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A REPORT TO
731011 ONTARIO LIMITED

A GEOTECHNICAL ASSESSMENT FOR PROPOSED COMMERCIAL DEVELOPMENT

HIGHWAY 11 AND CRIMSON KING WAY

TOWN OF EAST GWILLIMBURY

REFERENCE NO. 2402-S026

FEBRUARY 2024

DISTRIBUTION

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TABLES

ENCLOSURES

1.0 INTRODUCTION

In accordance with an email authorization from Ms. Joanne Barnett of 1049121 Ontario Ltd., dated February 1, 2024, an updated geotechnical assessment report is prepared for the proposed Commercial Development at the northeast corner of Highway 11 and Crimson King Way in the Town of East Gwillimbury.

This report is prepared in accordance with the borehole findings and the laboratory test results of soil samples completed by Soil Engineers Ltd. (SEL), for Kerbel Group Inc. (Our Reference No. 0807-S093, dated January 2009).

2.0 SITE AND PROJECT DESCRIPTION

The Town of East Gwillimbury is situated in the Simcoe Lowlands where, in places, the drift has been eroded by (glacial) Lake Algonquin and filled with sands, silts, clay and reworked till.

The site of investigation is located at the northeast corner of Highway 11 and Crimson King Way in the Town of East Gwillimbury. It is near rectangular in shape and is relatively flat, with the grade descending slightly towards the north.

The site has been rough-graded with earth fill placed in an engineered manner monitored by SEL between May 2018 and August 2023. An engineered fill certificate was provided for the earth fill placed in an engineered manner, Reference No. 1406-M065, dated February 5, 2024, and is enclosed in Appendix ‘A’ of this report.

A review of the site plan provided by 1049121 Ontario Ltd. indicates that the proposed commercial development will consist of three slab-on-grade buildings and a self-storage facility in the northern portion of the site. The development will be provided with landscaped areas, municipal services, on-grade parking, loading areas and access roadways.

3.0 SUBSURFACE CONDITIONS

A total of 6 sampled boreholes were conducted within the property and 2 sampled boreholes were conducted to the east of the site by Soil Engineers Ltd. on September 24 and 25, 2008, prior to the placement of the engineered fill. The borehole locations are shown in the Location Plan, Drawing No. 1.

The investigation has disclosed that beneath the engineered earth fill, the native soil, prior to the placement of the engineered fill, consists of strata of silty clay, sands, and silt. Detailed descriptions of the original subsurface conditions are presented on the Borehole Logs and presented in Appendix 'B'. The revealed original stratigraphy encountered is plotted in the Subsurface Profile, Drawing No. 2. The engineering properties of the disclosed soils are discussed herein.

3.1 **Engineered Earth Fill**

Prior to placement of engineered fill, the original topsoil encountered in the boreholes was removed, along with any weathered soil revealed during proof-rolling.

The engineered earth fill, consisting of a mixed, inorganic material, was placed above the prepared subgrade. Based on a review of the original grade and the present grade, approximately 2.4 to 3.5 m of earth fill has been placed within the subject site. The placement of the engineered fill was inspected and supervised by SEL.

Due to exposure to weathering, the surficial layer of the engineered earth fill must be reassessed by SEL during the project construction and may require some recompaction if construction is not imminent.

The fill is amorphous in structure; it will ravel and is susceptible to collapse in steep cuts.

The non-weathered engineered fill is suitable for supporting building foundations, slab-on-grade and pavement construction.

3.2 **Silty Clay/Silty Clay Till**

The silty clay and silty clay till were found either above or below the sand or silt deposits. It extends to the maximum investigated depths of Boreholes K2, K7, K12 and K13. Sample examinations show that the deposits contain occasional mixture of sand and gravel. The clay till is generally heterogeneous in structure, being amorphous in places, indicating that it is a glacial deposit which has been partially reworked by the past glaciation. A grain size analysis was performed on 1 representative sample of the silty clay; the result is plotted on Figure 55 in Appendix 'B'.

The obtained 'N' values range from 4 to over 100, with a median of 12. The low 'N' values were recorded in the weathered clay and clay till near the ground surface only. The majority of the clay and clay till indicates that their consistency is stiff to very stiff, being generally stiff.

The water content of the soil samples from the clay and clay till ranges from 14% to 27%, with a median of 21%, showing that the deposits are in a moist to wet, generally very moist condition.

Accordingly, the soil engineering properties of the clay and clay till pertaining to the project are given below:

- High frost susceptibility and high soil-adfreezing potential.
- Low water erodibility.
- A steep cut in the weathered clay and clay till may slough readily.

3.3 **Silts**

The silts were encountered at various depths, interstratified with the sand, till or clay deposits. It is non-cohesive, consisting of a variable amount of sand, ranging from a trace of sand to being sandy. Grain size analyses were performed on a representative sample of the sandy silt and the gradations are plotted on Figures 59 and 60 in Appendix 'B'.

The natural water content values of the soil samples ranged from 10% to 21%, with a median of 18%. This shows that the deposit is moist to saturated, being generally in a saturated and water-bearing condition.

The obtained 'N' values range from 5 to 17, with a median of 14. These values indicate that the relative density of the deposit is loose to compact, being generally compact. The relatively low 'N' value represents the weathered silt near the ground surface.

Based on the above findings, the soil engineering properties pertaining to the project are given below:

- High frost susceptibility, with high soil-adfreezing potential.
- High water erodibility.

- Due to its dilatancy, the shear strength of wet sandy silt is susceptible to impact disturbance; i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction in shear strength.
- In excavation, the very moist and wet silt will slough and run slowly with seepage bleeding from the cut face. It will boil under a piezometric head of about 0.3 m.

3.4 **Sands**

The sand deposits were contacted at various depths, interstratified with the sandy silt, clay or till deposits. In Boreholes K1 and K3, the sand deposit extended beyond the investigated depth of 5.0 m below the prevailing ground surface. They are fine grained, containing a variable amount of silt. Grain size analyses were performed on a representative sample of the silty fine sand and the gradation is plotted on Figure 61, presented in Appendix 'B'.

The obtained 'N' values range from 3 to 40, with a median of 26. These values indicate that the relative density of the sand deposits is very loose to dense, being generally compact. The low 'N' values represent the weathered sand near the ground surface.

The natural water content values of the soil samples range from 5% to 20%, with a median of 14%, indicating that the deposits are damp to wet, being generally in a wet condition.

Accordingly, the following engineering properties of the soils are deduced:

- Low to high frost susceptibility and soil-adfreezing potential, depending on its silt content.
- High water erodibility; they are susceptible to migration through small openings under seepage pressure.
- The sands have high capillarity and water retention capacity.
- Due to their dilatancy, the strength of wet sands is susceptible to impact disturbance; i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction in shear strength.
- In excavation, the very moist and wet sands will slough and run slowly with seepage bleeding from the cut face. They will boil under a piezometric head of about 0.3 m.

3.5 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Silty Clay/Silty Clay Till	14 to 27	15	12 to 19
Sands/Silts	5 to 21	10 to 13	6 to 14

4.0 GROUNDWATER CONDITION

The boreholes were checked for groundwater upon completion of the drilling. Borehole K13 remained dry upon completion of the field work in 2008. The groundwater level recorded in the boreholes are plotted on the Borehole Logs and summarized in Table 2.

Table 2 - Groundwater Levels on completion

Borehole No.	Ground Elevation (m)	Measured Groundwater Level and Cave-in* Level on completion	
		Depth (m)	Elevation (m)
K1	225.0	2.1/1.0*	222.9
K2	225.5	2.7/1.4*	222.8
K3	226.0	4.0	222.0
K7	225.0	4.3	220.7
K8	225.5	2.4	223.1
K10	Not available	4.0	Not available
K12	225.5	4.3	221.2
K13	226.0	Dry	-

The groundwater recorded upon completion of the field work ranges from 2.1 to 4.3 m below the prevailing ground surface, or El. 223.1 to 220.7 m, which is generally restricted within the native soils below the engineered earth fill.

5.0 DISCUSSION AND RECOMMENDATIONS

Based on the available information, the present site consists of a layer of engineered earth fill overlying deposits of silty clay till/silty clay, silts and sands.

The earth fill was placed in an engineered manner under the supervision of Soil Engineers Ltd. The Engineered Fill Certification, Reference No. 1406-M065, dated Feburary 5, 2024, is enclosed in the Appendix 'A' of this report.

The groundwater recorded upon completion of the field work ranges from 2.1 to 4.3 m below the prevailing ground surface, or El. 223.1 to 220.7 m, which is generally restricted within the native soils below the engineered earth fill.

The proposed commercial development will consist of 3 slab-on-grade commercial buildings and a self-storage facility at the northern portion of the property. The development will be provided with municipal services and access roadways. The geotechnical findings warranting special consideration for the proposed project are presented below:

1. The engineered fill and sound natural soils below the surficial weathered material is suitable for normal spread and strip footing construction. The weathered or disturbed engineered fill which, in places, may extends to depths of 0.5± m below the prevailing ground surface, is weak in shear strength. This can be alleviated by proof-rolling and surface compacting of the engineered fill subgrade.
2. Due to the presence of the weathered engineered earth fill, the soundness of the footing subgrade must be inspected by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, to ensure that the condition of the subgrade is compatible with the design of the foundations.

