517 Plains Road East, Burlington, ON

BryDec Developments Inc.

Type of Document:
Geotechnical Investigation Report

Project Name:
Proposed New Apartment Building
517 Plains Road East, Burlington, Ontario

Project Number:
HAM-25011698-C0

Prepared By:
EXP Services Inc.
1266 South Service Road, Suite C1-1
Stoney Creek, Ontario L8W 5R9
t: +1.905.573.4000
f: +1.905.573.9693

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1. Introduction and Background

This report presents the results of the geotechnical investigation carried out at the site of the proposed development at 517 Plains Road East, Burlington, Ontario. Based on the drawing provided to EXP, it is understood that the proposed development will consist of an 11-storey (plus a mechanical penthouse) mixed use development with two levels of underground parking. New associated paved accesses are also expected. The investigation was authorized by Mr. Bryan Decunha on behalf of BryDec Developments Inc.

The purpose of this investigation was to determine the general subsoil and groundwater conditions at the site by advancing five (5) boreholes and based on an assessment of the factual subsurface data, provide an engineering report containing general geotechnical recommendations pertinent to the proposed construction. EXP also carried out a Phase I Environmental Site Assessment (ESA), Phase II ESA, and hydrogeological study, the results of which are presented under separate covers.

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

1.1 Site Description & Geological Setting

The site is situated at 517 Plains Road East in Burlington and is currently occupied by two (2), one-storey commercial structures (motel) with an associated parking lot. The property is bounded by Mary Street to the north, Plains Road East to the south and commercial developments to the east and west.

Based on the Ontario Geological Survey (OGS) Map 2509, Quaternary Geology, Hamilton Area, and previous investigations undertaken in the vicinity of the site, the overburden at the site predominantly consists of lacustrine outwash sand overlying Halton Till (clay and silt). The underlying bedrock consists of red shale of the Queenston Formation as indicated on the OGS Map 2336, Hamilton Area.

2. Field Investigation

EXP advanced a total of five (5) boreholes at the site, numbered BH-1 to BH-5 on site for geotechnical investigation purposes. The approximate borehole locations are shown on Drawing No. 1 in Appendix A. The boreholes were advanced to depths ranging from approximately 15.9 m to 18.3 m below grade.

The fieldwork for this investigation was carried out between January 27 and February 2, 2026. Drilling and sampling operations were completed by a combination of auger, mud rotary, and split-spoon techniques using track and truck mounted drilling equipment owned and operated by a specialist drilling subcontractor. Prior to the commencement of the drilling, the public and private-owned underground services were located to minimize the risk of contacting any such services during the investigation.

Soil samples were obtained using a 51 mm (2 inch) outside diameter split-spoon sampler driven in conjunction with Standard Penetration Test procedure (ASTM D1586) at the depths noted graphically on the borehole logs. The retained soil samples were logged in the field and then carefully packaged and transported to our Hamilton

laboratory for detailed visual, textural and olfactory classification. The Standard Penetration Test (SPT) N values were recorded and used to provide an assessment of the compactness condition of the in-situ soils.

Groundwater levels within the boreholes were measured prior to starting mud rotary. All boreholes were backfilled upon completion of drilling in accordance with O.Reg. 903 and capped with cold patch asphalt (where applicable).

The boreholes were located in accessible areas on site by EXP field personnel. The ground surface elevations at the borehole locations were interpolated from Topographic drawing provided by the client, completed by A.T. McLaren Limited Surveys dated November 7, 2025.

3. Subsurface Conditions

Details of the subsurface conditions encountered during the drilling program are summarized on the borehole logs in Appendix A.

The logs include textural descriptions of the subsoil and groundwater conditions and indicate the soil boundaries inferred from non-continuous sampling and observations during drilling. These boundaries 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 Description" preceding the borehole logs form an integral part of and should be read in conjunction with this report.

3.1 Soil Stratigraphy

Surficial topsoil or the existing pavement structure was encountered at the surface in all boreholes, underlain by fill materials that extended to depths ranging from 0.8 to 2.3 m below grade. The underlying native soils consisted of sand and silty clay to clayey silt till which extended to the borehole termination depth of 15.9 m or to refusal on shale at depths ranging from 17.4 to 18.3 m. Details of the encountered materials are provided in the following subsections.

3.1.1 Topsoil

Surficial topsoil, approximately 120 mm thick, was encountered at Borehole BH-1. It should be noted that the topsoil thickness can vary across the site from the measurement at a single location.

3.1.2 Pavement Structure

All boreholes except for Borehole BH-1 were advanced through the existing pavement structure which was found to consist of approximately 30 to 55 mm of asphalt overlying approximately 150 to 350 mm of granular base.

3.1.3 Fill

A layer of sand fill was encountered below the pavement structure or topsoil in all boreholes. The fill extended to depths ranging from 0.8 to 2.3 m. The material contained trace gravel and occasional rootlets, was brown, and in a moist state, with moisture contents ranging from 12 to 22%. Occasional organics and wood pieces were noted at 0.8 m in Borehole BH-4. The sample with organic inclusions had moisture contents as high as 87%. Traces of brick and rubble were noted within fill material at Borehole BH-3 and Borehole BH-5.

3.1.4 Sand

Native sand was encountered below the fill in all borehole locations and extended to depths of 7.6 to 8.1 m. The stratum contained trace clay, silt, and gravel; was brown; and in a moist to wet state, with moisture contents of the

stratum ranging from 5 to 25%. Based on SPT N values ranged from 5 to 28 per 305 mm penetration, the stratum is classified loose to compact.

One (1) grain size analysis was conducted on selected sample of the stratum, with the result included in Appendix B and summarized in the table below.

Table 3-1: Summary of Grain Size Analysis

Sample	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-3 SS7	3	9	88	0

3.1.5 Silty Clay to Clayey Silt Till

Native Silty Clay to Clayey Silt Till was encountered in all boreholes below the sand and extended to the borehole termination depths of 15.7 to 18.3 m below grade. The till consisted of trace to some silt and gravel; was generally grey in colour; and was in a moist to wet state with moisture contents ranging from 11 to 27%. SPT N values ranged from 20 to greater than 100 blows per 305 mm penetration. Based on undrained shear strengths ranging from 150 to greater than 225 kPa as determined by pocket penetrometer measurements, the stratum is classified as very stiff to hard in consistency. Trace shale fragments were encountered below 17.3 m and 18.1 m at Boreholes BH-4 and BH-3 respectively.

Three (3) grain size analyses and Atterberg Limits tests were conducted on the stratum with the results included in Appendix B and summarized in table below.

Table 3-2: Summary of Laboratory testing

Sample	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH-1 SS9	24	48	21	7	24	18	6	CL-ML
BH-4 SS8	26	43	26	5	23	18	5	CL-ML
BH-5 SS10	31	57	10	2	27	18	9	CL

3.1.6 Assumed Bedrock

Refusal on the assumed bedrock surface was encountered at two borehole locations, BH-3 and BH-4 at depths ranging from 17.4 to 18.3 m below grade. The bedrock wasn't cored as part of this investigation, but based on experience in the area, drill performance, and recovered rock fragments in the samples, the bedrock is expected to consist of Queenston Shale.

The bedrock depths are summarized in Table 3-3 below. It should be noted that the refusal elevations should not be interpreted as exact planes of bedrock since the auger will frequently penetrate some distance into the weathered rock before noticeable resistance is encountered. Further, the distinction between highly weathered shale and the

overlying strata, particularly if the latter contains abundant shale fragments, is not always clear and consequently, some of the soils resting on the surface of the bedrock might be very weak or highly weathered rock.

Table 3-3: Depths and Elevations of Bedrock Surface

Borehole No.	Depth of Bedrock Surface (m)	Elevation of Bedrock Surface (m)
BH-3	18.3	79.9
BH-4	17.4	80.9

3.2 Groundwater Conditions

Groundwater levels were measured in the open boreholes during drilling. The boreholes were dry prior to starting mud rotary at 3.1 m. However, groundwater levels are not anticipated to have stabilized during the short term of the investigation. Groundwater levels were recorded in the monitoring wells with the results summarized in the table below.

Table 3-4: Groundwater Level Measurements at Monitoring Well Locations

Borehole No.	Groundwater Depth Below Grade and Elevation (m)							
	Upon Completion		February 27, 2026		March 2, 2026		March 9, 2026	
	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
BH-2	N/A	N/A	4.1	94.2	4.0	94.3	4.1	94.2
BH-3	7.0	91.2	4.3	93.9	4.3	93.9	4.3	93.9
BH-4	N/A	N/A	3.9	94.4	3.9	94.4	3.9	94.4

Seasonal variations in the water table should be anticipated, with higher levels occurring during wet weather conditions (spring thaw and late fall) and lower levels occurring during dry weather. EXP hydrogeological report for the project for more in depth discussion on the groundwater level and conditions.

4. Discussion and Preliminary Recommendations

It is understood that the proposed development will consist of an 11-storey (plus a mechanical floor) mixed use building with two (2) level of basement for parking. The geotechnical resistances provided are subject to footing base review by EXP during construction.

4.1 Foundation Considerations

The proposed building with two level of basement can be supported using conventional spread and strip footings constructed below the fill and on the compact native sand or hard native silty clay till. Conventional strip and spread footing foundations constructed on the hard native silty clay to clayey silt till can be designed using a geotechnical resistance of 200 kPa at SLS and 300 kPa at ULS at or below 7.6 m below grade. The geotechnical resistances provided are subject to review by EXP during construction. Details of the design were not available, but it is expected that the founding level for two underground levels would be approximately 7 m below grade. If the recommended depth above exceeds the proposed founding level, the footing base can be brought back to the design elevation using a

lean mix concrete (min. 10 MPa). Alternatively, *engineered fill* consisting of OPSS Granular A compacted to 100% Standard Proctor Maximum Dry Density (SPMDD) may also be used for this purpose and is to be constructed in accordance with the requirements given in Drawing No. 8 in Appendix A. Prior to placement of concrete, all existing fill, organics, and any deleterious material encountered must be removed down to the hard native soils and the exposed founding surface is to be reviewed by EXP.

