Geotechnical Investigation
Proposed Storage Building
3149-3169 Hawthorne Road, Ottawa, Ontario

Client:
Access Property Development
100 Canadian Road
Toronto, Ontario M1R 4Z5

Type of Document:
REVISED FINAL REPORT (supersedes final report dated November 12,2020)

Project Number:
OTT-00262560-A0

Prepared By:
Susan M. Potyondy, P.Eng.
Senior Geotechnical Engineer
Earth and Environment

Reviewed By:
Ismail M. Taki, M.Eng., P.Eng.
Senior Manager, Eastern Region
Earth and Environment

Date Submitted:
May 23,2023

100 - 2650 Queensview Drive, Ottawa, Ontario K2B 8H6
T: +1.613.688.1899 • F: +1.613.225.7337 • www.exp.com

Table of Contents:

Appendices:

Figures:

List of Tables:

Executive Summary

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed storage building to be located at 3149 Hawthorne Road Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by Access Property Development.

The proposed development will consist of the construction of a new 4483 m^2 four (4) storey building to be located on the currently vacant parcel of land identified by the address, 3149 Hawthorne Road and situated adjacent to and west of the existing eleven (11) storage buildings that are identified by the address, 3169 Hawthorne Road.

This geotechnical engineering report includes boreholes located at 3149 Hawthorne Road and 3169 Hawthorne Road but provides geotechnical engineering comments and recommendations only for the four (4) storey building to be located at 3149 Hawthorne Road.

The site grading plan for 3149 Hawthorne Road, Drawing No. CS-101 dated March 30,2023 (Revision No. 3) and prepared by Edilesse Consulting Civil Engineers (Architect's Project No. 219-0058) indicates the design elevation of the ground floor of the four (4) storey building will be at Elevation 73.65 m. It is our understanding that the building will not have a basement. The site grade raise will be a maximum 1.5 m. The ground floor may be exposed to heavy design loads that were not available at the time of this geotechnical investigation.

The fieldwork for the geotechnical investigation was completed on October 23 and 26, 2020 and consists of six (6) boreholes (Borehole Nos. BH-1 to BH-6). Borehole Nos. 1 to 3 are located at 3169 Hawthorne Road east of the proposed four (4) storey building site and Borehole Nos. 4 to 6 are located at the proposed four (4) storey building site at 3149 Hawthorne Road. The boreholes were advanced to depths ranging between 6.4 m and 8.2 m below the existing ground surface (Elevations 65.5 m to Elevation 67.8 m). The boreholes were drilled using a CME-75 track-mounted drill rig operated by a drilling specialist subcontracted to EXP. The fieldwork was supervised on a full-time basis by a representative of EXP.

The borehole information indicates the subsurface conditions consist of topsoil, fill, silty sand (possible fill), clay and glacial till underlain by bedrock contacted at a 7.0 m depth (Elevation 66.6 m and Elevation 66.1 m). The groundwater level ranges from 1.1 m to 2.7 m depths below the ground surface (Elevation 72.7 m to Elevation 70.4 m).

For the proposed four (4) storey building and based on the borehole information, the shear wave velocity was calculated to be 618 m/s. The 2012 Ontario Building Code (effective date January 1,2020) indicates in Table 4.1.8.4.A that for a site with a shear wave velocity of 618 m/s, the site classification for seismic site response is **Class C.** The subsurface soils are not susceptible to liquefaction during a seismic event.

The proposed maximum site grade raise for the new four (4) storey building will be 1.5 m and includes a site grade raise of approximately 0.5 m over the majority of the building footprint with the site grade raise increasing to 1.5 m in the approximate south and west-third portion of the building footprint. The proposed maximum site grade raise of 1.5 m using approved conventional soil fill is considered acceptable provided that the footings are founded on the native clay or on an engineered fill pad constructed on the native clay and designed for a bearing pressure at serviceability limit state (SLS) of 120 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 180

kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. If the recommended SLS and factored ULS values are not sufficient to support the proposed four (4) storey building, the building would have to be supported by piles driven to bedrock.

The ground floor of the proposed four (4) storey building may be constructed as a slab-on-grade provided it is set on a bed of well compacted 19 mm sized clear stone at least 200 mm thick, placed on a minimum 300 mm thick engineered fill pad constructed on the approved native clay. The clear stone would minimize the capillary rise of moisture from the sub-soil to the floor slab. As an alternative to using the 200 mm thick clear stone layer, a 200 mm thick layer of OPSS Granular A compacted to 98 percent SPMDD may be used instead and overlain by a vapour barrier. Adequate saw cuts should be provided in the floor slabs to control cracking. Perimeter and underfloor drainage systems are not required. The finished floor slab should be set at least 150 mm higher than the finished exterior grade. The finished exterior grade should be sloped away from the building to prevent ponding of surface water close to the exterior walls of the proposed building.

It is anticipated that excavation may be undertaken using conventional equipment. All excavation work should be completed in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils at the site are considered to be Type 3 soil. Excavations may be undertaken as open cut in Type 3 soil, provided the excavation walls are sloped back at 1H:1V from the bottom of the excavation as per OHSA. For excavations that extend below the groundwater level, the side slopes are expected to slough and eventually stabilize at 2H:1V to 3H:1V from the bottom of the excavation. Seepage of the surface and subsurface water into these excavations is anticipated. However, it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques. In areas of high infiltration or in areas where more permeable soil layers may exist, a higher seepage rate should be anticipated and may require high-capacity pumps to keep the excavation dry.

It is anticipated that the majority of the material required for engineered fill, backfilling purposes and as subgrade fill for the project would have to be imported and should preferably conform to the specifications in the attached geotechnical report.

The above and other related considerations are discussed in greater detail in the attached geotechnical report.

1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed storage building to be located at 3149 Hawthorne Road Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by Access Property Development.

The proposed development will consist of the construction of a new 4483 m^2 four (4) storey building to be located on the currently vacant parcel of land identified by the address, 3149 Hawthorne Road and situated adjacent to and west of the existing eleven (11) storage buildings that are identified by the address, 3169 Hawthorne Road.

This geotechnical engineering report includes boreholes located at 3149 Hawthorne Road and 3169 Hawthorne Road, but provides geotechnical engineering comments and recommendations only for the four (4) storey building to be located at 3149 Hawthorne Road.

The site grading plan for 3149 Hawthorne Road, Drawing No. CS-101 dated March 30,2023 (Revision No. 3) and prepared by Edilesse Consulting Civil Engineers (Architect's Project No. 219-0058) indicates the design elevation of the ground floor of the four (4) storey building will be at Elevation 73.65 m. It is our understanding that the building will not have a basement. The site grade raise will be a maximum 1.5 m. The ground floor may be exposed to heavy design loads that were not available at the time of this geotechnical investigation.

This geotechnical investigation was undertaken to:

a) Establish the subsurface soil, bedrock and groundwater conditions at the six (6) boreholes located at 3149 and 3169 Hawthorne Road,

b) Provide classification of the site for seismic design in accordance with requirements of the 2012 Ontario Building Code (OBC) (effective date January 1,2020) and assess the liquefication potential of the subsurface soils in a seismic event,

c) Comment on grade-raise restrictions for the site,

d) Provide recommendations on the most suitable type of foundations, founding depth and Serviceability Limit State (SLS) bearing pressures and Ultimate Limit State (ULS) factored geotechnical resistances for the proposed buildings as well as anticipated total and differential settlements,

e) Discuss slab-on-grade construction,

f) Discuss excavation conditions and dewatering requirements during construction,

g) Provide pipe bedding requirements,

h) Comment on backfilling requirements and suitability of the on-site soils for backfilling purposes,

i) Discuss subsurface concrete and steel requirements; and

j) Recommend pavement structure thicknesses for the reinstatement of paved areas and for new parking lot and access road areas.

The comments and recommendations given in this report assume that the above-described design concept will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Site Description

The overall site located at 3149-3169 Hawthorne Road is bounded by Hawthorne Road on the west side and industrial developments on the remaining sides of the properties. The site of the proposed four (4) storey building at 3149 Hawthorne Road is currently a vacant parcel of land that is grass covered with occasional shrubs and trees. The site is generally flat.

The site at 3169 Hawthorne Road located adjacent to and east of 3149 Hawthorne Road is currently occupied by eleven (11) existing storage buildings with a parking lot on the east side of the property and an access road from Hawthorne Road located on the south side of the property. The site is also generally flat.

3. Procedure

The fieldwork for the geotechnical investigation was completed on October 23 and 26, 2020 and consists of six (6) boreholes (Borehole Nos. BH-1 to BH-6). Borehole Nos. 1 to 3 are located at 3169 Hawthorne Road east of the proposed four (4) storey building site and Borehole Nos. 4 to 6 are located at the proposed four (4) storey building site at 3149 Hawthorne Road. The boreholes were advanced to depths ranging between 6.4 m and 8.2 m below the existing ground surface (Elevations 65.5 m to Elevation 67.8 m). The boreholes were drilled using a CME-75 track-mounted drill rig operated by a drilling specialist subcontracted to EXP. The fieldwork was supervised on a full-time basis by a representative of EXP.

