Proposed Residential Development

CreateTO

Type of Document:
Supplementary Geotechnical Assessment Report

Project Location:
1337 Queen Street West, Toronto, Ontario

Project Number:
GTR-21003722-C0

Prepared By:
Raymond Yan, P. Geo.
Geoscientist
Geotechnical Services

Reviewed By:
James Ng, P. Eng.
Geotechnical Manager
Geotechnical Services

Date Submitted:
2024-05-16

220 Commerce Valley Drive West, Suite 110 | Markham, ON L3T 0A8 | CANADA
t: +1.905.695.3217 | f: +1.905.695.0169 | exp.com

Table of Contents

1. Introduction

This report presents an update of the geotechnical investigation report submitted in December 2022 for the proposed residential building at 1337 Queen Street West in the City of Toronto, Ontario. The work was authorized by Mr. Jason Slidders of CreateTO.

Initially, the project entailed the design and construction of a condominium building ranging from three (3) to nine (9) stories with a basement intended for community use. EXP had issued a geotechnical investigation report pertaining to this original proposed development, dated December 7, 2022. However, recent information provided by CreateTO in February 2024 indicates significant alterations to the development plan: now a nineteen (19) storeys condominium with one (1) basement level is proposed.

Moreover, the client is exploring cost-effective measures to address potential groundwater contamination issues, particularly concerning the flow towards the southern property. Based on the most recent updates, the proposed solution involves the installation of a permeable reactive barrier (PRB) along the southern boundary of the site.

In light of the revised redevelopment plans, it is necessary to reassess the recommendations put forth in our previous geotechnical investigation report. The objective of this supplementary report is to provide additional information regarding the subsurface soil and groundwater conditions at the site, through the utilization of data acquired from previous geotechnical investigation as well as from boreholes completed in February 2024 for environmental purposes, and to provide geotechnical engineering guidelines pertaining to the design and construction of the proposed development.

Our Terms of Reference also included a Phase II Environmental Site Assessment (ESA). The results of the Phase II ESA will be presented under separate cover.

The comments and recommendations given in this report are based on the assumption 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 changes. 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.

2. Site Description

The site is located on the south side of Queen Street West, directly south of the intersection of Queen Street West and O'Hara Avenue, and bounded by Dunn Avenue in the west. The municipal address is 1337 Queen Street West, Toronto, Ontario.

The site has an area of approximately 1,984 square meters (m^2) and is presently developed with one (1) commercial building that is currently occupied by a Dollarama Store. The site is bounded by Queen Street West to the north, commercial buildings to the east and west, with residential land use to the south. It is relatively flat with ground surface elevations at the borehole locations ranged between 96.2 and 96.6 m.

3. Fieldwork

Three (3) geotechnical boreholes (BH/MW1-D – 3-D) were initially drilled on October 17 to 20, 2022. They were advanced to depths of about 13.7 to 15.4 m below existing grade. Additional fifteen (15) environmental boreholes (BH/MW101 – 115) for this supplementary geotechnical assessment were drilled during February 12 to 22, 2024. For the fifteen (15) environmental boreholes, thirteen (13) boreholes (BH/MW, 101 – 112, 115) were carried out outdoor, and advanced to depths of about 3.7 to 18.8 m below existing grade. Two (2) boreholes (BH/MW113 and 114) were carried out indoor In the Dollarama Store, and advanced to about 7.9 m below existing grade.

The approximate locations of all eighteen (18) boreholes are shown on the attached Borehole Location Plan (Drawing No. 1). Prior to drilling, the borehole locations were cleared of underground utilities by Ontario One Call contractors and a private locator.

Drilling and sampling operations for the outdoor boreholes were completed by a combination of auger or mud-rotary and split-spoon techniques using truck mounted drilling equipment owned and operated by a specialist drilling contractor. Indoor boreholes were advanced using Hilti Drill.

In each borehole, soil samples were recovered using conventional 51 mm outer diameter split spoon sampler generally at 0.75 m depth intervals from ground level to 3.1 m below ground surface and at 1.5 m intervals afterwards. The split spoon sampling procedure was carried out in conjunction with the standard penetration test (SPT) method (ASTM D-1557). The hammer used to drive the split spoon with the Hilti Drill weighed half as much as the standard hammer employed for SPT. Consequently, the blow counts registered with this hammer would need to be halved to accurately represent the SPT N values. This adjustment has been duly reflected in the borehole logs.

Water levels were observed in the boreholes during the course of the fieldwork and in monitoring wells installed in all the boreholes except BH106, 108, 112 and 115, to establish the short-term stabilized groundwater level at the site. Three (3) additional shallow monitoring wells, BH/MW1-S – 3-S, were also installed adjacent to the geotechnical boreholes for environmental purposes. The monitoring wells were installed in accordance with the Ontario Water Resources Act, R.R.O. 1990, Ontario Regulation (O. Reg.) 903 – Amended to O. Reg. 128/03.

Telescopic drilling was conducted in BH/MW101 - 103 to prevent the contaminants in the soils from migrating down to the monitoring well in bedrock. In these boreholes, soil samples were only collected at scatter depths for VOC measurements.

The fieldwork was supervised by EXP geotechnical staff who monitored the drilling operations and logged the borings. All split spoon samples were transported to our laboratory for detailed examination.

The location and ground surface elevation of the boreholes were determined in the field by EXP Services Inc. Ground surface elevations at the borehole locations were determined from Can-Net Elevations with the use of a Trimble TSC3 Controller.

4. Laboratory Testing

The laboratory testing program comprised the following:

- Moisture content determination on all recovered soil samples, with results presented on the Log of Borehole sheets (Drawing Nos. 2 to 29).
- Grain size analysis were conducted on five (5) samples from selected boreholes. The results are presented in Appendix A.
- Atterberg Limits testing was conducted on three (3) samples from selected boreholes. The results are presented in Appendix A.
- pH and sulphate testing conducted on two (2) soil samples from selected boreholes. The certificate of analysis is attached in Appendix B.

5. Subsurface Conditions

5.1 Soil

The detailed soil profile encountered in each borehole and the results of laboratory moisture content determinations are indicated on the attached borehole logs (Drawing Nos. 2 to 29). It should be noted the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling except the interior boreholes, BH/MW 113 & 114. 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 stratigraphy, as revealed in the boreholes, comprised a surficial pavement structure over fill, which was underlain by native deposits of silt, silty clay, sand and silt and / or silty sand till. A brief description of the stratigraphy in order of depth follows.

Pavement Structure

Surficial pavement structure layer, comprising 75 to 170 mm of asphaltic concrete over 100 to 315 mm granular base material, was encountered in all boreholes.

Fill

A fill unit was encountered below the pavement structure in all boreholes, extending to depths of about 0.7 m to 2.3 m below existing grade. The fill was brown to dark brown and grey in colour and composed of sandy silt with some clay and gravel, to clayey silt with some sand and gravel. A trace amount of brick fragments, and wood chips, was observed in BH/MW 2 and 3, respectively. Moisture contents of the moist to very moist fill ranged from 5 to 31%.

Particle size analysis conducted on one (1) select sample of the fill revealed that the fill contained 0% gravel, 39% sand, 59% silt and 2% clay. Details can be referred to the particle size analysis results in Appendix A.

Silt

Silt deposit was encountered below the fill in all boreholes except BH/MW 3, and extended to 4.6 m to 6.1 m below existing grade. The silt was brown or grey in colour, depending on weather it was above or below the groundwater table. It contained a trace of sand, some clay, and a trace of gravel. Occasional sand and gravel pockets / or sand seams at various depths were also observed in both boreholes. Standard Penetration Tests carried out in the deposit yielded SPT N-values from 8 to over 50 blows per 0.3 m of penetration, indicating compact to dense state of

compactness. The moisture contents ranged from 4 to 28, which indicated moist to wet conditions.

Silty Clay

Silty clay was encountered in BH/MW 3-D & 114 below the fill, extending to depths of 1.8 to 6.1 m below existing grade. It was brown in colour and contained a trace of sand. Based on the SPT 'N' values of 19 to 45, the silty clay existed in very stiff to hard consistency. Moisture contents ranged from 17 to 28%, indicating very moist to wet conditions.

Particle size analysis conducted on one (1) select sample of the silty clay revealed that the silty clay contained 0% gravel, 6% sand, 66% silt and 28% clay. Details can be referred to the particle size analysis results in Appendix A.

Atterberg limit testing carried out on two (2) select sample of silty clay revealed that the silty clay has liquid limit of 28-42%, plastic limit of 16-22% and plasticity index of 12-20%. It is a low plasticity clay. Details of the test can be referred to the Atterberg limit testing results in Appendix A.

Sand and Silt

Sand and Silt was encountered in BH/MW 105 below the silt, extending to a depth of 6m below existing grade. It was brown in colour and contained a trace of clay. Based on the SPT 'N' values of 29 to 34, the sand and silt existed in compact to dense consistency. Moisture contents ranged from 6 to 23%, indicating a moist to wet condition.

Particle size analysis conducted on one (1) select sample of the sand and silt revealed that the sand and silt contained 0% gravel, 64% sand, 35% silt and 1% clay. Details can be referred to the particle size analysis results in Appendix A.

Silty Sand Till

Silty sand till was encountered below the fill in all boreholes except BH108. It extended to the termination depth in all boreholes except BH101 to 103 and 108 and to a depth of about 15.24m below existing grade in Borehole 101 to 103. The silty sand till was brown to grey in colour and contained trace travel. Based on the SPT 'N' values of 4 to over 50 blows per 0.025 m, the silty sand till existed in dense to very dense states of compactness. The low SPT 'N' values, ranging from 4 to 6, observed in the silty sand till layer at BH/MW104 SS11, BH/MW107 SS9, and BH/MW111 SS13, may be indicative of sample disturbance. Moisture contents of the silty sand till ranged from 11 to 22%, indicating a wet condition.

Particle size analysis conducted on two (2) select samples of the silty sand till revealed that the silty sand till samples contained 3 to 9% gravel, 53 to 60% sand, 27 to 32% silt and 6 to 10% clay. Details can be referred to the particle size analysis results in Appendix A.

5.2 Groundwater

Upon completion of drilling, the groundwater levels in all three boreholes were not measured due to the use of water mixed with drilling mud during the drilling operations. Groundwater conditions were observed in monitoring wells installed in all the boreholes except BH106, 108, 112 and 115 for subsequent readings. Groundwater levels were also measured in three (3) additional shallow monitoring wells, BH/MW1-S – 3-S, installed adjacent to the geotechnical boreholes (BH/MW1-D – 3-D). These groundwater measurements are recorded in the attached borehole logs and a summary is presented in Table 1 below.

Table 1: Short-Term Groundwater Levels in Borehole Locations

Borehole No.	Ground Surface Elevation (m)	Groundwater Depth Upon Completion (m)	Monitoring Screen Bottom Depth / Elevation (m)	Groundwater Depth / Elevation in Monitoring Well on October 26, 2022	Groundwater Depth / Elevation in Monitoring Well on November 1, 2022	Groundwater Depth / Elevation in Monitoring Well on March 11, 2024 (m)	Groundwater Depth / Elevation in Monitoring Well on March 12, 2024 (m)	Groundwater Depth / Elevation in Monitoring Well on March 13, 2024 (m)
BH/MW 1-D	96.43	N/A	7.62 / 88.76	5.95 / 90.48	5.97 / 90.46	-	-	-
BH/MW 1-S	96.40	N/A	6.10 / 90.3	5.97 / 90.43	5.97 / 90.43	-	-	-
BH/MW 2-D	96.19	N/A	13.72 / 82.47	5.93 / 90.26	5.96 / 90.23	-	-	-
BH/MW 2-S	96.23	N/A	6.10 / 90.13	6.22 / 90.01	6.22 / 90.01	-	-	-
BH/MW 3-D	96.38	N/A	7.62 / 88.81	4.50 / 91.88	4.50 / 91.88	-	-	-
BH/MW 3-S	96.44	N/A	6.10 / 90.34	Dry	Dry	-	-	-
BH/MW 101	96.46	N/A	18.77 / 77.69	-	-	-	-	15.08 / 81.38
BH/MW 102	96.29	N/A	18.74 / 77.55	-	-	6.12 / 90.17	-	-
BH/MW 103	96.41	N/A	18.40 / 78.01	-	-	7.21 / 89.20	-	-
BH/MW 104	96.39	N/A	7.79 / 88.6	-	-	-	5.97 / 90.42	-
BH/MW 105	96.46	N/A	8.54 / 87.92	-	-	-	6.03 / 90.43	-

Borehole No.	Ground Surface Elevation (m)	Groundwater Depth Upon Completion (m)	Monitoring Screen Bottom Depth / Elevation (m)	Groundwater Depth / Elevation in Monitoring Well on October 26, 2022	Groundwater Depth / Elevation in Monitoring Well on November 1, 2022	Groundwater Depth / Elevation in Monitoring Well on March 11, 2024 (m)	Groundwater Depth / Elevation in Monitoring Well on March 12, 2024 (m)	Groundwater Depth / Elevation in Monitoring Well on March 13, 2024 (m)
BH 106	96.38	N/A	N/A	-	-	-	-	-
BH/MW 107	96.32	N/A	9.03 / 87.29	-	-	-	-	6.12 / 90.20
BH 108	96.19	N/A	N/A	-	-	-	-	-
BH/MW 109	96.31	N/A	9.25 / 87.06	-	-	-	6.25 / 90.06	-
BH/MW 110	96.19	N/A	8.86 / 87.33	-	-	-	6.20 / 89.99	-
BH/MW 111	96.57	N/A	8.92 / 87.65	-	-	-	6.52 / 90.05	-
BH 112	96.44	N/A	N/A	-	-	-	-	-
BH/MW 113	96.40	N/A	7.48 / 88.92	-	-	-	6.52 / 89.88	-
BH/MW 114	96.40	N/A	7.64 / 88.76	-	-	-	-	6.16 / 90.24
BH 115	96.57	N/A	N/A	-	-	-	-	-

The groundwater elevations reflect conditions at the time of the investigation. Seasonal fluctuation of the groundwater levels at the site should be anticipated.

Reference should be made to the Hydrogeological Investigation Report for further details of the hydrogeological conditions at this site.

6. Engineering Discussion and Recommendations

6.1 General

A geotechnical investigation was conducted for the proposed residential building at 1337 Queen Street West in the City of Toronto, Ontario. It is understood that the existing one (1) storey high commercial building and associated asphalt parking at the site are to be demolished. Based on the latest development information provided by CreateTO in February, 2024, the proposed residential condominium will be a nineteen (19) storeys high condominium with one (1) level of basement that extends to a depth of about 3 to 4 m below existing grade.

The investigation has generally revealed fill extending to depths of about 0.7 m to 2.3 m below existing grade overlying native deposits of silt or silty clay, which in turn overlied sand and/or silty sand till. Short-term groundwater levels measured in the fourteen (14) installed monitoring wells ranged between 4.5 to 7.2 m below existing grade.

Based on the results of the limited boreholes drilled at the site, it is considered that the site will be suitable for the construction of the proposed residential building. It is assumed that the existing foundations, floor slabs and buried underground services will be removed as part of the demolishing plan. The following subsections provide geotechnical engineering guidelines pertinent to the design and construction of the proposed structure.

6.2 Foundation Considerations

6.2.1 Footing Foundations

For the proposed structure with one (1) level of basement, it is anticipated the basement floor will extend to depths of about 3 to 4 m below existing grades.

The proposed structure may be supported on conventional spread and strip footings founded on the competent undisturbed native silt or silty clay below all existing pavement structure, fill and loose soils. Footings founded at or below the elevations shown in Table 2 below may be designed for a geotechnical reaction of 350 kPa at Serviceability Limit States (S.L.S.), subject to inspection during construction. The factored geotechnical resistance at Ultimate Limit States (U.L.S.) is 525 kPa.

