



December 5, 2013

FOUNDATION INVESTIGATION REPORT

**SWAMP CROSSINGS/HIGH FILL AREAS, DEEP CUT AND
EXCESS MATERIAL MANAGEMENT AREA
REALIGNMENT OF HIGHWAY 66 AT VIRGINIATOWN FROM 10.6 KM EAST OF
HIGHWAY 624 EASTERLY 3.4 KM
MINISTRY OF TRANSPORTATION, ONTARIO
GWP 5091-07-00**

Submitted to:

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REPORT





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PART A

FOUNDATION INVESTIGATION REPORT
SWAMP CROSSING / HIGH FILL AREAS, DEEP CUT AND EXCESS
MATERIAL MANAGEMENT AREA
REALIGNMENT OF HIGHWAY 66 AT VIRGINIATOWN
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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by McCormick Rankin (MRC), a member of MMM Group Limited (MMM) on behalf of the Ministry of Transportation, Ontario (MTO) to provide foundation engineering services for four swamp crossing/high fill embankments and one deep cut area within the limits of the new Highway 66 realignment to the east of the junction with Highway 624, as well as for the excess material management (EMM) area. The proposed work is part of the overall Highway 66 realignment from 10.6 km east of Highway 624 easterly 3.4 km. The foundation engineering components within the overall project limits include the engineering of: high fill embankments and embankments over swamps; a deep cut section; an excess material management area; as well as a number of culverts. The proposed foundation embankment sections along the Highway 66 realignment extend from approximately 11.0 km east of the junction of Highway 66 and Highway 624 easterly for a total distance of about 2.5 km. The general location of this section of the new Highway 66 alignment is shown on the Index Plan on Drawing 1.

The Terms of Reference (TOR) for the foundation investigation are outlined in MTO's Request for Proposal, dated October 2010. Golder's proposal (Scope of Work) for foundation engineering services is contained in Section 6.8 of MRC's Technical Proposal for this assignment. The work has been carried out in accordance with Golder's Supplementary Specialty Plan for foundation engineering services for this project, dated February 25, 2011. The Base Plan showing the proposed horizontal alignment of the Highway 66 realignment was provided to Golder by MRC.

This report addresses the investigation carried out for the Highway 66 realignment swamp crossing/high fill areas, deep cut area and EMM area only. A detailed list of the swamp crossing/high fill areas, deep cut area and EMM area is presented in Table 1. Separate reports address the foundation investigations for the culvert crossings.

The purpose of this investigation is to establish the subsurface conditions along the new highway alignment at the proposed swamp crossing/high fill areas, deep cut area and EMM area by methods of borehole drilling, rock coring, in situ testing and laboratory testing on selected samples. The centreline of the proposed highway realignment was staked in the field by MRC and the foundation investigation was carried out as defined in the TOR.

2.0 SITE DESCRIPTION

The new Highway 66 alignment is oriented generally in an east-west direction within the Township of McGarry. The section of the new highway realignment is approximately 2.5 km long and extends easterly from about 11.0 km north of the junction of Highway 66 and Highway 624. The proposed new alignment within this section of the highway is up to about 500 m northwest of the existing Highway 66 alignment. Along the proposed realignment the land use varies from industrial (i.e., formerly mining), recreational (ATV and snowmobile trails) to residential.

In general, the topography of this section of the highway consists of rolling terrain, including moderately to densely populated treed areas with two bedrock outcrops separated by large low-lying swamp areas, occasional ponded/standing water and various types of vegetation and surface organics. The ground surface within the limits of the swamp crossing/high fill/deep cut/EMM areas varies between about Elevation 302.5 m and Elevation 317.5 m, across the site. The large bedrock outcrops at the west and east ends of the site rise up to about Elevation 344 m and 330 m, respectively. A detailed description of each investigated swamp



crossing/high fill/deep cut/EMM area is presented in Section 4.0. The locations of these areas are shown in plan on Drawing 1.

3.0 INVESTIGATION PROCEDURES

3.1 Foundation Investigation

The subsurface investigation for the Highway 66 realignment swamp crossing/high fill areas, deep cut area and EMM area was carried out between July 26 and August 6, 2011, between July 26 and November 15, 2012, and between May 5 and May 25, 2013, during which time a total of one hundred and eleven (111) boreholes, seven (7) Cone Penetration Tests (CPTs) and thirty-three (33) Dynamic Cone Penetration Tests (DCPTs) were advanced at the locations summarized in Table 1 and shown on Drawings A1 to F1 in Appendices A to F. In general, boreholes, CPTs and DCPTs were advanced along the centreline and the toes of the proposed embankment. At the deep cut area, which will partially cut through a rock outcrop and an overburden plateau along the south toe of the roadway, the purpose of the investigation is to assess the subsurface conditions along the south toe of the roadway overburden cut as a supplementary assessment to the pavement investigation.