The borehole locations and geodetic elevations were established in the field by EXP and are shown on Figure 2.

Prior to the fieldwork, the locations of the boreholes were cleared of any public and private underground services. Standard penetration tests (SPTs) were performed in all boreholes at selected depth intervals and soil samples retrieved by split-barrel sampler. Field vane and penetrometer tests were carried out in the cohesive soil to measure the undrained shear strength.

A 19 mm diameter standpipe with slotted section was installed in Borehole Nos. 2, 5, and 6 for long-term monitoring of the groundwater levels. The standpipes were installed in accordance with EXP standard practice and the installation configuration is documented on the respective borehole log. The boreholes were backfilled upon completion of drilling and the installation of the standpipes.

All soil samples were visually examined in the field for textural classification, logged, preserved in plastic bags and identified. On completion of the fieldwork, all the soil samples were transported to the EXP laboratory in Ottawa, Ontario, where they were visually examined by a geotechnical engineer, and borehole logs were prepared. The engineer also assigned the laboratory testing which consisted of performing the following tests on the soil samples:

Natural Moisture Content ……..49 Tests

Grain Size Analysis……2 Tests

Atterberg Limits……2 Tests

Chemical Analysis (pH, sulphate, chloride and resistivity) ……..1 Test

4. Subsurface Soil and Groundwater Conditions

A detailed description of the geotechnical conditions encountered in the boreholes is given on the borehole logs, Figures 3 to 8 inclusive. The borehole logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and water levels at other locations may differ from conditions at the locations where sampling was conducted. The passage of time may also result in changes in the conditions interpreted to exist at the locations where sampling was conducted.

Boreholes were drilled to provide representation of subsurface conditions as part of a geotechnical exploration program and are not intended to provide evidence of environmental conditions.

It should be noted that the soil and rock boundaries indicated on the borehole logs are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The "Notes on Sample Descriptions" preceding the borehole logs form an integral part of this report and should be read in conjunction with this report.

A review of the borehole logs indicates the following subsurface conditions with depth and groundwater level measurements.

Borehole Nos. 1 to 3 are located at 3169 Hawthorne Road and Borehole Nos. 4 to 6 are located at the four (4) storey building site at 3149 Hawthorne Road.

4.1 Pavement Structure

The pavement structure in Borehole Nos. 1 to 3 comprises of a 55 mm to 75 mm thick asphaltic concrete underlain by 150 mm to 625 mm thick granular fill. The granular fill has a natural moisture content of 14 percent.

4.2 Topsoil

A 50 mm to 75 mm thick topsoil layer was contacted at ground surface in Borehole Nos. 4 to 6.

4.3 Fill

The pavement structure and topsoil are underlain by fill consisting of sand with gravel to silty sand or silty clay with some sand. The fill contains organic inclusions in Borehole Nos. 4 to 6. The fill extends to depths of 0.9 m to 1.7 m (Elevation 73.0 m to Elevation 71.0 m). The fill material is loose to compact and firm to very stiff as indicated by the SPT N-values which range from 6 to 26. The fill has a natural moisture content ranging from 6 percent to 25 percent.

4.4 Silty Sand (Possible Fill)

A silty sand was contacted beneath the fill in Borehole No. 6 and extends to a 2.3 m depth (Elevation 70.2 m). The silty sand is identified as a possible fill due to its slight reworked appearance. Based on the SPT N-value of 8, the silty sand is in a loose state. The natural moisture content of the silty sand is 18 percent.

4.5 Clay

The fill and silty sand (possible fill) in all boreholes are underlain by clay that extends to depths of 4.6 m to 6.6 m (Elevation 67.9 m to Elevation 66.9 m) in Borehole Nos. 4 to 6. Borehole Nos. 1 to 3 terminated within the clay at 6.4 m and 8.2 m depths (Elevation 67.8 m to 65.6 m). The consistency of the clay is firm to hard, as indicated by undrained shear strength measurements from field vane and penetrometer tests, ranging between 43 kPa to greater than 250 kPa. The clay has a natural moisture content ranging from 23 percent to 70 percent.

Grain size analysis and Atterberg Limits were conducted on two (2) samples of the clay and the grain size distribution curves are shown in Figure Nos. 9 and 10 and summarized in Tables I and II.

Table I: Summary of Grain-size Analysis Results – Clay Samples

Borehole No. – Sample No.	Depth (m)	Grain-size Analysis (%)				Soil Classification (USCS)
		Gravel	Sand	Silt	Clay	
BH-2 – SS3	1.5 – 2.1	0	22	40	38	CLAY with Sand (CL)
BH-3 – SS9	7.6 – 8.2	0	2	43	55	CLAY (CL)

Table II: Summary of Atterberg Limits Results – Clay Samples

Borehole No. – Sample No.	Depth (m)	Atterberg Limits Results					Soil Classification (USCS)
		w_c (%)	LL (%)	PL (%)	PI (%)	LI	
BH-2 – SS3	1.5 – 2.1	27	34	18	16	0.6	CL – Clay of low plasticity
BH-3 – SS9	7.6 – 8.2	46	39	19	20	1.4	CL – Clay of low plasticity

w_c: Moisture Content, **LL**: Limit Liquid; **PL:** Plastic Limit; **PI**: Plasticity Index; **LI**: Liquidity Index; [(1)]: Refer to Casagrande Plasticity Chart (1932)

Based on the results of the grain size analysis and Atterberg limits, the clay may be classified as clay with sand to clay (CL) of low plasticity in accordance with the Unified Soil Classification System (USCS).

4.6 Glacial Till

The clay in Borehole Nos. 4 to 6 is underlain by glacial till which extends to a 7.0 m depth (Elevation 66.6 m and Elevation 66.1 m) in Borehole Nos. 4 and 5. Borehole No. 6 terminated within the glacial till at 6.4 m depth (Elevation 66.1 m). The glacial till consists of silty clay with some sand and gravel. The glacial till may contain cobbles and boulders. The consistency of the glacial till is very stiff as indicated by undrained shear strength measurements from field vane tests of 100 kPa and 110 kPa. The natural moisture content of the glacial till is 12 percent and 65 percent.

4.7 Weathered Shale Bedrock

Weathered shale bedrock was encountered beneath the glacial till in Borehole Nos. 4 and 5 at a 7.0 m depth (Elevation 66.6 m and Elevation 66.1m). It was possible to auger 600 mm and 700 mm into the weathered shale bedrock.

4.8 Groundwater Level

Groundwater level measurements taken in standpipes installed in Borehole Nos. 2, 5, and 6 indicate the groundwater level ranges from 1.1 m to 2.7 m depths below the ground surface (Elevation 72.7 m to Elevation 70.4 m).

Groundwater levels were determined in the boreholes at the times and under the conditions stated in the scope of services. Note that fluctuations in the level of groundwater may occur due to a seasonal variation such as precipitation, snowmelt, rainfall activities, and other factors not evident at the time of measurement and therefore may be at a higher level during wet weather periods.

5. Seismic Site Classification and Liquefaction Potential of Soils

5.1 Site Classification for Seismic Site Response

For the four (4) storey building and based on the borehole information, the shear wave velocity was calculated to be 618 m/s. The 2012 Ontario Building Code (effective date January 1,2020) indicates in Table 4.1.8.4.A that for a site with a shear wave velocity of 618 m/s, the site classification for seismic site response is **Class C.**

5.2 Liquefaction Potential of Soils

For the four (4) storey building, the subsurface soils are not susceptible to liquefaction during a seismic event.

6. Grade Raise

The proposed four (4) storey building site is underlain by a sensitive marine clay deposit that is prone to consolidation settlement if overstressed by loads imposed on it by site grade raise, foundations, and by groundwater level lowering following construction. Overstressing of the clay will result in its consolidation and subsequent settlement of foundations, which may exceed the tolerable limits of the structure resulting in cracking of the structure.

The site grading plan for 3149 Hawthorne Road, Drawing No. CS-101 dated March 30,2023 (Revision No. 3) and prepared by Edilesse Consulting Civil Engineers (Architect's Project No. 219-0058) indicates the design elevation of the ground floor of the four (4) storey building will be at Elevation 73.65 m. It is our understanding that the building will not have a basement. The site grade raise will be a maximum 1.5 m.

The proposed maximum site grade raise for the new four (4) storey building will be 1.5 m and includes a site grade raise of approximately 0.5 m over the majority of the building footprint with the site grade raise increasing to 1.5 m in the south and west-third portion of the building footprint. The proposed maximum site grade raise of 1.5 m using approved conventional soi fill is considered acceptable provided that the footings that will support the building are designed for the recommended founding depth, founding soil and bearing pressure at serviceability limit state (SLS) and the factored geotechnical resistance at ultimate limit state (ULS) values discussed in Section 7 of this report. If the recommended SLS and factored ULS values are not sufficient to support the proposed four (4) storey building, the building would have to be supported by piles driven to bedrock. The ground floor of the building may be designed as a slab-on-grade for the building supported by footings or piles.

An allowance for the permanent groundwater lowering is not required, since the foundations of the proposed four (4) storey building will be above the groundwater level and clay seals will be installed in the service trenches to minimize the permanent lowering of the groundwater level at the site, as recommended in Section 10 of this report.

