GEOTECHNICAL REPORT, ROAD ALIGNMENT, PROPOSED TLICHO ALL-SEASON ROAD, NORTHWEST TERRITORIES

Project No. 144902448

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1.0 INTRODUCTION

Acting on the authorization of Tlicho Engineering and Environmental Services Ltd. (Tlicho), Stantec Consulting Ltd. (Stantec) carried out a geotechnical investigation along the proposed overland alignment of the Tlicho All Season Access Road (TASR). The purpose of the investigation was to characterize subsurface conditions and provide geotechnical comments and recommendations to assist in the design and site development of the roadway.

The investigation was carried out in general accordance with Stantec's proposal dated January 12, 2017, as part of an overall geotechnical program by Tlicho for the Government of the Northwest Territories (GNWT) along the proposed 94 km TASR alignment extending from the Yellowknife Highway (Highway 3) to the Settlement of Whati on the south shore of Lac La Martre (RFP Event ID: EV0000000001132). The scope of work outlined in the GNWT Request for Proposal includes the geotechnical investigation and design of the 94-km long TASR corridor, four bridges and three structural culverts. Tlicho was responsible for management and execution of the overall project and team as the Prime Contractor, with Stantec acting as sub-consultant providing geotechnical engineering and technical services to the project, including:

- Provision of geotechnical field personnel to log subsurface conditions during drilling operations at eighty-one (81) geotechnical boreholes in accordance with the RFP:
  - Thirteen (13) diamond drill boreholes at the four (4) proposed major bridge crossings:
    - Crossing #8, Station 40+400 - Duport River Crossing
    - Crossing #9, Station 45+175 - (unnamed)
    - Crossing #14, Station 69+666 - James River Crossing
    - Crossing #15, Station 85+397 - La Martre River
  - Three (3) auger boreholes at the three (3) proposed major bridge culvert crossings:
    - Crossing #5, Station 16+532
    - Crossing #6, Station 19+427
    - Crossing #10a, Station 48+208
  - Sixty-five (65) auger boreholes to observe the subsurface conditions along the overland road alignment;
- Installation and reading of thermistors;
- Borehole layout and as-drilled survey;
- Completion of a laboratory testing program on the recovered borehole samples as specified in the RFP; and
- Geotechnical engineering assessment and reporting on the field and laboratory findings in two reports (Geotechnical Data Report and Geotechnical Recommendations Report) for each crossing location and a geotechnical report for the overall roadway alignment. These documents should be read in conjunction with the Statement of General Conditions, Appendix A.

This Geotechnical Report contains all of the findings from the geotechnical investigation undertaken by Stantec along the general overland roadway alignment including: a summary of

the field and laboratory procedures; borehole records; laboratory test results; a discussion of the factual findings, and our comments and recommendations for design purposes. Results of the geotechnical investigations conducted at the bridge and structural culvert crossings are presented under separate covers.

2.0 SITE DESCRIPTION AND GEOLOGY AND CLIMATE

2.1 SITE DESCRIPTION

The proposed Tlicho All Season Access Road extends for approximately 94 km from the community of Whati, south to the Yellowknife Highway (NWT Highway No. 3) connecting at approximately Km 197, as shown on Key Map 1, provided in Appendix B.

The two-lane all season gravel road is planned to predominately follow the route of the 'Old Lac La Martre' / 'Old Airport Road', an overland winter road within a 60-metre-wide right of way corridor. Significant deviations are limited to between approximate station posts 25.5 km to 33 km and 84.25 km to 87.75 km, with occasional local offsets incorporated to better accommodate water crossing structure construction and general road engineering requirements.

It is understood that the original Lac La Martre overland winter road was established by the military in the 1950s, and used as a public winter road for the northern Tlicho communities up until the late 1980s. More recently, it has been used by local communities for travel using all-terrain vehicles including snowmobiles, dog sleds, all-terrain vehicles, and trucks (GNWT DOT, 2016). It is understood that the road was generally constructed at-grade, with roadbed approximately level with the surrounding undisturbed vegetated areas and no significant historic ground disturbance (regrading cut/fill) apparent.

Fifteen 'significant' water course crossings have been planned along the alignment, which include: four major bridge crossings - Duport River (Crossing #8), unnamed tributary near KM 45 (Crossing #9), James River (Crossing #14), and La Martre River (Crossing #15); three major bridge culvert crossings - Crossings #5, 6 and 10a; and eight smaller culverts - Crossings 1, 2, 3, 4, 7, 10, 11 and 13.

2.2 PHYSIOGRAPHY AND GEOLOGY

The TASR is located within the Great Slave Plain High Boreal Ecoregion (ECG, 2009 and GNWT DOT, 2016). The southern two-thirds of alignment (up to approximate Station 64+500) passes through the Great Slave Plain High Boreal Level IV Ecoregion (GSPHB), while the northern third of the corridor (past approximate Station 64+500 onward) passes through the Lac Grandin Plain Low Subarctic Level IV Ecoregion (LGPLS).

The Great Slave Plain High Boreal Ecoregion is classified (ECG, 2009) as occurring at higher elevations, and characteristically consisting of slow growing forests due to permafrost with low canopy, open black spruce, treed bogs; horizontal fens; peat plateaus in wet, poorly drained areas, and mixed wood stands on warmer, better drained slopes on hummocks. The Lac Grandin Plain Low Subarctic Ecoregion is classified (ECG, 2009) as consisting of undulating areas and deeply fluted till with spruce stands and horizontal fens common.

The topography over which the proposed TASR crosses is generally gentle and undulating, with elevations at the test locations ranging from a low of approximately 245 masl at the James River crossing up to a high of approximately 300 masl within the central portion of the alignment.

Based on available regional surficial geology mapping conducted by the Geological Survey of Canada (Craig, B G. 1965; Kerr, D.E., et al, 2016; Ednie, M. et al, 2014) and previous project terrain mapping along the route (Kavik AXYS Inc, 2008 and GNWT DOT, 2016), it is understood that natural overburden material along the corridor is thought to be dominated by a complex sequence of glacial till deposits from the last glacial episode in the Late Wisconsin and overlying glaciolacustrine sediments associated with glacial Lake McConnell and ancestral Great Slave Lake. A broad discontinuous band of till diamicton mantle is mapped extending SE-NW through the area corresponding to the southern and northern thirds of the alignment, while fine-grained glacio-lacustrine near-shore/littoral and/or deep water sediments are mapped as dominant throughout the middle of the alignment. Glaciofluvial (esker) deposits are noted, but uncommon. Post-glacial fluvial, organic soils, and bedrock exposures are generally thought to be scarce.

Based on available geological mapping for the area published by the Geological Survey of Canada (Okulitch, A.V, 2006), it is understood that the site is mapped within the Interior Platform geologic province, situated over Middle Devonian to Ordovician aged mixed carbonate (limestone and dolostone), evaporate (gypsum, anhydrite) and fine-grained clastic (shale, siltstone) sedimentary rocks from the Lonely Bay Formation Upper Member to the Chedabucto Lake Formation. Karst features (sinkholes) in the carbonate and evaporate (gypsiferous) rocks of the region have been reported (ECG, 2009; Ford, D. 2009; Craig, B G. 1965); however, it is understood that no karst features have been observed directly along the road alignment in previous project work (GNWT DOT, 2016).

2.3 CLIMATE & PERMAFROST

2.3.1 Climate

Based on a review of historic climate data completed using the Yellowknife Airport meteorological station (Climate Reference ID: 2204100), Whatì meteorological station (Lac la Martre, Climate Reference ID: 2202678) and other sources (GNWT, 2016), it is understood that the TASR area has a subarctic climate (Dfc according to the Köppen climate classification system) characterized by generally relatively cold winters followed by short summers. It is noted

that the Whatì station is located approximately 13 km west of the northern limit of the TASR and the Yellowknife station is located approximately 100 km east of the southern limit of the TASR.

Average annual daily mean temperatures are about -4.3°C (Yellowknife Station) to -4.7°C (Whatì Station), with the lowest average daily winter temperatures generally occurring in January, while the warmest month (based on the average temperature) occurs in July. The average annual precipitation is estimated in the order of 290 mm, with an average annual rainfall of 170.7 mm generally occurring throughout June through September, and an average annual snowfall of 157.6 cm generally occurring from September through May (Yellowknife Station).

The average freezing and thawing indices between 1981 and 2010 have been 3343.1 C° days and 1813.3 C° days, respectively (Yellowknife Station). A study completed by Holubec, et. al., in 2009 using data from 1978 to 2008 was adapted by CSA (2010). The CSA study suggests a warming trend of 0.58°C per decade within the Central Arctic region (including the TASR site). As per Table 5.2 in CSA (2010), seasonal mean temperature change under moderate (A1B) green-house gas scenarios, the mean annual temperatures for the Arctic Sector C1 are projected to be 1.3°C (2011-2040), 2.7°C (2041-2070), and 3.7°C (2071 – 2100) respectively. It is noted that the TASR site is located near the margins of the C1 and W1 sectors, therefore the temperatures will likely be some combination of the two sector predictions. This report references the temperatures for Arctic Sector C1, which are warmer temperatures compared to Arctic Sector W1

It is understood that streams and rivers in the region may be prone to icings (Fish et al, 2017).

2.3.2 Permafrost

Canada Permafrost mapping from the National Atlas of Canada (Heginbottom et al. 1995) shows the TASR site lies within the zone of extensive discontinuous permafrost, with an estimated 50% and 90% of the landscape covered. It is understood that no public thermistor or intrusive investigation records exist for the immediate vicinity of the TASR. Previous reconnaissance trips by earlier terrain mapping crews and GNWT personnel did not encounter any apparent permafrost landforms or thermokarst zones within the corridor, however a zone affected by thermokarst processes was noted between Whati, Behchoko, and the area north of Slemon Lake Kavik (AXYS Inc, 2008 and GNWT DOT, 2016).

Based on regional studies completed in surrounding areas (GNWT, 2016), permafrost is anticipated to be relatively warm and correlated with forest cover type areas underlain by finer-textured glacial and post-glacial sediments such as glaciolacustrine and lacustrine deposits, as well as peatlands where organic material contribute to the forming and preservation of permafrost. Ground ice content, if present in these finer grained deposits in the upper 10 to 20 m is anticipated to be less than 10% to 20% ice by volume (Heginbottom et al. 1995). Ground ice is generally expected to be less common in areas of exposed bedrock and where the underlying sediments are coarse and vegetation cover is thin.

Permafrost near Yellowknife is reported to be generally warm (>-2°C), less than 50 m thick with active layer thickness less than 1 m and up to 3 m (Wolfe, 1998). Permafrost conditions along the nearby Highway 3 have been reported as typically warmer than -1°C, with an active layer thickness varying from less than 0.7 m to 1.5 m. Permafrost degradation has been noted along the Highway in recent years with settlements in soil-covered areas generally attributed to the degradation of the ice-rich permafrost subgrade particularly where it was constructed adjacent to a water body and where the road crossed over the old alignment (Stirling et al, 2015; BGC, 2011; Wolfe et al, 2015;).

Permafrost stability is known to be negatively affected by ground disturbance, such as vegetation removal for linear infrastructure and from forest fires. The existing right-of-way for the old winter road represents a linear disturbance, and forest fires, specifically in the southern parts of the TASR route, may induce long-term permafrost degradation. Therefore, while the region of the TASR may lie within the extensive discontinuous permafrost zone, these disturbances may have modified the permafrost regime along the TASR route.

Recent studies commissioned by GNWT have reported that climate change trends have negatively impacted infrastructure supported on permafrost and are projected to continue to negatively impact permafrost conditions in the region (Dillon 2007; BGC, 2011). Continued warming, changes in freeze-thaw patterns, and ultimately degradation of permafrost in the region are anticipated due to increasing temperatures and amounts of precipitation, and decreases in snow and ice cover.

3.0 INVESTIGATION PROCEDURES

3.1 DRILL PROGRAM

The geotechnical field investigation for the overland road alignment was conducted between February 12 and March 29, 2017, as part of the overall geotechnical investigation for the corridor (including bridge and culvert crossings). Sixty-five roadway geotechnical auger holes were completed at locations shown on Figure No. 1, Key Map and associated borehole location Figures 1 to 8 in Appendix B. Borehole locations were selected by GNWT and spaced at regular intervals of approximately 1.5 km to provide a general characterization of subsurface conditions along the proposed road alignment. Locations were established in the field by Stantec using either recreational grade handheld GPS receivers with an estimated horizontal accuracy of ± 5 m, or a Trimble Geo XH GPS unit with an estimated horizontal accuracy of ± 1 m.

Fifty-five boreholes were completed within the cut-line/roadbed of the historical winter road after vegetation re-clearing and snow plowing/packing that was generally completed less than two weeks prior to drilling. Ten boreholes (BH17-01, 04, 22-25, 44, 54, 76-77) were completed offset from the existing winter road alignment in areas thought to be in their native, undisturbed state prior to mobilization. Site access in these areas was generally limited to vegetation clearing

sufficient to permit access and operation of the drill and support equipment and was completed generally less than two weeks prior to drilling.

Boreholes were completed using a track mounted Foremost auger drill rig provided and operated by Northtech Drilling Ltd. who was retained directly by Tlicho under separate contract. In accordance with the Guidelines for Investigation included in the RFP, boreholes were advanced to a target depth of 8 m below existing ground surface, or practical auger refusal using hollow and/or solid stem auguring techniques with regular sampling using conventional 50 mm split spoon samplers during the performance of the Standard Penetration Test (SPT). Auger refusal prior to the target depth was checked with at least two additional auger probe holes completed with the drill offset to account for potential boulders. Diamond drilling with core recovery to confirm bedrock, and the collection of frozen soil/ice cores by CRREL barrel sampler were not completed as per the RFP.

We noted that the blow counts and relative density/consistency descriptions of frozen soils in Appendix C should be reviewed with caution. It is highly likely, particularly for cohesive soils, that the strengths implied by the blow counts will be significantly reduced when thawed.

The field work was conducted under the part-time monitoring of a GNWT field representative and full-time supervision of Stantec personnel (Justin Matthew, P.Eng., Kyle Polito, C.Tech., Andrew Hall, P.Eng., David Metzger, C.Tech.), who maintained detailed logs and obtained representative samples from the various strata encountered. Subsurface conditions were classified in general accordance with the procedures outlined in the attached explanatory key: Symbol and Terms Used on Borehole and Test Pit Records with soil descriptions prepared in accordance with ASTM D2487 and D2488. Temperatures of soil samples were measured by handheld infrared thermometer on recovery at surface. Frozen soils were classified in accordance with ASTM D4083 and D7099. Observations of groundwater conditions were made in the open boreholes at the time of drilling with water level tape and/or the moisture condition of the recovered samples.

The temperature of soil samples measured in the field using an infrared thermometer are provided on the borehole records. Ground temperatures inferred from temperature measurements of soil samples should be interpreted with caution. Despite efforts to obtain information as accurately as possible, soil sample temperatures may be either warmer than in-situ due to drilling disturbance, or colder than in-situ due to cold air temperature exposure of the soil samples prior to temperature measurement.

On completion of drilling, holes were either backfilled without instrumentation by cuttings sand, or installed with thermistor strings to permit ground temperature measurement as noted in the following section.

The provision of all on-site coordination and logistics to support the field program was by Tlicho, including:

- All necessary regulatory permitting to complete the work
- Utility clearances
- Clearing and provision of access to the borehole locations, suitable for access.
- Project Health, Safety, Security and Environmental program development, execution, and management.
- Meals and accommodations for field personnel.

3.2 THERMISTOR INSTALLATION

Nine roadway auger holes (BH17-01, 03, 19, 23, 29, 37, 48, 61, 67) were instrumented with three-bead thermistor strings. Boreholes selected for installations and bead depths were specified by the GNWT field representative in consultation with the Stantec field engineer to provide a general overview of the ground thermal profile along the proposed alignment.

Strings were field assembled using single NTC 3kΩ model beads supplied by RST Instruments Ltd. with a rated accuracy of +/- 0.1°C. Depending on soil conditions, thermistors were installed open hole, or attached to a 25 mm PVC casing, and then backfilled to surface using auger cuttings and sand 0.3 m above and below the thermistors. A protective PVC casing with approximately 1 m stickup was installed at the thermistor location.

Thermistor resistance readings were collected by Stantec using a commercial grade digital multimeter immediately following installation, 3-6 days following, and greater than 14 days after installation over the period of February 16 to April 17, 2017. The 14-day reading was generally taken as the final reading as per the RFP, however additional readings were collected up to 30 days post-install by Stantec/Tlicho, where permitted by project scheduling.

Resistance readings were converted to temperature in accordance with the manufacturer's specifications (see attached thermistor supplier Certification and Calibration Sheets are provided in Appendix E). Additional field calibration checks were completed on select beads by ice-bath for any 0°C off-sets.

The locations of boreholes with thermistors are shown on the borehole location plans of Figures 1 to 8 in Appendix B.

3.3 LOCATION AND ELEVATION SURVEY

Final borehole locations and elevations were recorded in the field by Stantec personnel using a Trimble Geo XH GPS unit. Locations and elevations are generally considered accurate to the decimeter level; however, accuracy of the Trimble unit may have been locally affected by satellite coverage at the time of the survey of a particular hole. Horizontal survey control was

referenced to UTM NAD83 Zone 11N and vertical control to geodetic datum. Table B-1 summarizes the borehole information (Appendix B).

3.4 LABORATORY TESTING

All samples were taken to the Stantec Edmonton or Calgary laboratories for further detailed classification and testing. Sample preservation and handling of frozen samples was in general accordance with industry general practices (ASTM WK24243, ASTM Special Technical Publication, no 599).

Geotechnical laboratory testing was performed on select soil samples in general conformance to the minimum requirements detailed in the RFP and as follows under the applicable ASTM standards:

- Moisture content determinations in all boreholes at ≤1.5 m intervals, to coincide with the SPT split spoon sampling frequency;
- Gradation analysis (sieve and/or hydrometer) at a minimum of two per borehole;
- Atterberg limits at a minimum of two per alignment boreholes;
- California Bearing Ratio/Resilient modulus (CBR) from fifteen alignment boreholes;

The laboratory testing summary is shown in Table 1 below.

Table 1 Summary of Laboratory Tests Completed for Road Alignment Field Investigation

Laboratory Test	Moisture Content	Gradation Analysis	Atterberg Limits	California Bearing Ratio
Number of Tests	302	103	66	15

Samples remaining after testing will be placed in storage for a period of one year after issuance of the final report. After the storage period, the samples will be discarded unless directed otherwise by Tlicho Engineering and Environmental Services Ltd.

4.0 SUBSURFACE CONDITIONS

4.1 STRATIGRAPHY

The subsurface conditions observed in the boreholes and explanation of the symbols and terms used are presented in detail on the borehole records and Symbols and Terms provided in Appendix C. Soil classification was completed in accordance with ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). The laboratory test results are presented in Appendix D and on the attached borehole records. Further discussion on the individual soil units encountered is provided below.

In general, the subsurface stratigraphy encountered within the roadway auger holes varied along the proposed alignment, with a thin veneer of organic soils overlying various native soils ranging from fine-grained deposits (silts, clays) to less extensive coarser grained deposits (silty and clayey sands, sands and gravels). Given the large spacing of test holes, correlation of the individual layers between boreholes was not practical.

4.1.1 Organic Soils

Surficial layers of organic soils including rootmat, topsoil, and/or peat were encountered at 42 of the borehole locations. The combined thickness of the organic soils ranged from less than 0.05 m to 1.7 m.

In 34 boreholes, organic soils were limited to a thin veneer (0.05 to 0.45 m thickness) comprising frozen rootmat / topsoil. Accumulations of peat were encountered in 8 borehole locations at lower lying boggy areas (BH17-37, 40, 46, 48, 54, 61, 69, 81). The thickness of peat materials ranged from 0.15 m to 1.5 m. Peat materials were generally encountered at surface in a frozen state with high ice/water contents (40 – 830%). At borehole BH17-46, an approximately 0.15 m thick layer of unfrozen peat was encountered at a depth of 3.2 m below ground surface.

4.1.2 Sands and Gravels

Surficial deposits of brown, relatively clean sands and gravels were encountered in 18 boreholes completed within the southern third of the alignment between approximate Station 00+000 m and 39+000 m (Boreholes BH17-01 through BH17-30, with the exception of BH17-08 to 11, 13-16, 18, 20, 24, 28). Additional isolated surficial deposits were encountered within the northern portion of the alignment (BH17-67 and 81).

This granular unit was encountered at surface or underlying surficial organic soil veneers, extending for total thicknesses ranging from 0.3 m (BH17-19/26) to over 7.8 m (BH17-03). Based on the field observations and laboratory testing, the material is generally classified as poorly-graded sand (SP) to well-graded gravel with silt and/or clay with sand (GW-GM/GC). Occasional cobbles were inferred to occur within this unit based on auger drill response and larger rock fragments recovered in the cuttings.

Grain size distribution and moisture content analyses carried out on representative samples of this granular unit yielded the following results:

Gravel:	0 to 67%
Sand:	23 to 96%
Fines (silt and clay):	4 to 18%
Silt size:	2 to 11%
Clay size:	0 to 5%
Moisture Content:	2 to 18%

The sands and gravels were generally observed in a frozen state, non-visible ice and poorly bonded (Nf) to occasionally well-bonded without any apparent excess ice noted (Nbn). SPT N-values for the material in a frozen state ranged between 12 and 67 per 0.3 m or refusal. When encountered at depth in an unfrozen state, the material was generally in a compact state, with SPT N-values ranging between 12 and 32 per 0.3 m.

Based on preliminary screening by gradation, the granular materials are generally classified as Frost Group F2, indicating a low frost-susceptibility (U.S. Corps of Engineers Frost Design Soil Classification, as presented in Canadian Foundation Engineering Manual, 2006).

4.1.3 Silty / Clayey Sands

Layers of brown to grey clayey silty sand material were encountered in 27 boreholes across the length of the alignment, predominantly in the northern two-thirds (BH17-07, 09, 13, 15, 26, 29, 30, 40, 41, 43, 44, 45, 46, 47, 48, 50, 51, 55, 56, 64, 66, 67, 68, 69, 76, 78, 80).

These materials were encountered at depths ranging from surface to 6.9 m below ground surface, and extending to various other underlying soil strata or the termination depth of the hole for thicknesses ranging from 0.3 m (BH17-80) to over 7.6 m (BH17-30). Based on the field observations and laboratory testing, the material is generally classified as a silty sand (SM) with gravel to silty clayey sand (SM-SC) to clayey sand (SC). Occasional cobbles were inferred to occur within this unit at the majority of locations based on auger drill response and larger rock fragments recovered in the cuttings.

Grain size distribution and moisture content analyses carried out on representative samples of this unit yielded the following results:

Gravel:	7 to 19%
Sand:	37 to 73%
Fines (silt and clay):	17 to 50%
Silt size:	11 to 39%
Clay size:	1 to 14%
Moisture Content:	1 to 36%, average 9%

The layers were observed in both unfrozen and frozen states. When frozen, the material was generally classified as non-visible and well-bonded (Nbn), and occasionally (BH17-13, 26, 30, 49) as containing relatively small contents of visible ice (estimated <10%, by volume) as ice inclusions (Vx), grain coatings (Vc), or fine horizontal partings (Vs). SPT N-values for the material in a frozen state ranged between 25 per 0.3 m or refusal. When encountered at depth in an unfrozen / inferred unfrozen state, the material was generally compact to very dense, with SPT N-values ranging between 12 and 32 per 0.3 m. It should be noted that the gravel and cobble contents of this unit may have occasionally artificially raised the apparent SPT counts at some locations.

Based on preliminary screening by gradation, the clayey silty sand materials are generally classified as Frost Group F3 to occasionally F4, indicating a variable, and potentially high frost-susceptibility (U.S. Corps of Engineers Frost Design Soil Classification, as presented in Canadian Foundation Engineering Manual, 2006).

4.1.4 Silts

Layers of brown to grey silts were encountered in 11 boreholes across the length of the alignment, predominantly in the northern two-thirds (BH17-13, 28, 35, 48, 53, 54, 62, 63, 67, 70, 79).

Silts were encountered at depths ranging from surface to 5.5 m below ground surface, and extending to various other underlying soil strata or the termination depth of the hole for thicknesses ranging from 0.75 m (BH17-79) to over 7.0 m (BH17-63) thick. Based on the field observations and laboratory testing, the material is generally classified as silty (ML) to gravelly silt with sand (ML). Occasional cobbles were inferred to occur within this unit at some locations (BH17-35, 53, 63, 67, 70) based on auger drill response and larger rock fragments recovered in the cuttings.

Grain size distribution, Atterberg limit tests and moisture content analyses carried out on representative samples of this unit yielded the following results:

Gravel:	0 to 21%
Sand:	9 to 50%
Fines (silt and clay):	50 to 91%
Silt size:	38 to 81%
Clay size:	1 to 23%
Plastic Limit:	13 to 40
Liquid Limit:	16 to 43
Plasticity Index:	0 to 6
Moisture Content:	3 to 43%, average 13%

The layers were generally observed in a frozen state, classified as non-visible ice and well-bonded (Nbn) to occasionally containing visible ice (BH17-35, 48, 54) with contents estimated as <15% (by volume) in the form of inclusions (Vx), grain coatings (Vc), or fine horizontal partings (Vs). SPT N-values for the material in a frozen state ranged between 45 to 77 per 0.3 m or refusal. When encountered at depth in an unfrozen or inferred unfrozen state, the material was generally firm to hard, with SPT N-values ranging between 8 per 0.3 m and refusal. It should be noted that the gravel and cobble contents of this unit may have artificially raised the apparent SPT counts at some locations.

Based on preliminary screening by gradation, the silt materials are generally classified as Frost Group F4, indicating a variable, and potentially very high frost-susceptibility (U.S. Corps of Engineers Frost Design Soil Classification, as presented in Canadian Foundation Engineering Manual, 2006).

4.1.5 Clays

Layers of brown to grey clays were encountered extensively along the alignment at 33 borehole locations between BH17-01 and BH17-77 (BH17-01, 02, 04, 10, 11, 13, 17, 19, 20, 22, 23, 24, 29, 34, 35, 36, 37, 44, 46, 47, 48, 49, 50, 52, 54, 56, 61, 65, 67, 68, 69, 77).

Clays were encountered at surface to underlying the surficial organics, or other soil strata at depths up to 3.7 m below ground surface, and extending to various other underlying soil strata or the termination depth of the hole for thicknesses, ranging from 0.75 m (BH17-79) to over 7.0 m (BH17-63) thick.

Based on the field observations and laboratory testing, the materials are generally classified as ranging from silty clay (CL-ML) to lean clay (CL) to gravelly lean clay with sand (CL). Occasional to some cobbles were inferred to occur within this unit at many locations based on auger drill response and larger rock fragments recovered in the cuttings.

Grain size distribution, Atterberg limit tests and moisture content analyses carried out on representative samples of this unit yielded the following results:

Gravel:	0 to 15%
Sand:	1 to 39%
Fines (silt and clay):	51 to 99%
Silt size:	24 to 83%
Clay size:	4 to 60%
Plastic Limit:	10 to 20
Liquid Limit:	18 to 41
Plasticity Index:	5 to 24
Moisture Content:	1 to 34%, average 13%

The layers were observed in both unfrozen and frozen states. When frozen, the material was generally classified as non-visible and well-bonded (Nbn) to occasionally poorly-bonded (Nf). At 10 boreholes within the approximate middle third of the alignment, between Station 40+500 m and 63+000 m (BH17-34 to 37, 47 to 50, 52), upper portions of the clay were noted to contain visible ice. Total visible ice contents are estimated as <15% (by volume) and encountered in variable forms as ice inclusions (Vx), grain coatings (Vc), fine horizontal partings (Vs), or random/irregular ice formations (Vr). SPT N-values for the material in a frozen state ranged between 9 to 95 per 0.3 m or refusal, while pocket pen tests (measuring an estimated unconfined compressive strength) completed on frozen disturbed split spoon samples at the time of drilling ranged from 50 to 245 kPa with an average of 170 kPa, corresponding to a firm to hard consistency.

When encountered at depth in an unfrozen or inferred unfrozen state, SPT N-values ranged between 6 and 85 per 0.3 m or refusal, while pocket pen tests on disturbed split spoon samples at the time of drilling ranged from 50 to 300 kPa, indicating a firm to hard consistency.

Based on preliminary screening by gradation and plasticity, the clay materials are generally classified as Frost Group F4 to occasionally F3, indicating a variable, and potentially very high frost-susceptibility (U.S. Corps of Engineers Frost Design Soil Classification, as presented in Canadian Foundation Engineering Manual, 2006).

4.1.6 Auger Refusal

Practical auger refusal was encountered at 51 of the borehole locations at depths ranging from 0.0 m to 6.9 m. Augers were able to be advanced a limited distance prior to final refusal through the inferred layers of cobbles and boulders and/or bedrock at 6 of these locations (BH17-08, BH17-09, BH17-10, BH17-21, BH17-40, BH17-64).

It should be noted that practical auger and sampling equipment refusal can occur within dense/hard soil, cobbles and boulders, or well-bonded frozen soil and may not necessarily be representative of the bedrock surface. In order to confirm bedrock at the auger hole locations, diamond drilling with bedrock coring penetration of 3 m or greater would be required.

4.2 GROUND TEMPERATURE MEASUREMENTS

Subsurface temperature profiles recorded in the thermistors are presented graphically in Appendix E. Figures E1 to E9 present all readings from each of the instrumented boreholes; Figure E10 includes the final readings from all instrumented boreholes on the road alignment. Thermistor readings for bridge and culvert crossings are reported under separate covers.

Thermistor resistance measurements were taken to determine ground temperature profiles and generally include the initial installation readings, 3 to 6 day readings and two week readings. At some locations, where possible, subsequent readings were taken at times greater than two weeks. Initial readings were generally quite erratic and likely reflected the thermal disturbance imposed by the drilling process. In some cases, ground temperature readings were high due to the significant heat generated by the drilling augers. In other instances, the initial readings were low possibly due to the introduction of cold backfill materials. The later readings indicated tendency toward thermal equilibrium; however, we cannot confirm that seasonal thermal equilibrium had been reached in all cases.

The readings were taken during the period of February 16 to April 17, 2017 and represent an interval of ground temperatures at the end of the winter season when the ground should be coldest. None the less, nearly all temperature readings below a depth of 3 metres were found to be above 0 degrees, indicating that permafrost is absent or infrequent.

Temperature time series indicate that post-drilling borehole temperatures may not have equilibrated to in situ conditions for many thermistor nodes up to 30 days after thermistor installation. Temperatures continued to drift asymptotically. We recommend that additional readings should be taken as a minimum in late summer and again in late winter and, ideally

measured for a full year spanning spring, late summer/early fall and winter to define full temperature trumpet curve to confirm our observations and conclusions.

Massive or discrete thick ground ice was not directly observed in any drill cuttings or split spoon samples returned to the ground surface or inferred based on drill response (e.g., inferred by the ejection of water from the borehole during the drilling process). Examination of disturbed drill cuttings and split spoon samples did not suggest ice-rich soils, nor did the moisture contents measured in soil samples.

4.3 GROUNDWATER

Non-stabilized water levels were recorded in the open auger boreholes at the time of drilling by water level tape, and/or estimated based on sample moisture contents. Observed phreatic surfaces are summarized in Table 2, and presented on the attached borehole records.

Depth to the observed apparent phreatic surface, when encountered, ranged from 0.9 to 5.2 m below the ground surface. It should be noted that groundwater levels were recorded in winter conditions during the period of February 15 to March 27, 2017, and will likely fluctuate seasonally in response to precipitation events, and with alterations to the landscape. Based on the timing of the program, the measurements recorded during the field program may represent annual low values.

Groundwater flow in permafrost terrain is normally restricted to the near surface thaw zone in warmer parts of the year, but is more complex in discontinuous permafrost areas. It is possible that a saturated zone may exist seasonally perched at shallow depths above the seasonally receding frost table. This layer would not necessarily be reflected in the seepage observations noted in this investigation conducted during winter, but may be encountered during construction in warmer months.

Table 2 Inferred and Measured Groundwater Levels

Borehole No.	Observation/Measurement Date	Groundwater Depth (m)	Ground Surface Elevation (m)	Groundwater Elevation (m)
BH17-02	February 15, 2017	1.9 (inferred)	265.14	263.24
BH17-03	February 16, 2017	5.2 (inferred)	265.93	260.73
BH17-29	March 3, 2017	4.0 (inferred)	274.56	270.56
BH17-46	March 13, 2017	3.2 (inferred)	284.12	280.92
BH17-48	March 14, 2017	3.2 (inferred)	278.20	275.00
BH17-49	March 22, 2017	4.6 (inferred)	284.20	279.6
BH17-50	March 22, 2017	4.0 (inferred)	280.09	276.09
BH17-54	March 23, 2017	0.9 (inferred)	261.07	260.17
BH17-75	March 27, 2017	2.1 (inferred)	262.62	260.52

4.4 CALIFORNIA BEARING RATIO

Select near-surface soils sampled across the alignment were tested in general accordance with ASTM D1883 Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils. The CBRs were performed in an un-soaked condition at in-situ moisture contents, and compacted according to ASTM D698.

Table 3 summarizes the laboratory CBR values for the selected samples. Results were corrected to account for the reduction of strength experienced in a saturated condition.

Table 3 Summary of California Bearing Ratio Testing

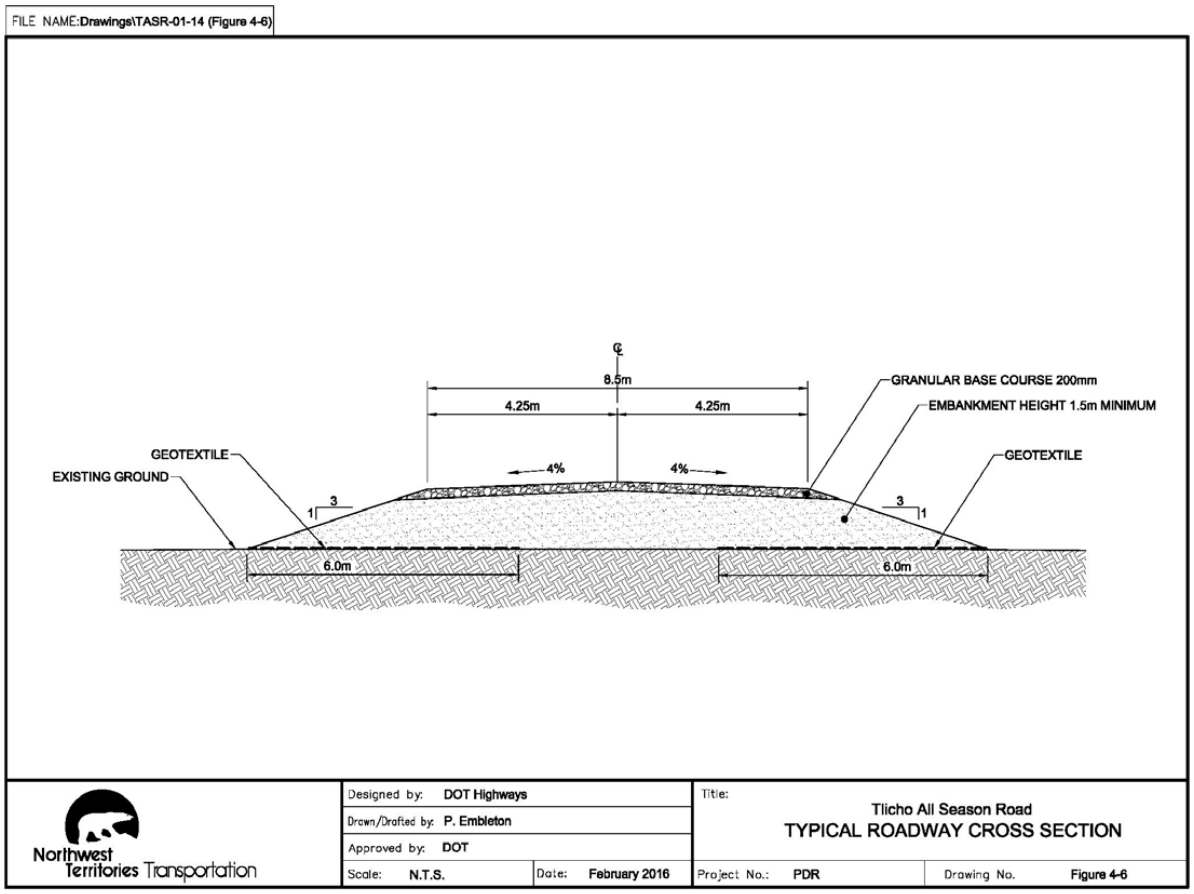
Sample	USC Classification	Depth (m)	Density (g/cm^3)	Moisture Content (%)	Laboratory CBR (%)
BH17-04 AS1	well-graded sand with silt and/or clay (SW-SM/SC)	0.0 – 0.9	1.79	7	17
BH17-06 AS3	silty and/or clayey sand with gravel (SW-SM/SC)	1.0 – 1.5	2.12	4	55
BH17-7 AS1	poorly-graded sand with clay and/or silt (SP-SM/SC)	0.0 - 0.6	1.75	3	16
BH17-10 AS1	sandy lean clay (CL)	0.0 – 1.0	1.95	11	9
BH17-17 AS1	silty sand with gravel (SM)	0.0 – 1.5	1.64	6	15
BH17-19 AS1	lean clay with sand (CL)	0.0 – 1.4	2.07	11	5
BH17-20 AS1	sandy silty clay (CL-ML)	0.0 – 0.9	2.11	9	12
BH17-24 AS1	sandy lean clay (CL)	0.0 - 1.0	2.05	9	13
BH17-27 AS1	silty and/or clayey gravel with sand (GC/GM)	0.0 – 0.7	2.06	4	32
BH17-29 AS1	sand with silt and/or clay (SW-SM/SC)	0.0 – 1.0	1.97	8	24
BH17-34 AS1	lean clay (CL)	0.0 – 1.0	1.73	18	4
BH17-36 AS1&SS2	sandy clay (CL)	0.0 - 1.5	2.04	7	14
BH17-44 AS1	silty clayey sand (SC-SM)	0.0 – 0.9	2.12	8	15
BH46 AS3, BH47 AS1 &AS3	sandy lean clay (CL)	0.0 - 2.6	1.96	13	11
BH17-53 to BH17-55, Multiple	sandy silt (ML)	0.0 – 2.4	2.08	10	5

5.0 DISCUSSION AND RECOMMEDATIONS

5.1 GENERAL

The March 2016 Project Description Report describes the proposed concept design for the All-Season Road as an all-season road approximately 94 km in length on a 60 m wide right-of-way with a cleared driving surface of approximately 8.5 m in width in order to accommodate a two-lane gravel road with culverts and/or double lane bridges over water crossings as necessary. A single 'typical' embankment conceptual design is presently considered, as shown in Figure 1. In this design, the roadway profile will be raised above the existing profile by a minimum of 1.5 metres at 3H:1V side slopes with geotextile reinforcement added between the existing ground and the embankment.

Figure 1 GNWT Typical Roadway Cross Section



It is understood that no other design options have been presented at this time to vary the embankment to accommodate a range of subsurface conditions that may be expected along

the alignment. Details on embankment construction materials have also not been provided at this time, however it is understood that granular borrow and quarried bedrock materials are presently being considered as part of an ongoing aggregate assessment conducted by others. We have interpreted "all-season" road to mean that some short periods of traffic interruptions due to weather and road conditions may exist on an annual basis, in contrast to what might be expected of an "all-weather" road. Furthermore, load restrictions, particularly in spring as the road embankment and subgrade thaw, should be expected.

Based on the thermistor and field temperature measurements of the soils we have inferred that few areas of the proposed alignment exhibit permafrost. However, the sampling of the project was limited to widely spaced boreholes at 1.5 km spacing and frequently in areas disturbed by the access road; permafrost conditions are likely present in some areas of the proposed alignment.

Generally speaking, near surface deposits of relatively clean sands and gravels were limited to 18 boreholes completed within the southern third of the alignment between approximate Stations 00+000 and 39+000 (Boreholes BH17-01 through BH17-30, except BH17-08 to 11, 13-16, 18, 20, 24, 28). These soils should be considered as least frost susceptible, if unfrozen, and most thaw stable, if frozen. Finer grained soils that should be considered as generally thaw unstable were generally the predominant overburden materials encountered in boreholes across the alignment. The following sections provide recommendations for the design and construction of the road embankments.

5.2 EMBANKMENT DESIGN AND CONSTRUCTION

The potential presence of frozen fine-grained thaw sensitive soils including organic soil, silt and clay increase the potential for thaw related settlement and subsidence (CSA, 2010). Calculation of the critical height of fill to preserve the permafrost table requires knowledge of the depth to the natural permafrost table, which is currently unknown over most of the site since permafrost was generally not encountered at the borehole locations.

Based on experience with similar site conditions, if permafrost is present, and the embankment thickness is greater than about 1.5 m, it is considered that permafrost will aggrade into the embankment, in the short term (Wu et al., 1998). In the longer term, the permafrost level may recede downward to the original level due to long-term climate warming. Thus, thaw settlement is likely to be less of an issue under the main part of the embankment, at least for the initial life of the embankment. Permafrost degradation may likely be an issue at the toe of the embankment slopes where the embankment fill thickness is less than 1.5 m. Additionally, snow tends to build up at the toe of the embankment and acts as an insulator, resulting in warming of the embankment toe. Both vertical and horizontal movements at or under the embankment toe could develop and could negatively impact the performance of the road embankment. Seasonal maintenance of the impacted slopes and ground surface should be anticipated.

It is understood that karst features in the carbonate and evaporate (gypsiferous/anhydritic) rocks of the region have been reported in the literature with potential karst like topography noted near the middle area of the alignment, between approximate chainages 36+000 m to 64+500 m; however, no karst features were inferred at any of the auger hole locations and it is understood that no features have been observed directly along the road alignment in previous project work. Site observations at the time of the investigation were limited by access constraints and snow cover. The potential for karstic bedrock can be further investigated by the design build contractor.

To help mitigate degradation of existing permafrost, the topsoil/rootmat layer should be maintained beneath the footprint of the embankment, and construction activity should be staged to avoid disturbance of these layers. Where permafrost is encountered with thaw sensitive soils a non-woven geotextile such as Terrafix 270R or approved equivalent should be placed directly on the subgrade and should extend 6 m laterally into the embankment footprint from the toe of embankment.

In permafrost and thaw sensitive soils it is recommended to minimize heavy surface drainage flow near the embankment fills. If practicable ditches with heavy flow should be offset from the toes of fill slopes.

The embankments should be constructed with pit run fill placed in lift thicknesses that are compatible with the size of compaction equipment and ambient conditions and compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD). Pit run fill should consist of well-graded sand and gravel with less than 10% fines (clay and silt size particles). Fill should be placed and compacted when air temperatures are consistently above freezing. Such a construction procedure will require "summer" construction. This may mean that embankment fills are end-dumped and spread/compacted from the existing embankment section.

There are advantages of constructing the road alignment in winter, which may outweigh desirability of finer-grained embankment materials and high compaction effort. If so, embankment materials fills should consist of well graded blasted rockfill or coarse pit run 250 mm minus with less than 10 fines. We note that a paper presented by BGC (Wolfe et al, 2015), observes that thaw settlement has been documented where open-graded blast-rock was used to construct the embankments and that the thawing could be from free flowing water at the subgrade level, increasing the potential for advective heat transfer. The designers should consider this in selection of fill materials, particularly in areas where massive ice is suspected. Soil gradation testing of the fill should be carried out and reviewed by a geotechnical engineer prior to delivery to site.

Design of granular pavement will be highly dependent on the source and quality of subgrade fills. We understand that selection of borrow sources and materials for subgrade fills is currently underway. We would be pleased to provide pavement design parameters when subgrade materials are defined.

The decision to undertake summer or winter construction should be based on a suitable risk assessment. Stantec may provide input to this risk assessment at an appropriate time. Some strategies for addressing summer/winter construction are provided in the following subsection.

5.3 EMBANKMENT SETTLEMENT

As discussed in the data sections of this report, the geotechnical conditions vary widely and detailed discussion of anticipated settlements for all possible subgrade and embankment cross section cases would be impractical and beyond the scope of this report. Settlement of the embankments at the various bridge crossings has been assessed based on self-weight settlement of embankment fill, thaw consolidation of underlying permafrost (if present) and the seasonal freeze / thaw layer, and the thawed consolidation of underlying unfrozen soil layers. These discussions can be found in the site-specific reports for the crossings.

Andersland and Ladanyi (1994) note that where variations of subsurface conditions exist (soil type and moisture content and ice content) and variable thaw progression beneath the embankment occur, significant differential settlements can be anticipated.

To mitigate embankment deformation from self-weight settlement and freeze thaw processes we recommend the following:

- Placing embankment fills during summer over frost stable soils and in winter over thaw sensitive soils.
- Over building the embankment by approximately 0.3 m to 0.5 m.

In addition, monitoring of the embankment performance will assist in identifying potential performance issues. Monitoring may comprise:

- Monitoring the embankment for a period of 2 years. Monitoring should include mapping of cracks, measurement of crack apertures (if present), observations on the condition of the embankment slope, toe of slope, abutment fore slopes, presence of sloughing of embankment soils, presence of ponded surface water, aufies development and significant changes in vegetation characteristics near the embankment.
- Where practical and where significant permafrost is encountered, installing multibead thermistor cables in the subgrade (vertically) and across the embankment (horizontally) to monitor changes in the geothermal regime.
- The monitoring observations should be reviewed by a geotechnical engineer.

During the first five years after construction seasonal grading and placement of additional fill should be anticipated. If applicable, it is recommended that the placement of a chip-seal surface layer be delayed for at least five years and the embankment is shown to be stable over several years.

5.4 STABILITY OF ROAD EMBANKMENT SIDE-SLOPES

The conceptual design for the road embankment side-slopes calls for gradients of 3 horizontal to 1 vertical. In our opinion, this slope angle is reasonable or appropriately conservative for most cases along the alignment. Global stability analyses were carried out for the proposed 3 H to 1V embankment slopes at bridge crossings resulting in estimated factors of safety against critical failure greater than 1.5 for static conditions. Where blasted rock is placed over thaw stable soils, slopes as steep as 1.5 H to 1 V could be constructed, though site specific confirmation of the conditions would be needed. Side-slope stability may be negatively impacted by thawing of ice-rich subgrade soils, where present.

Although the design concept for this road proposes primarily fill only to prevent permafrost degradation, it is anticipated that some cut slopes may be needed. If cuts are needed in thaw sensitive soils in permafrost, two methods can be considered. Slopes can be cut at a relatively steep slope (4V:1H) to minimize disturbance of the permafrost with a wide ditch at the base to allow for slumping and self-healing (see Berg and Smith (1974)). Alternatively, slopes can be cut and blanketed with nominally 1.5 metres of granular frost stable fill protected with rip-rap. These methods are discussed in detail in FROZEN GROUND ENGINEERING Andersland and Ladanyi, 2004.

5.5 STABILITY OF FROZEN LONGITUDINAL SLOPES

Instability of natural frozen slopes has been documented for many decades. The instability typically arises as a result of the rapid thawing of ice-rich soils. The thawing process liberates the water in the soils, causing an increase in the pore water pressure of the soil and an accompanying decrease in the effective stress and strength of the soils. Instability is most acute on slopes containing ice-rich (thaw sensitive) fine-grained soils. Many slope failures observed in the Mackenzie River valley can be attributed to this phenomenon.

Removal of vegetation, grading, fill construction and climate warming can all contribute to permafrost degradation in the long-term. The instability is time-dependent; slowing the rate of permafrost degradation to an appropriate rate will ensure stability of frozen slopes.

Review of longitudinal slope stability in frozen/thawing slopes is beyond the scope of this work, and in any event insufficient information is available to make any meaningful assessment of this issue. Stantec can provide additional input to this issues on request.

5.6 EROSION PROTECTION

Permanent slope protection and drainage measures may be required to ensure the long-term surficial stability of slopes. Slopes constructed of common fine-grained fill should be surfaced with rip-rap at least 300 mm thick with appropriate filtering properties or placed on a non-woven filter fabric such as Terrafix 270R or approved equivalent. Earth fill embankments or cut slopes, can also be protected with vegetation, which should be established as soon as possible after

completion of the embankment fills under favourable growing conditions to control surficial erosion.

Temporary silt fences and erosion control blankets, should be provided as required, throughout the duration of the construction to prevent erosion and sediment from being carried off the site, in accordance with local environmental standards.

5.7 CLIMATE CHANGE SENSITIVITY AND PERMAFROST DEGRADATION RISK

As discussed elsewhere thermistor results from nine boreholes do not indicate the presence of permafrost; however, the project site is located within the discontinuous permafrost zone and thus permafrost should be expected to be present along the route. Permafrost is most likely in areas such as where there is thick organic cover or on the north side of hills. Therefore, permafrost degradation due to climate change should be a design consideration for the proposed road alignment.

The 2010 CSA Technical Guide titled "Infrastructure in Permafrost: A Guideline for Climate Change Adaption" provides guidance on assessing the potential impacts of climate change on infrastructure in permafrost. As per Table 5.2 in CSA (2010), seasonal mean temperature change under moderate (A1B) green-house gas scenarios, the air temperature increase for the Arctic Sector C1 are projected to be 1.3 °C (2011-2040), 2.7 °C (2041-2070), and 3.7 °C (2071 – 2100). A warming climate could cause a change in the thickness of the seasonal active layer. A deepening of the active layer could also initiate thaw settlement of the underlying native soils, which will negatively impact the performance of the roadway, respectively. Based on the ground materials and temperatures encountered, permafrost 'sensitivity' along the alignment is estimated to vary from 'moderate' where relatively clean sand and gravel deposits/shallow bedrock exist, to 'high', where finer-grained silty/clayey and/or organic/peat deposits exist. The consequence of permafrost degradation is assessed to be "minor" for embankments, requiring seasonal re-grading and placement of additional embankment fill. The assessed site sensitivity and consequence suggests a risk level of "B" to "C", which suggests semi-quantitative (fine-grained soil deposits) to qualitative (granular soil deposits) analyses should be completed.

Long-term monitoring of the roadway, embankments, visually, by survey and through the use of thermistors should be carried out as part of the evaluation of the long-term performance of the d road. Recommended suggestions for monitoring and observations were provided above. In addition to the existing thermistors, new multibead thermistors should be installed in areas where permafrost is suspected to a depth of 15 m to provide long-term ground temperature monitoring.

6.0 CLOSURE

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of Tlicho Engineering and Environmental Services Ltd., who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd. should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report
- Basis of the report
- Standard of care
- Interpretation of site conditions
- Varying or unexpected site conditions
- Planning, design or construction

This report was written by Justin Matthew, P.Eng. and Dan R. McQuinn, P.Eng., and reviewed by Christopher McGrath, P.Eng. and Jim Oswell, P.Eng. Dan R. McQuinn, P.Eng. and Dr. Oswell are registered members of the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists. We trust that the information contained in this report is adequate for your present purposes. If you have any questions about the contents of the report or if we can be of any other assistance, please contact us at your convenience.

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APPENDIX A
Statement of General Conditions

STATEMENT OF GENERAL CONDITIONS

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STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

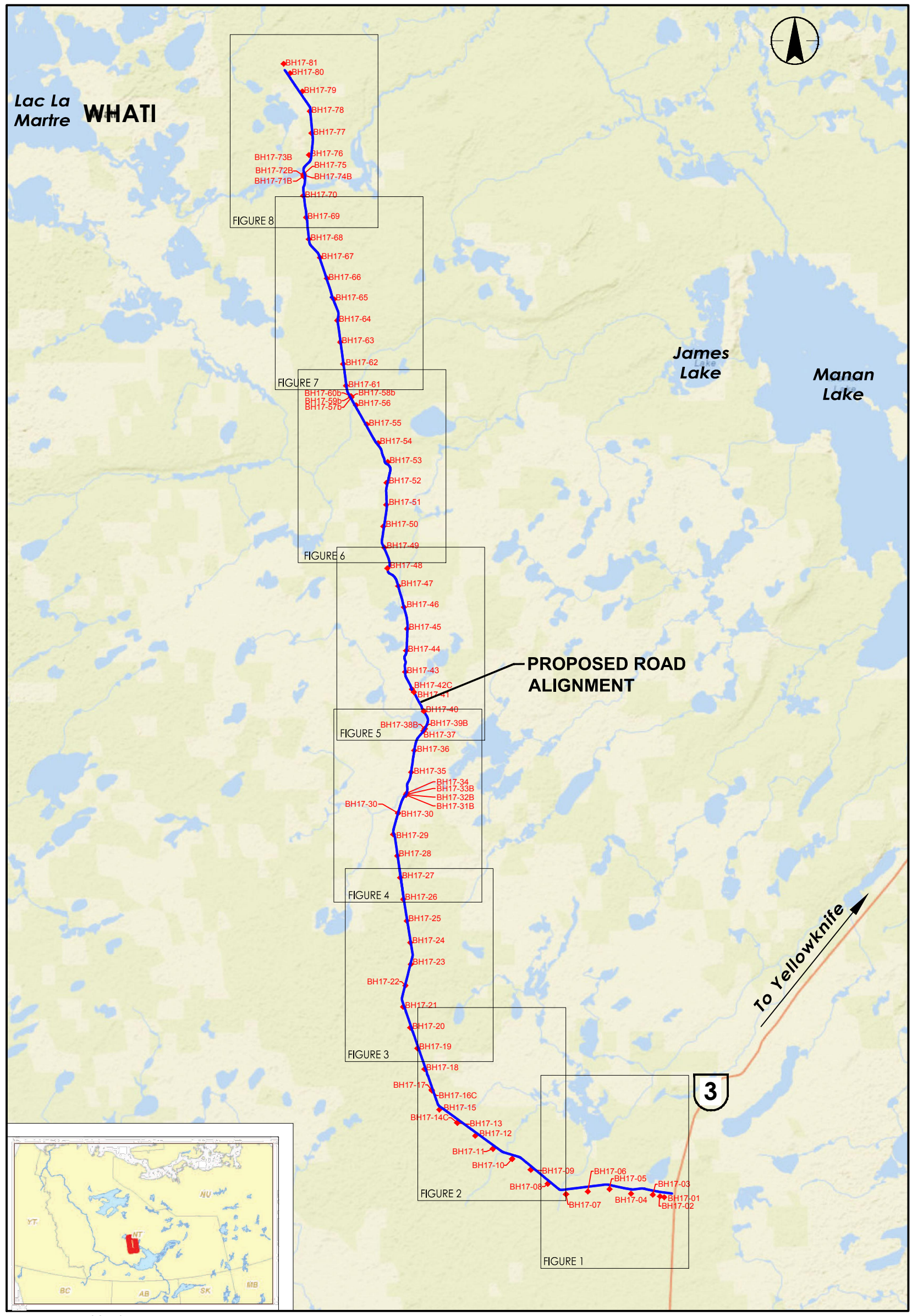
INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

APPENDIX B

Figure No. 1, Key Map
Figure Nos. 1 to 8, Borehole Location Plans
Borehole Site Photos



LOCATION PLAN NTS

ORIGINAL SHEET - ANSI B

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2017/07/05 2:24 PM By: Pinnell, Brian

Stantec

400 - 1331 Clyde Avenue
Ottawa, ON, Canada K2C 3G4
www.stantec.com

LEGEND

- PROPOSED ALIGNMENT
- BOREHOLE LOCATION

2.5 0 2.5 5 km

1 : 250 000

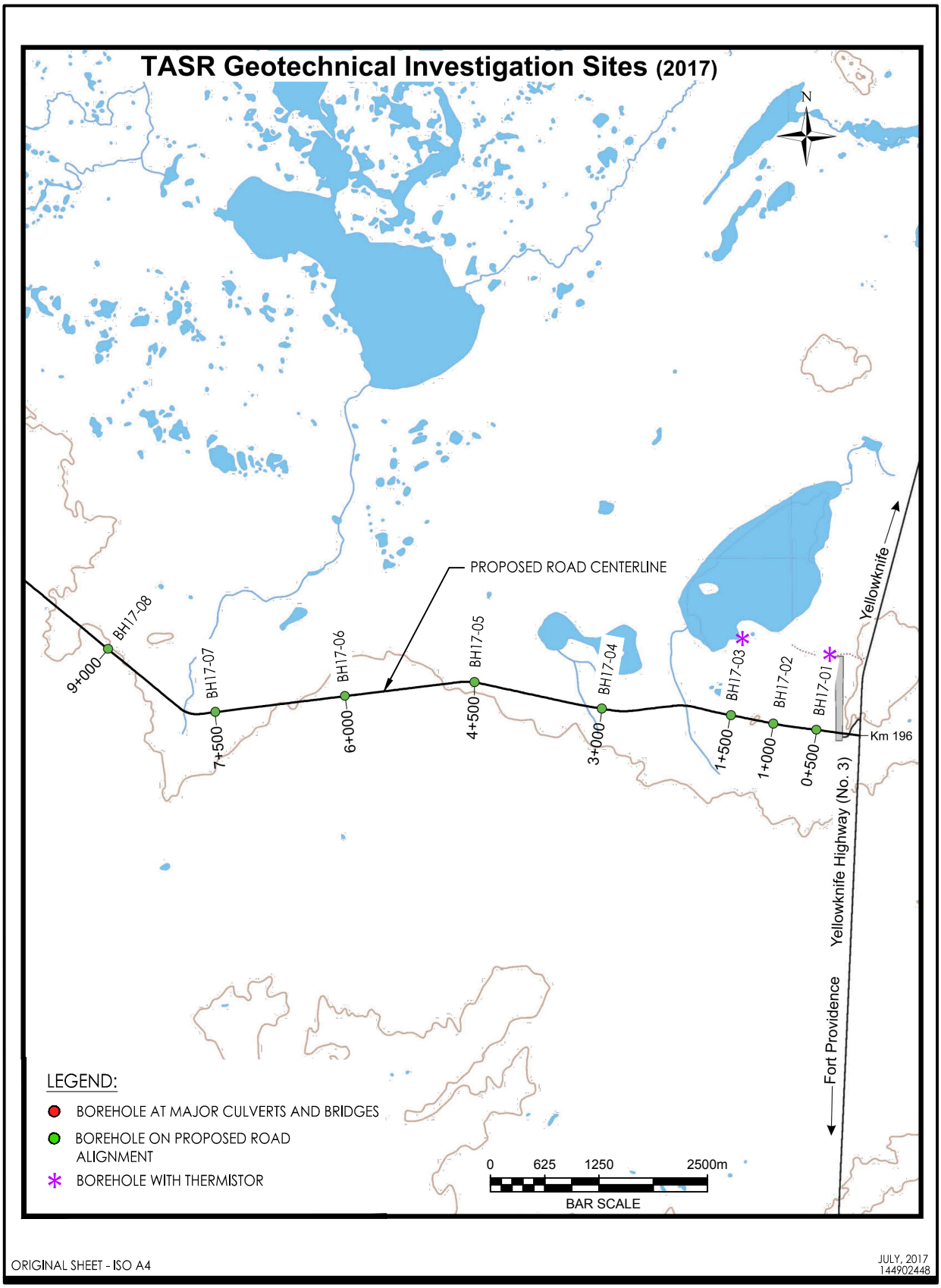
NOTES

IMAGERY: ESRI ©2017.

Client/Project
TLICHO ENGINEERING & ENVIRONMENTAL SERVICES LTD.
GEOTECHNICAL INVESTIGATION
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
1 KEYMAP

Title
KEY MAP



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400 - 1331 CLYDE AVENUE
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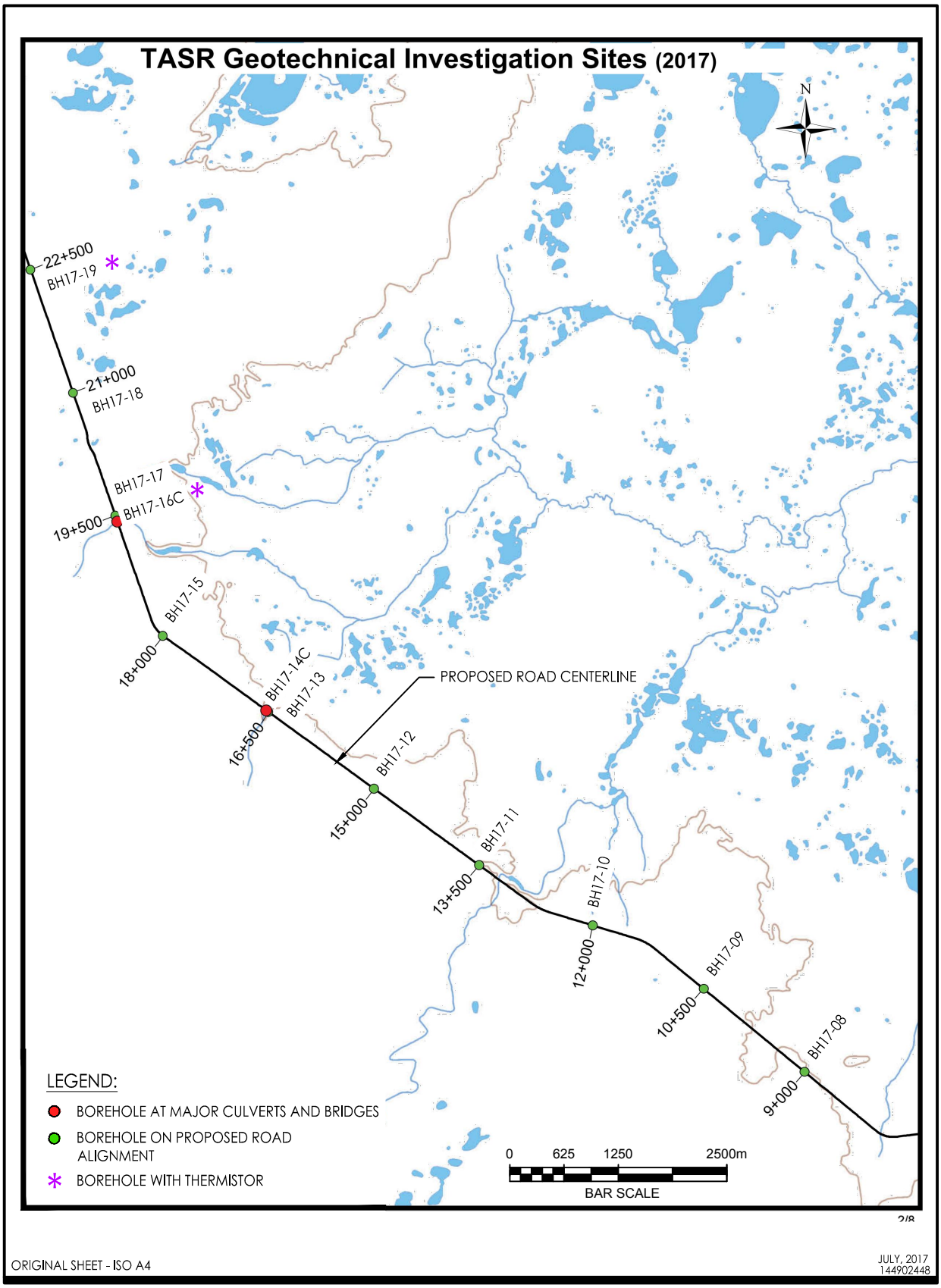
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
1

Title
BOREHOLE LOCATIONS
STA. 0+000 TO 9+000



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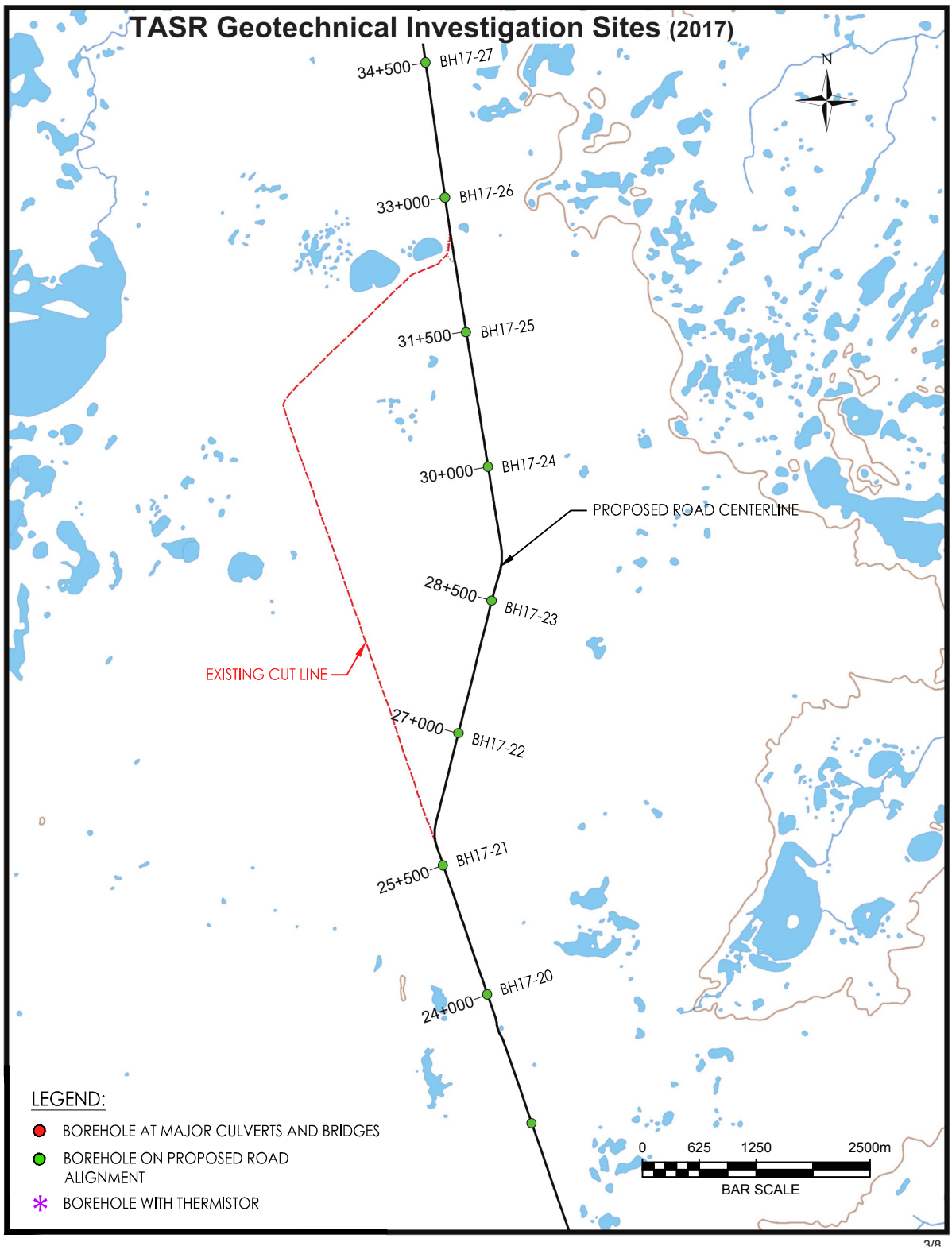
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
2

Title
BOREHOLE LOCATIONS
STA. 9+000 TO 22+500



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Stantec

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OTTAWA, ON, CANADA K2C 3G4
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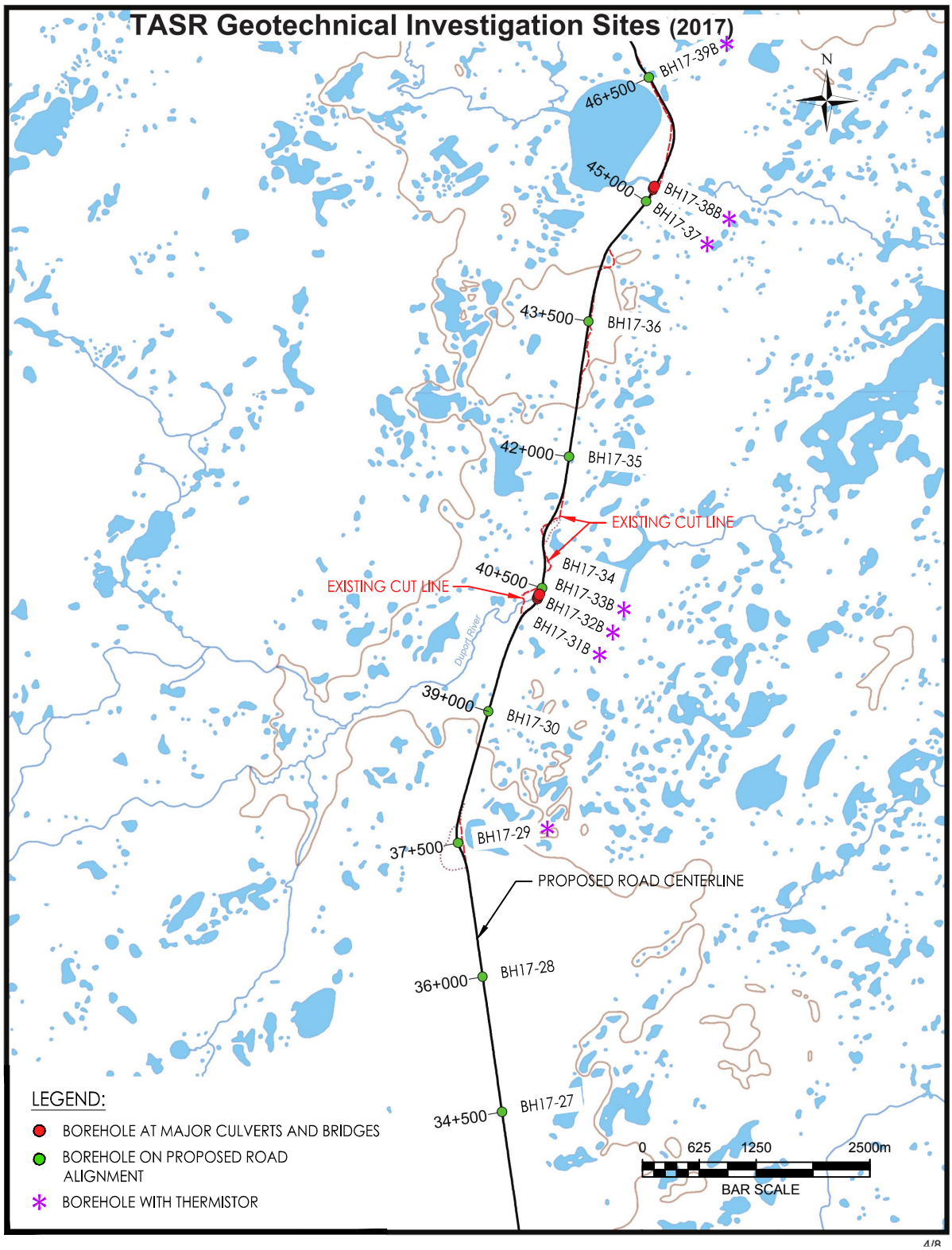
TLI CHO ENGINEERING & ENVIRONMENTAL SERVICES LTD - GEOTECHNICAL INVESTIGATION
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
3

Title
BOREHOLE LOCATIONS
STA. 22+500 TO 34+500



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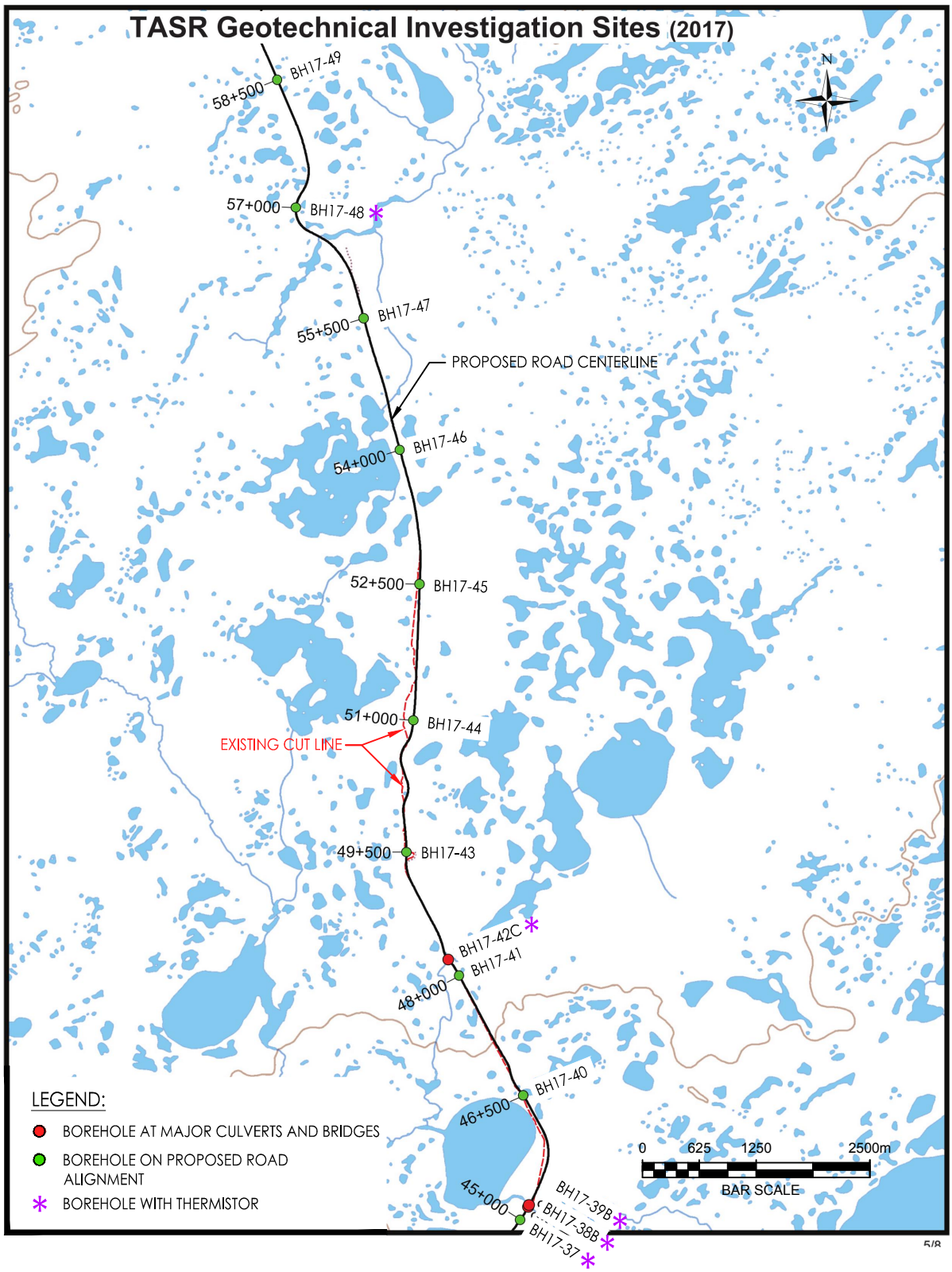
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
4

Title
BOREHOLE LOCATIONS
STA. 34+500 TO 46+500



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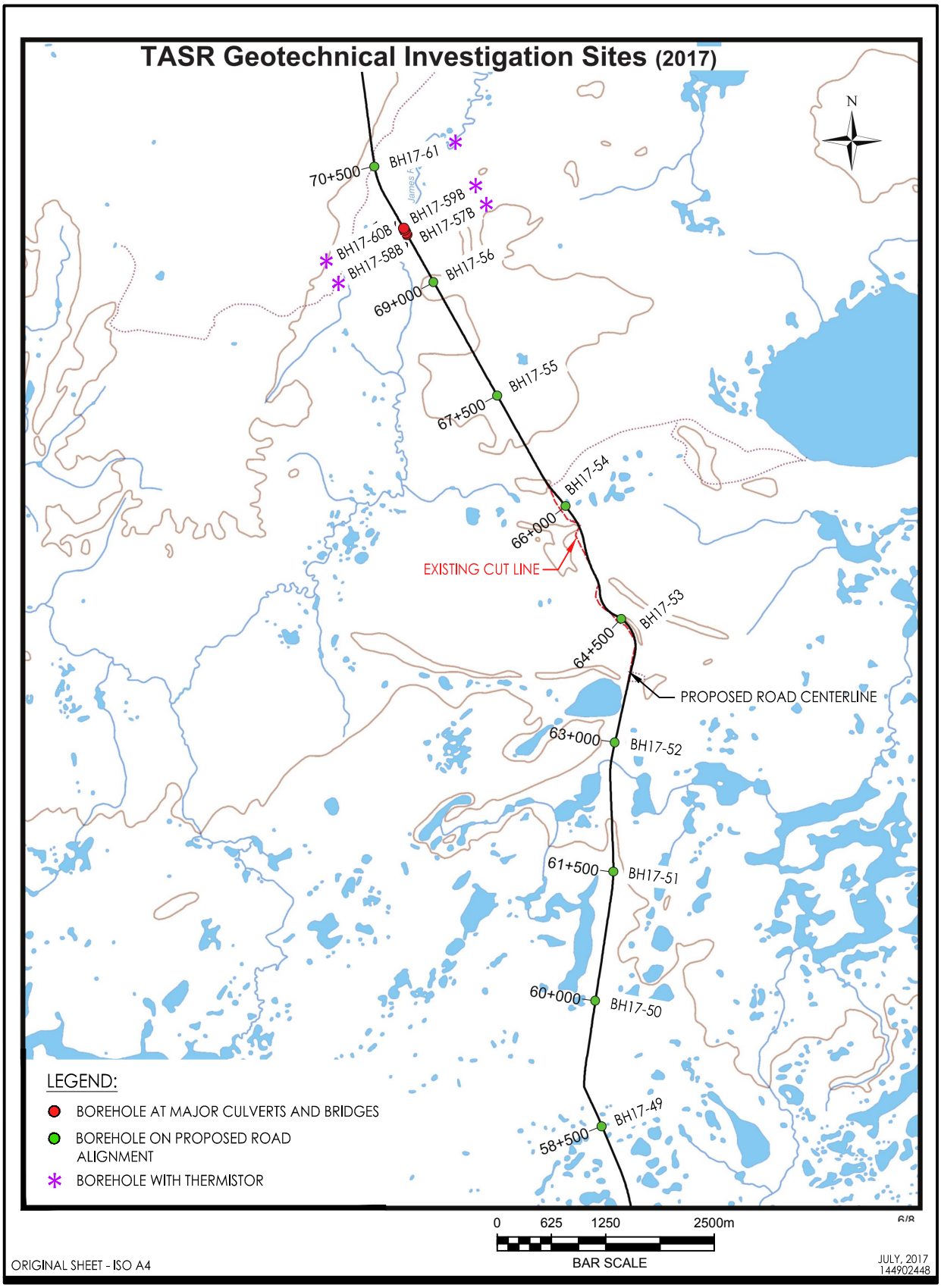
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
5

Title
BOREHOLE LOCATIONS
STA. 45+000 TO 58+500



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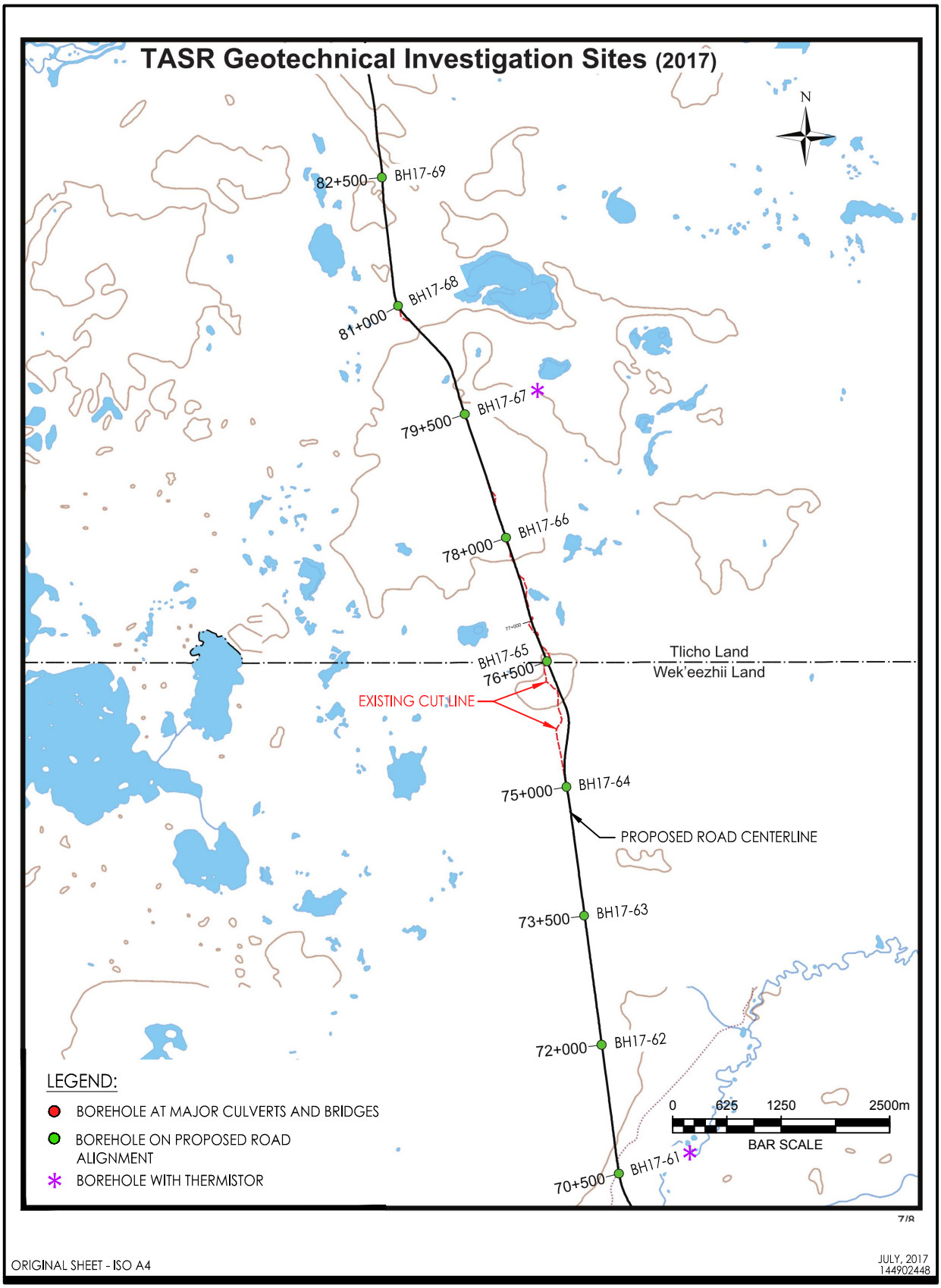
TLI CHO ENGINEERING & ENVIRONMENTAL SERVICES LTD - GEOTECHNICAL INVESTIGATION
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
6

Title
BOREHOLE LOCATIONS
STA. 58+500 TO 70+500



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2017/07/05 2:41 PM By: Pinnell, Brian

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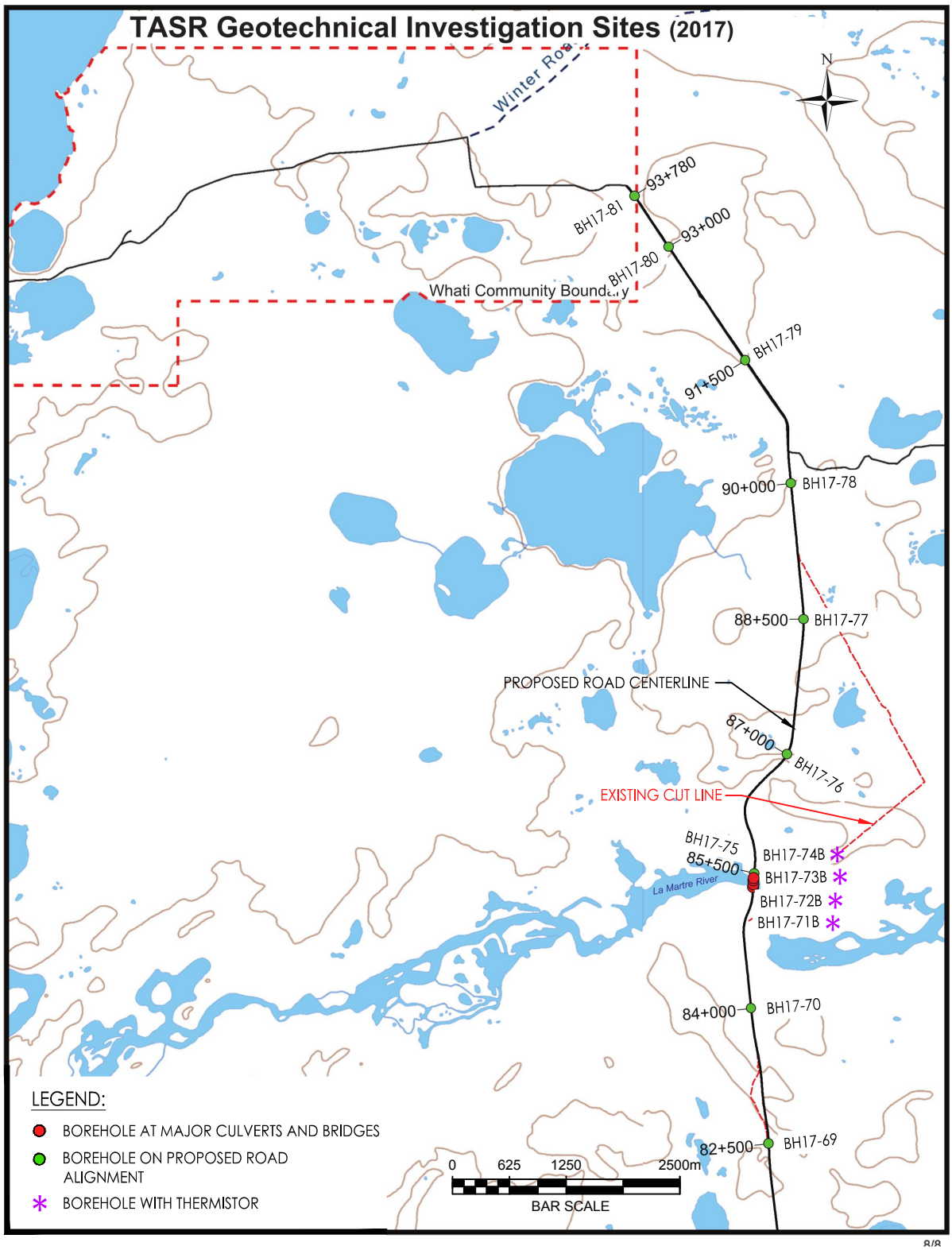
TLI CHO ENGINEERING & ENVIRONMENTAL SERVICES LTD - GEOTECHNICAL INVESTIGATION
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
7

Title
BOREHOLE LOCATIONS
STA. 70+500 TO 82+500



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www.stantec.com

Client/Project
TLI CHO ENGINEERING & ENVIRONMENTAL SERVICES LTD - GEOTECHNICAL INVESTIGATION
PROPOSED TLICHO ALLSEASON ROAD