The field investigation completed in 2011 was carried out using track mounted D50 Gas and D50 Turbo drill rigs supplied and operated by Walker Drilling Ltd. of Barrie, Ontario. The field investigation completed in 2012 was carried out using a track mounted CME 55 and portable drilling equipment supplied and operated by Landcore Drilling Inc. of Sudbury, Ontario. The field investigation completed in 2013 was carried out using a track-mounted CME-55 drill rig supplied and operated by George Downing Estate Drilling Ltd. of Grenville sur la Rouge, Quebec.

The boreholes were advanced through the overburden using 108 mm inner diameter hollow-stem augers, and/or 'NW' casing with wash boring techniques. In general, soil samples were advanced at intervals of depth of about 0.75 m, 1.5 m and 3.0 m, using a 50 mm outer diameter (O.D.) split-spoon sampler driven by automatic or cathead hammers on the track-mounted drill rigs, and carried out in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586, Standard Test Method for Standard Penetration Test). Boreholes advanced by portable equipment employed full-weight hammers, dropped from the standard SPT height. Samples of the cohesive soils were obtained at selected locations using 76 mm O.D. thin-walled 'Shelby' tubes (ASTM D1587, Standard Practice for Thin-Walled Tube Sampling) for relatively undisturbed samples. Field vane shear tests were carried out in cohesive soils for assessment of undrained shear strengths (ASTM D2573, Standard Test Method for Field Vane Strength Shear Test) using MTO Standard 'N' size vanes. Samples of the bedrock were obtained using an 'NQ' size rock core barrel. All boreholes not instrumented with a standpipe piezometer were backfilled with bentonite upon completion in accordance with Ontario Regulation 903 Wells (as amended).

The boreholes and DCPTs were advanced to depths up to 29.3 m below existing ground surface, generally penetrating 3 m into competent material, which is defined as material that will provide resistance to settlement or instability of the embankments, or to refusal. At some locations, boreholes and DCPTs were terminated on refusal to further auger, casing and/or split-spoon advancement, or dynamic cone penetration. These depths to refusal do not confirm bedrock surface elevations, but may be inferred to indicate potential proximity to the bedrock surface. In thirteen (13) boreholes, bedrock was cored for core lengths between about 3.0 m and 4.1 m and photographs of the recovered rock core samples are provided in the relevant appendices noted in Section 4.

The CPTs, an in situ testing technique used for the nearly continuous characterisation of subsurface soils, were advanced to depths below ground surface ranging from about 11.5 m to 23.6 m, corresponding to the bottom of



the cohesive deposit as defined by the adjacent boreholes. The CPT consists of a special probe equipped with electronic sensing elements to continuously measure tip resistance, local side friction on a sleeve and porewater pressure. It is pushed into the ground at a constant rate (ASTM D5778-07 Standard Test Method for Piezocone Penetration) and a nearly continuous stratigraphic profile, together with inferred engineering properties such as shear strength and stress history, can be interpreted from the results.

At this site, the CPT equipment was advanced using the hydraulic system on the drill rig. Cone Penetration Test sheets are included with the Record of Borehole sheets in Appendix C. Profiles of tip resistance, friction and porewater pressure are presented together with interpreted profiles of undrained shear strength and classification index that is used to infer the soil type (i.e., soil stratigraphy).

The groundwater conditions and water levels in the open boreholes were observed during the drilling operations and are described on the Record of Borehole sheets provided in Appendices A to F. Piezometers were installed in Boreholes C1-2, BC1-3, BC1A-1, BC2-2, BC5-2 and BC6-2 to permit monitoring of the groundwater levels at their respective locations. Piezometers C1-2, BC5-2 and BC6-2 consist of 20 mm diameter PVC pipe with a 1.5 m long slotted screen sealed within the silty sand to gravelly sand deposit, bedrock and sand and silt to silty sand deposit, respectively. Piezometers BC1-3, BC1A-1, and BC2-2 consist of 50 mm diameter PVC pipe with a 1.5 m long slotted screen sealed within the sand and gravel deposit, silt/gravel deposit and silty sand to gravel deposit, respectively. The borehole annulus surrounding the piezometer screen was backfilled with sand and the remainder of the borehole was backfilled with a bentonite plug and cuttings. All piezometers were decommissioned in May 2013. Borehole H7-5, wherein artesian groundwater was encountered during drilling, was sealed full column with cement grout upon completion of drilling.

Artesian groundwater conditions were encountered within the sand and gravel deposit underlying the clayey silt deposit in Borehole BC1-3 and within the sand deposit underlying the silt deposit in Borehole H7-5. The artesian groundwater level in Borehole BC1-3 was encountered after piezometer installation and was static above ground surface within the piezometer pipe (non-flowing). The piezometer was sealed full column with cement grout on May 19, 2013. Groundwater levels were recorded above ground surface after piezometer installation in Boreholes BC2-2 and BC6-2 at the same level (elevation) as the surface water ponded around the piezometer pipe. Groundwater levels were also measured above ground surface after piezometer installation and about one year later in Borehole BC5-2; however, the piezometer screen was noted to be plugged at the time of decommissioning, likely resulting in water being trapped within the piezometer.

