Preliminary Geotechnical Investigation
Proposed Residential Development
355 Franktown Road
Carleton Place, Ontario

Client:
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Executive Summary

EXP Services Inc. (EXP) is pleased to present the results of the preliminary geotechnical investigation completed for the proposed residential development to be constructed at the property registered by the street address of 355 Franktown Road, Carleton Place, Ontario (Figure 1). Terms and conditions of this assignment were outlined in EXP's proposal 21002179 dated February 2, 2021 and authorized by 11209455 Canada Inc (the client) via signed work authorization dated April 21, 2021.

The proposed development would comprise of two four (4) storey 48 units each residential buildings with one level of underground parking and one six units townhouse block. Associated access roadway, underground services, park land and surface parking facilities are also proposed to be constructed as part of the proposed development.

The fieldwork for the preliminary geotechnical investigation was completed on May 25, 2021, and consisted the excavation of thirteen (14) test pits (Test Pit Nos. 1 to 7, 7A to 13) advanced to refusal depths ranging from 0.4 m to 2.1 m below the existing ground surface..

The subsurface conditions established by the fourteen testpits generally consists of 150 to 450 mm of topsoil overlain by thin layer of fill and native soil overburden, extending to the surface of the bedrock contacted at depths of between 0.2 m to 2.1 m below the ground surface (Elevation 136.4 m to Elevation 133.0 m). All test pits remained dry n completion of excavation.

Based on the test pit information, seismic site response **Class C** can be used for the site as per Table 4.1.8.4.A of the 2012 Ontario Building Code (as amended May 2, 2019). A higher site class will likely be obtained if a shear-wave velocity testing is completed at the site and provided that the maximum depth of overburden between the underside of footing and bedrock is less than 3 m, which is likely the case for this site. However, this will depend on the final design grades.

Design grades for the finished floor, and invert of the sewers were not available at the time of preparation of this report. However, compressible clay soils were not encountered at the site. and therefore and for preliminary design purposes, a grade raise of up to 2 m is considered feasible at the site from a geotechnical perspective.

The topsoil and on-site fill and thin deposit of native soils are not considered suitable for founding purposes for footings and must be removed from the entire envelopes of the proposed buildings. Footings founded on the sound bedrock below any weathered or fractured zone may be designed for a factored geotechnical resistance at ULS of 1000 KPa. A higher ULS bearing pressure may be available when founding on sound bedrock following coring and sampling of bedrock which will be completed as part of the detailed investigation. For footings founded on sound bedrock, factored geotechnical resistance at Ultimate Limit State (ULS) will govern the design. Settlement of footings founded on sound bedrock is expected to be minimal.

For foundations placed on the surface of the bedrock, a minimum of 1.2 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 1.8 m for unheated structures if snow will not be removed from their vicinity and to 2.1 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.

The lowest floor of the proposed structures may be designed as a slab-on-grade set on a bed of clear stone placed on well compacted engineered fill set on the bedrock prepared as described in the body of the report. Perimeter drainage system will likely be required for the proposed buildings with basements. Whether underfloor drainage system will be required or not would depend on the final design grades and prevailing groundwater levels which will be established as part of the detailed investigation.

Excavations for the construction of the proposed buildings and underground services are expected to extend to a maximum depth of 2.0 to 4.0 m below the existing ground surface. These excavations will extend through the fill and into the bedrock with depths depending on the final design grades.

The overburden soils have been classified as Type 3 soils in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91 and therefore any open excavation must be sloped back at 1H:1V from the bottom of the excavation.

Excavations into the overburden soils may be undertaken using conventional equipment capable of removing cobbles and boulders from within the overburden soils. Excavation of the bedrock would require the use of hoe-ramming and/or line drilling and blasting and may be undertaken with near vertical sides. Contractors bidding on this project must review the available data and decide on their own the most suitable method to excavate the bedrock, i.e. line drilling, blasting, etc. Additional rock coring and laboratory testing is required to determine the strength of the bedrock underlying the site..

For excavations extending to up to 3.0 m below the existing grade, the excavations are anticipated to be above or slightly below the groundwater level. Therefore, the removal of groundwater from the excavation is anticipated to be minimal depending on the final design grades. However this would have to be established following the completion of the detailed geotechnical investigation. Seepage of 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.

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

It is anticipated that the majority of the material required for backfilling purposes would have to be imported and should preferably conform to the specifications described in the body of the report.

A detailed investigation is recommended at the site once the lowest floors of the proposed buildings and underground parking garage and sewer inverts are known as well as clearing and grubbing are undertaken at the site. The purpose of the borehole investigation is to:

- Establish the type and quality of the bedrock underlying the site; and
- Establish the groundwater table versus the proposed depth of excavation.

