Proposed Residential Development
5688 Main Street
Stouffville, Ontario

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Geotechnical Investigation

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1. Introduction

This report presents the results of a Geotechnical Investigation carried out at a site for a proposed residential development in Stouffville, Ontario.

The site is located at 5688 Main Street, Stouffville, Ontario. It is currently occupied in part by a single-storey building located on the west side of the site with paved parking in the remaining area.

Based on the development plans provided, the site area is approximately 0.99 acres. The proposed structure will have a 13-storey tower with a 6-storey podium over two (2) levels of underground parking.

The purpose of this study was to determine the subsurface conditions at the site by drilling a limited number of boreholes and based on this information, to provide geotechnical engineering guidelines for the design and construction of the proposed development. Specifically, recommendations and/or comments regarding foundation type, allowable bearing pressures, groundwater conditions, excavation and backfill, slab-on-grade construction, permanent drainage requirements and earthquake considerations were to be provided.

The information contained in this report in no way reflects on the environmental aspects of the soils and groundwater as this is beyond our terms of reference. The comments and recommendations given in this report are based on the assumption 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 the requirement of additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

A Hydrogeological Investigation was carried out concurrently with the geotechnical investigation. The findings of the Hydrogeological Investigation will be reported under separate cover.

2. Procedure

Based on our proposal, the original scope was to advance one (1) borehole to about 17 m below ground surface (mbgs) plus seven (7) boreholes to about 12 mbgs for both geotechnical and hydrogeological purposes. The boreholes were deepened as variable subsurface conditions were revealed during the fieldwork.

The fieldwork for this investigation was carried out during the period of January 26 to 31, 2024. A total of eight (8) sampled boreholes (Boreholes 1 to 8) were drilled to depths ranging from about 13.8 to 19.7 m for both geotechnical and hydrogeological purposes. The approximate locations of the 8 boreholes are shown on the attached Borehole Location Plan (Drawing No. 1).

In each borehole, representative samples of the subsurface overburden soils were recovered at regular intervals using conventional 50 mm O.D. split barrel sampler driven in accordance with Standard Penetration Test procedures (ASTM D1586). Water level observations were carried out in the open boreholes during the course of the fieldwork. Subsequent water level observations were carried out in a piezometer installed in each borehole.

To confirm the borehole findings, EXP returned to the site on March 25, 2024 to carry out additional testing. With the exception of Borehole 6, a Dynamic Cone Penetration Test (DCPT) was carried out at all borehole locations starting from about 4.6 m below existing ground surface. This test consists of driving a 51 mm diameter, 60 degree apex steel cone, attached to the drill rods into the undisturbed ground by applying the same energy as in the SPT method. The number of blows required to advance the cone for each 300 mm (1 foot) is recorded and the result of the test is a continuous record of driving resistance which indicates variations in the relative density (compactness condition) of the subsurface deposits.

Prior to the commencement of drilling operations, underground services were cleared to minimize the risk of contacting any such services during the drilling operations. In addition, a private locator was retained to scan around each borehole location to minimize the risk of contacting any buried utilities.

A representative of EXP was present throughout the drilling operations to monitor and direct the drilling and sampling operations, logged the borings, made groundwater observations during and upon completion of drilling, processed the recovered samples and prepared the borehole logs. Representative samples of the subsurface soils were recovered at regular intervals using conventional 50 mm O.D. split spoon sampling equipment driven in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586). All split spoon samples were returned to EXP's Brampton laboratory for testing which included moisture content and unit weight determinations on selected samples.

The location and ground surface elevation of the borehole were determined in the field by EXP Service Inc. The top of borehole elevations (Geodetic) at each borehole location was derived from SOKKIA TopNET Live RTK Network with the use of a SOKKIA GCX3 Controller.

3. Surface Conditions

3.1 Soil

The detailed soil profile encountered in each borehole and the results of laboratory moisture content determinations are indicated on the attached borehole logs. It should be noted the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change.

The "Notes on Sample Descriptions" preceding the borehole logs form an integral part of and should be read in conjunction with this report.

The following is a brief description of the soil conditions encountered during the investigation:

3.1.1 Asphalt

Asphalt with thickness of about 90 to 115 mm was encountered at the ground surface of Boreholes 5, 6, 7 and 8.

3.1.2 Fill

Fill comprising sand and gravel, clayey to sandy silt was encountered at the ground surface of Boreholes 1 to 4 and below the asphalt in Boreholes 5 to 8. Topsoil pockets and layers were noted in the fill samples recovered from Borehole 4. The fill material has moisture contents ranging from about 5 to 38 percent of dry mass and extending to depths ranging from about 1.8 to 3.0 m below existing ground surface (El. ~260.8 to 259.2 m).

3.1.3 Sandy Silt to Silty Sand

The fill was underlain by a sandy silt to silty sand deposit at all borehole locations. This deposit contains a trace of clay, a trace of silt pockets with occasional gravel. It is generally brown in colour and becoming grey with depth and has moisture contents of about 6 to 22 percent of dry mass, indicative that this layer is water bearing. With recorded 'N'-value of 0 to 51, this material is in a loose to very dense state of compactness (generally compact). The low 'N'-values recorded are likely affected by hydrostatic pressure when the borehole extended below groundwater table. The sandy silt to silty sand extends to depths ranging from about 10 to 13.3 m below existing ground surface (El. ~252.5 to 248.9 m).

3.1.4 Clayey Silt

A discontinued clayey silt deposit was encountered below the sandy silt to silty sand in Borehole 1. The clayey silt is grey in colour, contains a trace of gravel and a trace of sand. The clayey silt has a very stiff consistency (recorded 'N'-value of 28) and extends to a depth of about 11.7 m below existing grade (El. ~250.8 m).

3.1.5 Sandy Silt Till

A sandy silt till deposit was encountered below the clayey silt in Borehole 1 and below the sandy silt to silty sand in the remining boreholes. This deposit is grey in colour, contains a trace of clay, a trace of gravel and has moisture contents ranging from about 6 to 12 percent of dry mass. Based on recorded 'N'-value of 35 to over 100, the sandy silt till exists in a dense to very dense state of compactness. Boreholes 1 to 7 were terminated in the sandy silt till at depths of about 14 to 19.7 m below existing ground surface (El. ~248.3 to 242.5 m). In Borehole 8, the sandy silt till extends to a depth of 16.2 m below existing ground surface (El. ~245.8 m).

3.1.6 Gravelly Sand

The sandy silt till in Borehole 8 was underlain by a gravelly sand deposit. This deposit is grey in colour, wet and exists in a very dense state of compactness (recorded 'N'-value of over 100). The gravelly sand extends to the termination depth of about 17 m below ground surface in Borehole 8 (El. ~245.0 m).

Grain size analyses were carried out in the laboratory on nine (9) representative samples recovered from the various stratum encountered. The test results are presented in Appendix A and summarized in Table 1 below:.

Table 1: Summary of Grain Size Analysis Results

Sample	Depth (m)	Gravel	Sand	Silt	Clay	Description
BH1 SS10	10.7 – 11.3	2.5%	19.0%	56.6%	21.9%	Clayey Silt, some Sand, trace Gravel
BH2 SS8	7.6 – 8.2	0.0%	66.1%	33.5%	0.4%	Silty Sand, trace Clay
BH7 SS10	10.7 – 11.3	7.6%	34.5%	43.0%	14.9%	Sandy Silt, some Clay, trace Gravel
BH8 SS6	4.6 – 5.2	0.2%	44.6%	51.2%	4.0%	Sandy Silt, some Clay, trace Gravel
BH3 SS11	12.2 – 12.8	5.5%	30.1%	47.9%	16.5%	Sandy Silt, some Clay, trace Gravel
BH4 SS11	12.2 – 12.8	4.4%	36.2%	45.8%	13.6%	Sand & Silt, some Clay, trace Gravel
BH5 SS5	3.0 – 3.7	0.0%	38.7%	57.5%	3.8%	Silt & Sand, some Clay, trace Gravel
BH5 SS10	10.7 – 11.3	5.5%	38.8%	43.7%	12.0%	Silt & Sand, trace Sand
BH6 SS10	10.7 – 11.3	0.4%	0.9%	85.1%	13.6%	Silt, some Clay, trace Sand & Gravel

3.2 Groundwater Conditions

Groundwater conditions were assessed by taking readings in open holes during the course of the fieldwork and in monitoring wells installed in each borehole. Short-term groundwater level observations are recorded on the attached borehole logs and summarized in Table 2 below.

Table 2: Summary of Observed Groundwater Levels

Borehole Number	Date of Completion	Depth to Groundwater Level Below Existing Grade/Elevation (m)		
		February 8, 2024	February 15, 2024	February 28, 2024
1	January 26, 2024	~0.8 / ~261.7	~2.3 / ~260.2	~2.2 / ~260.3
2	January 26, 2024	~2.3 / ~260.3	~2.3 / ~260.3	~2.3 / ~260.3
3	January 30, 2024	~2.1 / ~260.1	~2.1 / ~260.1	~2.0 / ~260.2
4	January 31, 2024	~2.0 / ~260.2	~2.1 / ~260.1	~2.0 / ~260.2
8	January 29, 2024	~1.7 / ~260.3	~1.7 / ~260.3	~1.7 / ~260.3

Seasonal fluctuations in groundwater levels should be anticipated.

Groundwater conditions are discussed in detail in the hydrogeological study report which was issued under separate cover.

4. Engineering Discussion and Recommendations

The site is located at 5688 Main Street, Stouffville, Ontario. It is currently occupied in part by a single storey structure located near the southwest corner of the site. The remainder of the are paved parking area.

It is our understanding that the development plan had not yet been finalized. The preliminary plan calls for a 13-storey tower with a 6-storey podium residential development with 2 levels of underground parking.

The following sub-sections provide preliminary geotechnical engineering guidelines for the design and construction of the proposed development based on limited number of boreholes drilled at the site.

4.1 Foundation

For the proposed structure with 2 levels of underground parking, the anticipated level of the lowest basement (P2) will be about 7 m below the final exterior grade. The foundation level for normal spread and strip footings is anticipated at about 1 to 1.5 m below the lowest basement level, i.e. El. 254.2 to 253.7 m assuming the final exterior grade is at El. 262.2 m. If raft is used, it will be likely to be extended deeper by approximately 2 m.

At this level, the subsoil is expected to be a water bearing sandy silt/silty sand. The proposed structure may be supported on conventional pad and strip footings but it will be set below the groundwater table. To facilitate the foundation construction, positive groundwater control utilizing a suitable positive dewatering system designed, installed and operated by an experienced dewatering contractor will be required. In addition, a caisson wall shoring system, toed into the underlying till deposit will also be required to minimize the groundwater movements into the basement areas.

During the basement construction, the groundwater must be lowered to at least one metre below the lowest excavation level and shown to be so by observations in suitable number of groundwater monitoring wells installed throughout the site at representative locations.

Once the groundwater is positively controlled, the proposed structure may be supported on conventional spread and strip footings designed for a SLS soil bearing value of 300 kPa and a factored ULS bearing value of 450 kPa, subject to geotechnical inspection during construction. It should be noted that the borehole findings indicated that the sandy silt to silty sand is generally in a compact to dense state at the anticipated founding level at all borehole locations. However, the recorded ‘N’-values below the foundation level appeared to be highly variable. Additional boreholes and testing should therefore be carried out after the existing structure is demolished to further investigate/confirm the subsurface conditions at this site.

Table 3 below shows the highest elevations at the borehole locations where the above-mentioned bearing values can be applied.

Table 3: Highest Elevation at Borehole Locations Where Recommended Geotechnical Resistances Can Be Applied

Borehole Number	Spread and Strip Footing SLS 300 kPa / ULS 450 kPa ~Elevation (Depth Below Existing Grade (m))
1	256.5 (6.0)
2	255.1 (7.5)
3	257.7 (4.5)
4	256.2 (6.0)
5	259.1 (3.0)
6	257.6 (4.5)
7	256.0 (6.0)
8	259.0 (3.0)

The sandy silt to silty sand founding soil is susceptible to disturbance due to construction or foot traffic. As a result, it is recommended that a skim coat of concrete be poured at the footing bases. All footing bases must be hand cleaned to undisturbed soil and evaluated by a representative of EXP to confirm the founding soil and design bearing pressure prior to pouring the concrete. No footings should be allowed to remain open overnight. Preferably, the concrete should be poured neat against the excavation (no forming used).

To allow for safe excavation and to mitigate against disturbance, the groundwater must be depressed to at least 1 m below the proposed footings, elevator and sump pits prior to the excavation. This may necessitate the installation of additional well points/eductor wells from the general excavation level to provide a groundwater free excavation and to prevent base heaving at the footing base. This should be part of the overall dewatering plan.

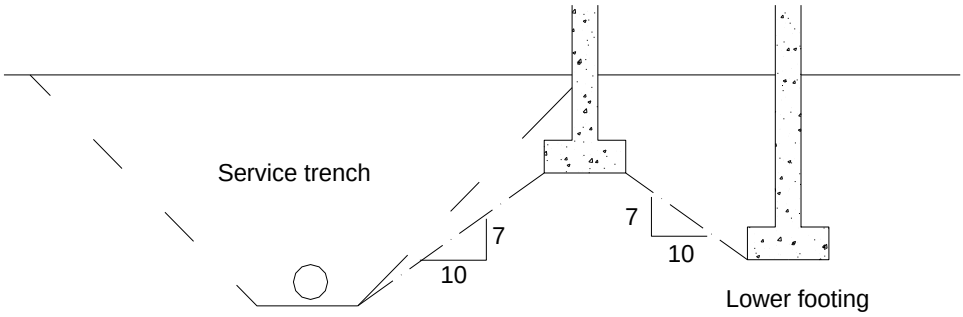
Raft Foundation

In the event that foundation drainage is not allowed to be discharged into the municipal sewer system, the underground structure will have to be “tanked”, i.e. watertight. A raft slab will be required to resist the hydrostatic uplift pressure. Unless further testing demonstrated that the soil at the lower part of the sand layer has similar geotechnical resistance as the upper portion (at the proposed founding elevations), the recommended contact pressures of 300 kPa at SLS and 450 kPa at ULS can be used for the raft foundation design. A Modulus of Subgrade Reaction of 45,000 kPa/m is recommended for the raft foundation. At all times, the groundwater must be depressed to at least 1 m below the subgrade level.

A 75 mm skim coat of concrete should be placed immediately after all loose soil is removed and the subgrade reviewed by EXP's representative in order to protect the subgrade soil. The raft slab should be designed to resist hydrostatic uplift pressure imposed by the recorded groundwater level. A settlement analysis of the raft should be carried out once the pressure contour of the raft becomes available.

