Preliminary Geotechnical Investigation – 159-163 Sulphur Springs Road

Ancaster, Ontario

Mizrahi Developments

133 Hazelton Avenue
Toronto, Ontario
M5R 0A6

Prepared by:

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December 19, 2024

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Revision Record

Revision	Date	Prepared By	Checked By	Authorized By
DRAFT	December 4, 2024	SM	DT	DT
FINAL	December 19, 2024	SM	DT	DT

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Executive Summary

SLR is pleased to submit the attached report describing the results of our geotechnical investigation for the project at the subject site (“the Site”) located in Ancaster, Ontario.

The report provides site information from our site investigation, laboratory testing, and our interpretations/recommendations for your consideration.

Thank you for the opportunity to be of service on this project. We trust that this report will be satisfactory for your current needs. If you have any questions or require further information, please contact our office at your convenience. This report is subject to the Statement of Limitations provided above.

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5.0 Introduction

SLR was retained by Mizrahi Developments to undertake a preliminary geotechnical investigation in support the proposed development of an estate residential subdivision at 159 – 163 Sulphur Springs Road in Ancaster, Ontario.

The objective of this geotechnical investigation was to determine the subsurface conditions in the area of the proposed development by means of ten (10) exploratory boreholes. From the findings in the boreholes, SLR makes engineering recommendations for the project.

The report is provided on the basis of the terms of reference presented above, and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the changes. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Mizrahi Developments and their designers. Use of this report by third party without SLR's consent is prohibited. The limitations of the report presented within form an integral part of the document and they must be considered in conjunction with this report.

2.0 Field and Laboratory Work

The field work for the geotechnical investigation was carried out from October 30, 31 and November 13, 2024, by drilling specialists subcontracted to SLR, during which time ten (10) boreholes (BH24-1 to BH24-10) were advanced. In addition, Borehole BH24-6 was moved and drilled again in the proposed location of the wet well and is represented by Borehole BH24-6A in the Borehole Logs in **Appendix A**. The locations of boreholes are shown on the Borehole/Monitoring Well Location Plan, **Drawing 1**. The boreholes were drilled to depths ranging from 1.6 to 6.7 m below existing ground surface (Elev. 189.9 to 217.9).

The boreholes were advanced with a power auger drilling machine, where soil stratigraphy was recorded by observing the quality and changes of augered materials which were retrieved from the boreholes, and by sampling the soils at regular intervals of depth using a 50 mm O.D. split spoon sampler, in accordance with the Standard Penetration Test (SPT) method (ASTM D 1586). This sampling method recovers samples from the soil strata, and the number of blows required to drive the sampler 300 mm depth into the soil (SPT 'N' values) gives an indication of the compactness condition or consistency of the sampled soil material. The SPT 'N' values are indicated on the borehole logs (Refer to **Appendix A**). The field work for this investigation was supervised by SLR engineering staff, who also logged the boreholes and cared for the recovered samples.

Eight (8) monitoring wells were installed in Boreholes BH24-1 to BH24-5, BH24-7, BH24-9, and BH24-10 to determine stabilized groundwater levels. The remaining boreholes without monitoring wells installed were backfilled and sealed upon completion of drilling. The stabilized groundwater levels were measured on November 6, 2024. The monitoring well installation details and the measured groundwater levels are summarized in **Table 1** and shown in the individual borehole logs.

All soil samples obtained during this investigation were brought to our laboratory for further examination. These soil samples will be stored for a period of three (3) months after the day of issuing the draft report, after which time they will be discarded unless SLR is advised otherwise in writing. In addition to visual examination in the laboratory, all soil samples from geotechnical boreholes were tested for moisture contents. Grain size analyses of eight (8) selected soil samples were conducted, and the results are presented in **Appendix B**.

The approximate elevations at the as-drilled borehole locations were surveyed using a differential GPS unit. The elevations at the as-drilled borehole locations were not provided by a professional surveyor and should be considered as approximate. Contractors performing the work should confirm the elevations prior to construction. The locations plotted on **Drawing 1** were based on the survey and should be considered as approximate.

3.0 Subsurface Conditions

The borehole locations are shown on **Drawing 1**. General notes on soil sample description are presented on the "Explanation of Terms Used in the record of borehole" sheet in **Appendix A**. The subsurface conditions in the boreholes are presented in the individual borehole logs (**Enclosures 1** to **10** and **6A** inclusive, **Appendix A**). The subsurface conditions in the boreholes are summarized in the following paragraphs.

3.1 Soil Conditions

Topsoil

A thin veneer of topsoil was encountered at the surface in all boreholes and extended to depths ranging from about 50 to 120 mm below existing ground surface. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Fill Materials

Fill Materials consisting of variable layers of silts and sands with some to trace clay and trace gravel was encountered below the topsoil in all boreholes and extended to depths ranging from about 0.8 to 2.3 m below existing ground surface (Elev. 195.8 to 222.4). Borehole BH24-6A was terminated in this deposit. The standard penetration 'N' values ranging from 2 to 29 indicated a very loose to compact compactness condition. The in-situ moisture contents measured in the fill samples ranged from approximately 14 to 37%.

Silt / Sandy Silt

A silt/sandy silt deposit was encountered below the fill materials in Boreholes BH24-1 to BH24-8, and BH24-10 and below the sand in Borehole BH24-9 and was extended to depths ranging from 2.4 to 6.7 m (Elev. 189.9 to 220.5). Boreholes BH24-4 to BH24-10 were terminated in this deposit. Standard penetration 'N' values ranging from 5 to 27 indicating a loose to compact compactness condition. Locally, in BH24-8, a 'N' value was recorded to be 2 indicating a very loose condition. The natural moisture contents measured in the soil samples were approximately 10 to 29%.

Grain size analysis was conducted on six (6) samples (BH24-1/SS6, BH24-4/SS7, BH24-5/SS4, BH24-7/SS2, BH24-9/SS6, and BH24-10/SS5) from the silt/sandy silt deposit. The results are presented on the borehole logs and in **Appendix B**, with the following fractions:

Gravel: 0 – 2%

Sand: 3 – 11%

Silt: 79 – 93%

Clay: 3 – 12%

Sand / Silty Sand

A sand to silty sand deposit was encountered below the fill materials in Borehole BH24-9 and below the silt in Boreholes BH24-1 to BH24-3 and was reached depths ranging from 2.4 to 6.7 m (Elev. 203.6 to 218.3). Borehole BH24-1 to BH24-3 was terminated in these deposits. Standard penetration ‘N’ values ranged from 6 to 25 indicating a loose to compact compactness condition. The natural moisture contents measured in the soil samples ranged from approximately 13 to 26%.

Grain size analyses were conducted on two (2) samples (BH24-2/SS6 and BH24-3/SS7) from the sand and silty sand deposits. The results are presented on individual borehole logs and in **Appendix B**, with the following range of fractions:

Gravel: 0 and 3%

Sand: 83 and 91%

Silt: 4 and 16%

Clay: 1 and 2%

Bedrock

Boreholes BH24-2, BH24-5, BH24-6, BH24-6A, BH24-8 and BH24-10 were all terminated on assumed bedrock upon practical refusal of auger. Additionally, several attempts were made to drill BH24-6 and BH24-6A to design depth in nearby locations indicated on Drawing 1 with all meeting early refusal. The additional boreholes were straight augered to save time and not sampled. The refusal depths and elevations of assumed bedrock as found in the boreholes drilled and attempted are summarized below in **Table 1**. Bedrock around the site is typically shale or limestone of the Guelph and formation in the southern half of the site and shale or limestone of the Lockport formation in the northern half of the site. Nearby well records indicate bedrock at various depths with some as shallow as approximately 4.5 m below ground surface. Additional drilling with rock coring is recommended to confirm bedrock presence and depth in the areas. The founding depth of the proposed development is unknown at the time of writing this report. For the purposes of this report a standard foundation depth of 3.0 m will be used.

Table 1: Auger Refusal Depth Monitoring Well Details and Water Level

Borehole ID	Assumed Bedrock Depth (mBGS)[1]/ Elevation (m)
BH24-2	6.1 / 214.2
BH24-5	6.1 / 208.3
BH24-6	2.4 / 203.6
BH24-6A	1.6 / 205.4
BH24-6B[2]	1.6 / 206.4
BH24-6C[2]	1.7 / 204.2
BH24-8	4.7 / 208.3
BH24-10	5.6 / 215.2
• Note: • 1. mBGS = meters below ground surface • 2. Depths recorded are taken from auger refusal and therefore are approximate.	

3.2 Groundwater Conditions

Eight (8) monitoring wells (50 mm dia.) were installed to monitor stabilized groundwater levels. The stabilized groundwater levels were measured on November 6 and 12/13 2024. The monitoring well installation details and the measured groundwater levels are summarized in **Table 2** and shown in the individual borehole logs.

Table 2: Monitoring Well Details and Water Level

Monitoring Well ID	Screen Interval (mBGS)	Water Level Depth (mBGS)/Water Level Elevation (m)	
		November 6, 2024	November 12/13, 2024
BH24-1	3.0 – 6.0	1.3 / 223.3	1.3 / 223.3
BH24-2	3.0 – 6.0	0.0 / 220.3	0.0 / 218.8
BH24-3	4.3 – 5.8	1.5 / 219.8	1.5 / 219.8
BH24-4	3.0 – 6.0	2.3 / 219.6	2.3 / 219.6
BH24-5	2.4 – 5.4	0.4 / 214.0	0.4 / 214.0
BH24-7	3.0 – 6.0	4.3 / 192.3	4.3 / 192.3
BH24-9	3.0 – 6.0	0.4 / 220.5	0.3 / 220.6
BH24-10	2.5 – 5.5	1.0 / 219.9	1.0 / 219.9
Note: mBGS = meters below ground surface			

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to weather events.

4.0 Discussion and Recommendations

It is understood that the proposed development is a residential development including detached homes, townhouses, roads and walkways, parking, parks, and natural heritage areas. It is understood that at the time of writing this report, the project is in its initial stages.

4.1 Building Foundation Considerations

The founding depths of the proposed residential buildings are unknown at the time of writing this report. For the purposes of this report a foundation depth of 3.0 m below existing grade is assumed to account for a standard basement. Based on the borehole information, the future residential buildings can be supported by spread and strip footings founded on the undisturbed native soils or engineered fill for a bearing capacity of 100 kPa at SLS (serviceability limit states), and for a factored geotechnical resistance of 150 kPa at ULS (ultimate limit states). Final site grading is not known at the time of writing this report. Assumed bedrock was found within 3.0 m of surface in boreholes BH24-6, BH24-6A as well as the straight-augered BH24-6B and BH24-6C. Foundations built in those areas will require regrading or excavation into assumed bedrock. The bearing values and the corresponding founding depths at borehole locations are summarized on **Table 3**.

Table 3: Bearing Values and Founding Levels of Spread and Strip Footings

Borehole ID	Anticipated Founding Material	Minimum Depth Below Existing Grade (m) / Elevation (m)
BH24-1	Silt	2.6 / 222.1
BH24-2	Silt	2.6 / 217.7
BH24-3	Sand	2.9 / 218.4
BH24-4	Silt	2.6 / 219.3
BH24-5	Silt	1.8 / 212.5
BH24-6	Sandy Silt/ Assumed Bedrock	1.8 / 204.12.4 / 203.6
BH24-6A	Assumed Bedrock	1.6 / 205.4
BH24-7	Sandy Silt	1.1 / 195.5
BH24-8	Silt	2.6 / 210.4
BH24-9	Silty Sand	1.8 / 219.0
BH24-10	Silt	2.6 / 218.3

All footing bases must be inspected by qualified geotechnical engineering personnel prior to pouring concrete. The excavated footing bases can be covered with 50 mm thick lean concrete slab immediately after inspection and cleaning in order to avoid disturbance of the founding soil due to water, construction activity and weathering/drying.

