Preliminary Geotechnical Investigation
Proposed Mixed Use
Residential-Commercial Development
41-43 Essa Road
Barrie, Ontario

PREPARED FOR:
Tonlu Holdings Limited

Project No: 21-113-100
Date: July 7**,** 2021

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1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Tonlu Holdings Limited to carry out a preliminary geotechnical investigation for the proposed mixed use residential/commercial development, located at 41-43 Essa Road in Barrie, Ontario.

DS carried out a preliminary geotechnical investigation field work at the subject site during the period of June 11 to 14, 2021, consisting of one borehole (BH 21-4) which was drilled to a depth of 25 m below the existing grade, at the location shown on the Borehole Location Plan, Drawing 1. The Borehole log is attached in Drawing 2 of this report. **The remaining three boreholes will be drilled at a later date and this report will be updated.**

The purpose of this preliminary geotechnical investigation was to obtain information about the subsurface conditions at boreholes location and from the findings in the borehole to provide preliminary geotechnical recommendations based on the available geotechnical information, for the proposed residential development, located at 41-43 Essa Road in Barrie, Ontario.

Based on the provided conceptual site plan and information, it is understood that the proposed at grade mixed use development will consist of four towers (varying from 25 to 37 storey structures).

The proposed development will not include basement or underground parking. The design grades are not known at this stage.

The purpose of this geotechnical report was to provide geotechnical recommendations for the following:

1. Foundations
2. Floor slabs and permanent drainage
3. Excavations and groundwater control
4. Earth pressures
5. Earthquake considerations
6. Pavement

This report deals with geotechnical issues only. The hydrogeological investigation report by DS will be submitted under separate cover and environmental investigations were carried out by others.

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with the applicable codes and standards.

If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

This report has been prepared for Tonlu Holdings Limited and its architect and designers. Third party use of this report without DS consent is prohibited.

2. FIELD AND LABORATORY WORK

DS carried out the preliminary geotechnical investigation field work at the subject site during the period of June 11 to 14, 2021, consisting of one (1) borehole (BH 21-4) which was drilled to a depth of 25 m below the existing grade, at the location shown on the Borehole Location Plan, Drawing 1. The Borehole log is attached in Drawing 2 of this report. The remaining boreholes (BH21-1 to BH21-3) will be drilled soon.

Borehole was drilled with hollow stem continuous flight augers and mud rotary methods by a drilling sub-contractor under the direction and supervision of DS personnel using a telescoped drilling procedure as recommended by the site owners environmental consultant. The telescopic drilling is required as the site is considered to have impacts associated with previous land uses. The drilling procedure included advancing 10" hollow stem augers through the upper contaminated aquifer (into the underlying aquitard) to a depth of about 10m at which time steel well casing was installed and a bentonite/portland cement grout injected between the casing and borehole wall from the bottom up. Drilling resumed with mud rotary methods within the sealed casing to the desired depth. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS laboratory for detailed examination by the project engineer and for laboratory testing. All retrieved soil samples were screened in the field for visual and olfactory observations. No obvious visual or olfactory evidence of potential contamination were noted. No aesthetic impacts (e.g. cinders, slag, hydrocarbon odours) were encountered during this investigation. The soil sample headspace vapour concentrations for all soil samples recovered during the investigation were screened using portable organic vapour testing equipment in accordance with the procedure outlined in the MECP's 'Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario'. Upon completion, the borehole was decommissioned with a grout/bentonite slurry.

As well as visual examination in the laboratory, all soil samples from geotechnical boreholes were tested for moisture contents. Selected soil samples were subjected to grain size analyses and Atterberg Limits testing. The gradation curves are provided on **Drawing 3** of this report.

Groundwater was observed at a depth of 3 m below existing ground surface during and upon completion of drilling.

The surface elevations at the borehole locations were surveyed by DS, using differential GPS system, leased from Sokkia Canada Inc.