Figure No.
8

Title
BOREHOLE LOCATIONS
STA. 82+500 TO 93+780

Photo No. 1: Borehole Location BH-01

Photo No. 2: Borehole Location BH-01

Photo No. 3: Borehole Location BH-02

Photo No. 4: Borehole Location BH-02

Photo No. 5: Borehole Location BH-03

Photo No. 6: Borehole Location BH-03

Photo No. 7: Borehole Location BH-04

Photo No. 8: Borehole Location BH-04

Photo No. 9: Borehole Location BH-05

Photo No. 10: Borehole Location BH-05

Photo No. 11: Borehole Location BH-06

Photo No. 12: Borehole Location BH-06

Photo No. 13: Borehole Location BH-07

Photo No. 14: Borehole Location BH-07

Photo No. 15: Borehole Location BH-08

Photo No. 16: Borehole Location BH-08

Photo No. 17: Borehole Location BH-09

Photo No. 18: Borehole Location BH-09

Photo No. 19: Borehole Location BH-10

Photo No. 20: Borehole Location BH-10

Photo No. 21: Borehole Location BH-11

Photo No. 22: Borehole Location BH-11

Photo No. 23: Borehole Location BH-12

Photo No. 24: Borehole Location BH-12

Photo No. 25: Borehole Location BH-13

Photo No. 26: Borehole Location BH-13

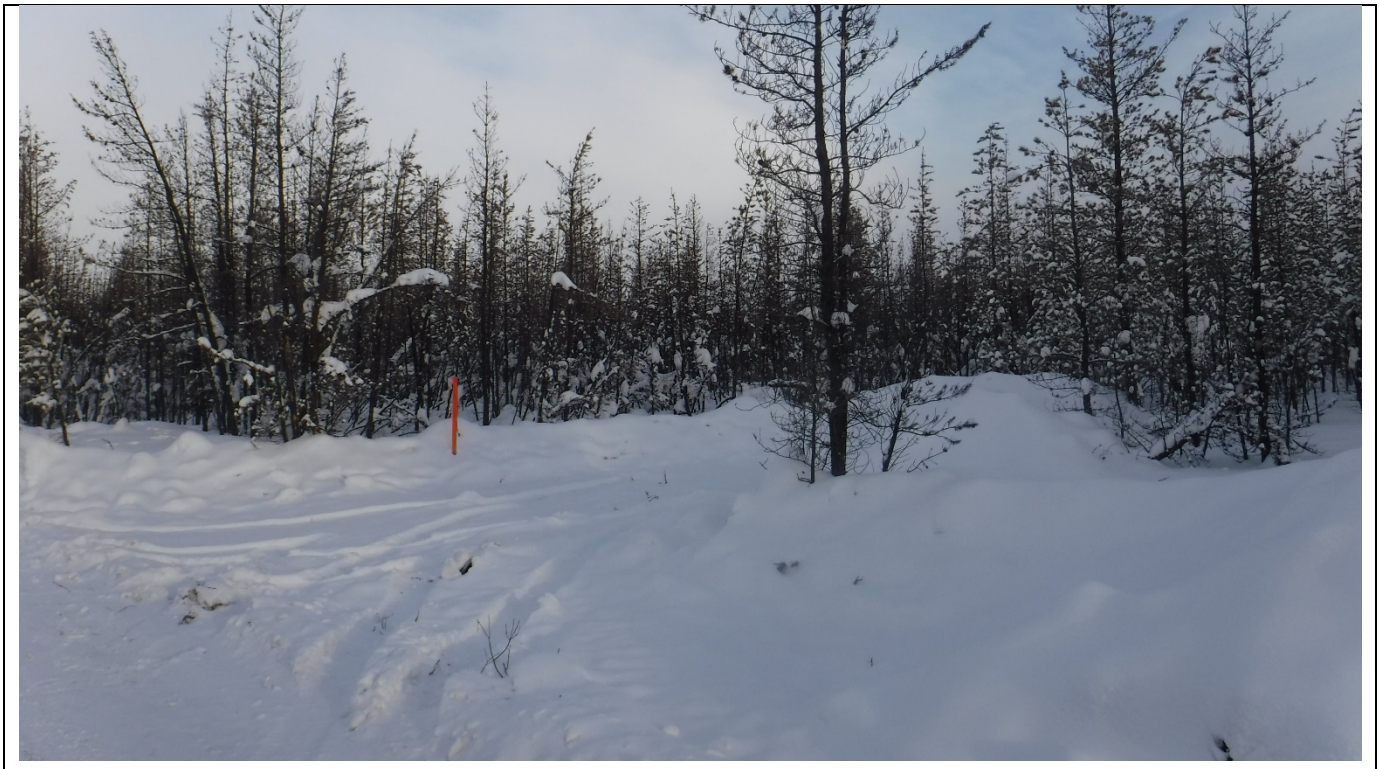


Photo No. 27: Borehole Location BH-15

Photo No. 28: Borehole Location BH-15

Photo No. 29: Borehole Location BH-17

Photo No. 30: Borehole Location BH-17

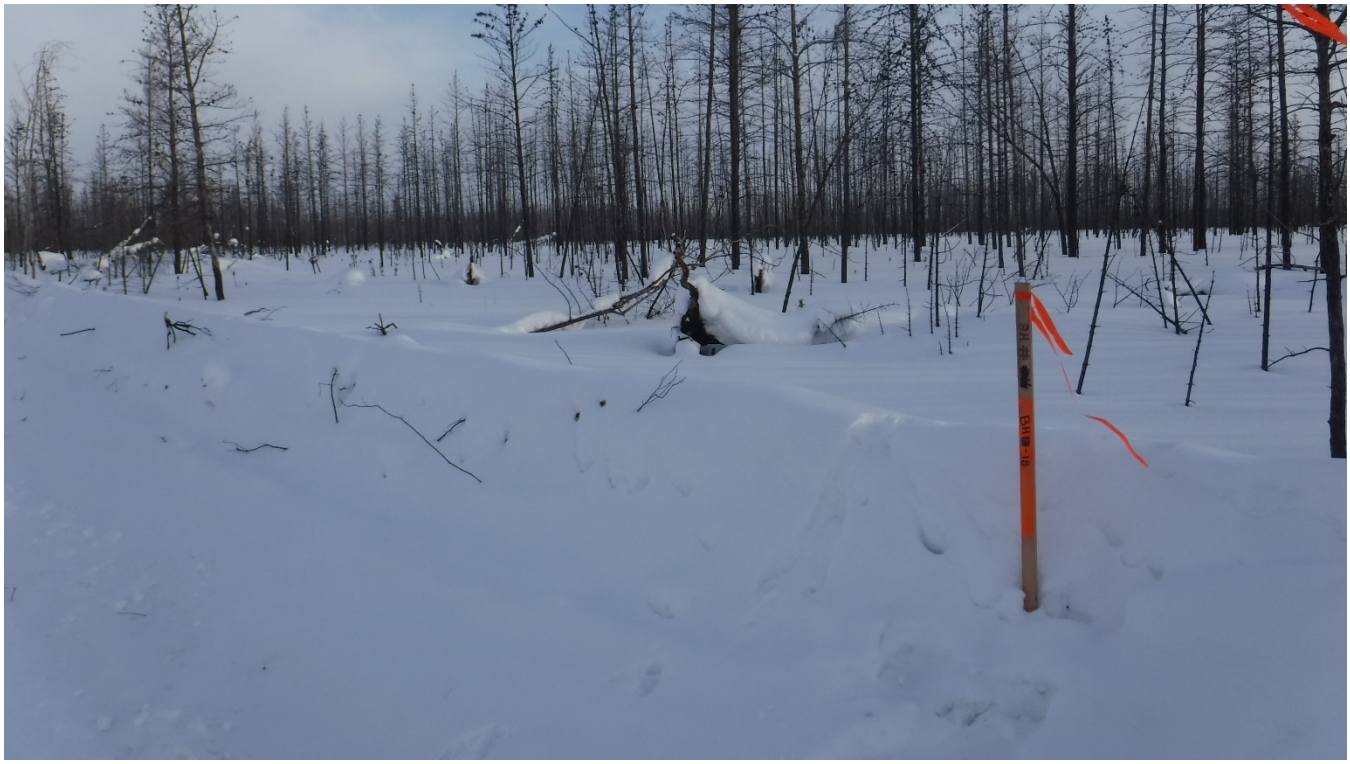


Photo No. 31: Borehole Location BH-18

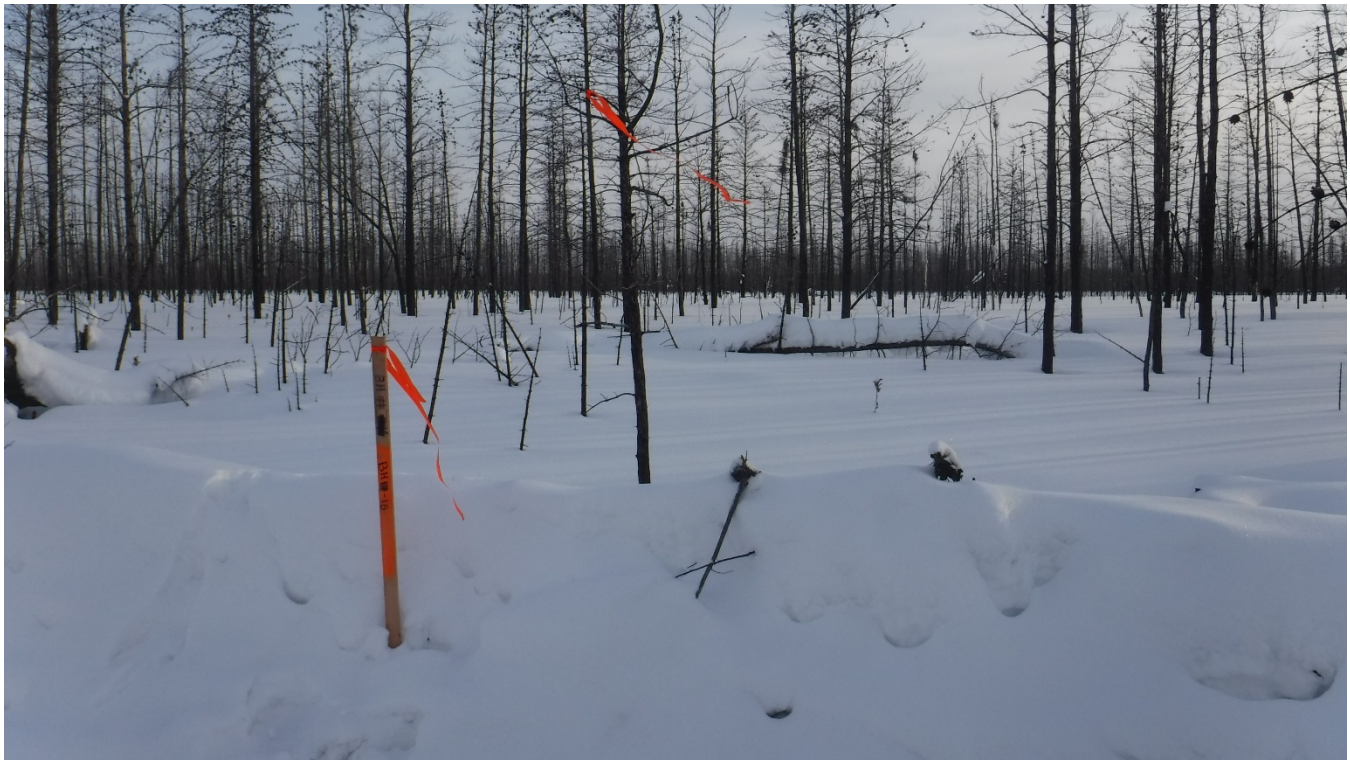


Photo No. 32: Borehole Location BH-18

Photo No. 33: Borehole Location BH-19

Photo No. 34: Borehole Location BH-19

Photo No. 35: Borehole Location BH-20

Photo No. 36: Borehole Location BH-20

Photo No. 37: Borehole Location BH-21

Photo No. 38: Borehole Location BH-21

Photo No. 39: Borehole Location BH-22

Photo No. 40: Borehole Location BH-22

Photo No. 41: Borehole Location BH-23

Photo No. 42: Borehole Location BH-23

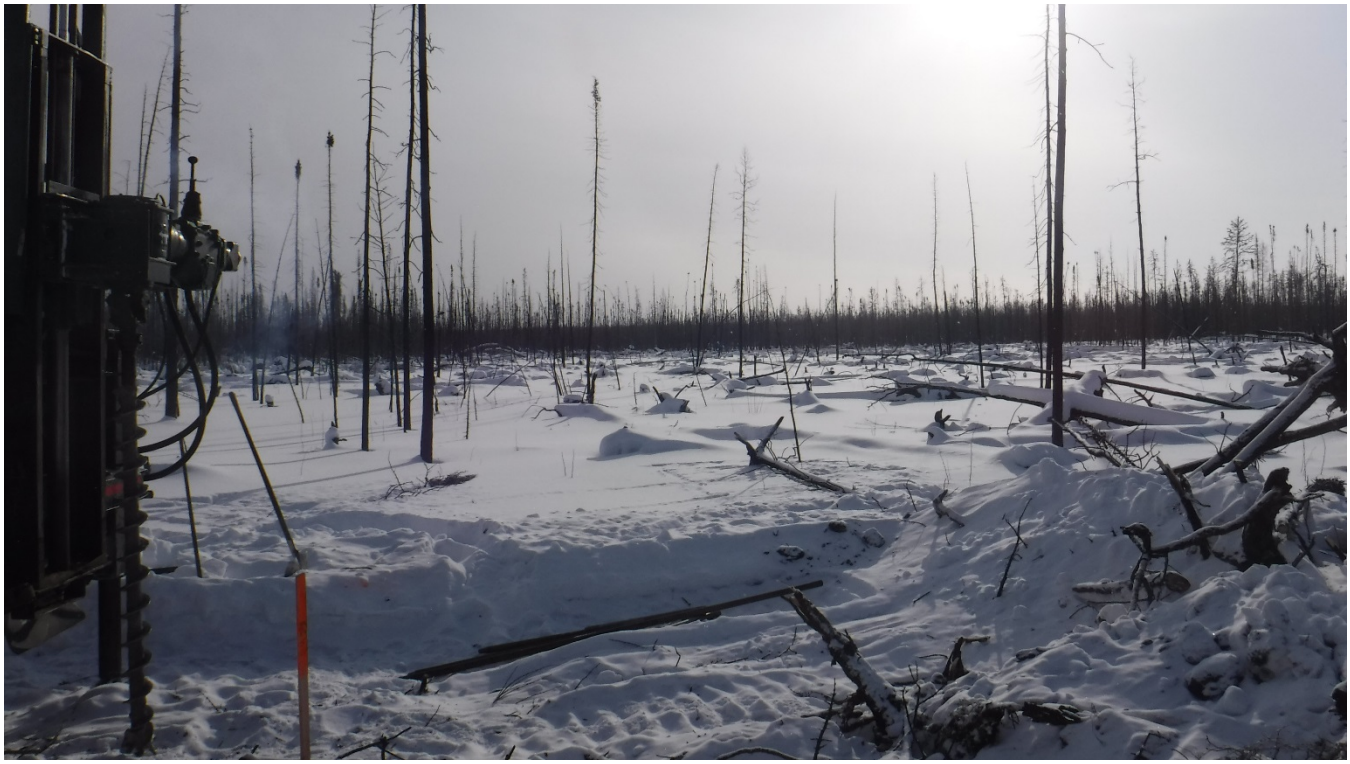


Photo No. 43: Borehole Location BH-24

Photo No. 44: Borehole Location BH-24

Photo No. 45: Borehole Location BH-25

Photo No. 46: Borehole Location BH-25

Photo No. 47: Borehole Location BH-26

Photo No. 48: Borehole Location BH-26

Photo No. 49: Borehole Location BH-27

Photo No. 50: Borehole Location BH-27

Photo No. 51: Borehole Location BH-28

Photo No. 52: Borehole Location BH-28

Photo No. 53: Borehole Location BH-29

Photo No. 54: Borehole Location BH-29

Photo No. 55: Borehole Location BH-30

Photo No. 56: Borehole Location BH-30

Photo No. 57: Borehole Location BH-34

Photo No. 58: Borehole Location BH-34

Photo No. 59: Borehole Location BH-35

Photo No. 60: Borehole Location BH-35

Photo No. 61: Borehole Location BH-36

Photo No. 62: Borehole Location BH-36

Photo No. 63: Borehole Location BH-37

Photo No. 64: Borehole Location BH-37

Photo No. 65: Borehole Location BH-40

Photo No. 66: Borehole Location BH-40

Photo No. 67: Borehole Location BH-41

Photo No. 68: Borehole Location BH-41

Photo No. 69: Borehole Location BH-43

Photo No. 70: Borehole Location BH-43

Photo No. 71: Borehole Location BH-44

Photo No. 72: Borehole Location BH-44

Photo No. 73: Borehole Location BH-45

Photo No. 74: Borehole Location BH-45

Photo No. 75: Borehole Location BH-46

Photo No. 76: Borehole Location BH-46

Photo No. 77: Borehole Location BH-47

Photo No. 78: Borehole Location BH-47

Photo No. 79: Borehole Location BH-48

Photo No. 80: Borehole Location BH-48

Photo No. 81: Borehole Location BH-49

Photo No. 82: Borehole Location BH-49

Photo No. 83: Borehole Location BH-50

Photo No. 84: Borehole Location BH-50

Photo No. 85: Borehole Location BH-51

Photo No. 86: Borehole Location BH-51

Photo No. 87: Borehole Location BH-52

Photo No. 88: Borehole Location BH-52

Photo No. 89: Borehole Location BH-53

Photo No. 90: Borehole Location BH-53

Photo No. 91: Borehole Location BH-54

Photo No. 92: Borehole Location BH-54

Photo No. 93: Borehole Location BH-55

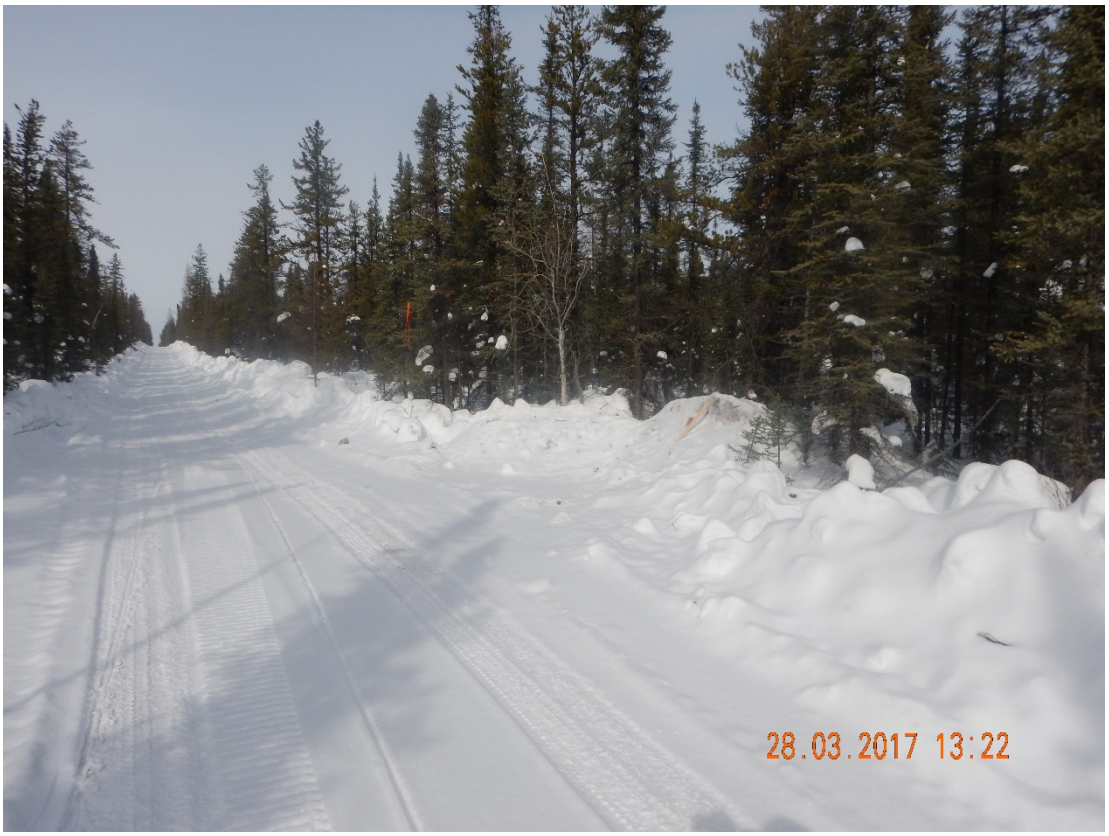


Photo No. 94: Borehole Location BH-55

Photo No. 95: Borehole Location BH-56

Photo No. 96: Borehole Location BH-56

Photo No. 97: Borehole Location BH-61

Photo No. 98: Borehole Location BH-61

Photo No. 99: Borehole Location BH-62

Photo No. 100: Borehole Location BH-62

Photo No. 101: Borehole Location BH-63

Photo No. 102: Borehole Location BH-63

Photo No. 103: Borehole Location BH-64

Photo No. 104: Borehole Location BH-64

Photo No. 105: Borehole Location BH-66

Photo No. 106: Borehole Location BH-66

Photo No. 107: Borehole Location BH-67

Photo No. 108: Borehole Location BH-67

Photo No. 109: Borehole Location BH-68

Photo No. 110: Borehole Location BH-68

Photo No. 111: Borehole Location BH-69

Photo No. 112: Borehole Location BH-69

Photo No. 113: Borehole Location BH-70

Photo No. 114: Borehole Location BH-70

Photo No. 115: Borehole Location BH-75

Photo No. 116: Borehole Location BH-75

Photo No. 117: Borehole Location BH-76

Photo No. 118: Borehole Location BH-76

Photo No. 119: Borehole Location BH-77

Photo No. 120: Borehole Location BH-77

Photo No. 121: Borehole Location BH-78

Photo No. 122: Borehole Location BH-78

Photo No. 123: Borehole Location BH-79

Photo No. 124: Borehole Location BH-79

Photo No. 125: Borehole Location BH-80

Photo No. 126: Borehole Location BH-80

Photo No. 127: Borehole Location BH-81

Photo No. 128: Borehole Location BH-81

APPENDIX C

Table C-1: Road Alignment Summary Table
Symbols and Terms Used on Borehole and Test Pit Records
Stantec Borehole Records

Stantec Consulting Ltd.
102-40 Highfield Park Drive
Dartmouth NS

Project: Geotechnical Investigation, Proposed Tlicho All-Season Road, Northwest Territories
Client: Tlicho Engineering and Environmental Services Ltd. **Project #:** 144902448

Table C-1: Road Alignment Borehole Summary

Borehole	Station	Ground Surface (NAD83 / UTM Zone 11N)			Termination Depth (m)	Termination Elevation (m)	Number of Samples	Thermistor	Notes
		Easting (m)	Northing (m)	Elevation (m)					
BH17-01	0+500	6928000	526043	266	7.5	-	10	X	
BH17-02	1+000	6928062	525547	265.1	7.5	257.6	7		
BH17-03	1+500	6928171	525058	265.9	7.9	258.0	9	X	
BH17-04	3+000	6928247	523570	264.3	3.1	261.2	4		Refusal
BH17-05	4+500	6928553	522108	266.0	1.6	264.4	2		Refusal
BH17-06	6+000	6928391	520619	275.4	1.5	273.9	3		Refusal
BH17-07	7+500	6928206	519126	264.1	4.0	260.2	3		Refusal
BH17-08	9+000	6928931	517889	270.5	0.0	270.5	0		Refusal
BH17-09	10+500	6929879	516729	275.4	1.4	274.0	4		Refusal
BH17-10	12+000	6930620	515454	275.6	3.7	271.9	5		Refusal
BH17-11	13+500	6931315	514143	270.5	4.4	266.1	5		Refusal
BH17-12	15+000	6932197	512931	277.1	1.0	276.1	2		Refusal
BH17-13	16+500	6933081	511712	269.8	2.2	267.6	3		Refusal
BH17-15	18+000	6933983	510481	284.6	0.6	284.0	1		Refusal
BH17-17	19+500	6935340	509951	273.8	7.6	266.1	9		
BH17-18	21+000	6936753	509467	281.8	0.0	281.8	0		Refusal
BH17-19	22+500	6938175	508977	279.4	6.1	273.2	7	X	Refusal
BH17-20	24+000	6939587	508493	278.1	3.7	274.5	6		Refusal
BH17-21	25+500	6941010	508004	289.2	2.2	287.0	4		Refusal
BH17-22	27+000	6942464	508171	291.3	3.0	288.2	4		Refusal
BH17-23	28+500	6943920	508536	288.8	6.0	282.8	6	X	Refusal
BH17-24	30+000	6945390	508498	280.9	3.3	277.5	5		Refusal
BH17-25	31+500	6946874	508256	289.7	0.6	289.1	1		Refusal
BH17-26	33+000	6948351	508017	278.7	1.2	277.5	2		Refusal
BH17-27	34+500	6949832	507806	293.1	0.7	292.4	1		Refusal
BH17-28	36+000	6951325	507607	286.7	0.7	285.9	2		Refusal
BH17-29	37+500	6952792	507326	274.6	7.7	266.8	7	X	
BH17-30	39+000	6954243	507664	272.1	7.6	264.5	7		
BH17-34	40+500	6955595	508258	265.9	6.9	258.9	10		Refusal
BH17-35	42+000	6957036	508555	272.2	5.0	267.2	7		Refusal
BH17-36	43+500	6958523	508770	278.2	4.7	273.5	6		Refusal
BH17-37	45+000	6959851	509397	264.6	4.3	260.3	6	X	Refusal
BH17-40	46+500	6961204	509425	269.9	4.9	265.0	7		Refusal
BH17-41	48+000	6962528.0	508721	277.0	1.5	275.5	3		Refusal
BH17-43	49+500	6963888	508141	278.3	2.1	276.2	3		Refusal
BH17-44	51+000	6965333	508213	282.0	7.8	274.2	10		
BH17-45	52+500	6966831	508280	288.9	3.5	285.4	5		Refusal
BH17-46	54+000	6968303	508067	284.1	8.4	275.7	10		

Stantec Consulting Ltd.
102-40 Highfield Park Drive
Dartmouth NS

Table C-1: Road Alignment Borehole Summary

Borehole	Station	Ground Surface (NAD83 / UTM Zone 11N)			Termination Depth (m)	Termination Elevation (m)	Number of Samples	Thermistor	Notes
		Easting (m)	Northing (m)	Elevation (m)					
BH17-47	55+500	6969750	507672	282.9	5.9	277.1	7		Refusal
BH17-48	57+000	6970967	506930	278.2	4.7	273.5	7	X	Refusal
BH17-49	58+500	6972375	506730	284.2	7.6	276.6	9		
BH17-50	60+000	6973819	506657	280.1	7.6	272.5	10		
BH17-51	61+500	6975304	506858	278.7	3.4	275.4	4		Refusal
BH17-52	63+000	6976800	506876	265.5	3.0	262.5	4		Refusal
BH17-53	64+500	6978225	506954	273.4	2.4	270.9	3		Refusal
BH17-54	66+000	6979521	506304	261.1	7.6	253.5	10		
BH17-55	67+500	6980794	505527	276.8	1.8	275.0	3		Refusal
BH17-56	69+000	6982104	504791	278.9	1.5	277.4	2		Refusal
BH17-61	70+500	6983439	504112	257.5	5.8	251.7	8	X	Refusal
BH17-62	72+000	6984923	503912	274.1	1.2	272.9	2		Refusal
BH17-63	73+500	6986411	503713	271.7	7.0	264.7	8		
BH17-64	75+000	6987893	503508	272.5	2.4	270.1	3		Refusal
BH17-65	76+500	6989342	503287	276.5	1.5	275.0	2		Refusal
BH17-66	78+000	6990764	502804	285.2	1.4	283.8	2		Refusal
BH17-67	79+500	6992190	502333	283.4	6.4	277.0	7	X	
BH17-68	81+000	6993440	501567	271.7	3.7	268.0	4		Refusal
BH17-69	82+500	6994930	501380	271.1	3.8	267.3	6		Refusal
BH17-70	84+000	6996417	501184	269.7	1.2	268.5	2		Refusal
BH17-75	85+500	6997890	501223	262.6	7.6	255.0	6		
BH17-76	87+000	6999200	501581	274.5	1.2	273.3	2		Refusal
BH17-77	88+500	7000689	501749	278.9	1.7	277.2	2		Refusal
BH17-78	90+000	7002178	501632	274.1	2.1	272.0	2		Refusal
BH17-79	91+500	7003535	501122	274.2	0.8	273.5	1		Refusal
BH17-80	93+000	7004778	500283	274.2	0.3	273.9	1		Refusal
BH17-81	93+780	7005424	499850	267.2	1.4	265.8	1		Refusal

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

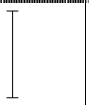
Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

Stantec

BOREHOLE RECORD

N: 6 928 000 E: 526 043

BH17-01

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-01

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 22, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**266.00**							
	265.8	150 mm FROZEN TOPSOIL, with rootlets			AS	1	-	-
1		Frozen, rusty brown, well-graded SAND with silty/clay and gravel (SW-SM/SC) to well-graded GRAVEL with sand (GW)			SS	2	175	50/280
	264.2	- Trace rootlets in top 0.3 m.						
2		- Frozen soil description: Nf - Approx. sample temperature: AS1: -5.2 to -1.5°C SS2: -1.3°C AS3: -1.2 to +3.1°C			AS	3	-	-
3		Grey brown, sandy lean CLAY (CL) to silty clayey SAND with gravel (SM)			SS	4	250	26
	262.6	- Occasional to frequent inferred cobbles / coarse gravel			AS	5	-	-
4		- inferred unfrozen			SS	6	350	30
5		- Unfrozen and very stiff to hard below 3.4 m - Approx. sample temperature: SS6: +1.9 to +3.6°C SS8: +8.0 to +3.2°C			AS	7	-	-
6		- SS6: PP > 245 kPa			SS	8	350	85
					AS	9	-	-
7	258.5				SS	10	300	51
		End of Borehole - Located approx. 30 m off existing winter road - Borehole terminated at target depth approved by field NWT DOT representative. - Thermistor installed.						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 928 062 E: 525 547

BH17-02

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-02

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 15, 2017 WATER LEVEL 1.9 m (Feb 15) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**265.14**							
	265.0	152 mm FROZEN ROOTMAT			AS	1		
	264.5	- Approx. sample temperature: AS1: -3.5°C at ground surface						
1		Frozen, brown, poorly-graded SAND (SP) to poorly-graded SAND with silt and/or clay (SP-SM/SC), trace rootlets			SS	2	425	45
		- Frozen soil description: Nf						
2		- Approx. sample temperature: SS2: -3.5°C to +0.8°C			SS	3	375	13
	262.2	Compact, brown, poorly-graded SAND (SP) to poorly-graded SAND with silt and/or clay (SP-SM/SC)			AS	4		-
3								
4		- Approx. sample temperature: SS3: +0.8 and +1°C			SS	5	375	23
		Very stiff to hard, brown-grey, sandy lean CLAY (CL), trace gravel						
5								
		- Approx. sample temperature: SS5: +3.9°C SS6: +5.8°C SS7: +4.8°C			SS	6	375	34
6								
7					SS	7	475	32
	257.6	End of Borehole						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 928 171 E: 525 058

BH17-03

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-03

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 16, 2017 WATER LEVEL 5.2 m (Feb 16) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**265.93**							
	265.8	150 mm FROZEN ROOTMAT						
		Frozen, brown, poorly-graded SAND (SP) to poorly-graded sand with clay and/or silt (SP-SC/SM) - Frozen soil description: Nf - Approx. sample temperature: AS1: -1.9°C SS2: -3.6°C SS4: -1.0 to -1.6°C AS5: +1.0°C			AS	1	-	-
1					SS	2	350	29
2					AS	3	-	-
	263.1	SS6: -0.5 to +1.0°C			SS	4	325	17
3		- Unfrozen and compact below 2.85 m depth - Approx. sample temperature: AS7: +0.4 to 0.5°C SS8: +0.9 to 1.8°C SS9: +0.5 to -1.0°C			AS	5	-	-
4					SS	6	325	32
5		- flowing sand at 5.6 to 7.2 m depth		▽	AS	7	-	-
6					SS	8	375	15
7								
					SS	9	610	18
	258.0							
8		End of Borehole - Located approx. 5 m off existing winter road. - Thermistor installed.						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 928 247 E: 523 570

BH17-04

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-04

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 22, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**264.32**							
	264.2	150 mm FROZEN TOPSOIL/ROOTMAT			AS	1	-	-
1		Frozen, brown to light brown, silty/clayey SAND (SM/SC) to well-graded SAND with silt and/or clay (SW-SM/SC), trace rootlets			SS	2	480	22
	262.5	- Frozen soil description: Nf						
2		- Approx. sample temperature: AS1: -3.0 to -4°C SS2: -4.0 to -2.3°C			AS	3	-	-
					SS	4	330	20/530
3	261.2	Compact, brown to grey-brown, sandy lean CLAY (CL), trace gravel						
		- Approx. sample temperature: SS4: +1.9 to +3.1°C						
4		End of Borehole						
		- Auger refusal at 3.1 m depth. Additional auger probes completed: - Auger refusal 1.2 m south at 2.6 m depth. - Auger refusal 1.3 m north at 2.5 m depth.						
5		- Located approx. 10 m off existing winter road						
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

Inferred Groundwater Level

Groundwater Level Measured in Standpipe

Field Vane Test, kPa

Remoulded Vane Test, kPa App'd

Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 928 553 E: 522 108

BH17-05

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-05

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 24, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**266.04**							
	265.9	152 mm FROZEN TOPSOIL/ROOTMAT						
		Frozen, light brown, poorly-graded SAND (SP), with silt, some gravel, trace rootlets - Frozen soil description: Nf			AS	1		
1					SS	2	180	75/180
	264.4	- Approx. sample temperature: AS1: -15.2 to -14.3°C SS2: -3.5 to -7.1°C						
2		End of Borehole						
		- Auger refusal at 1.6 m depth. - Refusal also encountered at 1.5 m depth, 1.2 m east of BH17-05 - Refusal also encountered at 1.5 m depth, 2.4 m east of BH17-05						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 928 391 E: 520 619

BH17-06

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-06

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 16, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	275.36							
		Frozen, red-brown to light brown, well-graded SAND (SW-SM) with silt and gravel - Frozen soil description: Nf			AS	1	-	-
1					SS	2	50	50/75
		- Approx. sample temperature: AS1: -3.0 to -4.0°C AS3: -0.3 to -1.5°C			AS	3	-	-
	273.9	End of Borehole - Auger refusal at 1.5 m depth. Additional auger probes completed: - Refusal also encountered at 1.5 m depth, 1.5 m south of BH17-06 - Refusal also encountered at 1.4 m depth, 2.7 m south of BH17-06						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 928 206 E: 519 126

BH17-07

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-07

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 16, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**264.13**							
		Frozen, light brown, well-graded SAND (SW), trace gravel - occasional inferred cobbles - Frozen soil decription: Nf - Approx. sample temperature: AS1: -3.0°C SS2: -2.8 to 3.0°C			AS	1	-	-
1								
2					SS	2	350	41
3	261.1							
		Frozen (inferred), brown, silty and/or clayey SAND with gravel (SC/SM) - occasional inferred cobbles - Frozen soil decription: Nbn - Approx. sample temperature: SS2: -3.0 to -3.5°C			SS	3	440	50/44
4	260.2	End of Borehole - Auger refusal at 4.0 m depth. Additional auger probes completed: - Auger refusal 3 m east at 2.3 m depth. - Auger refusal 6 m east at 2.2 m depth.						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 928 931 E: 517 889

BH17-08

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-08

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 17, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**270.47**							
	270.4	Auger refusal on inferred bedrock / boulders at surface.						
		End of Borehole						
		- Additional auger probes advanced with drill shifted over: - Auger refusal 3 m west at surface. - Auger refusal 2 m west at surface.						

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

1 2 3 4 5 6 7 8 9 10

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 929 879 E: 516 729

BH17-09

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-09

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 17, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**275.39**							
		Frozen, light brown, silty SAND (SM) to silty clayey SAND (SC-SM), trace gravel			GS	1	-	-
					GS	2	-	-
	274.5	- Frozen soil description: Nf to Nbn						
1					GS	3	-	-
	274.0	Inferred cobbles/boulders or bedrock			SS	4	0	50/25
		End of Borehole						
2		- Auger refusal at 1.4 m depth. Additional auger probes completed with drill shifted: - Auger refusal 4 m west at 0.8 m depth. - Auger refusal 4 m north-west at 0.9 m depth.						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 930 620 E: 515 454

BH17-10

CLIENT Tlicho Engineering and Environmental Services Ltd.

LOCATION Northwest Territories, Canada

DATES: BORING February 17, 2017 WATER LEVEL N/A

BOREHOLE No. BH17-10

PROJECT No. 144902448

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**275.57**							
	275.5	100 mm Frozen ROOTMAT/TOPSOIL						
		Frozen, brown, sandy lean CLAY (CL), trace gravel - Inferred cobbles/boulders - Frozen soil description: Nbn - Approx. Sample Temperature: AS1: -11.0 to -13.4°C SS2: -1.0 to +1.5°C			AS	1	-	-
1	274.3				SS	2	305	43
2		- Inferred unfrozen and very stiff below 1.3 m.			AS	3	-	-
3	272.2				SS	4	50	23
	271.9	Inferred cobbles and boulders or bedrock			AS	5	-	-
4		End of Borehole - Auger refusal at 3.7 m depth in inferred boulders and cobbles / bedrock. Additional auger probes completed with drill shifted: - Refusal was also encountered at 3.7 m depth, 0.9 m south of BH17-10						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

App'd

Date

Stantec

BOREHOLE RECORD

N: 6 931 315 E: 514 143

BH17-11

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-11

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 17, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**270.51**							
	270.1	460 mm Frozen ROOTMAT/TOPSOIL						
1		Frozen, brown, clayey SAND (SC) to sandy lean CLAY (CL), trace gravel - Frozen soil decription: Nbn			AS	1	-	-
	268.7	- Approx. sample temperature: SS2: 0 to 3.1°C			SS	2	165	23
2		- unfrozen and hard below 1.8 m depth			AS	3	-	-
3					SS	4	406	35
					AS	5	-	-
4	266.1							
		End of Borehole - Auger refusal at 4.4 m depth. Additional auger probes completed with drill shifted: - Refusal also encountered 0.9 m south at 3.8 m depth. - Refusal also encountered 1.8 m south at 4.4 m depth.						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 932 197 E: 512 931

BH17-12

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-12

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 17, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**277.14**							
	276.7	460 mm FROZEN ROOTMAT/TOPSOIL - Frozen soil description: Nf - Approx. sample temperature: AS1: -3.2 to -2.0°C			AS	1	-	-
1	276.1	Frozen, rusty brown to brown, well- to poorly-graded SAND (SP) with silt (SW-SM to SP-SM) - Frozen soil description: Nf - Approx. sample temperature: AS2: - 1.5 to -2.0°C			AS	2	-	-
2		End of Borehole - Refusal at 1.0 m depth. Additional auger probes completed with drill shifted: - Refusal also encountered 1.2 m south at 0.9 m depth. - Refusal also encountered 1.5 m south at 0.9 m depth.						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 933 081 E: 511 712

BH17-13

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-13

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 17, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**269.81**							
		Frozen, rusty brown to brown, sandy SILT (ML), trace gravel - Trace rootlets in top 0.6 m. - Frozen soil description: Nf - Approx. sample temperature: AS1: -3.2 to -2.0°C SS2: -1.4 to -3.2°C			AS	1	-	-
1	268.7				SS	2	381	54
	268.4	Laminations of frozen, grey silty SAND (SM) - Vx to Vs: with coatings and lenses (<2mm thick) of ice (<5% est'd total visible ice)			AS	3	-	-
2	267.6							
		Frozen, brown, sandy lean CLAY (CL) - occasional inferred cobbles - Frozen soil description: Nbn						
3		End of Borehole						
4		- Auger refusal at 2.2 m depth. Additional auger probes completed with drill shifted: - Auger refusal encountered 0.9 m east at 2.2 m depth. - Auger refusal encountered 1.8 m east at 2.2 m depth.						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 933 983 E: 510 481

BH17-15

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-15

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 17, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**284.60**							
	284.0	Frozen, brown, silty SAND with gravel (SM) - frequent cobbles observed at surface and inferred with depth - Approx. sample temperature: AS1: -7 to -7.5°C			AS	1	-	-
		End of Borehole - Auger refusal at 0.6 m depth. completed with drill shifted: Additional auger probe encountered refusal 2 m north at 0.3 m depth. - Additional auger probe encountered refusal 2 m north at <0.3 m depth.						
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 935 340 E: 509 951

BH17-17

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-17

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 17, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**273.76**							
0		Frozen, brown, poorly graded SAND (SP) to poorly graded SAND with silt or clay (SP-SM/SC) - Occasional inferred cobbles - Frozen soil description: Nf - Approx. sample temp: AS1: -3.5 to -4.0°C SS2: -3.5 to -3.8°C AS3: -4 to -4.8°C SS4: -3.9°C			AS	1	-	-
1								
2					SS	2	500	36
2					AS	3	-	-
3								
3					SS	4	490	12
	270.1							
4		Frozen (inferred), brown to grey, sandy lean CLAY (CL), trace gravel - Frozen soil description: Nf to Nbn - Approx. sample temperature: AS5: -4.3 to -4.8°C AS7: 2.6°C SS8: -1.8°C AS9: -4.5°C			AS	5	-	-
5					SS	6	560	6
5					AS	7	-	-
6								
6					SS	8	350	12
7					AS	9		-
	266.1							
8		End of Borehole						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

275

300

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 936 753 E: 509 467

BH17-18

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-18

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 18, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm)	SAMPLES: N-VALUE OR RQD
0	**281.83**							
	281.7	Auger refusal at surface due to inferred boulders - Additional auger probes completed with drill shifted: - Refusal encoutered 2 m east at surface on inferred boulder. - Refusal encoutered 9 m west at surface on inferred boulder. - Refusal encoutered 3 m to south and to 5 m west at surface on inferred boulder.						
1								
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7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 938 175 E: 508 977

BH17-19

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-19

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 21, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**279.36**							
	279.1	300 mm FROZEN ROOTMAT/TOPSOIL						
	278.7	Frozen, light to rusty brown, well-graded SAND with silt/clay and gravel (SW-SM/SC), trace rootlets - Frozen soil description: Nf - Approx. sample temperature: AS1: -4.2 to -1.3°C			AS	1	-	-
1					SS	2	406	11
2	277.2	Frozen, brown, sandy lean CLAY with gravel (CL) to sandy silt/clay (SC/SM) - Some inferred cobbles. - Frozen soil description: Nbn - Approx. sample temperature: SS2: -1.1 to 0.4°C			AS	3	-	-
3					SS	4	50	21
4		- Unfrozen and compact to dense below 2.2 m depth. - Approx. sample temperature: AS3: +3.3 to +8.2°C			AS	5	-	-
5		SS4: +2.6°C AS5: +3.8 to 5.6°C SS6: +3.0 to 5.6°C			SS	6	230	50/75
6	273.2	- Auger refusal at 2.8 m depth on inferred boulder. Drill shifted 1.5 m north and hole continued.			AS	7	-	
		End of Borehole - Terminated at target depth approved by NWT DOT field representative. - Additional auger probes completed 24/2/2017: - Auger refusal encountered 1.5 m north at 2.75 m depth. - Auger refusal encountered 3 m south at 5.9 m depth. - Thermistor installed.						
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

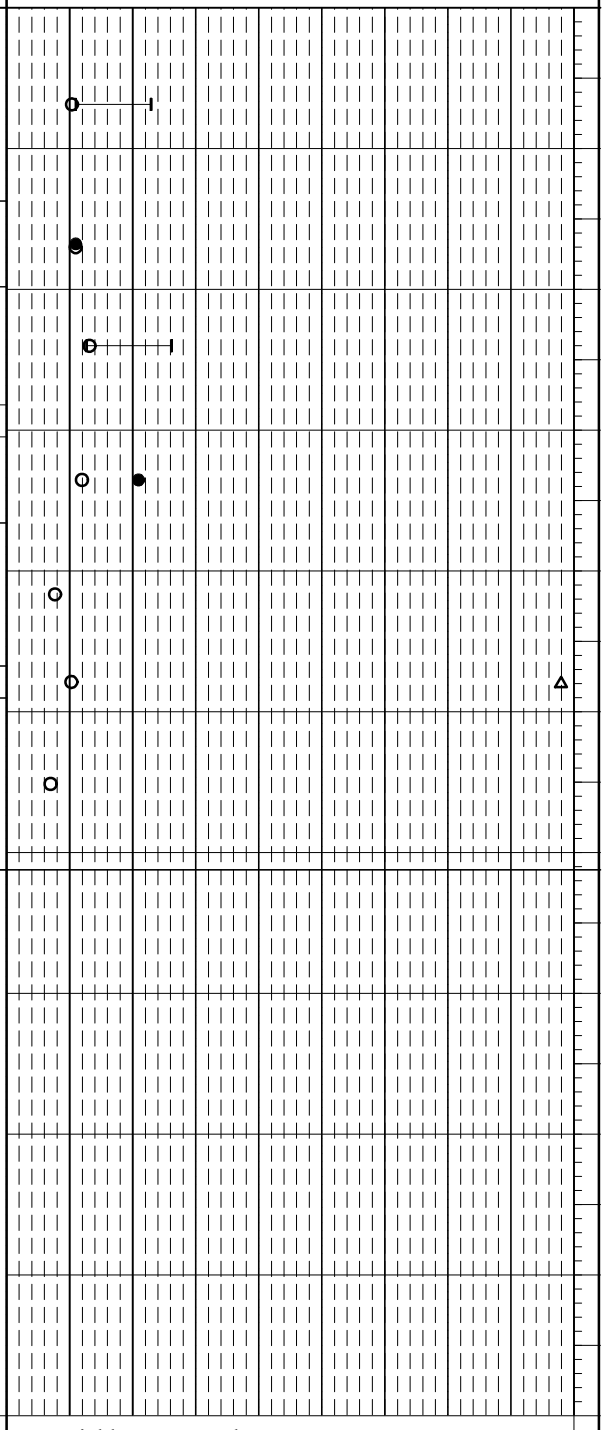
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd _____

△ Pocket Penetrometer Test, kPa Date _____

Stantec

BOREHOLE RECORD

N: 6 939 587 E: 508 493

BH17-20

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-20

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 23, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.13**							
	278.1	75 mm FROZEN TOPSOIL/ROOTMAT			AS	1	-	-
1		Frozen, brown, sandy-silty CLAY (CL-ML) to lean CLAY (CL) with sand, trace gravel - Frozen soil description: Nbn - Occasional inferred cobbles			SS	2	445	62
2		- Approx. sample temperature: AS1: -1.6 to -1.0°C SS2: -3.7 to -2.1°C AS3: +2.2 to +3.0°C SS4: -2.1 to -0.6°C			AS	3	-	-
3					SS	4	180	72/180
					AS	5	-	-
	274.5				SS	6	0	50/0
4		End of Borehole - Auger refusal at 3.7 m depth. - Auger probe refusal encountered 2 m north at 3.4 m depth. - Auger probe refusal encountered at 4 m north at 3.1 m depth.						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 941 010 E: 508 004

BH17-21

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-21

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 25, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**289.23**							
		Frozen, rusty light brown, poorly-graded SAND with silt/clay (SP-SM/SC), trace fine gravel			AS	1	-	-
	288.5	- Frozen soil description: Nf			AS	2	-	-
1		- Approx. sample temperature: AS1: -2.3 to -0.5°C			SS	3	0	50/25
		Inferred cobbles and boulders, or bedrock			AS	4	-	
2	287.0	- Thermal state unknown						
		End of Borehole						
3		- Auger refusal at 2.2 m depth. Additional auger probe holes completed with the drill offset: - Refusal encoutered 3 m south at 0.8 m depth. - Refusal encoutered 5 m north at 1.0 m depth.						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 942 464 E: 508 171

BH17-22

CLIENT Tlicho Engineering and Environmental Services Ltd.

LOCATION Northwest Territories, Canada

DATES: BORING February 25, 2017 WATER LEVEL N/A

BOREHOLE No. BH17-22

PROJECT No. 144902448

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**291.26**							
	291.1	150 mm FROZEN TOPSOIL/ROOTMAT			AS	1	-	-
1		Frozen, brown, well-graded GRAVEL with silt/clay and sand (GW-GM/GC)			SS	2	50	50/25
	290.0	- Frozen soil description: Nbn - Approx. sample temperature: AS1: -4.4 to -7.3°C			AS	3	-	-
2		Frozen, brown, sandy lean CLAY (CL), trace gravel						
	288.8	- Frozen soil description: Nbn - Approx. sample temperature: SS3: +0.8 to 2.3°C			SS	4	130	69
3	288.2	- Inferred unfrozen and hard below 2.4 m depth. - Approx. sample temperature: SS4: -1.6 to 2.3°C						
4		End of Borehole - Refusal at 3.0 m - Refusal also encountered at 3.2 m depth, 2.1 m west of BH17-22 - Refusal also encountered at 3.1 m depth, 1.8 m west of BH17-22 - Located approx. 10 m off existing winter road						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 943 920 E: 508 536

BH17-23

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-23

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**288.80**							
	288.6	150 mm FROZEN TOPSOIL/ROOTMAT			AS	1	-	-
		Frozen, brown, well-graded GRAVEL with sand and silt/clay (GW-GM/GC)						
1	287.4	- Trace rootlets in top 1.0 m - Frozen soil description: Nf to Nbn			SS	2	315	28
2	286.8	- Approx. sample temperature: AS1: < 0°C SS2: < 0°C			AS	3	-	-
		Frozen, brown to grey, sandy lean CLAY (CL) to gravelly lean CLAY with sand (CL)						
3		-Occasional inferred cobbles - Frozen soil description: Nbn			SS	4	100	39
		- Unfrozen and very stiff to hard below approx. 2.0 m depth.						
4		- Approx. sample temperature: SS4: +3.0 to +5.1°C SS6: +0.5 to 3.5°C			AS	5	-	-
5								
					SS	6	230	39
6	282.8	End of Borehole						
		- Auger refusal at 6.0 m depth. Additional auger probe holes completed with the drill offset: - Refusal also encountered 1.8 m east at 2.4 m depth. - Refusal also encountered 2.1 m east at 3.2 m depth. - Thermistor installed. - Located approx. 1.5 km off existing winter road						
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 945 390 E: 508 498

BH17-24

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-24

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 27, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**280.87**							
	280.7	150 mm FROZEN TOPSOIL/ROOTMAT						
		Frozen, brown, sandy lean CLAY (CL) to clayey SAND (SC), trace gravel - Occasional inferred cobbles - Frozen soil description: Nbn - Approx. sample temperature: SS2: -2.1 to -4.7°C AS3: -1.2 to -0.1°C SS4: -3.9 to -2.8°C			AS	1	-	-
1					SS	2	255	47
2					AS	3	-	-
3					SS	4	290	39
	277.5				AS	5	-	-
		End of Borehole - Auger refusal at 3.3 m depth. Additional auger probe holes completed with the drill offset: - Refusal encountered 2.1 m east at 2.8 m depth. - Refusal encountered 4.5 m east at 2.4 m depth. - Located approx. 1.9 km off existing winter road						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 946 874 E: 508 256

BH17-25

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-25

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING February 27, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**289.68**							
	289.5	200 mm Frozen ROOTMAT/TOPSOIL			GS	1	-	-
	289.1	Frozen, well-graded gravel with sand and silt (GW-GM) - Frozen soil description: Nf to Nbn - Rootlets - Occasional cobbles						
1								
2		End of Borehole - Borehole abandoned at 0.6 m depth due to drill breakdown. - Located approx. 0.8 km off existing winter road						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 948 351 E: 508 017

BH17-26

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-26

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 3, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.74**							
	278.6	450 mm FROZEN TOPSOIL/ROOTMAT						
	278.3	Frozen, brown, well-graded GRAVEL with silt and sand (GW-GM)			AS	1	-	-
1	277.5	- Trace rootlets - Frozen soil description: Nf - Approx. sample temperature: AS1: -5°C			SS	2	75	50/75
2		Frozen, brown, silty clayey SAND with gravel (SM-SC) - Frozen soil description: Nbe						
3		End of Borehole - Auger refusal at 1.2 m depth. Additional auger probe holes completed with the drill offset: - Refusal encountered 1.2 m east at 1.1 m depth. - Refusal encountered 2.4 m east at 1.0 m depth.						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 949 832 E: 507 806

BH17-27

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-27

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 3, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**293.12**							
	293.0	75 mm FROZEN TOPSOIL/ROOTMAT			AS	1	-	-
	292.4	Brown, frozen, silty clayey GRAVEL with sand (GW-GM/GC) - Trace rootlets in top 0.3 m - Frozen soil description: Nbn						
1		End of Borehole - Auger refusal at 0.7 m depth. Additional auger probe holes completed with the drill offset: - Refusal encountered 1.5 m east at 0.6 m depth. - Refusal encountered 3.0 m east at 0.7 m depth.						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 951 325 E: 507 607

BH17-28

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-28

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 3, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**286.65**							
	286.6	50 mm FROZEN ROOTMAT/TOPSOIL			AS	1	-	-
	285.9	Frozen, rusty brown, sandy SILT (ML), trace gravel - Trace rootlets in top 0.15 m - Frozen soil description: Nbn			SS	2	0	50/0
1		End of Borehole - Auger refusal at 0.7 m depth. Additional auger probe holes completed with the drill offset: - Refusal encountered 1.2 m west at 0.4 m depth. - Refusal encountered 1.5 m north-west at 0.5 m depth.						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 952 792 E: 507 326

BH17-29

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-29

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 17, 2017 WATER LEVEL 4.0 m (Mar 3) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**274.56**							
	274.5	100 mm FROZEN TOPSOIL\ROOTMAT						
		Frozen, rusty brown to brown, poorly-graded SAND with silt/clay (SP-SM/SC), trace fine gravel			AS	1	-	-
1		- Trace rootlets in top 0.3 m			SS	2	405	-
	272.8	- Frozen soil description: Nf						
2	272.4	- Approx. sample temperature: AS1: -2.8 to -3.9°C SS2: -8.3 to -5.6°C			AS	3	-	-
		Partings of frozen (Nbn) sandy SILT (ML) to silty SAND (SM) from 1.75 m to 2.1 m depth			SS	4	75	23
3	271.0	Frozen, grey, grey, sandy lean CLAY (CL) to silty clayey SAND with gravel (SC-SM)						
		- Occasional inferred cobbles						
4		- Frozen soil description: Nbn		▽	SS	5	280	22
		- Approx. sample temperature: SS4: -6.1 °C						
5		Unfrozen and very stiff to hard below approx. 2.1 m depth						
		- Approx. sample temperature: SS5: -2.1 to 0.7 °C SS6: 0.1 to 1.3 °C SS7: 12.9 to 15.8 °C			SS	6	190	48
6								
7		- With occasional partings of brown fine SAND to silty SAND material			SS	7	255	75
	266.8	End of Borehole						
8		- Thermistor installed.						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 954 243 E: 507 664

BH17-30

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-30

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING April 3, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**272.07**							
		Frozen, brown to grey, silty/clayey SAND with gravel - Frozen soil description: Vx - with trace fine ice inclusions (<5% est'd total visible ice content) - Approx. sample temperature: SS1: -6.2 to -4.8°C AS3: -1.7°C			AS	1	-	-
1					SS	2	430	67
2					AS	3	-	-
	269.6				SS	4	0	50/0
3		Dense to very dense, grey, silty SAND with gravel (SM) - Frequent inferred cobbles/boulders - Thermal state unknown due to drill disturbance (heat from difficult augering)			AS	5	-	-
4					SS	6	0	50/0
5					AS	7	-	-
6					SS	8	0	50/0
7					AS	9	-	-
	264.5				SS	10	0	50/0
8		End of Borehole						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 955 595 E: 508 258

BH17-34

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-34

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING April 3, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**265.87**							
	265.8	100 mm Frozen TOPSOIL/ROOTMAT						
		Frozen, brown, lean CLAY (CL) - Occasional fine sand laminations			AS	1	-	-
1	264.4	- Frozen soil description: Nbn to Vs - with thin horizontal laminations of ice (<10% est'd total visible ice)			SS	2	580	55
2		- Approx. sample temperature: SS2: -5.5 to -2.2°C			AS	3	-	-
		Frozen, brown, sandy lean CLAY with gravel - Occasional inferred cobbles - Frozen soil description: Nbn - Approx. sample temperature: SS4: +3.8 to -2.3°C SS5: -0.4 to -1.2°C SS6: -0.4 to +0.3°C			SS	4	330	24
3								
4					SS	5	280	31
	261.0			▽				
5		- Unfrozen, hard below 4.9 m depth - with frequent inferred cobbles below 5.2 m depth			SS	6	165	N/A
					SS	7	40	50/75
6					AS	8		
					SS	9	50	50/50
	258.9				SS	10	75	50/75
7		End of Borehole - Auger refusal at 6.9 m depth. - Additional auger probe hole 2.1 m east encounters refusal at 6.9 m depth. - Located approx. 20 m off existing winter road						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd _____

△ Pocket Penetrometer Test, kPa Date _____

Stantec

BOREHOLE RECORD

N: 6 957 036 E: 508 555

BH17-35

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-35

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 5, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**272.21**							
	272.1	130 mm FROZEN ROOTMAT						
		Frozen, medium brown to medium grey, sandy lean CLAY (CL)			AS	1	-	-
1	271.0	- Trace gravel - Some cobbles inferred - Frozen soil description: Nf to Vx (<5% est'd total visible ice) - Approx. sample temperature: AS1: -1.0 to -1.8°C			SS	2	560	77
2					AS	3	-	-
		Frozen, medium brown to light grey, gravelly SILT (ML) with sand - Trace cobbles inferred - Frozen soil description: Nf to Vx (<10% est'd total visible ice) - Approx. sample temperature: SS2: -4.2 to -5.2°C SS4: -1.7 to -2.3°C			SS	4	480	59
3					AS	5	-	-
4					SS	6	150	50/150
					AS	7	-	-
5	267.2	SS2: PP= >245 kPa SS4: PP= >245 kPa						
		End of Borehole - Refusal at 5.0 m depth - Refusal at 4.4 m depth, 1.5 m south of BH17-35 - Refusal at 4.6 m depth, 2.0 m south of BH17-35						
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 958 523 E: 508 770

BH17-36

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-36

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 6, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.25**							
	278.1	130 mm FROZEN ROOTMAT						
		Frozen, medium brown, sandy silt and/or clay to sandy lean CLAY (CL) - Trace gravel - Some cobbles inferred - Frozen soil description: Vx to Vc (<5% est'd total visible ice)) - Approx. sample temperature: AS1: -1 to -2.5°C SS2: -4.9 to -5.6°C AS3: -0.5 to +1.0°C SS4: -4.8 to -5.3°C			AS	1	-	-
1					SS	2	455	95
2					AS	3	-	-
	275.8							
3		SS2: PP=>245 kPa			SS	4	380	76
		Frozen, medium brown, lean CLAY (CL) with sand			AS	5	-	-
4	273.5	- Some cobbles inferred - Frozen soil description: Vx to Vc (<5% est'd total visible ice) - Approx. sample temperature: SS4: -4.8 to -5.3°C			SS	6	0	50/0
5		SS4: PP=>245 kPa						
6		End of Borehole						
7		- Refusal at 4.7 m depth - Refusal at 3.4 m depth, 1 m west of Bh17-36 - Refusal at 1.8 m depth, 3.5 m west of BH17-36						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245.25

245.25

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 959 851 E: 509 397

BH17-37

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-37

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 6, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	264.56							
	264.4	180 mm FROZEN ROOTMAT with organic material (peat)			AS	1	-	-
		Frozen, brown, ORGANIC SOIL trace silty clay - Frozen soil decription: Vx-Vc (<20% est'd total visible ice) - Approx. sample temperature: AS1: -1.0 to -1.9°C						
1	263.3				SS	2	355	17
2		Frozen, lean CLAY (CL) with sand to silt and/or clay with sand - Trace gravel - Trace organic material - Frozen soil decription: 1.2 m to 3.2 m: Vx-Vc (<5% est'd total visible ice) below 3.2 m: Nbn - Approx. sample temperature: SS2: -5.6 to -6.2°C AS3: -2.5 to -3.8°C SS4: -3.6 to -4.9°C AS5: -1.0 to -1.5°C PP: SS2> 245 kPa PP: SS4>245 kPa			AS	3	-	-
3					SS	4	305	21
4					AS	5	-	-
	260.3				SS	6	100	50/150
5		End of Borehole - Refusal at 4.3 m depth - Refusal at 4.3 m depth, 5 m south of BH17-37 - Refusal at 4.0 m depth, 7 m south of BH17-37 - Thermistor string installed.						
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

113.6
221.5
245.25
245.25

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 961 204 E: 509 425

BH17-40

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-40

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 8, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**269.87**							
	269.8	80 mm FROZEN ROOTMAT			AS	1	-	-
		Frozen, dark brown, ORGANIC SOIL (peat) with sand and some gravel						
1	269.0	- Frozen soil decription: Vc (<10% est'd total visible ice)			SS	2	44%	58
		Frozen, dark brown to dark grey, clayey SAND (SC)						
2		- trace gravel			AS	3	-	-
	267.5	- some cobbles inferred						
		- Frozen soil description: 0.9 m to 1.7 m: Vx-Vc (<5% est'd total visible ice), 1.7 m to 2.4 m: Nbn			SS	4	85%	53
3		- Approx. sample temperature: AS1: -2.3°C SS2: -2.3°C			AS	5	-	-
4	265.8	SS2: PP>245 kPa						
		SS4: PP>245 kPa			SS	6	54%	50
	265.2	- Inferred unfrozen and dense						
	265.0	below 2.4 m depth			AS	7	-	-
5		- Approx. sample temperature: SS6: 0.2 to 0.9°C						
		Dense, medium brown to dark grey, silty and/or clayey sand with gravel						
6		- some cobbles inferred						
		- Approx. sample temperature: SS6: 0.2 to 0.9°C						
7		Inferred white BEDROCK						
		End of Borehole						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

245.23

245.23

Inferred Groundwater Level

Groundwater Level Measured in Standpipe

Field Vane Test, kPa

Remoulded Vane Test, kPa App'd

Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 962 528 E: 508 721

BH17-41

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-41

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 11, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**277.00**							
	276.9	75 mm FROZEN ROOTMAT						
		Frozen, light brown to medium brown, silty and/or clayey SAND - trace gravel - occasional cobbles inferred			AS	1		
1					SS	2	0	50/0
					AS	3		
	275.5	- Frozen soil decription: Nbn - Approx. sample temperature: AS1: -1.4 to -1.9°C						
2		End of Borehole						
		- Refusal at 1.5 m depth - Refusal at 1.2 m depth, 2.5m north of BH17-41, large amount of cobbles to ground surface upon refusal - Refusal at 1.0 m depth, 2 m north of the location of second attempt						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 963 888 E: 508 141

BH17-43

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-43

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 11, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.31**							
	278.2	130 mm FROZEN ROOTMAT			AS	1	-	-
		Frozen, light brown to light grey, clayey SAND (SC) - Some gravel - Frozen soil description: Vx (<5% est'd total visible ice) - Approx. sample temperature: AS1: -1.2°C SS2: -5.6 to -6.1°C			SS	2	560	315
1								
2	276.2				AS	3	-	-
		SS2: PP>245 kPa						
		End of Borehole						
3		- Refusal at 2.1 m depth - Auger refusal at 2.1 m depth, 2 m north of BH 17-43 - Auger refusal at 1.8 m depth on third attempt						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245.25

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 965 333 E: 508 213

BH17-44

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-44

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 13, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**281.96**							
	281.9	90 mm FROZEN ROOTMAT						
		Frozen, light brown to medium brown, silty clayey SAND (SC-SM) - some gravel - trace cobbles and boulders inferred - Frozen soil description: Nbn to Nf			AS	1	-	-
1					SS	2	46%	37
2					AS	3	-	-
	279.5	- Approx. sample tempeature: AS1: -1.2 to -0.8°C SS2: -1.8 to -2.4°C AS3: -0.9 to -1.4°C						
3					SS	4	40%	27
		Frozen, medium brown, lean CLAY (CL) with sand - trace gravel - trace cobbles and boulders inferred - Frozen soil description: Nbn			AS	5	-	-
4					SS	6	23%	38
	277.2	Very stiff to hard, grey, lean CLAY (CL) with sand - trace gravel - trace cobbles and boulders inferred -unfrozen			AS	7	-	-
5					SS	8	65%	24
6		- Approx. sample temperature: SS8: +2.0 to +3.0°C AS9: +1.8 to +3.1°C SS10: +2.1 to +3.2°C			AS	9	-	-
7					SS	10	50%	60
	274.2	End of Borehole - Located approx. 80 m off existing winter road						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

245.25

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 966 831 E: 508 280

BH17-45

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-45

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 12, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**288.87**							
	288.7	130 mm FROZEN ROOTMAT						
		Very dense, light brown, silty and/or clayey SAND with gravel to sandy silt and/or clay - trace organic material to 0.9 m - inferred occasional to frequent cobbles and boulders - thermal state unknown due to drilling disturbance (heat from hard augering)			AS	1	-	-
1					SS	2	0	50/0
2					AS	3	-	-
3					SS	4	25	50/25
	285.4				AS	5	-	-
		End of Borehole - Auger refusal at 3.5 m depth on second attempt - Auger refusal at 3.4 m depth on third attempt						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 968 303 E: 508 067

BH17-46

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-46

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 13, 2017 WATER LEVEL 3.2 m (Mar 13) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**284.12**							
	284.0	130 mm FROZEN ROOTMAT						
		Frozen, brown, lean CLAY (CL) with sand - some organic material - Frozen soil description: Vx (<5% est'd total visible ice) - Approx. sample temperature: SS2: -1.9 to -3.1°C SS4: -2.0 to -2.2°C			AS	1	-	-
1					SS	2	67%	33
2					AS	3		-
3	280.9			▽	SS	4	33%	21
		- Unfrozen and compact below 3.2 m depth			AS	5		-
4	280.0							
	279.9	150 mm PEAT			SS	6	50%	15
		Compact, brown, silty and/or clayey SAND (SC) with gravel			AS	7		-
5								
6	277.9				SS	8	50%	101
		Compact, grey, clayey SAND (SC) - some gravel			AS	9		-
7								
8	275.7				SS	10	33%	13
		End of Borehole						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245.25

245.25

101

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 969 750 E: 507 672

BH17-47

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-47

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 13, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**282.95**							
	282.8	130 mm FROZEN ROOTMAT			AS	1	-	
		Frozen, brown, sandy lean CLAY (CL) - Frozen soil description: Vx (<5% est'd total visible ice)						
1					SS	2	450	92
		- Approx. sample temperature: SS2: -3.1°C SS4: -1.5 to -2.9°C			AS	3	-	
2		SS2: PP>245 kPa SS4: PP>245 kPa						
					SS	4	280	88
3	279.7							
		Frozen, light brown, sandy silt and/or clay - trace gravel - Frozen soil description: Nbn			AS	5	-	
4	278.7							
		Frozen, brown to grey, frozen silty clayey SAND (SC-SM) - Occasional to frequent cobbles and boulders inferred - Frozen soil description: Vx (<5% est'd total visible ice)			SS	6	25	50/25
5					SS	7	125	38
	277.1	- Approx. sample temperature: SS7: -3.4 to -5.1°C						
6		SS7: PP>245 kPa						
		End of Borehole						
7		- Refusal at 5.9 m depth, 2 m south of BH17-47 - Refusal at 4.3 m depth on BH 17-47 - Refusal at 3.7 m depth, 2 m east of BH 17-47						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245.25

245.25

245.25

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 970 967 E: 506 930

BH17-48

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-48

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 14, 2017 WATER LEVEL 3.2 (Mar 14) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.20**							
		Frozen, dark brown, PEAT with organic material and poorly graded sand - trace cobbles inferred			AS	1	-	-
	277.3	- Frozen soil description: Nbn to Vx (<15% est'd total visible ice)			SS	2	380	17
		Frozen, medium brown, sandy silt and/or clay - trace gravel			AS	3	-	-
	276.4	- Frozen soil description: Vc to Vr (<10% est'd total visible ice) - Approx. sample temperature: SS2: -3.5 to -4.0°C			SS	4	75	25/100
		Frozen, dark grey, clayey SAND (SC) - trace gravel			AS	5	-	-
	274.1	- Frozen soil description: Vx to Vc (<5% est'd total visible ice) - Approx. sample temperature: AS3: -1.8 to -2.2°C			SS	6	405	-
		Frozen, SILT (ML)			AS	7	-	-
	272.7	- Frozen soil description: Vs to Vc (<15% est'd total visible ice) - Inferred unfrozen and wet below approximately 4.7 m depth						
		End of Borehole - Refusal at 4.6 m depth - Refusal at 4.6 m depth, 2.0 m north of BH17-48 - Thermistor string installed.						

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS w_P w w_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

326.3

245

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 972 375 E: 506 730

BH17-49

CLIENT Tlicho Engineering and Environmental Services Ltd.

LOCATION Northwest Territories, Canada

DATES: BORING March 22, 2017 WATER LEVEL 4.6 m (Mar 22)

BOREHOLE No. BH17-49

PROJECT No. 144902448

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**284.20**							
		Frozen, light brown, sandy lean CLAY (CL) - Trace gravel - Trace rootlets - Frozen soil description: Vr (<5% est'd total visible ice) - Approx. sample temperature: AS1: -0.5°C SS2: -1.5°C			AS	1	-	-
1					SS	2	457	68
	282.8							
2					AS	3	-	-
	281.9	Frozen, light brown, CLAY (CL) - Some sand, trace gravel, - Frozen soil description: Vr (<5% est'd total visible ice) - Approx. sample temperature: AS2: -0.2°C - Inferred unfrozen and stiff below 2.3 m depth			SS	4	127	9
3					AS	5	-	-
4					SS	6	279	12
	279.6			▽				
		Stiff, grey, sandy lean CLAY (CL) - Some gravel - Approx. sample temperature: AS7: +3.8°C AS9: +4.6°C			AS	7	-	-
5								
6					SS	8	305	12
					AS	9	-	-
7								
	276.6							
8		End of Borehole						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

App'd

Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 973 819 E: 506 657

BH17-50

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-50

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 22, 2017 WATER LEVEL 4.0 m (Mar 22) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**280.09**							
		Frozen, brown, sandy lean CLAY (CL) - Some gravel, coal, oxides, and rootlets - Frozen soil description: Vr (<5% est'd total visible ice) - Approx. sample temperature: AS1: -0.6°C SS2: -1.6°C			AS	1	-	-
1					SS	2	356	74
	278.6				AS	3	-	-
2		- Unfrozen and very stiff to stiff below 1.5 m depth - Approx. sample temperature: AS3: +0.9°C SS4: +0.2°C SS6: +0.9°C			SS	4	305	22
3					AS	5	-	-
4				▽	SS	6	305	20
	275.5							
5		Stiff, grey, sandy lean CLAY (CL) - Some gravel - Approx. sample temperature: SS8: +1.5°C AS9: +3.9°C			AS	7	-	-
					SS	8	254	11
6					AS	9	-	-
	273.2							
7		Dense, grey, silty and/or clayey SAND with gravel			SS	10	330	32
	272.5							
8		End of Borehole						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level
▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa
□ Remoulded Vane Test, kPa App'd
△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 975 304 E: 506 858

BH17-51

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-51

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING 3/22-23/2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.72**							
		Brown, silty SAND (SM) - Some gravel - Trace cobbles and boulders inferred			AS	1	-	
1	277.8	- Thermal state unknown due to drilling disturbance (heat from hard augering)			SS	2	75	50/100
2		Dense to very dense brown silty, clayey SAND (SC-SM) with gravel - Trace cobbles and boulders inferred			AS	3	-	
3	275.4				SS	4	460	49
		- Approx. sample temperature: SS2: +2.1 to 3.1°C						
4		End of Borehole - Refusal at 3.4 m depth - Refusal at 0.5 m depth on first attempt - Refusal at 1.5 m depth, 2 m east of first attempt						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245.25 △

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 976 800 E: 506 876

BH17-52

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-52

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING 3/22-23/2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**265.54**							
	265.4	130 mm FROZEN ROOTMAT						
		Inferred frozen, brown, silt and/or clay with sand			AS	1	-	-
	264.6							
1		Frozen, brown, lean CLAY (CL) - trace gravel - Frozen soil description: Vx (<5% est'd total visible ice)			SS	2	480	74
2		- Approx. sample temperature: SS2: -2.3 to -3.0°C			AS	3	-	-
					SS	4	305	16
3	262.5							
		End of Borehole - Refusal at 3.0 m depth - Refusal at 1.8 m depth on second and third attempt						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245.25

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 978 225 E: 506 954

BH17-53

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-53

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 23, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	273.37							
0		Inferred frozen, brown, sandy SILT (ML) - Trace gravel - Non-plastic - Some inferred cobbles			AS	1	-	-
1					SS	-	0	50/0
1					AS	2	-	-
2					AS	3	-	-
2	270.9							
3		End of Borehole - Auger refual at 2.4 m depth - Refusal at surface, 3 m south of BH17-53 - Refusal at 0.3 m depth, 6 m south of BH17-53						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 979 521 E: 506 304

BH17-54

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-54

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 23, 2017 WATER LEVEL 0.9 m (Mar 23) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**261.07**							
0		1500 mm PEAT - Frozen to 0.6 m, unfrozen below 0.6 m depth		▽	AS	1	-	-
1					SS	2	150	1
	259.6	Stiff, grey, silty CLAY (CL-ML) - wet			AS	3	-	-
2					SS	4	150	11
3					AS	5	-	-
4					SS	6	405	13
5					AS	7	-	-
	255.6	Loose to very loose, grey, sandy SILT (ML)			SS	8	50	8
6					AS	9		-
7					SS	10	50	0
	253.5	End of Borehole - Located approx. 50 m off existing winter road						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

838.6

376.8

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 980 794 E: 505 527

BH17-55

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-55

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 23, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**276.79**							
	276.7	130 mm FROZEN ROOTMAT						
		Inferred frozen, brown, clayey SAND (SC)			AS	1	-	-
	275.9	- Trace organics						
1		- Inferred trace cobbles and boulders			SS	2	75	50/75
					AS	3	-	-
		Brown sandy silt and/or clay						
	275.0	- Inferred trace cobbles and boulders						
2		- Thermal state unknown due to drilling disturbance (heat from hard augering)						
3		End of Borehole						
		- Auger refusal at 1.8 m depth						
		- Auger refusal at 1.2 m depth, 2m south-west of BH17-55						
4		- Auger refusal at 1.1 m depth, 5m south-west of BH 17-55						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 982 104 E: 504 791

BH17-56

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-56

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 24, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.90**							
	278.8	130 mm FROZEN ROOTMAT						
		Inferred frozen, brown, SAND with silt and/or clay and gravel - Trace organic material			AS	1	-	-
1	278.0 277.7	- Occasional cobbles and boulders inferred			SS	2	50	50/50
		Brown, sandy CLAY - Inferred occasional to frequent cobbles and boudlers - Thermal state unknown due to drilling disturbance (heat from hard augering)						
2								
3		End of Borehole - Refusal at 1.2 m depth (Possible Boulder) - Auger refusal at 0.6 m depth on second attempt (Possible Boulder) - Auger refusal at 1.2 m depth on third attempt (Possible Boulder)						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 983 439 E: 504 112

BH17-61

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-61

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 24, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**257.53**							
	257.4	130 mm FROZEN ROOTMAT						
		Frozen, black to dark brown, ORGANIC SOIL (peat) - Approx. sample temperature: SS2: -2.1 to -3.4°C			AS	1	-	-
1					SS	2	25%	10
	255.7							
2		Inferred unfrozen, stiff, grey to brown, lean CLAY (CL) - Frequent organics - Non-plastic			AS	3	-	-
					SS	4	63%	12
3		- Approx. sample temperature: SS4: +2.6 to +3.0°C SS6: +3.5 to +4.5°C			AS	5	-	-
4					SS	6	42%	11
	253.0							
		Inferred unfrozen, dense, light brown, sandy silt and/or clay			AS	7	-	-
5								
	251.7				SS	8	75	51/230
6		End of Borehole - Refusal at 5.8 m depth - Refusal at 6.4 m depth on second attempt - Refusal at 5.8 m depth on third attempt - Thermistor string installed.						
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

316

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 984 923 E: 503 912

BH17-62

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-62

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 24, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**274.11**							
0		Frozen, brown, sandy SILT (ML) - Trace gravel - Some inferred cobbles - Frozen soil decription: Nbn			AS	1	-	-
1	272.9				AS	2	-	-
		End of Borehole - Refusal at 1.2 m depth - Refusal at 0.6 m depth on second attempt - Refusal at 0.9 m depth on third attempt						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 986 411 E: 503 713

BH17-63

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-63

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 24, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**271.73**							
0		Frozen, brown, sandy SILT (ML) with gravel to SILT (ML) with sand, trace gravel - Occasional cobbles and boulders inferred - Non-plastic			AS	1	-	-
1								
2		- Frozen soil decription: Nbn			AS	2	-	-
	269.3							
3		- Inferred unfrozen and hard below 2.4 m depth - Approx. sample temperature: SS3: +1.9°C SS5: +0.9°C SS7: +0.9°C			SS	3	152	48/150
					AS	4	-	-
4					SS	5	405	120
5					AS	6	-	-
					SS	7	152	80/150
6					AS	8	-	-
7	264.7	End of Borehole						
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 987 893 E: 503 508

BH17-64

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-64

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 24, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**272.52**							
		Frozen, brown, silty clayey SAND (SC-SM) - Trace gravel			AS	1	-	-
1					SS	-	0	50/0
	271.3							
		Inferred cobbles and boulders or bedrock			AS	2	-	-
2					AS	3	-	-
	270.1							
		End of Borehole - Refusal at 2.4 m depth on second attempt - Refusal at 1.8 m depth on BH 17-64 - Refusal at 1.5 m depth on third attempt						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 989 342 E: 503 287

BH17-65

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-65

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 24, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**276.48**							
	276.4	130 mm FROZEN ROOTMAT						
		Brown, lean CLAY (CL) - Trace sand - Trace organic material - Thermal state unknown due to drilling disturbance (heat from hard augering)			AS	1	-	-
1					SS	2	610	50
	275.0	End of Borehole						
2		- Auger refusal at 1.5 m depth - Refusal at 1.2 m depth on second attempt - Refusal at 1.7 m depth on third attempt						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

245.25

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 990 764 E: 502 804

BH17-66

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-66

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**285.18**							
0		Frozen, brown, silty clayey SAND (SC-SM) with gravel - Frozen soil decription: Nbn			AS	1	-	-
1					SS	-	0	50/0
1	283.8				AS	2	-	-
		End of Borehole - Refusal at 1.4 m depth - Refusal at 0.6 m depth on second attempt - Refusal at 1.2 m depth on third attempt						

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 992 190 E: 502 333

BH17-67

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-67

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**283.41**							
	283.4	50 mm FROZEN TOPSOIL/ROOTMAT			AS	1	-	-
	282.5	Frozen, brown, GRAVEL with sand - Some silt - Frozen soil decription: Nbn			AS	2	-	-
2	281.0	Inferred frozen, brown, sandy silt and/or clay - Trace gravel			SS	3	255	52
	280.4	Very dense, brown, well graded SAND (SW) with silt - Moist - Approx. sample temperature: SS3: +2.1°C			AS	4	-	-
4	279.5	Hard, brown, lean CLAY (CL) with sand - Moist - Occasional cobbbles and boulders inferred - Approx. sample temperature: AS4: +2.7°C			AS	5	-	-
		Very dense, brown, SAND with silt and/or clay and gravel			SS	6	150	50/0
6	277.0				AS	7	-	-
		End of Borehole - Auger refusal at 6.4 m depth - Refusal at 5.2 m depth on second attempt - Refusal at 5.5 m depth on third attempt - Thermistor string installed.						

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 993 440 E: 501 567

BH17-68

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-68

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**271.70**							
	271.4	305 mm FROZEN ROOTMAT with organics			AS	1	-	-
		Frozen, brown, sandy lean CLAY (CL)			AS	2	-	-
	270.8	- Trace gravel			SS	-	0	50/0
1		Brown, SAND with silt and/or clay and gravel						
		- Occasional to some cobbles and boulders inferred			AS	3	-	-
2		- Thermal state unknown due to drilling disturbance (heat from hard augering)						
3					AS	4	-	-
	268.0							
4		End of Borehole						
		- Refusal at 3.7 m depth						
		- Refusal at 1.5 m depth on second attempt						
5		- Refusal at 2.4 m depth on third attempt						
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 994 930 E: 501 380

BH17-69

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-69

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**271.11**							
		610 mm FROZEN ORGANIC SOIL			AS	1	-	-
	270.5	Frozen, brown, lean CLAY (CL) - Trace sand - Frozen soil decription: - Approx. sample temperature: SS3: -0.4°C			AS	2	-	-
1					SS	3	230	33
	269.6	Brown, SAND with silt and/or clay and gravel (SM/SC) - Frequent cobbles and boulders inferred - Thermal state unknown due to drilling disturbance (heat from hard augering)			AS	4	-	-
2					SS	-	0	50/0
					AS	5	-	-
3					AS	6	-	-
	267.3	End of Borehole - Refusal at 3.8 m depth - Refusal at 2.7 m depth on first attempt - Refusal at 2.7 m depth on third attempt						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level
▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa
□ Remoulded Vane Test, kPa App'd
△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 996 417 E: 501 184

BH17-70

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-70

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**269.69**							
		Brown sandy silt and/or clay - Trace gravel - Occasional cobbles and boulders inferred			AS	1	-	-
1					SS	-	0	50/0
	268.5	- Thermal state unknown due to drilling disturbance (heat from hard augering)			AS	2	-	-
		End of Borehole - Refusal at 1.2 m depth - Refusal at 1.2 m depth at second and third attempt						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 6 997 890 E: 501 223

BH17-75

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-75

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 27, 2017 WATER LEVEL 2.1 m (Mar 27) DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	262.62							
	262.3	305 mm FROZEN TOPSOIL with rootlets			AS	1	-	-
1		Olive green to grey, silty clayey GRAVEL (GC-GM) with sand - Occasional to frequent cobbles and boulders inferred - Thermal state unknown due to drilling disturbance (heat from hard augering)			AS	2	-	-
2				▽	AS	3	-	-
3					AS	4	-	-
4					AS	5	-	-
5								
6					AS	6	-	-
7	255.0							
8		End of Borehole - Located approx. 350 m off existing winter road						
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

385.6

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

STN13-STAN-GEO 144902448 TLICHO ALL SEASON ROAD INVESTIGATION_REV01.GPJ SMART.GDT 8/9/17

Stantec

BOREHOLE RECORD

N: 6 999 200 E: 501 581

BH17-76

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-76

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 27, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**274.50**							
		Brown SAND with silt and/or clay - Some gravel - Thermal state unknown due to drilling disturbance (heat from hard augering)			AS	1	-	-
1	273.3				AS	2	-	-
		End of Borehole - Auger refusal at 1.2 m depth - Refusal at 0.6 m depth on second attempt - Refusal at 0.9 m depth on third attempt - Located approx. 1.1 km off existing winter road						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 7 000 689 E: 501 749

BH17-77

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-77

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 27, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**278.91**							
		Soft brown sandy silty CLAY (CL-ML) - Trace gravel - Occasional to frequent cobbles and boulders inferred below 1.1 m depth			AS	1	-	-
1					AS	2	-	-
	277.2	- Thermal state unknown due to drilling disturbance (heat from hard augering)						
2		End of Borehole - Refusal at 1.7 m depth - Refusal at 1.7 m depth on second attempt - Refusal at 0.9 m depth on third attempt - Located approx. 280 m off existing winter road						
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 7 002 178 E: 501 632

BH17-78

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-78

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 27, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**274.13**							
0		Brown, poorly graded SAND (SP-SM) with silt and/or clay and gravel - Occasional to frequent cobbles and boulders inferred - Thermal state unknown due to drilling disturbance (heat from hard augering)			AS	1	-	-
1					SS	-	0	50/0
1					AS	2	-	-
2	272.0							
2		End of Borehole - Auger refusal at 2.1 m depth - Refusal at 1.2 m depth on second attempt - Refusal at 0.6 m depth on third attempt						

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 7 003 535 E: 501 122

BH17-79

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-79

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**274.21**							
		Inferred frozen, brown sandy silt and/or clay - Trace gravel			AS	1	-	-
	273.5	- Some organic material						
1		End of Borehole - Refusal at 0.6m depth on first attempt - Refusal at 0.8 m depth, 2 m south of BH17-79 - Refusal at 0.8 m depth, 4 m south of BH17-79						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 7 004 778 E: 500 283

BH17-80

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-80

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**274.17**							
	273.9	Frozen, brown, clayey SAND with gravel - Trace organic material - Frozen soil decription: Nbn			AS	1	-	-
1		End of Borehole - Refusal at 0.3 m depth - Refusal at 0.2 m depth, 2 m south of BH17-80 - Refusal at 0.3 m depth, 4 m south of BH17-80 - Refusal at 0.3 m depth, 6 m south of BH17-80						
2								
3								
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Stantec

BOREHOLE RECORD

N: 7 005 424 E: 499 850

BH17-81

CLIENT Tlicho Engineering and Environmental Services Ltd. BOREHOLE No. BH17-81

LOCATION Northwest Territories, Canada PROJECT No. 144902448

DATES: BORING March 26, 2017 WATER LEVEL N/A DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**267.18**							
		Frozen, brown, well graded SAND (SW) with gravel			AS	1	-	-
	266.6	- Frozen soil decription: Nbn						
1		Dark brown, organic silt and/or clay with sand						
	265.8	- Thermal state unknown						
		End of Borehole						
2		- Refusal at 1.4 m depth						
		- Refusal at 1.1 m depth, 2 m south of BH17-81						
3		- Refusal at 1.2 m depth, 4 m south of BH 17-81						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

APPENDIX D
Laboratory Test Results

Stantec

Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 5, 2017
Tested By: JA

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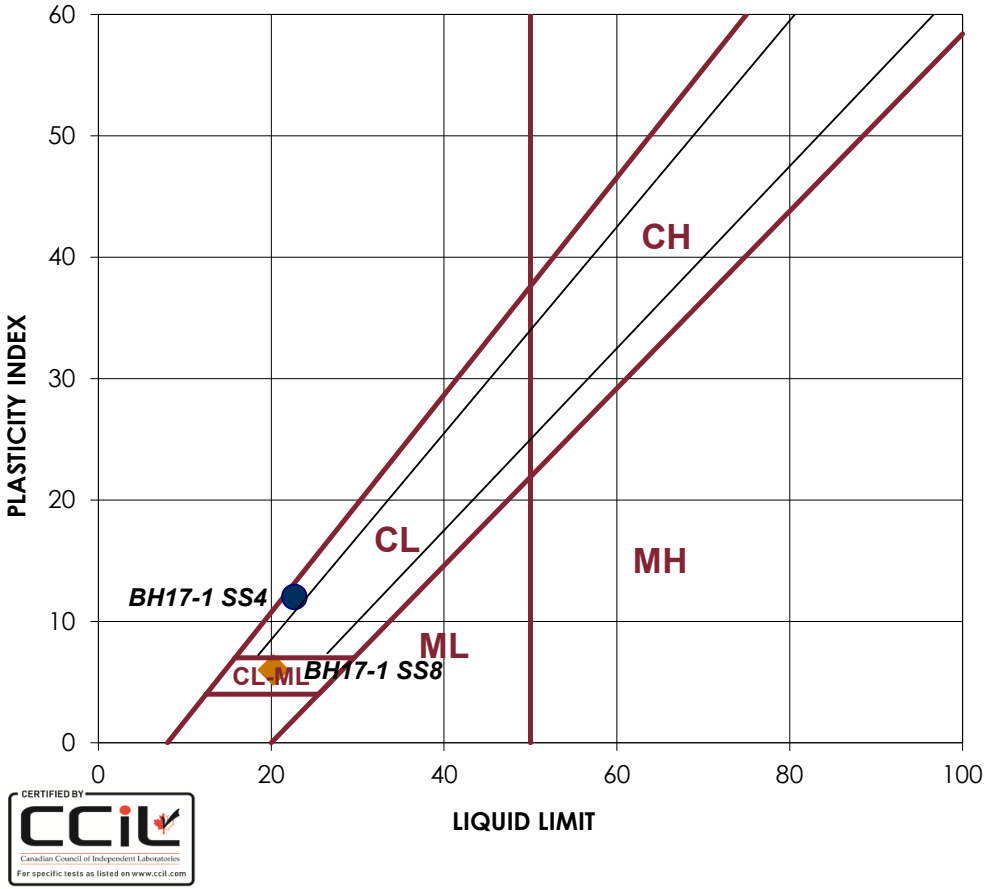
LABORATORY
10575 106 ST
Edmonton, Alberta
Canada T5H 2X5
Tel: (780) 917-7463

Sample: BH17-1 SS4			Sample: BH17-1 SS8	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	21	21
6B	44B	Container Number	41B	3B
41.26	41.13	Wt. Sample (wet+tare)(g)	37.07	39.18
36.32	36.29	Wt. Sample (dry+tare)(g)	33.37	35.12
15.16	15.51	Wt. Tare (g)	15.58	15.41
21.2	20.8	Wt. Dry Soil (g)	17.8	19.7
4.9	4.8	Wt. Water (g)	3.7	4.1
23.3%	23.3%	Water Content (%)	20.8%	20.6%
22.7%	22.7%	Corrected Water Content (%)	20.4%	20.2%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AH	AV	Container Number	AJ	AK
20.24	20.88	Wt. Sample (wet+tare)(g)	20.55	21.01
19.61	20.21	Wt. Sample (dry+tare)(g)	19.79	20.19
13.98	14.14	Wt. Tare (g)	14.18	14.26
5.6	6.1	Wt. Dry Soil (g)	5.6	5.9
0.6	0.7	Wt. Water (g)	0.8	0.8
11.2%	11.0%	Water Content (%)	13.5%	13.8%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	23		LL	20
PL	11		PL	14
PI	12		PI	6
CLASSIFICATION			CLASSIFICATION	
CL			CL-ML	



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Reviewed By: _____

Stantec

Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 4, 2017
Tested By: JA

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LABORATORY
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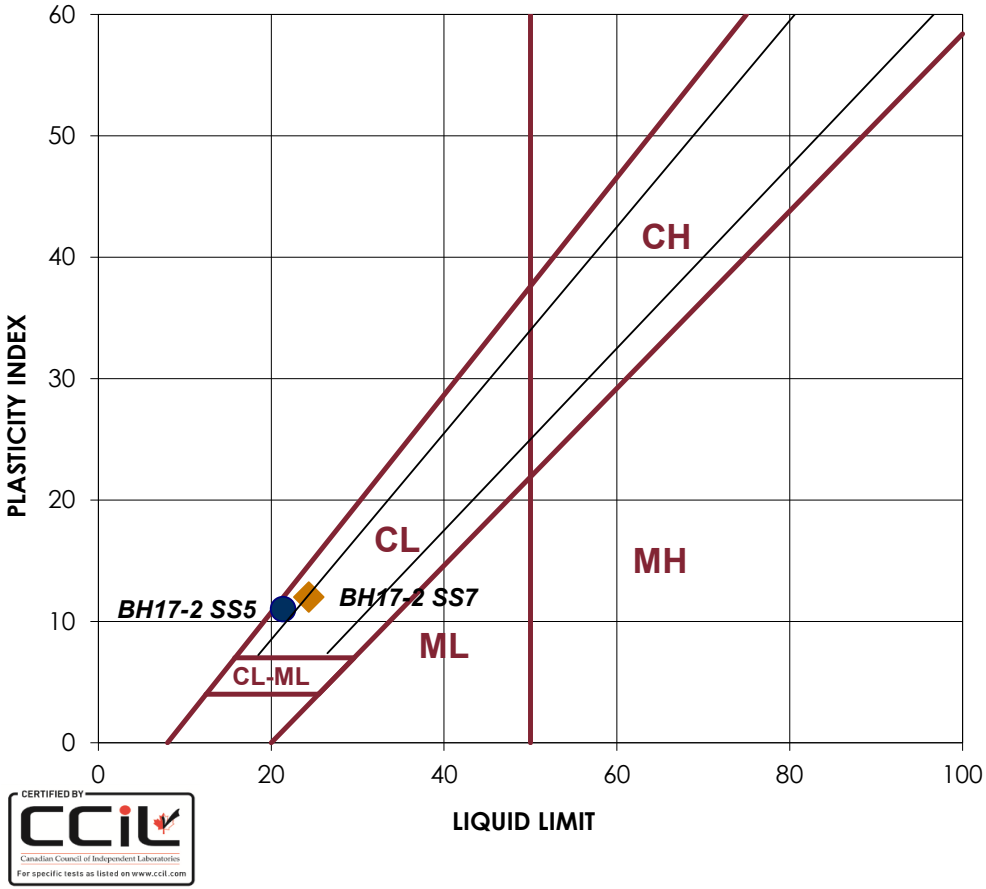
Edmonton, Alberta
Canada T5H 2X5
Tel: (780) 917-7463

Sample: BH17-2 SS5			Sample: BH17-2 SS7	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	21	21
9	40B	Container Number	18B	17B
42.02	41.57	Wt. Sample (wet+tare)(g)	40.28	45.54
37.26	36.84	Wt. Sample (dry+tare)(g)	35.31	39.54
15.63	15.32	Wt. Tare (g)	15.22	15.55
21.6	21.5	Wt. Dry Soil (g)	20.1	24.0
4.8	4.7	Wt. Water (g)	5.0	6.0
22.0%	22.0%	Water Content (%)	24.7%	25.0%
21.4%	21.4%	Corrected Water Content (%)	24.2%	24.5%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AT	AA	Container Number	BQ	BT
19.69	20.2	Wt. Sample (wet+tare)(g)	20.14	20.25
19.19	19.64	Wt. Sample (dry+tare)(g)	19.49	19.57
13.85	14.11	Wt. Tare (g)	14.08	13.95
5.3	5.5	Wt. Dry Soil (g)	5.4	5.6
0.5	0.6	Wt. Water (g)	0.7	0.7
9.4%	10.1%	Water Content (%)	12.0%	12.1%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	21		LL	24
PL	10		PL	12
PI	11		PI	12
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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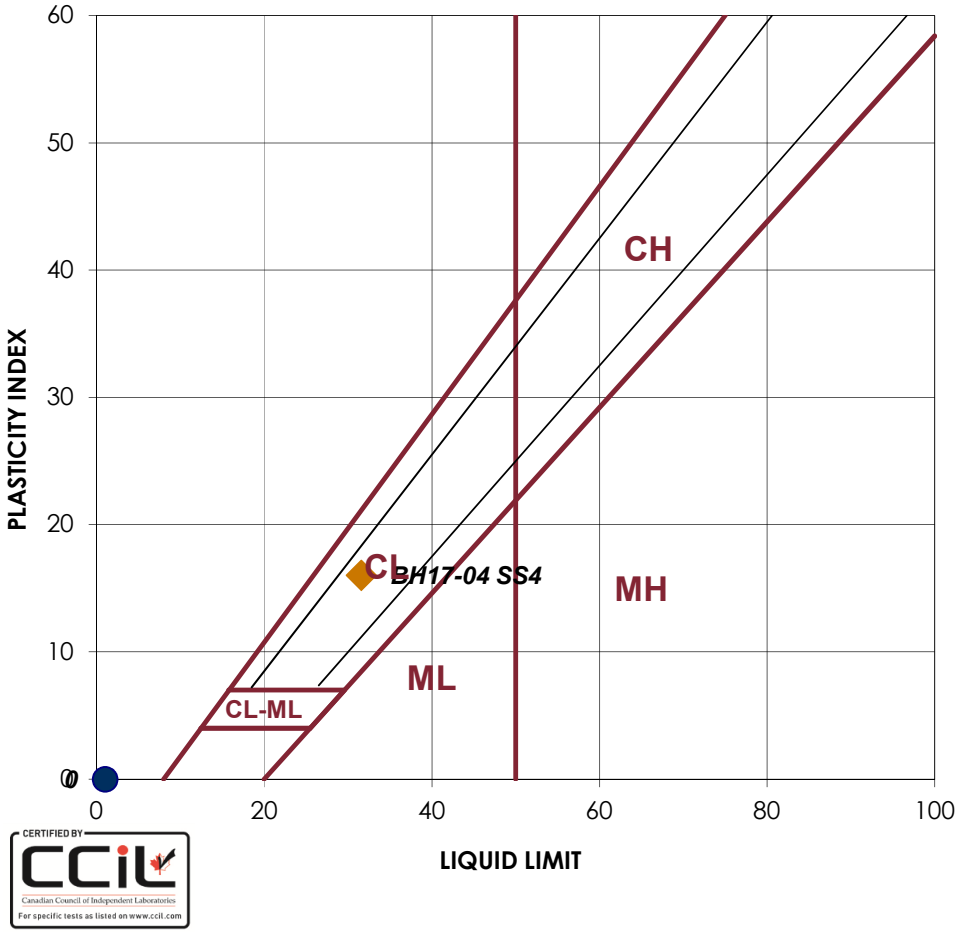
Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Ser
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 4, 2017
Tested By: JA

Sample:			Sample:
			BH17-04 SS4
LIQUID			LIQUID
1	2	Trial No.	1	2
		Number of Blows	22	23
		Container Number	24B	47B
		Wt. Sample (wet+tare)(g)	34.35	36.68
		Wt. Sample (dry+tare)(g)	29.69	31.60
		Wt. Tare (g)	15.20	15.63
		Wt. Dry Soil (g)	14.5	16.0
		Wt. Water (g)	4.7	5.1
		Water Content (%)	32.2%	31.8%
		Corrected Water Content (%)	31.7%	31.5%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number	BH	BO
		Wt. Sample (wet+tare)(g)	19.569	19.64
		Wt. Sample (dry+tare)(g)	18.81	18.84
		Wt. Tare (g)	14.06	14.01
		Wt. Dry Soil (g)	4.8	4.8
		Wt. Water (g)	0.8	0.8
		Water Content (%)	16.0%	16.6%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL			LL	32
PL			PL	16
PI			PI	16
CLASSIFICATION			CLASSIFICATION	
NON-PLASTIC			***CL***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: February 27, 2017
Date Tested: March 16, 2017
Tested By: JA

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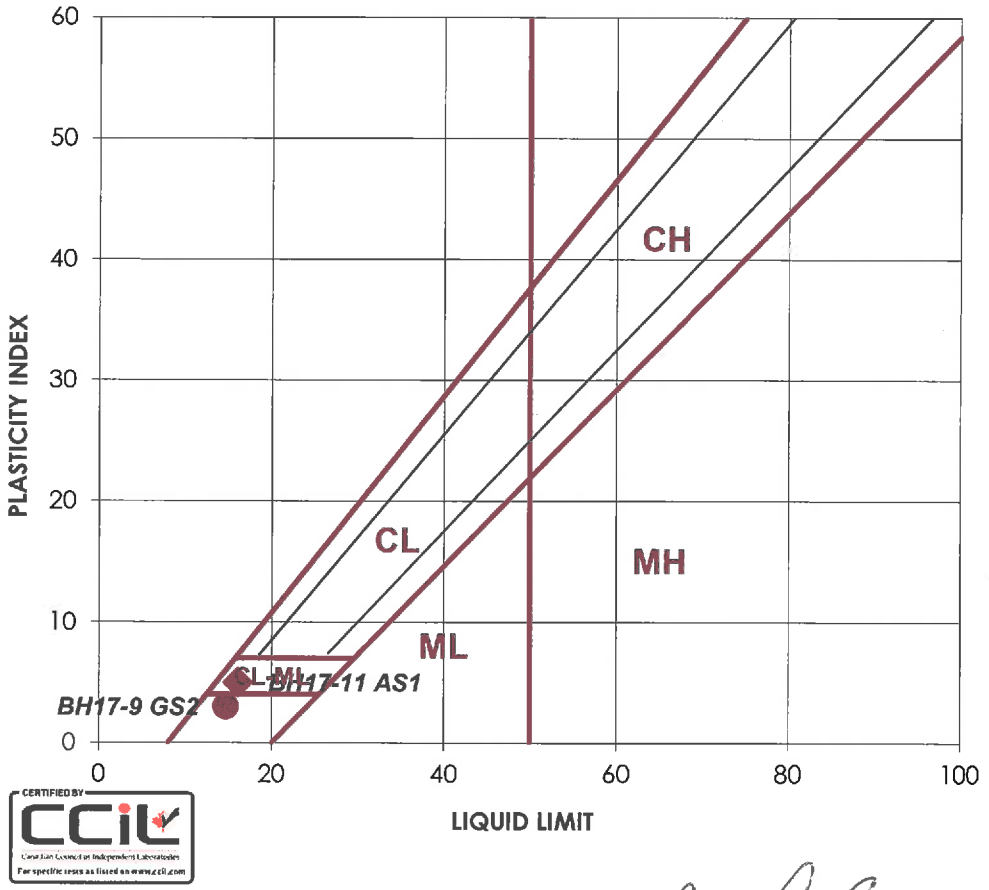
Sample: BH17-9 GS2			Sample: BH17-11 AS1	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	20	20
16B	27B	Container Number	AN	31B
43.17	42.24	Wt. Sample (wet+tare) (g)	36.66	41.20
39.56	38.72	Wt. Sample (dry+tare) (g)	33.42	37.60
15.63	15.42	Wt. Tare (g)	14.08	15.57
23.9	23.3	Wt. Dry Soil (g)	19.3	22.0
3.6	3.5	Wt. Water (g)	3.2	3.6
15.1%	15.1%	Water Content (%)	16.8%	16.3%
14.7%	14.7%	Corrected Water Content (%)	16.3%	15.9%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BI	BR	Container Number	BS	BE
20.84	21.65	Wt. Sample (wet+tare) (g)	20.32	20.47
20.15	20.88	Wt. Sample (dry+tare) (g)	19.7	19.83
14.2	14.14	Wt. Tare (g)	13.9	13.87
6.0	6.7	Wt. Dry Soil (g)	5.8	6.0
0.7	0.8	Wt. Water (g)	0.6	0.6
11.6%	11.4%	Water Content (%)	10.7%	10.7%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	15		LL	16
PL	12		PL	11
PI	3		PI	5
CLASSIFICATION			CLASSIFICATION	
ML			CL-ML	



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Reviewed By:

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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Serv
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	February 27, 2017
Date Tested:	March 16, 2017
Tested By:	JA

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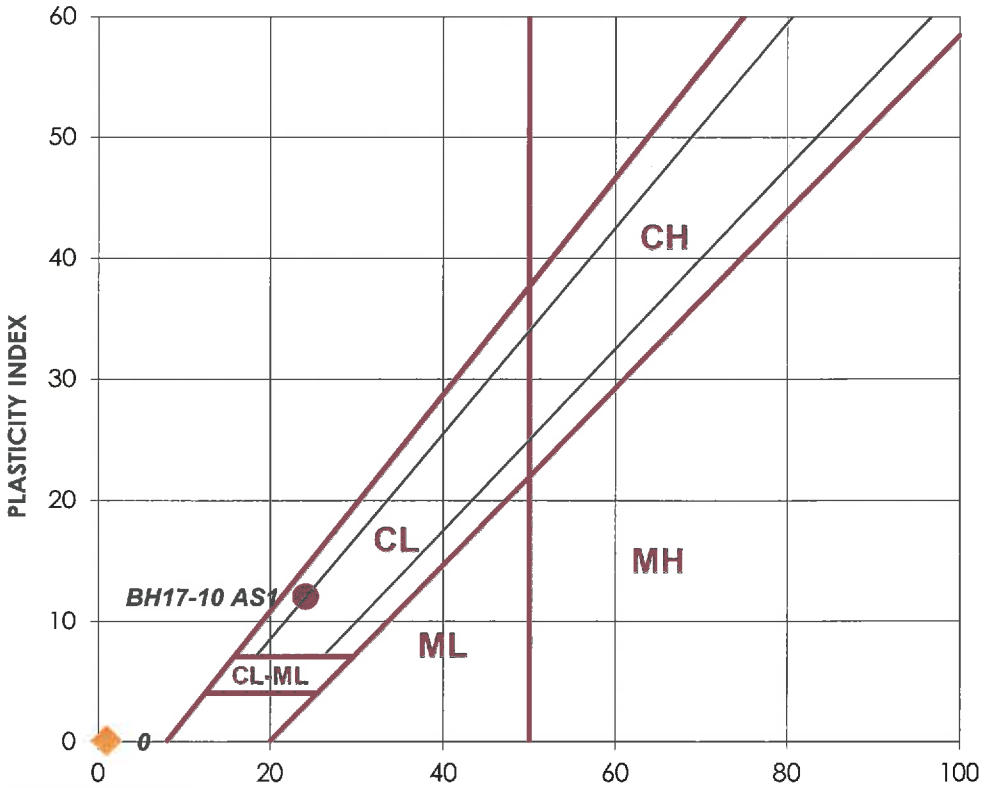
Sample:			Sample:	
BH17-10 AS1				
LIQUID			LIQUID	
1	2	Trial No.	1	2
28	29	Number of Blows		
22B	37B	Container Number		
34.26	37.37	Wt. Sample (wet+tare) (g)		
30.56	33.24	Wt. Sample (dry+tare) (g)		
15.51	15.25	Wt. Tare (g)		
15.1	18.0	Wt. Dry Soil (g)		
3.7	4.1	Wt. Water (g)		
24.6%	22.9%	Water Content (%)		
24.9%	23.4%	Corrected Water Content (%)		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AW	AS	Container Number		
21.19	21.08	Wt. Sample (wet+tare) (g)		
20.44	20.35	Wt. Sample (dry+tare) (g)		
14.24	14.12	Wt. Tare (g)		
6.2	6.2	Wt. Dry Soil (g)		
0.8	0.7	Wt. Water (g)		
12.1%	11.7%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	24		LL	
PL	12		PL	
PI	12		PI	
CLASSIFICATION			CLASSIFICATION	
CL			NON-PLASTIC	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 4, 2017
Tested By: JA