Table 2: Highest Founding Elevation at Which 350 kPa Pressure at SLS is Available

Borehole No.	Founding Depth/Elevation (m)*	Founding Soil
BH/MW 1	2.0 / 94.43	Silt
BH/MW 2	4.0 / 92.19	Silt
BH/MW 3	2.3 / 94.08	Silty Clay
BH/MW 104	2.0 / 94.39	Silt
BH/MW 105	2.8 / 93.66	Silt
BH 106	1.5 / 94.88	Silt
BH/MW 107	4.3 / 92.02**	Silt
BH/MW 109	4.6 / 91.71***	Silt
BH/MW 110	3.5 / 92.69	Silt
BH/MW 111	2.3 / 94.27	Silt
BH 112	2.3 / 94.14	Silt
BH/MW 113	2.0 / 94.4	Silt
BH/MW 114	2.5 / 93.9	Silt
BH 115	2.3 / 94.27	Silt

* or below founding elevation of the existing building foundations
** 300 kPa SLS at or below 2.5 / 93.8 m
*** 200 kPa SLS at or below 2.5 / 93.8 m

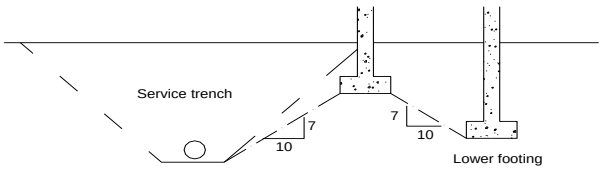
If the required structural loads result in a building footprint covered by the conventional footing foundation is greater than 50 percent, consideration may be given to support the structure on a mat foundation. The mat can be designed for a geotechnical reaction of 350 kPa at Serviceability Limit States (S.L.S) and a factored geotechnical resistance at Ultimate Limit States (U.L.S.) of 525 kPa. A modulus of subgrade reaction of 40 MPa/m may be used if a flexible design approach is considered. Once the loading details are available, it is recommended a settlement analysis be carried out to determine the settlement of the raft foundation to verify the settlements are within tolerable limit.

Prior to placement of concrete, all footing/mat bases should be inspected by geotechnical personnel from EXP Services Inc. to verify the competency of the founding material. It should be noted the founding soils are mostly fine grained and will be extremely sensitive to disturbance from construction traffic and weather. It is recommended that following excavation to the footing foundation level, the subgrade should be covered with a 50 mm working mat of lean

concrete following approval of the footing bases. If groundwater seepage is encountered in the footing excavations, the water level must be lowered to at least 1 m below base of excavation, to avoid softening of the founding soils (see further discussion in Section 6.3 of this report.)

6.2.2 Foundations General

Footing or mat 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, depending on the final design requirements.

The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations are expected to be less than 25 mm and 20 mm, respectively.

It should be noted the recommended bearing value 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 bearing levels may be required if unforeseen subsurface conditions are encountered 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.

6.3 Excavation and Groundwater Control

For the proposed dwelling with one (1) level of basement, it is anticipated that the basement and footing excavations will be carried out within the fill, silt and silty clay above the water table. After all existing foundations, basement walls and other associated underground services are removed as part of the demolition plan, excavations within the overburden materials should be relatively straightforward. Unsupported excavations must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and local regulations. The OHSA regulations require that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably

sloped and/or shored in accordance with OHSA requirements. OHSA specifies maximum slope of the excavation for the soil types encountered at the site as summarized in the following Table 3:

Table 3: Summary of the Soil Types encountered at the Site

Soil	Soil Type	Maximum Slope
Fill	Type 3* above groundwater	1 horizontal to 1 vertical
Native silt and silty clay	Type 3* above groundwater	1 horizontal to 1 vertical

*Note: Where loose soil is encountered or within zones of persistent seepage, it may be necessary to locally flatten the side slopes.

If the above recommended excavation side slopes cannot be maintained due to lack of space or any other reasons, the excavation sides must be supported by a properly designed shoring system, such as soldier pile and lagging with rakers. The shoring systems should be designed in accordance with the latest edition of the Canadian Foundation Engineering Manual (CFEM). Based on the manual, the following earth-pressure coefficients are recommended:

0.25 Where minor movements can be tolerated.

0.35 Where utilities, roads, sidewalks must be protected from significant movement or where vibration from traffic is a factor.

0.45 Where movements are to be minimized such as near adjacent building footings or movement sensitive services (i.e. gas and watermains).

Natural Unit Weight = 21.0 kN/m^3 (silt, silty clay)

For the anticipated excavation depth of about 4 m, no major groundwater dewatering requirements are expected. However, minor groundwater seepage into the excavation from perched water within the fill and pervious seams/layers within the native soils should be anticipated during construction. It should be possible to control and remove the minor seepage using conventional construction dewatering techniques, i.e. side ditches and pumping from filtered sumps.

If the groundwater level at the time of construction is higher than expected, it may be necessary to employ a more elaborate positive dewatering system to keep the excavations dry, and to prevent softening of the foundation soils. A system of closely spaced properly filtered well points may be needed to lower the groundwater level to 1 m below footing founding elevation.

6.4 Backfill Considerations

Backfill used to satisfy underfloor slab requirements, footings and service trenches, etc., should be compactible fill, i.e., inorganic soil with its moisture content close to its optimum value determined in the standard Proctor maximum dry density test. The existing fill free of brick

fragments, wood chips and otherwise deleterious materials is considered suitable for backfilling purposes. The native silt and silty clay are also considered suitable for reuse as backfill material. However, portions of these material may require moisture adjustments for proper compaction.

Any organic or excessively wet or otherwise deleterious material should not be used for backfilling purposes. Any shortfall of suitable on-site excavated material can be made up with imported granular material, OPSS Granular 'B' or equivalent. The backfill should be placed in lifts not more than 300 mm thick in the loose state with each lift being compacted to at least 98% standard Proctor maximum dry density (SPMDD) before subsequent lifts are placed. The degree of compaction achieved in the field should be checked by in-place density tests.

The on-site soils are not free draining and therefore should not be used where this characteristic is required or in confined areas where smaller compaction equipment is required. Imported granular material such as OPSS Granular 'B' would also be suitable for these purposes.

6.5 Floor Slab Construction and Permanent Drainage

The basement floor slab can be constructed as a slab-on-grade on the native material. Prior to slab-on-grade construction, all existing foundations and floor slabs should be removed. Any buried underground services and associated trench backfill should also be removed. Following rough grading, the exposed subgrade surface should be compacted and proof-rolled with a heavy vibratory roller and inspected by geotechnical personnel. Any soft areas identified during the proof-rolling operation should be sub-excavated and replaced with approved material compacted in the manner described in the "Backfill Considerations" subsection of the report.

A moisture barrier, consisting of a 200 mm thick layer of 19 mm clear crushed stone should be placed directly under the floor slab. Within any unheated areas and entrances to the un, 50 mm of Styrofoam insulation should be provided below the floor slab to protect against frost heave.

The foundation walls should be covered with a bituminous spray and a drainage sheet. Permanent perimeter tile drains should also be provided to prevent the build-up of water adjacent to the basement walls. The perimeter drains should consist of 100 mm diameter perforated pipe surrounded by 300 mm of 19 mm clear stone and wrapped with a filter fabric with a filtration size of 60 microns or smaller. The drainage system should be installed around the perimeter of the basement and connected to a frost free outlet from which the water can be removed.

The perimeter drainage system should be independent of any stormwater piping, such as rainwater leaders. Backflow prevention should be provided between the sumps and the drain headers.

Around the perimeter of the proposed building, the ground surface should be sloped on a positive grade away from the structure to promote surface water run-off and to reduce groundwater infiltration adjacent to the foundation.

6.6 Earth Pressure on Subsurface Walls

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

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

where: p = the pressure in kPa acting against any subsurface wall at depth, h, below the ground surface;

k = the earth pressure coefficient considered to be appropriate for the subsurface walls, for this case, 0.4;

γ = the bulk unit weight of the retained soils, use 21 KN/m^3;

h = the depth in m below the ground surface at which the pressure, p, is to be computed; and

q = the value of any adjacent surcharge in kPa which may be acting close to the wall.

The above expression assumes an effective perimeter drainage system will be incorporated to prevent the build-up of hydrostatic pressure behind the subsurface wall.

6.7 Earthquake Considerations

The recommendations for the geotechnical aspects to determine the earthquake loading are presented below.

6.7.1 Subsoil Conditions

The subsoil information at this site has been examined in relation to Section 4.1.8.4 of OBC 2012.

The subsoil consisted of fill overlying native silt, silty clay, sand and silty sand till. The proposed structure will be supported on conventional footing / mat foundation founded on native silt or silty clay.

There have been no shear wave velocity measurements carried out at this site.

6.7.2 Depth of Boreholes

Table 4.1.8.4.A Site Classification for Seismic Site Response in OBC 2012 indicated that to determine the site classification, the average properties in the top 30 m are to be used. The boreholes were advanced to depths of about 8.2 to 18.3 m below existing grade. No bedrock was encountered within the depths investigated.

6.7.3 Site Classification

Based on the known soil conditions, the Site Class for this site is "D" as per Table 4.1.8.4.A, Site Classification for Seismic Site Response, OBC 2012.

6.8 Corrosion Potential to Concrete

Two (2) selected soil sample was submitted to Bureau Veritas (BV) Laboratories in Mississauga for laboratory analyses of pH and Sulphate concentrations to determine the corrosion potential concrete. The pH values were 7.71-7.82, and the sulphate contents were 160-420 ppm as SO_4, indicating negligible degree of sulphate attack on subsurface concrete structures.

6.9 Permeable Reactive Barrier (PRB)

It is understood that the client is considering the installation of a permeable reactive barrier (PRB) to tackle a potential groundwater contamination concern that contaminated water potentially flows from the site into the residential property to the south. Based on the groundwater monitoring record, the groundwater levels range between 4.6 and 7.2 m below existing grade. It is anticipated that the PRB may need to extend from 4.6 to more than 7.2 m depth.

The details of the PRB are not available at the time of this report. It could consist of chemicals injected into the ground in a series of closely spaced boreholes along the southern boundary of the site. The injection process will be similar to permeation grouting, to ensure even distribution of the reactive chemicals throughout the target zone. Contaminants in any groundwater that flows through the PRB will be absorbed by the reactive materials.

In order not to negatively impact the foundations of the proposed development, the PRB should be located at a sufficient distance from the footings. This safe distance (or zone of influence) is to be determined by the supplier / installer of the PRB. In addition, the pressure used during injection must not be so high that it increases the pressure on the basement walls of the new building, or causes heaving of the footings, of hydro fracturing of the foundation soils. The intake volume, grout pressure, and ground movements must be closely monitored during installation. Any existing structures or buried services close to the south property line may also have to be monitored. It is noted that most of the soils below 6 m depth are dense to very dense, and a very high pressure may be needed to inject the reactive materials. Furthermore, the grouted soils are

expected to have very low permeability, which may limit the rate of groundwater flow through the PRB.

If possible, consideration should be given to installing the PRB before foundation construction.

7. General Comments

A geotechnical engineer should be retained for a general review of the final design and specifications to verify the recommendations in this report address all relevant geotechnical parameters regarding the design and construction of the proposed residential development.

The comments given in this report are intended only for the guidance of design and structural 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.

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, a geotechnical engineer 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.

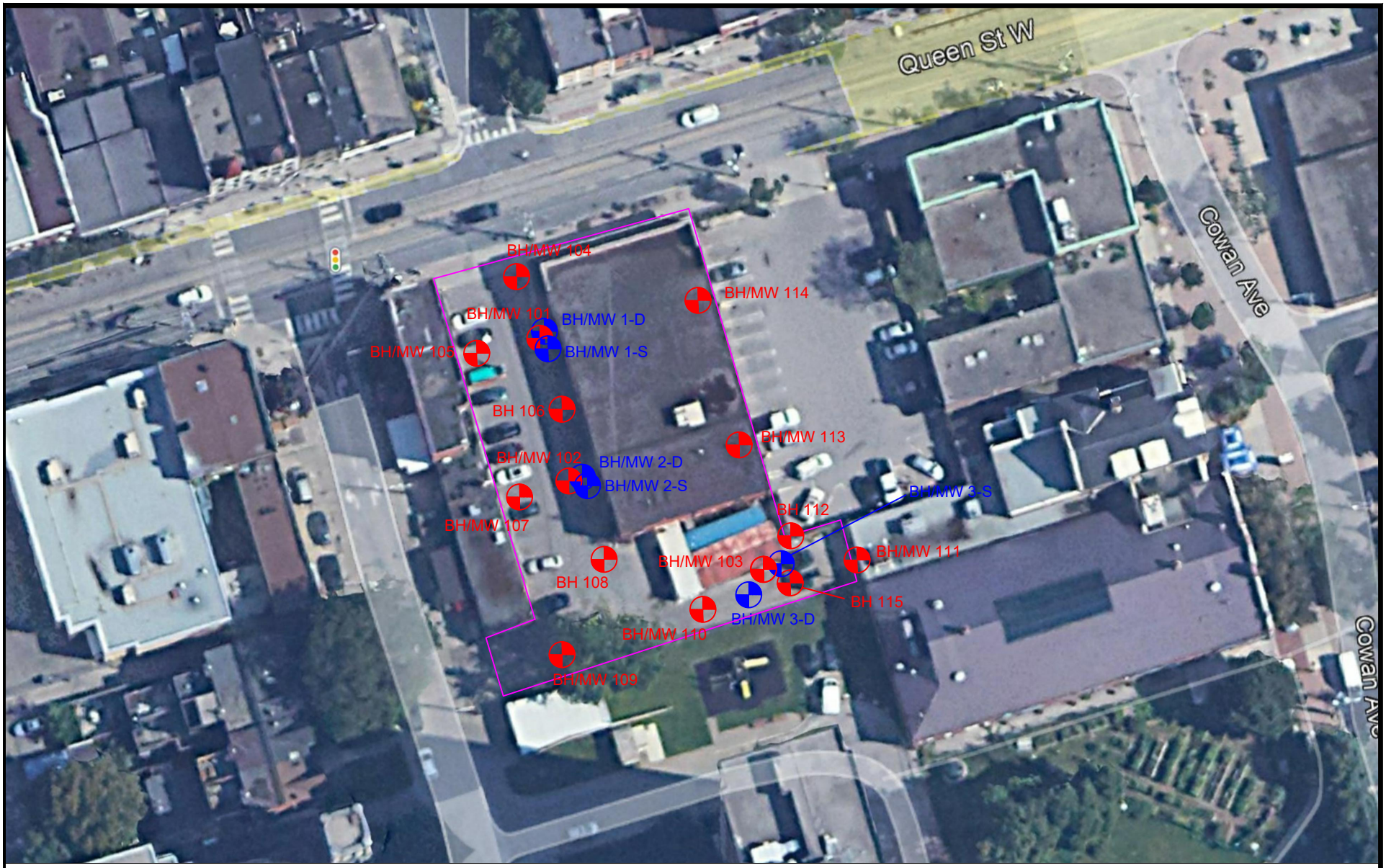
Yours truly,
EXP Services Inc.

Raymond Yan, P. Geo.
Geoscientist
Geotechnical Services

James Ng, P. Eng.
Geotechnical Manager
Geotechnical Services

Drawings

Borehole Location Plan
Borehole Logs



NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 1 MONTH AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. THIS BACKGROUND IMAGE WAS AN EXTRACT FROM GOOGLE EARTH IMAGE.