The fieldwork was observed by members of our engineering and technical staff, who located the boreholes, CPTs and DCPTs, arranged for the clearance of underground services, observed the drilling, sampling and in situ testing operations, logged the boreholes, and examined and cared for the soil and rock samples. The samples were identified in the field, placed in appropriate containers, labelled and transported to our Mississauga or Sudbury geotechnical laboratory where the samples underwent visual examination and laboratory testing. All of the laboratory tests were carried out to MTO and/or ASTM Standards, as appropriate. Classification testing (water content, Atterberg limits and grain size distribution) was carried out on selected samples. In addition, one-dimensional consolidation (oedometer) tests (both horizontally and vertically trimmed), consolidated isotropic undrained (CIU) triaxial tests with pore pressure measurements and consolidated drained direct shear test were carried out on select samples of the cohesive deposits. The summary of the consolidation test, triaxial tests and direct shear test results are presented in Table 2. The results of the laboratory classification testing are included in the respective appendices.



Classification of the rock mass quality of the bedrock with respect to the Rock Quality Designation (RQD) is described based on Table 3.10 in the Canadian Foundation Engineering Manual (CFEM, 2006)¹. The degree of weathering of the bedrock samples (i.e., fresh to completely weathered) and the strength classification of the intact rock mass based on field identification (i.e., very poor to very strong) are described in accordance with Table B.3 and Table B.6, respectively, of the International Society for Rock Mechanics (ISRM²) standard classification system. Classification of the bedrock core samples with respect to strength is based on Table 3.5 in CFEM (2006).

The proposed centreline of the new highway alignment was staked in the field by MRC prior to drilling. The as-drilled borehole locations (except for the EMM area), in stations and offsets, were measured in reference to the centreline alignment and were subsequently converted into MTM NAD 83 coordinates in AutoCAD. The as-drilled borehole locations for the EMM area were measured by a handheld global positioning system (GPS) and were subsequently converted into MTM NAD 83 coordinates in ESRI's ArcGIS software. Borehole elevations (except the EMM area) were surveyed by a member of our technical staff in reference to the ground surface elevations at temporary benchmarks. In areas of open water, the depth to firm bottom was measured at the time of drilling and the elevation of the water level was surveyed by a member of our technical staff in reference to the elevations of temporary benchmarks. All temporary benchmarks were installed by MRC prior to the commencement of fieldwork. Borehole elevations for the EMM area were obtained from referencing the borehole locations to the corresponding ground surface elevation in the Ontario Ministry of Natural Resources, Base data MNR LIO Provincial Digital Elevation Model (20m interval). The borehole locations given in the Record of Borehole sheets and shown on Drawings A1 to F1 in Appendices A to F are positioned relative to MTM NAD 83 northing and easting coordinates and the ground surface elevations are referenced to Geodetic datum.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

In the Quaternary Period, the Virginiatown area was encompassed by glacial Lakes Barlow and Ojibway. In areas of more turbulent waters in these lakes, coarse grained sediments of sand and gravel were deposited. In the calmer portions of the glacial lakes fine grained sediments consisting primarily of varved clay, were deposited. After Lakes Barlow and Ojibway receded, organic materials were deposited. In the Kirkland Lake area the organic deposits are usually found as fens, bogs and swamps containing varying thicknesses of organics and are often encountered in glaciolacustrine plains (overlying the sand and gravel or clay), along creeks and streams and in bedrock basins.³

Based on NOEGTS⁴ Mapping, the subsoils in the vicinity of the Highway 66 realignment generally consist of till deposited as a ground moraine. A primarily clay/clayey glaciolacustrine deposit is located further than 1 km north of the realignment. The soils along the Highway 66 realignment consist of variable deposits of organic materials, lacustrine sand, silt and clay and till.

¹Canadian Geotechnical Society, 2006. Canadian Foundation Engineering Manual, 4th Edition.

² International Society for Rock Mechanics Commission on Test Methods, 1985. Int. J. Rock Mech.Min. Sci. & Geomech. Abstr. Vol 22, No. 2, pp. 51-60.

³ C.L. Baker, 1985. Quaternary Geology of the Kirkland Lake Area, Districts of Cochrane and Timiskaming; Ontario Geological Survey.

⁴ Northern Ontario Engineering Geology Terrain Study. Ontario Geological Society Map Reference Number 32DSW.



Published literature indicates that the site is located in the Abitibi Subprovince of the Superior Province (OGS, 1991)⁵. The Abitibi Subprovince contains rocks of up to 2.75 Ga in age, is about 800 km by 300 km in area and lies within the southern portion of the Superior Province. Bedrock in this subprovince consists primarily of zones of mafic to intermediate metavolcanic rocks and metasedimentary rocks.