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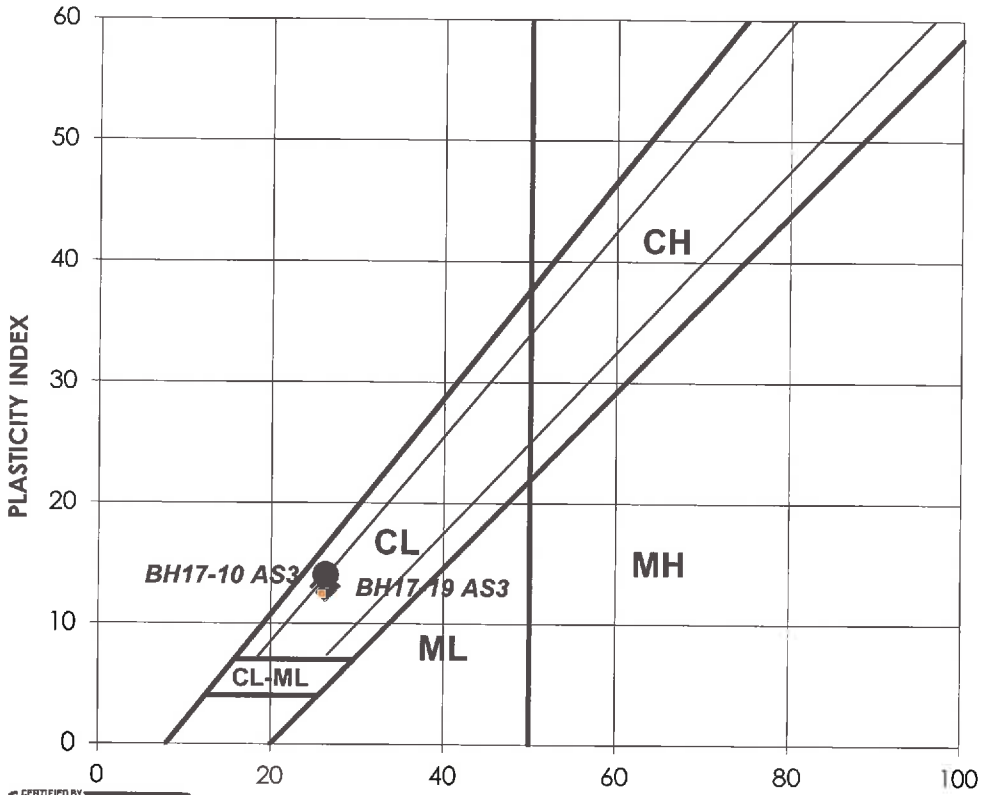
Sample: BH17-10 AS3			Sample: BH17-19 AS3	
LIQUID			LIQUID	
1	2	Trial No.	1	2
21	23	Number of Blows	20	21
21B	4B	Container Number	23B	42B
39.36	40.79	Wt. Sample (wet+tare) (g)	39.95	41.06
34.30	35.49	Wt. Sample (dry+tare) (g)	34.72	35.65
15.54	15.55	Wt. Tare (g)	15.28	15.61
18.8	19.9	Wt. Dry Soil (g)	19.4	20.0
5.1	5.3	Wt. Water (g)	5.2	5.4
27.0%	26.6%	Water Content (%)	26.9%	27.0%
26.4%	26.3%	Corrected Water Content (%)	26.2%	26.4%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BC	BM	Container Number	BG	BU
20.34	20.92	Wt. Sample (wet+tare) (g)	21.17	20.368
19.67	20.15	Wt. Sample (dry+tare) (g)	20.42	19.67
14.22	13.89	Wt. Tare (g)	14.68	13.99
5.5	6.3	Wt. Dry Soil (g)	5.7	5.7
0.7	0.8	Wt. Water (g)	0.8	0.7
12.3%	12.3%	Water Content (%)	13.1%	12.3%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	26		LL	26
PL	12		PL	13
PI	14		PI	13
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Reviewed By:

Stantec

Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Servi
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	February 27, 2017
Date Tested:	March 16, 2017
Tested By:	JA

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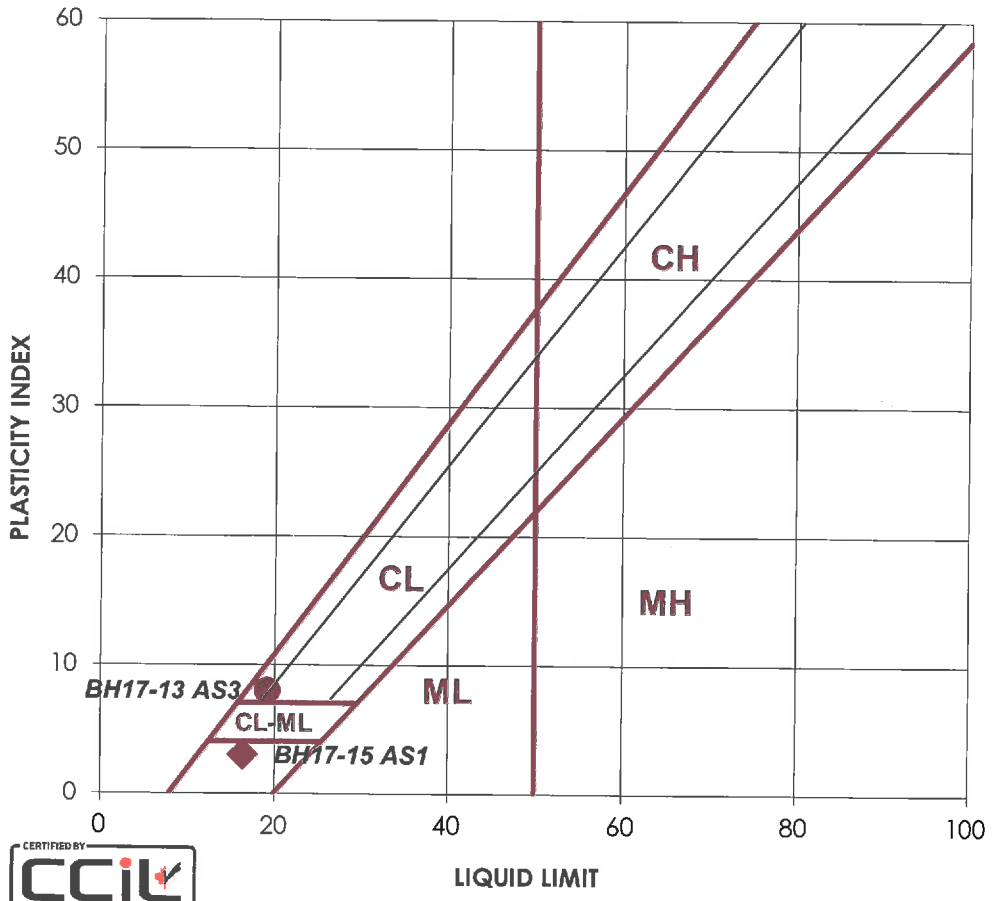
Sample: BH17-13 AS3			Sample: BH17-15 AS1	
LIQUID			LIQUID	
1	2	Trial No.	1	2
21	21	Number of Blows	20	20
24B	47B	Container Number	9B	40B
38.57	40.85	Wt. Sample (wet+tare)(g)	42.98	45.31
34.71	36.72	Wt. Sample (dry+tare)(g)	39.02	40.98
15.19	15.61	Wt. Tare (g)	15.64	15.34
19.5	21.1	Wt. Dry Soil (g)	23.4	25.6
3.9	4.1	Wt. Water (g)	4.0	4.3
19.8%	19.6%	Water Content (%)	16.9%	16.9%
19.4%	19.2%	Corrected Water Content (%)	16.5%	16.4%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BH	BO	Container Number	AY	AA
20.85	21.15	Wt. Sample (wet+tare)(g)	21.43	20.63
20.16	20.46	Wt. Sample (dry+tare)(g)	20.59	19.9
14.05	14.01	Wt. Tare (g)	13.83	14.17
6.1	6.5	Wt. Dry Soil (g)	6.8	5.7
0.7	0.7	Wt. Water (g)	0.8	0.7
11.3%	10.7%	Water Content (%)	12.4%	12.7%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	19		LL	16
PL	11		PL	13
PI	8		PI	3
CLASSIFICATION			CLASSIFICATION	
CL			ML	



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Reviewed By:

Stantec

Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Serv
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	February 27, 2017
Date Tested:	March 16, 2017
Tested By:	JA

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LABORATORY
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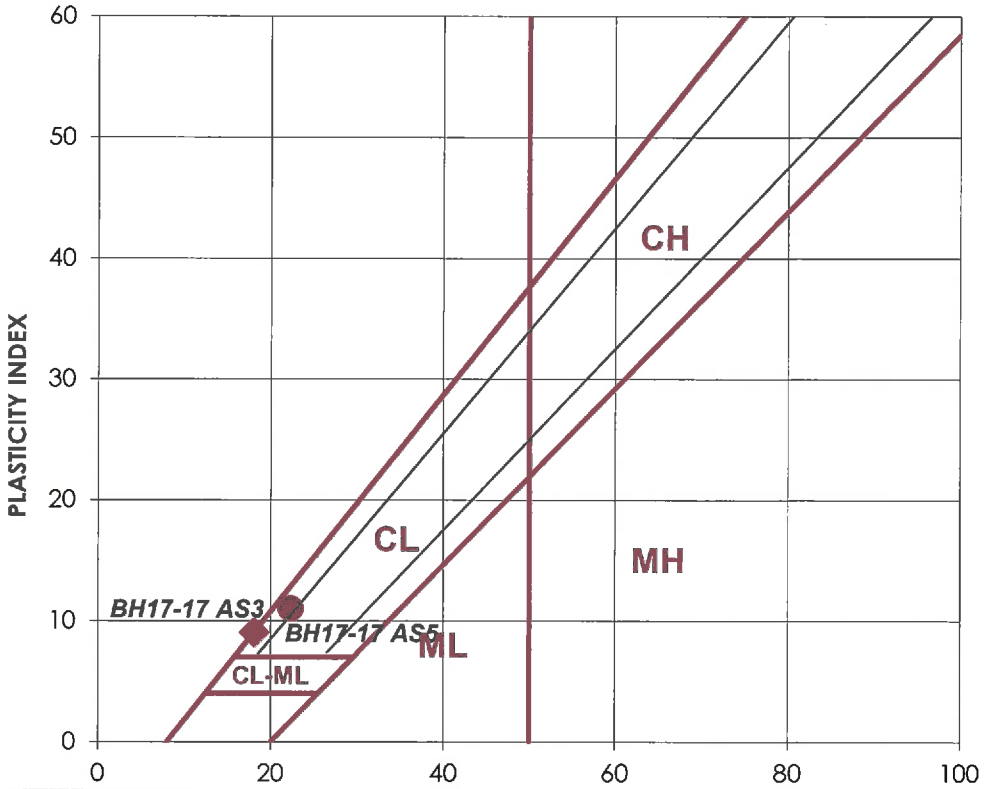
Canada T5H 2X5
Tel: (780) 917-7463

Sample:			Sample:	
BH17-17 AS3			BH17-17 AS5	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	21	Number of Blows	20	20
14B	34B	Container Number	21B	4B
40.51	39.54	Wt. Sample (wet+tare) (g)	40.59	45.25
35.84	35.02	Wt. Sample (dry+tare) (g)	36.62	40.62
15.46	15.28	Wt. Tare (g)	15.52	15.55
20.4	19.7	Wt. Dry Soil (g)	21.1	25.1
4.7	4.5	Wt. Water (g)	4.0	4.6
22.9%	22.9%	Water Content (%)	18.8%	18.5%
22.3%	22.4%	Corrected Water Content (%)	18.3%	18.0%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AB	AC	Container Number	BC	BM
20.26	20.84	Wt. Sample (wet+tare) (g)	21.08	20.93
19.64	20.2	Wt. Sample (dry+tare) (g)	20.48	20.33
13.97	14.29	Wt. Tare (g)	14.22	13.89
5.7	5.9	Wt. Dry Soil (g)	6.3	6.4
0.6	0.6	Wt. Water (g)	0.6	0.6
10.9%	10.8%	Water Content (%)	9.6%	9.3%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	22		LL	18
PL	11		PL	9
PI	11		PI	9
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 21, 2017
Tested By: JA

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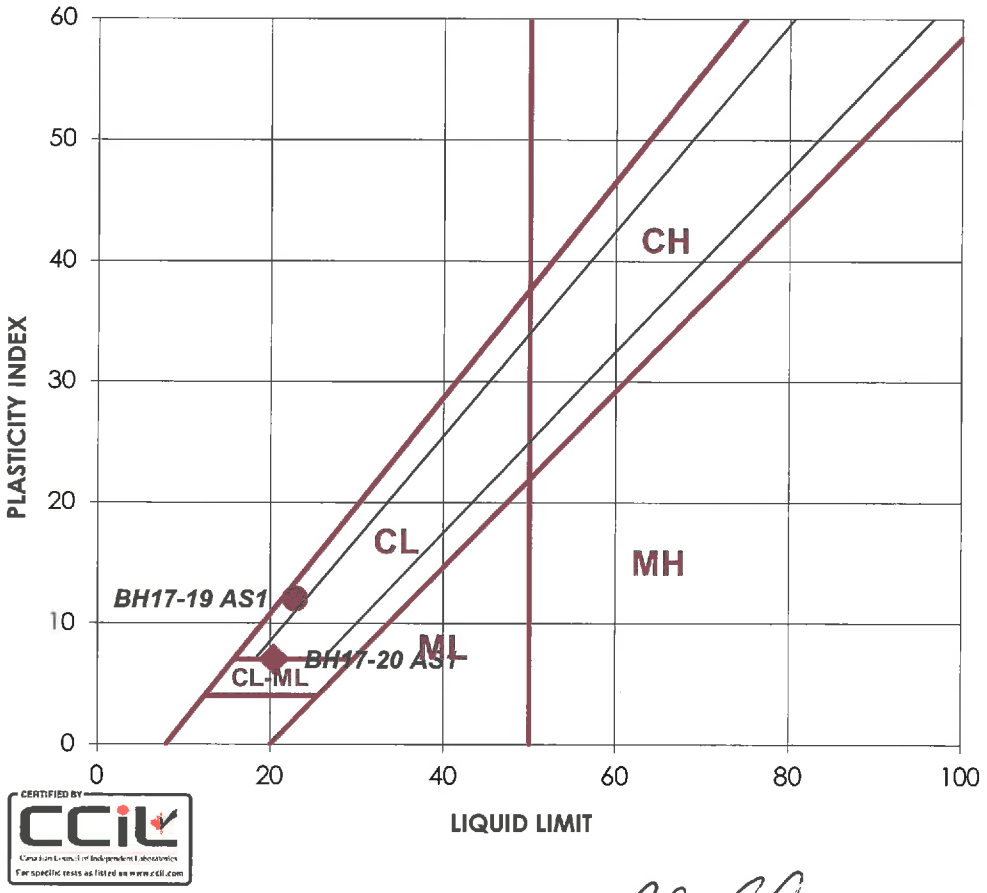
Sample: BH17-19 AS1			Sample: BH17-20 AS1	
LIQUID			LIQUID	
1	2	Trial No.	1	2
21	21	Number of Blows	24	23
17B	2B	Container Number	24B	47B
40.98	42.28	Wt. Sample (wet+tare) (g)	39.36	43.73
36.20	37.12	Wt. Sample (dry+tare) (g)	35.23	38.94
15.42	15.39	Wt. Tare (g)	15.23	15.63
20.8	21.7	Wt. Dry Soil (g)	20.0	23.3
4.8	5.2	Wt. Water (g)	4.1	4.8
23.0%	23.7%	Water Content (%)	20.7%	20.5%
22.5%	23.3%	Corrected Water Content (%)	20.5%	20.3%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BT	BQ	Container Number	AA	B4
21.75	22.16	Wt. Sample (wet+tare) (g)	21.72	22.5
20.96	21.35	Wt. Sample (dry+tare) (g)	20.88	21.55
13.96	14.09	Wt. Tare (g)	14.11	14.05
7.0	7.3	Wt. Dry Soil (g)	6.8	7.5
0.8	0.8	Wt. Water (g)	0.8	0.9
11.3%	11.2%	Water Content (%)	12.4%	12.7%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	23		LL	20
PL	11		PL	13
PI	12		PI	7
CLASSIFICATION			CLASSIFICATION	
CL			CL-ML	



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Reviewed By:

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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 4, 2017
Tested By: JA

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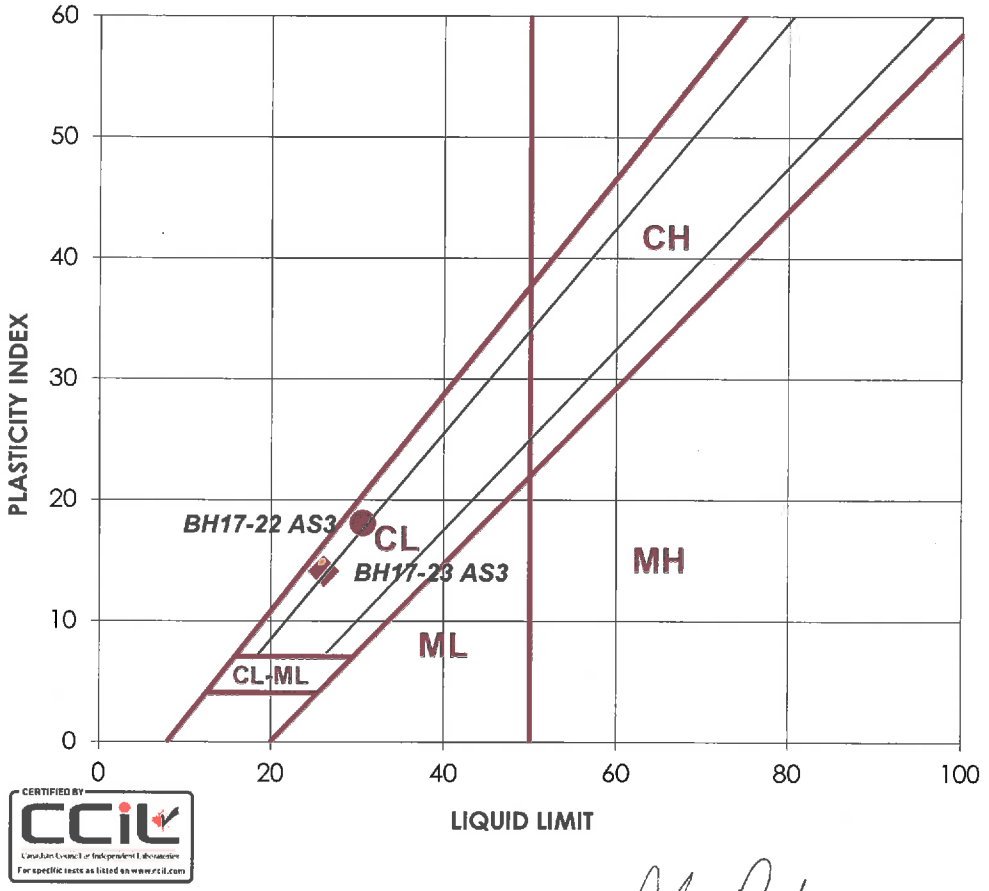
Sample: BH17-22 AS3			Sample: BH17-23 AS3	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	22	Number of Blows	20	20
2B	17B	Container Number	39B	20B
40.31	38.39	Wt. Sample (wet+tare) (g)	39.03	38.69
34.34	32.93	Wt. Sample (dry+tare) (g)	34.01	33.79
15.41	15.41	Wt. Tare (g)	15.43	15.48
18.9	17.5	Wt. Dry Soil (g)	18.6	18.3
6.0	5.5	Wt. Water (g)	5.0	4.9
31.5%	31.2%	Water Content (%)	27.0%	26.8%
30.7%	30.7%	Corrected Water Content (%)	26.3%	26.0%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AQ	AR	Container Number	BN	BD
20.09	20.42	Wt. Sample (wet+tare) (g)	20.26	20.7
19.38	19.7	Wt. Sample (dry+tare) (g)	19.61	20.02
13.88	14.11	Wt. Tare (g)	14.03	14.21
5.5	5.6	Wt. Dry Soil (g)	5.6	5.8
0.7	0.7	Wt. Water (g)	0.7	0.7
12.9%	12.9%	Water Content (%)	11.6%	11.7%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	31		LL	26
PL	13		PL	12
PI	18		PI	14
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 4, 2017
Tested By: JA

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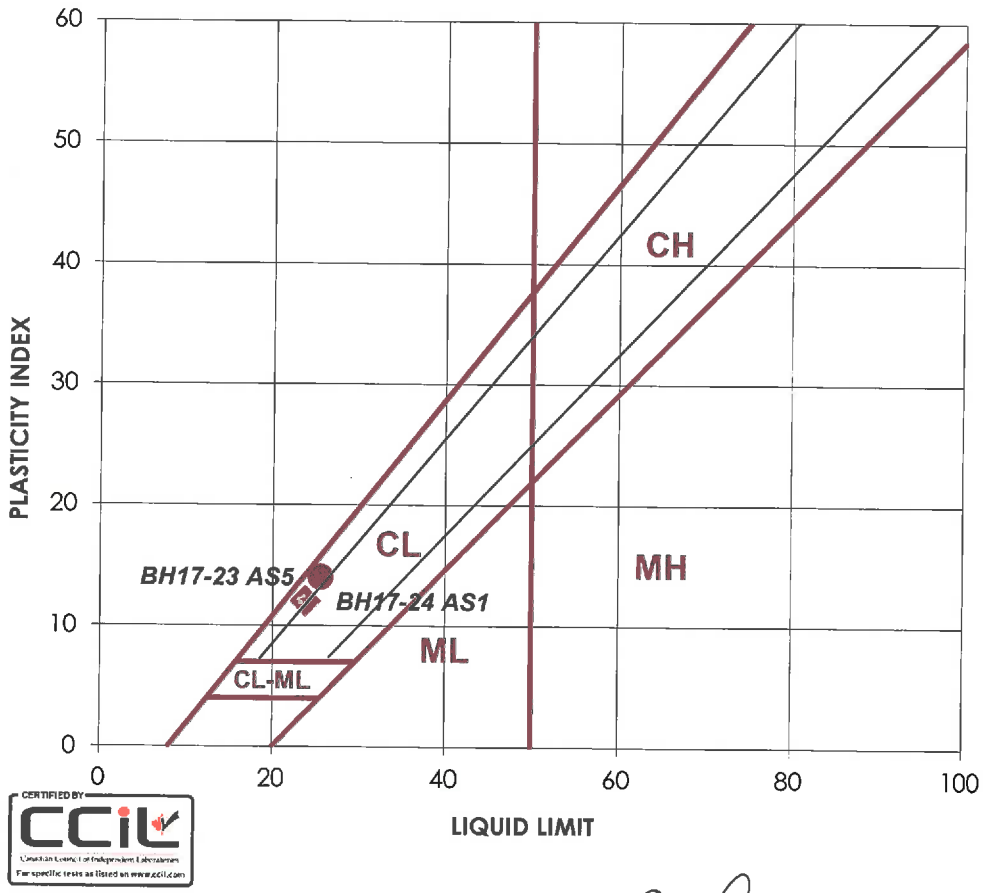
Sample:

BH17-23 AS5			BH17-24 AS1	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	21	Number of Blows	20	20
15B	38B	Container Number	8B	35B
37.29	39.83	Wt. Sample (wet+tare) (g)	37.76	38.45
32.77	34.81	Wt. Sample (dry+tare) (g)	33.33	34.00
15.58	15.62	Wt. Tare (g)	15.46	15.65
17.2	19.2	Wt. Dry Soil (g)	17.9	18.4
4.5	5.0	Wt. Water (g)	4.4	4.5
26.3%	26.2%	Water Content (%)	24.8%	24.3%
25.6%	25.6%	Corrected Water Content (%)	24.1%	23.6%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BA	BB	Container Number	BU	AZ
20.24	20.77	Wt. Sample (wet+tare) (g)	20.18	19.01
19.55	20.04	Wt. Sample (dry+tare) (g)	19.5	18.46
13.92	14.21	Wt. Tare (g)	14.15	13.92
5.6	5.8	Wt. Dry Soil (g)	5.4	4.5
0.7	0.7	Wt. Water (g)	0.7	0.6
12.3%	12.5%	Water Content (%)	12.7%	12.1%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	26		LL	24
PL	12		PL	12
PI	14		PI	12
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 5, 2017
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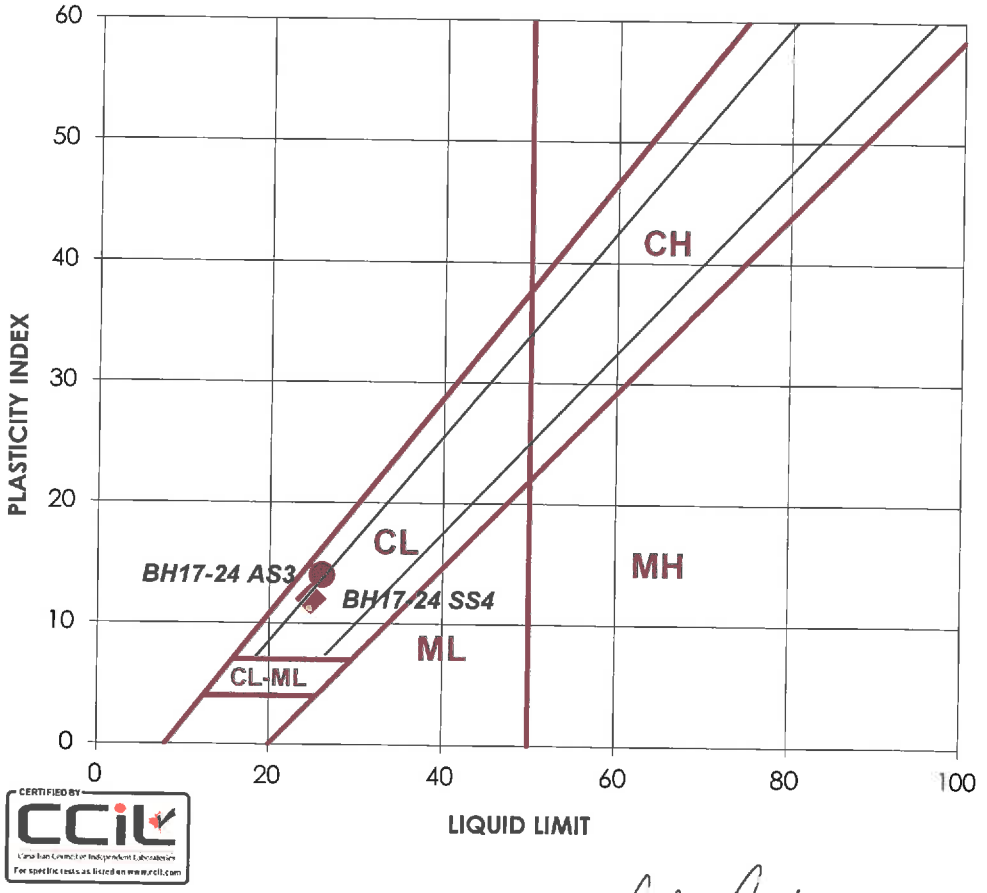
Sample: BH17-24 AS3			Sample: BH17-24 SS4	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	20	20
12B	26B	Container Number	5B	11B
37.69	37.52	Wt. Sample (wet+tare) (g)	36.74	38.03
32.86	32.89	Wt. Sample (dry+tare) (g)	32.41	33.44
14.97	15.53	Wt. Tare (g)	15.44	15.50
17.9	17.4	Wt. Dry Soil (g)	17.0	17.9
4.8	4.6	Wt. Water (g)	4.3	4.6
27.0%	26.7%	Water Content (%)	25.5%	25.6%
26.3%	26.0%	Corrected Water Content (%)	24.8%	24.9%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AE	AI	Container Number	AL	AU
20.42	20.54	Wt. Sample (wet+tare) (g)	20.55	20.68
19.74	19.83	Wt. Sample (dry+tare) (g)	19.86	19.91
14.1	14.09	Wt. Tare (g)	14.21	14.04
5.6	5.7	Wt. Dry Soil (g)	5.7	5.9
0.7	0.7	Wt. Water (g)	0.7	0.8
12.1%	12.4%	Water Content (%)	12.2%	13.1%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	26		LL	25
PL	12		PL	13
PI	14		PI	12
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Ser
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 5, 2017
Tested By: JA

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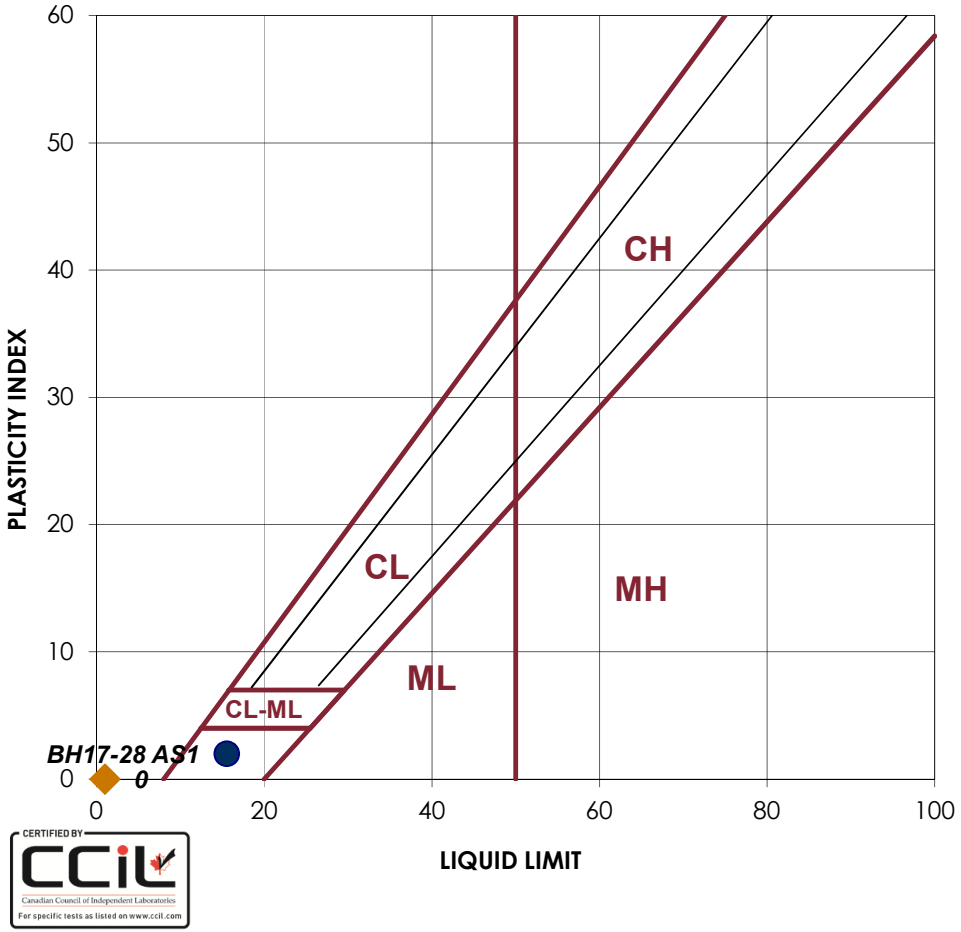
Sample:			Sample:	
BH17-28 AS1				
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows		
43B	32B	Container Number		
53.09	59.04	Wt. Sample (wet+tare)(g)		
47.88	53.03	Wt. Sample (dry+tare)(g)		
15.33	15.14	Wt. Tare (g)		
32.6	37.9	Wt. Dry Soil (g)		
5.2	6.0	Wt. Water (g)		
16.0%	15.9%	Water Content (%)		
15.6%	15.4%	Corrected Water Content (%)		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BC	BF	Container Number		
20.5	20.82	Wt. Sample (wet+tare)(g)		
19.73	20.02	Wt. Sample (dry+tare)(g)		
14.18	14.13	Wt. Tare (g)		
5.6	5.9	Wt. Dry Soil (g)		
0.8	0.8	Wt. Water (g)		
13.9%	13.6%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	16		LL	
PL	14		PL	
PI	2		PI	
CLASSIFICATION			CLASSIFICATION	
ML			***NON-PLASTIC***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 4, 2017
Tested By: JA

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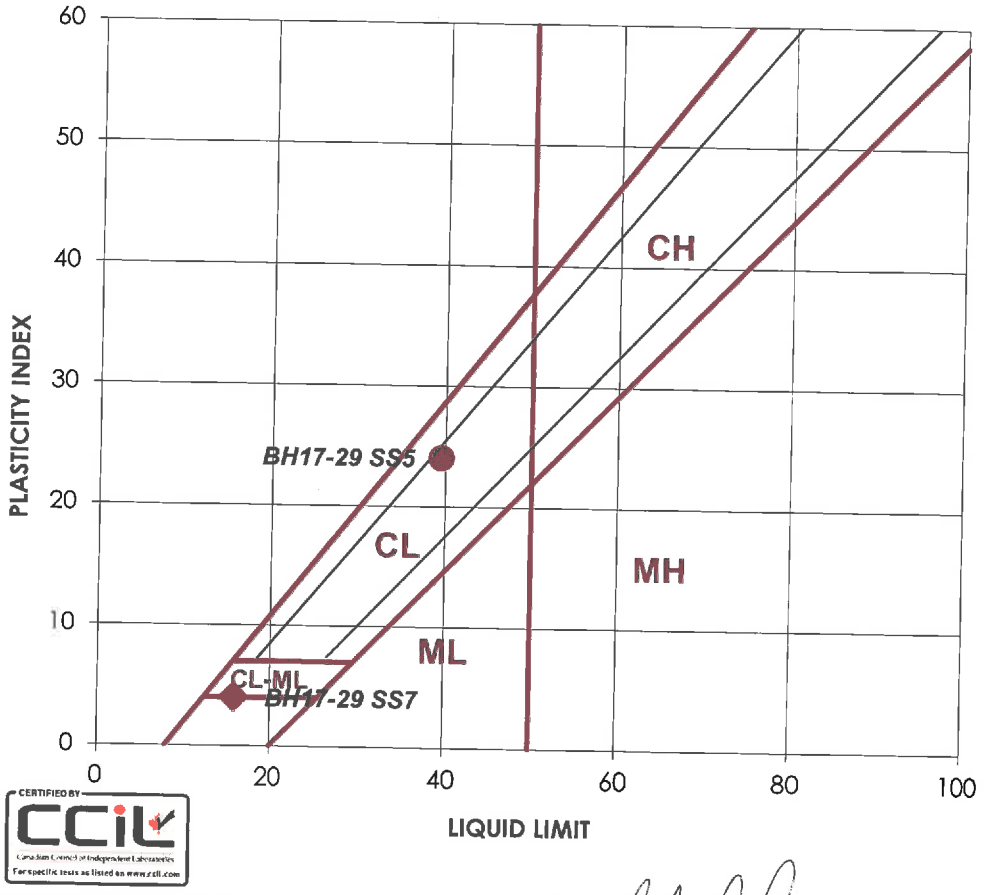
Sample:

BH17-29 SS5			
LIQUID			
1	2	Trial No.	
20	20	Number of Blows	
45B	23B	Container Number	
36.84	36.89	Wt. Sample (wet+tare)(g)	
30.75	30.67	Wt. Sample (dry+tare)(g)	
15.74	15.38	Wt. Tare (g)	
15.0	15.3	Wt. Dry Soil (g)	
6.1	6.2	Wt. Water (g)	
40.6%	40.7%	Water Content (%)	
39.5%	39.6%	Corrected Water Content (%)	
PLASTIC			
1	2	Trial No.	
BJ	BK	Container Number	
20.48	20.78	Wt. Sample (wet+tare)(g)	
19.59	19.9	Wt. Sample (dry+tare)(g)	
13.98	14.27	Wt. Tare (g)	
5.6	5.6	Wt. Dry Soil (g)	
0.9	0.9	Wt. Water (g)	
15.9%	15.6%	Water Content (%)	
AVERAGE VALUES			
1	2		
LL	40		
PL	16		
PI	24		
CLASSIFICATION			
CL			

Sample:

BH17-29 SS7	
LIQUID	
1	2
20	21
10B	36B
40.49	46.24
36.93	41.97
15.45	15.41
21.5	26.6
3.6	4.3
16.6%	16.1%
16.1%	15.7%
PLASTIC	
1	2
AD	AF
20.97	20.97
20.23	20.21
14.15	14.08
6.1	6.1
0.7	0.8
12.2%	12.4%
AVERAGE VALUES	
1	2
LL	16
PL	12
PI	4
CLASSIFICATION	
CL-ML	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Serv
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	March 27, 2017
Date Tested:	April 4, 2017
Tested By:	JA

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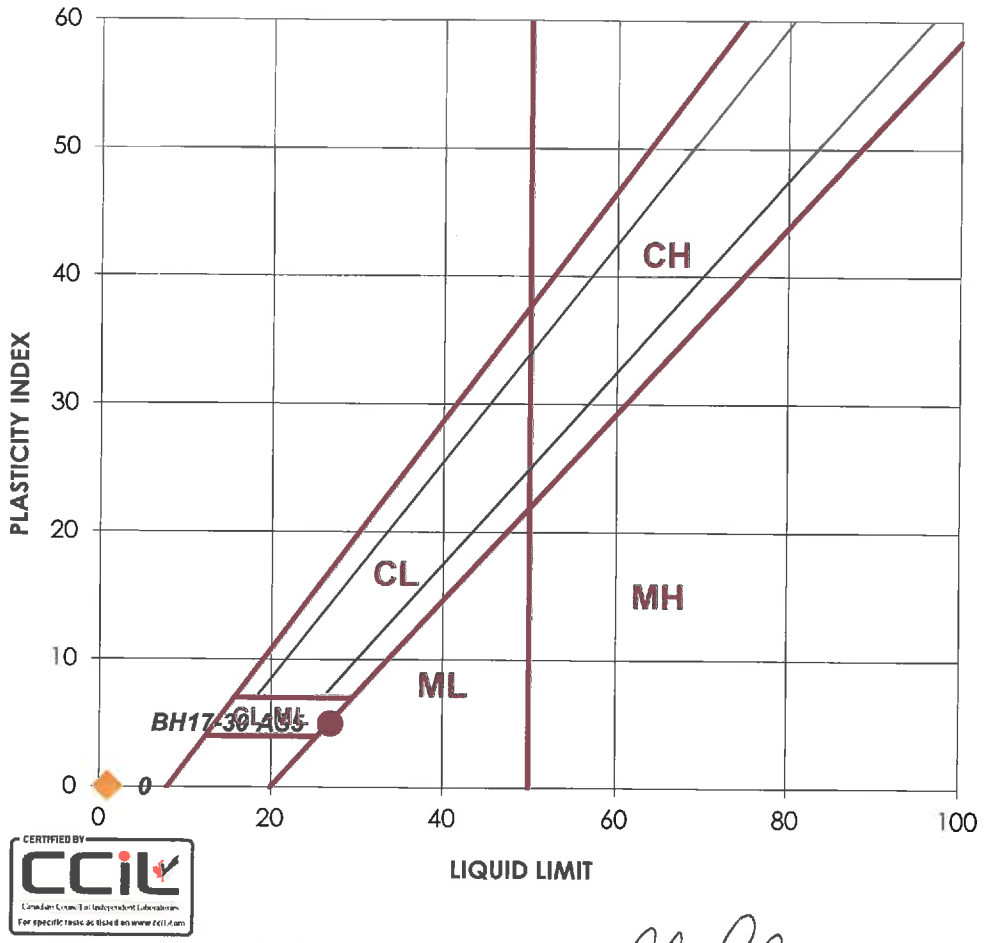
Sample:

BH17-30 AS5			
LIQUID			
1	2	Trial No.	
20	20	Number of Blows	
33B	19B	Container Number	
37.74	39.32	Wt. Sample (wet+tare) (g)	
32.91	34.07	Wt. Sample (dry+tare) (g)	
15.49	15.21	Wt. Tare (g)	
17.4	18.9	Wt. Dry Soil (g)	
4.8	5.3	Wt. Water (g)	
27.7%	27.8%	Water Content (%)	
27.0%	27.1%	Corrected Water Content (%)	
PLASTIC			
1	2	Trial No.	
AO	AP	Container Number	
20.52	20.7	Wt. Sample (wet+tare) (g)	
19.34	19.53	Wt. Sample (dry+tare) (g)	
14.18	14.2	Wt. Tare (g)	
5.2	5.3	Wt. Dry Soil (g)	
1.2	1.2	Wt. Water (g)	
22.9%	22.0%	Water Content (%)	
AVERAGE VALUES			
1	2		
LL	27		
PL	22		
PI	5		
CLASSIFICATION			
ML			

Sample:

LIQUID		
1	2	Trial No.
		Number of Blows
		Container Number
		Wt. Sample (wet+tare) (g)
		Wt. Sample (dry+tare) (g)
		Wt. Tare (g)
		Wt. Dry Soil (g)
		Wt. Water (g)
		Water Content (%)
		Corrected Water Content (%)
PLASTIC		
1	2	Trial No.
		Container Number
		Wt. Sample (wet+tare) (g)
		Wt. Sample (dry+tare) (g)
		Wt. Tare (g)
		Wt. Dry Soil (g)
		Wt. Water (g)
		Water Content (%)
AVERAGE VALUES		
1	2	
LL		
PL		
PI		
CLASSIFICATION		
NON-PLASTIC		



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 21, 2017
Tested By: JA

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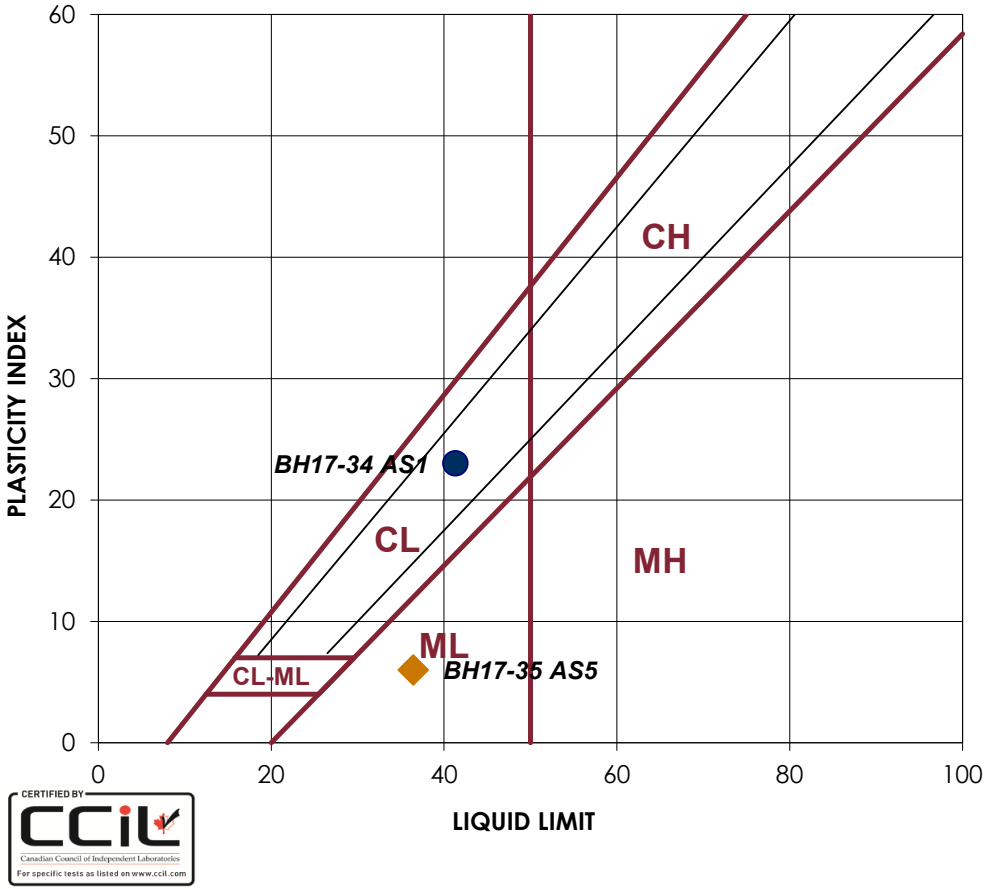
Sample: BH17-34 AS1			Sample: BH17-35 AS5	
LIQUID			LIQUID	
1	2	Trial No.	1	2
26	30	Number of Blows	21	22
14B	34B	Container Number	22B	37B
38.29	37.61	Wt. Sample (wet+tare)(g)	50.14	48.34
31.67	31.17	Wt. Sample (dry+tare)(g)	40.76	39.39
15.49	15.32	Wt. Tare (g)	15.52	15.25
16.2	15.9	Wt. Dry Soil (g)	25.2	24.1
6.6	6.4	Wt. Water (g)	9.4	9.0
40.9%	40.6%	Water Content (%)	37.2%	37.1%
41.1%	41.5%	Corrected Water Content (%)	36.4%	36.5%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AB	AC	Container Number	AW	AS
20.36	21.06	Wt. Sample (wet+tare)(g)	20.68	20.29
19.39	20.02	Wt. Sample (dry+tare)(g)	19.17	18.87
13.98	14.3	Wt. Tare (g)	14.24	14.12
5.4	5.7	Wt. Dry Soil (g)	4.9	4.8
1.0	1.0	Wt. Water (g)	1.5	1.4
17.9%	18.2%	Water Content (%)	30.6%	29.9%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	41		LL	36
PL	18		PL	30
PI	23		PI	6
CLASSIFICATION			CLASSIFICATION	
CL			ML	



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Atterberg Limits

ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 22, 2017
Tested By: JA

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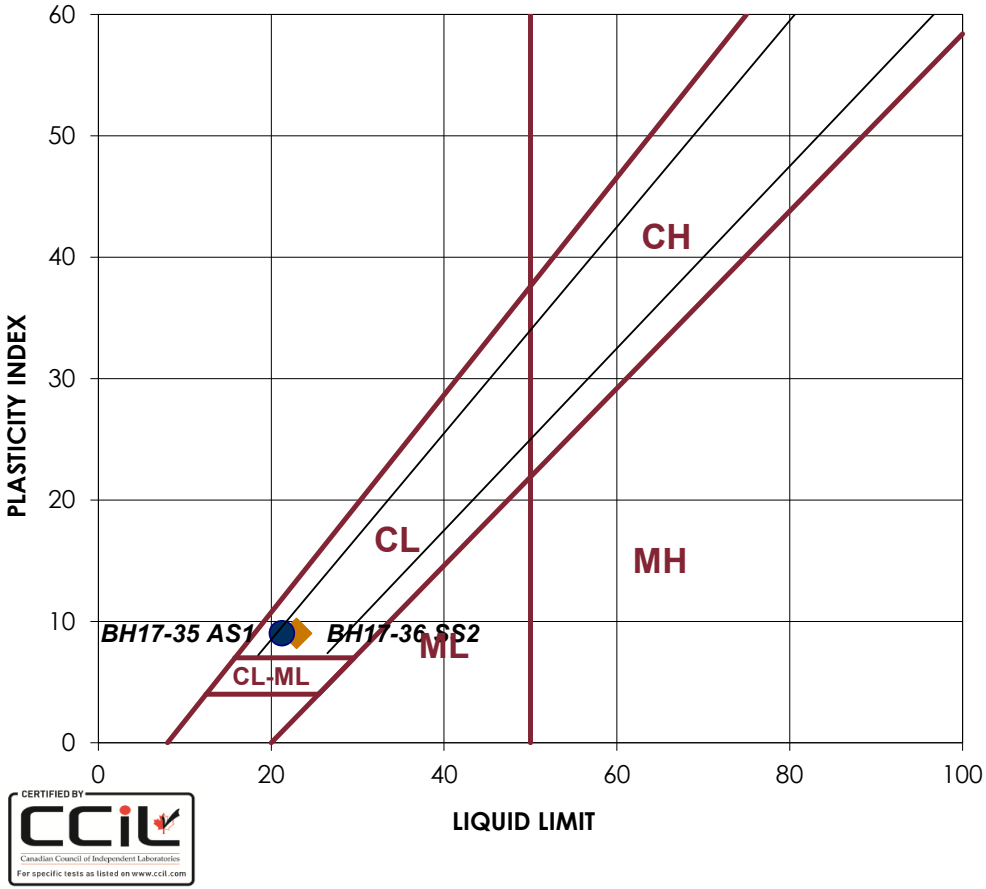
Sample: BH17-35 AS1			Sample: BH17-36 SS2	
LIQUID			LIQUID	
1	2	Trial No.	1	2
22	22	Number of Blows	20	21
18B	7B	Container Number	4B	21B
42.81	38.82	Wt. Sample (wet+tare)(g)	38.17	41.62
37.92	34.69	Wt. Sample (dry+tare)(g)	33.91	36.62
15.22	15.57	Wt. Tare (g)	15.57	15.57
22.7	19.1	Wt. Dry Soil (g)	18.3	21.1
4.9	4.1	Wt. Water (g)	4.3	5.0
21.5%	21.6%	Water Content (%)	23.2%	23.8%
21.2%	21.3%	Corrected Water Content (%)	22.6%	23.3%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BF	BC	Container Number	BS	AF
20.66	20.49	Wt. Sample (wet+tare)(g)	21.25	21.43
19.95	19.81	Wt. Sample (dry+tare)(g)	20.3	20.54
14.15	14.19	Wt. Tare (g)	13.4	14.1
5.8	5.6	Wt. Dry Soil (g)	6.9	6.4
0.7	0.7	Wt. Water (g)	0.9	0.9
12.2%	12.1%	Water Content (%)	13.8%	13.8%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	21		LL	23
PL	12		PL	14
PI	9		PI	9
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 22, 2017
Tested By: JA

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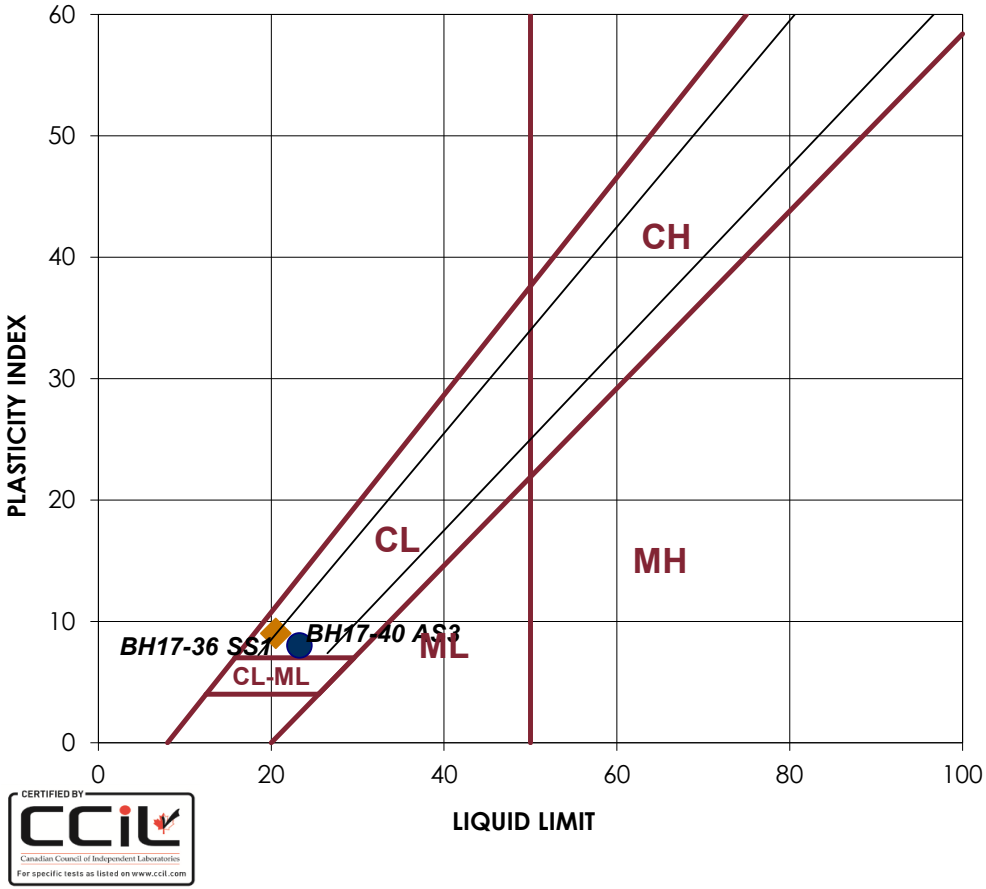
Sample: BH17-36 SS1			Sample: BH17-40 AS3	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	22	Number of Blows	20	20
46B	30B	Container Number	11B	5B
36.86	42.52	Wt. Sample (wet+tare)(g)	37.76	38.57
32.72	37.29	Wt. Sample (dry+tare)(g)	33.89	34.53
15.34	15.24	Wt. Tare (g)	15.48	15.44
17.4	22.1	Wt. Dry Soil (g)	18.4	19.1
4.1	5.2	Wt. Water (g)	3.9	4.0
23.8%	23.7%	Water Content (%)	21.0%	21.2%
23.2%	23.4%	Corrected Water Content (%)	20.5%	20.6%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AC	AV	Container Number	BO	AH
20.68	21.47	Wt. Sample (wet+tare)(g)	21.3	22.19
19.85	20.5	Wt. Sample (dry+tare)(g)	20.5	21.32
14.21	14.04	Wt. Tare (g)	13.84	14.1
5.6	6.5	Wt. Dry Soil (g)	6.7	7.2
0.8	1.0	Wt. Water (g)	0.8	0.9
14.7%	15.0%	Water Content (%)	12.0%	12.0%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	23		LL	21
PL	15		PL	12
PI	8		PI	9
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 22, 2017
Tested By: JA

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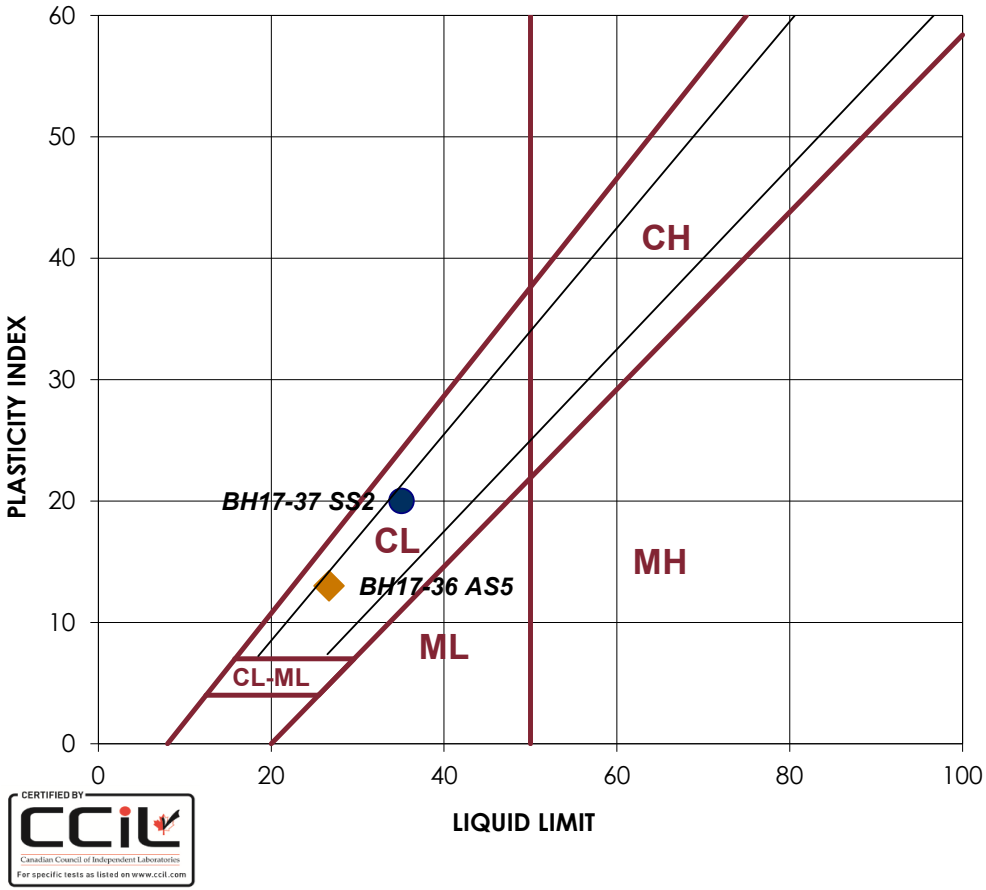
Sample: BH17-37 SS2			Sample: BH17-36 AS5	
LIQUID			LIQUID	
1	2	Trial No.	1	2
25	25	Number of Blows	21	21
32B	43B	Container Number	AN	31B
36.57	39.49	Wt. Sample (wet+tare)(g)	41.72	40.54
31.01	33.21	Wt. Sample (dry+tare)(g)	35.83	35.18
15.14	15.33	Wt. Tare (g)	14.09	15.62
15.9	17.9	Wt. Dry Soil (g)	21.7	19.6
5.6	6.3	Wt. Water (g)	5.9	5.4
35.0%	35.1%	Water Content (%)	27.1%	27.4%
35.0%	35.1%	Corrected Water Content (%)	26.5%	26.8%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AJ	AK	Container Number	BE	AP
20.61	20.65	Wt. Sample (wet+tare)(g)	20.83	20.85
19.77	19.81	Wt. Sample (dry+tare)(g)	19.99	20.06
14.17	14.25	Wt. Tare (g)	13.87	14.14
5.6	5.6	Wt. Dry Soil (g)	6.1	5.9
0.8	0.8	Wt. Water (g)	0.8	0.8
15.0%	15.1%	Water Content (%)	13.7%	13.3%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	35		LL	27
PL	15		PL	14
PI	20		PI	13
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Ser
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	March 27, 2017
Date Tested:	April 22, 2017
Tested By:	JA

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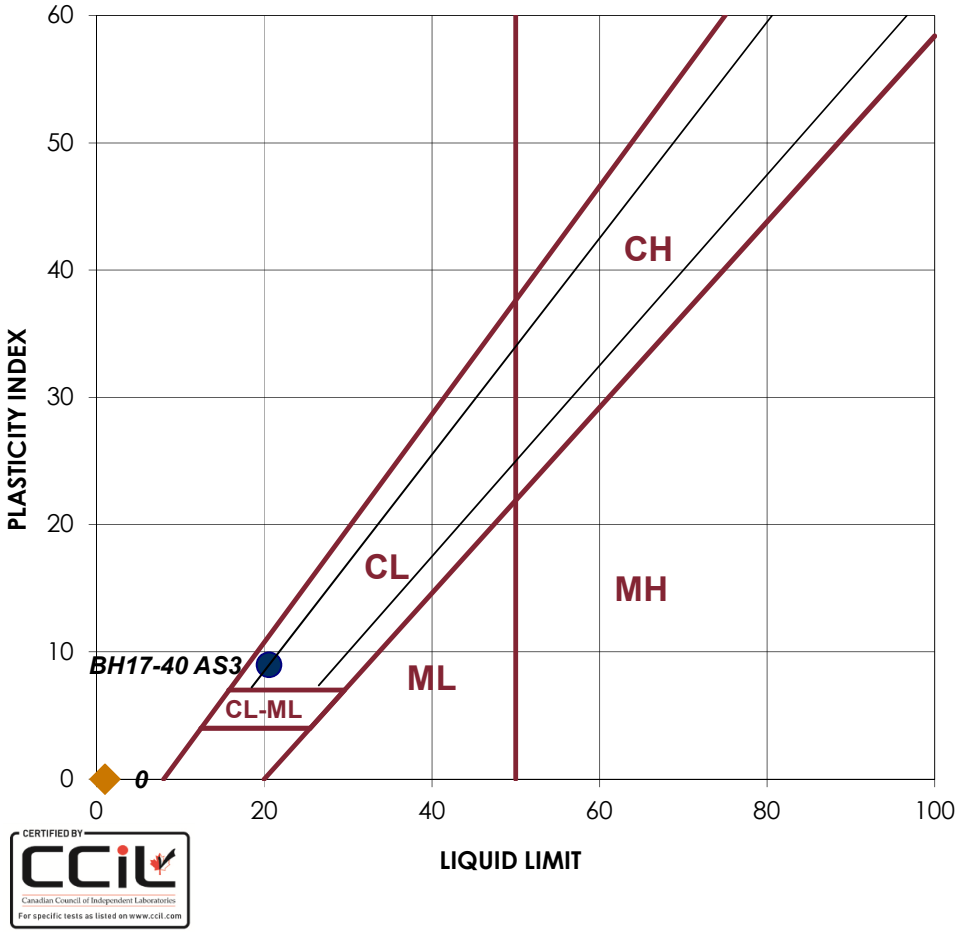
Sample:			Sample:	
BH17-40 AS3				
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows		
11B	5B	Container Number		
37.76	38.57	Wt. Sample (wet+tare) (g)		
33.89	34.53	Wt. Sample (dry+tare) (g)		
15.48	15.44	Wt. Tare (g)		
18.4	19.1	Wt. Dry Soil (g)		
3.9	4.0	Wt. Water (g)		
21.0%	21.2%	Water Content (%)		
20.5%	20.6%	Corrected Water Content (%)		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BO	AH	Container Number		
21.3	22.19	Wt. Sample (wet+tare) (g)		
20.5	21.32	Wt. Sample (dry+tare) (g)		
13.84	14.1	Wt. Tare (g)		
6.7	7.2	Wt. Dry Soil (g)		
0.8	0.9	Wt. Water (g)		
12.0%	12.0%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	21		LL	
PL	12		PL	
PI	9		PI	
CLASSIFICATION			CLASSIFICATION	
CL			***NON-PLASTIC***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 22, 2017
Tested By: JA

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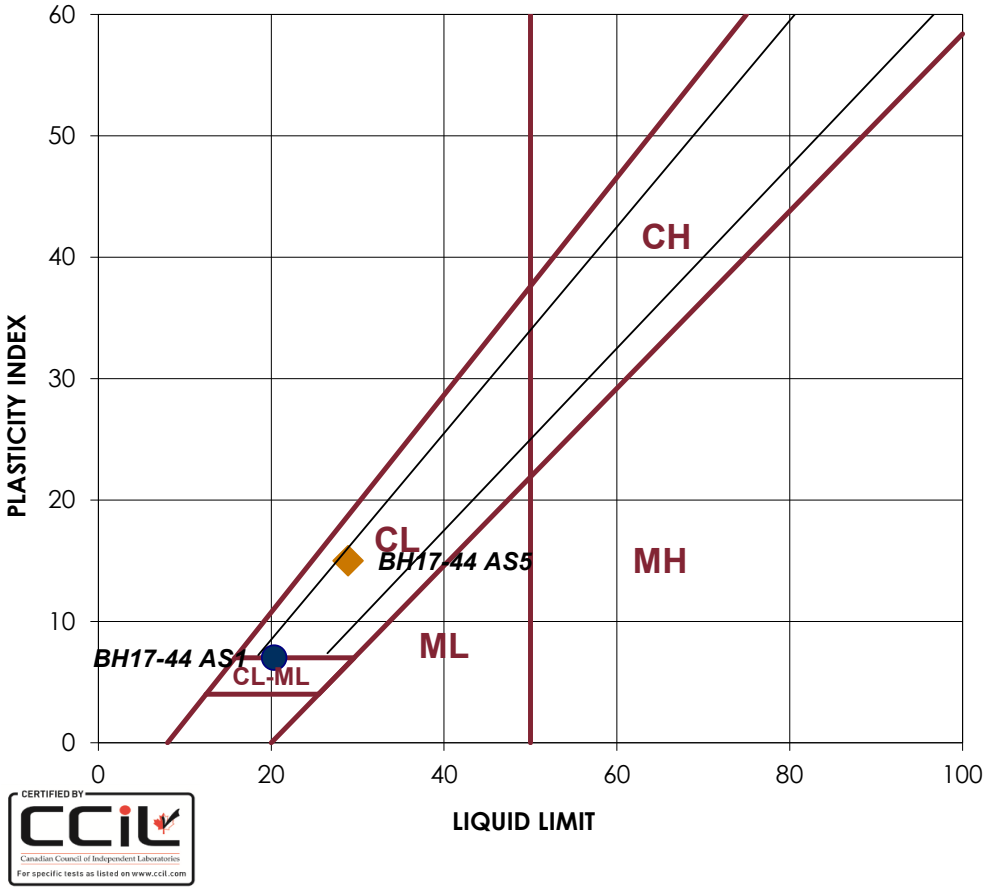
Sample: BH17-44 AS1			Sample: BH17-44 AS5	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	21	21
13B	29B	Container Number	10B	27B
38.86	40.02	Wt. Sample (wet+tare)(g)	43.69	42.32
34.85	35.82	Wt. Sample (dry+tare)(g)	37.36	36.08
15.66	15.75	Wt. Tare (g)	15.36	15.43
19.2	20.1	Wt. Dry Soil (g)	22.0	20.7
4.0	4.2	Wt. Water (g)	6.3	6.2
20.9%	20.9%	Water Content (%)	28.8%	30.2%
20.3%	20.4%	Corrected Water Content (%)	28.2%	29.6%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BR	AB	Container Number	B1	A4
22.2	22.62	Wt. Sample (wet+tare)(g)	20.49	21.29
21.29	21.65	Wt. Sample (dry+tare)(g)	19.73	20.43
14.14	13.76	Wt. Tare (g)	14.21	14.09
7.2	7.9	Wt. Dry Soil (g)	5.5	6.3
0.9	1.0	Wt. Water (g)	0.8	0.9
12.7%	12.3%	Water Content (%)	13.8%	13.6%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	20		LL	29
PL	13		PL	14
PI	7		PI	15
CLASSIFICATION			CLASSIFICATION	
CL-ML			***CL***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Ser
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	March 27, 2017
Date Tested:	April 26, 2017
Tested By:	JA

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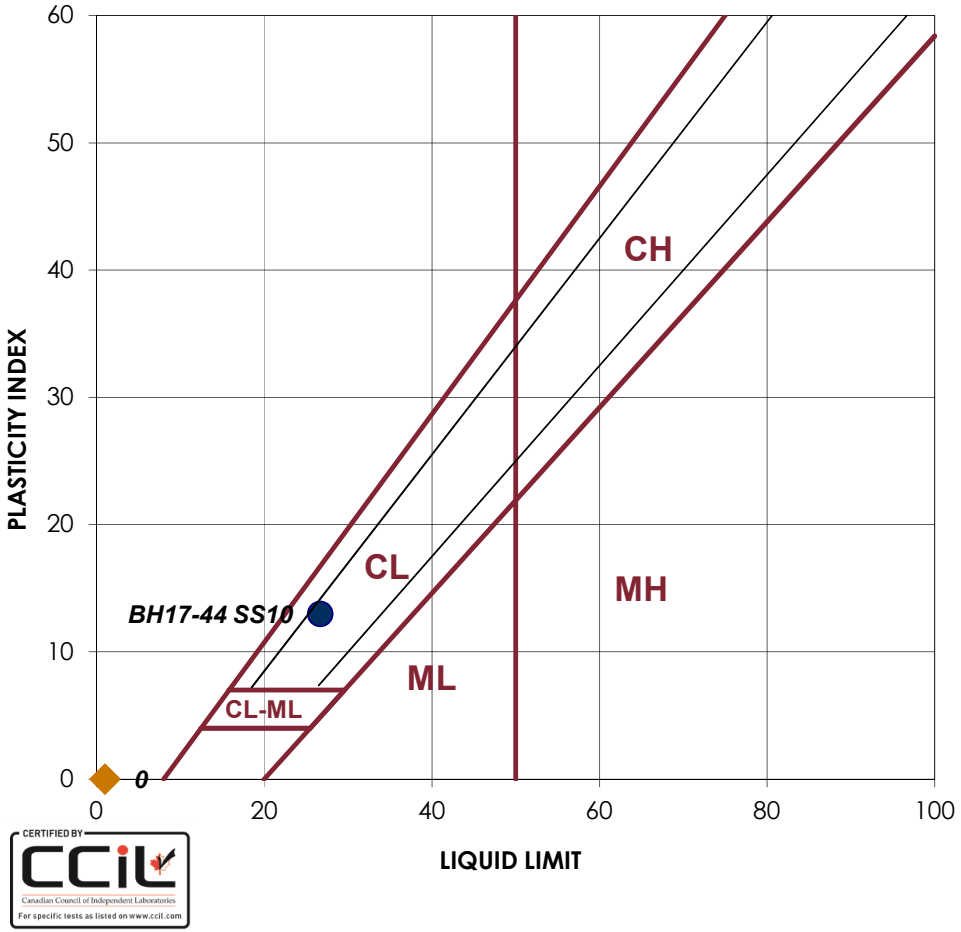
Sample:			Sample:	
BH17-44 SS10				
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows		
43B	32B	Container Number		
34.12	38.84	Wt. Sample (wet+tare) (g)		
30.11	33.72	Wt. Sample (dry+tare) (g)		
15.35	15.14	Wt. Tare (g)		
14.8	18.6	Wt. Dry Soil (g)		
4.0	5.1	Wt. Water (g)		
27.2%	27.6%	Water Content (%)		
26.4%	26.8%	Corrected Water Content (%)		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AJ	AK	Container Number		
21.45	21.72	Wt. Sample (wet+tare) (g)		
20.54	20.79	Wt. Sample (dry+tare) (g)		
14.17	14.25	Wt. Tare (g)		
6.4	6.5	Wt. Dry Soil (g)		
0.9	0.9	Wt. Water (g)		
14.3%	14.2%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	27		LL	
PL	14		PL	
PI	13		PI	
CLASSIFICATION			CLASSIFICATION	
CL			**NON-PLASTIC**	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Serv
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	March 27, 2017
Date Tested:	April 22, 2017
Tested By:	JA

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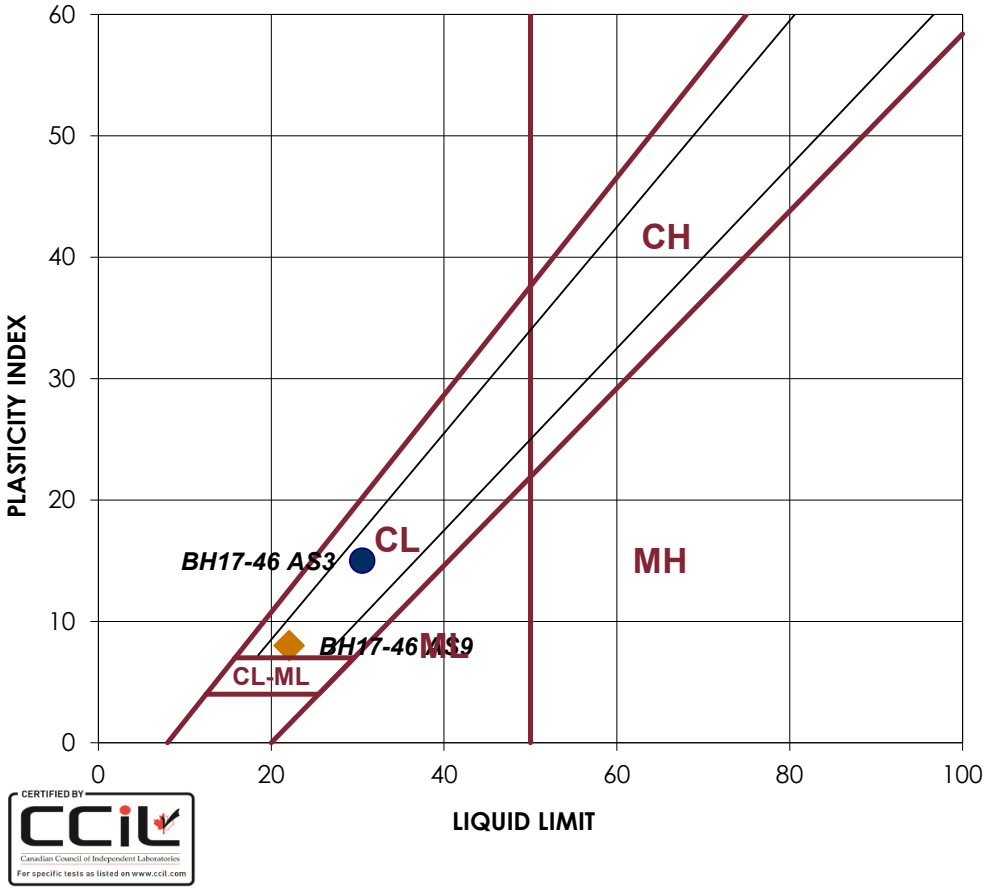
Sample:			Sample:	
BH17-46 AS3			BH17-46 AS9	
LIQUID			LIQUID	
1	2	Trial No.	1	2
21	21	Number of Blows	25	25
33B	41B	Container Number	3B	19B
43.60	42.55	Wt. Sample (wet+tare)(g)	37.02	40.82
36.92	36.14	Wt. Sample (dry+tare)(g)	33.11	36.20
15.55	15.54	Wt. Tare (g)	15.41	15.23
21.4	20.6	Wt. Dry Soil (g)	17.7	21.0
6.7	6.4	Wt. Water (g)	3.9	4.6
31.3%	31.1%	Water Content (%)	22.1%	22.0%
30.6%	30.5%	Corrected Water Content (%)	22.1%	22.0%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BU	BG	Container Number	AQ	AR
20.9	21.41	Wt. Sample (wet+tare)(g)	24.73	21.16
19.98	20.49	Wt. Sample (dry+tare)(g)	23.39	20.31
14.02	14.67	Wt. Tare (g)	13.89	14.11
6.0	5.8	Wt. Dry Soil (g)	9.5	6.2
0.9	0.9	Wt. Water (g)	1.3	0.9
15.4%	15.8%	Water Content (%)	14.1%	13.7%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	31		LL	22
PL	16		PL	14
PI	15		PI	8
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 24, 2017
Tested By: JA

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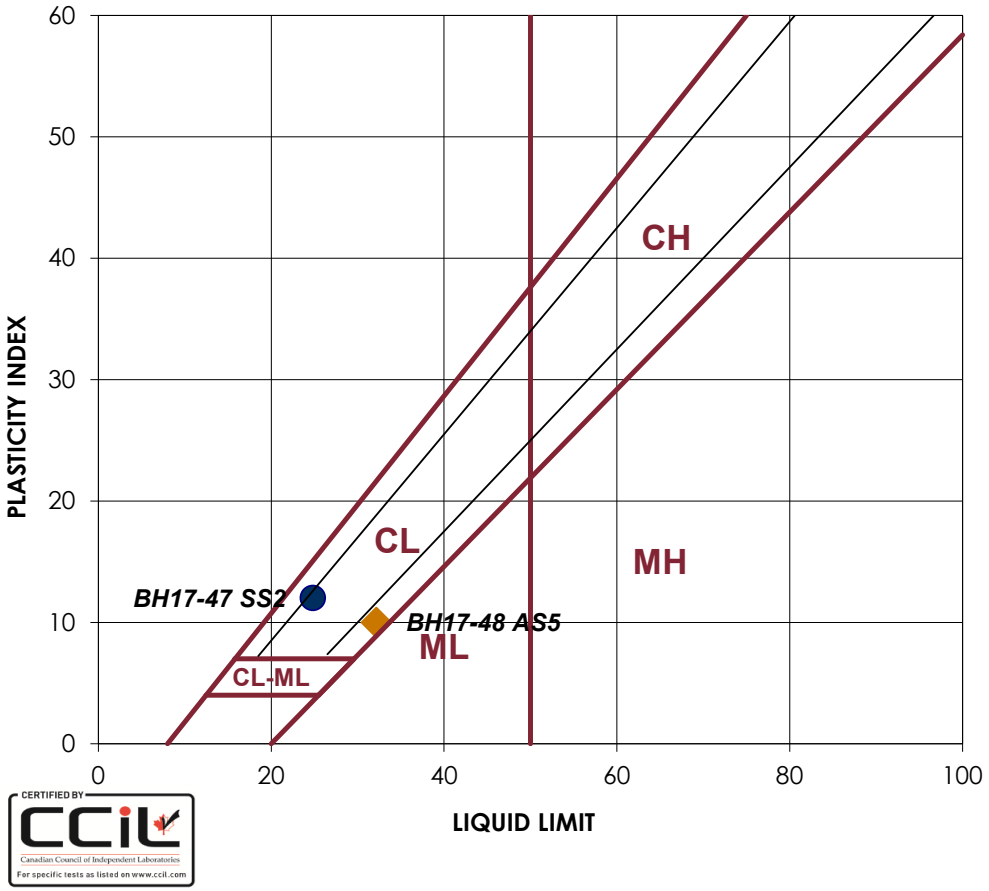
Sample: BH17-47 SS2			Sample: BH17-48 AS5	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	20	20
23B	23B	Container Number	36B	40B
40.20	38.32	Wt. Sample (wet+tare)(g)	39.74	40.68
35.15	33.64	Wt. Sample (dry+tare)(g)	33.69	34.38
15.41	15.25	Wt. Tare (g)	15.41	15.28
19.7	18.4	Wt. Dry Soil (g)	18.3	19.1
5.1	4.7	Wt. Water (g)	6.1	6.3
25.6%	25.4%	Water Content (%)	33.1%	33.0%
24.9%	24.8%	Corrected Water Content (%)	32.2%	32.1%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BL	BB	Container Number	AP	AO
20.8	21.12	Wt. Sample (wet+tare)(g)	20.71	20.45
20.05	20.31	Wt. Sample (dry+tare)(g)	19.53	19.32
14.22	14.21	Wt. Tare (g)	14.19	14.17
5.8	6.1	Wt. Dry Soil (g)	5.3	5.2
0.8	0.8	Wt. Water (g)	1.2	1.1
12.9%	13.3%	Water Content (%)	22.1%	21.9%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	25		LL	32
PL	13		PL	22
PI	12		PI	10
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Reviewed By: _____

Stantec

Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Serv
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	March 27, 2017
Date Tested:	April 24, 2017
Tested By:	JA

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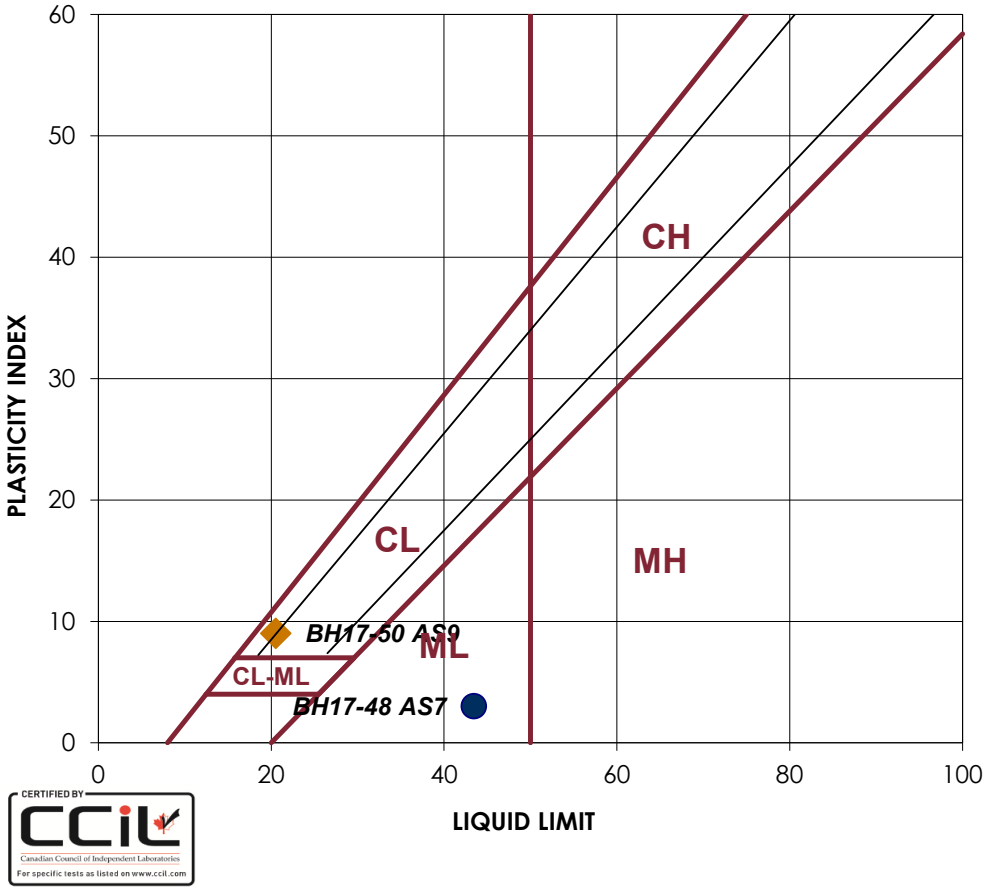
Sample:			Sample:	
BH17-48 AS7			BH17-50 AS9	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	20	20
34B	14B	Container Number	22B	37B
38.24	38.08	Wt. Sample (wet+tare)(g)	44.90	46.17
31.18	31.09	Wt. Sample (dry+tare)(g)	39.81	40.76
15.31	15.50	Wt. Tare (g)	15.52	15.24
15.9	15.6	Wt. Dry Soil (g)	24.3	25.5
7.1	7.0	Wt. Water (g)	5.1	5.4
44.5%	44.8%	Water Content (%)	21.0%	21.2%
43.3%	43.6%	Corrected Water Content (%)	20.4%	20.6%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AB	AC	Container Number	AW	AS
20.5	21.16	Wt. Sample (wet+tare)(g)	21.16	21.94
18.64	19.18	Wt. Sample (dry+tare)(g)	20.41	21.1
13.97	14.29	Wt. Tare (g)	14.25	14.12
4.7	4.9	Wt. Dry Soil (g)	6.2	7.0
1.9	2.0	Wt. Water (g)	0.8	0.8
39.8%	40.5%	Water Content (%)	12.2%	12.0%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	43		LL	21
PL	40		PL	12
PI	3		PI	9
CLASSIFICATION			CLASSIFICATION	
ML			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tli Cho Engineering & Environtmental Serv
Project Name:	TliCho AllSeason Rd.Investig.
Project No:	144902448
Date Received:	March 27, 2017
Date Tested:	April 22, 2017
Tested By:	JA

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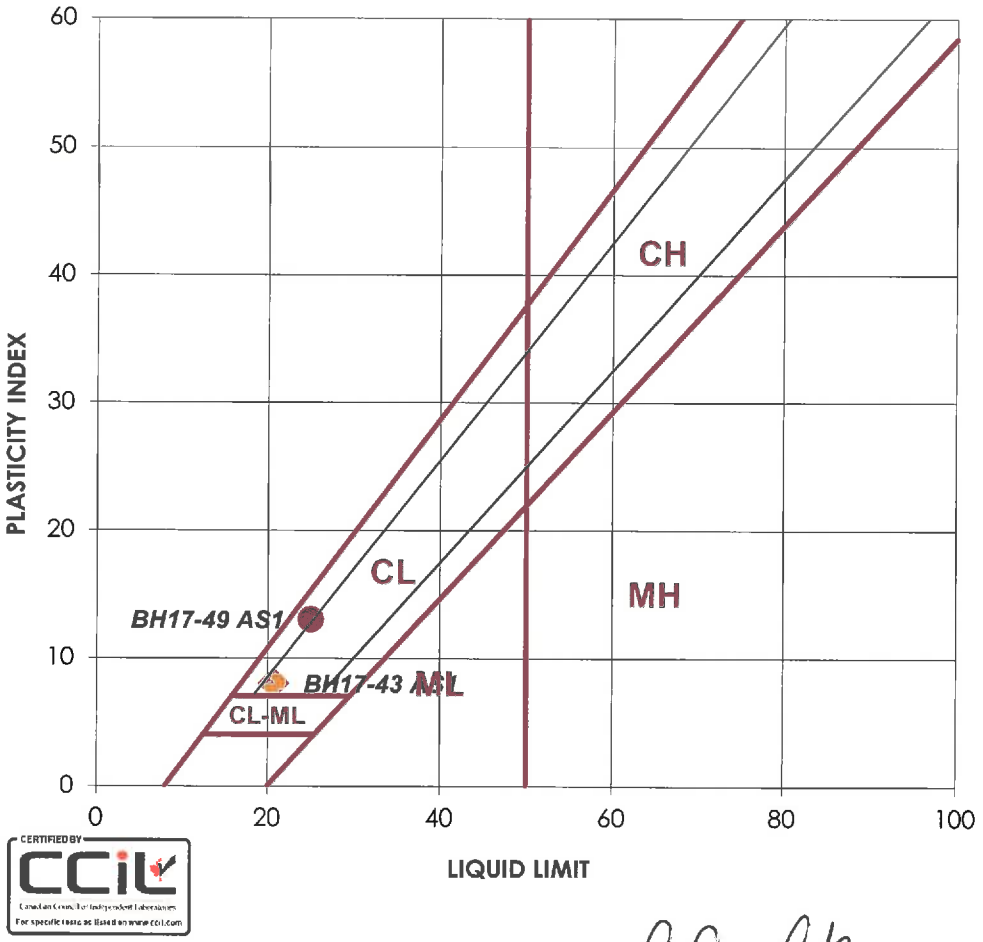
Sample:			Sample:	
BH17-49 AS1			BH17-43 AS1	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	20	Number of Blows	20	20
26B	12B	Container Number	44B	6B
39.07	41.58	Wt. Sample (wet+tare) (g)	42.25	41.15
34.26	36.12	Wt. Sample (dry+tare) (g)	37.57	36.59
15.52	14.98	Wt. Tare (g)	15.55	15.18
18.7	21.1	Wt. Dry Soil (g)	22.0	21.4
4.8	5.5	Wt. Water (g)	4.7	4.6
25.7%	25.8%	Water Content (%)	21.3%	21.3%
25.0%	25.1%	Corrected Water Content (%)	20.7%	20.7%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AE	AI	Container Number	AV	AH
21.67	21.13	Wt. Sample (wet+tare) (g)	21.73	23.31
20.85	20.38	Wt. Sample (dry+tare) (g)	20.88	22.28
14.12	14.16	Wt. Tare (g)	14.15	13.99
6.7	6.2	Wt. Dry Soil (g)	6.7	8.3
0.8	0.8	Wt. Water (g)	0.9	1.0
12.2%	12.1%	Water Content (%)	12.6%	12.4%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	25		LL	21
PL	12		PL	13
PI	13		PI	8
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Reviewed By:

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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 26, 2017
Tested By: JA

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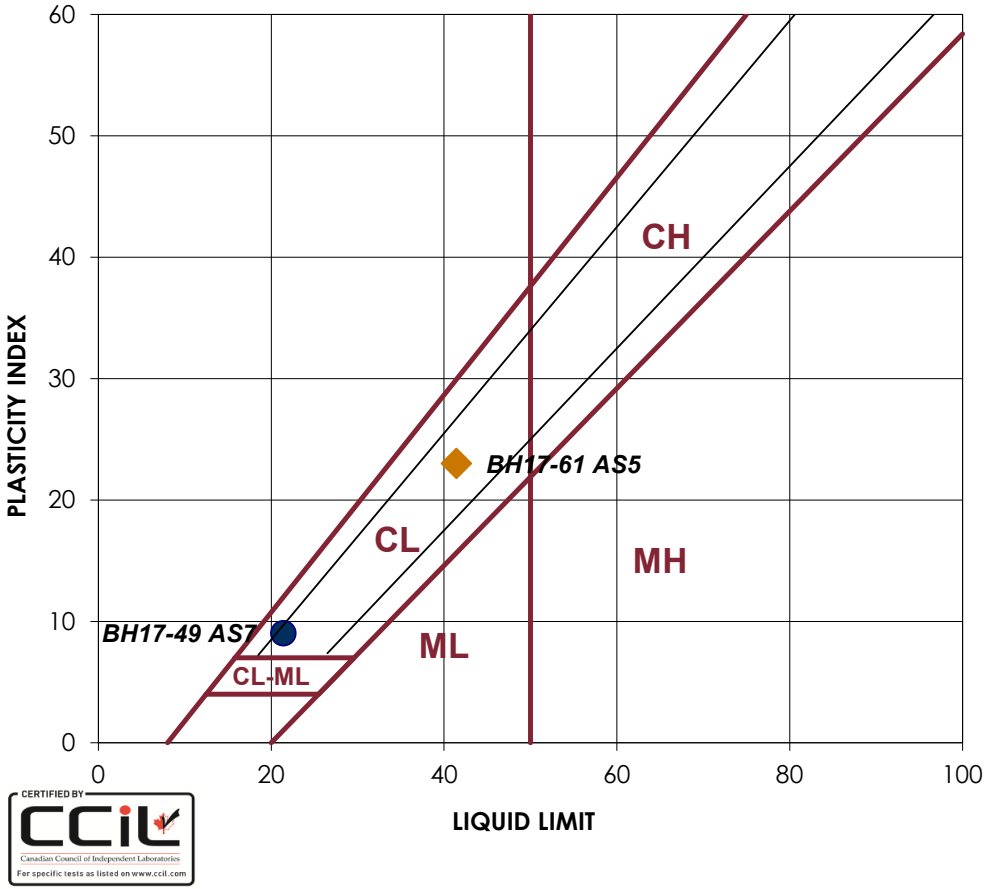
Sample: BH17-49 AS7			Sample: BH17-61 AS5	
LIQUID			LIQUID	
1	2	Trial No.	1	2
21	22	Number of Blows	21	22
45B	42B	Container Number	9B	8B
39.43	38.50	Wt. Sample (wet+tare)(g)	33.49	37.69
35.21	34.38	Wt. Sample (dry+tare)(g)	28.18	31.08
15.76	15.61	Wt. Tare (g)	15.58	15.44
19.5	18.8	Wt. Dry Soil (g)	12.6	15.6
4.2	4.1	Wt. Water (g)	5.3	6.6
21.7%	21.9%	Water Content (%)	42.1%	42.3%
21.2%	21.6%	Corrected Water Content (%)	41.3%	41.6%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BJ	AZ	Container Number	BA	BD
21.13	21.04	Wt. Sample (wet+tare)(g)	20.4	20.56
20.34	20.26	Wt. Sample (dry+tare)(g)	19.42	19.59
13.99	13.92	Wt. Tare (g)	13.93	14.18
6.4	6.3	Wt. Dry Soil (g)	5.5	5.4
0.8	0.8	Wt. Water (g)	1.0	1.0
12.4%	12.3%	Water Content (%)	17.9%	17.9%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	21		LL	41
PL	12		PL	18
PI	9		PI	23
CLASSIFICATION			CLASSIFICATION	
CL			CL	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 24, 2017
Tested By:	B.Pelkey

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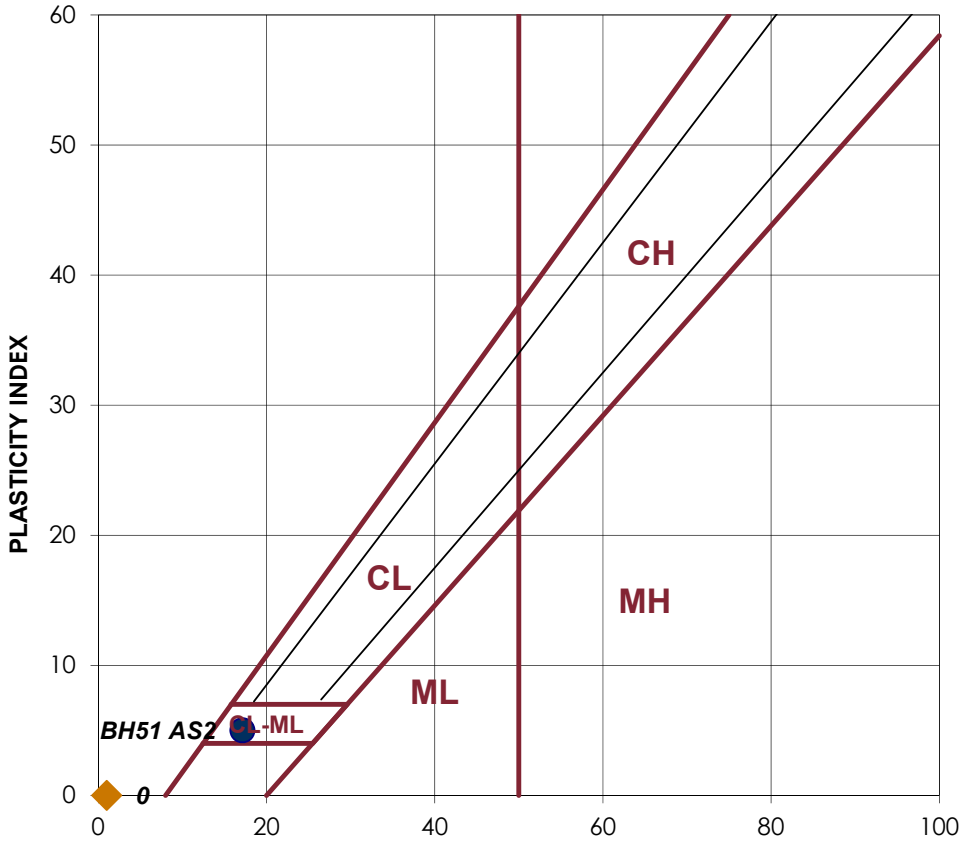
Sample:			Sample:	
BH17-51 AS3				
LIQUID			LIQUID	
1	2	Trial No.	1	2
26	27	Number of Blows		
		Container Number		
40.60	38.40	Wt. Sample (wet+tare)(g)		
34.85	33.00	Wt. Sample (dry+tare)(g)		
1.14	1.21	Wt. Tare (g)		
33.7	31.8	Wt. Dry Soil (g)		
5.8	5.4	Wt. Water (g)		
17.1%	17.0%	Water Content (%)		
17.1%	17.1%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
29.75	26.34	Wt. Sample (wet+tare)(g)		
28.08	25.04	Wt. Sample (dry+tare)(g)		
13.9	13.82	Wt. Tare (g)		
14.2	11.2	Wt. Dry Soil (g)		
1.7	1.3	Wt. Water (g)		
11.8%	11.6%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	17		LL	
PL	12		PL	
PI	5		PI	
Natural MC (%)	6.2%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL-ML			***NON-PLASTIC***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 21, 2017
Tested By:	B.Pelkey

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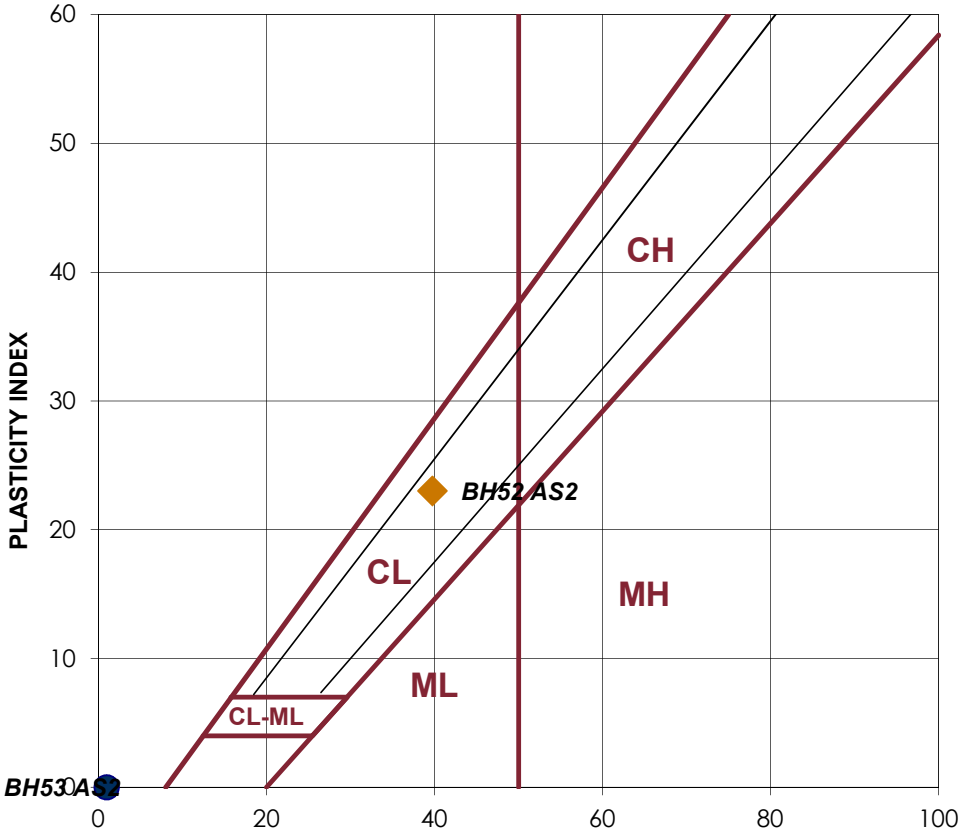
Sample:			Sample:	
BH17-53 AS2			BH17-52 AS3	
LIQUID			LIQUID	
1	2	Trial No.	1	2
non-plastic	non-plastic	Number of Blows	25	26
		Container Number		
		Wt. Sample (wet+tare) (g)	22.96	28.22
		Wt. Sample (dry+tare) (g)	16.84	20.60
		Wt. Tare (g)	1.39	1.41
		Wt. Dry Soil (g)	15.5	19.2
		Wt. Water (g)	6.1	7.6
		Water Content (%)	39.6%	39.7%
		Corrected Water Content (%	39.6%	39.9%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
non-plastic	non-plastic	Container Number		
		Wt. Sample (wet+tare) (g)	30.04	30.39
		Wt. Sample (dry+tare) (g)	27.65	27.93
		Wt. Tare (g)	13.85	13.78
		Wt. Dry Soil (g)	13.8	14.2
		Wt. Water (g)	2.4	2.5
		Water Content (%)	17.3%	17.4%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL			LL	40
PL			PL	17
PI			PI	23
Natural MC (%)	7.2%		Natural MC (%)	15.9%
CLASSIFICATION			CLASSIFICATION	
NON-PLASTIC			***CL***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tli Cho Engineering & Environtmental Serv
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448
Date Received: March 27, 2017
Date Tested: April 26, 2017
Tested By: JA

