FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
IN SUPPORT OF REZONING AND SITE PLAN APPROVAL

26 Grenville Street and 27 Grosvenor Street

City of Toronto
Toronto & East York District

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File Number: 18045

Prepared For:

Greenwin Inc.

2	Issued for Re-Zoning and SPA	November 13, 2020
1	Issued for Re-Zoning and SPA	February 27, 2019
No.	**Revision**	**Date**

EXECUTIVE SUMMARY

This Functional Servicing and Stormwater Management Report has been prepared on behalf of Greenwin Inc. in support of Re-Zoning and Site Plan Approval applications to provide for site specific regulations for the site. This Report presents a site servicing strategy for the proposed development that addresses the requirements of the applicable regulatory agencies and provides the basis for detailed servicing design. The servicing strategy for the proposed development is summarized as follows:

WATER SERVICING:

- The proposed development is to be serviced by connections to both the existing 150mmø watermain located on Grenville Street. The maximum water demand requirement of the proposed development for Maximum Day Demand plus Fire Flow is **8,143 L/min**. Additional fire connections will be required due to the heights being greater than 84m. Site specific watermain pressure tests indicate there is not sufficient pressure within the Grosvenor watermain but there is within the Grenville watermain to accommodate the proposed development.

FOUNDATION DRAINAGE:

- The short-term discharge rate is estimated to be **150 m^3/day**. This equates to lower than the proposed sanitary discharge from the site when the development is constructed. As such, there will be capacity in the downstream system subject to the proposed combined sewer offsets discussed in Section 5.2 of this Report.
- The quality limits for discharge to the sanitary sewer will satisfy the limits as listed in Table 1 – Limits for Sanitary and Combined Sewer Discharge.
- The long-term discharge rate is **19 m^3/day (0.22 L/s)**, however the peak discharge to the sanitary sewer will be at a pump rate of **1.58 L/s** (25 USG/min). The proposed external combined sewer offsets discussed in Section 5.2 of this Report can accommodate the peak groundwater discharge rate.

SANITARY SERVICING:

- The proposed development is to be serviced by a new sanitary connection to the existing 300mm diameter sanitary sewer on Grosvenor Street and the existing 450mm diameter sanitary sewer on Grenville Street**.** The peak sanitary design flow of the proposed development is **15.36 L/s** which is an increase from existing conditions. There is a single combined sewer leg with an HGL less than 1.8m of the road elevation as a result investigation work that has identified a source of storm flow to remove from the combined sewer system to offset the increase in sanitary flow. This would eliminate the need for any external combined sewer upgrades.

STORMWATER SERVICING:

- Under existing conditions the stormwater flows uncontrolled to the combined sewers on Grosvenor Street and Grenville Street. The proposed development will be serviced by new storm connection to the existing Grosvenor Street and Grenville Street storm sewers. The City of Toronto's *Wet Weather Flow Management Policy* identifies performance objectives for runoff from new development sites including water quantity, quality and water balance.

- Quantity - Quantity control will be provided on-site by storage tanks of approximately **49m^3** and **64m^3** respectively for the 27 Grosvenor and 26 Grenville buildings. Orifice control for each tank will be provided to attenuate the 100-year post development peak flows to the 2-year predevelopment allowable release rates.

- Quality – Roof coverage and non-vehicular areas comprise the entire site area. Runoff from rooftop surfaces and terraces is considered clean discharge and quality measures is not required for this drainage.

- Water Balance – A water balance volume of **14.8m^3** is required and will be retained through the re-use of storm water to be used for on-site irrigation. This volume will be split between the 27 Grosvenor building and the 26 Grenville building.

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1.0 INTRODUCTION

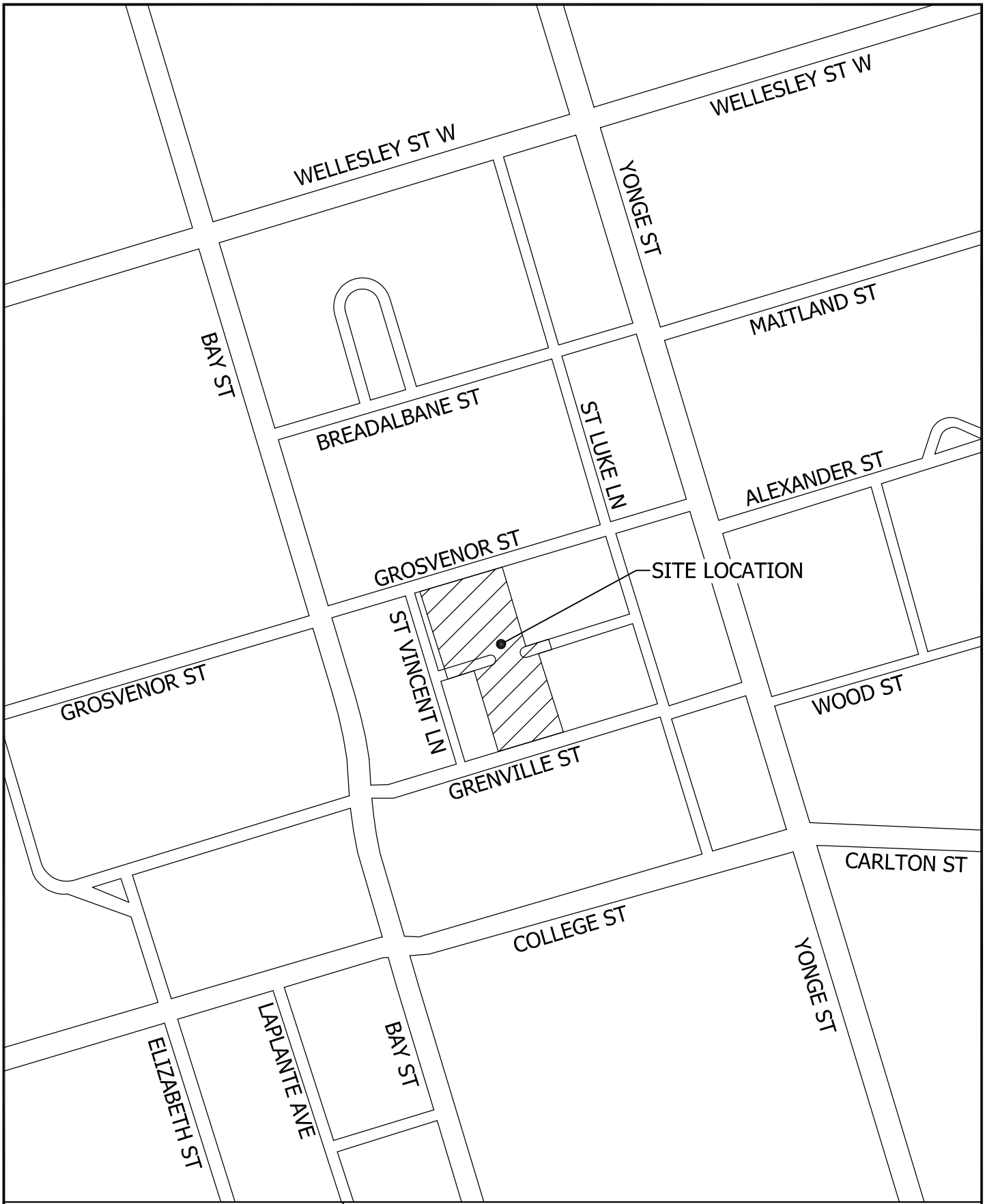
1.1 BACKGROUND

This Functional Servicing and Stormwater Management Report has been prepared on behalf of Greenwin Inc. in support of Re-Zoning and Site Plan Approval applications for a 0.385 ha site located at 26 Grenville Street and 27 Grosvenor Street.

The subject site lies just west of the Church and Wellesley area in Downtown of the City of Toronto. It is located on a parcel of land located between Grosvenor Street to the north and Grenville Street to the south, northwest of the Yonge Street and College Street intersection. The site is bound by mixed use; high-rise residential to the west, east and south; office to the west, and a community centre/YMCA to the north. **Figure 1 – Site Location** illustrates the subject site within the context of its surroundings. Existing underground servicing infrastructure is available on both Grosvenor Street and Grenville Street. The 0.385 ha site currently contains an above ground parking garage within the north portion of the site and a low-rise provincial office building within the south portion. For the existing conditions a topographical survey of the site has also been included in **Appendix A.**

The proposed commercial and residential development consists of two point towers of thirty-one (31, north tower, 27 Grosvenor) and forty-six (46, south tower, 26 Grenville) storeys, with commercial and daycare on the lower three levels, and 763 total proposed residential units (including rental units). There will be three levels of underground parking with vehicular access from St. Vincent Lane. Each point tower will be serviced via independent domestic water, fire, sanitary, and storm connections. Refer to **Appendix A** for the Site Plan prepared by Sweeney & Co Architects.

This Functional Servicing and SWM Report has been prepared to address the site servicing strategy (stormwater, sanitary, and water) in support of a Site Plan Approval application. The proposed servicing works (including stormwater conveyance) will be designed to meet City of Toronto Design Guidelines including the Design Criteria for Sewers and Watermains, the Wet Weather Flow Management Guidelines and the Water Servicing and Metering Manual.



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26 GRENVILLE ST & 27 GROSVENOR ST

COMMERCIAL & RESIDENTIAL DEVELOPMENT

TORONTO, ON

DESIGNED BY: TO	DATE: FEBRUARY 2019
CHECKED BY: RS	PROJECT No. 18045
DRAWING BY: TO	
CHECKED BY: RS	FIGURE No. 1
SCALE: NTS	

2.0 STUDY PARAMETERS

This Report is based on the review of the following documents and drawings as applicable:

- **Architectural Plans** prepared by Sweeney & Co Architects
- **Plan and Profile Drawings, Grenville Street (G-226)**, **Grosvenor Street (G-348)**, **St. Luke Lane (LA-778), St. Vincent Lane (LA-561),** received form the City of Toronto
- **DMOG Drawings (13-B-47, 13-B-53),** received from the City of Toronto
- **Sanitary Capacity Analysis,** prepared by Civica Infrastructure Inc.
- **Preliminary Hydrogeological Investigation,** prepared by B.I.G. Consulting Inc.
- **City of Toronto Design Criteria for Sewers and Watermains**, prepared by City of Toronto, Revised November 2009
- **City of Toronto Wet Weather Flow Management Guidelines**, prepared by City of Toronto, Revised November 2006
- **City of Toronto, Water Servicing and Metering Manual,** prepared by City of Toronto, Revised September 2011
- **City of Toronto, Construction Standards**, prepared by City of Toronto, various revision dates
- **City of Toronto, Development Guide,** prepared by the City of Toronto

3.0 WATER SUPPLY

3.1 EXISTING WATER SUPPLY

The existing 27 Grosvenor parking garage is serviced via a water connection from the 25 Grosvenor Street building which in turn is serviced off the existing 150mmø watermain on the south side of Grosvenor Street. The existing 26 Grenville Street building is serviced via the existing 150mmø watermain on the north side of Grenville Street. There is also an existing 600mmø watermain on the north side of Grosvenor Street.

The aforementioned connections will be abandoned upon redevelopment. There is an existing hydrant on the south side of Grosvenor Street adjacent to the site and an existing hydrant on the north side of Grenville Street adjacent to the site.

3.2 PROPOSED WATER SUPPLY

The site will be serviced by the aforementioned 150mmø watermain on the north side of Grenville Street. An 'H' connection will be provided for the south residential tower. Additionally, a second domestic connection will be provided for the north residential tower and a second fire connection will be provided for the development as a whole as both buildings are over 84m in height. Refer to the **Servicing Plan** for the proposed watermain connections.

The City of Toronto's design criteria states that the water demand used for watermain size selection should be sufficient to satisfy maximum day demand plus fire flow or the peak hour demand, whichever is greater. Fire flow for residential areas will not be less than 4,800 L/min for a 2 hour duration in addition to the maximum daily domestic demand, delivered with a residual pressure of not less than 140kPa. For commercial, institutional and industrial areas, the minimum fire flow available will not be less than 5,000 L/min for 4 hours, delivered with a residual pressure of not less than 140kPa. Fire demand was calculated as per the Fire Underwriter's Survey (FUS) guidelines (1999).

Refer to **Appendix B** for the supporting calculations of the following proposed flows for the north tower/podium (which has higher water demands):

- Maximum Hour Demand = 274.4 L/min
- Maximum Day Demand = 143.1 L/min
- Fire Flow Demand (1.5hours) = 8,000 L/min
- Maximum Day Demand plus Fire Flow Demand = **8,143 L/min** (governs)

City of Toronto design criteria dictates the following system pressure requirements:

- Average Day and Maximum Day range = 350kPa to 550kPa
- Minimum hour and peak hour range = 275kPa to 700kPa
- Minimum pressure under any non-fire demand scenario = not less than 275kPa
- Minimum residual pressure during maximum day plus fire scenarios = not less than 140kPa
- Maximum static pressure = 590kPa

Flow and pressure tests were completed in September 2019 on both the Grenville Street and Grosvenor Street water distribution systems. The static pressure in both systems is low however there is sufficient pressure and flow in the Grenville Street water system to accommodate the proposed water connections for both the north and south towers (and the podium). As such, we are proposing all water connections to be off the Grenville Street watermain. Refer to **Appendix B** for the flow test results.

4.0 FOUNDATION DRAINAGE

Discharge of foundation drains must be in accordance with Toronto Municipal Code, Chapter 681 Sewers. The quality limits for discharge in the sewers must satisfy the limits as listed in Table 1 – Limits for Sanitary and Combined Sewer Discharge and/or Table 2 – Limits for Storm Sewer Discharge of Chapter 681. A Permit To Take Water (PTTW) from the Ontario Ministry of the Environment, Conservation, and Parks (MECP) is required for water taking in excess of **50 m^3/day**, and a Permit or Agreement is required form the City of Toronto for temporary and long-term discharges to the municipal sewer system.

A Hydrogeological Investigation was prepared by B.I.G. Consulting Inc., dated November 12, 2020 for the proposed development.

Short Term (Construction) – Groundwater rates are expected to be **150m^3/ day** with an anticipated peak rate of 4.0 L/s. A limited PTTW from the MECP will be required for construction dewatering. The discharge will be to either the 300mmø sanitary sewer on Grosvenor Street or the existing 400mmø sanitary sewer on Grenville Street. Temporary discharge must meet Toronto Table 1 Sanitary/Combined Sewer Discharge Limits prior to discharge to the municipal sanitary sewer. Based on testing, the groundwater quality meets the requirements for discharge to the sanitary sewer. Details of Construction (short-term) dewatering will be provided by a dewatering contractor prior to construction that satisfies Toronto Municipal Code, Chapter 681 Sewers in order to obtain a short-term discharge permit from the City.

Long Term Discharge - The report indicates an estimated conservative long-term discharge rate of **19m^3/day (0.22 L/s)** and will be pumped at a peak rate of **1.58 L/s.** An agreement with the City of Toronto for long term discharge will be required. The report indicates that the groundwater quality currently meets the Table 1 – Limits for Sanitary and Combined Sewer Discharge. Details of the sub slab foundation system, sump pit sizing, water meter location and specification and peak flow rates to be provided, by others, at the time of Long Term Discharge Application. Two sampling access points will be installed at ground level at the property line to ensure quality and quantity control is maintained. The location of the sampling

access points is shown on our Servicing Plan. Discharge will be to both the Grosvenor Street and Grenville Street sanitary sewers.

As discussed in **Section 5.2** a downstream analysis was completed of the sanitary sewer system to the trunk. The analysis confirms that there is surcharging in the downstream system in existing conditions. The removal of storm runoff from the downstream system to offset the proposed increase in sanitary flow will be required prior to commencement of construction to facilitate short-term discharge. Refer to **Appendix C** for the body of the Hydrogeological Investigation.

5.0 SANITARY SERVICING

5.1 EXISTING SANITARY SERVICING

The existing 27 Grosvenor parking garage is serviced off the existing 300mmø sanitary sewer on Grosvenor Street. The existing 26 Grenville Street building is serviced via the existing 400mmø sanitary sewer on Grenville Street. There is also an existing 450mmø combined sewer on the north side of Grosvenor Street.

The aforementioned connections will be abandoned. Refer to **Appendix D** for detailed calculations.

5.2 PROPOSED SANITARY SERVICING

The 27 Grosvenor Street portion of the site will be serviced by a new connection to the 300mmø sanitary sewer on Grosvenor Street. The 26 Grenville Street portion of the site will be serviced by a new connection to the 400mmø sanitary sewer on Grenville Street. Refer to the **Servicing Plan** for the proposed sanitary service connection.

Using the City of Toronto Sanitary Design criteria the equivalent population for the proposed residential/commercial development is approximately **1486 persons**. The peak sanitary flow to the municipal sewer system for the proposed development (both 27 Grosvenor Street and 26 Grenville Street) has been calculated to be **16.94 L/s** which includes the peak groundwater pump rate. Refer to **Appendix D** for detailed calculations. The proposed

development results in an increase in the peak sanitary flow to the municipal sanitary sewer system. It should be noted that both the Grosvenor Street and Grenville Street sanitary sewers outlet to the same Yonge Street sanitary sewer therefore making the flows confluent shortly downstream from the proposed connections.

As a result of the increase in sanitary flow, a Sanitary Capacity Analysis was completed by Civica Infrastructure Inc. which is included in **Appendix D.** The analysis confirms that there is surcharging in existing wet conditions with the surcharging increasing marginally in proposed conditions. However, the downstream HGL remains lower than 1.8m from the road elevation in all legs during the May 2000 design storm event as per City requirements with the exception of one sewer leg on Gerrard Street East.

As a result of the one sewer with the HGL concern, an inflow and infiltration investigation was completed by a 3rd-party firm (I2S) to identify sources of cross-connections within the sewershed that would remove storm flow from the downstream combined sewer system to offset the increase in sanitary flow. The Investigation is included in **Appendix D** and identifies that if the catchbasins on St. Nicholas Street/Inkerman street are disconnected from the combined sewer system a total of 26.86 L/s of flow would be removed. This is greater than the proposed increase in sanitary flows and therefore would eliminate the need for an external upgrade of the sewer in question.

Should the above scenario be acceptable to City staff, the design, and construction of the disconnect work in the drainage area will be completed prior to the occupancy of the proposed development.

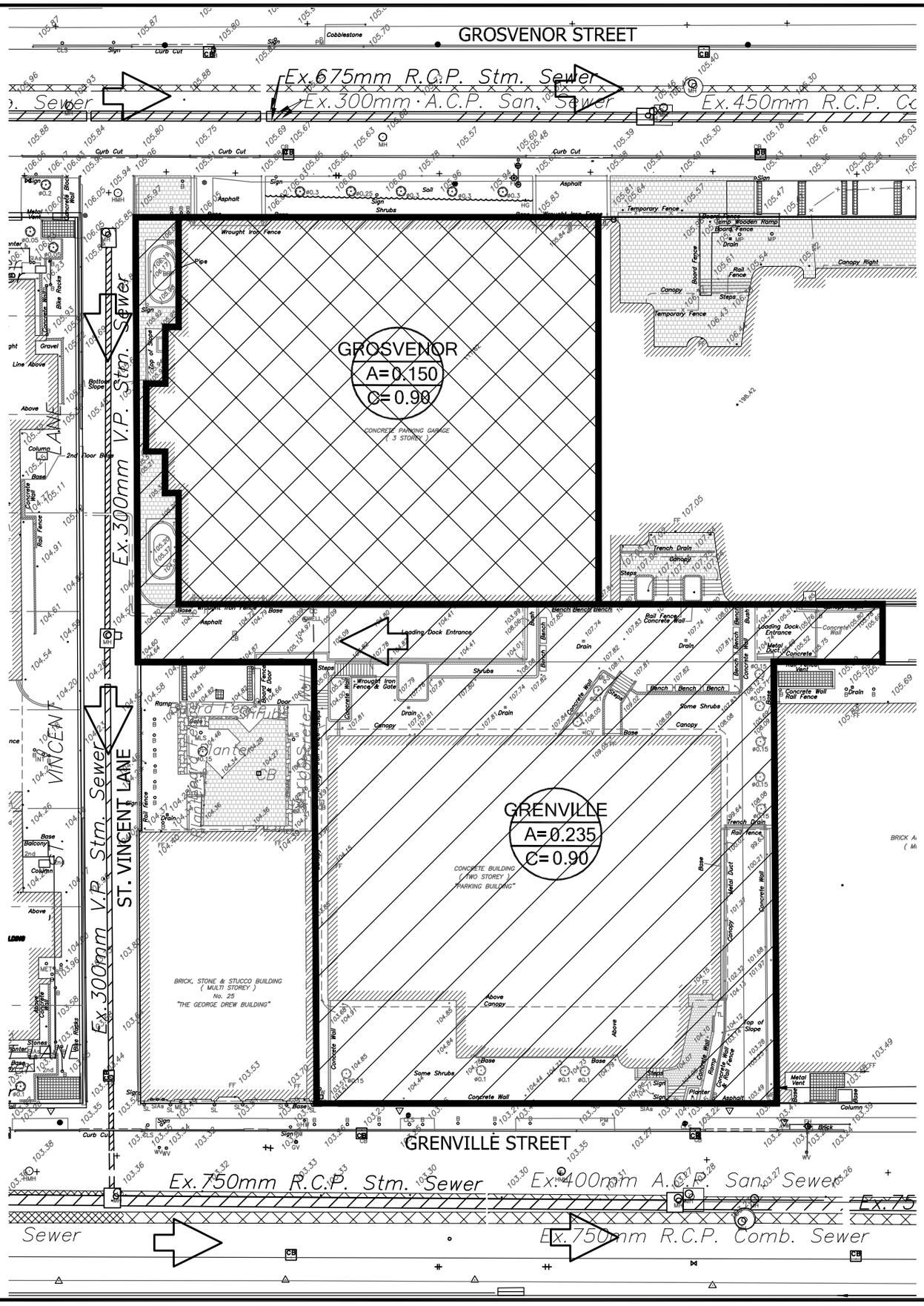
6.0 STORMWATER SERVICING

6.1 EXISTING STORMWATER SERVICING

The existing parking garage at 27 Grosvenor Street is serviced via the 675mmø storm sewer on Grosvenor Street. The existing 26 Grenville Street building is serviced via the 750mmø storm sewer on Grenville Street. Existing connections will be abandoned as per City standards upon redevelopment.

6.2 EXISTING DRAINAGE

The 27 Grosvenor Street portion of the subject site comprises 0.150 ha of the 0.385 ha site and the 26 Grenville Street portion of the subject site comprises 0.235 ha of the site. The existing buildings convey storm runoff uncontrolled to the aforementioned municipal storm sewers adjacent to the site on Grosvenor Street and Grenville Street respectively. The overland flow direction is generally south to Grenville Street, with approximately a 2.0m elevation change from the north limit to the south limit of the site. Refer to **Figure 2 – Existing Storm Drainage.**



LEGEND

EXISTING OVERLAND FLOW DIRECTION

DRAINAGE AREA BOUNDARY

GRENVILLE
A=0.235
C=0.90

AREA ID
AREA (ha)
RUNOFF COEFFICIENT

EXISTING SANITARY/ COMBINED SEWER

EXISTING STORM SEWER

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26 GRENVILLE ST AND 27 GROSVENOR ST
COMMERCIAL & RESIDENTIAL DEVELOPMENT
TORONTO, ON

EXISTING STORM DRAINAGE

DESIGNED BY: TO	DATE: FEBRUARY 2019
CHECKED BY: RS	PROJECT No. 18045
DRAWING BY: TO	
CHECKED BY: TO	FIGURE No. 2
SCALE: NTS	

Allowable Release Rate

The sites imperviousness under existing conditions is higher than 50%. Under Wet Weather Guidelines the maximum value of C (Runoff Coefficient) used in calculating the pre-development peak runoff rate is limited to 0.50 for the 2-year storm event. As the existing properties are greater than 50% impervious this rule applies.

As shown in **Figure 2**, the site drains to both Grosvenor Street and Grenville Street. As such, in post-development conditions there will be an allowable release rate for each future building which will also mitigate storm drainage complications as a result of the elevation differential across the site.

The allowable minor system discharge from the subject site to the Grosvenor Street storm sewer is calculated as follows:

$$\mathbf{Q_A = C \times A \times i \times N\ (L/s)}$$

Table 1: Allowable Release Rate – 27 Grosvenor Street

A - Site Area (ha)	0.150
Tc (min)	10
C - Runoff Coefficient	0.5
i – Intensity (mm/hr)	88.19
N – Conversion factor	2.778
Q - Release Rate (L/s)	**18.4**

The allowable minor system discharge from the subject site to the Grenville Street storm sewer is calculated as follows:

$$\mathbf{Q_A = C \times A \times i \times N\ (L/s)}$$

Table 2: Allowable Release Rate – 26 Grenville Street

A - Site Area (ha)	0.235
Tc (min)	10
C - Runoff Coefficient	0.5
i – Intensity (mm/hr)	88.19
N – Conversion factor	2.778
Q - Release Rate (L/s)	**28.8**

6.3 PROPOSED STORMWATER SERVICING

This report has been prepared in accordance with the criteria set by the City of Toronto Weather Flow Management Guidelines (WWFMG). The site will be serviced by the 675mmø storm sewer on Grosvenor Street and the 750mmø storm sewer on Grenville Street. Refer to the **Servicing Plan** for the proposed stormwater service connections.

6.4 QUANTITY CONTROL

The allowable site release rate for the proposed development was determined by calculating the 2-year peak flow with a maximum value of 50% impervious as per the City of Toronto Wet Weather Flow Management Guidelines.

Quantity control will be provided on-site by an underground storage tanks within the underground parking levels of both 27 Grosvenor Street and 26 Grenville Street in combination with an orifice control device to ensure that the 100 year post redevelopment peak flows from the site are attenuated to equal to or lower than the 2 year allowable release rates of **18.4 L/s** to the Grosvenor Street storm sewer and **28.8 L/s** to the Grenville Street storm sewer.

Storage volumes of approximately **49m^3 and 64m^3** will be required to control the 100-year post development flows to the allowable release rates for Grosvenor and Grenville buildings respectively. Refer to **Table 3 and Table 4** for a summary of the post-development areas and storage requirements.