3. SUBSURFACE CONDITIONS

3.1 Subsurface Soil Conditions

DS Borehole log is presented on **Drawing 2** of this report, at the location shown on borehole location plan Drawing 1. Soil Conditions

Granular Fill: Granular fill, consisting of sand and gravel, with approximate thickness of 600 mm, was present at the surface of the borehole. The fill was brown in color and contained some organics.

SPT 'N' value measured in the granular fill material was found 7 blows per 300mm penetration, indicating a loose state. The moisture content of this granular fill layer was 18%.

The type/quantity and extent of the existing fill (if encountered)/granular fill layers must be explored by further test pit investigation prior to excavations.

Silty Sand/Sand/Silt to Sandy Silt

Brown to grey deposit consisting of silty sand to sand and sandy silt to silt extended below the granular fill material to the maximum explored depth of the borehole, to a depth of 25 m. This deposit contained trace of clay and gravel. SPT 'N' values measured within this deposit varied from 7 to over 100 blows per 300mm of penetration, indicating loose to very dense relative density. The moisture content of the moist to wet cohesionless sandy/silty materials varied from 12 to 32%.

Grain size analyses of six (6) soil samples from the sandy and silty materials (BH21-4/SS5, SS8, SS9, SS12, SS16 and SS18) were conducted, and the results are presented in **Drawing 3**, with the following fractions:

Clay:	Up to 7%
Silt:	7 to 73%
Sand:	20 to 93%
Gravel:	up to 4%

3.2 Groundwater Conditions

During drilling, short-term (unstabilized) groundwater level was measured at a depth of 3 m below ground surface.

However, in general, groundwater levels in the monitoring wells installed during the previous environmental investigations, carried by others, were measured at approximate depths varying from 2 to 3.2 m below grades.

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

4. FOUNDATIONS

Based on the provided information, it is understood that the proposed development will consist of four towers (25 to 37 storey structures) with a common 4 storey podium. The mixed use residential/commercial development will not include any basements/underground parking.

Design details/grades of the proposed development are not available to us at the time of writing this report.

Therefore, our recommendations should be considered preliminary and will be revised when the remaining boreholes are drilled and proposed Site/Foundation plan becomes available.

The soils at the generally consisted of sandy deposits below groundwater level. Drilled caissons are not recommended due to anticipated soil caving and base heaving problems associated with groundwater. Driven piles are also not recommended because it will be difficult to drive the piles to design depth through dense to very dense soil layers with associated vibrations.

Based on the preliminary borehole information, due to the variable soil conditions and the presence of weak soil conditions and less competent sandy and silty layers, the proposed development can be supported by auger cast piles (CFA) or raft foundations supported by CFA, subject to design loads and confirmation by further borehole investigation.

4.1 Continuous Flight Auger Piles (CFA)

Subject to design loads, the proposed buildings without basements can be supported on continuous flight auger piles (CFA) and grade beams system.

The bearing resistance of the piles will highly depend on the quality and procedure of the pile installation, as well as on the diameter and depth of the piles. Due to presence of weak soil layers at the site, the pile skin friction from the soils listed in the following should be ignored:

For CFA piles of 610 mm in diameter and to a minimum depth of 24 m below existing grade (i.e. pile tip/toe to or below Elev. 203.0m, bearing capacity values of 2000 kN/pile at SLS and 2700 kN/pile at ULS can be used in the design.

The actual bearing resistance and required length of the piles must be determined by field load tests, prior to the installation of the production piles. The purpose of pile load testing is to determine the skin friction of the strong soils below the elevation indicated above. The skin friction of the weak soil layers above the strong soils as indicated above should not be included in the pile load testing. The test piles must be loaded to 1.67 time the design load at ULS.

It should be noted that the required depth of the CFA piles is quite significant. A specialty contractor must be retained to install the piles.

The bearing resistances of CFA piles will be highly dependent on the contractor's experience, the quality and procedure of the pile installation, and the skills of the installation operator(s). The CFA contractor must review the borehole information and evaluate bearing capacity of the piles based on their experience. The quality and the design bearing resistance of the piles must be ensured by the CFA contractor. A specialty contractor should be retained to design and install the CFA piles based on the performance specification and design bearing resistances.

