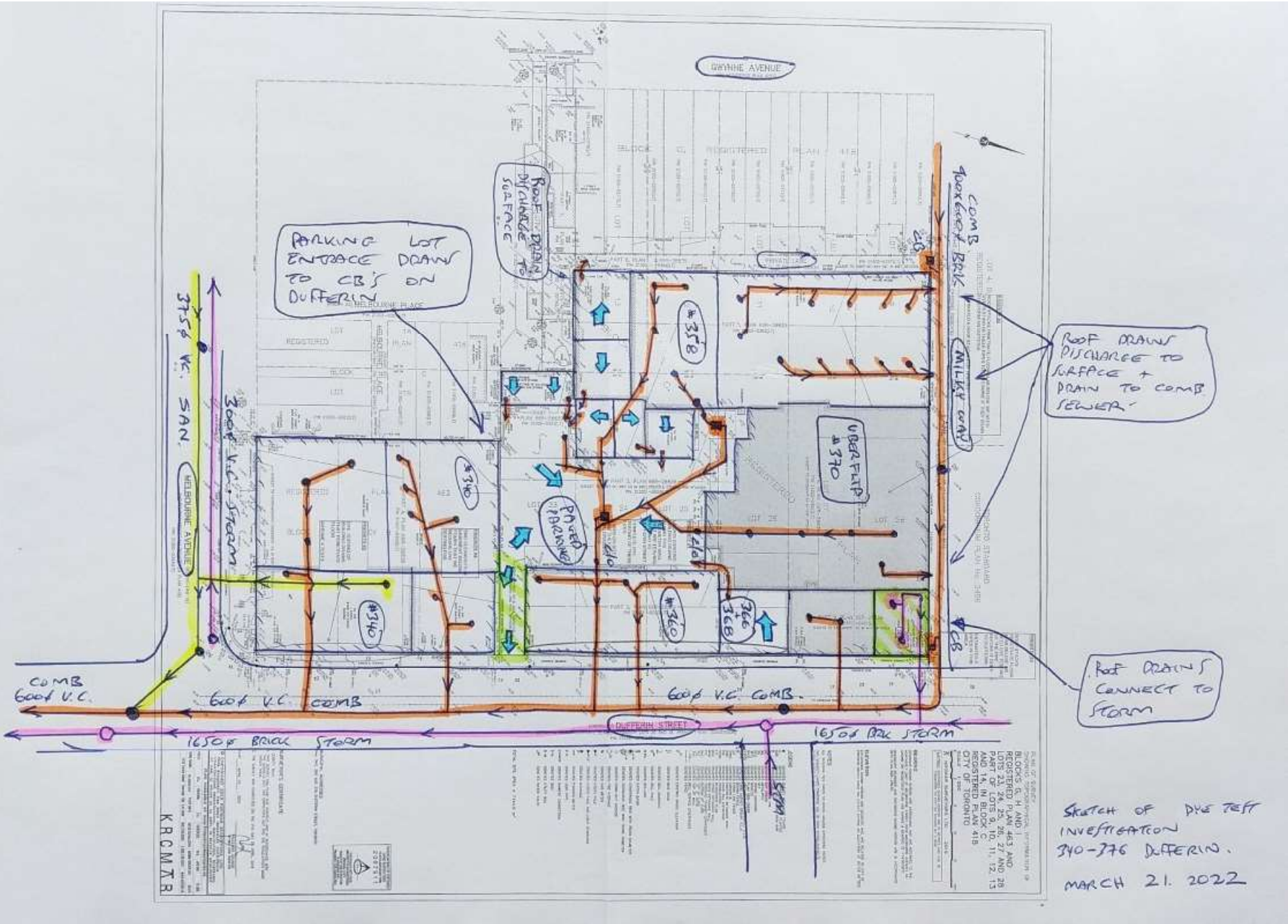

20. #360- Roof drains

21. #340- Roof drains

22. #340- Roof drains

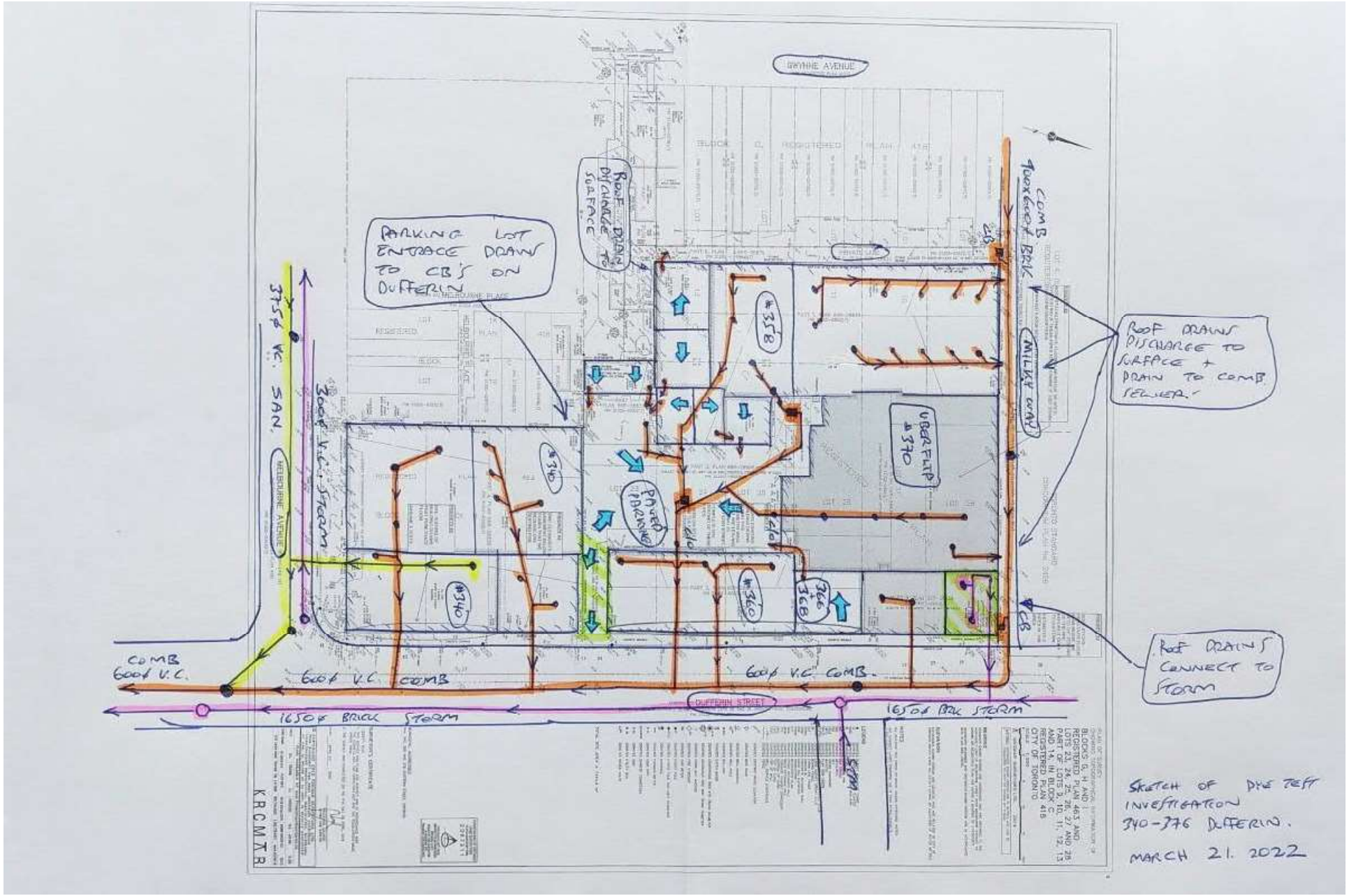
Report Prepared by:

Steven Lostracco, P. Eng.



SKETCH OF DYE TEST INVESTIGATION 340-376 DUFFERIN.

MARCH 21. 2022



SKETCH OF DYE TEST INVESTIGATION
340-376 DUFFERIN.
MARCH 21. 2022

APPENDIX B

SANITARY DEMAND ANALYSIS

TABLE B1 - EXISTING SITE

		Total
Total Office Floor Area**	m^2	7,916
Total Office Floor Area	ha	1
Total Equivalent Population @ 3.3 persons/100m2*	L/s/ha	261
Total Office Flow @ 250L/cap/day*	**L/s**	**0.76**
Total Site Area	m^2	7,444
Total Site Area	ha	0.74
Total Infiltration	**L/s**	**0.19**
Total Sanitary Peak Flow	**L/s**	**0.95**

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

** estimated footprint of existing buildings using Topographic Survey from KRCMAR Surveyors LTD. Dated April 25, 2019.

TABLE B2 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - RESIDENTIAL - PHASE 1

		TOTAL
Total Units**	units	564
Total One Bedroom Units	%	69%
Total Bachelor & One Bedroom Units**	units	387
Persons Per Unit*	persons/unit	1.4
Total Two Bedroom Units	%	21.6%
Total Two Bedroom Units**	units	122
Persons Per Unit*	persons/unit	2.1
Total Three Bedroom Units	%	9.8%
Total Three Bedroom Units**	units	55
Persons Per Unit*	persons/unit	3.1
Total Residential Population	persons	969
Total Population Used for Calculation Purposes***	persons	1,000
Total Residential Flow @ 240 L/person/day*	L/day	240,000
Total Residential Flow	L/s	2.78
Peaking Factor****		3.80
Total Residential Peak Flow- Phase 1	**L/s**	**10.56**

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

*** The population was rounded up to provide a conservative figure for demand calculations.

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

TABLE B3 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - RETAIL AREA - PHASE 1

		Total
Total Retail Floor Area**	m^2	988
Total Retail Floor Area	ha	0.0988
Total Equivalent Population @ 1.1persons/100m2*	persons	11
Total Retail Flow @ 250L/cap/day	L/s	0.03
Total Retail Peak Flow - Phase 1	**L/s**	**0.03**

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

TABLE B4 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - FLEX AREA - PHASE 1

		Total
Total Flex Floor Area**	m^2	1,975
Total Flex Floor Area	ha	0.1975
Total Equivalent Population @ 3.3persons/100m2*	persons	65
Total Flex Flow @ 250L/cap/day	L/s	0.19
Total Flex Peak Flow - Phase 1	**L/s**	**0.19**

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

TABLE B5 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - EXISTING BUILDING - PHASE 1

		Total
Total Building Floor Area	m^2	898
Total Building Floor Area	ha	0.0898
Total Equivalent Population @ 3.3persons/100m2*	persons	30
Total Building Flow @ 250L/cap/day	L/s	0.09
Total Building Peak Flow - Phase 1	**L/s**	**0.09**

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

** estimated footprint of existing building using Topographic Survey from KRCMAR Surveyors LTD. Dated April 25, 2019.

TABLE B6 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - INFILTRATION - PHASE 1

Site Area	m^2	5771
Site Area	ha	0.5771
Infiltration Allowance*	L/s/ha	0.26
Total Infiltration Peak Flow-Phase 1	L/s	**0.15**

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

TABLE B7 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - PHASE 1

		TOTAL
Total Residential Peak Flow	L/s	10.56
Total Retail Peak Flow	L/s	0.03
Total Flex Peak Flow	L/s	0.19
Total Office Peak Flow (Existing Building)	L/s	0.09
Total Infiltration Peak Flow	L/s	0.15
Total Sanitary Peak Flow - Phase 1	**L/s**	**11.01**

TABLE B8 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - RESIDENTIAL - Phase 2

		TOTAL
Total Units**	units	100
Total One Bedroom Units	%	50%
Total Bachelor & One Bedroom Units**	units	50
Persons Per Unit*	persons/unit	1.4
Total Two Bedroom Units	%	38.0%
Total Two Bedroom Units**	units	38
Persons Per Unit*	persons/unit	2.1
Total Three Bedroom Units	%	12.0%
Total Three Bedroom Units**	units	12
Persons Per Unit*	persons/unit	3.1
Total Residential Population	persons	187
Total Population Used for Calculation Purposes***	persons	200
Total Residential Flow @ 240 L/person/day*	L/day	48,000
Total Residential Flow	L/s	0.56
Peaking Factor****		4.15
Total Residential Peak Flow- Phase 2	**L/s**	**2.30**

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

*** The population was rounded up to provide a conservative figure for demand calculations.

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

TABLE B9 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - RETAIL - PHASE 2

		Total
Total Retail Floor Area**	m^2	752
Total Retail Floor Area	ha	0.0752
Total Equivalent Population @ 1.1persons/100m2*	persons	8
Total Retail Flow @ 250L/cap/day	L/s	0.02
Total Retail Peak Flow-Phase 2	**L/s**	**0.02**

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

TABLE B10 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - INFILTRATION - PHASE 2

Site Area	m^2	1673
Site Area	ha	0.1673
Infiltration Allowance*	L/s/ha	0.26
Total Infiltration Peak Flow-Phase 2	L/s	**0.04**

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

TABLE B11 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - PHASE 2

		TOTAL
Total Residential Peak Flow	L/s	2.30
Total Retail Peak Flow	L/s	0.02
Total Infiltration Peak Flow	L/s	0.04
Total Sanitary Peak Flow-Phase 2	**L/s**	**2.37**

TABLE B12 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - RESIDENTIAL - Phase 1&2

		TOTAL
Total Units**	units	664
Total One Bedroom Units	%	66%
Total Bachelor & One Bedroom Units**	units	437
Persons Per Unit*	persons/unit	1.4
Total Two Bedroom Units	%	24.1%
Total Two Bedroom Units**	units	160
Persons Per Unit*	persons/unit	2.1
Total Three Bedroom Units	%	10.1%
Total Three Bedroom Units**	units	67
Persons Per Unit*	persons/unit	3.1
Total Residential Population	persons	1,156
Total Population Used for Calculation Purposes***	persons	1,200
Total Residential Flow @ 240 L/person/day*	L/day	288,000
Total Residential Flow	L/s	3.33
Peaking Factor****		3.75
Total Residential Peak Flow- Phase 1&2	**L/s**	**12.49**

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

*** The population was rounded up to provide a conservative figure for demand calculations.

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

TABLE B13 - PROPOSED TOTAL SANITARY FLOW ESTIMATE - OVERALL (PHASE 1 & 2)

		TOTAL
Total Residential Peak Flow	L/s	12.49
Total Retail Peak Flow	L/s	0.06
Total Flex Peak Flow	L/s	0.19
Total Office Peak Flow (Existing Building)	L/s	0.09
Total Infiltration Peak Flow	L/s	0.19
Total Sanitary Peak Flow-Phase 1&2	L/s	13.02
Total Sanitary Peak Flow-Phase 1&2*	**L/s**	**13.50**

*The sanitary peak flow was rounded up to provide a conservative figure for demand calculations.

APPENDIX C

WATER DEMAND ANALYSIS

Lozzi Aqua Check

Massimo Lozzi Cell: 416 990-2131
E-mail: lozziaquacheck@gmail.com

Hydrant Flow Test Form

Job Location: 340 - 376 Dufferin St, Toronto Date: May 5,2021

Time of Test: 9:30 am

Location of Flow Hydrant: at S/E corner of Melbourne Ave and Dufferin St.

Residual : First hydrant south of Queen St on Dufferin St.

Main Size: 300 mm. Static Pressure: 68 psi

	Number of Outlets & Orifice Size	Pitot Pressure (psi)	Flow (U.S. G.P.M.)	Residual Pressure (psi)
1.	Static	0	0	68
2.	1 x 2 ½	52	1207	64
3.	2 x 2 ½	46	2271	62

Note :Flow test conducted in accordance with NFPA Std 291

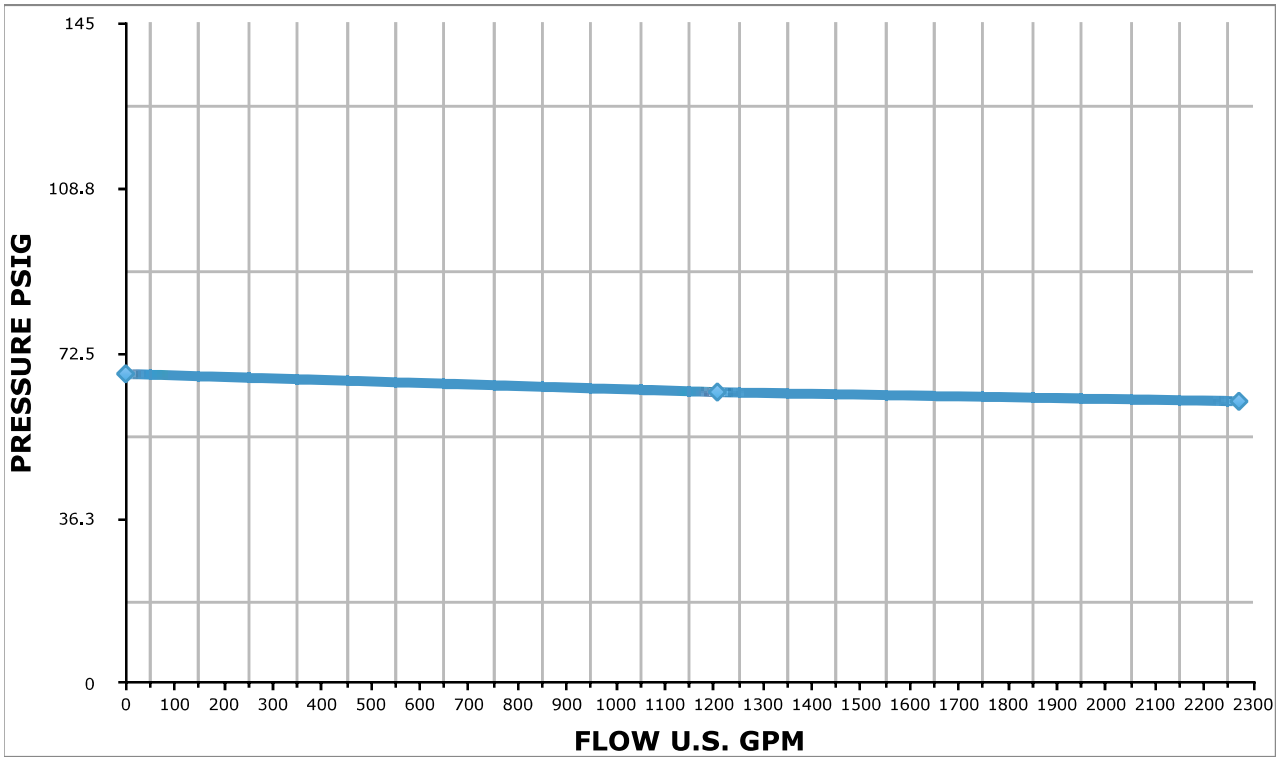


TABLE C1 - PROPOSED PEAK WATER DEMAND CALCULATIONS - RESIDENTIAL - PHASE 1

		TOTAL
Total Units	units	564
Total One-Bedroom Units	%	69%
Total One-Bedroom Units**	units	387
Persons Per Unit*	persons/unit	1.4
Total Two Bedroom Units	%	21.6%
Total Two Bedroom Units**	units	122
Persons Per Unit*	persons/unit	2.1
Total Three Bedroom Units	%	9.8%
Total Three Bedroom Units**	units	55
Persons Per Unit*	persons/unit	3.1
Total Residential Population	persons	969
Total Population Used for Calculation Purposes***	persons	1,000
Per Capita Demand @ 190 L/person/day*	L/day	190,000
Equivalent Population Demand	L/s	2.20
Peak Hour Peaking Factor*		2.5
Peak Hour Design Demand Rate	L/s	5.50
Peak Hour Design Demand Rate (m^3/day)	m^3/day	475
Maximum Day Peaking Factor*		1.3
Maximum Day Design Demand Rate	L/s	2.86
Maximum Day Design Demand Rate (m^3/day)	m^3/day	247

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

***The population was rounded up to provide a conservative figure for demand calculations.

TABLE C2 - PROPOSED PEAK WATER DEMAND CALCULATIONS - RETAIL - PHASE 1

		TOTAL
Total Retail Floor Area**	m^2	1,000
Equivalent Population Density*	persons/100m^2	1.1
Equivalent Population	persons	11
Per Capita Demand @ 190 L/person/day*	L/day	2,090
Total Retail Demand	L/s	0.02
Peak Hour Peaking Factor*		1.2
Peak Hour Design Demand	L/s	0.03
Peak Hour Design Demand	m^3/day	3
Maximum Day Peaking Factor*		1.1
Maximum Day Design Demand	L/s	0.03
Maximum Day Design Demand	m^3/day	2

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

TABLE C3 - PROPOSED PEAK WATER DEMAND CALCULATIONS - FLEX -

		TOTAL
Total Flex Floor Area**	m^2	1,500
Equivalent Population Density*	persons/100m^2	3.3
Equivalent Population	persons	50
Per Capita Demand @ 190 L/person/day*	L/day	9,405
Total Flex Demand	L/s	0.11
Peak Hour Peaking Factor*		1.9
Peak Hour Design Demand	L/s	0.21
Peak HourDesign Demand	m^3/day	18
Maximum Day Peaking Factor*		1.1
Maximum Day Design Demand	L/s	0.12
Maximum Day Design Demand	m^3/day	10