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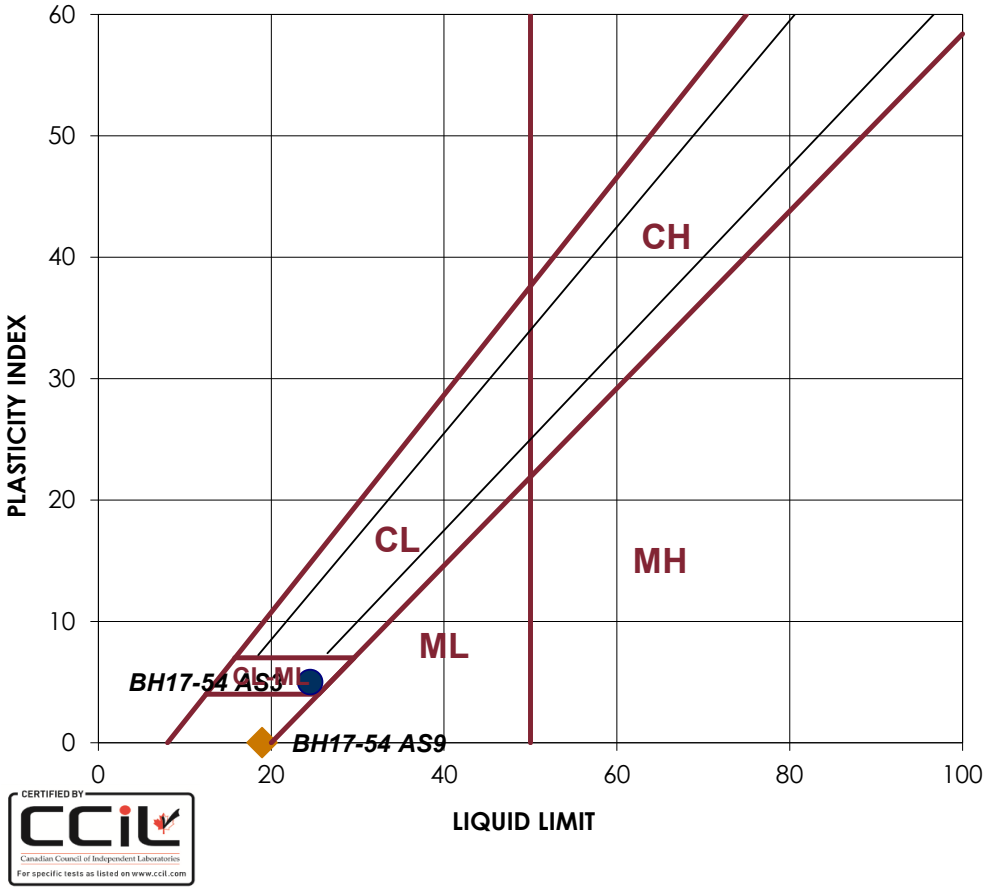
Sample: BH17-54 AS3			Sample: BH17-54 AS9	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	21	Number of Blows	22	23
39B	35B	Container Number	38B	15B
36.35	41.37	Wt. Sample (wet+tare)(g)	41.39	44.12
32.14	36.22	Wt. Sample (dry+tare)(g)	37.22	39.53
15.40	15.67	Wt. Tare (g)	15.50	15.59
16.7	20.6	Wt. Dry Soil (g)	21.7	23.9
4.2	5.2	Wt. Water (g)	4.2	4.6
25.1%	25.1%	Water Content (%)	19.2%	19.2%
24.5%	24.5%	Corrected Water Content (%)	18.9%	19.0%
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
BK	BV	Container Number	BN	AT
21.21	21.15	Wt. Sample (wet+tare)(g)	21.03	21.69
20.04	19.99	Wt. Sample (dry+tare)(g)	19.96	20.44
14.26	14.15	Wt. Tare (g)	14.04	13.84
5.8	5.8	Wt. Dry Soil (g)	5.9	6.6
1.2	1.2	Wt. Water (g)	1.1	1.3
20.2%	19.9%	Water Content (%)	18.1%	18.9%
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	25		LL	19
PL	20		PL	19
PI	5		PI	
CLASSIFICATION			CLASSIFICATION	
CL-ML			***ML***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client: Tlicho Engineering & Environtmental Servi
Project Name: Tlicho All Season Road
Project No: 144902448
Date Received: March 27, 2017
Date Tested: May 2, 2017
Tested By: JA

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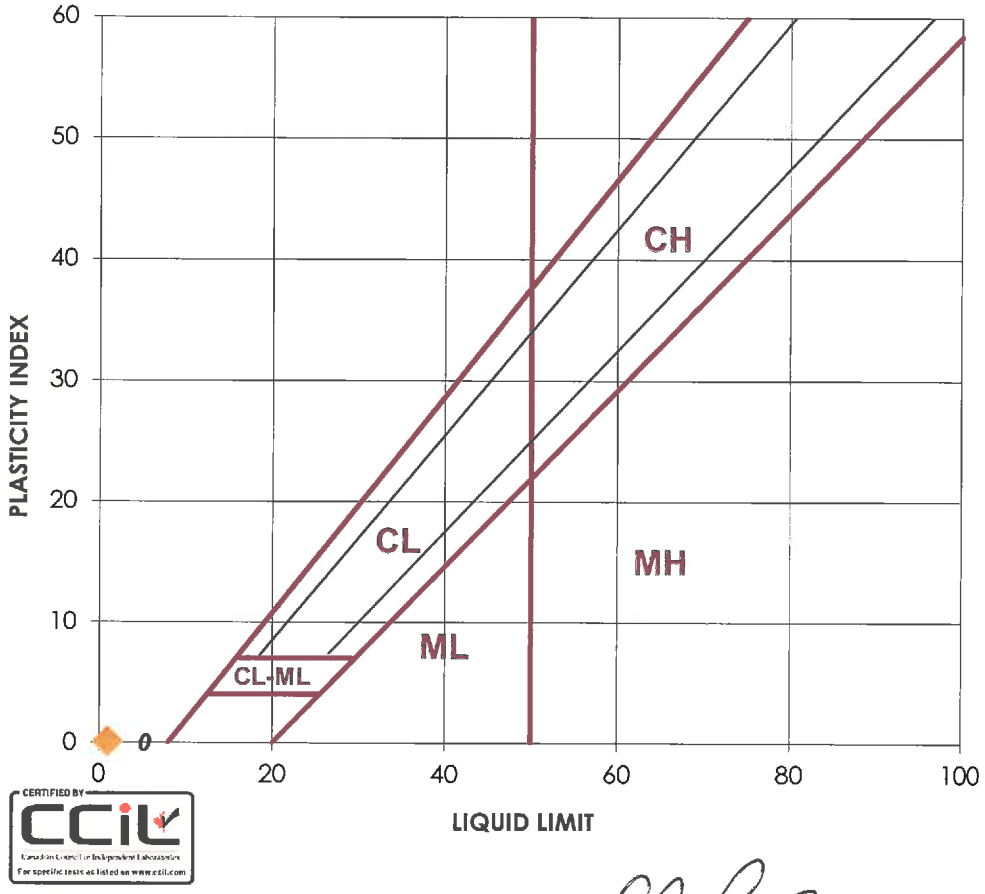
Sample: BH17-61 AS1 - AIR DRY			Sample:	
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	21	Number of Blows		
3B	19B	Container Number		
28.78	28.72	Wt. Sample (wet+tare) (g)		
19.59	19.47	Wt. Sample (dry+tare) (g)		
15.41	15.23	Wt. Tare (g)		
4.2	4.2	Wt. Dry Soil (g)		
9.2	9.3	Wt. Water (g)		
219.9%	218.2%	Water Content (%)		
214.0%	213.6%	Corrected Water Content (%)		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
AQ	AR	Container Number		
21.17	21.54	Wt. Sample (wet+tare) (g)		
16.92	17.21	Wt. Sample (dry+tare) (g)		
13.89	14.11	Wt. Tare (g)		
3.0	3.1	Wt. Dry Soil (g)		
4.3	4.3	Wt. Water (g)		
140.3%	139.7%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	214		LL	
PL	140		PL	
PI	74		PI	
CLASSIFICATION			CLASSIFICATION	
MH			NON-PLASTIC	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 21, 2017
Tested By:	C.Woods

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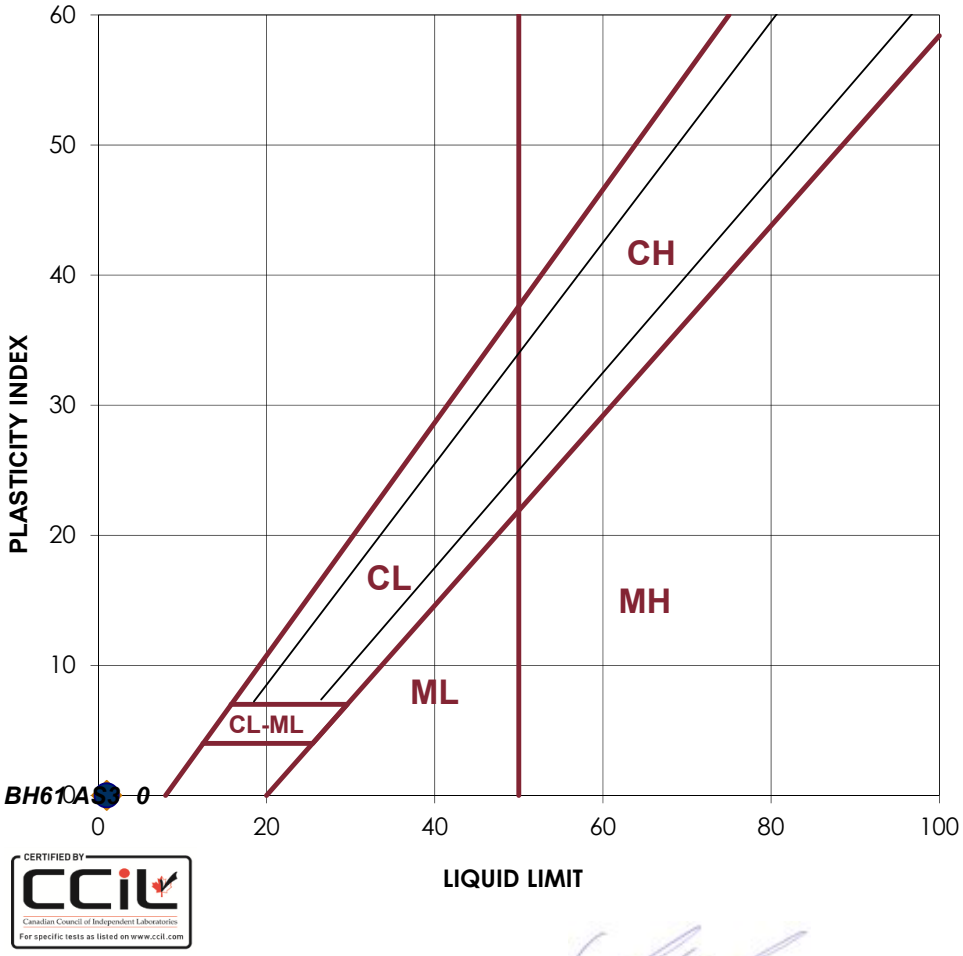
Sample:			Sample:	
BH17-61 AS5				
LIQUID			LIQUID	
1	2	Trial No.	1	2
non-plastic	non-plastic	Number of Blows		
		Container Number		
		Wt. Sample (wet+tare)(g)		
		Wt. Sample (dry+tare)(g)		
		Wt. Tare (g)		
		Wt. Dry Soil (g)		
		Wt. Water (g)		
		Water Content (%)		
		Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
non-plastic	non-plastic	Container Number		
		Wt. Sample (wet+tare)(g)		
		Wt. Sample (dry+tare)(g)		
		Wt. Tare (g)		
		Wt. Dry Soil (g)		
		Wt. Water (g)		
		Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL			LL	
PL			PL	
PI			PI	
Natural MC (%)	10.3%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
NON-PLASTIC			***NON-PLASTIC***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 21, 2017
Tested By:	C.Woods

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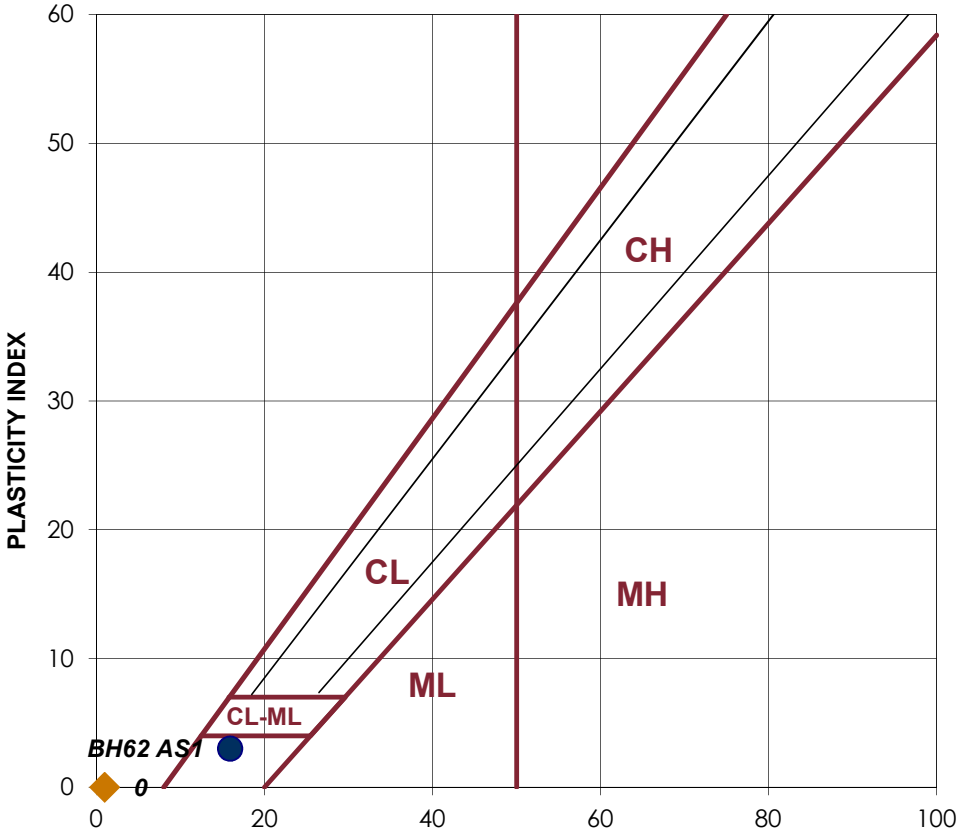
Sample:			Sample:	
BH17-62 AS1				
LIQUID			LIQUID	
1	2	Trial No.	1	2
23	21	Number of Blows		
		Container Number		
30.61	24.97	Wt. Sample (wet+tare)(g)		
26.52	21.66	Wt. Sample (dry+tare)(g)		
1.30	1.10	Wt. Tare (g)		
25.2	20.6	Wt. Dry Soil (g)		
4.1	3.3	Wt. Water (g)		
16.2%	16.1%	Water Content (%)		
16.1%	15.8%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
23.61	22.36	Wt. Sample (wet+tare)(g)		
22.52	21.39	Wt. Sample (dry+tare)(g)		
14.15	13.77	Wt. Tare (g)		
8.4	7.6	Wt. Dry Soil (g)		
1.1	1.0	Wt. Water (g)		
13.0%	12.7%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	16		LL	
PL	13		PL	
PI	3		PI	
Natural MC (%)	12.3%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
ML			***NON-PLASTIC***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 21, 2017
Tested By:	C.Woods

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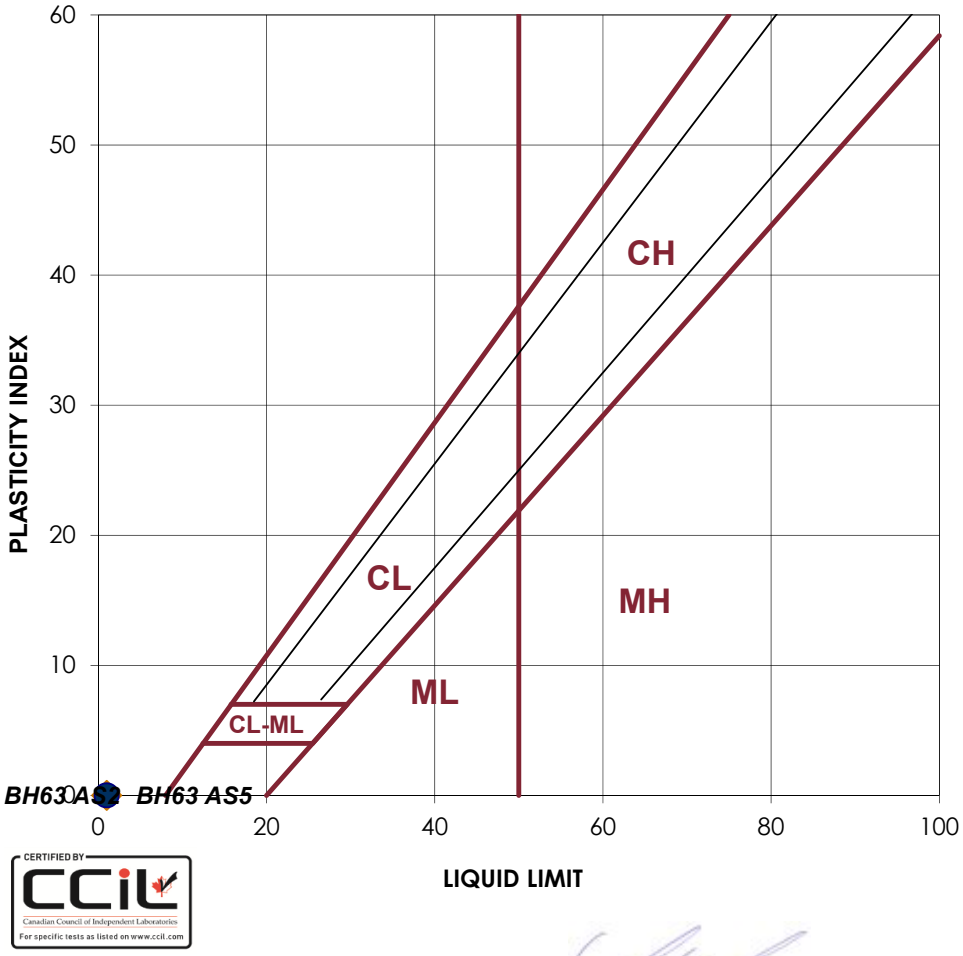
Sample:			Sample:	
BH17-63 AS2			BH17-63 AS8	
LIQUID			LIQUID	
1	2	Trial No.	1	2
non-plastic	non-plastic	Number of Blows	non-plastic	non-plastic
		Container Number		
		Wt. Sample (wet+tare)(g)		
		Wt. Sample (dry+tare)(g)		
		Wt. Tare (g)		
		Wt. Dry Soil (g)		
		Wt. Water (g)		
		Water Content (%)		
		Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
non-plastic	non-plastic	Container Number	non-plastic	non-plastic
		Wt. Sample (wet+tare)(g)		
		Wt. Sample (dry+tare)(g)		
		Wt. Tare (g)		
		Wt. Dry Soil (g)		
		Wt. Water (g)		
		Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL			LL	
PL			PL	
PI			PI	
Natural MC (%)	5.6%		Natural MC (%)	11.1%
CLASSIFICATION			CLASSIFICATION	
NON-PLASTIC			***NON-PLASTIC***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

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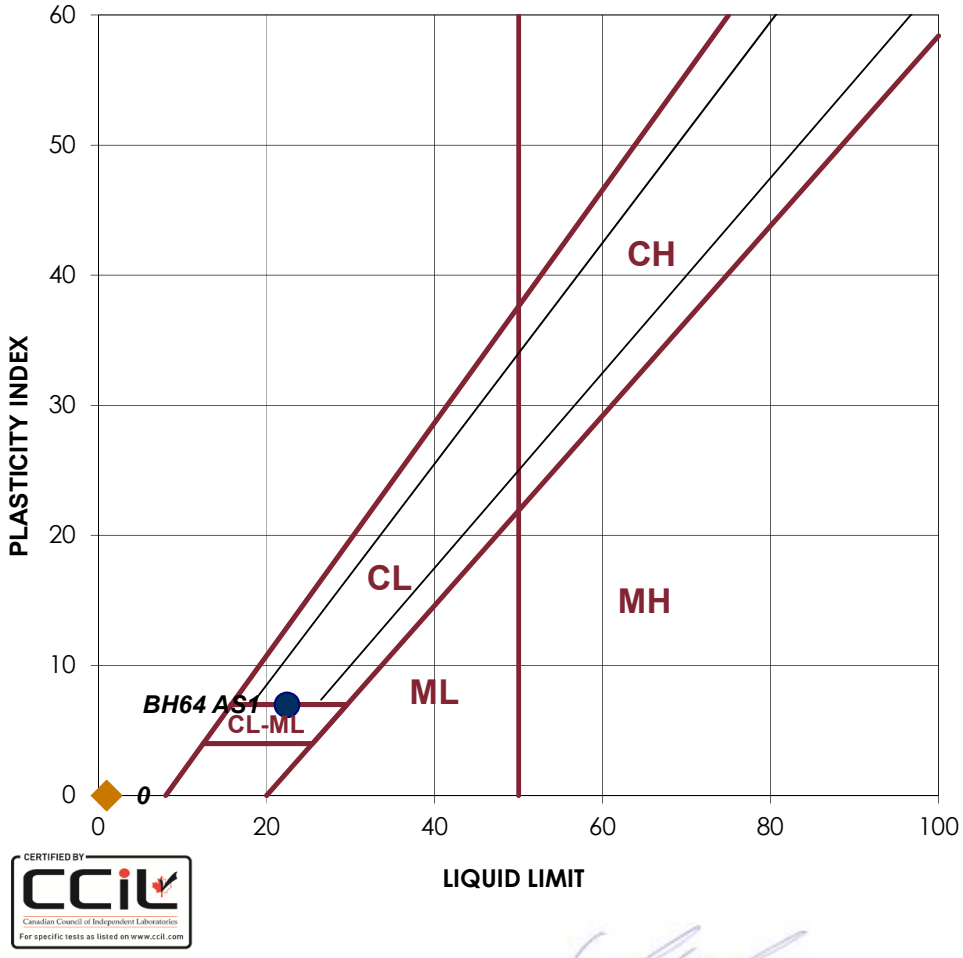
Sample:			Sample:	
BH17-64 AS1				
LIQUID			LIQUID	
1	2	Trial No.	1	2
24	23	Number of Blows		
		Container Number		
21.04	23.19	Wt. Sample (wet+tare) (g)		
17.37	19.14	Wt. Sample (dry+tare) (g)		
1.18	1.17	Wt. Tare (g)		
16.2	18.0	Wt. Dry Soil (g)		
3.7	4.1	Wt. Water (g)		
22.7%	22.5%	Water Content (%)		
22.6%	22.3%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
20.15	22.21	Wt. Sample (wet+tare) (g)		
19.35	21.13	Wt. Sample (dry+tare) (g)		
13.9	13.85	Wt. Tare (g)		
5.5	7.3	Wt. Dry Soil (g)		
0.8	1.1	Wt. Water (g)		
14.7%	14.8%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	22		LL	
PL	15		PL	
PI	7		PI	
Natural MC (%)	11.7%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL-ML			***NON-PLASTIC***	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

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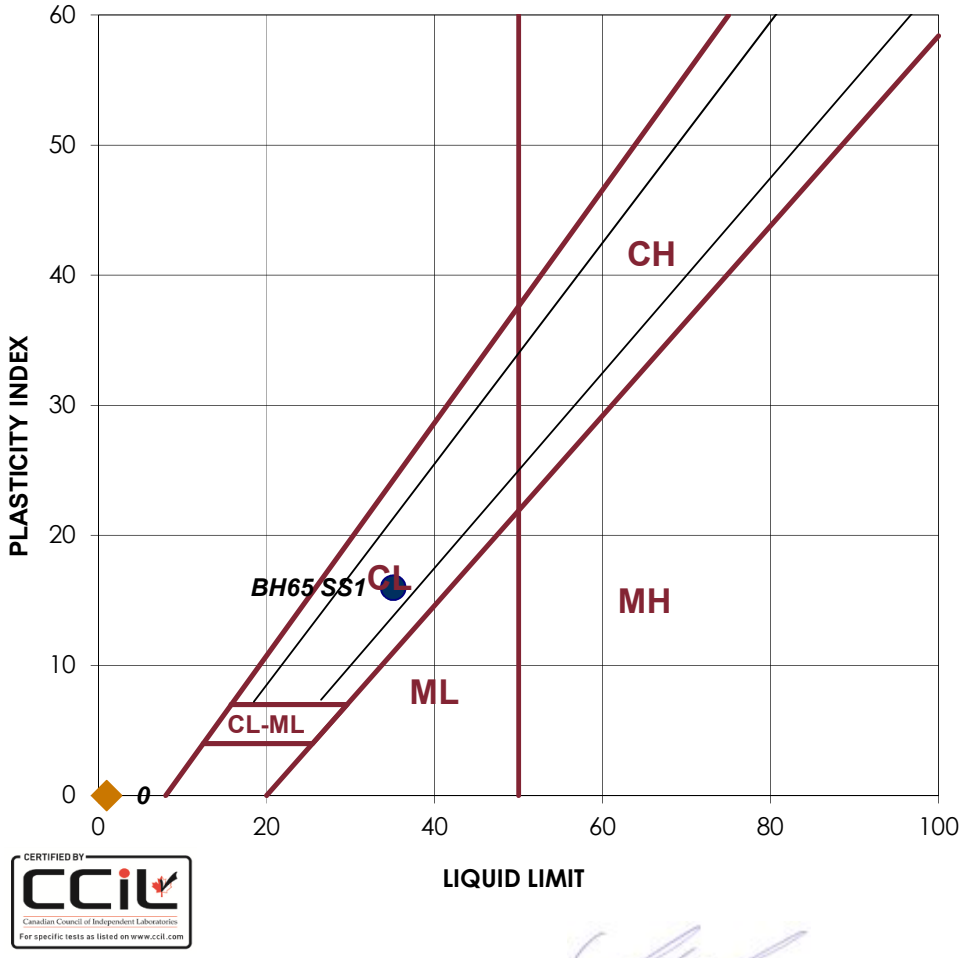
Sample:			Sample:	
BH17-65 SS2				
LIQUID			LIQUID	
1	2	Trial No.	1	2
22	21	Number of Blows		
		Container Number		
21.34	25.22	Wt. Sample (wet+tare) (g)		
16.05	18.92	Wt. Sample (dry+tare) (g)		
1.23	1.32	Wt. Tare (g)		
14.8	17.6	Wt. Dry Soil (g)		
5.3	6.3	Wt. Water (g)		
35.7%	35.8%	Water Content (%)		
35.1%	35.0%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
23.9	24.81	Wt. Sample (wet+tare) (g)		
22.31	23.09	Wt. Sample (dry+tare) (g)		
13.83	13.77	Wt. Tare (g)		
8.5	9.3	Wt. Dry Soil (g)		
1.6	1.7	Wt. Water (g)		
18.8%	18.5%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	35		LL	
PL	19		PL	
PI	16		PI	
Natural MC (%)	22.6%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL			NON-PLASTIC	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

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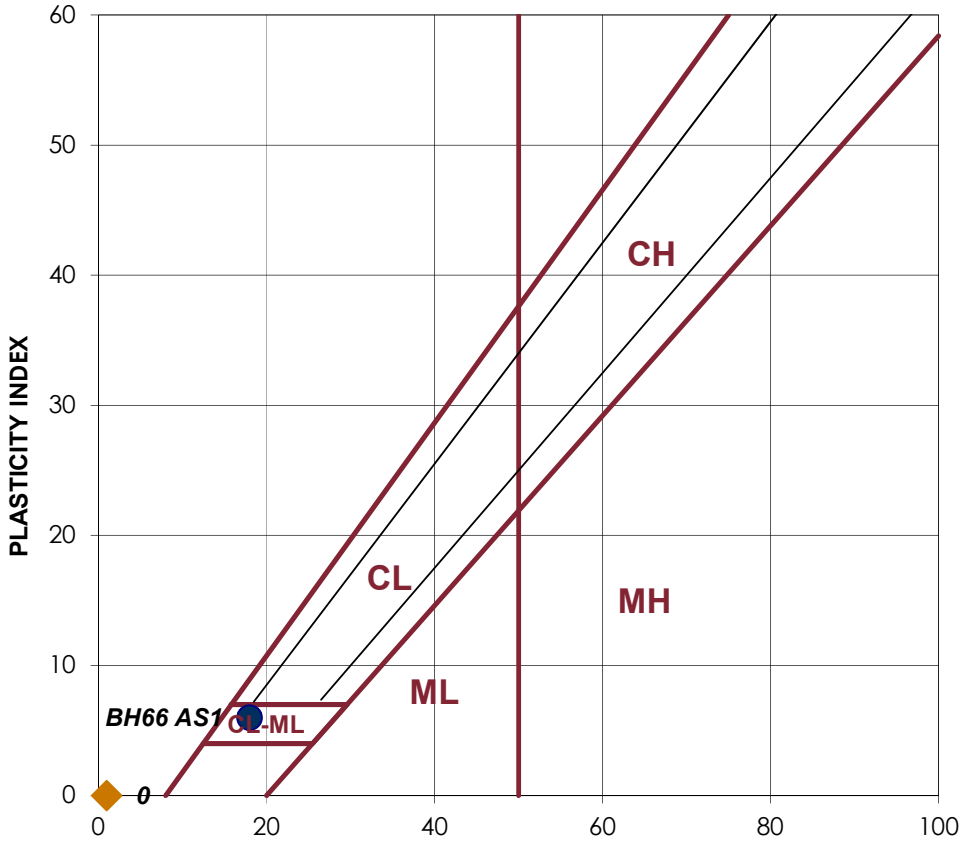
Sample:			Sample:	
BH17-66 AS1				
LIQUID			LIQUID	
1	2	Trial No.	1	2
27	29	Number of Blows		
		Container Number		
23.59	20.95	Wt. Sample (wet+tare) (g)		
20.21	18.00	Wt. Sample (dry+tare) (g)		
1.13	1.39	Wt. Tare (g)		
19.1	16.6	Wt. Dry Soil (g)		
3.4	3.0	Wt. Water (g)		
17.7%	17.8%	Water Content (%)		
17.9%	18.1%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
23.4	23.75	Wt. Sample (wet+tare) (g)		
22.6	22.85	Wt. Sample (dry+tare) (g)		
15.94	15.82	Wt. Tare (g)		
6.7	7.0	Wt. Dry Soil (g)		
0.8	0.9	Wt. Water (g)		
12.0%	12.8%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	18		LL	
PL	12		PL	
PI	6		PI	
Natural MC (%)	4.3%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL-ML			***NON-PLASTIC***	



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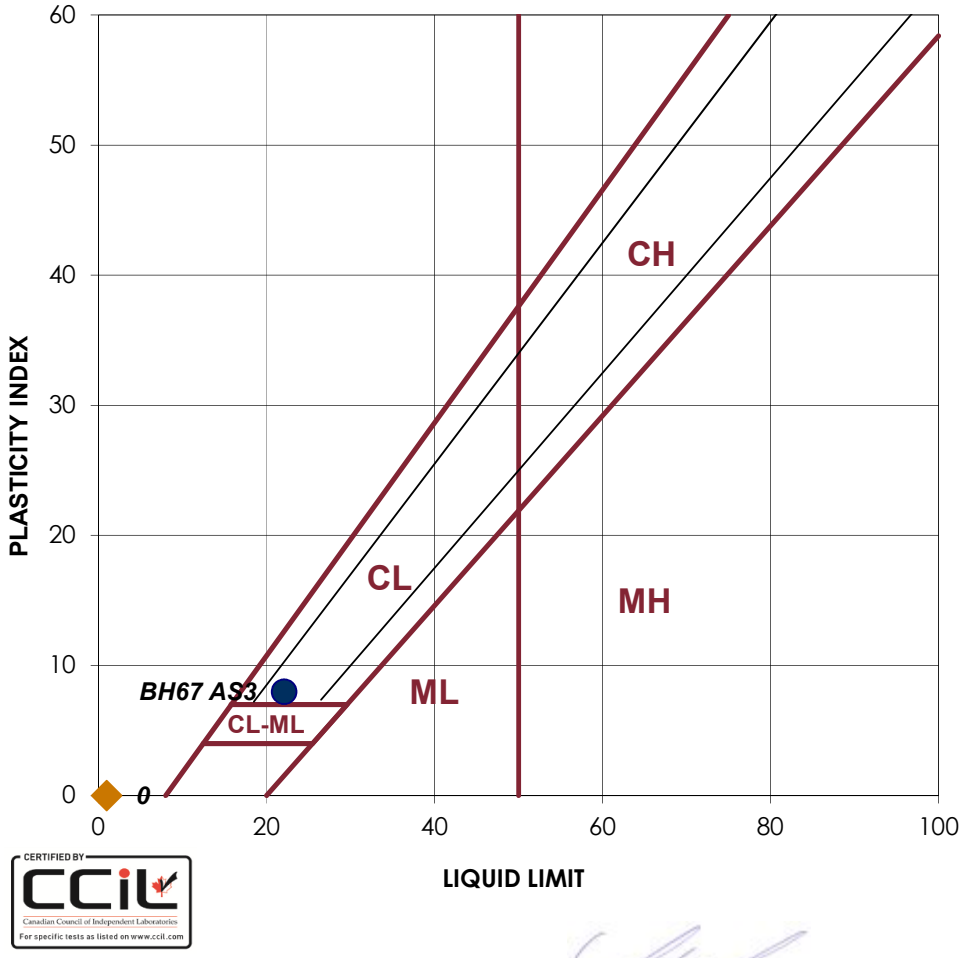
Atterberg Limits

ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

Sample:			Sample:	
BH17-67 AS4				
LIQUID			LIQUID	
1	2	Trial No.	1	2
22	23	Number of Blows		
		Container Number		
23.69	22.78	Wt. Sample (wet+tare) (g)		
19.56	18.84	Wt. Sample (dry+tare) (g)		
1.19	1.13	Wt. Tare (g)		
18.4	17.7	Wt. Dry Soil (g)		
4.1	3.9	Wt. Water (g)		
22.5%	22.2%	Water Content (%)		
22.1%	22.0%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
20.15	21.02	Wt. Sample (wet+tare) (g)		
19.39	20.15	Wt. Sample (dry+tare) (g)		
13.77	13.72	Wt. Tare (g)		
5.6	6.4	Wt. Dry Soil (g)		
0.8	0.9	Wt. Water (g)		
13.5%	13.5%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	22		LL	
PL	14		PL	
PI	8		PI	
Natural MC (%)	18.1%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL			NON-PLASTIC	



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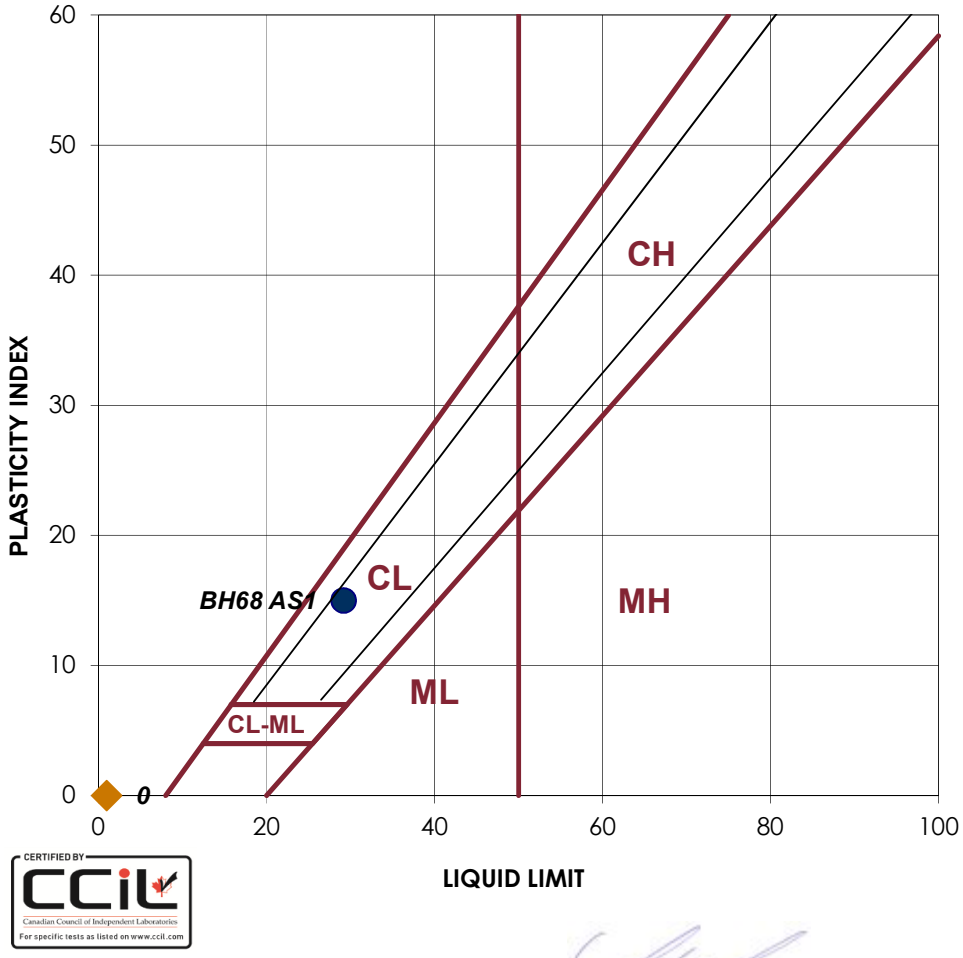
Atterberg Limits

ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

Sample:			Sample:	
BH17-68 AS2				
LIQUID			LIQUID	
1	2	Trial No.	1	2
22	22	Number of Blows		
		Container Number		
25.76	29.24	Wt. Sample (wet+tare) (g)		
20.14	22.86	Wt. Sample (dry+tare) (g)		
1.20	1.31	Wt. Tare (g)		
18.9	21.6	Wt. Dry Soil (g)		
5.6	6.4	Wt. Water (g)		
29.7%	29.6%	Water Content (%)		
29.2%	29.2%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
22.52	24.85	Wt. Sample (wet+tare) (g)		
21.44	23.47	Wt. Sample (dry+tare) (g)		
13.78	13.8	Wt. Tare (g)		
7.7	9.7	Wt. Dry Soil (g)		
1.1	1.4	Wt. Water (g)		
14.1%	14.3%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	29		LL	
PL	14		PL	
PI	15		PI	
Natural MC (%)	17.7%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL			NON-PLASTIC	



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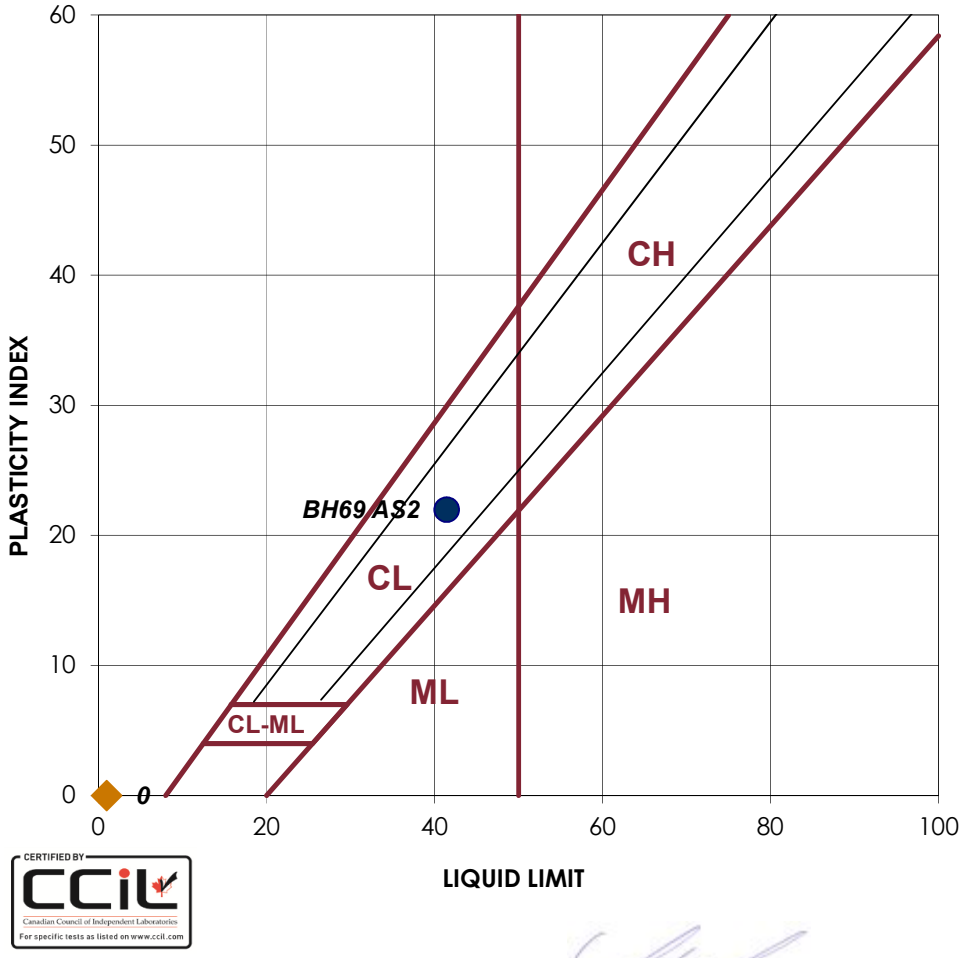
Atterberg Limits

ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

Sample:			Sample:	
BH17-69 AS2				
LIQUID			LIQUID	
1	2	Trial No.	1	2
28	29	Number of Blows		
		Container Number		
22.95	23.80	Wt. Sample (wet+tare) (g)		
16.67	17.25	Wt. Sample (dry+tare) (g)		
1.33	1.14	Wt. Tare (g)		
15.3	16.1	Wt. Dry Soil (g)		
6.3	6.6	Wt. Water (g)		
40.9%	40.7%	Water Content (%)		
41.5%	41.4%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
25.62	24.86	Wt. Sample (wet+tare) (g)		
23.75	23.11	Wt. Sample (dry+tare) (g)		
13.82	13.77	Wt. Tare (g)		
9.9	9.3	Wt. Dry Soil (g)		
1.9	1.8	Wt. Water (g)		
18.8%	18.7%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	41		LL	
PL	19		PL	
PI	22		PI	
Natural MC (%)	19.2%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL			NON-PLASTIC	



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Atterberg Limits
ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

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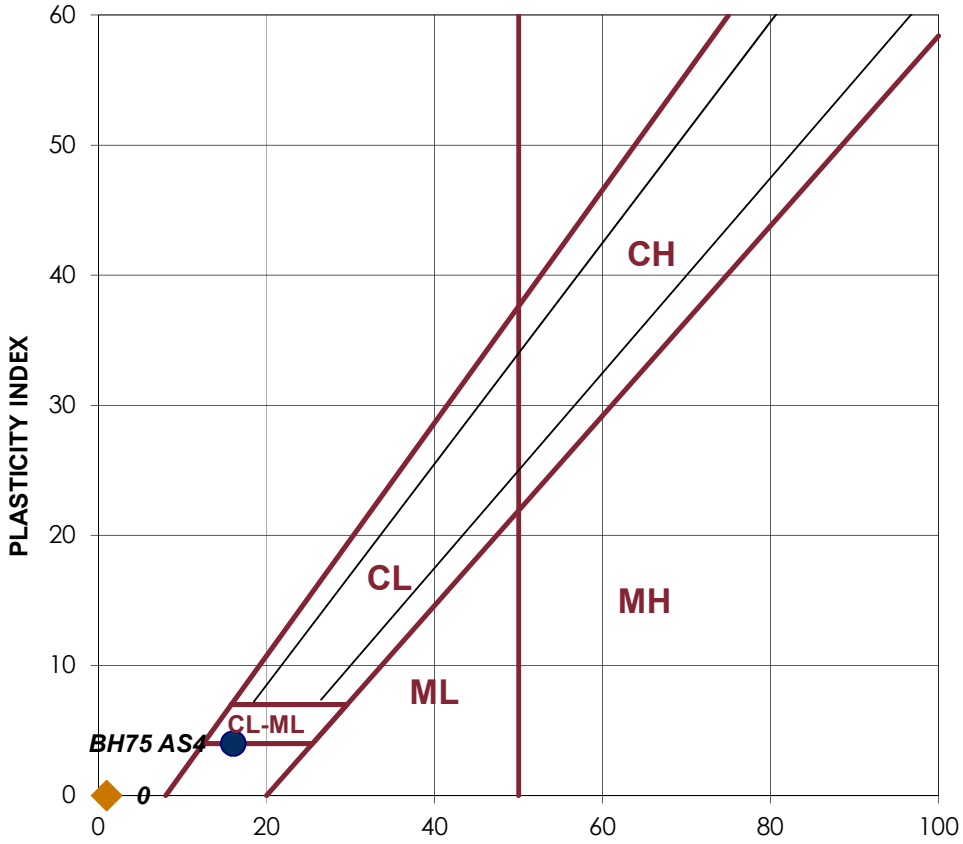
Sample:			Sample:	
BH17-75 AS4				
LIQUID			LIQUID	
1	2	Trial No.	1	2
20	23	Number of Blows		
		Container Number		
21.25	21.53	Wt. Sample (wet+tare) (g)		
18.43	18.69	Wt. Sample (dry+tare) (g)		
1.16	1.27	Wt. Tare (g)		
17.3	17.4	Wt. Dry Soil (g)		
2.8	2.8	Wt. Water (g)		
16.3%	16.3%	Water Content (%)		
15.9%	16.1%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
20.79	21.35	Wt. Sample (wet+tare) (g)		
20.03	20.56	Wt. Sample (dry+tare) (g)		
13.79	13.87	Wt. Tare (g)		
6.2	6.7	Wt. Dry Soil (g)		
0.8	0.8	Wt. Water (g)		
12.2%	11.8%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	16		LL	
PL	12		PL	
PI	4		PI	
Natural MC (%)	9.4%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL-ML			***NON-PLASTIC***	



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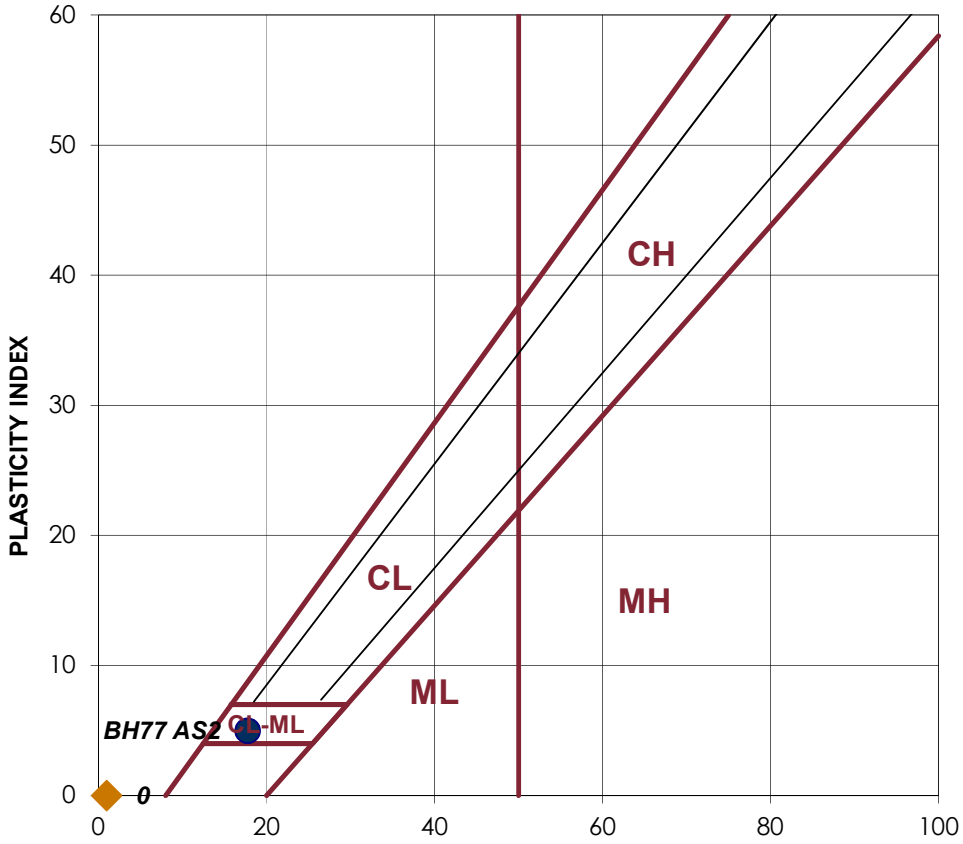
Atterberg Limits

ASTM D4318
Method B- One Point

Client:	Tlicho Eng. & Enviro. Services Ltd.
Project Name:	Tlicho All Season Road
Project No:	144902448.300.300.100
Date Received:	April 12, 2017
Date Tested:	April 27, 2017
Tested By:	E. Wahl

Sample:			Sample:	
BH17-77 AS2				
LIQUID			LIQUID	
1	2	Trial No.	1	2
23	24	Number of Blows		
		Container Number		
22.15	21.76	Wt. Sample (wet+tare) (g)		
18.96	18.65	Wt. Sample (dry+tare) (g)		
1.12	1.25	Wt. Tare (g)		
17.8	17.4	Wt. Dry Soil (g)		
3.2	3.1	Wt. Water (g)		
17.9%	17.9%	Water Content (%)		
17.7%	17.8%	Corrected Water Content (%		
PLASTIC			PLASTIC	
1	2	Trial No.	1	2
		Container Number		
20.1	20.01	Wt. Sample (wet+tare) (g)		
19.39	19.3	Wt. Sample (dry+tare) (g)		
14.15	13.94	Wt. Tare (g)		
5.2	5.4	Wt. Dry Soil (g)		
0.7	0.7	Wt. Water (g)		
13.5%	13.2%	Water Content (%)		
AVERAGE VALUES			AVERAGE VALUES	
1	2		1	2
LL	18		LL	
PL	13		PL	
PI	5		PI	
Natural MC (%)	11.6%		Natural MC (%)	
CLASSIFICATION			CLASSIFICATION	
CL-ML			**NON-PLASTIC**	



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Stantec

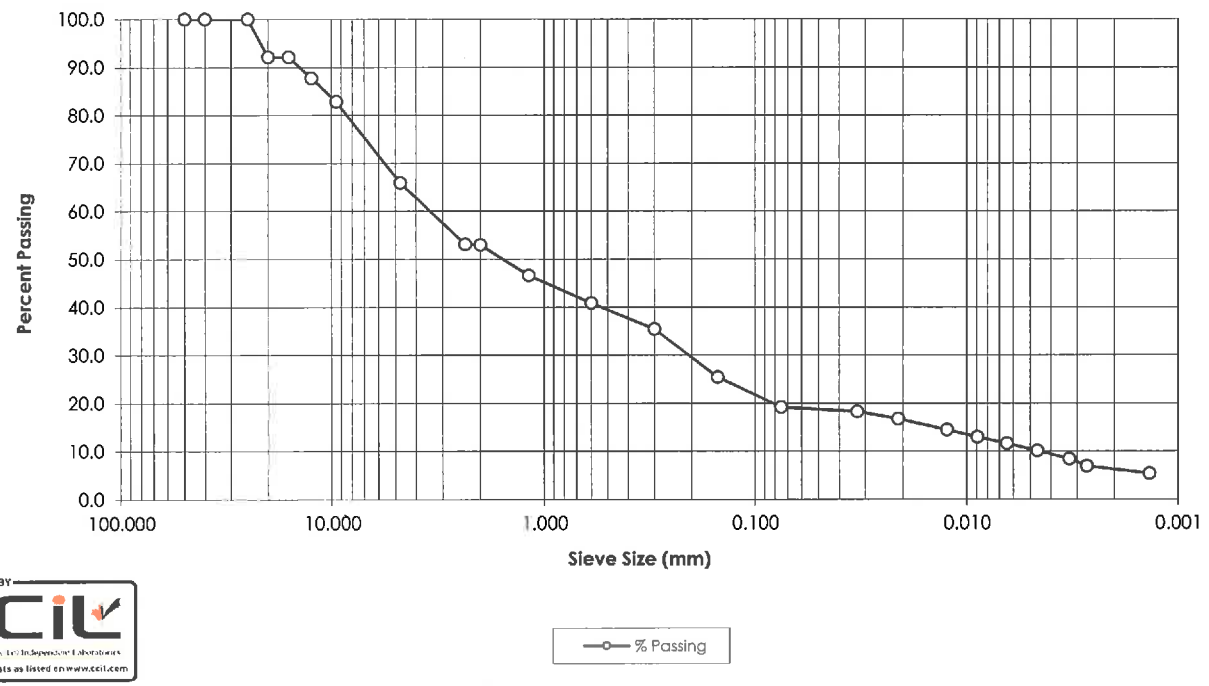
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-01
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silty and/or clayey sand with gravel



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0065**	**11.6**
40.0	**100.0**	**0.0046**	**10.1**
25.0	**100.0**	**0.0033**	**8.4**
20.0	**92.1**	**0.0027**	**6.9**
16.0	**92.1**	**0.0014**	**5.4**
12.5	**87.8**		
9.5	**82.9**		
4.75	**65.9**		
2.36	**53.1**		
2.00	**53.0**		
1.18	**46.6**		
0.600	**40.9**		
0.300	**35.4**		
0.150	**25.4**		
0.075	**19.2**		
0.0329	**18.2**		
0.0211	**16.7**		
0.0124	**14.4**		
0.0089	**12.9**		

Gravel:	34.1%	D_{10}:	0.0046
Sand:	46.8%	D_{30}:	0.2250
Silt:	12.9%	D_{60}:	3.7106
Clay:	6.2%	C_U:	810.42
		C_C:	2.98

Comments:

Reviewed by:

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Stantec

Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

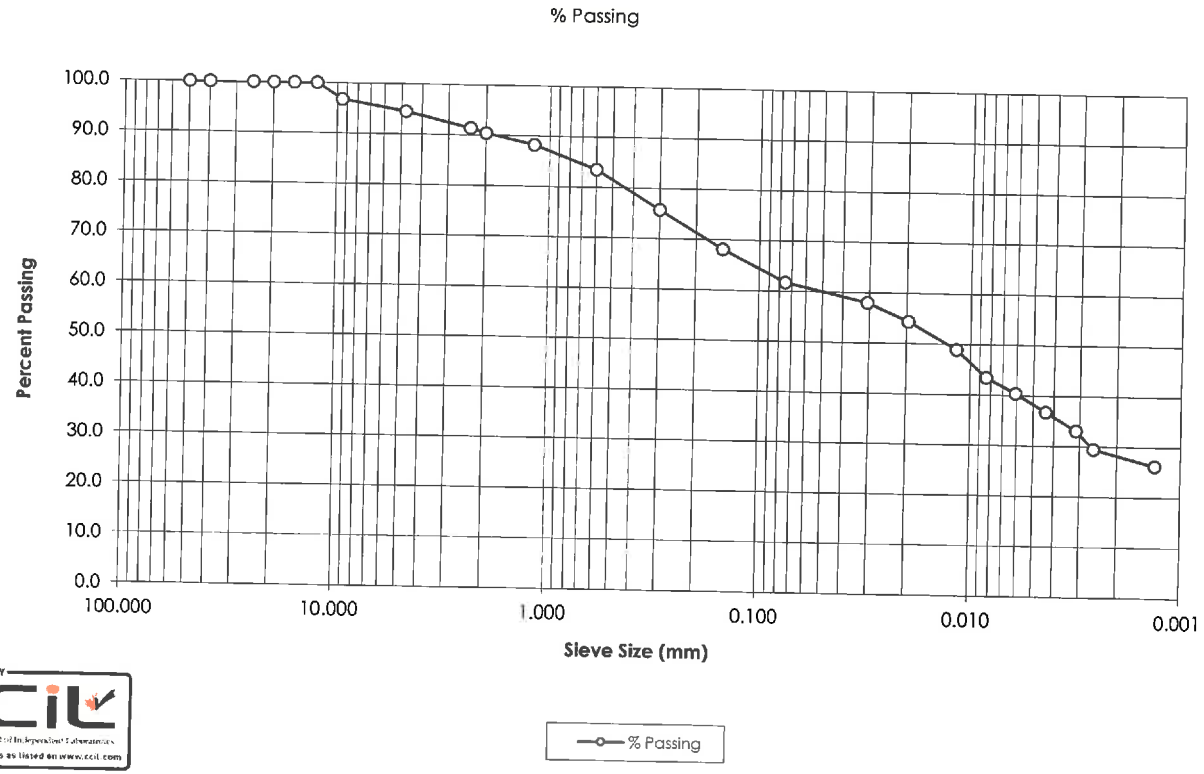
Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

OFFICE
10160 - 112 ST
Edmonton, Alberta
Canada T5K 2L6
Tel: (780) 917-7000

LABORATORY
10575 106 ST
Edmonton, Alberta
Canada T5H 2X5
Tel: (780) 917-7463

SAMPLE No.: SS4
SOURCE: BH17-1
TESTED BY: JA

DATE TESTED: April 7, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Sandy Lean Clay



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Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0061	40.4
40.0	100.0	0.0044	36.8
25.0	100.0	0.0031	33.2
20.0	100.0	0.0026	29.5
16.0	100.0	0.0013	26.3
12.5	100.0		
9.5	96.8		
4.75	94.5		
2.36	91.4		
2.00	90.5		
1.18	88.3		
0.600	83.5		
0.300	75.8		
0.150	68.1		
0.075	61.7		
0.0306	58.0		
0.0197	54.4		
0.0116	48.9		
0.0084	43.5		

Gravel:	5.5%	D_{10}:	-
Sand:	32.8%	D_{30}:	0.0027
Silt:	33.4%	D_{60}:	0.0548
Clay:	28.3%	C_U:	-
		C_C:	-

Comments:

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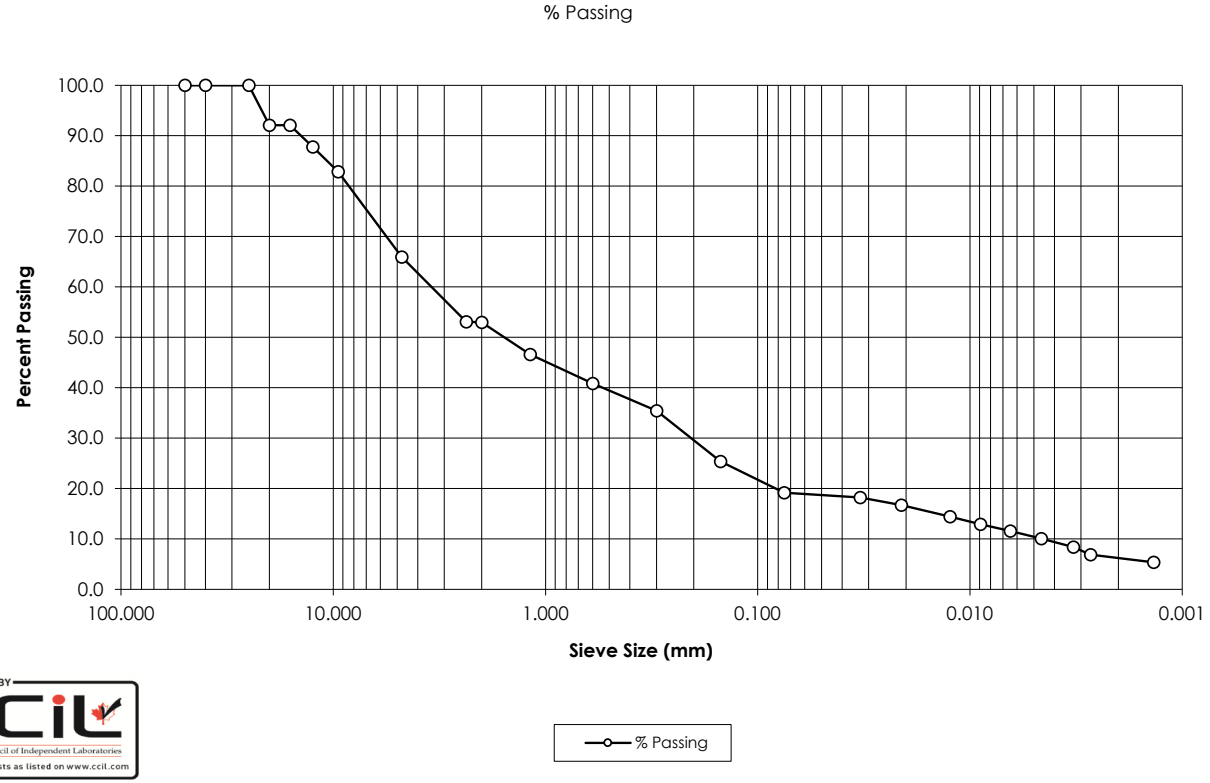
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-1
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sitly and/or clayey sand with gravel



CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0065**	**11.6**
40.0	**100.0**	**0.0046**	**10.1**
25.0	**100.0**	**0.0033**	**8.4**
20.0	**92.1**	**0.0027**	**6.9**
16.0	**92.1**	**0.0014**	**5.4**
12.5	**87.8**		
9.5	**82.9**		
4.75	**65.9**		
2.36	**53.1**		
2.00	**53.0**		
1.18	**46.6**		
0.600	**40.9**		
0.300	**35.4**		
0.150	**25.4**		
0.075	**19.2**		
0.0329	**18.2**		
0.0211	**16.7**		
0.0124	**14.4**		
0.0089	**12.9**		

Gravel:	34.1%	D_{10}:	0.0046
Sand:	46.8%	D_{30}:	0.2250
Silt:	12.9%	D_{60}:	3.7106
Clay:	6.2%	C_U:	810.42
		C_c:	2.98

Comments:

Reviewed by:

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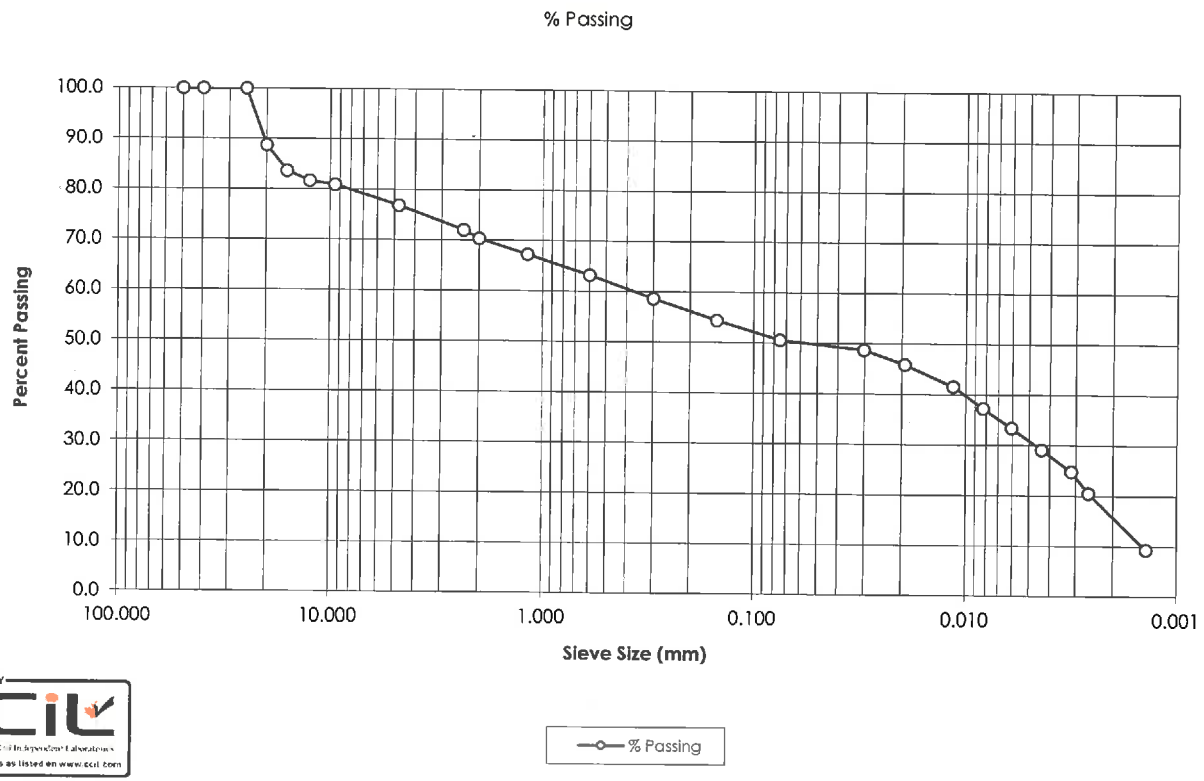
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

SAMPLE No.: SS8
SOURCE: BH17-1
TESTED BY: JA

DATE TESTED: April 7, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Sandy Silty Clay with Gravel



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Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**33.4**
40.0	**100.0**	**0.0044**	**29.1**
25.0	**100.0**	**0.0032**	**24.8**
20.0	**88.8**	**0.0026**	**20.5**
16.0	**83.6**	**0.0014**	**9.3**
12.5	**81.7**		
9.5	**80.9**		
4.75	**76.9**		
2.36	**72.0**		
2.00	**70.3**		
1.18	**67.3**		
0.600	**63.2**		
0.300	**58.6**		
0.150	**54.4**		
0.075	**50.6**		
0.0302	**48.7**		
0.0194	**45.9**		
0.0115	**41.6**		
0.0083	**37.3**		

Gravel:	23.1%	D_{10}:	0.0015
Sand:	26.3%	D_{30}:	0.0047
Silt:	34.9%	D_{60}:	0.3919
Clay:	15.7%	C_u:	261.00
		C_c:	0.04

Comments:

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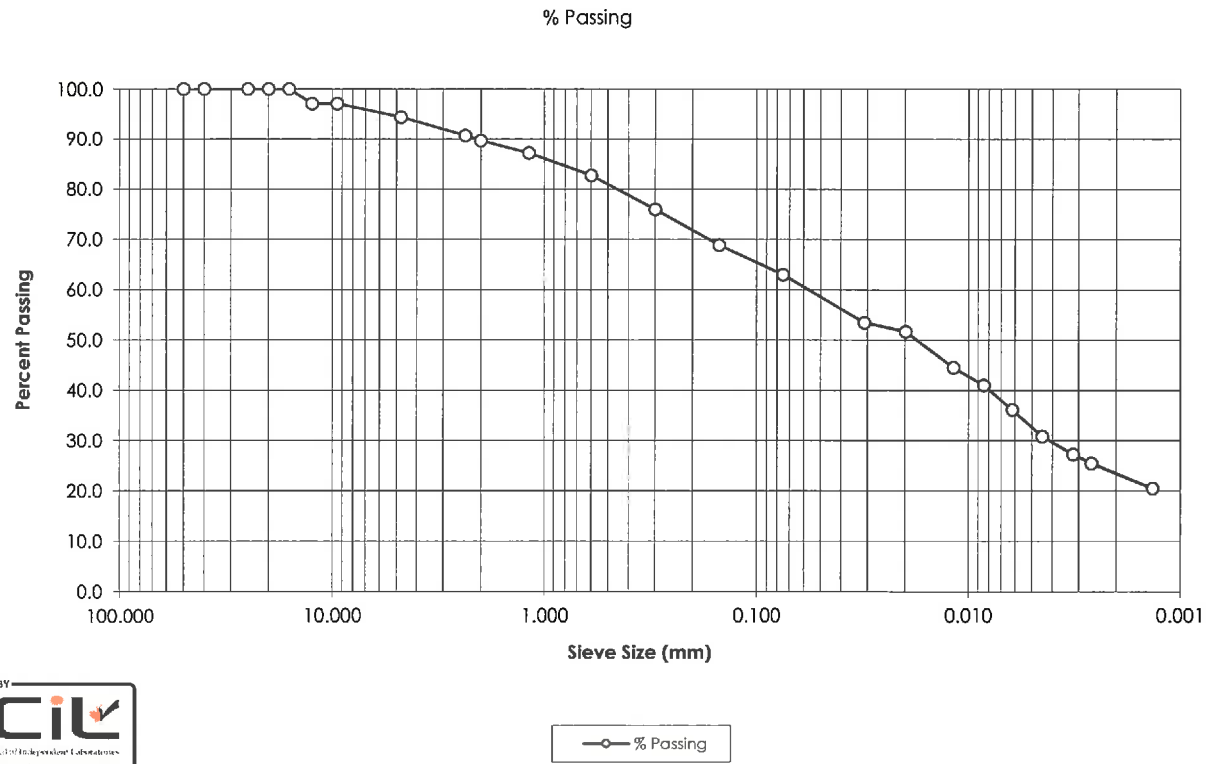
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

SAMPLE No.: SS5
SOURCE: BH17-2
TESTED BY: JA

DATE TESTED: April 8, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Sandy Lean Clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0062**	**36.2**
40.0	**100.0**	**0.0045**	**30.8**
25.0	**100.0**	**0.0032**	**27.3**
20.0	**100.0**	**0.0026**	**25.5**
16.0	**100.0**	**0.0013**	**20.5**
12.5	**97.1**		
9.5	**97.1**		
4.75	**94.4**		
2.36	**90.8**		
2.00	**89.7**		
1.18	**87.3**		
0.600	**82.8**		
0.300	**76.0**		
0.150	**68.9**		
0.075	**63.1**		
0.0311	**53.5**		
0.0198	**51.7**		
0.0118	**44.6**		
0.0085	**41.0**		

Gravel:	5.6%	D_{10}:	-
Sand:	31.4%	D_{30}:	0.0042
Silt:	39.6%	D_{60}:	0.0618
Clay:	23.4%	C_u:	-
		C_c:	-

Comments:

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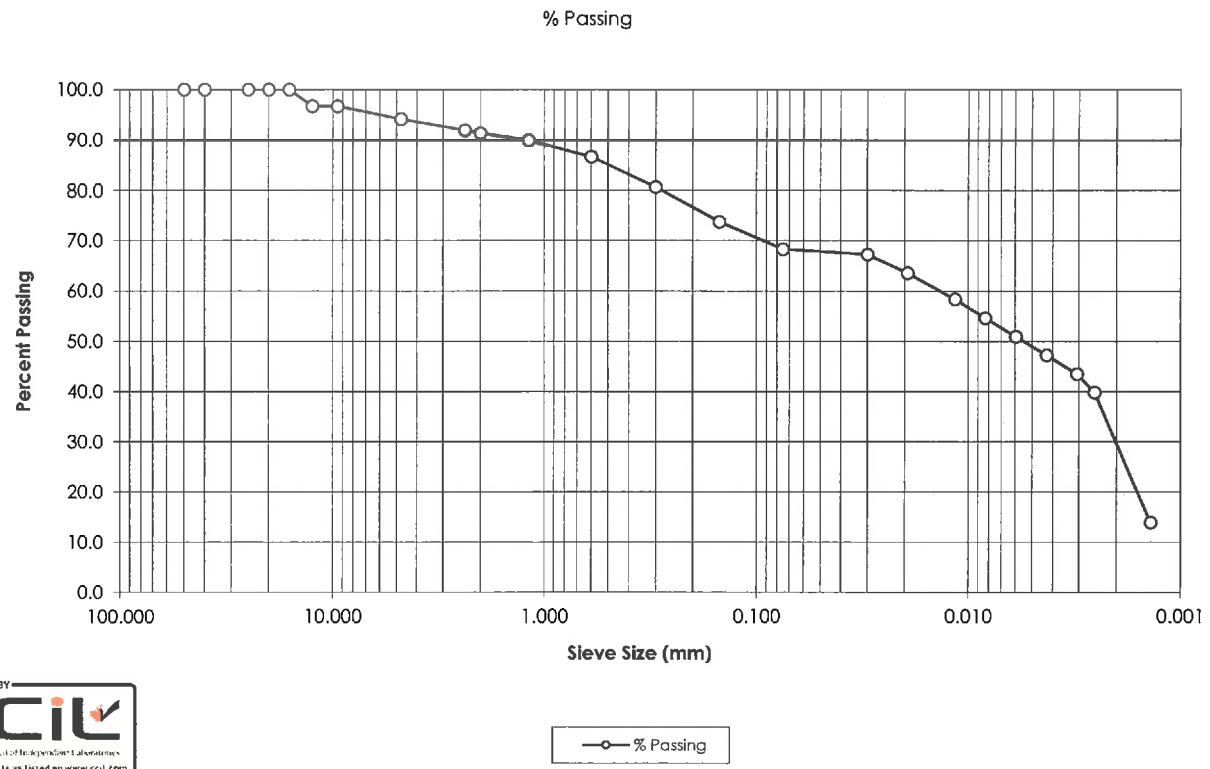
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

SAMPLE No.: SS7
SOURCE: BH17-2
TESTED BY: JA

DATE TESTED: April 7, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Sandy Lean Clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0060**	**51.0**
40.0	**100.0**	**0.0043**	**47.3**
25.0	**100.0**	**0.0031**	**43.6**
20.0	**100.0**	**0.0025**	**39.9**
16.0	**100.0**	**0.0014**	**13.9**
12.5	**96.8**		
9.5	**96.8**		
4.75	**94.3**		
2.36	**92.1**		
2.00	**91.5**		
1.18	**90.0**		
0.600	**86.7**		
0.300	**80.7**		
0.150	**73.8**		
0.075	**68.4**		
0.0300	**67.3**		
0.0193	**63.6**		
0.0115	**58.4**		
0.0083	**54.7**		

Gravel:	5.7%	D_{10}:	-
Sand:	25.9%	D_{30}:	0.0022
Silt:	38.7%	D_{60}:	0.0140
Clay:	29.7%	C_U:	-
		C_C:	-

Comments:

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Reviewed by:

Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services Lt
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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LABORATORY
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Edmonton, Alberta
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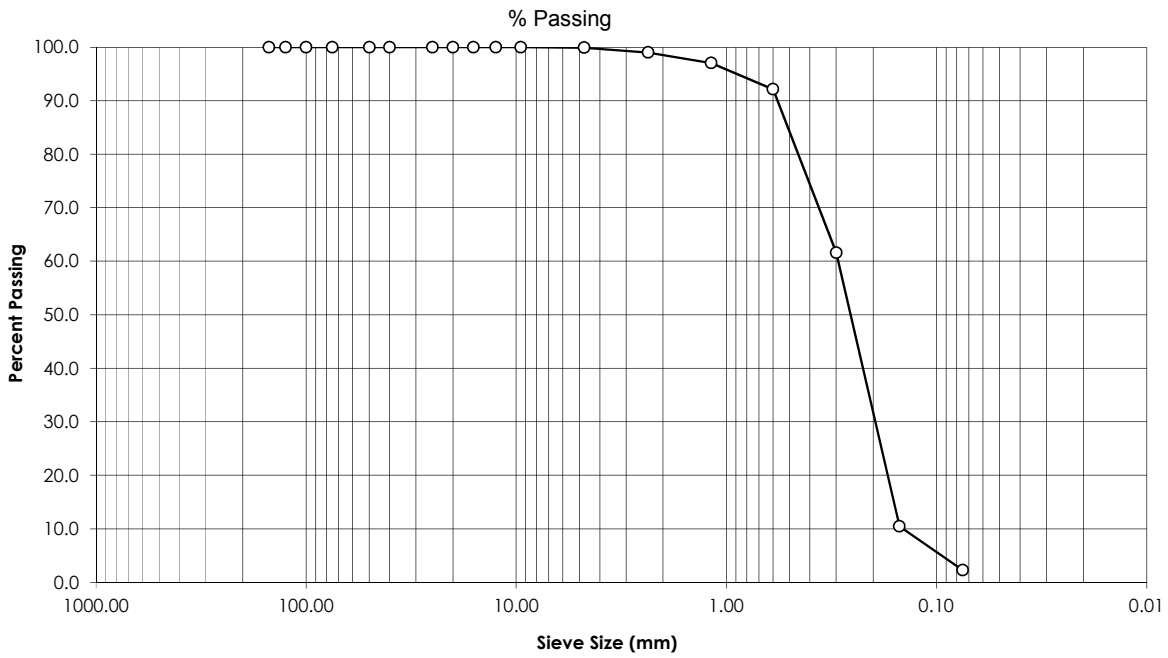
Tel: (780) 917-7463

SAMPLE No.: AS1
SOURCE: BH17-03
TESTED BY: JA

DATE RECEIVED: February 27, 2017
DATE TESTED: March 15, 2017
SAMPLE DESCRIPTION: Poorly graded sand



CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**100.0**	-	-
4.75	**99.9**	-	-
2.36	**99.0**	-	-
1.18	**97.0**	-	-
0.600	**92.1**	-	-
0.300	**61.6**	-	-
0.150	**10.5**	-	-
0.075	**2.3**	-	-

Cobble:	0.0%	D_{10}:	0.1477
Gravel:	0.1%	D_{30}:	0.2391
Sand:	97.6%	D_{60}:	0.2977
Fines:	2.3%	C_U:	2.02
		C_c:	1.30

Comments:

Reviewed by:

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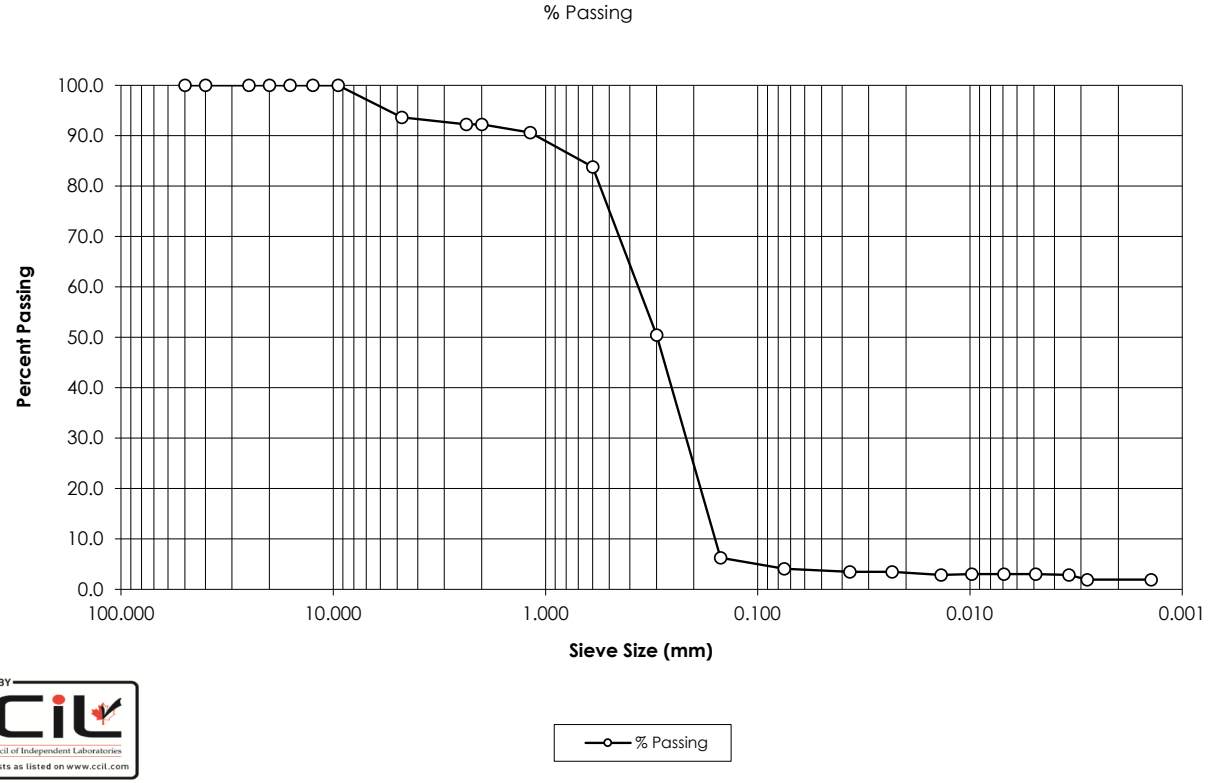
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS7
SOURCE: BH17-3
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Poorly graded sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0069**	**3.0**
40.0	**100.0**	**0.0049**	**3.0**
25.0	**100.0**	**0.0034**	**2.9**
20.0	**100.0**	**0.0028**	**1.9**
16.0	**100.0**	**0.0014**	**1.9**
12.5	**100.0**		
9.5	**100.0**		
4.75	**93.6**		
2.36	**92.3**		
2.00	**92.3**		
1.18	**90.6**		
0.600	**83.8**		
0.300	**50.5**		
0.150	**6.2**		
0.075	**4.1**		
0.0368	**3.5**		
0.0233	**3.5**		
0.0137	**2.9**		
0.0098	**3.0**		

Gravel:	6.4%	D_{10}:	0.1838
Sand:	89.6%	D_{30}:	0.2626
Silt:	2.1%	D_{60}:	0.4022
Clay:	1.9%	C_U:	2.19
		C_c:	0.93

Comments:

Reviewed by:

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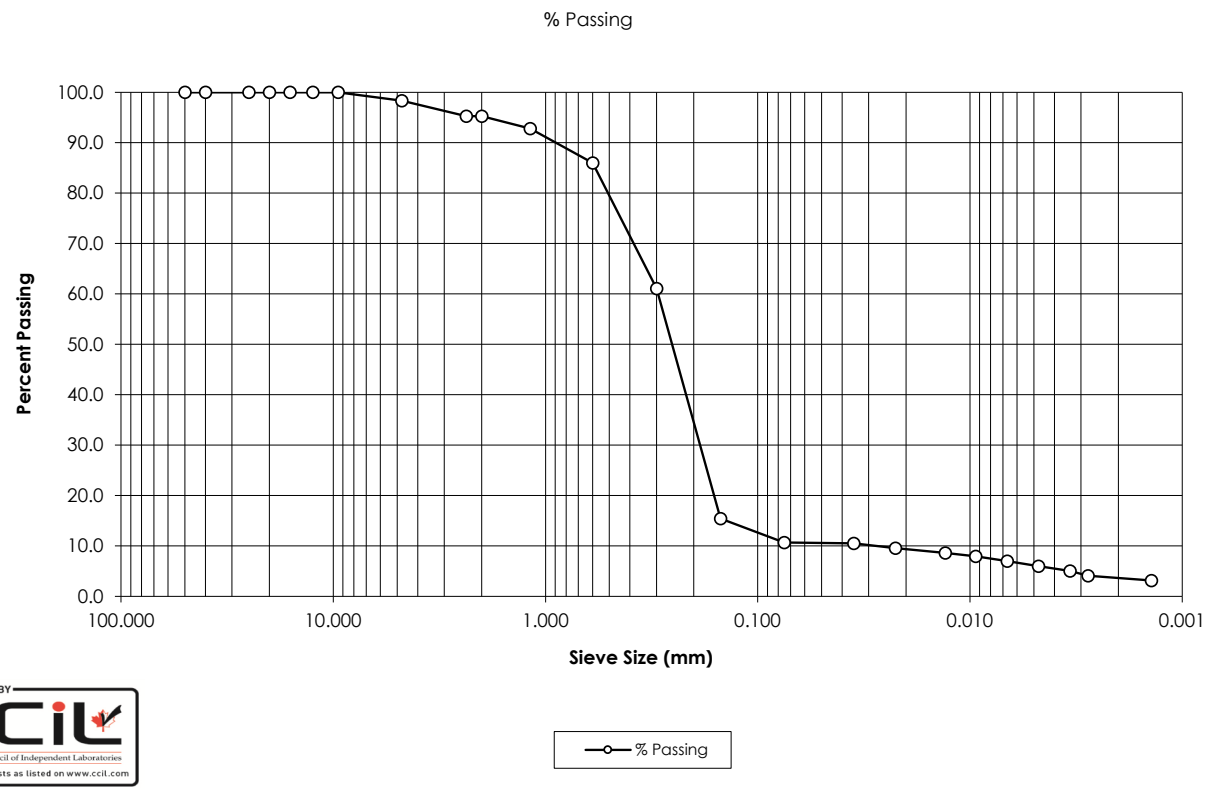
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-4
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Well graded sand with silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0067**	**7.0**
40.0	**100.0**	**0.0048**	**6.0**
25.0	**100.0**	**0.0034**	**5.1**
20.0	**100.0**	**0.0028**	**4.1**
16.0	**100.0**	**0.0014**	**3.2**
12.5	**100.0**		
9.5	**100.0**		
4.75	**98.4**		
2.36	**95.3**		
2.00	**95.3**		
1.18	**92.8**		
0.600	**86.0**		
0.300	**61.1**		
0.150	**15.4**		
0.075	**10.7**		
0.0353	**10.5**		
0.0225	**9.6**		
0.0131	**8.6**		
0.0094	**7.9**		

Gravel:	1.6%	D_{10}:	0.0286
Sand:	87.7%	D_{30}:	0.2225
Silt:	7.0%	D_{60}:	0.2980
Clay:	3.7%	C_u:	10.43
		C_c:	5.81

Comments:

Reviewed by:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

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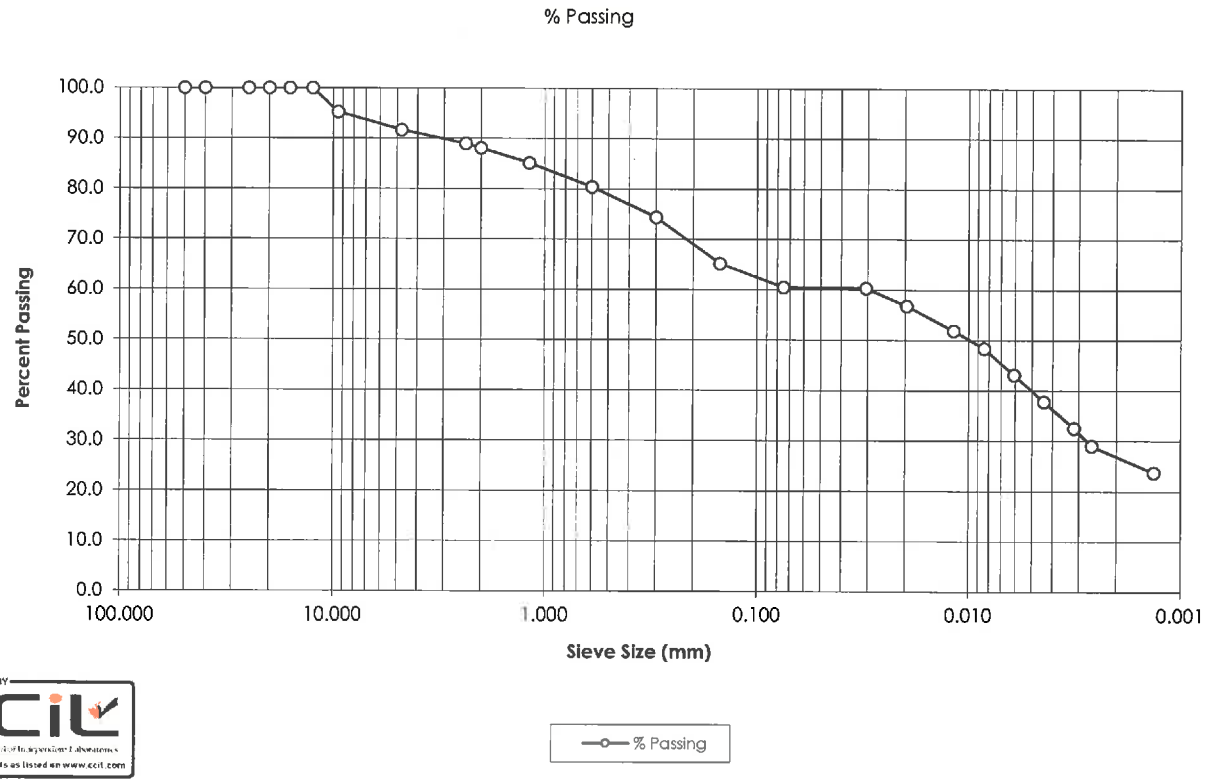
SAMPLE No.: SS4
SOURCE: BH17-4
TESTED BY: JA

DATE TESTED: April 7, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Sandy Lean Clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**43.1**
40.0	**100.0**	**0.0044**	**37.8**
25.0	**100.0**	**0.0032**	**32.6**
20.0	**100.0**	**0.0026**	**29.0**
16.0	**100.0**	**0.0013**	**23.8**
12.5	**100.0**		
9.5	**95.3**		
4.75	**91.7**		
2.36	**89.0**		
2.00	**88.1**		
1.18	**85.1**		
0.600	**80.4**		
0.300	**74.4**		
0.150	**65.2**		
0.075	**60.5**		
0.0306	**60.4**		
0.0196	**56.8**		
0.0117	**51.9**		
0.0084	**48.4**		

Gravel:	8.3%	D_{10}:	-
Sand:	31.2%	D_{30}:	0.0028
Silt:	33.6%	D_{60}:	0.0295
Clay:	26.9%	C_u:	-
		C_c:	-

Comments:

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Reviewed by:

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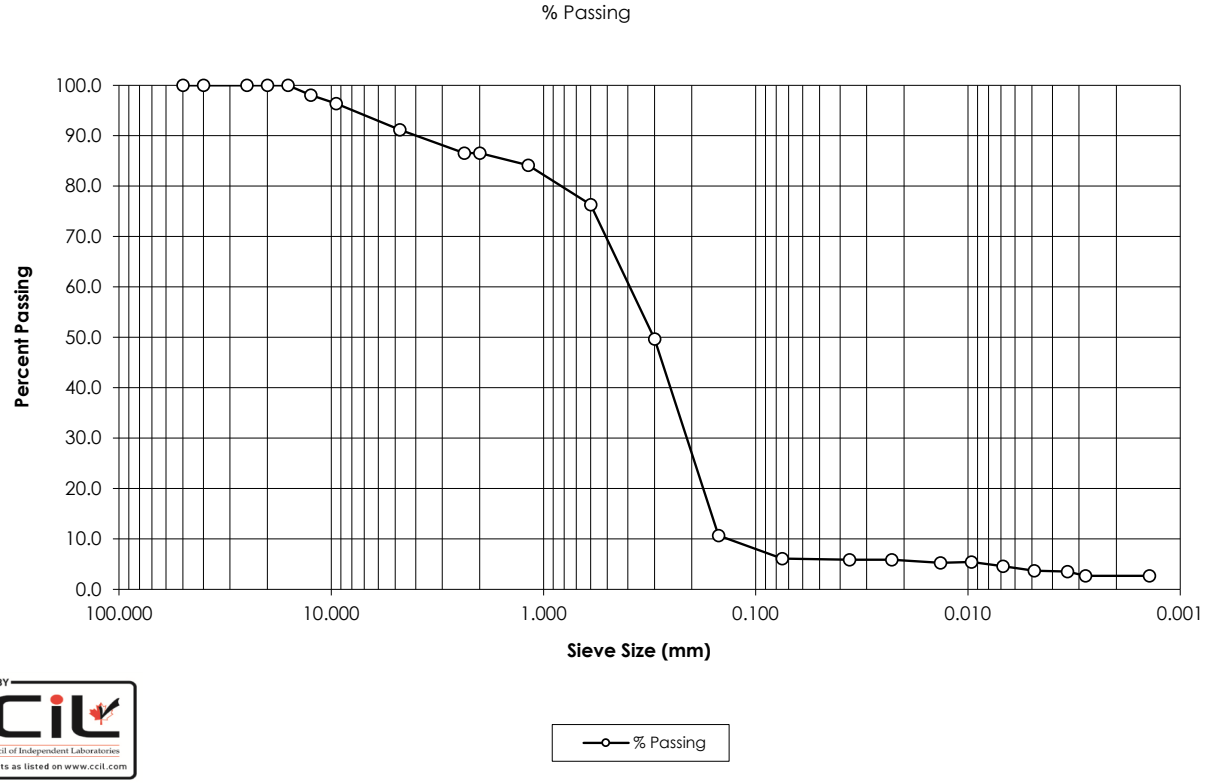
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-5
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Poorly graded sand with silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0068**	**4.6**
40.0	**100.0**	**0.0049**	**3.7**
25.0	**100.0**	**0.0034**	**3.5**
20.0	**100.0**	**0.0028**	**2.7**
16.0	**100.0**	**0.0014**	**2.7**
12.5	**98.1**		
9.5	**96.4**		
4.75	**91.2**		
2.36	**86.6**		
2.00	**86.5**		
1.18	**84.1**		
0.600	**76.3**		
0.300	**49.7**		
0.150	**10.7**		
0.075	**6.1**		
0.0362	**5.9**		
0.0229	**5.9**		
0.0135	**5.3**		
0.0096	**5.5**		

Gravel:	8.8%	D_{10}:	0.1413
Sand:	85.1%	D_{30}:	0.2508
Silt:	3.4%	D_{60}:	0.4319
Clay:	2.7%	C_u:	3.06
		C_c:	1.03

Comments:

Reviewed by:

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Stantec

Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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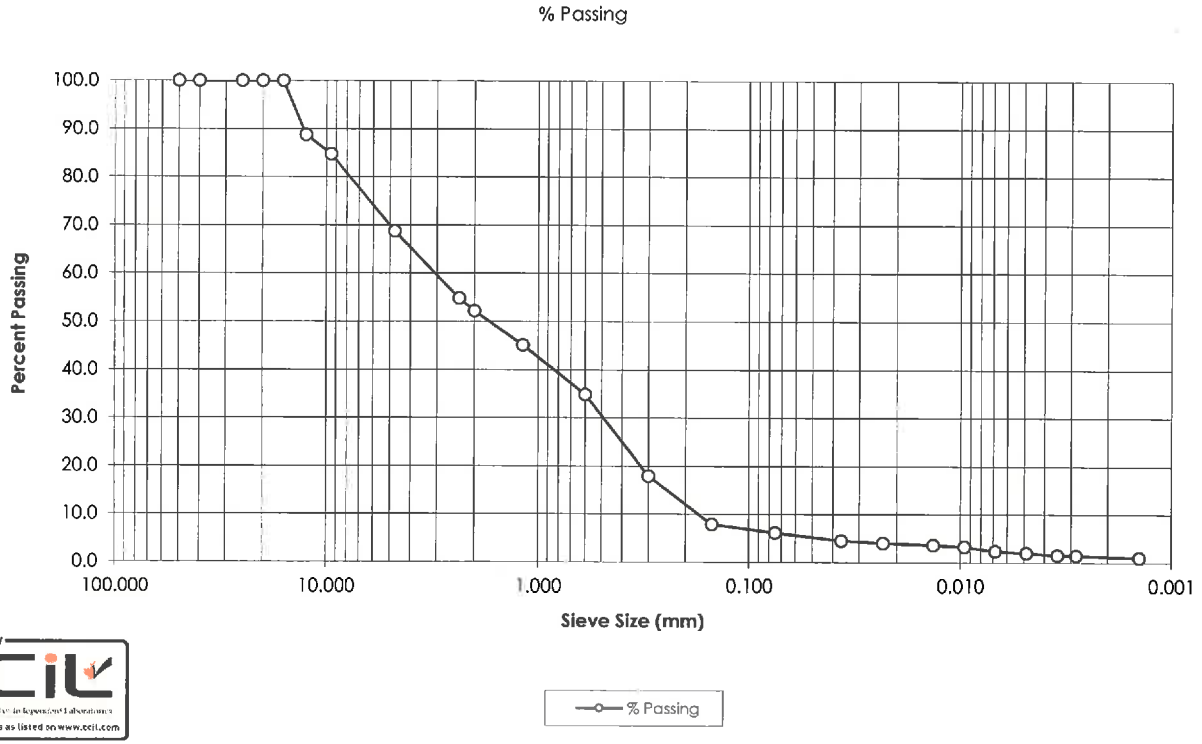
SAMPLE No.: AS1
SOURCE: BH17-6
TESTED BY: JA