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

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1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the preliminary geotechnical investigation completed for the proposed residential development to be constructed at the property registered by the municipal address of 355 Franktown Road, Carleton Place, Ontario (Figure No. 1). Terms and conditions of this assignment were outlined in EXP's proposal dated February 02, 2021 and authorized by 11309455 Canada Inc. (the client) on April 21, 2021.

It is our understanding that the proposed development will consist of two four (4) story 48 units each residential buildings with one level of underground parking extending to beyond the limits of the proposed buildings and one block of six-unit townhouse with one basement level. Underground services, parkland, surface parking facility and underground services will also be constructed as part of the proposed development. Design grades for the proposed buildings, exterior grades, and sewer inverts were not available at the time of preparation of this report.

The preliminary geotechnical investigation was undertaken to:

a) Establish the subsurface soil and groundwater conditions at the locations of testpits excavated in accessible areas throughout the site;

b) Provide classification of the site for seismic design in accordance with requirements of the 2012 Ontario Building Code (OBC) as amended May 2, 2019 and assess the liquefication potential of the subsurface soils in a seismic event;

c) Discuss grade raise restrictions;

d) Provide the bearing pressure at Serviceability Limit State (SLS) and factored geotechnical resistance at Ultimate Limit State (ULS) of the most suitable type of foundation for the new buildings, as well as anticipated total and differential settlements;

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

f) Discuss excavation conditions and dewatering requirements during construction;

g) Provide pipe bedding requirements for the new underground services; and

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

The comments and recommendations given in this report assume that the above-described design concept will proceed to 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 on the northeast side of Franktown Road in the town of Carleton Place, Ontario. It is bounded by residential properties to the south-west, by commercial properties on to the south and south-east, and by undeveloped land to the north and north-west (Figure No. 1). The subject site is an elongated rectangular area, with the front third of the site presently occupied by a light commercial building with asphalt paved parking area. A grassy area is located behind the existing building to the north-east. The remainder of the site is covered by shrubs and dense treed forest which limited access to certain areas of the site for test pitting purposes.

The site is fairly flat to gently undulating, with ground surface elevations at the location of the test pits ranging between Elevation 133.51 m and Elevation 136.90 m.

3. Background

A phase I and Phase II Environmental Site Assessments were completed by EXP at the subject site in 2019 and results reported under EXP project OTT-000252133-A0 dated April 26, 2019. As part of the Phase II ESA, one borehole was drilled at the southwest corner of the property to a depth of 4.6 m below grade and revealed the subsurface condition to comprise of 0.8 m thin deposit of overburden underlain by limestone bedrock. The groundwater was measured at depth of 2.5 m below grade, 4 days following the completion of the fieldwork. Log of the this borehole is attached in Appendix B.

4. Procedure

The fieldwork for the preliminary geotechnical investigation was completed on May 25, 2021 and consisted of fourteen (14) test pits (Test Pit Nos. 1 to 7, 7A to 13) advanced to refusal depths on intact bedrock ranging from 0.4 m to 2.1 m below the existing ground surface using a Caterpillar 320T hydraulic excavator and a Kubota KX080 hydraulic excavator, both operated by a local excavation contractor subcontracted to EXP. The fieldwork was supervised on a full-time basis by a representative from EXP.

The test pit locations and geodetic elevations were established by a survey crew from EXP and are shown on the Test Pit Location Plan (Figure No. 2).

Prior to the fieldwork, the locations of the test pits were cleared of any public and private underground services. Grab samples were collected from selected depths from the test pits.

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 the City of Ottawa, Ontario, where they were visually examined by a geotechnical engineer, and test pit logs were prepared. The engineer also assigned the laboratory testing which consisted of performing the following tests on soil samples:

Natural Moisture Content	9 Tests

5. Subsurface Soil and Groundwater Conditions

A detailed description of the geotechnical conditions encountered in the test pits is given on the test pit logs, Figure Nos. 3 to 16. The test pit 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.

The test pits were excavated 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 bedrock boundaries indicated on the test pit 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 test pit logs forms an integral part of this report and should be read in conjunction with this report.

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

5.1 Topsoil

A 150 mm to 450 mm thick layer of topsoil was encountered at ground surface in all test pits. The topsoil extended to refusal on bedrock in Test Pit Nos. 1, 3, 7, 7A, 8, 9 and 10 at depths ranging from 0.2 m to 0.5 m below existing grade (Elevation 133.0 m to Elevation 136.4 m), and to depths ranging from 0.15 m to 0.45 m below existing grade in all other test pits (Elevation 133.10 m to Elevation 136.7 m) in the remaining testpits.