7. Foundation Considerations

The site grading plan for 3149 Hawthorne Road, Drawing No. CS-101 dated March 30,2023 (Revision No. 3) and prepared by Edilesse Consulting Civil Engineers (Architect's Project No. 219-0058) indicates the design elevation of the ground floor of the four (4) storey building will be at Elevation 73.65 m. It is our understanding that the building will not have a basement. The site grade raise will be a maximum 1.5 m.

The proposed four (4) storey building can be supported by footings in conjunction with a maximum site grade raise of 1.5 m achieved by using approved conventional soil fill. If the bearing pressures for footings recommended below are not sufficient to support the proposed four (4) storey building, the proposed building would have to be supported by pile foundation driven to bedrock in conjunction with the 1.5 m site grade raise achieved by the placement of approved conventional soil fill.

The existing topsoil and fill are not considered suitable to support building foundations and the ground floor slab-on-grade and therefore, will require excavation and removal down to the native clay in the footprint of the proposed building.

During construction of the proposed four (4) storey building, the silty sand identified as possible fill in Borehole No. 6 located within the footprint of the proposed building should be evaluated to confirm that it is native soil. If the silty sand is confirmed to be fill, it will require excavation and removal down to the native clay for footing and slab-on-grade support and for engineered fill pad construction.

Footing and pile foundations for the proposed four (4) storey building are discussed in the following sections of this report.

7.1 Footings

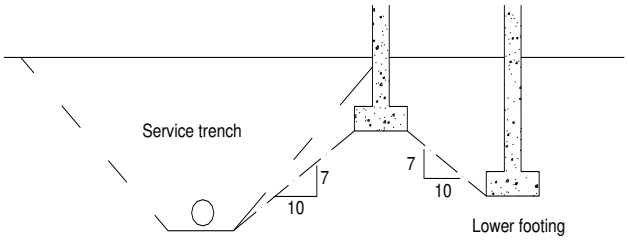
For a maximum site grade raise of 1.5 m using conventional approved soil fill, the proposed four (4) storey slab-on-grade building may be supported by strip and spread footings founded at a maximum depth of 1.5 m below the finished floor slab elevation on the native clay or on an engineered fill pad constructed on the native clay in accordance with the procedure below. Strip footings having a maximum width of 1.5 m and square footings having a maximum width and length of 3.0 m, may be designed for a bearing pressure at SLS of 120 kPa and factored geotechnical resistance at ULS of 180 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. The SLS and factored ULS values are valid for a maximum site grade raise of 1.5 m using conventional approved soil fill.

The settlement of footings designed for the above SLS bearing pressures are expected to be within the tolerable limits of 25 mm total and 19 mm differential.

Preparation of the engineered fill pad to support the footings of the proposed building should consist of the excavation and removal of the topsoil layer, fill, silty sand (possible fill – refer to note above) down to the clay. The excavation for the engineered fill pad should extend a sufficient distance beyond the perimeter of the proposed building to accommodate a 1.0 m wide bench of engineered fill, which is thereafter sloped at an inclination of 1H:1V down to the clay subgrade. The exposed subgrade should be examined by a geotechnician working under the direction of a geotechnical engineer. Any soft/loose and spongy areas of the subgrade should be excavated and

replaced with Ontario Provincial Standard Specification (OPSS) Granular B Type II compacted to 100 percent SPMDD. Following approval of the subgrade for the engineered fill pad, the excavation may be backfilled with OPSS Granular B Type II placed in 300 mm thick lifts and each lift compacted to 100 percent SPMDD beneath the footings and 98 percent SPMDD beneath the floor slab. The engineered fill should be placed under the full-time supervision of a geotechnician working under the direction of a geotechnical engineer. In-place density tests should be undertaken on each lift of the engineered fill to ensure that it is compacted to the specified degree of compaction prior to placement of the subsequent lift.

Footings founded on soils at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical (10H:7V) from the near edge of the lower footing, as shown below. This concept should also be applied to service excavation, etc. to ensure that undermining is not a problem.



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All footing beds should be examined by a geotechnical engineer to ensure that the founding soil is capable of supporting the bearing pressure at SLS and that the footings have been properly prepared.

For footings founded directly on the native clay, the exposed surface of the clay is susceptible to disturbance due to movement of workers and construction equipment. It is therefore recommended that the approved subgrade in the footing beds must be covered with a 50 mm thick concrete mud slab to prevent disturbance to the clay subgrade within the same day of approval.

A minimum of 1.5 m of earth cover should be provided to the exterior foundations of heated structures to protect them from damage due to frost penetration. The frost cover should be increased to 2.1 m for unheated structures if snow will not be removed from their vicinity and to 2.4 m if snow will be removed from the vicinity of the structure. When earth cover is less than the minimum required, an equivalent thermal combination of earth cover and rigid insulation or rigid insulation alone should be provided. EXP can provide additional comments in this regard, if required.

7.2 Pile Foundation

If the recommended SLS and factored ULS values for footings are not sufficient to support the proposed building, the proposed building may be supported by steel H or concrete filled pipe piles designed in end-bearing and driven to practical refusal into the underlying shale bedrock. The bedrock is anticipated to be at or below a 7.0 m depth

(Elevation 66.6 m and Elevation 66.1 m). The piles may achieve practical refusal at a depth below the surface of the bedrock; below a 7.0 m depth.

Since the piles are expected to meet refusal in the bedrock, the factored geotechnical resistance at ultimate limit state (ULS) will govern the design. The factored geotechnical resistance values at ULS for various pile sections are shown in Table III. The factored geotechnical resistance values at ULS are based on steel piles with a yield strength of 350 MPa and concrete compressive strength of 35 MPa and a geotechnical resistance factor of 0.4.

It is noted that the piles will be subjected to down-drag forces (negative skin friction) due to consolidation of the clay as a result of the maximum 1.5 m grade raise at the site. The negative skin friction that the piles would be subjected to is also listed in Table III. The allowable load on a pile may be computed by subtracting the negative skin friction from the factored geotechnical resistance at ULS.

Table III: Factored Geotechnical Resistance at Ultimate Limit State (ULS) and Estimated Negative Skin Friction of Steel Pipe and H-Piles

Pile Section	Description	Factored Geotechnical Resistance at ULS (kN)	Estimated Negative Skin Friction (kN)	Estimated Load Carrying Capacity of Pile (kN)
Steel Pipe	245 mm O.D. by 10 mm wall thickness	1275	75	1200
	245 mm O.D. by 12 mm wall thickness	1445	75	1370
	324 mm O.D. by 12 mm wall thickness	2120	100	2020
Steel H	HP 310 x 79	1260	120	1140
	HP 310 x 110	1775	120	1655
	HP 310 x 125	2000	125	1875

Total and differential settlement of the piles are expected to be less than 10 mm.

To achieve the capacity given previously, the pile-driving hammer must seat the pile in the overburden without overstressing the pile material. For guidance purposes, it is estimated that a hammer with rated energy of 54 kJ to 70 kJ (40,000 to 52,000 ft. lbs.) per blow would be required to drive the piles to practical refusal. Practical refusal is considered to have been achieved at a set of 5 blows for 6 mm or less of pile penetration. However, the driving criteria for a particular hammer-pile system must be established at the beginning of the project using the Pile Driving Analyzer.

The site is underlain by glacial till which may contain cobbles and boulders. It is therefore recommended that the piles should be equipped with a driving shoe to protect them from damage during driving as per Ontario Provincial Standard Drawing (OPSD) 3001.100, Type II, Revision No. 2 dated November 2017.

A number of test piles should be monitored with the Pile Driving Analyzer during the initial driving and re-striking at the beginning of the project. This monitoring will allow for the evaluation of transferred energy into the pile from the hammer, determination of driving criteria and an evaluation of the ultimate bearing capacity of the piles. Depending on the results of the pile driving analysis, the pile capacity may have to be proven by at least one pile

load test for each pile type before production piling begins. If necessary, the pile load test should be performed in accordance with the American Society for Testing and Materials (ASTM) D 1143.

Closed end pipe piles tend to displace a relatively large volume of soil. When driven in a cluster or group, they may tend to jack up the adjacent piles in the group. Consequently, the elevation and the location of the top of each pile in a group should be monitored immediately after driving and after all the piles in the group have been driven. This is to ensure that the piles are not heaving or being displaced. Any piles found to heave more than 3 mm should be re-tapped.

Piles driven at the site may be subject to relaxation (loss of set with time). It is therefore recommended that all the piles should be re-tapped at least 24 hours after initially driving and at 24-hour intervals thereafter until it can be proven that relaxation is no longer a problem.

The installation of the piles at the site should be monitored on a full-time basis by a geotechnician working under the direction and supervision of a qualified geotechnical engineer to verify that the piles are driven in accordance with the project specifications.

The concrete grade beams and pile caps for heated structures should be protected from frost action by providing the beams and caps with 1.5 m of earth cover. For non-heated structures, the pile caps and beams should be provided with 2.4 m of earth cover in areas where the snow will be removed and 2.1 m of earth cover where the snow will not be removed. Alternatively, frost protection may be provided by rigid insulation or a combination of rigid insulation and earth cover.