4.1.1 Raft Foundation

One level of underground parking is envisioned which corresponds to an assumed founding level on the order of 7 or 8 m below grade. As such, the raft would be supported by the hard till.

In the design of raft foundations, the traditional approach of the structural engineer has been to request a value for the coefficient of subgrade reaction for the supporting foundation soil. However, unlike strength and compressibility, the modulus of subgrade reaction is not a fundamental soil property, but rather a simplified method of representing the soil-structure interaction for a specific foundation configuration and loading condition.

For the design of a raft foundation established on the competent overburden below the fills and any loose or disturbed soils, the vertical modulus of subgrade reaction can be taken as 30 MPa/m. A geotechnical resistance of 200 kPa at Serviceability Limit State (SLS) and 300 kPa at Ultimate Limit State (ULS), subject to review by EXP prior to placing foundation concrete. The total and differential settlements of well designed and constructed raft foundation are expected to be small and well within the normally tolerated limits of 50 and 19 mm, respectively.

4.1.2 Caissons Foundation

Alternatively, a deep foundation scheme consisting of caissons may be considered. Caissons founded in the shale bedrock may be designed with an end bearing resistance of 1,000 kPa at SLS and 1,500 kPa at ULS may be used, for caissons socketed at least 1 m into the bedrock.

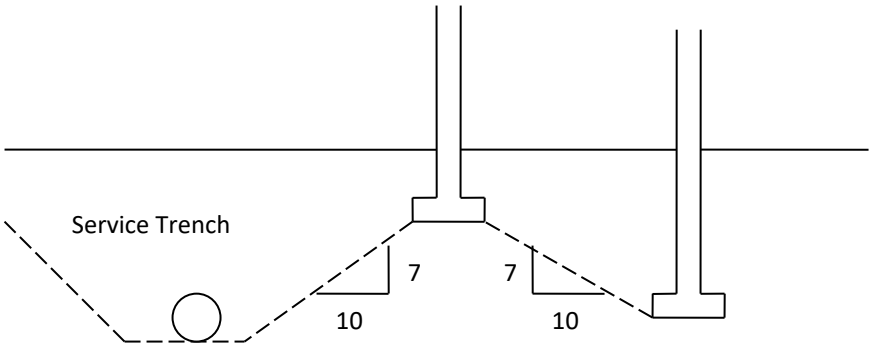
The caissons will require temporary liners for installation to prevent the soil from caving and thus minimize the possible formation of voids below the floor slab, and to help control any water seepage into the caissons. The liners must be tightly sealed into the weathered bedrock to prevent the infiltration of soil and groundwater into the hole. Once the caissons have been drilled to the final founding elevation and the rock conditions confirmed by EXP, it is recommended that the base be cleaned by placing about 0.3 to 0.5 m of concrete into the final base and mixing it with the loose material present at the base. All concrete and loose soil should then be removed prior to placing the reinforcing cage and the structural concrete.

Prior to withdrawal of the inner liner, the contractor should be prepared to place concrete by ‘tremmie’ method if the liner cannot form a seal to prevent groundwater infiltration. An experienced contractor should be employed to ensure the above procedures are followed and no ‘necking’ or voids in the concrete occurs in the caisson shaft during the concrete pour.

Concrete being placed into the caissons should have a slump of about 150 mm in order to minimize the risk of necking in the shaft. Once the method of construction is established the concrete mix must be reviewed by this office.

4.2 General Foundation Recommendations

Conventional foundations in soil at different elevations should be located such that higher footings are set below a line drawn up at 10:7, horizontal to vertical from the near edge of the lower footing. This requirement is not applicable for foundations in sound bedrock. This concept should also be applied to excavations for new foundations in relation to existing foundations or underground services.



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All foundations and grade beams for caissons exposed to freezing conditions must be provided with a minimum of 1.2 m of earth cover or equivalent insulation for frost protection, depending on the final grade requirements. Provided that the ground is not disturbed due to groundwater, precipitation, traffic, etc. and the aforementioned geotechnical resistance values are not exceeded, then total and differential settlements should be within the normally tolerated limits of 25 mm and 19 mm respectively.

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

4.3 Excavations

Excavations across the site are expected to extend to depths as deep as about 7 or 8 m below existing grade. Excavations will be carried out through the sand fill and compact sand, and into the upper levels of the silty clay to clayey silt till. Excavation of the overburden soil at this site is generally not expected to pose any difficulty and can be carried out with heavy hydraulic excavators as required. The silty clay till is a non-sorted sediment and cobbles and boulders may be encountered in the stratum. Consequently, provisions should be made in the contract documents to cover any delays caused by limestone interbedding, boulders, obstructions, etc., particularly if the final design requires excavations significantly deeper than 7 m.

All excavations must be completed in accordance with the most recent regulations of the Ontario Occupation Health and Safety Act (OHSA). The fill and compact sand can be generally classified as Type 3 Soil above the groundwater level (approximately 4 m), and the hard native silty clay to clayey silt as Type 2 Soil. In accordance with the OHSA regulations if the excavation contains more than one type of soil, the soil shall be classified as the type with the highest number. The OHSA requires that excavation slopes be cut at predetermined inclinations, based on the soil types encountered. The sand was noted to be very wet and loose in some boreholes below the groundwater level; The need to excavate flatter side slopes if excessively wet or soft/loose materials, or concentrated seepage zones are encountered, should not be overlooked. Water (i.e. surface water runoff) should not be permitted to enter and/or pond within the construction area.

It is important to note that soils encountered in the construction excavations may vary significantly across the site. Our preliminary soil classifications are based solely on the materials encountered in the boreholes. The contractor

should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, we recommend that EXP be contacted immediately to evaluate the conditions encountered.

4.4 Temporary Shoring

Depending on the final excavation depths and extents, and given the presence of adjacent infrastructure and structures, temporary shoring may be required. The shoring method chosen by the structural engineer and/or contractor will depend on the settlement tolerance of the surrounding structures and infrastructure. Where settlement sensitive structures or services are located within a distance from the excavation equal or less than the excavation depth, the use of a rigid retaining structure will be required. 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).

A natural unit weight of 19.0 kN/m^3 of the soil on site may be used.

Groundwater elevation throughout the site is generally noted to be about 3.9 to 4.3 m below existing grade. Due to the presence of groundwater at this site, the shoring should be designed to account for the groundwater table.

Any rock anchors should be cased though the wet sandy soil.

The shoring system should be designed by a specialist shoring designer. All drilled vertical holes and tieback holes should be temporary cased to minimize the risk of caving. During winter months, the shoring should be covered with thermal blankets to prevent frost penetration behind the shoring system which may result in unacceptable movements.

The recommended design parameters should be confirmed by load testing a number of anchors to 200% design load in accordance with the latest edition of the CFEM. The design for the production anchors should then be modified based on the test results, where necessary. All remaining anchors must be installed using similar procedures and proof tested to 1.33 times the design load.

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

4.5 Lateral Earth Pressure

The lateral earth pressure acting on the foundation walls may be calculated using the following equation:

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

where
- p = lateral earth pressure intensity at depth h (kPa)
- K = earth pressure coefficient (assume 0.40)
- γ = unit weight of retained soil (assume 22.0 kN/m^3 for granular backfill)
- h = depth to point of interest (m)
- q = surcharge load acting adjacent to the wall at the ground surface (kPa)

The above expression assumes that the perimeter drainage system prevents the build-up of hydrostatic pressure behind the wall and free-draining granular material will be used for backfilling adjacent to the wall. Otherwise, if the building is constructed as a waterproof tank without drainage, lateral hydrostatic and uplift pressures below the slab will need to be accounted for using the expression below:

$$p = K[(\gamma h_w) + \gamma'(h - h_w) + q] + \gamma_w (h - h_w)$$

where
- p = lateral earth pressure and hydrostatic pressure acting at depth h (kPa)
- K = active earth pressure coefficient (assume 0.40)
- γ_w = unit weight of water (9.8 kN/m^3)
- γ = unit weight of soil surrounding the structure (assume 22.0 kN/m^3)
- γ' = effective unit weight of retained soil (assume 11.2 kN/m^3)
- h = depth to point of interest (m)
- q = equivalent value of surcharge on the ground surface (kPa).

4.6 Groundwater Control

Groundwater levels within the monitoring wells ranged from 3.9 to 4.3 m below grade (Elev. 93.9 to 94.4 m). Reference should be made to the hydrogeological study for the site for additional groundwater comments and groundwater volumes. Dewatering requirements will be governed by the time of year the construction is performed. It is the responsibility of the contractor to propose a suitable dewatering system base on the groundwater levels at the time of construction.

4.7 Building Floor Slab-on-Grade and Permanent Drainage

The basement floor slab-on-grade for two underground levels would be expected be cast at a depth below the surficial fill and on the native sand or clayey silt to silty clay. The basement floor slab-on-grade can generally be supported on these native materials. It is recommended that the exposed subgrade be examined by a geotechnical engineer prior to constructing the floor slab-on-grade. Any loose or disturbed material encountered during the review should be sub-excavated and replaced with approved fill placed in lifts not exceeding 200 mm and compacted to 100 percent Standard Proctor Maximum Dry Density (SPMDD) within 2 % of the optimum moisture content. Given the wet nature of the sandy soils near the sand to till transition at approximately this depth, some need to sub-excavate saturated sand material locally should be anticipated if the slab on grade is cast at a depth of less than approximately 7.6 m below grade.

The floor slab should be cast on a moisture barrier consisting of 19 mm clear stone with a thickness of at least 200 mm. The clear stone layer will minimize the capillary rise of moisture from the subsoil to the floor slab (moisture barrier). Adequate saw cuts should be provided in the floor slab as directed by the structural engineer to help control

cracking. Unless the building is constructed as a “tank” and waterproofed, the installation of a perimeter drainage is required and a separate underfloor drainage system installed at 3 m intervals one-way is recommended. The exterior grade should be sloped to ensure positive drainage of surface water away from the structure and reduce groundwater infiltration adjacent to the foundations.

