Servicing and Stormwater Management Report: 283 -285 McLeod Street

Stantec Project No. 160401560

August 18, 2021

Prepared for:

Zyer Developments Inc.

Prepared by:

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Revision	Description	Author		Quality Check		Independent Review	
0	1st Submission (re-zoning application)	NN	2021-08-11	KS, ALG, TR	2021-08-12	KK	2021-08-13

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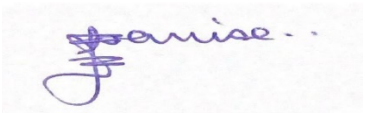
Prepared by 

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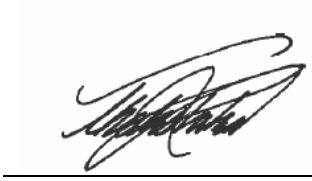
Reviewed by 

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1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by Zyer Developments Inc. to prepare the following site servicing and stormwater management (SWM) report in support of a rezoning application in respect of the proposed 8-storey residential development at 283 and 285 McLeod Street in the City of Ottawa.

The subject property is approximately 832m^2 in area containing two existing buildings (See **Figure 1**). The existing building on 283 McLeod will be demolished while the building on 285 McLeod will be underpinned and have its basement height lowered with concrete. GRC Architects have prepared a draft site plan to support the rezoning application (see **Appendix B**). The site plan shows the amalgamation of Lot 283 & 285, proposed 8-storey building, basement parking with provision for 11 cars and 19 bike storages. The proposed development consists of 30 residential units with indoor and outdoor amenity areas serving a projected population of 67 people.

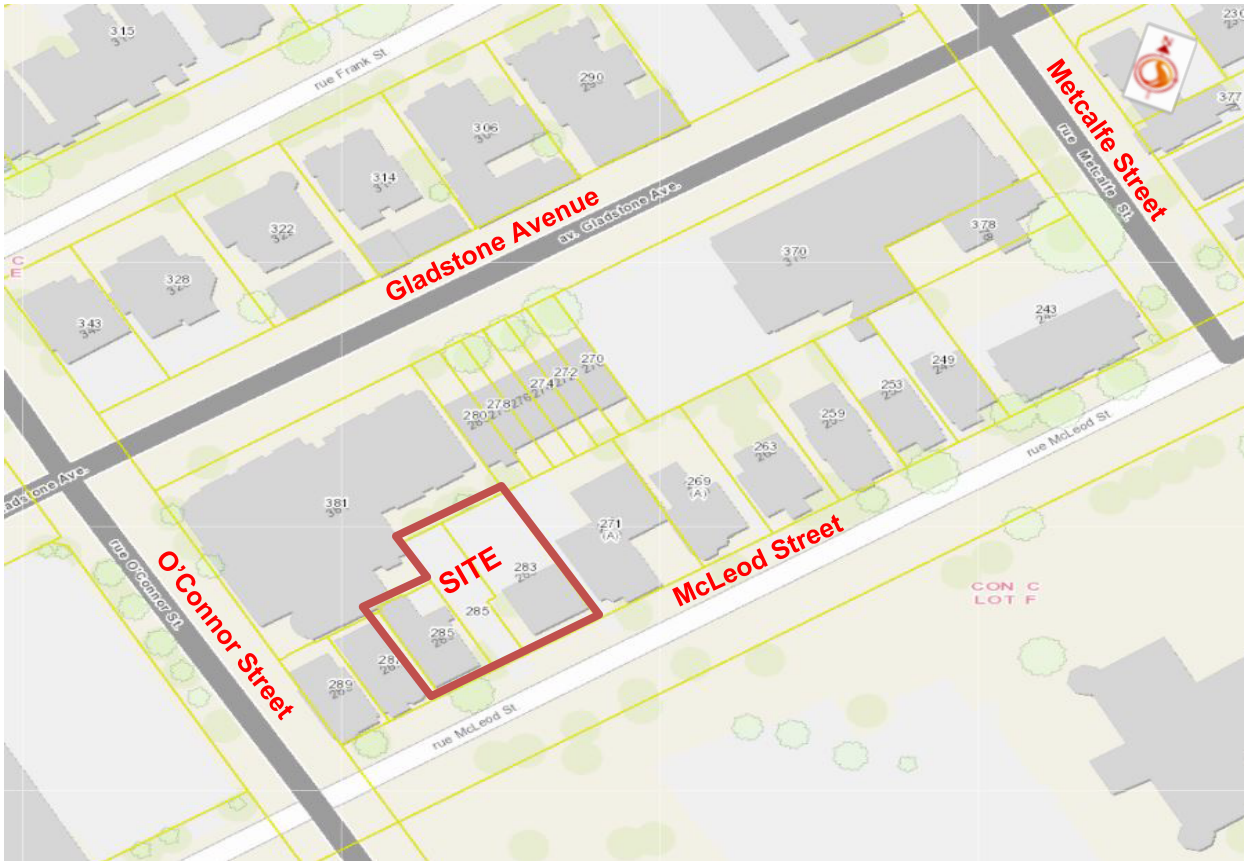


Figure 1: Location Map

The site is located within a combined sewer area and will be serviced by a single connection to the existing municipal services on McLeod Street. The intent of this report is to provide a servicing scenario for the site that is free of conflicts, provides on-site servicing in accordance with City of Ottawa design

guidelines, and utilizes the existing local infrastructure in accordance with the guidelines outlined per consultation with City of Ottawa staff.

2.0 REFERENCES

Documents referenced in preparation of this servicing and stormwater management study include:

- *City of Ottawa Design Guidelines - Water Distribution*, City of Ottawa, July 2010 (including all subsequent technical bulletins).
- *City of Ottawa Sewer Design Guidelines (SDG)*, City of Ottawa, October 2012 (including all subsequent technical bulletins).
- Geotechnical Investigation - Proposed Multi-Storey Building, 283 & 285 McLeod Street, Ottawa, ON, Paterson Group Inc, September 2020.

3.0 POTABLE WATER SERVICING

3.1 BACKGROUND

The property is located within the City's Pressure Zone 1W. The proposed development comprises an 8-storey residential apartment building consisting of 30 residential units with indoor and outdoor amenity areas. The site is currently serviced using two separate water service connections fed from the existing 203mm dia. watermain on McLeod Street. The City requires a single service connection for properties built on combined lot areas; therefore, the proposed development will be serviced by a new single water service connection off McLeod Street. Average ground elevations of the site are approximately 71m. Under normal operating conditions, hydraulic grade lines vary from approximately 106.8m to 115.3m as confirmed through boundary conditions provided by the City of Ottawa (see **Appendix A.3**).

3.2 WATER DEMANDS

3.2.1 Domestic Water Demands

Water demands for the development were estimated using the Ministry of Environment's Design Guidelines for Drinking Water Systems (2008) and the Ottawa Design Guidelines – Water Distribution (2010). A daily rate of 350 L/cap/day has been applied for the projected population of the proposed development. Population densities have been assumed as 1.4 pers./one bedroom, 2.1 pers./ one bedroom with den and two-bedroom, 3.1 pers./ two bedroom with den and three-bedroom units. See **Appendix A.1** for detailed domestic water demand estimates.

The average day demand (AVDY) for the entire site was determined to be 0.28 L/s. The maximum daily demand (MXDY) is 2.5 times the AVDY for residential areas, which sums to 0.70 L/s. The peak hour demand (PKHR) is 2.2 times the MXDY for residential areas totaling 1.52 L/s. A demand of 28,000 L/ha/day was applied to the 398 m^2 amenity space consisting of indoor and outdoor amenity space. The estimated demands are summarized in **Table 3–1** below.

Table 3–1: Estimated Water Demands

Demand Type	Population	Area (m^2)	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Residential	67	-	0.27	0.68	1.49
Communal Amenity Space	-	398	0.01	0.02	0.03
Total Site:	**67**	-	**0.28**	**0.70**	**1.52**

3.2.2 Fire Flow Demands

Non-combustible construction with 2-hour fire separation provided between each floor and 1-hour fire separation for exterior vertical communications was considered in the assessment of fire flow requirements

for the site. Based on calculations per Fire Underwriters Survey's (FUS) Water Supply for Public Fire Protection, 1999 requirements (see **Appendix A.2**), the minimum required fire flow for this development is 83.3L/s (5,000L/min). A sprinkler system per NFPA 13 is required to service the proposed site.

3.2.3 Boundary Conditions

The boundary conditions provided by the City of Ottawa on July 19th, 2021 shown in **Table 3–2** and **Appendix A.3** represents the hydraulic boundary conditions for the site and have been used to determine the residual watermain pressures on McLeod Street.

Table 3–2: Boundary Conditions

	Connection at McLeod Street
Min. HGL (m)	106.8
Max. HGL (m)	115.3
Max. Day + Fire Flow (83.3 L/s) (m)	106.5

3.3 PROPOSED SERVICING

The proposed finished floor elevation at the front of the building (71.28m) will serve as the ground elevation for the calculation of residual pressures at ground level. On-site pressures are expected to range from 352kPa (51 psi) to 434 kPa (63 psi) under normal operating conditions. These values are within the normal operating pressure range as defined by City of Ottawa design guidelines which desires 50 to 80 psi and not less than 40 psi. Booster pumps internal to the buildings will be required to provide adequate pressures for upper storeys. These pumps are to be designed by the buildings' mechanical engineer.

Based on anticipated maximum daily demand and fire flow requirements as per the FUS methodology (**Appendix A.2**) of 83.3L/s, the boundary conditions provided by the City of Ottawa indicate that the 203mm watermain within McLeod Street is expected to maintain a residual pressure of 35.22m equivalent to 345kPa (51 psi) under the specified fire flow conditions. This demonstrates that the existing watermain and nearby hydrants can provide the designed fire flows while maintaining a residual pressure of 20psi. The nearest existing hydrant fronting the site on McLeod Street is about 45m from the main building entrance, this is well within the City of Ottawa requirements.

The existing water service connections to the existing buildings will be removed and blanked at the main according to the City's standards. A new 150mm diameter water service connection to the building will be introduced.

3.4 SUMMARY OF FINDINGS

Based on these results, there is currently adequate supply and pressure in the water distribution system to meet the domestic and fire flow demands expected for the new development.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

The site will be serviced via an existing 525 mm diameter combined sanitary and stormwater sewer fronting the site on McLeod Street ROW (see **Drawing SSP-1** in **Appendix F**). The existing buildings on 283 and 285 McLeod Street are currently separately serviced by two sanitary service laterals, these connections will be capped and removed according to City of Ottawa standards. The proposed development will be serviced by a single 200mm dia. sanitary service lateral connection to the existing 525 mm dia. combined sewer as per the City of Ottawa guidelines.

4.2 DESIGN CRITERIA

As outlined in the City of Ottawa Sewer Design Guidelines and the MOE Design Guidelines for Sewage Works, the following criteria were used to calculate projected wastewater flow rates and to size the sanitary sewer 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 – 200mm dia. for residential areas
- Average Wastewater Generation – 280L/cap/day
- Peak Factor – 4.0 (Harmon's)
- Extraneous Flow Allowance – 0.33 l/s/ha (conservative value)
- Manhole Spacing – 120m
- Minimum Cover – 2.5m
- Population density for single-bedroom apartments - 1.4ppu
- Population density for single-bedroom apartments with den & two-bedroom apartments - 2.1ppu
- Population density for two-bedroom apartments with Den and three-bedroom apartments - 3.1ppu.

4.3 PROPOSED SERVICING

The proposed site will be serviced by gravity sewers which will direct the wastewater flows (approx. 0.80 L/s with allowance for infiltration) to the existing 525 mm diameter combined sewer. The proposed 8-storey residential building is to contain 398 m^2 of amenity space with a total projected population of 67 persons using the City of Ottawa's recommended population densities. The anticipated wastewater peak flow generated from the proposed development is summarized in **Table 4–1** while the sanitary sewer design sheet is included in **Appendix C.2**.

Wastewater Servicing

Table 4–1: Estimated Wastewater Peak Flow

Residential/Amenity Peak Flows					Infiltration Flow (L/s)	Total Peak Flow (L/s)
Demand Type	No. of Units/ Area (ha)	Population	Peak Factor	Peak Flow (L/s)		
Residential	30 units	67	3.43	0.76	0.03	0.80
Amenity	0.04	-	1.50	0.02		

Full port backwater valves are to be installed on all sanitary services within the site to prevent any surcharge from the downstream sewer main from impacting the proposed development.

Due to the depth of the footings and the elevation of the existing sewer, the proposed sanitary lateral for the property will be installed through the foundation wall below the basement floor slab to provide a gravity outlet for the basement level and all floors above grade.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The objective of this stormwater management plan is to determine the measures necessary to control the quantity/quality of stormwater released from the proposed development to criteria established during the pre-consultation and City of Ottawa Sewer Design Guidelines as well as to provide sufficient detail for the rezoning process.

5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), 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).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa)
- The proposed site is not subject to quality control criteria due to the small site size and land usage of the development (City of Ottawa).

Storm Sewer & Inlet Controls

- Size storm sewers to convey 2-year storm event under free-flow conditions using City of Ottawa I-D-F parameters (City of Ottawa).
- Site discharge rates for each storm event to be restricted to 2-year storm event pre-development rates with a maximum pre-development C coefficient of 0.4 (City of Ottawa).
- Peak discharge rates during wet weather events to be further reduced by peak calculated sanitary discharge from the site (City of Ottawa).
- Proposed site to discharge into the existing 525mm dia. combined sewer within Mcleod street which drains to the Rideau Canal trunk sewer and into the interceptor Sewer at Wellington Street (City of Ottawa).
- Tc = 20 minutes or can be calculated; Tc should be not less than 10 minutes since IDF curves become unrealistic at less than 10 min (City of Ottawa).

Surface Storage & Overland Flow

- Any storm events greater than 2 years, up to and including 100-year storm event must be detained on site.
- Building openings to be a minimum of 0.30m above the 100-year water level (City of Ottawa)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.30m (City of Ottawa)

The outlet for the sanitary and storm systems for this site is a combined sewer within Mcleod Street. The City of Ottawa has required separate connections for each of the services to the combined sewer. As such, separate sanitary and storm service connections have been proposed. The combined sewer connections to the existing buildings will be removed in accordance with the City of Ottawa's infrastructure requirements. Full port backwater valves will be installed on sanitary and storm building services.

5.3 STORMWATER MANAGEMENT

The Modified Rational Method was employed to assess the rate and volume of runoff generated during pre-development and post-development conditions. The site was subdivided into ten (10) drainage areas (i.e., 9 sub-catchments and a roof storage). All areas will be captured by the building's internal plumbing and directed to the cistern. The cistern shall be equipped with a pump set to restrict flows not more than the allowable release rate established for the site based on a pre-consultation with the City (see **Appendix C.1**). A summary of subareas and runoff coefficients is provided in **Appendix D.1** and **Drawing SD-1** in **Appendix F**.

5.3.1 Allowable Release Rate

Based on consultation with City of Ottawa staff, the peak post-development discharge from the subject site is to be limited to that of the 2-year event discharge under pre-development conditions, to a maximum runoff coefficient C of 0.4, and reduced further by the estimated peak sanitary discharge from the site. The predevelopment release rate for the area has been determined using the rational method based on the criteria above. Time of concentration (Tc) for the predevelopment area was calculated as 3.41 minutes using the Federal Aviation Administration (FAA) (1970) method (see **Appendix D.2).** As recommended by the City in our preconsultation notes shown in **Appendix C.1** for Tc less than 10 minutes. A Tc of 10 minutes was assigned to the site as values below 10 minutes become unrealistic. Runoff coefficient (C) values have been increased by 25% for the post-development 100-year storm event based on MTO Drainage Manual recommendations. Peak flow rates have been calculated using the rational method as follows:

Q = 2.78 CiA
Where: Q = peak flow rate, L/s
A = drainage area, ha
I = rainfall intensity, mm/hr (as per Ottawa IDF curves)
C = site runoff coefficient

The target release rate for the site is summarized in **Table 5–1** below:

Table 5–1: Target Release Rates

Design Storm	Target Flow Rate (L/s)	Less peak Sanitary Discharge (L/s)	Allowable Storm Release Rate (L/s)
All Events	7.11	0.80	6.31

5.3.2 Storage Requirements

The site requires quantity control measures to meet the restrictive stormwater release criteria. It is proposed that rooftop storage via restricted roof release in combination within stormwater cistern equipped with mechanical pumps be used to reduce site peak outflow to target rates.

5.3.2.1 Rooftop Storage

It is proposed to retain stormwater on the building rooftop by installing restricted flow roof drains. The following calculations assume the roof will be equipped with standard Watts Model R1100 Accuflow Roof Drains or approved equivalent, see **Appendix D.1** for Modified Rational Method design sheet.

Watts Drainage “Accutrol” roof drain weir data has been used to calculate a practical roof release rate and detention storage volume for the rooftops. It should be noted that the “Accutrol” weir has been used as an example only, and that other products may be specified for use, provided that the total roof drain release rate is restricted to match the maximum rate of release indicated in **Table 5–2**, and that sufficient roof storage is provided to meet (or exceed) the resulting volume of detained stormwater. Proposed drain release rates have been calculated based on the Accutrol weir setting at 50% open. Storage volume and controlled release rate are summarized in **Table 5–2**:

Table 5–2: Roof Control Area (ROOF)

Design Storm	Depth (mm)	Discharge (L/s)	Volume Stored (m^3)
2-Year	93	1.81	3.92
100-Year	143	2.43	13.71

5.3.2.2 Subsurface Storage

As per the modified rational method calculations included as part of **Appendix D.1**, the remainder of the site including roof discharge is to be directed towards a proposed stormwater cistern to be located below the basement floor slab.

To control peak discharge from the subject site to within target levels, a storm cistern will be provided. The volume of stormwater to be stored in the cistern is 14m^3 and the release rate restricted to 6.31L/s using a mechanical pump. The stormwater cistern and mechanical pump will be coordinated with the mechanical engineer. Storage volumes and controlled release rates are summarized in **Table 5–3**:

Table 5–3: Stormwater Cistern Tributary Area (Roof, drainage areas RF101a - RF101i)

Design Storm	Discharge (L/s)	$V_{required}$ (m^3)	$V_{available}$ (m^3)
2-Year	6.31	3	30
100-Year	6.31	27	30

5.3.3 Results

Considering the target release rate of 7.11L/s and subtracting the sanitary peak flows of 0.80L/s (as per pre-consultation with the City), the proposed stormwater management plan demonstrates adherence to target peak outflow rates for the site.

6.0 SITE GRADING AND DRAINAGE

The proposed development site measures approximately 0.08ha in area. The topography across the site is relatively flat, and currently drains from north to south, with overland flow generally being directed to the adjacent McLeod Street ROW. A functional grading plan (see **Drawing SSGP-1**) has been provided to satisfy the stormwater management requirements, adhere to any geotechnical restrictions (see **Section 10.0**) for the site, and provide for minimum cover requirements for storm and sanitary sewers where possible. Site grading has been established to capture all storm runoff up to 100-years within the proposed stormwater cistern.

7.0 UTILITIES

As the subject site lies within a mature developed residential community, Hydro, Bell, Gas and Cable servicing for the proposed development should be readily available within subsurface plant and adjacent overhead utility lines within the McLeod Street ROW. Exact size, location and routing of utilities, along with determination of any off-site works required for redevelopment, will be finalized after design circulation.

8.0 APPROVALS

Pre-consultation with Ontario Ministry of Environment, Conservation and Parks (MECP) staff concerning Environmental Compliance Approvals (ECAs, formerly Certificates of Approval (CofA)) under the Ontario Water Resources Act is forthcoming. It is expected that a direct submission ECA will be required for approval of the proposed building service connections and stormwater management system, as they connect directly to an existing combined sewer. The Rideau Valley Conservation Authority will need to be consulted in order to obtain municipal approval for site development.

9.0 EROSION CONTROL DURING CONSTRUCTION

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

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving watercourse(s).
2. Limit extent of 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 plastic or synthetic mulches.
6. Provide sediment traps and basins during dewatering.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Plan construction at proper time to avoid flooding.

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

9. Verification that water is not flowing under silt barriers.
10. Clean and change sediment traps at catch basins.

10.0 GEOTECHNICAL INVESTIGATION

A geotechnical Investigation Report was prepared by Paterson Group Inc. on September 23rd, 2020. The report summarizes the existing soil conditions within the subject area and construction recommendations. For details which are not summarized below, please see the original Paterson report in **Appendix E.1.**

Subsurface soil conditions within the subject area were determined from 3 boreholes distributed across the proposed site. Generally, the subsurface profile at the test hole locations consists of an approximate 50 to 100 mm thickness of asphalt underlain by fill which extends to approximate depths of 2.3 to 3.1 m below the existing ground surface. The fill was generally observed to consist of a either a brown silty sand with gravel and brick or a brown silty clay.

Groundwater levels were observed to be well below the basement level at 7.70m to 10.4m depth from ground surface elevation. Due to the presence of the silty clay deposit, a permissible grade raise restriction of 1.5 m was recommended for grading at the subject site.

11.0 APPROVALS/PERMITS

If the ground or surface water volumes being pumped during the construction phase are between 50,000 and 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 preparation of the Water Taking and Discharge Plan by a Qualified Person as stipulated under O.Reg. 63/16. A Permit to Take Water (PTTW) through the MECP would be required for dewatering in excess of 400,000 L/day, which is unlikely for this site. However, if a PTTW is required, at least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP. If blasting is used to remove the bedrock as part of the excavation for the building foundation, prior approval is required from the owners/operators of any water storage reservoir, pumping station, or water works transformer station within 200 m of the site.

12.0 CONCLUSIONS

12.1 WATER SERVICING

The average day water demand (AVDY) for the entire site was determined to be 0.28 L/s, the maximum daily demand (MXDY) is 0.70 L/s, peak hour demand (PKHR) is 1.52 L/s while Fire flow demand is 83.3L/s. Based on the boundary conditions provided by the City and current site conditions there is sufficient water supply and pressure to meet the demand of the proposed development.

12.2 WASTEWATER SERVICING

The proposed site will be serviced by gravity sewers which will direct the wastewater flows (approx. 0.80 L/s with allowance for infiltration) to the existing 525 mm diameter combined sewer via a proposed 200mm diameter sanitary sewer. Existing connections are to be removed and full port backwater valves installed on the proposed sanitary service within the site to prevent any surcharge from the downstream sewer main from impacting the proposed property. The proposed sanitary lateral for the property will be installed through the foundation wall below the basement floor slab to provide a gravity outlet for the basement level and all floors above grade.

12.3 STORMWATER SERVICING AND MANAGEMENT

The imperviousness ratio of the site is not being increased by the proposed development. Roof storage will be providing additional detention benefits by controlling the expected post development 100-year storm runoff from the proposed redevelopment area to the 2-year predevelopment runoff.

A storm cistern equipped with a mechanical pump is proposed to collect runoff from all areas including the roof and release flows at a restricted flow rate of 6.31L/s to the existing 525mm dia. combined sewer on McLeod Street.

12.4 GEOTECHNICAL CONSIDERATIONS

Subsurface soil conditions within the subject area were determined from 3 boreholes distributed across the proposed site. Generally, the subsurface profile at the test hole locations consists of an approximate 50 to 100 mm thickness of asphalt underlain by fill which extends to approximate depths of 2.3 to 3.1 m below the existing ground surface. Groundwater levels were observed to be well below the basement level at 7.70m to 10.4m depth from ground surface elevation. Due to the presence of the silty clay deposit, a permissible grade raise restriction of 1.5 m was recommended for grading at the subject site.

12.5 GRADING

The proposed development site measures approximately 0.08ha in area. The topography across the site is relatively flat, and currently drains from north to south, with overland flow generally being directed to the adjacent McLeod Street ROW. Site grading has been established to capture all storm runoff up to 100-years within the proposed stormwater cistern.

12.6 UTILITIES

As the subject site lies within a mature developed residential community, Hydro, Bell, Gas, and Cable servicing for the proposed development should be readily available within subsurface plant and adjacent overhead utility lines within the McLeod Street ROW. Exact size, location, and routing of utilities, along with determination of any off-site works required for redevelopment, will be finalized after design circulation.

