2503858 Ontario Inc.

Geotechnical Investigation

Type of Document
Final

Project Name
Proposed Mixed Use Building Development
172 Main Street, Ottawa, Ontario

Project Number
OTT-00258388-A0

Prepared By: Ismail M. Taki, M.Eng, P.Eng

Reviewed By: Susan M. Potyondy, P.Eng

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

Date Submitted:
April 14, 2020

2503858 Ontario Inc.

984 Bunchberry Way
Ottawa, Ontario K1T 0L6

Type of Document:
Final

Project Name:
Geotechnical Investigation
Proposed Mixed Use Building Development
172 Main Street, Ottawa, Ontario

Project Number:
OTT-00258388-A0

Prepared By:
EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6 Canada
T: 613-688-1899
F: 613-225-7337
www.exp.com

Ismail M. Taki, M.Eng. P.Eng.
Manager, Geotechnical Services
Earth and Environment

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

Chris T. Kimmerly, M.Sc., P.Geo
Manager, Environmental Services
Earth and Environment

Date Submitted:
April 14, 2020

Legal Notification

This report was prepared by EXP Services Inc. (EXP) for the account of **2503858 Ontario Inc**.

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.

Executive Summary

A geotechnical investigation was undertaken at the site of the proposed mixed-use building development to be located at the property situated at 172 Main Street, Ottawa, Ontario (Figure 1). The EXP Services Inc. (EXP) terms of reference for this project were outlined in EXP's proposal dated January 28, 2020. This work was authorized by Mr. Robbie Gharib on January 31, 2020 via EXP's signed and dated work authorization form.

Preliminary plans call for the construction of a three-story mixed-use building with one basement level. Available design plans indicate the elevation of the ground floor will be at Elevation 65.00 m and the elevation of the underside of footings for the proposed building to be set at Elevation 61.90 m. The proposed site grade raise exterior to the proposed building appears to be in the order of +/- 0.5 m.

The fieldwork for the geotechnical investigation comprised the drilling of two (2) boreholes to cone refusal and termination depths of 5.5 to 20.9 m below the existing ground surface. A 19 mm diameter slotted standpipe was installed in Borehole No.2 for long-term monitoring of the groundwater level at the site.

The geotechnical investigation has revealed the subsurface conditions to comprise of fill and very loose to loose silty sand to sandy silt to 2.2 m and 2.9 m depths (Elevation 61.9 m and 61.8 m) underlain by firm to stiff silty clay to 11.3 m depth (Elevation 52.8 m) overlying compact sandy silt and inferred bedrock or boulders at 20.9 m depth (Elevation 43.2 m).. The groundwater table was established at a depth of 2.8 m below grade (Elev. 61.9 m) fourteen (14) days following the completion of the fieldwork. The groundwater table is subject to seasonal fluctuation and may be at higher depths during wet weather conditions.

The subject site has been classified as **Class D** for seismic site response in relation to Section 4.1.8.4 of the 2012 Ontario Building Code (OBC). The on-site soils are not considered liquefiable in a seismic event.

Based on the soil conditions and available information about the design of the proposed residential building, a maximum grade raise of 0.5 m is permissible at the site from a geotechnical point of view.

Based on the results of the geotechnical investigation, the proposed building may be supported by strip and spread footings set at the design elevation of Elevation 61.90 on the firm to stiff silty clay and designed for a serviceability limit state (SLS) bearing pressure of 75 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 115 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5.

All the footing beds should be examined by a senior geotechnician to ensure that they are properly prepared and able to support the SLS/ULS bearing pressures recommended above. Consideration should be given to place a 50 mm thick concrete mud slab at the founding level following approval to protect the silty clay from any disturbance.

The basement slab of the proposed residential building may be constructed as a slab-on-grade set on a bed of 300 mm thick clear stone set over the well compacted engineered fill or on the native silty clay. Perimeter and underfloor drainage systems are required for the proposed building with one basement level.

Excavations at the site in the overburden may be undertaken as open-cut provided they are cut back at a slope of 1H to 1V above the prevailing groundwater table and at a slope of 2H:1V to 3H:1V below the groundwater table. If the excavation sides required cannot be achieved due to space restriction, the excavation sides will have to be shored. Care must be undertaken to ensure that the footings of the neighbouring properties are not undermined in any way. Therefore, the founding levels of the foundations of the buildings on the neighbouring properties must be established prior to commencement of the excavation so appropriate measures/steps can be taken.

Seepage of surface and sub-surface water into the excavations should be anticipated. However, it should be possible to collect them in perimeter ditches and to remove it by pumping from sumps.

Excess soils generated from the site as part of the proposed construction should be management as per the recommendation stated in Section 14 of the report.

EXP recommends that the upper fill unit be managed as impacted in reference to the provincial residential soil standards. The impacted soil will need to be excavated and disposal of at a licensed landfill. Prior to landfill acceptance, a soil sample will also need to be submitted for toxicity characteristic leaching procedure (TCLP) analysis to confirm landfill suitability. Confirmatory soil samples will need to be analysed following removal of the fill to determine that the remaining soil meets the residential land use standards.

If additional excess soil is generated at the site beyond the upper fill unit, the following options are considered suitable for soil management:

- Assuming the soil is acceptable from a geotechnical perspective, the soil is suitable for on-site use and may be left in place or used as fill material for construction and/or backfilling purposes;

- The soil may be suitable for use at another site in the area where soil meeting the MECP Table 3 standards. The receiver may request a copy of the Kollards report and additional testing may be required.

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

Table of Contents

List of Tables

List of Figures

Appendices

1 Introduction

A geotechnical investigation was undertaken at the site of the proposed mixed-use building development to be located at the property situated at 172 Main Street, Ottawa, Ontario (Figure 1). The EXP Services Inc. (EXP) terms of reference for this project are outlined in EXP's proposal dated January 28, 2020. This work was authorized by Mr. Robbie Gharib on January 31, 2020 via EXP's signed and dated work authorization form.

Preliminary plans call for the construction of a three-story mixed-use building with one basement level. Available design plans indicate the elevation of the ground floor will be at Elevation 65.00 m and the elevation of the underside of footings for the proposed building to be set at Elevation 61.90 m. The proposed site grade raise exterior to the proposed building appears to be in the order of +/- 0.5 m.

The geotechnical investigation was undertaken to:

a) Establish the subsurface soil and groundwater conditions at the two (2) boreholes located on the site;

b) Classify the site for seismic design in accordance with the requirements of the 2012 Ontario Building Code (OBC) and assess the liquefaction potential of the on-site soils during a seismic event;

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

d) Make 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 building and anticipated total and differential settlements;

e) Comment on slab-on-grade construction and permanent drainage requirements;

f) Provide lateral earth pressure parameters (static and seismic) for subsurface basement wall design;

g) Discuss excavation conditions and dewatering requirements during construction;

h) Provide pipe bedding requirements;

i) Comment on backfilling requirements and suitability of the on-site soils for backfilling purposes;

j) Recommend pavement structure thicknesses for the outdoor parking lot; and,

k) Assess the quality of the fill to be excavated from the site as part of the proposed construction.

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 subject site is located at 172 Main Street, Ottawa, Ontario, and comprises a rectangular vacant parcel of land roughly 11 m wide by 30.2 m in depth (Figure No. 1). The site is bounded by institutional-use buildings to the east and north, and by residential buildings on all other sides. The site is generally flat lying with approximate ground surface elevations ranging between Elevation 64.10 m and 64.70 m.

3 Procedure

The fieldwork for the geotechnical investigation was undertaken on March 6, 2020 and comprised the drilling of two (2) boreholes (Borehole Nos. 1 and 2) to cone refusal and termination depths of 20.9 m and 5.5 m below the existing ground surface, respectively. The fieldwork was supervised on a full-time basis by a representative of EXP.

The locations of the boreholes were established in the field by EXP and are shown on the Borehole Location Plan in Figure No. 2. The ground surface elevation at each borehole location was estimated from a topographical survey of the site and therefore are considered approximate. Prior to the drilling, the locations of the boreholes were cleared of any public and private underground services.

The boreholes were drilled using a CME-55 truck-mounted drill rig equipped with continuous flight hollow stem augers and casing/washboring capabilities. Standard penetration tests (SPTs) were performed in both the boreholes at 0.75 m to 1.5 m depth intervals and soil samples retrieved by split-barrel sampler. In-situ field vane tests were performed in the cohesive soil to determine the shear strength of the soil. Auger samples were retrieved in each borehole from the ground surface to a 0.8 m depth. Borehole No. 1 was advanced below the groundwater level and within the sandy soil from a 10.7 m to 14.3 m depth by advancing casing using the washboring technique. Dynamic cone penetration test (DCPT) was conducted in Borehole No.1 from 14.3 m depth to cone refusal at 20.9 m depth below existing grade.

Water levels were measured in the open boreholes upon completion of drilling. In addition, a long-term groundwater monitoring installation consisting of 19 mm diameter polyvinyl chloride (PVC) pipe was installed in Borehole No. 2 in accordance with EXP standard practice. The installation configuration is documented on the respective borehole log. All the boreholes were backfilled upon completion of the fieldwork.

All the 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 prepared. The engineer also assigned the laboratory testing which consisted of performing the following tests on soil samples:

Natural Moisture Content	20 tests
Unit Weight Test	1 test
Grain Size Analysis	4 tests
Atterberg Limits	2 test

4 Subsurface Soil and Groundwater Conditions

A detailed description of the subsurface soil and groundwater conditions encountered in the boreholes is given on the borehole logs, Figure Nos. 3 and 4 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.

It should be noted that the soil 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 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 soil conditions with depth and groundwater levels.

4.1 Fill

A 550 mm to 600 mm thick layer of granular fill was surficially encountered in both boreholes. The moisture content of the surficial granular fill layer is 14 percent.