4.8 Backfill

Backfill used to satisfy under slab requirements and service trenches, etc., should be compactible fill, i.e., inorganic soil with its moisture content close to its optimum moisture content as determined in the standard Proctor test. Fill placed below concrete slab areas should be compacted to 100 % Standard Proctor Maximum Dry Density (SPMDD) in lifts not exceeding 200 mm.

To minimize potential problem, any trench backfilling operations should follow closely after excavation so that only minimal length of trench slope is exposed. This will minimize wetting of the subgrade material. Should construction extend to the winter season, particular attention should be given to ensure that frozen material is not used as backfill.

The majority of excavated material will likely consist of sand fill or native sand. In general, the excavated material may be reused for backfill subject to the removal of any topsoil or other obviously unsuitable/deleterious material. However, moisture content adjustment of re-used soils might be required, particularly for any wet sand excavated from below a depth of approximately 3 to 4 m. While moderately permeable, the sandy soils would not be considered free draining and should not be used where this property is specified.

All backfilling and compaction operations must be closely examined by a qualified geotechnical consultant to ensure uniform compaction to specification requirements, especially in the vicinity of manholes and catch basins, and in all areas that are not readily accessible to compaction equipment.

4.9 Earthquake Considerations

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

4.9.1 Subsoil Conditions

The subsoil and groundwater information at this site have been examined in relation to Section 4.1.8.4 of the OBC 2024. Foundations for the proposed buildings with two basement level are anticipated to be founded directly on the encountered compact sand or hard till at the depth of 7 to 8 m below grade. The reported N values for the sand, silty clay till below this depth ranged from 25 to over 100 blows per 305 mm penetration.

There have been no shear wave velocity measurements carried out at this site and therefore, N values and EXP’s knowledge of the soil conditions in the area have been used to determine the site classification.

4.9.2 Site Classification

Based on the above assumptions and interpretations and the known soil conditions, the Site Class for this site is “D” as per Table 4.1.8.4.-B, Site Classification for Seismic Site Response, OBC 2024. It should be noted that an improved site classification may be achievable if shear wave velocity testing is carried out. EXP can be contacted to provide this service if required.

4.10 Pavement Construction

It is understood that new paved accesses will be constructed at the site. The recommended pavement structures provided in Table 4-2 below are based on an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples and traffic requirements. Consequently, the recommended pavement structures should be considered for preliminary design purposes only.

Table 4-2: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Medium-Duty Parking	Heavy-Duty Parking
Asphaltic Concrete (OPSS 1150)	Min 92.0% Maximum Relative Density (MRD)	40 mm HL3 50 mm HL8	40 mm HL3 80 mm HL8
Granular A Crusher Run Limestone (OPSS 1010)	100% SPMDD	150 mm	150 mm
Granular B Type II (OPSS 1010)	100% SPMDD	250 mm	350 mm

The granular base and sub-base must be placed in maximum 200 mm lifts and compacted to 100 percent of the Standard Proctor Maximum Dry Density (SPMDD) at a moisture content within 2 percent of the optimum moisture content. The subgrade should be compacted to 98 percent SPMDD for at least the upper 600 mm. The recommended pavement structures outlined assume adequate provision for drainage.

The foregoing design assumes construction is carried out during dry periods; if construction is carried out during wet weather, and heaving or rolling of the subgrade is experienced, additional thickness of sub-base course material may be required. Further recommendations for pavement construction will be provided in a supplementary investigation.

5. General Comments

The information presented in this report is based on a limited investigation designed to provide information to support an overall assessment of the current geotechnical conditions of the subject property. The conclusions presented in this report reflect site conditions existing at the time of the investigation.

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

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

More specific information, with respect to the conditions between samples, or the lateral and vertical extent of materials, may become apparent during excavation operations. Consequently, during the future development of the

property, conditions not observed during this investigation may become apparent; should this occur, EXP Services Inc. should be contacted to assess the situation and additional testing and reporting may be required. EXP Services Inc. has qualified personnel to provide assistance in regard to future geotechnical and environmental issues related to this property.

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



Shailesh Bhattarai, P.Eng., MSc.
Project Manager

Matt LiVecchi, P.Eng.
Manager, Hamilton Geotechnical Services

Appendix A

Drawings & Borehole Logs



EXP Services Inc.
t: +1.905.573.4000 | f: +1.905.573.9693
1266 South Service Rd. Unit C1-1
Stoney Creek, ON L8E 5R9
Canada
www.exp.com
• BUILDINGS • EARTH & ENVIRONMENT • ENERGY •
• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

LEGEND:

APPROXIMATE BOREHOLE LOCATION

APPROXIMATE BOREHOLE/
MONITORING WELL LOCATION

TITLE AND LOCATION:

BOREHOLE LOCATION PLAN
GEOTECHNICAL INVESTIGATION
PROPOSED NEW APARTMENT BUILDING
517 PLAINS ROAD EAST, BURLINGTON, ON

JOB NO.:	DRAWN BY:
HAM-25011698-C0	DM
SCALE:	CHECKED BY:
1:800	SB
DATE:	DWG NO.:
JANUARY 2026	1

Notes on Sample Descriptions

1. All sample descriptions included in this report follow the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as outlined in the Canadian Foundation Engineering Manual. Note, however, that behavioral properties (i.e. plasticity, permeability) take precedence over particle gradation when classifying soil. 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.

UNIFIED SOIL CLASSIFICATION

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



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

ISSMFE SOIL CLASSIFICATION

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

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 (75 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.

Notes On Soil Descriptions

4. The following table gives a description of the soil based on particle sizes. With the exception of those samples where grain size analyses have been performed, all samples are classified visually. The accuracy of visual examination is not sufficient to differentiate between this classification system or exact grain size.

Soil Classification		Terminology	Proportion
Clay and Silt	<0.060 mm	"trace" (e.g. Trace sand)	1% to 10%
Sand	0.060 to 2.0 mm	"some" (e.g. Some sand)	10% to 20%
Gravel	2.0 to 75 mm	adjective (e.g. sandy, silty)	20% to 35%
Cobbles	75 to 200 mm	"and" (e.g. and sand)	35% to 50%
Boulders	>200 mm		

The compactness of Cohesionless soils and the consistency of the cohesive soils are defined by the following:

Cohesionless Soil		Cohesive Soil		
Compactness	**Standard Penetration Resistance "N" Blows / 0.3 m**	**Consistency**	**Undrained Shear Strength (kPa)**	**Standard Penetration Resistance "N" Blows / 0.3 m**
Very Loose	0 to 4	Very soft	<12	<2
Loose	4 to 10	Soft	12 to 25	2 to 4
Compact	10 to 30	Firm	25 to 50	4 to 8
Dense	30 to 50	Stiff	50 to 100	8 to 15
Very Dense	Over 50	Very Stiff	100 to 200	15 to 30
		Hard	>200	>30

5. **ROCK CORING**

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundless of the rock mass. It is obtained from the rock cores by summing the length of the core covered, counting only those pieces of sound core that are 100 mm or more length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very Poor Quality	<25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

$$\text{Recovery Designation \% Recovery} = \frac{\text{Length of Core Per Run}}{\text{Total Length of Run}} \times 100$$

