FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

152-164 BATHURST STREET AND 623-627 RICHMOND STREET WEST
623 RICHMOND ST WEST,
TORONTO ON M6J 1C2

PREPARED FOR:
ORIGINATE (BATHURST & RICHMOND) LP.
2 ST. CLAIR EAST, UNIT 1204
TORONTO, ON M5V 2R3

DATE: MARCH 2023

PROJECT NO. 211176

PREPARED BY HUSSON
200 CACHET WOODS COURT, SUITE 204
MARKHAM, ON L6C 0Z8
GENERAL@HUSSON.CA

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF DRAWINGS

1.0 INTRODUCTION

The purpose of this report is to provide site servicing and stormwater management (SWM) design information in support of the Zoning Bylaw Amendment (ZBA) and Site Plan Approval (SPA) applications for the proposed residential development at Bathurst and Richmond Street in the City of Toronto.

Specifically, this report will demonstrate how the site will be serviced and the SWM measures that will be undertaken to deal with the quantity, quality and water balance requirements for the site.

1.1 Site Description

The site is located on the southwest corner of Bathurst Street and Richmond Street. The existing land use is commercial and residential. The existing buildings on the site will be demolished as part of the development, with the exception of the historical building in the northeast corner of the site. The exterior of this building will be retained. The site area is 1,968m^2.

The site is bordered by residential developments to the west (along Richmond Street) and residential development to the south on Bathurst Street.

It is proposed to construct a 18-storey residential development with retail space on the first floor and two levels of underground parking. Approximately 593m^2 of commercial retail space is proposed on the ground floor with frontage on Bathurst Street and Richmond Street. The site location is shown on **Figure 1**.

1.2 Background

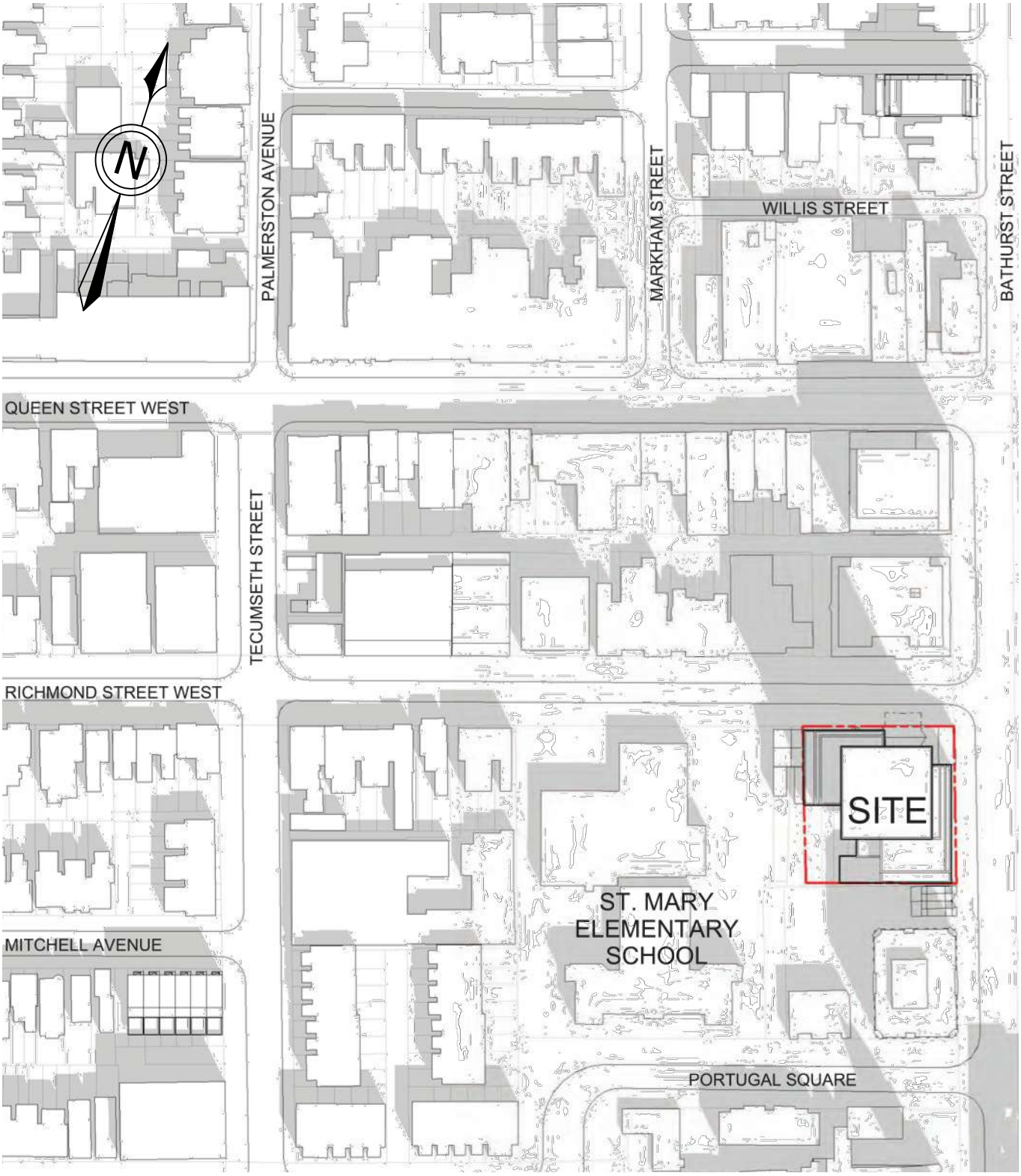
The SWM design for the site has been prepared to meet the requirements of the City of Toronto. The following materials were referenced in the preparation of this report:

- The City of Toronto's Wet Weather Flow Management Guidelines (WWFM Guidelines).
- The site servicing design has been designed following the City of Toronto, Design Criteria for Sewers and Watermain, January 2021.
- The Stormwater Management Planning and Design Manual (MECP Guidelines), prepared by the Ministry of the Environment, Conservation and Parks, March 2003, were referenced in the preparation of the stormwater management plan.
- Plan and profile drawings showing the existing services on Richmond and Bathurst Streets and DMOG mapping of the surrounding area provided by the City.
- The Hydrogeological Report, 152-164 Bathurst Street and 623-627 Richmond Street West, Toronto, Ontario, completed by GEMS Groundwater Environmental Management Services, dated November 1, 2022.

2.0 STORM DRAINAGE

2.1 Existing Drainage

There is an existing 600mm by 900mm combined sewer on Richmond Street West flowing to a 750mm x 1125mm combined sewer on Bathurst Street, which flows to the south across the frontage of the site. There are no dedicated storm sewers in the vicinity of the site.



HUSSON
ENGINEERING + MANAGEMENT
P 905.709.5825
200 CACHET WOODS COURT, SUITE 204
MARKHAM, ON L6C 0Z8
HUSSON.CA

FIGURE 1
BATHURST AND RICHMOND
SITE LOCATION PLAN

DATE: MARCH 2023 SCALE: N.T.S. PROJECT: 211176

The existing site consists of building, paved and gravel parking areas and an outdoor patio. The rainwater leaders for the buildings discharge at grade both to the Richmond Street frontage and rear parking areas. Drainage is generally from north to south. The rear parking area drains south, through the neighboring properties toward Portugal Square and then toward Bathurst Street.

The site is generally higher than the neighboring properties to the west and south. It received no external drainage.

The existing site is primarily parking lot and rooftop with an overall runoff coefficient of 0.87. As this runoff coefficient exceeds 0.50, a runoff coefficient of 0.50 used to determine the allowable peak flow, based on Section 2.2.3.8 of the WWFM Guidelines. Refer to **Figure 2** for details of the existing site conditions.

2.2 Site Grading

All grading will be completed in a manner to satisfy the following goals:

- Enable gravity servicing connections (where possible) to the existing sewers located on Richmond Street West.
- Meet the stormwater management objectives for the site.

Grading of the boulevards around the building will be maintained at existing elevations, to the extent possible.

The site will be graded to suit the City's design criteria and accommodate any constraints that may be imposed by the storm drainage and servicing objectives. Details can be referenced on **Drawing SW1.**

2.3 Minor System Drainage

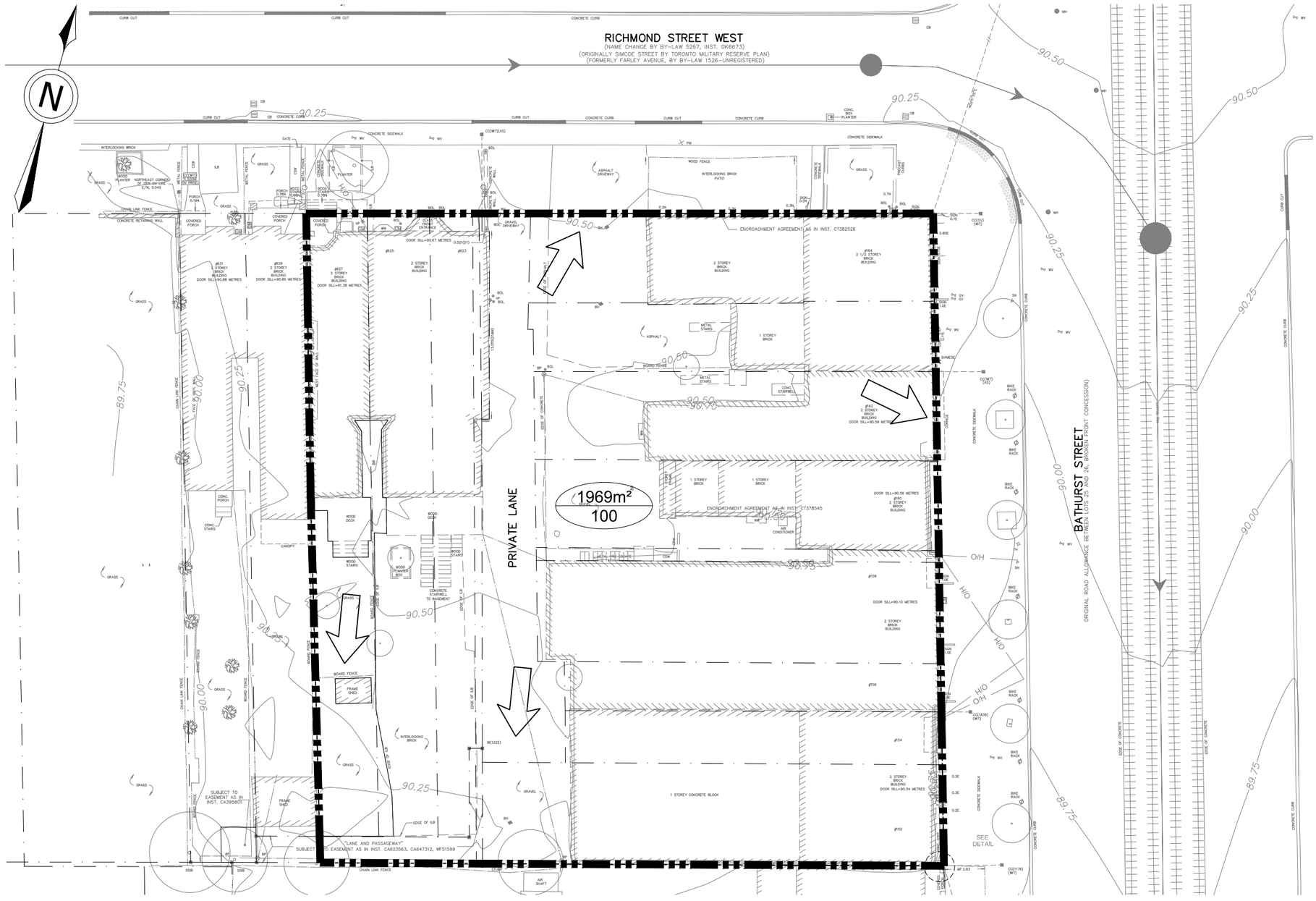
The development's internal storm system will be designed to collect drainage from the majority of the site for the 100-year design storm. In addition, roof drainage will be collected by roof drains and routed towards a cistern located underground in the northern portion of the site.

The controlled stormwater flows will discharge by gravity through a flow control device to the storm sewer located on Richmond Street West. Refer to **Section 3.0** for details on the on-site controls.

2.4 Major System Drainage

Since the majority of the site will be covered by the building with the exception of the southwest driveway, the internal storm system will be designed for the 100-year event. All site drainage will be directed to the cistern on the P1 level, which will have an emergency overflow through the access chamber which will flow toward Richmond Street. In the event of total system blockage, the rear parking lot area will flow overland towards the south and west.

A portion of the site frontage along Bathurst and Richmond Streets will drain uncontrolled to the right-of-way due to grading constraints. Drainage from the remainder of the site will be over-controlled to account for this uncontrolled runoff.



CATCHMENT 100			
	AREA (m^2)	C	C x A
PERVIOUS	98	0.25	24.48
IMPERVIOUS	1871	0.90	1683.54
TOTAL	1969	0.87	1708.02

HUSSON
ENGINEERING + MANAGEMENT
P 905.709.5625
200 CACHET WOODS COURT, SUITE 204
MARKHAM, ON L6C 0Z8
HUSSON.CA

LEGEND

1969m² / 100 — CATCHMENT AREA / CATCHMENT ID

CATCHMENT BOUNDARY

OVERLAND FLOW DIRECTION

FIGURE 2
BATHURST AND RICHMOND EXISTING DRAINAGE PLAN

DATE: MARCH 2023 SCALE: 1:300 PROJECT: 211176

2.5 Groundwater

A hydrogeological report was completed by GEMS, in November 2022. Groundwater depths were monitored and the high groundwater level varied between elevation of 80.88m and 87.72m above sea level. It was assumed that a conservative estimate for the bottom of the excavation would be at an elevation of 83.10m, therefore the building would need to be constructed water tight, or a foundation drainage system would need to be connected to the municipal sewer.

Short Term Discharge

It was estimated that the short-term construction dewatering rate would be approximately 10,958L/day (0.13L/s) including a 1.5X factor of safety. With an assumed rainfall contribution of 15mm on the open excavation, the maximum short-term dewatering rate was 41,000L/day (0.48L/s). For the downstream capacity analysis, included in Section 3.3, the discharge from the site, including post development sanitary flow and groundwater is 4.81/s (4.45L/s residential plus 0.11L/s commercial plus 0.25L/s groundwater), therefore, the peak discharge to the combined sewer, during construction, should be limited to this rate.

The interim outlet for the groundwater will be the existing sanitary service to the site which connects to the 600mm by 900mm combined sewer on Richmond Street West.

Long Term Discharge

It was estimated that the long-term post construction water taking volume would be approximately 97.3L/day (0.001L/s) including a 1.5X factor of safety. Based on the low rate, it is recommended that the volume of the sump collect the maximum daily discharge volume and be pumped. The foundation drainage will be collected and pumped to the sanitary control maintenance hole which will be connected to the combined sewer on Richmond Street West.

The Hydrogeological Impact Assessment included a Water Quality Control Report to determine the suitability of groundwater for discharge into the municipal storm and/or sanitary sewer system. The groundwater quality was compared to Table 1 – Limits for Sanitary and Combined Sewers Discharge and the Table 2 – Limits for Storm Sewer Discharge in the sewer use by-law. It was determined that pre-treatment of the groundwater for total suspended solids and manganese would be required prior to discharge to the storm sewer; however, the water quality met the requirements for discharge to a sanitary or combined sewer. The discharge will be to the combined sewer on Richmond Street West. An application for a Discharge Permit for Private Water will be made under a separate cover.

The peak long-term groundwater flow rate is 100L/day (0.001L/s). Refer to Section 3.3 for details. The analysis to confirm compliance with MECP Procedure F-5-5 assumed a peak groundwater pump rate of 0.25L/s. A letter from the mechanical engineer, confirming this flow rate is included in **Appendix C**.

The groundwater will discharge to the 600mm by 900mm combined sewer on Richmond Street West via the new sanitary service to be provided to the site. The hydrogeological impact assessment is included in **Appendix C**.

3.0 STORMWATER MANAGEMENT PLAN

3.1 Stormwater Management Criteria

The WWFM Guidelines require a hierarchy approach to wet weather flow management using source controls, conveyance controls and finally end-of-pipe controls to meet the following objectives:

- Water balance – maintenance or reduction of annual runoff volume may be required.
- Water quality – water quality control. Enhanced control is required based on MOE guidelines, where applicable.
- Water quantity - peak flow controls for flood management and erosion protection.

The SWM criteria are referenced in Table 7 of the WWFM Guidelines, based on Section 3 – Residential Development (relatively small isolated development or intensification situations with site areas less than 5ha and storm/combined sewer infrastructure exists). The requirements are as follows:

Water Balance – The minimum on-site runoff retention requires the proponent to retain all runoff from a small design rainfall event, typically 5mm (in Toronto, storms with 24-hour volumes of 5mm or less contribute about 50 percent of annual rainfall volume). The City of Toronto permits a maximum drawdown time of 72 hours for infiltration measures. The on-site retention requirements for this site will be achieved through use of site landscaping, green roof and stormwater re-use for irrigation.

Water Quality – The water quality criteria for this site is 80 percent average annual TSS removal from runoff originating on-site. Filtration will be implemented to achieve the water quality requirements on-site.

Water Quantity – The site will outlet to a municipal combined sewer; therefore, the flood flow requirement is to control the 100-year post development flow to the 2-year pre-development level, as per the WWFM Guidelines.

For small infill/redevelopment sites less than 2 hectares, erosion control in the form of stormwater detention is not required, provided the on-site minimum runoff retention from a 5mm rainfall event is achieved under the Water Balance criteria.

The following measures are proposed to meet the requirements for this site:

- Landscaping and green roof.
- A filter unit to provide quality control for the driveway runoff.
- A cistern for detention and retention storage in conjunction with a flow control device to provide storage, peak flow control and to retain stormwater for re-use.

The proposed stormwater management facilities can be referenced on **Drawing SW2**.

3.2 Water Balance

The WWFM Guidelines require retention of water on site, to the extent possible, to match pre-development runoff volumes. This requirement is typically achieved by retaining the runoff from a 5mm, 24-hour storm on site, which is equivalent to approximately 50 percent of the total average annual rainfall volume (WWFM Guidelines). Alternatively, on-site retention can be reviewed on an annual basis, based on an annual rainfall volume of 840mm. Since irrigation is proposed, which can only be used for a portion of the year, the annual basis approach is taken.

As noted in Section 1, the site area is 1,969m^2. Based on the total annual rainfall in the City of Toronto being 840mm, approximately 827m^3 of rainfall is required to be retained on site. However, this volume can be reduced by applying the initial abstraction (IA) values for the site surfaces. The initial abstraction values based on Toronto Standards are as follows:

- For paved areas and rooftop areas, the initial abstraction is 1.0mm.
- For intensive green roofs, the initial abstraction is 7.0mm.

- For planters an initial abstraction of 7.0mm can be applied.

To increase the retention within the terrace areas, it is proposed to use the SpongeBase. This is a layered system placed below the decking or patio slabs that includes a drainage board and needled mineral hydro blanket. Based on information from the supplier, this can increase retention between 25 and 75mm. A 25mm thick blanket is proposed within the amenity terrace areas. An initial abstraction of 2.5mm is applied for these areas. Refer to **Appendix B** for product details.

Based on the initial abstraction values and Figure 1a from the WWFM Guidelines, the annual capture for each surface was estimated. This results in an annual capture of 12%, 30% and 58% corresponding to initial abstraction values of 1.0mm, 2.5mm and 7.0mm, respectively. **Table 1** below summarizes the total annual capture from the proposed site, based on the average annual rainfall of 840mm in Toronto.

Table 1. Proposed Site Annual Capture from Initial Abstraction

Catchment	Area (m^2)	% of Total Area	IA (mm)	Annual Capture (%)	Annual Capture (m^3)
Flat Roof	898	46%	1.0	12%	90.5
Flat Roof with SpongeBase	362	18%	2.5	30%	91.2
Green Roof	365	19%	7.0	58%	177.8
Landscape & Planters	13	1%	7.0	58%	6.3
Pavement/Driveways	331	17%	1.0	12%	33.4
Total	**1969**	**100%**	**2.0**		**399.3**

The initial abstraction from the proposed site surfaces will capture approximately 399m^3 of rainfall on an annual basis. This reduces the total requirement of 827m^3 down to 428m^3. Therefore, the total amount of rainwater required to be retained, or re-used, on an annual basis is 428m^3.

The water balance requirements for this site will be addressed through water re-use from a portion of the cistern system that will not outlet to the municipal sewer system. The retention portion of the cistern will have a volume of 59.8m^3. This volume will be re-used on site for irrigation as described below.

Irrigation calculations were prepared by NextLevel Stormwater Management, the green roof supplier, to estimate the monthly irrigation volumes, and can be referenced in **Appendix B**. **Table 2** below details the irrigation demands for the proposed site.

Table 2. Total Water Applied (Irrigation)

Month	Total Water Applied (m^3)
May	34.0
June	40.9
July	45.4
August	40.9
September	34.0
Total	**195.2**

As shown above, with the irrigation demands provided in **Table 2**, a total of 194m^3 can be used each year during the warmer months (May to September).

Calculations were completed to determine if sufficient water would be captured by the retention portion of the cistern to satisfy the above water demands. m^2 of site area will be captured by the retention portion of the cistern. The proposed retention portion of the cistern is approximately 59.8m^3. This would result in an equivalent initial abstraction over the site of approximately 31.4mm. Using Figure 1a from the WWFM Guidelines, an initial abstraction value of 31.4mm corresponds to approximately 97 percent of annual rainfall capture. Therefore, over the year, the retention portion of the cistern will capture approximately 97 percent of the total rainfall. Using this value in conjunction with the runoff coefficient of the proposed site (0.83) and monthly precipitation values for the City of Toronto, the total rainfall collected can be calculated. **Table 3** below summarizes the volume of rainwater captured and remaining in the retention portion of the cistern at the end of each month.

Table 3. Total Water Collected

Month	Total Precipitation (mm)	Runoff Coefficient	Water Collected (%)	Rainwater Volume Collected (m^3)	Total Consumption (m^3)	Retention Volume at End of Month (m^3)
January	61	0.91	97%	91.2	0	59.8
February	50			74.8	0	59.8
March	66			98.7	0	59.8
April	71			106.2	0	59.8
May	74			110.6	34.0	59.8
June	73			109.1	40.9	59.8
July	68			101.7	45.4	59.8
August	81			121.1	40.9	59.8
September	84			125.6	34.0	59.8
October	65			97.2	0	59.8
November	76			113.6	0	59.8
December	71			106.2	0	59.8
Total	840				**Yearly Deficit =**	0.0

As shown above, there is an adequate supply of water for the proposed irrigation demands. Therefore, 195.2m^3 of rainwater will be re-used for irrigation on an annual basis.

On an annual basis, the site will retain or re-use a total volume of 195m^3. The target of 428m^3 on an annual basis is not met due to site constraints. The proposed development consists of a large area of residential terraces where a green roof could not be used. Additionally, internal water re-use is not feasible, based on the proposed type of development. This would require significant treatment before re-using in a residential building. Best efforts have been made to meet the water balance requirements for the site.

Refer to **Appendix B** for additional calculations.

3.3 Quality Control

Based on the City's requirements, the water quality criterion for this site is 80 percent average annual TSS removal from runoff originating onsite. The majority of the site is rooftop which produces clean runoff, additional treatment will be provided by the landscaped areas and on-site retention.

Overall TSS removal capabilities are based on the following assumptions:

- Rooftop runoff is generally clean, runoff from the rooftop will be routed to the cistern. Based on acceptable values provided by Toronto Water, rooftop runoff is credited with 80 percent TSS removal.
- Landscaped areas provide significant infiltration and generally have a lower TSS loading compared to roadways. Based on acceptable values provided by Toronto Water, landscape runoff is credited with 80 percent TSS removal.
- The remaining site area is the driveway, which is credited with 0 percent TSS removal as per Toronto Water standards. Therefore, the driveway runoff is proposed to be treated with a Storm Filter System (SFPD0806). The system uses variable flow controls, media-filled cartridges, and a storage sump to capture and retain a broad spectrum of pollutants, and is certified for 80 percent TSS removal by the State of New Jersey Department of Environmental Protection (NJDEP).

Runoff from the driveway will be captured in area drains and flow by gravity to the Storm Filter, located on the P1 level, and then be routed to the cistern for re-use or controlled discharge. The StormFilter has been designed to treat a catchment area of 0.03ha, with a runoff coefficient of 0.90, as shown on **Figure 3**.

The StormFilter System is an offline system consisting of three chambers; the inlet bay, outlet bay and filtration bay. Only the low flows, not exceeding the filter capacity, will enter the filtration bay. There is a weir between the inlet bay and outlet bay such that, during high flows, the filtration bay will be by-passed. The treatment flow rate will be 1.5L/s, based on the catchment area parameters and the quality control storm event.

Therefore, with the Storm Filter in place, all runoff originating on site will be treated to the minimum requirement of 80 percent TSS removal. System specifications, as well as the New Jersey Department Environmental Protection Certification are included in **Appendix D**.

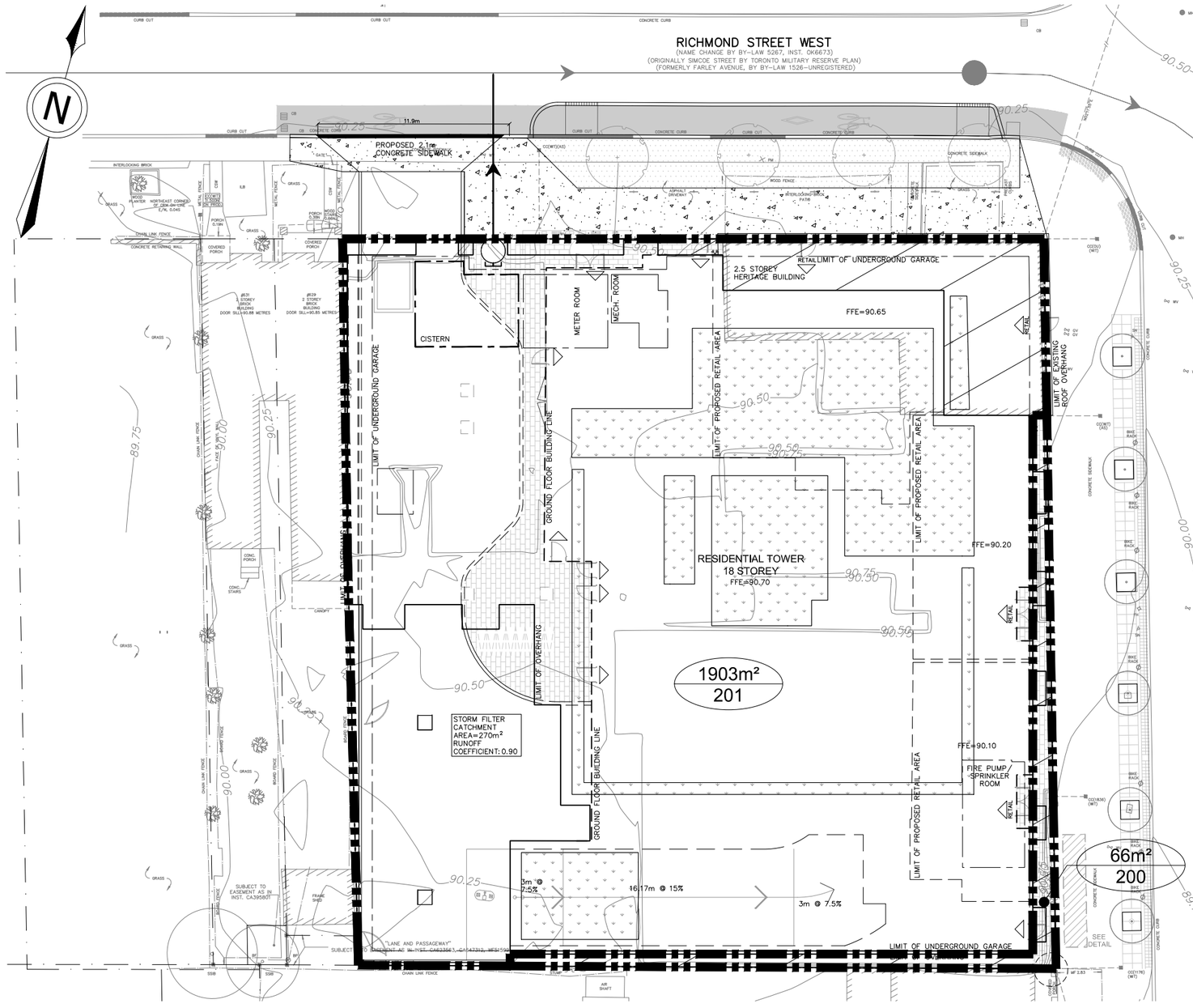
3.4 Quantity Control

3.4.1 Target Release Rate

A rational method calculation was used to determine the target flow from the site, based on the 2-year pre-development peak flow. The pre-development peak flow from the site was calculated using the existing imperviousness, which resulted in a corresponding runoff coefficient of 0.87, therefore 0.50 was used for calculations, and the City of Toronto 2-year storm IDF curve. The allowable peak release rate for the site is 24.1L/s.

3.4.2 Quantity Control Measures

Quantity control will be provided in the cistern in conjunction with inlet control device which allow for excess runoff to be stored and released at a controlled rate. A portion of the upper rooftop will be a green roof. The remainder of the rooftop area will be comprised of terraces. Therefore, controlled flow rooftop has not been assumed at this time.



CATCHMENT 200			
	AREA (m^2)	C	C x A
PERVIOUS	0	0.25	0.00
IMPERVIOUS	66	0.90	59.40
TOTAL	66	0.90	59.40

CATCHMENT 201			
	AREA (m^2)	C	C x A
PERVIOUS	13	0.25	3.25
IMPERVIOUS	265	0.90	238.50
GREEN ROOF	365	0.45	164.25
BUILDING	1260	0.90	1134.00
TOTAL	1903	0.81	1540.00

HUSSON
ENGINEERING + MANAGEMENT
P 905.709.5625
200 CACHET WOODS COURT, SUITE 204
MARKHAM, ON L6C 0Z8
HUSSON.CA

LEGEND

66m² / 200 — CATCHMENT AREA / CATCHMENT ID

CATCHMENT BOUNDARY

OVERLAND FLOW DIRECTION

FIGURE 3
BATHURST AND RICHMOND STORMWATER MANAGEMENT PLAN

DATE: MARCH 2023 SCALE: 1:300 PROJECT: 211176

Uncontrolled Drainage

There is a portion of walkway area along the west and south sides of the building, will drain uncontrolled towards the municipal roads. The area is approximately 66m^2 in size with a runoff coefficient of 0.90, which contributes 4.1L/s to the total site discharge in the 100-year storm event (Refer to **Figure 3**).

Cistern Storage

In the 100-year event, the required active storage volume is 53.5m^3. The cistern will be used to provide all of the required storage. The cistern will have a footprint of 31m^2. Active storage will be provided between the outlet pipe invert of 88.23m and the 100-year water level of 89.96m, resulting in a 100-year storage depth of 1.73m. A total volume of 54.9m^3 is provided to at the top of the cistern (90.0m).

The retention portion of the cistern will be located below the outlet and therefore will never discharge offsite to the municipal storm sewer system. A retention storage depth of 1.93m is proposed to the bottom elevation of the cistern of 86.30m, resulting in a total retention volume of 59.8m^3 for reuse. An irrigation pump will be provided to use the retention volume during the warmer months.

An 80mm orifice plate will be used to control the release rate from the cistern to a maximum of 18.2L/s.

The 100-year water level is 89.96m. All flows captured in the cistern will be discharged through the site storm sewer connection to the Richmond Street West combined sewer. Calculations for the discharge rate at the maximum water level can be found in **Appendix A**.

Site Release Rate

The site flows are summarized below in **Table 4**.

