

Functional Servicing and Stormwater Management Report



Project: 48 Grenoble Drive

Tenblock

Application No: 22 127125 NNY 16 OZ

PREPARED BY:



Isaak Chlorotiris, P.E., M.A.Sc.
Project Designer

REVIEWED BY:



John Pasalidis, P.E., M.A.Sc.
Project Engineer

AUTHORIZED FOR ISSUE BY:

LITHOS GROUP INC.



Nick Moutzouris, P.Eng., M.A.Sc.
Principal

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Executive Summary

Lithos Group Inc. (Lithos) was retained by Tenblock (the “Owner”) to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of Zoning and Site Plan Applications for a proposed residential development at 48 Grenoble Drive, in the City of Toronto (the “City”). The following is a summary of our conclusions:

Storm Drainage

The site stormwater discharge will be controlled to the 2-year pre-development flow and will be connected to the proposed 300mm diameter storm sewer on Grenoble Drive. In order to attain the target flows and meet the City’s Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 174.37 m³ on-site storage will be required for the proposed residential development. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of Environment, Conservation and Parks (MECP). Quality control will be provided for the subject site for a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

Four (4) separate connections will be provided for the proposed development: one for the East Tower; one for the Podium; one for the West Tower and one for the Parkland Dedication. All sanitary connections from the proposed development will connect to a proposed 375 mm diameter sanitary sewer on Grenoble Drive flowing West, and the sanitary connection from the Parkland Dedication will connect to the existing 450 mm diameter sanitary sewer, along the Easement, located at the West side of the site. The additional net discharge flow from the entire property (proposed and existing development), is anticipated at approximately 14.67 L/s.

Under Dry Weather post development conditions, all the downstream sanitary sewer segments operate under free flow conditions. Under Wet-Weather post development conditions eight (8) downstream sanitary sewer segments are experiencing minor surcharging; however, the lowest freeboard in the system is above minimum required freeboard of 1.8m. Therefore, the property under proposed conditions will not adversely affect flow conditions downstream and the existing infrastructure will be capable to support the proposed development.

Water Supply

Three (3) separate water lines will serve the proposed Podium, East and West towers. As per the City’s guidelines, these waterlines will split into domestic and fire connections. Furthermore, due to the fact that the proposed Towers exceed 84m in height, two (2) additional fire lines will be provided for each of the proposed Towers. In addition, one (1) waterline will be service the proposed Parkland dedication. Water supply for the site will be from the existing 400 mm diameter watermain on the East side of Deauville Lane and the existing 400 mm diameter watermain on the North side of Grenoble Drive.

It is anticipated that a total design flow of 109.06 L/s (worst case scenario) will be required to support the proposed development. The results of the fire hydrant test, conducted by Lithos Group Inc., on May 5, 2022, reveal that the existing water infrastructure along Grenoble Drive and Deauville Lane will be able to support the proposed development.

Site Grading

The proposed grades will match current drainage patterns wherever feasible. Grades will be maintained along property lines to the extent practical.

Furthermore, under post-development conditions, there will be no surface drainage towards the Parkland Dedication portion of the site from the residential development.

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1.0 Introduction

Lithos Group Inc. (Lithos) was retained by Tenblock (the “Owner”) to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of Zoning and Site Plan Applications for a proposed residential use development at 48 Grenoble Drive (M3C 1C8), in the City of Toronto (City).

The purpose of this report is to provide site-specific information for the City’s review with respect to infrastructure, required to support the proposed development. More specifically, the report will present details on sanitary discharge, water supply and stormwater management drainage.

We contacted the City’s engineering department to obtain existing information in preparation of this report. The following documents were available for our review:

- Plan and profile drawings of Deauville Lane, from Grenoble Drive to Rochefort Drive, drawing No. D-186-01, dated October, 1959;
- Plan and profile drawings of Easement, from Grenoble Drive to St. Dennis Drive, drawing No. SA-58-R-01, dated January, 1967;
- Plan and profile drawings of Grenoble Drive, from Gateway Boulevard to Deauville Lane, drawing No. G-113-03, January, 1967;
- Plan and profile drawings of Gateway Boulevard, drawing No. ST-391-R, February, 1967;
- Toronto CU Maps of Grenoble Drive and Deauville Lane;
- Geotechnical engineering report by Grounded Engineering Inc., dated February 8, 2023;
- Hydrogeological review report by Grounded Engineering Inc., dated March 10, 2022 (revised February 3, 2023);
- Site Plan prepared by Diamond Schmitt Architects, dated February 8, 2023;
- Site Statistics prepared by Diamond Schmitt Architects, dated February 8, 2023;
- Survey Plan prepared by R. AVIS SURVEYING INC., dated August 4, 2021.

2.0 Site Description

The existing site is approximately 6,749 m² (0.675 hectares). It is currently occupied by a residential development and by outdoor parking area. The site is bound by a residential development to the north, Deauville Lane to the east, Grenoble Drive to the south and Parkland to the west. Refer to **Figures 1** and **2** following this report and site photographs in **Appendix A**.

The entire City was deemed as an area of basement flooding. As shown in the updated map, included in **Appendix B**, Environmental Assessment (EA) Studies are being performed across the City of Toronto, separated in areas. According to the “*Current Basement Flooding Investigation Environmental Assessment Studies*” for the City of Toronto found online, the site is located in area 55 into which, EA study is in progress .

3.0 Site Proposal

The proposed development will be comprised by:

- A residential high-rise development; and,

- Parkland area to be dedicated to the City.

The proposed development will consist of a 6-storey podium with two (2) high-rise, 39-storey towers, supporting residential use.

It will consist of 966 residential units and will be facilitated by two (2) levels of underground parking.

The existing site is approximately 0.675 hectares. In addition, under post-development conditions, approximately 0.068 ha will be conveyed to the City for parkland dedication; therefore, the proposed site area will be 0.607 ha. The total development will be approximately 67,811 m² of Gross Floor Area (GFA). Please refer to **Appendix B** for the proposed site plan and statistics.

4.0 Terms of Reference and Methodology

4.1. Terms of Reference

The Terms of Reference used for the scope of this report were based on the City's Sewer Capacity Assessment Guidelines, July 2021, the January 2021 Second Edition of the City of Toronto Design Criteria for Sewers and Watermains and the November 2006 Wet Weather Flow Management Guidelines (WWFMG).

All erosion and sediment control BMP's shall be designed, constructed and maintained in all development sites in accordance with the GTA CA's Erosion and Sediment Control Guidelines for Urban Construction (2005) and/or other City of Toronto requirements on a site-by-site basis.

4.2. Methodology: Stormwater Drainage and Management

This report provides a detailed Stormwater Management (SWM) review of the pre-development and post-development conditions and comments on opportunities to reduce peak flows. This is illustrated on a proposed servicing connection plan. Other requirements set by the WWFMG will also be discussed.

The proposed development will be designed to meet the City's WWFMG and the standards of the Province of Ontario as set out in the Ministry of Environment, Conservation and Parks (MECP) 2003 Stormwater Management Planning and Design Manual (SWMPD). The following design criteria will be reviewed:

- Post-development peak flow for the 100-year storm event from the site will be controlled to the two (2)-year target flow;
- A specified rainfall depth of 5 mm is to be retained on-site, as required by the WWFMG; and,
- A safe overland flow will be provided for all flows in excess of the 100-year storm event.

4.3. Methodology: Sanitary Discharge

The sanitary sewage discharge from the site will be determined using sanitary sewer design sheets that incorporate the land use and building statistics, as supplied by the design team. The calculated values provide peak sanitary discharge flow that considers infiltration.

The estimated sanitary discharge flows from the proposed site will be calculated based on the criteria shown in **Table 4-1** below.

Table 4-1 – Sanitary Flows

Usage	Design Flow	Units	Population Equivalent
Residential	240	Litres / capita / day	Townhouse unit = 2.7 ppu Studio/1 Bedroom Unit = 1.4 ppu 2 Bedroom Unit = 2.1 ppu 3 Bedroom Unit = 3.1 ppu

Based on the calculated peak flows, the adequacy of the existing infrastructure to support the proposed development will be discussed.

A spreadsheet sewer capacity analysis has been prepared as the EA study basement flooding area 55 is not yet completed, thus the model information is not yet available.

4.4. Methodology: Water Usage

The fire flow requirements were estimated using the method prescribed by the Fire Underwriters Survey (FUS). This method is based on the fire protected building floors, the type and combustibility of the structural frame and the separation distances with adjoining building units. The domestic water usage was calculated based on the City's design criteria (OBC Table 8.2.3.B) outlined in [Table 4-2](#) below.

Table 4-2 – Water Usage

Usage	Water Demand	Units
Residential	190	Litres / capita / day

Pressure and flow testing have been conducted on hydrants, in the vicinity of the proposed development to obtain existing flows, residual and static pressure on the existing infrastructure along Grenoble Drive and Deauville Lane.

5.0 Stormwater Management and Drainage

5.1. Existing Conditions

According to available records, there are three (3) existing storm sewers abutting the subject property. More specifically, there is:

- A 300 mm diameter storm sewer on Grenoble Drive, flowing west;
- A 375 mm diameter storm sewer within the parkland area, flowing south; and
- A 450 mm diameter storm sewer on Deauville Lane, flowing north.

Residential Development

Following an investigation (please refer to 'Site Investigation And Dye Test Report' prepared by Lithos Group dated November 1st, 2022 in [Appendix B](#)), it was discovered that storm runoff from the existing building located at 48 Grenoble Drive is directed towards the storm sewer networks at Grenoble Drive, Deauville Lane and the existing Easement located at the west side of the site. Refer to drainage figure [DAP-1](#) in [Appendix C](#).

Furthermore, our investigation showed that the existing storm service connection from the existing building, is to the existing 375 mm diameter storm sewer, along the existing Easement located at the west side of the site.

All existing storm services will be removed from the right-of-way and capped at the City's main and this work is to be performed by City forces at the Owner's expense. Lastly, there is no overland external storm flow towards our site under pre-development conditions.

Parkland Dedication

The existing Park and future Parkland Dedication is located at the western portion of the site. As mentioned above, storm runoff from that area flows overland uncontrolled towards the City's storm sewer networks at Grenoble Drive and the existing Easement.

The existing run-off coefficients are estimated based on the infiltration of the area as well as the City's WWFMG guidelines. **Table 5-1** shows the input parameters which are illustrated on the pre-development drainage area plan in **Figure DAP-1** in **Appendix C**.

Table 5-1 – Target Input Parameters

Catchment	Drainage Area (ha)	Design "C"	Tc (min.)
A1 Pre – towards Grenoble Drive	0.269	0.43	10
A2 Pre – towards Easement	0.394	0.50	10
A3 Pre – towards Deauville Lane	0.012	0.50	10

Peak flows calculated for the existing conditions are shown in **Table 5-2** below. Detailed calculations are in **Appendix C**.

Table 5-2 – Target Peak Flows

Catchment	Peak Flow Rational Method (L/s)		
	2-year	5-year	100-year
A1 Pre – towards Grenoble Drive	28.4	42.4	80.5
A2 Pre – towards Easement	48.2	72.1	136.9
A3 Pre – towards Deauville Lane	1.5	2.2	4.2

As shown in **Table 5-2**, post-development flows towards Grenoble Drive and towards the Easement will need to be controlled to the target flow of 28.4 L/s and 48.2 L/s respectively. Furthermore, there will be no storm runoff towards Deauville Lane under post-development conditions, up to a 100-year storm event.

5.2. Stormwater Management

In order to meet the WWFMG criteria, the post development flow rate from the subject site is to be controlled to the two (2)-year target flow established in **Section 4.2**. The site consists of five (5) internal drainage areas:

1. A1 Post – Storm runoff from the green roof, controlled into the underground storage tank;
2. A2 Post – Storm runoff from the rooftop/terraces/walkways, controlled into the underground storage tank;

3. A3 Post – Storm runoff from driveway directed into the treatment device and then controlled into the underground storage tank;
4. A4 Post – Storm runoff from landscape surfaces, controlled into the underground storage tank; and,
5. A5 Post – Storm runoff from the Parkland Dedication. Storm flow will be conveyed, either directly through an internal swayers network or overland, towards the sewer network at the easement area.

The post-development drainage areas and runoff coefficients are indicated on **Figure DAP-2**, located in **Appendix C** and summarized in **Table 5-3** below.

Table 5-3 – Post-development Input Parameters

Drainage Area	Drainage Area (ha)	"C"	Tc (min.)
A1 Post - Green Roof (Controlled in Tank)	0.118	0.45	10
A2 Post - Rooftop/Terraces/walkways (Controlled in Tank)	0.368	0.90	10
A4 Post - Driveway (Controlled in Tank)	0.028	0.90	10
A4 Post - Landscape (Controlled in Tank)	0.093	0.25	10
A5 Post- Parkland Dedication	0.068	0.50	10

5.2.1. Water Balance

Residential Development

Based on the "**Water Balance Calculations**" found in **Appendix C**, the site will provide 14.51m³ of initial abstraction in post-development conditions. The remaining 15.85m³ will be provided within the main stormwater storage tank and will be used to service the proposed development through irrigation of the green roof and landscape areas. A pumping system (details of which will be provided by the mechanical engineer) will be implemented to facilitate the proposed irrigation design of the proposed development.

According to the irrigation calculations, provided by "Studio TLA", dated February 6, 2023, found in **Appendix B**, the landscape water requirement within 72-hours is estimated at 22.58 m³. The results of the water balance analysis are summarized in **Table 5.4** below.

Table 5-4 – Post-development Input Parameters

Total Site Area (m ²)	Depth of Rainfall (mm)	Water Balance Requirement (m ³)	Water Balance Provided through Initial Abstraction (m ³)	Water Balance Provided in the Underground Tank (m ³)	Total Water Balance Volume Provided (m ³)
6,073	5.0	30.37	14.51	16.32	30.83

Parkland Dedication

The parkland dedication area will be designed to be composed exclusively by soft scape areas , thus it will meet the water balance requirement.

5.2.2. Quantity Controls

As mentioned in **Section 5.1** storm runoff from the existing property drains towards three (3) storm sewer networks.

Due to the fact that storm runoff, up to a 100-year storm event, will not drain towards the Deauville Lane under post-development conditions, a quantity control analysis will not be required. Therefore, a quantity control analysis has been prepared for each storm network adjacent to the site in order to assess the pre to post development impacts on each network.

5.2.2.1 Post-development flows towards Grenoble Drive

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5 and 100-year storm events are provided in **Table 5-5**. The detailed post-development quantity control calculations are provided in **Appendix C**.

Table 5-5 – Post-development Quantity Control as per City Requirements (towards Grenoble Drive)

Site	Storm Event	Target Flow (L/s)	Required Storage Volume (m ³)	Total Controlled Release Rate of the Tank (L/s)
48 Grenoble Drive	2-year	28.4	46.57	28.4
	5-year		78.03	
	100-year		174.37	

As shown in **Table 5-5**, in order to control post-development flows to 2-year pre-development conditions, a target flow of 28.4 L/s is to be satisfied. The required on-site storage is accommodated by an underground storage tank located at P2 level.

Storm water from the driveway will be gravity driven towards the treatment device (Stormfilter SFPD 0608), before being discharged into the underground storage tank. Please refer to "**Site Servicing Plan**" (**SS-01**), submitted separately.

The stormwater flow released from the green roof, the rooftops, walkways and landscaped surfaces (**Drainage Areas A1 Post**, **A2 Post** and **A4 Post**), will be gravity driven into the proposed underground storage tank at P2 level. The 100-year storm yielded an underground storage tank of 74.20m². Due to the fact that the underground storage tank located at P2 level which is lower from the municipal storm sewer in the right-of-way, a gravity SWM system would not be feasible. Therefore, storm runoff will be pumped towards the control maintenance hole and then through gravity towards the City storm sewer network.

Underground Storage Tank

An underground storage tank is proposed to meet the quantity control requirements set forth by the City's WWFMG. Stormwater from the green roof (**A1 Post**), rooftop/terraces/walkways (**A2 Post**), driveway area (**A3 Post**) and landscaped area (**A4 Post**) and will be gravity driven into the underground storage tank. The **Drainage Area A3 Post** will be driven to the treatment device before being discharged into the underground storage tank.

The 100-year storm yielded an underground storage tank capable to store up to 174.37 m³, which will be pumped into the proposed controlled maintenance hole, with a maximum release rate of 28.4 L/s achieved, ultimately reaching the Town's infrastructure by gravity.

The underground storage tank will have a minimum storage of 190.69 m³ and a minimum storage depth of 2.57 m (2.35 m of active storage depth tank accounting for a quantity control maximum storage of 174.37 m³, and another 0.22 m accounting for 16.32 m³ of storage for Water Balance purposes), during the hundred-year storm event. The pump inlet from the underground storage will be installed 0.27 m above the bottom of the tank and will discharge stormwater at a flow rate of 28.4 L/s into the control. Additional details of the storage tank design will also be provided by the mechanical engineer. Tank configuration may also be found in **Figure 3, Appendix C**.

We recommend that a pumping system (designed by the mechanical engineer) discharging at least 28.4 L/s should be installed to accommodate the pumping needs. In case of a power blackout, a secondary (diesel) pumping system will be activated.

In case of pumping system failure, the proposed pump operates as a control valve, preventing any storm runoff discharging into the gravity fed system. Furthermore, backflow preventors will be implemented on all inlets of the proposed underground storage. Therefore, storm runoff overflow will ensue from the tank's access hatch and will be directed to Grenoble Drive.

5.2.2.2 Post-development flows towards Easement

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5 and 100-year storm events are provided in **Table 5-6**. The detailed post-development quantity control calculations are provided in **Appendix C**.

Table 5-6 – Post-development Quantity Control as per City Requirements (towards Easement)

Site	Storm Event	Target Flow (L/s)	Post-development Uncontrolled Flow (L/s)
Parkland Dedication	2-year	48.2	8.3
	5-year		12.4
	100-year		23.5

As shown on **Table 5-6**, under post-development conditions, uncontrolled flow towards the Easement during a 100-year storm event is smaller than the two (2)-year pre-development target flow, therefore, no stormwater storage is required and the existing storm infrastructure along the Easement will not be negatively affected by the proposed Parkland dedication.

5.2.3 Quality Controls

For MECP Enhanced Level protection, the removal of 80% total suspended solids (TSS) is required. Stormwater, discharged from the areas that will not be polluted by car waste, is considered "clean" and will be driven to the underground tank. Car waste polluted water from the driveway, captured by the proposed trench drain #2 will be driven into the manufactured treatment device (Stormfilter SFPD 0608 with three (3) 12in cartridges), before being discharged into the underground storage tank. Therefore, polluted stormwater will be "cleaned" prior being discharged into the City's storm sewer network. The detailed quality control calculations and Proposed manufactured treatment device can be found in **Appendix C**. A summary of the site quality control is included in **Table 5-7** below.

Table 5-7 – Site TSS Removal

Drainage Area	Drainage Area (ha)	Overall TSS Removal	Additional Quality Control Required
Rooftop / Terraces / Green Roof/ Walkways / Hardscape Areas	0.579	76%	Inherent
Driveway / Landscape Areas	0.028	4%	Stormfilter SFPD 0608
Total	0.607	80%	

5.3 Proposed Storm Connection

Residential Development

The storm sewer system for the residential development will be designed to meet the City's requirements and discharge into the existing 300 mm diameter storm on Grenoble Drive via a 200 mm diameter storm lateral connection with a minimum grade of 2.00% (or equivalent design).

The engineering drawing (refer to "Site Servicing Plan" (SS-01), submitted separately), indicates the stormwater service connection.

Parkland Dedication

The proposed SWM plan in conjunction with the proposed grading and servicing, retains enough runoff volume to reduce the post-development flows below the pre-development target flows for each storm event. Consequently, no stormwater storage will be required for the Parkland Dedication portion of the site.

The storm sewer system for the Parkland Dedication will discharge into the existing 375 mm diameter storm along the Easement at the west side of the site, via a 150 mm diameter storm lateral connection with a minimum grade of 2.00% (or equivalent design).

6.0 Sanitary Drainage System

6.1 Existing Sanitary Drainage System

The existing site is currently occupied by one (1) residential building. According to available records, there is one (1) sanitary sewer, abutting the subject property. More specifically there is:

- A 450 mm diameter sanitary sewer on the west side of the subject property and within the parkland area, flowing south towards Grenoble Drive.

Following an investigation (please refer to 'Site Investigation And Dye Test Report' prepared by Lithos Group dated November 1st, 2022 in [Appendix B](#)), it was discovered that the existing sanitary service connection from the existing building, is to the existing 450 mm diameter sanitary sewer, along the existing Easement located at the west side of the site. All existing sanitary services will be removed from the right-of-way and capped at the City's main and this work is to be performed by City forces at the Owner's expense.

Following our review of the information provided by the City, the sanitary network abutting our property eventually discharges into the trunk sewer between Don Mills Road and Don Valley Parkway.

6.2 Existing and Proposed Sanitary Flows

The sanitary flow generated by the proposed development at 48 Grenoble Drive was compared to the existing flow in order to quantify the net increase in the sanitary sewer.

Using the design criteria outlined in [Section 4.3](#) and existing site information, the sanitary discharge flow from the existing residential building is estimated at 4.19 L/s. Detailed calculations can be found in [Appendix D](#).

Residential Development

Using the design criteria outlined in [Section 4.3](#) and the proposed development statistics, the proposed development will discharge 18.86 L/s into the City's infrastructure.

The capacity of the existing sanitary sewer network along Grenoble Drive to accommodate the post-development sanitary flow, will be discussed under [Section 8.0](#) of this report.

Parkland Dedication

Due to the absence of any permanent structures at the parkland design, there will be no sanitary discharge assumed into the City's infrastructure from the future Parkland Dedication, at this stage.

6.3 Proposed Sanitary Connection

Residential Development

The new service connections cannot run under the parkland dedication area to tie into the existing sewer segments located at the easement area, west of the subject property. Furthermore, the service connections should connect to sewers in the roadway for future serviceability. In addition, the installation of new sewers under the parkland dedication area could inhibit the use of the parkland in the future. Consequently, in order to support the proposed development, a sanitary sewer extension, with a 300mm diameter, is proposed to the existing sanitary sewer system.

Therefore a new 375mm diameter sanitary sewer with a minimum grade of 1.0% is proposed along Grenoble Drive, flowing West. The required horizontal separation of 2.5m cannot be achieved between the existing 400mm diameter watermain and the proposed 375mm diameter sanitary sewer on Grenoble Drive, therefore, low pressure air testing of the new sanitary sewer according to TS 410.07.16.04.03 shall be performed.

Three (3) separate 150mm lateral connections will be provided for the proposed development: one for the East Tower; one for the Podium; and one for the West Tower.

Parkland Dedication

A 150mm diameter sanitary lateral will connect to the existing 450 mm sanitary sewer along the Easement at the west side of the site. Refer to "[Site Servicing Plan](#)" ([SS-01](#)), (submitted separately) for the proposed sanitary connections.

7.0 Groundwater

According to the "Geotechnical Engineering Report" prepared by 'Grounded Engineering Inc.' dated February 8, 2023 and to the "Hydrogeological Review Report" prepared by Grounded Engineering Inc., dated March 10th, 2022 (revised February 3, 2023), the stabilized ground water level is at an elevation of approximately 119.50 masl.

The results of groundwater sampling on site, reveal that groundwater exceeds the City's limits of total suspended solids, cyanide, BOD and manganese for discharging into the storm sewer network, however it is within the City's limits for discharging into the sanitary and combined sewer network. The results of the Hydrogeological review report can be found in [Appendix B](#).

7.1 Long Term Dewatering

The proposed development will be serviced by two (2) basement levels, with the lowest basement slab elevation at 120.00 masl. Therefore it is anticipated that the proposed underground construction will be above; However very close to the groundwater table. Following that fact, the proposed underground construction is proposed to be water-tight.

7.2 Short Term Dewatering

Site dewatering during construction, under the worst case scenario, is anticipated at 247,000 L/day, which translates to approximately 2.85 L/s. Following the fact that the existing network along Grenoble Drive can accommodate the proposed total net flow of 14.67 L/s under post-development conditions, it is anticipated that it will be capable to accommodate the groundwater discharge during construction. Groundwater will be discharged into the proposed 375mm diameter sanitary sewer along Grenoble Drive.

8.0 Sanitary Sewer Capacity Analysis

The Capacity Sewer Analysis, prepared by Lithos Group Inc., dated February, 2023, has been provided in order to identify the impact of the proposed development into the existing sanitary network. Sanitary flow from the proposed development will be discharged into the City's sanitary network. A Downstream Sanitary Sewer Capacity Analysis has been conducted using pre- and post-development flows and can be found in [Appendix D](#).

According to the Capacity Sewer Analysis, eight (8) model scenarios were developed to access the sewer condition. Scenarios and findings are listed below:

- **Scenario 1:** Sewer capacity under existing dry weather conditions (DWF Existing Conditions).
- **Scenario 2:** Sewer capacity under post-development dry weather conditions (DWF Proposed Conditions).
- **Scenario 3:** Sewer capacity under existing wet weather conditions (WWF Existing Conditions).
- **Scenario 4:** Sewer capacity under post-development wet weather conditions (WWF Proposed Conditions).
- **Scenario 5:** Hydraulic Grade Line Analysis under pre-development dry weather conditions (DWF Existing Conditions).
- **Scenario 6:** Hydraulic Grade Line Analysis under post-development dry weather conditions (DWF Proposed Conditions).
- **Scenario 7:** Hydraulic Grade Line Analysis under pre-development wet weather conditions (WWF Existing Conditions).
- **Scenario 8:** Hydraulic Grade Line Analysis under post-development wet weather conditions (WWF Proposed Conditions).

Sanitary sewer analysis has been prepared up to the outlet of the sewer segment leading to the trunk sewer, in order to evaluate the impact of the proposed development to the existing sanitary network. In addition, the Downstream Sanitary Capacity Analysis, includes all updates to the model to reflect changes (i.e., sewer construction), since the model was initially prepared, as well as new buildings, sites where zoning has been completed and where applications are currently in progress.

8.1 Capacity Assessment Results

The external analysis conducted by Lithos Group Inc., shows that under **pre-development Dry Weather Conditions**, the capacity of the existing sanitary sewer network downstream of the site does not carry more than 42.9% (**Scenario 1**). Under **post-development Dry Weather Conditions (Scenario 2)**, the capacity of the existing network up to the Trunk sewer reaches 47.3%.

Furthermore, the external analysis regarding **pre and post-development Wet Weather Conditions (Scenario 3 and Scenario 4)** shows that the decrease to the capacity of the downstream sanitary sewer segments is not more than 3.1% (from 123.6% to 127.6%). Consequently, the proposed development will not adversely affect the functionality of the downstream sanitary sewer system.

In addition, according to the Hydraulic Grade Line Analysis conducted by Lithos Group Inc., under **existing and proposed development Dry-Weather conditions (Scenario 5 and Scenario 6)**, the system operates under free flow conditions and there is no surcharge to the sanitary network up to the trunk sewer. We have been led to the aforementioned conclusion taking into account that the freeboard varies between 2.50 m and 7.60 m under pre development conditions and between 2.50 m and 7.60 m under post development conditions.

Finally, under **existing and proposed Wet-Weather Conditions (Scenario 7 and 8)**, the Hydraulic Grade Line Analysis indicated that eight (8) sewer segments of the sanitary sewer system experience minor surcharge with freeboard (freeboard > 1.8 m). The sanitary sewer network downstream of the site has a minimum freeboard equal to 2.11 m > 1.8 m in the worst case scenario of proposed Wet Weather Conditions.

The Downstream Sanitary Capacity Analysis Report can be found in [Appendix D](#).

9.0 Water Supply System

9.1 Existing System

Based on plans provided by the City, the existing watermain system consists of the following waterlines:

- A 400 mm diameter watermain on the south side of Deauville Lane; and
- A 400 mm diameter watermain on the west side of Grenoble Drive.

The existing water service connection from the site, is to the existing 400 mm diameter watermain on the west side of Grenoble Drive. All existing water services will be removed from the right-of-way and capped at the City's main and this work is to be performed by City forces at the Owner's expense.

Two (2) fire hydrant flow tests were carried out by Lithos Group Inc., on May 5, 2022 along Deauville Lane and Grenoble Drive, to determine the flow and pressure in the existing 400 mm diameter watermain.

The results of the test conducted on Deauville Lane indicate that the existing static pressure is 620 KPa (90 psi) and 101.55 L/sec (1609 USGPM) of water is available with a residual pressure of 592 KPa (86 psi). Similarly, according to the test conducted on Grenoble Drive, the existing static pressure is 592 KPa (86 psi) and 66.96 L/sec (1061 USGPM) of water is available with a residual pressure of 558 KPa (81 psi). The full detailed report is included in [Appendix E](#).

9.2 Proposed Water Supply Requirements

The estimated water consumption was calculated based on the occupancy rates shown on [Table 4-2](#), based on the City's watermain design criteria, revised in November 2009. Calculations for the east tower, podium and west tower, were conducted to confirm that can be supported by the existing water servicing infrastructure.

Residential Development

West Tower

It is anticipated that an average consumption of approximately 1.45 L/s (125,210 L/day), a maximum daily consumption of 2.17 L/s (187,815 L/day) and a peak hourly demand of 3.26 L/s (1,694 L/hr) will be required to service this development with domestic water. Detailed calculations are found in [Appendix E](#).

The fire flow requirements were calculated using the method prescribed by the Fire Underwriters Survey (FUS) be undertaken to assess the minimum requirement for fire suppression. The fire flow calculations is conducted for the largest storey, by area, and for the two immediately adjacent storey.

As a result to the above mentioned method, we have selected Levels 1, 2 and 3 to determine the fire flow demand. [Table 9.1](#) illustrates the input parameters used for the FUS calculations. According to our calculations, a minimum fire suppression flow of approximately 106.88 L/s (1,694 USGPM) will be required. Refer to detailed calculations found in [Appendix E](#).

Table 9.1 – Fire Flow Input Parameters (West Tower)

Parameter	Frame used for Building	Combustibility of Contents	Presence of Sprinklers	Separation Distance			
				North	West	South	East
Value according to FUS options	Fire Resistive Construction	Non-combustible	Yes	3.1m to 10m	> 45m	30.1m to 45m	> 45m
Surcharge/reduction from base flow	0.6	25%	30%	20%	0%	5%	0%

Based on the table above the maximum fire suppression flow is estimated at 106.88 L/s. The design flow requirement is either the maximum hourly demand or the sum of the fire flow requirements and the maximum daily demand.

In summary, the required design flow is the sum of 'the minimum fire suppression flow' and the 'maximum daily demand' ($106.88 + 2.17 = 109.06$ L/s, 1729 USGPM).

The results of the hydrant flow test carried out by Lithos Group Inc., on May 5, 2022 along Grenoble Drive, indicate that 269.74 L/s (4274.80 USGPM) of water is available with a pressure of 138KPa (20.0 psi) revealing that the existing water infrastructure will support the proposed development. The hydrant flow test can be found in [Appendix E](#).

East Tower

It is anticipated that an average consumption of approximately 1.45 L/s (125,210 L/day), a maximum daily consumption of 2.17 L/s (187,815 L/day) and a peak hourly demand of 3.26 L/s (11,738 L/hr) will be required to service this development with domestic water. Detailed calculations are found in [Appendix E](#).

The fire flow requirements were calculated using the method prescribed by the Fire Underwriters Survey (FUS) be undertaken to assess the minimum requirement for fire suppression. The fire flow calculations is conducted for the largest storey, by area, and for the two immediately adjacent storey.

As a result to the above mentioned method, we have selected Levels 1, 2 and 3 to determine the fire flow demand. [Table 9-2](#) below illustrates the input parameters used for the FUS calculations. According to our calculations, a minimum fire suppression flow of approximately 106.88 L/s (1,694 USGPM) will be required. Refer to detailed calculations found in [Appendix E](#).

Table 9-2 – Fire Flow Input Parameters (East Tower)

Parameter	Frame used for Building	Combustibility of Contents	Presence of Sprinklers	Separation Distance			
				North	East	South	West
Value according to FUS options	Fire Resistive Construction	Non-combustible	Yes	3.1m to 10m	> 45m	30.1m to 45m	> 45m
Surcharge/reduction from base flow	0.6	25%	30%	20%	0%	5%	0%

Based on the table above the maximum fire suppression flow is estimated at 106.88 L/s. The design flow requirement is either the maximum hourly demand or the sum of the fire flow requirements and the maximum daily demand.

In summary, the required design flow is the sum of ‘the minimum fire suppression flow’ and the ‘maximum daily demand’ ($106.88 + 2.17 = 109.06$ L/s, 1,729 USGPM).

The results of the hydrant flow test carried out by Lithos Group Inc., on May 5, 2022 along Deauville Lane, indicate that 476.36 L/s (7549.36 USGPM) of water is available with a pressure of 138KPa (20.0 psi) revealing that the existing water infrastructure will support the proposed development. The hydrant flow test can be found in [Appendix E](#).

Podium

It is anticipated that an average consumption of approximately 0.86 L/s (74,480 L/day), a maximum daily consumption of 1.29 L/s (111,720 L/day) and a peak hourly demand of 1.94 L/s (6,983 L/hr) will be required to service this development with domestic water. Detailed calculations are found in [Appendix E](#).

The fire flow requirements were calculated using the method prescribed by the Fire Underwriters Survey (FUS) be undertaken to assess the minimum requirement for fire suppression. The fire flow calculations is conducted for the largest storey, by area, and for the two immediately adjacent storey.

As a result to the above mentioned method, we have selected Levels 1, 2 and 3 to determine the fire flow demand. **Table 9-3** below illustrates the input parameters used for the FUS calculations. According to our calculations, a minimum fire suppression flow of approximately 106.88 L/s (1,694 USGPM) will be required. Refer to detailed calculations found in **Appendix E**.

Table 9-3 – Fire Flow Input Parameters (Podium)

Parameter	Frame used for Building	Combustibility of Contents	Presence of Sprinklers	Separation Distance			
				North	East	South	West
Value according to FUS options	Fire Resistive Construction	Non-combustible	Yes	3.1m to 10m	> 45m	30.1m to 45m	> 45m
Surcharge/reduction from base flow	0.6	25%	30%	20%	0%	5%	0%

Based on the tables above the maximum fire suppression flow is estimated at 106.88 L/s. The design flow requirement is either the maximum hourly demand or the sum of the fire flow requirements and the maximum daily demand.

In summary, the required design flow is the sum of ‘the minimum fire suppression flow’ and the ‘maximum daily demand’ ($106.88 + 1.29 = 108.18$ L/s, 1,715 USGPM).

The results of the hydrant flow test carried out by Lithos Group Inc., on May 5, 2022 along Deauville Lane, indicate that 476.36 L/s (7549.36 USGPM) of water is available with a pressure of 138KPa (20.0 psi) revealing that the existing water infrastructure will support the proposed development. The hydrant flow test can be found in **Appendix E**.

Parkland Dedication

Due to the absence of any permanent structures at the parkland design, no equipment is currently proposed, at this stage.

9.3 Proposed Watermain Connection

Residential Development

According to the Ontario Building Code (OBC), for each building greater than 84m in height an additional fire line is required. Three (3) separate domestic connections will be provided for the proposed development: one for the South Tower; one for the Podium and one for the North Tower. The connections will be as follows:

West Tower

Residential-Use of the high-rise building: one (1) 200 mm diameter fire split to a 150 mm domestic water will connect on the 400 mm watermain on Grenoble Drive and one (1) 200 mm diameter fire will connect on the 400 mm watermain sewer on Deauville Lane

East Tower

Residential-Use of the high-rise building: one (1) 200 mm diameter fire split to a 150 mm domestic water will connect on the on the 400 mm watermain sewer on Deauville Lane and one (1) 200 mm diameter fire will connect on the 400 mm watermain sewer on Grenoble Drive;

Podium

Residential-Use of the Podium: one (1) 150 mm diameter fire split to a 100 mm domestic water will connect on the 400 mm watermain on Deauville Lane;

Parkland Dedication

Parkland Area to be dedicated to the City: one (1) 50 mm diameter domestic water will connect on the 400 mm watermain sewer on Grenoble Drive;

According to City's standard drawing T-1104.02-3, fire and domestic connections on Grenoble Drive and Deauville Lane will be split two (2) meters away from the property line and valve and boxes will be installed on each service at the property line. For details (refer to "Site Servicing Plan" (SS-01), submitted separately).