4.2 General Overview of Local Subsurface Conditions

The detailed subsurface soil and groundwater conditions as encountered in the boreholes and CPTs advanced during this investigation, together with the results of the laboratory tests carried out on selected soil and bedrock core samples, are presented on the attached Record of Borehole and Cone Penetration sheets and the soil laboratory test sheets provided in Appendices A to F. The results of the in situ field tests (i.e., SPT 'N'-values and undrained shear strengths from the field vanes) as presented on the Record of Borehole sheets and in Section 4 are uncorrected. The stratigraphic boundaries shown on the Record of Borehole sheets are inferred from non-continuous sampling, observations of drilling progress and the results of in situ testing. These boundaries, therefore, represent transitions between soil types rather than exact planes of geological change. Further, subsurface conditions will vary between and beyond the borehole, DCPT and CPT locations. The thickness of the overburden/depth to refusal in the investigated areas as inferred from the resistance to DCPT advancement are shown on the Record of DCPT sheets in Appendices A to F.

The inferred soil stratigraphy as encountered in the boreholes and DCPTs advanced for the Highway 66 realignment high fill areas are shown in profile and cross-section on Drawings A1 to F1, inclusive. The orientation (i.e., north, south, east, west) stated in the text of the report is typically referenced to project north and/or up-chainage (along the proposed Highway 66 alignment). For purposes of this report, Highway 66 is oriented east-west.

In general, the stratigraphy encountered at the various borehole locations typically consists of layers of peat or topsoil underlain by cohesive soils. The overburden (soil material) thickness is variable, with refusal to further auger/split spoon, casing or DCPT advancement measured at depth, ranging from 0.5 m to about 29.3 m below ground surface. The stratigraphy generally consists of:

- surficial layers of fibrous or amorphous peat or topsoil, or silty sand to sandy gravel fill in some locations near the existing highway;
- cohesionless deposits of silty sand to sandy silt;
- cohesive deposits of clayey silt to silty clay to clay, interbedded with silt seams and organic pockets in some areas;
- cohesionless deposits of silt below the cohesive deposits;
- cohesionless deposits of silty sand to gravel below the silt deposits; and
- bedrock (inferred or cored).

⁵ Ontario Geological Survey, 1991. Geology of Ontario, Special Volume 4, Part 1. Eds P.C. Thurston, H.R. Williams, R.H. Sutcliffe and G.M. Stott, Ministry of Northern Development and Mines, Ontario.



Detailed descriptions of the subsurface conditions at each investigated swamp crossing/high fill/excess material management and deep cut areas are provided in the following sections of this report. Where relatively significant thicknesses of overburden were encountered, the various soil types are described in detail for each main deposit.

4.3 Highway 66 – STA 13+080 to 13+185 (High Fill H4) and Highway 66 Connection – STA 10+000 to 10+125 (High Fill H1)

The plan and profiles along the centreline and toes of the proposed Highway 66 realignment embankment showing the borehole locations and interpreted stratigraphy between about STA 13+080 and 13+185 along the Highway 66 realignment and between about 10+000 and 10+125 along the Highway 66 Connection are shown on Drawings A1 and A2 in Appendix A. The realignment extends across a low-lying area bounded by a large rock outcrop to the north and the existing Highway 66 to the south. The proposed embankment in this section of the highway realignment is up to about 6 m high relative to the existing ground surface.

A total of seventeen (17) boreholes (H1-4 to H1-7, H1-6a, H1-9 and H1-10, H4-1 to H4-6, C1-2 and BC1-1 to BC1-3) and five (5) DCPTs (H1-D1, H1-D3, H1-D4, H4-D1 and H4-D2) were completed to investigate the subsurface conditions within the High Fill H1 and H4 areas. The topography in these sections of the proposed highway realignment and connection is characterized by flat terrain and bedrock ridges, sloping downward from north to south. These sections of the proposed realignment contain moderate to dense tree cover and a wet grassy area adjacent to the existing Highway 66.

The subsurface soils generally consist of surficial layers of fill, peat or topsoil, underlain by a cohesive deposit consisting of an upper zone of clayey silt, a middle zone of silty clay to clay and transitioning to a lower zone of clayey silt. The cohesive deposit is underlain by a deposit of silt to sandy silt, which in turn is underlain by a deposit of silty sand to sand to sand and gravel to sandy gravel, underlain by bedrock. Refusal to further split spoon, auger or casing advancement and dynamic cone penetration was encountered at depths of up to about 20.8 m, being deepest in the vicinity of about STA 10+ 125 along the Highway 66 Connection, at the existing Highway 66 location.

4.3.1 Embankment Fill

Borehole H1-10 was advanced through the existing Highway 66 embankment and encountered a 125 mm thick layer of asphalt, with the road surface at approximately Elevation 303.6 m. A deposit of silty sand and gravel to sandy gravel fill was encountered below the asphalt in Borehole H1-10 and from ground surface in Boreholes H1-6 and H1-9, which were advanced through the shoulder of the existing roadway. The fill deposit was encountered between Elevation 303.5 m and 304.2 m and the thickness of the deposit ranges from 1.4 m to 2.2 m.