Table 4. Site Quantity Control

Catchment Name (Catchment Number)	Area (m^2)	100 Year Runoff Coefficient (C)	Storage Required (m^3)	Peak Flow (L/s)
Controlled	1903	0.81	53.5	18.2
Uncontrolled	66	0.90	-	4.1
Total	**1,969**		**53.5**	**22.3**

Therefore, with all controls in place the 100-year post development peak flow will not exceed the target flow of 22.3L/s.

Figure 3 shows the proposed catchment plan. Refer to **Drawing SW2** for the full servicing and cistern details. Hydrology calculations are provided in **Appendix A**.

The existing municipal storm infrastructure can support the proposed site without the need for external upgrades or retrofit.

3.5 Maintenance & Monitoring

3.5.1 Cistern

Based on the pretreatment and clean flows directed to the cistern there should be minimal sediment accumulation. The cistern and access hatches will be installed in the northern portion of the site. The system should be inspected every 6 months for the first two years and annually after that, once the sediment loading rate is determined. The cistern should be cleaned out when there is noticeable sediment accumulation to ensure the pump intake does not become obstructed by sediment.

3.5.2 Storm Filter System

The Storm Filter System is to be inspected on a regular interval as specified in the manufacture's maintenance guidelines. Maintenance is to take place on regular intervals ranging from 1 to 3 years as specified by the manufacturer. This maintenance includes replacement of filter cartridges and removal of any debris or sediment which have accumulated in the vault. Refer to manufacturer's specifications for all inspection and maintenance requirements.

4.0 EROSION AND SEDIMENT CONTROL

All Erosion and Sediment Control measures must be designed, maintained and constructed in accordance with the GTA CA's Erosion and Sediment Control Guidelines for Urban Construction (2006) and/or other City of Toronto requirements.

Erosion and sediment control plans have been prepared to meet the requirements of the City. The plans have been designed to limit sediment and debris from leaving the site during construction and from entering the adjacent lands. The plans consist of the following:

- A sediment control fence will be installed along the perimeter of the site where the grade will direct flows off-site.
- Site access will be limited to one entrance. A gravel access pad will be installed to remove mud from vehicles leaving the site.
- Once the site has been stripped of topsoil and then pre-graded, the lot will generally be lower than the surrounding property. This will limit runoff from entering neighbouring properties until the storm sewers are installed.
- Once the storm sewer system has been constructed, catchbasin sediment control devices will be installed and maintained until the majority of the construction is complete.

Erosion measures will be in place prior to any grading on the site. A program will be in place to monitor and maintain the erosion and sediment controls. The sediment controls will be inspected by the Site Engineer and contractor every two weeks and after each significant rainfall event.

Proper construction sequencing will also help with erosion and sediment control. The following schedule is recommended:

1. Install sediment control fence and gravel access road.
2. Strip topsoil and export.
3. Rough grade site to subgrade elevations.
4. Install services and sediment control devices on catchbasins.
5. Re-vegetate disturbed areas.
6. Remove sediment controls.

Refer to **Drawing SW3** for erosion and sediment control details.

5.0 WASTEWATER

5.1 Receiving System

There is an existing 600mm by 900mm combined sewer on Richmond Street West flowing to a 750mm x 1125mm combined sewer on Bathurst Street, which flows to the south across the frontage of the site. All existing buildings are connected to these sewers.

It is proposed to construct a new sanitary service connection from the building to the combined sewer on Richmond Street. Refer to **Drawing SW2** for the proposed sanitary design. Calculations are provided in **Appendix D**.

Table 5 and **Table 6** provides a comparison of the pre and post development peak flows from the site to the combined sewer system. The detailed calculations are provided in **Appendix B**.

Table 5. Existing Development Sanitary Flows

	Quantity	Unit Rate	Peaking Factor	Total Flow (L/s)
Residential	34 People	240L/c/d	4.3	0.41[1]
Commercial	2,381m^2	180,000L/ha/d	included	0.50
Total				**0.91**

[1] Equivalent Flow as per the latest City of Toronto *Design Criteria for Sewers and Watermain*
(Average wastewater flow = 240 L/capita/day, peaking factor: Harmon)

Table 6. Proposed Development Sanitary Flows

	Quantity	Unit Rate	Peaking Factor	Total Flow (L/s)
Residential	401 People	240L/c/d	4.0	4.48[1]
Commercial	593m^2	180,000L/ha/d	included	0.12
Groundwater				0.25
Total				**4.85**

[1] Equivalent Flow as per the latest City of Toronto *Design Criteria for Sewers and Watermain*
(Average wastewater flow = 450 L/capita/day, peaking factor: Harmon)

The I&I for residential flows is based on drainage area. For the existing development a unit rate of 3.0L/s/ha is used as per City Criteria. This rate can be reduced to 0.26L/s/ha for the new development as per City Criteria. Since there is no change in site area, to be conservative, this flow is ignored in the above flow estimates. By comparing the peak flows in the pre and post development scenarios, it can be seen that there is a net increase of 3.94L/s. Since both storm and sanitary sewers outlet to the combined sewer, this flow is offset by the decrease in the 2-year post development peak stormwater flow. This is described in Section 4.2.

5.2 MECP Procedure F-5-5

Since the site will discharge to a combined sewer system, it is necessary to demonstrate compliance with MECP Procedure F-5-5. It must be demonstrated that:

a) Increases in dry weather flow (DWF) causes no overflows at downstream CSO point/diversion structures under DWF plus 90% of the volume resulting from wet weather flow (WWF) from an average year.

b) Under wet weather flow conditions, there is no increase in overflow volumes at downstream CSO points/diversion structures.

In this case, it is proposed to meet the requirements by reducing the stormwater peak flow to offset the increase in sanitary flow. Therefore, based on the City's guidelines, the following is required:

Provide an on-site assessment of discharges (i.e., wastewater, inflow & infiltration and storm runoff) from the subject site showing no net increase in total flows under post-development conditions to the receiving combined sewer compared to existing conditions. The following conditions must be considered:

i. Confirm that storm runoff from the existing site is currently draining into the combined sewer system through investigations (e.g., sewer survey, service connection cards, CCTV, dye/smoke tests) to confirm any existing storm servicing connections (i.e., foundation / roof drain / catch basin connections).

ii. Where existing storm contributions are confirmed to the combined sewer, demonstrate that reductions in the post-development storm runoff rate as a result of on-site SWM controls can offset the increase in dry weather flows for the 2-year design storm event.

As indicated in Section 2.1, there are no separate storm sewers in the vicinity of the site. The roof drains discharge at grade and drain toward the municipal right-of-ways. During frequent storm events the rainwater would be collected in the catchbasins and drain to the combined sewers. Likewise, the surface drainage is collected in catchbasins which drain to the combined sewer system. It is not known if the existing buildings have foundation drain connections to the combined sewer, therefore, to be conservative, this flow is ignored in the pre-development flow estimate.

Since it is evident that the storm drainage is directed to the combined sewer system, for frequent storm events (2-year), a comparison of pre- and post-development peak flows to the combined sewers was completed (refer to **Table 7**).

Table 7. Flow Comparison to Combined Sewer

	Pre-Development (L/s)	**Post Development (L/s)**
2-Year Peak Flow (Storm)	41.8	19.6
Sanitary	0.9	4.6
Groundwater	0	0.25
Total	**42.7**	**24.5**

Therefore, there will be a net decrease of 18.3L/s from the site to the combined sewer system. Therefore, the requirements for MECP Procedure F-5-5 are satisfied.

Based on the analysis, there will be a decrease in the peak flow to the combined sewers. Therefore, there will be no adverse impacts on the existing municipal infrastructure and the existing municipal combined sewer infrastructure can support the proposed development without the need for external upgrades or retrofit.

6.0 WATER DISTRIBUTION

6.1 Proposed Water System

There is an existing 300mm diameter watermain under the roadway of Richmond Street West across the frontage of the site. It is proposed to provide a 100mm diameter domestic and 150mm diameter fire line to service the new development.

6.2 Water Design Criteria

The following calculations for water demand and fire flow for the proposed development are based on the City of Toronto's Design Criteria for Sewers and Watermains and the Fire Underwriters Survey (FUS).

City of Toronto's Design Criteria for Sewers and Watermains:

Persons per unit (ppu):	Apartment	
	Bachelor/1 Bedroom	1.4
	2 Bedroom	2.1
	3 Bedroom	3.1

Residential (high rise apartment):		191L/cap/day
Peaking Factor (pf):	Peak Hour	2.48
	Maximum Day	1.65
Commercial:		180,000L/ha/day
Peaking Factor (pf):	Peak Hour	1.10
	Maximum Day	1.20

Minimum Pressure (under non-fire demand scenario)	275kPa
Minimum Pressure (under fire demand scenario)	140kPa

Fire Underwriters Survey:

Minimum high rise fire flow – 19,000L/min - 2 hour duration (5,019gal/min)

6.3 Watermain Analysis

The Average Daily Demand is calculated based on the residential population and gross floor area of the retail development as shown in **Table 8**.

Table 8. Average Daily Demand Calculation

Unit Type	Number of Units	People per Unit	Population
Bachelor/1 BR	112	1.4	156.8
2BR	82	2.1	172.2
3BR	23	3.1	71.3
Total	**217**		**401**

Average Daily Demand Res. (L/day)		76,591
Commercial Flow:		
GFA (m2)	593	
Average Daily Demand Comm. (L/day)		10,674
Average Daily Demand Total (L/day)		**87,265**

Based on the Average Daily Demand and peaking factors

Peak Hour Demand:

Residential =131.9L/min
Commercial = 8.9L/min
Total = 140.8L/min

Maximum Day Demand:

Residential = 87.8L/min
Commercial = 8.2L/min
Total = 95.9L/min

Fire Demand:

The detailed fire formula on page 17 of the FUS was used to calculate the minimum fire flow.

Table 9 provides the estimate for the maximum GFA.

Table 9. Building Area Breakdown

	GFA
Residential GFA	14,628
Retail GFA	593
Total	**15,221m^2**

The following is assumed regarding the construction of the building.

- Non-combustible construction (unprotected metal structural).
- Sprinklers are will be provided as per NFPA 13, at a minimum with a fully automatic sprinkler system.

Table 10. Fire Flow Estimates

Population Type	Area (m^2)	Construction Coefficient	Occupancy Increase/ Decrease	Sprinkler	Exposure	Required Flow (L/min.)
Full Building	15,221	0.8	0%	50%	65%	25,000

As shown in **Table 10**, when using this information, the minimum fire flow is 25,000L/min. Refer to calculations attached in **Appendix E**.

A hydrant flow test was completed by Corix Water Services, dated June 9, 2021. The results of the hydrant flow test show that the theoretical fire flow at the minimum City pressure of 140kPA (20psi) was 25,188L/min (2,772gal/min). The required fire flow of 25,000L/min plus the maximum day demand 96L/min is 25,096L/min. This is less than the theoretical fire flow of 25,188L/min at 140kPa. Therefore, the proposed building will be protected. The hydrant flow test results are provided in **Appendix E**.

The existing municipal water infrastructure can support the proposed site without the need for external upgrades or retrofit.

7.0 CONCLUSIONS

The stormwater management design for the site is summarized on **Table 11** and **Table 12** below.

Table 11. Site Quantity Control Summary

Target Release Rate (L/s)	Actual Release Rate (L/s)	Orifice Plate Size (mm)	Storage Required (m^3)	Storage Provided (m^3)
24.1	**22.3**	80mm	53.5	54.9

Table 12. Site Quality Control Summary

Filter System	Number of Cartridges	Media Type	Annual TSS Removal	Percent Runoff Capture	Catchment Area (ha)	Runoff Coefficient
StormFilter SPFD0806	1	Perlite (3 Cartridges)	**80%**	**94%**	0.30	0.90

The proposed development meets the City of Toronto's requirements as follows:

- Retention measures, including a cistern with retention storage in conjunction with an irrigation system for on-site re-use and landscaping will be provided to reduce runoff volumes. Best efforts are made to meet the required retention volume.
- Quality control will be provided by a StormFilter system to treat the storm runoff to a minimum of 80% TSS removal for the driveway. The remainder of the site will be rooftop or landscape and therefore, 80% TSS removal is provided.
- A cistern in conjunction with an inlet control device will be provided on site to meet the storage requirements and to limit the release rates to below the allowable release rate as per the WWFM Guidelines.
- An effective erosion and sediment control plan has been prepared to limit sediment from leaving the site during construction.
- Gravity connections can be provided to the new development from the existing municipal combined sewer on Richmond Street West.
- A hydrogeological impact assessment was completed by GEMS Groundwater Environmental Management Services and recommendations in the report will be followed. An application for a Discharge Permit for Private Water into the combined sewer will be made under a separate cover. Groundwater collected by the foundation drainage system will be pumped to the combined sewer at a rate of 0.25L/s.
- The sanitary, storm and groundwater discharge from the site to the combined sewer system has been analyzed to confirm compliance with the MECP Procedure F-5-5. The reduced stormwater discharge in the 2-year storm will offset the increase in wastewater and groundwater flows from the new development.
- The water system has been analyzed and adequate fire and domestic flows can be provided to the site from the municipal main.
- The existing municipal infrastructure can support the proposed site without the need for external upgrades or retrofit.

With the proposed controls in place, the site design will meet the requirements of the Wet Weather Flow Management Guidelines and City of Toronto Standards.

Greg Rapp, P.Eng.

APPENDIX A

STORMWATER MANAGEMENT CALCULATIONS

Rational Method Calc.

Project:	Bathurst and Richmond
Project No.:	211176
Municipality:	Toronto
Catchment:	Controlled

Pre Development Peak Flows

	100 Year	2 Year	2 Year Actual
Runoff Coefficient (C) =	0.50	0.50	0.87
Area (A) =	0.197	0.197	0.197
A:	59.70	21.80	21.80
B:	0.00	0.00	0.00
C:	-0.80	-0.78	-0.78
Tc:	0.167	0.167	0.17
Intensity (I) mm/hr =	250.3	88.2	88.2
Peak Flow (Q) L/s =	68.5	24.1	41.8

	Area	C	CxA
Landscape	99	0.25	24.8
Hard surface	1870	0.90	1683.0
Building	0	0.90	0.0
	1969	**0.87**	1707.8

Rational Method Calc.

Project:	Bathurst and Richmond
Project No.:	211176
Municipality:	Toronto
Catchment:	Uncontrolled

Post Development Peak Flows

	100 Year	2 Year
Runoff Coefficient (C) =	0.90	0.90
Area (A) =	0.007	0.007
A:	59.70	21.80
B:	0.00	0.00
C:	-0.80	-0.78
Tc:	0.167	0.167
Intensity (I) mm/hr =	250.3	88.2
Peak Flow (Q) L/s =	4.1	1.5

	Area	C	CxA
Landscape	0	0.25	0
Hard Landscape	66	0.90	59.4
Building	0	0.90	0
	66.0	**0.90**	59.4

Summary (MECP F5-5)

Post UC (2 Year)	1.5	L/s
Post Controlled	18.2	L/s
Sanitary	4.6	L/s
GW	0.25	L/s
Total	24.5	L/s
Pre (2 year)	41.8	L/s
Sanitary	0.9	L/s
Total	42.7	L/s
Change	-18.3	L/s

Rational Method Calc.

Project:	Bathurst and Richmond
Project No.:	211176
Municipality:	Toronto
Catchment:	Controlled

Post Development Peak Flows

	100 Year	2 Year
Runoff Coefficient (C) =	0.81	0.81
Area (A) =	0.190	0.190
A:	59.70	21.80
B:	0.00	0.00
C:	-0.80	-0.78
Tc:	0.167	0.167
Intensity (I) mm/hr =	250.3	88.2
Peak Flow (Q) L/s =	107.0	37.7

	Area	C	CxA
Landscape	13	0.25	3.2
Driveway	265	0.90	238.5
Green Roof	365	0.45	162.5
Building	1260	0.90	1134.0
	1903	**0.81**	1538.1

Full Site

	Area	C	CxA
Landscape	13	0.25	3.3
Driveway	331	0.90	297.9
Green Roof	365	0.45	164.3
Building	1260	0.90	1134.0
	1969	**0.81**	1599.4

Modified Rational Method

Project: Bathurst and Richmond
Project No.: 211176
Municipality: Toronto

Controlled

Area:	0.1903	ha	Rainfall $I=A*(T+B)^C$	
Runoff Coefficient:	0.81		A:	1579.4
			B:	0
Discharge Rate:	0.0182	m^3/s	C:	-0.8
Storage Required	53.5	m3		

Initial Time 10 min Increment 2 min

Time (min)	Intensity (mm/hr)	Peak Flow (m^3/s)	Roof Flow (m^3/s)	Total Flow (m^3/s)	Runoff Volume (m^3)	Discharge Volume (m^3)	Storage Volume (m^3)
10	250.3	0.107	0.0000	0.1070	64.17	10.89	53.3
12	216.3	0.092	0.0000	0.0924	66.55	13.07	53.5
14	191.2	0.082	0.0000	0.0817	68.64	15.25	53.4
16	171.9	0.073	0.0000	0.0734	70.50	17.43	53.1
18	156.4	0.067	0.0000	0.0668	72.18	19.61	52.6
20	143.8	0.061	0.0000	0.0614	73.71	21.79	51.9
22	133.2	0.057	0.0000	0.0569	75.13	23.97	51.2
24	124.3	0.053	0.0000	0.0531	76.45	26.15	50.3
26	116.6	0.050	0.0000	0.0498	77.68	28.32	49.4
28	109.8	0.047	0.0000	0.0469	78.84	30.50	48.3
30	103.9	0.044	0.0000	0.0444	79.94	32.68	47.3
32	98.7	0.042	0.0000	0.0422	80.98	34.86	46.1
34	94.0	0.040	0.0000	0.0402	81.97	37.04	44.9
36	89.8	0.038	0.0000	0.0384	82.91	39.22	43.7
38	86.0	0.037	0.0000	0.0368	83.81	41.40	42.4
40	82.6	0.035	0.0000	0.0353	84.67	43.58	41.1
42	79.4	0.034	0.0000	0.0339	85.50	45.75	39.7
44	76.5	0.033	0.0000	0.0327	86.30	47.93	38.4

Orifice Flow Calculation

Pipe Diameter	80	mm
Area	0.0050	m^2
Maximum WL	90	m
Invert	88.23	m
Head (h)	1.73	m
Co-efficient	0.62	
Flow (Q)	$Q=CA(2gh)^{0.5}$	
	0.018	m^3/s
Target Flow	**24.1**	**L/s**
Uncontrolled	4.1	L/s
Controlled	18.2	L/s
Total	**22.3**	**L/s**

Active Storage:		
Footprint	31	m2
Top of Cistern	90	m
Depth	1.77	m
Total Volume	54.87	m3
100 Year Depth	1.73	m
100 year WL	89.96	m
Bottom of Cistern	86.3	m3
Bottom to Invert	1.93	m3
Retention Storage	59.8	m3

APPENDIX B

WATER BALANCE CALCULATIONS

Next Level
STORMWATER MANAGEMENT
18 King Street East, Suite 1400, Toronto, ON M5C 1C4 | 416 637 5772 | info@nlsm.ca | nlsm.ca

Project:	**152-164 Bathurst St.**
Location:	**152-164 Bathurst, Toronto, ON M5V 2R3**
Date:	30-Mar-23
Contact:	Sasha Aguilera | Sasha@nlsm.ca | 647-466-5595

CALCULATIONS - WATER BALANCE AND IRRIGATION REUSE

Proposed Site Annual Capture from Initial Abstraction

Site Area = 1969 m2
Total Annual Rainfall = 840 mm
Total Annual Rainfall = 1654 m3
50% Capture = 827 m3

WWFMG - Fig 1A

IA (mm)	Annual Capture (%)
1	12%
2.5	30%
5	50%
7	58%
10	70%

Catchment	Area (m2)	% of Total Area	IA (mm)	Annual Capture (%)	Annual Capture (m3)
Flat Roof	898	46%	1.0	12%	90.5
Flat Roof with SpongeBase	362	18%	2.5	30%	91.2
Green Roof	365	19%	7.0	58%	177.8
Landscape & Planters	13	1%	7.0	58%	6.3
Pavement/Driveways	331	17%	1.0	12%	33.4
Total	**1969**	**100%**	**2.0**		**399.3**

Total required to be captured by cistern for reuse (m3) = 427.7 Storage Volume (m3)

WR (m3) = Average irrigation water use per year

Surface Type	System Name	Area (m2)	WR (m3)
Intensive Green Roof	Alpine Meadow	365	195.21
Total		**727**	**195.21**

Irrigation Reuse (m3)

DISCLAIMER: Next Level Stormwater Management has used its best effort in the preparation of this calculation. Users should verify with the appropriate licensed professionals.

Next Level™
STORMWATER MANAGEMENT
18 King Street East, Suite 1400, Toronto, ON M5C 1C4 | 416 637 5772 | info@nlsm.ca | nlsm.ca

Project:	**152-164 Bathurst St.**
Location:	**152-164 Bathurst, Toronto, ON M5V 2R3**
Date:	2023-03-30
Contact:	Sasha Aguilera | Sasha@nlsm.ca | 647-466-5595

CALCULATIONS - LANDSCAPE IRRIGATION REQUIREMENTS FOR WATER REUSE

Methodology Estimate the landscape irrigation water needs using the landscape coefficient method with the following equations:

$$WR = (ET_O * K_L - R_e) * A / IE$$ *Equation 1*

where
- WR = Water Requirement (l/day)
- ET_O = Local Reference Evapotranspiration (mm/month)
- K_L = Landscape Coefficient (dimensionless)
- R_e = Effective Rainfall (mm/month), defined as 25% of average peak monthly rainfall
- A = Area (m2)
- IE = Irrigation Efficiency (dimensionless)

$$K_L = K_S * K_D * K_{MC}$$ *Equation 2*

where
- K_L = Landscape Coefficient (dimensionless)
- K_S = Species Factor (dimensionless)
- K_D = Density Factor (dimensionless)
- K_{MC} = Microclimate Factor (dimensionless)

Species Factor (K_S) - account for differences in species' water needs, e.g. succulents vs. turfgrass.

Water Needs	K_S
Very low	<0.1
Low	0.1 - 0.3
Moderate	0.4 - 0.6
High	0.7 - 0.9

Density Factor (K_D) - account for differences in vegetation density, e.g. pre-vegetated mat vs plant plugs.

Density	K_D	Examples
Low	0.5 - 0.9	tree with <70% canopy cover
Average	1	Groundcover with > 90% canopy cover
High	1.1 - 1.3	Mixed planting types or tiered plantings

Microclimate Factor (K_{MC}) - account for differences in microclimate, e.g. high wind on rooftop, reflected heat from claddings

Density	K_D	Examples
Low	0.5 - 0.9	shaded or protected from wind
Average	1	similar to ET_O conditions
High	1.1 - 1.4	Next to heat absorbing or reflective surfaces, exposed to windy conditions

Reference Evapotranspiration (ET_O) in July for the Greater Toronto Area is used (Source: EPA WaterSense Water Budget Data Finder)

ET_O = 138.2 mm
R_e = 0 mm

Irrigation Efficiency (IE) based on average values of different irrigation systems (Source: USGBC)

Water Requirement Calculations

Landscape Type	System Name	Area (m^2)	Species Factor K_S	Density Factor K_D	Microclimate Factor K_{MC}	Landscape Coefficient K_L	Landscape Evapotranspiration ET_L (mm/month)	Irrigation Type	Irrigation Efficiency IE
Extensive	LiteN'Less Classic III	0	0.5	1	1.2	0.6	83	Drip	0.8
Intensive/Biodiverse	Alpine Meadow	365	0.6	1	1.2	0.72	100	Drip	0.8

		LiteN'Less Classic III		**Alpine Meadow**		**Total**
	Irrigation Month	WR (m^3)	WR (l)	WR (m^3)	WR (l)	WR (m^3)
	May	0.0	-	34.0	34,049	34.0
	June	0.0	-	40.9	40,859	40.9
	July	0.0	-	45.4	45,399	45.4
	August	0.0	-	40.9	40,859	40.9
	September	0.0	-	34.0	34,049	34.0
Total irrigation water use per year		**0.0**	**-**	**195.2**	**195,214**	**195.2**
Average irrigation water use per month		**0.0**	**-**	**39.0**	**39,043**	**39.0**
Average irrigation water use for 72 hours		**0.0**	**-**	**3.8**	**3,828**	**3.8**
Average irrigation water use for 48 hours		**0.0**	**-**	**2.6**	**2,552**	**2.6**

On-Site Irrigation Calculations

Project: Bathurst and Richmond
Project No.: 211176
Municipality: Toronto

Site Area = **1969 m2**
Total Annual Rainfall= **840 mm**
50% Capture= **827 m3**

Catchment	Area (m^2)	% of Total Area	IA (mm)	Annual Capture (%)	Annual Capture (m^3)
Flat Roof	898	46%	1.0	12%	90.5
Flat Roof with SpongeBase	362	18%	2.5	30%	91.2
Green Roof	365	19%	7.0	58%	177.8
Landscape & Planters	13	1%	7.0	58%	6.3
Pavement/Driveways	331	17%	1.0	12%	33.4
Total	**1969**	**100%**	**2.0**		**399.3**

Total required to be captured by cistern for reuse = **428 m3**

On-Site Water Reuse Calculations

Project: Bathurst and Richmond
Project No.: 211176
Municipality: Toronto

Catchment Area (A) =	1,903	m2	
Runoff Coefficient (C) =	0.81		
Cistern Volume =	59.8	m3	
Cistern as rainfall depth	31.4	mm	= A / V
% Total Collection	97%		From Figure 1A in WWFM Guildelines.

Total Water Applied | **Total Water Collected**

Month	(1) Irrigation[1] [per month]	(2) Indoor Wash [per month]	(3) Outdoor Wash [per month]	(4) = (1)+(2)+(3) Total Consumption [per month]	(5) Monthly Precip. mm	(6) % of Total Collection	(7) = (5)x(6)xCxA Rainwater Volume [m3]	(8) See notes. Vol Remaining [m3]
January	0	0.0		0.0	61.0		91.2	59.8
February	0	0.0		0.0	50.0		74.8	59.8
March	0	0.0		0.0	66.0		98.7	59.8
April	0.0	0.0	0	0.0	71.0		106.2	59.8
May	34.0	0.0	0	34.0	74.0		110.6	59.8
June	40.9	0.0	0	40.9	73.0	97%	109.1	59.8
July	45.4	0.0	0	45.4	68.0		101.7	59.8
August	40.9	0.0	0	40.9	81.0		121.1	59.8
September	34.0	0.0	0	34.0	84.0		125.6	59.8
October	0.0	0.0		0.0	65.0		97.2	59.8
November	0	0.0		0.0	76.0		113.6	59.8
December	0	0.0		0.0	71.0		106.2	59.8
Total	195.2	0.0		**195.2**	**840.0**		**Yearly Deficit=**	**0.0**

Total Yearly Water Demand =	195.2	m3
Total Yearly Supply Deficit =	0.0	m3
Total Water Consumption =	**195.2**	m3
Water Balance Requirement =	**427.7**	m3

Notes:
(1) From "NexLevel Stormwater Management Calculations".
(5) From "Canadian Climate Normals 1981-2010 Station Data" Toronto. Monthly values were factored by 1.011 to match the annual rainfall volume of 840mm as per WWFM Guidelines.
(6) From Figure 1A in WWFM Guildelines. 94% of annual rainfall comes from storms less than 23mm.
(8) = Volume remaining from previous month + surplus/deficit from previous month. Volume cannot be greater than the cistern volume.
Total Water Consumption = Total Yearly Demand - Total Yearly Supply Deficit.
Total Water Consumption per 72 hours = Total Water Consumption / (7 months * 10 72 hour periods per month)
Total Water Consumption per 72 hours = 2.79

Next Level™
STORMWATER MANAGEMENT

SpongeBase™

Transforms Impervious Areas
Non-Vegetated System

An innovative method to increase retention, and detention, on-site

SpongeBase™ is an innovative nature-based solution that enables impervious rooftop surfaces to manage rainwater without sacrificing accessibility and aesthetics. Hidden and invisible, the system provides source control by managing rainfall exactly where it lands; on rooftop terraces, exposed balconies, walkways, and vegetation-free zones. The light-weight components are placed within the void space between the impervious surface and the roofing system where they receive rain that falls between the walkway's joints. SpongeBase™ can be customized to retain and detain rain-water to help achieve water balance and quantity control targets on site. The core of SpongeBase™ is a lightweight, fire resistant, highly absorbent needled mineral hydro blanket that evaporates stored water; returning it to the atmosphere via the natural hydrological cycle.

200323

Next Level Stormwater Management™
416 637 5772 | info@nlsm.ca | nlsm.ca

Stormwater management made easy.

Next Level™
STORMWATER MANAGEMENT

SpongeBase™ Retention

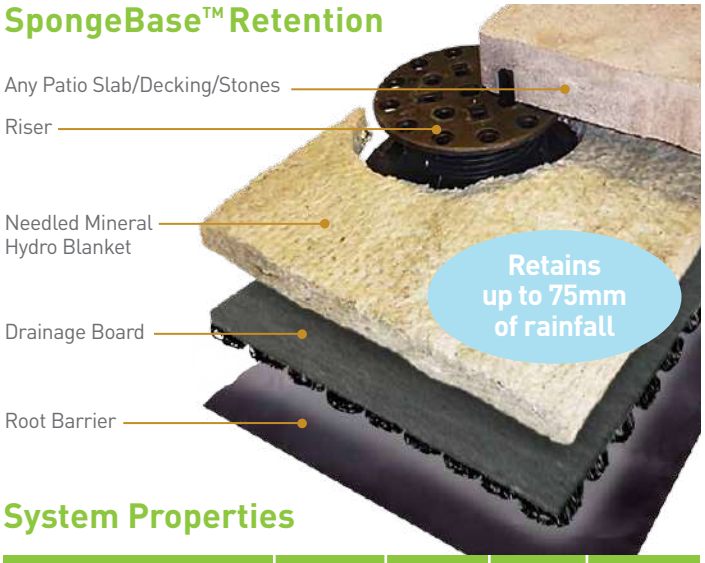
Transforms Impervious Areas
Non-Vegetated System

SpongeBase™ Retention *retains* rainwater and reduces runoff under impervious surfaces such as rooftop terraces, walkways, or vegetation-free zones. The lightweight, highly absorbent needled mineral hydro blanket stores and distributes rainwater laterally under the impervious surfaces. The thickness of hydro blanket can be customized from 25mm to 75mm to meet the project's specific water balance target. The drainage mat creates an effective air gap that facilitates drying so the system recharges and is ready for additional water storage during the next storm event. As rainwater evaporates, SpongeBase™ cools the surfaces and mitigates the urban heat island. SpongeBase™ is an effective multi-tasking green infrastructure solution for any climate change adaptation toolbox.

