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ENGINEERING

Professional Engineers Ontario

GEOTECHNICAL INVESTIGATION

PROPOSED 2-STOREY RESTAURANT, 1144 HUGEL AVENUE, MIDLAND, ONTARIO

Prepared for:

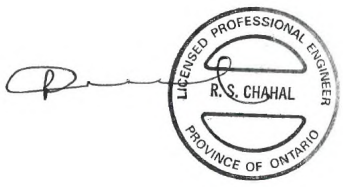
United Hotels Inc.

400 Esna Park Drive, Unit 15
Markham, ON
L3R 3K2

Tel: (905) 475-7755
Fax: (905) 475-7718
www.fishereng.com

Project No. FG 23-12807

April 20, 2023

Issued to:	United Hotel Inc.
Contact:	S.P. Dhillon dhillon7865@yahoo.ca
Project Name:	Proposed 2-Storey Restaurant
Project Address:	1144 Hugel Avenue, Midland, Ontario
Project Number:	FG 23-12807
Issued on:	April 20, 2023
	
Report Prepared by: **(Primary Contact)**	Rajinder Chahal, P. Eng., Senior Project Engineer 647.227.8473 rajinder@fishereng.com
	
Project Manager:	Clive Wiggan, PhD., PMP., Project Manager clive@fishereng.com
	
Reviewed By:	Dave Fisher, C. Chem., P. Eng., President dave@fishereng.com

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1. INTRODUCTION

Fisher Engineering Limited was retained by United Hotels Inc to carry out a geotechnical subsurface investigation for the proposed 2-storey restaurant at 1144 Hugel Avenue, Midland, Ontario.

The purpose of the geotechnical investigation was to determine general subsurface conditions in the are of the proposed two storey restaurant at the site and provide geotechnical comments/recommendations for the design of the proposed restaurant building by means of seven (7) boreholes.

This report presents results of tests performed in accordance with the general terms of reference outlined in the scope of work.

The report has been prepared specifically and solely regarding geotechnical aspects of design and construction for the proposed restaurant building as shown in the site plan provided.

2. SITE AND PROJECT DESCRIPTION

The subject Super 8 by Wyndham property is located on the north side of Hugel Avenue, east of County Road 93 in a predominantly commercial area in the west portion of Midland.

The property is occupied by a three-storey vinyl side building located on the southeast potion. Asphalt paved driveways were observed around the building along with parking areas on the north and west sides.

The site is bounded by a two-storey Huronia Medical Centre building to the east, Hugel Avenue to the south, A & W Canada burger shop towards the west, followed by County Road 93, and a Canadian Tire property to the north.

We understand that a two-storey restaurant building is proposed on the north side of the existing hotel building.

3. SCOPE OF GEOTECHNICAL WORK

The geotechnical scope of work includes the following:

- Investigation of subsurface conditions in the area of the proposed restaurant building by advancing boreholes, soil sampling and visual evaluation/classification of the soil samples.

- Preparation of a geotechnical report with comments and recommendations regarding:
    - Appropriate foundation depths, type and soil bearing pressures (SLS & ULS).
    - Seismic Site Classification.
    - Slab-on-grade construction.
    - Pavement construction and
    - Excavation etc.

4. METHOD OF INVESTIGATION

Subsurface exploration/drilling of boreholes was carried on March 21, 2023, during which seven (7) boreholes (BH1 – BH7), were advanced to approximate depths of 3.51m and 6.55m below prevailing grades. The approximate location of the boreholes and elevations are shown on the Borehole Location Plan in Appendix A.

Elevations at borehole locations were established by interpolation from a topographic survey/plan dated April 14, 2022, prepared by F.S. Surveying Inc.

All boreholes were advanced using a truck mounted drill rig equipped with solid stem augurs. Subsurface strata were sampled at regular intervals of depth using a split-spoon sampler following the procedure as detailed in ASTM Standard specification D1586 for Standard Penetration Tests. Field tests to determine engineering parameters of the soil were carried out during drilling, which included Standard Penetration Tests (SPT).

All soil samples were taken to our accredited laboratory for final visual assessment, classification and selected moisture content testing and grain size analyses. The samples were tested and classified in general accordance with the Unified Soil Classification System, ASTM D 2487, and Standard Practice for Classification of Soils for Engineering Purposes.

Soil description and test results are presented in the borehole records and in Appendix C.

The soil samples recovered during the investigation will be stored in our laboratory for a period of 30 days after which they will be discarded unless further instructions are received.

5. SUBSOIL CONDITIONS

Subsurface conditions encountered at borehole locations are shown on the Log Sheets in Appendix B. The logs include stratification at borehole locations along with detailed soil descriptions. Variations in soil stratification may occur and should be expected between borehole locations and elsewhere on the site.

Asphalt/Granular Material/Topsoil/Fill

Asphalt underlain by granular material was found at the surface of BH1 & BH4. Topsoil was found at the surface of BHs 2, 3, 6 & 7. Fill soils were encountered at the surface of BH5 and below the granular/topsoil of BHs 1 to 4, 6 & 7.

The fill extended to approximate depths below prevailing grades/elevations as shown in Table 1.

Table 1: Approximate Fill Depths/Elevations

Borehole No.	Surface Elevation (m asl)	Depth of Borehole (m bgs)	Elevation at Bottom of Borehole (m asl)	Depth of Fill (m bgs)	Elevation at Bottom of Fill (m asl)
BH1(MW)	245.67	5.03	240.64	0.61	245.06
BH2(MW)	246.01	5.03	240.98	0.61	245.40
BH3(MW)	245.96	6.55	239.41	0.38	245.58
BH4(MW)	245.76	5.03	240.73	0.61	245.15
BH5(MW)	245.88	5.03	240.85	0.38	245.50
BH6	245.96	3.51	242.45	0.38	245.58
BH7	245.98	3.51	242.47	0.38	245.60

The fill composition varied from dark brown to brown sand with trace of roots/topsoil and trace to some gravel.

BROWN SAND

Native soils of brown sand with trace of silt were encountered below the fill soils. Relative density of the sandy deposit varied from loose to compact and it extended to depth of 4.57m in BH5.

Boreholes 1 to 4, 6 and 7 were terminated in the brown sand between depths of 3.51m and 5.03m. We consider the low ‘N’-value of 6 in SS3 of borehole 3 may be due to localised/disturbed soils.

BROWN SILTY SAND

Loose greyish brown silty sand was encountered towards the bottom of BH5.

6. GROUNDWATER CONDITIONS

The boreholes were advanced using dry solid stem auguring. All boreholes were found to be dry on completion of the respective soil boring operations.

Monitoring wells were installed in BH1 to BH5 for groundwater observations / sampling and testing.

Groundwater levels/elevations as measured on completion of soil boring operations and from the monitoring wells are presented in Table 2.

Table 2: Groundwater Depths and Elevations

Monitoring Well No.	Surface Elevation (m, asl)	Depth of Well, m bgs	Elevation at well base, m asl	In open borehole on Completion		23-Apr-23	
				GW level, m bgs	GW Ele, m asl	GW level, m bgs	GW Ele, m asl
BH1(MW)	245.67	4.57	241.10	dry		dry	
BH2(MW)	246.01	4.57	241.44	dry		dry	
BH3(MW)	245.96	6.10	239.86	dry		dry	
BH4(MW)	245.76	4.57	241.19	dry		dry	
BH5(MW)	245.88	4.57	241.31	dry		dry	
BH6	245.96	-	-	dry		dry	
BH7	245.98	-	-	dry		dry	

Based on the preceding information and visual examination of the soil samples, we consider that water bearing aquifer was not encountered within the depths penetrated by the boreholes. However, groundwater may be encountered from the wet seams/pockets/layers trapped inside the fill or embedded in native soils.

It should be noted that Fisher also carried out a hydrogeological investigation in conjunction with this geotechnical investigation. Issues pertaining to the groundwater, such as requirements for temporary dewatering, permanent drainage, amount/quality of water for discharge etc., have been

discussed/addressed separately in the hydrogeological investigation report. These reports should be read in conjunction in finalizing the subsurface structure design process.

7. GEOTECHNICAL DISCUSSIONS AND RECOMMENDATIONS

7.1 General Discussion

We understand that a 2-Storey restaurant building with slab-on-grade construction is proposed in the area covered by boreholes 2, 3 & 5.

