Lithos

May 2022

UD18-028

Functional Servicing and Stormwater Management Report

Project: 70 Richmond Road
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Identification	Date	Description of issued and/or revision
FSR/SWM Report	September 25th, 2020	Issued for Zoning By-law Amendment
FSR/SWM Report	August 12th, 2021	Issued for Zoning By-law Amendment
FSR/SWM Report	February 1st, 2022	Issued for Zoning By-law Amendment
FSR/SWM Report	April 11th, 2022	Issued for Zoning By-law Amendment
FSR/SWM Report	May 13th, 2022	Issued for Site Plan Application

Statement of Conditions

This Report / Study (the "Work") has been prepared at the request of, and for the exclusive use of, the Owner / Client, the City of Toronto and its affiliates (the "Intended User"). No one other than the Intended User has the right to use and rely on the Work without first obtaining the written authorization of Lithos Group Inc. and its Owner. Lithos Group Inc. expressly excludes liability to any party except the intended User for any use of, and/or reliance upon, the work.

Executive Summary

Lithos Group Inc. (Lithos) was retained by Devtrin (Island Park) Inc. (the "Owner") to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of a Site Plan Application for a proposed mixed-use development at 70 Richmond Road (K1Z 6V7), in the City of Ottawa (the "City"). The following is a summary of our conclusions:

Storm Drainage

The site stormwater discharge will be controlled to meet the half of the 5-year pre-development flow and will be discharging into the existing 525mm diameter storm sewer on Richmond Road. In order to attain the target flows and meet the City's requirements, quantity controls will be utilized and up to 61.45m^3 of on-site storage will be required for the proposed development. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of the Environment, Conservation and Parks (MECP). Quality control will be provided for the project site for a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

The proposed development will be connected to the existing 250mm diameter sanitary sewer on the south side of Richmond Road. The additional net discharge flow from the proposed development, is anticipated at approximately 2.41 L/s. Confirmation is anticipated by the City on whether the existing sanitary infrastructure along Richmond Road can support the proposed development.

Water Supply

Water supply for the site will be from the existing 200mm diameter watermain, on the east side of Island Park Drive and from the existing 300mm diameter watermain, on the south side of Richmond Road. It is anticipated that a total design flow of 93.72 L/s will be required to support the proposed development. Based on the boundary conditions received from the City it is revealed that the existing water infrastructure can support the existing development.

Site Grading

The proposed grades will improve the existing drainage conditions to meet the City's/Regional requirements. Grades will be maintained along the property line whether feasible and emergency overland flow will be driven to the adjacent right-of-way's (ROW).

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1.0 Introduction

Lithos Group Inc. (Lithos) was retained by Devtrin (Island Park) Inc. (the "Owner") to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of a Site Plan Application for a proposed mixed-use development at 70 Richmond Road (K1Z 6V7), in the City of Ottawa (the "City").

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

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

- As built plans for the underground services bounding the property, located at the intersection between Richmond Road and Island Park Drive (Drawing No. 055042-12, 055042-18);
- Utilities Plan in CAD format;
- Phase II – Environmental Site Assessment prepared by Paterson Group, dated July 14, 2021;
- Geotechnical Investigation prepared by Paterson Group, dated May 10,2022;
- Site Plan and Site Statistics prepared by HOBIN, dated May 13, 2022; and,
- Topographical Survey prepared by Stantec Geomatics Ltd., dated July, 2021.

2.0 Site Description

The existing site is approximately 0.159 hectares of residential and commercial-use land, located on the south corner of the intersection between Richmond Road and Island Park Drive, in the City of Ottawa. It is currently occupied by an abandoned single-storey commercial heritage building, a two-storey residential building and an outdoor parking area. The site is bound by a residential building to the south-east, Island Park Drive to the north-east, Richmond Road to the north-west and by a commercial development to the south-west. Refer to **Figures 1** and **2** following this report, site photographs in **Appendix A** and to the topographic survey in **Appendix B**.

3.0 Site Proposal

The proposed development will be comprised by a 10-storey mixed-use commercial/residential building and seven (7) townhouses, which will be facilitated by two (2) levels of underground parking. The existing single-storey commercial heritage building will be relocated at the north corner of the site. The proposed development will have a total of 88 residential units and ground floor retail units with a Gross Floor Area (GFA) of 209.96 m^2.

The total development will include approximately 9,122.1 m^2 of Gross Floor Area (GFA). Please refer to **Appendix B** for proposed site plan and building site statistics.

4.0 Terms of Reference and Methodology

4.1. Terms of Reference

The following references and technical guidelines were consulted in the present study:

- **City of Ottawa Servicing Study Guidelines**, online edition;
- **City of Ottawa Sewer Design Guidelines**, (2012);
- **City of Ottawa Design Guidelines – Water Distribution**, (2010);
- **Ministry of Environment, Conservation and Park (MECP) Guidelines for the Design of Water Systems** (2008);
- **MECP Guidelines for the Design of Sanitary** Sewage Systems (2008);
- **MECP Stormwater Planning and Design Manual** (2003); and,
- **Ontario Building Code** (2010).

4.2. Methodology: Stormwater Drainage and Management

This report provides a detailed Stormwater Management (SWM) review of the pre-development and post-development conditions and comments on opportunities to reduce peak flows, as per the City of Ottawa guidelines.

The stormwater management criteria for this development are based on the City of Ottawa Sewer Design Guidelines, as well as the Ministry of Environment, Conservation and Parks (MECP) 2003 Stormwater Management Planning and Design Manual (SWMPD). The following design criteria will be reviewed:

- Post-development peak flow for the 100-year storm event from the site should be controlled to the half of the 5-year target flow. A 20-minute time of concentration and a 10 min inlet time derived from City of Ottawa IDF curves, were considered for connection to a dedicated storm sewer;
- For connection to a dedicated storm sewer, when the imperviousness of the existing property is greater than 50%, the maximum value of the runoff coefficient, “c”, used in calculating the pre-development peak runoff rate is limited to 0.50; and,
- A safe overland flow will be provided for all flows in excess of the 100-year storm event.

4.3. Methodology: Sanitary Discharge

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

The estimated sanitary discharge flows from the proposed site will be calculated based on the criteria shown in **Table 4.1** below (Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines).

Table 4.1 – Sanitary Flows

Design Parameter	Value
Residential Units (Average Apartment)	Bachelor Unit =1.4 people/unit 1 Bedroom Unit=1.4 people/unit 2 Bedroom Unit=2.1 people/unit 3 Bedroom Unit=3.1 people/unit
Average Daily Residential Flow	280 L/person/day
Residential Peak Factor	$PF = 1 + (14/(4+(P/1000)^{1/2})$
Commercial Floor Space	50000 L/ha/day
Commercial Peaking Factor	1.5 if commercial contribution >20%, otherwise 1.0
Infiltration and Inflow Allowance	0.28 L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	1.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s

4.4. Methodology: Water Usage

The fire flow requirements were estimated using the method prescribed by the Fire Underwriters Survey (FUS). This method is based on the fire protected building floors, the type and combustibility of the structural frame and the separation distances with adjoining building units.

Section 4.3.22 of the City Design guidelines for water distribution provides guidance for determining the method for estimating Fire Demand. As indicated, the requirements for levels of fire protection on private property are covered in the Ontario Building Code. Section 7.2.11 of the OBC addresses the installation of water service pipes and fire service mains. Part 3 of the OBC outlines the requirement for Fire Protection, Occupant Safety, and Accessibility; and subsection A-3.2.5.7 provides the provisions for firefighting. Based on trained personnel responding to the emergency, and water supply being delivered through a municipal, the required minimum provision for water supply flow rates shall not be less than 2,700L/min or greater than 9,000L/min (OBC Section A.3.2.5.7, Table 2).

The domestic water usage was calculated based on the City's design criteria (OBC Table 8.2.1.3.B) outlined in **Table 4.2.**

Table 4.2 – Water Usage

Design Parameter	Value
Average Residential Day Demand	350 L/person/day
Maximum Residential Day Demand	2.5 x Average Day Demand
Maximum Residential Hour Demand	2.2 x Max Day Demand
Average Commercial Day Demand	2.5 L/m^2/d
Maximum Commercial Day Demand	1.5 x Average Day Demand
Maximum Commercial Hour Demand	1.8 x Max Day Demand
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During Peak Hour Demand desired operating pressure is within	350kPa and 480KPa
Minimum pressure during normal operating conditions (average day to maximum hour demand)	275kPa
During normal operating conditions, pressure must not exceed	552kPa
Minimum pressure during fire flow plus maximum day demand	140kPa

5.0 Stormwater Management and Drainage

5.1. Existing Conditions

The existing site is approximately 0.159 hectares and is currently occupied by an abandoned single-storey commercial building, a two-storey residential building and an outdoor parking area.

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

- A 525 mm diameter storm sewer, located at the south side of Richmond Road running west;
- A 525 mm diameter storm sewer, located at the east side of Island Park Drive running north-east; and,
- A 450 mm diameter storm sewer, located at the south-west side of the property along the easement area.

The existing site is primarily covered by building, thus, there is no significant infiltration onsite. Although the existing run-off coefficient is estimated at 0.76, the City of Ottawa Guidelines require target flow calculations, based on a run-off coefficient of 0.50. The input parameters, summarized in **Table 5.1** below, are illustrated in the pre-development drainage area plan in **Figure DAP-1** in **Appendix C**.

Table 5.1 – Pre-development Input Parameters

Drainage Area	Drainage Area (ha)	Actual "C"	Design "C"	Tc (min.)
A1 Pre	0.159	0.76	0.50	20

Peak flows calculated for the existing conditions are shown in **Table 5.2** below. Detailed calculations can be found in **Appendix C**.

Table 5.2 – Target Peak Flows

Catchment	Peak Flow Rational Method (L/s)		
	2-year	5-year	100-year
A1 Pre	11.5	15.5	26.5

Further to our consultation with the City, half of the calculated target flow has to be used to estimate the required post-development storage volume. Hence, post-development flows towards Richmond Road will need to be controlled to the target flow of 7.8L/s (15.5 /2 L/s).

5.2. Proposed Conditions

In order to meet the City's Stormwater Management criteria, the development flow rate is to be controlled to the half of the five (5)-year pre-development conditions, as established in **Section 5.1.** Overland flow from the site will be directed towards the adjacent right-of-ways.

The site consists of two (2) internal drainage areas:

1. A1 Post – Storm runoff from the rooftop/terraces/hardscaped/landscaped areas, controlled into the underground storage tank; and
2. A2 Post – Uncontrolled storm runoff from the site, towards the adjacent right-of-way (Richmond Road).

The post-development drainage areas and runoff coefficients are indicated on **Figure DAP-2**, located in **Appendix C** and summarized in **Table 5.3** below.

Table 5.3 - Post-development Input Parameters

Drainage Area	Drainage Area (ha)	"C"	Tc (min.)
A1 Post (Rooftop/Terraces/Hardscaped/Landscaped Areas)	0.152	1.00*	10
A2 Post (Uncontrolled Site Area)	0.007	0.88*	10

* "C" value for the 100-year storm event is increased by 25%, with a maximum of 1.0 per City's Sewer Design Guidelines.

5.3. Quantity Controls

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5 and 100-year storm events are provided in **Table 5.4**. The detailed post-development quantity control calculations are provided in **Appendix C.**

Table 5.4 – Post-development Quantity Control as per City Requirements

Storm Event	Total Uncontrolled Flow (L/s)	Target Site Release Rate (L/s)	Required Storage Tank Volume (m^3)	Total Controlled Release Rate of the Tank (L/s)
2-year	1.0	6.6	15.03	6.6
5-year	1.4		23.80	
100-year	2.3		61.45	

As shown in **Table 5.4**, in order to control post-development flows to the half of the 5-year pre-development conditions, a target flow of 6.6 L/s is to be satisfied. The required on-site storage is 61.45 m^3 for the 100-year storm event and is accommodated by the use of one (1) suspended underground storage tank, located at P1 level.

5.3.1. Underground Storage Tank

An underground storage tank is proposed to meet the quantity control requirements, set forth by the City's WWFMG Guidelines. Controlled stormwater flow from the rooftop, terraces, landscaped and hardscaped area (**Drainage Area A1 Post**) will be gravity driven into the proposed main underground storage tank located at P1 level (refer to engineering drawing **SS-01**, submitted separately).

The 100-year storm yielded an underground storage tank capable to store up to 61.45m^3, controlled by a 104mm Vortex Valve Flow Regulator CEV 250, with a maximum release rate of 6.6 L/s, achieved and will be ultimately directed through gravity towards the City's existing storm sewer network. Detailed sizing calculations for the Vortex Flow Regulator are provided in **Appendix C**.

In addition, the proposed main storage tank will have a footprint area of 86.80m^2 and an active storage depth of 0.71m above the invert of the outlet pipe. Refer to **Figure 3**, included in **Appendix C**, for the maximum tank design requirements. A maximum control stormwater release rate from the main storage tank of 6.6L/s, along with the uncontrolled release rate of 2.3L/s (**Drainage Area A2 Post**), results to a post-development total release rate of 8.9L/s, for the 100-year event. For over 100-year storm events, the storm tank will also include a perforated access hatch and in case of emergency will overflow towards the adjacent right-of-way (ROW). Consequently, the proposed SWM plan retains enough runoff volume, to reduce the post-development peak flows for each storm event to the extent possible and approach the required target flow.

5.4. Quality Controls

Stormwater treatment must meet Enhanced Protection criteria as defined by the MECP 2003 SWMPD Manual, including the removal of at least 80% total suspended solids (TSS). Stormwater discharged from the site area will not be polluted by car waste (**Drainage Area A1** and **A2 Post**). Therefore, it is considered "clean" and will be directly driven into the underground storage tank. The detailed quality control calculations can be found in **Appendix C**. A summary of the site quality control is included in **Table 5.5** below.

Table 5.5 – Site TSS Removal

Drainage Area	Drainage Area (ha)	Overall TSS Removal	Additional Quality Control Required
Rooftop/Terraces/ Hardscaped/Landscaped Areas	0.152	80%	Inherent
Total	0.152	80%	

5.5. Proposed Storm Connection

The proposed development will connect to the existing 525mm diameter storm sewer on Richmond Road via a proposed 150 mm diameter storm sewer service connection with a minimum grade of 2.00% (or equivalent pipe design). Refer to engineering drawing **"SS-01"** (submitted separately) for more details.

The post-development 100-year storm flow has been designed to match the half of the five (5)-year pre-development storm flow. Therefore, the proposed development will not adversely affect flow conditions downstream and the existing infrastructure on Richmond Road will be adequate to service this development.

Flows above the 100-year event will be conveyed within pipes and overland to the adjacent municipal right-of-way (ROW). Refer to engineering drawing "**SG-01**" (submitted separately) for overland flow in excess of the 100-year storm event.

6.0 Sanitary Drainage System

6.1. Existing Sanitary Drainage System

The site is currently occupied by an abandoned single-storey commercial building, a residential two-storey building and an outdoor parking area. According to available records, there are three (3) existing sanitary sewers abutting the subject property. More specifically there are:

- A 250 mm diameter sanitary sewer on the south side of Richmond Road, flowing west;
- A 200 mm diameter sanitary sewer on the east side of Island Park Drive, which becomes 250mm, flowing north; and,
- A 200 mm diameter sanitary sewer along the easement located west of the property, flowing north.

6.2. Existing Sanitary Flows

The sanitary flow generated by the proposed development at 70 Richmond Road was compared to the existing flow in order to quantify the net increase in the sanitary sewer. Using the design criteria outlined in **Table 4.1** and the existing site information, the sanitary flow from the existing development is estimated at 0.09 L/s. Detailed calculations are included in **Appendix D**.

6.3. Proposed Sanitary Flows

According to the proposed development's site statistics, as well as the design criteria outlined in **Section 4.3**, the sanitary flow from the new building is calculated at 2.50 L/s (0.04 L/s infiltration flow, 2.11L/s sanitary flow and 0.35L/s groundwater flow), towards the City's infrastructure.

Following the above, there is an increase in the sanitary flow of approximately 2.41 L/s within the City's sewer network. Detailed calculations can be found in **Appendix D.**

The proposed development will increase the sanitary flows into the downstream network; however, confirmation on whether there is adequate capacity to the City's infrastructure to accommodate the additional sanitary flow under both dry and wet weather conditions, is anticipated by the City.

6.4. Proposed Sanitary Connection

The proposed development will connect to the existing 250mm diameter sanitary sewer on Richmond Road, via a 150 mm diameter lateral sanitary connection with a minimum grade of 2.00% (or equivalent pipe design). Refer to engineering drawing **"SS-01"** (submitted separately), for the proposed sanitary connection.

7.0 Water Supply System

7.1. Existing System

The existing water supply system consists of a 300 mm diameter watermain on the north side of Richmond Road, a 200 mm diameter watermain on the east side of Island Park Drive and a 150 mm diameter watermain along the easement, located at the west side of the property.

7.2. Water Supply Requirements

The estimated water consumption was calculated based on the occupancy rates shown on **Table 4.2** in **Section 4.4**, according to the City of Ottawa Guidelines. Based on the proposed use, it is anticipated that an average domestic water consumption of 0.66 L/s (56,350 L/day) (Average Commercial Water Demand + Average Residential Water Demand= 0.01 L/s + 0.65 L/s = 0.66 L/s), a maximum daily consumption of 1.64 L/s (141,696 L/day) and a peak hourly demand of 3.60 L/s (12,960 L/hour) will be required to service the proposed development with domestic water.

The fire flow requirements were estimated using the method prescribed by the Fire Underwriters Survey (FUS) be undertaken to assess the minimum requirement for fire suppression. The fire flow calculations are normally conducted for the greater storey and for the other two immediately adjoining storeys.

Table 7.1 illustrates the input parameters used for the FUS calculations. According to our calculations, a minimum fire suppression flow of approximately 92.08 L/s (1460 USGPM) will be required. Refer to detailed calculations found in **Appendix E.**

Table 7.1 – Fire Flow Input Parameters

Parameter	Frame used for Building	Combustibility of Contents	Presence of Sprinklers	Separation Distance			
				North-West	South-West	North-East	South-East
Value according to FUS options	Fire-Resistive Construction	Limited Combustible Occupancy	Yes	30.1m to 45m	3.1m to 10m	30.1m to 45m	0m to 3.0m
Surcharge/reduction from base flow	0.6	15%	30%	5%	20%	5%	25%

In summary, the required design flow is the sum of 'the minimum fire suppression flow' and 'maximum daily demand' (92.08 + 1.64 = 93.72L/s, 1,486 USGPM).

Table 7.2 summarizes the anticipated water demand for the proposed development based on the City of Ottawa Guidelines – Water Distribution.

Table 7.2 – Water Demand

Design Parameter	Anticipated Demand[1] (L/s)
Average Day Demand	0.66
Max Day + Fire Flow	1.64 + 92.08 = 93.72
Max Hour Demand	3.60
1. Water demand calculations per City of Ottawa Guidelines. See **Appendix E** for detailed calculations.	

Boundary conditions from the City has been obtained (Refer to email correspondence in **Appendix B**).

7.3. Water Analysis Results

Upon completion of the detailed calculations in order to determine the anticipated domestic water consumption and the required minimum fire flow for the proposed development, the calculation results were provided to the City of Ottawa. As a result, the above noted values were used to generate the municipal watermain network boundary conditions.

Table 7.3 below summarizes the boundary conditions provided by the City of Ottawa for the existing municipal watermain network along Richmond Road and Island Park Drive.

Table 7.3 – Boundary Conditions Provided by the City

Municipal Watermain Boundary Condition	Richmond Road Connection	Island Park Drive Connection
Minimum HGL	108.3	108.3
Maximum HGL	114.9	114.9
Max Day + Fire Flow	109.8	108.9

Table 7.4 operating conditions and compares the anticipated operating pressures at the watermains to the normal operating pressures outlined in the City of Ottawa Design Guidelines.