4.2 Foundation General

Footings which are to be placed at different elevations should be located such that the higher footing is set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footing, as indicated on the following sketch:



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All footings exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m of soil cover or equivalent insulation for frost protection, depending on the final grade requirements. There is no official rule governing the required founding depth for footings below unheated basement floors. Certainly it will not be greater than the 1.2 m required in Southern Ontario for exterior footings. Unmonitored experience in the last few years indicates that a shallower depth ranging from about 0.82 to 0.9 m for interior footings and 0.4 m for wall footings has been successful where 2 or more basement levels apply. Adjacent to air shafts and entrance and exit doors, a footing depth of 1.2 m below floor surface level is required or, alternatively, insulation protection must be provided.

The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations are expected to be well within the normally tolerated limits of 25 mm and 19 mm, respectively.

It should be noted the recommended bearing capacity has been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated modification to the bearing levels may be required if unforeseen subsoil conditions are revealed after the excavation is exposed to full view or if final design decisions differ from those assumed in this report. For this reason, this office should be retained to review final foundation drawings and to provide field inspections during the construction stage.

4.3 Temporary Shoring

Based on the anticipated building elevations and assumed plans for excavation to extend to the property boundaries, site constraints will not allow for an open cut excavation. Therefore, temporary shoring will be required during footing and elevator pit installations.

Given the presence of the water bearing sandy deposit, the use of a contiguous caisson walls toed into the lower relatively impermeable sandy silt till deposit is recommended. The caisson wall will facilitate the support of the sides of the excavation, for groundwater cut-off purposes as well as to support the existing structures and roadways where they fall within the zone of influence as required by the Canadian Foundation Engineering Manual (CFEM).

The temporary shoring of the soil boundaries for this project should be designed on the basis of the state-of-the-art information given in the fourth edition of the CFEM. The parameters that are considered to be applicable for this project and have been used successfully on many other deep excavations in the greater Toronto area, are as follows:

Earth pressure coefficient

= 0.25 (where small movements permissible)

= 0.35 (where utilities, roads, sidewalks must be protected from significant movement, or where vibration from traffic is a factor)

= 0.40 (where adjacent building footings or movement sensitive services, i.e., gas and water mains, are above a line 60 degrees from the horizontal extending from the bottom edge of the excavation)

Approximate soil unit weight (γ)	= 22.0 kN/m^3
Unit weight for groundwater (γ_w)	= 10.0 kN/m^3
Bond resistance for anchors in sandy silt and sandy silt till	= 50 to 75* kPa

* For regroutable anchors, the effective bond resistance is expected to be higher. This will have to be designed and verified by field testing.

Unshored excavation heights should not exceed 1.2 m in the excavation as per the Occupational Health and Safety Act. However, the side slopes should be flattened where instability is noted.

A rectangular pressure distribution as outlined in the CFEM can be used for calculating the earth pressures. If the shoring system does not extend up to the top of the ground, the sloped bank should either be treated as a surcharge to the shoring system or alternatively, a higher K_a value, reflecting the sloping ground, should be used.

Due to the presence of groundwater at this site, the caisson wall would have to be installed in such a way that can prevent the caving of holes and/or base heaving conditions when drilling below the groundwater table. As such, the use of slurry drilling techniques or keeping sufficient soil inside the liner to counterbalance the uplift pressure will be required. If slurry drilling is used, the concrete toe would then have to be tremied through the slurry, pouring from the bottom upwards. The soldier units as well as the filler units will all have to be toed in the sandy silt till deposit. Sound toe construction is particularly important when tiebacks are used and significant downward force on piles would be experienced, since settlement can cause de-stressing of anchors. If sectional liners are used (with Bauer machine), enough sand must be left inside the liner to counterbalance the groundwater uplift pressure while advancing the boring otherwise voids will be left around the caisson walls.

The soil anchors would have to be installed by the use of hollow stem augers or the use of casing to prevent caving of the ground and pressure grouting due to the presence of the groundwater table. In view of the sandy nature of the soil at this site, re-groutable type anchors would likely be more cost effective than the conventional soil anchors.

At the beginning of the anchor installation, load testing to 200 percent of design load on a number of anchors for each bearing layer should be carried out at each tieback level. As per the CFEM, at least one test per 100 anchors should be carried out. As a minimum for this site, at least four (4) anchor load tests should be carried out to verify the capacity of the anchors. The design for the production anchors should then be modified based on the test results, where necessary. All remaining anchors must be installed in similar procedures and proof tested to 1.33 times the design load.

It is recommended that the contract have a performance specification limiting movement. A maximum of 13 mm is generally acceptable for a street where movement sensitive utilities are not nearby. Otherwise, the engineering departments of the utility companies must be contacted to assess what movement is acceptable. Anchor spacing and elevation, and the timing of the excavation and anchoring operations are critical in determining the movements.

During winter months, the shoring walls should be covered with thermal blankets to prevent frost penetration behind the shoring system which may result in unacceptable movements.

EXP should be retained to review the shoring design, to monitor installation and testing of the system, and to monitor the shoring movements during all phases of the excavation. Inclinometers should be installed at locations where sensitive buildings or services lie close to the excavation. Careful monitoring is needed in any shored excavation, especially when buildings are located in close proximity. This is necessary not only to anticipate when and if additional support is needed, but also to provide data to meet claims from adjacent property owners. In this regard, it is essential that detailed precondition surveys be carried out on adjacent buildings.

4.4 Earth Pressure

The lateral earth pressure acting on basement walls may be calculated from the following equation:

$$p = K(\gamma h + q)$$

where p = lateral earth pressure in kPa acting at depth h;
K = earth pressure coefficient a value of 0.4 is recommended;
γ = unit weight of retained soil, a value of 22 kN/m^3 is recommended
h = depth to point of interest in m; and
q = equivalent value of any surcharge on the ground surface in kPa.

The above expression assumes that the perimeter drainage system is effective to prevent hydrostatic pressure build-up behind the perimeter walls. All subsurface walls should be waterproofed.

If water is retained such as in the case of tanking the underground structure, submerged unit weight can be used for the retained soil below the groundwater table and full hydrostatic pressure should be added. The lateral earth pressures acting on basement walls may be calculated from the following expression:

$$p = K(\gamma h_1 + \gamma' h_2 + q) + \gamma_w h_2$$

where p = lateral earth pressure in kPa acting at depth h;
K = earth pressure coefficient a value of 0.4 is recommended;
γ = unit weight of retained soil, a value of 22 kN/m^3 may be assumed
h_1 = depth in meters above the water table
γ' = effective unit weight of soil, a value of 12 kN/m^3 may be assumed
γ_w = unit weight of water (10 kN/m^3)
h_2 = depth in metres below the water table; and
q = equivalent value of surcharge on the ground surface in kPa

Where drainage is not provided, the basement walls should be designed to resist hydrostatic pressure imposed by the recommended groundwater level presented in the hydrogeological study. All basement walls must be waterproofed to 1 m below the final exterior grade.

4.5 Excavation and Groundwater Control

Excavation for the proposed structure is expected to be carried out within the contiguous caisson wall shoring system. The excavation of the soil can be carried out utilizing conventional hydraulic type backhoe and must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA) and local regulations. The soil encountered at this site can be classified as follows:

- Fill — Type 3
- Sandy Silt to Silty Sand (above groundwater table or dewatered) — Type 3
- Sandy Silt to Silty Sand (below groundwater table) — Type 4

Based on the site configuration and the proposed basement levels, shoring will be required to support the soil to facilitate the basement construction. Within the shored area, excavation above the groundwater level is expected to be relatively straight forward. A conventional hydraulic type backhoe is expected to be suitable for the proposed excavation. Excavation should not be carried out below El. ~261.0 m unless positive dewatering or groundwater control is carried out.

The dewatering system must be designed and installed by specialty contractors experienced in this field. The dewatering system must be able to depress the groundwater at this site to an elevation at least 1 m below the lowest excavation level (below footings, elevator and sump pits). No excavation should be carried out before the groundwater is depressed and shown to be so by observations in sufficient monitoring wells. An adequate length of time should be allowed for the groundwater level to be depressed by the dewatering system during the excavation.

4.6 Floor Slab and Permanent Drainage

A normal slab-on-grade construction may be considered for the lowest basement slab, which is expected to be founded on the water bearing native sandy silt to silty sand subgrade. The underfloor areas should first be thoroughly proof-rolled, any soft spots detected should be sub-excavated and replaced with compactible fill in the manner described in the “Backfill Consideration" section of this report.

As the lowest basement slab will be set below the groundwater table, it is recommended that a 300 mm layer of concrete sand should be used to cover the entire subgrade area. Weeping tiles should be installed in the upper level of this concrete sand. A 200 mm layer of 19 mm clear stone should then be placed between the concrete sand and the floor slab to serve as a moisture barrier.

The conventional method in handling permanent drainage for the proposed structure with 2 levels of basement is to install a network of perimeter and underfloor drainage systems to collect groundwater in a sump and discharged into the municipal system. Discharge applications will be based on the groundwater quality and quantity. The hydrogeological study will address the groundwater quality and quantity for this site.

If the groundwater quality meets the municipal stormwater guidelines and is allowed to discharge into the municipal system, the groundwater can be collected in a sump before being discharged. Since the excavation will probably come up to the boundary limits, commercially available wall drains, such as SITEDRAIN HQ240 by American Wick Drain or equivalent, will be required. The drains should extend continuous laterally and from about 1.0 m below ground level to the base of the excavation. A suggested perimeter drainage system against shoring is shown on the enclosed Drawing No. 10: Suggested Exterior Drainage Against Shoring System. Full coverage of the basement walls is recommended.

A solid pipe should be installed to within 1 m of the exterior wall to collect seepage from the wall drains. Underfloor drains and perimeter drains should not be connected into the same collector pipe. See Drawing Nos. 10 and 11 for a recommended perimeter drainage and underfloor system, respectively. Further comments can be provided once design plans are finalized.

An underfloor drainage system should be installed as the groundwater table at this site is higher than the lowest basement slab. Even though the caisson walls are toed into the lower relatively impermeable sandy silt till deposit, some long-term seepages can be anticipated. In order to collect the groundwater seepages, underfloor drainage pipes placed at 3 m centre to centre spacing should be installed below the clear stone in the upper portion of the concrete sand fill. Additional underfloor drainage pipes may be required if significant seepage is observed. This can be reviewed when the excavation reaches the subgrade level. The filter fabric wrapped drainage pipes should be wrapped with a double layer of filter fabric, Terrafix 600R or equivalent. A minimum drain slope should suffice since the water can develop its own gradient within the drainage line.

The weeping tile should be connected to a system of 150 mm diameter collector pipes at 1% gradient which drains into the storm sump for removal off site. The sump should be placed close to the centre of the building in order to minimize the depth of the collector pipes. The water should first be drained into a sediment pit before draining into a second sump pit for removal. Adequate clean-out ports should be installed for each line of weeping tile, shoring drainage ports and drainage pipes to facilitate the cleaning of the pipes in the future. The connection into the sump pits must be sealed to prevent any leakage around the connection between the collector pipe and the sump pit. The layout and details of the underfloor drainage system should be reviewed by this office prior to construction.

The raft foundation option will be utilized if foundation drainage into the municipal sewer system is not allowed or as an alternative to deal with the groundwater issues. A slab-on-grade can be constructed over the raft and drainage pipes can be installed in the space between the raft and the slab on grade. Clear stone can be used to backfill between the top of the raft and the slab-on-grade.

Underfloor weeping tiles should not be installed under the raft slab and perimeter wall drains will not be required if the basement is tanked. The foundation walls and the underside of the raft should be designed and waterproofed to resist hydrostatic pressure. The design groundwater level can be obtained from the Hydrogeological Study report.

4.7 Backfill Considerations

Backfill used to satisfy underfloor slab requirements, in footings and service trenches, etc., should be compactable fill, i.e., inorganic soil with its moisture content close to its optimum moisture content determined in the standard Proctor maximum dry density test. For ease of compaction and quality control in confined areas, sand fill such as Ontario Provincial Standard Specifications (OPSS) 1010 Granular 'B' is recommended. The backfill should be placed in lifts not more than 200 mm thick in the loose state, each lift being compacted to the recommended degree of compaction. The degree of compaction achieved in the field should be checked by in-place density tests.

The majority of excavated native material near the subgrade level will consist of sandy silt to silty sand which will have high moisture contents and therefore, are not suitable for use in service trenches. The use of imported Granular B is therefore recommended.

All backfilling and compaction operations should be monitored on a full-time basis by EXP personnel to approve the material and ensure the specified degree of compaction has been achieved.

4.8 Earthquake Considerations

The recommendations for the geotechnical aspects to determine the earthquake loading for design in accordance with Section 4.1.8 Earthquake Load and Effects in the Ontario Building Code (OBC) 2024, are presented below.

4.8.1 Subsoil Conditions

The subsoil and groundwater information at this site have been examined in relation to Section 4.1.8.4 of the OBC 2012 (R2019). The subsoil generally consist of fill, sandy silt to silty sand and sandy silt till. It is anticipated that the foundation and the lowest basement slab of the proposed structure with 2 levels of underground parking will both be supported on the sandy silt to silty sand deposit.

4.8.2 Depth of Boreholes and In-situ Measurements

Table 4.1.8.4.-A Exceptions for Site Designation Using V_{s30} Calculated from In Situ Measurements and Table 4.1.8.4.-B Site Classes, S, for Site Designation X_s in OBC (2024) indicated that to determine the site classification, the average properties in the top 30 m (below the lowest basement level) are to be used. Site Classification can be determined using the average shear wave velocity (V_{s30}) as per the classifications stated in Table 4.1.8.4.-A and Table 4.1.8.4.-B. If in-situ shear wave velocity measurements are not available, the site designation X_s shall be determined based on the energy-corrected average standard penetration resistance (SPT) $\bar{N}_{60}$ or the average undrained shear strength S_u in accordance with Table 4.1.8.4.-B.

There are no shear wave measurements carried out at this site and therefore, the Site Designation will be determined based on the energy-corrected average SPT. The boreholes advanced at this site terminated at depths of about 13.8 to 19.7 m below existing grade. Therefore, the recommended site classification would be based on the available information as well as our interpretation of conditions below the boreholes based on our knowledge of the soil conditions in the area.

4.8.3 Site Classification

Based on the above assumptions and currently available information, the Site Class for the proposed structure is "C" as per Table 4.1.8.4.-A and Table 4.1.8.4.-B, OBC 2024. According to Section A-4.1.8.4 of OBC 2024, the in-situ measurements of shear wave velocity can be utilized to lower the demand in the seismic design. Therefore, field shear wave velocity measurements are recommended to be performed through non-intrusive (e.g. multichannel analysis of surface waves) and/or intrusive (e.g. downhole/cross hole techniques, or SCPT) geophysical tests.