SLR recommends additional boreholes in the areas in which early refusal occurred with rock coring to confirm bedrock depths. Foundations designed to the specified bearing capacity at the SLS of 100 kPa are expected to settle less than 25 mm total and 19 mm differential.

All foundations exposed to seasonal freezing conditions must have at least 1.2 metres of soil cover for frost protection. It should be noted that basement floor slabs should be at least 1 m above the seasonal high water level.

Where it is necessary to place footings at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

It should be noted that the recommended bearing resistances have been estimated by SLR from the borehole information for the preliminary development stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections to validate the information for use during the construction stage.

4.2 Pumping Station Foundations

The depth of the installed pumping station is unknown at the time of writing this report, and a founding depth of 5 to 6 m is assumed. Based on the borehole information, the pumping station will be below the assumed bedrock found in Borehole BH24-6A and excavation into the assumed bedrock would be required for installation. SLR recommends an additional borehole with rock coring to confirm bedrock depth and quality of rock to provide bearing capacity for the pumping station foundation.

Otherwise, the design location of the pumping station can be relocated to an area with deeper bedrock. If the pumping station is to be relocated an additional borehole with provisional rock coring is recommended to confirm bearing capacities at the founding depth or depth of bedrock if present.

4.3 Floor Slab and Permanent Drainage

The existing fills are considered not suitable for supporting the floor slab. Construction of the floor slab as a conventional slab-on-grade on competent native or engineered fill is considered feasible. Preparation of the floor slab subgrade should include stripping of the uncontrolled fill and otherwise deleterious material followed by proof-rolling of the exposed subgrade with a heavy roller to ensure uniform adequate support. Any soft spots revealed during proof rolling must be sub-excavated and backfilled with a well compacted approved material. The backfill required to raise the grade can consist of inorganic soil, placed in shallow lifts (200 mm) and compacted to 98% of Standard Proctor Maximum Dry Density (SPMDD).

Floor slabs, including basement floor slabs should be constructed so that the underside of the drainage layer is at a minimum of 0.5 m above the seasonal high groundwater levels. Site grading and building configuration should take into account observed groundwater.

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

For slab-on-grade building without basement, if the floor slab is more than about 300 mm higher than the exterior grade, then a perimeter drainage system is not considered to be necessary. If the floor is lower, then the perimeter drainage system shown on **Drawing 2** is recommended.

General comments regarding Engineered fill can be found in **Appendix C**.

4.4 Lateral Earth Pressures

The planned loading bay will experience lateral earth pressures as well as any foundation walls. The lateral earth pressures acting at any depth on foundation walls may be calculated from the following expression:

$$\mathbf{P_h = K (\gamma h + q)}$$

where P_h = Lateral earth pressure acting at depth “h” (kPa)

K = Earth pressure coefficient, assumed to be 0.40 for vertical walls and horizontal backfill for permanent construction

γ = Unit weight of backfill, may assume a value of 21 kN/m^3

h = Depth below finished grade of the point of interest (m)

q = Equivalent value of surcharge on the ground surface (kPa)

The above expression assumes that the perimeter drainage system as shown on **Drawing 2** prevents the build-up of any hydrostatic pressure behind the wall.

4.5 Excavations and Backfill

Excavations are expected to extend through the fill/reworked native soils into the native soils. Excavations can be carried out with a heavy hydraulic backhoe. It should be noted that the soil deposits are non-sorted sediments and therefore may contain boulders. Possible large obstructions such as buried concrete pieces, and existing foundations may also be encountered at the Site within the fill materials near existing and previously demolished structures. Provisions must be made in the excavation contract for the removal of possible boulders in the soil or obstructions in the fill material. It is assumed that work at this time will not involve excavation into the bedrock. If excavation into the bedrock is required, boreholes with rock coring and further study would be required to provide recommendations.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill materials, disturbed native soils, the loose to compact cohesionless soil would be classified as Type 3 above the groundwater table and Type 4 below the groundwater table.

Provided adequate groundwater control is achieved, it is anticipated that the majority of the foundation excavations at the Site could consist of temporary open cuts with side slopes of 1.5 horizontal to 1 vertical (1.5H: 1V) to the base of the excavation. However, depending on the construction procedures adopted by the contractor and weather conditions at the time of construction, some local flattening of the slopes may be required. Where side slopes of excavations are to be steepened, then a positive excavation support system should be considered.

The existing fill in the boreholes is generally not suitable for re-use as backfill. The native soils free from organics and other deleterious materials can be used as general construction backfill. Loose lifts of soil, which are to be compacted, should not exceed 200 mm. Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

Under floor fill should be compacted to at least 98% of SPMDD. The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular “B” should be used. Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should be compacted at the surface or be covered with tarpaulins to minimize moisture uptake.

It is expected that any seepage above the groundwater table can be removed by pumping from sumps in the building development area. Groundwater was encountered on site below the expected excavation depths and is not expected to be an issue. However, due to the presence of the on-site pond as well as high water levels in some of the boreholes, a more significant dewatering system may be needed.

It should be noted that if the construction dewatering system/sumps result in a water taking of more than 50,000 L/day but less than 400,000 L/day, a registration should be made in the Environmental Activity and Sector Registry (EASR). If a water taking is more than 400,000 L/day, a permit to take water (PTTW), issued by the MECP, will be required. In the future, SLR would be able to assist in quoting a separate Hydrogeological Assessment by to provide more detailed discussions on the dewatering requirements.

Surface water should be directed away from the excavation area, to prevent ponding of water that could result in disturbance and weakening of the foundation subgrade.

It should be noted that various attempts to drill the proposed borehole located near BH24-6A to analyze for pumping station installation and all were met with refusal. It is recommended that an additional borehole with rock coring is drilled in the proposed pumping station to confirm bedrock depth and groundwater conditions in the area of the proposed pumping station.

4.6 Seismic Considerations

The 2012 Ontario Building Code (OBC 2012) came into effect on January 1, 2014, and contains updated seismic analysis and design methodology. The seismic site classification methodology outlined in the code is based on the subsurface conditions within the upper 30 m below existing grade.

The conservative site classification is based on physical borehole information obtained at depths of less than 30 m and based on general knowledge of the local geology and physiography. In this regard, SLR’s drilling program included boreholes drilled to depths up to 6.7 m below the existing ground surface. Based on the borehole information and our local experience, a Site Class D may be used for the building design.

Should optimization of the site class be recommended by the structural engineer, in situ geophysical testing or a deep borehole extending to 30 m may be considered.

Pavements

The recommended pavement structures provided in **Table 3** are based upon borehole information obtained in this investigation and the City of Hamilton standards. The recommended pavement structures should be considered for reference purposes only. A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

Table 3: Recommended Pavement Structure Thickness

Pavement Layer	Compaction Requirements	Residential Pavement
Asphaltic Concrete	92%	40 mm HM 3
	Maximum Relative Density (MRD)	80 mm HL 8
OPSS Granular “A” Base (or 20mm Crusher Run Limestone)	100% SPMDD*	150 mm
OPSS Granular “B” (or 50mm Crusher Run Limestone)	100% SPMDD	300 mm
Note: * Denotes Standard Proctor Maximum Dry Density, ASTM-D698		

The subgrade must be compacted to 98% SPMDD for at least the upper 500 mm unless accepted by SLR.

The pavement design considers that construction will be carried out during the drier time of the year and that the subgrade is stable, as determined by proofrolling operations. If the subgrade should become excessively wet or rutted during construction activities, additional subbase material may be required. The need for additional subbase is best determined during construction.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. The excavation around catch basins and manholes should be backfilled with free-draining granular material to minimize differential movements between the pavement and structures due to frost action. The manholes/catch basins should be provided with perforated stub drains to permit drainage of the backfill. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

Additional comments on the construction of internal roadways and parking areas are as follows:

1) As part of the subgrade preparation, proposed areas for internal roads and pavements should be stripped of topsoil and other obvious deleterious material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report. The subgrade should be properly shaped, crowned then proof-rolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved granular backfill compacted to 98% SPMDD.

2) The locations and extent of sub-drainage required within the roadways and other paved areas should be reviewed by a pavement engineer in conjunction with the proposed site grading. The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines. Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory. If shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by a pavement engineer.

The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavourable weather.

4.7 Geotechnical Quality of Excavated Soils

Reference to the borehole logs suggests that the excavated materials with respect to their compaction characteristics can be divided into two groups:

- **Group 1** soils comprise the cohesionless to low plasticity silt/sandy silt to silty sand/sand. The compaction of these soils will require a very tight control of their moisture content during placement and compaction. At moisture contents more than 3% below the optimum, the soil will likely be dusty and “flour” like while at moisture contents ±1% higher than optimum, the soil will be “spongy” and will “pump”.
- **Group 2** soils consist of unsuitable materials because of their high moisture or organic inclusions, including the topsoil and some of the existing fill materials. These soils should be either disposed off-site or should be used only in “soft” landscaping areas where they can be placed with nominal compaction, and where surface settlements are tolerable to the Region.

As a general requirement, all backfill material should be placed in 200 to 300mm thick loose lifts and compacted to at least 96% of SPMDD, at a placement moisture content within ±2% of the optimum. Below existing/future roads, the backfill must be Granular “A” or “B” material, and the top 1.5m of subgrade backfill below the underside of the pavement structure should be compacted to 98% of SPMDD. The existing road pavement structure should be reinstated. New granular fill must match in thickness to the underside of the existing to ensure unimpeded cross drainage. Where a free draining backfill is needed or where the backfill is needed for structural support of overlying structures, the site soils will not be suitable and OPSS Granular “A” or “B” sand and gravel will be required. Similarly, during work in the autumn, winter and spring months, re-use of the excavated soils as compacted fill may not be practical and imported OPSS Granular “B” should be used.

4.8 Slope Stability

Slope stability analysis of the eastern pond slope as requested is forthcoming. However more boreholes are recommended in the northern section of the Site to review the south pond slope if long term stable top of slope is required for building setbacks.

5.0 Closure

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

This report was prepared, reviewed and approved by the undersigned:

SLR Consulting (Canada) Ltd.

