

# **1137/1151 Ogilvie Road and 1111 Cummings Avenue Servicing and Stormwater Management Report**



## Revision Schedule

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date

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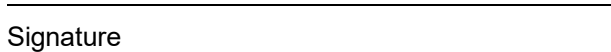


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# 1 Introduction

Stantec Consulting Ltd. has been commissioned by TCU Development Corporation to prepare the following Functional Servicing Report in support of a Zoning By-Law Amendment application for the proposed development located at 1137/1151 Ogilvie Road and 1111 Cummings Avenue in the City of Ottawa.

The 0.71 ha site is situated at the northeast corner of the intersection between Cummings Avenue and Ogilvie Road. The site is currently zoned LC6 and contains two existing one-storey commercial buildings with surface parking and small grassed areas. The property consists of the 1137/1151 Ogilvie Road and 1111 Cummings Avenue parcels. The site is bound by Ogilvie Road to the south, Cummings Avenue to the west, an existing residential development to the north and an existing park to the east as shown in **Figure 1-1** below.



*Figure 1-1: Key Plan of Site*

The proposed 0.71 ha site comprises of two 31-storey residential buildings with around 769 m<sup>2</sup> of ground floor commercial area. Roderick Lahey Architect Inc. has prepared a site plan dated February 6, 2025, which defines the proposed development, while the unit type breakdown is listed in **Table 1.1** below.



*Table 1.1: Unit Type Breakdown*

<b>Unit Type</b>	<b>1137 Ogilvie Number</b>	<b>1151 Ogilvie Number</b>
Studio	143	139
One-bedroom	123	120
One-bedroom with Study	52	51
Two-bedroom	72	70
Two-bedroom with Study	28	27
Three-bedroom	0	0
<b>Total</b>	<b>418</b>	<b>407</b>

## **1.1 Objective**

This site servicing and stormwater management (SWM) report presents a servicing scheme that is free of conflicts, provides on-site servicing in accordance with City of Ottawa Design Guidelines, and uses the existing municipal infrastructure in accordance with any limitations communicated during consultation with the City of Ottawa staff. Details of the existing infrastructure located within Cummings Avenue and Ogilvie Road were obtained from available as-built drawings and site topographic survey.

Criteria and constraints provided by the City of Ottawa have been used as a basis for the detailed servicing design of the proposed development. Specific and potential development constraints to be addressed are as follows:

- Potable Water Servicing
  - Estimated water demands to characterize the proposed feed(s) for the proposed development which will be serviced from the existing 305 mm diameter watermain within the Cummings Avenue ROW.
  - Watermain servicing for the development is to be able to provide average day and maximum day (including peak hour) demands (i.e., non-emergency conditions) at pressures within the acceptable range of 345 to 552 kPa (50 to 80 psi).
  - Under fire flow (emergency) conditions, the water distribution system is to maintain a minimum pressure greater than 140 kPa (20 psi).
- Wastewater (Sanitary) Servicing
  - Define and size the sanitary service laterals which will be connected to the existing 250 mm diameter sanitary sewer within the Cummings Avenue ROW.
- Storm Sewer Servicing
  - Define major and minor conveyance systems in conjunction with the proposed grading plan.
  - Determine the stormwater management storage requirements to meet the allowable release rate for the site.
  - Define and size the proposed storm service lateral that will be connected to the existing 525 mm diameter municipal storm sewer within the Ogilvie Road ROW.
- Prepare a grading plan in accordance with the proposed site plan and existing grades.



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**Drawing SSP-1** illustrates the proposed servicing scheme for the site.





## 2 Background

Documents referenced in preparing this stormwater and servicing report include:

- *City of Ottawa Sewer Design Guidelines* (SDG), City of Ottawa, October 2012, including all subsequent technical bulletins
- *City of Ottawa Design Guidelines – Water Distribution*, City of Ottawa, July 2010, including all subsequent technical bulletins
- *Design Guidelines for Drinking Water Systems*, Ministry of the Environment, Conservation, and Parks (MECP), 2008
- *Fire Protection Water Supply Guideline* for Part 3 in the Ontario Building Code, Office of the Fire Marshal (OFM), October 2020
- *Water Supply for Public Fire Protection*, Fire Underwriters Survey (FUS), 2020
- *Geotechnical Investigation – Proposed Multi-Storey Building, 1137 to 1151 Ogilvie Road & 1111 Cummings Avenue, Ottawa, ON, Paterson Group Inc, February 2025.*



## 3 Water Servicing

### 3.1 Background

The proposed building is in Pressure Zone 1E of the City of Ottawa's Water Distribution System. The existing dwellings have water service lateral connections to the existing 305 mm diameter watermain on Cummings Avenue and an assumed connection to the existing 610 mm diameter watermain on Ogilvie Road. The existing services will be blanked at the main by City forces, which will be confirmed at the detailed design.

### 3.1 Water Demands

#### 3.1.1 Potable (Domestic) Water Demands

The City of Ottawa Water Distribution Guidelines (July 2010) and ISTB 2021-03 Technical Bulletin were used to determine water demands based on projected population densities for residential areas and associated peaking factors.

The population was estimated using an occupancy of 1.4 persons per unit for studio and one-bedroom apartments, 2.1 persons per unit for one-bedroom with study and two-bedroom apartments and 3.1 persons per unit for two-bedroom with study and three-bedroom units. Based on the unit type breakdown in **Table 1.1**, the proposed buildings are estimated to have a total population of 1420 persons.

A daily rate of 280 L/cap/day and 28,000 L/gross ha/day has been used to estimate average daily (AVDY) potable water demand for the residential units and commercial area respectively. Maximum daily (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas and 1.5 for commercial areas, while peak hourly (PKHR) demands were determined by multiplying the MXDY demands by a factor of 2.2 for residential areas and 1.8 for commercial areas. The estimated demand for the proposed residential building is summarized in **Table 3.1** below and detailed in **Appendix B.1**.

*Table 3.1: Estimated Water Demands*

Demand Type	Area (m <sup>2</sup> )	Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Residential	-	1420	4.60	11.50	25.31
Commercial	773	-	0.02	0.03	0.05
<b>Total Site:</b>	<b>773</b>	<b>1420</b>	<b>4.62</b>	<b>11.53</b>	<b>25.36</b>



### 3.1.2 Fire Flow Demands

Fire flow demand was calculated based on the 2020 Fire Underwriters Survey (FUS) Guidelines. The FUS estimate is based on a building of non-combustible construction type. Additionally, it is anticipated that the buildings will be equipped with an automatic sprinkler system that is fully supervised and conforms to the NFPA 13 standard. Required fire flows were determined to be 83.3 L/s (5,000 L/min). Detailed fire flow calculations per the FUS methodology are provided in **Appendix B.2**, while correspondence with the architect on the construction type are provided in **Appendix A.1**.

## 3.2 Level of Servicing

### 3.2.1 Boundary Conditions

The estimated domestic water and fire flow demands were used to define the level of servicing required for the proposed development from the municipal watermain and hydrants within the Cummings Avenue ROW. **Table 3.2** outlines the boundary conditions provided by the City of Ottawa (**Appendix B.3**).

*Table 3.2: Boundary Conditions*

	Connection at Cummings Avenue
Min. HGL (m)	109.3
Max. HGL (m)	118.2
Max. Day + Fire Flow (100.0 L/s) HGL (m)	113.0

### 3.2.2 Allowable Domestic Pressures

The desired normal operating pressure range in occupied areas as per the City of Ottawa 2010 Water Distribution Design Guidelines is 345 kPa to 552 kPa (50 psi to 80 psi) under a condition of maximum daily flow and no less than 276 kPa (40 psi) under a condition of maximum hourly demand. Furthermore, the maximum pressure at any point in the water distribution should not exceed 689 kPa (100 psi) as per the Ontario Building/Plumbing Code; pressure reducing measures are required to service areas where pressures greater than 552 kPa (80 psi) are anticipated in occupied areas.

The proposed finished floor elevation, 72.20 m, will serve as the ground floor elevation for the calculation of the residual pressures at ground level. As per the boundary conditions, the on-site pressures are expected to range from 364.0 kPa (52.8 psi) to 450.9 kPa (65.4 psi) under normal operating conditions, which are within the normal operating pressure range defined by the City of Ottawa as within 276 kPa (40 psi) to 552 kPa (80 psi). It is anticipated that booster pumps will be required to service the upper stories of the building.



### 3.2.3 Allowable Fire Flow Pressures

The boundary conditions provided by the City of Ottawa indicate that the watermain within Cummings Avenue is expected to maintain a residual pressure of 40.8 m equivalent to 400.0 kPa (58.0 psi) under worst-case fire flow conditions. This demonstrates that the watermain and nearby hydrants can provide the required fire flows while maintaining a residual pressure of 20 psi.

### 3.2.4 Fire Hydrant Coverage

The building will be sprinklered and a Siamese (fire department) connection is to be provided with an unobstructed maximum distance of 45 m from the Siamese connection to the closest hydrant, as per the Ontario Building Code (OBC). There are two existing hydrants in the proximity of the proposed development site, as shown on drawing **SSP-1**.

According to the NFPA 1 Table 18.5.4.3 in Appendix I of the City of Ottawa Technical Bulletin ISTB-2018-02, a hydrant situated less than 76 m away from a building can supply a maximum capacity of 5,678 L/min, while a hydrant situated between 76 m and 152 m away from a building can supply a maximum capacity of 3,785 L/min. Hence, the required fire flow demands for the proposed buildings can be achieved with the existing hydrants at the intersection of Cummings Avenue and Ogilvie Road (HYD-01) and at Ken Steele Park (HYD-02). Refer to **Appendix B.4** for fire hydrant coverage calculations.

## 3.3 Proposed Water Servicing

The development will be serviced via dual 150 mm building services connecting to the existing 305 mm diameter watermain on Cummings Avenue with a 300 mm main isolation valve. The water valves are proposed to allow for the isolation of the municipal watermain to the north or south on Cummings Avenue in case of any breaks, repairs, or replacements of the municipal water system north or south of the proposed site.

The proposed water servicing is shown on **Drawing SSP-1**. Based on the City of Ottawa Water Design Guidelines and the provided boundary conditions, the existing 305 mm diameter watermain on Cummings Avenue can provide adequate fire and domestic flows for the subject site.

Confirmation of the service sizes to the building, the water pressure within the building, and booster pump requirements to meet building code will be the responsibility of the mechanical engineering consultant at the building permit phase.



## 4 Wastewater Servicing

### 4.1 Background

The existing municipal sanitary sewers adjacent to the site consist of existing 250 mm diameter asbestos cement sanitary sewers within the Cummings Avenue and Ogilvie Road ROW's.

### 4.2 Design Criteria

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP Design Guidelines for Sewage Works, the following criteria were used to calculate the estimated wastewater flow rates and to determine the size and location of the sanitary service lateral:

- Minimum velocity = 0.6 m/s (0.8 m/s for upstream sections)
- Maximum velocity = 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes = 0.013
- Minimum size of sanitary sewer service = 135 mm
- Minimum grade of sanitary sewer service = 1.0 % (2.0 % preferred)
- Average wastewater generation = 280 L/person/day (per City Design Guidelines)
- Peak Factor = based on Harmon Equation; maximum of 4.0 (residential)
- Harmon correction factor = 0.8
- Infiltration allowance = 0.33 L/s/ha (per City Design Guidelines)
- Minimum cover for sewer service connections = 2.0 m
- Population density for one-bedroom and bachelor apartments = 1.4 persons/apartment
- Population density for one-bedroom with den and two-bedroom apartments = 2.1 persons/apartment
- Population density for two-bedroom with den and three-bedroom apartments = 3.1 persons/apartment

### 4.3 Wastewater Generation and Servicing Design

The estimated peak wastewater flows generated are based on the current site plan and unit breakdown as shown in **Table 1.1**. The anticipated wastewater peak flow generated from the proposed development is summarized in **Table 4.1** below.

*Table 4.1: Estimated Peak Wastewater Flow*

Peak Residential Wastewater Flow			C+I+I Flow	Infiltration Flow (L/s)	Total Peak Flow (L/s)
Population	Peak Factor	Peak Flow (L/s)			
1420	3.16	14.53	0.02	0.23	14.79

Preliminary sanitary sewage calculations are included in **Appendix C.1**.



The anticipated peak wastewater flows for the proposed development were provided to the City of Ottawa staff on November 28, 2024 (see **Appendix C.2**) to evaluate the adequacy of the receiving municipal sanitary sewer system in the vicinity of the site and downstream network. City Staff had confirmed that the downstream municipal sanitary sewers have adequate capacity to accept the estimated peak sanitary flow from the proposed development.

## **4.4 Proposed Sanitary Servicing**

Sanitary discharge from the site is to outlet through a sanitary monitoring manhole before connecting to the existing 250 mm diameter sanitary sewer in Cummings Avenue via a 200 mm diameter sanitary building service and a new manhole within Cummings Avenue. The proposed functional sanitary servicing is shown on **Drawing SSP-1 and SA-1**.

The mechanical engineering consultant is responsible to confirm service lateral sizes and that the appropriate backwater valve requirements are satisfied at the building permit phase.



## 5 Stormwater Management and Servicing

### 5.1 Background

The existing storm servicing system along the boundaries of the site consists of curb and catch basins (urban roadway section) along Cummings Avenue and Ogilvie Road, with the drainage collected by the catch basins directed to the 525 mm diameter storm sewer within Ogilvie Road and the 600 mm diameter storm sewer within Cummings Avenue.

### 5.2 Stormwater Management (SWM) Criteria

The Stormwater Management (SWM) criteria were established by combining current design practices outlined by the City of Ottawa Sewer Design Guidelines (SDG) (October 2012), review of project pre-consultation notes with the City of Ottawa, and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

#### General

- Use of the dual drainage principle (City of Ottawa SDG)
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff (City of Ottawa SDG)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on the major and minor drainage systems (City of Ottawa SDG)

#### Storm Sewer & Inlet Controls

- Discharge for each storm event to be restricted to a 2-year storm event pre-development rate with a maximum pre-development C coefficient of 0.5 (City of Ottawa pre-consultation)
- Peak flows generated from events greater than the 2-year storm up to and including the 100-year storm must be detained on site (City of Ottawa pre-consultation)
- The preferred stormwater system outlet for this site is the 525 mm diameter storm sewer within Ogilvie Road
- The foundation drainage system is to be pumped to the building site storm service lateral directed to Ogilvie Road.
- $T_c$  should be not less than 10 minutes (City of Ottawa SDG).

#### Surface Storage & Overland Flow

- Building openings to be a minimum of 0.30 m above the 100-year water level (City of Ottawa SDG)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35 m (City of Ottawa SDG)



- Provide adequate emergency overflow conveyance off-site with a minimum vertical clearance of 15 cm between the spill elevation and the ground elevation at the building envelope in the proximity of the flow route or ponding area (City of Ottawa SDG)

#### **Quality Control**

- An enhanced level of quality control of 80% Total Suspended Solids (TSS) Removal is required for this site (City of Ottawa pre-consultation)
- Sizing shall be under the ISO 14034 Environmental Technology Verification (ETV) particle distribution (City of Ottawa pre-consultation)

### **5.3 Existing Conditions**

The 0.71 ha site area currently consists of an existing strip mall and restaurant with asphalt parking and patches of grassed areas and some trees. The existing storm drainage plan (**Drawing EXSD-1**) shows the existing surface conditions and related runoff coefficients considered. The pre-development imperviousness of the proposed development area is calculated at 91 % ( $C = 0.84$ ).

Under existing conditions stormwater runoff, the from the majority of the 1137 Ogilvie Road property drains uncontrolled to the public drainage system with a small portion of drainage directed north to a private catch basin on 96-106 Strathaven Private. A network of private catch basins exists through the 1151 Ogilvie Road property and ultimately discharge to the existing 450 mm diameter storm sewer within Ogilvie Road

### **5.4 Stormwater Management Design**

The Modified Rational Method (MRM) is employed to assess the rate and volume of runoff anticipated during post-development rainfall runoff events. Based on the proposed Site Plan and preliminary Grading Plan, drainage area boundaries are defined, runoff coefficient values are then assigned to each drainage area based on the anticipated finished surface condition (e.g. asphalt, concrete, gravel, grass, etc.). Runoff coefficients for each surface type are assigned based on City of Ottawa SDG and accepted practices. A summary of subareas and runoff coefficients is provided in **Table 5.1** below. Further details can be found in **Appendix D.1 and D.2**, while **Drawing SD-1** illustrates the proposed sub-catchments.

*Table 5.1: Summary of Subcatchment Areas*

<b>Catchment Areas</b>	<b>C</b>	<b>A (ha)</b>	<b>Catchment Type</b>	<b>Outlet</b>
ROOF1	0.90	0.18	Tributary	525 mm Storm Sewer (Ogilvie Road)
ROOF2	0.90	0.16	Tributary	525 mm Storm Sewer (Ogilvie Road)
CISTERN	0.28	0.65	Tributary	525 mm Storm Sewer (Ogilvie Road)





UNC-1	0.09	0.67	Non-Tributary	Ogilvie Road ROW Cummings Avenue ROW
<b>Total Site</b>	<b>0.71</b>	<b>0.77</b>	-	-

### 5.4.1 Allowable Release Rate

Based on pre-consultation with City of Ottawa staff, the design criterion for the peak post-development discharge from the subject site is to be limited to the discharge resulting from the 2-year pre-development event using a site runoff coefficient of  $C = 0.5$  or the pre-development  $C$ , whichever is less. Based on the calculated  $C$  value of 0.84 for the existing site condition, a runoff coefficient of 0.5 is used to establish the allowable release rate.

Given the limitations of site grading based on the existing topography, and the existing uncontrolled runoff condition for the site, it is proposed that the post-development drainage pattern for the uncontrolled area (UNC-1) along the west and south perimeters be allowed to continue to drain uncontrolled to the adjacent public roads. The resultant areas that can be restricted to meet the allowable release rate is limited to drainage areas defined by 'ROOF1', 'ROOF2', and 'CISTERN', totalling 0.62 ha.

The allowable release rate for the site is determined using the modified rational method based on the criteria above. A time of concentration of 10 minutes is used based on the small site size, its proximity to the existing drainage outlet, and recommendations provided during pre-consultation with the City.

The peak pre-development flow rates shown in **Table 5.2** have been calculated using the rational method as follows:

$$Q = 2.78 (C)(I)(A)$$

Where:

$Q$  = peak flow rate, L/s

$C$  = site runoff coefficient

$I$  = rainfall intensity, mm/hr (per City of Ottawa IDF curves)

$A$  = drainage area, ha

*Table 5.2: Peak Pre-Development Flow Rates*

Design Storm	Pre-Development Flow Rate (L/s) for $C=0.50$ , $A=0.71$ ha, $t_c = 10$ min
<b>2-year</b>	<b>75.8</b>

For the proposed development, the target allowable release rate of 75.8 L/s is used to assess water quantity control measures to be applied.

#### 5.4.1.1 Uncontrolled Areas

As specified above, considering the existing conditions of the site and the grading restrictions along the site's perimeter, it is proposed to control the interior of the site and the apartment building roof areas only



and allow the rest of the site to drain uncontrolled per existing conditions. The drainage area UNC-1 will direct uncontrolled surface runoff to the Cummings Avenue and Ogilvie Road ROW's. Peak discharges from the uncontrolled areas are calculated using the Modified Rational Method (MRM) approach and are summarized in the **Table 5.3** below.

*Table 5.3: Peak Post-Development Discharge of Uncontrolled Areas*

Uncontrolled Drainage Area	Design Storm	Post-Development Discharge (L/s)
UNC-1	2-Year	12.9
	100-Year	37.4

The proposed uncontrolled runoff condition from 0.09 ha is considered an improvement over the existing condition during which the area outside the strip mall building, at 0.40 ha, contributes uncontrolled runoff to the existing public drainage system.

For reference, the uncontrolled runoff rates for the existing 0.40 ha site area (applying the 0.89 runoff coefficient as per drawing **EXSD-1**) are 76.0 L/s for the 2-year return period, and 176.7 L/s for the 100-year return period design storms.

## **5.4.2 Quantity Control**

Based on the change in overall imperviousness of the site, expressed by the calculated runoff coefficients, quantity control measures are needed to manage stormwater runoff. Two storage options are proposed to reduce the site's peak outflow: Solely using underground storage, or a combination of rooftop capture across the full roof area and underground storage. A spreadsheet approach using the MRM is used to determine the storage volume required for both storage options.

The associated calculations consider the allowable release rate of 75.8 L/s for the uncontrolled area, the roof areas, and controlled areas tributary to the proposed SWM underground storage and the runoff coefficients associated with the proposed post-development catchments. The MRM calculations used to establish the storage volume requirements for both storage options are provided in **Appendix D.1 and D.2** and the storm sewer design sheet is provided in **Appendix D.3**.

The total storage volumes for each storage option are tabulated in **Table 5.4** below. Both options can attenuate peak flows from the roof and controlled areas for a release at a controlled flow rate to meet the target allowable release rate for the site.

*Table 5.4: Total Volume for Each Storage Option*

Storage Option	Roof Storage (m³)	Cistern (m³)	Total (m³)
Cistern Only	-	200	200
Cistern + Rooftop	136	70	206



### 5.4.3 Quality Control

To meet the expected quality control requirements for the site, storm runoff from the proposed development area will be captured within the site storm sewer system and directed to a proposed oil/grit separator (OGS) unit. A Stormceptor, or approved equivalent product, sized to provide 80% TSS removal under the ETV particle distribution is anticipated to achieve the enhanced water quality control objective. Detailed sizing details will be made available at detailed design.

## 5.5 Results

Through the MRM analysis, the controlled 2-year post-development release rates are under the pre-development target release rate of 75.8 L/s. In addition, the 100-year post-development storm event release rate will be maintained at the 75.8 L/s allowable target. The uncontrolled portions of the site with runoff draining to the adjacent ROWs are consistent with the existing drainage pattern.

Relative to the existing site condition with 0.40 ha of uncontrolled runoff, the proposed post-development 2-year flow control for 0.62 ha of the site is anticipated to reduce the total stormwater discharge from the site. The data summarized in **Table 5.5** indicates that the proposed SWM plan reduces the overall site storm runoff release rate by 74 % compared to the pre-development C=0.84, 100-year design storm event.

Table 5.5: Comparison of Pre- and Post-Development Release Rates

Drainage areas	Without Rooftop Storage		With Rooftop Storage	
	2-year Discharge (L/s)	100-Year Discharge (L/s)	2-year Discharge (L/s)	100-Year Discharge (L/s)
Pre-Development Total (0.71 ha)	127.3	296.1	127.3	296.1
Post-Development				
Tributary (0.62 ha)	38.4	38.4	34.3	38.4
Non-Tributary (0.09 ha)	12.9	37.4	12.9	37.4
Post-Development Total (0.71 ha)	51.3	75.8	47.2	75.8
<b>Target (L/s)</b>	<b>75.8</b>	<b>75.8</b>	<b>75.8</b>	<b>75.8</b>
<b>Difference (Post minus Pre)</b>	<b>-76.0 (-59.7 %)</b>	<b>-220.2 (-74.4 %)</b>	<b>-80.1 (-62.9 %)</b>	<b>-220.2 (-74.4 %)</b>

## 5.6 Proposed Stormwater Servicing

The development is to be serviced via an internal storm network part of the building's mechanical system, which will receive the runoff from the roof and site areas. Stormwater detention infrastructure (e.g. cistern, underground linear pipe storage, rooftop storage, etc.) will be provided onsite and discharged from the



## 1137/1151 Ogilvie Road and 1111 Cummings Avenue Servicing and Stormwater Management Report

proposed development at a controlled flow rate. The final sizing and layout of the infrastructure, including the method(s) of flow attenuation, shall be confirmed at detailed design. See **Drawings SSP-1** and **SD-1** for the proposed preliminary locations of the stormwater infrastructure.

The mechanical engineering consultant is responsible to confirm sizing of the sump pumps and services to the building, that the appropriate backwater valve requirements are satisfied, and that any roof drainage systems and underground storages and pumping systems are adequate for accommodating the 100-year design storm conditions.



## 6 Site Grading

The proposed re-development site measures approximately 0.71 ha in area and consists of surface parking, grassed areas with trees and two existing commercial buildings. The topography across the site generally slopes from the eastern boundary towards the Cummings Avenue ROW at the west and away from the commercial building to the Ogilvie Road ROW to the south.

A functional grading plan (see **Drawing GP-1**) has been provided to satisfy the stormwater management requirements, as detailed in **Section 5**, adhere to any grade raise restrictions for the site, and provide for minimum cover requirements for storm and sanitary sewers where possible.

Site grading has been established to provide emergency overland flow routes required for stormwater management. Upon review of the existing grading at neighbouring properties, it is concluded the site will not receive external drainage from the neighbouring properties. The main overland escape route will follow the west drive aisle with overland flow to Cummings Avenue right of way while a portion of the site will be directed towards the Ogilvie Road right of way. The proposed development will require a section of retaining wall along the east to maintain existing property line ground conditions and to ensure the overland spill route is directed to Ogilvie Road rather than to neighboring parcels.