10.0 Site Grading

10.1 Existing Grades

The subject site drains mainly towards Grenoble Drive and the easement areas west of the property, with a small portion of the property, at its north-east corner, draining towards Deauville Lane.

10.2 Proposed Grades

The proposed grades will maintain the existing drainage patterns wherever feasible. Grades will be maintained along property lines to the extent practical. Furthermore, under post-development conditions, there will be no surface drainage towards the Parkland Dedication portion of the site from the residential development.

11.0 Conclusions and Recommendations

Based on our investigations, we conclude the following:

Storm Drainage

The site stormwater discharge will be controlled to the 2-year pre-development flow and will be connected to the proposed 300mm diameter storm sewer on Grenoble Drive. In order to attain the target flows and meet the City's Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 174.37 m³ on-site storage will be required for the proposed residential development. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of Environment, Conservation and Parks (MECP). Quality control will be provided for the subject site for a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

Four (4) separate connections will be provided for the proposed development: one for the East Tower; one for the Podium; one for the West Tower and one for the Parkland Dedication. All sanitary connections from the proposed development will connect to a proposed 375 mm diameter sanitary sewer on Grenoble Drive flowing West, and the sanitary connection from the Parkland Dedication will connect to the existing 450 mm diameter sanitary sewer, along the Easement, located at the West side of the site. The additional net discharge flow from the entire property (proposed and existing development), is anticipated at approximately 14.67 L/s.

Under Dry Weather post development conditions, all the downstream sanitary sewer segments operate under free flow conditions. Under Wet-Weather post development conditions eight (8) downstream sanitary sewer segments are experiencing minor surcharging; however, the lowest freeboard in the system is above minimum required freeboard of 1.8m. Therefore, the property under proposed conditions will not adversely affect flow conditions downstream and the existing infrastructure will be capable to support the proposed development.

Water Supply

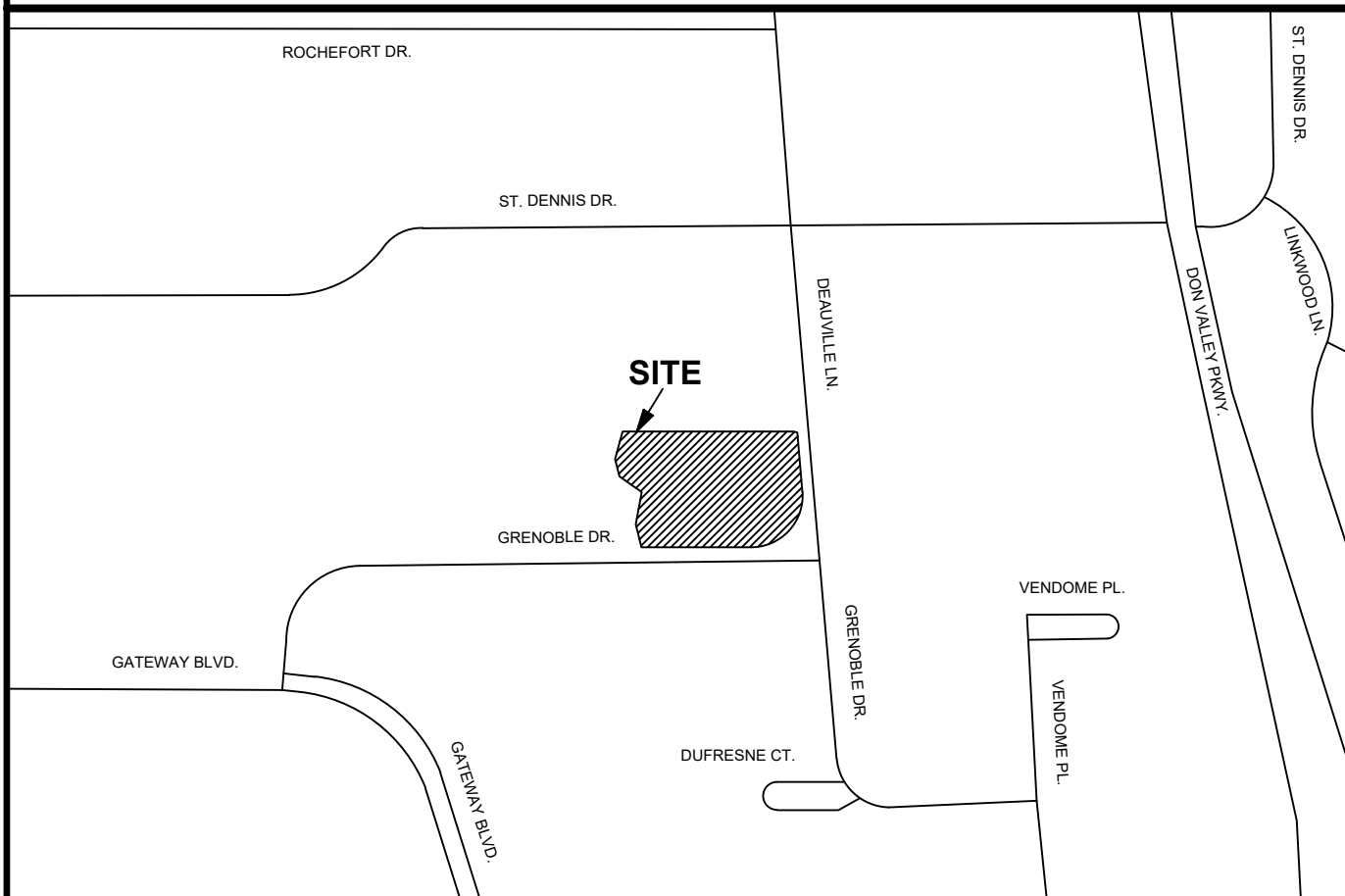
Three (3) separate water lines will serve the proposed Podium, East and West towers. As per the City's guidelines, these waterlines will split into domestic and fire connections. Furthermore, due to the fact that the proposed Towers exceed 84m in height, two (2) additional fire lines will be provided for each of the proposed Towers. In addition, one (1) waterline will be service the proposed Parkland dedication. Water supply for the site will be from the existing 400 mm diameter watermain on the East side of Deauville Lane and the existing 400 mm diameter watermain on the North side of Grenoble Drive.

It is anticipated that a total design flow of 109.06 L/s (worst case scenario) will be required to support the proposed development. The results of the fire hydrant test, conducted by Lithos Group Inc., on May 5, 2022, reveal that the existing water infrastructure along Grenoble Drive and Deauville Lane will be able to support the proposed development.

Site Grading

The proposed grades will match current drainage patterns wherever feasible. Grades will be maintained along property lines to the extent practical.

Furthermore, under post-development conditions, there will be no surface drainage towards the Parkland Dedication portion of the site from the residential development



LOCATION PLAN
RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

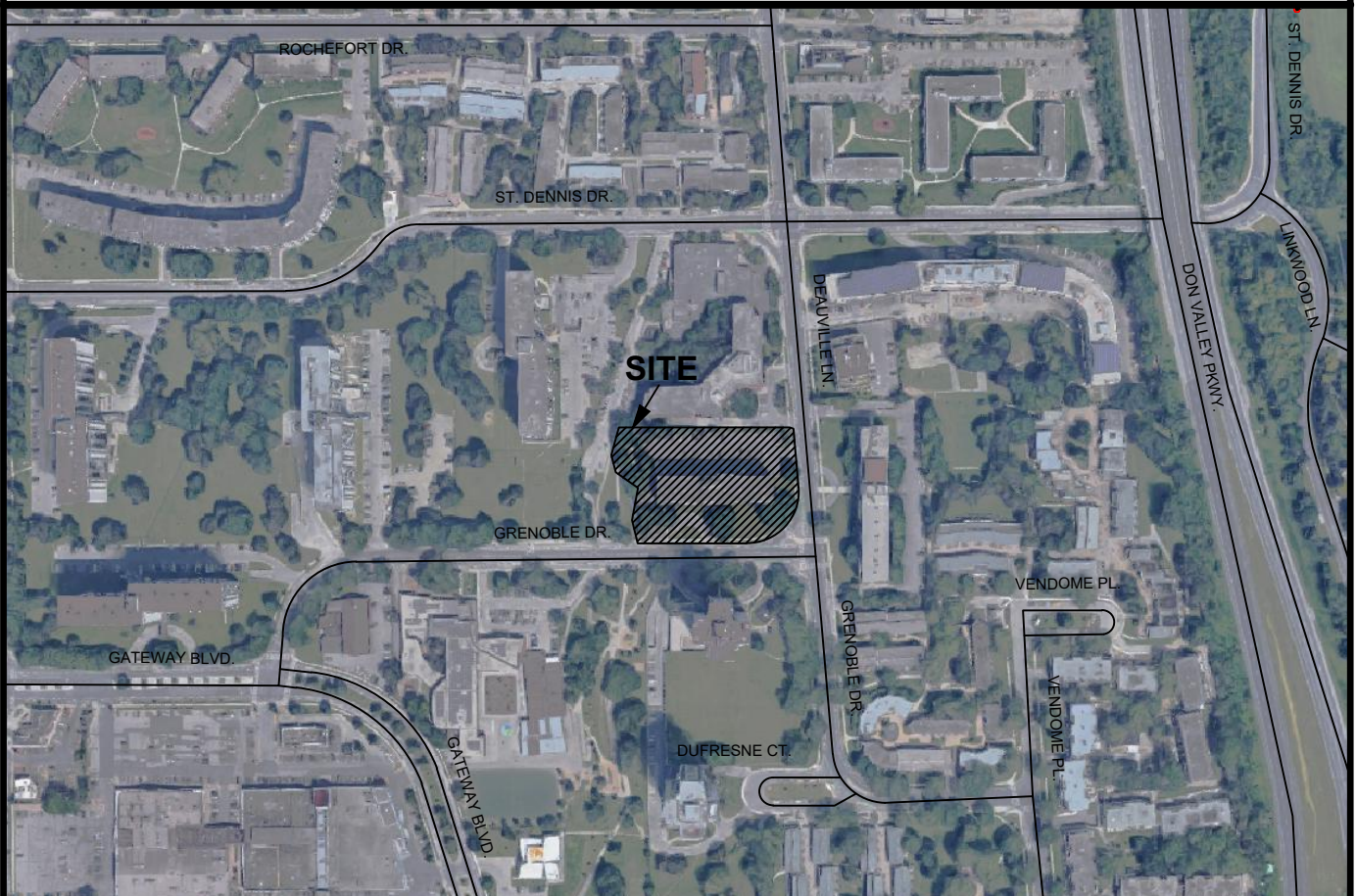
150 Bermondsey Road, Toronto, Ontario M4A 1Y1

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: PUD21-110

FIGURE No: FIG 1



AERIAL PLAN
RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: PUD21-110

FIGURE No: FIG 2

Appendix A

Site Photographs



North East Corner of Property along Deauville Lane – Facing South West



South West Corner along Grenoble Drive – Facing North East



South East Corner along Grenoble Drive – Facing North West

Appendix B

Background Information

PLAN OF SURVEY OF
PART OF BLOCK G2
REGISTERED PLAN M-834
CITY OF TORONTO

SCALE 1 : 250

R. AVIS SURVEYING INC.

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

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NOTES AND LEGEND

BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE DERIVED FROM OBSERVE REFERENCE POINTS (S) AND (B) HAVING A BEARING OF N15°41'52" E BY REAL TIME NETWORK (RTN) OBSERVATION, ZONE 10, CENTRAL MERIDIAN 79° 30' WEST LONGITUDE
(1) MODIFIED TRANSVERSE MERCATOR PROJECTION, NAD 83 (CSRS-2010)

3' MTM ZONE 10 COORDINATES		
NAD83(CSRS-2010) (CENTRAL MERIDIAN 79°30' WEST LONGITUDE)		
	NORTHING	EASTING
A	4841837.355	318364.595
B	4841857.513	318425.919
C	4841898.285	318444.610
D	4841930.651	318430.958

- DENOTES SURVEY MONUMENT FOUND
 - RB DENOTES SURVEY MONUMENT PLANTED
 - SB DENOTES ROUND IRON BAR
 - IB DENOTES STANDARD IRON BAR
 - WT DENOTES WITNESS
 - W(1042) DENOTES EDWARDS & GUNN LIMITED
 - (OU) DENOTES ORIGIN UNKNOWN
 - MEAS/N DENOTES MEASURED
 - N,S,E,W DENOTES NORTH, SOUTH, EAST, WEST
 - RP DENOTES REGISTERED PLAN M-834
 - P1 DENOTES SURVEYOR'S REAL PROPERTY REPORT BY P.SALNA COMPANY LTD., O.L.S. DATED OCTOBER 08, 2001
 - P2 DENOTES PLAN 66R-11956
 - BD DENOTES BRICK
 - BRW DENOTES BRICK RETAINING WALL
 - BF DENOTES BOARD FENCE
 - CLF DENOTES CHAIN LINK FENCE
 - CONC. DENOTES CONCRETE
 - CB DENOTES CONCRETE
 - FI DENOTES FIRE HYDRANT
 - GM DENOTES GAS METER
 - C DENOTES COLUMN
 - LS DENOTES LIGHT STANDARD
 - MH DENOTES MANHOLE
 - TS DENOTES TRAFFIC SIGN
 - TR DENOTES TRANSFORMER
 - (T) DENOTES TOP OF CURB
 - (B) DENOTES BOTTOM OF CURB
 - (G) DENOTES GUTTER
 - AV DENOTES AIR VENT
 - ICV DENOTES IRRIGATION CONTROL VALVE
 - SAN DENOTES SANITARY
 - PED DENOTES PEDIESTAL
 - DENOTES OVERHEAD WIRE
- 0.109 DENOTES CONIFEROUS TREE WITH TRUNK DIAMETER 0.10 metres
- 0.109 DENOTES DECIDUOUS TREE WITH TRUNK DIAMETER 0.10 metres
- DENOTES SPOT ELEVATION

AREA = 6748.9 sq. m.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.

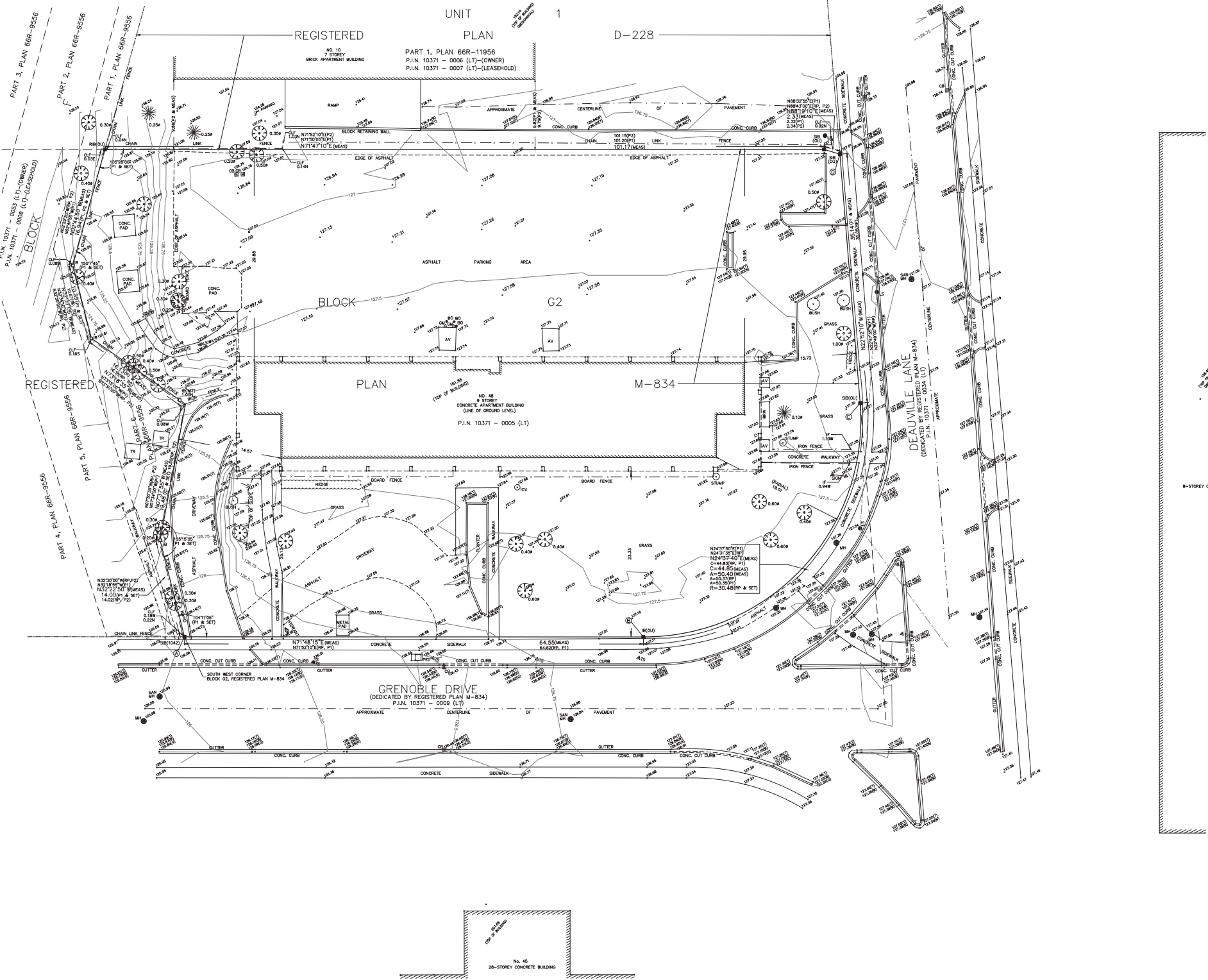
2. THE SURVEY WAS COMPLETED ON THE 4th DAY OF AUGUST, 2021

AUGUST 5, 2021
DATE

PIRATHEEPAN RAMACHANDRAN
Ontario Land Surveyor

R. AVIS SURVEYING INC.
SUITE 203
235 YORKLAND BOULEVARD
TORONTO, ONTARIO
M2J 4Y8
TEL: (416) 490-8352 FAX: (416) 491-8206
www.ravissurveying.com

CHECKED BY : P.R. O.L.S.	PROJECT No. : 3487-0
CALCULATED BY : .B	DRAWING No. : 3487-0T
DRAWN BY : .B	



UNIT DISTRIBUTIONEAST TOWER (L7-3)MARKET UNITS AT 14.0 AMENITY

5.0 PARKING

Vehicle Parking Rate achieved	0.21
Visitors Vehicle Parking	0.01
Resident Vehicle Parking	0.20

7.0 LOADING		
Level	Count	Type
1	1	Type C Loading
1	1	Type G Loading

8.0 WASTE		
Level	Type	Area (m ²)

WEST BUILDING		
1	Bulky Storage	10
1	Carbonyl Room	175

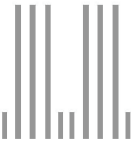
EAST BUILDING		
1	Bulky Storage	10
1	Garbage Room	90
TOTAL		285

Statistics Template - Toronto Green Standard Version 3.0			
Mid to High Rise Residential and all New Non-Residential Development			
Water Efficiency	Required	Proposed	Proposed %
Total landscaped site area (m ²)		1362.6	
Landscaped site area planted with drought-tolerant plants (minimum 50% (m ²) and 1% (if applicable)	681.3	681.3	100%
Tree Planting Areas & Soil Volume	Required	Proposed	Proposed %
Total site area (m ²)	n/a	6,749	n/a
Total Soil Volume (40% of the site area + 66 m ³ /30 m ³)	1227	1450	131%
Total number of planting areas (minimum of 30m ² soil)	n/a	12	n/a
Total number of trees planted	n/a	45	n/a
Number of surface parking spaces (if applicable)	n/a	n/a	n/a
Number of shade trees located in surface parking area interior (minimum 1 tree for 5 parking spaces)	n/a	n/a	n/a
Native and Pollinator Supportive Species	Required	Proposed	Proposed %
Total number of plants		13	
Total number of native plants and % of total plants (min 50%)	6	9	100%
Bird Friendly Glazing	Required	Proposed	Proposed %
Total area of glazing at all elevations within 12m ² above grade (including glass balcony railings)		2699	
Total area of treated glazing (minimum 85% of total area of glazing within 12m ² above grade) (m ²)		2699	100%
Percentage of glazing within 12m ² above grade treated with:			
a) Low reflectance opaque materials		0	
b) Visual markers		2699	100%
c) Shading		0	

*Areas given are within 16m above grade.

*Areas given are within 16m above grade





No.	Date	Description
1	09/18/2022	ISSUED FOR ZBA/SPA
2	02/08/2023	ISSUED FOR ZBA2/SPAD

ISSUED

NOTES

1. COLLECTION VEHICLE ACCESS DRIVEWAY TO BE LEVELLED TO EXISTING GRADE.
2. A TRAFFIC ON SITE STAFF MEMBER WILL BE AVAILABLE TO MANEUVER BINS FOR THE CITY COLLECTION DRIVER AND ALSO ACT AS A SPOTTER WHEN THE TRUCK IS REVERSING. IN THE EVENT THAT 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.
3. ALL ASPHALT WITHIN THE CITY'S RIGHT OF WAY IS TO BE CONFORMING WITH ALL CITY STANDARDS.
4. 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 LANE DIVISION, STAFF MAY REQUIRE LEGAL ADVICE, INCLUDING BUT NOT LIMITED TO LEGAL OPINION, WITH RESPECT TO THE APPROVED SERVICES. SUCH ADVICE, INCLUDING BUT NOT LIMITED TO LEGAL OPINION, WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL.
5. THE OWNER IS REQUIRED TO INSTALL AND MAINTAIN A PERMITS COLLECTION SERVICE FOR ALL APPLICABLE WASTE SERVICES IN ACCORDANCE WITH TORONTO MUNICIPAL CODE, CHAPTER B01 WASTE SUPPLY, THE BUILDING CODE, AND CSA B64 SERIES STANDARDS.
6. BEFORE SOLID WASTE COLLECTION SERVICES ARE TO BEGIN THE CITY WILL BE PROVIDED WITH A LETTER CERTIFIED BY A PROFESSIONAL ENGINEER THAT IN CASES WHERE A COLLECTION VEHICLE IS REQUIRED TO DRIVE ONTO OR OVER A SUPPORTED STRUCTURE (SUCH AS AN UNDERGROUND PARKING GARAGE) CAN SAFELY SUPPORT A FULLY LOADED COLLECTION VEHICLE (20,000 KG) AND BE CONFORMANT TO THE FOLLOWING:
 - (A) DESIGN CODE - ONTARIO BUILDING CODE
 - (B) DESIGN LOAD - CITY BUS LIFT VEHICLE IN ADDITION TO BUILDING CODE REQUIREMENTS
 - (C) IMPACT FACTOR - 15% FOR MAXIMUM VEHICULAR SPEEDS TO TRANSIT AND 20% FOR MAXIMUM SPEEDS
7. PROVIDE AND MAINTAIN A WARNING SYSTEM TO ALERT OTHERS WHEN ENTERING THE UNDERGROUND PARKING GARAGE THAT LARGE TRUCKS ARE MANEUVERING WITHIN THE DRIVING ALLE.
8. ALL EXISTING ACCESSORIES, CURB CUTS, TRAFFIC CONTROL DEVICES THAT ARE NO LONGER REQUIRED HAVE BEEN REMOVED AND REINSTATE THE CURB, GUTTER AND SIDEWALK WITHIN THE CITY'S RIGHT OF WAY IN ACCORDANCE WITH CITY STANDARDS AND TO THE SATISFACTION OF THE CHIEF ENGINEER AND DEPUTY CHIEF ENGINEER, ENGINEERING AND CONSTRUCTION SERVICES.

CONVEX MIRROR

P1 - BENTHOS VEHICLE PARKING USE
P1 - BENTHOS RESIDENT PARKING USE
P1 - BENTHOS PARKING STATIONS WITH EYE

NOT FOR
CONSTRUCTION

Contractor Must Check & Verify all Dimensions on the Job.
Do Not Scale Drawings.
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Diamond Schmitt Architects Inc. and shall be returned upon request. Reproduction of any part
of these drawings without the written permission of the Architect.
This Drawing is Not to be Used for Construction Until Signed by the Architect.

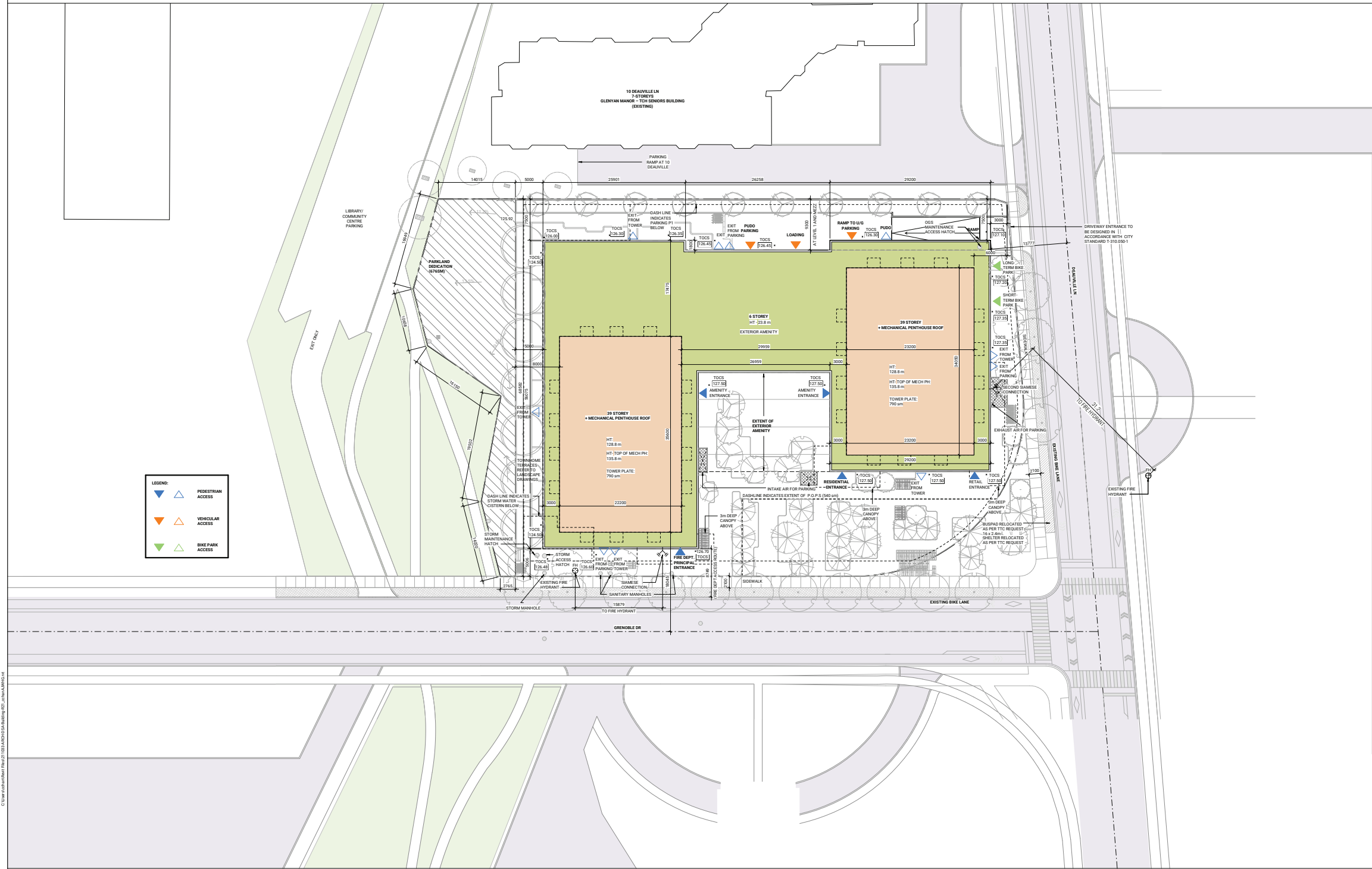
48 Grenoble Drive

211033

SITE PLAN

As indicated

A012



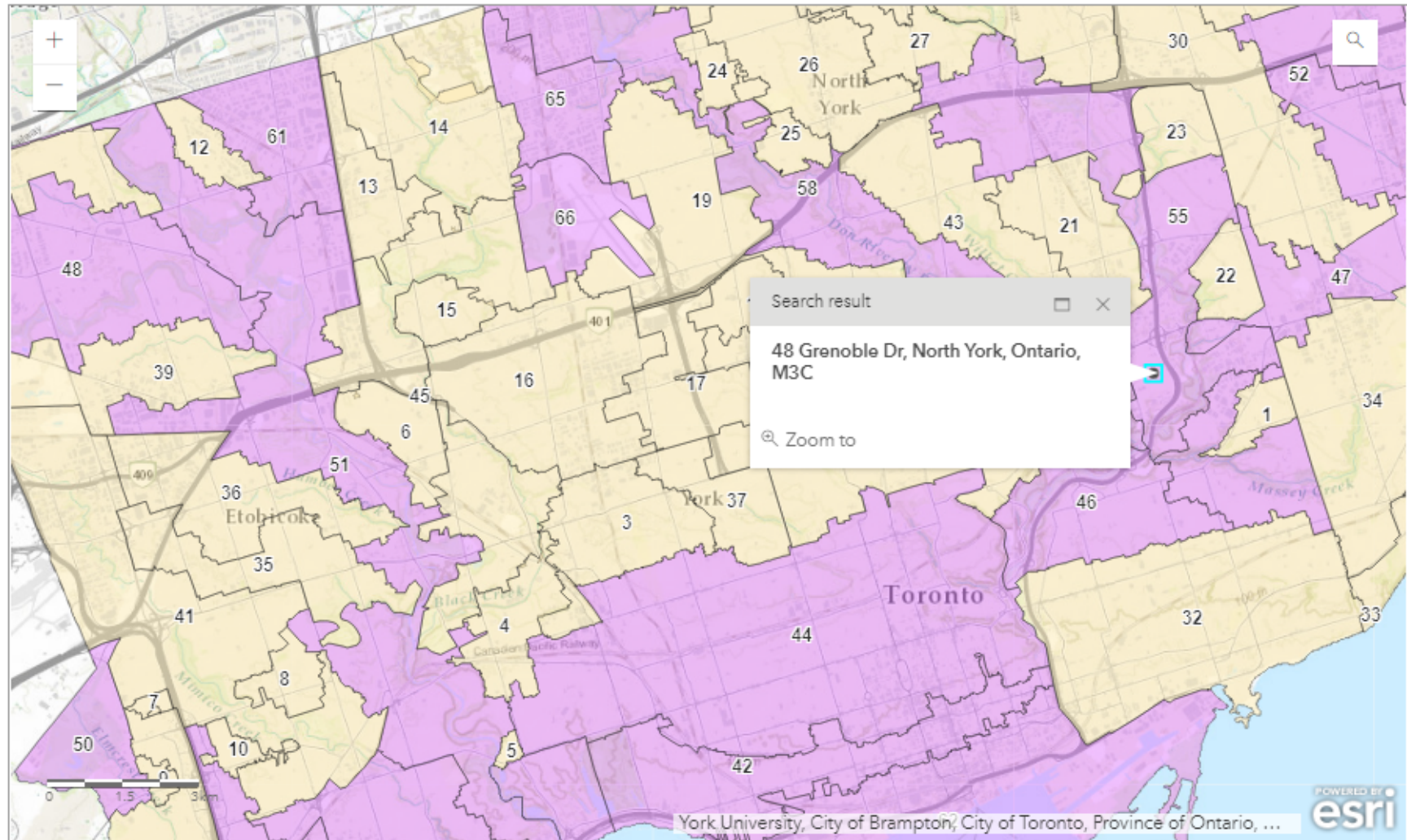
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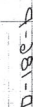
2/10/2023 1:05:44 PM

Map Legend

- Basement Flooding Study Completed
- Basement Flooding Study in Progress (started before 2019)
- Basement Flooding Study in Progress (started in 2019)

For more information enter an address in the search bar and/or click on the shaded area in the map





6	DRUGS AND	ROAD GRAPHS ASSEMBLY	BY	
7	(O. 14)	UNDERGROUND SERVICES DESIGN AND LAYOUT	BY	
8	(O. 15)	SEWERAGE AND WASTE WATER SERVICE	BY	
9	(O. 16)	ROAD GRAPHS AND LOCATION OF C&G SERVICES	BY	
10	(O. 17)	WATER SERVICE PLAN THE TOWNSHIP	BY	
11	(O. 18)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
12	(O. 19)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
13	(O. 20)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
14	(O. 21)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
15	(O. 22)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
16	(O. 23)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
17	(O. 24)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
18	(O. 25)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
19	(O. 26)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
20	(O. 27)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
21	(O. 28)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
22	(O. 29)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
23	(O. 30)	SEWERAGE SERVICE PLAN THE TOWNSHIP	BY	
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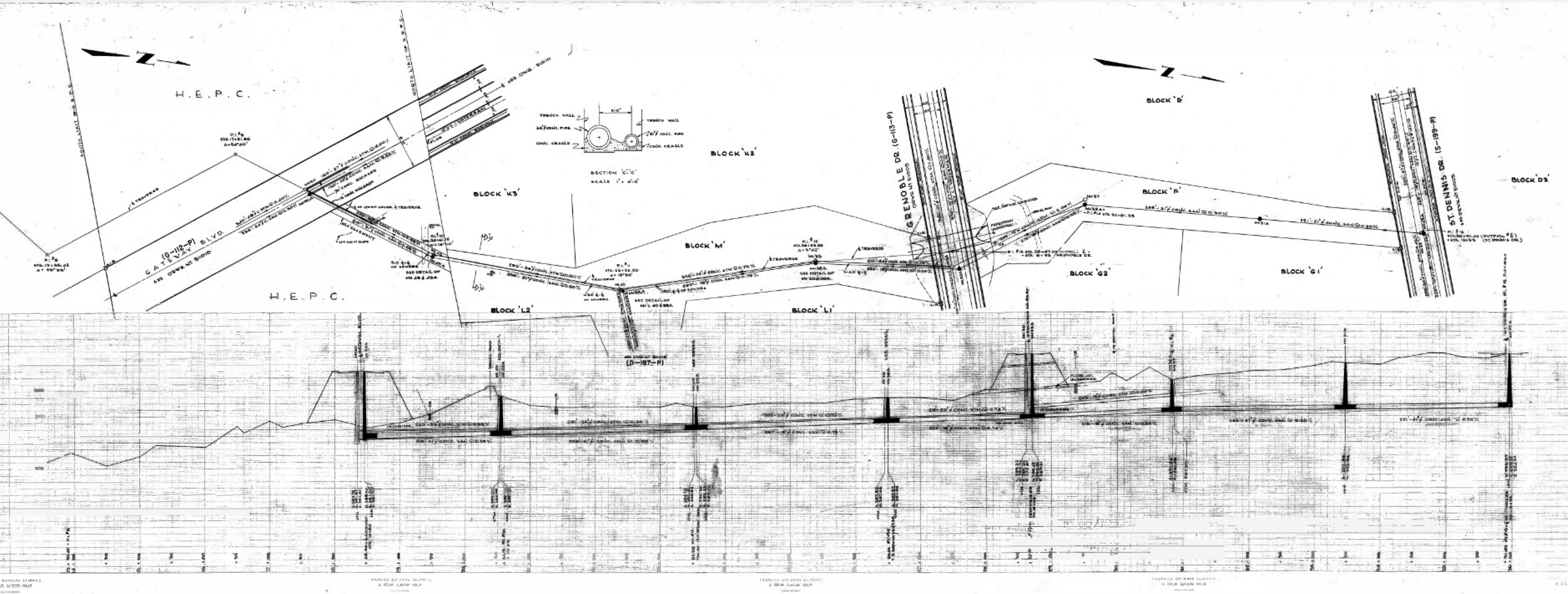
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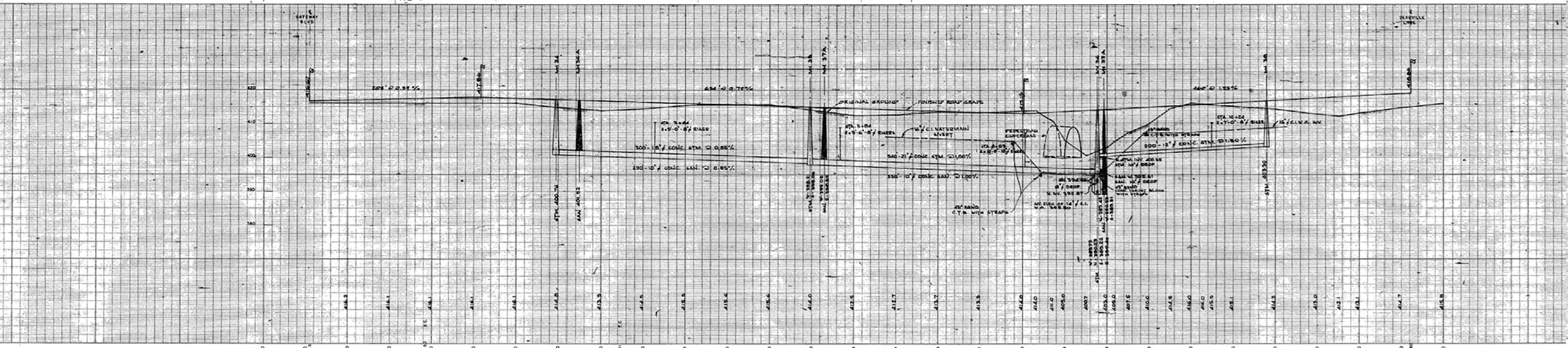
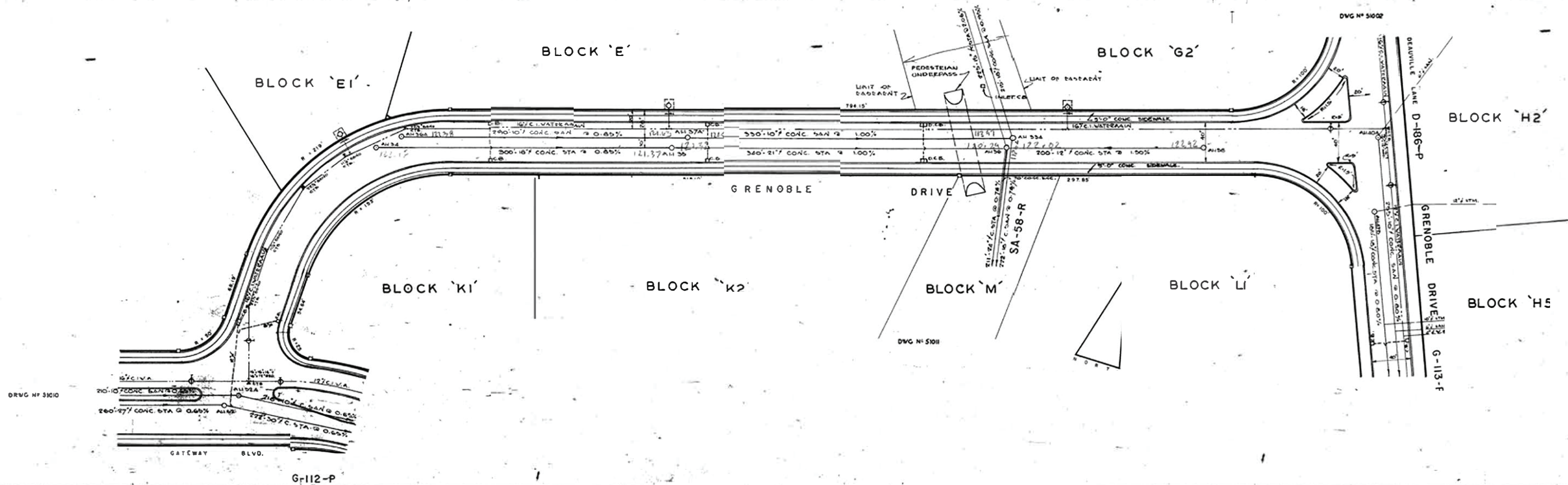
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PART OF PLAN & PROFILE SA-58-R-01

PART OF PLAN & PROFILE G-113-03



21-05-T2

21-05-T2

OVERLEA BLVD.