DATE TESTED: March 20, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Well graded sand with clay and/or silt and gravel



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0068	2.4
40.0	100.0	0.0049	2.0
25.0	100.0	0.0035	1.5
20.0	100.0	0.0028	1.4
16.0	100.0	0.0014	1.0
12.5	88.7		
9.5	84.7		
4.75	68.7		
2.36	54.8		
2.00	52.2		
1.18	45.1		
0.600	34.9		
0.300	17.9		
0.150	7.9		
0.075	6.1		
0.0365	4.5		
0.0232	4.0		
0.0135	3.6		
0.0096	3.3		

Gravel:	31.3%	D_{10}:	0.1937
Sand:	62.6%	D_{30}:	0.5324
Silt:	4.9%	D_{60}:	3.3198
Clay:	1.2%	C_U:	17.14
		C_C:	0.44

Comments:

Reviewed by:

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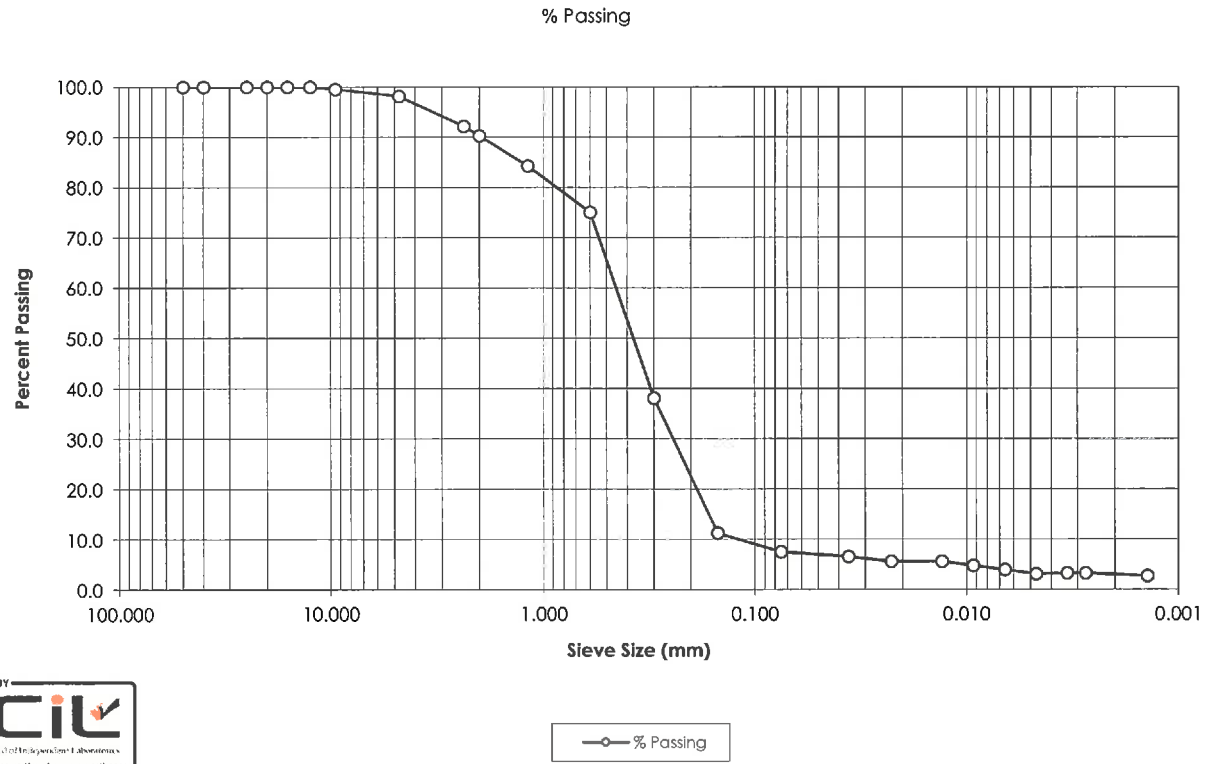
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-7
TESTED BY: JA

DATE TESTED: April 14, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Poorly graded sand with clay and/or silt



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0066**	**3.9**
40.0	**100.0**	**0.0047**	**3.1**
25.0	**100.0**	**0.0034**	**3.3**
20.0	**100.0**	**0.0027**	**3.3**
16.0	**100.0**	**0.0014**	**2.7**
12.5	**100.0**		
9.5	**99.6**		
4.75	**98.2**		
2.36	**92.2**		
2.00	**90.3**		
1.18	**84.3**		
0.600	**75.0**		
0.300	**38.1**		
0.150	**11.2**		
0.075	**7.5**		
0.0359	**6.6**		
0.0226	**5.6**		
0.0131	**5.6**		
0.0093	**4.8**		

Gravel:	1.8%	D_{10}:	0.1284
Sand:	90.7%	D_{30}:	0.2706
Silt:	4.5%	D_{60}:	0.5011
Clay:	3.0%	C_u:	3.90
		C_c:	1.14

Comments:

Reviewed by:

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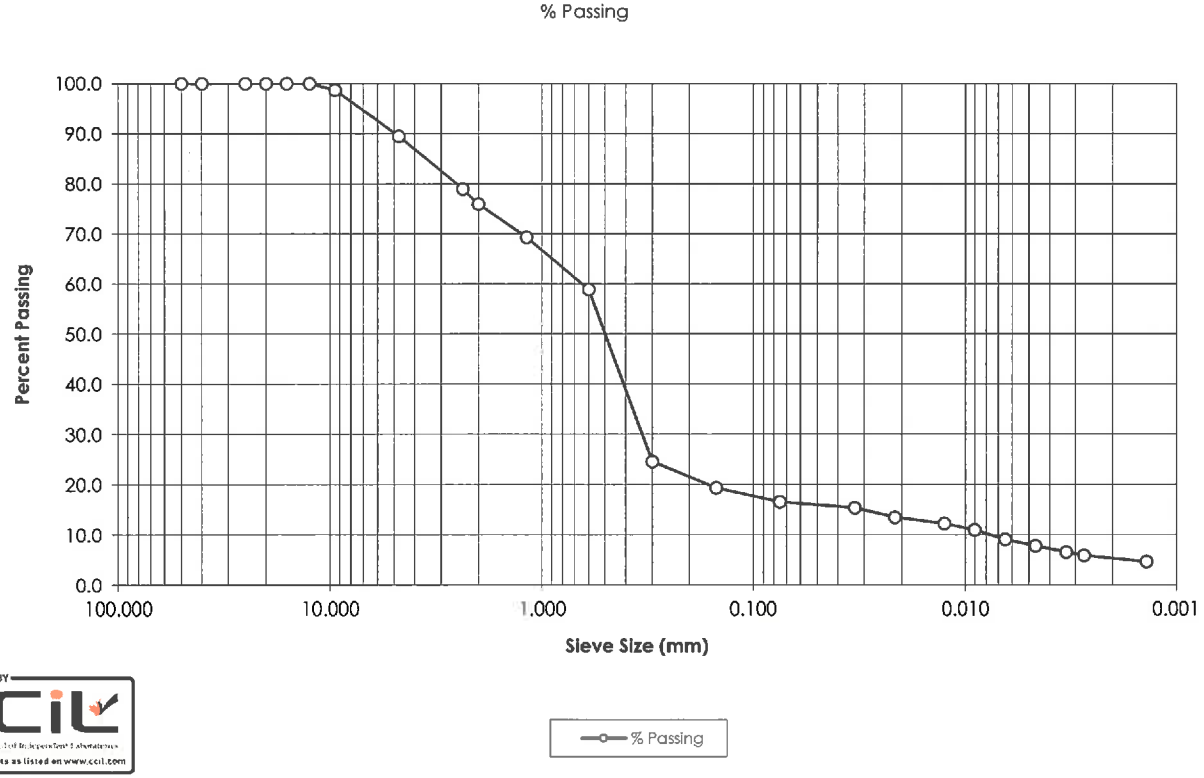
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: GS1
SOURCE: BH17-9
TESTED BY: JA

DATE TESTED: March 20, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Clayey and/or silty sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0065**	**9.1**
40.0	**100.0**	**0.0047**	**7.8**
25.0	**100.0**	**0.0033**	**6.5**
20.0	**100.0**	**0.0027**	**5.9**
16.0	**100.0**	**0.0014**	**4.6**
12.5	**100.0**		
9.5	**98.7**		
4.75	**89.5**		
2.36	**79.0**		
2.00	**76.0**		
1.18	**69.3**		
0.600	**58.9**		
0.300	**24.6**		
0.150	**19.3**		
0.075	**16.5**		
0.0333	**15.4**		
0.0215	**13.5**		
0.0126	**12.2**		
0.0090	**11.0**		

Gravel:	10.5%	D_{10}:	0.0078
Sand:	73.0%	D_{30}:	0.3683
Silt:	11.2%	D_{60}:	0.6648
Clay:	5.3%	C_U:	85.12
		C_C:	26.12

Comments:

Reviewed by:

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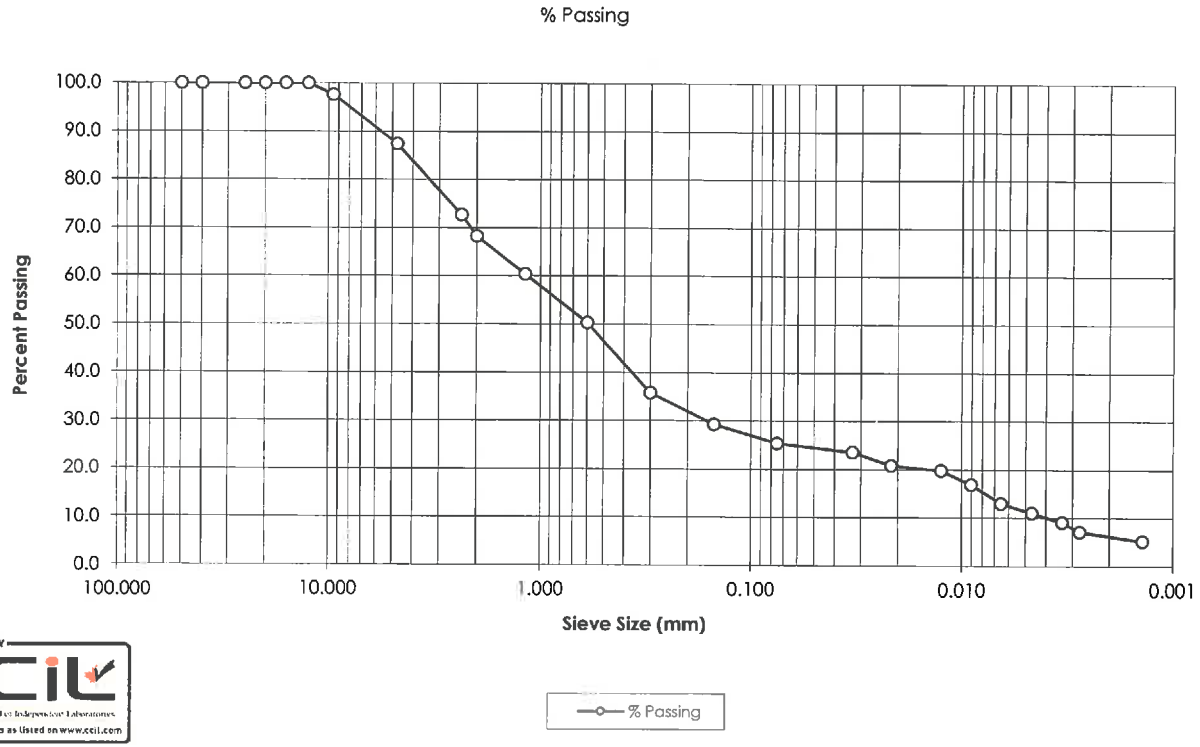
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: GS2
SOURCE: BH17-9
TESTED BY: JA

DATE TESTED: March 20, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silty sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0065	13.0
40.0	100.0	0.0047	11.0
25.0	100.0	0.0034	9.1
20.0	100.0	0.0028	7.1
16.0	100.0	0.0014	5.2
12.5	100.0		
9.5	97.6		
4.75	87.4		
2.36	72.7		
2.00	68.3		
1.18	60.4		
0.600	50.3		
0.300	35.8		
0.150	29.2		
0.075	25.4		
0.0329	23.5		
0.0215	20.8		
0.0125	19.8		
0.0090	16.9		

Gravel:	12.6%	D_{10}:	0.0040
Sand:	62.0%	D_{30}:	0.1691
Silt:	19.2%	D_{60}:	1.1588
Clay:	6.2%	C_u:	288.96
		C_c:	6.15

Comments:

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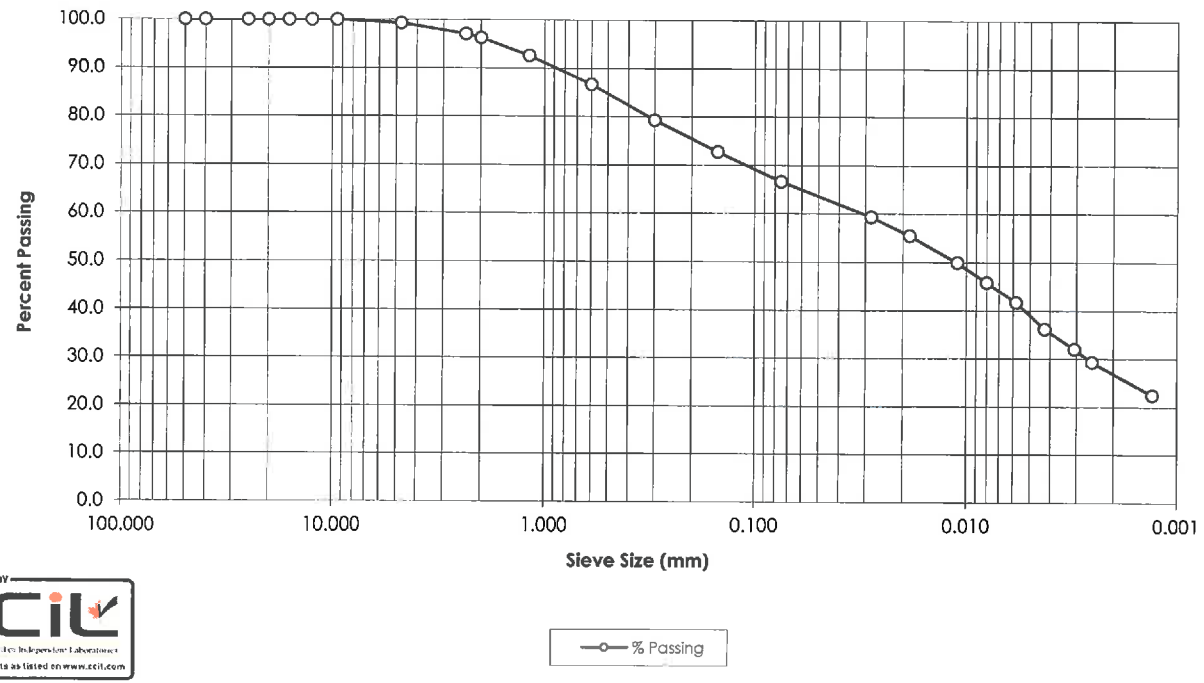
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-10
TESTED BY: JA

DATE TESTED: March 20, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0058**	**41.7**
40.0	**100.0**	**0.0042**	**36.2**
25.0	**100.0**	**0.0031**	**32.1**
20.0	**100.0**	**0.0025**	**29.3**
16.0	**100.0**	**0.0013**	**22.4**
12.5	**100.0**		
9.5	**100.0**		
4.75	**99.3**		
2.36	**97.1**		
2.00	**96.3**		
1.18	**92.6**		
0.600	**86.7**		
0.300	**79.3**		
0.150	**72.7**		
0.075	**66.6**		
0.0282	**59.3**		
0.0186	**55.5**		
0.0111	**50.0**		
0.0080	**45.8**		

Gravel:	0.7%	D_{10}:	-
Sand:	32.7%	D_{30}:	0.0027
Silt:	39.8%	D_{60}:	0.0328
Clay:	26.8%	C_U:	-
		C_C:	-

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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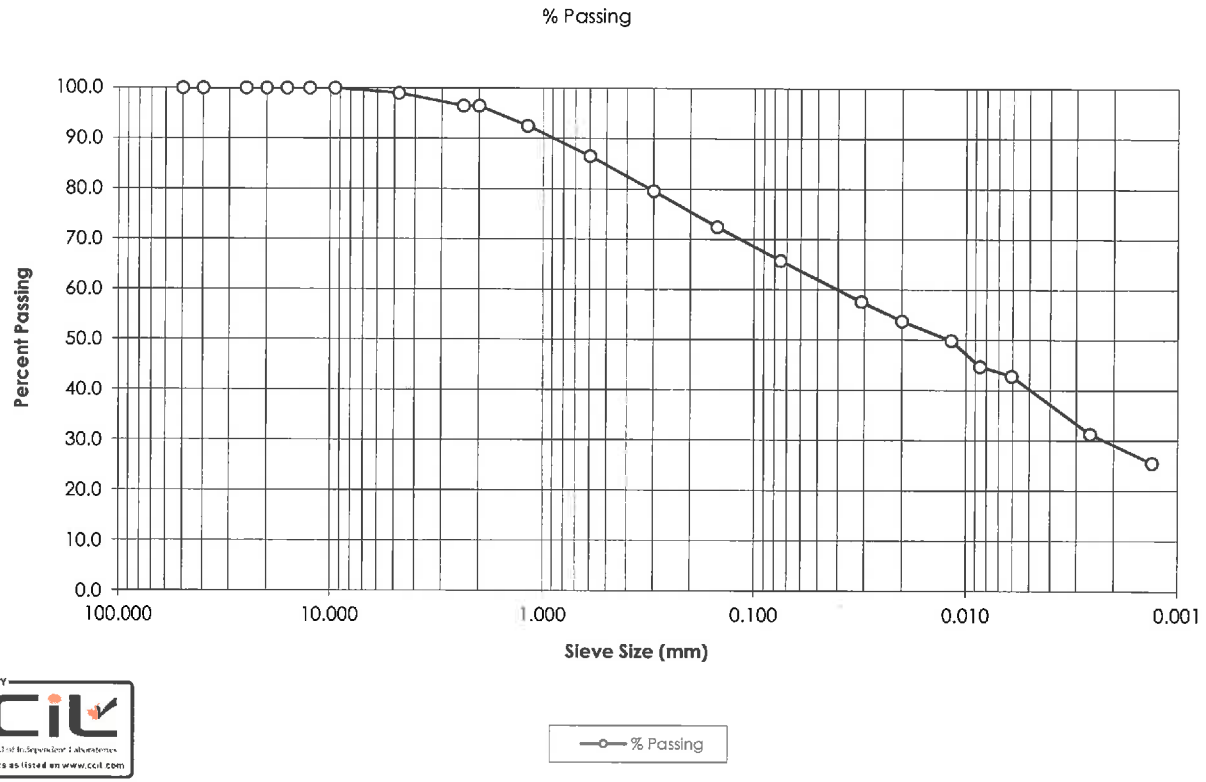
SAMPLE No.: AS3
SOURCE: BH17-10
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**42.8**
40.0	**100.0**	**#N/A**	**#N/A**
25.0	**100.0**	**#N/A**	**#N/A**
20.0	**100.0**	**0.0026**	**31.3**
16.0	**100.0**	**0.0013**	**25.5**
12.5	**100.0**		
9.5	**100.0**		
4.75	**99.0**		
2.36	**96.5**		
2.00	**96.5**		
1.18	**92.5**		
0.600	**86.5**		
0.300	**79.6**		
0.150	**72.5**		
0.075	**65.8**		
0.0311	**57.6**		
0.0200	**53.8**		
0.0117	**49.9**		
0.0086	**44.7**		

Gravel:	1.0%	D_{10}:	-
Sand:	33.3%	D_{30}:	0.0023
Silt:	36.7%	D_{60}:	0.0446
Clay:	29.0%	C_U:	-
		C_C:	-

Comments:

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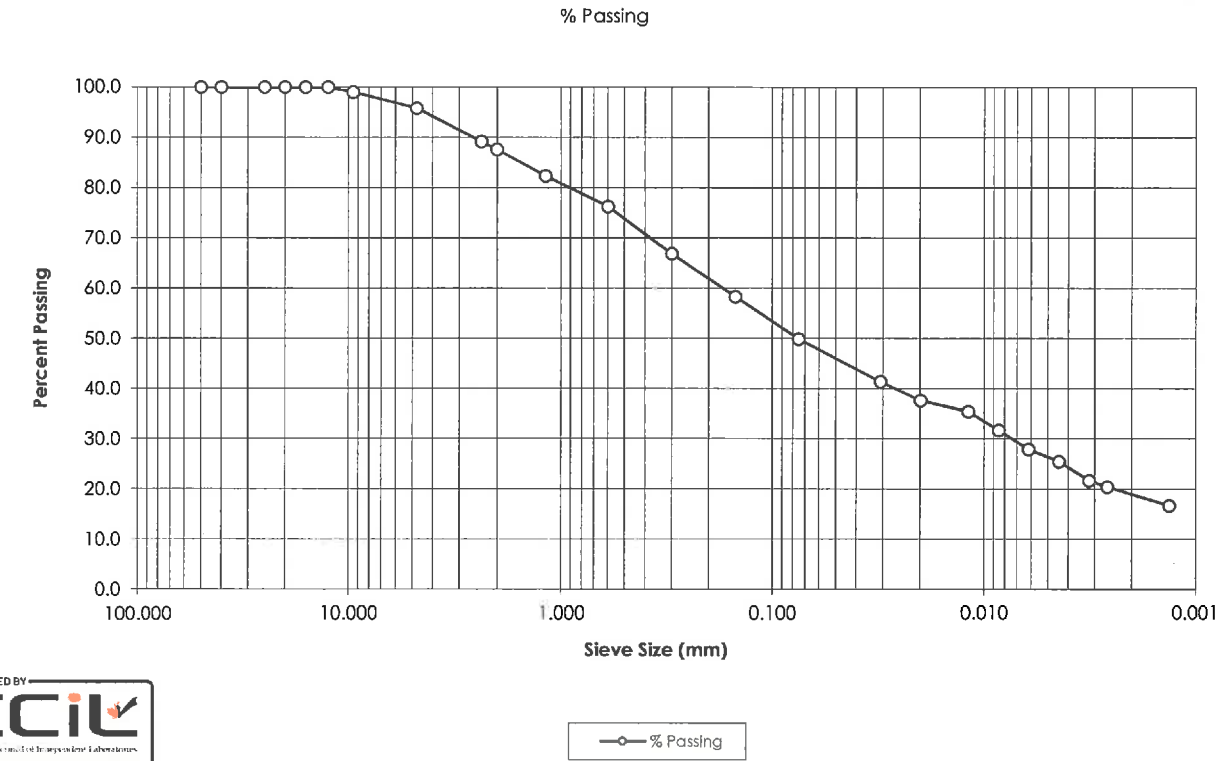
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-11
TESTED BY: JA

DATE TESTED: March 20, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silty and/or clayey sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0062	27.9
40.0	100.0	0.0044	25.4
25.0	100.0	0.0032	21.7
20.0	100.0	0.0026	20.4
16.0	100.0	0.0013	16.6
12.5	100.0		
9.5	99.0		
4.75	95.8		
2.36	89.2		
2.00	87.6		
1.18	82.4		
0.600	76.3		
0.300	66.9		
0.150	58.4		
0.075	49.9		
0.0307	41.4		
0.0199	37.7		
0.0119	35.4		
0.0085	31.7		

Gravel:	4.2%	D_{10}:	-
Sand:	45.9%	D_{30}:	0.0075
Silt:	31.0%	D_{60}:	0.1805
Clay:	18.9%	C_u:	-
		C_c:	-

Comments:

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Reviewed by:

Stantec

Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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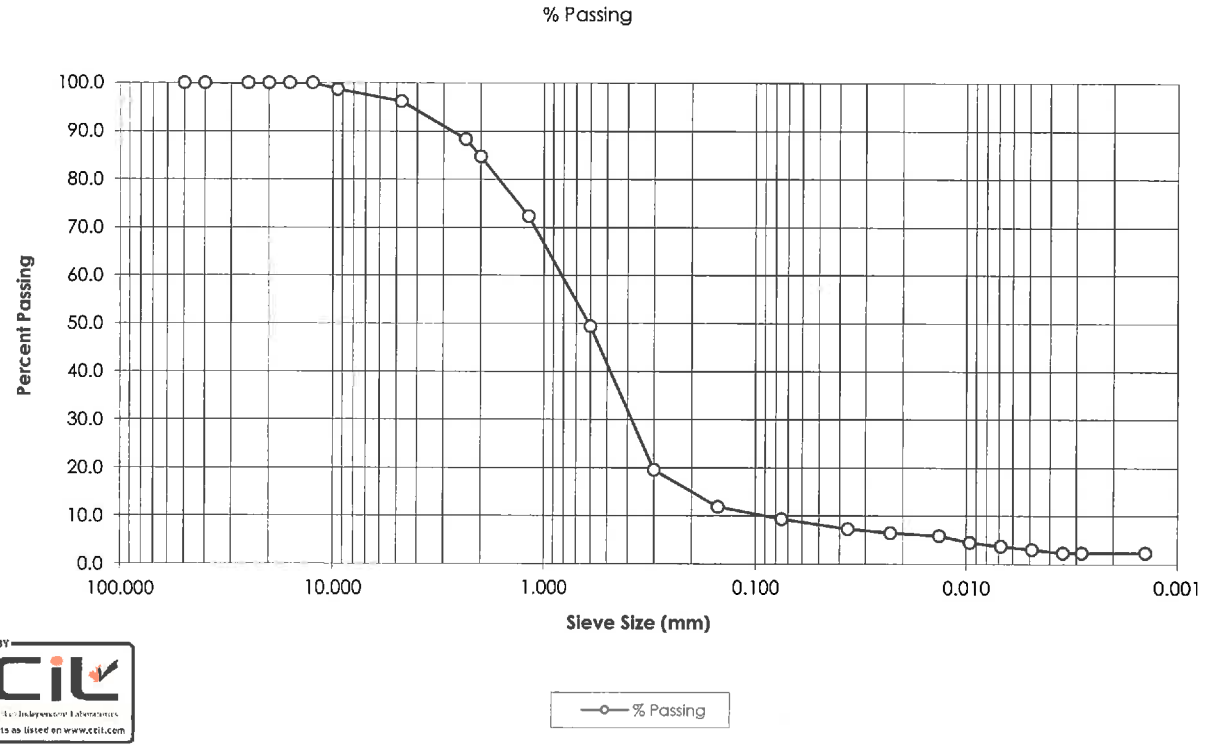
Tel: (780) 917-7463

SAMPLE No.: AS2
SOURCE: BH17-12
TESTED BY: JA

DATE TESTED: March 20, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Well graded sand with clay and/or silt



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0068	3.8
40.0	100.0	0.0049	3.0
25.0	100.0	0.0035	2.3
20.0	100.0	0.0028	2.3
16.0	100.0	0.0014	2.3
12.5	100.0		
9.5	98.6		
4.75	96.2		
2.36	88.3		
2.00	84.7		
1.18	72.3		
0.600	49.4		
0.300	19.5		
0.150	11.8		
0.075	9.3		
0.0365	7.3		
0.0229	6.4		
0.0135	5.9		
0.0096	4.5		

Gravel:	3.8%	D_{10}:	0.0973
Sand:	86.9%	D_{30}:	0.4389
Silt:	7.0%	D_{60}:	0.8960
Clay:	2.3%	C_u:	9.21
		C_c:	2.21

Comments:

Reviewed by:

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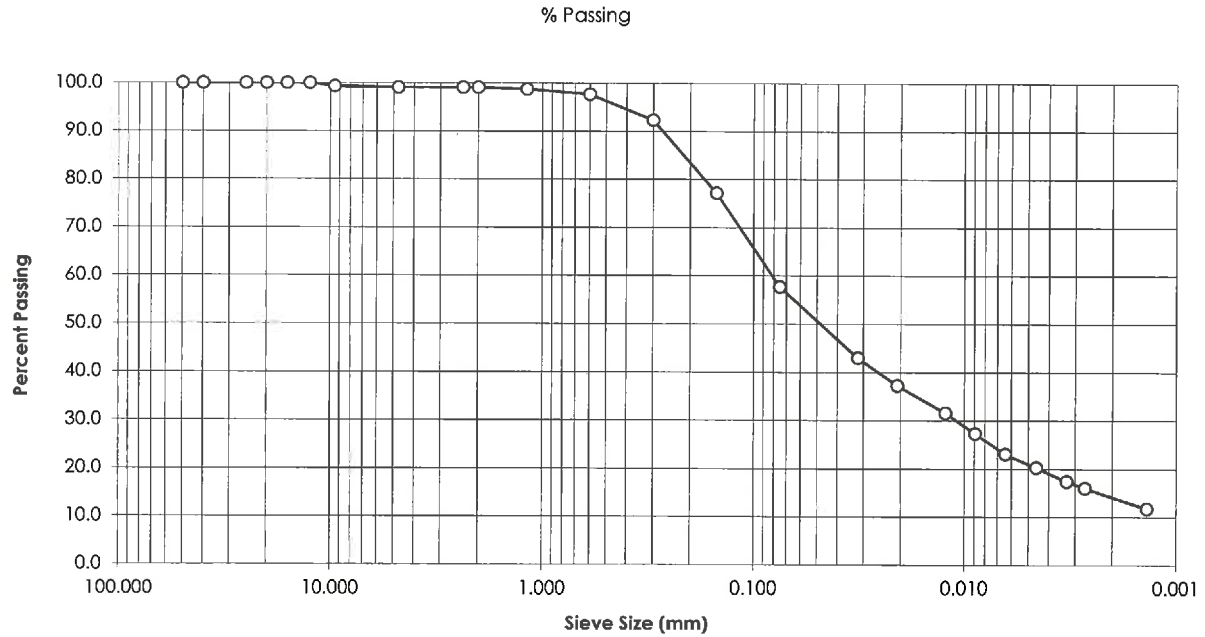
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-13
TESTED BY: JA

DATE TESTED: March 20, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0064	23.1
40.0	100.0	0.0046	20.3
25.0	100.0	0.0033	17.4
20.0	100.0	0.0027	16.0
16.0	100.0	0.0014	11.8
12.5	100.0		
9.5	99.3		
4.75	99.1		
2.36	99.1		
2.00	99.1		
1.18	98.7		
0.600	97.7		
0.300	92.3		
0.150	77.1		
0.075	57.7		
0.0319	42.9		
0.0208	37.3		
0.0123	31.6		
0.0089	27.3		

Gravel:	0.9%	D_{10}:	-
Sand:	41.4%	D_{30}:	0.0111
Silt:	43.5%	D_{60}:	0.0852
Clay:	14.2%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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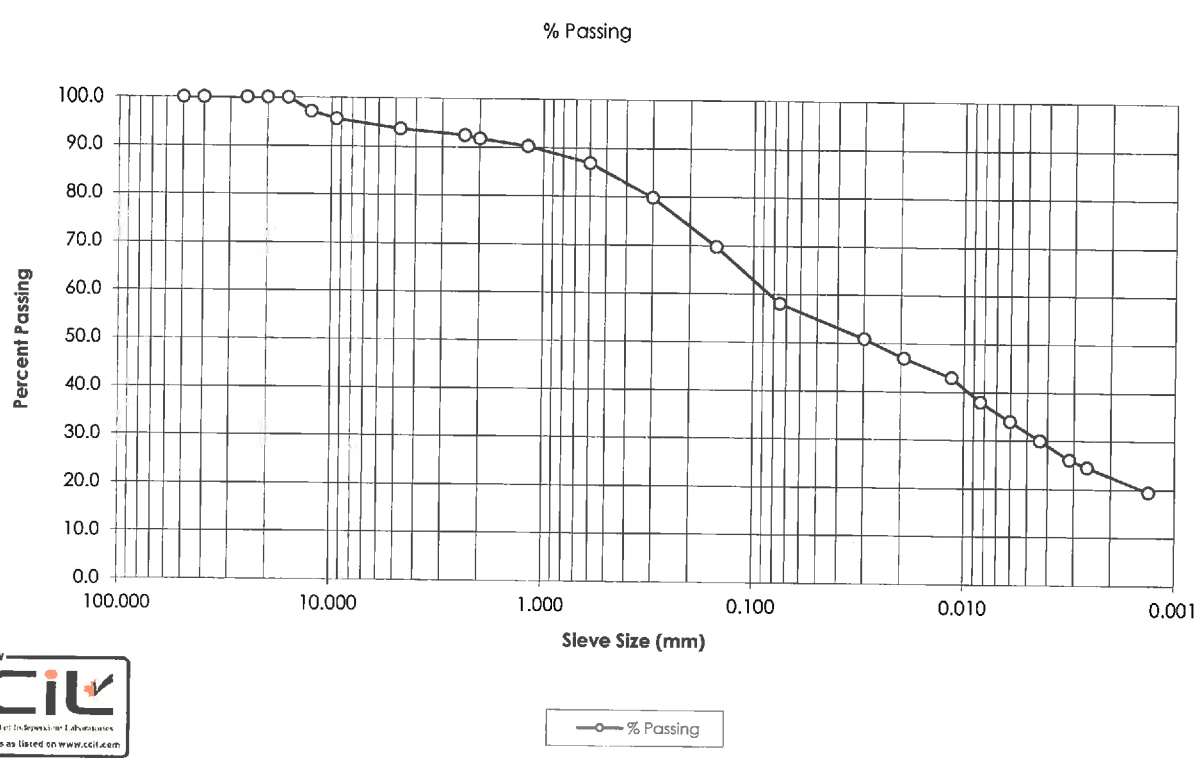
SAMPLE No.: AS3
SOURCE: BH17-13
TESTED BY: JA

DATE TESTED: March 22, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0060	34.0
40.0	100.0	0.0044	30.0
25.0	100.0	0.0031	26.0
20.0	100.0	0.0026	24.5
16.0	100.0	0.0013	19.4
12.5	97.1		
9.5	95.6		
4.75	93.7		
2.36	92.4		
2.00	91.8		
1.18	90.3		
0.600	86.9		
0.300	79.8		
0.150	69.7		
0.075	58.1		
0.0299	50.9		
0.0194	46.9		
0.0115	43.0		
0.0084	37.9		

Gravel:	6.3%	D_{10}:	-
Sand:	35.6%	D_{30}:	0.0044
Silt:	35.5%	D_{60}:	0.0885
Clay:	22.6%	C_u:	-
		C_c:	-

Comments:

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Reviewed by:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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10160 - 112 ST
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LABORATORY
10575 106 ST
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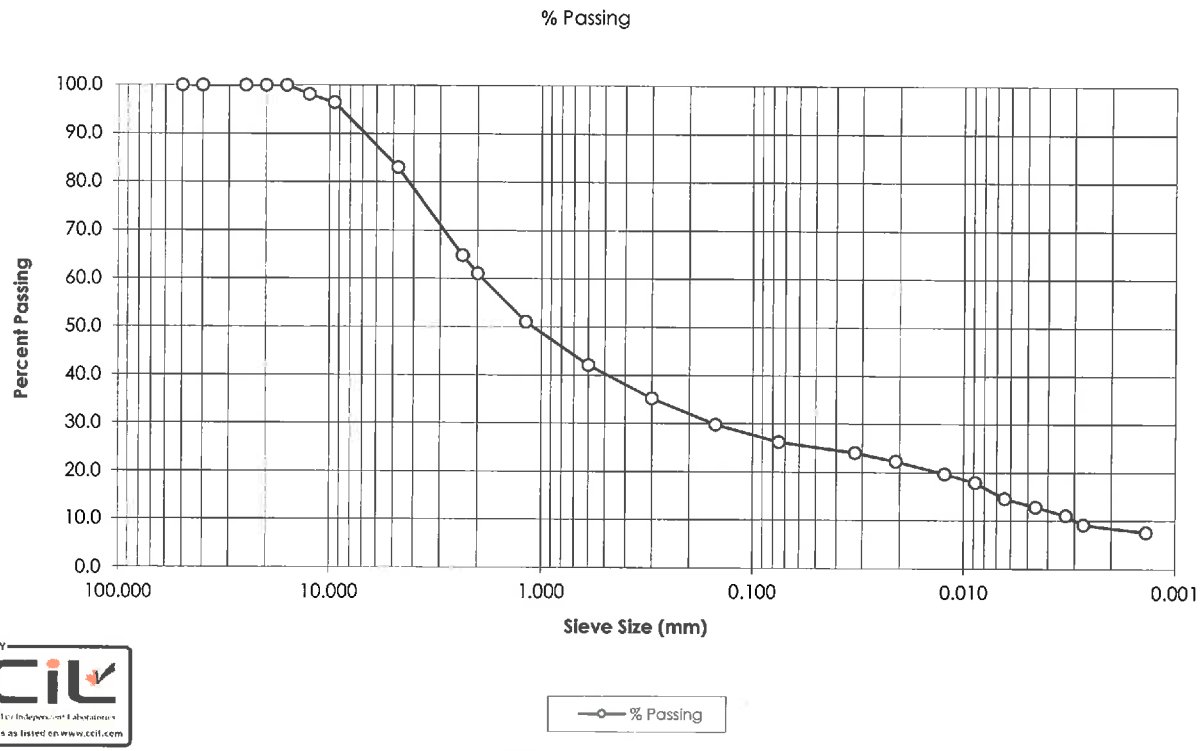
Tel: (780) 917-7463

SAMPLE No.: AS1
SOURCE: BH17-15
TESTED BY: JA

DATE TESTED: March 22, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silty sand with gravel



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**14.6**
40.0	**100.0**	**0.0046**	**12.8**
25.0	**100.0**	**0.0033**	**11.1**
20.0	**100.0**	**0.0027**	**9.2**
16.0	**100.0**	**0.0014**	**7.6**
12.5	**98.2**		
9.5	**96.4**		
4.75	**83.0**		
2.36	**64.8**		
2.00	**61.1**		
1.18	**51.1**		
0.600	**42.1**		
0.300	**35.2**		
0.150	**29.8**		
0.075	**26.2**		
0.0326	**24.0**		
0.0209	**22.3**		
0.0123	**19.6**		
0.0089	**17.9**		

Gravel:	17.0%	D_{10}:	0.0030
Sand:	56.8%	D_{30}:	0.1566
Silt:	17.8%	D_{60}:	1.9173
Clay:	8.4%	C_u:	643.47
		C_c:	4.29

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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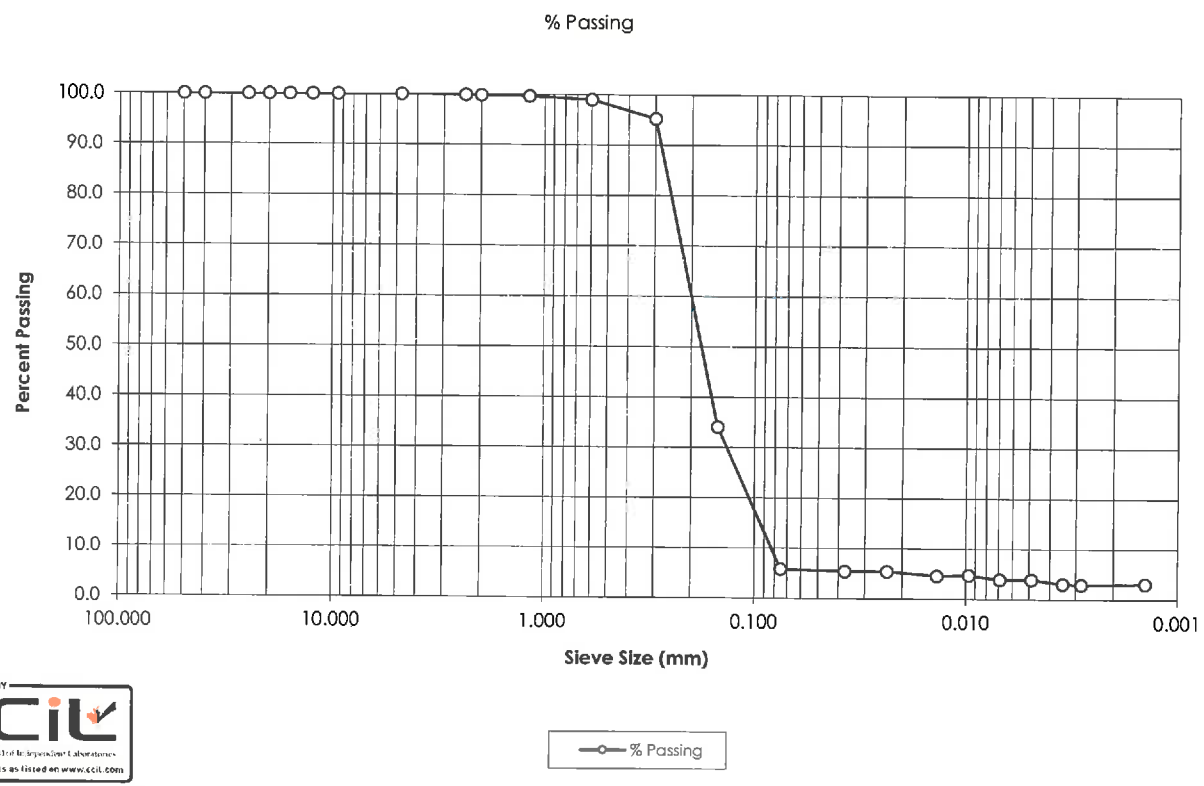
Tel: (780) 917-7463

SAMPLE No.: AS1
SOURCE: BH17-17
TESTED BY: JA

DATE TESTED: March 22, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Poorly graded sand with clay and/or silt



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0069**	**3.9**
40.0	**100.0**	**0.0049**	**3.9**
25.0	**100.0**	**0.0035**	**3.1**
20.0	**100.0**	**0.0028**	**2.9**
16.0	**100.0**	**0.0014**	**3.1**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**99.9**		
2.00	**99.9**		
1.18	**99.7**		
0.600	**99.0**		
0.300	**95.3**		
0.150	**34.1**		
0.075	**5.8**		
0.0374	**5.4**		
0.0236	**5.4**		
0.0137	**4.6**		
0.0097	**4.7**		

Gravel:	0.0%	D_{10}:	0.0980
Sand:	94.2%	D_{30}:	0.1446
Silt:	2.8%	D_{60}:	0.2326
Clay:	3.0%	C_U:	2.37
		C_C:	0.92

Comments:

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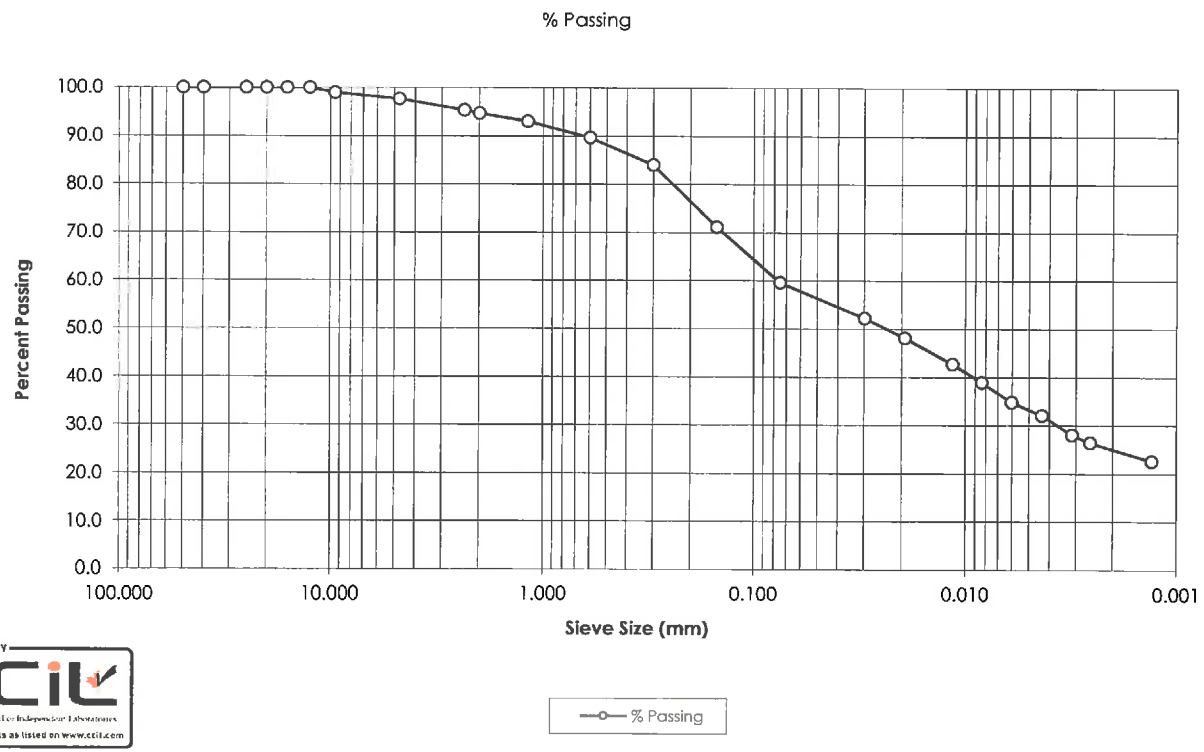
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS3
SOURCE: BH17-17
TESTED BY: JA

DATE TESTED: March 22, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0060	34.8
40.0	100.0	0.0043	32.1
25.0	100.0	0.0031	28.1
20.0	100.0	0.0026	26.4
16.0	100.0	0.0013	22.6
12.5	100.0		
9.5	98.9		
4.75	97.7		
2.36	95.3		
2.00	94.7		
1.18	93.0		
0.600	89.7		
0.300	84.0		
0.150	71.2		
0.075	59.6		
0.0299	52.2		
0.0194	48.1		
0.0115	42.7		
0.0084	38.9		

Gravel:	2.3%	D_{10}:	-
Sand:	38.0%	D_{30}:	0.0037
Silt:	34.6%	D_{60}:	0.0776
Clay:	25.1%	C_U:	-
		C_C:	-

Comments:

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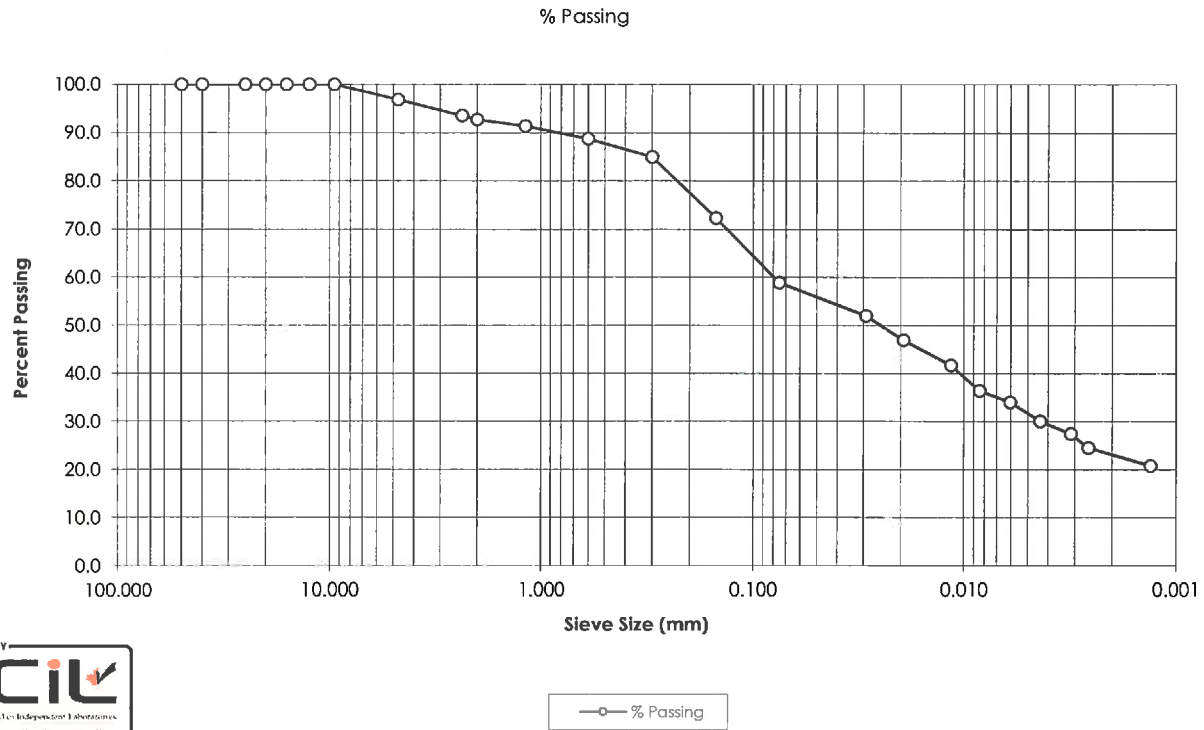
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-17
TESTED BY: JA

DATE TESTED: March 22, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0060**	**34.0**
40.0	**100.0**	**0.0044**	**30.0**
25.0	**100.0**	**0.0031**	**27.4**
20.0	**100.0**	**0.0026**	**24.5**
16.0	**100.0**	**0.0013**	**20.8**
12.5	**100.0**		
9.5	**100.0**		
4.75	**96.9**		
2.36	**93.5**		
2.00	**92.7**		
1.18	**91.4**		
0.600	**88.8**		
0.300	**85.0**		
0.150	**72.3**		
0.075	**58.9**		
0.0292	**52.0**		
0.0194	**46.9**		
0.0115	**41.7**		
0.0084	**36.4**		

Gravel:	3.1%	D_{10}:	-
Sand:	38.0%	D_{30}:	0.0044
Silt:	35.8%	D_{60}:	0.0819
Clay:	23.1%	C_u:	-
		C_c:	-

Comments:

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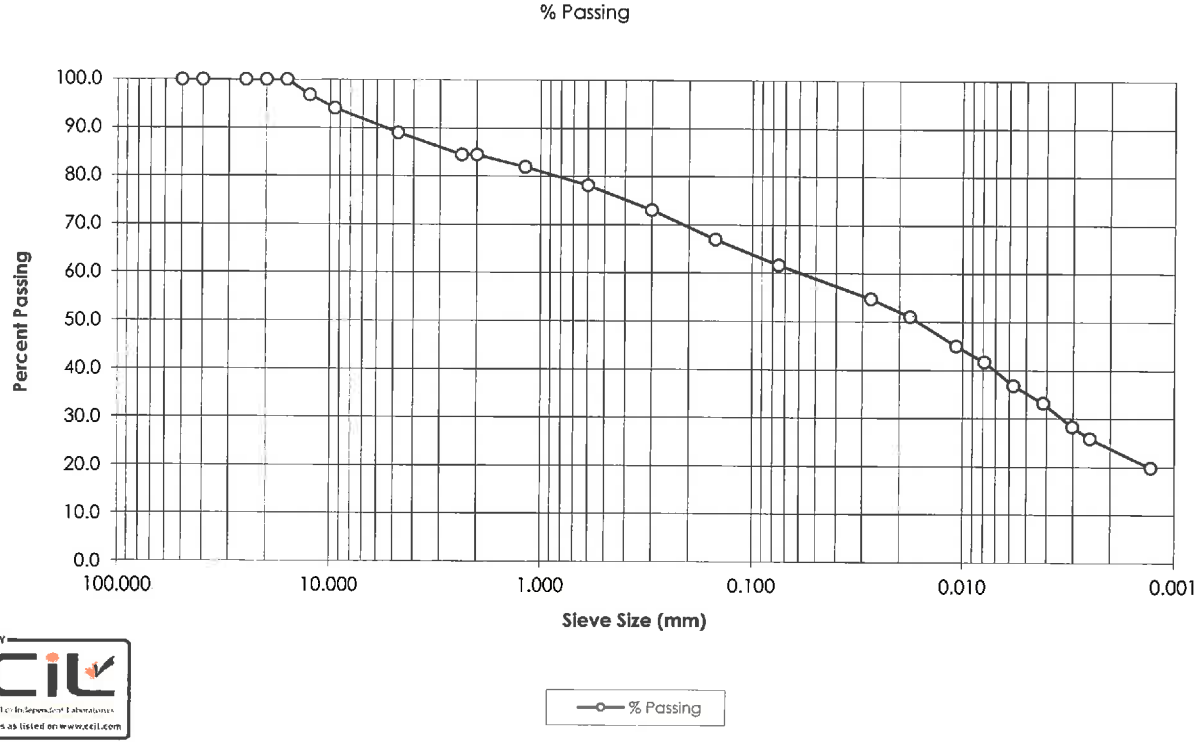
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS7
SOURCE: BH17-19
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0057**	**36.8**
40.0	**100.0**	**0.0042**	**33.2**
25.0	**100.0**	**0.0030**	**28.3**
20.0	**100.0**	**0.0025**	**25.9**
16.0	**100.0**	**0.0013**	**19.8**
12.5	**96.8**		
9.5	**94.1**		
4.75	**89.0**		
2.36	**84.5**		
2.00	**84.4**		
1.18	**81.9**		
0.600	**78.2**		
0.300	**73.0**		
0.150	**67.0**		
0.075	**61.7**		
0.0274	**54.7**		
0.0178	**51.1**		
0.0108	**45.0**		
0.0079	**41.7**		

Gravel:	11.0%	D_{10}:	-
Sand:	27.3%	D_{30}:	0.0034
Silt:	37.8%	D_{60}:	0.0641
Clay:	23.9%	C_u:	-
		C_c:	-

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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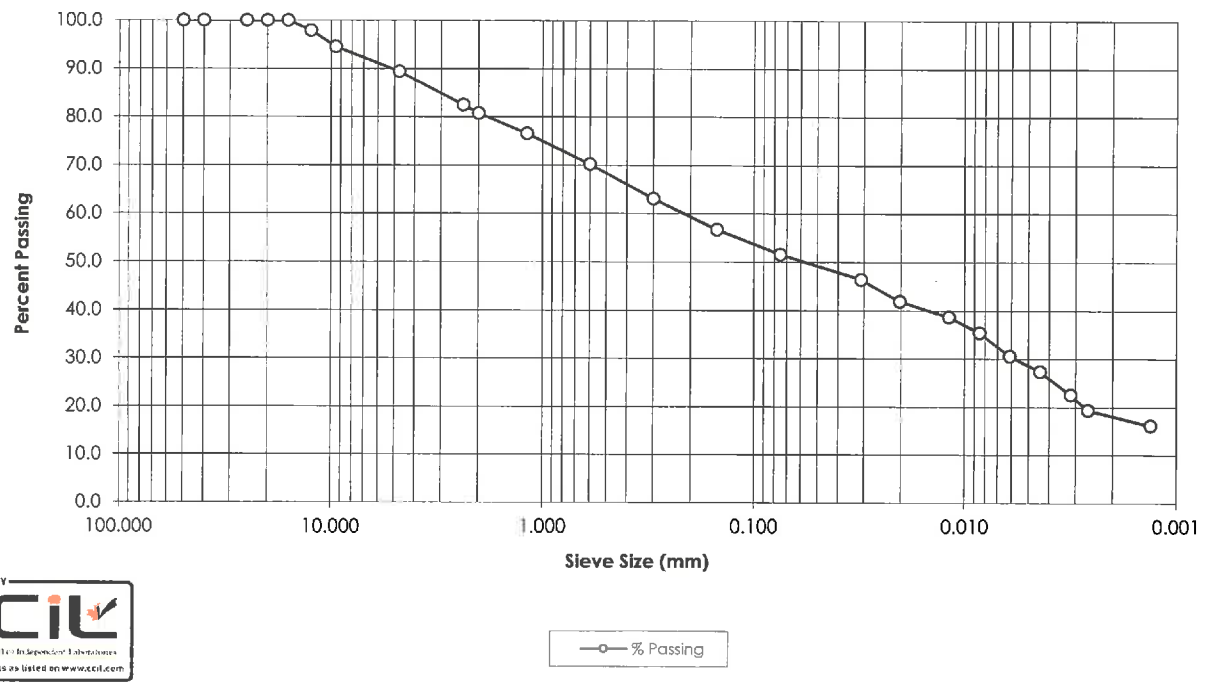
SAMPLE No.: AS1
SOURCE: BH17-20
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy silty clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**30.6**
40.0	**100.0**	**0.0044**	**27.4**
25.0	**100.0**	**0.0032**	**22.6**
20.0	**100.0**	**0.0026**	**19.3**
16.0	**100.0**	**0.0013**	**16.1**
12.5	**97.9**		
9.5	**94.5**		
4.75	**89.4**		
2.36	**82.5**		
2.00	**80.8**		
1.18	**76.6**		
0.600	**70.2**		
0.300	**63.1**		
0.150	**56.7**		
0.075	**51.6**		
0.0310	**46.4**		
0.0203	**41.9**		
0.0119	**38.7**		
0.0085	**35.5**		

Gravel:	10.6%	D_{10}:	-
Sand:	37.8%	D_{30}:	0.0058
Silt:	33.5%	D_{60}:	0.2290
Clay:	18.1%	C_u:	-
		C_c:	-

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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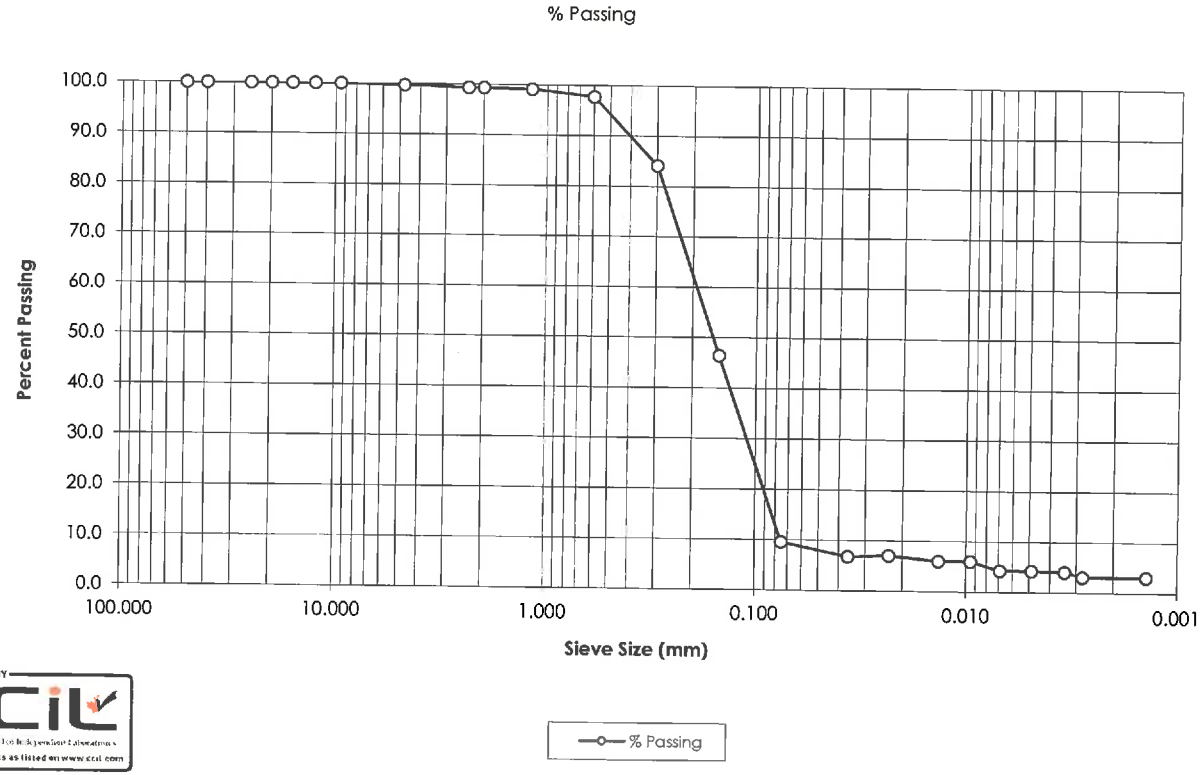
SAMPLE No.: AS1B
SOURCE: BH17-21
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Poorly graded sand with silty clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0069	4.3
40.0	100.0	0.0049	4.3
25.0	100.0	0.0034	4.1
20.0	100.0	0.0028	3.1
16.0	100.0	0.0014	3.1
12.5	100.0		
9.5	100.0		
4.75	99.8		
2.36	99.4		
2.00	99.4		
1.18	99.1		
0.600	97.7		
0.300	84.2		
0.150	46.5		
0.075	9.6		
0.0362	6.8		
0.0232	7.1		
0.0135	6.1		
0.0095	6.1		

Gravel:	0.2%	D_{10}:	0.0771
Sand:	90.2%	D_{30}:	0.1292
Silt:	6.5%	D_{60}:	0.2145
Clay:	3.1%	C_U:	2.78
		C_C:	1.01

Comments:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services Lt
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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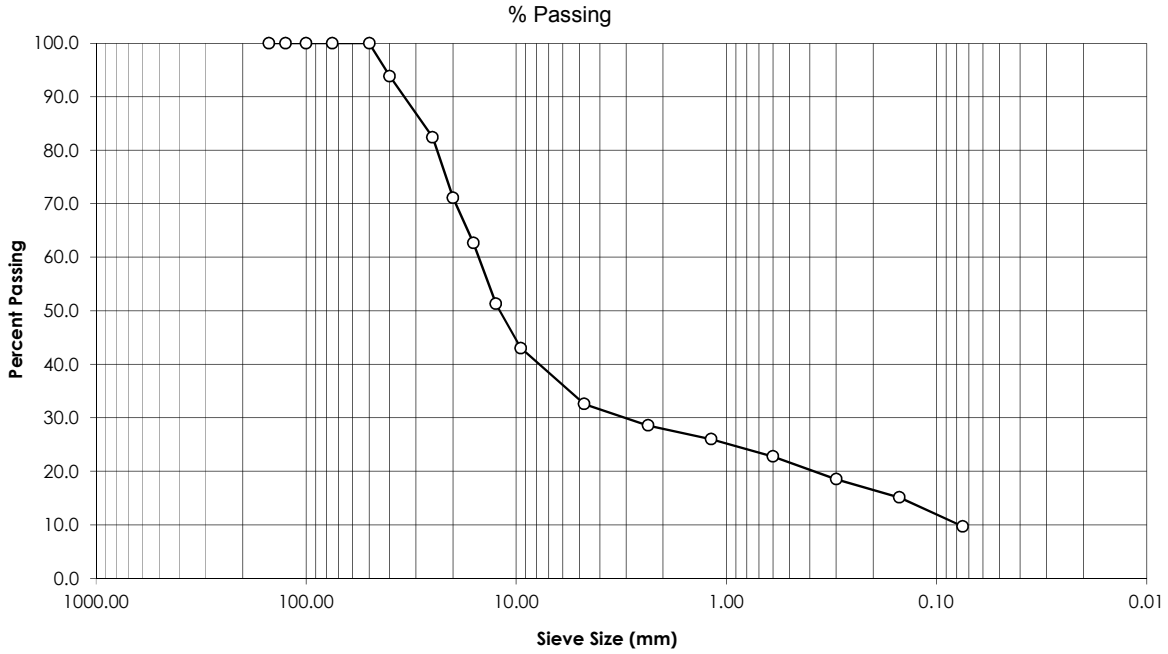
SAMPLE No.: AS1
SOURCE: BH17-22
TESTED BY: NN

DATE RECEIVED: March 27, 2017
DATE TESTED: March 31, 2017
SAMPLE DESCRIPTION: Well graded gravel with silt and/or clay with sand



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	100.0	-	-
125.0	100.0	-	-
100.0	100.0	-	-
75.0	100.0	-	-
50.0	100.0	-	-
40.0	93.8	-	-
25.0	82.4	-	-
20.0	71.1	-	-
16.0	62.7	-	-
12.5	51.3	-	-
9.5	43.0	-	-
4.75	32.6	-	-
2.36	28.6	-	-
1.18	26.0	-	-
0.600	22.8	-	-
0.300	18.5	-	-
0.150	15.1	-	-
0.075	9.7	-	-

Cobble:	0.0%	D_{10}:	0.0798
Gravel:	67.4%	D_{30}:	3.2328
Sand:	22.9%	D_{60}:	15.2295
Fines:	9.7%	C_U:	190.73
		C_c:	8.59

Comments:

Reviewed by:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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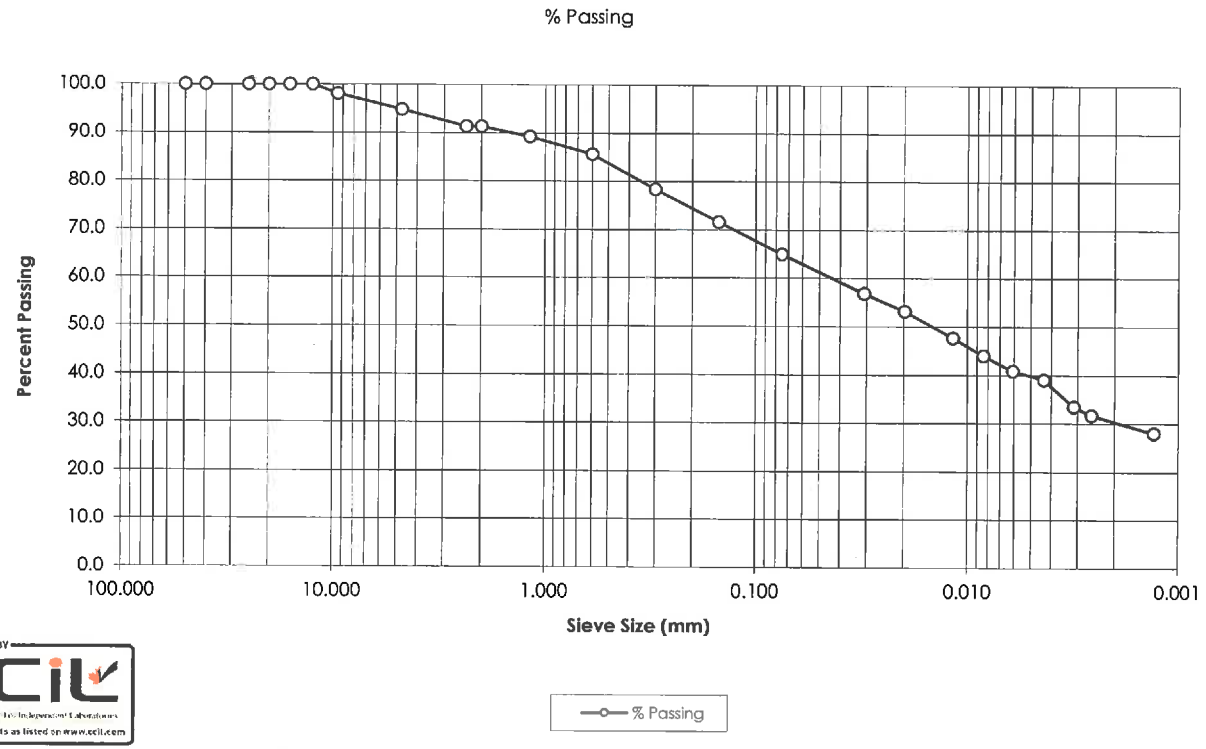
SAMPLE No.: AS3
SOURCE: BH17-22
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**40.9**
40.0	**100.0**	**0.0043**	**39.0**
25.0	**100.0**	**0.0031**	**33.5**
20.0	**100.0**	**0.0026**	**31.7**
16.0	**100.0**	**0.0013**	**28.0**
12.5	**100.0**		
9.5	**98.1**		
4.75	**94.8**		
2.36	**91.3**		
2.00	**91.3**		
1.18	**89.2**		
0.600	**85.6**		
0.300	**78.4**		
0.150	**71.6**		
0.075	**65.0**		
0.0308	**56.8**		
0.0198	**53.1**		
0.0117	**47.6**		
0.0084	**44.0**		

Gravel:	5.2%	D_{10}:	-
Sand:	29.8%	D_{30}:	0.0020
Silt:	34.6%	D_{60}:	0.0488
Clay:	30.4%	C_u:	-
		C_c:	-

Comments:

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Reviewed by:

Stantec

Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services Lt
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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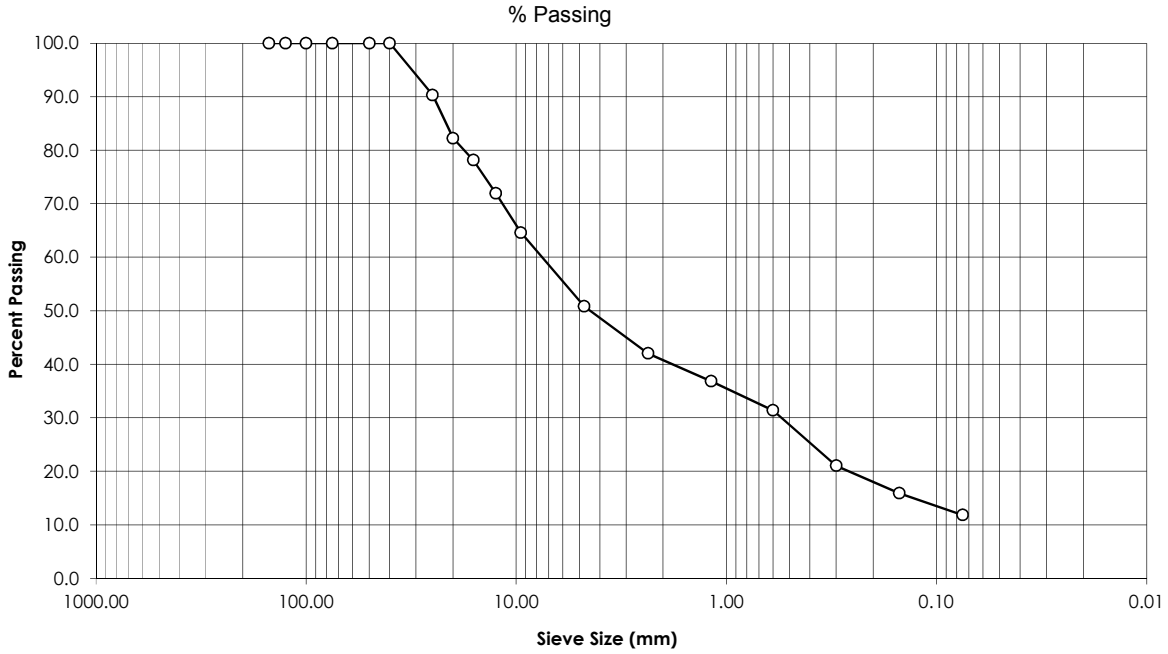
SAMPLE No.: AS1
SOURCE: BH17-23
TESTED BY: NN

DATE RECEIVED: March 27, 2017
DATE TESTED: March 31, 2017
SAMPLE DESCRIPTION: Gravel with sand with silt and/or clay



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**90.3**	-	-
20.0	**82.3**	-	-
16.0	**78.2**	-	-
12.5	**72.0**	-	-
9.5	**64.6**	-	-
4.75	**50.8**	-	-
2.36	**42.0**	-	-
1.18	**36.8**	-	-
0.600	**31.4**	-	-
0.300	**21.1**	-	-
0.150	**15.9**	-	-
0.075	**11.8**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	49.2%	D_{30}:	0.5654
Sand:	39.0%	D_{60}:	8.0338
Fines:	11.8%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Stantec

Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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10160 - 112 ST
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LABORATORY
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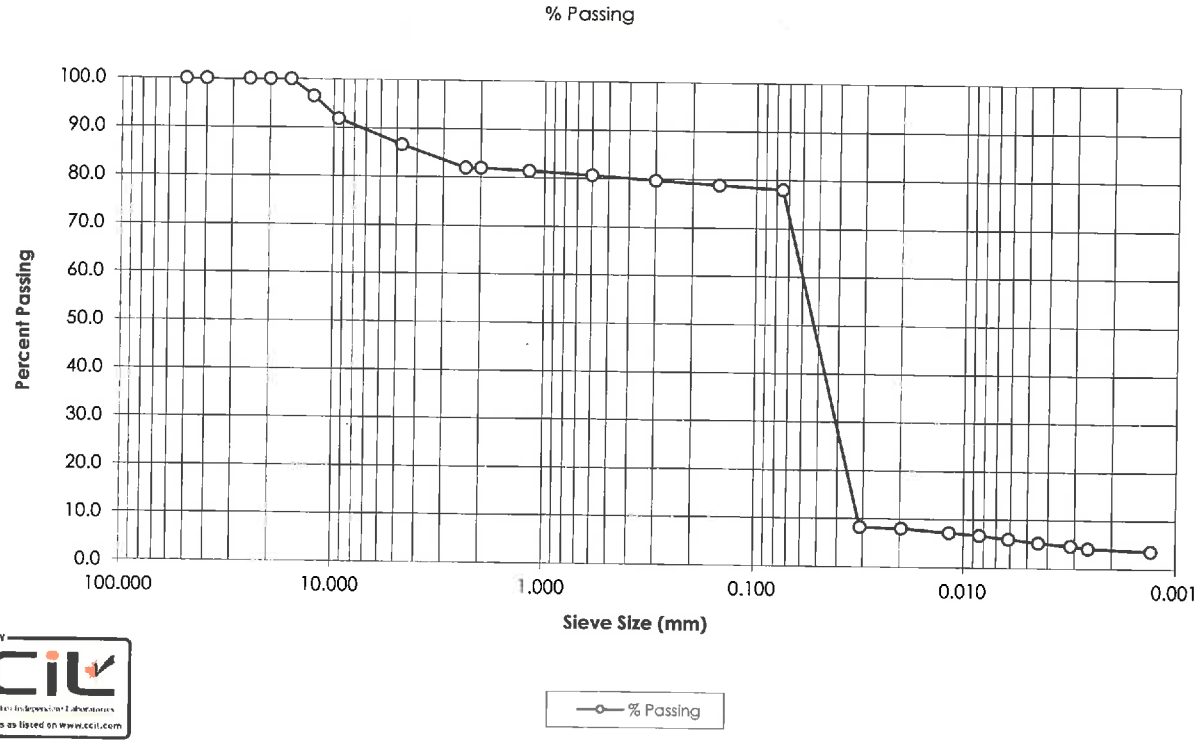
Tel: (780) 917-7463

SAMPLE No.: AS3
SOURCE: BH17-23
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Gravelly lean clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0061	6.0
40.0	100.0	0.0044	5.2
25.0	100.0	0.0031	4.7
20.0	100.0	0.0026	4.1
16.0	100.0	0.0013	3.6
12.5	96.5		
9.5	91.9		
4.75	86.6		
2.36	82.0		
2.00	81.9		
1.18	81.4		
0.600	80.7		
0.300	79.7		
0.150	78.8		
0.075	78.0		
0.0310	8.3		
0.0197	8.0		
0.0117	7.2		
0.0084	6.7		

Gravel:	13.4%	D_{10}:	0.0348
Sand:	8.5%	D_{30}:	0.0563
Silt:	74.1%	D_{60}:	0.0698
Clay:	4.0%	C_U:	2.01
		C_C:	1.30

Comments:

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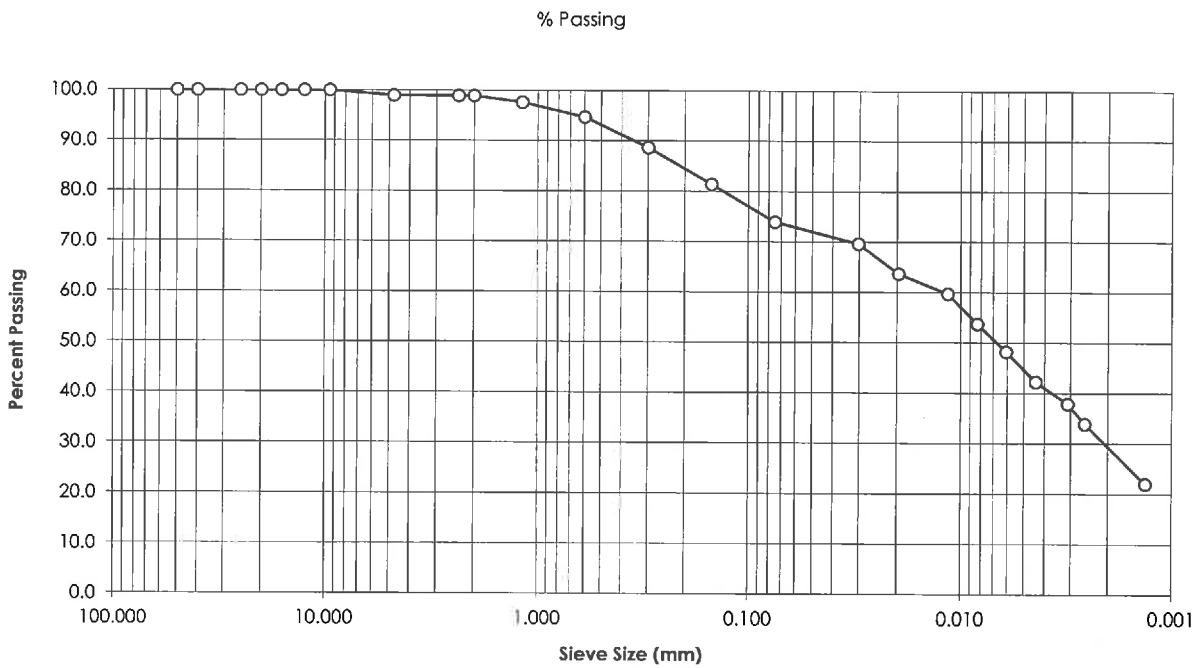
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-23
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0061	48.2
40.0	100.0	0.0044	42.3
25.0	100.0	0.0031	37.9
20.0	100.0	0.0026	33.9
16.0	100.0	0.0013	22.0
12.5	100.0		
9.5	100.0		
4.75	99.0		
2.36	98.9		
2.00	98.9		
1.18	97.6		
0.600	94.7		
0.300	88.7		
0.150	81.4		
0.075	73.9		
0.0303	69.6		
0.0196	63.7		
0.0115	59.7		
0.0083	53.8		

Gravel:	1.0%	D_{10}:	-
Sand:	25.1%	D_{30}:	0.0022
Silt:	44.6%	D_{60}:	0.0121
Clay:	29.3%	C_u:	-
		C_c:	-

Comments:

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Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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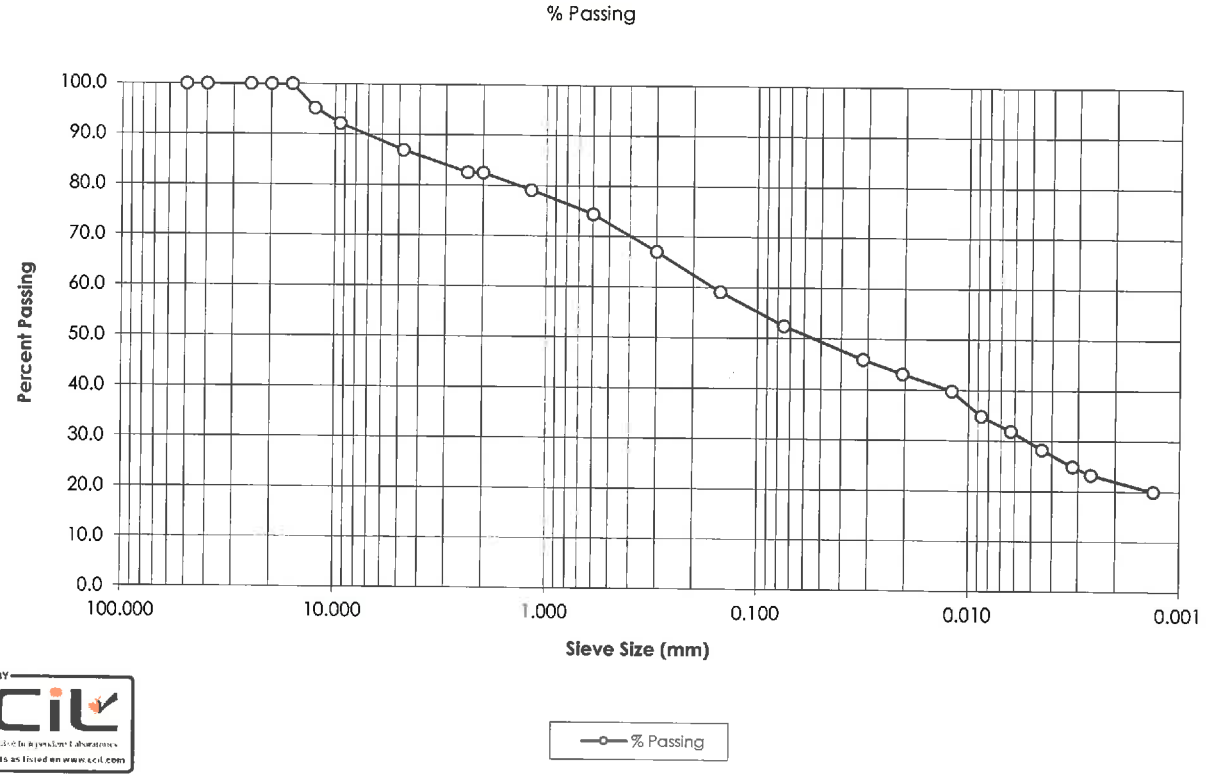
SAMPLE No.: AS1
SOURCE: BH17-24
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0063	31.9
40.0	100.0	0.0045	28.3
25.0	100.0	0.0032	25.0
20.0	100.0	0.0026	23.3
16.0	100.0	0.0013	20.0
12.5	95.2		
9.5	92.2		
4.75	87.0		
2.36	82.6		
2.00	82.6		
1.18	79.2		
0.600	74.4		
0.300	67.1		
0.150	59.1		
0.075	52.5		
0.0317	46.0		
0.0206	43.1		
0.0120	39.8		
0.0087	34.9		

Gravel:	13.0%	D_{10}:	-
Sand:	34.5%	D_{30}:	0.0054
Silt:	30.5%	D_{60}:	0.1670
Clay:	22.0%	C_u:	-
		C_c:	-

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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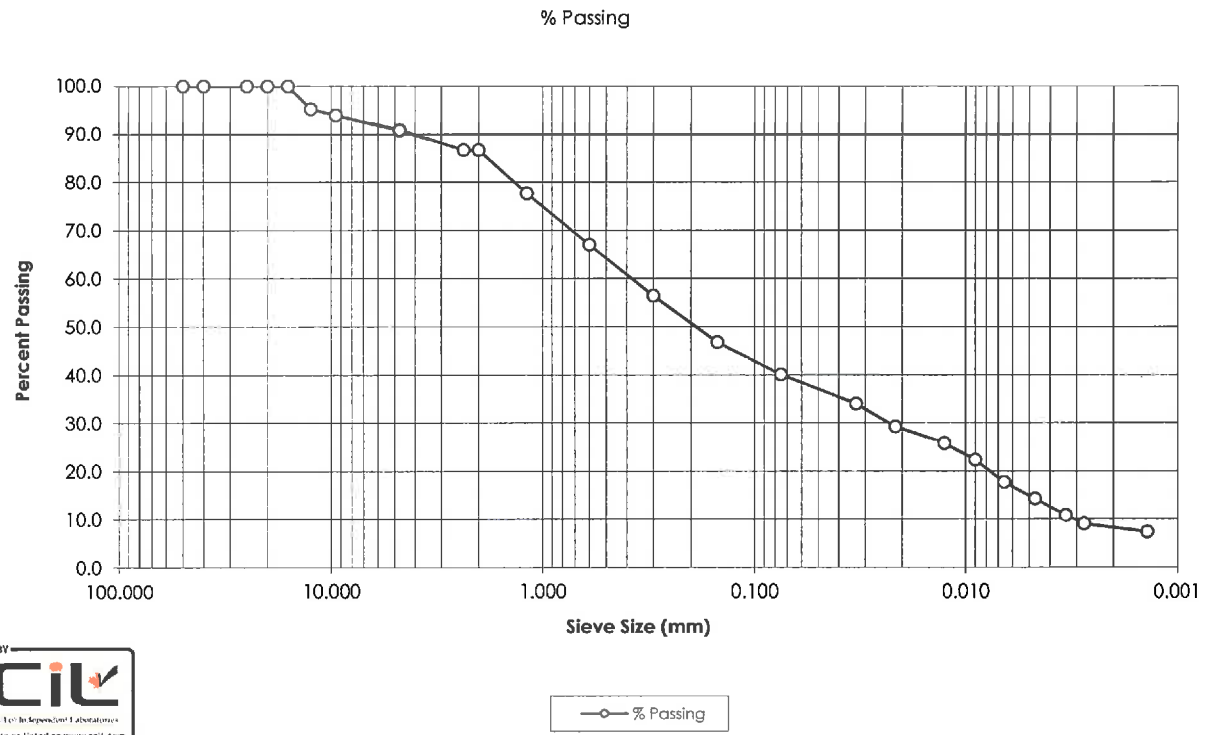
SAMPLE No.: AS3
SOURCE: BH17-24
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Clayey sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0066**	**17.7**
40.0	**100.0**	**0.0047**	**14.3**
25.0	**100.0**	**0.0034**	**10.8**
20.0	**100.0**	**0.0028**	**9.1**
16.0	**100.0**	**0.0014**	**7.4**
12.5	**95.3**		
9.5	**94.0**		
4.75	**90.9**		
2.36	**86.7**		
2.00	**86.6**		
1.18	**77.7**		
0.600	**67.0**		
0.300	**56.5**		
0.150	**46.8**		
0.075	**40.1**		
0.0331	**34.0**		
0.0216	**29.2**		
0.0126	**25.8**		
0.0090	**22.4**		

Gravel:	9.1%	D_{10}:	0.0031
Sand:	50.7%	D_{30}:	0.0236
Silt:	31.8%	D_{60}:	0.4058
Clay:	8.4%	C_u:	131.44
		C_c:	0.44

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

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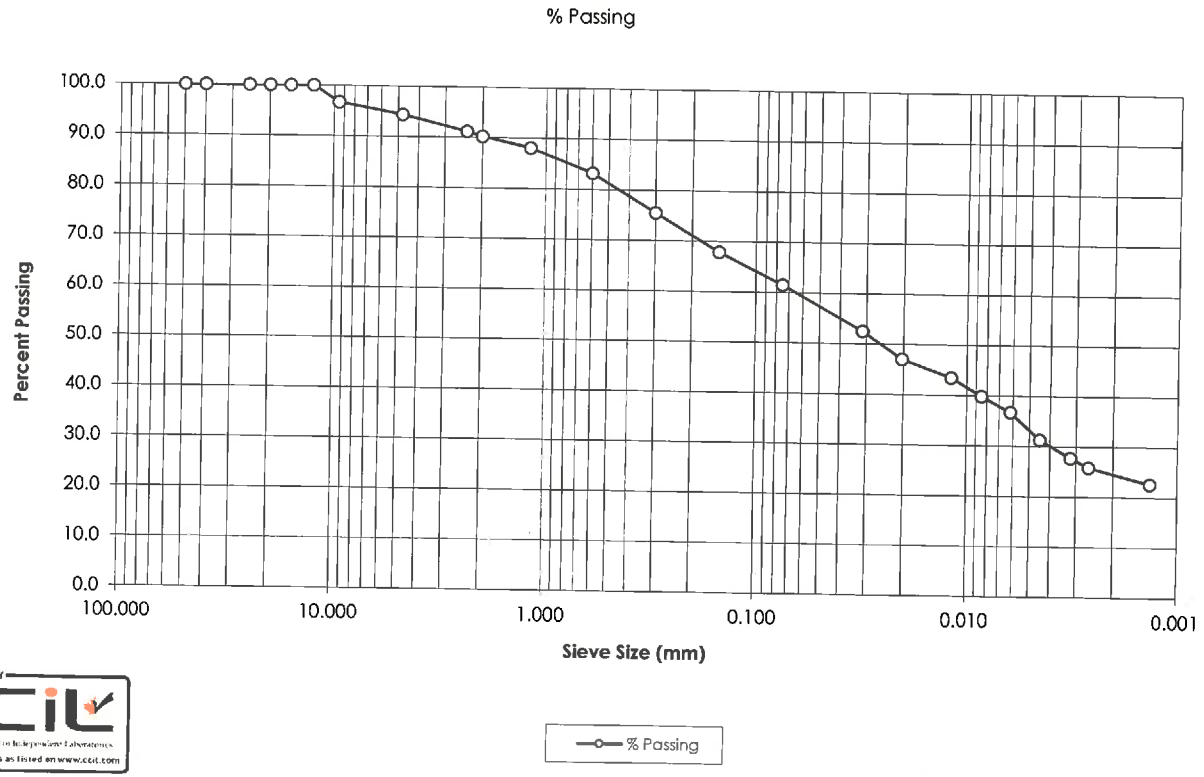
SAMPLE No.: SS4
SOURCE: BH17-24
TESTED BY: JA

DATE TESTED: April 7, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Sandy Lean Clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0062	36.8
40.0	100.0	0.0045	31.3
25.0	100.0	0.0032	27.7
20.0	100.0	0.0026	25.9
16.0	100.0	0.0013	22.6
12.5	100.0		
9.5	96.7		
4.75	94.4		
2.36	91.2		
2.00	90.2		
1.18	88.1		
0.600	83.3		
0.300	75.6		
0.150	67.9		
0.075	61.5		
0.0314	52.5		
0.0203	47.1		
0.0119	43.5		
0.0085	39.8		

Gravel:	5.6%	D_{10}:	-
Sand:	32.9%	D_{30}:	0.0040
Silt:	36.9%	D_{60}:	0.0682
Clay:	24.6%	C_u:	-
		C_c:	-

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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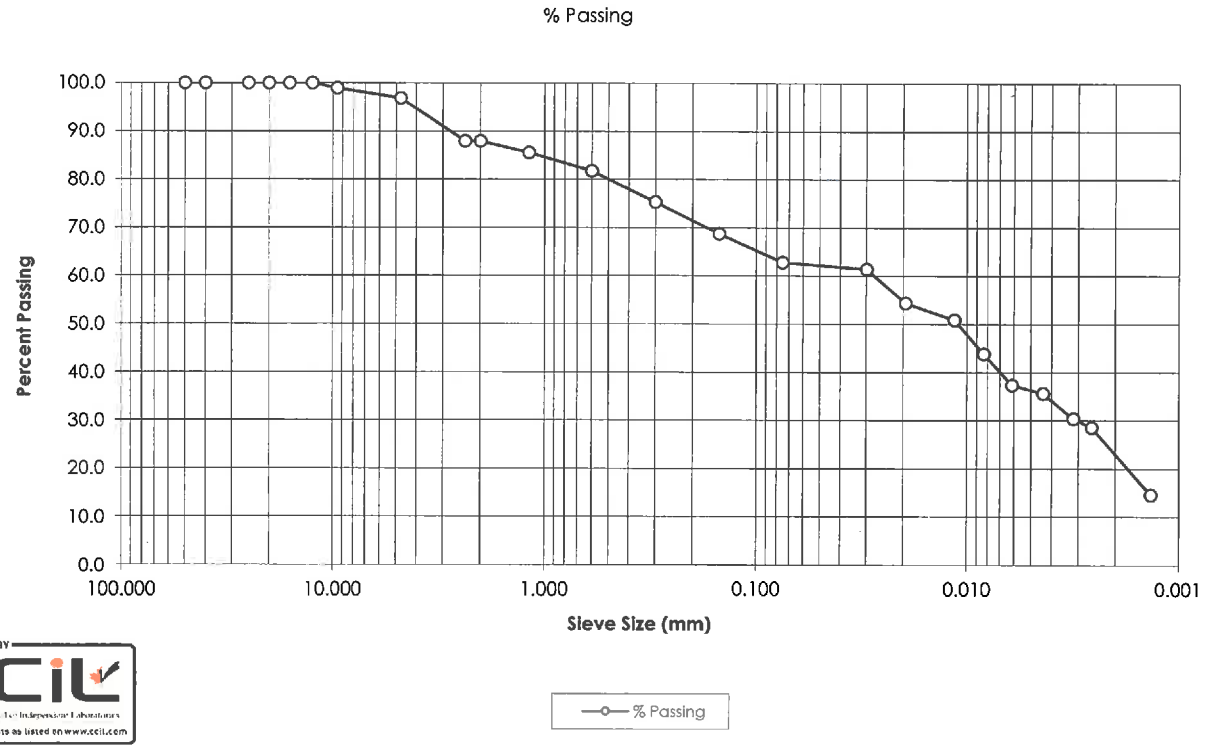
SAMPLE No.: AS1
SOURCE: BH17-28
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy silt



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**37.3**
40.0	**100.0**	**0.0044**	**35.6**
25.0	**100.0**	**0.0032**	**30.3**
20.0	**100.0**	**0.0026**	**28.6**
16.0	**100.0**	**0.0014**	**14.6**
12.5	**100.0**		
9.5	**98.9**		
4.75	**96.9**		
2.36	**88.0**		
2.00	**88.0**		
1.18	**85.6**		
0.600	**81.8**		
0.300	**75.3**		
0.150	**68.7**		
0.075	**62.8**		
0.0299	**61.4**		
0.0195	**54.4**		
0.0115	**50.9**		
0.0083	**43.8**		

Gravel:	3.1%	D_{10}:	-
Sand:	34.1%	D_{30}:	0.0030
Silt:	39.8%	D_{60}:	0.0280
Clay:	23.0%	C_u:	-
		C_c:	-

Comments:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

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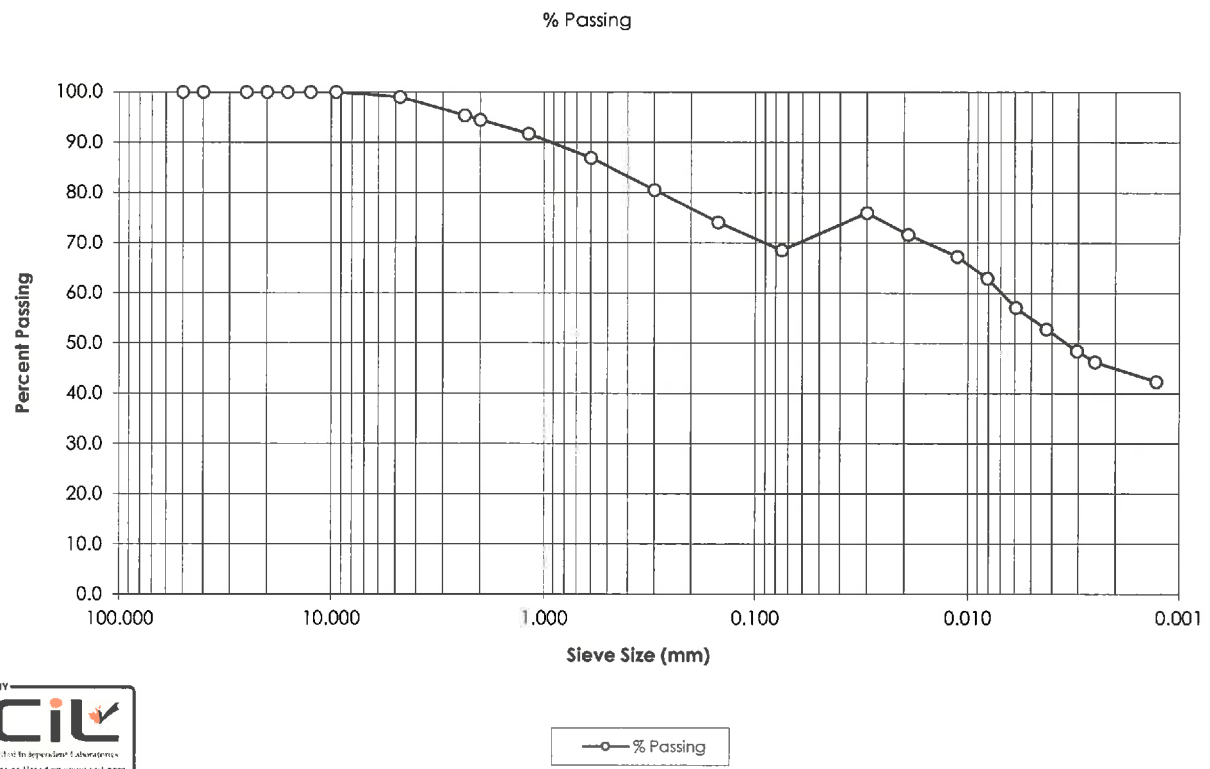
SAMPLE No.: SS5
SOURCE: BH17-29
TESTED BY: JA