## 7 Utilities

Overhead (OH) hydro-wires run parallel to the west property line. All utilities within the work area will require relocation during construction. The existing utility poles within the public right of way are to be protected during construction.

As the site is surrounded by existing residential and commercial development, Hydro Ottawa, Bell, Rogers, and Enbridge servicing is readily available through existing infrastructure to service this site. The exact size, location, and routing of utilities will be finalized after design circulation. Existing underground hydro ducts and gas service north of the existing commercial building are to be removed as per **Drawing EX-1**. Existing overhead wires and utility plants may need to be temporarily moved/reconfigured to allow sufficient clearance for the movement of heavy machinery required for construction. The relocation of existing utilities will be coordinated with the individual utility providers upon design circulation.



## 8 Approvals

The proposed development lies on private sites with multiple owners. Therefore, the site will be required to follow the Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Application (ECA) process under O.Reg. 525/98.

For 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). It is possible that groundwater may be encountered during the foundation excavation on this site. A minimum of two to four weeks should be allotted for completion of the EASR registration and the preparation of the Water Taking and Discharge Plan by a Qualified Person as stipulated under O.Reg. 63/16. An MECP Permit to Take Water (PTTW), which is required for dewatering volumes exceeding 400,000L/day, is not anticipated for the site.



## 9 Erosion and Sediment Control During Construction

To protect downstream water quality and prevent sediment build-up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Install silt barriers/fencing around the perimeter of the site to prevent the migration of sediment offsite.
7. Install trackout control mats (mud mats) at the entrance/egress to prevent migration of sediment into the public ROW.
8. Provide sediment traps and basins during dewatering works.
9. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
10. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

An erosion control plan will be prepared during detailed design for the proposed location of silt fences, sediment traps, and other erosion control measures.





## 10 Geotechnical Investigation

A geotechnical investigation for 1137 to 1151 Ogilvie Road and 1111 Cummings Avenue was completed by Paterson on February 3, 2025. Field testing consisting of the advancement of nine boreholes to a maximum depth of 7.1m below existing grade was carried out throughout the subject site on April 19, 2021 and June 4, 2024. The information obtained from the field investigation will guide the site design and identify development constraints.

The subsurface profile encountered at the test hole locations consists of asphaltic concrete, underlain by fill and glacial till, overlying bedrock. The fill was noted to consist of a mixture of brown silty sand with gravel and crushed stone, trace topsoil and organics. Bedrock was observed to consist of black shale and is classified as very poor quality at the top, generally increasing in quality with depth.

Groundwater levels were measured to be at depths ranging from 1.90 m to 3.15 m below ground surface (BGS) at six boreholes on site. Long term groundwater level is estimated to be at 2.5 m to 3.5 m BGS, though seasonal variations in the water table should be expected.

Clean imported granular fill should be used for grading beneath the building areas, while site-excavated soil and non-specified existing fill can be used for general landscaping fill where settlement of the ground surface is of minor concern.

The subject site is considered suitable for the proposed buildings, and it is recommended that it be founded using conventional spread footings placed on clean, surface sounded bedrock. Bedrock removal will be required to complete the underground parking level.

The recommended rigid pavement structure is provided as follows in **Table 10.1** below.

*Table 10.1: Pavement Structure*

Material	Thickness (mm)		
	Access Lanes Over Podium	Car Parking Over Podium	Underground Parking
Exposure Class C2 – 32 MPa concrete with air entrainment	-	-	125
Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete	40	50	-
Binder – HL-8 or Superpave 19.0 Asphaltic Concrete	50	-	-
Base – OPSS Granular A Crushed Stone	300	200	300
Sub-Base – OPSS Granular B Type II	-	-	-

Refer to the full geotechnical report attached as part of the submission package for further details.



## **11 Conclusions**

### **11.1 Water Servicing**

Based on the supplied boundary conditions for existing watermains and calculated domestic and fire flow demands for the subject site, the adjacent watermain on Cummings Avenue has sufficient capacity to sustain the required domestic demands and fire flow demands for the site. The proposed development will be serviced by the existing 300 mm watermain on Cummings Avenue via a dual connection. Sizing of the water service laterals are to be confirmed by the mechanical engineering consultant.

### **11.2 Sanitary Servicing**

The proposed sanitary sewer service will consist of a 200 mm diameter sanitary service lateral connected to the existing 250 mm diameter sanitary sewer on Cummings Avenue. The municipal sanitary sewers have the downstream capacity required to receive the projected peak wastewater flows from the proposed development. Sizing of the service lateral and the appropriate backwater valve requirements are to be confirmed by the mechanical consultant.

### **11.3 Stormwater Servicing and Management**

The proposed storm service will consist of the internal storm sewers within the building's mechanical system and roof and foundation drains directing stormwater to the existing 525 mm diameter storm sewer in Ogilvie Road. Stormwater storage options (cistern only or combination of rooftop storage with cistern) proposed onsite will meet the site's target discharge. The final sizing of the infrastructure shall be confirmed at detailed design. Sizing of the storm sewer laterals, and the appropriate backwater valve requirements are to be confirmed by the mechanical engineering consultant.

### **11.4 Grading**

Preliminary site grading is designed to provide an adequate emergency overland flow route and drainage to support the proposed storm sewer network and SWM systems. The site will not receive external drainage from neighbouring properties. The west and south sides drain uncontrolled to the Cummings Avenue and Ogilvie Road rights-of-way as per existing conditions.

### **11.5 Erosion and Sediment Control During Construction**

Erosion and sediment control measures and best management practices outlined in this report will be implemented during construction to reduce the impact on adjacent properties, the public ROW, and existing facilities.



## **11.6 Geotechnical Investigation**

Based on the Geotechnical Investigation, the site is considered suitable for the proposed building, and it is recommended that it be founded using conventional spread footing placed on clean, surface sounded bedrock. Long term groundwater level is estimated to be at 2.5 to 3.5 m BGS, though seasonal variations in the water table should be expected.

## **11.7 Utilities**

The site is situated within an established neighbourhood, hence existing utility infrastructure is readily available to service the proposed development.

## **11.8 Approvals**

The proposed development lies on private sites with multiple owners so the Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Application (ECA) process under O.Reg. 525/98 will be required. For the expected dewatering needs of 50,000 to 400,000 L/day, the proponent will need to register on the MECP's Environmental Activity and Sector Registry (EASR). A Permit to Take Water, for dewatering needs in excess of 400,000 L/day, is not anticipated for this site.



# **Appendices**



## **Appendix A Appendix A Background Documents**

### **A.1 Correspondence with Architect on Construction Type**



## Wu, Michael

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**From:** Kilborn, Kris  
**Sent:** February 7, 2025 05:49  
**To:** Wu, Michael  
**Cc:** Wang, Ziyi  
**Subject:** FW: 1137-1151 Ogilvie Road - Landscape Site Plan RLA Coordination mk ups 2025.01.29  
**Attachments:** 2420\_1137-1151 Ogilvie Road\_Building Stats\_2025-01-27.xlsx; 2420\_Ogilvie Road\_Ground Floor Plan\_Commercial Area Markup\_2025-02-06.pdf; L5 RTC 25.02.06.pdf; L7 RTC 25.02.06.pdf; Upper most Roof RTC 25.02.06.pdf

Hey Michael

See attached some unit counts and information for updating of the 1137 Ogilvie report.

Sincerely

### Kris Kilborn

Principal, Community Development  
Business Center Practice Lead

Mobile: 613 297-0571  
Fax: 613 722-2799  
kris.kilborn@stantec.com  
Stantec  
300 - 1331 Clyde Avenue  
Ottawa ON K2C 3G4

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**From:** Liam McNairn <lmcnairn@rlaarchitecture.ca>  
**Sent:** Thursday, February 6, 2025 2:34 PM  
**To:** Kilborn, Kris <kris.kilborn@stantec.com>; Evan Johnson <e.johnson@tcudevcorp.com>  
**Cc:** Marina Knuckey <mknuckey@nak-design.com>; Jennifer Hemmings <jhemmings@nak-design.com>; Shannon Card <scard@nak-design.com>; Kevin Reid <kreid@rlaarchitecture.ca>; Johnson, Warren <Warren.Johnson@stantec.com>; Moroz, Peter <peter.moroz@stantec.com>  
**Subject:** RE: 1137-1151 Ogilvie Road - Landscape Site Plan RLA Coordination mk ups 2025.01.29

Hi Kris,

Please see my responses in **red** to your questions below. If you have any other questions or points of discussion, please do not hesitate to reach out!

Kind regards,

**Liam McNairn**  
M.Arch, B.A.S., MRAIC  
**Intern Architect**  
**RLA Architecture**  
56 Beech Street,  
Ottawa, Ontario K1S 3J6  
Tel: 613.724.9932 x 223  
[lmcnairn@rlaarchitecture.ca](mailto:lmcnairn@rlaarchitecture.ca)

 rla / architecture  
roderick lahey architect inc.

---

**From:** Kilborn, Kris <[kris.kilborn@stantec.com](mailto:kris.kilborn@stantec.com)>  
**Sent:** February 6, 2025 10:15 AM  
**To:** Liam McNairn <[lmcnairn@rlaarchitecture.ca](mailto:lmcnairn@rlaarchitecture.ca)>; Evan Johnson <[e.johnson@tcudevcorp.com](mailto:e.johnson@tcudevcorp.com)>  
**Cc:** Marina Knuckey <[mknuckey@nak-design.com](mailto:mknuckey@nak-design.com)>; Jennifer Hemmings <[jhemmings@nak-design.com](mailto:jhemmings@nak-design.com)>; Shannon Card <[scard@nak-design.com](mailto:scard@nak-design.com)>; Kevin Reid <[kreid@rlaarchitecture.ca](mailto:kreid@rlaarchitecture.ca)>; Johnson, Warren <[Warren.Johnson@stantec.com](mailto:Warren.Johnson@stantec.com)>; Moroz, Peter <[peter.moroz@stantec.com](mailto:peter.moroz@stantec.com)>  
**Subject:** RE: 1137-1151 Ogilvie Road - Landscape Site Plan RLA Coordination mk ups 2025.01.29

Good morning everyone

Please find attached our autocad and pdf of the proposed grading for the 1137-1151 Ogilvie Road project for review and coordination.

In speaking with Shannon this morning, there are minor changes that may be required for the work she is completing on the Terraces.

Servicing from 1151 Ogilvie is being designed and brought through parking garage through 1137 Ogilvie.

Kevin / Liam – We are looking for you to confirm the following information that forms part of our analysis and report

1. Residential unit breakdowns for each tower

**I have attached the unit mix and building stats spreadsheet. Please note it does not include the Phase 2 unit mix, however for the time being, the tower unit mix for phase 2 will be based on phase 1.**

2. Proposed ground floor commercial in each tower

**Please see the attached ground floor plan. The proposed commercial spaces are highlighted in red.**

3. Roof plans with areas where stormwater can be stored. If not available, it would be fine as our report speaks to roof storage and non-roof storage options.

**Please see the attached L5, L7 and MPH Roof plans. The areas with potential for stormwater control are highlighted in a light blue.**

4. Building construction type

**At current, we are planning for a cast-in-place concrete structure.**

Let me know if you have any questions

Sincerely

**Kris Kilborn**

Principal, Community Development  
Business Center Practice Lead

Mobile: 613 297-0571  
Fax: 613 722-2799  
[kris.kilborn@stantec.com](mailto:kris.kilborn@stantec.com)  
Stantec  
300 - 1331 Clyde Avenue  
Ottawa ON K2C 3G4

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**From:** Liam McNairn <[lmcnairn@rlaarchitecture.ca](mailto:lmcnairn@rlaarchitecture.ca)>  
**Sent:** Tuesday, February 4, 2025 2:11 PM  
**To:** Kilborn, Kris <[kris.kilborn@stantec.com](mailto:kris.kilborn@stantec.com)>; Evan Johnson <[e.johnson@tcudevcorp.com](mailto:e.johnson@tcudevcorp.com)>  
**Cc:** Marina Knuckey <[mknuckey@nak-design.com](mailto:mknuckey@nak-design.com)>; Jennifer Hemmings <[jhemmings@nak-design.com](mailto:jhemmings@nak-design.com)>; Shannon Card <[scard@nak-design.com](mailto:scard@nak-design.com)>; Kevin Reid <[kreid@rlaarchitecture.ca](mailto:kreid@rlaarchitecture.ca)>; Johnson, Warren <[Warren.Johnson@stantec.com](mailto:Warren.Johnson@stantec.com)>  
**Subject:** RE: 1137-1151 Ogilvie Road - Landscape Site Plan RLA Coordination mk ups 2025.01.29

Hi Kris,

## **A.2 Pre-Consultation Meeting Minutes from Previous 1137 Ogilvie Road Application**







File No.: PC2023-0275

Tyler Yakichuk  
Fotenn Consultants  
Via email: yakichuk@fotenn.com

**Subject: Pre-Consultation: Meeting Feedback  
Proposed Zoning By-law Amendment Application – 1137 Ogilvie Road**

Please find below information regarding next steps as well as consolidated comments from the above-noted pre-consultation meeting held on October 25, 2023.

**Pre-Consultation Preliminary Assessment**

1 <input checked="" type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
---------------------------------------	----------------------------	----------------------------	----------------------------	----------------------------

One (1) indicates that considerable major revisions are required while five (5) suggests that the proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.

**Next Steps**

1. A review of the proposal and materials submitted for the above-noted pre-consultation has been undertaken. The applicant is strongly advised to revise their concept plan for a second Phase 1 pre-consultation.
2. In your subsequent pre-consultation submission, please ensure that all comments or issues detailed herein are addressed. A detailed cover letter stating how each issue has been addressed must be included with the submission materials. Please coordinate the numbering of your responses within the cover letter with the comment number(s) herein.
3. Please note, if your development proposal changes significantly in scope, design, or density before the Phase 3 pre-consultation, you may be required to complete or repeat the Phase 2 pre-consultation process.

**Supporting Information and Material Requirements**

1. The attached **Study and Plan Identification List** outlines the information and material that has been identified, during this phase of pre-consultation, as either required (R) or advised (A) as part of a future complete application submission.
  - a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on [Ottawa.ca](https://ottawa.ca). These ToR and Guidelines outline



the specific requirements that must be met for each plan or study to be deemed adequate.

### **Consultation with Technical Agencies**

You are encouraged to consult with technical agencies early in the development process and throughout the development of your project concept.

### **Planning**

The proposal is for a 30-storey high-rise building with a nine-storey podium. 455 residential units and three ground floor commercial units are proposed, with two levels of underground parking. The proposed design is for a “C” shaped building containing outdoor amenity area.

As discussed in the pre-consultation meeting, there are some important City comments to address on this site before progressing with the design. You are welcome to provide an updated concept to me so I may distribute it to the team and organize high-level thoughts before you begin work on the required studies and plans. It may be more productive to hold a second Phase 1 – Pre-Consultation meeting before progressing further in the process.

Comments:

1. Official Plan: The subject lands are designated Hub lands with an Evolving Neighbourhood Overlay, within the Inner Urban Transect of the Official Plan. The lands are just outside of the Protected Major Transit Station Area generated by the Cyrville LRT station. Ogilvie is a Mainstreet Corridor and Existing Arterial Road and Cummings is a Minor Corridor and Existing Collector Road. Adjacent lands to the north and west are Neighbourhood Area with an Evolving Neighbourhood Overlay. The intent of Hubs within the Inner Urban Transect is to develop with mid to high-density building forms, a mix of uses, and a high-quality urban design, with heights and massing that respond to surrounding context.
2. Inner East Lines 1 and 3 Stations Secondary Plan: The subject lands are within “Area A” of this Secondary Plan, which permits a “Maximum height [of] 30 storeys and Minimum density [of] 350 units per net hectare (residential)”. Surrounding lands are also within the Secondary Plan, and within Area D with a 6-storey height maximum. The proposed heights of 30 storeys are so far consistent with the Secondary Plan.
3. Urban Design Policies are provided in Section 4.6 of the Official Plan, and [Urban Design Guidelines for High Rise Buildings](#) are a separate document that provide the City’s standards and requirements for high-rise building design. The current concept– particularly the nine-storey podium - is not consistent with these guidelines, which require the base portion of the building to be equal to the width

of the ROW, to respect existing and planned conditions of surrounding lands, and provide a transition in height on the base.

4. The subject lands are within a Design Priority Area and will be required to attend the City's Urban Design Review Panel (UDRP). Attending the UDRP during the pre-consultation process is now a requirement before officially applying for Zoning By-law Amendment Applications.
5. The former Section 37 regime has been replaced with a "Community Benefits Charge" ([By-law No. 2022-307](#)) of 4% of the land value. This charge will be required for ALL buildings that are 5 or more storeys and 10 or more units and will be required at the time of building permit unless the development is subject to an existing registered Section 37 agreement. Questions regarding this change can be directed to [Ranbir.Singh@ottawa.ca](mailto:Ranbir.Singh@ottawa.ca).
6. Any reductions in parking requirements will need to be justified in your Planning Rationale, with further justification from a Transportation Engineering perspective; TDM measures, etc. You discussed how you are at about a 0.35 parking to unit ratio and wish to reduce further. Please analyze the zoning requirement for the proposed zone and discuss whether an exception is required to reduce the ratio.
7. You are required to meet the City's Bird-Safe Design Guidelines. Please reference and demonstrate how you meet the requirements. At the eventual Phase 3 Pre-Consultation step we will circulate the plans to an expert who reviews them for compliance with these guidelines.

## **Urban Design**

### **Comments:**

8. An Urban Design Brief is required for a Zoning By-law Amendment application (ZBA). Please see attached customized Terms of Reference to guide the preparation. Here are a few highlights:
  - a. The Urban Design Brief should be structured by generally following the headings highlighted under Section 3 – Contents of these Terms of Reference.
  - b. Please explore alternative site plan and massing options and include diagrams and images to show and document options explored.
  - c. Please note that Urban Design Brief will also serve as the submission to the Urban Design Review Panel (see notes below).
9. Please refer to relevant Terms of Reference available on the City's website ([Planning application submission information and materials | City of Ottawa](#)) to prepare additional drawings and studies required. Please note both shadow and wind studies are required.

## UDRP Review and Report

10. The site is in a Design Priority Area. According to the current Urban Design Review Panel (UDRP) Terms of Reference, a ZBA to support a high-rise development is subject to UDRP review. The UDRP review will occur in the pre-consultation stage. Please contact [udrp@ottawa.ca](mailto:udrp@ottawa.ca) for scheduling details.
11. The submission of a UDRP report is a requirement for deeming an application complete. The Terms of Reference of the UDRP report can be found in [this link](#).

## Comments on the Concept Presented

The concept presented at the meeting was very similar to (if not the same as) the concept presented in April 2021. Hence, comments provided at that time remain valid. Here are the highlights:

12. Site organization
  - a. Urban design supports commercial uses on Ogilvie and residential frontage on Cummings.
  - b. The ramp leading to the underground garage should be incorporated into the building design rather than being a standalone structure.
  - c. The proposal includes too many curb cuts on Cummings.
  - d. The U-shape building footprint appears to be very dense for the site. The courtyard is proportionally too narrow and likely in perpetual shade.
13. Building massing
  - a. The proposed 9-storey podium is too tall for Cummings. The TOD plan and the TD zoning supports a maximum 6-storey podium.
  - b. The tower appears to setback appropriately. However, it is unclear what the floor plate size is. The City's policy supports point tower design with a small floor plate (maximum 750m<sup>2</sup>). Slightly larger floor plate may be supportable if additional tower separations and sculpting are provided.

## Suggestions for Design

14. The required provision of parkland dedication on the site will result in a redesign of the site. It is recommended that as the next step, the applicant explore a few site and massing options, discuss such options with staff before moving forward in the planning approval process.
15. Practical and functional requirements need to be carefully studied and appropriately organized on site. Passengers drop off, garbage pick-up, temporary short-term parking for delivery services, etc., should be reasonably accommodated on site, not spill over into City streets.
16. Consider a L-shape building footprint with two wings framing Ogilvie and Cummings. Locate the above-noted practical functions internal to the site behind the two wings.
17. The podium should be sensitively designed and provide appropriate transition to the low-rise buildings to the north. Apply a 45-degree angular plane from the

northern property line to determine the appropriate height and step-backs on the podium.

18. Given the differences in character between Ogilvie and Cummings, the podium may be treated differently on these two streets. Cummings is a relatively narrow street with residential characteristics. It is therefore desirable and appropriate to establish a 2 or 3 storey base with step-backs on the upper floors.
19. Design a point tower with small floor plate.
20. Treatments along both Ogilvie and Cummings should be carefully considered in accordance with the TOD plan and other relevant City policies and guidelines, including the planned functions of both streets, such as sidewalks and cycle tracks.
21. Continuous tree canopies should be provided along both public streets.

## **Engineering**

Comments:

### Water

22. Watermain looping is recommended to avoid creating a vulnerable service area. District Metering Area (DMA) Chamber(s) are required for private developments serviced by a connection 150 mm or larger or when there are two or more private connections to the public watermain. Refer to the City of Ottawa Water Distribution Guidelines.

Please be advised that capacity of the existing system will be determined after Water Boundary conditions are requested. Water Boundary condition requests must be submitted to the City Project Manager, Development Review by the civil design engineer or consultant prior to submission and include the following information:

- The location of the service and the expected water demand of the proposed development shown on a plan, figure, or map;
- Type of development;
- Average daily demand: \_\_\_\_ l/s;
- Maximum daily demand: \_\_\_\_ l/s;
- Maximum hourly daily demand: \_\_\_\_ l/s;
- Required fire flow and completed FUS Design Declaration if applicable;
- Supporting Calculations for all demands listed above and required fire flow as per Ontario Building Code or Fire Underwriter Surveys (See technical Bulletin ISTB-2021-03;
- Watermain system analysis demonstrating adequate pressure as per section 4.2.2 of the Water Distribution Guidelines;

23. Demonstrate adequate hydrant coverage for fire protection. Please review Technical Bulletin ISTB-2018-02, Appendix I Table 1 – maximum flow to be considered from a given hydrant;

24. Proposed emergency route (to be satisfactory to Fire Services)

#### Sanitary Sewers

25. A monitoring maintenance hole shall be required just inside the property line for all non-residential and multi residential buildings connections from a private sewer to a public sewer. See the sewer use by-law for details.

26. Plantings are not permitted overtop of City infrastructure other than sod.

27. Provide pre and post CCTV of the sanitary trunk sewer as per City Standard CCTV spec S.P. F-4090.

28. Provide an analysis to demonstrate that there is adequate residual capacity in the receiving and downstream wastewater system to accommodate the proposed development.

29. Please apply the wastewater design flow parameters in Technical Bulletin PIEDTB-2018-01.

30. A maintenance hole is required to be installed over the public sewer where private sewer connection to the public sewer exceeds 50% of the public sewer diameter. If a maintenance hole is proposed to be installed over existing City infrastructure, clearly indicate on the design drawings the applicable Standard City Drawing. For example, S12.1 or doghouse structure / S12.2, etc.

#### Stormwater Management

31. A monitoring maintenance hole shall be required just inside the property line for all non-residential and multi residential buildings connections from a private sewer to a public sewer. See the sewer use by-law for details.

32. A maintenance hole is required to be installed over the public sewer where private sewer connection to the public sewer exceeds 50% of the public sewer diameter.

33. If a maintenance hole is proposed to be installed over existing City infrastructure, clearly indicate on the design drawings the applicable Standard City Drawing. For example, S12.1 or doghouse structure / S12.2, etc.

34. Stormwater Quality: Characterize the water quality to be protected and Stormwater Contaminants (e.g., suspended solids, nutrients, bacteria, water temperature) for potential impact on the Natural Environment, and control as necessary; OR As per the MSS, watershed/subwatershed plan, similar area-wide



Stormwater study, or Stormwater management plan to minimize, or where possible, prevent increases in Contaminant loads and impacts to receiving waters.

- 35. Provide Enhanced level of protection (80%) for suspended solids removal.
- 36. OGS unit sizing shall be as per ISO 14034 Environmental Technology Verification (ETV)
- 37. Stormwater Quantity: Stormwater Management for the site requires runoff detention of the 100 year post to 2 year pre. The allowable release rate is to be computed using the lesser of  $C=0.5$  or existing. Time of concentration ( $T_c$ ) to be calculated, min  $T_c = 10$ mins

#### Grading and Drainage

- 38. Permissible ponding of 350mm for 100-year. No spilling to adjacent sites. At 100-year ponding elevation, you must spill to the ROW. 100-year Spill elevation must be 300mm lower than any building opening or ramp.
- 39. Consider Pedestrian Accessibilities at max 5%.

#### Geotechnical and Slope Stability

- 40. Sensitive Marine Clay (SMC) is widely found across Ottawa- geotechnical reports should include Atterberg Limits, consolidation testing, sensitivity values, and vane shear test. Refer to City of Ottawa Geotechnical and Slope Stability Guidelines.