The following sections provide general geotechnical recommendations for design and construction.

7.2 Foundation Considerations

Boreholes indicate that natural soils can be used for foundation support using conventional strip and/or spread footing foundations.

For footings placed over undisturbed natural soils at approximate depth of 0.9m (nos. 2 & 5) and 1.9m (no. 3) below existing grades, soil bearing pressures of 120kPa (SLS) and 180kPa (ULS) can be used for foundation design purposes.

For footings founded at different levels in the vicinity of each other or located adjacent to excavated and backfilled areas, such as sewer trenches/existing footing/other excavations etc., the slope of the imaginary line joining the bottom of two footings, or the bottom of footing and excavation should not be steeper than 1.5H:1V. Footings beside existing footings should be placed/founded at the existing footing founding levels. For stepped footings the horizontal distance between two risers should not be less than 600mm and the vertical distance between two horizontal portions should be limited to 400mm.

Subsoil conditions at footing founding levels should be inspected by soils engineer from our office, prior to pouring concrete, to ensure that the design soil bearing pressures are being attained.

Footings subject to seasonal winter weather, such as exterior wall and column footings, should be founded at least 1.4m below adjacent finished grades to prevent any damage due to frost penetration.

During cold/freezing weather conditions founding soils should be adequately protected to prevent any damage due to frost penetration.

7.3 Earthquake Considerations

The 2012 OBC Subsection 4.1.8 stipulates that a building should be designed to meet the requirements of the Earthquake Load and Effects. Site Classification for Seismic Site Response (Table 4.1.8.4.A) is determined from the average Standard Penetration Resistance (N_{60}) and/or the undrained shear strength (Su) of the soils within the upper 30m.

Based on the results of standard penetration tests i.e., “N” values from the current geotechnical investigation of limited depths, site designation for seismic analysis applicable for the proposed building is expected to be **"Class E"**. However, we are of the opinion that Site Class “D” will be available. Shear wave velocity measurements should be carried out if so desired.

Seismic parameters and analysis requirements are detailed in Subsection 4.1.8 of the 2012 OBC.

7.4 Slab-on-Grade Construction

From boreholes the existing fill soils generally appear to be free of highly compressible organic/topsoil mixed soils or other deleterious materials. Based on SPT ‘N’ values, fill in the proposed building area generally appears to be reasonably compacted.

The existing fill should be further evaluated from footing/service trenches at the time of construction. All loose and unsuitable fill, such as organic/topsoil mixed soils etc., should be removed from the areas to be slabbed.

Exposed subgrade should be proof rolled in the presence of our soils personnel to detect any compressible, spongy, or unstable areas. If any isolated pockets of such materials are detected, they should be sub-excavated to competent subsoils and backfilled with approved inorganic materials compacted to at least 95% of their Standard Proctor Maximum Dry Density (S.P.M.D.D.) in thin layers.

Any new fill should consist of approved compactable inorganic soils, placed in thin layers (not exceeding 300mm), and each layer should be compacted to at least 98% of its S.P.M.D.D. under dry and frost-free conditions.

For normal light duty slab-on-grade construction, a minimum 150mm thick bedding layer consisting of granular 'A' or 20mm crusher run material should be specified under the slab-on-grade to serve as a moisture barrier. The bedding layer should be compacted to a minimum of 98% of its S.P.M.D.D.

7.5 Pavement Design

The functional life of a pavement depends directly on the soil subgrade conditions and load carrying capacity of the pavement structure. Minimum flexible pavement structure thicknesses are recommended in Table 3. The pavement structure should also meet the minimum municipal design requirements, if any, for the proposed development.

Pavement thicknesses in Table 3 are applicable for dry and stable subgrade conditions during summer season construction only. If construction is to be carried out during winter/wet weather conditions and for unstable subgrade conditions, the thicknesses of granular materials may have to be increased.

Table 3: Minimum Flexible Pavement Structure Thicknesses

PAVEMENT LAYER	COMPACTED THICKNESSES	
	LIGHT DUTY PARKING	DRIVEWAYS & HEAVY DUTY PARKING
Asphalt top course, HL-3	40mm	40mm
Asphalt base course, HL-8	40mm	60mm
Granular 'A' or 20mm crusher run limestone base	150mm	150mm
Granular 'B' or 50mm crusher run limestone sub-base	150mm	300mm

The granular base materials should conform to O.P.S.S. Form 1010 specifications and be compacted to at least 98% of their SPMDD's. Similarly, asphaltic concretes should meet O.P.S.S. Form 1150 requirements for specified grades and be compacted to at least 97% of their Marshall Densities.

Subgrade may be prepared as described in Subsection 7.4.

All loose/compressible organic fill should be removed from the subgrade areas to be paved. Upper 1m of fill subgrade must be compacted to at least 98%SPMDD.

Water should not be allowed to accumulate at the edges of pavement and regular monitoring/maintenance should be carried out as required.

7.6 Excavation

The proposed excavations may extend to depth of 1.4m or more. In accordance with the Ontario Occupational Health and Safety Act, all excavation deeper than 1.2m should be properly supported or sloped back to a safe angle.

Moist fill and native sandy soils are Type 3 Soils. Dry sand will crumble to its estimated angle of internal friction of 32 degrees.

The presence of wet seam/layers/pockets may require flattening of the side slopes.

Soil parameters in Table 4 can be used in the evaluation of lateral earth pressures.

Table 4: Soil parameters

SUBSOIL	Unit Weight, γ (kN/m^3)	Coefficient of Earth Pressure		
		K_a	K_p	K_o
Fill	18	0.40	2.50	0.45
Sand	20	0.33	3.00	0.40

No significant groundwater issues are anticipated. Small amounts of seepage water, if any can be handled using conventional sump pumping method.

The excavation sides should be protected to prevent erosion from surface water or water bearing wet pockets/layers.

8. SULPHATE ATTACK

Four soil samples from boreholes BH1 and BH3 between depths of 0.76m and 1.98m were submitted to Fisher Environmental laboratories for chemical analyses related to potential sulphate attack on buried concrete. Test results are presented in Appendix C.

Sulphate concentration in the soil samples tested are 3mg/kg, <1mg/kg, 7mg/kg & <1mg/kg or 0.0003%, <0.0001%, 0.0007 & <0.0001% respectively.

According to CSA-A23. 1-09 Table 3, the above results indicate negligible degree of exposure to sulphate attack (much less than 0.10 to 0.20% for S-3 class exposure).

pH values varied from 7.30 to 7.72 which are within the acceptable range of 5 - 11 for soils.

Chloride content was found to be less than 18µg/g.

9. GENERAL CONSIDERATIONS

This report is preliminary in nature and limited in scope to those items specifically referenced in the text. No other testing and design calculations have been performed except as specifically reported.

The discussions and recommendations presented in this report are intended for the sole guidance of the client named and design consultants. It should not be relied upon for any other purposes.

The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction.

The fact that localized variations in subsurface conditions may be present between and beyond the boreholes/depths investigated and that those conditions may be significantly different from the general description provided for design purposes should be understood.

Contractors bidding on or undertaking the work should decide on their own investigations, as well as their own interpretations of the factual borehole results. This concern specifically applies to the classification of subsurface soils and potential disposal/reuse of these soils on/off site. Contractors must draw their own conclusions as to how the near surface and subsurface conditions may affect them.

It is recommended that Fisher be contacted to aid in the interpretation of the borehole records by anyone undertaking work on/or below the ground surface at this site prior to this work being carried out.

The client expressly agrees that Fisher's employees and principals shall have no personal liability to the client in respect of a claim, whether in contract, tort and/or any other cause of action in law. Accordingly, the client expressly agrees that they will bring no proceedings and take no action in any court of law against any of Fisher's employees or principals in their personal capacity.

10. CLOSING

We trust that the foregoing information is sufficient for your present needs and will be pleased to review the contents of this report in greater detail should you so require. Should you require our services further in this regard, please do not hesitate to contact our office.