The recommendations appropriate for the design of the development are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should subsurface variances become apparent during construction, a geotechnical engineer must be consulted.

5.1 Site Preparation

Any disturbed engineered fill should be removed and properly recompacted. Where additional earth fill is required to raise the grade, the earth fill can be constructed in an engineered manner for building construction, underground services and pavement support. The engineering requirements for a certifiable fill are presented below:

1. All disturbed soils must be subexcavated and further assessed of their suitability for engineered fill.
2. The soil subgrade must be inspected and proof-rolled prior to any fill placement.
3. Inorganic soils must be used for the fill, and they must be uniformly compacted in lifts 20 cm thick to 98% or + of the maximum Standard Proctor dry density (SPDD) up to the proposed pre-grade or finished grade. The soil moisture must be properly controlled near the optimum. If the foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% SPDD.
4. If the engineered fill is compacted with the moisture content on the wet side of the optimum, the underground services and pavement construction should not begin until the pore pressure within the fill mantle has completely dissipated. This must be further assessed at the time of the engineered fill construction.
5. If imported fill is to be used, it should be inorganic soils, free of any deleterious material with environmental issue (contamination). Any potential imported earth fill from off-site must be reviewed for geotechnical and environmental quality by the appropriate personnel as authorized by the developer or agency, before it is hauled to the site.
6. The engineered fill must not be placed during the period where freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow.
7. The fill operation must be supervised on a full time basis and monitored by a technician under the direction of a geotechnical engineer.
8. The engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented.
9. Any excavation carried out in the certified engineered fill must be reported to the geotechnical consultant who supervised the fill placement in order to document the locations of excavation and/or to supervise reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within

a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.

10. The footing and underground services subgrade must be inspected by the geotechnical consulting firm that supervised the engineered fill placement. This is to ensure that the foundations and service pipes are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.

5.2 **Foundations**

The proposed development will consist of slab-on-grade commercial buildings and a self-storage warehouse facility. They can be supported on conventional spread and strip footings, founded on the engineered fill. The recommended soil bearing pressures for the design of conventional footings are provided below:

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 75 kPa
- Factored Bearing Pressure at Ultimate Limit State (ULS) = 120 kPa

Where higher bearing capacity is required, additional review of the site grading plan, structure sitings and additional boreholes will be necessary.

The total and differential settlements of structures designing for the bearing pressure at SLS are estimated within 25 mm and 20 mm, respectively.

Foundations exposed to weathering or in unheated areas should have at least 1.6 m of earth cover for protection against frost action.

The building foundation should meet the requirements specified in the latest Ontario Building Code and the structures should be designed to resist an earthquake force using Site Classification ‘D’ (stiff soil).

Soil Engineers Ltd. certifies that the results of the Field Density Tests for the compacted, earth fill attain or exceed 98% of the maximum SPDD, for all test locations. The compacted fill is suitable for normal foundation construction with the following qualifications:

1. Proper surface drainage must be maintained within the engineered fill areas. Soil Engineers Limited must be informed of any construction activities within the engineered fill envelope, which may cause disturbance and loosening of the engineered fill mantle.
2. If the engineered fill if to be left over the winter months, adequate earth cover, or equivalent, must be provided to protect it against frost action. Otherwise, the finished engineered fill will require inspection to assess the extent of the frost loosening, and to determine the measures for rectification before foundation construction.
3. Footings adjacent to easements for services within the engineered fill envelope must be placed on the undisturbed engineered fill or natural soil at or below the invert of the pipe, or at a safe level as determined by our field inspection.
4. The footing subgrade must be inspected by our engineer to ensure the following:
   - The footings are founded on the engineered fill and are a suitable distance of 3.0 metres from the limits of the controlled engineered fill envelope and a minimum of 0.5 metre below the finished engineered fill grade.
   - The subgrade has not been compromised by construction disturbance and/or environmental degradation.
5. Despite stringent control in the placement of engineered fill, variations in soil type and density may occur in the engineered fill. The strip footing and upper section of the foundation walls must be reinforced continuously (minimum of 1.0 metre overlap), by two 15mm, or equivalent, steel bars which must be inspected by our engineer.
6. If the engineered fill exceeds 5 metres in depth, construction of the foundations must not begin until one year after completion of the engineered fill placement.

If any one of the above qualifications is not met, our certification is deemed null and void and Soil Engineers Limited cannot warrant the condition of the engineered fill and explicitly accepts no liability for any damage resulting from placement of foundations or structures on the engineered fill.

5.3 **Slab-on-Grade Construction**

The subgrade for slab-on-grade construction must consist of sound native soils or properly compacted inorganic earth fill. In preparation of the subgrade, the subgrade should be inspected and assessed by proof-rolling. Any weathered and/or loose soil should be subexcavated, sorted free of any deleterious material, aerated and uniformly compacted to at least 98% SPDD.

The concrete slab must be constructed on a 20 mm thick granular bedding, consisting of 19-mm Crusher-Run Limestone (CRL), compacted to 100% SPDD. Alternatively, 19-mm Clear Stone can also be used below the concrete slab.

A Modulus of Subgrade Reaction of 30 MPa/m can be used for the design of the floor slab placed on the compacted granular base.

The grading around the building structure must be such that it directs runoff away from the structure.

5.4 Truck Loading Docks

In the loading dock area, the subgrade soil will be subject to frost heaving during freezing temperature. It is recommended that the backfill behind the loading dock should consist of non-frost susceptible granular material. 50-mm thick rigid foam insulation should be placed behind the concrete walls exposed to freezing. The foundation walls at the truck loading docks should be designed as a retaining structure using the soil parameters presented in Section 5.8 of this report.

Concrete apron is recommended at the truck loading area and ramp. The apron should be constructed on compacted granular bedding, minimum 300 mm in thickness. Perforated subdrains may be used to drain the subsurface water around the concrete pad to prevent accumulation of precipitation in the subgrade, which may induce excessive seasonal ground movement.

The subgrade should be inspected and assessed by proof-rolling prior to the placement of granular bedding. Where loose subgrade or soft spots is encountered, it should be subexcavated and replaced with inorganic material, uniformly compacted to 98% SPDD. The granular bedding should be compacted to 100% SPDD.

5.5 Underground Services

The underground services should be founded on engineered fill. Where disturbed soils are encountered, it should be subexcavated and replaced with the bedding material, compacted to at least 98% SPDD.

A Class 'B' bedding is recommended for the underground services construction. It should consist of compacted 19-mm Crusher-Run Limestone (CRL), or equivalent, as approved by a geotechnical engineer.

The pipe joints into the manholes and catch basins must be leak-proof to prevent the migration of fines and water infiltration through the joints. Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.
A soil cover having a thickness at least equal to the diameter of the pipe should be in place at all times after pipe installation, to prevent pipe floatation when the trench is deluged with water derived from precipitation.

The on-site soils are considered corrosive to ductile iron pipes and metal fittings; therefore, the underground services should be protected against soil corrosion. For estimation for the anode weight requirements, the electrical resistivities of the disclosed soils can be used. The proposed anode weight must meet the minimum requirements as specified by the Town of East Gwillimbury and York Region Standard.

5.6 **Backfilling in Trenches and Excavated Areas**

Selected on site inorganic soils are suitable for use as trench backfill. The on-site material is generally close to or on the wet side of the optimum. The wet soils will either require mixing with drier soils or must be aerated prior to structural compaction. The aeration and compaction should be completed in the dry, warm weather. The weathered soils must be sorted free of concentrated topsoil and organics before reusing for structural backfill and/or engineered fill.

The backfill in service trenches should be compacted to at least 98% SPDD, particularly below concrete floor subgrade and in the zone within 1.0 m below the pavement. The material should be compacted with the water content at 2% to 3% drier than the optimum.

When compacting the tills on the dry side of the optimum, the compactive energy will frequently bridge over the chunks in the soil and be transmitted laterally into the soil mantle. Therefore, the lifts must be limited to 20 cm or less (before compaction). Boulders over 15 cm in size must be sorted and removed from the backfill.

In normal sewer construction practice, the problem areas of pavement settlement largely occur adjacent to manholes, catch basins services crossings, foundation walls and columns, it is recommended that a sand backfill should be used.

The narrow trenches for services crossings should be cut at 1V:2H so that the backfill in the trenches can be effectively compacted. Otherwise, soil arching in the trenches will prevent achievement of the proper compaction. In confined areas where the desired slope cannot be achieved or the operation of a proper kneading-type roller cannot be facilitated, imported sand fill, which can be appropriately compacted by using a smaller vibratory compactor, must be used.

5.7 **Pavement Design**

Based on the borehole findings, the pavement subgrade will generally consist of compacted engineered earth fill. Accordingly, the recommended pavement design is presented in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	40	HL3
Asphalt Binder Parking Fire Route	 50 80	HL8
Granular Base	150	Granular 'A' or equivalent
Granular Sub-Base Parking Fire Route	 300 450	Granular 'B' or equivalent

In preparation of pavement subgrade, all topsoil and compressible material should be removed. The final subgrade must be proof-rolled using a heavy roller or loaded dump truck. Any soft spot identified must be rectified by subexcavation and replacing with selected dry inorganic material. The subgrade within 1.0 m below the underside of the granular sub-base must be compacted to at least 98% SPDD, with the water content at 2% to 3% drier than its optimum.