#### Additional Notes

- 41. Work Project that would impact the application has not been identified at this time.
- 42. No road moratorium that would impact the application has been identified.
- 43. Any easement required should be shown on all plans.
- 44. For any proposed exterior light fixtures, please provide certification from a licensed professional engineer confirming lighting has been designed only using fixtures that meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America and result in minimal light spillage onto adjacent properties (maximum allowable spillage is 0.5 fc). Additionally, include in the submission the location of the fixtures, fixture type (make, model, part number and mounting height).
- 45. Sewer connections to be made above the springline of the sewermain as per:

- i) Std Dwg S11.1 for flexible main sewers – connections made using approved tee or wye fittings.
- ii) Std Dwg S11 (For rigid main sewers) – lateral must be less than 50% the diameter of the sewermain,
- iii) Std Dwg S11.2 (for rigid main sewers using bell end insert method) – for larger diameter laterals where manufactured inserts are not available; lateral must be less than 50% the diameter of the sewermain,
- iv) Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.
- v) No submerged outlet connections.

#### Minimum Drawing and File Requirements

Plans are to be submitted on standard A1 size (594mm x 841mm) sheets, utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400, or 1:500).

With all submitted hard copies provide individual PDF of the DWGs and for reports please provide one PDF file of the reports. All PDF documents are to be unlocked and flattened.

#### Drawings, Plans and geoOttawa

Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at [InformationCentre@ottawa.ca](mailto:InformationCentre@ottawa.ca) or by phone at (613) 580-2424 x.44455).

Please refer to GeoOttawa with the Water and Wastewater Infrastructure layer turned on to determine what servicing is available for this site:

<https://maps.ottawa.ca/geottawa/>.

#### For information on preparing required studies and plans refer to:

- Planning application submission information and materials | City of Ottawa;
- Ottawa Sewer Design Guidelines (October 2012);
- Ottawa Design Guidelines – Water Distribution (2010);
- Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007);
- City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012);
- City of Ottawa Environmental Noise Control Guidelines (January, 2016);
- City of Ottawa Park and Pathway Development Manual (2012);
- City of Ottawa Accessibility Design Standards (2012);
- Ottawa Standard Tender Documents (latest version);
- Please refer to other applicable Guidelines (provincial and federal);



- Site Alteration (By-law No. 2018-164) | City of Ottawa;
- Sewer Connection (By-law No. 2003-513) | City of Ottawa;
- Sewer Use (By-law No. 2003-514) | City of Ottawa;
- Building (By-law No. 2014-220) | City of Ottawa;
- Community Benefits Charge By-law (By-law No. 2022-307) | City of Ottawa;
- Delegation of Authority (By-law No. 2023-67) | City of Ottawa;
- Encroachments on City Highways (By-law No. 2003-446) | City of Ottawa;
- Fence (By-law No. 2003-462) | City of Ottawa;
- Fire Routes (By-law No. 2003-499) | City of Ottawa;
- Integrated Orléans Community Improvement Plan (By-law No. 2021-284) | City of Ottawa;
- Integrated Orléans Community Improvement Plan (By-law No. 2021-285) | City of Ottawa;
- Montreal Road Community Improvement Plan (By-law No. 2019-224) | City of Ottawa;
- Montreal Road Community Improvement Plan Area (By-law No. 2019-213) | City of Ottawa;
- Noise (By-law No. 2017-255) | City of Ottawa;
- Private Approach (By-law No. 2003-447) | City of Ottawa;
- Road Activity (By-law No. 2003-445) | City of Ottawa;
- Site Plan Control (By-law No. 2014 - 256) | City of Ottawa;
- Tree Protection (By-law No. 2020-340) | City of Ottawa;
- Water (By-law No. 2019-74) | City of Ottawa;
- Zoning (By-law No. 2008-250) | City of Ottawa;

Please contact Alex Polyak, Infrastructure Project Manager, for questions regarding engineering.

## **Noise**

Comments:

46. A noise study is not required for a Zoning By-law Amendment application.

47. Noise studies (roadway, stationary) will be required at the time of Site Plan application.

Please contact Josiane Gervais, Transportation Project Manager, for follow-up questions on noise requirements.

## **Transportation**

### Comments:

#### 48. Follow Transportation Impact Assessment Guidelines.

- a. Note that the TIA guidelines have been updated to align with the new pre-application consultation process. The changes are available on the City's website: <https://ottawa.ca/en/transportation-impact-assessment-guidelines#section-41824473-e537-4647-b516-dd528523f9fe>
- b. A Transportation Impact Assessment is required. Please submit the Scoping report to [josiane.gervais@ottawa.ca](mailto:josiane.gervais@ottawa.ca) at your earliest convenience or, at the latest, as part of the Phase 2 pre-con package. Should a Phase 2 pre-con be waived, the applicant is still responsible to submit the Scoping Report and must allow for a 14 day circulation period.
- c. The Strategy Report must be submitted for review at the latest with the Phase 3 pre-con package. The applicant is still encouraged to submit the Strategy Report to the TMP before submission of the Phase 3 pre-con package and allow for a 14 day circulation period.
- d. If an RMA is required to support the proposed development, the functional plan and/or RMA plans must be submitted with the formal submission to deem complete. Request base mapping asap if RMA is required. Contact Engineering Services (<https://ottawa.ca/en/city-hall/planning-and-development/engineering-services>)

#### 49. Ensure that the development proposal complies with the Right-of-Way protection requirements of the Official Plan's Schedule C16.

- a. See [Schedule C16 of the Official Plan](#), which identifies the protection on both Ogilvie Road and Cummings Avenue.
- b. Any requests for exceptions to ROW protection requirements must be discussed with Transportation Planning and concurrence provided by Transportation Planning management.
- c. Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required (measure on the property line/ROW protected line; no structure above or below this triangle): Collector Road to Arterial Road: 5 m x 5 m
- d. ROW and corner triangles must be unincumbered and conveyed at no cost to the City as part of the Site Plan application. Note that conveyance of the ROW/corner triangle will be required prior to registration of the SP agreement. Additional information on the conveyance process can be provided upon request.

50. TMP identifies:

- a. LRT Cyrville Station is within 600m radius of the site.
- b. Ogilvie Road is identified as a Transit Priority Corridor (Isolated Measures) (2031 Network Concept)

51. Nearby planned construction and infrastructure projects include: "Work by Public Works and Environmental Services" planned in the next 1-2 years identified along Ogilvie Road.

52. Additional notes provided should be considered while developing the site plan:

- a. Ensure site access meets the City's Private Approach Bylaw. Consolidating accesses is preferred. Should two accesses on Cummings be pursued, ensure the two accesses meet the minimum separation requirements as set out by the Bylaw.
- b. The car share parking stalls are within the required clear throat of the site access and are not supported. Clear throat requirements for >200 units on a collector is 25m. The clear throat length is measured from the ends of the driveway curb return radii at the roadway and the point of first conflict on-site. Note the minimum throat length provided must be maintained with the future ROW protection.
- c. Corner clearances should follow minimum distances set out within TAC Figure 8.8.2.
- d. Show all details of the roads abutting the site; include such items as pavement markings, accesses and/or sidewalks.
- e. Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
- f. Turning movement diagrams required for internal movements (loading areas, garbage), as applicable.
- g. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible and fall within TAC guidelines (Figure 8.5.1).
- h. Show dimensions for site elements (i.e. lane/aisle widths, access width and throat length, parking stalls, sidewalks, pedestrian pathways, etc.)
- i. Sidewalk is to be continuous across access, as per City Specification 7.1.
- j. Show slope of garage ramp on site plan. Note that underground ramps should be limited to a 12% grade and must contain a subsurface melting

device when exceeding 6%. Ramp grades greater than 15% can be psychological barriers to some drivers.

- k. Parking stalls at the end of dead-end parking aisles require adequate turning around space.
- l. Pavers within City ROW would require Maintenance and Liability Agreement.
- m. The at-grade bike storage is supported and appreciated.
- n. As the proposed site is multi-use, AODA legislation applies.
  - i. Ensure all crosswalks located internally on the site provide a TWSI at the depressed curb, per requirements of the Integrated Accessibility Standards Regulation under the AODA.
  - ii. Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).
  - iii. Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements.  
<https://ottawa.ca/en/city-hall/creating-equal-inclusive-and-diverse-city/accessibility-services/accessibility-design-standards-features#accessibility-design-standards>

Please contact Josiane Gervais, Transportation Project Manager, for follow-up questions regarding traffic.

### **Planning Forestry**

- 53. The site must be designed to allow enough space and provide adequate soil volume for tree planting. This must be considered when establishing the zone and associated building setbacks for the site. If there are any landscaping implications from a geotechnical standpoint, this must also be considered now.
- 54. It is advised that a conceptual landscape plan be submitted with the Zoning By-law Application to show how trees can be incorporated into the site with adequate growing space and soil volume.
- 55. The LC6 zone, for a non-residential use building or a mixed residential/non-residential use building, from that portion of a rear lot line abutting a residential zone the setback provision is a 7.5m rear yard setback. For the proposed TD3 zone, the setback is 3m. This should be considered when ensuring space is

available on the site to accommodate trees that will provide canopy cover on the site (medium to large).

Please contact Hayley Murray, Planning Forester, for follow-up questions regarding forestry.

## **Parkland**

Comments:

### **Parkland Dedication:**

56. The amount of required parkland conveyance is to be calculated as per the City of Ottawa Parkland Dedication By-law No.2022-280 (or as amended):

- (i) For conveyance of parkland (residential > 18 units/net ha):
  - i. one hectare per 600 net residential units but shall not exceed a maximum of 10% of the gross land area where less than or equal to five hectares.
- (ii) For cash-in-lieu of conveyance of parkland (residential > 18 units/net ha):
  - i. one hectare per 1,000 net residential units but shall not exceed a maximum of 10% of the gross land area where less than or equal to five hectares.
- (iii) For conveyance of parkland, cash-in-lieu of conveyance parkland, or combination thereof:
  - i. 5% of the gross land area (residential ≤ 18 units/net ha).
  - ii. 5% of the gross land area (other purposes, including residential care facility as defined by the Zoning By-law, excluding residential).
  - iii. 2% of the gross land area (commercial & industrial uses).
- (iv) Where land is developed for a mix of land uses that are located on discrete parts of the site, the conveyance requirement shall be the cumulative sum for each use, as calculated using the applicable rate and based upon the portion of the site allocated to each use, including, but not limited to, required and provided parking spaces, amenity space, landscape buffers, driveways, and drive aisles.
- (v) Where land is developed for a mix of uses within a building, the conveyance requirement shall be the cumulative sum for each use, as calculated using the applicable rate prorated proportionally to the gross floor area allocated to each use.

### **Preliminary Parkland Dedication Calculation:**

57. *Preliminary* parkland conveyance calculations based on information provided/identified in the pre-application consultation, is calculated to be **approximately 460 square meters**.

58. Please note, if the proposed unit count or land use changes, then the parkland dedication requirement will be re-evaluated accordingly.

59. PFP requests the following information to confirm and calculate the parkland conveyance:

- a) Gross land area, in square meters
- b) Number of residential units proposed/existing
- c) Gross floor area of proposed residential development
- d) Gross floor area of proposed/existing commercial development
- e) The proportion of commercial/residential development proposed on site.

Form of Parkland Dedication:

60. PFP will be requesting **land conveyance** for parkland dedication in accordance with the Parkland Dedication By-law (as amended).

61. The proposed park block is to provide the full required parkland conveyance.

62. PFP requests a surveyor's note (or equivalent) which specifies the gross land area of the property with your application.

Shape & Location of Park Block:

63. A continuous sidewalk is required along all park street frontages.

64. The park block shall be dedicated as one, contiguous parcel.

65. The park block shall be rectangular-based.

66. PFP is open to discussing an appropriate location for the proposed parkland and invite the applicant to review our Park Development Manual for further direction.

Policies:

67. The required parkland dedication is requested in **land conveyance**.

68. Policy 4.4.1(2) of the City of Ottawa's Official Plan indicates the following:

*All development, regardless of use, shall meet all of the following criteria to the satisfaction of the City:*

- a) *Consider land acquisition for parks as directed by the Parkland Dedication By-law **to meet community needs** for both residential and non-residential development, with an emphasis on active recreation amenities and potential cultural development with new parks acquired to address gaps or community needs; and*
- b) **Prioritize land for parks on-site over cash-in-lieu of parkland.** *Cash-in-lieu of parkland shall only be accepted when land or location is not suitable. The land to be conveyed shall, wherever feasible:*
  - i) Be a **minimum of 400 square metres** or as described in the Land First Policy and updated Park Development Manual as directed by the Parks and Recreation Facilities Master Plan;
  - ii) Be free of encumbrances above and below ground when land for parks is obtained by parkland dedication; or in the case of land purchases for the creation of new parks in established areas, unless the encumbrances have been approved by the City where reasonable;

- iii) Be of a usable shape, topography and size that reflects its intended use;
  - iv) Meet applicable provincial soil regulations; and
  - v) Meet the minimum standards for drainage, grading and general condition.
69. Policy 4.4.1(3) of the City of Ottawa's Official Plan indications:  
*For Site Plan Control applications in the Downtown, Inner Urban, Outer Urban and Suburban Transects, where the development site is more than 4,000 m<sup>2</sup>, the City shall place a priority on acquisition of land for park(s) as per the Planning Act and the Parkland Dedication By-law.*
70. Policy 4.4.6(1)(e) of the City of Ottawa's Official Plan indicates that a preferred minimum of 50% of the park perimeter shall be continuous frontage on abutting streets.
71. The conveyance of parkland is further supported by the Parks and Recreation Facilities Master Plan, where *the city will prioritize the acquisition of new parkland in neighbourhoods that do not meet the 2ha per 1,000 people target.*

#### Zoning:

72. It is common practice for the City to zone most parks as "O1" (Parks and Open Space Zone). PFP request that the park block be rezoned through the Zoning By-law Amendment application.
73. PFP will request a surveyor's certificate to confirm parkland dedication required, prior to Zoning By-law amendment approval.
74. We will request a appropriate interior side yard setback from an "O1" zone to mitigate the impact of the proposed buildings on the park block.
75. The applicant should submit a site plan with the dimensions of the park or a CAD file for the purpose of preparing the Location Map / Zoning Key Plan for the Details of the Recommended Zoning By-law Amendment portion of the staff report.
76. The future site plan illustrating the park block is to show high level park macro-grading on the Preliminary Grading Plan, including key spot elevations, stormwater flow arrows and slope percentages. Park block is to be graded to the surrounding levels and needs to show positive surface drainage towards the ROW.
77. Park services are to be connected from a municipal street. At a minimum, the park would require the following:
- i. 300mm diameter storm sewer connection to a municipal storm sewer and CB/MH located 2m inside the park lot line
  - ii. A 50mm diameter water line complete with water vault chamber at 2m inside the park property line as per city standard details for unit price contracts. Costs for the water vault chamber and water meter, if

ultimately required, shall be paid for by the City or be included as part of the maximum park construction budget for the park;

- iii. 150mm diameter sanitary sewer and Manhole at 2m inside the park property line;
- iv. A 120/240 volt, 200 amperes single phase hydro service at 2m inside the park property line complete with electrical kiosk for park services as per city standard details.
- v. Electrical and water connections (minimum 50mm) are to be connected directly to the street line, including back flow preventors, shutoff valves, water and hydro meters and chambers.

78. The park block shall be conveyed to the City in a 'clean and green' state. This includes, but is not limited to:

- Removal of all debris, contaminated soils, vegetation (except as identified for retention), etc;
- Being brought to the same grade level as the surrounding area, ensuring positive surface drainage throughout the park block;
- Services are to be provided to 2m inside the park block property line;
- Supplying and installing a minimum depth of 150mm of topsoil and seed or sod to City standards.

79. Any fill or disposal of soil to/from the park block is to meet current soil regulations.

80. The Owner may be required to supply and install a minimum 1.5m high commercial grade chain link fence or approved equivalent along the park lot lines depending on the final location of the park block and proposed land use(s) adjacent to the park.

81. The above noted requirements are standard requirements the owner is responsible for in the construction and installation of the 'base park improvements' for the park block and at the owner's sole expense.

82. A Record of Site Condition would be required prior to registration of the site plan agreement since there is a proposed change in use to parkland.

83. The conditions of site plan approval would require the Owner to convey the parkland to the City at the time of registration of the site plan agreement. The Owner would be responsible for retaining a land surveyor to prepare a draft reference plan describing the park parcel.

84. Before carrying out any of the 'base park improvements' the Owner must obtain, at the Owner's expense, a License of Occupation (LOO) or a Consent to Enter (CTE) from the City's Corporate Real Estate Office.

85. The City would take over the park block after the site works have been completed and the grassed areas in the park have been established to the satisfaction of the City.

86. The City would be responsible for the future development of the park.



#### Facility Fit Plan:

87. PFP requests a Facility Fit Plan at Site Plan.

(b) Facility Fit Plans must clearly show (in metric) the following:

- a. Those items required on a Site Plan but for the park block
- b. Key Plan showing the location of the park block within the development site
- c. Overlaid over an aerial photo if requested
- d. Critical dimensions of all park amenities including buffers and setbacks
- e. Grading across the park block and within the context of development area
- f. Any existing vegetation and special features within the park which may be preserved

#### Urban Design Review Panel

88. If the Urban Design Review Panel provides comments on the park size, location or configuration that differ from the above comments, staff may need to revisit the above comments.

#### Phase 1 Environmental Site Assessment

89. PFP and ERU will need to receive confirmation that redevelopment of the site from (industrial use) to park use is achievable. Any remedial work required to convert land use will be the responsibility of the owner prior to conveyance of park block to the City.

#### Reference Documents:

Please review the following City of Ottawa reference documents which outline the requirements for parkland conveyance and/or cash-in-lieu of parkland.

- o Official Plan (2021)
- o Parks and Recreation Facilities Master Plan (2021)
- o Park Development Manual, 2nd edition
- o Parkland Dedication By-Law (2022-280) and Planning Act amendments
- o City of Ottawa Standard Parks Conditions

Please note that the park comments are preliminary and will be finalized (and subject to change) upon receipt of the development application and the requested supporting documentation.

Please contact Phil Castro, Parks Planner, for follow-up questions related to parkland.

## **Community issues**

Comments:

90. The [Ottawa Neighbourhood Equity Index](#) identifies the community in this area as having a strong equity concern. Development proponents in this area should consider how their proposal may contribute to improving inequities, especially in the domain of economics, community belonging and the physical environment.

## **Other**

91. The High Performance Development Standard (HPDS) is a collection of voluntary and required standards that raise the performance of new building projects to achieve sustainable and resilient design. The HPDS was passed by Council on April 13, 2022.
- a. At this time, the HPDS is not in effect and Council has referred the 2023 HPDS Update Report back to staff with direction to bring forward an updated report to Committee with recommendations for revised phasing timelines, resource requirements and associated amendments to the Site Plan Control By-law by no later than Q1 2024.
  - b. Please refer to the HPDS information attached and [ottawa.ca/HPDS](http://ottawa.ca/HPDS) for more information.

Should there be any questions, please do not hesitate to contact myself or the contact identified for the above areas / disciplines.

Yours Truly,  
Kelly Livingstone, Planner

cc.

Alex Polyak, PM (Infrastructure Approvals)  
Cam Elsby, PM (Infrastructure Approvals)  
Jerrica Gilbert, PL (DR)  
Josiane Gervais, PM (Transportation)  
Phil Castro, PL (Parks and Facilities)  
Hayley Murray, PL (Forestry)  
Randolph Wang, PL (Urban Design)

## **Appendix B Water Servicing**

### **B.1 Domestic Water Demands**



# 1137/1151 Ogilvie Road & 1111 Cummings Avenue - Domestic Water Demand Estimates

Based on Architectural Plans from rla Architecture (2025-02-06)

Project No. 160402095

Date: 2/18/2025

Revision: 01

Designed by: WJ

Checked by: MW



Population densities per Table 4.1 City of Ottawa Water Design Guidelines:		
Studio and 1 Bedroom	1.4	ppu
2 Bedroom	2.1	ppu
3 Bedroom	3.1	ppu
Demand conversion factors per Table 4.2 of the City of Ottawa Water Design Guidelines and Technical Bulletin ISTB-2021-03:		
Residential	280	L/cap/day
Commercial	28000	L/gross ha/day

Unit Type	1137 Ogilvie Commercial Area (m <sup>2</sup> )	1151 Ogilvie Commercial Area (m <sup>2</sup> )	1137 Ogilvie Number of Residential Units	1151 Ogilvie Number of Residential Units	Population	Avg Day Demand		Max Day Demand <sup>1, 2</sup>		Peak Hour Demand <sup>1, 2</sup>	
						(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Studio	-	-	143	139	395	76.8	1.28	191.9	3.20	422.2	7.04
1 Bedroom	-	-	123	120	340	66.2	1.10	165.4	2.76	363.8	6.06
1 Bedroom + Study <sup>3</sup>	-	-	52	51	216	42.1	0.70	105.1	1.75	231.3	3.86
2 Bedroom	-	-	72	70	298	58.0	0.97	145.0	2.42	318.9	5.32
2 Bedroom + Study <sup>3</sup>	-	-	28	27	171	33.2	0.55	82.9	1.38	182.3	3.04
3 Bedroom	-	-	0	0	0	0.0	0.00	0.0	0.00	0.0	0.00
Ground Floor Commercial Space	543	230	-	-	-	1.1	0.02	1.6	0.03	2.9	0.05
<b>Total Site :</b>	<b>542.7</b>	<b>230.5</b>	<b>418</b>	<b>407</b>	<b>1420</b>	<b>277.2</b>	<b>4.62</b>	<b>691.9</b>	<b>11.53</b>	<b>1521.5</b>	<b>25.36</b>

## Notes:

1 The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:

maximum day demand rate = 2.5 x average day demand rate

peak hour demand rate = 2.2 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)

2 Water demand criteria used to estimate peak demand rates for gross commercial area are as follows:

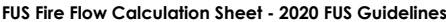
maximum daily demand rate = 1.5 x average day demand rate

peak hour demand rate = 1.8 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)

3 Assumption that "1 bedroom with study" has density of 2.1 ppu, "2-bedroom with with study" has density of 3.1 ppu

## **B.2 Fire Flow Demands (2020 FUS)**





**Stantec Project #: 160402095**

**Project Name: 1137/1151 Ogilvie Road and 1111 Cummings Avenue**

**Date: 2/18/2025**

**Fire Flow Calculation #: 1**

**Description:** 1137 Ogilvie Road

**30-storey + penthouse mixed-use high-rise (with 6-storey podium) with commercial space on the ground floor and residential space on remaining floors.**

Notes: Building information provided by RLA Architecture dated February 3, 2025. Assumed 2-hour fire separation provided between each floor and 1-hour fire separation provided for exterior vertical communications.

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type II - Noncombustible Construction / Type IV-A - Mass Timber Construction										0.8	-
2	Determine Effective Floor Area	Sum of Largest Floor + 25% of Two Additional Floors					Vertical Openings Protected?					YES	-
		1640	1640	1612							2453	-	
3	Determine Required Fire Flow	[F = 220 x C x A <sup>1/2</sup> ]. Round to nearest 1000 L/min										-	9000
4	Determine Occupancy Charge	Limited Combustible										-15%	7650
5	Determine Sprinkler Reduction	Conforms to NFPA 13										-30%	-3825
		Standard Water Supply										-10%	
		Fully Supervised										-10%	
		% Coverage of Sprinkler System										100%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?		-	-		
		North	20.1 to 30	45.6	3	> 100	Type V	NO		10%	765		
		East	10.1 to 20	53.9	31	> 100	Type I-II - Protected Openings		YES	0%			
		South	> 30	45.6	1	41-60	Type V		NO	0%			
		West	> 30	53.9	1	41-60	Type V		NO	0%			
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min										5000	
		Total Required Fire Flow in L/s										83.3	
		Required Duration of Fire Flow (hrs)										1.75	
		Required Volume of Fire Flow (m³)										525	



**Date: 2/18/2025**

**Description:** 1151 Ogilvie Road

Notes: Building information provided by RLA Architecture dated February 3, 2025. Assumed 2-hour fire separation provided between each floor and 1-hour fire separation provided for exterior vertical communications.