Log of Borehole BH-1

Project No. HAM-25011698-C0 | Drawing No. 3

Project: Geotechnical Investigation Report | Sheet No. 1 of 2

Location: 517 Plains Road East, Burlington, Ontario

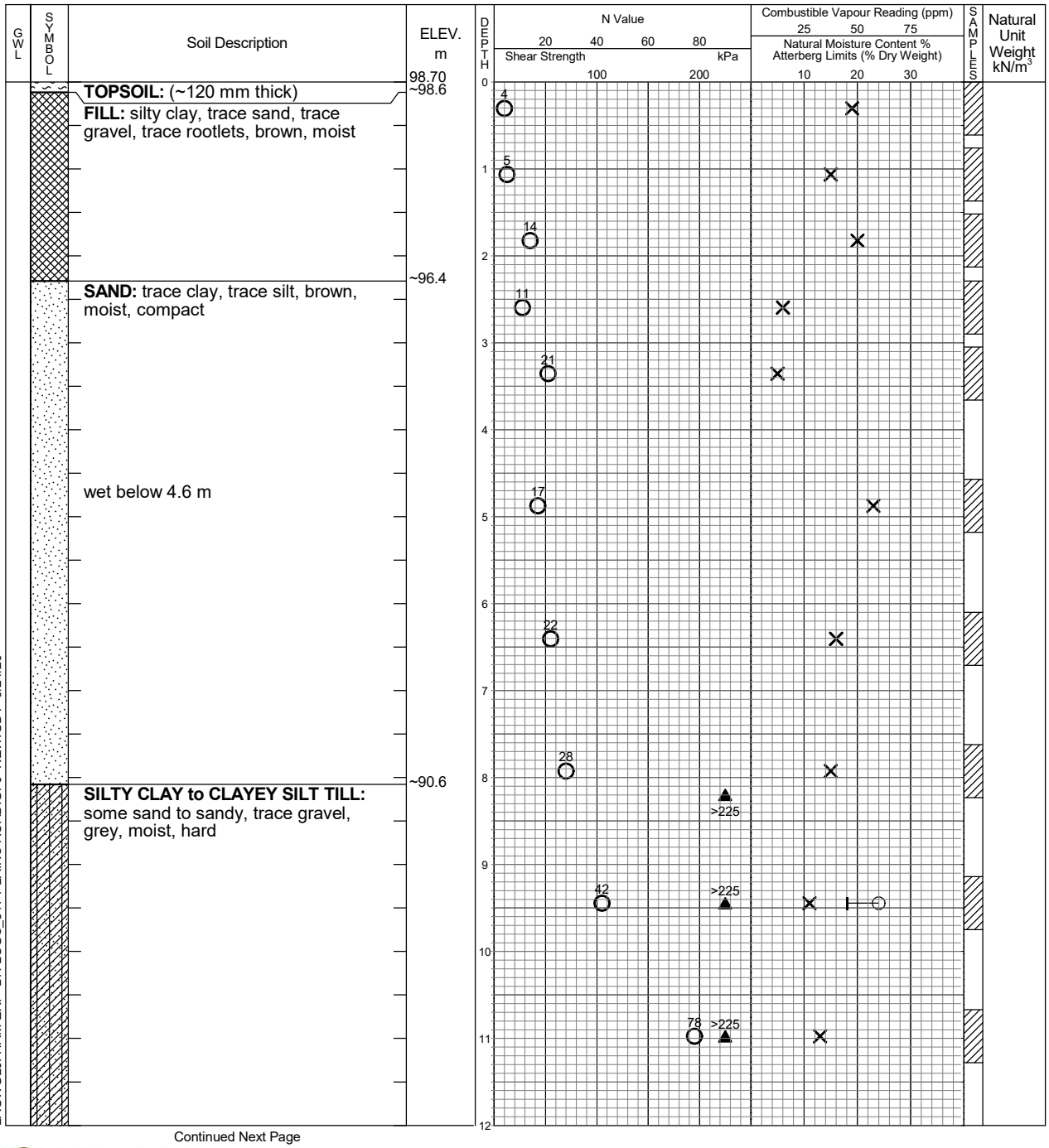
Date Drilled: February 2, 2026

Drill Type: D-50 Track Mount, Solid Stem

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



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

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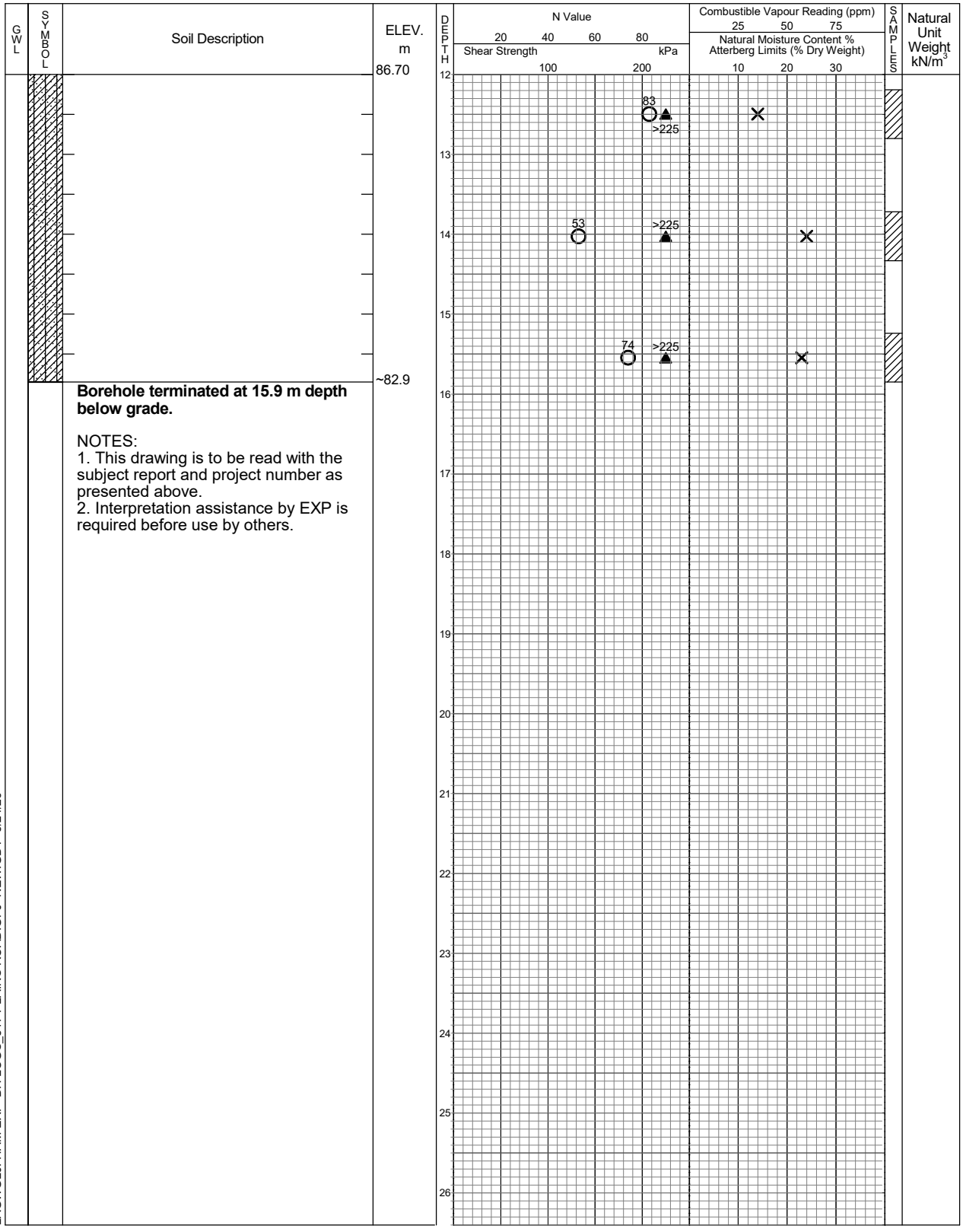
EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	0.5	4.9

Log of Borehole BH-1

Project No. HAM-25011698-C0 Drawing No. 3

Project: Geotechnical Investigation Report Sheet No. 2 of 2



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	0.5	4.9

Log of Borehole BH-2

Project No. HAM-25011698-C0 | Drawing No. 4

Project: Geotechnical Investigation Report | Sheet No. 1 of 2

Location: 517 Plains Road East, Burlington, Ontario

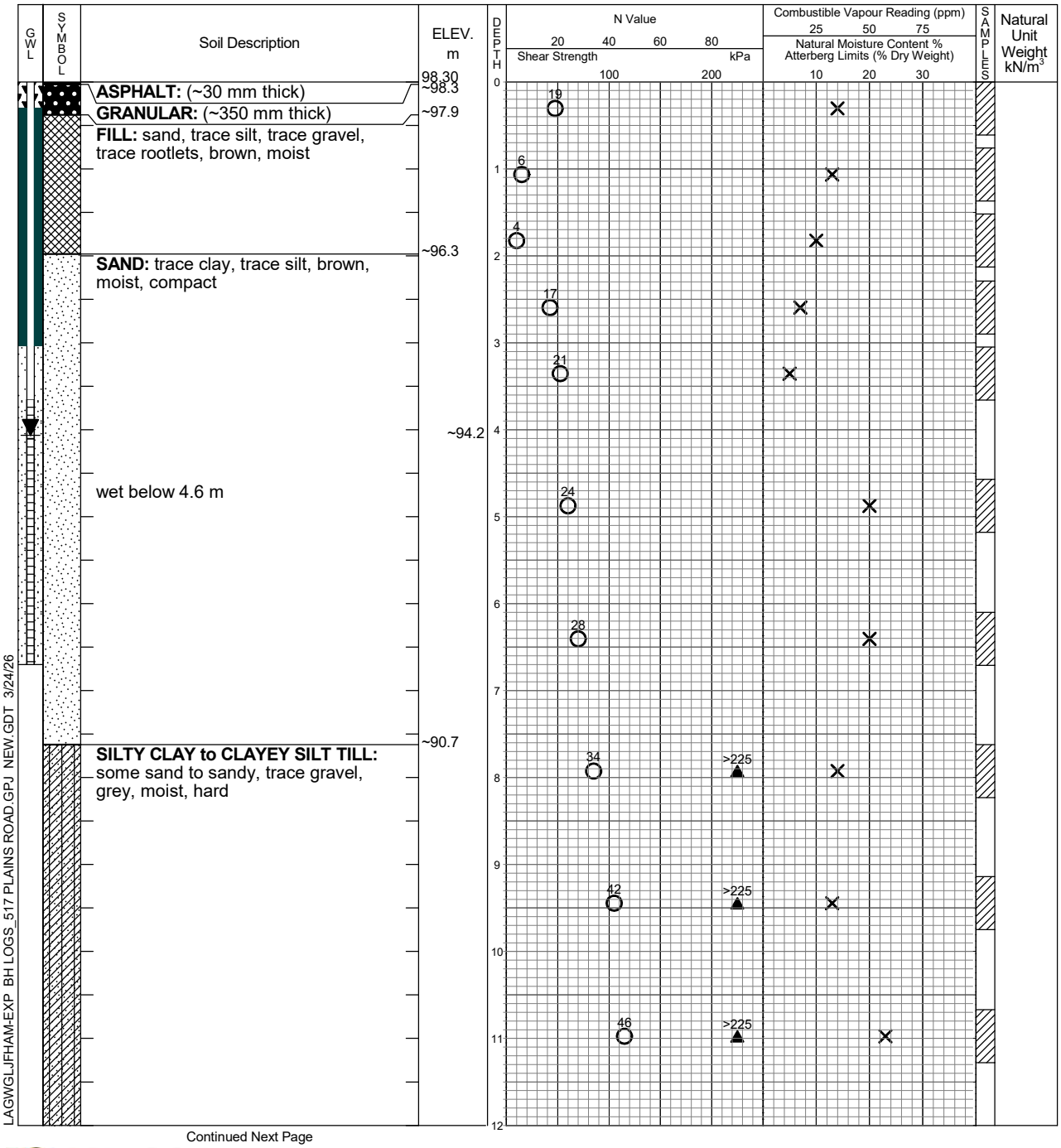
Date Drilled: January 27, 2026

Drill Type: CME 75 Truck Mount. Mud-Rotary.