APPENDIX A – SITE & LOCATION PLANS

FISHER ENGINEERING

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718

NORTH

N

LEGEND

SITE BOUNDARY

PROJECT NAME AND ADDRESS

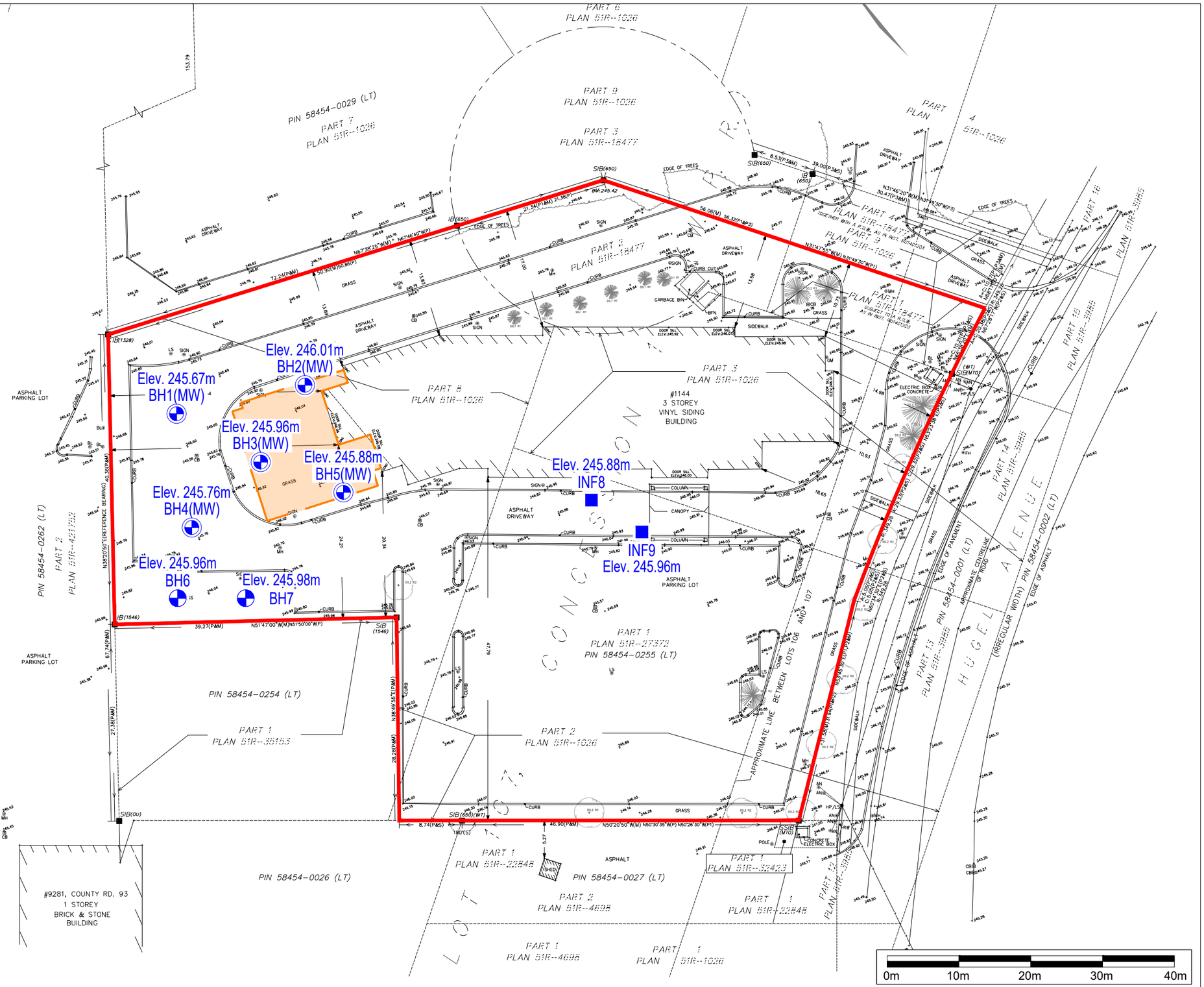
GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

1144 Hugel Ave,
Midland, ON

FIGURE A1:

SITE LOCATION PLAN

PROJECT NO.	SHEET NO.
FE-P 23-12806/12807	A1
DATE: 5 April 2023	
SCALE: AS SHOWN	



FISHER ENGINEERING

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718

NORTH

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- TEST HOLE LOCATION

PROJECT NAME AND ADDRESS

GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

1144 Hugel Ave,
Midland, ON

FIGURE A2:

SITE PLAN WITH BOREHOLES / MONITORING WELL LOCATIONS

PROJECT NO.	SHEET NO.
FE-P 23-12806/12807	A2
DATE: 5 April 2023	
SCALE: AS SHOWN	

APPENDIX B – LOGS OF BOREHOLES

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH1(MW) SHEET. 1 of 1

PROJECT NO.: FE-P# 23-12806/12807

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 1144 Hugel Ave, Midland, ON

DRILLING METHOD: CME-55, Solid Stem

DRILLING DATE: 21 March, 2023

DEPTH (feet)	DEPTH (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
				245.67			
0	0	~2.5" ASPHALT ~4" GRANULAR MATERIAL FILL: Brown gravelly sand, with crushed rock, moist		0.61 / 245.06		SS-1	38
4	1	SAND: Brown, moist, loose to compact to loose				SS-2	10
6	2	Slightly moist @ 1.52m				SS-3	7
8	3					SS-4	11
10	3					SS-5	13
14	4	Moist @ 4.57m				SS-6	9
16	5	End of borehole at 5.03m		5.03 / 240.64			
18							
20	6						
22	7						
24							
26	8						
28							
30	9						
32							
34	10						

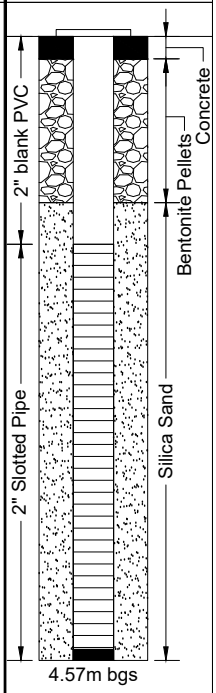
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: Dry

DRAWN: D.C. LOGGED: R.R. CHECKED: C.W.

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH2(MW) SHEET. 1 of 1

PROJECT NO.: FE-P# 23-12806/12807

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 1144 Hugel Ave, Midland, ON

DRILLING METHOD: CME-55, Solid Stem

DRILLING DATE: 21 March, 2023

DEPTH (feet)	DEPTH (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
				246.01			
0	0	5" TOPSOIL: Organic material, roots, clay, silt & sand, moist				SS-1	14
2		FILL: Dark brown sand, trace clay, silt & gravel, moist		0.61 / 245.40			
4	1	SAND: Brown, moist, compact to loose to compact				SS-2	10
6	2					SS-3	11
8						SS-4	9
10	3					SS-5	13
12	4						
14							
16	5	End of borehole at 5.03m		5.03 / 240.98		SS-6	11
18							
20	6						
22	7						
24							
26	8						
28							
30	9						
32							
34	10						

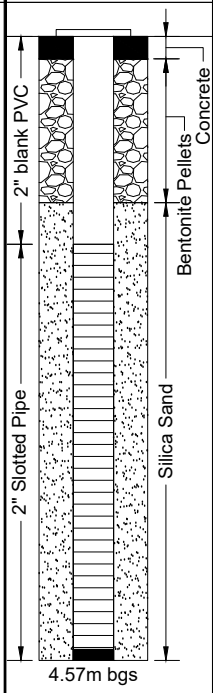
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: Dry

DRAWN: D.C. LOGGED: R.R. CHECKED: C.W.

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 1 of 1

PROJECT NO.: FE-P# 23-12806/12807

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 1144 Hugel Ave, Midland, ON

DRILLING METHOD: CME-55, Solid Stem

DRILLING DATE: 21 March, 2023

DEPTH (feet)	DEPTH (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
				245.96			
0	0	5" TOPSOIL: Organic material, roots, clay, silt & sand, moist				SS-1	6
		FILL: Brown sand, trace gravel, moist		0.38 / 245.58			
4	1	SAND: Brown, moist, loose to compact Trace gravel between 0.38m & 1.52m Trace roots between 0.76m & 1.52m				SS-2	11
6	2					SS-3	6
8						SS-4	11
10	3					SS-5	13
16	5					SS-6	13
20	6					SS-7	24
22		End of borehole at 6.55m		6.55 / 239.41			
24	7						
26	8						
30	9						
32	10						

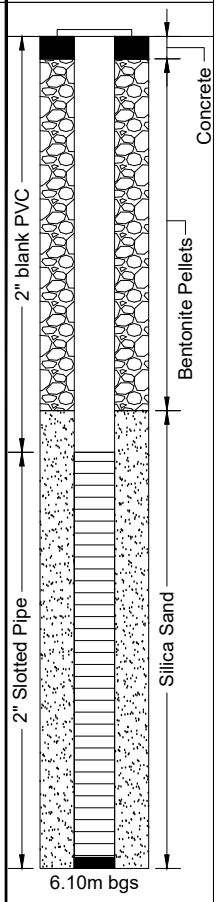
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: Dry

DRAWN: D.C. LOGGED: R.R. CHECKED: C.W.