Detailed design of the required utility services will be completed by the respective utility companies at the detailed design stage.

APPENDICES

Appendix A POTABLE WATER SERVICING

A.1 WATER DEMAND CALCULATIONS

283 - 285 Mcleod, Ottawa, ON - Domestic Water Demand Estimates

Site Plan provided by GRC Architects (2021-06-23)

Project No. 160401560

Densities as per City Guidelines:		
Apartment Units		
1 Bedroom	1.4	ppu
2 Bedroom	2.1	ppu
3 Bedroom	3.1	ppu

Building ID	Amenity areas (m²)	No. of Units	Population	Daily Rate of Demand [1] [2] (L/cap/day or L/ha/day)	Avg Day Demand		Max Day Demand [3] [4]		Peak Hour Demand [3] [4]	
					(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Apartment Units										
1 Bedroom		6	8	350	2.0	0.03	5.1	0.09	11.2	0.19
1 Bedroom + Den		7	15	350	3.6	0.06	8.9	0.15	19.7	0.33
2 Bedroom		9	19	350	4.6	0.08	11.5	0.19	25.3	0.42
2 bedroom + Den		2	6	350	1.5	0.03	3.8	0.06	8.3	0.14
3 Bedroom		6	19	350	4.5	0.08	11.3	0.19	24.9	0.41
Amenity areas	398			28000	0.77	0.013	1.2	0.019	2.1	0.03
Total Site :		**30**	**67**		**17.0**	**0.28**	**41.8**	**0.70**	**91.4**	**1.52**

1 Average day water demand for residential areas: 350 L/cap/d

2 Average day water demand for Amenity/common areas: 28,000 L/ha/d (Based on commercial water demand rates)

3 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 for residential

peak hour demand rate = 2.2 x maximum day demand rate for residential

4 Water demand criteria used to estimate peak demand rates for amenity/common areas 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

A.2 FIRE FLOW REQUIREMENTS PER FUS 1999 GUIDELINES

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401560
Project Name: 283-285 MCLEOD, OTTAWA, ON
Date: 2021-07-13
Fire Flow Calculation #: 1
Description: Residential
Notes: 8-storey residential building with indoor and outdoor amenity areas. Information taken from Site plan by GRS Architects dated June 23, 2021. 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	Non-Combustible Construction						0.8	-
2	Determine Ground Floor Area of One Unit (m2)	Used the 'gross floor area' of the ground floor (floor with the largest footprint 524.02 m2) + 25% of the gross construction area of the two immediately adjoining floors (the second floor and third floor). Methodology as per Page 17 of the Fire Underwriters Survey's Water Supply for Public Fire Protection, 1999.						786	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	5000
5	Determine Occupancy Charge	Limited Combustible						-15%	4250
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	-1700
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						100%	
7	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	-	-
		North	3.1 to 10	46	8	> 120	Wood Frame or Non-Combustible	20%	2933
		East	0 to 3	40	3	91-120	Wood Frame or Non-Combustible	25%	
		South	> 45	0	0	0-30	Wood Frame or Non-Combustible	0%	
		West	0 to 3	30	3	61-90	Wood Frame or Non-Combustible	24%	
8	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)							2.00
		Required Volume of Fire Flow (m^3)							600

A.3 BOUNDARY CONDITIONS

Nwanise, Nwanise

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: Monday, July 19, 2021 2:19 PM
To: Nwanise, Nwanise
Subject: 283-285 McLeod Str. Boundary condition request
Attachments: 283-285 McLeod Street July 2021.pdf

Good afternoon Nwanise.
Please find requested information below and attached.

The following are boundary conditions, HGL, for hydraulic analysis at 283-285 McLeod Street (zone 1W) with an assumed connection to the 203 mm watermain on McLeod Street (see attached PDF for location).

Minimum HGL: 106.8 m

Maximum HGL: 115.3 m

Max Day + Fire Flow (83.3 L/s): 106.5 m

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

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

Please note that I will be away from the office August 9 – 13th.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji

Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Infrastructure and Economic Development Department | Direction générale de la planification de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Ave. W. | 110, avenue Laurier Ouest, Ottawa ON K1P 1J1
(613) 580 2424 Ext. | Poste 33017
Int. Mail Code | Code de Courrier Interne 01-14
shawn.wessel@ottawa.ca

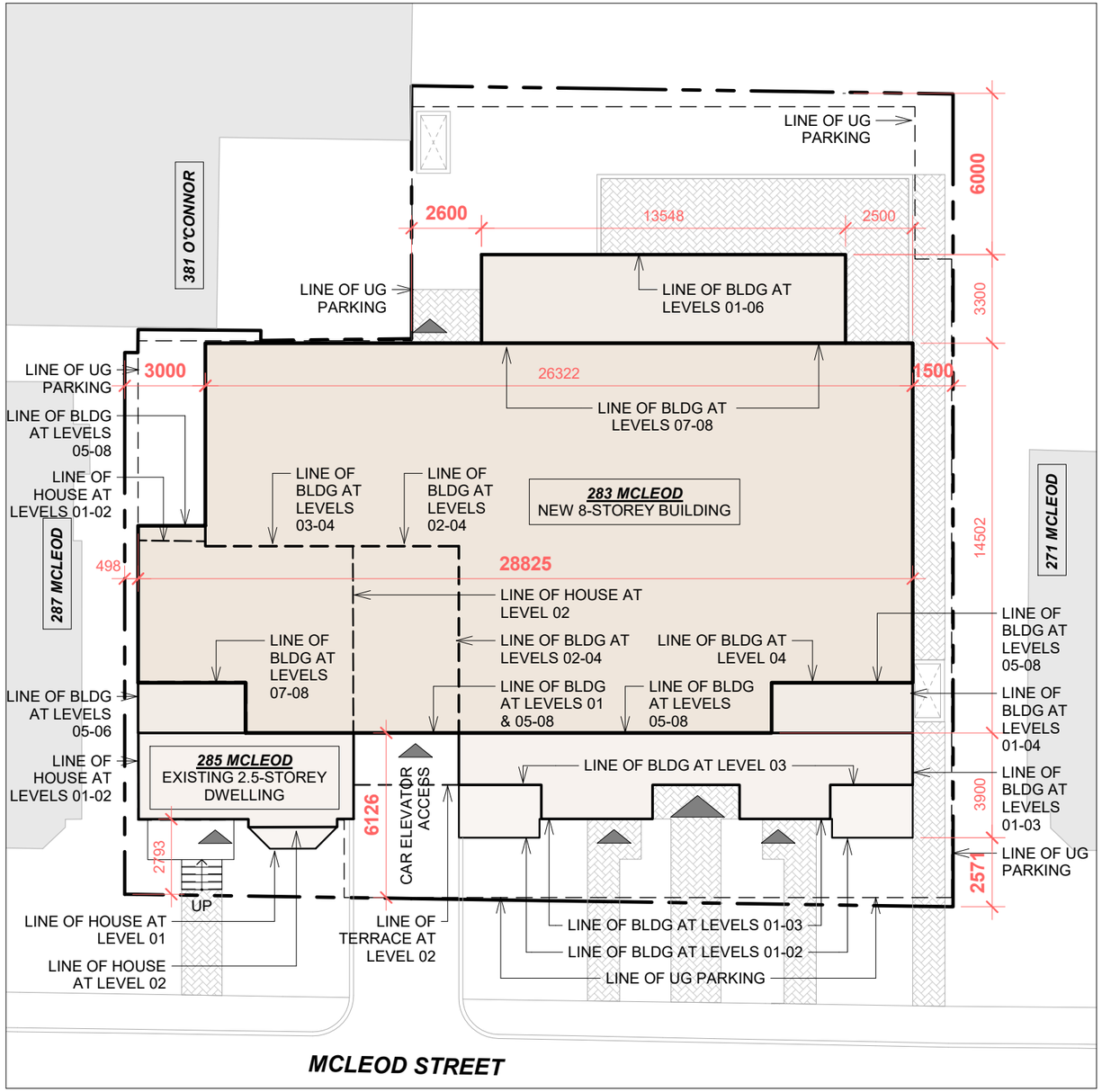
Please consider the environment before printing this email

*****Please also note that, while my work hours may be affected by the current situation and am working from home, I still have access to email, video conferencing and telephone. Feel free to schedule video conferences and/or telephone calls, as necessary.*****

'

'

Appendix B PROPOSED SITE PLAN



0 1 2 5 10

N

Zyer DEVELOPMENTS

283-285 MCLEOD
Ottawa, ON

SITE PLAN

grc architects

June 23, 2021

BASEMENT FLOOR PLAN

GROUND FLOOR PLAN

LEGEND

- AMENITY
- COMMON
- PARKING
- RESIDENTIAL
- SERVICE & STORAGE
- VERTICAL CIRCULATION

30 RESIDENTIAL UNITS

RES. PARKING		BICYCLE PARKING		AMENITY AREA	
REQUIRED:	*8*	*REQUIRED:*	*15*	*TOTAL REQUIRED:*	*180m²*
PROVIDED:	*11*	*PROVIDED:*	*19*	*TOTAL PROVIDED:*	*398.1m²*
VISITOR PARKING				*COMMUNAL REQUIRED:*	*90m²*
REQUIRED:	*2*			*COMMUNAL PROVIDED:*	*181m²*
PROVIDED:	*0*				