Prior to the pile construction, the contractor should submit the details of the installation plan, load test program, installation procedure, automated monitoring system and control parameters, grout/concrete mix design, and reinforcement installation etc. for the review by the structural engineer and the geotechnical engineer.

All pile installation must be inspected by this office. In addition to the pre-production pile load tests, post-installation integrity tests and/or verification load tests are also required.

4.2 Combined Raft-CFA Pile Foundation System:

Alternatively, subject to environmental conditions and design loads, the proposed development can be founded on combined raft supported by CFA piles.

Based on the borehole information, the available soil bearing capacity for the proposed raft foundation at or below a depth of 3 m, in native undisturbed sand soils, is 200 kPa at SLS (270 kPa at ULS) which is not enough for the expected high loads from subject development.

Therefore, the raft foundation should be combined with deep foundations such as CFA piles to support the additional loads above 200 kPa at SLS (270 kPa at ULS). Recommendations of CFA piles are presented in Section 4.1 above.

4.3 General Comments on Foundations

During the design stage, detailed settlement analyses of the raft-pile foundation system should be carried out when the design load conditions are known and the details of the raft and/or CFA piles are available.

In case of raft foundation is utilized, dewatering will be required for the installation of foundations below the groundwater table. The groundwater table must be lowered to at least 1.0 m below the excavation base.

All raft bases (if utilized)/CFA pile installations must be inspected by this office prior to pouring concrete. The excavated footing/raft bases must be covered with 50 mm thick mud slab

immediately after inspection and cleaning, in order to avoid disturbance of the founding soil due to weathering and construction activity.

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

Subject to the proximity of the site to Railway, a pre-construction survey/instrumentation and monitoring and other precautionary measures should be carried out prior to commencement of shoring design/foundation installations.

Should a crash wall be required to mitigate potential impact of a train crash into the proposed development. A conceptual design of the proposed wall should be prepared by the structural engineer and reviewed by this office.

5. FLOOR SLAB AND PERMANENT DRAINAGE

The ground floor slab can be supported on grade, provided all fill/loose/disturbed native soils (if any) are removed, the base thoroughly proof rolled. Any backfill required to raise the grade can consist of inorganic soil, placed in shallow lifts and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

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

6. ELEVATOR PITS

The elevator pits will be installed in cohesionless sandy soils below the water table. In this case, drainage systems at the base level of the elevator pits are not recommended, due to the concern of loss of fines. The elevator pits should be designed as a water-tight structures and should be fully waterproofed to avoid any water leaks, due to the presence of wet seams/layers of silt/sandy silt/ silty sand soils.

7. EARTH PRESSURES

The lateral earth pressures acting on retaining walls (if any) can be calculated from the following expression:

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

where p = Lateral earth pressure in kPa acting at depth h

K = Earth pressure coefficient, K = 0.4.

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

h = Depth to point of interest in meters

q = Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that a drainage system will be installed to prevent the build-up of any hydrostatic pressure behind the wall.

8. FROST PROTECTION

All exterior underside of raft/grade beams/caps exposed to seasonal freezing conditions must have at least 1.5 metres of soil cover for frost protection.

There is no official rule governing the required founding depth for grade beams below unheated basement floors.

Certainly, it will not be greater than the 1.5 m required in Southern Ontario (Barrie) for exterior footings. Un-monitored experience indicates that a shallower depth ranging from 0.82 to 0.9 m for interior column footings. The 0.82 m depth is believed to be close to the minimum structural requirement for interior column footings. Adjacent to air shafts and entrance and exit doors, a footing depth of 1.5 m below floor level is required or, alternatively, insulation protection must be provided.

It is also emphasized that an adequate free draining gravel base is required to minimize the risk of floor dampness. Floor dampness could lead to temporary icing and the risk of accidents.

9. EARTHQUAKE CONSIDERATION

Based on the drilled boreholes on site and our review of the general subsurface information in the area, and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed development founded on undisturbed native soils can be classified as 'Class D' for seismic site response.