The SPT 'N'-values measured within the fill deposit range between 9 blows and 85 blows per 0.3 m of penetration, indicating a loose to very dense relative density.

The natural water content measured on one sample of the fill deposit is about 12 per cent.



4.3.2 Peat / Topsoil

A layer of black topsoil ranging from about 0.1 m to 0.2 m thick was encountered from ground surface between Elevation 306.0 m and Elevation 303.5 m in Boreholes H1-4, H1-5, H1-7, H4-1, H4-2, H4-4 to H4-6 and BC1-1 to BC1-3. In Borehole C1-2 and Borehole H4-3, a deposit of black fibrous peat was encountered from ground surface at Elevation 305.4 m and 304.3 m with thicknesses of 0.3 m and 0.8 m, respectively. In Boreholes H1-9 and H1-10, a deposit of black fibrous or amorphous peat was encountered underlying the existing Highway 66 embankment fill at Elevation 301.7 m and 301.5 m with thicknesses of 0.8 m and 0.5 m, respectively.

SPT 'N'-values measured within the peat deposit range from 3 blows to 8 blows per 0.3 m of penetration, suggesting a soft to firm consistency.

The natural water content measured on one sample of the topsoil is about 26 per cent and on two samples of the peat are about 60 per cent and 72 per cent.

4.3.3 Clayey Silt to Clay

A cohesive deposit consisting of an upper zone of clayey silt, a middle zone of silty clay to clay and transitioning in places to a lower zone of clayey silt was encountered underlying the fill, topsoil or peat in the boreholes. The total thickness of the deposit is between about 2.2 m and 12.5 m and the surface of the deposit was encountered between Elevation 305.9 m and 300.9 m.

The upper zone consists of grey to brown clayey silt to gravelly sandy clayey silt, trace organics and trace rootlets and is between 0.5 m and 2.7 m thick. The middle zone consists of brown to grey silty clay to clay, trace sand and is between 1.3 m and 12.5 m thick. The lower zone consists of clayey silt, some sand and is between 1.9 m and 3.0 m thick.

4.3.3.1 Clayey Silt

SPT 'N'-values measured within the upper clayey silt portion of the deposit range between 3 blows and 14 blows per 0.3 m of penetration. In situ field vane tests carried out within this clayey silt portion of the deposit measured undrained shear strengths greater than 100 kPa. The SPT 'N'-values and in situ field vane test results suggest that the deposit has a soft to very stiff consistency.

The natural water content measured on eleven samples of the upper clayey silt portion of the deposit ranges from about 13 per cent to 32 per cent.

The organic content measured on two samples of the upper clayey silt portion of the deposit are between about 1 per cent and 8 per cent. Where the organic content is 8 per cent, the material is classified as an organic clayey silt, although the high organic content is likely influenced by the peat deposit immediately after the sample.

Grain size distributions of five samples from the upper clayey silt portion of the deposit are shown on Figure A1 in Appendix A.

Atterberg limits tests were carried out on six samples of the upper clayey silt portion of the deposit and measured liquid limits ranging from about 23 per cent to 30 per cent, plastic limits ranging from about 16 per cent to 19 per cent and plasticity indices ranging from about 7 per cent to 11 per cent. The results of the



Atterberg limits testing are shown on the plasticity chart on Figure A2 in Appendix A and indicate that the material is classified as clayey silt of low plasticity.

4.3.3.2 Silty Clay to Clay

SPT 'N'-values measured within the silty clay to clay portion of the deposit range between 0 blows (i.e., weight of hammer) and 8 blows per 0.3 m of penetration. In situ field vane tests carried out within the silty clay to clay portion of the deposit measured undrained shear strengths ranging between 15 kPa and 96 kPa, with a calculated sensitivity between 1 and 10. The field vane tests results indicate that the silty clay to clay portion of the deposit has a soft to stiff consistency.

The natural water content measured on forty-three samples of the silty clay to clay portion of the deposit ranges from about 25 per cent to 74 per cent.

Grain size distributions of ten samples from the silty clay to clay portion of the deposit are shown on Figure A3.1 in Appendix A. One test result from a silt seam within the silty clay to clay deposit is shown on Figure A3.2 in Appendix A.

Atterberg limits tests were carried out on thirty-one (31) samples of the silty clay to clay portion of the deposit and measured liquid limits ranging from about 35 per cent to 67 per cent, plastic limits ranging from about 19 per cent to 29 per cent and plasticity indices ranging from about 16 per cent to 39 per cent. The result of the Atterberg limits tests are shown on the plasticity chart on Figure A4.1 and A4.2 in Appendix A and indicate that the material is classified as silty clay of intermediate plasticity to clay of high plasticity.