5.2 Fill

The topsoil in Test Pit Nos.2, 4, 5, and 6 is underlain by a layer of sandy fill with silt that extends to refusal on bedrock at depths ranging from 0.6 m to 0.9 m below existing grade (Elevation 134.0 m to Elevation 134.1 m) in Test Pit Nos. 5 and 6, and to depths ranging from 0.9 m to 1.7 m below existing grade (Elevation 135.1 m to Elevation 135.3 m) in Test Pit Nos. 2 and 4. The sandy fill material was brown to grey-brown in colour and contained gravel, rootlets and root pieces in all test pits, as well as asphalt fragments and topsoil inclusions in Test Pit No. 6. Natural moisture content in the silty sand fill ranged from 7.4 to 18.4 percent.

5.3 Sandy Silty Clay

A deposit of native sandy silty clay was encountered in Borehole Nos. 2 and 4 underlying the fill material at depths ranging from 0.6 m to 0.9 m below existing grade (Elevation 134.0 m to Elevation 134.1 m). Minor traces of the native sandy silty clay deposit were also observed in Test Pit Nos. 5 and 7. The native sandy silty clay deposit was dark grey to blue grey in colour and contained rootlets and root fragments in both test pits, and sandy inclusions in Test Pit No. 4. The native sandy silty clay deposit extended to refusal on bedrock at depths ranging from 1.4 m to 2.1 m below existing grade (Elevation 134.8 m). Natural moisture content in the native deposit ranged from 19.8 to 36.7 percent.

5.4 Sand

A deposit of native sand was encountered in Borehole Nos. 10, 11, 12, and 13 underlying the topsoil at depths ranging from 0.2 m to 0.25 m below existing grade (Elevation 133.2 m to Elevation 134.9 m). The native silty sand deposit was yellow-brown in colour and contained gravel and silt, as well as rootlets and root fragments. The native sand deposit extended to refusal on the surface of the bedrock at depths ranging from 0.5 m to 0.6 m below existing grade (Elevation 133.0 m to Elevation 134.5 m). Natural moisture content in the native silty sand deposit ranged from 14.6 to 19.7 percent.

5.5 Bedrock

Refusal to hydraulic excavator bucket was met in all test pits at depths ranging from 0.2 m to 2.1 m below the existing ground surface (Elevation 136.4 m to Elevation 133.0 m). It was possible to excavate through the upper 0.1 m to 0.3 m layer of the weathered bedrock in Test Pit Nos. 6, 7, 7a, and 8 through 12. A review of bedrock geology map (Map 1508A – Generalized Bedrock geology, Ottawa-Hull, Ontario and Quebec, Geological Survey of Canada, printed by the Surveys and Mapping Branch, 1979) indicates that the site is underlain by dolomite with limestone beddings of the Oxford Formation. A summary of the inferred bedrock depths and elevations contacted in all test pits is shown in Table II.

Table I: Summary of Inferred Bedrock Depths (Elevations) at Test Pit Locations

Borehole No.	Ground Surface Elevation (m)	Depth (Elevation) of Inferred Bedrock (m)	Bedrock Proven by Coring
BH-01 (2019)	136.48	0.8 (135.7)	Yes
TP-01	135.46	0.3 (135.2)	No
TP-02	136.90	2.1 (134.8)	No
TP-03	135.25	0.4 (134.9)	No
TP-04	136.24	1.4 (134.8)	No
TP-05	134.59	0.6 (134.0)	No
TP-06	134.85	0.8 (134.1)	No
TP-07	136.46	0.3 (136.2)	No
TP-07A	133.89	0.5 (133.4)	No
TP-08	134.04	0.2 (133.8)	No
TP-09	136.72	0.3 (136.4)	No
TP-10	133.51	0.5 (133.0)	No
TP-11	133.67	0.4 (133.3)	No
TP-12	133.48	0.4 (133.1)	No
TP-13	135.13	0.6 (134.5)	No

5.6 Groundwater Level

All test pits remained dry following the completion of the excavation. Additional geotechnical investigation in the form of borehole drilling and monitoring well installation is highly recommended to be undertaken to provide additional data on groundwater levels to the civil designer. Groundwater was established at 2.5 m in the borehole drilled in 2019. Additional reading will be collected in this borehole in the next week or so.

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.

Photos collected during the fieldwork are attached in Appendix C

6. Seismic Site Classification and Liquefaction Potential of Soils

6.1 Site Classification for Seismic Site Response

Based on the test pit information and Table 4.1.8.4.A in the 2012 Ontario Building Code (as amended May 2, 2019), the site classification for seismic site response is **Class C.**

A higher site class will likely be obtained if a shear-wave velocity testing is completed at the site and provided that the maximum depth of overburden between the underside of footing and bedrock is less than 3 m, which is likely the case for this site. However, this will depend on the final design grades.