DATE TESTED: April 8, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Sandy Lean Clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0059**	**57.1**
40.0	**100.0**	**0.0042**	**52.8**
25.0	**100.0**	**0.0030**	**48.4**
20.0	**100.0**	**0.0025**	**46.3**
16.0	**100.0**	**0.0013**	**42.4**
12.5	**100.0**		
9.5	**100.0**		
4.75	**99.0**		
2.36	**95.4**		
2.00	**94.5**		
1.18	**91.7**		
0.600	**86.9**		
0.300	**80.6**		
0.150	**74.1**		
0.075	**68.6**		
0.0299	**76.0**		
0.0192	**71.7**		
0.0112	**67.3**		
0.0081	**63.0**		

Gravel:	1.0%	D_{10}:	-
Sand:	30.4%	D_{30}:	-
Silt:	23.6%	D_{60}:	0.0070
Clay:	45.0%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering & Environmental Services Ltd
Project Name: Tlicho AllSeason Rd.Investig.
Project No: 144802448

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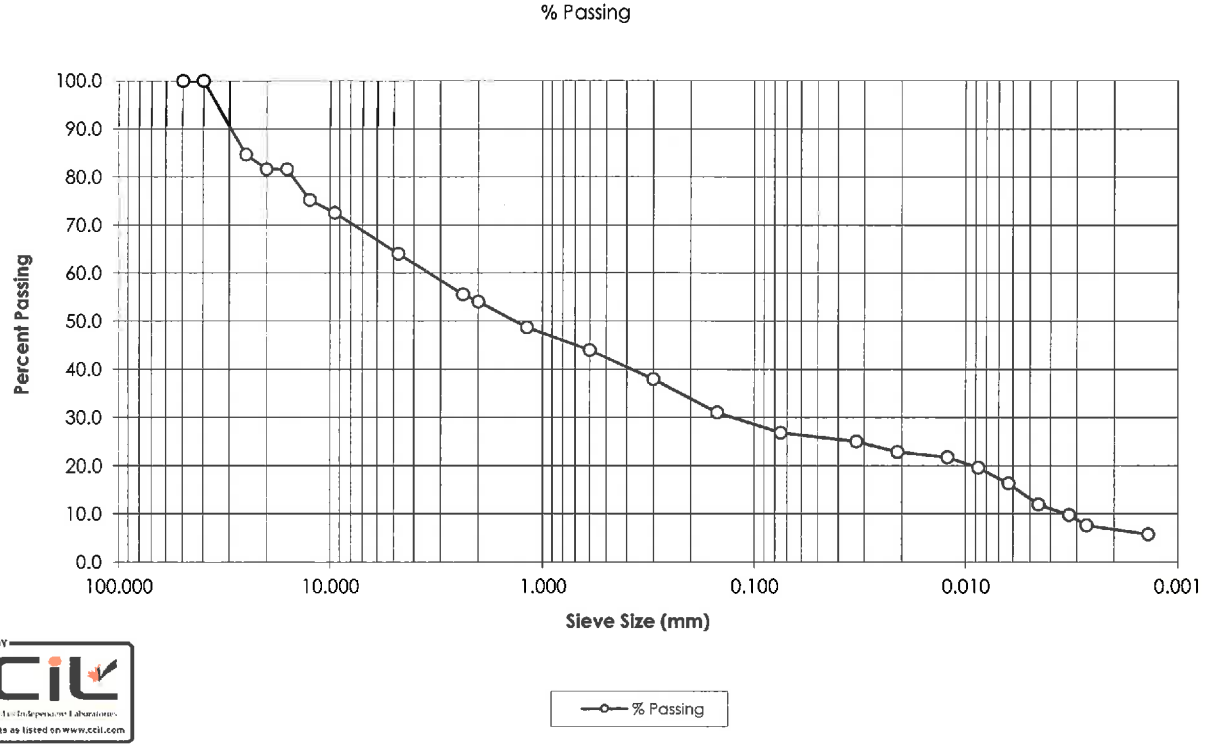
SAMPLE No.: SS7
SOURCE: BH17-29
TESTED BY: JA

DATE TESTED: April 8, 2017
DATE RECEIVED: March 27, 2017
SAMPLE DESCRIPTION: Silty clayey sand with gravel



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Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0063**	**16.3**
40.0	**100.0**	**0.0046**	**12.0**
25.0	**84.6**	**0.0033**	**9.8**
20.0	**81.6**	**0.0027**	**7.6**
16.0	**81.6**	**0.0014**	**5.8**
12.5	**75.2**		
9.5	**72.5**		
4.75	**64.0**		
2.36	**55.5**		
2.00	**54.0**		
1.18	**48.7**		
0.600	**44.0**		
0.300	**38.0**		
0.150	**31.0**		
0.075	**26.8**		
0.0328	**25.0**		
0.0210	**22.8**		
0.0122	**21.7**		
0.0087	**19.6**		

Gravel:	36.0%	D_{10}:	0.0034
Sand:	37.2%	D_{30}:	0.1330
Silt:	20.0%	D_{60}:	3.6661
Clay:	6.8%	C_U:	1074.23
		C_C:	1.41

Comments:

Reviewed by:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

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Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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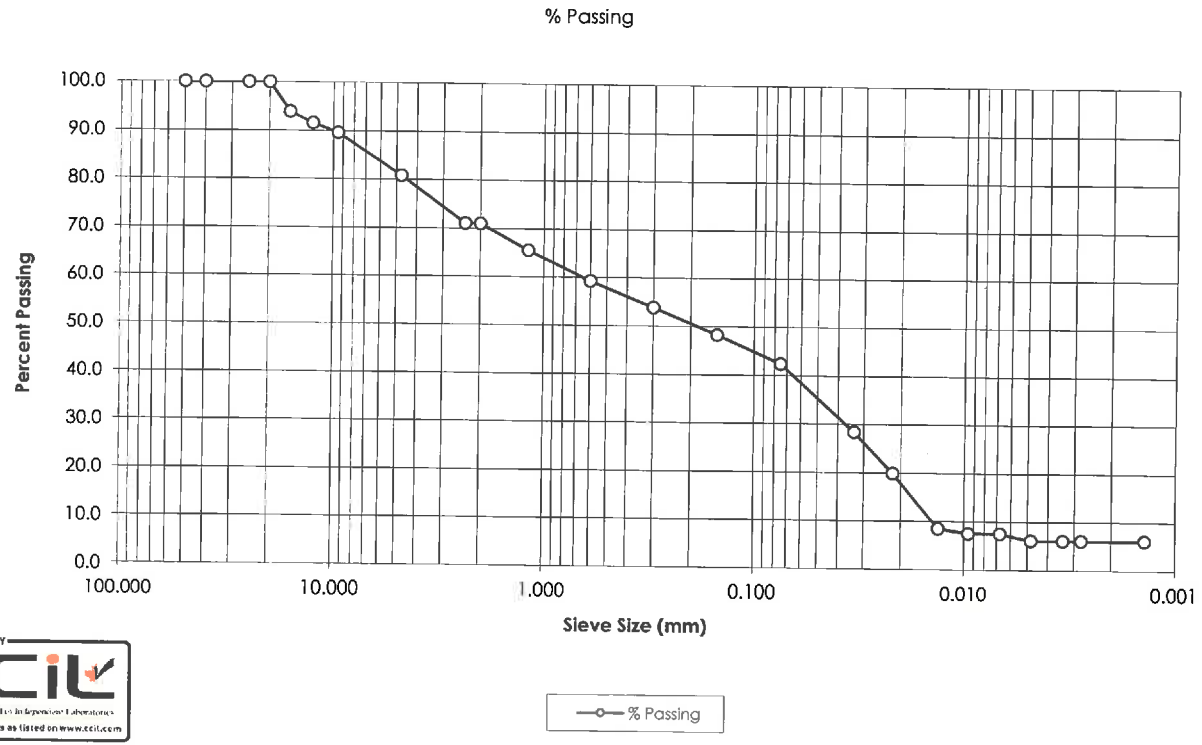
SAMPLE No.: AS5
SOURCE: BH17-30
TESTED BY: JA

DATE TESTED: April 4, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silty sand with gravel



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0068	7.5
40.0	100.0	0.0048	6.1
25.0	100.0	0.0034	6.1
20.0	100.0	0.0028	6.1
16.0	93.9	0.0014	6.1
12.5	91.5		
9.5	89.6		
4.75	80.8		
2.36	71.0		
2.00	71.0		
1.18	65.5		
0.600	59.3		
0.300	53.9		
0.150	48.2		
0.075	42.3		
0.0335	28.4		
0.0219	19.9		
0.0133	8.5		
0.0096	7.5		

Gravel:	19.2%	D_{10}:	0.0149
Sand:	38.5%	D_{30}:	0.0393
Silt:	36.2%	D_{60}:	0.6718
Clay:	6.1%	C_u:	44.95
		C_c:	0.15

Comments:

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Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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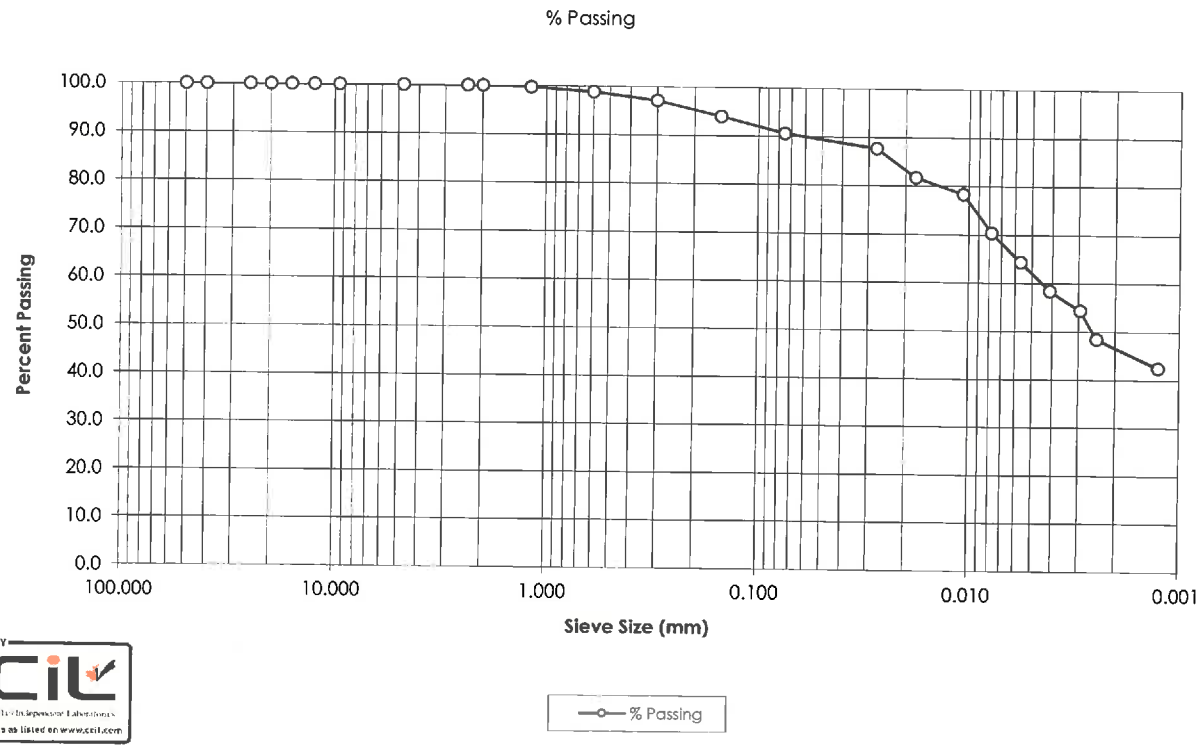
SAMPLE No.: AS1
SOURCE: BH17-34
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0057**	**64.4**
40.0	**100.0**	**0.0041**	**58.4**
25.0	**100.0**	**0.0029**	**54.4**
20.0	**100.0**	**0.0025**	**48.4**
16.0	**100.0**	**0.0013**	**42.4**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**99.7**		
0.600	**98.9**		
0.300	**97.2**		
0.150	**94.0**		
0.075	**90.6**		
0.0275	**87.7**		
0.0179	**81.7**		
0.0107	**78.3**		
0.0078	**70.3**		

Gravel:	0.0%	D_{10}:	-
Sand:	9.4%	D_{30}:	-
Silt:	44.0%	D_{60}:	0.0045
Clay:	46.6%	C_u:	-
		C_c:	-

Comments:

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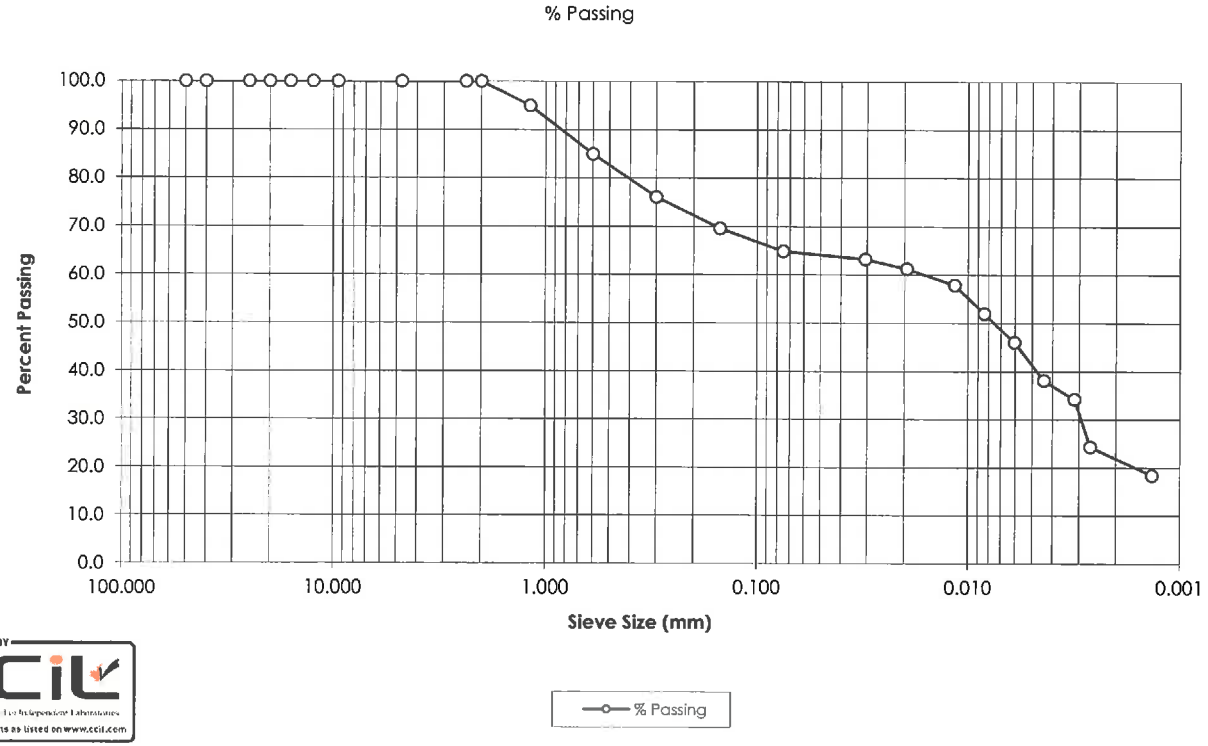
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-35
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**46.0**
40.0	**100.0**	**0.0044**	**38.1**
25.0	**100.0**	**0.0032**	**34.2**
20.0	**100.0**	**0.0027**	**24.3**
16.0	**100.0**	**0.0014**	**18.4**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**95.0**		
0.600	**84.9**		
0.300	**76.1**		
0.150	**69.6**		
0.075	**64.9**		
0.0306	**63.2**		
0.0195	**61.3**		
0.0116	**57.9**		
0.0084	**52.0**		

Gravel:	0.0%	D_{10}:	-
Sand:	35.1%	D_{30}:	0.0030
Silt:	43.1%	D_{60}:	0.0166
Clay:	21.8%	C_u:	-
		C_c:	-

Comments:

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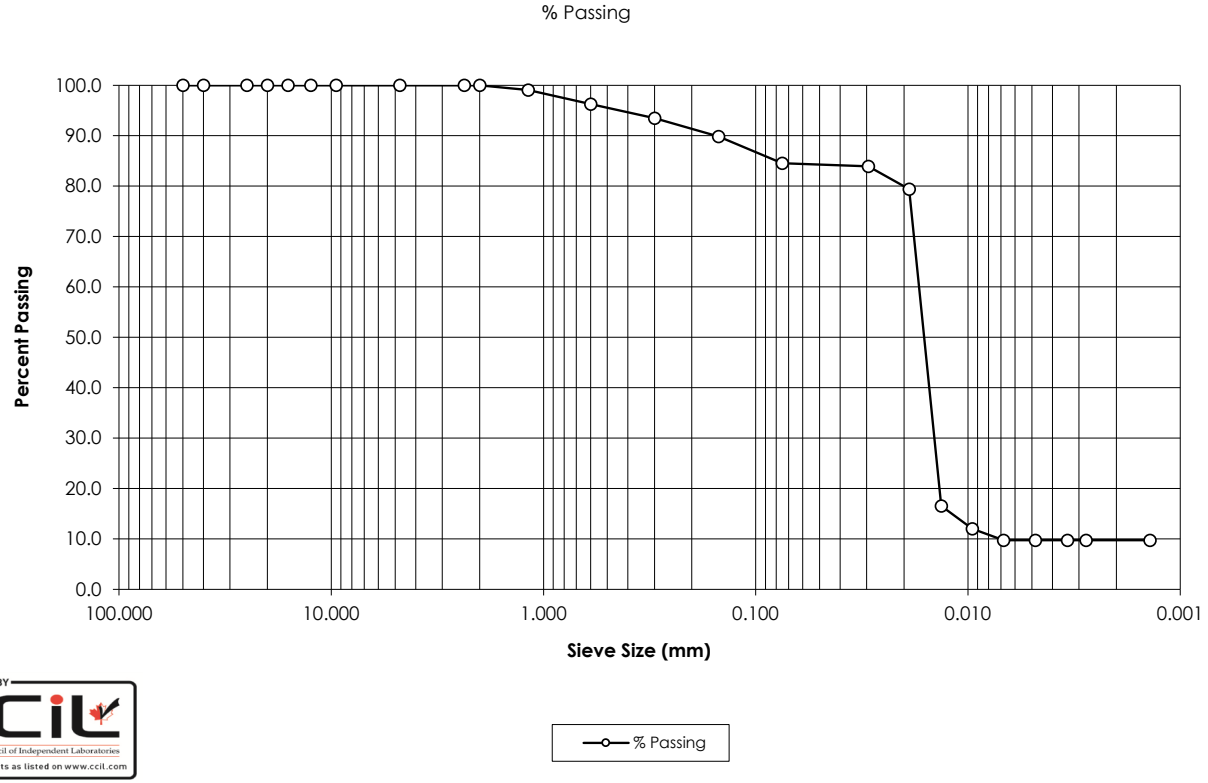
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-35
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Gravelly silt with sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0068**	**9.8**
40.0	**100.0**	**0.0048**	**9.8**
25.0	**100.0**	**0.0034**	**9.8**
20.0	**100.0**	**0.0028**	**9.8**
16.0	**100.0**	**0.0014**	**9.8**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**99.1**		
0.600	**96.3**		
0.300	**93.5**		
0.150	**89.9**		
0.075	**84.6**		
0.0294	**83.9**		
0.0189	**79.4**		
0.0134	**16.6**		
0.0096	**12.0**		

Gravel:	0.0%	D_{10}:	0.0071
Sand:	15.4%	D_{30}:	0.0155
Silt:	74.8%	D_{60}:	0.0179
Clay:	9.8%	C_U:	2.51
		C_c:	1.87

Comments:

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Grain Size Analysis
ASTM C136, ASTM C117

Client: Tlicho Engineering & Environtmental Services Lt
Project Name: Tlicho All Season Road
Project No: 144902448

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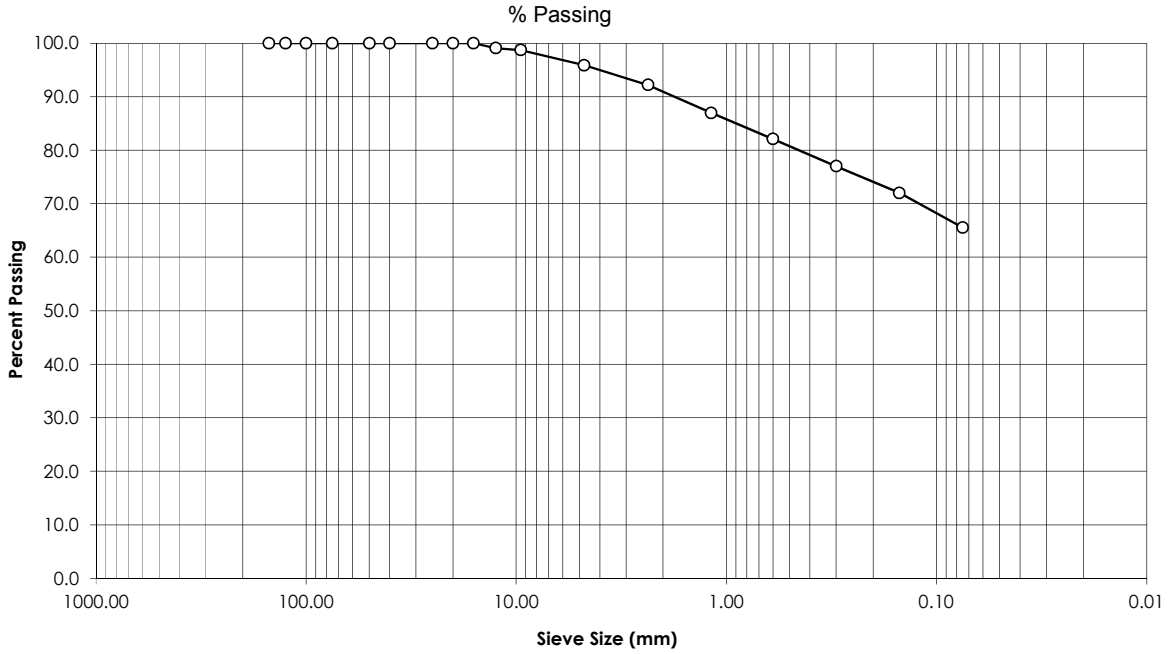
Tel: (780) 917-7463

SAMPLE No.: AS1&AS3
SOURCE: BH17-36
TESTED BY: NN

DATE RECEIVED: March 27, 2017
DATE TESTED: April 28, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	100.0	-	-
125.0	100.0	-	-
100.0	100.0	-	-
75.0	100.0	-	-
50.0	100.0	-	-
40.0	100.0	-	-
25.0	100.0	-	-
20.0	100.0	-	-
16.0	100.0	-	-
12.5	99.1	-	-
9.5	98.7	-	-
4.75	95.9	-	-
2.36	92.2	-	-
1.18	87.0	-	-
0.600	82.1	-	-
0.300	77.0	-	-
0.150	72.0	-	-
0.075	65.5	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	4.1%	D_{30}:	-
Sand:	30.3%	D_{60}:	-
Fines:	65.6%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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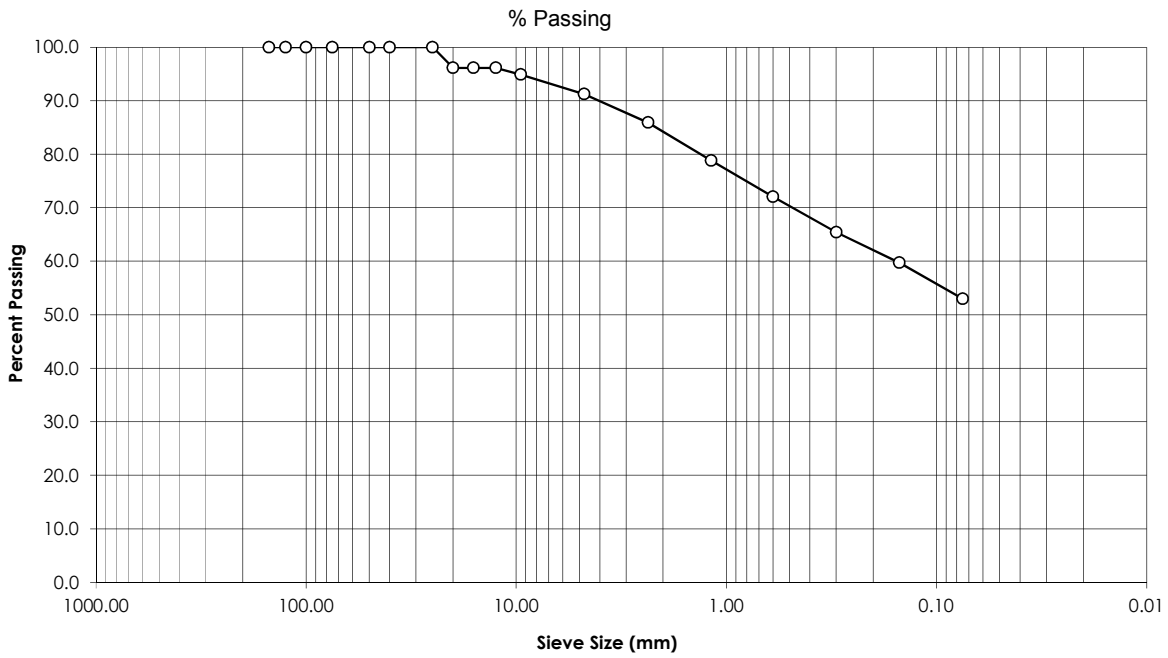
SAMPLE No.: SS2
SOURCE: BH17-36
TESTED BY: RP

DATE RECEIVED: March 27, 2017
DATE TESTED: April 20, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**96.1**	-	-
16.0	**96.1**	-	-
12.5	**96.1**	-	-
9.5	**94.9**	-	-
4.75	**91.2**	-	-
2.36	**85.9**	-	-
1.18	**78.8**	-	-
0.600	**72.1**	-	-
0.300	**65.4**	-	-
0.150	**59.7**	-	-
0.075	**53.0**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	8.8%	D_{30}:	-
Sand:	38.2%	D_{60}:	0.1575
Fines:	53.0%	C_U:	-
		C_C:	-

Comments:

Reviewed by:

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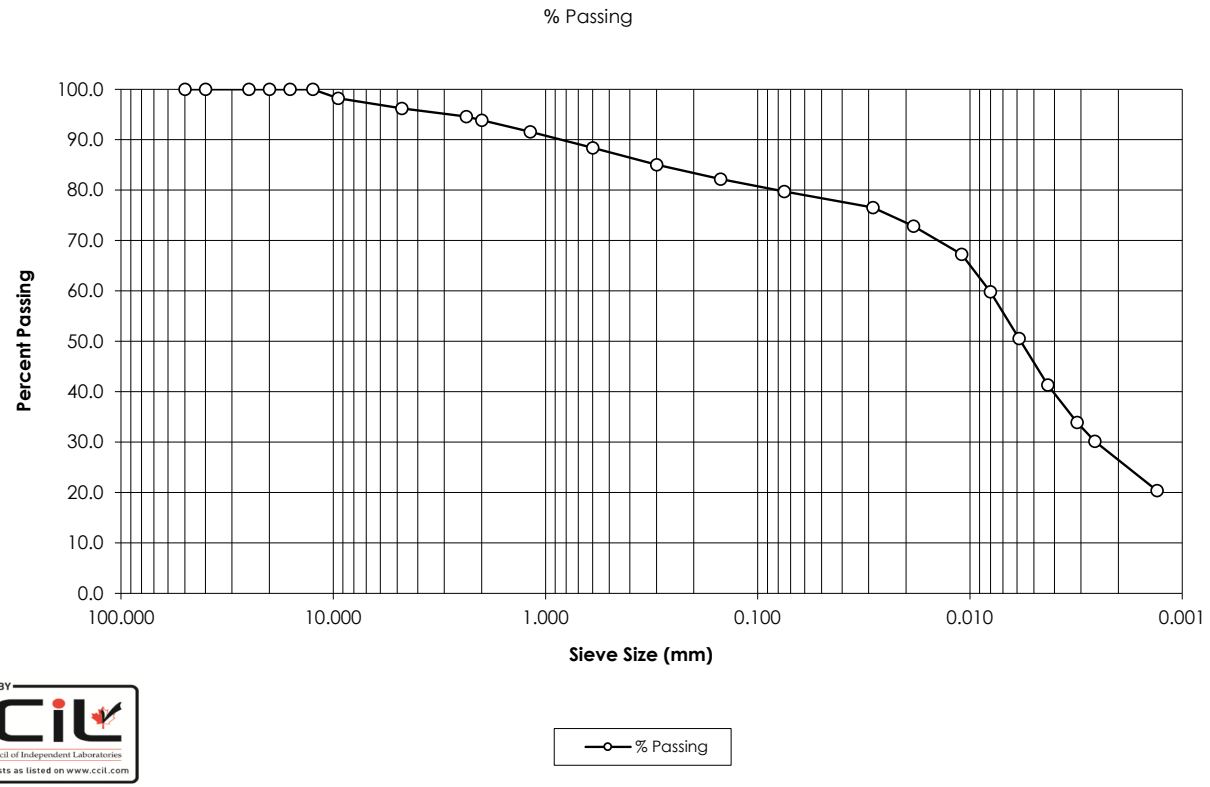
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-36
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: April 4, 2017
SAMPLE DESCRIPTION: Lean clay with sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0059**	**50.6**
40.0	**100.0**	**0.0043**	**41.3**
25.0	**100.0**	**0.0031**	**33.9**
20.0	**100.0**	**0.0026**	**30.2**
16.0	**100.0**	**0.0013**	**20.4**
12.5	**100.0**		
9.5	**98.2**		
4.75	**96.3**		
2.36	**94.6**		
2.00	**93.9**		
1.18	**91.6**		
0.600	**88.4**		
0.300	**85.0**		
0.150	**82.2**		
0.075	**79.7**		
0.0287	**76.6**		
0.0185	**72.8**		
0.0109	**67.3**		
0.0080	**59.9**		

Gravel:	3.7%	D_{10}:	-
Sand:	16.5%	D_{30}:	0.0026
Silt:	53.3%	D_{60}:	0.0081
Clay:	26.5%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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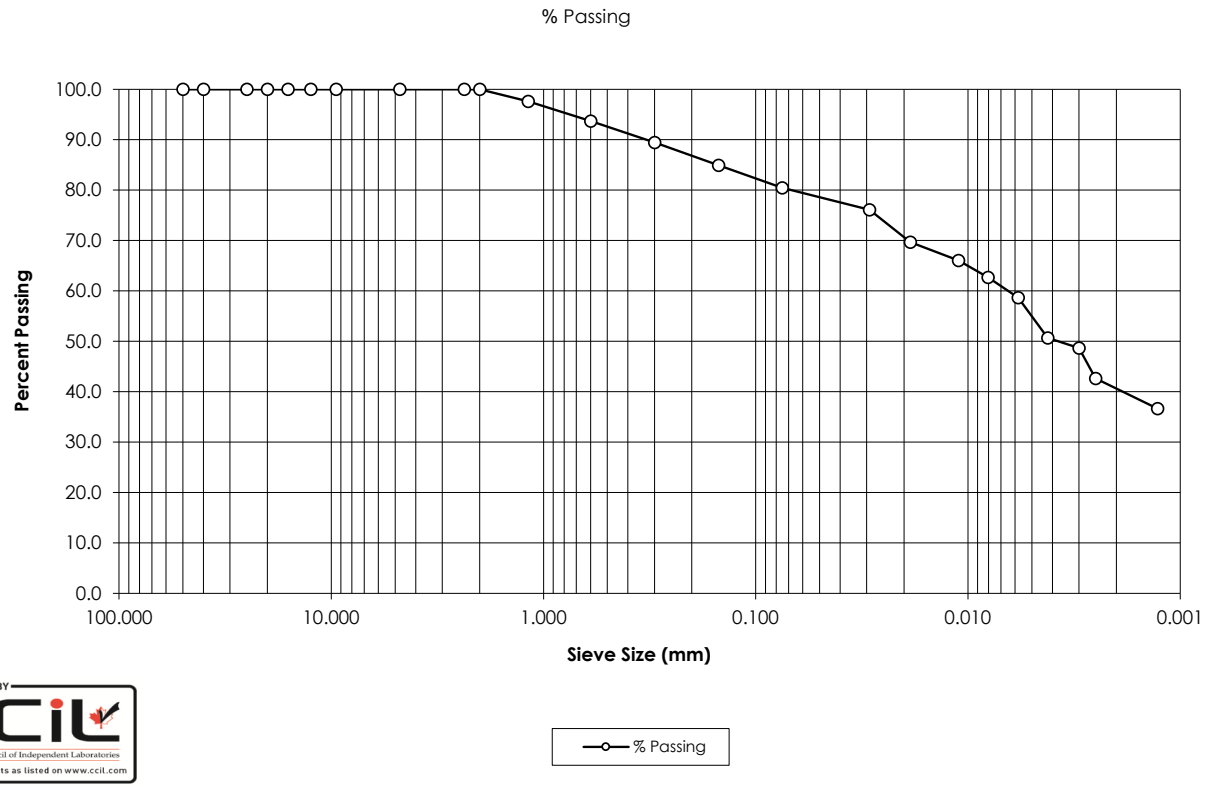
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: SS2
SOURCE: BH17-37
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Lean clay with sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0058**	**58.7**
40.0	**100.0**	**0.0042**	**50.7**
25.0	**100.0**	**0.0030**	**48.7**
20.0	**100.0**	**0.0025**	**42.7**
16.0	**100.0**	**0.0013**	**36.6**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**97.6**		
0.600	**93.7**		
0.300	**89.5**		
0.150	**84.9**		
0.075	**80.5**		
0.0291	**76.1**		
0.0187	**69.7**		
0.0111	**66.1**		
0.0081	**62.7**		

Gravel:	0.0%	D_{10}:	-
Sand:	19.5%	D_{30}:	-
Silt:	39.8%	D_{60}:	0.0066
Clay:	40.7%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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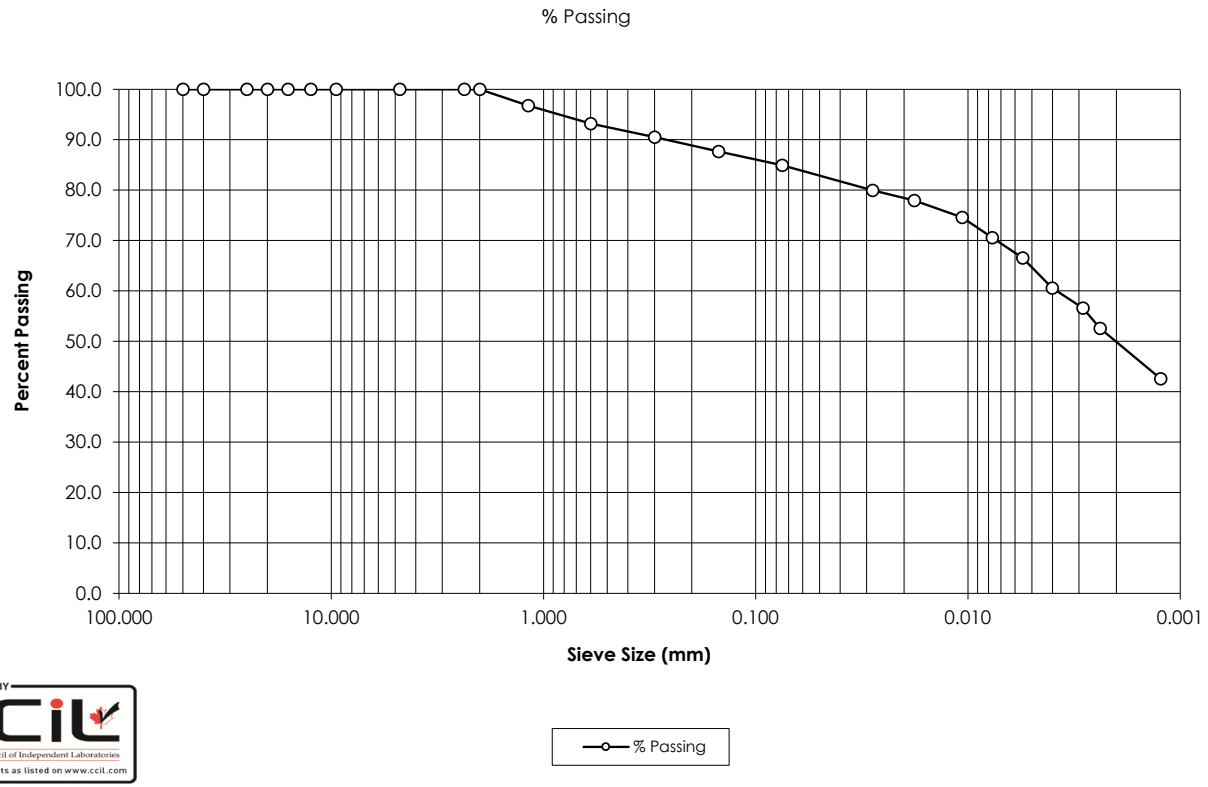
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-37
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silt and/or clay with sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0055**	**66.6**
40.0	**100.0**	**0.0040**	**60.6**
25.0	**100.0**	**0.0029**	**56.6**
20.0	**100.0**	**0.0024**	**52.6**
16.0	**100.0**	**0.0012**	**42.6**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**96.8**		
0.600	**93.2**		
0.300	**90.5**		
0.150	**87.7**		
0.075	**85.0**		
0.0282	**80.0**		
0.0179	**78.0**		
0.0107	**74.6**		
0.0077	**70.6**		

Gravel:	0.0%	D_{10}:	-
Sand:	15.0%	D_{30}:	-
Silt:	35.1%	D_{60}:	0.0038
Clay:	49.9%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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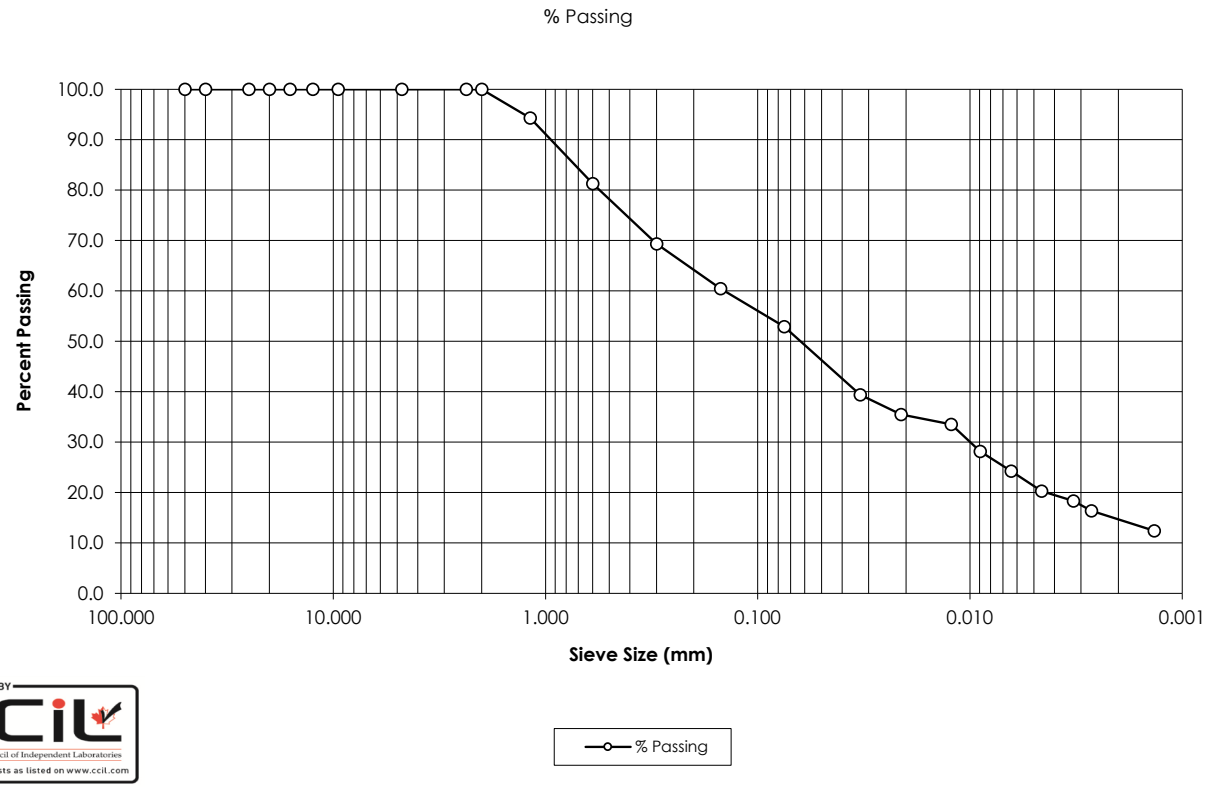
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS3
SOURCE: BH17-40
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**24.2**
40.0	**100.0**	**0.0046**	**20.3**
25.0	**100.0**	**0.0033**	**18.3**
20.0	**100.0**	**0.0027**	**16.4**
16.0	**100.0**	**0.0014**	**12.4**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**94.3**		
0.600	**81.3**		
0.300	**69.4**		
0.150	**60.5**		
0.075	**52.9**		
0.0329	**39.4**		
0.0212	**35.5**		
0.0123	**33.5**		
0.0090	**28.2**		

Gravel:	0.0%	D_{10}:	-
Sand:	47.1%	D_{30}:	0.0101
Silt:	38.3%	D_{60}:	0.1454
Clay:	14.6%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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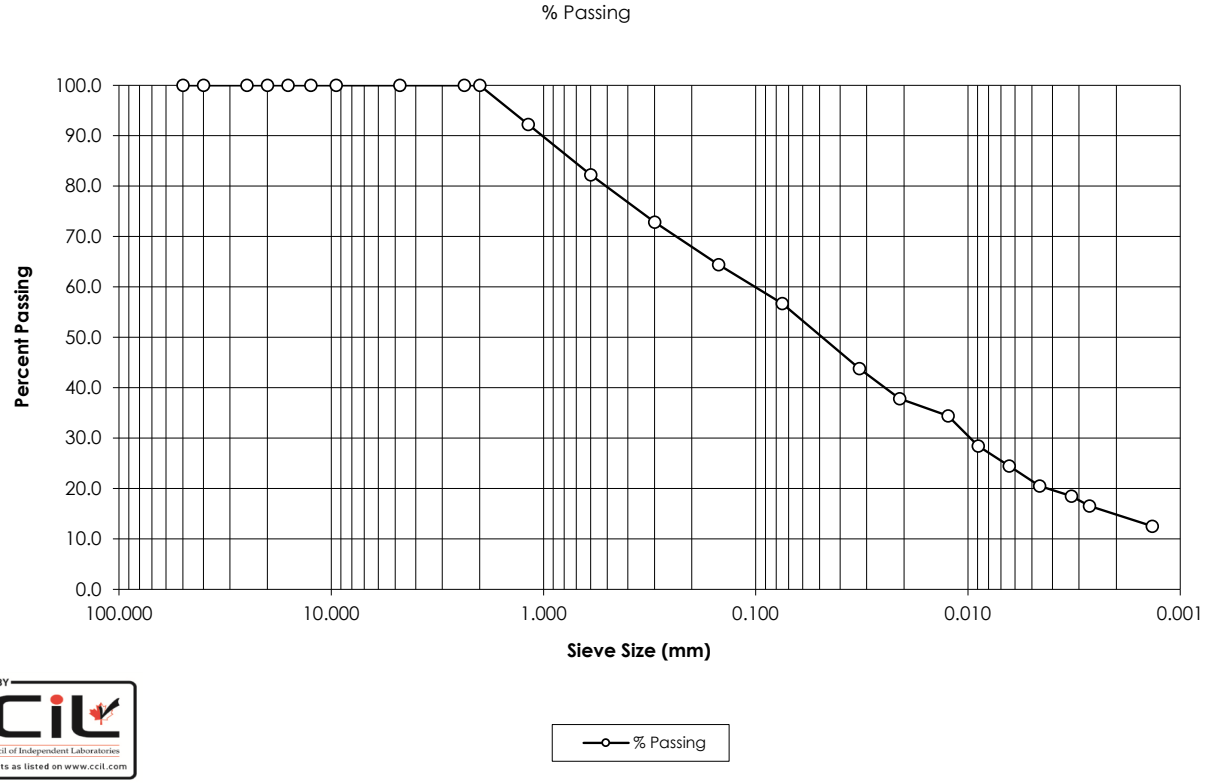
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: SS4
SOURCE: BH17-40
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**24.5**
40.0	**100.0**	**0.0046**	**20.5**
25.0	**100.0**	**0.0033**	**18.5**
20.0	**100.0**	**0.0027**	**16.5**
16.0	**100.0**	**0.0014**	**12.5**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**92.3**		
0.600	**82.3**		
0.300	**72.9**		
0.150	**64.4**		
0.075	**56.7**		
0.0325	**43.8**		
0.0210	**37.8**		
0.0124	**34.5**		
0.0090	**28.5**		

Gravel:	0.0%	D_{10}:	-
Sand:	43.3%	D_{30}:	0.0099
Silt:	41.9%	D_{60}:	0.1080
Clay:	14.8%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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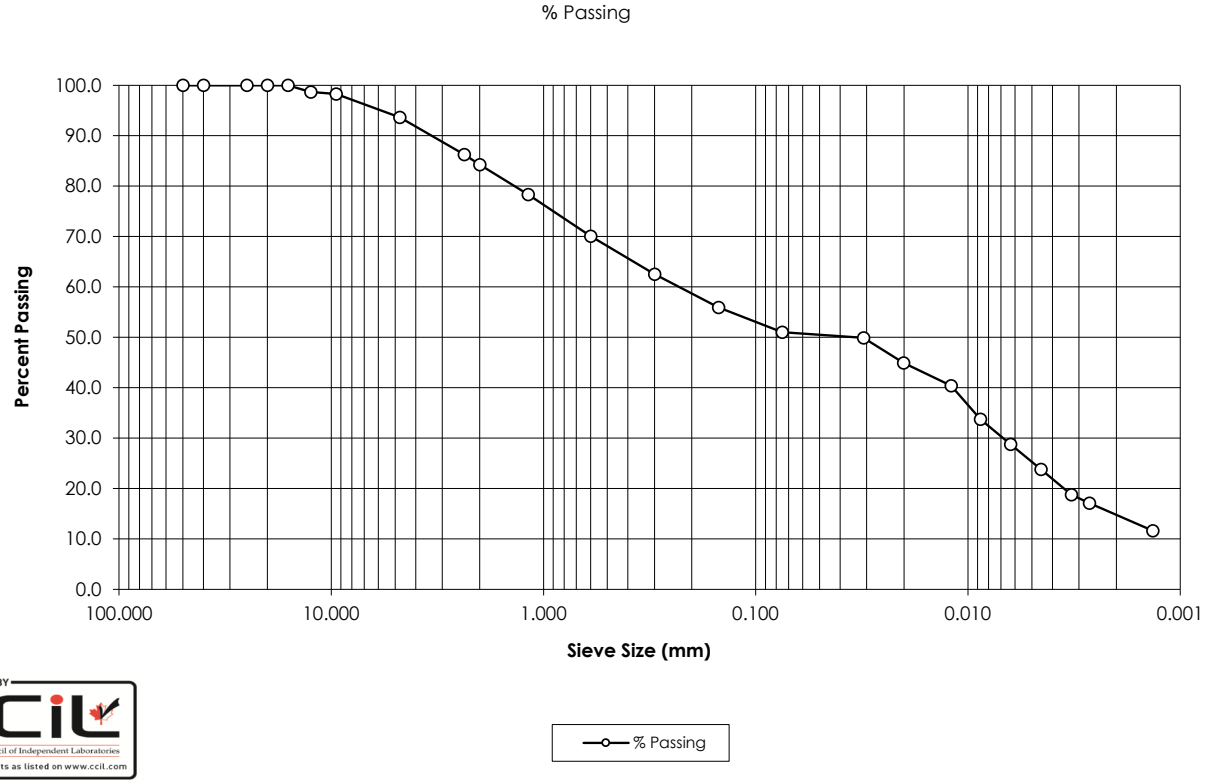
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS3
SOURCE: BH17-41
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: April 4, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0063**	**28.8**
40.0	**100.0**	**0.0045**	**23.8**
25.0	**100.0**	**0.0033**	**18.8**
20.0	**100.0**	**0.0027**	**17.1**
16.0	**100.0**	**0.0013**	**11.6**
12.5	**98.7**		
9.5	**98.3**		
4.75	**93.7**		
2.36	**86.3**		
2.00	**84.2**		
1.18	**78.3**		
0.600	**70.1**		
0.300	**62.5**		
0.150	**55.9**		
0.075	**51.0**		
0.0311	**49.9**		
0.0201	**44.9**		
0.0120	**40.4**		
0.0088	**33.8**		

Gravel:	6.3%	D_{10}:	-
Sand:	42.7%	D_{30}:	0.0069
Silt:	36.2%	D_{60}:	0.2444
Clay:	14.8%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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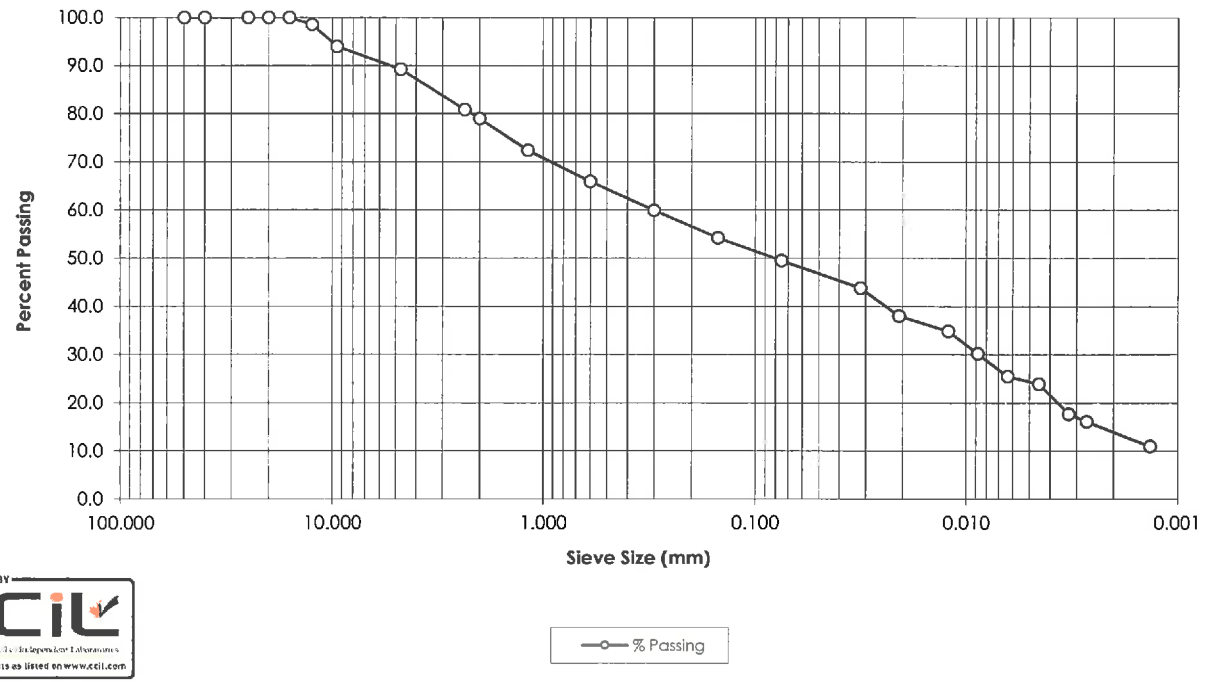
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-43
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: April 4, 2017
SAMPLE DESCRIPTION: Clayey sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0063**	**25.5**
40.0	**100.0**	**0.0045**	**23.9**
25.0	**100.0**	**0.0033**	**17.7**
20.0	**100.0**	**0.0027**	**16.1**
16.0	**100.0**	**0.0013**	**10.9**
12.5	**98.6**		
9.5	**94.0**		
4.75	**89.2**		
2.36	**80.8**		
2.00	**79.0**		
1.18	**72.4**		
0.600	**65.9**		
0.300	**59.9**		
0.150	**54.2**		
0.075	**49.5**		
0.0317	**43.8**		
0.0208	**38.0**		
0.0122	**34.9**		
0.0088	**30.2**		

Gravel:	10.8%	D_{10}:	-
Sand:	39.7%	D_{30}:	0.0087
Silt:	35.6%	D_{60}:	0.3057
Clay:	13.9%	C_u:	-
		C_c:	-

Comments: Sample description (USCS) derived from the Grain Size analysis and Atterberg limit test results.

Reviewed by:

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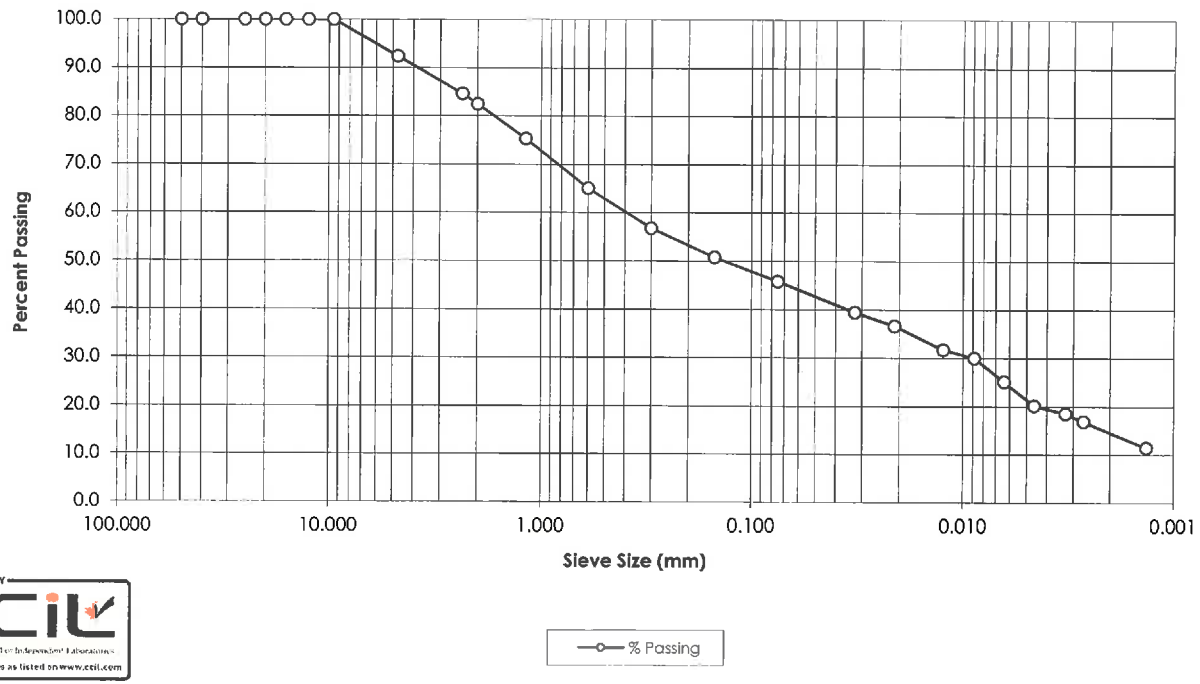
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-44
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: April 4, 2017
SAMPLE DESCRIPTION: Silty clayey sand



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For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	100.0	0.0064	25.1
40.0	100.0	0.0046	20.2
25.0	100.0	0.0033	18.5
20.0	100.0	0.0027	16.9
16.0	100.0	0.0013	11.5
12.5	100.0		
9.5	100.0		
4.75	92.4		
2.36	84.6		
2.00	82.5		
1.18	75.3		
0.600	65.0		
0.300	56.8		
0.150	50.8		
0.075	45.8		
0.0325	39.4		
0.0211	36.6		
0.0124	31.7		
0.0089	30.0		

Gravel:	7.6%	D_{10}:	-
Sand:	46.5%	D_{30}:	0.0088
Silt:	31.2%	D_{60}:	0.4217
Clay:	14.7%	C_u:	-
		C_c:	-

Comments:

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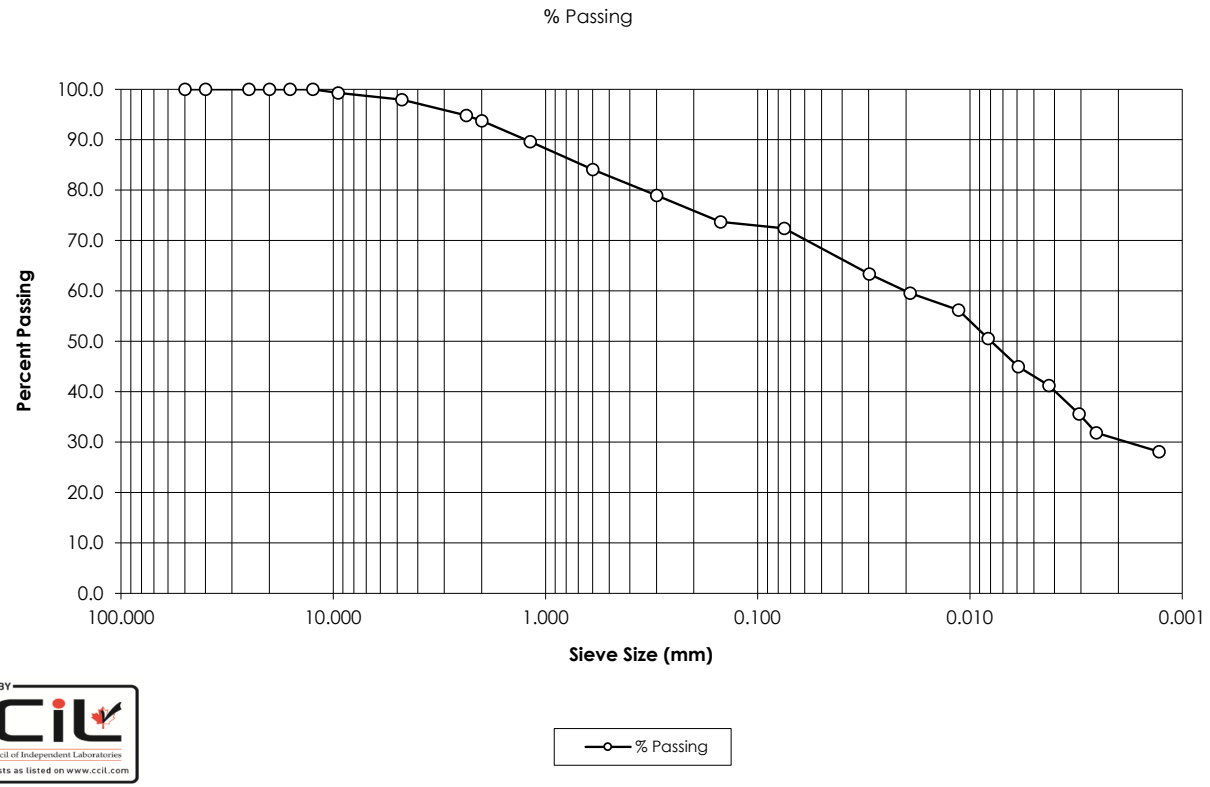
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-44
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Lean clay with sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0059**	**45.0**
40.0	**100.0**	**0.0043**	**41.2**
25.0	**100.0**	**0.0031**	**35.6**
20.0	**100.0**	**0.0025**	**31.9**
16.0	**100.0**	**0.0013**	**28.1**
12.5	**100.0**		
9.5	**99.3**		
4.75	**98.0**		
2.36	**94.8**		
2.00	**93.8**		
1.18	**89.6**		
0.600	**84.1**		
0.300	**79.0**		
0.150	**73.7**		
0.075	**72.4**		
0.0298	**63.3**		
0.0192	**59.6**		
0.0114	**56.2**		
0.0082	**50.6**		

Gravel:	2.0%	D_{10}:	-
Sand:	25.5%	D_{30}:	0.0019
Silt:	41.9%	D_{60}:	0.0203
Clay:	30.6%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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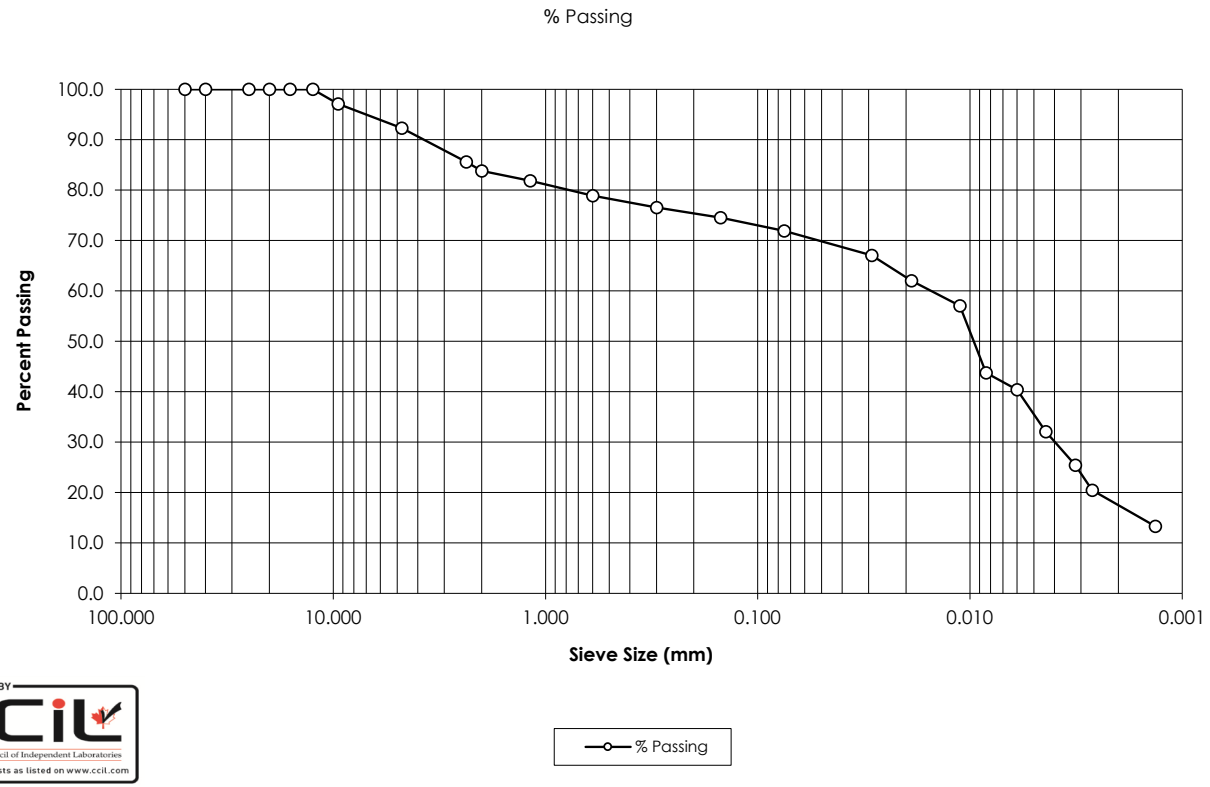
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: SS10
SOURCE: BH17-44
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: April 4, 2017
SAMPLE DESCRIPTION: Lean clay with sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0060**	**40.4**
40.0	**100.0**	**0.0044**	**32.1**
25.0	**100.0**	**0.0032**	**25.5**
20.0	**100.0**	**0.0027**	**20.5**
16.0	**100.0**	**0.0013**	**13.3**
12.5	**100.0**		
9.5	**97.1**		
4.75	**92.3**		
2.36	**85.6**		
2.00	**83.8**		
1.18	**81.9**		
0.600	**78.9**		
0.300	**76.5**		
0.150	**74.6**		
0.075	**71.9**		
0.0290	**67.0**		
0.0189	**62.1**		
0.0112	**57.1**		
0.0084	**43.8**		

Gravel:	7.7%	D_{10}:	-
Sand:	20.4%	D_{30}:	0.0040
Silt:	54.4%	D_{60}:	0.0158
Clay:	17.5%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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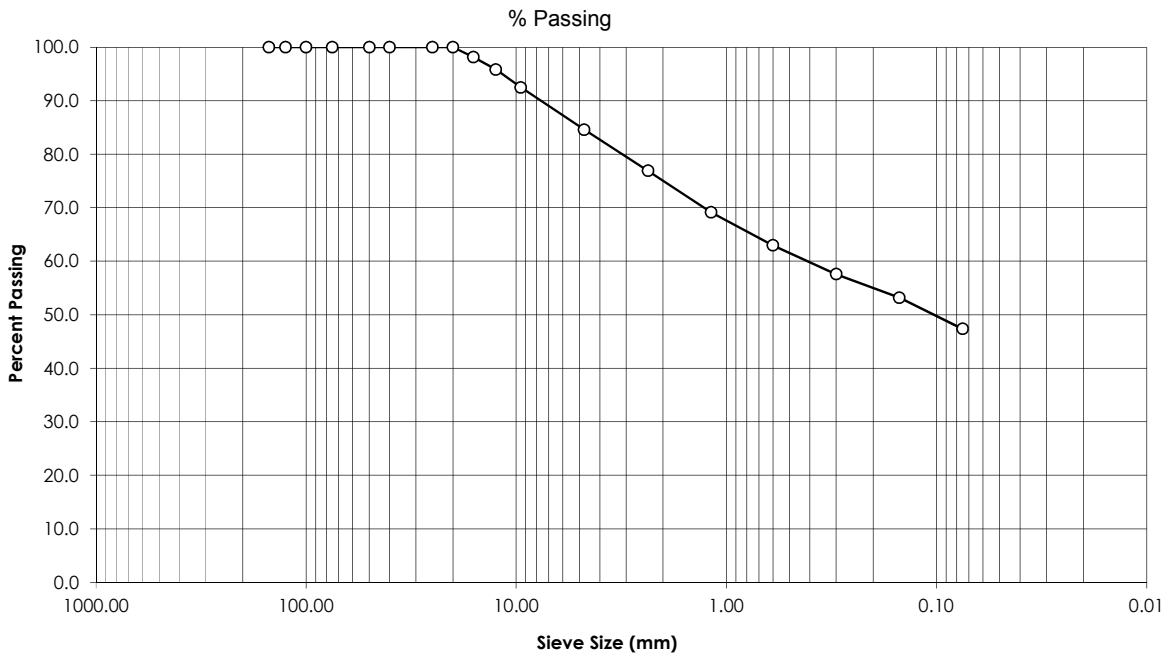
SAMPLE No.: AS1
SOURCE: BH17-45
TESTED BY: RP

DATE RECEIVED: March 27, 2017
DATE TESTED: April 20, 2017
SAMPLE DESCRIPTION: Silty and/or clayey sand with gravel



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**98.1**	-	-
12.5	**95.8**	-	-
9.5	**92.5**	-	-
4.75	**84.6**	-	-
2.36	**76.9**	-	-
1.18	**69.1**	-	-
0.600	**62.9**	-	-
0.300	**57.6**	-	-
0.150	**53.2**	-	-
0.075	**47.3**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	15.4%	D_{30}:	-
Sand:	37.2%	D_{60}:	0.4385
Fines:	47.4%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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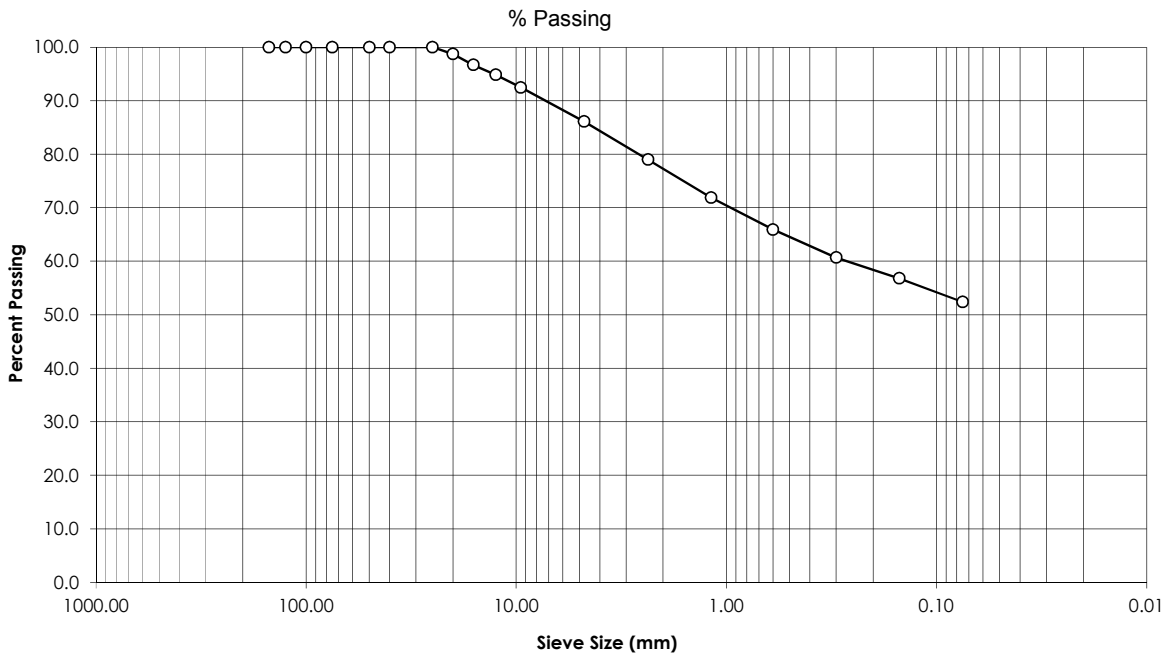
SAMPLE No.: AS5
SOURCE: BH17-45
TESTED BY: NN

DATE RECEIVED: March 27, 2017
DATE TESTED: April 14, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**98.7**	-	-
16.0	**96.7**	-	-
12.5	**94.8**	-	-
9.5	**92.5**	-	-
4.75	**86.1**	-	-
2.36	**79.0**	-	-
1.18	**71.9**	-	-
0.600	**65.9**	-	-
0.300	**60.7**	-	-
0.150	**56.8**	-	-
0.075	**52.4**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	13.9%	D_{30}:	-
Sand:	33.7%	D_{60}:	0.2735
Fines:	52.4%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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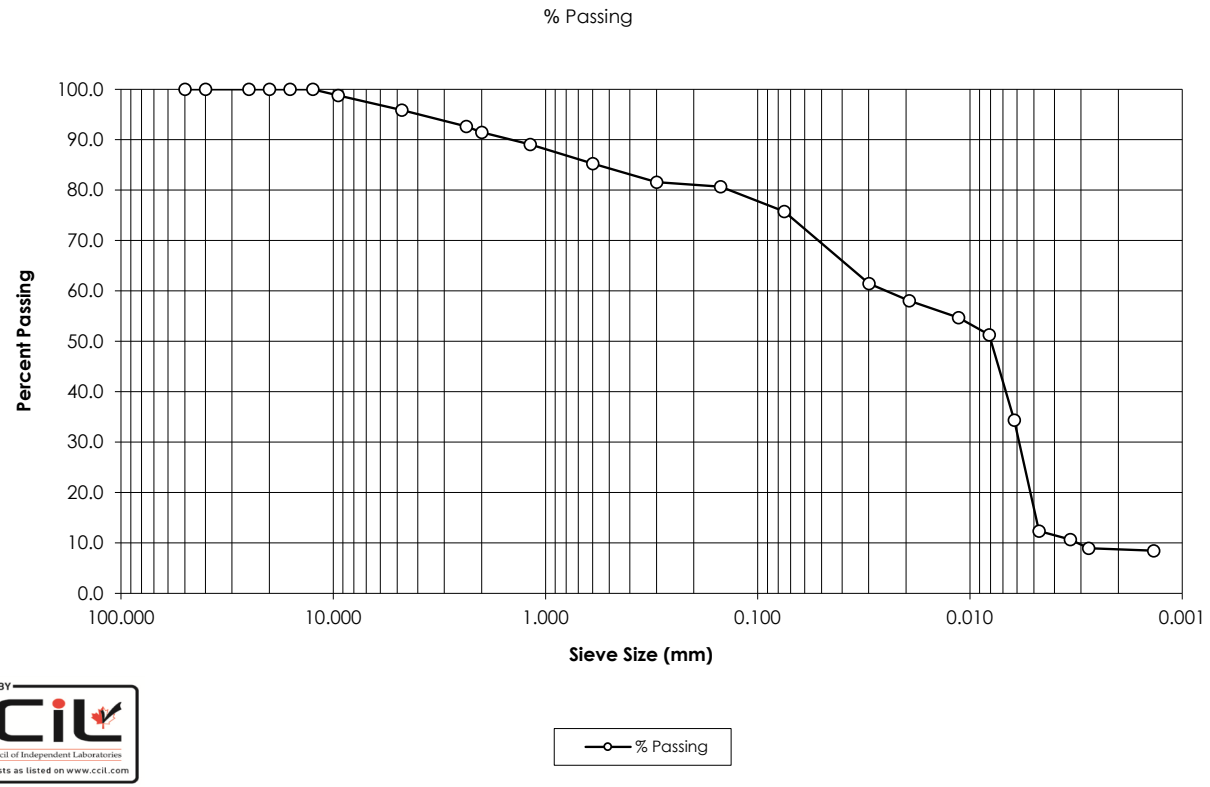
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS3
SOURCE: BH17-46
TESTED BY: JA

DATE TESTED: April 19, 2017
DATE RECEIVED: April 4, 2017
SAMPLE DESCRIPTION: Lean clay with sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0062**	**34.4**
40.0	**100.0**	**0.0047**	**12.4**
25.0	**100.0**	**0.0034**	**10.7**
20.0	**100.0**	**0.0028**	**9.0**
16.0	**100.0**	**0.0014**	**8.5**
12.5	**100.0**		
9.5	**98.8**		
4.75	**95.9**		
2.36	**92.7**		
2.00	**91.5**		
1.18	**89.0**		
0.600	**85.3**		
0.300	**81.6**		
0.150	**80.7**		
0.075	**75.8**		
0.0300	**61.5**		
0.0193	**58.1**		
0.0113	**54.7**		
0.0081	**51.3**		

Gravel:	4.1%	D_{10}:	0.0031
Sand:	20.1%	D_{30}:	0.0060
Silt:	67.0%	D_{60}:	0.0254
Clay:	8.8%	C_u:	8.09
		C_c:	0.45

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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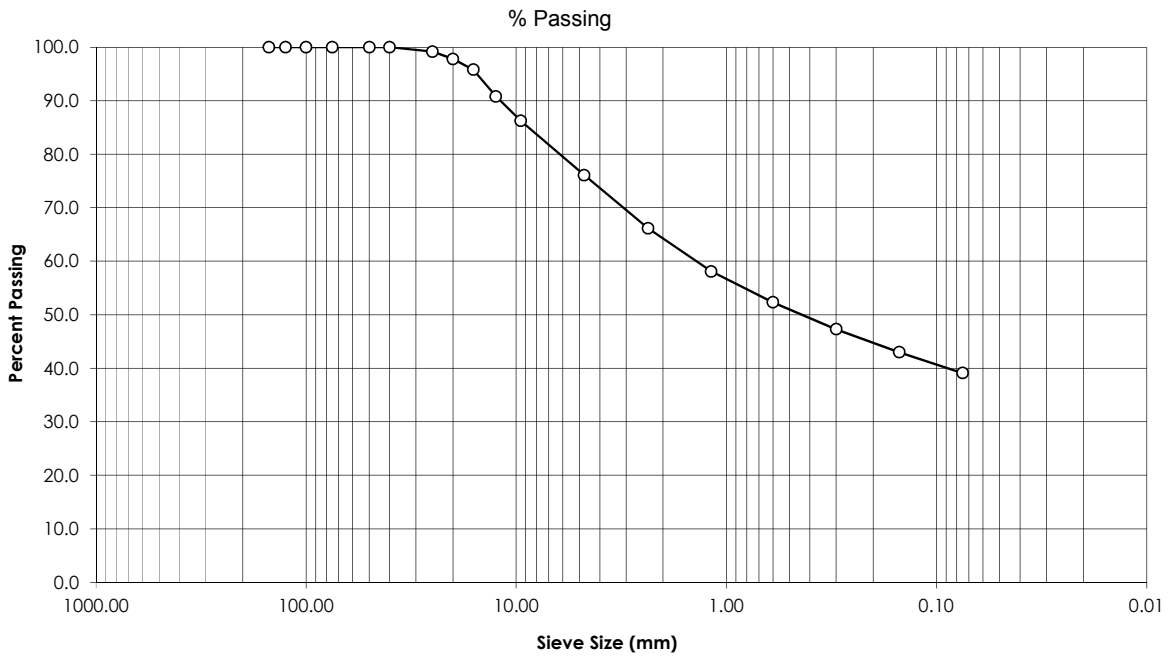
SAMPLE No.: AS7
SOURCE: BH17-46
TESTED BY: RP

DATE RECEIVED: March 27, 2017
DATE TESTED: April 14, 2017
SAMPLE DESCRIPTION: Silty and/or clayey sand with gravel



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**99.2**	-	-
20.0	**97.8**	-	-
16.0	**95.8**	-	-
12.5	**90.8**	-	-
9.5	**86.2**	-	-
4.75	**76.1**	-	-
2.36	**66.2**	-	-
1.18	**58.1**	-	-
0.600	**52.3**	-	-
0.300	**47.3**	-	-
0.150	**43.0**	-	-
0.075	**39.1**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	23.9%	D_{30}:	-
Sand:	37.0%	D_{60}:	1.4723
Fines:	39.1%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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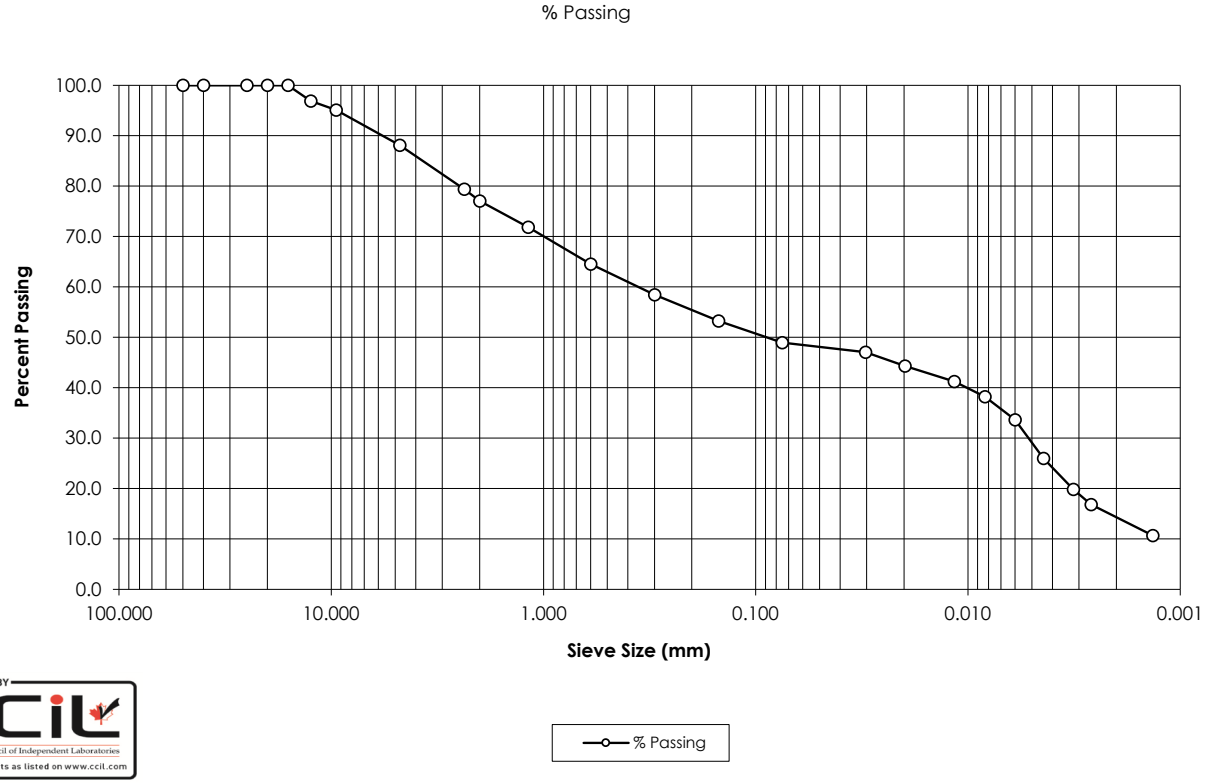
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS9
SOURCE: BH17-46
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Clayey sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0060**	**33.6**
40.0	**100.0**	**0.0044**	**26.0**
25.0	**100.0**	**0.0032**	**19.9**
20.0	**100.0**	**0.0026**	**16.8**
16.0	**100.0**	**0.0013**	**10.7**
12.5	**96.9**		
9.5	**95.1**		
4.75	**88.1**		
2.36	**79.4**		
2.00	**77.1**		
1.18	**71.9**		
0.600	**64.5**		
0.300	**58.5**		
0.150	**53.3**		
0.075	**49.0**		
0.0304	**47.1**		
0.0198	**44.3**		
0.0116	**41.3**		
0.0083	**38.2**		

Gravel:	11.9%	D_{10}:	-
Sand:	39.1%	D_{30}:	0.0053
Silt:	34.7%	D_{60}:	0.3792
Clay:	14.3%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis
Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

OFFICE
10160 - 112 ST
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LABORATORY
10575 106 ST
Edmonton, Alberta
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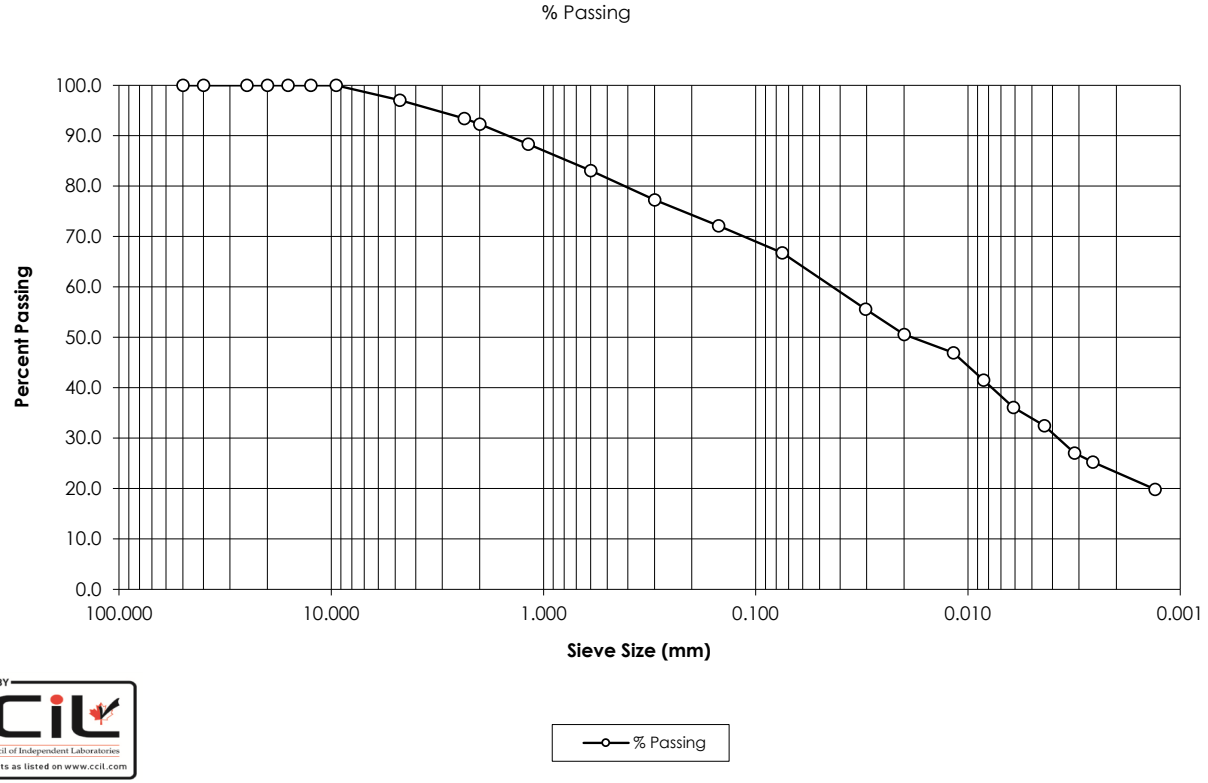
Tel: (780) 917-7463

SAMPLE No.: SS2
SOURCE: BH17-47
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0061**	**36.1**
40.0	**100.0**	**0.0044**	**32.5**
25.0	**100.0**	**0.0032**	**27.1**
20.0	**100.0**	**0.0026**	**25.3**
16.0	**100.0**	**0.0013**	**19.9**
12.5	**100.0**		
9.5	**100.0**		
4.75	**97.1**		
2.36	**93.5**		
2.00	**92.3**		
1.18	**88.4**		
0.600	**83.1**		
0.300	**77.3**		
0.150	**72.2**		
0.075	**66.8**		
0.0304	**55.6**		
0.0200	**50.6**		
0.0117	**46.9**		
0.0085	**41.5**		

Gravel:	2.9%	D_{10}:	-
Sand:	30.3%	D_{30}:	0.0038
Silt:	43.5%	D_{60}:	0.0490
Clay:	23.3%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Stantec

Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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Edmonton, Alberta
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10575 106 ST
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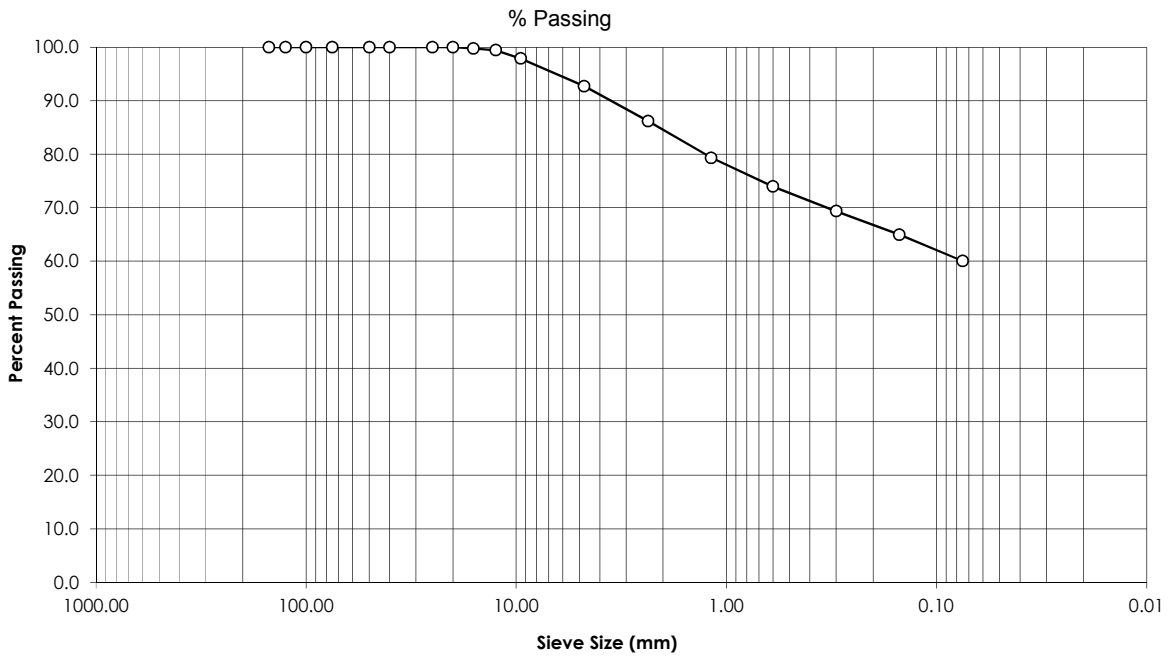
Tel: (780) 917-7463

SAMPLE No.: AS5
SOURCE: BH17-47
TESTED BY: RP

DATE RECEIVED: March 27, 2017
DATE TESTED: April 14, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**99.8**	-	-
12.5	**99.4**	-	-
9.5	**97.9**	-	-
4.75	**92.7**	-	-
2.36	**86.2**	-	-
1.18	**79.3**	-	-
0.600	**74.0**	-	-
0.300	**69.4**	-	-
0.150	**65.0**	-	-
0.075	**60.0**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	7.3%	D_{30}:	-
Sand:	32.7%	D_{60}:	-
Fines:	60.0%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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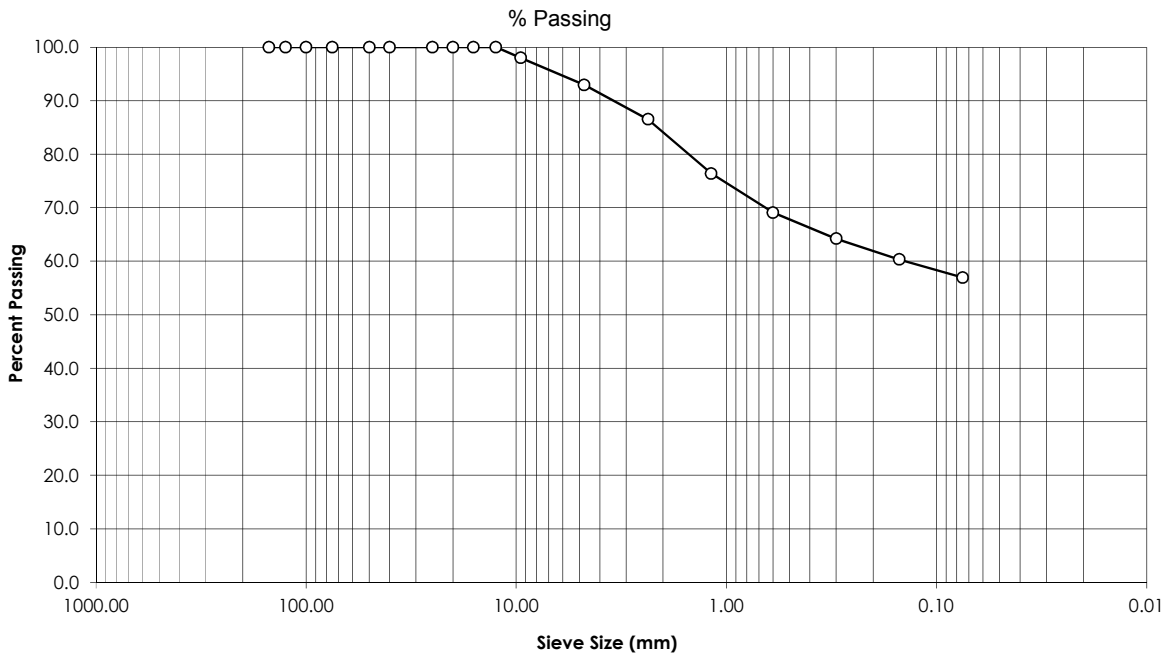
Tel: (780) 917-7463

SAMPLE No.: SS2
SOURCE: BH17-48
TESTED BY: RP

DATE RECEIVED: March 27, 2017
DATE TESTED: April 14, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**98.0**	-	-
4.75	**93.0**	-	-
2.36	**86.5**	-	-
1.18	**76.4**	-	-
0.600	**69.1**	-	-
0.300	**64.2**	-	-
0.150	**60.3**	-	-
0.075	**57.0**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	7.0%	D_{30}:	-
Sand:	36.0%	D_{60}:	0.1430
Fines:	57.0%	C_U:	-
		C_c:	-

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Comments:

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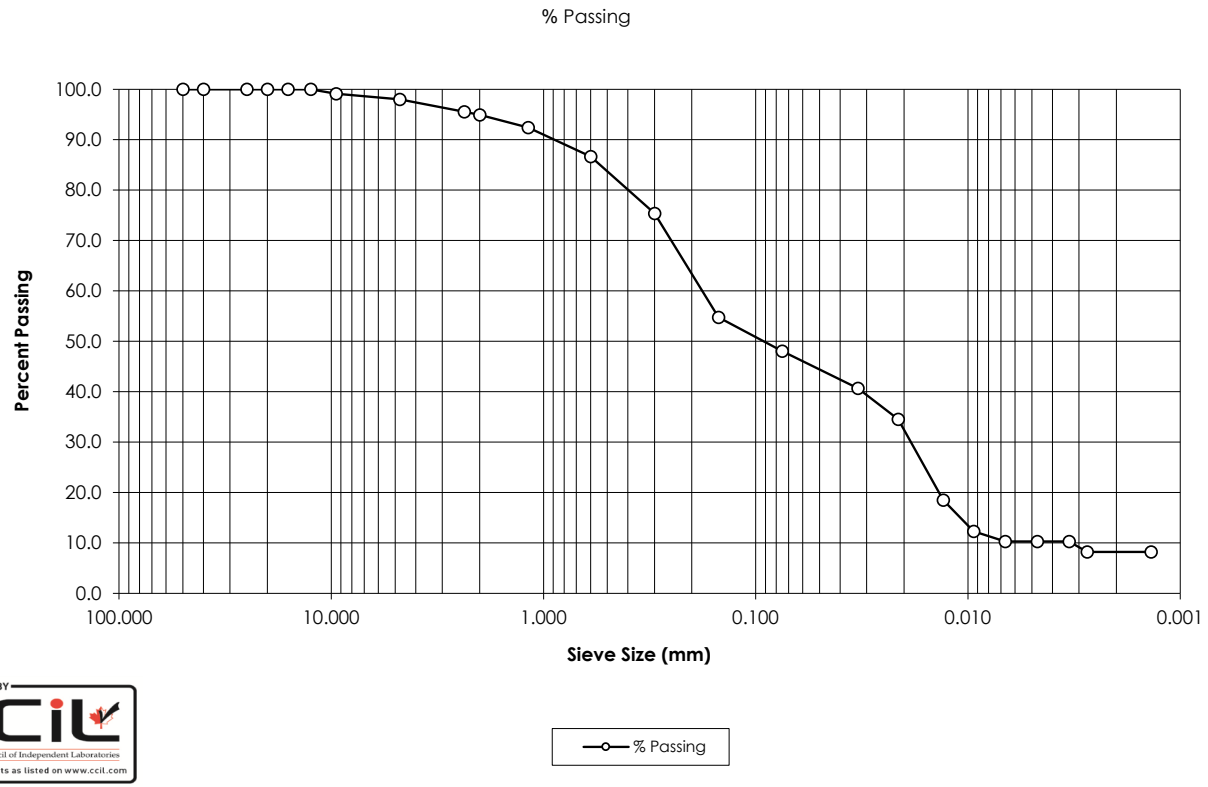
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-48
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Clayey sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0067**	**10.3**
40.0	**100.0**	**0.0047**	**10.3**
25.0	**100.0**	**0.0033**	**10.3**
20.0	**100.0**	**0.0027**	**8.2**
16.0	**100.0**	**0.0014**	**8.2**
12.5	**100.0**		
9.5	**99.1**		
4.75	**98.0**		
2.36	**95.6**		
2.00	**94.9**		
1.18	**92.4**		
0.600	**86.7**		
0.300	**75.4**		
0.150	**54.7**		
0.075	**48.1**		
0.0331	**40.7**		
0.0213	**34.5**		
0.0131	**18.5**		
0.0094	**12.3**		

Gravel:	2.0%	D_{10}:	0.0033
Sand:	49.9%	D_{30}:	0.0195
Silt:	39.8%	D_{60}:	0.1930
Clay:	8.3%	C_u:	59.10
		C_c:	0.60

Comments:

Reviewed by:

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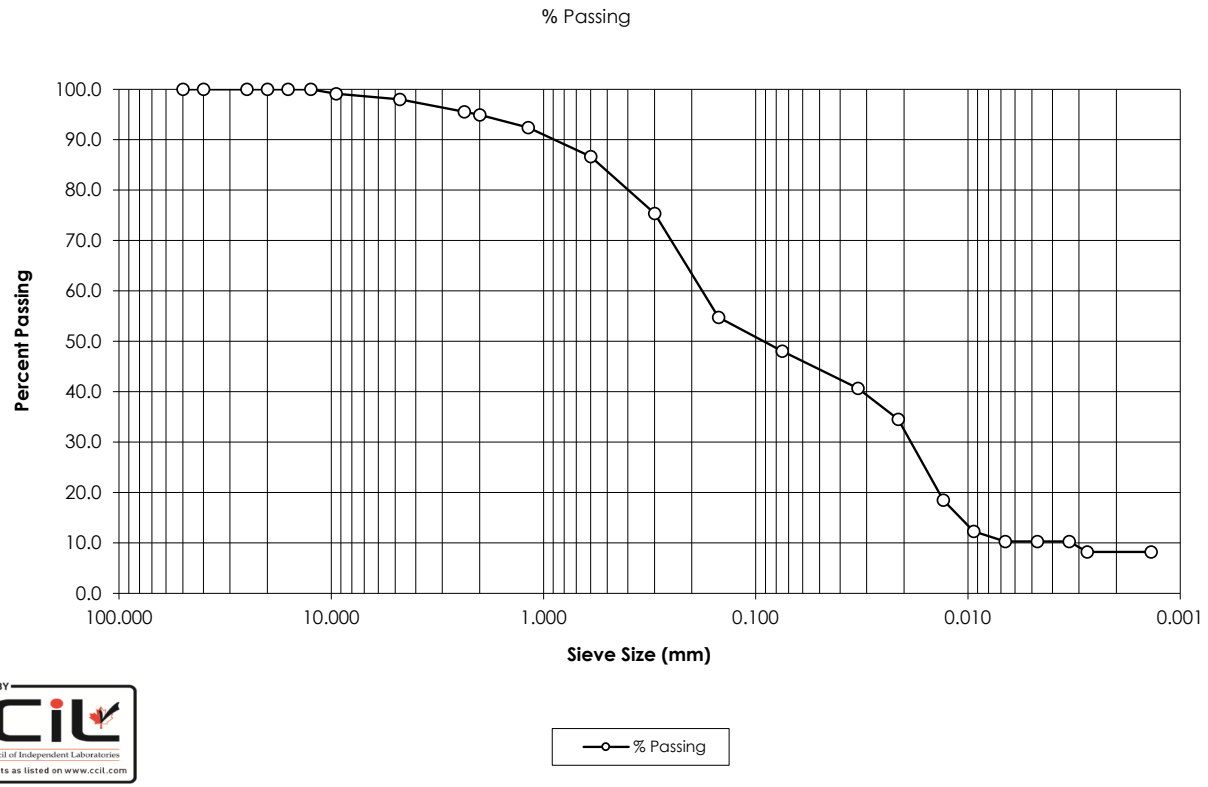
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-48
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Clayey sand



CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0067**	**10.3**
40.0	**100.0**	**0.0047**	**10.3**
25.0	**100.0**	**0.0033**	**10.3**
20.0	**100.0**	**0.0027**	**8.2**
16.0	**100.0**	**0.0014**	**8.2**
12.5	**100.0**		
9.5	**99.1**		
4.75	**98.0**		
2.36	**95.6**		
2.00	**94.9**		
1.18	**92.4**		
0.600	**86.7**		
0.300	**75.4**		
0.150	**54.7**		
0.075	**48.1**		
0.0331	**40.7**		
0.0213	**34.5**		
0.0131	**18.5**		
0.0094	**12.3**		

Gravel:	2.0%	D_{10}:	0.0033
Sand:	49.9%	D_{30}:	0.0195
Silt:	39.8%	D_{60}:	0.1930
Clay:	8.3%	C_u:	59.10
		C_c:	0.60

Comments:

Reviewed by:

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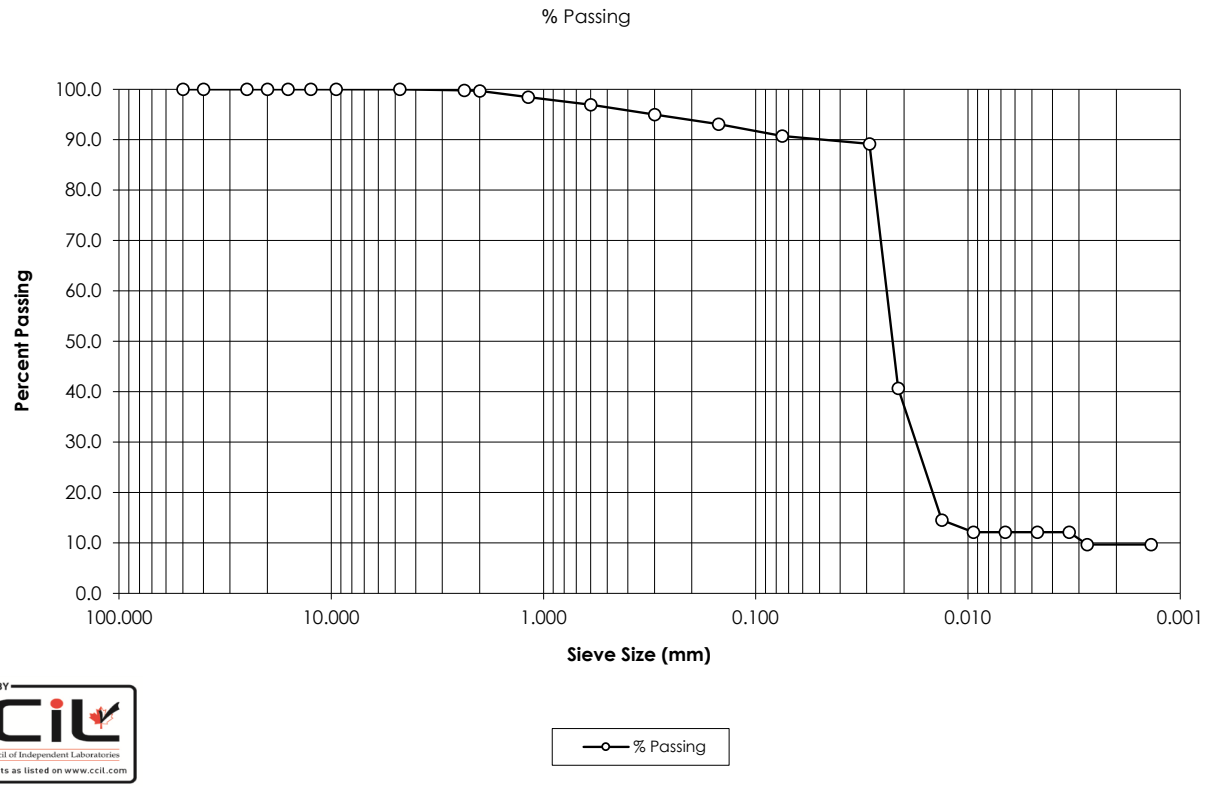
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS7
SOURCE: BH17-48
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silt



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0067**	**12.1**
40.0	**100.0**	**0.0047**	**12.1**
25.0	**100.0**	**0.0033**	**12.1**
20.0	**100.0**	**0.0027**	**9.7**
16.0	**100.0**	**0.0014**	**9.7**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**99.8**		
2.00	**99.7**		
1.18	**98.5**		
0.600	**97.0**		
0.300	**95.0**		
0.150	**93.1**		
0.075	**90.7**		
0.0291	**89.2**		
0.0213	**40.7**		
0.0133	**14.5**		
0.0094	**12.1**		

Gravel:	0.0%	D_{10}:	0.0028
Sand:	9.3%	D_{30}:	0.0189
Silt:	81.0%	D_{60}:	0.0252
Clay:	9.7%	C_u:	8.91
		C_c:	5.05

Comments:

Reviewed by:

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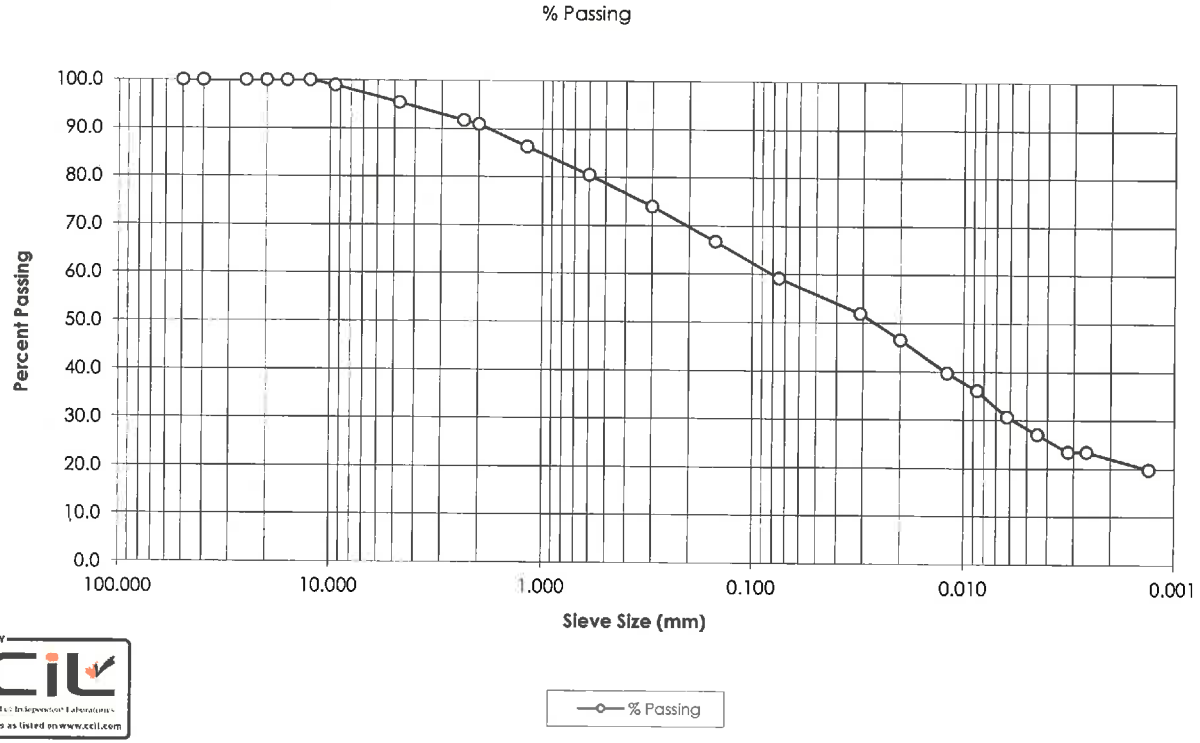
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS1
SOURCE: BH17-49
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Canadian Council for Independent Laboratories
For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0062**	**30.7**
40.0	**100.0**	**0.0045**	**27.1**
25.0	**100.0**	**0.0032**	**23.4**
20.0	**100.0**	**0.0026**	**23.4**
16.0	**100.0**	**0.0013**	**19.8**
12.5	**100.0**		
9.5	**99.0**		
4.75	**95.4**		
2.36	**91.8**		
2.00	**90.9**		
1.18	**86.3**		
0.600	**80.5**		
0.300	**73.9**		
0.150	**66.7**		
0.075	**59.1**		
0.0310	**51.9**		
0.0201	**46.5**		
0.0120	**39.7**		
0.0086	**36.1**		

Gravel:	4.6%	D_{10}:	-
Sand:	36.3%	D_{30}:	0.0059
Silt:	37.1%	D_{60}:	0.0841
Clay:	22.0%	C_u:	-
		C_c:	-

Comments:

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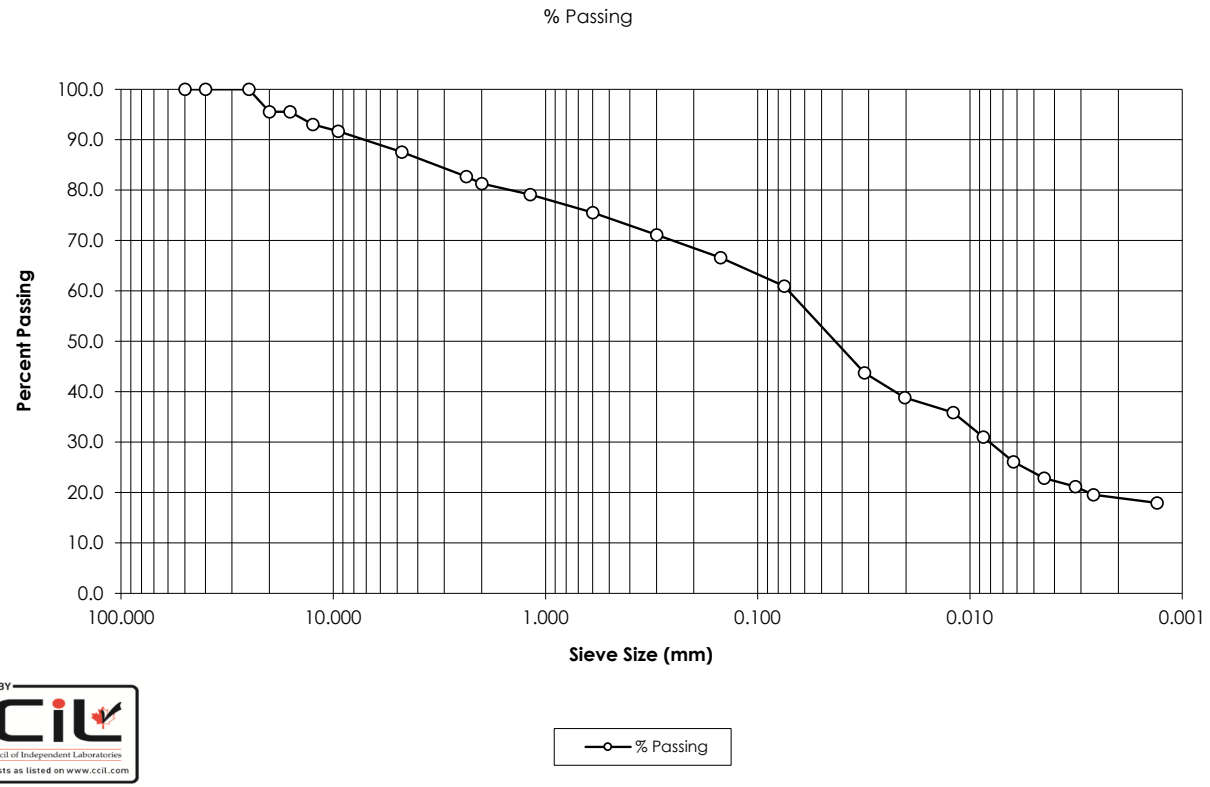
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS7
SOURCE: BH17-49
TESTED BY: JA

DATE TESTED: April 21, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0063**	**26.1**
40.0	**100.0**	**0.0045**	**22.8**
25.0	**100.0**	**0.0032**	**21.2**
20.0	**95.6**	**0.0026**	**19.6**
16.0	**95.6**	**0.0013**	**18.0**
12.5	**93.1**		
9.5	**91.7**		
4.75	**87.5**		
2.36	**82.7**		
2.00	**81.3**		
1.18	**79.1**		
0.600	**75.6**		
0.300	**71.1**		
0.150	**66.6**		
0.075	**61.0**		
0.0314	**43.7**		
0.0203	**38.8**		
0.0120	**35.9**		
0.0087	**31.0**		

Gravel:	12.5%	D_{10}:	-
Sand:	26.6%	D_{30}:	0.0082
Silt:	42.0%	D_{60}:	0.0729
Clay:	18.9%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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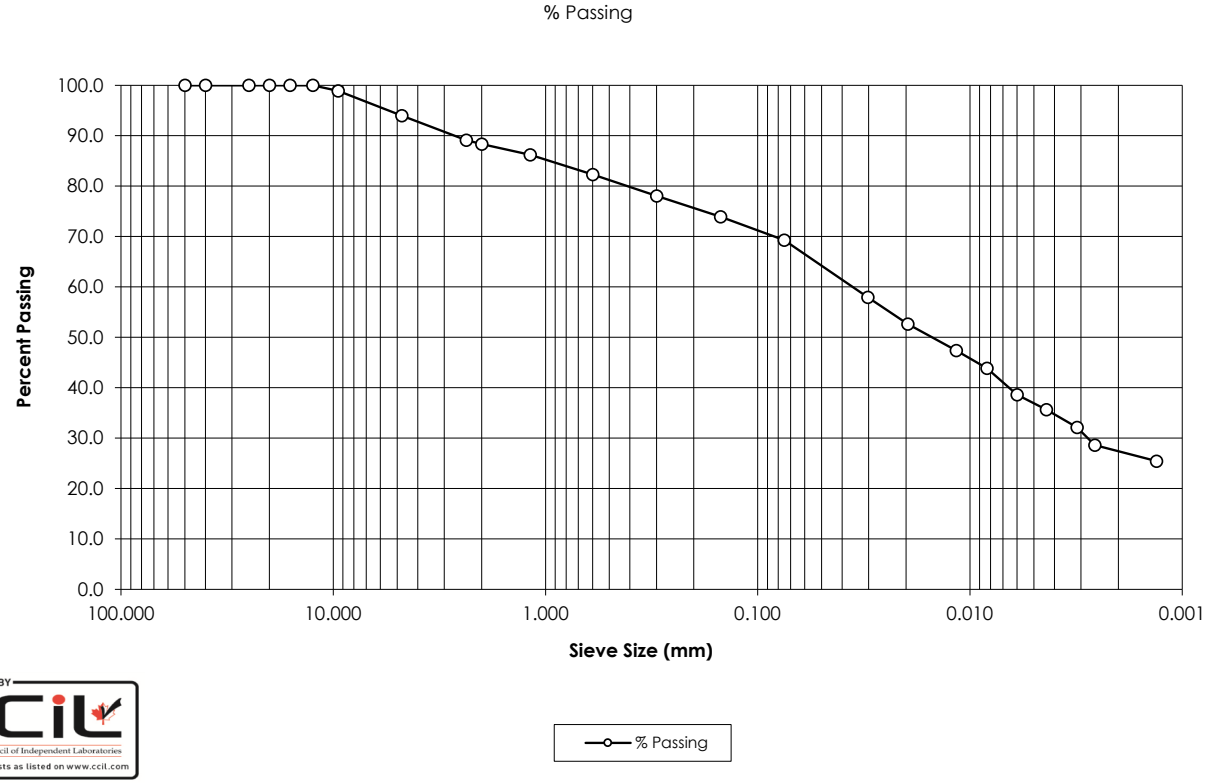
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS3
SOURCE: BH17-50
TESTED BY: JA

DATE TESTED: April 14, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0060**	**38.6**
40.0	**100.0**	**0.0044**	**35.6**
25.0	**100.0**	**0.0031**	**32.1**
20.0	**100.0**	**0.0026**	**28.6**
16.0	**100.0**	**0.0013**	**25.5**
12.5	**100.0**		
9.5	**98.9**		
4.75	**94.0**		
2.36	**89.1**		
2.00	**88.4**		
1.18	**86.2**		
0.600	**82.3**		
0.300	**78.0**		
0.150	**73.9**		
0.075	**69.3**		
0.0304	**57.9**		
0.0197	**52.7**		
0.0116	**47.4**		
0.0083	**43.9**		

Gravel:	6.0%	D_{10}:	-
Sand:	24.7%	D_{30}:	0.0028
Silt:	41.9%	D_{60}:	0.0391
Clay:	27.4%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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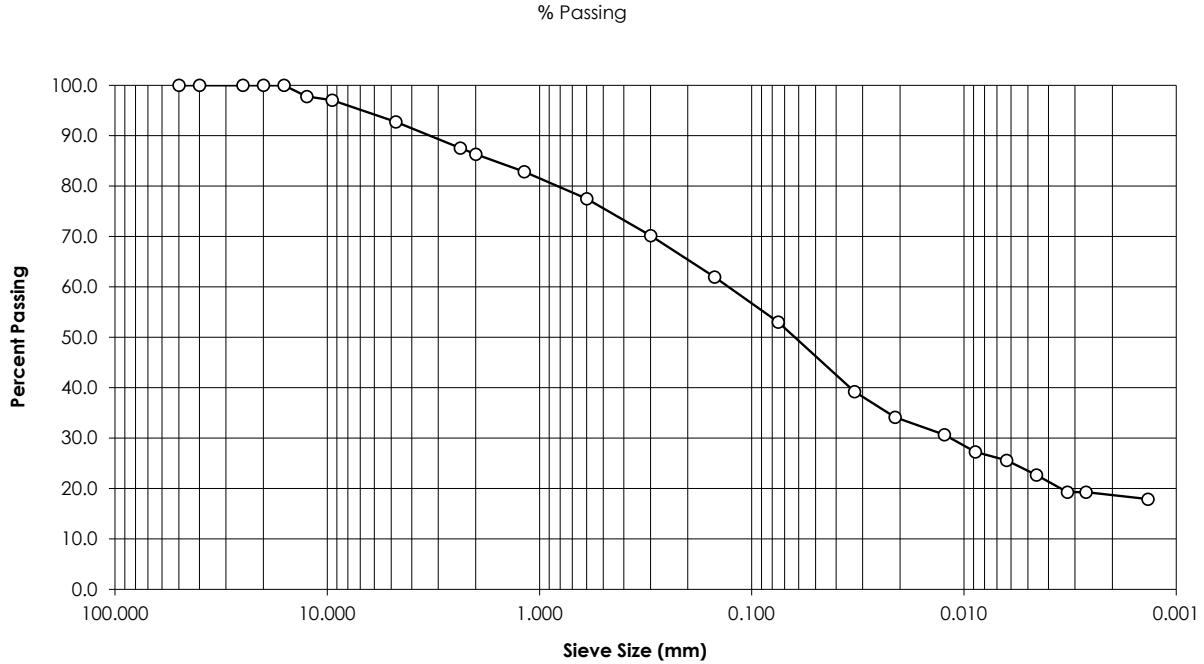
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS9
SOURCE: BH17-50
TESTED BY: JA

DATE TESTED: April 14, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0063**	**25.6**
40.0	**100.0**	**0.0046**	**22.7**
25.0	**100.0**	**0.0033**	**19.3**
20.0	**100.0**	**0.0027**	**19.3**
16.0	**100.0**	**0.0014**	**17.9**
12.5	**97.8**		
9.5	**97.1**		
4.75	**92.8**		
2.36	**87.6**		
2.00	**86.3**		
1.18	**82.8**		
0.600	**77.5**		
0.300	**70.2**		
0.150	**62.0**		
0.075	**53.0**		
0.0328	**39.2**		
0.0212	**34.1**		
0.0124	**30.7**		
0.0088	**27.3**		

Gravel:	7.2%	D_{10}:	-
Sand:	39.8%	D_{30}:	0.0117
Silt:	34.3%	D_{60}:	0.1344
Clay:	18.7%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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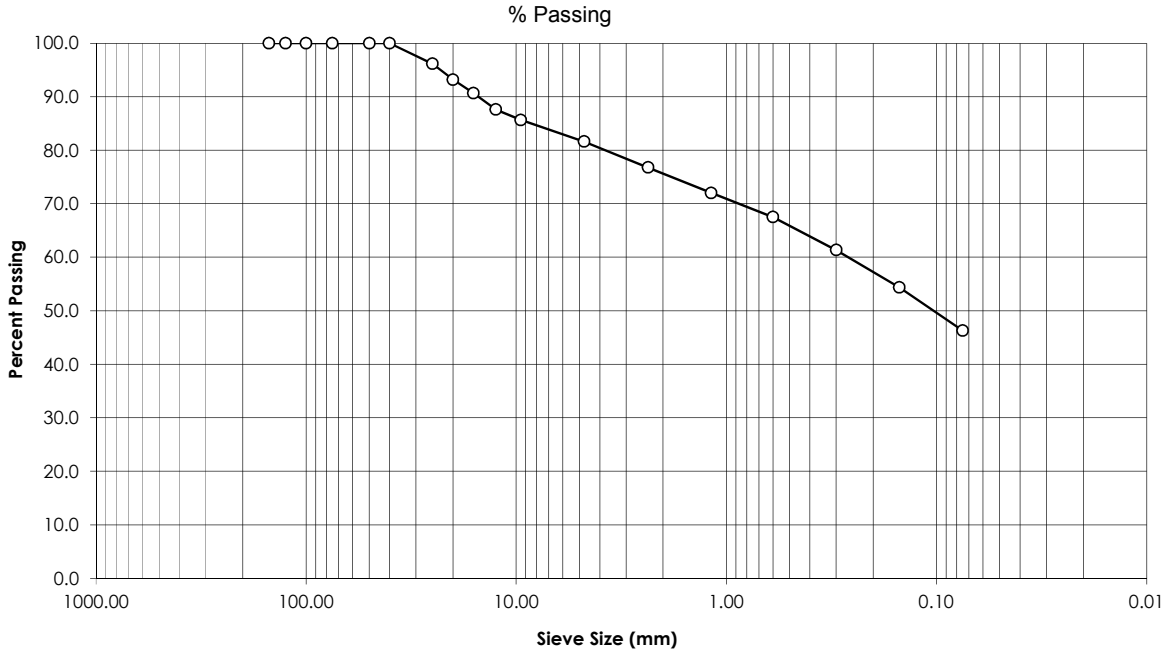
SAMPLE No.: SS10
SOURCE: BH17-50
TESTED BY: RP

DATE RECEIVED: March 27, 2017
DATE TESTED: April 14, 2017
SAMPLE DESCRIPTION: Silty and/or clayey sand with gravel



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**96.1**	-	-
20.0	**93.2**	-	-
16.0	**90.7**	-	-
12.5	**87.6**	-	-
9.5	**85.7**	-	-
4.75	**81.6**	-	-
2.36	**76.8**	-	-
1.18	**72.0**	-	-
0.600	**67.5**	-	-
0.300	**61.4**	-	-
0.150	**54.4**	-	-
0.075	**46.3**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	18.4%	D_{30}:	-
Sand:	35.3%	D_{60}:	0.2722
Fines:	46.3%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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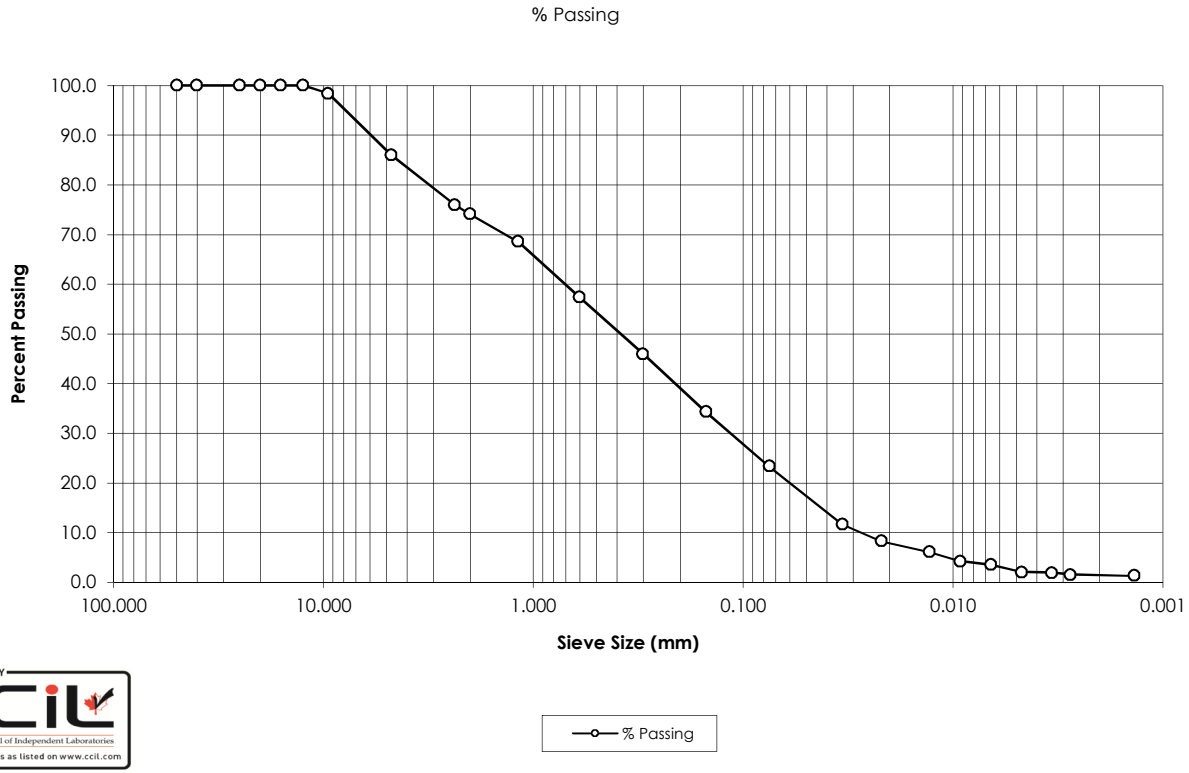
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS1
SOURCE: BH17-51
TESTED BY: C. Woods

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Silty Sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0066**	**3.5**
40.0	**100.0**	**0.0047**	**2.0**
25.0	**100.0**	**0.0034**	**1.8**
20.0	**100.0**	**0.0028**	**1.5**
16.0	**100.0**	**0.0014**	**1.3**
12.5	**100.0**		
9.5	**98.4**		
4.75	**86.0**		
2.36	**76.0**		
2.00	**74.1**		
1.18	**68.6**		
0.600	**57.3**		
0.300	**45.9**		
0.150	**34.3**		
0.075	**23.3**		
0.0336	**11.6**		
0.0219	**8.2**		
0.0129	**6.0**		
0.0092	**4.2**		

Gravel:	14.0%	D_{10}:	0.0286
Sand:	62.7%	D_{30}:	0.1242
Silt:	21.9%	D_{60}:	0.7475
Clay:	1.4%	C_U:	26.14
		C_C:	0.72

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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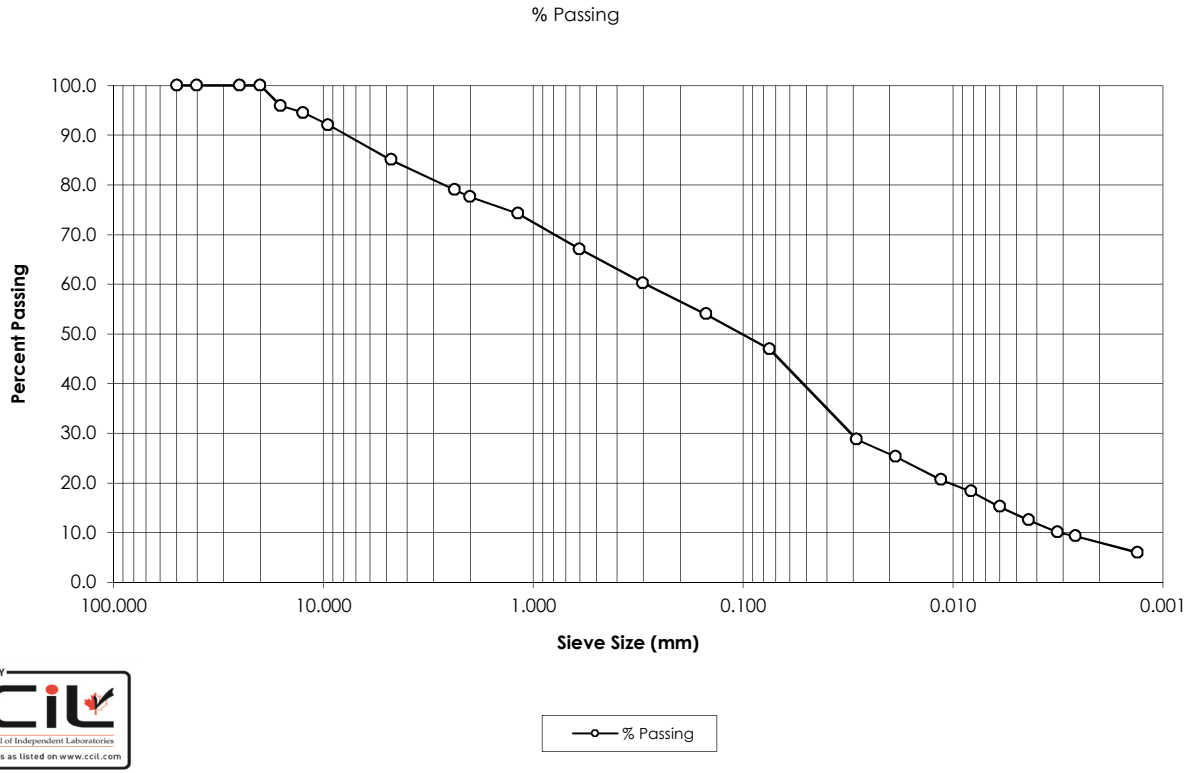
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS3
SOURCE: BH17-51
TESTED BY: C. Woods

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Silty, Clayey Sand with Gravel



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0060**	**15.2**
40.0	**100.0**	**0.0043**	**12.5**
25.0	**100.0**	**0.0032**	**10.0**
20.0	**100.0**	**0.0026**	**9.3**
16.0	**95.9**	**0.0013**	**6.0**
12.5	**94.5**		
9.5	**92.1**		
4.75	**85.0**		
2.36	**79.0**		
2.00	**77.6**		
1.18	**74.2**		
0.600	**67.1**		
0.300	**60.2**		
0.150	**54.0**		
0.075	**47.0**		
0.0287	**28.8**		
0.0187	**25.3**		
0.0114	**20.6**		
0.0082	**18.3**		

Gravel:	15.0%	D_{10}:	0.0031
Sand:	38.0%	D_{30}:	0.0327
Silt:	39.0%	D_{60}:	0.2949
Clay:	8.0%	C_U:	94.10
		C_C:	1.16

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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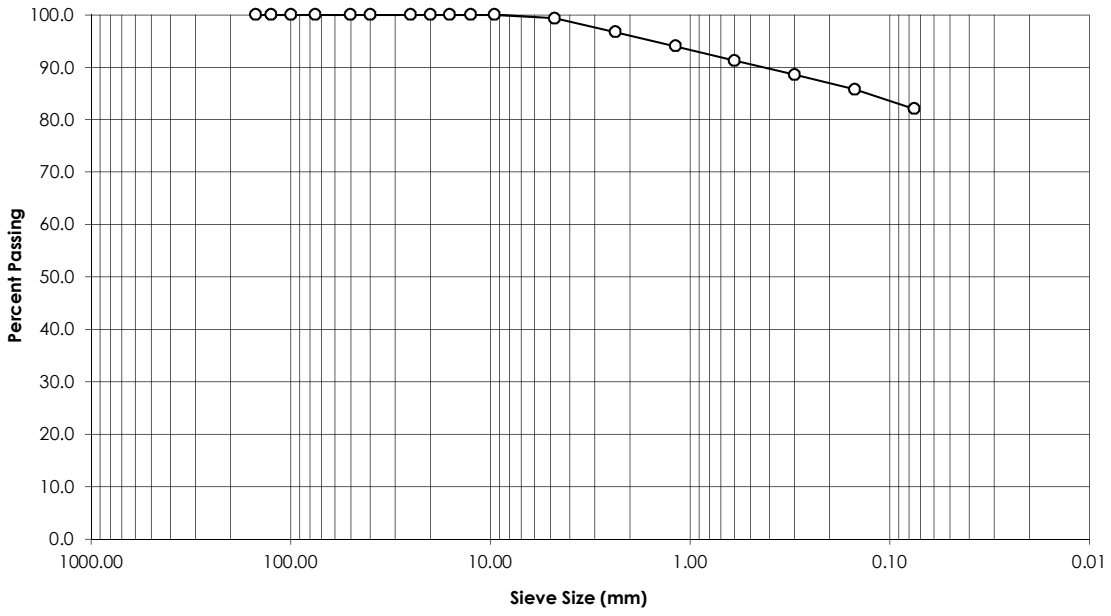
SAMPLE No.: AS1
SOURCE: BH17-52
TESTED BY: E. Wahl

DATE RECEIVED: April 12, 2017
DATE TESTED: April 25, 2017
SAMPLE DESCRIPTION: Fines with Sand



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**100.0**	-	-
4.75	**99.3**	-	-
2.36	**96.7**	-	-
1.18	**94.0**	-	-
0.600	**91.2**	-	-
0.300	**88.6**	-	-
0.150	**85.8**	-	-
0.075	**82.1**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	0.7%	D_{30}:	-
Sand:	17.3%	D_{60}:	-
Fines:	82.0%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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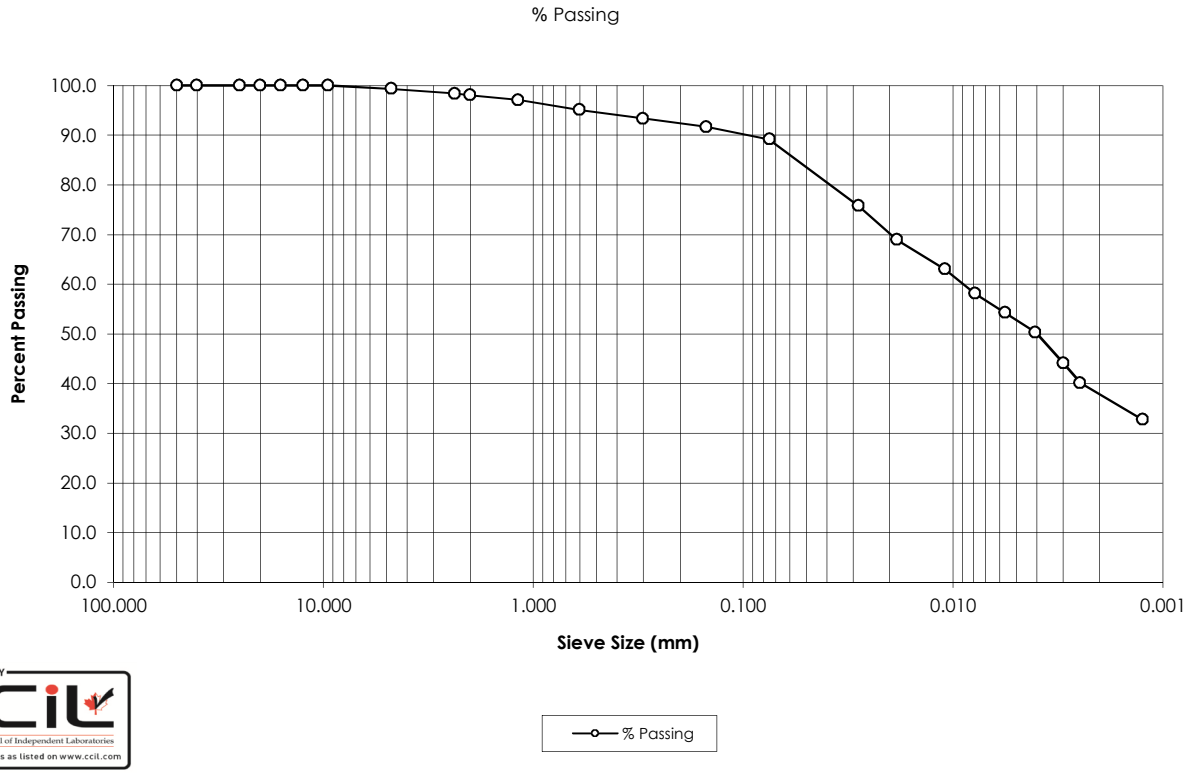
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS3
SOURCE: BH17-52
TESTED BY: C. Woods

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Lean Clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0056**	**54.2**
40.0	**100.0**	**0.0041**	**50.3**
25.0	**100.0**	**0.0030**	**44.1**
20.0	**100.0**	**0.0025**	**40.1**
16.0	**100.0**	**0.0012**	**32.7**
12.5	**100.0**		
9.5	**100.0**		
4.75	**99.4**		
2.36	**98.4**		
2.00	**98.0**		
1.18	**97.1**		
0.600	**95.1**		
0.300	**93.3**		
0.150	**91.7**		
0.075	**89.1**		
0.0282	**75.8**		
0.0184	**68.9**		
0.0109	**63.0**		
0.0078	**58.2**		

Gravel:	0.6%	D_{10}:	-
Sand:	10.2%	D_{30}:	-
Silt:	51.3%	D_{60}:	0.0090
Clay:	37.9%	C_U:	-
		C_C:	-

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

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Reviewed by:

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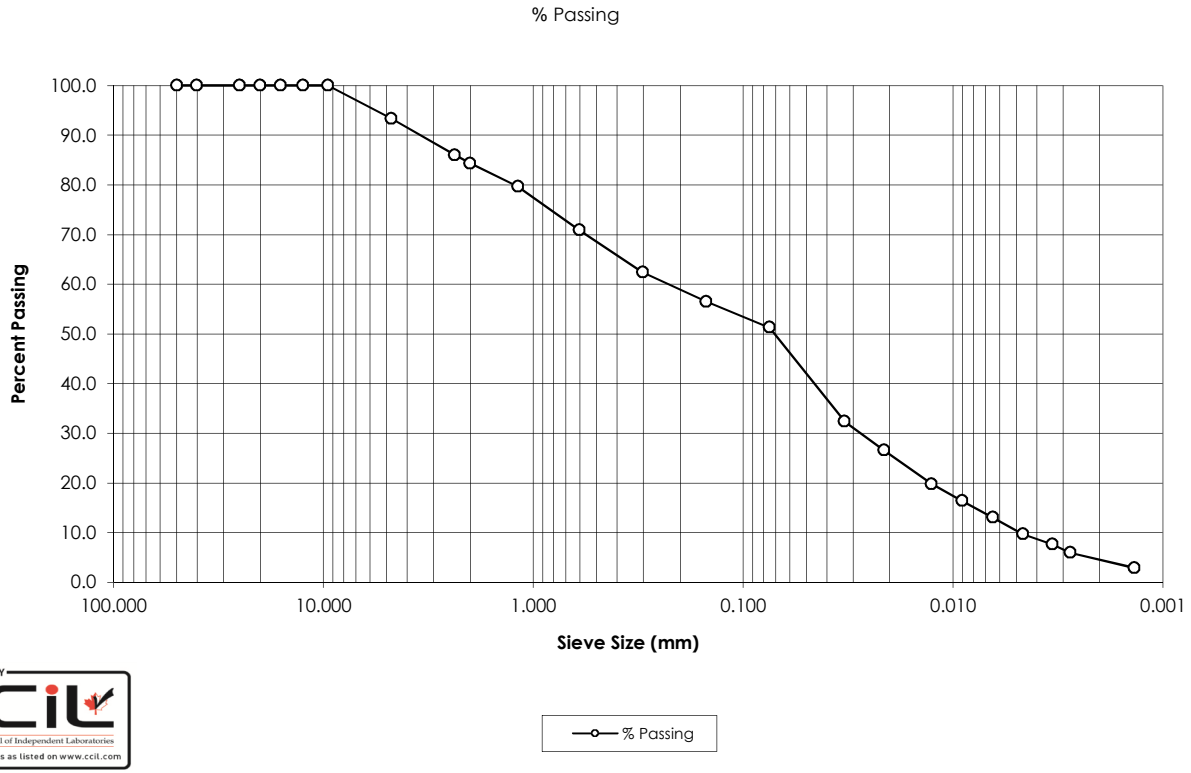
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS2
SOURCE: BH17-53
TESTED BY: B. Pelkey

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sandy Silt



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**13.0**
40.0	**100.0**	**0.0046**	**9.6**
25.0	**100.0**	**0.0033**	**7.6**
20.0	**100.0**	**0.0028**	**5.9**
16.0	**100.0**	**0.0014**	**2.9**
12.5	**100.0**		
9.5	**100.0**		
4.75	**93.4**		
2.36	**86.0**		
2.00	**84.3**		
1.18	**79.6**		
0.600	**70.9**		
0.300	**62.4**		
0.150	**56.5**		
0.075	**51.3**		
0.0329	**32.4**		
0.0213	**26.5**		
0.0126	**19.8**		
0.0090	**16.4**		

Gravel:	6.6%	D_{10}:	0.0049
Sand:	42.1%	D_{30}:	0.0284
Silt:	46.8%	D_{60}:	0.2407
Clay:	4.5%	C_U:	49.58
		C_C:	0.69

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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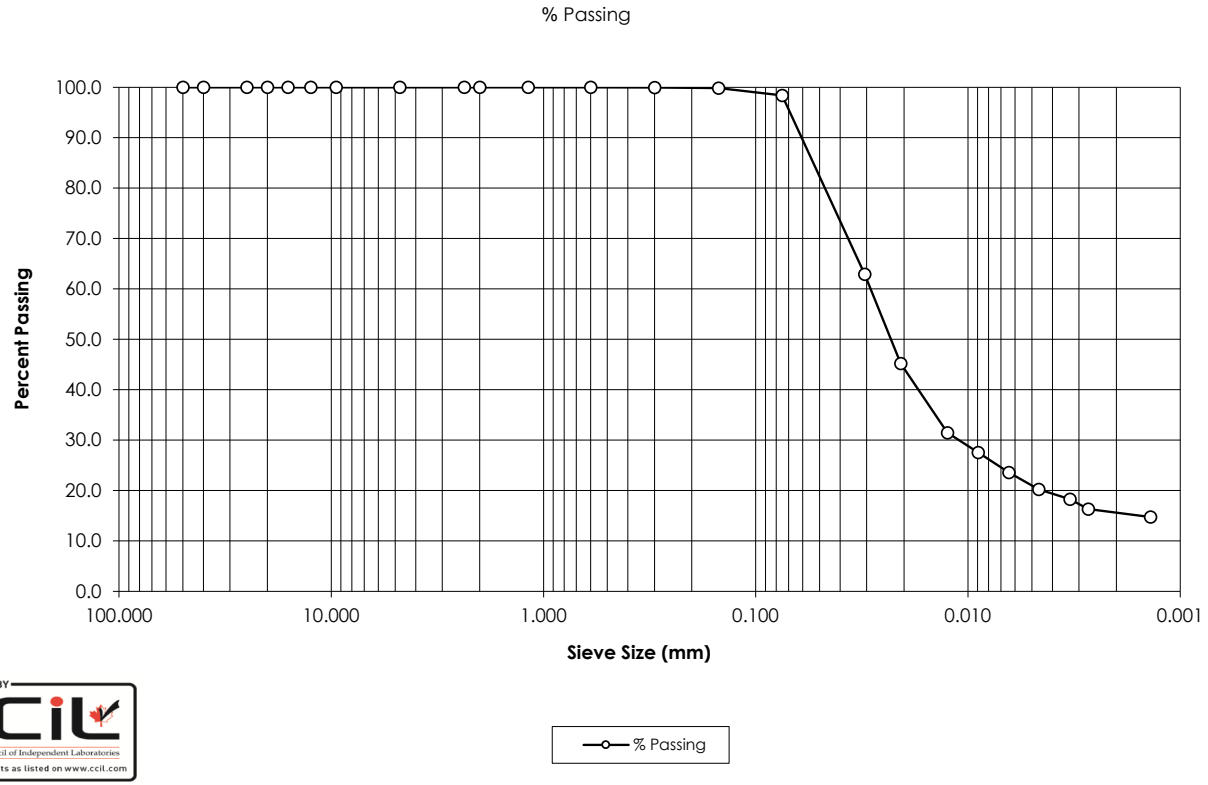
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS3
SOURCE: BH17-54
TESTED BY: JA

DATE TESTED: April 14, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Silty clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**23.6**
40.0	**100.0**	**0.0046**	**20.3**
25.0	**100.0**	**0.0033**	**18.3**
20.0	**100.0**	**0.0027**	**16.3**
16.0	**100.0**	**0.0014**	**14.8**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**100.0**		
0.600	**100.0**		
0.300	**100.0**		
0.150	**99.8**		
0.075	**98.4**		
0.0306	**62.9**		
0.0207	**45.2**		
0.0125	**31.5**		
0.0089	**27.5**		

Gravel:	0.0%	D_{10}:	-
Sand:	1.6%	D_{30}:	0.0112
Silt:	82.8%	D_{60}:	0.0292
Clay:	15.6%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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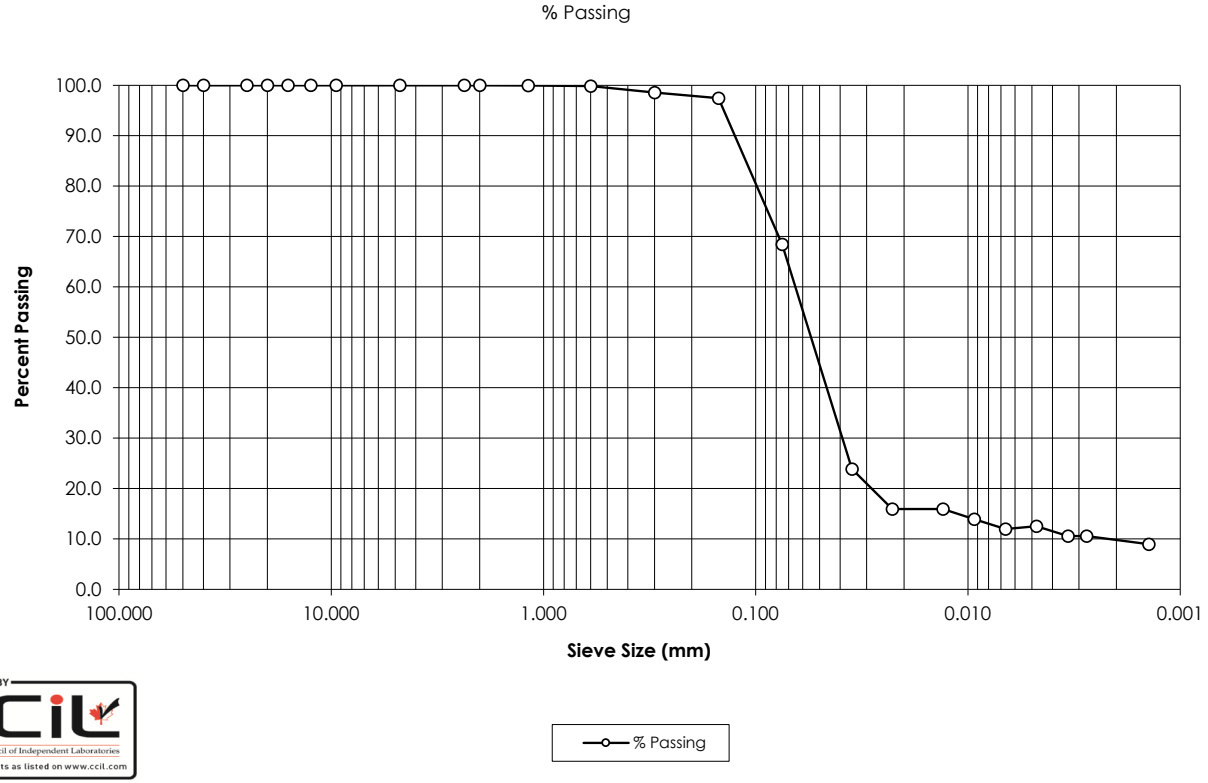
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS9
SOURCE: BH17-54
TESTED BY: JA

DATE TESTED: April 14, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Sandy silt



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0067**	**11.9**
40.0	**100.0**	**0.0048**	**12.5**
25.0	**100.0**	**0.0034**	**10.6**
20.0	**100.0**	**0.0028**	**10.6**
16.0	**100.0**	**0.0014**	**9.0**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**100.0**		
0.600	**99.8**		
0.300	**98.6**		
0.150	**97.5**		
0.075	**68.5**		
0.0352	**23.9**		
0.0227	**15.9**		
0.0131	**15.9**		
0.0093	**13.9**		

Gravel:	0.0%	D_{10}:	0.0023
Sand:	31.5%	D_{30}:	0.0438
Silt:	58.7%	D_{60}:	0.0700
Clay:	9.8%	C_u:	30.26
		C_c:	11.84

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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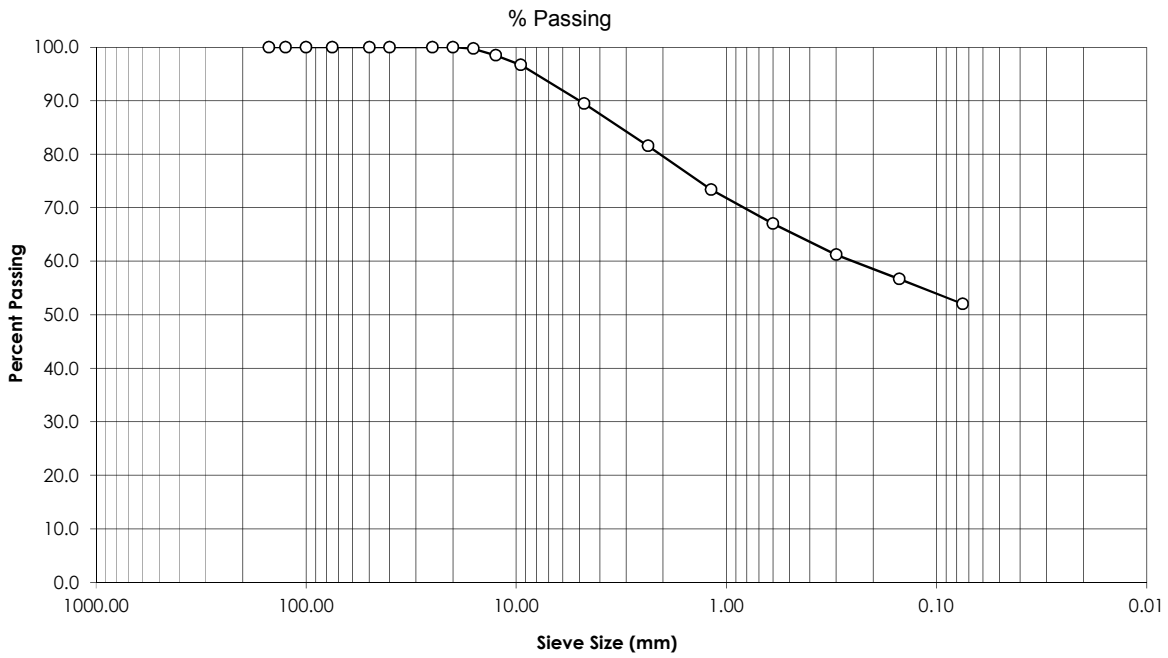
SAMPLE No.: AS3
SOURCE: BH17-55
TESTED BY: NN

DATE RECEIVED: March 27, 2017
DATE TESTED: April 14, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**99.7**	-	-
12.5	**98.5**	-	-
9.5	**96.7**	-	-
4.75	**89.4**	-	-
2.36	**81.6**	-	-
1.18	**73.4**	-	-
0.600	**67.0**	-	-
0.300	**61.2**	-	-
0.150	**56.7**	-	-
0.075	**52.0**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	10.6%	D_{30}:	-
Sand:	37.4%	D_{60}:	0.2609
Fines:	52.0%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

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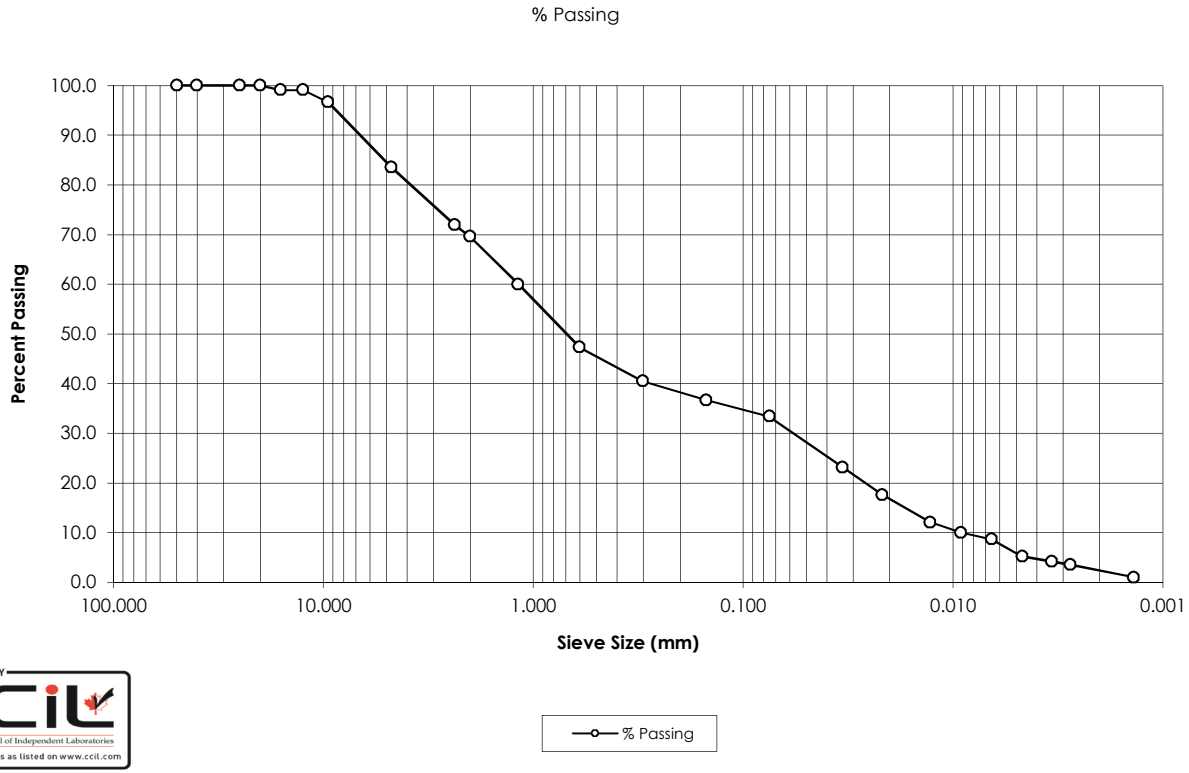
SAMPLE No.: AS1
SOURCE: BH17-56
TESTED BY: C. Woods

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sand with silt and/or clay and gravel



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0065**	**8.6**
40.0	**100.0**	**0.0047**	**5.1**
25.0	**100.0**	**0.0034**	**4.2**
20.0	**100.0**	**0.0028**	**3.5**
16.0	**99.1**	**0.0014**	**1.0**
12.5	**99.1**		
9.5	**96.7**		
4.75	**83.5**		
2.36	**71.9**		
2.00	**69.6**		
1.18	**60.0**		
0.600	**47.3**		
0.300	**40.5**		
0.150	**36.7**		
0.075	**33.4**		
0.0335	**23.1**		
0.0217	**17.6**		
0.0128	**12.0**		
0.0092	**10.0**		

Gravel:	16.5%	D_{10}:	0.0092
Sand:	50.2%	D_{30}:	0.0629
Silt:	31.1%	D_{60}:	1.1832
Clay:	2.2%	C_U:	127.98
		C_C:	0.36

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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Stantec

Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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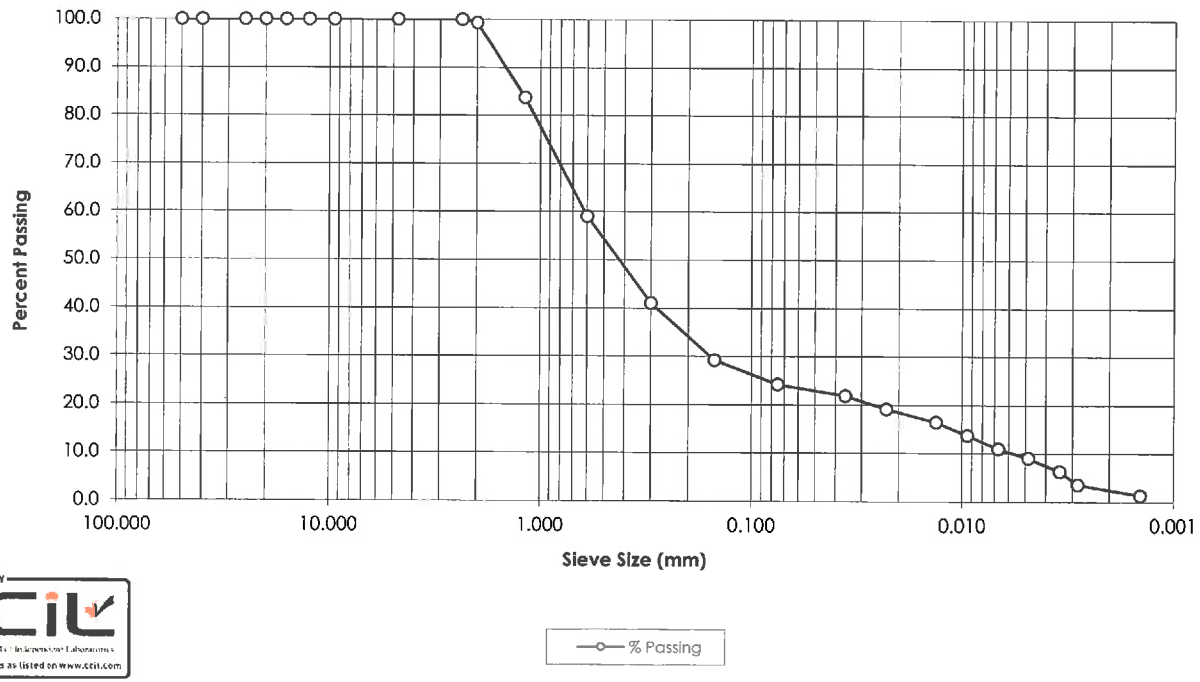
SAMPLE No.: AS1
SOURCE: BH17-61
TESTED BY: JA

DATE TESTED: April 22, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Organic silty sand



CERTIFIED BY CCIL
For specific tests as listed on www.ccil.com

Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0067**	**10.9**
40.0	**100.0**	**0.0048**	**9.0**
25.0	**100.0**	**0.0034**	**6.3**
20.0	**100.0**	**0.0028**	**3.6**
16.0	**100.0**	**0.0014**	**1.4**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**99.3**		
1.18	**83.8**		
0.600	**59.0**		
0.300	**41.0**		
0.150	**29.2**		
0.075	**24.2**		
0.0359	**21.9**		
0.0229	**19.1**		
0.0133	**16.4**		
0.0094	**13.7**		

Gravel:	0.0%	D_{10}:	0.0058
Sand:	75.8%	D_{30}:	0.1622
Silt:	21.8%	D_{60}:	0.6267
Clay:	2.4%	C_u:	107.21
		C_c:	7.18

Comments:

Reviewed by:

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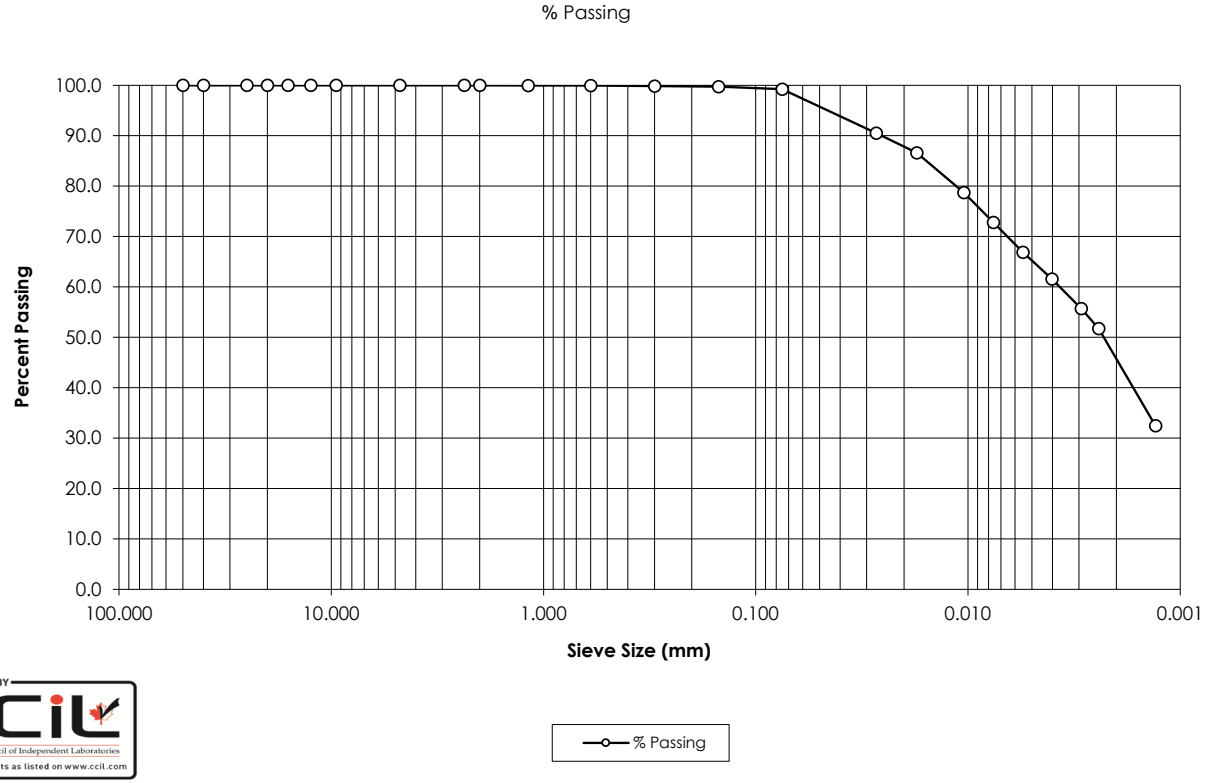
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tli Cho Engineering&Environmental Services Ltd
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

SAMPLE No.: AS5
SOURCE: BH17-61
TESTED BY: JA

DATE TESTED: April 14, 2017
DATE RECEIVED: February 27, 2017
SAMPLE DESCRIPTION: Lean clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0055**	**66.9**
40.0	**100.0**	**0.0040**	**61.6**
25.0	**100.0**	**0.0029**	**55.7**
20.0	**100.0**	**0.0024**	**51.8**
16.0	**100.0**	**0.0013**	**32.5**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**100.0**		
2.00	**100.0**		
1.18	**100.0**		
0.600	**99.9**		
0.300	**99.9**		
0.150	**99.7**		
0.075	**99.2**		
0.0270	**90.5**		
0.0174	**86.6**		
0.0105	**78.7**		
0.0076	**72.8**		

Gravel:	0.0%	D_{10}:	-
Sand:	0.8%	D_{30}:	-
Silt:	53.5%	D_{60}:	0.0037
Clay:	45.7%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tli Cho Engineering & Environmental Services
Project Name: TliCho AllSeason Rd.Investig.
Project No: 144902448

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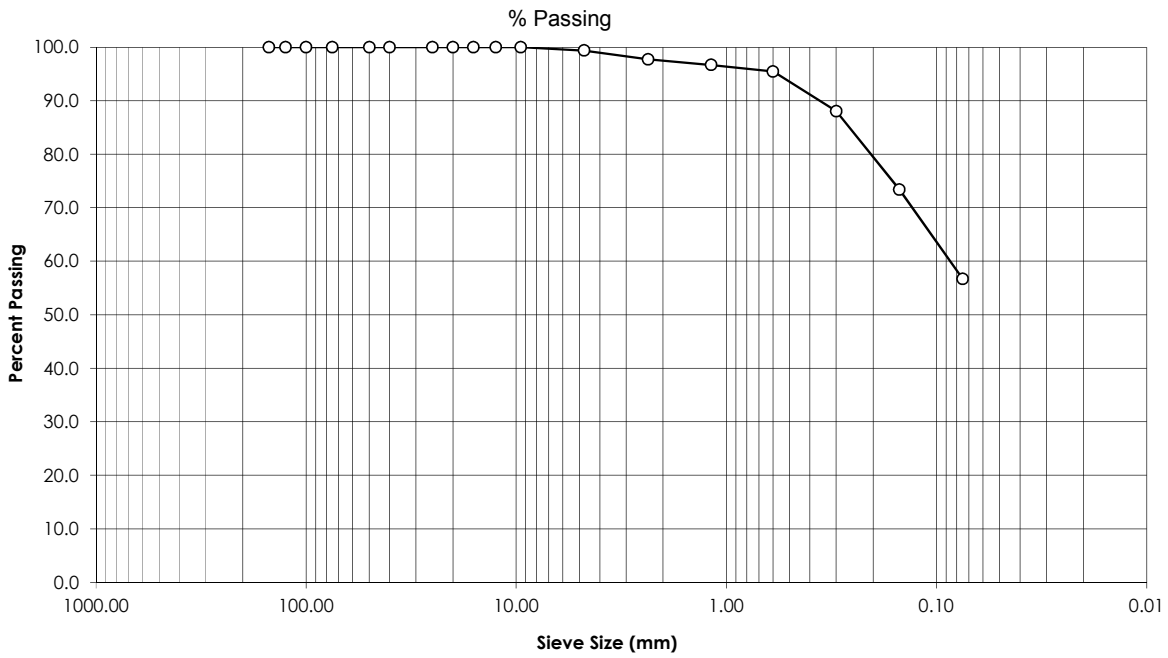
SAMPLE No.: SS8
SOURCE: BH 17-61
TESTED BY: NN

DATE RECEIVED: March 27, 2017
DATE TESTED: April 22, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**100.0**	-	-
4.75	**99.4**	-	-
2.36	**97.7**	-	-
1.18	**96.7**	-	-
0.600	**95.5**	-	-
0.300	**88.0**	-	-
0.150	**73.4**	-	-
0.075	**56.7**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	0.6%	D_{30}:	-
Sand:	42.7%	D_{60}:	0.0914
Fines:	56.7%	C_U:	-
		C_c:	-

Comments:

Reviewed by:

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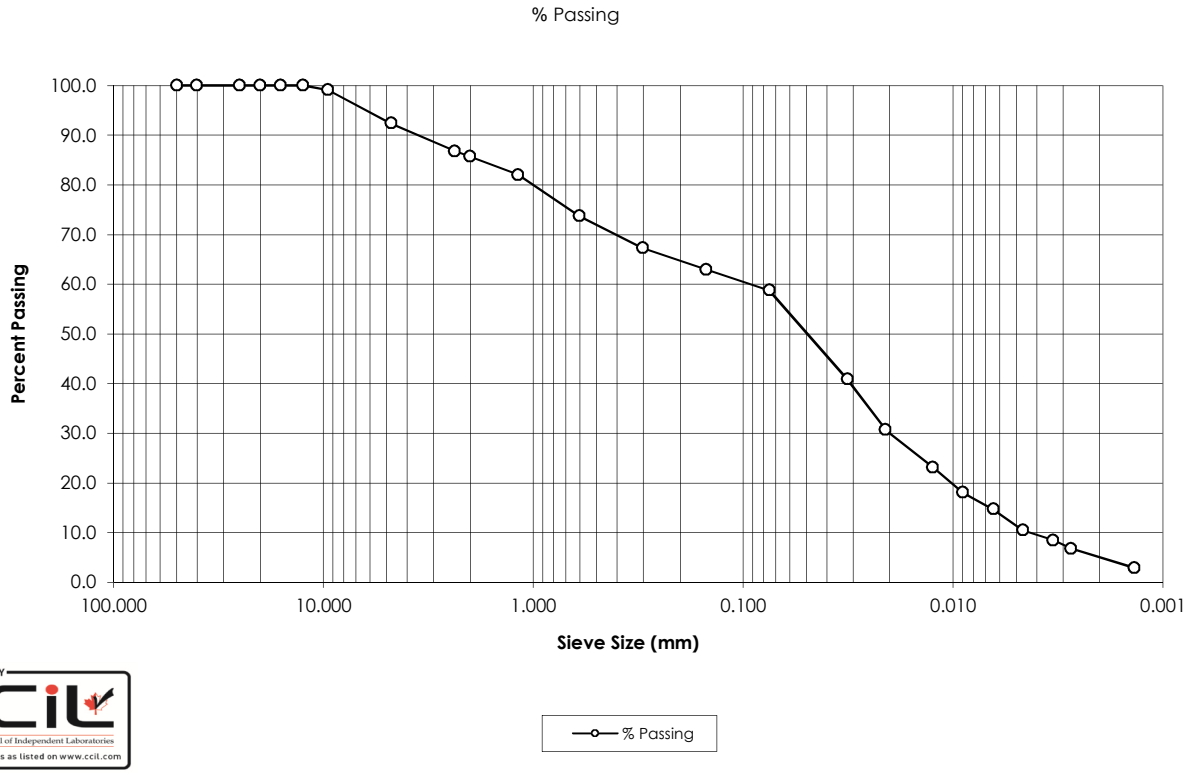
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS1
SOURCE: BH17-62
TESTED BY: C. Woods

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sandy Silt



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**14.7**
40.0	**100.0**	**0.0046**	**10.5**
25.0	**100.0**	**0.0033**	**8.4**
20.0	**100.0**	**0.0027**	**6.7**
16.0	**100.0**	**0.0014**	**2.9**
12.5	**100.0**		
9.5	**99.1**		
4.75	**92.4**		
2.36	**86.8**		
2.00	**85.7**		
1.18	**82.0**		
0.600	**73.7**		
0.300	**67.3**		
0.150	**63.0**		
0.075	**58.8**		
0.0318	**40.8**		
0.0210	**30.7**		
0.0125	**23.1**		
0.0089	**18.0**		

Gravel:	7.6%	D_{10}:	0.0044
Sand:	33.6%	D_{30}:	0.0203
Silt:	53.8%	D_{60}:	0.0976
Clay:	5.0%	C_U:	22.43
		C_C:	0.97

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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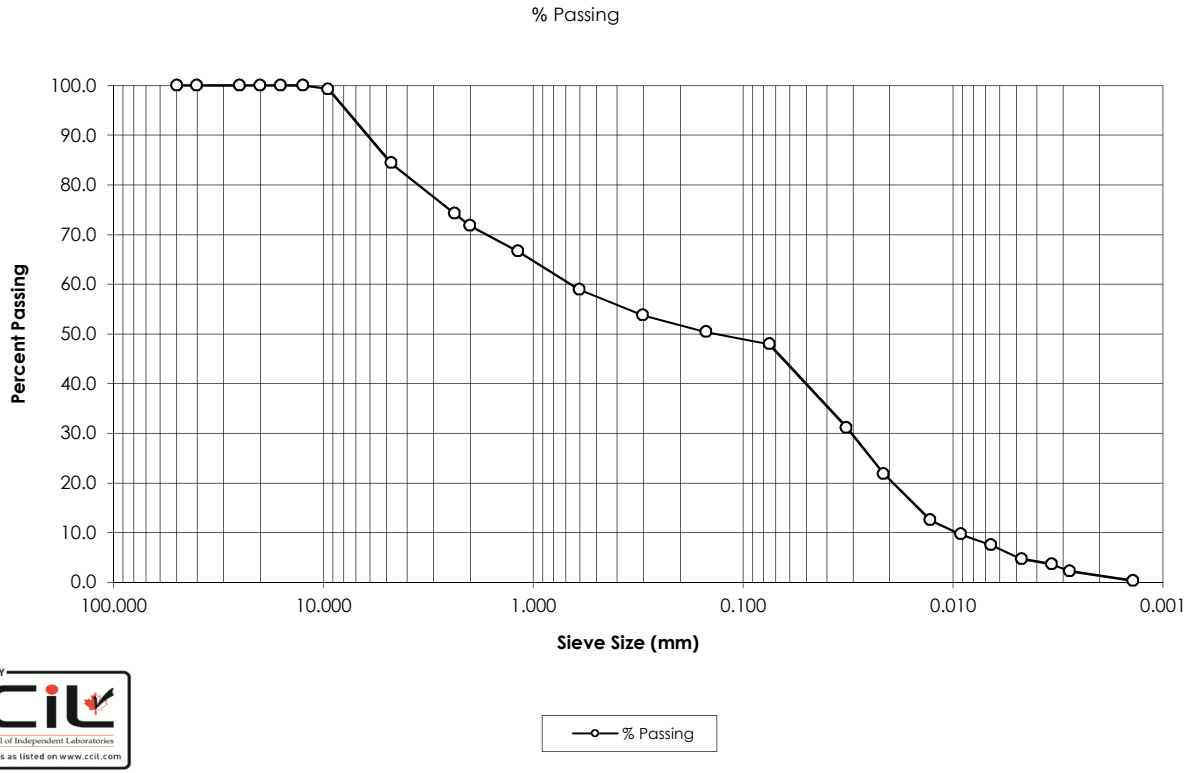
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS2
SOURCE: BH17-63
TESTED BY: C. Woods

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sandy Silt with Gravel



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0066**	**7.5**
40.0	**100.0**	**0.0047**	**4.6**
25.0	**100.0**	**0.0034**	**3.6**
20.0	**100.0**	**0.0028**	**2.2**
16.0	**100.0**	**0.0014**	**0.3**
12.5	**100.0**		
9.5	**99.3**		
4.75	**84.4**		
2.36	**74.2**		
2.00	**71.8**		
1.18	**66.6**		
0.600	**58.9**		
0.300	**53.8**		
0.150	**50.4**		
0.075	**47.9**		
0.0322	**31.1**		
0.0214	**21.8**		
0.0128	**12.5**		
0.0092	**9.6**		

Gravel:	15.6%	D_{10}:	0.0097
Sand:	36.5%	D_{30}:	0.0311
Silt:	46.6%	D_{60}:	0.6862
Clay:	1.3%	C_U:	70.48
		C_C:	0.14

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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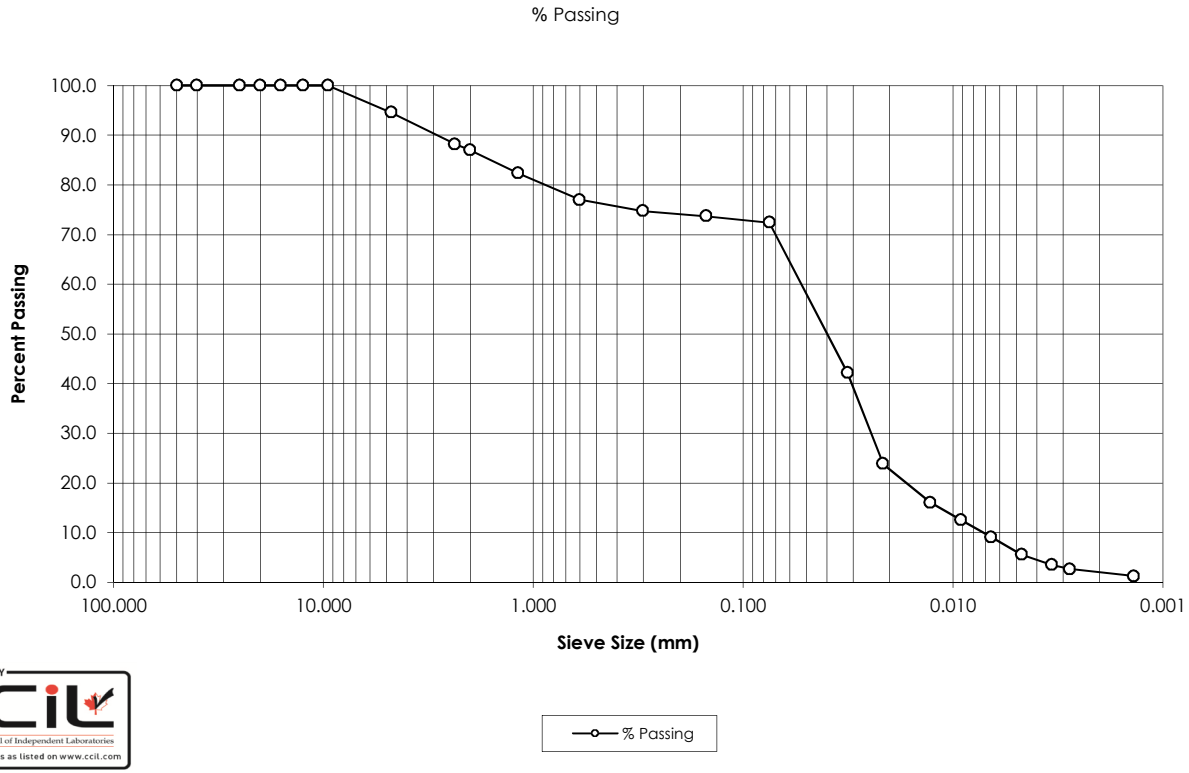
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS8
SOURCE: BH17-63
TESTED BY: C. Woods

DATE TESTED: April 18, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Silt with Sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0066**	**9.1**
40.0	**100.0**	**0.0047**	**5.6**
25.0	**100.0**	**0.0034**	**3.5**
20.0	**100.0**	**0.0028**	**2.6**
16.0	**100.0**	**0.0014**	**1.2**
12.5	**100.0**		
9.5	**100.0**		
4.75	**94.6**		
2.36	**88.2**		
2.00	**87.0**		
1.18	**82.4**		
0.600	**77.0**		
0.300	**74.7**		
0.150	**73.7**		
0.075	**72.4**		
0.0318	**42.1**		
0.0216	**23.9**		
0.0128	**16.0**		
0.0092	**12.5**		

Gravel:	5.4%	D_{10}:	0.0074
Sand:	22.1%	D_{30}:	0.0257
Silt:	70.5%	D_{60}:	0.0600
Clay:	2.0%	C_U:	8.15
		C_C:	1.50

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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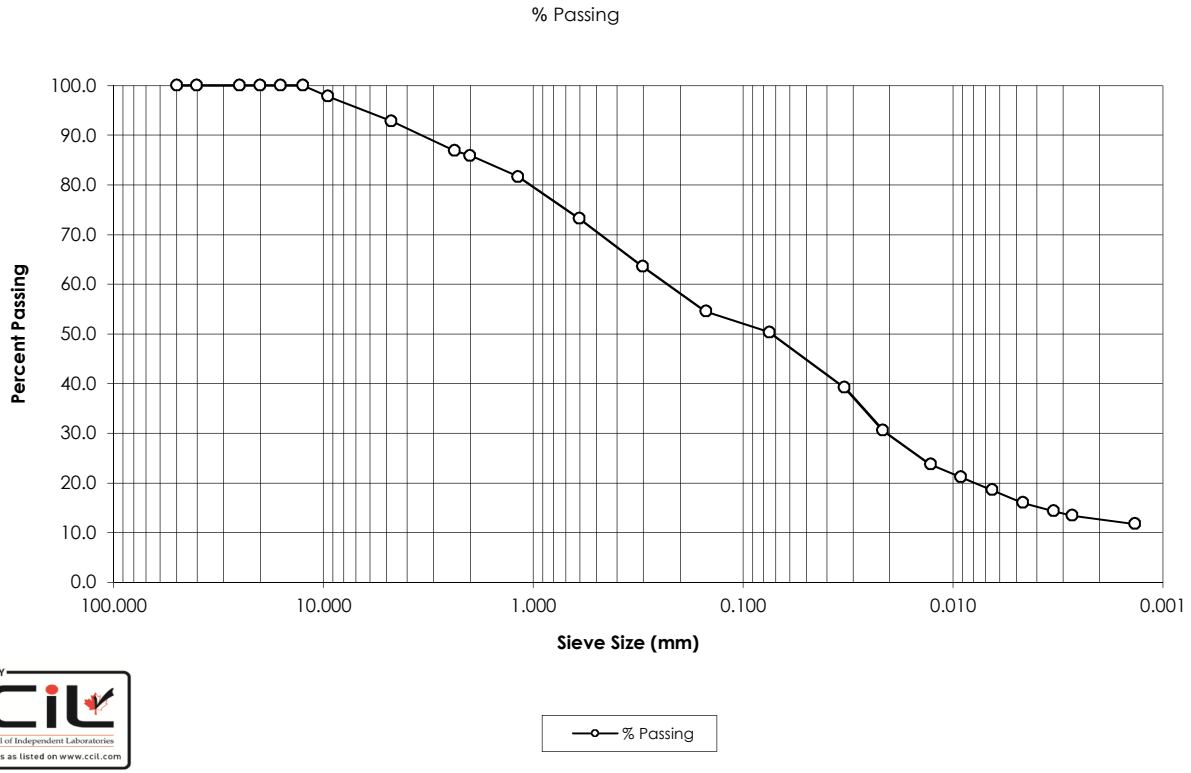
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS1
SOURCE: BH17-64
TESTED BY: B. Pelkey

DATE TESTED: April 24, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Silty, Clayey Sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0065**	**18.5**
40.0	**100.0**	**0.0046**	**16.0**
25.0	**100.0**	**0.0033**	**14.3**
20.0	**100.0**	**0.0027**	**13.4**
16.0	**100.0**	**0.0014**	**11.7**
12.5	**100.0**		
9.5	**97.8**		
4.75	**92.8**		
2.36	**86.9**		
2.00	**85.9**		
1.18	**81.6**		
0.600	**73.2**		
0.300	**63.5**		
0.150	**54.5**		
0.075	**50.3**		
0.0329	**39.1**		
0.0215	**30.6**		
0.0128	**23.7**		
0.0091	**21.1**		

Gravel:	7.2%	D_{10}:	-
Sand:	42.5%	D_{30}:	0.0209
Silt:	37.7%	D_{60}:	0.2442
Clay:	12.6%	C_U:	-
		C_C:	-

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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Stantec

Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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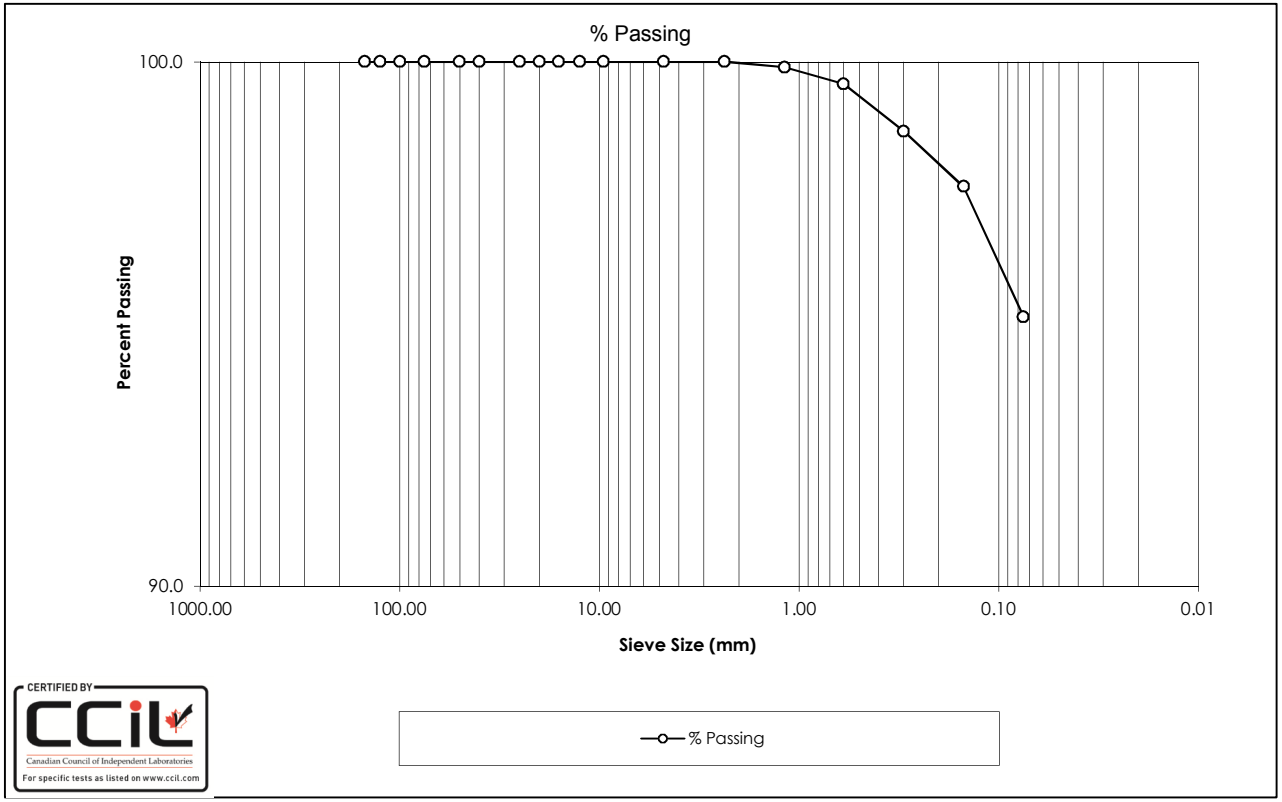
SAMPLE No.: AS1
SOURCE: BH17-65
TESTED BY: E. Wahl

DATE RECEIVED: April 12, 2017
DATE TESTED: April 25, 2017
SAMPLE DESCRIPTION: Fines



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**100.0**	-	-
4.75	**100.0**	-	-
2.36	**100.0**	-	-
1.18	**99.9**	-	-
0.600	**99.6**	-	-
0.300	**98.7**	-	-
0.150	**97.6**	-	-
0.075	**95.1**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	0.0%	D_{30}:	-
Sand:	4.9%	D_{60}:	-
Fines:	95.1%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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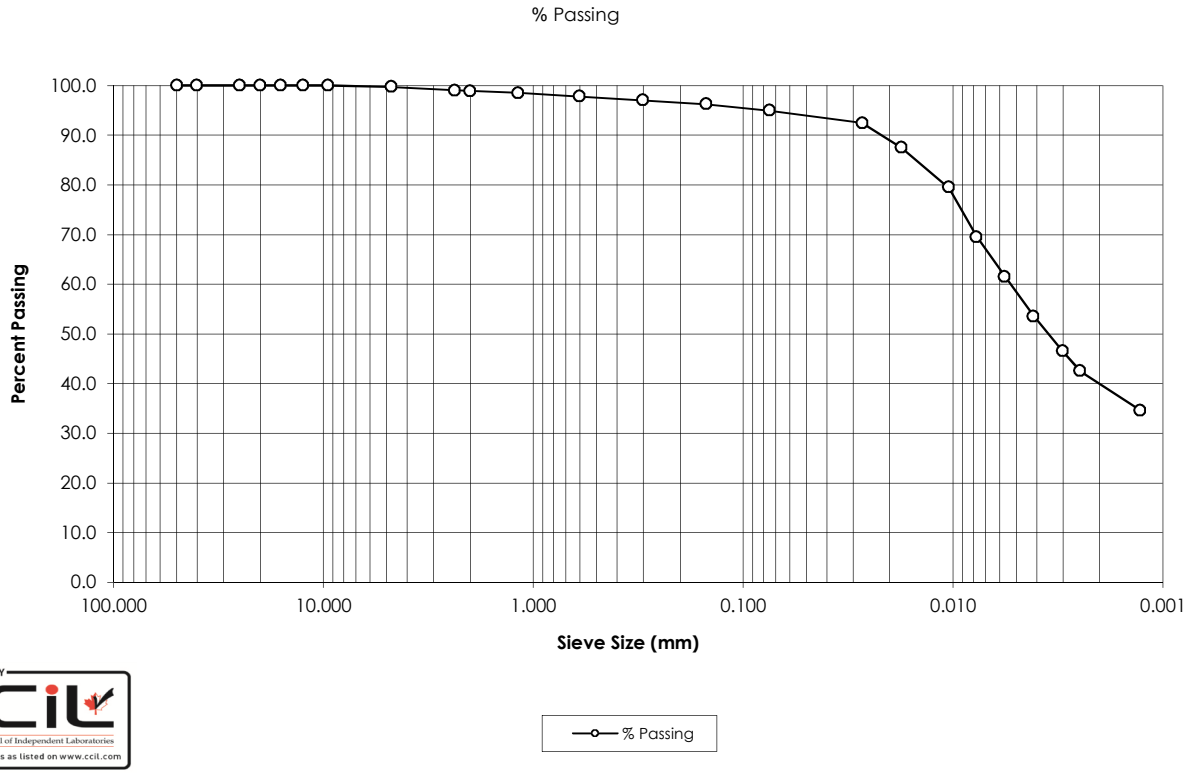
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: SS2
SOURCE: BH17-65
TESTED BY: B. Pelkey

DATE TESTED: April 24, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Lean Clay (CL)



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0057**	**61.5**
40.0	**100.0**	**0.0041**	**53.5**
25.0	**100.0**	**0.0030**	**46.5**
20.0	**100.0**	**0.0025**	**42.5**
16.0	**100.0**	**0.0013**	**34.6**
12.5	**100.0**		
9.5	**100.0**		
4.75	**99.8**		
2.36	**99.0**		
2.00	**98.9**		
1.18	**98.5**		
0.600	**97.8**		
0.300	**97.0**		
0.150	**96.3**		
0.075	**95.0**		
0.0270	**92.5**		
0.0175	**87.5**		
0.0105	**79.5**		
0.0077	**69.5**		

Gravel:	0.2%	D_{10}:	-
Sand:	4.8%	D_{30}:	-
Silt:	55.1%	D_{60}:	0.0054
Clay:	39.9%	C_U:	-
		C_C:	-

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limits test results.