A 50 mm thick concrete mud slab is recommended to installed under the grade beams and pile caps immediately upon excavation and approval of the subgrade to protect the surface of the clay from disturbance from water, the effects from the weather and foot traffic from construction workers.

Temporary granular roads and mats (at least 900 mm thick) may be required to provide access to the pile driving rig. The actual thickness required for the granular roads and mats will have to be established by the piling contractor, based on the type of piling rig that will be used on site and subsurface condition.

7.3 Additional Comment

The recommended bearing pressure at SLS and factored geotechnical resistances at ULS have been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field monitoring provided by an experienced geotechnical engineer to validate the information for use during the construction stage.

8. Floor Slab and Drainage Requirements

8.1 Slab-on-Grade

The site grading plan for 3149 Hawthorne Road, Drawing No. CS-101 dated March 30,2023 (Revision No. 3) and prepared by Edilesse Consulting Civil Engineers (Architect's Project No. 219-0058) indicate the design elevation of the ground floor of the four (4) storey building will be at Elevation 73.65 m. It is our understanding that the building will not have a basement. The site grade raise will be a maximum 1.5 m.

The ground floor of the proposed four (4) storey building may be constructed as a slab-on-grade provided it is set on a bed of well compacted 19 mm sized clear stone at least 200 mm thick, placed on a minimum 300 mm thick engineered fill pad constructed on the approved clay. The clear stone would minimize the capillary rise of moisture from the sub-soil to the floor slab. As an alternative to using the 200 mm thick clear stone layer, a 200 mm thick layer of OPSS Granular A compacted to 98 percent SPMDD may be used instead and overlain by a vapour barrier. Adequate saw cuts should be provided in the floor slabs to control cracking.

Perimeter and underfloor drainage systems are not required for the proposed building.

The finished floor slab should be set at least 150 mm higher than the finished exterior grade.

The finished exterior grade should be sloped away from the buildings to prevent ponding of surface water close to the exterior walls of the proposed buildings.

8.2 Vertical Modulus Subgrade Reaction

For the slab-on-grade constructed on a 200 mm thick clear stone or OPSS Granular A layer over a minimum 300 mm thick engineered fill pad (OPSS Granular B Type II) compacted to 98 percent SPMDD and placed on the native clay, the vertical modulus of subgrade reaction is estimated to be 20 MPa/m.

9. Excavation and De-Watering Requirements

9.1 Excess Soil Management

Ontario Regulation 406/19 specifies protocols that are required for the management and disposal of excess soils. As set forth in the regulation, specific analytical testing protocols need to be implemented and followed based on the volume of soil to be managed. The testing protocols are specific as to whether the soils are stockpiled or in-situ. In either scenario, the testing protocols are far more onerous than have been historically carried out as part of standard industry practices. These decisions should be factored in and accounted for prior to the initiation of the project-defined scope of work. EXP would be pleased to assist with the implementation of a soil management and testing program that would satisfy the requirements of Ontario regulation 406/19.

9.2 Excavations

Excavations for the foundations of the proposed building and underground services are expected to extend to an approximate depth of 3.0 m below the existing ground surface. These excavations will extend through the topsoil, fill, silty sand (possible fill) and into the clay. The excavations are anticipated to be approximately 2.0 m below the groundwater level.

It is anticipated that excavations may be undertaken using conventional equipment. All excavation work should be completed in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils at the site are considered to be Type 3 soil. Excavations may be undertaken as open cut in Type 3 soil, provided the excavation walls are sloped back at 1H:1V from the bottom of the excavation as per OHSA. For excavations that extend below the groundwater level, the side slopes are expected to slough and eventually stabilize at 2H:1V to 3H:1V from the bottom of the excavation.

Base heave type failure is not anticipated in excavations that extend to a 3.0 m depth below existing grade.

The clay stratum at the site is susceptible to disturbance due to the movement of construction equipment, and personnel on its surface. It is therefore recommended that the excavation at the site should be undertaken by equipment that does not travel on the excavated surface, such as a gradually or mechanical shovel. It is anticipated that temporary granular roads may be required to gain access to the site by construction equipment.

Many geologic materials deteriorate rapidly upon exposure to meteorological elements. Unless otherwise specifically indicated in this report, walls and floors of excavations must be protected from moisture, desiccation, and frost action throughout the course of construction.

9.3 De-Watering Requirements

Seepage of the surface and subsurface water into these excavations is anticipated. However, it should be possible to collect water entering the excavations at low points and to remove it by conventional pumping techniques. In areas of high infiltration or in areas where more permeable soil layers may exist, a higher seepage rate should be anticipated and may require high-capacity pumps to keep the excavation dry.

For construction dewatering, an Environmental Activity and Sector Registry (EASR) approval may be obtained for water takings greater than 50 m^3 and less than 400 m^3 per day. If more than 400 m^3 per day of groundwater are generated for dewatering purposes, then a Category 3 Permit to Take Water (PTTW) must be obtained from the Ministry of the Environment, Conservation and Parks (MECP). A Category 3 PTTW would require a complete hydrogeological assessment and would take at least 90 days for the MECP to process once the application is submitted.

Although this investigation has estimated the groundwater levels at the time of the fieldwork, and commented on dewatering and general construction problems, conditions may be present which are difficult to establish from standard boring and excavating techniques and which may affect the type and nature of dewatering procedures used by the contractor in practice. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile, thin layers of soil with large or small permeabilities compared with the soil mass, etc. Only carefully controlled tests using pumped wells and observation wells will yield the quantitative data on groundwater volumes and pressures that are necessary to adequately engineer construction dewatering systems.

10. Pipe Bedding Requirements

It is recommended that the bedding for the underground services including material specifications, thickness of cover material and compaction requirements conform to City of Ottawa requirements and/or Ontario Provincial Standard Specification and Drawings (OPSS and OPSD).

The pipe subgrade material is anticipated to be clay. In this case, it is recommended the pipe bedding consist of 300 mm thick OPSS 1010 Granular B Type II sub-bedding material overlain by 150 mm thick OPSS 1010 Granular A bedding material. The bedding materials should be compacted to at least 98 percent SPMDD.

The bedding thickness may be further increased in areas where the clay subgrade become disturbed. Trench base stabilization techniques, such as removal of loose/soft material, placement of crushed stone sub-bedding (Granular B Type II), completely wrapped in a non-woven geotextile, may also be used if trench base disturbance becomes a problem in wet or soft areas.

If the backfill for the service trenches will consist of granular fill, clay seals should be installed in the service trenches at select intervals as per City of Ottawa Drawing No. S8. The seals should be 1 m wide, extend over the entire trench width and from the bottom of the trench to the underside of the pavement structure. The clay should be compacted to 95 percent SPMDD. The purpose of the clay seals is to prevent the permanent lowering of the groundwater level.

The underground services should be installed in short open trench sections that are excavated and backfilled the same day.

11. Backfilling Requirements and Suitability of On-Site Soils for Backfilling Purposes

The material to be excavated from the site will mainly comprise of topsoil, fill, clay and silty sand (possible fill). The topsoil and fill are not considered suitable for use under structural elements or for backfill purposes. Comments regarding the suitability of the on-site materials for re-use as backfill material from a geotechnical perspective are provided below:

- Topsoil is not suitable for use as backfill material and should be discarded and removed off site. If the topsoil is deemed suitable, it may be used in landscaped areas.
- Portions of the existing fill above the groundwater level may be used as fill in landscaped areas provided any debris, cobbles and boulders (if encountered) are removed prior to placement and subject to additional examination and testing at construction.
- Portions of the excavated silty sand (possible fill) and silty clay above the groundwater level may be used as trench backfill outside the proposed building area and as subgrade fill in parking areas and access roads provided the moisture content is maintained within +/- 3 percent of its optimum value and subject to additional examination and testing at construction. However, the silty sand (possible fill) and silty clay are susceptible to moisture absorption during precipitation events (rain and snow) and therefore, should be protected at all times from the elements if stockpiled on site.

Therefore, it is anticipated that the majority of the material required for backfilling in the interior and exterior of the buildings, in service trenches and for site grading purposes would have to be imported and should preferably conform to the following specifications:

- Engineered fill under footings and beneath the floor slab - OPSS Granular B Type II placed in 300 mm thick lifts and each lift compacted to 100 percent SPMDD beneath footings and 98 percent SPMDD beneath the floor slab.
- Backfill of service trenches exterior to the building and backfill against the exterior side of the foundation walls of the buildings – OPSS Granular B Type II material placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD.
- Trench backfill and subgrade fill in parking areas, access roadways – OPSS Select Subgrade Material (SSM) or on-site approved fill, silty sand (possible fill) and clay placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD.

12. Subsurface Concrete and Steel Requirements

Chemical tests limited to pH, chloride, sulphate and resistivity were performed on two (2) selected soil samples. The certificate of the laboratory test results is attached in Appendix A and the results are summarized in Table IV below.