0 1 2 5 10

N

Zyer DEVELOPMENTS

BASEMENT & GROUND FLOOR PLANS - SCENARIO 4C4

283-285 MCLEOD
Ottawa, ON

grc architects

June 18, 2021

SECOND FLOOR PLAN

THIRD FLOOR PLAN

LEGEND

- AMENITY
- COMMON
- PARKING
- RESIDENTIAL
- SERVICE & STORAGE
- VERTICAL CIRCULATION

0 1 2 5 10

N

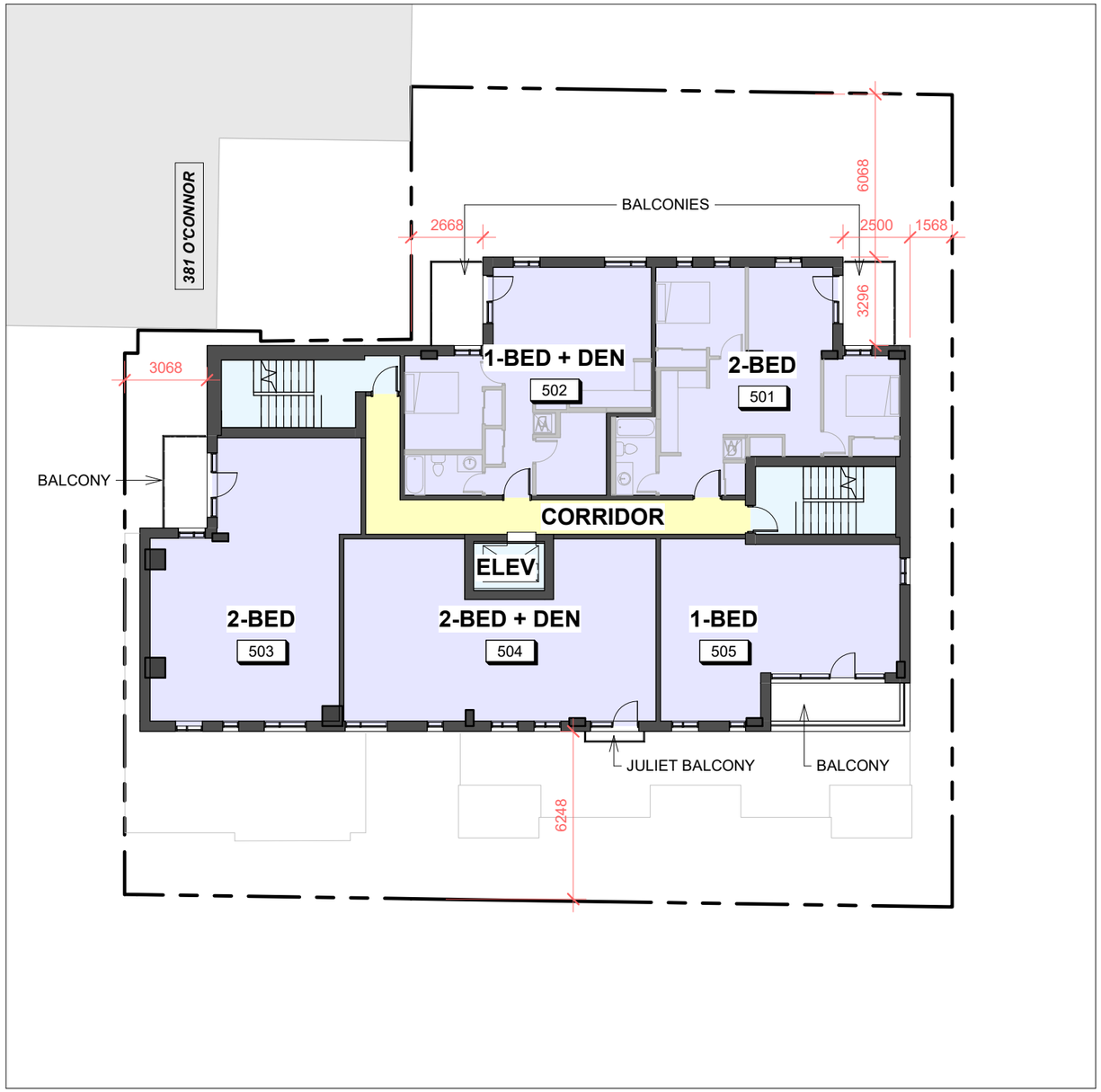
Zyer DEVELOPMENTS

SECOND & THIRD FLOOR PLANS - SCENARIO 4C4

283-285 MCLEOD
Ottawa, ON

grc architects
June 18, 2021

FOURTH FLOOR PLAN



FIFTH/SIXTH FLOOR PLAN

LEGEND

- AMENITY
- COMMON
- PARKING
- RESIDENTIAL
- SERVICE & STORAGE
- VERTICAL CIRCULATION

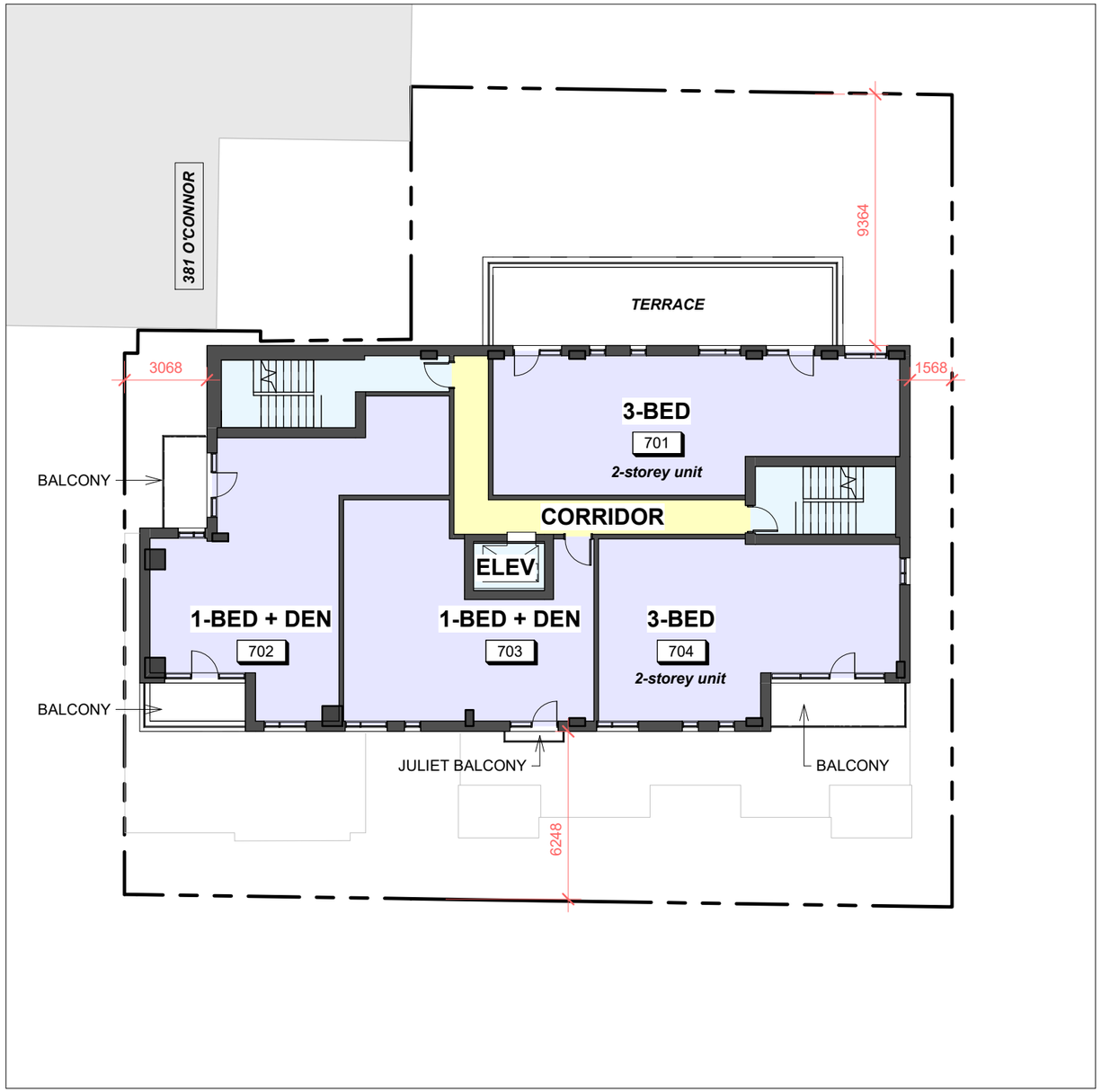
Zyer DEVELOPMENTS

FOURTH TO SIXTH FLOOR PLANS - SCENARIO 4C4

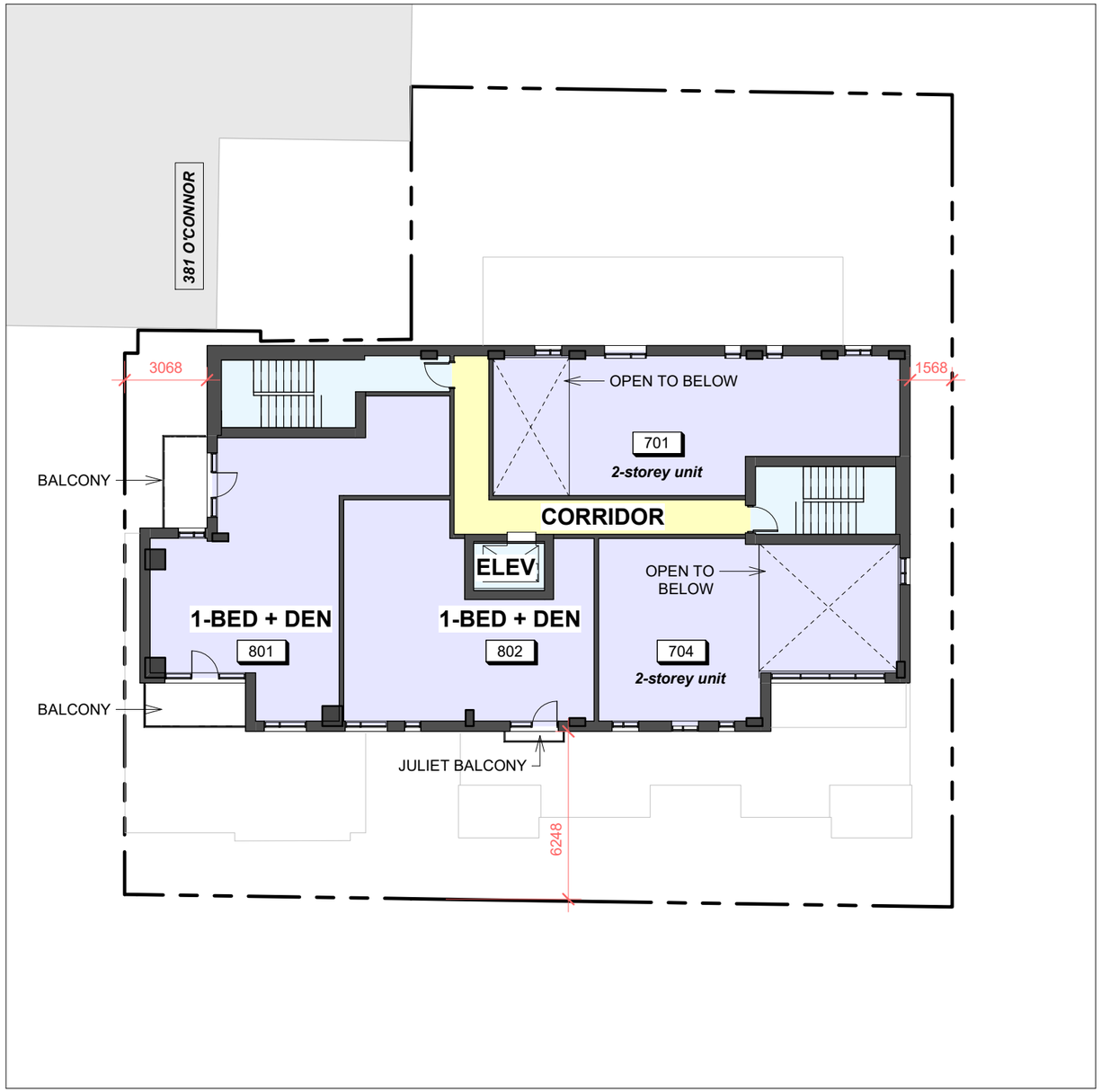
283-285 MCLEOD
Ottawa, ON

grc architects

June 18, 2021



SEVENTH FLOOR PLAN



EIGHTH FLOOR PLAN

LEGEND

- AMENITY
- COMMON
- PARKING
- RESIDENTIAL
- SERVICE & STORAGE
- VERTICAL CIRCULATION

0 1 2 5 10

N

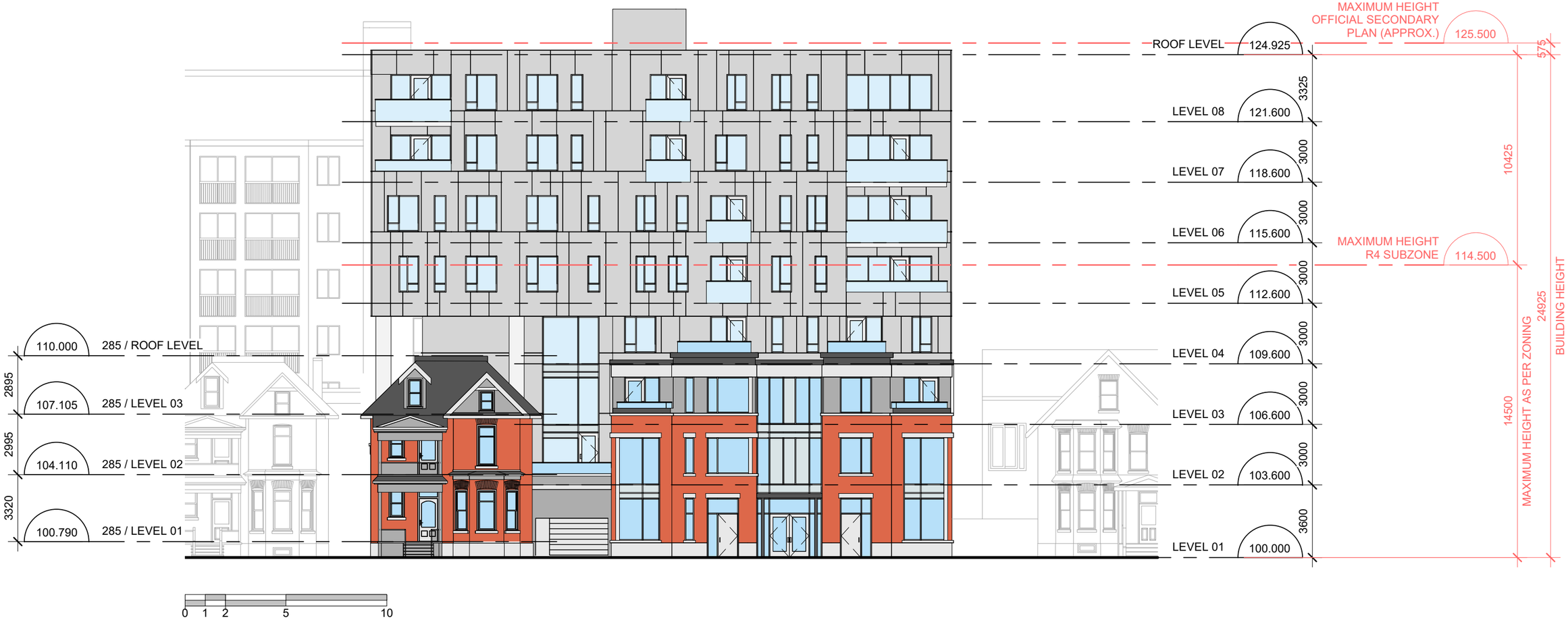
Zyer DEVELOPMENTS

SEVENTH & EIGHTH FLOOR PLANS - SCENARIO 4C4

283-285 MCLEOD
Ottawa, ON

grc architects

June 18, 2021



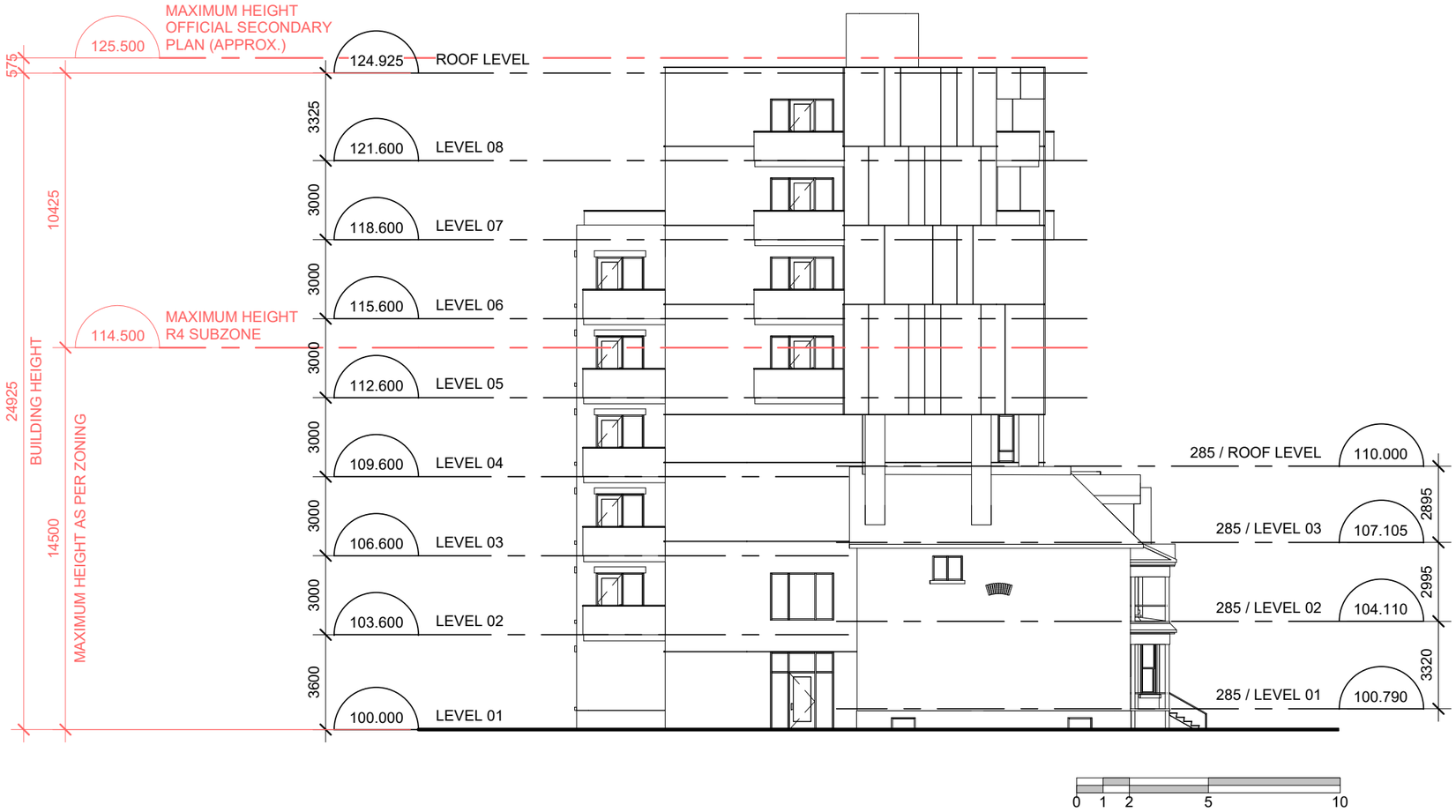
Zyer DEVELOPMENTS

283-285 MCLEOD
Ottawa, ON

SOUTH ELEVATION

grc architects

June 21, 2021



Zyer DEVELOPMENTS

283-285 MCLEOD
Ottawa, ON

WEST ELEVATION

grc architects

June 23, 2021

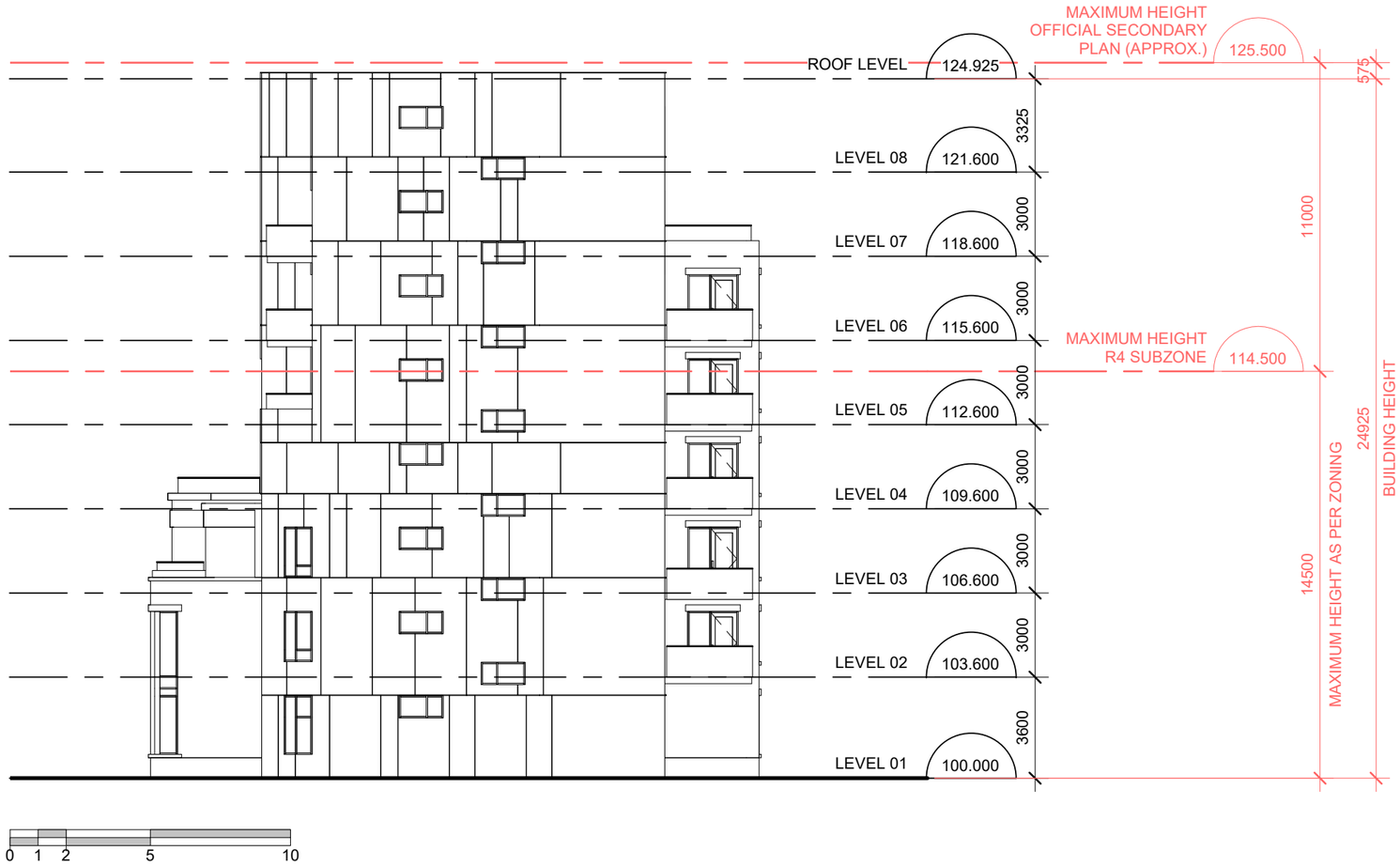
DEVELOPMENTS

283-285 MCLEOD
Ottawa, ON

NORTH ELEVATION

grc architects

June 21, 2021



Zyer DEVELOPMENTS

283-285 MCLEOD
Ottawa, ON

EAST ELEVATION

grc architects

June 23, 2021

PROPERTY LINE

PROPERTY LINE

MAXIMUM HEIGHT
OFFICIAL SECONDARY
PLAN (APPROX.) 125.500

MAXIMUM HEIGHT
R4 SUBZONE 114.500

ROOF LEVEL 124.925

LEVEL 08 121.600 — 3325

LEVEL 07 118.600 — 3000

LEVEL 06 115.600 — 3000

LEVEL 05 112.600 — 3000

LEVEL 04 109.600 — 3000

LEVEL 03 106.600 — 3000

LEVEL 02 103.600 — 3600

LEVEL 01 100.000 — 3300

BASEMENT LEVEL 96.700

575

10425

14500 MAXIMUM HEIGHT AS PER ZONING

24925 BUILDING HEIGHT

110.000 285 / ROOF LEVEL

2895

107.105 285 / LEVEL 03

2995

104.110 285 / LEVEL 02

3320

100.790 285 / LEVEL 01

2400

98.390 285 / BASEMENT LEVEL

287 McLeod

275 McLeod

LEGEND

AMENITY
PARKING
SERVICE & STORAGE
COMMON
RESIDENTIAL
VERTICAL CIRCULATION

0 1 2 5 10

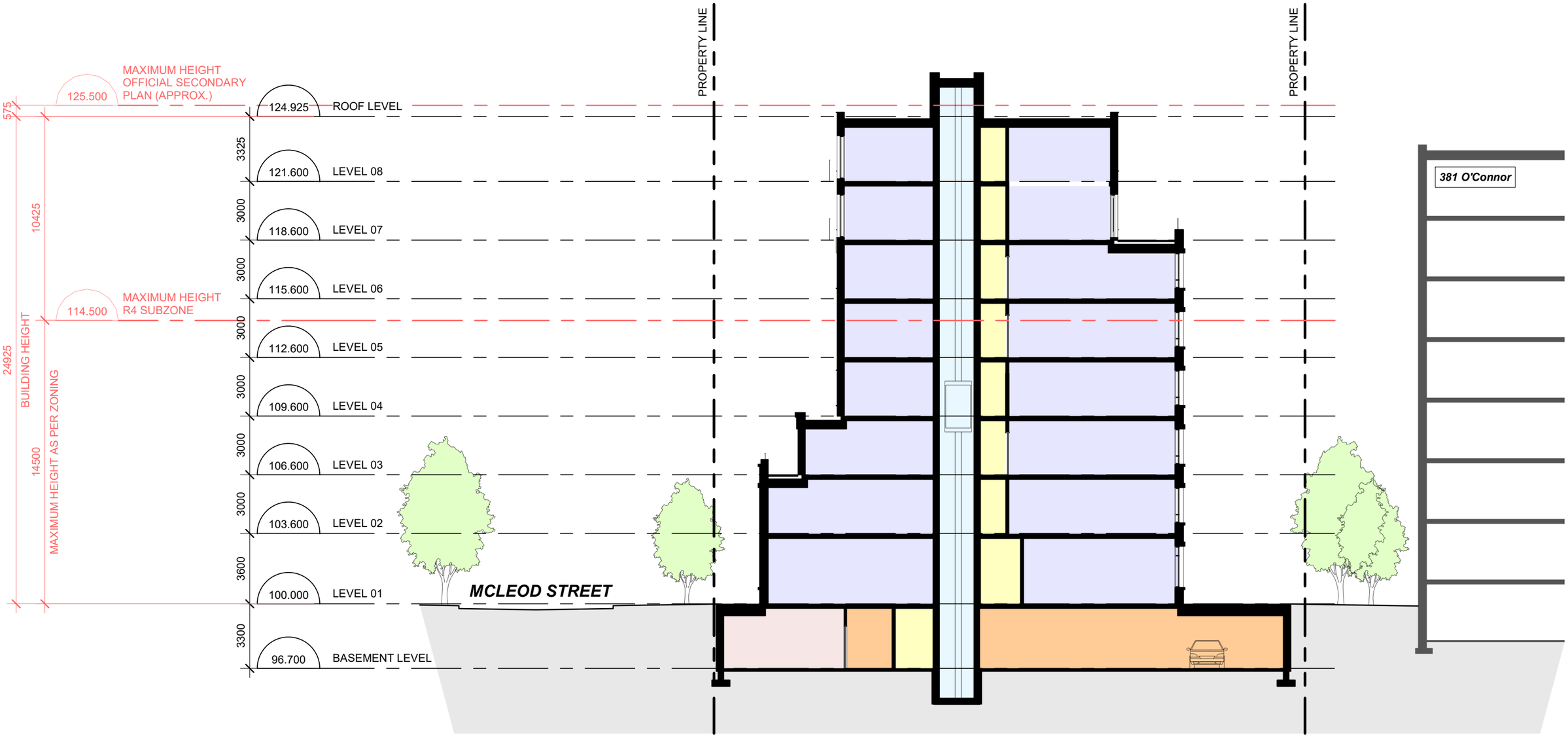
Zyer DEVELOPMENTS

BUILDING SECTION A - SCENARIO 4C

283-285 MCLEOD
Ottawa, ON

grc architects

June 21, 2021



Zyer DEVELOPMENTS

283-285 MCLEOD
Ottawa, ON

BUILDING SECTION B - SCENARIO 4C

grc architects

June 21, 2021

Appendix C WASTEWATER SERVICING

C.1 PRECONSULTATION WITH CITY OF OTTAWA

Stantec July 12th, 2021

Re: 283/285 McLeod Changes to Applicant's Study and Plan I.D. List

Hi Kris:

Thank you for the telephone meeting on your return.

Please find two separate study and plan I.D. lists, together with pre-application consultation notes marked with green and green lined for your ease of locating areas of concern in the site servicing and civil site drawing preparation, including SHAWN WESSEL engineering comments sheet.

Thank you for considering that roof for retention may be sufficient for storm water retention, with control weirs and overflow scuppers, if a stormwater retention tank is to be located in the basement (hopefully not necessary in order to eliminate the need for an access manhole), which would be appropriately located by us

Please do send our water main boundary request to the city. The original lead planner was S. Deiaco and the orginal applicant's study and plan identification list was provided to Stantec, (see attached). Unfortunately, S. Deliaco was assigned other duties and was replaced by a file lead: Seana Turkington.

Please review the enclosed new pre-consultation notes (green marked) and the greenlined study and plan I.D. lists (two of them) and advise if the original budgeting and engagements prices can remain, at your convenient time, soon. Due to time now being of essence, I have confidence in your scruples and undertaking. I understand your suggested July 27th coordination meeting with Alex Leung and myself, however, if possible, lets attend sooner to hopefully improve the targeting date of August 13th submission to the city.

The water main is academic in order to provide sufficiently for potable, domestic supply for no more than 30 apartment units and to suffice for fire protection. Both the sprinkler system and fire hose cabinets to an entirely concrete build and wood frame existing (orginal only) heritage newly fit-up building. As for the combined sewer and existing water lines, they will be removed and capped in accordance with the infrastructure requirements. One with the demolition of 283 McLeod and the lowering of the basement height with 6' of concrete and pile underpinning in 285. The new combined sanitary/storm sewer will be required to enter the new structure to the east of the elevators from which we will connect the sanitary/storm to the new lateral main within the garage via a sanitary Y connection. We can determine appropriate location for the laterals and connections from the hydrostatic relief weeping tiles around the buildings. Due to the basement/parking garage floor elevations pumping will be required, also for both elevators. We would discuss the Bilge Pump and space locations once we engage the M/E consulting engineers.

Kris, your efforts to reduce the completion time as you deem possible, would be much appreciated.

Please call me anytime for any questions or instructions.

My Kind Regards,

John

P.S. – I'm glad you are back. I'll advise Alex Leung and the GRC Group of our final connection.

Pre-Application Consultation Meeting Notes: ~~230-232 Lisgar Street~~ 283-285 McLeod.

Shawn Wessel, Engineering

Infrastructure:

- A 203 mm dia. UCI Watermain (c. 1888) is available.
- A 525 mm dia. Conc. Combined Sewer (c. 1901) is available, which drains to the Rideau Canal . Trunk Sewer and onto the Interceptor Sewer at Wellington St.
- The following apply to this site and any development within a combined sewer area:
  - **Total** (San & Stm) allowable release rate will be 2-year pre-development rate.
  - Coefficient (C) of runoff will need to be determined **as per existing conditions** but in no case more than 0.4
  - TC = 20 minutes or can be calculated
    - TC should be not be less than 10 minutes, since IDF curves become unrealistic at less than 10 min.
  - Any storm events greater than 2 year, up to 100 year, and including 100 year storm event must be detained on site.
  - Two separate sewer laterals (one for sanitary and other for storm) will be required.
- An MECP ECA will be required.
- Please have applicant provide one copy of the following for our review:
  - MECP ECA Application Form - Direct Submission tied to SPC
  - Fees - Certified Cheque made out to "Ministry of Finance"
  - Proof of Applicant's Identification (if no Certificate of Incorporation)
  - Certificate of Incorporation (if Applicable)
  - NAICS Code (If Applicable)
  - Plan & Profile
  - Grading and Servicing Plans
  - Survey Plan
  - Pipe Data Form
  - Draft ECA (City of Ottawa Expanded Works Form)
  - Source Protection Policy Screening & Significant Threat Report
  - Sewer Drainage Area Plan
  - SWM Report
  - Services Report
  - Geotechnical Report & any other supportive documentation
  - Correspondence: City of Ottawa including ROW, Water Resources Dept., ISD etc., MNR, Conservation Authority & MECP.
- Please note that once the review has been completed and the Sr. Engineer is satisfied and ready to sign off on the application, after the PM recommendations 3 final bound copies including 3 CD Rom disks will be required to accompany the applications with MECP and for City of Ottawa records.
- Footer of ECA Application should have reference #: 8551E (2019/05)
- Please also note:
  - Foundation drains are to be independently connected to sewermain (separated or combined) unless being pumped with appropriate back up power, sufficient sized pump and back flow prevention.
  - Roof drains are to be connected downstream of any incorporated ICD within the SWM system.
  - Boundary Conditions will be provided at request of consultant after providing Average Daily Demands, Peak Hour Demands & Max Day + Fire Flow Demands

Other:

- Due to more sensitive use, a Record of Site Condition (RSC) is required. Ensure Phase I, and if applicable, Phase II ESA's speak to required RSC.
- An internal oil/grit separator will be required for car elevator sump sanitary connection and be accessible and meet all Ministry of Labour requirements – as applicable.

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: S indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

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

http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	3	1. Site Servicing Plan	2. Assessment of Adequacy of Public Services / Site Servicing Study	S	3
S	3	3. Grade Control and Drainage Plan	4. Geotechnical Study	S	3
	2	5. Composite Utility Plan	6. Groundwater Impact Study (if over 10,000 L/day)		4
	5	7. Servicing Options Report	8. Wellhead Protection Study		6
S	9	9. Transportation Impact Assessment (dependent on Screening Form)	10. Erosion and Sediment Control Plan	S	3
S	3	11. Storm water Management Report	12. Full Hydro geological and Terrain Analysis		3
	3	13. Hydraulic Water main Analysis (is over 10,000 L/day)	14. Noise Study (environmental and stationary)	S	3
	35/50/55	15. Roadway Modification Design Plan	16. Pre-Construction/Blast Survey (Prior to Excavation & Shoring Permits)	A	3

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	50	17. Draft Plan of Subdivision	18. Plan Showing Layout of Parking Garage	S	3
	30	19. Draft Plan of Condominium	20. Planning Rationale	S	3
S	3	21. Site Plan	22. Minimum Distance Separation (MDS) Calculations (can include in Planning Rationale)		2
	20	23. Concept Plan Showing Proposed Land Uses and Landscaping	24. Agrology and Soil Capability Study		5
S	3	25. Floor Plans	26. Cultural Heritage Impact Statement	S	3
S	3	27. Landscape Plan	28. Archaeological Resource Assessment Requirements: Dependent on results of screening form		2
S	2	29. Survey Plan	30. Shadow Analysis	S	3
S	3	31. Architectural Building Elevation Drawings (dimensioned)	32. Design Brief (includes the Design Review Panel Submission Requirements)	S	3
S	3	33. Wind Analysis			

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	3	34. Phase 1 Environmental Site Assessment	35. Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
S	3	36. Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37. Assessment of Landform Features		7
S	4	38. Record of Site Condition	39. Mineral Resource Impact Assessment		3
S	2	40. Tree Conservation Report (can be combined with Landscape Plan)	41. Environmental Impact Statement / Impact Assessment of Endangered Species		2
S	1	42. PDF copy of all plans and reports	43. Lighting Study		

Meeting Date: June 3, 2021

Application Type(s): *Site Plan Control (Complex, subject to public consultation)*

File Lead: Seana Turkington

Infrastructure Approvals Project Manager: Shawn Wessel

Site Address (Municipal Address): 283-285 McLeod Street

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5☐

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that 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.**

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning and Growth Management Department will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning and Growth Management Department.