LICENSED PROFESSIONAL ENGINEER
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100184358
PROVINCE OF ONTARIO

Sam MacDonald, EIT
Geotechnical Project Manager

Chi Cheng (Dennis) Tseng, M.Sc., P.Eng.
Principal Geotechnical Engineer

6.0 References

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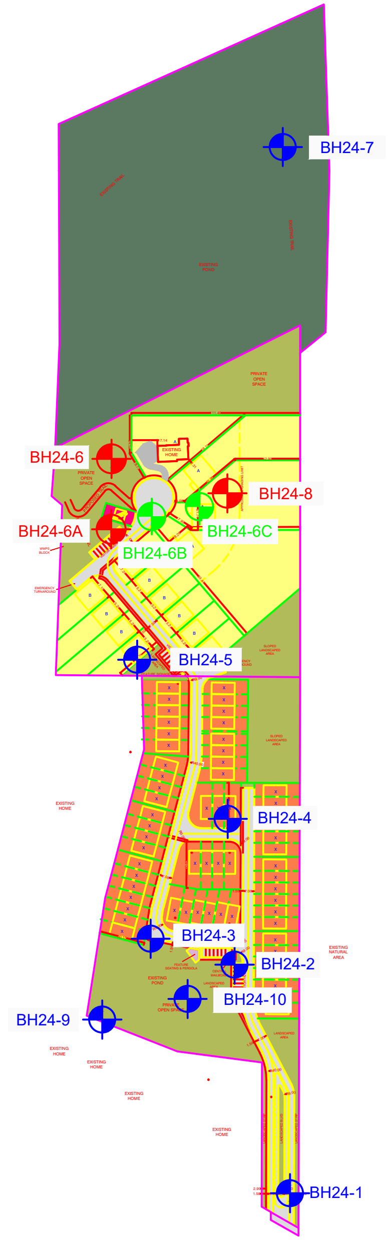


LEGEND

⊕ ⊕ Borehole/Monitoring Well Location

⊕ Unlogged Borehole Attempts

Client: **Mizrahi Developments**

Drawn: **SM**

Approved: **MDS**

Date: **December, 2024**

Scale: **As Shown**

Original Size: **Letter**

Rev: **N/A**

Project No.: **244.024373.00003**

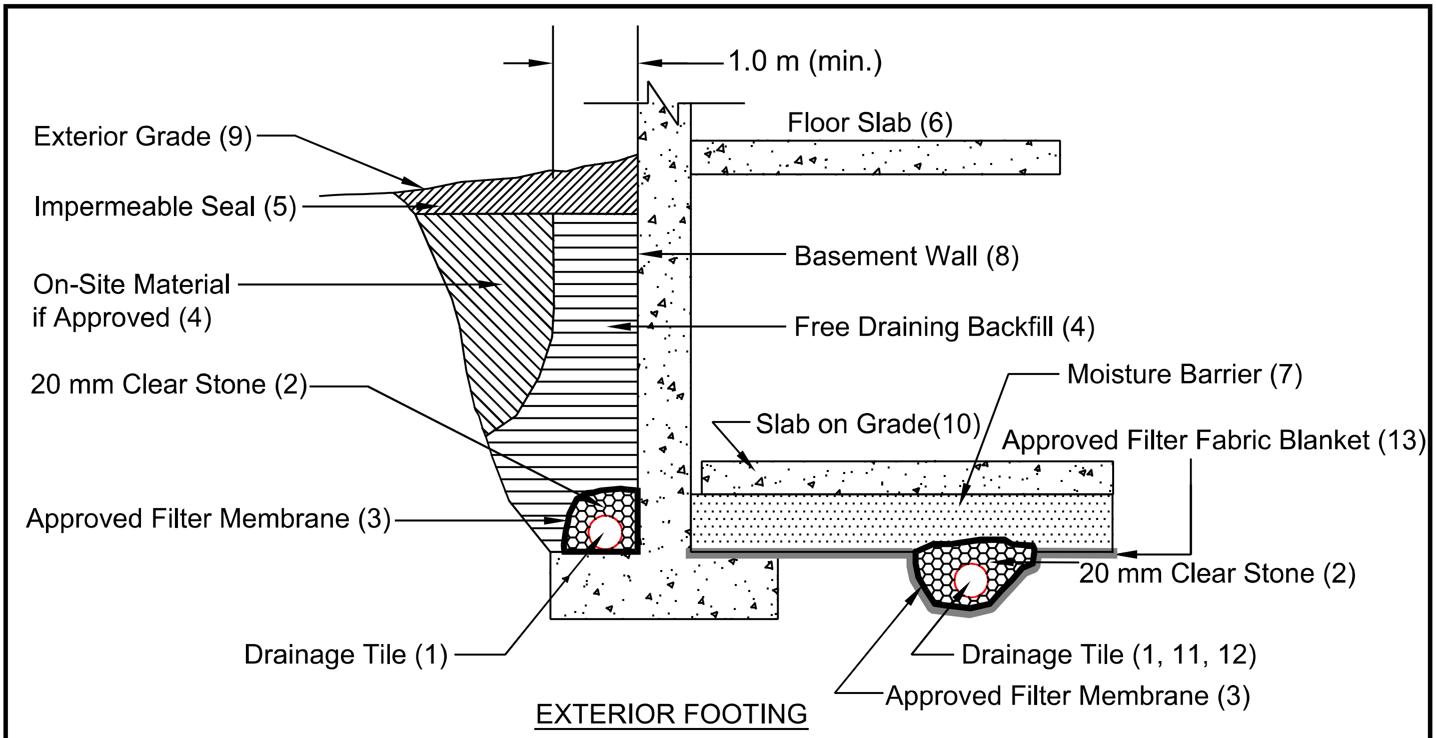
Drawing No.: **1**

Title: **Borehole/Monitoring Well Location Plan**

Project: **Preliminary Geotechnical Investigation**
159-163 Sulphur Springs Road, Acaster, ON

SLR

871 Equestrian Court, Unit 1
Oakville, Ontario
L6L 6L7



Notes

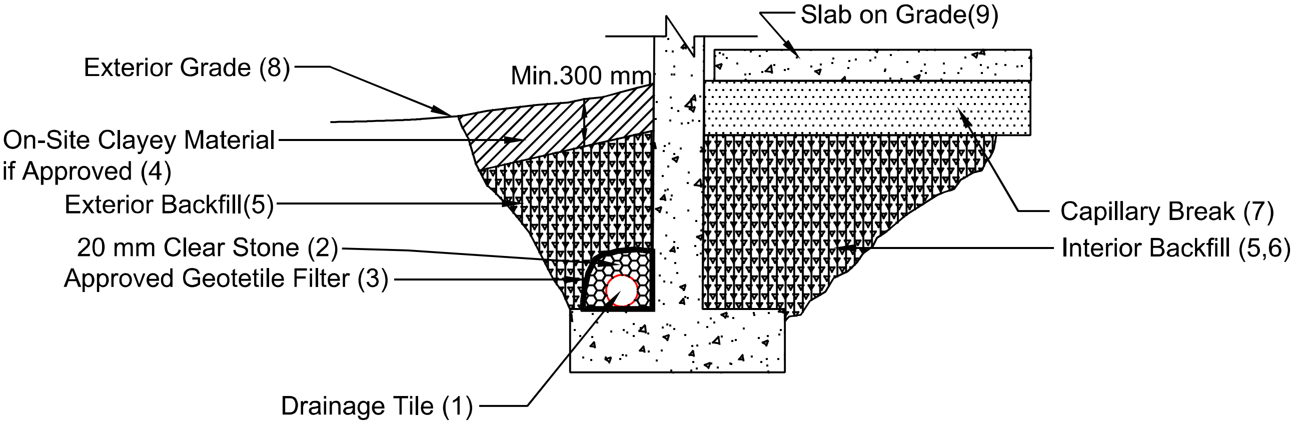
1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be damp proofed /water proofed.
9. Exterior grade to slope away from building.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Basement with Underfloor Drainage

(not to scale)

Project: 244.024373.00003

Drawing No. 3



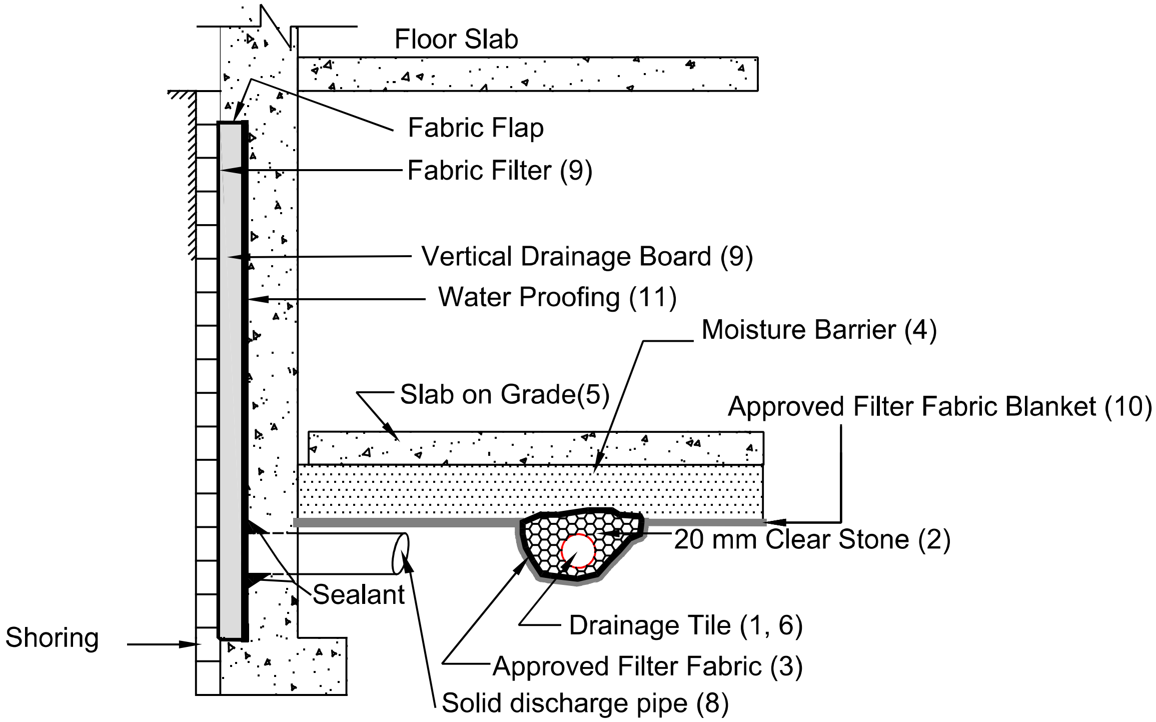
EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved geotetile filter (Terrafix 270R or equivalent).
4. The on-site clayey material, if approved, can be used as backfill in the upper 300 mm.
5. The interior and exterior fill adjacent to foundation walls should be OPSS Granular 'B' Type I. Compact to at least 98% SPMDD.
6. Do not use heavy compaction equipment within 450 mm (18") of the wall. Do not fill or compact within 1.8 m (6') of the wall. Place fill on both sides simultaneously.
7. Capillary break to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors (consult with archtect).
8. Exterior grade to slope away from building at min. 2%.
9. Slab on grade should not be structurally connected to the wall or footing.
10. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Slab on Grade Construction Without Underfloor Drainage

(not to scale)



EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board with filter cloth should be kept a minium of 1.2 m below exterior finished grade.
10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
11. The basement walls should be water proofed using bentonite or equivalent water-proofing system.
12. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS

Shored Basement wall with Underfloor Drainage System

(not to scale)

Appendix A Borehole Logs

Preliminary Geotechnical Investigation – 159-163 Sulphur Springs Road

Ancaster, Ontario

Mizrahi Developments

SLR Project No.: 244.024373.00003

December 19, 2024

EXPLANATION OF TERMS USED IN THE BOREHOLE LOGS

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Spoon sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), ‘N’:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter open sampler for a distance of 300 mm (12 in).