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 1 of 1

PROJECT NO.: FE-P# 23-12806/12807

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 1144 Hugel Ave, Midland, ON

DRILLING METHOD: CME-55, Solid Stem

DRILLING DATE: 21 March, 2023

DEPTH (feet)	DEPTH (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
				245.76			
0	0	~2.5" ASPHALT ~4" GRANULAR MATERIAL FILL: Brown gravelly sand, with crushed rock, moist		0.61 / 245.15		SS-1	34
4	1	SAND: Brown, slightly moist, loose to compact				SS-2	10
6	2					SS-3	9
8	2					SS-4	11
10	3					SS-5	12
16	5	End of borehole at 5.03m		5.03 / 240.73		SS-6	12

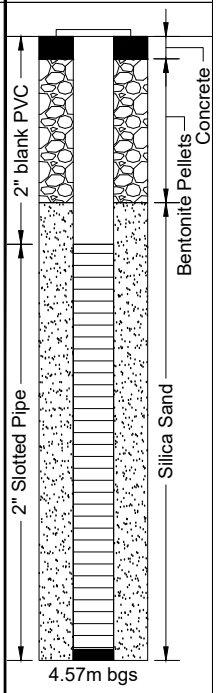
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: Dry

DRAWN: D.C. LOGGED: R.R. CHECKED: C.W.

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 1 of 1

PROJECT NO.: FE-P# 23-12806/12807

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 1144 Hugel Ave, Midland, ON

DRILLING METHOD: CME-55, Solid Stem

DRILLING DATE: 21 March, 2023

DEPTH (feet)	DEPTH (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
				245.88			
0	0	5" TOPSOIL: Organic material, roots, clay, silt & sand, moist		0.18 / 245.70		SS-1	9
2		FILL (POSSIBLE FILL): Brown sand, moist					
4	1	SAND: Brown, moist, loose to compact				SS-2	10
6	2					SS-3	10
8							
10	3					SS-4	11
12	4					SS-5	15
14				4.57 / 241.31			
16	5	SILTY FINE SAND: Greyish brown, moist, loose				SS-6	9
18		End of borehole at 5.03m		5.03 / 240.85			
20	6						
22	7						
24							
26	8						
28							
30	9						
32							
34	10						

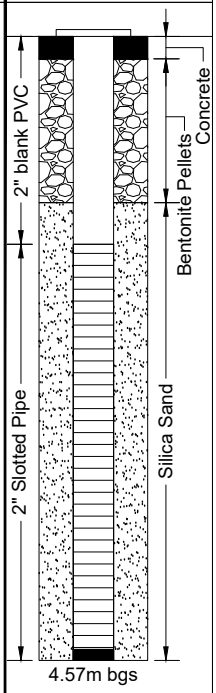
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: Dry

DRAWN: D.C. LOGGED: R.R. CHECKED: C.W.

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH6 SHEET. 1 of 1

PROJECT NO.: FE-P# 23-12806/12807

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 1144 Hugel Ave, Midland, ON

DRILLING METHOD: CME-55, Solid Stem

DRILLING DATE: 21 March, 2023

DEPTH (feet)	DEPTH (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
				245.96			
0	0	5" TOPSOIL: Organic material, roots, clay, silt & sand, moist		0.30 / 245.66		SS-1	6
2		FILL (POSSIBLE FILL): Brown sand, very moist					
	1	SAND: Brown, moist, loose to compact to loose				SS-2	9
4							
		Slightly moist @ 1.52m				SS-3	11
6	2						
8						SS-4	9
	3	Moist @ 3.05m					
10						SS-5	10
12		End of borehole at 3.51m		3.51 / 242.45			
14	4						
16	5						
18							
20	6						
22	7						
24							
26	8						
28							
30	9						
32							
34	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Groundwater Depth (m): on completion: Dry

DRAWN: D.C. LOGGED: R.R. CHECKED: C.W.

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH7 SHEET. 1 of 1

PROJECT NO.: FE-P# 23-12806/12807

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 1144 Hugel Ave, Midland, ON

DRILLING METHOD: CME-55, Solid Stem

DRILLING DATE: 21 March, 2023

DEPTH (feet)	DEPTH (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
				245.98			
0	0	5" TOPSOIL: Organic material, roots, clay, silt & sand, moist		0.30 / 245.68		SS-1	6
2		FILL (POSSIBLE FILL): Brown sand, very moist					
4	1	SAND: Brown, moist, loose				SS-2	7
6	2					SS-3	10
8		Slightly moist @ 2.29m				SS-4	10
10	3					SS-5	9
12	4	End of borehole at 3.51m		3.51 / 242.47			
14							
16	5						
18							
20	6						
22							
24	7						
26	8						
28							
30	9						
32							
34	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Groundwater Depth (m): on completion: Dry

DRAWN: D.C. LOGGED: R.R. CHECKED: C.W.

APPENDIX C – LABORATORY TEST RESULTS

FISHER ENGINEERING

CERTIFIED BY CCIL

Project Name: Geotechnical Investigation
Client: United Hotels Inc.
Project ID: 23-12807
Location: 1141 Hugel Avenue, Midland, Ontario

F.E. Lab #: 23-220
Date Sampled: 21-Mar-2023
Date Received: 23-Mar-2023
Date Reported: 6-Apr-2023

Certificate of Analysis

Analyses	Matrix	Quantity	Testing Date	Method Reference
Moisture Content	Soil	14	23-Mar-23	ASTM D2216
Grain Size (Sieve Analysis)	Soil	6	24-Mar-23	LS-602
Grain Size (Hydrometer)	Soil	2	03-Apr-23	LS-702
Atterberg test	Soil	0	N.A.	LS-703/704

Authorized by: Behnam Sayad-Pour

Behnam Sayad Pour Zanjani
Geo-Lab Supervisor

400 Esna Park Drive, Unit 15, Markham, ON L3R 3K2
Tel:(905) 475-7755 www.fishereng.com

Certificate of Analysis

Analysis Requested:	Moisture Content	***Sample Description:***	14 Soil Sample(s)

Sample Info	BH1 SS2	BH1 SS3	BH1 SS4	BH1 SS5	BH3 SS2	BH3 SS3
Sample Depth (m)	0.76-1.22	1.53-1.98	2.29-2.75	3.05-3.51	0.76-1.22	1.53-1.98
Moisture Content (%)	4.9	3.8	4.2	4.6	4.9	4.4

Sample Info	BH3 SS4	BH3 SS5	BH5 SS2	BH5 SS3	BH5 SS4	BH5 SS5
Sample Depth (m)	2.29-2.75	3.05-3.51	0.76-1.22	1.53-1.98	2.29-2.75	3.05-3.51
Moisture Content (%)	4.4	4.9	5.3	4.5	3.8	4.8

Sample Info	TH1	TH2				
Sample Depth (m)	1.53-1.98	1.53-1.98				
Moisture Content (%)	19.3	23.4				