All the granular bases should be compacted in 150 to 200 mm lifts to 100% SPDD.

Along the perimeter where surface runoff may drain onto the pavement, or water may seep into the granular bases, a swale or an intercept subdrain system should be installed. In the parking lot areas, subdrains, consisting of filter-wrapped weepers, should also be installed 0.3 m below the granular sub-base and they should be connected to the catch basins and storm manholes in the paved areas and backfilled with free-draining granular material.

5.8 Soil Parameters

The recommended soil parameters for the project design are given in Table 4.

Table 4 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Silts	21.5	11.5	1.25	1.03
Sands	20.0	10.0	1.20	0.98
Silty Clay/Silty Clay Till	21.0	11.0	1.25	1.03

Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_o**	**Passive K_p**
Sands and Silts	0.33	0.45	3.00
Silty Clay/Silty Clay Till	0.40	0.55	2.50

Coefficient of Permeability (K) and Percolation Time (T)	**K (cm/sec)**	**T (min/cm)**
Sands	10^{-3} to 10^{-4}	8 to 12
Silts	10^{-4} to 10^{-5}	12 to 20
Silty Clay/Silty Clay Till	10^{-7}	80+

Estimated Electrical Resistivity (ohm·cm)	
Sands	5000
Silts	4500
Silty Clay/Silty Clay Till	2500 to 3000

Table 4 - Soil Parameters (Cont'd)

Coefficients of Friction	
Between Concrete and Granular Base	0.50
Between Concrete and Sound Native Soils	0.35
Maximum Allowable Soil Pressure (SLS) For Thrust Block Design	
Engineered Fill and Sound Natural Soils	50 kPa

5.9 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. For excavation purposes, the types of soils are classified in Table 5.

Table 5 - Classification of Soils for Excavation

Material	Type
Sound Natural Clay or Clay Till	2
Engineered Earth Fill, dry Sands or Silts	3
Saturated Sands or Silts	4

The groundwater yield from the clay and tills is expected to be small and can be controlled and removed by conventional pumping from sumps.

The groundwater yield from the sands and silts is expected to be appreciable and consistent and will require the use of closely spaced sump wells or, if necessary, by the use of a well-point dewatering system. In order to provide a stable subgrade for the services or foundation construction, the groundwater should be depressed to at least 1.0 m below the subgrade.

Excavation into the till containing boulders will require extra effort and the use of a heavy-duty, properly equipped backhoe.

Prospective contractors must be asked to assess the in situ subsurface conditions for soil cuts by digging test pits to at least 0.5 m below the intended bottom of excavation prior to excavating. These test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.

6.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of 731011 Ontario Limited. and for review by the designated consultants, financial institutions, government agencies and contractors. The material in the report reflects the judgment of Kelvin Hung, P.Eng., and Kin Fung Li, P.Eng., in light of the information available to it at the time of preparation.

Use of the report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, and/or any reliance on decisions to be made based on it is the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

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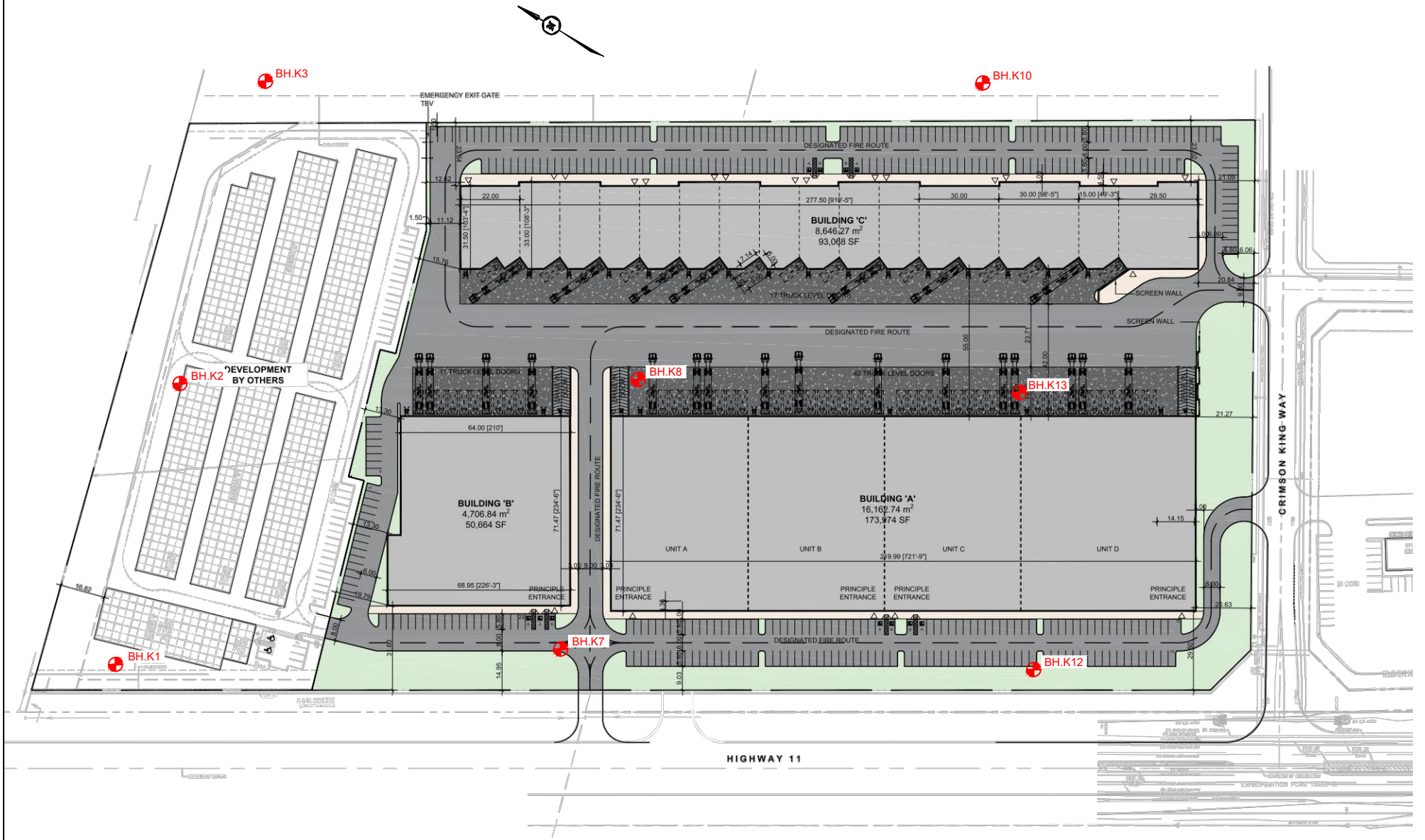

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BOREHOLE LOCATION PLAN

SITE: Highway 11 and Crimson King Way, Town of East Gwillimbury			
DESIGNED BY: -	**CHECKED BY:** -	**DWG NO.:** 1	
SCALE: 1:2000	**REF. NO.:** 2402-S026	**DATE:** February 2024	**REV**