4.9 Subsurface Concrete Structures

A native soil sample was analyzed for pH and sulphate concentrations and the test results are summarized in Table 4 below:

Table 4: Summary of pH and Sulphate Test Results

Sample Identification	Sample Location	pH	Sulphate (µg/g)
BH6 SS4 (YGU770)	Borehole 6 – 2.3 to 2.9 m	7.81	54

The sulphate content of the sample analyzed indicates a negligible degree of sulphate attack on buried concrete structures. The Certificate of Analysis is included in Appendix B.

For information regarding the selection of cement type for subsurface concrete structures, reference is made to CSA Standard CAN 3-A23.

5. General Comments

The information presented in this report is based on a limited investigation designed to provide information to support an overall assessment of the current geotechnical conditions of the subject property. The conclusions presented in this report reflect site conditions existing at the time of the investigation. Additional boreholes should be advanced at the site once the existing building is demolished to further investigate the subsoil and groundwater conditions in the area.

EXP Services Inc. should be retained for a general review of the final design and specifications to verify this report has been properly interpreted and implemented. If not accorded the privilege of making this review, EXP will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be 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 in no way reflects on the environmental aspects of the soils since this is beyond our terms of reference. It is our understanding that environmental considerations have been addressed under separate cover. More specific information with respect to the conditions between samples or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent; should this occur, EXP should be contacted to assess the situation and additional testing and reporting may be required. EXP has qualified personnel to provide assistance in regard to future geotechnical issues related to this property.

We trust this report is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

Yours truly,

EXP Services Inc.

Kevin W. Y. Leung, M. Sc., P. Eng.
Senior Engineer, Geotechnical Division

Stephen Cheng

Stephen S. M. Cheng, P. Eng.
Discipline Manager, Geotechnical Division

Drawings

Borehole Location Plan
Borehole Logs

SCALE:

0 8 16 24 32 40 m

exp.

DRAWN BY:	CHECKED BY:
JA	KL

NOTES:

1. THE BOUNDARIES AND SOIL TYPE HAVE BEEN ESTABLISHED ONLY AT THE BOREHOLE LOCATIONS. BETWEEN BOREHOLES BOUNDARIES ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 3 MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES OTHERWISE.
3. TOPSOIL QUANTITIES AND/OR VOLUME OF UNSUITABLE FILL SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT THE BOREHOLE LOCATIONS.
4. BOREHOLE ELEVATION SHOULD NOT BE USED TO DESIGN BUILDING(S), OR FLOOR SLAB(S), OR PARKING LOT(S) GRADES.
5. THE DRAWING IS TO BE READ WITH SUBJECT REPORT, PROJECT NUMBER AS SHOWN BELOW.
6. SEE REPORT TEXT FOR SITE DATUM.
7. BOREHOLE LOCATIONS ARE APPROXIMATE.
8. DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRIC UNITS, UNLESS OTHERWISE NOTED.

BOREHOLE LOCATION PLAN

DRAWING: 1

GEOTECHNICAL INVESTIGATION
5688 MAIN STREET
WHITCHURCH-STOUFFVILLE, ONTARIO

PROJECT NUMBER: BRM-23014306-A0

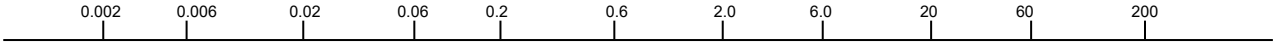
DATE: NOVEMBER 2024

Notes On Sample Descriptions Drawing 1A

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 Society 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 1

Project No. BRM-23014306-A0 | Drawing No. 2

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

Date Drilled: January 26, 2024

Drill Type: Mud Rotary

Datum: Geodetic

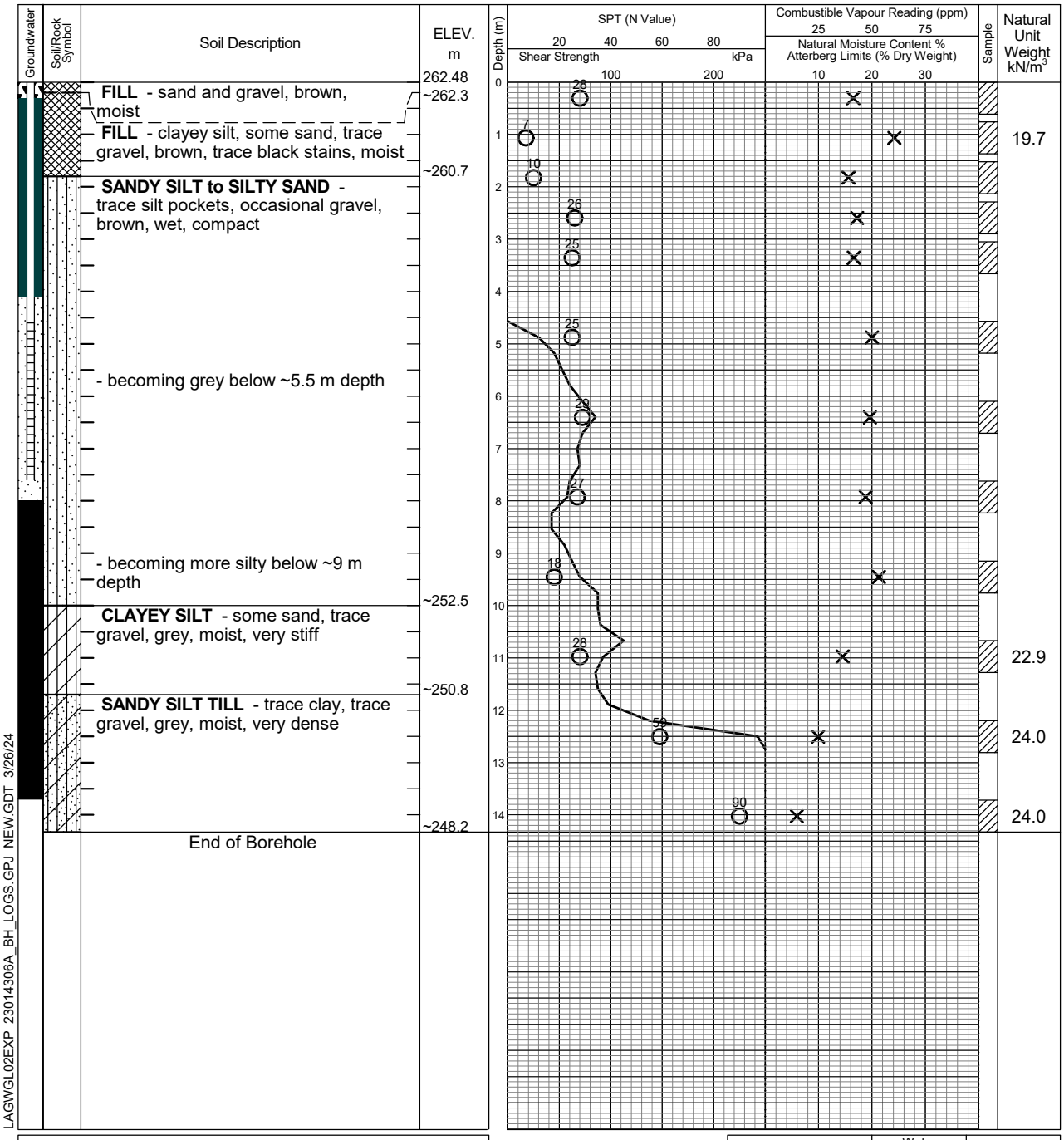
Auger Sample | Combustible Vapour Reading

SPT (N) Value | Natural Moisture

Dynamic Cone Test | Plastic and Liquid Limit

Shelby Tube | Undrained Triaxial at % Strain at Failure

Field Vane Test (S) | Penetrometer



LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Notes:
1. Borehole advanced to completion at ~14.3 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp.
Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)
February 8, 2024	~0.8	Well
February 15, 2024	~2.2	Well
February 28, 2024	~2.2	Well

Log of Borehole 2

Project No. BRM-23014306-A0 | Drawing No. 3

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

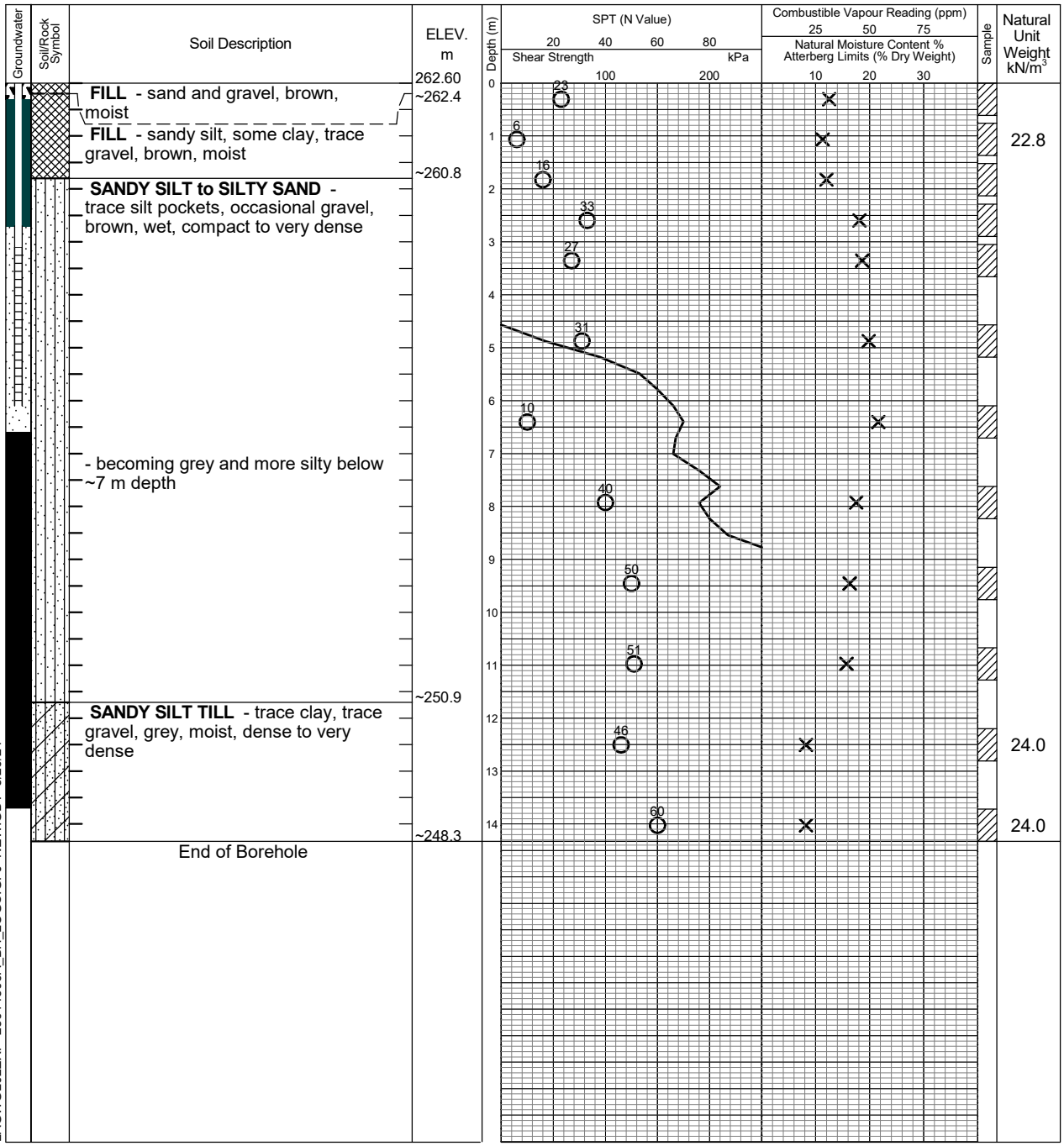
Date Drilled: January 26, 2024

Drill Type: Mud Rotary

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Notes:
1. Borehole advanced to completion at ~14.3 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp.
Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)
February 8, 2024	~2.3	Well
February 15, 2024	~2.4	Well
February 28, 2024	~2.3	Well

Log of Borehole 3

Project No. BRM-23014306-A0 | Drawing No. 4

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

Date Drilled: January 30, 2024

Drill Type: Mud Rotary

Datum: Geodetic

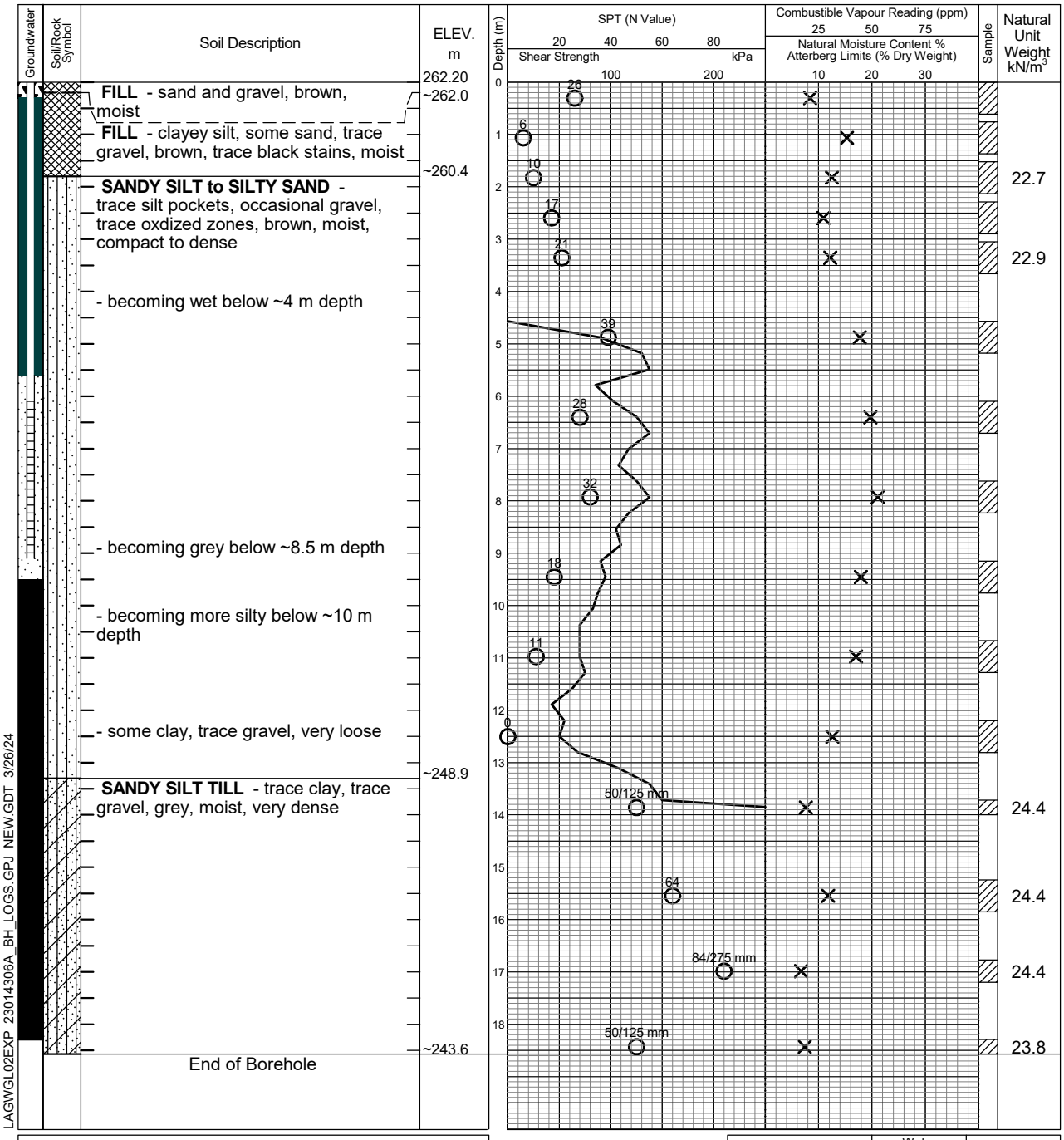
Auger Sample ☒ | Combustible Vapour Reading □