Certificate of Analysis

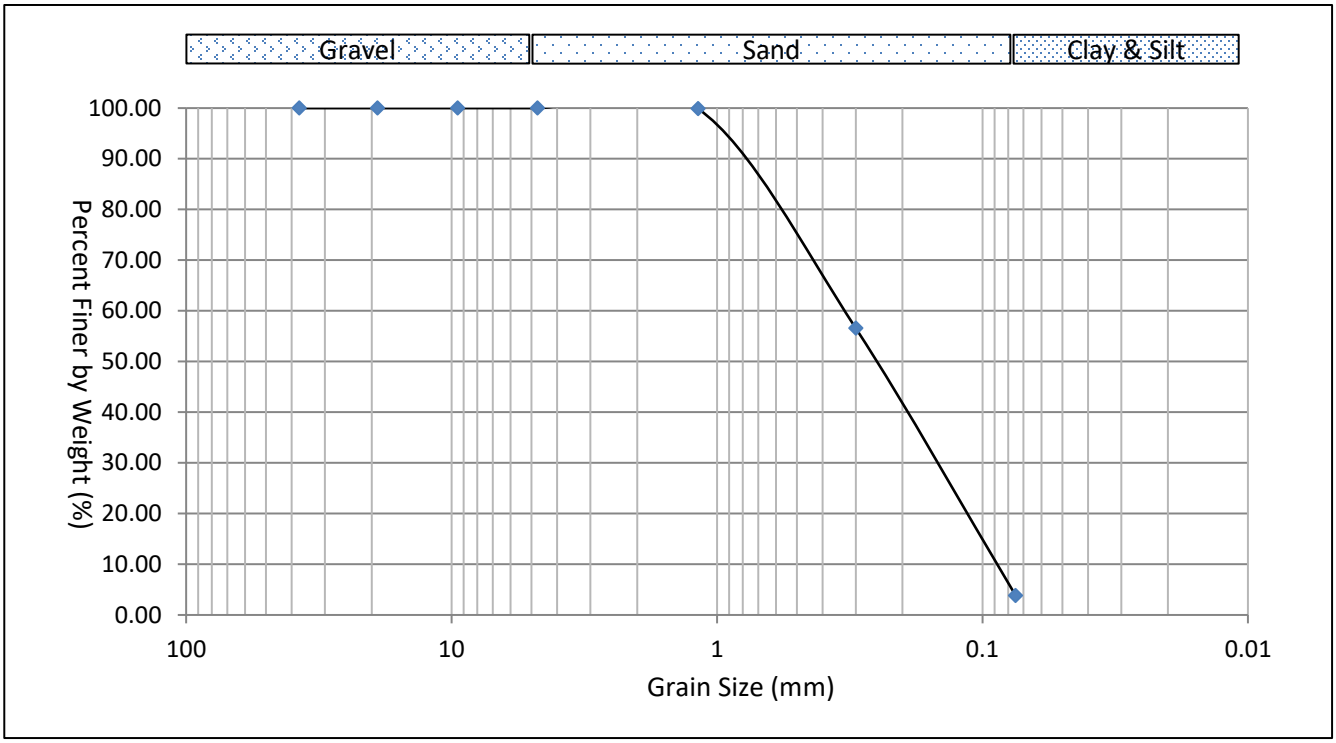
Analysis Requested:	Grain Size (Sieve Analysis)	***Sample Quantity:***	6	Soil Sample(s)

Sample Info	***23-221 BH1 SS2***	***23-222 BH1 SS3***	***23-223 BH3 SS2***	***23-224 BH3 SS3***	***23-225 BH5 SS2***	***23-226 BH5 SS3***
Sample Depth (m)	***0.76-1.22***	***1.53-1.98***	***0.76-1.22***	***1.53-1.98***	***0.76-1.22***	***1.53-1.98***
Grain Size (%)						
>19mm	0.0	0.0	0.0	0.0	0.0	0.0
9.5mm-19mm	0.0	0.0	2.4	0.0	0.0	0.0
4.75mm-9.5mm	0.0	0.0	1.1	0.0	0.0	0.0
1.18mm-4.75mm	0.1	0.0	0.8	0.0	0.3	0.0
300um-1.18mm	43.3	47.4	29.6	42.6	19.5	30.3
75um-300um	52.7	47.0	63.8	53.0	74.6	65.0
<75um	3.8	5.6	2.2	4.4	5.6	4.7
Clay and Silt	**3.8**	**5.6**	**2.2**	**4.4**	**5.6**	**4.7**
Sand	**96.2**	**94.4**	**94.3**	**95.6**	**94.4**	**95.3**
Gravel	**0.0**	**0.0**	**3.5**	**0.0**	**0.0**	**0.0**

Grain Size Distribution

Sample ID: 23-221 BH1 SS2 0.76-1.22m

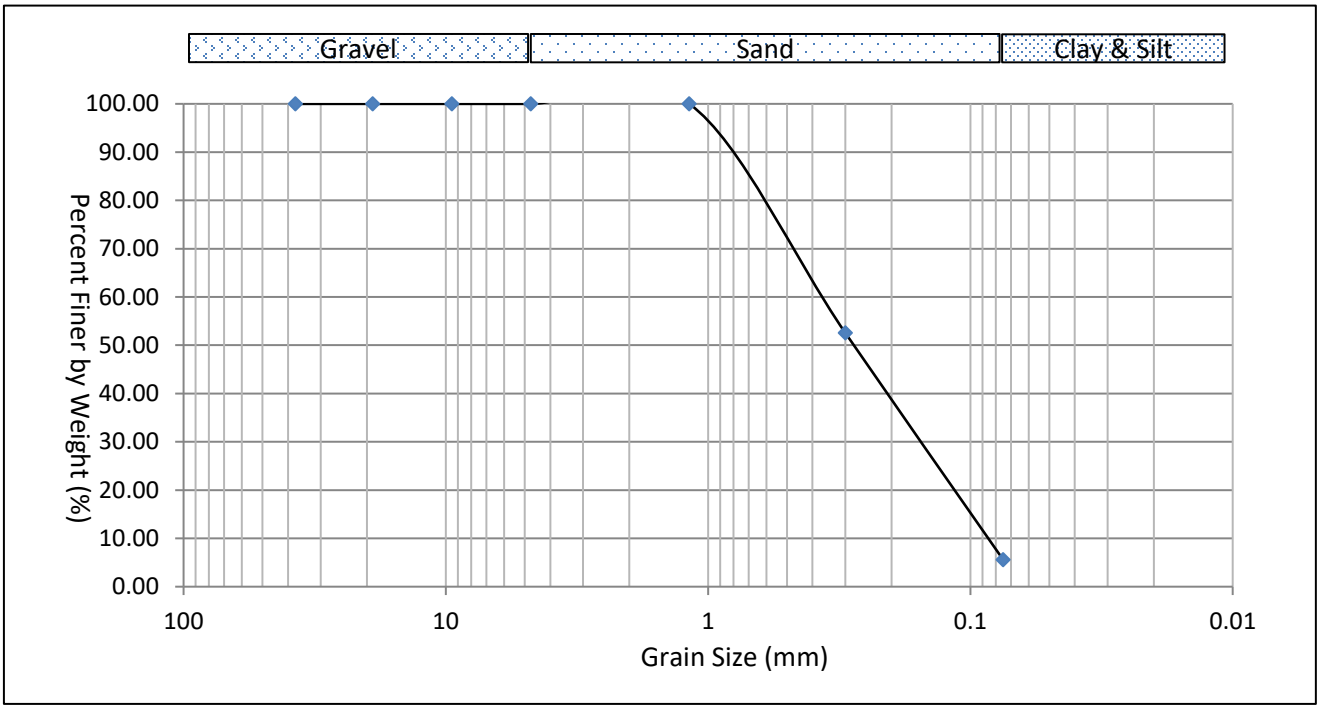
Gravel: 0% Sand: 96.2% Clay and Silt 3.8%