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type II - Noncombustible Construction / Type IV-A - Mass Timber Construction										0.8	-
2	Determine Effective Floor Area	Sum of Largest Floor + 25% of Two Additional Floors					Vertical Openings Protected?					YES	-
		1611	1611	1557							2403	-	
3	Determine Required Fire Flow	(F = 220 x C x A <sup>1/2</sup> ). Round to nearest 1000 L/min										-	9000
4	Determine Occupancy Charge	Limited Combustible										-15%	7650
5	Determine Sprinkler Reduction	Conforms to NFPA 13										-30%	-3825
		Standard Water Supply										-10%	
		Fully Supervised										-10%	
		% Coverage of Sprinkler System										100%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?		-	-	
		North	10.1 to 20	27	3	81-100	Type V		NO		14%	1071	
		East	> 30	53.9	1	41-60	Type V		NO		0%		
		South	> 30	45.6	1	41-60	Type V		NO		0%		
		West	10.1 to 20	53.9	31	> 100	Type I-II - Protected Openings		YES		0%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											5000
		Total Required Fire Flow in L/s											83.3
		Required Duration of Fire Flow (hrs)											1.75
		Required Volume of Fire Flow (m <sup>3</sup> )											525

## **B.3 Boundary Conditions**





**From:** [Kilborn, Kris](#)  
**To:** [Johnson, Warren](#)  
**Subject:** FW: 1137-1147 Ogilvie - Sanitary and Watermain Confirmation  
**Date:** Tuesday, February 4, 2025 8:53:11 AM  
**Attachments:** [image001.png](#)  
[1137-1147 Ogilvie Road December 2024.pdf](#)

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**From:** Polyak, Alex <alex.polyak@ottawa.ca>  
**Sent:** Friday, December 20, 2024 8:49 AM  
**To:** Kilborn, Kris <kris.kilborn@stantec.com>  
**Cc:** Evan Johnson <e.johnson@tcudevcorp.com>; Wang, Ziyi <Ziyi.Wang@stantec.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>; Haynes, Kris <Kris.Haynes@ottawa.ca>; Fadel, Rafic <rafic.fadel@ottawa.ca>  
**Subject:** 1137-1147 Ogilvie - Sanitary and Watermain Confirmation

Good morning Kris,

The following are boundary conditions, HGL, for hydraulic analysis at 1137-1147 Ogilvie Road (zone 1E) assumed to be a dual connection connected to the 305mm watermain on Cummings Avenue (see attached PDF for location).

Minimum HGL = 109.3 m  
Maximum HGL = 118.2 m  
Max Day + Fire Flow (100 L/s) = 113.0 m

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

Happy Holidays,

---

**Oleksandr (Alex) Polyak, B.Eng., C.E.T., P.Eng.** 

Project Manager, Infrastructure Approvals, Development Review East Branch | Gestionnaire de projet, Direction de l'examen des projets d'aménagement – Est.

Planning, Development and Building Services Department (PDBS) | Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)

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110 Laurier Ave., 4th Fl East, Ottawa ON K1P 1J1  
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# Boundary Conditions 1137-1147 Oglivie Road



## Legend

- Private
- Public

## **B.4 Fire Hydrant Coverage Calculations**





Project:	1137/1151 Ogilvie Road and 1111 Cummings Avenue	160402095
<b>TABLE 1: FIRE HYDRANT COVERAGE TABLE</b>		
Revision: 01	Prepared By: WJ	
Revision Date: 2/18/2025	Checked By: MW	

Description	Hydrants <sup>1</sup>			Total Available Fire Flow (L/min)	Total Required Fire Flow <sup>2</sup> (L/min)
	HYD-01	HYD-02			
1137 Ogilvie Road					
Distance from building (m)	10.2	78.7		-	-
Maximum fire flow capacity <sup>3</sup> (L/min)	5,678	3,785		9,463	5,000
1151 Ogilvie Road					
Distance from building (m)	68.2	40.3		-	-
Maximum fire flow capacity <sup>3</sup> (L/min)	5,678	5,678		11,356	5,000

<b>NFPA 1 Table 18.5.4.3</b>	
Distance to Building (m)	Maximum Capacity (L/min)
≤ 76	5,678
> 76 and ≤ 152	3,785
> 152 and ≤ 305	2,839


Notes:

1. Hydrant HYD-02 as per GeoOttawa accessed on February 3, 2025. Refer to drawing SSP-1.
2. See FUS Calculations, Appendix B.2 for fire flow requirements.
3. See NFPA 1 Table 18.5.4.3 for maximum fire flow capacity of hydrants by distance to building.

## **Appendix C Sanitary**

### **C.1 Sanitary Calculation Sheet**



<div></div>			SUBDIVISION:		<div>SANITARY SEWER DESIGN SHEET (City of Ottawa)</div>								<div>DESIGN PARAMETERS</div> <div><div>MAX PEAK FACTOR (RES.)=4.0</div><div>MIN PEAK FACTOR (RES.)=2.0</div><div>PEAKING FACTOR (INDUSTRIAL):2.4</div><div>PEAKING FACTOR (ICI &gt;20%):1.5</div><div>PERSONS / 1 BED &amp; DEN1.4</div><div>PERSONS / 2 BED &amp; 1 BED + DEN2.1</div><div>PERSONS / 3 BED &amp; 2 BED + DEN3.1</div></div> <div><div>AVG. DAILY FLOW / PERSON280 l/p/day</div><div>COMMERCIAL28,000 l/ha/day</div><div>INDUSTRIAL (HEAVY)55,000 l/ha/day</div><div>INDUSTRIAL (LIGHT)35,000 l/ha/day</div><div>INSTITUTIONAL28,000 l/ha/day</div><div>INFILTRATION0.33 l/s/Ha</div></div> <div><div>MINIMUM VELOCITY0.60 m/s</div><div>MAXIMUM VELOCITY3.00 m/s</div><div>MANNINGS n0.013</div><div>BEDDING CLASSB</div><div>MINIMUM COVER2.50 m</div><div>HARMON CORRECTION FACTOR0.8</div></div>																						
			1137/1151 Ogilvie Road and 1111 Cummings Avenue																																
			DATE: 2/18/2025																																
			REVISION: 1																																
DESIGNED BY: WAJ			FILE NUMBER: 160402095																																
CHECKED BY: MW																																			
LOCATION			RESIDENTIAL AREA AND POPULATION								COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+H	INFILTRATION			TOTAL	PIPE									
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	1 BED STUDIO	UNITS 2 BED 1 BED + DEN	3 BED 2 BED + DEN	POP. 1420	CUMULATIVE AREA (ha)	POP. 1420	PEAK FACT. 3.16	PEAK FLOW (l/s) 14.53	AREA (ha) 0.08	ACCU. AREA (ha) 0.08	AREA (ha) 0.00	ACCU. AREA (ha) 0.00	AREA (ha) 0.00	ACCU. AREA (ha) 0.00	AREA (ha) 0.00	ACCU. AREA (ha) 0.00	PEAK FLOW (l/s) 0.02	TOTAL AREA (ha) 0.71	ACCU. AREA (ha) 0.71	INFILT. FLOW (l/s) 0.23	FLOW (l/s) 14.79	LENGTH (m) 14.79	DIA (mm) 18.6	MATERIAL 200	CLASS SDR 35	SLOPE (%) 1.00	CAP. (FULL) (l/s) 33.4	CAP. V PEAK FLOW (%) 44.23%	VEL (FULL) (m/s) 1.05	VEL. (ACT.) (m/s) 0.86		
Proposed site	BLDG 2	2 1	0.71	525	245	55	1420	0.71	1420	3.16	14.53	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.71	0.71	0.23	14.79	0.5	200	PVC	SDR 35	1.00	33.4	44.23%	1.05	0.86		
			0.00	0	0	0	0	0.71	1420	3.16	14.53	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.71	0.23	14.79	18.6	200	PVC	SDR 35	1.00	33.4	44.23%	1.05	0.86		
																										250									

- Notes
- Unit breakdown provided by RLA Architects and dated February 6, 2025
  - Site to outlet to existing 250 mm dia. sanitary sewer on Cummings Avenue.
  - Entire site area considered as potential source of infiltration.
  - Assumed studio unit has 1.4 ppu, "1 bedroom with den" has 2.1 ppu, "2 bedroom with den" has 3.1 ppu.

## **C.2 Correspondence with City on Sanitary Sewer Capacity**





## Kilborn, Kris

---

**From:** Polyak, Alex <alex.polyak@ottawa.ca>  
**Sent:** Tuesday, December 10, 2024 10:25 AM  
**To:** Kilborn, Kris  
**Cc:** Evan Johnson; Wang, Ziyi; Thiffault, Dustin; Haynes, Kris  
**Subject:** RE: 1137-1147 Ogilvie - Sanitary and Watermain Confirmation

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Hello Kris,

We confirm that the sanitary sewer has the capacity for the proposed 16.09 L/s from 1137 and 1147 Ogilvie Road.

Regards,

---

**Oleksandr (Alex) Polyak, B.Eng., C.E.T., P.Eng.** 

Project Manager, Infrastructure Approvals, Development Review East Branch | Gestionnaire de projet, Direction de l'examen des projets d'aménagement – Est.

Planning, Development and Building Services Department (PDBS) | Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)

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---

**From:** Kilborn, Kris  
**Sent:** Thursday, November 28, 2024 2:39 PM  
**To:** Polyak, Alex <[alex.polyak@ottawa.ca](mailto:alex.polyak@ottawa.ca)>; Elsby, Cam <[Cam.Elsby@ottawa.ca](mailto:Cam.Elsby@ottawa.ca)>  
**Cc:** Evan Johnson <[e.johnson@tcudevcorp.com](mailto:e.johnson@tcudevcorp.com)>; Wang, Ziyi <[Ziyi.Wang@stantec.com](mailto:Ziyi.Wang@stantec.com)>; Thiffault, Dustin <[Dustin.Thiffault@stantec.com](mailto:Dustin.Thiffault@stantec.com)>  
**Subject:** FW: 1137-1147 Ogilvie - Sanitary and Watermain Confirmation

Good afternoon Alex and Cam and hope all is well

We are working with TCU Development Corporation on a new concept development for their existing site at 1137 Ogilvie Road incorporating the property at 1147 Ogilvie Road which they are looking at purchasing. The development at 1137 Ogilvie Road ( D02-02-24-0028) has been submitted for zoning bylaw amendment with a single 24-storey residential complex building. The proposed development would look at sharing the two properties and have two residential 30 story towers with shared podium and underground parking. Although there is no detailed conceptual site plan available to share

at this stage, we are looking to obtain information on the sanitary capacity allowance for the sewer along Ogilvie for the two combined properties and submission of a new watermain boundary request for the two parcels.

Stantec is in the process of preparing a serviceability memo for TCU Development Corporation to seek approval of the sanitary flows and availability of fire flows to service the two properties. TCU requires confirmation by Dec 12 in order assess and meet the conditions of purchase and sale of the property at 1147 Ogilvie Road. Below are the conceptual site stats for the two combined properties.

The total estimated units for 1137-1147 Ogilvie contains:

Unit Type	Number of Units	Population factor
Studio:	336 units	1.4
1 Bedroom:	306 units	1.4
1 Bedroom + Den:	93 units	2.1
2 Bedroom:	129 units	2.1
2 Bedroom + Den:	56 units	3.1
3 Bedroom:	7 units	3.1

The two parcels have a total area of 0.733 ha according to the data from GeoOttawa, please find the following key plan for the site location and boundary condition locations:



Based on the information we have we are requesting water boundary conditions and the sanitary capacity at the locations indicated on the attached figure under the following condition:

#### Water Boundary Conditions

- Domestic Demands
  - o 2119.4L/min
- Fire Flow Demand
  - o ~ 6000L/min minimum requirements
  - o Would the current watermain on Cummings Ave and Ogilvie Road be able to provide a higher Fire Flow Volume for this site?

#### Sanitary Capacity

- The overall conceptual development would generate approximate 16.1 L/s total sanitary flow.
- Could you please advise if there are any sanitary capacity constraints and if the combined development is permitted to release at 16.1 L/s

The existing site at 1137 Ogilvie Road was approved to discharge to release at 9.44 L/s ( Email from Alex Polyak to Kris Kilborn Jan 24, 2024). We would be looking to confirm discharge of approximately 6.6 l/s for the 1147 Ogilvie property.

For the assumption of domestic water calculation, we are also using 2.5 as the peak factor for max day demand, and 2.2 for peak hour demand per the City's guideline. The peak flow parameters for sanitary flow calculation are per the City of Ottawa Sewer Design Guideline revised section 4.4.1 ( Tech bulletin ISTB-2018-01 the figure 4.3)

Please find attached the FUS calculations, domestic water demand calculation sheet and sanitary design sheet for your reference.

We would like to receive confirmation on the water and sanitary by Dec 9 to meet the timelines for the purchase and sale by the owner.

Appreciate any help to move this along and please give me a call if you have any questions

Sincerely

#### **Kris Kilborn**

Principal, Community Development  
Business Center Practice Lead

Mobile: 613 297-0571

Fax: 613 722-2799

kris.kilborn@stantec.com

Stantec

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## **Appendix D Stormwater Servicing**

### **D.1 Modified Rational Method Sheet without Rooftop Storage**



## Stormwater Management Calculations

File No: **160402095**  
 Project: **1137/1151 Ogilvie Road and 1111 Cummings Ave**  
 Date: **18-Feb-25**

SWM Approach:  
 100-year Post-development to 2-year Pre-development flows  
 No rooftop storage

**Post-Development Site Conditions:**

**Overall Runoff Coefficient for Site and Sub-Catchment Areas**

Runoff Coefficient Table								
Catchment Type	Sub-catchment Area ID / Description		Area (ha) "A"		Runoff Coefficient "C"		"A x C"	Overall Runoff Coefficient
Uncontrolled - Non-Tributary	UNC-1	Hard	0.060		0.9		0.054	
		Soft	0.030		0.2		0.006	
	Subtotal			0.09			0.0603	0.670
Uncontrolled - Tributary	BLDG2	Hard	0.160		0.9		0.144	
		Soft	0.000		0.2		0.000	
	Subtotal			0.16			0.144	0.900
Uncontrolled - Tributary	BLDG1	Hard	0.180		0.9		0.162	
		Soft	0.000		0.2		0.000	
	Subtotal			0.18			0.162	0.900
Controlled - Tributary	CISTERN	Hard	0.180		0.9		0.162	
		Soft	0.100		0.2		0.020	
	Subtotal			0.28			0.182	0.650
Total				0.710			0.548	
Overall Runoff Coefficient= C:								0.77

Total Roof Areas	0.000 ha
Total Tributary Surface Areas (Controlled and Uncontrolled)	0.620 ha
Total Tributary Area to Outlet	0.620 ha
Total Uncontrolled Areas (Non-Tributary)	0.090 ha
Total Site	0.710 ha

# Stormwater Management Calculations

Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave  
Modified Rational Method Calculators for Storage

2 yr Intensity City of Ottawa	$I = a/(t + b)^c$	a = 732.951	t (min)	I (mm/hr)
		b = 6.199	10	76.8
		c = 0.81	20	52.0
			30	40.0
			40	32.9
			50	28.0
			60	24.6
			70	21.9
			80	19.8
			90	18.1
			100	16.7
			110	15.6
			120	14.6

**2 YEAR Predevelopment Target Release from Portion of Site**

Subdrainage Area: Predevelopment Tributary Area to Outlet  
Area (ha): 0.7100  
C: 0.50

Typical Time of Concentration

tc (min)	I (2 yr) (mm/hr)	Qtarget (L/s)
10	76.8	75.8

**2 YEAR Modified Rational Method for Entire Site**

Subdrainage Area: UNC-1 Uncontrolled - Non-Tributary  
Area (ha): 0.09  
C: 0.67

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	76.8	12.9	12.9		
20	52.0	8.7	8.7		
30	40.0	6.7	6.7		
40	32.9	5.5	5.5		
50	28.0	4.7	4.7		
60	24.6	4.1	4.1		
70	21.9	3.7	3.7		
80	19.8	3.3	3.3		
90	18.1	3.0	3.0		
100	16.7	2.8	2.8		
110	15.6	2.6	2.6		
120	14.6	2.4	2.4		

Subdrainage Area: BLDG2 Uncontrolled - Tributary  
Area (ha): 0.16  
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	76.8	30.7	30.7		
20	52.0	20.8	20.8		
30	40.0	16.0	16.0		
40	32.9	13.2	13.2		
50	28.0	11.2	11.2		
60	24.6	9.8	9.8		
70	21.9	8.8	8.8		
80	19.8	7.9	7.9		
90	18.1	7.3	7.3		
100	16.7	6.7	6.7		
110	15.6	6.2	6.2		
120	14.6	5.8	5.8		

Subdrainage Area: BLDG1 Uncontrolled - Tributary  
Area (ha): 0.18  
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	76.8	34.6	34.6		
20	52.0	23.4	23.4		
30	40.0	18.0	18.0		
40	32.9	14.8	14.8		
50	28.0	12.6	12.6		
60	24.6	11.1	11.1		
70	21.9	9.9	9.9		
80	19.8	8.9	8.9		
90	18.1	8.2	8.2		
100	16.7	7.5	7.5		
110	15.6	7.0	7.0		
120	14.6	6.6	6.6		

Subdrainage Area: CISTERN Controlled - Tributary  
Area (ha): 0.28  
C: 0.65

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	76.8	104.2	38.4	65.8	39.5
20	52.0	70.6	38.4	32.2	38.6
30	40.0	54.3	38.4	15.9	28.7
40	32.9	44.6	38.4	6.2	14.9
50	28.0	38.0	38.0	0.0	0.0
60	24.6	33.3	33.3	0.0	0.0
70	21.9	29.7	29.7	0.0	0.0
80	19.8	26.9	26.9	0.0	0.0
90	18.1	24.6	24.6	0.0	0.0
100	16.7	22.7	22.7	0.0	0.0
110	15.6	21.1	21.1	0.0	0.0
120	14.6	19.8	19.8	0.0	0.0

Storage: Underground Cistern storage. Roof areas to be directed to cistern.

Stage	Head	Discharge	Vreq	Vavail	Volume
-------	------	-----------	------	--------	--------

Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave  
Modified Rational Method Calculators for Storage

100 yr Intensity City of Ottawa	$I = a/(t + b)^c$	a = 1735.688	t (min)	I (mm/hr)
		b = 6.014	10	178.6
		c = 0.820	20	120.0
			30	91.9
			40	75.1
			50	64.0
			60	55.9
			70	49.8
			80	45.0
			90	41.1
			100	37.9
			110	35.2
			120	32.9

**100 YEAR Predevelopment Target Release from Portion of Site**

Subdrainage Area: Predevelopment Tributary Area to Outlet  
Area (ha): 0.7100  
C: 0.50

**100 YEAR Modified Rational Method for Entire Site**

Subdrainage Area: UNC-1 Uncontrolled - Non-Tributary  
Area (ha): 0.09  
C: 0.84

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.6	37.4	37.4		
20	120.0	25.1	25.1		
30	91.9	19.3	19.3		
40	75.1	15.7	15.7		
50	64.0	13.4	13.4		
60	55.9	11.7	11.7		
70	49.8	10.4	10.4		
80	45.0	9.4	9.4		
90	41.1	8.6	8.6		
100	37.9	7.9	7.9		
110	35.2	7.4	7.4		
120	32.9	6.9	6.9		

Subdrainage Area: BLDG2 Uncontrolled - Tributary  
Area (ha): 0.16  
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.6	79.4	79.4		
20	120.0	53.4	53.4		
30	91.9	40.9	40.9		
40	75.1	33.4	33.4		
50	64.0	28.4	28.4		
60	55.9	24.9	24.9		
70	49.8	22.1	22.1		
80	45.0	20.0	20.0		
90	41.1	18.3	18.3		
100	37.9	16.9	16.9		
110	35.2	15.7	15.7		
120	32.9	14.6	14.6		

Subdrainage Area: BLDG1 Uncontrolled - Tributary  
Area (ha): 0.18  
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.6	89.4	89.4		
20	120.0	60.0	60.0		
30	91.9	46.0	46.0		
40	75.1	37.6	37.6		
50	64.0	32.0	32.0		
60	55.9	28.0	28.0		
70	49.8	24.9	24.9		
80	45.0	22.5	22.5		
90	41.1	20.6	20.6		
100	37.9	19.0	19.0		
110	35.2	17.6	17.6		
120	32.9	16.5	16.5		

Subdrainage Area: CISTERN Controlled - Tributary  
Area (ha): 0.28  
C: 0.81

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.6	281.7	38.4	243.3	146.0
20	120.0	189.2	38.4	150.9	181.0
30	91.9	144.9	38.4	106.6	191.8
40	75.1	118.6	38.4	80.2	192.4
50	64.0	100.9	38.4	62.5	187.5
60	55.9	88.2	38.4	49.8	179.3
70	49.8	78.6	38.4	40.2	168.7
80	45.0	71.0	38.4	32.6	156.5
90	41.1	64.9	38.4	26.5	143.0
100	37.9	59.8	38.4	21.4	128.5
110	35.2	55.5	38.4	17.2	113.2
120	32.9	51.9	38.4	13.5	97.3

Storage: Underground Cistern storage. Roof areas to be directed to cistern.

Stage	Head	Discharge	Vreq	Vavail	Volume
-------	------	-----------	------	--------	--------

## Stormwater Management Calculations

**Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave**  
**Modified Rational Method Calculatons for Storage**

2-year Water Level	(m)	(L/s)	(cu. m)	(cu. m)	Check
-	-	38.4	39.5	200.0	OK
<b>SUMMARY TO OUTLET</b>					
			Vrequired	Vavailable*	
Tributary Area	0.620 ha				
Total 2yr Flow to Sewer	38.4 L/s		39	200 m <sup>3</sup>	Ok
Non-Tributary Area	0.090 ha				
Total 2yr Flow Uncontrolled	12.9 L/s				
Total Area	0.710 ha				
Total 2yr Flow	51.3 L/s				
Target	75.8 L/s				

**Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave**  
**Modified Rational Method Calculatons for Storage**

100-year Water Level	(m)	(L/s)	(cu. m)	(cu. m)	Check
-	-	38.4	192.4	200.0	OK
7.6					
<b>SUMMARY TO OUTLET</b>					
			Vrequired	Vavailable*	
Tributary Area	0.620 ha				
Total 100yr Flow to Sewer	38.4 L/s		192	200 m <sup>3</sup>	Ok
Non-Tributary Area	0.090 ha				
Total 100yr Flow Uncontrolled	37.4 L/s				
Total Area	0.710 ha				
Total 100yr Flow	75.8 L/s				
Target	75.8 L/s				

## **D.2 Modified Rational Method Sheet with Rooftop Storage**





## Stormwater Management Calculations

File No: **160402095**  
 Project: **1137/1151 Ogilvie Road and 1111 Cummings Ave**  
 Date: **18-Feb-25**

SWM Approach:  
 100-year Post-development to 2-year Pre-development flows  
 Assumed available rooftop storage.

**Post-Development Site Conditions:**

**Overall Runoff Coefficient for Site and Sub-Catchment Areas**

Runoff Coefficient Table								
Sub-catchment Area			Area (ha)	Runoff Coefficient			Overall Runoff Coefficient	
Catchment Type	ID / Description	"A"	"C"	"A x C"				
Uncontrolled - Non-Tributary	UNC-1	Hard	0.060	0.9	0.054			
		Soft	0.030	0.2	0.006			
	Subtotal			0.09		0.0603	0.670	
Roof	BLDG2	Hard	0.160	0.9	0.144			
		Soft	0.000	0.2	0.000			
	Subtotal			0.16		0.144	0.900	
Roof	BLDG1	Hard	0.180	0.9	0.162			
		Soft	0.000	0.2	0.000			
	Subtotal			0.18		0.162	0.900	
Controlled - Tributary	CISTERN	Hard	0.180	0.9	0.162			
		Soft	0.100	0.2	0.020			
	Subtotal			0.28		0.182	0.650	
Total			0.710	0.548				
Overall Runoff Coefficient= C:						0.77		

Total Roof Areas	0.340 ha
Total Tributary Surface Areas (Controlled and Uncontrolled)	0.280 ha
Total Tributary Area to Outlet	0.620 ha
Total Uncontrolled Areas (Non-Tributary)	0.090 ha
Total Site	0.710 ha

# Roof Drain Design Calculation Sheet

**Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave**  
**Roof Drain Design Sheet, Area BLDG1**  
**Standard Watts Model R1100 Accutrol Roof Drain**

Rating Curve				Volume Estimation				Water Depth (m)
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m)		
						Increment	Accumulated	
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0022	0	0.025	40	0	0	0.025
0.050	0.0006	0.0044	3	0.050	160	2	3	0.050
0.075	0.0008	0.0055	9	0.075	360	6	9	0.075
0.100	0.0009	0.0066	21	0.100	640	12	21	0.100
0.125	0.0011	0.0077	42	0.125	1000	20	42	0.125
0.150	0.0013	0.0088	72	0.150	1440	30	72	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
2.3	528.3	2.3	0.14676
8.7	1147.3	6.3	0.46545
21.0	1861.8	12.3	0.98261
41.3	2630.9	20.3	1.71342
71.7	3434.2	30.3	2.66738

## Roof Storage Summary

Total Building Area (sq.m)	1800	
Assume Available Roof Area (sq. 80%)	1440	
Roof Imperviousness	0.99	
Roof Drain Requirement (sq.m/Notch)	232	
Number of Roof Notches*	7	
Max. Allowable Depth of Roof Ponding (m)	0.15	* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).
Max. Allowable Storage (cu.m)	72	
Estimated 100 Year Drawdown Time (h)	2.6	

\* Note: Number of drains can be reduced if multiple-notch drain used.