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

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

http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/A	Number of copies	ENGINEERING		S/A	Number of copies
	3	1. Site Servicing Plan	2. Assessment of Adequacy of Public Services / Site Servicing Study	S	3
	3	3. Grade Control and Drainage Plan	4. Geotechnical Study		3
	2	5. Composite Utility Plan	6. Groundwater Impact Study (if over 10,000 L/day)		4
S	5	7. **Servicing Options Report**	8. Wellhead Protection Study		6
S	9	9. **Transportation Impact Assessment (dependent on Screening Form)**	10. Erosion and Sediment Control Plan		3
	3	11. Storm water Management Report	12. Full Hydro geological and Terrain Analysis		3
	3	13. Hydraulic Water main Analysis (is over 10,000 L/day)	14. **Noise Study (environmental and stationary)**	S	3
	35/50/55	15. Roadway Modification Design Plan	16.		3

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	50	17. Draft Plan of Subdivision	18. Plan Showing Layout of Parking Garage		3
	30	19. Draft Plan of Condominium	20. **Planning Rationale**	S	3
	3	21. Site Plan	22. Minimum Distance Separation (MDS) Calculations (can include in Planning Rationale)		2
S	20	23. **Concept Plan Showing Proposed Land Uses and Landscaping**	24. Agrology and Soil Capability Study		5
	3	25. Floor Plans	26. **Cultural Heritage Impact Statement**	S	3
	3	27. Landscape Plan	28. Archaeological Resource Assessment Requirements: Dependent on results of screening form		2
S	2	29. **Survey Plan**	30. **Shadow Analysis**	S	3
S	3	31. **Architectural Building Elevation Drawings (dimensioned)**	32. **Design Brief (includes the Design Review Panel Submission Requirements)**	S	3
S	6	33. **Wind Analysis**			

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	3	34. **Phase 1 Environmental Site Assessment**	35. Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
S	3	36. **Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)**	37. Assessment of Landform Features		7
S	4	38. **Record of Site Condition**	39. Mineral Resource Impact Assessment		3
	2	40. Tree Conservation Report (can be combined with Landscape Plan)	41. Environmental Impact Statement / Impact Assessment of Endangered Species		2
S	1	42. **PDF copy of all plans and reports**	43. Lighting Study		

Meeting Date: June 3, 2021

Application Type(s): *Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA)*

File Lead: Seana Turkington

Infrastructure Approvals Project Manager: Shawn Wessel

Site Address (Municipal Address): 283-285 McLeod Street

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5☐

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that 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.**

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A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

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

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	5	1. Site Servicing Plan	2. Site Servicing Study	S	3
S	5	3. Grade Control and Drainage Plan	4. Geotechnical Study	S	3
	2	5. Composite Utility Plan	6. Groundwater Impact Study		6
S	5	7. Servicing Options Report	8. Wellhead Protection Study		6
S	9	9. Transportation Impact Study	10.Erosion and Sediment Control Plan	S	5
S	3	11.Storm water Management Report	12.Hydro geological and Terrain Analysis		8
	3	13.Hydraulic Water main Analysis	14.Noise Study	S	3
	5	15.Roadway Modification Design Plan	16.Confederation Line Proximity Study		9

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	50	17.Draft Plan of Subdivision	18.Plan Showing Layout of Parking Garage	S	2
	30	19.Draft Plan of Condominium	20.Planning Rationale	S	3
S	5	21.Site Plan	22.Minimum Distance Separation (MDS)		3
S	5	23.Concept Plan Showing Proposed Land Uses and Landscaping	24.Agrology and Soil Capability Study		5
S	3	25.Concept Plan Showing Ultimate Use of Land	26.Cultural Heritage Impact Statement	S	3
S	5	27.Landscape Plan	28.Archaeological Resource Assessment Requirements: S (site plan) A (subdivision, condo)		3
S	2	29.Survey Plan	30.Shadow Analysis	S	3
S	3	31.Architectural Building Elevation Drawings (dimensioned)	32.Design Brief (includes the Design Review Panel Submission Requirements)	S	Available online
S	3	33.Wind Analysis (addendum to previous study)	34. Public Consultation Strategy: S (zoning, official plan, subdivision) may be included as part of Planning Rationale		1

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	5	35.Phase 1 Environmental Site Assessment	36.Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
S	5	37.Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	38.Assessment of Landform Features		7
A	4	39.Record of Site Condition	40.Mineral Resource Impact Assessment		4
S	5	41.Tree Conservation Report (combine with landscape plan).	42.Environmental Impact Statement / Impact Assessment of Endangered Species		11
	4	43.Mine Hazard Study / Abandoned Pit or Quarry Study	44.Integrated Environmental Review (Draft, as part of Planning Rationale)		3

Meeting Date: January 7, 2020

Application Type: OPA/ZBA

File Lead (Assigned Planner): S. Deiaco

Infrastructure Approvals Project Manager: S. Wessel

Site Address (Municipal Address): 283-285 McLeod

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that 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.

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C.2 SANITARY SEWER CALCULATION SHEET

Stantec

SITE:
283 - 285 Mcleod Road, Ottawa,ON

DATE: 8/11/2021
REVISION: 1
DESIGNED BY: NN
CHECKED BY: KS

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401560

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / 1 BEDROOM	1.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / 2 BEDROOM	2.1	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / 3 BEDROOM	3.1				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMM/AMENITY		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE								
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	1 BEDROOM	2 BEDROOM	3 BEDROOM	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)	(ha)	(l/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)	(m/s)
PROPOSED BLDG	BLDG	EX SAN	0.052	6	16	8	68	0.05	68	3.43	0.76	0.040	0.040	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.02	0.083	0.08	0.03	0.80	8.0	200	PVC	SDR 35	1.00	33.4	**2.40%**	1.05	0.36

Notes

1. Unit breakdown for proposed 8-storey residential building provided by GRC Architects in June 2021
2. Site to outlet to existing 525mm dia. combined sewer on McLeod Street.
3. Entire site area considered as potential source of infiltration.

Appendix D STORMWATER SERVICING AND MANAGEMENT

D.1 MODIFIED RATIONAL METHOD CALCULATIONS

Stormwater Management Calculations

File No: **160401560**
Project: **283-285 MCLEOD STR.**
Date: **18-Aug-21**

SWM Approach:
Post-development to Pre-development flows

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 - Cistern	RF101a	Hard	0.005		0.9	0.005		
		Soft	0.000		0.2	0.000		
		Subtotal		0.005			0.0045	0.900
Uncontrolled - Cistern	RF101c	Hard	0.002		0.9	0.002		
		Soft	0.000		0.2	0.000		
		Subtotal		0.002			0.0018	0.900
Uncontrolled - Cistern	RF101b	Hard	0.013		0.9	0.012		
		Soft	0.004		0.2	0.001		
		Subtotal		0.017			0.01275	0.750
Uncontrolled - Cistern	RF101d	Hard	0.004		0.9	0.004		
		Soft	0.000		0.2	0.000		
		Subtotal		0.004			0.0036	0.900
Uncontrolled - Cistern	RF101e	Hard	0.001		0.9	0.001		
		Soft	0.000		0.2	0.000		
		Subtotal		0.001			0.0009	0.900
Uncontrolled - Cistern	RF101f	Hard	0.001		0.9	0.001		
		Soft	0.000		0.2	0.000		
		Subtotal		0.001			0.0009	0.900
Uncontrolled - Cistern	RF101g	Hard	0.001		0.9	0.001		
		Soft	0.000		0.2	0.000		
		Subtotal		0.001			0.0009	0.900
Uncontrolled - Cistern	RF101h	Hard	0.001		0.9	0.001		
		Soft	0.000		0.2	0.000		
		Subtotal		0.001			0.0009	0.900
Roof	ROOF	Hard	0.039		0.9	0.035		
		Soft	0.000		0.2	0.000		
		Subtotal		0.039			0.0351	0.900
Uncontrolled - Cistern	RF101i	Hard	0.011		0.9	0.010		
		Soft	0.003		0.2	0.001		
		Subtotal		0.014			0.0105	0.750
Total				**0.085**			**0.072**	
Overall Runoff Coefficient= C:								**0.85**

Total Roof Areas	**0.039 ha**
Total Tributary Surface Areas (Controlled and Uncontrolled)	**0.032 ha**
Total Tributary Area to Outlet	**0.071 ha**
Total Uncontrolled Areas (Non-Tributary)	**0.014 ha**
Total Site	**0.085 ha**

Stormwater Management Calculations

Project #160401560, 283-285 MCLEOD STR.
Modified Rational Method Calculatons 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): 0.083
C: 0.40

Target stormwater release rate determined using a C of 0.4 in a 2-year event and subtracting the peak sanitary flow rate (as per preconsultation with the City).

Using a typical time of concentration of 10 minutes
(Used Federal Aviation Administration Method (1970) to confirm that the actual pre-development time of concentration is less than 10 minues)

tc (min)	I (2 yr) (mm/hr)	Qtarget (L/s)
10	76.81	**7.11**

Subtracting the peak sanitary discharge of: 0.80 L/s
Target release rate: 6.31 L/s

2 YEAR Modified Rational Method for Entire Site

Subdrainage Area: RF101a — Uncontrolled - Cistern
Area (ha): 0.01
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	0.96	0.96		
20	52.03	0.65	0.65		
30	40.04	0.50	0.50		
40	32.86	0.41	0.41		
50	28.04	0.35	0.35		
60	24.56	0.31	0.31		
70	21.91	0.27	0.27		
80	19.83	0.25	0.25		
90	18.14	0.23	0.23		
100	16.75	0.21	0.21		
110	15.57	0.19	0.19		
120	14.56	0.18	0.18		
130	13.69	0.17	0.17		
140	12.93	0.16	0.16		
150	12.25	0.15	0.15		
160	11.65	0.15	0.15		
170	11.11	0.14	0.14		
180	10.63	0.13	0.13		
190	10.19	0.13	0.13		
200	9.78	0.12	0.12		

Subdrainage Area: RF101c — Uncontrolled - Cistern
Area (ha): 0.00
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	0.38	0.38		
20	52.03	0.26	0.26		
30	40.04	0.20	0.20		
40	32.86	0.16	0.16		
50	28.04	0.14	0.14		
60	24.56	0.12	0.12		
70	21.91	0.11	0.11		
80	19.83	0.10	0.10		
90	18.14	0.09	0.09		
100	16.75	0.08	0.08		
110	15.57	0.08	0.08		
120	14.56	0.07	0.07		
130	13.69	0.07	0.07		
140	12.93	0.06	0.06		
150	12.25	0.06	0.06		
160	11.65	0.06	0.06		
170	11.11	0.06	0.06		
180	10.63	0.05	0.05		
190	10.19	0.05	0.05		
200	9.78	0.05	0.05		

Subdrainage Area: RF101b — Uncontrolled - Cistern
Area (ha): 0.02
C: 0.75

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	2.72	2.72		
20	52.03	1.84	1.84		
30	40.04	1.42	1.42		
40	32.86	1.16	1.16		
50	28.04	0.99	0.99		
60	24.56	0.87	0.87		
70	21.91	0.78	0.78		
80	19.83	0.70	0.70		
90	18.14	0.64	0.64		
100	16.75	0.59	0.59		
110	15.57	0.55	0.55		
120	14.56	0.52	0.52		
130	13.69	0.49	0.49		
140	12.93	0.46	0.46		
150	12.25	0.43	0.43		
160	11.65	0.41	0.41		
170	11.11	0.39	0.39		
180	10.63	0.38	0.38		
190	10.19	0.36	0.36		
200	9.78	0.35	0.35		

Project #160401560, 283-285 MCLEOD STR.
Modified Rational Method Calculatons 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): 0.083
C: 0.40

Target stormwater release rate determined using a C of 0.4 in a 2-year event and subtracting the peak sanitary flow rate (as per preconsultation with the City).

Target release rate: 6.31 L/s

100 YEAR Modified Rational Method for Entire Site

Subdrainage Area: RF101a — Uncontrolled - Cistern
Area (ha): 0.01
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	2.48	2.48		
20	119.95	1.67	1.67		
30	91.87	1.28	1.28		
40	75.15	1.04	1.04		
50	63.95	0.89	0.89		
60	55.89	0.78	0.78		
70	49.79	0.69	0.69		
80	44.99	0.63	0.63		
90	41.11	0.57	0.57		
100	37.90	0.53	0.53		
110	35.20	0.49	0.49		
120	32.89	0.46	0.46		
130	30.90	0.43	0.43		
140	29.15	0.41	0.41		
150	27.61	0.38	0.38		
160	26.24	0.36	0.36		
170	25.01	0.35	0.35		
180	23.90	0.33	0.33		
190	22.90	0.32	0.32		
200	21.98	0.31	0.31		

Subdrainage Area: RF101c — Uncontrolled - Cistern
Area (ha): 0.002
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	0.99	0.99		
20	119.95	0.67	0.67		
30	91.87	0.51	0.51		
40	75.15	0.42	0.42		
50	63.95	0.36	0.36		
60	55.89	0.31	0.31		
70	49.79	0.28	0.28		
80	44.99	0.25	0.25		
90	41.11	0.23	0.23		
100	37.90	0.21	0.21		
110	35.20	0.20	0.20		
120	32.89	0.18	0.18		
130	30.90	0.17	0.17		
140	29.15	0.16	0.16		
150	27.61	0.15	0.15		
160	26.24	0.15	0.15		
170	25.01	0.14	0.14		
180	23.90	0.13	0.13		
190	22.90	0.13	0.13		
200	21.98	0.12	0.12		

Subdrainage Area: RF101b — Uncontrolled - Cistern
Area (ha): 0.02
C: 0.94

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	7.91	7.91		
20	119.95	5.31	5.31		
30	91.87	4.07	4.07		
40	75.15	3.33	3.33		
50	63.95	2.83	2.83		
60	55.89	2.48	2.48		
70	49.79	2.21	2.21		
80	44.99	1.99	1.99		
90	41.11	1.82	1.82		
100	37.90	1.68	1.68		
110	35.20	1.56	1.56		
120	32.89	1.46	1.46		
130	30.90	1.37	1.37		
140	29.15	1.29	1.29		
150	27.61	1.22	1.22		
160	26.24	1.16	1.16		
170	25.01	1.11	1.11		
180	23.90	1.06	1.06		
190	22.90	1.01	1.01		
200	21.98	0.97	0.97		

Stormwater Management Calculations

Project #160401560, 283-285 MCLEOD STR.
Modified Rational Method Calculatons for Storage

Subdrainage Area: RF101d — Uncontrolled - Cistern
Area (ha): 0.004
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	0.77	0.77		
20	52.03	0.52	0.52		
30	40.04	0.40	0.40		
40	32.86	0.33	0.33		
50	28.04	0.28	0.28		
60	24.56	0.25	0.25		
70	21.91	0.22	0.22		
80	19.83	0.20	0.20		
90	18.14	0.18	0.18		
100	16.75	0.17	0.17		
110	15.57	0.16	0.16		
120	14.56	0.15	0.15		
130	13.69	0.14	0.14		
140	12.93	0.13	0.13		
150	12.25	0.12	0.12		
160	11.65	0.12	0.12		
170	11.11	0.11	0.11		
180	10.63	0.11	0.11		
190	10.19	0.10	0.10		
200	9.78	0.10	0.10		

Subdrainage Area: RF101e — Uncontrolled - Cistern
Area (ha): 0.001
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	0.19	0.19		
20	52.03	0.13	0.13		
30	40.04	0.10	0.10		
40	32.86	0.08	0.08		
50	28.04	0.07	0.07		
60	24.56	0.06	0.06		
70	21.91	0.05	0.05		
80	19.83	0.05	0.05		
90	18.14	0.05	0.05		
100	16.75	0.04	0.04		
110	15.57	0.04	0.04		
120	14.56	0.04	0.04		
130	13.69	0.03	0.03		
140	12.93	0.03	0.03		
150	12.25	0.03	0.03		
160	11.65	0.03	0.03		
170	11.11	0.03	0.03		
180	10.63	0.03	0.03		
190	10.19	0.03	0.03		
200	9.78	0.02	0.02		

Subdrainage Area: RF101f — Uncontrolled - Cistern
Area (ha): 0.001
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	0.19	0.19		
20	52.03	0.13	0.13		
30	40.04	0.10	0.10		
40	32.86	0.08	0.08		
50	28.04	0.07	0.07		
60	24.56	0.06	0.06		
70	21.91	0.05	0.05		
80	19.83	0.05	0.05		
90	18.14	0.05	0.05		
100	16.75	0.04	0.04		
110	15.57	0.04	0.04		
120	14.56	0.04	0.04		
130	13.69	0.03	0.03		
140	12.93	0.03	0.03		
150	12.25	0.03	0.03		
160	11.65	0.03	0.03		
170	11.11	0.03	0.03		
180	10.63	0.03	0.03		
190	10.19	0.03	0.03		
200	9.78	0.02	0.02		

Subdrainage Area: RF101g — Uncontrolled - Cistern
Area (ha): 0.001
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	0.19	0.19		
20	52.03	0.13	0.13		
30	40.04	0.10	0.10		
40	32.86	0.08	0.08		
50	28.04	0.07	0.07		
60	24.56	0.06	0.06		
70	21.91	0.05	0.05		
80	19.83	0.05	0.05		
90	18.14	0.05	0.05		
100	16.75	0.04	0.04		
110	15.57	0.04	0.04		
120	14.56	0.04	0.04		
130	13.69	0.03	0.03		
140	12.93	0.03	0.03		
150	12.25	0.03	0.03		
160	11.65	0.03	0.03		
170	11.11	0.03	0.03		
180	10.63	0.03	0.03		
190	10.19	0.03	0.03		
200	9.78	0.02	0.02		

Subdrainage Area: RF101h — Uncontrolled - Cistern
Area (ha): 0.001
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	0.19	0.19		
20	52.03	0.13	0.13		
30	40.04	0.10	0.10		
40	32.86	0.08	0.08		

Project #160401560, 283-285 MCLEOD STR.
Modified Rational Method Calculatons for Storage

Subdrainage Area: RF101d — Uncontrolled - Cistern
Area (ha): 0.004
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	1.99	1.99		
20	119.95	1.33	1.33		
30	91.87	1.02	1.02		
40	75.15	0.84	0.84		
50	63.95	0.71	0.71		
60	55.89	0.62	0.62		
70	49.79	0.55	0.55		
80	44.99	0.50	0.50		
90	41.11	0.46	0.46		
100	37.90	0.42	0.42		
110	35.20	0.39	0.39		
120	32.89	0.37	0.37		
130	30.90	0.34	0.34		
140	29.15	0.32	0.32		
150	27.61	0.31	0.31		
160	26.24	0.29	0.29		
170	25.01	0.28	0.28		
180	23.90	0.27	0.27		
190	22.90	0.25	0.25		
200	21.98	0.24	0.24		

Subdrainage Area: RF101e — Uncontrolled - Cistern
Area (ha): 0.001
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	0.50	0.50		
20	119.95	0.33	0.33		
30	91.87	0.26	0.26		
40	75.15	0.21	0.21		
50	63.95	0.18	0.18		
60	55.89	0.16	0.16		
70	49.79	0.14	0.14		
80	44.99	0.13	0.13		
90	41.11	0.11	0.11		
100	37.90	0.11	0.11		
110	35.20	0.10	0.10		
120	32.89	0.09	0.09		
130	30.90	0.09	0.09		
140	29.15	0.08	0.08		
150	27.61	0.08	0.08		
160	26.24	0.07	0.07		
170	25.01	0.07	0.07		
180	23.90	0.07	0.07		
190	22.90	0.06	0.06		
200	21.98	0.06	0.06		

Subdrainage Area: RF101f — Uncontrolled - Cistern
Area (ha): 0.001
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	0.50	0.50		
20	119.95	0.33	0.33		
30	91.87	0.26	0.26		
40	75.15	0.21	0.21		
50	63.95	0.18	0.18		
60	55.89	0.16	0.16		
70	49.79	0.14	0.14		
80	44.99	0.13	0.13		
90	41.11	0.11	0.11		
100	37.90	0.11	0.11		
110	35.20	0.10	0.10		
120	32.89	0.09	0.09		
130	30.90	0.09	0.09		
140	29.15	0.08	0.08		
150	27.61	0.08	0.08		
160	26.24	0.07	0.07		
170	25.01	0.07	0.07		
180	23.90	0.07	0.07		
190	22.90	0.06	0.06		
200	21.98	0.06	0.06		

Subdrainage Area: RF101g — Uncontrolled - Cistern
Area (ha): 0.001
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	0.50	0.50		
20	119.95	0.33	0.33		
30	91.87	0.26	0.26		
40	75.15	0.21	0.21		
50	63.95	0.18	0.18		
60	55.89	0.16	0.16		
70	49.79	0.14	0.14		
80	44.99	0.13	0.13		
90	41.11	0.11	0.11		
100	37.90	0.11	0.11		
110	35.20	0.10	0.10		
120	32.89	0.09	0.09		
130	30.90	0.09	0.09		
140	29.15	0.08	0.08		
150	27.61	0.08	0.08		
160	26.24	0.07	0.07		
170	25.01	0.07	0.07		
180	23.90	0.07	0.07		
190	22.90	0.06	0.06		
200	21.98	0.06	0.06		

Subdrainage Area: RF101h — Uncontrolled - Cistern
Area (ha): 0.001
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	0.50	0.50		
20	119.95	0.33	0.33		
30	91.87	0.26	0.26		
40	75.15	0.21	0.21		

Stormwater Management Calculations

Project #160401560, 283-285 MCLEOD STR.
Modified Rational Method Calculatons for Storage

50	28.04	0.07	0.07
60	24.56	0.06	0.06
70	21.91	0.05	0.05
80	19.83	0.05	0.05
90	18.14	0.05	0.05
100	16.75	0.04	0.04
110	15.57	0.04	0.04
120	14.56	0.04	0.04
130	13.69	0.03	0.03
140	12.93	0.03	0.03
150	12.25	0.03	0.03
160	11.65	0.03	0.03
170	11.11	0.03	0.03
180	10.63	0.03	0.03
190	10.19	0.03	0.03
200	9.78	0.02	0.02

Subdrainage Area: ROOF — Roof
Area (ha): 0.039 — Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	76.81	7.49	1.75	5.74	3.44	88.98	0.00
20	52.03	5.08	1.81	3.27	**3.92**	93.44	0.00
30	40.04	3.91	1.80	2.11	3.80	92.32	0.00
40	32.86	3.21	1.76	1.45	3.48	89.30	0.00
50	28.04	2.74	1.71	1.03	3.08	85.55	0.00
60	24.56	2.40	1.66	0.74	2.65	81.56	0.00
70	21.91	2.14	1.61	0.53	2.22	77.54	0.00
80	19.83	1.93	1.55	0.38	1.84	72.98	0.00
90	18.14	1.77	1.48	0.29	1.55	67.63	0.00
100	16.75	1.63	1.42	0.21	1.27	62.68	0.00
110	15.57	1.52	1.36	0.16	1.02	58.11	0.00
120	14.56	1.42	1.31	0.11	0.79	53.93	0.00
130	13.69	1.34	1.26	0.07	0.58	49.99	0.00
140	12.93	1.26	1.20	0.06	0.53	47.49	0.00
150	12.25	1.20	1.14	0.05	0.48	45.25	0.00
160	11.65	1.14	1.09	0.05	0.44	43.23	0.00
170	11.11	1.08	1.04	0.04	0.40	41.40	0.00
180	10.63	1.04	1.00	0.03	0.37	39.73	0.00
190	10.19	0.99	0.96	0.03	0.34	38.20	0.00
200	9.78	0.95	0.93	0.03	0.31	36.80	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	93.44	0.09	1.81	3.92	15.60	0.00

Subdrainage Area: RF101i (including all flows to the cistern) — Uncontrolled - Cistern
Area (ha): 0.014
C: 0.75

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	9.60	6.31	3.29	1.98
20	52.03	7.13	6.31	0.82	0.98
30	40.04	5.89	6.31	0.00	0.00
40	32.86	5.12	6.31	0.00	**0.00**
50	28.04	4.58	6.31	0.00	0.00
60	24.56	4.17	6.31	0.00	0.00
70	21.91	3.85	6.31	0.00	0.00
80	19.83	3.58	6.31	0.00	0.00
90	18.14	3.34	6.31	0.00	0.00
100	16.75	3.13	6.31	0.00	0.00
110	15.57	2.95	6.31	0.00	0.00
120	14.56	2.80	6.31	0.00	0.00
130	13.69	2.66	6.31	0.00	0.00
140	12.93	2.52	6.31	0.00	0.00
150	12.25	2.39	6.31	0.00	0.00
160	11.65	2.28	6.31	0.00	0.00
170	11.11	2.18	6.31	0.00	0.00
180	10.63	2.09	6.31	0.00	0.00
190	10.19	2.00	6.31	0.00	0.00
200	9.78	1.93	6.31	0.00	0.00

Notes: 1) Stormwater storage provide via a stormwater cistern located in the basement level of the building.

2) Stormwater cistern accepts uncontrolled runoff from Roof, drainage areas RF101a through RF101i. Uncontrolled runoff from all areas tributary to the stormwater cistern are presented in the Qactual column in this table.

3) Volume of stormwater to be stored in the cistern is 1.98m^3. A pump to be designed by a mechnical engineer is required to maintain a restricted flow of not more than 6.31L/s

4) No stormwater storage is provided above CBs.