SPT (N) Value ○ ▨ | Natural Moisture ×

Dynamic Cone Test — | Plastic and Liquid Limit ⊢○

Shelby Tube ■ | Undrained Triaxial at % Strain at Failure ⊕

Field Vane Test S | Penetrometer ▲



LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Notes:
1. Borehole advanced to completion at ~18.6 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp.
Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)
February 8, 2024	~2.1	Well
February 15, 2024	~2.1	Well
February 28, 2024	~2.0	Well

Log of Borehole 4

Project No. BRM-23014306-A0 | Drawing No. 5

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

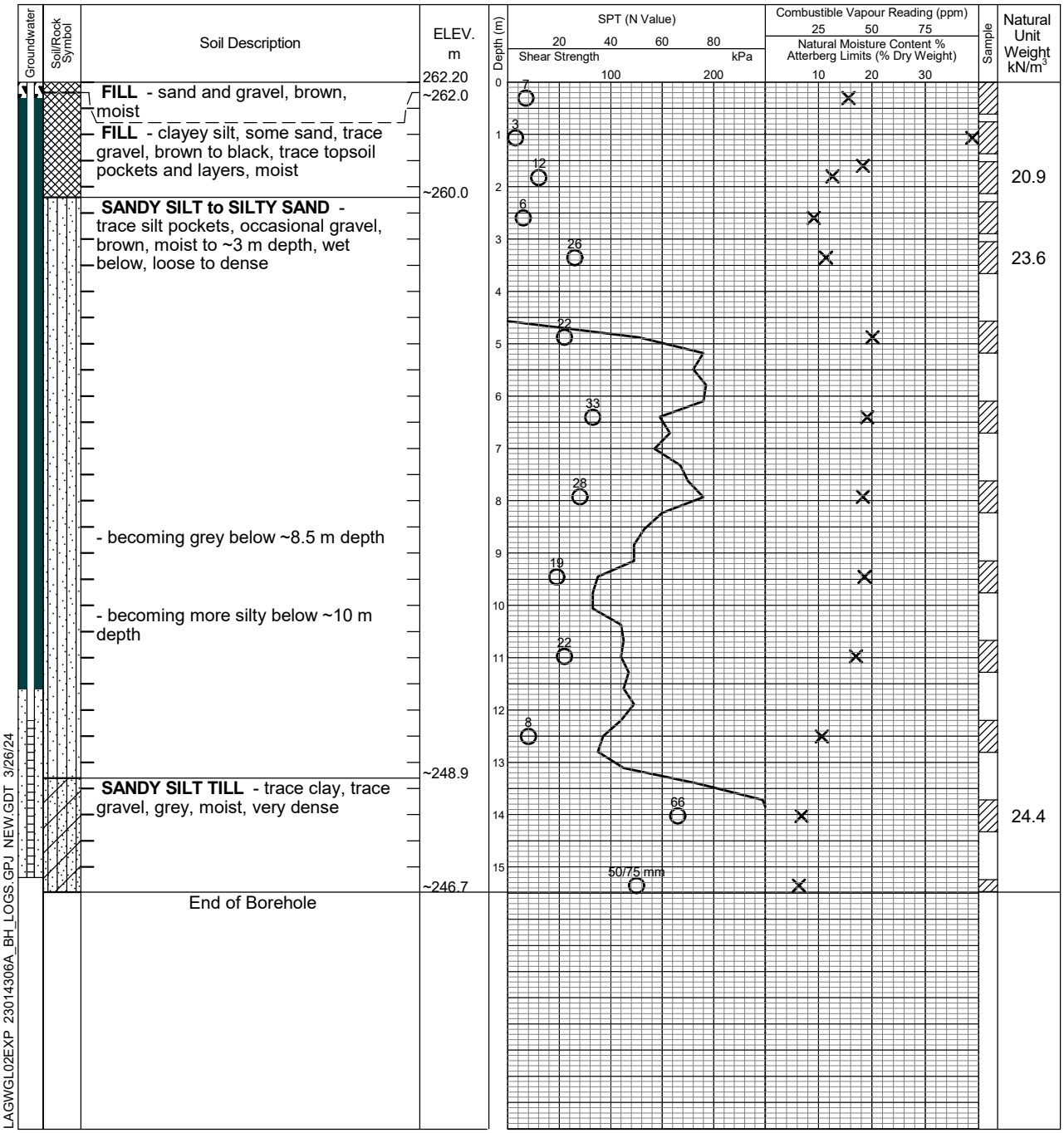
Date Drilled: January 31, 2024

Drill Type: Mud Rotary

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer



LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Notes:
1. Borehole advanced to completion at ~15.5 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp.
Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)
February 8, 2024	~2.0	Well
February 15, 2024	~2.1	Well
February 28, 2024	~2.0	Well

Log of Borehole 5

Project No. BRM-23014306-A0 | Drawing No. 6

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

Date Drilled: January 31, 2024

Drill Type: Mud Rotary

Datum: Geodetic

Auger Sample ☒ | Combustible Vapour Reading □

SPT (N) Value ○ ▨ | Natural Moisture ×

Dynamic Cone Test — | Plastic and Liquid Limit ⊢○

Shelby Tube ■ | Undrained Triaxial at % Strain at Failure ⊕

Field Vane Test S | Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~100 mm **ASPHALT** over	262.13	0				
		FILL - sand and gravel, brown, moist	~261.8					
		FILL - clayey to sandy silt, trace gravel, brown, moist		1	7, 6			22.0
			~259.9	2	4			23.2
		SANDY SILT to SILTY SAND - trace silt pockets, occasional gravel, trace clay, brown, moist to ~3 m depth, wet below, loose to dense		3	18, 33			22.3
				4				21.6
				5	36			
				6	41			
		- becoming grey below ~7 m depth		7				
				8	34			
		- becoming more silty below ~8.5 m depth		9	27			
				10				
				11	6			23.1
			~250.4	12				
		SANDY SILT TILL - trace clay, trace gravel, grey, moist, dense to very dense		13	48			24.0
				14	50/125 mm			23.9
			~248.1					
		End of Borehole						

LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Notes:
1. Borehole advanced to completion at ~14.0 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp.
Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)

Log of Borehole 6

Project No. BRM-23014306-A0 | Drawing No. 7

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

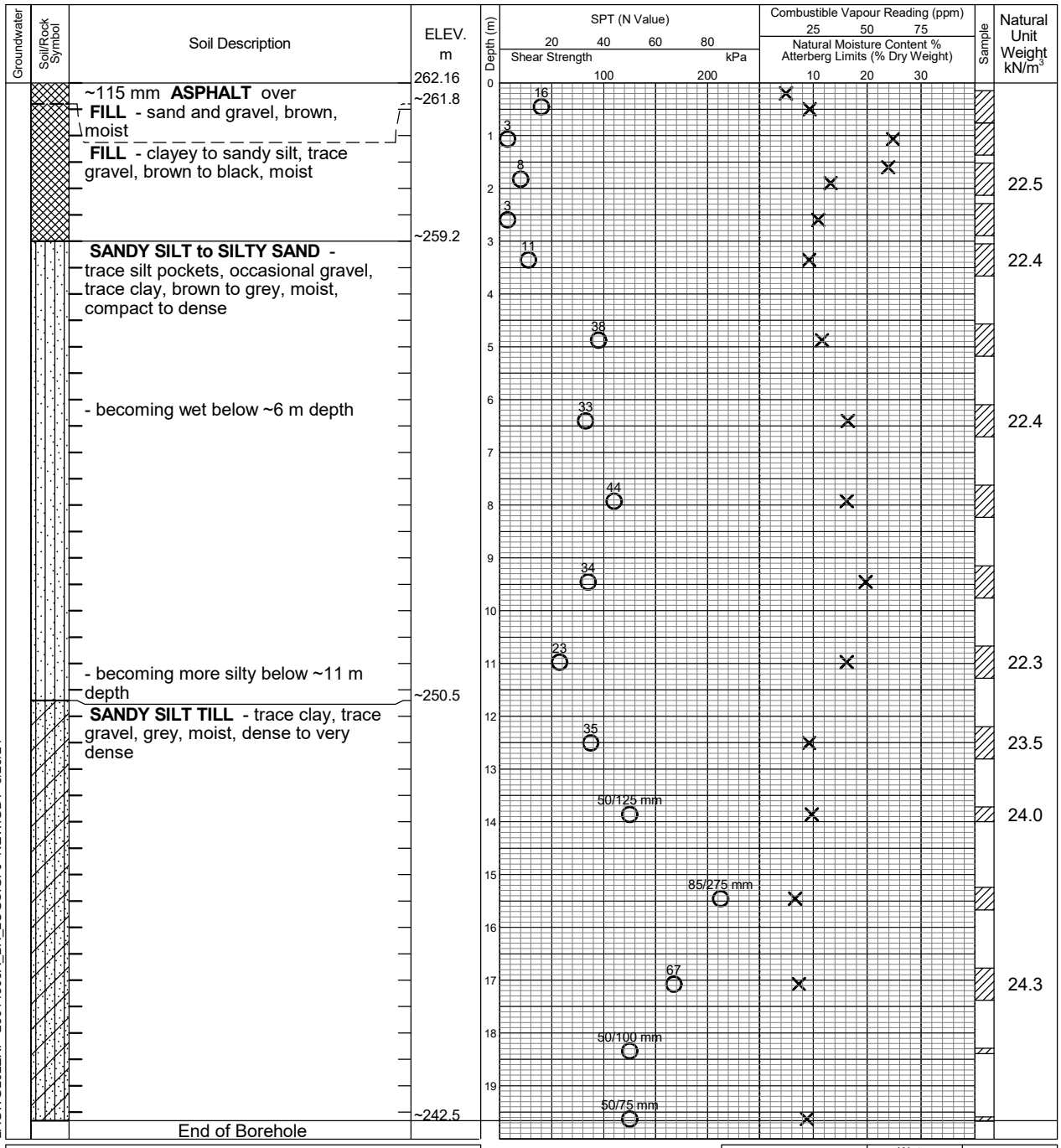
Date Drilled: January 30, 2024

Drill Type: Mud Rotary

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer



LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Notes:
1. Borehole advanced to completion at ~19.7 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp. Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)

Log of Borehole 7

Project No. BRM-23014306-A0 | Drawing No. 8

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

Date Drilled: January 29, 2024

Drill Type: Mud Rotary

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer

Soil Description	ELEV. m	Depth (m)	Natural Unit Weight kN/m³
~100 mm **PATIO STONE** over **FILL** - screening, brown, moist	261.99 ~261.8	0	
FILL - clayey to sandy silt, trace gravel, trace black stains, brown to black, moist	~259.8	1	22.4
SANDY SILT to SILTY SAND - trace silt pockets, occasional gravel, trace clay, brown to ~3 m depth, grey below, moist, loose to dense		2	22.9
		3	23.5
		4	
		5	23.3
- becoming wet below ~6 m depth		6	
		7	
		8	
- clayey seam		9	22.2
		10	
		11	23.6
SANDY SILT TILL - some clay, trace gravel, grey, moist, very dense	~250.3	12	23.6
		13	
End of Borehole	~248.2		

SPT (N Value): 20 40 60 80 | Shear Strength kPa: 100 200

Combustible Vapour Reading (ppm): 25 50 75 | Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SPT values: 7, 9, 7, 9, 10, 23, 36, 38, 25, 17, 58, 50/75 mm

Notes:
1. Borehole advanced to completion at ~13.8 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp. Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)

LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Log of Borehole 8

Project No. BRM-23014306-A0 | Drawing No. 9

Project: Geotechnical and Hydrogeological Investigations | Sheet No. 1 of 1

Location: 5688 Main Street, Stouffville, Ontario

Date Drilled: January 29, 2024

Drill Type: Mud Rotary

Datum: Geodetic

Auger Sample ☒ | Combustible Vapour Reading □

SPT (N) Value ○ ▨ | Natural Moisture ×

Dynamic Cone Test ——— | Plastic and Liquid Limit ⊢—○

Shelby Tube ■ | Undrained Triaxial at % Strain at Failure ⊕

Field Vane Test S | Penetrometer ▲

Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
~90 mm **ASPHALT** over	262.01					
FILL - sand and gravel, brown, moist	~261.6					
FILL - clayey silt, some sand, trace gravel, brown to black, moist						
			18	×		
		1	7	×		
		2	4	×		22.4
	~259.5		14	×		23.7
SANDY SILT to SILTY SAND - trace silt pockets, occasional gravel, trace clay, brown, moist to ~4 m depth, wet below, compact		3	34	×		
		4				
		5	35	×		
		6	28	×		
		7				
		8	25	×		
- becoming grey below ~9 m depth		9	26	× ×		
		10				
		11	24	×		23.4
	~250.3					
SANDY SILT TILL - trace clay, trace gravel, grey, moist, dense to very dense		12	56	×		23.7
		13				
		14	50/100 mm	×		
		15	50/125 mm	×		
	~245.8	16				
GRAVELLY SAND - grey, wet, very dense	~245.0		50/75 mm	×		
End of Borehole		17				