Table IV: Results of pH, Chloride, Sulphate and Resistivity Tests on Soil Samples

Borehole No. (Sample No.)	Soil Type	Depth (m)	pH	Sulphate (%)	Chloride (%)	Resistivity (ohm.cm)
BH-1 (SS3)	Clay	1.5 – 2.1	7.73	0.0164	0.0118	2350
BH-6 (SS4)	Clay	2.3 – 2.9	8.13	0.0128	0.0039	3030

The results indicate the clay deposit with sulphate and chloride contents of less than 0.1 percent and 0.04 percent respectively. These concentrations of sulphate and chloride in the clay would have a negligible potential of sulphate and chloride attack on subsurface concrete. The concrete should be designed in accordance with Table Nos. 3 and 6 of CSA A.23.1-19. However, the concrete should be dense, well compacted and cured.

Based on a review of the resistivity test results, the clay samples are considered mildly corrosive to bare steel as per the National Association of Corrosion Engineers (NACE). Appropriate measures should be undertaken to protect buried steel elements from corrosion.

13. Pavement Reinstatement and New Construction

Pavement structure thicknesses required to reinstate the areas affected by the proposed storage building construction and for any new pavement areas were computed and are shown on Table V. The thicknesses are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples and pavement functional design life of ten (10) to fifteen (15) years. The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. The subgrade is anticipated to consist of fill, silty sand, clay, OPSS Granular B Type II material and select subgrade material (SSM).

Table V: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Pavement Design to be used by Light Duty Vehicles (Cars Only)	Heavy Duty Vehicles (Fire Trucks, Garbage Trucks)
Asphaltic Concrete (PG 58-34)	92-97 % MRD*	65 mm HL/SP12.5 Cat B3	40 mm HL3/SP12.5 Cat B 50 mm HL8 SP19.0 Cat B
OPSS 1010 Granular A Base	100% SPMDD**	150 mm	150 mm
OPSS 1010 Granular BSub-Base, Type II	100% SPMDD**	450 mm	600 mm

**Denotes maximum relative density.*

*** Denotes standard Proctor maximum dry density, ASTM-D698-12e2.*

The foregoing design assumes that construction is carried out during dry periods and that the subgrade is stable under the load of construction equipment. If construction is carried out during wet weather, and heaving or rolling of the subgrade is experienced, additional thickness of granular material and/or geotextile may be required.

Additional comments on the construction of the parking areas and access roads are as follows:

1. As part of the subgrade preparation for the areas to be paved, the proposed parking and access roadway should be stripped of topsoil, organic stained soil and exposed buried organic soil (topsoil) and other obviously unsuitable material. The subgrade should be properly shaped, crowned, then proofrolled with a heavy vibratory roller in the full-time presence of a representative of this office. Any soft or spongy subgrade areas detected should be sub excavated and properly replaced with suitable OPSS 1010 Granular B Type II compacted to 95 percent SPMDD (ASTM D698). To prevent overstressing the clay subgrade, coarser material may be required in the lower 300 mm of the subgrade fill such as OPSS 1010 Granular B Type II or well graded blast-shattered bedrock.
2. The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. The need for adequate drainage cannot be over-

emphasized. Subdrains should be installed on both sides of the access road(s). Subdrains must be installed in the proposed parking area at low points and should be continuous between catchbasins to intercept excess surface and subsurface moisture and to prevent subgrade softening. This will ensure no water collects in the granular course, which could result in pavement failure during the spring thaw. The location and extent of sub drainage required within the paved areas should be reviewed by this office in conjunction with the proposed site grading.

3. To minimize the problems of differential movement between the pavement and catchbasins/ manhole due to frost action, the backfill around the structures should consist of free-draining granular preferably conforming to OPSS 1010 Granular B Type II material. Weep holes should be provided in the catchbasins/manholes to facilitate drainage of any water that may accumulate in the granular fill.
4. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted lanes, half-loads during paving, temporary construction roadways, etc., may be required, especially if construction is carried out during unfavorable weather.
5. The finished pavement surface should be free of depressions and should be sloped (preferably at a minimum cross fall of 2 percent) to provide effective surface drainage towards catchbasins. Surface water should not be allowed to pond adjacent to the outside edges of paved areas.
6. Relatively weaker subgrade may develop over service trenches at subgrade level. These areas may require the use of thicker/coarser sub-base material and the use of a geotextile at the subgrade level. if this is the case, it is recommended that additional 150 mm of granular sub-base Granular B should be provided in these areas in addition to the use of a geotextile at the subgrade level. On-site excavated soils should not be used as backfill of the service trenches.
7. The granular materials used for pavement construction should conform to OPSS 1010 for Granular A and Granular B, Type II and should be compacted to 100 percent of the SPMDD (ASTM D698). The asphaltic concrete and its placement should meet OPSS requirements. It should be compacted to 92 to 97 percent of the maximum relative density in accordance with ASTM D2041.

It is recommended that EXP be retained to review the final pavement structure design and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

14. Tree Planting Restrictions

The proposed four (4) storey building site at 3149 Hawthorne Road and the adjacent property to the east at 3169 Hawthorne Road are underlain by similar sensitive marine clay. The test results of the marine clay were compared with the document titled, "Tree Planting in Sensitive Marine Clay Soils – 2017 City of Ottawa Guidelines (2017 Guidelines)" and indicate the clay has a low/medium potential for soil volume change. For soils that have a low/medium potential for soil volume change, the 2017 Guidelines indicate that the tree to foundation setback distance and tree planting restrictions should be in accordance with the 2017 Guidelines.

A landscape architect should be consulted to ensure the setbacks and tree planting restrictions are in accordance with the 2017 Guidelines.

15. General Comments

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions, between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well, as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The information contained in this report is not intended to reflect on environmental aspects of the soils and groundwater. Should specific information be required, including for example the presence of pollutants, contaminants or other hazards in the soil, additional testing may be required.

We trust that this information is satisfactory for your purposes. Should you have any questions, please contact this office.

Sincerely.

Susan M. Potyondy P.Eng.
Senior Project Manager
Earth and Environment

Ismail M. Taki, M.Eng., P.Eng.
Senior Manager, Eastern Region
Earth and Environment

Figures

0 200m 400m 800m

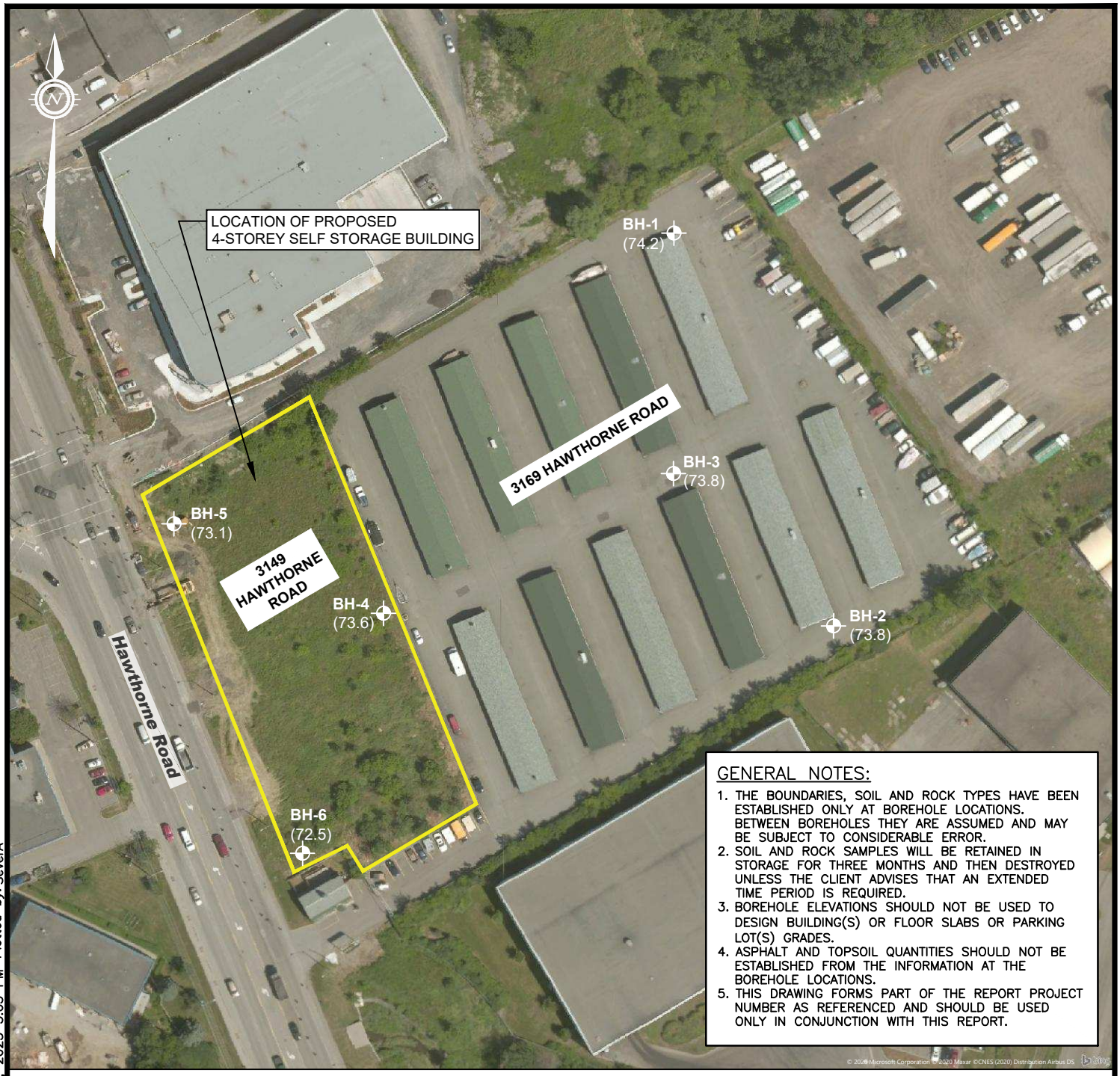
HORIZONTAL 1:20,000

EXP Services Inc. **www.exp.com**

t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

DATE: MAY 2023	CLIENT: ACCESS PROPERTY DEVLOPMENT	project no.: OTT-00262560-A0
DESIGN: A.N. / S.P. — CHECKED: I.T.		scale: 1:20,000
DRAWN BY: M.P. / A.S.	TITLE: PROPOSED STORAGE BUILDING – SITE LOCATION PLAN 3149 - 3169 HAWTHORNE ROAD, OTTAWA, ON	FIG 1

Filename: E:\OTT\OTT-00262560-A0\60 Execution\65 Drawings\262560-A0_3169-Hawthorne_2023.dwg
Last Saved: May 19, 2023 3:00 PM Last Plotted: May 19, 2023 3:00 PM Plotted by: SeverA



GENERAL NOTES:

1. THE BOUNDARIES, SOIL AND ROCK TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL AND ROCK SAMPLES WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. BOREHOLE ELEVATIONS SHOULD NOT BE USED TO DESIGN BUILDING(S) OR FLOOR SLABS OR PARKING LOT(S) GRADES.
4. ASPHALT AND TOPSOIL QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION AT THE BOREHOLE LOCATIONS.
5. THIS DRAWING FORMS PART OF THE REPORT PROJECT NUMBER AS REFERENCED AND SHOULD BE USED ONLY IN CONJUNCTION WITH THIS REPORT.

LEGEND

AREA OF PROPOSED NEW BUILDING

BH-5 (73.1) BOREHOLE LOCATION & NUMBER (GROUND SURFACE ELEVATION)

0 15m 30m 60m

HORIZONTAL 1:1500

EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

DATE: MAY 2023	CLIENT: ACCESS PROPERTY DEVELOPMENT	project no. OTT-00262560-A0
DESIGN: A.N. / S.P. CHECKED: I.T.		scale: 1:1,500
DRAWN BY: M.P. / A.S.	TITLE: PROPOSED STORAGE BUILDING – BOREHOLE LOCATION PLAN 3149 - 3169 HAWTHORNE ROAD, OTTAWA, ON	FIG 2

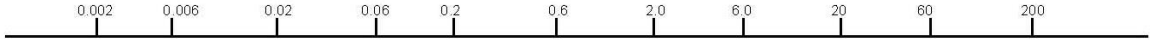
Filename: E:\OTT\OTT-00262560-A0\60 Execution\65 Drawings\262560-A0_3169-Hawthorne_2023.dwg
Last Saved: May 19, 2023 3:02 PM Last Plotted: May 19, 2023 3:03 PM Plotted by: SeverA

Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Societv for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** Services Inc. also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Log of Borehole BH-1

Project No: OTT-00262560-A0

Project: Proposed Storage Building

Location: 3149 - 3169 Hawthorne Road, Ottawa, Ontario

Figure No. 3

Page. 1 of 1

Date Drilled: 'October 23, 2020

Drill Type: CME-75 Track-Mounted Drill-Rig

Datum: Geodetic Elevation

Logged by: M. Leroux Checked by: A. Nader

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		PAVEMENT STRUCTURE 55 mm asphaltic concrete over 150 mm granular fill	74.2 74.0	0	10		SS1	
		FILL Sand with gravel to silty sand, grey to brown, moist, (loose to compact)	73.0	1	7		SS2	
		CLAY WITH SAND TO CLAY (CL) Grey, moist to wet, (stiff to very stiff)		2	4 140 s=10		SS3	
				3	3 120 s=8		SS4	
				4	2 86 s=6		SS5	
				5	2 101 s=5		SS6	
				6	Hammer Weight 67 s=8		SS7	
					Hammer Weight 53 s=4		SS8	
		Borehole Terminated at 6.4 m Depth	67.8					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of the drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00262560-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
On Completion	4.6	6.1

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 262560.GPJ TROW OTTAWA.GDT 5/23/23

Log of Borehole BH-2

Project No: OTT-00262560-A0

Project: Proposed Storage Building

Location: 3149 - 3169 Hawthorne Road, Ottawa, Ontario

Figure No. 4

Page. 1 of 1

Date Drilled: 'October 23, 2020

Drill Type: CME-75 Track-Mounted Drill-Rig

Datum: Geodetic Elevation

Logged by: M. Leroux Checked by: A. Nader

Split Spoon Sample
Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Shear Strength by Vane Test (S)
Combustible Vapour Reading
Natural Moisture Content
Atterberg Limits
Undrained Triaxial at % Strain at Failure
Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		PAVEMENT STRUCTURE 75 mm asphaltic concrete over 625 mm granular fill	73.8	0	14		SS1	
			73.1					
		FILL Silty clay, some sand and gravel, grey to brown, moist, (very stiff)	72.7	1	15		SS2	
			72.3					
		CLAY WITH SAND TO CLAY (CL) Grey, moist to wet, (firm to very stiff)		2	11, 180		SS3	
					6		SS4	
				3	115 s=7; 3		SS5	
					86 s=6			
				4	2		SS6	
					53 s=5			
					Hammer Weight		SS7	
				5	58 s=6			
					Hammer Weight		SS8	
				6	48 s=7			
			67.4					
		Borehole Terminated at 6.4 m Depth						

LOG OF BOREHOLE BH LOGS - 262560.GPJ TROW OTTAWA.GDT 5/23/23

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. 19 mm standpipe was installed upon the completion of the drilling as noted above.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00262560-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
On Completion	4.9	6.1
18 Days	1.1	N/A

CORE DRILLING RECORD

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

Log of Borehole BH-3

Project No: OTT-00262560-A0

Project: Proposed Storage Building

Location: 3149 - 3169 Hawthorne Road, Ottawa, Ontario

Figure No. 5

Page. 1 of 1

Date Drilled: 'October 23, 2020

Drill Type: CME-75 Track-Mounted Drill-Rig

Datum: Geodetic Elevation

Logged by: M. Leroux Checked by: A. Nader

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		PAVEMENT STRUCTURE 60 mm asphaltic concrete over 200 mm granular fill	73.8	0	26		SS1	
		FILL Silty sand, grey to brown, moist to wet, (compact)	73.5	1	13		SS2	
		CLAY WITH SAND TO CLAY (CL) Grey, moist to wet, (stiff to very stiff)	72.6	2	7; 156▲; 190 +S s=6		SS3	
				3	3; 160 +S s=7		SS4	
				4	3; 101 +S s=6		SS5	
				5	1; 86 +S s=7		SS6	
				6	Hammer Weight; 58 +S s=8		SS7	
				7	Hammer Weight; 53 +S s=7		SS8	
				8	Hammer Weight		SS9	
		Borehole Terminated at 8.2 m Depth	65.6					

LOG OF BOREHOLE BH LOGS - 262560.GPJ TROW OTTAWA.GDT 5/23/23

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of the drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00262560-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
On Completion	4.9	7.6

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH-4

Project No: OTT-00262560-A0

Project: Proposed Storage Building

Location: 3149 - 3169 Hawthorne Road, Ottawa, Ontario

Figure No. 6

Page. 1 of 1

Date Drilled: 'October 26, 2020

Drill Type: CME-75 Track-Mounted Drill-Rig

Datum: Geodetic Elevation

Logged by: A. Neguss Checked by: A. Nader

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~50 mm thick	73.6	0				
		FILL Silty clay, some sand and gravel, some organics, brown, moist, (loose)			6		SS1	
				1	8		SS2	
			71.9					
		CLAY WITH SAND TO CLAY (CL) Brown to grey, moist to wet, (firm to hard)		2	5		SS3	
					10 / 168	>250	SS4	
				3	4		SS5	
					53 s=7			
				4	2		SS6	
					43			
					Hammer Weight		SS7	
				5				
					62 s=9			
				6				
			67.0		3		SS8	
		GLACIAL TILL Silty clay, some sand and gravel, grey, wet	66.6	7				
		WEATHERED SHALE BEDROCK Shale pieces			50 for 75 mm		SS9	
			65.9					
		Auger Refusal 7.7 m Depth						

LOG OF BOREHOLE BH LOGS - 262560.GPJ TROW OTTAWA.GDT 5/23/23

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of the drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00262560-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
On Completion	4.6	7.6