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
2-year Water Level	N/A	N/A	6.31	1.98	14.00	OK

Excess storage (m^3): 12.02

SUMMARY TO OUTLET

			Vrequired	Vavailable*	
Tributary Area	0.071	ha			
Total 2yr Flow to Sewer	8.12	L/s	6	30 m^3	Ok
Non-Tributary Area		ha			
Total 2yr Flow Uncontrolled		L/s			
Total Area	0.071	ha			
Total 2yr Flow	8.12	L/s			
Target	7.11	L/s			

Project #160401560, 283-285 MCLEOD STR.
Modified Rational Method Calculatons for Storage

50	63.95	0.18	0.18
60	55.89	0.16	0.16
70	49.79	0.14	0.14
80	44.99	0.13	0.13
90	41.11	0.11	0.11
100	37.90	0.11	0.11
110	35.20	0.10	0.10
120	32.89	0.09	0.09
130	30.90	0.09	0.09
140	29.15	0.08	0.08
150	27.61	0.08	0.08
160	26.24	0.07	0.07
170	25.01	0.07	0.07
180	23.90	0.07	0.07
190	22.90	0.06	0.06
200	21.98	0.06	0.06

Subdrainage Area: ROOF — Roof
Area (ha): 0.039 — Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	19.36	2.27	17.09	10.26	129.67	0.00
20	119.95	13.01	2.39	10.62	12.74	139.13	0.00
30	91.87	9.96	2.43	7.53	13.56	142.25	0.00
40	75.15	8.15	2.43	5.71	**13.71**	142.83	0.00
50	63.95	6.93	2.42	4.51	13.53	142.12	0.00
60	55.89	6.06	2.41	3.65	13.15	140.68	0.00
70	49.79	5.40	2.38	3.01	12.66	138.82	0.00
80	44.99	4.88	2.36	2.52	12.11	136.71	0.00
90	41.11	4.46	2.33	2.13	11.50	134.42	0.00
100	37.90	4.11	2.30	1.81	10.88	132.03	0.00
110	35.20	3.82	2.27	1.55	10.23	129.59	0.00
120	32.89	3.57	2.23	1.33	9.59	127.13	0.00
130	30.90	3.35	2.20	1.15	8.95	124.57	0.00
140	29.15	3.16	2.16	1.00	8.39	121.36	0.00
150	27.61	2.99	2.12	0.87	7.84	118.24	0.00
160	26.24	2.84	2.08	0.76	7.30	115.20	0.00
170	25.01	2.71	2.05	0.66	6.78	112.24	0.00
180	23.90	2.59	2.01	0.58	6.27	109.36	0.00
190	22.90	2.48	1.98	0.51	5.78	106.57	0.00
200	21.98	2.38	1.94	0.44	5.30	103.86	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	142.83	0.14	2.43	13.71	15.60	0.00

Subdrainage Area: RF101i (including all flows to the cistern) — Uncontrolled - Cistern
Area (ha): 0.014
C: 0.94

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	24.14	6.31	17.83	10.70
20	119.95	17.08	6.31	10.77	12.93
30	91.87	13.68	6.31	7.37	13.27
40	75.15	11.64	6.31	5.33	12.80
50	63.95	10.26	6.31	3.95	11.86
60	55.89	9.25	6.31	2.95	10.61
70	49.79	8.48	6.31	2.18	9.14
80	44.99	7.87	6.31	1.56	7.49
90	41.11	7.36	6.31	1.06	5.71
100	37.90	6.94	6.31	0.63	3.80
110	35.20	6.58	6.31	0.27	1.80
120	32.89	6.26	6.31	0.00	**0.00**
130	30.90	5.99	6.31	0.00	0.00
140	29.15	5.73	6.31	0.00	0.00
150	27.61	5.50	6.31	0.00	0.00
160	26.24	5.30	6.31	0.00	0.00
170	25.01	5.11	6.31	0.00	0.00
180	23.90	4.94	6.31	0.00	0.00
190	22.90	4.78	6.31	0.00	0.00
200	21.98	4.63	6.31	0.00	0.00

Notes: 1) Stormwater storage provide via a stormwater cistern located in the basement level of the building.

2) Stormwater cistern accepts uncontrolled runoff from Roof, drainage areas RF101a through RF101i. Uncontrolled runoff from all areas tributary to the stormwater cistern are presented in the Qactual column in this table.

3) Volume of stormwater to be stored in the cistern is 13.27m^3. A pump to be designed by a mechnical engineer is required to maintain a restricted flow of not more than 6.31L/s

4) No stormwater storage is provided above CBs.

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	N/A	N/A	6.31	13.27	14.00	OK

Excess storage (m^3): 0.73

SUMMARY TO OUTLET

			Vrequired	Vavailable*		
Tributary Area	0.071	ha				
Total 100yr Flow to Sewer	7.11	L/s	27	30 m^3	Ok	
Non-Tributary Area		ha				
Total 100yr Flow Uncontrolled		L/s				
Total Area	0.071	ha				
Total 100yr Flow	7.11	L/s				
Target	7.11	L/s				**Target met**

Project #160401560, 283-285 MCLEOD STR.
Roof Drain Design Sheet, Area ROOF
Watts Drainage "Accutrol" roof drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0006	0	0.025	9	0	0	0.025
0.050	0.0006	0.0013	1	0.050	35	1	1	0.050
0.075	0.0008	0.0016	2	0.075	78	1	2	0.075
0.100	0.0009	0.0019	5	0.100	139	3	5	0.100
0.125	0.0011	0.0022	9	0.125	217	4	9	0.125
0.150	0.0013	0.0025	16	0.150	312	7	16	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.5	400.7	0.5	0.11129
1.9	870.0	1.4	0.35296
4.6	1411.9	2.7	0.74514
9.0	1995.1	4.4	1.29935
15.5	2604.3	6.6	2.02276

Rooftop Storage Summary

Total Building Area (sq.m)		390
Assume Available Roof Area (sq.m)	80%	312
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		900
Number of Roof Notches*		2
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		16
Estimated 100 Year Drawdown Time (h)		1.8

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* 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	2yr	100yr	Available
Qresult (cu.m/s)	0.00181	0.00243	-
Depth (m)	0.093	0.143	0.150
Volume (cu.m)	3.9	13.7	15.6
Draintime (hrs)	0.7	1.8	

D.2 PREDEVELOPMENT TIME OF CONCENTRATION CALCULATION

Federal Aviation Administration (FAA) (1970) Pre-Development Time of Concentration Calculation
Project: 283 - 285 McLeod Street
Stantec Project Number: 160401560
Last updated on: 2021-08-10

Federal Aviation Administration (1970)	$t_c = 1.8(1.1 - C)L^{0.50}/S^{0.333}$ [min] C = rational method runoff coefficient L = length of overland flow, ft S = surface slope, ft/ft	Developed from air field drainage data assembled by the US Corps of Engineers; method is intended for use on airfield drainage problems, but has been used frequently for overland flow in urban basins

For the existing site in the pre-development condition:

t_c = 3.41 minutes

Variable	Value	Unit	Notes
C	0.85	unitless	Represents existing condition of the site
L	112	ft	Measured from the North edge of site (rear end) to South edge (entrance) of site along prevailing slope.
S	2.73	%	

Since the calculated time of concentration is less than 10 minutes, a 10 minute time of concentration will be used to determine the stormwater target release rate.

Appendix E EXTERNAL REPORT

E.1 GEOTECHNICAL INVESTIGATION BY PATERSON GROUP INC (SEPT. 2020)

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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Consulting Engineers
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patersongroup

Geotechnical Investigation

Proposed Multi-Storey Building
283 & 285 McLeod Street
Ottawa, Ontario

Prepared For

Zyer Developments

September 23, 2020

Report PG5489-1

Table of Contents

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Zyer Developments to conduct a geotechnical investigation for the proposed multi-storey building to be located at 283 & 285 McLeod Street 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 boreholes.
- ❑ Provide geotechnical recommendations for 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.

2.0 Proposed Development

Based on available drawings, it is understood that the existing low-rise buildings located within the southern half of the subject site are to remain and that a new, multi-storey building with 1 level of underground parking is to be constructed within the northern half of the site. Associated access lanes and landscaped areas are also anticipated 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 September 4, 2020 and consisted of 3 boreholes advanced to a maximum depth of 11.3 m. The borehole locations were distributed in a manner to provide general coverage of the subject site. The approximate locations of the boreholes are shown on Drawing PG5489-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were advanced using a truck-mounted auger 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 drilling procedure consisted of augering to the required depths at the selected locations, sampling and testing the overburden.

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. All samples were visually inspected and initially classified on site and subsequently placed in sealed plastic bags. All samples were transported to our laboratory for further examination and classification. The depths at which the auger and split spoon samples were recovered from the boreholes are shown as AU and SS, 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.

Undrained shear strength testing, using a vane apparatus, was carried out at regular intervals of depth in cohesive soils.

The overburden thickness was evaluated by a dynamic cone penetration test (DCPT) completed at BH 3. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

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

3.2 Field Survey

The test hole locations were selected by Paterson to provide general coverage of the subject site 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 and are referenced to a geodetic datum. The location of the test holes and ground surface elevation at each test hole location are presented on Drawing PG5489-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

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

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was analyzed to determine its concentration of sulphate and chloride along with its resistivity and pH. The laboratory test results are shown in Appendix 1 and the results are discussed in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site consists of 2 contiguous properties, 285 and 283 McLeod Street, which border each other to the east and west, respectively. The site is bordered by a commercial property to the north, residential properties to the east and west, and McLeod Street to the south.

The southern half of the subject site is currently occupied by a 2 storey residential structure at 283 McLeod Street and a 2 storey commercial structure at 285 McLeod Street. The northern half of the property is currently occupied by an asphalt paved parking lot. The ground surface across the site is relatively level at approximate geodetic elevation 71 m.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile at the test hole locations consists of an approximate 50 to 100 mm thickness of asphalt underlain by fill which extends to approximate depths of 2.3 to 3.1 m below the existing ground surface. The fill was generally observed to consist of a either a brown silty sand with gravel and brick or a brown silty clay.

A stiff grey silty clay deposit was observed underlying the fill material in boreholes BH 1 and BH 3. The silty clay in borehole BH 2 was observed to transition from a very stiff brown silty clay crust to a stiff grey silty clay at a depth of 3.8 m below the existing ground surface.

Refusal of the DCPT was encountered at an approximate depth of 28.2 m below the existing ground surface.

Bedrock

Based on available geological mapping, the bedrock at the subject site consists of shale of the Billings formation with a drift thickness of 25 to 50 m.

4.3 Groundwater

Groundwater levels were measured in the standpipes on April 9, 2020. The observed groundwater levels are summarized in Table 1.

Table 1 - Summary of Groundwater Level Readings

Test Hole Number	Ground Surface Elevation (m)	Groundwater Depth (m)	Groundwater Elevation (m)	Recording Date
BH 1	71.04	7.70	63.34	September 11, 2020
BH 2	71.48	10.40	61.08	September 11, 2020
BH 3	71.46	Blocked and Dry	-	September 11, 2020

Note: - The ground surface elevations at the borehole locations are referenced to a geodetic datum.

The recorded groundwater levels are noted on the applicable Soil Profile and Test Data sheet presented in Appendix 1. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater level could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed development. It is recommended that the proposed building be founded on one of the following:

- ❑ Conventional shallow footings bearing on an undisturbed, stiff silty clay bearing surface.
- ❑ A raft foundation bearing on an undisturbed, stiff silty clay bearing surface.

Due to the presence of a deep silty clay deposit, a permissible grade raise restriction is required for the subject site.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and fill, such as those containing organic or deleterious materials, should be stripped from under any building, 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. Under paved areas, existing construction remnants, such as foundation walls, should be excavated to a minimum of 1 m below final grade.

Protection of Subgrade (Raft Foundation)

Since the subgrade material will consist of a silty clay deposit, it is recommended that a minimum 75 mm thick lean concrete mud slab be placed on the undisturbed silty clay subgrade shortly after the completion of the excavation. The main purpose of the mudslab is to reduce the risk of disturbance of the subgrade under the traffic of workers and equipment.

The final excavation to the raft bearing surface level and the placing of the mud slab should be done in smaller sections to avoid exposing large areas of the silty clay to potential disturbance due to drying.

Fill Placement

Fill used for grading beneath the proposed building 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.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **150 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings designed using the above-noted bearing resistance value at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

Raft Foundation

As noted above, it is expected that a raft foundation may be required to support the proposed multi-storey building. For our design calculations, one level of underground parking was assumed which would extend approximately 3 to 3.5 m below existing ground surface. The maximum SLS contact pressure is **125 kPa** for a raft foundation bearing on the undisturbed, stiff silty clay. It should be noted that the weight of the raft slab and everything above has to be included when designing with this value. The loading conditions for the contact pressure are based on sustained loads, that are generally taken to be 100% Dead Load and 50% Live Load. The factored bearing resistance (contact pressure) at ULS can be taken as **200 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

The modulus of subgrade reaction was calculated to be **5 MPa/m** for a contact pressure of **125 kPa**. The design of the raft foundation is required to consider the relative stiffness of the reinforced concrete slab and the supporting bearing medium. A common method of modeling the soil structure interaction is to consider the bearing medium to be elastic and to assign a subgrade modulus. However, glacial till is not elastic and limits have to be placed on the stress ranges of a particular modulus.

The proposed building can be designed using the above parameters with total and differential settlements of 25 and 20 mm, respectively.

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 glacial till bearing medium when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V, passes only through in situ soil or engineered fill of the same or higher capacity as the soil.

Permissible Grade Raise

Due to the presence of the silty clay deposit, a permissible grade raise restriction of **1.5 m** is recommended for grading at the subject site.

If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class D**. Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code 2012 for a full discussion of the earthquake design requirements.

5.5 Basement Floor Slab

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the undisturbed, stiff silty clay subgrade approved by the geotechnical consultant at the time of excavation will be considered an acceptable subgrade surface on which to commence backfilling for basement slab construction. It is recommended that the upper 200 mm of sub-floor fill consists of 19 mm clear crushed stone.

If a raft slab is considered for the proposed multi-storey building, a granular layer of OPSS Granular A crushed stone will be required to allow for the installation of sub-floor services above the raft slab foundation. The thickness of the OPSS Granular A crushed stone will be dependent on the piping requirements.

A sub-slab drainage system, consisting of lines of perforated drainage pipe subdrains connected to a positive outlet, should be provided under the lowest level floor slab. The spacing of the sub-slab drainage pipes can be determined at the time of construction to confirm groundwater infiltration levels, if any. 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 subject structure. However, 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 bulk (drained) unit weight of 20 kN/m^3.

Where undrained conditions are anticipated (i.e. below the groundwater level), the applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

Lateral 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)
γ = unit weight of fill of the applicable retained soil (kN/m^3)
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 (ΔP_{AE}).

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

a_c = $(1.45-a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5\ K_o\ \gamma\ H^2$, where $K_o = 0.5$ 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 Pavement Structure

Should a flexible pavement be required for the project, the recommended flexible pavement structures shown in Tables 2 and 3 would be applicable.

Table 2 - Recommended Flexible Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill

Table 3 - Recommended Flexible Pavement Structure - Access Lanes and Ramp

Thickness (mm)	Material Description
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill

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 SPMDD using suitable vibratory equipment.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage and Waterproofing

It is recommended that a perimeter foundation drainage system be provided for the proposed building. The system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Where insufficient room is available for exterior backfill, it is suggested that the composite drainage system (such as Delta Drain 6000 or equivalent) be secured against the shoring system extending to a series of drainage sleeve inlets through the building foundation wall. The drainage sleeves should be at lease 150 mm diameter and be spaced 3 m along the perimeter foundation walls. An interior perimeter drainage pipe should be placed along the building perimeter along with the sub-slab drainage system. The perimeter drainage pipe and sub-slab drainage system should direct water to sump pit(s) within the lower garage area.

Foundation Raft Slab Construction Joints

It is expected that the raft slab, where utilized, will be poured in sections. For the construction joint at each pour, a rubber water stop along with a chemical grout (Xypex or equivalent) should be applied to the entire vertical joint of the slab. Furthermore, a rubber water stop should be incorporated in the horizontal interface between the foundation wall and the raft slab.

Sub-slab Drainage

Sub-slab drainage will be required to control water infiltration below the lowest level floor slab. For preliminary design purposes, we recommend that 100 or 150 mm perforated pipes be placed at approximate 6 m centres. 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 for conventional wall construction, backfill against the exterior sides of the foundation walls should consist of free-draining, non-frost susceptible granular materials. Imported granular materials, such as clean sand or OPSS Granular A, should be used for this purpose.

6.2 Protection of Footings Against Frost Action

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

Exterior unheated foundations, 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, the foundations are expected to have sufficient frost protection due to the founding depth. Unheated structures such as the access ramp may require insulation against the deleterious effect of frost action.

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be excavated at acceptable slopes or retained by shoring systems from the beginning of the excavation until the structure is backfilled. Given that the proposed building is anticipated to extend to the property lines, it is expected that a temporary shoring will be required to support the excavation.

Unsupported Excavations

The excavation side slopes above the groundwater level 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.

A trench box is recommended to protect personnel working in trenches with steep or vertical sides. Services are expected to be installed by "cut and cover" methods and excavations should not remain open for extended periods of time.

Temporary Shoring

Temporary shoring may be required to support the overburden soils. The design and approval of the 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.

Furthermore, the design of the temporary shoring system should take into consideration a full hydrostatic condition which can occur during significant precipitation events.

The temporary shoring system may consist of a soldier pile and lagging system or steel sheet piles which could be cantilevered, anchored or braced. The shoring system is recommended to be adequately supported to resist toe failure, if required, by means of rock bolts or extending the piles into the bedrock through pre-augered holes, if a soldier pile and lagging system is the preferred method.

Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be added to the earth pressures described below. The earth pressures acting on the shoring system may be calculated using the following parameters.

Table 4 - Soil Parameters	
Parameters	**Values**
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 (γ), kN/m^3	21
Submerged Unit Weight (γ), kN/m^3	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 level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight are calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil/bedrock 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.

Underpinning of Adjacent Structures

Should the excavation for the underground parking level extend within the lateral support zone of the footing of the adjacent building(s) to the southwest, and northwest (downward and outward at 1.5H:1V), underpinning of the adjacent footing(s) would be required.

Conventional timber lagged pits and concrete underpinning piers are considered to be suitable for this project. The depth of the underpinning, should it be required, will be dependent on the depth of the adjacent foundations relative to the foundation depths of the proposed addition at the subject site.

It is recommended that test pits be completed prior to construction, or at the start of construction, in order to evaluate the foundation depths of the adjacent structures.

6.4 Pipe Bedding and Backfill

At least 150 mm of OPSS Granular A should be used for pipe bedding for sewer and water pipes. However, the bedding thickness should be increased to 300 mm for areas over a grey silty clay subgrade. The bedding should extend to the spring line of the

pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe, should consist of OPSS Granular A or Granular B Type II with a maximum size of 50 mm. The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to 95% of the material's standard Proctor maximum dry density. It should generally be possible to re-use the site materials above the cover material if the operations are carried out in dry weather conditions. Wet silty clay materials will be difficult to re-use, at the high water contents make compacting impractical without an extensive drying period.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.5 m below finished grade) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the material standard Proctor maximum dry density.

6.5 Groundwater Control

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.

Groundwater Control for Building Construction

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

For typical ground or surface water volumes being pumped during the construction phase, 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 on Neighbouring Properties

Based on the existing groundwater level, the extent of any significant groundwater lowering will take place within a limited range of the proposed building. Based on the proximity of neighbouring buildings and minimal zone impacted by the groundwater lowering, the proposed development will not negatively impact the neighbouring structures. It should be noted that no issues are expected with respect to groundwater lowering that would cause long term adverse effects to adjacent structures surrounding the proposed building.

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.

The trench excavations should be carried out in a manner to avoid the introduction of frozen materials, snow or ice into the trenches.

6.7 Corrosion Potential and Sulphate

The results of analytical testing 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 non-aggressive to slightly aggressive corrosive environment.

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 grading plan from a geotechnical perspective.
- ❑ Review the Contractor's design of the temporary shoring system.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials used.
- ❑ 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 request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations provided in this report are in accordance with our present understanding of the project. We request that we be permitted to review the grading plan once available and to review our recommendations when the drawings and specifications are complete.

A geotechnical investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request 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 its 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 Zyer Developments or their agents is not authorized without review by Paterson for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Kevin A. Pickard, EIT

Scott S. Dennis, P.Eng.

Report Distribution

- ❑ Zyer Developments (e-mail copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 283-285 McLeod Street
Ottawa, Ontario

DATUM Geodetic

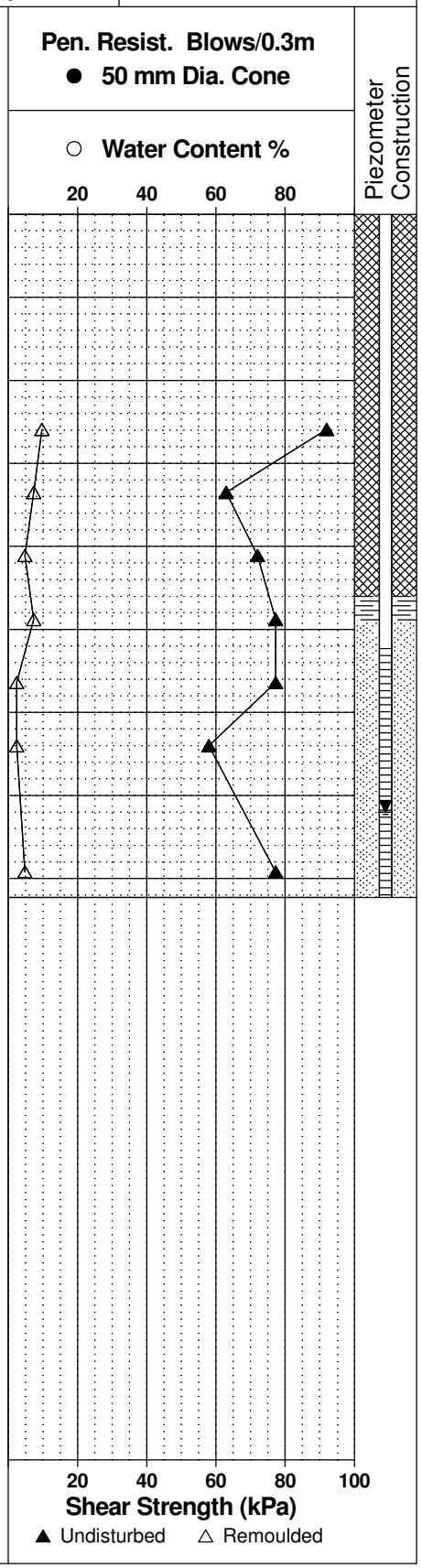
FILE NO. PG5489

REMARKS

HOLE NO. BH 1

BORINGS BY CME-55 Low Clearance Drill **DATE** September 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.04
Asphaltic concrete 0.05		AU	1				
FILL: Brown silty sand with crushed stone, trace clay 0.63						1	70.04
FILL: Brown silty sand		SS	2	4	8		
1.52						2	69.04
		SS	3	33	5		
FILL: Brown silty clay						3	68.04
3.05						4	67.04
Stiff, grey **SILTY CLAY**						5	66.04
						6	65.04
						7	64.04
8.23						8	63.04
End of Borehole							
(GWL @ 7.20m - Sept. 11, 2020)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 283-285 McLeod Street
Ottawa, Ontario

DATUM Geodetic

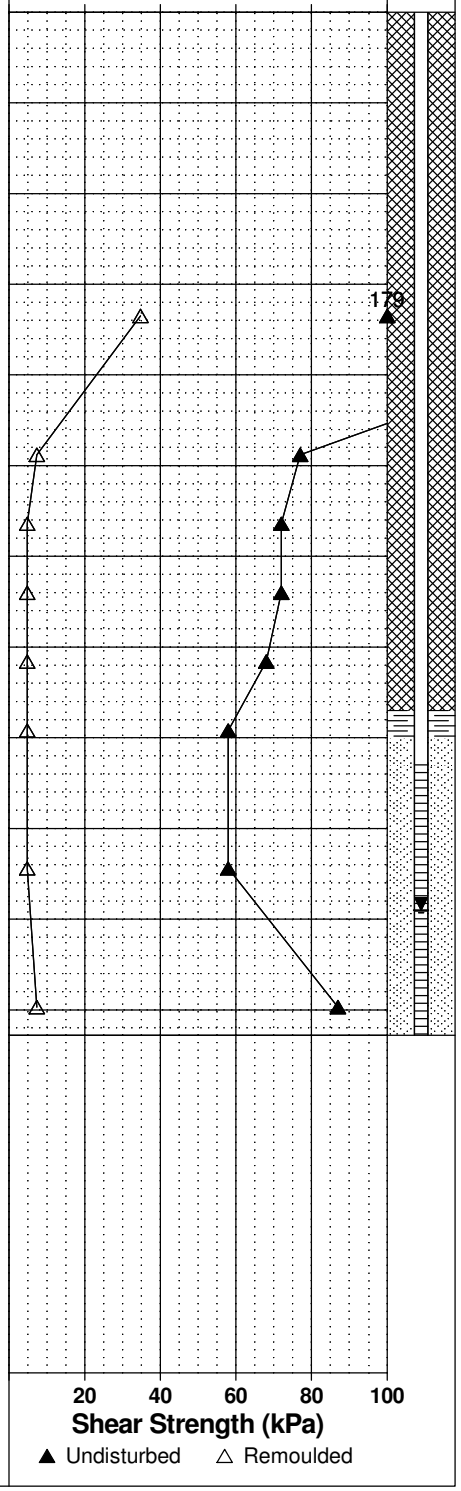
FILE NO. PG5489

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill **DATE** September 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.48
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand with crushed stone 0.59		SS	2	46	5	1	70.48
FILL: Brown silty sand, trace gravel and brick 2.29		SS	3	33	4	2	69.48
		SS	4	75	9	3	68.48
Very stiff, brown **SILTY CLAY**		SS	5	100	2	4	67.48
- stiff and grey by 3.8m depth						5	66.48
						6	65.48
						7	64.48
						8	63.48
						9	62.48
						10	61.48
11.28						11	60.48
End of Borehole							
(GWL @ 9.90m - Sept. 11, 2020)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 283-285 McLeod Street
Ottawa, Ontario