Reviewed by:

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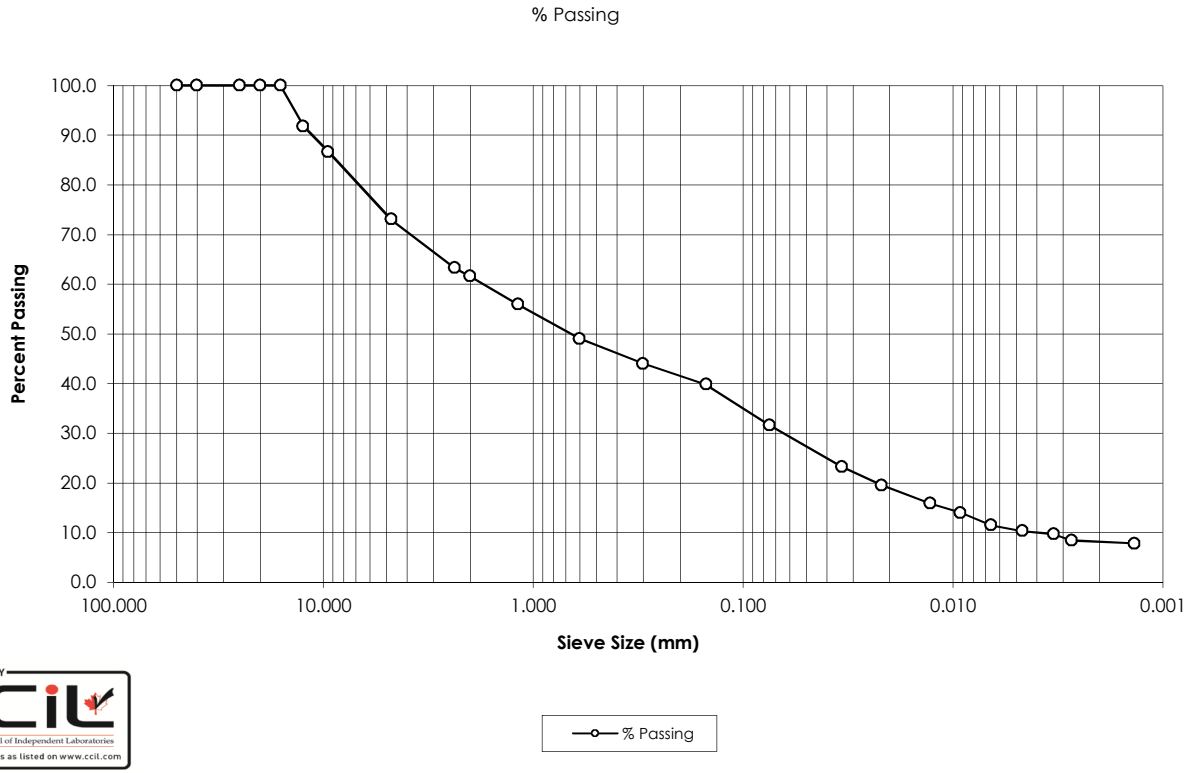
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS1
SOURCE: BH17-66
TESTED BY: B. Pelkey

DATE TESTED: April 24, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Silty, Clayey Sand with Gravel



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0066**	**11.5**
40.0	**100.0**	**0.0047**	**10.3**
25.0	**100.0**	**0.0033**	**9.6**
20.0	**100.0**	**0.0027**	**8.4**
16.0	**100.0**	**0.0014**	**7.8**
12.5	**91.8**		
9.5	**86.7**		
4.75	**73.1**		
2.36	**63.3**		
2.00	**61.6**		
1.18	**55.9**		
0.600	**49.0**		
0.300	**44.0**		
0.150	**39.8**		
0.075	**31.6**		
0.0339	**23.2**		
0.0219	**19.5**		
0.0128	**15.8**		
0.0092	**14.0**		

Gravel:	26.9%	D_{10}:	0.0041
Sand:	41.5%	D_{30}:	0.0680
Silt:	23.5%	D_{60}:	1.7746
Clay:	8.1%	C_U:	431.22
		C_C:	0.63

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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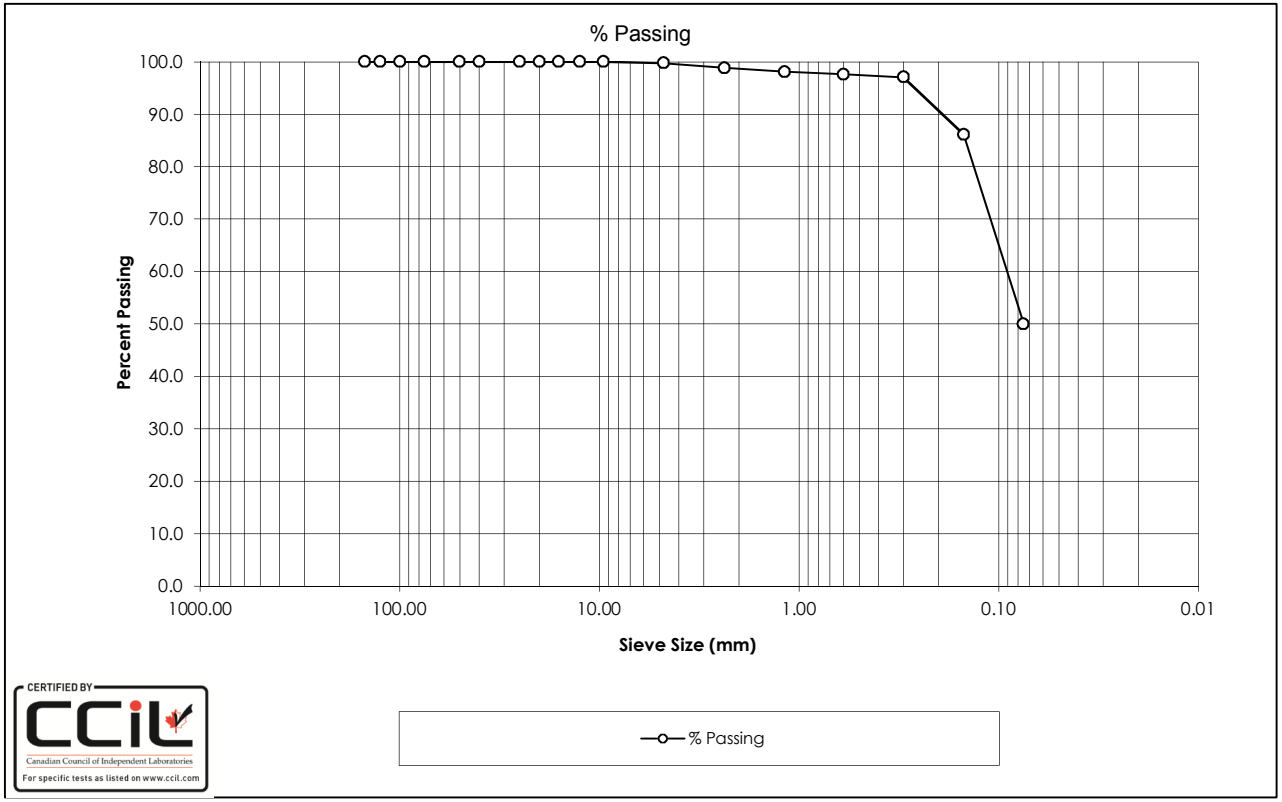
SAMPLE No.: AS2
SOURCE: BH17-67
TESTED BY: C. Woods

DATE RECEIVED: April 12, 2017
DATE TESTED: April 24, 2017
SAMPLE DESCRIPTION: Sandy Fines



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**100.0**	-	-
4.75	**99.8**	-	-
2.36	**98.9**	-	-
1.18	**98.1**	-	-
0.600	**97.6**	-	-
0.300	**97.1**	-	-
0.150	**86.1**	-	-
0.075	**50.0**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	0.2%	D_{30}:	-
Sand:	49.8%	D_{60}:	0.1001
Fines:	50.0%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

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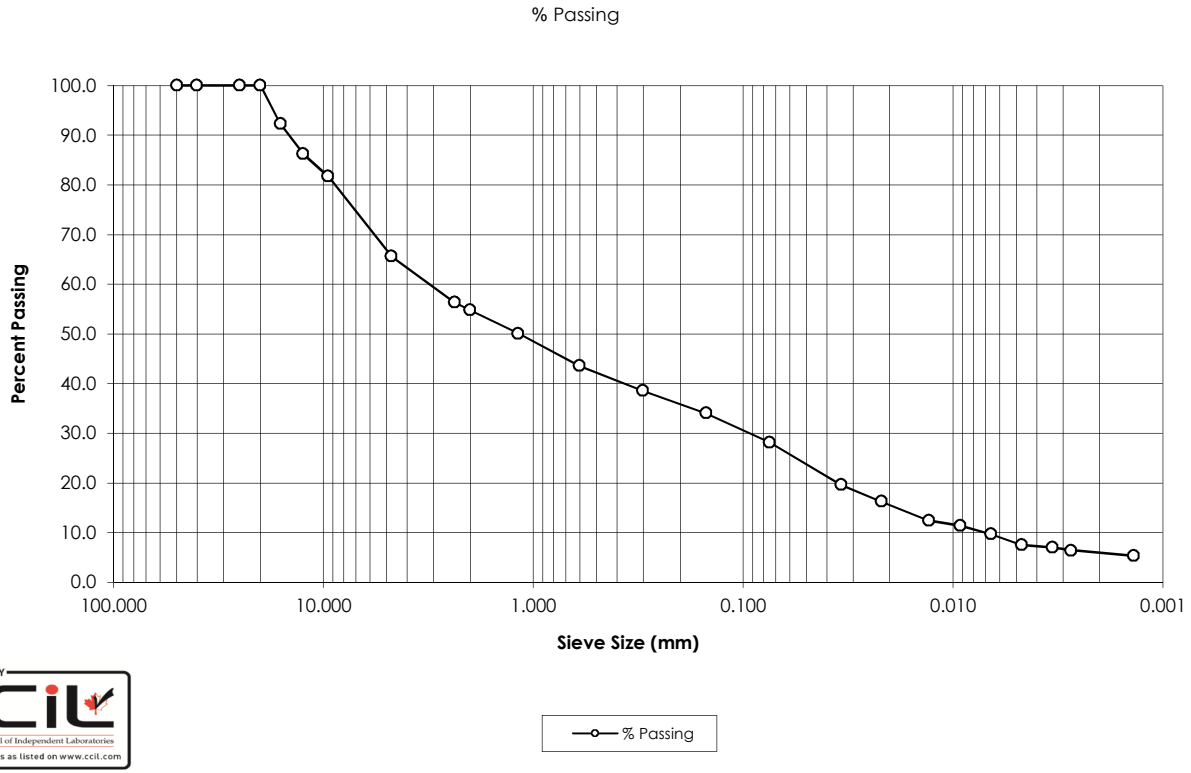
SAMPLE No.: AS5
SOURCE: BH17-67
TESTED BY: B. Pelkey

DATE TESTED: April 24, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sand with Gravel and Fines



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0066**	**9.7**
40.0	**100.0**	**0.0047**	**7.5**
25.0	**100.0**	**0.0033**	**6.9**
20.0	**100.0**	**0.0027**	**6.4**
16.0	**92.2**	**0.0014**	**5.3**
12.5	**86.2**		
9.5	**81.7**		
4.75	**65.6**		
2.36	**56.3**		
2.00	**54.7**		
1.18	**50.1**		
0.600	**43.5**		
0.300	**38.6**		
0.150	**34.0**		
0.075	**28.1**		
0.0340	**19.5**		
0.0219	**16.2**		
0.0130	**12.4**		
0.0092	**11.3**		

Gravel:	34.4%	D_{10}:	0.0072
Sand:	37.5%	D_{30}:	0.1003
Silt:	22.3%	D_{60}:	3.3551
Clay:	5.8%	C_U:	468.69
		C_C:	0.42

Comments: Sample description (USCS) derived from the Grain Size analysis only.

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Reviewed by:

Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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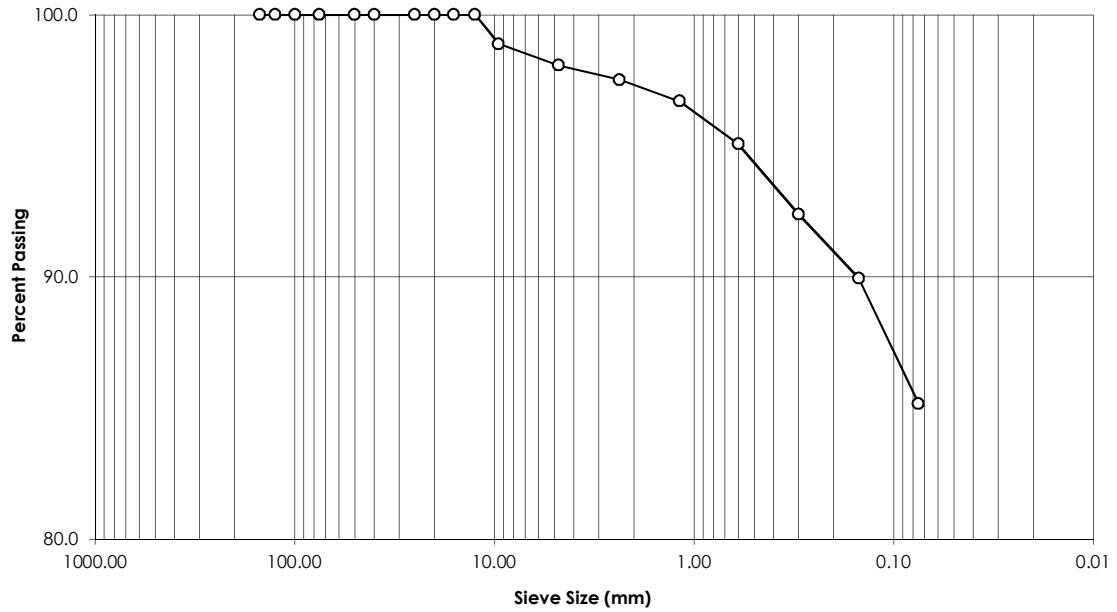
SAMPLE No.: AS2
SOURCE: BH17-68
TESTED BY: C. Woods

DATE RECEIVED: April 12, 2017
DATE TESTED: April 24, 2017
SAMPLE DESCRIPTION: Fines



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**98.9**	-	-
4.75	**98.1**	-	-
2.36	**97.5**	-	-
1.18	**96.7**	-	-
0.600	**95.1**	-	-
0.300	**92.4**	-	-
0.150	**89.9**	-	-
0.075	**85.2**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	1.9%	D_{30}:	-
Sand:	12.9%	D_{60}:	-
Fines:	85.2%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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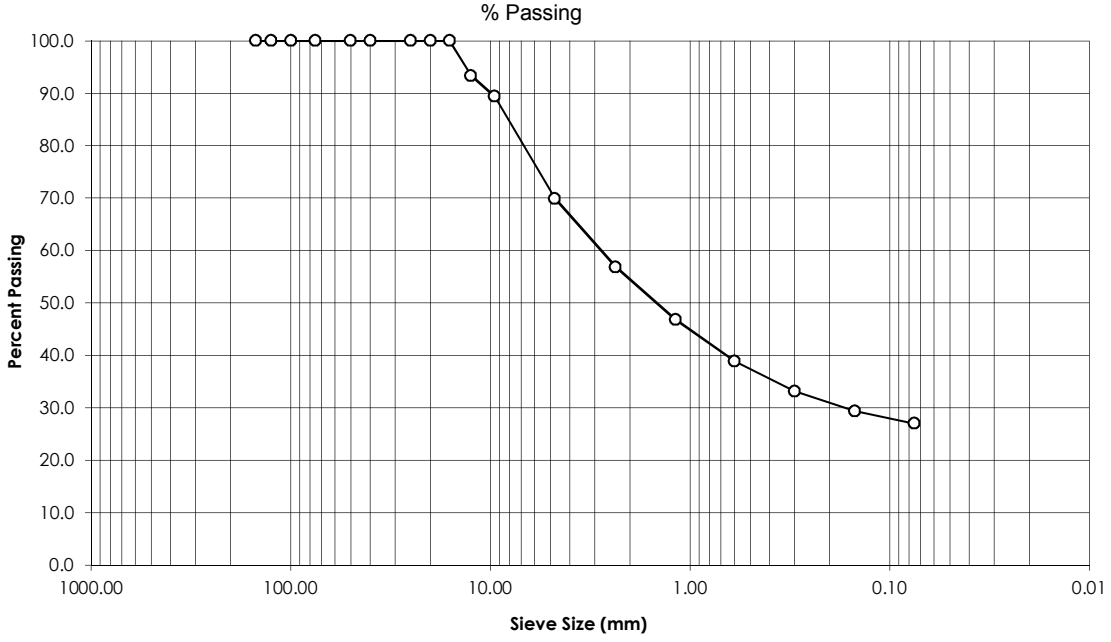
SAMPLE No.: AS3
SOURCE: BH17-68
TESTED BY: E. Wahl

DATE RECEIVED: April 12, 2017
DATE TESTED: April 25, 2017
SAMPLE DESCRIPTION: Sand with Gravel and Fines



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**93.4**	-	-
9.5	**89.3**	-	-
4.75	**69.9**	-	-
2.36	**56.8**	-	-
1.18	**46.8**	-	-
0.600	**38.9**	-	-
0.300	**33.2**	-	-
0.150	**29.4**	-	-
0.075	**27.0**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	30.1%	D_{30}:	0.1753
Sand:	43.0%	D_{60}:	2.9865
Fines:	26.9%	C_U:	-
		C_C:	-

Comments:

Reviewed by:

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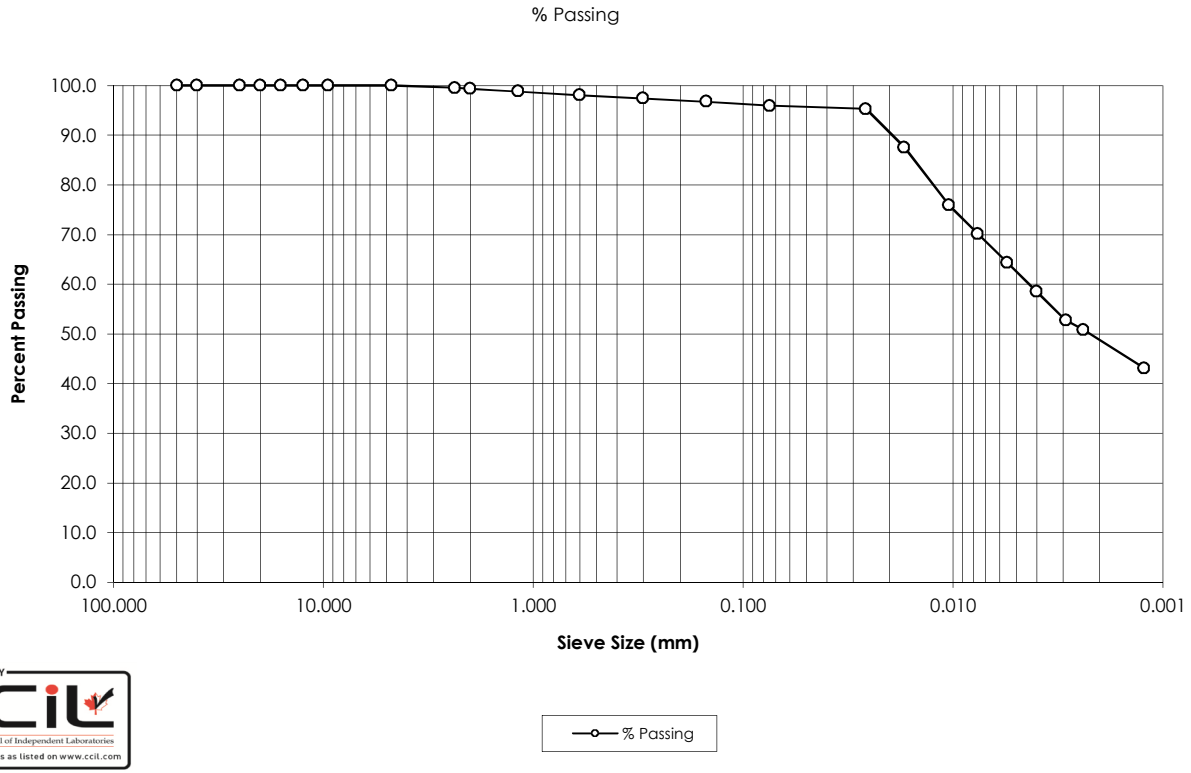
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS2
SOURCE: BH17-69
TESTED BY: B.Pelkey

DATE TESTED: April 25, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Lean Clay (CL)



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0055**	**64.4**
40.0	**100.0**	**0.0040**	**58.6**
25.0	**100.0**	**0.0029**	**52.8**
20.0	**100.0**	**0.0024**	**50.8**
16.0	**100.0**	**0.0012**	**43.1**
12.5	**100.0**		
9.5	**100.0**		
4.75	**100.0**		
2.36	**99.6**		
2.00	**99.3**		
1.18	**98.9**		
0.600	**98.1**		
0.300	**97.4**		
0.150	**96.8**		
0.075	**95.9**		
0.0260	**95.3**		
0.0171	**87.6**		
0.0105	**76.0**		
0.0076	**70.2**		

Gravel:	0.0%	D_{10}:	-
Sand:	4.1%	D_{30}:	-
Silt:	47.1%	D_{60}:	0.0044
Clay:	48.8%	C_U:	-
		C_C:	-

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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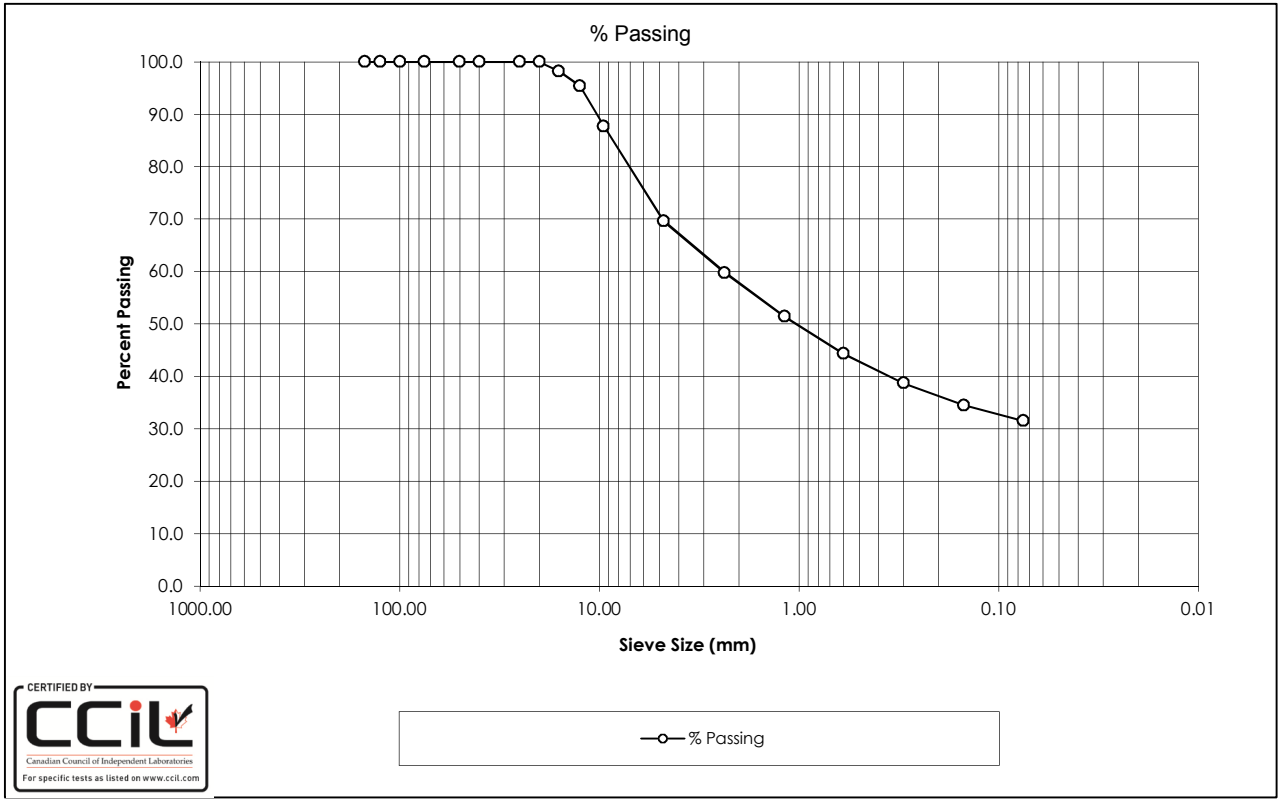
SAMPLE No.: AS4
SOURCE: BH17-69
TESTED BY: C. Woods

DATE RECEIVED: April 12, 2017
DATE TESTED: April 24, 2017
SAMPLE DESCRIPTION: Sand with Gravel and Fines



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**98.2**	-	-
12.5	**95.4**	-	-
9.5	**87.7**	-	-
4.75	**69.6**	-	-
2.36	**59.8**	-	-
1.18	**51.4**	-	-
0.600	**44.3**	-	-
0.300	**38.7**	-	-
0.150	**34.5**	-	-
0.075	**31.5**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	30.4%	D_{30}:	-
Sand:	38.1%	D_{60}:	2.4160
Fines:	31.5%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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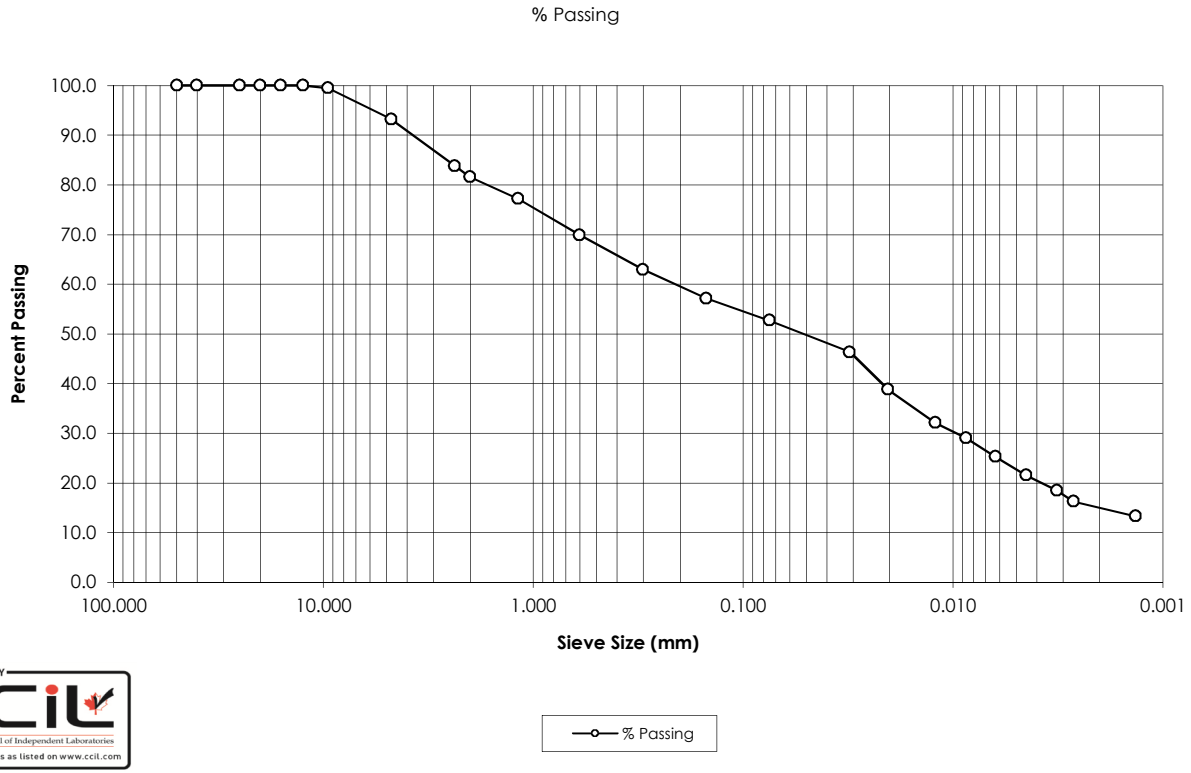
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS1
SOURCE: BH17-70
TESTED BY: B. Pelkey

DATE TESTED: April 25, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0063**	**25.3**
40.0	**100.0**	**0.0045**	**21.5**
25.0	**100.0**	**0.0032**	**18.5**
20.0	**100.0**	**0.0027**	**16.2**
16.0	**100.0**	**0.0013**	**13.2**
12.5	**100.0**		
9.5	**99.5**		
4.75	**93.2**		
2.36	**83.8**		
2.00	**81.6**		
1.18	**77.2**		
0.600	**69.9**		
0.300	**63.0**		
0.150	**57.2**		
0.075	**52.7**		
0.0310	**46.3**		
0.0204	**38.8**		
0.0121	**32.0**		
0.0087	**29.0**		

Gravel:	6.8%	D_{10}:	-
Sand:	40.5%	D_{30}:	0.0098
Silt:	37.7%	D_{60}:	0.2252
Clay:	15.0%	C_U:	-
		C_C:	-

Comments: Sample description (USCS) derived from the Grain Size analysis only.

Reviewed by:

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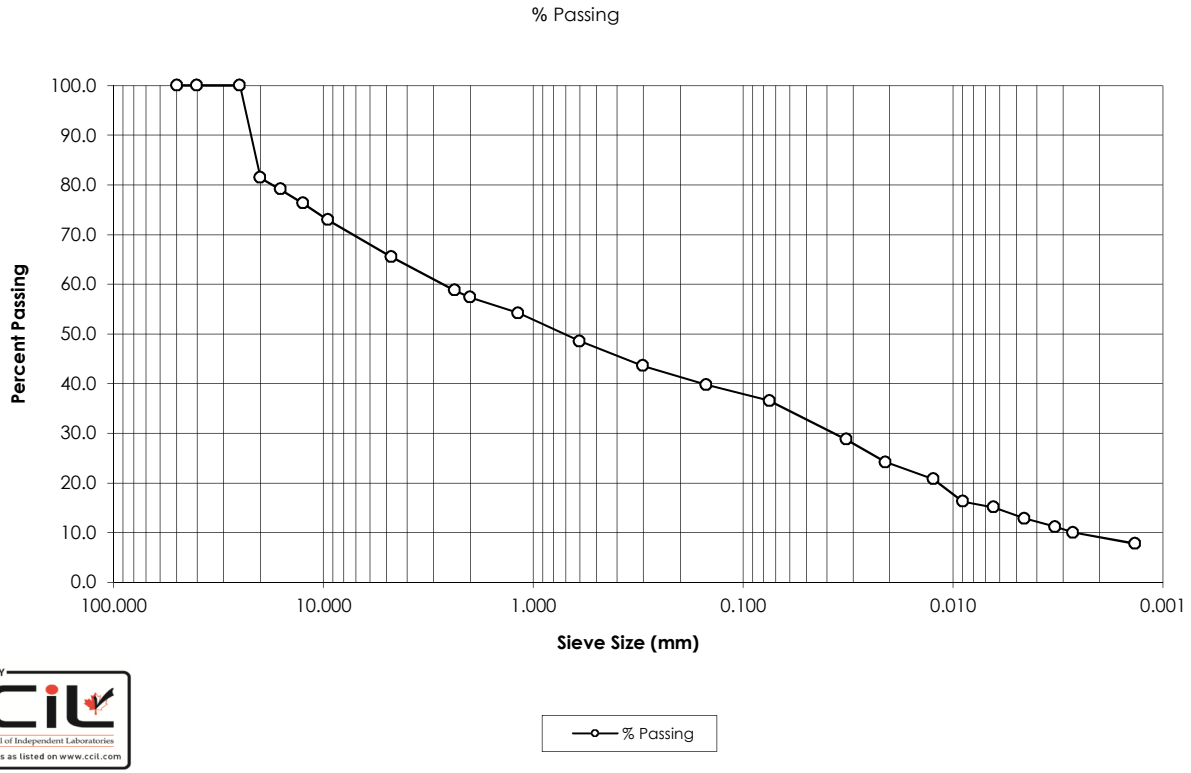
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS4
SOURCE: BH17-75
TESTED BY: B.Pelkey

DATE TESTED: April 25, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Silty, Clayey Gravel with Sand



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**15.1**
40.0	**100.0**	**0.0046**	**12.8**
25.0	**100.0**	**0.0033**	**11.1**
20.0	**81.5**	**0.0027**	**10.0**
16.0	**79.1**	**0.0014**	**7.7**
12.5	**76.3**		
9.5	**72.9**		
4.75	**65.5**		
2.36	**58.8**		
2.00	**57.3**		
1.18	**54.2**		
0.600	**48.5**		
0.300	**43.6**		
0.150	**39.8**		
0.075	**36.5**		
0.0322	**28.7**		
0.0210	**24.2**		
0.0124	**20.8**		
0.0090	**16.2**		

Gravel:	34.5%	D_{10}:	0.0027
Sand:	29.0%	D_{30}:	0.0401
Silt:	27.5%	D_{60}:	2.8108
Clay:	9.0%	C_U:	1043.60
		C_C:	0.21

Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

Reviewed by:

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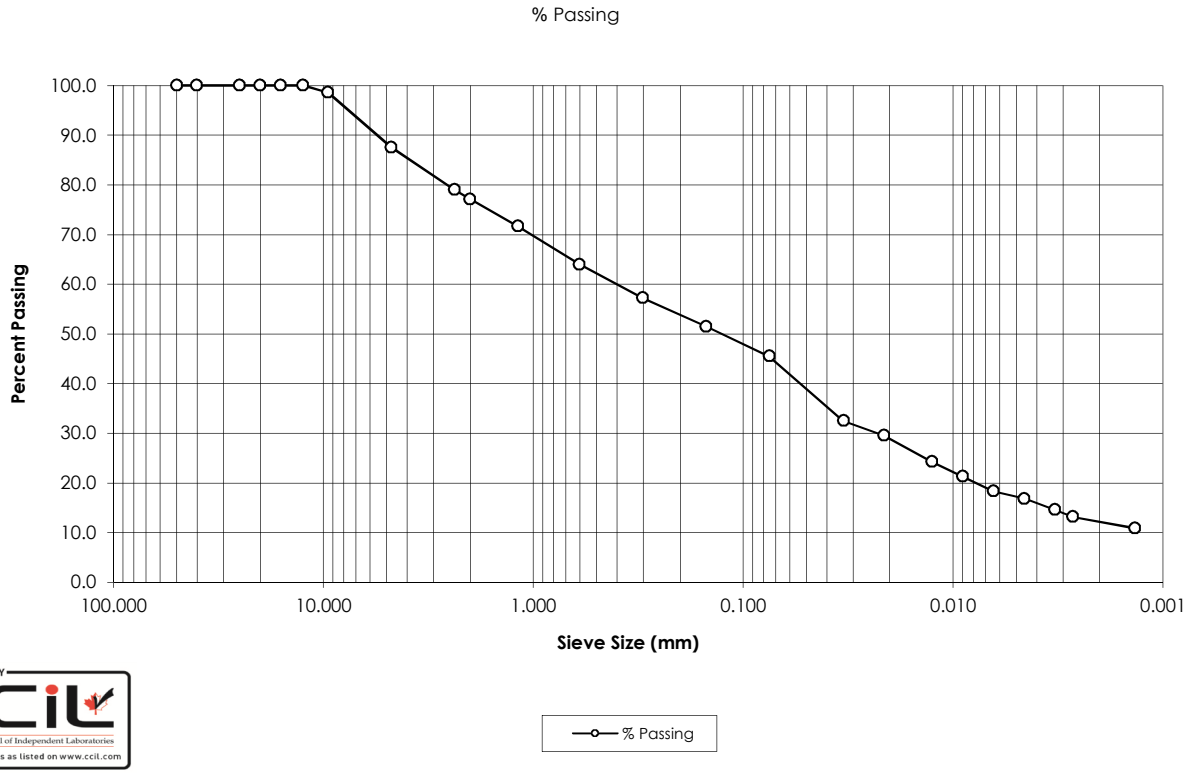
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS1
SOURCE: BH17-76
TESTED BY: B. Pelkey

DATE TESTED: April 25, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sand with silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0064**	**18.3**
40.0	**100.0**	**0.0046**	**16.8**
25.0	**100.0**	**0.0033**	**14.6**
20.0	**100.0**	**0.0027**	**13.1**
16.0	**100.0**	**0.0014**	**10.9**
12.5	**100.0**		
9.5	**98.6**		
4.75	**87.5**		
2.36	**79.0**		
2.00	**77.1**		
1.18	**71.6**		
0.600	**64.0**		
0.300	**57.2**		
0.150	**51.5**		
0.075	**45.5**		
0.0332	**32.4**		
0.0213	**29.5**		
0.0125	**24.3**		
0.0090	**21.3**		

Gravel:	12.5%	D_{10}:	-
Sand:	42.1%	D_{30}:	0.0235
Silt:	33.3%	D_{60}:	0.4286
Clay:	12.1%	C_U:	-
		C_C:	-

Comments: Sample description (USCS) derived from the Grain Size analysis only.

Reviewed by:

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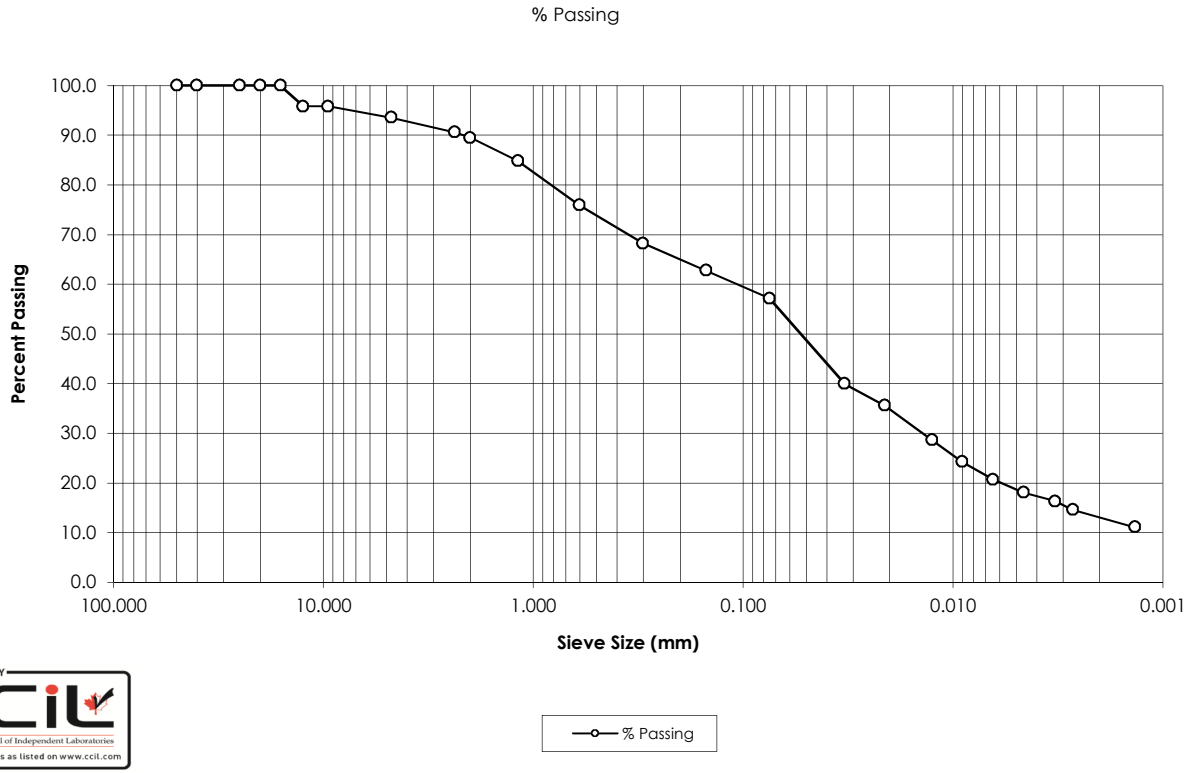
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS2
SOURCE: BH17-77
TESTED BY: B.Pelkey

DATE TESTED: April 25, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sandy Silty Clay (CL-ML)



Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0065**	**20.7**
40.0	**100.0**	**0.0046**	**18.1**
25.0	**100.0**	**0.0033**	**16.3**
20.0	**100.0**	**0.0027**	**14.5**
16.0	**100.0**	**0.0014**	**11.0**
12.5	**95.8**		
9.5	**95.8**		
4.75	**93.5**		
2.36	**90.6**		
2.00	**89.5**		
1.18	**84.8**		
0.600	**75.9**		
0.300	**68.2**		
0.150	**62.7**		
0.075	**57.2**		
0.0329	**40.0**		
0.0211	**35.6**		
0.0125	**28.6**		
0.0090	**24.2**		

Gravel:	6.5%	D_{10}:	-
Sand:	36.4%	D_{30}:	0.0144
Silt:	44.1%	D_{60}:	0.1140
Clay:	13.0%	C_U:	-
		C_C:	-

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Comments: Sample description (USCS) derived from both the Grain Size analysis and Atterberg Limit test results.

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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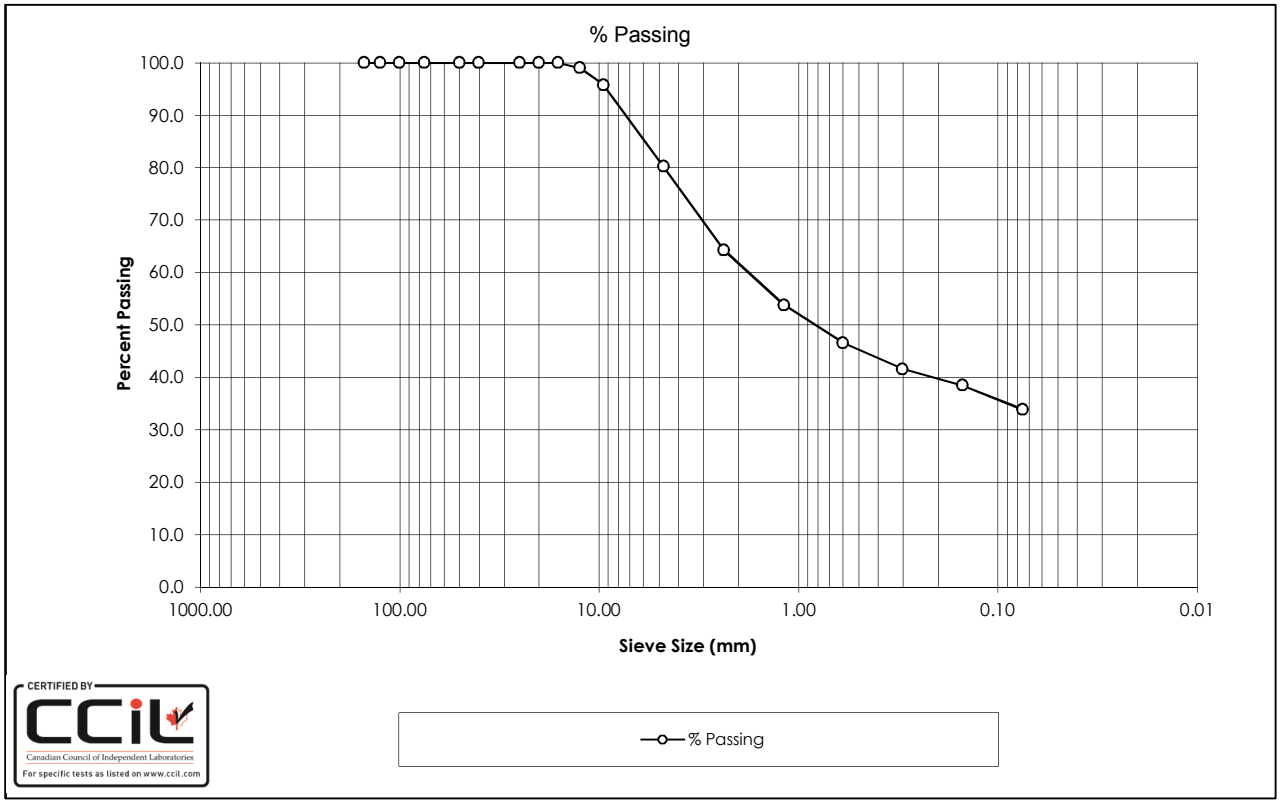
SAMPLE No.: AS2
SOURCE: BH78
TESTED BY: E. Wahl

DATE RECEIVED: April 12, 2017
DATE TESTED: April 25, 2017
SAMPLE DESCRIPTION: Sand with Gravel and Fines



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**99.0**	-	-
9.5	**95.8**	-	-
4.75	**80.2**	-	-
2.36	**64.2**	-	-
1.18	**53.8**	-	-
0.600	**46.6**	-	-
0.300	**41.6**	-	-
0.150	**38.4**	-	-
0.075	**33.8**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	19.8%	D_{30}:	-
Sand:	46.4%	D_{60}:	1.9104
Fines:	33.8%	C_u:	-
		C_c:	-

Comments: Sample description (USCS) derived from the Grain Size analysis only.

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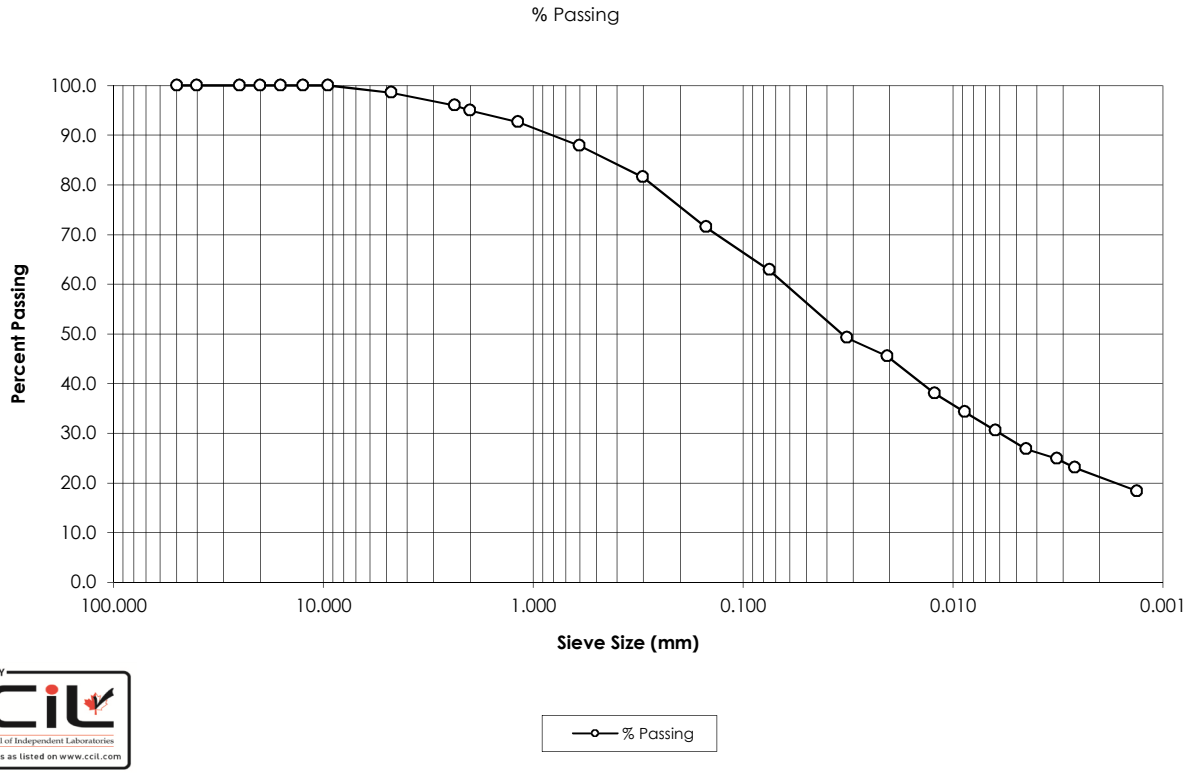
Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Tlicho Eng. & Enviro. Services Ltd
Project Name: Tlicho All Season Road
Project No: 144902448.300.300.100

SAMPLE No.: AS1
SOURCE: BH17-79
TESTED BY: B. Pelkey

DATE TESTED: April 25, 2017
DATE RECEIVED: April 12, 2017
SAMPLE DESCRIPTION: Sandy silt and/or clay



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Sieve (mm)	Sample % Passing	Sieve (mm)	Sample % Passing
50.0	**100.0**	**0.0063**	**30.5**
40.0	**100.0**	**0.0045**	**26.8**
25.0	**100.0**	**0.0032**	**24.9**
20.0	**100.0**	**0.0026**	**23.0**
16.0	**100.0**	**0.0013**	**18.3**
12.5	**100.0**		
9.5	**100.0**		
4.75	**98.6**		
2.36	**96.0**		
2.00	**95.0**		
1.18	**92.7**		
0.600	**87.9**		
0.300	**81.6**		
0.150	**71.5**		
0.075	**62.9**		
0.0321	**49.2**		
0.0206	**45.5**		
0.0122	**38.0**		
0.0088	**34.3**		

Gravel:	1.4%	D_{10}:	-
Sand:	35.7%	D_{30}:	0.0060
Silt:	41.7%	D_{60}:	0.0667
Clay:	21.2%	C_U:	-
		C_C:	-

Comments: Sample description (USCS) derived from the Grain Size analysis only.

Reviewed by:

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Grain Size Analysis

ASTM C136, ASTM C117

Client: Tlicho Eng. & Enviro. Services Ltd.
Project Name: Tlicho All Season Road
Project No: 144902248.300.300.100

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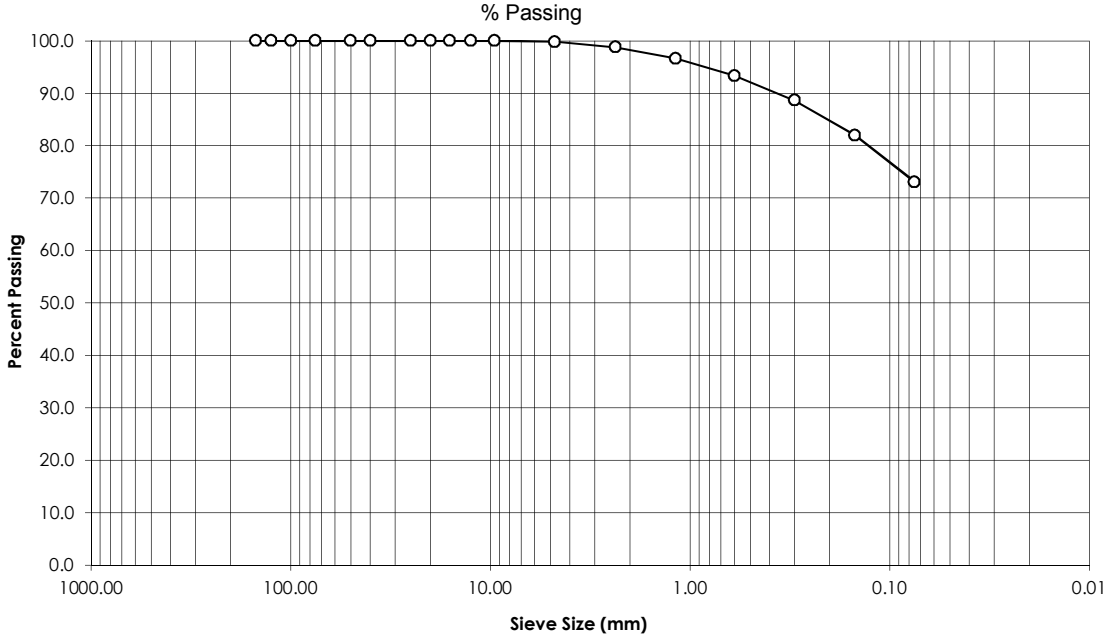
SAMPLE No.: AS1
SOURCE: BH17-81
TESTED BY: E. Wahl

DATE RECEIVED: April 12, 2017
DATE TESTED: April 24, 2017
SAMPLE DESCRIPTION: Fines with Sand



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Sieve (mm)	Sample % Passing	Specifications Lower	Specifications Upper
150.0	**100.0**	-	-
125.0	**100.0**	-	-
100.0	**100.0**	-	-
75.0	**100.0**	-	-
50.0	**100.0**	-	-
40.0	**100.0**	-	-
25.0	**100.0**	-	-
20.0	**100.0**	-	-
16.0	**100.0**	-	-
12.5	**100.0**	-	-
9.5	**100.0**	-	-
4.75	**99.8**	-	-
2.36	**98.8**	-	-
1.18	**96.7**	-	-
0.600	**93.4**	-	-
0.300	**88.7**	-	-
0.150	**82.0**	-	-
0.075	**73.1**	-	-

Cobble:	0.0%	D_{10}:	-
Gravel:	0.2%	D_{30}:	-
Sand:	26.7%	D_{60}:	-
Fines:	73.1%	C_u:	-
		C_c:	-

Comments:

Reviewed by:

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APPENDIX E

Thermistor Resistance versus Temperature Table
Thermistor Readings

Resistance versus Temperature Relationship 3000 Ohm NTC Thermistors

Ohms	Temp	Ohms	Temp	Ohms	Temp	Ohms	Temp	Ohms	Temp
201.1K	-50	16.60K	-10	2417	30	525.4	70	153.2	110
187.3K	-49	15.72K	-9	2317	31	507.8	71	149.0	111
174.5K	-48	14.90K	-8	2221	32	490.9	72	145.0	112
162.7K	-47	14.12K	-7	2130	33	474.7	73	141.1	113
151.7K	-46	13.39K	-6	2042	34	459.0	74	137.2	114
141.6K	-45	12.70K	-5	1959	35	444.0	75	133.6	115
132.2K	-44	12.05K	-4	1880	36	429.5	76	130.0	116
123.5K	-43	11.44K	-3	1805	37	415.6	77	126.5	117
115.4K	-42	10.86K	-2	1733	38	402.2	78	123.2	118
107.9K	-41	10.31K	-1	1664	39	389.3	79	119.9	119
101.0K	-40	9796	0	1598	40	376.9	80	116.8	120
94.48K	-39	9310	1	1535	41	364.9	81	113.8	121
88.46K	-38	8851	2	1475	42	353.4	82	110.8	122
82.87K	-37	8417	3	1418	43	342.2	83	107.9	123
77.99K	-36	8006	4	1363	44	331.5	84	105.2	124
72.81K	-35	7618	5	1310	45	321.2	85	102.5	125
68.30K	-35	7252	6	1260	46	311.3	86	99.9	126
64.09K	-33	6905	7	1212	47	301.7	87	97.3	127
60.17K	-32	6576	8	1167	48	282.4	88	94.9	128
56.51K	-31	6265	9	1123	49	283.5	89	92.5	129
53.10K	-30	5971	10	1081	50	274.9	90	90.2	130
49.91K	-29	56.92	11	1040	51	266.6	91	87.9	131
46.94K	-28	5427	12	1002	52	258.6	92	85.7	132
44.16K	-27	5177	13	965	53	250.9	93	83.6	134
39.13K	-25	4714	15	895.8	55	236.2	95	79.6	135
36.86K	-24	4500	16	863.3	56	229.3	96	77.6	136
34.73K	-23	4297	17	832.2	57	222.6	97	75.8	137
32.74K	-22	4105	18	802.3	58	216.1	98	73.9	138
30.87K	-21	3922	19	773.7	59	209.8	99	72.2	139
29.13K	-20	3748	20	746.3	60	203.8	100	70.4	140
27.49K	-19	3583	21	719.9	61	197.9	101	68.8	141
25.95K	-18	3426	22	694.7	62	192.2	102	67.1	142
24.51K	-17	3277	23	670.4	63	186.8	103	65.5	143
23.16K	-16	3135	24	647.1	64	181.5	104	64.0	144
21.89K	-15	3000	25	624.7	65	176.4	105	62.5	145
20.70K	-14	2872	26	603.3	66	171.4	106	61.1	146
19.58K	-13	2750	27	582.6	67	166.7	107	59.6	147
18.52K	-12	2633	28	562.8	68	162.0	108	58.3	148
17.53K	-11	2523	29	543.7	69	157.6	109	56.8	149
								55.6	150

Temperature calculated using:

Steinhart-Hart Linearization

$$T_C = \frac{1}{C_0 + C_1(\ln R) + C_3(\ln R)^3} - 273.15$$

3000 Ohm @ 25C NTC Thermistor

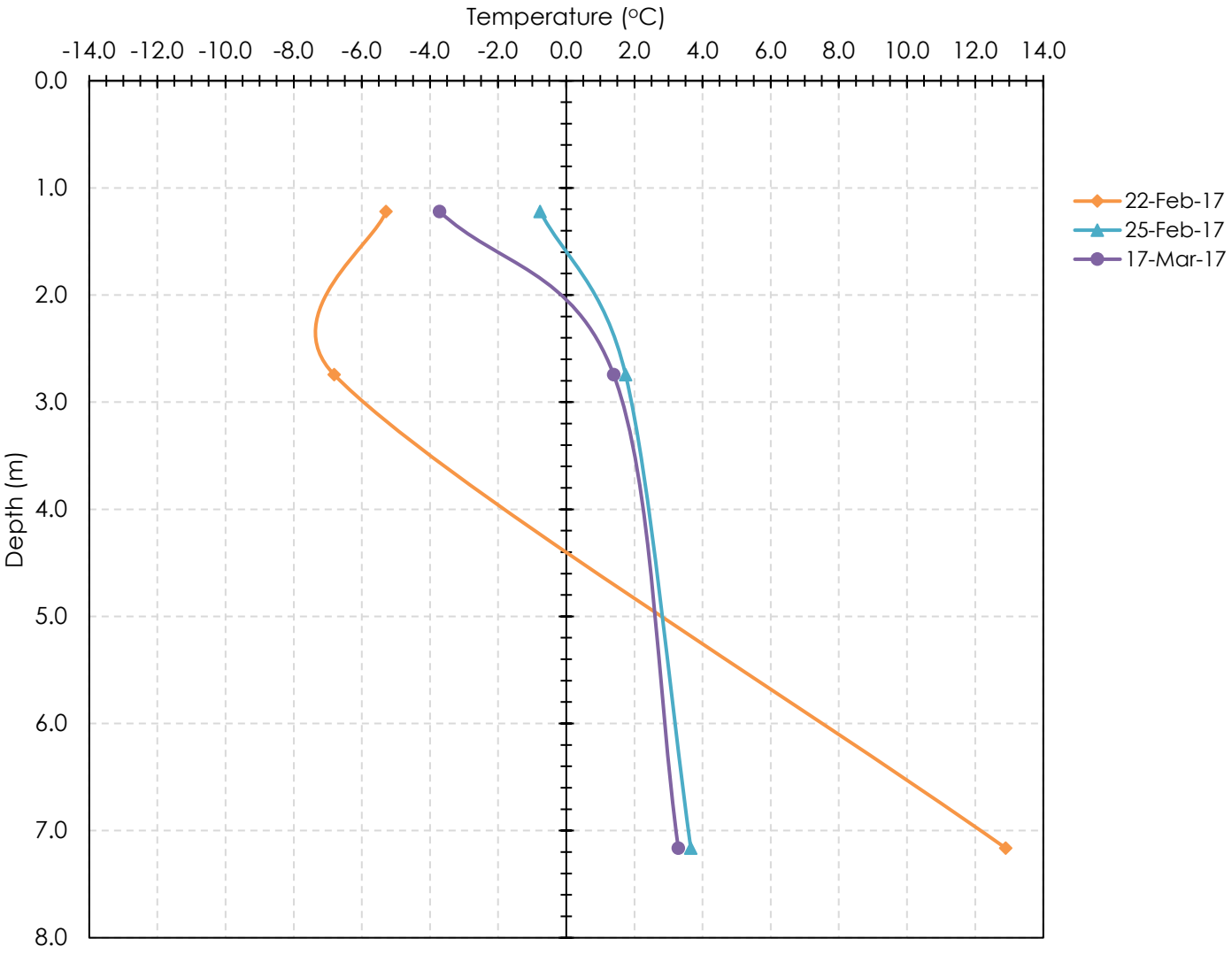
C_0= 0.0014051

C_1= 0.0002369

C_3= 0.0000001019

InR= Natural Log of Resistance

T_c= Temperature in °C



Borehole	**BH-01**					
Drilled:	22-Feb-17		Drilled Depth:		7.54	m
Installed:	22-Feb-17					
Reading			**Bead**	TS4338	TS4336	TS4372
Date		**Days**	**Depth (m)**	1.22	2.74	7.16
Post-Install	22-Feb-17	0	R (k ohms)	12.88	13.96	5.20
			T (°C)	-5.3	-6.8	12.9
2	25-Feb-17	3	R (k ohms)	10.18	8.96	8.14
			T (°C)	-0.8	1.7	3.7
3	17-Mar-17	23	R (k ohms)	11.86	9.12	8.29
			T (°C)	-3.7	1.4	3.3

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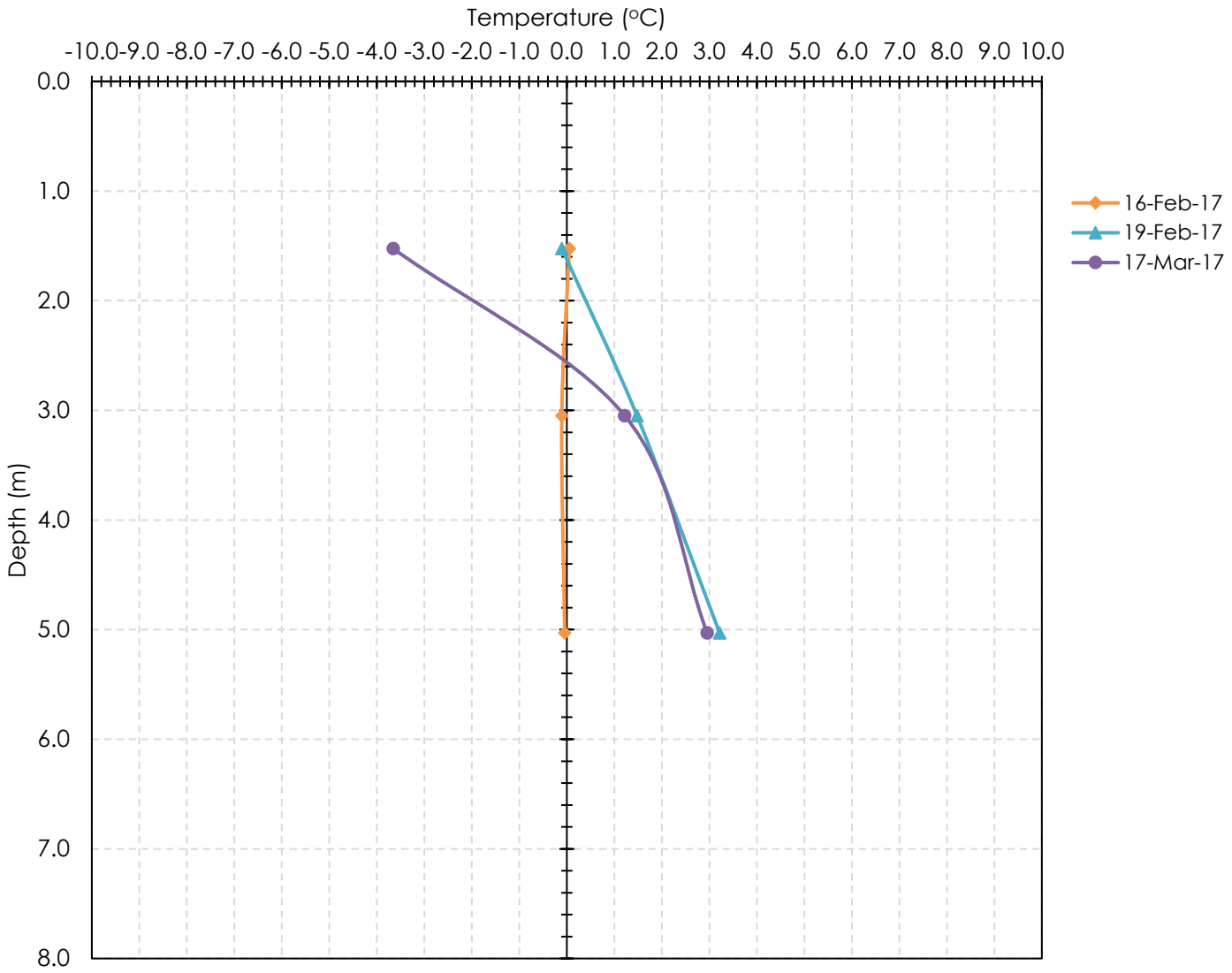
Thermistor Readings BH17-01

Figure No. E-1

Project No. 144902448



Borehole	**BH-03**					
Drilled:	16-Feb-17		Drilled Depth:		7.92	m
Installed:	16-Feb-17					
Reading			**Bead**	TS4364	TS4367	TS4366
Date		**Days**	**Depth (m)**	1.52	3.05	5.03
Post-Install	16-Feb-17	0	R (k ohms)	9.76	9.84	9.81
			T (°C)	0.1	-0.1	0.0
2	19-Feb-17	3	R (k ohms)	9.84	9.08	8.32
			T (°C)	-0.1	1.5	3.2
3	17-Mar-17	29	R (k ohms)	11.82	9.2	8.43
			T (°C)	-3.7	1.2	3.0

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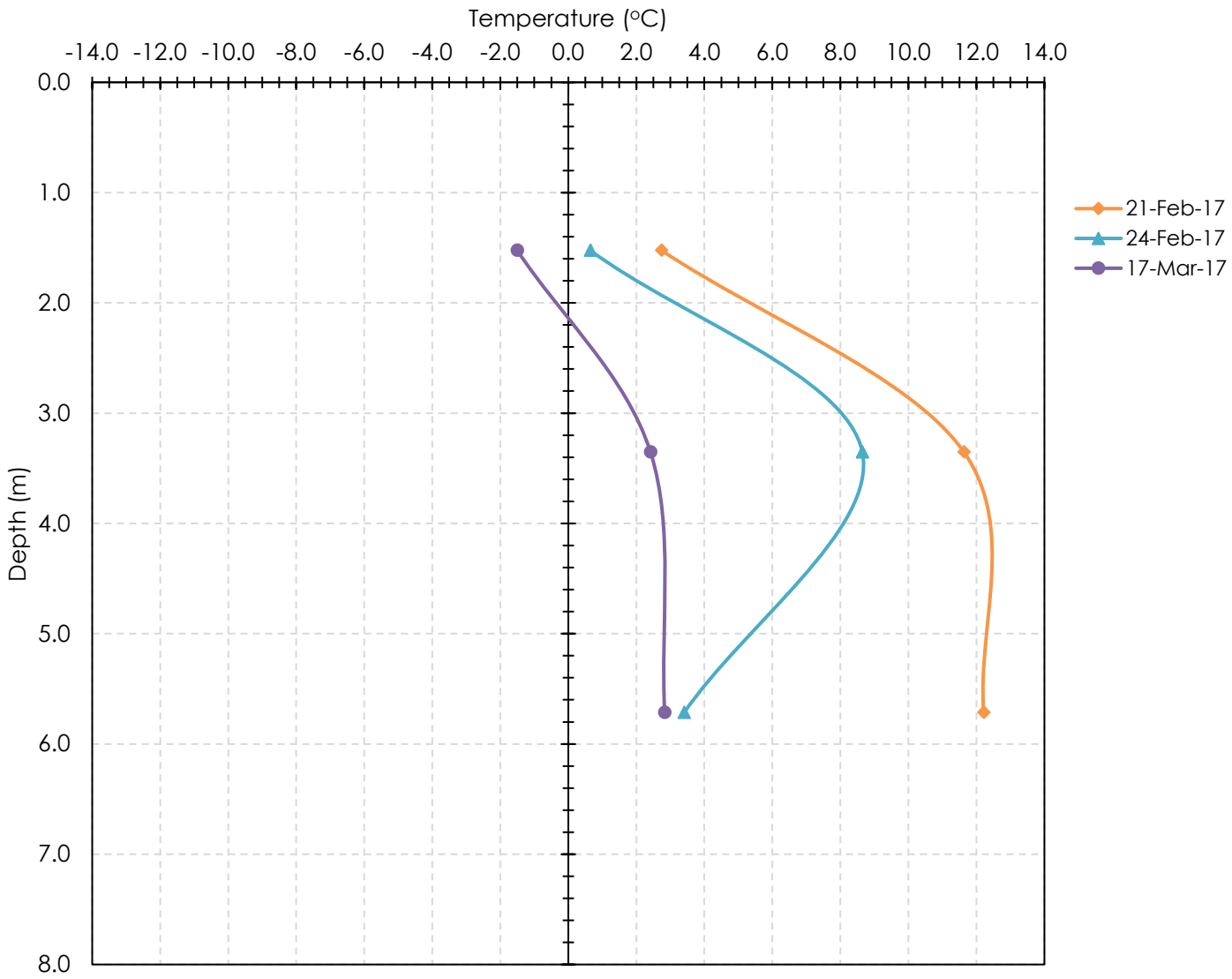
Thermistor Readings BH17-03

Figure No. E-2

Project No. 144902448



Borehole	**BH-19**					
Drilled:	21-Feb-17		Drilled Depth:		6.10	m
Installed:	21-Feb-17					
Reading			**Bead**	TS4359	TS4361	TS4360
Date		**Days**	**Depth (m)**	1.52	3.35	5.72
Post-Install	21-Feb-17	0	R (k ohms)	8.52	5.52	5.37
			T (°C)	2.7	11.6	12.2
2	24-Feb-17	3	R (k ohms)	9.47	6.37	8.24
			T (°C)	0.6	8.6	3.4
3	17-Mar-17	24	R (k ohms)	10.57	8.66	8.48
			T (°C)	-1.5	2.4	2.8

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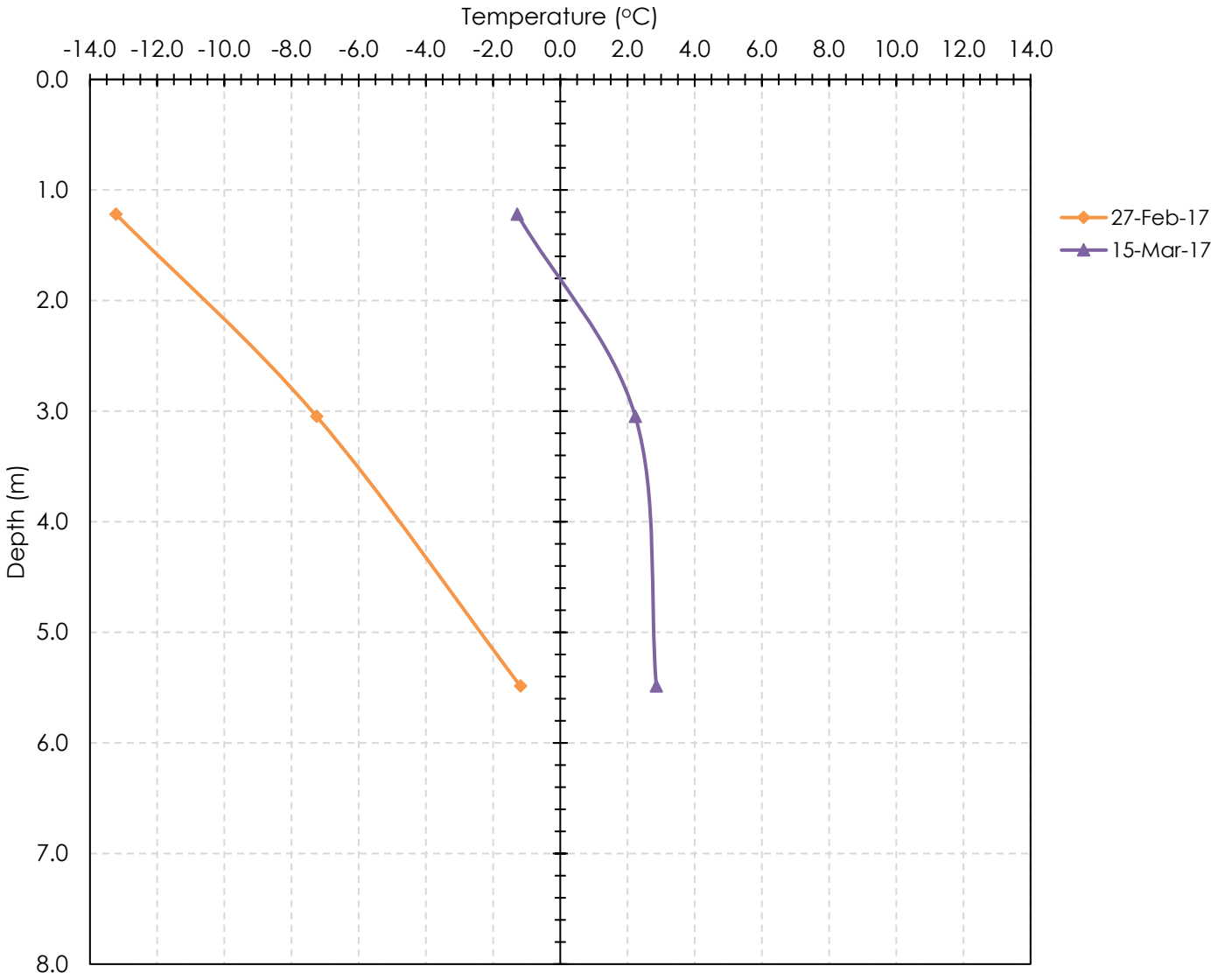
Thermistor Readings BH17-19

Figure No. E-3

Project No. 144902448



Borehole	**BH-23**					
Drilled:	26-Feb-17		Drilled Depth:		6.02	m
Installed:	27-Feb-17					
Reading			**Bead**	TS4357	TS4358	TS4354
Date		**Days**	**Depth (m)**	1.22	3.05	5.49
Post-Install	27-Feb-17	0	R (k ohms)	19.78	14.29	10.40
			T (°C)	-13.2	-7.3	-1.2
2	15-Mar-17	16	R (k ohms)	10.45	8.74	8.47
			T (°C)	-1.3	2.2	2.9

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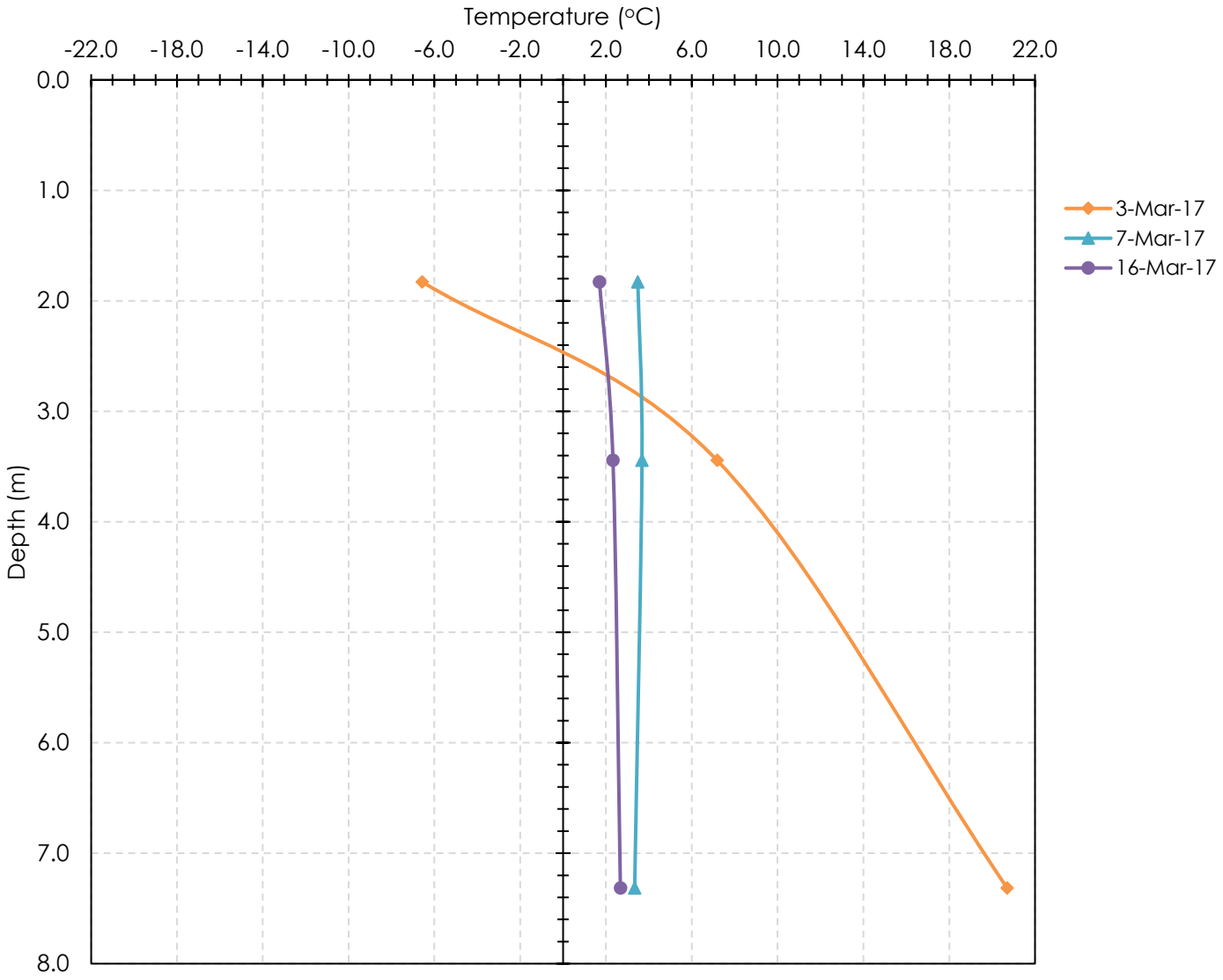
Thermistor Readings BH17-23

Figure No. E-4

Project No. 144902448



Borehole	**BH-29**					
Drilled:	3-Mar-17		Drilled Depth:		7.77	m
Installed:	3-Mar-17					
Reading			**Bead**	TS4262	TS4335	TS4370
Date		**Days**	**Depth (m)**	1.83	3.44	7.32
Post-Install	3-Mar-17	0	R (k ohms)	13.78	6.84	3.63
			T (°C)	-6.6	7.2	20.7
2	7-Mar-17	4	R (k ohms)	8.21	8.13	8.27
			T (°C)	3.5	3.7	3.3
3	16-Mar-17	13	R (k ohms)	8.98	8.7	8.55
			T (°C)	1.7	2.3	2.7

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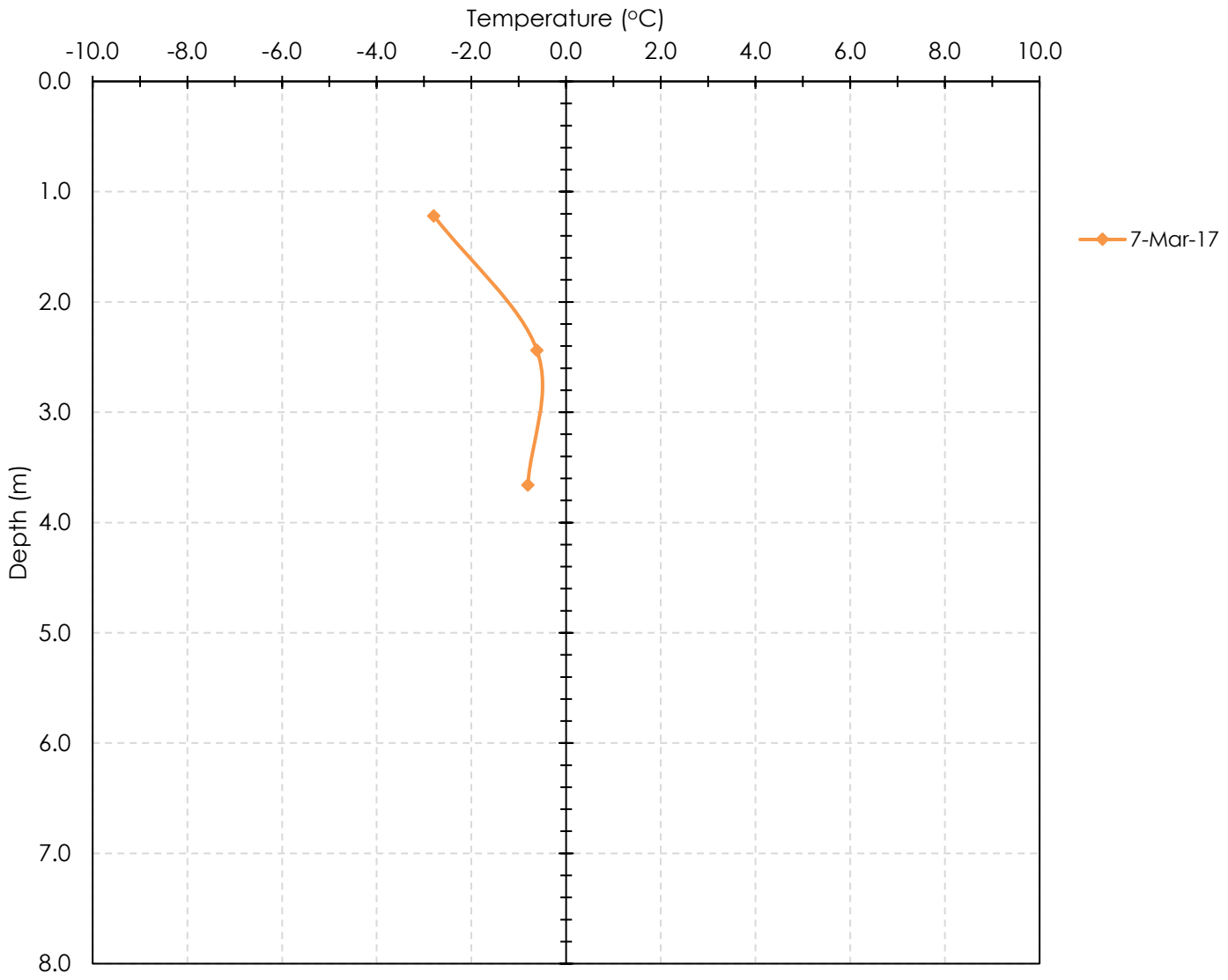
Thermistor Readings BH17-29

Figure No. E-5

Project No. 144902448



Borehole	**BH-37**					
Drilled:	7-Mar-17		Drilled Depth:		4.27	m
Installed:	7-Mar-17					
Reading			**Bead**	TS4330	TS4331	TS4375
Date		**Days**	**Depth (m)**	1.22	2.44	3.66
Post-Install	7-Mar-17	0	R (k ohms)	11.30	10.10	10.20
			T (°C)	-2.8	-0.6	-0.8

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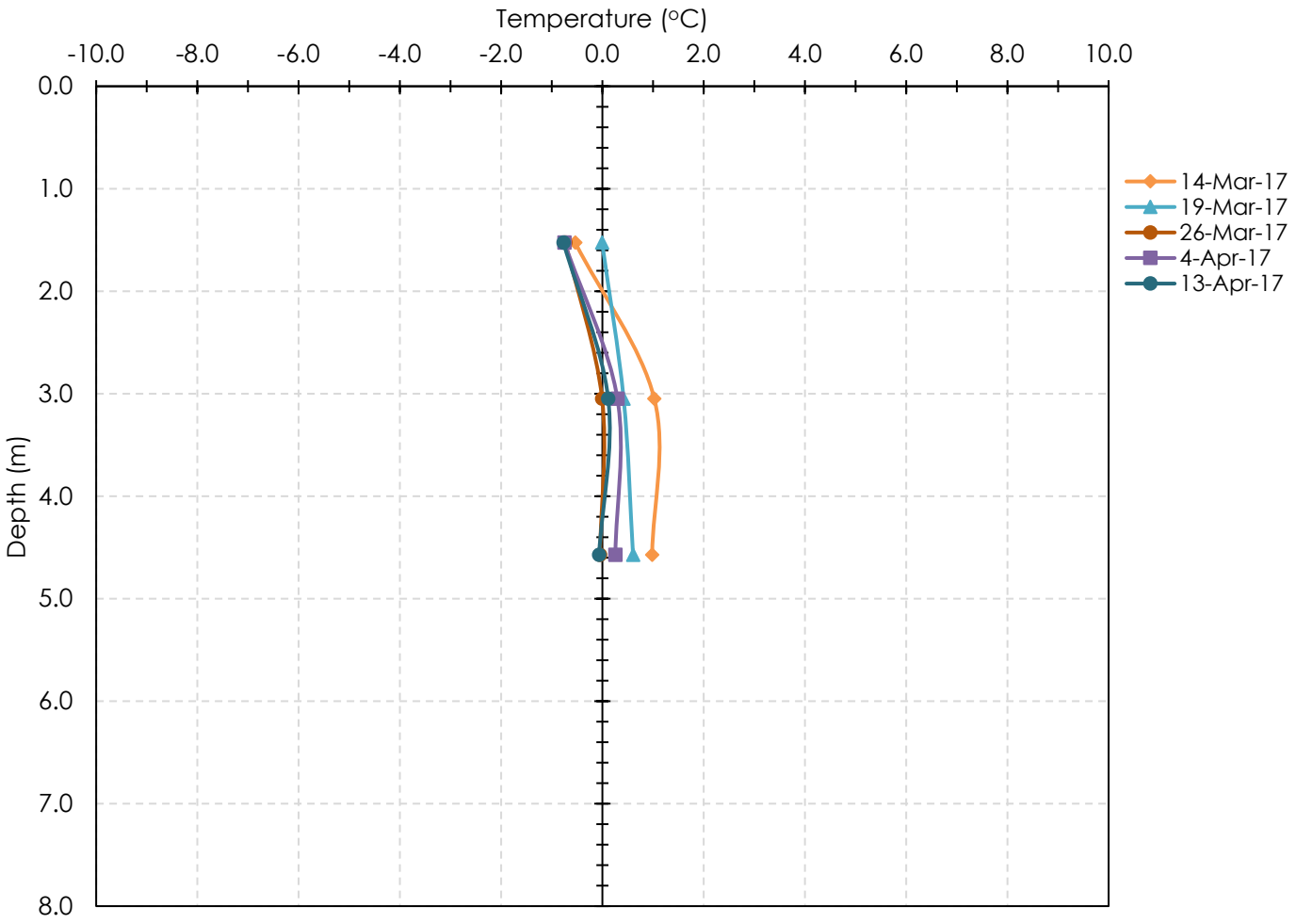
Thermistor Readings BH17-37

Figure No. E-6

Project No. 144902448



Borehole	**BH-48**					
Drilled:	14-Mar-17		Drilled Depth:		5.49	m
Installed:	14-Mar-17					

Reading			**Bead**	TS4323	TS4348	TS4353
Date		**Days**	**Depth (m)**	1.52	3.05	4.57
Post-Install	14-Mar-17	0	R (k ohms)	10.06	9.29	9.31
			T (°C)	-0.5	1.0	1.0
2	19-Mar-17	5	R (k ohms)	9.79	9.58	9.49
			T (°C)	0.0	0.4	0.6
3	26-Mar-17	12	R (k ohms)	10.16	9.79	9.81
			T (°C)	-0.7	0.0	0.0
4	4-Apr-17	21	R (k ohms)	10.17	9.64	9.66
			T (°C)	-0.8	0.3	0.3
5	13-Apr-17	30	R (k ohms)	10.18	9.73	9.82
			T (°C)	-0.8	0.1	-0.1

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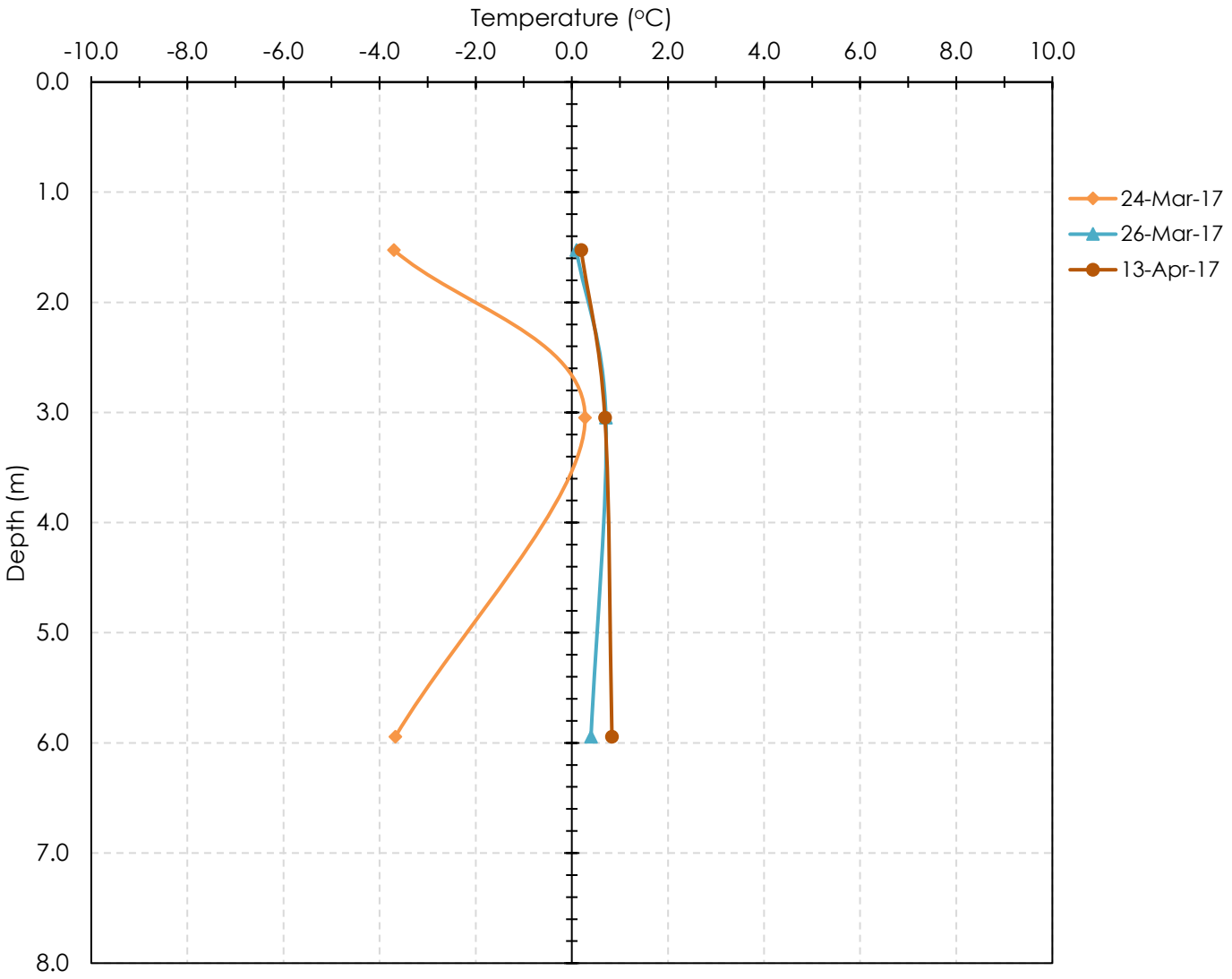
Thermistor Readings BH17-48

Figure No. E-7

Project No. 144902448



Borehole	**BH-61**					
Drilled:	24-Mar-17		Drilled Depth:		6.10	m
Installed:	24-Mar-17					
Reading			**Bead**	TS4345	TS4346	TS4351
Date		**Days**	**Depth (m)**	1.83	3.44	7.32
Post-Install	24-Mar-17	0	R (k ohms)	11.85	9.65	11.83
			T (°C)	-3.7	0.3	-3.7
2	26-Mar-17	2	R (k ohms)	9.74	9.44	9.59
			T (°C)	0.1	0.7	0.4
3	13-Apr-17	20	R (k ohms)	9.69	9.45	9.38
			T (°C)	0.2	0.7	0.8

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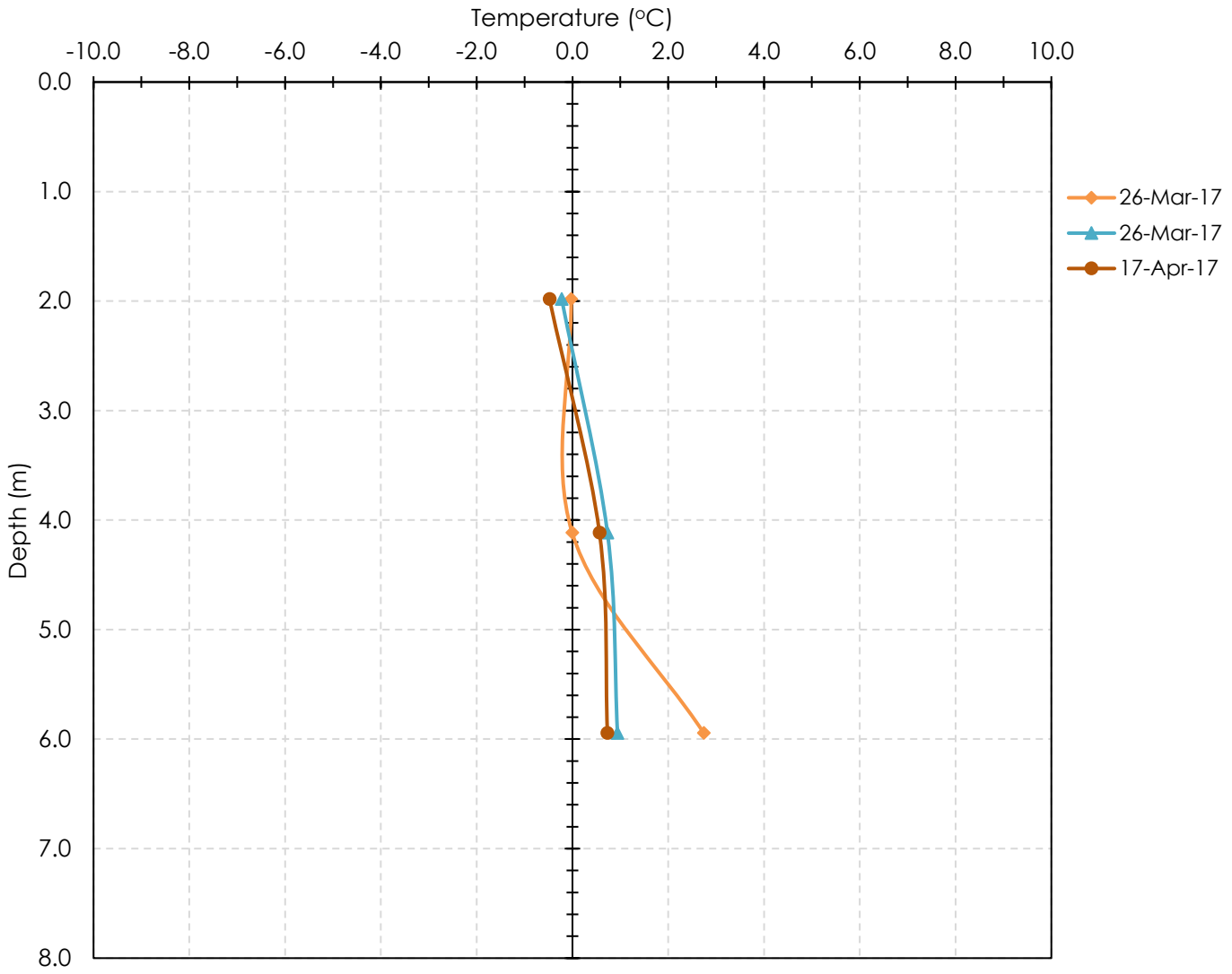
Thermistor Readings BH17-61

Figure No. E-8

Project No. 144902448



Borehole	**BH-67**					
Drilled:	24-Mar-17		Drilled Depth:		6.40	m
Installed:	24-Mar-17					
Reading			**Bead**	TS4321	TS4320	TS4318
Date		**Days**	**Depth (m)**	1.98	4.11	5.94
Post-Install	26-Mar-17	0	R (k ohms)	9.80	9.79	8.52
			T (°C)	0.0	0.0	2.7
2	26-Mar-17	0	R (k ohms)	9.90	9.43	9.33
			T (°C)	-0.2	0.7	0.9
3	17-Apr-17	22	R (k ohms)	10.03	9.51	9.43
			T (°C)	-0.5	0.6	0.7

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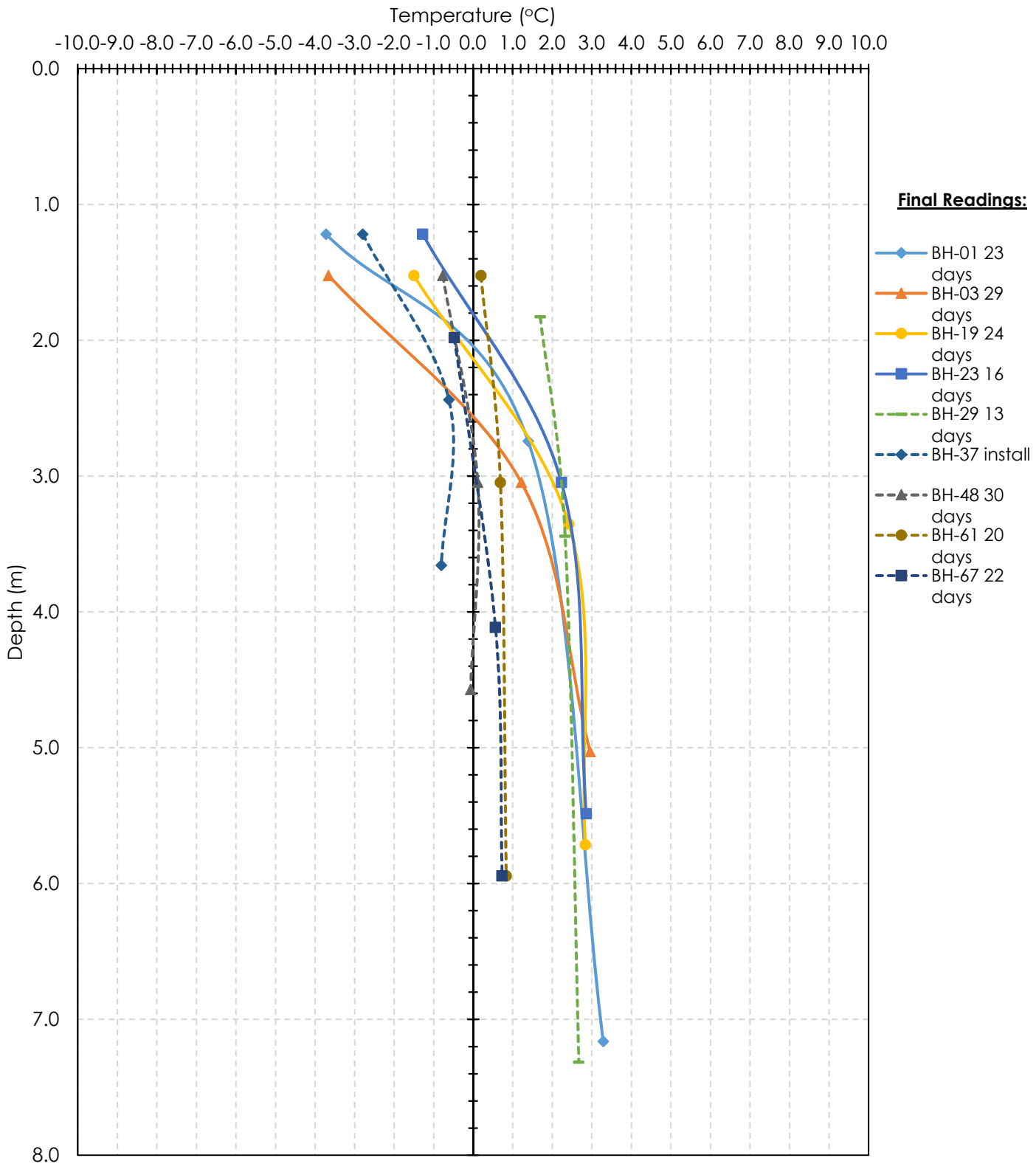
Thermistor Readings BH17-67

Figure No. E-9

Project No. 144902448



Stantec	**Project:** Geotechnical Investigation, Proposed Tlicho All-Season Road, Northwest Territories	
	Client: Tlicho Engineering & Environmental Services	**Figure E-10** **All Boreholes (≥13 days)** **Thermistor Ground Temperature Profiles**
	Project #: 144902448	