The surficial granular fill is underlain by fill in both boreholes that extends to a 1.5 m depth (Elevation 63.2 m and 62.6 m). In Borehole No.1, the fill consists of silty clay with sand with a moisture content of 29 percent. The fill in Borehole No. 2 consists of an organic clayey silty sand with a moisture content of 52 percent. Based on standard penetration test (SPT) N-values of 19 and 29, the clay fill has a very stiff consistency and the organic fill is in a compact state. Grain size analysis conducted on one fill sample from Borehole No.1 revealed a soil composition of 29 percent sand and 71 percent fines (silt and clay). The grain size distribution curve is shown in Figure 5. Atterberg limits of the fill from Borehole No. 1 indicate a liquid limit of 32 percent, plastic limit of 15 percent and plasticity index of 17 percent. Based on the results from the grain size analysis and Atterberg limits, the fill in Borehole No. 1 may be classified as a silty clay with sand of a low plasticity in accordance with the Unified Soil Classification System (USCS).

4.2 Silty Sand to Sandy Silt

The fill in Borehole Nos.1 and 2 is underlain by silty sand and sandy silt to 2.2 m and 2.9 m depths (Elevation 61.9 m and 61.8 m). Based on the SPT N values of 1 to 7, the sand and silt are in a very loose to loose state. The natural moisture content of the silty sand is 15 percent and 30 percent to 33 percent for the sandy silt.

Gran size analysis conducted on one (1) sample of the sandy silt from Borehole No. 2 indicates a soil composition of 48 percent sand and 52 percent fines (silt and clay). The grain size distribution curve is

shown in Figure 6. Based on the results of the grain size analysis the soil maybe classified as a sandy silt (ML) in accordance with the USCS.

4.3 Silty Clay

Silty clay was contacted in both boreholes beneath the silty sand and sandy silt and extends to an 11.3 m depth (Elevation 52.8 m) in Borehole No. 1 and to the maximum depth investigated of 5.5 m (Elevation 59.2 m) in Borehole No. 2.

The silty clay deposit is grey in colour and contains partings and seams of sand. The silty clay deposit is firm to stiff as indicated by undrained shear strength measurements ranging from 43 kPa to 96 kPa. The natural moisture content of the silty clay varies from 27 percent to 54 percent. Grain size analysis conducted on one (1) sample of the silty clay indicates a soil composition of 10 percent sand and 90 percent fines (silt and clay). The grain size distribution curve is shown on Figure 7. The Atterberg limit test results indicate a liquid limit of 30 percent, plastic limit of 17 percent and plasticity index of 13 percent. Based on the results from the grain size analysis and Atterberg limits, the soil may be classified as a silty clay with sand of low plasticity (CL) in accordance with the USCS.

4.4 Sandy Silt

The clay in Borehole No.1 is underlain by sandy silt contacted at 11.3 m depth (Elevation 52.8m) The SPT-N values are 13 and 18 indicating the sandy silt is in a compact state. The natural moisture content of the sandy silt is 21 percent and 23 percent.

Grain size analysis conducted on one (1) sample from this deposit revealed a soil composition of 40 percent sand and 60 percent fines (silt and clay). The grain size distribution curve is shown on Figure 8. Based on the results of the grain size analysis the soil may be classified as a sandy silt (ML) in accordance with the USCS.

4.5 Cone Refusal

A dynamic cone penetration test (DCPT) was performed in Borehole No. 1 from 14.3 m depth to cone refusal depth at 20.9 m (Elevation 49.8 m to 43.2 m). Cone refusal may have bene met on boulders or on bedrock.

4.6 Groundwater Levels

Water level observations were made in the open boreholes during drilling and subsequent to completion of drilling in the standpipe installed in Borehole No. 2. Groundwater observations collected in the standpipe on March 20, 2020 revealed the groundwater level to be at a depth of 2.8 m below the existing ground surface (Elevation 61.9 m)

Water 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 for Seismic Response and Liquefaction Potential of Soils

The geotechnical investigation has revealed the subsurface conditions at the site to comprise of fill and very loose to loose silty sand to sandy silt to 2.2 m and 2.9 m depths (Elevation 61.9 m and 61.8 m) underlain by firm to stiff silty clay to 11.3 m depth (Elevation 52.8 m) overlying compact sandy silt and inferred bedrock or boulders at 20.9 m depth (Elevation 43.2 m)..

Based on the subsurface soil conditions, the site is classified as **Class D** for seismic site response in accordance with Section 4.1.8.4 of the 2012 Ontario Building Code (OBC).

The on-site soils are not considered to be liquefiable during a seismic event.

6 Grade Raise Restriction

The geotechnical investigation has revealed the subject site is underlain by a deep deposit of firm to stiff silty clay that is prone to consolidation settlement if overstressed by loads imposed on it by site grade raise, building foundations and by groundwater level lowering following construction.

Based on the findings from the geotechnical investigation, a maximum grade raise of 0.5 m is permitted at the site in conjunction with the bearing pressure at serviceability limit state (SLS) and factored geotechnical resistance at ultimate limit state (ULS) recommended for footings in the next section of this report. Since the groundwater level and the underside of the footing will be located at the surface of the silty clay, the lowering of the groundwater level within the silty clay is not anticipated and therefore, loads imposed on the silty clay by groundwater lowering is not expected.

The final grading plan should be reviewed by EXP.

7 Foundation Considerations

Based on the results of the geotechnical investigation, the proposed building may be supported by spread and strip footings founded on the silty clay at the proposed design elevation of Elevation 61.90 m designed for a serviceability limit state (SLS) bearing pressure of 75 kPa and factored geotechnical resistance at ultimate limit state (ULS) of 115 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. If the footings will be founded at a lower elevation within the silty clay, EXP should be contacted to review the new design elevation of the underside of the footing and assess whether or not the SLS and ULS values need to be updated for the footings.

In areas where very loose to loose silty sand and sandy silt may be encountered at the proposed design founding elevation of the footing, the excavation should be extended to the surface of the silty clay and footing founded on the surface of the silty clay or on engineered fill pad constructed from the surface of the silty clay to the design elevation of the underside of the footings. The engineered fill should comprise of OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 100 percent of the standard Proctor dry density (SPMDD).

Settlements of the footings designed for the SLS bearing pressure recommended above and properly constructed are expected to be within the normally tolerated limits of 25 mm total and 19 mm differential movements.

All footing beds should be examined by a geotechnical engineer to ensure that the founding surfaces can support the design SLS bearing pressure and that the footing beds have been properly prepared as described above. Consideration should be given for the placement of a 50 mm thick concrete mud slab on the silty clay subgrade to protect the founding silty clay from groundwater infiltration and from disturbance from workers and the elements.

A minimum of 1.5 m of earth cover should be provided to the footings of a heated structure founded on the silty clay to protect them from damage due to frost penetration. The frost cover should be increased to 2.1 m if snow will be not be removed and to 2.4 m if snow will be removed. Alternatively, frost protection for the footings may be provided by rigid board insulation board only or by a combination of rigid board insulation and earth cover.

The recommended bearing pressures 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

The lowest basement floor slab of the proposed building with one basement level may be constructed as slab-on-grade provided it is set on a bed of well-compacted 19 mm clear stone at least 300 mm thick placed on the surface of the silty clay or engineered fill compacted to 98 percent SPMDD. The clear stone would prevent the capillary rise of moisture to the floor slab. Adequate saw cuts should be provided in the floor slab to control cracking.

It is anticipated that perimeter and underfloor drainage system would be required for the proposed multi-use development with one basement level. The underfloor drainage system may consist of 100 mm diameter perforated pipe or equivalent placed at least 300 mm below the underside of the floor slab. The drains should be set on 100 mm of pea-gravel and covered on top and sides with 150 mm of pea-gravel and 300 mm of CSA Fine Concrete Aggregate. The CSA Fine Concrete Aggregate may be replaced by an approved porous geotextile membrane, such as Terrafix 270R or equivalent. The perimeter drains may also consist of 100 mm diameter perforated pipe set on the footings and surrounded with 150 mm of pea-gravel and 300 mm of CSA Concrete Aggregate. The perimeter and underfloor drains should be connected to separate sumps so that at least one system would be operational should the other fail.

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

9 Pipe Bedding Requirements

It is recommended that the bedding for the underground services including material specification, thickness of cover material and compaction requirements conform to the local requirements of the municipality and/or Ontario provincial Standard Specification and Drawings (OPSS and OPSD).

For guidance, the pipe bedding may consist of 300 mm of OPSS 1010 Granular A for municipal underground services on the silty clay. The bedding material should be also placed along the sides and on top of the pipes to provide a minimum cover of 300 mm. The bedding, spring line and cover should be compacted to at least 98 percent the SPMDD.

10 Lateral Earth Pressure against Basement Walls

The subsurface walls should be backfilled with free draining material, such as OPSS 1010 Granular B Type II and equipped with a perimeter drainage system to prevent the buildup of hydrostatic pressure behind the walls. The walls will be subjected to lateral static and dynamic (seismic) earth forces. The expressions below assume free draining backfill material, a perimeter drainage system, level backfill surface behind the wall and vertical face on the back side of the wall.

For design purposes, the lateral static earth thrust against the subsurface walls may be computed from the following equation:

$$P = K_0\, h\, (\tfrac{1}{2}\, \gamma h + q)$$

where P = lateral earth thrust acting on the subsurface wall; kN/m

K_0 = lateral earth pressure coefficient for 'at rest' condition for Granular B Type II backfill material = 0.50

γ = unit weight of free draining granular backfill; Granular B Type II = 22 kN/m^3

h = depth of point of interest below top of backfill, m

q = surcharge load stress, kPa

The lateral seismic thrust may be computed from the equation given below:

$$\Delta_{Pe} = \gamma H^2 \frac{a_h}{g} F_b$$

where Δ_{Pe} = dynamic thrust in kN/m of wall

H = height of wall, m

γ = unit weight of backfill material = 22 kN/m^3

$\frac{a_h}{g}$ = seismic coefficient = 0.32

F_b = thrust factor = 1.0

The dynamic thrust does not take into account the surcharge load. The resultant force acts approximately at 0.63H above the base of the wall.

All subsurface walls should be properly waterproofed.

11 Excavation and De-watering Requirements

Excavations for the construction of the proposed building with one basement level and underground services will likely be undertaken through the shallow fill material and into the native sand, sandy silt and silty clay.

All excavations must be undertaken in accordance with the latest edition of the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils on site are considered to be Type 3 and as such must be cut back at 1H:1V from the bottom of the excavation above the groundwater level. Within zones of persistent seepage and below the groundwater level in the soils, the excavation side slopes are expected to slough and eventually stabilize at a slope of 2H:1V to 3H:1V.