6.2 Liquefaction Potential of Soils

The subsurface soils are not susceptible to liquefaction during a seismic event.

7. Grade Raise Restrictions

The investigation has revealed that the site to be underlain by 0.2 to 2.1 m of overburden over bedrock.

Design grades were not available at the time of preparation of this report. However, compressible clay soils were not encountered at the site. Therefore, for preliminary design purposes, a grade raise of up to 2 m is considered feasible at the site from a geotechnical perspective.

Should this assumption be incorrect, EXP should be contacted to review the acceptability of the proposed grade raise from a geotechnical point of view.

8. Foundation Considerations

Design grades for the finished floor, basement floors of the proposed structures and invert of any site services were not available at the time of preparation of this report. Therefore, this section should be updated once this information becomes available.

The investigation has revealed the subsurface condition to comprise of 0.2 to 2.1 m thick overburden soils (topsoil and fill, native soil) underlain by bedrock. The topsoil and overburden fill and thin deposit of native soils are not suitable founding material and must be removed to surface of the bedrock as part of the site preparation for the proposed buildings.

Footings founded on the sound bedrock below any weathered or fractured zone may be designed for a factored geotechnical resistance at ULS of 1000 kPa. A higher ULS bearing will likely be available following the completion of the detailed investigation at the site and underside of footings of the proposed buildings are established. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. For footings founded on sound bedrock, factored geotechnical resistance at ULS will govern the design. Settlement of footings founded on sound bedrock is expected to be minimal.

If engineered fill will be required in some areas to raise the grades, it must be placed from the surface of the bedrock following the removal of the topsoil and fill and should comprise of OPSS 1010 Granular B Type II placed in 300 mm lifts and each lift compacted to 100 percent of the standard Proctor maximum dry density (SPMDD) in accordance with ASTM D-698-12e2. The engineered fill pad must extend at least 0.6 m from the exterior edge of the footing and then slope down at a gradient of 1H:1V. In-place density tests must be conducted on each lift to ensure that the specified degree of compaction has been achieved.

Footings designed to bear on well-prepared engineered fill pad founded on the surface of the bedrock may be designed for a bearing pressure at SLS of 200 kPa and a factored geotechnical resistance at ULS of 300 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. Settlements of footings designed for the above SLS bearing pressure are expected to be within the tolerable limits of 25 mm total and 19 mm differential.

Footings for a single building must not bear partly on bedrock and partly on the engineered fill. If this is the case, transition zone or construction joints must be provided to reduce the potential of differential settlement between the two founding media or the footings must be stepped down to be founded on the bedrock.

For foundations placed on the surface of the bedrock, a minimum of 1.2 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 1.8 m for unheated structures if snow will not be removed from their vicinity and to 2.1 m if snow will be removed from the vicinity of the structure.

For foundations placed on engineered fill, 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.

The founding surfaces should be reviewed and approved by a geotechnician prior to placement of concrete or engineered fill.

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.

9. Slab-on-Grade Construction

The lowest floor slab of the proposed residential buildings may be designed as a slab-on-grade set on a bed of clear stone placed on the bedrock or on well compacted engineered fill set on the bedrock prepared as described below.

As part of lowest floor slab construction, all fill must be removed from the building envelopes and grades raised using OPSS 1010 Granular B Type II placed in 300 mm lifts and each lift compacted to 98 percent of the standard Proctor maximum dry density (SPMDD) in accordance with ASTM D-698-12e2. In-place density tests must be conducted on each lift to ensure that the specified degree of compaction has been achieved.

Perimeter drainage systems are likely required for the proposed buildings with basement. The drainage systems may consist of 100 mm perforated pipes wrapped with filter cloth (sock), set on the foundations and surrounded with 150 mm of 19 mm clear stone, and properly outletted. Requirement of any underfloor drainage system need to be reviewed once the grades at the site are set and finalized.

The ground floor of the new buildings should be at least 150 mm above 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.

10. Lateral Earth Pressure to Subsurface Walls

The subsurface basement walls of the new buildings 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:

$$P = K_0 h (½ \gamma h + q)$$

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

11.1 Excess Soil Management

A new Ontario Regulation 406/19 made under the Environmental Protection Act (November 28, 2019) has been implemented as of January 1, 2021. The new regulation dictates the testing protocol that is 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.

11.2 Excavations

Excavations for the construction of the new building and underground services are expected to extend to a maximum depth of 3.0 m to 4.0 m below the existing ground surface. These excavations will extend through the fill and into the bedrock depending on the final design grades and will likely be above or slightly below the groundwater table.

The overburden soils have been classified as Type 3 soils in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91 and therefore any open excavation must be sloped back at 1H:1V from the bottom of the excavation.