Laboratory consolidation tests were carried out on two specimens of the silty clay to clay deposit obtained from Shelby tube samples in Boreholes H1-6A and H1-9. Preconsolidation pressures ranging between 62 kPa and 130 kPa were estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. Bulk unit weights ranging of about 15.1 kN/m³ to 15.6 kN/m³ and a specific gravity between about 2.73 and 2.75 were measured on the consolidation test specimens. Details of the test results are shown on Figure A5 and A6 in Appendix A and the test results are summarized below.

Borehole Sample No.	Sample Depth/Elevation	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_p' - \sigma_{vo}'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm²/s)
Borehole H1-6A Sample 4	4.9 m/ 299.3 m	87	130	43	1.5	1.20	0.06	2.16	3.9×10^{-3}
Borehole H1-9 Sample 7	6.3 m/ 297.6 m	78	78	0	1.0	0.57	0.04	1.92	8.6×10^{-3}

*For stress range between approximately effective overburden stress and final stress due to 3 m high embankment, that is about $31 \text{ kPa} \leq \sigma_v' \leq 143 \text{ kPa}$

where: σ_{vo}' is the effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is overconsolidation ratio
 C_c is the compression index
 C_r is the recompression index
 e_o is initial void ratio
 c_v is the coefficient of consolidation in cm²/s



4.3.3.3 Clayey Silt

SPT 'N'-values measured within the lower clayey silt portion of the deposit range between 0 blows (weight of hammer) and 7 blows per 0.3 m of penetration. In situ field vane tests carried out within the lower clayey silt portion of the deposit measured undrained shear strengths between 23 kPa and 90 kPa, and sensitivities between 3 and 5. The results of the in situ field vane tests indicate that the deposit has a soft to stiff consistency.

The natural water content measured on four samples of the clayey silt portion of the deposit ranges from about 27 per cent to 34 per cent.

A grain size distribution on one sample from the lower clayey silt portion of the deposit is shown on Figure A1 in Appendix A.

Atterberg limits tests were carried out on two samples of the lower clayey silt portion of the deposit and measured liquid limits of about 26 per cent and 30 per cent, plastic limits of about 18 per cent and 19 per cent and plasticity indices of about 7 per cent and 11 per cent. The result of the Atterberg limits tests are shown on the plasticity chart on Figure A2 in Appendix A and indicate that the material is classified as clayey silt of low plasticity.

4.3.4 Silt to Sandy Silt

A deposit of grey to brown silt to sandy silt, trace to some clay, trace gravel was encountered underlying the silty clay to clay in Boreholes H1-4, H1-6, H1-9, H4-3 and H4-5. The surface of the silt to sandy silt deposit was encountered between Elevation 302.4 m and 292.2 m and the thickness of the deposit ranges from 0.3 m to 4.6 m.

SPT 'N'-values measured within the silt to sandy silt deposit range between 0 blows (i.e., weight of hammer) and 12 blows per 0.3 m of penetration, indicating a very loose to compact relative density.

The natural water content measured on eight samples of the silt to sandy silt deposit ranges from about 10 per cent to 38 per cent.

Grain size distributions of five samples from the silt to sandy silt deposit are shown on Figure A7 in Appendix A.

Atterberg limits testing was carried out on four samples of the silt to sandy silt deposit, of which two were determined to be non-plastic and two measured liquid limits of about 18 per cent and 23 per cent, plastic limits of about 16 per cent and 20 per cent and a corresponding plasticity index of about 2 per cent and 4 per cent, respectively. The result of the Atterberg limits testing is shown on the plasticity chart on Figure A8 in Appendix A and together with the non-plastic test results indicate that the material is classified as silt to silt of slight plasticity.

4.3.5 Silty Sand to Sandy Gravel

A deposit of grey to brown silty sand to sandy gravel, trace clay was encountered underlying the cohesive deposit in Boreholes H1-5, H1-7, H4-1, H4-2, H4-4, H4-6, C1-2 and BC1-1 to BC1-3 and underlying the silt to sandy silt deposit in Boreholes H1-4, H1-6, H1-9, H1-10, H4-3 and H4-5. The surface of the silty sand to sandy gravel deposit was encountered between Elevation 303.4 m and 287.6 m and the thickness of the deposit



ranges from 0.2 m to 4.5 m. A zone of cobbles was encountered in Boreholes BC-1 and BC-2 at Elevation 294.9 m and Elevation 299.7 m, with a thickness of 0.2 m and 0.6 m, respectively.

SPT 'N'-values measured within the silty sand to sandy gravel deposit generally range between 10 blows and 90 blows per 0.3 m of penetration with several higher 'N'-values for which the split spoon did not penetrate the full sampled depth, indicating a compact to very dense relative density.

The natural water content measured on thirteen samples of the silty sand to sandy gravel deposit ranges from about 2 per cent to 24 per cent.