Table 3 – Peak Flow and Storage Summary - 100-Year Storm Event (27 Grosvenor Street)

Area ID	Area (ha)	Runoff Coefficient	t_c (min)	Storage Available (m^3)	Storage Required (m^3)	Orifice Release Rate (L/s)	Description	Orifice Size (mm)
SITE	0.164	0.88	10	TBD	49	18.4	Orifice Plate	72

*On-site storage will be provided via an underground storage tank
* Refer to **Appendix E** for modified rational calculations**.**

Table 4 – Peak Flow and Storage Summary - 100-Year Storm Event (26 Grenville Street)

Area ID	Area (ha)	Runoff Coefficient	t_c (min)	Storage Available (m^3)	Storage Required (m^3)	Orifice Release Rate (L/s)	Description	Orifice Size (mm)
SITE	0.221	0.88	10	TBD	64	28.8	Orifice Plate	95

*On-site storage will be provided via an underground storage tank
* Refer to **Appendix E** for modified rational calculations**.**

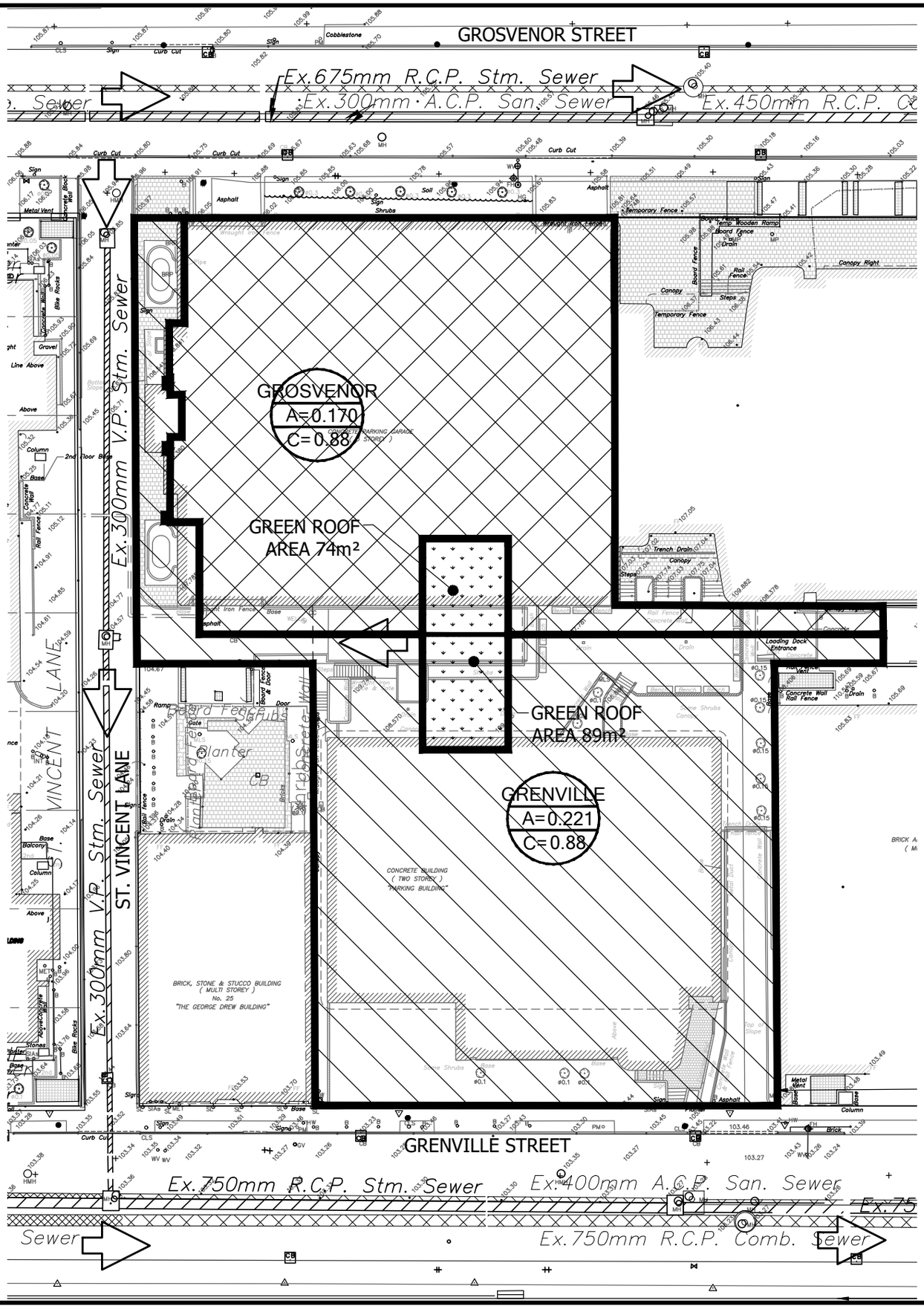
As shown in **Table 3** and **Table 4** above, the proposed release rates of **18.4 L/s** and **28.8 L/s** during the 100-year storm event will be equivalent to the allowable release rates for Grosvenor Street and Grenville Street as discussed in Section 6.3. Refer to **Appendix E** for storage volume calculations and **Figure 3 – Proposed Storm Drainage.**

6.5 QUALITY CONTROL

The proposed building covers the majority of the site resulting in the majority of site runoff being generated from rooftop surfaces. The small areas not covered by the building consist of non-vehicular pedestrian surfaces. Runoff from rooftop and pedestrian surfaces is generally considered to be clean and does not require water quality treatment as such no quality control measures are proposed for the site as it will achieve 80% TSS removal as proposed.

6.6 WATER BALANCE

The Wet Weather Flow Guidelines indicate that the minimum on-site runoff retention requires the proponent to retain all runoff from a small design rainfall event – typically 5 mm (In Toronto, storms with 24 hour volumes of 5 mm or less contribute about 50% of the total average annual rainfall volume). This runoff must be retained through infiltration, evapotranspiration or rainwater reuse. As the building footprint and underground garage occupies the entire site the opportunity for infiltration is not feasible.



N

LEGEND

EXISTING OVERLAND FLOW DIRECTION

DRAINAGE AREA BOUNDARY

GRENVILLE
A=0.221
C=0.88

AREA ID
AREA (ha)
RUNOFF COEFFICIENT

EXISTING SANITARY/ COMBINED SEWER

EXISTING STORM SEWER

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26 GRENVILLE ST AND 27 GROSVENOR ST
COMMERCIAL & RESIDENTIAL DEVELOPMENT
TORONTO, ON

PROPOSED STORM DRAINAGE

DESIGNED BY: TO	DATE: FEBRUARY 2019
CHECKED BY: RS	PROJECT No. 18045
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CHECKED BY: TO	FIGURE No. 3
SCALE: NTS	

This development will incorporate water reuse through irrigation of proposed plantings. Other measures that were previously accepted such as car washing or parking garage cleaning are no longer considered acceptable for water balance measures. Also, as previously indicated, the building underground covers the entire site so infiltration opportunities are not feasible. The above uses represent best efforts for a development of this nature and the water balance achieved is the maximum.

To achieve the water balance objectives, the site was categorized by surface types: impervious asphalt/paved/roof, pervious green roof/landscaped areas. The initial abstraction values for the impervious surfaces and pervious surfaces were 1 mm and 5 mm, respectively. The initial abstraction was determined based on percent of surface area and initial abstraction values of each surface type. Based on the site area of 0.385 ha, a 5 mm - 24 hour storm is equivalent to approximately **19.2m^3** of total site storage (3846m^2 x 0.005 m). Without any specific on-site retention measures, the proposed development would achieve the following levels of water balance as seen in **Table 5**.

Table 5 – Achieved Water Balance

Site Description	Fraction of Site Area		Initial Abstraction (mm)	Overall Initial Abstraction (mm)
Non-Green Roof / Impervious Area	96.0%	0.369 ha	1.0	0.96
Pervious / Green Roof Area	4.0%	0.016 ha	5.0	0.21
Total	**100.0%**	**0.385** ha		**1.17**

Based on **Table 5** the site will have a shortfall of 3.83mm (5mm - 1.17mm) of initial abstraction. This is equivalent to approximately **14.8m^3** of storage which will be split between each building. The proposed uses for the water balance volume will consist of on-site irrigation.

The re-use storage volumes will form part of the underground stormwater storage tanks provided for quantity control for each building. The underground storage tank will outlet at an elevation such that **14.8m^3** will be available below the outlet invert for re-use.

6.8 EROSION AND SEDIMENT CONTROL

During construction, erosion and sediment control will be implemented on site. This will be achieved through methods such as installation of a construction fence around the perimeter of the site, placement of mud mats at site access points to municipal roadways and the use of sediment control barriers at catchbasins located in proximity to the site.

7.0 CONCLUSIONS

This Functional Servicing and Stormwater Management Report presents a site servicing strategy for the proposed development that addresses the requirements of the applicable design guidelines and provides the basis for detailed servicing design.

We trust this report sufficiently addresses the site servicing and stormwater management requirements and allows for approval of the proposed Re-Zoning and Site Plan Approval of the subject site for the proposed use described herein. Should there be any questions or comments, please feel free to contact the undersigned.

Sincerely,
Counterpoint Engineering Inc.

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Appendix A

PLAN OF SURVEY WITH TOPOGRAPHY OF

LOTS 80 TO 91, 99 TO 104, PART OF LOTS 92, 98 AND 105 AND PART OF LANE REGISTERED PLAN 159

CITY OF TORONTO

SCALE 1 : 250

5 0 5 10 15 20 25 metres

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ONTARIO LAND SURVEYORS
2018

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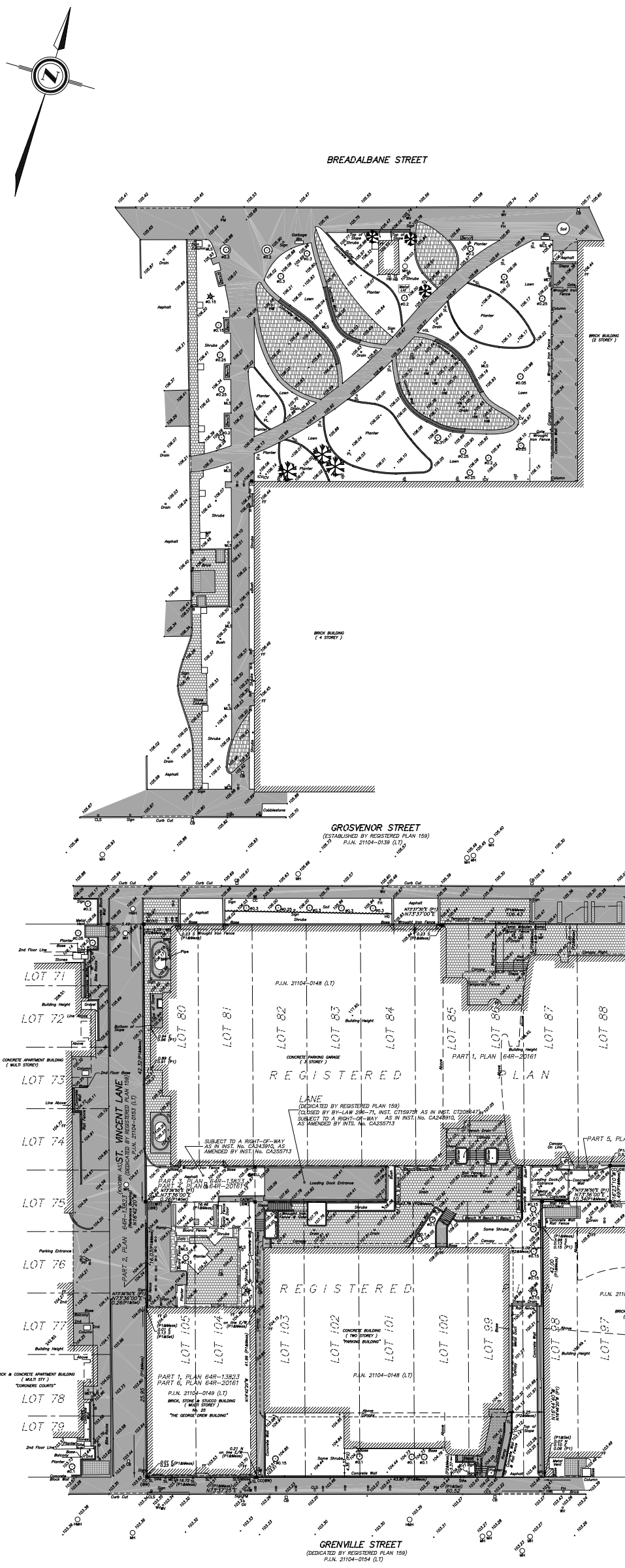


ELEVATION NOTE

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM THE CITY OF TORONTO BENCHMARK No. 12219740769, also known as CT-769.

LOCATION :

2 STOREY BRICK BUILDING (FIRE HALL) 0.41M E FROM SOUTHWEST CITY OF TORONTO NS GROSVERNOR ST W OF YONGE ST. BM ON CORNER AND 0.40 METRES ABOVE GRADE.

ELEVATION:

PUBLISHED ELEVATION = 105.524 metres.

BEARING NOTE

BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE REFERRED TO THE EASTERLY LIMIT OF ST. VINCENT LANE AS SHOWN ON PLAN 66R-20161 HAVING A BEARING OF N16°42'20"W.

METRIC

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND

■	DENOTES	SURVEY MONUMENT FOUND
□	-	SURVEY MONUMENT PLANTED
WIT	-	WITNESS MONUMENT
SIB	-	STANDARD IRON BAR
IB	-	IRON BAR
CA	-	CUT ARROW
CC	-	CUT CROSS
N,S,E,W	-	NORTH, SOUTH, EAST, WEST
OU	-	ORIGIN UNKNOWN
JDB	-	J. D. BARNES LIMITED, O.L.S.
IBW	-	IBW SURVEYORS, O.L.S.
P1	-	PLAN 66R-20161
P2	-	PLAN OF SURVEY BY IBW SURVEYORS, DATED JANUARY 23, 2018
MH	-	MANHOLE
SMH	-	SEWER MANHOLE
WMH	-	WATER MANHOLE
HMH	-	HYDRO MANHOLE
BMH	-	BELL MANHOLE
CB	-	CATCH BASIN
FH	-	FIRE HYDRANT
WV	-	WATER VALVE
MET	-	METER
HW	-	HAND WELL
CHP	-	CONCRETE HYDRO POLE
WHP	-	WOODEN HYDRO POLE
CLS	-	CONCRETE LIGHT STANDARD
MLS	-	METAL LIGHT STANDARD
PM	-	PARKING METER
SL	-	SPOT LIGHT
ICV	-	IRRIGATION CONTROL VALVE
MP	-	METAL POLE
FF	-	FLOOR FINISH
	-	DECIDUOUS TREE
	-	COMIFEROUS TREE
	-	CONCRETE
	-	BRICK
111.45	-	ELEVATION TOP OF BUILDING

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

DATE : _____

_____
D. A. WILTON
ONTARIO LAND SURVEYOR

SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS
750 OAKDALE ROAD, Units 65 & 66
TORONTO, ONTARIO M3N 2Z4
TEL. 416 749-SVNG(7864) FAX 416 749-7866
E-MAIL: toronto@svng.on.ca

DRAWN :	M. D. / M. M.	FILE NAME :	A1800048.DWG
CHECKED :	D. A. W.	PLOT SCALE :	MET. 1=0.25
JOB No. :	180-0048	PLOTTED :	L44
REF. No. :	47-159 CITY	UPDATED :	

Notes:

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

.2 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.

.3 BUILDING STRUCTURE WITH ACCESS TO TRUCKS TO 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 MAZ VEHICULAR SPEEDS TO 15 km/h AND 35% FOR HIGHER SPEED.

.4 ALL METAL GRATES TO HAVE MAXIMUM POROSITY OF 40mm x 10mm AT GROUND LEVEL AND MEETING STRUCTURAL REQUIREMENTS OF NOTE 3 ABOVE.

.5 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.

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

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

.10 PEDESTRIAN-SCALED LIGHTING TO BE SPECIFIED.

11. ALL INTAKE SHAFTS AT GRADE TO BE COVERED BY LIGHT DUTY GRATE WITH WIRED MESH UNDERNEATH TO COMPLY WITH TGS EC.4.

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

.13 ALL ACCESS DRIVEWAYS TO BE USED BY THE COLLECTION VEHICLE WILL BE LEVEL (+/-8%) AND HAVE A MINIMUM VERTICAL CLEARANCE OF 4.4 METRES THROUGHOUT.

.14 BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL.

GARBAGE ROOM CALCULATIONS

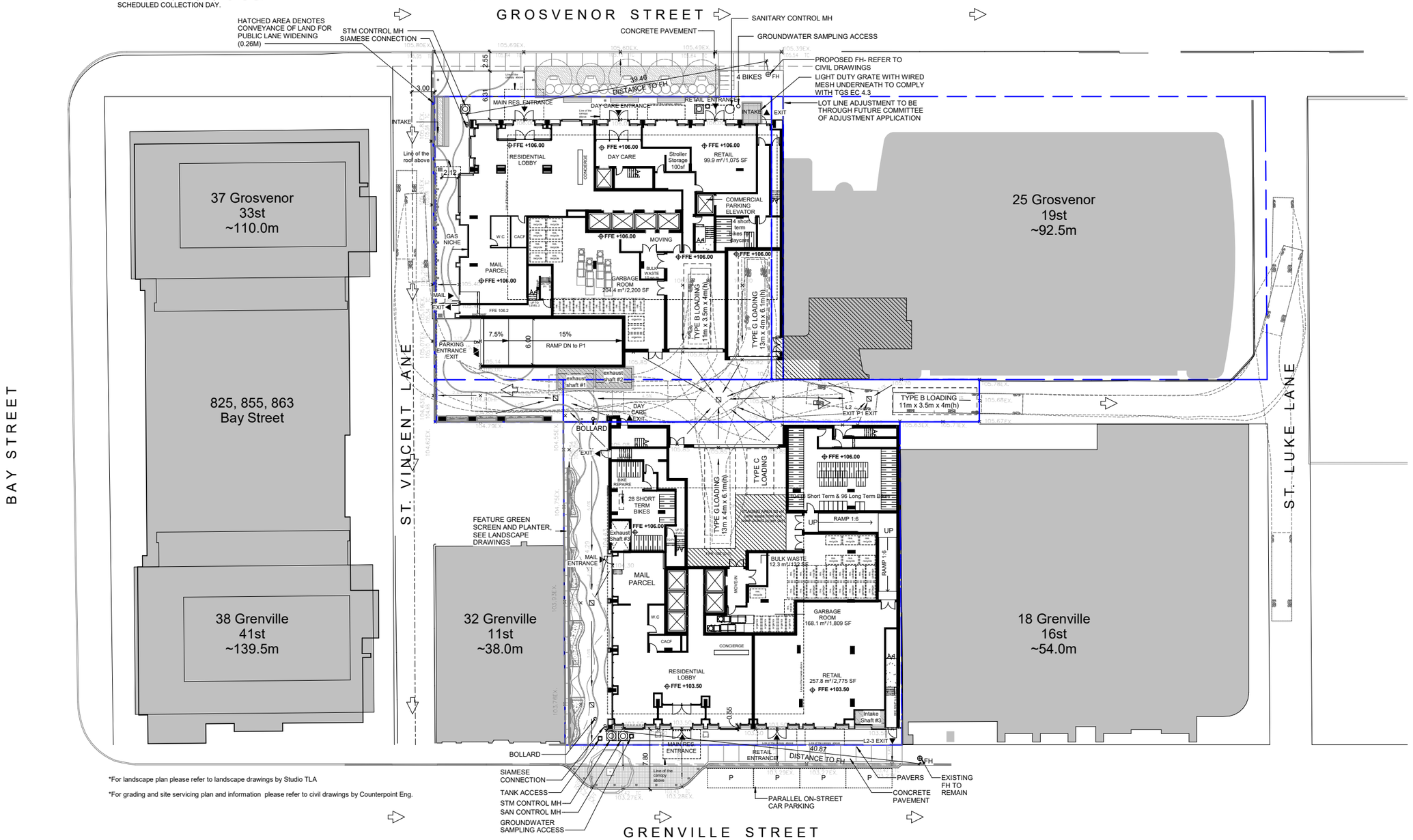
	Number of Units
North Tower	276
South Tower	487

NORTH TOWER GARBAGE ROOM:

276-50=226
226/50= 4.5
25+ (5X13)=90 SQ.M
+10 SQ.M BULK

SOUTH TOWER GARBAGE ROOM

487-50=437
437/50=8.7
25+ (9X13)=142 SQ.M
+10 SQ.M BULK



*For landscape plan please refer to landscape drawings by Studio TLA

*For grading and site servicing plan and information please refer to civil drawings by Counterpoint Eng.

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.

This drawing shall not be used for construction purposes until signed by the consultant responsible. This drawing, as an instrument of service, is provided by and is the property of Sweeny & Co. Architects.

ISSUED / REVISED

No.	Description	Date
1	Issued for ZBA and SPA	JAN 16, 2019
2	Issued for SPA	NOV 13,2020

GREENWIN

Choice Properties REIT

Sweeny&Co Architects

134 Peter Street
Suite 1601
Toronto ON
Canada M5V 2H2

P 416.971.6252
F 416.971.5420
E info@andco.com
W sweenyandco.com

PROJ. NAME
The G2
26 Grenville + 27 Grosvenor

OWNER
Greenwin Holdings Corp / Choice Properties REIT

DWG TITLE
Site Plan

DATE : 2020-11-09
SCALE : As indicated
DRAWN : MS
CHECKED : DC/CR
PROJ. No. : 1801
DWG No. **A-100**

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2020-11-13 11:34:29 AM

Appendix B

Counterpoint Engineering Inc.

Water Demand Design Calculations

Project: **27 Grosvenor & 26 Grenville - North Tower and Podium**
Project No: **18045**
Location: **Toronto, Ontario**
Site Area: 0.3846 ha

Population

1BR/1BR+Den	1.4	ppu
2BR/2BR+Den/	2.1	ppu
3BR/3BR+Den	3.1	ppu
Commercial / Retail	1.1	persons/100m^2
Offices	3.3	persons/100m^2

	Residential Units				Commercial
	1B / 1B+D	**2B / 2B + D**	**3B / 3B+D**	**Total Units**	**Area (m^2)**
TOTAL UNITS / AREA (m^2)	**127**	**170**	**93**	**390**	**600.0**

		Population 1BR / 1B + D	Population 2BR / 2BR + D	Population 3BR / 3BR + D	TOTAL POPULATION
Residential		178	357	289	824
Commercial		-	-	-	7
Total Equivalent Population					**831**

City of Toronto Watermain Guidelines

Per Capita Demand

Single Family	320	(L/capita/day)
Multi-Unit	191	(L/capita/day)

Peaking Factors

Land Use	Minimum Hour	Maximum Hour	Maximum Day	
Residential	0.70	2.48	1.65	
Commercial	0.84	1.20	1.10	*Values used for Commercial Land Use
Industrial	0.84	0.90	1.10	
Institutional	0.84	0.90	1.10	
Apartment	0.84	2.50	1.30	*Values used for Residential (Multi-Unit) Land Use

Water Demand based on Equivalent Population

Land Use	Population	Minimum Hour (L/min)	Maximum Hour (L/min)	Maximum Day (L/min)	Fire Flow Required (L/min)	Fire Flow Duration (hr)*	Max Day + Fire Flow (L/min)
Commercial	7	0.8	1.1	1.0	-	-	-
Residential (Multi-Unit)	824	91.8	273.2	142.1	-	-	-
Totals	**831**	**92.6**	**274.4**	**143.1**	**8000**	**2.00**	**8,143.1**

Counterpoint Engineering Inc.

REQUIRED FIRE FLOW WORKSHEET - PROPOSED DEVELOPMENT
Fire Underwriters Survey

Project : **27 Grosvenor & 26 Grenville - North Tower and Podium**
Project No: **18045**

Guide for Determination of Required Flow Copyright I.S.O

$$F = 220C\sqrt{A}$$ where

F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).
= 0.6 for fire-resistive construction (fully protected frame, floors, roof).
A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

Type of Construction		Class Factor
WF	Wood Frame	1.5
OC	Ordinary Construction	1.0
NC	Non-Combustible	0.8
FC	Fire-Resistive	0.6

Contents		% Reduction
NC	Non-Combustible	25
LC	Limited Combustible	15
C	Combustible	0
FB	Free Burning	15
RB	Rapid Burning	25

Area Notes for Fire Resistive Buildings (from FUS manual, 1999):

If Vertical Openings are inadequately protected (less than 1-hour fire rating): Area is the total of the two largest adjoining floors (above ground level) plus 50% of the area of each of the next 8 adjoining floors above that.

If Vertical Openings are adequately protected (at least 1-hour fire rating): Area is the total of the largest floor (above ground level) plus 25% of the area of each of the next 2 immediately adjoining floors above that.

1) Fire Flow

Type of Construction:	FC		
C=	0.6		
A*=	4217	m^2	
F=	8,572	**L/min**	**9,000 L/min** (round to the nearest 1,000L/min)

Note: Assuming fire restive building. Assuming Vertical Openings are adequately protected.
Area is the total of the largest floor (level 3) plus 25% of the next 2 adjoining floors above.

2) Occupancy Reduction/Surcharge

Contents Factor:		NC			
Reduction/Surcharge of		-25%	=	-2,143	L/min
F=	9000L/min +	-2143	**L/min** =	6,857	**L/min**

3) System Type Reduction

NFPA 13 Sprinkler:		YES	30%		
Standard Water Supply:		YES	10%		
Fully Supervised:		YES	10%		
Total			50%		
Reduction of		50%	L/min =	3,429	L/min
F=	6857L/min -	3,429	**L/min** =	3,429	**L/min**

4) Separation Charge

Building Face	Dist(m)	Charge			
North	23	10%			
East	0	25%			
South	21	10%			
West	6	20%			
Total		65%	**of** 6857	**L/min =** 4,457	**L/min**

(max exposure charge can be 75%)

Separation	Charge	Separation	Charge
0 to 3m	25%	20.1 to 30 m	10%
3.1 to 10m	20%	30.1 to 45m	5%
10.1 to 20m	15%		

F= 3429L/min + 4457L/min = 7,886 **L/min** (2,000L/min<F<45,000L/min)

F=	8,000	**L/min**	(round to the nearest 1,000L/min)
F=	133	**L/s**	
F=	2,113	**gpm**	

counterpoint engineering

NFPA Theoretical Flow Calculations

Project Name: **27 Grosvenor & 26 Grenville - North Tower and Podium**
Project Number: **18045**

Based on National Fire Protection Association Guidelines, the available flow at the minimum residual pressure of 20psi can be calculated based on the observed flow at the observed pressure readings, as follows:

$$\mathbf{Q_F = 29.83 \times c \times d^2 \times p^{0.5}}$$, where

Q_F = observed flow (US GPM)
c = hydrant nozzle coefficient (0.90 - 0.95)
d = nozzle diameter (in)
p = observed pitot pressure

$$\mathbf{Q_R = Q_F \times h_F^{0.54} / h_R^{0.54}}$$, where

Q_R = available flow
Q_F = observed flow (US GPM)
h_F = drop from measured static to desired baseline pressure
h_R = drop from measured static to measured residual pressure

Based on flow test results obtained by Lozzi Aqua Check dated September 4, 2019

c =	0.9	
d =	2.5	in
number of ports =	2	
p =	5	

Q_F = 750 US GPM

Measured Static Pressure =	55	psi	
Measured Residual Pressure =	37	psi	
Desired Residual Pressure =	20	psi	, minimum per City of Toronto design criteria

Q_R = 1075 US GPM per fire conneciton
4,068 L/min

Counterpoint Engineering Inc.

Water Demand Design Calculations

Project: **27 Grosvenor & 26 Grenville - South Tower**
Project No: **18045**
Location: **Toronto, Ontario**
Site Area: 0.3846 ha

Population

1BR/1BR+Den	1.4	ppu
2BR/2BR+Den/	2.1	ppu
3BR/3BR+Den	3.1	ppu
Commercial / Retail	1.1	persons/100m^2
Offices	3.3	persons/100m^2

	Residential Units				Commercial
	1B / 1B+D	**2B / 2B + D**	**3B / 3B+D**	**Total Units**	**Area (m^2)**
TOTAL UNITS / AREA (m^2)	**198**	**165**	**10**	**373**	**0.0**

		Population 1BR / 1B + D	Population 2BR / 2BR + D	Population 3BR / 3BR + D	TOTAL POPULATION
Residential		278	347	31	656
Commercial		-	-	-	0
Total Equivalent Population					**656**

City of Toronto Watermain Guidelines

Per Capita Demand

Single Family	320	(L/capita/day)
Multi-Unit	191	(L/capita/day)

Peaking Factors

Land Use	Minimum Hour	Maximum Hour	Maximum Day	
Residential	0.70	2.48	1.65	
Commercial	0.84	1.20	1.10	*Values used for Commercial Land Use
Industrial	0.84	0.90	1.10	
Institutional	0.84	0.90	1.10	
Apartment	0.84	2.50	1.30	*Values used for Residential (Multi-Unit) Land Use

Water Demand based on Equivalent Population

Land Use	Population	Minimum Hour (L/min)	Maximum Hour (L/min)	Maximum Day (L/min)	Fire Flow Required (L/min)	Fire Flow Duration (hr)*	Max Day + Fire Flow (L/min)
Commercial	0	0.0	0.0	0.0	-	-	-
Residential (Multi-Unit)	656	73.1	217.5	113.1	-	-	-
Totals	**656**	**73.1**	**217.5**	**113.1**	**8000**	**2.00**	**8,113.1**

Counterpoint Engineering Inc.

REQUIRED FIRE FLOW WORKSHEET - PROPOSED DEVELOPMENT
Fire Underwriters Survey

Project : **27 Grosvenor & 26 Grenville - South Tower**
Project No: **18045**

Guide for Determination of Required Flow Copyright I.S.O

$$F = 220C\sqrt{A}$$ where

F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).
= 0.6 for fire-resistive construction (fully protected frame, floors, roof).
A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

Type of Construction		Class Factor
WF	Wood Frame	1.5
OC	Ordinary Construction	1.0
NC	Non-Combustible	0.8
FC	Fire-Resistive	0.6

Contents		% Reduction
NC	Non-Combustible	25
LC	Limited Combustible	15
C	Combustible	0
FB	Free Burning	15
RB	Rapid Burning	25

Area Notes for Fire Resistive Buildings (from FUS manual, 1999):

If Vertical Openings are inadequately protected (less than 1-hour fire rating): Area is the total of the two largest adjoining floors (above ground level) plus 50% of the area of each of the next 8 adjoining floors above that.

If Vertical Openings are adequately protected (at least 1-hour fire rating): Area is the total of the largest floor (above ground level) plus 25% of the area of each of the next 2 immediately adjoining floors above that.

1) Fire Flow

Type of Construction:	FC		
C=	0.6		
A*=	1175	m^2	
F=	4,524	**L/min**	**5,000 L/min** (round to the nearest 1,000L/min)

Note: Assuming fire restive building. Assuming Vertical Openings are adequately protected.
Area is the total of the largest floor (level 12) plus 25% of the next 2 adjoining floors above.