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH-5

Project No: OTT-00262560-A0

Project: Proposed Storage Building

Location: 3149 - 3169 Hawthorne Road, Ottawa, Ontario

Figure No. 7

Page. 1 of 1

Date Drilled: 'October 26, 2020

Drill Type: CME-75 Track-Mounted Drill-Rig

Datum: Geodetic Elevation

Logged by: A. Neguss Checked by: A. Nader

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○—|
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~50 mm thick	73.1	0				
		FILL Sand with gravel, brown, moist, (compact)	73.1		12	×	SS1	
			72.2	1	11	×	SS2	
		CLAY WITH SAND TO CLAY (CL) Brown to grey, moist to wet, (stiff to very stiff)		2	8, 144	×	SS3	
▼					2, 96	×	SS4	
			70.4	3	2	×	SS5	
					58, s=8			
					Hammer Weight	×	SS6	
					53, s=7			
				5	Hammer Weight	×	SS7	
					58, s=23			
			66.9	6				
		GLACIAL TILL Silty clay, some sand and gravel, grey, wet, (firm)			7	×	SS8	
			66.1	7				
		WEATHERED SHALE BEDROCK Shale pieces			50 for 50 mm		SS9	
			65.5					
		Auger Refusal AT 7.6 m Depth						

LOG OF BOREHOLE BH LOGS - 262560.GPJ TROW OTTAWA.GDT 5/23/23

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. 19 mm standpipe was installed upon the completion of the drilling as noted above.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00262560-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
On Completion	4.6	7.6
18 Days	2.7	N/A

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH-6

Project No: OTT-00262560-A0

Project: Proposed Storage Building

Location: 3149 - 3169 Hawthorne Road, Ottawa, Ontario

Figure No. 8

Page. 1 of 1

Date Drilled: 'October 23, 2020

Drill Type: CME-75 Track-Mounted Drill-Rig

Datum: Geodetic Elevation

Logged by: M. Leroux Checked by: A. Nader

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~75 mm thick	72.5	0
		FILL Silty clay, some gravel, some organics, dark brown, moist, (loose)	72.4	
				1
			71.0	
▼		**SILTY SAND (POSSIBLE FILL)** With clay, grey, wet, (loose)	70.9	2
			70.2	
		CLAY WITH SAND TO CLAY (CL) Grey, moist to wet, (stiff to very stiff)		3
				4
			67.9	
		GLACIAL TILL Silty clay, some sand and gravel, grey, wet, (very stiff)		5
				6
		Borehole Terminated at 6.4 m Depth	66.1	

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	Standard Penetration Test N Value	Shear Strength kPa	Combustible Vapour Reading (ppm)	Natural Moisture Content % Atterberg Limits (% Dry Weight)
SS1		6			×
SS2		7			×
SS3		8			×
SS4		3			×
SS5		2	101 s=6		×
SS6		2	86 s=6		×
SS7		2	86 s=6		×
SS8		4	110 s=5		×
			100 s=8		

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. 19 mm standpipe was installed upon the completion of the drilling as noted above.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00262560-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
On Completion	4.3	6.1
18 Days	1.6	N/A

CORE DRILLING RECORD

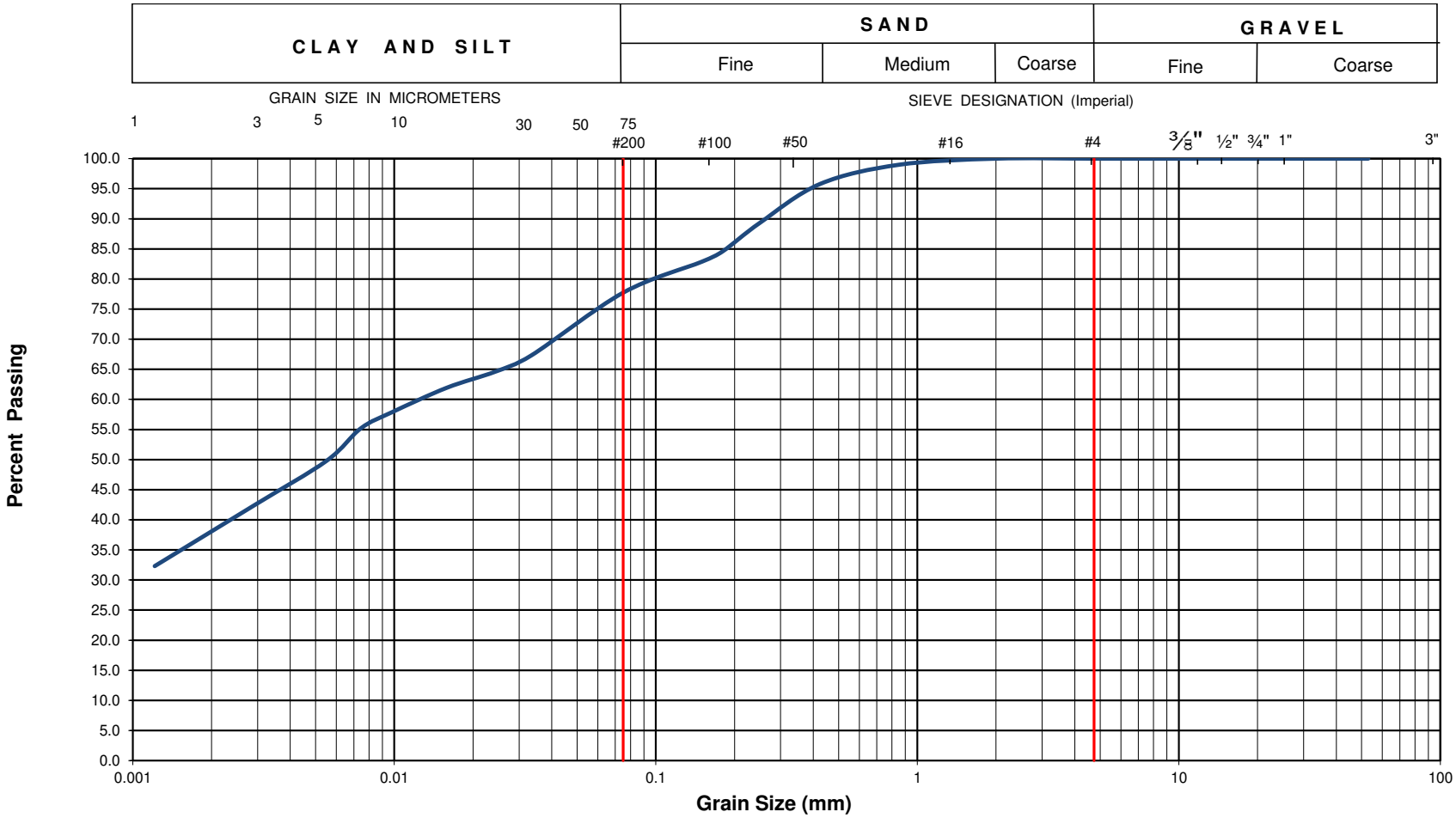
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 262560.GPJ TROW OTTAWA.GDT 5/23/23