Grain size distributions of ten samples from the silty sand to sandy gravel deposit are shown on Figure A9 in Appendix A. One test result is from a sand seam within the sandy gravel deposit.

4.3.6 Refusal/Bedrock

Refusal to further split spoon, auger and/or casing advancement or dynamic cone penetration was encountered in the boreholes at depths ranging from 3.1 m to 20.8 m below existing ground surface, ranging from Elevations 303.9 m to 286.5 m.

Bedrock was encountered at depths between about 6.9 m and 13.0 m below ground surface, corresponding to between Elevation 299.1 m and Elevation 292.1 m in Boreholes BC1-1 to BC1-3 and C1-2, and the bedrock was cored for lengths between 3.4 m and 4.1 m. The retrieved bedrock core is described as very fine grained, moderately weathered to fresh, green to grey, metasediment with occasional fractured sheared zones. The bedrock core retrieved from Borehole C1-2 is described as fine to medium grained, fresh, foliated, green to grey and white, schist. Photographs of the retrieved bedrock core samples are shown on Figure A10.

The Total Core Recovery (TCR) measured on all core samples ranges from 86 per cent to 100 per cent. The Solid Core Recovery (SCR) of the rock core samples ranges from 17 per cent to 100 per cent. The RQD measured on the core samples ranges from 17 per cent to 100 per cent, indicating a rock mass of very poor to excellent quality.

Laboratory Uniaxial Compression Strength (UCS) tests were carried out on selected bedrock core samples. The UCS values are presented on the Record of Drillhole sheets in Appendix A and are summarized below, and indicate that the bedrock is strong to very strong (Grade R4 to R5).

Borehole	Elevation (m)	UCS (MPa)
BC1-1	293.4	112
BC1-2	296.7	114
BC1-3	290.8	62

4.3.7 Groundwater Conditions

Groundwater levels were measured in the open boreholes during and upon completion of drilling at depths ranging between 1.0 m and 3.4 m depth below ground surface, or between Elevation 304.1 m and 300.8 m. A piezometer was installed in Borehole C1-2 sealed within the gravelly sand deposit and in Borehole BC1-3 sealed within the sand and gravel deposit, to monitor the groundwater levels. The piezometers in Boreholes C1-2 and



BC1-3 were installed in August 2011 and September 2012, respectively. The measured groundwater levels in the piezometers are presented below.

Borehole	Installation	Time and/or Date	Depth to Groundwater (m)	Groundwater Elevation (m)
C1-2	Piezometer ¹	May 19, 2013	0.0 (i.e., at ground surface)	305.4
BC1-3	Piezometer	November 17, 2012	-1.0 (i.e., above ground surface)	306.1 ²
	Piezometer	May 19, 2013	-1.1 (i.e., above ground surface)	306.2 ²

¹ Piezometer lock seized, unable to open and obtain water level during 2012 field investigation.

² Groundwater stabilized at this elevation inside the piezometer tubing as the tubing was extended to greater height above ground surface.

Groundwater elevations as encountered in the boreholes may not be representative of static groundwater levels since the groundwater levels in the boreholes may not have stabilized on completion of drilling. Furthermore, groundwater elevations will vary depending on seasonal fluctuations, precipitation and local soil permeability.

4.4 Highway 66 – STA 13+300 to 13+345 (High Fill H5)

The plan and profiles along the centreline and toes of the proposed Highway 66 realignment embankment showing the borehole locations and interpreted stratigraphy between about STA 13+300 and 13+345 are shown on Drawing B1 in Appendix B. This section of the realignment extends across a valley between two rock outcrops, which is crossed by an ATV trail in a northwest-southeast orientation. The proposed embankment in this section of the realignment is up to about 7.5 m relative to existing ground surface.

A total of eight (8) boreholes (H5-1, H5-2 and BC1A-1 to BC1A-6) and two (2) DCPTs (H5-D1 and H5-D2) were completed to investigate the subsurface conditions within the High Fill H5 area. The topography in this section of the proposed highway realignment slopes upward to both the west and east sides of the valley and the terrain has moderate to dense tree cover.

The subsurface soils in High Fill H5 area generally consist of a surface layer of topsoil, underlain by a deposit of sandy silt to sand and gravel to gravel and a cohesive deposit consisting of clayey silt to clay. The cohesive deposit is generally underlain by deposits of silt, and gravelly sand to gravel, underlain by metasediment bedrock. The bedrock surface and refusal to further auger/casing advancement and dynamic cone penetration was encountered at depths between about 17 m and 9.2 m below ground surface, being deepest in the vicinity of about STA 13+310 along the Highway 66 Realignment.



4.4.1 Topsoil

A 30 mm to 300 mm thick layer of black topsoil was encountered from ground surface between Elevation 305.7 m and Elevation 303.0 m in all the boreholes.