DATUM Geodetic

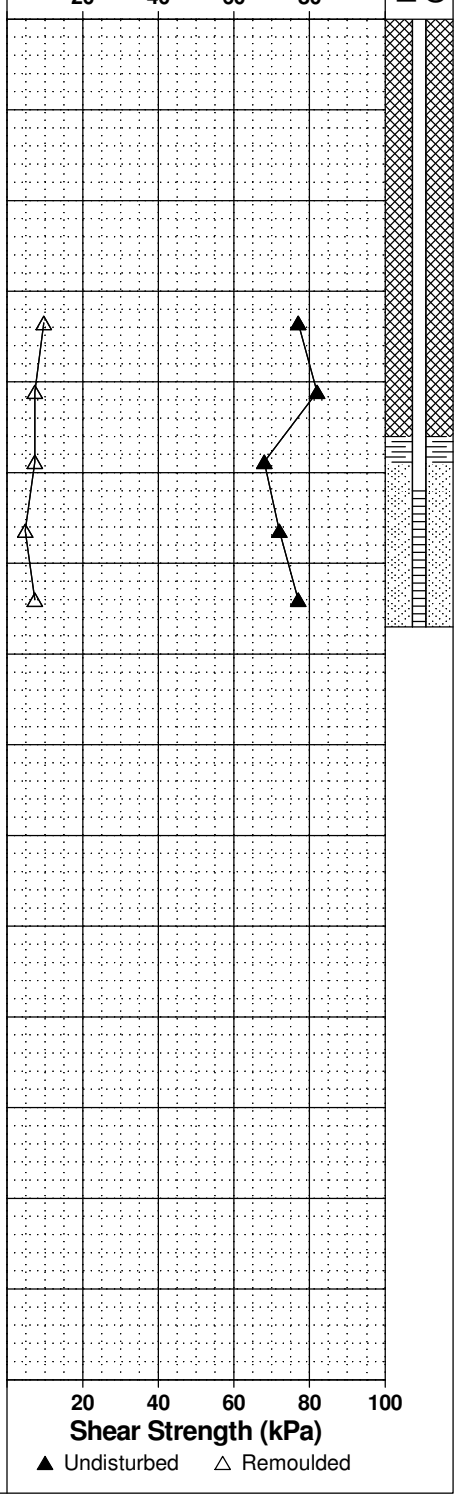
FILE NO. PG5489

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** September 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.46
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand with crushed stone 0.56		SS	2	0	50+	1	70.46
FILL: Brown silty sand, trace gravel and brick 1.52						2	69.46
FILL: Brown silty sand with gravel 2.29		SS	3	33	12		
		SS	4	83	9	3	68.46
Stiff, grey **SILTY CLAY**						4	67.46
						5	66.46
						6	65.46
6.70							
Dynamic Cone Penetration Test commenced @ 6.70m depth. Cone pushed to 22.25m depth.						7	64.46
						8	63.46
						9	62.46
						10	61.46
						11	60.46
						12	59.46
						13	58.46
						14	57.46
						15	56.46



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 283-285 McLeod Street
Ottawa, Ontario

DATUM Geodetic

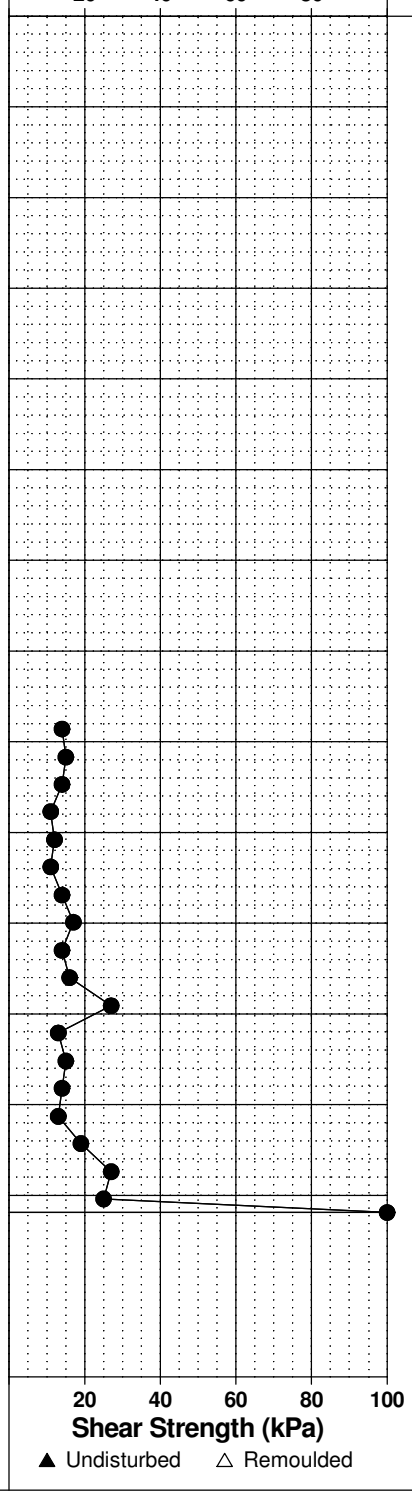
FILE NO. PG5489

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** September 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						15	56.46		
						16	55.46		
						17	54.46		
						18	53.46		
						19	52.46		
						20	51.46		
						21	50.46		
						22	49.46		
						23	48.46		
						24	47.46		
						25	46.46		
						26	45.46		
						27	44.46		
						28	43.46		
28.19									
End of Borehole Practical DCPT refusal @ 28.19m depth. (Piezometer blocked and dry at 2.4m depth - Sept. 11, 2020)									



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 strength of cohesionless soils is the relative density, 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.

Relative Density	'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 vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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 is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

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 NXL size core. However, it can be used on smaller core sizes, such as BX, 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
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture 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 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 = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

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

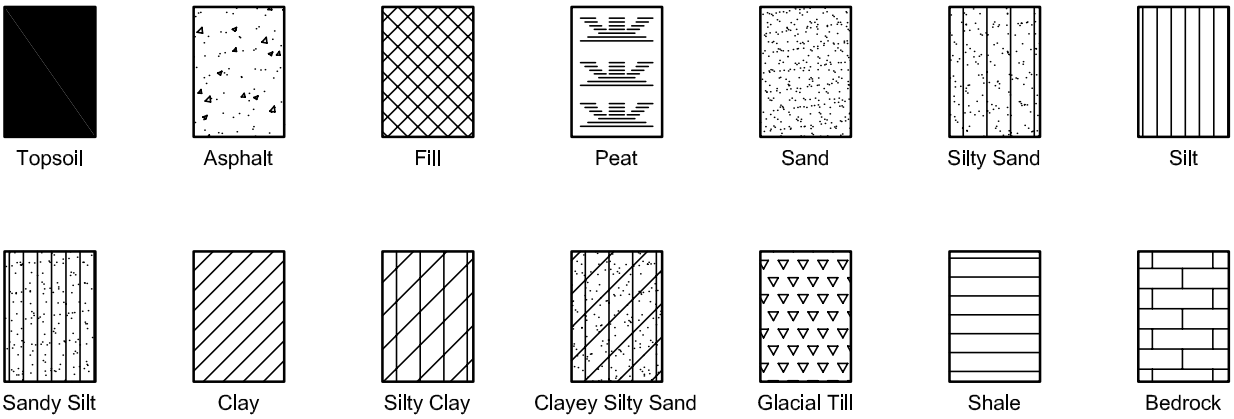
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

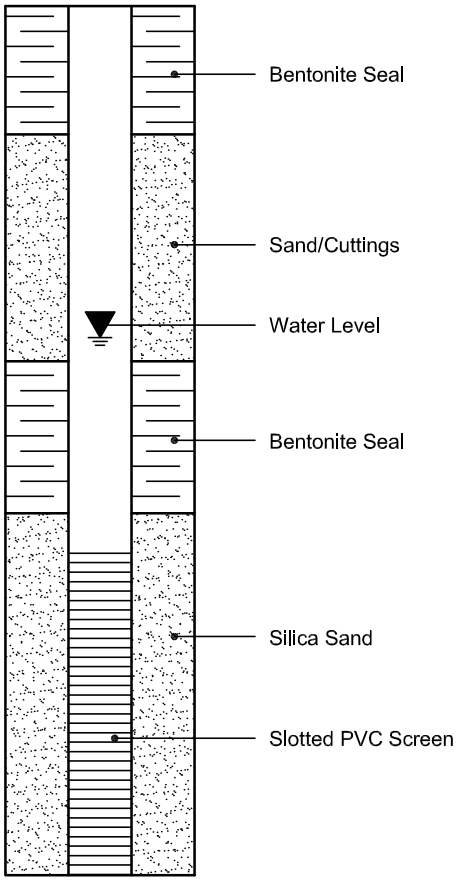
SYMBOLS AND TERMS (continued)

STRATA PLOT

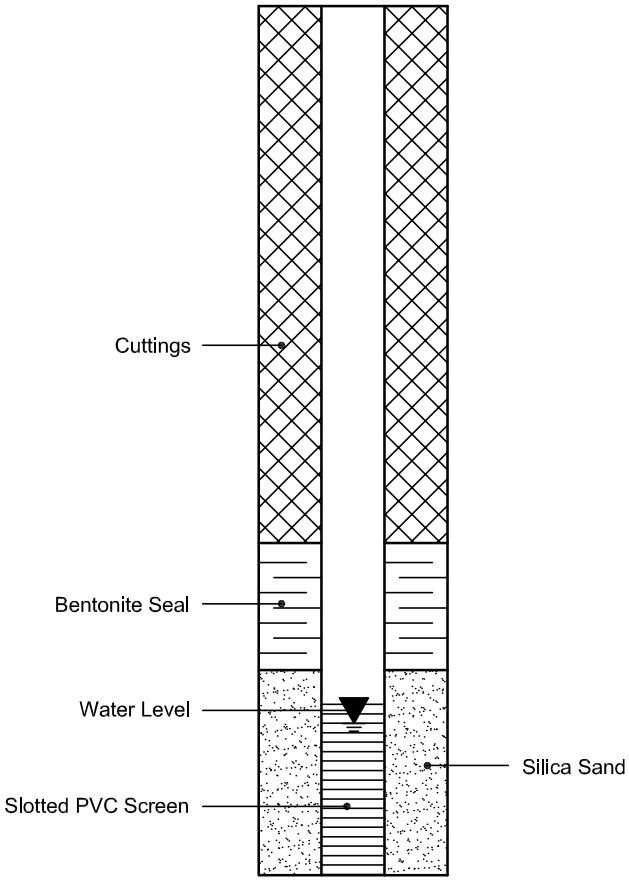


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Report Date: 14-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 8-Sep-2020

Client PO: 30820

Project Description: PG5489

	Client ID:	BH2-SS4	-	-	-
	Sample Date:	04-Sep-20 08:50	-	-	-
	Sample ID:	2037133-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	69.5	-	-	-
General Inorganics					
pH	0.05 pH Units	7.43	-	-	-
Resistivity	0.10 Ohm.m	4.63	-	-	-
Anions					
Chloride	5 ug/g dry	1420	-	-	-
Sulphate	5 ug/g dry	79	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG5489-1 - TEST HOLE LOCATION PLAN

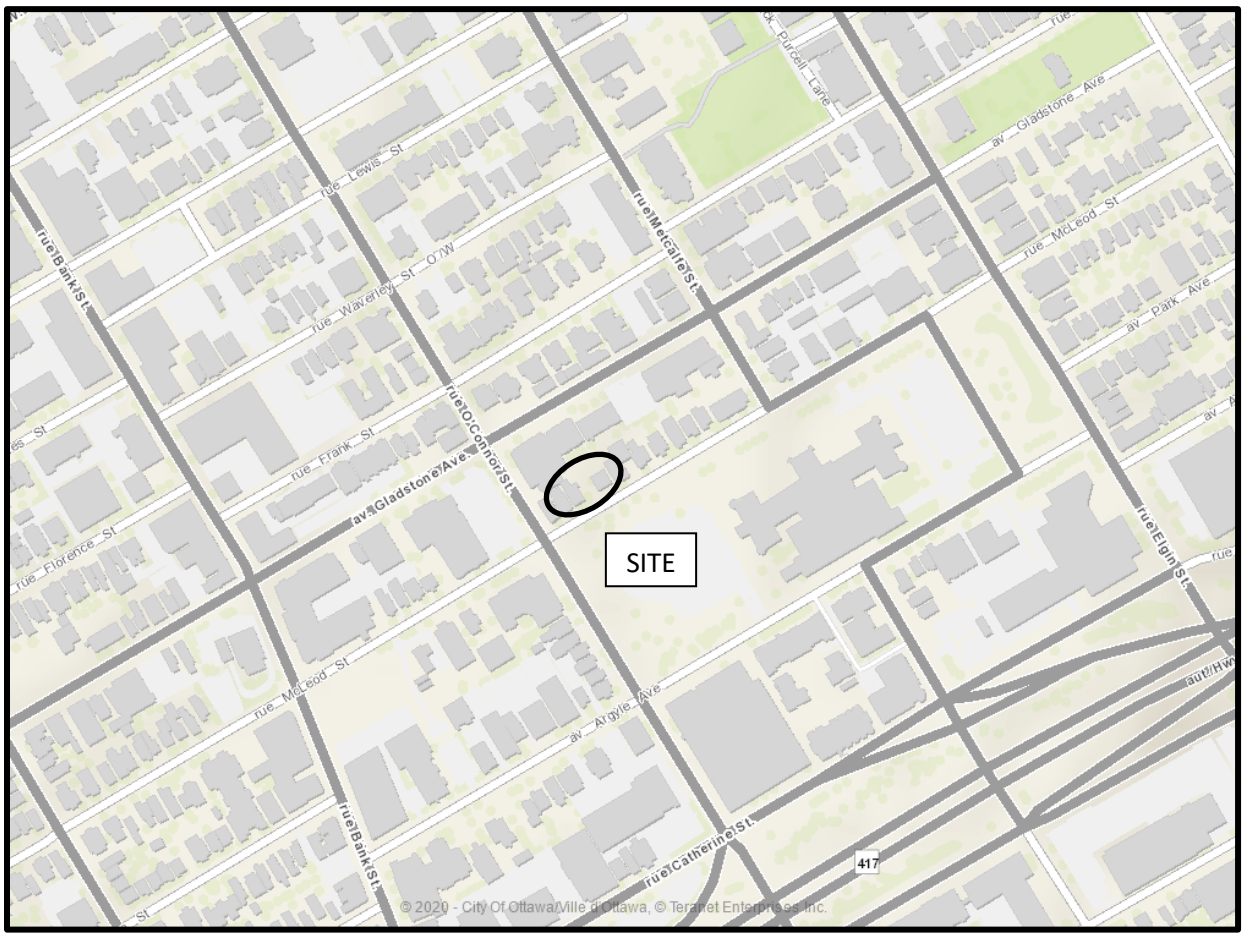
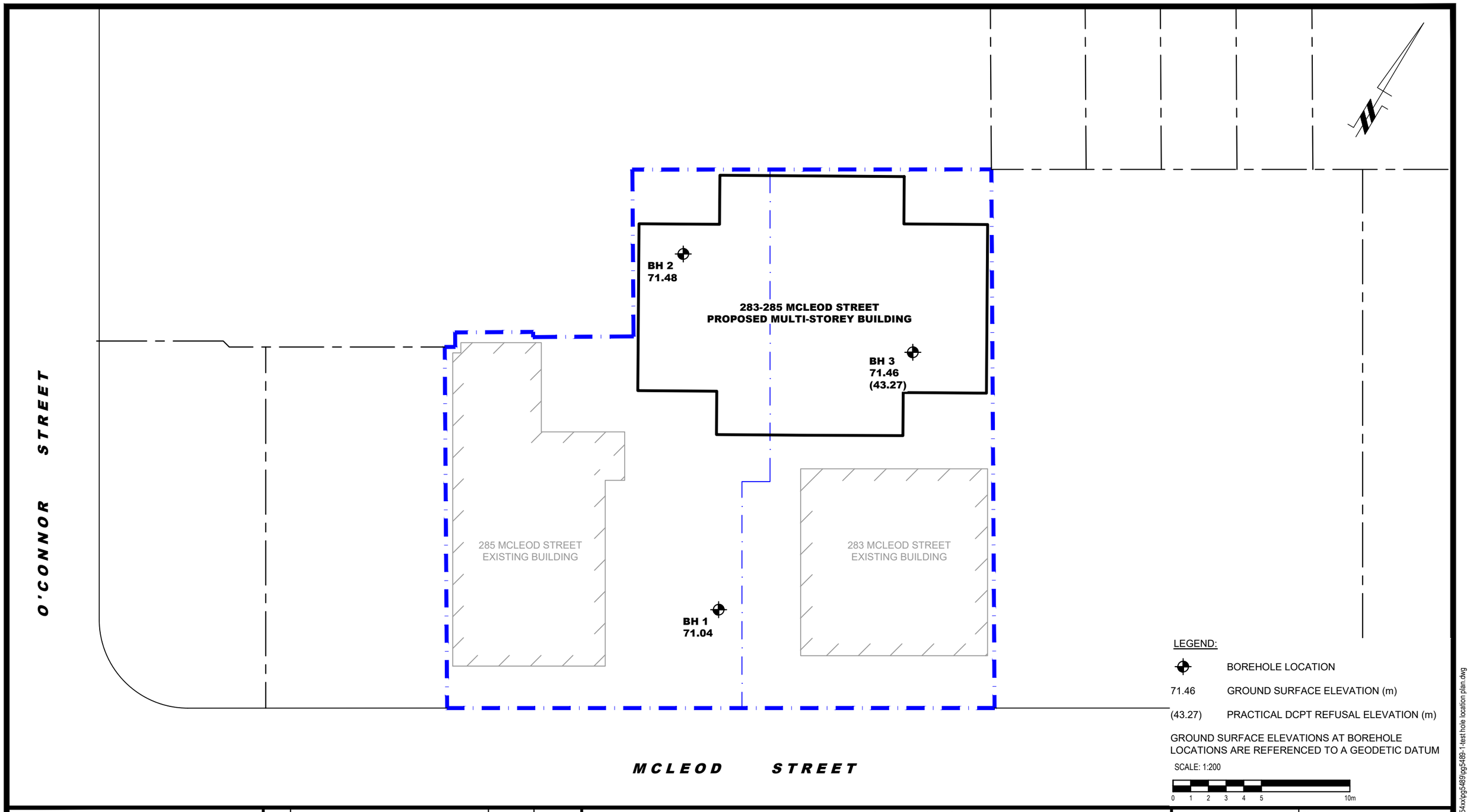


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE LOCATION
- 71.46 GROUND SURFACE ELEVATION (m)
- (43.27) PRACTICAL DCPT REFUSAL ELEVATION (m)

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM

SCALE: 1:200

0 1 2 3 4 5 10m

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

ZYER DEVELOPMENTS INC.

GEOTECHNICAL INVESTIGATION

PROPOSED MULTI-STOREY BUILDING - 283 AND 285 MCLEOD STREET

OTTAWA, ONTARIO

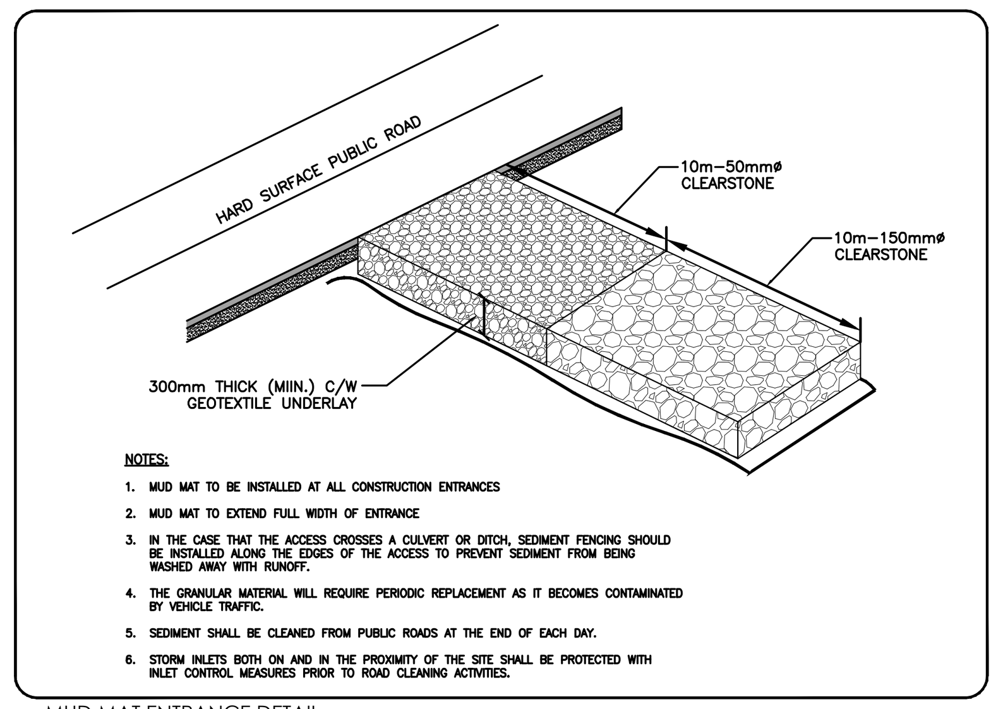
Title:

TEST HOLE LOCATION PLAN

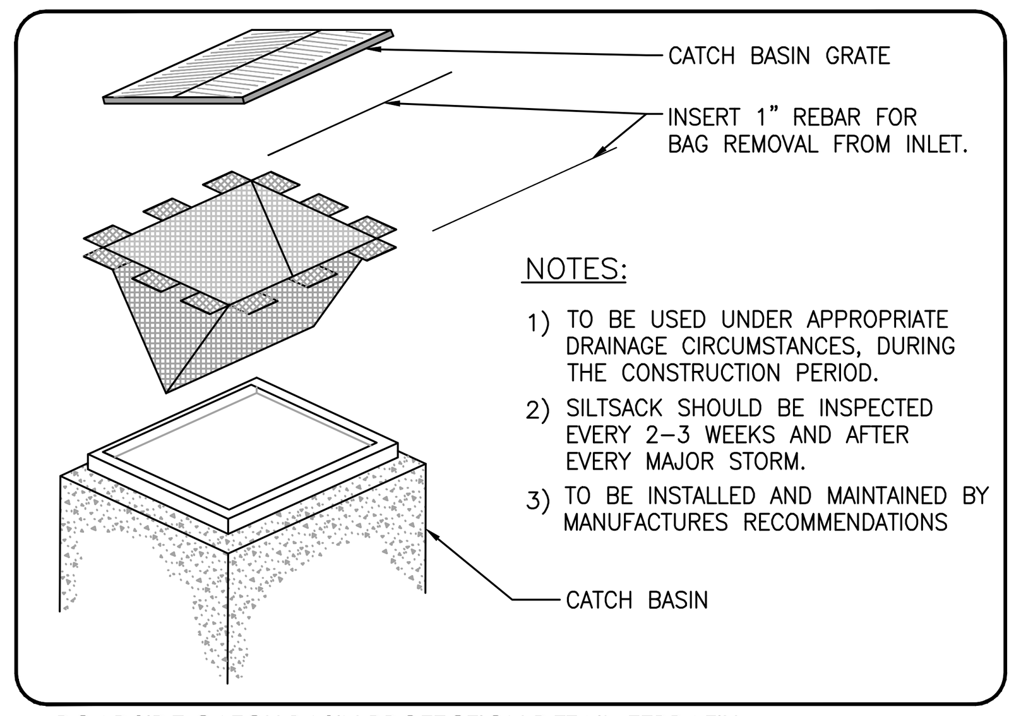
Scale: 1:200	Date: 09/2020
Drawn by: YA	Report No.: PG5489-1
Checked by: KP	Dwg. No.: PG5489-1
Approved by: SD	Revision No.:

p:\autocad drawings\geotechnical\pg54xx\pg5489\pg5489-1-test hole location plan.dwg