Table 7.4 – Watermain Analysis Results

Watermain Connections	Design Parameter	Anticipated Demand (L/s)	Approximate Design Operating Pressures (psi) / Relative Head (m)	Normal Municipal Operating Pressures (psi)
a) Island Park Drive b) Richmond Road	Average Demand	0.66	68 psi (47.7m)	50-70 psi
	Peak Hour Demand	3.60	58 psi (41.1m)	40-70 psi
	Max Day + Fire Flow Demand	93.72	a) 61 psi (42.6m) b) 59 psi (41.7m)	20 psi (min)

The design operating pressures shown in **Table 7.4**, are within the normal municipal operating pressures, per the City's requirements. Therefore, the municipal water network will be able to support the proposed development.

7.4. Proposed Watermain Connections

The proposed development will be serviced by two (2) 150 mm diameter service connections, one (1) will be connected to the existing 200 mm diameter watermain located on the east side of Island Park Drive and one (1) will be connected to the existing 300mm diameter watermain located on the south side of Richmond Road. According to City standards the watermain connections will be insulated. For details refer to engineering drawing "**SS-01**" (submitted separately).

8.0 Groundwater Conditions

According to the Geotechnical Investigation prepared by Paterson Group, dated May 10, 2022, the groundwater depths range from 2.23 m to 5.13 m below the ground surface. In addition, the proposed development will be serviced by two (2) underground parking levels and the lowest basement slab depth will be approximately 6.6m from the ground surface (lowest basement slab elevation at 60.60 masl).

The results of groundwater sampling on site, reveal that groundwater quality limits according to the City's by-laws are not within the acceptable range. According to the Letter provided by Paterson Group, dated February 22, 2022, the groundwater remediation program will result in one of four (4) scenarios.

In general, during long-term conditions, according to scenarios 1 and 2, the groundwater should be "clean" by the time it will be discharged from the proposed building into the municipal infrastructure, via a sump pump. Therefore, no treatment should be necessary. In case treatment is required upon remediation process (scenarios 3 and 4), a treatment facility will need to be installed. For details refer to the Letter provided by Paterson Group, dated February 22, 2022, found in **Appendix B**.

More specifically, according to Scenario 1, groundwater quality is in compliance with the City's limits for both sanitary and storm sewer networks, therefore, groundwater could be discharged either into sanitary or storm municipal infrastructure without treatment. According to Scenario 2, groundwater quality limits as per the City's by-laws are met only for discharging into the sanitary municipal sewer network. Consequently, groundwater flow could be discharged into the City's sanitary sewer network, without being treated. In addition, according to Scenario 3, the City's groundwater limits are not met for discharging neither to the storm or the sanitary infrastructure and treatment is required for both options. According to Scenario 4, groundwater quality will be in compliance with the City's limits for discharging into the municipal sanitary network upon treatment. For details refer to the Letter provided by Paterson Group, dated February 22, 2022, found in **Appendix B**. Eventually, the peak groundwater flow from the proposed development will be discharged under all four (4) scenarios into the City's sanitary network. Please refer to "**Sanitary Sewer Design Sheet – Scenario 1**", design sheet 1 of 4, "**Sanitary Sewer Design Sheet – Scenario 2**", design sheet 2 of 4, "**Sanitary Sewer Design Sheet – Scenario 3**", design sheet 3 of 4, "**Sanitary Sewer Design Sheet – Scenario 4**" design sheet 4 of 4, found in **Appendix D**, for more details.

8.1. Long-Term Dewatering

The proposed development will be serviced by two (2) underground parking levels and the lowest basement slab depth will be approximately 6.6m from the ground surface (lowest basement slab elevation at 60.60 masl), thus a permanent groundwater discharge into the City's infrastructure will be required. According to the Geotechnical Investigation, prepared by Paterson Group, dated May 10, 2022, found in **Appendix B,** the long-term discharge flow rate is anticipated between 25,000 and 30,000 L/day. Taken into account the worst-case scenario, 30,000 L/day, a groundwater peak flow rate of 0.35L/sec will be discharged into the 250mm diameter existing sanitary sewer along Richmond Road.

8.2. Short-Term Dewatering

On a short-term basis periodic management of surface water associated with precipitation events may be required. According to the Geotechnical Investigation prepared by Paterson Group, dated May 10, 2022, found in **Appendix B,** a discharge flow rate between 50,000L/day to 400,000 L/day is anticipated, which translates to approximately 0.58 L/s up to 4.63 L/s. During construction, groundwater will be hauled-off through a truck.

9.0 Erosion and Sediment Control

Soil erosion occurs naturally and is a function of soil type and climate topography. The extent of erosion losses is exaggerated during construction where vegetation has been removed and the top layer of soil becomes agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction.

Catch basins will have filter fabric installed under the grate during construction, to protect from silt entering the storm sewer system.

A mud mat will also be installed at the construction access, in order to prevent mud tracking onto adjacent roads.

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

- Limit extend of exposed soils at any given time.
- Re-vegetate exposed areas as soon as possible.
- Minimize the area to be cleared and grubbed.
- Protect exposed slopes with plastic or synthetic mulches.
- Install silt fence to prevent sediment from entering existing ditches.
- No refueling or cleaning of equipment near existing watercourses.
- Provide sediment traps and basins during dewatering.
- Install filter cloth between catch basins and frames.
- Plan construction at proper time to avoid flooding.

Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not following under silt barriers.
- Clean and change filter cloth at catch basins.

10.0 Site Grading

10.1. Existing Grades

The existing site is approximately 0.159 hectares of residential and commercial-use land, located on the south corner of the intersection between Richmond Road and Island Park Drive, in the City of Ottawa. It is currently occupied by an abandoned single-storey commercial heritage building, a two-storey residential building and an outdoor parking area.

The site drains into the existing stormwater system inside the property and overland towards the adjacent right of ways (ROW).

10.2. Proposed Grades

The proposed grades will improve the existing drainage conditions to meet the City's/Regional requirements. Grades will be maintained along the property line wherever feasible and emergency overland flow will be directed towards Richmond Road. Existing drainage patterns on adjacent properties will not be altered and stormwater runoff from the subject development will not affect the adjacent properties.

11.0 Conclusions and Recommendations

Based on our investigations, we conclude the following:

Storm Drainage

The site stormwater discharge will be controlled to meet the half of the 5-year pre-development flow and will be discharging into the existing 525mm diameter storm sewer on Richmond Road. In order to attain the target flows and meet the City's requirements, quantity controls will be utilized and up to 61.45m^3 of on-site storage will be required for the proposed development. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of the Environment, Conservation and Parks (MECP). Quality control will be provided for the project site for a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

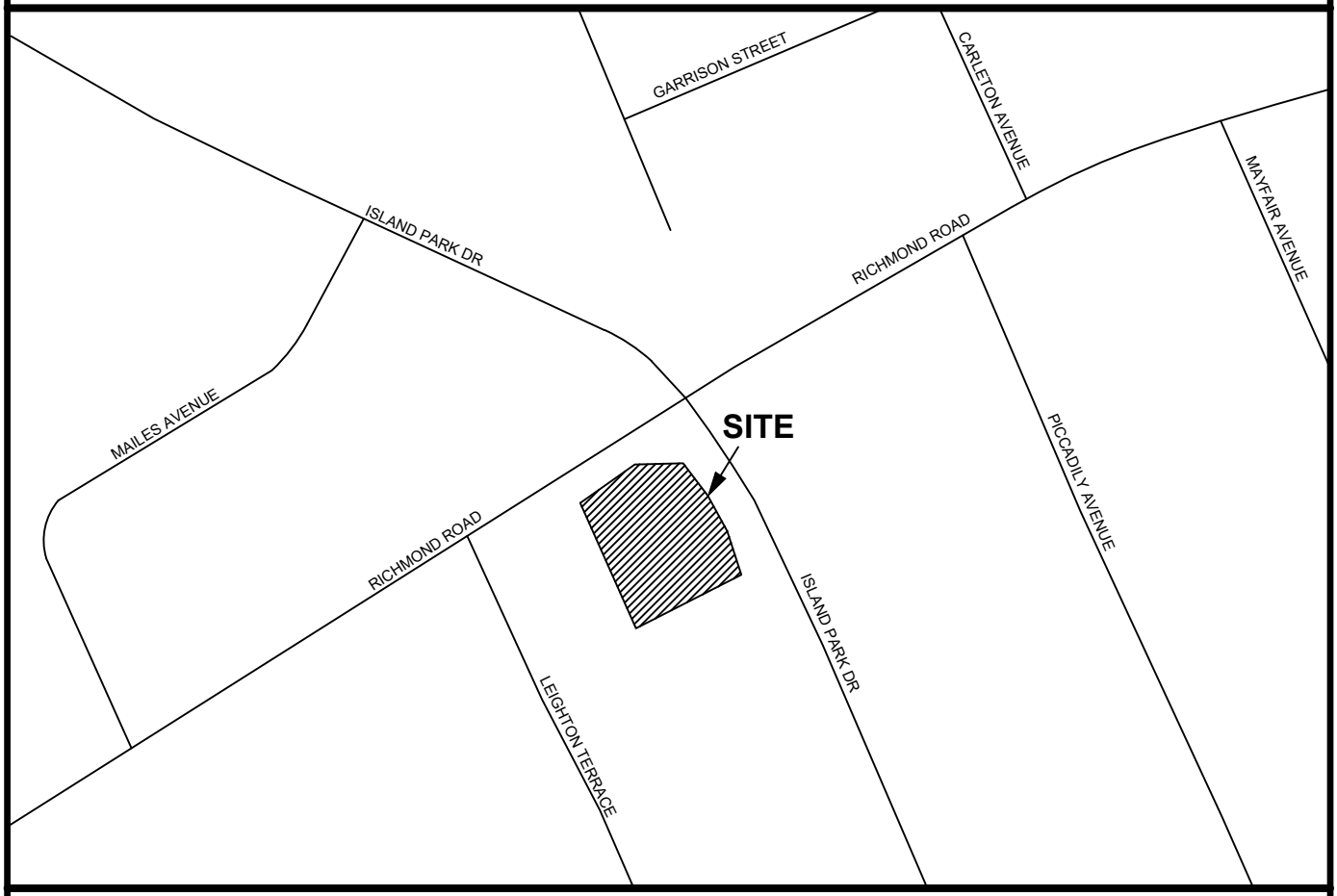
The proposed development will be connected to the existing 250mm diameter sanitary sewer on the south side of Richmond Road. The additional net discharge flow from the proposed development, is anticipated at approximately 2.41 L/s. Confirmation is anticipated by the City on whether the existing sanitary infrastructure along Richmond Road can support the proposed development.

Water Supply

Water supply for the site will be from the existing 200mm diameter watermain, on the east side of Island Park Drive and from the existing 300mm diameter watermain, on the south side of Richmond Road. It is anticipated that a total design flow of 93.72 L/s will be required to support the proposed development. Based on the boundary conditions received from the City it is revealed that the existing water infrastructure can support the existing development.

Site Grading

The proposed grades will improve the existing drainage conditions to meet the City's/Regional requirements. Grades will be maintained along the property line whether feasible and emergency overland flow will be driven to the adjacent right-of-way's (ROW).



Lithos

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LOCATION PLAN
MIXED USE DEVELOPMENT
70 RICHMOND ROAD
OTTAWA, ONTARIO

DATE:	MAY 2022	PROJECT No:	UD18-028
SCALE:	N.T.S.	FIGURE No:	FIG 1

Lithos

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

AERIAL PLAN

MIXED USE DEVELOPMENT
70 RICHMOND ROAD
OTTAWA, ONTARIO

DATE:	MAY 2022	PROJECT No:	UD18-028
SCALE:	N.T.S.	FIGURE No:	FIG 2

Appendix A

Site Photographs

East Corner of Property

North Corner of Property

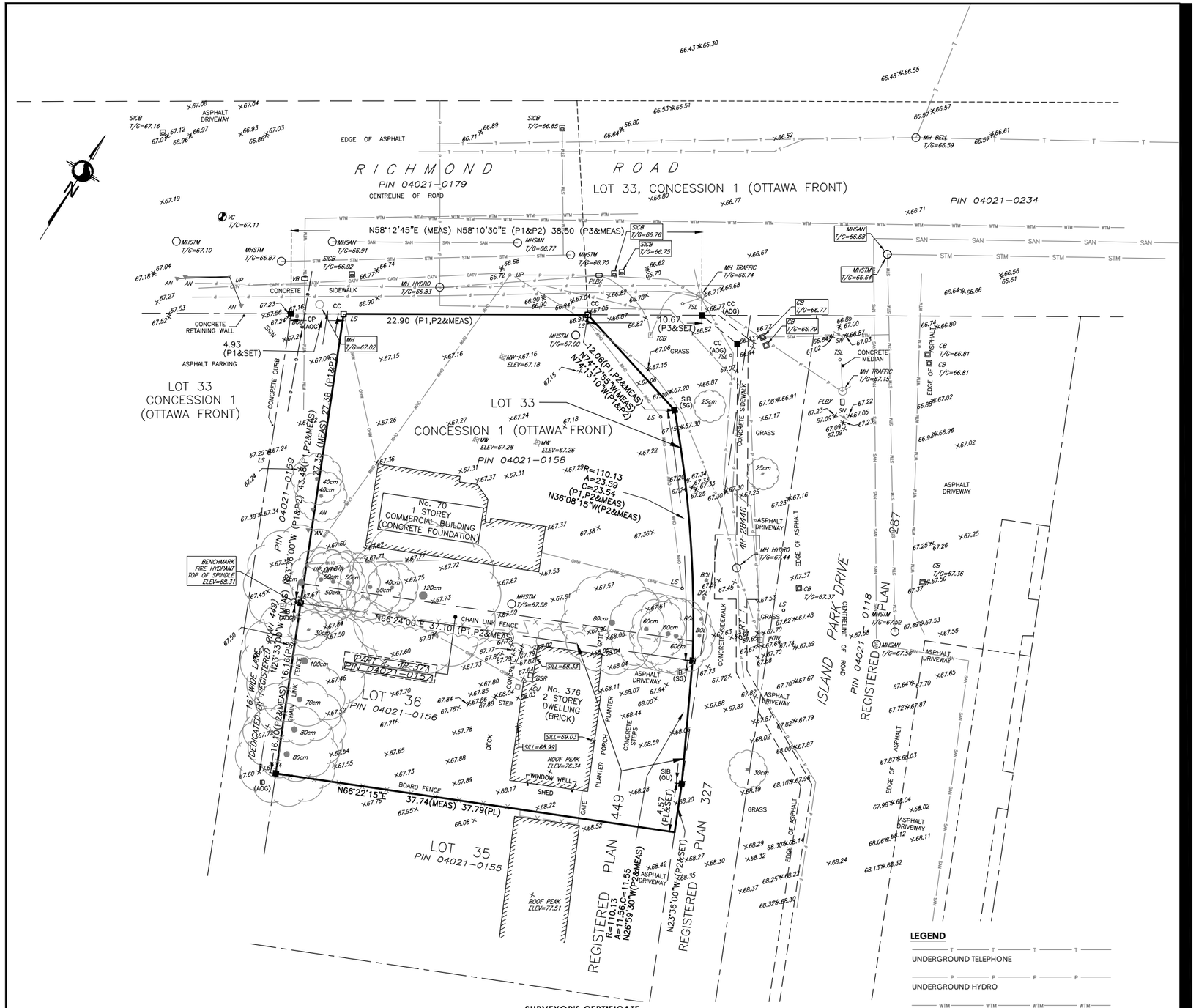
West Corner of Property

North-West Side of Property

North-East Side of Property

Appendix B

Background Information



SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THE SURVEY WAS COMPLETED ON THE 11th DAY OF JUNE, 2021.

July 27, 2021
DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

LEGEND

UNDERGROUND TELEPHONE	T T T T	
UNDERGROUND HYDRO	P P P P	
WATERMAIN	WTM WTM WTM WTM	
GASMAIN	G G G G	
STORM SEWER	STM STM STM STM	
UNDERGROUND CABLE	CATV CATV CATV CATV	

Stantec

Stantec Geomatics Ltd.
400-1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

TOPOGRAPHIC SKETCH OF

PART OF LOT 33 CONCESSION 3 (OTTAWA FRONT)

(GEOGRAPHIC TOWNSHIP OF NEPEAN)
AND

LOT 36 REGISTERED PLAN 449 CITY OF OTTAWA

Scale 1:250

5 0 5 10 15 METRES

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

GRID SCALE CONVERSION
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999933.

BEARING NOTE
BEARINGS ARE REFERRED TO THE * LIMIT OF *, AS SHOWN ON PLAN *, HAVING A BEARING OF XX°XX'XX".

ELEVATION NOTE
ELEVATIONS SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMENT: OTTAWA ELEVATION = 95.230.

UTILITY NOTE
LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE AND PER THE CITY OF OTTAWA SHEETS, AND MUST BE VERIFIED PRIOR TO CONSTRUCTION.

LEGEND

■	DENOTES	FOUND MONUMENTS
□	"	SET MONUMENTS
IB	"	IRON BAR
IBØ	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
PL	"	REGISTERED PLAN 449
P1	"	PLAN BY W&S DATED DEC.13, 1996
P2	"	PLAN BY AOV DATED FEB.10, 2016
P3	"	PLAN 4R-28446
ACU	"	AIR CONDITIONING UNIT
AN	"	ANCHOR
BOL	"	BOLLARD
CB	"	CATCH BASIN
SICB	"	SIDE INLET CB
GSR	"	GAS SERVICE REGULATOR
HTN	"	HYDRO TRANSFORMER
HYD	"	FIRE HYDRANT
LS	"	LIGHT STANDARD
MH	"	MAINTENANCE HOLE UNIDENTIFIED
MHB	"	MAINTENANCE HOLE BELL
MHH	"	MAINTENANCE HOLE HYDRO
MHSA	"	MAINTENANCE HOLE SANITARY
MHST	"	MAINTENANCE HOLE STORM
MHT	"	MAINTENANCE HOLE TRAFFIC
MW	"	MONITORING WELL
PLBX	"	PULL BOX
SN	"	SIGN
TCB	"	TRAFFIC CONTROL BOX
TSL	"	TRAFFIC SIGNAL LIGHT
UP	"	UTILITY POLE
VB	"	VALVE BOX
VC	"	VALVE CHAMBER
WV	"	WATER VALVE
	"	TREE DECIDUOUS

DRAWN: NJ CHECKED: BW PM: BW FIELD: CK/AW PROJECT No.: 161614226-111

This plan was signed with a scanned signature as a result of the Emergency Order related to the COVID-19 pandemic.

70 Richmond Road

BUILDING SUMMARY

1 BUILDING AREA SUMMARY

SITE AREA		17,093	SQ.FT.	
BUILDING FOOTPRINT		12,180	SQ.FT.	71% COVERAGE
NUMBER OF STOREYS ABOVE GRADE		9	STOREYS	
TOTAL GROSS AREA		98,190	SQ.FT.	(**EXCLUDES BELOW GRADE AREA)
TOTAL NET/LEASEABLE AREA				
	RESIDENTIAL	77,500	SQ.FT.	
	COM/RET	2,260	SQ.FT.	
TOTAL GFA (AS PER CITY DEF.)		-	SQ.FT.	

2 UNIT SUMMARY

TOTAL UNITS **88**	QTY.	RATIO %
STUDIO	3	3%
1 BEDROOM	30	34%
1 BEDROOM + DEN	7	8%
2 BEDROOM	24	27%
2 BEDROOM + DEN	17	19%
TOWNHOUSE (2 BED + DEN)	7	8%
AVERAGE UNIT SIZE	881	SQ.FT.

3 PARKING REQUIREMENTS (ZBL) total units -12

RES	TOTAL PARKING REQUIRED (ZBL)	38	SPACES	*Rate = 88 - 12 X 0.5 = 38
	TOTAL PARKING PROVIDED	63	SPACES	*Rate = 0.85
	PARKING RATE PROVIDED	0.83	/UNIT	
VIS	TOTAL VISITOR PARKING REQUIRED (ZBL)	8	SPACES	*Rate = 88 - 12 X 0.1 = 7.6
	TOTAL VISITOR PROVIDED	8	SPACES	*Rate = 0.1
	PARKING RATE PROVIDED	0.1	/UNIT	
TOTAL PARKING REQUIRED (ZBL)		**46**	**SPACES**	* 38 + 8 = 46 spaces
TOTAL PARKING PROVIDED		**71**	**SPACES**	* 63 + 8 = 71 spaces

4 TOTAL AMENITY SPACE REQUIRED (ZBL)

TOTAL AMENITY SPACE REQUIRED	5,683	SQ.FT.	*88 x 6 sqm = 5,683 sqft
TOTAL SHARED AMENITY SPACE REQUIRED	2,842	SQ.FT.	5,683 / 2 = 2841.5 sqft
SHARED AMENITY SPACE PROVIDED:	**3,985**	**SQ.FT.**	
GROUND FLOOR RES LOBBY LOUNGE	270	SQ.FT.	
ROOFTOP INDOOR AMENITY	1,630	SQ.FT.	
ROOFTOP OUTDOOR AMENITY	2,085	SQ.FT.	
PRIVATE AMENITY SPACE PROVIDED (BALCONIES):	**2,841**	**SQ.FT.**	
TOTAL AMENITY SPACE PROVIDED	**6,826**	**SQ.FT.**	

5 BICYCLE PARKING REQUIREMENTS (ZBL)

TOTAL BIKE PARKING SPACES REQUIRED	88	STALLS
RATE/UNIT	1	/UNITS
TOTAL BIKE PARKING SPACES PROVIDED	88	STALLS

1- BUILDING AREA BREAKDOWN

	GROSS		EFF.	NET			CITY GFA		UNITS/FL ACTUAL
P2	15,720	SQ.FT.			SQ.FT.			SQ.FT.	
P1	15,720	SQ.FT.			SQ.FT.			SQ.FT.	
LEVEL 1	12,180	SQ.FT.	46%	5,655	SQ.FT.	RES		SQ.FT.	7
MEZ	5,510		n/a	5,655		MEZ			
			19%	2,260		COM/RET			
LEVEL 2	10,960	SQ.FT.	85%	9,350	SQ.FT.	RES		SQ.FT.	12
LEVEL 3	11,100	SQ.FT.	85%	9,390	SQ.FT.	RES		SQ.FT.	12
LEVEL 4	11,100	SQ.FT.	85%	9,390	SQ.FT.	RES		SQ.FT.	12
LEVEL 5	11,100	SQ.FT.	85%	9,390	SQ.FT.	RES		SQ.FT.	12
LEVEL 6	9,585	SQ.FT.	88%	8,420	SQ.FT.	RES		SQ.FT.	10
LEVEL 7	9,395	SQ.FT.	87%	8,220	SQ.FT.	RES		SQ.FT.	10
LEVEL 8	7,450	SQ.FT.	87%	6,485	SQ.FT.	RES		SQ.FT.	7
LEVEL 9	6,480	SQ.FT.	86%	5,545	SQ.FT.	RES		SQ.FT.	6
LEVEL 10/ROOF	3,330	SQ.FT.	n/a			INTERIOR			
TOTAL	**98,190**	**SQ.FT.**					-	**SQ.FT.**	88

77,500	**SQ.FT.**	**TOTAL NET RESIDENTIAL**
2,260	**SQ.FT.**	**TOTAL NET COM/RETAIL**

HOBIN

70 RICHMOND RD

BUILDING STATS

SCALE N/A

Issued for SPA / May 13, 2022

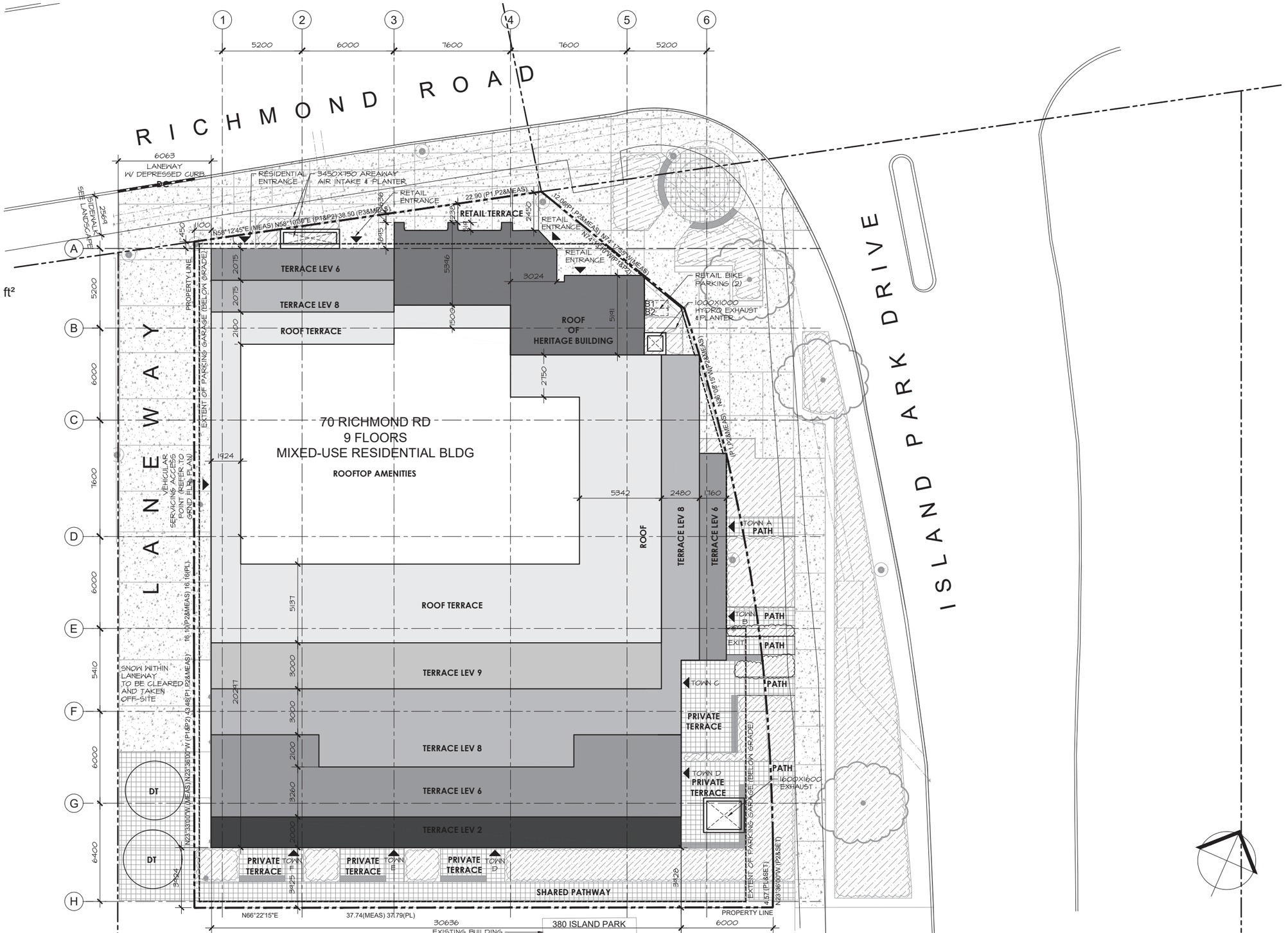
TOTA PROJECT GFA
TOTAL GFA = 98,190 ft²
RETAIL = 2,260 ft²
NET RES = 77,500 ft²
TOTAL UNITS = 88

PARKING PROVIDED
RES = 63
VIS = 8
TOTAL PARKING = 71 SPACES

TOTAL BIKE PARKING = 88
TOTAL LOCKERS = 95

AMENITY PROVIDED:
INDOOR AMENITIES
(Lobby Lounge 270 ft² + Roof Amenity 1,630 ft²) = 1,900 ft²
OUTDOOR AMENITIES = 2,085 ft²
TOTAL AMENITIES: 3,985 ft²

MIN AMENITY REQUIRED = 64.58 ft²/ Unit (6m²/ Unit)
TOTAL AMENITY REQ'D = 5,683 ft² (528 m²)
PRIVATE AMENITY (50%) = 2,842 ft² (264m²)
COMMON AMENITY (50%) = 2,842 ft² (264m²)



70 RICHMOND RD

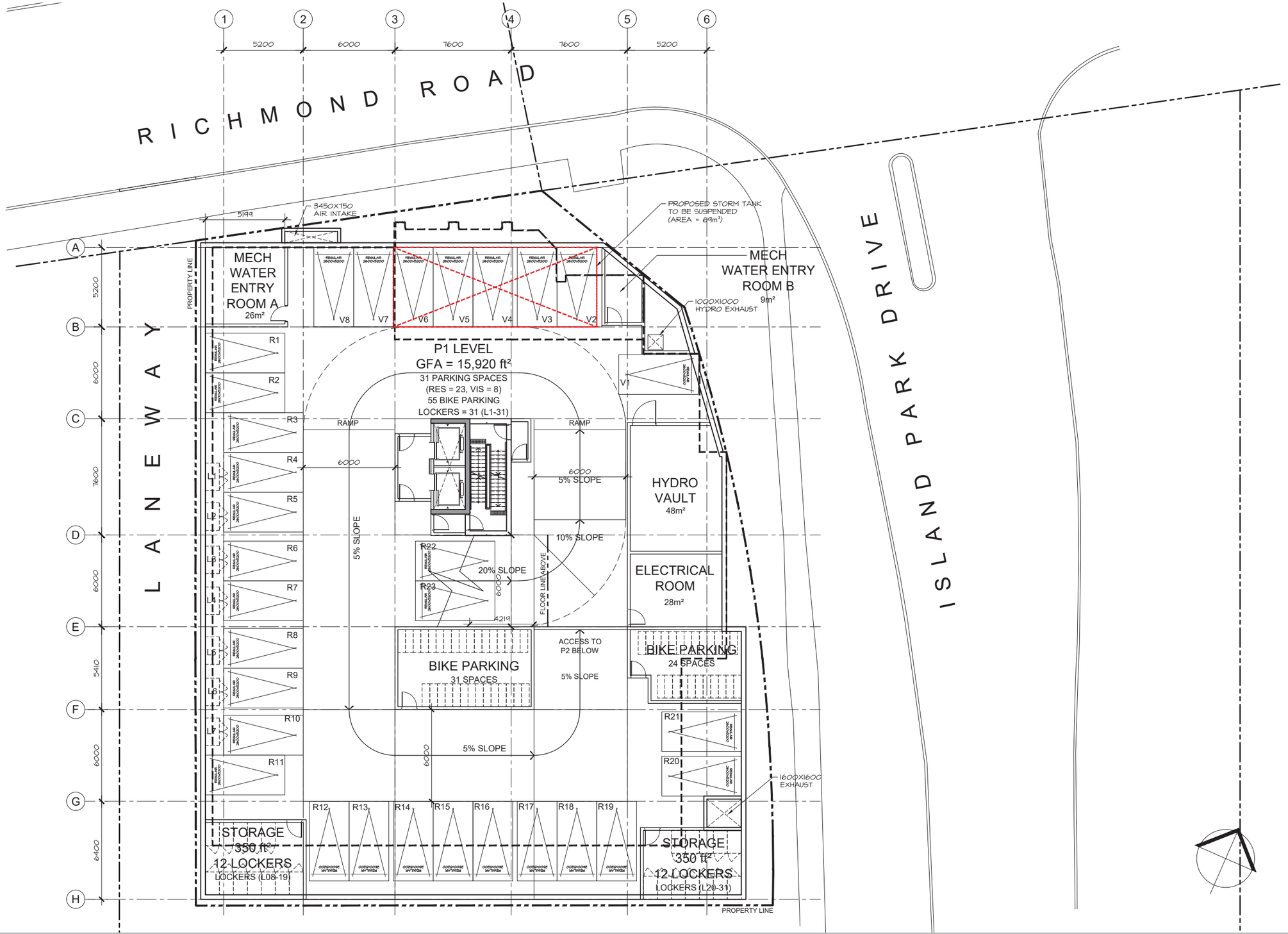
SITE PLAN

SCALE 1:250
Issued for SPA / May 13, 2022

HOBIN

LEVEL P1
GFA = 15,721 ft²
RES = 23
VIS = 8
TOTAL = 31 PARKING SPACES

BIKE PARKING = 55
LOCKERS = 31



HOBIN

70 RICHMOND RD

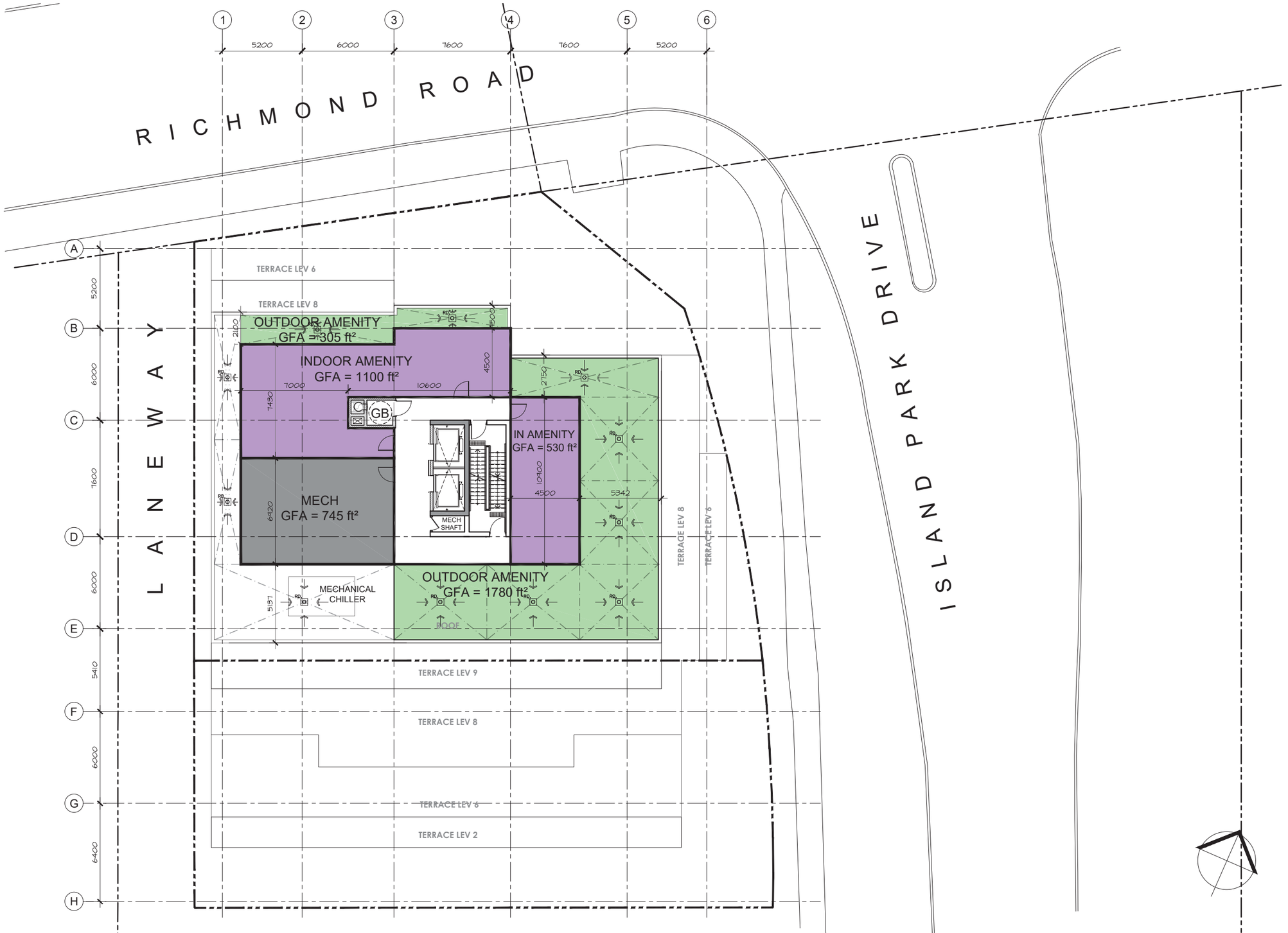
LEVEL P1

SCALE 1:250
Issued for SPA / May 13, 2022

MAIN ROOF LEVEL
GFA = 3,330 ft²

ROOF AMENITY BREAKDOWN:
INDOOR AMENITIES (1100+530) = 1630 ft²
OUTDOOR AMENITIES (1780 + 305) = 2,085 ft²

TOTAL ROOF AMENITIES: 3,715 ft²



HOBIN

70 RICHMOND RD

ROOF LEVEL

SCALE 1:250
Issued for SPA / May 13, 2022

LEGEND

- PROPOSED CURB INLET CATCHBASIN
- PROPOSED ROADSIDE CATCHBASIN
- PROPOSED CATCHBASIN/MANHOLE
- PROPOSED MANHOLE WITH PVC BASIN
- PROPOSED CATCH BASIN MANHOLE AS PER S28
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED WATERMAIN
- CIVIC ADDRESS/BASEMENT ELEVATION
- EXISTING SANITARY SERVICE CONNECTION AS PER CCTV INSPECTION
- EXISTING WATER SERVICE CONNECTION

BOREHOLE LEGEND

- ASPHALTIC CONCRETE
- BEDROCK
- CRUSHED STONE
- SILTY SAND
- GLACIAL TILL
- BOREHOLE BY PATERSON GROUP LTD. (REPORT No. PG0452-1) DEC. 15, 2004

AS-BUILT

R.S. CEBRYK
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

NO.	REVISIONS	BY	DATE
1.	PRELIMINARY DESIGN CIRCULATION	DHI	OCT.25,04
2.	FINAL DESIGN CIRCULATION	DHI	MAY 2,05
3.	ISSUED FOR M.O.E. APPROVAL	DHI	MAY 2,05
4.	ISSUED FOR TENDER	DHI	MAY 10,05
5.	ISSUED FOR CONSTRUCTION	DHI	JUNE 6,05
6.	SAN MH 2 RELOCATED	RSC	APR. 4, 06
7.	SERVICE CONNECTIONS TO 93 RICHMOND ROAD	RSC	JUN 19/06
8.	AS BUILT	RSC	DEC 22,06

NOTE:
The location of the utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned.
The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage

RICHMOND ROAD
REHABILITATION
KIRKWOOD AVENUE TO WESTERN AVENUE

GRADING AND DRAINAGE
STATION 2+700 TO STATION 2+850

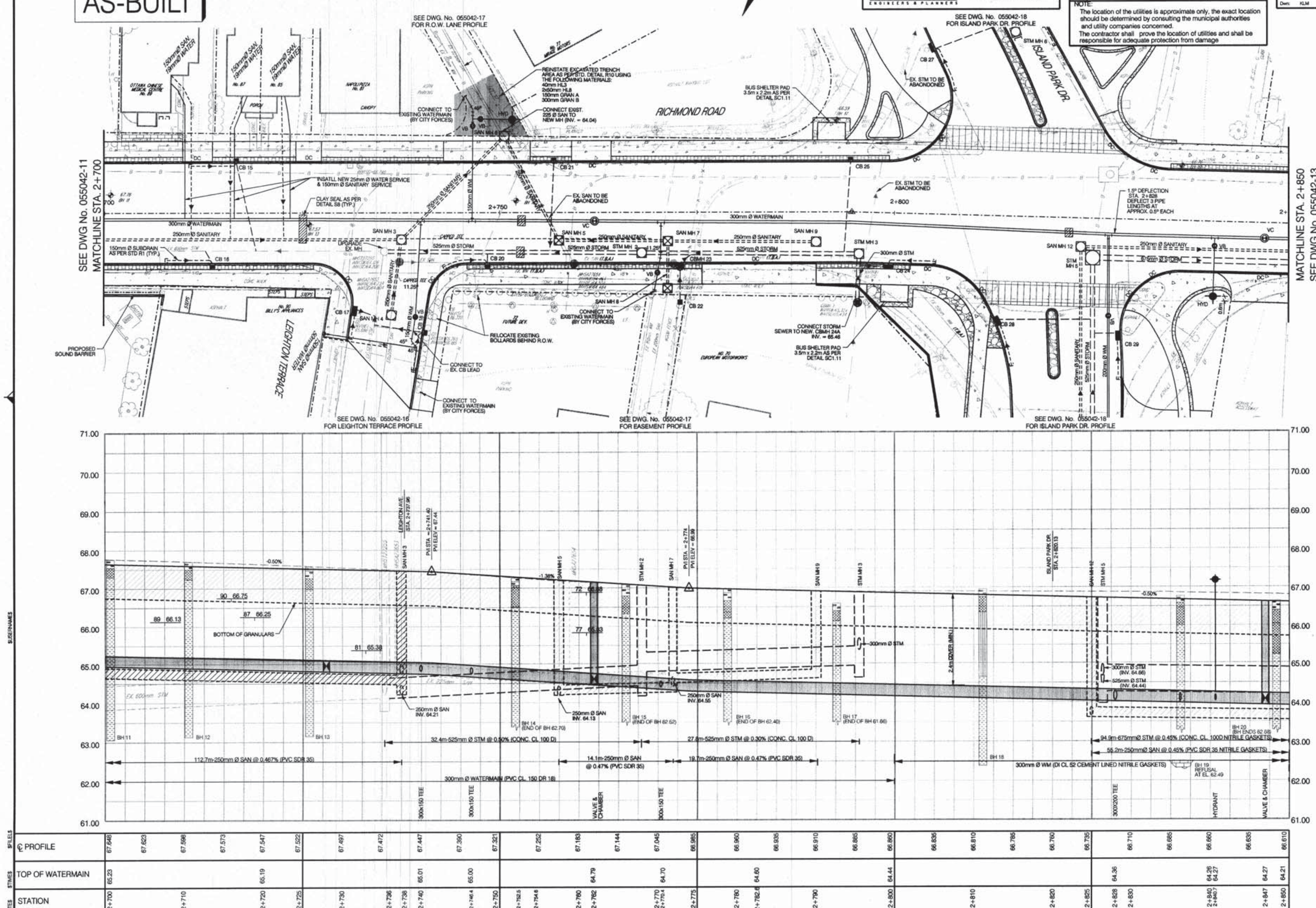
R. G. HEWITT, P.ENG.
Director Infrastructure Services

W. NEWELL, P.ENG.
Manager Construction Services - West

Dwn: KLM | Chkd: DHI | Des: DHI | Chkd: RSC

Ottawa

CONTRACT NO. ISB05-5042
DWG. NO. 055042-12
SHEET 12 OF 39
Date: OCTOBER 2004
Scale: HORIZONTAL 1:250 — 0m 2.5 5 10
VERTICAL 1:50 — 0m 0.5 1 2



CATCH BASIN DATA						
NO.	STATION	OFFSET (m)	TYPE	COVER	ELEVATION (m) T/GRATE	ELEVATION (m) LOW/INV.
CB 15	2+718.62	6.40 LT	OPSD-705.010	S22, S23	67.37*	65.67
CB 16	2+713.62	6.40 RT	OPSD-705.010	S22, S23	67.38*	65.98
CB 17	27+013	4.60 RT	OPSD-705.020	S22, S23	67.25*	65.85
CB 18	27+014.73	4.60 LT	OPSD-705.010	S22, S23	67.24*	65.84
CB 19	2+743.09	12.10 RT	OPSD-705.010	S19	67.15	65.75
CB 20	2+748.45	6.40 RT	OPSD-705.010	S22, S23	67.16*	65.76
CB 21	2+756.87	6.40 LT	OPSD-705.010	S22, S23	67.03*	65.33
CB 22	2+772.87	11.17 RT	OPSD-705.010	S19	66.90	65.50
CBMH 23	2+772.87	6.40 RT	OPSD-701.010	S28	66.81*	65.45
CB 24	2+799.40	6.40 RT	OPSD-705.020	S22, S23	66.80*	65.50
CBMH 24A	2+795.65	11.56 RT	OPSD-701.010	S19	66.85	65.43
CB 25	2+794.44	6.40 LT	OPSD-705.010	S22, S23	66.69*	65.69

OFFSETS ARE FROM BASELINE TO FACE OF CURB FOR CATCH BASINS
* = CURB INLET ELEV (E/P ELEVATION).

STORM MANHOLE DATA					
NO.	STATION	OFFSET (m)	TYPE	ELEVATION (m) T/GRATE	ELEVATION (m) LOW/INV.
STM MH 2	2+768	5.15 RT	OPSD-701.010	66.92	64.433
STM MH 3	2+795.65	5.31 RT	OPSD-701.010	66.72	64.944
STM MH 5	2+825.32	5.04 RT	OPSD-701.011	66.71	64.274

OFFSETS ARE FROM BASELINE TO CENTRE OF STRUCTURE
NOTE: ALL STORM MHs TO HAVE PERFORATED COVERS AS PER S24

STORM SEWER DATA					
SEWER	DIA.	TYPE	LENGTH	INVERT ELEVATION (m) UP STR.	INVERT ELEVATION (m) DOWN STR.
STM MH 2 TO STM MH EX.	525mm	CONC CL 100D	32.4m	64.433	64.122
STM MH 3 TO STM MH 2	525mm	CONC CL 100D	27.8m	64.944	64.750
STM MH 5 TO STM MH 7	675mm	CONC CL 100D	94.9m	64.274	64.012
CBMH 24A TO STM MH 3	300mm	PVC SDR 35	7.8m	65.460	65.378

SANITARY MANHOLE DATA						
NO.	STATION	OFFSET (m)	TYPE	ELEVATION (m) T/GRATE	ELEVATION (m) LOW/INV.	
SAN MH 2	2+651.36	3.28 RT	OPSD-701.010	67.80	~~64.700~~ 65.008	
SAN MH 3	2+737.54	3.42 RT	OPSD-701.010	67.38	64.259	
SAN MH 5	2+757.81	3.56 RT	OPSD-701.010	67.21	64.189	PVC BASIN
SAN MH 7	2+771.77	3.68 RT	OPSD-701.010	66.92	64.266	PVC BASIN
SAN MH 8	29+009.74	0.0 RT	OPSD-701.010	67.00	64.470	PVC BASIN
SAN MH 9	2+790.07	3.80 RT	OPSD-701.010	66.84	64.634	
SAN MH 12	2+823.78	3.66 RT	OPSD-701.010	66.72	63.614	

OFFSETS ARE FROM BASELINE TO CENTRE OF STRUCTURE
NOTE: ALL SANITARY MHs TO HAVE SOLID COVERS AS PER S24

SANITARY SEWER DATA					
SEWER	DIA.	TYPE	LENGTH	INVERT ELEVATION (m) UP STR.	INVERT ELEVATION (m) DOWN STR.
SAN MH 2 TO SAN MH 3	250mm	PVC SDR 35	112.7	~~64.496~~ 65.008	64.479
SAN MH 7 TO SAN MH 5	250mm	PVC SDR 35	14.1m	64.266	64.204
SAN MH 9 TO SAN MH 7	250mm	PVC SDR 35	19.7m	64.634	64.514
SAN MH 12 TO SAN MH 13	250mm	PVC SDR 35	55.2m	63.614	63.463

NOTES:

GENERAL

1. BOREHOLE LOCATIONS ARE APPROXIMATE ONLY. FOR FURTHER INFORMATION, REFER TO GEOTECHNICAL INFORMATION IN THE REPORT PREPARED BY PATERSON GROUP LTD. (REPORT No. PG0452-1 AND PE 0315-1)
2. EXISTING TREES IN THE CONSTRUCTION ZONE AREA TO BE PRESERVED AND PROTECTED DURING THE CONSTRUCTION PERIOD.
3. LIMITS OF GRADING MAY VARY FROM THAT INDICATED, DEPENDING ON FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.
4. WHERE AVAILABLE, EXISTING SERVICING INFORMATION TO PRIVATE PROPERTY HAS BEEN SHOWN.
5. SIGNS AND PAVEMENT MARKING TO BE REMOVED AND INSTALLED BY OTHERS.

STORM AND SANITARY SEWERS

1. ALL STORM AND SANITARY SERVICES SHALL BE REPLACED TO PROPERTY LINE, OR FURTHER AS REQUIRED. TIE-IN LOCATION BEYOND PROPERTY LINE TO BE APPROVED BY ENGINEER. WHERE NEW STORM LATERALS ARE TO BE PLACED TO PROPERTY LINE, THEY SHALL BE CAPPED WITH A WATER TIGHT SEAL.
2. ALL STORM AND SANITARY SERVICES TO HAVE NITRILE GASKETS AS PER SPECIAL PROVISION GENERAL No. D-017.
3. ALL CATCHBASINS TO HAVE A SUMP OF 0.6m (MIN.), STORM MANHOLES TO HAVE 0.3m SUMP. EXCEPT FOR SHALLOW CB WHICH IS TO HAVE 0.1m SUMP.
4. ALL SEWERS TO HAVE CLASS "B" BEDDING AND APPROVED BACKFILL MATERIAL AS SPECIFIED. SEE TRENCH DETAIL.
5. **SUBDRAIN OUTLETS INTO MANHOLES AND CATCHBASINS SHALL BE LOCATED TO SUIT FIELD CONDITIONS.**
6. THE CONTRACTOR WILL BE REQUIRED TO LOCATE AND VERIFY THE STATUS OF EXISTING SERVICE PIPES. DYE TESTING OR OTHER METHODS (TO THE SATISFACTION OF THE ENGINEER),SHALL BE USED TO DETERMINE THE STATUS (ABANDONED, IN USE, SANITARY, STORM) AND/OR THAT THE EXISTING SERVICES ARE CONNECTED TO BUILDINGS.
7. ACCESS INTO ALL CITY OF OTTAWA MH'S WILL BE AVAILABLE AT ALL TIMES. DURING THE PAVING PROCESS THERE IS TO BE NO CITY OWNED COVERS OF ANY TYPE TO BE PAVED OVER PREVENTING ACCESS.
8. EXISTING MH STRUCTURES THAT ARE TO REMAIN IN USE SHALL BE UPDATED TO CITY STANDARDS AS PER SP No. F-5042-06. (i.e. REPLACE UPPER ACCESS SECTIONS & COVERS AND LADDER RUNGS).
9. INSTALL "RAINSTOPPER" BASIN (BY ONTARIO WATER PRODUCTS) IN ALL SANITARY MAINTENANCE HOLES AS INDICATED PER LEGEND.
10. WHERE OLD CB'S ARE REMOVED, EXISTING LEAD IS TO BE PLUGGED AT SEWER.

WATERPLANT

1. ALL WATERMAIN MATERIALS AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY STANDARD SPECIFICATIONS AND STANDARD DRAWINGS.
2. ALL CONNECTIONS TO EXIST. SERVICES INCLUDING REINSTATEMENT SHALL BE DONE BY THE CONTRACTOR. ALL CONNECTIONS OF NEW WM TO EXISTING WM AND ALL BLANKINGS SHALL BE PERFORMED BY CITY FORCES.
3. RESTRAINING RINGS AND THRUST BLOCKING SHALL BE UTILIZED ON ALL BENDS, TEES AND PLUGS IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY STANDARD SPECIFICATIONS AND STANDARD DRAWINGS.
4. A MINIMUM 2m SEPARATION IS REQUIRED BETWEEN ALL NEW WATER SERVICES AND CATCHBASINS OR OPEN STRUCTURES AND SHALL BE INSULATED PER CITY SPECIFICATION WSD-23 AS APPLICABLE.
5. A MINIMUM 2m SEPARATION IS REQUIRED BETWEEN ALL NEW HYDRANTS AND CATCHBASINS OR OPEN STRUCTURES AND SHALL BE INSULATED PER CITY SPECIFICATION WSD-23 AS APPLICABLE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE TO DETERMINE VIA EXCAVATION THE EXACT LOCATION AND ELEVATION OF THE EXISTING WATERMAINS AS REQUIRED FOR ALL CONNECTIONS, RELOCATIONS AND BLANKING.
7. ALL HYDRANT LATERALS TO HAVE NITRILE GASKETS.

13112

LEGEND

- PROPOSED CURB INLET CATCHBASIN
- PROPOSED ROADSIDE CATCHBASIN
- PROPOSED CATCHBASIN/MANHOLE
- PROPOSED MANHOLE WITH PVC BASIN
- PROPOSED CATCH BASIN MANHOLE AS PER S28
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED WATERMAIN
- CIVIC ADDRESS/BASEMENT ELEVATION
- EXISTING SANITARY SERVICE CONNECTION AS PER CCTV INSPECTION
- EXISTING WATER SERVICE CONNECTION
- REINSTATE ASPHALT

AS-BUILT

REGISTERED PROFESSIONAL ENGINEER
R.S. CEBRYK
PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email novainfo@novatech-eng.com

NO.	REVISIONS	BY	DATE
1.	ISSUED FOR NCC APPROVAL	DHI	JAN.25/05
2.	FINAL DESIGN CIRCULATION	DHI	MAY 2/05
3.	ISSUED FOR M.O.E. APPROVAL	DHI	MAY 2/05
4.	ISSUED FOR TENDER	DHI	MAY 10/05
5.	ISSUED FOR CONSTRUCTION	DHI	JUNE 6/05
6.	LIGHT STANDARD RELOCATION	DHI	JUN 27/05
7.	STORM SEWER RELOCATION	DHI	SEP 06/05
8.	AS BUILT	RSC	DEC 22/06

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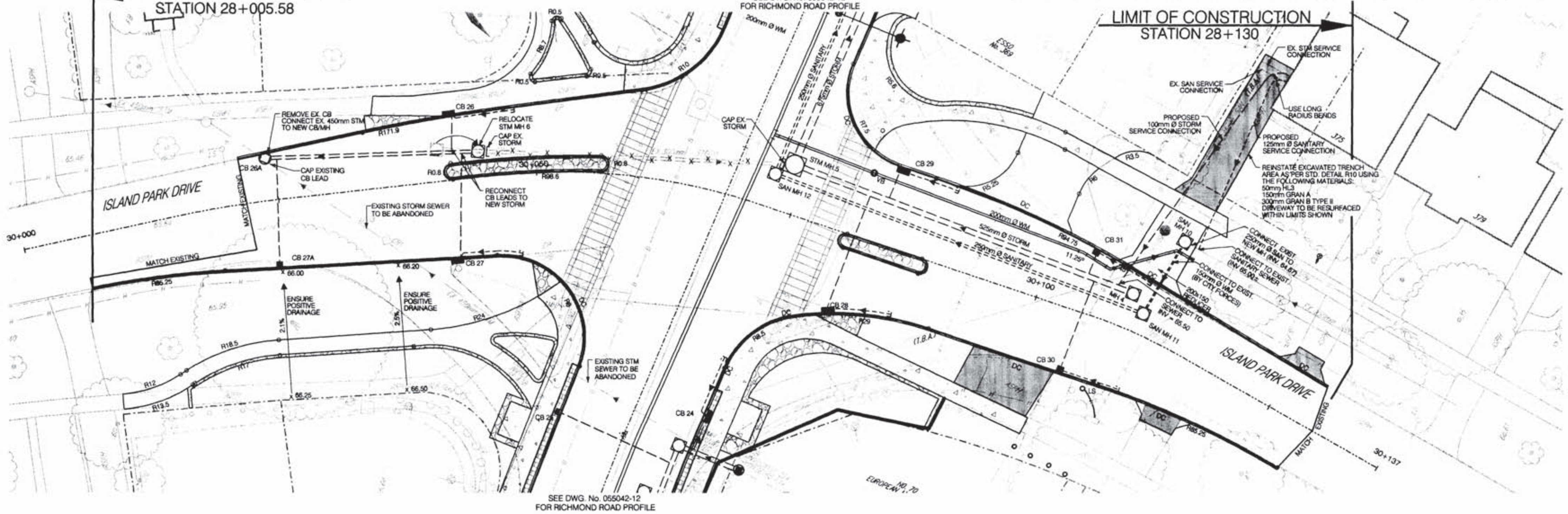
RICHMOND ROAD
REHABILITATION
KIRKWOOD AVENUE TO WESTERN AVENUE

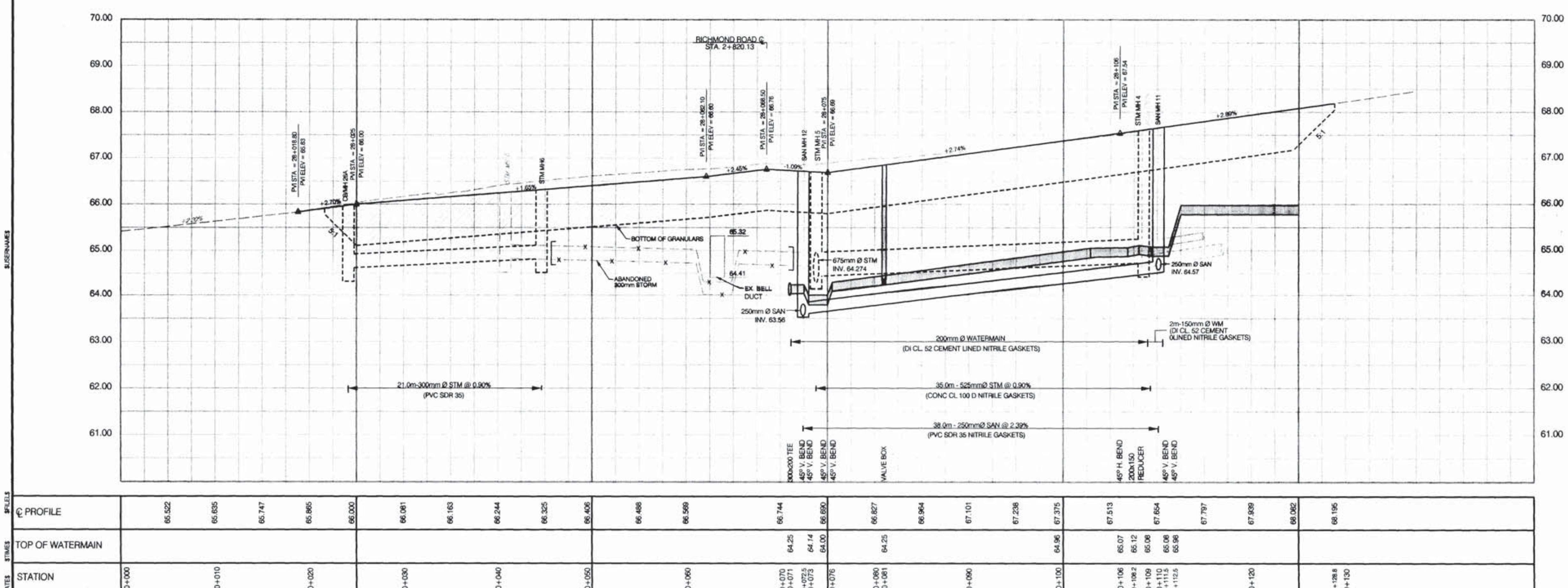
GRADING AND DRAINAGE
ISLAND PARK DRIVE

Ottawa

CONTRACT NO. ISB05-5042
DWG. NO. 055042-18
SHEET 18 OF 39
Date: OCTOBER 2004
Scale: HORIZONTAL 1:250 (0m 2.5 5 10) VERTICAL 1:50 (0m 0.5 1 2)

R. G. HEWITT, P.ENG. Director Infrastructure Services
W. NEWELL, P.ENG. Manager Construction Services
Dwn: KLM | Chkd: DHI | Des: DHI | Chkd: RSC





CATCH BASIN DATA						
NO.	STATION	OFFSET	TYPE	COVER	ELEVATION T/GRATE	ELEVATION LOW/INV.
CB 25	2+794.44	8.40 LT	OPSD 705.010	S22, S23	66.69*	65.69
CB 26	30+042.46	8.15 LT	OPSD 705.020	S22, S23	66.22*	64.82
CB 26A	30+024.16	4.13 LT	OPSD 705.010	S19	65.92	64.61
CB 27	30+041.80	7.58 RT	OPSD 705.020	S22, S23	66.13*	64.73
CB 27A	30+024.40	6.62 RT	OPSD 705.010	S19	65.86	64.71
CB 28	30+081.22	8.00 RT	OPSD 705.020	S19	66.76	65.36
CB 29	30+083.68	7.86 LT	OPSD 705.020	S19	66.80	65.40
CB 30	30+104.42	6.22 RT	OPSD 705.010	S19	67.37	65.97
CB 31	30+104.19	6.33 LT	OPSD 705.010	S19	67.37	65.97

OFFSETS ARE FROM BASELINE TO FACE OF CURB FOR CATCH BASINS
* = CURB INLET ELEV(E/P ELEVATION).