MILLS ROAD

DON

BLOCK 'O'

(G-112)

GATEWAY

BOULEVARD

BLOCK 'R'

DWG No 2064-02

LEGEND:

- M.H. 1 - STORM MANHOLE
- M.H. 2 - SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- VALVE & CHAMBER
- HYDRANT & VALVE
- SINGLE CATCHBASIN
- DOUBLE CATCHBASIN

NOTES:

ALL SERVICES CONSTRUCTED TO THE BOROUGH OF NORTH YORK STANDARDS AND SPECIFICATIONS AND TO THE SATISFACTION OF THE COMMISSIONER OF PUBLIC WORKS.

WATERMAINS ARE 12" DUCTILE IRON PIPE WITH WALL THICKNESS OF 0.37". ALL JOINTS ARE TYTON OR EQUIVALENT.

MANHOLES ARE 4'x4' N.Y. STD. DWG. NO. S-58.B EXCEPT IF OTHERWISE NOTED.

HIGH BENCHING REQUIRED ON ALL MANHOLES EXCEPT FOR TYPE S-117-B.

NOTE:

MINIMUM 1' OF COVER BETWEEN M.H. 14-B & M.H. 14-A. USED 1" ROSS LUGS ON THE CMP. AT ALL JOINTS. DISTURBED AREAS SODDED & WIRED & STAKED.

SURFACE COURSE (ASPHALT) & BASE COURSE (ASPHALT) OVERLAY AS PER BOROUGH SPECIFICATIONS.

B.M. TOP OF S.H. 6017 AT 446.51
TRAFFIC LIGHT ON N.E. CORNER OF INTERSECTION OF DON MILLS ROAD & GATEWAY BLVD.
NORTH YORK DATUM 1985

NOV 88	AS CONSTRUCTED	
REVISION		BY APP'D
E.D. RICHARD		
ANDERSON ASSOCIATES LIMITED		
CONSULTING ENGINEERS		
194 WILSON AVENUE		
TORONTO, ONTARIO		
BOROUGH OF NORTH YORK		
DEPARTMENT OF PUBLIC WORKS		
STORM & SANITARY		
OUTFALL		
APPROVED		
JUL 20 1987		
BOROUGH OF NORTH YORK		
PUBLIC WORKS DEPT.		
DATE: FEB - 1987		
DRAWN BY: H.J.M./P.M.		
CHECKED BY: E.D.R.		
206-4-03		
ST-391-R		

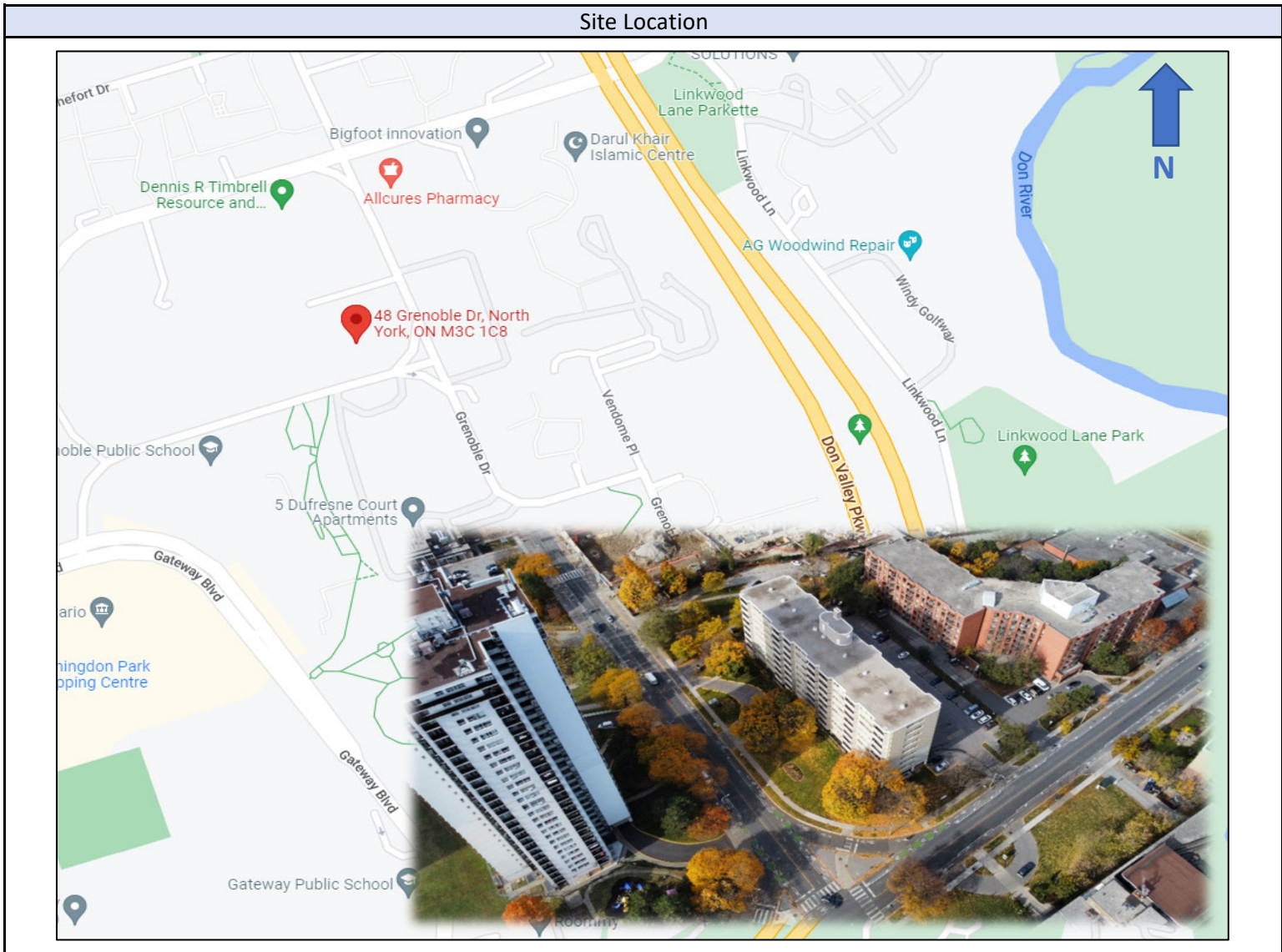
SUB DIV. 666 PHASE II

General Information	
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Attendants			
	Name	Title	Contact Info.
Lithos Inspector	Keyvan Vahedi	Senior Project Coordinator	437-776-4086
Lithos Inspector	Pradeep Oleti	Construction Inspector	905-609-3435

Weather Condition			
☒ Sunny	☒ Cold	☐ Light Rain	☐ Windy
☐ Partly Cloudy	☐ Cool	☐ Heavy Rain	☐ Foggy
☐ Overcast	☐ Warm	☐ Light Snow	
Temperature : +6°C	☐ Hot	☐ Heavy Snow	

Existing Facilities at Project/Site
The subject property is occupied by a nine(9) story residential building .



General Information	
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Background and Summary of Findings

Background:

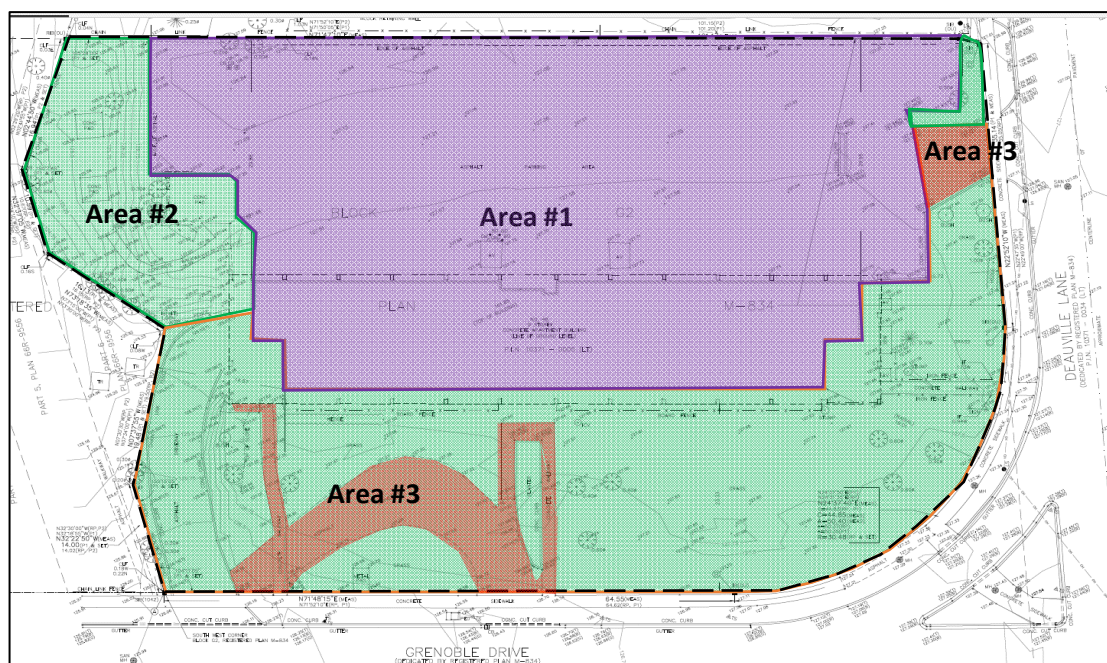
Further to our previous site inspection at 48 Grenoble Drive, on September 22nd, 2021, we conducted three (3) dye tests on the existing Storm and Sanitary within the site, in order to confirm the Storm and Sanitary discharge pattern within the subject site.

Based on the finding from our previous site investigation, the subject site consists of 3 areas as bellow:

Area #1 : All the storm runoff from this area is discharged into the existing storm network within the property; no storm outlet was visible within the building.

Area #2: This area includes unpaved areas within the property and all storm runoff within this area, infiltrates into the ground.

Area#3: This area includes paved areas within the property and all storm runoff within this area, flows overland and is captured by existing CBs along Grenoble Drive.



Summary of findings:

Area #1 consists of an existing nine (9) storey building and a parking area.

In order to confirm the Storm and Sanitary discharge pattern within Area#1, three (3) dye test conducted on the Storm and Sanitary network within the existing building, as well as existing catch basin within the parking area.

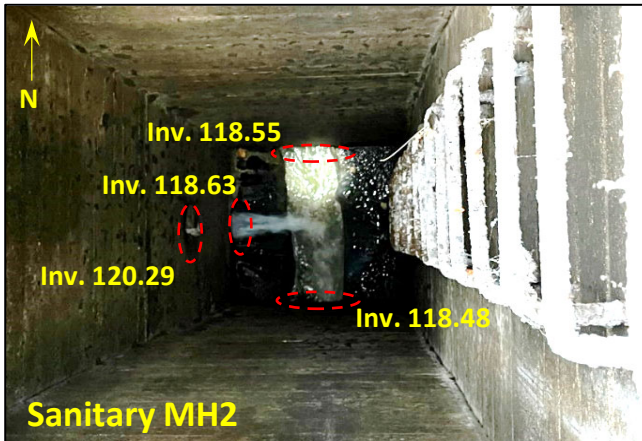
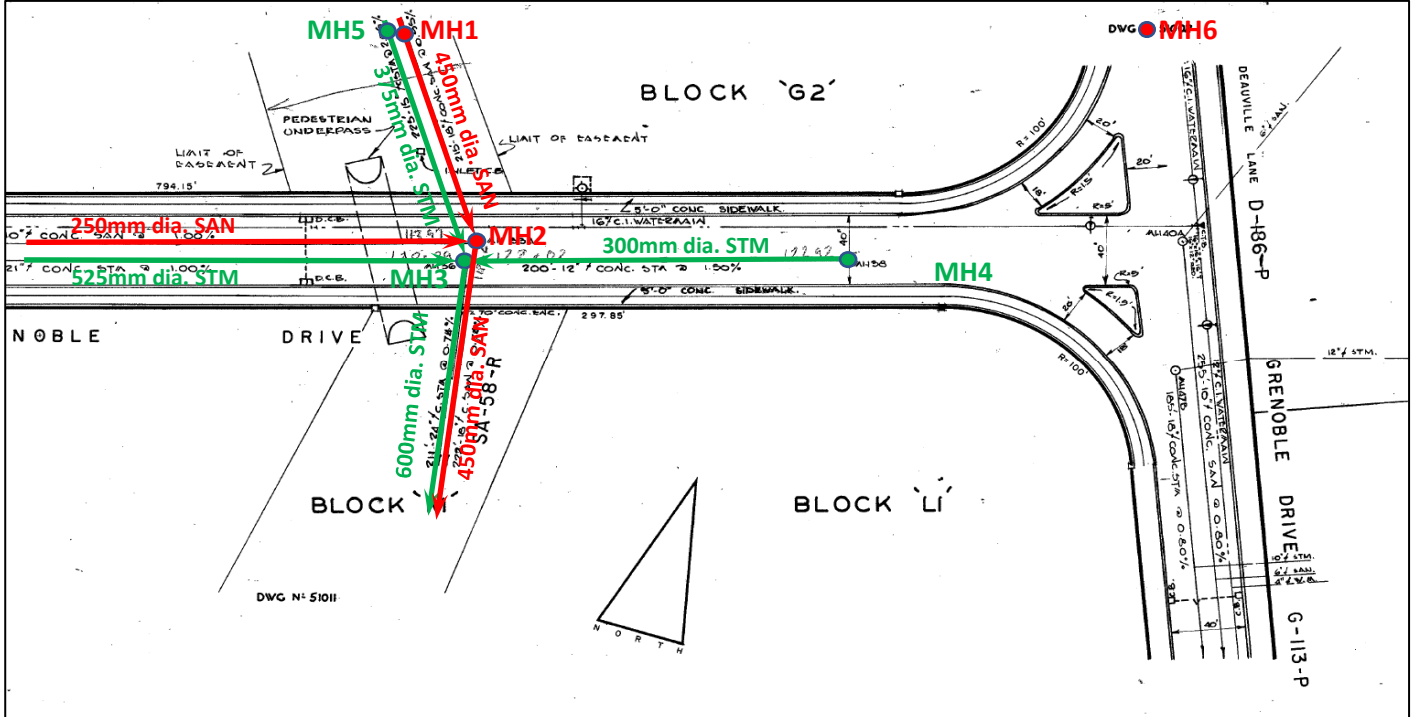
The results of the dye tests confirmed that:

- All Storm runoff from roof of the existing building is discharged into an existing 375mm dia. Storm Sewer, along the easment, west of the subject site.
- All Storm runoff from the Parking area is collected by an existing CB and discharged into an existing 375mm dia. Storm Sewer, along the easment, west of the subject site.
- All Sanitary discharge from the existing building is conveyed into an existing 450mm dia. Sanitary Sewer, along the easment, west of the subject site.

General Information

Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Existing Infrastructure (Storm and Sanitary) within the area of investigation



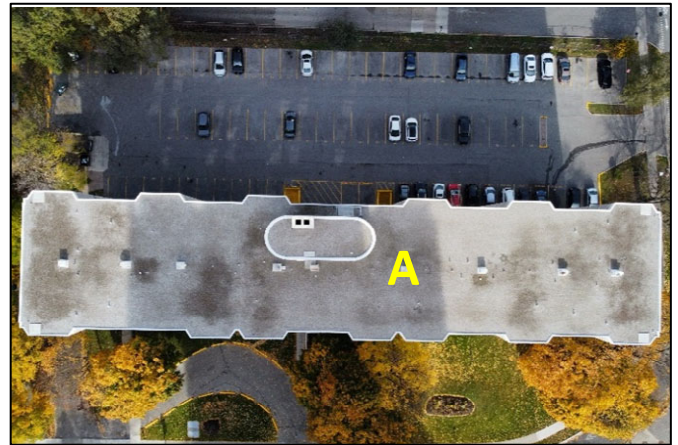
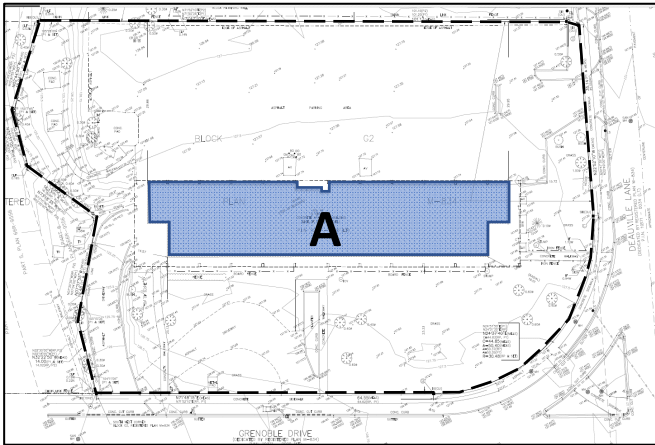
General Information	
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Investigation Details

Dye Test #1:

In order to identify/confirm the Storm runoff discharge pattern, within the existing building, a Dye Test conducted on one of the existing roof drains and the dye was observed at Storm MH3.

The result of the dye test confirmed that, all the storm runoff from the roof of the existing building is conveyed into the existing 375mm dia storm sewer along the Easement.



General Information

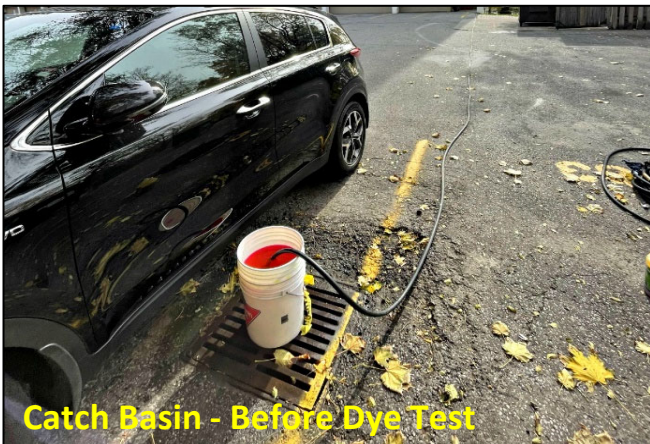
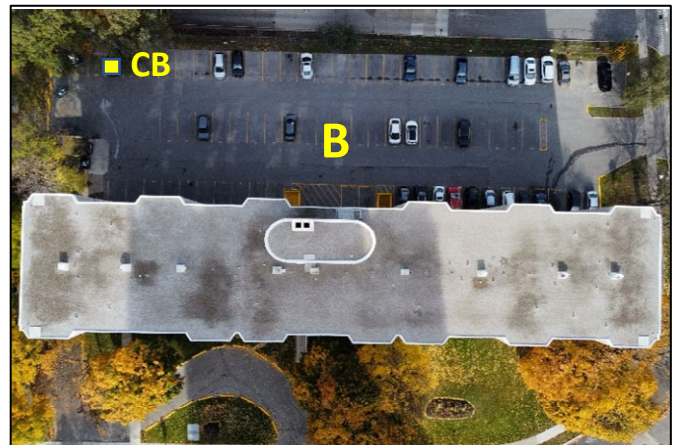
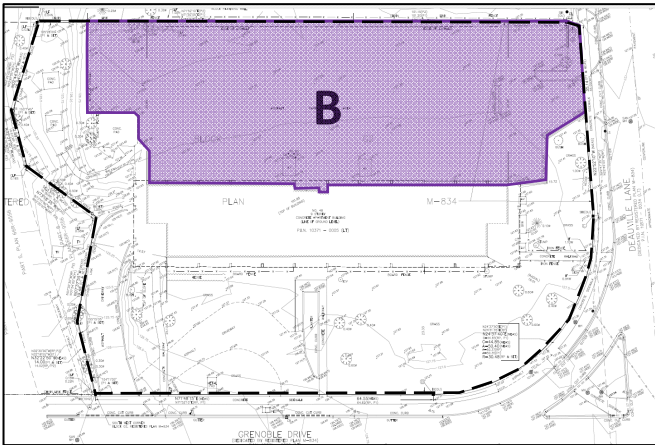
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Investigation Details

Dye Test #2:

In order to identify/confirm the Storm runoff discharge pattern, within the existing Parking area, a Dye Test conducted on the existing CB within the parking area and the dye was observed at Storm MH3.

The result of the dye test confirmed that, all the storm runoff from the Parking area is conveyed into the existing 375mm dia storm sewer along the Easement.



General Information

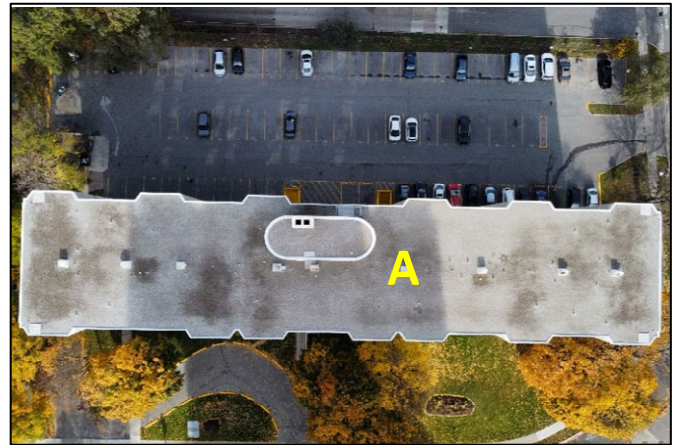
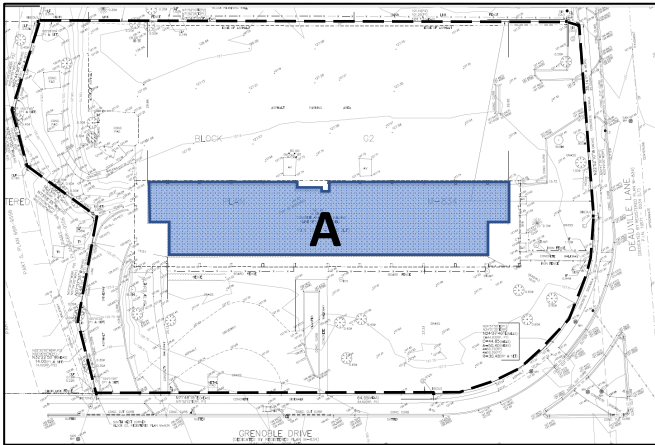
Date: November 1, 2022	Report No. : R22-11-01-01
Project No. : PUD21-110	Address : 48 Grenoble Drive
Owner : Lifestyle Group of Companies	Region/Municipality: City of Toronto

Investigation Details

Dye Test #3:

In order to identify/confirm the Sanitary discharge pattern, within the existing building, a Dye Test conducted on one of sanitary sinks within the building and the dye was observed at Sanitary MH2.

The result of the dye test confirmed that, all the Sanitary discharge from the existing building is conveyed into the existing 450mm dia sanitary sewer along the Easement.



March 18, 2022

Attention:

Chief Engineer and Executive Director, Engineering and Construction Services
c/o Manager, Development Engineering
55 John Street, 16th Floor
Toronto, ON M5v 3C6

cc:

General Manager, Toronto Water
c/o Manager, Environmental Monitoring and Protection Unit
30 Dee Ave, Toronto ON M9N 1S9

Re: 48 Grenoble Drive, Toronto, ON
Our Project No. 22.161

Dear Sir or Madam,

I, Anthony Mirvish, confirm that all buildings on the subject lands (48 Grenoble Drive) can be constructed water-tight below grade in a manner that will resist hydrostatic pressure without any necessity for Private Water Drainage System (subsurface drainage system) consisting of but not limited to weeping tile(s), foundation drain(s), private water collection sump(s), private water pump or any combination thereof for the disposal of private water on the surface of the ground or to a private sewer connection directly or indirectly or drainage system for disposal directly or indirectly in a municipal sewer.

Sincerely,
Honeycomb Group Inc.



Anthony Mirvish, P. Eng.
Principal
anthony.mirvish@honeycombgroup.ca
416-451-9806





30 Soudan Ave., Suite 200
Toronto, Ontario M4S 1V6
Direct line: 416.322.4112
mkelling@tenblock.ca

Microbjo Properties Inc. c/o Tenblock
30 Soudan Avenue, Suite 200
Toronto, ON M4S 1V6

March 18, 2022

Attention: Chief Engineer and Executive Director, Engineering and Construction Services
c/o Manager, Development Engineering
Metro Hall
55 John Street, 16th Floor
Toronto ON M5V 3C6

cc: General Manager, Toronto Water
c/o Manager, Environmental Monitoring and Protection Unit
30 Dee Ave, Toronto ON M9N 1S9

Dear Sir or Madam,

I, Tenblock, confirm and undertake that I will construct and maintain all building(s) on the subject lands (48 Grenoble Drive) in a manner which shall be completely water-tight below grade and resistant to hydrostatic pressure without any necessity for Private Water Drainage System (subsurface drainage system) consisting of but not limited to weeping tile(s), foundation drain(s), private water collection sump(s), private water pump or any combination thereof for the disposal of private water on the surface of the ground or to a private sewer connection directly or indirectly or drainage system for disposal directly or indirectly in a municipal sewer.

Sincerely,
Tenblock

Matthew Kelling, Development Manager
mkelling@tenblock.ca

I, Matthew Kelling, have the authority to bind the corporation.



Smith + Andersen

1100 – 100 Sheppard Ave. East, Toronto ON, M2N 6N5

416 487 8151 f 416 487 9104 smithandandersen.com

2022-03-15

Attention: Chief Engineer and Executive Director, Engineering and Construction Services
c/o Manager, Development Engineering

cc: General Manager, Toronto Water
c/o Manager, Environmental Monitoring and Protection Unit
30 Dee Ave, Toronto ON M9N 1S9

Dear Sir or Madam,

I Vadim Vatoutine, confirm that all building(s) on the subject lands 48 Grenoble Dr. will be designed and constructed in a manner without Private Water Drainage System (subsurface drainage system) consisting of but not limited to weeping tile(s), foundation drain(s), private water collection sump(s), private water pump or any combination thereof for the disposal of private water on the surface of the ground or to a private sewer connection directly or indirectly or drainage system for disposal directly or indirectly in a municipal sewer. Underground structure(s) of the proposed building(s) will be built completely watertight without any direct or indirect connection to the City sewer for the discharge of groundwater (from a PWDS or floor drain or other infrastructure).

I understand that a Private Water Drainage System as an emergency back up system is not permitted, as part of this proposal.

Yours truly,

SMITH + ANDERSEN



Vadim Vatoutine, P.Eng.
Senior Project Manager

21729.002.m. - 48 Grenoble Dr - GW Letter.docx

HYDROGEOLOGICAL REVIEW REPORT

PREPARED FOR:

Tenblock
30 Soudan Avenue, Suite 200
Toronto, ON M4S 1V6

ATTENTION:

Matthew Kelling

48 Grenoble Drive | Toronto, Ontario

Grounded Engineering Inc.

File No. 21-195

Issued March 10, 2022

Revised February 3, 2023



Executive Summary

Grounded Engineering Inc. (Grounded) was retained by Tenblock to conduct a Hydrogeological Review for the proposed redevelopment of 48 Grenoble Drive in Toronto, Ontario (site). The conclusions of the investigation are summarized as follows:

Development Information

Current Development					
Development Phase	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Footings (masl)
			Depth (m)	Elevation (masl)	
1 Building	9	1	Unknown	Unknown	Unknown

Proposed Development					
Development Phase	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Footings (masl)
			Depth (m)	Elevation (masl)	
1 Building (2 towers and associated podium)	Podium - 6 Tower A - 39 Tower B - 39	2	7.5	120.0	118.5

Site Conditions

Site Stratigraphy				
Stratum/Formation	Aquifer or Aquitard	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)
Fill	Aquifer	0.0 – 3.1	127.5 – 124.4	$1.0 \times 10^{-5***}$
Upper Sands	Aquifer	3.1 – 6.9	124.4 – 120.6	$3.6 \times 10^{-6**}$
Upper Glacial Till	Aquifer	6.9 – 20.2	120.6 – 107.3	$5.5 \times 10^{-8*}$
Silts and Clays	Aquitard	20.2 – 26.3	107.3 – 101.2	$1.6 \times 10^{-8*}$
Lower Sands	Aquifer	26.3 – 36.7	101.2 – 90.8	$1.5 \times 10^{-6*}$
Lower Glacial Till	Aquifer	36.7 – 39.7	90.8 – 87.8	$1.0 \times 10^{-7***}$

*Indicates conductivity was calculated by Slug Test

**Indicates conductivity was estimated using grain size analysis

***Indicates conductivity was estimated using typical published values from Freeze and Cherry (1979)

Maximum Groundwater Elevation		
Monitoring Well ID	Depth Below Grade (m)	Elevation (masl)
BH1	13.1	114.2
BH2	15.2	112.0
BH3	16.2	114.8
BH4	14.8	113.1
BH5	10.6	118.2



Maximum Groundwater Elevation		
BH6	17.5	109.6
BH7	30.2	97.3
BH8	30.7	98.4
BH9	30.4	97.5

Groundwater Quality				
Sample ID	Sample Date	Sample Expiry Date	City of Toronto Storm Sewer Limits	City of Toronto Sanitary and Combined Sewer Limits
SW-UF-BH2	Feb 16, 2022	Nov 16, 2022	Exceeds	Meets

Groundwater Control

Stored Groundwater (pre-excavation/dewatering)					
Volume of Excavation (m ³)	Volume of Excavation Below Water Table (m ³)	Volume of Stored Groundwater		Volume of Available Groundwater	
		(m ³)	(L)	(m ³)	(L)
45,240	19,793	8,000	8,000,000	5,800	5,800,000

Short Term (Construction) Groundwater Quantity – Safety Factor of 1.5 Used					
Groundwater Seepage		Design Rainfall Event (25mm)		Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
105,000	72.9	142,000	98.6	247,000	171.5

Long Term (Permanent) Groundwater Quantity – Safety Factor of 1.5 Used						
Scenario	Groundwater Seepage		Infiltration Design Rainfall Event (25mm)		Total Daily Water Takings	
	L/day	L/day	L/min	L/day	L/day	L/min
Drained Structure	105,000	72.9	22,000	15.3	127,000	88.2
Fully Watertight Structure	0	0	0	0	0	0

Maximum Zone of Influence (m)		
Site	Short Term (Construction)	Long Term (Permanent)
48 Grenoble Dr.	Soldier Pile & Lagging – 16 m	Soldier Pile & Lagging – 14 m Fully Watertight Structure – 0 m



Maximum Potential Settlement		
Site	Short Term (Construction)	Long Term (Permanent)
48 Grenoble Dr.	Solider Pile & Lagging – 6 mm	Solider Pile & Lagging – 1 mm Fully Watertight Structure – 0 mm

Regulatory Requirements	Drained Structure	Fully Watertight Structure
Environmental Activity and Sector Registry (EASR) Posting	Required	Required
Short Term Permit to Take Water (PTTW)	Not Required	Not Required
Long Term Permit to Take Water (PTTW)	Required	Not Required
Short Term Discharge Agreement City of Toronto	Required	Required
Long Term Discharge Agreement City of Toronto	Required	Not Required



384 Adelaide Street West, Suite 100
Toronto, ON M5V 1R7

t: 416 862 8800

1050 West Pender Street, Suite 2010
Vancouver, BC V6E 3S7

t: 604 674 0866

1776 Broadway, Suite 2200
New York, NY 10019

t: 212 710 4329

www.dsai.ca
info@dsai.ca

Feb 3, 2022

Sarra Karavasili, P. Eng.
Lithos Groups Inc.
Main Office: 416-366-9610-x1
www.LithosGroup.ca
Sarrak@LithosGroup.ca
150 Bermondsey Rd, Unit #200
Toronto, Ontario M4A 1Y1

Dear Sarra,

RE: 48 Grenoble
Type of Construction Proposed

We are the architects for 48 Grenoble proposed multi-unit residential building. The design of the proposed building for 48 Grenoble is to follow the below requirements of the Ontario Building Code: Group C, any height, any area, sprinklered, non-combustible construction (sentence 3.2.2.42 OBC). Floor assemblies shall be fire separation with a fire-resistance no less than 2hr. Mezzanines shall have a fire-resistance rating no less than 1hr. Loadbearing walls, columns, and arches shall have a fire-resistance rating no less than that required for the supported assembly.