Excavations into the overburden soils may be undertaken using conventional equipment capable of removing cobbles and boulders and large tree roots within the overburden soils. Excavation of the bedrock would require the use of hoe-ramming and/or line drilling and may be undertaken with near vertical sides. Contractors bidding on this project must review the available data and decide on their own the most suitable method to excavate the bedrock, i.e. line drilling, blasting, etc. It should be noted that laboratory testing has revealed the bedrock underlaying the site to be strong to very strong.

Vibrations should be monitored during construction to prevent damage to adjacent structures and services. A pre-condition survey of all the structures and services situated within the proximity of the site will be required prior to the commencement of construction and during the excavation of the bedrock. Care must be undertaken to ensure that the footings of the neighboring properties are not damaged during construction.

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.

11.3 De-Watering Requirements and Impact on Surrounding Structures and Infrastructure

For excavations extending to 2.0 to 3.0 m below the existing grade, the excavations are anticipated to at or above the groundwater level. Therefore, the removal of groundwater from the excavation will not be required.

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. It

must be noted that high infiltration is anticipated within excavations that extend into the bedrock. Therefore, a higher seepage rate is anticipated and the need for high-capacity pumps to keep the excavation dry should not be ignored.

Based on the limited scope of the preliminary investigation further information on the groundwater conditions at the site is not available; additional geotechnical investigation work is recommended to provide information on groundwater conditions. 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. 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 the municipal requirements and/or Ontario Provincial Standard Specification and Drawings (OPSS and OPSD).

The pipe subgrade material is anticipated to be bedrock. In this case, it is recommended the pipe bedding consist of 150 mm thick OPSS 1010 Granular A bedding material for the bedrock subgrade. The bedding materials should be compacted to at least 98 percent SPMDD. The bedding material should be also placed along the sides and on top of the pipes to provide a minimum cover of 300 mm and should be compacted to at least 98 percent SPMDD.

Even though this case is unlikely, a transition zone in the pipe bedding must be provided when the founding material changes from bedrock to overburden soils and vice versa if applicable anywhere on this site. In the areas where the bedrock slopes at a steeper gradient than 3H:1V, the bedrock should be excavated, and additional bedding material placed to create a 3H:1V transition zone.

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

The material to be excavated from the site will consist of topsoil, fill and native overburden and bedrock. The fill is comprised of sand with silt and contains roots, rootlets, topsoil inclusions, cobbles and boulders, and therefore is not considered suitable for use under structural elements, for backfilling purposes, or against foundation walls. It may be used however for general grading purposes in the landscaped areas.

A portion of the on-site excavated fill material free of debris, cobbles, boulders, and organic material and native soils which is limited in quantity may be used as backfill in services trenches situated at the exterior of the buildings following further sampling and testing during construction. It is anticipated that the majority of the material required for underfloor fill and backfilling purposes would have to be imported and should preferably conform to the following specification:

- Engineered fill under the slab-on-grade area and footings - OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 and 100 percent SPMDD respectively.
- Backfill in footing trenches and against foundation walls – OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent of the SPMDD inside the building and 95 percent SPMDD outside the building respectively.
- Backfill in services trenches inside building – OPSS 1010 Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent of the SPMDD.
- Backfill in exterior services trenches or subgrade fill– OPSS 1010 Select Subgrade Material (SSM) placed in 300 mm thick lifts and each lift compacted to 95 percent of the SPMDD or on-site approved excavated material as noted above. Trench backfill and subgrade fill, select on-site material free if organics, boulders and cobbles and following further sampling and testing during construction.

14. Pavement Structure

The subgrade for the parking lots and access roads is anticipated to consist of imported granular fill (compacted to 95 percent SPMDD) used to raise the grades at the site. Pavement structure thicknesses required for light and heavy-duty traffic on the access roads and in parking lots were computed and are shown in Table II. 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 II: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Light Duty Parking Areas	Heavy Duty Parking Areas and Access Roads	Lowest Parking Level if Concrete
Asphaltic Concrete (PG 58-34)	92% to 97 % MRD	65 mm – SP12.5 Cat B or HL3	40 mm – 12.5 Cat B/HL3 50 mm – 19 Cat B/HL8	150 mm of Concrete 32 MPa – 5 to 8 % Air
Granular A Base (OPSS 1010) (crushed limestone)	100% SPMDD	150 mm	150 mm	300 mm of Granular A
Granular B Sub-base, Type II (OPSS 1010)	100% SPMDD	300 mm	450 mm	Competent Subgrade
SPMDD denotes Standard Proctor Maximum Dry Density, ASTM-D698-12e2 MRD denotes Maximum Relative Density, ASTM D2041				

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

(1) As part of the subgrade preparation, the proposed access road and parking lot areas should be stripped of unsuitable fill and other obviously unsuitable material. Fill required to raise the grades to design elevations should be organic-free and at a moisture content which will permit compaction to the densities indicated. After all the underground services have been installed, the subgrade should be properly shaped, crowned and proofrolled 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 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. As a minimum drains should be installed for a distance of 3 m in all directions from the catch basins to intercept excess surface and subsurface water. 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 subdrainage 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 Granular B Type II material. Weep holes should be provided in the catchbasins and manholes to facilitate drainage of the granular fill.