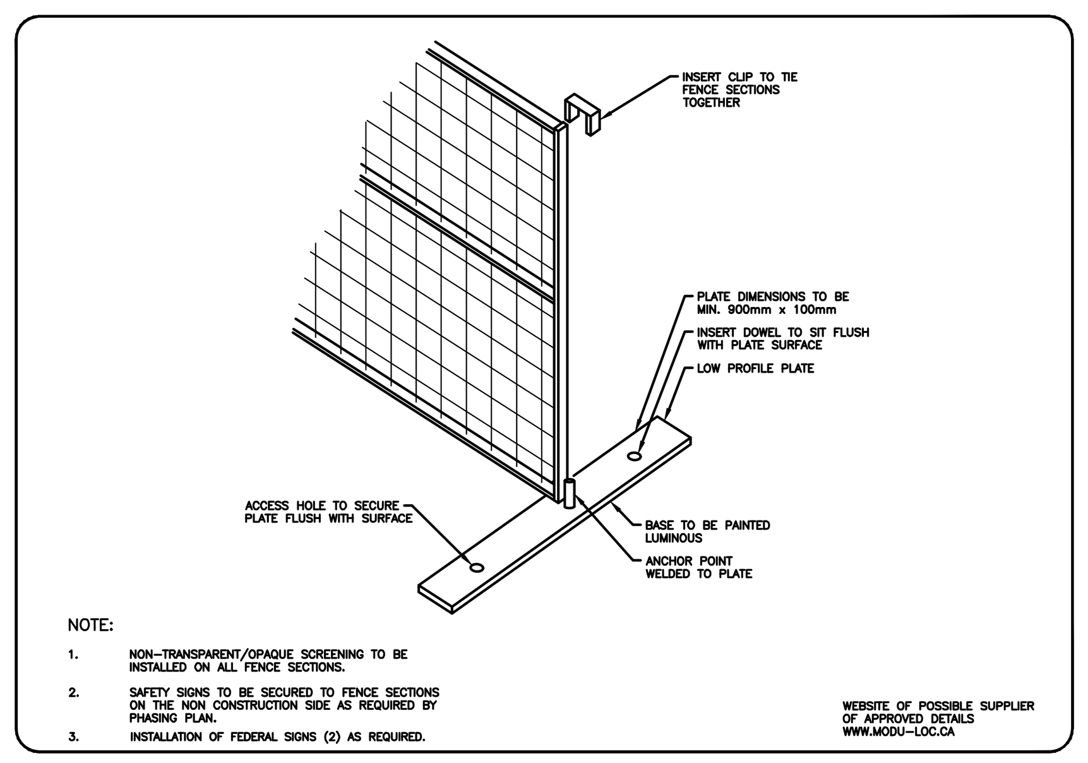
Appendix F DRAWINGS



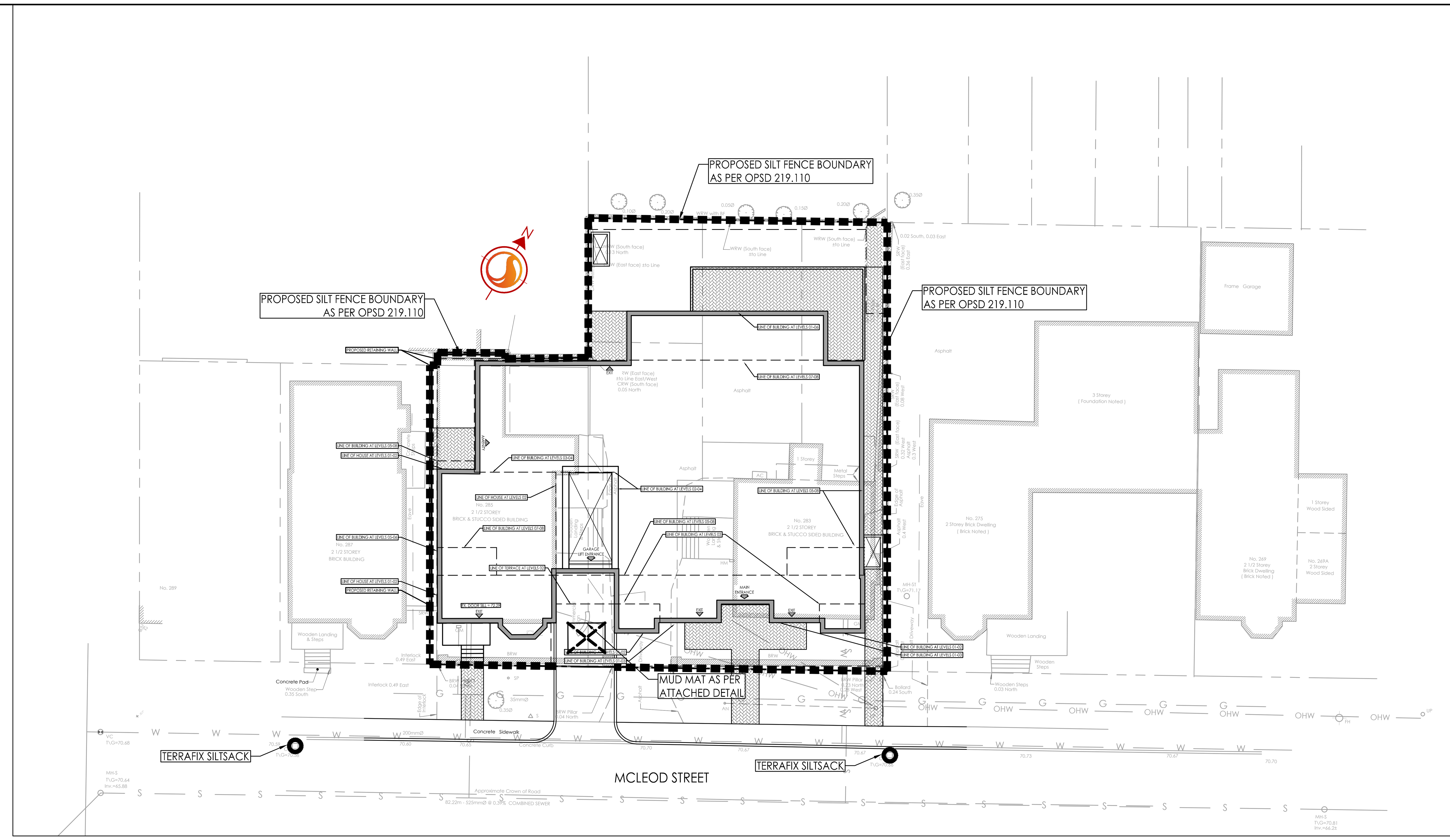
MUD MAT ENTRANCE DETAIL
SCALE: N.T.S.

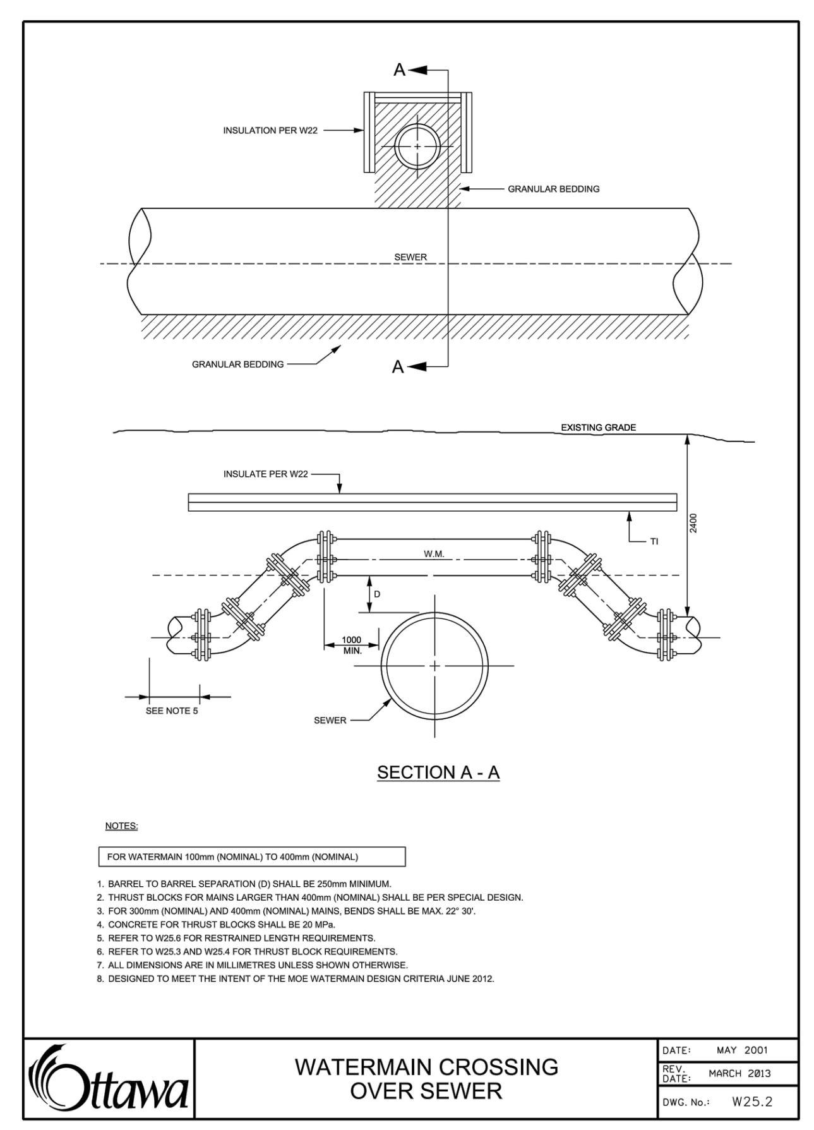


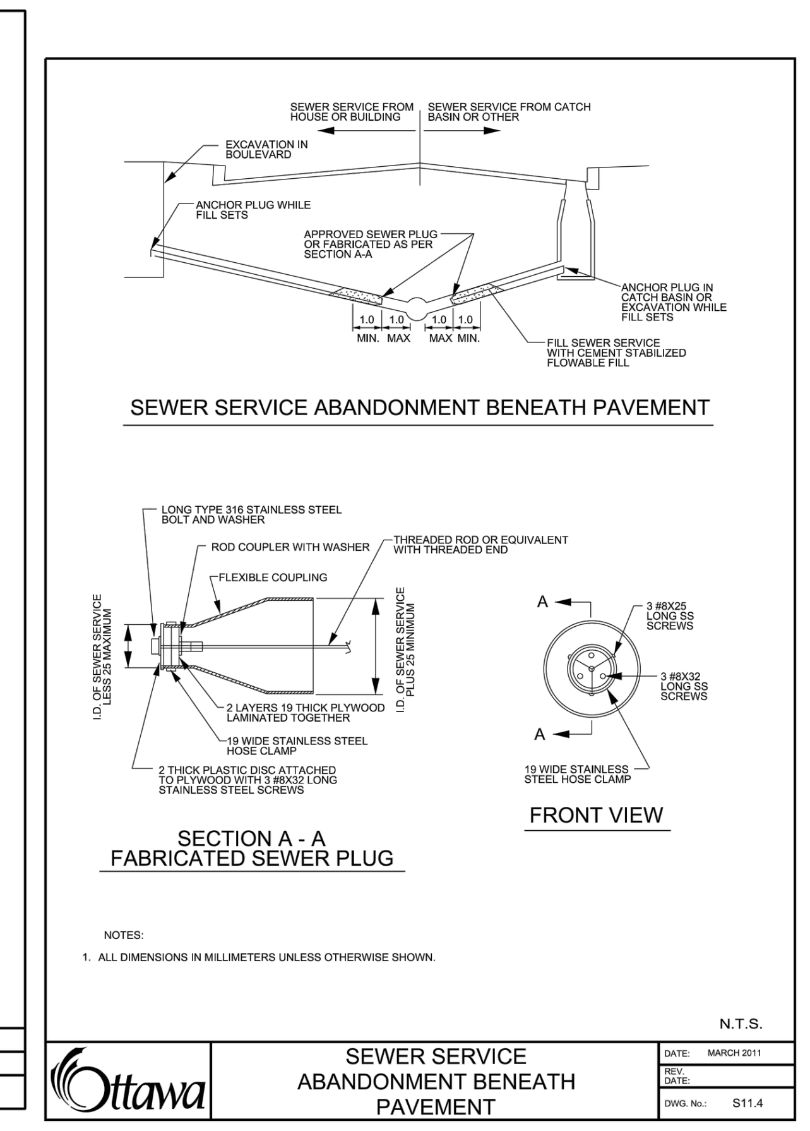
ROADSIDE CATCH BASIN PROTECTION DETAIL: TERRAFIX SILTSACK
SCALE: N.T.S.

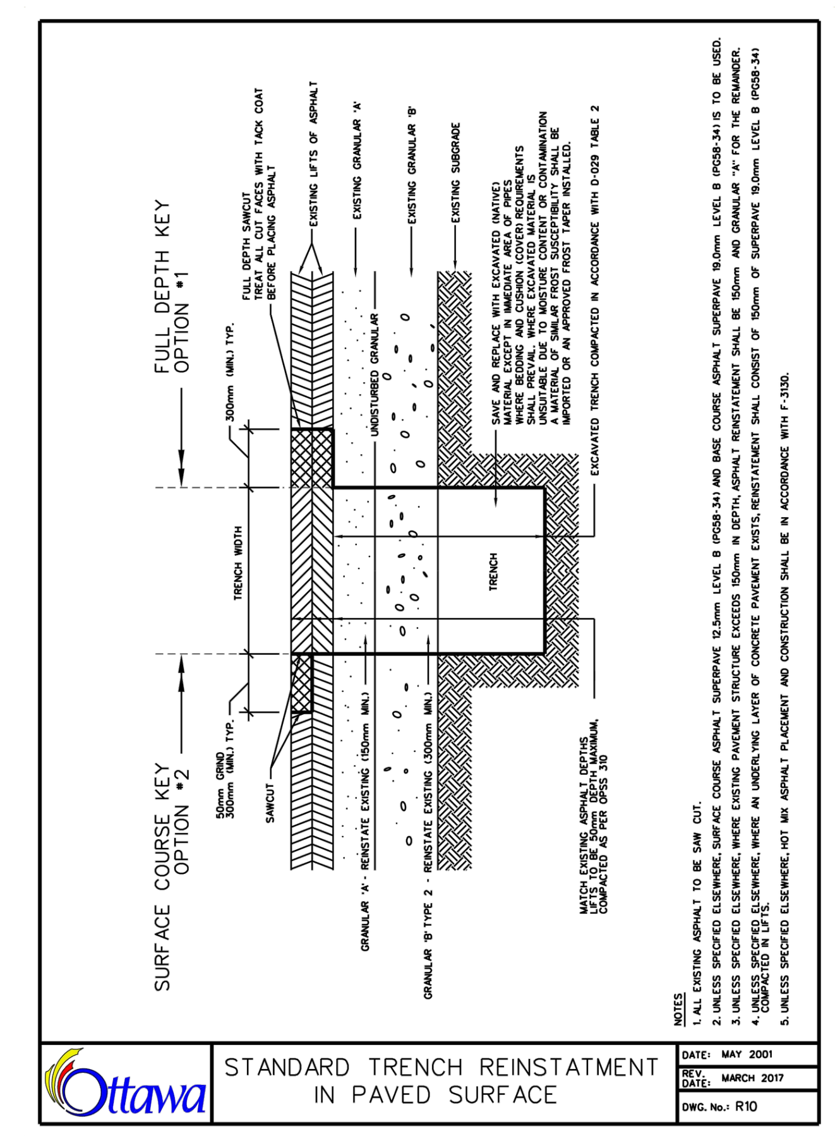


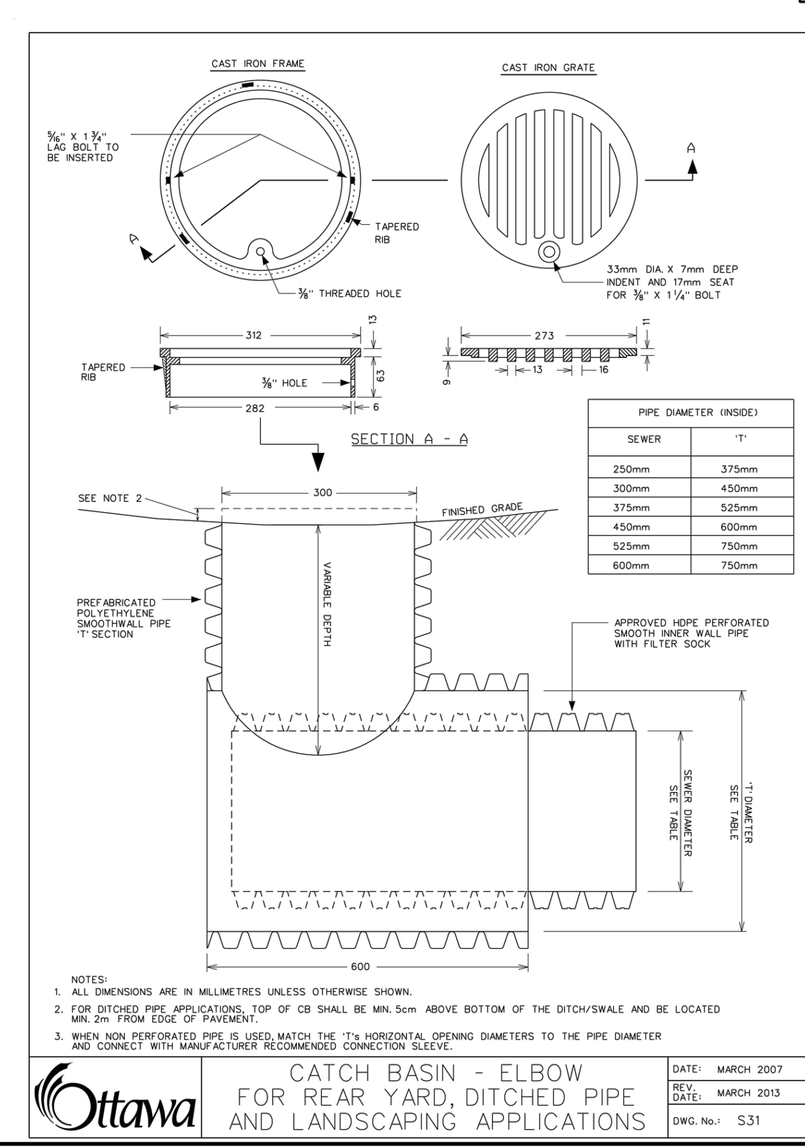
CONSTRUCTION FENCE DETAIL
SCALE: N.T.S.