Datum: Geodetic

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

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



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

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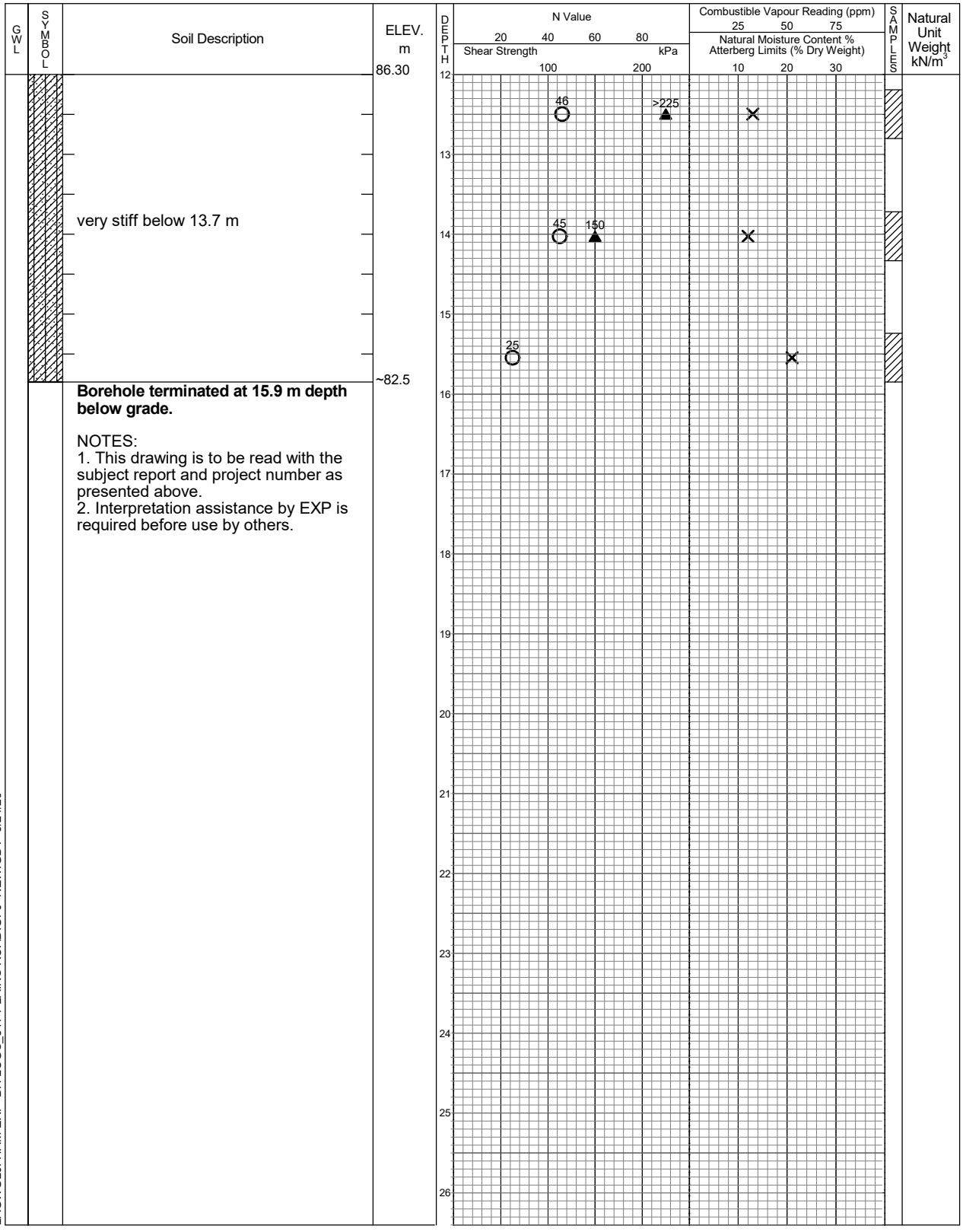
EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
starting mud rotary	dry	open
on completion	N/A	N/A
February 27, 2026	4.1	--
March 4, 2026	4.0	--
March 9, 2026	4.1	--

Log of Borehole BH-2

Project No. HAM-25011698-C0 Drawing No. 4

Project: Geotechnical Investigation Report Sheet No. 2 of 2



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
starting mud rotary	dry	open
on completion	N/A	N/A
February 27, 2026	4.1	--
March 4, 2026	4.0	--
March 9, 2026	4.1	--

Log of Borehole BH-3

Project No. HAM-25011698-C0 Drawing No. 5

Project: Geotechnical Investigation Report Sheet No. 1 of 2

Location: 517 Plains Road East, Burlington, Ontario

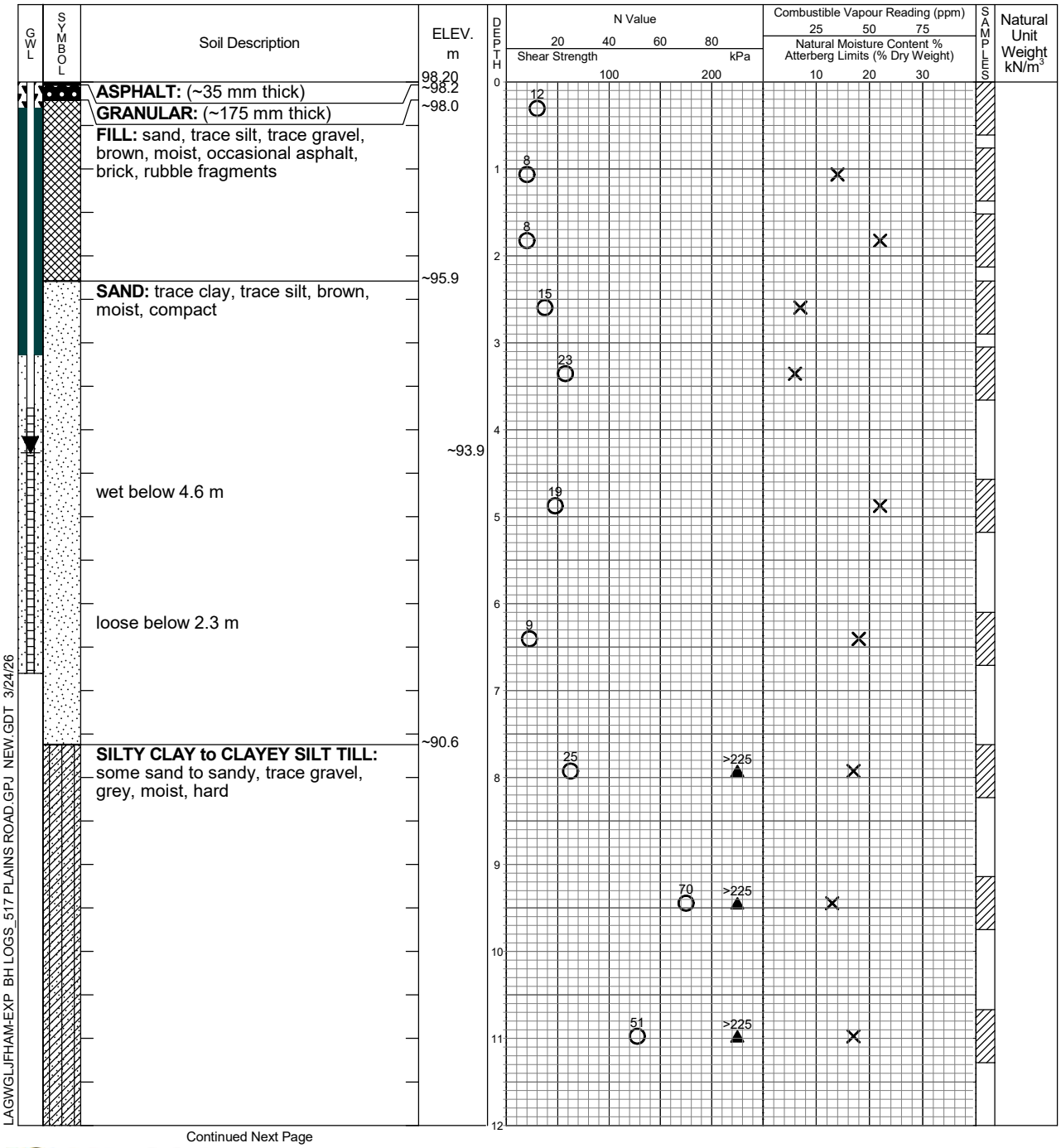
Date Drilled: January 28 and 30, 2026

Drill Type: CME 75 Truck Mount. Mud-Rotary.