If space restriction prevents cutting of the excavation side slopes to the gradient noted above, the excavation will have to be shored. The shoring system may consist of soldier pile and timber lagging system or a steel interlocking sheeting system. The most appropriate shoring system and the design and installation of the shoring system should be determined by the contractors bidding on this project. The design of the shoring system should be undertaken by a professional engineer experienced in shoring design and the installation of the shoring system should be undertaken by a contractor experienced in the installation of shoring systems. The shoring system should be designed and installed in accordance with latest edition of Ontario Regulation 213/91 under the OHSA and the 2006 Fourth Edition Canadian Foundation Engineering Manual (CFEM).

Care must be undertaken to ensure that the footings of the neighbouring properties are not undermined in any way. Therefore, the founding levels of the foundations of the buildings of the neighbouring properties must be established prior to commencement of the excavation so appropriate measures/steps can be taken.

A pre-construction survey of buildings and infrastructure within the influence zone of the construction should be undertaken prior to start of construction.

The shoring system as well as adjacent settlement sensitive structures (buildings) and infrastructure should be monitored for movement (deflection) on a periodic basis during construction operations.

It is recommended that vibration monitoring be conducted at the site and at adjacent existing buildings and infrastructure during the installation of the shoring system and the pile foundations.

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.

Seepage of groundwater into the excavation should be anticipated and may be removed by collecting the water at low points within the excavation and pumping from sumps. In areas of high infiltration, a higher

seepage rate should be anticipated and the need for high capacity pumps to keep the excavation dry should not be ignored.

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.

12 Backfilling Requirements and Suitability of On-Site Soils for Backfilling Purposes

The soils to be excavated will comprise of fill, silty sand, sandy silt and silty clay. These soils are not free draining and therefore not considered suitable for use as backfill material inside and outside the building and should be discarded. Management of any excess soils should be as per the recommendation stated in Section 14 of the report.

It is anticipated that majority of the material required for backfilling purposes will need to be imported and should preferably conform to OPSS 1010 Granular A and B Type II. The backfill material should be placed in minimum 300 mm thick lifts and each lift compacted to minimum 98 and 95 percent of the SPMDD in the interior and exterior of the building, respectively.

13 Pavement Design

The subgrade for the outdoor surface parking lot at the site is anticipated to consist of approved existing fill subgrade and imported granular fill. Pavement structure thicknesses required for light-duty and heavy-duty traffic areas were computed and are shown in Table I. The pavement structure thicknesses are based upon an estimate of the properties of the imported granular fill subgrade and functional design life of eight (8) to ten (10) years. The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out.

Table I: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Light Duty Traffic (Cars only)	Heavy Duty (Garbage Trucks)
Asphaltic Concrete (PG 58-34)	92% to 97 % MRD	65 mm – 12.5 Cat B/HL3	40 mm HL3/SP12.5 50 mm HL8 SP19
Granular A Base (OPSS 1010) (crushed limestone)	100% SPMDD	150 mm	150 mm
Granular B Type II Sub-base (OPSS 1010)	100% SPMDD	450 mm	450 mm
SPMDD denotes Standard Proctor Maximum Dry Density, ASTM-D698-12e2 MRD denotes Maximum Relative Density, ASTM D2041			

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 lot are as follows:

(1) As part of the subgrade preparation, the proposed pavement area should be stripped of unsuitable fill and other obviously unsuitable material. The subgrade should be properly shaped, crowned and proof-rolled with a heavy 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 approved backfill compacted to 95 percent SPMDD.

(2) The granular materials used for pavement construction should conform to Ontario Provincial Standard Specifications (OPSS) for Granular A and Granular B Type II and should be compacted to 100 percent SPMDD. The asphaltic concrete and its placement should meet OPSS 1151 requirements. It should be placed and compacted to OPSS 311 and 313.

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 Environmental Assessment of on-Site Fill

14.1 Soil Sampling

It is noted that previous testing of the underling sand unit in 2016 by Kollards Associates Inc. determined that the sand unit was not impacted with benzene, toluene, ethylbenzene, xylenes (BTEX), petroleum hydrocarbon F1-F4, or metals. The overlying fill was not analyzed; however, it was recommended that these materials be considered impacted and managed as impacted through landfill disposal.

During the current geotechnical investigation, samples collected during the drilling program were reviewed for any signs of visual or olfactory impacts and selected samples were submitted for laboratory analysis. The purpose of the soil sampling component of the investigation was to gain an understanding of the environmental quality of the soil, particularly the fill unit, so that recommendations regarding soil management could be made.

No staining or odours were observed during the drilling program. One soil sample from each borehole (BH1-SS1, BH2-SS1 + Dupl. of BH-1 SS1) were submitted to a certified laboratory for analysis o fBTEX, polycyclic aromatic hydrocarbons (PAH) and metals. Soil descriptions are shown on the borehole logs (Figures 3 and 4).

Soil samples identified for possible laboratory analysis were collected from the split-spoon sampler and placed into pre-cleaned, laboratory-supplied glass sample jars/vials. Samples to be analyzed for BTEX were collected using a soil core sampler and placed into vials containing methanol as a preservative. The jars and vials were sealed with Teflon-lined lids to minimize headspace and reduce the potential for induced volatilization during storage/transport prior to analysis. All soil samples were placed in clean coolers containing ice prior to and during transportation to the laboratory, Bureau Veritas Laboratory (BV Labs), formerly Maxxam Laboratories in Ottawa, Ontario. The samples were transported and submitted to BV Labs following chain of custody protocols for chemical analysis.

BV Labs is an accredited laboratory under the Standards Council of Canada/Canadian Association for Laboratory Accreditation in accordance with ISO/IEC *17025:1999- General Requirements for the Competence of Testing and Calibration Laboratories*. All testing was completed by BV Labs.

14.2 Applicable Site Conditions Standards

Analytical results obtained for the soil samples were assessed against site condition standards (SCS) as established under subsection 169.4 (1) of the Environmental Protection Act, and presented in the document Ontario Ministry of Environment, Conservation and Parks (MECP) “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*”. Tabulated background SCS (Table 1) applicable to environmentally sensitive sites and effects based generic SCS (Tables 2 to 9) applicable to non-environmentally sensitive sites are provided. The effects based SCS (Tables 2 to 9) are protective of human health and the environment for different groundwater conditions (potable and non-

potable), land use scenarios (residential, parkland, institutional, commercial, industrial, community and agricultural/other), soil texture (coarse or medium/fine) and restoration depth (full or stratified).

For comparison purposes, EXP selected the MECP (2011) Table 3: Full depth SCS in a non-potable ground water condition for a residential property use and fine textured soil. The selection of this category was based on the following factors:

- The predominant soil type on the site was fine-textured fill based on the field observations and grain size analysis of the fill and native soils.
- Potable water wells were not identified within 250 m of the site.
- Properties within 250 m of the site are supplied with municipal water and the site is not located in a well head protection area.
- More than two-thirds of the site has an overburden thickness greater than 2 m.
- The site is not located within 30 m of a surface water body or an area of natural significance.

14.3 Soil Analytical Results

The soil analytical results for BTEX, PAH and metals are presented along with the Table 3 SCS in Tables A-1 to A-3 in Appendix A. The laboratory certificates of analysis are presented in Appendix B.

When compared to the 2011 MECP Table 3 SCS, the following observations were made:

- Reported BTEX concentrations were below the 2011 MECP Table 3 standards for both soil samples submitted;
- Soil samples collected from BH-1 SS1 and BH-2 SS2 exceeded the 2011 MECP Table 3 standards for lead and various PAH parameters.

As noted above, the sand unit was determined by Kollards (2016) not to be impacted with BTEX, petroleum hydrocarbon F1-F4, or metals.

14.4 Recommendations

EXP recommends that the upper fill unit be managed as impacted in reference to the provincial residential soil standards. The impacted soil will need to be excavated and disposal of at a licensed landfill. Prior to landfill acceptance, a soil sample will also need to be submitted for toxicity characteristic leaching procedure (TCLP) analysis to confirm landfill suitability. Confirmatory soil samples will need to be analysed following removal of the fill to determine that the remaining soil meets the residential land use standards.

If additional excess soil is generated at the site beyond the upper fill unit, the following options are considered suitable for soil management:

- Assuming the soil is acceptable from a geotechnical perspective, the soil is suitable for on-site use and may be left in place or used as fill material for construction and/or backfilling purposes;

- The soil may be suitable for use at another site in the area where soil meeting the MECP Table 3 standards. The receiver may request a copy of the Kollards report and additional sampling and testing may be required.

15 General Comments

The comments given in this report are intended only for the guidance of the 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 interpretation of the factual borehole results to draw their own conclusions as to how the subsurface conditions may affect them.

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

Figures

LEGEND

SITE LOCATION

0 30m 60m 120m

HORIZONTAL 1:3,000

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: MAR. 2020	CLIENT: 2503858 ONTARIO LTD. 172 MAIN STREET, OTTAWA, ON	project no.: OTT-00258388-A0
DESIGN: I.T. / CHECKED: I.T.		scale: 1:3,000
DRAWN BY: G.C.	TITLE: SITE LOCATION KEY PLAN	FIG 1

Filename: e:\ott\ott-00258388-a0\60 execution\65 drawings_geot\172 main st.fig 1-e-8.dwg
Last Saved: 3/23/2020 10:51:40 AM
Last Plotted:3/23/2020 10:54:48 AM Plotted by: CuiG
Pen Table:: exp-64.ctb

LEGEND

PROPERTY BOUNDARY

BH-01 BOREHOLE NUMBER & LOCATION

0 5m 10m 20m

HORIZONTAL 1:500

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: MAR. 2020	CLIENT: 2503858 ONTARIO LTD. 172 MAIN STREET, OTTAWA, ON	project no.: OTT-00258388-A0
DESIGN: I.T. / CHECKED: I.T.		scale: 1:1,000
DRAWN BY: G.C.	TITLE: BOREHOLE LOCATION PLAN	FIG 2

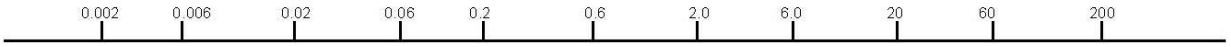
Filename: e:\ott\ott-00258388-a0\60 execution\65 drawings_geot\172 main st.fig 1-e-8.dwg
Last Saved: 3/23/2020 10:51:40 AM
Last Plotted:3/23/2020 10:56:02 AM Plotted by: CuiG
Pen Table:: exp-64.ctb

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-00258388-A0

Project: Proposed Mixed Use Building Development

Location: 172 Main Street, Ottawa, Ontario

Figure No. 3

Page. 1 of 2

Date Drilled: 'March 6, 2020

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Approximate Geodetic Elevation

Logged by: M.L. Checked by: I.T.