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

TABLE C4 - PROPOSED PEAK WATER DEMAND CALCULATIONS - EXISTING BUILDING - PHASE 1

		TOTAL
Total Building Floor Area**	m^2	500
Equivalent Population Density*	persons/100m^2	3.3
Equivalent Population	persons	17
Per Capita Demand @ 190 L/person/day*	L/day	3,135
Total Water Demand	L/s	0.04
Peak Hour Peaking Factor*		1.9
Peak Hour Design Demand	L/s	0.07
Peak Hour Design Demand	m^3/day	6
Maximum Day Peaking Factor*		1.1
Maximum Day Design Demand	L/s	0.04
Maximum Day Design Demand	m^3/day	3

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

** estimated footprint of existing buildings using Topographic Survey from KRCMAR Surveyors LTD. Dated April 25, 2019.

TABLE C5- PROPOSED PEAK WATER DEMAND CALCULATIONS - DOMESTIC - PHASE 1

		PEAK HOUR	MAXIMUM DAY	AVERAGE
Residential Demand	L/s	5.50	2.86	2.20
Retail Demand	L/s	0.03	0.03	0.02
Flex Demand	L/s	0.21	0.12	0.11
Existing Building Demand	L/s	0.07	0.04	0.04
Total Flow Rate	L/s	5.80	3.05	2.37
Total Flow Rate	L/min	348	183	142

TABLE C6 - PROPOSED PEAK WATER DEMAND CALCULATIONS - EXISTING PHASE 2 BUILDING

		TOTAL
Total Building Floor Area**	m^2	2,000
Equivalent Population Density*	persons/100m^2	3.3
Equivalent Population	persons	66
Per Capita Demand @ 190 L/person/day*	L/day	12,540
Total Water Demand	L/s	0.15
Peak Hour Peaking Factor*		1.9
Peak Hour Design Demand	L/s	0.28
Peak Hour Design Demand	m^3/day	24
Maximum Day Peaking Factor*		1.1
Maximum Day Design Demand	L/s	0.16
Maximum Day Design Demand	m^3/day	14

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

** estimated footprint of existing buildings using Topographic Survey from KRCMAR Surveyors LTD. Dated April 25, 2019.

TABLE C7 - PROPOSED PEAK WATER DEMAND CALCULATIONS - RESIDENTIAL - PHASE 2

		TOTAL
Total Units	units	100
Total One-Bedroom Units**	%	50%
Total One-Bedroom Units	units	50
Persons Per Unit*	persons/unit	1.4
Total Two Bedroom Units	%	38.0%
Total Two Bedroom Units**	units	38
Persons Per Unit*	persons/unit	2.1
Total Three Bedroom Units	%	12.0%
Total Three Bedroom Units**	units	12
Persons Per Unit*	persons/unit	3.1
Total Residential Population	persons	187
Total Population Used for Calculation Purposes***	persons	200
Per Capita Demand @ 190 L/person/day	L/day	38,000
Equivalent Population Demand	L/s	0.44
Peak Hour Peaking Factor*		2.5
Peak Hour Design Demand Rate	L/s	1.1
Peak Hour Design Demand Rate (m^3/day)	m^3/day	95
Maximum Day Peaking Factor*		1.3
Maximum Day Design Demand Rate	L/s	0.57
Maximum Day Design Demand Rate (m^3/day)	m^3/day	49

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

**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

***The population was rounded up to provide a conservative figure for demand calculations.

TABLE C8 - PROPOSED PEAK WATER DEMAND CALCULATIONS - RETAIL - PHASE 2

		TOTAL
Total Retail Floor Area**	m^2	800
Equivalent Population Density*	persons/100m^2	1.1
Equivalent Population	persons	9
Per Capita Demand @ 190 L/person/day*	L/day	1,672
Total Retail Demand	L/s	0.02
Peak Hour Peaking Factor*		1.2
Peak Hour Design Demand	L/s	0.02
Peak HourDesign Demand	m^3/day	2
Maximum Day Peaking Factor*		1.1
Maximum Day Design Demand	L/s	0.02
Maximum Day Design Demand	m^3/day	2

* as per City of Toronto Design Criteria for Sewers and Watermains - Jan. 2021
**Based on Architectural Stats received from Sweeny and Co Architects. dated Mar 17, 2022

TABLE C9- PROPOSED PEAK WATER DEMAND CALCULATIONS - DOMESTIC - PHASE 2

		PEAK HOUR	MAXIMUM DAY	AVERAGE
Residential Demand	L/s	1.10	0.57	0.44
Retail Demand	L/s	0.02	0.02	0.02
Total Flow Rate	L/s	1.12	0.59	0.46
Total Flow Rate	L/min	67	36	28

TABLE C10 - PROPOSED PEAK WATER DEMAND CALCULATIONS - DOMESTIC - PHASE 1&2

		PEAK HOUR	MAXIMUM DAY	AVERAGE
Residential Demand	L/s	6.60	3.43	2.64
Retail Demand	L/s	0.05	0.05	0.04
Flex Demand	L/s	0.21	0.12	0.11
Existing Building Demand	L/s	0.07	0.04	0.04
Total Flow Rate	L/s	6.93	3.64	2.83
Total Flow Rate	L/min	416	218	170

TABLE C16 - FIRE DEMAND CALCULATIONS - BASED ON F.U.S. GUIDELINES - PHASE 1 & EXISTING COURTYARD BUILDING - 2

		PHASE 1		EXISTING COURTYARD BUILDING	
Coefficient for type of construction:		Fire-resistive	0.6	Ordinary	1
Height in Stories			23		2
3rd Floor Area (Largest Floor Area)	m^2		3,261		
Stories to Use in Calculation (3rd + 25% of each of two immediately adjoining floors)	m^2	(4th + 5th) * 25%	1420		
Total Area	m^2		4,681		500
Fire Flow Required	L/min		10,000		5,000
Occupancy Charge	L/min	15% Reduction for Limited Combustible	-1,500	0% Reduction for Combustible	0
Fire Flow Required	L/min		8,500		5,000
SUBTOTAL	**L/min**		**13,500**		
Reduction for Automatic Sprinklers	L/min	30%	-2,550	0%	0
SUBTOTAL	**L/min**		**-2,550**		
Charge for Building Separation					
North: Nearest Building			5m	20%	
East: Nearest Building			25m	10%	
South: Nearest Building			0m	25%	
West: Nearest Building			8m	20%	
Charge for Building Separation	**L/min**		**10,125**		
Fire Flow Required	**L/min**		**22,000**		
Fire Flow Required	**L/s**		**366.7**		

TABLE C20 - FIRE DEMAND CALCULATIONS - BASED ON F.U.S. GUIDELINES - PHASE 1&2 & EXISTING COURTYARD BUILDING - 2

		PHASE 1&2		EXISTING COURTYARD BUILDING	
Coefficient for type of construction:		Fire-resistive	0.6	Ordinary	1
Height in Stories			25		2
3rd Floor Area (Largest Floor Area)	m^2		4,174		
Stories to Use in Calculation (3rd + 25% of each of two immediately adjoining floors)	m^2	(4th + 5th) * 25%	1853		
Total Area	m^2		6,027		500
Fire Flow Required	L/min		11,000		5,000
Occupancy Charge	L/min	15% Reduction for Limited Combustible	-1,650	0% Reduction for Combustible	0
Fire Flow Required	L/min		9,350		5,000
SUBTOTAL	**L/min**		**14,350**		
Reduction for Automatic Sprinklers	L/min	30%	-2,805	0%	0
SUBTOTAL			**-2805**		
Charge for Building Separation					
North: Nearest Building			5m	20%	
East: Nearest Building			25m	10%	
South: Nearest Building			0m	25%	
West: Nearest Building			8m	20%	
Charge for Building Separation	**L/min**		**10,763**		
Fire Flow Required	**L/min**		**22,308**		
Fire Flow Required	**L/s**		**371.8**		

TABLE C22 - TOTAL WATER DEMAND

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

MAX DAY	3.64	L/S
FIRE	371.8	L/s
Total Max Day & Fire Flow	375.4	L/s

PEAK HOUR DOMESTIC DEMAND

PEAK RATE	6.93	L/s

THEREFORE, MAX DAY + FIRE FLOW IS GOVERNING REQUIREMENT

WATER DEMAND

Max Day Demand	3.64	L/s	218	L/min
Fire Flow*	371.8	L/s	22,308	L/min
Total Water Demand Requirement	375.4	L/s	22,526	L/min

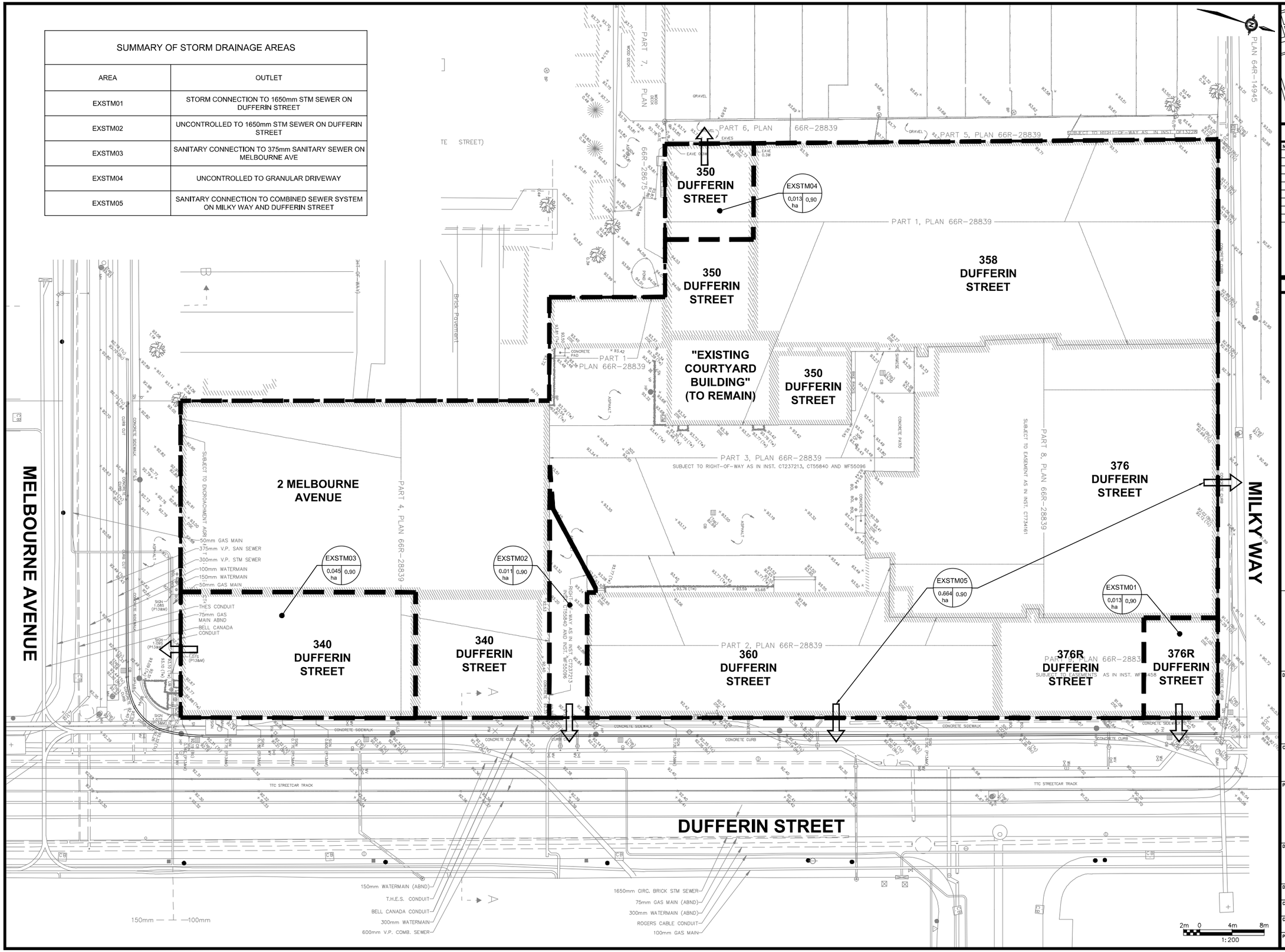
Note (*): Per City of Toronto's Design Criteria for Sewers and Watermains, in accordance with the Fire Underwriters Survey (FUS), fire flows will not be less than 4,800L/minute for a 2-hour duration in addition to maximum daily domestic demand, delivered with a residual pressure of not less than 140kPa (20psi).

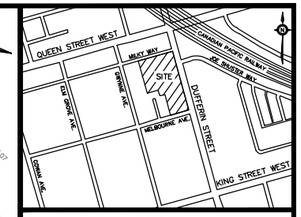
Note: The total water demand shows the worst case where Phase 1 and 2 have been constructed and the existing courtyard building has remained separate.

APPENDIX D

POST DEVELOPMENT PEAK DISCHARGE RATE AND REQUIRED STORAGE

SUMMARY OF STORM DRAINAGE AREAS	
AREA	OUTLET
EXSTM01	STORM CONNECTION TO 1650mm STM SEWER ON DUFFERIN STREET
EXSTM02	UNCONTROLLED TO 1650mm STM SEWER ON DUFFERIN STREET
EXSTM03	SANITARY CONNECTION TO 375mm SANITARY SEWER ON MELBOURNE AVE
EXSTM04	UNCONTROLLED TO GRANULAR DRIVEWAY
EXSTM05	SANITARY CONNECTION TO COMBINED SEWER SYSTEM ON MILKY WAY AND DUFFERIN STREET





KEY PLAN
N.T.S.

No.	Date	Comments
1	2022/06/24	ISSUED FOR ZBA/SPA

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

LEGEND

- PRE-DEVELOPMENT DRAINAGE AREA BOUNDARY
- PROPERTY BOUNDARY
- 100 — CATCHMENT ID
- 0.36ha 0.76 — RUN-OFF COEFFICIENT
- CATCHMENT AREA IN HECTARE
- STORMWATER FLOW DIRECTION

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 SEVICING ONLY

Drawing Prepared By:
arva
R.V. Anderson Associates Limited
engineering • environment • infrastructure

Client:
HULLMARK SUN LIFE (376 DUFFERIN) LP

Project Name:
340 - 376 DUFFERIN STREET, TORONTO "RADIATOR"

Drawing Title:
PRE DEVELOPMENT STORM DRAINAGE PLAN

Drawn:	Design:	Date:
F.Y/M.S	M.S/D.A.S	MAR 2022
Checked:	Approved:	Scale:
A.S.T	M.S	1: 200
CADD File: 216056-S-EXSTM.dwg		Dwg. No.: STM-1
Project No.: 216056		

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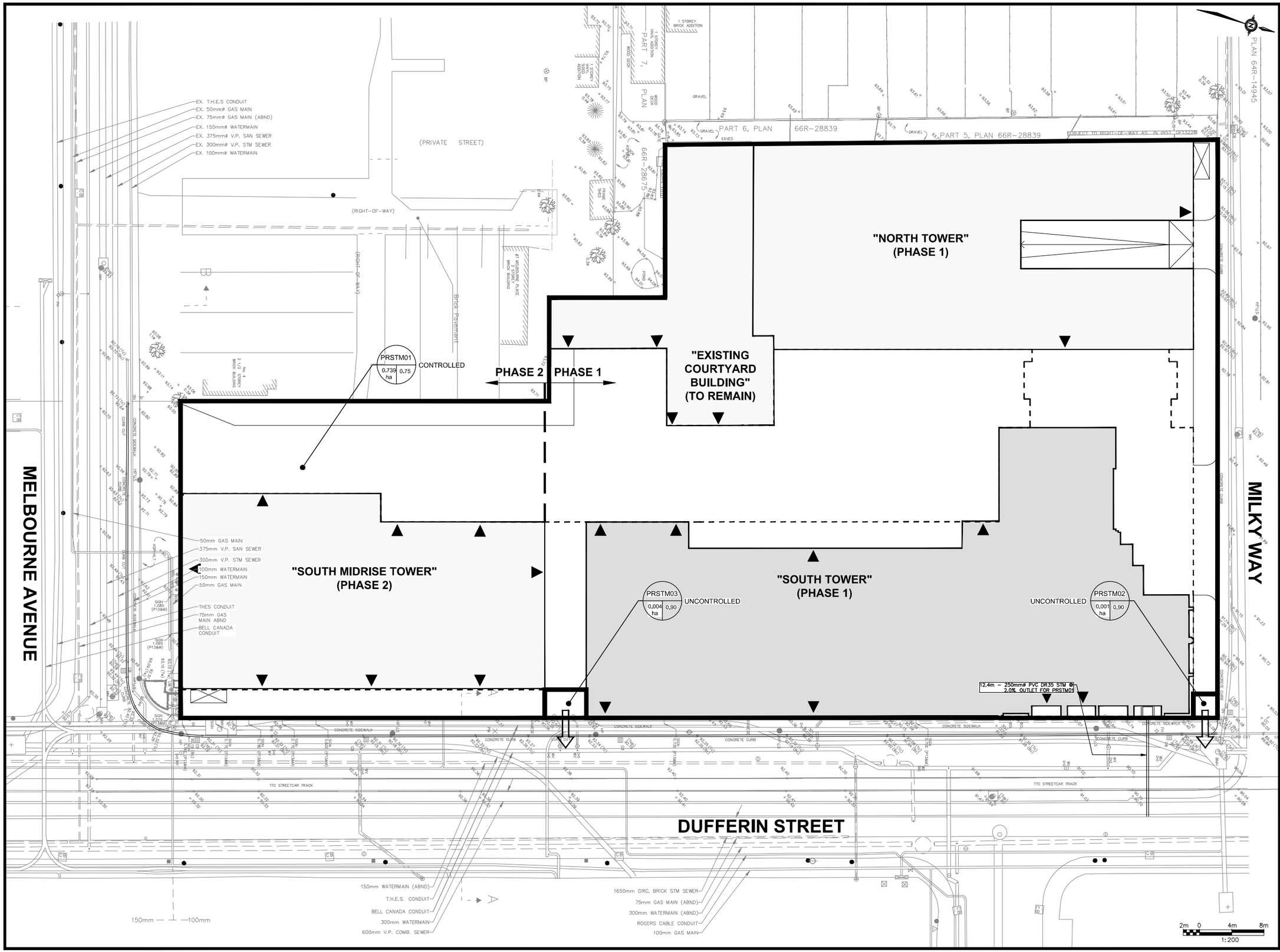

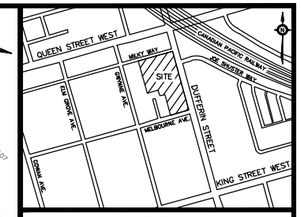

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FOR SITE SERVICING ONLY

Drawing Prepared By:
arva
R.V. Anderson Associates Limited
engineering • environment • infrastructure

Client:
HULLMARK SUN LIFE (376 DUFFERIN) LP

Project Name:
340 - 376 DUFFERIN STREET, TORONTO "RADIATOR"

Drawing Title:
POST DEVELOPMENT STORM DRAINAGE PLAN

Drawn: F.Y/M.S	Design: M.S/D.A.S	Date: MAR 2022
Checked: A.S.T	Approved: M.S	Scale: 1:200
CADD File: 216056-S-PRSTM.dwg		Dwg. No.: STM-2
Project No.: 216056		

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CRITERIA: REDUCE POST DEVELOPMENT FLOWS FROM THE 2 TO 100-YEAR EVENTS TO THE 2-YEAR PRE-DEVELOPMENT PEAK FLOW RATE WITH A MAXIMUM RUNOFF COEFFICIENT OF "C"=0.50

ALLOWABLE FOR SITE - Phase 1 & 2

2-YEAR TORONTO
A= 531.391
B= 0.0
C= 0.78

TIME OF CONCENTRATION (Tc)
10

INTENSITY = A/(t+B)^C
88.2 mm/hr

AREA

7,444 m^2

RUN-OFF COEFFICIENT
C= 0.50

PEAK FLOW
Q = CiA

Q = 91.2 L/s

Storm Event Modelling - Storage System Characteristics - Condominium Detention System

Tank Area (m²)	77.00

Storage System Discharge Details	
Orifice Equation (Orifice Plate)	$Q=C_dA(2g(h_2-h_1))^{0.5}$
Orifice Coefficient (C_d)	0.62
Orifice Diameter (mm)	155
Orifice Area (m²)	0.0189

Elevation (m)	Description	Depth of Storage (m)	Orifice Head (m)	Storage (m³)	Orifice Discharge (L/s)
87		0.00	0.00	0.00	0.00
87.41		0.332	0.332	25.583	29.869
87.74		0.665	0.665	51.167	42.242
88.07		0.997	0.997	76.750	51.735
88.41		1.329	1.329	102.333	59.739
88.74		1.661	1.661	127.916	66.790
89.07		1.994	1.994	153.500	73.165
89.40		2.326	2.326	179.083	79.027
89.74		2.658	2.658	204.666	84.484
90.07		2.990	2.990	230.249	89.608
90.40		3.323	3.323	255.833	94.455