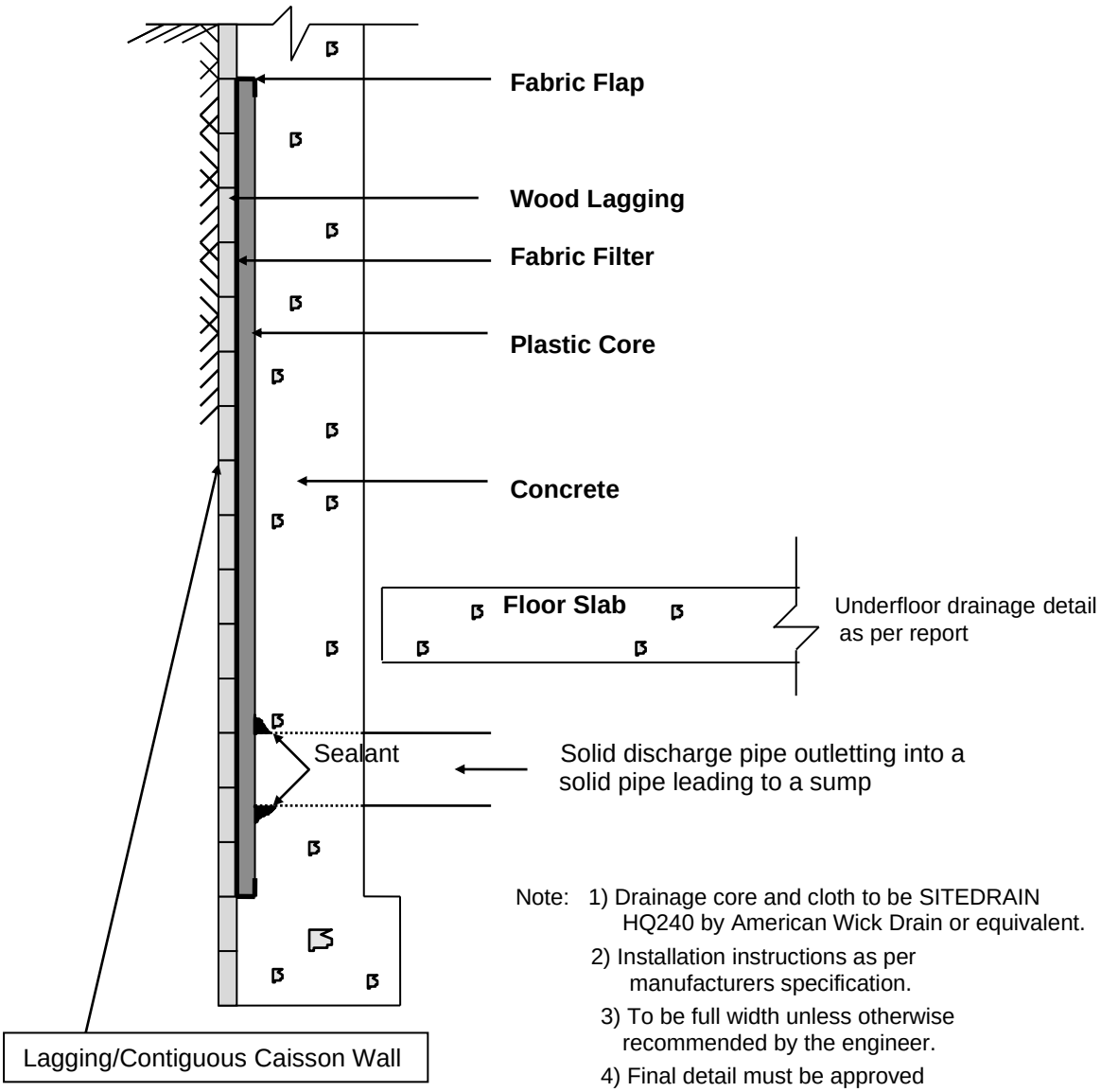
Notes:
1. Borehole advanced to completion at ~17.0 m depth by conventional soil sampling methods using a specialist drilling subcontractor. For borehole definitions, see notes prior to logs.
2. This drawing forms part of and must be read in conjunction with the subject report (Ref. No.: BRM-23014306-A0); borehole data requires interpretation assistance by exp professional staff before use by others.

exp. Brampton

Elapsed Time	Water Level (m)	Hole Open to (m)
February 8, 2024	~1.7	Well
February 15, 2024	~1.7	Well
February 28, 2024	~1.7	Well

LAGWGL02EXP 23014306A_BH_LOGS.GPJ NEW.GDT 3/26/24

Project: BRM-23014306-AE0 **Drawing No. 10**



Note: 1) Drainage core and cloth to be SITEDRAIN HQ240 by American Wick Drain or equivalent.

2) Installation instructions as per manufacturers specification.

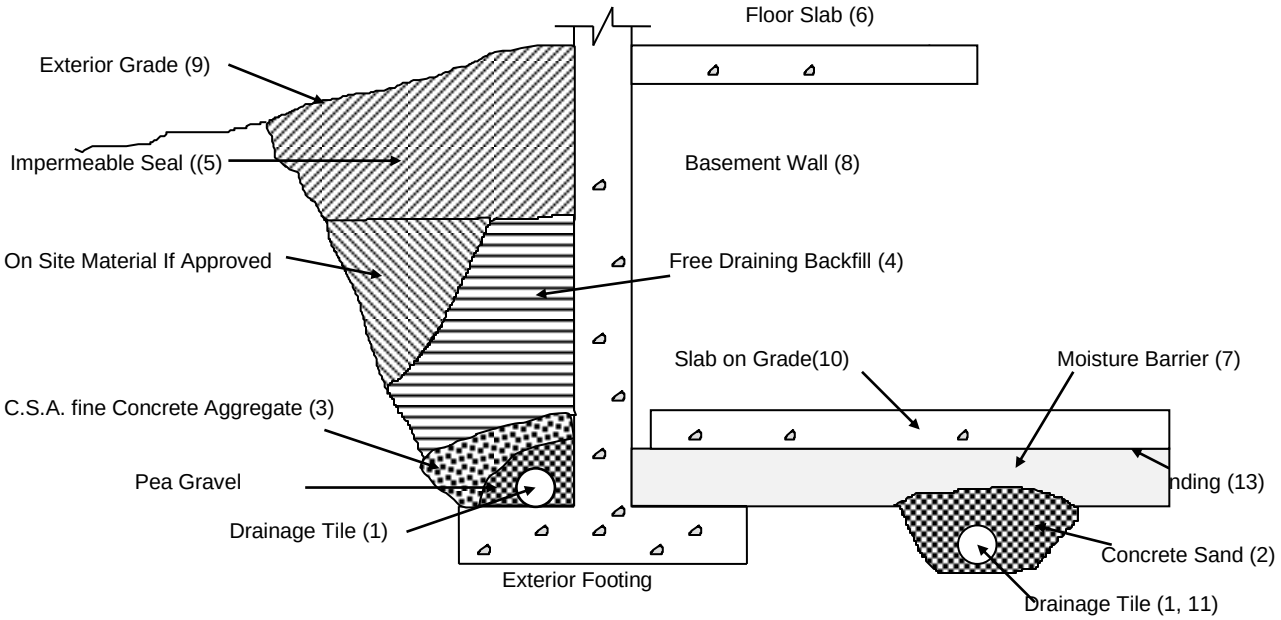
3) To be full width unless otherwise recommended by the engineer.

4) Final detail must be approved before system is considered acceptable.

5) SITEDRAIN HQ240 should be kept a minimum of 1.2 m below exterior finished grade.

SUGGESTED EXTERIOR DRAINAGE AGAINST SHORING SYSTEM

Project: BRM-23014306-A0 **Drawing No. 11**



Notes

1. Drainage tile to consist of 100 mm (4”) diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. Concrete sand - 150 mm (6”) top and side of drain. If drain is not on footing, place 100 mm (4 inches) of pea gravel below drain. 20 mm (3/4”) clear stone is an alternative provided it is surrounded by an approved filter fabric (Terrafix 600R or equivalent).
3. C.S.A. fine concrete aggregate to act as filter material. Minimum 300 mm (12”) top and side of tile drain. This may be replaced by an approved filter fabric as indicated in (2).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18”) of the wall. Use hand controlled light compaction equipment within 1.8 m (6’) of wall.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8”) of compacted clear 20 mm (3/4”) stone.
8. Basement wall to be damp-proofed or waterproofed as per report.
9. Exterior grade to slope away from building.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm(12”) below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25’) centres one way. Place drain below subgrade with 150 mm(6”) of concrete sand on top and sides.
12. Do not connect the underfloor drains to perimeter drains.
13. If the 20 mm (3/4”) stone requires surface blinding, use 6 mm (1/4”) clear stone chips.

DRAINAGE AND BACKFILL RECOMMENDATIONS

(not to scale)

Appendix A

Grain Size Analysis Results

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440035-3 **Report No.:** 1 **Date Reported:** 07-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

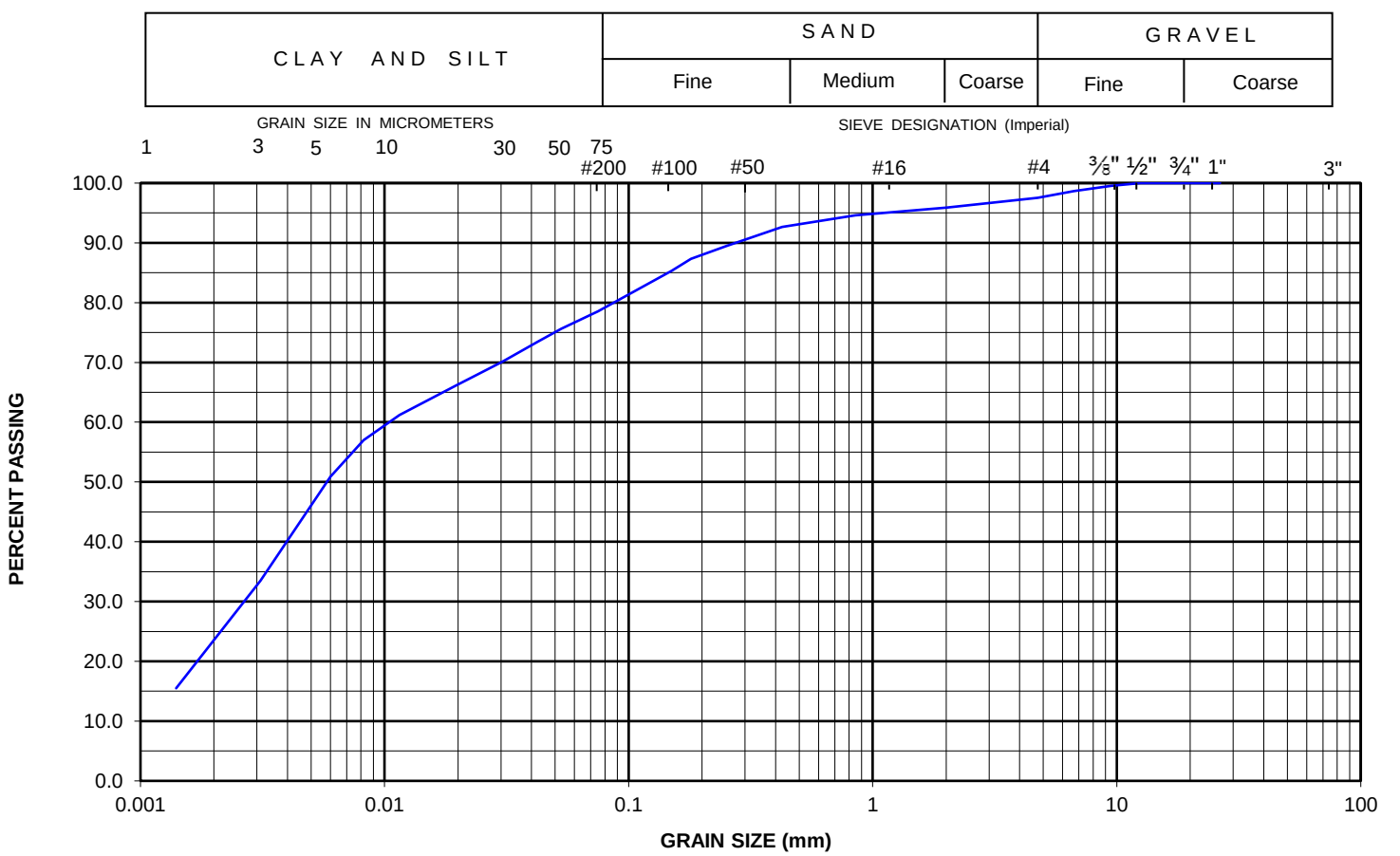
Gravel (> 4.75mm):	**2.5**
Sand (> 75µm, < 4.75mm):	**19.0**
Silt (> 2µm), < 75µm):	**56.6**
Clay (< 2µm):	**21.9**
Total:	**100.0**

Sample Information

Location: BH 1
Sample Method: SS
Sample No.: 10
Depth: 10.7 - 11.3 m
Sample Description: Clayey Silt, some Sand, trace Gravel; Grey
Sampled By: D. P.
Sampling Date: 2/26/2024
Date Received: 2/29/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0422**	73.4
22.4	100.0	**0.0303**	70.1
19	100.0	**0.0195**	66.1
16	100.0	**0.0115**	61.2
13.2	100.0	**0.0082**	57.0
12.5	100.0	**0.0060**	50.9
9.5	99.5	**0.0031**	33.5
6.7	98.7	**0.0014**	15.5
4.75	97.5		
2	95.9		
0.85	94.6		
0.425	92.7		
0.25	89.4		
0.18	87.3		
0.15	85.3		
0.075	78.5		
0.053	75.6		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 07-Feb-24
Arcadio Petrola, Lab Supervisor

exp Services Inc.
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Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440047-2 **Report No.:** 2 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