LEGEND:

- BOREHOLE LOCATIONS (2024)
- BOREHOLE LOCATIONS (2022)
- APPROXIMATE SITE BOUNDARY

EXP Services Inc.
t: +1.905.695.3217 | f: +1.905.695.0169
220 COMMERCE VALLEY DR., SUITE 110
MARKHAM, ON L3T 0A8
Canada
www.exp.com

PROJECT TITLE AND LOCATION:
SUPPLEMENTARY GEOTECHNICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
1337 QUEEN STREET WEST,
TORONTO, ONTARIO

DRAWING TITLE:
BOREHOLE LOCATION PLAN

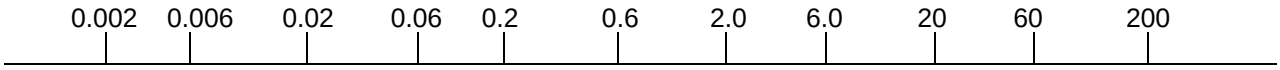
PROJECT#: GTR-21003722-C0	DWN.: JW
SCALE: N.T.S.	CHKD.: RY
DATE: MAY 2024	DWG. No.: 1

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 Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by exp 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 MILLIMETERS

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 BH/MW1-D

Project No. BRM-21003722-C0 Drawing No. 2

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

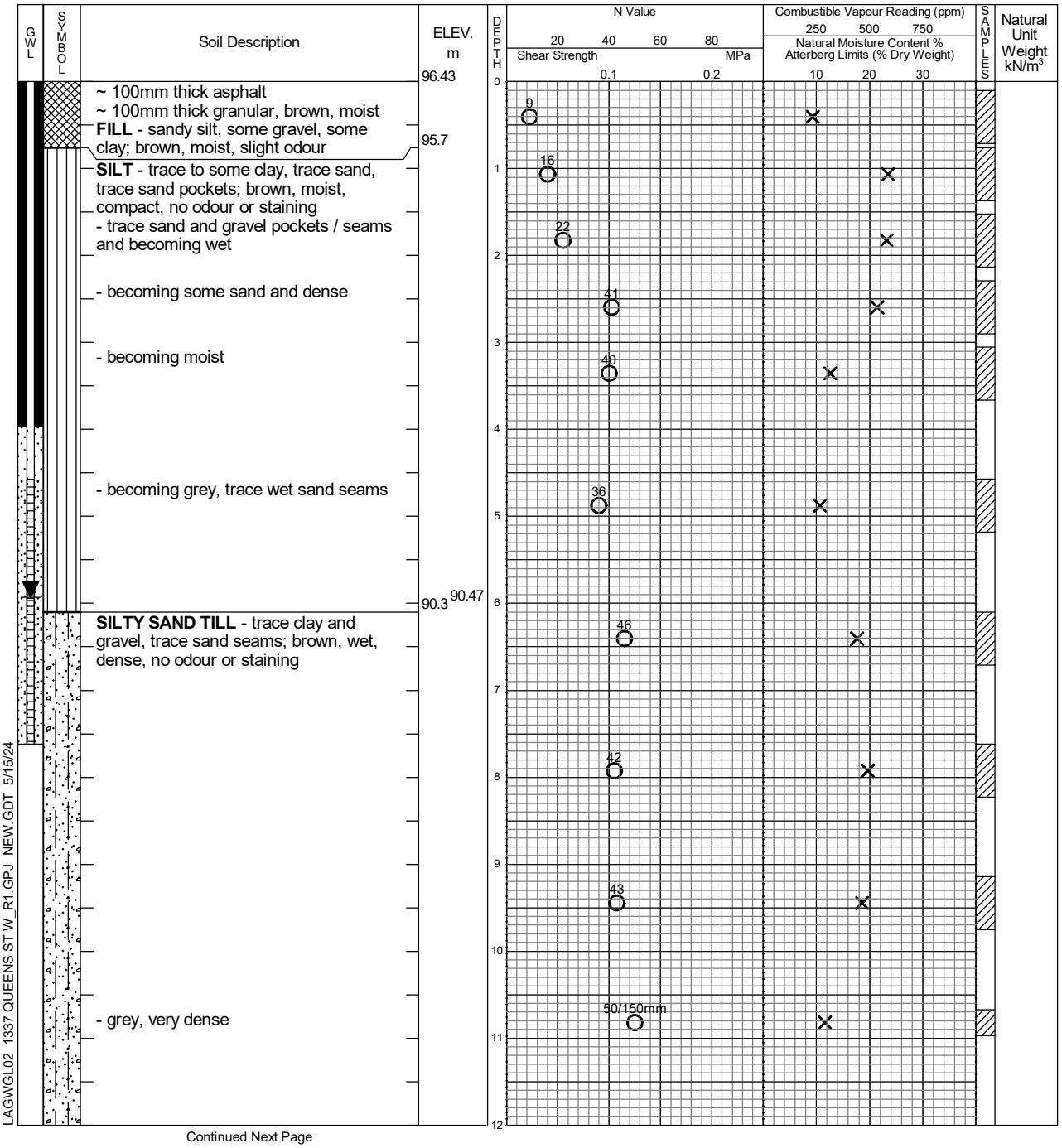
Date Drilled: October 17, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

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

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



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	5.95	
November 1, 2022	5.97	

Log of BH/MW1-D

Project No. BRM-21003722-C0 Drawing No. 2

Project: Geotechnical Investigation Sheet No. 2 of 2

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (MPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
		SILTY SAND TILL - continued	84.43	12	84			
		- some gravel, trace shale fragments		13				
				14	50/80mm			
			81.0	15	50/150mm			
		END OF BOREHOLE						

NOTES:
1. Groundwater monitoring well installed to about 7.6 m depth.

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	5.95	
November 1, 2022	5.97	

Log of BH/MW1-S

Project No. BRM-21003722-C0 Drawing No. 5

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

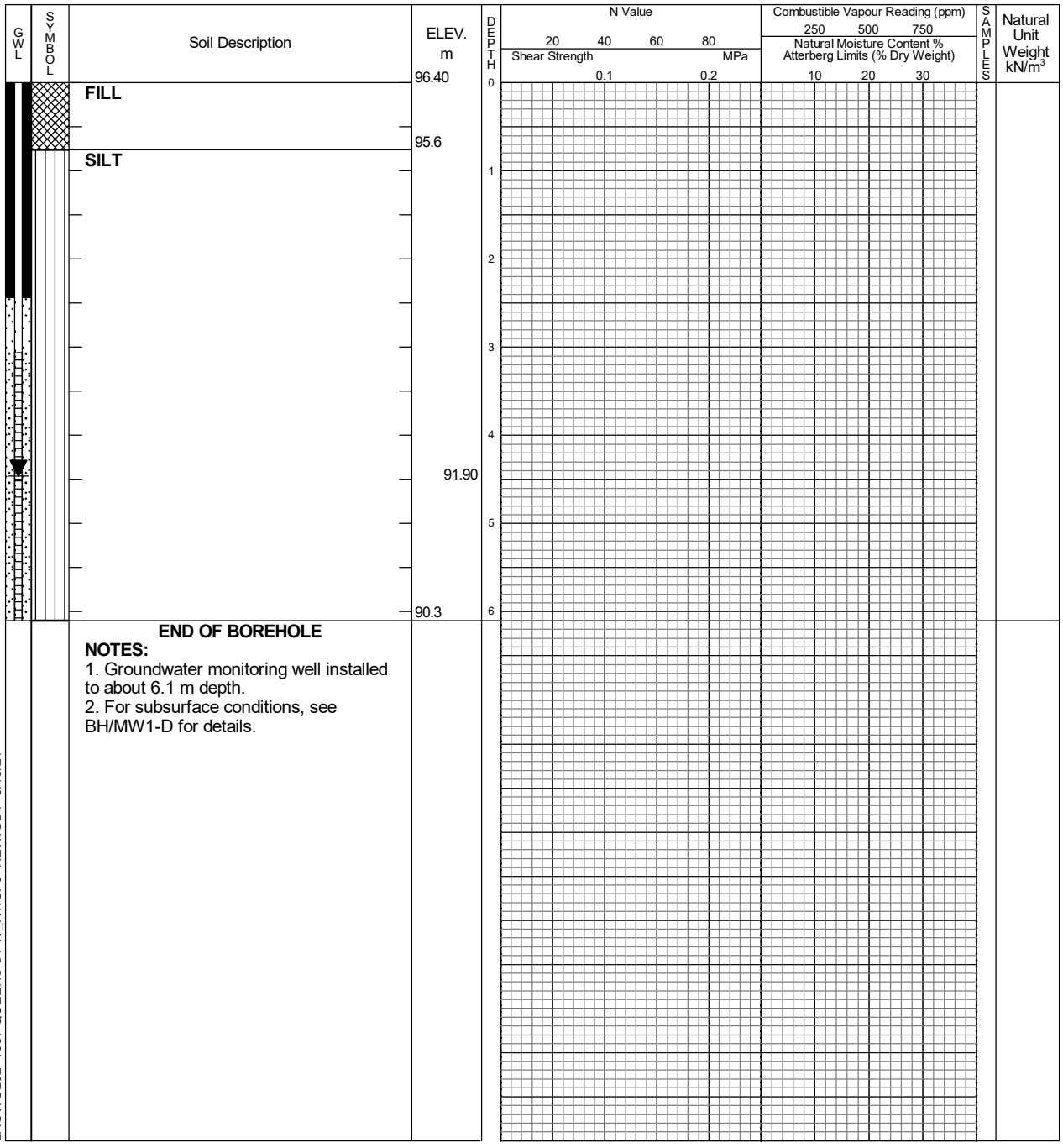
Date Drilled: October 17, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

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

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



NOTES:
1. Groundwater monitoring well installed to about 6.1 m depth.
2. For subsurface conditions, see BH/MW1-D for details.

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	5.97	
November 1, 2022	5.97	

Log of BH/MW2-D

Project No. BRM-21003722-C0 Drawing No. 3

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

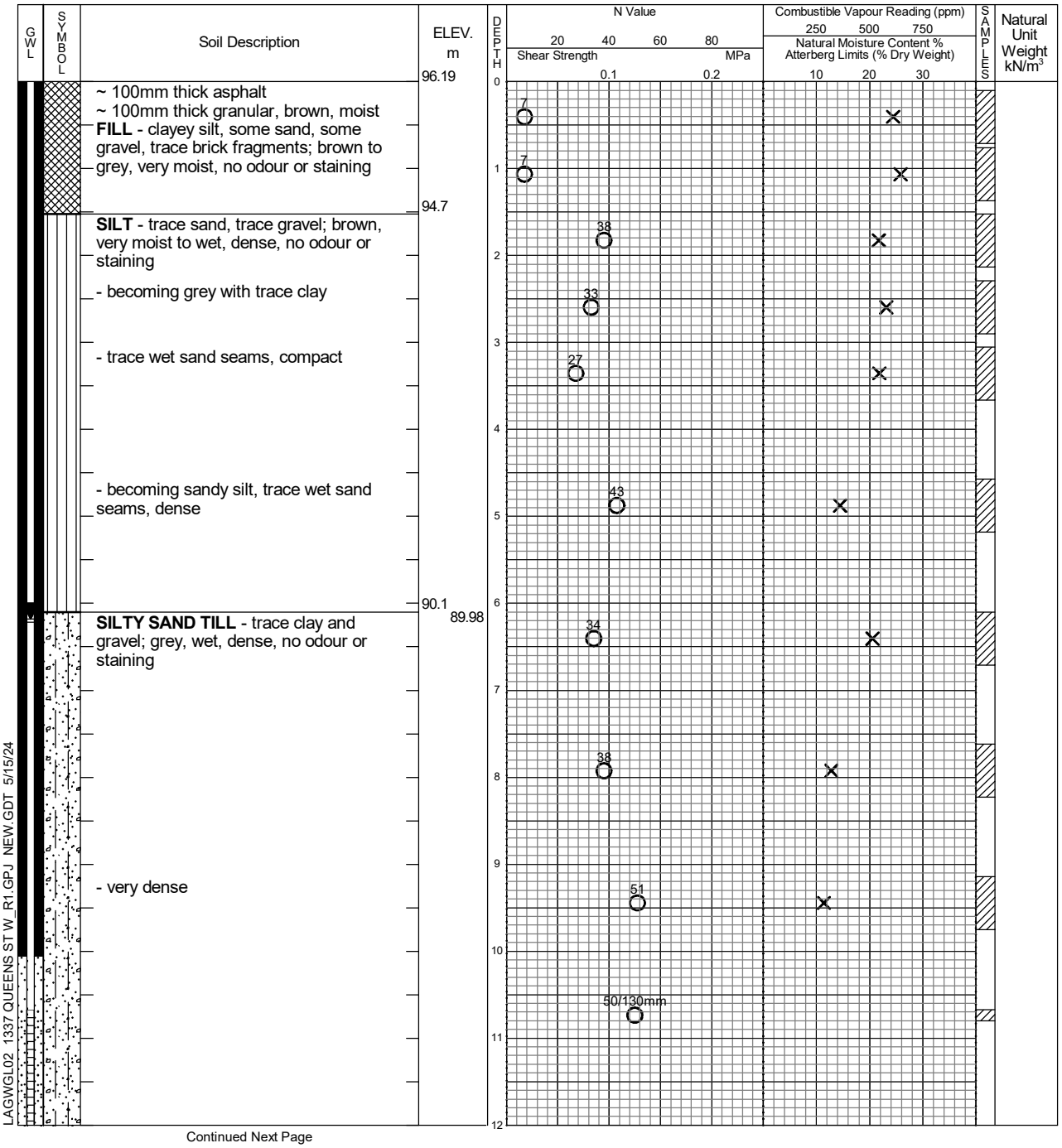
Date Drilled: October 19, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

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

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



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	5.93	
November 1, 2022	5.96	

Log of BH/MW2-D

Project No. BRM-21003722-C0 Drawing No. 3

Project: Geotechnical Investigation Sheet No. 2 of 2

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (MPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
		SILTY SAND TILL - continued - trace shale fragments	84.19	12	50/110mm			
				13				
			82.5					
		END OF BOREHOLE **NOTES:** 1. Groundwater monitoring well installed to about 13.7 m depth.						

N Value: 20 40 60 80

Shear Strength: 0.1 MPa 0.2

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	5.93	
November 1, 2022	5.96	

Log of BH/MW2-S

Project No. BRM-21003722-C0 Drawing No. 6

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: October 17, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (MPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
		FILL	96.23	0	20 40 60 80 / 0.1 0.2	250 500 750 / 10 20 30		
		SILT	94.7	1				
				2				
				3				
				4				
				5				
			90.1	6				
		END OF BOREHOLE	90.27					

NOTES:
1. Groundwater monitoring well installed to about 6.1 m depth.
2. For subsurface conditions, see BH/MW2-D for details.

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	6.22	
November 1, 2022	6.22	

Log of BH/MW3-D

Project No. BRM-21003722-C0 Drawing No. 4

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

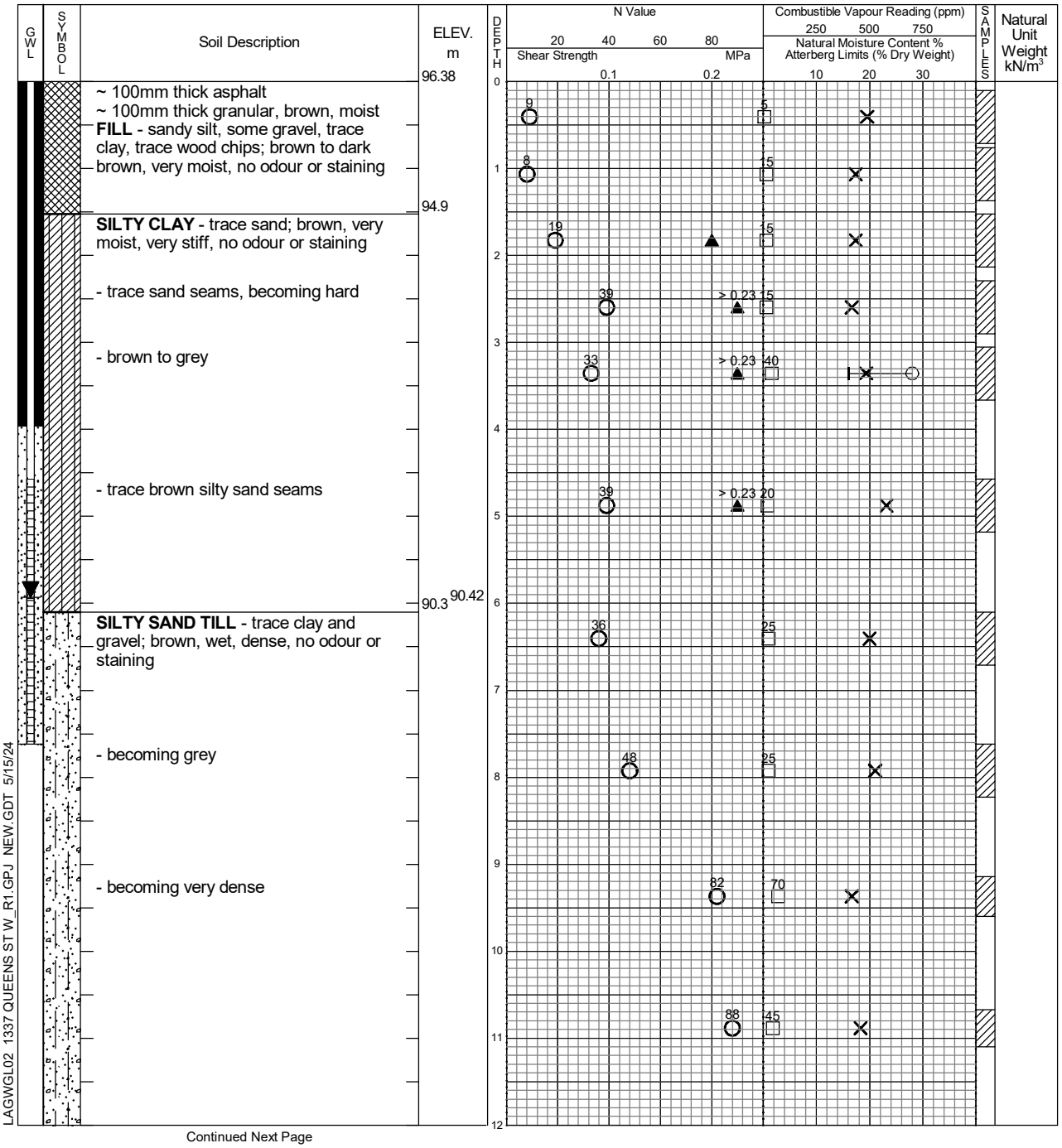
Date Drilled: October 20, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

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

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



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	4.50	
November 1, 2022	4.50	

Log of BH/MW3-D

Project No. BRM-21003722-C0 Drawing No. 4

Project: Geotechnical Investigation Sheet No. 2 of 2

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (MPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
		SILTY SAND TILL - continued	84.38	12	72 (N Value)	20 (Natural Moisture Content %)		
		- some clay		13				
				14	85 (N Value)	30 (Natural Moisture Content %)		
			81.1	15				
		END OF BOREHOLE						

NOTES:
1. Groundwater monitoring well installed to about 7.6 m depth.