NOTE: SEE OTTHYMO RESULTS FOR MODEL

340-376 Duffein Street
POST-DEVELOPMENT WATER BALANCE - ALL SURFACES TO CISTERN

Surface	Area (sq.m)	% of Total Site Area	Surface IA (mm)	% 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)	Depth to SWM Tank (mm)	Total Effective IA (mm)	% of Average Annual Rain Capture	% of Total Annual Average Rainfall Depth Weighted Over Entire Site	Volume to Cistern (m^3)	Volume to SWM Tank (m^3)
TOWER CONTROLED AREAS												
Conventional Roof*	3184	42.8%	1.0	15.0%	6.42%	3.50	0.00	4.50	47.0%	20.1%	11.14	
Ammenity Terrace	0	0.0%	1.0	15.0%	0.00%	0.00	0.00	1.00	15.0%	0.0%	0.00	
Green Roof**	2123	28.5%	7.0	60.0%	17.11%	0.00	0.00	7.00	60.0%	17.1%	0.00	
AT GRADE CONTROLED AREAS												
Landscaping at Grade***	418	5.6%	7.0	60.0%	3.37%	0.00	0.00	7.00	60.0%	3.4%	0.00	
Impervious at Grade****	1672	22.5%	1.0	15.0%	3.37%	3.50	0.00	4.50	47.0%	10.6%	5.85	
0	0	0.0%	0.0	1.0%	0.00%	0.00	0.00	0.00	0.0%	0.0%	0.00	
Uncontrolled Areas to Municipal R.O.W.												
Impervious at Grade	47	0.6%	1.0	15.0%	0.09%	0.00	0.00	1.00	15.0%	0.1%	0.00	
Landscape at Grade	0	0.00%	7.0	60.0%	0.00%	0.00	0.00	7.00	60.0%	0.0%	0.00	
Total	**7444**	**100.0%**			**30.4%**					**51.2%**	**17.00**	
									Total Harvested Volume Required =		**17.00**	

340-376 Duffein Street
IRRIGATION - POST-DEVELOPMENT WATER BALANCE

Total Annual Average Rainfall in Toronto (WWFMG) =	840	mm
50% of above is to be retained onsite yearly =	420	mm
% of total annual average rainfall captured through initital abstraction	30.4%	mm
% of total annual average rainfall to be captured through other means (50% - 30.4%) =	19.6%	mm
Total annual average rainfall to be retained through other means (19.6% of 840mm) =	165	mm
Total annual average rainfall volume to be retained through other means (165mm x Site Area) =	1228.1	m^3

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

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DATE: 06-24-2022 TIME: 07:03:45

USER:

COMMENTS: _____

****
** SIMULATION : #1 TORONTO 2-YEAR **
****

| CHICAGO STORM |
| Ptotal= 32.33 mm |

IDF curve parameters: A= 531.391
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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	1.24	1.67	3.18	3.17	3.75	4.67	1.69
0.33	1.32	1.83	4.03	3.33	3.26	4.83	1.61
0.50	1.42	2.00	5.67	3.50	2.89	5.00	1.53
0.67	1.53	2.17	10.99	3.67	2.61	5.17	1.46
0.83	1.66	2.33	88.19	3.83	2.38	5.33	1.40
1.00	1.82	2.50	12.86	4.00	2.20	5.50	1.34
1.17	2.03	2.67	7.53	4.17	2.04	5.67	1.29
1.33	2.29	2.83	5.53	4.33	1.91	5.83	1.24
1.50	2.66	3.00	4.44	4.50	1.79	6.00	1.19

| CALIB |
| STANDHYD (0003) |
|ID= 1 DT= 5.0 min |

Area (ha)= 0.21
Total Imp(%)= 1.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.21
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	37.62	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61

0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.53	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	19.25	
over (min)	5.00	20.00	
Storage Coeff. (min)=	1.49 (ii)	15.14 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.33	0.07	
			TOTALS
PEAK FLOW (cms)=	0.00	0.01	0.006 (iii)
TIME TO PEAK (hrs)=	2.33	2.58	2.58
RUNOFF VOLUME (mm)=	31.33	10.35	10.52
TOTAL RAINFALL (mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT =	0.97	0.32	0.33

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0004)| Area (ha)= 0.32
ID= 1 DT= 5.0 min | Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	46.07	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.53	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	25.84	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.69 (ii)	2.87 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.32	0.28	
			TOTALS
PEAK FLOW (cms)=	0.08	0.00	0.077 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33

```
     RUNOFF VOLUME    (mm)=      31.33        10.35          31.12
     TOTAL RAINFALL   (mm)=      32.33        32.33          32.33
     RUNOFF COEFFICIENT   =       0.97         0.32           0.96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=   1.00   Dir. Conn.(%)=   1.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00         0.04
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      16.69        40.00
     Mannings n           =      0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    1.24 | 1.583    3.18 | 3.083    3.75 |  4.58    1.69
              0.167    1.24 | 1.667    3.18 | 3.167    3.75 |  4.67    1.69
              0.250    1.32 | 1.750    4.03 | 3.250    3.26 |  4.75    1.61
              0.333    1.32 | 1.833    4.03 | 3.333    3.26 |  4.83    1.61
              0.417    1.42 | 1.917    5.67 | 3.417    2.89 |  4.92    1.53
              0.500    1.42 | 2.000    5.67 | 3.500    2.89 |  5.00    1.53
              0.583    1.53 | 2.083   10.99 | 3.583    2.61 |  5.08    1.46
              0.667    1.53 | 2.167   10.99 | 3.667    2.61 |  5.17    1.46
              0.750    1.66 | 2.250   88.19 | 3.750    2.38 |  5.25    1.40
              0.833    1.66 | 2.333   88.19 | 3.833    2.38 |  5.33    1.40
              0.917    1.82 | 2.417   12.86 | 3.917    2.20 |  5.42    1.34
              1.000    1.82 | 2.500   12.86 | 4.000    2.20 |  5.50    1.34
              1.083    2.03 | 2.583    7.53 | 4.083    2.04 |  5.58    1.29
              1.167    2.03 | 2.667    7.53 | 4.167    2.04 |  5.67    1.29
              1.250    2.29 | 2.750    5.53 | 4.250    1.91 |  5.75    1.24
              1.333    2.29 | 2.833    5.53 | 4.333    1.91 |  5.83    1.24
              1.417    2.66 | 2.917    4.44 | 4.417    1.79 |  5.92    1.19
              1.500    2.66 | 3.000    4.44 | 4.500    1.79 |  6.00    1.19

     Max.Eff.Inten.(mm/hr)=      88.19        19.25
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       0.92 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00        0.001 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.50         2.50
     RUNOFF VOLUME    (mm)=      31.33        10.35         9.93
     TOTAL RAINFALL   (mm)=      32.33        32.33        32.33
     RUNOFF COEFFICIENT   =       0.97         0.32         0.31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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 (  0002)|   Area    (ha)=   0.17
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      33.39        40.00
     Mannings n           =      0.013        0.250
```

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.53	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	25.84		
over (min)	5.00	5.00		
Storage Coeff. (min)=	1.39 (ii)	2.57 (ii)		
Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	0.33	0.29		
			TOTALS	
PEAK FLOW (cms)=	0.04	0.00	0.041 (iii)	
TIME TO PEAK (hrs)=	2.33	2.33	2.33	
RUNOFF VOLUME (mm)=	31.33	10.35	31.12	
TOTAL RAINFALL (mm)=	32.33	32.33	32.33	
RUNOFF COEFFICIENT =	0.97	0.32	0.96	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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.

ADD HYD (0005)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0001):	0.04	0.001	2.50	9.93
	+ ID2= 2 (0002):	0.17	0.041	2.33	31.12
	ID = 3 (0005):	0.21	0.041	2.33	26.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	ID1= 3 (0005):	0.21	0.041	2.33	26.88
	+ ID2= 2 (0003):	0.21	0.006	2.58	10.52
	ID = 1 (0005):	0.42	0.044	2.33	18.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0005):	0.42	0.044	2.33	18.64
	+ ID2= 2 (0004):	0.32	0.077	2.33	31.12
	ID = 3 (0005):	0.74	0.121	2.33	24.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR(0006)| OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0732	0.0154
0.0299	0.0026	0.0790	0.0179
0.0422	0.0051	0.0845	0.0205
0.0517	0.0077	0.0896	0.0230
0.0597	0.0102	0.0945	0.0256
0.0668	0.0128	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	0.740	0.121	2.33	24.01
OUTFLOW: ID= 1 (0006)	0.740	0.044	2.42	23.99

PEAK FLOW REDUCTION [Qout/Qin](%)= 36.65
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0060

| CALIB
| STANDHYD (0007)| Area (ha)= 0.00
|ID= 1 DT= 5.0 min | Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	5.60	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.53	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=		88.19	25.84	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.48 (ii)	1.66 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.32	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.00	0.001 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	31.33	10.35	22.31
TOTAL RAINFALL	(mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT	=	0.97	0.32	0.69

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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.

| ADD HYD (0008)|
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

```
        ID1= 1 (  0006):     0.74   0.044     2.42    23.99
      + ID2= 2 (  0007):     0.00   0.001     2.33    22.31
        ================================================
        ID = 3 (  0008):     0.74   0.045     2.42    23.98

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

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       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 6.1\VO2\voin.dat
  Output  filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\9825ef9d-8
  Summary filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\9825ef9d-8


DATE: 06-24-2022                          TIME: 07:03:45

USER:


COMMENTS: _____________________________________________________


-------------------------------------------------------------------------------------------------------------
  ***********************************************
  ** SIMULATION : #2 TORONTO 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
                0.17    1.71 |  1.67    4.43 |  3.17    5.23 |  4.67    2.34
                0.33    1.82 |  1.83    5.63 |  3.33    4.54 |  4.83    2.22
                0.50    1.96 |  2.00    7.96 |  3.50    4.03 |  5.00    2.11
                0.67    2.11 |  2.17   15.58 |  3.67    3.63 |  5.17    2.01
                0.83    2.30 |  2.33  131.79 |  3.83    3.31 |  5.33    1.92
                1.00    2.53 |  2.50   18.26 |  4.00    3.05 |  5.50    1.84
                1.17    2.81 |  2.67   10.62 |  4.17    2.83 |  5.67    1.77
                1.33    3.18 |  2.83    7.77 |  4.33    2.64 |  5.83    1.70
                1.50    3.69 |  3.00    6.22 |  4.50    2.48 |  6.00    1.64


---------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.21
|ID= 1 DT= 5.0 min |   Total Imp(%)=   1.00   Dir. Conn.(%)=   1.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.21
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      37.62         40.00
     Mannings n             =    0.013         0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

Max.Eff.Inten.(mm/hr)=		131.79	55.93	
over (min)		5.00	15.00	
Storage Coeff. (min)=		1.27 (ii)	10.18 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.33	0.10	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.02	0.018 (iii)
TIME TO PEAK	(hrs)=	2.33	2.50	2.50
RUNOFF VOLUME	(mm)=	45.62	20.04	20.27
TOTAL RAINFALL	(mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT	=	0.98	0.43	0.43

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0004)
ID= 1 DT= 5.0 min

Area (ha)= 0.32
Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	46.07	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

Max.Eff.Inten.(mm/hr)=		131.79	55.93

```
                over (min)        5.00          5.00
     Storage Coeff.  (min)=       1.44 (ii)     2.44 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.33          0.30
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.12          0.00          0.116 (iii)
     TIME TO PEAK    (hrs)=       2.33          2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62         20.04          45.36
     TOTAL RAINFALL   (mm)=      46.62         46.62          46.62
     RUNOFF COEFFICIENT   =       0.98          0.43           0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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)=   0.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=   1.00   Dir. Conn.(%)=   1.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.04
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      16.69         40.00
     Mannings n             =    0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.71 | 1.583    4.43 | 3.083    5.23 |  4.58    2.34
               0.167    1.71 | 1.667    4.43 | 3.167    5.23 |  4.67    2.34
               0.250    1.82 | 1.750    5.63 | 3.250    4.54 |  4.75    2.22
               0.333    1.82 | 1.833    5.63 | 3.333    4.54 |  4.83    2.22
               0.417    1.96 | 1.917    7.96 | 3.417    4.03 |  4.92    2.11
               0.500    1.96 | 2.000    7.96 | 3.500    4.03 |  5.00    2.11
               0.583    2.11 | 2.083   15.58 | 3.583    3.63 |  5.08    2.01
               0.667    2.11 | 2.167   15.58 | 3.667    3.63 |  5.17    2.01
               0.750    2.30 | 2.250  131.79 | 3.750    3.31 |  5.25    1.92
               0.833    2.30 | 2.333  131.79 | 3.833    3.31 |  5.33    1.92
               0.917    2.53 | 2.417   18.26 | 3.917    3.05 |  5.42    1.84
               1.000    2.53 | 2.500   18.26 | 4.000    3.05 |  5.50    1.84
               1.083    2.81 | 2.583   10.62 | 4.083    2.83 |  5.58    1.77
               1.167    2.81 | 2.667   10.62 | 4.167    2.83 |  5.67    1.77
               1.250    3.18 | 2.750    7.77 | 4.250    2.64 |  5.75    1.70
               1.333    3.18 | 2.833    7.77 | 4.333    2.64 |  5.83    1.70
               1.417    3.69 | 2.917    6.22 | 4.417    2.48 |  5.92    1.64
               1.500    3.69 | 3.000    6.22 | 4.500    2.48 |  6.00    1.64

     Max.Eff.Inten.(mm/hr)=     131.79        55.93
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       0.78 (ii)     9.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34          0.11
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00          0.004 (iii)
     TIME TO PEAK    (hrs)=       2.33          2.42           2.42
     RUNOFF VOLUME    (mm)=      45.62         20.04          20.17
     TOTAL RAINFALL   (mm)=      46.62         46.62          46.62
     RUNOFF COEFFICIENT   =       0.98          0.43           0.43

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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 (  0002)|   Area    (ha)=   0.17
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
```

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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      33.39        40.00
     Mannings n           =      0.013        0.250

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


                            ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     1.71 | 1.583     4.43 | 3.083     5.23 |  4.58     2.34
               0.167     1.71 | 1.667     4.43 | 3.167     5.23 |  4.67     2.34
               0.250     1.82 | 1.750     5.63 | 3.250     4.54 |  4.75     2.22
               0.333     1.82 | 1.833     5.63 | 3.333     4.54 |  4.83     2.22
               0.417     1.96 | 1.917     7.96 | 3.417     4.03 |  4.92     2.11
               0.500     1.96 | 2.000     7.96 | 3.500     4.03 |  5.00     2.11
               0.583     2.11 | 2.083    15.58 | 3.583     3.63 |  5.08     2.01
               0.667     2.11 | 2.167    15.58 | 3.667     3.63 |  5.17     2.01
               0.750     2.30 | 2.250   131.79 | 3.750     3.31 |  5.25     1.92
               0.833     2.30 | 2.333   131.79 | 3.833     3.31 |  5.33     1.92
               0.917     2.53 | 2.417    18.26 | 3.917     3.05 |  5.42     1.84
               1.000     2.53 | 2.500    18.26 | 4.000     3.05 |  5.50     1.84
               1.083     2.81 | 2.583    10.62 | 4.083     2.83 |  5.58     1.77
               1.167     2.81 | 2.667    10.62 | 4.167     2.83 |  5.67     1.77
               1.250     3.18 | 2.750     7.77 | 4.250     2.64 |  5.75     1.70
               1.333     3.18 | 2.833     7.77 | 4.333     2.64 |  5.83     1.70
               1.417     3.69 | 2.917     6.22 | 4.417     2.48 |  5.92     1.64
               1.500     3.69 | 3.000     6.22 | 4.500     2.48 |  6.00     1.64

     Max.Eff.Inten.(mm/hr)=     131.79        55.93
                 over (min)       5.00         5.00
     Storage Coeff.  (min)=       1.18 (ii)    2.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.31
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.00          0.061 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      45.62        20.04          45.36
     TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
     RUNOFF COEFFICIENT   =       0.98         0.43           0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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.

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0001):     0.04   0.004     2.42    20.17
     + ID2= 2 (  0002):     0.17   0.061     2.33    45.36
       ==========================================================
       ID = 3 (  0005):     0.21   0.064     2.33    40.32

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0005):     0.21   0.064     2.33    40.32
     + ID2= 2 (  0003):     0.21   0.018     2.50    20.27
       ==========================================================
       ID = 1 (  0005):     0.42   0.074     2.33    30.22

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0005):     0.42   0.074     2.33    30.22
```

```
      + ID2= 2 (  0004):     0.32   0.116     2.33    45.36
        ==================================================
        ID = 3 (  0005):     0.74   0.190     2.33    36.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0732      0.0154
                          0.0299     0.0026    |   0.0790      0.0179
                          0.0422     0.0051    |   0.0845      0.0205
                          0.0517     0.0077    |   0.0896      0.0230
                          0.0597     0.0102    |   0.0945      0.0256
                          0.0668     0.0128    |   0.0000      0.0000

                                  AREA      QPEAK      TPEAK       R.V.
                                  (ha)      (cms)      (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      0.740      0.190       2.33       36.73
   OUTFLOW: ID= 1 (  0006)      0.740      0.058       2.42       36.71

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 30.41
                    TIME SHIFT OF PEAK FLOW          (min)=  5.00
                    MAXIMUM  STORAGE   USED        (ha.m.)=  0.0097

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--------------------
| CALIB              |
| STANDHYD (  0007)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       5.60         40.00
     Mannings n           =      0.013         0.250

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


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     1.71 | 1.583     4.43 | 3.083     5.23 |  4.58     2.34
               0.167     1.71 | 1.667     4.43 | 3.167     5.23 |  4.67     2.34
               0.250     1.82 | 1.750     5.63 | 3.250     4.54 |  4.75     2.22
               0.333     1.82 | 1.833     5.63 | 3.333     4.54 |  4.83     2.22
               0.417     1.96 | 1.917     7.96 | 3.417     4.03 |  4.92     2.11
               0.500     1.96 | 2.000     7.96 | 3.500     4.03 |  5.00     2.11
               0.583     2.11 | 2.083    15.58 | 3.583     3.63 |  5.08     2.01
               0.667     2.11 | 2.167    15.58 | 3.667     3.63 |  5.17     2.01
               0.750     2.30 | 2.250   131.79 | 3.750     3.31 |  5.25     1.92
               0.833     2.30 | 2.333   131.79 | 3.833     3.31 |  5.33     1.92
               0.917     2.53 | 2.417    18.26 | 3.917     3.05 |  5.42     1.84
               1.000     2.53 | 2.500    18.26 | 4.000     3.05 |  5.50     1.84
               1.083     2.81 | 2.583    10.62 | 4.083     2.83 |  5.58     1.77
               1.167     2.81 | 2.667    10.62 | 4.167     2.83 |  5.67     1.77
               1.250     3.18 | 2.750     7.77 | 4.250     2.64 |  5.75     1.70
               1.333     3.18 | 2.833     7.77 | 4.333     2.64 |  5.83     1.70
               1.417     3.69 | 2.917     6.22 | 4.417     2.48 |  5.92     1.64
               1.500     3.69 | 3.000     6.22 | 4.500     2.48 |  6.00     1.64

     Max.Eff.Inten.(mm/hr)=     131.79         55.93
               over (min)          5.00          5.00
     Storage Coeff.  (min)=       0.41 (ii)     1.41 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.34          0.33
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00        0.002 (iii)
     TIME TO PEAK    (hrs)=       2.33          2.33         2.33
     RUNOFF VOLUME    (mm)=      45.62         20.04        36.13
     TOTAL RAINFALL   (mm)=      46.62         46.62        46.62
     RUNOFF COEFFICIENT   =       0.98          0.43         0.78

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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  (  0008)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0006):     0.74   0.058     2.42    36.71
     + ID2= 2 (  0007):     0.00   0.002     2.33    36.13
       ================================================
       ID = 3 (  0008):     0.74   0.058     2.42    36.71

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

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       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 6.1\VO2\voin.dat
  Output  filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\5ab8d992-c
  Summary filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\5ab8d992-c


DATE: 06-24-2022                          TIME: 07:03:45

USER:


COMMENTS: _____________________________________________________


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  ***********************************************
  ** SIMULATION : #3 TORONTO 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
                0.17    1.94 |  1.67    5.08 |  3.17    6.01 |  4.67    2.66
                0.33    2.07 |  1.83    6.47 |  3.33    5.21 |  4.83    2.52
                0.50    2.22 |  2.00    9.19 |  3.50    4.61 |  5.00    2.40
                0.67    2.40 |  2.17   18.14 |  3.67    4.15 |  5.17    2.28
                0.83    2.61 |  2.33  162.27 |  3.83    3.78 |  5.33    2.18
                1.00    2.87 |  2.50   21.31 |  4.00    3.48 |  5.50    2.09
                1.17    3.20 |  2.67   12.30 |  4.17    3.22 |  5.67    2.01
                1.33    3.63 |  2.83    8.97 |  4.33    3.01 |  5.83    1.93
                1.50    4.22 |  3.00    7.16 |  4.50    2.82 |  6.00    1.86


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--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.21
|ID= 1 DT= 5.0 min |   Total Imp(%)=   1.00   Dir. Conn.(%)=   1.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00         0.21
```

Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	37.62	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Max.Eff.Inten.(mm/hr)=		162.27	79.01	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.17 (ii)	8.93 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.34	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.03	0.029 (iii)
TIME TO PEAK	(hrs)=	2.33	2.42	2.42
RUNOFF VOLUME	(mm)=	54.38	26.66	26.91
TOTAL RAINFALL	(mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT	=	0.98	0.48	0.49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0004)
ID= 1 DT= 5.0 min

Area (ha)= 0.32
Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	46.07	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01

1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Max.Eff.Inten.(mm/hr)=	162.27	79.01	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.32 (ii)	2.25 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.33	0.30	
			TOTALS
PEAK FLOW (cms)=	0.14	0.00	0.143 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	54.38	26.66	54.10
TOTAL RAINFALL (mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT =	0.98	0.48	0.98

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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)=	0.04	
ID= 1 DT= 5.0 min	Total Imp(%)=	1.00	Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.04
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	16.69	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Max.Eff.Inten.(mm/hr)=	162.27	79.01	
over (min)	5.00	10.00	
Storage Coeff. (min)=	0.72 (ii)	8.47 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.12	
			TOTALS
PEAK FLOW (cms)=	0.00	0.01	0.006 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.42
RUNOFF VOLUME (mm)=	54.38	26.66	26.81
TOTAL RAINFALL (mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT =	0.98	0.48	0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0002) ID= 1 DT= 5.0 min	Area (ha)= 0.17 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.17	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.39	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

				TOTALS
Max.Eff.Inten.(mm/hr)=		162.27	79.01	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.09 (ii)	2.02 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.31	
PEAK FLOW	(cms)=	0.07	0.00	0.075 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	54.38	26.66	54.10
TOTAL RAINFALL	(mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT	=	0.98	0.48	0.98

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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.