STORM MANHOLE DATA					
NO.	STATION	OFFSET	TYPE	ELEVATION T/GRATE	ELEVATION LOW/INV.
STM MH 4	30+108.55	3.43 LT	OPSD 701.010	67.49	64.726
STM MH 5	30+073.80	4.73 LT	OPSD 701.010	66.71	64.274
STM MH 6	30+044.63	2.46 LT	OPSD 701.010	66.30	64.814

OFFSETS ARE FROM BASELINE TO CENTRE OF STRUCTURE
NOTE: ALL STORM MHs TO HAVE PERFORATED COVERS AS PER S24

STORM SEWER DATA					
SEWER	DIA.	TYPE	LENGTH	INVERT ELEVATION UP STR.	INVERT ELEVATION DOWN STR.
STM MH 4 TO STM MH 5	525mm	CONC. CL. 1000	35m	64.726	64.449
STM MH 6 TO CB26A	300mm	PVC SDR 35	21m	64.814	64.627

SANITARY MANHOLE DATA					
NO.	STATION	OFFSET	TYPE	ELEVATION T/GRATE	ELEVATION LOW/INV.
SAN MH 10	30+110.79	10.09 LT	OPSD 701.010	67.60	64.589
SAN MH 11	30+110.12	3.29 LT	OPSD 701.010	67.61	64.519
SAN MH 12	30+072.32	2.04 LT	OPSD 701.010	66.72	63.614

OFFSETS ARE FROM BASELINE TO CENTRE OF STRUCTURE
NOTE: ALL SANITARY MHs TO HAVE SOLID COVERS AS PER S24

SANITARY SEWER DATA					
SEWER	DIA.	TYPE	LENGTH	INVERT ELEVATION UP STR.	INVERT ELEVATION DOWN STR.
SAN MH 10 TO SAN MH 11	250mm	PVC SDR 35	8m	64.589	64.584
SAN MH 11 TO SAN MH 12	250mm	PVC SDR 35	38m	64.519	63.649

NOTES:

GENERAL

1. BOREHOLE LOCATIONS ARE APPROXIMATE ONLY. FOR FURTHER INFORMATION, REFER TO GEOTECHNICAL INFORMATION IN THE REPORT PREPARED BY PATERSON GROUP LTD. (REPORT No. PG0452-1 AND PE 0315-1)
2. EXISTING TREES IN THE CONSTRUCTION ZONE AREA TO BE PRESERVED AND PROTECTED DURING THE CONSTRUCTION PERIOD.
3. LIMITS OF GRADING MAY VARY FROM THAT INDICATED, DEPENDING ON FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.
4. WHERE AVAILABLE, EXISTING SERVICING INFORMATION TO PRIVATE PROPERTY HAS BEEN SHOWN.
5. SIGNS AND PAVEMENT MARKING TO BE REMOVED AND INSTALLED BY OTHERS.

STORM AND SANITARY SEWERS

1. ALL STORM AND SANITARY SERVICES SHALL BE REPLACED TO PROPERTY LINE, OR FURTHER AS REQUIRED. TIE-IN LOCATION BEYOND PROPERTY LINE TO BE APPROVED BY ENGINEER. WHERE NEW STORM LATERALS ARE TO BE PLACED TO PROPERTY LINE, THEY SHALL BE CAPPED WITH A WATER TIGHT SEAL.
2. ALL STORM AND SANITARY SERVICES TO HAVE NITRILE GASKETS AS PER SPECIAL PROVISION GENERAL No. D-017.
3. ALL CATCHBASINS TO HAVE A SUMP OF 0.6m (MIN.). STORM MANHOLES TO HAVE 0.3m SUMP. EXCEPT FOR SHALLOW CB WHICH IS TO HAVE 0.1m SUMP.
4. ALL SEWERS TO HAVE CLASS 'B' BEDDING AND APPROVED BACKFILL MATERIAL AS SPECIFIED. SEE TRENCH DETAIL.
5. SUBDRAIN OUTLETS INTO MANHOLES AND CATCHBASINS SHALL BE LOCATED TO SUIT FIELD CONDITIONS.
6. THE CONTRACTOR WILL BE REQUIRED TO LOCATE AND VERIFY THE STATUS OF EXISTING SERVICE PIPES. DYE TESTING OR OTHER METHODS (TO THE SATISFACTION OF THE ENGINEER) SHALL BE USED TO DETERMINE THE STATUS (ABANDONED, IN USE, SANITARY, STORM) AND/OR THAT THE EXISTING SERVICES ARE CONNECTED TO BUILDINGS.
7. ACCESS INTO ALL CITY OF OTTAWA MH'S WILL BE AVAILABLE AT ALL TIMES. DURING THE PAVING PROCESS THERE IS TO BE NO CITY OWNED COVERS OF ANY TYPE TO BE PAVED OVER PREVENTING ACCESS.
8. EXISTING MH STRUCTURES THAT ARE TO REMAIN IN USE SHALL BE UPDATED TO CITY STANDARDS AS PER SP No. F-5042-06. (i.e. REPLACE UPPER ACCESS SECTIONS & COVERS AND LADDER RUNGS).
9. INSTALL "RAINSTOPPER" BASIN (BY ONTARIO WATER PRODUCTS) IN ALL SANITARY MAINTENANCE HOLES AS INDICATED PER LEGEND.
10. WHERE OLD CB'S ARE REMOVED, EXISTING LEAD IS TO BE PLUGGED AT SEWER.

WATERPLANT

1. ALL WATERMAIN MATERIALS AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY STANDARD SPECIFICATIONS AND STANDARD DRAWINGS.
2. ALL CONNECTIONS TO EXIST. SERVICES INCLUDING REINSTATEMENT SHALL BE DONE BY THE CONTRACTOR. ALL CONNECTIONS OF NEW WM TO EXISTING WM AND ALL BLANKINGS SHALL BE PERFORMED BY CITY FORCES.
3. RESTRAINING RINGS AND THRUST BLOCKING SHALL BE UTILIZED ON ALL BENDS, TEES AND PLUGS IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY STANDARD SPECIFICATIONS AND STANDARD DRAWINGS.
4. A MINIMUM 2m SEPARATION IS REQUIRED BETWEEN ALL NEW WATER SERVICES AND CATCHBASINS OR OPEN STRUCTURES AND SHALL BE INSULATED PER CITY SPECIFICATION WSD-23 AS APPLICABLE.
5. A MINIMUM 2m SEPARATION IS REQUIRED BETWEEN ALL NEW HYDRANTS AND CATCHBASINS OR OPEN STRUCTURES AND SHALL BE INSULATED PER CITY SPECIFICATION WSD-23 AS APPLICABLE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE TO DETERMINE VIA EXCAVATION THE EXACT LOCATION AND ELEVATION OF THE EXISTING WATERMAINS AS REQUIRED FOR ALL CONNECTIONS, RELOCATIONS AND BLANKING.
7. ALL HYDRANT LATERALS TO HAVE NITRILE GASKETS.

13112

MAIN AND MAIN

70 RICHMOND RD OTTAWA

From: Wu, John <John.Wu@ottawa.ca>
Sent: August 9, 2021 10:33 AM
To: matinas@lithosgroup.ca
Subject: RE: 70 Richmond Road - Boundary conditions

******The following information may be passed on to the consultant, but do NOT forward this e-mail directly.******

The following are boundary conditions, HGL, for hydraulic analysis at 70 Richmond Road (zone 1W) assumed connected to the 305 mm watermain on Richmond Road and the 203 mm on Island Park Drive (see attached PDF for location).

Connection 1:

Minimum HGL: 108.3m

Maximum HGL: 114.9m

MaxDay + FireFlow (92.08 L/s): 109.8m

Connection 2:

Minimum HGL: 108.3m

Maximum HGL: 114.9 m

MaxDay + FireFlow (92.08 L/s): 108.9m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

John

From: matinas@lithosgroup.ca <matinas@lithosgroup.ca>
Sent: August 4, 2021 10:44 AM
To: Wu, John <John.Wu@ottawa.ca>
Cc: anastasial@lithosgroup.ca
Subject: RE: 70 Richmond Road - Boundary conditions

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

patersongroup

Phase II - Environmental Site Assessment

70 Richmond Road & 376 Island Park Drive
Ottawa, Ontario

Prepared For

Devtrin (Island Park) Inc.

July 14, 2021

Report: PE4525-2R

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property addressed 70 Richmond Road and 376 Island Park Drive, in the City of Ottawa, Ontario. The purpose of the Phase II ESA is to address the areas of environmental concern (APECs) that were identified on the Phase II Property during the Phase I ESA.

The Phase II ESA consisted of drilling three (3) boreholes on the Phase II Property, all of which were instrumented with groundwater monitoring wells installed in the bedrock.

The soil profile generally consisted of an asphaltic concrete structure, underlain by fill material consisting of reworked silty sand and crushed stone (gravel), followed by native silty sand-gravel (modified till), underlain by limestone bedrock. The boreholes were terminated in bedrock, which was encountered at depths of 5.51 to 6.15 mbgs. Soil samples were obtained from the boreholes and screened based on visual observation and sample intervals (depths).

Based on the screening results in combination with sample depth and location, soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). Based on these recent analytical results, PHCs (F1-F4) concentrations in the upper/shallower samples were in excess of the MECP Table 3 Residential Standards.

Groundwater samples were recovered and analyzed for BTEX, PHCs and/or VOCs. No free-phase product was observed on the groundwater surface at any of the monitoring well locations during the groundwater sampling events. All groundwater results comply with the MECP Table 3 Standards, with the exception of hexane and xylenes in MW3.

Recommendations

As noted in this report, the Phase II Property will be redeveloped for residential land use and as such, the subject property will require a Record of Site Condition (RSC).

Soil

Based on the 2012 to 2021 analytical result, the fill material and underlying native soil on the northeastern portion of the Phase II Property is impacted with VOCs, PHCs, BTEX and/or PAHs in excess of the Table 3 Residential Standards.

To obtain an RSC, the impacted soil material will need to be removed. The excavation of the soil from the property should be monitored and confirmed by Paterson. Soil/fill in excess of Table 3, will need to be removed and disposed of at an approved waste disposal facility.

Testing of the fill and underlying native soil will be required in conjunction with the excavation program to segregate clean soil from impacted soil and for final confirmatory purposes, prior to an RSC submission.

Groundwater

Remediation of the groundwater using a licenced hauling company pumping from the excavation may be a viable option, depending upon the groundwater level at the time of the remediation, however, if a significant volume of water is anticipated, a pump and treat system would likely be more economical. Depending upon the methodology selected, post remediation groundwater monitoring will be required for up to 12 months prior to filing an RSC.

Monitoring Wells

It is our recommendation that the monitoring wells installed on the subject site should remain viable for future monitoring. If they are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

4.10 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, and custody, equipment cleaning procedures, and field quality control measurements is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

The soil profile encountered consisted of a layer of asphaltic concrete underlain by a layer of granular fill underlain by native glacial till. The fill consisted of silty sand gravel. The fill depth ranged from 2.1 to 2.2 m below ground surface. The specific details of the soil profile at each test hole location are presented on the attached Soil Profile and Test Data Sheets provided in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on August 26, 2020 and June 21, 2021, using an electronic water level meter. Groundwater levels are summarized below in Table 5.

TABLE 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH7-20	67.43	5.13	62.30	August 26, 2020
BH8-20	67.27	4.17	63.10	August 26, 2020
BH9-20	67.20	4.37	62.83	August 26, 2020
MW1	~67.68	4.14	~63.54	June 21, 2021
MW3	~67.17	3.90	~63.27	June 21, 2021

Based on the groundwater elevations measured during the February 2012 and August 2020 sampling event, a groundwater contour plan was completed. The groundwater contour mapping is shown on Drawing PE4525-3R – Groundwater Contour Plan. Based on the contour mapping, groundwater flow beneath the Phase II Property is in a north-easterly direction. A horizontal hydraulic gradient of approximately 0.03 m/m was calculated.

The concentrations of hexane and xylenes in groundwater sample MW3-GW are in excess of the MECP Table 3 standards.

Analytical results of BTEX, PHCs and VOCs in the groundwater with respect to borehole locations are shown on Drawing PE4525-5R - Analytical Testing Plan – Groundwater.

The maximum concentrations identified in groundwater from the current data only are presented in Table 10.

TABLE 10: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Groundwater Sample	Screened Interval (m BGS)
Benzene	3.8	MW3-GW1	2.91-4.41
Chlorobenzene	2.7	MW3-GW1	2.91-4.41
Ethylbenzene	1030	MW3-GW1	2.91-4.41
Hexane	**89.5**	MW3-GW1	2.91-4.41
Toluene	52.3	MW3-GW1	2.91-4.41
Xylenes	**5210**	MW3-GW1	2.91-4.41

No other parameter concentrations in groundwater were detected above the laboratory method detection limits.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the July 27 and August 26, 2020 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

As per the sampling and analysis plan, a duplicate soil sample (DUP) was obtained from BH8-20-AU1 and analyzed for BTEX and PHCs. Test results for the duplicate soil sample and RPD calculations are provided below in Table 11.

TABLE 11: QA/QC Results – Soil (BTEX and PHCs)

Parameter	BH8-20-AU1	DUP	RPD (%)	QA/QC Results
Ethylbenzene	0.14	0.09	43	Outside the acceptable range
Xylenes, total	0.52	0.50	4	Within the acceptable range
PHC F_2	17	15	13	Within the acceptable range
PHC F_3	377	936	85	Outside the acceptable range
PHC F_4	1180	2370	67	Outside the acceptable range
PHC F_4 (gravimetric)	4660	3540	27	Outside the acceptable range

The majority of the RPD results are outside the acceptable range, with the exception of a couple of parameters. It is not uncommon that very small or very high concentrations or values will yield higher RPD values, and as such, the RPD value is not an accurate measure in these cases. Additionally, both the original and duplicate sample contain parameter concentrations in excess of the MECP Table 3 standards, which therefore does not have a material effect on our conclusions.

A duplicated groundwater sample was obtained from the monitoring well installed in MW1 and analyzed for VOCs. The results are provided below in Table 12:

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 70 Richmond Road and 376 Island Park Drive, in the City of Ottawa, Ontario. The purpose of the Phase II ESA is to address the areas of environmental concern (APECs) that were identified on the Phase II Property during the Phase I ESA.

The Phase II ESA consisted of drilling three (3) boreholes on the Phase II Property, all of which were instrumented with groundwater monitoring wells installed in the bedrock.

The soil profile generally consisted of an asphaltic concrete structure, underlain by fill material consisting of reworked silty sand and crushed stone (gravel), followed by native silty sand-gravel (modified till), underlain by limestone bedrock. The boreholes were terminated in bedrock, which was encountered at depths of 5.51 to 6.15 mbgs. Soil samples were obtained from the boreholes and screened based on visual observation and sample intervals (depths).

Based on the screening results in combination with sample depth and location, soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). Based on these recent analytical results, PHCs (F1-F4) concentrations in the upper/shallower samples were in excess of the MECP Table 3 Residential Standards.

Groundwater samples were recovered and analyzed for BTEX, PHCs and/or VOCs. No free-phase product was observed on the groundwater surface at any of the monitoring well locations during the groundwater sampling events. All groundwater results comply with the MECP Table 3 Standards, with the exception of hexane and xylenes in MW3.

Recommendations

As noted in this report, the Phase II Property will be redeveloped for residential land use and as such, the subject property will require a Record of Site Condition (RSC).

Soil

Based on the 2012 to 2021 analytical result, the fill material and underlying native soil on the northeastern portion of the Phase II Property is impacted with VOCs, PHCs, BTEX and/or PAHs in excess of the Table 3 Residential Standards.

To obtain an RSC, the impacted soil material will need to be removed. The excavation of the soil from the property should be monitored and confirmed by Paterson. Soil/fill in excess of Table 3, will need to be removed and disposed of at an approved waste disposal facility.

Testing of the fill and underlying native soil will be required in conjunction with the excavation program to segregate clean soil from impacted soil and for final confirmatory purposes, prior to an RSC submission.

Groundwater

Remediation of the groundwater using a licenced hauling company pumping from the excavation may be a viable option, depending upon the groundwater level at the time of the remediation, however, if a significant volume of water is anticipated, a pump and treat system would likely be more economical. Depending upon the methodology selected, post remediation groundwater monitoring will be required for up to 12 months prior to filing an RSC.

Based on the recent groundwater test results, it is recommended that additional groundwater testing be completed before site remediation/redevelopment commences.

Monitoring Wells

It is our recommendation that the monitoring wells installed on the subject site should remain viable for future monitoring. If they are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04, as amended, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes themselves.

Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Devtrin (Island Park) Inc. Notification from Devtrin (Island Park) Inc. and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Nick Sullivan, B.Sc.

Mark D'Arcy, P.Eng, QP$_{ESA}$

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Geotechnical Investigation

Proposed Multi-Storey Building
70 Richmond Road
Ottawa, Ontario

Prepared For

Devtrin (Island Park) Inc.

May 10, 2022

Report PG5501-1 Revision 4

Paterson Group Inc.
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4.3 Groundwater

Groundwater levels were measured on April 13, 2022 in several of the current and previous test holes. In addition, groundwater measurements were completed during the previous investigations on June 22, 2012 and August 26, 2020. Table 1 provides a summary of the groundwater level measurements completed during the current and previous investigations.

Table 1 - Measured Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Water Level		Date
		Depth (m)	Elevation (m)	
BH 2-12	67.12	2.38	64.74	April 13, 2022
BH 3-12	67.32	2.23	65.09	April 13, 2022
BH 8-20	67.27	3.85	63.42	April 13, 2022
BH 9-20	67.20	2.73	64.47	April 13, 2022
BH 1-22	68.19	2.64	65.55	April 13, 2022
BH 2-22	67.90	2.67	65.23	April 13, 2022
BH 7-20	67.34	5.13	62.21	August 26, 2020
BH 8-20	67.27	4.17	63.10	August 26, 2020
BH 9-20	67.20	4.37	62.83	August 26, 2020
BH 1-12	67.49	2.60	64.89	June 22, 2012
BH 2-12	67.12	2.50	64.62	June 22, 2012
BH 3-12	67.32	2.57	64.75	June 22, 2012
BH 4-12	67.85	2.67	65.18	June 22, 2012
BH 5-12	67.80	2.66	65.14	June 22, 2012

Groundwater levels are subject to seasonal fluctuations and therefore levels could differ at the time of construction.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

It is understood that the building foundation walls will be placed in close proximity to all the boundaries. It is expected that insufficient room will be available for exterior backfill along these walls and, therefore, the foundation wall will be poured against a drainage system placed against the shoring face. It is anticipated that the maximum groundwater in-flow during the spring thaw and rain events will range between 25,000 and 30,000 L/day with the partially tanked groundwater suppression and foundation drainage system. Refer to Figure 2 – Groundwater Suppression and Foundation Drainage System, for specific details of the foundation drainage recommendations attached to the current memorandum.

To manage and control groundwater infiltration to the building's storm sump pump(s) over the long term, the following foundation drainage and water suppression system is recommended to be installed on the exterior perimeter and surface of the building's foundation walls using the following methodology:

- ❏ Throughout the building excavation and bedrock removal process, the vertical bedrock should be hoe-rammed and grinded to provide a smooth and flat substrate surface approved for the placement of the waterproofing membrane. Shotcrete and/or lean concrete anchored into the bedrock with steel dowels and/or rock anchors may be required to fill in cavities and smooth out angular features and voids. This process and the requirement for shotcrete and/or lean concrete should be periodically reviewed by Paterson personnel during the excavation program.

- ❏ A waterproofing membrane will be required to lessen the effect of water infiltration for the lower underground parking level between the underside of footing elevation and up to the top of slab of the first level of underground parking. The waterproofing membrane should consist of a 150 miL granular bentonite surface laminated to 20 miL thick HDPE membrane. The membrane should be installed in horizontal lifts and in accordance with the manufacturer's specifications in a shingle fashion with the HDPE side facing the applicator/the building to an adequately prepared substrate surface.

6.5 Groundwater Control

Groundwater Control for Building Construction

Due to existing groundwater level and inferred depths of the proposed footings, it is anticipated that groundwater infiltration into the excavations should be low to moderate and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

Permit to Take Water

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, and EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

Long-term Groundwater Control

Our recommendations for the proposed building's long-term groundwater control are presented in Subsection 6.1. Any groundwater encountered along the building's perimeter or sub-slab drainage system will be directed to the proposed building's cistern/sump pit. Provided the proposed groundwater infiltration control system is properly implemented and approved by the geotechnical consultant at the time of construction, it is expected that groundwater flow will be low (i.e.- less than 50,000 L/day) with peak periods noted after rain events. A more accurate estimate can be provided at the time of construction, once groundwater infiltration levels are observed. It is anticipated that the groundwater flow will be controllable using conventional open sumps.

8.0 Statement of Limitations

The recommendations provided in this report are in accordance with our present understanding of the project. We request permission to review our recommendations when the grading plan, drawings and specifications are completed.

A geotechnical investigation is a limited sampling of a site. The recommendations are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around the test locations. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests notification immediately in order to permit reassessment of the recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Devtrin (Island Park) Inc., or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Maha K. Saleh, M.A.Sc., P.Eng.

David J. Gilbert, P.Eng.

Report Distribution:

- ❏ Devtrin (Island Park) Inc.
- ❏ Paterson Group

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February 22, 2022
File: PE4525-LET.03

Devtrin (Island Park) Inc.
77 Bloor Street West, Suite 1601
Toronto, Ontario
M5S 1M2

Attention: **Mr. Aly Premji**

Subject: **Response to City Comments**
City File No. D01-01-20-0018 & D02-02-20-0102)
70 Richmond Road and 376 Island Park Drive
Record of Site Condition
Ottawa, Ontario

Dear Sir,

This letter provides additional information, as requested by the City of Ottawa, for the proposed groundwater treatment methodologies and the Record of Site Condition filing for 70 Richmond Road and 376 Island Park Drive, which is referred to as the Phase II Property.

Background

The Phase II ESA identifed Hexane, PHCs and BTEX concentrations in the overburden groundwater at locations MW-1, MW-3 and MW-4 in excess of the MECP Table 3 Standards. The groundwater impacts are expected to be confined to the northeastern portion of the Phase II Property. The groundwater in the underlying bedrock is in compliance with the selected MECP standards.

The analytical test results and descriptive plans are available as part of the Phase II ESA, available under a separate cover.

Groundwater Treatment

Based on the location and nature of the overburden containing the impacted groundwater, the following remedial action(s) will be undertaken during the redevelopment of the site:

- ❒ Excavate the impacted zone beyond the bottom of the impacted well screen and to the proposed founding elevation of the building.
- ❒ Collect impacted groundwater from within the excavation for off-site disposal at a licensed groundwater treatment facility.
- ❒ Continue off-site treatment of impacted groundwater until the groundwater is in compliance with the MECP Table 3 Standards.
- ❒ Monitor the groundwater quality throughout the excavation program until the groundwater is in compliance with the MECP Table 3 Standards and/or the Sanitary Sewer Discharge Criteria.

The groundwater remediation program will result in one of 4 scenarios.

1. The groundwater remediation will result in groundwater in compliance with the MECP Table 3 Standards (and subsequently the Sanitary Sewer Discharge Criteria). At this time, post-remediation groundwater monitoring wells will be installed at the base of the excavation to satisfy the Generic Record of Site Condition (RSC) requirements, if deemed necessary, given that the underlying bedrock is clean.

2. The groundwater remediation will result in groundwater in compliance with the Sanitary Sewer Discharge Criteria, but not the MECP Table 3 Standards. At this time the groundwater infiltrating into the site can be discharged to the sanitary sewer system. At this time a risk assessment (RA) based RSC will be completed.

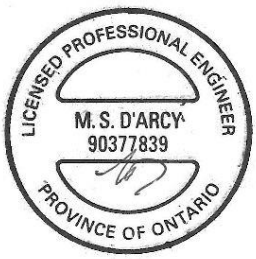
3. The groundwater remediation does not result in groundwater which complies with the Sanitary Sewer Discharge Criteria or with the MECP Table 3 Standards. At this time, a groundwater treatment system will be required for the property. The treatment system will be required to collect the groundwater from the site during and post-construction, until such a time that the groundwater is observed to meet the applicable discharge criteria. As part of this groundwater remediation program a RA based RSC would be required for the property.

4. An alternative option would be to treat impacted groundwater on site for disposal to the sanitary sewer system once the treated water has met the sanitary sewer discharge criteria. At this time a risk assessment (RA) based RSC will be completed. The goal of the site remediation program is to file a Generic RSC for the property.

We trust that this submission satisfies your current requirements. Should you have any questions please contact the undersigned.

Paterson Group Inc.

Mandy Witteman, B.Eng., M.A.Sc.



Mark D'Arcy, P.Eng., QP_{ESA}

4.1 General Content

☒ Executive Summary (for larger reports only).

Comments: *Page iii*

☒ Date and revision number of the report.

Comments: *Page i*

☒ Location map and plan showing municipal address, boundary, and layout of proposed development.

Comments: *Figure 1 and Figure 3 in Appendix F*

☒ Plan showing the site and location of all existing services.

Comments: *Figure 3 in Appendix F*

☒ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.

Comments: *Appendix B*

☐ Summary of Pre-consultation Meetings with City and other approval agencies.

Comments: *N/A*

☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.

Comments: *N/A. Reference to the City's guidelines are included in Section 4.0 pg. 2*

☒ Statement of objectives and servicing criteria.

Comments: *Section 4.2 (Stormwater Criteria), Section 4.3 (Sanitary Sewer Criteria), Section 4.4 (Water Usage Criteria)*

☒ Identification of existing and proposed infrastructure available in the immediate area.

Comments: *Section 5.1 (ex. storm sewers), Section 6.1 (ex. sanitary sewers), Section 7.1 (ex. water system)*

☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

Comments: *N/A*

☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.

Comments: *N/A during Zoning Application*

☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.

Comments: *N/A*

☐ Proposed phasing of the development, if applicable.

Comments: *N/A*

☐ Reference to geotechnical studies and recommendations concerning servicing.

Comments: *N/A*

☒ All preliminary and formal site plan submissions should have the following information:

- ☒ Metric scale
- ☒ North arrow (including construction North)
- ☒ Key plan
- ☒ Name and contact information of applicant and property owner
- ☒ Property limits including bearings and dimensions
- ☒ Existing and proposed structures and parking areas
- ☒ Easements, road widening and rights-of-way
- ☒ Adjacent street names

Comments: *Existing and proposed structures and parking areas are included in topo survey and architectural dwgs. Name and owner info. can be found in zba cover letter.*

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available

Comments: *Not available*

☒ Availability of public infrastructure to service proposed development

Comments: *Section 5.2.1*

☒ Identification of system constraints

Comments: *N/A*

☒ Identify boundary conditions

Comments: *Boundary conditions can be foun in Appendix B*

☒ Confirmation of adequate domestic supply and pressure

Comments: *Based on the boundary conditions received from the city, the existing water infrastructure along Island Park Drive, will support the proposed development at 70*

☒ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.

Comments: *Section 7.2 and Appendix E*

☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.

Comments: *N/A*

☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

Comments: *N/A*

☐ Address reliability requirements such as appropriate location of shut-off valves

Comments: *N/A*

☐ Check on the necessity of a pressure zone boundary modification.

Comments: *N/A*

☒ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

Comments: *Appendix E*

☒ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.

Comments: *Appendix E and Figure-3 at Appendix F*

☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.

Comments: *N/A*

☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

Comments: *Section 4.4*

☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

Comments: *Appendix B*

4.3 Development Servicing Report: Wastewater

☒ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).

Comments: *Section 4.3*

☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.

Comments: *N/A*

☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.

Comments: *N/A*

☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

Comments: *Section 6.1*

☒ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)

Comments: *Upon receipt of the City of Ottawa available capacity of the existing sanitary infrastructure.*

☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

Comments: *N/A*

☐ Special considerations such as contamination, corrosive environment etc.

Comments: *N/A*

4.4 Development Servicing Report: Stormwater

☐ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

Comments: *N/A*

☒ Analysis of available capacity in existing public infrastructure.

Comments: *Section 5.3*

☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

Comments: *DAP1 and 2 in Appendix C*

☒ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.

Comments: *Section 5.2.2*

☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

Comments: *N/A during Zoning Application Stage*

☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

Comments: *Section 5.4*

☐ Set-back from private sewage disposal systems.

Comments: *N/A*

☐ Watercourse and hazard lands setbacks.

Comments: *N/A*

☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

Comments: *N/A*

☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

Comments: *N/A*

☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).

Comments: *Appendix C*

☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

Comments: *N/A*

☒ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.

Comments: *Section 5.2 and Appendix C*

☐ Any proposed diversion of drainage catchment areas from one outlet to another.

Comments: *N/A*

☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

Comments: *Section 5.3 and Figure 3 in Appendix F*

☒ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.

Comments: *Section 5.2 and Figure 3 in Appendix F*

☒ Identification of potential impacts to receiving watercourses

Comments: *Section 5.4 and Figure 3 in Appendix F*

☒ Identification of municipal drains and related approval requirements.

Comments: *Section 5.4 and Figure 3 in Appendix F*

☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.

Comments: *Section 5.4 and Figure 3 in Appendix F*

☐ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

Comments: *N/A*

☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.

Comments: *N/A*

☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

Comments: *Section 8.0*

☐ Identification of floodplains - proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.

Comments: *N/A*

☐ Identification of fill constraints related to floodplain and geotechnical investigation.

Comments: *N/A*

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.

Comments: *N/A*

☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

Comments: *N/A*

☐ Changes to Municipal Drains.

Comments: *N/A*

☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

Comments: *N/A*

4.6 Conclusion Checklist

☒ Clearly stated conclusions and recommendations

Comments: *Section 9.0*

☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

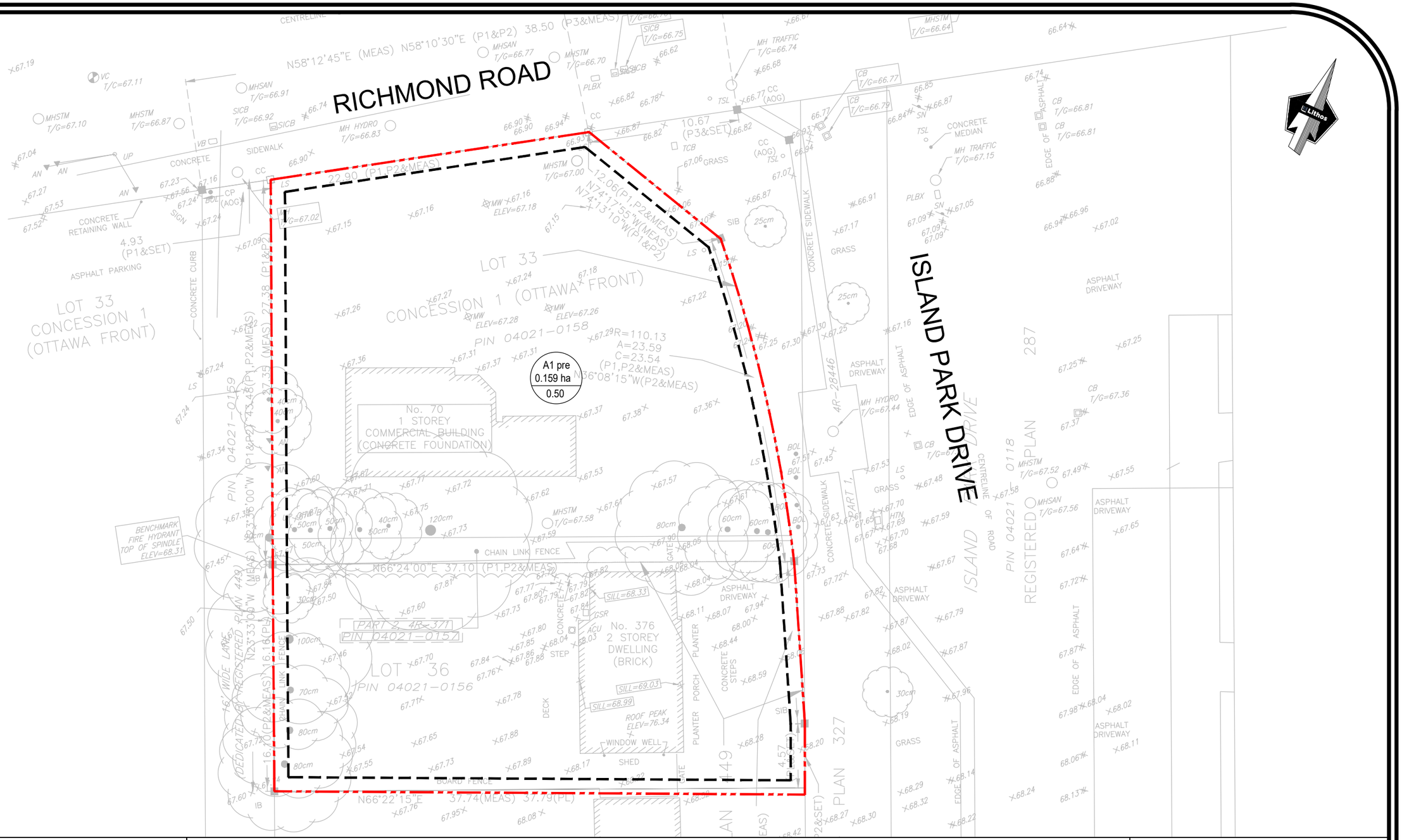
Comments: *N/A*

☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

Comments: *Signed and stamped by Ontario engineer*

Appendix C

Storm Analysis



LEGEND

- A1 pre / 0.04 ha / 0.50 — STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); COMPOSITE RUNOFF COEFFICIENT
- PRE-DEVELOPMENT STORM DRAINAGE AREA
- PROPERTY LINE

Lithos
150 Bermondsey Road, Toronto, Ontario M4A 1Y1

PRE-DEVELOPMENT DRAINAGE AREA PLAN

MIXED USE DEVELOPMENT
70 RICHMOND ROAD
OTTAWA, ONTARIO

DATE: MAY 2022	PROJECT No: UD18-028
SCALE: N.T.S.	FIGURE No: DAP1

Lithos

Prepared By: Dimitra Savvaoglou, P.E., M.A.Sc.
Reviewed By: Anastasia Tzakopoulou, P.Eng., M.A.Sc.

Pre-Development Flow Calculation

70 Richmond Road
File No. UD18-028
City of Ottawa
Date: May 2022

	Area (ha)	Actual "C"	Design "C"	Tc (min.)
A1 pre	0.159	0.76	0.50	20

Rational Method Calculation

Event 2 yr
IDF Data Set City of Ottawa
a = 732.95
b = 6.199
c = 0.810

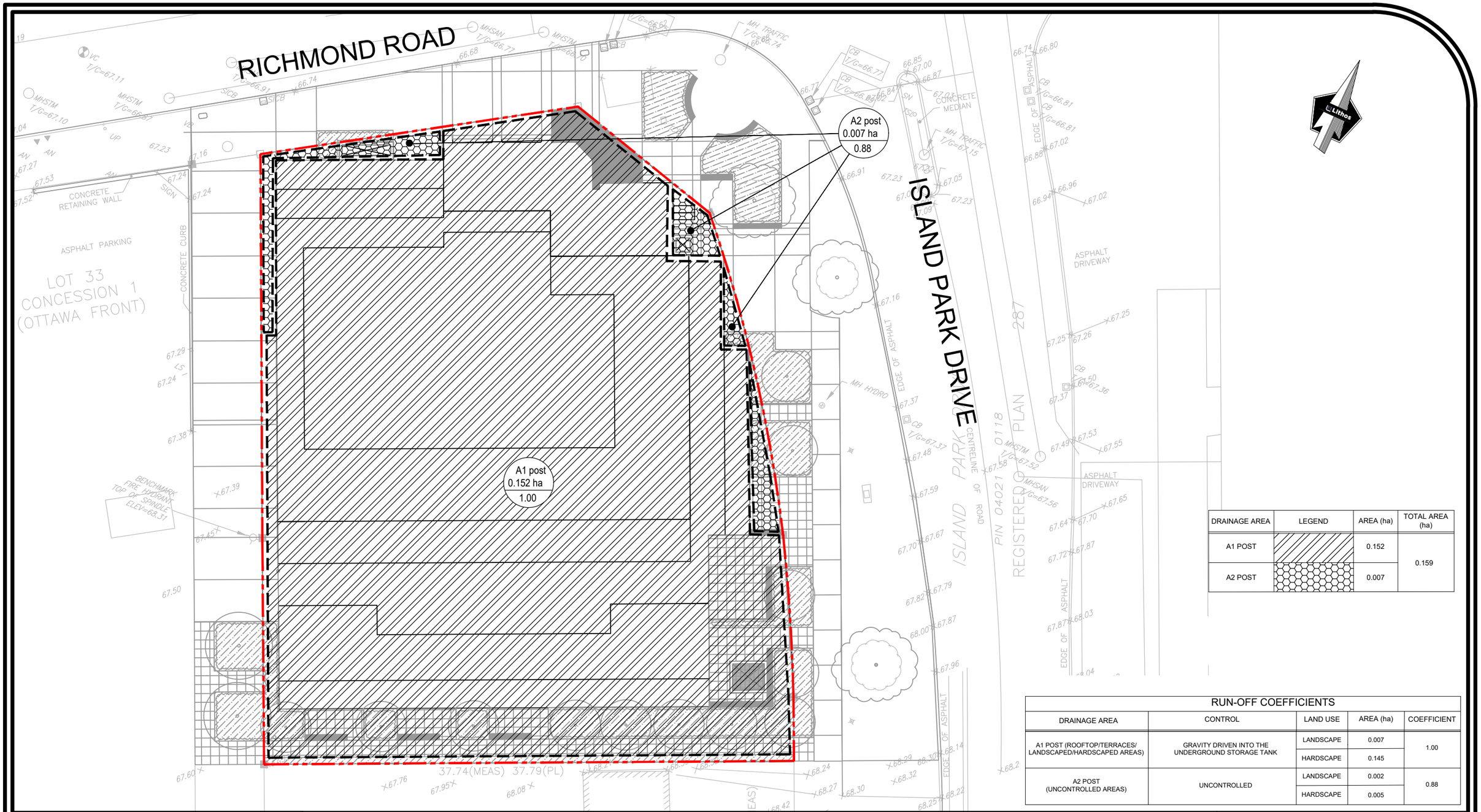
Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 pre	0.159	0.50	0.08	20	52.0	0.011	11.5

Event 5 yr
IDF Data Set City of Ottawa
a = 998.07
b = 6.053
c = 0.814

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 pre	0.159	0.50	0.08	20	70.3	0.016	15.5

Event 100 yr
IDF Data Set City of Ottawa
a = 1735.69
b = 6.014
c = 0.820

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 pre	0.159	0.50	0.08	20	120.0	0.026	26.5



DRAINAGE AREA	LEGEND	AREA (ha)	TOTAL AREA (ha)
A1 POST		0.152	0.159
A2 POST		0.007	

RUN-OFF COEFFICIENTS				
DRAINAGE AREA	CONTROL	LAND USE	AREA (ha)	COEFFICIENT
A1 POST (ROOFTOP/TERRACES/ LANDSCAPED/HARDSCAPED AREAS)	GRAVITY DRIVEN INTO THE UNDERGROUND STORAGE TANK	LANDSCAPE	0.007	1.00
		HARDSCAPE	0.145	
A2 POST (UNCONTROLLED AREAS)	UNCONTROLLED	LANDSCAPE	0.002	0.88
		HARDSCAPE	0.005	

Lithos

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LEGEND

A1 post / 0.04 ha / 0.50

- STORM DRAINAGE AREA NUMBER
- DRAINAGE AREA (ha)
- COMPOSITE RUNOFF COEFFICIENT
- POST-DEVELOPMENT STORM DRAINAGE AREA
- PROPERTY LINE

POST-DEVELOPMENT DRAINAGE AREA PLAN

MIXED USE DEVELOPMENT
70 RICHMOND ROAD
OTTAWA, ONTARIO

DATE: MAY 2022	PROJECT No: UD18-028
SCALE: N.T.S.	FIGURE No: DAP2

Modified Rational Method - Two Year Storm

70 Richmond Road

File No. UD18-028

Date:May 2022

City of Ottawa
File No. UD18-028
Prepared By: Dimitra Savvaoglou, P.E., M.A.Sc.
Reviewed By: Anastasia Tzakopoulou, P.Eng., M.A.Sc.

Drainage Area A1 Post

Rootop/Terraces/Hardscaped/Landscaped Areas - Controlled in Undergroun Tank

Area(A1) = **0.152** ha
"C" = **0.87**
AC1 = **0.13**
Tc = **10.0** min
Time Increment = **5.0** min
Max Release Rate = **28.2** L/s

Drainage Area A2 Post

Uncontrolled Site Area

Area (A2) = **0.007** ha
"C" = **0.71**
AC3= **0.00**
Tc = **10.0** min
Time Increment = **5.0** min
Max. Release Rate = **1.0** L/s

Total Site

Total Site = A1

5-yr Pre-Development Site Release Rate= **15.5** L/s

Uncontrolled Flow = **1.0** L/s

Target Site Release Rate= **7.3** L/s

Design Controlled Release Rate (Vortex Valve CEV 250) = **6.6** L/s

Total Site Release Rate Achieved = **7.6** L/s

Max. Storage Tank Size = **15.03** m^3

Storage Tank footpring Area = **86.80** m^2

2-Year Design Storm

a=	732.95
b=	6.199
c=	0.810
I =	$a / (T_C + b)^c$

Tributary Area (A1)	ha	C
Landscape Area	0.007	0.25
Hardscape Area	0.145	0.90
Total	0.152	0.87

Tributary Area (A2)	ha	C
Landscape Area	0.002	0.25
Hardscape Area	0.005	0.90
Total	0.007	0.71

1	2	3	4	5	6	7	8	9	10
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A2 Post)**	**Runoff Volume (A2 Post)**	**Total Storm Runoff Volume**	**Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	76.8	0.0282	16.94	0.001	0.61	16.94	3.96	13.0	0.15
15.0	61.8	0.0227	20.43	0.001	0.73	20.43	5.94	14.5	0.17
20.0	52.0	0.0191	22.95	0.001	0.82	22.95	7.92	15.0	0.17
25.0	45.2	0.0166	24.90	0.001	0.89	24.90	9.90	15.0	0.17
30.0	40.0	0.0147	26.49	0.001	0.95	26.49	11.88	14.6	0.17
35.0	36.1	0.0133	27.83	0.000	1.00	27.83	13.86	14.0	0.16
40.0	32.9	0.0121	28.99	0.000	1.04	28.99	15.84	13.1	0.15
45.0	30.2	0.0111	30.01	0.000	1.07	30.01	17.82	12.2	0.14
50.0	28.0	0.0103	30.92	0.000	1.11	30.92	19.80	11.1	0.13
55.0	26.2	0.0096	31.74	0.000	1.14	31.74	21.78	10.0	0.11
60.0	24.6	0.0090	32.49	0.000	1.16	32.49	23.76	8.7	0.10
65.0	23.2	0.0085	33.19	0.000	1.19	33.19	25.74	7.4	0.09
70.0	21.9	0.0081	33.83	0.000	1.21	33.83	27.72	6.1	0.07
75.0	20.8	0.0076	34.42	0.000	1.23	34.42	29.70	4.7	0.05
80.0	19.8	0.0073	34.98	0.000	1.25	34.98	31.68	3.3	0.04
85.0	18.9	0.0070	35.51	0.000	1.27	35.51	33.66	1.9	0.02
90.0	18.1	0.0067	36.01	0.000	1.29	36.01	35.64	0.4	0.00
95.0	17.4	0.0064	36.48	0.000	1.30	36.48	37.62	0.0	0.00
100.0	16.7	0.0062	36.93	0.000	1.32	36.93	39.60	0.0	0.00
105.0	16.1	0.0059	37.36	0.000	1.34	37.36	41.58	0.0	0.00
110.0	15.6	0.0057	37.77	0.000	1.35	37.77	43.56	0.0	0.00
115.0	15.0	0.0055	38.16	0.000	1.36	38.16	45.54	0.0	0.00
120.0	14.6	0.0054	38.54	0.000	1.38	38.54	47.52	0.0	0.00
125.0	14.1	0.0052	38.90	0.000	1.39	38.90	49.50	0.0	0.00
130.0	13.7	0.0050	39.25	0.000	1.40	39.25	51.48	0.0	0.00
135.0	13.3	0.0049	39.58	0.000	1.42	39.58	53.46	0.0	0.00
140.0	12.9	0.0048	39.91	0.000	1.43	39.91	55.44	0.0	0.00
145.0	12.6	0.0046	40.22	0.000	1.44	40.22	57.42	0.0	0.00
150.0	12.3	0.0045	40.53	0.000	1.45	40.53	59.40	0.0	0.00
155.0	11.9	0.0044	40.82	0.000	1.46	40.82	61.38	0.0	0.00
160.0	11.7	0.0043	41.11	0.000	1.47	41.11	63.36	0.0	0.00
165.0	11.4	0.0042	41.39	0.000	1.48	41.39	65.34	0.0	0.00

Modified Rational Method - Five Year Storm

70 Richmond Road

File No. UD18-028

Date:May 2022

City of Ottawa
File No. UD18-028
Prepared By: Dimitra Savvaoglou, P.E., M.A.Sc.
Reviewed By: Anastasia Tzakopoulou, P.Eng., M.A.Sc.

Drainage Area A1 Post

Rootop/Terraces/Hardscaped/Landscaped Areas - Controlled in Undergroun Tank

Area(A1) = **0.152** ha
"C" = **0.87**
AC1 = **0.13**
Tc = **10.0** min
Time Increment = **5.0** min
Max Release Rate = **38.3** L/s

Drainage Area A2 Post

Uncontrolled Site Area

Area (A2) = **0.007** ha
"C" = **0.71**
AC2= **0.00**
Tc = **10.0** min
Time Increment = **5.0** min
Max. Release Rate = **1.4** L/s

Total Site

Total Site = A1

5-yr Pre-Development Site Release Rate= **15.5** L/s

Uncontrolled Flow = **1.4** L/s

Target Site Release Rate= **7.1** L/s

Design Controlled Release Rate (Vortex Valve CEV 250) = **6.6** L/s

Total Site Release Rate Achieved = **8.0** L/s

Max. Storage Tank Size = **23.80** m^3

Storage Tank footpring Area = **86.80** m^2

5-Year Design Storm

a=	998.07
b=	6.053
c=	0.814
I =	$a / (T_C + b)^c$

Tributary Area (A1)	ha	C
Landscape Area	0.007	0.25
Hardscape Area	0.145	0.90
Total	0.152	0.87

Tributary Area (A2)	ha	C
Landscape Area	0.002	0.25
Hardscape Area	0.005	0.90
Total	0.007	0.71

1	2	3	4	5	6	7	8	9	10
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A2 Post)**	**Runoff Volume (A2 Post)**	**Total Storm Runoff Volume**	**Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	104.2	0.0383	22.98	0.001	0.82	22.98	3.96	19.0	0.22
15.0	83.6	0.0307	27.64	0.001	0.99	27.64	5.94	21.7	0.25
20.0	70.3	0.0258	30.98	0.001	1.11	30.98	7.92	23.1	0.27
25.0	60.9	0.0224	33.57	0.001	1.20	33.57	9.90	23.7	0.27
30.0	53.9	0.0198	35.68	0.001	1.28	35.68	11.88	23.8	0.27
35.0	48.5	0.0178	37.45	0.001	1.34	37.45	13.86	23.6	0.27
40.0	44.2	0.0162	38.98	0.001	1.39	38.98	15.84	23.1	0.27
45.0	40.6	0.0149	40.32	0.001	1.44	40.32	17.82	22.5	0.26
50.0	37.7	0.0138	41.52	0.000	1.48	41.52	19.80	21.7	0.25
55.0	35.1	0.0129	42.60	0.000	1.52	42.60	21.78	20.8	0.24
60.0	32.9	0.0121	43.59	0.000	1.56	43.59	23.76	19.8	0.23
65.0	31.0	0.0114	44.50	0.000	1.59	44.50	25.74	18.8	0.22
70.0	29.4	0.0108	45.34	0.000	1.62	45.34	27.72	17.6	0.20
75.0	27.9	0.0103	46.13	0.000	1.65	46.13	29.70	16.4	0.19
80.0	26.6	0.0098	46.86	0.000	1.68	46.86	31.68	15.2	0.17
85.0	25.4	0.0093	47.55	0.000	1.70	47.55	33.66	13.9	0.16
90.0	24.3	0.0089	48.21	0.000	1.72	48.21	35.64	12.6	0.14
95.0	23.3	0.0086	48.83	0.000	1.75	48.83	37.62	11.2	0.13
100.0	22.4	0.0082	49.41	0.000	1.77	49.41	39.60	9.8	0.11
105.0	21.6	0.0079	49.97	0.000	1.79	49.97	41.58	8.4	0.10
110.0	20.8	0.0077	50.51	0.000	1.81	50.51	43.56	7.0	0.08
115.0	20.1	0.0074	51.02	0.000	1.82	51.02	45.54	5.5	0.06
120.0	19.5	0.0072	51.52	0.000	1.84	51.52	47.52	4.0	0.05
125.0	18.9	0.0069	51.99	0.000	1.86	51.99	49.50	2.5	0.03
130.0	18.3	0.0067	52.45	0.000	1.88	52.45	51.48	1.0	0.01
135.0	17.8	0.0065	52.89	0.000	1.89	52.89	53.46	0.0	0.00
140.0	17.3	0.0063	53.31	0.000	1.91	53.31	55.44	0.0	0.00
145.0	16.8	0.0062	53.73	0.000	1.92	53.73	57.42	0.0	0.00
150.0	16.4	0.0060	54.12	0.000	1.94	54.12	59.40	0.0	0.00
155.0	15.9	0.0059	54.51	0.000	1.95	54.51	61.38	0.0	0.00
160.0	15.6	0.0057	54.89	0.000	1.96	54.89	63.36	0.0	0.00
165.0	15.2	0.0056	55.25	0.000	1.98	55.25	65.34	0.0	0.00

Modified Rational Method - Hundred Year Storm

70 Richmond Road

File No. UD18-028

Date:May 2022

City of Ottawa
File No. UD18-028
Prepared By: Dimitra Savvaoglou, P.E., M.A.Sc.
Reviewed By: Anastasia Tzakopoulou, P.Eng., M.A.Sc.

***C value for the 100 year storm event is increased by 25%, with a maximum of 1.0 per City's Sewer Design Guidelines**

100-Year Design Storm

a=	1735.69
b=	6.014
c=	0.820
I =	$a / (T_C + b)^c$

Drainage Area A1 Post

Rootop/Terraces/Hardscaped/Landscaped Areas - Controlled in Undergroun Tank

Area(A1) =	**0.152**	ha
"C" * =	**1.00**	
AC1 =	**0.15**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max Release Rate =	**75.5**	L/s

Tributary Area (A1)	ha	C	C 100
Landscape Area	0.007	0.25	0.31
Hardscape Area	0.145	0.90	1.13
Total	0.152	0.87	1.09

Drainage Area A2 Post

Uncontrolled Site Area

Area (A2) =	**0.007**	ha
"C"* =	**0.88**	
AC2=	**0.01**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**2.3**	L/s

Tributary Area (A2)	ha	C	C 100
Landscape Area	0.002	0.25	0.31
Hardscape Area	0.005	0.90	1.13
Total	0.007	0.71	0.88

Total Site

Total Site = A1

5-yr Pre-Development Site Release Rate=	**15.5**	L/s
Uncontrolled Flow =	**2.3**	L/s
Target Site Release Rate=	**6.6**	L/s
Design Controlled Release Rate (Vortex Valve CEV 250) =	**6.6**	L/s
Total Site Release Rate Achieved =	**8.9**	L/s
Max. Storage Tank Size =	**61.45**	m^3
Storage Tank footpring Area =	**86.80**	m^2

1	2	3	4	5	6	7	8	9	10
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A2 Post)**	**Runoff Volume (A2 Post)**	**Total Storm Runoff Volume**	**Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	178.6	0.0755	45.32	0.002	1.20	45.32	3.96	41.4	0.48
15.0	142.9	0.0604	54.40	0.002	2.11	54.40	5.94	48.5	0.56
20.0	120.0	0.0507	60.89	0.002	2.37	60.89	7.92	53.0	0.61
25.0	103.8	0.0439	65.90	0.002	2.56	65.90	9.90	56.0	0.65
30.0	91.9	0.0389	69.95	0.002	2.72	69.95	11.88	58.1	0.67
35.0	82.6	0.0349	73.36	0.001	2.85	73.36	13.86	59.5	0.69
40.0	75.1	0.0318	76.29	0.001	2.96	76.29	15.84	60.5	0.70
45.0	69.1	0.0292	78.87	0.001	3.06	78.87	17.82	61.0	0.70
50.0	64.0	0.0271	81.16	0.001	3.15	81.16	19.80	61.4	0.71
55.0	59.6	0.0252	83.23	0.001	3.23	83.23	21.78	61.5	0.71
60.0	55.9	0.0236	85.12	0.001	3.31	85.12	23.76	61.4	0.71
65.0	52.6	0.0223	86.86	0.001	3.37	86.86	25.74	61.1	0.70
70.0	49.8	0.0211	88.46	0.001	3.44	88.46	27.72	60.7	0.70
75.0	47.3	0.0200	89.96	0.001	3.49	89.96	29.70	60.3	0.69
80.0	45.0	0.0190	91.36	0.001	3.55	91.36	31.68	59.7	0.69
85.0	43.0	0.0182	92.67	0.001	3.60	92.67	33.66	59.0	0.68
90.0	41.1	0.0174	93.91	0.001	3.65	93.91	35.64	58.3	0.67
95.0	39.4	0.0167	95.09	0.001	3.69	95.09	37.62	57.5	0.66
100.0	37.9	0.0160	96.20	0.001	3.74	96.20	39.60	56.6	0.65
105.0	36.5	0.0154	97.27	0.001	3.78	97.27	41.58	55.7	0.64
110.0	35.2	0.0149	98.28	0.001	3.82	98.28	43.56	54.7	0.63
115.0	34.0	0.0144	99.26	0.001	3.86	99.26	45.54	53.7	0.62
120.0	32.9	0.0139	100.19	0.001	3.89	100.19	47.52	52.7	0.61
125.0	31.9	0.0135	101.09	0.001	3.93	101.09	49.50	51.6	0.59
130.0	30.9	0.0131	101.95	0.001	3.96	101.95	51.48	50.5	0.58
135.0	30.0	0.0127	102.79	0.000	3.99	102.79	53.46	49.3	0.57
140.0	29.2	0.0123	103.59	0.000	4.02	103.59	55.44	48.1	0.55
145.0	28.4	0.0120	104.37	0.000	4.05	104.37	57.42	46.9	0.54
150.0	27.6	0.0117	105.12	0.000	4.08	105.12	59.40	45.7	0.53
155.0	26.9	0.0114	105.85	0.000	4.11	105.85	61.38	44.5	0.51
160.0	26.2	0.0111	106.56	0.000	4.14	106.56	63.36	43.2	0.50
165.0	25.6	0.0108	107.25	0.000	4.17	107.25	65.34	41.9	0.48

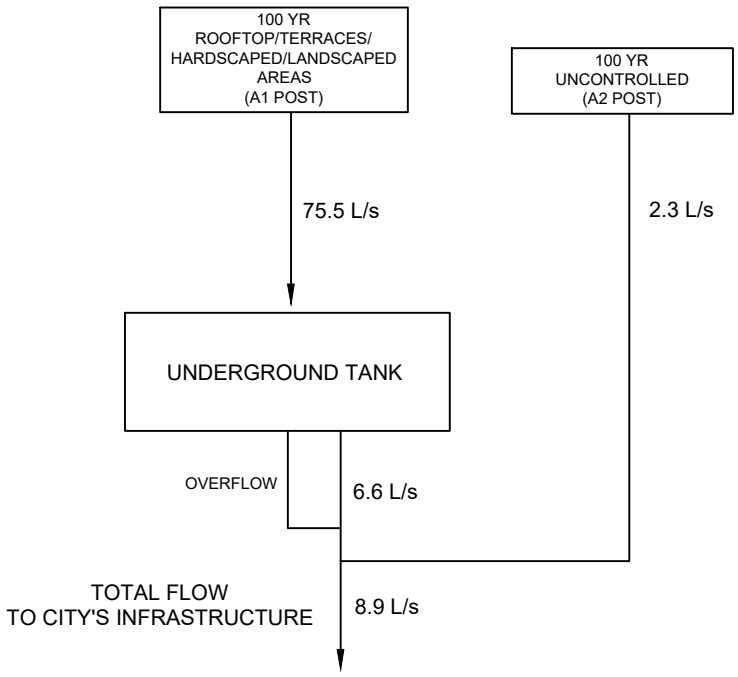
Lithos

Water Quality Calculations

70 Richmond Road
File No. UD18-028
Date:May 2022

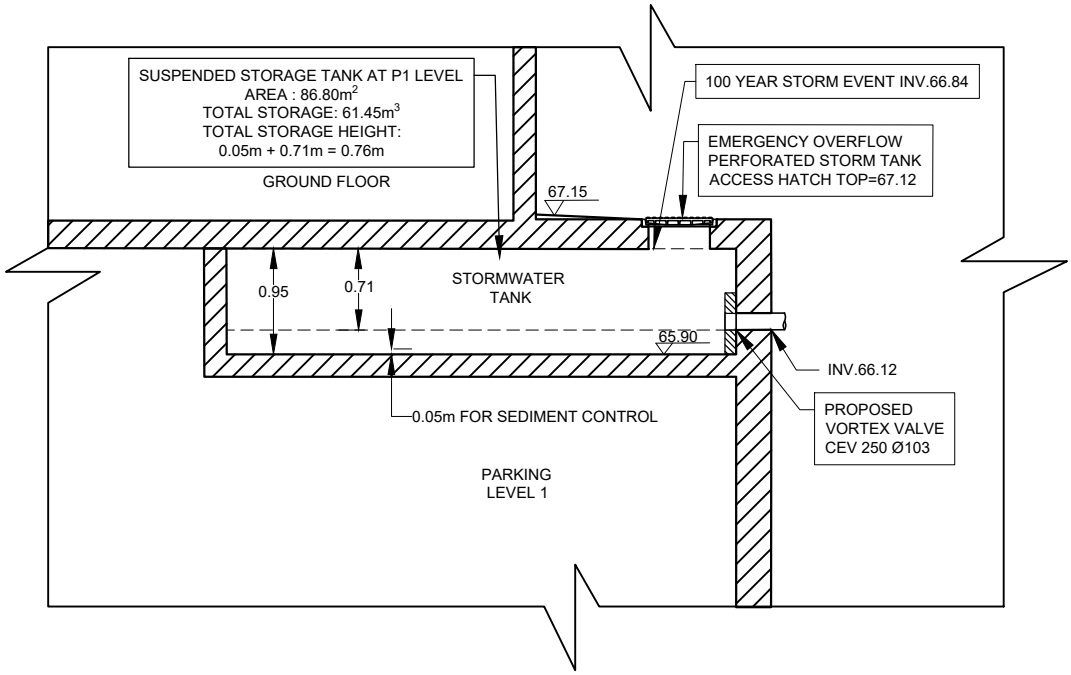
Surface	Method	Effective TSS Removal	Area (ha)	% Area of Controlled Site	Overall TSS Removal
Rooftop/Terraces/ Hardscaped/ Landscaped Areas	Inherent	80%	0.152	100%	80%
Total			0.152	100%	80%