Datum: Geodetic

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

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



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

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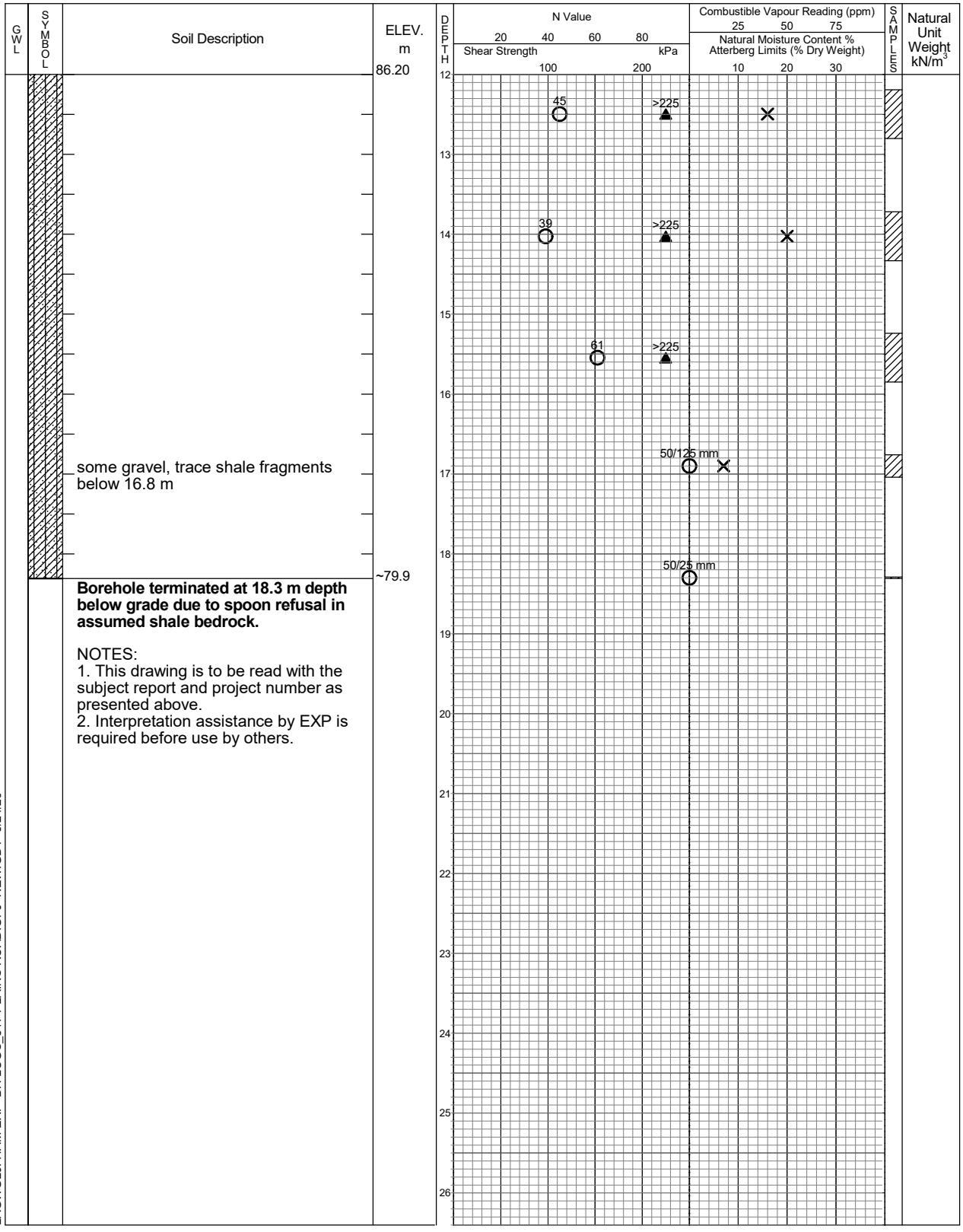
EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	7.0	16.4
February 27, 2026	4.3	--
March 4, 2026	4.3	--
March 9, 2026	4.3	--

Log of Borehole BH-3

Project No. HAM-25011698-C0 Drawing No. 5

Project: Geotechnical Investigation Report Sheet No. 2 of 2



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	7.0	16.4
February 27, 2026	4.3	--
March 4, 2026	4.3	--
March 9, 2026	4.3	--

Log of Borehole BH-4

Project No. HAM-25011698-C0 Drawing No. 6

Project: Geotechnical Investigation Report Sheet No. 1 of 2

Location: 517 Plains Road East, Burlington, Ontario

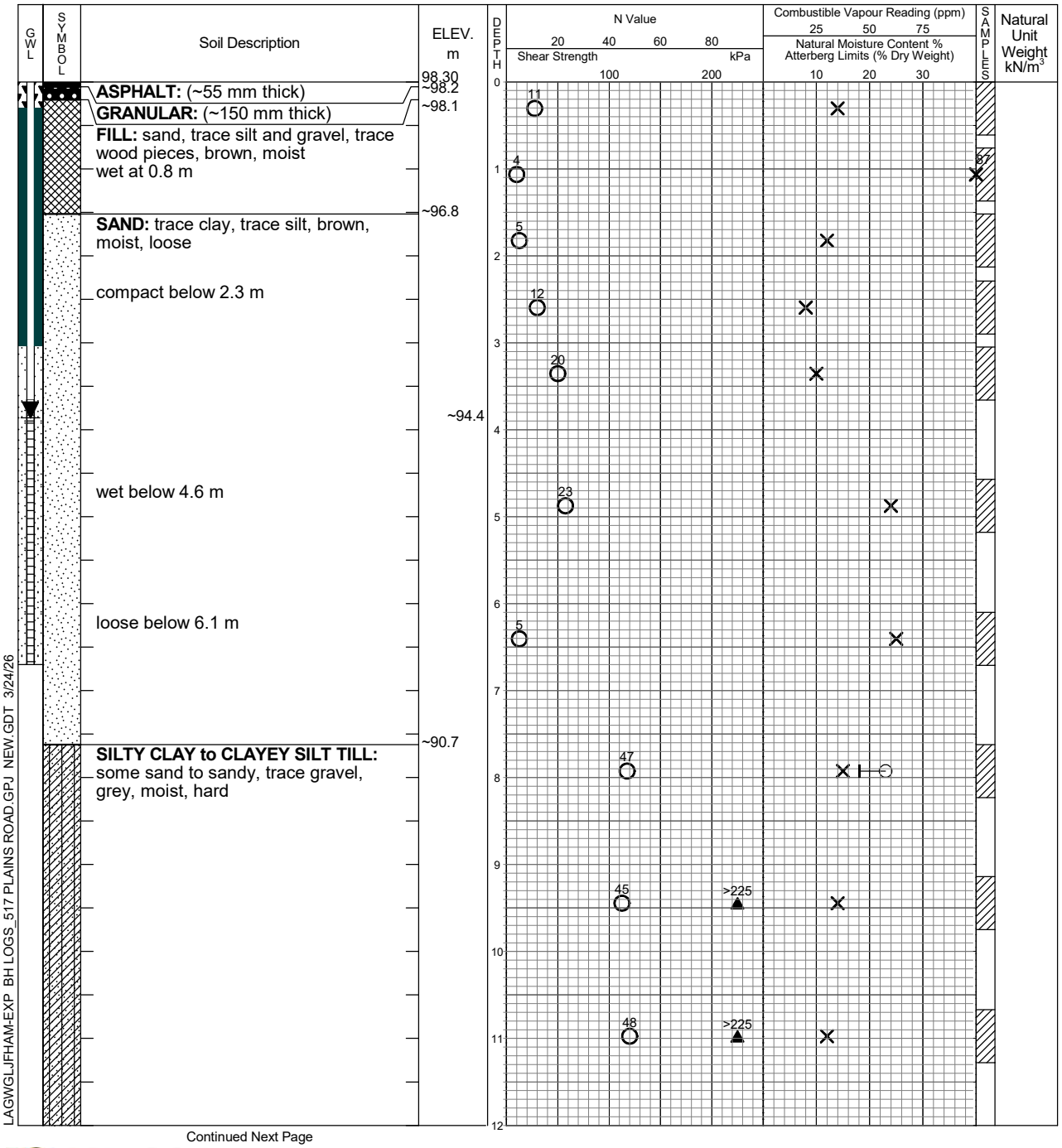
Date Drilled: January 29, 2026

Drill Type: CME 75 Truck Mount. Mud-Rotary.

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



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

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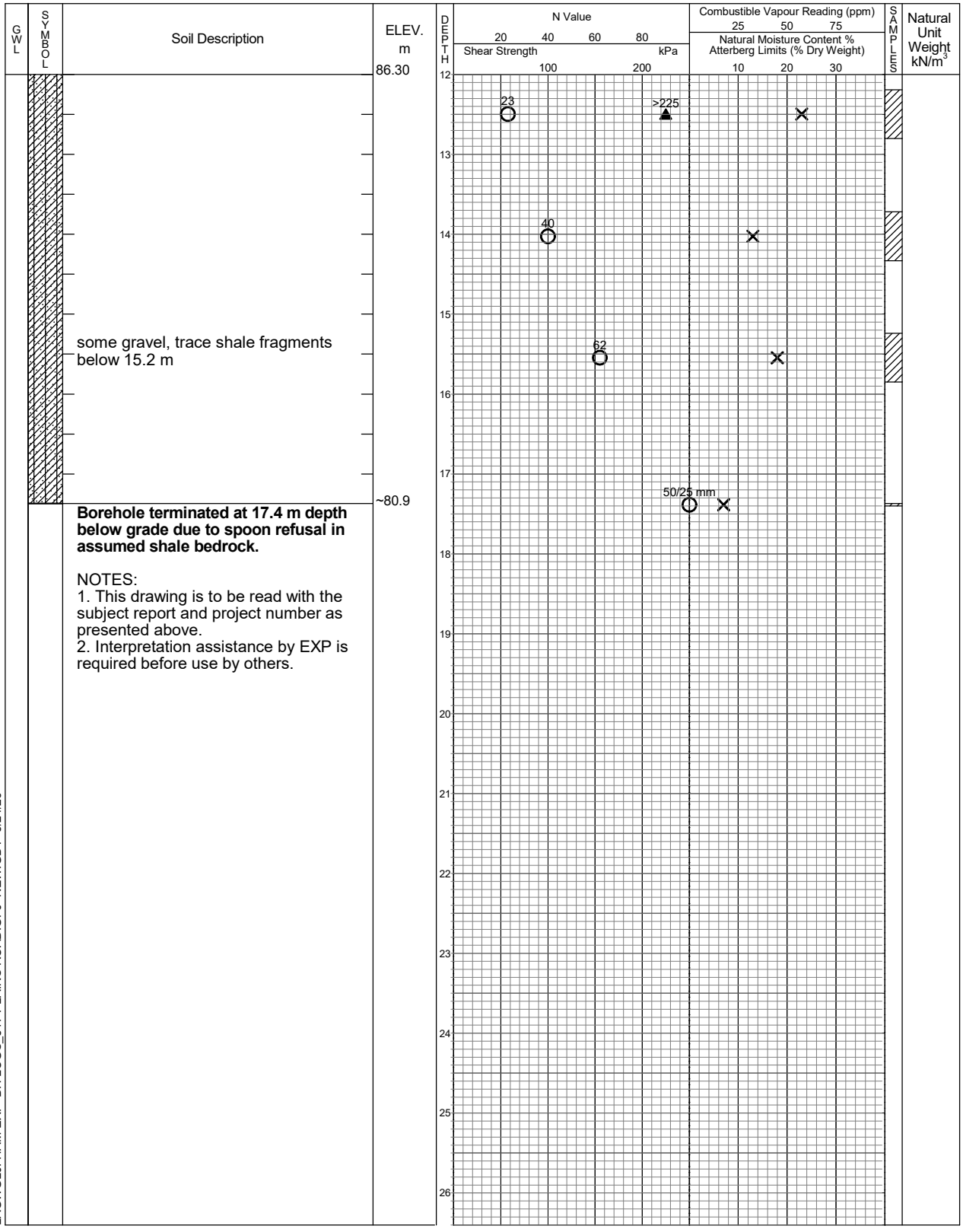
EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
starting mud rotary	dry	open
on completion	N/A	N/A
February 27, 2026	3.9	--
March 4, 2026	3.9	--
March 9, 2026	3.9	--

Log of Borehole BH-4

Project No. HAM-25011698-C0 Drawing No. 6

Project: Geotechnical Investigation Report Sheet No. 2 of 2



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
starting mud rotary	dry	open
on completion	N/A	N/A
February 27, 2026	3.9	--
March 4, 2026	3.9	--
March 9, 2026	3.9	--

Log of Borehole BH-5

Project No. HAM-25011698-C0 Drawing No. 7

Project: Geotechnical Investigation Report Sheet No. 1 of 2

Location: 517 Plains Road East, Burlington, Ontario

Date Drilled: January 28, 2026

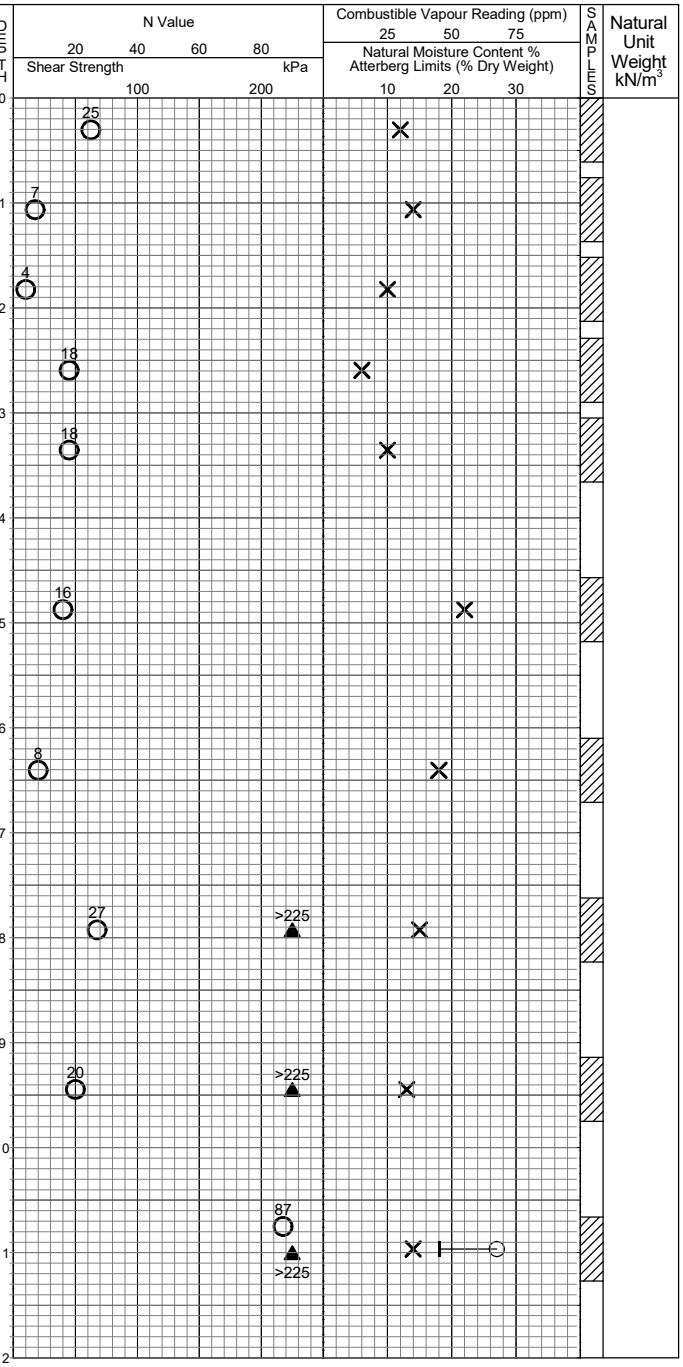
Drill Type: CME 75 Truck Mount. Mud-Rotary.

Datum: Geodetic

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

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

GWL	SYMBOL	Soil Description	ELEV. m
			98.30
		ASPHALT: (~30 mm thick)	~98.3
		GRANULAR: (~200 mm thick)	~98.1
		FILL: sand, trace silt, trace gravel, brown, trace rootlets, moist, trace brick fragments	
			~96.0
		SAND: trace silt, trace gravel, brown, moist, compact	
		wet below 4.6 m	
		loose below 6.1 m	
			~90.7
		SILTY CLAY to CLAYEY SILT TILL: some sand to sandy, trace gravel, grey, moist, hard	



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EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

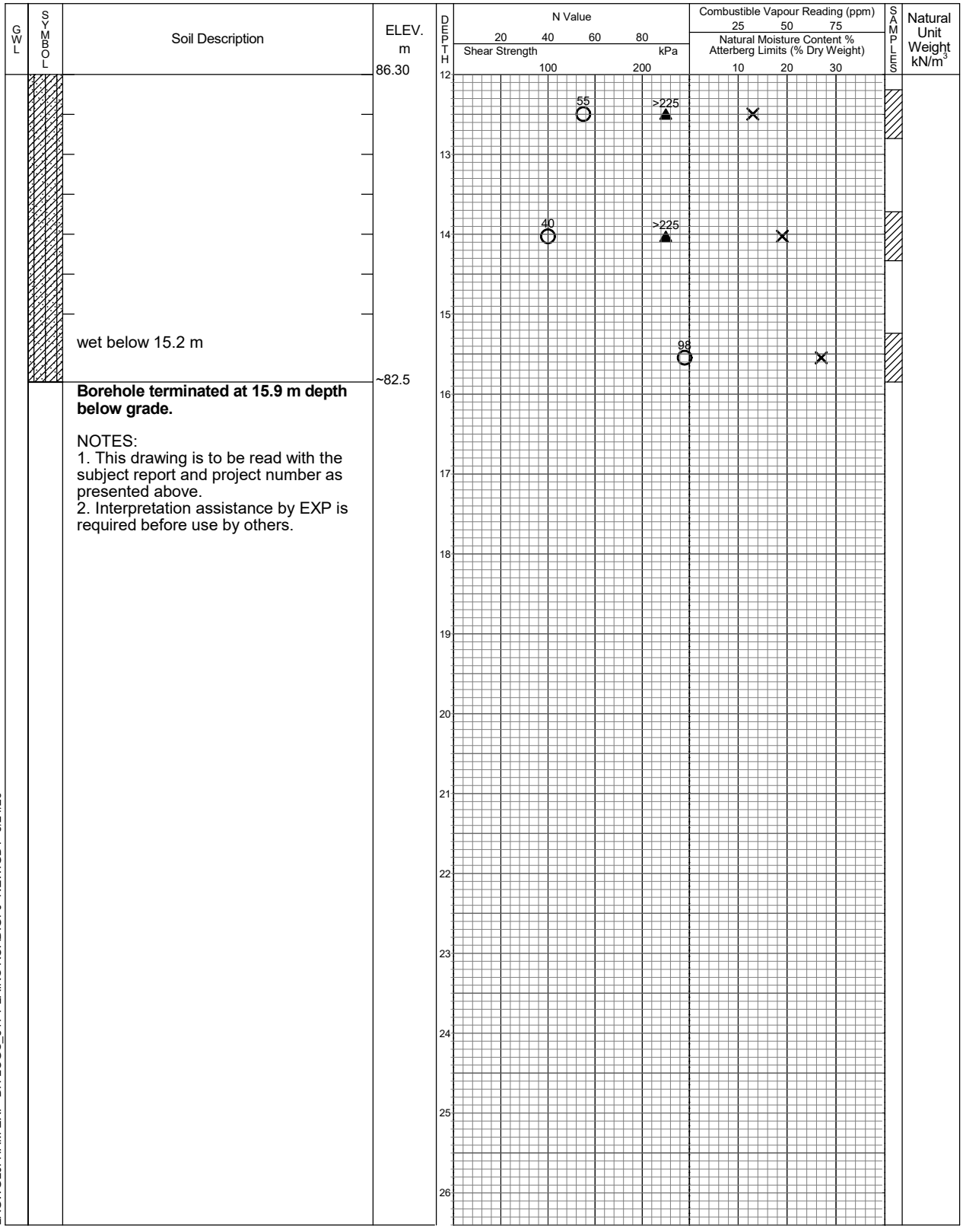
Time	Water Level (m)	Depth to Cave (m)
on completion	2.4	open

LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

Log of Borehole BH-5

Project No. HAM-25011698-C0 Drawing No. 7

Project: Geotechnical Investigation Report Sheet No. 2 of 2



LAGWGLJFHAM-EXP BH LOGS_517 PLAINS ROAD.GPJ NEW.GDT 3/24/26

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	2.4	open

GENERAL REQUIREMENTS FOR ENGINEERED FILL

1. The area must be stripped of all topsoil, fill, organic stained or disturbed native material and proof-rolled. Soft/loose spots must be dug out. The stripped native subgrade must be examined and approved by an EXP Services Inc. (EXP) engineer prior to placement of engineered fill.

2. The structure footprint must be defined by offset stakes that remain in place until the foundations and service connections are all constructed. Confirmation that the foundations are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and EXP. Without this confirmation, no responsibility for the performance of the structure can be accepted by EXP.

3. The approved engineered fill must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Granular fill conforming to OPSS Granular B is preferred.

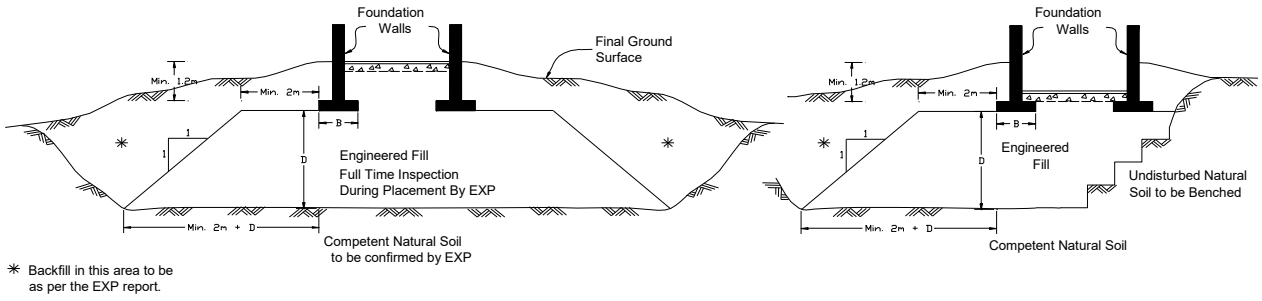
4. Full-time geotechnical inspection by EXP during placement of engineered fill is required.

5. The fill must be placed such that the specified geometry is achieved. Refer to sketches below for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

6. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

7. All excavations must be done in accordance with the Ontario Occupational Health and Safety Act.

8. These guidelines are to be read in conjunction with the EXP report attached. Foundations built on engineered fill constructed in accordance with the above requirements and the attached EXP report may support a geotechnical resistance of 200 kPa at Serviceability Limit States (SLS) and 300 kPa at Ultimate Limit States (ULS).



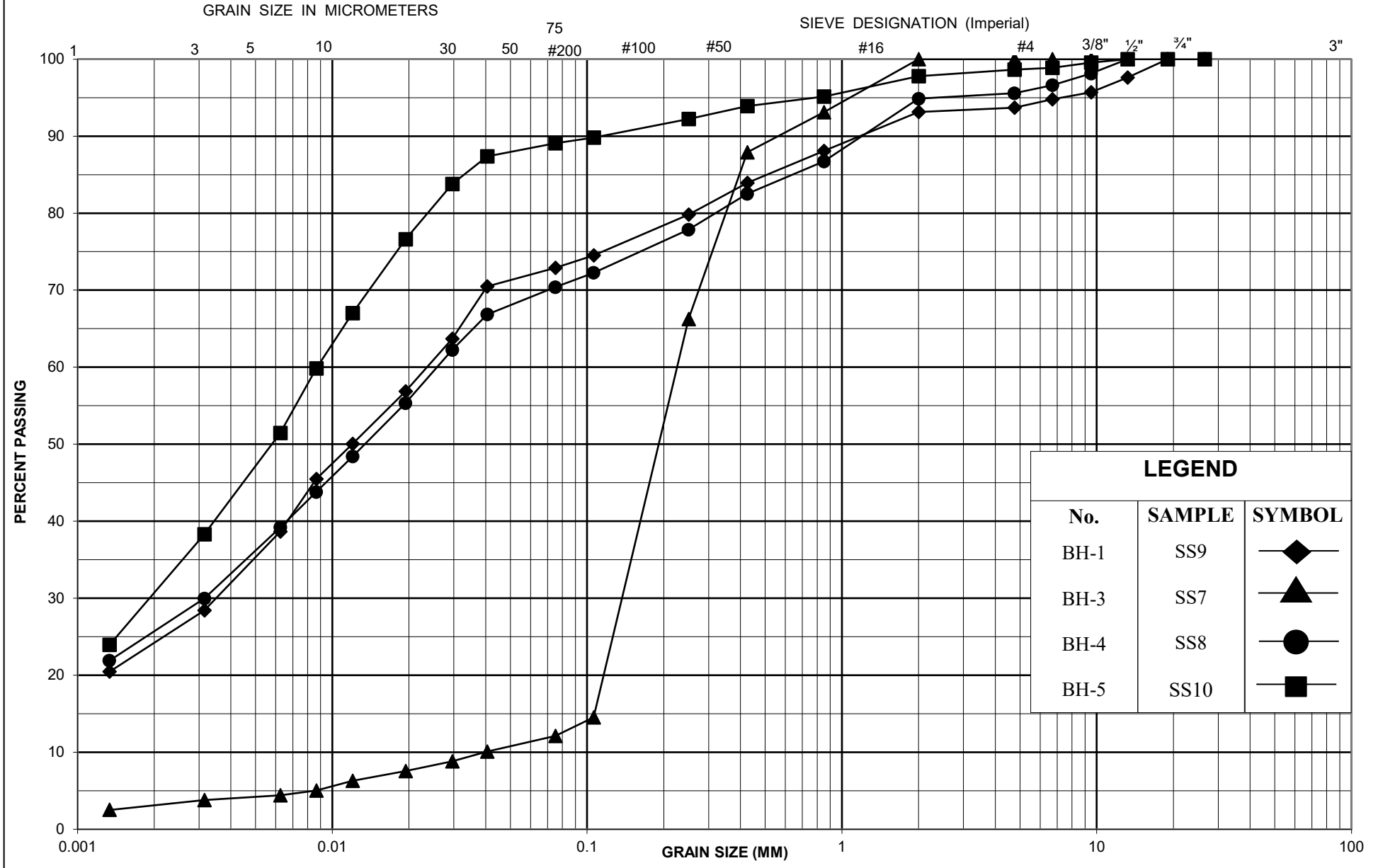
✳ Backfill in this area to be as per the EXP report.

Appendix B

Laboratory Test Results

ISSMFE SOIL CLASSIFICATION SYSTEM

CLAY	SILT			SAND			GRAVEL			Cobbles
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

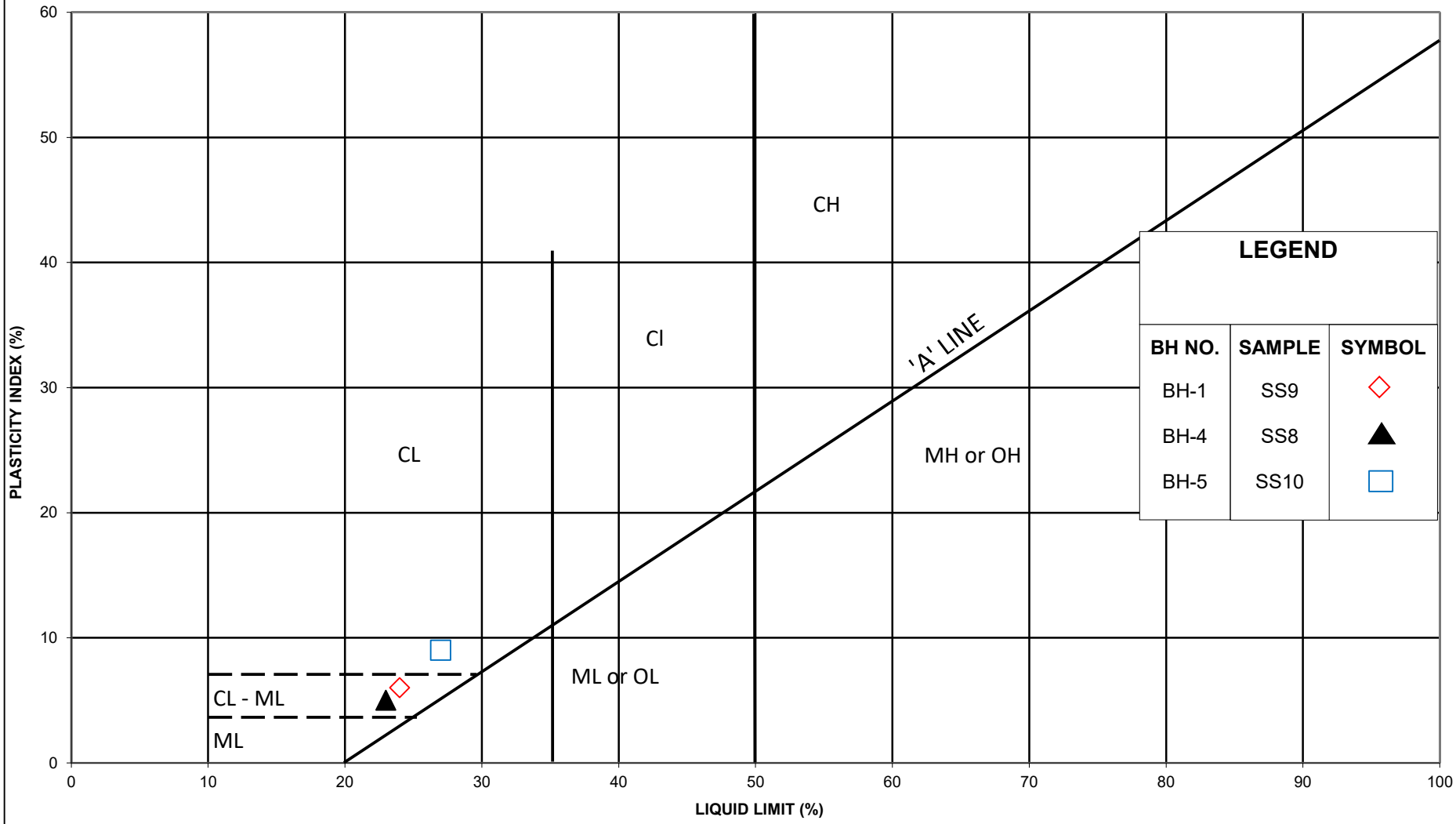


exp.

GRAIN SIZE DISTRIBUTION

DRAWING NO.:	B1
PROJECT NO.:	HAM-25011698-C0
DATE:	MARCH 2026

Proposed New Apartment Building
517 Plains Road East,
Burlington, ON



exp.

PLASTICITY CHART

CLAYEY SILT to SILTY CLAY (CL-ML to CL)

DRAWING NO.:	B2
PROJECT NUMBER:	HAM-25011698-C0
DATE:	MARCH 2026