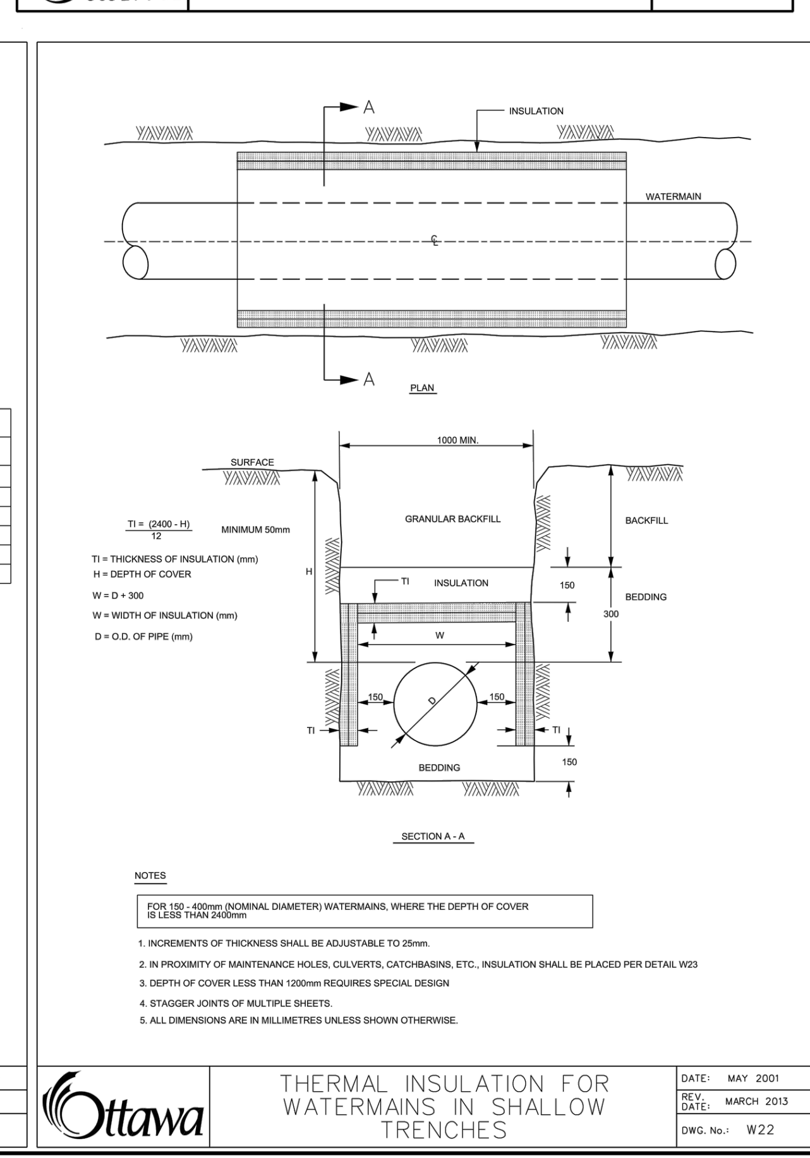


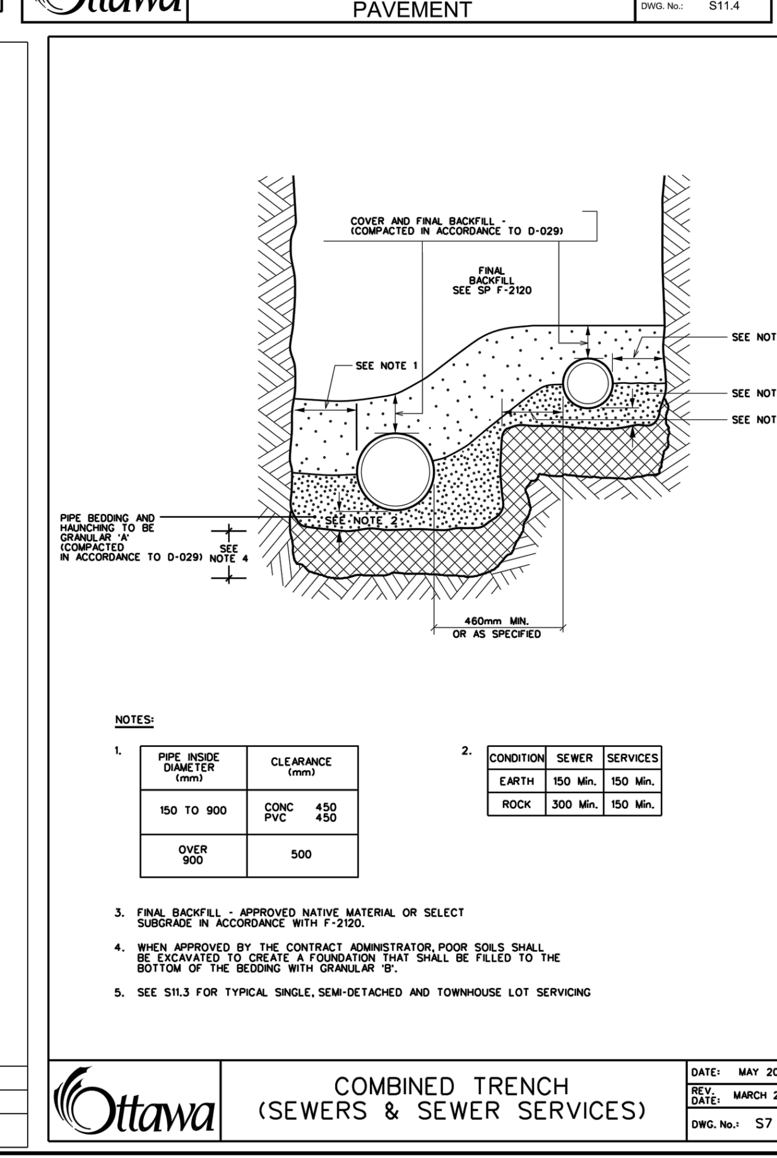


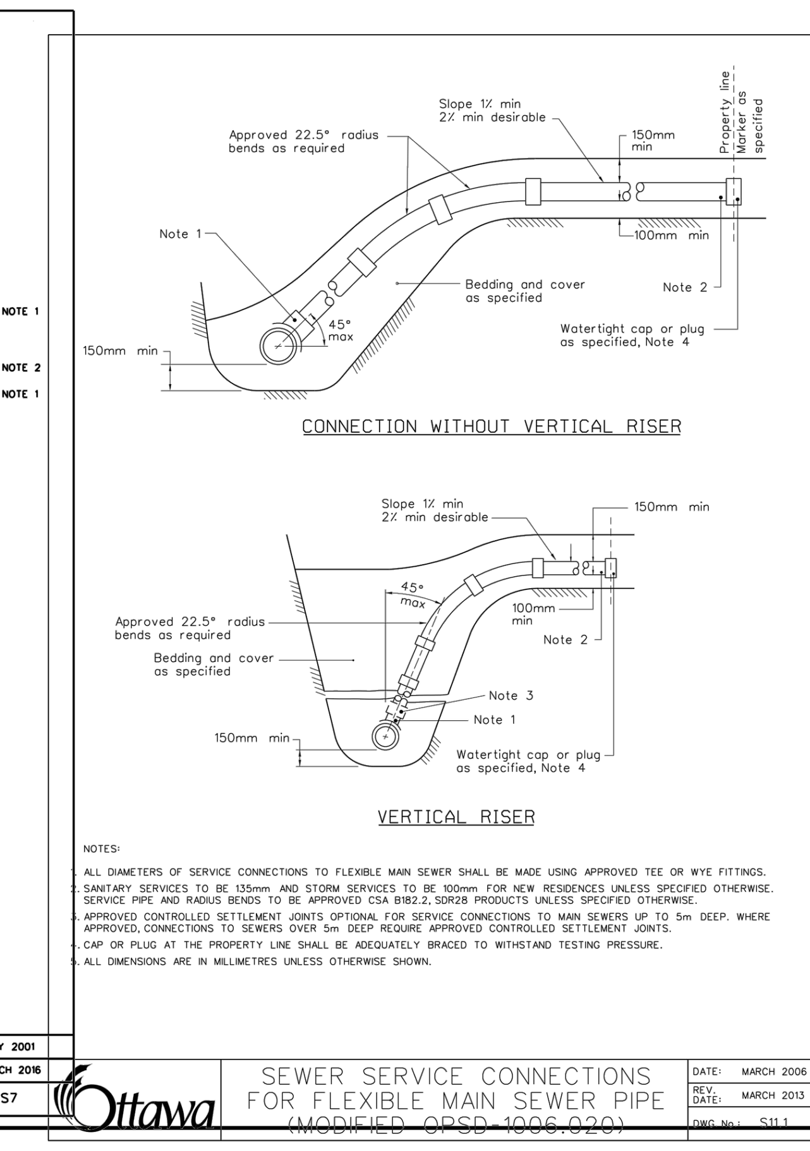


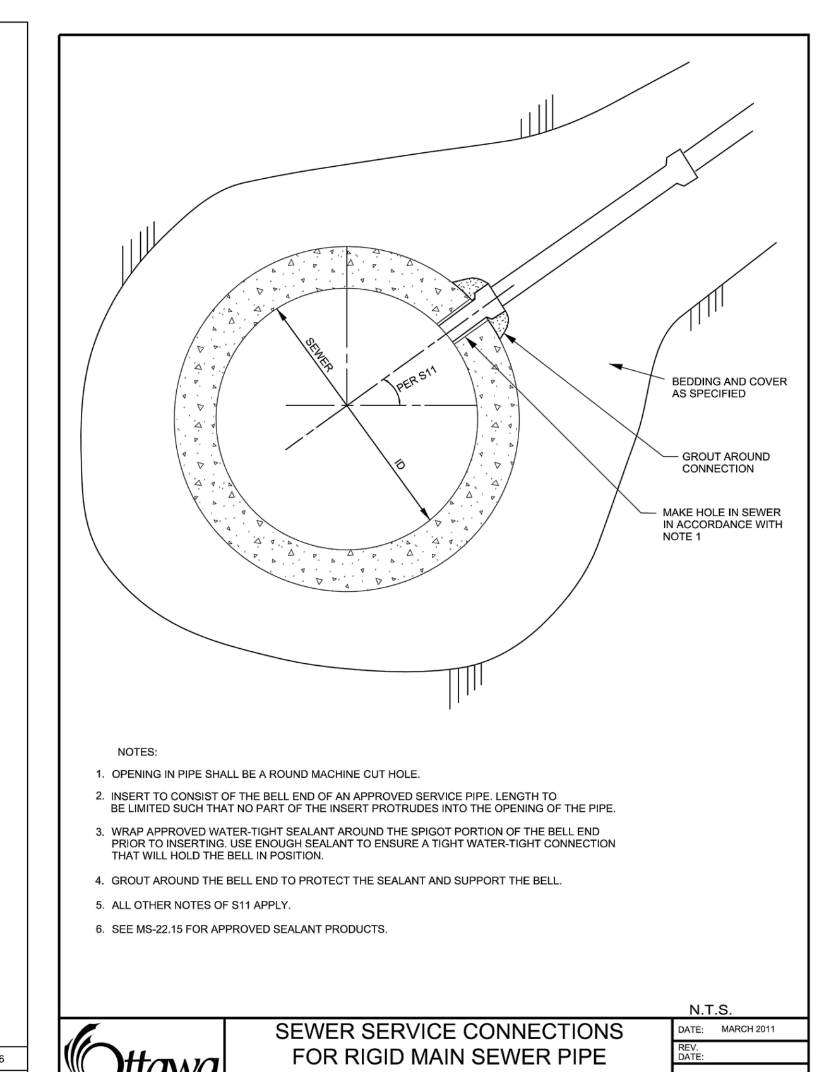












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Tel. 613.722.4420
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Legend

- PROPOSED SILT FENCE BOUNDARY AS PER OPSD 219.110
- PROPOSED CATCH BASIN PROTECTION AS PER DETAIL.
- PROPOSED MUD MAT LOCATION
- PROPOSED VALVE BOX
- PROPOSED VALVE CHAMBER
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CATCHBASIN

Notes

Best Management Practices

CONTRACTOR TO PROVIDE EROSION AND SEDIMENT CONTROLS (BEST MANAGEMENT PRACTICES) DURING CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

EROSION MUST BE MINIMIZED AND SEDIMENTS MUST BE REMOVED FROM CONSTRUCTION SITE RUN-OFF IN ORDER TO PROTECT DOWNSTREAM AREAS. DURING ALL CONSTRUCTION, EROSION AND SEDIMENTATION SHOULD BE CONTROLLED BY THE FOLLOWING TECHNIQUES:

1. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
2. REVEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE.
3. MINIMIZE AREA TO BE CLEARED AND GRUBBED.
4. PROTECT EXPOSED SLOPES WITH PLASTIC OR SYNTHETIC MULCHES.
5. INSTALL CATCH BASIN INSERTS OR EQUIVALENT IN ALL PROPOSED CATCH BASINS AND CATCH BASIN MANHOLES AND IN ALL EXISTING CATCH BASINS THAT WILL RECEIVE RUN-OFF FROM THE SITE.
6. A SILT FENCE SHALL BE INSTALLED AROUND THE PERIMETER OF ALL AND ANY STOCKPILES OF MATERIAL TO BE USED OR REMOVED FROM SITE. (LOCATION TO BE DETERMINED)
7. A VISUAL INSPECTION SHALL BE DONE DAILY ON SEDIMENT CONTROL MEASURES AND CLEANED OF ANY ACCUMULATED SILT AS REQUIRED. THE DEPOSITS WILL BE DISPOSED OFF SITE AS PER THE REQUIREMENTS OF THE CONTRACT.
8. SEDIMENT CONTROL BARRIERS MAY ONLY BE REMOVED TEMPORARILY WITH APPROVAL OF CONTRACT ADMINISTRATOR TO ACCOMMODATE CONSTRUCTION OPERATIONS. ALL AFFECTED BARRIERS MUST BE REINSTATED AT NIGHT WHEN CONSTRUCTION IS COMPLETED. NO REMOVAL WILL OCCUR IF THERE IS A SIGNIFICANT RAINFALL EVENT ANTICIPATED (>10mm) UNLESS A NEW DEVICE HAS BEEN INSTALLED TO PROTECT EXISTING STORM AND SANITARY SEWER SYSTEMS, OR DOWNSTREAM WATERCOURSES.
9. NO REFUELING OR CLEANING OF EQUIPMENT IS PERMITTED NEAR ANY EXISTING WATERWAY.
10. CONTRACTOR SHALL REMOVE SEDIMENT CONTROL MEASURES WHEN, IN THE OPINION OF THE CONTRACT ADMINISTRATOR, THE MEASURE(S) IS NO LONGER REQUIRED. NO CONTROL MEASURES SHALL BE PERMANENTLEY REMOVED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE CONTRACT ADMINISTRATOR.
11. THE CONTRACTOR SHALL PERIODICALLY, OR WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENTS AS REQUIRED.
12. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO THE WATERCOURSE. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
13. CONTRACTOR SHALL INSTALL MUD MATS AT ALL CONSTRUCTION ENTRANCES TO THE SITE.
14. STORMWATER SWALES TO BE COVERED WITH HYDRO-SEED AND MULCH.

2	ISSUED FOR APPROVAL	AJ	ALG	21.08.13
1	ISSUED FOR REVIEW	AJ	ALG	21.08.06
Revision		By	Appd.	YY.MM.DD

File Name: 160401560-DB	AJ	ALG	AJ	21.08.01
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
ZYER DEVELOPMENTS

CENTRETOWN
283-285 McLEOD STREET
OTTAWA, ON, CANADA

Title
EROSION CONTROL AND DETAIL SHEET

Project No.	Scale
160401560	1:100

Drawing No.	Sheet	Revision
EC/DS-1	1 of 3	2

PLAN #

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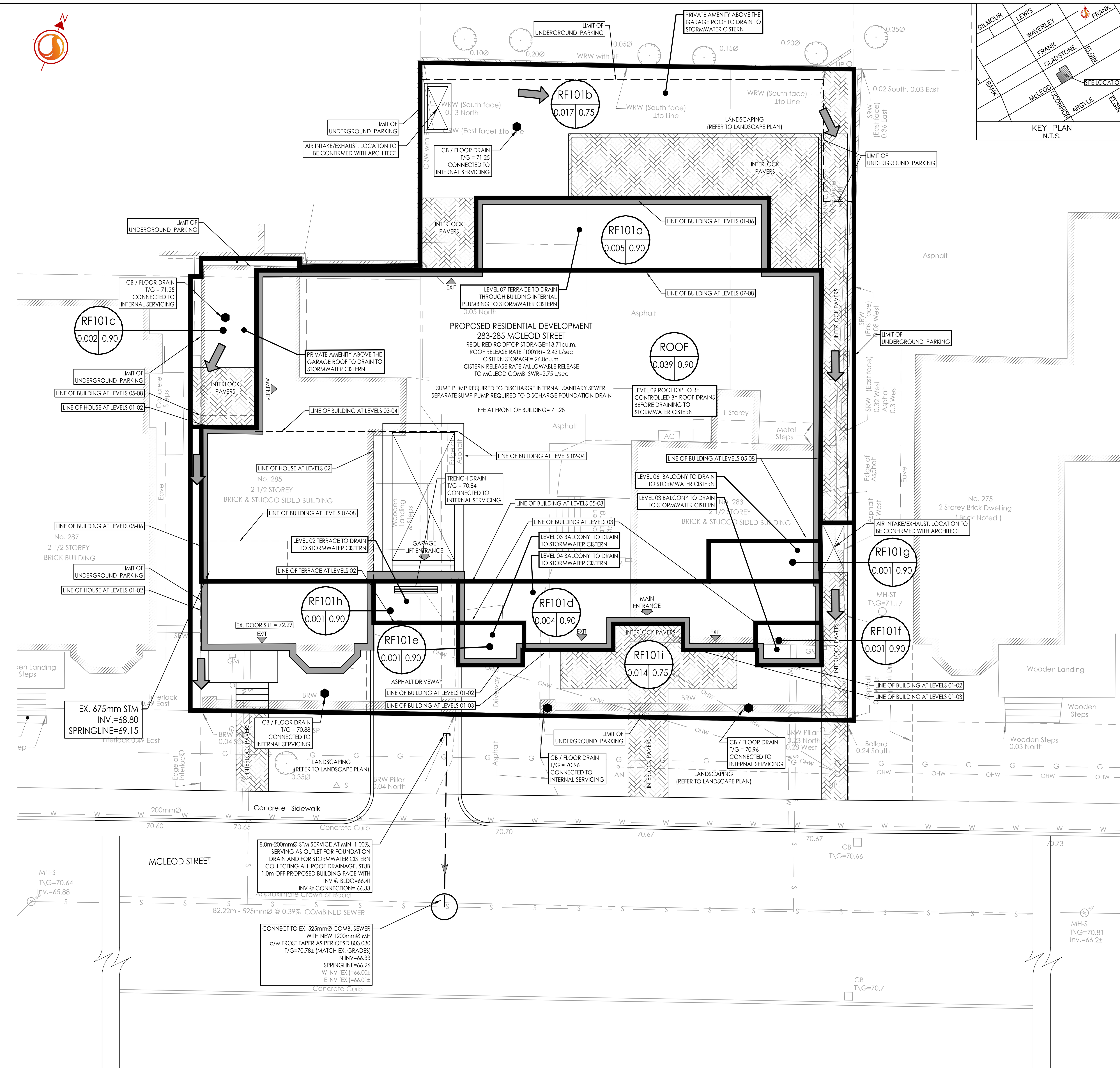

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Legend

- AREA ID
- RUNOFF COEFFICIENT
- STORM DRAINAGE AREA ha.
- STORM DRAINAGE BOUNDARY
- DIRECTION OF OVERLAND FLOW
- PROPOSED STORM SEWER
- PROPOSED AREA DRAIN
- PROPOSED TRENCH DRAIN

Notes

1. ALL CATCH BASINS TO BE CONNECTED TO INTERNAL PLUMBING AND COLLECTED IN STORM WATER MANAGEMENT CISTERN. INSTALLATION BY OTHERS.
2. INTERNAL PLUMBING AND SUMP PUMPS TO BE DESIGNED BY THE MECHANICAL CONSULTANT.
3. STORMWATER MANAGEMENT TO BE PROVIDED THROUGH A 26m³ CISTERN LOCATED BELOW THE PARKING SLAB. CISTERN TO BE DESIGNED BY THE MECHANICAL CONSULTANT.
4. ROOF TO BE EQUIPPED WITH RESTRICTED RELEASE ROOF DRAINS FOR ROOFTOP STORAGE. SCUPPERS TO ALLOW EMERGENCY OVERFLOW OVER 6" (150mm) STORAGE DEPTH.
5. PROPOSED BUILDING SERVICE SIZES TO BE CONFIRMED WITH THE MECHANICAL CONSULTANT.

2	ISSUED FOR APPROVAL	AJ	ALG	21.08.13
1	ISSUED FOR REVIEW	AJ	ALG	21.08.06
Revision		By	Appd.	YY.MM.DD

File Name: 160401560-DB	AJ	ALG	AJ	21.08.01
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
ZYER DEVELOPMENTS

CENTRETOWN
283-285 McLEOD STREET
OTTAWA, ON, CANADA

Title
STORM DRAINAGE PLAN

SCHEDULE OF ROOF RELEASE RATES

DRAIN TYPE	TRIBUTARY AREA ID	# OF DRAINS	100YR Head (m)	100YR RELEASE RATE (L/s)
WATTS DRAINAGE ACCUTROL (75% OPEN)	ROOF	2	0.143	2.43

Project No. 160401560
Scale 1:100
Drawing No. SD-1
Sheet 3 of 3
Revision 2
PLAN #

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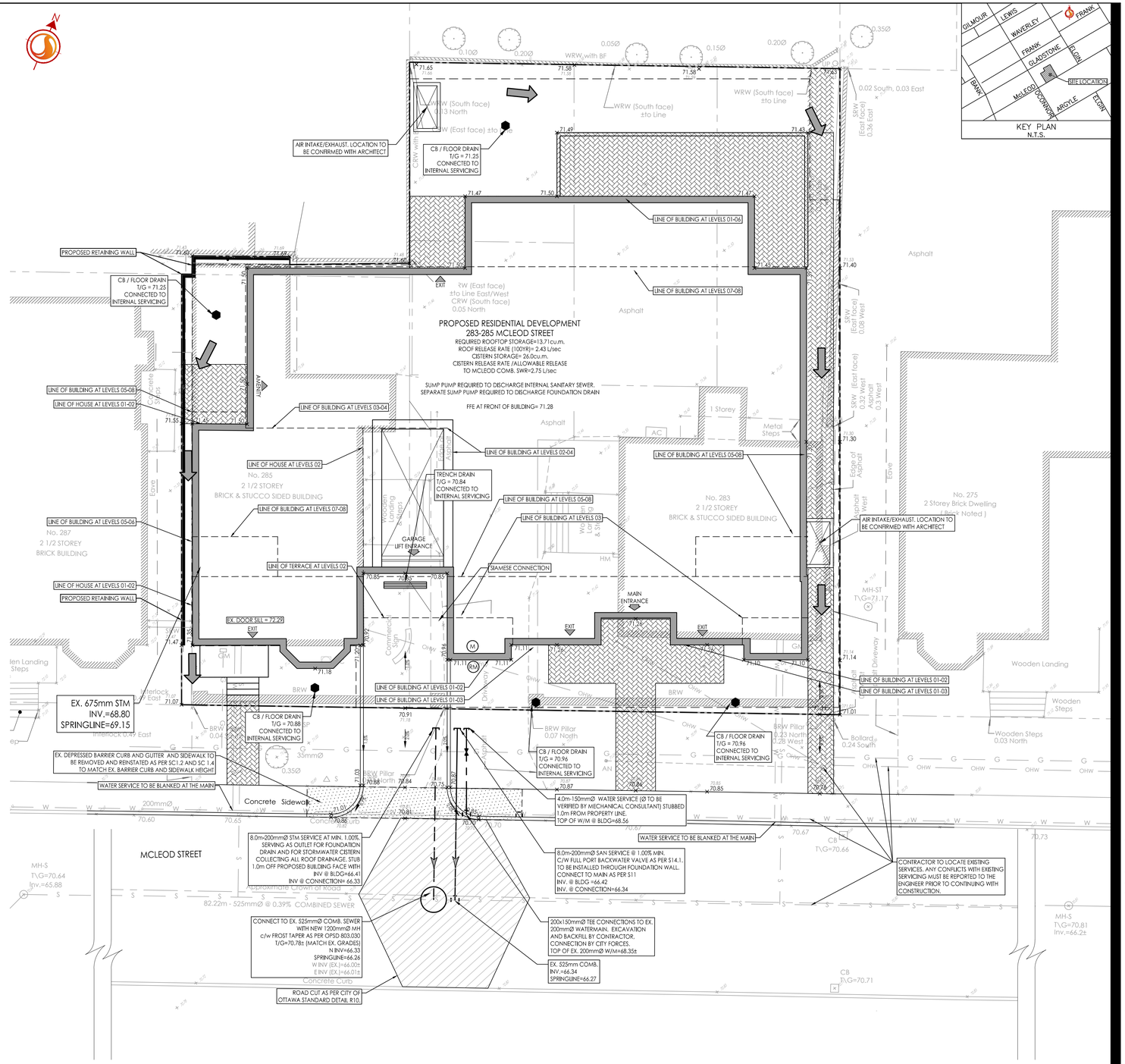

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Legend

- PROPOSED WATERMAIN
- PROPOSED VALVE AND VALVE BOX
- PROPOSED VALVE CHAMBER
- PROPOSED REDUCER
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- CIRCULAR ORIFICE (SEE ICD TABLE ON SSP-1 AND SD-1)
- EX/FUT. WATERMAIN
- EXISTING/FUTURE VALVE AND VALVE BOX
- EXISTING/FUTURE VALVE CHAMBER
- EXISTING/FUTURE REDUCER
- EXISTING/FUTURE FIRE HYDRANT
- EXISTING/FUTURE SANITARY SEWER
- EXISTING/FUTURE STORM SEWER
- EXISTING/FUTURE CATCHBASIN MANHOLE
- EXISTING/FUTURE CATCHBASIN
- PROPOSED DEPRESSED CURB LOCATIONS
- PROPOSED BARRIER CURB
- THERMAL INSULATION ON STORM SEWER WHERE COVER IS LESS THAN 1.5m. THERMAL INSULATION ON WATERMAIN WHERE COVER IS LESS THAN 2.4m AS PER W22.
- WATER METER
- REMOTE WATER METER
- ROAD CUT AS PER CITY OF OTTAWA STANDARD DETAIL R10
- PROPOSED AREA DRAIN
- PROPOSED TRENCH DRAIN

Notes

1. ALL AREA DRAINS AND TRENCH DRAIN TO BE CONNECTED TO INTERNAL PLUMBING AND COLLECTED IN STORM WATER MANAGEMENT. CISTERN DESIGN BY OTHERS.
2. FINAL METER AND REMOTE METER LOCATIONS TO BE CONFIRMED BY MECHANICAL CONSULTANT.
3. FINAL SERVICE SIZES TO BE DETERMINED BY THE MECHANICAL CONSULTANT.
4. CONTRACTOR TO LOCATE EXISTING SERVICE LATERALS PRIOR TO CONSTRUCTION. EXISTING STORM AND SANITARY SERVICE LATERALS TO BE ABANDONED PER S11.4. EXISTING WATER SERVICE TO BE BLANKED AT THE MAIN.
5. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR THEIR PROTECTION AND THE IMPLEMENTATION OF ANY NECESSARY PROCEDURES CALLED FOR IN THE APPROPRIATE STANDARD AND REGULATIONS.
6. INTERNAL PLUMBING AND SUMP PUMPS TO BE DESIGNED BY THE MECHANICAL CONSULTANT.
7. BOOSTER PUMPS TO BE PROVIDED TO MAINTAIN MINIMUM PRESSURES FOR LEVEL 02 AND ABOVE. SIZES AND FLOW RATES TO BE DETERMINED BY THE MECHANICAL CONSULTANT.

2	ISSUED FOR APPROVAL	AJ	ALG	21.08.13
1	ISSUED FOR REVIEW	AJ	ALG	21.08.06
Revision		By	Appd.	YY.MM.DD

File Name: 160401560-DB	AJ	ALG	AJ	21.08.01
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
ZYER DEVELOPMENTS

CENTRETOWN
283-285 McLEOD STREET
OTTAWA, ON, CANADA

Title
SITE SERVICING AND GRADING PLAN

Project No.	Scale	Revision
160401560	1:100 (0, 1, 3, 5m)	
Drawing No.	Sheet	
SSGP-1	2 of 3	2
		PLAN #