Grain Size Distribution

Sample ID: 23-222 BH1 SS3 1.53-1.98m

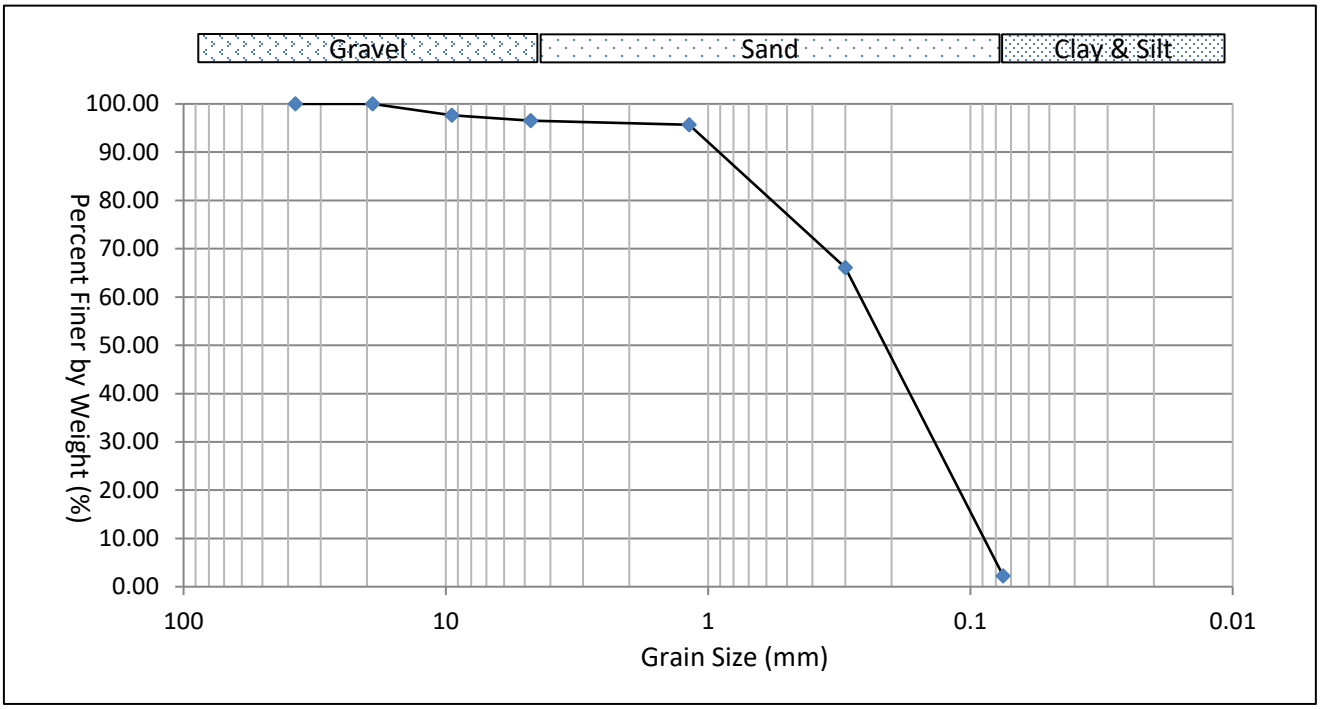
Gravel: 0% Sand: 94.4% Clay and Silt 5.6%



Grain Size Distribution

Sample ID: 23-223 BH3 SS2 0.76-1.22m

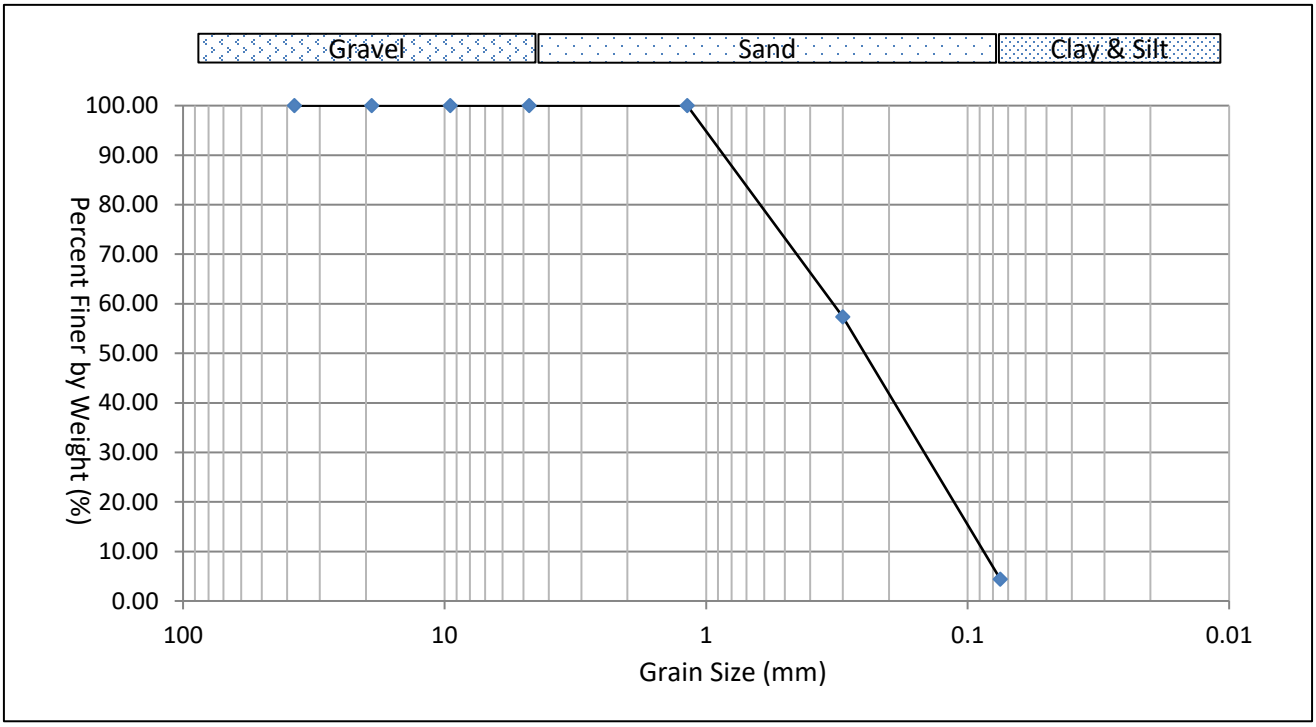
Gravel: 3.5% Sand: 94.3% Clay and Silt 2.2%



Grain Size Distribution

Sample ID: 23-224 BH3 SS3 1.53-1.98m

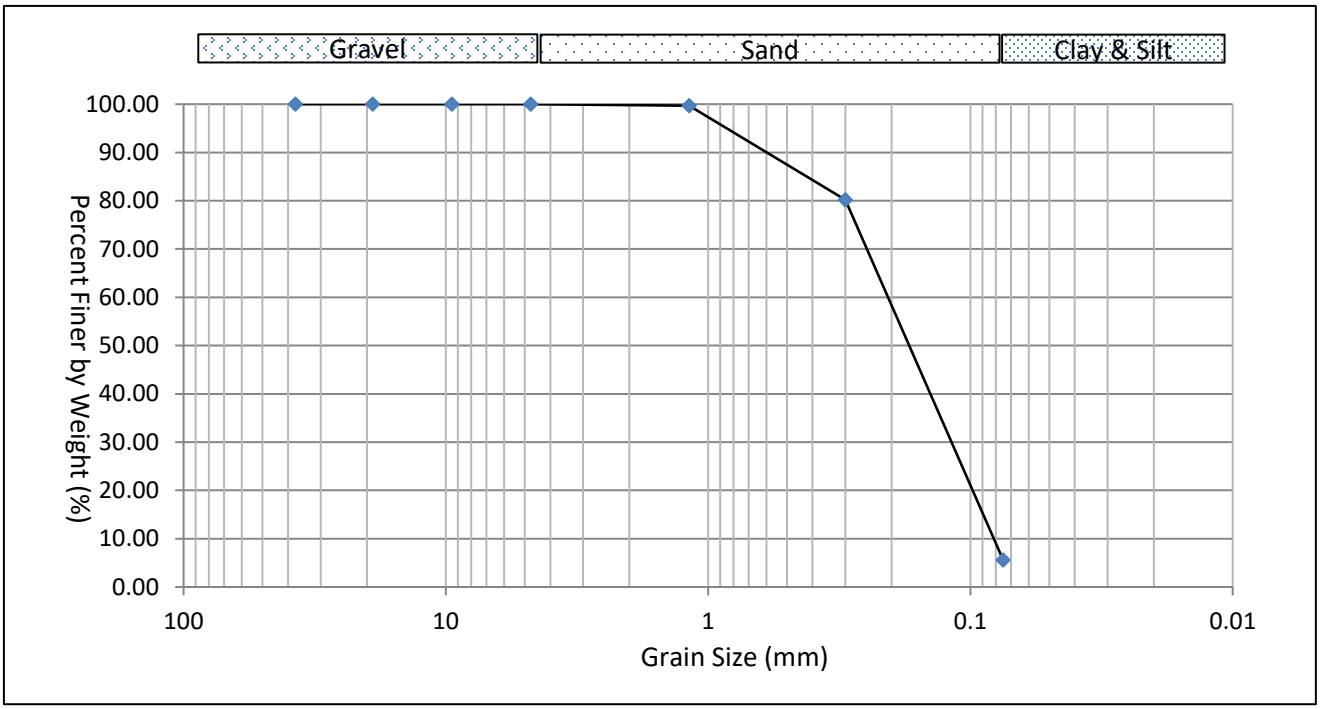
Gravel: 0% Sand: 95.6% Clay and Silt 4.4%