## From Watts Drain Catalogue

Head (m) L/s					
Open	75%	50%	25%	Closed	
0.025	0.3155	0.3155	0.3155	0.3155	0.3155
0.050	0.6309	0.6309	0.6309	0.6309	0.6309
0.075	0.9464	0.8675	0.7886	0.7098	0.6309
0.100	1.2618	1.1041	0.9464	0.7886	0.6309
0.125	1.5773	1.3407	1.1041	0.8675	0.6309
0.150	1.8927	1.5773	1.2618	0.9464	0.6309

## Calculation Results

	5yr	100yr	Available
Qresult (cu.m/s)	0.007	0.009	-
Depth (m)	0.099	0.148	0.150
Volume (cu.m)	20.6	69.8	72.0
Drain time (hrs)	1.0	2.6	

# Roof Drain Design Calculation Sheet

**Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave**  
**Roof Drain Design Sheet, Area BLDG2**  
**Standard Watts Model R1100 Accutrol Roof Drain**

Rating Curve				Volume Estimation				Water Depth (m)
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m)		
						Increment	Accumulated	
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0019	0	0.025	36	0	0	0.025
0.050	0.0006	0.0038	2	0.050	142	2	2	0.050
0.075	0.0008	0.0047	8	0.075	320	6	8	0.075
0.100	0.0009	0.0057	19	0.100	569	11	19	0.100
0.125	0.0011	0.0066	37	0.125	889	18	37	0.125
0.150	0.0013	0.0076	64	0.150	1280	27	64	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
2.1	547.9	2.1	0.1522
7.7	1189.8	5.6	0.48268
18.7	1930.7	11.0	1.019
36.7	2728.4	18.1	1.77688
63.7	3561.4	27.0	2.76617

## Roof Storage Summary

Total Building Area (sq.m)	1600	
Assume Available Roof Area (sq. 80%)	1280	
Roof Imperviousness	0.99	
Roof Drain Requirement (sq.m/Notch)	232	
Number of Roof Notches*	6	
Max. Allowable Depth of Roof Ponding (m)	0.15	* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).
Max. Allowable Storage (cu.m)	64	
Estimated 100 Year Drawdown Time (h)	2.7	

\* Note: Number of drains can be reduced if multiple-notch drain used.

## From Watts Drain Catalogue

Head (m) L/s					
Open	75%	50%	25%	Closed	
0.025	0.3155	0.3155	0.3155	0.3155	0.3155
0.050	0.6309	0.6309	0.6309	0.6309	0.6309
0.075	0.9464	0.8675	0.7886	0.7098	0.6309
0.100	1.2618	1.1041	0.9464	0.7886	0.6309
0.125	1.5773	1.3407	1.1041	0.8675	0.6309
0.150	1.8927	1.5773	1.2618	0.9464	0.6309

## Calculation Results

	5yr	100yr	Available
Qresult (cu.m/s)	0.006	0.008	-
Depth (m)	0.100	0.149	0.150
Volume (cu.m)	18.9	62.8	64.0
Drain time (hrs)	1.0	2.7	

# Stormwater Management Calculations

Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave  
Modified Rational Method Calculations for Storage

2 yr Intensity City of Ottawa	$I = a/(t + b)^c$	a = 732.951 b = 6.199 c = 0.81	t (min)	I (mm/hr)
			10	76.81
			20	52.03
			30	40.04
			40	32.86
			50	28.04
			60	24.56
			70	21.91
			80	19.83
			90	18.14
			100	16.75
			110	15.57
			120	14.56

**2 YEAR Predevelopment Target Release from Portion of Site**

Subdrainage Area: Predevelopment Tributary Area to Outlet  
Area (ha): 0.7100  
C: 0.50

Typical Time of Concentration

tc (min)	I (2 yr) (mm/hr)	Qtarget (L/s)
10	76.81	75.80

**2 YEAR Modified Rational Method for Entire Site**

Subdrainage Area: UNC-1  
Area (ha): 0.09  
C: 0.67

Uncontrolled - Non-Tributary

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	76.81	12.88	12.88		
20	52.03	8.72	8.72		
30	40.04	6.71	6.71		
40	32.86	5.51	5.51		
50	28.04	4.70	4.70		
60	24.56	4.12	4.12		
70	21.91	3.67	3.67		
80	19.83	3.32	3.32		
90	18.14	3.04	3.04		
100	16.75	2.81	2.81		
110	15.57	2.61	2.61		
120	14.56	2.44	2.44		

Subdrainage Area: BLDG2  
Area (ha): 0.16  
C: 0.90

Maximum Storage Depth: 150 mm

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)	Depth (mm)
10	76.81	30.75	4.99	25.76	15.46	92.0
20	52.03	20.83	5.36	15.47	18.57	99.1
30	40.04	16.03	5.53	10.50	18.90	99.8
40	32.86	13.16	5.62	7.54	18.09	98.0
50	28.04	11.23	5.65	5.57	16.72	94.9
60	24.56	9.83	5.65	4.18	15.04	91.1
70	21.91	8.77	5.64	3.14	13.17	86.8
80	19.83	7.94	5.61	2.33	11.20	82.3
90	18.14	7.26	5.57	1.70	9.17	77.7
100	16.75	6.70	5.52	1.18	7.11	71.0
110	15.57	6.23	5.47	0.76	5.05	61.9
120	14.56	5.83	5.41	0.42	2.99	52.8

Storage: Roof Storage

Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check	
2-year Water Level	99.85	0.10	5.65	18.90	64.00	0.22

Subdrainage Area: BLDG1  
Area (ha): 0.18  
C: 0.90

Maximum Storage Depth: 150 mm

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)	Depth (mm)
10	76.81	34.59	6.24	28.35	17.01	91.2
20	52.03	23.43	6.53	16.90	20.28	97.9
30	40.04	18.03	6.56	11.47	20.65	98.6
40	32.86	14.80	6.50	8.30	19.93	97.1
50	28.04	12.63	6.39	6.24	18.72	94.7
60	24.56	11.06	6.26	4.80	17.27	91.8
70	21.91	9.87	6.12	3.75	15.73	88.6
80	19.83	8.93	5.98	2.95	14.15	85.4
90	18.14	8.17	5.84	2.33	12.58	82.3
100	16.75	7.54	5.70	1.84	11.04	79.1
110	15.57	7.01	5.57	1.44	9.53	76.1
120	14.56	6.56	5.40	1.16	8.32	72.3

Storage: Roof Storage

Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check	
2-year Water Level	98.61	0.10	6.56	20.65	72.00	0.00

Subdrainage Area: CISTERN  
Area (ha): 0.28  
C: 0.65

Controlled - Tributary

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	76.81	38.86	22.10	16.76	10.05
20	52.03	26.33	22.10	4.22	5.06
30	40.04	20.26	20.26	0.00	0.00

Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave  
Modified Rational Method Calculations for Storage

100 yr Intensity City of Ottawa	$I = a/(t + b)^c$	a = 1735.688 b = 6.014 c = 0.820	t (min)	I (mm/hr)
			10	178.56
			20	119.95
			30	91.87
			40	75.15
			50	63.95
			60	55.89
			70	49.79
			80	44.99
			90	41.11
			100	37.90
			110	35.20
			120	32.89

**100 YEAR Predevelopment Target Release from Portion of Site**

Subdrainage Area: Predevelopment Tributary Area to Outlet  
Area (ha): 0.7100  
C: 0.50

Estimated Time of Concentration after Development

tc (min)	I (100 yr) (mm/hr)	Q100yr (L/s)
10	178.56	176.22

**100 YEAR Modified Rational Method for Entire Site**

Subdrainage Area: UNC-1  
Area (ha): 0.09  
C: 0.84

Uncontrolled - Non-Tributary

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.56	37.42	37.42		
20	119.95	25.13	25.13		
30	91.87	19.25	19.25		
40	75.15	15.75	15.75		
50	63.95	13.40	13.40		
60	55.89	11.71	11.71		
70	49.79	10.43	10.43		
80	44.99	9.43	9.43		
90	41.11	8.61	8.61		
100	37.90	7.94	7.94		
110	35.20	7.38	7.38		
120	32.89	6.89	6.89		

Subdrainage Area: BLDG2  
Area (ha): 0.16  
C: 1.00

Maximum Storage Depth: 150 mm

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)	Depth (mm)
10	178.56	79.42	6.85	72.57	43.54	131.0
20	119.95	53.35	7.27	46.09	55.31	141.9
30	91.87	40.86	7.44	33.43	60.17	146.4
40	75.15	33.42	7.51	25.92	62.20	148.3
50	63.95	28.45	7.53	20.92	62.76	148.8
60	55.89	24.86	7.52	17.35	62.44	148.6
70	49.79	22.15	7.49	14.66	61.58	147.8
80	44.99	20.01	7.44	12.57	60.33	146.6
90	41.11	18.29	7.39	10.90	58.84	145.2
100	37.90	16.86	7.33	9.53	57.17	143.7
110	35.20	15.66	7.27	8.39	55.37	142.0
120	32.89	14.63	7.20	7.43	53.49	140.3

Storage: Roof Storage

Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check	
100-year Water Level	148.85	0.15	7.53	62.76	64.00	0.00

Subdrainage Area: BLDG1  
Area (ha): 0.18  
C: 1.00

Maximum Storage Depth: 150 mm

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)	Depth (mm)
10	178.56	89.35	7.99	81.36	48.82	130.9
20	119.95	60.02	8.46	51.56	61.87	141.7
30	91.87	45.97	8.66	37.31	67.17	146.0
40	75.15	37.60	8.73	28.87	69.29	147.8
50	63.95	32.00	8.75	23.25	69.76	148.1
60	55.89	27.97	8.73	19.24	69.25	147.7
70	49.79	24.91	8.69	16.22	68.14	146.8
80	44.99	22.51	8.64	13.88	66.61	145.6
90	41.11	20.57	8.57	12.00	64.81	144.1
100	37.90	18.97	8.50	10.47	62.81	142.4
110	35.20	17.62	8.42	9.19	60.68	140.7
120	32.89	16.46	8.34	8.12	58.47	138.8

Storage: Roof Storage

Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check	
100-year Water Level	148.15	0.15	8.75	69.76	72.00	0.00

Subdrainage Area: CISTERN  
Area (ha): 0.28  
C: 0.81

Controlled - Tributary

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.56	112.93	22.10	90.82	54.49
20	119.95	75.86	22.10	53.76	64.51
30	91.87	58.10	22.10	36.00	64.79

## Stormwater Management Calculations

### Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave Modified Rational Method Calculatons for Storage

40	32.86	16.63	16.63	0.00	0.00
50	28.04	14.19	14.19	0.00	0.00
60	24.56	12.43	12.43	0.00	0.00
70	21.91	11.09	11.09	0.00	0.00
80	19.83	10.03	10.03	0.00	0.00
90	18.14	9.18	9.18	0.00	0.00
100	16.75	8.47	8.47	0.00	0.00
110	15.57	7.88	7.88	0.00	0.00
120	14.56	7.37	7.37	0.00	0.00
Storage: Underground cistern storage					
Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
2-year Water Level	-	-	22.10	10.05	70.00 OK
SUMMARY TO OUTLET					
Tributary Area		0.620 ha	Vrequired	Vavailable*	
Total 2yr Flow to Sewer		34.3 L/s	0	0 m <sup>3</sup>	Ok
Non-Tributary Area		0.090 ha			
Total 2yr Flow Uncontrolled		12.9 L/s			
Total Area		0.710 ha			
Total 2yr Flow		47.2 L/s			
Target		75.8 L/s			

### Project #160402095, 1137/1151 Ogilvie Road and 1111 Cummings Ave Modified Rational Method Calculatons for Storage

40	75.15	47.53	22.10	25.42	61.01
50	63.95	40.45	22.10	18.34	55.03
60	55.89	35.35	22.10	13.25	47.68
70	49.79	31.49	22.10	9.38	39.41
80	44.99	28.45	22.10	6.35	30.48
90	41.11	26.00	22.10	3.90	21.04
100	37.90	23.97	22.10	1.87	11.20
110	35.20	22.26	22.10	0.16	1.05
120	32.89	20.80	20.80	0.00	0.00
Storage: Underground cistern storage					
Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	-	-	22.10	64.79	70.00 OK
5.21					
SUMMARY TO OUTLET					
Tributary Area		0.620 ha	Vrequired	Vavailable*	
Total 100yr Flow to Sewer		38.4 L/s	197	206 m <sup>3</sup>	Ok
Non-Tributary Area		0.090 ha			
Total 100yr Flow Uncontrolled		37.4 L/s			
Total Area		0.710 ha			
Total 100yr Flow		75.8 L/s			
Target		75.8 L/s			

## **D.3 Storm Sewer Design Sheet**





## **Appendix E Background Studies**

### **E.1 Geotechnical Investigation (Paterson Group, February 2025)**





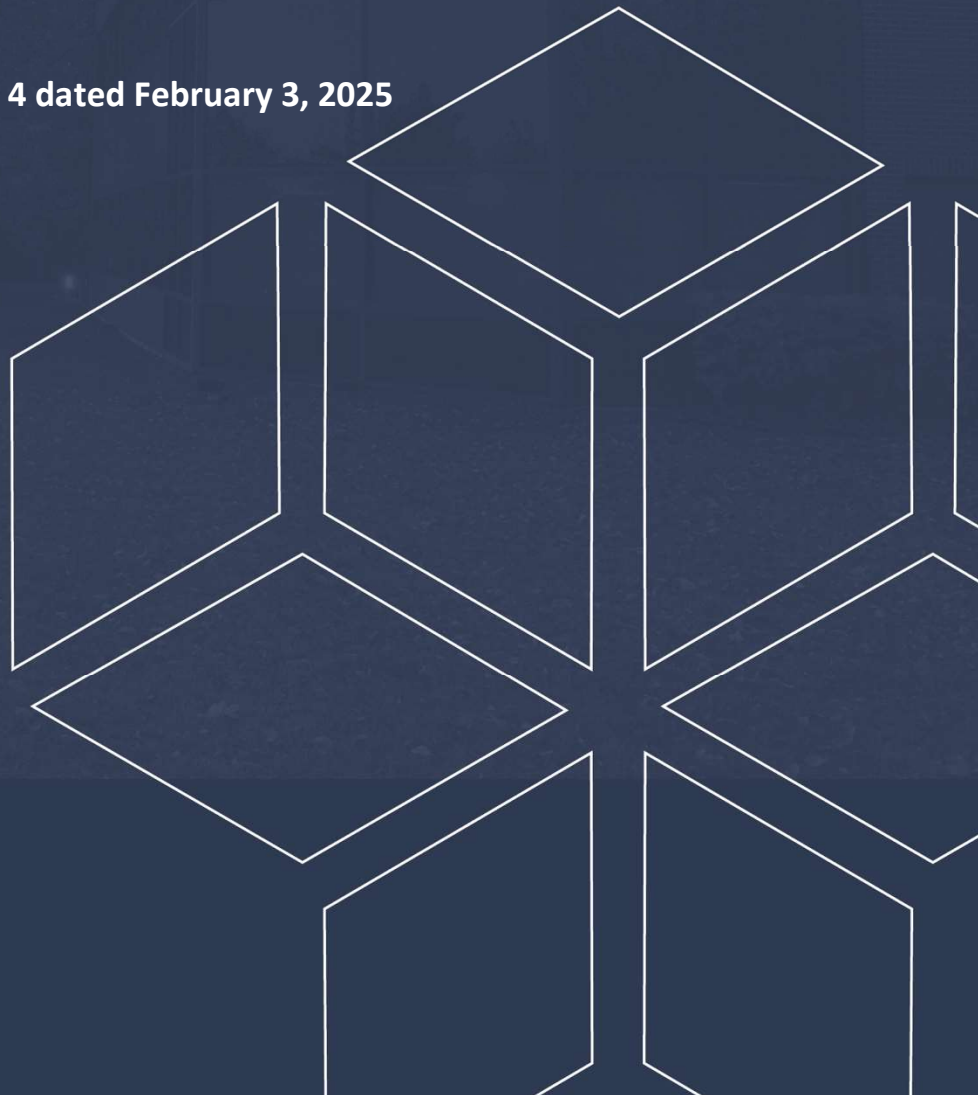
# **Geotechnical Investigation**

## **Proposed Multi-Storey Building**

1137 to 1151 Ogilvie Road & 1111 Cummings Avenue  
Ottawa, Ontario

Prepared for TCU Development Corporation

Report PG5770-1 Revision 4 dated February 3, 2025



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## Appendices

<b>Appendix 1</b>	Soil Profile and Test Data Sheets Symbols and Terms Log of Borehole Sheets by Others Grain Size Distribution Curve by Others Analytical Testing Results by Others
<b>Appendix 2</b>	Figure 1 - Key Plan Figure 2 – Aerial Photograph – 1991 Figure 3 – Aerial Photograph – 2019 Figure 4 & 5 – Seismic Shear Wave Velocity Profiles Drawing PG5770-1 – Test Hole Location Plan

## 1.0 Introduction

Paterson Group (Paterson) was commissioned by TCU Development Corporation to conduct a geotechnical investigation for the proposed multi-storey building to be located at 1137 to 1151 Ogilvie Road and 1111 Cummings Avenue, in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objectives of the geotechnical investigation were to:

- ❑ Determine the subsoil and groundwater conditions at this site by means of test holes.
- ❑ Provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating for the presence or potential presence of contamination on the subject property was not part of the scope of the present investigation. Therefore, the present report does not address environmental issues.

## 2.0 Proposed Development

Based on available drawings, it is understood that the proposed development will consist of two multi-storey mixed-use buildings, with three levels of underground parking which will occupy the majority of the site footprint. At-grade parking areas, access lanes and landscaped margins are also anticipated. It is expected that the proposed development will be municipally serviced.

It is also expected that the existing structures will be demolished as part of the proposed development.

## **3.0 Method of Investigation**

### **3.1 Field Investigation**

#### **Field Program**

The field program for the geotechnical investigation was carried out on April 19, 2021 and consisted of advancing 5 boreholes to a maximum depth of 6.8 m below the existing ground surface. A geotechnical investigation was carried out by others at the 1151 Ogilvie Road property on June 4, 2024. The investigation by others consisted of advancing a total of 4 boreholes to a maximum depth of 7.1 m.

The borehole locations were determined in the field by Paterson personnel, taking into consideration existing site features and underground services. The locations of the boreholes are shown on Drawing PG5770-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were completed with a low clearance, track-mounted drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of our personnel under the direction of a senior engineer. The test hole procedure consisted of augering and rock coring to the required depths at the selected locations, and sampling and testing the overburden and bedrock.

#### **Sampling and In-Situ Testing**

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. Rock cores (RC) were obtained using 47.6 mm inside diameter coring equipment. All samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags, and rock cores were placed in cardboard boxes. All samples were transported to our laboratory for further examination and classification. The depths at which the auger, split spoon and rock core samples were recovered from the boreholes are shown as AU, SS and RC, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Bedrock samples were recovered using a core barrel and diamond drilling techniques. The depths at which rock core samples were recovered from the boreholes are shown as RC on the Soil Profile and Test Data sheets in Appendix 1.

A recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section (core run) of bedrock and are shown on the borehole logs. The recovery value is the ratio, in percentage, of the length of the bedrock sample recovered over the length of the drilled section (core run). The RQD value is the ratio, in percentage, of the total length of intact rock pieces longer than 100 mm in one core run over the length of the core run. These values are indicative of the quality of the bedrock.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data sheets presented in Appendix 1.

### **Groundwater**

Monitoring wells were installed within boreholes BH 1-21 through BH 3-21 to measure the stabilized groundwater levels subsequent to completion of the sampling program. Groundwater conditions were also observed and recorded in the field during the field investigation program. Groundwater monitoring wells were also installed in boreholes BH 1, BH 2 and BH 4 during the investigation by others.

All monitoring wells should be decommissioned in accordance with Ontario Regulations O.Reg 903 by a qualified licensed well technician and prior to construction.

## **3.2 Field Survey**

The test hole locations were selected by Paterson to provide general coverage of the proposed development taking into consideration the existing site features and underground utilities. The test hole locations and ground surface elevation at each test hole location were surveyed by Paterson using a GPS unit with respect to a geodetic datum. The location of the test holes and ground surface elevation at each test hole location are presented on Drawing PG5770-1 - Test Hole Location Plan in Appendix 2.

## **3.3 Laboratory Review**

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging.

A total of one (1) grain size distribution analysis were completed on selected soil samples by others. Unconfined compressive strength testing was carried out by others on two (2) bedrock samples from BH 3. The results of the testing are discussed in Subsection 4.2 and are provided in Appendix 1.

### **3.4 Analytical Testing**

Two (2) samples was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures by others. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the samples. The results are presented in Appendix 1 and are discussed further in Subsection 6.7.

## **4.0 Observations**

### **4.1 Surface Conditions**

The subject site consists of 3 contiguous properties, 1111 Cummings Avenue, 1151 Ogilvie Road and 1137 Ogilvie Road. The properties at 1137 and 1151 Ogilvie Road are each occupied by a commercial building with associated asphalt-paved parking areas and landscaped margins.

The property at 1111 Cummings Avenue is currently occupied by an asphalt paved parking and landscapes areas. However, based on available aerial photos, a residential dwelling was located within the western portion of the site as recently as 1991, and was no longer present in 1999. Reference should be made to the aerial photographs in Figure 2 - Aerial Photograph - 1991 and Figure 3 - Aerial Photograph - 2019 which illustrate the former and present site conditions, respectively.

The subject site is bordered by residential dwellings to the north, a tree-covered area to the east, Ogilvie Road to the south and Cummings Avenue to the west. The existing ground surface across the site is relatively level and at grade with the surrounding roadways and neighbouring properties.

### **4.2 Subsurface Profile**

#### **Overburden**

Generally, the subsurface profile at the test hole locations consists of an approximate 25 to 130 mm thick layer of asphaltic concrete underlain by fill which extends to approximate depths of 0.5 to 3.1 m below the existing ground surface. The fill was generally observed to consist of a brown silty sand to silty clay with gravel and crushed stone. Trace amounts of topsoil and organics were also observed within the fill at boreholes BH 1-21, BH 2-21 and BH 4.

A glacial till deposit was encountered underlying the fill layer at boreholes BH 1, BH 2 and BH 3 on the 1151 Ogilvie Road property and was generally observed to consist of compact to very dense brown silty sand with clay, gravel, cobbles and boulders. The glacial till deposit was observed to extend to maximum depths of 1.9 to 3.1 m below the existing ground surface.



## Grain Size Distribution Testing

One (1) grain size distribution test were completed by others to further classify the selected soil sample. The results are summarized in Table 1 below and are presented in Appendix 1.

<b>Table 1 – Summary of Grain Size Distribution Analysis by Others</b>					
<b>Test Hole</b>	<b>Sample</b>	<b>Depth (m)</b>	<b>Gravel (%)</b>	<b>Sand (%)</b>	<b>Silt &amp; Clay (%)</b>
BH 24-2	SS3	1.5 - 2.1	12	66	22

## Bedrock

Practical refusal to augering on the bedrock surface was encountered at approximate depths ranging from 1.7 to 3.1 m. The bedrock was observed to consist of black shale and based on the RQDs of the recovered bedrock core, was generally weathered and of very poor quality to approximate depths ranging from 3.1 to 4.6 m, becoming fair to excellent in quality with depth. At boreholes BH 1-21 to BH 3-21 and BH 3, the bedrock was cored to depths ranging from 5.9 to 7.1 m below the existing ground surface. Approximate 10 cm clay seams were noted at approximate depths of 4.1 and 4.4 at borehole BH 3.

Based on available geological mapping, bedrock in the area of the subject site consists of black shale of the Billings Formation with an overburden thickness ranging from approximately 2 to 3 m.

Reference should be made to the Soil Profile and Test Data sheets and Log of Borehole Sheets by others in Appendix 1 for specific details of the soil and bedrock profiles encountered at each test hole location.

## Unconfined Compressive Strength Testing by Others

Two (2) bedrock cores were tested for unconfined compressive strength by others. The results are summarized in Table 2 below.

<b>Table 2 – Summary of Unconfined Bedrock Compressive Strength Testing Results</b>						
<b>Borehole</b>	<b>Sample</b>	<b>Test Core Depth (m)</b>	<b>Unit Weight (kN/m<sup>3</sup>)</b>	<b>Unconfined Compressive Strength (MPa)</b>	<b>Classification of Rock with respect to Strength</b>	<b>Bedrock Type</b>
BH 3	RC6	4.5 - 4.6	25.4	61.2	Strong R4	Shale
BH 3	RC7	5.3 - 5.4	25.2	57.8	Strong R4	Shale

## 4.3 Groundwater

Groundwater levels were measured in the monitoring wells at boreholes BH 1-21, BH 2-21 and BH 3-21 on April 26, 2021. Groundwater monitoring devices were installed in the boreholes BH 1, BH 2 and BH 4 by others. The results are presented in Table 3 below.

Table 3 – Summary of Groundwater Levels				
Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1-21	72.33	2.80	69.53	April 26, 2021
BH 2-21	71.97	3.06	68.91	
BH 3-21	71.78	3.15	68.63	
BH 1	71.61	1.90	69.70	June 24, 2024
BH 2	71.85	2.00	69.90	
BH 4	71.55	1.70	69.90	
Note: The ground surface elevation at each test hole location was surveyed using a GPS referenced to a geodetic datum.				