Note: Uncontrolled water does not account in the above calculations



QUANTITY CONTROL
Volume required for 100-year storm event = 61.45 m³
Area of Underground Tank = 86.80m^2

NOTE: TANK TO BE VERIFIED BY BUILDING MECHANICAL CONSULTANT



Lithos

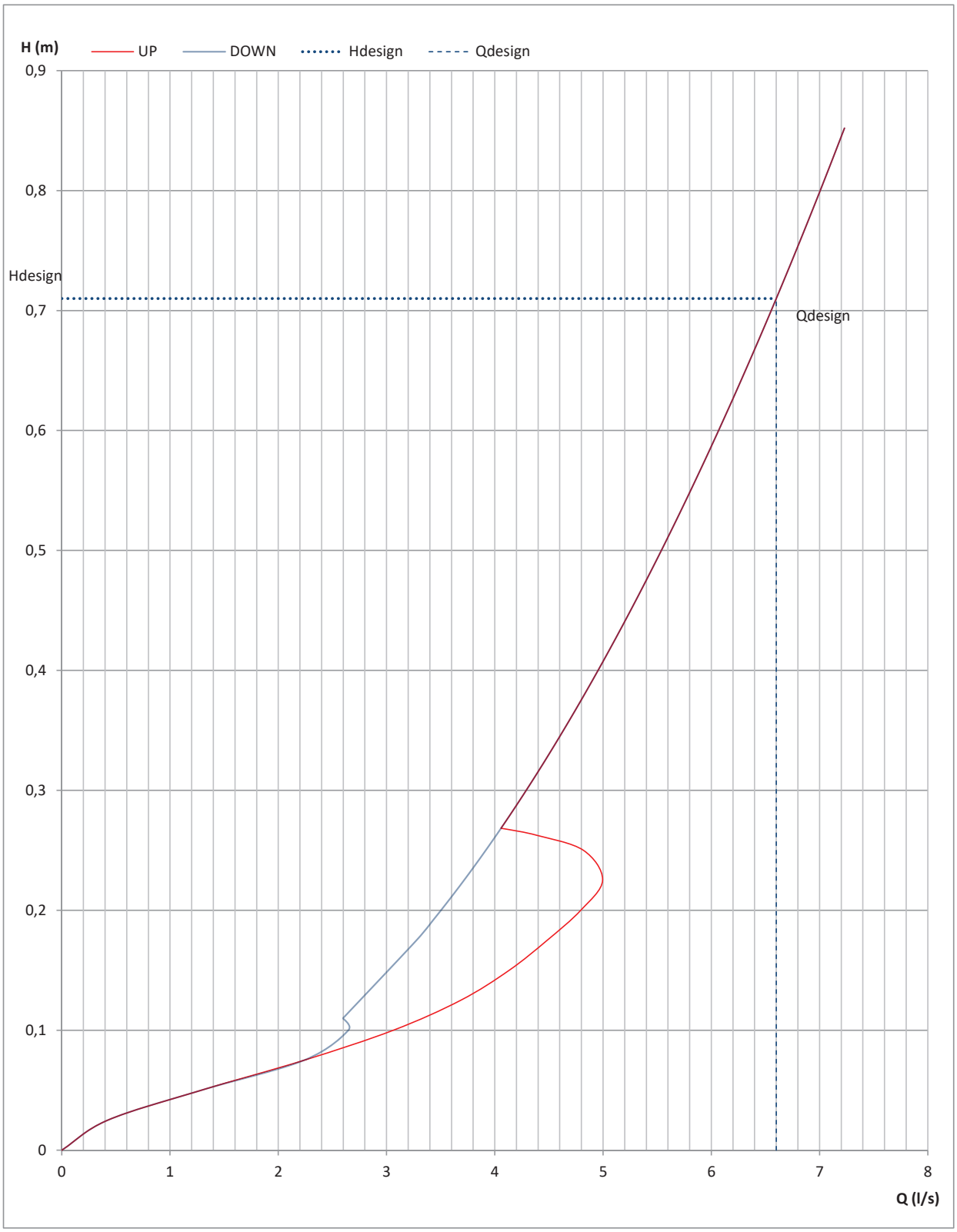
150 Bermondsey Road, Toronto, Ontario M4A 1Y1

FLOW SCHEMATIC
MIXED USE DEVELOPMENT
70 RICHMOND ROAD
OTTAWA, ONTARIO

DATE:	MAY 2022	PROJECT No:	UD18-028
SCALE:	N.T.S.	FIGURE No:	FIG 3

Ref: 24936.2.1
Date: 09-05-2022
Design: Q=6,6l/s
H=0,71m

CEV 250 ø104



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Vaerkstedsvej 20
DK-4600 Koege, Denmark
Tel +45 56 63 85 80 Fax +45 56 63 86 80

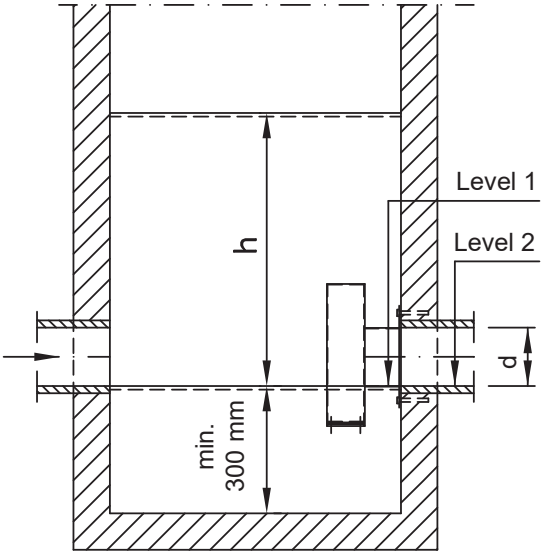
Date 09.05.2022 Ref. No. 24936.2.1
Type CEV 250 160 P
Q = 6.6 l/s at h = 0.71 m

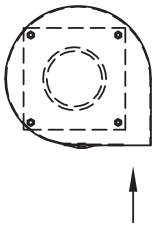
Projekt: 70 Richmond Road, Ottawa

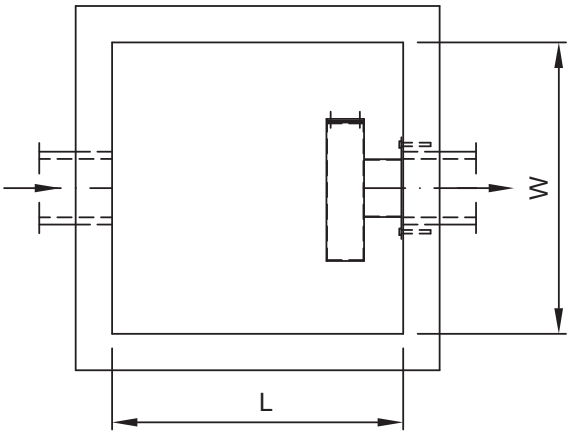
-

When ordering please state the information as follows:

1)	Ref. No.	:	24936.2.1
2)	d	:	min. ø 115 mm
3)	L	:	min. 2xD mm
4)	W	:	min. 1.5xD mm







Installation

The flow regulator is provided with a mounting plate. The mounting plate must be fastened to the wall of the chamber covering the outlet opening by means of drilled or embedded bolts/threaded rods of acid-resistant steel.
Please note that level 1 and level 2 must be equal.
Tightening between plate and wall of chamber is made with waterresistant silicone, rubber sealing or the like.

Appendix D

Sanitary Data Analysis

SANITARY SEWER DESIGN SHEET- SCENARIO 1

70 Richmond Road

CITY OF OTTAWA

LOCATION	SECTION AREA (ha.)	RESIDENTIAL: NUMBER OF UNITS: Single Fam. Dwell @ 3.4 ppu	Townhouse @ 2.7	Studio @ 1.4 ppu	1 Bed. Apts. @ 1.4 ppu	2 Bed. Apts. @ 2.1 ppu	3 Bed. Apts. @ 3.1 ppu	TOTAL RESIDENTIAL POPULATION (persons)	AVERAGE RES. FLOW '@' 280 L/c/d (L/s)	HARMON PEAKING FACTOR	RES. PEAK FLOW (L/s)	COMMERCIAL AREA (ha.)	AVERAGE COMMERCIAL @ 50000 L/ha/day (L/s)	COMM. PEAK FLOW (L/s)	INFILTRATION: TOTAL ACCUM. AREA (ha.)	INFILT. @ 0.28 L/s/ha. (L/s)	TOTAL DESIGN FLOW (L/s)	SEWER DESIGN: PIPE LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAPACITY n = 0.013 (L/sec)	% of DESIGN CAPACITY (%)
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Existing Condition																						
Commercial / Residential Development	0.159	1	0	0	0	0	0	3	0.01	4.00	0.04	0.0105	0.006	0.01	0.159	0.04	**0.09**					
Proposed Condition																						
Commercial/ Residential Development	0.159	0	7	3	37	41	0	161	0.52	4.00	2.09	0.021	0.01	0.02	0.159	0.04	**2.15**	8.5	150	1.0%	15.23	14.12%
Groundwater																	**0.35**					
															Total Flow		2.50					
															Total Net Flow		2.41					

Average Residential Flow Rate - 280 Litres / capita / day
Average Daily Flow Commercial - 50,000 Litres / gross ha / day
Average Daily Flow Institutional - 50,000 Litres / gross ha / day
Average Daily Flow Industrial - 35,000 Litres / gross ha / day

Infiltration Allowance (Dry Weather) - 0.05 Litres / s / gross ha
Infiltration Allowance (Wet Weather) - 0.28 Litres / s / gross ha
Infiltration Allowance (Total I/I) - 0.33 Litres / s / gross ha
Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands

Site Area: **0.159 Ha**

Prepared by: Dimitra Savvaoglou, P.Eng., M.A.Sc.
Reviewed by: Anastasia Tzakopoulou, P.Eng., M.A.Sc.
Date: May 2022

Project: 70 Richmond Road
Project: UD18-028

SANITARY SEWER DESIGN SHEET- SCENARIO 2

70 Richmond Road

CITY OF OTTAWA

LOCATION	SECTION AREA (ha.)	RESIDENTIAL: NUMBER OF UNITS: Single Fam. Dwell @ 3.4 ppu	Townhouse @ 2.7	Studio @ 1.4 ppu	1 Bed. Apts. @ 1.4 ppu	2 Bed. Apts. @ 2.1 ppu	3 Bed. Apts. @ 3.1 ppu	TOTAL RESIDENTIAL POPULATION (persons)	AVERAGE RES. FLOW '@' 280 L/c/d (L/s)	HARMON PEAKING FACTOR	RES. PEAK FLOW (L/s)	COMMERCIAL AREA (ha.)	AVERAGE COMMERCIAL @ 50000 L/ha/day (L/s)	COMM. PEAK FLOW (L/s)	INFILTRATION: TOTAL ACCUM. AREA (ha.)	INFILT. @ 0.28 L/s/ha. (L/s)	TOTAL DESIGN FLOW (L/s)	SEWER DESIGN: PIPE LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAPACITY n = 0.013 (L/sec)	% of DESIGN CAPACITY (%)
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Existing Condition																						
Commercial / Residential Development	0.159	1	0	0	0	0	0	3	0.01	4.00	0.04	0.0105	0.006	0.01	0.159	0.04	**0.09**					
Proposed Condition																						
Commercial/ Residential Development	0.159	0	7	3	37	41	0	161	0.52	4.00	2.09	0.021	0.01	0.02	0.159	0.04	**2.15**	8.5	150	1.0%	15.23	14.12%
Groundwater																	**0.35**					
															Total Flow		2.50					
															Total Net Flow		2.41					

Average Residential Flow Rate - 280 Litres / capita / day
Average Daily Flow Commercial - 50,000 Litres / gross ha / day
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Infiltration Allowance (Dry Weather) - 0.05 Litres / s / gross ha
Infiltration Allowance (Wet Weather) - 0.28 Litres / s / gross ha
Infiltration Allowance (Total I/I) - 0.33 Litres / s / gross ha
Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands

Site Area: 0.159 Ha

Prepared by: Dimitra Savvaoglou, P.Eng., M.A.Sc.
Reviewed by: Anastasia Tzakopoulou, P.Eng., M.A.Sc.
Date: May 2022

Project: 70 Richmond Road
Project: UD18-028

SANITARY SEWER DESIGN SHEET- SCENARIO 3

70 Richmond Road

CITY OF OTTAWA

LOCATION	SECTION AREA (ha.)	RESIDENTIAL: NUMBER OF UNITS: Single Fam. Dwell @ 3.4 ppu	Townhouse @ 2.7	Studio @ 1.4 ppu	1 Bed. Apts. @ 1.4 ppu	2 Bed. Apts. @ 2.1 ppu	3 Bed. Apts. @ 3.1 ppu	TOTAL RESIDENTIAL POPULATION (persons)	AVERAGE RES. FLOW '@' 280 L/c/d (L/s)	HARMON PEAKING FACTOR	RES. PEAK FLOW (L/s)	COMMERCIAL AREA (ha.)	AVERAGE COMMERCIAL @ 50000 L/ha/day (L/s)	COMM. PEAK FLOW (L/s)	INFILTRATION: TOTAL ACCUM. AREA (ha.)	INFILT. @ 0.28 L/s/ha. (L/s)	TOTAL DESIGN FLOW (L/s)	SEWER DESIGN: PIPE LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAPACITY n = 0.013 (L/sec)	% of DESIGN CAPACITY (%)
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Existing Condition																						
Commercial / Residential Development	0.159	1	0	0	0	0	0	3	0.01	4.00	0.04	0.0105	0.006	0.01	0.159	0.04	**0.09**					
Proposed Condition																						
Commercial/ Residential Development	0.159	0	7	3	37	41	0	161	0.52	4.00	2.09	0.021	0.01	0.02	0.159	0.04	**2.15**	8.5	150	1.0%	15.23	14.12%
Groundwater																	**0.35**					
															Total Flow		2.50					
															Total Net Flow		2.41					

Average Residential Flow Rate - 280 Litres / capita / day
Average Daily Flow Commercial - 50,000 Litres / gross ha / day
Average Daily Flow Institutional - 50,000 Litres / gross ha / day
Average Daily Flow Industrial - 35,000 Litres / gross ha / day

Infiltration Allowance (Dry Weather) - 0.05 Litres / s / gross ha
Infiltration Allowance (Wet Weather) - 0.28 Litres / s / gross ha
Infiltration Allowance (Total I/I) - 0.33 Litres / s / gross ha
Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands

Site Area: 0.159 Ha

Prepared by: Dimitra Savvaoglou, P.Eng., M.A.Sc.
Reviewed by: Anastasia Tzakopoulou, P.Eng., M.A.Sc.
Date: May 2022

Project: 70 Richmond Road
Project: UD18-028
City of Ottawa Sheet 3 OF 4

SANITARY SEWER DESIGN SHEET- SCENARIO 4

70 Richmond Road

CITY OF OTTAWA

LOCATION	SECTION AREA (ha.)	RESIDENTIAL: NUMBER OF UNITS: Single Fam. Dwell @ 3.4 ppu	Townhouse @ 2.7	Studio @ 1.4 ppu	1 Bed. Apts. @ 1.4 ppu	2 Bed. Apts. @ 2.1 ppu	3 Bed. Apts. @ 3.1 ppu	TOTAL RESIDENTIAL POPULATION (persons)	AVERAGE RES. FLOW '@' 280 L/c/d (L/s)	HARMON PEAKING FACTOR	RES. PEAK FLOW (L/s)	COMMERCIAL AREA (ha.)	AVERAGE COMMERCIAL @ 50000 L/ha/day (L/s)	COMM. PEAK FLOW (L/s)	INFILTRATION: TOTAL ACCUM. AREA (ha.)	INFILT. @ 0.28 L/s/ha. (L/s)	TOTAL DESIGN FLOW (L/s)	SEWER DESIGN: PIPE LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAPACITY n = 0.013 (L/sec)	% of DESIGN CAPACITY (%)
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Existing Condition																						
Commercial / Residential Development	0.159	1	0	0	0	0	0	3	0.01	4.00	0.04	0.0105	0.006	0.01	0.159	0.04	**0.09**					
Proposed Condition																						
Commercial/ Residential Development	0.159	0	7	3	37	41	0	161	0.52	4.00	2.09	0.021	0.01	0.02	0.159	0.04	**2.15**	8.5	150	1.0%	15.23	14.12%
Groundwater																	**0.35**					
															Total Flow		2.50					
															Total Net Flow		2.41					

Average Residential Flow Rate - 280 Litres / capita / day
Average Daily Flow Commercial - 50,000 Litres / gross ha / day
Average Daily Flow Institutional - 50,000 Litres / gross ha / day
Average Daily Flow Industrial - 35,000 Litres / gross ha / day

Infiltration Allowance (Dry Weather) - 0.05 Litres / s / gross ha
Infiltration Allowance (Wet Weather) - 0.28 Litres / s / gross ha
Infiltration Allowance (Total I/I) - 0.33 Litres / s / gross ha
Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands

Site Area: 0.159 Ha

Prepared by: Dimitra Savvaoglou, P.Eng., M.A.Sc.
Reviewed by: Anastasia Tzakopoulou, P.Eng., M.A.Sc.
Date: May 2022

Project: 70 Richmond Road
Project: UD18-028
City of Ottawa

Appendix E

Water Data Analysis

WATER DEMAND

70 Richmond Road
File No: UD18-028
Date: May 2022
Prepared by: Dimitra Savvaoglou, P.Eng.,M.A.Sc.
Reviewed By: Anastasia Tzakopoulou, P.Eng., M.A.Sc.

Fire Flow Calculation

1 $F = 220\ C\ (A)^{1/2}$

Where F= Fire flow in Lpm
C= construction type coefficient
= 0.6 fire-resistive construction
A = total floor area in sq.m. excluding basements

		Area Applied
Level 4=	1031 m^2	100%
Level 5=	1031 m^2	25%
Level 3=	1031 m^2	25%
=	1,547 sq.m.	
F =	5,191.53 L/min	
F =	5,200 L/min	Round to nearest 100 l/min

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

2 Occupancy Reduction
15% reduction for limited combustible occupancy
F = 4420 L/min

3 Sprinkler Reduction
30% Reduction for NFPA Sprinkler System
F = 3094 l/min

4 Separation Charge

5%	North-West	30.1m to 45m
20%	South-West	3.1m to 10m
5%	North-East	30.1m to 45m
25%	South-East	0m to 3.0m
55%	Total Separation Charge	2431 L/min

F = 5,525.00 L/min
92.08 L/s

F = 1460 US GPM

Domestic Flow Calculations

Population=	161	Persons		
Commercial Area =	209.96	m^2		
Average Day Demand (Residential) =	350.0	L/person/day		
Average Day Demand (Commercial) =	2.5	$L/m^2/day$	(OBC)	1 US Gallon=3.785 L
Average Residential Water Demand=	0.65	L/s		
	10	US GPM		1 US GPM=15.852L/s
Average Commercial Water Demand=	0.01	L/s		
	0	US GPM		

Max. Daily Residential Demand Peaking Factor= 2.5
Max. Daily Commercial Demand Peaking Factor = 1.5
Max. Daily Demand = 1.64 L/s = 26 US GPM

or

Max. Hourly Residential Demand Peaking Factor = 2.2
Max. Hourly Commercial Demand Peaking Factor = 1.8
Max. Hourly Demand = 3.60 L/s = 57 US GPM

Max Daily Demand = 1.64 L/s
Fire Flow = 92.08 L/s

Required 'Design' Flow = 93.72 L/s
1486 US GPM

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