Grain Size Distribution

Sample ID: 23-225 BH5 SS2 0.76-1.22m

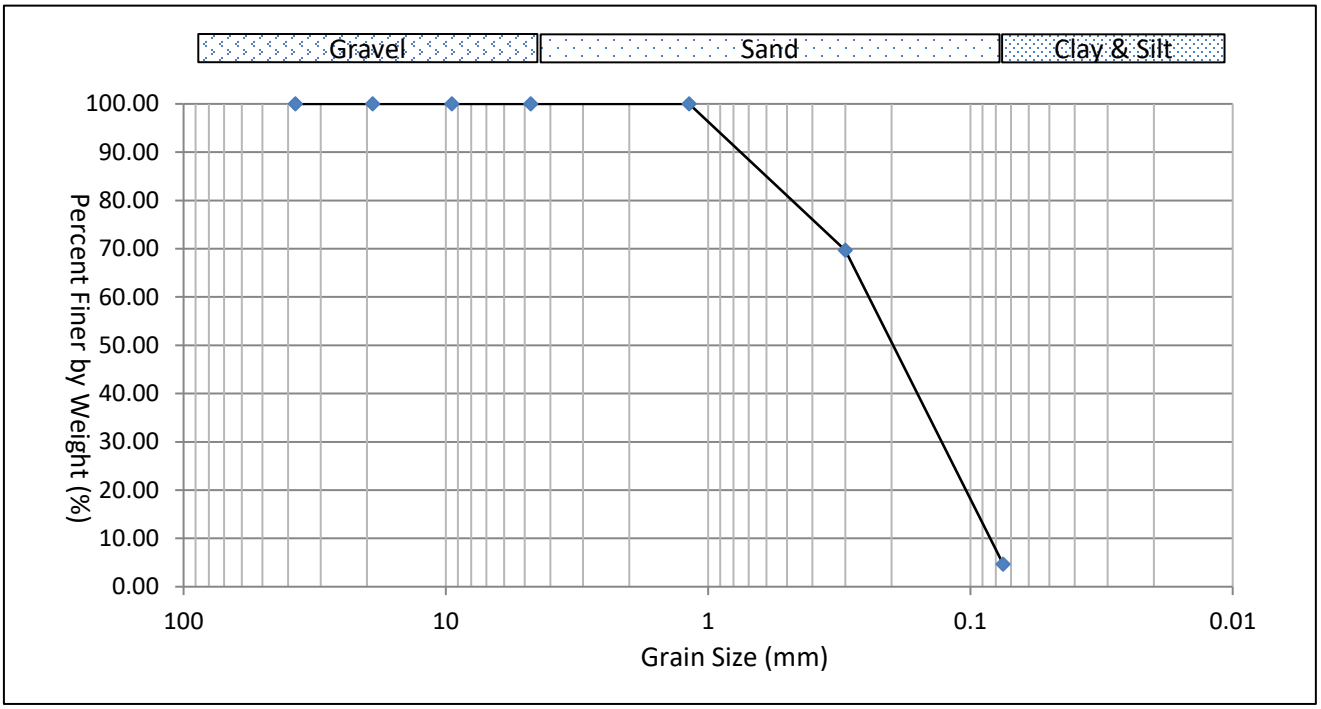
Gravel: 0% Sand: 94.4% Clay and Silt 5.6%



Grain Size Distribution

Sample ID: 23-226 BH5 SS3 1.53-1.98m

Gravel: 0% Sand: 95.3% Clay and Silt 4.7%



F.E. Job #: 23-220

Certificate of Analysis

Analysis Requested:	Grain Size (Hydrometer)
Sample Description:	2 Soil Sample(s)

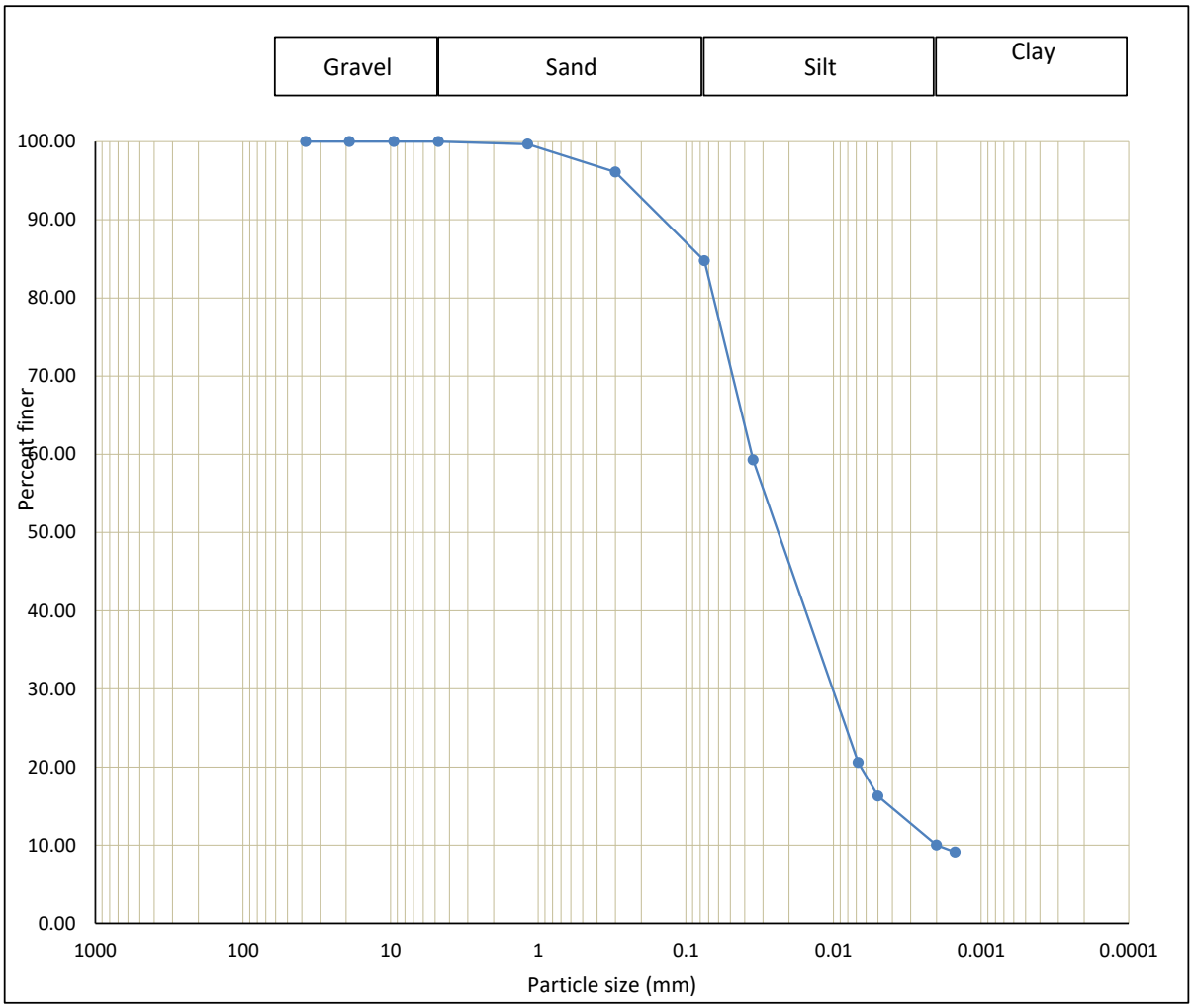
Sample Info	***23-228 TH1***	***23-229 TH2***				
Sample Depth (m)	***1.53-1.98***	***1.53-1.98***				
Grain Size (%)						
>19mm	0.0	0.0				
9.5mm-19mm	0.0	0.0				
4.75mm-9.5mm	0.0	0.0				
1.18mm-4.75mm	0.3	0.6				
300um-1.18mm	3.6	2.4				
75um-300um	11.4	19.4				
5um-75um	68.5	64.4				
2um-5um	6.3	4.5				
<2um	10.0	8.6				
Clay	**10.0**	**8.6**				
Silt	**74.7**	**68.9**				
Sand	**15.3**	**22.5**				
Gravel	**0.0**	**0.0**				