It should be noted that groundwater levels could be influence by surface water infiltrating the backfilled boreholes. Long-term groundwater levels can also be estimated based on the observed colour, moisture content and consistency of the recovered soil samples. Based on these observations, the long-term groundwater level is expected to be between an approximate **2.5 to 3.5 m** depth. However, it should be noted that groundwater levels are subject to seasonal fluctuations, and therefore, the groundwater levels could vary at the time of construction.

## **5.0 Discussion**

### **5.1 Geotechnical Assessment**

From a geotechnical perspective, the subject site is suitable for the proposed development. It is recommended that the proposed high-rise buildings be founded on conventional spread footings placed on clean, surface sounded bedrock.

Bedrock removal will be required to complete the underground parking levels. Hoe ramming is an option where the bedrock is weathered and/or where only small quantities of bedrock need to be removed. Line drilling and controlled blasting is recommended where large quantities of bedrock need to be removed. The blasting operations should be planned and completed under the guidance of a professional engineer with experience in blasting operations.

Expansive shale bedrock could be present on site. Precautions should be provided during construction to reduce the risks associated with the potentially heaving shale bedrock. This is discussed further in Section 6.7.

The above and other considerations are discussed in the following sections.

### **5.2 Site Grading and Preparation**

#### **Stripping Depth**

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding, and other settlement sensitive structures.

Existing foundation walls and other construction debris should be entirely removed from within the building perimeter and within the lateral support zones of the foundations. Under paved areas, existing construction remnants, such as foundation walls, should be excavated to a minimum of 1 m below final grade.

Due to the relatively shallow depth of the bedrock surface and the anticipated founding level for the proposed building, all existing overburden material should be excavated from within the proposed building footprint.

## **Bedrock Removal**

Bedrock removal can be accomplished by hoe ramming where the bedrock is weathered and/or where only small quantities of the bedrock need to be removed. Sound bedrock may be removed by line drilling in conjunction with controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in proximity of the blasting operations should be completed prior to commencing construction. The extent of the survey should be determined by the blasting consultant and sufficient to respond to any inquiries/claims related to the blasting operations.

As a general guideline, peak particle velocity (measured at the structures) should not exceed 25 mm/s during the blasting program to reduce the risks of damage to the existing structures.

The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

## **Vibration Considerations**

Construction operations are the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels as much as possible should be incorporated in the construction operations to maintain a cooperative environment with the residents.

The following construction equipment could be the source of vibrations: hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the source of detrimental vibrations at the nearby buildings and structures. Therefore, it is recommended that all vibrations be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz). The guidelines are for current construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended to be completed minimize the risks of claims during or following the construction of the proposed building.

## **Fill Placement**

Fill used for grading beneath the proposed buildings should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building and paved areas should be compacted to at least 98% of the material's standard Proctor maximum dry density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. This material should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless used in conjunction with a composite drainage membrane.

Expansive shale deteriorates upon exposure to air and is not generally suitable for reuse as an engineered fill. The use of imported granular fill is recommended for this purpose.

## **5.3 Foundation Design**

### **Bearing Resistance Values**

Footings placed on clean, surface sounded shale bedrock can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **2,000 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance at ULS.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Footings bearing on an acceptable bedrock bearing surface and designed for the bearing resistance values provided herein will be subjected to negligible potential post-construction total and differential settlements.

## **Lateral Support**

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending horizontally and vertically from the footing perimeter at a minimum of 1H:6V (or shallower) passes through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete.

## **5.4 Design for Earthquakes**

Seismic shear wave velocity testing was completed for the subject site to accurately determine the applicable seismic site classification for the proposed building in accordance with Table 4.1.8.4.A of the Ontario Building Code 2012. The shear wave velocity testing was completed by Paterson personnel. The results of the shear wave velocity testing are provided on Figures 4 and 5 in Appendix 2 of the present report.

### **Field Program**

The seismic array testing location was placed as shown on Drawing PG5770-1-Test Hole Location Plan, attached to the present report. Paterson field personnel placed 18 horizontal 4.5 Hz. geophones mounted to the surface by means of two 75 mm ground spikes attached to the geophone land case. The geophones were spaced at 1 m intervals and connected by a geophone spread cable to a Geode 24 Channel seismograph.

The seismograph was also connected to a computer laptop and a hammer trigger switch attached to a 12-pound dead blow hammer. The hammer trigger switch sends a start signal to the seismograph. The hammer is used to strike an I-Beam seated into the ground surface, which creates a polarized shear wave.

The hammer shots are repeated between four (4) to eight (8) times at each shot location to improve signal to noise ratio. The shot locations were 5.0 and 1.0 m away from the first and last geophone of the seismic array and in the middle of the array.

### **Data Processing and Interpretation**

Interpretation of the shear wave velocity results was completed by Paterson personnel. Shear wave velocity measurement was made using reflection/refraction method. The interpretation is performed by recovering arrival times from direct and refracted waves. The interpretation is repeated at each shot location to provide an

average shear wave velocity,  $V_{s30}$ , of the upper 30 m profile, immediately below the proposed foundations of the building.

The layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave records to compute the bedrock depth at each location.

The bedrock velocity was interpreted using the main refractor wave velocity, which is considered a conservative estimate of the bedrock velocity due to the increasing quality of the bedrock with depth. It should be noted that as bedrock quality increases, the bedrock shear wave velocity also increases.

Based on our testing results, the bedrock shear wave velocity is **1,918 m/s**. Further, it is expected that footings will be founded on the bedrock surface. Based on the above, the  $V_{s30}$  was calculated using the standard equation for average shear wave velocity provided in the OBC 2012 and as presented below.

$$V_{s3} = \frac{Depth_{of\ interest}(m)}{\left( \frac{Depth_{Layer1}(m)}{V_{s_{Layer1}}(m/s)} + \frac{Depth_{Layer2}(m)}{V_{s_{Layer2}}(m/s)} \right)}$$

$$V_{s30} = \frac{30\ m}{\left( \frac{30\ m}{1,918\ m/s} \right)}$$

$$V_{s30} = 1,918\ m/s$$

Based on the results of the shear wave velocity testing, the average shear wave velocity  $V_{s30}$  for the proposed building with foundation bearing directly on the bedrock surface is **1,918 m/s**.

Therefore, **Site Class X<sub>1918</sub>** is applicable for the design of the proposed building, as per Table 4.1.8.4.A of the Ontario Building Code (OBC) 2024. Soils underlying the subject site are not susceptible to liquefaction.

## 5.5 Basement Floor Slab

For the proposed development, all overburden soil will be removed from the building footprint, leaving the bedrock as the founding medium for the basement floor slab.



It is anticipated that the basement area for the proposed building will be mostly parking and the recommended pavement structures noted in Subsection 5.8 will be applicable. However, if storage or other uses of the lower level will involve the construction of a concrete floor slab, the upper 200 mm of sub-slab fill is recommended to consist of 19 mm clear crushed stone.

Any soft areas in the basement slab subgrade should be removed and backfilled with appropriate backfill material prior to placing fill. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

In consideration of the groundwater conditions at the site, a sub-slab drainage system, consisting of lines of perforated drainage pipe subdrains connected to a positive outlet, should be provided in the subfloor fill under the lower basement floor. This is discussed further in Subsection 6.1.

## **5.6 Basement Wall**

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the proposed building. However, in our opinion, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a dry unit weight of 20 kN/m<sup>3</sup>.

The applicable effective unit weight of the retained soil can be estimated as 13 kN/m<sup>3</sup>, where applicable. A hydrostatic pressure should be added to the total static earth pressure when calculating the effective unit weight.

The total seismic force ( $P_{AE}$ ) includes both the earth force component ( $P_o$ ) and the seismic component ( $\Delta P_{AE}$ ).

### **Static Earth Pressures**

The static horizontal earth pressure ( $p_o$ ) can be calculated using a triangular earth pressure distribution equal to  $K_o \cdot \gamma \cdot H$  where:

$K_o$  = at-rest earth pressure coefficient of the applicable retained soil (0.5)

$\gamma$  = unit weight of fill of the applicable retained soil (kN/m<sup>3</sup>)

$H$  = height of the wall (m)



An additional pressure having a magnitude equal to  $K_o \cdot q$  and acting on the entire height of the wall should be added to the above diagram for any surcharge loading,  $q$  (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the “at-rest” case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

## Seismic Earth Pressures

The total seismic force ( $P_{AE}$ ) includes both the earth force component ( $P_o$ ) and the seismic component ( $\Delta P_{AE}$ ).

The seismic earth force ( $\Delta P_{AE}$ ) can be calculated using  $0.375 \cdot a \cdot H^2/g$  where:

$$a_c = (1.45 - a_{max}/g)a_{max}$$

$\gamma$  = unit weight of fill of the applicable retained soil (kN/m<sup>3</sup>)

$H$  = height of the wall (m)

$g$  = gravity, 9.81 m/s<sup>2</sup>

The peak ground acceleration, ( $a_{max}$ ), for the Ottawa area is 0.33g according to OBC 2024. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component ( $P_o$ ) under seismic conditions can be calculated using  $P_o = 0.5 K_o \cdot \gamma \cdot H^2$ , where  $K = 0.5$  for the soil conditions noted above.

The total earth force ( $P_{AE}$ ) is considered to act at a height,  $h$  (m), from the base of the wall, where:

$$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\} / P_{AE}$$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2012.

## 5.7 Rock Anchor Design

### Overview of Anchor Features

The geotechnical design of grouted rock anchors in sedimentary bedrock is based upon two possible failure modes. The anchor can fail either by shear failure along the grout/rock interface or a 60 to 90 degree pullout of rock cone with the apex of

the cone near the middle of the bonded length of the anchor. Interaction may develop between the failure cones of anchors that are relatively close to one another, resulting in a total group capacity smaller than the sum of the load capacity of each individual anchor.

A third failure mode of shear failure along the grout/steel interface should be reviewed by the structural engineer to ensure all typical failure modes have been reviewed.

Anchors in close proximity to each other are recommended to be grouted at the same time to ensure any fractures or voids are completely in-filled and grout fluid does not flow from one hole to adjacent empty one.

Anchors can be of the “passive” or the “post-tensioned” type, depending on whether the anchor tendon is provided with post-tensioned load or not, prior to servicing. To resist seismic uplift pressures, a passive rock anchor system is adequate. However, a post-tensioned anchor will absorb the uplift load pressure with less deflection than a passive anchor.

Regardless of whether an anchor is of the passive or the post-tensioned type, it is recommended that the anchor is provided with a fixed anchor length at the anchor base, and a free anchor length between the rock surface and the top of the bonded length. As the depth at which the apex of the shear failure cone develops midway along the bonded length, a fully bonded anchor would tend to have a much shallower cone, then therefore, less geotechnical resistance, than one where the bonded length is limited to the bottom part of the overall anchor.

Permanent anchors should be provided with corrosion protection. As a minimum, the entire drill hole should be filled with cementitious grout. The free anchor length is provided by installing a plastic sleeve to act as a bond break, with the sleeve filled with grout or a corrosion inhibiting mastic.

Double corrosion protection can be provided with factory assembled systems, such as those available from Dywidag Systems or Williams Form Engineering Corp. Recognizing the importance of the anchors for the long-term performance of the foundation of the proposed building, if required, any rock anchors for this project are recommended to be provided with double corrosion protection.

### **Grout to Rock Bond**

The Canadian Foundation Engineering Manual recommends a maximum allowable grout to rock bond stress (for sound rock) of  $1/30$  of the unconfined compressive strength (UCS) of either the grout or rock (but less than 1.3 MPa) for an anchor of minimum length (depth) of 3 m. The unconfined compressive strength

of shale bedrock ranges between 40 and 90 MPa, which is stronger than most routine grouts. A factored tensile grout to rock bond resistance value at ULS of **1.0 MPa**, incorporating a resistance factor of 0.3, can be used. A minimum grout strength of 40 MPa is recommended.

### Rock Cone Uplift

As discussed previously, the geotechnical capacity of the rock anchors depends on the dimensions of the rock anchors and the configuration of the anchorage system. A **Rock Mass Rating (RMR) of 44** was assigned to the bedrock, and Hoek and Brown parameters (m and s) were taken as **0.183 and 0.00009**, respectively. For design purposes, all rock anchors were assumed to be placed at least 1.2 m apart to reduce group anchor effects.

### Recommended Rock Anchor Lengths

Parameters used to calculate rock anchor lengths are provided in Table 4 below.

<b>Table 4 - Parameters used in Rock Anchor Review</b>	
Grout to Rock Bond Strength - Factored at ULS	1.0 MPa
Compressive Strength - Grout	40 MPa
Rock Mass Rating (RMR)-Fair quality Shale Hoek and Brown parameters	44 m=0.183 and s=0.00009
Unconfined compressive strength - Shale bedrock	50 MPa
Unit weight - Submerged Bedrock	15 kN/m <sup>3</sup>
Apex angle of failure cone	60°
Apex of failure cone	mid-point of fixed anchor length

The fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75 mm and 125 mm diameter hole are provided in the following Table 3.

The factored tensile resistance values given in Table 5 are based on a single anchor with no group influence effects. A detailed analysis of the anchorage system, including potential group influence effects, could be provided once the details of the loading for the proposed building are determined.

<b>Table 5 - Recommended Rock Anchor Lengths - Grouted Rock Anchor</b>				
<b>Diameter of Drill Hole (mm)</b>	<b>Anchor Lengths (m)</b>			<b>Factored Tensile Resistance (kN)</b>
	<b>Bonded Length</b>	<b>Unbonded Length</b>	<b>Total Length</b>	
75	3.0	1.0	4.0	250
	2.2	3.6	5.8	500
	3.2	3.7	6.9	750
	5.3	4.3	9.6	1250
125	0.7	3.1	3.8	250
	1.3	4.0	5.3	500
	1.9	4.4	6.3	1250
	3.2	5.3	8.5	1250

### Other considerations

The anchor drill holes should be within 1.5 to 2 times the rock anchor tendon diameter, inspected by geotechnical personnel, and should be flushed clean prior to grouting. A tremie tube is recommended to place grout from the bottom of the anchor holes.

Compressive strength testing is recommended to be completed for the rock anchor grout. The geotechnical capacity of each rock anchor should be proof tested at the time of construction. More information on testing can be provided upon request. A set of grout cubes should be tested for each day grout is prepared.

## 5.8 Pavement Design

### Lowest Underground Parking Level

For design purposes, it is recommended that the rigid pavement structure for the lower underground parking level of the proposed building consist of Category C2, 32 MPa concrete at 28 days with air entrainment of 5 to 8%. The recommended rigid pavement structure is further presented in Table 6 below.

<b>Table 6 – Recommended Rigid Pavement Structure – Underground Parking Level</b>	
<b>Thickness (mm)</b>	<b>Material Description</b>
125	<b>Exposure Class C2 – 32 MPa Concrete</b> (5 to 8% Air Entrainment)
300	<b>BASE</b> – OPSS Granular A Crushed Stone
<b>SUBGRADE</b> – Existing imported fill, or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

To control cracking due to shrinking of the concrete floor slab, it is recommended that strategically located saw cuts be used to create control joints within the concrete floor slab of the lower underground parking level. The control joints are generally recommended to be located at the center of the column lines and spaced at approximately 24 to 36 times the slab thickness (for example; a 0.15 m thick slab should have control joints spaced between 3.6 and 5.4 m).

The joints should be cut between 25 and 30% of the thickness of the concrete floor slab and completed as early as 4 hour after the concrete has been poured during warm temperatures and up to 12 hours during cooler temperatures.

### **Pavement Structure Over Podium Deck**

The pavement structures presented in Tables 7 and 8 should be used for car only parking areas, at grade access lanes and heavy loading parking areas over the top of the podium structure, should they be required.

<b>Table 7 - Recommended Pavement Structure - Car Only Parking Areas Over Podium Deck</b>	
<b>Thickness (mm)</b>	<b>Material Description</b>
50	<b>Wear Course</b> – HL-3 or Superpave 12.5 Asphaltic Concrete
200*	<b>BASE</b> - OPSS Granular A Crushed Stone
See below**	<b>Thermal Break**</b> - Rigid Insulation (See Following Paragraph)
n/a	<b>Waterproofing Membrane and IKO Protection Board</b>
<b>SUBGRADE</b> – Reinforced concrete podium deck * Thickness of base course is dependent on grade of insulation as noted in proceeding paragraph ** If specified by others, not required from a geotechnical perspective	

**Table 8 - Recommended Pavement Structure – Access Lanes, Fire Truck Lane, Ramp, and Heavy Loading Areas Over Podium Deck**

Thickness (mm)	Material Description
40	<b>Wear Course</b> – HL-3 or Superpave 12.5 Asphaltic Concrete
50	<b>Binder Course</b> – HL-8 or Superpave 19.0 Asphaltic Concrete
300*	<b>BASE</b> - OPSS Granular A Crushed Stone
See below**	<b>Thermal Break**</b> - Rigid Insulation (See Following Paragraph)
n/a	<b>Waterproofing Membrane and IKO Protection Board</b>
<b>SUBGRADE</b> – Reinforced concrete podium deck * Thickness of base course is dependent on grade of insulation as noted in proceeding paragraph ** If specified by others, not required from a geotechnical perspective	

The transition between the pavement structure over the podium deck subgrade and soil subgrade beyond the footprint of the podium deck is recommended to be transitioned to match the pavement structures provided in the following section.

For this transition, a 5H:1V is recommended between the two subgrade surfaces. Further, the base layer thickness should be increased to a minimum thickness of 500 mm below the top of the podium slab a minimum of 1.5 m from the face of the foundation wall prior to providing the recommended taper.

Should the proposed podium deck be specified to be provided a thermal break by the use of a layer of rigid insulation below the pavement structure, its placement within the pavement structure is recommended to be as per the above-noted tables. The layer of rigid insulation is recommended to consist of a DOW Chemical High-Load 100 (HI-100), High-Load 60 (HI-60), or High-Load 40 (HI-40). The base layer thickness will be dependent on the grade of insulation considered for this project and should be reassessed by the geotechnical consultant once pertinent design details have been prepared.

The higher grades of insulation have more resistance to deformation under wheel-loading and require less granular cover to avoid being crushing by vehicular loading. It should be noted that SM (Styrofoam) rigid insulation is **not** considered suitable for this application.

### **Other Considerations**

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular (base and subbase) should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable compaction equipment.

## **6.0 Design and Construction Precautions**

### **6.1 Foundation Drainage and Backfill**

#### **Water Suppression System and Foundation Drainage**

For the proposed underground parking levels, it is anticipated that the majority of the building foundation walls will be placed in close proximity to the site boundaries. Therefore, it is recommended that the foundation wall be blind poured against a drainage system and waterproofing system fastened to the temporary shoring system. Waterproofing of the foundation wall is recommended, and the membrane is to be installed starting at the top of the foundation wall, extending down to founding elevation. The waterproofing membrane should also be extended horizontally below the proposed footings a minimum of 600 mm away from the face of the excavation. The membrane will serve as a water infiltration suppression system.

It is also recommended that the composite drainage system, such as Delta Drain 6000 or equivalent, be installed between the waterproofing membrane and the foundation wall, and extend from the exterior finished grade to the founding elevation (underside of footing or raft slab). The purpose of the composite drainage system is to direct any water infiltration resulting from a breach of the waterproofing membrane to the building sump pit.

It is recommended that 150 mm diameter sleeves at 3 m centres be cast in the foundation wall at the footing interface to allow the infiltration of water to flow to an interior perimeter underslab drainage pipe. The perimeter drainage pipe should direct water to sump pit(s) within the lower basement area.

#### **Sub-slab Drainage**

Sub-slab drainage will be required to control water infiltration below the lowest underground parking level slab. For preliminary design purposes, we recommend that 150 mm diameter perforated pipes be placed at approximate 6 m centres underlying the lowest level floor slab. The spacing of the sub-slab drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.

#### **Foundation Backfill**

Where space is available, backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials.



The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls unless used in conjunction with a composite drainage system, such as Delta Drain 6000 or an approved equivalent. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

## **6.2 Protection of Footings Against Frost Action**

Perimeter footings of heated structures are required to be insulated against the deleterious effects of frost action. A minimum of 1.5 m of soil cover alone, or a minimum of 0.6 m of soil cover in conjunction with adequate foundation insulation, should be provided.

Exterior unheated footings, such as those for isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the heated structure and require additional protection, such as soil cover of 2.1 m or an equivalent combination of soil cover and foundation insulation.

However, foundations which are founded directly on clean, surface-sounded bedrock, and which is approved by Paterson at the time of construction, is not considered frost susceptible and does not require soil cover.

The underground parking area should not require protection against frost action due to the founding depth. Unheated structures, such as the access ramp wall footings, may be required to be insulated against the deleterious effect of frost action. A minimum of 2.1 m of soil cover alone, or a minimum of 0.6 m of soil cover, in conjunction with foundation insulation, should be provided.

## **6.3 Excavation Side Slopes**

The side slopes of excavations in the overburden materials and weathered shale bedrock should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled.

### **Unsupported Excavations**

The excavation side slopes in the overburden and very poor to poor quality bedrock, above the groundwater level and extending to a maximum depth of 3 m, should be excavated at 1H:1V or shallower. The shallower slope is required for excavation below groundwater level. The subsurface soils are considered to be a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box is used to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

### **Bedrock Stabilization**

In sound bedrock, almost vertical side slopes can be constructed, provided all weathered and loose rock is removed or stabilized with rock anchors. A minimum 1 m horizontal ledge should remain between the unsupported excavation and sound bedrock surface. Where sufficient space for the horizontal ledge is not available, it is recommended that a temporary concrete block retaining wall be used to retain the overburden soils.

Where the vertical sides are constructed within sound bedrock, bedrock stabilization may be required. Specifically, horizontal anchors may be required at specific location to prevent pop-outs of the bedrock, especially in areas where bedrock fractures and weak bedding planes are conducive to the failure of the bedrock surface.

The requirement for horizontal rock anchors should be evaluated by Paterson during the excavation operations and should be discussed with the structural engineer during the design stage.

### **Temporary Shoring**

Temporary shoring may be required for the overburden soil and weathered bedrock to complete the required excavations where insufficient room is available for open cut methods. The design and approval of the temporary shoring system will be the responsibility of the shoring contractor and the shoring designer who is a licensed professional engineer and is hired by the shoring contractor. It is the responsibility of the shoring contractor to ensure that the temporary shoring is in compliance with safety requirements, designed to avoid any damage to adjacent structures, and include dewatering control measures.

In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes. The designer should also take into account the impact of a significant precipitation event and designate design measures to ensure that precipitation will not negatively impact the shoring system or soils supported by the system.

The temporary shoring system may consist of a soldier pile and lagging system. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be added to the earth pressures described below. These systems can be cantilevered, anchored or braced. Generally, the shoring systems should be provided with tie-back rock anchors to ensure the stability.

The toe of the shoring is recommended to be adequately supported to resist toe failure by means of rock bolts or extending the piles into the bedrock through pre-augered holes if a soldier pile and lagging system is used.

The earth pressure acting on the shoring system may be calculated using the parameters in Table 9:

<b>Table 9 – Soil Parameters</b>	
<b>Parameters</b>	<b>Values</b>
Active Earth Pressure Coefficient ( $K_a$ )	0.33
Passive Earth Pressure Coefficient ( $K_p$ )	3
At-Rest Earth Pressure Coefficient ( $K_o$ )	0.5
Unit Weight, kN/m <sup>3</sup>	21
Submerged Unit Weight, kN/m <sup>3</sup>	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible.

The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater table.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight is calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil should be calculated full weight, with no hydrostatic groundwater pressure component. For design purposes, the minimum factor of safety of 1.5 should be calculated.

## **6.4 Pipe Bedding and Backfill**

Bedding and backfill materials should be in accordance with the most recent Material Specifications & Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on soil subgrade. If the bedding is placed on bedrock, the thickness of the bedding should be increased to 300 mm for sewer pipes. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to 95% of the SPMDD.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to reduce the potential differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD.

## **6.5 Groundwater Control**

### **Groundwater Control for Building Construction**

It is anticipated that groundwater infiltration into the excavations should be controllable using open sumps. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

A temporary Ministry of Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required if more than 400,000 L/day of ground and/or surface water are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application 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, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

### **Impacts to Neighbouring Properties**

Based on the subsurface conditions encountered at the subject site, it is anticipated that the adjacent structures are founded on bedrock. Therefore, no adverse effects from short term and long term dewatering are expected for surrounding structures.

## **6.6 Winter Construction**

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site mostly consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters, tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

## **6.7 Corrosion Potential and Sulphate**

The results of analytical testing by others show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a moderate to very aggressive corrosive environment.

## **6.8 Protection of Potentially Expansive Bedrock**

Upon being exposed to air and moisture, shale may decompose into thin flakes along the bedding planes. Previous studies have concluded shales containing pyrite are subject to volume changes upon exposure to air. As a result, the formation of jarosite crystals by aerobic bacteria occurs under certain ambient conditions.