For the proposed buildings, it may be possible to classify the site as 'Class C', provided field seismic shear wave velocity test (SWVT) is to be carried out at the site to confirm the 'Class C' classification.

10. EXCAVATIONS AND GROUNDWATER CONTROL

Excavations in the fill and native soils can be carried out with heavy hydraulic backhoe. Groundwater in the monitoring wells installed in the previous environmental investigations by others was recorded at depths ranging from 2 to 3.2 m below the existing grade. Long-term groundwater table is expected to be 1 to 2 m higher.

Dewatering will be required prior to any excavation in wet cohesionless soils below the groundwater table (if required), otherwise it will be result in unstable base and flowing sides.

The hydrogeological investigation report by DS presents more comments and recommendations on dewatering requirement.

It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Possible large obstructions such as buried concrete pieces are also anticipated in the fill material. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill materials (if any) and the native soils can be classified as Type 3 Soil above the groundwater table and as Type 4 Soil below the groundwater table.

Select inorganic fill and native soils free from topsoil and organics can be used as general construction backfill. Loose lifts of soil, which are to be compacted, should not exceed 200 mm.

Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

Underfloor fill should be compacted to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

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

11. PAVEMENTS

11.1 At Grade Asphalt Pavement Structure

For public roads (**if any**): subject to the anticipated road traffic volumes/AADT/axle loads, the pavement structural design matrix as per City of Barrie Standards must be followed.

For the remaining pavement areas, **if any**, the recommended pavement structures provided in **Table 1** are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. The values may need to be adjusted based on the city/regional standards. Consequently, the recommended pavement structures should be considered for preliminary design purposes only.

A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions.

Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

Table 1: Recommended Pavement Structure Thickness for Parking Lots

Pavement Layer	Compaction Requirements	Light Duty Parking (Cars)	Heavy Duty Parking (Delivery Trucks)
Asphaltic Concrete	92.0 to 96.5% Maximum Relative Density (MRD)	40 mm HL 3 or SP 12.5 50 mm HL 8 or SP 19.0	40 mm HL 3 or SP 12.5 80 mm HL 8 or SP 19.0
OPSS Granular A Base (or 20mm Crusher Run Limestone)	100% SPMDD*	150 mm	150 mm
OPSS Granular B (or 50mm Crusher Run Limestone)	100% SPMDD	250 mm	350 mm

* Denotes Standard Proctor Maximum Dry Density, ASTM-D698
The subgrade must be compacted to 98% SPMDD for at least the upper 300 mm unless accepted by DS Consultants Ltd.

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

1. As part of the subgrade preparation, proposed parking areas and access roadways should be stripped of topsoil and other obvious objectionable material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report.

The subgrade should be properly shaped, crowned then proof-rolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD.

2. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed lot grading.

Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory.

In the event that shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by DS Consultants Ltd.

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

4. It is recommended that DS Consultants Ltd. be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

11.2 Concrete Sidewalk

It is understood that the sidewalks may be constructed in the area. Recommendations for the pavement structure of the sidewalk are as follows:

150 mm Concrete, over 150 mm Granular 'A' Base

The Granular 'A' base must be compacted to at least 100 percent of Standard Proctor Maximum Dry Density (SPMDD). The subgrade must be stripped of topsoil or other unsuitable material. The top 300 mm of the subgrade must be compacted to at least 98 percent of SPMDD. Prior to placing the Granular 'A' base material, the subgrade must be inspected by the geotechnical engineer.

12. GENERAL COMMENTS AND LIMITATIONS OF REPORT

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

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS at the time of preparation.

Unless otherwise agreed in writing by DS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at MCR and DS borehole locations.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer.

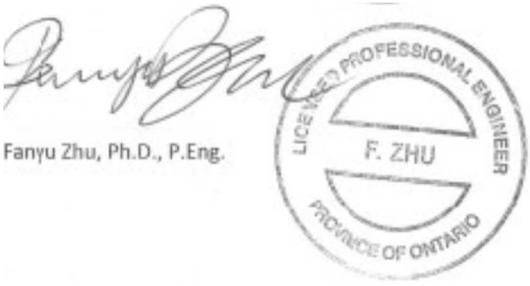
Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

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

DS CONSULTANTS LTD.