Liviu Budur, OAA

Senior Associate

STUDIO TLA

PROJECT NUMBER		22-101		PROJECT NAME		48 Grenoble Dr.		STUDIO TLA					
DATE		February 6, 2023		COMPLETED BY		JCP							
CALCULATIONS FOR WATER COLLECTED vs. LANDSCAPE WATER REQUIREMENTS													
GENERAL INFO		All measures are in Metric Landscape Water Requirements (LWR) are based on regional evapotranspiration data (Etl), landscape coefficient per plant type (Kl), and irrigation efficiency (IE). Based on LEED v4, which refers to U.S. Environmental Protection Agency (EPA) WaterSense Water Budget Tool.											
Species Factor (Ks)		Plant water needs are determined as follows: North and East / shaded enter the 'Low' value (0.2 shrubs, 0.6 turf, and 0.1 Sedum) South and West / sunny enter the ' Avg' based on shade (0.5 shrubs, 0.7 turf, and 0.2 Sedum)											
Density Factor (Kd)		Plant grouping:		Sparsely planted:		'Low' (0.5, shrubs, 0.6 mixed, 0.6 turf, and 0.6 Sedum mats)							
				Densely Planted:		'High' (1.0 shrubs, 1.3 mixed, 1.0 turf, and 1.0 Sedum Plugs)							
Microclimate Factor (Kmc)		Plant grouping exposure to wind, heat, reflected light:				NE / shaded: 'Low', see above SW / hot and gets the summer wind: 'Ave or High'							
Kl = Ks x Kd x Kmc, landscape coefficient for the type of plant in that hydrozone. Etl = Kl x 138.2 , local reference evapotranspiration for Greater Toronto Area, this example is for July. IE can be Drip, Sprinkler (Spray) or Efficient Flow Nozzles, irrigation Efficient. LWR (H)= area (m²) x (Etl / IE), landscape water requirement for each hydrozone.													
WATER COLLECTION (if applicable)										X			
Cistern:		5mm Retention of Storm Water for Irrigation Purposes				0.000		m³		0.000			
Part 2 - LWR													
Hydro Zone	Feature Area (sq. m.)	Species Factor	Density Factor	Microclimate	Landscape Coefficient (Kl)	Irrigation Efficiency (IE) Drip (.9), Low flow (0.75), Spray (.625)	LWR Average (liters)	LWR May	LWR June	LWR July	LWR August	LWR Sept	
Type	m²	Ks	Kd	Kmc									
Trees in Tree Pits*	129.000	0.500	1.000	0.500	0.250	0.750	4,702	4,369	5,371	5,943	4,747	3,079	
Shrubs	766.000	0.400	1.100	1.300	0.572	0.900	53,231	49,462	60,806	67,281	53,747	34,857	
Perennials	283.000	0.300	1.100	1.300	0.429	0.900	14,750	13,706	16,849	18,643	14,893	9,659	
Mixed	646.000	0.200	1.300	0.500	0.130	0.900	10,203	9,480	11,655	12,896	10,302	6,681	
Turfgrass	0.000	0.700	1.000	1.200	0.840	0.625	0	0	0	0	0	0	
Green Walls	0.000	0.300	1.100	1.200	0.396	0.900	0	0	0	0	0	0	
Sedum Mats	2106.000	0.500	1.000	1.000	0.500	0.900	127,928	118,872	146,133	161,694	129,168	83,772	
Total m²	3930.000						Subtotal (L) per month	210,812	195,889	240,813	266,456	212,856	138,048
							Net potable water (L) from Design Case per week	52,703	48,972	60,203	66,614	53,214	34,512
							Irrigation water use for 72 hours, (subtotal/7days)*3days	22,587	20,988	25,801	28,549	22,806	14,791
							5mm Retention for Irrigation Purposes (see X above)	0	0	0	0	0	0
							AVERAGE WATER REMAINING IN CISTERN AFTER 72 HR (May-Sept)	0	0	0	0	0	0
*Trees in Tree Pits, include 6.4 sq m/Tree													



Smith + Andersen

1100 – 100 Sheppard Ave. East, Toronto ON, M2N 6N5

416 487 8151 f 416 487 9104 smithandandersen.com

2023-02-07

Attention: Chief Engineer and Executive Director, Engineering and Construction Services
c/o Manager, Development Engineering
North York Civic Centre
5100 Yonge Street, 4th floor
Toronto, Ontario, M2N 5V7

Dear Sir or Madam,

I Bram Atlin, confirm that the sprinkler system of all building(s) on the subject lands 48 Grenoble Drive will be designed and constructed in a manner which meets the requirements of NFPA 13 as well as all other NFPA standards as required by code.

Yours truly,

SMITH + ANDERSEN

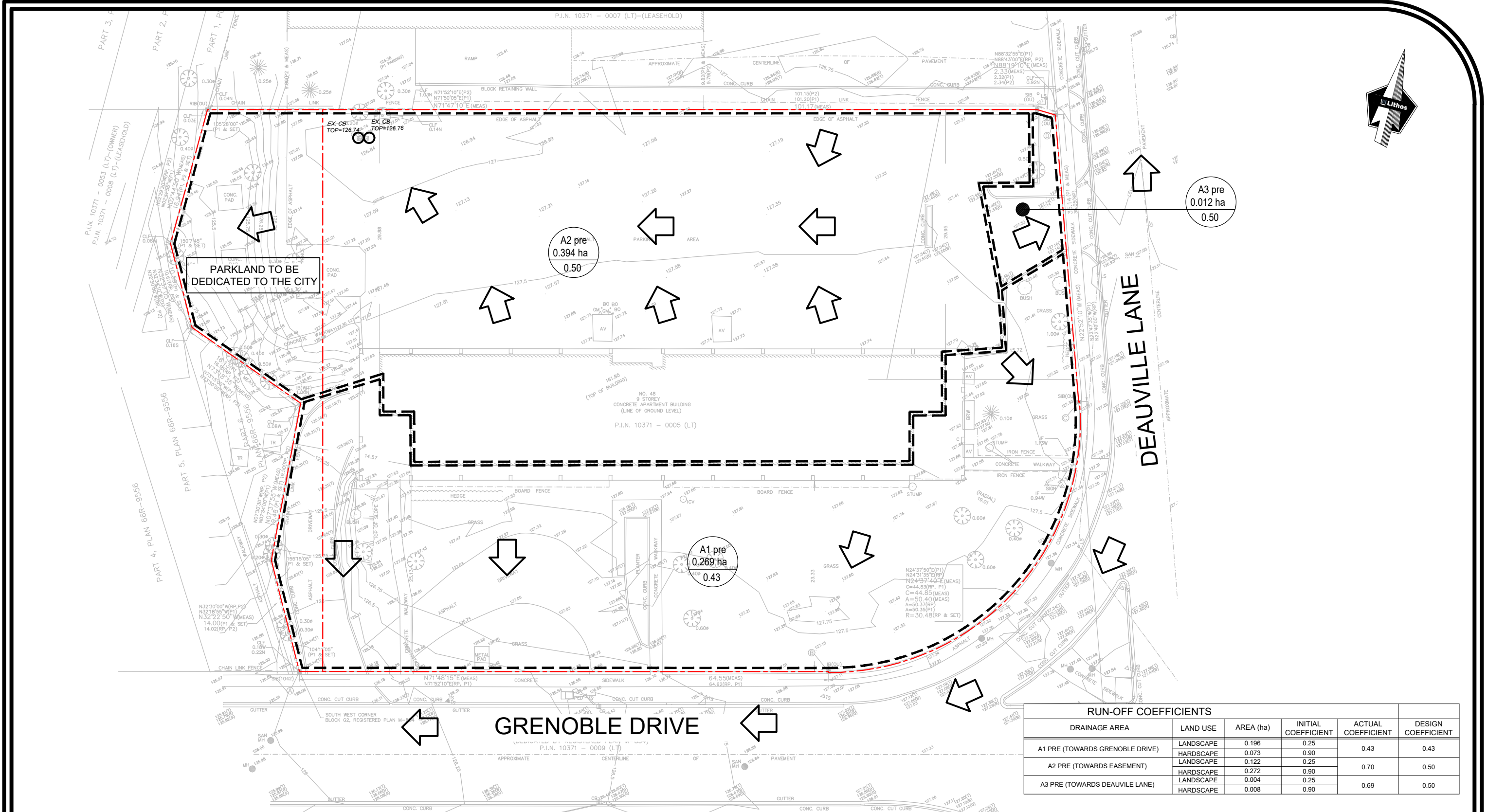
Bram Atlin, P.Eng.
Principal



21729.002.m - 48 Grenoble Dr - Sprinkler Letter.docx

Appendix C

Storm Analysis





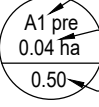
150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LEGEND

PRE-DEVELOPMENT STORM DRAINAGE AREA

PROPERTY LINE

MAJOR DRAINAGE PATTERN

STORM DRAINAGE AREA NUMBER

DRAINAGE AREA (ha)

COMPOSITE RUNOFF COEFFICIENT

PRE-DEVELOPMENT DRAINAGE AREA PLAN

RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: UD21-110

FIGURE No: DAP1

RUN-OFF COEFFICIENTS					
DRAINAGE AREA	LAND USE	AREA (ha)	INITIAL COEFFICIENT	ACTUAL COEFFICIENT	DESIGN COEFFICIENT
A1 PRE (TOWARDS GRENABLE DRIVE)	LANDSCAPE	0.196	0.25	0.43	0.43
	HARDSCAPE	0.073	0.90		
A2 PRE (TOWARDS EASEMENT)	LANDSCAPE	0.122	0.25	0.70	0.50
	HARDSCAPE	0.272	0.90		
A3 PRE (TOWARDS DEAUVILLE LANE)	LANDSCAPE	0.004	0.25	0.69	0.50
	HARDSCAPE	0.008	0.90		



Prepared By: Isaak Chlorotiris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Rational Method Pre-Development Flow Calculation

48 Grenoble Drive

File No. UD21-110

City of Toronto

Date: February 2023

Area Number	Area (ha)	Actual Coefficient	Design Coefficient
A1 Pre – towards Grenoble Drive	0.269	0.43	0.43
A2 Pre – towards Easement	0.394	0.70	0.50
A3 Pre – towards Deauville Lane	0.012	0.69	0.50

Rational Method Calculation

A1 Pre – towards Grenoble Drive

Event 2-year IDF Data Set City of Toronto a = 21.80 c = -0.780

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A1 Pre	0.269	0.43	0.12	10	88.2	0.028	28.4

Event 5-year IDF Data Set City of Toronto a = 32.00 c = -0.790

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A1 Pre	0.269	0.43	0.12	10	131.8	0.042	42.4

Event 100-year IDF Data Set City of Toronto a = 59.70 c = -0.800

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A1 Pre	0.269	0.43	0.12	10	250.3	0.080	80.5

A2 Pre – towards Easement

Event 2-year IDF Data Set City of Toronto a = 21.80 c = -0.780

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A2 Pre	0.394	0.50	0.20	10	88.2	0.048	48.2

Event 5-year IDF Data Set City of Toronto a = 32.00 c = -0.790

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A2 Pre	0.394	0.50	0.20	10	131.8	0.072	72.1

Event 100-year IDF Data Set City of Toronto a = 59.70 c = -0.800

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A2 Pre	0.394	0.50	0.20	10	250.3	0.137	136.9

Rational Method Calculation

A3 Pre

Event 2-year IDF Data Set City of Toronto a = 21.80 c = -0.780

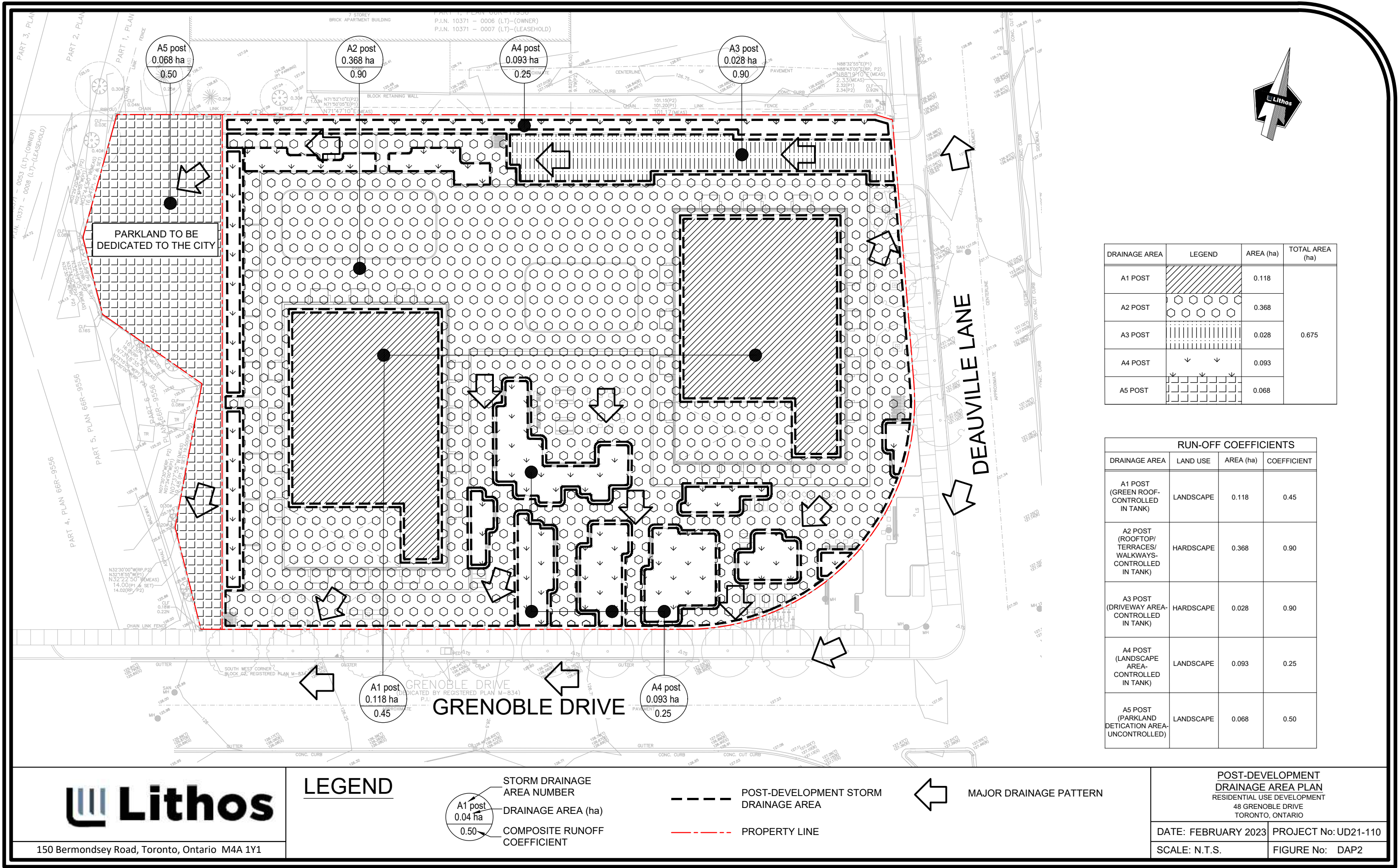
Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A3 Pre	0.012	0.50	0.01	10	88.2	0.001	1.5

Event 5-year IDF Data Set City of Toronto a = 32.00 c = -0.790

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A3 Pre	0.012	0.50	0.01	10	131.8	0.002	2.2

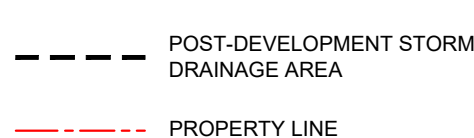
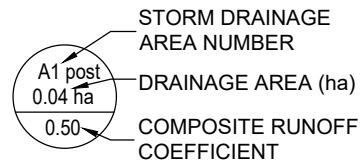
Event 100-year IDF Data Set City of Toronto a = 59.70 c = -0.800

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m ³ /s)	Q (L/s)
A3 Pre	0.012	0.50	0.01	10	250.3	0.004	4.2



150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LEGEND



MAJOR DRAINAGE PATTERN

POST-DEVELOPMENT
DRAINAGE AREA PLAN
RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

DATE: FEBRUARY 2023 PROJECT No: UD21-110

SCALE: N.T.S. FIGURE No: DAP2

DRAINAGE AREA	LEGEND	AREA (ha)	TOTAL AREA (ha)
A1 POST		0.118	0.675
A2 POST		0.368	
A3 POST		0.028	
A4 POST		0.093	
A5 POST		0.068	

RUN-OFF COEFFICIENTS			
DRAINAGE AREA	LAND USE	AREA (ha)	COEFFICIENT
A1 POST (GREEN ROOF- CONTROLLED IN TANK)	LANDSCAPE	0.118	0.45
A2 POST (ROOFTOP/ TERRACES/ WALKWAYS- CONTROLLED IN TANK)	HARDSCAPE	0.368	0.90
A3 POST (DRIVEWAY AREA- CONTROLLED IN TANK)	HARDSCAPE	0.028	0.90
A4 POST (LANDSCAPE AREA- CONTROLLED IN TANK)	LANDSCAPE	0.093	0.25
A5 POST (PARKLAND DEDICATION AREA- UNCONTROLLED)	LANDSCAPE	0.068	0.50

Lithos Modified Rational Method - Two Year Storm Site Flow and Storage Summary - towards Grenoble Drive City of Toronto										File No. UD21-110 Date: February 2023 Prepared By: Isaak Chlorotyris, P.E., M.A.Sc. Reviewed By: John Pasalidis, P.Eng., M.A.Sc.			
	Drainage Area A1 Post			Drainage Area A2 Post		Drainage Area A3 Post		Drainage Area A4 Post		Total Site			
	Green Roofs - Controlled In Underground Tank			Rooftops/Terraces/Walkways - Controlled In Underground Tank		Driveway area - Controlled In Underground Tank		Landscaped - Controlled In Underground Tank		Total Site = A1 + A2 + A3 +A4			
	Area (A1) = 0.118 ha "C" = 0.45 AC1= 0.05 Tc = 10.0 min Time Increment = 5.0 min			Area (A2) = 0.368 ha "C" = 0.90 AC2= 0.332 Tc = 10 min Time Increment = 5 min		Area (A3) = 0.028 ha "C" = 0.90 AC3= 0.025 Tc = 10 min Time Increment = 5 min		Area (A4) = 0.093 ha "C" = 0.25 AC4= 0.023 Tc = 10 min Time Increment = 5 min		2-yr Pre-Development Site Release Rate = 28.4 L/s			
	Max. Release Rate = 13.0 L/s			Max. Release Rate = 81.2 L/s		Max. Release Rate = 6.1 L/s		Max. Release Rate = 5.7 L/s		Uncontrolled Flow = 0.0 L/s Total Uncontrolled Release Rate Achieved = 0.0 L/s Design Controlled Release Rate (Pump) = 28.4 L/s			
	2-Year Design Storm									Total Site Release Rate Achieved = 28.4 L/s			
a= 21.80										Max. Storage Tank Size = 46.57 m³			
c= -0.78										Stor. Tank footprint Area = 74.20 m²			
I = A(T) ^c													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Time	Rainfall	Storm	Runoff	Storm	Runoff	Storm	Runoff	Storm	Runoff	Total Storm	Released Volume	Storage	Storage
	Intensity	Runoff (A1 Post)	Volume (A1 Post)	Runoff (A2 Post)	Volume (A2 Post)	Runoff (A3 Post)	Volume (A3 Post)	Runoff (A4 Post)	Volume (A4 Post)	Runoff Volume (4)+(6)+(8)+(10)=(11)"	(32.0/1000)*((1)*60)	Volume	Depth of Tank
(min)	(mm/hr)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³)	(m³)	(m³)	(m)
10.0	88.2	0.013	7.78	0.081	48.73	0.006	3.67	0.006	3.43	63.61	17.04	46.6	0.63
15.0	64.3	0.009	8.50	0.059	53.28	0.004	4.01	0.004	3.75	69.55	25.56	44.0	0.59
20.0	51.4	0.008	9.06	0.047	56.76	0.004	4.28	0.003	4.00	74.09	34.08	40.0	0.54
25.0	43.2	0.006	9.52	0.040	59.62	0.003	4.49	0.003	4.20	77.82	42.60	35.2	0.47
30.0	37.4	0.006	9.90	0.034	62.06	0.003	4.68	0.002	4.37	81.01	51.12	29.9	0.40
35.0	33.2	0.005	10.25	0.031	64.20	0.002	4.84	0.002	4.52	83.80	59.64	24.2	0.33
40.0	29.9	0.004	10.55	0.028	66.11	0.002	4.98	0.002	4.65	86.30	68.16	18.1	0.24
45.0	27.3	0.004	10.83	0.025	67.85	0.002	5.11	0.002	4.78	88.56	76.68	11.9	0.16
50.0	25.1	0.004	11.08	0.023	69.44	0.002	5.23	0.002	4.89	90.64	85.20	5.4	0.07
55.0	23.3	0.003	11.32	0.021	70.91	0.002	5.34	0.002	4.99	92.56	93.72	0.0	0.00
60.0	21.8	0.003	11.54	0.020	72.28	0.002	5.45	0.001	5.09	94.35	102.24	0.0	0.00
65.0	20.5	0.003	11.74	0.019	73.56	0.001	5.54	0.001	5.18	96.03	110.76	0.0	0.00
70.0	19.3	0.003	11.93	0.018	74.77	0.001	5.63	0.001	5.26	97.61	119.28	0.0	0.00
75.0	18.3	0.003	12.12	0.017	75.92	0.001	5.72	0.001	5.34	99.10	127.80	0.0	0.00
80.0	17.4	0.003	12.29	0.016	77.00	0.001	5.80	0.001	5.42	100.52	136.32	0.0	0.00
85.0	16.6	0.002	12.46	0.015	78.04	0.001	5.88	0.001	5.49	101.87	144.84	0.0	0.00
90.0	15.9	0.002	12.61	0.015	79.02	0.001	5.95	0.001	5.56	103.15	153.36	0.0	0.00
95.0	15.2	0.002	12.76	0.014	79.97	0.001	6.03	0.001	5.63	104.39	161.88	0.0	0.00
100.0	14.6	0.002	12.91	0.013	80.88	0.001	6.09	0.001	5.69	105.57	170.40	0.0	0.00
105.0	14.1	0.002	13.05	0.013	81.75	0.001	6.16	0.001	5.75	106.71	178.92	0.0	0.00
110.0	13.6	0.002	13.18	0.013	82.59	0.001	6.22	0.001	5.81	107.81	187.44	0.0	0.00
115.0	13.1	0.002	13.31	0.012	83.40	0.001	6.28	0.001	5.87	108.87	195.96	0.0	0.00
120.0	12.7	0.002	13.44	0.012	84.19	0.001	6.34	0.001	5.93	109.89	204.48	0.0	0.00
125.0	12.3	0.002	13.56	0.011	84.95	0.001	6.40	0.001	5.98	110.89	213.00	0.0	0.00
130.0	11.9	0.002	13.68	0.011	85.68	0.001	6.46	0.001	6.03	111.85	221.52	0.0	0.00
135.0	11.6	0.002	13.79	0.011	86.40	0.001	6.51	0.001	6.08	112.78	230.04	0.0	0.00
140.0	11.3	0.002	13.90	0.010	87.09	0.001	6.56	0.001	6.13	113.68	238.56	0.0	0.00
145.0	11.0	0.002	14.01	0.010	87.77	0.001	6.61	0.001	6.18	114.57	247.08	0.0	0.00
150.0	10.7	0.002	14.11	0.010	88.42	0.001	6.66	0.001	6.22	115.42	255.60	0.0	0.00
155.0	10.4	0.002	14.22	0.010	89.06	0.001	6.71	0.001	6.27	116.26	264.12	0.0	0.00
160.0	10.1	0.001	14.31	0.009	89.69	0.001	6.76	0.001	6.31	117.07	272.64	0.0	0.00
165.0	9.9	0.001	14.41	0.009	90.30	0.001	6.80	0.001	6.36	117.87	281.16	0.0	0.00
170.0	9.7	0.001	14.51	0.009	90.89	0.001	6.85	0.001	6.40	118.65	289.68	0.0	0.00
175.0	9.5	0.001	14.60	0.009	91.47	0.001	6.89	0.001	6.44	119.40	298.20	0.0	0.00
180.0	9.3	0.001	14.69	0.009	92.04	0.001	6.94	0.001	6.48	120.15	306.72	0.0	0.00
185.0	9.1	0.001	14.78	0.008	92.60	0.001	6.98	0.001	6.52	120.87	315.24	0.0	0.00
190.0	8.9	0.001	14.87	0.008	93.14	0.001	7.02	0.001	6.56	121.58	323.76	0.0	0.00
195.0	8.7	0.001	14.95	0.008	93.68	0.001	7.06	0.001	6.59	122.28	332.28	0.0	0.00
200.0	8.5	0.001	15.04	0.008	94.20	0.001	7.10	0.001	6.63	122.96	340.80	0.0	0.00
205.0	8.4	0.001	15.12	0.008	94.71	0.001	7.14	0.001	6.67	123.63	349.32	0.0	0.00
210.0	8.2	0.001	15.20	0.008	95.22	0.001	7.17	0.001	6.70	124.29	357.84	0.0	0.00
215.0	8.1	0.001	15.28	0.007	95.71	0.001	7.21	0.001	6.74	124.94	366.36	0.0	0.00
220.0	7.9	0.001	15.35	0.007	96.20	0.001	7.25	0.001	6.77	125.57	374.88	0.0	0.00
225.0	7.8	0.001	15.43	0.007	96.67	0.001	7.28	0.001	6.81	126.19	383.40	0.0	0.00
230.0	7.6	0.001	15.50	0.007	97.14	0.001	7.32	0.000	6.84	126.80	391.92	0.0	0.00
235.0	7.5	0.001	15.58	0.007	97.60	0.001	7.35	0.000	6.87	127.41	400.44	0.0	0.00
240.0	7.4	0.001	15.65	0.007	98.06	0.001	7.39	0.000	6.90	128.00	408.96	0.0	0.00
245.0	7.3	0.001	15.72	0.007	98.50	0.001	7.42	0.000	6.93	128.58	417.48	0.0	0.00
250.0	7.2	0.001	15.79	0.007	98.94	0.000	7.46	0.000	6.96	129.15	426.00	0.0	0.00
255.0	7.1	0.001	15.86	0.006	99.37	0.000	7.49	0.000	7.00	129.72	434.52	0.0	0.00
260.0	6.9	0.001	15.93	0.006	99.80	0.000	7.52	0.000	7.03	130.27	443.04	0.0	0.00
265.0	6.8	0.001	16.00	0.006	100.22	0.000	7.55	0.000	7.05	130.82	451.56	0.0	0.00
270.0	6.7	0.001	16.06	0.006	100.63	0.000	7.58	0.000	7.08	131.36	460.08	0.0	0.00



Modified Rational Method - Five Year Storm
Site Flow and Storage Summary - towards Grenoble Drive
City of Toronto

File No. UD21-110
Date: February 2023
Prepared By: Isaak Chlorotyris, P.E., M.A.Sc.
Reviewed By: John Pasalidis, P.Eng., M.A.Sc.

5-Year Design Storm		Drainage Area A1 Post		Drainage Area A2 Post		Drainage Area A3 Post		Drainage Area A4 Post		Total Site			
		Green Roofs - Controlled In Underground Tank		Rooftops/Terraces/Walkways - Controlled In Underground Tank		Driveway area - Controlled In Underground Tank		Landscaped - Controlled In Underground Tank		Total Site = A1 + A2 + A3 +A4			
		Area (A1) = 0.118 ha "C" = 0.45 AC1= 0.05 Tc = 10.0 min Time Increment = 5.0 min		Area (A2) = 0.368 ha "C" = 0.90 AC2= 0.332 Tc = 10 min Time Increment = 5 min		Area (A3) = 0.028 ha "C" = 0.90 AC3= 0.025 Tc = 10 min Time Increment = 5 min		Area (A4) = 0.093 ha "C" = 0.25 AC4= 0.023 Tc = 10 min Time Increment = 5 min		2-yr Pre-Development Site Release Rate = 28.4 L/s			
		Max. Release Rate = 19.4 L/s		Max. Release Rate = 121.4 L/s		Max. Release Rate = 9.1 L/s		Max. Release Rate = 8.5 L/s		Uncontrolled Flow = 0.0 L/s Total Uncontrolled Release Rate Achieved = 0.0 L/s Design Controlled Release Rate (Pump) = 28.4 L/s			
		Total Site Release Rate Achieved = 28.4 L/s								Max. Storage Tank Size = 78.03 m³ Stor. Tank footprint Area = 74.20 m²			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Time	Rainfall	Storm	Runoff	Storm	Runoff	Storm	Runoff	Storm	Runoff	Total Storm	Released	Storage	Storage
(min)	(mm/hr)	Runoff (A1 Post)	Volume (A1 Post)	Runoff (A2 Post)	Volume (A2 Post)	Runoff (A3 Post)	Volume (A3 Post)	Runoff (A4 Post)	Volume (A4 Post)	Runoff Volume "(4)+(6)+(8)+(10)=(11)"	Volume	Volume	Depth of Tank
		(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³)	(m³)	(m³)	(m)
10.0	131.8	0.019	11.62	0.121	72.83	0.009	5.49	0.009	5.13	95.07	17.04	78.0	1.05
15.0	95.7	0.014	12.66	0.088	79.30	0.007	5.98	0.006	5.58	103.52	25.56	78.0	1.05
20.0	76.2	0.011	13.45	0.070	84.24	0.005	6.35	0.005	5.93	109.96	34.08	75.9	1.02
25.0	63.9	0.009	14.09	0.059	88.28	0.004	6.65	0.004	6.21	115.24	42.60	72.6	0.98
30.0	55.3	0.008	14.64	0.051	91.73	0.004	6.91	0.004	6.46	119.74	51.12	68.6	0.92
35.0	49.0	0.007	15.12	0.045	94.74	0.003	7.14	0.003	6.67	123.68	59.64	64.0	0.86
40.0	44.1	0.006	15.55	0.041	97.44	0.003	7.34	0.003	6.86	127.19	68.16	59.0	0.80
45.0	40.2	0.006	15.94	0.037	99.88	0.003	7.53	0.003	7.03	130.38	76.68	53.7	0.72
50.0	37.0	0.005	16.30	0.034	102.11	0.003	7.69	0.002	7.19	133.29	85.20	48.1	0.65
55.0	34.3	0.005	16.63	0.032	104.18	0.002	7.85	0.002	7.33	135.99	93.72	42.3	0.57
60.0	32.0	0.005	16.93	0.029	106.10	0.002	7.99	0.002	7.47	138.50	102.24	36.3	0.49
65.0	30.0	0.004	17.22	0.028	107.90	0.002	8.13	0.002	7.60	140.84	110.76	30.1	0.41
70.0	28.3	0.004	17.49	0.026	109.59	0.002	8.26	0.002	7.71	143.05	119.28	23.8	0.32
75.0	26.8	0.004	17.75	0.025	111.19	0.002	8.38	0.002	7.83	145.14	127.80	17.3	0.23
80.0	25.5	0.004	17.99	0.023	112.71	0.002	8.49	0.002	7.93	147.12	136.32	10.8	0.15
85.0	24.3	0.004	18.22	0.022	114.15	0.002	8.60	0.002	8.04	149.01	144.84	4.2	0.06
90.0	23.2	0.003	18.44	0.021	115.53	0.002	8.71	0.002	8.13	150.81	153.36	0.0	0.00
95.0	22.3	0.003	18.65	0.020	116.85	0.002	8.80	0.001	8.23	152.53	161.88	0.0	0.00
100.0	21.4	0.003	18.85	0.020	118.11	0.001	8.90	0.001	8.31	154.18	170.40	0.0	0.00
105.0	20.6	0.003	19.05	0.019	119.33	0.001	8.99	0.001	8.40	155.77	178.92	0.0	0.00
110.0	19.8	0.003	19.23	0.018	120.50	0.001	9.08	0.001	8.48	157.30	187.44	0.0	0.00
115.0	19.1	0.003	19.41	0.018	121.63	0.001	9.17	0.001	8.56	158.77	195.96	0.0	0.00
120.0	18.5	0.003	19.59	0.017	122.72	0.001	9.25	0.001	8.64	160.20	204.48	0.0	0.00
125.0	17.9	0.003	19.76	0.017	123.78	0.001	9.33	0.001	8.71	161.58	213.00	0.0	0.00
130.0	17.4	0.003	19.92	0.016	124.80	0.001	9.40	0.001	8.79	162.91	221.52	0.0	0.00
135.0	16.9	0.002	20.08	0.016	125.80	0.001	9.48	0.001	8.86	164.21	230.04	0.0	0.00
140.0	16.4	0.002	20.23	0.015	126.76	0.001	9.55	0.001	8.92	165.47	238.56	0.0	0.00
145.0	15.9	0.002	20.38	0.015	127.70	0.001	9.62	0.001	8.99	166.69	247.08	0.0	0.00
150.0	15.5	0.002	20.53	0.014	128.61	0.001	9.69	0.001	9.05	167.88	255.60	0.0	0.00
155.0	15.1	0.002	20.67	0.014	129.50	0.001	9.76	0.001	9.12	169.04	264.12	0.0	0.00
160.0	14.7	0.002	20.81	0.014	130.37	0.001	9.82	0.001	9.18	170.17	272.64	0.0	0.00
165.0	14.4	0.002	20.94	0.013	131.21	0.001	9.89	0.001	9.24	171.28	281.16	0.0	0.00
170.0	14.1	0.002	21.07	0.013	132.04	0.001	9.95	0.001	9.29	172.35	289.68	0.0	0.00
175.0	13.7	0.002	21.20	0.013	132.84	0.001	10.01	0.001	9.35	173.41	298.20	0.0	0.00
180.0	13.4	0.002	21.33	0.012	133.63	0.001	10.07	0.001	9.41	174.44	306.72	0.0	0.00
185.0	13.1	0.002	21.45	0.012	134.40	0.001	10.13	0.001	9.46	175.44	315.24	0.0	0.00
190.0	12.9	0.002	21.57	0.012	135.16	0.001	10.18	0.001	9.51	176.43	323.76	0.0	0.00
195.0	12.6	0.002	21.69	0.012	135.90	0.001	10.24	0.001	9.57	177.39	332.28	0.0	0.00
200.0	12.4	0.002	21.81	0.011	136.62	0.001	10.29	0.001	9.62	178.34	340.80	0.0	0.00
205.0	12.1	0.002	21.92	0.011	137.33	0.001	10.35	0.001	9.67	179.27	349.32	0.0	0.00
210.0	11.9	0.002	22.03	0.011	138.03	0.001	10.40	0.001	9.72	180.18	357.84	0.0	0.00
215.0	11.7	0.002	22.14	0.011	138.71	0.001	10.45	0.001	9.76	181.07	366.36	0.0	0.00
220.0	11.5	0.002	22.25	0.011	139.38	0.001	10.50	0.001	9.81	181.94	374.88	0.0	0.00
225.0	11.3	0.002	22.35	0.010	140.04	0.001	10.55	0.001	9.86	182.80	383.40	0.0	0.00
230.0	11.1	0.002	22.46	0.010	140.69	0.001	10.60	0.001	9.90	183.65	391.92	0.0	0.00
235.0	10.9	0.002	22.56	0.010	141.33	0.001	10.65	0.001	9.95	184.48	400.44	0.0	0.00
240.0	10.7	0.002	22.66	0.010	141.95	0.001	10.70	0.001	9.99	185.30	408.96	0.0	0.00
245.0	10.5	0.002	22.76	0.010	142.57	0.001	10.74	0.001	10.04	186.10	417.48	0.0	0.00
250.0	10.4	0.002	22.85	0.010	143.18	0.001	10.79	0.001	10.08	186.89	426.00	0.0	0.00
255.0	10.2	0.001	22.95	0.009	143.77	0.001	10.83	0.001	10.12	187.67	434.52	0.0	0.00
260.0	10.0	0.001	23.04	0.009	144.36	0.001	10.88	0.001	10.16	188.44	443.04	0.0	0.00
265.0	9.9	0.001	23.13	0.009	144.94	0.001	10.92	0.001	10.20	189.20	451.56	0.0	0.00
270.0	9.8	0.001	23.22	0.009	145.51	0.001	10.96	0.001	10.24	189.94	460.08	0.0	0.00



Modified Rational Method - Hundred Year Storm
Site Flow and Storage Summary - towards Grenoble Drive
City of Toronto

File No. UD21-110
Date: February 2023
Prepared By: Isaak Chlorotyris, P.E., M.A.Sc.
Reviewed By: John Pasalidis, P.Eng., M.A.Sc.