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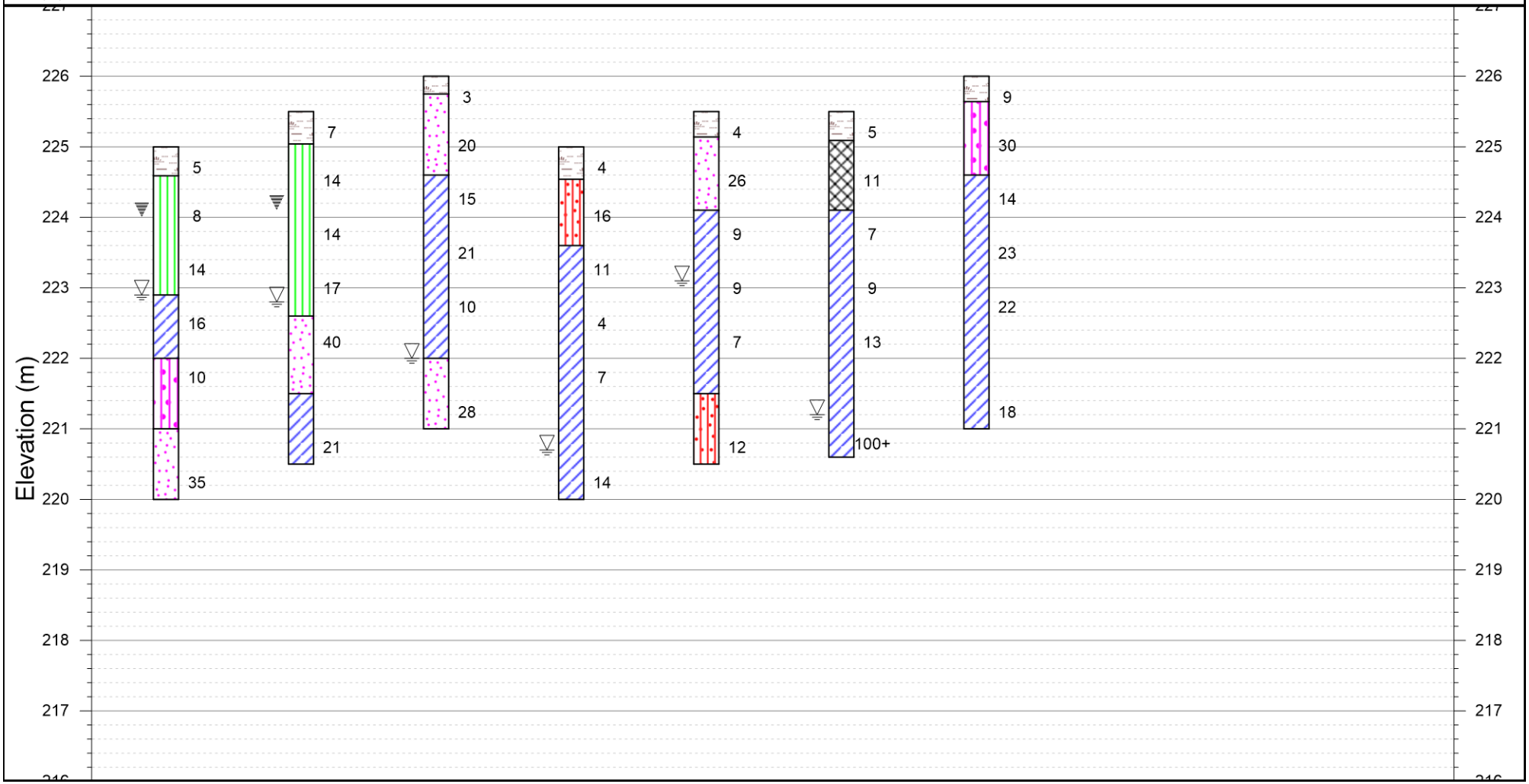
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2402-S026
REPORT DATE: February 2024
PROJECT DESCRIPTION: Proposed Commercial Development
PROJECT LOCATION: Highway 11 and Crimson King Way, Township of East Gwillimbury

LEGEND

TOPSOIL | FINE SAND | SANDY SILT | SILTY CLAY
FILL | SILTY FINE SAND | SILT

WATER LEVEL (END OF DRILLING) | CAVE-IN



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APPENDIX 'A'

ENGINEERED FILL CERTIFICATE FOR NORTH COMMERCIAL BLOCK CRIMSON KING WAY AND HIGHWAY 11 WEST HOLLAND LANDING RESIDENITAL SUBDIVISION - PHASE 1 TOWN OF EAST GWILLIMBURY (2014)

REFERENCE NO. 2402-S026

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TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

February 5, 2024

Reference No. 1406-M065

WSP Canada Group Limited
100 Commerce Valley Drive West
Markham, Ontario
L3T 0A1

Attention: Mr. Bruce Burke, P.Eng.

Re: Engineered Fill Certification for
North Commercial Block
Crimson King Way and Hwy-11
West Holland Landing Residential Subdivision – Phase 1
Town of East Gwillimbury

Dear Sir,

We have inspected the earth fill placement on sound natural soil at the above-captioned site, and the placement meets our engineered fill requirements. The finished engineered fill elevation as provided by WSP Canada Group Limited, and the engineered fill envelopes as constructed from on-site layout stakes and siltation fences, are shown on the enclosed drawings, for your reference.

We hereby certify that the results of the Field Density Tests for the compacted, earth fill attain or exceed 98% of the maximum Standard Proctor Dry Density, for all test locations. The compacted fill is suitable for normal foundation construction with a Maximum Allowable Soil Pressure of 75 kPa (SLS), with the following qualifications:

1. Proper surface drainage must be maintained within the engineered fill areas. Soil Engineers Limited must be informed of any construction activities within the engineered fill envelope, which may cause disturbance and loosening of the engineered fill mantle.

2. If the engineered fill if to be left over the winter months, adequate earth cover, or equivalent, must be provided to protect it against frost action. Otherwise, the finished engineered fill will require inspection to assess the extent of the frost loosening, and to determine the measures for rectification before foundation construction.

3. Footings adjacent to easements for services within the engineered fill envelope must be placed on the undisturbed engineered fill or natural soil at or below the invert of the pipe, or at a safe level as determined by our field inspection.

.../2

4. The footing subgrade must be inspected by our engineer to ensure the following:

   1) The footings are founded on the engineered fill and are a suitable distance of 3.0 metres from the limits of the controlled engineered fill envelope and a minimum of 0.5 metre below the finished engineered fill grade.

   2) The subgrade has not been compromised by construction disturbance and/or environmental degradation.

5. Despite stringent control in the placement of engineered fill, variations in soil type and density may occur in the engineered fill. The strip footing and upper section of the foundation walls must be reinforced continuously (minimum of 1.0 metre overlap), by two 15mm, or equivalent, steel bars which must be inspected by our engineer.

6. If the engineered fill exceeds 5 metres in depth, construction of the foundations must not begin until one year after completion of the engineered fill placement.

If any one of the above qualifications is not met, our certification is deemed null and void and Soil Engineers Limited cannot warrant the condition of the engineered fill and explicitly accepts no liability for any damage resulting from placement of foundations or structures on the engineered fill.

Higher bearing capacity may be available. However, the site plan and structural drawing should be reviewed by Soil Engineers Ltd. to confirm higher bearing capacity if required.

Should any queries arise, please feel free to contact the undersigned.

Yours very truly,
Soil Engineers Ltd.

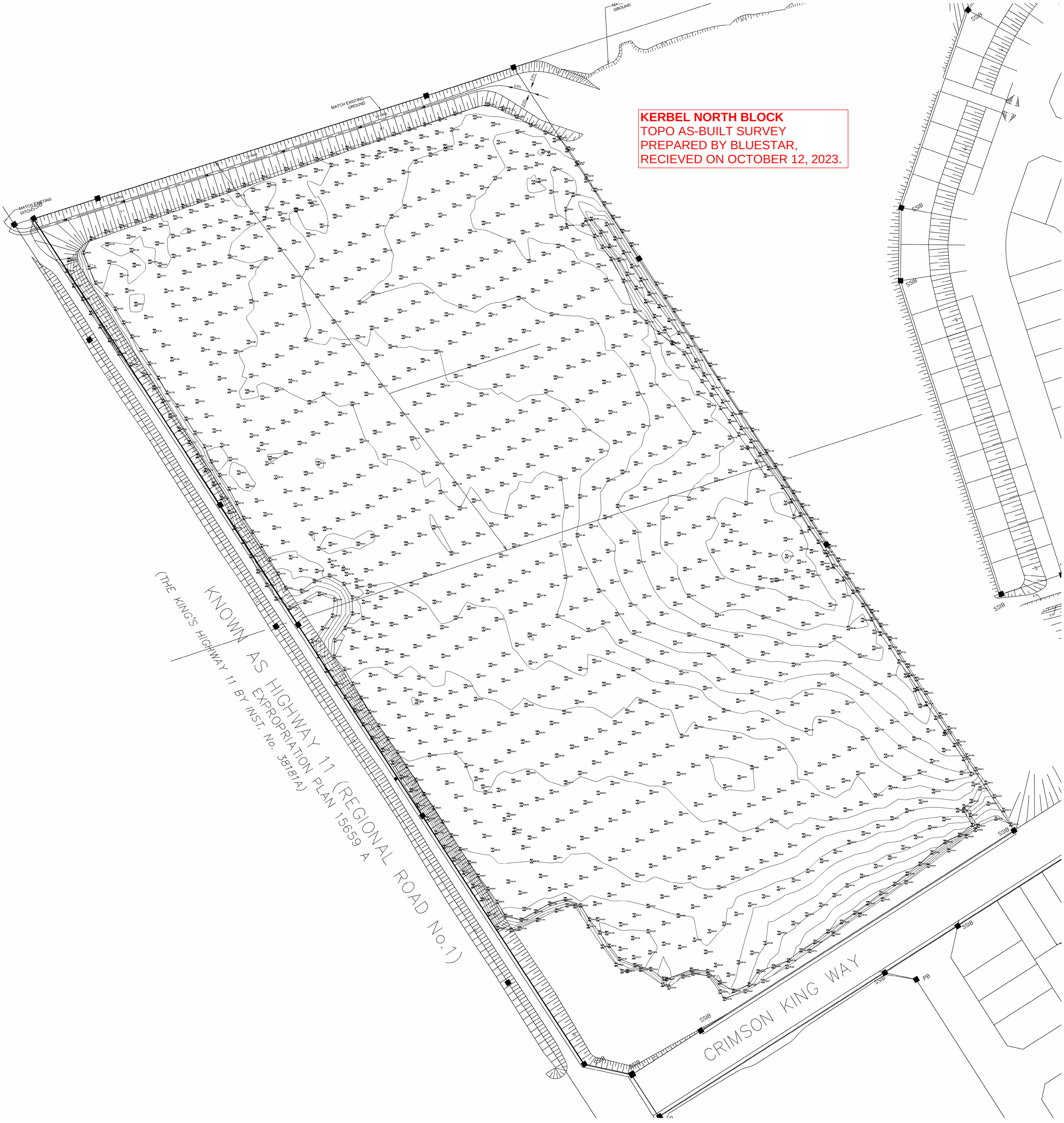
Peng (Geoff) Gao, M.Eng., P.Eng.

c. 731011 Ontario Ltd.
Attn: Mr. Gino D'Ambrosio

Kerbel Group Inc.
Attn: Ms. Joanne Barnett

WSP Canada Group Limited
Attn: Mr. Dan Abram

KERBEL NORTH BLOCK
TOPO AS-BUILT SURVEY
PREPARED BY BLUESTAR,
RECIEVED ON OCTOBER 12, 2023.



Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 721-7863	TEL: (905) 777-7956
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APPENDIX 'B'

BOREHOLE LOGS AND GRAIN SIZE DISTRIBUTION GRAPHS PREPARED BY SOIL ENGINEERS LTD. (2007)

REFERENCE NO. 2402-S026

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Standard Penetration Resistance or 'N' Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as '○'

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

Plotted as '—●—'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/30 cm)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
>50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	'N' (blows/30 cm)	Consistency
<12	<2	very soft
12 to <25	2 to <4	soft
25 to <50	4 to <8	firm
50 to <100	8 to <15	stiff
100 to 200	15 to 30	very stiff
>200	>30	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding
△ Laboratory vane test

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K1

FIGURE NO.: 1

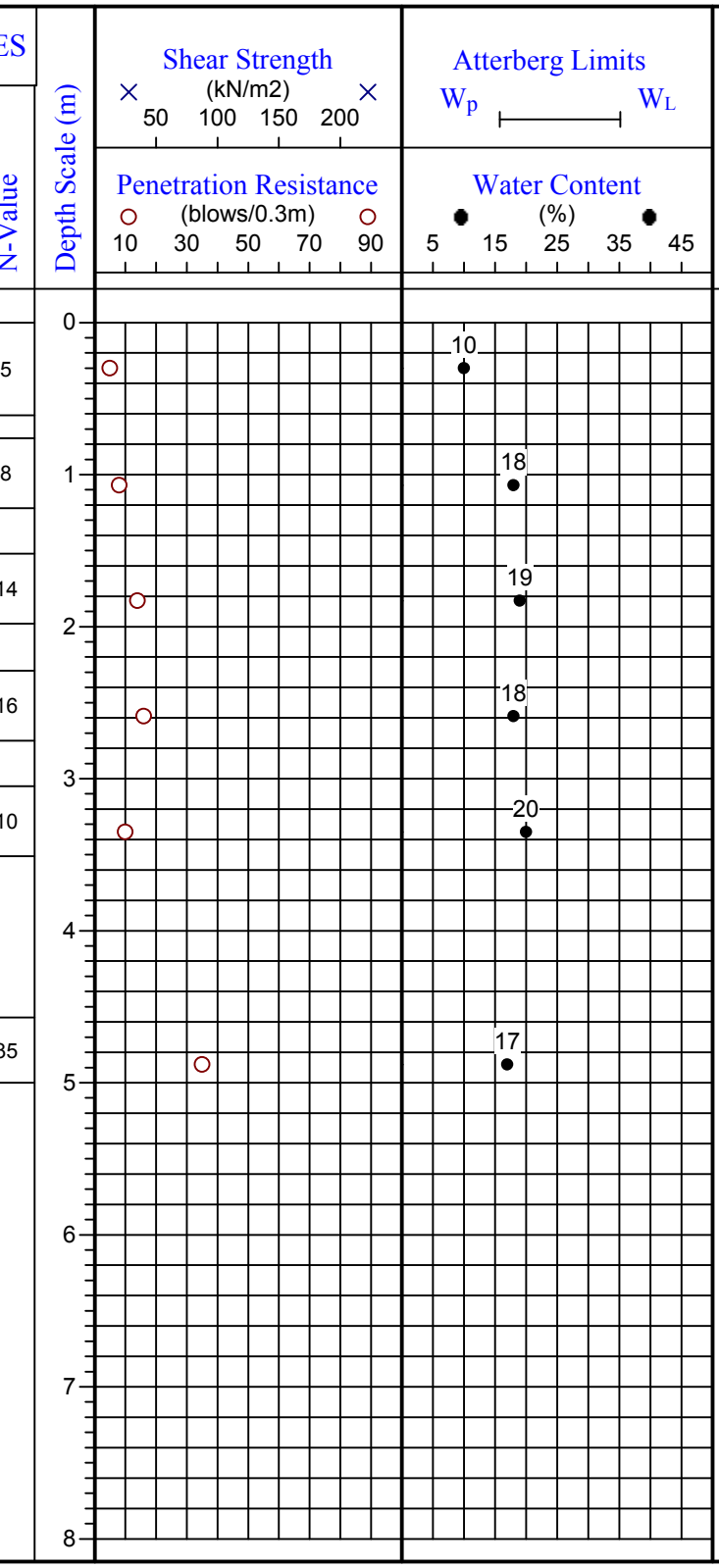
JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 24, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
225.0 / 0.0	Ground Surface			
	41cm TOPSOIL	1	DO	5
	Brown, loose to compact **SILT** weathered some sand, a tr. of clay occ. sand and clay seams and layers	2	DO	8
		3	DO	14
222.9 / 2.1	Brown, stiff **SILTY CLAY** a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	4	DO	16
222.0 / 3.0	Grey, loose **SILTY FINE SAND** a tr. to some clay occ. silt seams and layers	5	DO	10
221.0 / 4.0	Grey, dense **FINE SAND** a tr. to some silt	6	DO	35
220.0 / 5.0	**END OF BOREHOLE** Installed 50mm ø monitoring well to 4.6m. Sand backfill from 2.4 to 4.6m. Bentonite seal from 0.3 to 2.4m. Concrete from 0.0 to 0.3m mounted with a steel protective casing.			



Soil Engineers Ltd.

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K2

FIGURE NO.: 2

JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 24, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
225.5 / 0.0	Ground Surface			
	46cm TOPSOIL	1	DO	7
	Brown, loose to compact weathered	2	DO	14
	SILT			
	some sand, a tr. of clay occ. sand and clay seams and layers	3	DO	14
		4	DO	17
222.6 / 2.9	Brown, dense	5	DO	40
	FINE SAND a tr. to some silt			
221.5 / 4.0	Grey, very stiff **SILTY CLAY** a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	6	DO	21
220.5 / 5.0	**END OF BOREHOLE**			

Depth Scale (m): 0 1 2 3 4 5 6 7 8

Shear Strength (kN/m2): × 50 100 150 200 ×

Penetration Resistance (blows/0.3m): ○ 10 30 50 70 90 ○

Atterberg Limits: W_P ——— W_L

Water Content (%): ● 5 15 25 35 45 ●

Water Content values: 15, 13, 20, 21, 17, 17

WATER LEVEL

W.L. @ El. 222.8 m on completion
Cave-In @ El. 224.1 m on ocmpletion

Soil Engineers Ltd.

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K3

FIGURE NO.: 3

JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 24, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
226.0	Ground Surface			
0.0	**25cm TOPSOIL**	1	DO	3
	Brown, loose to compact			
	FINE SAND weathered	2	DO	20
	a tr. to some silt			
224.6				
1.4	Brown, stiff to very stiff	3	DO	15
	SILTY CLAY	4	DO	21
	a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	5	DO	10
222.0				
4.0	Grey, compact **FINE SAND** a tr. to some silt	6	DO	28
221.0				
5.0	**END OF BOREHOLE**			

Depth Scale (m): 0 1 2 3 4 5 6 7 8

Shear Strength (kN/m2): × 50 100 150 200 ×

Penetration Resistance (blows/0.3m): ○ 10 30 50 70 90 ○

Atterberg Limits: W_P ⊢——⊣ W_L

Water Content (%): ● 5 15 25 35 45 ●

Water Content values: 5, 14, 20, 23, 19, 19

WATER LEVEL: W.L. @ El. 222.0 m on completion

Soil Engineers Ltd.

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K7

FIGURE NO.: 7

JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 25, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
225.0 / 0.0	Ground Surface			
	46cm TOPSOIL	1	DO	4
	Brown, compact **SANDY SILT** traces of gravel and clay occ. sand seams and layers	2	DO	16
223.6 / 1.4	Grey, firm to sitff			
	humus inclusions	3	DO	11
	SILTY CLAY			
	weathered	4	DO	4
	a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	5	DO	7
220.0 / 5.0		6	DO	14
	END OF BOREHOLE			

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8

Shear Strength (kN/m2): 50, 100, 150, 200

Penetration Resistance (blows/0.3m): 10, 30, 50, 70, 90

Atterberg Limits: W_P — W_L

Water Content (%): 5, 15, 25, 35, 45

Water Content values: 14, 18, 27, 22, 24, 19

WATER LEVEL: W.L. @ El. 220.7 m on completion

K

Soil Engineers Ltd.