It has been determined that the expansion process does not occur or can be retarded when air (i.e. oxygen) is prevented from contact with the shale and/or the ambient temperature is maintained below 20°C, and/or the shale is confined by pressures in excess of 70 kPa. The latter restriction on the heaving process is probably the major reason why damage to structures has, for the greater part, been confined to slabs-on-grade rather than footings.

Based on the borehole logs, expansive shale may be encountered at the subject site. To reduce the long-term deterioration of the shale, exposure of the bedrock surface to oxygen should be kept as low as possible. The bedrock surface within the proposed building footprint should be protected from excessive dewatering and exposure to ambient air. A 50 mm thick concrete mud slab, consisting of minimum 15 MPa lean concrete, should be placed on the exposed bedrock surface within a 48-hour period of being exposed.

Another option for protecting the shale from deterioration is placing granular fill over the exposed surface within a 48-hour period after exposure. Preventing the dewatering of the shale bedrock will also prevent the rapid deterioration and expansion of the shale bedrock. This can be accomplished by spraying bituminous emulsion as noted above.

## 7.0 Recommendations

A materials testing and observation services program is a requirement for the provided foundation design data to be applicable. The following aspects of the program should be performed by the geotechnical consultant:

- ☐ Review of the geotechnical aspects of the excavating contractor's shoring design, prior to construction.
- ☐ Review the bedrock stabilization and excavation requirements.
- ☐ Observation of all bearing surfaces prior to the placement of concrete.
- ☐ Sampling and testing of the concrete and fill materials.
- ☐ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ☐ Observation of all subgrades prior to backfilling.
- ☐ Field density tests to determine the level of compaction achieved.
- ☐ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

All excess soil must be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management*.



## 8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

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 TCU Development Corporation, or their agent(s), is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

**Paterson Group Inc.**



Kevin Pickard, P.Eng.



Scott S. Dennis, P.Eng.

**Report Distribution:**

- ☐ TCU Development Corporation (email copy)
- ☐ Paterson Group (1 copy)



# APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LOG OF BOREHOLE SHEETS BY OTHERS

GRAIN SIZE DISTRIBUTION CURVE BY OTHERS

ANALYTICAL TESTING RESULTS BY OTHERS

## SOIL PROFILE AND TEST DATA

**BH 1-21**

[illegible]

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Proposed Multi-Storey Building

1137 Ogilvie Road and 1111 Cummings Ave., Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE April 19, 2021

FILE NO.

PG5770

HOLE NO.

BH 2-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
Asphaltic concrete	0.13		AU	1			0	71.97				
FILL: Brown silty sand with crushed stone	0.60											
FILL: Brown silty clay with sand and gravel, trace topsoil	1.45		SS	2	75	8	1	70.97				
FILL: Brown silty sand with gravel	2.36	SS	3	17	19	2	69.97					
		SS	4	20	50+							
BEDROCK: Very poor quality, black shale		RC	1	100	0	3	68.97					
- good quality by 3.1m depth		RC	2	100	85	4	67.97					
		RC	3	100	88	5	66.97					
	6.17					6	65.97					
End Borehole												
(GWL @ 3.06m - April 26, 2021)												

## SOIL PROFILE AND TEST DATA

**1137 Ogilvie Road and 1111 Cummings Ave., Ottawa, Ontario**

PG5770

**BH 3-21**

**DATE** April 19, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>												
Asphaltic concrete 0.10						0	71.78					
<b>FILL:</b> Brown silty sand with crushed stone 0.60		AU	1									
<b>FILL:</b> Dark grey to brown silty sand with clay, trace wood		SS	2	42	19	1	70.78					
1.68		SS	3	60	50+							
Compact, brown <b>SILTY SAND</b> , trace gravel 1.78						2	69.78					
		RC	1	87	0							
<b>BEDROCK:</b> Very poor to poor quality, black shale						3	68.78					
		RC	2	72	25	4	67.78					
- excellent quality by 4.6m depth												
		RC	3	100	94	5	66.78					
5.87												
End of Borehole												
(GWL @ 3.15m - April 26, 2021)												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

[illegible]

[illegible]

# SYMBOLS AND TERMS

## SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

## SYMBOLS AND TERMS (continued)

### SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity,  $S_t$ , is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

### ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

### SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.



## SYMBOLS AND TERMS (continued)

### PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = $D_{60} / D_{10}$

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have:  $1 < Cc < 3$  and  $Cu > 4$

Well-graded sands have:  $1 < Cc < 3$  and  $Cu > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

Cc and Cu are not applicable for the description of soils with more than 10% silt and clay  
(more than 10% finer than 0.075 mm or the #200 sieve)

### CONSOLIDATION TEST

$p'_o$	-	Present effective overburden pressure at sample depth
$p'_c$	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below $p'_c$ )
Cc	-	Compression index (in effect at pressures above $p'_c$ )
OC Ratio		Overconsolidation ratio = $p'_c / p'_o$
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

### PERMEABILITY TEST

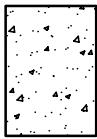
k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.
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## SYMBOLS AND TERMS (continued)

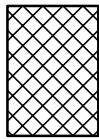
### STRATA PLOT



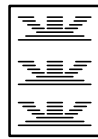
Topsoil



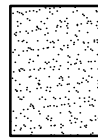
Asphalt



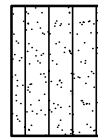
Fill



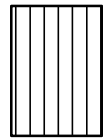
Peat



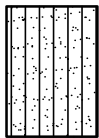
Sand



Silty Sand



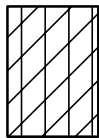
Silt



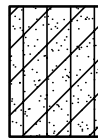
Sandy Silt



Clay



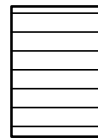
Silty Clay



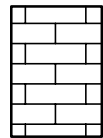
Clayey Silty Sand



Glacial Till



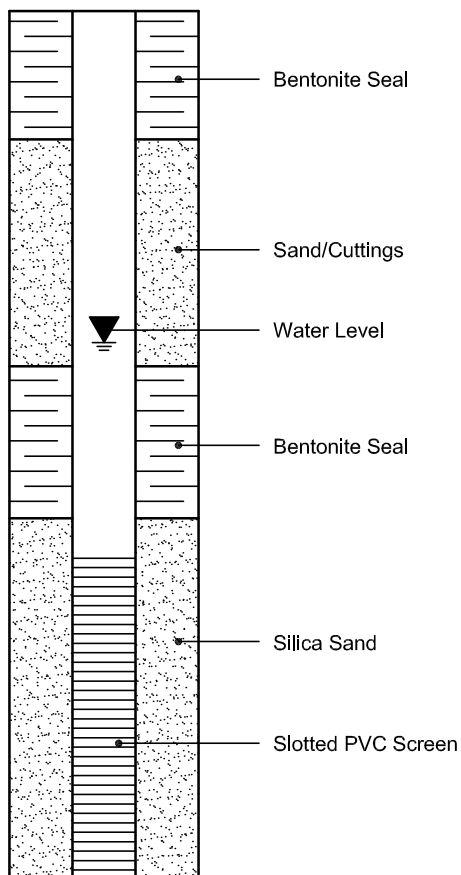
Shale



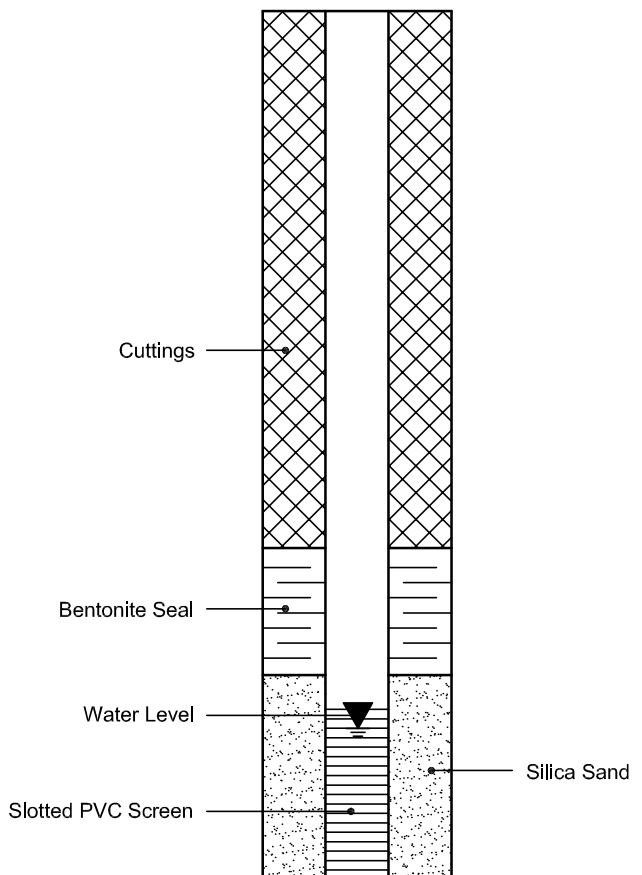
Bedrock

### MONITORING WELL AND PIEZOMETER CONSTRUCTION

#### MONITORING WELL CONSTRUCTION



#### PIEZOMETER CONSTRUCTION



# Log of Borehole BH1



Project No: OTT-24006095-A0

Project: Proposed Geotechnical Investigation

Location: 1151 Ogilvie, Ottawa, ON

Figure No. 3

Page. 1 of 1

Date Drilled: June 4, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: DW

Split Spoon Sample ☒

Auger Sample ☒

SPT (N) Value ☐

Dynamic Cone Test ☐

Shelby Tube ☒

Shear Strength by  
Vane Test ☐

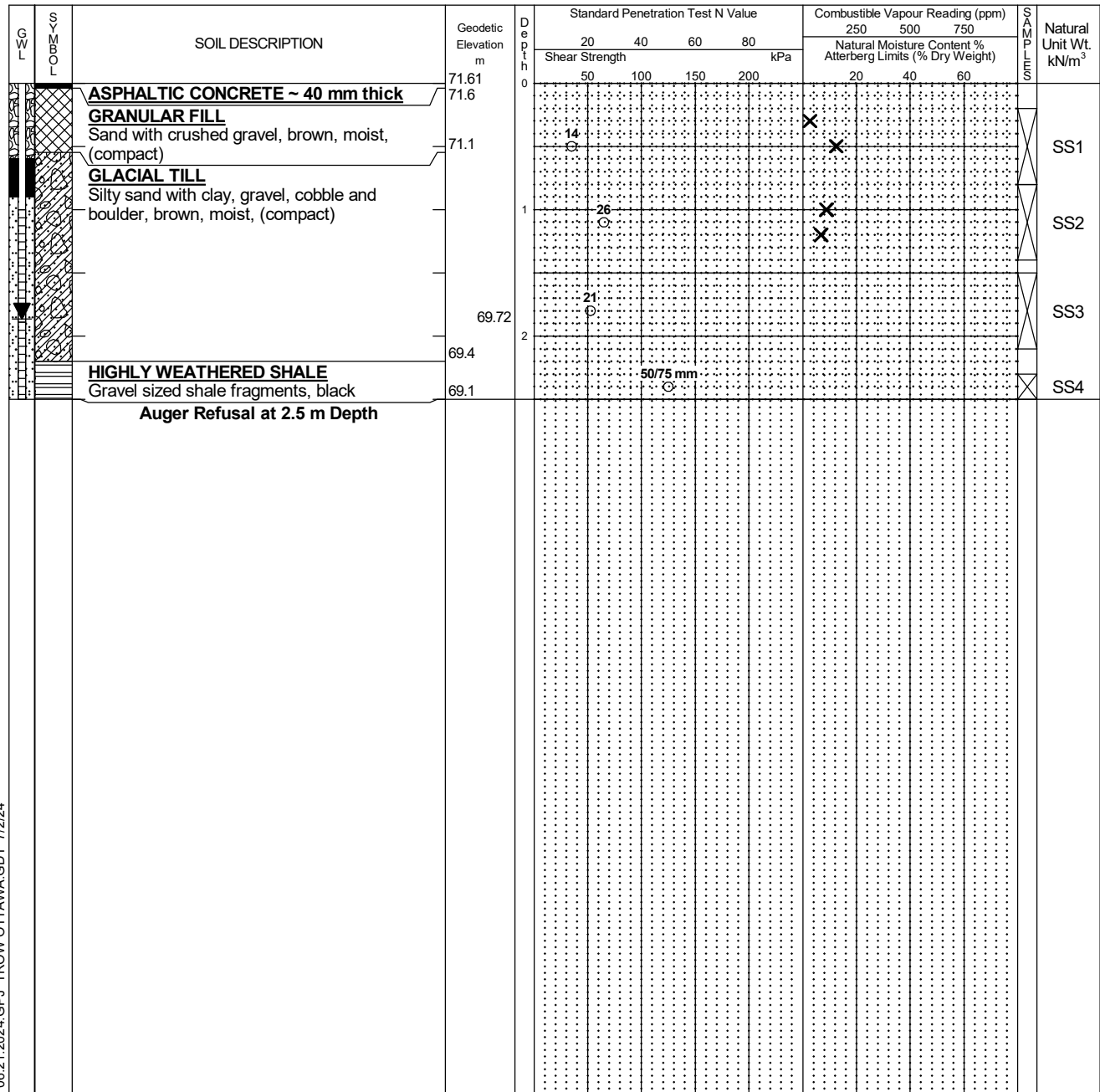
Combustible Vapour Reading ☐

Natural Moisture Content ☒

Atterberg Limits ☐

Undrained Triaxial at  
% Strain at Failure ☐

Shear Strength by  
Penetrometer Test ☒



## NOTES:

- Borehole data requires interpretation by EXP before use by others
- 32 mm monitoring well installed upon completion
- Field work was supervised by an EXP representative.
- See Notes on Sample Descriptions
- Log to be read with EXP Report OTT-24006095-A0

## WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
6/24/2024	1.9	

## CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE GINT LOGS 06.21.2024.GPJ TROW OTTAWA.GDT 7/2/24

# Log of Borehole BH2



Project No: OTT-24006095-A0

Project: Proposed Geotechnical Investigation

Location: 1151 Ogilvie, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: June 4, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: DW

Split Spoon Sample ☒

Auger Sample ☐

SPT (N) Value ☐

Dynamic Cone Test ☐

Shelby Tube ☐

Shear Strength by  
Vane Test ☐

Combustible Vapour Reading ☐

Natural Moisture Content ☒

Atterberg Limits ☐

Undrained Triaxial at  
% Strain at Failure ☐

Shear Strength by  
Penetrometer Test ☐

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth m	Standard Penetration Test N Value				Combustible Vapour Reading (ppm)			SAMPLES	Natural Unit Wt. kN/m³	
									250	500	750			
					Shear Strength kPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)					
					20	40	60	80	20	40	60			
		<b>ASPHALTIC CONCRETE ~ 50 mm thick</b>	71.85	0										
		<b>GRANULAR FILL</b>	71.8											
		Sand with crushed gravel, brown, moist, (compact)												
		<b>FILL</b>	71.2											SS1
		Silty sand with gravel, brown, moist, (loose)												
				1										SS2
		<b>GLACIAL TILL</b>	70.5											
		Silty sand with clay, gravel, cobble and boulder, brown, moist, (dense)												SS3
		<b>Auger Refusal at 2 m Depth</b>	69.969.88	2										

## NOTES:

- Borehole data requires interpretation by EXP before use by others
- 32 mm monitoring well installed upon completion
- Field work was supervised by an EXP representative.
- See Notes on Sample Descriptions
- Log to be read with EXP Report OTT-24006095-A0

## WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
6/24/2024	2.0	

## CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE GINT LOGS 06.21.2024.GPJ TROW OTTAWA.GDT 7/2/24

# Log of Borehole BH3



Project No: OTT-24006095-A0

Project: Proposed Geotechnical Investigation

Location: 1151 Ogilvie, Ottawa, ON

Figure No. 5

Page. 1 of 1

Date Drilled: June 4, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: DW

Split Spoon Sample ☒

Auger Sample ☐

SPT (N) Value ☐

Dynamic Cone Test ☐

Shelby Tube ☐

Shear Strength by  
Vane Test ☐

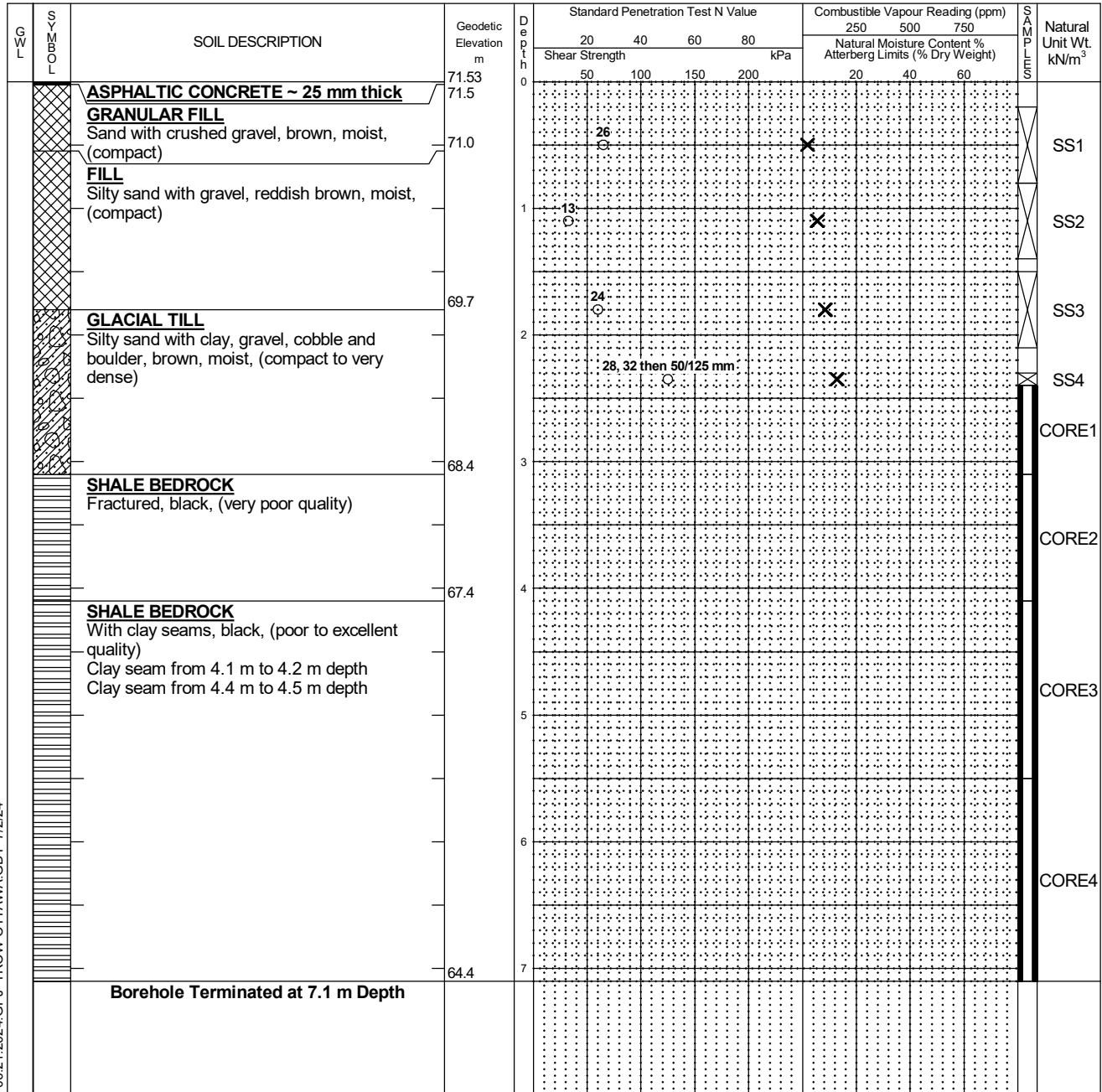
Combustible Vapour Reading ☐

Natural Moisture Content ☒

Atterberg Limits ☐

Undrained Triaxial at  
% Strain at Failure ☐

Shear Strength by  
Penetrometer Test ☐



## NOTES:

- Borehole data requires interpretation by EXP before use by others
- The borehole was backfilled upon completion.
- Field work was supervised by an EXP representative.
- See Notes on Sample Descriptions
- Log to be read with EXP Report OTT-24006095-A0

## WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

## CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.4 - 3.1	28	0
2	3.1 - 4.1	100	0
3	4.1 - 5.5	100	40
4	5.5 - 7.1	100	97

# Log of Borehole BH4



Project No: OTT-24006095-A0

Project: Proposed Geotechnical Investigation

Location: 1151 Ogilvie, Ottawa, ON

Figure No. 6

Page. 1 of 1

Date Drilled: June 4, 2024

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: MZ Checked by: DW

Split Spoon Sample ☒

Auger Sample ☒

SPT (N) Value ☐

Dynamic Cone Test ☐

Shelby Tube ☒

Shear Strength by  
Vane Test ☐

Combustible Vapour Reading ☐

Natural Moisture Content ☒

Atterberg Limits ☐

Undrained Triaxial at  
% Strain at Failure ☐

Shear Strength by  
Penetrometer Test ☒

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth m	Standard Penetration Test N Value				Combustible Vapour Reading (ppm)			SAMPLES	Natural Unit Wt. kN/m³	
					20      40      60      80				250      500      750					
					Shear Strength kPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)					
			71.55	0	50	100	150	200		20	40	60		
		<b>ASPHALTIC CONCRETE ~ 50 mm thick</b>	71.5											
		<b>GRANULAR FILL</b>												
		Sand with crushed gravel, brown, moist, (compact)	70.9	19						X				SS1
		<b>FILL</b>												
		Silty sand with gravel, brown, moist, (loose)		8						X				SS2
		With topsoil inclusions from 0.8 m to 1.4 m depth												
			69.83	7						X				SS3
			69.4											
		<b>HIGHLY WEATHERED SHALE</b>												
		Gravel sized shale fragments, black	69.0	28, then 50/75 mm						X				SS4
		<b>Auger Refusal at 2.6 m Depth</b>												

## NOTES:

- Borehole data requires interpretation by EXP before use by others
- 38 mm monitoring well was installed in the borehole upon completion
- Field work was supervised by an EXP representative.
- See Notes on Sample Descriptions
- Log to be read with EXP Report OTT-24006095-A0

## WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
6/24/2024	1.7	

## CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

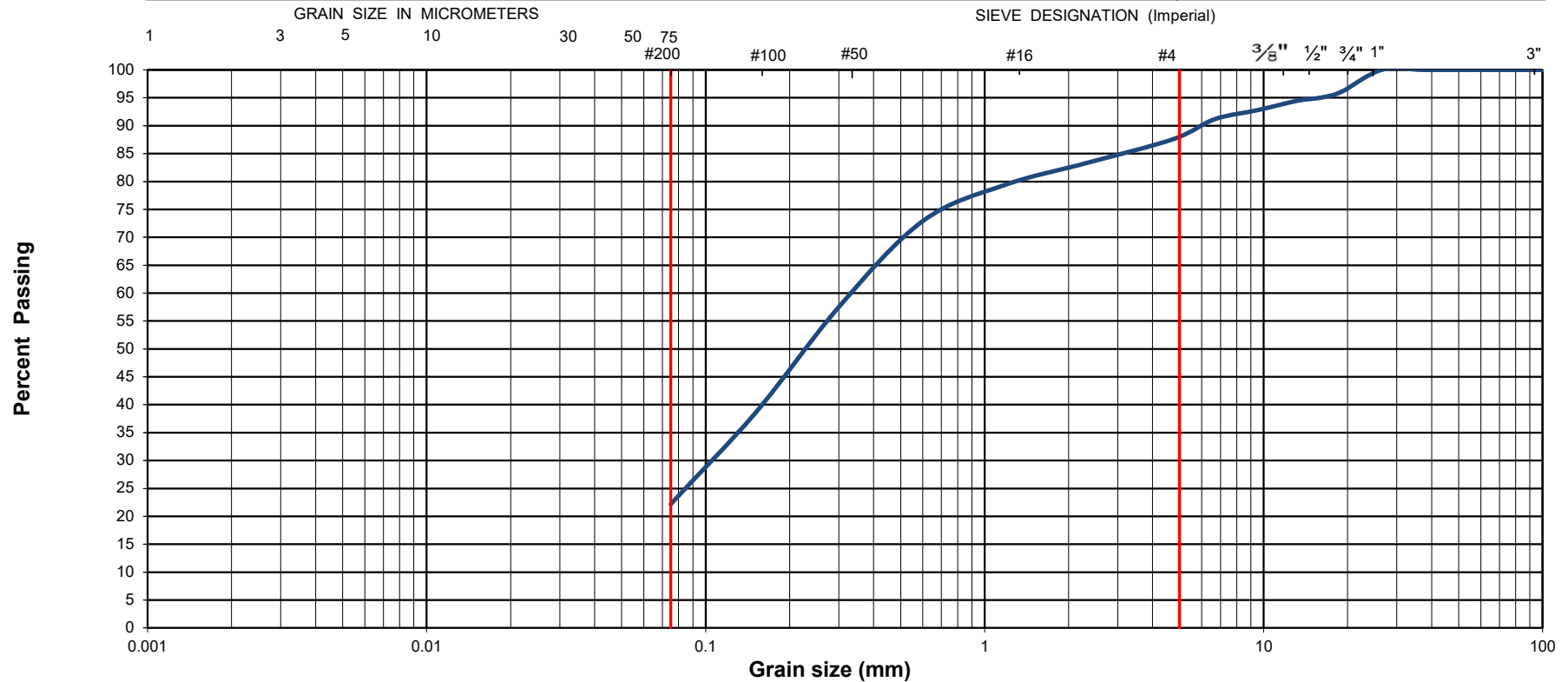


**Grain-Size Distribution Curve**  
**Method of Test For Sieve Analysis of Aggregate**  
**ASTM C-136**

**EXP Services Inc.**  
100-2650 Queensview Drive  
Ottawa, ON K2B 8H6

**Unified Soil Classification System**

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



EXP Project No.:	OTT-24006095-A0	Project Name : Proposed Residential Development						
Client :	Starwood Group	Project Location : 1151 Ogilvie Road, Ottawa, Ontario						
Date Sampled :	June 4, 2024	Borehole No: BH24-2			Sample: SS3		Depth (m) : 1.5-2.1	
Sample Composition :		Gravel (%)	12	Sand (%)	66	Silt & Clay (%)	22	Figure : 8
Sample Description : Glacial Till - Silty Sand (SM), some gravel								

**CLIENT NAME: EXP SERVICES INC**  
**2650 QUEENSVIEW DRIVE, UNIT 100**  
**OTTAWA, ON K2B8H6**  
**(613) 688-1899**

**ATTENTION TO: Daniel Wall**

**PROJECT: OTT-24006095-A0**

**AGAT WORK ORDER: 24Z161936**

**SOIL ANALYSIS REVIEWED BY: Sukhwinder Randhawa, Inorganic Team Lead**

**DATE REPORTED: Jun 20, 2024**

**PAGES (INCLUDING COVER): 5**

**VERSION\*: 1**

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

\*Notes

**Disclaimer:**

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.