		Drainage Area A1 Post		Drainage Area A2 Post		Drainage Area A3 Post		Drainage Area A4 Post		Total Site			
		Green Roofs - Controlled In Underground Tank		Rooftops/Terraces/Walkways - Controlled In Underground Tank		Driveway area - Controlled In Underground Tank		Landscaped - Controlled In Underground Tank		Total Site = A1 + A2 + A3 +A4			
		Area (A1) = 0.118 ha "C" = 0.45 AC1= 0.05 Tc = 10.0 min Time Increment = 5.0 min		Area (A2) = 0.368 ha "C" = 0.90 AC2= 0.332 Tc = 10 min Time Increment = 5 min		Area (A3) = 0.028 ha "C" = 0.90 AC3= 0.025 Tc = 10 min Time Increment = 5 min		Area (A4) = 0.093 ha "C" = 0.25 AC4= 0.023 Tc = 10 min Time Increment = 5 min		2-yr Pre-Development Site Release Rate = 28.4 L/s			
		Max. Release Rate = 36.8 L/s		Max. Release Rate = 230.5 L/s		Max. Release Rate = 17.4 L/s		Max. Release Rate = 16.2 L/s		Uncontrolled Flow = 0.0 L/s Total Uncontrolled Release Rate Achieved = 0.0 L/s Design Controlled Release Rate (Pump) = 28.4 L/s			
100-Year Design Storm										Total Site Release Rate Achieved = 28.4 L/s			
a=	59.70									Max. Storage Tank Size = 174.37 m³			
c=	-0.80									Stor. Tank footprint Area = 74.20 m²			
l =	A(T) ^c												
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Time	Rainfall	Storm	Runoff	Storm	Runoff	Storm	Runoff	Storm	Runoff	Total Storm	Released	Storage	Storage
	Intensity	Runoff (A1 Post)	Volume (A1 Post)	Runoff (A2 Post)	Volume (A2 Post)	Runoff (A3 Post)	Volume (A3 Post)	Runoff (A4 Post)	Volume (A4 Post)	Runoff Volume "(4)+(6)+(8)+(10)=(11)"	Volume	Volume	Depth of Tank
(min)	(mm/hr)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³/s)	(m³)	(m³)	(m³)	(m³)	(m)
10.0	250.3	0.037	22.08	0.231	138.33	0.017	10.42	0.016	9.74	180.57	17.04	163.5	2.20
15.0	181.0	0.027	23.94	0.167	150.01	0.013	11.30	0.012	10.56	195.82	25.56	170.3	2.29
20.0	143.8	0.021	25.36	0.132	158.90	0.010	11.97	0.009	11.19	207.42	34.08	173.3	2.34
25.0	120.3	0.018	26.52	0.111	166.15	0.008	12.52	0.008	11.70	216.88	42.60	174.28	2.35
30.0	103.9	0.015	27.50	0.096	172.32	0.007	12.98	0.007	12.13	224.94	51.12	173.8	2.34
35.0	91.9	0.014	28.36	0.085	177.71	0.006	13.39	0.006	12.51	231.98	59.64	172.3	2.32
40.0	82.6	0.012	29.13	0.076	182.52	0.006	13.75	0.005	12.85	238.26	68.16	170.1	2.29
45.0	75.1	0.011	29.83	0.069	186.87	0.005	14.08	0.005	13.15	243.94	76.68	167.3	2.25
50.0	69.1	0.010	30.46	0.064	190.85	0.005	14.38	0.004	13.43	249.13	85.20	163.9	2.21
55.0	64.0	0.009	31.05	0.059	194.53	0.004	14.66	0.004	13.69	253.93	93.72	160.2	2.16
60.0	59.7	0.009	31.59	0.055	197.94	0.004	14.92	0.004	13.93	258.38	102.24	156.1	2.10
65.0	56.0	0.008	32.10	0.052	201.14	0.004	15.16	0.004	14.16	262.55	110.76	151.8	2.05
70.0	52.8	0.008	32.58	0.049	204.14	0.004	15.38	0.003	14.37	266.47	119.28	147.2	1.98
75.0	49.9	0.007	33.04	0.046	206.98	0.003	15.60	0.003	14.57	270.18	127.80	142.4	1.92
80.0	47.4	0.007	33.46	0.044	209.66	0.003	15.80	0.003	14.76	273.69	136.32	137.4	1.85
85.0	45.2	0.007	33.87	0.042	212.22	0.003	15.99	0.003	14.94	277.02	144.84	132.2	1.78
90.0	43.2	0.006	34.26	0.040	214.66	0.003	16.18	0.003	15.11	280.21	153.36	126.8	1.71
95.0	41.3	0.006	34.63	0.038	217.00	0.003	16.35	0.003	15.28	283.26	161.88	121.4	1.64
100.0	39.7	0.006	34.99	0.037	219.23	0.003	16.52	0.003	15.43	286.18	170.40	115.8	1.56
105.0	38.2	0.006	35.33	0.035	221.38	0.003	16.68	0.002	15.58	288.98	178.92	110.1	1.48
110.0	36.8	0.005	35.67	0.034	223.45	0.003	16.84	0.002	15.73	291.68	187.44	104.2	1.40
115.0	35.5	0.005	35.98	0.033	225.45	0.002	16.99	0.002	15.87	294.29	195.96	98.3	1.33
120.0	34.3	0.005	36.29	0.032	227.37	0.002	17.13	0.002	16.01	296.80	204.48	92.3	1.24
125.0	33.2	0.005	36.59	0.031	229.24	0.002	17.27	0.002	16.14	299.24	213.00	86.2	1.16
130.0	32.2	0.005	36.88	0.030	231.04	0.002	17.41	0.002	16.26	301.59	221.52	80.1	1.08
135.0	31.2	0.005	37.16	0.029	232.79	0.002	17.54	0.002	16.39	303.88	230.04	73.8	1.00
140.0	30.3	0.004	37.43	0.028	234.49	0.002	17.67	0.002	16.51	306.10	238.56	67.5	0.91
145.0	29.5	0.004	37.69	0.027	236.15	0.002	17.79	0.002	16.62	308.25	247.08	61.2	0.82
150.0	28.7	0.004	37.95	0.026	237.75	0.002	17.92	0.002	16.74	310.35	255.60	54.8	0.74
155.0	27.9	0.004	38.20	0.026	239.32	0.002	18.03	0.002	16.85	312.39	264.12	48.3	0.65
160.0	27.2	0.004	38.44	0.025	240.84	0.002	18.15	0.002	16.95	314.38	272.64	41.7	0.56
165.0	26.6	0.004	38.68	0.024	242.33	0.002	18.26	0.002	17.06	316.32	281.16	35.2	0.47
170.0	25.9	0.004	38.91	0.024	243.78	0.002	18.37	0.002	17.16	318.22	289.68	28.5	0.38
175.0	25.4	0.004	39.14	0.023	245.20	0.002	18.48	0.002	17.26	320.07	298.20	21.9	0.29
180.0	24.8	0.004	39.36	0.023	246.58	0.002	18.58	0.002	17.36	321.88	306.72	15.2	0.20
185.0	24.3	0.004	39.57	0.022	247.94	0.002	18.68	0.002	17.45	323.65	315.24	8.4	0.11
190.0	23.7	0.003	39.78	0.022	249.26	0.002	18.78	0.002	17.55	325.38	323.76	1.6	0.02
195.0	23.3	0.003	39.99	0.021	250.56	0.002	18.88	0.002	17.64	327.07	332.28	0.0	0.00
200.0	22.8	0.003	40.19	0.021	251.83	0.002	18.98	0.001	17.73	328.73	340.80	0.0	0.00
205.0	22.3	0.003	40.39	0.021	253.08	0.002	19.07	0.001	17.82	330.36	349.32	0.0	0.00
210.0	21.9	0.003	40.59	0.020	254.30	0.002	19.16	0.001	17.90	331.95	357.84	0.0	0.00
215.0	21.5	0.003	40.78	0.020	255.50	0.001	19.25	0.001	17.99	333.52	366.36	0.0	0.00
220.0	21.1	0.003	40.97	0.019	256.68	0.001	19.34	0.001	18.07	335.06	374.88	0.0	0.00
225.0	20.7	0.003	41.15	0.019	257.84	0.001	19.43	0.001	18.15	336.57	383.40	0.0	0.00
230.0	20.4	0.003	41.33	0.019	258.97	0.001	19.51	0.001	18.23	338.05	391.92	0.0	0.00
235.0	20.0	0.003	41.51	0.018	260.09	0.001	19.60	0.001	18.31	339.51	400.44	0.0	0.00
240.0	19.7	0.003	41.69	0.018	261.19	0.001	19.68	0.001	18.39	340.94	408.96	0.0	0.00
245.0	19.4	0.003	41.86	0.018	262.26	0.001	19.76	0.001	18.46	342.35	417.48	0.0	0.00
250.0	19.1	0.003	42.03	0.018	263.33	0.001	19.84	0.001	18.54	343.73	426.00	0.0	0.00
255.0	18.8	0.003	42.20	0.017	264.37	0.001	19.92	0.001	18.61	345.10	434.52	0.0	0.00
260.0	18.5	0.003	42.36	0.017	265.40	0.001	20.00	0.001	18.68	346.44	443.04	0.0	0.00
265.0	18.2	0.003	42.52	0.017	266.41	0.001	20.07	0.001	18.75	347.76	451.56	0.0	0.00
270.0	17.9	0.003	42.68	0.017	267.41	0.001	20.15	0.001	18.82	349.07	460.08	0.0	0.00



Modified Rational Method
Two Year Storm
Site Flow and Storage Summary
- towards Easement
48 Grenoble Drive

Drainage Area A5 Post

Uncontrolled area towards Easement

Area (A5) = **0.068** ha
Design Coefficient "C" = **0.50**
AC5 = **0.034**
Tc = **10.0** min
Time Increment = **5.0** min
Max. Release Rate = **8.3** L/s

2-Year Design Storm

a = 21.80
c = -0.78
I = A(T)^c

Type	Area (ha)	Actual Coefficient "C"
Landscaped	0.068	0.25
Hardscaped	0.000	0.90
Total Area (A5 Post)	0.068	0.25

2-yr Pre-Development Site
Release Rate towards Easement (A2-pre)= 48.2 L/s

Site Release Rate towards Easement (A6 Post)= 8.3 L/s

(1)	(2)	(3)	(4)
Time	Rainfall	Storm	Runoff
	Intensity	Runoff (A5 post)	Volume (A5 post)
(min)	(mm/hr)	(m ³ /s)	(m ³)
10.0	88.2	0.008	4.97
15.0	64.3	0.006	5.43
20.0	51.4	0.005	5.79
25.0	43.2	0.004	6.08
30.0	37.4	0.004	6.33
35.0	33.2	0.003	6.54
40.0	29.9	0.003	6.74
45.0	27.3	0.003	6.92
50.0	25.1	0.002	7.08
55.0	23.3	0.002	7.23
60.0	21.8	0.002	7.37
65.0	20.5	0.002	7.50
70.0	19.3	0.002	7.62
75.0	18.3	0.002	7.74
80.0	17.4	0.002	7.85
85.0	16.6	0.002	7.96
90.0	15.9	0.001	8.06
95.0	15.2	0.001	8.15
100.0	14.6	0.001	8.24
105.0	14.1	0.001	8.33
110.0	13.6	0.001	8.42
115.0	13.1	0.001	8.50
120.0	12.7	0.001	8.58
125.0	12.3	0.001	8.66
130.0	11.9	0.001	8.73
135.0	11.6	0.001	8.81
140.0	11.3	0.001	8.88
145.0	11.0	0.001	8.95
150.0	10.7	0.001	9.01
155.0	10.4	0.001	9.08
160.0	10.1	0.001	9.14
165.0	9.9	0.001	9.21

			Modified Rational Method Five Year Storm Site Flow and Storage Summary - towards Easement 48 Grenoble Drive		
Drainage Area A5 Post Uncontrolled area towards Easement Area (A5) = 0.068 ha Design Coefficient "C" = 0.50 AC5= 0.034 Tc = 10.0 min Time Increment = 5.0 min Max. Release Rate = 12.4 L/s 5-Year Design Storm a= 32.00 c= -0.79 I = A(T)^c					
Type		Area (ha)	Actual Coefficient "C"		
Landscaped		0.068	0.25		
Hardscaped		0.000	0.90		
Total Area (A5 Post)		0.068	0.25		
2-yr Pre-Development Site Release Rate towards Easement (A2-pre)= 48.2 L/s Site Release Rate towards Easement (A6 Post)= 12.4 L/s					
(1)	(2)	(3)		(4)	
Time	Rainfall	Storm		Runoff	
	Intensity	Runoff (A5 post)		Volume (A5 post)	
(min)	(mm/hr)	(m³/s)		(m³)	
10.0	131.8	0.012		7.42	
15.0	95.7	0.009		8.08	
20.0	76.2	0.007		8.59	
25.0	63.9	0.006		9.00	
30.0	55.3	0.005		9.35	
35.0	49.0	0.005		9.66	
40.0	44.1	0.004		9.93	
45.0	40.2	0.004		10.18	
50.0	37.0	0.003		10.41	
55.0	34.3	0.003		10.62	
60.0	32.0	0.003		10.82	
65.0	30.0	0.003		11.00	
70.0	28.3	0.003		11.17	
75.0	26.8	0.003		11.33	
80.0	25.5	0.002		11.49	
85.0	24.3	0.002		11.64	
90.0	23.2	0.002		11.78	
95.0	22.3	0.002		11.91	
100.0	21.4	0.002		12.04	
105.0	20.6	0.002		12.16	
110.0	19.8	0.002		12.28	
115.0	19.1	0.002		12.40	
120.0	18.5	0.002		12.51	
125.0	17.9	0.002		12.62	
130.0	17.4	0.002		12.72	
135.0	16.9	0.002		12.82	
140.0	16.4	0.002		12.92	
145.0	15.9	0.001		13.02	
150.0	15.5	0.001		13.11	
155.0	15.1	0.001		13.20	
160.0	14.7	0.001		13.29	
165.0	14.4	0.001		13.38	

			Modified Rational Method Hundred Year Storm Site Flow and Storage Summary - towards Easement 48 Grenoble Drive										
Drainage Area A5 Post													
Uncontrolled area towards Easement													
Area (A5) =		0.068	ha		<table><tr><th colspan="2">100-Year Design Storm</th></tr><tr><td>a=</td><td>59.70</td></tr><tr><td>c=</td><td>-0.80</td></tr><tr><td>I =</td><td>A(T)^c</td></tr></table>	100-Year Design Storm		a=	59.70	c=	-0.80	I =	A(T) ^c
100-Year Design Storm													
a=	59.70												
c=	-0.80												
I =	A(T) ^c												
Design Coefficient "C" =		0.50											
AC5=		0.034											
Tc =		10.0	min										
Time Increment =		5.0	min										
Max. Release Rate =		23.5	L/s										
Type		Area (ha)	Actual Coefficient "C"										
Landscaped		0.068	0.25										
Hardscaped		0.000	0.90										
Total Area (A5 Post)		0.068	0.25										
2-yr Pre-Development Site													
Release Rate towards Easement (A2-pre)=			48.2	L/s									
Site Release Rate towards Easement (A6 Post)=			23.5	L/s									
(1)	(2)	(3)		(4)									
Time	Rainfall	Storm		Runoff									
	Intensity	Runoff (A5 post)		Volume (A5 post)									
(min)	(mm/hr)	(m³/s)		(m³)									
10.0	250.3	0.024		14.10									
15.0	181.0	0.017		15.29									
20.0	143.8	0.013		16.20									
25.0	120.3	0.011		16.94									
30.0	103.9	0.010		17.57									
35.0	91.9	0.009		18.12									
40.0	82.6	0.008		18.61									
45.0	75.1	0.007		19.05									
50.0	69.1	0.006		19.46									
55.0	64.0	0.006		19.83									
60.0	59.7	0.006		20.18									
65.0	56.0	0.005		20.50									
70.0	52.8	0.005		20.81									
75.0	49.9	0.005		21.10									
80.0	47.4	0.004		21.37									
85.0	45.2	0.004		21.63									
90.0	43.2	0.004		21.88									
95.0	41.3	0.004		22.12									
100.0	39.7	0.004		22.35									
105.0	38.2	0.004		22.57									
110.0	36.8	0.003		22.78									
115.0	35.5	0.003		22.98									
120.0	34.3	0.003		23.18									
125.0	33.2	0.003		23.37									
130.0	32.2	0.003		23.55									
135.0	31.2	0.003		23.73									
140.0	30.3	0.003		23.90									
145.0	29.5	0.003		24.07									
150.0	28.7	0.003		24.24									
155.0	27.9	0.003		24.40									
160.0	27.2	0.003		24.55									
165.0	26.6	0.002		24.70									



Water Balance Calculation

48 Grenoble Drive

File No. UD21-110

Date: February 2023

Prepared By: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed By: John Pasalidis, P.Eng., M.A.Sc.

Contributing Drainage Area	6073	m ²
Rainfall depth to be retained	5.0	mm
Total rainfall volume required at 5mm	30.37	m³

Initial Abstraction Calculations

Surface	Area (m ²)	IA (mm)	Volume (m ³)	
Green Roofs	1176	5.0	5.88	m ²
Landscape	934	5.0	4.67	m ³
Hardscape	3963	1.0	3.96	m ³
Total	6073		14.51	m ³

Water Volume provided by initial abstraction is	14.51	m³
Therefore Required Remaining Rainfall Volume to be retained	15.85	m³



Water Quality Calculations

48 Grenoble Drive

File No. UD21-110

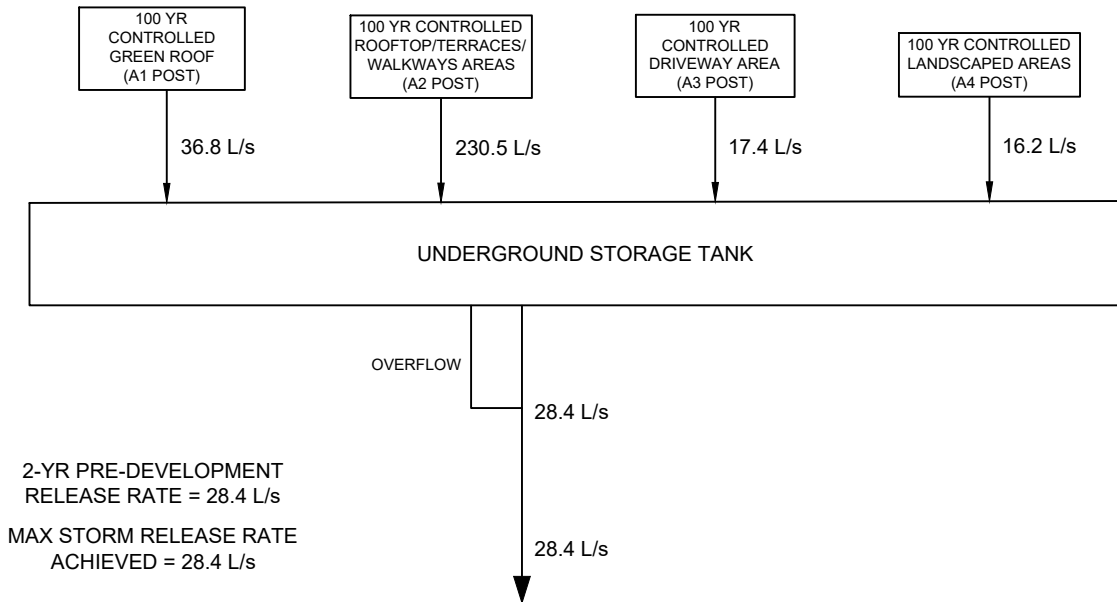
Date: February 2023

Prepared By: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Surface	Method	Effective TSS Removal	Area (ha)	% Area of Controlled Site	Overall TSS Removal
Rooftop/ Terraces/Green Roof/Walkways/Landscape/Hardscape	Inherent	80%	0.579	95%	76%
Driveway / Landscape Area	SPFD 0608	80%	0.028	5%	4%
Total			0.607	100%	80%

Note: Uncontrolled water does not account in the above calculations



QUANTITY CONTROL

Volume required for 100-year event = 174.37 m³

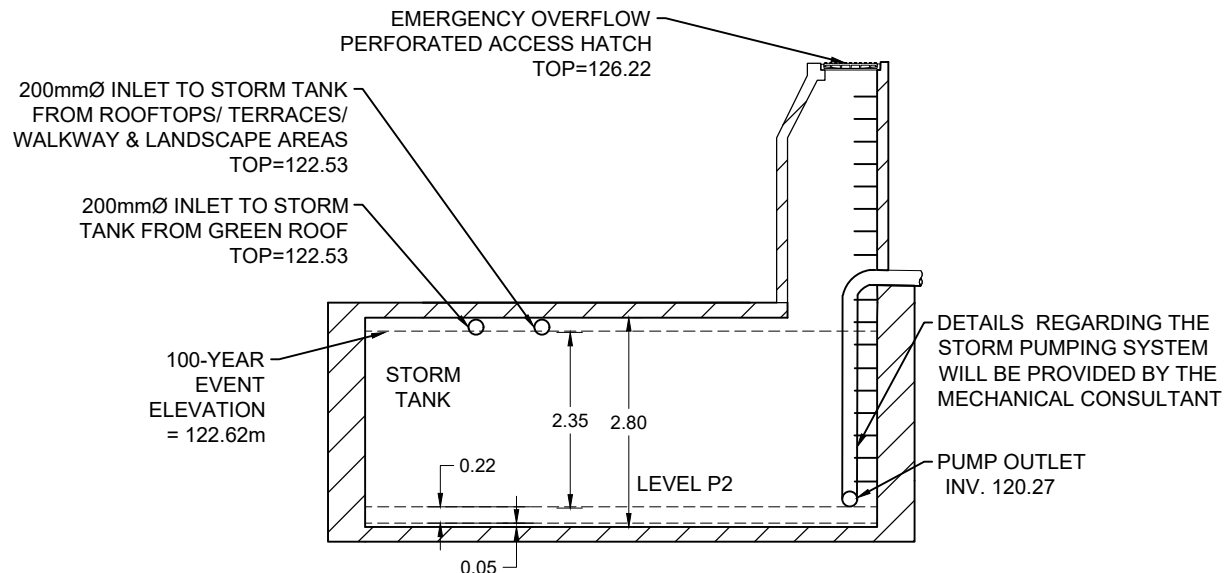
Additional Volume required to be stored for Water Balance = 14.51 m³

Additional Volume provided to be stored for Water Balance = 16.32 m³

Volume of Storage Tank provided = Refer to Mechanical Engineering Drawing

Tank Area=74.20 m²

NOTE: TANK DESIGN TO BE VERIFIED BY BUILDING MECHANICAL CONSULTANT



CONCEPTUAL FLOW SCHEMATIC

RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: PUD21-110

FIGURE No: FIG 3



Determining Number of Cartridges for Flow Based Systems

Date

3/8/2022

Black Cells = Calculation

Site Information

Project Name	48 Grenoble Drive
Project Location	Toronto, ON
OGS ID	Stormfilter - Revision 1
Drainage Area, Ad	0.07 ac (0.028 ha)
Impervious Area, Ai	0.07 ac
Pervious Area, Ap	0.00
% Impervious	100%
Runoff Coefficient, Rc	0.90
Treatment storm flow rate, Q_{treat}	0.05 cfs (1.4 L/s)
Peak storm flow rate, Q_{peak}	0.61 cfs (17.4 L/s)

Filter System

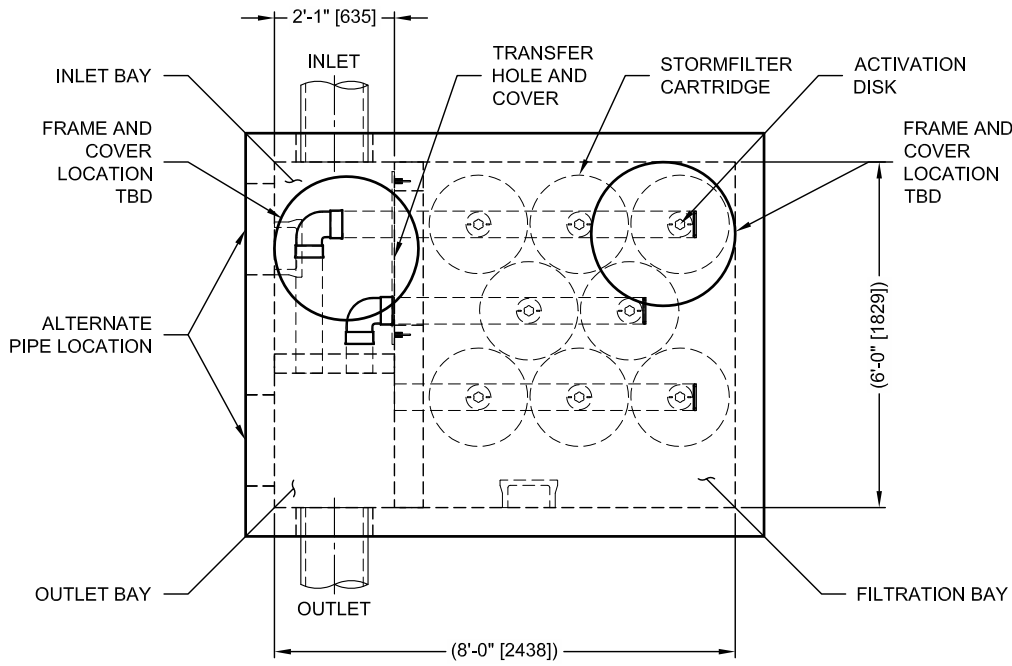
Filtration brand	StormFilter
Cartridge height	12 in
Specific Flow Rate	2.00 gpm/ft ²
Flow rate per cartridge	10.00 gpm

SUMMARY

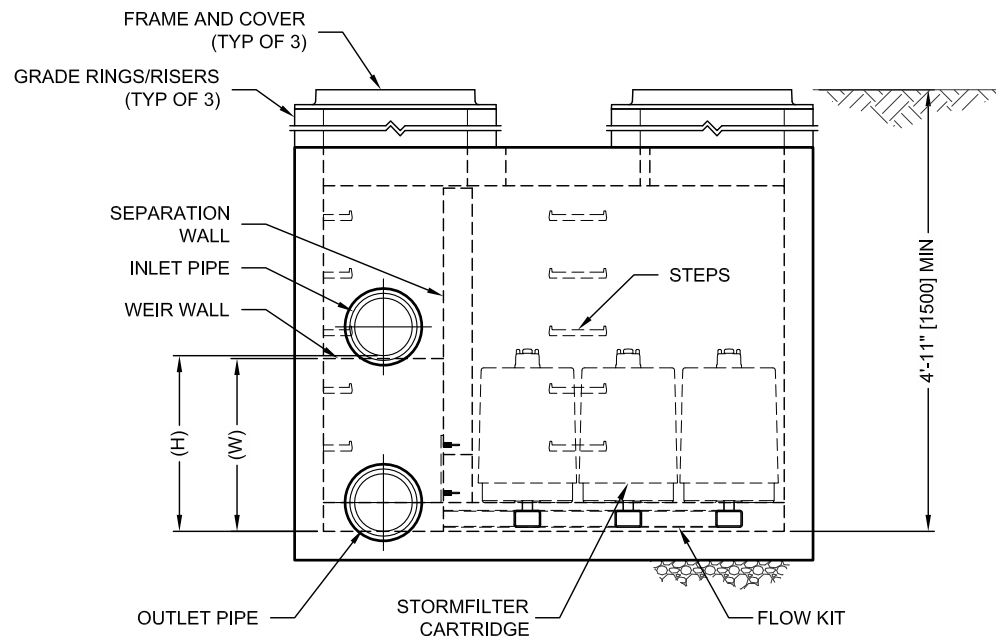
Number of Cartridges	3
Media Type	Perlite

Event Mean Concentration (EMC)	120 mg/L
Annual TSS Removal	80%
Percent Runoff Capture	90%

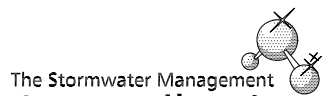
Recommend SF08608 vault or CIP



PLAN



ELEVATION



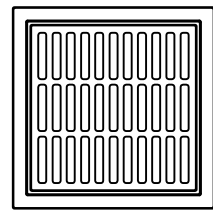
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING
U.S. PATENTS: 5,322,629; 5,524,576; 5,707,527; 5,985,157; 6,027,639; 6,649,048;
RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

STORMFILTER DESIGN NOTES

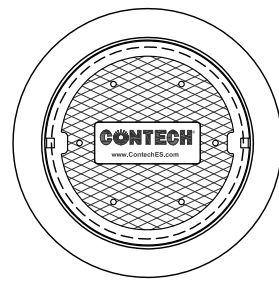
- STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD
- A 6' x 8' [1829 x 2438] PEAK DIVERSION STYLE STORMFILTER IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (8) AND IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR A RIGHT INLET CONFIGURATION
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS NOTED OTHERWISE

CARTRIDGE SIZE (in. [mm])	27 [686]			18 [457]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H) (ft. [mm])	3.05 [930]			2.3 [701]			1.8 [549]		
HEIGHT OF WEIR (W) (ft. [mm])	3.00 [914]			2.25 [686]			1.75 [533]		
SPECIFIC FLOW RATE (gpm/sf [L/s/m ²])	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]
CARTRIDGE FLOW RATE (gpm [L/s])	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.47]	10 [0.63]	8.35 [0.53]	5 [0.32]

* 1.67 gpm/sf [1.13 L/s/m²] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB[®] (PSORB) MEDIA ONLY



FRAME AND GRATE
(24" SQUARE)
(NOT TO SCALE)



FRAME AND COVER
(30" ROUND)
(NOT TO SCALE)

SITE SPECIFIC
DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
CARTRIDGE FLOW RATE			
CARTRIDGE SIZE (27, 18, LOW DROP (LD))			
MEDIA TYPE (PERLITE, ZPG, PSORB)			
NUMBER OF CARTRIDGES REQUIRED			
INLET BAY RIM ELEVATION			
FILTER BAY RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES/SPECIAL REQUIREMENTS:			

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7" [178].** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **38 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF [1.36 L/s/m²] (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF [13.39 L/s/m³] OF MEDIA (MAXIMUM)**.

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. ALTERNATE DIMENSIONS ARE IN MILLIMETERS [mm] UNLESS NOTED OTHERWISE.
4. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
5. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
6. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 10' [3048] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES

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

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

SFPD0608 (6' x 8')
PEAK DIVERSION STORMFILTER
STANDARD DETAIL



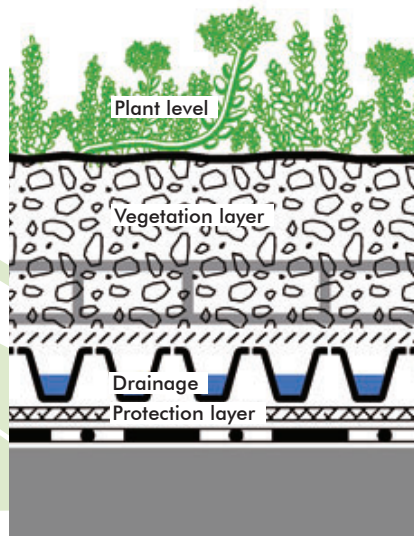
Plant Suggestions "Sedum Carpet"

Plants in small groups (groups of 3, 5 or 7)

Botanical Name	Common Name	Height (mm)	Blossom Colour	Blossom Period (month)
<i>Sedum album</i> varieties e.g. 'Coral Carpet' 'Murale'	White stonecrop varieties	50–100 50–100 50–100	white white pale-rose	6–8 6–8 6
<i>Sedum caucolicum</i>	Nettle-leaved goosefoot	100–150	rose	8–9
<i>Sedum floriferum</i> 'Weihenstep. Gold'	Gold sedum	100–150	yellow	6–7
<i>Sedum hybridum</i> 'Immergrünchen'	Hybrid stonecrop	100–150	yellow	7–8
<i>Sedum reflexum</i>	Crooked yellow stonecrop	200–250	yellow	6–7
<i>Sedum sexangulare</i>	Tasteless yellow stonecrop	50–100	yellow	6–7
<i>Sedum spurium</i> in varieties. e.g. 'Album Superbum' 'Fuldaglut' 'Roseum Superbum' 'Splendens' 'Variegatum'	Dragon's blood	100–150 100–150 100–150 100–150 100–150	white**	7–8 7–8 7–8 7–8 7–8

** infrequent blooming

Weight kg/m ²		Height mm
dry	water-saturated	
67	84	60
2	10	30
69	94	



Mixture of Sedum Cuttings according to plant suggestions "Sedum Carpet"

System Substrate "Sedum Carpet"

Safety Device "Fallnet®", if required
(attention to load requirements)

Filter Sheet SF

Floradrain® FD 25-E

Protection Mat SSM 45

Root Barrier WSF 40,
if waterproofing is not root-resistant

Build-up height:	ca. 90 mm
Weight, saturated:	ca. 95 kg/m ²
Water retention capacity:	ca. 25 l/m ²



System Build-ups with European Technical Assessment. Details on Page 15.



System Build-up with EPD verification. Details on Page 15.

Specification Suggestion

"Sedum Roof Plus" with Floradrain® FD 25-E

SPEC NOTE:

This guide specification gives general information about the ZinCo green roof assembly. It has to be clear, that the information that is shown must be understood as guide and recommendations.

It is possible that your green roof project need special technical requirements. Please contact us for further information regarding technical advice, specifications and budget cost.

ZinCo Canada Inc.