2) Occupancy Reduction/Surcharge

Contents Factor:		NC			
Reduction/Surcharge of		-25%	=	-1,131	L/min
F=	5000L/min +	-1131	L/min =	3,869	**L/min**

3) System Type Reduction

NFPA 13 Sprinkler:		YES	30%		
Standard Water Supply:		YES	10%		
Fully Supervised:		YES	10%		
Total			50%		
Reduction of		50%	L/min =	1,935	L/min
F=	3869L/min -	1,935	L/min =	1,935	**L/min**

4) Separation Charge

Building Face	Dist(m)	Charge			
North	23	10%			
East	0	25%			
South	21	10%			
West	6	20%			
Total		65%	**of** 3869.1 **L/min** =	2,515	**L/min**

(max exposure charge can be 75%)

Separation	Charge	Separation	Charge
0 to 3m	25%	20.1 to 30 m	10%
3.1 to 10m	20%	30.1 to 45m	5%
10.1 to 20m	15%		

F= 1935L/min + 2515L/min = 4,449 **L/min** (2,000L/min<F<45,000L/min)

F=	4,000	**L/min**	(round to the nearest 1,000L/min)
F=	67	**L/s**	
F=	1,057	**gpm**	

counterpoint engineering

NFPA Theoretical Flow Calculations

Project Name: **27 Grosvenor & 26 Grenville - South Tower**
Project Number: **18045**

Based on National Fire Protection Association Guidelines, the available flow at the minimum residual pressure of 20psi can be calculated based on the observed flow at the observed pressure readings, as follows:

$$Q_F = 29.83 \times c \times d^2 \times p^{0.5}$$, where

Q_F = observed flow (US GPM)
c = hydrant nozzle coefficient (0.90 - 0.95)
d = nozzle diameter (in)
p = observed pitot pressure

$$Q_R = Q_F \times h_F^{0.54} / h_R^{0.54}$$, where

Q_R = available flow
Q_F = observed flow (US GPM)
h_F = drop from measured static to desired baseline pressure
h_R = drop from measured static to measured residual pressure

Based on flow test results obtained by Lozzi Aqua Check dated September 4, 2019

c =	0.9	
d =	2.5	in
number of ports =	2	
p =	25	

Q_F = 1678 US GPM

Measured Static Pressure =	56	psi	
Measured Residual Pressure =	40	psi	
Desired Residual Pressure =	20	psi	, minimum per City of Toronto design criteria

Q_R = 2600 US GPM per fire conneciton
9,842 L/min

Lozzi Aqua Check

4820 18th Sideroad

Schomberg, Ontario

L0G-1T0

Massimo Lozzi Cell: 416 990-2131

E-mail: lozziaquacheck@gmail.com

Hydrant Flow Test Form

Job Location: 18 Grenville St,Toronto

Date: September 4,2019

Test Data

Time of Test: 11:00 am

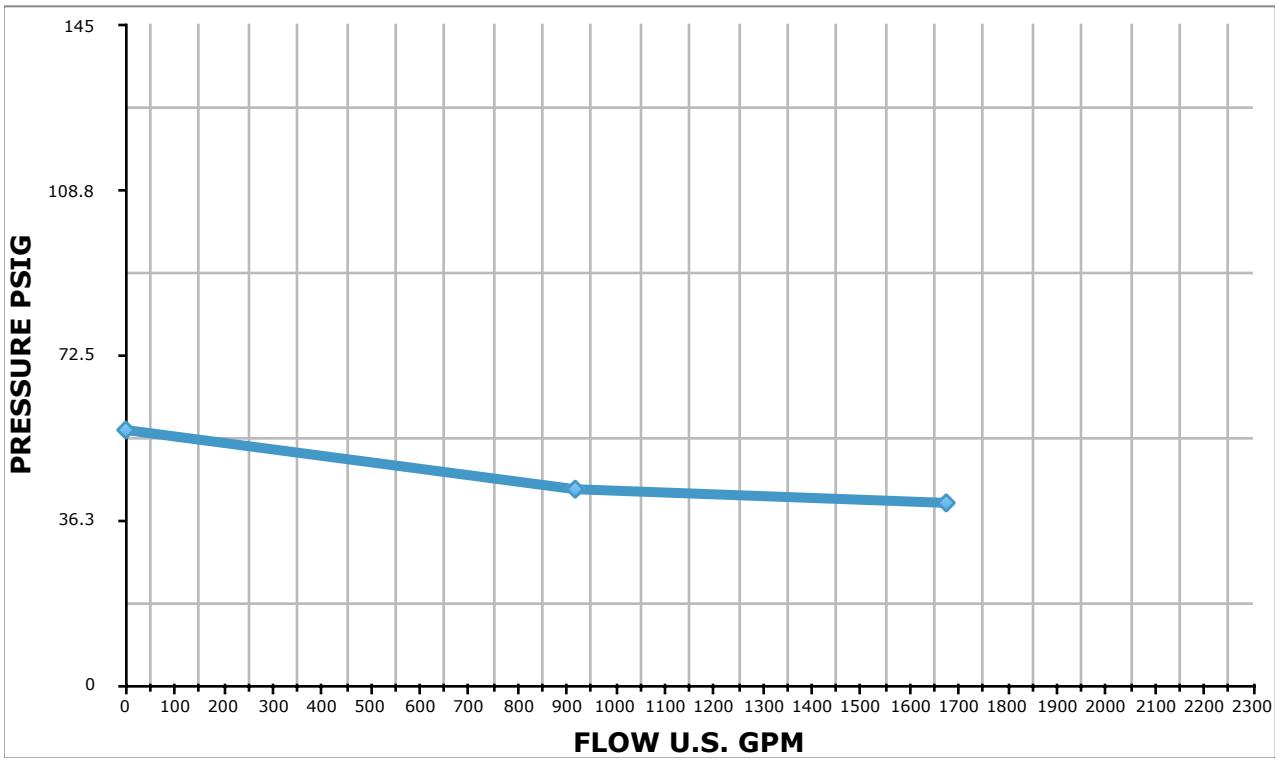
Location of Hydrant: flow hydrant in front of 18 Grenville St.Static at the corner of Grenville St and Terauley Ln.

Main Size: 150 CI

Static Pressure: 56 psi

	Number of Outlets & Orifice Size	Pitot Pressure (psi)	Flow (U.S. G.P.M.)	Residual Pressure (psi)
1.	Static	0	0	56
2.	1 x 2 ½	30	917	43
3.	2 x 2 ½	25	1674	40

Note :Flow test conducted in accordance with NFPA Std 291



Lozzi Aqua Check

4820 18th Sideroad

Schomberg, Ontario

L0G-1T0

Massimo Lozzi Cell: 416 990-2131

E-mail: lozziaquacheck@gmail.com

Hydrant Flow Test Form

Job Location: 25 Grosvenor St,Toronto

Date: September 4,2019

Test Data

Time of Test: 12:00am

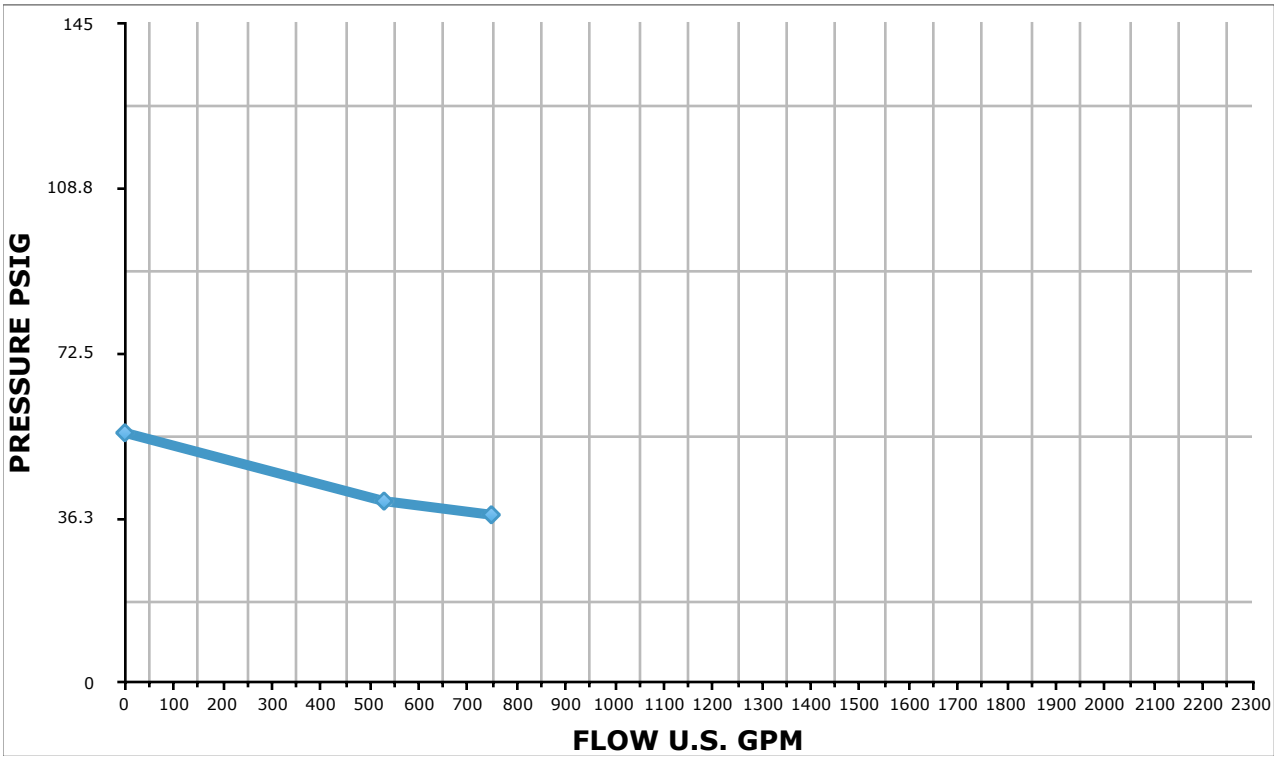
Location of Hydrant: flow hydrant in front of 25 Grosvenor St.Static at 12 Grosvenor St.

Main Size: 150 CI

Static Pressure: 55 psi

	Number of Outlets & Orifice Size	Pitot Pressure (psi)	Flow (U.S. G.P.M.)	Residual Pressure (psi)
1.	Static	0	0	55
2.	1 x 2 ½	10	529	40
3.	2 x 2 ½	5	748	37

Note :Flow test conducted in accordance with NFPA Std 291



Appendix C

HYDROGEOLOGICAL INVESTIGATION

27 Grosvenor Street and 26 Grenville Street, Toronto, Ontario

Client

Greenwin Holdings Inc.
19 Lesmill Road
Toronto, Ontario
M3B 2T3

Project Number

BIGC-ENV-222A

Prepared By:

B.I.G. Consulting Inc.
12-5500 Tomken Road
Mississauga, Ontario, L4W 2Z4
T: 416.214.4880
www.bigconsultinginc.com

Date Submitted

February 26, 2019 (Original)
November 12, 2020 (Revision 1)

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1 Introduction

1.1 Project Description

B.I.G. Consulting Inc. (BIG) was retained by Greenwin Holdings Inc. to provide geo-environmental services including environmental, geotechnical and hydrogeological investigations to support the proposed development of the site located at 27 Grosvenor Street and 26 Grenville Street, Toronto, Ontario, M7A 2G6 and M7A 2G9 (Site).

The Site is located south of Grosvenor Street and east of Bay Street, in Toronto, Ontario, as shown on Figure 1. The Site measures approximately 3,500 m² in size and is currently occupied by two (2) commercial buildings with two (2) levels of basement. The Site at 27 Grosvenor Street is occupied by a three (3) storey commercial building with two (2) levels of underground parking. The Site at 26 Grenville Street is occupied by a two (2) storey commercial building with a mezzanine overlying one (1) level of basement. The areas surrounding the Site buildings are covered with asphalt pavement with landscaped areas along the northern and southern property boundaries. A Site Location Plan is provided in Figure 1.

It is BIG's understanding that the proposed development will consist of rental housing mixed use buildings with three (3) levels of underground parking. If changes to the design are implemented, the recommendations in this report must be revised. Based on the information provided by Sweeny & Co Architects Inc. (Sweeny), dated October 6, 2020, the finished floor elevation (FFE) for level P3 is 92.6 m asl. BIG prepared a report previously and submitted in February 2019 which considered short-term construction dewatering evaluation. This revised report includes the evaluation of both short-term construction dewatering and long-term dewatering discharges.

This report addresses the hydrogeological aspects of the proposed project. The environmental and geotechnical assessment reports will be issued under separate covers. The field investigation for the hydrogeological assessment was carried out concurrently with that for the environmental and geotechnical assessments.

1.2 Project Objectives

The main objectives of the Preliminary Hydrogeological Investigation were to:

a) Establish the subsurface geological and hydrogeological conditions at the expected foundation elevation;
b) Estimate any potential construction dewatering flow rates; and,
c) Prepare a Preliminary Hydrogeological Investigation Report.

1.3 Scope of Work

To achieve the investigation objectives, BIG proposed and initiated the following scope of work:

a) Background desktop review of pertinent geological and hydrogeological resources;
b) Review of the Ministry of Environment, Conservation and Parks (MECP) Water Well Records;
c) Drilling five (5) boreholes (BH1 to BH5) to depths ranging from 2.6 m to 21.9 m to investigate the subsurface conditions;
d) Installation of four (4) monitoring wells (BH/MW1 to BH/MW4);
e) Perform slug tests at monitoring wells to assess the hydraulic characteristics of the saturated soils at the Site;
f) Initiation of bi-weekly groundwater monitoring for a period of three (3) months at installed monitoring wells;

g) Evaluate the information collected during the field investigation program, including borehole geological information, particle size distribution, groundwater level measurements and groundwater water quality;
h) Collection of one (1) groundwater sample for laboratory testing and compare it against the City of Toronto Storm and Combined/Sanitary Sewer Use By-Law parameters;
i) Preparation of site plan, cross section, geological mapping, and groundwater contour mapping for the Site;
j) Estimation of construction dewatering flow rates; and,
k) The preparation of a Preliminary Hydrogeological Investigation Report.

2 Regional Setting

2.1 Regional Physiography

The Site is located in the Iroquois Plain physiographic region of Southern Ontario known as the bevelled till plain (Chapman & Putnam, 2007). Figure 2 shows the physiographic regions of southern Ontario around the Site.

During the last retreat of the Laurentide Ice Sheet (12,000 years B.P.) lake levels in what was to become Lake Ontario were much higher due to ice blockage in the St. Lawrence seaway. This created the glacial Lake Iroquois which was up to 60 m higher in elevation in the Toronto area than the current Lake Ontario water levels. The Iroquois Shoreline that coincided with this elevated lake, terminated just below St. Clair Avenue West, north of the Site.

2.2 Regional Geology

The surficial geology of the immediate area around the Site described as coarse-textured glaciolacustrine deposits and fine-textured glaciolacustrine deposits consisting of sand, gravel, silt and clay, foreshore deposits, basinal deposits and massive to well laminated. The surficial geology for the Site and surrounding areas is shown on Figure 3.

Bedrock of the region corresponds to the Georgian Bay Formation, Blue Mountain Formation, Billings Formation, Collingwood Member and Eastview Member consisting of shale, limestone, dolostone, and siltstone. The bedrock is expected at depths of approximately 40 m bgs at the Site.

2.3 Regional Hydrogeology

Groundwater movement through the subsurface is controlled by hydraulic gradients, the physical characteristics of the sediments, and the interconnectedness of lithological formations. Fine grained sediments restrict lateral movement of groundwater and induce vertical infiltration, while coarse grained sediments allow vertical flow with increased transmissivity.

The regional shallow groundwater flow is expected to follow the local topography and discharge to local river and lake. Local deviation from the regional groundwater flow directions may occur in response to changes in topography and/or soil stratigraphy, as well as the presence of surface water features and/or existing subsurface infrastructure.

No local aquifers were identified that could negatively impact the subject Site.

3 Site Setting

3.1 Site Topography and Drainage

The Site is irregular in shape and has an area of approximately 3,500 m². The land is covered with asphalt pavement with landscaped areas along the northern and southern property boundaries. Precipitation falling within the Site is inferred to be directed to the nearby City of Toronto catch basins.

3.2 Local Surface Water Features

There are no surface water bodies on or immediately adjacent to the Site. The closest surface water body to the Site is the Don River is situated approximately 2.3 km east of the Site and Lake Ontario is situated approximately 2.4 km south of the Site. The Site is situated within the Lake Ontario watershed and is not within a Toronto and Region Conservation Authority (TRCA) regulated area.

3.3 MECP Water Well Review

Well Records from the MECP Water Well Record Database (WWR) were reviewed to determine the number of water wells and those locations present within a 500 m radius of the Site boundaries.

The MECP WWR database indicated that there were 176 well records within a 500 m radius of the Site. All identified well records are marked on Figure 4. A summary of the Water Well Records is included in Appendix B. A review of the records indicate that the majority of the wells were classified as observation wells and test holes for 500 m radius of the Site. One (1) supply water well was identified within 500 m of the Site. However, the well is located within an urbanized area in Toronto, no private well water user is expected.

3.4 Existing Permit to Take Water and Environmental Activity and Sector Registry Search

The MECP maintains a database of all active Permit to Take Water (PTTW) and Environmental Activity and Sector Registry (EASR) items related to Construction Dewatering. There are existing and expired PTTW registrations within 1 km of the Site and are summarized in Table B-2, Appendix B. There are a few registered EASR for construction dewatering for the neighboring properties, summarized in Table B-2, Appendix B. The location for each of these registrations is shown on Figure 5.

4 Field Program

4.1 Borehole and Monitoring Well Details

BIG advanced five (5) boreholes on-Site to a depth ranging from 2.6 m to 21.9 m from August 15 through December 12, 2018, four (4) of which were instrumented with monitoring wells. BH/MW3 was advanced from the ground, BH/MW1, BH/MW2, BH/MW4 and BH5 were advanced from the basement. The boreholes were advanced using truck mounted hollow stem continuous flight auger equipment under the direction and supervision of BIG field personnel. Soil samples were retrieved at regular intervals with a 50 mm outside diameter split barrel sampler drive and accordance with the Standard Penetration Test Procedure (ASTM D1586). The samples were logged in the field and returned to the BIG laboratory for detailed visual examination and for laboratory testing. The borehole records and monitoring well construction details are included in Appendix A. Figure 6 is a detailed Borehole/Monitoring Well Location Map of the Site.

4.2 Site Specific Overburden Geology

The borehole locations are shown on Figure 6 and detailed subsurface conditions are presented on the borehole logs in Appendix A. The following table is provided in addition to the borehole descriptions to provide a general summary of the soil conditions. The soil boundaries indicated on the borehole logs and discussed herein are inferred from the visual observations and auger resistance and should not be regarded as exact planes of geological change.

The soil conditions encountered at the borehole locations are summarized below. A stratigraphic cross-section across the property as aligned on Figure 6 is included as Figure 7.

Layer	Description
Pavement structure/Slab-on-grade	BH/MW3 was drilled from the at-grade pavement. All remaining boreholes were drilled from the existing lowest underground parking garage floor level. BH/MW1 and BH/MW3 contacted a composite pavement structure consisting of 25 and 80 mm of asphaltic concrete overlying 280 and 130 mm of concrete which was in turn underlain by 200 and 280 mm of granular fill at the respective boreholes. At BH/MW2, BH/MW4 and BH5, drilled from the basement slab-on-grade, 300 to 360 mm of concrete overlying 50 to 130 mm of granular fill was contacted at the surface of the boreholes.
Fill	Beneath the pavement structure in BH/MW3, a layer of fill was encountered and extended to a depth of 1.7 m bgs. The fill generally consisted of silty sand with brick and slag inclusions below 0.49 m depth.
Silty Sand	Below the granular fill or fill in BH/MW1, BH/MW2, BH/MW4 ang BH5, a deposit of silty sand was contacted and extended to a depth ranging from 2.6 to 4.6 m bgs, and the maximum depth explored in BH5. Gravel inclusions were present in the deposit and the deposit was brown and became grey with increasing depth.
Sandy Silt/Sand and Silt (Glacial) Till	The predominant subsurface deposit encountered in the investigated depths was sandy silt/sand and silt (glacial) till which encountered to the maximum depth explored in BH/MW1 to BH/MW4, i.e. a depth ranging from 8.2 to 21.9 m bgs. Gravel was widely dispersed throughout the deposit and sand, silt and clay inclusions were prevalent. The deposit was generally moist to wet.

4.3 Water Level Monitoring

Water levels at each of the borehole and monitoring well locations were recorded both during the initial drilling and after installation. A summary of all water level observations is included below in Table 4-1. Groundwater was observed in all monitoring wells on January 11, 2019 and produces a continuous surface across the Site that is situated at an elevation of between 89.51 m and 93.01 m asl.

BIG conducted a three (3)-month groundwater monitoring program and the monitoring data indicated that there was marginal groundwater fluctuation.

An interpreted shallow groundwater contour map for the monitoring well water level measurements recorded on January 11, 2019 are included as Figure 8. Based on the water level measurements obtained, the inferred direction of shallow groundwater flow across the Site is interpreted to be in the east/northeast direction.

Seasonal variability can produce significant changes to the static water level. It has been observed that groundwater can rise and lower in response to changing weather and climate. It is also likely that some wells may take prolonged periods of time to equilibrate and provide true representative groundwater levels.

Table 4-1: Monitoring Well Details and Water Level Elevations

Borehole/ Well ID	Ground/ Basement Elevation (m asl)	Coordinates (NAD27-76 Adj. MTM10)		Well Depth (m)	December 13, 2018		January 11, 2019		January 25, 2019		February 8, 2019		February 22, 2019		March 8, 2019	
		Easting	Northing		Water Level (m bgs/below basement)	Groundwater Elevation (m asl)	Water Level (m bgs/below basement)	Groundwater Elevation (m asl)	Water Level (m bgs/below basement)	Groundwater Elevation (m asl)	Water Level (m bgs/below basement)	Groundwater Elevation (m asl)	Water Level (m bgs/below basement)	Groundwater Elevation (m asl)	Water Level (m bgs/below basement)	Groundwater Elevation (m asl)
BH/MW1	97.10	314062.9	4835641.1	7.4	4.31	92.79	4.41	92.69	4.44	92.66	4.43	92.67	4.44	92.66	4.41	92.69
BH/MW2	97.12	314030.6	4835631.3	6.1	3.92	93.20	4.11	93.01	4.13	92.99	4.13	92.99	4.13	92.99	4.10	93.02
BH/MW3	105.04	314043.6	4835599.4	19.8	15.41	89.63	15.53	89.51	15.50	89.54	15.48	89.56	15.53	89.51	15.43	89.61
BH/MW4	97.96	314082.1	4835574.0	9.1	4.84	93.12	4.97	92.99	4.98	92.98	4.98	92.98	4.99	92.97	4.95	93.01
BH5	97.93	314064.9	4835568.4	-	-	-	-	-	-	-	-	-	-	-	-	-

4.4 Hydraulic Conductivity Testing

The hydraulic conductivity test was completed to estimate the saturated hydraulic conductivity (K) of the soil at the well screen depth. Single Well Response Test (SWRT) analyses were conducted at all monitoring wells (BH/MW1 to BH/MW4).

Given the low recovery rate of the native soil, a pump test is not applicable for the Site.

During the SWRT, a slug of water was instantaneously removed from the well and the response to the water level was recorded. The hydraulic conductivity values for each of the tested wells were calculated from the SWRT data using Aqtesolv Software and the Hvorlsev solution for unconfined conditions. The semi-log plots for normalized drawdown versus time are included in Appendix C.

The summary of the hydraulic conductivity (K) values estimated from the SWRTs are provided below in Table 4-2:

Table 4-2: Summary of Hydraulic Conductivity (K) Testing Results

Monitoring Well	Estimated Hydraulic conductivity (m/s)
BH/MW1	2.41×10^{-7}
BH/MW2	2.11×10^{-7}
BH/MW3	1.14×10^{-7}
BH/MW4	4.61×10^{-7}
Highest hydraulic conductivity	**4.61×10^{-7}**

The SWRT provides an estimate of K for the geological formation in the immediate media zone surrounding the well screen and may not be representative of bulk formation hydraulic conductivities.

4.5 Groundwater Sampling

To assess the suitability for discharge of pumped groundwater to the City of Toronto Sanitary or Storm Sewer during dewatering activities, one (1) groundwater sample was collected from BH/MW1 on December 14, 2018 and November 2, 2020. Prior to collection of the samples, approximately three (3) standing well volumes of groundwater were purged from the well.

The sample was collected and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required. The sample was not field filtered. Dedicated nitrile gloves were used during sample handling. The groundwater sample was submitted to an independent laboratory, Bureau Veritas, of Mississauga, Ontario, for analysis.

For the assessment purposes, the analytical results were compared to Table 1 – Limits for Sanitary and Combined Sewer Discharge (amended 2002-10-31 by By-Law No. 855-2002; 2010-07-08 by By-Law No.868-2010; 2016-02-4 by By-Law No.100-2016); and Table 2 – Limits for Storm Sewer Discharge (amended 2010-07-08 by By-Law No 868-2010; 2016-02-4 by By-Law No.100-2016) of Toronto Municipal Code (Toronto Municipal Code Chapter 681, 2016).

The laboratory Certificate of Analysis (COA) and chain of custody are enclosed in Appendix D.

The laboratory analyses of groundwater collected from BH/MW1 identified no exceedances of Table 1 - Limits for Sanitary and Combined Sewer Discharge.

When compared against the most stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedances for total suspended solids (TSS), total manganese and total phosphorus. A summary of the exceedances is provided in Table 4-3.

Table 4-3: Summary of Analytical Results

Parameter	Limits for Sanitary and Combined Sewer Discharge (Table 1) (mg/L)	Limits for Storm Sewer Discharge (Table 2) (mg/L)	Concentration for BH/MW1 (December 14, 2018) (mg/L)	Concentration for BH/MW1 (November 2, 2020) (mg/L)
Total Suspended Solids	350	15	**18**	**160**
Total Manganese	5	0.05	**0.640**	**0.34**
Total Biochemical Oxygen Demand	300	15	**20**	12
Total Phosphorus	10	0.4	**0.440**	**1.1**
Total Zinc	2	0.04	**0.045**	0.02

Notes:
Bold indicates concentration exceeds the Storm Sewer Discharge Limit.

If the groundwater encountered during excavation activities or long-term dewatering is discharged to the City of Toronto storm sewer, it will require pre-treatment prior to discharge. Discharge water to the sanitary and combined sewer does not require pre-treatment prior to discharge.

5 Temporary Construction Dewatering

5.1 Construction Dewatering Requirements

The proposed development involves the construction of rental housing mixed use buildings with three (3) levels of underground parking. Based on the information provided by Sweeny & Co Architects Inc. (Sweeny), dated October 6, 2020, the finished floor elevation (FFE) for level P3 is 92.6 m asl. The footing elevation is assumed 2.6 m below FFE. For conservative purposes, the construction dewatering calculation is based on an open cut excavation at the present time. Water levels obtained on January 11, 2019 indicated that the groundwater elevation is between 89.51 m and 93.01 m asl. To excavate under dry conditions, the water level is anticipated to be lowered approximately 1.0 m below the footing elevation.

Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all times.

Additional dewatering capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. It should be noted that the dewatering estimate provided in this report are based on the conceptual building information available at this time. If design details are changed (including any changes to excavation depth), the dewatering estimates must be revised to include the final layout of the development.

5.2 Construction Dewatering Flow Rate Assumptions

The assumptions used to the calculation of the dewatering rate for the proposed excavation for the residential building is presented in Table 5-1.

Table 5-1: Dewatering Rate Assumptions

Input Parameter	Site	Notes
Surface Elevation	105.04 m asl	Ground elevation
FFE Elevation	92.60 m asl	Based on the information provided by Sweeny, dated October 6, 2020
Footing Elevation	92.0 m asl	Assumed 2.6 m below FFE
Groundwater Elevation	93.01 m asl	Highest groundwater elevation on January 11, 2019
Dewatered Elevation Target	89.0 m asl	Assumed 1 m below footing elevation
Estimated Excavation Area	80 m x 45 m	Based on area extent equivalent
Hydraulic Conductivity (K) of Overburden	4.61×10^{-7} m/s	Highest K value

5.3 Dewatering Flow Rate Equation

The Dupuit equation for steady flow from a linear line source on both sides of a rectangular slot of an excavation through an unconfined aquifer resting on a horizontal impervious surface was used to obtain a flow rate estimate, and is expressed as follows:

$$Q_w = \frac{K(x + a)(H^2 - h^2)}{L_o}$$

Where:

Q_w = Rate of pumping (m^3/sec)

x = Length of excavation (m)

a = Width of excavation (m)

K = Hydraulic conductivity (m/sec)

H = Head beyond the influence of pumping (static groundwater elevation) (m)

h = Head above base of aquifer at the excavation (m)

L_o = Distance of Influence (m)

It is expected that the initial dewatering rate will be higher in order to remove groundwater from within the overburden formation. The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed locally from storage resulting in lower seepage rates into the excavation. Additionally, the use of a continuous caisson shoring system will further reduce groundwater migration into the excavation reducing the ongoing seepage rate.