# Certificate of Analysis

AGAT WORK ORDER: 24Z161936

PROJECT: OTT-24006095-A0

5835 COOPERS AVENUE  
MISSISSAUGA, ONTARIO  
CANADA L4Z 1Y2  
TEL (905)712-5100  
FAX (905)712-5122  
<http://www.agatlabs.com>

CLIENT NAME: EXP SERVICES INC

SAMPLING SITE: 1151 Ogilvie Road, Ottawa

ATTENTION TO: Daniel Wall

SAMPLED BY: EXP

## (Soil) Inorganic Chemistry

DATE RECEIVED: 2024-06-12

DATE REPORTED: 2024-06-20

		SAMPLE DESCRIPTION:		BH24-4 SS4 (7.5'-9.5')	BH24-1 SS3 (5'-7')
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2024-06-04	2024-06-04
Parameter	Unit	G / S	RDL	5933210	5933211
Chloride (2:1)	µg/g		2	125	66
Sulphate (2:1)	µg/g		2	540	301
pH (2:1)	pH Units		NA	7.38	8.52
Electrical Conductivity (2:1)	mS/cm		0.005	0.769	0.217

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard

**5933210-5933211** EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by \*)

Certified By:



*D. Wall*

## Quality Assurance

CLIENT NAME: EXP SERVICES INC

PROJECT: OTT-24006095-A0

SAMPLING SITE: 1151 Ogilvie Road, Ottawa

AGAT WORK ORDER: 24Z161936

ATTENTION TO: Daniel Wall

SAMPLED BY: EXP

### Soil Analysis

RPT Date: Jun 20, 2024			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper

#### (Soil) Inorganic Chemistry

Chloride (2:1)	5936670		189	194	2.6%	< 2	98%	70%	130%	99%	80%	120%	96%	70%	130%
Sulphate (2:1)	5936670		86	87	1.2%	< 2	100%	70%	130%	100%	80%	120%	98%	70%	130%
pH (2:1)	5946237		7.40	8.30	11.5%	NA	98%	80%	120%						
Electrical Conductivity (2:1)	5946237		0.172	0.174	1.2%	< 0.005	101%	80%	120%						

Comments: NA signifies Not Applicable.

pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

#### (Soil) Inorganic Chemistry

pH (2:1)	5933210	5933210	7.38	6.96	5.9%	NA	98%	80%	120%
Electrical Conductivity (2:1)	5933210	5933210	0.769	0.749	2.6%	< 0.005	100%	80%	120%

Comments: NA signifies Not Applicable.

pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By:


*Subhinder Kaur Randhawa*



## Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 24Z161936

PROJECT: OTT-24006095-A0

ATTENTION TO: Daniel Wall

SAMPLING SITE: 1151 Ogilvie Road, Ottawa

SAMPLED BY: EXP

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
<b>Soil Analysis</b>			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE



## Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

### Report Information:

Company: EXP Services Inc  
Contact: Daniel Wall  
Address: 2650 Queensview Drive, Suit 100  
Ottawa, Ontario, K2B 8H6  
Phone: 613-688-1899 Fax:  
Reports to be sent to:  
1. Email: daniel.wall@exp.com  
2. Email: ryan.digiuseppe@exp.com

### Project Information:

Project: OTT-24006095-A0  
Site Location: 1151 Ogilvie Road, Ottawa  
Sampled By: EXP  
AGAT Quote #: PO:

### Invoice Information:

Bill To Same: Yes ☒ No ☐  
Company:  
Contact:  
Address:  
Email:

### Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04

Table Indicate One  
☐ Ind/Com  
☐ Res/Park  
☐ Agriculture

Soil Texture (Check One)

☐ Coarse  
☐ Fine

☐ Regulation 406

Table Indicate One  
☐ Ind/Com  
☐ Res/Park  
☐ Agriculture

☐ Regulation 558

☐ CCME

☐ Sewer Use

☐ Sanitary ☐ Storm

Region

☐ Prov. Water Quality  
Objectives (PWQO)

☐ Other

Indicate One

Is this submission for a Record  
of Site Condition (RSC)?

☐ Yes ☐ No

Report Guideline on  
Certificate of Analysis

☐ Yes ☐ No

Legal Sample ☐

### Sample Matrix Legend

GW Ground Water SD Sediment  
O Oil SW Surface Water  
P Paint R Rock/Shale  
S Soil

### Laboratory Use Only

Work Order #: 242161936

Cooler Quantity: n/a-no ice/packs

Arrival Temperatures: 24.2 24.4 24.4

Depart Temperatures: 4.7 4.9 5.2

Custody Seal Intact: ☒ Yes ☐ No ☐ N/A

Notes: BIF

### Turnaround Time (TAT) Required:

Regular TAT

☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT  
\*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CSR

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, Cu, DOC	O, Reg 153	O, Reg 406	O, Reg 558	Field Filtered - Metals, Hg, Cu, DOC	Metals & Inorganics	Metals - <input type="checkbox"/> Cu, <input type="checkbox"/> Hg, <input type="checkbox"/> HWSB	BTEX, F1-F4 PHCs	VOC	PAHs	PCBs: Aroclors <input type="checkbox"/>	Regulation 406 Characterization Package	pH, Metals, BTEX, F1-F4	EC, SAR	Regulation 406 SPLP Rainwater Leach	msSPLP <input type="checkbox"/> Metals <input type="checkbox"/> VOCs <input type="checkbox"/> SVOCs <input type="checkbox"/> OC	Landfill Disposal Characterization TCLP:	TCLP <input type="checkbox"/> M&T <input type="checkbox"/> VOCs <input type="checkbox"/> A&Hs <input type="checkbox"/> Biodegradables <input type="checkbox"/> PCBs	Corrosivity: <input type="checkbox"/> Moisture <input type="checkbox"/> Sulphide	pH	Sulphates	Chlorides	Electro Conductivity	Potentially Hazardous or High Concentration (Y/N)		
1. BH24-4 SS4 (7.5'-9.5')	June 4	AM	1																												
2. BH 24-1 SS3 (5'-7')	June 4	AM	1																												
3.		AM																													
4.		AM																													
5.		AM																													
6.		AM																													
7.		AM																													
8.		AM																													
9.		AM																													
10.		AM																													
11.		AM																													

Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:
Ca. To Puro	06/13/24	1500	C. Griffiths	06/12/24	110115
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:
			John 14	06/14	09:25
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

## APPENDIX 2

FIGURE 1 – KEY PLAN

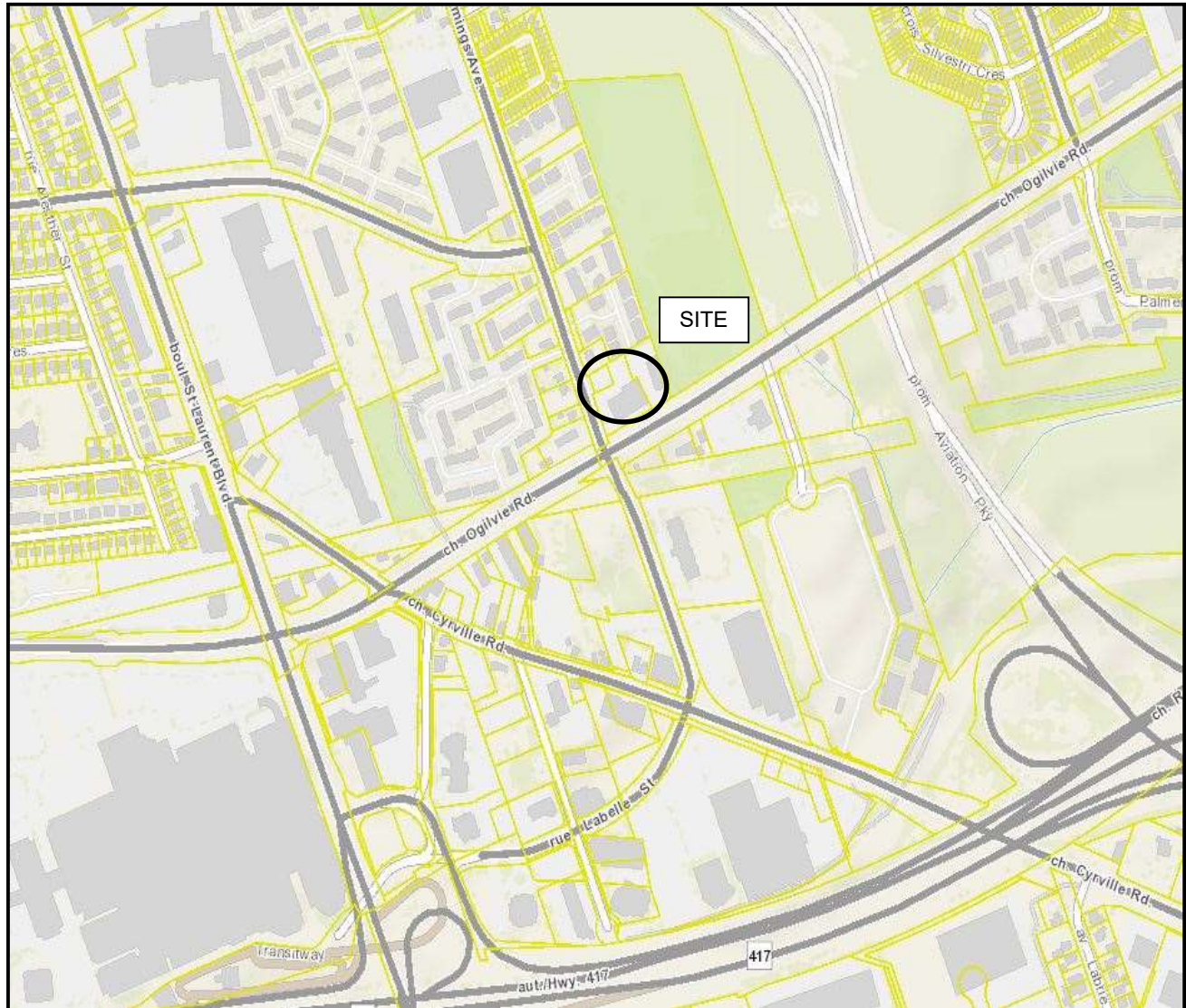
FIGURE 2 – AERIAL PHOTOGRAPH – 1991

FIGURE 3 – AERIAL PHOTOGRAPH – 2019

FIGURE 4 & 5 – SEISMIC SHEAR WAVE VELOCITY PROFILES

DRAWING PG5770-1 – TEST HOLE LOCATION PLAN





**FIGURE 1**

**KEY PLAN**



## **FIGURE 2**

**Aerial Photograph - 1991**





**FIGURE 3**

**Aerial Photograph - 2019**



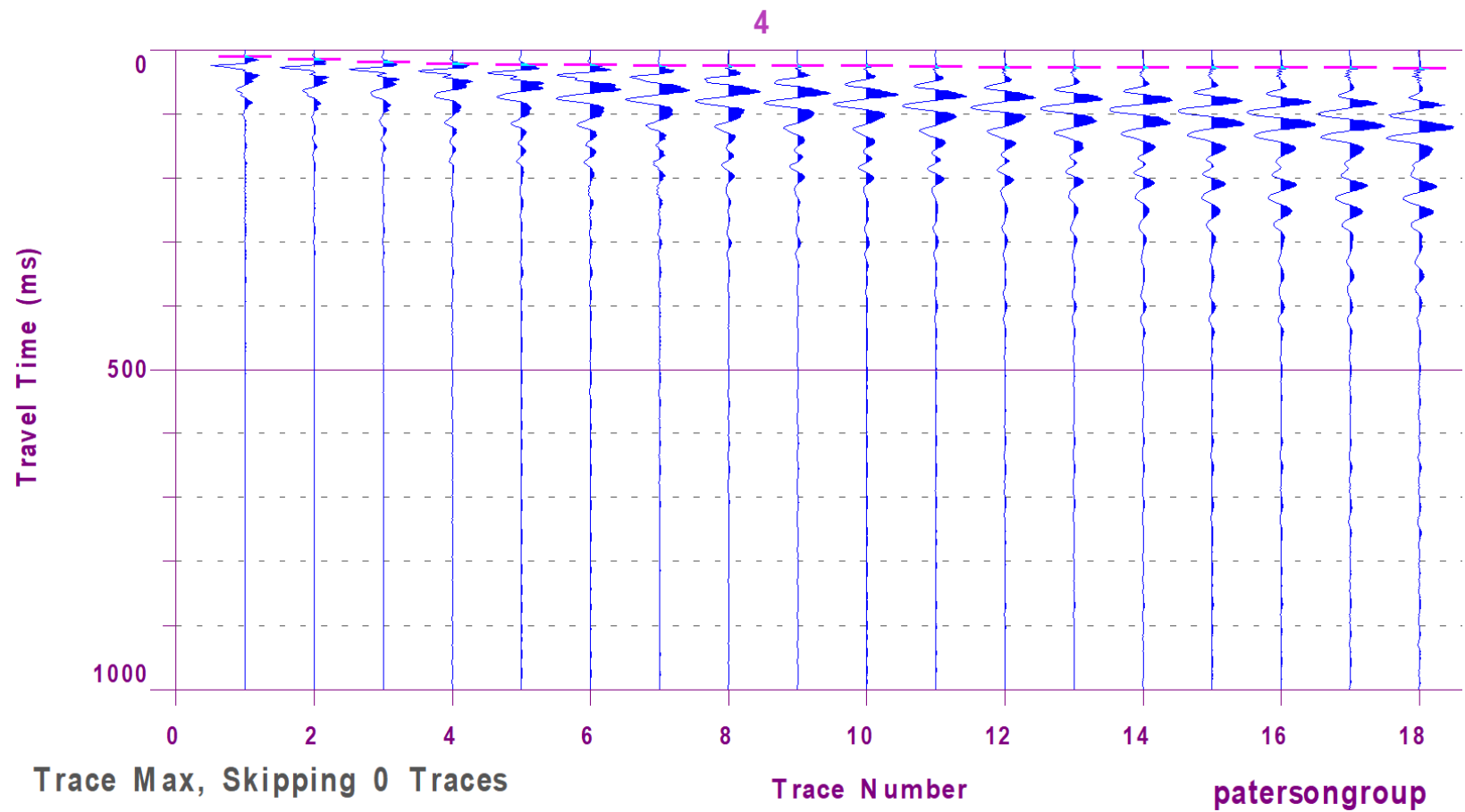


Figure 4 – Shear Wave Velocity Profile at Shot Location -5 m

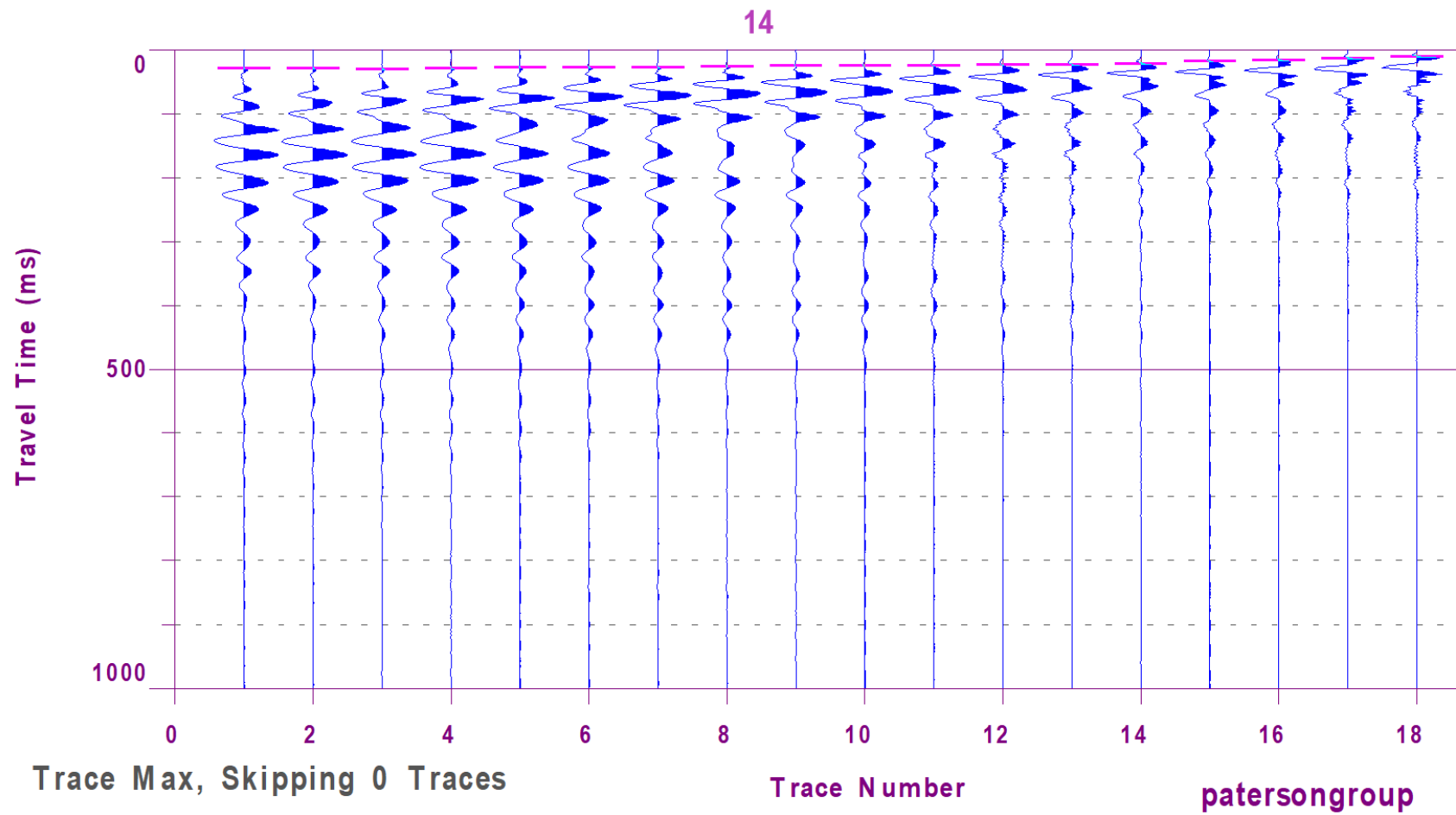
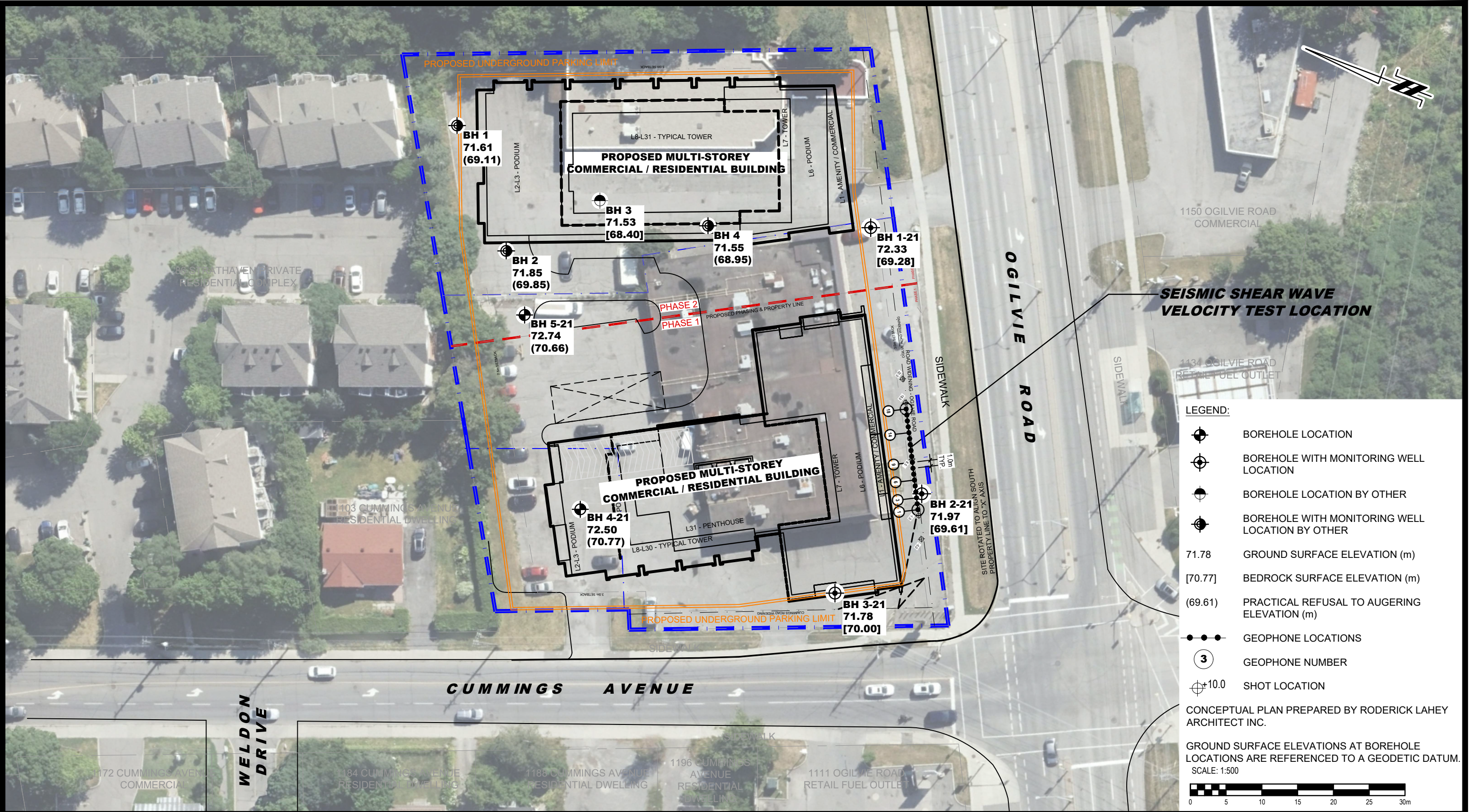



Figure 5 – Shear Wave Velocity Profile at Shot Location 22 m







9 AURIGA DRIVE  
OTTAWA, ON  
K2E 7T9  
TEL: (613) 226-7381

4	UPDATED TO NEW CONCEPTUAL PLAN	03/02/2025	KP
3	UPDATED TO NEW CONCEPTUAL PLAN AND ADDED BOREHOLE LOCATION BY OTHERS	20/01/2025	MA
2	ADDED SEISMIC SHEAR WAVE VELOCITY TEST LOCATION	13/08/2024	FC
1	UPDATED TO NEW CONCEPTUAL PLAN	03/07/2024	KP
NO.	REVISIONS	DATE	INITIAL

TCU DEVELOPMENT CORP.

GEOTECHNICAL INVESTIGATION  
PROPOSED MULTI-STOREY BUILDING

OTTAWA, ONTARIO

1137/1151 OGILVIE ROAD AND 1111 CUMMINGS AVENUE

Title: TEST HOLE LOCATION PLAN

Scale:	1:500	Date:	05/2021
Drawn by:	JM	Report No.:	PG5770-1
Checked by:	KP	Dwg. No.:	PG5770-1
Approved by:	DJG	Revision No.:	4



**With every community, we redefine what's possible.**



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