P.O.Box 29
Carlisle, ON Canada L0R 1H0
T. 1-905-690-1661
E. greenroof@zinco.ca
www.zinco.ca

PART 1 – GENERAL

TECHNICAL DATA

Depth:

120 -140 mm (5"-6")

Saturated weight:

130 - 155 kg/m² (27 – 32 lbs/ft²)

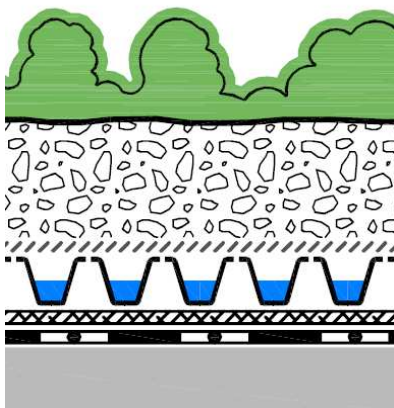
Water retention capacity:

44 - 51 L/m²

Slope:

2-5 degrees

SECTION



Section includes:

1. Plant Community: "Sedum Roof Plus"
2. Growing Medium ZinCo Blend-E.
Depth: 100 or 120 mm (3.0 or 4.0")
3. a. Filter Sheet ZinCo SF
b. Aquafleece AF300
4. Drainage Element ZinCo Floradrain® FD 25
5. Protection Mat ZinCo SSM45
6. Related Materials:
 - ZinCo Root Barrier WSF40
 - Inspection Chamber ZinCo KS10
 - Gravel Retain ZinCo KL100/120
 - Gravel Strip
 - ZinCo Irrigation Unit BM4

REFERENCES

- The ZinCo "Sedum Roof" assembly meets or exceed the requirements of the FLL-standards (Guideline for Planning, Execution and Upkeep of Green-Roof Sites, Release 2008).
- The ZinCo "Sedum Roof" meets or exceed the Toronto Green Roof Construction Standard (Toronto Municipal Code Chapter 492, Article IV).

DEFINITIONS

- **Green Roof:** A Green Roof is an innovative, multi-layered system that covers all types of waterproofed roof surfaces with growing medium and plant material.
- **Extensive Green Roof:** A vegetated ecological protection that is light weight, has a low growing medium depth, has a natural/native plant selection, and has low maintenance and low installation costs.
- **Sedum:** Sedum is a large and diverse group of durable Green Roof plants known for its fleshy succulent foliage and stalks of yellow, pink or white flowers. Sedum is very easy to care for, low maintenance plants and once established

are drought tolerant.

SUBMITTALS

- Submit signed shop drawings showing that the roofing system, green roof assembly, materials, perimeter and penetration details and fall protection are accepted by the green roof manufacturer to ensure that the green roof system meets the necessary performance requirements.
- Submit a certification showing that all the components of the green roof assembly are supplied and warranted by the green roof manufacturer.
- Submit an inspection report, signed by the roof contractor and the green roof contractor, resulting from the quality control of the roofing system installation prior to the installation of the green roof assembly indicating that the roofing system is installed correctly.
- Submit references which indicate that the green roof manufacturer as well as the green roof contractor has recently successfully completed projects of similar scope and nature.

QUALITY ASSURANCE

- **Installers Qualifications:** Work of this section shall be installed by a recognized green roof or landscape contractor, approved by ZinCo Canada Inc. The contractor shall have adequate equipment, skilled workers with extensive practical experience, skills and knowledge of plants horticulture techniques and overall landscape design requirements.
- Roof details such as flashing, roof edges, roof penetrations, outlets, roof fall and type of insulation must be adjusted to the Green Roof Assembly used. ZinCo Canada Inc. provides consultation and engineering to (landscape) architects, roof contractors and green roof contractors to finalize these adjustments before

Specification Suggestion

"Sedum Roof Plus" with Floradrain® FD 25-E

Page | 2

construction of the roof commences, if requested.

- Prior to the installation of the green roof system, test the water tightness of the roofing system by flood testing for at least a 48 hour period or an electronic leak detection process performed by a qualified testing agency.
- Submit documentation certifying that the load bearing capacity of the roof and building construction is tested and approved by a structural engineer, with regard to the extra weight of the Green Roof assembly.

ENVIRONMENTAL CONDITIONS

- The plant community should be chosen in consideration of the climatic circumstances and hardiness zone. Please contact ZinCo Canada Inc. for more information.
- Proceed with planting between spring and early fall so as to enable plants to take root in order to survive the winter months.
- Provide a temporary fall protection (safety railing or fall arrest) during the installation to ensure a safe and healthy work environment.
- Provide a permanent fall protection (safety railing or fall arrest) for maintenance to ensure a safe and healthy work environment.

DELIVERY, STORAGE & HANDLING

- By storage on the roof makes sure that the load of the materials does not exceed the load bearing capacity of the roof and building construction
- Store the materials in a dry area, out of direct sunlight, protected from freezing, staining or damage.

- Stored plant materials have to be watched carefully. Watering the plants can be necessary during a long storage period.

WARRANTY

- Submit a 10-year (insurance backed) product manufacturing warranty according to the specifications of the green roof manufacturer which warrants all the components of the green roof assembly. (except the vegetation)
- Submit a 2-year workmanship warranty which warrants the installation of the green roof system according to the specifications.
- Submit a 2 year growing warranty to take effect immediately after the installation of the Green Roof. This warranty is to ensure that the vegetation properly encloses the roof area. After that a maintenance program has to be covering the full period of the warranty.

MAINTENANCE

- Provide a maintenance program for the duration of two growing seasons as per following maintenance measures:
 - Four visits in the first year.
 - Four visits in the second year.
 - The removal of coarse and unwanted weeds and the seedlings of trees; some 'newcomers' are quite acceptable.
 - The removal of vegetation from the gravel strips;
 - Visual inspection of the drain outlets; Maintaining a functioning drainage layer is critical to the establishment of the vegetation. Retained water will stagnate and is detrimental to proper plant growth;
 - Soil Testing & Fertilizing the vegetation with a slow released chemical fertilizer; - type of fertilizer: slow release N-P-K: 20-6-11 75 % coated.
 - recommended quantity: 25 gram

per square meter. Soil testing may be required.

- Replace plant material that dies, as necessary;
- Replace lost growing medium from erosion through foot traffic, wind damage, or nesting animals. Use ZinCo growing medium.
- Removal of unwanted debris to ensure no damage to the vegetation.
- Irrigation if necessary;

Submit maintenance report to the owner at the end of the growing season.

PART 2 - PRODUCTS

Specified green roof assembly:
ZinCo Floradrain ® FD25: Sedum Roof Plus

Supplier:

ZinCo Canada Inc.
P.O. Box 29
Carlisle, ON Canada, L0R 1H0

Phone: 905-690-1661
E-mail: greenroof@zinco.ca
Website: www.zinco.ca

1. ROOT BARRIER

- **ZinCo root barrier WSF 40** (Optional item if non root-resistant is waterproofing used.) made of special-polyethylene – Bitumen and Polystyrol resistant - Without plasticizer - UV-stabilized. Thickness: 0,38 mm. Weight: 320 g/m². Tensile strength: 40 – 47 N/mm². Density: 940 kg/m³.

2. SEPARATION/PROTECTIVE LAYER

(PLEASE CHOOSE CONVENTIONAL OR INVERTED ASSEMBLY)

(CONVENTIONAL ROOF ASSEMBLY)

- **ZinCo moisture retention and protection mat SSM45** made of recycled non-rotting fibers for water- and nutrient retention as well as a protection layer. Thickness: 5 mm. Weight approx.



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"Sedum Roof Plus" with Floradrain® FD 25-E

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470 g/m². Water retention capacity: 5 l/m². Bitumen resistant – Biologically and Chemically neutral. Penetration resistance: > 2000 N. Tensile strength length wise: >8.5 KN/m.

Or

(INVERTED ROOF ASSEMBLY)

- Air and vapour permeable membrane **ZinCo diffusion membrane TGV21** made of thermal consolidated Polypropylene. Bitumen resistant – Biologically and Chemically neutral. Vapour opening size $S_d \leq 0,01$ m) Thickness: 0,55 mm. Weight: 80 g/m². To be used as separation layer on inverted roofs and protection against small particle infiltration.

3. DRAINAGE – WATER STORAGE LAYER

- **ZinCo Drainage and water storage element Floradrain® FD25-E** made of 100% thermoformed recycled polyethylene, with water storage cells, openings for aeration and diffusion as well as a multidirectional drainage channel system on the underside. Bitumen resistant – Compressive strength: 270 kN/m². Water retention capacity: 3 l/m². Weight: approx. 1,7 kg/m². Dimensions: 1.00 x 2.00 x 0.025 m.

4. FILTER LAYER (UNIRRIGATED)

(PLEASE CHOOSE IRRIGATED OR NON-IRRIGATED ASSEMBLY)

(NON IRRIGATED ASSEMBLY)

- **ZinCo Filter Sheet SF** made of non-rotting thermal consolidated Polypropylene. Water flow rate: 70 l/(m²s) if there is a water column of 100 mm. Apparent Opening size: $d_{90\%} = 95 \mu\text{m}$. Weight: 100 g/m².

Or

(IRRIGATED ASSEMBLY)

- Highly efficient irrigation fleece **ZinCo Aquafleec AF300** made of polyacrylic fibers, attached to tear-resistant woven fabric made of PP, for its use in irrigated extensive green roof build-ups. Water flow rate: 20 L/(m²s). Water Retention Capacity 3-4 L/m². Thickness: 2.4 mm. Weight: 300 g/m².

5. GROWING MEDIUM

- **Growing medium for extensive Green Roofs - ZinCo Blend-E**, produced using light weight recycled or re-used materials and minerals, enriched with high quality compost elements, resistant to flying sparks, frost-resistant, stable structure. Specially engineered by ZinCo Canada and meets the FLL-Standards for Planning, Execution and Upkeep of Green Roof sites. Depth: 100 or 120 mm.

(PLEASE CHOOSE REQUIRED DEPTH)

Particle Size Distribution

Proportion of silting components ($d < 0.063$ mm):
 ≤ 15 Mass %

Density Measurements

Bulk Density (at max. water-holding capacity): 1100 – 1500 kg/m³

Compression Factor: <20% Vol. %

Water/Air Measurements

Total Pore Volume: ≥ 65 Vol. %

Maximum water-holding capacity: $\geq 35\%$ Vol. %

Air-filled porosity at max water-holding: ≥ 10 Vol. %

Water permeability (saturated hydraulic conductivity):
 ≥ 0.001 cm/sec

pH

6.5 – 9.5

Organic Measurements

Organic matter content: $\leq 8\%$ mass%

Nutrients

Phosphorus, P205 (CAL): ≤ 200 mg/L

Potassium, K2O (CAL): ≤ 700 mg/L

Magnesium, Mg (CaCl2): ≥ 200 mg/L

Nitrate + Ammonium (CaCl2): ≤ 80 mg/L

6. PLANT MATERIAL

(PLEASE CHOOSE ONE OF THE PLANTING OPTIONS)

SEDUM CUTTINGS

- **Sedum cuttings** shall be harvested from healthy, vigorous plants while in a vegetative growth mode. They shall range in length from 1/2" to 3" and possess sufficient rooting nodes to allow for rapid root development once sown.

PLUG PLANTS

- **Plug plants:** Plant material potted in 50 or 72 tray plugs in a mix of Sedums, Grasses and Herbs. Quantity: at 16 plants/m² or 18 plants/m² or 20 plants/m².

(PLEASE CHOOSE REQUIRED PLANT DENSITY)

PRE-GROWN VEGETATION MATS

- **Pre-cultivated Vegetation Mats** with firmly rooted, for extensive green roofs suitable plant species, pre-cultivated over one growing season in the field. The carrier material decomposes after time. Delivery weight: approx. 16–20 kg/m² (3-5 lbs/ft²). Height: ca. 20–25 mm (0.75 - 1 inch) Supplying quantity: minimum 2.00 m². Standard dimensions: ca. 1.20 m x 2.00 m. On request also mats in other dimensions or with non-decaying carriers are available.

Plant types:

The basis vegetation mats are 12–14 adapted Sedum types, e.g. Sedum album, Sedum acre, Sedum spurium, Sedum floriferum, Sedum kamschaticum, Sedum reflexum, Sedum sexangulare, and



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Sedum hybridum. Various herbs and grasses are also available for extensive green roofs.

The coverage is at least 85% when shipped.

7. RELATED PRODUCTS

- **ZinCo inspection chamber KS 10** made of plastic coated galvanized steel with thermally insulated cover, resistant to compression. Height: 60 mm. To ensure accessibility of the roof drains at any time. Dimensions: 0.25 x 0.25 x 0.10 m. Weight: 3 kg.

- **ZinCo gravel retainer KL100/120** made of aluminum L-bracket with square slots for drainage. Designed as gravel retainer for gravel strips. Length: approx. 3 m. Height: 100 mm or 120 mm. Including joint connectors.

(PLEASE CHOOSE REQUIRED HEIGHT)

- **Gravel strip** to protect roofing details, using a 1"-2" round aggregate. Width: at least 30 cm. Depth: 100 or 120 mm.

(PLEASE CHOOSE REQUIRED DEPTH)

- Pre-assembled **Irrigation unit ZinCo BM4** in lockable stainless steel box for outdoor use for automated irrigation of green roofs. Contains: connection for water supply line 32 mm, filter, pressure regulator, connection for garden hose, irrigation time controller (with 9V battery, therefore no power supply required), 4 magnetic valves 1" including connectors for 32 mm tube and rain sensor. To be used in combination with Aquafleece AF300 and driplines.

- **ZinCo irrigation dripline 500-L2** in combination with the water distribution fleece AF300. Outer diameter: ca. 16 mm, with inside placed drippers, dripper spacings 100 mm, dripper capacity ca. 1 l/h, pressure-compensating.

PART 3 – EXECUTION

1. INSPECTION

- Clean up the waterproofing membrane carefully (well-swept)
- Careful inspection of the waterproofing membrane including seams, penetrations and details after flood testing or electronic leak detection. If the waterproofing system and the Green Roof system are not carried out by the same company, the acceptance of the method used for waterproofing quality should be agreed by all the parties. Identified defects are to be reported in written form. Do not proceed until corrected.

2. ROOT BARRIER

- Deliver and install the **ZinCo root barrier WSF40** on top of the non root-resistant waterproofing with a minimum overlap of 500 mm according to the manufacturer's instructions. The root barrier must be installed above the growing medium along the edges and roof penetrations.

3. SEPARATION / PROTECTIVE LAYER

(PLEASE CHOOSE CONVENTIONAL OR INVERTED ASSEMBLY)

(CONVENTIONAL ROOF ASSEMBLY)

Deliver and install the **ZinCo moisture retention and protection mat SSM45** directly on the top of the root barrier with a minimum overlap of 100 mm, according to the manufacturer's instructions. The separation sheet must be installed above the growing medium along the edges and at roof penetrations.

Or

(INVERTED ROOF ASSEMBLY)

- In the case of an inverted roof: Deliver and install the **ZinCo diffusion membrane TGV21** directly on the top of the insulation with a minimum overlap of 100 mm, according to the manufacturer's instructions. The separation sheet must be installed above the growing medium along the edges and at roof penetrations.

4. DRAINAGE & WATER STORAGE LAYER

- Deliver and install the **ZinCo Drainage and water storage element Floradrain® FD25-E** directly on the protection mat or diffusion membrane according to the manufacturer's instructions. Install the Floradrain elements butt jointed with the evaporation holes facing up and. Cut the drain elements in place along the edges and roof penetrations. Fill the water retention cups of the drain layer once with water.

5. FILTER SHEET

(PLEASE CHOOSE IRRIGATED OR NON-IRRIGATED ASSEMBLY)

- Deliver and install the **ZinCo filter sheet SF** on the drainage layer with a minimum overlap of 100 mm according to the manufacturer's instructions. The filter must be installed above the growing medium along the edges and roof penetrations. Cut the filter sheet in place along the edges and at roof penetrations.

Or

- Deliver and install the **ZinCo Aquafleece AF300** on the drainage layer with a minimum overlap of 100 mm according to the manufacturer's instructions. The fleece must be installed above the growing medium along the edges and roof penetrations. Cut the fleece sheet in place along the edges and at roof penetrations.



6. GROWING MEDIUM

- Deliver and install the **growing medium for extensive Green Roofs ZinCo Blend-E** on the filter sheet or Aqua fleece. Spread out the growing medium equally to a depth of 100 mm or 120 mm. Check the depth on several places to ensure the right thickness. A tolerance of 1 cm is acceptable. Small amounts of growing medium will be delivered in big bags. Larger amounts will be delivered by a blower truck.

7. PLANT MATERIAL

(PLEASE CHOOSE ONE OF THE PLANTING OPTIONS)

- Deliver and install the plant material in the growing medium according to the planting design and plant lists. Including one watering right after the installation.

SEDUM CUTTINGS:

Spread the sedum cuttings out over the growing medium at the recommended rate and apply them in the top 20 mm of the growing medium by raking. Cover the cuttings with a thin layer (10 mm) of compost mulch. Water the cuttings right after the installation.

PLUG PLANTS:

Take the plugs out of the plant trays and lay them out on the growing medium following the planting design. Dig a hole, the size of root ball and apply the plug in the hole. Cover the root ball with growing medium and compact it gently in place. Water the plugs right after the installation.

PRE-GROWN VEGETATION MAT:

Install mats same day as the delivery. Do not store without permission of the grower. Do not place in full sun. During hot sunny days water/cool of the soil layer with 15-25 minutes of pre-watering. Hot scorching soil burns the roots and might damage the Sedum mats.

Starting in the corner, carefully place each roll at location and unroll the mats over the entire roof area. Make sure that the mats are in contact with the growing medium. Water immediately for 30-60 minutes after installation.

After installation: Water the first month according to the grower's specification depending on the season and time of year using automatic timers.

8. RELATED PRODUCTS

- **ZinCo inspection chamber KS 10**
Deliver and install the ZinCo Inspection Chamber on top of the drainage layer above the roof outlets. Install the ZinCo filter sheet SF on the flange of the inspection chamber.
- **ZinCo gravel retainer KL100/120.**
Deliver and install the ZinCo gravel retainer on top of the filter fabric between the gravel strip and the growing medium.
- **Gravel strip**
Deliver and install a gravel strip along roof edges, flashing details and roof penetrations using a 1"-2" round aggregate. Depth: 100 or 120 mm.
- **ZinCo Irrigation Unit BM4**
Deliver and install ZinCo irrigation unit at the appropriate location on the roof. Hook up waterline and driplines and program the controller to the required settings.
- **ZinCo Dripline 500-L2**
Deliver and install ZinCo Dripline irrigation on top of the Aquafleece AF300. Fasten the dripline to the Aquafleece using velcro strips.

9. COMPLETION

- Upon completion, water the plant material and leave the site in a neat, clean and workmanlike condition.

10. MAINTENANCE

- Execute the maintenance program as described on page 2.

END OF SECTION

Appendix D

Sanitary Data Analysis



SANITARY SEWER DESIGN SHEET

48 Grenoble Drive

CITY OF TORONTO

LOCATION	RESIDENTIAL								PARKLAND		COMMERCIAL		FLOW										SEWER DESIGN				
	SECTION AREA	NUMBER OF UNITS						SECTION POP.	SECTION AREA	SECTION POP.	COMM AREA	SECTION POP.	TOTAL ACCUM.	AVERAGE RESIDENTIAL FLOW 'a' 240 L/c/d	HARMON PEAKING FACTOR	RES. PEAK FLOW	AVERAGE COMMERCIAL FLOW @ 250 L/c/d	TOTAL ACCUM.	INFILT. @ 0.26 L/s/ha.	TOTAL SANITARY FLOW	PEAK GROUNDWATER FLOW	TOTAL DESIGN FLOW	PIPE LENGTH	PIPE DIA.	SLOPE	FULL FLOW CAPACITY n = 0.013	% of DESIG CAPACITY
		Single	Townhouse	Studio	1 Bed Apts.	2 Bed Apts.	3 Bed Apts.																				
		Fam. Dwell.																									
(ha.)	@ 3.5 ppu	@ 2.7	@ 1.4 ppu	@ 1.4 ppu	@ 2.1 ppu	@ 3.1 ppu	(persons)	(ha.)	(persons)	(ha.)	(persons)	(persons)	(L/s)		(L/s)	(L/s)	(ha.)	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/sec)	(%)	
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Existing Condition Residential Development	0.675	0.00	0.00	0	112	48	32	357			0	0	357	0.99	4.05	4.01	0.00	0.675	0.18	4.01	0.00	4.19					
Proposed Condition Residential Development																											
Podium	0.607	0	0	0	80	86	32	392	0.000	0	0.000	0	392	1.09	4.03	4.38	0.00	0.607	0.16	4.38	0.00	4.54		150	2.0%	21.54	21.1%
East Building	0.000	0	0	0	256	96	32	659	0.000	0	0.000	0	659	1.83	3.91	7.16	0.00	0.000	0.00	7.16	0.00	7.16		150	2.0%	21.54	33.2%
West Building	0.000	0	0	0	256	96	32	659	0.000	0	0.000	0	659	1.83	3.91	7.16	0.00	0.000	0.00	7.16	0.00	7.16		150	2.0%	21.54	33.2%
Parkland Dedication	0.068	0	0	0	0	0	0	0	0.068	1	0.000	0	1	0.00	4.50	0.00	0.00	0.068	0.02	0.00	0.00	0.02					
Residential Flow Rate - 240 litres/capita/day					Total Post Flow (Residential Development)															18.86							
Commercial/Office Flow Rate - 250 litres/capita/day					Total Net Flow (Towards Downstream Sanitary Network)															14.67							
Firehouse Flow Rate - 180000 L/ha/day																											
Infiltration - 0.26 L/ha																											
Foundation allowance - 3.0 L/ha																											
Peaking Factor = 1 + [14 / (4 + P ^{0.5})], P=Population in thousands																											
Site Area (ha): 0.607																											
			Prepared by: Isaak Chlorotiris, P.E., M.A.Sc. Reviewed by: John Pasalidis, P.Eng., M.A.Sc. Date: February 2023										Project: 48 Grenoble Drive Project: UD21-110 City of Toronto										Sheet 1 OF 9				



SITE SANITARY ANALYSIS

COLLUMN

(1)= Section area from Site Statistics

(2)= Number of Single Family Dwellings from Site Statistics

(3)= Number of Townhouses from Site Statistics

(4)= Studio =Number of Studios from Site Statistics

(5)= Number of 1 bed apartments from Site Statistics

(6)= Number of 2 bed apartments from Site Statistics

(7)= Number of 3 apartments from Site Statistics

(8)= Section Population (persons) = (2) X 3.5+(3) X 2.7+(4) X 1.4+(5) X 1.4 +(6) X 2.1 +(7) X 3.1

(9)= Parkland Section Area from Site Statistics

(10)=Parkland Section population = (9) X 110 ppha (persons per ha)

(11)=Commercial Area from Site Statistics

(12)= Section population= (11) X 110 ppha

(13)= Total accumulative population = (8) + (10) + (12)

(14)= Average Residential Flow = (8) X 240 L/c/d

(15)= Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands

(16)= Residential Peak flow= (14) X (15)

(17)= Average commercial flow = (12) X 250 L/c/d

(18)= Total Accumulative Area = (1)

(19)= Infiltration = (18) X 0.26 L/s/ha

(20)= Total Sanitary Flow= (16) X (17)

(21)= Peak Groundwater Flow from Hydrogeological Report

(22)= Total Design Flow= (19) + (20) + (21)

(23)= Pipe Length of design sewer

(24)= Pipe Diameter of design sewer

(25)= Slope of design sewer

(26)= Full Flow Capacity = $23976 \times (24)^{8/3} \times (25)^{0.5}$

(27)= Design Capacity (%) = (22)/(26)



EXTERNAL SANITARY SEWER SEGMENTS
48 Grenoble Drive
DRY WEATHER
City of Toronto

450 L/c/day - new commercial/residential
250 L/c/day - existing institutional/commercial
240 L/c/day - existing residential
q = average daily per capita flow (L/c./day)
Q (p) = peak population flow (L/s)
Q (I) = peak extraneous flow (L/s)
Q (C) = peak flow from commercial area (L/s)
Q (d) = existing peak flow (L/s)

M = Peaking Factor (residential) = $1 + 14(I+P^{0.5})$ where P = population in 1000's
I = unit of peak extraneous flow
Q (p) = $PqM88.4$ (L/s)
Q (I) = IA (L/s) where I = 0.26 L/s/ha, and A = drainage area (ha)
Q (C) = based on Y L/p/day - residential equivalent (see below)
Q (d) = Q(p) + Q(I) + Q(C)

LOCATION															POPULATION											Peak Factor (residential)	Drainage Area	Infiltration Area	F L O W S (CUMMULATIVE)				EXISTING PEAK			SCENARIO 1		
DESCRIPTION	Street Name	Maintennace hole ID		MAP ID based on CUMAP Drawing	Drainage Area (hectares)	Infiltration Area (hectares)	Semi - Detached/ Townhouse (units)	Residential (hectares)	OFFICE (hectares)	Hospital/O ld age (hectares)	Church/S chool (hectares)	Commercial (hectares)	Future Development (Residential) (persons)	Future Development (Church) (persons)	Future Development (Commercial) (persons)	RESIDENTIAL	OFFICE	Hospital/Old age	CHURCH	COMMERCIAL	RESIDENTIAL	OFFICE	TOTAL Hospital/ Old age	CHURCH	COMMERCIAL				PEOPLE	RESIDENTIAL	INFILTRATION DRY WEATHER	NON RESIDENTIAL	FLOW	GRADE	Max. Allowable	PIPE	FLOW VELOCITY	Pre-development % of DESIGN
		@ 2.7 people/Unit and 270 people/ha	@ 330 people/ha													@ 333 people/ha	(258 people/ha)	@ 110people/ha	(cumulative) (persons)	(cumulative) (persons)	(cumulative) (persons)	(cumulative) (persons)	(cumulative) (persons)	(dimensionless)	(cumulative) (hectares)				(cumulative) (hectares)	Q (p) (L/s)	Q (I) (L/s)	Q (C) (L/s)	(Cumulative) (L/s)	(used) (%)	Flow (L/s)	SIZE (mm)	V (m/sec)	CAPACITY (%)
column number DOWNSTREAM SEWER SEGMENTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	55.05	55.05	299	25.14	10.06	0.49	1.62	3.71	1287	0	12	8883	3350	164	419	420	8883	3350	164	419	420	13235	3.01	55.73	55.73	74.16	14.49	12.59	101.25	0.74%	245.3	450	1.47	41.3%
Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	1.42	1.42	0	0.00	0.00	0.00	0.17	0.00	0	0	0	0	0	0	44	0	8883	3350	164	462	420	13278	3.01	57.15	57.15	74.16	14.86	12.72	101.74	0.79%	253.4	450	1.51	40.1%
Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	8.78	8.78	178	1.33	0.00	0.00	0.07	0.00	0	0	0	838	0	0	19	0	9721	3350	164	481	420	14136	2.97	65.93	65.93	80.11	17.14	12.77	110.03	0.50%	304.1	525	1.29	36.2%
Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	1.02	1.02	0	5.63	0.00	0.00	0.00	0.00	0	0	0	1521	0	0	0	0	11242	3350	164	481	420	15657	2.90	66.95	66.95	90.69	17.41	12.77	120.87	0.55%	318.9	525	1.37	37.9%
Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	8.93	8.93	0	3.77	0.00	0.00	0.99	1.22	0	0	0	1018	0	0	256	134	12260	3350	164	737	555	17065	2.87	75.88	75.88	97.62	19.73	13.90	131.25	0.30%	336.3	600	1.12	39.0%
Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	0.31	0.31	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	12260	3350	164	737	555	17065	2.87	76.19	76.19	97.62	19.81	13.90	131.33	0.30%	336.3	600	1.12	39.1%
Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	9.23	9.23	0	4.66	0.00	0.00	1.01	0.00	0	0	0	1257	0	0	262	0	13518	3350	164	999	555	18584	2.82	85.42	85.42	106.03	22.21	14.66	142.90	0.57%	463.6	600	1.44	30.8%
Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	1.39	1.39	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	13518	3350	164	999	555	18584	2.82	86.81	86.81	106.03	22.57	14.66	143.26	0.60%	475.6	600	1.47	30.1%
Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	1.95	1.95	0	1.21	0.00	0.00	0.00	0.00	0	0	0	326	0	0	0	0	13844	3350	164	999	555	18910	2.81	88.76	88.76	108.18	23.08	14.66	145.93	0.60%	475.6	600	1.48	30.7%
Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	1.80	1.80	0	0.69	0.00	0.00	0.00	0.00	0	0	0	186	0	0	0	0	14030	3350	164	999	555	19097	2.81	90.56	90.56	109.41	23.54	14.66	147.62	0.65%	495.0	600	1.53	29.8%
Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	1.11	1.11	0	2.30	0.00	0.00	0.00	0.00	0	0	0	620	0	0	0	0	14650	3350	164	999	555	19717	2.79	91.67	91.67	113.48	23.83	14.66	151.98	46.50%	4187.0	600	7.03	3.6%
Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	0.76	0.76	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	14650	3350	164	999	555	19717	2.79	92.43	92.43	113.48	24.03	14.66	152.17	2.00%	868.4	600	2.31	17.5%
Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	3.09	3.09	0	1.78	0.00	0.00	1.47	0.00	0	0	0	480	0	0	380	0	15130	3350	164	1378	555	20576	2.77	95.52	95.52	116.60	24.83	15.76	157.20	3.26%	776.5	525	2.81	20.2%
Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	1.31	1.31	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	96.83	96.83	116.60	25.17	15.76	157.54	2.00%	608.2	525	2.36	25.9%
Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	0.18	0.18	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	97.01	97.01	116.60	25.22	15.76	157.59	3.60%	816.0	525	2.91	19.3%
Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	0.88	0.88	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	97.89	97.89	116.60	25.45	15.76	157.82	0.36%	368.4	600	1.25	42.8%
Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	1.23	1.23	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	99.12	99.12	116.60	25.77	15.76	158.14	0.36%	368.4	600	1.25	42.9%
Trunk Sewer																																						

- NOTES:
- Calculated flows are estimated based on the existing development within the drainage area.
 - The population equivalent for medium density development (apartments) was assumed at 270 people/hectare.
 - The above calculations assume only sanitary flow from the drainage area in the combined sewers
 - The post development flow can be supported by the existing sanitary network, thus the sewers can support the proposed development.
 - CUMAP data and Plan Profiles were used to collect pipe slope and size information.
 - Future Developments within our Drainage Area were included in our External Analysis. Population assumed for 25 St. Dennis Drive Development : 209 1-Bedroom x 1.4 people/unit = 293 persons, 156 2-Bedroom x 2.1 people/unit = 426 persons, 103 3-Bedroom x 3.1 people/unit = 319 persons, 5 4-Bedroom x 3.7 people/unit = 19 persons, 23 townhomes x 2.7 people/unit = 62 persons, 0.11 ha commercial area x 110 people/ha = 12 persons, 0.076 ha.



Prepared by: Isaak Chlorotris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.
Date: February 2023

Project: 48 Grenoble Drive
Project: UD21-110
City of Toronto

External Sanitary Analysis - DRY

- (1)= Street Name from DAP_3
- (2)= Maintennace hole ID from DAP_3
- (3)= Maintennace hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with existing sewer segment #2)
- (5)= Drainage area from DAP_3
- (6)= Infiltration Area from DAP_3
- (7)= Semi-Detached / Townhouse from DAP_3
- (8)= Residential from DAP_3
- (9)= Office from DAP_3
- (10)= Hospital old age From DAP_3
- (11)= Church/Schools from DAP_3
- (12)= Commercial from DAP_3
- (13)= Future development (Residential) from Development Application
- (14)= Future development (Church) from Development Application
- (15)= Future development (Commercial) from Development Application
- (16)= Residential population= (7)*2.7 X (8)*270 + (13)
- (17)= Office population = (9) X 330
- (18)= Hospital/Old ages populations= (10) X 333
- (19)= Church population= (11) X 258 + (14)
- (20)= Commercial population = (12) X 110 + (15)
- (21)= Total Residential population= (16)+ previous segment total population
- (22)= Total Office Population = (17) +Previous segment total population
- (23)= TotalHospital/Old ages populations= (18) + Previous segment total population
- (24)= Total Church population= (19) + Previous segment total population
- (25)= Total Commercial population = (20) + previous segment total population
- (26)= Total People (cummulative) = (21) + (22) + (23) + (24)
- (27)= Peak factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands
- (28)=Drainage area from DAP_3
- (29)=Infiltration Area from DAP_3
- (30)= Residential flow $Q(p) = (21) \times (27) \times 240/86400$
- (31)= Infiltration Dry Weather $Q(I) = (29) \times 0.26$
- (32)= Non Residential $Q(C) = (22) + (23) + (24) + (25) \times 250/86400$
- (33)= Existing peak flow= (30)+ (31) + (32)
- (34)= Grade of existing Segment from Plan n Profiles
- (35)= Max allowable flow = $23976 \times (36)^{(8/3)} \times (34)^{0.5}$
- (36)= Pipe size from Plan n Profiles
- (37)= Flow velocity
- (38)= Pre development % of Design = (33) / (35)



EXTERNAL SANITARY SEWER SEGMENTS

POST-DEVELOPMENT_DRY-WEATHER

48 Grenoble Drive

City of Toronto

SCENARIO 2

LOCATION					FLOWS								
					EXISTING PEAK FLOW (Cumulative) (L/s)	PROPOSED FLOW (Cumulative) (L/s)	TOTAL PEAK DESIGN FLOW (Cumulative) (L/s)	GRADE (used) (%)	max.flow Capacity (L/s)	PIPE LENGTH (m)	PIPE SIZE (mm)	FLOW VELOCITY V (m/s)	Post-development % of DESIGN CAPACITY (%)
DESCRIPTION	Street Name	Maintennace hole ID FROM TO		MAP ID									
column number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
DOWNSTREAM SEWER													
Sewer Segment	Grenoble Dr.	PROP. MH4A	EX. MH33A	# 1	0.18	14.67	14.85	1.00%	175.3	38.10	375	0.97	8.5%
Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	101.25	14.67	115.92	0.74%	245.3	67.70	450	1.52	47.3%
Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	101.74	14.67	116.41	0.79%	253.4	90.50	450	1.53	45.9%
Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	110.03	14.67	124.70	0.50%	304.1	87.20	525	1.34	41.0%
Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	120.87	14.67	135.54	0.55%	318.9	64.00	525	1.41	42.5%
Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	131.25	14.67	145.92	0.30%	336.3	102.40	600	1.15	43.4%
Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	131.33	14.67	146.00	0.30%	336.3	99.70	600	1.15	43.4%
Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	142.90	14.67	157.57	0.57%	463.6	74.10	600	1.48	34.0%
Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	143.26	14.67	157.93	0.60%	475.6	67.10	600	1.51	33.2%
Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	145.93	14.67	160.60	0.60%	475.6	61.00	600	1.52	33.8%
Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	147.62	14.67	162.29	0.65%	495.0	48.20	600	1.57	32.8%
Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	151.98	14.67	166.65	46.50%	4187.0	20.70	600	7.21	4.0%
Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	152.17	14.67	166.84	2.00%	868.4	5.40	600	2.37	19.2%
Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	157.20	14.67	171.87	3.26%	776.5	113.40	525	2.88	22.1%
Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	157.54	14.67	172.21	2.00%	608.2	104.20	525	2.42	28.3%
Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	157.59	14.67	172.26	3.60%	816.0	55.20	525	2.99	21.1%
Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	157.82	14.67	172.49	0.36%	368.4	97.50	600	1.28	46.8%
Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	158.14	14.67	172.81	0.36%	368.4	97.50	600	1.28	46.9%
Trunk Sewer													



Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Date: February 2023

Project: 48 Grenoble Drive

Project: UD21-0110

City of Toronto

Sheet 3 of 9

External Dry Post

- (1)= Street Name from DAP_3
- (2)= Maintennace hole ID from DAP_3
- (3)= Maintennace hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with proposed sewer segment #1)
- (5)= Existing peak flow = (33) [from External Sanitary Analysis]
- (6)= Proposed flow= Total Net flow [from Site Sanitary Analysis]
- (7)= Total Peak Design Flow= (5) + (6)
- (8)= Grade of existing Segment from Plan n Profiles
- (9)= Max allowable flow = $23976 \times (36)^{(8/3)} \times (34)^{0.5}$
- (10)= Pipe Length from Plan n Profiles
- (11)= Pipe size from Plan n Profiles
- (12)= Flow velocity
- (13)= Pre development % of Design = (33) / (35)

Lithos

EXTERNAL SANITARY SEWER SEGMENTS

48 Grenoble Dr

WET WEATHER

City of Toronto

400 L/c/day - new commercial/residential

250 L/c/day - existing institutional/commercial

240 L/c/day - existing residential

q = average daily per capita flow (L/c/day)

Q (p) = peak population flow (L/s)

Q (W) = peak extraneous flow (L/s)

Q (C) = peak flow from commercial area (L/s)

Q (d) = existing peak flow (L/s)

M = Peaking Factor (residential) = 1 + 14(4+P^{0.5}) where P = population in 1000's

I = unit of peak extraneous flow

Q (p) = Pqk4886.4 (L/s)

Q (F) = IA (L/s) where I = 3.0 L/s/ha, and A = Foundation Area (ha)

Q (C) = based on Y L/c/day - residential equivalent (see below)

Q (d) = Q (p) + Q (I) + Q (C)

LOCATION															POPULATION										FLOWS (CUMULATIVE)										SCENARIO 3							
DESCRIPTION	Street Name	Maintennance hole ID		MAP ID	Drainage Area (hectares)	Infiltration Area (hectares)	Semi - Detached/ Townhouse (units)	Residential (hectares)	OFFICE (hectares)	Hospital/Old age (hectares)	Church/ School (hectares)	Commercial (hectares)	Future Development (Residential) (persons)	Future Development (Church) (persons)	Future Development (Commercial) (persons)	RESIDENTIAL	OFFICE	Hospital/Old age	CHURCH	COMMERCIAL	TOTAL RESIDENTIAL	TOTAL OFFICE	TOTAL Hospital/Old age	TOTAL CHURCH	TOTAL COMMERCIAL	TOTAL PEOPLE	Peak Factor (residential)	Drainage Area	Infiltration Area	Foundation Area	RESIDENTIAL	INFILTRATION WET WEATHER	FOUNDATION ALLOWANCE	NON RESIDENTIAL	EXISTING PEAK FLOW	GRADE	Max. Allowable	PIPE	FLOW VELOCITY	Pre-development % of DESIGN		
		@ 2.7 people/unit and 270 people/ha	@ 330 people/ha													@ 333 people/ha	(258 people/ha)	@ 110people/ha	(cumulative)	(cumulative)	(cumulative)	(cumulative)	(cumulative)	(cumulative)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(persons)	(dimensionless)	(hectares)	(hectares)	(hectares)
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
DOWNSTREAM SEWER SEGMENTS																																										
Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	55.05	55.05	299	25.14	10.06	0.49	1.62	3.71	1287	0	12	8883	3350	164	419	420	8883	3350	164	419	420	13235	3.01	55.73	55.73	55.73	74.16	14.49	167.18	12.59	268.42	0.74%	245.3	450	1.43	109.4%		
Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	1.42	1.42	0	0.00	0.00	0.00	0.17	0.00	0	0	0	0	0	0	44	0	8883	3350	164	462	420	13278	3.01	57.15	57.15	57.15	74.16	14.86	171.44	12.72	273.18	0.79%	253.4	450	1.47	107.8%		
Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	8.78	8.78	178	1.33	0.00	0.00	0.07	0.00	0	0	0	838	0	0	19	0	9721	3350	164	481	420	14136	2.97	65.93	65.93	65.93	80.11	17.14	197.78	12.77	307.81	0.50%	304.1	525	1.60	101.2%		
Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	1.02	1.02	0	5.63	0.00	0.00	0.00	0.00	0	0	0	1521	0	0	0	0	11242	3350	164	481	420	15657	2.90	66.95	66.95	66.95	90.69	17.41	200.84	12.77	321.71	0.55%	318.9	525	1.68	100.9%		
Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	8.93	8.93	0	3.77	0.00	0.00	0.99	1.22	0	0	0	1018	0	0	256	134	12260	3350	164	737	555	17065	2.87	75.88	75.88	75.88	97.62	19.73	227.63	13.90	358.88	0.30%	336.3	600	1.34	106.7%		
Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	0.31	0.31	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	12260	3350	164	737	555	17065	2.87	76.19	76.19	76.19	97.62	19.81	228.56	13.90	359.89	0.30%	336.3	600	1.33	107.0%		
Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	9.23	9.23	0	4.66	0.00	0.00	1.01	0.00	0	0	0	1257	0	0	262	0	13518	3350	164	999	555	18584	2.82	85.42	85.42	85.42	106.03	22.21	256.25	14.66	399.15	0.57%	463.6	600	1.84	86.1%		
Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	1.39	1.39	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	13518	3350	164	999	555	18584	2.82	86.81	86.81	86.81	106.03	22.57	260.42	14.66	403.68	0.60%	475.6	600	1.89	84.9%		
Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	1.95	1.95	0	1.21	0.00	0.00	0.00	0.00	0	0	0	326	0	0	0	0	13844	3350	164	999	555	18910	2.81	88.76	88.76	88.76	108.18	23.08	266.27	14.66	412.19	0.60%	475.6	600	1.89	86.7%		
Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	1.80	1.80	0	0.69	0.00	0.00	0.00	0.00	0	0	0	186	0	0	0	0	14030	3350	164	999	555	19097	2.81	90.56	90.56	90.56	109.41	23.54	271.67	14.66	419.29	0.65%	495.0	600	1.96	84.7%		
Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	1.11	1.11	0	2.30	0.00	0.00	0.00	0.00	0	0	0	620	0	0	0	0	14650	3350	164	999	555	19717	2.79	91.67	91.67	91.67	113.48	23.83	275.00	14.66	426.97	46.50%	4187.0	600	9.52	10.2%		
Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	0.76	0.76	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	14650	3350	164	999	555	19717	2.79	92.43	92.43	92.43	113.48	24.03	277.28	14.66	429.45	2.00%	868.4	600	3.06	49.5%		
Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	3.09	3.09	0	1.78	0.00	0.00	1.47	0.00	0	0	0	480	0	0	380	0	15130	3350	164	1378	555	20576	2.77	95.52	95.52	95.52	116.60	24.83	286.55	15.76	443.75	3.26%	776.5	525	3.71	57.1%		
Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	1.31	1.31	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	96.83	96.83	96.83	116.60	25.17	290.48	15.76	448.02	2.00%	608.2	525	3.07	73.7%		
Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	0.18	0.18	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	97.01	97.01	97.01	116.60	25.22	291.02	15.76	448.60	3.60%	816.0	525	3.86	55.0%		
Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	0.88	0.88	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	97.89	97.89	97.89	116.60	25.45	293.66	15.76	451.47	0.36%	368.4	600	1.24	122.5%		
Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	1.23	1.23	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	15130	3350	164	1378	555	20576	2.77	99.12	99.12	99.12	116.60	25.77	297.35	15.76	455.48	0.36%	368.4	600	1.24	123.6%		
Trunk Sewer																																										
NOTES: 1. Calculated flows are estimated based on the existing development within the drainage area. 2. The population equivalent for medium density development (apartments) was assumed at 270 people/hectare. 3. The above calculations assume only sanitary flow from the drainage area in the combined sewers 4. The post development flow can be supported by the existing sanitary network, thus the sewers can support the proposed development. 5. CUMAP data and Plan Profiles were used to collect pipe slope and size information. 6. Future Developments within our Drainage Area were included in our External Analysis. Population assumed for 25 St. Dennis Drive Development : 209 1-Bedroom x 1.4 people/unit = 293 persons, 156 2-Bedroom x 2.1 people/unit = 426 persons, 103 3-Bedroom x 3.1 people/unit = 319 persons, 5 4-Bedroom x 3.7 people/unit = 19 persons, 23 townhomes x 2.7 people/unit = 62 persons, 0.11 ha commercial area x 110 people/ha = 12 persons, 0.076 ha.																																										
Lithos															Prepared by: Isaak Chlorotiris, P.E., M.A.Sc. Reviewed by: John Pasalidis, P.Eng., M.A.Sc. Date: February 2023										Project: 48 Grenoble Dr Project: UD21-110 City of Toronto										Sheet 4 OF 9							

External Sanitary analysis WET

- (1)= Street Name from DAP_3
- (2)= Maintenance hole ID from DAP_3
- (3)= Maintenance hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with existing sewer segment #2)
- (5)= Drainage area from DAP_3
- (6)= Infiltration Area from DAP_3
- (7)= Semi-Detached / Townhouse from DAP_3
- (8)= Residential from DAP_3
- (9)= Office from DAP_3
- (10)= Hospital old age From DAP_3
- (11)= Church/Schools from DAP_3
- (12)= Commercial from DAP_3
- (13)= Future development (Residential) from Development Application
- (14)= Future development (Church) from Development Application
- (15)= Future development (Commercial) from Development Application
- (16)= Residential population= (7)*2.7 X (8)*270 + (13)
- (17)= Office population = (9) X 330
- (18)= Hospital/Old ages populations= (10) X 333
- (19)= Church population= (11) X 258 + (14)
- (20)= Commercial population = (12) X 110 + (15)
- (21)= Total Residential population= (16)+ previous segment total population
- (22)= Total Office Population = (17) +Previous segment total population
- (23)= Total Hospital/Old ages populations= (18) + Previous segment total population
- (24)= Total Church population= (19) + Previous segment total population
- (25)= Total Commercial population = (20) + previous segment total population
- (26)= Total People (cumulative) = (21) + (22) + (23) + (24)
- (27)= Peak factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands
- (28)=Drainage area from DAP_3
- (29)=Infiltration Area from DAP_3
- (30) =Foundation Area = (29)
- (31)= Residential flow $Q(p) = (21) \times (27) \times 240/86400$
- (32)= Infiltration Dry Weather $Q(l) = (29) \times 0.26$
- (33)= Foundation allowance= (30) X 3
- (34)= Non Residential $Q(C) = (22) + (23) + (24) + (25) \times 250/86400$
- (35)= Existing peak flow= (31)+ (32) + (33)+ (34)
- (36)= Grade of existing Segment from Plan n Profiles
- (37)= Max allowable flow = $23976 \times (38)^{(8/3)} \times (36)^{0.5}$
- (38)= Pipe size from Plan n Profiles
- (39)= Flow velocity
- (40)= Pre development % of Design = (35) / (37)



EXTERNAL SANITARY SEWER SEGMENTS
POST-DEVELOPMENT_WET-WEATHER
48 Grenoble Drive
City of Toronto

SCENARIO 4

LOCATION					FLOWS								
					EXISTING PEAK FLOW (Cumulative) (L/s)	PROPOSED FLOW (Cumulative) (L/s)	TOTAL PEAK DESIGN FLOW (Cumulative) (L/s)	GRADE (used) (%)	max.flow Capacity (L/s)	PIPE LENGTH (m)	PIPE SIZE (mm)	FLOW VELOCITY V (m/s)	Post-development % of DESIGN CAPACITY (%)
DESCRIPTION	Street Name	Maintennace hole ID FROM TO		MAP ID									
column number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
DOWNSTREAM SEWER													
Sewer Segment	Grenoble Dr.	PROP. MH4A	EX. MH33A	# 1	2.21	14.67	16.88	1.00%	175.3	38.10	375	1.01	9.6%
Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	268.42	14.67	283.09	0.74%	245.3	67.70	450	1.45	115.4%
Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	273.18	14.67	287.85	0.79%	253.4	90.50	450	1.49	113.6%
Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	307.81	14.67	322.48	0.50%	304.1	87.20	525	1.59	106.0%
Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	321.71	14.67	336.38	0.55%	318.9	64.00	525	1.67	105.5%
Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	358.88	14.67	373.55	0.30%	336.3	102.40	600	1.11	111.1%
Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	359.89	14.67	374.56	0.30%	336.3	99.70	600	1.11	111.4%
Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	399.15	14.67	413.82	0.57%	463.6	74.10	600	1.85	89.3%
Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	403.68	14.67	418.35	0.60%	475.6	67.10	600	1.90	88.0%
Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	412.19	14.67	426.86	0.60%	475.6	61.00	600	1.90	89.7%
Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	419.29	14.67	433.96	0.65%	495.0	48.20	600	1.97	87.7%
Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	426.97	14.67	441.64	46.50%	4187.0	20.70	600	9.61	10.5%
Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	429.45	14.67	444.12	2.00%	868.4	5.40	600	3.09	51.1%
Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	443.75	14.67	458.42	3.26%	776.5	113.40	525	3.73	59.0%
Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	448.02	14.67	462.69	2.00%	608.2	104.20	525	3.09	76.1%
Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	448.60	14.67	463.27	3.60%	816.0	55.20	525	3.89	56.8%
Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	451.47	14.67	466.14	0.36%	368.4	97.50	600	1.25	126.5%
Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	455.48	14.67	470.15	0.36%	368.4	97.50	600	1.25	127.6%
Trunk Sewer													



Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.
Date: February 2023

Project: 48 Grenoble Drive

Project: UD21-0110

City of Toronto

Sheet 5 of 9

External WET Post

- (1)= Street Name from DAP_3
- (2)= Maintennace hole ID from DAP_3
- (3)= Maintennace hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with proposed sewer segment #1)
- (5)= Existing peak flow = (33) [from External Sanitary Analysis WET-POST]
- (6)= Proposed flow= Total Net flow [from Site Sanitary Analysis]
- (7)= Total Peak Design Flow= (5) + (6)
- (8)= Grade of existing Segment from Plan n Profiles
- (9)= Max allowable flow = $23976 \times (36)^{(8/3)} \times (34)^{0.5}$
- (10)= Pipe Length from Plan n Profiles
- (11)= Pipe size from Plan n Profiles
- (12)= Flow velocity
- (13)= Pre development % of Design =(33) / (35)



HYDRAULIC GRADE LINE ANALYSIS DRY WEATHER - PRE-DEVELOPMENT CONDITIONS

48 Grenoble Drive
City of Toronto

SCENARIO 5

DESCRIPTION	Street Name	Maintennace hole ID		MAP ID based on CUMAP Drawing	EXISTING	GRADE	Max. Allowable	PIPE	Pre-development	PIPE LENGTH (m)	GROUND ELEVATION (m)	UPPER INVERT (m)	UPPER OBVERT (m)	LOWER INVERT (m)	LOWER OBVERT (m)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (L/s)	U/s HGL (m)	U/s SURCHARGE (m)	U/s FREEBOARD (m)	
		PEAK FLOW	(used)		Flow	SIZE	% of DESIGN	CAPACITY													
		(Cummulative)	(%)		(L/s)	(mm)	(%)														
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
DOWNSTREAM SEWER SEGMENTS	Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	101.25	0.74%	245.3	450	41.3%	67.7	126.000	118.660	119.110	118.160	118.610	1.54	245.26	118.860	0.00	7.14
	Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	101.74	0.79%	253.4	450	40.1%	90.5	122.850	118.130	118.580	117.420	117.870	1.59	253.41	118.328	0.00	4.52
	Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	110.03	0.50%	304.1	525	36.2%	87.2	120.090	117.150	117.675	116.700	117.225	1.40	304.10	117.368	0.00	2.72
	Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	120.87	0.55%	318.9	525	37.9%	64.0	121.310	116.670	117.195	116.320	116.845	1.47	318.94	116.895	0.00	4.42
	Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	131.25	0.30%	336.3	600	39.0%	102.4	124.050	116.190	116.790	115.930	116.530	1.19	336.31	116.450	0.00	7.60
	Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	131.33	0.30%	336.3	600	39.1%	99.7	122.520	115.900	116.500	115.620	116.220	1.19	336.31	116.160	0.00	6.36
	Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	142.90	0.57%	463.6	600	30.8%	74.1	121.050	115.350	115.950	114.930	115.530	1.64	463.57	115.579	0.00	5.47
	Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	143.26	0.60%	475.6	600	30.1%	67.1	119.940	114.900	115.500	114.500	115.100	1.68	475.61	115.125	0.00	4.82
	Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	145.93	0.60%	475.6	600	30.7%	61.0	119.480	114.470	115.070	114.100	114.700	1.68	475.61	114.699	0.00	4.78
	Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	147.62	0.65%	495.0	600	29.8%	48.2	119.170	114.070	114.670	113.760	114.360	1.75	495.03	114.295	0.00	4.88
	Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	151.98	46.50%	4187.0	600	3.6%	20.7	116.280	113.150	113.750	103.530	104.130	14.81	4187.00	113.228	0.00	3.05
	Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	152.17	2.00%	868.4	600	17.5%	5.4	106.520	103.070	103.670	102.940	103.540	3.07	868.34	103.258	0.00	3.26
	Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	157.20	3.26%	776.5	525	20.2%	113.4	105.760	99.710	100.235	96.010	96.535	3.59	776.50	99.868	0.00	5.89
	Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	157.54	2.00%	608.2	525	25.9%	104.2	98.300	94.820	95.345	92.730	93.255	2.81	608.20	95.001	0.00	3.30
	Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	157.59	3.60%	816.0	525	19.3%	55.2	96.310	92.680	93.205	90.700	91.225	3.77	815.99	92.833	0.00	3.48
	Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	157.82	0.36%	368.4	600	42.8%	97.5	93.720	88.740	89.340	88.390	88.990	1.30	368.41	89.012	0.00	4.71
	Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	158.14	0.36%	368.4	600	42.9%	97.5	91.130	88.360	88.960	88.010	88.610	1.30	368.41	88.632	0.00	2.50
	Trunk Sewer																				

NOTES:

1. Calculated flows are estimated based on the existing development within the drainage area.
2. Flows were retrieved from the External Sanitary Analysis design sheet.
3. Information on the existing Sanitary System, were retrieved from the City.



Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.
Date: February 2023

Project: 48 Grenoble Drive
Project: UD21-110
City of Toronto

Sheet 6 OF 9

HGL Analysis DRY-PRE

- (1)= Street Name from DAP_3
- (2)= Maintennace hole ID from DAP_3
- (3)= Maintennace hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with existing sewer segment #2)
- (5)= Existing peak flow = (33) [from External Sanitary Analysis DRY-PRE]
- (6)= Grade of existing Segment from Plan n Profiles
- (7)= Max allowable flow = $23976 \times (8)^{(8/3)} \times (7)^{0.5}$
- (8)= Pipe size from Plan n Profiles
- (9)= Pre development % of Design = $(5) / (7)$
- (10)= Pipe Length from Plan n Profiles
- (11)= Ground Elevation from Plan n Profiles
- (12)= Upper Invert from Plan n Profiles
- (13)= Upper Obvert from Plan n Profiles
- (14)= Lower Invert from Plan n Profiles
- (15)= Lower Obvert from Plan n Profiles
- (16)= Full flow Velocity = $(1/0.013) \times ((8) \times 4)^{(2/3)} \times (6)^{0.5}$
- (17)= Full flow Capacity= $1000 \times (16) \times \text{PI}() \times ((8)^{2/4})$
- (18)= U/S HGL
- (19)= U/s Surcharge= $(13)-(18)$
- (20) U/s Freeboard= $(11)-(18)$



HYDRAULIC GRADE LINE ANALYSIS

DRY WEATHER - POST-DEVELOPMENT CONDITIONS

48 Grenoble Drive

City of Toronto

SCENARIO 6

DESCRIPTION	Street Name	Maintennace hole ID		MAP ID based on CUMAP	PROPOSED	GRADE	Max. Allowable	PIPE	Post-development	PIPE LENGTH (m)	GROUND ELEVATION (m)	UPPER INVERT (m)	UPPER OBVERT (m)	LOWER INVERT (m)	LOWER OBVERT (m)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (L/s)	U/s HGL (m)	U/s SURCHARGE (m)	U/s FREEBOARD (m)
		FROM	TO		PEAK FLOW (Cumulative) (L/s)	(used) (%)	Flow (L/s)	SIZE (mm)	% of DESIGN CAPACITY (%)											
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DOWNSTREAM SEWER SEGMENTS																				
Sewer Segment	Grenoble Dr.	PROP. MH4A	EX. MH33A	# 1	14.85	1.00%	175.3	375	8.5%	28.5	124.730	119.320	119.695	118.700	119.075	1.59	175.33	119.320	0.00	5.41
Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	115.92	0.74%	245.3	450	47.3%	67.7	126.000	118.660	119.110	118.160	118.610	1.54	245.26	118.860	0.00	7.14
Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	116.41	0.79%	253.4	450	45.9%	90.5	122.850	118.130	118.580	117.420	117.870	1.59	253.41	118.328	0.00	4.52
Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	124.70	0.50%	304.1	525	41.0%	87.2	120.090	117.150	117.675	116.700	117.225	1.40	304.10	117.368	0.00	2.72
Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	135.54	0.55%	318.9	525	42.5%	64.0	121.310	116.670	117.195	116.320	116.845	1.47	318.94	116.895	0.00	4.42
Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	145.92	0.30%	336.3	600	43.4%	102.4	124.050	116.190	116.790	115.930	116.530	1.19	336.31	116.450	0.00	7.60
Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	146.00	0.30%	336.3	600	43.4%	99.7	122.520	115.900	116.500	115.620	116.220	1.19	336.31	116.160	0.00	6.36
Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	157.57	0.57%	463.6	600	34.0%	74.1	121.050	115.350	115.950	114.930	115.530	1.64	463.57	115.579	0.00	5.47
Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	157.93	0.60%	475.6	600	33.2%	67.1	119.940	114.900	115.500	114.500	115.100	1.68	475.61	115.125	0.00	4.82
Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	160.60	0.60%	475.6	600	33.8%	61.0	119.480	114.470	115.070	114.100	114.700	1.68	475.61	114.699	0.00	4.78
Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	162.29	0.65%	495.0	600	32.8%	48.2	119.170	114.070	114.670	113.760	114.360	1.75	495.03	114.295	0.00	4.88
Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	166.65	46.50%	4187.0	600	4.0%	20.7	116.280	113.150	113.750	103.530	104.130	14.81	4187.00	113.228	0.00	3.05
Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	166.84	2.00%	868.4	600	19.2%	5.4	106.520	103.070	103.670	102.940	103.540	3.07	868.34	103.258	0.00	3.26
Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	171.87	3.26%	776.5	525	22.1%	113.4	105.760	99.710	100.235	96.010	96.535	3.59	776.50	99.868	0.00	5.89
Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	172.21	2.00%	608.2	525	28.3%	104.2	98.300	94.820	95.345	92.730	93.255	2.81	608.20	95.001	0.00	3.30
Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	172.26	3.60%	816.0	525	21.1%	55.2	96.310	92.680	93.205	90.700	91.225	3.77	815.99	92.833	0.00	3.48
Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	172.49	0.36%	368.4	600	46.8%	97.5	93.720	88.740	89.340	88.390	88.990	1.30	368.41	89.012	0.00	4.71
Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	172.81	0.36%	368.4	600	46.9%	97.5	91.130	88.360	88.960	88.010	88.610	1.30	368.41	88.632	0.00	2.50
Trunk Sewer																				

NOTES:

1. Calculated flows are estimated based on the existing development within the drainage area.
2. Flows were retrieved from the External Sanitary Analysis design sheet.
3. Information on the existing Sanitary System, were retrieved from the City.



Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.
Date: February 2023

Project: 48 Grenoble Drive
Project: UD21-110
City of Toronto

Sheet 7 OF 9

HGL Analysis DRY-POST

- (1)= Street Name from DAP_3
- (2)= Maintennace hole ID from DAP_3
- (3)= Maintennace hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with proposed sewer segment #1)
- (5)= Proposed peak flow = (7) [from External Sanitary Analysis DRY-POST]
- (6)= Grade of existing Segment from Plan n Profiles
- (7)= Max allowable flow = $23976 \times (8)^{(8/3)} \times (7)^{0.5}$
- (8)= Pipe size from Plan n Profiles
- (9)= Pre development % of Design = $(5) / (7)$
- (10)= Pipe Length from Plan n Profiles
- (11)= Ground Elevation from Plan n Profiles
- (12)= Upper Invert from Plan n Profiles
- (13)= Upper Obvert from Plan n Profiles
- (14)= Lower Invert from Plan n Profiles
- (15)= Lower Obvert from Plan n Profiles
- (16)= Full flow Velocity = $(1/0.013) \times ((8) \times 4)^{(2/3)} \times (6)^{0.5}$
- (17)= Full flow Capacity= $1000 \times (16) \times \text{PI}() \times ((8)^{2/4})$
- (18)= U/S HGL
- (19)= U/s Surcharge= $(13)-(18)$
- (20) U/s Freeboard= $(11)-(18)$



HYDRAULIC GRADE LINE ANALYSIS

WET WEATHER - PRE-DEVELOPMENT CONDITIONS

48 Grenoble Drive
City of Toronto

SCENARIO 7

DESCRIPTION	Street Name	Maintennace hole ID		MAP ID	EXISTING	GRADE	Max. Allowable	PIPE	Pre-development											
		FROM	TO	based on CUMAP Drawing	PEAK FLOW (Cumulative) (L/s)	(used) (%)	Flow (L/s)	SIZE (mm)	% of DESIGN CAPACITY (%)	PIPE LENGTH (m)	GROUND ELEVATION (m)	UPPER INVERT (m)	UPPER OBVERT (m)	LOWER INVERT (m)	LOWER OBVERT (m)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (L/s)	U/s HGL (m)	U/s SURCHARGE (m)	U/s FREEBOARD (m)
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DOWNSTREAM SEWER SEGMENTS																				
Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	268.42	0.74%	245.3	450	109.4%	67.7	126.000	118.660	119.110	118.160	118.610	1.54	245.26	119.310	-0.20	6.69
Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	273.18	0.79%	253.4	450	107.8%	90.5	122.850	118.130	118.580	117.420	117.870	1.59	253.41	118.673	-0.09	4.18
Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	307.81	0.50%	304.1	525	101.2%	87.2	120.090	117.150	117.675	116.700	117.225	1.40	304.10	117.771	-0.10	2.32
Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	321.71	0.55%	318.9	525	100.9%	64.0	121.310	116.670	117.195	116.320	116.845	1.47	318.94	117.294	-0.10	4.02
Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	358.88	0.30%	336.3	600	106.7%	102.4	124.050	116.190	116.790	115.930	116.530	1.19	336.31	116.903	-0.11	7.15
Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	359.89	0.30%	336.3	600	107.0%	99.7	122.520	115.900	116.500	115.620	116.220	1.19	336.31	116.531	-0.03	5.99
Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	399.15	0.57%	463.6	600	86.1%	74.1	121.050	115.350	115.950	114.930	115.530	1.64	463.57	115.775	0.00	5.28
Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	403.68	0.60%	475.6	600	84.9%	67.1	119.940	114.900	115.500	114.500	115.100	1.68	475.61	115.320	0.00	4.62
Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	412.19	0.60%	475.6	600	86.7%	61.0	119.480	114.470	115.070	114.100	114.700	1.68	475.61	114.900	0.00	4.58
Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	419.29	0.65%	495.0	600	84.7%	48.2	119.170	114.070	114.670	113.760	114.360	1.75	495.03	114.490	0.00	4.68
Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	426.97	46.50%	4187.0	600	10.2%	20.7	116.280	113.150	113.750	103.530	104.130	14.81	4187.00	113.276	0.00	3.00
Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	429.45	2.00%	868.4	600	49.5%	5.4	106.520	103.070	103.670	102.940	103.540	3.07	868.34	103.406	0.00	3.11
Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	443.75	3.26%	776.5	525	57.1%	113.4	105.760	99.710	100.235	96.010	96.535	3.59	776.50	99.992	0.00	5.77
Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	448.02	2.00%	608.2	525	73.7%	104.2	98.300	94.820	95.345	92.730	93.255	2.81	608.20	95.153	0.00	3.15
Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	448.60	3.60%	816.0	525	55.0%	55.2	96.310	92.680	93.205	90.700	91.225	3.77	815.99	92.958	0.00	3.35
Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	451.47	0.36%	368.4	600	122.5%	97.5	93.720	88.740	89.340	88.390	88.990	1.30	368.41	89.577	-0.24	4.14
Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	455.48	0.36%	368.4	600	123.6%	97.5	91.130	88.360	88.960	88.010	88.610	1.30	368.41	89.024	-0.06	2.11
Trunk Sewer																				

NOTES:

1. Calculated flows are estimated based on the existing development within the drainage area.
2. Flows were retrieved from the External Sanitary Analysis design sheet.
3. Information on the existing Sanitary System, were retrieved from the City.



Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.
Date: February 2023

Project: 48 Grenoble Drive
Project: UD21-110
City of Toronto

Sheet 8 OF 9

HGL Analysis WET-PRE

- (1)= Street Name from DAP_3
- (2)= Maintennace hole ID from DAP_3
- (3)= Maintennace hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with proposed sewer segment #1)
- (5)= Existing peak flow = (33) [from External Sanitary Analysis WET-PRE]
- (6)= Grade of existing Segment from Plan n Profiles
- (7)= Max allowable flow = $23976 \times (8)^{(8/3)} \times (7)^{0.5}$
- (8)= Pipe size from Plan n Profiles
- (9)= Pre development % of Design = $(5) / (7)$
- (10)= Pipe Length from Plan n Profiles
- (11)= Ground Elevation from Plan n Profiles
- (12)= Upper Invert from Plan n Profiles
- (13)= Upper Obvert from Plan n Profiles
- (14)= Lower Invert from Plan n Profiles
- (15)= Lower Obvert from Plan n Profiles
- (16)= Full flow Velocity = $(1/0.013) \times ((8) \times 4)^{(2/3)} \times (6)^{0.5}$
- (17)= Full flow Capacity= $1000 \times (16) \times \text{PI}() \times ((8)^{2/4})$
- (18)= U/S HGL
- (19)= U/s Surcharge= $(13)-(18)$
- (20) U/s Freeboard= $(11)-(18)$



HYDRAULIC GRADE LINE ANALYSIS

WET WEATHER - POST-DEVELOPMENT CONDITIONS

48 Grenoble Drive

City of Toronto

SCENARIO 8

DESCRIPTION	Street Name	Maintennace hole ID		MAP ID based on CUMAP Drawing	PROPOSED	GRADE (used)	Max. Allowable Flow	PIPE SIZE	Post-development	PIPE LENGTH (m)	GROUND ELEVATION (m)	UPPER INVERT (m)	UPPER OVERT (m)	LOWER INVERT (m)	LOWER OVERT (m)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (L/s)	U/s HGL (m)	U/s SURCHARGE (m)	U/s FREEBOARD (m)
		PEAK FLOW	% of DESIGN																	
		(Cummulative)	CAPACITY																	
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DOWNSTREAM SEWER SEGMENTS																				
Sewer Segment	Grenoble Dr.	PROP. MH4A	EX. MH33A	# 1	2.21	1.00%	175.3	375	1.3%	28.5	124.730	119.32	119.70	118.70	119.08	1.59	175.33	119.348	0.00	5.38
Sewer Segment	St. Denis Dr.	EX. MH33A	EX. MH38A	# 2	268.42	0.74%	245.3	450	109.4%	67.7	126.000	118.66	119.11	118.16	118.61	1.54	245.26	119.310	-0.20	6.69
Sewer Segment	St. Denis Dr.	EX. MH38A	EX. MH39A	# 3	273.18	0.79%	253.4	450	107.8%	90.5	122.850	118.13	118.58	117.42	117.87	1.59	253.41	118.673	-0.09	4.18
Sewer Segment	St. Denis Dr.	EX. MH39A	EX. MH49A	# 4	307.81	0.50%	304.1	525	101.2%	87.2	120.090	117.15	117.68	116.70	117.23	1.40	304.10	117.771	-0.10	2.32
Sewer Segment	St. Denis Dr.	EX. MH49A	EX. MH50A	# 5	321.71	0.55%	318.9	525	100.9%	64.0	121.310	116.67	117.20	116.32	116.85	1.47	318.94	117.294	-0.10	4.02
Sewer Segment	Gateway Blvd.	EX. MH50A	EX. MH51A	# 6	358.88	0.30%	336.3	600	106.7%	102.4	124.050	116.19	116.79	115.93	116.53	1.19	336.31	116.903	-0.11	7.15
Sewer Segment	Gateway Blvd.	EX. MH51A	EX. MH56A	# 7	359.99	0.30%	336.3	600	107.0%	99.7	122.520	115.90	116.50	115.62	116.22	1.19	336.31	116.531	-0.03	5.99
Sewer Segment	Gateway Blvd.	EX. MH56A	EX. MH57A	# 8	399.15	0.57%	463.6	600	86.1%	74.1	121.050	115.35	115.95	114.93	115.53	1.64	463.57	115.775	0.00	5.28
Sewer Segment	Gateway Blvd.	EX. MH57A	EX. MH58A	# 9	403.68	0.60%	475.6	600	84.9%	67.1	119.940	114.90	115.50	114.50	115.10	1.68	475.61	115.320	0.00	4.62
Sewer Segment	Gateway Blvd.	EX. MH58A	EX. MH59A	# 10	412.19	0.60%	475.6	600	86.7%	61.0	119.480	114.47	115.07	114.10	114.70	1.68	475.61	114.900	0.00	4.58
Sewer Segment	Gateway Blvd.	EX. MH59A	EX. MH60A	# 11	419.29	0.65%	495.0	600	84.7%	48.2	119.170	114.07	114.67	113.76	114.36	1.75	495.03	114.490	0.00	4.68
Sewer Segment	Gateway Blvd.	EX. MH60A	EX. MH61A	# 12	426.97	46.50%	4187.0	600	10.2%	20.7	116.280	113.15	113.75	103.53	104.13	14.81	4187.00	113.276	0.00	3.00
Sewer Segment	Gateway Blvd.	EX. MH61A	EX. MH64A	# 13	429.45	2.00%	868.4	600	49.5%	5.4	106.520	103.07	103.67	102.94	103.54	3.07	868.34	103.406	0.00	3.11
Sewer Segment	Gateway Blvd.	EX. MH64A	EX. MH65A	# 14	443.75	3.26%	776.5	525	57.1%	113.4	105.760	99.71	100.24	96.01	96.54	3.59	776.50	99.992	0.00	5.77
Sewer Segment	Gateway Blvd.	EX. MH65A	EX. MH66A	# 15	448.02	2.00%	608.2	525	73.7%	104.2	98.300	94.82	95.35	92.73	93.26	2.81	608.20	95.153	0.00	3.15
Sewer Segment	Gateway Blvd.	EX. MH66A	EX. MH67A	# 16	448.60	3.60%	816.0	525	55.0%	55.2	96.310	92.68	93.21	90.70	91.23	3.77	815.99	92.958	0.00	3.35
Sewer Segment	Gateway Blvd.	EX. MH67A	EX. MH68A	# 17	451.47	0.36%	368.4	600	122.5%	97.5	93.720	88.74	89.34	88.39	88.99	1.30	368.41	89.577	-0.24	4.14
Sewer Segment	Gateway Blvd.	EX. MH68A	EX. MH69A	# 18	455.48	0.36%	368.4	600	123.6%	97.5	91.130	88.36	88.96	88.01	88.61	1.30	368.41	89.024	-0.06	2.11
Trunk Sewer																				

NOTES:

1. Calculated flows are estimated based on the existing development within the drainage area.
2. Flows were retrieved from the External Sanitary Analysis design sheet.
3. Information on the existing Sanitary System, were retrieved from the City.



Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.
Reviewed by: John Pasalidis, P.Eng., M.A.Sc.
Date: February 2023

Project: 48 Grenoble Drive
Project: UD21-110
City of Toronto

Sheet 9 OF 9

HGL Analysis WET-POST

- (1)= Street Name from DAP_3
- (2)= Maintennace hole ID from DAP_3
- (3)= Maintennace hole ID from DAP_3
- (4)= MAD ID based on CUMAP drawing (analysis begins with proposed sewer segment #1)
- (5)= Proposed peak flow = (33) [from External Sanitary Analysis WET-POST]
- (6)= Grade of existing Segment from Plan n Profiles
- (7)= Max allowable flow = $23976 \times (8)^{(8/3)} \times (7)^{0.5}$
- (8)= Pipe size from Plan n Profiles
- (9)= Pre development % of Design = $(5) / (7)$
- (10)= Pipe Length from Plan n Profiles
- (11)= Ground Elevation from Plan n Profiles
- (12)= Upper Invert from Plan n Profiles
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- (15)= Lower Obvert from Plan n Profiles
- (16)= Full flow Velocity = $(1/0.013) \times ((8) \times 4)^{(2/3)} \times (6)^{0.5}$
- (17)= Full flow Capacity= $1000 \times (16) \times \text{PI}() \times ((8)^{2/4})$
- (18)= U/S HGL
- (19)= U/s Surcharge= $(13)-(18)$
- (20) U/s Freeboard= $(11)-(18)$

Appendix E

Water Data Analysis



WATER DEMAND

48 Grenoble Dr

Project No: UD21-110

Date: February 2023

Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Fire Flow Calculation

West Tower

- $F = 220 C (A)^{1/2}$
 Where F= Fire flow in Lpm
 C= construction type coefficient
 = 0.6 fire resistive construction
 A = total floor area in sq.m. excluding basements, includes garage*

		Area Applied
Level 2=	3200.0 m ²	100%
Level 1=	4065.0 m ²	25%
Level 3=	3200.0 m ²	25%
=	5,016 sq.m.	

Note: The levels indicated, reference the floors with the largest areas (refer to building stats)

F = 9,349 L/min
 F = 9,000 L/min Round to nearest 1000 l/min

- Occupancy Reduction
 25% reduction for non combustible occupancy
 F = 6750 L/min

- Sprinkler Reduction
 30% Reduction for NFPA Sprinkler System
 F = 4725 l/min

- Separation Charge
 20% North 3.1m to 10m
 0% East > 45m
 5% South 30.1m to 45m
 0% West > 45m
 25% Total Separation Charge, 1688 L/min

F = 6,413 L/min
 106.88 L/s
 F = 1694 US GPM

Domestic Flow Calculations

Population High Rise = 659 Persons from Site Statistics
 Average Day Demand = 190 L/cap/day 1 US Gallon=3.785 L
 Residential Flow= 1.45 L/s

Retail/Commercial Area= 0 m2 from Site Statistics
 Average Day Demand= 2.8 L/m2/day 1 US GPM=15.852L/s
 Retail/Commercial Flow= 0.00 L/s

Total Flow= 1.45 L/s
 = 22.58 US GPM

Max. Daily Demand Peaking Factor = 1.5
 Max. Daily Demand = 2.17 L/s = 34 US GPM

or
 Max. Hourly Demand Peaking Factor = 2.25
 Max. Hourly Demand = 3.26 L/s = 52 US GPM

Max Daily Demand = 2.17 L/s
 Fire Flow = 106.88 L/s

Required 'Design' Flow = 109.06 L/s
 1729 US GPM

Note: Required 'Design' Flow is the maximum of either:
 1) Fire Flow + Maximum Daily Demand
 2) Maximum Hourly Demand



WATER DEMAND

48 Grenoble Dr

Project No: UD21-110

Date: February 2023

Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Pressure Losses

Hazen-Williams Formula

$$V = k C R_h^{0.63} S^{0.54}$$

k= 0.85 - conversion factor (0.849 for SI units and 1.318 for US customary units)

C= 140 - roughness coefficient (PVC : 140-150)

S= h_f/L

R_h= D/4 - hydraulic radius (D/4 for full flow, A/P_w for partially flow)

Fire Fighting and Domestic Head Loss

Flow Requirements= 109.06 l/s
Diameter= 200 mm
Area= 1.77E-02
L= 8.6 m
V= 6.17 m/s
S= 1.93E-01
R_h= 0.04
H_f= 1.66 m
= 2.36 psi

Flow Test (dated: May 5, 2022)

when: Static Pressure =	86 psi	Flow =	0 gpm	=	0	L/s
Residual Pressure =	81 psi	Flow =	1061.22 gpm	=	66.96	L/s

Pressure (psi)	Flow (L/s)
86	0.0
81	67.0

Based on the Pressure/Flow relationship, we have to confirm that the flow requirement of 109.06 L/s can be provided at minimum pressure (20.3 psi + Losses) as set out by the FUS guidelines

77.9 109.06

Fire Flow is above minimum of 22.66 psi (20.3+H_f)

Since the flow of 109.06 L/s required for the proposed development is provided in the existing watermain at 77.9 psi (which is more than the minimum of 22.66 psi), we anticipate that the existing watermain infrastructure can support the proposed development.

Flow available at 20psi = 4275 gpm = 269.70 L/s

$$\begin{aligned} Q_{\text{avail @ 20psi}} &= Q_T ((P_S - P_A) / (P_S - P_R))^{0.54} \\ &= 1061.22 \times ((86 - 20) / (86 - 81))^{0.54} \\ &= 4275 \text{ gpm} \end{aligned}$$



WATER DEMAND

48 Grenoble Dr

Project No: UD21-110

Date: February 2023

Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Fire Flow Calculation

East Tower

- 1 $F = 220 C (A)^{1/2}$
Where F= Fire flow in Lpm
C= construction type coefficient
= 0.6 fire resistive construction
A = total floor area in sq.m. excluding basements, includes garage*

		Area Applied
Level 2=	3200.0 m ²	100%
Level 1=	4065.0 m ²	25%
Level 3=	3200.0 m ²	25%
=	5,016 sq.m.	

Note: The levels indicated, reference the floors with the largest areas (refer to building stats)

F = 9,349 L/min
F = 9,000 L/min Round to nearest 1000 l/min

- 2 Occupancy Reduction
25% reduction for non combustible occupancy
F = 6750 L/min

- 3 Sprinkler Reduction
30% Reduction for NFPA Sprinkler System
F = 4725 l/min

- 4 Separation Charge
20% North 3.1m to 10m
0% East > 45m
5% South 30.1m to 45m
0% West > 45m
25% Total Separation Charge, 1688 L/min

F = 6,413 L/min
106.88 L/s
F = 1694 US GPM

Domestic Flow Calculations

Population High Rise = 659 Persons from Site Statistics
Average Day Demand = 190 L/cap/day 1 US Gallon=3.785 L
Residential Flow= 1.45 L/s

Retail/Commercial Area= 0 m2 from Site Statistics
Average Day Demand= 2.8 L/m2/day 1 US GPM=15.852L/s
Retail/Commercial Flow= 0.00 L/s

Total Flow= 1.45 L/s
= 22.58 US GPM

Max. Daily Demand Peaking Factor = 1.5
Max. Daily Demand = 2.17 L/s = 34 US GPM

or
Max. Hourly Demand Peaking Factor = 2.25
Max. Hourly Demand = 3.26 L/s = 52 US GPM

Max Daily Demand = 2.17 L/s
Fire Flow = 106.88 L/s

Required 'Design' Flow = 109.06 L/s
1729 US GPM

Note: Required 'Design' Flow is the maximum of either:
1) Fire Flow + Maximum Daily Demand
2) Maximum Hourly Demand



WATER DEMAND

48 Grenoble Dr

Project No: UD21-110

Date: February 2023

Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Pressure Losses

Hazen-Williams Formula

$$V = k C R_h^{0.63} S^{0.54}$$

k= 0.85 - conversion factor (0.849 for SI units and 1.318 for US customary units)

C= 140 - roughness coefficient (PVC : 140-150)

S= h_f/L

R_h= D/4 - hydraulic radius (D/4 for full flow, A/P_w for partially flow)

Fire Fighting and Domestic Head Loss

Flow Requirements= 109.06 l/s

Diameter= 200 mm

Area= 1.77E-02

L= 14.5 m

V= 6.17 m/s

S= 1.93E-01

R_h= 0.04

H_f= 2.79 m

= 3.97 psi

Assuming zero head losses

Flow Test (dated: May 5, 2022)

when: Static Pressure = 90 psi
Residual Pressure = 86 psi

Flow = 0 gpm = 0 L/s
Flow = 1609.42 gpm = 101.55 L/s

Pressure (psi)	Flow (L/s)
90	0.0
86	101.6

Based on the Pressure/Flow relationship, we have to confirm that the flow requirement of 109.06 L/s can be provided at minimum pressure (20.3 psi + Losses) as set out by the FUS guidelines

85.7 109.06

Fire Flow is above minimum of 24.27 psi (20.3+H_f)

Since the flow of 109.06 L/s required for the proposed development is provided in the existing watermain at 85.7 psi (which is more than the minimum of 24.27 psi), we anticipate that the existing watermain infrastructure can support the proposed development.

Flow available at 20psi = 7549 gpm = 476.29 L/s

$$\begin{aligned} Q_{\text{avail}} @ 20\text{psi} &= Q_T ((P_S - P_A) / (P_S - P_R))^{0.54} \\ &= 1609.42 \times ((86 - 20) / (86 - 81))^{0.54} \\ &= 7549 \text{ gpm} \end{aligned}$$



WATER DEMAND

48 Grenoble Dr

Project No: UD21-110

Date: February 2023

Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Fire Flow Calculation

Podium

- $F = 220 C (A)^{1/2}$
 Where F= Fire flow in Lpm
 C= construction type coefficient
 = 0.6 fire resistive construction
 A = total floor area in sq.m. excluding basements, includes garage*

		Area Applied
Level 2=	3200.0 m ²	100%
Level 1=	4065.0 m ²	25%
Level 3=	3200.0 m ²	25%
=	5,016 sq.m.	

Note: The levels indicated, reference the floors with the largest areas (refer to building stats)

$$F = 9,349 \text{ L/min}$$

$$F = 9,000 \text{ L/min} \quad \text{Round to nearest 1000 l/min}$$

- Occupancy Reduction
 25% reduction for non combustible occupancy
 $F = 6750 \text{ L/min}$

- Sprinkler Reduction
 30% Reduction for NFPA Sprinkler System
 $F = 4725 \text{ l/min}$

- Separation Charge
 20% North 3.1m to 10m
 0% East > 45m
 5% South 30.1m to 45m
 0% West > 45m
 25% Total Separation Charge, 1688 L/min

$$F = 6,413 \text{ L/min}$$

$$106.88 \text{ L/s}$$

$$F = 1694 \text{ US GPM}$$

Domestic Flow Calculations

Population High Rise =	392 Persons	from Site Statistics	
Average Day Demand =	190 L/cap/day		1 US Gallon=3.785 L
Residential Flow=	0.86 L/s		

Retail/Commercial Area=	0 m2	from Site Statistics	
Average Day Demand=	2.8 L/m2/day		1 US GPM=15.852L/s
Retail/Commercial Flow=	0.00 L/s		

$$\text{Total Flow} = 0.86 \text{ L/s}$$

$$= 13.43 \text{ US GPM}$$

$$\text{Max. Daily Demand Peaking Factor} = 1.5$$

$$\text{Max. Daily Demand} = 1.29 \text{ L/s} = 20 \text{ US GPM}$$

or

$$\text{Max. Hourly Demand Peaking Factor} = 2.25$$

$$\text{Max. Hourly Demand} = 1.94 \text{ L/s} = 31 \text{ US GPM}$$

$$\text{Max Daily Demand} = 1.29 \text{ L/s}$$

$$\text{Fire Flow} = 106.88 \text{ L/s}$$

$$\text{Required 'Design' Flow} = 108.18 \text{ L/s}$$

$$1715 \text{ US GPM}$$

Note: Required 'Design' Flow is the maximum of either:

- 1) Fire Flow + Maximum Daily Demand
- 2) Maximum Hourly Demand



WATER DEMAND

48 Grenoble Dr

Project No: UD21-110

Date: February 2023

Prepared by: Isaak Chlorotiris, P.E., M.A.Sc.

Reviewed by: John Pasalidis, P.Eng., M.A.Sc.

Pressure Losses

Hazen-Williams Formula

$$V = k C R_h^{0.63} S^{0.54}$$

k= 0.85 - conversion factor (0.849 for SI units and 1.318 for US customary units)

C= 140 - roughness coefficient (PVC : 140-150)

S= h_f/L

Rh= D/4 - hydraulic radius (D/4 for full flow, A/P_W for partially flow)

Fire Fighting and Domestic Head Loss

Flow Requirements= 108.18 l/s
Diameter= 150 mm
Area= 1.77E-02
L= 14.5 m
V= 6.12 m/s
S= 1.90E-01
R_h= 0.04
H_f= 2.75 m
= 3.91 psi

Flow Test (dated: May 5, 2022)

when: Static Pressure =	90 psi	Flow =	0 gpm =	0	L/s
Residual Pressure =	86 psi	Flow =	1609.42 gpm =	101.55	L/s

Pressure (psi)	Flow (L/s)
90	0.0
86	101.6

Based on the Pressure/Flow relationship, we have to confirm that the flow requirement of 108.18 L/s can be provided at minimum pressure (20.3 psi + Losses) as set out by the FUS guidelines

85.7	108.18	Fire Flow is above minimum of	24.21	psi (20.3+H _f)
------	--------	-------------------------------	-------	----------------------------

Since the flow of 108.18 L/s required for the proposed development is provided in the existing watermain at 85.7 psi (which is more than the minimum of 24.21 psi), we anticipate that the existing watermain infrastructure can support the proposed development.

Flow available at 20psi = 7549 gpm = 476.29 L/s

$$\begin{aligned} Q_{\text{avail}} @ 20\text{psi} &= Q_T ((P_S - P_A) / (P_S - P_R))^{0.54} \\ &= 1609.42 \times ((90 - 20) / (90 - 86))^{0.54} \\ &= 7549 \text{ gpm} \end{aligned}$$

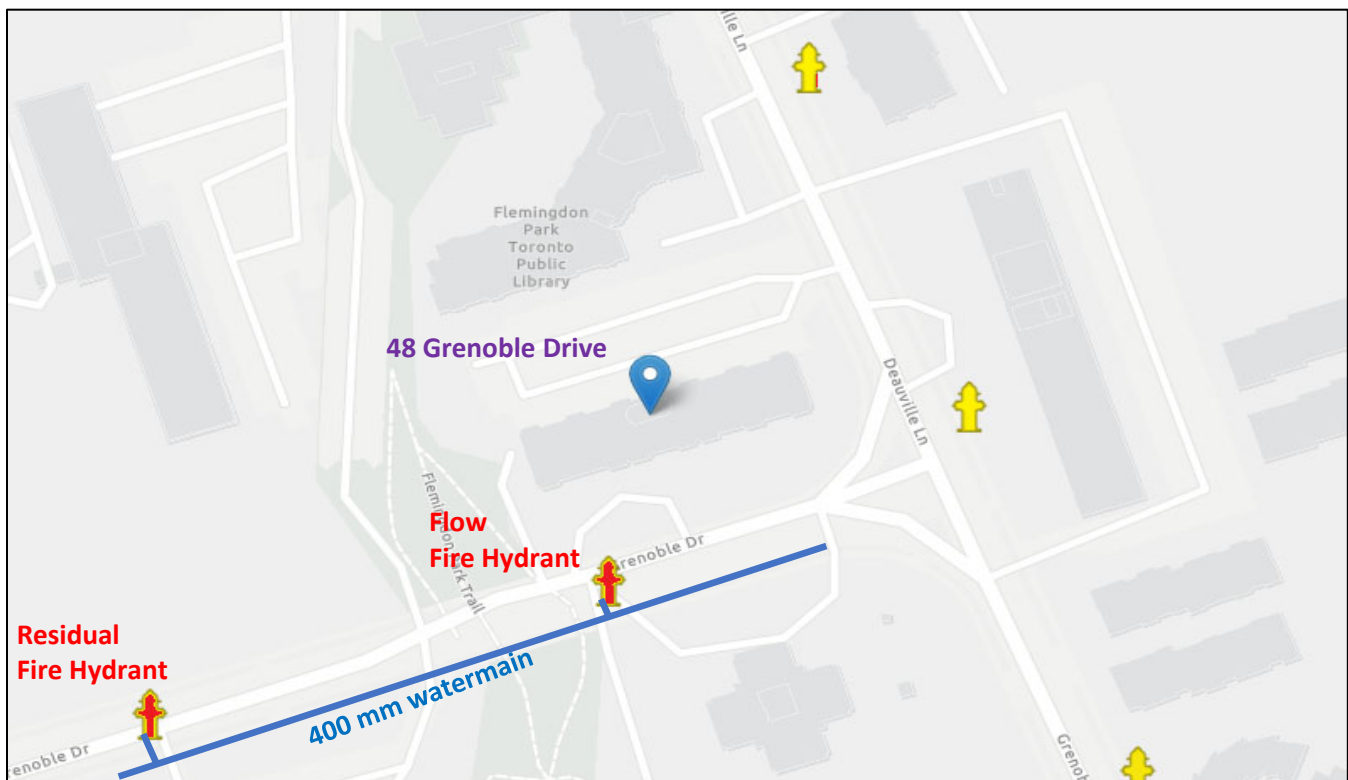
General Information

Report No. : **FHR-22-05-05-02** Date : **05-May-22**
 Project No. : **PUD21-110**
 Site Address/Location: **48 Grenoble Dr, To**
 Region/Municipality: **City of Toronto**
 Residual Fire Hydrant Location/description : **OP/ 9 GRENOBLE DR/HY4015064**
 Flow Fire Hydrant Location/description : **48 GRENOBLE DR/HY4015071**
 Watermain Pipe Size (mm) : **400 mm**
 Test Equipment Orifice Size (in) : **2.5**
 Test Equipment Orifice coefficient : **0.9**
 Date of test: **May 5,2022**
 Time of test: **12:30 pm**
 Temperature: **12°C**
 Testing Method : **NFPA 291 (Recommended Practice for Fire Flow Testing and Marking of Hydrants)**

Attendants

	Name	Title	Contact Info.
Lithos Inspector	Keyvan Vahedi, P.Eng.	Senior Project Coordinator	(437)-776-4086
Lithos Inspector	Surabhi Suresh	Project Coordinator	(647)-394-1527
Lithos Inspector	Pradeep Kumar Oleti	Construction Inspector	(905) 609-3435
City of Toronto Rep.	Jim Popouski	Inspector	(647)-458-6073

Site Plan/Sketch



Pressure Readings (PSIG)

Flow Hydrant's Outlet Condition	C-0 { Outlet #1 : Close Outlet #2 : Close	C-1 { Outlet #1 : Open Outlet #2 : Close	C-2 { Outlet #1 : Open Outlet #2 : Open
Residual Fire Hydrant	86	82	81
Flow Fire Hydrant		18	10

General Information

Report No. : **FHR-22-05-05-02**

Date : **05-May-22**

Project No. : **PUD21-110**

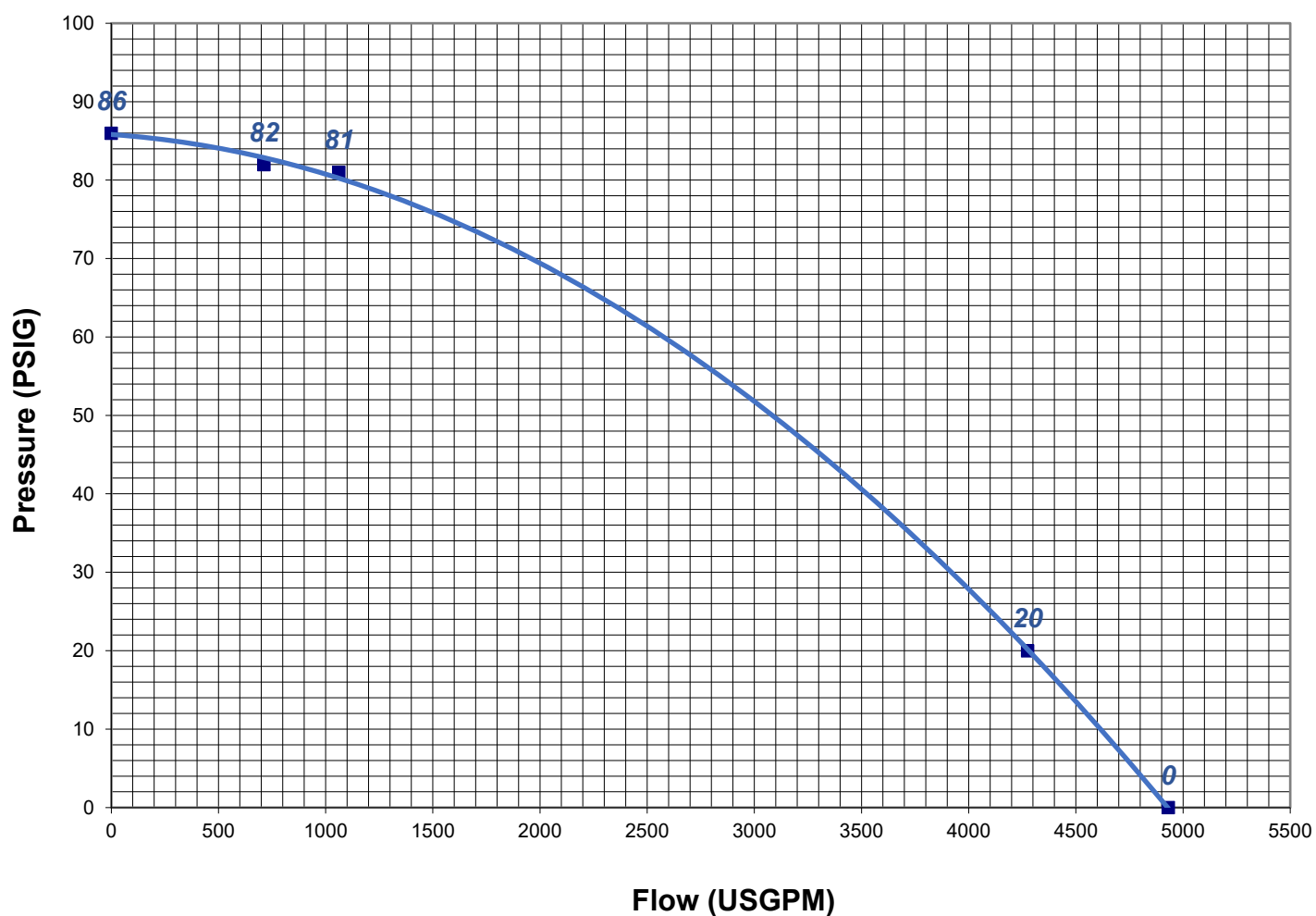
Site Address/Location: **48 Grenoble Dr, To**

Region/Municipality: **City of Toronto**

Pressure-Flow Table

Condition		C-0	C-1	C-2	C(20)	C(0)
Pressure (PSIG)		86	82	81	20	0
Flow	(USGPM)	0	711.89	1061.22	4274.80	4931.64
	(L/S)	0.00	44.92	66.96	269.74	311.19

Pressure-Flow Graph



Result

Maximum available flow at 20PSI = 4274.80 USGPM or 269.74 L/s

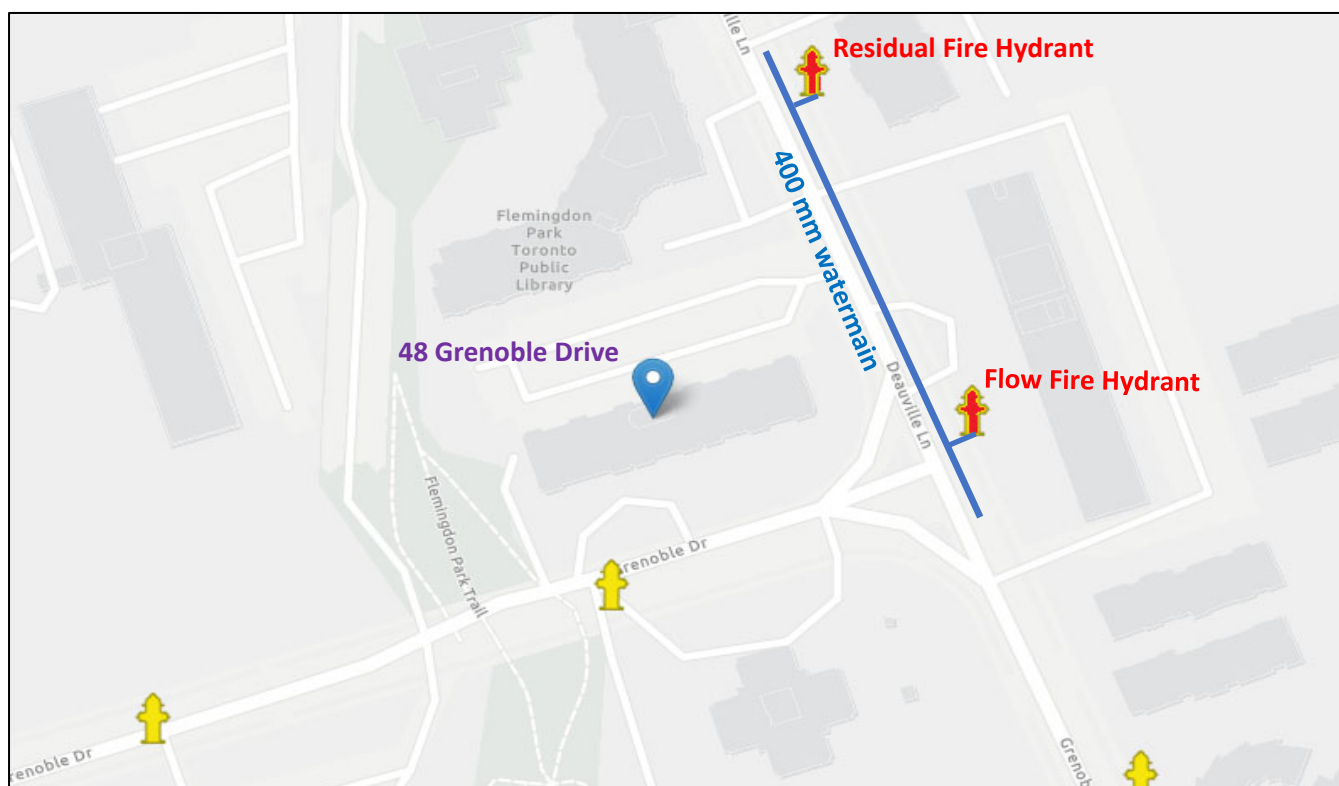
General Information

Report No. : **FHR-22-05-05-03** Date : **05-May-22**
 Project No. : **PUD21-110**
 Site Address/Location: **48 Grenoble Dr, To**
 Region/Municipality: **City of Toronto**
 Residual Fire Hydrant Location/description : **5 DEAUVILLE LANE/HY4015267**
 Flow Fire Hydrant Location/description : **1 DEAUVILLE LANE/HY4015242**
 Watermain Pipe Size (mm) : **400 mm**
 Test Equipment Orifice Size (in) : **2.5**
 Test Equipment Orifice coefficient : **0.9**
 Date of test: **May 5, 2022**
 Time of test: **1:00 pm**
 Temperature: **12°C**
 Testing Method : **NFPA 291 (Recommended Practice for Fire Flow Testing and Marking of Hydrants)**

Attendants

	Name	Title	Contact Info.
Lithos Inspector	Keyvan Vahedi, P.Eng.	Senior Project Coordinator	(437)-776-4086
Lithos Inspector	Surabhi Suresh	Project Coordinator	(647)-394-1527
Lithos Inspector	Pradeep Kumar Oleti	Construction Inspector	(905) 609-3435
City of Toronto Rep.	Jim Popouski	Inspector	(647)-458-6073

Site Plan/Sketch



Pressure Readings (PSIG)

Flow Hydrant's Outlet Condition	C-0 { Outlet #1 : Close Outlet #2 : Close	C-1 { Outlet #1 : Open Outlet #2 : Close	C-2 { Outlet #1 : Open Outlet #2 : Open
Residual Fire Hydrant	90	88	86
Flow Fire Hydrant		35	23

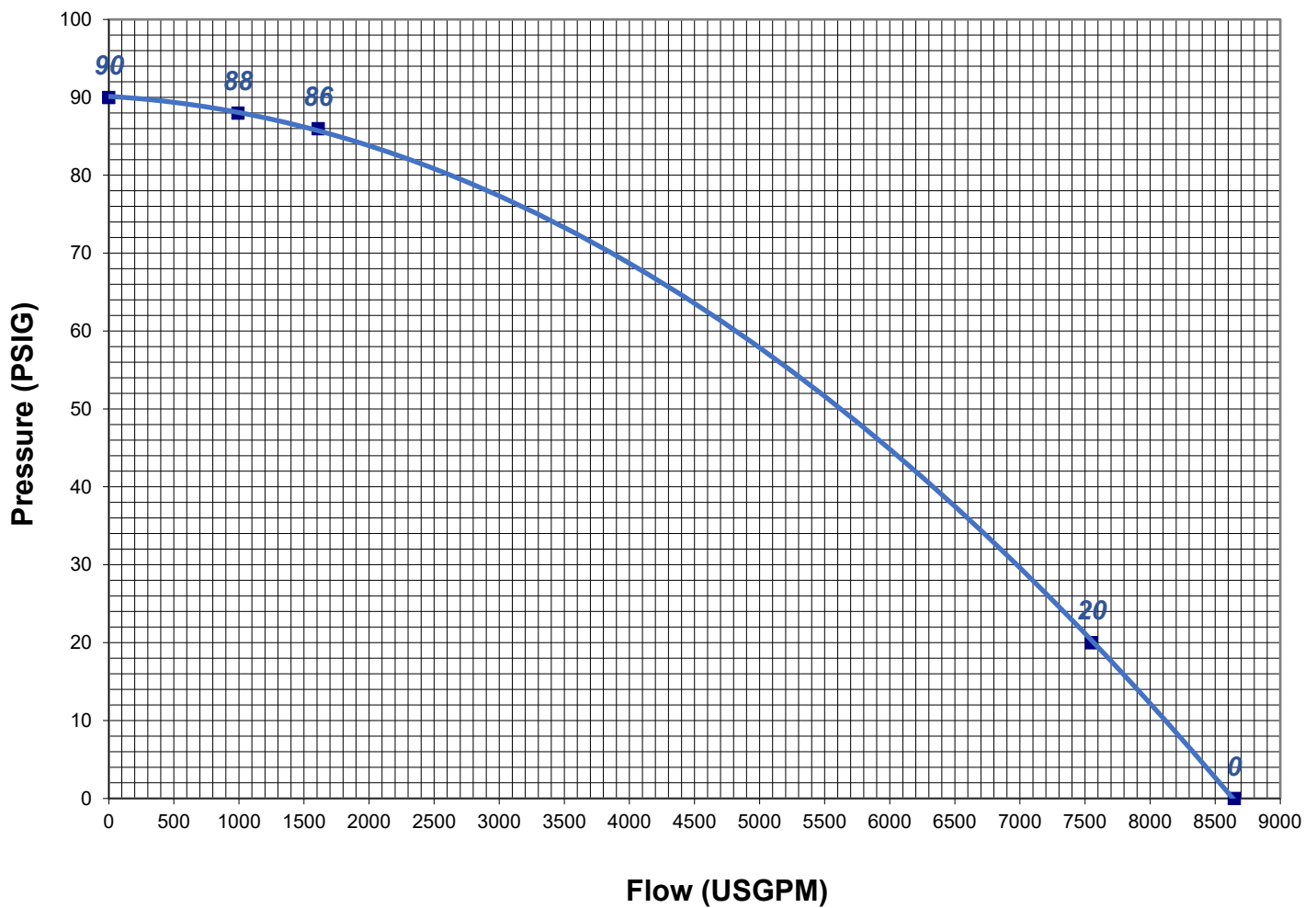
General Information

Report No. : **FHR-22-05-05-03** Date : **05-May-22**
 Project No. : **PUD21-110**
 Site Address/Location: **48 Grenoble Dr, To**
 Region/Municipality: **City of Toronto**

Pressure-Flow Table

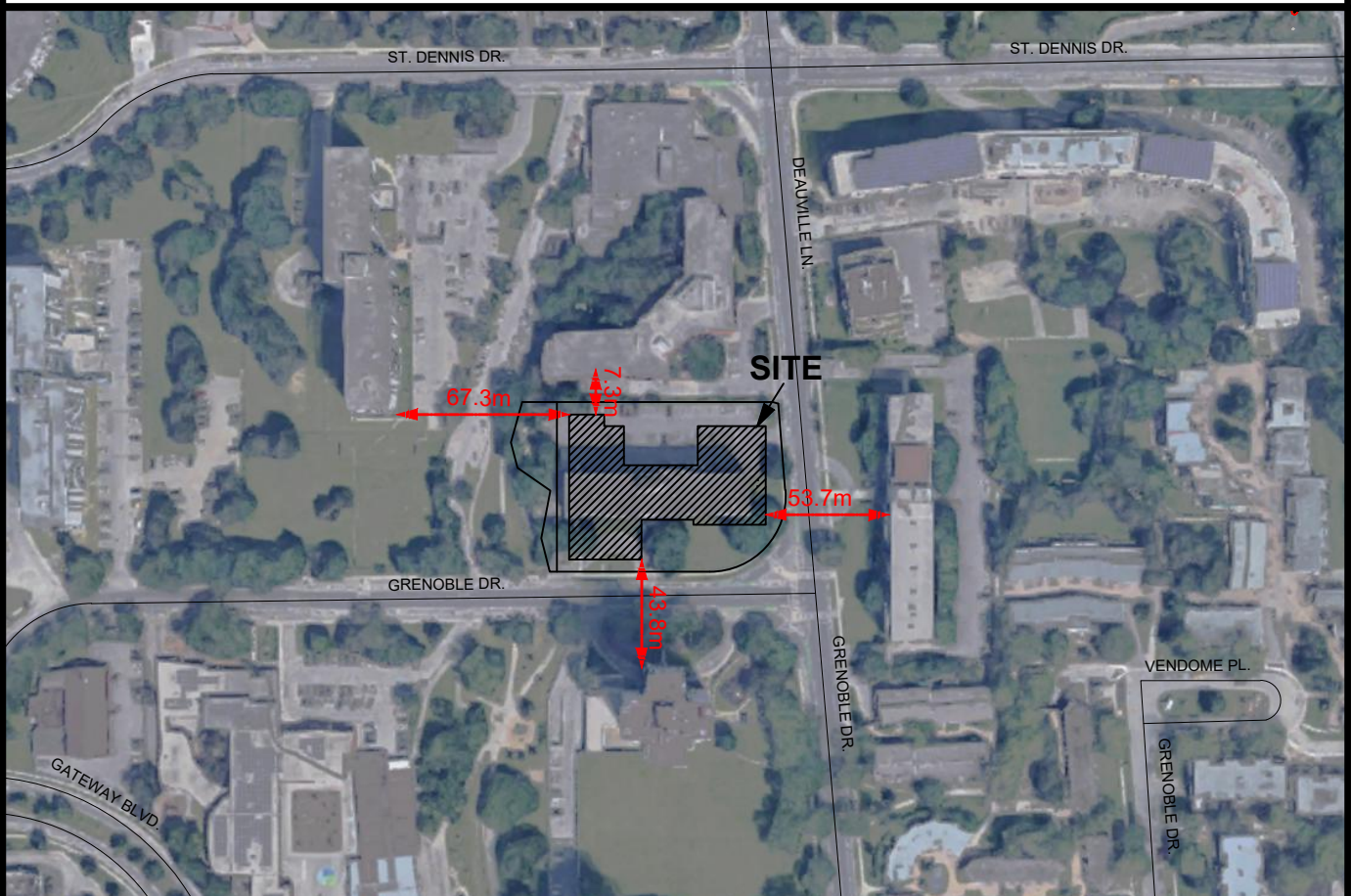
Condition		C-0	C-1	C-2	C(20)	C(0)
Pressure (PSIG)		90	88	86	20	0
Flow	(USGPM)	0	992.68	1609.42	7549.36	8646.66
	(L/S)	0.00	62.64	101.55	476.36	545.60

Pressure-Flow Graph



Result

Maximum available flow at 20PSI = 7549.36 USGPM or 476.36 L/s



SEPARATION DISTANCES

RESIDENTIAL USE DEVELOPMENT
48 GRENABLE DRIVE
TORONTO, ONTARIO

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

DATE: FEBRUARY 2023

SCALE: N.T.S.

PROJECT No: PUD21-110

FIGURE No: FIG 4