Labib Mousa, P. Eng.



Fanyu Zhu, Ph.D., P.Eng.

Shabbir Dandukwala, M.Eng., P.Eng.

Drawings

C:\Projects\Essa Rd\BH Location.qgs

Legend

Borehole Location

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Project: 41-43 Essa Rd. and 259 Innisfil St., Barrie, ON

Title: **Geotechnical Investigation - Proposed Residential Development**

N

Client: Tonlu Holdings Limited

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	L.M	S.W	July 2021
Rev: 0	Scale: As Shown	Project No.: 21-113-100	Figure No.: 1

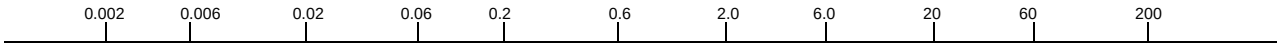
Image/Map Source: *Google Satellite Image*

Figure 1A: Notes on Soil Sample Descriptions

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

ISSMFE SOIL CLASSIFICATION

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



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

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

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

LOG OF TEST PIT BH21-4

PROJECT: Geotech and hydrogeo - Proposed Residential Development

CLIENT: Tonlu Holdings Limited

PROJECT LOCATION: 41-43 Essa Rd. and 259 Innisfil St., Barrie, ON

DATUM: Geodetic

BH LOCATION: See Drawing 1 N 4914178.332 E 604213.78

DRILLING DATA

Method: Hollow Stem Auger/ Mud Rotary

Diameter: 200mm

Date: Jun/14/2021

REF. NO.: 21-113-100

ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
227.0								
0.0 / 226.4	**GRANULAR FILL:** sand some gravel, some organics, brown, moist, loose		1	SS	7			HEX:15, IBL:0
0.6	**SAND:** trace silt, yellowish brown, moist, loose to compact		2	SS	14		226	HEX:15, IBL:0
2			3	SS	7			HEX:10, IBL:0
			4	SS	19			HEX:10, IBL:0
	grey below 3m		5	SS	24		224	0 93 7 0 HEX:10, IBL:0 wet spoon
4								
			6	SS	16		Bentonite	HEX:5, IBL:0
6								
220.1			7	SS	23			HEX:20, IBL:0
6.9	**SANDY SILT:** trace clay, grey, wet, compact						220	
8			8	SS	11			0 31 64 5 HEX:0, IBL:0
217.9								
9.1	**SILT:** some sand, trace clay, grey, wet, stiff		9	SS	40		218	0 20 73 7 HEX:0, IBL:0
10								
216.0			10	SS	22		216	HEX:0, IBL:0
11.0	**SAND:** grey, wet, compact							
12			11	SS	24			HEX:20, IBL:0
213.3							214	
14 13.7	**SANDY SILT:** trace gravel, trace clay, grey, wet, compact to dense		12	SS	18			4 35 53 7 HEX:5, IBL:0
			13	SS	35		212	HEX:0, IBL:1
16								
			14	SS	61		210	HEX:0, IBL:0
							Grout	
18	some clay below 18.3m		15	SS	62			HEX:0, IBL:0
207.2							208	
20 19.8	**SILT AND SAND:** trace clay, grey, wet, compact (disturbed due to groundwater)		16	SS	11			0 45 50 5 HEX:0, IBL:0
205.4							206	
			17	SS	70			HEX:0, IBL:0
22 21.6	**SAND:** some silt, grey, wet, very dense							
204.1							204	
22.9	**SANDY SILT:** grey, wet, very dense		18	SS	>100			0 34 66 0 HEX:0, IBL:0
24								
202.0			19	SS	>100			HEX:0, IBL:0
25.0	**END OF BOREHOLE:** Notes: 1)water at 3mbgs during drilling 2)BH backfilled with grout to 10m							