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

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

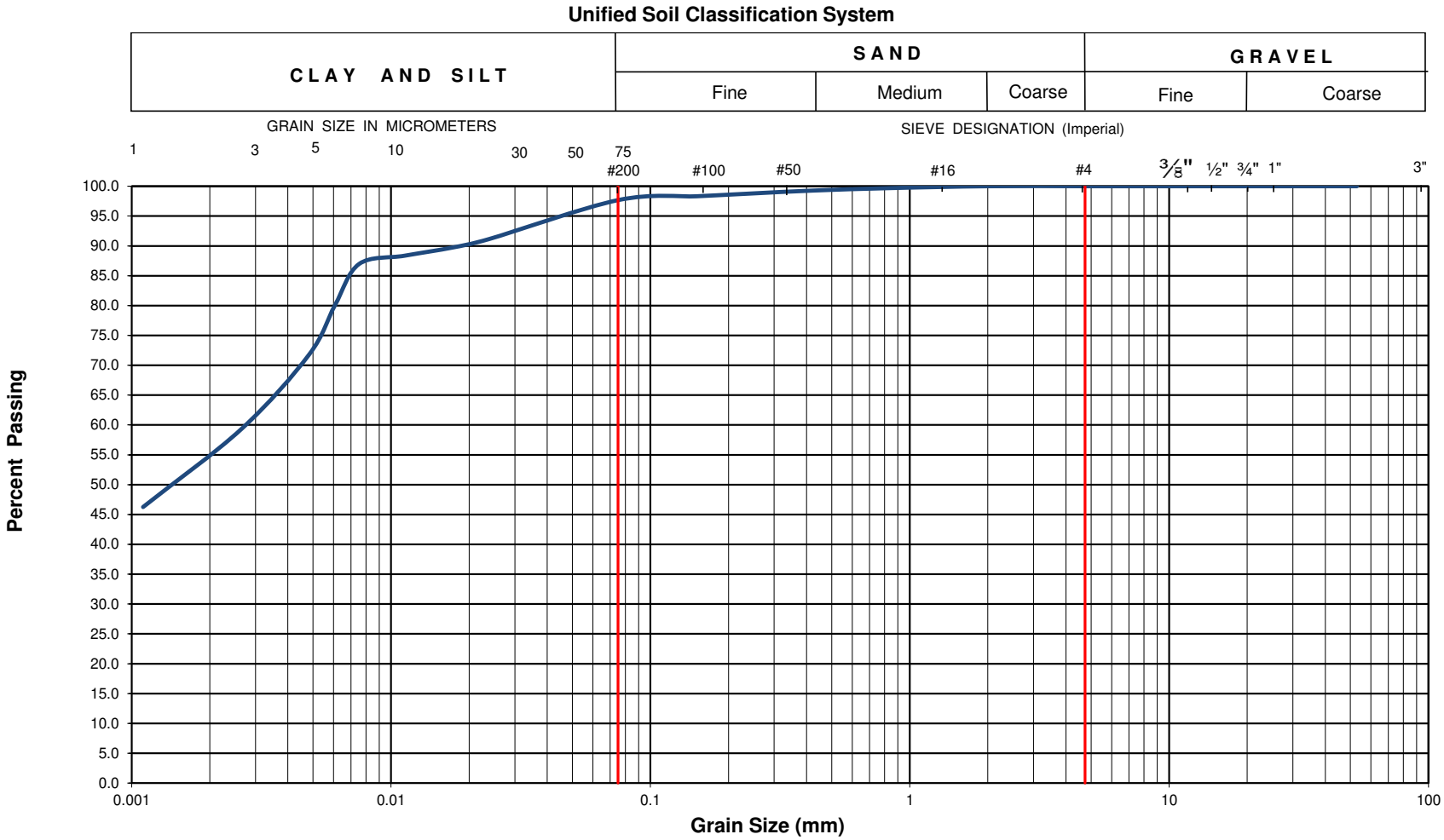
Unified Soil Classification System



EXP Project No.:	**OTT-00262560-A0**	**Project Name :**	**Proposed Storage Buildings**						
Client :	**Access Property Development**	**Project Location :**	**3149-3169 Hawthorne Road, Ottawa, ON**						
Date Sampled :	**October 23, 2020**	**Borehole No:**	**BH-2**		**Sample No.:**	**SS3**		**Depth (m) :**	**1.5-2.1**
Sample Description :		**% Silt and Clay**	**78**	**% Sand**	**22**	**% Gravel**	**0**	**Figure :**	**9**
Sample Description :		**CLAY with Sand (CL)**							

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

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-00262560-A0**	**Project Name :**	**Proposed Storage Buildings**						
Client :	**Access Property Development**	**Project Location :**	**3149-3169 Hawthorne Road, Ottawa**						
Date Sampled :	**October 23, 2020**	**Borehole No:**	**BH-3**	**Sample No.:**	**SS9**	**Depth (m) :**	**7.6-8.2**		
Sample Description :		**% Silt and Clay**	**98**	**% Sand**	**2**	**% Gravel**	**0**	**Figure :**	**10**
Sample Description :		**CLAY (CL)**							

Appendix A:
Laboratory Certificates of Analysis

AGAT Laboratories

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

CLIENT NAME: **EXP SERVICES INC**
2650 QUEENSVIEW DRIVE, UNIT 100
OTTAWA, ON K2B8H6
(613) 688-1899
ATTENTION TO: **Ismail M. Taki**
PROJECT: **OTT-262560**
AGAT WORK ORDER: **20Z671399**
SOIL ANALYSIS REVIEWED BY: **Nivine Basily, Inorganics Report Writer**
DATE REPORTED: **Nov 06, 2020**
PAGES (INCLUDING COVER): **6**
VERSION*: **1**

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

Notes

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 20Z671399

PROJECT: OTT-262560

CLIENT NAME: EXP SERVICES INC

SAMPLING SITE:3169 Hawthorne Rd

ATTENTION TO: Ismail M. Taki

SAMPLED BY:EXP

Inorganic Chemistry (Soil)

DATE RECEIVED: 2020-10-30 **DATE REPORTED: 2020-11-06**

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: BH1 SS3 5'-7'	BH6 SS4 7. 5'-9.5'
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2020-10-23	2020-10-23
				1624127	1624129
Chloride (2:1)	µg/g		2	118	39
Sulphate (2:1)	µg/g		2	164	128
pH (2:1)	pH Units		NA	7.73	8.13
Resistivity (2:1) (Calculated)	ohm.cm		1	2350	3030

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

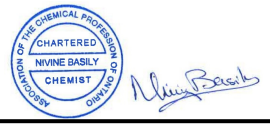
1624127-1624129 Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

pH was determined on the 0.01M CaCl2 extract obtained from 2:1 leaching procedure (2 parts extraction fluid:1 part wet soil).

Resistivity is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 20Z671399

PROJECT: OTT-262560

CLIENT NAME: EXP SERVICES INC

SAMPLING SITE:3169 Hawthorne Rd

ATTENTION TO: Ismail M. Taki

SAMPLED BY:EXP

Inorganic Chemistry (Soil) %

DATE RECEIVED: 2020-10-30 **DATE REPORTED: 2020-11-06**

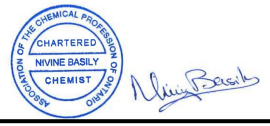
		SAMPLE DESCRIPTION:		BH1 SS3 5'-7'	BH6 SS4 7. 5'-9.5'
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2020-10-23	2020-10-23
Parameter	Unit	G / S	RDL	1624127	1624129
Chloride (2:1)	%		0.0002	0.0118	0.0039
Sulfate (2:1)	%		0.0002	0.0164	0.0128

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

1624127-1624129 Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



AGAT Laboratories

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

Quality Assurance

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 20Z671399

PROJECT: OTT-262560

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:3169 Hawthorne Rd

SAMPLED BY:EXP

Soil Analysis

RPT Date: Nov 06, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Soil)															
Chloride (2:1)	1636288		22	22	0.0%	< 2	100%	70%	130%	103%	80%	120%	105%	70%	130%
Sulphate (2:1)	1636288		38	39	2.6%	< 2	106%	70%	130%	104%	80%	120%	108%	70%	130%
pH (2:1)	1624127	1624127	7.73	7.77	0.5%	NA	100%	90%	110%						

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Inorganic Chemistry (Soil) %															
Chloride (2:1)	1636288		0.0022	0.0022	0.0%	< 0.0002	100%	70%	130%	103%	70%	130%	105%	70%	130%
Sulfate (2:1)	1636288		0.0038	0.0039	2.6%	< 0.0002	106%	70%	130%	104%	70%	130%	108%	70%	130%

Comments: NA signifies Not Applicable.

Certified By:

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

Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 20Z671399

PROJECT: OTT-262560

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:3169 Hawthorne Rd

SAMPLED BY:EXP

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Chloride (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Sulfate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH

1g BTK LT(ice) -5.8|6.7|6.9

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

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

Laboratory Use Only

Work Order #: 2076713 99

Cooler Quantity: 9no - no ice

Arrival Temperatures: 16.2 | 16.3 | 16.1

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: EXP Services

Contact: Ismail Tak

Address: 2650 Queensview Drive Suite 100
Ottawa ON K2B 8H6

Phone: 613-688-1899 Fax:

Reports to be sent to:

1. Email: Ismail.Tak@exp.com

2. Email:

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use ☐ Sanitary ☐ Storm
Region (Indicate One) ☐ MISA

☐ Regulation 558 ☐ CCME ☐ Prov. Water Quality Objectives (PWQO) ☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

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

OR Date Required (Rush Surcharges May Apply):

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

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

Project Information:

Project: OTT-262560

Site Location: 3169 Hawthorne Rd

Sampled By: EXP

AGAT Quote #: PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:

Contact:

Address:

Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	All Metals ☐ 153 Metals (excl. Hydrides)	Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN	☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg	☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN	☐ NO_3 ☐ NO_2 ☐ NO_2+NO_3	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	pH	Sulphide	Electro Conductivity			Potentially Hazardous or High Concentration (Y/N)
BH1 SS3 5'-7'	Oct 23/20																								✓	✓	✓			
BH4 SS4 7.5'-9.5'	Oct 26/20																								✓	✓	✓			

Samples Relinquished By (Print Name and Sign): Ryan DiGiuseppe	Date: Oct 29/20	Time: 6:30p.m	Samples Received By (Print Name and Sign):	Date: 2020.10.30	Time: 9hrs		
Samples Relinquished By (Print Name and Sign):	Date: 2020/10/30	Time: 15hrs	Samples Received By (Print Name and Sign): SIMRAN	Date: Oct 31/20	Time: 8:50am	Page ____ of ____	
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:	Nº: T 101293	

Appendix B:
Legal Notification

Legal Notification

This report was prepared by EXP Services Inc. (EXP) for the account of Access Property Development.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

Report Distribution

Hind Barnieh, Access Property Development; hbarnieh@accesspd.ca

Mauro Savoldelli, P.Eng., EC^{2}E – Edilesse Consulting Civil Engineers Ltd.; mauro@ec2e.ca

Liam Morgan, Corbett Land Strategies Inc.; liam@corbettlandstrategies.ca