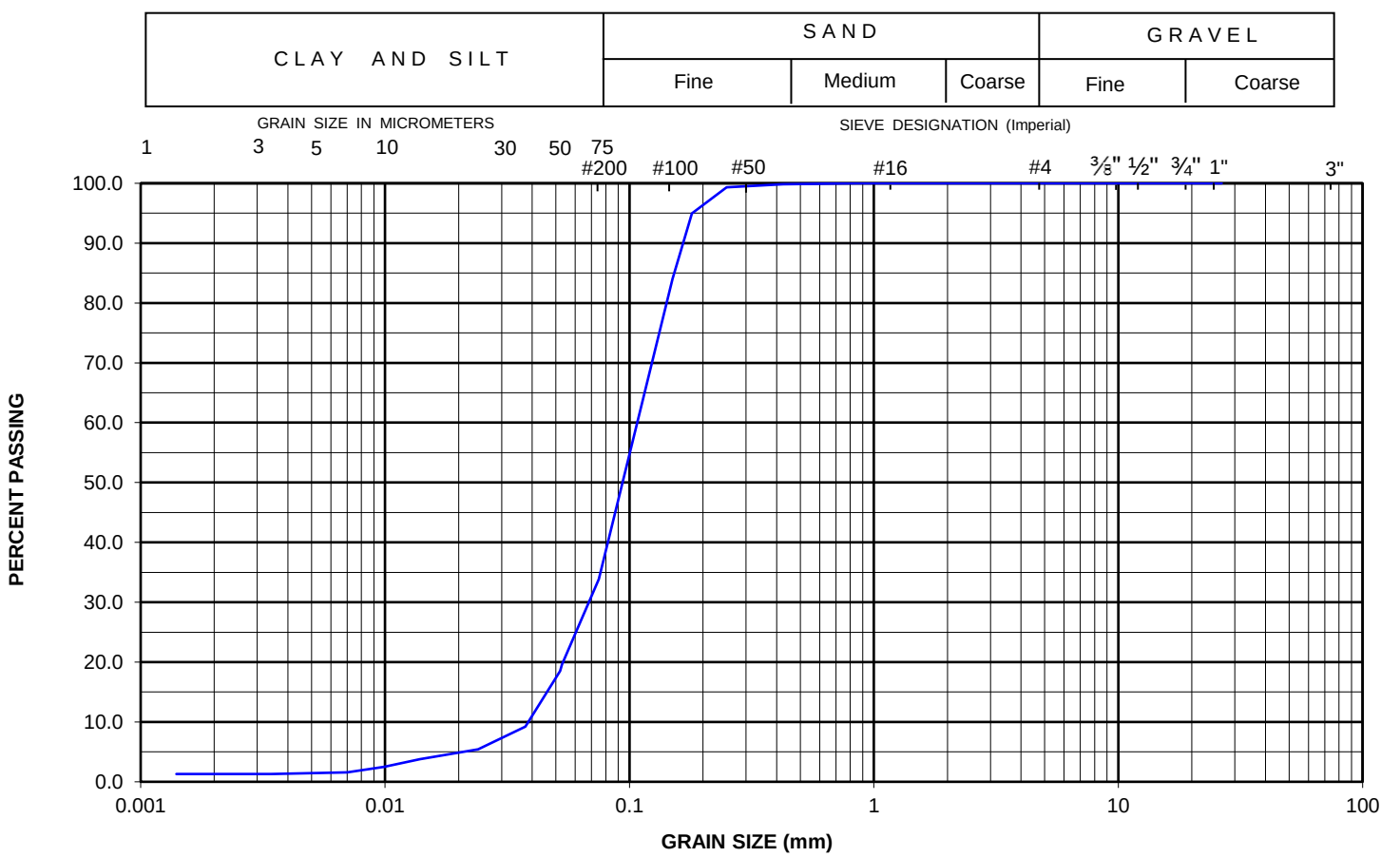
Gravel (> 4.75mm):	
Sand (> 75µm, < 4.75mm):	**66.1**
Silt (> 2µm), < 75µm):	**33.5**
Clay (< 2µm):	**0.4**
Total:	**100.0**

Sample Information

Location: BH 2
Sample Method: SS
Sample No.: 8
Depth: 7.6 - 8.2 m
Sample Description: Silty Sand, trace Clay; Grey
Sampled By: D. P.
Sampling Date: 2/26/2024
Date Received: 2/29/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0520**	18.5
22.4	100.0	**0.0375**	9.2
19	100.0	**0.0240**	5.4
16	100.0	**0.0139**	3.8
13.2	100.0	**0.0099**	2.5
12.5	100.0	**0.0070**	1.6
9.5	100.0	**0.0034**	1.3
6.7	100.0	**0.0014**	
4.75	100.0		
2	100.0		
0.85	100.0		
0.425	99.8		
0.25	99.3		
0.18	95.0		
0.15	84.0		
0.075	33.9		
0.053	19.6		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
Arcadio Petrola, Lab Supervisor

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440063-3 **Report No.:** 3 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

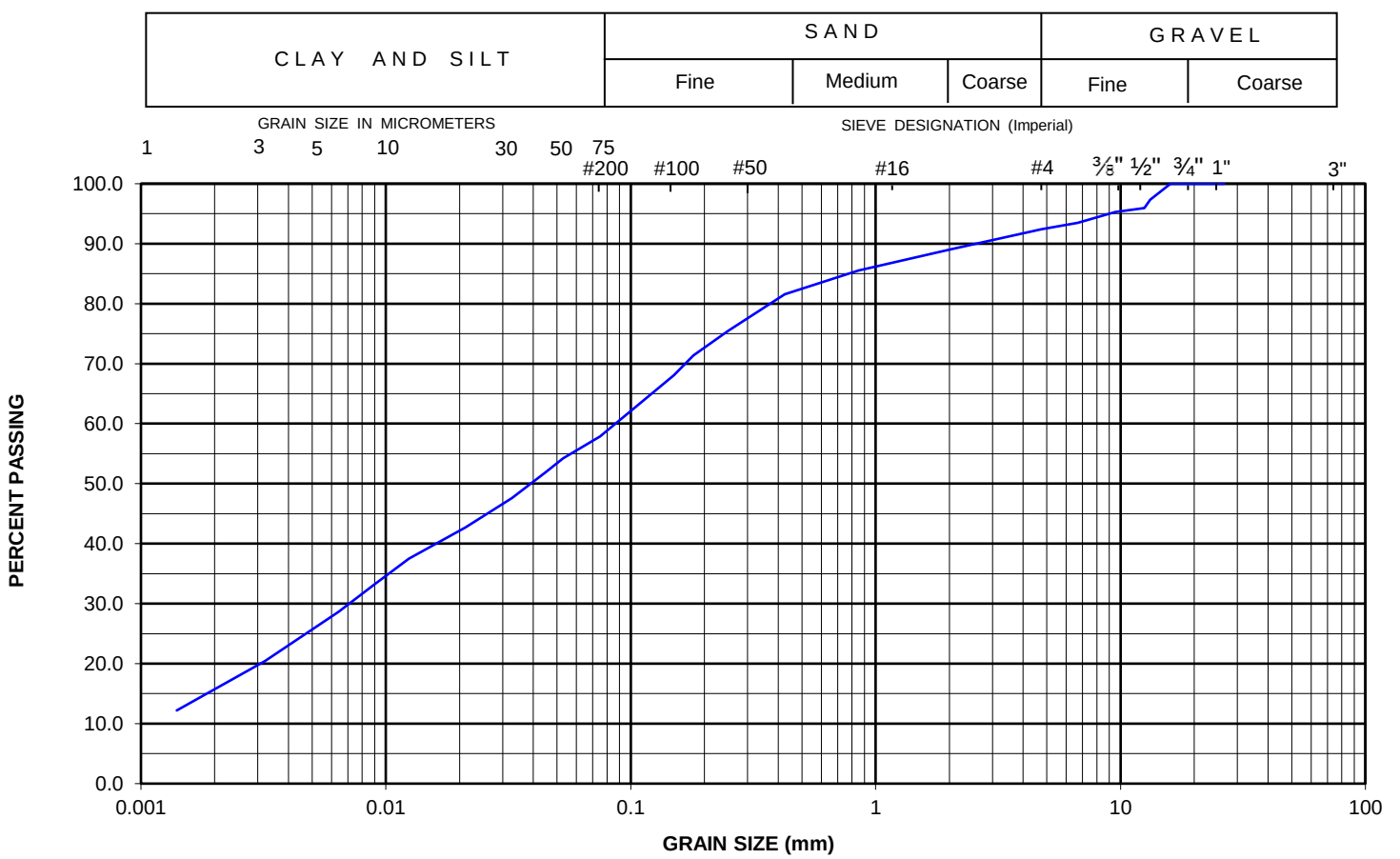
Gravel (> 4.75mm):	**7.6**
Sand (> 75µm, < 4.75mm):	**34.5**
Silt (> 2µm), < 75µm):	**43.0**
Clay (< 2µm):	**14.9**
Total:	**100.0**

Sample Information

Location: BH 7
Sample Method: SS
Sample No.: 10
Depth: 10.7 - 11.3 m
Sample Description: Sandy Silt, some Clay, trace Gravel; Grey
Sampled By: D. P.
Sampling Date: 2/26/2024
Date Received: 2/29/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0453**	52.0
22.4	100.0	**0.0327**	47.6
19	100.0	**0.0211**	42.7
16	100.0	**0.0124**	37.5
13.2	97.4	**0.0089**	33.1
12.5	95.9	**0.0064**	28.6
9.5	95.3	**0.0032**	20.4
6.7	93.5	**0.0014**	12.2
4.75	92.4		
2	89.0		
0.85	85.5		
0.425	81.6		
0.25	75.5		
0.18	71.4		
0.15	68.1		
0.075	57.9		
0.053	54.2		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
Arcadio Petrola, Lab Supervisor

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
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Fax: (905) 793-0641

Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440072-2 **Report No.:** 4 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

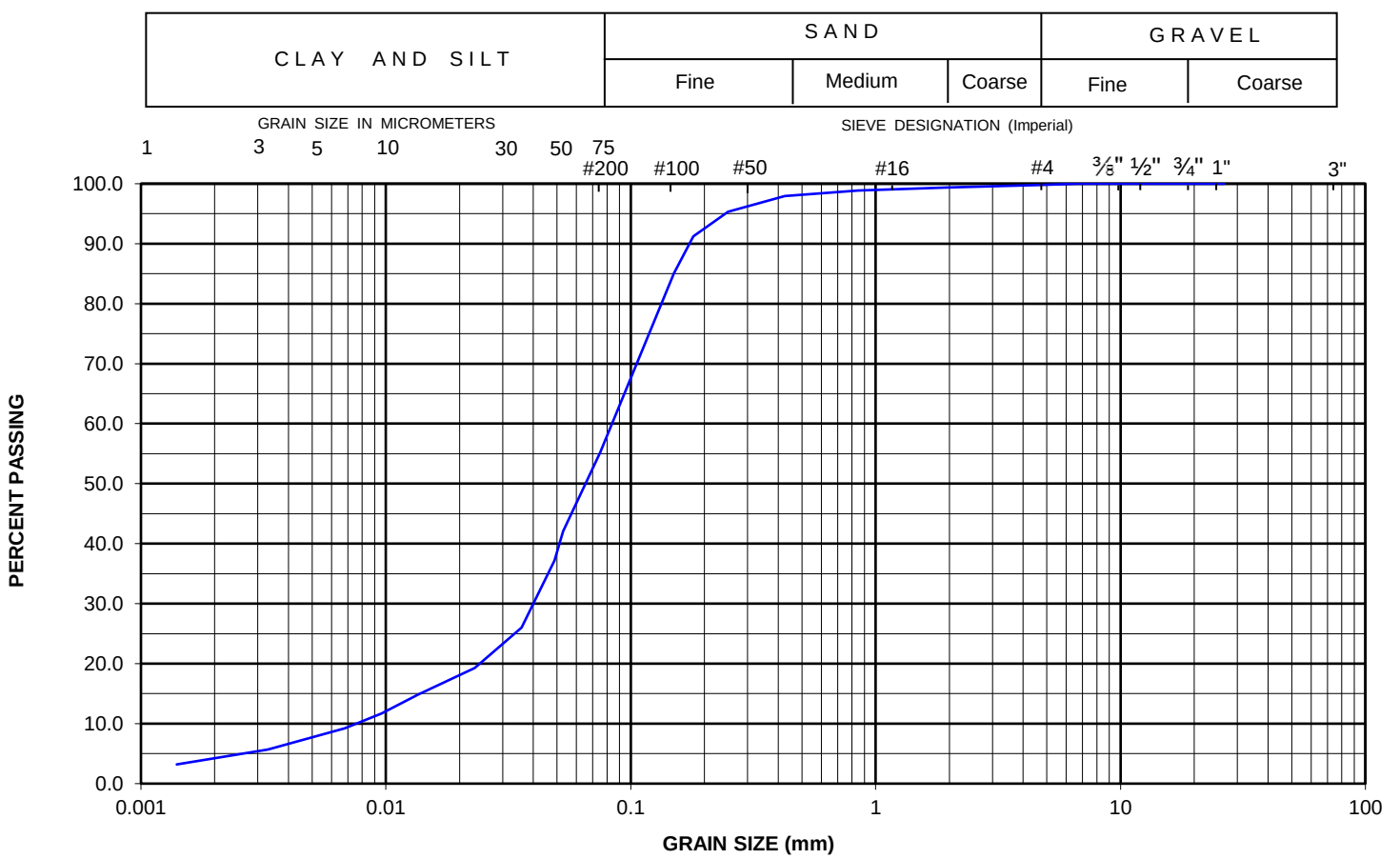
Gravel (> 4.75mm):	**0.2**
Sand (> 75µm, < 4.75mm):	**44.6**
Silt (> 2µm), < 75µm):	**51.2**
Clay (< 2µm):	**4.0**
Total:	**100.0**

Sample Information

Location: BH 8
Sample Method: SS
Sample No.: 6
Depth: 4.6 - 5.2 m
Sample Description: Silt and Sand, trace Clay and Gravel; Brown
Sampled By: D. P.
Sampling Date: 2/26/2024
Date Received: 2/29/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0488**	37.2
22.4	100.0	**0.0358**	26.0
19	100.0	**0.0231**	19.3
16	100.0	**0.0135**	14.8
13.2	100.0	**0.0096**	11.7
12.5	100.0	**0.0068**	9.2
9.5	100.0	**0.0033**	5.7
6.7	100.0	**0.0014**	3.2
4.75	99.8		
2	99.4		
0.85	98.8		
0.425	98.0		
0.25	95.3		
0.18	91.2		
0.15	85.1		
0.075	55.2		
0.053	42.1		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
Arcadio Petrola, Lab Supervisor

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440397-2 **Report No.:** 5 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