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter 60° cone attached to “A” size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils

Classification	Particle Size
Boulders	>300 mm
Cobbles	75 mm – 300 mm
Gravel (Gr)	4.75 mm – 75 mm
Sand (Sa)	0.075 mm – 4.75 mm
Silt (Si)	0.002 mm – 0.075 mm
Clay (Cl)	<0.002 mm

Terminology	Proportion
Trace	0 – 10%
Some	10 – 20%
Adjective (e.g. silty or sandy)	20 – 35%
And (e.g. sand and gravel)	> 35 %

Soil Description

a) Cohesive Soils

Consistency	Undrained Shear Strength (kPa)	SPT ‘N’ Value
Very Soft	< 12	0 – 2
Soft	12 – 25	2 – 4
Firm	25 – 50	4 – 8
Stiff	50 – 100	8 – 15
Very Stiff	100 – 200	15 – 30
Hard	> 200	> 30

b) Cohesionless Soils

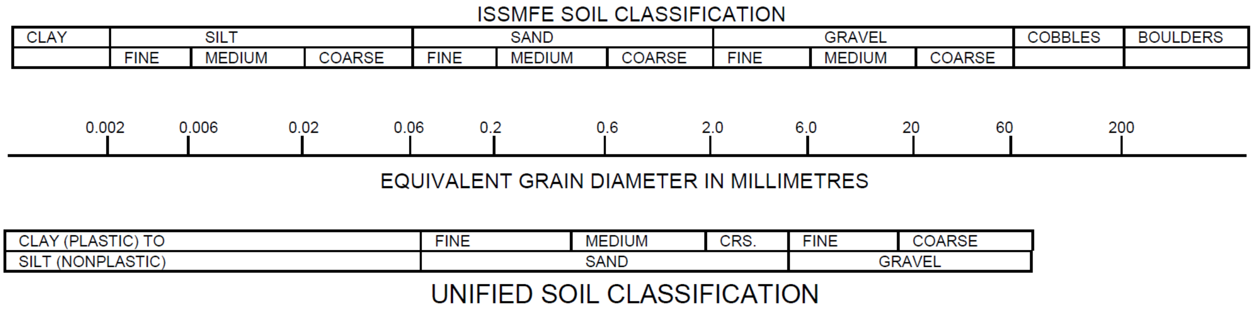
Density Index (Relative Density)	Undrained Shear Strength (kPa)	SPT ‘N’ Value
Very Loose	N/A	< 4
Loose	N/A	4 – 10
Compact	N/A	10 – 30
Dense	N/A	30 – 50
Very Dense	N/A	> 50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	Consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (Specific gravity, Gs)
DS	Direct shear test
ENV	Environmental / chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
V	Field vane (LV – laboratory vane test)
γ	Unit weight

NOTES ON SAMPLE DESCRIPTIONS

1. All sample descriptions included in this report generally follow the Unified Soil Classification system. Laboratory grain size analyses provided by SLR also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that with the exception of samples where Gradation and / or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between classification systems.



2. Fill: Where fill is designated on the borehole log, it is defined as indicated by the sample recovered during the drilling process. The reader is cautioned that fills are heterogeneous in nature and consequently 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 obstructions 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 indicated 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. The readings are to advise to 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 underground reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary 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 on the borehole logs. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone, caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

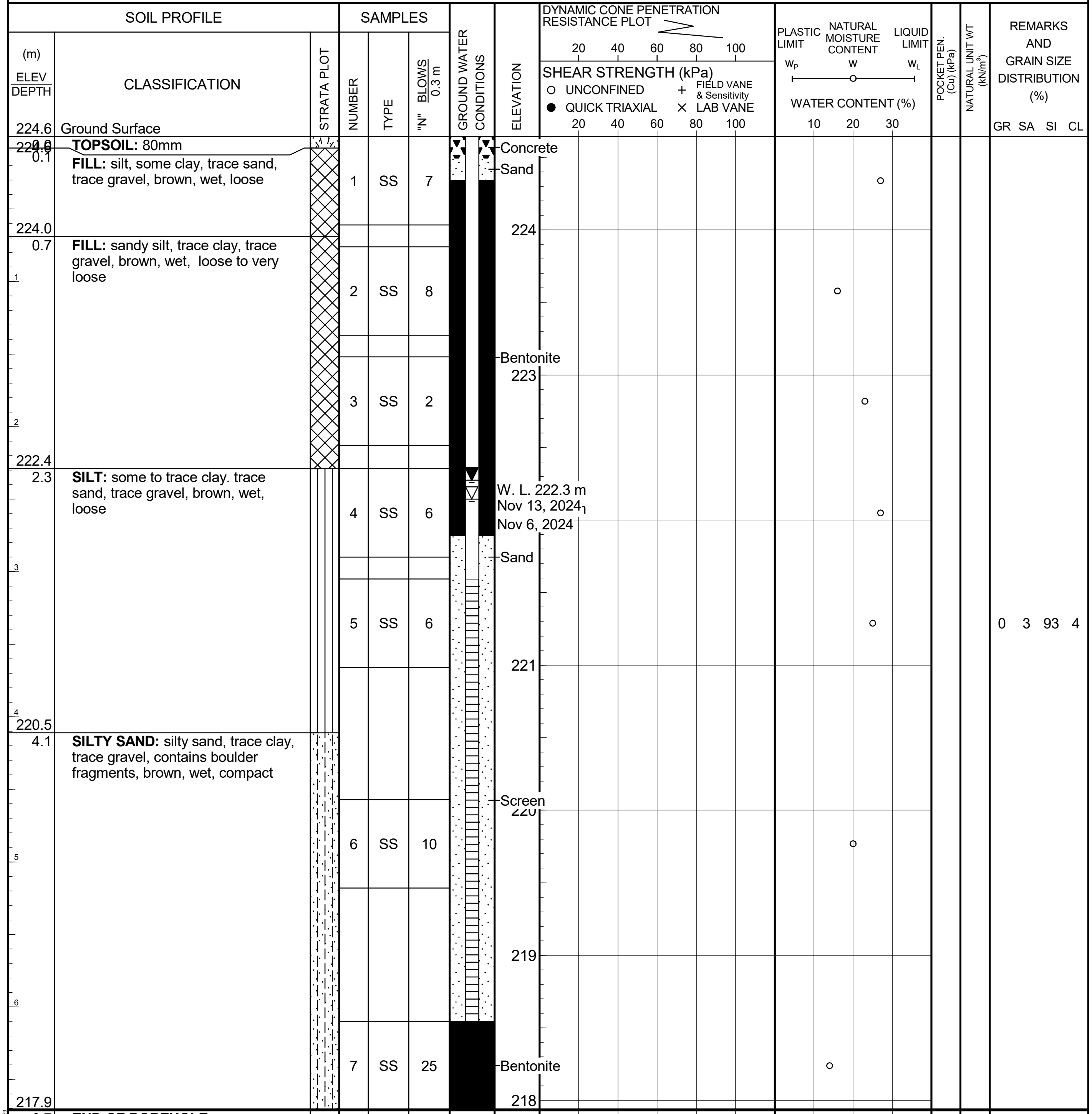
LOG OF BOREHOLE BH24-01

1 OF 1

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road
CLIENT: Mizrahi Developments
PROJECT LOCATION: Ancaster, ON
DATUM: Geodetic
BH LOCATION: N 4786568.922 E 582480.39

Method: Solid Stem Augers
Diameter: 150 mm
Date: Oct 31, 2024

REF. NO.: 244.024373.00003
ENCL NO.: 1



(m) ELEV DEPTH	CLASSIFICATION	NUMBER	TYPE	"N" BLOWS/0.3 m	GR	SA	SI	CL
224.6	Ground Surface							
224.5 0.1	**TOPSOIL:** 80mm							
	FILL: silt, some clay, trace sand, trace gravel, brown, wet, loose	1	SS	7				
224.0 0.7	**FILL:** sandy silt, trace clay, trace gravel, brown, wet, loose to very loose	2 3	SS SS	8 2				
222.4 2.3	**SILT:** some to trace clay. trace sand, trace gravel, brown, wet, loose	4 5	SS SS	6 6	 0	 3	 93	 4
220.5 4.1	**SILTY SAND:** silty sand, trace clay, trace gravel, contains boulder fragments, brown, wet, compact	6 7	SS SS	10 25				
217.9 6.7	**END OF BOREHOLE:**							

1) 50mm diameter monitoring well was installed upon completion of drilling.
2) Water Level Readings:

Date	W. L. Depth (mBGS)
2024-11-06	2.50
2024-11-13	2.37

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ 8 =3% Strain at Failure

SLR

LOG OF BOREHOLE BH24-02

1 OF 1

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road
CLIENT: Mizrahi Developments
PROJECT LOCATION: Ancaster, ON
DATUM: Geodetic
BH LOCATION: N 4786702.007 E 582417.444

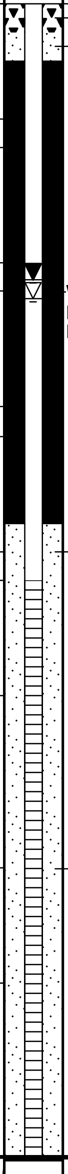
Method: Solid Stem Augers
Diameter: 150 mm
Date: Oct 30, 2024

REF. NO.: 244.024373.00003
ENCL NO.: 2

(m) ELEV / DEPTH	SOIL PROFILE CLASSIFICATION	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
220.3	Ground Surface				
0.0	**TOPSOIL:** 50mm				
220.3 0.1	**FILL:** silt, some clay, trace sand, trace gravel, brown to grey, wet, compact to loose	1	SS	6	
		2	SS	13	
		3	SS	7	
218.0 2.3	**SILT:** some to trace clay. trace sand, trace gravel, brown, wet, loose	4	SS	7	
		5	SS	5	
216.3 4.1	**SILTY SAND:** silty sand, trace clay, trace gravel, brown, wet, compact	6	SS	14	0 83 16 1
	grey				
214.2	auger refusal at 6.0 m				
6.1	**END OF BOREHOLE:**	7	SS	50/ initial 25mm	

1) 50mm diameter monitoring well was installed upon completion of drilling.
2) Water Level Readings:

Date	W. L. Depth (mBGS)
2024-11-06	1.56
2024-11-12	1.46



ELEVATION: 220, 219, 218, 217, 216, 215

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m^3)

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity ○ ^{8}=3% Strain at Failure