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

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

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

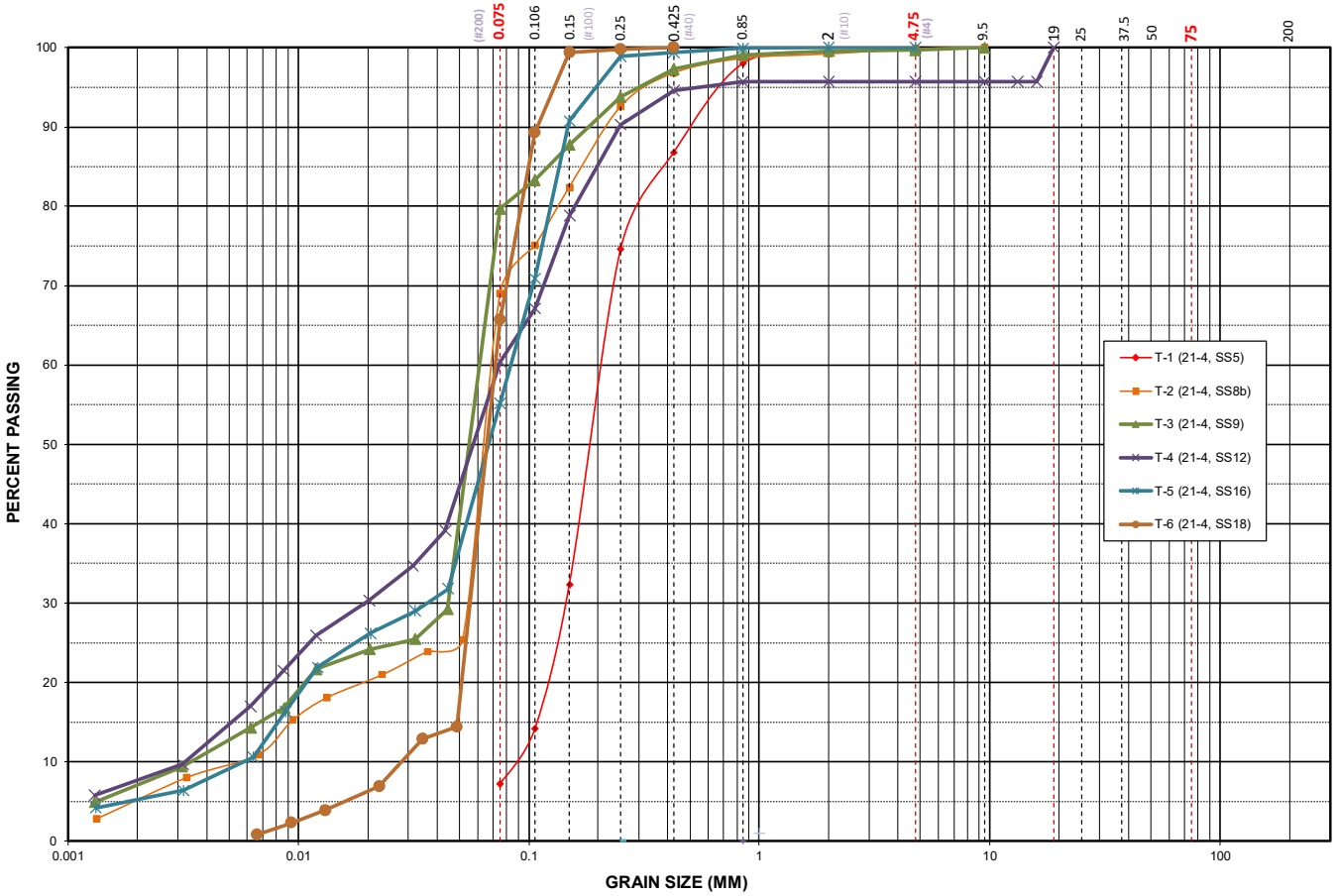
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

Particle Size Distribution (ASTM-D421/D422)



Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	

Specification and Comments:

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Project:	Geotechnical Investigation - Essa Rd. & Innisfil St. Properties	Tested by :	HH
Project No.:	21-113-100	Date:	July-2-2021
Client:	Tonlu Holdings Ltd.	Dwg. No.	3