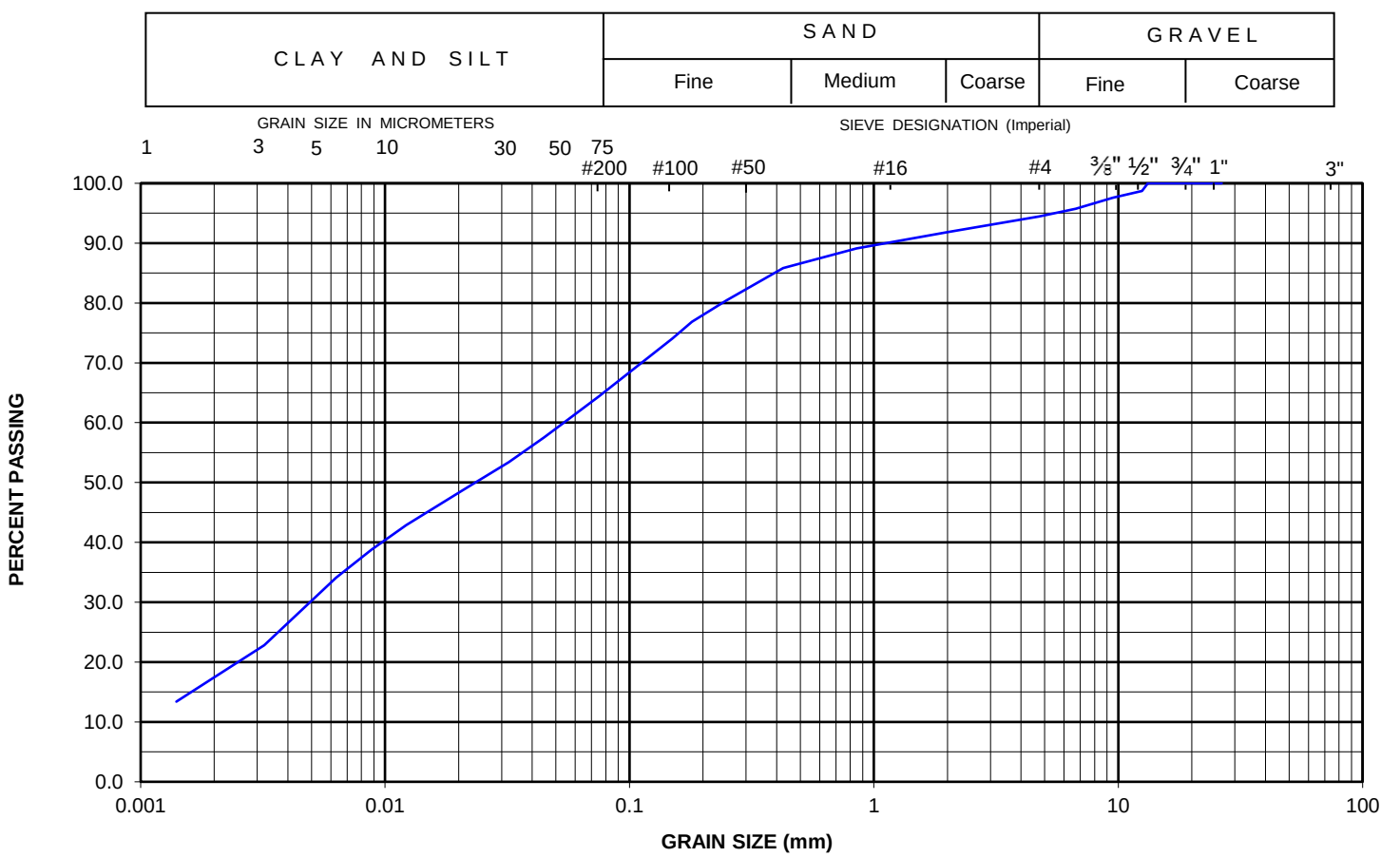
Gravel (> 4.75mm):	**5.5**
Sand (> 75µm, < 4.75mm):	**30.1**
Silt (> 2µm), < 75µm):	**47.9**
Clay (< 2µm):	**16.5**
Total:	**100.0**

Sample Information

Location: BH 3
Sample Method: SS
Sample No.: 11
Depth: 12.2 - 12.8 m
Sample Description: Sandy Silt, some Clay, trace Gravel; Grey
Sampled By: D. P.
Sampling Date: 1/30/2024
Date Received: 1/31/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0446**	57.5
22.4	100.0	**0.0321**	53.4
19	100.0	**0.0207**	48.7
16	100.0	**0.0122**	42.9
13.2	100.0	**0.0088**	38.8
12.5	98.7	**0.0063**	34.1
9.5	97.6	**0.0032**	22.8
6.7	95.7	**0.0014**	13.4
4.75	94.5		
2	91.9		
0.85	89.1		
0.425	85.8		
0.25	80.5		
0.18	76.8		
0.15	74.1		
0.075	64.4		
0.053	59.7		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
Arcadio Petrola, Lab Supervisor

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440413-2 **Report No.:** 6 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

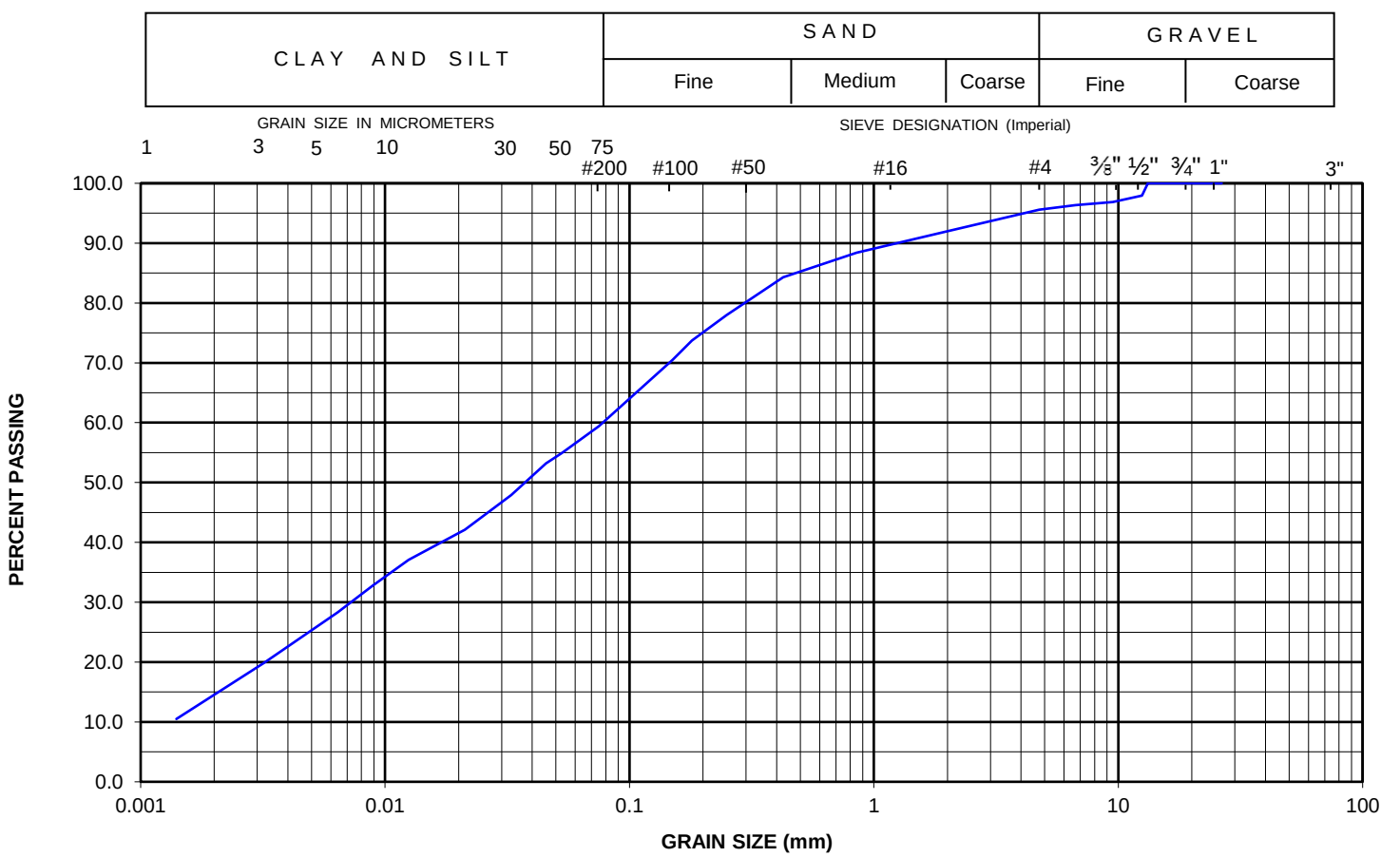
Gravel (> 4.75mm):	**4.4**
Sand (> 75µm, < 4.75mm):	**36.2**
Silt (> 2µm), < 75µm):	**45.8**
Clay (< 2µm):	**13.6**
Total:	**100.0**

Sample Information

Location: BH 4
Sample Method: SS
Sample No.: 11
Depth: 12.2 - 12.8 m
Sample Description: Silt and Sand, some Clay, trace Gravel; Grey
Sampled By: D. P.
Sampling Date: 1/30/2024
Date Received: 1/31/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0455**	53.2
22.4	100.0	**0.0328**	47.9
19	100.0	**0.0212**	42.1
16	100.0	**0.0125**	37.1
13.2	100.0	**0.0089**	32.8
12.5	97.9	**0.0064**	28.3
9.5	96.9	**0.0032**	19.9
6.7	96.4	**0.0014**	10.5
4.75	95.6		
2	92.0		
0.85	88.4		
0.425	84.3		
0.25	78.0		
0.18	73.7		
0.15	70.5		
0.075	59.4		
0.053	55.0		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
Arcadio Petrola, Lab Supervisor

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440421-3 **Report No.:** 7 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

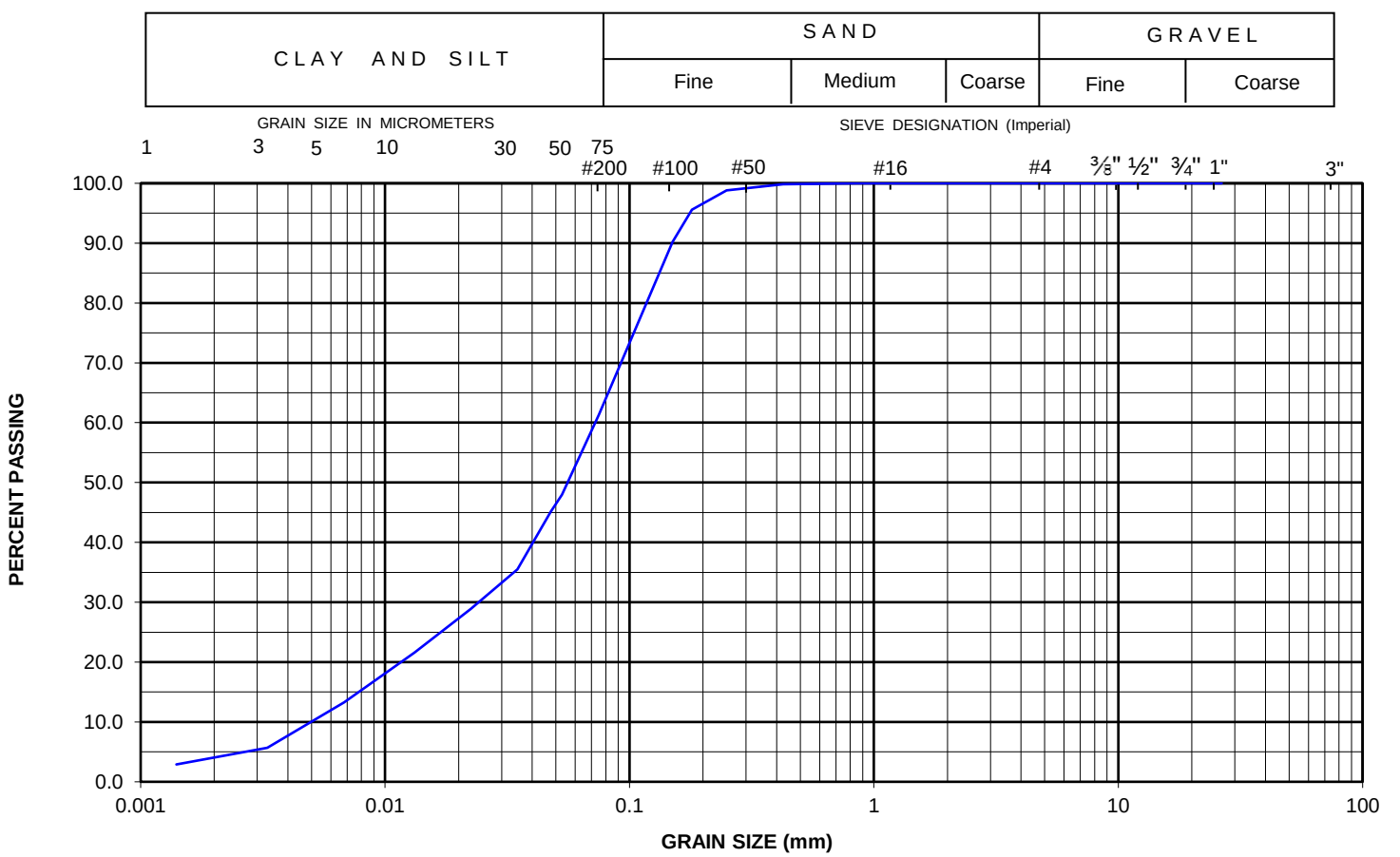
Gravel (> 4.75mm):	
Sand (> 75µm, < 4.75mm):	**38.7**
Silt (> 2µm), < 75µm):	**57.5**
Clay (< 2µm):	**3.8**
Total:	**100.0**

Sample Information

Location: BH 5
Sample Method: SS
Sample No.: 5
Depth: 3.0 - 3.7 m
Sample Description: Silt and Sand, trace Clay; Brown
Sampled By: D. P.
Sampling Date: 1/30/2024
Date Received: 1/31/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0476**	45.1
22.4	100.0	**0.0348**	35.5
19	100.0	**0.0224**	28.9
16	100.0	**0.0132**	21.6
13.2	100.0	**0.0095**	17.5
12.5	100.0	**0.0068**	13.3
9.5	100.0	**0.0033**	5.7
6.7	100.0	**0.0014**	2.9
4.75	100.0		
2	100.0		
0.85	100.0		
0.425	99.8		
0.25	98.8		
0.18	95.6		
0.15	90.2		
0.075	61.3		
0.053	48.0		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
Arcadio Petrola, Lab Supervisor

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440426-3 **Report No.:** 8 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

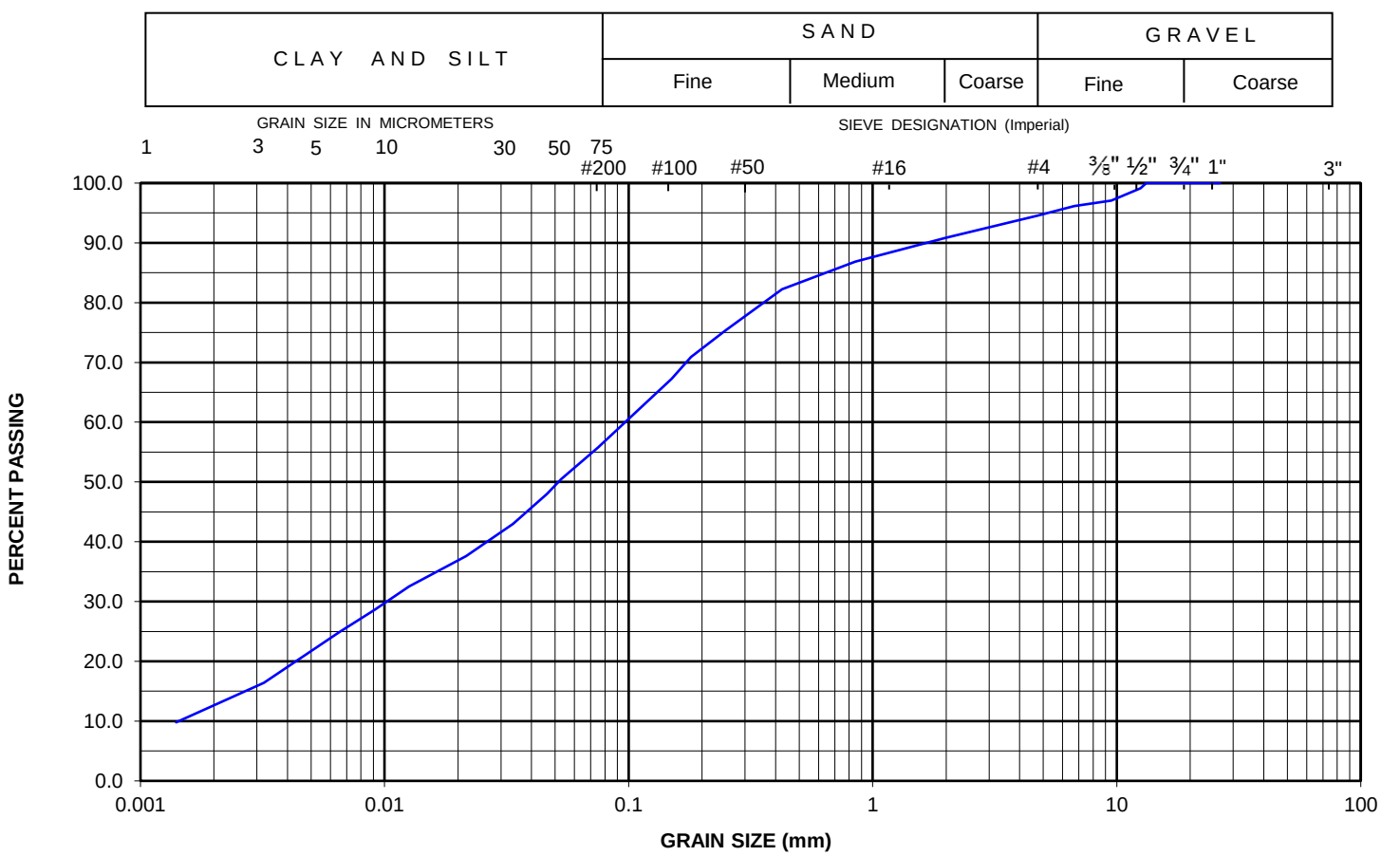
Gravel (> 4.75mm):	**5.5**
Sand (> 75µm, < 4.75mm):	**38.8**
Silt (> 2µm), < 75µm):	**43.7**
Clay (< 2µm):	**12.0**
Total:	**100.0**

Sample Information

Location: BH 5
Sample Method: SS
Sample No.: 10
Depth: 10.7 - 11.3 m
Sample Description: Silt and Sand, some Clay, trace Gravel; Grey
Sampled By: D. P.
Sampling Date: 1/30/2024
Date Received: 1/31/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0464**	48.0
22.4	100.0	**0.0336**	43.0
19	100.0	**0.0216**	37.6
16	100.0	**0.0126**	32.5
13.2	100.0	**0.0091**	28.6
12.5	99.1	**0.0065**	24.8
9.5	97.1	**0.0032**	16.4
6.7	96.1	**0.0014**	9.8
4.75	94.5		
2	90.8		
0.85	86.9		
0.425	82.2		
0.25	75.4		
0.18	70.9		
0.15	67.3		
0.075	55.7		
0.053	50.5		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 440379-3 **Report No.:** 9 **Date Reported:** 08-Feb-24

Project No.: brm-23014306-a0 102
Project Name: Combined Drilling

Grain Size Proportion (%)

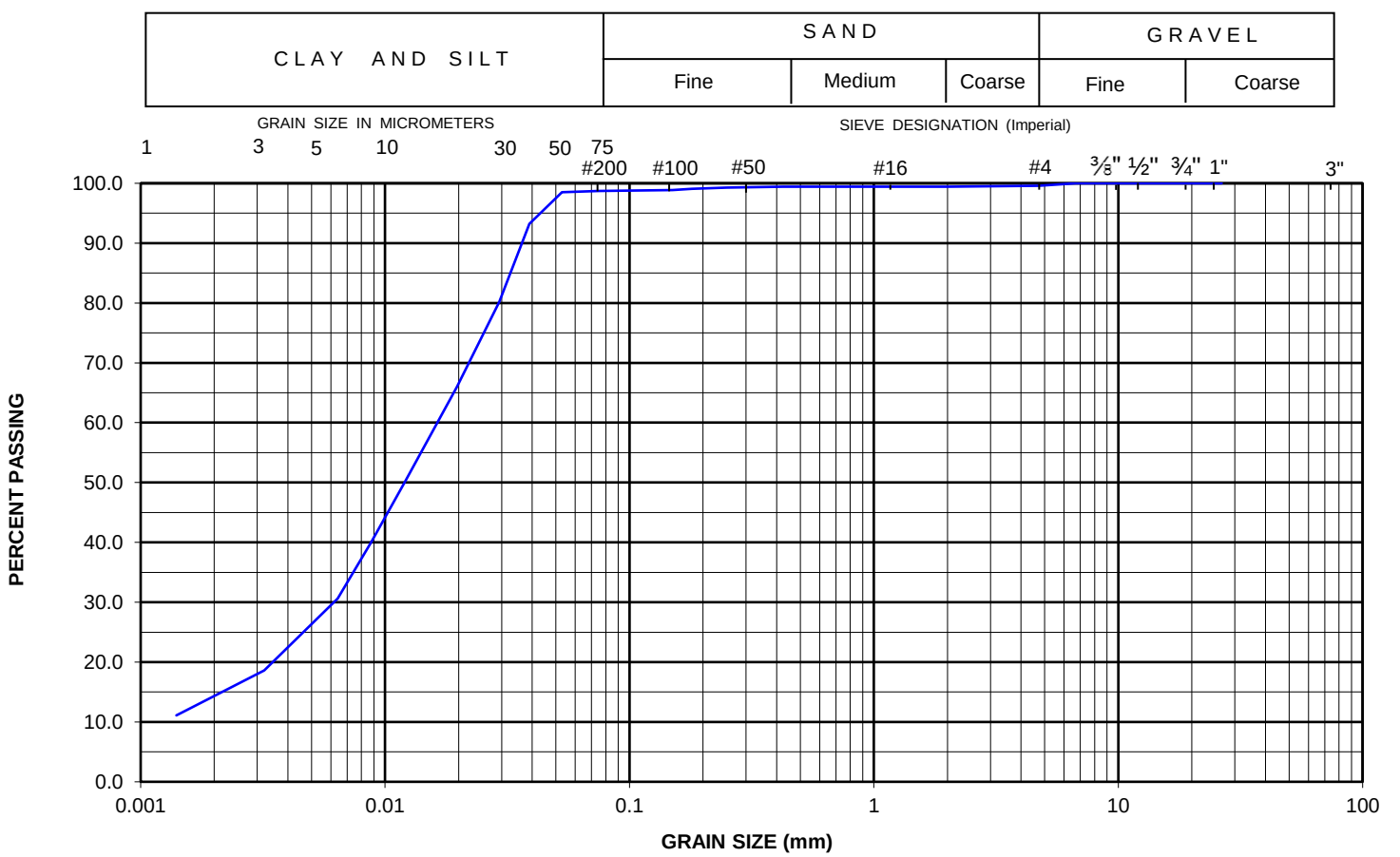
Gravel (> 4.75mm):	**0.4**
Sand (> 75µm, < 4.75mm):	**0.9**
Silt (> 2µm), < 75µm):	**85.1**
Clay (< 2µm):	**13.6**
Total:	**100.0**

Sample Information

Location: BH 6
Sample Method: SS
Sample No.: 10
Depth: 10.7 - 11.3 m
Sample Description: Silt, some Clay, trace Sand and Gravel; Grey
Sampled By: D. P.
Sampling Date: 1/30/2024
Date Received: 1/31/2024
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0389**	93.2
22.4	100.0	**0.0293**	80.2
19	100.0	**0.0197**	66.0
16	100.0	**0.0121**	50.2
13.2	100.0	**0.0088**	40.1
12.5	100.0	**0.0064**	30.6
9.5	100.0	**0.0032**	18.6
6.7	100.0	**0.0014**	11.1
4.75	99.6		
2	99.4		
0.85	99.4		
0.425	99.4		
0.25	99.3		
0.18	99.1		
0.15	98.9		
0.075	98.7		
0.053	98.5		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Kevin Leung **Approved By:** *Original Signed By* **Date Approved:** 08-Feb-24
Arcadio Petrola, Lab Supervisor

Appendix B

Certificate of Analysis

Your Project #: BRM-23014306-A0
Site Location: 5688 MAIN ST., STOUFFVILLE, ONTARIO
Your C.O.C. #: n/a

Attention: Kevin Leung

exp Services Inc
Brampton Branch
1595 Clark Blvd
Brampton, ON
CANADA L6T 4V1

Report Date: 2024/02/06
Report #: R8017850
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C432486
Received: 2024/02/01, 15:44

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
pH CaCl2 EXTRACT	1	2024/02/06	2024/02/06	CAM SOP-00413	EPA 9045 D m
Sulphate (20:1 Extract)	1	2024/02/05	2024/02/05	CAM SOP-00464	MOE E3013 m

Remarks:

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

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas 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.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas 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 Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas 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 Bureau Veritas, 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.

Your Project #: BRM-23014306-A0
Site Location: 5688 MAIN ST., STOUFFVILLE, ONTARIO
Your C.O.C. #: n/a

Attention: Kevin Leung

exp Services Inc
Brampton Branch
1595 Clark Blvd
Brampton, ON
CANADA L6T 4V1

Report Date: 2024/02/06
Report #: R8017850
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C432486
Received: 2024/02/01, 15:44

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Patricia Legette, Project Manager
Email: Patricia.Legette@bureauveritas.com
Phone# (905)817-5799

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas 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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C432486
Report Date: 2024/02/06

exp Services Inc
Client Project #: BRM-23014306-A0
Site Location: 5688 MAIN ST., STOUFFVILLE, ONTARIO
Sampler Initials: KL

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		YGU770		
Sampling Date		2024/01/30		
COC Number		n/a		
	UNITS	**BH6 SS4 2.3-2.9 M**	**RDL**	**QC Batch**
Inorganics				
Available (CaCl2) pH	pH	7.81		9203837
Soluble (20:1) Sulphate (SO4)	ug/g	54	20	9201286

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C432486
Report Date: 2024/02/06

exp Services Inc
Client Project #: BRM-23014306-A0
Site Location: 5688 MAIN ST., STOUFFVILLE, ONTARIO
Sampler Initials: KL

TEST SUMMARY

Bureau Veritas ID: YGU770
Sample ID: BH6 SS4 2.3-2.9 M
Matrix: Soil

Collected: 2024/01/30
Shipped:
Received: 2024/02/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	9203837	2024/02/06	2024/02/06	Vidhi Khatri
Sulphate (20:1 Extract)	SKAL/EC	9201286	2024/02/05	2024/02/05	Massarat Jan

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

GENERAL COMMENTS

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

Package 1	1.0°C

Results relate only to the items tested.

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Bureau Veritas Job #: C432486
Report Date: 2024/02/06

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: BRM-23014306-A0
Site Location: 5688 MAIN ST., STOUFFVILLE, ONTARIO
Sampler Initials: KL

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9201286	Soluble (20:1) Sulphate (SO4)	2024/02/05	93	70 - 130	93	70 - 130	<20	ug/g	17	35
9203837	Available (CaCl2) pH	2024/02/06			100	97 - 103			0.16	N/A

N/A = Not Applicable

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.

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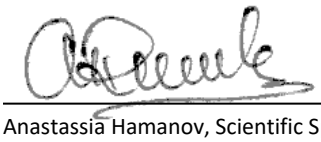
VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, Scientific Specialist

Bureau Veritas 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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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BUREAU VERITAS

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/6

CHAIN OF CUSTODY RECORD

Page ____ of ____

Invoice Information
Company Name: EXP Services Inc.
Contact Name: Kevin Leung
Address: 1595 Clark Boulevard, Brampton, ON L6T 4V1
Phone: 905-793-9800 Fax: 905-793-0641
Email: kevin.leung@exp.com

Report Information (if differs from invoice)
Company Name:
Contact Name:
Address:
Phone: Fax:
Email:

Project Information (where applicable)
Quotation #: Stream 3
P.O. #/ AFE#:
Project #: BRM-23014306-A0
Site Location: 5688 Main St., Stouffville
Site #: Ontario
Site Location Province:
Sampled By:

Turnaround Time (TAT) Required
[X] Regular TAT (5-7 days) Most analyses
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Rush TAT (Surcharges will be applied)
[ ] 1 Day [ ] 2 Days [ ] 3-4 Days
Date Required:
Rush Confirmation #:

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS LABORATORIES' DRINKING WATER CHAIN OF CUSTODY

Regulation 153
[X] Table 1 [X] Res/Park [ ] Med/ Fine
[ ] Table 2 [ ] Ind/Comm [ ] Coarse
[ ] Table 3 [ ] Agri/ Other
[ ] Table ____
FOR RSC (PLEASE CIRCLE) Y / (N)

Other Regulations
[ ] CCME [ ] Sanitary Sewer Bylaw
[ ] MISA [ ] Storm Sewer Bylaw
[ ] PWQO Region
[ ] Other (Specify)
[ ] REG 558 (MIN. 3 DAY TAT REQUIRED)
[ ] REG 406 Table

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

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

LABORATORY USE ONLY
CUSTODY SEAL Y / N: Present W, Intact W
COOLER TEMPERATURES: 1/1/1
COOLING MEDIA PRESENT: Y (N)

	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)	pH	Sulphate	HOLD- DO NOT ANALYZE	COMMENTS
1	BH6 SS4 2.3 - 2.9 m	2024/01/30		Soil	1								X	X		
2																
3																
4																
5																
6																
7																
8																
9																
10																

01-Feb-24 15:44
Patricia Legette
C432486
URE ENV-107

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	BV JOB #
	2024/02/01	1645	BVR 410 TDuncan	SH 2024/02/01	15:44	
				2024/02/01		

Bureau Veritas Job #: C432486
Report Date: 2024/02/06

exp Services Inc
Client Project #: BRM-23014306-A0
Site Location: 5688 MAIN ST., STOUFFVILLE, ONTARIO
Sampler Initials: KL

Exceedance Summary Table – Reg153/04 T1-Soil/Res

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
No Exceedances						

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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