(4) 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 catch basins. Surface water should not be allowed to pond adjacent to the outside edges of paved areas.

(5) 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 used and its placement should meet OPSS 1151 requirements. It should be placed and compacted in accordance with 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.

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15. General Comments

The comments given in this report are intended only for the guidance of design engineers. The number of testholes required to determine the localized underground conditions between testholes 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.

A detailed geotechnical investigation is recommended at the site once the location of the proposed building as well as the invert of the proposed services are known as well once access to the entire portions of the suite is provided by clearing and grubbing. The additional investigation is required to:

- Establish the type and quality of the bedrock underlying the site; and
- Establish the groundwater table versus the proposed depth of excavation.

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

Sincerely.

DRAFT

Gary Cui
Engineer-in-Training, Geotechnical Services
Earth and Environment

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

Figures

0 50m 100m 200m

HORIZONTAL 1:5000

exp Services Inc.
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Ottawa, ON K2B 8H6

www.exp.com

DESIGN	GC
DRAWN	GC
DATE	JUNE 2021
FILE NO	OTT-21008943-A0

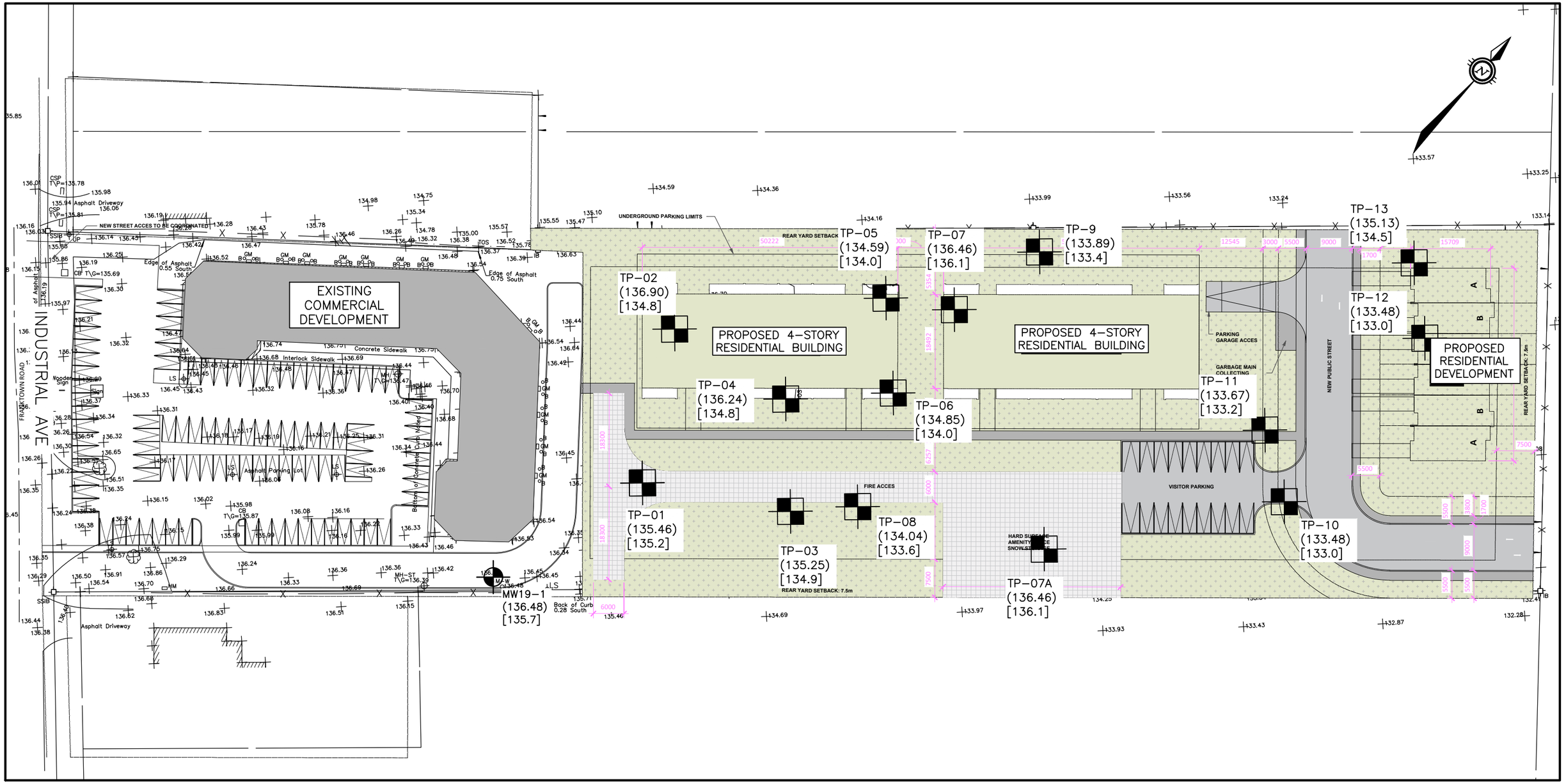
PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
355 FRANKTOWN ROAD, CARLETON PLACE, ON