LOG OF BOREHOLE BH24-03

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road

CLIENT: Mizrahi Developments

Method: Solid Stem Augers

PROJECT LOCATION: Ancaster, ON

Diameter: 150 mm

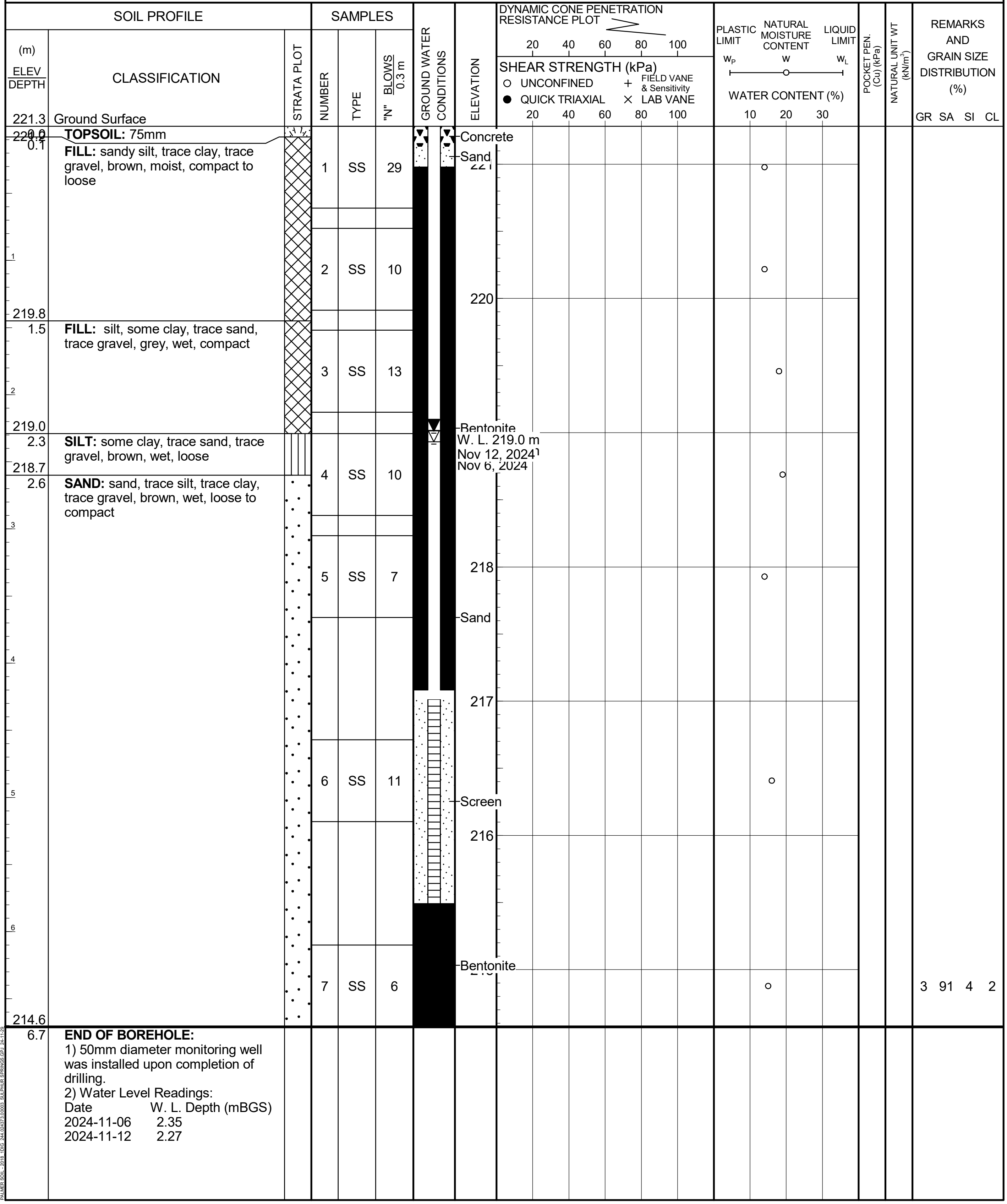
REF. NO.: 244.024373.00003

DATUM: Geodetic

Date: Oct 30, 2024

ENCL NO.: 3

BH LOCATION: N 4786706.41 E 582360.245



(m) ELEV DEPTH	CLASSIFICATION	NUMBER	TYPE	"N" BLOWS/0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
221.3	Ground Surface							
0.0	**TOPSOIL:** 75mm							
221.2 0.1	**FILL:** sandy silt, trace clay, trace gravel, brown, moist, compact to loose	1	SS	29				
		2	SS	10				
219.8 1.5	**FILL:** silt, some clay, trace sand, trace gravel, grey, wet, compact	3	SS	13				
219.0 2.3	**SILT:** some clay, trace sand, trace gravel, brown, wet, loose	4	SS	10				
218.7 2.6	**SAND:** sand, trace silt, trace clay, trace gravel, brown, wet, loose to compact	5	SS	7				
		6	SS	11				
		7	SS	6	3	91	4	2
214.6 6.7	**END OF BOREHOLE:** 1) 50mm diameter monitoring well was installed upon completion of drilling. 2) Water Level Readings:							

Date	W. L. Depth (mBGS)
2024-11-06	2.35
2024-11-12	2.27

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH24-04

1 OF 1

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road

CLIENT: Mizrahi Developments

PROJECT LOCATION: Ancaster, ON

DATUM: Geodetic

BH LOCATION: N 4786794.508 E 582393.586

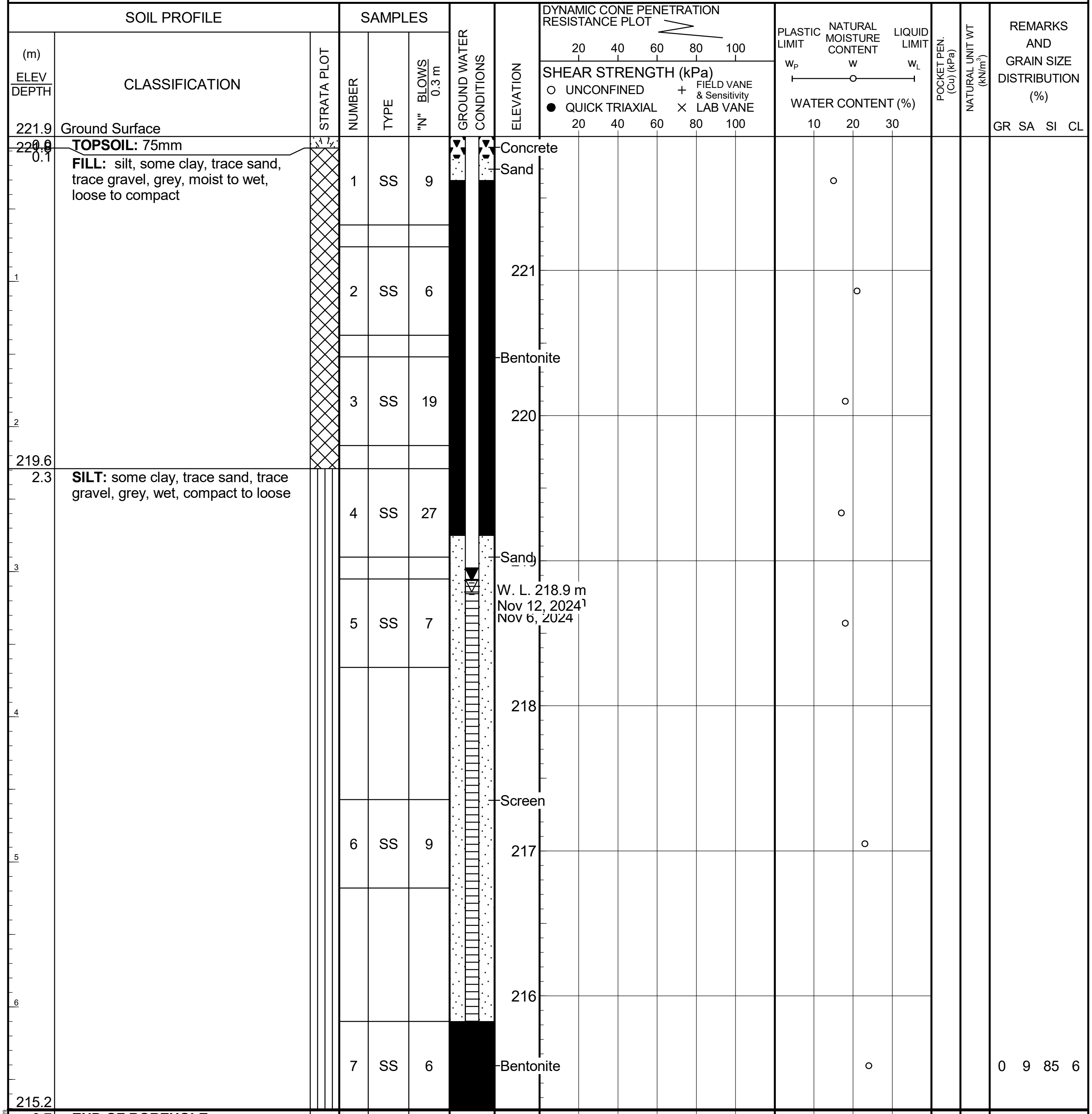
Method: Solid Stem Augers

Diameter: 150 mm

Date: Oct 30, 2024

REF. NO.: 244.024373.00003

ENCL NO.: 4



(m) ELEV DEPTH	SOIL PROFILE CLASSIFICATION
221.9	Ground Surface
221.8 0.1	**TOPSOIL:** 75mm **FILL:** silt, some clay, trace sand, trace gravel, grey, moist to wet, loose to compact
219.6 2.3	**SILT:** some clay, trace sand, trace gravel, grey, wet, compact to loose
215.2 6.7	**END OF BOREHOLE:**

NUMBER	TYPE	"N" BLOWS 0.3 m	GR	SA	SI	CL
1	SS	9				
2	SS	6				
3	SS	19				
4	SS	27				
5	SS	7				
6	SS	9				
7	SS	6	0	9	85	6

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

END OF BOREHOLE:

1) 50mm diameter monitoring well was installed upon completion of drilling.

2) Water Level Readings:

Date	W. L. Depth (mBGS)
2024-11-06	3.14
2024-11-12	3.06

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

$+^3, \times^3$: Numbers refer to Sensitivity

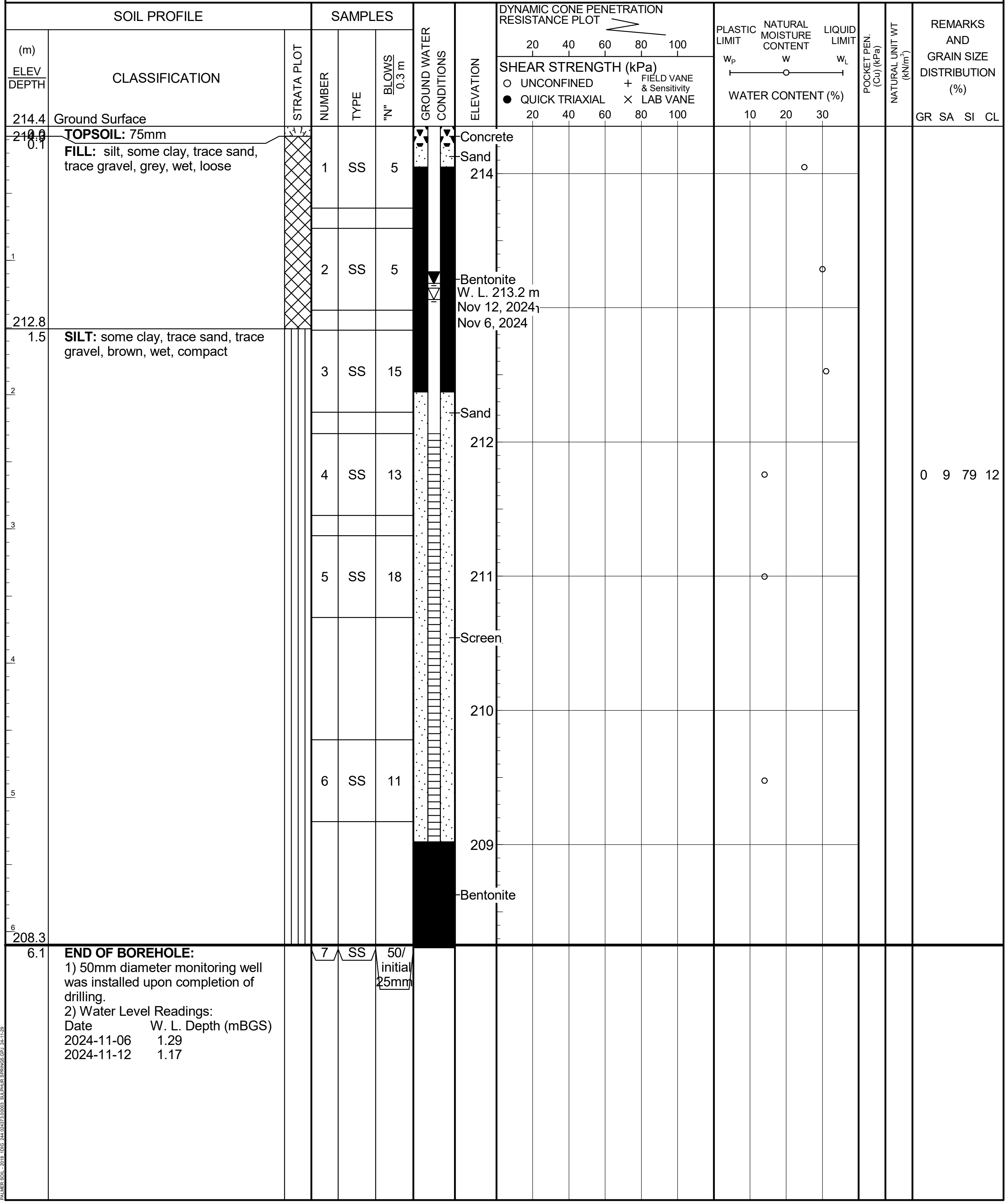
○ $^{\varepsilon}$=3% Strain at Failure

LOG OF BOREHOLE BH24-05

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road
CLIENT: Mizrahi Developments
PROJECT LOCATION: Ancaster, ON
DATUM: Geodetic
BH LOCATION: N 4786884.293 E 582313.732

Method: Solid Stem Augers
Diameter: 150 mm
Date: Oct 30, 2024

REF. NO.: 244.024373.00003
ENCL NO.: 5



(m) ELEV DEPTH	CLASSIFICATION	NUMBER	TYPE	"N" BLOWS 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
214.4	Ground Surface				
214.3 0.1	**TOPSOIL:** 75mm				
	FILL: silt, some clay, trace sand, trace gravel, grey, wet, loose	1	SS	5	
		2	SS	5	
212.8 1.5	**SILT:** some clay, trace sand, trace gravel, brown, wet, compact	3	SS	15	
		4	SS	13	0 9 79 12
		5	SS	18	
		6	SS	11	
208.3 6.1	**END OF BOREHOLE:**	7	SS	50/ initial 25mm	

1) 50mm diameter monitoring well was installed upon completion of drilling.
2) Water Level Readings:

Date	W. L. Depth (mBGS)
2024-11-06	1.29
2024-11-12	1.17

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH24-06

1 OF 1

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road

CLIENT: Mizrahi Developments

PROJECT LOCATION: Ancaster, ON

DATUM: Geodetic

BH LOCATION: N 4787008.677 E 582271.368

Method: Solid Stem Augers

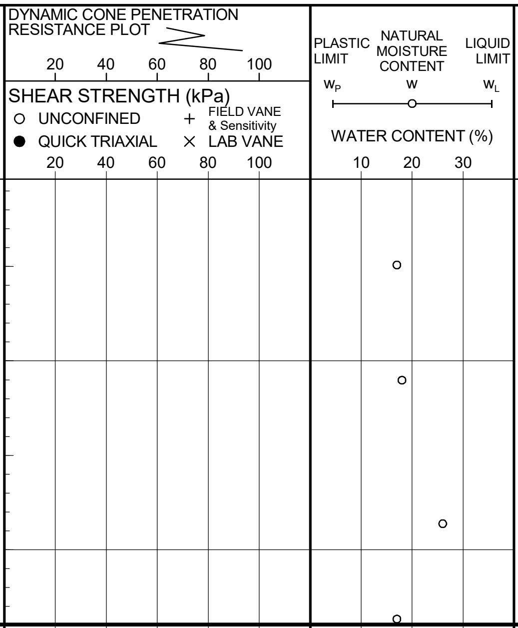
Diameter: 150 mm

Date: Oct 31, 2024

REF. NO.: 244.024373.00003

ENCL NO.: 6

SOIL PROFILE			SAMPLES					
(m) ELEV DEPTH	CLASSIFICATION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
206.0	Ground Surface							
206.9 0.0	**ASPHALT:** 100mm	■						
0.1	**FILL:** sand and gravel, trace silt, trace clay, contains cobbles, brown, wet, compact	⊠	1	SS	16			
205.2 0.8	**FILL:** clayey silt, trace sand, trace gravel, trace rootlets, brown, moist, stiff	⊠	2	SS	10		205	
204.4 1.5	**SANDY SILT:** trace clay, trace gravel, contains boulders, brown, wet, compact to very dense		3	SS	18		204	
203.6			4	SS	50/ 75 mm			
2.4	**END OF BOREHOLE UPON PRACTICAL REFUSAL OF AUGER**							



0_SOIL-ROCK-FEB 2023_CORRECT DATE FORMAT_NEW LOGO.GLB
PALMER SOIL - 2018_1DIG_244.024373.00003_SULPHUR SPRINGS.GPJ 24-11-29

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH24-07

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road
CLIENT: Mizrahi Developments
PROJECT LOCATION: Ancaster, ON
DATUM: Geodetic
BH LOCATION: N 4787237.405 E 582313.771

Method: Solid Stem Augers
Diameter: 150 mm
Date: Oct 31, 2024

REF. NO.: 244.024373.00003
ENCL NO.: 8

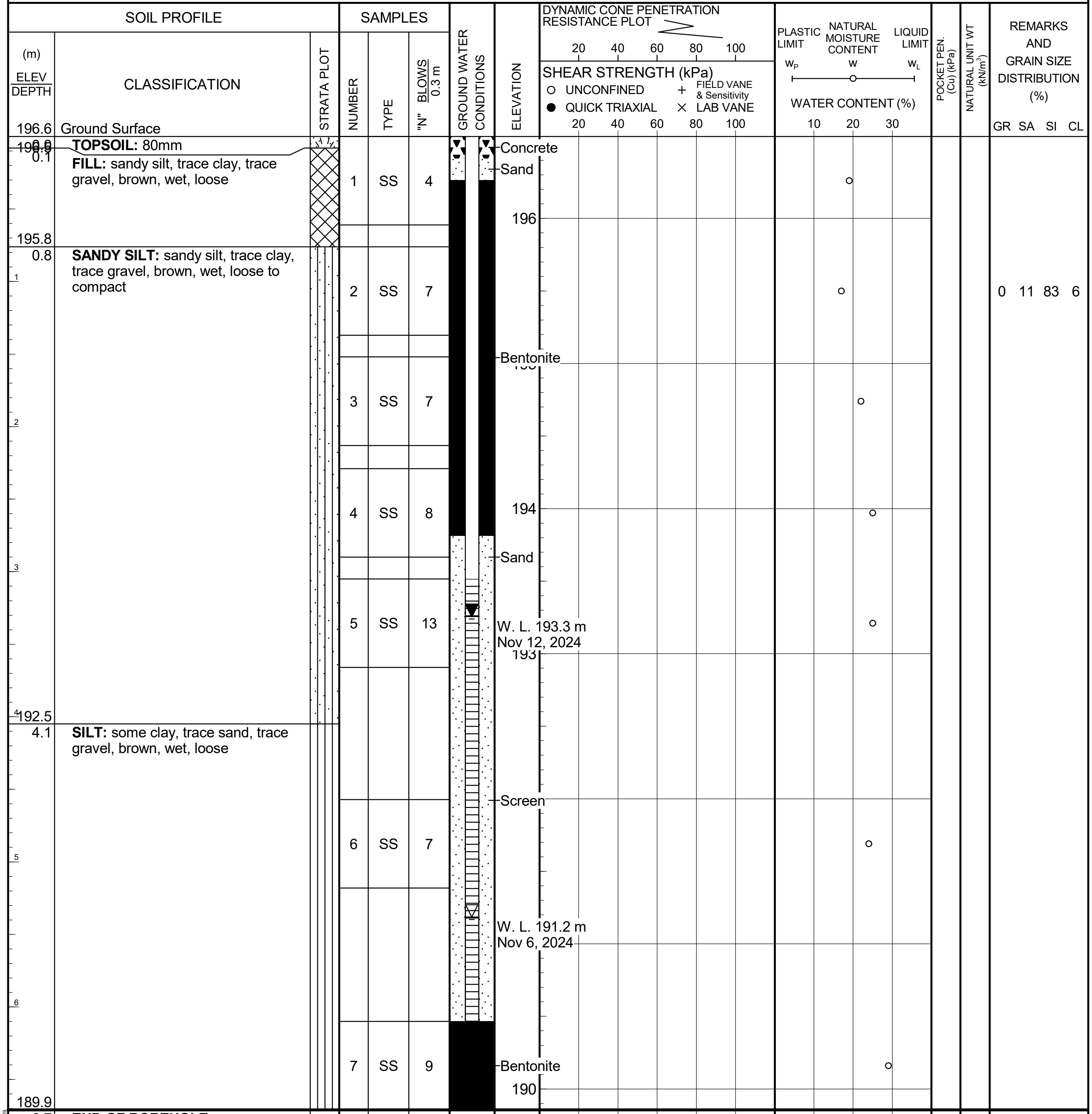
SOIL PROFILE

(m) ELEV / DEPTH	CLASSIFICATION
196.6	Ground Surface
0.0	**TOPSOIL:** 80mm
196.5 0.1	**FILL:** sandy silt, trace clay, trace gravel, brown, wet, loose
195.8 0.8	**SANDY SILT:** sandy silt, trace clay, trace gravel, brown, wet, loose to compact
192.5 4.1	**SILT:** some clay, trace sand, trace gravel, brown, wet, loose
189.9 6.7	**END OF BOREHOLE:** 1) 50mm diameter monitoring well was installed upon completion of drilling. 2) Water Level Readings:

Date	W. L. Depth (mBGS)
2024-11-06	5.38
2024-11-12	3.31

SAMPLES

NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
1	SS	4				
2	SS	7	0	11	83	6
3	SS	7				
4	SS	8				
5	SS	13				
6	SS	7				
7	SS	9				



GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ 8=3% Strain at Failure

LOG OF BOREHOLE BH24-08

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road

CLIENT: Mizrahi Developments

PROJECT LOCATION: Ancaster, ON

DATUM: Geodetic

BH LOCATION: N 4787000.169 E 582350.072

Method: Solid Stem Augers

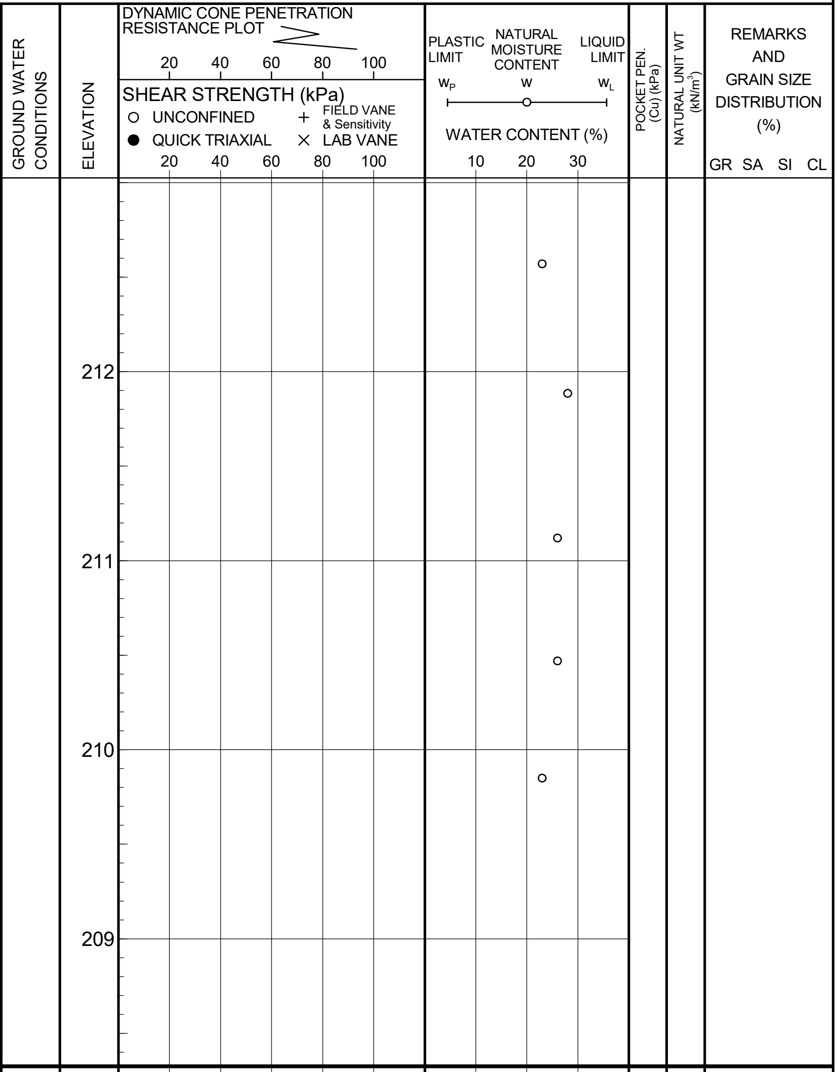
Diameter: 150 mm

Date: Oct 30, 2024

REF. NO.: 244.024373.00003

ENCL NO.: 9

SOIL PROFILE		SAMPLES		
(m) ELEV / DEPTH	CLASSIFICATION	NUMBER	TYPE	"N" BLOWS / 0.3 m
213.0	Ground Surface			
213.0 0.0	**TOPSOIL:** 75mm			
212.9 0.1	**FILL:** silt, some clay, trace sand, trace gravel, brown, moist, loose to very loose	1	SS	4
		2	SS	3
		3	SS	6
210.7 2.3	**SILT:** some clay, trace sand, trace gravel, brown, wet, loose to very loose	4	SS	5
		5	SS	2
		6	SS	50/ initial 25 mm
208.3 4.7	**END OF BOREHOLE UPON PRACTICAL REFUSAL OF AUGER**			



GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

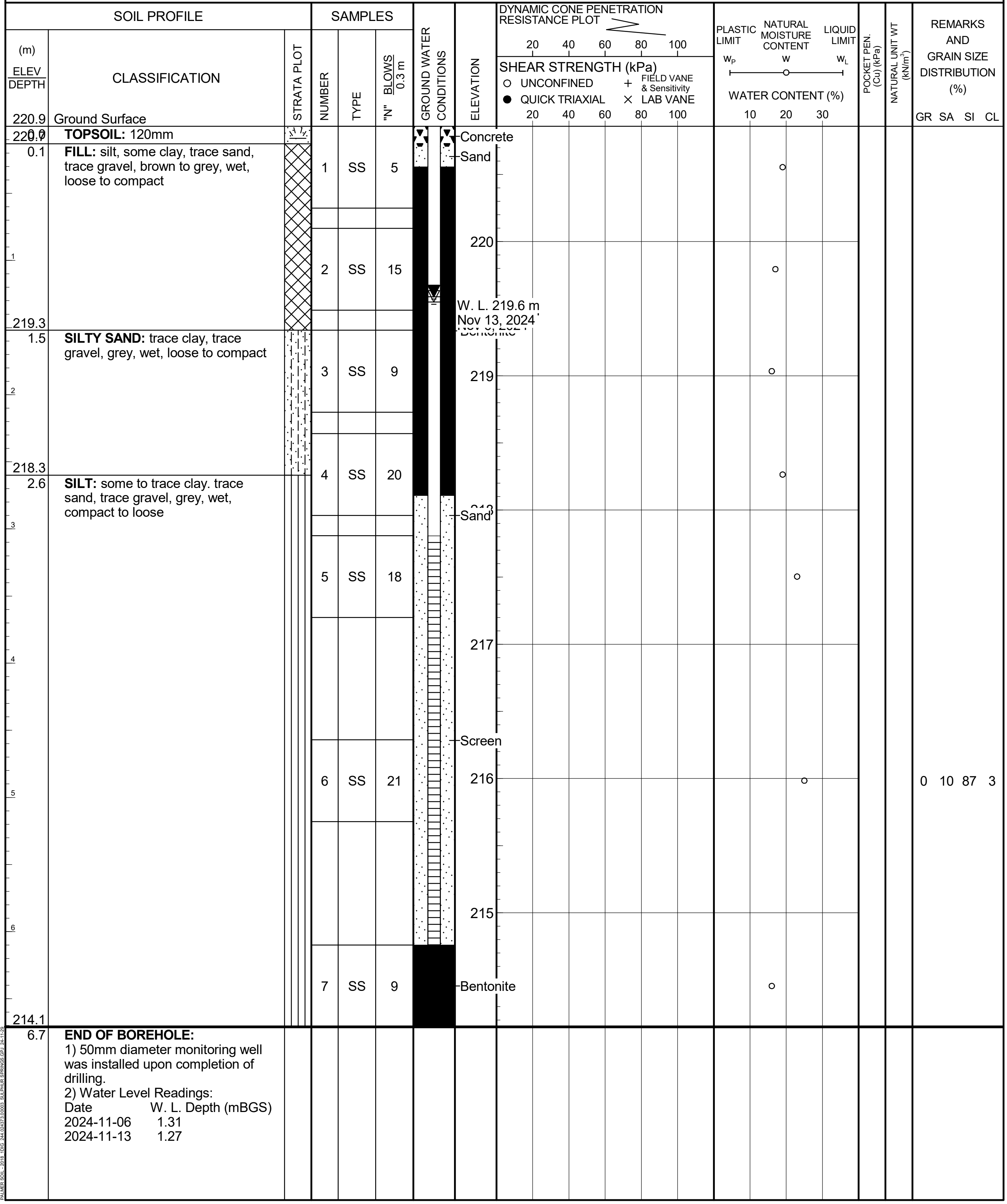
GRAPH NOTES +³, ×³: Numbers refer to Sensitivity ○ ^{8}=3% Strain at Failure

LOG OF BOREHOLE BH24-09

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road
CLIENT: Mizrahi Developments
PROJECT LOCATION: Ancaster, ON
DATUM: Geodetic
BH LOCATION: N 4786658.579 E 582337.27

Method: Solid Stem Augers
Diameter: 150 mm
Date: Oct 31, 2024

REF. NO.: 244.024373.00003
ENCL NO.: 10



(m) ELEV DEPTH	SOIL PROFILE CLASSIFICATION	SAMPLE NUMBER	TYPE	"N" BLOWS 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
220.9	Ground Surface				
220.8 0.0	**TOPSOIL:** 120mm				
0.1	**FILL:** silt, some clay, trace sand, trace gravel, brown to grey, wet, loose to compact	1	SS	5	
		2	SS	15	
219.3 1.5	**SILTY SAND:** trace clay, trace gravel, grey, wet, loose to compact	3	SS	9	
218.3 2.6	**SILT:** some to trace clay. trace sand, trace gravel, grey, wet, compact to loose	4	SS	20	
		5	SS	18	
		6	SS	21	0 10 87 3
		7	SS	9	
214.1 6.7	**END OF BOREHOLE:**				

1) 50mm diameter monitoring well was installed upon completion of drilling.
2) Water Level Readings:

Date	W. L. Depth (mBGS)
2024-11-06	1.31
2024-11-13	1.27

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH24-10

1 OF 1

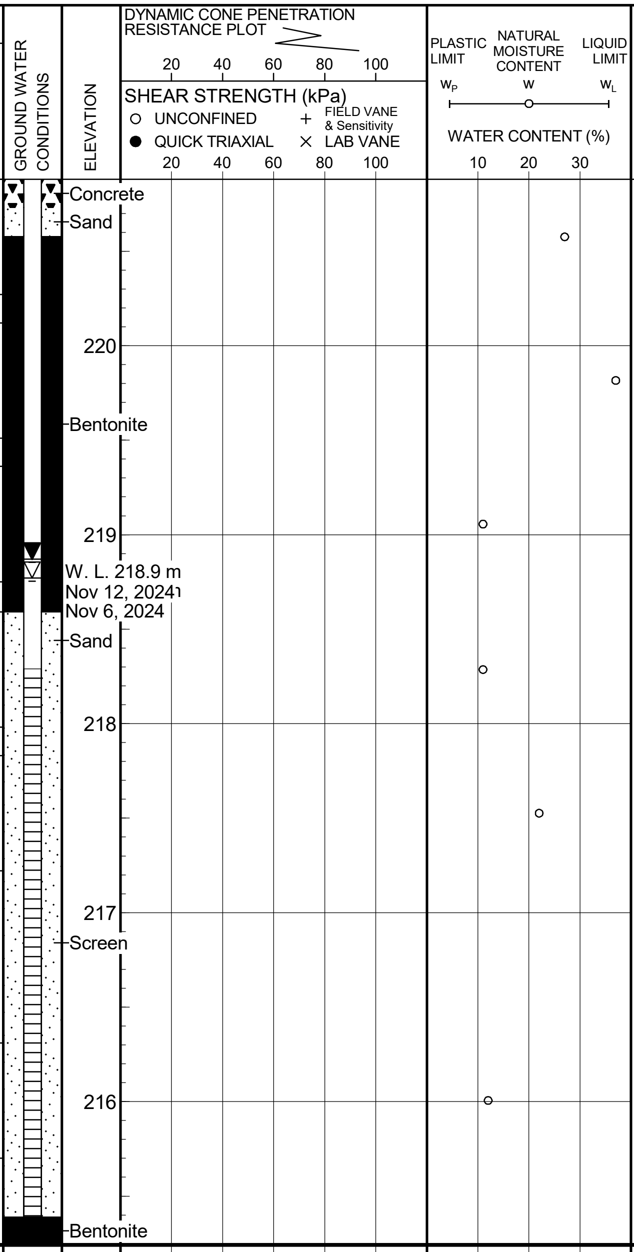
PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road
CLIENT: Mizrahi Developments
PROJECT LOCATION: Ancaster, ON
DATUM: Geodetic
BH LOCATION: N 4786673.772 E 582392.614

Method: Solid Stem Augers
Diameter: 150 mm
Date: Oct 31, 2024

REF. NO.: 244.024373.00003
ENCL NO.: 11

(m) ELEV DEPTH	SOIL PROFILE CLASSIFICATION
220.9	Ground Surface
220.8 0.0	**TOPSOIL:** 120mm
0.1	**FILL:** silt, some clay, trace sand, trace gravel, grey, wet to moist, loose to compact
218.6 2.3	**SILT:** some clay, trace sand, trace gravel, brown, moist to wet, loose to compact
215.2	auger refusal
5.6	**END OF BOREHOLE:** 1) 50mm diameter monitoring well was installed upon completion of drilling. 2) Water Level Readings: Date W. L. Depth (mBGS) 2024-11-06 2.11 2024-11-12 2.01

SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
1	SS	6				
2	SS	5				
3	SS	11				
4	SS	9				
5	SS	12	2	6	80	12
6	SS	12				



POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH24-6A

PROJECT: Geotechnical Investigation - 159-163 Sulphur Springs Road
CLIENT: Mizrahi Developments
PROJECT LOCATION: Ancaster, ON
DATUM: Geodetic
BH LOCATION: N 4786981.09 E 582266.141

Method: Solid Stem Augers
Diameter: 150 mm
Date: Nov 13, 2024

REF. NO.: 244.024373.00003
ENCL NO.: 7

(m) ELEV / DEPTH	SOIL PROFILE CLASSIFICATION	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION
207.0	Ground Surface					
206.9 0.0 0.1	**TOPSOIL:** 80mm					
	FILL: clayey silt, trace sand, trace gravel, trace rootlets, brown, moist, firm to stiff	1	SS	7		
205.9 1.0	**FILL:** sandy silt, trace clay, trace gravel, brown, moist, compact	2	SS	16		206
205.4 1.6	**END OF BOREHOLE UPON PRACTICAL REFUSAL OF AUGER**	3	SS	50/ initial 25mm		

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED
● QUICK TRIAXIAL
+ FIELD VANE & Sensitivity
× LAB VANE
20 40 60 80 100

PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT W_L
WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m^3)

REMARKS AND GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Appendix B Geotechnical Laboratory Results

Preliminary Geotechnical Investigation – 159-163 Sulphur Springs Road

Ancaster, Ontario

Mizrahi Developments

SLR Project No.: 244.024373.00003

December 19, 2024

SLR

SLR Consulting (Canada) Ltd.

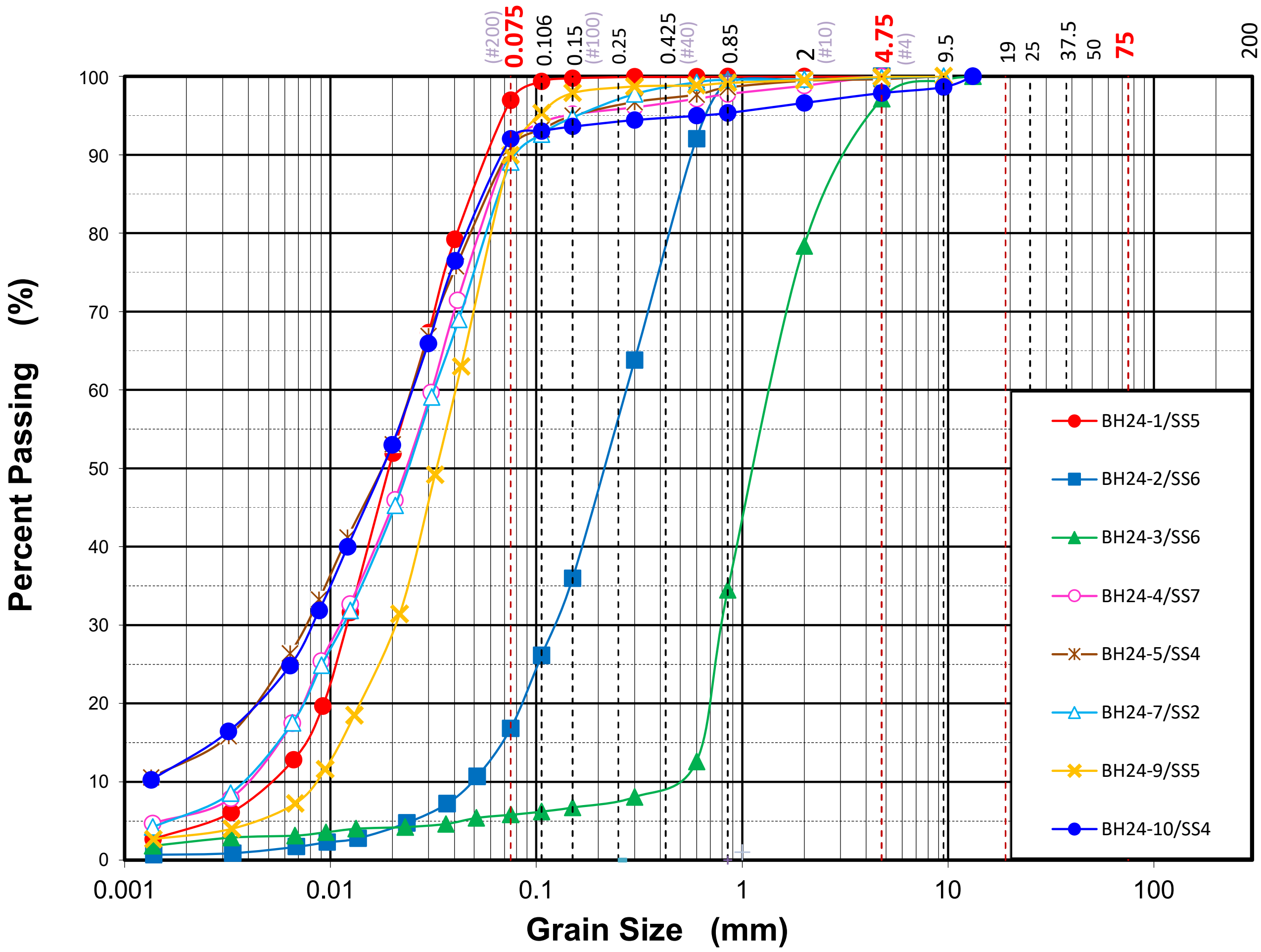
871 Equestrain Ct, Unit 1
Oakville, ON L6L 6L7

Particle Size Distribution Report
(ASTM D421/422)

Project No.:	244.024373.00003	Lab No.:	R24-052
Project Name:	159-163 Sulphur Springs Road	Tested By:	BW
Client:	Mizrahi Developments	Checked By:	OT
Location:	Ancaster, Ontario	Date:	11/15/2024

Test Results

Test No.	Sample No.	Clay	Silt	Sand			Gravel		Cobble+	Remarks
				Fine	Medium	Coarse	Fine	Coarse		
1	BH24-1/SS5	4	93	3			0			
2	BH24-2/SS6	1	16	83			0			
3	BH24-3/SS6	2	4	91			3			
4	BH24-4/SS7	6	85	9			0			
5	BH24-5/SS4	12	79	9			0			
6	BH24-7/SS2	6	83	11			0			
7	BH24-9/SS5	3	87	10			0			
8	BH24-10/SS4	12	80	6			2			



Appendix C General Comments Regarding Engineered Fill

Preliminary Geotechnical Investigation – 159-163 Sulphur Springs Road

Ancaster, Ontario

Mizrahi Developments

SLR Project No.: 244.024373.00003

December 19, 2024

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements, is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of the site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. Specifically, OPSS Granular 'B' sand and gravel fill material is recommended.

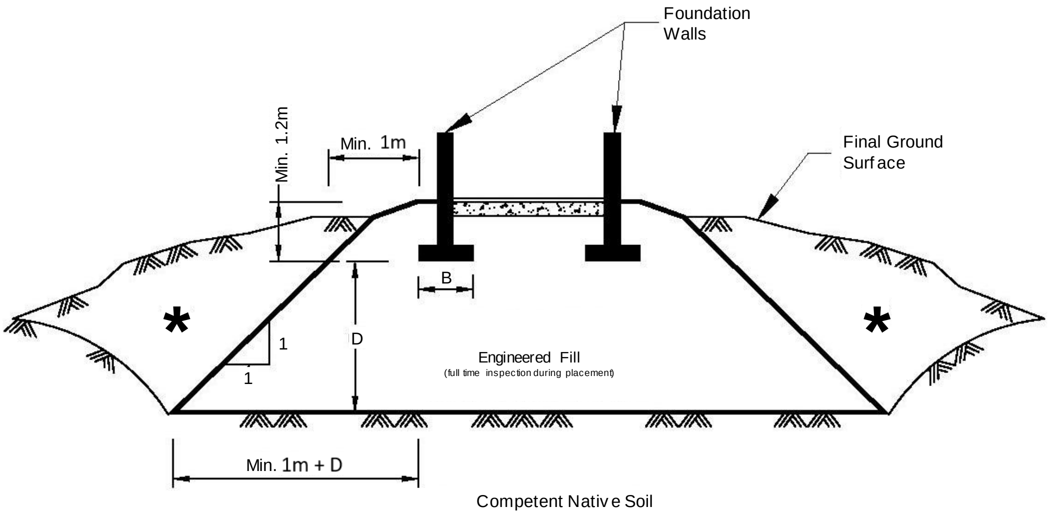
Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; additionally, engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

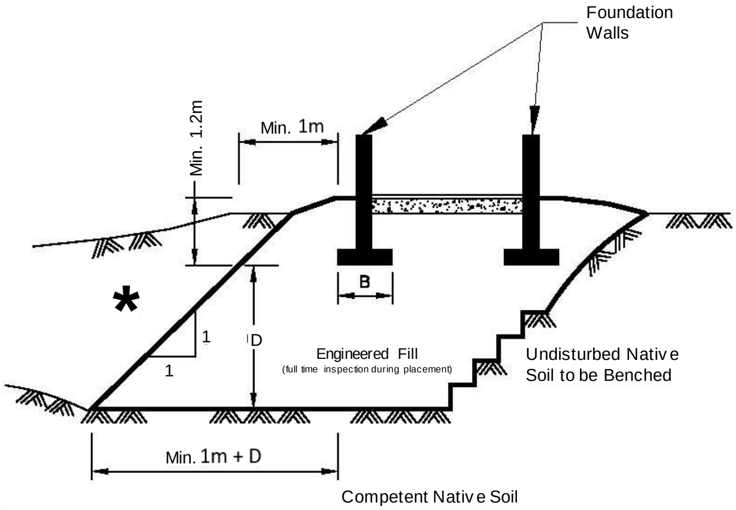
The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows, however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.
2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.
3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings 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 Palmer. Without this confirmation no responsibility for the performance of the structure can be accepted by Palmer. Survey drawing of the pre and post fill location and elevations will also be required.
4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by an engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.
6. Full-time geotechnical inspection by approved geotechnical engineering personnel during placement of engineered fill is required. Work cannot commence or continue without the presence of a geotechnical engineering representative.
7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches 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.
8. A bearing capacity of 100 kPa at SLS (150 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.
9. All excavations must be made in accordance with the Occupational Health and Safety Regulations of Ontario
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from geotechnical consultant prior to footing concrete placements. All excavations must be backfilled under full time supervision by approved geotechnical engineering personnel to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of a geotechnical engineer.
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and to protect from excessive moisture take up.
12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.
13. The geometry of the engineered fill as illustrated in these general requirements is broad in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be extended.
14. These guidelines are to be read in conjunction with the Palmer report attached.





* Backfill in this area as
per Palmer report

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