5.4 Radius of Influence

The Radius of Influence (ROI) for the construction dewatering is based on the empirical Sichardt Equation. This equation is used to predict the distance at which the drawdown resulting from pumping is negligible. This equation is empirical and was developed to provide representative flow rates using the steady state flow dewatering equations, as discussed below.

It is noted that in steady state conditions, the radius of influence of pumping will extend until boundary flow conditions are reached and provide sufficient water inputs to the aquifer, such as recharge and surface water bodies. As a result, the distance of influence calculated using Sichardt equation is used to provide a representative flow rate calculation, but it is not precise in determining the actual radius influenced by pumping.

The ROI of pumping (dewatering) for linear flow is calculated based on the Sichardt equation, which is described as follows:

$$\mathrm{Lo} = 1750\ (\mathrm{H} - \mathrm{h})\sqrt{\mathrm{K}}$$

Where:

K = Hydraulic conductivity (m/sec)

H = Static Saturated Head in m

h = Dynamic Saturated Head in m

Based on the Sichardt equation, the ROI while dewatering may extend up to approximately 4.8 m from the side of the excavation for Linear Flow (Lo=Ro/2). The ROI calculation is provided in Appendix E.

5.5 Results of Construction Dewatering Flow Rate Estimates

Based on the assumptions provided in this report, the results of the dewatering rate estimate are as follows:

Table 5-2 Summary of Construction Dewatering Flow Rate Estimate

Location	Construction Dewatering Flow Rate Without Safety Factor (L/day)	Peak Construction Dewatering Flow Rate Including Safety Factor of 3 (L/day)
Approximate excavation area	50,000	150,000

Construction dewatering flow rate estimates are provided in Table E-1, in Appendix E.

The peak construction dewatering flow rate includes a factor of safety of three (3) to account for accumulation of precipitation, seasonal fluctuations in the groundwater table, flow from beddings of

existing sewers, and variation in hydrogeological properties beyond those encountered during the course of this study. This peak dewatering flow rate also provides additional capacity for the dewatering contractors. Given that the predicted dewatering volume exceeds the 50,000 L/day limit, it is necessary to register the construction activities through an EASR.

At the detailed design stage of the project and subject to the geotechnical consideration and the shoring system configuration, the dewatering quantities suggested above can be re-evaluated to verify if reduction in discharge volume can be achieved.

Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all times.

Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events.

The maximum flow calculation is intended to provide a conservative estimate to account for unforeseeable conditions that may arise during construction. It should be noted that the dewatering estimate provided in this report is based on the proposed development information available at this time. If changes to the design are implemented (increase to planned excavation depths, widening of excavations, etc.), the dewatering estimates must be revised to include and reflect future changes.

6 Long Term Discharge Estimate

6.1 Long-Term Dewatering Assumptions

Given that the groundwater level is above foundation depths for the development, a permanent foundation sub-drain is recommended. It is assumed that the below grade structure will feature a perimeter drain and sub-drain system installed at approximately 0.5 m below the footing elevation. Table 6-1 presents the assumptions used to calculate the long-term drainage rate estimates.

Table 6-1 Dewatering Estimate Assumptions

Input Parameter	Values	Notes
Surface Elevation	105.04 m asl	Ground elevation
FFE Elevation	92.60 m asl	Based on the information provided by Sweeny, dated October 6, 2020
Footing Elevation	92.0 m asl	Assumed 2.6 m below FFE
Groundwater Elevation	93.01 m asl	Highest groundwater elevation on January 11, 2019
Foundation Elevation	89.5 m asl	Assumed 0.5 m below the footing elevation
Sub-drain Elevation Target	89.5 m asl	Assumed 0.5 m below the footing elevation
Drainage Dimensions	80 m x 45 m	Based on aerial extent of the Site
Hydraulic Conductivity (m/s)	4.61×10^{-7} m/s	Highest K value

6.2 Radius of Influence

The Radius of Influence (ROI) for the long-term dewatering is based on the empirical Weber Equation. This equation is used to predict the distance at which the drawdown resulting from pumping is negligible. This equation is empirical and was developed to provide representative flow rates using the steady state flow dewatering equations, as discussed below.

It is noted that in steady state conditions, the radius of influence of pumping will extend until boundary flow conditions are reached and provide sufficient water inputs to the aquifer, such as recharge and surface water bodies. As a result, the distance of influence calculated using Weber equation is used to provide a representative flow rate calculation, but it is not precise in determining the actual radius influenced by pumping.

The ROI of pumping (dewatering) for linear flow is calculated based on the Weber equation, which is described as follows:

$$\mathrm{Ro} = 2.45 \left(\frac{\mathrm{HKt}}{\mathrm{s}}\right)^{0.5}$$

Where:

K = Hydraulic conductivity (m/s)

H = Static Saturated Head in m

t = time in number of days

s = Storage coefficient (unitless)

Based on the Weber equation and the geometric mean K value, the ROI is approximately 34 m from the side of the excavation for linear flow. The ROI calculation is provided in Table G-1, Appendix G.

The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during long-term dewatering. It should be noted that there will be no active pumping during long-term dewatering. The foundation drains will be constructed below the floor slab and/or near the foundation and the groundwater would passively drain into these sub drains and discharged directly to sumps. Due to the nature of overburden material, the groundwater will flow through the natural gradient that exists on the Site and passively flow into the foundation sub-drains and will not be actively pumped. Although, the ROI which was conservatively predicted was at 34 m from the side of edge of the sub-drain, over a period of time, the drawdown curve will be very close to the foundation walls and thus resulting in negligible ROI.

6.3 Long-Term Perimeter Drain Flow Rate Estimate

Based on the assumptions provided in this report (outlined in Section 6.1), the results of the long-term discharge volume estimate are summarized below:

Table 6-2 Summary of Long-Term Discharge Flow Rate

Location	Long-Term Peak Flow Rate (L/day)	Notes
Flow into sub-drain after initial dewatering stages	19,000	Long term sub-drain flow value rounded based on Dupuit's equation including flow from all sides. Safety factor of 3 was used.

The results for the estimate are available in Appendix F, Table F-1. The maximum flow rate estimate represents short term events and are not indicative of long-term continuous contributions to the drainage system. Intermittent cycling of sump pumps and seasonal fluctuation in groundwater regimes should be considered for pump specifications. Given that the predicted dewatering volume does not exceed the 50,000 L/day limit, a PTTW is not required.

If the groundwater encountered during excavation activities or long-term dewatering is discharged to the City of Toronto storm sewer, it will require pre-treatment prior to discharge. Discharge water to the sanitary and combined sewer does not require pre-treatment prior to discharge.

It should be noted that the dewatering estimates provided in this report are based on the proposed building information available at this time.

In the event that the long-term foundation drainage is not allowed to discharge into the City's sewer system, the proposed building may be designed and supported by "tanked" water-proofed continuous raft foundation without permanent dewatering (i.e. avoiding permanent perimeter and under-floor drainage system).

7 Potential Groundwater Impacts

7.1 Impacts to Nearby Groundwater Users

The Site lies within a heavily urbanized area of Toronto, which features 100% municipal water supply. There are no expected impacts to nearby groundwater users due to active dewatering.

7.2 Impacts to Nearby Structures

The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during long-term dewatering. It should be noted that there will be no active pumping during long-term dewatering. The foundation drains will be constructed below the floor slab and/or near the foundation and the groundwater would passively drain into these sub drains and discharged directly to sumps. Due to the nature of overburden material, the groundwater will flow through the natural gradient that exists on the Site and passively flow into the foundation sub-drains and will not be actively pumped. Although, the ROI which was conservatively predicted was at 34 m from the side of edge of the sub-drain, over a period of time, the drawdown curve will be very close to the foundation walls and thus resulting in negligible ROI.

8 Water Taking and Discharge Permits

8.1 EASR

During the active construction dewatering phase, the volume of water expected to be pumped exceeds the daily limit on groundwater taking under the Ontario Water Resources Act (50,000 L/day) if the excavation is to be undertaken all at once. Therefore, it is necessary to register the construction dewatering under the EASR guidelines, as the cumulative discharge rate for construction is 150,000 L/day. The limit for water taking under an EASR is 400,000 L/day. If combined storm and groundwater were to exceed this limit, the dewatering rate would need to be capped to 400,000 L/day of pumped water. If it is necessary to exceed 400,000 L/day of water taking, a PTTW as per O./Reg. 387/04 would be required.

8.2 City of Toronto Sewer Discharge Agreement

The City of Toronto describes any water source not supplied by the City as private water. This includes groundwater and storm water that accumulate on a property. If private water is to be discharged into a City of Toronto sanitary or storm sewer, a permit under the City of Toronto Municipal Code, Chapter 681 must be granted. The discharge agreement features two (2) types of approvals:

- Short Term Private Water Discharge Approval which covers temporary arrangements for activities such as construction dewatering, road work, etc.; and,
- Long Term Private Water Discharge Approval which is intended to cover long term discharges from building foundation drains and other applications.

Given the current consideration for short-term and long-term discharges, a Private Water Discharge Approval (PWDS) with the City of Toronto will be required.

9 Conclusions

Based on the findings of the Hydrogeological Investigation, the following summary of conclusions are provided:

a) It is BIG's understanding that the proposed development will consist of rental housing mixed use buildings with three (3) levels of underground parking. If changes to the design are implemented, the recommendations in this report must be revised;
b) The Site is located within a physiographic region of Iroquois Plain known as the bevelled till plain;
c) The surficial geology around the Site is described as coarse-textured glaciolacustrine deposits and fine-textured glaciolacustrine deposits consisting of sand, gravel, silt and clay, foreshore deposits, basinal deposits and massive to well laminated;
d) The MECP Water Well Records indicate that there are 176 well records registered with the database within 500 m of the Site. One (1) supply water well was identified within 500 m of the Site. However, the well is located within an urbanized area in Toronto, no private well water user is expected;
e) Groundwater produces a continuous surface across the Site that is situated at an elevation of between 89.51 m and 93.01 m asl (January 11, 2019 readings);
f) Based on the water level measurements obtained, the inferred direction of groundwater flow within the shallow overburden formation across the Site is towards the east/northeast;
g) The estimated hydraulic conductivity for the overburden formation ranges between 1.14×10^{-7} m/s and 4.61×10^{-7} m/s;
h) Based on the assumptions outlined in this report, the estimated peak short-term construction dewatering flow rate for the proposed construction activities with a safety factor of 3 is approximately 150,000 L/day;
i) Due to the anticipated construction dewatering flow rate, it is recommended that a registration under the Environmental Activity and Sector Registry (EASR) be completed;
j) Based on the assumptions outlined in this report, the cumulative long-term contribution to the foundation drains is 19,000 L/day;
k) The laboratory COA shows that no exceedance under Table 1 – Limits for Sanitary and Combined Sewer Discharge;
l) When compared against the most stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedances for total suspended solids (TSS), total manganese and total phosphorus; and,
m) If the groundwater discharges are directed to the City's storm sewer system, a treatment process will be required to meet the City's storm sewer use by-law. If the groundwater discharges are directed to the City's sanitary and combined sewer system, no treatment will be required.
n) A sewer discharge agreement with the City of Toronto Water division will be required for the short-term and long-term discharges.

It should be noted that the comments and recommendations in this report are based on the assumption that the present design concept described throughout the report will proceed to construction. Any changes to the design concept may result in a modification to the recommendations provided in this report. It is noted that these conclusions and recommendations should be read in conjunction with the entirety of the report.

10 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusion and recommendations presented within this report reflect Site conditions existing at the time of the assessment. BIG must be contacted immediately if any unforeseen Site conditions are experienced during the dewatering activities. This will allow BIG to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost-effective manner.

Our undertaking at BIG, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience profession. No other warranty or presentation, either expressed or implied, is included or intended in this report.

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We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

Yours truly,

B.I.G. Consulting Inc.

Eileen Liu, M.Env.Sc., P.Geo.
Project Manager

Prem Manicks, P.Geo.
Partner

Appendix D

Counterpoint Engineering Inc.

Project: 27 Grosvenor & 26 Grenville
Project No: 18045
Location: Toronto
Site Area: 0.3846 ha

Proposed Sanitary Flow Calculations

As per Design Criteria for Sewers and Watermains - First Edition November 2009 City of Toronto
Design flow = average daily dry weather flow x peaking factor + infiltration

Persons Per Unit and per Land Use

1BR/1BR+Den	1.4	ppu
2BR/2BR+Den/	2.1	ppu
3BR/3BR+Den	3.1	ppu
Commercial / Retail	1.1	persons/100m^2
Offices	3.3	persons/100m^2

	Residential Units				Commercial
	1B / 1B+D	2B / 2B + D	3B / 3B+D	Total Units	Area (m^2)
TOTAL UNITS / AREA (m^2)	**325**	**335**	**103**	**763**	**600**

	Population 1BR / 1B + D	Population 2BR / 2BR + D	Population 3BR / 3BR + D	TOTAL POPULATION
Residential	455	704	320	1479
Commercial	-	-	-	7
Total Equivalent Population				**1486**

Peak flow Design Parameters

Residential Average flow	240	litres/person/day
Commercial Average flow	180,000	litres/ha/day
Infiltration	0.26	litres/second/ha

Harmon Peaking Factor

PF = 1 + (14/(4+(P/1000)$^{1/2}$))

Residential Population	Harmon Peak Factor
1479	**3.68**

Residential Flow	15.14	**L/s**	*based on population
Retail Flow	0.13	**L/s**	*based on floor area
Infiltration	0.10	**L/s**	
Groundwater Flows	1.58	**L/s**	* 25 USGPM pump

Flow	**16.94**	**L/s**

CIVICA
Water Management Solutions

January 15, 2019 **CIVICA Ref: COU18-0094**

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100
Vaughan, ON
L4K 5Y2

Attention: Rasheed Serrao, P.Eng.
Project Manager

Dear Mr. Serrao,

RE: 25-27 Grosvenor & 26 Grenville Sanitary Capacity Analysis, City of Toronto

Civica Infrastructure Inc. (Civica) is pleased to submit the Sanitary Capacity Analysis for the proposed development at 25-27 Grosvenor Street and 26 Grenville Street in the City of Toronto. The City of Toronto's BPR InfoWorks ICM model was used to assess the existing and proposed conditions of the combined sewer downstream of the proposed site.

Based on the analysis and assumptions presented in the report, the findings can be summarized as follows:

1. The expected sanitary peak flow from the proposed re-development site is 18.38 L/s. A net increase of 17.95 L/s compared to existing conditions;
2. Under the May 12th, 2000 storm, in both existing and proposed conditions, the combined sewer system is surcharging from just downstream of the intersection of Yonge and Grosvenor Streets to the downstream outlet on Victoria Street. The HGL in the combined sewer system is within basement flooding levels, less than 1.8 m below the surface, at one location:
    a. In the combined sewer along Gerrard Street East, the freeboard is: 1.145 m at MH3525714281.
3. Under the 100-year storm, in both existing and proposed conditions, the combined sewer system is surcharging from upstream of the site to the downstream outlet on Victoria Street. The HGL in the combined sewer system is within basement flooding levels, less than 1.8 m below the surface, at four locations:
    a. In the combined sewer along Grosvenor Street, the freeboard is: 1.439 m at MH3565014050, 1.091 m at MH3566614107, and 0.740 m at MH3567714144;
    b. In the combined sewer along Grenville Street, the freeboard is: 0.732 m at MH3555114082, 1.504 m at MH3557914178;
    c. In the combined sewer along Yonge Street, the freeboard is: 0.923 m at MH3567914155, 1.310 m at MH3563414164, 1.572 m at MH3561914176, 1.568 m at MH3557914188, 1.711 m at Dummy34, 1.688 m at MH3556614193, 1.762 m at MH3551914207, 1.164 m at MH3541114225, 0.790 m at MH3532414257; and,

5. Timing at flow junctions may cause minor differences in peak flow and HGL downstream of the proposed site;
6. The storm flows will be split between sites and connected to the 760-mm rectangular shaped storm sewers on both Grosvenor Street and Grenville Street; and,
7. Due to the HGL results, the existing municipal sanitary sewer cannot support the proposed re-development site without the need for external upgrades or retrofits.

Based on the conclusions presented in the report, the recommendations can be summarized as follows:

1. It is recommended that the implementation of a flow monitoring program be undertaken to calibrate the model to observed conditions; or,
2. The implementation of a wet weather reduction program be evaluated in an effort to increase the capacity of the combined sewer system under proposed conditions.

Do not hesitate to contact us for further clarification and/or comment.

Sincerely,

CIVICA INFRASTRUCTURE INC.

Alan Villalobos
Project Analyst

Edward, M.A.Sc.Eng., P.Eng.
President

Encl. 25-27 Grosvenor & 26 Grenville Sanitary Capacity Analysis, City of Toronto

Disclaimer

The data used for this analysis has been obtained from City of Toronto sources with the understanding that these are provided without warranties. This data is included in the hydrodynamic model. The information has been reviewed to ensure consistency with general sanitary sewer system modeling principles used in the City of Toronto. Unless noted in this memo, specific sewer system geometric characteristics and operating conditions have not been verified in the field or by cross-referencing with As-Built drawings or other sources that may be available from the City of Toronto.

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1.0 Introduction

This memo summarizes the sanitary servicing analysis for the proposed 0. ha re-development site located at 25-27 Grosvenor Street and 25 Grenville Street, in Toronto. The capacity conditions in the existing combined sewer system has been evaluated from the proposed site to the downstream outlet on Victoria Street south of Gerrard Street East.

The existing site on Grosvenor Street is currently occupied by a 21-storey office building and a 3-storey parking garage. Whereas, the existing site on Grenville Street is currently occupied by a 2-storey office building. The proposed re-development site consists of two high rise residential towers with a common podium. **Figure 1** shows the location of the site and the tributary area.

1.1 Servicing Connections

The sanitary flows from the existing site are currently split between the two addresses with the connections occurring on their respective streets.

For 25-27 Grosvenor Street, the existing site is connected to the 300-mm sanitary sewer on Grosvenor Street which conveys flows east connecting to the 900-mm circular shaped combined sewer flowing south on Yonge Street.

For 25 Grenville Street, the existing site is connected to the 400-mm sanitary sewer on Grenville Street which conveys flows east connecting to the 1050-mm circular shaped combined sewer flowing south on Yonge Street.

From its connection with Grenville Street, the sewer continues south on Yonge Street and then east to the 900-mm combined sewer on Gerrard Street East. Finally the conveyance goes south in the 1300-mm combined sewer on Victoria Street before out-letting into the trunk sewer also located on Victoria Street. The proposed sanitary flows will maintain their respective connections, outlined above, on both Grenville Street (300-mm sanitary sewer) and Grosvenor Street (400-mm sanitary sewer).

The proposed storm flows will also be split based on their respective address and connected to the 760-mm rectangular shaped storm sewers on both Grenville Street and Grosvenor Street.

1.2 Capacity Analysis Approach

The sewer capacity after redevelopment has been quantified using the City of Toronto's BPR InfoWorks ICM model, originally obtained from Toronto Water. This model was developed and calibrated in 2014 to assess the performance of the sanitary, combined and storms sewers, and to identify the mechanism(s) by which water enters the basement. At that time, population estimates were obtained from the latest available census data for residential units and from Industrial-Commercial-Institutional (ICI) water demand information.

The drainage system has also been evaluated to include new and other proposed developments/re-developments in the area since the model was originally created in 2014, eight (8) new development applications were found in the drainage area since 2014.

Figure 2 shows the location of the proposed development site, the new developments and the downstream sewer conveyance flow the outlet.

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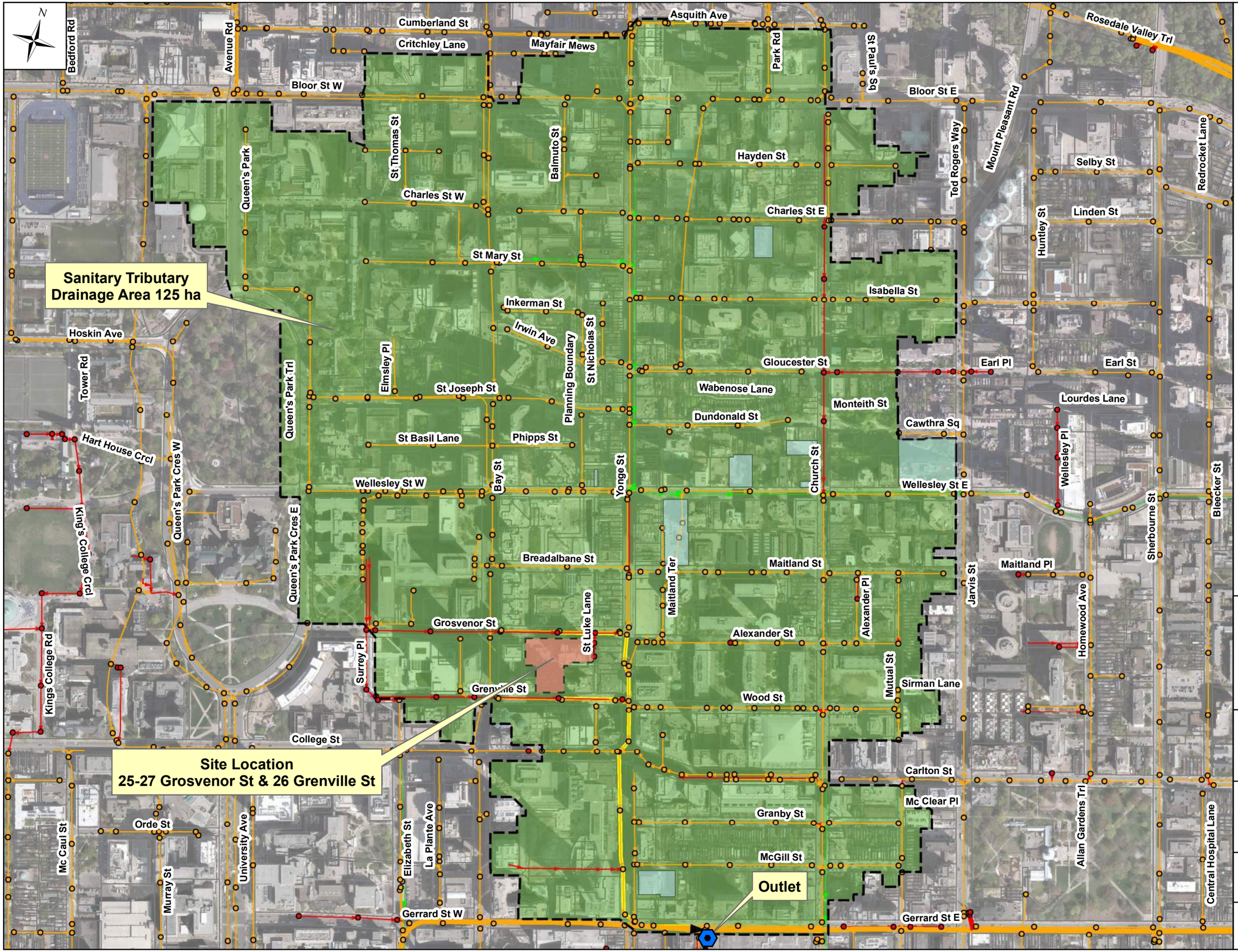

Legend

- Sanitary Tributary Drainage Area
- Site Location
- New Developments
- Parcels

Manholes:

- Combined
- Sanitary

Local Sewers:

- Combined
- Sanitary
- Downstream Conveyance

Trunk Sewers:

- Combined
- Sanitary

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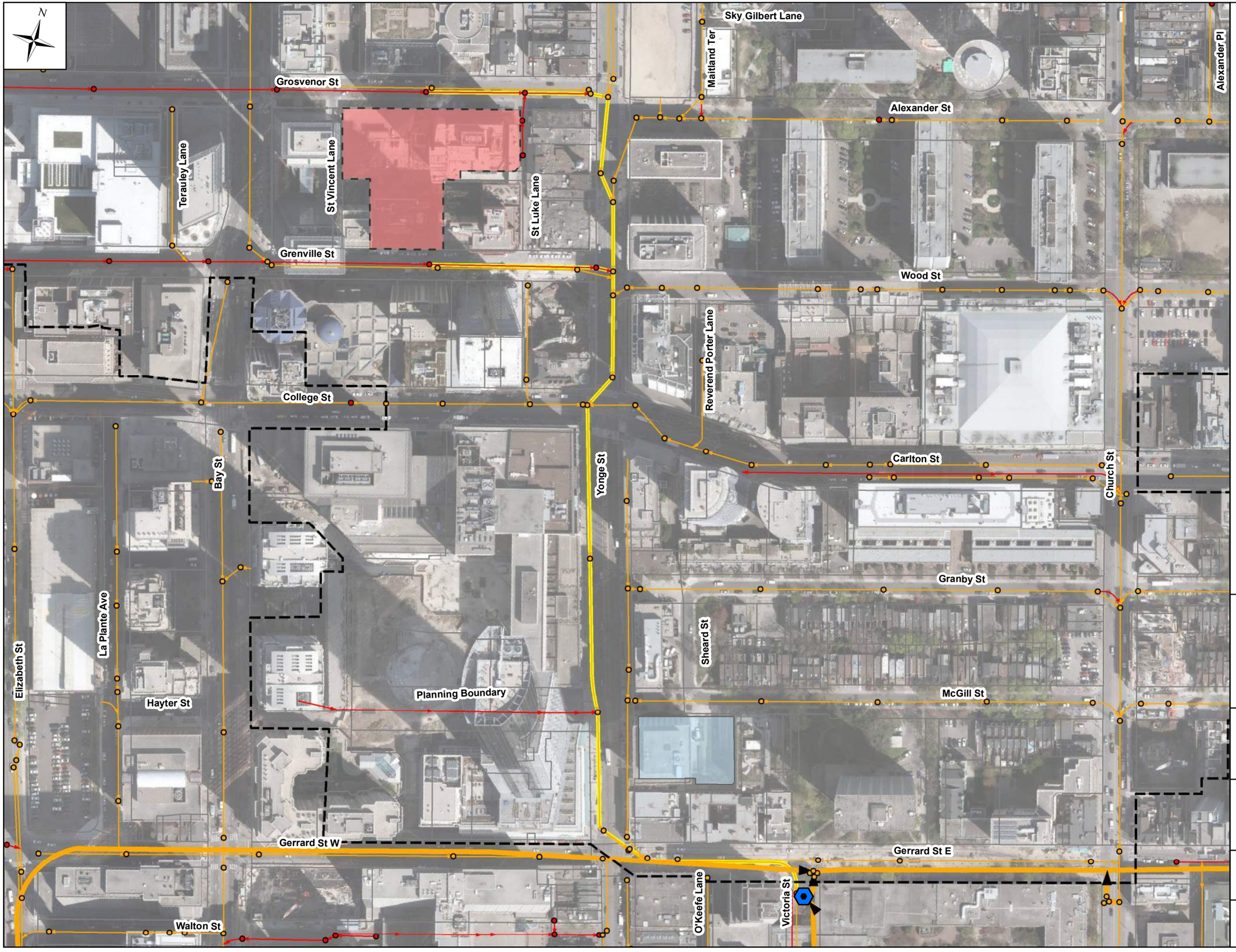
Sanitary Capacity Analysis

Figure 1:
Sanitary Tributary Drainage Area

Drawn By: R.H. Date: October 25, 2018

0 40 80 160 Meters



Legend

- Sanitary Tributary Drainage Area
- Site Location
- New Developments
- Parcels

Manholes:

- Combined
- Sanitary

Local Sewers:

- Combined
- Sanitary
- Downstream Conveyance

Trunk Sewers:

- Combined
- Sanitary

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Sanitary Capacity Analysis

Figure 2:
Downstream Conveyance of Combined Sewer Flows

Drawn By: R.H. Date: October 25, 2018

0 15 30 60
Meters

2.0 Design Sanitary Flows

2.1 Existing Sanitary Flows

The flow generation for the existing site has been obtained from City of Toronto's BPR InfoWorks ICM model. The breakdown flow generation calculation for the combined sewer under existing conditions is presented below. The total flow into the combined sewer was calculated to be 0.43 L/s.