SITE LOCATION PLAN

SCALE 1:5000

SKETCH NO FIG 1

Filename: E:\OTT\OTT-21002179-A0\60 Execution\65 Drawings\21002179-A0.dwg
Last Saved: Jun 9, 2021 5:04 PM Last Plotted: Jun 11, 2021 3:26 PM Plotted by: CuiG



LEGEND

TP-01 (135.25) [134.9] — TEST PIT LOCATION
GROUND SURFACE ELEVATION IN METERS
BEDROCK ELEVATION IN METERS

MW19-1 (136.48) [135.7] — MONITORING WELL LOCATION (FROM EXP REPORT OTT-00252133-A0 DATED APRIL 26, 2019)
GROUND SURFACE ELEVATION IN METERS
BEDROCK ELEVATION IN METERS

0 5m 10m 30m
HORIZONTAL 1:750

NOTES:

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

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
www.exp.com

DESIGN	GC
DRAWN	GC
DATE	JUNE 2021
FILE NO	OTT-21008914-A0

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
355 FRANKTOWN ROAD, CARLETON PLACE, ON

TEST PIT LOCATION PLAN

SCALE 1:750
SKETCH NO FIG 2

Filename: E:\OTT\OTT-21002179-A0\60 Execution\65 Drawings\21002179-A0.dwg
Last Saved: Jun 16, 2021 3:05 PM Last Plotted: Jun 16, 2021 3:14 PM Plotted by: CuiG

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		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

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 TP-01

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 03

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~300 mm	135.46	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			135.2					
		Refusal to Excavator Bucket at 0.3 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

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

LOG OF BOREHOLE TP LOGS-21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-02

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 04

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~200 mm	136.9	0				
		FILL Sand with silt, contains gravel, interbedded 0.2 - 0.3 m layers, contains wood pieces and rootlets, brown to dark brown, moist	136.7					
				1		×	GS1	
		SANDY SILTY CLAY contains rootlets, dark grey to blue grey, very moist	135.1					
				2		×	GS2	18.1
		Refusal to Excavator Bucket at 2.1 m Depth on Inferred Bedrock	134.8					

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS -21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-03

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 05

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~400 mm	135.25	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			134.9					
		Refusal to Excavator Bucket at 0.4 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS -21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-04

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 06

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 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
		TOPSOIL ~150 mm	136.24	0				
		FILL Sand with silt, contains gravel, contains rootlets and root fragments, brown, moist	136.1			×	GS1	
		SANDY SILTY CLAY contains rootlets and root fragments, contains sandy pockets, dark grey to blue grey, very moist	135.3	1		×	GS2	20.2
		Refusal to Excavator Bucket at 1.4 m Depth on Inferred Bedrock	134.8					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

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

LOG OF BOREHOLE TP LOGS-21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-05

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 07

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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
		TOPSOIL ~200 mm	134.59	0				
		FILL Sand with silt, contains gravel, contains rootlets and root fragments, brown, moist	134.4			×	GS1	
		- discontinuous seams/pockets of native blue-grey sandy silty clay	134.0					
		Refusal to Excavator Bucket at 0.6 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS-21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-06

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 08

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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
		TOPSOIL ~450 mm	134.85	0				
		FILL Sand with silt, contains gravel, contains rootlets and root fragments, contains asphalt pieces, contains topsoil inclusions, grey-brown, moist	134.4			×	GS1	
		WEATHERED BEDROCK Heavily weathered, platy, light grey	134.1					
		Refusal to Excavator Bucket at 0.9 m Depth on Inferred Bedrock	134.0					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS -21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-07

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 09

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~250 mm	136.46	0				
		WEATHERED BEDROCK Heavily weathered, platy, light grey - discontinuous seams/pockets of native blue-grey sandy silty clay	136.2					
		Refusal to Excavator Bucket at 0.4 m Depth on Inferred Bedrock	136.1					

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS -21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-07A

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 10

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~450 mm	133.89	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			133.4					
		WEATHERED BEDROCK Heavily weathered, platy, light grey	133.4					
		Refusal to Excavator Bucket at 0.5 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS -21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-08

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 11

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~250 mm	134.04	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			133.8					
		WEATHERED BEDROCK Heavily weathered, platy, light grey	133.6					
		Refusal to Excavator Bucket at 0.4 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS-21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-09

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 12

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~300 mm	136.72	0				
			136.4					
		WEATHERED BEDROCK Heavily weathered, platy, light grey	136.3					
		Refusal to Excavator Bucket at 0.3 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS -21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-10

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 13

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~500 mm	133.51	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			133.0					
		Refusal to Excavator Bucket at 0.5 m Depth on Inferred Bedrock						

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS-21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-11

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 14

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~250 mm	133.67	0				
		WELL-GRADED SAND Contains gravel and silt, contains rootlets and root fragments, yellow-brown, moist	133.4			×	GS1	
		WEATHERED BEDROCK Heavily weathered, platy, light grey	133.3					
		Refusal to Excavator Bucket at 0.5 m Depth on Inferred Bedrock	133.2					

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS -21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-12

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 15

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	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 ~250 mm	133.48	0				
		WELL-GRADED SAND Contains gravel and silt, contains rootlets and root fragments, yellow-brown, moist	133.2			×	GS1	
		WEATHERED BEDROCK Heavily weathered, platy, light grey	133.1					
		Refusal to Excavator Bucket at 0.5 m Depth on Inferred Bedrock	133.0					

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

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS-21002179.GPJ TROW OTTAWA.GDT 6/17/21

Log of Borehole TP-13

Project No: OTT-21002179-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 355 Franktown Road, Carleton Place, ON

Figure No. 16

Page. 1 of 1

Date Drilled: 'May 25, 2021

Drill Type:

Datum: Geodetic Elevation

Logged by: G.C. 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	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 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
		TOPSOIL ~250 mm	135.13	0				
		WELL-GRADED SAND Contains gravel and silt, contains rootlets and root fragments, yellow-brown, moist	134.9			×		GS1
		Refusal to Excavator Bucket at 0.6 m Depth on Inferred Bedrock	134.5					

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. Test pit backfilled with excavated material and nominally compacted using excavator bucket.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-21002179-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 25, 2021	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS-21002179.GPJ TROW OTTAWA.GDT 6/17/21

Appendix A: Legal Notification

Legal Notification

This report was prepared by EXP Services Inc. (EXP) for the account of 11309455 Canada 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.

Appendix B: Log of Borehole Previously drilled at the site by EXP in 2019

Log of Borehole BH1

Project No: OTT-00252133-A0

Project: PIIESA

Location: 355 Franktown Road, Carleton Place, Ontario

Figure No. 1

Page. 1 of 1

Date Drilled: 4/12/19

Drill Type:

Datum: Estimated

Logged by: AN Checked by: MGM

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
		ASPHALT ~ 30 mm	136.48	0				
		SAND AND GRAVEL FILL	136.4					
		Crushed stone with trace silt, grey, dry to moist, no odour.	135.7		27	0	SS1	
		LIMESTONE BEDROCK		1			Run 1	
		Grey, some horizontal and vertical fractures, (good quality).		2			Run 2	
			134.02	3			Run 3	
				4			Run 4	
			131.6					
		Borehole Terminated at 4.87 m Depth						

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

NOTES:
1. Borehole/Test Pit data requires Interpretation by exp. before use by others
2. A flushmount monitoring well with a 51 mm slotted standpipe was installed in the borehole upon completion.
3. Field work was supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00252133-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
completion	4.2	-
4 days	2.5	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	5.05 - 6.12	94	16
2	6.12 - 7.57	100	79
3	7.57 - 9.14	100	74

LOG OF BOREHOLE LOGS OF BOREHOLES FRANKTOWN- APRIL 2019.GPJ TROW OTTAWA.GDT 6/17/21

Appendix B: Site Photographs taken during testpit excavation

Photo 1: Subsurface Profile in Test Pit No. 2

Photo 2: Subsurface Profile in Test Pit No. 4

Photo 3: Subsurface profile in Test Pit No. 5

Photo 4: Subsurface Profile in Test Pit No. 7

Photo 5: Subsurface Profile in Test Pit No. 11, showing traces of sandy silty clay

Photo 6: Subsurface Profile in Test Pit No. 12

Report Distribution

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