Key Features:

- Retains up to 75 mm of rainfall to meet water balance target
- Diverts runoff from and reduces burden on the municipal sewer infrastructure
- Cools building to save energy and mitigates the urban heat island

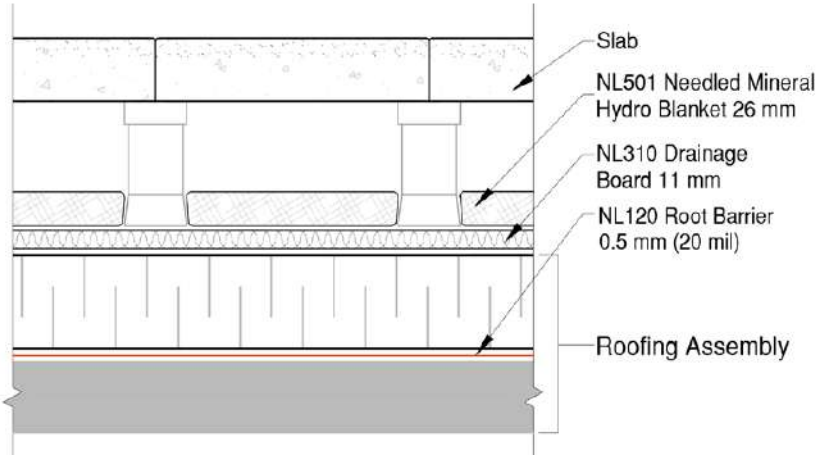
SpongeBase™ Retention



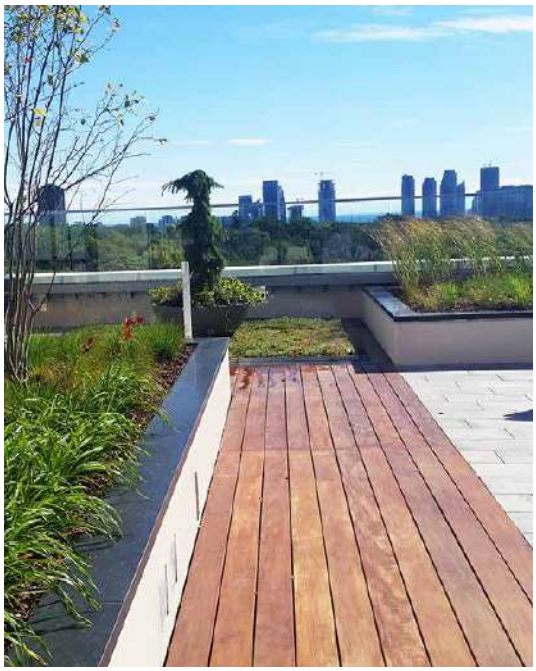
System Properties

Build-Up		Thickness (cm)	Dry Wt. (kg/m²)	Sat. Wt. (kg/m²)	Water ret. (l/m²)
NL501	NM Hydro Blanket	2.58	3.90	28.80	24.90
NL310	Drainage Board	1.14	0.80	1.72	0.92
NL120	Root Barrier	0.05	0.46	0.46	0.00
	Total	**3.77**	**5.36**	**30.98**	**25.82**

SpongeBase™ Retention goes under any patio slab or decking



Contact us for more technical info and AutoCAD details.



200323

Next Level Stormwater Management™
416 637 5772 | info@nlsm.ca | nlsm.ca

Layers of experience.
Layers of innovation.

APPENDIX C

HYDROLOGICAL IMPACT ASSESSMENT

August 2018

HYDROLOGICAL REVIEW SUMMARY

The form is to be completed by the Professional that prepared the Hydrological Review.
Use of the form by the City of Toronto is not to be construed as verification of engineering/hydrological content.

Refer to the Terms of Reference, Hydrological Review:
Link to Terms of Reference Hydrological Review

For City Staff Use Only:	
Name of ECS Case Manager (Please print)	
Date Review Summary provided to to TW, EM&P	

IF ANY OF THE REQUIREMENTS LISTED BELOW HAVE NOT BEEN INLCUDED IN THE HYDROLOGICAL REVIEW, THE REVIEW WILL BE CONSIDERED INCOMPLETE.
THE GREY SHADED BOXES WILL REQUIRE A CONSISTANCY CHECK BY THE ECS CASE MANAGER.

Summary of Key Information:

SITE INFORMATION		**Page # & Section # of Review**	**Review Includes this Information City Staff (Check)**
Site Address	152-164 Bathurst Street and 623 Richmond Street West, Toronto, Ontario		
Postal Code	M6J 1C2	Sec 1, Pg. 3	
Property Owner (on request for comments memo)	ORIGINATE (BATHURST & RICHMOND) INC	Sec 1, Pg. 3	
Proposed description of the project (if applicable) (point towers, number of podiums)	Single 18-storey tower Site area approximately 1,950 m2	Sec 1, Pg. 3	
Land Use (ex. commercial, residential, mixed, institutional, industrial)	Residential, Commercial residential employment, commercial residential and open space	Sec 2, Pg. 3	
Number of below grade levels for the proposed structure	2 levels of underground	Sec 2 Pg 4	
HYDROLOGICAL REVIEW INFORMATION			
Date Hydrological Review was prepared:	November 1, 2022	Pg 1	
Who Performed the Hydrological Review (Consulting Firm)	Groundwater Environmental Management Services (GEMS)	Pg 1	
Name of Author of Hydrological Review	Kenley Bairos & Laura Maharaj	Sec 10, Pg 17	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Check the directories on the website for Professional Geoscientists and/or Professional Engineers of Ontario been checked to ensure that the Hydrological Report has been prepared by a qualified person who is a licensed Professional Geoscientist as set out in the Professional Geoscientist Act of Ontario or a Professional Engineer? PEO: Professional Engineers of Ontario APGO: Association of Professional Geoscientists of Ontario		N/A	
Has the Hydrological Review been prepared in accordance with all the following: • Ontario Water Resources Act • Ontario Regulation 387/04 • Toronto Municipal Code Chapter 681-Sewers	Yes		
		Page # & Section # of every occurrence in the Review	**Review Includes this Information City Staff (Check)**

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) **with safety factor included**	What safety factor was used? 1.5	Sec 5.4 Pg. 11	
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) **without safety factor included**	7,306 L/day	Sec 5.4 Pg. 11	
Total Volume (L/day) Long Term drainage of groundwater (from foundation drainage, weeping tiles, sub slab drainage) **with safety factor included** If the development is part of a multiple-tower complex, include total volume for each separate tower	What safety factor was used? 1.5 97.3 L/day	Sec 5.5 Pg. 12	
List the nearest surface water (river, creek, lake)	Lake Ontario	Sec 4.2 Pg 7	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Lowest basement elevation	84.35	Sec 2.2 Pg 4	
Foundation elevation	84.35	Sec 2.2 Pg 4	
Ground elevation	90.23	Sec 2.2 Pg 4	
STUDY AREA MAP		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
Study area map(s) have been included in the report.	**X Yes**	Figure 2 Page 20	N/A
Study area map(s) been prepared according to the Hydrological Review Terms of Reference.	**X Yes**		N/A
WATER LEVEL AND WELLS		**Page # & Section # of every occurrence**	**Review Includes this Information (City Staff Initial)**

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
		in the Review	
The groundwater level has been monitored using all wells located on site (within property boundary).	Yes	Sec 4.3 Pg 8	
The static water level measurements have been monitored at all monitoring wells for a minimum of 3 months with samples taken every 2 weeks for a minimum of 6 samples. The intent is for the qualified professional to use professional judgement to estimate the seasonally high groundwater level.	Yes	Sec 4.3 Pg 8	
All water levels in the wells have been measured with respect to masl.	Yes	Sec 4.3 Pg 8	
A table of geology/soil stratigraphy for the property has been included.	Yes	Sec 4.1 Table 4.1B Pg 6	
GEOLOGY AND PHYSICAL HYDROLOGY		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information (City Staff Initial)**
The review has made reference to the soil materials including thickness, composition and texture, and bedrock environments.	Yes	Sec 4.1 Table 4.1B Pg 6	
Key aquifers and the site's proximity to nearby surface water has been identified.	**X Yes**	Sec 4.2 Pg 7	N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
PUMP TEST/SLUG TEST/DRAWDOWN ANALYSIS		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
A summary of the pumping test data and analysis is included in the review.	Pumping test was not completed for this site – please see next section	Sec 4.4 Pg 9 Appendix C	
The pump test been carried out for at least 24 hours if possible. If not, has a slug test been conducted?	Pumping test was not completed for this site – Rising head tests were completed in 3 monitoring wells	Sec 4.4 Pg 9 Appendix C	
Have the monitoring well(s) have been monitored using digital devices? If yes how frequently?	Yes – Three wells, 6 tests, 30 second intervals	Sec 4.4 Pg 9 Appendix C	
If a slug or pump test has been conducted has the static groundwater level been monitored at all monitoring well(s) multiple times to measure recovery? -prior to the slug or pumping test(s)? -post slug or pumping test(s)?	**X Yes** Recovery was monitored following the removal of a slug from the test well	Sec 4.4 Pg 9 Appendix C	N/A
The above noted slug or pump tests have been included in the report.	**X Yes**	Sec 4.4 Pg 9 Appendix C	
WATER QUALITY		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
The report includes baseline water quality samples from a laboratory. The water quality must be analyzed for all parameters listed in Tables 1 and 2 of Chapter 681 Sewers of the Toronto Municipal Code (found in Appendix A) and the samples must have to be taken unfiltered within 9 months of the date of submission.	Baseline water quality data provided in Tables provided by Toronto Water	Sec 4.5 Page 10 Appendix D	
The water quality data templates in Appendix A have been completed for each sample taken for both sanitary/combined and storm sewer limits.	For sanitary discharge- See the sanitary/combined sewer parameter limit template **Yes** For storm discharge- See the storm sewer parameter limit template **Yes**		
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the sanitary/combined Bylaw limits **If there are any sample parameter Exceedances the groundwater can't be discharged as is.**	Exceedances listed in report	Page 10 Section 4.5	
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the storm Bylaw limits. **If there are any sample parameter exceedances the groundwater can't be discharged as is.**	Exceedances listed in report	Page 10 Section 4.5	
The water quality samples have been analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and/or Canadian Association for Laboratory Accreditation.	**X Yes** Samples analyzed by Bureau Veritas	Appendix D	N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
List of Canadian accredited laboratories: Standards Council of Canada			
A chain of custody record for the samples is included with the report.	Yes	Appendix D	
Has the chain of custody reference any filtered sample? If yes, the report has to be amended and re-submitted to include only non-filtered samples.	No filtered samples		
List any of the sample parameters that exceed the Bylaw limits with the reporting detection limit (RDL) included.	Total Suspended Solids (TSS) - RDL 10 Total Manganese (Mn) - RDL 2.0	Appendix D	
A true copy of the Certificate of Analysis report, is included with the report.	Yes	Appendix D	
EVALUATION OF IMPACT		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
Does the report recommend a back-up system or relief safety valve(s)?	◯ **Yes** **X No**		
Does the associated Geotechnical report recommend a back-up system or relief safety valve(s)?	◯ **Yes** **X No**		
The taking and discharging of groundwater on site has been analyzed to ensure that no negative	**X Yes**		N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
impacts will occur to: the City sewage works in terms of quality and quantity (including existing infrastructure), the natural environment, and settlement issues.	The hydrogeology report has provided information on the anticipated quantities and quality of groundwater. Short term dewatering of groundwater for excavation is anticipated.		
Has it been determined that there will be a negative impact to the natural environment, City sewage works, or surrounding properties has the study identified the following: the extent of the negative impact, the detail of the precondition state of all the infrastructure, City sewage works, and natural environment within the effected zone and the proposed remediation and monitoring plan?	◯ **Yes** **If yes, identify impact:** **X No**	Sec 5.4 Pg 11	N/A

Summary of Additional Information and Key Items (if applicable):

Appendix A:

SANITARY/COMBINED **Sample Location:**

Inorganics		Sample Result	Sample Result with upper RDL included	
Parameter	mg/L	mg/L	mg/L	ug/L
BOD	300	3	2	300,000
Fluoride	10	0.51	0.10	10,000
TKN	100	3.3	0.10	100,000
pH	6.0 - 11.5	8.03		6.0 - 11.5
Phenolics 4AAP	1	<0.0010	0.0010	1,000
TSS	350	19	10	350,000
Total Cyanide	2	<0.0050	0.0050	2,000
Metals		ug/L	ug/L	
Chromium Hexavalent	2	<0.50	0.50	2,000
Mercury	0.01	<0.00010	0.00010	10
Total Aluminum	50	550	4.9	50,000
Total Antimony	5	<0.50	0.50	5,000
Total Arsenic	1	9.3	1.0	1,000
Total Cadmium	0.7	<0.090	0.090	700
Total Chromium	4	<5.0	5.0	4,000
Total Cobalt	5	<0.50	0.50	5,000
Total Copper	2	4.6	0.90	2,000
Total Lead	1	1.4	0.50	1,000
Total Manganese	5	300	2.0	5,000
Total Molybdenum	5	12	0.50	5,000
Total Nickel	2	1.4	1.0	2,000
Total Phosphorus	10	140	100	10,000
Total Selenium	1	<2.0	2.0	1,000
Total Silver	5	<0.090	0.090	5,000
Total Tin	5	<1.0	1.0	5,000
Total Titanium	5	5.4	5.0	5,000
Total Zinc	2	<5.0	5.0	2,000
Petroleum Hydrocarbons				
Animal/Vegetable Oil & Grease	150	<0.50	0.50	150,000
Mineral/Synthetic Oil & Grease	15	<0.50	0.50	15,000

August 2018

HYDROLOGICAL REVIEW SUMMARY

Volatile Organics		Sample Result	Sample Result with upper RDL included	
Parameter	mg/L	ug/L	ug/L	ug/L
Benzene	0.01	<0.40	0.40	10
Chloroform	0.04	<0.40	0.40	40
1,2-Dichlorobenzene	0.05	<0.80	0.80	50
1,4-Dichlorobenzene	0.08	<0.80	0.80	80
Cis-1,2-Dichloroethylene	4	<1.0	1.0	4,000
Trans-1,3-Dichloropropylene	0.14	<0.80	0.80	140
Ethyl Benzene	0.16	<0.40	0.40	160
Methylene Chloride	2	<4.0	4.0	2,000
1,1,2,2-Tetrachloroethane	1.4	<0.80	0.80	1,400
Tetrachloroethylene	1	<0.40	0.40	1,000
Toluene	0.016	<0.40	0.40	16
Trichloroethylene	0.4	<0.40	0.40	400
Total Xylenes	1.4	<0.40	0.40	1,400
Semi-Volatile **Organics**		ug/L	ug/L	
Di-n-butyl Phthalate	0.08	<2	2	80
Bis (2-ethylhexyl) Phthalate	0.012	<2	2	12
3,3'-Dichlorobenzidine	0.002	<0.8	0.8	2
Pentachlorophenol	0.005	<1	1	5
Total PAHs	0.005	<1	1	5
Misc **Parameters**		mg/L	mg/L	
Nonylphenols	0.02	<0.005	0.005	20
Nonylphenol Ethoxylates	0.2	<0.001	0.001	200

Sample Collected:
Temperature:

August 2018

HYDROLOGICAL REVIEW SUMMARY

STORM **Sample Location:**

Inorganics		Sample Result	Sample Result with upper RDL included	
Parameter	mg/L	mg/L	mg/L	ug/L
pH	6.0 - 9.5	8.03		
BOD	15	3	2	15,000
Phenolics 4AAP	0.008	<0.0010	0.0010	8
TSS	15	19	10	15,000
Total Cyanide	0.02	<0.0050	0.0050	20
Metals		ug/L	ug/L	
Total Arsenic	0.02	9.3	1.0	20
Total Cadmium	0.008	<0.090	0.090	8
Total Chromium	0.08	<5.0	5.0	80
Chromium Hexavalent	0.04	<0.50	0.50	40
Total Copper	0.04	4.6	0.90	40
Total Lead	0.12	1.4	0.50	120
Total Manganese	0.05	300	2.0	50
Total Mercury	0.0004	<0.10	0.10	0.4
Total Nickel	0.08	1.4	1.0	80
Total Phosphorus	0.4	140	100	400
Total Selenium	0.02	<2.0	2.0	20
Total Silver	0.12	<0.090	0.090	120
Total Zinc	0.04	<5.0	5.0	40
Microbiology				
E.coli	200	<10	10	200,000
Volatile Organics				
Parameter	mg/L	ug/L	ug/L	ug/L
Benzene	0.002	<0.40	0.40	2
Chloroform	0.002	<0.40	0.40	2
1,2-Dichlorobenzene	0.0056	<0.80	0.80	6
1,4-Dichlorobenzene	0.0068	<0.80	0.80	7
Cis-1,2-Dichloroethylene	0.0056	<1.0	1.0	6
Trans-1,3-Dichloropropylene	0.0056	<0.80	0.80	6
Ethyl Benzene	0.002	<0.40	0.40	2
Methylene Chloride	0.0052	<4.0	4.0	5
1,1,2,2-Tetrachloroethane	0.017	<0.80	0.80	17
Tetrachloroethylene	0.0044	<0.40	0.40	4
Toluene	0.002	<0.40	0.40	2
Trichloroethylene	0.0076	<0.40	0.40	8
Total Xylenes	0.0044	<0.40	0.40	4

August 2018

HYDROLOGICAL REVIEW SUMMARY

Semi-Volatile Organics		Sample Result	Sample Result with upper RDL included	
Di-n-butyl Phthalate	0.015	<2	2	5
Bis (2-ethylhexyl) Phthalate	0.0088	<2	2	8.8
3,3'-Dichlorobenzidine	0.0008	<0.8	0.8	0.8
Pentachlorophenol	0.002	<1	1	2
Total PAHs	0.002	<1	1	2
PCBs	0.0004	<0.05	0.05	0.4
Misc Parameters		mg/L	mg/L	
Nonylphenols	0.001	<0.005	0.005	1
Nonylphenol Ethoxylates	0.01	<0.001	0.001	10

Sample Collected:
Temperature:

Consulting Firm that prepared Hydrological Report: Groundwater Environmental Management Services (GEMS)

Qualified Professional who completed the report summary: K e n l e y B a i r o s Kenley Bairos
Print Name

PROFESSIONAL GEOSCIENTIST ONTARIO
Nov 1, 2022
LAURA A.T. MAHARAJ
PRACTISING MEMBER
2497 LM

Qualified Professional who completed the report summary: L a u r a M a h a r a j Laura Maharaj
Signature Date & Stamp

GEMS®

Groundwater Environmental Management Services

Hydrogeological Report

152–164 Bathurst Street and
623–627 Richmond Street West
Toronto, Ontario
M6J 1C2

Project: 23-1633

November 1, 2022

PREPARED FOR:
Toronto (Bathurst & Richmond) LP
1204 - 2 St.Clair Avenue West
Toronto, Ontario
M4T 2T5

PREPARED BY:
Groundwater Environmental
Management Services Inc.
8800 Dufferin Street, Suite 303
Concord, ON, L4K 0C5

Contents

List of Figures

List of Appendices

1.0 Introduction

Groundwater Environmental Management Services Inc. (GEMS) was retained by Toronto (Bathurst & Richmond) LP to evaluate the hydrogeological conditions for a proposed development located at 152-164 Bathurst Street and 623-627 Richmond Street, Toronto, Ontario (the Site). The regional location of the Site is illustrated in **Figure 1.**

The Site area is approximately 1,950 square metres (m^2) (Kirkor, 2022) and is currently occupied by multiple mixed-use low-rise buildings. The proposed development consists of an 18-storey, mixed-use condominium building with two levels of underground parking. The proposed architectural drawings are provided in **Appendix A.**

GEMS has reviewed the available relevant hydrogeological, environmental, and geotechnical information and has prepared this Hydrogeological Report in support of the proposed development by assessing the short and long-term dewatering requirements.

GEMS' scope of work includes:

- A review of hydrogeological conditions and environmental information based on previous reports prepared for the Site
- A review of subsurface soils conditions
- Well development
- Groundwater level monitoring
- Hydraulic conductivity testing
- Water quality analysis
- Calculation of maximum radius of influence
- Calculation of maximum probable short and long-term dewatering rates
- Assessment of potential adverse environmental impacts, as it relates to dewatering
- Assessment of MECP well records within 500 m of the Site

2.0 Site Conditions

2.1 Location and Land Usage

The Site is rectangular and located on the southwest corner of Richmond Street West and Bathurst Street, approximately 90 m south of Queen St West (Google Earth, 2022). The Site is zoned as Commercial Residential (City of Toronto Zoning By-law 569-2013, 2022) and is currently comprised of nine (9) rectangular properties.

Lands within 500 metres (m) of the Site are urban and predominately consist of residential, commercial residential employment, commercial residential, and open space (City of Toronto Zoning By-law 569-2013, 2020).

North: Residential, Commercial Residential and Open Space

East: Commercial Residential Employment and Open Space

South: Residential and Commercial Residential

West: Residential, Commercial Residential and Open Space

2.2 Proposed Development

The Site Plan outlines a total Site area of approximately 1,950 m^2. The proposed development consists of a single, eighteen (18) storey tower composed of retail space on the ground floor and residential units above (Kirkor 2021). The proposed underground structure will consist of 2 parking levels that extend to a depth of 6.15 mbgs (meters below ground surface).

According to the architectural drawings in **Appendix A** and survey work completed by Kirkor Architects and Planners in 2022, the ground elevation is approximately 90.23 masl and the approximate Finished Floor Elevation (FEE) of the lowest underground level will be 84.35 metres above sea level (masl). The base of the excavation (excavation invert) for use in dewatering estimations is assumed to be one metre below the FFE (83.35 masl).

3.0 Methodology

The methodologies followed to complete the field investigation are outlined in this section.

3.1 Drilling Program

In February 2021, PGL Environmental Consultants (PGL) and Terrapex Environmental Ltd. (Terrapex) carried out a field investigation that included the advancement of twelve (12) boreholes (BH201 to BH212) ranging in depth from 0.9 mbgs to 16 mbgs. Seven of the boreholes were converted to monitoring wells (BH201S, BH201D, BH201MS, BH202M, BH203M, BH204M and BH206M) ranging in depth from 4.5 mbgs to 15.8 mbgs. A new naming convention was used to denote the monitoring wells using "WH" in place of the "BH" for the respective borehole.

All Monitoring wells were equipped with a 50-millimetre (mm) diameter, schedule-40, Polyvinyl chloride (PVC) monitoring wells, with screened intervals of 3.05 m length at their base. The wells were installed to evaluate static groundwater elevations, conduct hydraulic testing, and obtain water quality samples. All monitoring wells were developed prior to sampling and slug testing activities using a Waterra inertial lift pump by purging at least three well volumes or until the monitoring well was purged dry. Borehole logs made by PGL are provided in **Appendix B,** and a detailed Site Plan showing the borehole locations is presented in **Figure 2**.

3.2 Hydraulic Testing

On 19 September 2022, GEMS personnel visited the Site to develop monitoring wells MW201S, MW203 and MW204 in preparation for hydraulic testing. On 27 September 2022, GEMS personnel returned to the Site to complete the Single Well Response Tests (SWRTs).

The SWRTs consisted of rising head testing performed by 'instantaneously' removing a pre-determined volume of water (a slug). Water level recovery back to static conditions was monitored using an automated water level logging device and validated with manual measurements. A dedicated barologger was set above the water table to allow the data to compensate for changes in atmospheric pressure.

3.3 Water Quality Sampling

On 19 September 2022, PGL personnel were on-Site to collect one (1) groundwater sample for water quality analysis. The sample was taken from monitoring well MW204 using a low-flow peristaltic pump

and sterile nitrile gloves to preserve sample integrity and ensure that the results represent in-situ groundwater conditions. The sample collection was not filtered.

The sample was packed with ice in a cooler to maintain sample temperature, and the cooler was sealed and transported for analysis to Bureau Veritas, a Canadian laboratory accredited and licensed by the Standards Council of Canada and/or the Canadian Association for Laboratory Accreditation (CALA). The sample was tested for all parameters denoted in The City of Toronto Sanitary and Storm Sewer By-law criteria.

4.0 Geology and Hydrogeological Setting

The Site is occupied by the bevelled till plains of the Peel Plain physiographic region (Chapman & Putnam, 2007). The Peel Plain is an area of dense clay soils deposited by glacial meltwater that was ponded on the low permeability Halton Till plain (underlain by shale and limestone). It is relatively flat, with a general slope toward Lake Ontario.

Surficial soils in the area are mapped as the Sunnybrook Drift overlying the Scarborough Formation (OGS, 1991a). The Sunnybrook drift is composed of mainly silt and clay materials deposited on the floor of a glacially dammed lake. Boulders and pebbles are rare and are interpreted to result from melting icebergs. This unit is generally less than 10 to 20 metres thick and is considered an aquitard.

The Scarborough Formation is an aquifer unit that was deposited by a fluvial-deltaic system fed by large, braided meltwater rivers draining from an ice sheet. It is composed of organic-rich sands over silts and clays (Karrow, 1967; Eyles 1997). The upper sands can be channelized in some locations. The surficial geology of the Site is displayed in **Figure 3.**

Bedrock in the area is mapped as Upper Ordovician deposits of shale and limestone belonging to the Georgian Bay Formation (OGS, 1991b).

4.1 Subsurface Investigation

All twelve (12) boreholes (BH201 to BH212) and seven (7) monitoring wells (MW201D and MW201S to MW206) on-Site were evaluated for this report. The boreholes were advanced to depths ranging 0.9 mbgs to 16 mbgs, and monitoring well depths ranged from 4.5 mbgs to 15.8 mbgs.

The details of borehole advancement are summarized below in **Table 4.1A,** their locations are presented in **Figure 2,** and their corresponding borehole logs are provided in **Appendix B.**

Table 4.1A Borehole Details

Well ID	Date Installed	Ground Elevation (masl)	Borehole Depth (mbgs)	Borehole Depth (masl)	Monitoring Well Depth (mbgs)	Monitoring Well Depth (masl)
MW201S	2021-02-22	90.23	8.0	82.2	7.9	82.3
MW201D	2021-02-22	90.23	16.0	74.2	15.9	74.3
MW202	2021-02-23	90.18	7.6	82.6	6.1	84.1
MW203	2021-02-24	90.33	14.6	75.7	7.9	82.4
MW204	2021-02-26	90.50	14.6	75.9	7.9	82.6
MW205	2021-02-24	90.18	12.8	77.4	7.9	69.5
MW206	2021-02-24	87.43	5.5	81.9	4.6	77.3

**Ground elevation obtained from PGL borehole logs 2021*

GEMS characterized the site stratigraphy based on overburden soils encountered during drilling, in descending order from the surface, as shown in **Table 4.1B**:

Table 4.1B Site Stratigraphy

Asphalt/Pavers	The site is partially overlain by a driveway composed of approximately 5 cm of asphaltic concrete or brick pavers.
Fill	In all boreholes, approximately 1.5 to 2.2 metres of Sand and Gravel, Silty Sand and Clayey Silt fill material was encountered at 90.4 masl. It was described as brown, moist and containing construction debris.
Silty Clay	Two Silty Clay layers were described across the site. The shallower layer is described as moist with some sand and traces of gravel and was encountered at approximately 88.2 masl. The thickness of this layer ranged from 10.6 m (MW204) to 6.0 m (MW203). The second, deeper layer appears directly beneath the Silty sand unit at approximately 80.0 masl and is reported as grey, moist, and sometimes containing weathered shale.
Silty Sand	A layer of Silty Sand was encountered in MW201D, MW203 and MW205 at an elevation of approximately 81.8 masl. This layer contains traces of clay and gravel and is described as grey and moist.
Bedrock	Bedrock was encountered in boreholes MW201D, MW203, MW204 and MW205 at approximately 78.0 masl. It was described as a weathered shale.

This characterization is consistent with what was expected from the available published literature and mapping information.

4.2 Stratigraphy and Hydrogeological Conditions

The native soils at the site consist of two silty clay layers intersected by a silty sand layer, interpreted to be part of the Sunnybrook Drift Formation. These fine-grained units represent the geologic material requiring dewatering for the proposed development. No dewatering of the weathered shale bedrock is

anticipated. The Sunnybrook Drift formation is described as an aquitard and is therefore characterized by low hydraulic conductivity.

The topography of the Site and surrounding area is relatively flat. Surficial drainage on-Site is expected to be north to south, directed to the City's Stormwater Management System via catch basins located on Richmond Street West that runs along the south of the Site property.

The nearest surface water feature is Lake Ontario, approximately 1.2 km south of the Site (**Figure 1**). Local groundwater flow is indicated to be south towards the lake.

4.3 Groundwater Level/Elevation Monitoring

From 9 March 2021 to 19 September 2021, PGL carried out three (6) weekly Site visits to obtain water level measurements from each of the seven (7) monitoring wells installed on the Site: MW201S, MW201D, MW202, MW203, MW204, MW205, and MW206

The locations of these monitoring wells are shown in **Figure 2,** and the well installation details and groundwater monitoring results are summarized in **Table 4.3**.

Table 4.3 Monitoring Well Summary and Groundwater Elevations

Well ID	Screened Unit and Screen Depth (masl)	Ground Elevation (masl)	Static Water Level Measurements			
			Date (YYYY-MM-DD)	Water Level (mbgs)	Water Elevation (masl)	Average (masl)
MW201S	Silty Clay 85.3 – 82.3	90.23	2021-03-09	7.91	82.32	83.71
			2021-03-17	7.77	82.46	
			2021-03-25	7.57	82.66	
			2021-04-01	7.04	83.19	
			2021-06-24	5.42	84.81	
			2021-09-19	3.43	86.80	
MW201D	Weathered Shale 77.3 – 74.3	90.23	2021-03-09	8.23	82.0	81.24
			2021-03-17	9.33	80.88	
			2021-03-25	8.84	81.39	
			2021-04-01	9.01	81.22	
			2021-06-24	9.27	80.96	
			2021-09-19	9.27	80.96	
MW202	Clayey Silt / Silty Clay 87.2 – 84.2	90.18	2021-03-09	6.10	84.08	82.28
			2021-03-17	5.65	84.54	
			2021-03-25	5.32	84.86	
			2021-04-01	-	-	
			2021-06-24	-	-	
			2021-09-19	2.53	87.65	
MW203	Silty Clay 85.5 – 82.5	90.33	2021-03-09	2.61	87.72	85.45
			2021-03-17	7.13	83.20	
			2021-03-25	7.41	82.92	
			2021-04-01	6.94	83.39	
			2021-06-24	2.86	87.47	
			2021-09-19	2.35	87.98	
MW204	Silty Clay 85.6 – 82.6	90.50	2021-03-09	6.75	83.75	86.77
			2021-03-17	5.38	85.12	
			2021-03-25	3.10	87.40	
			2021-04-01	2.58	87.92	
			2021-06-24	2.37	88.13	
			2021-09-19	2.23	88.27	
MW205	Silty Clay 85.3 – 82.3	90.18	2021-03-09	7.67	82.51	84.51
			2021-03-17	7.43	82.73	
			2021-03-25	7.15	83.04	
			2021-04-01	6.24	83.94	
			2021-06-24	3.12	87.06	
			2021-09-19	2.42	87.76	
MW206	Silty Clay 86.9 – 82.9	87.43	2021-03-09	3.34	84.19	84.21
			2021-03-17	3.48	84.09	
			2021-03-25	3.22	84.31	
			2021-04-01	-	-	
			2021-06-24	-	-	
			2021-09-19	3.16	84.27	

Water levels provided by PGL
*Ground Elevation taken from PGL Borehole logs (**Appendix B**)*
"-" no water level taken due to inaccessible well

During the monitoring period, groundwater elevations at the Site ranged from 80.88 masl to 88.27 masl, with the highest observed in MW204 on 19 September 2021. Based on a literature review, the groundwater elevation ranges from 84.76 masl to 86.73 masl from Oak Ridge Moraine Groundwater Program (ORMGP, 2022). All units screened above the bedrock are interpreted to be hydrologically connected and local groundwater flow at the Site is generally southward towards Lake Ontario. Lower water levels observed in the bedrock unit (MW201D) indicate that the shale acts as a separate hydrogeologic unit from overlying unconsolidated material. Water level fluctuations in the overburden wells are interpreted to be caused by seasonal weather patterns.

4.4 Single Well Response Tests

On 27 September 2022, GEMS was on-Site to complete single well response tests (SWRTs) in three (3) monitoring wells: MW201S, MW203, and MW204.

For each SWRT, a 'slug' of water was removed from the well and the water level recovery was monitored and analyzed for 1.5 to 18 hours thereafter. Estimations of hydraulic conductivity were made in AQTESOLV Aquifer Test Analysis Software using the Hvorslev Method (Hvorslev, 1951). Hydraulic Conductivity analysis graphs for each SWRT are provided in **Appendix C**.

Data from MW204 was determined to be inconclusive and not included in the analysis because a significant rain event caused surface runoff water to enter the well during the recovery monitoring period.