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	Approximate 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
		FILL ~550 mm thick Crushed gravel with sand and silt, grey, moist	64.12	0			AS1	
		FILL Silty clay with sand, low plasticity, brown and grey, moist, (very stiff)	63.6	1	19		SS2	
		SILTY SAND Brown and grey, moist, (loose)	62.6	2	7		SS3	
		SILTY CLAY With sand partings and seams, sensitive to extra-sensitive, grey, wet, (firm to stiff)	61.9	3	3 43 s = 6.0		SS4	
				4	1 48 s = 6.7		SS5	
				5	1 53 s = 7.3 Hammer Weight		SS6	
				6	58 s = 6.0 Hammer Weight		SS7	
				7	62 s = 8.7 Hammer Weight		SS8	
				8	72 s = 7.2 Hammer Weight		SS9	
				9	86 s = 8.0 Hammer Weight		SS10	
				10	96 s = 6.7		SS11	

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258388-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
completion	N/A	13.7

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 258388.GPJ TROW OTTAWA.GDT 3/24/20

Log of Borehole BH-1

Project No: OTT-00258388-A0

Project: Proposed Mixed Use Building Development

Figure No. 3

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Approximate Geodetic Elevation m	Depth	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
		SILTY CLAY With sand partings and seams, sensitive to extra-sensitive, grey, wet, (firm to stiff) *(continued)* Borehole advanced from 10.7 m to 11.3 m depths using casing and washboring technique.	54.12	10				
				11	Hammer Weight	×	SS12	
		SANDY SILT Grey, wet, (compact)	52.8	12				
				13	13	×	SS13	
		Borehole advanced from 11.3 m to 14.3 m depths using casing and washboring technique.		14	18	×	SS14	
		Dynamic Cone Penetration Test (DCPT) conducted from 14.3 m depth to dynamic cone refusal depth at at 20.9 m.	49.8	15				
				16				
				17				
				18				
				19				
				20				
		Cone Refusal at 20.9 m Depth	43.2					

LOG OF BOREHOLE BH LOGS - 258388.GPJ TROW OTTAWA.GDT 3/24/20

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258388-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
completion	N/A	13.7

CORE DRILLING RECORD

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

Log of Borehole BH-2

Project No: OTT-00258388-A0

Project: Proposed Mixed Use Building Development

Location: 172 Main Street, Ottawa, Ontario

Figure No. 4

Page. 1 of 1

Date Drilled: 'March 6, 2020

Drill Type: CME-55 Truck Mounted Drill Rig

Datum: Approximate Geodetic Elevation

Logged by: M.L. Checked by: I.T.

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	Approximate 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
		FILL ~600 mm thick Crushed gravel with sand and silt, grey, moist	64.67	0			AS1	
		FILL Organic clayey silty sand, dark grey, moist, (compact)	64.1	1	29		SS2	
		SANDY SILT Grey, moist to wet, (very loose to loose)	63.2	2	5		SS3	18.6
					1		SS4	
		SILTY CLAY With sand partings and seams, low plasticity, sensitive, grey, wet, (firm to stiff)	61.8 61.87	3	53 s = 7.3 Hammer Weight		SS5	
					43 s = 5.1 Hammer Weight		SS6	
				5	48 s = 6.7 Hammer Weight		SS7	
		Borehole Terminated at 5.5 m Depth	59.2		53 s = 6.3			

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter standpipe installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-00258388-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
completion	Dry	5.5
March 20, 2020	2.8	

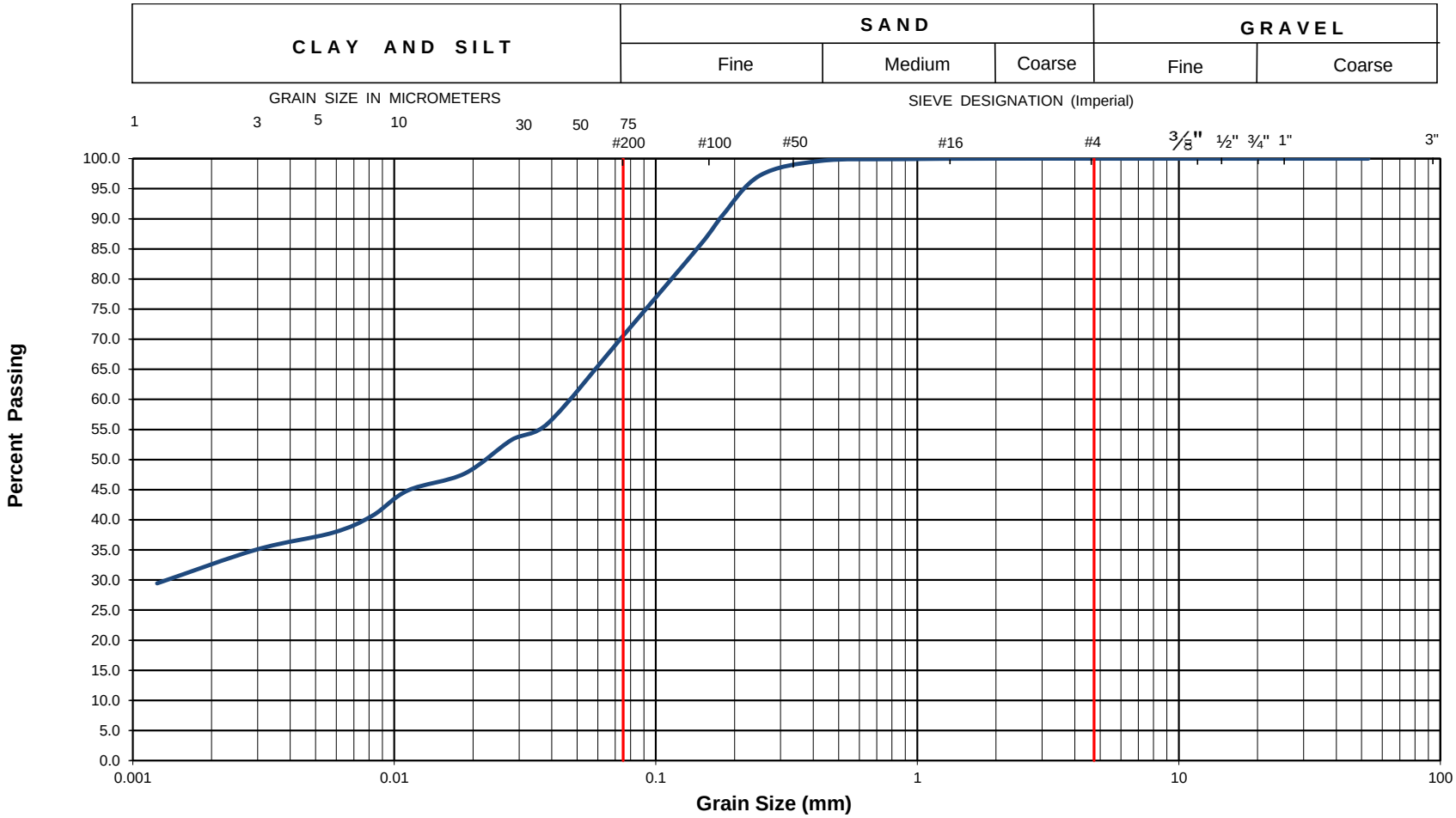
CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 258388.GPJ TROW OTTAWA.GDT 3/24/20

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

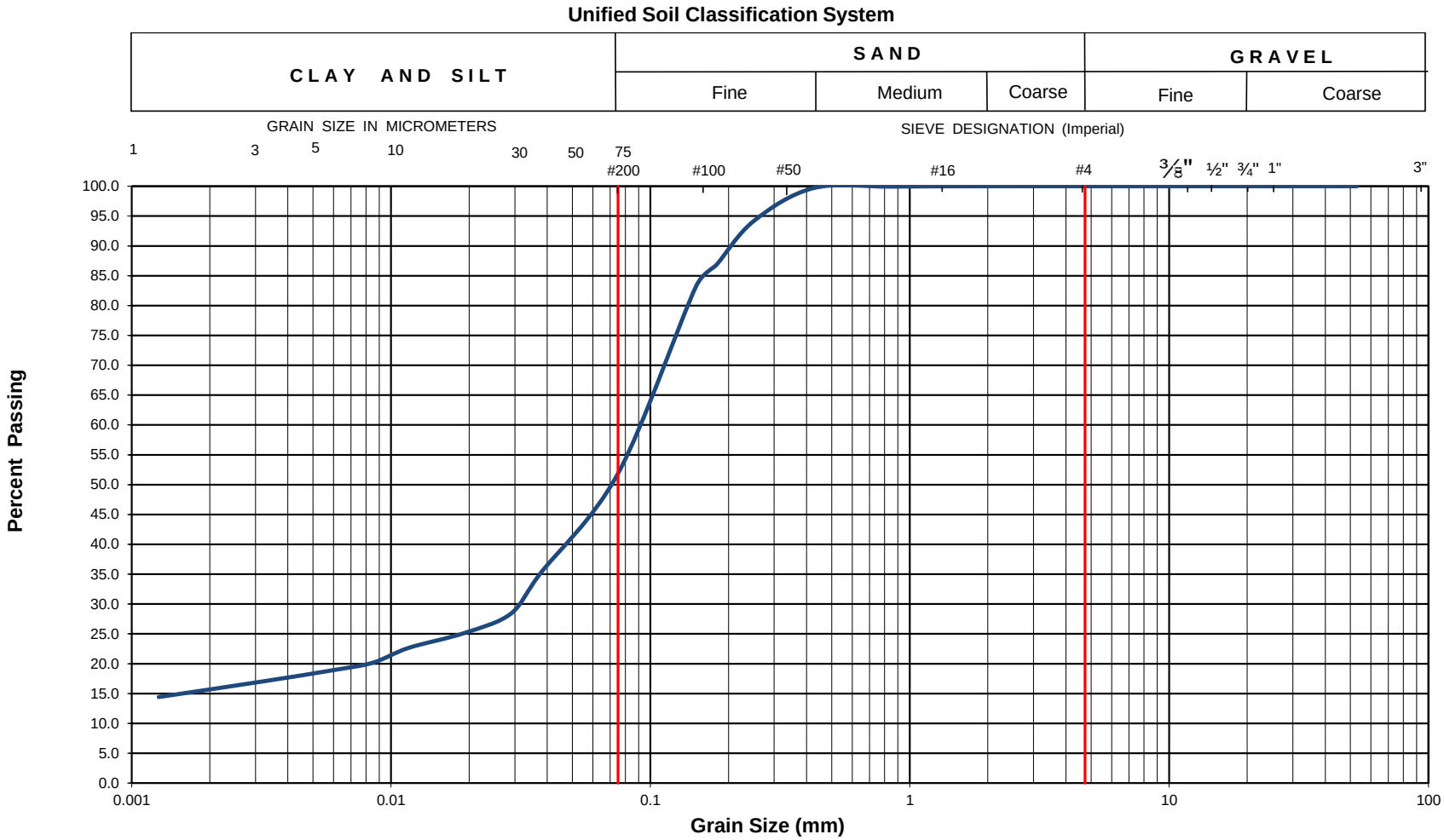
Unified Soil Classification System



EXP Project No.:	**OTT-00258388-A0**	**Project Name :**	**Proposed Mixed Use Building Development**						
Client :	**2503858 Ontario Inc.**	**Project Location :**	**172 Main Street, Ottawa, ON.**						
Date Sampled :	**March 6, 2020**	**Borehole No:**	**BH1**	**Sample No.:**	**SS2**	**Depth (m) :**	**0.8-1.4**		
Sample Description :		**% Silt and Clay**	**71**	**% Sand**	**29**	**% Gravel**	**0**	**Figure :**	**5**
Sample Description :	**FILL: Silty Clay with Sand of Low Plasticity (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

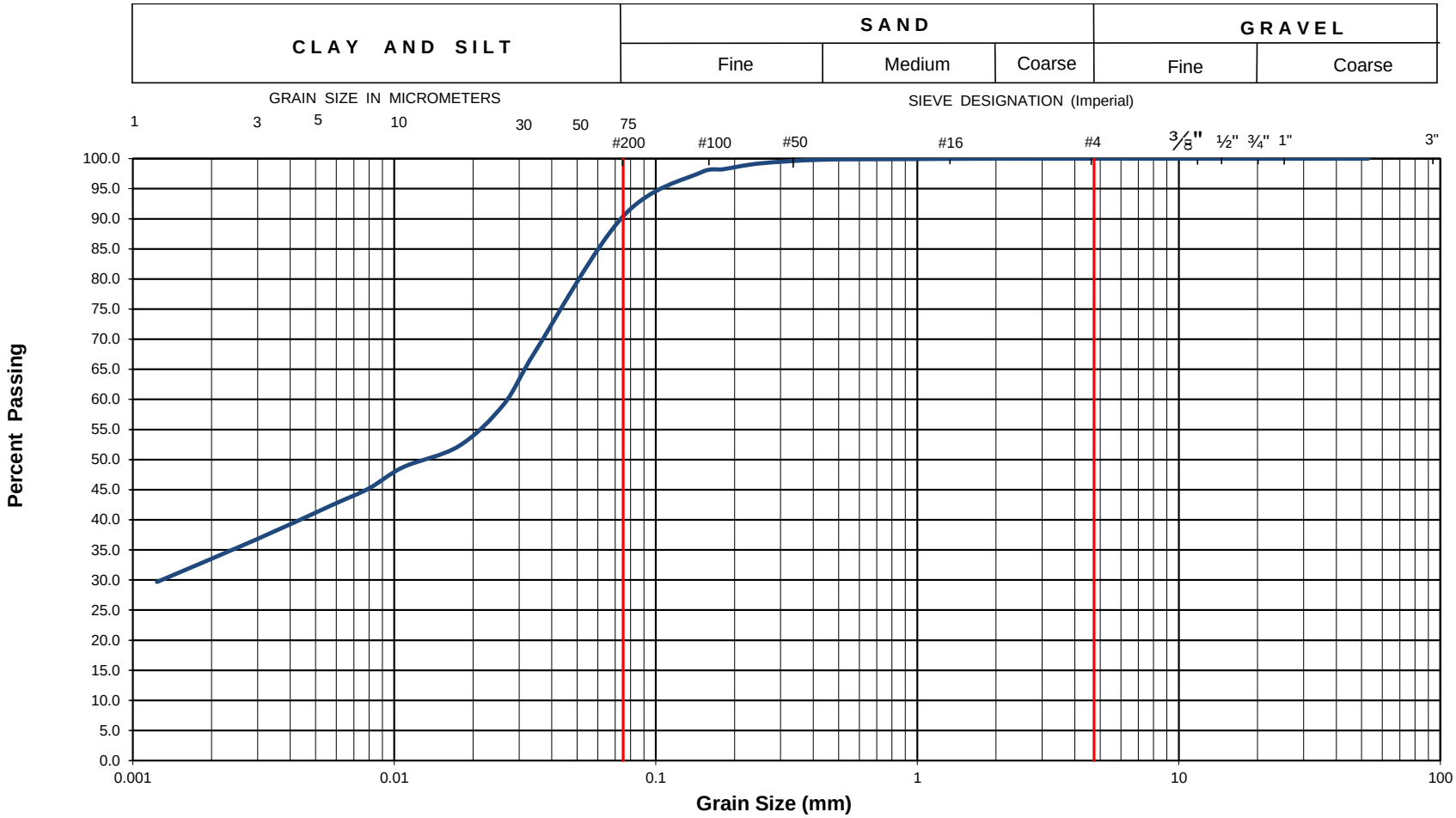


EXP Project No.:	**OTT-00258388-A0**	**Project Name :**	**Proposed Mixed Use Building Development**						
Client :	**2503858 Ontario Inc.**	**Project Location :**	**172 Main Street, Ottawa, ON.**						
Date Sampled :	**March 6, 2020**	**Borehole No:**	**BH2**		**Sample No.:**	**SS4**		**Depth (m) :**	**2.3-2.9**
Sample Description :		**% Silt and Clay**	**52**	**% Sand**	**48**	**% Gravel**	**0**	**Figure :**	**6**
Sample Description :		**Sandy Silt (ML)**							

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

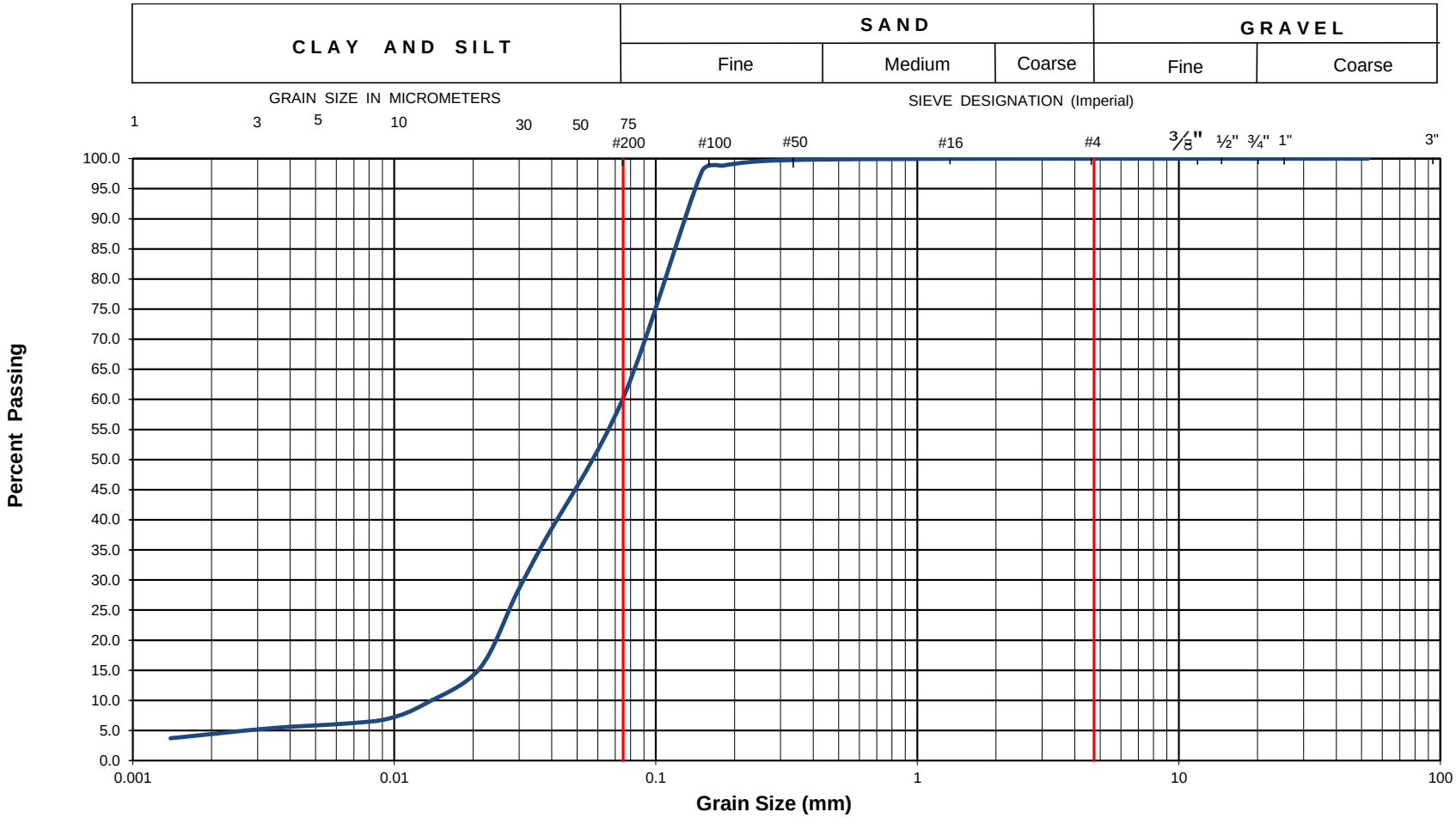


EXP Project No.:	**OTT-00258388-A0**	**Project Name :**	**Proposed Mixed Use Building Development**						
Client :	**2503858 Ontario Inc.**	**Project Location :**	**172 Main Street, Ottawa, ON.**						
Date Sampled :	**March 6, 2020**	**Borehole No:**	**BH2**		**Sample No.:**	**SS6**		**Depth (m) :**	**3.8 - 4.4**
Sample Description :		**% Silt and Clay**	**90**	**% Sand**	**10**	**% Gravel**	**0**	**Figure :**	**7**
Sample Description :		**Silty Clay with Sand of Low Plasticity (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

Unified Soil Classification System



EXP Project No.:	**OTT-00258388-A0**	**Project Name :**	**Proposed Mixed Use Building Development**						
Client :	**2503858 Ontario Inc.**	**Project Location :**	**172 Main Street, Ottawa, ON.**						
Date Sampled :	**March 6, 2020**	**Borehole No:**	**BH1**		**Sample No.:**	**SS13**		**Depth (m) :**	**12.2 - 12.8**
Sample Description :		**% Silt and Clay**	**60**	**% Sand**	**40**	**% Gravel**	**0**	**Figure :**	**8**
Sample Description :		**Sandy Silt (ML)**							

Appendix A: Analytical Test Results

Table A-1: Metals
OTT-00258388-A0

Sample ID	MECP Table 3 SCS [1]	RDL	Units	BH-1 SS-1	BH-2 SS-1	DUP-1
Laboratory ID				MET045	MET046	MET047
BV Labs Job #				C062890	C062890	C062890
Sampling Date				06-March-2020	06-March-2020	06-March-2020
Antimony	7.5	0.2	ug/g	1.2	0.5	1.3
Arsenic	18	1	ug/g	6.6	3.9	6.6
Barium	390	0.5	ug/g	130	78	150
Beryllium	5	0.2	ug/g	0.31	0.23	0.33
Boron (Hot Water Soluble)	1.5	-	-	-	-	-
Cadmium	1.2	0.1	ug/g	0.28	<0.10	0.31
Chromium	160	1	ug/g	19	14	20
Chromium VI	10	-	-	-	-	-
Cobalt	22	0.1	ug/g	6	5.2	6.4
Copper	180	0.5	ug/g	21	11	21
Lead	120	1	ug/g	**270**	59	**290**
Mercury	1.8	-	-	-	-	-
Molybdenum	6.9	0.5	ug/g	1.8	2.7	3
Nickel	130	0.5	ug/g	13	11	13
Selenium	2.4	0.5	ug/g	0.85	<0.50	0.83
Silver	25	0.2	ug/g	<0.20	<0.20	<0.20
Thallium	1	0.05	ug/g	0.13	0.13	0.16
Vanadium	86	5	ug/g	21	13	20
Zinc	340	5	ug/g	100	29	100
pH (pH Units)	NV	-	-	-	-	-
Conductivity (ms/cm)	0.7	-	-	-	-	-
Sodium Adsorption Ratio	5	-	-	-	-	-
Cyanide, Free	0.051	-	-	-	-	-
Chloride	NV	-	-	-	-	-
Boron (Total)	120	5	ug/g	5.5	7.7	<5.0
Uranium	23	0.05	ug/g	0.5	0.45	0.55

Notes:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Full Depth Generic Site Condition Standards (SCS) in a Potable Ground Water Condition for Residential/Parkland/Institutional property use and medium-fine textured soils.

RDL Reported Detection Limit

\- Not Analyzed

Indicates soil exceedance of MECP Table 3 SCS

Table A-2: BTEX
OTT-00258388-A0

Sample ID	MECP Table 3 SCS [1]	RDL	Units	BH-1 SS-1	BH-2 SS-1	DUP-1
Laboratory ID				MET045	MET046	MET047
BV Labs Job #				C062890	C062890	C062890
Sampling Date				06-March-2020	06-March-2020	06-March-2020
Benzene	0.17	0.02	ug/g	<0.020	<0.020	<0.020
Toluene	6	0.02	ug/g	<0.020	<0.020	<0.020
Ethylbenzene	15	0.02	ug/g	<0.020	<0.020	<0.020
m/p xylenes	NV	0.04	ug/g	<0.040	<0.040	<0.040
o xylene	NV	0.02	ug/g	<0.020	<0.020	<0.020
Total Xylenes	25	0.04	ug/g	<0.040	<0.040	<0.040
F1 (C6-C10)	65	10	ug/g	<10	<10	<10
F1 (C6-C10) - BTEX	65	10	ug/g	<10	<10	<10
F2 (C10-C16)	150	-	ug/g	-	-	-
F3 (C16-C34)	1300	-	ug/g	-	-	-
F4 (C34-C50)	5600	-	ug/g	-	-	-
Reached Baseline at C50	NV	-	ug/g	-	-	-
F4 Gravimetric	5600	-	ug/g	-	-	-

Notes:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Full Depth Generic Site Condition Standards (SCS) in a Potable Ground Water Condition for Residential/Parkland/Institutional property use and medium-fine textured soils.

RDL Reported Detection Limit

\- Not Analyzed

Indicates soil exceedance of MECP Table 3 SCS

Table A-3: PAH
OTT-00258388-A0

Sample ID	MECP Table 3 SCS [1]	RDL	Units	BH-1 SS-1	BH-2 SS-1	DUP-1
Laboratory ID				MET045	MET046	MET047
BV Labs Job #				C062890	C062890	C062890
Sampling Date				06-March-2020	06-March-2020	06-March-2020
Acenaphthene	58	0.005	ug/g	0.027	0.015	0.075
Acenaphthylene	0.17	0.005	ug/g	0.055	0.11	0.12
Anthracene	0.74	0.005	ug/g	0.089	0.084	0.23
Benzo(a)anthracene	0.63	0.005	ug/g	0.3	0.39	**0.68**
Benzo(a)pyrene	0.3	0.005	ug/g	0.3	**0.42**	**0.67**
Benzo(b/j)fluoranthene	0.78	0.005	ug/g	0.37	0.53	**0.8**
Benzo(ghi)perylene	7.8	0.005	ug/g	0.2	0.29	0.46
Benzo(k)fluoranthene	0.78	0.005	ug/g	0.14	0.19	0.3
Chrysene	7.8	0.005	ug/g	0.28	0.36	0.61
Dibenzo(a,h)anthracene	0.1	0.005	ug/g	0.048	0.074	**0.11**
Fluoranthene	0.69	0.005	ug/g	0.59	0.66	**1.3**
Fluorene	69	0.005	ug/g	0.027	0.019	0.076
Indeno(1,2,3-cd)pyrene	0.48	0.005	ug/g	0.22	0.32	**0.49**
1-Methylnaphthalene	3.4	0.005	ug/g	0.0085	0.0057	0.024
2-Methylnaphthalene	3.4	0.005	ug/g	0.01	0.0082	0.027
Naphthalene	0.75	0.005	ug/g	0.012	0.0088	0.046
Phenanthrene	7.8	0.005	ug/g	0.32	0.22	0.82
Pyrene	78	0.005	ug/g	0.5	0.56	1.2
Methylnaphthalene, 2-(1-)	3.4	-	ug/g	-	-	-

Notes:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Full Depth Generic Site Condition Standards (SCS) in a Potable Ground Water Condition for Residential/Parkland/Institutional property use and medium-fine textured soils.

RDL Reported Detection Limit

\- Not Analyzed

Indicates soil exceedance of MECP Table 3 SCS

Appendix B: Laboratory Certificate of Analysis

Your Project #: OTT-00258388-AO
Site Location: 172 MAIN
Your C.O.C. #: 126090

Attention: Chris Kimmerly

exp Services Inc
Ottawa Branch
100-2650 Queensview Drive
Ottawa, ON
CANADA K2B 8H6

Report Date: 2020/03/13
Report #: R6109438
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C062890
Received: 2020/03/09, 15:20

Sample Matrix: Soil
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Methylnaphthalene Sum (1)	3	N/A	2020/03/13	CAM SOP-00301	EPA 8270D m
Petroleum Hydro. CCME F1 & BTEX in Soil (1, 2)	3	N/A	2020/03/12	CAM SOP-00315	CCME PHC-CWS m
Strong Acid Leachable Metals by ICPMS (1)	1	2020/03/11	2020/03/11	CAM SOP-00447	EPA 6020B m
Strong Acid Leachable Metals by ICPMS (1)	2	2020/03/11	2020/03/12	CAM SOP-00447	EPA 6020B m
Moisture (1)	3	N/A	2020/03/11	CAM SOP-00445	Carter 2nd ed 51.2 m
PAH Compounds in Soil by GC/MS (SIM) (1)	3	2020/03/12	2020/03/13	CAM SOP-00318	EPA 8270D m

Remarks:

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

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

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Laboratories Mississauga
(2) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is the date sampled unless otherwise stated.

Your Project #: OTT-00258388-AO
Site Location: 172 MAIN
Your C.O.C. #: 126090

Attention: Chris Kimmerly

exp Services Inc
Ottawa Branch
100-2650 Queensview Drive
Ottawa, ON
CANADA K2B 8H6

Report Date: 2020/03/13
Report #: R6109438
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C062890
Received: 2020/03/09, 15:20

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bvlabs.com
Phone# (613) 274-0573
==========

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

BV Labs Job #: C062890
Report Date: 2020/03/13

exp Services Inc
Client Project #: OTT-00258388-AO
Site Location: 172 MAIN
Sampler Initials: ML

O.REG 153 ICPMS METALS (SOIL)

BV Labs ID		MET045	MET046	MET047		
Sampling Date		2020/03/06	2020/03/06	2020/03/06		
COC Number		126090	126090	126090		
	UNITS	**BH-1 SS-1**	**BH-2 SS-1**	**DUP-1**	**RDL**	**QC Batch**
Metals						
Acid Extractable Antimony (Sb)	ug/g	1.2	0.50	1.3	0.20	6630030
Acid Extractable Arsenic (As)	ug/g	6.6	3.9	6.6	1.0	6630030
Acid Extractable Barium (Ba)	ug/g	130	78	150	0.50	6630030
Acid Extractable Beryllium (Be)	ug/g	0.31	0.23	0.33	0.20	6630030
Acid Extractable Boron (B)	ug/g	5.5	7.7	<5.0	5.0	6630030
Acid Extractable Cadmium (Cd)	ug/g	0.28	<0.10	0.31	0.10	6630030
Acid Extractable Chromium (Cr)	ug/g	19	14	20	1.0	6630030
Acid Extractable Cobalt (Co)	ug/g	6.0	5.2	6.4	0.10	6630030
Acid Extractable Copper (Cu)	ug/g	21	11	21	0.50	6630030
Acid Extractable Lead (Pb)	ug/g	270	59	290	1.0	6630030
Acid Extractable Molybdenum (Mo)	ug/g	1.8	2.7	3.0	0.50	6630030
Acid Extractable Nickel (Ni)	ug/g	13	11	13	0.50	6630030
Acid Extractable Selenium (Se)	ug/g	0.85	<0.50	0.83	0.50	6630030
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	0.20	6630030
Acid Extractable Thallium (Tl)	ug/g	0.13	0.13	0.16	0.050	6630030
Acid Extractable Uranium (U)	ug/g	0.50	0.45	0.55	0.050	6630030
Acid Extractable Vanadium (V)	ug/g	21	13	20	5.0	6630030
Acid Extractable Zinc (Zn)	ug/g	100	29	100	5.0	6630030

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

BV Labs Job #: C062890
Report Date: 2020/03/13

exp Services Inc
Client Project #: OTT-00258388-AO
Site Location: 172 MAIN
Sampler Initials: ML

O.REG 153 PAHS (SOIL)

BV Labs ID		MET045	MET046	MET047		
Sampling Date		2020/03/06	2020/03/06	2020/03/06		
COC Number		126090	126090	126090		
	UNITS	**BH-1 SS-1**	**BH-2 SS-1**	**DUP-1**	**RDL**	**QC Batch**
Inorganics						
Moisture	%	15	10	15	1.0	6629031
Calculated Parameters						
Methylnaphthalene, 2-(1-)	ug/g	0.018	0.014	0.051	0.0071	6625671
Polyaromatic Hydrocarbons						
Acenaphthene	ug/g	0.027	0.015	0.075	0.0050	6633139
Acenaphthylene	ug/g	0.055	0.11	0.12	0.0050	6633139
Anthracene	ug/g	0.089	0.084	0.23	0.0050	6633139
Benzo(a)anthracene	ug/g	0.30	0.39	0.68	0.0050	6633139
Benzo(a)pyrene	ug/g	0.30	0.42	0.67	0.0050	6633139
Benzo(b/j)fluoranthene	ug/g	0.37	0.53	0.80	0.0050	6633139
Benzo(g,h,i)perylene	ug/g	0.20	0.29	0.46	0.0050	6633139
Benzo(k)fluoranthene	ug/g	0.14	0.19	0.30	0.0050	6633139
Chrysene	ug/g	0.28	0.36	0.61	0.0050	6633139
Dibenzo(a,h)anthracene	ug/g	0.048	0.074	0.11	0.0050	6633139
Fluoranthene	ug/g	0.59	0.66	1.3	0.0050	6633139
Fluorene	ug/g	0.027	0.019	0.076	0.0050	6633139
Indeno(1,2,3-cd)pyrene	ug/g	0.22	0.32	0.49	0.0050	6633139
1-Methylnaphthalene	ug/g	0.0085	0.0057	0.024	0.0050	6633139
2-Methylnaphthalene	ug/g	0.010	0.0082	0.027	0.0050	6633139
Naphthalene	ug/g	0.012	0.0088	0.046	0.0050	6633139
Phenanthrene	ug/g	0.32	0.22	0.82	0.0050	6633139
Pyrene	ug/g	0.50	0.56	1.2	0.0050	6633139
Surrogate Recovery (%)						
D10-Anthracene	%	99	109	100		6633139
D14-Terphenyl (FS)	%	98	105	100		6633139
D8-Acenaphthylene	%	96	104	99		6633139

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

BV Labs Job #: C062890
Report Date: 2020/03/13

exp Services Inc
Client Project #: OTT-00258388-AO
Site Location: 172 MAIN
Sampler Initials: ML

PETROLEUM HYDROCARBONS (CCME)

BV Labs ID		MET045	MET046	MET047		
Sampling Date		2020/03/06	2020/03/06	2020/03/06		
COC Number		126090	126090	126090		
	UNITS	**BH-1 SS-1**	**BH-2 SS-1**	**DUP-1**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons						
Benzene	ug/g	<0.020	<0.020	<0.020	0.020	6631656
Toluene	ug/g	<0.020	<0.020	<0.020	0.020	6631656
Ethylbenzene	ug/g	<0.020	<0.020	<0.020	0.020	6631656
o-Xylene	ug/g	<0.020	<0.020	<0.020	0.020	6631656
p+m-Xylene	ug/g	<0.040	<0.040	<0.040	0.040	6631656
Total Xylenes	ug/g	<0.040	<0.040	<0.040	0.040	6631656
F1 (C6-C10)	ug/g	<10	<10	<10	10	6631656
F1 (C6-C10) - BTEX	ug/g	<10	<10	<10	10	6631656
Surrogate Recovery (%)						
1,4-Difluorobenzene	%	99	102	101		6631656
4-Bromofluorobenzene	%	98	97	97		6631656
D10-Ethylbenzene	%	103	113	122		6631656
D4-1,2-Dichloroethane	%	103	105	102		6631656

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

BV Labs Job #: C062890
Report Date: 2020/03/13

exp Services Inc
Client Project #: OTT-00258388-AO
Site Location: 172 MAIN
Sampler Initials: ML

TEST SUMMARY

BV Labs ID: MET045
Sample ID: BH-1 SS-1
Matrix: Soil

Collected: 2020/03/06
Shipped:
Received: 2020/03/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	6625671	N/A	2020/03/13	Automated Statchk
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	6631656	N/A	2020/03/12	Georgeta Rusu
Strong Acid Leachable Metals by ICPMS	ICP/MS	6630030	2020/03/11	2020/03/12	Daniel Teclu
Moisture	BAL	6629031	N/A	2020/03/11	Chun Yan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	6633139	2020/03/12	2020/03/13	Mitesh Raj

BV Labs ID: MET046
Sample ID: BH-2 SS-1
Matrix: Soil

Collected: 2020/03/06
Shipped:
Received: 2020/03/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	6625671	N/A	2020/03/13	Automated Statchk
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	6631656	N/A	2020/03/12	Georgeta Rusu
Strong Acid Leachable Metals by ICPMS	ICP/MS	6630030	2020/03/11	2020/03/11	Daniel Teclu
Moisture	BAL	6629031	N/A	2020/03/11	Chun Yan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	6633139	2020/03/12	2020/03/13	Mitesh Raj

BV Labs ID: MET047
Sample ID: DUP-1
Matrix: Soil

Collected: 2020/03/06
Shipped:
Received: 2020/03/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	6625671	N/A	2020/03/13	Automated Statchk
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	6631656	N/A	2020/03/12	Georgeta Rusu
Strong Acid Leachable Metals by ICPMS	ICP/MS	6630030	2020/03/11	2020/03/12	Daniel Teclu
Moisture	BAL	6629031	N/A	2020/03/11	Chun Yan
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	6633139	2020/03/12	2020/03/13	Mitesh Raj

BV Labs Job #: C062890
Report Date: 2020/03/13

exp Services Inc
Client Project #: OTT-00258388-AO
Site Location: 172 MAIN
Sampler Initials: ML

GENERAL COMMENTS

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

Package 1	4.0°C

Results relate only to the items tested.

BV Labs Job #: C062890
Report Date: 2020/03/13

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: OTT-00258388-AO
Site Location: 172 MAIN
Sampler Initials: ML

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6631656	1,4-Difluorobenzene	2020/03/11	99	60 - 140	100	60 - 140	103	%		
6631656	4-Bromofluorobenzene	2020/03/11	100	60 - 140	101	60 - 140	98	%		
6631656	D10-Ethylbenzene	2020/03/11	101	60 - 140	95	60 - 140	95	%		
6631656	D4-1,2-Dichloroethane	2020/03/11	104	60 - 140	93	60 - 140	107	%		
6633139	D10-Anthracene	2020/03/12	110	50 - 130	107	50 - 130	99	%		
6633139	D14-Terphenyl (FS)	2020/03/12	108	50 - 130	104	50 - 130	95	%		
6633139	D8-Acenaphthylene	2020/03/12	103	50 - 130	107	50 - 130	95	%		
6629031	Moisture	2020/03/11							1.1	20
6630030	Acid Extractable Antimony (Sb)	2020/03/11	99	75 - 125	101	80 - 120	<0.20	ug/g	NC	30
6630030	Acid Extractable Arsenic (As)	2020/03/11	99	75 - 125	99	80 - 120	<1.0	ug/g	6.9	30
6630030	Acid Extractable Barium (Ba)	2020/03/11	103	75 - 125	94	80 - 120	<0.50	ug/g	3.1	30
6630030	Acid Extractable Beryllium (Be)	2020/03/11	101	75 - 125	100	80 - 120	<0.20	ug/g	NC	30
6630030	Acid Extractable Boron (B)	2020/03/11	97	75 - 125	102	80 - 120	<5.0	ug/g	0.22	30
6630030	Acid Extractable Cadmium (Cd)	2020/03/11	97	75 - 125	99	80 - 120	<0.10	ug/g	NC	30
6630030	Acid Extractable Chromium (Cr)	2020/03/11	100	75 - 125	98	80 - 120	<1.0	ug/g	3.0	30
6630030	Acid Extractable Cobalt (Co)	2020/03/11	95	75 - 125	99	80 - 120	<0.10	ug/g	4.4	30
6630030	Acid Extractable Copper (Cu)	2020/03/11	93	75 - 125	98	80 - 120	<0.50	ug/g	0.10	30
6630030	Acid Extractable Lead (Pb)	2020/03/11	96	75 - 125	98	80 - 120	<1.0	ug/g	2.7	30
6630030	Acid Extractable Molybdenum (Mo)	2020/03/11	101	75 - 125	99	80 - 120	<0.50	ug/g	NC	30
6630030	Acid Extractable Nickel (Ni)	2020/03/11	93	75 - 125	98	80 - 120	<0.50	ug/g	9.5	30
6630030	Acid Extractable Selenium (Se)	2020/03/11	96	75 - 125	96	80 - 120	<0.50	ug/g	NC	30
6630030	Acid Extractable Silver (Ag)	2020/03/11	98	75 - 125	101	80 - 120	<0.20	ug/g	NC	30
6630030	Acid Extractable Thallium (Tl)	2020/03/11	94	75 - 125	97	80 - 120	<0.050	ug/g	NC	30
6630030	Acid Extractable Uranium (U)	2020/03/11	96	75 - 125	97	80 - 120	<0.050	ug/g	4.0	30
6630030	Acid Extractable Vanadium (V)	2020/03/11	101	75 - 125	100	80 - 120	<5.0	ug/g	1.5	30
6630030	Acid Extractable Zinc (Zn)	2020/03/11	89	75 - 125	90	80 - 120	<5.0	ug/g	5.4	30
6631656	Benzene	2020/03/11	86	60 - 140	92	60 - 140	<0.020	ug/g	NC	50
6631656	Ethylbenzene	2020/03/11	98	60 - 140	103	60 - 140	<0.020	ug/g	NC	50
6631656	F1 (C6-C10) - BTEX	2020/03/11					<10	ug/g	NC	30
6631656	F1 (C6-C10)	2020/03/11	78	60 - 140	89	80 - 120	<10	ug/g	NC	30
6631656	o-Xylene	2020/03/11	98	60 - 140	103	60 - 140	<0.020	ug/g	NC	50
6631656	p+m-Xylene	2020/03/11	96	60 - 140	100	60 - 140	<0.040	ug/g	NC	50

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6631656	Toluene	2020/03/11	90	60 - 140	94	60 - 140	<0.020	ug/g	NC	50
6631656	Total Xylenes	2020/03/11					<0.040	ug/g	NC	50
6633139	1-Methylnaphthalene	2020/03/12	117	50 - 130	124	50 - 130	<0.0050	ug/g	NC	40
6633139	2-Methylnaphthalene	2020/03/12	111	50 - 130	119	50 - 130	<0.0050	ug/g	NC	40
6633139	Acenaphthene	2020/03/12	113	50 - 130	115	50 - 130	<0.0050	ug/g	NC	40
6633139	Acenaphthylene	2020/03/12	108	50 - 130	110	50 - 130	<0.0050	ug/g	NC	40
6633139	Anthracene	2020/03/12	114	50 - 130	111	50 - 130	<0.0050	ug/g	NC	40
6633139	Benzo(a)anthracene	2020/03/12	122	50 - 130	120	50 - 130	<0.0050	ug/g	NC	40
6633139	Benzo(a)pyrene	2020/03/12	114	50 - 130	114	50 - 130	<0.0050	ug/g	NC	40
6633139	Benzo(b/j)fluoranthene	2020/03/12	112	50 - 130	118	50 - 130	<0.0050	ug/g	NC	40
6633139	Benzo(g,h,i)perylene	2020/03/12	112	50 - 130	109	50 - 130	<0.0050	ug/g	NC	40
6633139	Benzo(k)fluoranthene	2020/03/12	111	50 - 130	106	50 - 130	<0.0050	ug/g	NC	40
6633139	Chrysene	2020/03/12	118	50 - 130	117	50 - 130	<0.0050	ug/g	NC	40
6633139	Dibenzo(a,h)anthracene	2020/03/12	102	50 - 130	92	50 - 130	<0.0050	ug/g	NC	40
6633139	Fluoranthene	2020/03/12	120	50 - 130	117	50 - 130	<0.0050	ug/g	NC	40
6633139	Fluorene	2020/03/12	112	50 - 130	114	50 - 130	<0.0050	ug/g	NC	40
6633139	Indeno(1,2,3-cd)pyrene	2020/03/12	115	50 - 130	109	50 - 130	<0.0050	ug/g	NC	40
6633139	Naphthalene	2020/03/12	97	50 - 130	108	50 - 130	<0.0050	ug/g	NC	40
6633139	Phenanthrene	2020/03/12	117	50 - 130	114	50 - 130	<0.0050	ug/g	NC	40
6633139	Pyrene	2020/03/12	121	50 - 130	116	50 - 130	<0.0050	ug/g	NC	40

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

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

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

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

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

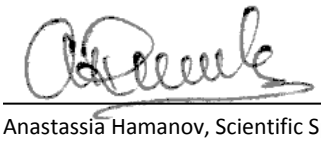
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

BV Labs Job #: C062890
Report Date: 2020/03/13

exp Services Inc
Client Project #: OTT-00258388-AO
Site Location: 172 MAIN
Sampler Initials: ML

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Anastassia Hamanov, Scientific Specialist

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

Bureau Veritas Laboratories 100 – 36 Antares Dr. Nepean, ON, K2E 7W5 Phone: 613-274-0573 Website: www.bvlabs.com

Maxxam
A Bureau Veritas Group Company

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/4

CHAIN OF CUSTODY RECORD 126090

Page ____ of ____

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: EXP Services Inc.	Company Name:	Quotation #:	☑ Regular TAT (5-7 days) Most analyses
Contact Name: Chris Kimmerly	Contact Name: Same	P.O. #/ AFE#: OTT-00258388-A0	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 2650 Queensview Dr	Address:	Project #:	Rush TAT (Surcharges will be applied)
Phone: 613-688-1899	Phone: Fax:	Site Location: 172 Main	☐ 1 Day ☐ 2 Days ☐ 3-4 Days
Email: chris.kimmerly@exp.com	Email:	Site #:	Date Required:
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY		Site Location Province:	Rush Confirmation #:
		Sampled By: M. Leroux	

Regulation 153	Other Regulations
☐ Table 1 ☑ Res/Park ☐ Med/ Fine	☐ CCME ☐ Sanitary Sewer Bylaw
☐ Table 2 ☐ Ind/Comm ☑ Coarse	☐ MISA ☐ Storm Sewer Bylaw
☑ Table 3 ☐ Agri/ Other	☐ PWQO Region
☐ Table ____	☐ Other (Specify)
FOR RSC (PLEASE CIRCLE) (Y) / N	☐ REG 558 (MIN. 3 DAY TAT REQUIRED)

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

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

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	BTEX/ PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B)	PAH								HOLD- DO NOT ANALYZE
1	BH-1 SS-1	2020/03/06	PM	Soil	4		✓				✓		✓								
2	BH-2 SS-1	2020/03/06	PM	Soil	4		✓				✓		✓								
3	Dupl.	2020/03/06	PM	Soil	4		✓				✓		✓								
4																					
5	*Stream 3*																				
6																					
7																					
8																					
9																					
10																					

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
✓	✓	3.3.6

COOLING MEDIA PRESENT: Y / N

COMMENTS

09-Mar-20 15:20
Katherine Szozda
C062890
KJY OTT-001
ON Rec.

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Chris Kimmerly	2020/03/09	2:00pm	Kam Jary	2020/03/09	15:20	

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms. Sample container, preservation, hold time and packages information can be viewed at http://maxxam.ca/wp-content/uploads/Ontario-COC.pdf.

COC-1004 (01/19)

White: Maxxam ~ Yellow: Client

Maxxam
A Bureau Veritas Group Company

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/4

CHAIN OF CUSTODY RECORD 126090

Page ____ of ____

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: EXP Services Inc.	Company Name:	Quotation #:	☑ Regular TAT (5-7 days) Most analyses
Contact Name: Chris Kimmerly	Contact Name: Same	P.O. #/ AFE#: OTT-00258388-A0	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 2650 Queensview Dr	Address:	Project #:	Rush TAT (Surcharges will be applied)
Phone: 613-688-1899	Phone: Fax:	Site Location: 172 Main	☐ 1 Day ☐ 2 Days ☐ 3-4 Days
Email: chris.kimmerly@exp.com	Email:	Site #:	Date Required:
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY		Site Location Province:	Rush Confirmation #:
		Sampled By: M. Lecroux	

Regulation 153	Other Regulations
☐ Table 1 ☑ Res/Park ☐ Med/ Fine	☐ CCME ☐ Sanitary Sewer Bylaw
☐ Table 2 ☐ Ind/Comm ☑ Coarse	☐ MISA ☐ Storm Sewer Bylaw
☑ Table 3 ☐ Agri/ Other	☐ PWQO Region
☐ Table ____	☐ Other (Specify)
FOR RSC (PLEASE CIRCLE) (Y) N	☐ REG 558 (MIN. 3 DAY TAT REQUIRED)

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

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

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / Cr VI	BTEX/ PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals: HWS - B)	PAH								HOLD - DO NOT ANALYZE
1	BH-1 SS-1	2020/03/06	PM	Soil	4		✓				✓		✓								
2	BH-2 SS-1	2020/03/06	PM	Soil	4		✓				✓		✓								
3	Dupl.	2020/03/06	PM	Soil	4		✓				✓		✓								
4																					
5	*Stream 3*																				
6																					
7																					
8																					
9																					
10																					

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
✓	✓	3.3.6
		2.4.2

COOLING MEDIA PRESENT: Y / N

COMMENTS

09-Mar-20 15:20
Katherine Szozda
C062890
KJY OTT-001
ON Rush

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Chris Kimmerly	2020/03/09	2:00pm	[illegible]	2020/03/09	15:20	
			[illegible]	2020/03/10	08:00	

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms. Sample container, preservation, hold time and packages information can be viewed at http://maxxam.ca/wp-content/uploads/Ontario-COC.pdf.

COC-1004 (01/19)

White: Maxxam - Yellow: Client

List of Distribution

Report Distributed To:

Mr. Robbie Gharib; robbiegharibe@hotmail.com

Mr. Tony El Haibi, telhaibi@gmail.com

Bruce Thomas, bruce.thomas@exp.com