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	4.50	
November 1, 2022	4.50	

Log of BH/MW3-S

Project No. BRM-21003722-C0 Drawing No. 7

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: October 17, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		FILL	96.44	0
			94.9	1
		SILTY CLAY		2
				3
				4
				5
			90.3	6
		END OF BOREHOLE		

NOTES:
1. Groundwater monitoring well installed to about 6.1 m depth.
2. For subsurface conditions, see BH/MW3-D for details.

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
October 26, 2022	DRY	
November 1, 2022	DRY	

Log of BH/MW101

Project No. BRM-21003722-C0 Drawing No. 8

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 13to14, 2022

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 100mm thick asphalt	96.46	0
		~ 100 mm thick granular, brown, moist		
		FILL: sandy silt, some gravel, some clay; brown, moist, slight odour	95.7	
		SILT: trace to some clay, trace sand, trace sand pockets; brown, moist, compact, no odour or staining	95.1	1
		NO SAMPLING CARRIED OUT		2
				3
				4
				5
			90.4	6
		SILTY SAND TILL: trace clay, trace gravel, trace sand seams; brown, wet, compact to dense, no odour or staining		7
				8
				9
				10
		- grey, very dense		11
				12

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES: 12, 24, 34, 23, 43, 74

Natural Unit Weight kN/m³

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

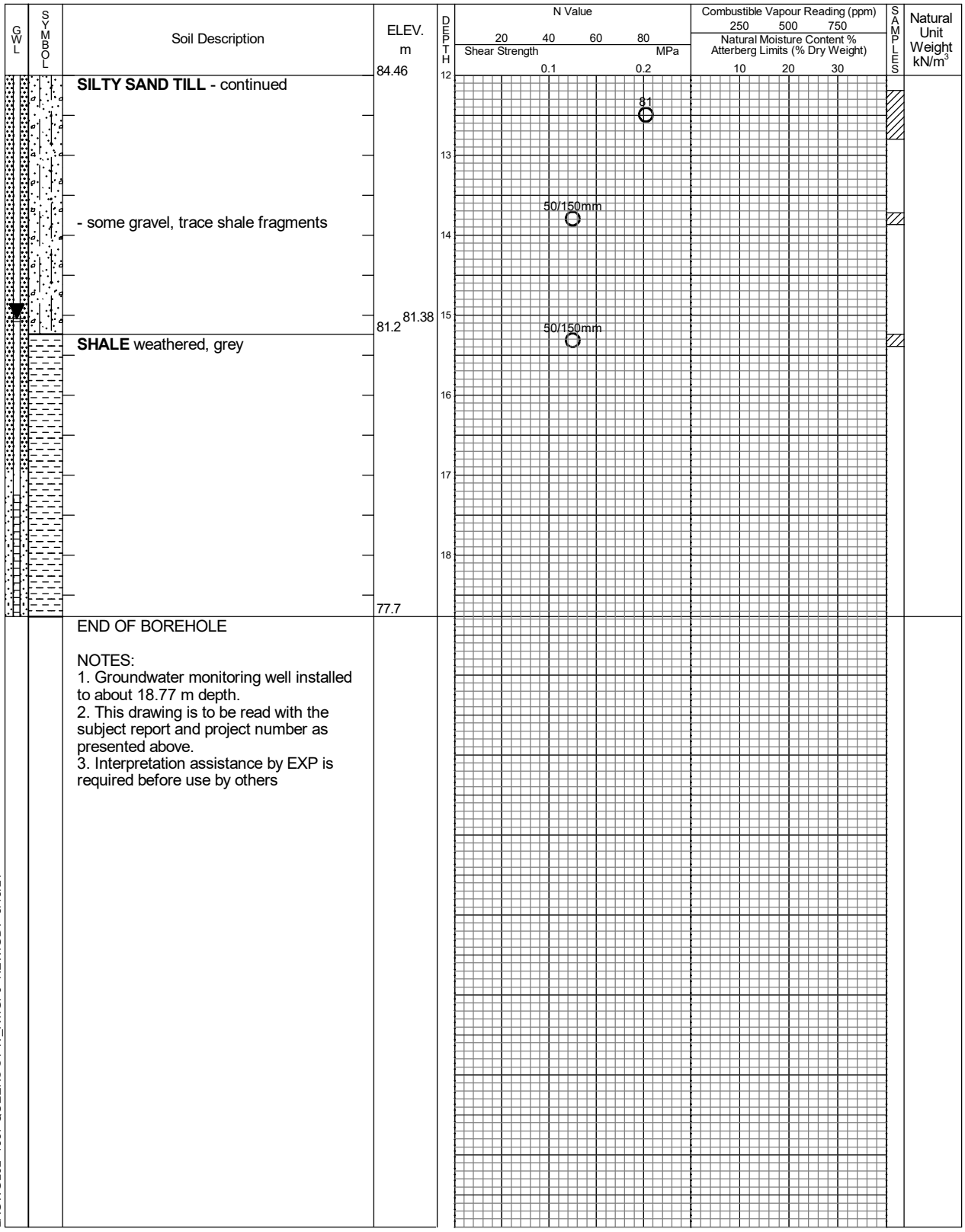
Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion March 13, 2024	N/A 15.08	

Log of BH/MW101

Project No. BRM-21003722-C0 Drawing No. 8

Project: Geotechnical Investigation Sheet No. 2 of 2



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 13, 2024	15.08	

Log of BH/MW102

Project No. BRM-21003722-C0 Drawing No. 9

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 15, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 150mm thick asphalt ~ 200 mm granular, brown, moist **FILL:** clayey silt, some sand, some gravel, trace brick fragments; brown to grey, very moist, no odour or staining	96.29	0
			94.2	2
		NO SAMPLING CARRIED OUT		
▼			90.17	6
				12

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

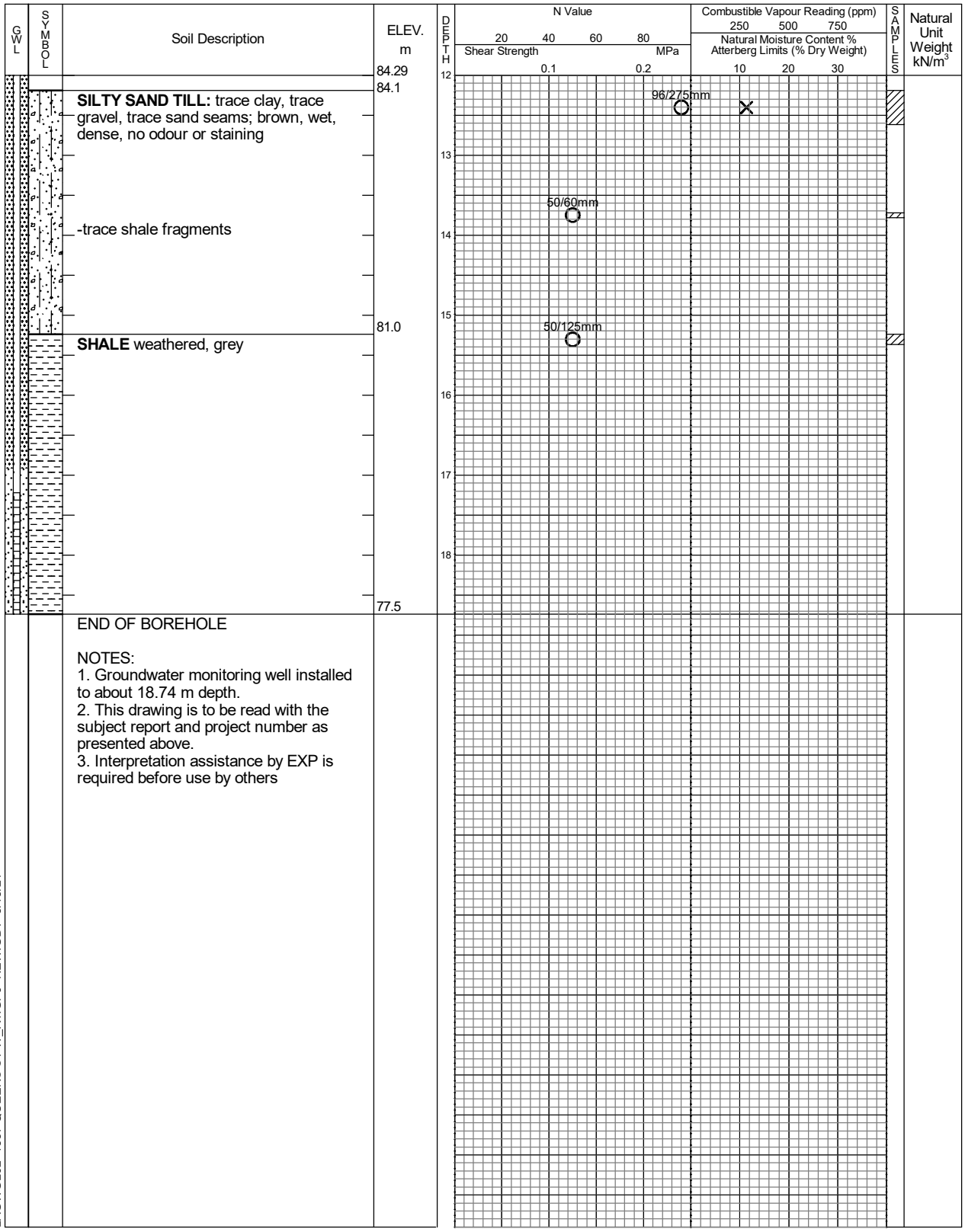
Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 11, 2024	6.12	

Log of BH/MW102

Project No. BRM-21003722-C0 Drawing No. 9

Project: Geotechnical Investigation Sheet No. 2 of 2



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 11, 2024	6.12	

Log of BH/MW103

Project No. BRM-21003722-C0 Drawing No. 10

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 21, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		NO SAMPLING CARRIED OUT	96.41	0
			89.20	7
		SILTY SAND TILL: trace clay, trace gravel, trace sand seams; brown, wet, dense, no odour or staining	88.8	
			87.4	9
		NO SAMPLING CARRIED OUT		

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES: 79, 90

Natural Unit Weight kN/m³

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 11, 2024	7.21	

Log of BH/MW103

Project No. BRM-21003722-C0 Drawing No. 10

Project: Geotechnical Investigation Sheet No. 2 of 2

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		NO SAMPLING CARRIED OUT - continued	84.41	12
				13
				14
				15
			81.2	
		SHALE weathered, grey		16
				17
				18
			78.0	
		END OF BOREHOLE NOTES: 1. Groundwater monitoring well installed to about 18.4 m depth. 2. This drawing is to be read with the subject report and project number as presented above. 3. Interpretation assistance by EXP is required before use by others.		

N Value: 20 40 60 80

Shear Strength: 0.1 0.2 MPa

50/100mm

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 11, 2024	7.21	

Log of BH/MW104

Project No. BRM-21003722-C0 Drawing No. 11

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

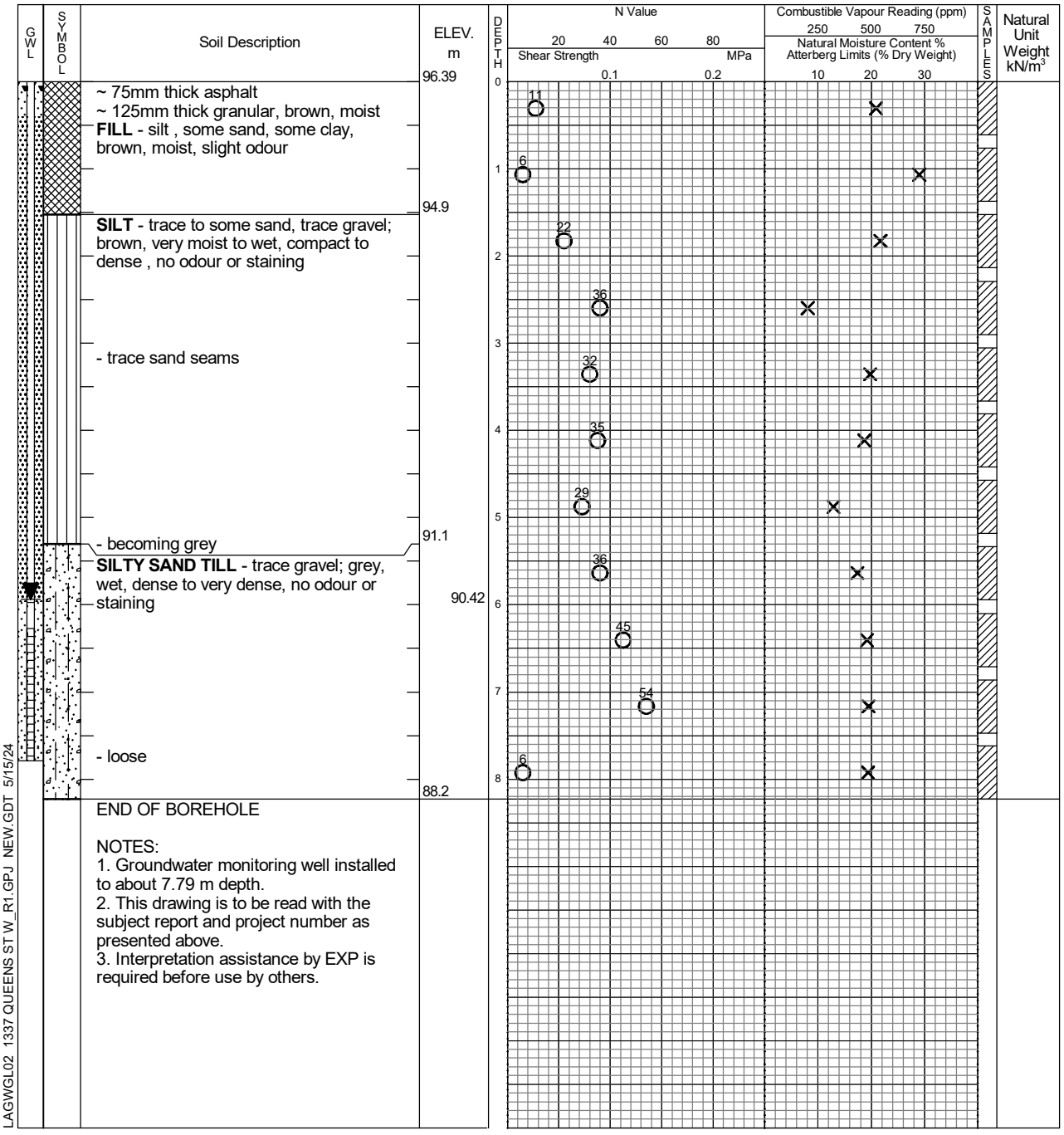
Date Drilled: Feb 20, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 12, 2024	5.97	

Log of BH/MW105

Project No. BRM-21003722-C0 | Drawing No. 12

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 20, 2024

Drill Type: CME75 Truck Mount

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 100mm thick asphalt ~ 152mm thick granular, brown, moist **FILL** - clayey silt, trace some sand, trace gravel, brown, moist, no odour or staining	96.46	0
		SILT - some sand; brown, moist to wet, compact to dense , no odour or staining	94.9	1
		- very dense	91.9	2
		SAND AND SILT - trace clay; brown, moist to wet, compact to dense , no odour or staining - becoming grey and wet	90.5	3
		SILTY SAND TILL - trace gravel; grey, wet, dense, no odour or staining	90.43	4
		END OF BOREHOLE NOTES: 1. Groundwater monitoring well installed to about 8.54 m depth. 2. This drawing is to be read with the subject report and project number as presented above. 3. Interpretation assistance by EXP is required before use by others.	87.9	5

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

N Value: 9, 6, 18, 30, 43, 52, 34, 29, 41, 47, 39

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 12, 2024	6.03	

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Log of BH106

Project No. BRM-21003722-C0 Drawing No. 13

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 12, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 75mm thick asphalt ~ 152mm thick granular, brown, moist **FILL:** sandy silt, trace clay, trace gravel and wood fragments; brown, moist	96.38	0
		SILT: trace to some clay, trace sand; brown, moist, dense, no odour or staining	94.9	1
		SILTY SAND TILL: trace clay, trace gravel, trace sand seams; grey, wet, dense, no odour or staining	90.3	6
		- very dense	86.8	9
		END OF BOREHOLE NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others.		