F.E. Job #: 23-220

Grain Size Distribution

Sample ID: 23-228 TH1 1.53-1.98m

Gravel: 0% Sand: 15.3% Silt: 74.7% Clay: 10%

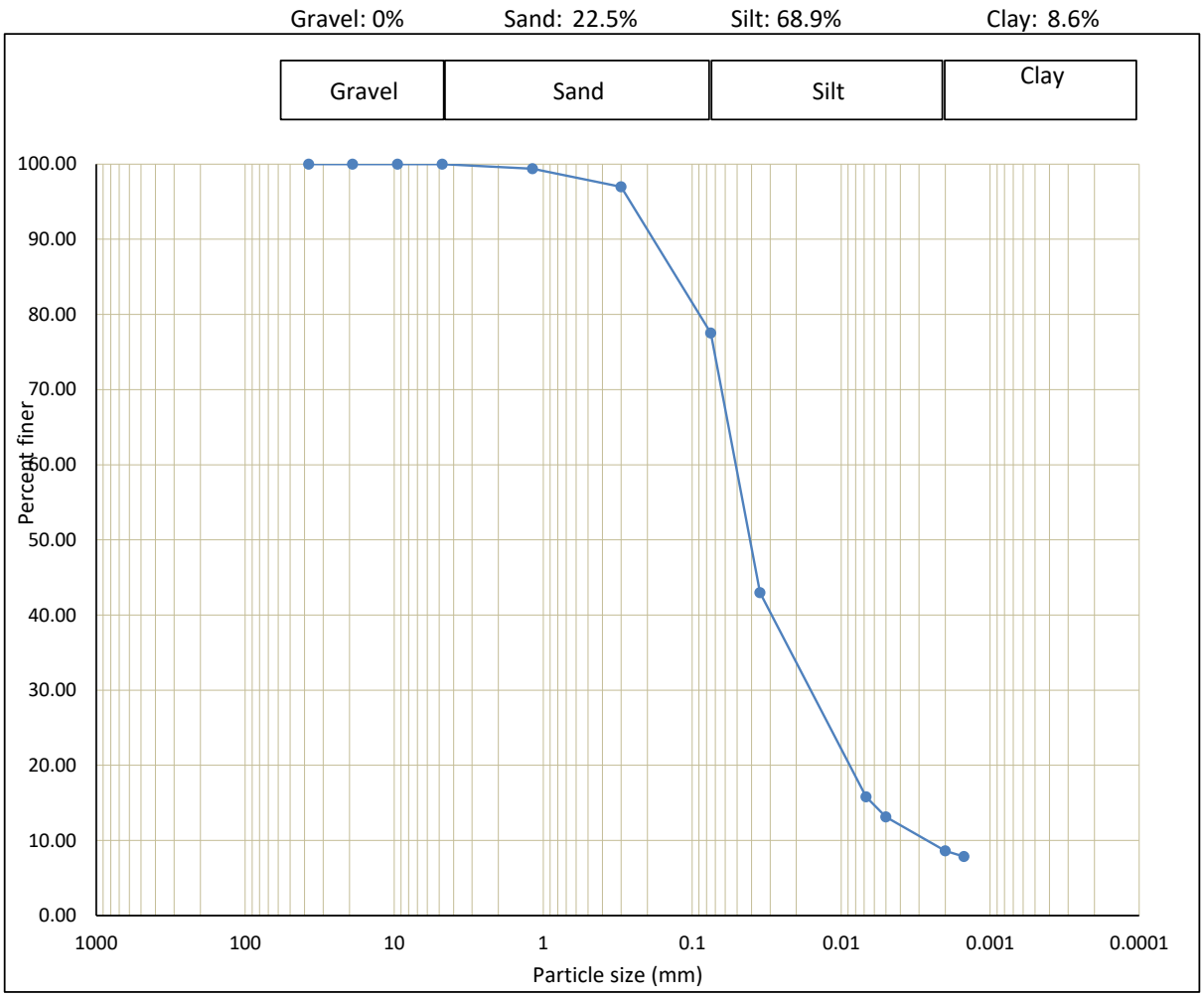


Sample ID: 23-228 TH1 1.53-1.98m		
Diameter	***Weight (%)***	***Grain Size***
>4.75mm	0.0	Gravel
1.18mm-4.75mm	0.3	Coarse Sand
300um-1.18mm	3.6	Medium Sand
75um-300um	11.4	Fine Sand
5um-75um	68.5	Silt
2um-5um	6.3	
<2um	10.0	Clay

F.E. Job #: 23-220

Grain Size Distribution

Sample ID: 23-229 TH2 1.53-1.98m



Sample ID: 23-229 TH2 1.53-1.98m		
Diameter	***Weight (%)***	***Grain Size***
>4.75mm	0.0	Gravel
1.18mm-4.75mm	0.6	Coarse Sand
300um-1.18mm	2.4	Medium Sand
75um-300um	19.4	Fine Sand
5um-75um	64.4	Silt
2um-5um	4.5	
<2um	8.6	Clay

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Address:
Tel.:
Email:
Attn.:

F.E. Job #: 23-9971
Project Name: Geotechnical
Project ID: FG-P 23-12807
Date Sampled: 21-Mar-2023
Date Received: 23-Mar-2023
Date Reported: 30-Mar-2023
Location: 1144 Hugel Avenue

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
pH	Soil	4	27-Mar-23	27-Mar-23	pH-EC-SAR F-16	SW-846, 9045D
Chloride	Soil	4	N/A	28-Mar-23	Chloride F-20	SM 4500-Cl-E
Sulphate	Soil	4	27-Mar-23	28-Mar-23	Sulphate F-21	SM 4500-SO_4

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:

Roger Lin, Ph. D., C. Chem.
Laboratory Manager

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
Ronggen (Roger) Lin
CHEMIST

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride
Sample Description:	4 Soil Sample(s)

Parameter	***23-9971-1*** BH1 SS2 0.76-1.22m	***23-9971-2*** BH1 SS3 1.52-1.98m	***23-9971-3*** BH3 SS2 0.76-1.22m	***23-9971-4*** BH3 SS3 1.52-1.98m		**Soil Standards** *
pH *(pH unit)*	7.72	7.30	7.64	7.57		(5-11) 5-9

* Surface soil pH value from 5 - 9, Sub-surface soil pH value from 5-11.

QA/QC Report

Parameter	**LCS**	**AR**	**Duplicate**	**AR**		
	Absolute Difference *(pH Unit)*					
pH *(pH unit)*	7.12	6.90-7.20	0.05	<0.3		

LEGEND:
LCS - Laboratory Control Sample
AR - Acceptable Range

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride
Sample Description:	4 Soil Sample(s)

Parameter	***23-9971-1*** BH1 SS2 0.76-1.22m	***23-9971-2*** BH1 SS3 1.52-1.98m	***23-9971-3*** BH3 SS2 0.76-1.22m	***23-9971-4*** BH3 SS3 1.52-1.98m		
	Concentration (µg/g)					
Chloride in Soil	18	15	11	13		

< result obtained was below RL (Reporting Limit).

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**MS**	**AR**
	(µg/g)		**Recovery (%)**		**Recovery (%)**	
Chloride in Soil	<10	10	103	70-130	117	70-130

Parameter	**Duplicate**	**AR**				
	RPD (%)					
Chloride in Soil	3.4	0-20				

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
AR - Acceptable Range
RPD - Relative Percent Difference

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride
Sample Description:	4 Soil Sample(s)

Parameter	***23-9971-1*** BH1 SS2 0.76-1.22m	***23-9971-2*** BH1 SS3 1.52-1.98m	***23-9971-3*** BH3 SS2 0.76-1.22m	***23-9971-4*** BH3 SS3 1.52-1.98m		
Sulphate *(mg/kg)*	3	<1	7	<1		

QA/QC Report

Parameter	**Blank**	**RL**	**LCS/Spike**	**AR**	**Duplicate**	**AR**
	(mg/kg)		**Recovery (%)**		**RPD (%)**	
Sulphate	<1	1	101	70-130	5	0-30

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference