Toronto Inspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS

REPORT ON
GEOTECHNICAL INVESTIGATION
430 OTTAWA STREET
ALMONTE, ONTARIO

REPORT NO.: 5559-22-GB
REPORT DATE: NOVEMBER 9, 2022

PREPARED FOR
ELM DEVELOPMENTS CORP.
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1.0 INTRODUCTION

Toronto Inspection Ltd. (TIL) was retained by Elm Developments Corp. to conduct a geotechnical investigation for a proposed redevelopment at a property, located at 430 Ottawa Street, in Almonte, Ontario (hereinafter referred to as "the Site").

We understand that the redevelopment of the Site will consist of one residential building with one level of underground parking and two retail buildings with no basements.

The purpose of the geotechnical investigation was to determine the subsoil and groundwater conditions, encountered at boreholes carried out within the subject Site and provide our recommendations for the design and construction of the proposed structures at the Site. In particular, Geotechnical data was to be provided for:

- General founding conditions
- Foundation design bearing pressures
- Construction recommendations
- Excavation recommendations

The parameters and recommendations for the design and construction of the proposed industrial buildings are based on the factual subsoil and groundwater conditions, encountered at the borehole locations, on the basis of the terms of reference and on an assumption that the design of the structures will be in accordance with the applicable guidelines, building codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, ***TIL*** should be consulted to review the design and to confirm the recommendations and comments provided in the report.

2.0 SITE CONDITION

The Site, approximately 2.4 ha in area and near trapezoid in shape, is located on the north side of Ottawa Street, approximately 250m west of Ramsay Con 11A, and 40m east of Sadler Drive, in Almonte, Ontario.

At the time of the investigation, the Site was a commercial plaza, occupied by a L shaped building, including a number of retail stores, with its associated driveways and parking. Landscaped strips were observed along the boundaries of the Site.

The site gradient was fairly flat and slightly higher than the street levels and the west property, but slightly lower than the east property.

3.0 INVESTIGATION PROCEDURE

The field work for the investigation was carried out on October 6, 2022, and consisted of drilling eight sampled boreholes (22BH-1 to 22BH-4 and 22BH-6 to 22BH-9), extending to auger refusal depths varying from 0.8m to 2.2m from grade. In addition, two boreholes, 22BH-5 and 22BH-10, were drilled, without sampling, to auger refusal at depths of 0.6m and 1.2m from grade, respectively. Below these depths, the bedrock was cored for depths of approximately 5.2m (17ft) and 4.6m (15ft) to confirm that the refusal was in the bedrock and to determine the rock quality. The rock cores at Boreholes 22BH-5 and 22BH-10 locations were terminated at depths of 5.8m from grade.

The sampled portion of the boreholes were advanced using a truck mounted drill rig, equipped with continuous flight solid stem augers, sampling rods and a dropped hammer, supplied and operated by a specialist drilling contractor. Soil samples were taken at 0.76m intervals to the depths of refusal to the augering. The samples were obtained using a split spoon sampler in conjunction with Standard Penetration Tests using a driving energy of 475 joules (350 ft-lbs). Each sample was identified and logged in the field and was carefully bagged for later visual identification and laboratory testing, including moisture content determination. Groundwater observations were made in the open boreholes during and upon completion of the drilling.

The locations of boreholes, established in the field by our field personnel, are shown on the appended Borehole Location Plan (Drawing No. 1).

The ground elevations at the borehole locations were interpolated from Topographic Plan of #430 Ottawa Street, Shopping Plaza, Almonte, Ontario, prepared by GeoVerra, dated October 3, 2022, provided to our office by the client.

4.0 SUMMARISED SITE AND SUBSURFACE CONDITIONS

Reference is made to the appended Borehole Location Plan (Drawing No. 1), and Logs of Boreholes 22BH-1 to 22BH-10 (Drawing Nos. 2 to 11), and a section (Drawing No. 12), for details of field work including soil classification, inferred stratigraphy and groundwater observations carried out during and upon completion of borehole drilling.

The boreholes revealed that the overburden over the bedrock, below the surficial course of asphalt or gravel, consisted of a layer of fill, overlying a thin layer of native silt till deposit.

The brief descriptions of the subsoil and groundwater conditions, encountered at the borehole locations, are as follows:

4.1 Surface Course

Asphalt pavement, approximately 50mm to 90mm asphalt over granular bases, was contacted at the ground surface, at Boreholes 22BH-1 to 22BH-4 and 22BH-6 to 22BH-8 locations, and extended to depths of 0.6m from grade. A sand and gravel (granular bases) was contacted at the ground surface, at Borehole 22BH-9 locations, extending to a depth of 0.6m from grade.

4.2 Fill

A layer of fill was contacted below the asphalt pavement and the sand and gravel at Boreholes 22BH-1 to 22BH-4 and 22BH-6 to 22BH-9 locations. The fill extended to depths of 0.8m to 2.1m from grade.

The fill generally consisted of sandy silt, trace to some gravel, or sand with gravel, and localized clayey silt with some organics at Borehole 22BH-2 location.

Based on the Standard Penetration N-values of 21 to 24 blows for a penetration of 300mm, it appeared that the fill was compact.

The in-situ moisture content of the soil samples, retrieved from the fill, ranged from 3% to 26%, indicating moist to very moist conditions. The in-situ moisture content more than 20% was due to the organics content in the fill at Borehole 22BH-2 location.

4.3 Silt Till

A silt till deposit was contacted, underlying the fill, at Boreholes 22BH-1 to 22BH-4 and 22BH-6 to 22BH-9 locations, at depths of 0.8m to 2.1m from grade. The silt till deposit consisted of a heterogeneous mixture of silt and sand with some gravel and trace clay, with occasional sand stone or rock pieces.

Boreholes 22BH-1 to 22BH-4 and 22BH-6 to 22BH-9 were terminated in the silt till deposit at depths of 0.8m to 2.2m from grade, due to auger refusal, probably on the bedrock.

Based on the Standard Penetration N-values of 42 to more than 100 blows for a penetration of 300 mm, the relative density of the silt till deposit was dense to very dense.

The in-situ moisture content of the soil samples, retrieved from this deposit, ranged from 2% to 12%, indicating moist conditions.

4.4 Bedrock

Boreholes 22BH-5 and 22BH-10 were drilled without sampling to auger refusal on probable bedrock at depths of 0.6m and 1.2m from grade, respectively.

Approximately 5.2m (17ft) and 4.6m (15ft) long NQ rock cores were obtained at 22BH-5 and 22BH-10 locations, below the auger refusal depths of 0.6m and 1.2m from grade to determine the rock quality. An inspection of the rock cores indicated that the bedrock consisted of sand stone with limestone layers and the bedrock quality, within the cored depths, was very poor to good, generally in fair state. The very poor to poor bedrock was just below the contact depth - the first core length at each borehole, based on RQD values of 0% to 88% and Recovery of 32% to 100%.

The rock cores at Boreholes 22BH-5 and 22BH-10 locations were terminated at depths of 5.8m from grade.

4.5 Groundwater

No free water was recorded in the open boreholes during and upon completion of the drilling; however, cave-in was recorded in the open boreholes, 22BH-1 to 22BH-4 and 22BH-6 to 22BH-9, at depths of 0.5m to 0.3m from grade.

Based on the moisture content profile of the soil samples and our field observations at the Site during the drilling investigation, it is our opinion that there is no continuous groundwater table within the depth of investigation. However, some water could be present in the horizontally layered limestone bedrock.

5.0 RECOMMENDATIONS

We understand that the redevelopment of the Site will consist of one residential building with one level of underground parking at the north portion and two retail buildings with no basements at the south portion, and with their associated driveways and parking lots.

The finished floor elevations at the ground floor and the slab-on-grade elevations of the proposed buildings were not known at the time of preparation of this report. We have assumed that the finished floor elevations of the buildings will be at or above the existing ground levels, and the slab-on-grade level will be at a depth of 3.0m below the existing grade for one level of underground parking.

The footings for the buildings are assumed to be founded at depths of 1.8m (without a basement) or 4.0m (with underground parking) below the existing ground level. However, the elevator and the surrounding foundations are anticipated to be deeper than the above assumed founding level, at the depth of approximately 6.0 below the existing ground level.

Based on the subsoils and groundwater conditions encountered at the borehole locations, our recommendations and comments on the design and construction of the proposed development are as follows:

5.1 Site Preparation

The soil description and depth of fill shown on the Borehole Logs are specific depths at the borehole locations only. The thickness of topsoil and the depth of the fill at locations beyond the boreholes may be thicker or deeper. We recommend that the contractor bidding for the job should determine the depths of deleterious material by test pits and allow for removal of any deleterious fill and material, with high moisture and/or organic content, during the site preparation for site grading.

Depending on the final grades, the Site may have to be regraded. The on-site excavated fill and/or native soils, to be used for site grading, should be organic free and maintained at or close to its optimum moisture content during placement and compaction. The new fill should be compacted in lifts of 200mm to at least 98% of its Standard Proctor maximum dry density (SPMDD).

The backfill of cavity, after demolition of the existing structures and removal of all foundations and substructures, should consist of organic free material and should be placed and compacted in lifts not exceeding 200mm, to at least 100% of its SPMDD within the proposed building area, in according with Guidelines for Engineered Fill, as attached in Appendix A, and to at least 98%of its SPMDD within the pavement area.

The building pad preparation should include removal of any compressible topsoil, loose fill in the landscaped area and deleterious fill material, if encountered, and backfilling the building pad with selected on-site material, free of organics, or pre-approved material, to the subgrade level. The backfill within the building pad should be replaced and compacted in 200mm lifts to at least 100% of its SPMDD, according to the Guidelines of Engineered Fill.

Compressible topsoil and the fill material, containing relatively high organic content, will not be suitable for reuse in areas where future settlement cannot be tolerated. This material will have to be disposed off-site or reused in landscaped areas, subject to approval by the landscape architect.

5.2 Foundation Design

Conventional spread and strip footings, placed on the engineered fill, existing compact fill and native undisturbed silt till deposit, at depths of 1.8m below the finished outside grade, can be designed for the following bearing pressures:

- 150 kPa at Serviceability Limit State (SLS)
- 250 kPa at Factored Ultimate Limit State (ULS)

Conventional spread and strip footings, placed on the bedrock, at depths of 1.8m below the finished outside grade, or at depths of 4.0m to 6.0m below the existing grade at the one level of underground parking area, can be designed for the following bearing pressures:

- 1500 kPa at Serviceability Limit State (SLS)
- 2250 kPa at Factored Ultimate Limit State (ULS)

For strip foundations placed in the engineered fill, we recommend that all strip footings should be reinforced with at least 2-15M rebar, continuously. This reinforcement will bridge any loose pockets of the engineered fill, if any, under the footings.

The total and differential settlement of footings, designed for the above Serviceability Limit State, will not exceed 25mm and 20mm, respectively.

All perimeter footings or any footings, which may be exposed to freezing conditions, should be placed below the frost penetration depth of 1.8m below the outside grade or provided with an equivalent thermal protection.

We recommend that the site grading and the foundation plans of the proposed development should be reviewed by this office to confirm the bearing strata and the recommended design bearing pressures for the new structures.

It should be noted that the above recommendations for the foundations have been analyzed by ***TIL*** from the information obtained at the borehole locations. The bearing material, the interpretation between the boreholes and the recommendations of this report must be checked through field inspection provided by ***TIL*** to validate the information for use during construction.

5.3 Floor Slab Construction

Following the site preparation of the building pads, the floor slab in the retail buildings and the slab-on-grade of one level of underground parking, can be designed and constructed as a conventional slab-on-grade method.

The subgrade, in the retail building pads, should be thoroughly proof-rolled under the supervision of a geotechnical technician from ***TIL***. Any compressible, loose or weak spots encountered during the proof rolling process should be sub-excavated to a firm ground. Any backfill of the sub-excavated areas or new fill, below the slab-on-grade, should consist of organic free soils, compacted to at least 98% of its Standard Proctor maximum dry density (SPMDD).

A bedding consisting of at least 150 mm of granular A (OPSS Form 1010) or its approved equivalent, is recommended as a moisture barrier. The bedding should be compacted to at least 100% SPMDD.

5.4 Earthquake Consideration

The Ontario Building Code requires that all buildings be designed to resist earthquake forces. The Soil Classification for Seismic Site Response, in accordance with Table 4.1.8.4.A of the Ontario Building Code of Canada, is Class C (Very dense soil and soft rock).

The acceleration and velocity based site factors, Fa and Fv, should conform to Tables 4.1.8.4.B and 4.1.8.4.C. These values should be reviewed by the Structural Engineer.

5.5 Excavation and Backfilling

All excavations should comply with the Ontario Occupational Health and Safety Act. Any excavation in the fill should be sloped back to a safe angle of 45° or flatter. Shallow excavation in the overburden, below the fill, can be excavated vertically for a depth not exceeding 1.2m.

We do not anticipate any serious groundwater problems in excavations at the Site. Localized seepage of water, if encountered, can be drained to sump pits and removed by pumping from sumps.

The in-situ moisture content of the fill and the native soils was at or close to its optimum moisture content. Selected on-site excavated soils can be reused for backfilling, provided they are free of organics and allowed to air dry to the dry side of its optimum, prior to placement. The use of the compressible fill should be limited to backfilling of locations where future settlement will be of little consequence.

Based on the borehole information, the subsoil at service trench inverts may consist of fill, silt till deposit or bedrock.

Backfill around manholes and narrow trenches in the pavement area should consist of imported granular material and should be compacted using a vibratory equipment. In addition, catch basins and manholes should be perforated just above the drain level and the holes should be screened with a filter fabric. This will help in draining the pavement structure as well as alleviate the problem of differential movement of manholes due to frost action.

5.6 Lateral Earth Pressure

Where subsurface walls will retain unbalanced loads or where a retaining wall is proposed, the lateral earth pressure of the retained soil may be computed using the following equation:

$$P = K (\gamma H + q)$$

where	P = Lateral earth pressure	kPa
	K = Lateral earth pressure coefficient	0.40
	γ = Bulk unit weight of the soil	21.0 kN/m^3
	H = Depth of the wall below the finish grade	m
	q = Surcharge loads adjacent to the retaining wall	kPa

The equation assumes that a permanent free draining system will be provided to prevent the buildup of hydrostatic pressure next to the wall.

The drainage system should include a free-draining granular backfill or a drainage membrane placed against the concrete wall, together with an effective perimeter weeping tile drainage system at the wall base. The weeping tile should consist of a minimum 100mm diameter perforated pipe, surrounded by a geotextile filter fabric (OPSS 405) and installed on a positive grade leading to a frost free sump or outlet.

For an open cut excavation at the location of the basement/underground parking, the recommended permanent perimeter drainage system is shown on Figure No. 1.

5.7 Pavement Construction

The existing on-site material generally consists of sandy silt with clayey silt. These materials are highly frost susceptible.

The following pavement design is recommended based on the assumption that perforated sub-drains will be installed to prevent buildup of water in the granular bases of the pavement:

Pavement Structure		Light Duty Parking	Heavy Duty Fire Routes
Asphaltic Concrete:	**OPSS HL3 or equivalent**	**65mm**	**40mm**
	OPSS HL8 or equivalent	**-**	**60mm**
Base:	**OPSS Granular A or 20mm crusher-run**	**150mm**	**150mm**
Sub-base:	**OPSS Granular B or 50mm crusher-run**	**200mm**	**300mm**

The granular base and sub-base should be compacted to a minimum of 100% SPMDD. Asphaltic concrete should be compacted to at least 96% Marshall density.

The above pavement thicknesses are based on favourable site conditions and the construction being carried out during the drier time of the year, that the subgrade is stable, and not heaving under construction traffic. If the subgrade is wet and unstable, additional thickness of sub-base material will be required.

Following site grading, the subgrade of the entire pavement should be proof-rolled using a heavy vibratory roller. Any soft spots revealed by the proof-rolling should be sub-excavated and replaced with approved dry material and compacted to at least 98% of the Standard Proctor maximum dry density (SPMDD).

Continuous perforated, OPSS 405, longitudinal drains, minimum diameter of 100mm, should be used as sub-drains, on both sides of the roadways. The sub-drains should be installed on a positive gradient towards the outlets (collecting into catch basins), at a minimum depth of 800mm below the pavement level, to allow for a free flow of water. The backfill above the drains should comprise of free draining Granular B or its equivalent and should be continuous with the granular sub-base of the pavement. This will help in draining the pavement structure and minimize the differential heave of the pavement.

6.0 GENERAL STATEMENT OF LIMITATION

The comments and recommendations presented in this report are based on the subsoil and ground water conditions encountered at the borehole locations, indicated in the borehole location plan, and are intended for the guidance of the design engineer.

Although we consider this report to be representative of the subsurface conditions at the subject property, the soil and the ground water conditions between and beyond the borehole locations may differ from those encountered at the time of our investigation and may become apparent during construction. Any contractor bidding on, or undertaking the works, should decide on their own investigation and interpretations of the groundwater and the soil conditions between the borehole locations.

Any use and / or the interpretation of the data presented in this report, and any decisions made on it by the third party are responsibility of the third parties. The responsibility of ***Toronto Inspection Ltd.*** is limited to the accurate interpretation of the soil and ground water conditions prevailing in the locations investigated and accepts no responsibility for the loss of time and damages, if any, suffered by the third party as a result of decisions or actions based on this report.

Yours very truly
TORONTO INSPECTION LTD.

David Wang, P.Eng.
Senior Engineer

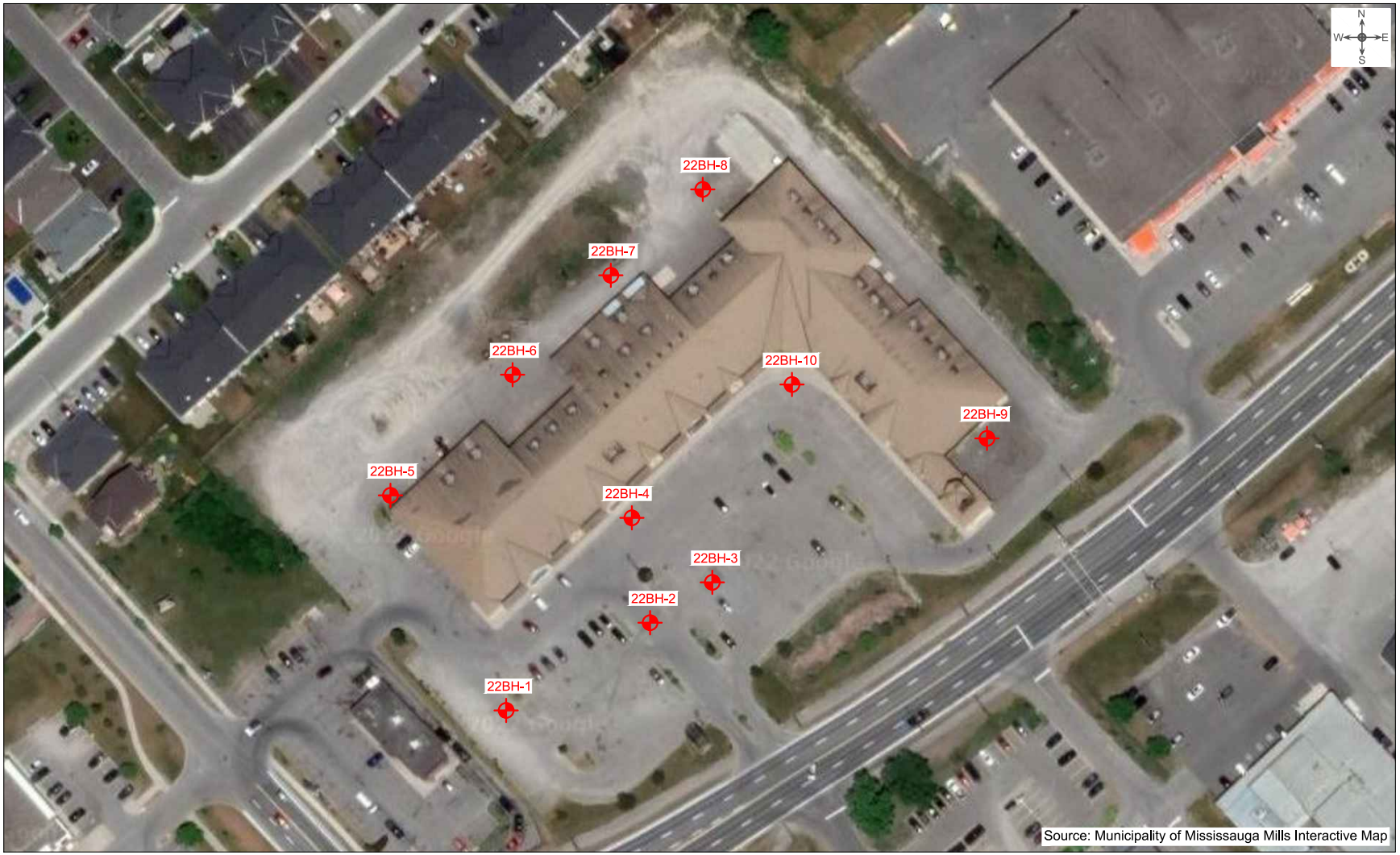
Upkar S. Sappal, P. Eng.
Principal Engineer

Toronto Inspection Ltd.

Drawings

Borehole Location Plan
Borehole Logs

Section



LEGEND:

Borehole Location / Monitoring Well Location

NOT TO SCALE

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TITLE:	Borehole and Monitoring Well Location Plan
LOCATION:	430 Ottawa Street, Almonte, Ontario
PROJECT NO.	5559-22-GB
DATE :	October 2022
DRAWING NO.	1

Project No. 5559-22-GB

Log of Borehole 22BH-01

Dwg No. 2

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

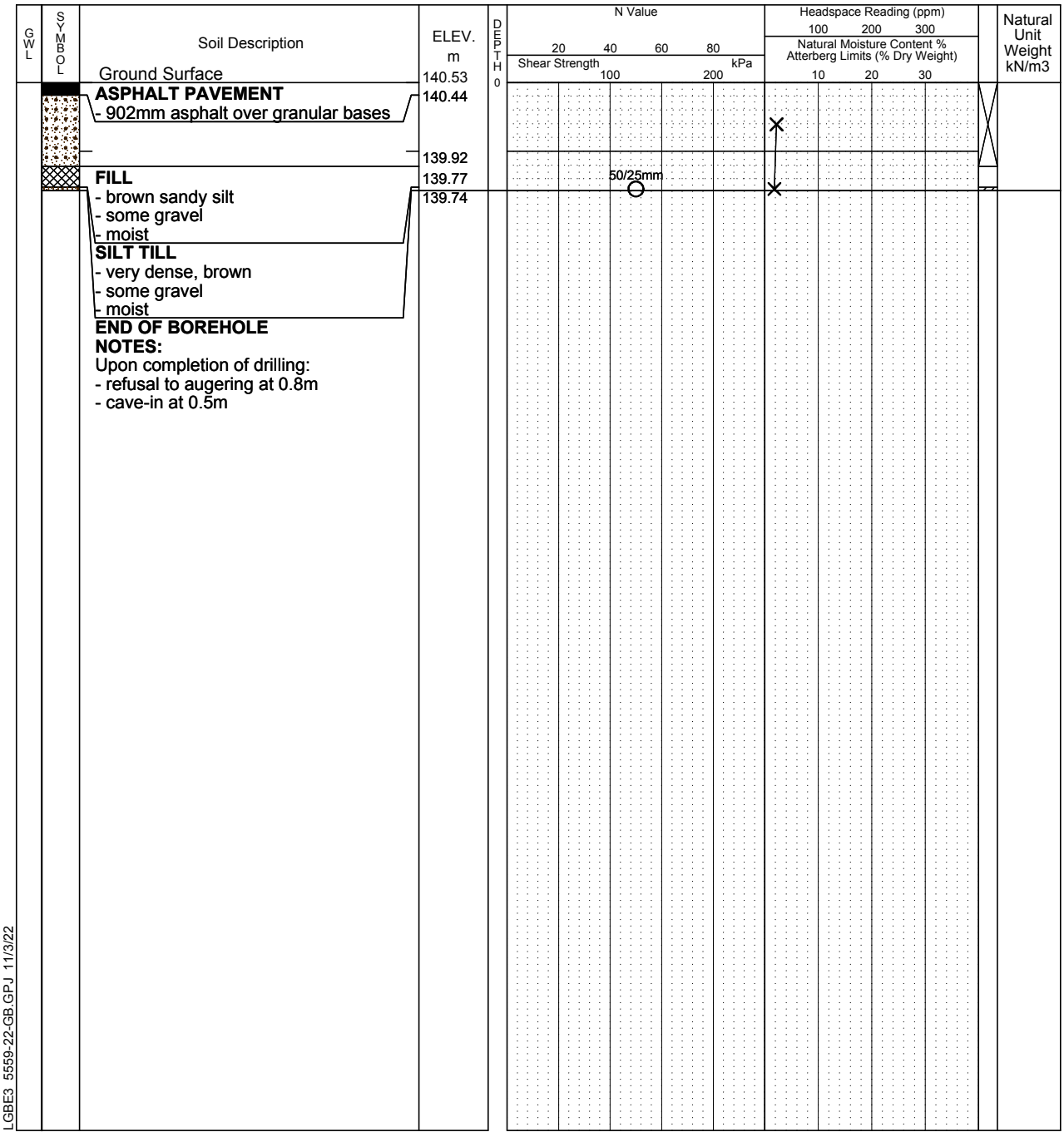
Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer



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NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-02

Dwg No. 3

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

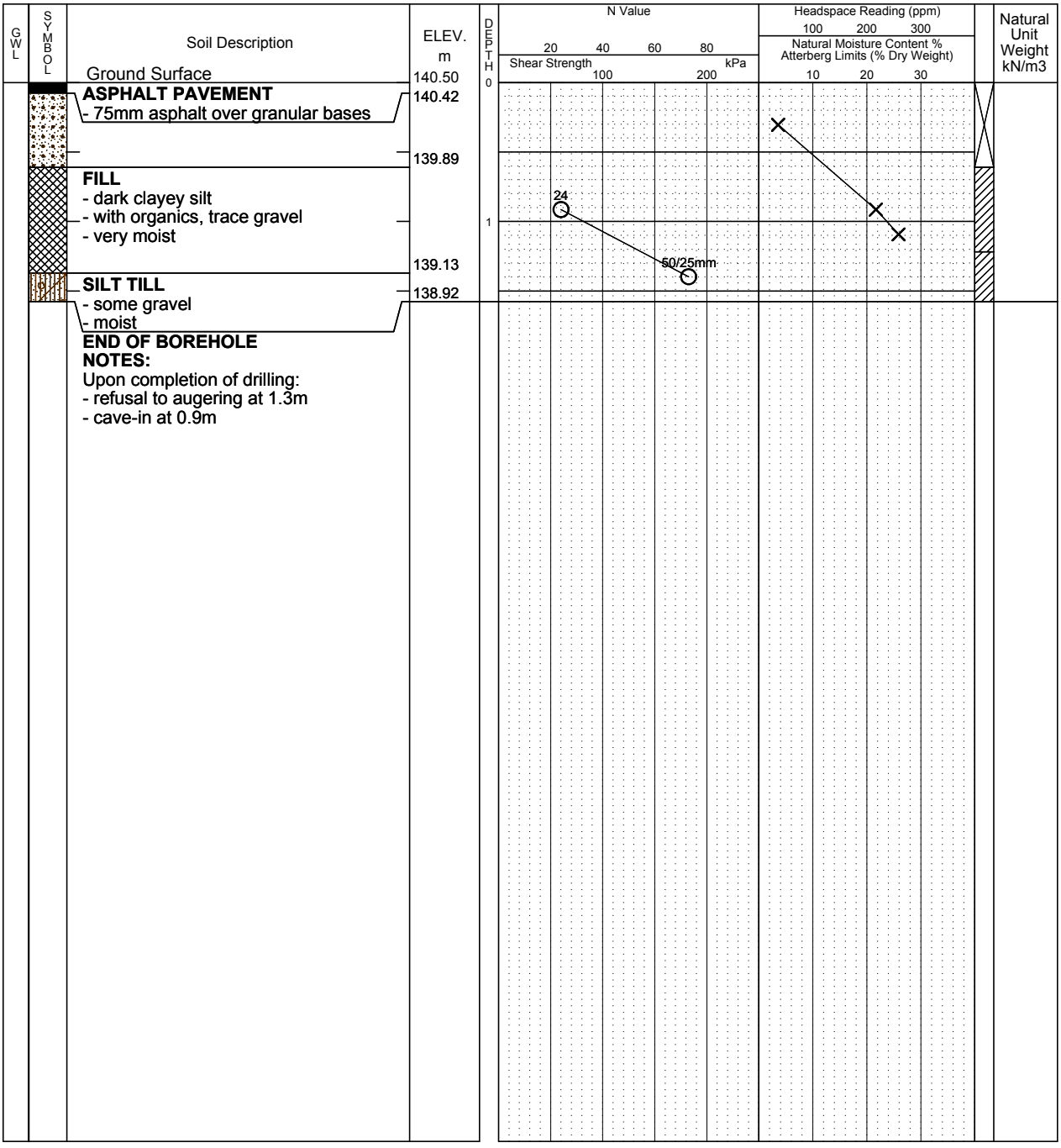
Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer



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NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-03

Dwg No. 4

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	140.40	0
		ASPHALT PAVEMENT - 75mm asphalt over granular bases	140.32	
			139.79	
		FILL - brown sandy silt - some gravel - moist	139.64	
		SILT TILL - very dense, grey - sand stone pieces - moist	139.46	
		END OF BOREHOLE		
		NOTES: Upon completion of drilling: - refusal to augering at 0.9m - cave-in at 0.6m		

N Value: 20 40 60 80
Shear Strength: 100 200 kPa
50/50mm
Headspace Reading (ppm): 100 200 300
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Natural Unit Weight kN/m3

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NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-04

Dwg No. 5

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	140.59	0
		ASPHALT PAVEMENT - 50mm asphalt over granular bases	140.54	
			139.98	
		FILL - brown sandy silt - trace gravel - moist to very moist	139.67	
		SILT TILL - very dense, brown - some gravel, some sand - moist	139.27	1
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - refusal to augering at 1.3m - cave-in at 1.0m		

N Value: 20 40 60 80
Shear Strength: 100 200 kPa
50/130mm

Headspace Reading (ppm): 100 200 300
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Natural Unit Weight kN/m3

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Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-05

Dwg No. 6

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	140.60	0
		NO SAMPLING		
			139.97	
		BEDROCK - Limestone layers - Recovery 73% - RQD 0%		1
			139.31	
		- Limestone layers - Recovery 100% - RQD 74%		2
			137.83	
		- Limestone layers - Recovery 100% - RQD 56%		3
			136.31	4
		- Limestone layers - Recovery 100% - RQD 67%		5
			134.79	
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - refusal to augering at 0.6m, prior to rock coring		

N Value: 20 40 60 80
Shear Strength: 100 200 kPa

Headspace Reading (ppm): 100 200 300
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Natural Unit Weight kN/m3

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Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-06

Dwg No. 7

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	140.50	0
		ASPHALT PAVEMENT - 50mm asphalt pavement over granular bases	140.45	
			139.89	
		FILL - brown sandy silt - some gravel, pockets of topsoil - moist		1
			139.28	
		SILT TILL - dense, brown - some gravel, some sand - moist	139.08	
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - refusal to augering at 1.4m - cave-in at 0.5m		

N Value: 20 40 60 80; Shear Strength kPa: 100 200; N = 42

Headspace Reading (ppm): 100 200 300

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

Natural Unit Weight kN/m3

LGBE3 5559-22-GB.GPJ 11/3/22

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Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-07

Dwg No. 8

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	140.55	0
		ASPHALT PAVEMENT - 50mm asphalt pavement over granular bases	140.50	
			139.94	
		FILL - brown sand with gravel - moist	139.48	1
		SILT TILL - very dense, brown - gravelly, moist	139.43	
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - refusal to augering at 1.1m - cave-in at 0.5m		

N Value: 20 40 60 80
Shear Strength: 100 200 kPa
50/50mm
Headspace Reading (ppm): 100 200 300
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Natural Unit Weight kN/m3

LGBE3 5559-22-GB.GPJ 11/3/22

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-08

Dwg No. 9

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	140.55	0
		ASPHALT PAVEMENT - 50mm asphalt over granular bases	140.50	
			139.94	
		FILL - brown sandy silt - some gravel - moist	139.79	
		SILT TILL - very dense, brown - some gravel - moist	139.69	
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - cave-in at 0.6m		

N Value: 50/100mm

Shear Strength (kPa): 20, 40, 60, 80; 100, 200

Headspace Reading (ppm): 100, 200, 300

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

Natural Unit Weight kN/m3

LGBE3 5559-22-GB.GPJ 11/3/22

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-09

Dwg No. 10

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

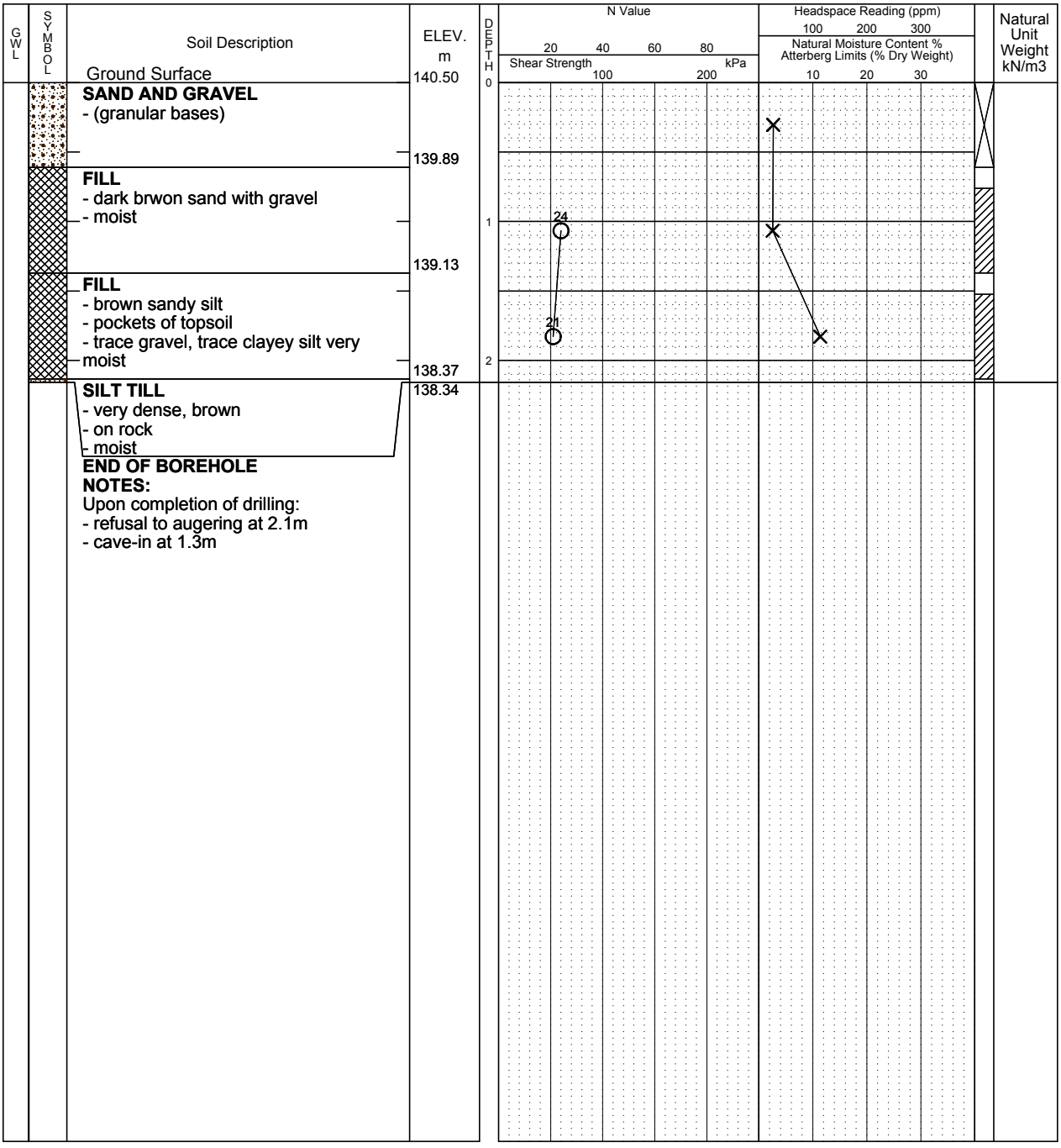
Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer



LGBE3 5559-22-GB.GPJ 11/3/22

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5559-22-GB

Log of Borehole 22BH-10

Dwg No. 11

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 430 Ottawa Street, Almonte, Ontario

Date Drilled: 10/6/22

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

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

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	140.60	0
		NO SAMPLING		
			139.36	1
		BEDROCK - Limestone layers - Recovery 32% - RQD 21%		2
			137.83	
		- Limestone layers - Recovery 100% - RQD 84%		3
			136.31	4
		- Limestone layers - Recovery 32% - RQD 66%		5
			134.79	
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - refusal to augering at 2.1m, prior to rock coring		

N Value: 20 40 60 80
Shear Strength: 100 200 kPa

Headspace Reading (ppm): 100 200 300
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

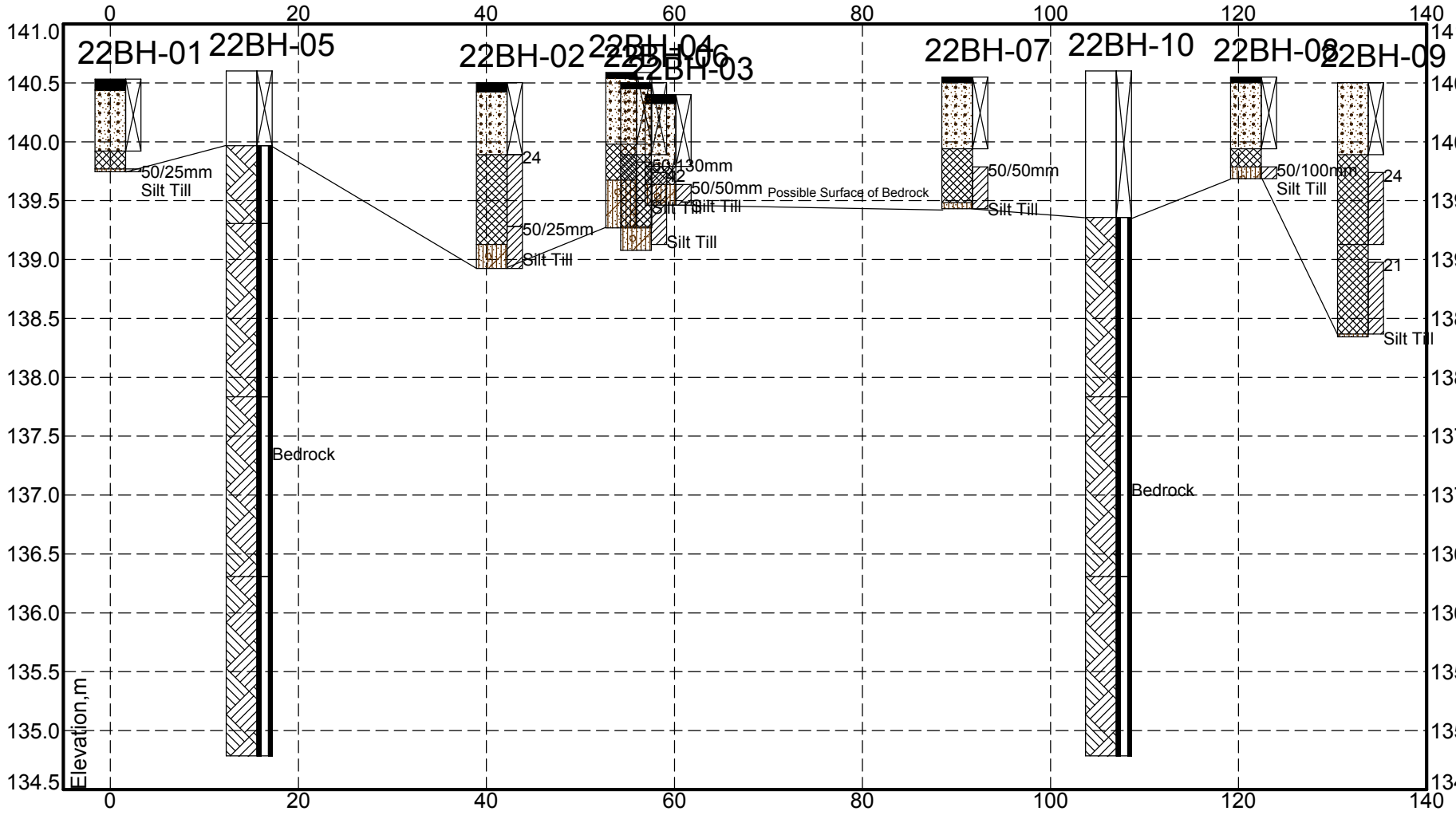
Natural Unit Weight kN/m3

LGBE3 5559-22-GB.GPJ 11/3/22

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)



Borehole No	Elev.	Depth
22BH-01	140.5	0.8
22BH-02	140.5	1.6
22BH-03	140.4	0.9
22BH-04	140.6	1.3
22BH-05	140.6	5.8
22BH-06	140.5	1.4
22BH-07	140.5	1.1

Toronto Inspection Ltd.

SUBSURFACE STRATIGRAPHY

Section

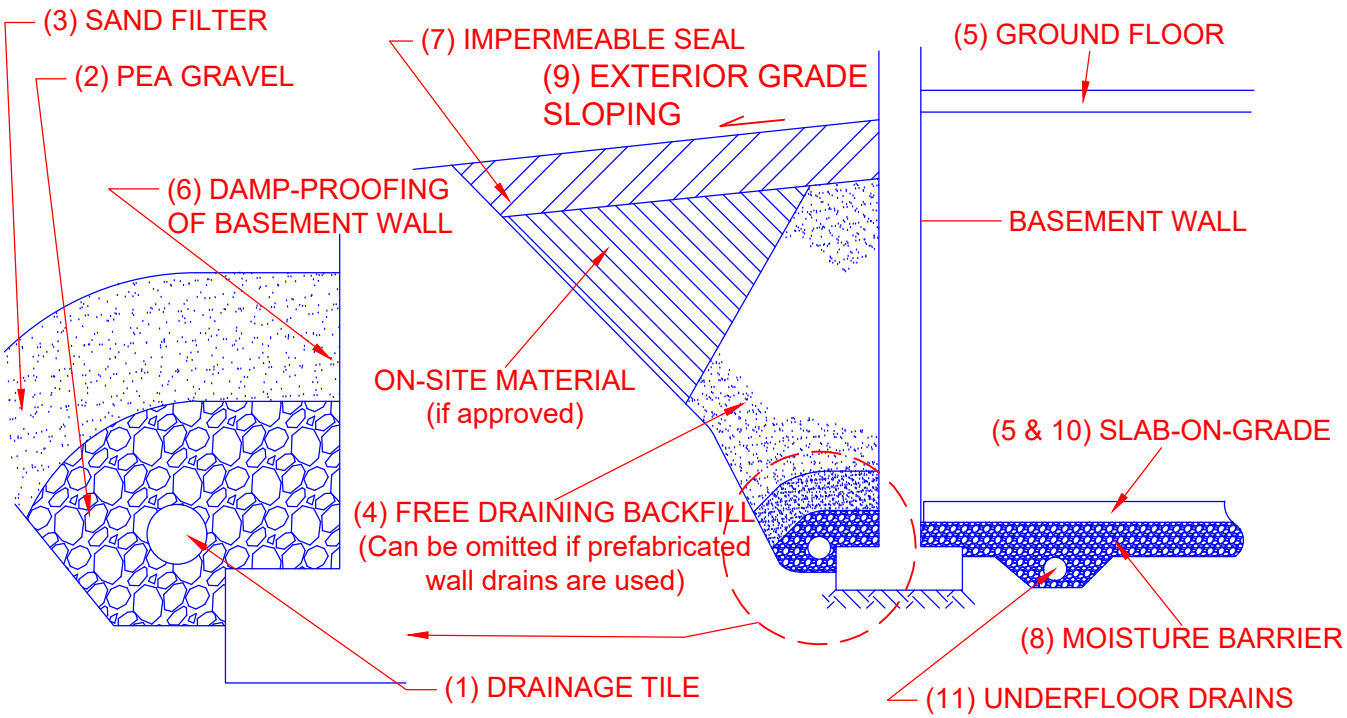
Geotechnical Investigation

430 Ottawa Street, Almonte, Ontario

PROJECT #	DATE	DRAWING
5559-22-GB	Oct 22	12

Figure

Details of Perimeter Subdrain and Basement Backfill



Notes:

1. **Drainage tile**: consist of 100mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. invert to be at minimum of 150mm (6") below underside of basement floor level.
2. **Pea gravel**: at 150mm (6") on the top and sides of drain. If drain is not placed on footing, provide 100mm (4") of pea gravel below drain. The pea gravel may be replaced by 20mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270 R or equivalent.
3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300mm (12") on the top and sides of gravel. This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.
4. **Free-draining backfill**: OPSS Granular B or equivalent, compacted to 93 to 95% (maximum) Standard Proctor Density. Do not ocmpact closer than 1.8m (6ft.) from wall with heavy equipment. This may be replaced by on site material if prefabicated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.
5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adequate bracing.
6. **Damp-proofing** of the basement wall is requred before backfilling.
7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free draining sand, the seal may be omitted.
8. **Moisture barrier**: consists of 20mm clear stone or compacted OPSS Granular A, or equivalent. The thickness of this layer to be 150mm (6") minimum.
9. **Exterior Grade**: slope away from basement wall on all the sides of the building.
10. **Slab-on-grade** should not be structurally connected to walls or foundations.
11. **Underfloor drains *** should be placed in parallel rows at 6-8m (20-25 ft.) centre, on 100mm (4") of pea gravel with 150mm (6") of pea gravel on top and sides. The invert should be at least 300mm (12") below the underside of the floor slab. The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

* Underfloor drains can be deleted where not required.

NOT TO SCALE

TIL Toronto Inspection LTD. GEO-ENVIRONMENTAL CONSULTANTS
110 Konrad Cresent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192 Email: TIL@torontoinspection.com

TITLE:
Details of Perimeter Subdrain and Basement Backfill

FIGURE NO.
1

Appendix A
Engineering Fill Guidelines

GUIDELINES FOR ENGINEERED FILL

The information presented in this guideline is intended for general guidance only. Site specific and prevailing weather conditions may require modification of the material(s) to be used and the compaction standards or procedures changed. The site preparation and the material(s) to be used must be discussed and procedures agreed with ***Toronto Inspection Ltd.*** prior to the start of the earthworks and must be subjected to on going review during construction.

For fill to be classified as engineered fill, suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Areal Extent

The engineered fill must extend beyond the envelope of the structure to be supported. The minimum extent should be 2.0m beyond the envelope in all directions at the foundation level, including the loading dock pad and the front sidewalk, and sloping downwards to the sub-grade at 45°. Once the envelope is set, the structure cannot be moved out of the envelope without consultation with ***Toronto Inspection Ltd.*** Similarly, no excavation should encroach on the engineered fill envelope without consultation with ***Toronto Inspection Ltd.***

2. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor. During construction. it is necessary to have qualified surveyors providing control stations on the three-dimensional extent of the engineered fill.

3. Subsurface Preparation

Prior to placement of the engineered fill, the sub-grade must be prepared to the satisfaction of ***Toronto Inspection Ltd.*** All deleterious material must be removed and in some cases excavation of native mineral soils may also be required. Particular attention must be paid to wet sub-grade and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching will be necessary and natural drainage paths must not be blocked.

4. Suitable Fill Material

All material to be used as fill must be approved by ***Toronto Inspection Ltd.*** Such approval will be influenced by weather factors. External sources of fill material must be sampled, tested and approved prior to material being hauled to the job site.

5. Trial Test Section

In advance of the construction of the engineered fill pad, the contractor should conduct a trial test section. The compaction criterion will be assessed for the backfill material to be used, using specified lift thicknesses and number of passes for the compaction equipment proposed by the contractor. To achieve a uniform degree of compaction of each layer, the lift thickness of loose

material, prior to start of compaction, must not exceed 200mm (8 inches). Additional trial test section(s) may be required throughout the course of the project to reflect changes in material sources, the moisture content of the material and the weather conditions.

6. Degree of Compaction

The minimum degree of compaction for the engineered fill should not be less than 100% of the Standard Proctor maximum dry density, or 95% of the Modified Proctor maximum dry density, to the level at or above 0.3m from proposed footing founding level. Each layer must be tested and approved by this office before the next layer is placed.

7. Inspection and Testing

Uniform and thorough compaction is crucial to the performance of the fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be done with full time inspection and to the satisfaction of ***Toronto Inspection Ltd.*** All founding surfaces must be inspected and approved by ***Toronto Inspection Ltd.*** prior to placement of concrete.

8. Protection of Fill

Fills are generally more susceptible to the effects of weather than are natural soils. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where inadequate protection had been provided, it may be necessary to provide deeper founding level for footings or to strip and re-compact some of the filled layers.

9. Limitations

The engineered fill is subjected to the following limitations:

i. Proper drainage must be maintained at all times within the engineered fill pad.
ii. If the engineered fill is left in place during the winter months, adequate protection must be provided against frost penetration to the proposed footing depths.
iii. If the engineered fill depth exceeds 5m below the foundation depth, the construction of the foundations might have to be delayed for a period of 1 year after placement, depending on the type of fill material used.
iv. Strip footings and foundation walls founded on engineered fill must be reinforced continuously with a minimum of two 15mm steel bars with at least 1m of overlap.