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K8

FIGURE NO.: 8

JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 25, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
225.5 / 0.0	Ground Surface			
	36cm TOPSOIL	1	DO	4
	Brown, loose to compact			
	FINE SAND	2	DO	26
	a tr. to some silt			
224.1 / 1.4	Grey, firm to stiff			
	humus inclusions	3	DO	9
	SILTY CLAY			
		4	DO	9
	a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers — weathered	5	DO	7
221.5 / 4.0	Grey, compact			
	SANDY SILT traces of gravel and clay occ. sand seams and layers	6	DO	12
220.5 / 5.0	**END OF BOREHOLE**			

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8

Shear Strength (kN/m2): × 50 100 150 200 ×

Penetration Resistance (blows/0.3m): ○ 10 30 50 70 90 ○

Atterberg Limits: W_P ⊢—⊣ W_L

Water Content (%): ● 5 15 25 35 45 ●

Water Content values: 10, 14, 17, 20, 21

WATER LEVEL

W.L. @ El. 223.1 m on completion

Soil Engineers Ltd.

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K10

FIGURE NO.: 10

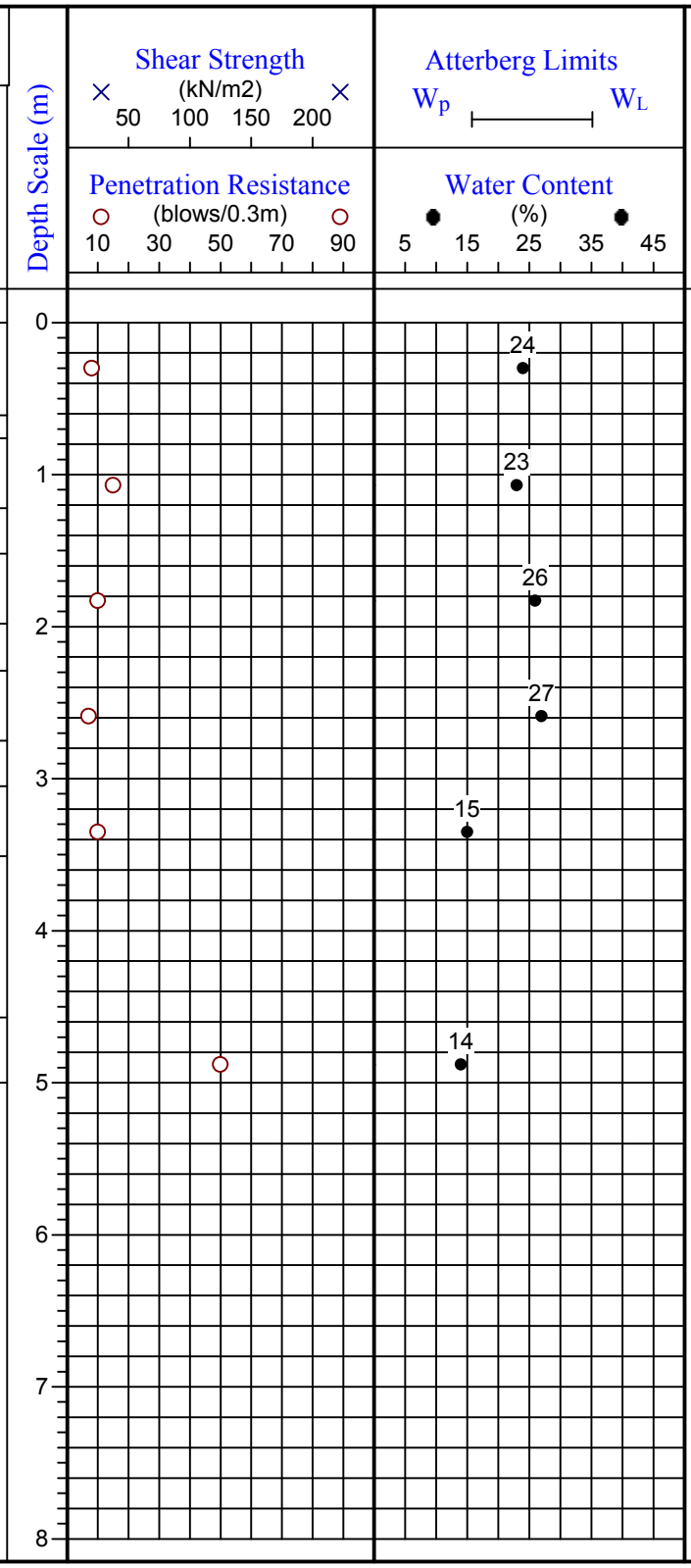
JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 25, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
	Ground Surface			
0.0	**30cm TOPSOIL**	1	DO	8
	Grey, firm to stiff weathered **SILTY CLAY**	2	DO	15
	a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	3	DO	10
		4	DO	7
3.0	Grey, stiff **SILTY CLAY, Till** some sand to sandy a tr. of gravel occ. wet sand, silt and silty clay seams and layers, cobbles and boulders	5	DO	10
4.0	Grey, hard **SILTY CLAY** a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	6	DO	50
5.0	**END OF BOREHOLE** Installed 50mm ø monitoring well to 4.6m. Sand backfill from 2.4 to 4.6m. Bentonite seal from 0.3 to 2.4m. Concrete from 0.0 to 0.3m mounted with a steel protective casing.			



Soil Engineers Ltd.

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K12

FIGURE NO.: 12

JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 25, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
225.5	Ground Surface			
0.0	**41cm TOPSOIL, Fill**	1	DO	5
	Brown			
	SANDY SILT, Fill	2	DO	11
224.1				
1.4	Firm to hard			
	brown / grey	3	DO	7
	SILTY CLAY			
		4	DO	9
	a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	5	DO	13
		6	DO	100+
220.6				
4.9	**END OF BOREHOLE**			

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8

Shear Strength (kN/m2): × 50 100 150 200 ×

Penetration Resistance (blows/0.3m): ○ 10 30 50 70 90 ○

Atterberg Limits: W_P ⊢——⊣ W_L

Water Content (%): ● 5 15 25 35 45 ●

Water Content values: 25, 16, 18, 17, 21, 19

WATER LEVEL: W.L. @ El. 221.2 m on completion

K

Soil Engineers Ltd.

JOB NO.: 0807-S093

LOG OF BOREHOLE NO.: K13

FIGURE NO.: 13

JOB DESCRIPTION: Proposed Mixed-Use Development

JOB LOCATION: Holland Landing Rd./Hwy. 11
Town of East Gwillimbury

METHOD OF BORING: Flight-Auger

DATE: September 25, 2008

Elev. / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
226.0	Ground Surface			
0.0	**36cm TOPSOIL**	1	DO	9
	Brown, loose to dense **SILTY FINE SAND** weathered a tr. to some clay occ. silt seams and layers	2	DO	30
224.6				
1.4	Grey, stiff to very stiff	3	DO	14
	SILTY CLAY	4	DO	23
		5	DO	22
	a tr. to some sand a tr. of gravel occ. silty clay till layers, with wet sand and silt seams and layers	6	DO	18
221.0				
5.0	**END OF BOREHOLE**			

Depth Scale (m): 0 1 2 3 4 5 6 7 8

Shear Strength (kN/m2): × 50 100 150 200 ×

Penetration Resistance (blows/0.3m): ○ 10 30 50 70 90 ○

Atterberg Limits: W_P ⊢—⊣ W_L

Water Content (%): ● 5 15 25 35 45 ●

Water Content values: 15, 13, 22, 24, 23, 24

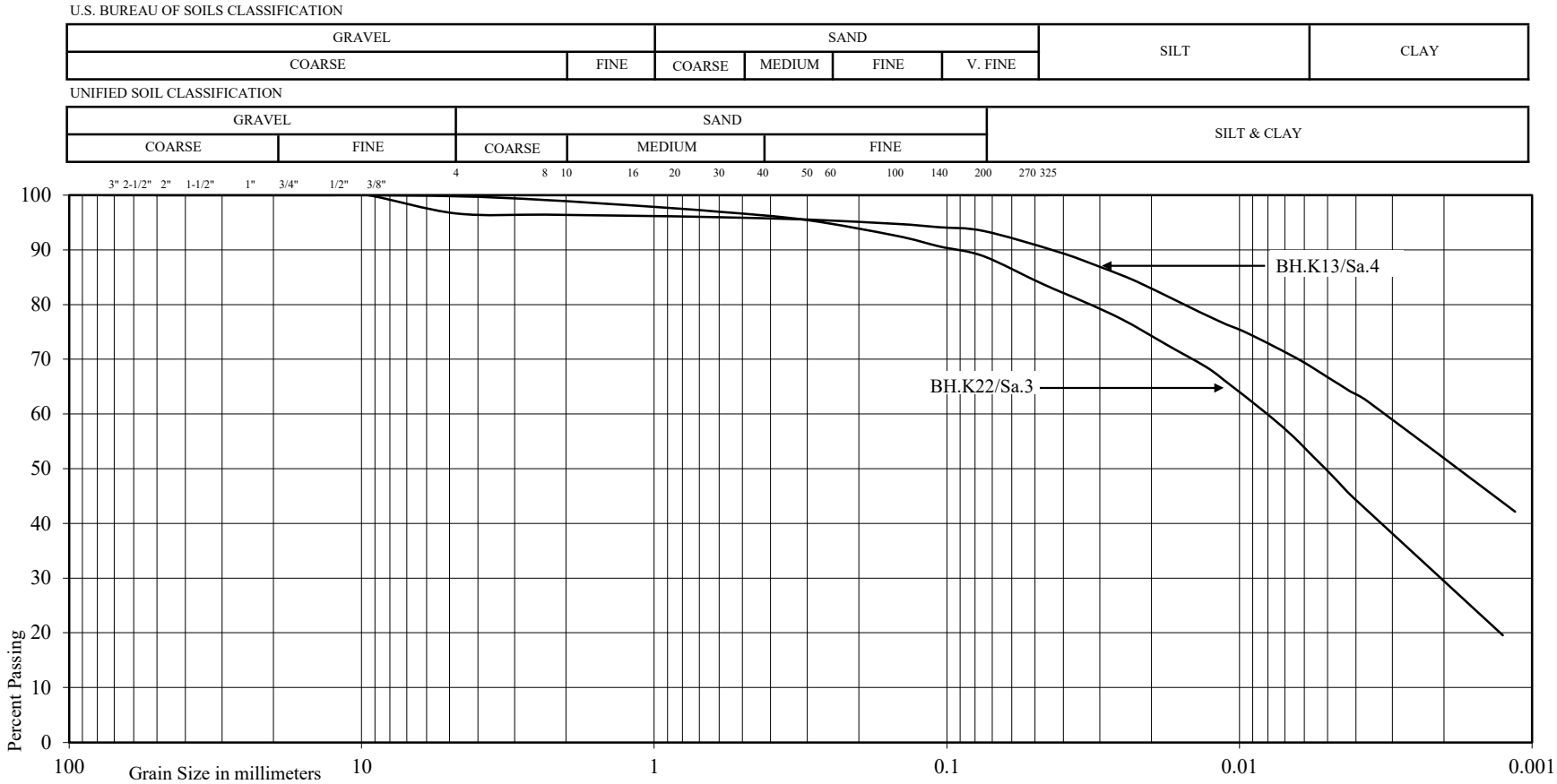
WATER LEVEL: Dry on completion

Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 0807-S093



			BH./Sa.	K 13/4	K 22/3
Project:	Proposed Mix-Use Development		Liquid Limit (%) =	37	27
Location:	Holland Landing Rd./Hwy. 11, Town of East Gwillimbury		Plastic Limit (%) =	19	17
Borehole No:	K 13	K 22	Plasticity Index (%) =	18	10
Sample No:	4	3	Moisture Content (%) =	24	22
Depth (m):	2.6	1.8	Estimated Permeability		
Elevation (m):	223.4	234.2	(cm./sec.) =	10^{-7}	10^{-7}

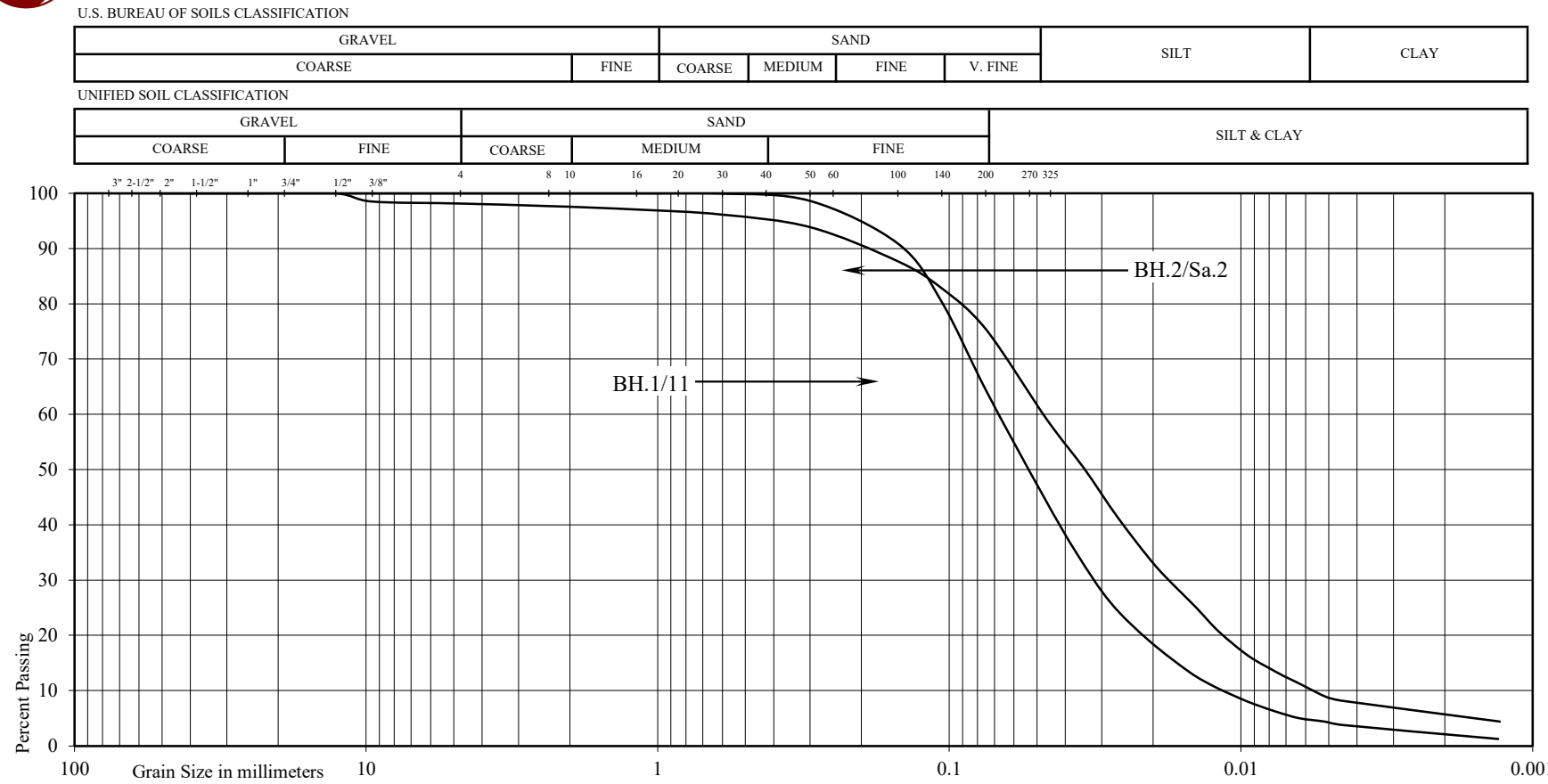
Classification of Sample [& Group Symbol]:	SILTY CLAY	BH.K13/Sa.4 - traces of sand and gravel BH.K22/Sa.3 - some sand

Figure: 55

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 0807-S093



Project:	Proposed Mix-Use Development	
Location:	Holland Landing Rd./Hwy. 11, Town of East Gwillimbury	
Borehole No:	K 7	K 16
Sample No:	2	2
Depth (m):	1.1	1.1
Elevation (m):	223.9	227.4

BH./Sa.	K 7/2	K 16/2
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	18	15
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-5}

Classification of Sample [& Group Symbol]: SANDY SILT
traces of gravel and clay

Figure: 59

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

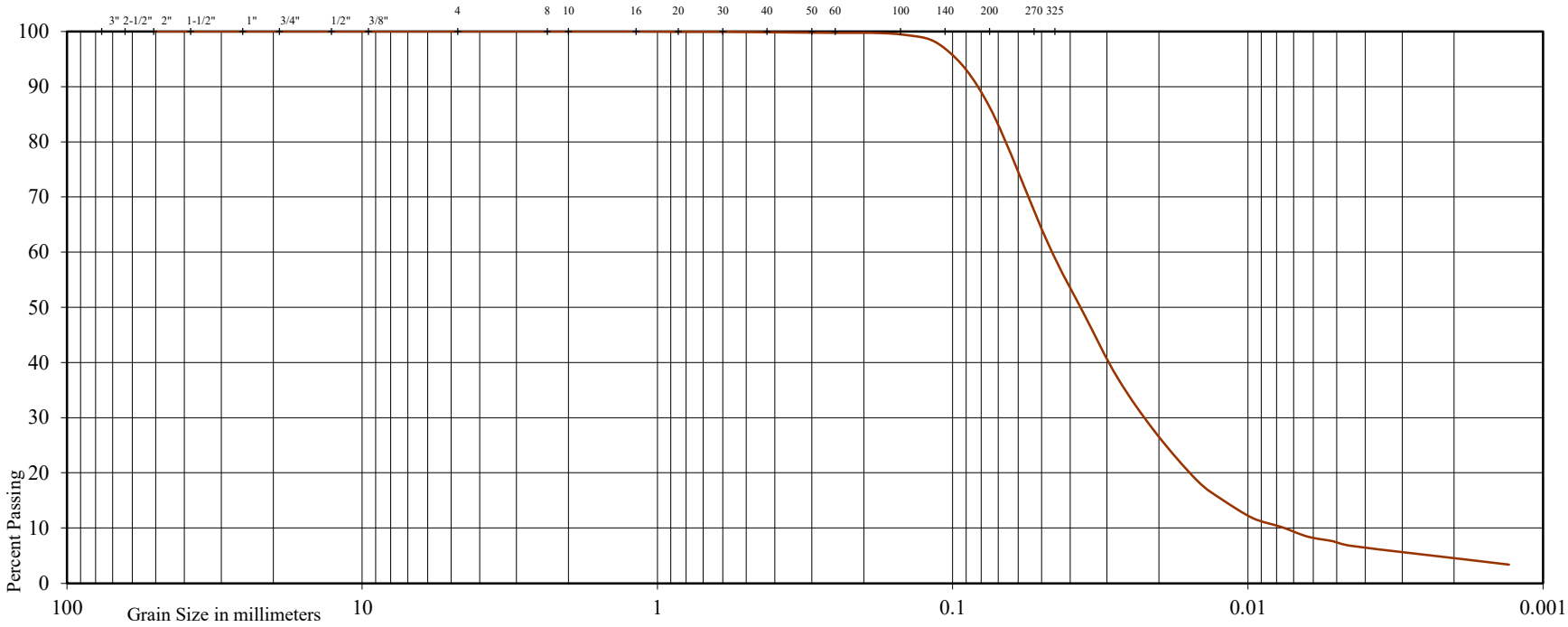
Reference No: 0807-S093

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mix-Use Development

Location: Holland Landing Rd./Hwy. 11, Town of East Gwillimbury

Borehole No: K 1

Sample No: 3

Depth (m): 1.8

Elevation (m): 223.2

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 19

Estimated Permeability (cm./sec.) = 10^{-4}

Classification of Sample [& Group Symbol]: SILT some sand

Figure: 60

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

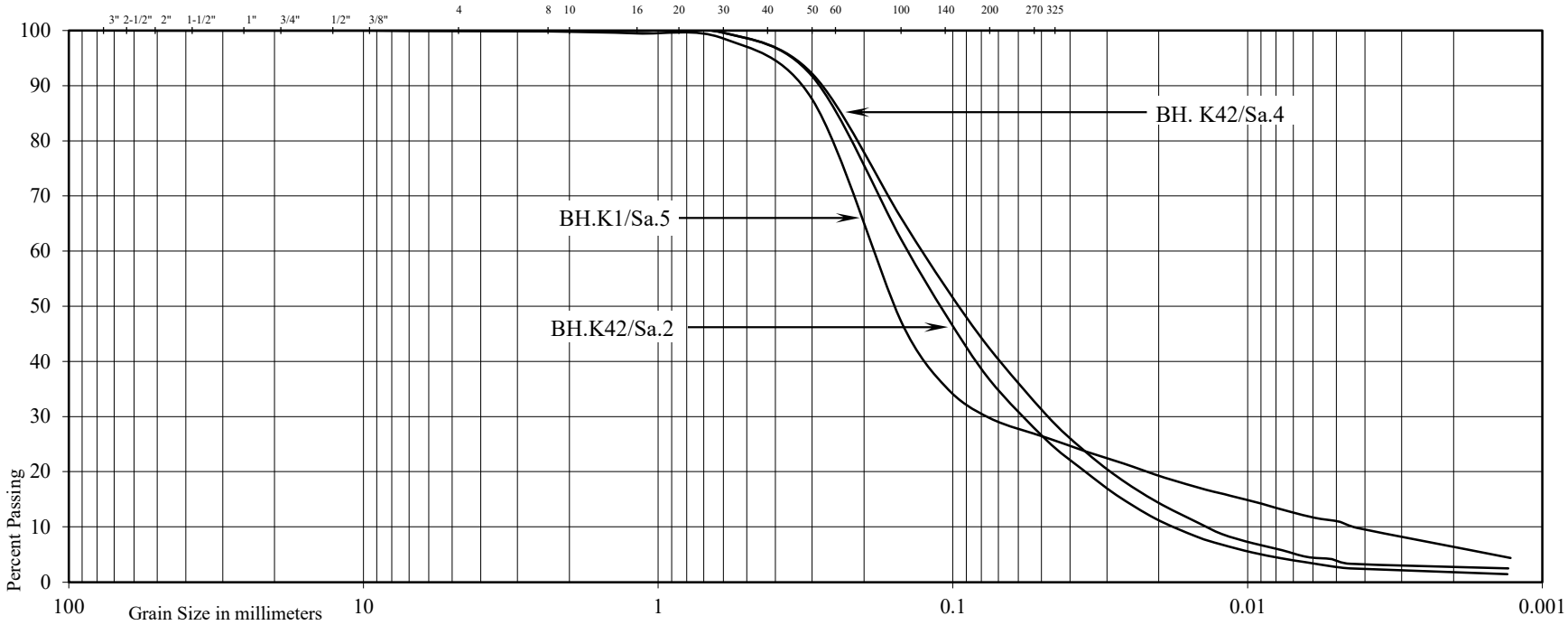
Reference No: 0807-S093

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mix-Use Development

Location: Holland Landing Rd./Hwy. 11, Town of East Gwillimbury

Borehole No:	K 1	K 42	K 42
Sample No:	5	2	4
Depth (m):	3.4	1.1	2.4
Elevation (m):	221.6	225.9	224.6

BH./Sa.	K 1/5	K 42/2	K 42/4
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	20	7	8
Estimated Permeability (cm./sec.) =	$10^{-?}$	$10^{-?}$	$10^{-?}$

Classification of Sample [& Group Symbol]: SILTY FINE SAND

a tr. To some clay

Figure: 61

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

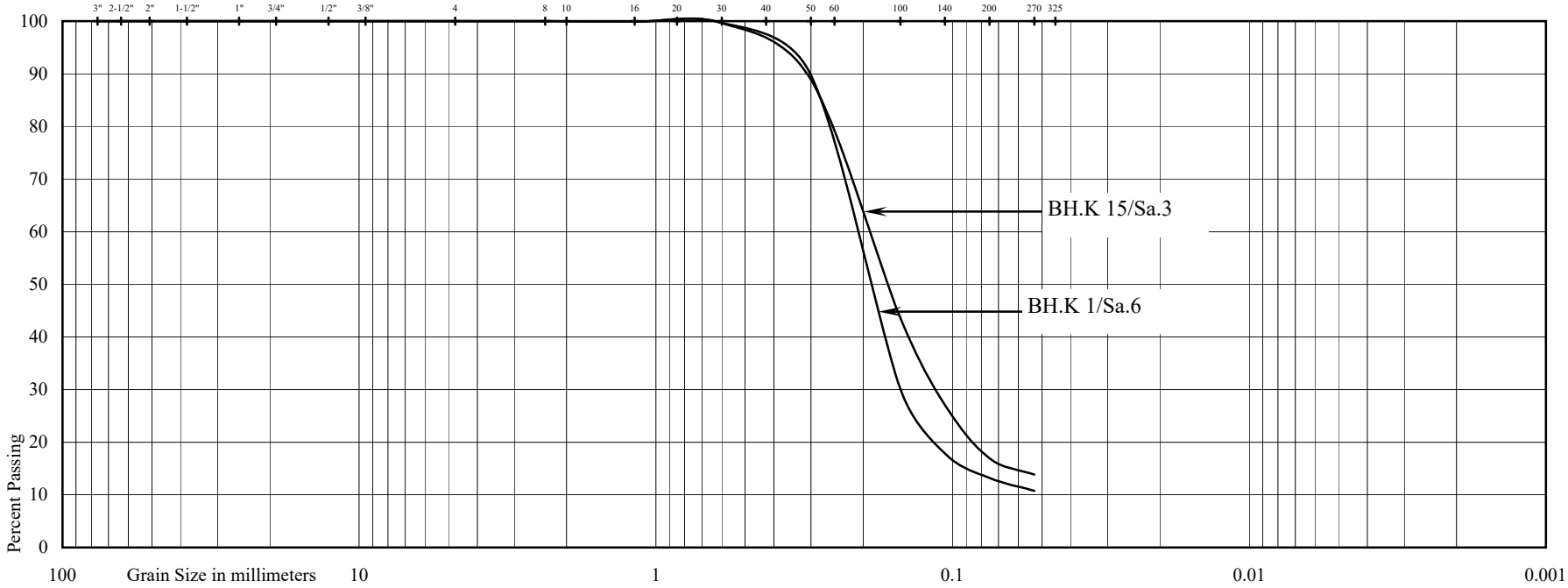
Reference No: 0807-S093

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mix-Use Development

Location: Holland Landing Rd./Hwy. 11, Town of East Gwillimbury

Borehole No:	K 1	K 15
Sample No:	6	3
Depth (m):	4.9	1.8
Elevation (m):	220.1	225.5

BH./Sa.	K 1/6	K 15/3
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	17	10
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}

Classification of Sample [& Group Symbol]: FINE SAND
some silt

Figure: 62