1) Site Area = **0.61 ha**

2) Criteria for existing development:

Flow generation rate (from BPR model) =	240 L/c/d
Harmon peaking factor =	1 + 14 / [4+(Pop/1000)^0.5]
Infiltration allowance =	0.26 L/s/ha

3) Existing Population:

Population =	**22 person**
Harmon peaking factor =	**4.37**

4) Sanitary DWF to the combined sewer:

DWF = Population x Average daily flow x Harmon PF / 86400 sec/d
DWF = 22 people x 240 L/c/d x 4.37 / 86400 = **0.27 L/s**

5) Infiltration allowance contributing to the sanitary sewer:

I/I = Area x Inf. Rate
I/I = 0.61 ha x 0.26 L/s/ha = **0.16 L/s**

6) Total flow into the sanitary sewer under existing condition = Dry Weather Flow + Infiltration allowance flow:

Peak Flow = 0.27 + 0.16 **0.43 L/s**

2.2 Proposed Sanitary Flows

The flow generation parameters for the site are re-calculated in accordance to the City's criteria manual (DCSW). The expected sanitary peak flow from the proposed re-development site is 20.24 L/s. A net increase of 19.81 L/s compared to existing conditions

Grenville Connection

1) Area:

Site Area = **0.185 ha**

2) Criteria for new developments:

Sanitary flow generation rates =	250 L/c/d
Harmon Peaking Factor =	1 + 14 / [4+(Pop/1000)^0.5]

Infiltration allowance = 0.26 L/s/ha

3) Population = **958 persons**

4) Peaking Factor = **3.81**

5) Sanitary DWF:

Residential = Population x Average daily flow x Harmon PF / 86400 sec/d
Residential = 958 people x 250 L/c/d x 3.81 / 86400 = **10.56 L/s**

6) Infiltration allowance contributing to the sanitary sewer:

I/I = Area x Inf. Rate
I/I = 0.185 ha x 0.26 L/s/ha = **0.037 L/s**

7) Total flow into the sanitary sewer = Dry Weather Flow + Infiltration allowance:

Peak Flow = 10.56 L/s + 0.037 L/s = **10.60 L/s**

Grosvenor Connection

1) Area:

Site Area = **0.20 ha**

2) Criteria for new developments:

Sanitary flow generation rates = 250 L/c/d
Harmon Peaking Factor = 1 + 14 / [4+(Pop/1000)^0.5]
Infiltration allowance = 0.26 L/s/ha

3) Population = **685 persons**

4) Peaking Factor = **3.90**

5) Sanitary DWF:

Residential = Population x Average daily flow x Harmon PF / 86400 sec/d
Residential = 685 people x 250 L/c/d x 3.90 / 86400 = **7.73 L/s**

6) Infiltration allowance contributing to the sanitary sewer:

I/I = Area x Inf. Rate
I/I = 0.20 ha x 0.26 L/s/ha = **0.05 L/s**

7) Total flow into the sanitary sewer = Dry Weather Flow + Infiltration allowance:

Peak Flow = 7.73 L/s + 0.05 L/s = **7.78 L/s**

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3.0 Methodology for Total System Flow and Hydraulic Gradeline Analysis

When calculating the total flow and resulting hydraulic gradelines (HGL) in the sewer system, the population in the existing upstream and downstream areas were estimated using Toronto's BPR InfoWorks ICM model that was developed and calibrated in 2014. The flow generation from the various tributary areas upstream and downstream from the site were calculated using InfoWorks ICM hydrodynamic model.

The per capita dry-weather flow generation in the model varies from 240 L/c/d to 250 L/c/d. We understand that this value was calibrated based on the flow measurements by the City of Toronto (or their consultants). For existing and proposed conditions, the model assumes an institutional sewage generation rate of 250 L/c/d.

The runoff coefficient used in the model over impervious surfaces varies from 0.9 to 1.0. The model varies the initial loss (or initial abstraction) values and slopes according to the local conditions. Runoff over pervious areas is calculated using Horton's infiltration method.

4.0 Results

4.1 Dry-Weather Flow (DWF)

Figure 4 to **Figure 9** show the HGL under DWF conditions for both pre- and post-development conditions. **Table 1** and **Table 2** summarize the peak flows and water levels (HGL) under the pre- and post-development conditions.

Under the dry weather flow, the findings can be summarized as follows:

- Under existing and proposed conditions, the combined sewer system operates under free-flow conditions.
- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grosvenor Street at manhole MH3565014050, increases 7.70 L/s from 0.00 L/s to 7.70 L/s.
- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grenville Street at manhole MH3555114082, increases 10.49 L/s from 2.53 L/s to 13.02 L/s.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grosvenor Street (MH3565014050) increases 0.042 m from 100.333 m to 100.375 m.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grenville Street (MH3555114082) increases 0.041 m from 99.775 m to 99.816 m.
- Under proposed conditions, the peak flow at the study outlet increases 17.82 L/s, from 304.80 L/s to 322.62 L/s.
- Under proposed conditions, the HGL at the study outlet increases 0.005 m, from 88.675 m to 88.680 m.
- Note that the peak flow from the proposed site may not happen at the same time as the peak flow from the tributary area upstream.

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4.2 Dry-Weather Flow (DWF) + 2-year Stormwater Runoff

The wet-weather flow analysis combines DWF with the infiltration allowance and the runoff surface contributions for the 1 in 2-year storm flows from the site.

Peak flows and HGL elevations in the combined sewer are listed in **Table 1** and **Table 2**. **Figure 10** to **Figure 15** show pre- and post-development HGL profile in the combined sewer during the 2-year storm.

- Under existing and proposed conditions, the combined sewer system is experiencing backflow along Yonge Street from MH3563414164 to MH3541114225; however, the Freeboard in the sewer is greater than the City's 1.8 m basement flooding criteria.
- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grosvenor Street at manhole MH3565014050, increases 7.70 L/s from 0.00 L/s to 7.70 L/s.
- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grenville Street at manhole MH3555114082, increases 8.98 L/s from 112.06 L/s to 121.04 L/s.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grosvenor Street (MH3565014050) increases 0.042 m from 100.333 m to 100.375 m.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grenville Street (MH3555114082) increases 0.017 m from 100.000 m to 100.017 m.
- Under proposed conditions, the peak flow at the study outlet increases 4.97 L/s, from 3,705.95 L/s to 3,710.92 L/s.
- Under proposed conditions, the HGL at the study outlet increases 0.001 m, from 89.412 m to 89.413 m.
- Note that the peak flow from the proposed site may not happen at the same time that the peak flow from the tributary area upstream.
- Timing at flow junctions may cause minor differences in peak flow and HGL downstream of the proposed site.
- Under proposed conditions the HGL downstream of the subject site will increase as compared to existing conditions.

4.3 Dry-Weather Flow (DWF) + Extreme Wet Weather Flow Runoff

The extreme wet-weather flow analysis combines DWF with the infiltration allowance and the runoff surface contributions for the May 12, 2000 storm (as gauged at the City's Oriole Yard (Station 102) located at Sheppard Avenue and Leslie Street) and the 1 in 100-year storm flows from the site. The May 12, 2000 event is considered equivalent to a storm with a return period of 1 in 25 years.

Peak flows and HGL elevations in the combined sewer are listed in **Table 1** and **Table 2**. **Figure 16** to **Figure 19** show pre- and post-development HGL profile in the combined sewer during the May 12th, 2000 design storm. **Figure 20** to **Figure 23** show pre- and post-development HGL profile in the combined sewer during the 100-year storm.

4.3.1 May 12th, 2000 storm

- Under existing and proposed conditions, the combined sewer system is experiencing backflow along Yonge Street from MH3567914155 to MH3525714281. The Freeboard in the sewer is

anticipated to be less than the City's 1.8 m basement flooding criteria at MH3525714281 (see **Table 2** for details).

- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grosvenor Street at manhole MH3565014050, decreases 3.68 L/s from 34.01 L/s to 30.33 L/s.
- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grenville Street at manhole MH3555114082, increases 2.13 L/s from 174.17 L/s to 176.30 L/s.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grosvenor Street (MH3565014050) increases 0.009 m from 100.606 m to 100.615 m.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grenville Street (MH3555114082) increases 0.020 m from 100.261 m to 100.281 m.
- Under proposed conditions, the peak flow at the study outlet decreases 4.90 L/s, from 5,002.08 L/s to 5,006.98 L/s.
- Under proposed conditions, the HGL at the study outlet decreases 0.004 m, from 90.435 m to 90.439 m.
- Note that the peak flow from the proposed site may not happen at the same time that the peak flow from the tributary area upstream.
- Timing at flow junctions may cause minor differences in peak flow and HGL downstream of the proposed site.
- Under proposed conditions the HGL downstream of the subject site will increase as compared to existing conditions.

4.3.2 100-year storm

- Under existing and proposed conditions, the combined sewer system is experiencing backflow along Yonge Street from MH3567914155 to MH3532414257. The Freeboard in the sewer is anticipated to be less than the City's 1.8 m basement flooding criteria from MH3565014050 to MH3525214299 (see **Table 2** for details).
- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grosvenor Street at manhole MH3565014050, increases 2.84 L/s from 77.66 L/s to 80.50 L/s.
- Under proposed conditions, the peak flow immediately downstream of the propose re-development site on Grenville Street at manhole MH3555114082, increases 1.93 L/s from 199.35 L/s to 201.28 L/s.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grosvenor Street (MH3565014050) decreases 0.001 m from 104.038 m to 104.037 m.
- Under proposed conditions, the HGL at the manhole downstream of the propose re-development site on Grenville Street (MH3555114082) increases 0.049 m from 102.446 m to 102.495 m.
- Under proposed conditions, the peak flow at the study outlet decreases 15.40 L/s, from 6,385.06 L/s to 6,369.66 L/s.
- Under proposed conditions, the HGL at the study outlet decreases 0.017 m, from 91.706 m to 91.689 m.

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- Note that the peak flow from the proposed site may not happen at the same time that the peak flow from the tributary area upstream.
- Timing at flow junctions may cause minor differences in peak flow and HGL downstream of the proposed site.
- Under proposed conditions the HGL downstream of the subject site will increase as compared to existing conditions.

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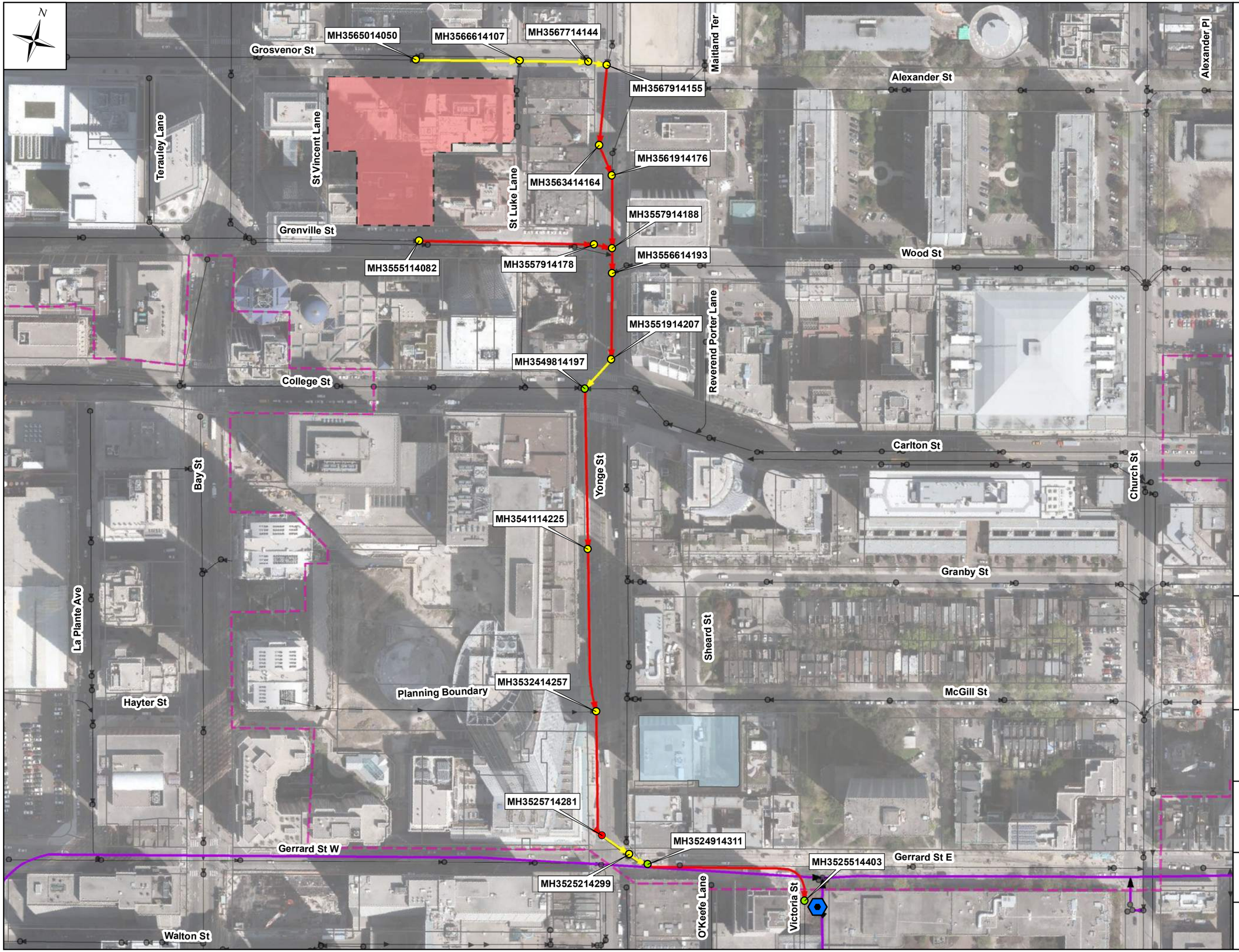


Legend

- Drainage Area
- Proposed Site
- New Development
- Land Parcel

Sewer Infrastructure

- Manhole
- Sewerline
- Trunk Sewerline

Freeboard:

- At or Above Surface Level
- Within Basement Level (0.0 m - 1.8 m)
- Below Basement (> 1.8 m)

Surcharge State:

- Surcharge - Bottleneck
- Surcharge - Backflow

CIVICA
Municipal Water Resources

25-27 Grosvenor St & 26 Grenville St
Sanitary Capacity Analysis

Figure 3:
Model Results for the
100-year Design Storm

Drawn By: R.H. Date: January 15, 2019

0 15 30 60 Meters

Table 1: Existing and proposed peak flows downstream of the proposed development site

Street Name	US node ID	DS node ID	Length (m)	Height (mm)	US invert level (m AD)	DS invert level (m AD)	Conduit Full capacity (m3/s)	Existing DWF + 2 year storm		Proposed DWF + 2 year storm		Existing DWF + May 12, 2000		Proposed DWF + May 12, 2000		Existing DWF + 100 year storm		Proposed DWF + 100 year storm	
								Max DS flow (m3/s)	Q/Qcap	Max DS flow (m3/s)	Q/Qcap	Max DS flow (m3/s)	Q/Qcap	Max DS flow (m3/s)	Q/Qcap	Max DS flow (m3/s)	Q/Qcap	Max DS flow (m3/s)	Q/Qcap
Grosvenor Street	MH3565014050	MH3566614107	59.2	300	100.313	99.792	0.091	0.0000	0%	0.0077	8%	0.0340	37%	0.0303	33%	0.0777	85%	0.0805	88%
	MH3566614107	MH3567714144	39.4	300	99.792	99.261	0.112	0.0059	5%	0.0119	11%	0.0388	35%	0.0358	32%	0.0868	78%	0.0889	79%
	MH3567714144	MH3567914155	10.7	525	99.120	98.840	0.696	0.1530	22%	0.1585	23%	0.2058	30%	0.2077	30%	0.4050	58%	0.4030	58%
Yonge Street	MH3567914155	MH3563414164	45.9	900	98.709	98.228	1.853	1.5547	84%	1.5590	84%	1.7805	96%	1.7826	96%	2.1815	**118%**	2.1835	**118%**
	MH3563414164	MH3561914176	18.7	900	98.176	98.079	1.304	1.5520	**119%**	1.5557	**119%**	1.7784	**136%**	1.7810	**137%**	2.1696	**166%**	2.1660	**166%**
	MH3561914176	MH3557914188	41.7	1050	98.158	97.670	2.954	2.0737	70%	2.0733	70%	2.3938	81%	2.3952	**81%**	3.0491	**103%**	3.0399	**103%**
Grenville Street	MH3555114082	MH3557914178	100.0	400	99.734	99.209	0.151	0.1121	74%	0.1210	80%	0.1742	**115%**	0.1763	**117%**	0.1994	**132%**	0.2013	**133%**
	MH3557914178	MH3557914188	10.4	450	98.996	98.984	0.097	0.1121	**116%**	0.1210	**125%**	0.1742	**180%**	0.1762	**182%**	0.1989	**205%**	0.2000	**206%**
Yonge Street	MH3557914188	Dummy34	4.2	1050	97.609	97.581	2.222	2.1843	98%	2.1923	99%	2.5543	**115%**	2.5575	**115%**	3.2130	**145%**	3.2055	**144%**
	Dummy34	MH3556614193	10.0	1050	97.581	97.515	2.222	2.6154	**118%**	2.6207	**118%**	3.1008	**140%**	3.1059	**140%**	3.8664	**174%**	3.8621	**174%**
	MH3556614193	MH3551914207	49.1	1050	97.484	96.972	2.789	2.6639	96%	2.6769	96%	3.4874	**125%**	3.4925	**125%**	4.4003	**158%**	4.3956	**158%**
	MH3551914207	MH3549814197	22.5	1050	96.884	95.631	6.445	2.6758	42%	2.6881	42%	3.5059	54%	3.5110	54%	4.4464	69%	4.4399	69%
	MH3549814197	MH3541114225	91.8	1200	92.251	91.663	3.121	3.0210	97%	3.0284	97%	4.0332	**129%**	4.0363	**129%**	4.7389	**152%**	4.7414	**152%**
	MH3541114225	MH3532414257	92.8	1200	91.659	91.093	3.045	3.0972	**102%**	3.1040	**102%**	4.1596	**137%**	4.1615	**137%**	5.0134	**165%**	4.9947	**164%**
	MH3532414257	MH3525714281	72.0	1200	91.074	90.526	3.402	3.2605	96%	3.2660	96%	4.4728	**131%**	4.4765	**132%**	5.7983	**170%**	5.8013	**171%**
Gerrard Street East	MH3525714281	MH3525214299	18.9	900	90.526	89.782	3.592	1.6367	46%	1.6399	46%	2.2261	62%	2.2234	62%	2.8244	79%	2.8164	78%
	MH3525214299	MH3524914311	12.4	900	89.782	89.306	3.547	1.6295	46%	1.6326	46%	2.2069	62%	2.2082	62%	2.8107	79%	2.8027	79%
	MH3524914311	MH3525514403	103.0	1350	89.306	88.490	5.400	3.7226	69%	3.7276	69%	5.0040	93%	5.0089	93%	6.3886	**118%**	6.3732	**118%**
Victoria Street	MH3525514403	FT-MH1004831	181.7	1300	88.490	87.151	4.088	3.7060	91%	3.7109	91%	5.0021	**122%**	5.0070	**122%**	6.3851	**156%**	6.3697	**156%**

Red Font = Backflow

Table 2: Existing and proposed HGL in the combined sewer downstream of the site.

Street Name	Node ID	Ground level (m)	DWF + 2 year storm				DWF + May 12, 2000 storm				DWF + 100 year storm			
			Existing Conditions HGL (m)	Proposed Conditions HGL (m)	Difference Existing vs Proposed (m)	Freeboard for Proposed Conditions (m)	Existing Conditions HGL (m)	Proposed Conditions HGL (m)	Difference Existing vs Proposed (m)	Freeboard for Proposed Conditions (m)	Existing Conditions HGL (m)	Proposed Conditions HGL (m)	Difference Existing vs Proposed (m)	Freeboard for Proposed Conditions (m)
Grosvenor Street	MH3565014050	105.476	100.333	100.375	0.042	5.101	100.606	100.615	0.009	4.861	104.038	104.037	-0.001	**1.439**
	MH3566614107	104.705	99.812	99.853	0.041	4.852	100.605	100.613	0.008	4.092	103.645	103.614	-0.031	**1.091**
	MH3567714144	104.115	99.543	99.554	0.011	4.561	100.604	100.612	0.008	3.503	103.440	103.375	-0.065	**0.740**
Yonge Street	MH3567914155	104.181	99.523	99.534	0.011	4.647	100.576	100.583	0.007	3.598	103.331	103.258	-0.073	**0.923**
	MH3563414164	103.815	99.129	99.140	0.011	4.675	100.043	100.048	0.005	3.767	102.567	102.505	-0.062	**1.310**
	MH3561914176	103.733	98.956	98.967	0.011	4.766	99.789	99.794	0.005	3.939	102.221	102.161	-0.060	**1.572**
Grenville Street	MH3555114082	103.227	100.000	100.017	0.017	3.210	100.261	100.281	0.020	2.946	102.446	102.495	0.049	**0.732**
	MH3557914178	103.114	99.266	99.278	0.012	3.836	99.401	99.406	0.005	3.708	101.671	101.610	-0.061	**1.504**
Yonge Street	MH3557914188	103.126	98.650	98.664	0.014	4.462	99.354	99.359	0.005	3.767	101.627	101.558	-0.069	**1.568**
	Dummy34	103.126	98.588	98.601	0.013	4.525	99.211	99.215	0.004	3.911	101.480	101.415	-0.065	**1.711**
	MH3556614193	102.782	98.446	98.458	0.012	4.324	98.920	98.923	0.003	3.859	101.151	101.094	-0.057	**1.688**
	MH3551914207	101.416	97.372	97.373	0.001	4.043	97.502	97.503	0.001	3.913	99.686	99.654	-0.032	**1.762**
	MH3549814197	100.944	93.347	93.357	0.010	7.587	95.381	95.392	0.011	5.552	98.873	98.855	-0.018	2.089
	MH3541114225	98.606	92.728	92.735	0.007	5.871	94.301	94.311	0.010	4.295	97.435	97.442	0.007	**1.164**
	MH3532414257	96.570	92.063	92.068	0.005	4.502	93.133	93.142	0.009	3.428	95.775	95.780	0.005	**0.790**
Gerrard Street East	MH3525714281	93.178	90.973	90.973	0.000	2.205	92.027	92.033	0.006	**1.145**	94.028	94.002	-0.026	**0.000**
	MH3525214299	94.000	90.395	90.397	0.002	3.603	91.578	91.584	0.006	2.416	93.412	93.386	-0.026	**0.614**
	MH3524914311	95.805	90.229	90.231	0.002	5.574	91.263	91.269	0.006	4.536	92.967	92.942	-0.025	2.863
Victoria Street	MH3525514403	95.378	89.412	89.413	0.001	5.965	90.435	90.439	0.004	4.939	91.706	91.689	-0.017	3.689

Red Font = Freeboard less than 1.8 m

5.0 Conclusions

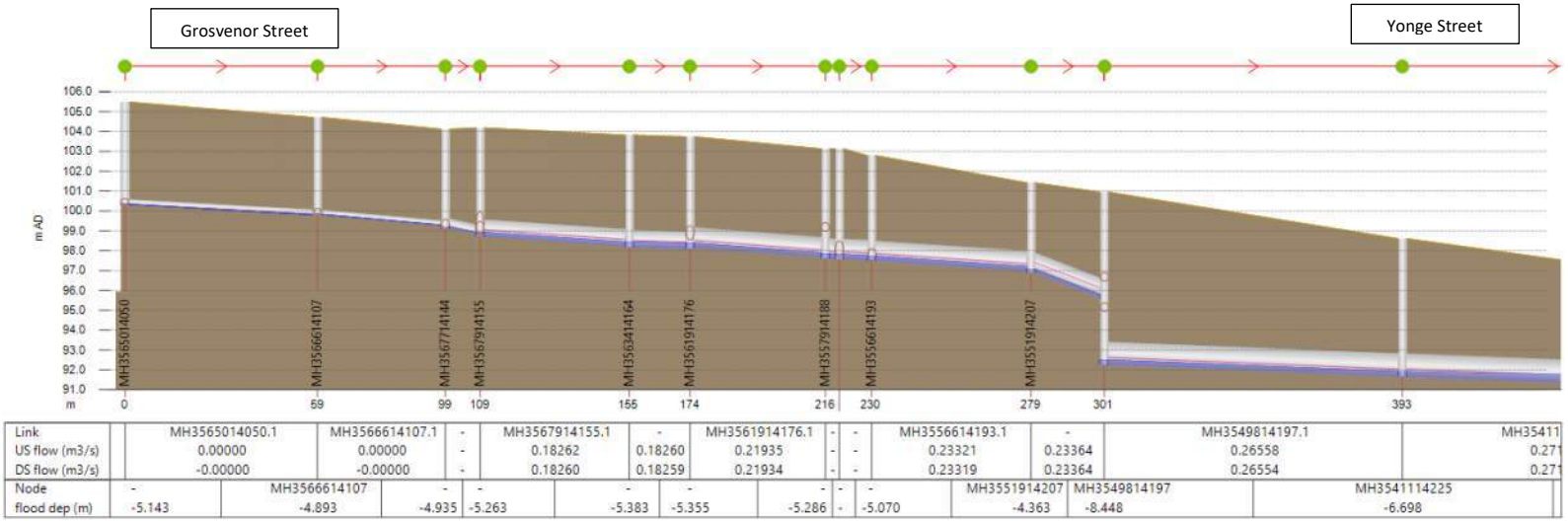
Based on the analysis and assumptions presented in the report, the findings can be summarized as follows:

1. The expected sanitary peak flow from the proposed re-development site is 18.38 L/s. A net increase of 17.95 L/s compared to existing conditions;
2. Under the May 12th, 2000 storm, in both existing and proposed conditions, the combined sewer system is surcharging from just downstream of the intersection of Yonge and Grosvenor Streets to the downstream outlet on Victoria Street. The HGL in the combined sewer system is within basement flooding levels, less than 1.8 m below the surface, at one location:
    a. In the combined sewer along Gerrard Street East, the freeboard is: 1.145 m at MH3525714281.
3. Under the 100-year storm, in both existing and proposed conditions, the combined sewer system is surcharging from upstream of the site to the downstream outlet on Victoria Street. The HGL in the combined sewer system is within basement flooding levels, less than 1.8 m below the surface, at four locations:
    a. In the combined sewer along Grosvenor Street, the freeboard is: 1.439 m at MH3565014050, 1.091 m at MH3566614107, and 0.740 m at MH3567714144;
    b. In the combined sewer along Grenville Street, the freeboard is: 0.732 m at MH3555114082, 1.504 m at MH3557914178;
    c. In the combined sewer along Yonge Street, the freeboard is: 0.923 m at MH3567914155, 1.310 m at MH3563414164, 1.572 m at MH3561914176, 1.568 m at MH3557914188, 1.711 m at Dummy34, 1.688 m at MH3556614193, 1.762 m at MH3551914207, 1.164 m at MH3541114225, 0.790 m at MH3532414257; and,
    d. In the combined sewer along Gerrard Street East, the freeboard is: at or above the surface level at MH3525714281 and 0.614 m at MH3525214299.
4. The existing sewer system does not have capacity to accommodate the proposed wet-weather flow while maintaining free-flow conditions;
5. The peak flow from the proposed site may not happen at the same time that the peak flow from the tributary area upstream;
6. Timing at flow junctions may cause minor differences in peak flow and HGL downstream of the proposed site;
7. The storm flows will be split between sites and connected to the 760-mm rectangular shaped storm sewers on both Grosvenor Street and Grenville Street; and,
8. Due to the HGL results, the existing municipal sanitary sewer cannot support the proposed re-development site without the need for external upgrades or retrofits.

6.0 Recommendations

Based on the conclusions presented in the report, the recommendations can be summarized as follows:

1. It is recommended that the implementation of a flow monitoring program be undertaken to calibrate the model to observed conditions; or,
2. The implementation of a wet weather reduction program be evaluated in an effort to increase the capacity of the combined sewer system under proposed conditions.



Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	0.00000	0.00000	-	0.18262	0.18260	0.21935	-	-	0.23321	0.23364	0.26558	0.27
DS flow (m3/s)	-0.00000	-0.00000	-	0.18260	0.18259	0.21934	-	-	0.23319	0.23364	0.26554	0.27

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-5.143	-4.893	-4.935	-5.263	-5.383	-5.355	-5.286	-	-5.070	-4.363	-8.448	-6.698

Figure 4: Existing HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF (Profile 1 of 3)

Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	0.00772	0.00770	-	0.18996	0.18996	0.22672	-	-	0.25070	0.25113	0.28324	0.289
DS flow (m3/s)	0.00770	0.00768	-	0.18996	0.18996	0.22673	-	-	0.25068	0.25114	0.28323	0.288

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-5.101	-4.852	-4.925	-5.259	-5.380	-5.353	-5.278	-	-5.064	-4.358	-8.442	-6.691

Figure 5: Proposed HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF (Profile 1 of 3)

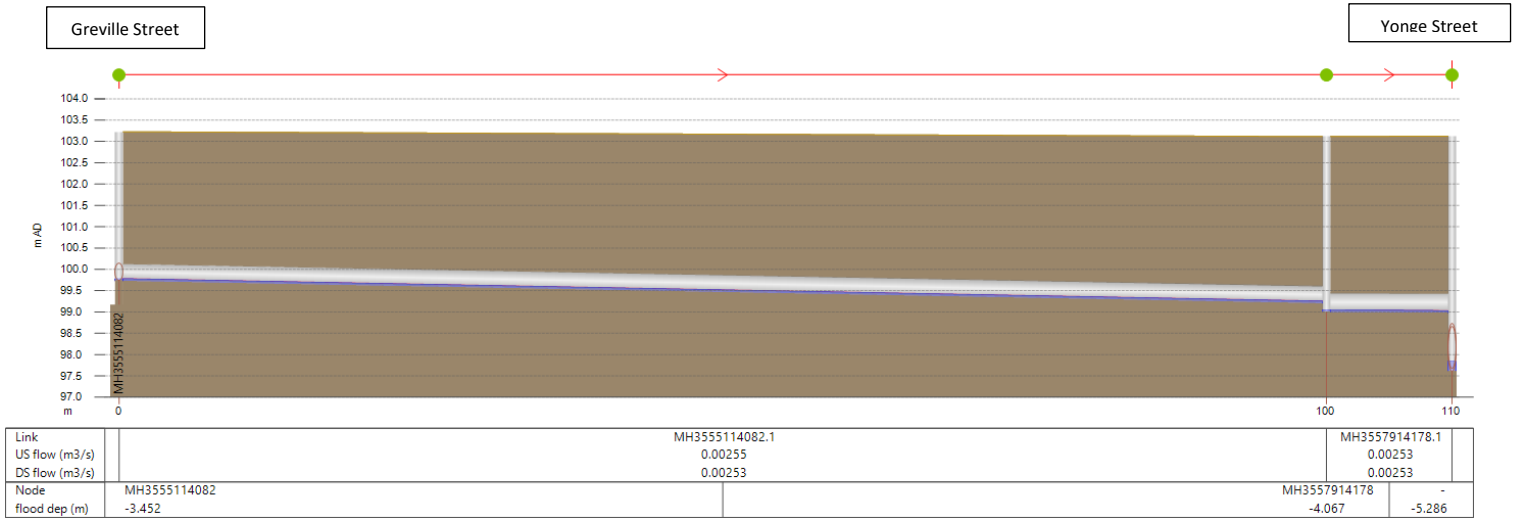


Figure 6: Existing HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF (Profile 2 of 3)

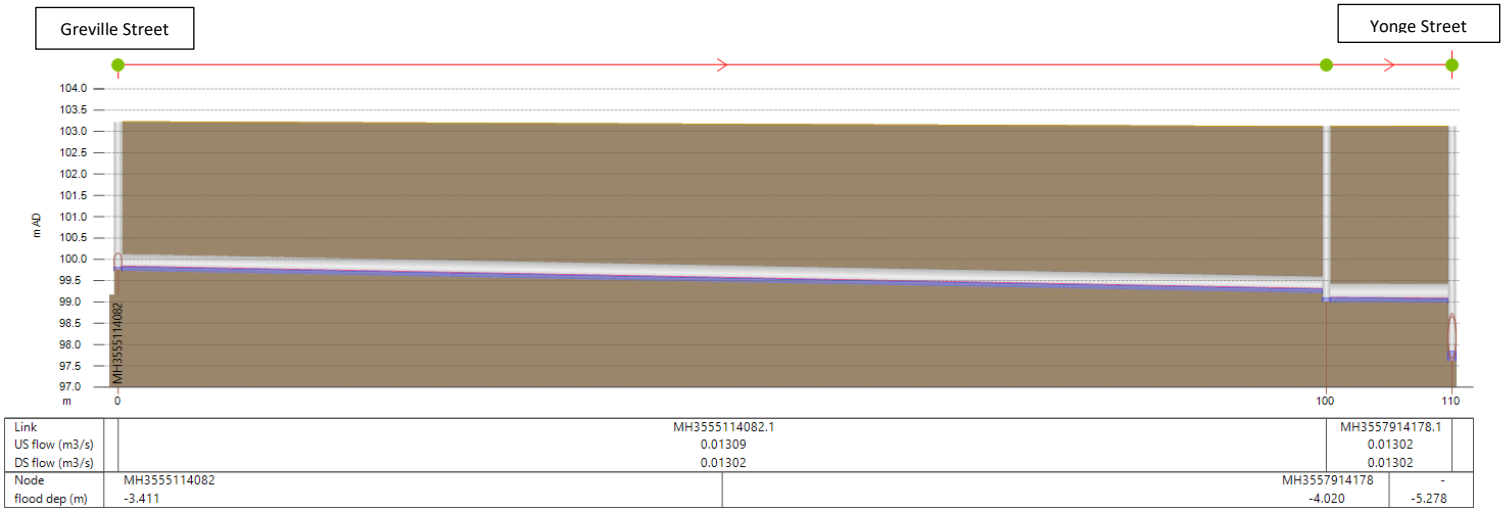
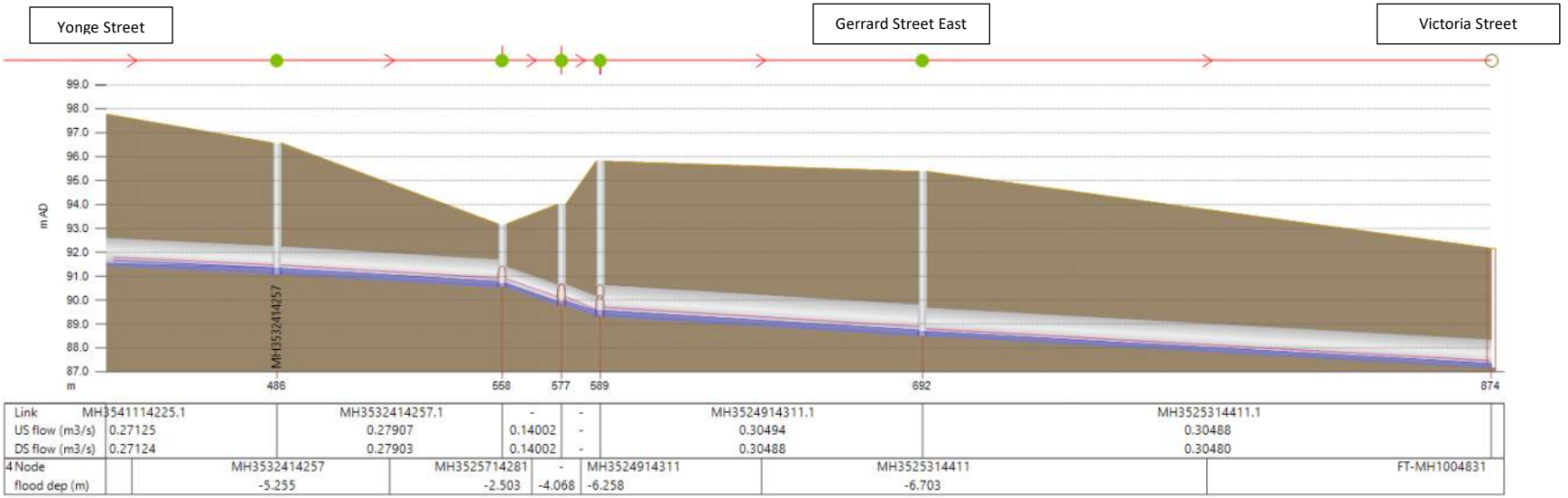


Figure 7: Proposed HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF (Profile 2 of 3)

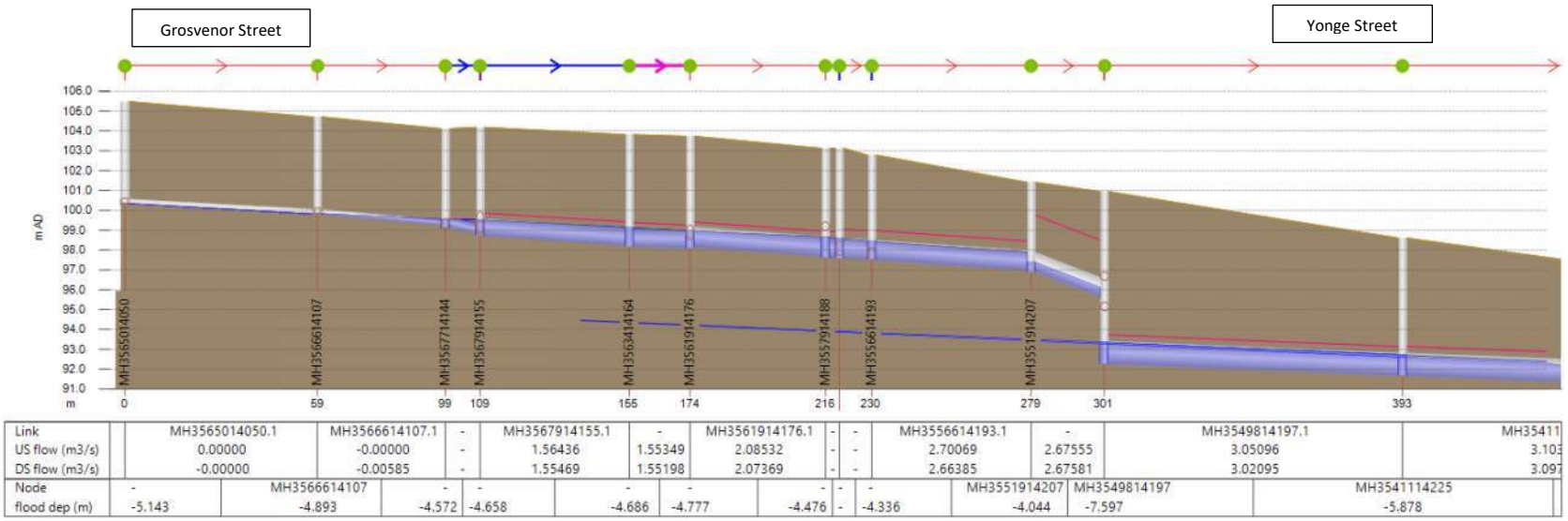


Link	MH3541114225.1	MH3532414257.1	-	-	MH3524914311.1	MH3525314411.1	
US flow (m3/s)	0.27125	0.27907	0.14002	-	0.30494	0.30488	
DS flow (m3/s)	0.27124	0.27903	0.14002	-	0.30488	0.30480	
4 Node		MH3532414257	MH3525714281	-	MH3524914311	MH3525314411	FT-MH1004831
flood dep (m)		-5.255	-2.503	-4.068	-6.258	-6.703	

Figure 8: Existing HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF (Profile 3 of 3)

Link	MH3541114225.1	MH3532414257.1	-	-	MH3524914311.1	MH3525314411.1	
US flow (m3/s)	0.28900	0.29684	0.14892	-	0.32278	0.32274	
DS flow (m3/s)	0.28894	0.29680	0.14892	-	0.32275	0.32262	
4 Node		MH3532414257	MH3525714281	-	MH3524914311	MH3525314411	FT-MH1004831
flood dep (m)		-5.249	-2.500	-4.065	-6.251	-6.698	

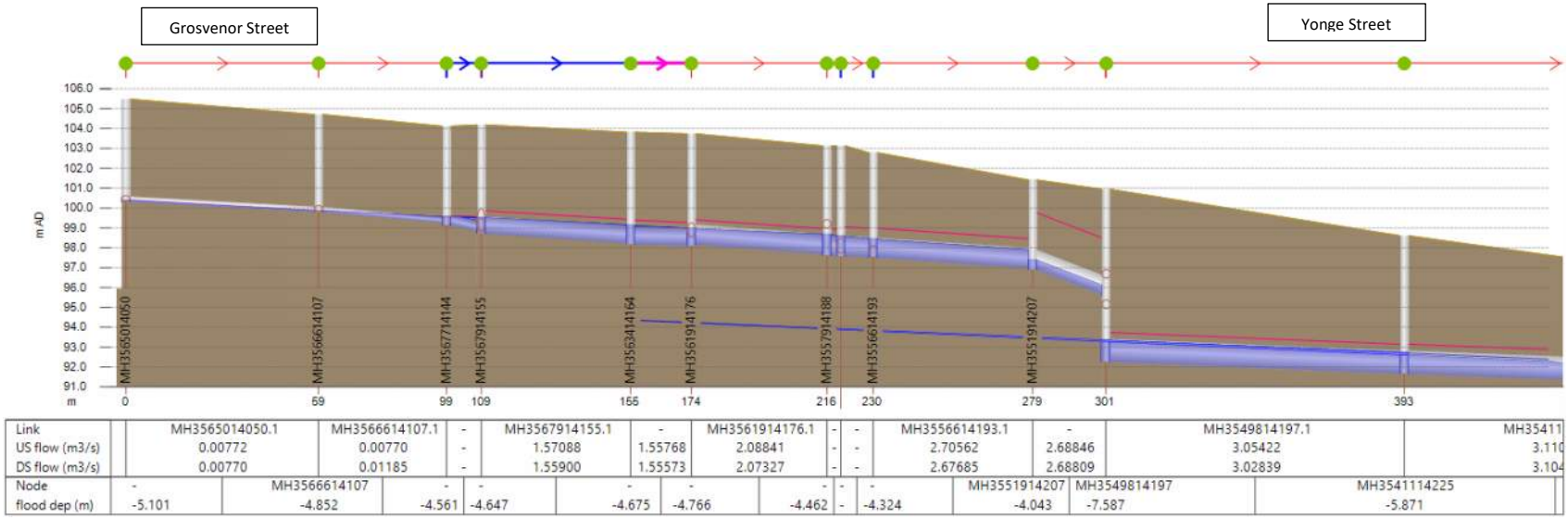
Figure 9: Proposed HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF (Profile 3 of 3)



Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	0.00000	-0.00000	-	1.56436	1.55349	2.08532	-	-	2.70069	2.67555	3.05096	3.103
DS flow (m3/s)	-0.00000	-0.00585	-	1.55469	1.55198	2.07369	-	-	2.66385	2.67581	3.02095	3.097

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-5.143	-4.893	-4.572	-4.658	-4.686	-4.777	-4.476	-4.336	-4.044	-7.597	-5.878	

Figure 10: Existing HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF + 2-year design storm (Profile 1 of 3)



Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	0.00772	0.00770	-	1.57088	1.55768	2.08841	-	-	2.70562	2.68846	3.05422	3.110
DS flow (m3/s)	0.00770	0.01185	-	1.55900	1.55573	2.07327	-	-	2.67685	2.68809	3.02839	3.104

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-5.101	-4.852	-4.561	-4.647	-4.675	-4.766	-4.462	-4.324	-4.043	-7.587	-5.871	

Figure 11: Proposed HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF + 2-year design storm (Profile 1 of 3)

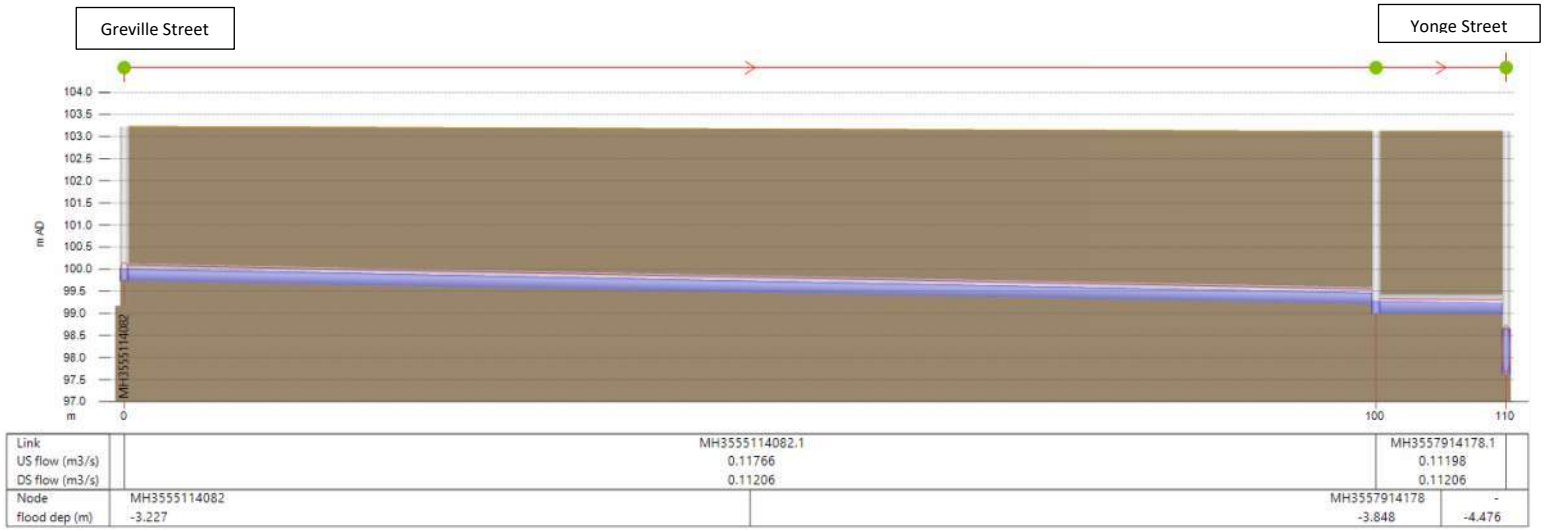


Figure 12: Existing HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF + 2-year design storm (Profile 2 of 3)

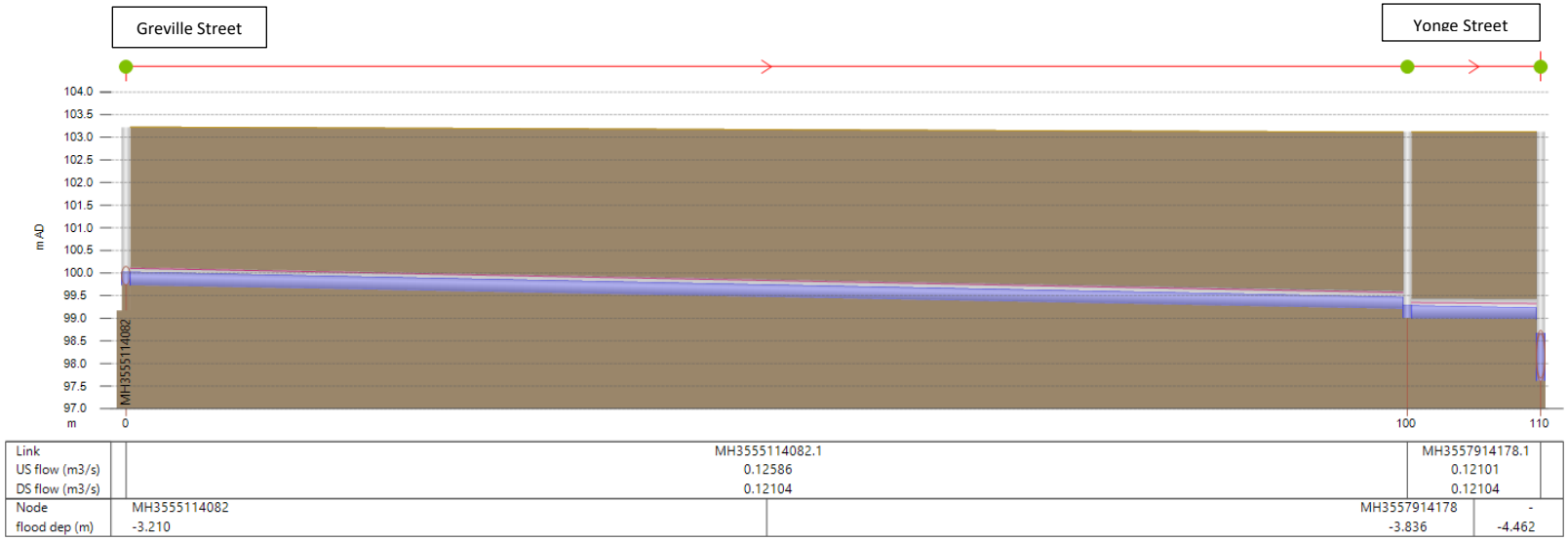


Figure 13: Proposed HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF + 2-year design storm (Profile 2 of 3)

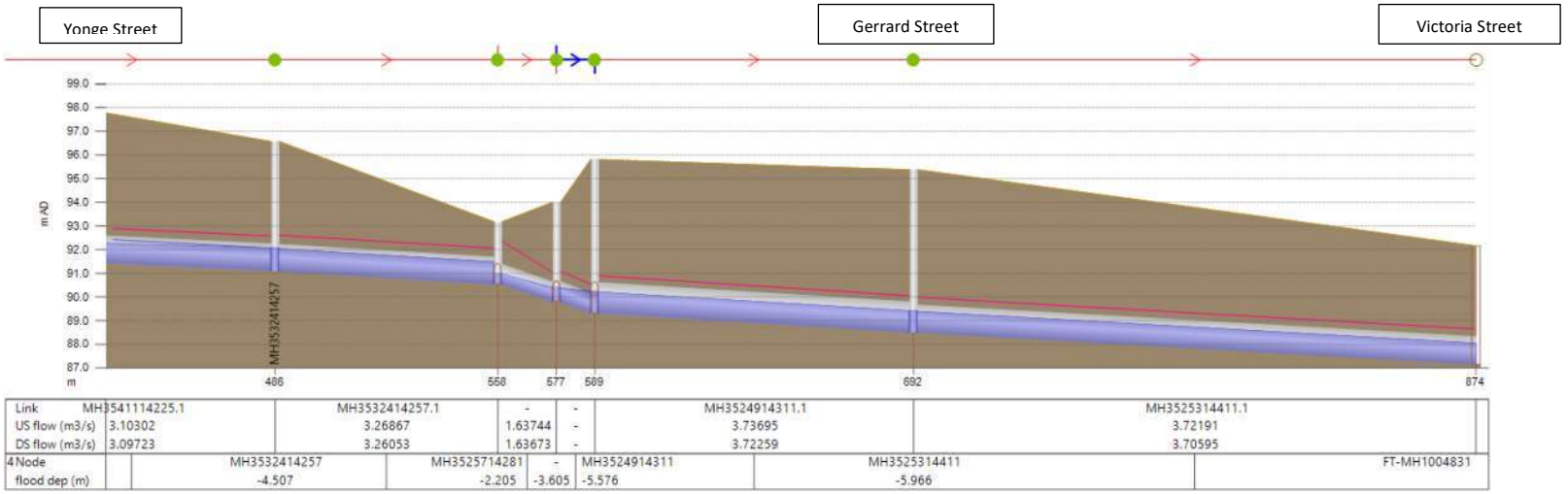


Figure 14: Existing HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF + 2-year design storm (Profile 3 of 3)

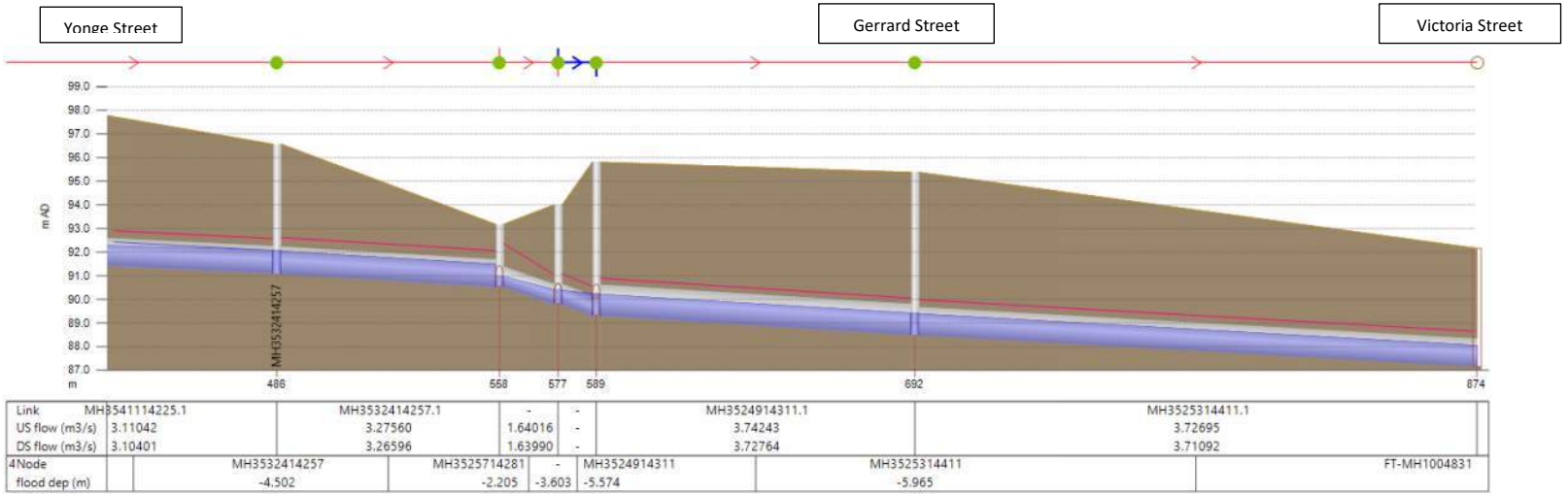
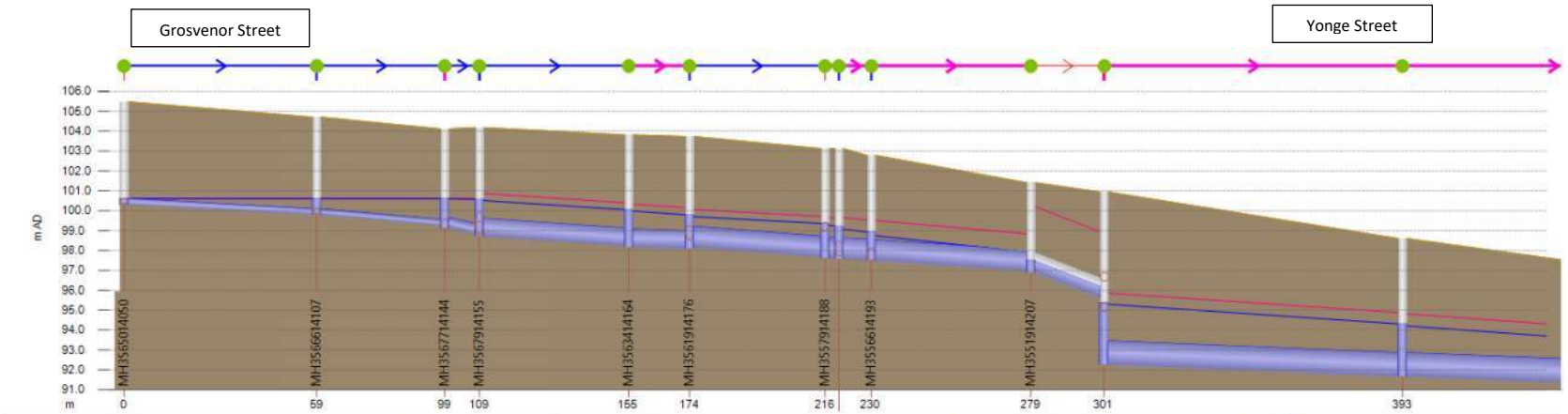


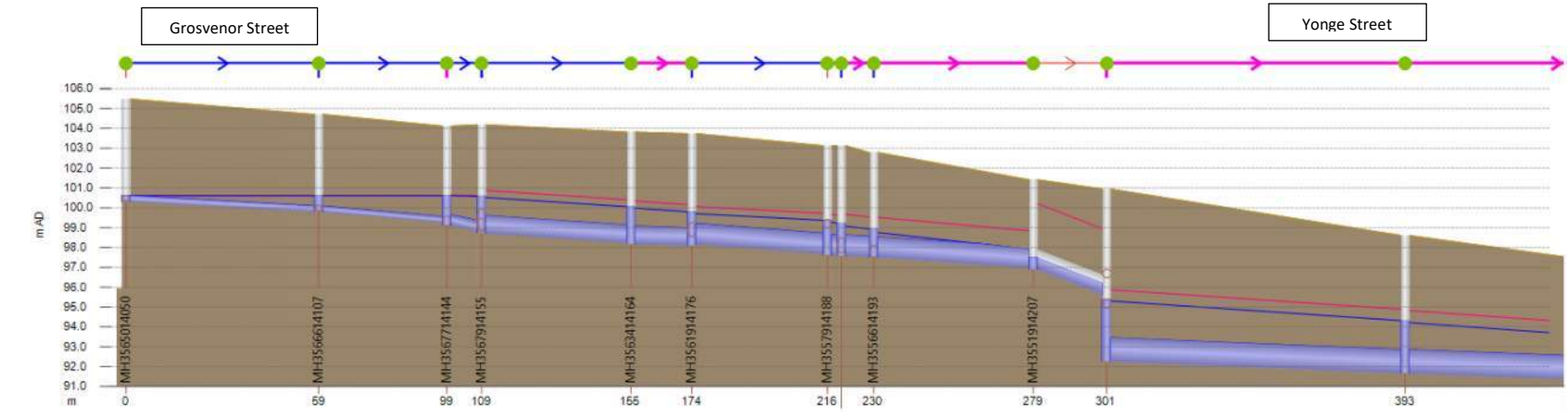
Figure 15: Proposed HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF + 2-year design storm (Profile 3 of 3)



Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	-0.01603	-0.03849	-	1.78176	1.77858	2.39332	-	-	3.48771	3.50658	4.03709	4.164
DS flow (m3/s)	-0.03401	-0.03881	-	1.78048	1.77844	2.39380	-	-	3.48737	3.50588	4.03316	4.159

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-4.870	-4.100	-3.511	-3.605	-3.772	-3.944	-3.772	-	-3.862	-3.914	-5.563	-4.305

Figure 16: Existing HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF + May 12th, 2000 storm (Profile 1 of 3)



Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	-0.01587	-0.03509	-	1.78394	1.78111	2.39485	-	-	3.49284	3.51171	4.03989	4.166
DS flow (m3/s)	-0.03033	-0.03575	-	1.78258	1.78096	2.39522	-	-	3.49249	3.51103	4.03631	4.161

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-4.861	-4.092	-3.503	-3.598	-3.767	-3.939	-3.767	-	-3.859	-3.913	-5.552	-4.295

Figure 17: Proposed HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF + May 12th, 2000 storm (Profile 1 of 3)

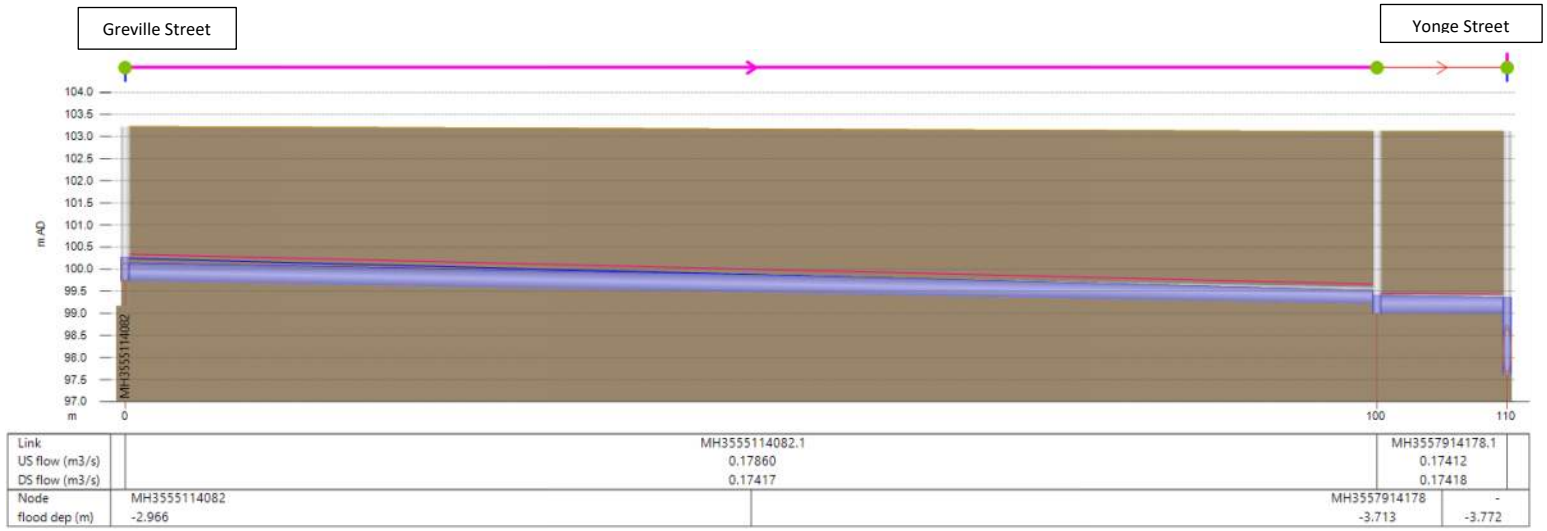


Figure 18: Existing HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF + May 12th, 2000 storm (Profile 2 of 3)

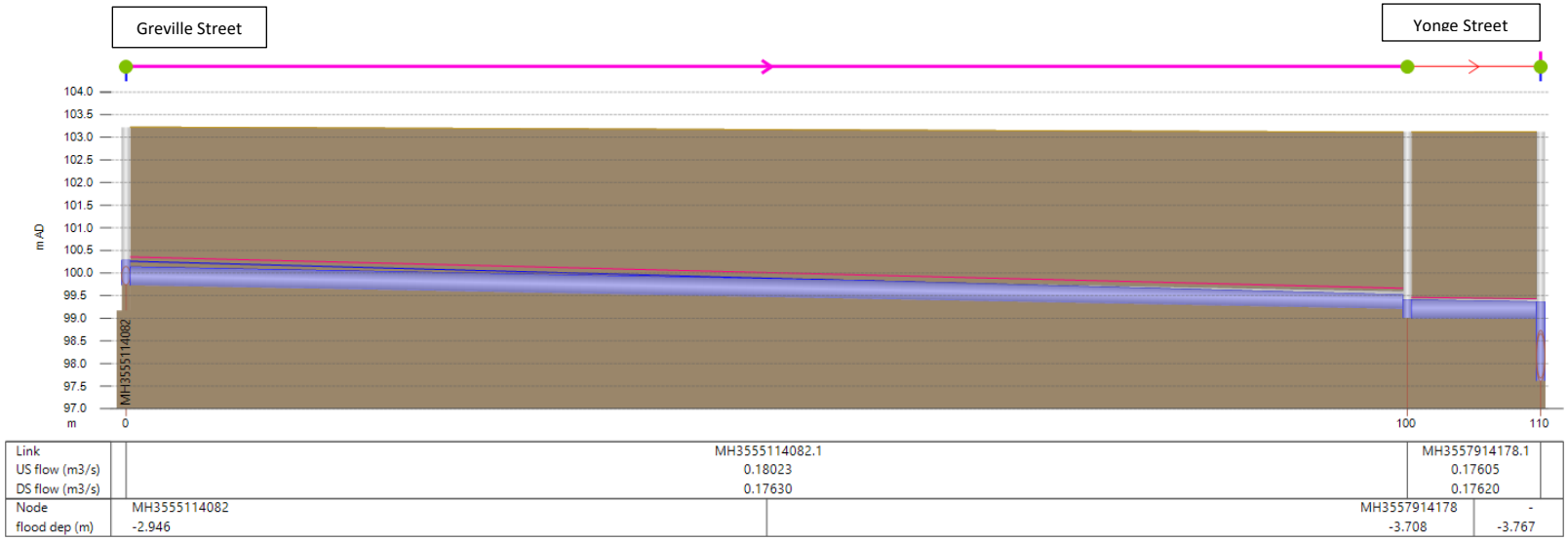


Figure 19: Proposed HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF + May 12th, 2000 storm (Profile 2 of 3)

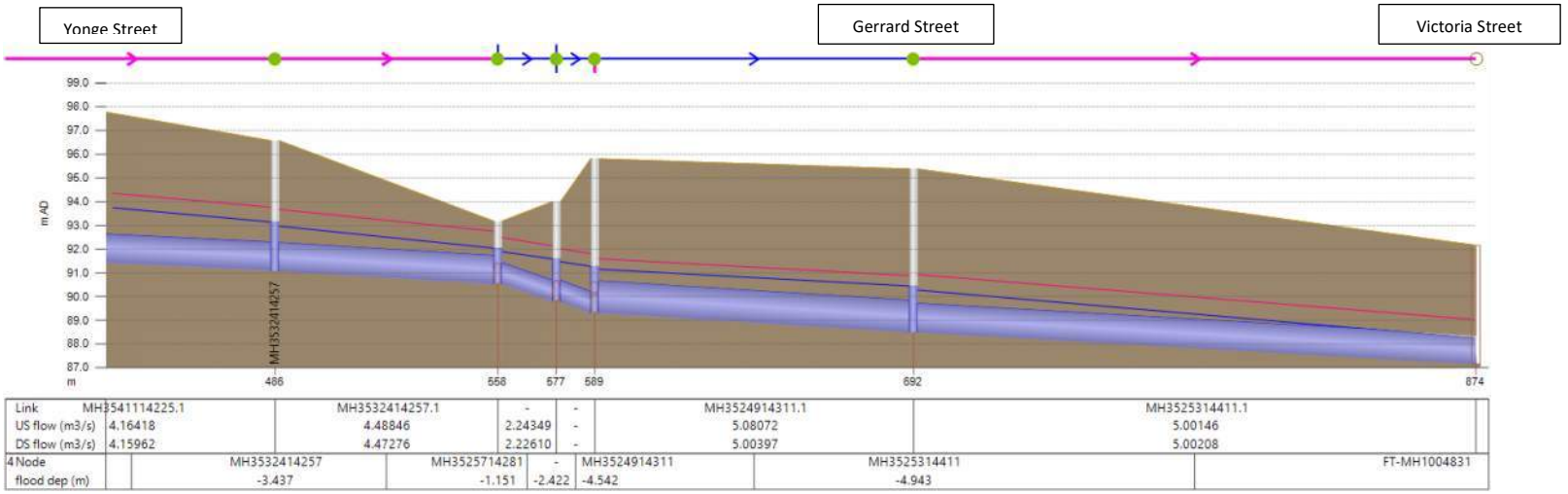


Figure 20: Existing HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF + May 12th, 2000 storm (Profile 3 of 3)

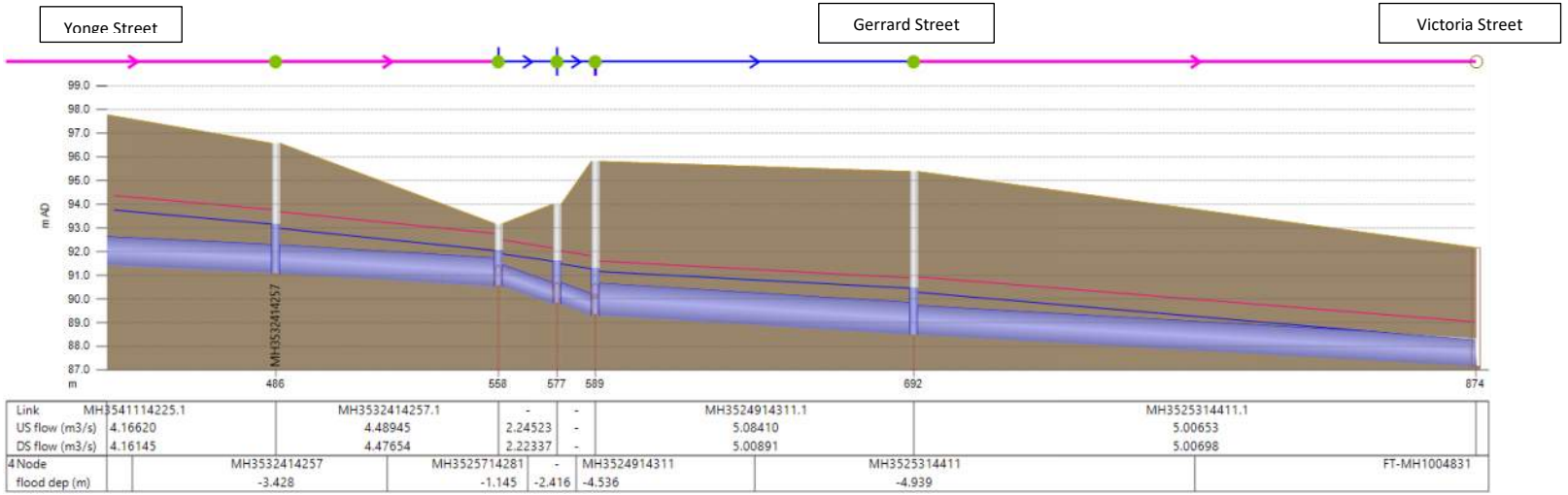
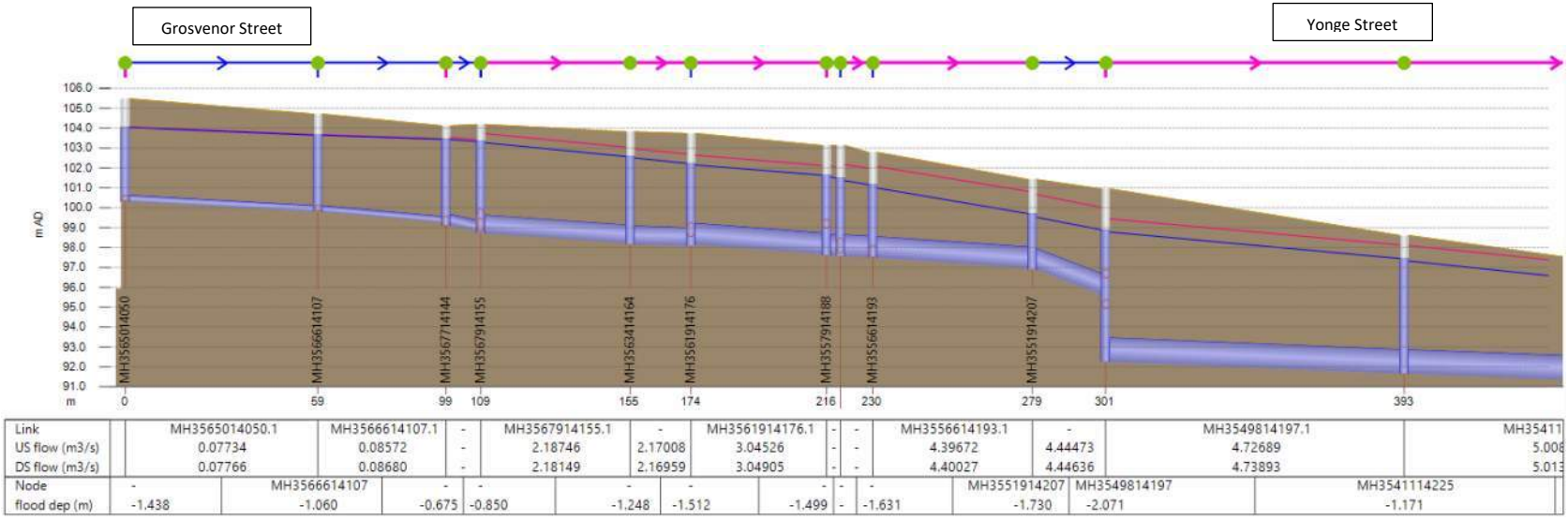


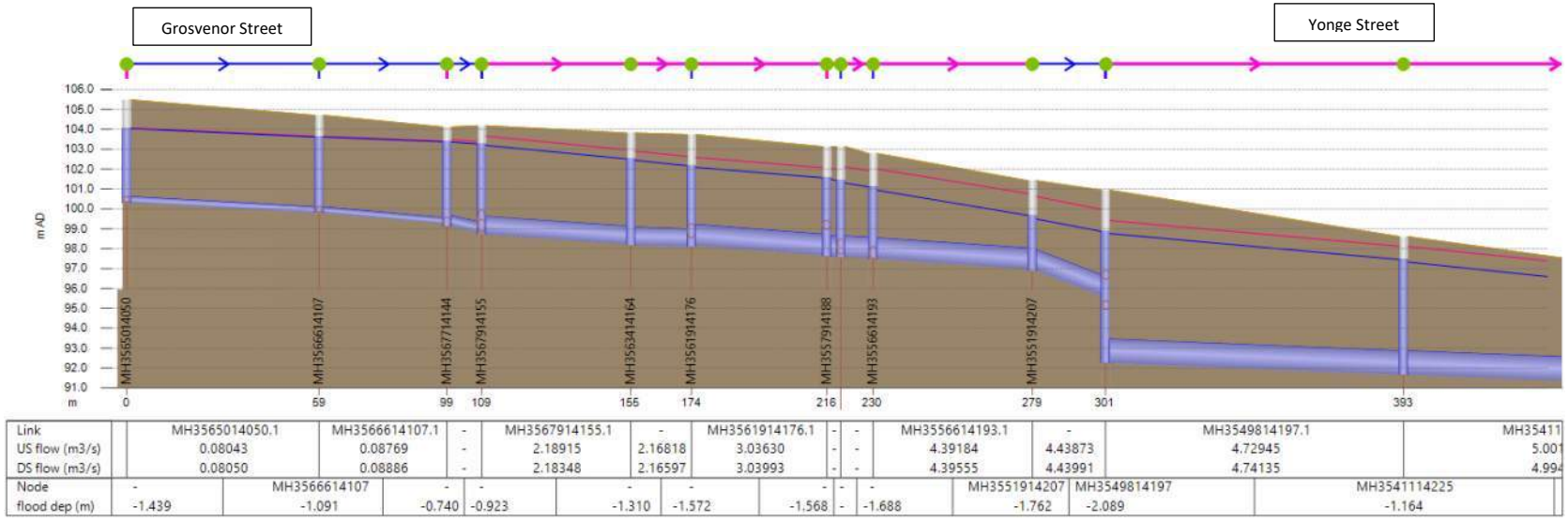
Figure 21: Proposed HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF + May 12th, 2000 storm (Profile 3 of 3)



Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	0.07734	0.08572	-	2.18746	2.17008	3.04526	-	-	4.39672	4.44473	4.72689	5.008
DS flow (m3/s)	0.07766	0.08680	-	2.18149	2.16959	3.04905	-	-	4.40027	4.44636	4.73893	5.013

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-1.438	-1.060	-0.675	-0.850	-1.248	-1.512	-1.499	-	-1.631	-1.730	-2.071	-1.171

Figure 22: Existing HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF + 100-year design storm (Profile 1 of 3)



Link	MH3565014050.1	MH3566614107.1	-	MH3567914155.1	-	MH3561914176.1	-	-	MH3556614193.1	-	MH3549814197.1	MH35411
US flow (m3/s)	0.08043	0.08769	-	2.18915	2.16818	3.03630	-	-	4.39184	4.43873	4.72945	5.001
DS flow (m3/s)	0.08050	0.08886	-	2.18348	2.16597	3.03993	-	-	4.39555	4.43991	4.74135	4.994

Node	-	MH3566614107	-	-	-	-	-	-	-	MH3551914207	MH3549814197	MH3541114225
flood dep (m)	-1.439	-1.091	-0.740	-0.923	-1.310	-1.572	-1.568	-	-1.688	-1.762	-2.089	-1.164

Figure 23: Proposed HGL profile in the combined sewer from Grosvenor Street to Yonge Street under DWF + 100-year design storm (Profile 1 of 3)

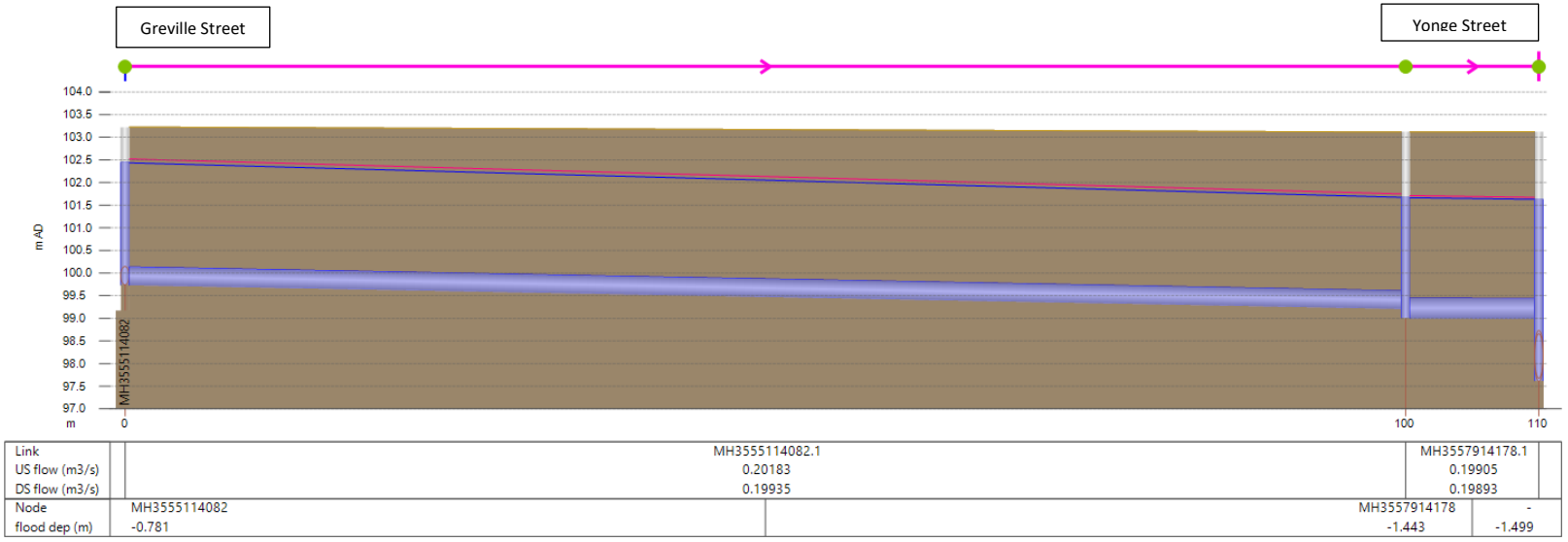


Figure 24: Existing HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF + 100-year design storm (Profile 2 of 3)

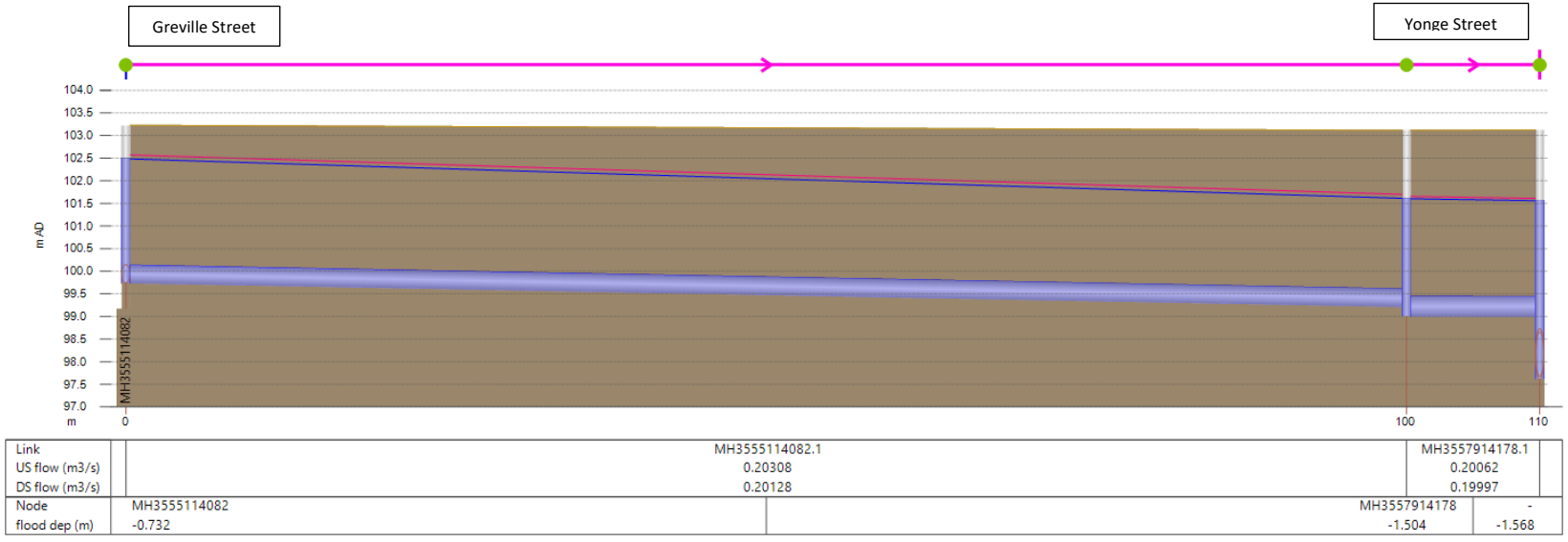


Figure 25: Proposed HGL profile in the combined sewer from Grenville Street to Yonge Street under DWF + 100-year design storm (Profile 2 of 3)

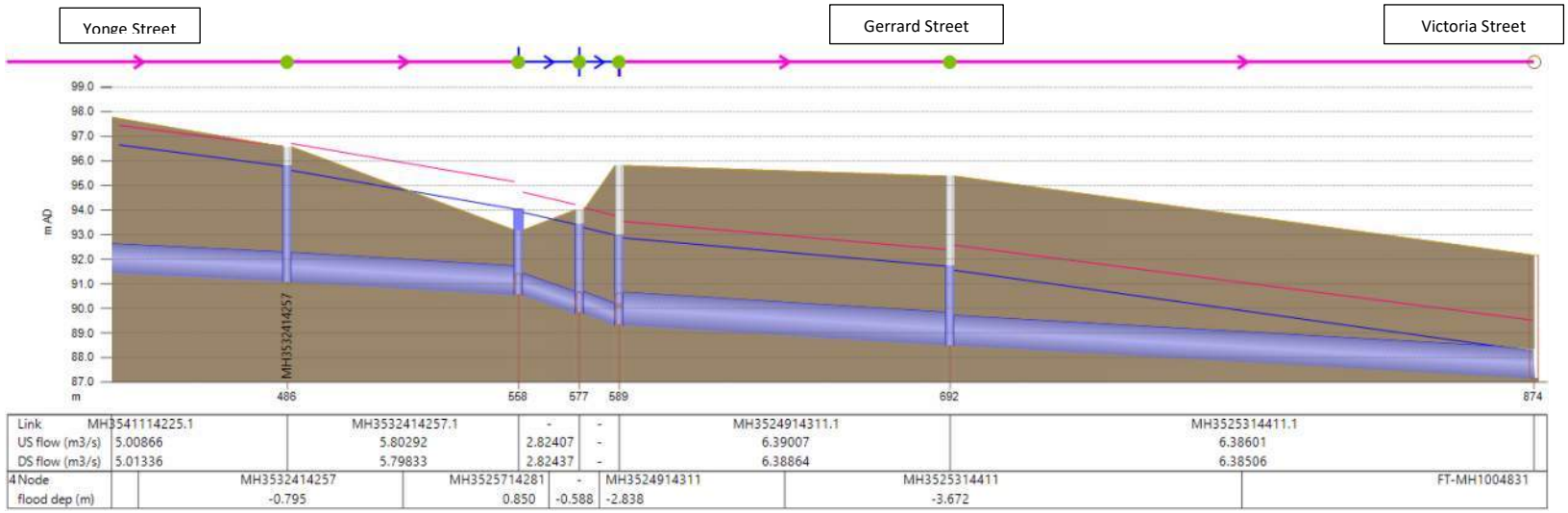


Figure 26: Existing HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF + 100-year design storm (Profile 3 of 3)

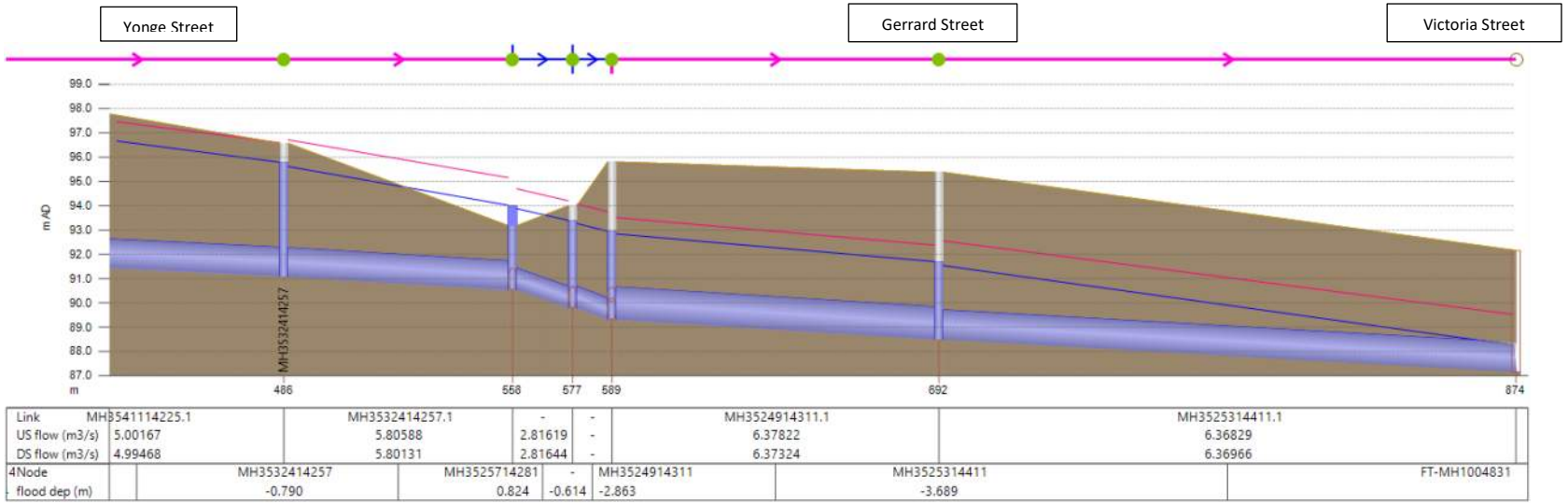


Figure 27: Proposed HGL profile in the combined sewer from Yonge Street to the outlet on Victoria Street under DWF + 100-year design storm (Profile 3 of 3)

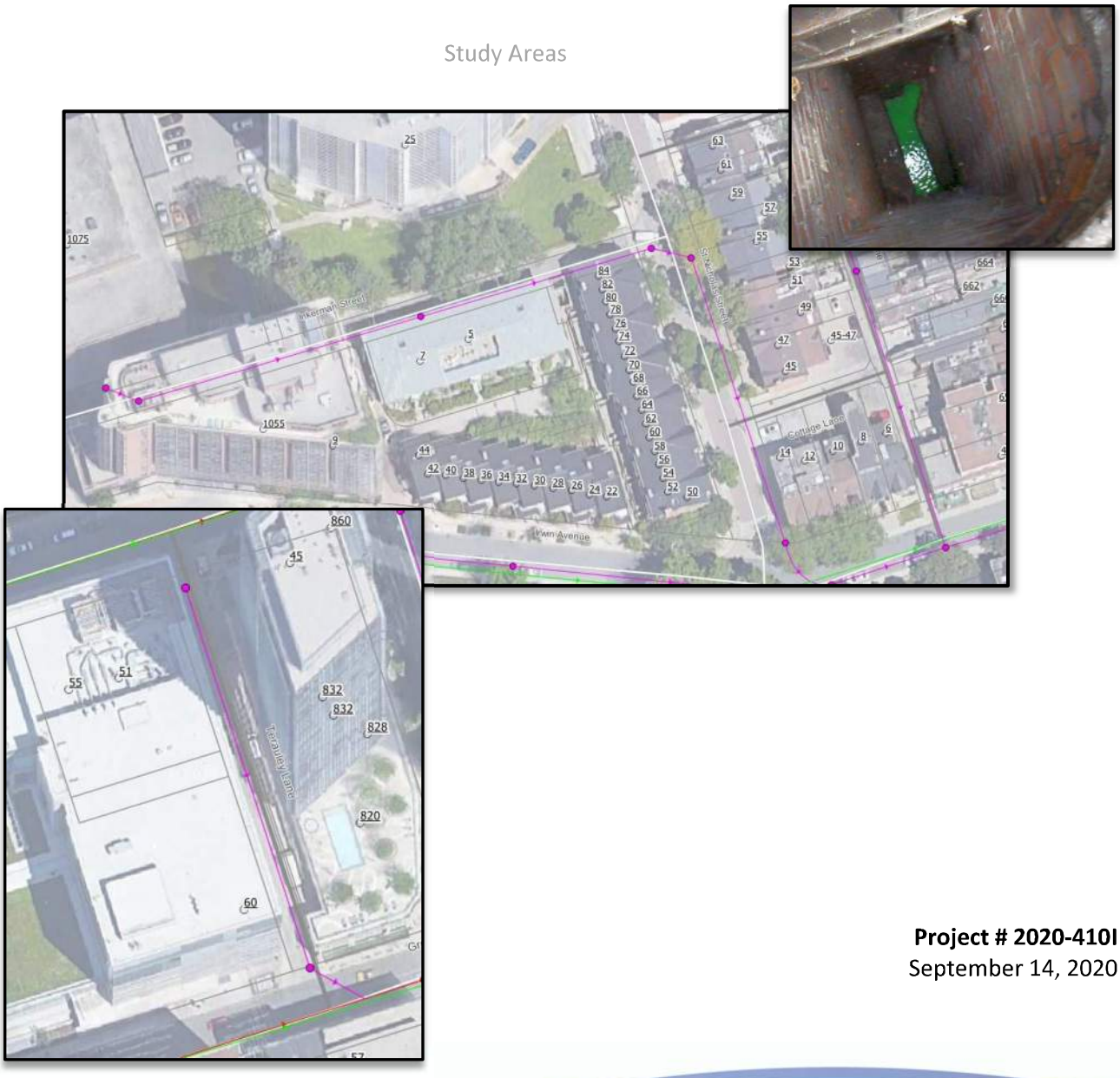
Counterpoint Engineering Inc.

Infrastructure Intelligence Services Inc.

INTEGRITY | COLLABORATION | PERFORMANCE

Dye Testing Results
26 Grenville Street Project

Study Areas



Project # 2020-410I
September 14, 2020

615 Main St. E.
Milton, Ontario
L9T 3J2

905-699-1065
info@i2sinc.ca
I2Sinc.ca

September 14, 2020

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100
Vaughan, ON
L4K 5Y2

I2S Infrastructure Intelligence Services Inc.
INTEGRITY | COLLABORATION | PERFORMANCE

Att: Rasheed Serrao

RE: Dye Testing Results
26 Grenville Street Project
Toronto, Ontario

Infrastructure Intelligence Services Inc. (I2S Inc.) is pleased to submit the attached results of the dye testing at public inlets on several nearby streets and lanes. Specifically Terauley Lane, Cottage Lane and St. Nicholas Street/Inkerman Street were tested. The work was undertaken on August 20, 2020, and the findings are as follows:

Terauley Lane:

- Two catch basins were identified in Terauley Lane.
- The catch basin near the northern end of the Lane was documented to be connected to the combined sewer. The combined sewer manhole at the north end of the Lane was found to be dry, and the combined sewer manhole at the south end of the Lane had very limited flow.
- The second catch basin, located at the south end of the Lane was documented to be connected to the storm sewer.

Cottage Lane:

- One catch basin was identified in Cottage Lane. The catch basin was documented to be connected to the storm sewer.

St. Nicholas Street/Inkerman Street:

- Nine catch basins were identified in the study area of St. Nicholas Street and Inkerman Street.
- Seven of the catch basins were documented to be connected to the combined sewer.

Based on the catch basin locations, documented connectivity and general topographical observations contributing to assumed surface flow direction, the City of Toronto's document *Design Criteria for Sewers and Watermains* was used to estimate potential off-set flows from the study areas.

The estimated catchment area contributing to the combined sewer from the St. Nicholas Street/Inkerman Street area was 1300 m^2 which may provide an off-set of approximately 28.68 L/s. Our supporting calculations are presented in **Appendix C.**

We would recommend undertaking a detailed topographic survey to confirm the above assumptions and then updating the calculations as required.

Please feel free to contact the undersigned if you have questions/comments.

Sincerely,

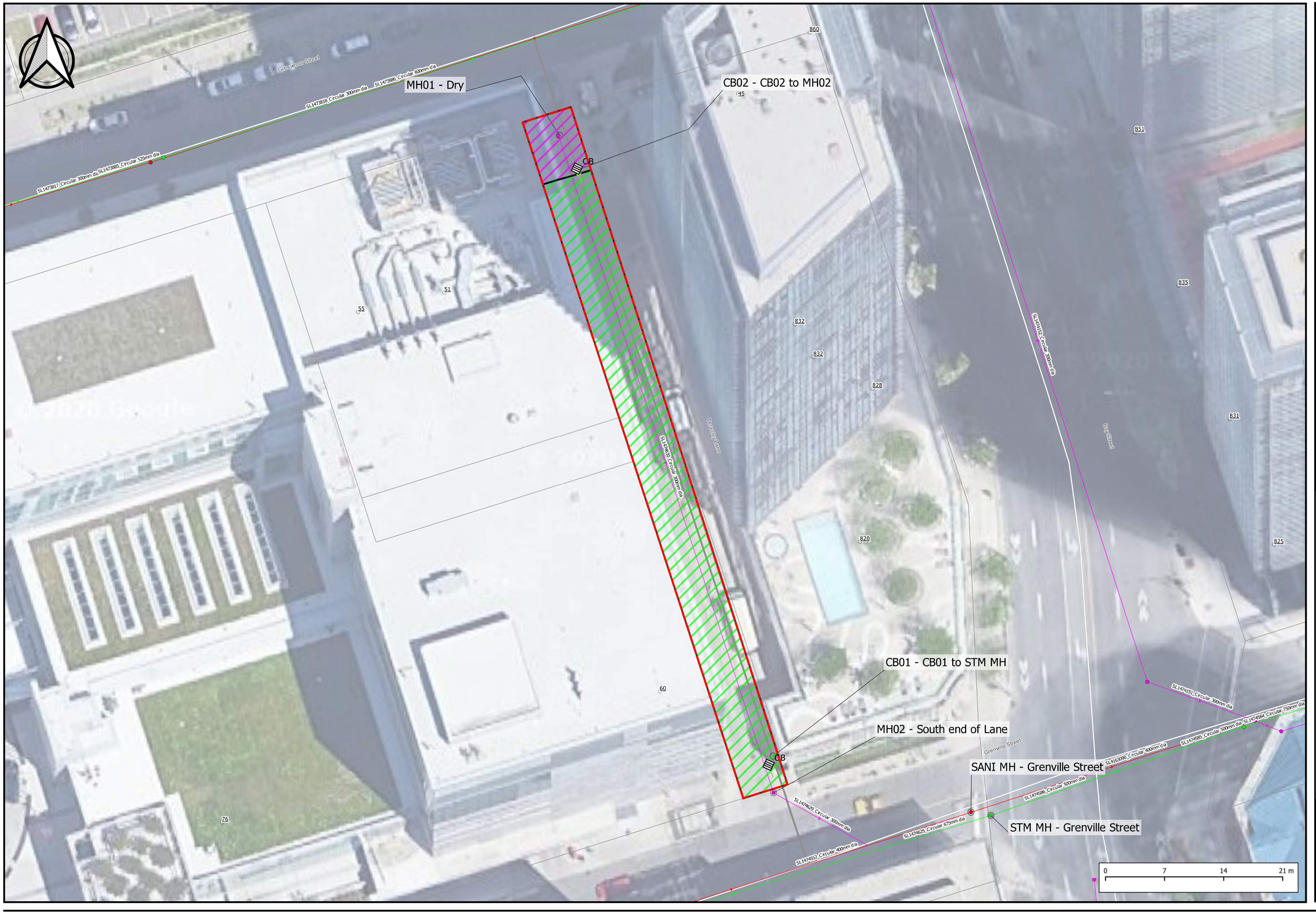
Alyssa Ambrose
Project Manager, I&I Services
Tel.: 647-887-8354
Email: alyssa.ambrose@i2sinc.ca

Niall Quinlan
Manager, I&I Services
Tel.: 647-229-9175
Email: niall.quinlan@i2sinc.ca

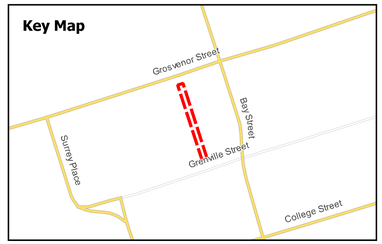
CC'd:
Attached: Dye Testing Results

Appendix A

Investigation Maps



Key Map



General Notes

I

Map Legend

- Extent
- Drainage Features
  - CB
  - MH
  - Manhole
  - Drain
- Sewer Lines
  - Combined
  - Storm
- Drainage Area - Outlet
  - Combined Sewer
  - Surface Overland
  - Storm Sewer

Sources:
Projection System: NAD 83 UTM ZONE 17N

Prepared By:

Associated With:

counterpoint ENGINEERING

Drawn: Alyssa Ambrose Sep 15, 2020

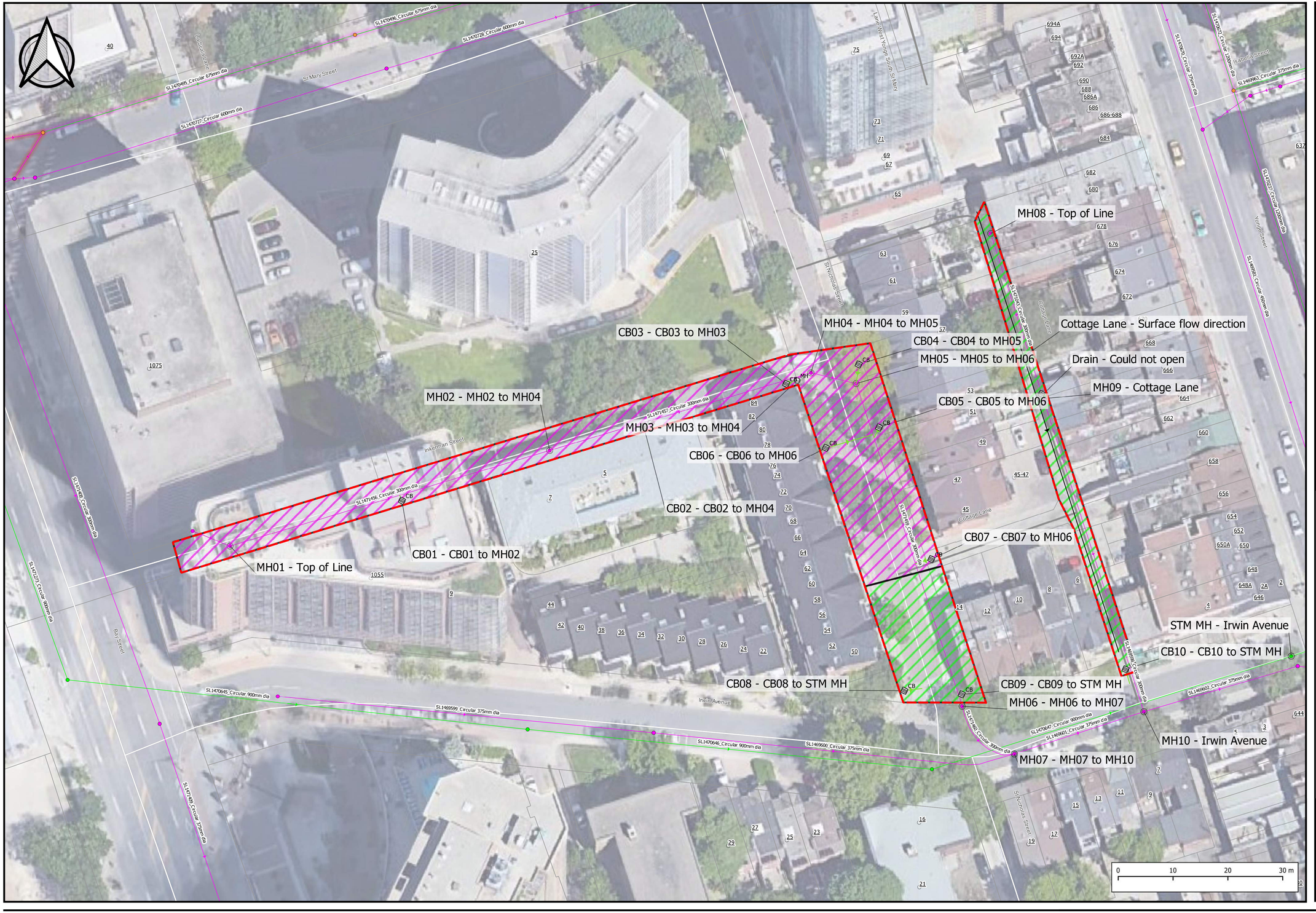
Checked: Niall Quinlan

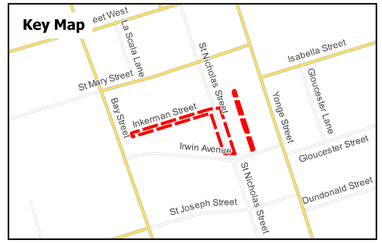
Approved:

Revision History

Project: 26 Grenville St I&I Off-Set - Terauley Lane

Project #: 2020-410I





General Notes

Map Legend

- Extent

Drainage Features
- CB
- Manhole
- Drain

Sewer Lines
- Combined
- Storm

Drainage Area - Outlet
- Combined Sewer
- Surface Overland
- Storm Sewer

Sources:
Projection System: NAD 83 UTM ZONE 17N

Prepared By:

Associated With:

Drawn: Alyssa Ambrose Sep 15, 2020

Checked: Niall Quinlan

Approved:

Revision History

Project: 26 Grenville St I&I Off-Set - St. Nicholas St/Inkerman St and Cottage Lane

Project #: 2020-410I

Appendix B

Photo Pages

Site ID: 26 Grenville Street Project **Date:** August 20, 2020 **Location:** Terauley Lane **Reference** Dye Testing Results

CB01 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Storm sewer on Grenville Street
Other Comments	

Observed Dye Location

Storm sewer on Grenville Street

CB02 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer in Terauley Lane
Other Comments	

Observed Dye Location

Combined sewer in Terauley Lane

Site ID: 26 Grenville Street Project	**Date:** August 20, 2020	**Location:** Cottage Lane	**Reference** Dye Testing Results

CB10 - Results

Dye Testing	
Test Completed	No
Sewer Outlet	Storm sewer on Irwin Avenue
Other Comments	Knock test used to confirm connectivity to storm sewer

Site ID: 26 Grenville Street Project **Date:** August 20, 2020 **Location:** St. Nicholas St/Inkerman Street **Reference** Dye Testing Results

CB01 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer on Inkerman Street
Other Comments	

Observed Dye Location

Combined sewer on Inkerman Street

CB02 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer on Inkerman Street
Other Comments	

Observed Dye Location

Combined sewer on Inkerman Street

Site ID: 26 Grenville Street Project **Date:** August 20, 2020 **Location:** St. Nicholas St/Inkerman Street **Reference** Dye Testing Results

CB03 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer on Inkerman Street
Other Comments	

Observed Dye Location

Combined sewer on Inkerman Street

CB04 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer on St. Nicholas Street
Other Comments	

Observed Dye Location

Combined sewer on St. Nicholas Street

Site ID: 26 Grenville Street Project **Date:** August 20, 2020 **Location:** St. Nicholas St/Inkerman Street **Reference** Dye Testing Results

CB05 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer on St. Nicholas Street
Other Comments	

Observed Dye Location

Combined sewer on St. Nicholas Street

CB06 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer on St. Nicholas Street
Other Comments	

Observed Dye Location

Combined sewer on St. Nicholas Street

Site ID: 26 Grenville Street Project **Date:** August 20, 2020 **Location:** St. Nicholas St/Inkerman Street **Reference** Dye Testing Results

CB07 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Combined sewer on St. Nicholas Street
Other Comments	

Observed Dye Location

Combined sewer on St. Nicholas Street

CB08 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Storm sewer on Irwin Avenue
Other Comments	

Observed Dye Location

Storm sewer on Irwin Avenue

Site ID: 26 Grenville Street Project **Date:** August 20, 2020 **Location:** St. Nicholas St/Inkerman Street **Reference** Dye Testing Results

CB09 - Results

Dye Testing	
Test Completed	Yes
Sewer Outlet	Storm sewer on Irwin Avenue
Other Comments	

Observed Dye Location

Storm sewer on Irwin Avenue

Appendix C

Estimated Flow Calculations

Estimated flow calculations for the St. Nicholas Street/Inkerman Street area

Reference: *Design Criteria for Sewers and Watermains*, prepared by the City of Toronto and dated November 2009

Toronto Rainfall Intensity (for 2 year return period)

$$I = A\,T^{c}$$

$$I = (21.8)(10/60)^{-0.78}$$

$$I = 88.18901 \text{ mm/hr}$$

Notes:

I - Intensity of rainfall in mm/hour
A and c - Parameters presented in City of Toronto Design Criteria for Sewers and Watermains
T - time of concentration in hours

Run-Off Calculation - Rational Method

$$Q = 2.78\,C\,I\,A$$

$$Q = 2.78(0.90)(88.18901)(1300/10000)$$

$$Q = 28.68 \text{ L/s}$$

Notes:

Q - Flow in litres per second
A - Drainage area in hectares
C - Run-off coefficient, dimensionless
I - Intensity of rainfall in mm/hr

Appendix D

Digital Package of Files

Inspection Videos & Photos

Appendix E

counterpoint engineering

Allowable Release Rate - Grosvenor Street

Project Name: 27 Grosvenor and 26 Grenville

Project Number: 18045

Rational Method - 2 Year

Event:		2	years
ABC's:	A	21.8	
	C	0.78	
Time of Concentration:	t	10	min
Runoff Coefficient:	C	0.5	*(0.5 maximum)
Site Area	A	0.150	ha
Intensity	i	88.19	mm/hr
$i=A/(T)^c$			
Flow	Q	0.018	m^3/s
Q=CiA/360		**18.4**	**l/s**

counterpoint engineering

Allowable Release Rate - Grenville Street

Project Name: 27 Grosvenor and 26 Grenville

Project Number: 18045

Rational Method - 2 Year

Event:		2	years
ABC's:	A	21.8	
	C	0.78	
Time of Concentration:	t	10	min
Runoff Coefficient:	C	0.5	*(0.5 maximum)
Site Area	A	0.235	ha
Intensity	i	88.19	mm/hr
$i=A/(T)^c$			
Flow	Q	0.029	m^3/s
Q=CiA/360		**28.8**	**l/s**

counterpoint engineering

Project Name: 27 Grosvenor and 26 Grenville
Project Number: 18045

27 Grosvenor

Rainfall Data			
Location:	Toronto	a	59.7
Event	100 Year	b	0
		c	0.8

Area ID	Area (ha)	Runoff Coefficient	t_c (min)	Storage Available (m^3)	Storage Required (m^3)	Allowable Release Rate (L/s)	Description	Orifice Size (mm)	Orifice Release Rate (L/s)
27 Grosvenor Site	0.164	0.88	10	TBD	49	18.4	Plate	72	18.4
	0.164			**0**	**49**	**18.4**			

NOTES: On-site storage will be provided via an ungerground storage tank

AREA ID 27 Grosvenor Site

Composite RC Value	Area [ha]	RC	RC * Area
Green Roof	0.007	0.45	0.0032
Building/Impervious Area	0.157	0.90	0.1413
	0.164 Total		0.1445
	Divided by Total Area =		0.88

counterpoint engineering

Project Name: 27 Grosvenor and 26 Grenville
Project Number: 18045

26 Grenville

Rainfall Data			
Location:	Toronto	a	59.7
Event	100 Year	b	0
		c	0.8

Area ID	Area (ha)	Runoff Coefficient	t_c (min)	Storage Available (m^3)	Storage Required (m^3)	Allowable Release Rate (L/s)	Description	Orifice Size (mm)	Orifice Release Rate (L/s)
26 Grenville Site	0.221	0.88	10	TBD	64	28.8	Orifice Plate	95	28.8
	0.221			**0**	**64**	**28.8**			

NOTES: On-site storage will be provided via an ungerground storage tank

AREA ID 26 Grenville Site

Composite RC Value	Area [ha]	RC	RC * Area
Green Roof	0.009	0.45	0.0041
Building/Impervious Area	0.212	0.90	0.1908
	0.221 Total		0.1949
	Divided by Total Area =		0.88

counterpoint engineering

Modified Rational **Area:** **27 Grosvenor**
Residential Tower

Project Name: 27 Grosvenor and 26 Grenville
Project Number: 18045

Rainfall Data			
Location:	Toronto	a	59.700
Event	100 Year	b	0.000
		c	0.800

Site Data		
Area	0.164	ha
Runoff Coefficient	0.88	
AC	0.14	
Tc	10	
Time Increment	10	
Release Rate	18.4	l/s
Storage Required	49	m^3

Time	Rainfall Intensity	Storm Runoff	Runoff Volume	Released Volume	Storage Volume	
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3)	(m^3)	
10	250	0.10	60	11	49	********
20	144	0.06	69	22	47	
30	104	0.04	75	33	42	
40	83	0.03	80	44	35	
50	69	0.03	83	55	28	
60	60	0.02	86	66	20	
70	53	0.02	89	77	12	
80	47	0.02	91	88	3	
90	43	0.02	94	99	-6	
100	40	0.02	96	110	-15	
110	37	0.01	97	121	-24	
120	34	0.01	99	132	-33	
130	32	0.01	101	143	-43	
140	30	0.01	102	154	-52	
150	29	0.01	104	165	-62	
160	27	0.01	105	176	-71	
170	26	0.01	106	187	-81	
180	25	0.01	108	198	-91	
190	24	0.01	109	209	-101	
200	23	0.01	110	220	-111	
210	22	0.01	111	231	-121	
220	21	0.01	112	243	-131	
230	20	0.01	113	254	-141	

counterpoint engineering

Modified Rational **Area:** **Grosvenor Site**
Residential Tower

Project Name: 27 Grosvenor and 26 Grenville
Project Number: 18045

Rainfall Data			
Location:	Toronto	a	59.700
Event	100 Year	b	0.000
		c	0.800

Site Data		
Area	0.221	ha
Runoff Coefficient	0.88	
AC	0.19	
Tc	10	
Time Increment	10	
Release Rate	28.8	l/s
Storage Required	64	m^3

Time	Rainfall Intensity	Storm Runoff	Runoff Volume	Released Volume	Storage Volume	
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3)	(m^3)	
10	250	0.14	81	17	64	********
20	144	0.08	93	35	59	
30	104	0.06	101	52	50	
40	83	0.04	107	69	38	
50	69	0.04	112	86	26	
60	60	0.03	116	104	13	
70	53	0.03	120	121	-1	
80	47	0.03	123	138	-15	
90	43	0.02	126	155	-29	
100	40	0.02	129	173	-44	
110	37	0.02	131	190	-59	
120	34	0.02	134	207	-74	
130	32	0.02	136	225	-89	
140	30	0.02	138	242	-104	
150	29	0.02	140	259	-119	
160	27	0.01	142	276	-135	
170	26	0.01	143	294	-150	
180	25	0.01	145	311	-166	
190	24	0.01	147	328	-182	
200	23	0.01	148	345	-197	
210	22	0.01	150	363	-213	
220	21	0.01	151	380	-229	
230	20	0.01	152	397	-245	

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Orifice Control

Job 27 Grosvenor and 26 Grenville
Job No. 18045

Orifice Equation: $Q = C_d A(2gh)^{1/2}$ **Area:** **27 Grosvenor**

Orifice Diameter: 72 mm
Area: 0.004 m^2
g = 9.81 m/s^2
C_d = 0.62

	Stage	**Head (m)**	**Storage (m3)**	**Discharge (L/s)**
Invert E.L.	103.19	0.00	0	0.00
Spill Elevation	105.95	2.72	0.0	18.4

* invert based on centre of orifice plate

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Orifice Control

Job 27 Grosvenor and 26 Grenville
Job No. 18045

Orifice Equation: $Q = C_d A(2gh)^{1/2}$ **Area:** **26 Grenville**

Orifice Diameter: 95 mm
Area: 0.007 m^2
g = 9.81 m/s^2
C_d = 0.62

	Stage	**Head (m)**	**Storage (m3)**	**Discharge (L/s)**
Invert E.L.	101.24	0.00	0	0.00
Spill Elevation	103.55	2.26	0.0	28.8

* invert based on centre of orifice plate

Counterpoint Engineering

Water Balance

Project Name: 27 Grosvenor and 26 Grenville

Project Number: 18045

City of Toronto's Green Standard Tier 1 Section QW 2.2

Initial Abstraction Asphalt, I	1	mm
Initial Abstraction Pervious, P	5	mm
Initial Abstraction Roof, R	1	mm
Toronto's small design rainfall event has 5mm excess rainfall		

Type of Area	Area	Units	% Redevelopment Area
Non-Green Roof Area / Impervious Area	0.369	ha	96%
Asphalt	0.000	ha	0%
Pervious / Green Roof Area	0.016	ha	4%
Total Area	0.3850	ha	100%

Initial Abstraction= Percent Impervious (Roof) *R + Percent Impervious (Asphalt)* I + Percent Previous Green Roof * P

Initial Abstraction= 0.96 x 1mm + 0.00 x 1.0mm + 0.04 x 5mm

Initial Abstraction (credit)= 1.17 mm

Required Development Retention = (Excess Rainfall- Initial Abstraction) * (Total Development Area)

Required Development Retention = (5mm - 1.17 mm) x (0.385)ha

Required Development Retention (debit)= 14.8 m^3