The Hvorslev Method was chosen for its versatility and is based on the following assumptions:

- Water-bearing unit has infinite areal extent;
- Water-bearing unit is homogeneous and of uniform thickness;
- Water bearing unit is confined or unconfined;
- Water table is initially horizontal before testing;
- The well is fully or partially penetrating into the water-bearing unit;
- The slug is instantaneously removed from the well; and
- Groundwater flow is steady.

The estimated hydraulic conductivity results for all SWRTs is presented in **Table 4.4.**

Table 4.4: Hydraulic Conductivity Results from Single Well Response Tests

Well ID	Screened Unit	Screen Interval (masl)	SWRT	Hydraulic Conductivity (m/s)	Geometric Mean (m/s)
MW201	Silty Clay	85.3 – 82.3	1	3.4×10^{-7}	3.4×10^{-7}
MW203	Silty Clay	85.5 – 82.5	1	8.6×10^{-9}	4.5×10^{-9}
			2	2.3×10^{-9}	
Geometric Mean Hydraulic Conductivity (m/s) for all SWRTs					**1.9×10^{-8}**
Highest Hydraulic Conductivity (m/s) for all SWRTs					**3.4×10^{-7}**

The hydraulic conductivity results ranged from 2.3×10^{-9} m/s to 3.4×10^{-7} m/s, with an overall geometric mean of 1.9×10^{-8} m/s.

The borehole records (**Appendix B**) indicate that both tested wells are screened across the water-bearing unit silty clay. The observed geometric mean of hydraulic conductivity estimates is approximately 10^{-8} m/s for the silty clay till unit and is within the textbook range for silty loess and glacial till materials denoted by Freeze & Cherry (1979).

As a conservative estimate, GEMS recommends using the highest observed hydraulic conductivity result of 3.4×10^{-7} m/s to forecast the overburden dewatering rate.

4.5 Groundwater Quality

The water quality discharged by the dewatering system during construction is expected to be similar to in-situ groundwater quality.

On 19 September 2022, a groundwater sample was collected from borehole MW204S to characterize the in-situ groundwater quality at the Site. The water quality analysis results are included in **Appendix D**.

Water quality results were compared to the following criteria:

- City of Toronto Storm Sewer Discharge Use By-Law
- City of Toronto Sanitary and Combined Sewers Discharge Guidelines

The water quality exceeded the City of Toronto Storm Sewer Discharge Use By-law criteria for Total Suspended Solids (TSS) and Total Manganese (Mn). The water quality did not exceed any criteria outlined by the City of Toronto Sanitary and Combined Sewers Discharge Guidelines.

Exceedances were identified and are summarized in **Table 4.5,** with the criteria exceeded in bold.

Table 4.5: Water Quality Results Exceeding Discharge Criteria

Water Quality Parameters	Units	MW204 Results	Storm Criteria	Sanitary Criteria
Total Suspended Solids (TSS)	mg/L	19	15	350
Total Manganese (Mn)	ug/L	300	50	5000

Groundwater quality should be expected to change over time during active construction dewatering. A dewatering contractor should assess the quality of current groundwater conditions before any water-taking and discharging activities.

5.0 Short and Long-Term Discharge Rates

5.1 Short-Term Construction Dewatering

A construction dewatering system design may include well points, several sump pumps, and a network of gravity drains. Implementing a dewatering system is the responsibility of the property owner. A qualified dewatering contractor with experience in construction dewatering should be retained to design and outline the methodology of the dewatering system.

Dewatering estimates have been calculated assuming an excavation invert of 83.10 masl. To achieve a groundwater level 1.0 m below the lowest base of excavation, groundwater levels need to be lowered to 82.10 masl.

A conceptual sump dewatering model has been used to forecast the dewatering rates. For calculations, the bottom of the sump pit has been assumed to be located 1.0 m deeper than the excavation invert.

5.2 Radius of Influence

Calculations for dewatering effects typically require estimation of the radius of influence (ROI) for the construction of the underground parking levels. This project will surround the excavation with a fully interlocking caisson wall set into bedrock and therefore the ROI will be contained within the excavation area.

5.3 Pumping Rate Calculations

Dewatering was simulated by analyzing flow to an excavation in an unconfined aquifer. The calculation for the dewatering of the rectangular excavation is based on a scenario that models flow into a circular pit with a calculated equivalent radius reflective of the area to be dewatered.

Flows into the excavation sides and base were calculated separately using the following analytical solutions (Marinelli & Niccoli, 2000)

$$Q_h = (pi)(K)(H^2 - h^2)/\ln(R/r)$$

$$Q_v = 4r(K_h/sqrt(K_h/K_v))(H - h)$$

Where the symbols and input values are as follows:

- Q_h = Discharge flow through the sides of excavation (L/min)
- Q_v = Discharge flow through the base of excavation (L/min)
- K_h = Horizontal Hydraulic conductivity = 3.4 x 10^{-7} m/s
- K_v = Vertical Hydraulic conductivity = 3.4 x 10^{-8} m/s (assuming anisotropy ratio of 0.1)
- H = Head of pre-construction static water level = 88.27 masl
- h = Head of target water level above datum = 0.0 masl
- r = Effective radius of open excavation

5.4 Construction Dewatering Rates

Assuming sump pits are used during excavation, the estimated maximum dewatering rate is 7,306 litres/day (5.1 litres/min).

For the purpose of permitting applications for dewatering, GEMS recommends using the forecasted dewatering rate with a 1.5 safety factor to account for variability in site soil composition and groundwater fluctuation. After applying the safety factor, the resulting pumping rate is 10,958 L/day (7.6 L/min). The estimated maximum dewatering rate for a 15 mm rainfall event is 30,000 L/day (20.8 L/min). Therefore, the total maximum pumping rate is rounded to 41,000 L/day (28.5 L/min) for permitting.

A summary of the construction dewatering rates is outlined in **Table 5.3.**

Table 5.3: Construction Dewatering Rate Summary

Dewatering	Dewatering Rate	1.5 Safety Factor
Groundwater	7,306 L/day (5.1 L/min)	10,958 L/day (7.6 L/min)

15 mm Rainfall Contribution	30,000 L/day (20.9 L/min
Maximum with SF and rainfall contribution	**41,000 L/day* (28.5 L/min)**

**Rounded for permitting*

Based on the above estimate, a Permit to Take Water is not required for water taking during dewatering and construction of the proposed development, as the forecast dewatering rate is below 400,000 L/day. An Environmental Activity and Sector Registry (EASR) is also not required because the estimated maximum groundwater takings during dewatering is less than 50.000 L/day.

A short-term discharge agreement with the City of Toronto will be required before discharging water into any sewers owned by the City.

5.5 Long-Term Seepage Rates

Post-construction, permanent groundwater drainage is expected to be negligible based on the following factors:

- The foundation will incorporate a nearly impermeable, full-caisson design to greatly restricts the flow of groundwater into the foundation drainage system.
- The soil across the site displays very low hydraulic conductivity (geometric mean of 1.9 x 10^{-8} m/s) therefore the movement of groundwater will be naturally inhibited.

An estimate was made using the analytical solutions for flow into an excavation described in section 5.3 but with the application of lower hydraulic conductivity to account for the presence of a fully interlocking caisson wall keyed into bedrock (K_h = 3.0 x 10^{-9}m/s).

The resulting long-term seepage rate is estimated to be 64.8 L/day (0.05 L/min). After the application of a safety factor of 1.5 the maximum long-term discharge estimate is 97.3 L/day (0.07 L/min).

Since the volume of water entering the sump will be less than 100 L/day, the sump will likely fill overtime and then discharge the full volume of the sump in one day. Therefore, for permitting, it is recommended that the volume of the sump be used as the maximum discharge volume per day.

6.0 Potential for Adverse Effects

The following section identifies the potential for adverse environmental effects resulting from the proposed construction dewatering program.

6.1 Regulated and Sensitive Areas

According to The Ministry of Environment, Conservation and Parks' (MECP) Source Protection Information Atlas (MECP, 2021), the Site is not located in an area of development control as defined by the Niagara Escarpment Planning & Development Act. The Site is also not located in the Oak Ridges Moraine Conservation Area as defined by the Oak Moraine Conservation Plan.

There are no Toronto and Region Conservation Authority (TRCA) regulated areas within the zone of influence of the Site.

6.2 MECP Well Records and Groundwater Resources

The City of Toronto municipal water services the area within 500 m of the Site. The City of Toronto obtains their water supply from Lake Ontario, therefore, there is no potential for groundwater interference complaints during construction dewatering activities.

A copy of the Ministry of Environment, Conservation and Parks (MECP) well listings within 500 m of the Site are provided in **Appendix E**. The wells within 500 m of the Site are displayed in **Figure 3**.

There are two hundred and eighty (280) wells identified within the 500 m area surrounding the Site. There are seventy (70) monitoring wells, fifty-seven (57) monitoring and test holes, forty (40) test holes, and one (1) municipal well used as an observation well. The remaining ten (10) wells are not available or not used. Therefore, no water supply wells or domestic wells are expected to be impacted by construction dewatering. Water-taking activities related to construction dewatering are not expected to impact any of the wells near the Site, and no monitoring is recommended.

An MECP licensed drill contractor should properly decommission all monitoring wells at the Site prior to the existing building's demolition.

6.3 Settlement

Since the method of dewatering will be via sump pumping and construction of the building will use of full interlocking caisson walls surrounding the site and socketed into bedrock, GEMS does not anticipate any settlement issues during construction dewatering or long-term discharge.

6.1 Recommended Additional Fieldwork and Monitoring

The proposed monitoring and additional fieldwork are recommended during temporary construction dewatering:

If dewatering discharge is directed to the City of Toronto sanitary or storm sewer, GEMS recommends the following monitoring for water quality:

Location:	Discharge outlet pipe or sampling port of the dewatering system.
Parameters:	City of Toronto sewer use By-Law
Schedule:	First sample is recommended to be obtained within the first two (2) days of discharge start. Routine samples are recommended to be obtained monthly thereafter.
Trigger:	If one or more parameters have a concentration above the By-Law.
Mitigation:	Filtration/treatment approaches would be reviewed on a specific basis. Upon installation of a filtration/treatment system, an additional sample should be performed to ensure compliance with the criteria.
Reporting:	As required, all results will be reported to the project supervisor for submission to the City of Toronto or the MECP.

Monitoring of the discharge water quantity is required to ensure compliance with the discharge agreement. GEMS recommends the following program for monitoring the groundwater taking and discharge volumes:

Location:	A flow meter attached to the discharge pipe of the dewatering system.
Parameter:	Total volume of discharge, date, and time of measurement.
Schedule:	Minimum of daily recording by on-Site personnel, with values reported to the Project supervisor weekly for submission to the City, and/or Region.
Trigger:	Discharge volume exceeds the maximum rate of dewatering specified in the discharge agreement.
Mitigation:	Immediately reduce the pumping rate so that discharge is within permitted limit.
Reporting:	Values will be reported to the Project supervisor weekly for submission to the City, and/or Region

Additional Fieldwork: Well decommissioning is required before construction. A licensed well contractor should decommission any inactive wells within the Site, according to Ontario Regulation 903. This regulation applies to any existing monitoring wells.

7.0 Conclusion

Based on the above analysis, GEMS offers the following conclusions and recommendations for the proposed reconstruction of 152-164 Bathurst Street and 623-627 Richmond Street West, Toronto, Ontario:

- The geology within the Site is characterized by Bevelled Till Plains, generally composed of silty clay till.
- Hydraulic conductivity tests for the silty clay till water bearing unit ranges from 2.31 x 10^{-9} m/s to 3.38 x 10^{-7} m/s, with a geometric mean of 1.89 x 10^{-8} m/s. Groundwater table at the Site ranges between 82.32 – 88.27 masl. Water level measurements from MW201D represent the pressure head within the bedrock and do not reflect the water table.
- Groundwater quality at the Site currently exceeds the City of Toronto Storm Sewers Discharge Guidelines for Total Suspended Solids (TSS) and Total Manganese (Mn). It is recommended that an additional sample be obtained from the dewatering wells once installed.
- The short-term discharge volume for construction dewatering is estimated to be 7,306 L/day (5.1 L/min).
- The estimated maximum dewatering rate for a 15 mm rainfall event is 30,000 L/day (20.8 L/min).
- When a safety factor of 1.5 is applied, the maximum forecasted dewatering rate is 40,958 L/day (28 L/min) for precipitation, surface runoff, and stormwater infiltration entering the excavation area. This is rounded to 41,000 (28 L/min) for permitting purposes.
- The zone of influence for construction dewatering will be confined within the boundaries of the excavation area by fully interlocking caissons set into the bedrock.

- Long-term dewatering of groundwater will be negligible due to the use of caissons set into bedrock around the foundation perimeter and the low-hydraulic conductivity silt and clay soils that are prevalent within the subsurface. A maximum long-term discharge rate of 97.3 L/day (0.07 L/min) has been estimated using a safety factor of 1.5. It is recommended that the volume of the sump be used as the maximum discharge volume per day for permitting.
- Well-decommissioning will be required before construction. A licensed well contractor should decommission any inactive wells within the Site, according to Ontario. A licensed well contractor should decommission any inactive wells within the Site, according to Ontario.

8.0 Limitations

Groundwater Environmental Management Services Inc. (GEMS) has prepared this report for our client and its agents exclusively. GEMS accepts no responsibility for any damages that third parties may suffer resulting from decisions or actions based on this report.

The findings and conclusions are site-specific and were developed in a manner consistent with the level of care and skill normally exercised by environmental professionals currently practicing under similar conditions in the area. Changing assessment techniques, regulations, and site conditions mean that environmental investigations and their conclusions can quickly become dated, so this report is current up to two years from the published date. The report should not be used after that without GEMS' review/approval.

The project has been conducted according to our instructions and work program. Additional conditions and limitations on our liability are outlined in our work program/contract. No warranty, expressed or implied, is made.

9.0 References

Chapman, L. J., & Putnam, D. F. (2007). The Physiography of Southern Ontario: Ontario Geological Survey, 3rd edition. Ontario Geological Survey.

City of Toronto Zoning By-law 569-2013 (2020). Zoning Map. City of Toronto.

Eyles, N. 1997. Chapter 2. Environmental Geology of a Supercity: The Greater Toronto Area. In Eyles, N. (Ed), Environmental Geology of Urban Areas, Geological Association of Canada, Geotext #3, 7-80.

Freeze, R. A., & Cherry, J. A. (1979). Groundwater. Englewood Cliffs, New Jersey: Prentice Hall. ISBN 0-13-365312-9.

Google Earth. (2022). [Street view of 623 Richmond Street West, Toronto, ON]

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bull. No. 36, Waterways Exper. Sta. Corps of Engrs, U.S. Army, Vicksburg, Mississippi, pp. 1-50.

Marinelli, F. and Niccoli, W.L. (2000), Simple Analytical Equations for Estimating Ground Water Inflow to a Mine Pit. Groundwater, 38: 311-314. https://doi.org/10.1111/j.1745-6584.2000.tb00342.x

Karrow, PF. 1967. Pleistocene geology of the Scarborough area. Ontario Geological Survey, Report 46, Ontario Department of Mines.

Kirkor Architects and Planners (2022). Building Sections 152-164 Bathurst Street and 623-627 Richmond Street West.

MECP. (2021, March). Source Protection Information Atlas. Retrieved from https://www.lioapplications.lrc.gov.on.ca/SourceWaterProtection/index.html?viewer=SourceWaterProtection.SWPViewer&locale=en-CA

OGS. (1991a). Quaternary Geology of Southern Ontario Map 2556. Southern sheet. Queens Printer for Ontario.

OGS. (1991b). Bedrock Geology of Ontario of Southern Ontario Map 2544. Southern sheet. Queens Printer for Ontario.

ORMGP (2022). Cross Sections Preview Versions 2.0. Retrieved from https://partners.oakridgeswater.ca/CrossSection

PGL Environmental Consultants (2022). 152-164 Bathurst Street and 623-627 Richmond Street West Toronto, ON, Hydrogeological Impact Assessment.

10.0 Closing

We trust this information meets your current requirements. Please do not hesitate to contact the undersigned should you have any questions or require additional information.

Yours truly,

Groundwater Environmental Management Services Inc.

Prepared By:

Kenley Bairos

Kenley Bairos, M.Sc., G.I.T

Hydrogeologist

Reviewed By:

PROFESSIONAL GEOSCIENTIST ONTARIO
Nov 1, 2022
LAURA A.T. MAHARAJ
PRACTISING MEMBER
2497

Laura Maharaj

Laura Maharaj, B.Sc., P.Geo

Hydrogeologist

Figures

Figure 1

Regional Location Plan

Legend

Site: 152-164 Bathurst Street and 623-627 Richmond Street, Toronto

GEMS
Groundwater Environmental Management Services

Client: **Toronto (Bathurst & Richmond) LP**

Date: October 2022

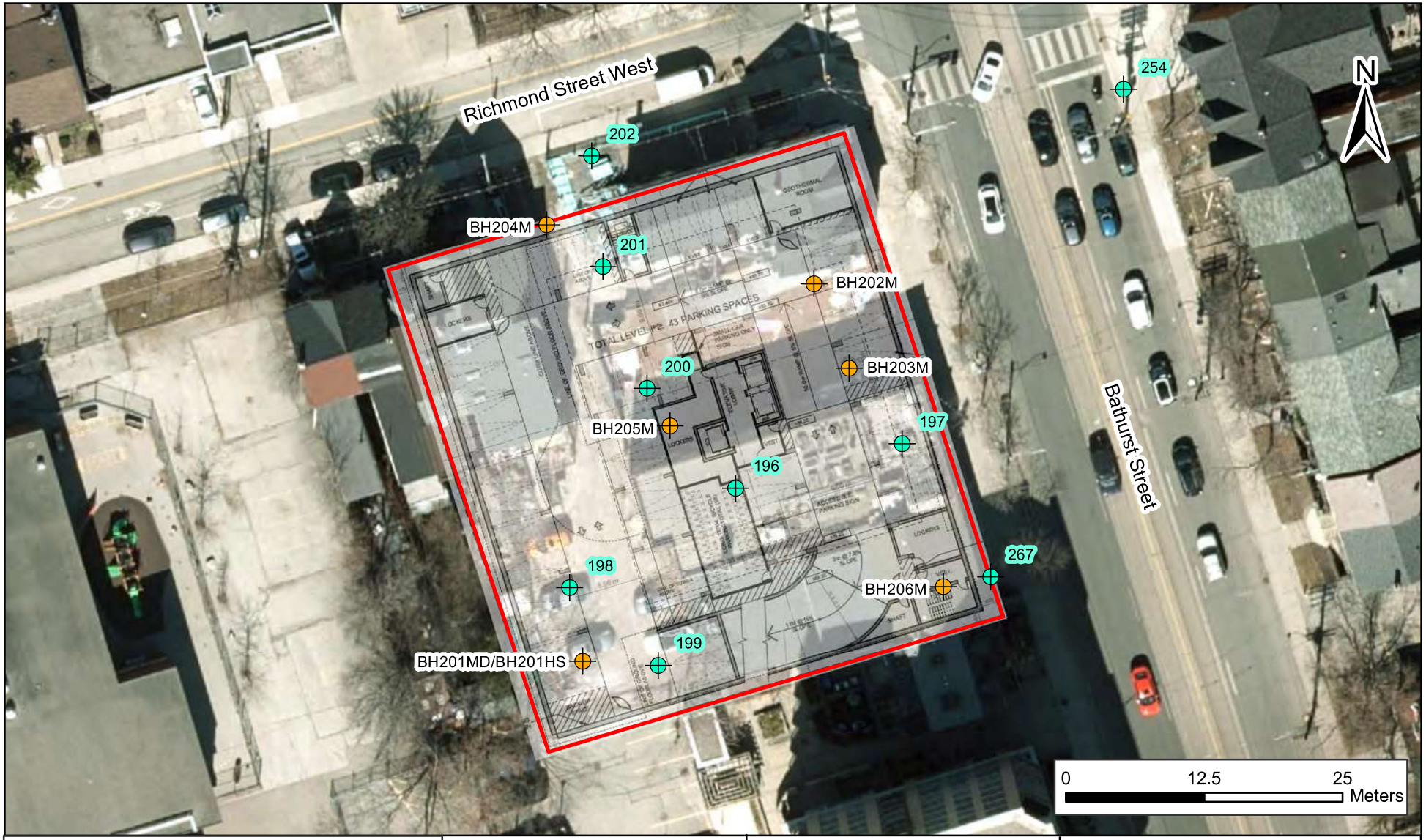
Scale: 1:20,000

Title:	Figure No.	Project No.	Drawn By:
Regional Location Plan	1	23-1633	JP

Source: ESRI Basemap
WGS1984 UTM Zone 17N

Figure 2

Detailed Site Plan



Legend

- Site: 152-164 Bathurst Street and 623-627 Richmond Street, Toronto
- Monitoring well
- MECP wells

GEMS
Groundwater Environmental Management Services

Client: **Toronto (Bathurst & Richmond) LP**

Date: October 2022

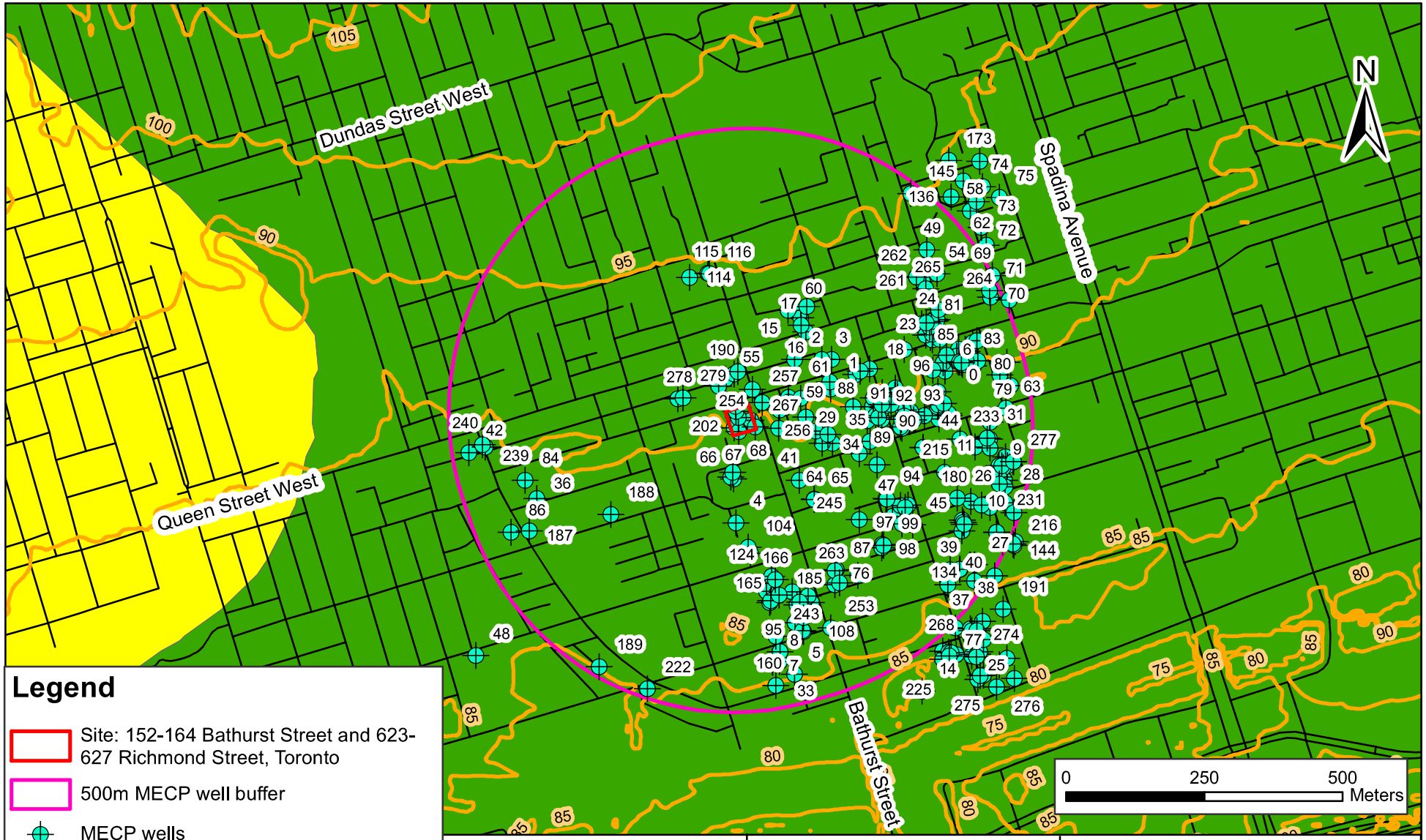
Scale: 1:500

Title:	Figure No.	Project No.	Drawn By:
Detailed Site Plan	2	23-1633	JP

Source: ESRI Basemap
WGS1984 UTM Zone 17N

Figure 3

Surface Geology and MECP Wells



Legend

- Site: 152-164 Bathurst Street and 623-627 Richmond Street, Toronto
- 500m MECP well buffer
- MECP wells
- 5m contours
- Streets

Surface Geology

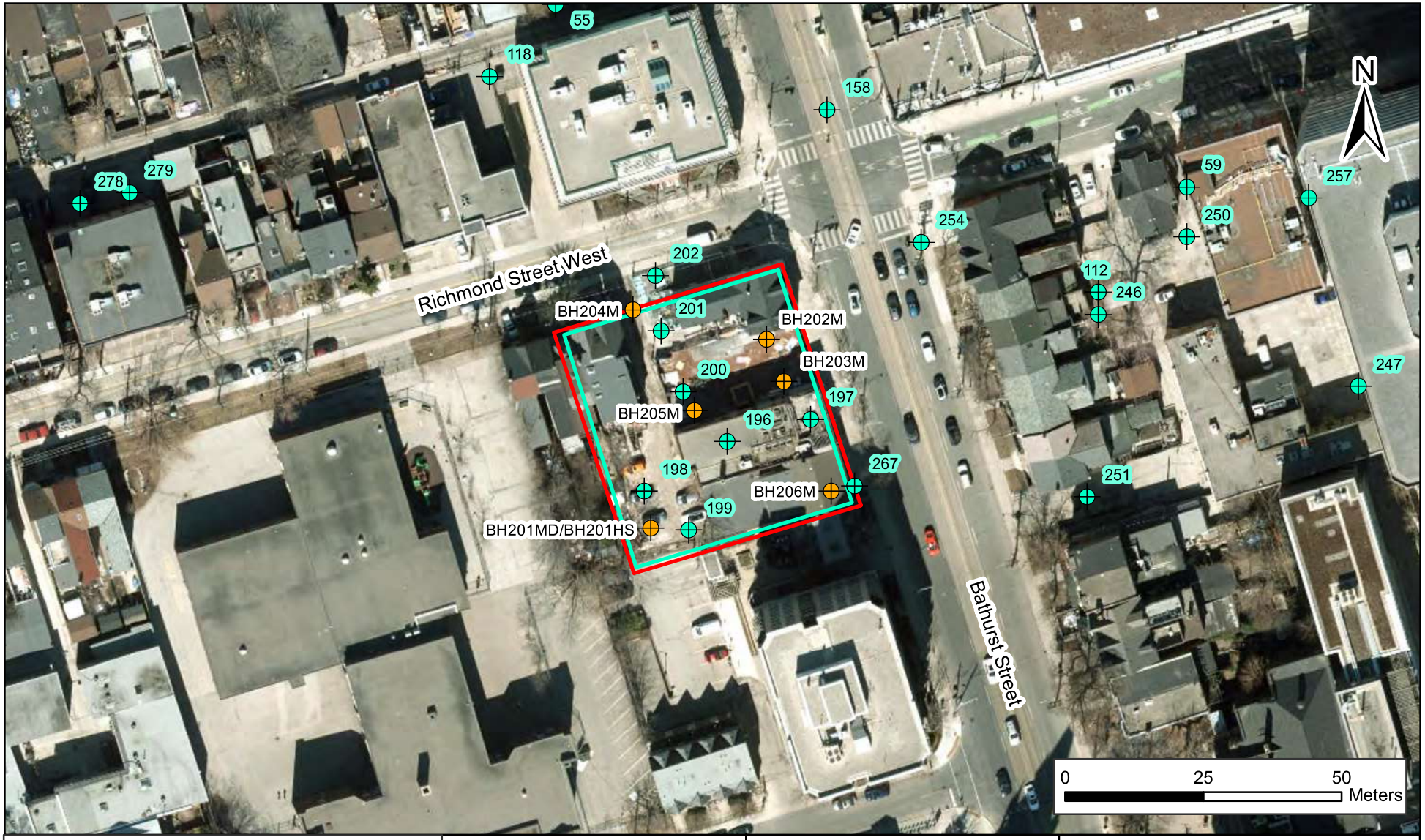
- Sand and silty sand
- Till, fine-medium sand, and laminated silt and clay

GEMS
Groundwater Environmental Management Services

Client: Toronto (Bathurst & Richmond) LP			Date: October 2022
			Scale: 1:10,000
Title: Surface Geology and MECP Wells	Figure No. 3	Project No. 23-1633	Drawn By: JP
			Source: ESRI Basemap WGS1984 UTM Zone 17N

Figure 4

Dewatering Area Plan



Legend

- Site: 152-164 Bathurst Street and 623-627 Richmond Street, Toronto
- Dewatering area
- Monitoring well
- MECP wells

GEMS
Groundwater Environmental Management Services

Client: Toronto (Bathurst & Richmond) LP			Date: October 2022
			Scale: 1:1,000
Title: Dewatering Area	Figure No. 4	Project No. 23-1633	Drawn By: JP
			Source: ESRI Basemap WGS1984 UTM Zone 17N

Appendix A

Architectural Drawings

RICHMOND ST. W.

NEIGHBOURHOODS DESIGNATION

FIRE ROUTE

DEPRESSED CURB

DRIVEWAY ENTRANCE AS PER CITY OF TORONTO STANDARD T-310.050-1

SHORT TERM RESIDENTIAL BICYCLE PARKING (14)

PRINCIPAL RESIDENTIAL ENTRANCE

SIAMESE CONNECTION

EXIT

EXISTING PATIO RETAIL

PEDESTRIAN R.O.W

LINE OF GROUND FLOOR

8.11 m

6.85 m

1.00 m

2.70 m

20.15 m

SIAMESE TO ENTRANCE DISTANCE

HYDRANT TO SIAMESE 49.9m

EXISTING 2.5 STOREY HERITAGE BUILDING

LINE OF CURB

H=12.55m

H=15.5m

H=21.8m

H=31.05m

1.00 m

1.50 m

2.40 m

4.90 m

4.90 m

2.10 m

RETAIL

6.25 m

MECHANICAL PENTHOUSE (GREEN ROOF)

PROPOSED 18 STOREY RESIDENTIAL TOWER

10.37 m

1.50 m

0.87 m

1.50 m

2.50 m

3.87 m

SIAMESE CONNECTION

HYDRANT TO SIAMESE 49.9m

23.75 m

12.93 m

PRIVATE TERRACES AT LEVEL 4

PRIVATE TERRACES AT LEVEL 5

PRIVATE TERRACES AT LEVEL 7

GAS METER LOCATION AT GRADE

23.80 m

H=59.9m

13.25 m

3.50 m

2.75 m

7.00 m

3 STOREYS

4 STOREYS

6 STOREYS

AMENITY POPUP (GREEN ROOF)

RETAIL GARBAGE ROOM @ GRADE

LONG TERM RETAIL BICYCLE ROOM @ GRADE

30.25 m

9.40 m

MOVING ROOM @ GRADE

H=65.9m

RETAIL

EXISTING FIRE HYDRANT

1.55 m

5.67 m

1.50 m

8.47 m

7.57 m

1.55 m

VISITOR BICYCLE ROOM @ GRADE

RESIDENTIAL GARBAGE ROOM @ GRADE

OUTDOOR AMENITY AT ROOF

8.95 m

LINE OF U/G

LINE OF GROUND FLOOR

LINE OF GROUND FLOOR

TYPE 'G' LOADING @ GRADE

H=59.2m

12.88 m

LOADING

18 STOREYS

1.55 m

RETAIL

2 STOREY AT LEVEL 3

2.70 m

9 STOREYS

PRIVATE TERRACE AT LEVEL 10

H=31.05m

BATHURST STREET

POTENTIAL BIKE SHARE STATION LOCATION

RAMP DN TO LEVEL P1

10.00 m

GREEN ROOF 1 STOREY

4.35 m

6 STOREYS

PRIVATE TERRACE AT LEVEL 7

H=21.8m

H=5.5m

9.45 m

3 STOREYS

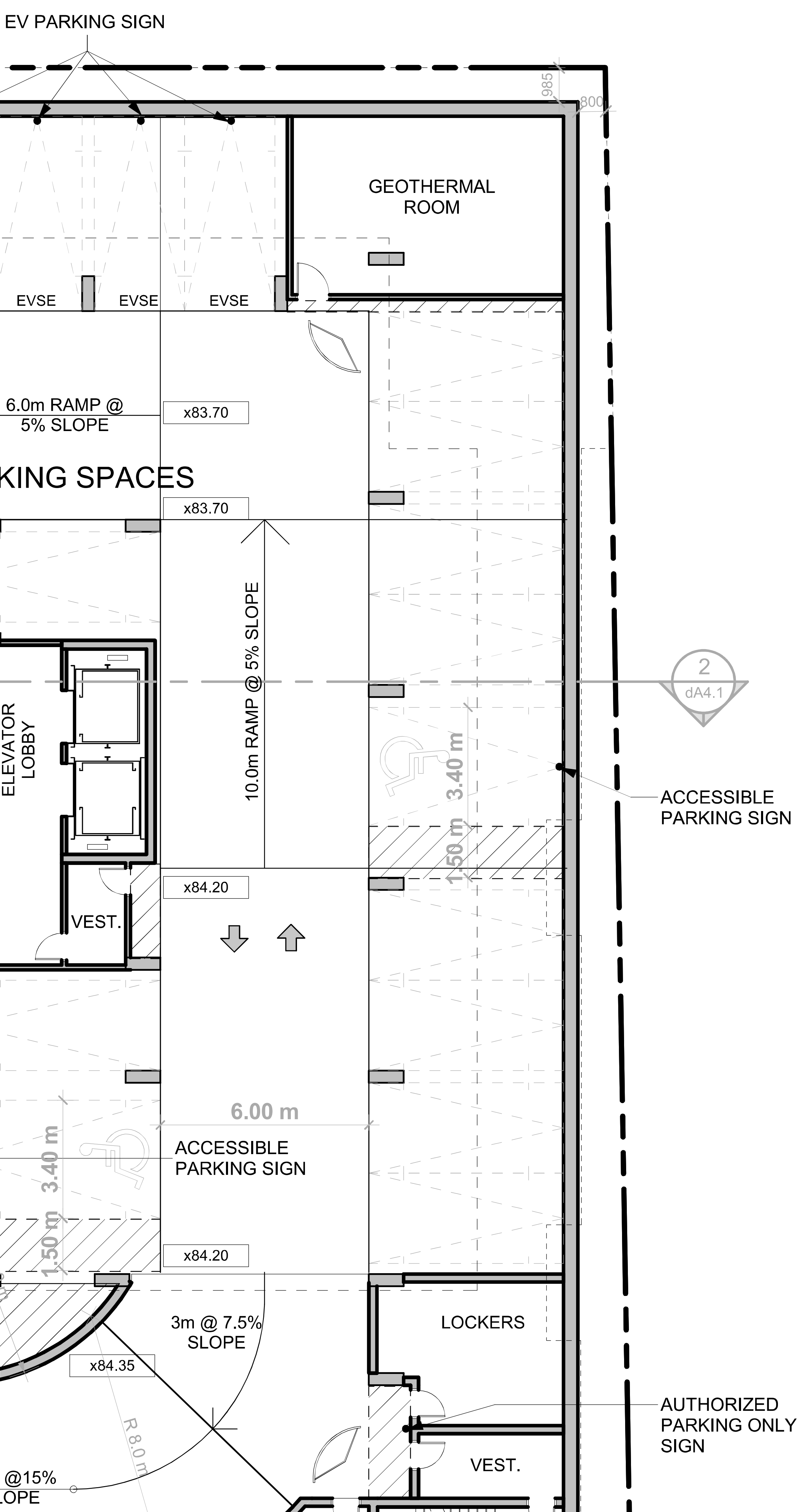
OUTDOOR AMENITY AT LEVEL 4

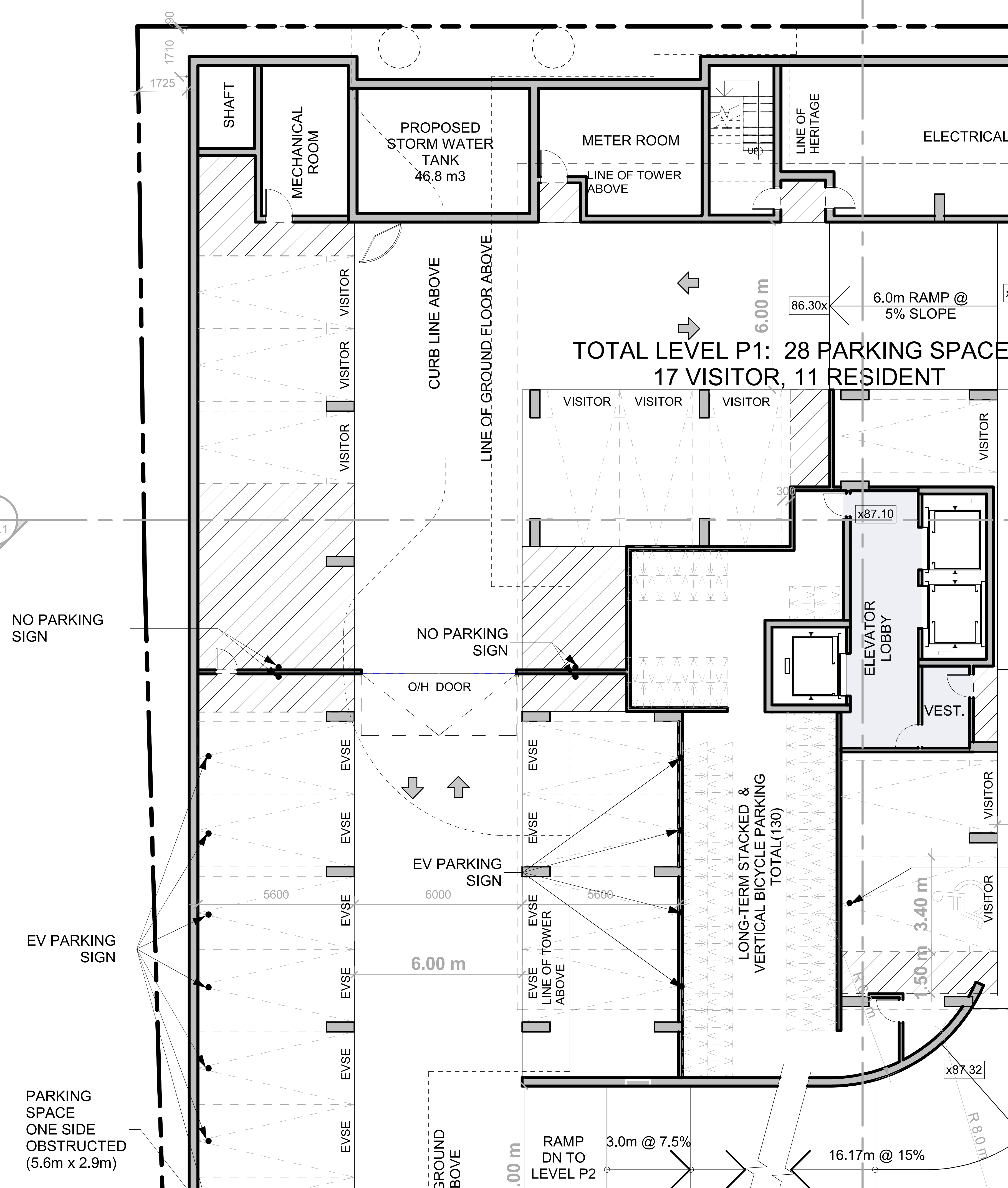
H=12.55m

2.00 m

EXIT

FIRE ROUTE


EV PARKING SIGN
GEOTHERMAL ROOM
EVSE
6.0m RAMP @ 5% SLOPE
x83.70
KING SPACES
10.0m RAMP @ 5% SLOPE
ELEVATOR LOBBY
VEST.
x84.20
ACCESSIBLE PARKING SIGN
6.00 m
3.40 m
1.50 m
3m @ 7.5% SLOPE
x84.35
R 8.0 m
LOCKERS
AUTHORIZED PARKING ONLY SIGN
@15% OPE


SHAFT
MECHANICAL ROOM
PROPOSED STORM WATER TANK 46.8 m3
METER ROOM
LINE OF TOWER ABOVE
LINE OF HERITAGE
ELECTRICAL
1725
CURB LINE ABOVE
LINE OF GROUND FLOOR ABOVE
VISITOR
86.30x
6.0m RAMP @ 5% SLOPE
6.00 m
TOTAL LEVEL P1: 28 PARKING SPACE
17 VISITOR, 11 RESIDENT
x87.10
ELEVATOR LOBBY
VEST.
NO PARKING SIGN
O/H DOOR
EVSE
EV PARKING SIGN
5600
6000
LONG-TERM STACKED &
VERTICAL BICYCLE PARKING
TOTAL(130)
3.40 m
1.50 m
x87.32
R 8.0 m
PARKING SPACE ONE SIDE OBSTRUCTED (5.6m x 2.9m)
RAMP DN TO LEVEL P2
3.0m @ 7.5%
16.17m @ 15%

Appendix B

Borehole Logs and Well Installation Details

BOREHOLE RECORD

BOREHOLE NO: **BH207**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.14 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
		TOPSOIL						
0.2		**Clayey SILT (FILL)** with rock fragments, grey, moist						90.0
0.4							Bentonite	89.8
0.6				**BH207-SS1**: Metals PAHs PHCs	■<25			89.6
0.8								89.4

End of borehole at 0.90 m

INVESTIG. METHOD: Geoprobe 420M

INVESTIG. DATE: February 25, 2021

LOGGED BY: RSC HOLE DIAM (mm): 102

Sample Notes: Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

PGL ENVIRONMENTAL CONSULTANTS

BOREHOLE RECORD

BOREHOLE NO: **BH208**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.5 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
0.2		**Sandy SILT (FILL)** with gravel, trace clay, grey and brown, moist						90.4
0.4							Bentonite	90.2
0.6				**BH208**: Metals PAHs PHCs	■<25			90.0
0.8								89.8
		End of borehole at 0.90 m						89.6

INVESTIG. METHOD: Geoprobe 420M

INVESTIG. DATE: February 25, 2021

LOGGED BY: RSC HOLE DIAM (mm): 102

Sample Notes: Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

PGL ENVIRONMENTAL CONSULTANTS

BOREHOLE RECORD

BOREHOLE NO: **BH209**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.488 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
0.2		**Silty SAND (FILL)** trace gravel, grey, moist						90.4
0.4				**BH209-SS1**: Metals PAHs PHCs	■<25		Bentonite	90.2
0.6		**Clayey SILT** trace construction debris, brown, moist						90.0
0.8				**BH209-SS2**	■<25			89.8
								89.6

End of borehole at 0.90 m

INVESTIG. METHOD: Geoprobe 420M

INVESTIG. DATE: February 25, 2021

LOGGED BY: RSC HOLE DIAM (mm): 102

Sample Notes ⋈ Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

PGL ENVIRONMENTAL CONSULTANTS

BOREHOLE RECORD

BOREHOLE NO: **BH210**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.414 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
		ASPHALT						90.4
0.2		**Silty SAND (FILL)** with gravel, grey, moist						90.2
0.4				**BH210-SS1**: Metals PAHs PHCs	■<25		Bentonite	90.0
0.6		**Clayey SILT (FILL)** trace construction debris, trace gravel, brown, moist						89.8
0.8				**BH210-SS2**	■<25			89.6

End of borehole at 0.90 m

INVESTIG. METHOD: Geoprobe 420M

INVESTIG. DATE: February 25, 2021

LOGGED BY: RSC HOLE DIAM (mm): 102

Sample Notes: Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

BOREHOLE RECORD

BOREHOLE NO: **BH211**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.365 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	PID READING (ppmv) / VAPOUR READING (ppmv)	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
		ASPHALT						
		Silty SAND (FILL) with gravel, brown, moist						
0.2		**Silty CLAY (FILL)** trace construction debris, brown, moist						90.2
0.4				**BH211-SS1**: Metals PAHs PHCs	<25		Bentonite	90.0
0.6								89.8
0.8								89.6

End of borehole at 0.90 m

INVESTIG. METHOD: Geoprobe 420M

INVESTIG. DATE: February 25, 2021

LOGGED BY: RSC HOLE DIAM (mm): 102

Sample Notes: Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

PGL ENVIRONMENTAL CONSULTANTS

BOREHOLE RECORD

BOREHOLE NO: **BH212**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.251 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
		TOPSOIL						90.2
0.2		**Clayey SILT (FILL)** with rock fragments, grey, moist		**BH212-SS1**: Metals PAHs PHCs	■<25			90.0
0.4							Bentonite	89.8
0.6		**Silty CLAY (FILL)** trace construction debris, brown, moist		**BH212-SS2**	■<25			89.6
0.8								89.4

End of borehole at 0.90 m

INVESTIG. METHOD: Geoprobe 420M

INVESTIG. DATE: February 25, 2021

LOGGED BY: RSC HOLE DIAM (mm): 102

Sample Notes: Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW201D**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.23 m**

DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
0.2	Brick Pavers 50 mm					Roadbox, J-plug	90.0
0.4	**SAND AND GRAVEL (FILL)** some clay, some silt, brown, moist					Silica Sand	89.8
0.6							89.6
0.8							89.4
1.0							89.2
1.2	**Clayey SILT (FILL)** trace construction debris, brown, moist						89.0
1.4							88.8
1.6							88.6
1.8							88.4
2.0	**Silty CLAY** some sand, trace gravel, brown, moist						88.2
2.2							88.0
2.4							87.8
2.6							87.6
2.8			**MW201D-SS3**: Metals, PAHs, PHCs				87.4
3.0							87.2
3.2							87.0
3.4							86.8
3.6							86.6
3.8							86.4
4.0	grey below 3.7		**MW201D-SS4**: Metals, PAHs, PHCs				86.2
4.2							86.0
4.4							85.8
4.6							85.6
4.8							85.4
5.0							85.2
5.2							85.0
5.4							84.8
5.6							84.6
5.8							84.4
6.0							84.2
6.2							84.0
6.4							83.8
6.6						Bentonite	83.6
6.8							83.4
7.0							83.2
7.2							83.0
7.4							82.8
7.6							82.6
7.8							82.4
8.0							82.2
8.2							82.0
8.4							81.8
8.6							81.6
8.8							81.4
9.0							81.2
9.2	**Silty SAND** trace clay, trace gravel, grey, moist			▼			81.0
9.4							80.8
9.6							80.6
9.8							80.4
10.0							80.2
10.2							80.0
10.4	**Silty CLAY** grey, moist						79.8
10.6							79.6
10.8							79.4
11.0							79.2
11.2							79.0
11.4							78.8
11.6							78.6
11.8							78.4
12.0							78.2
12.2							78.0
12.4							77.8
12.6	Weathered Shale						77.6
12.8							77.4
13.0							77.2
13.2							77.0
13.4							76.8
13.6							76.6
13.8							76.4
14.0							76.2
14.2						Silica Sand 50mm 010 Slot PVC	76.0
14.4							75.8
14.6							75.6
14.8							75.4
15.0							75.2
15.2							75.0
15.4							74.8
15.6							74.6
15.8							74.4
16.0						Slough	

End of borehole at 16.00 m

Screened interval from 12.9 m to 15.9 m below surface.
GW 9.33 mbgs
(3/17/2021)

INVESTIG. METHOD: B37X Diamond Drill
INVESTIG. DATE: February 22, 2021
LOGGED BY: RSC HOLE DIAM (mm): 203

Sample Notes ⊠ Split Spoon

PGL MULTI-TEST VAPOR LOG 2015 5660-03.GPJ PGL CANADA 2015.GDT 4/22/21

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW201S**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.23 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
0.2		Brick Pavers 50 mm			Roadbox, J-plug Silica Sand	90.0
0.4		**SAND AND GRAVEL (FILL)** some clay, some silt, brown, moist				89.8
0.6		**Clayey SILT** trace construction debris, brown, moist				89.6
0.8						89.4
1.0						89.2
1.2						89.0
1.4						88.8
1.6						88.6
1.8						88.4
2.0		**Silty CLAY** some sand, trace gravel, brown, moist				88.2
2.2						88.0
2.4						87.8
2.6					Bentonite	87.6
2.8						87.4
3.0						87.2
3.2						87.0
3.4						86.8
3.6						86.6
3.8		grey below 3.7m				86.4
4.0						86.2
4.2						86.0
4.4						85.8
4.6						85.6
4.8						85.4
5.0						85.2
5.2						85.0
5.4						84.8
5.6						84.6
5.8						84.4
6.0						84.2
6.2					Silica Sand 50mm 010 Slot PVC	84.0
6.4						83.8
6.6						83.6
6.8						83.4
7.0						83.2
7.2						83.0
7.4						82.8
7.6			▼			82.6
7.8						82.4
8.0					Slough	

End of borehole at 8.00 m

Screened interval from 4.9 m to 7.9 m below surface.
GW 7.77 mbgs
(3/17/2021)

INVESTIG. METHOD: B37X Diamond Drill
INVESTIG. DATE: February 22, 2021
LOGGED BY: RSC HOLE DIAM (mm): 203

Sample Notes

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW202**

PGL ENVIRONMENTAL CONSULTANTS

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.18 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	PID READING (ppmv) / VAPOUR READING (ppmv)	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
0.2		**Clayey SILT (FILL)** some gravel, some sand, brown, moist		**MW202-SS1**: Metals PAHs PHCs	<25			Roadbox, J-plug Silica Sand	90.0
0.4									89.8
0.6									89.6
0.8				**MW202-SS2**: Metals PAHs PHCs	<25				89.4
1.0						5			89.2
1.2									89.0
1.4				**MW202-SS3**	<25				88.8
1.6		grey, moist to dry below 1.5m						Bentonite	88.6
1.8		0.15m sand seam at 1.8m							88.4
2.0				**MW202-SS4**: Metals PAHs PHCs	<25				88.2
2.2									88.0
2.4									87.8
2.6				**MW202-SS5**	<25				87.6
2.8									87.4
3.0									87.2
3.2				**MW202-SS6/Z001**: Metals PAHs	<25				87.0
3.4		**Silty CLAY** trace gravel, brown, moist							86.8
3.6									86.6
3.8		grey below 3.8m							86.4
4.0									86.2
4.2				**MW202-SS7**	<25				86.0
4.4								Silica Sand 50mm 010 Slot PVC	85.8
4.6									85.6
4.8									85.4
5.0									85.2
5.2									85.0
5.4									84.8
5.6				**MW202-SS8**	<25				84.6
5.8									84.4
6.0									84.2
6.2									84.0
6.4				**MW202-SS9**	<25				83.8
6.6									83.6
6.8								Slough	83.4
7.0									83.2
7.2				**MW202-SS10**	<25				83.0
7.4									82.8
7.6									82.6

End of borehole at 7.60 m

Screened interval from 3 m to 6.1 m below surface.
GW 5.65 mbgs
(3/17/2021)

INVESTIG. METHOD: B37X Diamond Drill
INVESTIG. DATE: February 23, 2021
LOGGED BY: RSC HOLE DIAM (mm): 203

Sample Notes ⊠ Split Spoon

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

PGL MULTI-TEST VAPOR LOG 2015 5660-03.GPJ PGL CANADA 2015.GDT 4/22/21

WELL RECORD

WELL NO: **MW203**

PGL PROJECT NO: **5660-03.03**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

SURFACE ELEVATION: **90.33 m**

DEPTH (m)	SOIL DESCRIPTION	LABORATORY ANALYSES	PID READING (ppmv) / VAPOUR READING (ppmv)	COMPLETION NOTES	ELEVATION (m)
0.0	**Clayey SILT (FILL)** trace gravel with rock fragments, trace roots, grey, dry to moist	**MW203-SS1**: Metals PAHs PHCs	<25	Roadbox, J-plug Silica Sand	90.33
1.8	**SAND (FILL)** some gravel, brown, moist	**MW203-SS2**: Metals PAHs PHCs	<25		88.53
2.4	**Silty CLAY** grey and brown, moist	**MW203-SS3**	<25		87.93
		MW203-SS4: Metals PAHs PHCs	<25	Bentonite	
		MW203-SS5	<25		
	grey below 4m	**MW203-SS6/Z002**: VOCs	<25		
8.6	**Silty SAND** trace clay, trace gravel, grey, wet			Silica Sand 50mm 010 Slot PVC Slough	81.73

INVESTIG. METHOD: B37X Diamond Drill

INVESTIG. DATE: February 24, 2021

LOGGED BY: RSC HOLE DIAM (mm): 203

Sample Notes: Split Spoon

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

PGL MULTI-TEST VAPOR LOG 2015 5660-03.GPJ PGL CANADA 2015.GDT 4/22/21

WELL RECORD

WELL NO: **MW203**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.33 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
10.2									80.2
10.4		**Silty CLAY** grey, moist							80.0
10.6									79.8
10.8									79.6
11.0									79.4
11.2									79.2
11.4									79.0
11.6									78.8
11.8									78.6
12.0									78.4
12.2		Weathered Shale						Slough	78.2
12.4									78.0
12.6									77.8
12.8									77.6
13.0									77.4
13.2									77.2
13.4									77.0
13.6									76.8
13.8									76.6
14.0									76.4
14.2									76.2
14.4									76.0
14.6									75.8

End of borehole at 14.60 m

Screened interval from 4.9 m to 7.9 m below surface.
GW 7.13 mbgs
(3/17/2021)

PGL MULTI-TEST VAPOR LOG 2015 5660-03.GPJ PGL CANADA 2015.GDT 4/22/21

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW204**

PGL PROJECT NO: **5660-03.03**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

SURFACE ELEVATION: **90.5 m**

DEPTH (m)	SOIL DESCRIPTION	LABORATORY ANALYSES	PID READING (ppmv) / VAPOUR READING (ppmv)	COMPLETION NOTES	ELEVATION (m)
0.0	**ASPHALT**			Roadbox, J-plug	90.4
0.2	**Gravelly SAND (FILL)** with construction debris, brown, moist	**MW204-SS1**: Metals, PAHs, PHCs	<25	Silica Sand	90.2
0.4					90.0
0.6					89.8
0.8	**Clayey SILT (FILL)** brown, moist				89.6
1.0					89.4
1.2		**MW204-SS2**: Metals, PAHs, PHCs	<25		89.2
1.4					89.0
1.6					88.8
1.8	**Silty CLAY** some sand, trace gravel, brown, moist	**MW204-SS3**	<25		88.6
2.0					88.4
2.2					88.2
2.4					88.0
2.6				Bentonite	87.8
2.8		**MW204-SS4/Z004**: Metals, PAHs, PHCs	<25		87.6
3.0					87.4
3.2					87.2
3.4					87.0
3.6					86.8
3.8	grey below 3.7m				86.6
4.0					86.4
4.2					86.2
4.4					86.0
4.6					85.8
4.8					85.6
5.0					85.4
5.2					85.2
5.4					85.0
5.6					84.8
5.8					84.6
6.0					84.4
6.2				Silica Sand 50mm 010 Slot PVC	84.2
6.4					84.0
6.6					83.8
6.8					83.6
7.0					83.4
7.2					83.2
7.4					83.0
7.6					82.8
7.8					82.6
8.0					82.4
8.2					82.2
8.4					82.0
8.6	with weathered shale below 8.5m				81.8
8.8					81.6
9.0				Slough	81.4
9.2					81.2
9.4					81.0
9.6					80.8
9.8					80.6

INVESTIG. METHOD: B37X Diamond Drill

INVESTIG. DATE: February 25 - February 26, 2021

LOGGED BY: RSC HOLE DIAM (mm): 203

Sample Notes: Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW204**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.5 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
10.2		**Silty CLAY** some sand, trace gravel, brown, moist *continued from previous page*							80.4
10.4									80.2
10.6									80.0
10.8									79.8
11.0									79.6
11.2									79.4
11.4									79.2
11.6									79.0
11.8									78.8
12.0									78.6
12.2									78.4
12.4								Slough	78.2
12.6		Weathered Shale							78.0
12.8									77.8
13.0									77.6
13.2									77.4
13.4									77.2
13.6									77.0
13.8									76.8
14.0									76.6
14.2									76.4
14.4									76.2
14.6									76.0

End of borehole at 14.60 m

Screened interval from 4.9 m to 7.9 m below surface.
GW 5.38 mbgs
(3/17/2021)

PGL MULTI-TEST VAPOR LOG 2015 5660-03.GPJ PGL CANADA 2015.GDT 4/22/21

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW205**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.18 m**

DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	PID READING (ppmv) / VAPOUR READING (ppmv)	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
0.2	**Clayey SILT (FILL)** trace sand, brown, moist		**MW205-SS1**: Metals PAHs PHCs	<25			Roadbox, J-plug Silica Sand	90.0
0.4								89.8
0.6								89.6
0.8								89.4
1.0			**MW205-SS2**: Metals PAHs PHCs	<25				89.2
1.2								89.0
1.4								88.8
1.6								88.6
1.8			**MW205-SS3**	<25				88.4
2.0	**Silty CLAY** some sand, trace gravel, brown, moist							88.2
2.2								88.0
2.4			**MW205-SS4**: Metals PAHs PHCs	<25				87.8
2.6							Bentonite	87.6
2.8								87.4
3.0								87.2
3.2								87.0
3.4								86.8
3.6								86.6
3.8								86.4
4.0								86.2
4.2								86.0
4.4								85.8
4.6								85.6
4.8								85.4
5.0								85.2
5.2								85.0
5.4								84.8
5.6								84.6
5.8								84.4
6.0								84.2
6.2							Silica Sand 50mm 010 Slot PVC	84.0
6.4								83.8
6.6								83.6
6.8								83.4
7.0								83.2
7.2					▼			83.0
7.4								82.8
7.6								82.6
7.8								82.4
8.0								82.2
8.2								82.0
8.4								81.8
8.6	**Silty SAND** trace clay, trace gravel, grey, moist							81.6
8.8								81.4
9.0							Slough	81.2
9.2								81.0
9.4								80.8
9.6								80.6
9.8								80.4

INVESTIG. METHOD: B37X Diamond Drill

INVESTIG. DATE: February 24, 2021

LOGGED BY: RSC HOLE DIAM (mm): 203

Sample Notes ⊠ Split Spoon

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW205**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **90.18 m**

DEPTH (m)	SOIL TYPE	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	● PID READING (ppmv) ● ■ VAPOUR READING (ppmv) ■	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
10.2									80.0
10.4		**Silty CLAY** with weathered shale, grey, moist							79.8
10.6									79.6
10.8									79.4
11.0									79.2
11.2									79.0
11.4								Slough	78.8
11.6									78.6
11.8									78.4
12.0									78.2
12.2									78.0
12.4									77.8
12.6		Weathered Shale							77.6
12.8									77.4

End of borehole at 12.80 m

Screened interval from 4.9 m to 7.9 m below surface.
GW 7.43 mbgs
(3/17/2021)

PGL MULTI-TEST VAPOR LOG 2015 5660-03.GPJ PGL CANADA 2015.GDT 4/22/21

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

WELL RECORD

WELL NO: **MW206**

CLIENT: Originate Developments Inc.

PROJECT: 156-164 Bathurst St. & 623-627 Richmond St. West, Toronto, ON

PGL PROJECT NO: **5660-03.03**

SURFACE ELEVATION: **87.43 m**

DEPTH (m)	SOIL DESCRIPTION	SAMPLE TYPE	LABORATORY ANALYSES	PID READING (ppmv) / VAPOUR READING (ppmv)	WATER LEVEL	WELL COMPLETION	COMPLETION NOTES	ELEVATION (m)
0.2	**CONCRETE**						Roadbox, J-plug	87.2
0.4	**GRAVEL (FILL)** grey, dry						Silica Sand	87.0
0.6		MW206-SS1	Grain Size, Metals, PAHs, pH, PHCs	<25				86.8
0.8	**Silty CLAY** trace rock fragments, trace sand, brown, moist							86.6
1.0							Bentonite	86.4
1.2		MW206-SS2/ Z003	Metals, PAHs, PHCs, VOCs	<25				86.2
1.4								86.0
1.6	grey below 1.5m							85.8
1.8	some gravel at 1.65m							85.6
2.0	no sand below 1.8m							85.4
2.2		MW206-SS3						85.2
2.4								85.0
2.6								84.8
2.8		MW206-SS4	Metals, PAHs, PHCs	<25				84.6
3.0							Silica Sand 50mm 010 Slot PVC	84.4
3.2								84.2
3.4					▼			84.0
3.6		MW206-SS5		<25				83.8
3.8								83.6
4.0								83.4
4.2		MW206-SS6		<25				83.2
4.4								83.0
4.6								82.8
4.8		MW206-SS7		<25				82.6
5.0							Slough	82.4
5.2								82.2
5.4		MW206-SS8		<25				82.0

End of borehole at 5.50 m

Screened interval from 1.5 m to 4.6 m below surface.

Borehole located within the basement of Site address
GW 3.48 mbgs
(3/17/2021)

INVESTIG. METHOD: Geoprobe 420M

INVESTIG. DATE: February 24, 2021

LOGGED BY: RSC HOLE DIAM (mm): 102

Sample Notes: Macro Core Sampler

THIS LOG IS FOR ENVIRONMENTAL PURPOSES ONLY.

Borehole Logs by Terrapex Environmental

PGL
ENVIRONMENTAL CONSULTANTS

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH201MD**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.23	
LOCATION: Toronto, Ontario	NORTHING: 4833784.86	EASTING: 628704.11	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		BRICK PAVERS 50 mm FILL, gravelly sand and clayey silt	0	90	17	20	1A		17		Borehole advanced with hollow stem augers. 50 mm diameter monitoring well installed.
		FILL firm to stiff, moist brown and black clayey silt trace brick fragments	0.5	89.5	8	21	1B				
			1	89		17	2		8		
			1.5	88.5	13	16	3		13		
			2	88							
			2.5	87.5	22	16	4		22		
			3	87	15	22	5		15		
		brown --- grey	3.5	86.5							
			4	86	18		6		18		
			4.5	85.5	14	15	7		14		
		very stiff to stiff --- firm moist SILTY CLAY some sand to sandy trace gravel (TILL)	5	85							
			5.5	84.5							
			6	84	5	17	8		5		
			6.5	83.5	67						
			7	83							
			7.5	82.5	6	19	9		6		
			8	82							
			8.5	81.5		15	10A				
		dense, moist, grey SILTY fine SAND trace clay, trace gravel	9	81	34	16	10B		34		
			9.5	80.5							

TERRAPEX

LOGGED BY: JC | DRILLING DATE: February 22, 2021

REVIEWED BY: VN

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH201MD**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.23	
LOCATION: Toronto, Ontario	NORTHING: 4833784.86	EASTING: 628704.11	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	dense, moist, grey SILTY fine SAND trace clay, trace gravel	10	80							
	very dense SILTY CLAY (TILL) and weathered SHALE COMPLEX	10.5	79.5	47	10	11		47		
		11	79							
		11.5	78.5	40	14	12		40		
		12	78		12	13A		100+		
		12.5	77.5	100+		13B				
	grey weathered SHALE	13	77	100+	5	14		100+		TCR 85% RQD 61%
	grey SHALE with limestone interbeds slightly weathered moderately fractured	13.5	76.5			15				Unconfined compressive strength at 13.7 m depth is 53.7 MPa.
		14	76							TCR 100% RQD 93%
		14.5	75.5							
		15	75			16				
		15.5	74.5							
	END OF BOREHOLE									

TERRAPEX

LOGGED BY: JC | DRILLING DATE: February 22, 2021

REVIEWED BY: VN |

CLIENT: PGL Environmental Consultants	METHOD: Augering		**BH No.: BH201MS**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.23	
LOCATION: Toronto, Ontario	NORTHING: 4833784.86	EASTING: 628704.11	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		REFER TO BOREHOLE BH201MD FOR SOIL STRATIGRAPHY	0 – 7.5	90 – 82.5							Borehole advanced with hollow stem augers. 50 mm diameter monitoring well installed.
		END OF BOREHOLE									

TERRAPEX

LOGGED BY: EM | DRILLING DATE: February 23, 2021

REVIEWED BY: VN | Page 1 of 1

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH202M**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.18	
LOCATION: Toronto, Ontario	NORTHING: 4833816.34	EASTING: 628723.99	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		FILL stiff to very stiff, moist dark brown and grey clayey silt occasional pockets of crusher run limestone and gravelly sand	0 – 3.5	90 – 86.5	24, 9, 16, 17, 18		1A, 1B, 2, 3A, 3B, 4A, 4B, 5A, 5B		24, 9, 16, 17, 18		Borehole advanced with hollow stem augers. 50 mm diameter monitoring well installed.
		stiff to firm, moist, grey SILTY CLAY some sand to sandy trace gravel (TILL)	3.5 – 8	86.5 – 82	9, 8, 4, 6, 4, 4		6, 7, 8, 9, 10, 11		9, 8, 4, 6, 4, 4		
		END OF BOREHOLE									

TERRAPEX

LOGGED BY: EM | DRILLING DATE: February 23, 2021

REVIEWED BY: VN |

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH203M**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.33	
LOCATION: Toronto, Ontario	NORTHING: 4833809.60	EASTING: 628727.77	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL 100 mm	0	90	15	17	1A				Borehole advanced with hollow stem augers.
			0.5	89.5	9	7	1B		15		
		FILL stiff, moist, brown and grey clayey silt occasional shale fragments occasional pockets of crusher run limestone	1	89			2		9		50 mm diameter monitoring well installed in straight augered borehole adjacent to sampled borehole.
			1.5	88.5	25	15	3A				
			2	88			3B		25		
			2.5	87.5	14	18	4		14		
		brown	3	87	8	17	5		8		
		grey	3.5	86.5							
			4	86	7	16	6		7		
		stiff to firm, moist SILTY CLAY some sand to sandy trace gravel (TILL)	4.5	85.5	3	18	7		3		
			5	85							
			5.5	84.5							
			6	84	7	3	8		7		
			6.5	83.5							
			7	83							
			7.5	82.5	8	20	9		8		
			8	82							
			8.5	81.5							
		dense, wet, grey SILTY fine SAND trace clay, trace gravel	9	81	40	17	10		40		
			9.5	80.5							

TERRAPEX

LOGGED BY: JC | DRILLING DATE: February 24, 2021

REVIEWED BY: VN |

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH203M**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.33	
LOCATION: Toronto, Ontario	NORTHING: 4833809.60	EASTING: 628727.77	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		dense, wet, grey SILTY fine SAND, trace clay, trace gravel	10								
			10.5	80							
		hard SILTY CLAY (TILL) and weathered SHALE COMPLEX	11	79.5	39	12	11		39		
			11.5	79							
			12	78.5	100+	9	12		100+		TCR 100% RQD 46%
			12.5	78							
		grey SHALE with limestone interbeds slightly weathered moderately fractured	13	77.5			13				TCR 100% RQD 94%
			13.5	77							Shale unconfined compressive strength at 13.5 m depth is 17.1 MPa.
			14	76.5			14				
			14.5	76							
		END OF BOREHOLE									

TERRAPEX

LOGGED BY: JC	DRILLING DATE: February 24, 2021
REVIEWED BY: VN	Page 2 of 2

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH204M**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.50	
LOCATION: Toronto, Ontario	NORTHING: 4833822.21	EASTING: 628701.54	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		ASPHALTIC CONCRETE 50 mm	0	90.5							Borehole advanced with hollow stem augers.
		FILL moist, brown and black gravelly sand with brick pieces and ash	0.5	90	33	14	1		33		50 mm diameter monitoring well installed.
		FILL firm, moist, brown clayey silt	1	89.5	6	23	2		6		
			1.5	89		30	3A				
					6	22	3B		6		
			2	88.5							
			2.5	88	21	18	4		21		
			3	87.5							
					19	17	5		19		
		brown	3.5	87							
		-----									
		grey	4	86.5	11	15	6		11		
		very stiff to firm, moist SILTY CLAY some sand to sandy trace gravel (TILL)	4.5	86							
					11	18	7		11		
			5	85.5							
			5.5	85							
			6	84.5							
					5	18	8		5		
			6.5	84							
			7	83.5							
			7.5	83							
					7	20	9		7		
			8	82.5							
			8.5	82							
		hard SILTY CLAY (TILL) and weathered SHALE COMPLEX	9	81.5							
					24	20	10		24		
			9.5	81							

TERRAPEX

LOGGED BY: JC | DRILLING DATE: February 26, 2021

REVIEWED BY: VN |

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH204M**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.50	
LOCATION: Toronto, Ontario	NORTHING: 4833822.21	EASTING: 628701.54	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		hard SILTY CLAY (TILL) and weathered SHALE COMPLEX	10	80.5	43	9					
			10.5	80							
			11	79.5			11		43		
			11.5	79							
			12	78.5	61	10					
			12.5	78			12		61		
			13	77.5	100+		13		100+		
		grey weathered SHALE	13.5	77							
			14	76.5							
			14.5	76	100+		14		100+		
		END OF BOREHOLE									

TERRAPEX	LOGGED BY: JC	DRILLING DATE: February 26, 2021
	REVIEWED BY: VN	Page 2 of 2

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH205M**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.18	
LOCATION: Toronto, Ontario	NORTHING: 4833805.47	EASTING: 628711.82	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		FILL stiff to firm, moist, brown clayey silt occasional sand pockets	0	90	9		1		9		Borehole advanced with hollow stem augers. 50 mm diameter monitoring well installed.
			0.5	89.5							
			1	89	7		2		7		
			1.5	88.5			3A				
			2	88	10		3B		10		
			2.5	87.5	12		4		12		
		brown	3	87							
		-----			12		5		12		
		grey	3.5	86.5							
			4	86	5		6		5		
		stiff to firm, moist SILTY CLAY some sand to sandy trace gravel (TILL)	4.5	85.5							
			5	85	8		7		8		
			5.5	84.5							
			6	84							
			6.5	83.5	6		8		6		
			7	83							
			7.5	82.5							
			8	82	6		9		6		
			8.5	81.5							
		very dense, moist, grey SILTY fine SAND trace clay, trace gravel	9	81							
			9.5	80.5	63		10		63		

TERRAPEX

LOGGED BY: JC	DRILLING DATE: February 24, 2021
REVIEWED BY: VN	Page 1 of 2

CLIENT: PGL Environmental Consultants	METHOD: Augering and Split Spoon Sampling		**BH No.: BH205M**
PROJECT: SW Corner of Richmond and Bathurst	PROJECT ENGINEER: VN	ELEV. (m) 90.18	
LOCATION: Toronto, Ontario	NORTHING: 4833805.47	EASTING: 628711.82	PROJECT NO.: 21-014

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, moist, grey SILTY fine SAND, trace clay, trace gravel	10	80							
			10.5	79.5	55		11		55		
		hard SILTY CLAY (TILL) and weathered SHALE COMPLEX	11	79							
			11.5	78.5	49		12		49		
			12	78							
		grey weathered SHALE	12.5	77.5	100+		13		100+		
		END OF BOREHOLE									

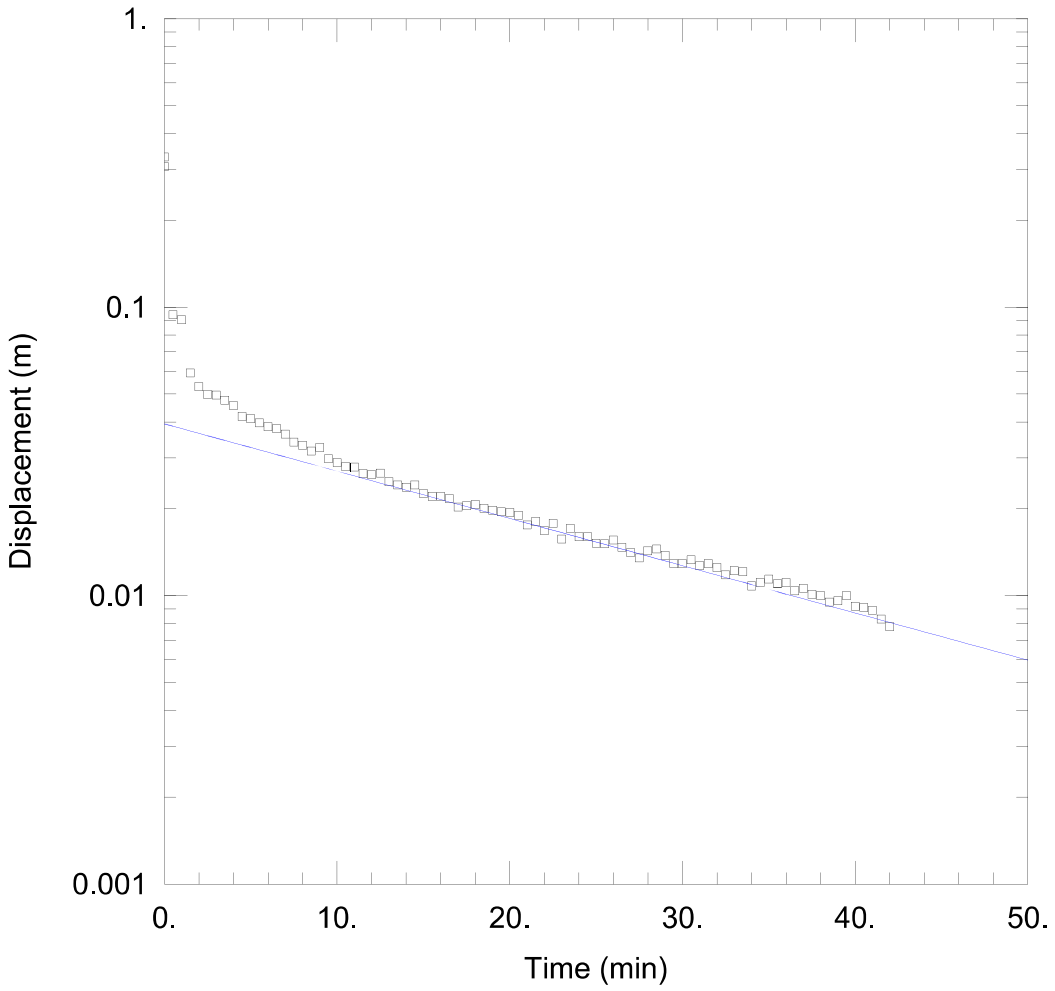
TERRAPEX

LOGGED BY: JC | DRILLING DATE: February 24, 2021

REVIEWED BY: VN |

Appendix C

Hydraulic Conductivity Analysis



WELL TEST ANALYSIS

Data Set: C:\...\MW201 Test1.aqt
Date: 10/13/22 Time: 13:00:39

PROJECT INFORMATION

Company: GEMS
Project: 23-1633
Location: 623 Richmond
Test Well: MW-203
Test Date: 22/09/28

AQUIFER DATA

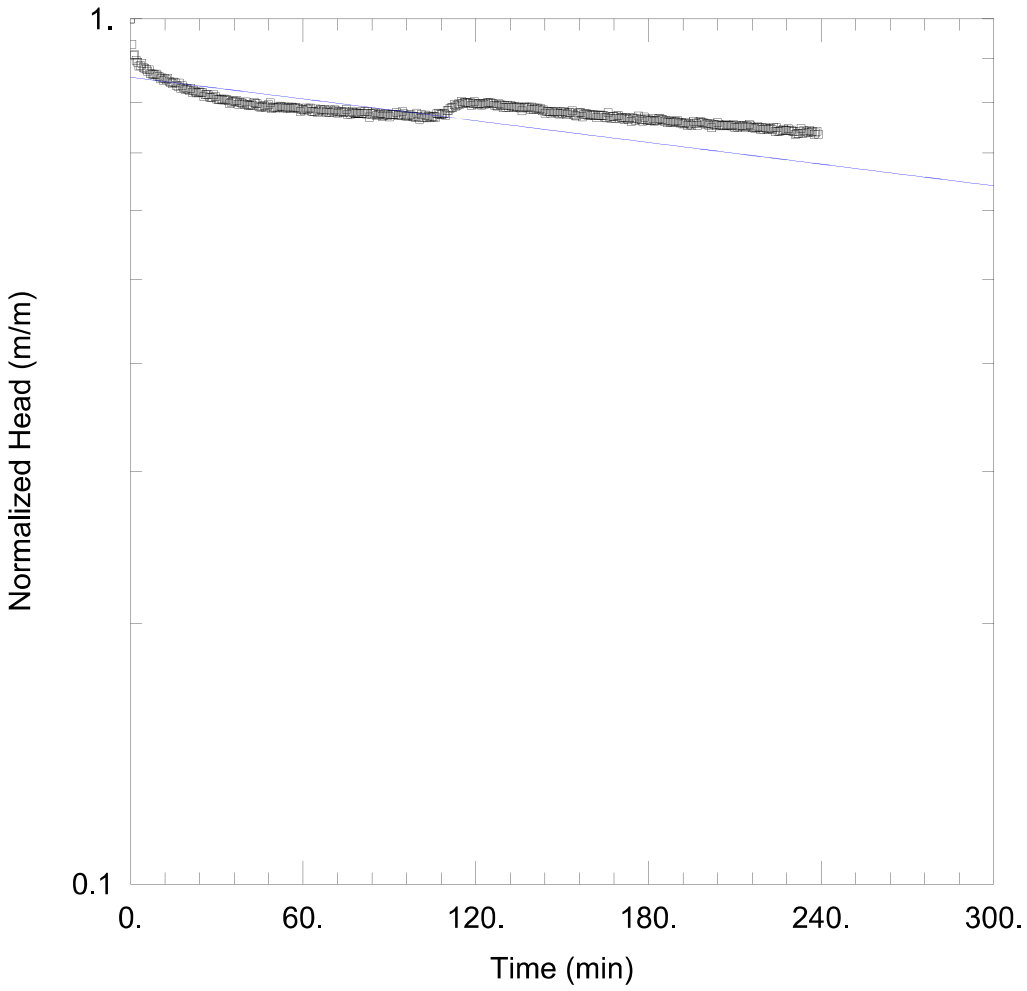
Saturated Thickness: 6.47 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW201)

Initial Displacement: 0.3074 m Static Water Column Height: 1.77 m
Total Well Penetration Depth: 3. m Screen Length: 3. m
Casing Radius: 0.026 m Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev
K = 3.38E-7 m/sec y0 = 0.03938 m



WELL TEST ANALYSIS

Data Set: C:\...\MW203 Test1.aqt
Date: 10/13/22 Time: 13:20:51

PROJECT INFORMATION

Company: GEMS
Project: 23-1633
Location: 623 Richmond
Test Well: MW-203
Test Date: 22/09/28

AQUIFER DATA

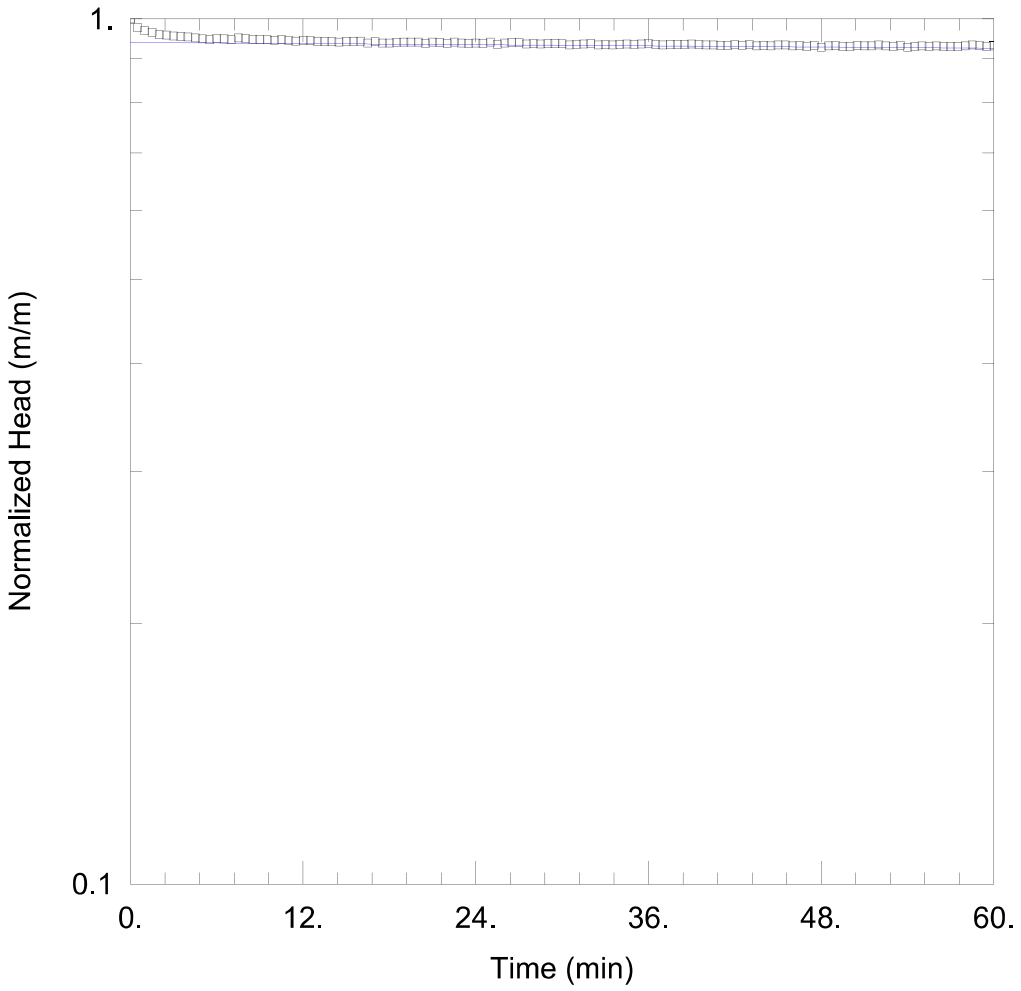
Saturated Thickness: 5.625 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW203)

Initial Displacement: 0.1238 m Static Water Column Height: 1.025 m
Total Well Penetration Depth: 3. m Screen Length: 3. m
Casing Radius: 0.026 m Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev
K = 8.629E-9 m/sec y0 = 0.106 m



WELL TEST ANALYSIS

Data Set: C:\...\MW203 Test2.aqt
Date: 10/13/22 Time: 13:22:33

PROJECT INFORMATION

Company: GEMS
Project: 23-1633
Location: 623 Richmond
Test Well: MW-203
Test Date: 22/09/28

AQUIFER DATA

Saturated Thickness: 5.625 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW203)

Initial Displacement: 0.2047 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.026 m
Static Water Column Height: 1.025 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 2.312E-9 m/sec
y0 = 0.1922 m

Appendix D

Water Quality Analysis

Your Project #: 5660-03.03
Your C.O.C. #: 897762-01-01

Attention: Debra Posen

PGL Environmental Consultants
250 Water Street
Unit 102
Whitby, ON
CANADA L1N 0G5

Report Date: 2022/09/27
Report #: R7317734
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2Q9766
Received: 2022/09/19, 16:45

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Sewer Use By-Law Semivolatile Organics	1	2022/09/23	2022/09/26	CAM SOP 00301	EPA 8270 m
Biochemical Oxygen Demand (BOD)	1	2022/09/21	2022/09/26	CAM SOP-00427	SM 23 5210B m
Chromium (VI) in Water	1	N/A	2022/09/22	CAM SOP-00436	EPA 7199 m
Total Cyanide	1	2022/09/20	2022/09/20	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2022/09/20	2022/09/21	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2022/09/21	2022/09/21	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2022/09/22	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2022/09/19	CAM SOP-00552	
Total Nonylphenol in Liquids by HPLC	1	2022/09/21	2022/09/22	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	1	2022/09/21	2022/09/22	CAM SOP-00313	In-house Method
Animal and Vegetable Oil and Grease	1	N/A	2022/09/21	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2022/09/21	2022/09/21	CAM SOP-00326	EPA1664B m,SM5520B m
Polychlorinated Biphenyl in Water	1	2022/09/21	2022/09/22	CAM SOP-00309	EPA 8082A m
pH	1	2022/09/20	2022/09/21	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2022/09/22	CAM SOP-00444	OMOE E3179 m
Total Kjeldahl Nitrogen in Water	1	2022/09/21	2022/09/21	CAM SOP-00938	OMOE E3516 m
Total PAHs (1)	1	N/A	2022/09/26	CAM SOP - 00301	
Mineral/Synthetic O & G (TPH Heavy Oil) (2)	1	2022/09/21	2022/09/21	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2022/09/21	2022/09/22	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2022/09/22	CAM SOP-00228	EPA 8260C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your Project #: 5660-03.03
Your C.O.C. #: 897762-01-01

Attention: Debra Posen

PGL Environmental Consultants
250 Water Street
Unit 102
Whitby, ON
CANADA L1N 0G5

Report Date: 2022/09/27
Report #: R7317734
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2Q9766
Received: 2022/09/19, 16:45

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(2) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Deepthi Shaji, Project Manager
Email: Deepthi.Shaji@bureauveritas.com
Phone# (905)817-5700 Ext:7065843
==========
This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Job #: C2Q9766
Report Date: 2022/09/27

PGL Environmental Consultants
Client Project #: 5660-03.03
Sampler Initials: AES

TORONTO SANITARY&STORM SEWER (100-2016)

Bureau Veritas ID					TTT085			TTT085		
Sampling Date					2022/09/19			2022/09/19		
COC Number					897762-01-01			897762-01-01		
	UNITS	**San**	**Stm**	**Criteria**	**BH204M**	**RDL**	**QC Batch**	**BH204M Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters										
Total Animal/Vegetable Oil and Grease	mg/L	150	-	150	<0.50	0.50	8233031			
Inorganics										
Total BOD	mg/L	300	15	300	3	2	8237522			
Fluoride (F-)	mg/L	10	-	10	0.51	0.10	8236769			
Total Kjeldahl Nitrogen (TKN)	mg/L	100	-	100	3.3	0.10	8238168	3.5	0.10	8238168
pH	pH	6.0:11.5	6.0:9.5	6.0:11.5	8.03		8236782			
Phenols-4AAP	mg/L	1.0	0.008	1.0	<0.0010	0.0010	8242210			
Total Suspended Solids	mg/L	350	15	350	19	10	8238130	18	10	8238130
Total Cyanide (CN)	mg/L	2	0.02	2	<0.0050	0.0050	8234502	<0.0050	0.0050	8234502
Petroleum Hydrocarbons										
Total Oil & Grease	mg/L	-	-	-	<0.50	0.50	8238081			
Total Oil & Grease Mineral/Synthetic	mg/L	15	-	15	<0.50	0.50	8238085			
Miscellaneous Parameters										
Nonylphenol Ethoxylate (Total)	mg/L	0.2	0.01	0.2	<0.005	0.005	8237257	<0.005	0.005	8237257
Nonylphenol (Total)	mg/L	0.02	0.001	0.02	<0.001	0.001	8237238	<0.001	0.001	8237238
Metals										
Chromium (VI)	ug/L	2000	40	2000	<0.50	0.50	8239915			
Mercury (Hg)	mg/L	0.01	0.0004	0.01	<0.00010	0.00010	8238069	<0.00010	0.00010	8238069
Total Aluminum (Al)	ug/L	50000	-	50000	550	4.9	8240602			
Total Antimony (Sb)	ug/L	5000	-	5000	<0.50	0.50	8240602			
Total Arsenic (As)	ug/L	1000	20	1000	9.3	1.0	8240602			
Total Cadmium (Cd)	ug/L	700	8	700	<0.090	0.090	8240602			
Total Chromium (Cr)	ug/L	4000	80	4000	<5.0	5.0	8240602			
Total Cobalt (Co)	ug/L	5000	-	5000	<0.50	0.50	8240602			
Total Copper (Cu)	ug/L	2000	40	2000	4.6	0.90	8240602			
Total Lead (Pb)	ug/L	1000	120	1000	1.4	0.50	8240602			
Total Manganese (Mn)	ug/L	5000	50	5000	300	2.0	8240602			
Total Molybdenum (Mo)	ug/L	5000	-	5000	12	0.50	8240602			
Total Nickel (Ni)	ug/L	2000	80	2000	1.4	1.0	8240602			
Total Phosphorus (P)	ug/L	10000	400	10000	140	100	8240602			
Total Selenium (Se)	ug/L	1000	20	1000	<2.0	2.0	8240602			
Total Silver (Ag)	ug/L	5000	120	5000	<0.090	0.090	8240602			
Total Tin (Sn)	ug/L	5000	-	5000	<1.0	1.0	8240602			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
San,Stm: Toronto Sanitary and Storm Sewer Use By Law Guidelines, respectively. Referenced to Chapter 681
Criteria: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Bureau Veritas Job #: C2Q9766
Report Date: 2022/09/27

PGL Environmental Consultants
Client Project #: 5660-03.03
Sampler Initials: AES

TORONTO SANITARY&STORM SEWER (100-2016)

Bureau Veritas ID					TTT085			TTT085		
Sampling Date					2022/09/19			2022/09/19		
COC Number					897762-01-01			897762-01-01		
	UNITS	**San**	**Stm**	**Criteria**	**BH204M**	**RDL**	**QC Batch**	**BH204M Lab-Dup**	**RDL**	**QC Batch**
Total Titanium (Ti)	ug/L	5000	-	5000	5.4	5.0	8240602			
Total Zinc (Zn)	ug/L	2000	40	2000	<5.0	5.0	8240602			
Semivolatile Organics										
Di-N-butyl phthalate	ug/L	80	15	80	<2	2	8242895			
Bis(2-ethylhexyl)phthalate	ug/L	12	8.8	12	<2	2	8242895			
3,3'-Dichlorobenzidine	ug/L	2	0.8	2	<0.8	0.8	8242895			
Pentachlorophenol	ug/L	5	2	5	<1	1	8242895			
Phenanthrene	ug/L	-	-	-	<0.2	0.2	8242895			
Anthracene	ug/L	-	-	-	<0.2	0.2	8242895			
Fluoranthene	ug/L	-	-	-	<0.2	0.2	8242895			
Pyrene	ug/L	-	-	-	<0.2	0.2	8242895			
Benzo(a)anthracene	ug/L	-	-	-	<0.2	0.2	8242895			
Chrysene	ug/L	-	-	-	<0.2	0.2	8242895			
Benzo(b/j)fluoranthene	ug/L	-	-	-	<0.2	0.2	8242895			
Benzo(k)fluoranthene	ug/L	-	-	-	<0.2	0.2	8242895			
Benzo(a)pyrene	ug/L	-	-	-	<0.2	0.2	8242895			
Indeno(1,2,3-cd)pyrene	ug/L	-	-	-	<0.2	0.2	8242895			
Dibenzo(a,h)anthracene	ug/L	-	-	-	<0.2	0.2	8242895			
Benzo(g,h,i)perylene	ug/L	-	-	-	<0.2	0.2	8242895			
Dibenzo(a,i)pyrene	ug/L	-	-	-	<0.2	0.2	8242895			
Benzo(e)pyrene	ug/L	-	-	-	<0.2	0.2	8242895			
Perylene	ug/L	-	-	-	<0.2	0.2	8242895			
Dibenzo(a,j) acridine	ug/L	-	-	-	<0.4	0.4	8242895			
7H-Dibenzo(c,g) Carbazole	ug/L	-	-	-	<0.4	0.4	8242895			
1,6-Dinitropyrene	ug/L	-	-	-	<0.4	0.4	8242895			
1,3-Dinitropyrene	ug/L	-	-	-	<0.4	0.4	8242895			
1,8-Dinitropyrene	ug/L	-	-	-	<0.4	0.4	8242895			
Calculated Parameters										
Total PAHs (18 PAHs)	ug/L	5	2	5	<1	1	8233486			
Volatile Organics										
Benzene	ug/L	10	2	10	<0.40	0.40	8236788			
Chloroform	ug/L	40	2	40	<0.40	0.40	8236788			
1,2-Dichlorobenzene	ug/L	50	5.6	50	<0.80	0.80	8236788			
1,4-Dichlorobenzene	ug/L	80	6.8	80	<0.80	0.80	8236788			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
San,Stm: Toronto Sanitary and Storm Sewer Use By Law Guidelines, respectively. Referenced to Chapter 681
Criteria: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

TORONTO SANITARY&STORM SEWER (100-2016)

Bureau Veritas ID					TTT085			TTT085		
Sampling Date					2022/09/19			2022/09/19		
COC Number					897762-01-01			897762-01-01		
	UNITS	**San**	**Stm**	**Criteria**	**BH204M**	**RDL**	**QC Batch**	**BH204M Lab-Dup**	**RDL**	**QC Batch**
cis-1,2-Dichloroethylene	ug/L	4000	5.6	4000	<1.0	1.0	8236788			
trans-1,3-Dichloropropene	ug/L	140	5.6	140	<0.80	0.80	8236788			
Ethylbenzene	ug/L	160	2	160	<0.40	0.40	8236788			
Methylene Chloride(Dichloromethane)	ug/L	2000	5.2	2000	<4.0	4.0	8236788			
1,1,2,2-Tetrachloroethane	ug/L	1400	17	1400	<0.80	0.80	8236788			
Tetrachloroethylene	ug/L	1000	4.4	1000	<0.40	0.40	8236788			
Toluene	ug/L	16	2	16	<0.40	0.40	8236788			
Trichloroethylene	ug/L	400	7.6	400	<0.40	0.40	8236788			
p+m-Xylene	ug/L	1400	4.4	-	<0.40	0.40	8236788			
o-Xylene	ug/L	1400	4.4	-	<0.40	0.40	8236788			
Total Xylenes	ug/L	1400	4.4	1400	<0.40	0.40	8236788			
PCBs										
Total PCB	ug/L	1	0.4	1	<0.05	0.05	8238674			
Microbiological										
Escherichia coli	CFU/100mL	-	200	-	<10	10	8234004			
Surrogate Recovery (%)										
2,4,6-Tribromophenol	%	-	-	-	47		8242895			
2-Fluorobiphenyl	%	-	-	-	45		8242895			
D14-Terphenyl (FS)	%	-	-	-	80		8242895			
D5-Nitrobenzene	%	-	-	-	47		8242895			
D8-Acenaphthylene	%	-	-	-	47		8242895			
Decachlorobiphenyl	%	-	-	-	65		8238674			
4-Bromofluorobenzene	%	-	-	-	98		8236788			
D4-1,2-Dichloroethane	%	-	-	-	109		8236788			
D8-Toluene	%	-	-	-	97		8236788			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
San,Stm: Toronto Sanitary and Storm Sewer Use By Law Guidelines, respectively. Referenced to Chapter 681
Criteria: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Bureau Veritas Job #: C2Q9766
Report Date: 2022/09/27

PGL Environmental Consultants
Client Project #: 5660-03.03
Sampler Initials: AES

TEST SUMMARY

Bureau Veritas ID: TTT085
Sample ID: BH204M
Matrix: Water

Collected: 2022/09/19
Shipped:
Received: 2022/09/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	8242895	2022/09/23	2022/09/26	Kathy Horvat
Biochemical Oxygen Demand (BOD)	DO	8237522	2022/09/21	2022/09/26	Gurjot Kaur
Chromium (VI) in Water	IC	8239915	N/A	2022/09/22	Theodora Luck
Total Cyanide	SKAL/CN	8234502	2022/09/20	2022/09/20	Prgya Panchal
Fluoride	ISE	8236769	2022/09/20	2022/09/21	Kien Tran
Mercury in Water by CVAA	CV/AA	8238069	2022/09/21	2022/09/21	Japneet Gill
Total Metals Analysis by ICPMS	ICP/MS	8240602	N/A	2022/09/22	Rupinder Gill
E.coli, (CFU/100mL)	PL	8234004	N/A	2022/09/19	Sonja Elavinamannil
Total Nonylphenol in Liquids by HPLC	LC/FLU	8237238	2022/09/21	2022/09/22	Furneesh Kumar
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	8237257	2022/09/21	2022/09/22	Furneesh Kumar
Animal and Vegetable Oil and Grease	BAL	8233031	N/A	2022/09/21	Automated Statchk
Total Oil and Grease	BAL	8238081	2022/09/21	2022/09/21	Maulik Jashubhai Patel
Polychlorinated Biphenyl in Water	GC/ECD	8238674	2022/09/21	2022/09/22	Joy Zhang
pH	AT	8236782	2022/09/20	2022/09/21	Kien Tran
Phenols (4AAP)	TECH/PHEN	8242210	N/A	2022/09/22	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	8238168	2022/09/21	2022/09/21	Massarat Jan
Total PAHs	CALC	8233486	N/A	2022/09/26	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	8238085	2022/09/21	2022/09/21	Maulik Jashubhai Patel
Total Suspended Solids	BAL	8238130	2022/09/21	2022/09/22	Masood Siddiqui
Volatile Organic Compounds in Water	GC/MS	8236788	N/A	2022/09/22	Narayan Ghimire

Bureau Veritas ID: TTT085 Dup
Sample ID: BH204M
Matrix: Water

Collected: 2022/09/19
Shipped:
Received: 2022/09/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Cyanide	SKAL/CN	8234502	2022/09/20	2022/09/20	Prgya Panchal
Mercury in Water by CVAA	CV/AA	8238069	2022/09/21	2022/09/21	Japneet Gill
Total Nonylphenol in Liquids by HPLC	LC/FLU	8237238	2022/09/21	2022/09/22	Furneesh Kumar
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	8237257	2022/09/21	2022/09/22	Furneesh Kumar
Total Kjeldahl Nitrogen in Water	SKAL	8238168	2022/09/21	2022/09/21	Massarat Jan
Total Suspended Solids	BAL	8238130	2022/09/21	2022/09/22	Masood Siddiqui

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	15.0°C

Sample TTT085 [BH204M] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8234502	GYA	Matrix Spike [TTT085-07]	Total Cyanide (CN)	2022/09/20		95	%	80 - 120
8234502	GYA	Spiked Blank	Total Cyanide (CN)	2022/09/20		100	%	80 - 120
8234502	GYA	Method Blank	Total Cyanide (CN)	2022/09/20	<0.0050		mg/L	
8234502	GYA	RPD [TTT085-07]	Total Cyanide (CN)	2022/09/20	NC		%	20
8236769	KIT	Matrix Spike	Fluoride (F-)	2022/09/21		98	%	80 - 120
8236769	KIT	Spiked Blank	Fluoride (F-)	2022/09/21		101	%	80 - 120
8236769	KIT	Method Blank	Fluoride (F-)	2022/09/21	<0.10		mg/L	
8236769	KIT	RPD	Fluoride (F-)	2022/09/21	0		%	20
8236782	KIT	Spiked Blank	pH	2022/09/21		102	%	98 - 103
8236782	KIT	RPD	pH	2022/09/21	0.46		%	N/A
8236788	NGH	Matrix Spike	4-Bromofluorobenzene	2022/09/22		99	%	70 - 130
			D4-1,2-Dichloroethane	2022/09/22		110	%	70 - 130
			D8-Toluene	2022/09/22		98	%	70 - 130
			Benzene	2022/09/22		92	%	70 - 130
			Chloroform	2022/09/22		92	%	70 - 130
			1,2-Dichlorobenzene	2022/09/22		95	%	70 - 130
			1,4-Dichlorobenzene	2022/09/22		108	%	70 - 130
			cis-1,2-Dichloroethylene	2022/09/22		100	%	70 - 130
			trans-1,3-Dichloropropene	2022/09/22		92	%	70 - 130
			Ethylbenzene	2022/09/22		87	%	70 - 130
			Methylene Chloride(Dichloromethane)	2022/09/22		111	%	70 - 130
			1,1,2,2-Tetrachloroethane	2022/09/22		97	%	70 - 130
			Tetrachloroethylene	2022/09/22		85	%	70 - 130
			Toluene	2022/09/22		90	%	70 - 130
			Trichloroethylene	2022/09/22		97	%	70 - 130
			p+m-Xylene	2022/09/22		87	%	70 - 130
			o-Xylene	2022/09/22		86	%	70 - 130
8236788	NGH	Spiked Blank	4-Bromofluorobenzene	2022/09/22		98	%	70 - 130
			D4-1,2-Dichloroethane	2022/09/22		104	%	70 - 130
			D8-Toluene	2022/09/22		100	%	70 - 130
			Benzene	2022/09/22		91	%	70 - 130
			Chloroform	2022/09/22		91	%	70 - 130
			1,2-Dichlorobenzene	2022/09/22		94	%	70 - 130
			1,4-Dichlorobenzene	2022/09/22		107	%	70 - 130
			cis-1,2-Dichloroethylene	2022/09/22		99	%	70 - 130
			trans-1,3-Dichloropropene	2022/09/22		102	%	70 - 130
			Ethylbenzene	2022/09/22		89	%	70 - 130
			Methylene Chloride(Dichloromethane)	2022/09/22		107	%	70 - 130
			1,1,2,2-Tetrachloroethane	2022/09/22		90	%	70 - 130
			Tetrachloroethylene	2022/09/22		88	%	70 - 130
			Toluene	2022/09/22		93	%	70 - 130
			Trichloroethylene	2022/09/22		99	%	70 - 130
			p+m-Xylene	2022/09/22		90	%	70 - 130
			o-Xylene	2022/09/22		88	%	70 - 130
8236788	NGH	Method Blank	4-Bromofluorobenzene	2022/09/22		97	%	70 - 130
			D4-1,2-Dichloroethane	2022/09/22		102	%	70 - 130
			D8-Toluene	2022/09/22		99	%	70 - 130
			Benzene	2022/09/22	<0.20		ug/L	
			Chloroform	2022/09/22	<0.20		ug/L	
			1,2-Dichlorobenzene	2022/09/22	<0.40		ug/L	
			1,4-Dichlorobenzene	2022/09/22	<0.40		ug/L	
			cis-1,2-Dichloroethylene	2022/09/22	<0.50		ug/L	

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			trans-1,3-Dichloropropene	2022/09/22	<0.40		ug/L	
			Ethylbenzene	2022/09/22	<0.20		ug/L	
			Methylene Chloride(Dichloromethane)	2022/09/22	<2.0		ug/L	
			1,1,2,2-Tetrachloroethane	2022/09/22	<0.40		ug/L	
			Tetrachloroethylene	2022/09/22	<0.20		ug/L	
			Toluene	2022/09/22	<0.20		ug/L	
			Trichloroethylene	2022/09/22	<0.20		ug/L	
			p+m-Xylene	2022/09/22	<0.20		ug/L	
			o-Xylene	2022/09/22	<0.20		ug/L	
			Total Xylenes	2022/09/22	<0.20		ug/L	
8236788	NGH	RPD	Benzene	2022/09/22	7.4		%	30
			Chloroform	2022/09/22	NC		%	30
			1,2-Dichlorobenzene	2022/09/22	NC		%	30
			1,4-Dichlorobenzene	2022/09/22	NC		%	30
			cis-1,2-Dichloroethylene	2022/09/22	0.52		%	30
			trans-1,3-Dichloropropene	2022/09/22	NC		%	30
			Ethylbenzene	2022/09/22	NC		%	30
			Methylene Chloride(Dichloromethane)	2022/09/22	NC		%	30
			1,1,2,2-Tetrachloroethane	2022/09/22	NC		%	30
			Tetrachloroethylene	2022/09/22	NC		%	30
			Toluene	2022/09/22	NC		%	30
			Trichloroethylene	2022/09/22	0.31		%	30
			p+m-Xylene	2022/09/22	NC		%	30
			o-Xylene	2022/09/22	NC		%	30
			Total Xylenes	2022/09/22	NC		%	30
8237238	FKU	Matrix Spike	Nonylphenol (Total)	2022/09/21		85	%	50 - 130
8237238	FKU	Spiked Blank	Nonylphenol (Total)	2022/09/21		74	%	50 - 130
8237238	FKU	Method Blank	Nonylphenol (Total)	2022/09/21	<0.001		mg/L	
8237238	FKU	RPD [TTT085-11]	Nonylphenol (Total)	2022/09/22	NC		%	40
8237257	FKU	Matrix Spike	Nonylphenol Ethoxylate (Total)	2022/09/21		96	%	50 - 130
8237257	FKU	Spiked Blank	Nonylphenol Ethoxylate (Total)	2022/09/21		97	%	50 - 130
8237257	FKU	Method Blank	Nonylphenol Ethoxylate (Total)	2022/09/21	<0.005		mg/L	
8237257	FKU	RPD [TTT085-11]	Nonylphenol Ethoxylate (Total)	2022/09/22	NC		%	40
8237522	GUJ	QC Standard	Total BOD	2022/09/26		89	%	80 - 120
8237522	GUJ	Method Blank	Total BOD	2022/09/26	<2		mg/L	
8237522	GUJ	RPD	Total BOD	2022/09/26	3.2		%	30
8238069	JGC	Matrix Spike [TTT085-13]	Mercury (Hg)	2022/09/21		98	%	75 - 125
8238069	JGC	Spiked Blank	Mercury (Hg)	2022/09/21		102	%	80 - 120
8238069	JGC	Method Blank	Mercury (Hg)	2022/09/21	<0.00010		mg/L	
8238069	JGC	RPD [TTT085-13]	Mercury (Hg)	2022/09/21	NC		%	20
8238081	MJ2	Spiked Blank	Total Oil & Grease	2022/09/21		99	%	85 - 115
8238081	MJ2	RPD	Total Oil & Grease	2022/09/21	0.25		%	25
8238081	MJ2	Method Blank	Total Oil & Grease	2022/09/21	<0.50		mg/L	
8238085	MJ2	Spiked Blank	Total Oil & Grease Mineral/Synthetic	2022/09/21		96	%	85 - 115
8238085	MJ2	RPD	Total Oil & Grease Mineral/Synthetic	2022/09/21	0.52		%	25
8238085	MJ2	Method Blank	Total Oil & Grease Mineral/Synthetic	2022/09/21	<0.50		mg/L	
8238130	MSQ	QC Standard	Total Suspended Solids	2022/09/22		100	%	85 - 115
8238130	MSQ	Method Blank	Total Suspended Solids	2022/09/22	<10		mg/L	
8238130	MSQ	RPD [TTT085-03]	Total Suspended Solids	2022/09/22	5.4		%	25
8238168	MJ1	Matrix Spike [TTT085-05]	Total Kjeldahl Nitrogen (TKN)	2022/09/21		NC	%	80 - 120
8238168	MJ1	QC Standard	Total Kjeldahl Nitrogen (TKN)	2022/09/21		96	%	80 - 120
8238168	MJ1	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2022/09/21		101	%	80 - 120

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8238168	MJ1	Method Blank	Total Kjeldahl Nitrogen (TKN)	2022/09/21	<0.10		mg/L	
8238168	MJ1	RPD [TTT085-05]	Total Kjeldahl Nitrogen (TKN)	2022/09/21	3.4		%	20
8238674	JZ	Matrix Spike	Decachlorobiphenyl	2022/09/22		61	%	60 - 130
			Total PCB	2022/09/22		64	%	60 - 130
8238674	JZ	Spiked Blank	Decachlorobiphenyl	2022/09/22		59 (1)	%	60 - 130
			Total PCB	2022/09/22		66	%	60 - 130
8238674	JZ	Method Blank	Decachlorobiphenyl	2022/09/22		66	%	60 - 130
			Total PCB	2022/09/22	<0.05		ug/L	
8238674	JZ	RPD	Total PCB	2022/09/22	NC		%	40
8239915	TL2	Matrix Spike	Chromium (VI)	2022/09/22		99	%	80 - 120
8239915	TL2	Spiked Blank	Chromium (VI)	2022/09/22		102	%	80 - 120
8239915	TL2	Method Blank	Chromium (VI)	2022/09/22	<0.50		ug/L	
8239915	TL2	RPD	Chromium (VI)	2022/09/22	NC		%	20
8240602	RG4	Matrix Spike	Total Aluminum (Al)	2022/09/22		95	%	80 - 120
			Total Antimony (Sb)	2022/09/22		102	%	80 - 120
			Total Arsenic (As)	2022/09/22		NC	%	80 - 120
			Total Cadmium (Cd)	2022/09/22		101	%	80 - 120
			Total Chromium (Cr)	2022/09/22		98	%	80 - 120
			Total Cobalt (Co)	2022/09/22		100	%	80 - 120
			Total Copper (Cu)	2022/09/22		98	%	80 - 120
			Total Lead (Pb)	2022/09/22		98	%	80 - 120
			Total Manganese (Mn)	2022/09/22		98	%	80 - 120
			Total Molybdenum (Mo)	2022/09/22		102	%	80 - 120
			Total Nickel (Ni)	2022/09/22		99	%	80 - 120
			Total Phosphorus (P)	2022/09/22		97	%	80 - 120
			Total Selenium (Se)	2022/09/22		104	%	80 - 120
			Total Silver (Ag)	2022/09/22		102	%	80 - 120
			Total Tin (Sn)	2022/09/22		100	%	80 - 120
			Total Titanium (Ti)	2022/09/22		94	%	80 - 120
			Total Zinc (Zn)	2022/09/22		103	%	80 - 120
8240602	RG4	Spiked Blank	Total Aluminum (Al)	2022/09/22		99	%	80 - 120
			Total Antimony (Sb)	2022/09/22		101	%	80 - 120
			Total Arsenic (As)	2022/09/22		100	%	80 - 120
			Total Cadmium (Cd)	2022/09/22		101	%	80 - 120
			Total Chromium (Cr)	2022/09/22		97	%	80 - 120
			Total Cobalt (Co)	2022/09/22		100	%	80 - 120
			Total Copper (Cu)	2022/09/22		97	%	80 - 120
			Total Lead (Pb)	2022/09/22		99	%	80 - 120
			Total Manganese (Mn)	2022/09/22		98	%	80 - 120
			Total Molybdenum (Mo)	2022/09/22		102	%	80 - 120
			Total Nickel (Ni)	2022/09/22		99	%	80 - 120
			Total Phosphorus (P)	2022/09/22		106	%	80 - 120
			Total Selenium (Se)	2022/09/22		107	%	80 - 120
			Total Silver (Ag)	2022/09/22		100	%	80 - 120
			Total Tin (Sn)	2022/09/22		100	%	80 - 120
			Total Titanium (Ti)	2022/09/22		99	%	80 - 120
			Total Zinc (Zn)	2022/09/22		103	%	80 - 120
8240602	RG4	Method Blank	Total Aluminum (Al)	2022/09/22	<4.9		ug/L	
			Total Antimony (Sb)	2022/09/22	<0.50		ug/L	
			Total Arsenic (As)	2022/09/22	<1.0		ug/L	
			Total Cadmium (Cd)	2022/09/22	<0.090		ug/L	
			Total Chromium (Cr)	2022/09/22	<5.0		ug/L	

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Cobalt (Co)	2022/09/22	<0.50		ug/L	
			Total Copper (Cu)	2022/09/22	<0.90		ug/L	
			Total Lead (Pb)	2022/09/22	<0.50		ug/L	
			Total Manganese (Mn)	2022/09/22	<2.0		ug/L	
			Total Molybdenum (Mo)	2022/09/22	<0.50		ug/L	
			Total Nickel (Ni)	2022/09/22	<1.0		ug/L	
			Total Phosphorus (P)	2022/09/22	<100		ug/L	
			Total Selenium (Se)	2022/09/22	<2.0		ug/L	
			Total Silver (Ag)	2022/09/22	<0.090		ug/L	
			Total Tin (Sn)	2022/09/22	<1.0		ug/L	
			Total Titanium (Ti)	2022/09/22	<5.0		ug/L	
			Total Zinc (Zn)	2022/09/22	<5.0		ug/L	
8240602	RG4	RPD	Total Aluminum (Al)	2022/09/22	1.1		%	20
			Total Antimony (Sb)	2022/09/22	3.0		%	20
			Total Arsenic (As)	2022/09/22	0.45		%	20
			Total Cadmium (Cd)	2022/09/22	2.9		%	20
			Total Chromium (Cr)	2022/09/22	NC		%	20
			Total Cobalt (Co)	2022/09/22	2.3		%	20
			Total Copper (Cu)	2022/09/22	0.44		%	20
			Total Lead (Pb)	2022/09/22	4.6		%	20
			Total Manganese (Mn)	2022/09/22	4.8		%	20
			Total Molybdenum (Mo)	2022/09/22	2.7		%	20
			Total Nickel (Ni)	2022/09/22	2.0		%	20
			Total Selenium (Se)	2022/09/22	NC		%	20
			Total Silver (Ag)	2022/09/22	0.51		%	20
			Total Tin (Sn)	2022/09/22	NC		%	20
			Total Titanium (Ti)	2022/09/22	NC		%	20
			Total Zinc (Zn)	2022/09/22	0.91		%	20
8242210	MKX	Matrix Spike	Phenols-4AAP	2022/09/22		105	%	80 - 120
8242210	MKX	Spiked Blank	Phenols-4AAP	2022/09/22		101	%	80 - 120
8242210	MKX	Method Blank	Phenols-4AAP	2022/09/22	<0.0010		mg/L	
8242210	MKX	RPD	Phenols-4AAP	2022/09/22	NC		%	20
8242895	KHO	Matrix Spike	2,4,6-Tribromophenol	2022/09/23		67	%	10 - 130
			2-Fluorobiphenyl	2022/09/23		77	%	30 - 130
			D14-Terphenyl (FS)	2022/09/23		85	%	30 - 130
			D5-Nitrobenzene	2022/09/23		79	%	30 - 130
			D8-Acenaphthylene	2022/09/23		79	%	30 - 130
			Di-N-butyl phthalate	2022/09/23		93	%	30 - 130
			Bis(2-ethylhexyl)phthalate	2022/09/23		101	%	30 - 130
			3,3'-Dichlorobenzidine	2022/09/23		18 (1)	%	30 - 130
			Pentachlorophenol	2022/09/23		70	%	30 - 130
			Phenanthrene	2022/09/23		93	%	30 - 130
			Anthracene	2022/09/23		90	%	30 - 130
			Fluoranthene	2022/09/23		97	%	30 - 130
			Pyrene	2022/09/23		97	%	30 - 130
			Benzo(a)anthracene	2022/09/23		96	%	30 - 130
			Chrysene	2022/09/23		97	%	30 - 130
			Benzo(b/j)fluoranthene	2022/09/23		104	%	30 - 130
			Benzo(k)fluoranthene	2022/09/23		101	%	30 - 130
			Benzo(a)pyrene	2022/09/23		104	%	30 - 130
			Indeno(1,2,3-cd)pyrene	2022/09/23		104	%	30 - 130
			Dibenzo(a,h)anthracene	2022/09/23		106	%	30 - 130

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Benzo(g,h,i)perylene	2022/09/23		109	%	30 - 130
			Dibenzo(a,i)pyrene	2022/09/23		83	%	30 - 130
			Benzo(e)pyrene	2022/09/23		105	%	30 - 130
			Perylene	2022/09/23		95	%	30 - 130
			Dibenzo(a,j) acridine	2022/09/23		107	%	30 - 130
			7H-Dibenzo(c,g) Carbazole	2022/09/23		117	%	30 - 130
			1,6-Dinitropyrene	2022/09/23		74	%	30 - 130
			1,3-Dinitropyrene	2022/09/23		71	%	30 - 130
			1,8-Dinitropyrene	2022/09/23		63	%	30 - 130
8242895	KHO	Spiked Blank	2,4,6-Tribromophenol	2022/09/23		61	%	10 - 130
			2-Fluorobiphenyl	2022/09/23		66	%	30 - 130
			D14-Terphenyl (FS)	2022/09/23		78	%	30 - 130
			D5-Nitrobenzene	2022/09/23		75	%	30 - 130
			D8-Acenaphthylene	2022/09/23		73	%	30 - 130
			Di-N-butyl phthalate	2022/09/23		83	%	30 - 130
			Bis(2-ethylhexyl)phthalate	2022/09/23		95	%	30 - 130
			3,3'-Dichlorobenzidine	2022/09/23		89	%	30 - 130
			Pentachlorophenol	2022/09/23		45	%	30 - 130
			Phenanthrene	2022/09/23		85	%	30 - 130
			Anthracene	2022/09/23		85	%	30 - 130
			Fluoranthene	2022/09/23		89	%	30 - 130
			Pyrene	2022/09/23		89	%	30 - 130
			Benzo(a)anthracene	2022/09/23		88	%	30 - 130
			Chrysene	2022/09/23		91	%	30 - 130
			Benzo(b/j)fluoranthene	2022/09/23		95	%	30 - 130
			Benzo(k)fluoranthene	2022/09/23		99	%	30 - 130
			Benzo(a)pyrene	2022/09/23		101	%	30 - 130
			Indeno(1,2,3-cd)pyrene	2022/09/23		93	%	30 - 130
			Dibenzo(a,h)anthracene	2022/09/23		95	%	30 - 130
			Benzo(g,h,i)perylene	2022/09/23		97	%	30 - 130
			Dibenzo(a,i)pyrene	2022/09/23		82	%	30 - 130
			Benzo(e)pyrene	2022/09/23		98	%	30 - 130
			Perylene	2022/09/23		89	%	30 - 130
			Dibenzo(a,j) acridine	2022/09/23		94	%	30 - 130
			7H-Dibenzo(c,g) Carbazole	2022/09/23		105	%	30 - 130
			1,6-Dinitropyrene	2022/09/23		73	%	30 - 130
			1,3-Dinitropyrene	2022/09/23		69	%	30 - 130
			1,8-Dinitropyrene	2022/09/23		65	%	30 - 130
8242895	KHO	Method Blank	2,4,6-Tribromophenol	2022/09/23		45	%	10 - 130
			2-Fluorobiphenyl	2022/09/23		63	%	30 - 130
			D14-Terphenyl (FS)	2022/09/23		95	%	30 - 130
			D5-Nitrobenzene	2022/09/23		81	%	30 - 130
			D8-Acenaphthylene	2022/09/23		71	%	30 - 130
			Di-N-butyl phthalate	2022/09/23	<2		ug/L	
			Bis(2-ethylhexyl)phthalate	2022/09/23	<2		ug/L	
			3,3'-Dichlorobenzidine	2022/09/23	<0.8		ug/L	
			Pentachlorophenol	2022/09/23	<1		ug/L	
			Phenanthrene	2022/09/23	<0.2		ug/L	
			Anthracene	2022/09/23	<0.2		ug/L	
			Fluoranthene	2022/09/23	<0.2		ug/L	
			Pyrene	2022/09/23	<0.2		ug/L	
			Benzo(a)anthracene	2022/09/23	<0.2		ug/L	

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Chrysene	2022/09/23	<0.2		ug/L	
			Benzo(b/j)fluoranthene	2022/09/23	<0.2		ug/L	
			Benzo(k)fluoranthene	2022/09/23	<0.2		ug/L	
			Benzo(a)pyrene	2022/09/23	<0.2		ug/L	
			Indeno(1,2,3-cd)pyrene	2022/09/23	<0.2		ug/L	
			Dibenzo(a,h)anthracene	2022/09/23	<0.2		ug/L	
			Benzo(g,h,i)perylene	2022/09/23	<0.2		ug/L	
			Dibenzo(a,i)pyrene	2022/09/23	<0.2		ug/L	
			Benzo(e)pyrene	2022/09/23	<0.2		ug/L	
			Perylene	2022/09/23	<0.2		ug/L	
			Dibenzo(a,j) acridine	2022/09/23	<0.4		ug/L	
			7H-Dibenzo(c,g) Carbazole	2022/09/23	<0.4		ug/L	
			1,6-Dinitropyrene	2022/09/23	<0.4		ug/L	
			1,3-Dinitropyrene	2022/09/23	<0.4		ug/L	
			1,8-Dinitropyrene	2022/09/23	<0.4		ug/L	
8242895	KHO	RPD	Di-N-butyl phthalate	2022/09/23	NC		%	40
			Bis(2-ethylhexyl)phthalate	2022/09/23	NC		%	40
			3,3'-Dichlorobenzidine	2022/09/23	NC		%	40
			Pentachlorophenol	2022/09/23	NC		%	40
			Phenanthrene	2022/09/23	NC		%	40
			Anthracene	2022/09/23	NC		%	40
			Fluoranthene	2022/09/23	NC		%	40
			Pyrene	2022/09/23	NC		%	40
			Benzo(a)anthracene	2022/09/23	NC		%	40
			Chrysene	2022/09/23	NC		%	40
			Benzo(b/j)fluoranthene	2022/09/23	NC		%	40
			Benzo(k)fluoranthene	2022/09/23	NC		%	40
			Benzo(a)pyrene	2022/09/23	NC		%	40
			Indeno(1,2,3-cd)pyrene	2022/09/23	NC		%	40
			Dibenzo(a,h)anthracene	2022/09/23	NC		%	40
			Benzo(g,h,i)perylene	2022/09/23	NC		%	40
			Dibenzo(a,i)pyrene	2022/09/23	NC		%	40
			Benzo(e)pyrene	2022/09/23	NC		%	40
			Perylene	2022/09/23	NC		%	40
			Dibenzo(a,j) acridine	2022/09/23	NC		%	40
			7H-Dibenzo(c,g) Carbazole	2022/09/23	NC		%	40
			1,6-Dinitropyrene	2022/09/23	NC		%	40
			1,3-Dinitropyrene	2022/09/23	NC		%	40

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			1,8-Dinitropyrene	2022/09/23	NC		%	40

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

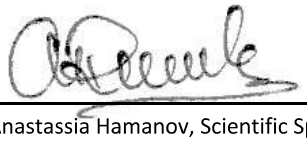
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

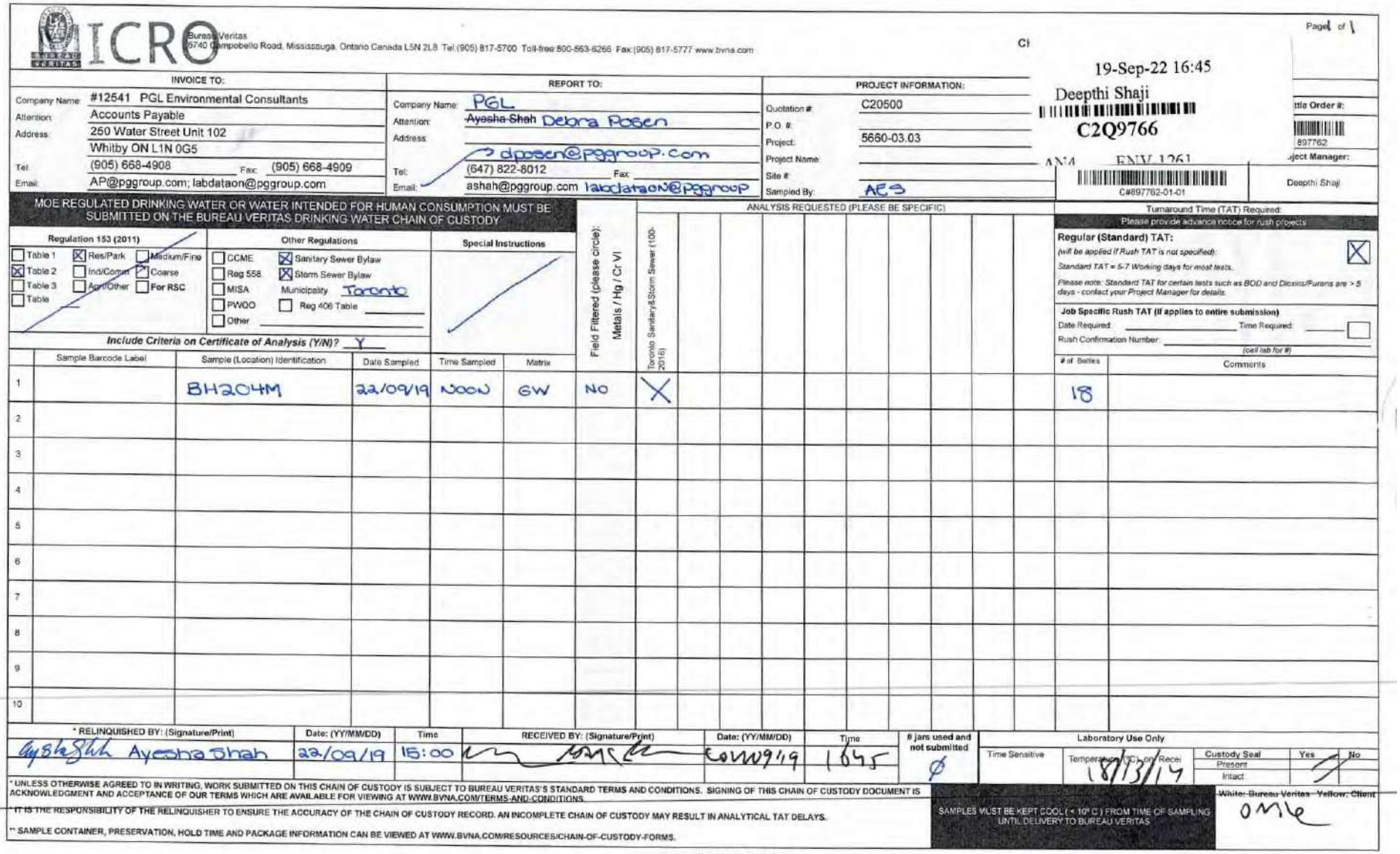


Anastassia Hamanov, Scientific Specialist

Sonja Elavinamannil, Master of Biochemistry, Team Lead

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com



MICRO

Bureau Veritas
2740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-563-6266 Fax:(905) 817-5777 www.bvna.com

Page 1 of 1

19-Sep-22 16:45
Deepthi Shaji
C2Q9766
C#897762-01-01

INVOICE TO:
Company Name: #12541 PGL Environmental Consultants
Attention: Accounts Payable
Address: 250 Water Street Unit 102, Whitby ON L1N 0G5
Tel: (905) 668-4908 Fax: (905) 668-4909
Email: AP@pggroup.com; labdataon@pggroup.com

REPORT TO:
Company Name: PGL
Attention: ~~Ayesha Shah~~ Debra Posen
Address: dposen@pggroup.com
Tel: (647) 822-8012 Fax:
Email: ashah@pggroup.com labdataon@pggroup

PROJECT INFORMATION:
Quotation #: C20500
P.O. #:
Project: 5660-03.03
Project Name:
Site #:
Sampled By: AES

Project Manager: Deepthi Shaji

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): Table 1 / Table 2 / Table 3 / Table ___ — Res/Park / Ind/Comm / Agri/Other — Medium/Fine / Coarse / For RSC
Other Regulations: CCME / Reg 558 / MISA / PWQO / Other ___ — Sanitary Sewer Bylaw / Storm Sewer Bylaw / Municipality Toronto / Reg 406 Table ___
Special Instructions:

Include Criteria on Certificate of Analysis (Y/N)? Y

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Toronto Sanitary&Storm Sewer (100-2016)	# of Bottles	Comments
1		BH204M	22/09/19	N00N	GW	NO	X	18	
2									
3									
4									
5									
6									
7									
8									
9									
10									

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: X
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ (call lab for #)

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Ayesha Shah Ayesha Shah	22/09/19	15:00	[illegible]	22/09/19	1645	0

Laboratory Use Only: Time Sensitive | Temperature (°C) on Recei: 18/13/14 | Custody Seal Present: Yes X / No | Intact

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

Exceedance Summary Table – Toronto San/Stm Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
No Exceedances						

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Exceedance Summary Table – Toronto Sanitary Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
No Exceedances						

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Appendix E

MECP Wells

ing
Test Hole
Test Hole
Test Hole
Test Hole
Test Hole

ing

le
le

le
le
Test Hole
Test Hole
ing
Test Hole
Test Hole
Test Hole

ing
Test Hole
Test Hole
Test Hole
Test Hole
Test Hole
Test Hole
Test Hole

ing
Test Hole
Test Hole
ing
Test Hole
Test Hole
Test Hole

Test Hole
Test Hole

ing

ing
ing
ing

ing
Test Hole

ing
ing
ing
ing
Test Hole

Test Hole
Test Hole
ed
ing

Test Hole
Test Hole
Test Hole
Test Hole
Test Hole
le

le
ing
Test Hole
Test Hole
Test Hole

ing
ing

le
le
le

ing
le

le
le

le
le
le
le
le
le

ing
le
ing
ing
le
ing
le
le
ing
ing

Test Hole
Test Hole
ing

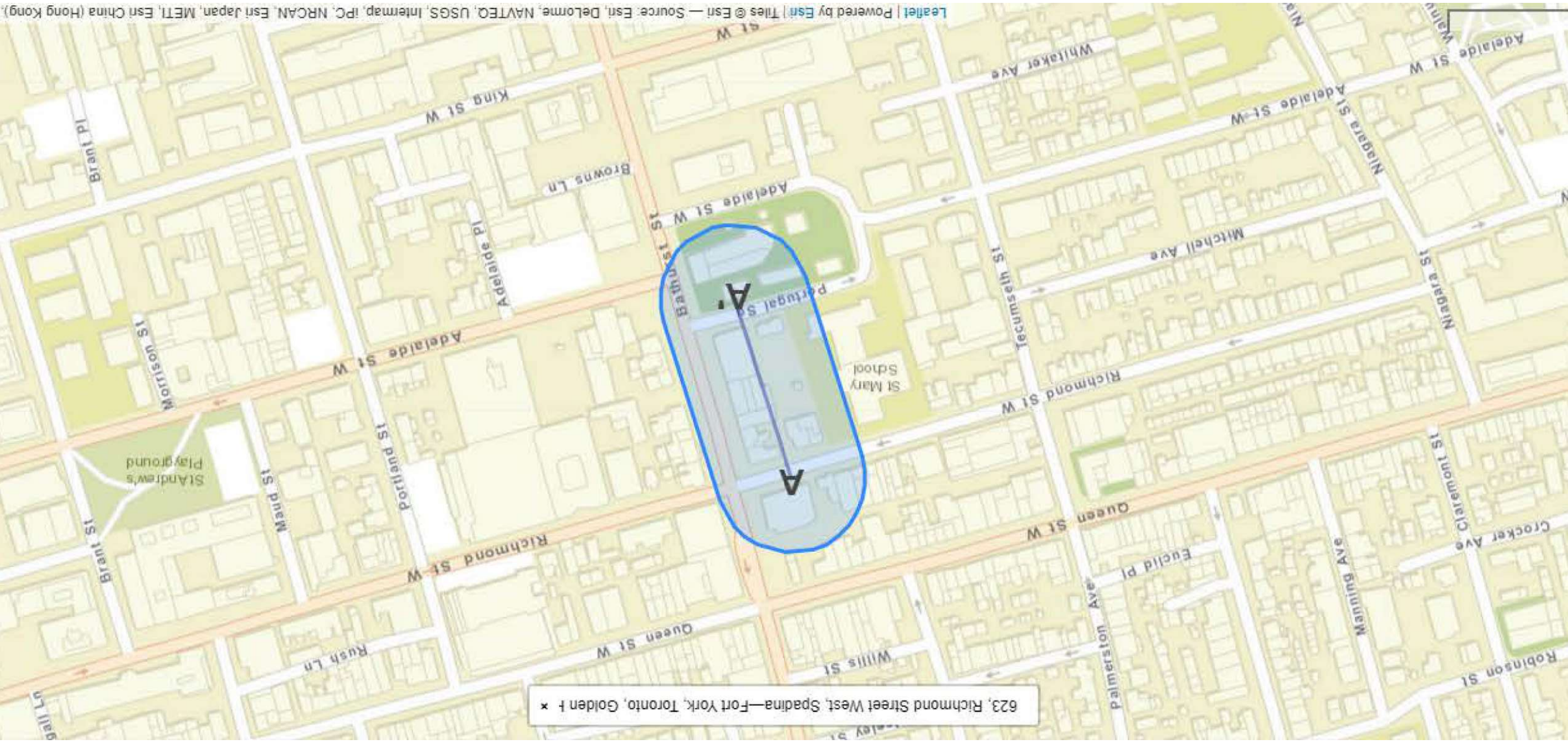
ing
Test Hole
ing
ing
le
le
le
le
le
le
le

ing

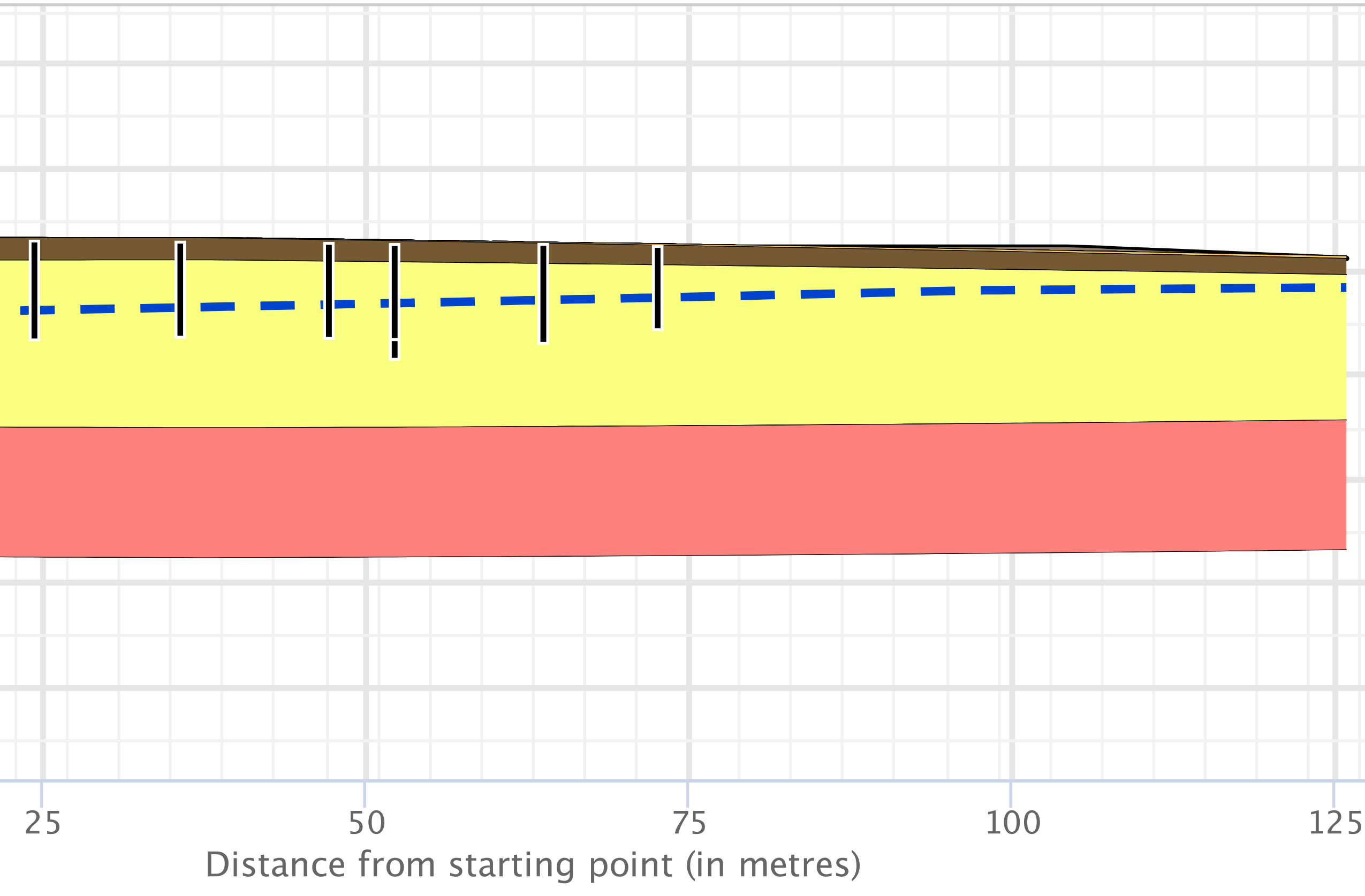
ing
ing
ing
ing
ing

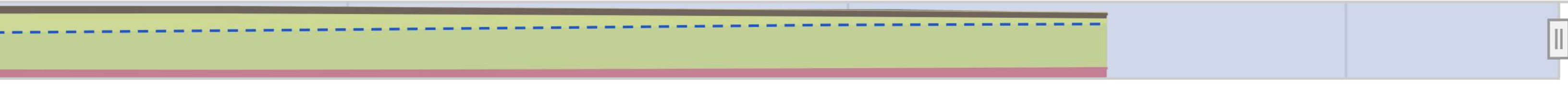
Appendix F

Site Cross Section


A
A'
St W
King St W
Adelaide St W
Richmond St W
Queen St W
Wellington St W
Whitaker Ave
Mitchell Ave
Richmond St W
Queen St W
Brant Pl
Brant St
Morrison St
Adelaide Pl
Browns Ln
Bathurst St
Portugal Sq
St Mary Stdool
Tecumseth St
Niagara St
Maud St
Portland St
Rush Ln
Willis St
Euclid Pl
Palmerston Ave
Manning Ave
Claremont St
Crocker Ave
Robinson St
St Andrew's Playground
Leaflet | Powered by Esri | Tiles © Esri — Source: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong),
623, Richmond Street West, Spadina—Fort York, Toronto, Golden I ×

Cross Section





December 2017

SERVICING REPORT GROUNDWATER SUMMARY

The form is to be completed by the Professional that prepared the Servicing Report.
Use of the form by the City of Toronto is not to be construed as verification of engineering/hydrological content.

For City Staff Use Only:	
Name of ECS Case Manager (please print)	
Date Review Summary provided to to TW	

A. SITE INFORMAITON		Included in SR (reference page number)	Report Includes this information City staff (Check)
Date Servicing Report was prepared: March 2023		Cover	
Title of Servicing Report: FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT		Cover	
Name of Consulting Firm that prepared Servicing Report: Husson Limited		Cover	
Site Address	152-164 BATHURST STREET AND 623-627 RICHMOND STREET WEST	Cover	
Postal Code	M6J 1C2	Cover	
Property Owner (identified on planning request for comments memo)	ORIGINATE (BATHURST & RICHMOND) LP	Cover	
Proposed description of the project (ex. number of point towers, number of podiums, etc.)	18 Storey Residential Development with commercial on main floor.	1	
Land Use (ex. commercial, residential, mixed, industrial, institutional) as defined by the Planning Act	Commercial/residential	1	
Number of below grade levels	2	1	

December 2017

SERVICING REPORT GROUNDWATER SUMMARY

Does the SR include a private water drainage system (PWDS)? **PWDS: Private Water Drainage System:** A subsurface drainage system which may consist of but is 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 or drainage system for disposal in a municipal sewer.	If **Yes** continue completing Section B (Information Relating to Groundwater) **ONLY** **If Yes, Number of PWDS?** **_____1_____** *(Each of these PWDS may require a separate Toronto Water agreement)* If **No** skip to Sections C (On-site Groundwater Containment) and/or D (Water Tight Requirements) as applicable	**X YES** ◯ NO	
B. INFORMATION RELATING TO GROUNDWATER		**Included in SR (reference page number)**	**Report Includes this information City Staff (Check)**
A copy of the pump schedule(s) for **ALL** groundwater sump pump(s) for the development site has been included in the SR **or** A letter written by a Mechanical Consultant (signed and stamped by a Professional Engineer of Ontario) shall be attached to the SR stating the peak flow rate of the groundwater discharge for the development site for all groundwater sump pump(s). This peak flow rate must be based on the pump schedule(s) that have been designed by the	**Estimated pump flow = 0.25/s.** **Letter included in Appendix C**	3 App C	

SERVICING REPORT GROUNDWATER SUMMARY

Mechanical Consultant. A template of this letter is attached in Schedule A. ****If there is more than one groundwater sump they must ALL be included in the letters along with a combined flow****			
Is it proposed that the groundwater from the development site will be discharged to the sanitary, combined or storm sewer?	◯ **Sanitary Sewer** **X** Combined Sewer ◯ Storm Sewer	3	
Will the proposed PWDS discharge from the site go to the Western Beaches Tunnel (WBT)? *Reference attached WBT drainage map*	◯ YES X **NO** **If Yes, private water discharge fees will apply and site requires a sanitary discharge agreement.**		
What is the street name where the receiving sewer is located?	Richmond Street West	3	
What is the diameter of the receiving sewer?	600mm x 900mm	3	
Is there capacity in the proposed local sewer system? X YES ◯ **NO**	Are there any improvements required to the sewer system? If yes, identify them below and refer to the section and page number of the SR where this information can be found. If a sewer upgrade is required, the owner is required to enter into an Agreement with the City to improve the infrastructure? ◯ YES	12	
Has Toronto Water-WIM confirmed that there is there capacity in the proposed infrastructure listed below? - Trunk System? ◯ YES **X** **NO**	No confirmation received to date.		

SERVICING REPORT GROUNDWATER SUMMARY

-Pumping Station? ◯ YES X **NO** -Wastewater treatment plant? ◯ YES X **NO** -Outfall? ◯ YES X **NO** -Combined Sewer Overflow? ◯ YES X **NO** *If there is no capacity in any of the above then alternative options need to be considered by the Owner and site cannot discharge to City sewer system.			
Total allowable peak flow rate during a 100 year storm event (L/sec) to storm sewer When groundwater is to be discharged to the storm sewer the total groundwater and stormwater discharge shall not exceed the permissible peak flow rate during a 2 year pre development storm event, as per the City's Wet Weather Flow Management Guidelines, dated 2006	_24.1 L/sec	8	
Short-Term Groundwater Discharge Provide proposed total flow rate to the sanitary/combined sewer in post-development scenario Total Flow (L/sec) = sanitary flow + peak short-term groundwater flow rate	__4.85_____ L/sec	3/10	
Long-Term Groundwater Discharge Provide proposed total flow rate to the sanitary/combined sewer in post-development		10	

SERVICING REPORT GROUNDWATER SUMMARY

scenario Total Flow (L/sec) = sanitary flow + peak long-term groundwater flow rate	____4.85____ L/sec 4.81=4.45(residential sanitary)+0.11(commercial sanitary))+0.25(long-term groundwater		
Does the water quality meet the receiving sewer Bylaw limits? **X** YES ◯ NO	If the water quality does not meet the applicable receiving sewer Bylaw limits and the applicant is proposing a treatment system the applicant will need to include a letter stating that a treatment system will be installed and the details of the treatment system will be included in the private water discharge application that will be submitted to TW EM&P.	3	
C. ON-SITE GROUNDWATER CONTAINMENT		**Included in SR (reference page number)**	**Report Includes this information City Staff (Check)**
How is the site proposing to manage the groundwater discharge on site?	N/A		
Has the above proposal been approved by:	◯ TW-WIM And ◯ TW-EM&P And ◯ ECS		
If the site is proposing a groundwater infiltration gallery, has it been stated that the groundwater infiltration gallery will not be connected to the municipal sewer?	◯ YES ◯ NO		

SERVICING REPORT GROUNDWATER SUMMARY

A connection between the infiltration gallery/dry well and the municipal sewer is not permitted Please be advised if an infiltration gallery/dry well on site is not connected to the municipal sewer, the site **must** submit two letters using the templates in Schedule B and Schedule C.			
Confirm that the infiltration gallery can infiltrate 100% of the expected peak groundwater flow year round, ensure that the top of the infiltration trench is below the frost line (1.8m depth), not less than 5 m from the building foundation, bottom of the trench 1m above the seasonally high water table, and located so that the drainage is away from the building.			
D. WATER TIGHT REQUIREMENTS		**Included in SR (reference page number)**	**Report Includes this information City Staff (Check)**
If the site is proposing a water tight structure: 1. The owner must submit a letter using the template in Schedule D. 2. A Professional Engineer (Structural), licensed to practice in Ontario and qualified in the subject must submit a letter using the template in Schedule E. 3. A Professional Engineer (Mechanical), licensed to practice in Ontario and qualified in the subject must submit a letter using the template in Schedule F.			

Provide a copy of the approved SR to Toronto Water Environmental Monitoring & Protection Unit at pwapplication@toronto.ca.

December 2017

SERVICING REPORT GROUNDWATER SUMMARY

Consulting Firm that prepared Servicing Report: _____HUSSON Limited_____

Professional Engineer who completed the report summary: _____Greg Rapp_____
Print Name

Professional Engineer who completed the report summary: _____
Signature Date & Stamp

Smith + Andersen
1100 – 100 Sheppard Ave. East, Toronto ON, M2N 6N5
416 487 8151 f 416 487 9104 smithandandersen.com

2022-12-01

Attention: Executive Director, Engineering and Construction Services
c/o Manager, Development Engineering
5100 Yonge Street, 4th floor.
Toronto, Ontario, M2N 5V7

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

RE: 152-164 BATHURST 623-627 RICHMOND STREET, TORONTO, ONTARIO
S+A PROJECT # 22121.002.M.001
GROUND WATER DISCHARGE STRATEGY

To whom it may concern;

This letter is to confirm that groundwater from the Private Water Drainage System for the above mentioned project will be collected and discharged into the sanitary control manhole of the Site located at 152-164 Bathurst 623-627 Richmond Street.

The groundwater sump pumps will be sized at 0.25 L/sec (groundwater peak flow rate) and are expected to run approximately 7 minutes per day.

This peak flow rate will be used for assessing capacity for the peak discharge flow into the City's sanitary sewer system.

Once the proposed groundwater peak flow rate of 0.25 L/sec is approved by Engineering Construction Services (ECS), City of Toronto, the property owner will not be allowed to amend this flow rate in the future. Should there be any amendment to the peak flow rate of 0.25 L/sec in future, the property owner shall re-submit either the updated pump schedule or a revised letter to ECS. In addition, the sewer capacity will need to be re-assessed.

Smith + Andersen

Bram Atlin P.Eng., LEED AP
Principal
22121.002.M.001.l001 - Ground Water Strategy

APPENDIX D

STORMFILTER SIZING AND DETAILS

Determining Number of Cartridges for Flow Based Systems

Date	**08/04/2021**	**Black Cells =**	**Calculation**

Site Information

Project Name	**164 Bathurst Street**		
Project Location	**Toronto, ON**		
OGS ID	**OGS 1**		
Drainage Area, Ad	**0.07**	ac	(0.03 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	(1.5 L/s)
Peak storm flow rate, Q_{peak}	**TBD**	cfs	

Filter System

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

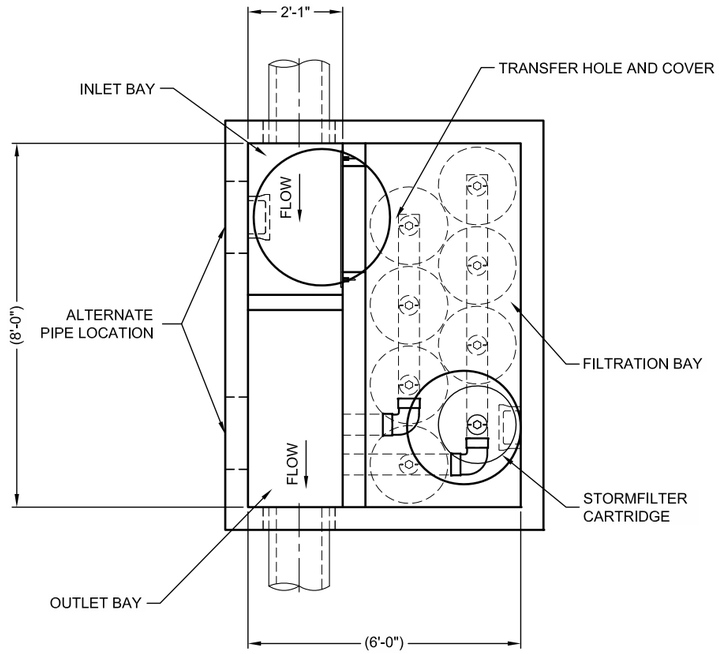
SUMMARY

Number of Cartridges	3
Media Type	Perlite

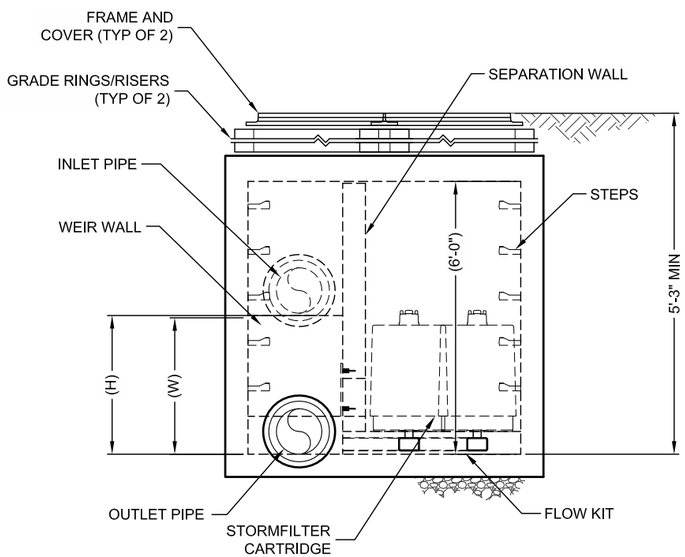
Event Mean Concentration (EMC)	**150**	mg/L
Annual TSS Removal	**80%**	
Percent Runoff Capture	**90%**	

Recommend SFPD0806 vault or CIP

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



PLAN



ELEVATION

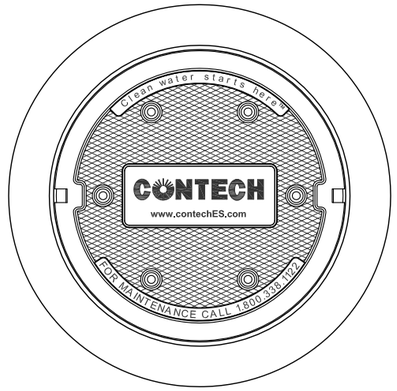
The Stormwater Management StormFilter®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,324,579; 5,707,527; 5,985,157; 6,027,639; 6,946,065; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

STORMFILTER DESIGN TABLE

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

CARTRIDGE HEIGHT	27"		18"		LOW DROP	
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	3.05'		2.3'		1.8'	
HEIGHT OF WEIR (W)	3.00'		2.25'		1.75'	
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5



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

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (CSF, PERLITE, ZPG)	*

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

INLET BAY RIM ELEVATION	*
FILTER BAY RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

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-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

GENERAL NOTES

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

INSTALLATION NOTES

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

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

THE STORMWATER MANAGEMENT STORMFILTER 8' x 6' PEAK DIVERSION STORMFILTER STANDARD DETAIL

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
Mail Code 401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

December 14, 2016

Derek M. Berg
Director - Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Laboratory Certification
Stormwater Management StormFilter® (StormFilter) by Contech Engineered Solutions LLC
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the StormFilter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the afore-mentioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the StormFilter System by Contech Engineered Solutions LLC at a TSS removal rate of 80%, when designed, operated and maintained in accordance with the information provided in the Verification Appendix and subject to the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 2.12 gpm/sf of effective filtration treatment area.

2. The StormFilter System shall be installed using the same configuration as the unit tested by NJCAT, and sized in accordance with the criteria specified in item 6 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the StormFilter, which is attached to this document. However, it is recommended to review the maintenance website at http://www.conteches.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=2813&PortalId=0&DownloadMethod=attachment for any changes to the maintenance requirements.

6. Sizing Requirements:

   The example below demonstrates the sizing procedure for a StormFilter System.

   Example: A 0.25 acre impervious site is to be treated to 80% TSS removal using a StormFilter System. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

   The calculation of the minimum number of cartridges for use in the StormFilter System is based upon both the MTFR and the maximum inflow drainage area. It is necessary to calculate the required cartridges using both methods and to rely on the method that results in the highest minimum number of cartridges determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the StormFilter System in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the maximum drainage area:

1. Five (5) 12” cartridges,
2. Three (3) 18” cartridges, or
3. Two (2) 27” cartridges

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was determined based on the following:

time of concentration = 10 minutes
i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c=0.99 (runoff coefficient for impervious)
Q=ciA=0.99x3.2x0.25=0.79 cfs=0.79x448.83 gpm=354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the MTFR:

1. Thirty-six (36) 12” cartridges,
2. Twenty-four (24) 18” cartridges, or
3. Sixteen (16) 27” cartridges

The MTFR Evaluation results will be used since that method results in the higher minimum number of cartridges determined by the two methods.

The sizing table corresponding to the available system models are noted below:

TABLE 1 STORMFILTER CARTRIDGE HEIGHTS AND NEW JERSEY TREATMENT CAPACITIES

StormFilter Cartridge Heights and New Jersey Treatment Capacities				
StormFilter Cartridge Height	**Filtration Surface Area (sq.ft)**	**MTFR[1] (GPM)**	**Mass Capture Capacity (lbs)**	**Maximum Allowable Inflow Area[2] (acres)**
Low Drop (12")	4.71	10	36.3	0.061
18"	7.07	15	54.5	0.09
27"	10.61	22.5	81.8	0.136

Notes:

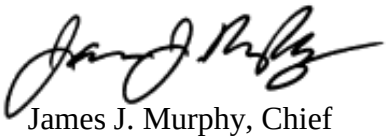
1. *MTFR calculated based on 4.72x10-3 cfs/sf (2.12 gpm/sf) of effective filtration treatment area.*
2. *Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.*

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of

indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Shashi Nayak of my office at (609) 633-7021.

Sincerely,



James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

CONTECH®
ENGINEERED SOLUTIONS

StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Inspection Report

Date: Personnel:

Location: System Size:

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: Date:

Sediment Depth on Vault Floor:

Structural Damage:

Estimated Flow from Drainage Pipes (if available):

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water:

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal:

☐ Minor Structural Repairs:

☐ Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source:

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source:

Erosion of Landscaped Areas: Yes ☐ No ☐ Source:

Items Needing Further Work:

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

RECYCLED PAPER

CONTECH®
ENGINEERED SOLUTIONS

800-338-1122

www.ContechES.com

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit contech-cpi.com or call 800.338.1122.

Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

800.338.1122
www.conteches.com

HUSSON

APPENDIX E

WATER DEMAND CALCULATIONS

Fire Flow Requirements

Project: Bathurst and Richmond
Project No.: 211176
Municipality: Toronto

Commercial/Office Building

GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOW
(as per the Water Supply for Public Fire Protection 1999 manual by the Fire Underwriters Survey)

STEP 1
Determine the fire flow.

Required Fire Flow (F)	F = 220 x C x sqrt(A)	The required fire flow in litres per minute.
Maximum Floor Area (A) =	15221 m2	Total Above Grade GFA
Coefficient (C) =	0.8	Coefficient related to the type of construction. = 1.5 for wood frame construction (structure essentially all combustible). = 1.0 for ordinary construction (brick or other masonry walls, combustible floor = 0.8 for non-combustible construction (unprotected metal structural) = 0.6 for fire-resistive construction (fullyprotected frame,floors, roof).
F =	21800 L/min.	

STEP 2
Determine the increase or decrease for occupancy.

	0%	Reduction for Low Hazard Occupancy (Dwellings).
Decrease	0 L/min.	

STEP 3
Determine the decrease, if any, for automatic sprinkler protection.

	50%	30% for sprinklered as per NFPA 13.
Decrease	10900 L/min.	50% for fully automatic sprinkler.

STEP 4
Determine the total increase for exposures.

0 -3m (25%), 3-10m (20%), 10-20m (15%), 20-30m (10%), 30-45m (5%)

North - 35m	10%	21
East - <3m	5%	31
South - >20m	25%	1
West - 8m	25%	1
	65.0%	Maximum exposure increase is 75%.
Increase	14170 L/min.	

STEP 5
Determine the minimum required fire flow.

F =	**25,000 L/min.**	**Round to the nearest 1000L/min.**

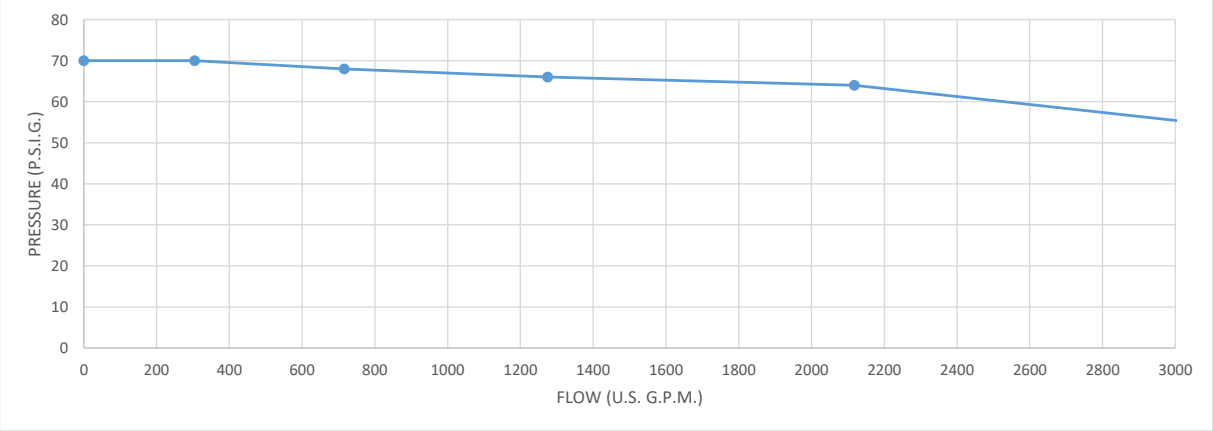
10 Estate Drive
Toronto, Ontario
Canada M1H 2Z1

T 416.282.1665
F 416.282.7702
www.corix.com

FLOW TEST REPORT

Date	JUNE 9TH 2021
Customer	HUSSON ENGINEERING
Job Location	152-164 BATHURST STREET, TORONTO ON
Time of Test	9:45AM
Location of test (flow)	MCAVITY M67 BRIGADIER HYD, 608 RICHMOND STREET WEST
Location of test (residual)	MCAVITY M67 BRIGADIER HYD, 656 RICHMOND STREET WEST
Main Size (mm)	
Static Pressure (psi)	70

	Number of Outlets & Orifice Size	PITOT Pressure (psi)	Flow (U.S. G.P.M.)	Residual Pressure (psi)
#1	1 x 1 1/8	66	305	70
#2	1 x 1 3/4	62	716	68
#3	1 x 2 1/2	58	1275	66
#4	2 x 2 1/2	40	2117	64
#5			6654	20
Colour code	Blue			



Comments	PERFORMED ONE COMPLETE NFPA 291 FLOW TEST AS REQUESTED.
Crew Member	COLIN MACDONALD