ADD HYD (0005) 1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):		0.04	0.006	2.42	26.81
+ ID2= 2 (0002):		0.17	0.075	2.33	54.10
ID = 3 (0005):		0.21	0.080	2.33	48.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005) 3 + 2 = 1		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0005):		0.21	0.080	2.33	48.64
+ ID2= 2 (0003):		0.21	0.029	2.42	26.91
ID = 1 (0005):		0.42	0.104	2.33	37.69

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK      R.V.
--------------------          (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0005):     0.42   0.104     2.33    37.69
     + ID2= 2 (  0004):     0.32   0.143     2.33    54.10
       ================================================
       ID = 3 (  0005):     0.74   0.247     2.33    44.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0732      0.0154
                          0.0299     0.0026    |   0.0790      0.0179
                          0.0422     0.0051    |   0.0845      0.0205
                          0.0517     0.0077    |   0.0896      0.0230
                          0.0597     0.0102    |   0.0945      0.0256
                          0.0668     0.0128    |   0.0000      0.0000

                                 AREA      QPEAK      TPEAK       R.V.
                                 (ha)      (cms)      (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      0.740      0.247       2.33       44.75
   OUTFLOW: ID= 1 (  0006)      0.740      0.067       2.42       44.73

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 26.99
                  TIME SHIFT OF PEAK FLOW          (min)=  5.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=  0.0128

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0007)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       5.60         40.00
     Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     1.94 | 1.583     5.08 | 3.083     6.01 |  4.58     2.66
               0.167     1.94 | 1.667     5.08 | 3.167     6.01 |  4.67     2.66
               0.250     2.07 | 1.750     6.47 | 3.250     5.21 |  4.75     2.52
               0.333     2.07 | 1.833     6.47 | 3.333     5.21 |  4.83     2.52
               0.417     2.22 | 1.917     9.19 | 3.417     4.61 |  4.92     2.40
               0.500     2.22 | 2.000     9.19 | 3.500     4.61 |  5.00     2.40
               0.583     2.40 | 2.083    18.14 | 3.583     4.15 |  5.08     2.28
               0.667     2.40 | 2.167    18.14 | 3.667     4.15 |  5.17     2.28
               0.750     2.61 | 2.250   162.27 | 3.750     3.78 |  5.25     2.18
               0.833     2.61 | 2.333   162.27 | 3.833     3.78 |  5.33     2.18
               0.917     2.87 | 2.417    21.31 | 3.917     3.48 |  5.42     2.09
               1.000     2.87 | 2.500    21.31 | 4.000     3.48 |  5.50     2.09
               1.083     3.20 | 2.583    12.30 | 4.083     3.22 |  5.58     2.01
               1.167     3.20 | 2.667    12.30 | 4.167     3.22 |  5.67     2.01
               1.250     3.63 | 2.750     8.97 | 4.250     3.01 |  5.75     1.93
               1.333     3.63 | 2.833     8.97 | 4.333     3.01 |  5.83     1.93
               1.417     4.22 | 2.917     7.16 | 4.417     2.82 |  5.92     1.86
               1.500     4.22 | 3.000     7.16 | 4.500     2.82 |  6.00     1.86

     Max.Eff.Inten.(mm/hr)=     162.27         79.01
               over (min)          5.00          5.00
     Storage Coeff.  (min)=        0.37 (ii)     1.30 (ii)
     Unit Hyd. Tpeak (min)=        5.00          5.00
     Unit Hyd. peak  (cms)=        0.34          0.33
                                                          *TOTALS*
     PEAK FLOW       (cms)=        0.00          0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=        2.33          2.33           2.33
     RUNOFF VOLUME    (mm)=       54.38         26.66          43.56
     TOTAL RAINFALL   (mm)=       55.38         55.38          55.38
     RUNOFF COEFFICIENT   =        0.98          0.48           0.79
```

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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.

ADD HYD (0008)|		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3			(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0006):		0.74	0.067	2.42	44.73
	+ ID2= 2 (0007):		0.00	0.002	2.33	43.56
	ID = 3 (0008):		0.74	0.067	2.42	44.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       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 6.1\VO2\voin.dat
Output filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\2ff74081-b
Summary filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\2ff74081-b

DATE: 06-24-2022 TIME: 07:03:45

USER:

COMMENTS: _____

****
** SIMULATION : #4 TORONTO 25-YEAR **
****

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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.26	1.67	5.93	3.17	7.02	4.67	3.11
0.33	2.41	1.83	7.55	3.33	6.08	4.83	2.94
0.50	2.59	2.00	10.73	3.50	5.38	5.00	2.80
0.67	2.80	2.17	21.19	3.67	4.85	5.17	2.67
0.83	3.05	2.33	189.52	3.83	4.41	5.33	2.55
1.00	3.36	2.50	24.89	4.00	4.06	5.50	2.44
1.17	3.74	2.67	14.37	4.17	3.77	5.67	2.34
1.33	4.24	2.83	10.47	4.33	3.52	5.83	2.25
1.50	4.93	3.00	8.36	4.50	3.30	6.00	2.17

```
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   0.21
|ID= 1 DT= 5.0 min |   Total Imp(%)=   1.00   Dir. Conn.(%)=   1.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.21
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      37.62         40.00
     Mannings n             =     0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     2.26 | 1.583     5.93 | 3.083     7.02 |  4.58     3.11
               0.167     2.26 | 1.667     5.93 | 3.167     7.02 |  4.67     3.11
               0.250     2.41 | 1.750     7.55 | 3.250     6.08 |  4.75     2.94
               0.333     2.41 | 1.833     7.55 | 3.333     6.08 |  4.83     2.94
               0.417     2.59 | 1.917    10.73 | 3.417     5.38 |  4.92     2.80
               0.500     2.59 | 2.000    10.73 | 3.500     5.38 |  5.00     2.80
               0.583     2.80 | 2.083    21.19 | 3.583     4.85 |  5.08     2.67
               0.667     2.80 | 2.167    21.19 | 3.667     4.85 |  5.17     2.67
               0.750     3.05 | 2.250   189.52 | 3.750     4.41 |  5.25     2.55
               0.833     3.05 | 2.333   189.52 | 3.833     4.41 |  5.33     2.55
               0.917     3.36 | 2.417    24.89 | 3.917     4.06 |  5.42     2.44
               1.000     3.36 | 2.500    24.89 | 4.000     4.06 |  5.50     2.44
               1.083     3.74 | 2.583    14.37 | 4.083     3.77 |  5.58     2.34
               1.167     3.74 | 2.667    14.37 | 4.167     3.77 |  5.67     2.34
               1.250     4.24 | 2.750    10.47 | 4.250     3.52 |  5.75     2.25
               1.333     4.24 | 2.833    10.47 | 4.333     3.52 |  5.83     2.25
               1.417     4.93 | 2.917     8.36 | 4.417     3.30 |  5.92     2.17
               1.500     4.93 | 3.000     8.36 | 4.500     3.30 |  6.00     2.17

     Max.Eff.Inten.(mm/hr)=     189.52       102.70
               over (min)          5.00        10.00
     Storage Coeff.  (min)=        1.10 (ii)    8.08 (ii)
     Unit Hyd. Tpeak (min)=        5.00        10.00
     Unit Hyd. peak  (cms)=        0.34         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=        0.00         0.04          0.039 (iii)
     TIME TO PEAK    (hrs)=        2.33         2.42           2.42
     RUNOFF VOLUME    (mm)=       63.68        34.08          34.35
     TOTAL RAINFALL   (mm)=       64.68        64.68          64.68
     RUNOFF COEFFICIENT   =        0.98         0.53           0.53

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  85.0    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 (  0004)|   Area    (ha)=   0.32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32          0.00
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      46.07         40.00
     Mannings n             =     0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     2.26 | 1.583     5.93 | 3.083     7.02 |  4.58     3.11
               0.167     2.26 | 1.667     5.93 | 3.167     7.02 |  4.67     3.11
               0.250     2.41 | 1.750     7.55 | 3.250     6.08 |  4.75     2.94
               0.333     2.41 | 1.833     7.55 | 3.333     6.08 |  4.83     2.94
               0.417     2.59 | 1.917    10.73 | 3.417     5.38 |  4.92     2.80
               0.500     2.59 | 2.000    10.73 | 3.500     5.38 |  5.00     2.80
```

0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	102.70	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.24 (ii)	2.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.33	0.31	
			TOTALS
PEAK FLOW (cms)=	0.17	0.00	0.167 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	63.68	34.08	63.38
TOTAL RAINFALL (mm)=	64.68	64.68	64.68
RUNOFF COEFFICIENT =	0.98	0.53	0.98

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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)= 0.04
ID= 1 DT= 5.0 min | Total Imp(%)= 1.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.04
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	16.69	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	102.70	
over (min)	5.00	10.00	
Storage Coeff. (min)=	0.68 (ii)	7.66 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.13	
			TOTALS
PEAK FLOW (cms)=	0.00	0.01	0.008 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.42
RUNOFF VOLUME (mm)=	63.68	34.08	34.25
TOTAL RAINFALL (mm)=	64.68	64.68	64.68
RUNOFF COEFFICIENT =	0.98	0.53	0.53

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

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0002)	Area (ha)= 0.17
ID= 1 DT= 5.0 min	Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.17	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.39	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

				TOTALS
Max.Eff.Inten.(mm/hr)=		189.52	102.70	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.02 (ii)	1.89 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.32	
PEAK FLOW	(cms)=	0.09	0.00	0.088 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	63.68	34.08	63.38
TOTAL RAINFALL	(mm)=	64.68	64.68	64.68
RUNOFF COEFFICIENT	=	0.98	0.53	0.98

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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.

ADD HYD (0005)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	0.04	0.008	2.42	34.25
+ ID2= 2 (0002):	0.17	0.088	2.33	63.38
ID = 3 (0005):	0.21	0.094	2.33	57.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)
3 + 2 = 1

	AREA	QPEAK	TPEAK	R.V.

```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):     0.21   0.094     2.33    57.55
      + ID2= 2 (  0003):     0.21   0.039     2.42    34.35
        ==================================================
        ID = 1 (  0005):     0.42   0.128     2.33    45.86

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):     0.42   0.128     2.33    45.86
      + ID2= 2 (  0004):     0.32   0.167     2.33    63.38
        ==================================================
        ID = 3 (  0005):     0.74   0.295     2.33    53.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)    |   (cms)     (ha.m.)
                           0.0000     0.0000    |   0.0732      0.0154
                           0.0299     0.0026    |   0.0790      0.0179
                           0.0422     0.0051    |   0.0845      0.0205
                           0.0517     0.0077    |   0.0896      0.0230
                           0.0597     0.0102    |   0.0945      0.0256
                           0.0668     0.0128    |   0.0000      0.0000

                                  AREA      QPEAK      TPEAK       R.V.
                                  (ha)      (cms)      (hrs)       (mm)
   INFLOW : ID= 2 (  0005)       0.740      0.295       2.33       53.40
   OUTFLOW: ID= 1 (  0006)       0.740      0.074       2.50       53.38

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 24.98
                  TIME SHIFT OF PEAK FLOW          (min)= 10.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=  0.0157

------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0007)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       5.60         40.00
     Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     2.26 | 1.583     5.93 | 3.083     7.02 |  4.58     3.11
               0.167     2.26 | 1.667     5.93 | 3.167     7.02 |  4.67     3.11
               0.250     2.41 | 1.750     7.55 | 3.250     6.08 |  4.75     2.94
               0.333     2.41 | 1.833     7.55 | 3.333     6.08 |  4.83     2.94
               0.417     2.59 | 1.917    10.73 | 3.417     5.38 |  4.92     2.80
               0.500     2.59 | 2.000    10.73 | 3.500     5.38 |  5.00     2.80
               0.583     2.80 | 2.083    21.19 | 3.583     4.85 |  5.08     2.67
               0.667     2.80 | 2.167    21.19 | 3.667     4.85 |  5.17     2.67
               0.750     3.05 | 2.250   189.52 | 3.750     4.41 |  5.25     2.55
               0.833     3.05 | 2.333   189.52 | 3.833     4.41 |  5.33     2.55
               0.917     3.36 | 2.417    24.89 | 3.917     4.06 |  5.42     2.44
               1.000     3.36 | 2.500    24.89 | 4.000     4.06 |  5.50     2.44
               1.083     3.74 | 2.583    14.37 | 4.083     3.77 |  5.58     2.34
               1.167     3.74 | 2.667    14.37 | 4.167     3.77 |  5.67     2.34
               1.250     4.24 | 2.750    10.47 | 4.250     3.52 |  5.75     2.25
               1.333     4.24 | 2.833    10.47 | 4.333     3.52 |  5.83     2.25
               1.417     4.93 | 2.917     8.36 | 4.417     3.30 |  5.92     2.17
               1.500     4.93 | 3.000     8.36 | 4.500     3.30 |  6.00     2.17

     Max.Eff.Inten.(mm/hr)=     189.52       102.70
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.35 (ii)    1.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.33
```

```
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      63.68        34.08          52.46
     TOTAL RAINFALL   (mm)=      64.68        64.68          64.68
     RUNOFF COEFFICIENT   =       0.98         0.53           0.81

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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.

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

--------------------
| ADD HYD  (  0008)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0006):     0.74   0.074     2.50    53.38
     + ID2= 2 (  0007):     0.00   0.002     2.33    52.46
       ================================================
       ID = 3 (  0008):     0.74   0.074     2.50    53.38

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

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       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 6.1\VO2\voin.dat
  Output  filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\acc481b8-4
  Summary filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\acc481b8-4


DATE: 06-24-2022                          TIME: 07:03:46

USER:


COMMENTS: _____________________________________________________


--------------------------------------------------------------------------------------------------------------------------
  ***********************************************
  ** SIMULATION : #5 TORONTO 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
                0.17    2.68 |  1.67    7.02 |  3.17    8.31 |  4.67    3.68
                0.33    2.86 |  1.83    8.94 |  3.33    7.20 |  4.83    3.49
                0.50    3.07 |  2.00   12.71 |  3.50    6.37 |  5.00    3.31
                0.67    3.31 |  2.17   25.08 |  3.67    5.74 |  5.17    3.16
                0.83    3.61 |  2.33  224.32 |  3.83    5.23 |  5.33    3.02
```

1.00	3.97	2.50	29.45	4.00	4.81	5.50	2.89
1.17	4.43	2.67	17.01	4.17	4.46	5.67	2.77
1.33	5.02	2.83	12.39	4.33	4.16	5.83	2.67
1.50	5.84	3.00	9.90	4.50	3.91	6.00	2.57

CALIB STANDHYD (0003)	Area (ha)= 0.21		
ID= 1 DT= 5.0 min	Total Imp(%)= 1.00	Dir. Conn.(%)= 1.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.21
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	37.62	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.91	6.00	2.57

Max.Eff.Inten.(mm/hr)=		224.32	134.53	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.03 (ii)	7.30 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.34	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.05	0.053 (iii)
TIME TO PEAK	(hrs)=	2.33	2.42	2.42
RUNOFF VOLUME	(mm)=	75.56	44.00	44.29
TOTAL RAINFALL	(mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT	=	0.99	0.57	0.58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0004)	Area (ha)= 0.32		
ID= 1 DT= 5.0 min	Total Imp(%)= 99.00	Dir. Conn.(%)= 99.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	46.07	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.91	6.00	2.57

Max.Eff.Inten.(mm/hr)=	224.32	134.53	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.16 (ii)	1.97 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.31	
			TOTALS
PEAK FLOW (cms)=	0.20	0.00	0.198 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	75.56	44.00	75.24
TOTAL RAINFALL (mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT =	0.99	0.57	0.98

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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= 5.0 min

Area (ha)= 0.04
Total Imp(%)= 1.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.04
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	16.69	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.91	6.00	2.57

Max.Eff.Inten.(mm/hr)=	224.32	134.53	
over (min)	5.00	10.00	
Storage Coeff. (min)=	0.63 (ii)	6.90 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.14	
			TOTALS

```
     PEAK FLOW       (cms)=       0.00          0.01          0.011 (iii)
     TIME TO PEAK    (hrs)=       2.33          2.42           2.42
     RUNOFF VOLUME    (mm)=      75.56         44.00          44.17
     TOTAL RAINFALL   (mm)=      76.56         76.56          76.56
     RUNOFF COEFFICIENT   =       0.99          0.57           0.58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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 (  0002)|   Area    (ha)=   0.17
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17          0.00
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      33.39         40.00
     Mannings n             =    0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     2.68 | 1.583     7.02 | 3.083     8.31 |  4.58     3.68
               0.167     2.68 | 1.667     7.02 | 3.167     8.31 |  4.67     3.68
               0.250     2.86 | 1.750     8.94 | 3.250     7.20 |  4.75     3.49
               0.333     2.86 | 1.833     8.94 | 3.333     7.20 |  4.83     3.49
               0.417     3.07 | 1.917    12.71 | 3.417     6.37 |  4.92     3.31
               0.500     3.07 | 2.000    12.71 | 3.500     6.37 |  5.00     3.31
               0.583     3.31 | 2.083    25.08 | 3.583     5.74 |  5.08     3.16
               0.667     3.31 | 2.167    25.08 | 3.667     5.74 |  5.17     3.16
               0.750     3.61 | 2.250   224.32 | 3.750     5.23 |  5.25     3.02
               0.833     3.61 | 2.333   224.32 | 3.833     5.23 |  5.33     3.02
               0.917     3.97 | 2.417    29.46 | 3.917     4.81 |  5.42     2.89
               1.000     3.97 | 2.500    29.45 | 4.000     4.81 |  5.50     2.89
               1.083     4.43 | 2.583    17.01 | 4.083     4.46 |  5.58     2.77
               1.167     4.43 | 2.667    17.01 | 4.167     4.46 |  5.67     2.77
               1.250     5.02 | 2.750    12.39 | 4.250     4.16 |  5.75     2.67
               1.333     5.02 | 2.833    12.39 | 4.333     4.16 |  5.83     2.67
               1.417     5.84 | 2.917     9.90 | 4.417     3.91 |  5.92     2.57
               1.500     5.84 | 3.000     9.90 | 4.500     3.91 |  6.00     2.57

     Max.Eff.Inten.(mm/hr)=     224.32        134.53
               over (min)          5.00          5.00
     Storage Coeff.  (min)=       0.96 (ii)     1.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.34          0.32
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.10          0.00          0.104 (iii)
     TIME TO PEAK    (hrs)=       2.33          2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56         44.00          75.24
     TOTAL RAINFALL   (mm)=      76.56         76.56          76.56
     RUNOFF COEFFICIENT   =       0.99          0.57           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0001):      0.04    0.011     2.42    44.17
     + ID2= 2 (  0002):      0.17    0.104     2.33    75.24
       ==========================================================
       ID = 3 (  0005):      0.21    0.113     2.33    69.03
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0005):	0.21	0.113	2.33	69.03
	+ ID2= 2 (0003):	0.21	0.053	2.42	44.29
	ID = 1 (0005):	0.42	0.160	2.33	56.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0005):	0.42	0.160	2.33	56.56
	+ ID2= 2 (0004):	0.32	0.198	2.33	75.24
	ID = 3 (0005):	0.74	0.358	2.33	64.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0006)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0732	0.0154
	0.0299	0.0026	0.0790	0.0179
	0.0422	0.0051	0.0845	0.0205
	0.0517	0.0077	0.0896	0.0230
	0.0597	0.0102	0.0945	0.0256
	0.0668	0.0128	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	0.740	0.358	2.33	64.60
OUTFLOW: ID= 1 (0006)	0.740	0.083	2.50	64.58

PEAK FLOW REDUCTION [Qout/Qin](%)= 23.10
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0197

CALIB		
STANDHYD (0007)	Area (ha)=	0.00
ID= 1 DT= 5.0 min	Total Imp(%)=	99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	5.60	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57

```
               1.500    5.84 | 3.000    9.90 | 4.500    3.91 |  6.00    2.57

     Max.Eff.Inten.(mm/hr)=     224.32       134.53
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       0.33 (ii)    1.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.34
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.003 (iii)
     TIME TO PEAK    (hrs)=       2.33         2.33           2.33
     RUNOFF VOLUME    (mm)=      75.56        44.00          63.69
     TOTAL RAINFALL   (mm)=      76.56        76.56          76.56
     RUNOFF COEFFICIENT   =       0.99         0.57           0.83

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    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.

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

--------------------
| ADD HYD  (  0008)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0006):     0.74   0.083     2.50    64.58
      + ID2= 2 (  0007):     0.00   0.003     2.33    63.69
        ==========================================================
        ID = 3 (  0008):     0.74   0.083     2.50    64.57

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

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2003)
       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 6.1\VO2\voin.dat
  Output  filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\a9828841-3
  Summary filename: C:\Users\mshabbir\AppData\Local\Civica\VH5\2ff07612-3a92-4af5-96c5-feb13b9923f4\a9828841-3


DATE: 06-24-2022                          TIME: 07:03:46

USER:


COMMENTS: _____________________________________________________


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  ***********************************************
  ** SIMULATION : #6 TORONTO 100-YEAR           **
  ***********************************************

--------------------
| 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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.99	1.67	7.83	3.17	9.27	4.67	4.11
0.33	3.19	1.83	9.98	3.33	8.03	4.83	3.89
0.50	3.42	2.00	14.18	3.50	7.11	5.00	3.70
0.67	3.70	2.17	27.99	3.67	6.40	5.17	3.52
0.83	4.03	2.33	250.32	3.83	5.83	5.33	3.37
1.00	4.43	2.50	32.87	4.00	5.36	5.50	3.22
1.17	4.94	2.67	18.98	4.17	4.97	5.67	3.09
1.33	5.61	2.83	13.83	4.33	4.64	5.83	2.98
1.50	6.51	3.00	11.04	4.50	4.36	6.00	2.87

CALIB STANDHYD (0003) ID= 1 DT= 5.0 min	Area (ha)= 0.21 Total Imp(%)= 1.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.21
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	37.62	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=		250.32	159.16	
over (min)		5.00	10.00	
Storage Coeff. (min)=		0.98 (ii)	6.84 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.34	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.06	0.064 (iii)
TIME TO PEAK	(hrs)=	2.33	2.42	2.42
RUNOFF VOLUME	(mm)=	84.43	51.64	51.95
TOTAL RAINFALL	(mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT	=	0.99	0.60	0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0004) ID= 1 DT= 5.0 min	Area (ha)= 0.32 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	46.07	40.00

Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

			TOTALS
Max.Eff.Inten.(mm/hr)=	250.32	159.16	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.11 (ii)	1.89 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.32	
PEAK FLOW (cms)=	0.22	0.00	0.221 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	51.64	84.10
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.60	0.98

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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= 5.0 min

Area (ha)= 0.04
Total Imp(%)= 1.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.00	0.04
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	16.69	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=	250.32	159.16	
over (min)	5.00	10.00	
Storage Coeff. (min)=	0.60 (ii)	6.47 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.14	
			TOTALS
PEAK FLOW (cms)=	0.00	0.01	0.013 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.42
RUNOFF VOLUME (mm)=	84.43	51.64	51.91
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.60	0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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 (0002) | Area (ha)= 0.17
ID= 1 DT= 5.0 min | Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.17	0.00
Dep. Storage (mm)=		1.00	5.00
Average Slope (%)=		1.00	2.00
Length (m)=		33.39	40.00
Mannings n =		0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=	250.32	159.16	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.92 (ii)	1.69 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.32	
			TOTALS
PEAK FLOW (cms)=	0.12	0.00	0.116 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	51.64	84.10
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.60	0.98

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 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.

```
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.04   0.013     2.42    51.91
      + ID2= 2 (  0002):     0.17   0.116     2.33    84.10
        ================================================
        ID = 3 (  0005):     0.21   0.128     2.33    77.66

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

-------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):     0.21   0.128     2.33    77.66
      + ID2= 2 (  0003):     0.21   0.064     2.42    51.95
        ================================================
        ID = 1 (  0005):     0.42   0.185     2.33    64.71

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

-------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):     0.42   0.185     2.33    64.71
      + ID2= 2 (  0004):     0.32   0.221     2.33    84.10
        ================================================
        ID = 3 (  0005):     0.74   0.406     2.33    73.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0006)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0732      0.0154
                         0.0299     0.0026    |   0.0790      0.0179
                         0.0422     0.0051    |   0.0845      0.0205
                         0.0517     0.0077    |   0.0896      0.0230
                         0.0597     0.0102    |   0.0945      0.0256
                         0.0668     0.0128    |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      0.740     0.406      2.33      73.05
   OUTFLOW: ID= 1 (  0006)      0.740     0.089      2.50      73.04

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.93
                  TIME SHIFT OF PEAK FLOW          (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0228

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD (  0007)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
-------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       5.60         40.00
     Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
               0.083     2.99 | 1.583     7.83 | 3.083     9.27 |  4.58     4.11
               0.167     2.99 | 1.667     7.83 | 3.167     9.27 |  4.67     4.11
               0.250     3.19 | 1.750     9.98 | 3.250     8.03 |  4.75     3.89
               0.333     3.19 | 1.833     9.98 | 3.333     8.03 |  4.83     3.89
               0.417     3.42 | 1.917    14.18 | 3.417     7.11 |  4.92     3.70
               0.500     3.42 | 2.000    14.18 | 3.500     7.11 |  5.00     3.70
               0.583     3.70 | 2.083    27.99 | 3.583     6.40 |  5.08     3.52
               0.667     3.70 | 2.167    27.99 | 3.667     6.40 |  5.17     3.52
               0.750     4.03 | 2.250   250.32 | 3.750     5.83 |  5.25     3.37
               0.833     4.03 | 2.333   250.32 | 3.833     5.83 |  5.33     3.37
```

0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=	250.32	159.16	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.31 (ii)	1.09 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.34	
			TOTALS
PEAK FLOW (cms)=	0.00	0.00	0.003 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	51.64	72.54
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.60	0.85

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

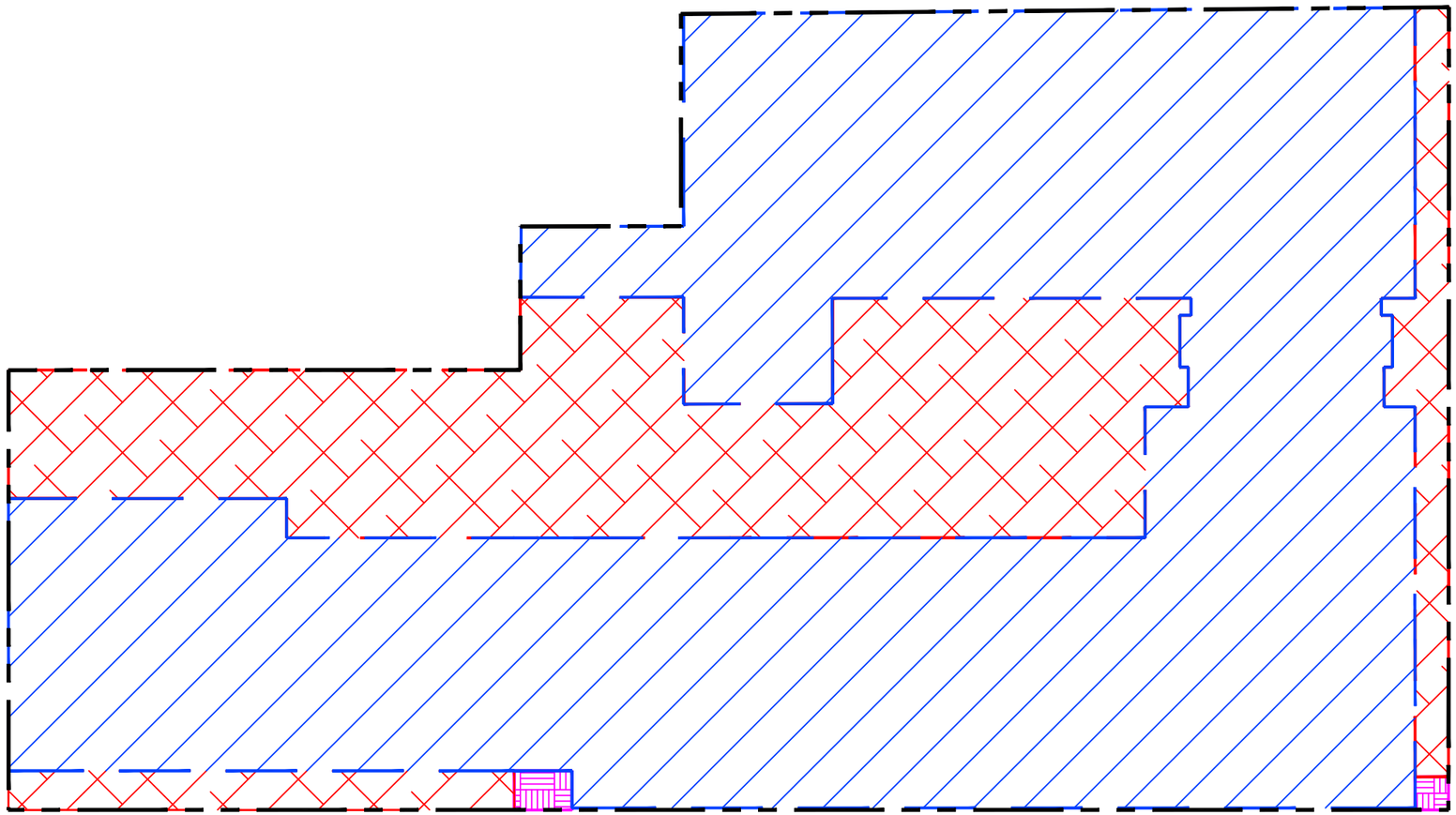
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 85.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0008)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (0006):	0.74	0.089	2.50	73.04
	+ ID2= 2 (0007):	0.00	0.003	2.33	72.54
	ID = 3 (0008):	0.74	0.089	2.50	73.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

==========



LEGEND

CONVENTIONAL ROOF AND GREEN ROOF AREA 5307m2

AT GRADE CONTROLLED PERVIOUS AND IMPERVIOUS AREAS 2090m2

AT GRADE UNCONTROLLED PERVIOUS AND IMPERVIOUS AREAS 47m2

arva
R.V. Anderson Associates Limited
engineering • environment • infrastructure

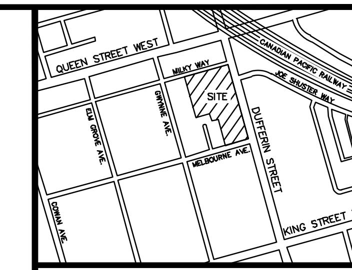
340–376 DUFFERIN STREET
POST–DEVELOPMENT DRAINAGE AREA TYPES

Scale	Date
N.T.S.	JUNE. 2022

Dwg No. D1

APPENDIX E

CIVIL DRAWINGS



KEY PLAN
N.T.S.

No.	Date	Comments
1	2022/07/20	ISSUED FOR ZBA/SPA

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

GENERAL NOTES

1. ALL WORK TO CONFORM TO THE LATEST CITY OF TORONTO STANDARD DRAWINGS AND SPECIFICATIONS AS WELL AS THE LATEST ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS.
2. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CURRENT "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATION FOR CONSTRUCTION PROJECTS". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
3. ALL TEMPORARY TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT ONTARIO TRAFFIC MANUAL BOOK 7: TEMPORARY CONDITIONS FIELD EDITION.
4. ALL TRENCHES WITHIN THE EXISTING RIGHT-OF-WAY SHALL BE BACKFILLED WITH UNSHRINKABLE FILL. TEMPORARY REPAIRS TO UTILITY CUTS WILL BE AS PER MUNICIPAL CONSENT REQUIREMENTS, APPENDIX D, TEMPORARY REPAIRS TO UTILITY CUTS.
5. THE CONTRACTOR SHALL RECTIFY ALL DISTURBED AREAS TO THE ORIGINAL CONDITION OR BETTER AND TO THE SATISFACTION OF THE EXECUTIVE DIRECTOR OF TECHNICAL SERVICES.
6. PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL RIGHT-OF-WAY THE CONTRACTOR OR DEVELOPER OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT-OF-WAY MANAGEMENT SECTION.
7. CONTACT CITY INSPECTOR AND ENGINEER 48 HOURS BEFORE EXCAVATION, INSTALLATION OR BACKFILL.
8. LOCATION AND COMPLETENESS OF EXISTING SERVICES/UTILITIES SHOWN ON THE DRAWINGS ARE NOT GUARANTEED. CONTRACTOR SHALL NOTIFY THE UTILITY COMPANIES AT LEAST FORTY-EIGHT (48) HOURS PRIOR TO COMMENCEMENT OF ANY LOCATION WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS TO LOCATE THE EXISTING SERVICES ON SITE.
9. THE DRAWINGS INDICATE EXISTING SERVICES AND DID NOT ATTEMPT TO LOCATE ANYTHING OTHER THAN THESE SERVICES (I.E. ABANDONED BUILDING FOUNDATIONS AND OTHER EXISTING FACILITIES WERE NOT INVESTIGATED OR SHOWN ON THE DRAWINGS).
10. THE CONTRACTOR SHALL PROVE THE EXACT LOCATION AND SIZE OF ALL SERVICES AND STRUCTURES AND SHALL BE RESPONSIBLE FOR ADEQUATELY PROTECTING THEM AGAINST DAMAGE ASSUMING ALL LIABILITIES FOR DAMAGE.
11. THE CONTRACTOR SHALL REPORT TO THE ENGINEER ANY CONFLICT WHICH THE EXISTING SERVICES MAY CREATE WITH THE PROPOSED WORK AND SHALL SCHEDULE CONSTRUCTION WORK AVOIDING CONSTRUCTION DELAYS CAUSED BY SUCH CONFLICTS.
12. MAINTAIN VEHICULAR AND PEDESTRIAN TRAFFIC AT ALL TIMES.
13. ALL SERVICES TO BE SUPPORTED AS PER CITY STD T-1007.01 TO T-1007.01-10.
14. THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND LICENSES BEFORE PROCEEDING WITH ANY WORK.
15. THE CONTRACTOR SHALL BECOME SOLE OWNER OF ALL EXCESS MATERIAL.
16. WITHIN THE PROPOSED PAVED AREAS AND EASEMENTS GRAN. B SHALL BE USED AS BACKFILL WITHIN 1M FROM MANHOLES, VALVE CHAMBERS AND CATCHBASINS, AND APPROVED NATIVE OR IMPORTED BACKFILL SHALL BE USED FOR ALL OTHER AREAS.
17. PROTECT ALL TREES FROM DAMAGE. SEE LANDSCAPE DRAWINGS FOR DETAILS.
18. REMOVE OBJECTS AS PER OPSS 510, INCLUDING APPROVED COMPACTED BACKFILL. AND ABANDON PIPE AS PER OPSS 510 INCLUDING SEALING OF PIPE AND FILLING IT WITH 15MPA CONCRETE OR GROUT.
19. ADJUST ALL EXISTING MANHOLE, CATCHBASIN AND VALVEBOX FRAMES TO PROPOSED FINISHED GRADE.
20. RELOCATE EXISTING SERVICES AS REQUIRED TO CONSTRUCT PROPOSED INFRASTRUCTURE.
21. CONTRACTOR TO WORK IN DRY CONDITIONS. TEMPORARY PLUGGING OF SEWER UP AND DOWN STREAM WILL BE REQUIRED. PROVISION FOR WET WEATHER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
22. WHERE THE STABILITY, SAFETY OR FUNCTION OF THE EXISTING ROADWAY OR UNDERGROUND FACILITIES MAY BE IMPAIRED DUE TO THE CONTRACTOR'S METHOD OF OPERATIONS, THE CONTRACTOR SHALL PROVIDE SUCH PROTECTION AS MAY BE REQUIRED INCLUDING SHEETING, SHORING AND DRIVING PILES WHERE NECESSARY. CONSTRUCTION OF SHORING, BRACING AND PROTECTION SCHEMES SHALL CONFORM TO OPSS 538 AND OPSS 539.
23. ANY AREA OUTSIDE THE LIMIT OF WORK THAT IS DISTURBED SHALL BE RESTORED TO ITS ORIGINAL CONDITION BY THE CONTRACTOR AT NO COST TO THE OWNER.
24. REQUIRED SHOP DRAWINGS SHALL BE BASED ON FIELD MEASUREMENT AND LAYOUT VERIFICATION BY THE CONTRACTOR.
25. WHERE NEW PAVING OR EARTHWORK MEETS EXISTING PAVING OR EARTHWORK, SMOOTHLY BLEND LINE AND GRADE OF EXISTING WITH NEW.
26. EXPANSION JOINT FILLER SHALL BE PLACED WHERE PAVEMENT MEETS STRUCTURES-INCLUDING WALLS, LIGHT POLES, HYDRANTS, BUILDINGS AND BUILDING COLUMNS, STAIRS AND AT OTHER CONDITIONS SHOWN ON THE DRAWINGS.
27. EXCAVATION REQUIRED WITHIN PROXIMITY OF UTILITY LINES AND WITHIN THE TREE PROTECTION ZONE OF TREES DESIGNATED TO REMAIN SHALL BE DONE BY HAND. CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATION AT NO COST TO THE UTILITY COMPANIES OR THE OWNER.

LAYOUT AND MATERIALS

1. ALL DIMENSIONS SHOWN ON THE DRAWINGS ARE IN METERS, EXCEPT PIPE DIAMETERS, WHICH ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. CONSTRUCTION LAYOUT BY CONTRACTOR.
3. ALL HORIZONTAL DIMENSION ARE TO CENTER OF OBJECT OR TO GUTTER OF CURB.
4. LASER ALIGNMENT CONTROL IS MANDATORY. AS-BUILT OF PIPE INVERT ELEVATIONS WITH CORRESPONDING STATIONS SHALL BE RECORDED PRIOR TO BACK FILLING OF TRENCH.
5. AS-BUILT ELEVATION AND COORDINATES SHALL BE PROVIDED AT 20M INTERVALS, AND AT EVERY HORIZONTAL AND VERTICAL CHANGE OF ALIGNMENT AND UPSTREAM AND DOWNSTREAM OF EACH SANITARY OR STORM MAHHOLE, AND WATERMAIN VALVE CHAMBERS.
6. HORIZONTAL AND VERTICAL CONTROL BASED ON THE CITY OF TORONTO PUBLISHED BENCHMARKS AND HORIZONTAL CONTROL MARKERS.
7. ALL LINE AND GRADE WORK PER DRAWING AND SPECIFICATION SHALL BE LAID OUT BY A REGISTERED CIVIL ENGINEER OR SURVEYOR.

DEWATERING AND SOIL STABILIZATION

1. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEWATERING AND SOIL STABILIZATION.

SANITARY AND STORM SEWERS

1. MAIN LINE PVC PIPE AS PER DR 35 CSA B182.2-06 CERTIFIED ASTM D3034-04A, F679-03. SERVICE CONNECTION PVC PIPE TO BE AS PER DR 28 CSA B182.2-06 CERTIFIED ASTM D3034-04A.
2. BEDDING FOR FLEXIBLE PIPE SHALL BE AS PER OPSD 802.010, 802.013 OR 802.014.
3. ULTRA-RIB PIPE IS NOT PERMITTED WITHIN THE MUNICIPAL RIGHT OF WAY.
4. MAINTENANCE HOLES AS PER CITY OF TORONTO STANDARD, T-701.010 (1200MM), T-701.011 (1500MM), T-701.012-1(1800MM), T-701.013 (2400MM) OR OPSD 701.014(3000MM). FRAME AND COVER AS PER OPSD 401.010 TYPE A CLOSED (SANITARY) TYPE B OPEN (STORM).
5. BENCHING SHALL BE AS PER CITY OF TORONTO STANDARD T-701.021.
6. DROP STRUCTURES TO BE AS PER CITY OF TORONTO STANDARD T-1003.01 (EXTERNAL) AND T-1003.01-2 (INTERNAL).
7. SANITARY SERVICE CONNECTIONS SHALL BE SINGLE, 150MMØ MINIMUM, PVC CLASS DR 28 INSTALLED AT 2 PERCENT AND THE COLOUR SHALL BE GREEN, FOR SINGLE RESIDENTIAL DWELLINGS.
8. SANITARY MAINTENANCE HOLE SHALL HAVE WATERTIGHT FRAME AND COVER IN PONDING AREAS AS PER OPSD 401.030.
9. REINFORCED CONCRETE PIPE SHALL BE AS PER CSA A257.2-03 (MINIMUM 65-D). HEIGHT OF FILL TO BE VERIFIED USING OPSD TABLES 807.010 AND 807.030.
10. NON-REINFORCED CONCRETE PIPE 150 MM TO 250 MM SHALL BE AS PER CSA A257.1-03 CLASS 3. HEIGHT OF FILL TO BE VERIFIED USING OPSD TABLES 807.040.
11. BEDDING FOR RIGID PIPE SHALL BE CLASS B AS PER OPSD 802.030, 802.031, 802.032 OR 802.033.
12. SINGLE CATCHBASINS SHALL BE AS PER CITY OF TORONTO STANDARD T-705.010 COMPLETE WITH GOSS TRAP WHERE SPECIFIED. FRAME AND COVER AS PER OPSD 400.070.
13. DOUBLE CATCHBASINS SHALL BE AS PER CITY OF TORONTO STANDARD T-705.020 COMPLETE WITH GOSS TRAP WHERE SPECIFIED. FRAME AND COVER AS PER OPSD 400.070.
14. SERVICE CONNECTIONS AND UTILITY CUTS TO BE BACKFILLED WITH UNSHRINKABLE FILL.
15. CATCHBASIN LEADS TO BE 200MMØ PVC DR 35 FOR SINGLE CATCHBASINS AND 250MMØ PVC DR 35 FOR DOUBLE CATCHBASINS UNLESS OTHERWISE NOTED.
16. UPON COMPLETION OF INSTALLATION, SEWERS ARE TO BE CLEANED AND HAVE CCTV INSPECTION PER TS 409 AND MANDRELL TEST PER TS 410. SEWERS TO HAVE DEFLECTION NO GREATER THAN 5.0%.
17. REAR YARD CATCHBASINS & CATCHBASINS IN PARKS SHALL BE AS PER CITY OF TORONTO STANDARD 235 T-705.010 COMPLETE WITH GOSS TRAP. FRAME AND COVER AS PER OPSD 400.070.

WATERMAINS

1. ALL SERVICE CONNECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH T-1104.01, T-1104.02-1, T-1104.02-2, T-1105.02-1 AND T-1105.02-2.
2. WATERMAIN AND WATERMAIN APPURTENANCES SHALL CONFORM TO CITY OF TORONTO MATERIAL/MANUFACTURER SPECIFICATIONS. SEE CHAPTER 6, MATERIAL SPECIFICATIONS.
3. ALL POLYVINYL CHLORIDE (PVC) PIPES, RANGING IN SIZE FROM 100 MM THROUGH 300 MM IN DIAMETER SHALL BE PRESSURE CLASS 235, DR 18 AND MANUFACTURED IN ACCORDANCE AWWA C900-07 AND TO CSA B137.3-05 AND SHALL HAVE CAST IRON OUTSIDE DIAMETER DIMENSIONS. ALL PVC PIPE LARGER THAN 350 MM THROUGH 400 MM IN DIAMETER, SHALL BE PRESSURE CLASS 235, DR 18 AND MANUFACTURED IN ACCORDANCE TO AWWA C905-97 STANDARD AND CSA B137.3-05 AND SHALL HAVE CAST IRON OUTSIDE DIAMETER DIMENSIONS.
4. BEDDING FOR FLEXIBLE PIPE SHALL BE AS PER OPSD 802.010, 802.013 OR 802.014.
5. MINIMUM COVER ON WATERMAINS WILL BE 1.8 METRES.
6. PROVISIONS FOR FLUSHING THE WATER LINE PRIOR TO TESTING AND SO FORTH MUST BE PROVIDED WITH AT LEAST A 50 MM OUTLET ON 100 MM AND LARGER LINES AS PER T-1104.03-1. COPPER LINES ARE TO HAVE FLUSHING POINTS AT THE END, THE SAME SIZE AS THE LINE. ON FIRE LINES, FLUSHING OUTLET TO BE 100 MM DIAMETER MINIMUM OR A HYDRANT.
7. ALL HYDRANTS TO BE AS PER CITY OF TORONTO STANDARD T-1105.01. IT SHALL CONFORM TO CITY OF TORONTO MATERIAL /MANUFACTURER SPECIFICATIONS. SEE CHAPTER 6, MATERIAL SPECIFICATIONS.
8. SINGLE WATER SERVICE CONNECTIONS SHALL BE A MINIMUM OF 19 MM DIAMETER AND CONFORM TO ASTM B88-03 (ASTM B88M-05 FOR METRIC SIZES) TYPE "K" SOFT COPPER AS PER T-1104.01.
9. ALL CURB AND VALVE BOXES TO BE LOCATED AT STREET LINE.
10. MECHANICAL THRUST RESTRAINTS SHALL BE INSTALLED AT ALL FITTINGS, BENDS, TEES, CROSSES, REDUCERS AND VALVES FOR ALL WATERMAIN SIZES. MECHANICAL RESTRAINTS AT JOINTS SHALL BE INSTALLED WITHIN 6.1 METRES OF EITHER SIDE OF THE VALVE FOR WATERMAINS 300 MM DIAMETER OR LARGER. MECHANICAL THRUST RESTRAINTS SHALL CONFORM TO THE MATERIAL SPECIFICATIONS CONTAINED IN CITY OF TORONTO MATERIAL/MANUFACTURER SPECIFICATIONS. SEE CHAPTER 6, MATERIAL SPECIFICATIONS.
11. ALL TEES, PLUGS, HORIZONTAL, VERTICAL BENDS, REDUCERS AND HYDRANTS TO HAVE CONCRETE THRUST BLOCKS AS PER CITY OF TORONTO STANDARD T-1103.01, T-1103.020.
12. WATERMAINS MUST FOLLOW THE MINISTRY OF THE ENVIRONMENT PROCEDURES THAT GOVERN THE SEPARATION OF SEWERS AND WATERMAINS F-6-1. A MINIMUM VERTICAL CLEARANCE OF 0.30 METRE OVER, 0.5 METRE UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING. MUST ALSO MAINTAIN 2.5 METRES HORIZONTAL SEPARATION WITH SEWERS.
13. ALL VALVES LESS THAN 400 MM WILL BE IN A VALVE AND BOX AS PER CITY OF TORONTO STANDARD T-1101.02-2. ALL VALVES 400 MM AND LARGER WILL BE IN A CHAMBER.
14. SACRIFICIAL ANODES TO BE INSTALLED FOR ALL METAL PIPES AND APPURTENANCES, WATER SERVICES AND FITTINGS AS PER CITY OF TORONTO STANDARD T-1106.04, T-1106.05 AND T-1106.06 CONSTRUCTION SPECIFICATION T.S. 7.22.
15. TRACER WIRE INSTALLATION AS PER CITY OF TORONTO CONSTRUCTION SPECIFICATION T.S. 7.40.
16. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING FROM THE EXISTING SYSTEM. FLUSHING, SWABBING, AND TESTING OF WATERMAIN AS PER ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS (OPSS), AS WELL AS CITY OF TORONTO SPECIFICATION TS 7.30 OR LATEST AMENDMENT.
17. AFTER PASSING THE HYDROSTATIC PRESSURE TEST AND LEAKAGE TEST, CHLORINATION CAN PROCEED. SAMPLING OF THE NEW MAINS IS TO BE DONE AT THE REQUIRED LOCATIONS PRIOR TO CONNECTING TO THE CITY WATERMAIN SYSTEM. THE TEE FITTING IS TO BE CUT INTO THE EXISTING WATERMAIN TO MAKE THE CONNECTION. TO MAINTAIN THE PRESSURE IN THE NEW MAIN DURING INSTALLATION OF SERVICE, A 50 MM BY-PASS WITH AN APPROVED PRESSURE DIFFERENTIAL BACKFLOW PREVENTER, MOUNTED ABOVE GROUND LEVEL IS TO BE INSTALLED AROUND THE CLOSED ISOLATING VALVE.
18. CITY IN-SERVICE WATER VALVES CAN ONLY BE OPERATED BY TORONTO WATER STAFF.
19. WATERMAINS TO BE INSTALLED TO GRADE AS SHOWN ON APPROVED PLANS, COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHEN REQUESTED BY INSPECTOR.
17. INSULATE WATERMAIN WHERE COVER IS LESS THAN 1.8M.

WATERMAIN – FILL AREAS

1. PIPES ARE NOT TO BE LAID ON FILL UNTIL THE FIELD DENSITY TEST REPORTS HAVE BEEN SUBMITTED AND APPROVED BY THE ENGINEER.
2. FILL TO BE PLACED TO A MINIMUM OF 600 MM ABOVE THE WATERMAIN GRADES AND TO 3 METRES MINIMUM ON EACH SIDE PRIOR TO WATERMAIN LAYING COMPACTED TO A MINIMUM OF 100 PERCENT STANDARD PROCTOR DENSITY IN 300 MM LIFTS.
3. SOIL DENSITY TESTS SHALL BE TAKEN ALONG CENTRELINE OF THE WATERMAIN AND ON LINES 1.5 METRES ON EITHER SIDE OF SAME AT A MAXIMUM INTERVAL OF 30 METRES. TESTS TO BE TAKEN AT EACH 600 MM LIFT.
4. ALL HYDRANTS, TEES, VALVES, BENDS, PLUGS AND EACH PIPE JOINT ARE TO BE MECHANICALLY RESTRAINED.
5. PIPE JOINT DEFLECTIONS ARE NOT ALLOWED.

ADDITIONAL SEWER NOTES

1. MODULOC RINGS SHALL EXTEND 300MM MAXIMUM BELOW CATCHBASIN OR MANHOLE COVER FRAME AND THE REMAINING DISTANCE SHALL BE BUILT UP WITH PRECAST CONCRETE ADJUSTMENT UNITS 1200MMØ OR LARGER
2. MANHOLES OVER 5M DEEP SHALL HAVE SAFETY PLATFORMS ACCORDING TO OPSD-404.020 MODIFIED WITH FIBRE REINFORCED PLASTIC LANDINGS.
3. INSTALL FACTORY MADE TEES (CITY STD. T-708.01 AND T-708.03) FOR LATERAL CONNECTIONS TO SEWERS INCLUDING CORE DRILLING AND FACTORY MADE SADDLES FOR CONNECTION TO EXISTING SEWERS.
4. AT ALL MANHOLES USE FLEXIBLE PIPE-TO-MANHOLE CONNECTORS KOR-N-SEAL ASSEMBLIES FOR 450MM DIAMETER PIPES OR SMALLER, EXCLUDING DROP CONNECTIONS.
5. INSULATE SEWERS AS PER CITY STD. T-708.01-4 WHERE COVER IS LESS THAN 1.2m.
6. CATCHBASIN CONNECTION TO MAIN SEWER AS PER OPSD-708.010
7. GOSS TRAPS SHALL NOT RESTRICT FLOWS
8. GRANULAR MATERIALS INCLUDING SEWER EMBEDMENT SHALL NOT CONSIST OF RECLAIMED/RECYCLED MATERIAL
9. THE USE OF HIGH PERFORMANCE BEDDING (HPB) FOR SEWER PIPE BEDDING/BACKFILL WILL NOT BE PERMITTED UNLESS REQUIRED AS A RESULT OF A SPECIFIC TRENCH CONDITIONS AND SUPPORTED WITH A RECOMMENDATION FROM A GEOTECHNICAL ENGINEER WHICH WILL INCLUDE THE POTENTIAL FOR MIGRATION OF NATIVE FINES INTO HPB VOIDS AND ITS MITIGATION
9. GRANULAR EMBEDMENT MATERIALS FOR SEWERS SHALL BE NATIVE GRANULAR A MATERIAL.

GRADING & ROAD / PAVEMENTS

1 ALL AREA GRADING AND RESULTING DRAINAGE PATTERNS SHALL NOT ADVERSELY AFFECT ADJACENT LANDS.
2 THE STORM DRAINAGE SHALL BE SELF CONTAINED WITHIN THE SUBJECT PROPERTY UNTIL IT CAN BE DISCHARGED, REUSED, INFILTRATED AND/OR EVAPOTRANSPIRATED IN A MANNER ACCEPTABLE TO THE CITY.
3. MINIMUM GENERALLY ACCEPTED GRADIENT – 2.0%.
4. MAXIMUM GENERALLY ACCEPTABLE GRADIENT – 5.0%.
5. MAXIMUM ACCEPTABLE SLOPE 3 PARTS HORIZONTAL TO 1 PART VERTICAL (3:1).
6. NO ALTERATIONS TO EXISTING BOUNDARY ELEVATIONS OR ADJACENT LANDS SHALL BE UNDERTAKEN UNLESS WRITTEN AGREEMENT WITH THE ADJACENT PROPERTY OWNER IS OBTAINED AND SUBMITTED IN A FORMAT ACCEPTABLE TO THE CITY.
7. MINIMUM SWALE GRADIENT – 2.0%.
8. MINIMUM SWALE DEPTH – 150MM.
9. ALL SWALES OR DITCHES HAVING A VELOCITY IN EXCESS OF 1.5M/S SHALL BE DESIGNED TO INCORPORATE EROSION PROTECTION.
10. THE MINIMUM GRADIENT ON ANY DRIVEWAY SHALL BE 2.0%. THE MAXIMUM DRIVEWAY GRADIENT IS 8.0%.
11. RETAINING WALLS SHALL BE CONSTRUCTED ENTIRELY ON THE UPPER PROPERTY SO THAT TIE BACKS (IF REQUIRED) DO NOT CROSS PROPERTY BOUNDARIES.
12. MAXIMUM PONDING DEPTH 0.3 METERS.
13. PROPOSED SPOT ELEVATIONS WILL BE SHOWN FOR ASPHALT, LANDSCAPE OR CONCRETE AREAS. UNLESS OTHERWISE NOTED, TOP OF CURB ELEVATIONS ARE 0.15M ABOVE ASPHALT ELEVATIONS EXCEPT AT CURB DEPRESSIONS AND WHEEL CHAIR RAMPS.
14. WHERE NEW ASPHALT MATCHES EXISTING ASPHALT, GRIND EXISTING ASPHALT A MINIMUM OF 300MM WIDE AND 40MM DEEP FOR KEYING. APPLY HOT RUBBER SEALING COMPOUND IN ACCORDANCE WITH OPSS 1212. ALL SURFACES TO BE TACK COATED WITH SS-1.
15. THE CONCRETE CURB, CONCRETE SIDEWALK (IF APPLICABLE) AND ALL RESTORATION ALONG FRONTING ROADWAYS TO THE SITE MUST BE CONSTRUCTED AND CARRIED OUT IN ACCORDANCE WITH ALL APPLICABLE AND CURRENT CITY OF TORONTO STANDARDS.
    - CITY OF TORONTO STANDARDS INCLUDE BUT ARE NOT LIMITED TO:
      - T-350.01 – URBAN ENTRANCES
      - T-310.010-2 – CONCRETE SIDEWALK WITH BOULEVARD
      - T-310.010-4 – COMBINED CONCRETE CURB AND SIDEWALK
      - T-600.11-1 – CONCRETE CURB (BORDERING DRIVEWAY RETURN CURB AT ENTRANCES)
      - T-600.050-1 – CONCRETE CURB AND GUTTER
16. PRIOR TO PAVING, REMOVE UNSUITABLE MATERIAL AS DIRECTED BY THE ENGINEER.
17. CRUSHED LIME STONE SHALL BE USED FOR ALL GRANULAR BASE MATERIAL BELOW ASPHALT SURFACES.
18. GRANULAR ROAD BASE SHALL BE COMPACTED TO 100% SPMDD.
19. ASPHALT SHALL BE COMPACTED TO 92.0% TO 96.5% MRD.
20. REFER TO TORONTO STANDARD SPECIFICATION 310 FOR PAVEMENT COMPACTION REQUIREMENTS.
21. SET EXISTING AND PROPOSED MANHOLES, CATCHBASINS, VALVES, ETC. TO BASE ASPHALT IF TOP ASPHALT WILL BE PAVED AFTER THE UPCOMING WINTER AND RAISE THEM PRIOR TO PLACING TOP ASPHALT.
22. SAW CUT EXISTING PAVED SURFACES FULL DEPTH AND IN STRAIGHT LINES, WHERE PROPOSED AND EXISTING PAVED SURFACES MEET.
23. MINIMUM ROAD CURB SLOPE IS 0.6% AND AT HORIZONTAL CURVES (AT INTERSECTIONS) THE CURB SLOPE IS 1.0% MINIMUM UNLESS OTHERWISE SHOWN.
24. SUPPLY AND PLACE 150MM SUB DRAIN AS PER CITY STANDARD T-216.02-8.
25. STANDARD SIDEWALK THICKNESS SHALL BE 150MM AND WILL BE INCREASED TO A THICKNESS OF 180MM AT ALL ENTRANCES CONCRETE SIDEWALKS INCLUDE 150MM GRANULAR BASE AS OUTLINED IN CITY OF TORONTO SPECIFICATION T.S.3.70

ADDITIONAL ROAD IMPROVEMENT NOTES:

1. UNLESS INDICATED OTHERWISE, ALL WORK WITHIN THE CITY RIGHT-OF-WAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF TORONTO DESIGN STANDARDS AND SPECIFICATION AND THE UNDERTAKING. ONTARIO PROVINCIAL STANDARDS MAY, SUBJECT TO THE APPROVAL OF THE CITY OF TORONTO, BE USED WHERE NO STANDARD OR SPECIFICATION IS NOTED.
2. ANY DISCREPANCIES BETWEEN SITE CONDITIONS AND THE DRAWINGS MUST BE REPORTED TO THE CONSULTING ENGINEER/CITY PRIOR TO COMMENCEMENT OF CONSTRUCTION AND APPROPRIATE ACTION TAKEN TO THE SATISFACTION OF THE CITY OF TORONTO.
3. ALL SURVEY POINTS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE LAYOUT SHALL BE REPORTED TO THE CONSULTING ENGINEER/CITY AND THE CONSULTING ENGINEER/CITY SHALL NOTIFY THE CITY OF THE NECESSARY CHANGES.
4. NO PORTION OF THE WORK SHALL BE CARRIED OUT WITHOUT FIRST HAVING OBTAINED APPROVED CONSTRUCTION DRAWINGS, APPROVED PROJECT SCHEDULE(S), APPROVED TRAFFIC STAGING PLANS AND PERMITS FOR SUCH PORTION OF THE INFRASTRUCTURE WORK IN ACCORDANCE WITH THE PROVISIONS HEREOF AND GIVING 10 WORKING DAYS PRIOR WRITTEN NOTICE TO THE EXECUTIVE DIRECTOR, TECHNICAL SERVICES THAT SUCH WORK IS TO BE CARRIED OUT WITH SUCH NOTICE TO SPECIFY THE ANTICIPATED DATE OF COMMENCEMENT OF THE WORK. A PRE-CONSTRUCTION COORDINATION MEETING WITH CITY STAFF IS TO BE HELD A MINIMUM OF FIVE WORKING DAYS PRIOR TO THE COMMENCEMENT OF ANY OF THE WORK.
5. THE REMOVAL OF TREES REQUIRES THE APPROVAL OF PARKS, FORESTRY AND RECREATION DIVISION.
6. ALL AREAS DISTURBED DURING CONSTRUCTION WITHIN THE CITY'S RIGHT-OF-WAY SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITION. GRASSED AREAS SHALL BE PROVIDED WITH 100 MM OF TOPSOIL AND SHALL BE SODDED AS PER T.S. 5.00 AND T.S. 5.10.
7. THE CONTRACTOR SHALL REFER TO THE ONTARIO TRAFFIC MANUAL BOOK 7, TEMPORARY CONDITIONS FOR TEMPORARY CONSTRUCTION SIGNAGE.
8. CONTRACTOR SHALL VERIFY AND MATCH EXISTING PAVEMENT STRUCTURE IN DEPTH AND MATERIAL. ANY DISCREPANCIES BETWEEN EXISTING AND LATEST STANDARD PAVEMENT STRUCTURE SHALL BE REPORTED TO THE CONSULTANT PRIOR TO COMMENCEMENT OF CONSTRUCTION AND APPROPRIATE ACTION TAKEN TO THE SATISFACTION OF THE CITY OF TORONTO.
9. ANY DAMAGE TO PROPERTY ADJACENT TO THE CONSTRUCTION SITE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
10. CONCRETE SIDEWALK TO BE COMPLETE WITH 150 MM GRANULAR BASE OR AS DIRECTED BY THE CITY INSPECTOR.

FILL

1. FILL SHALL BE NATIVE MATERIAL UNLESS OTHERWISE SHOWN. THE NATIVE MATERIAL SHALL BE FREE OF ORGANICS AND DEBRIS AND WITH A NATURAL MOISTURE CONTENT WHICH IS WITHIN 2% OF THE OPTIMUM MOISTURE CONTENT. WET MATERIAL MAY REQUIRE AERATION FOR PROPER COMPACTION BY SPREADING THEM THINLY ON THE GROUND.
2. ALL PIPE BEDDING MATERIAL SHALL BE COMPACTED TO 95% OF SPMDD.
3. FILL SHALL BE COMPACTED TO 95% SPMDD, EXCEPT UNDER PAVED SURFACES, WHERE THE UPPER 1.0M OF THE SUBGRADE SHALL BE COMPACTED TO 98% SPMDD. THE LIFT OF EACH LAYER SHALL BE LIMITED TO 200MM OR THE LIFT THICKNESS SHALL BE DETERMINED BY TEST STRIPS.
4. STONES GREATER THAN 75MM IN ANY DIMENSION WILL NOT BE PERMITTED IN BACKFILL PLACED WITHIN 300MM OF UTILITIES AND PAVEMENT SUBGRADE.
5. FILL SHALL BE PLACED AS FOLLOWS:
   - 1.1 THE AREA SHALL BE STRIPPED OF ALL EXISTING TOPSOIL AND OTHER UNSUITABLE MATERIALS. ALL SOFT SPOTS SHALL BE SUB-EXCAVATED. THE EXPOSED NATIVE SUBGRADE SHALL BE EXAMINED BY THE SOILS CONSULTANT PRIOR TO PLACEMENT OF FILL.
   - 1.2 THE FILL SHALL BE PLACED, SUCH THAT THE SPECIFIED FILL GEOMETRY IS ACHIEVED.
   - 1.3 TYPICALLY THE FILL MUST NOT BE PLACED BETWEEN THE PERIOD BETWEEN LATE NOVEMBER AND EARLY APRIL, AS IT IS DIFFICULT TO ENSURE THAT THE FILL IS FREE OF FROZEN SOILS. IF GRANULAR MATERIAL/RECYCLED CONCRETE IS USED, THE ABOVE PRECAUTIONARY MEASURES ARE NOT NECESSARY.
6. REFER TO "WATERMAIN-FILL AREAS" NOTES FOR FILL REQUIREMENTS AT PROPOSED WATERMAINS.
7. FILL SHALL MEET THE REMEDIATION PLAN REQUIREMENTS.

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.

MANAGER, DEVELOPMENT ENGINEERING ______ DATE ______

EROSION AND SEDIMENT CONTROL

1. SEDIMENT BARRIERS, CHECK DAMS, AND TEMPORARY CONSTRUCTION ACCESS TO BE INSTALLED PRIOR TO THE BEGINNING OF CONSTRUCTION.
2. ALL SEDIMENT CONTROL DEVICES TO BE ROUTINELY INSPECTED AND MAINTAINED IN PROPER WORKING ORDER UNTIL AREA IS STABILIZED.
3. IF NECESSARY, TRUCKS WILL BE WASHED DOWN BEFORE LEAVING THE SITE.
4. THE SITE WILL BE WET DOWN IF NECESSARY TO CONTROL DUST.
5. ALL CONSTRUCTION EQUIPMENT MUST BE PARKED ON-SITE.
6. ALL CONSTRUCTION ACTIVITY WILL COMPLY WITH CITY OF TORONTO NOISE BYLAW.
7. SEDIMENT CONTROL FENCE TO BE AS PER CITY OF TORONTO STANDARD T-219.130-1.
8. ALL CONSTRUCTION VEHICLES TO ENTER AND EXIT SITE FROM TEMPORARY CONSTRUCTION ACCESS.
9. ALL TOPSOIL STOCKPILES TO BE SURROUNDED WITH SEDIMENT CONTROL FENCING.
10. FILTER FABRIC TO BE PLACED UNDER GRATES ON ALL CATCHBASINS TO TRAP SEDIMENT. SILT TRAPS ARE TO BE CLEANED REGULARLY AND ARE NOT TO BE REMOVED UNTIL SUCH TIME AS THE CURBS ARE CONSTRUCTED AND THE BOULEVARDS ARE SODDED OR BACKYARDS GRADED AND SODDED. FILTER FABRIC FOR SILT CONTROL TO BE TERRA FIX 270R OR APPROVED EQUIVALENT.
11. FILTER CLOTH WILL BE PLACED ON THE CATCHBASINS ON PUBLIC STREET ACROSS THE PROPERTY'S FRONTAGE.
12. IN THE CASE OF ANY CONFLICT WITH ANOTHER PLAN, THIS PLAN PREVAILS ONLY IN RESPECT TO CONSTRUCTION MEASURES AND ACTIVITIES SUCH AS THE CONSTRUCTION ACCESS, SILT FENCE, SECURITY FENCING, SEDIMENT CONTROL, AND MUD MATS.
13. STREET SWEEPING, CATCH BASIN CLEANING AND DUST CONTROL ARE THE RESPONSIBILITY OF THE DEVELOPER AND MUST BE KEPT UNDER CONTROL ON ALL ROADWAYS TO THE SATISFACTION OF THE CITY.
14. MUD MATS TO BE INSTALLED AT ALL TEMPORARY CONSTRUCTION ACCESS POINTS.
15. THE CONTRACTOR WILL BE RESPONSIBLE TO DETERMINE LOCATIONS OF TOPSOIL AND/OR GRANULAR STOCKPILES WITHIN THE SITE. LOCATION OF STOCKPILES MAY CHANGE TO SUIT VARIOUS STAGES OF CONSTRUCTION.
16. THE CONTRACTOR SHALL PROVIDE SEPERATE STORAGE AREAS WITHIN THE SITE FOR HAZARDOUS AND WASTE MATERIALS. THE STORAGE AREAS SHALL BE LOCATED AWAY FROM ANY RECEIVING WATER BODIES, INCLUDING PONDS, SEWERS, DITCHES, ETC. AND INCLUDE SPILL CONTAINMENT AREAS WITH IMPERVIOUS SURFACES. THE CONTRACTOR IS RESPONSIBLE FOR ADDRESSING AND REPORTING ANY HAZARDOUS WASTE SPILLS TO THE APPROPRIATE LOCAL AGENCY.
17. CONTRACTOR TO ENSURE THAT PORTABLE TOILETS ARE LOCATED OFF PAVED ROADWAYS AND AWAY FROM ANY RECEIVING WATERS SUCH AS PONDS AND SEWERS.
18. THE SEDIMENT CONTROLS, INCLUDING SEDIMENTS, SHALL BE REMOVED OFF SITE AFTER GRASS SURFACES HAVE BEEN RESTORED TO THE SATISFACTION OF THE ENGINEER.
18. THE CONTRACTOR WILL BE RESPONSIBLE FOR ADDITIONAL SEDIMENT AND EROSION CONTROLS, AS DESCRIBED IN THE "GTA CA'S EROSION & SEDIMENT CONTROL GUIDELINES FOR URBAN CONSTRUCTION" AND/OR OTHER CITY OF TORONTO REQUIREMENTS ON A SITE-BY-SITE BASIS SUCH AS INTERCEPTOR SWALES/DIKES, ROCK CHECK DAMS, SEDIMENT TRAPS, ETC. TO PREVENT SEDIMENTS FROM THEIR CONSTRUCTION OPERATIONS FROM ENTERING THE EXISTING AND PROPOSED STORM DRAINAGE SYSTEMS.
19. AFTER ROAD CONSTRUCTION AND PRIOR TO LANDSCAPE OR SODDING OF SITE, CONTRACTOR TO INSTALL SEDIMENT CONTROLS, SUCH AS SEDIMENT FENCING, ALONG DOWNSTREAM EDGES OF INDIVIDUAL BLOCKS.

NOTES FOR SITE STORMWATER MANAGEMENT SYSTEMS:

1. DESIGN / CONSTRUCTION RESPONSIBILITIES FOR SWM SYSTEMS WITHIN BUILDING FOOTPRINT:

THE STORMWATER MANAGEMENT (SWM) SYSTEM DEPICTED ON THIS DRAWING SET ESTABLISHES THE FUNCTIONAL PARAMETERS TO MEET THE OBJECTIVES OF THE APPROVED SWM PLAN. THESE PARAMETERS INCLUDE SIZE AND SHAPE OF THE TANK(S), ORIFICE SIZE(S), PROPRIETARY TREATMENT UNIT(S), PIPE SIZE(S), INVERT(S), WEIR ELEVATION(S) AND ACCESS OPENING FRAME AND GRATE MODELS AND LOCATION(S).

THE HYDROLOGIC FUNCTION OF THE SWM SYSTEM IS BASED ON THE GROUND AND BUILDING SURFACES AND AREA MATERIALS (I.E. EXTENT OF GREEN ROOF, PAVING STONES AND OTHER LANDSCAPING) OUTLINED IN THE APPROVED SWM REPORT. CHANGES TO THESE MATERIALS WILL AFFECT THE SWM SYSTEM.

HOWEVER, SINCE THE PRESCRIBED BUILDING SURFACES (I.E. GREEN ROOFS, ROOFTOP LANDSCAPING AND ROOF DRAIN CONVEYANCE) ARE BUILDING SYSTEMS, DETAILED DESIGN OF THESE SYSTEMS ARE UNDERTAKEN BY OTHERS. IN THAT REGARD, THE FOLLOWING PARTIES AND THEIR RESPECTIVE DESIGN DRAWINGS AND DOCUMENTATION SHOULD BE REFERRED TO WITH RESPECT TO THE CONSTRUCTION AND OPERATION OF THE SWM SYSTEM.

- ARCHITECT – SWEENY&CO ARCHITECTS INC.
- STRUCTURAL – RJC ENGINEERS
- MECHANICAL – SMITH AND ANDERSON CONSULTING ENGINEERING
- LANDSCAPE ARCHITECT – LAND ART DESIGN

DETAILED DESIGN AND SPECIFICATIONS FOR THE FOLLOWING ITEMS ASSOCIATED WITH THE SWM SYSTEM ARE PROVIDED BY OTHERS:

- LANDSCAPE SURFACES AND GREEN ROOF SYSTEMS
- ROOF DRAINS AND AREA DRAINS (TO BE DESIGNED TO CAPTURE 100-YEAR DESIGN STORM)
- STORM PIPING WITHIN THE BUILDING ENVELOPE (TO BE DESIGNED TO CAPTURE 100-YEAR DESIGN STORM)
- TANK(S) INLET PIPING LOCATIONS AND INVERTS
- PUMPING SYSTEMS AND ASSOCIATED PIPING, VALVES, UNIONS, CHECK VALVES, FILTERS, ETC.
- CONTROL SYSTEMS
- TANK VENTING
- ELECTRICAL SUPPLY, DISTRIBUTION AND CLASSIFICATION OF AREAS
- TANK STRUCTURAL DESIGN
- TANK WATERPROOFING
- PROPRIETARY SWM EQUIPMENT
- GREYWATER IRRIGATION SYSTEM
- GREYWATER TOILET FLUSHING SYSTEM

DURING CONSTRUCTION, THE CONTRACTOR IS TO IDENTIFY ANY DISCREPANCIES BETWEEN THE VARIOUS DESIGN INFORMATION PERTAINING TO THE SWM SYSTEM TO R.V.ANDERSON ASSOCIATES LIMITED FOR COORDINATION OF RESOLUTION.

2. MAINTENANCE BY BUILDING OWNER

A. THE SWM SYSTEM DEPICTED ON THE DRAWING SET REQUIRES ONGOING MAINTENANCE IN ORDER TO PRESERVE THE INTENDED FUNCTION.
B. CATCHBASINS, AREA DRAINS, STRIP DRAINS, ROOF DRAINS AND OTHER INLETS REQUIRE ONGOING ROUTINE CONDITION INSPECTION AND CLEANING TO ENSURE THAT THEY REMAIN FREE OF ANY BLOCKAGE OR OBSTRUCTIONS.
C. THE SWM TANK, CATCHBASINS, AREA DRAINS, STORMWATER FILTRATION SYSTEMS, AND AREA DRAIN SUMPS WILL ACCUMULATE SEDIMENT AND DEBRIS AND ONGOING ROUTINE INSPECTION AND CLEANING MUST BE PERFORMED BY A QUALIFIED/LICENSED SERVICE PROVIDER.
D. OTHER MAINTENANCE REQUIREMENTS PRESCRIBED BY THE STRUCTURAL ENGINEER, ARCHITECT, MECHANICAL ENGINEER AND SPECIALITY CONSULTANTS DESIGNING THE GREYWATER SYSTEMS SHOULD ALSO BE ADHERED TO.
E. THE SWM TANK IS A CONFINED SPACE UNDER THE OHSA, AND THEREFORE APPLICABLE CONFINED SPACE ENTRY PROCEDURES APPLY FOR TANK ENTRY.
F. THE BUILDING OWNER IS CAUTIONED THAT CHANGES TO THE BUILDING AND SITE SURFACE MATERIALS MAY ALTER THE PERFORMANCE OF THE SWM SYSTEMS AND SHOULD BE REVIEWED BY A QUALIFIED PROFESSIONAL ENGINEER.

3. STORMWATER MANAGEMENT SYSTEM – FUNCTIONAL/DESIGN PARAMETERS

REFER TO SITE SERVICING AND STAGE 2 STORMWATER MANAGEMENT REPORT – DATED JUNE 2022

TOPOGRAPHIC SURVEY NOTES:

TOPOGRAPHIC SURVEY WAS PREPARED BY KRCMAR SURVEYORS LIMITED, DWG NAME 15-285BT01, ISSUE APRIL 25, 2019

BEARING NOTE
BEARINGS SHOWN HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE NORTHERLY LIMIT OF MELBOURNE STREET (NOW MELBOURNE AVENUE) AS SHOWN ON REGISTERED PLAN 418 HAVING A BEARING OF N74°00'00"E.

DISTANCE NOTE
BOUNDARY BEARINGS AND DISTANCES SHOWN HEREON ARE IN ACCORDANCE WITH PLAN 66R-28839.

BENCHMARK
ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO CITY OF TORONTO BENCH MARK No. CT1577 HAVING AN ELEVATION OF 93.128 METRES.

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.

LICENSED PROFESSIONAL ENGINEER
MUFADDAL SHABBIR
100558981
2022.07.20
216056
PROVINCE OF ONTARIO

Drawing Prepared By:
rva
R.V. Anderson Associates Limited
engineering • environment • infrastructure

Client:
HULLMARK SUN LIFE (376 DUFFERIN) LP

Project Name:
340 - 376 DUFFERIN STREET, TORONTO "RADIATOR"

Drawing Title:
GENERAL NOTES

Drawn:	Design:	Date:
F.Y/M.S	M.S/D.A.S	MAR 2022
Checked:	**Approved:**	**Scale:**
A.S.T	M.S	1:200
CADD File: 216056-S-GENERAL NOTES.dwg		**Dwg. No.:** C-1
Project No.: 216056		

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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.

MANAGER, DEVELOPMENT ENGINEERING _____ DATE _____

EX. T.H.E.S CONDUIT
EX. 50mmø GAS MAIN
EX. 75mmø GAS MAIN (ABND)
EX. 150mmø WATERMAIN
EX. 375mmø V.P. SAN SEWER
EX. 300mmø V.P. STM SEWER
EX. 100mmø WATERMAIN

(PRIVATE STREET)

(RIGHT-OF-WAY)

EXISTING FIRE HYDRANT

PHASE 2' SOUTH MIDRISE TOWER 10.4m – 150mmø PVC DR28 SAN @ 2.0% INV. @ ℄ ±89.60 (REFER TO SECTION D ON DWG. C-4)

PHASE 2' PODIUM 10.4m – 150mmø PVC DR28 SAN @ 2.0% INV. @ ℄ ±89.60 (REFER TO SECTION D ON DWG. C-4)

TWO (2) – 1200mmx1200mm 'PHASE 2' CITY SANITARY CONTROL MH'S. F&G PER OPSD 401.010 'A'. ADJUST TO FINISHED GRADE WITH ADJUSTMENT UNITS
N. INV – REFER TO MECHANICAL DWGS
S. INV – ±89.65
BENCHING AS PER T-701.021

CONNECT TO EXISTING V.P. 375mmø SANITARY SEWER WITH CITY APPROVED CONNECTION

CITY CONTRACTOR SHALL COORDINATE DIRECTLY WITH TORONTO HYDRO FOR SUPPORTING THE POLE DURING INSTALLATION OF ADJACENT SANITARY SERVICE CONNECTIONS

50mm GAS MAIN
375mm V.P. SAN SEWER
300mm V.P. STM SEWER
100mm WATERMAIN
150mm WATERMAIN
50mm GAS MAIN

THES CONDUIT
75mm GAS MAIN ABND
BELL CANADA CONDUIT

EX. FIRE HYDRANT

WATER METER ROOM (REFER TO ARCHITECTURAL AND MECHANICAL DRAWINGS FOR DETAILS)

PHASE 2' SOUTH MIDRISE TOWER DOMESTIC WATER SERVICE CONNECTION 150mmø PVC DR 18 INV. @ ℄ ±90.20. (REFER TO SECTION B ON DWG. C-4)

PHASE 2' PODIUM DOMESTIC WATER SERVICE CONNECTION 150mmø PVC DR 18 INV. @ ℄ ±90.20. (REFER TO SECTION B ON DWG. C-4)

THREE (3) – 1200mmx1200mm 'PHASE 1' CITY SANITARY CONTROL MH'S. F&G PER OPSD 401.010 'A'. ADJUST TO FINISHED GRADE WITH ADJUSTMENT UNITS
W. INV – REFER TO MECHANICAL DWGS
E. INV – 89.00
BENCHING AS PER T-701.021

'PHASE 1' SOUTH TOWER 10.9m – 200mmø PVC DR35 SAN @ 3.4% INV. @ ℄ ±88.95 (REFER TO SECTION C ON DWG. C-4)

'PHASE 1' NORTH TOWER 10.9m – 200mmø PVC DR35 SAN @ 3.4% INV. @ ℄ ±88.95 (REFER TO SECTION C ON DWG. C-4)

'PHASE 1' PODIUM 10.9m – 200mmø PVC DR35 SAN @ 3.4% INV. @ ℄ ±88.95 (REFER TO SECTION C ON DWG. C-4)

WATER METER ROOM (REFER TO ARCHITECTURAL AND MECHANICAL DRAWINGS FOR DETAILS)

'PHASE 1' FIRE AND 'PHASE 1' SOUTH TOWER DOMESTIC WATER SERVICE CONNECTION PER T-1104.02-3.
FIRE: 200mmø PVC DR 18.
INV. @ ℄ ±89.65
150mmø PVC DR 18
INV. @ ℄ ±89.65
(REFER TO SECTION A ON DWG. C-4)

'PHASE 1' SOUTH TOWER DOMESTIC WATER SERVICE CONNECTION 150mmø PVC DR 18 INV. @ ℄ ±89.65 (REFER TO SECTION A ON DWG. C-4)

'PHASE 1' PODIUM DOMESTIC WATER SERVICE CONNECTION 150mmø PVC DR 18 INV. @ ℄ ±89.65 (REFER TO SECTION A ON DWG. C-4)

ALL AREA DRAINS (AD) ABOVE SLAB TO BE CONNECTED TO INTERNAL MECHANICAL PIPING SYSTEM. AD'S TO BE SIZED BY MECHANICAL CONSULTANT TO CAPTURE 100-YR STORM. REFER TO MECHANICAL DRAWINGS FOR DETAILS (TYP.)

"NORTH TOWER" (PHASE 1)

PHASE 2 PHASE 1

"EXISTING COURTYARD BUILDING" (TO REMAIN)

COURTYARD

"SOUTH MIDRISE TOWER" (PHASE 2)

"SOUTH TOWER" (PHASE 1)

900mmx600mm BRICK COMBINED SEWER
BELL CANADA CONDUIT

SANITARY AREA DRAIN

STORMFILTER INLET BAY

STORMFILTER FILTRATION BAY

SWM DETENTION/RAINWATER HARVESTING TANK. REFER TO DETAILS ON DRAWING C-4

STRIP DRAIN

140mmø ORIFICE PLATE (REFER TO DETAIL ON DWG C-4)

CITY STORM CONTROL MH. F&G PER OPSD 401.010 'A'. ADJUST TO FINISHED GRADE WITH ADJUSTMENT UNITS
W. INV – 87.00 (ORIFICE)
E. INV – 86.90
BENCHING AS PER T-701.021

PROPOSED SIAMESE CONNECTIONS

12.4m – 250mmø PVC DR35 STM @ 2.0% INV. @ ℄ ±86.90 (REFER TO SECTION E ON DWG. C-4)

MELBOURNE AVENUE

MILKY WAY

DUFFERIN STREET

CONCRETE SIDEWALK
CONCRETE CURB
CURB CUT
TTC STREETCAR TRACK

150mm WATERMAIN (ABND)
T.H.E.S. CONDUIT
BELL CANADA CONDUIT
300mm WATERMAIN
600mm V.P. COMB. SEWER
BELL CANADA CONDUIT

CONNECT TO EXISTING 300mmø WM WITH TAPPING SLEEVE AND VALVE AND VALVE BOX

PROPOSED RELOCATED CB T-705.010 CONNECT TO EXISTING CB LEAD. RELOCATE WM LOCALLY AT PROPOSED DUFFERIN CB LOCATIONS PENDING SUE INVESTIGATION

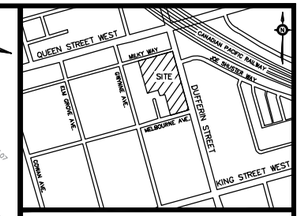
CONNECT TO EXISTING CONCRETE 600mmø COMBINED SEWER WITH CITY APPROVED CONNECTION

CONNECT TO EXISTING 300mmø WM WITH TAPPING SLEEVE AND VALVE AND VALVE BOX

1650mm CIRC. BRICK STM SEWER
75mm GAS MAIN (ABND)
300mm WATERMAIN (ABND)
ROGERS CABLE CONDUIT
100mm GAS MAIN

CONNECT TO EXISTING CONCRETE 1650mmø STORM SEWER WITH CITY APPROVED CONNECTION

2m 0 4m 8m
1:200



KEY PLAN
N.T.S.

No.	Date	Comments
1	2022/07/20	ISSUED FOR ZBA/SPA

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

LEGEND

- PROPERTY LINE
- GROUND FLOOR BLDG OUTLINE
- EXTENT OF BLDG OUTLINE ABOVE
- UNDERGROUND PARKING STRUCTURE
- AREA DRAIN
- ACCESS OPENING FRAME & GRATE (F&G)
- SEWER AND FLOW DIRECTION
- WATERMAIN
- VALVE & BOX (V&B)
- FIRE DEPARTMENT CONNECTION
- M+B WATER METER & BACK FLOW PREVENTER
- (D) DETECTOR ASSEMBLY

NOTE:
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LICENSED PROFESSIONAL ENGINEER
MUFADDAL SHABBIR
100558981
2022.07.20
216056
PROVINCE OF ONTARIO

Drawing Prepared By:

arva
R.V. Anderson Associates Limited
engineering ♦ environment ♦ infrastructure

Client:
HULLMARK SUN LIFE (376 DUFFERIN) LP

Project Name:
340 - 376 DUFFERIN STREET, TORONTO "RADIATOR"

Drawing Title:
GENERAL SITE SERVICING

Drawn:	Design:	Date:
F.Y/M.S	M.S/D.A.S	MAR 2022
Checked:	Approved:	Scale:
A.S.T	M.S	1: 200
CADD File: 216056-S-SERVICING.dwg		Dwg. No.: C-2
Project No.: 216056		

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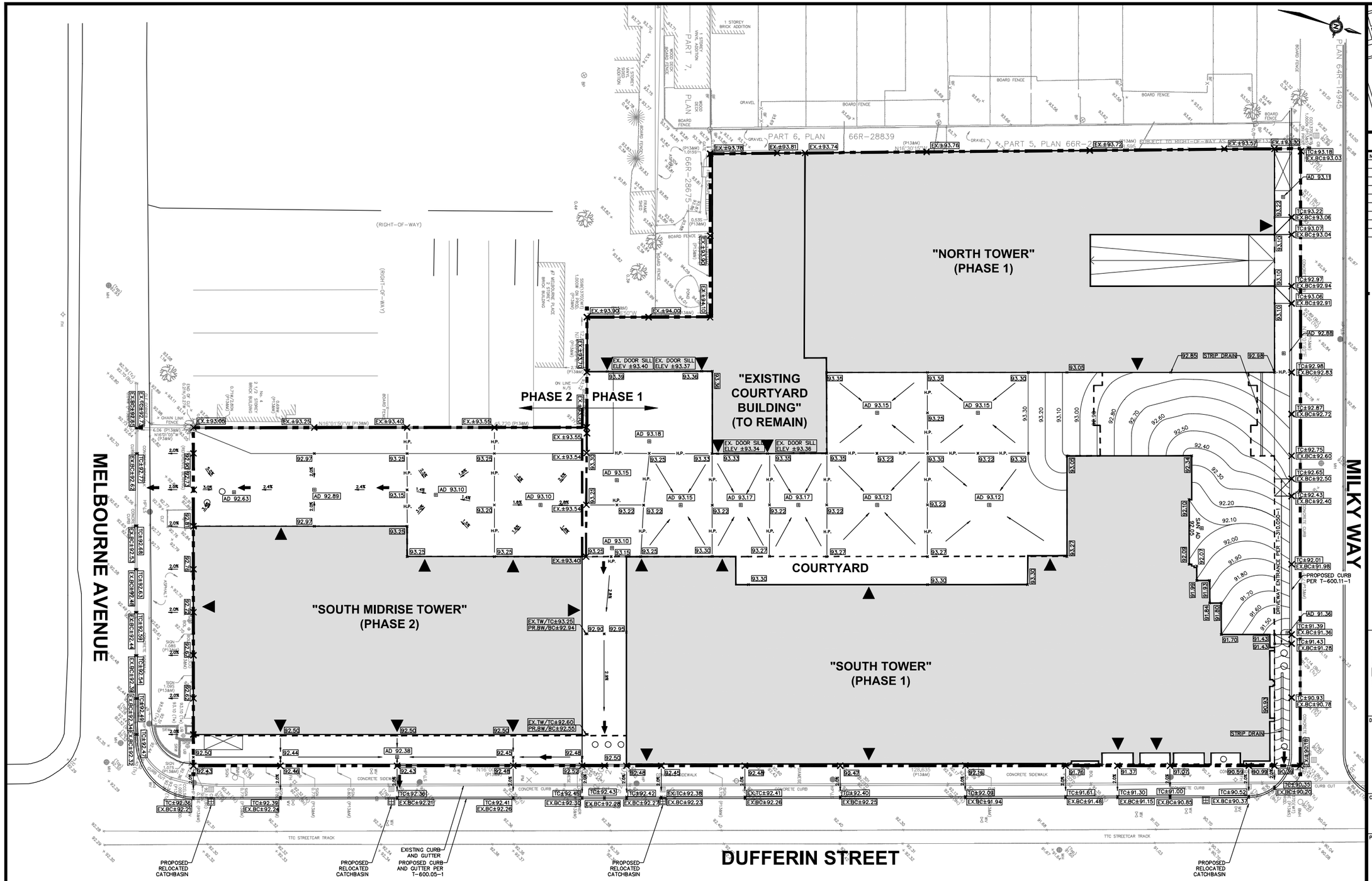

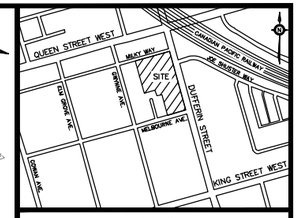

KEY PLAN
N.T.S.

No.	Date	Comments
1	2022/07/20	ISSUED FOR ZBA/SPA

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

LEGEND

- PROPERTY LINE
- AREA DRAIN
- ACCESS OPENING FRAME & GRATE (F&G)
- 91.29 PROPOSED ELEVATION
- EX.±90.18 EXISTING ELEVATION
- 2.0% PROPOSED SLOPE
- H.P. HIGH POINT
- SD STRIP DRAIN
- EMERGENCY OVERLAND FLOW ROUTE
- CATCHBASIN
- CURB RAMP
- GROUND FLOOR BLDG OUTLINE
- EXTENT OF BLDG OUTLINE ABOVE

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

NOTE:
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LICENSED PROFESSIONAL ENGINEER
MUFADDAL SHABBIR
100558981
2022.07.20
216056
PROVINCE OF ONTARIO

Drawing Prepared By:
arva
R.V. Anderson Associates Limited
engineering ● environment ● infrastructure

Client:
HULLMARK SUN LIFE (376 DUFFERIN) LP

Project Name:
340 - 376 DUFFERIN STREET, TORONTO "RADIATOR"

Drawing Title:
GENERAL SITE GRADING

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.

MANAGER, DEVELOPMENT ENGINEERING — DATE

2m 0 4m 8m
1:200

Drawn:	Design:	Date:
F.Y/M.S	M.S/D.A.S	MAR 2022
Checked:	Approved:	Scale:
A.S.T	M.S	1:200
CADD File: 216056-S-GRADING.dwg		Dwg. No.: C-3
Project No.: 216056		

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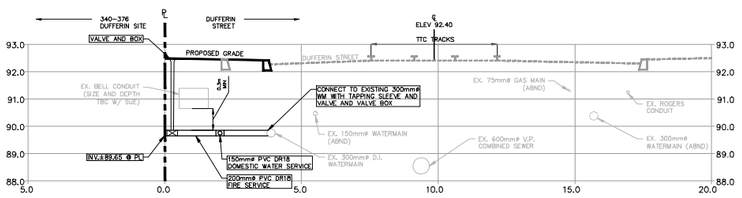
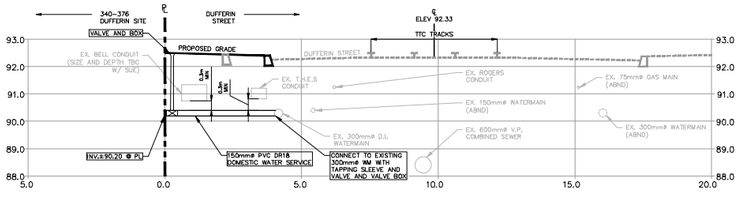
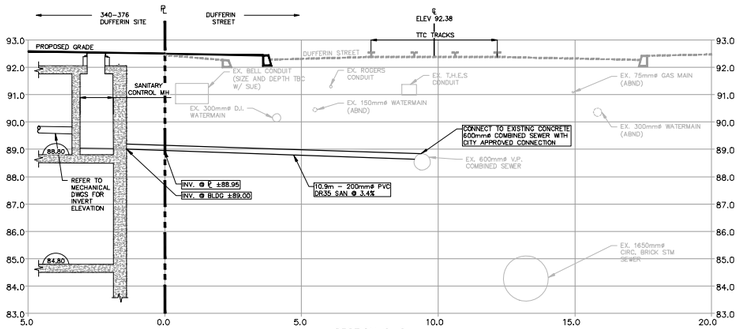


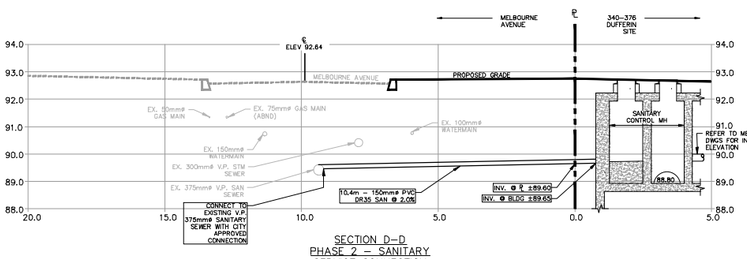
SECTION A–A
PHASE 1 – COMBINED FIRE AND DOMESTIC SERVICE CONNECTION
SCALE 1:100



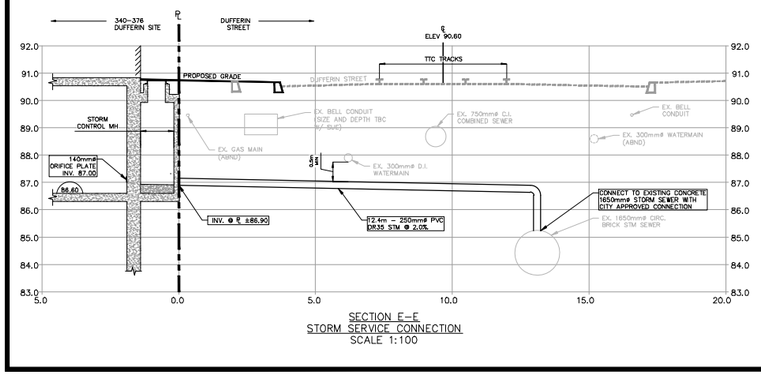
SECTION B–B
PHASE 2 – DOMESTIC WATER SERVICE CONNECTION
SCALE 1:100



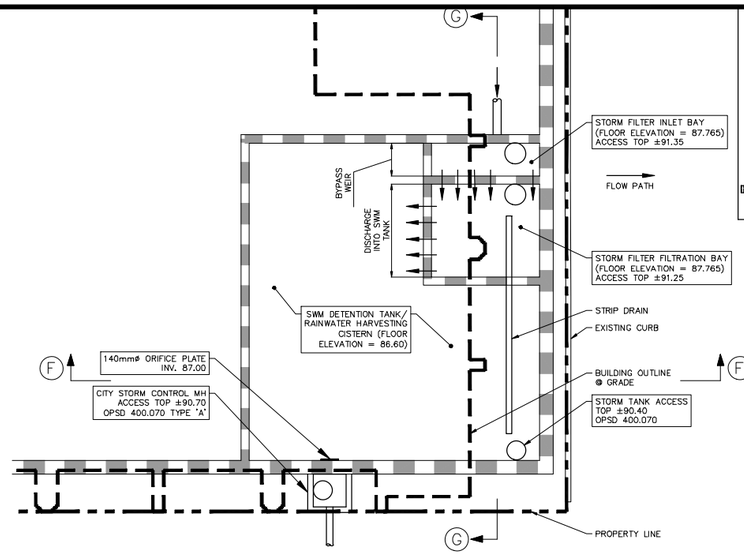
SECTION C–C
PHASE 1 – SANITARY SERVICE CONNECTION
SCALE 1:100

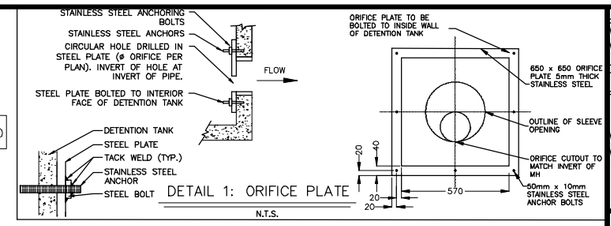


SECTION D–D
PHASE 2 – SANITARY SERVICE CONNECTION
SCALE 1:100

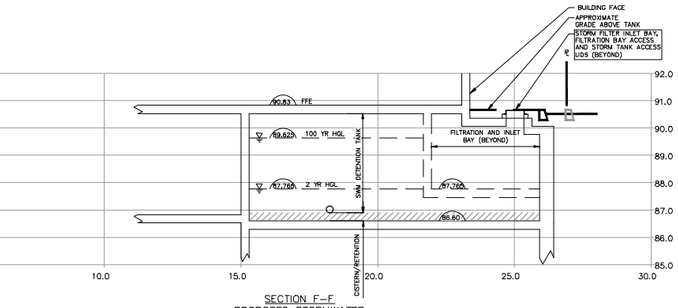


SECTION E–E
STORM SERVICE CONNECTION
SCALE 1:100

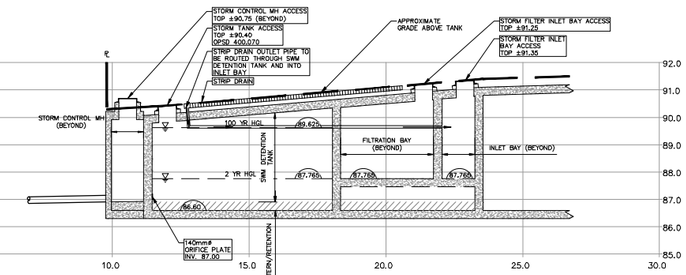




DETAIL 1: ORIFICE PLATE
N.T.S.



SECTION F–F
PROPOSED STORMWATER MANAGEMENT FACILITY
SCALE 1:100



SECTION G–G
PROPOSED STORMWATER MANAGEMENT FACILITY
SCALE 1:100

SWM FACILITY SUMMARY

RAINWATER HARVESTING CISTERN VOLUME REQUIRED (m3)	RAINWATER HARVESTING CISTERN VOLUME (m3)	DETENTION TANK REQUIRED VOLUME (m3)	DETENTION TANK VOLUME PROVIDED (m3)	ORIFICE SIZE (mm)	PEAK ORIFICE DISCHARGE (L/s)	TOTAL POST DEVELOPMENT PEAK DISCHARGE DURING 100 YEAR STORM (L/s)	ALLOWED PEAK DISCHARGE RATE (L/s)	FILTRATION SYSTEM MODEL
17	30	228	300	155 PLATE	89	89	91.2	STORMFILTER

*REFER TO STORMFILTER SHOP DRAWINGS PRIOR TO CONSTRUCTION

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.

MANAGER, DEVELOPMENT ENGINEERING — DATE

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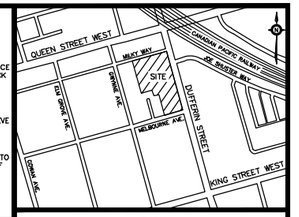
1:100



KEY PLAN
N.T.S.

No.	Date	Comments
1	2022/07/20	ISSUED FOR ZBA/SPA

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

NOTE:
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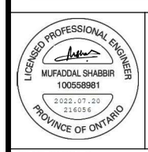

Drawing Prepared By:
R.V. Anderson Associates Limited
engineering • environment • infrastructure

Client:
HULLMARK SUN LIFE (376 DUFFERIN) LP

Project Name:
340 - 376 DUFFERIN STREET, TORONTO "RADIATOR"

Drawing Title:
SWM TANK DETAILS AND CROSS SECTIONS

Drawn:	Design:	Date:
F.Y/M.S	M.S/D.A.S	MAR 2022
Checked:	Approved:	Scale:
A.S.T	M.S	1:100
CADD File: 216056-S-SERVICING.dwg		Dwg. No.: C-4
Project No.: 216056		

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APPENDIX G

STORMFILTER® SIZING INFORMATION

Determining Number of Cartridges for Flow Based Systems

Date	**17/03/2022**	**Black Cells =**	**Calculation**

Site Information

Project Name	**340 - 376 Dufferin Street**		
Project Location	**Toronto, ON**		
OGS ID	**OGS (PH 1&2)**		
Drainage Area, Ad	**1.84**	ac	(0.7444 ha)
Impervious Area, Ai	**1.47**	ac	
Pervious Area, Ap	**0.37**		
% Impervious	**80%**		
Runoff Coefficient, Rc	**0.77**		
Treatment storm flow rate, Q_{treat}	**1.12**	cfs	(31.8 L/s)
Peak storm flow rate, Q_{peak}	**TBD**	cfs	

Filter System

Filtration brand	**StormFilter**	
Cartridge height	**18**	in
Specific Flow Rate	**2.00**	gpm/ft^2
Flow rate per cartridge	**15.00**	gpm

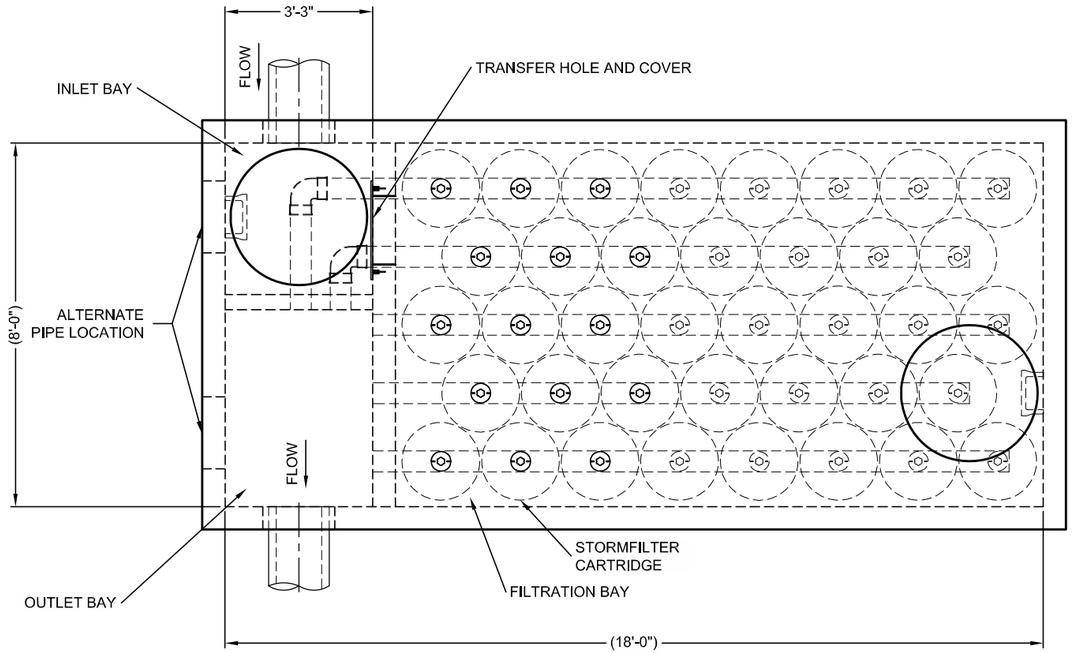
SUMMARY

Number of Cartridges	34
Media Type	Perlite

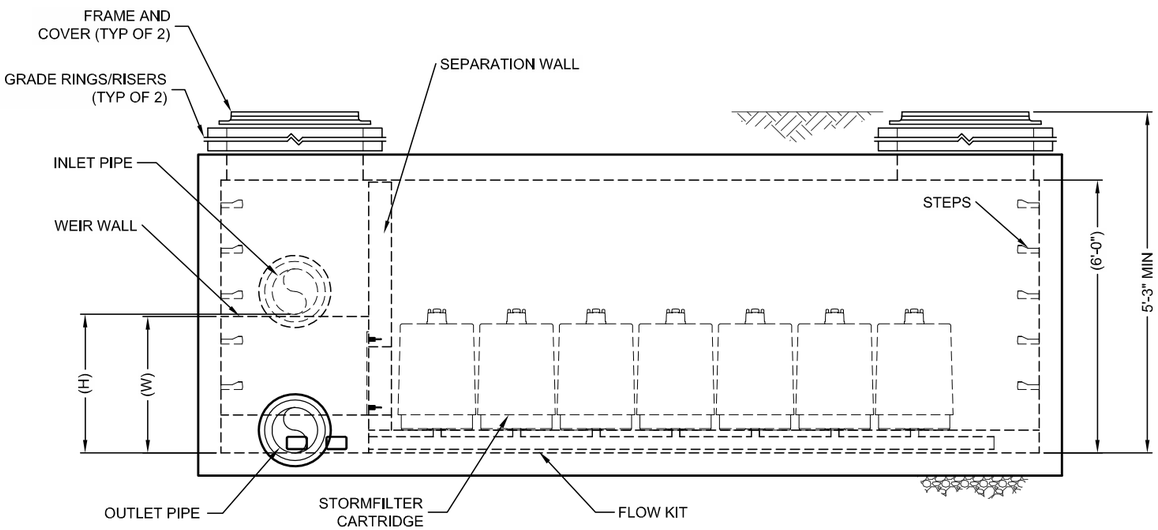
Event Mean Concentration (EMC)	**150**	mg/L
Annual TSS Removal	**80%**	
Percent Runoff Capture	**90%**	

Recommend SFPD0818 vault or CIP

200 Enterprise Drive
Scarborough, ME 04074
Phone 877-907-8676
Fax 207-885-9825



PLAN



ELEVATION

The Stormwater Management StormFilter®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,324,978; 5,707,527; 5,893,187; 6,027,639; 6,045,018; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

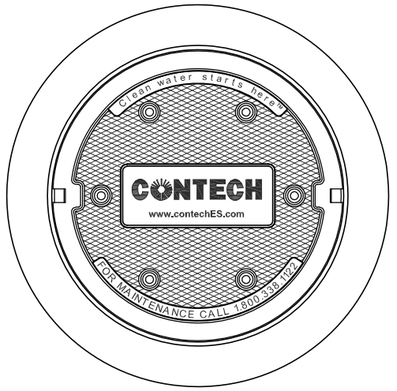
STORMFILTER DESIGN NOTES

- THE 8' x 18' PEAK DIVERSION STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.
- THE PEAK DIVERSION STORMFILTER IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR RIGHT INLET CONFIGURATION.
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"			18"			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H)	3.05'			2.3'			1.8'		
HEIGHT OF WEIR (W)	3.00'			2.25'			1.75'		
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf
CARTRIDGE FLOW RATE (gpm)	22.5	18.79	11.25	15	12.53	7.5	10	8.35	5

* 1.67 gpm/sf SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB ® (PSORB) MEDIA ONLY



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
CARTRIDGE HEIGHT (27", 18", LOW DROP(LD))	*
NUMBER OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (PERLITE, ZPG, PSORB)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE	*	*	*
OUTLET PIPE	*	*	*

UPSTREAM RIM ELEVATION	*
DOWNSTREAM RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **38 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
F. CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

THE STORMWATER MANAGEMENT STORMFILTER 8' x 18' PEAK DIVERSION STORMFILTER STANDARD DETAIL