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa

Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

11
14
39
39
36
33
34
35
36
48
33
98/225mm
75/275mm

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	

Log of BH/MW107

Project No. BRM-21003722-C0 | Drawing No. 14

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 13, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 100mm thick asphalt ~ 100mm thick granular, brown, moist **FILL:** clayey silt, some sand, some gravel; brown to grey, very moist, no odour or staining	96.32	0
		SILT: trace to some clay, trace sand, trace sand pockets; brown, moist, compact, no odour or staining - becoming grey	94.0	2
		SILTY SAND TILL: trace clay, trace gravel, trace sand seams; brown, wet, compact to dense, no odour or staining - loose	91.7 90.20	4 6
		END OF BOREHOLE NOTES: 1. Groundwater monitoring well installed to about 9.03 m depth. 2. This drawing is to be read with the subject report and project number as presented above. 3. Interpretation assistance by EXP is required before use by others.	86.6	9

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

14 8 17 25 26 27 31 32 5 41 41 38 21

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 13, 2024	6.12	

Log of BH108

Project No. BRM-21003722-C0 Drawing No. 15

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 20, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 100mm thick asphalt	96.19	0
		FILL - sandy fill, trace clay, trace some sand, trace gravel, trace black staining, trace some rock fragments, brown, moist, no odour or staining	94.7	1
		SILT - trace fine sand, brown, moist to very moist, compact, no odour or staining	92.5	2
		END OF BOREHOLE NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others.		3

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

37
6
23
26
27

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Log of BH/MW109

Project No. BRM-21003722-C0 Drawing No. 16

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

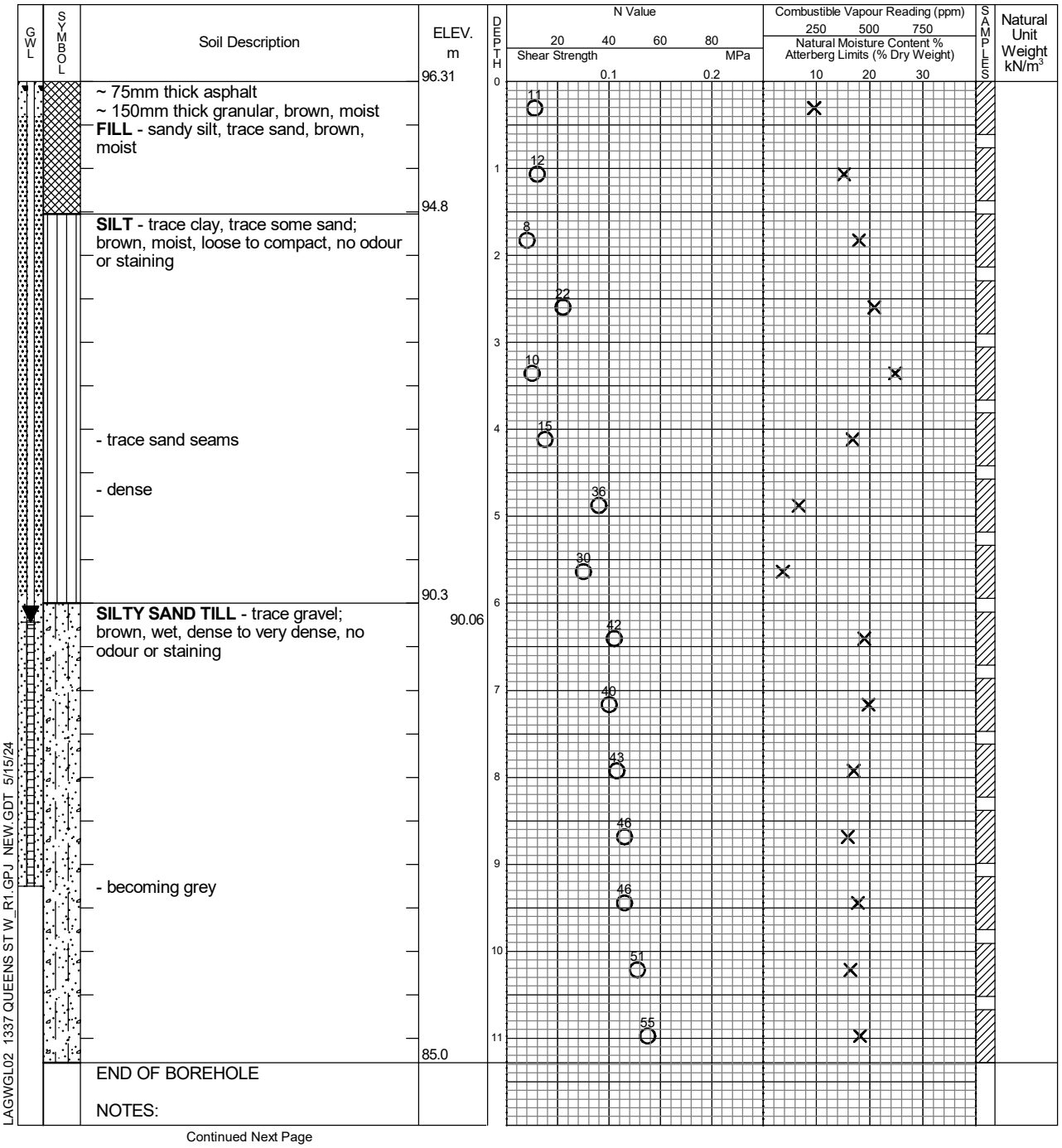
Date Drilled: Feb 22, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion March 12, 2024	N/A 6.25	

Log of BH/MW109

Project No. BRM-21003722-C0 Drawing No. 16

Project: Geotechnical Investigation Sheet No. 2 of 2

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (MPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
		1. Groundwater monitoring well installed to about 9.25 m depth. 2. This drawing is to be read with the subject report and project number as presented above. 3. Interpretation assistance by EXP is required before use by others.	84.31		N Value: 20 40 60 80 Shear Strength: 0.1 0.2 MPa	250 500 750 10 20 30		

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 12, 2024	6.25	

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Log of BH/MW110

Project No. BRM-21003722-C0 | Drawing No. 17

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

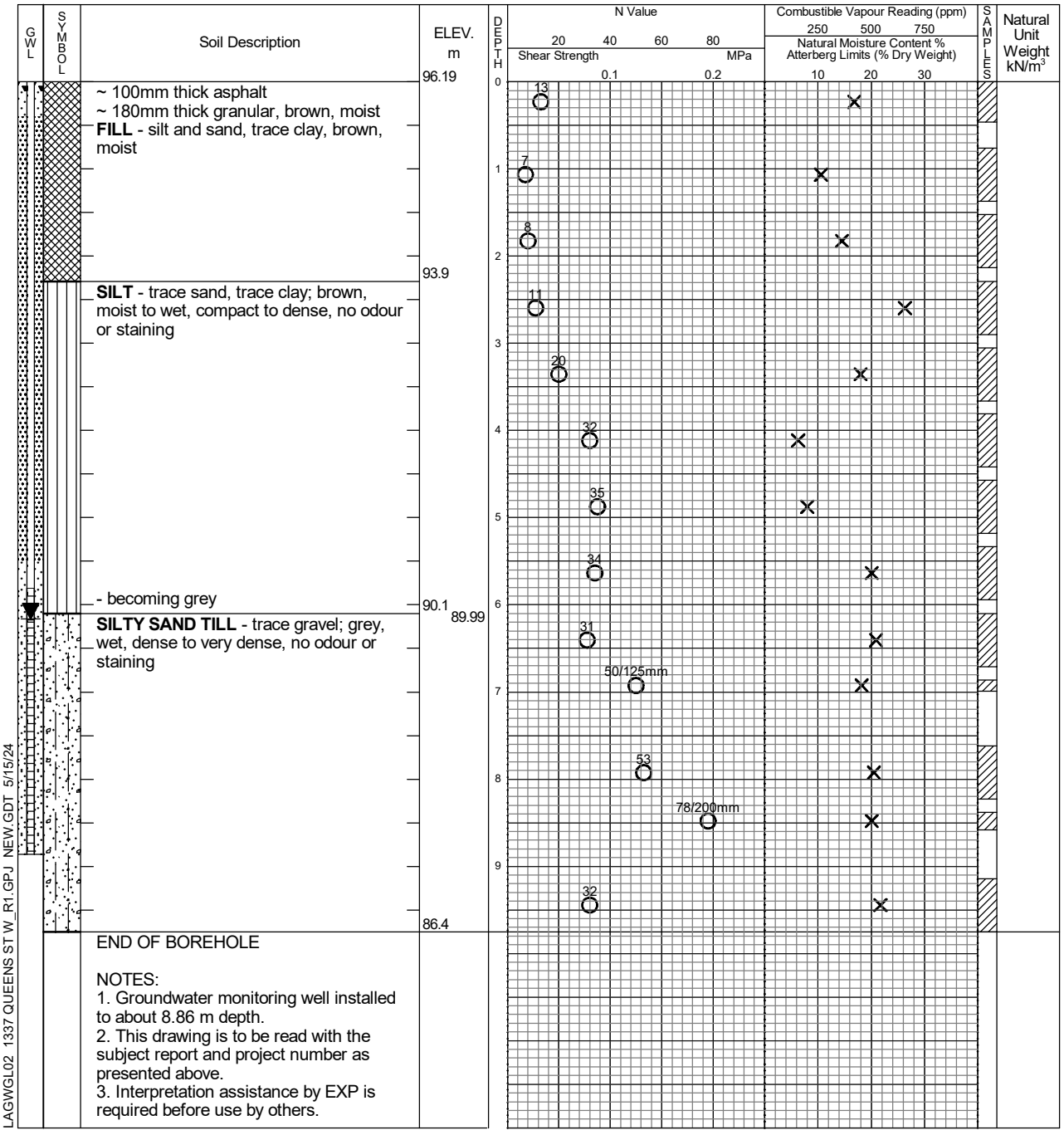
Date Drilled: Feb 22, 2024

Drill Type: CME75 Truck Mount

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



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 12, 2024	6.2	

Log of BH/MW111

Project No. BRM-21003722-C0 | Drawing No. 18

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 13, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 100mm thick asphalt ~ 180mm thick granular, brown, moist **FILL:** sandy silt, trace gravel, brown, moist	96.57	0
		SILT: trace to some clay, trace sand, trace sand pockets; brown, moist, compact, no odour or staining	94.3	1
		SILTY SAND TILL: trace clay, trace gravel, trace sand seams; brown, wet, dense to very dense, no odour or staining	90.5	2
		- very dense	90.05	3
		END OF BOREHOLE NOTES: 1. Groundwater monitoring well installed to about 8.92 m depth. 2. This drawing is to be read with the subject report and project number as presented above. 3. Interpretation assistance by EXP is required before use by others.	86.8	4

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

7
5
7
32
37
36
45
40
43
37
41
68/290mm
4

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 12, 2024	6.52	

Log of BH112

Project No. BRM-21003722-C0 Drawing No. 19

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 12, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 125mm thick asphalt ~ 100mm thick granular, brown, moist **FILL:** sandy silt, trace clay and gravel; brown, no odour or staining	96.44	0
		SILT: trace sand, trace gravel; brown, very moist to wet, dense, no odour or staining - becoming grey	94.2	2
		SILTY SAND TILL: trace clay, trace gravel; grey, wet, dense to very dense, no odour or staining - compact	91.0	5
		END OF BOREHOLE NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others.	86.7	9

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa

Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

N Value: 11, 7, 10, 41, 41, 43, 40, 59, 45, 37, 18, 77, 45

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	

Log of BH/MW113

Project No. BRM-21003722-C0 Drawing No. 20

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

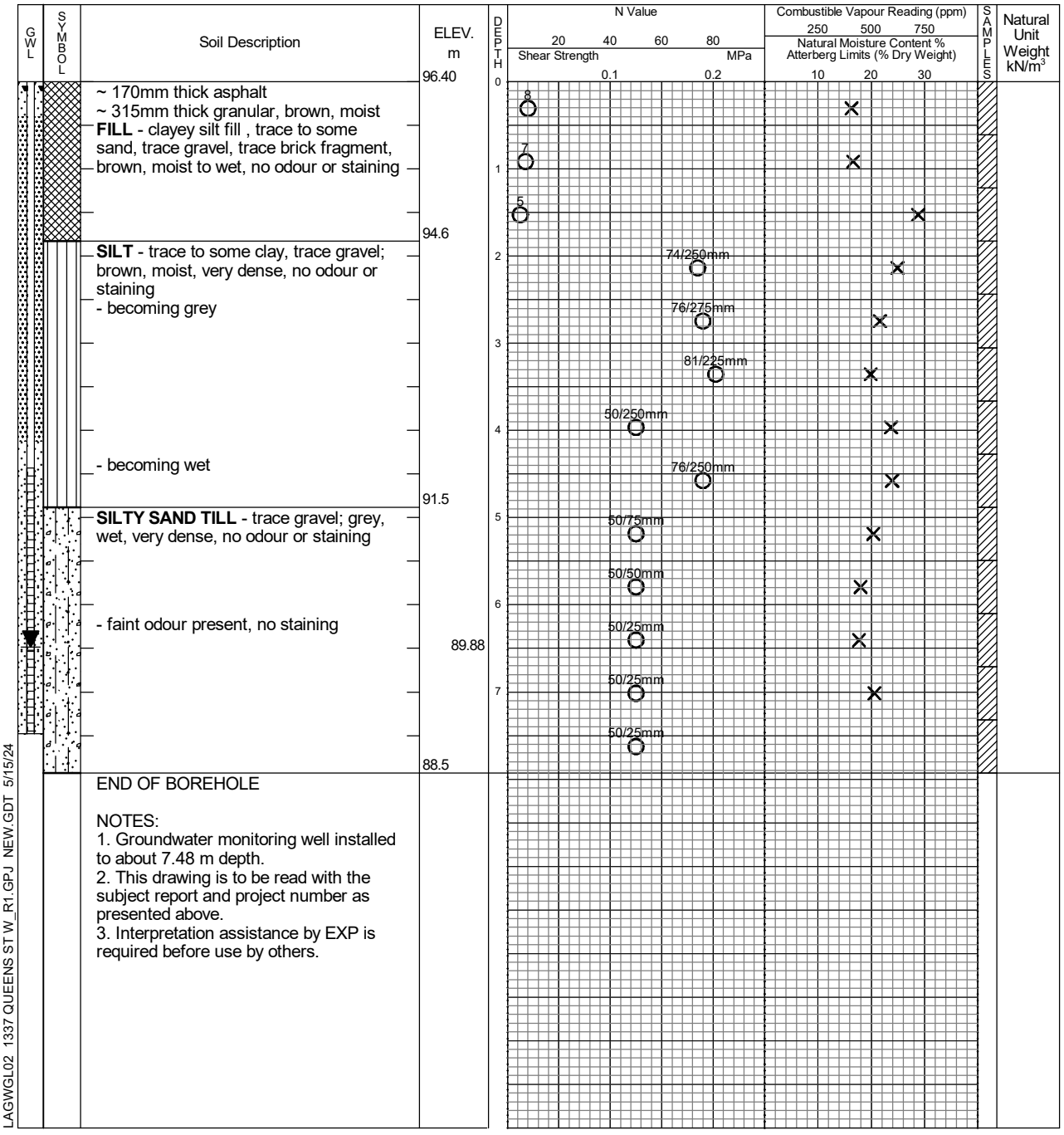
Date Drilled: Feb 12, 2024

Drill Type: Hilti Drill

Datum: Geodetic

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

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



LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 12, 2024	6.52	

Log of BH/MW114

Project No. BRM-21003722-C0 Drawing No. 21

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

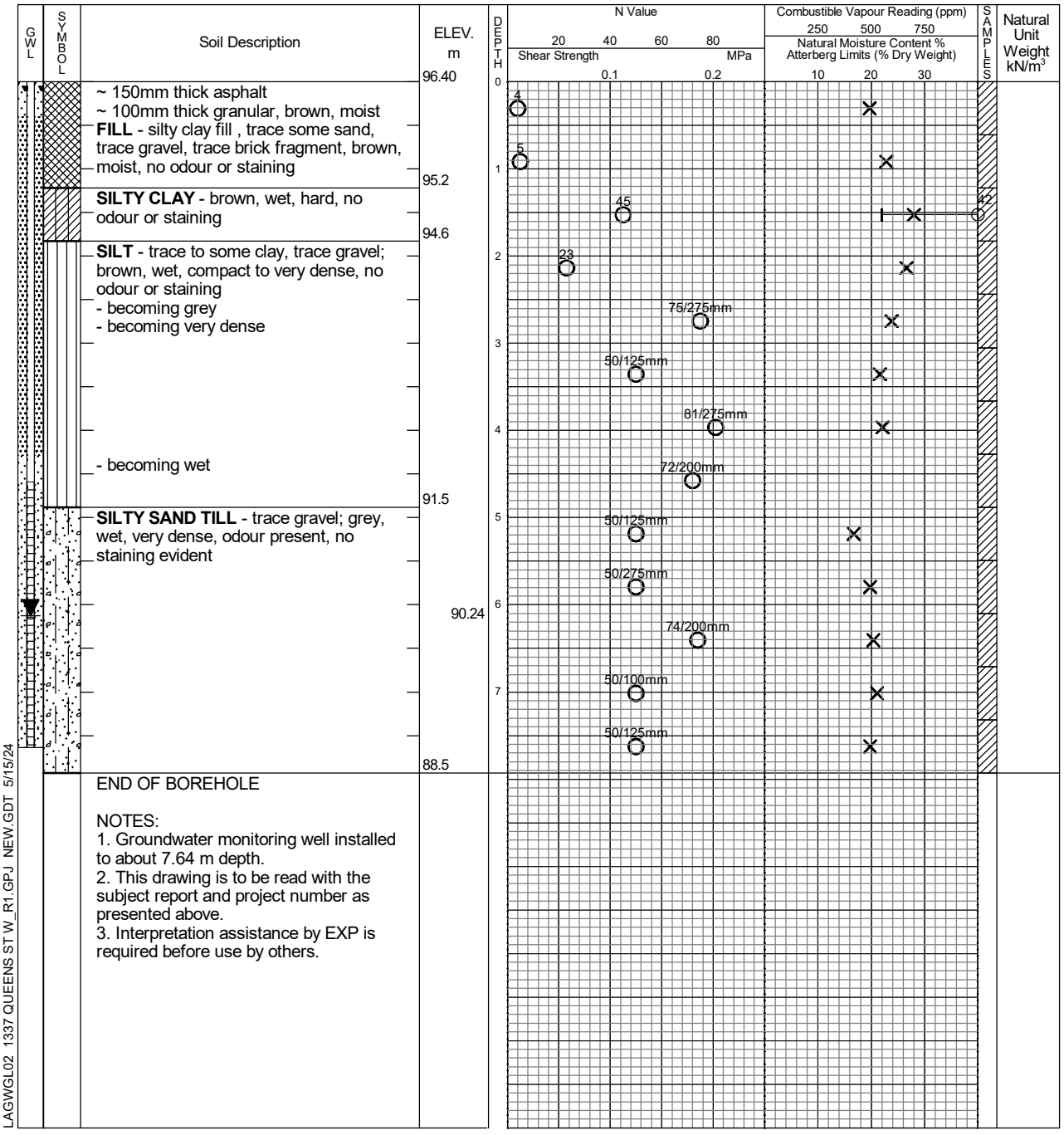
Date Drilled: Feb 13, 2024

Drill Type: Hilti Drill

Datum: Geodetic

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

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



NOTES:
1. Groundwater monitoring well installed to about 7.64 m depth.
2. This drawing is to be read with the subject report and project number as presented above.
3. Interpretation assistance by EXP is required before use by others.

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
March 13, 2024	6.16	

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Log of BH115

Project No. BRM-21003722-C0 Drawing No. 22

Project: Geotechnical Investigation Sheet No. 1 of 1

Location: 1337 Queen Street West, Toronto, Ontario Refer to Borehole Location Plan

Date Drilled: Feb 12, 2024

Drill Type: CME75 Truck Mount

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 150mm thick asphalt ~ 150mm thick granular, brown, moist **FILL:** sandy silt, trace clay and gravel, moist	96.57	0
		SILT: trace clay, trace sand, trace gravel; brown, moist, dense, no odour or staining	94.3	1
		- trace sand seams		2
				3
				4
				5
			90.5	6
		SILTY SAND TILL: trace clay, trace gravel; grey, wet, dense, no odour or staining		7
		- compact		8
		- very dense		9
			87.0	
		END OF BOREHOLE NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others.		

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa

Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

12
7
17
36
38
34
42
34
35
46
30
28
67/275mm

LAGWGL02 1337 QUEENS ST W_R1.GPJ NEW.GDT 5/15/24

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	

Appendix A

Particle Size Analysis / Atterberg Limit Testing 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.: 408981-1 **Report No.:** 1 **Date Reported:** 04-Nov-22

Project No.: brm-21003722-a0 b103
Project Name: 1337 Queen Street West, Toronto, Ontario

Grain Size Proportion (%)

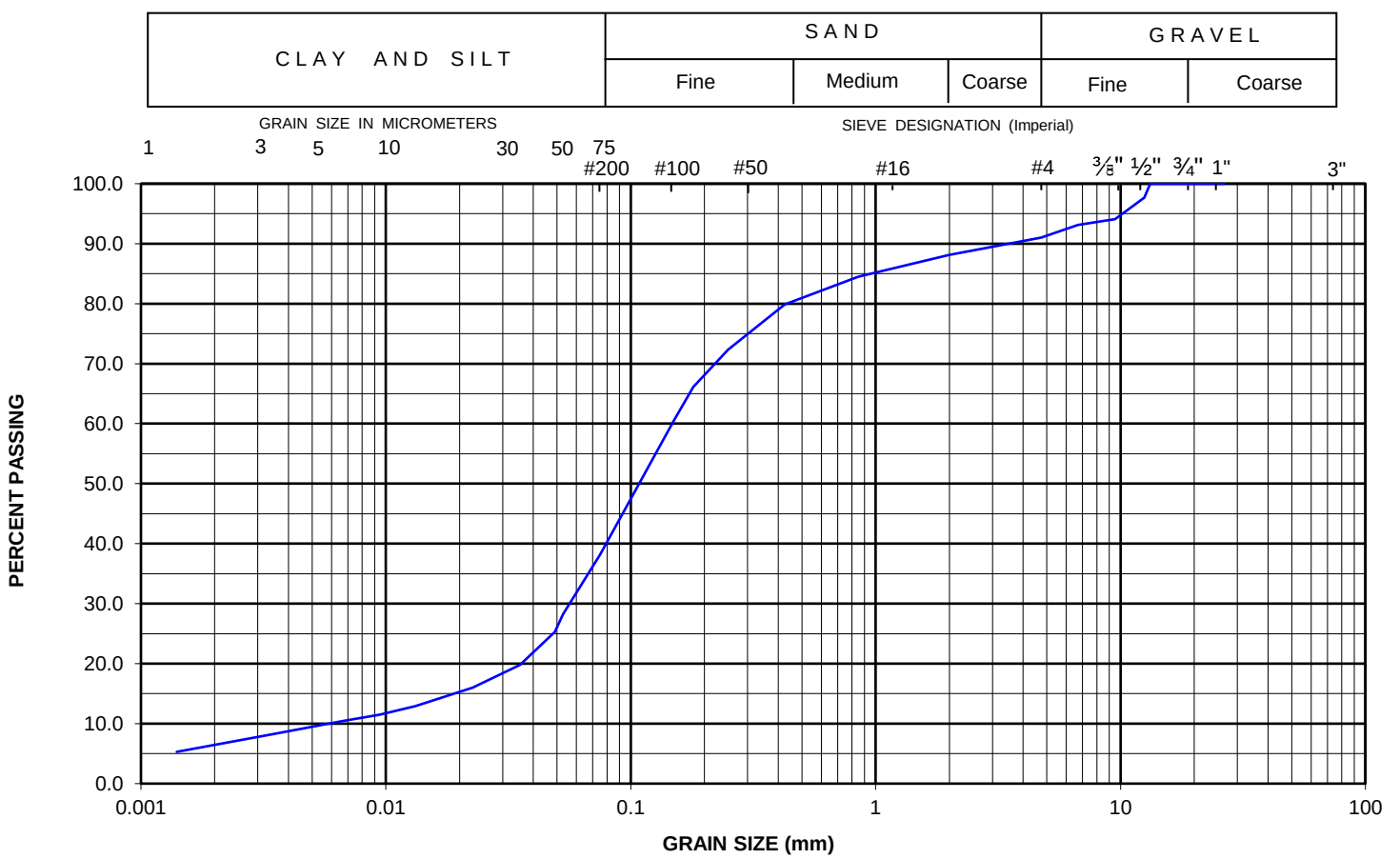
Gravel (> 4.75mm):	**9.0**
Sand (> 75µm, < 4.75mm):	**52.8**
Silt (> 2µm), < 75µm):	**32.0**
Clay (< 2µm):	**6.2**
Total:	**100.0**

Sample Information

Location: BH 1
Sample Method: SS
Sample No.: 11
Depth: 12.2 - 12.8 m
Sample Description: Silty Sand, trace Gravel and Clay; Grey
Sampled By: exp Markham
Sampling Date: 10/28/2022
Date Received: 10/31/2022
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0490**	25.3
22.4	100.0	**0.0353**	19.8
19	100.0	**0.0226**	16.0
16	100.0	**0.0132**	12.9
13.2	100.0	**0.0094**	11.5
12.5	97.7	**0.0066**	10.4
9.5	94.1	**0.0033**	8.1
6.7	93.1	**0.0014**	5.3
4.75	91.0		
2	88.2		
0.85	84.5		
0.425	79.9		
0.25	72.4		
0.18	66.1		
0.15	60.5		
0.075	38.2		
0.053	28.3		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Jennifer Hayman **Approved By:** *Original Signed By*
Arcadio Petrola; C.E.T. **Date Approved:** 04-Nov-22

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.: 408983-1 **Report No.:** 2 **Date Reported:** 04-Nov-22

Project No.: brm-21003722-a0 b103
Project Name: 1337 Queen Street West, Toronto, Ontario

Grain Size Proportion (%)

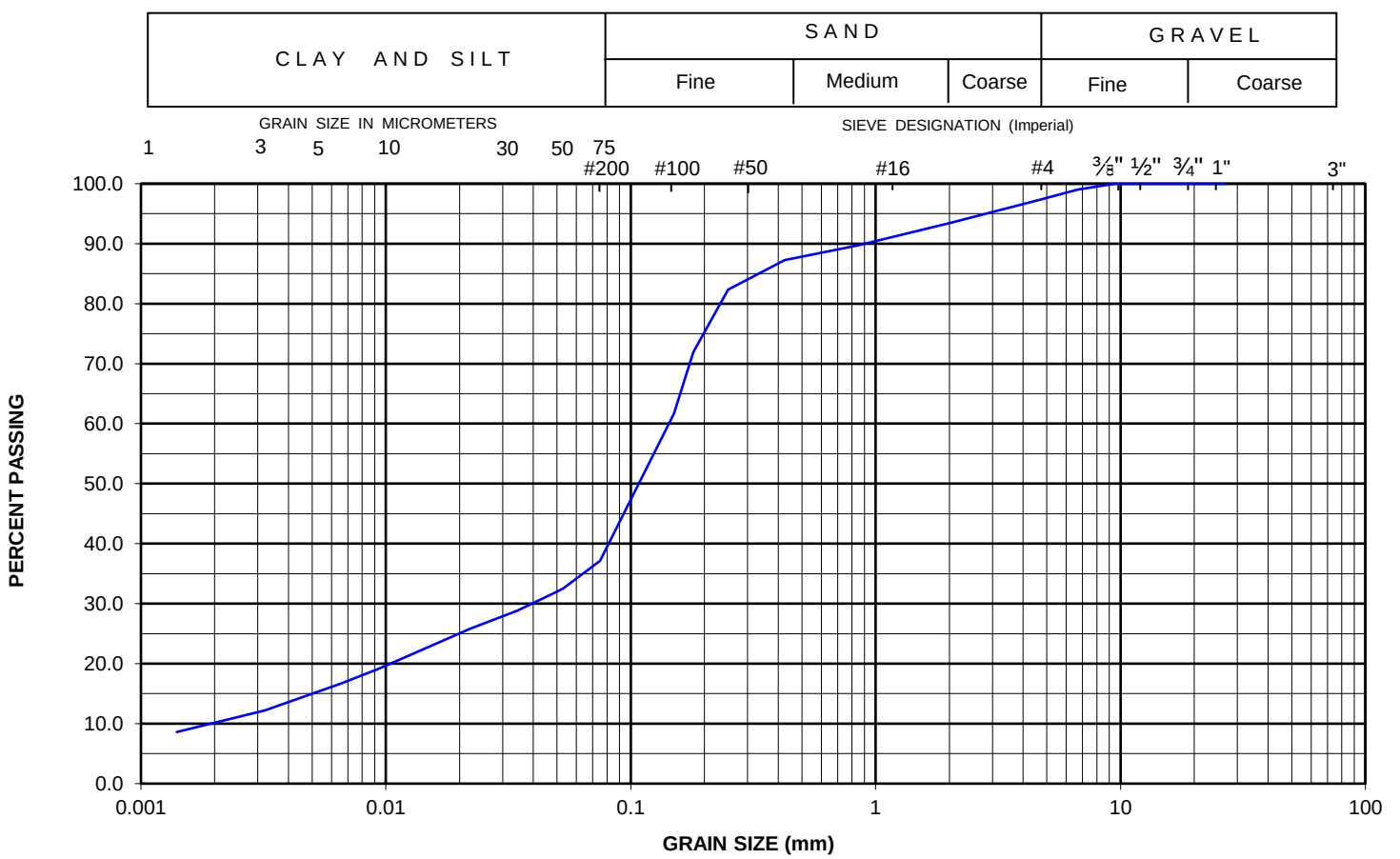
Gravel (> 4.75mm):	**2.6**
Sand (> 75µm, < 4.75mm):	**60.3**
Silt (> 2µm), < 75µm):	**27.3**
Clay (< 2µm):	**9.8**
Total:	**100.0**

Sample Information

Location: BH 2
Sample Method: SS
Sample No.: 8
Depth: 7.6 - 8.2 m
Sample Description: Silty Sand, trace Clay and Gravel; Grey
Sampled By: exp Markham
Sampling Date: 10/28/2022
Date Received: 10/31/2022
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0482**	31.7
22.4	100.0	**0.0344**	28.8
19	100.0	**0.0220**	25.8
16	100.0	**0.0128**	21.6
13.2	100.0	**0.0092**	19.0
12.5	100.0	**0.0065**	16.6
9.5	100.0	**0.0032**	12.2
6.7	99.0	**0.0014**	8.6
4.75	97.4		
2	93.4		
0.85	89.7		
0.425	87.3		
0.25	82.4		
0.18	71.9		
0.15	61.7		
0.075	37.1		
0.053	32.5		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Jennifer Hayman **Approved By:** *Original Signed By* **Date Approved:** 04-Nov-22
Arcadio Petrola; C.E.T.

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.: 408984-1 **Report No.:** 3 **Date Reported:** 04-Nov-22

Project No.: brm-21003722-a0 b103
Project Name: 1337 Queen Street West, Toronto, Ontario

Grain Size Proportion (%)

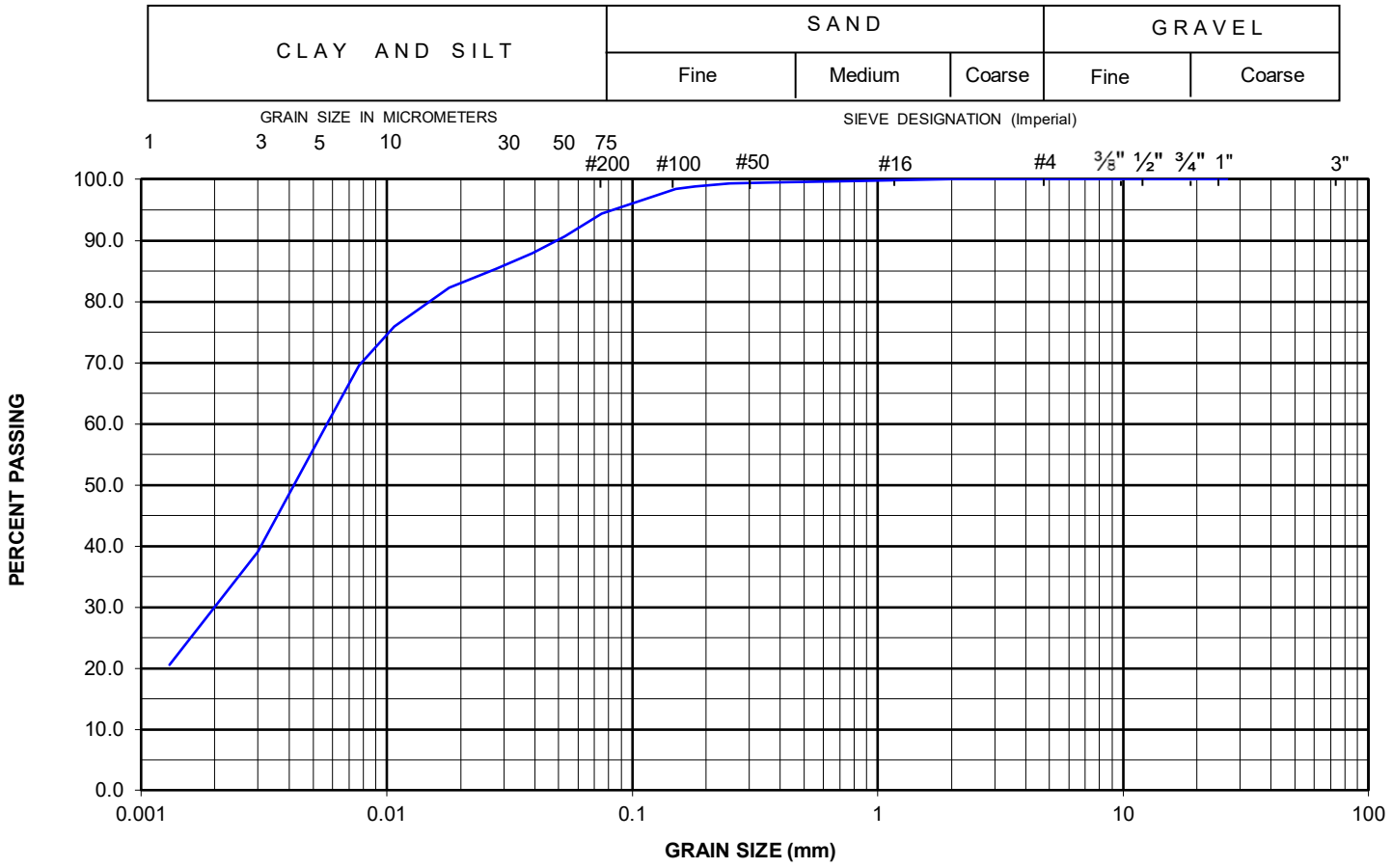
Gravel (> 4.75mm):	
Sand (> 75µm, < 4.75mm):	**5.6**
Silt (> 2µm), < 75µm):	**66.2**
Clay (< 2µm):	**28.2**
Total:	**100.0**

Sample Information

Location: BH 3
Sample Method: SS
Sample No.: 5
Depth: 3.0 - 3.7 m
Sample Description: Clayey Silt, trace Sand; Grey
Sampled By: exp Markham
Sampling Date: 10/28/2022
Date Received: 10/31/2022
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0392**	88.0
22.4	100.0	**0.0280**	85.4
19	100.0	**0.0179**	82.3
16	100.0	**0.0107**	75.9
13.2	100.0	**0.0077**	69.6
12.5	100.0	**0.0057**	60.0
9.5	100.0	**0.0030**	39.1
6.7	100.0	**0.0013**	20.6
4.75	100.0		
2	100.0		
0.85	99.8		
0.425	99.6		
0.25	99.4		
0.18	98.9		
0.15	98.5		
0.075	94.4		
0.053	90.7		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Jennifer Hayman **Approved By:** *Original Signed By* **Date Approved:** 04-Nov-22
Arcadio Petrola; C.E.T.

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

Plasticity Index Test Report

ST03

Project No.: Brm-21003722-A0
Sample Number: 408984-2
Date Sampled: October 28, 2022
Date Received: October 31, 2022

Date Reported: November 15, 2022
Borehole No: BH3 / SS5
Sample Depth:

Liquid Limit

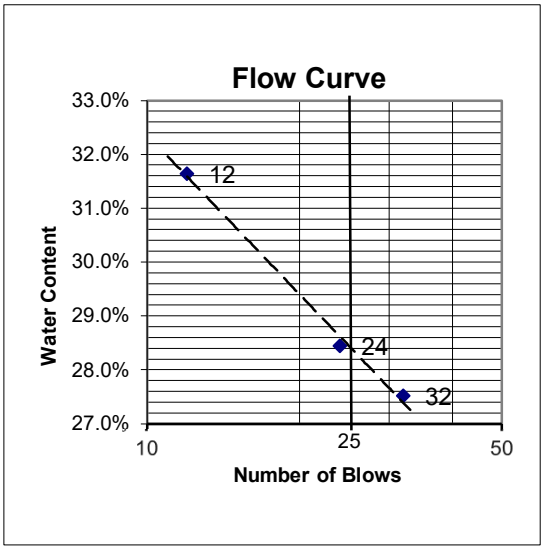
Trial Number	1	2	3	4	5
Number of Blows	32	24	12		
Moisture Tin No.	2	3	13		
Mass of Soil and Tin, g	29.518	31.575	29.711		
Mass of Dry Soil and Tin, g	26.779	28.287	26.577		
Mass of Tin, g	16.826	16.728	16.672		
Mass of Water, g	2.739	3.288	3.134		
Mass of Dry Soil, g	9.953	11.559	9.905		
Water Content	27.5%	28.4%	31.6%		

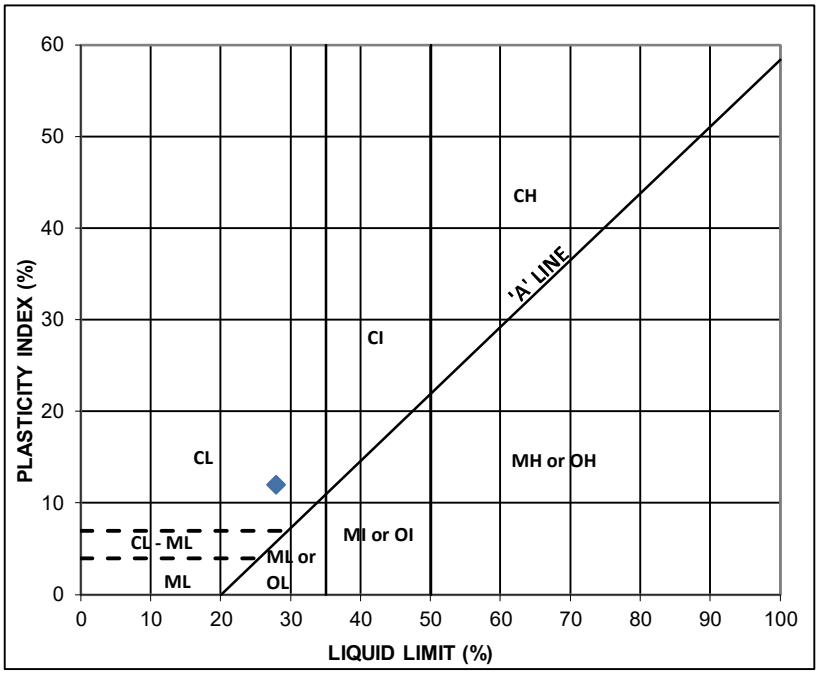
Plastic Limit

Trial Number	1	2	3
Moisture Tin No.	17	18	19
Mass of Soil and Tin, g	29.000	28.680	26.852
Mass of Dry Soil and Tin, g	27.290	26.973	25.329
Mass of Tin, g	16.699	16.496	15.629
Mass of Water, g	1.710	1.707	1.523
Mass of Dry Soil, g	10.591	10.477	9.7
Water Content	16.1%	16.3%	15.7%

Summary of Results

Liquid Limit *(LL)*: 28
Plastic Limit *(PL)*: 16
Plasticity Index *(PI)*: 12
Classification: CL





Tested By:

Checked By: **Arcadio Petrola, CET**
Senior Lab. Technician

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.: 445643-2 **Report No.:** 2 **Date Reported:** 15-May-24

Project No.: gtr-21003722-c0 100
Project Name: Field Work

Grain Size Proportion (%)

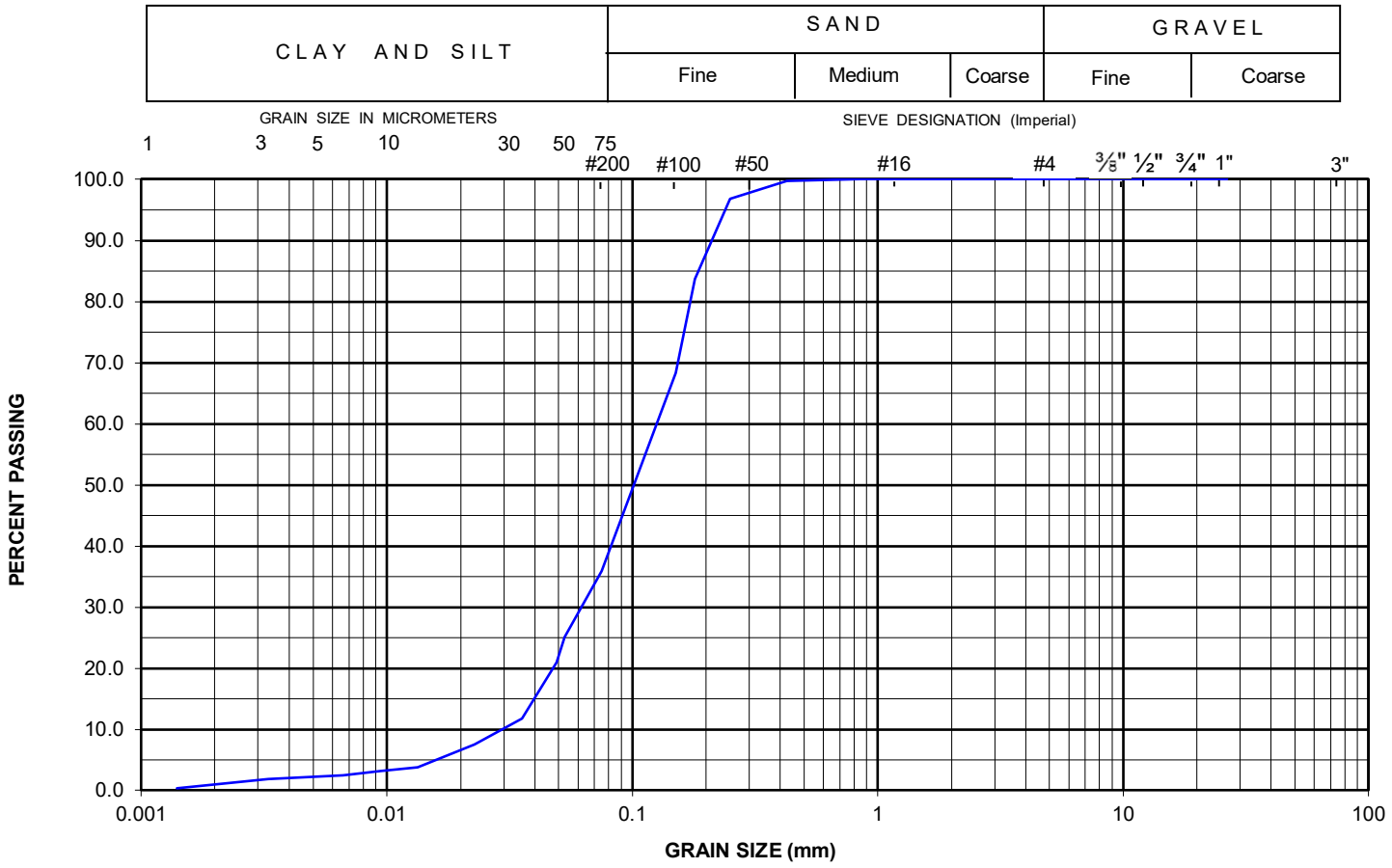
Gravel (> 4.75mm):	
Sand (> 75µm, < 4.75mm):	**64.1**
Silt (> 2µm), < 75µm):	**35.1**
Clay (< 2µm):	**0.8**
Total:	**100.0**

Sample Information

Location:	BH 105
Sample Method:	SS
Sample No.:	7
Depth:	4.6 - 5.2 m
Sample Description:	Sand and Silt, trace Clay; Brown
Sampled By:	exp Markham
Sampling Date:	2/20/2024
Date Received:	4/30/2024
Client Sample ID:	
Comments:	

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0491**	21.0
22.4	100.0	**0.0355**	11.8
19	100.0	**0.0227**	7.6
16	100.0	**0.0133**	3.8
13.2	100.0	**0.0094**	3.2
12.5	100.0	**0.0066**	2.5
9.5	100.0	**0.0033**	1.9
6.7	100.0	**0.0014**	0.3
4.75	100.0		
2	100.0		
0.85	100.0		
0.425	99.8		
0.25	96.8		
0.18	83.7		
0.15	68.4		
0.075	35.9		
0.053	25.1		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Jennifer Hayman **Approved By:** *Original Signed By* **Date Approved:** 15-May-24
Arcadio Petrola, Lab Supervisor

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

Plasticity Index Test Report

ST03

Project No.: Gtr-21003722-C0
Sample Number: 445657-2
Date Sampled: February 22, 2024
Date Received: April 30, 2024

Date Reported: May 6, 2024
Borehole No: BH 109 / SS5
Sample Depth: 3.0 - 3.7 m

Liquid Limit

Trial Number	1	2	3	4	5
Number of Blows					
Moisture Tin No.	10	26	32		
Mass of Soil and Tin, g					
Mass of Dry Soil and Tin, g					
Mass of Tin, g	15.487	16.754	15.624		
Mass of Water, g					
Mass of Dry Soil, g					
Water Content					

Plastic Limit

Trial Number	1		
Moisture Tin No.	9		22
Mass of Soil and Tin, g			
Mass of Dry Soil and Tin, g			
Mass of Tin, g		16.738	16.471
Mass of Water, g			
Mass of Dry Soil, g			
Water Content			

Non - Plastic

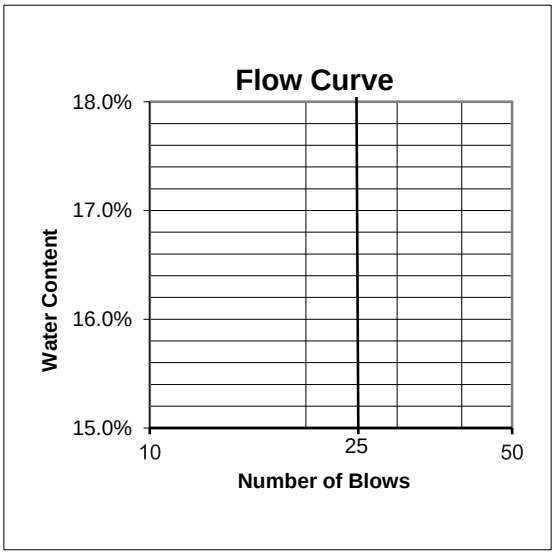
Summary of Results

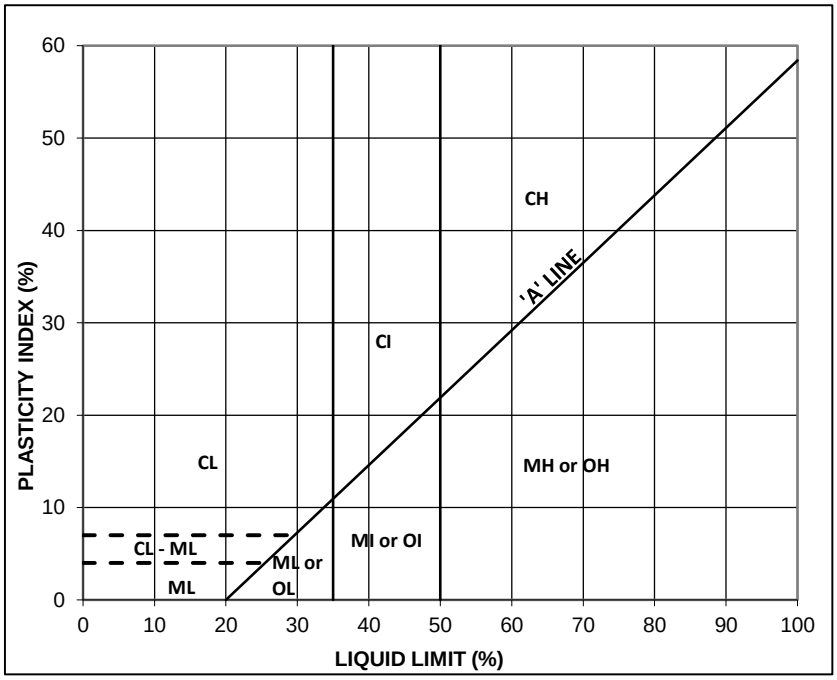
Liquid Limit *(LL)* : *

Plastic Limit *(PL)* : *NP*

Plasticity Index *(PI)* :

Classification:





* The Liquid Limit could not be determine; the soil pat slides in the cup *(N<25)*.

Tested By: **Carlito Picache, C.Tech.**
Lab. Technician

Checked By: **Arcadio Petrola, CET**
Senior Lab. Technician

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.: 445671-3 **Report No.:** 3 **Date Reported:** 15-May-24

Project No.: gtr-21003722-c0 100
Project Name: Field Work

Grain Size Proportion (%)

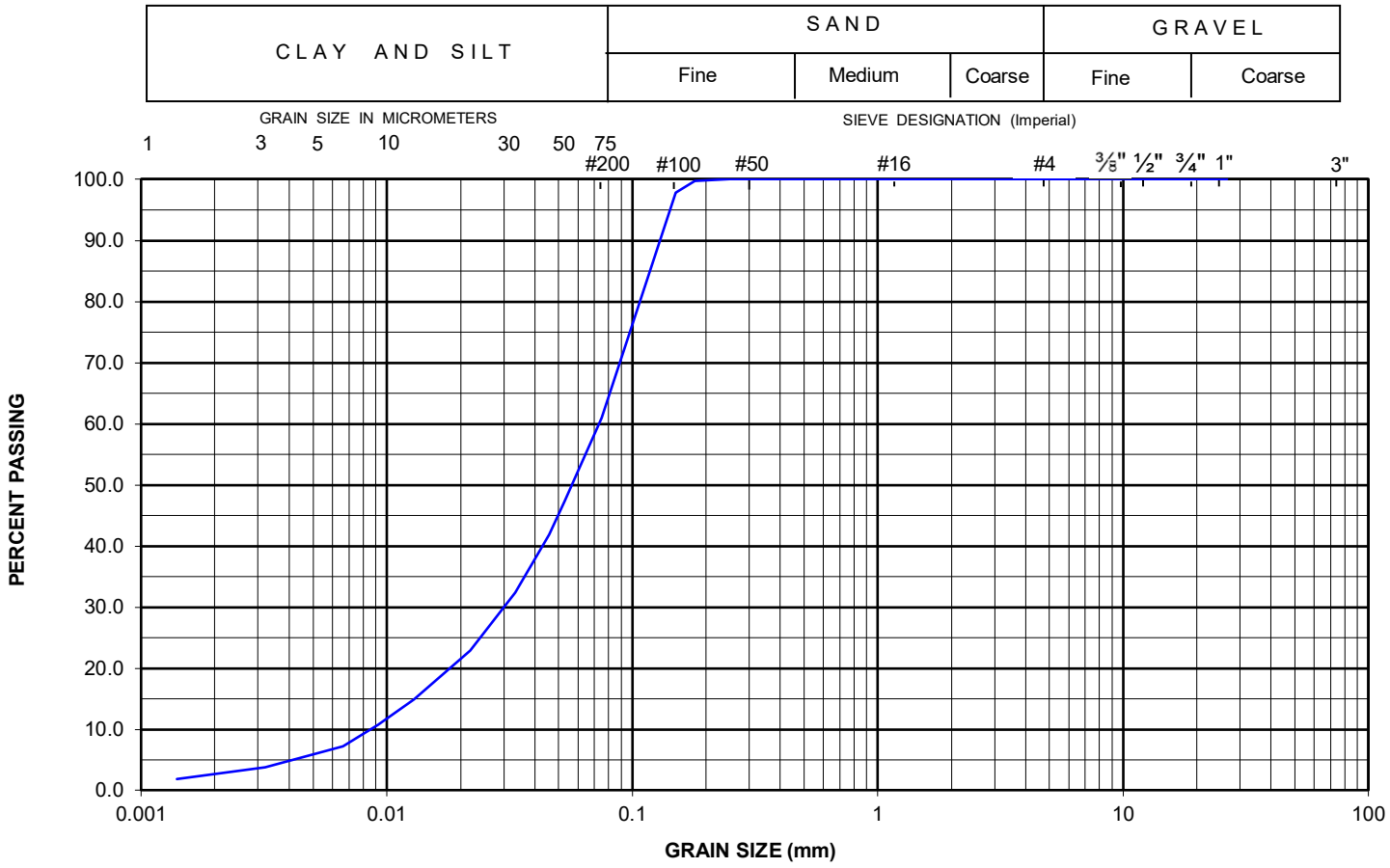
Gravel (> 4.75mm):	
Sand (> 75µm, < 4.75mm):	**39.0**
Silt (> 2µm), < 75µm):	**58.5**
Clay (< 2µm):	**2.5**
Total:	**100.0**

Sample Information

Location:	BH 110
Sample Method:	SS
Sample No.:	3
Depth:	1.5 - 2.1 m
Sample Description:	Silt and Sand, trace Clay; Brown
Sampled By:	exp Markham
Sampling Date:	2/22/2024
Date Received:	4/30/2024
Client Sample ID:	
Comments:	

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0458**	41.9
22.4	100.0	**0.0334**	32.4
19	100.0	**0.0218**	22.9
16	100.0	**0.0129**	14.9
13.2	100.0	**0.0092**	10.8
12.5	100.0	**0.0066**	7.3
9.5	100.0	**0.0032**	3.8
6.7	100.0	**0.0014**	1.9
4.75	100.0		
2	100.0		
0.85	100.0		
0.425	100.0		
0.25	100.0		
0.18	99.8		
0.15	97.9		
0.075	61.0		
0.053	47.4		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Jennifer Hayman **Approved By:** *Original Signed By* **Date Approved:** 15-May-24
Arcadio Petrola, Lab Supervisor

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

Plasticity Index Test Report

ST03

Project No.: Gtr-21003722-C0
Sample Number: 445696-2
Date Sampled: February 13, 2024
Date Received: April 30, 2024

Date Reported: May 6, 2024
Borehole No: BH 114 / SS3
Sample Depth: 1.2 - 1.8 m

Liquid Limit

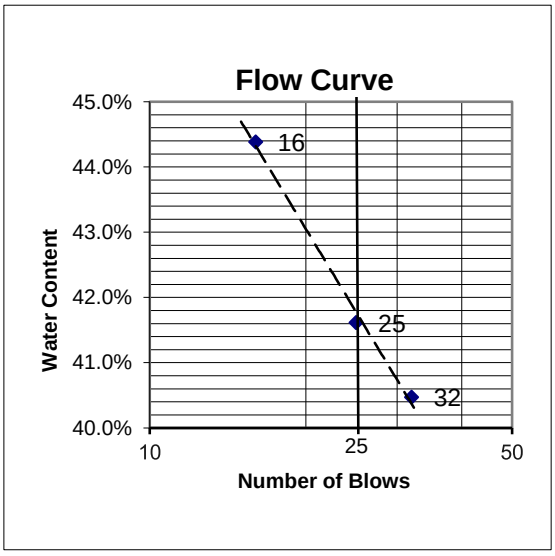
Trial Number	1	2	3	4	5
Number of Blows	32	25	16		
Moisture Tin No.	7	17	27		
Mass of Soil and Tin, g	31.605	32.264	29.311		
Mass of Dry Soil and Tin, g	27.339	27.690	24.960		
Mass of Tin, g	16.799	16.699	15.157		
Mass of Water, g	4.266	4.574	4.351		
Mass of Dry Soil, g	10.540	10.991	9.803		
Water Content	40.5%	41.6%	44.4%		

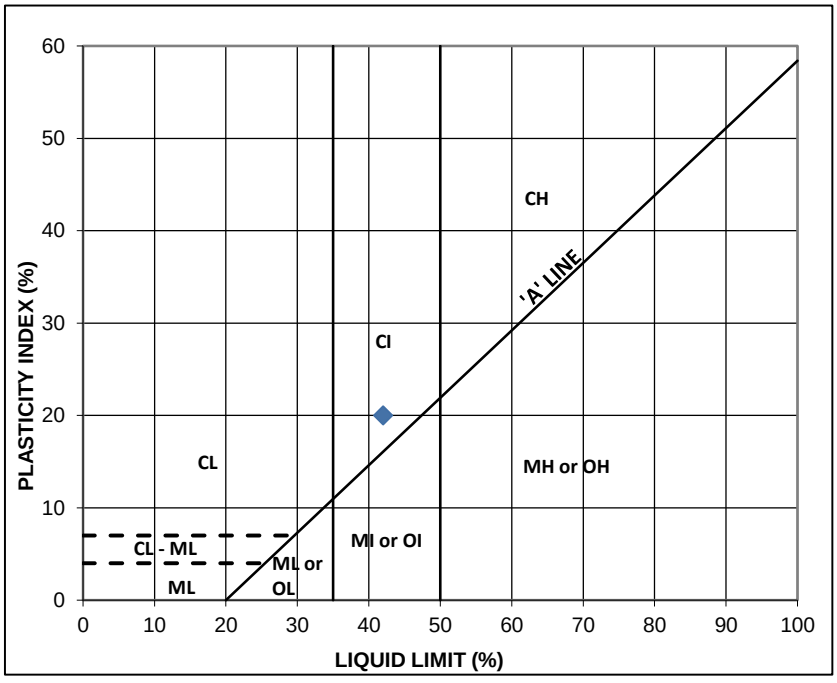
Plastic Limit

Trial Number	1	2	3
Moisture Tin No.	1	14	32
Mass of Soil and Tin, g	33.006	33.066	31.390
Mass of Dry Soil and Tin, g	30.079	30.127	28.567
Mass of Tin, g	16.763	16.678	15.564
Mass of Water, g	2.927	2.939	2.823
Mass of Dry Soil, g	13.316	13.449	13.003
Water Content	22.0%	21.9%	21.7%

Summary of Results

Liquid Limit *(LL)* : 42
Plastic Limit *(PL)* : 22
Plasticity Index *(PI)* : 20
Classification: **CI**





Tested By: **Carlito Picache, C.Tech.**
Lab. Technician

Checked By: **Arcadio Petrola, CET**
Senior Lab. Technician

Appendix B

pH and Sulphate Chemical Testing Results

Your Project #: GTR-21003722-C0
Site Location: 1337 QUEEN ST W, TORONTO, ON
Your C.O.C. #: N/A

Attention: Raymond Yan

Exp Services Inc
Markham Branch
220 Commerce Valley Dr W
Suite 500
Markham, ON
CANADA L3T 0A8

Report Date: 2024/05/08
Report #: R8140267
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4D1965
Received: 2024/05/02, 16:14

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
pH CaCl2 EXTRACT	2	2024/05/07	2024/05/07	CAM SOP-00413	EPA 9045 D m
Sulphate (20:1 Extract)	2	2024/05/07	2024/05/08	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 #: GTR-21003722-C0
Site Location: 1337 QUEEN ST W, TORONTO, ON
Your C.O.C. #: N/A

Attention: Raymond Yan

Exp Services Inc
Markham Branch
220 Commerce Valley Dr W
Suite 500
Markham, ON
CANADA L3T 0A8

Report Date: 2024/05/08
Report #: R8140267
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4D1965
Received: 2024/05/02, 16:14

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 #: C4D1965
Report Date: 2024/05/08

Exp Services Inc
Client Project #: GTR-21003722-C0
Site Location: 1337 QUEEN ST W, TORONTO, ON
Sampler Initials: JW

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		ZBK199		ZBK199		ZBK200		
Sampling Date		2024/02/20 15:00		2024/02/20 15:00		2024/02/12 15:00		
COC Number		N/A		N/A		N/A		
	UNITS	**BH105 SS5**	**QC Batch**	**BH105 SS5 Lab-Dup**	**QC Batch**	**BH113 SS5**	**RDL**	**QC Batch**
Inorganics								
Available (CaCl2) pH	pH	7.82	9377267			7.71		9377267
Soluble (20:1) Sulphate (SO4)	ug/g	160	9377151	190	9377151	420	20	9377151

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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 #: C4D1965
Report Date: 2024/05/08

Exp Services Inc
Client Project #: GTR-21003722-C0
Site Location: 1337 QUEEN ST W, TORONTO, ON
Sampler Initials: JW

TEST SUMMARY

Bureau Veritas ID: ZBK199
Sample ID: BH105 SS5
Matrix: Soil

Collected: 2024/02/20
Shipped:
Received: 2024/05/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	9377267	2024/05/07	2024/05/07	Kien Tran
Sulphate (20:1 Extract)	SKAL/EC	9377151	2024/05/07	2024/05/08	Alina Dobreanu

Bureau Veritas ID: ZBK199 Dup
Sample ID: BH105 SS5
Matrix: Soil

Collected: 2024/02/20
Shipped:
Received: 2024/05/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate (20:1 Extract)	SKAL/EC	9377151	2024/05/07	2024/05/08	Alina Dobreanu

Bureau Veritas ID: ZBK200
Sample ID: BH113 SS5
Matrix: Soil

Collected: 2024/02/12
Shipped:
Received: 2024/05/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	9377267	2024/05/07	2024/05/07	Kien Tran
Sulphate (20:1 Extract)	SKAL/EC	9377151	2024/05/07	2024/05/08	Alina Dobreanu

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	-0.7°C

Results relate only to the items tested.

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 #: C4D1965
Report Date: 2024/05/08

QUALITY ASSURANCE REPORT

Exp Services Inc
Client Project #: GTR-21003722-C0
Site Location: 1337 QUEEN ST W, TORONTO, ON
Sampler Initials: JW

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9377151	Soluble (20:1) Sulphate (SO4)	2024/05/08	NC	70 - 130	92	70 - 130	<20	ug/g	15	35
9377267	Available (CaCl2) pH	2024/05/07			100	97 - 103			0.10	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.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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 #: C4D1965
Report Date: 2024/05/08

Exp Services Inc
Client Project #: GTR-21003722-C0
Site Location: 1337 QUEEN ST W, TORONTO, ON
Sampler Initials: JW

VALIDATION SIGNATURE PAGE

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

Cristina Carriere

Cristina Carriere, Senior 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.

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

www.BVNA.com

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

CHAIN OF CUSTODY RECORD

ENV COC - 00014v3

NONT-2024-05-264

Invoice Information	Invoice to (requires report) ☐	Report Information (if differs from invoice)		Project Information	
Company:	EXP Services Inc.	Company:		Quotation #:	Stream 3
Contact Name:	Raymond Yan	Contact Name:		P.O. #/ AFE#:	
Street Address:	1595 Clark Boulevard	Street Address:		Project #:	GTR-21003722-C0
City:	Brampton Prov: ON Postal Code: L6T 4V1	City:	Prov: Postal Code:	Site #:	
Phone:	416-897-6333	Phone:		Site Location:	1337 Queen St W, Toronto
Email:	raymond.yan@exp.com	Email:		Site Location Province:	ON
Copies:		Copies:		Sampled By:	James Wong

Regulatory Criteria

REG 153: ☑ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ____ ☑ Res/Park ☑ Ind/Comm ☐ Agri/other ☐ Med/Fine ☑ Course ☐ For RSC

OTHER: ☐ CME ☐ Reg 558* ☐ *min 3 day TAT ☐ MISA ☐ PWQO ☑ Reg 406, Table: 1,2,3 ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ____ ☐ Other:

Include Criteria on Certificate of Analysis (check if yes): ☐

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

	Sample Identification	Date Sampled YY	MM	DD	Time (24hr) HH	MM	Matrix	1 FIELD FILTERED	2 FIELD PRESERVED	3 LAB FILTRATION REQUIRED	4 BTEX/ F1	5 F2 - F4	6 VOCs	7 Reg 406 metals and inorganics	8 Reg 153 ICPMS metals	9 Reg 153 metals (Hg, Cr VI, ICPMS metals, HWS - B)	10 pH & Sulphate	11	12	13	14	15	16	17	18	19	20	21 # OF CONTAINERS SUBMITTED	22 HOLD - DO NOT ANALYZE
1	BH 105 SS5	24	02	20	15	00	S										X											1	
2	BH 113 SS5	24	02	12	15	00	S										X											1	
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													
11																													
12																													

Regular Turnaround Time (TAT)

☑ 5 to 7 Day ☐ 10 Day

Rush Turnaround Time (TAT) Surcharges apply

☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ 4 Day

Date Required: YY MM DD

Comments

*UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS AND CONDITIONS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS OR BY CALLING THE LABORATORY LISTED ABOVE TO OBTAIN A COPY

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present		☑				
Seal intact						
Cooling media present	☑			1	-1	-2

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

Temperature reading by: 1 2 3

	Relinquished by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Received by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Special instructions
1	Raymond Yan	24	04	30	9	00	1 [illegible]	2024	05	02	16	19	
2							2						