4.4.2 Sandy Silt to Gravel

A 0.5 m to 0.7 m thick non-cohesive deposit of brown to grey sandy silt to silty sand to sand and gravel to gravel was encountered below the topsoil in Boreholes H5-1, H5-2, BC1A-1 and BC1A-3 to BC1A-5 between Elevation 305.7 m and Elevation 302.8 m.

The SPT 'N'-values measured within the sandy silt to gravel deposit range between 6 blows and 23 blows per 0.3 m of penetration, indicating a loose to compact relative density.

The natural water content measured on two samples of the sandy silt to gravel deposit are about 7 per cent and 11 per cent.

4.4.3 Clayey Silt to Clay

A deposit of grey to brown clayey silt to clay trace sand was encountered underlying the silty sand to gravel deposit in Boreholes H5-1, H5-2, BC1A-1 and BC1A-3 to BC1A-5, and below the topsoil in Boreholes BC1A-2 and BC1A-6. The surface of the clayey silt to clay deposit was encountered between Elevation 305.0 m and 302.2 m and the thickness of the deposit ranges from 1.0 m to 5.1 m. Generally, the deposit transitioned from an upper zone of silty clay to clay lower zone of clayey silt.

The SPT 'N'-values measured within the clayey silt to clay deposit range between 3 blows and 20 blows per 0.3 m of penetration. In situ field vane tests carried out within the clayey silt to clay deposit measured undrained shear strengths ranging from 34 kPa to greater than 100 kPa, and sensitivities between 3 and 7. The results of the field vane tests, together with the SPT 'N'-values indicate that the deposit generally has a firm to very stiff consistency.

The natural water content measured on fourteen samples of the clayey silt to clay deposit ranges from about 18 per cent to 50 per cent.

Grain size distributions of six samples of the clayey silt to clay deposit are shown on Figure B1 in Appendix B.

Atterberg limits tests were carried out on eleven samples of the cohesive deposit and measured liquid limits ranging from about 31 per cent to 60 per cent, a plastic limit ranging from about 18 per cent to 28 per cent and plasticity indices ranging from about 13 per cent to 34 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure B2 in Appendix B and indicate that the material is classified as clayey silt of low plasticity to clay of high plasticity.

4.4.4 Silt

A deposit of grey silt, trace to some clay, trace sand was encountered underlying the cohesive deposit in Boreholes BC1A-1 and BC1A-3 to BC1A-6. The surface of the silt deposit was encountered between Elevation 302.0 m and 299.2 m and the thickness of the deposit ranges from 1.1 m to 3.9 m.



SPT 'N'-values measured within the silt deposit typically range between 3 blows and 11 blows per 0.3 m of penetration, indicating a very loose to compact relative density. One SPT 'N'-value measured within the silt deposit was 47 blows per 0.3 m, likely due to the spoon partially penetrating into the underlying gravelly sand to gravel deposit.

The natural water content measured on four samples of the silt deposit ranges from about 22 per cent to 32 per cent.

Grain size distributions of four samples of the silt deposit are shown on Figure B3 in Appendix B.

4.4.5 Silty Sand to Gravel

A deposit of brown to grey silty sand to gravelly sand to sand and gravel to gravel, trace silt, trace organics was encountered underlying the clay to clayey silt deposit in Borehole H5-2 and underlying the silt deposit in Boreholes BC1A-1, BC1A-2 and BC1A-4 to BC1A-6. The silty sand to gravel deposit was encountered between Elevation 301.4 m and 297.4 m and the thickness of the deposit ranges from 0.6 m to 4.9 m.

The SPT 'N'-values measured within the gravelly sand to gravel deposit range between 13 blows and 80 blows per 0.3 m of penetration, and up to 17 blows per 0.1 m of penetration, indicating a compact to very dense relative density. Boulders 0.5 m thick were encountered in Borehole BC1A-4 at Elevation 297.8 m and 296.4 m, respectively. A 0.3 m thick boulder was encountered in Borehole BC1A-6 at Elevation 294.3 m. Cobbles were encountered in Borehole BC1A-5 at Elevation 297.4 m.

The natural water contents measured on four samples of the gravelly sand to gravel deposit range from about 8 per cent to 12 per cent.

Grain size distributions of three samples of the silty sand to gravelly sand portion of the deposit are shown on Figure B4 in Appendix B.

4.4.6 Refusal/Bedrock

Refusal to further split spoon, auger advancement and dynamic core penetration was encountered at depths of 1.7 m and 7.0 m, below existing ground surface, between Elevation 297.2 m and 303.1 m in Boreholes H5-1 and H5-2 and DCPT H5-D1 and H1-D2. Bedrock was encountered at depths ranging from 5.9 m to 10.9 m below existing ground surface, between Elevation 293.2 and 299.8 m in Boreholes BC1A-1 to BC1A-6 and the bedrock was cored for lengths ranging from 3.1 m to 3.8 m. The retrieved bedrock core is described as fine grained, completely weathered to fresh, grey, metasediment, with highly fractured zones. Photographs of the retrieved bedrock cores are shown on Figure B5 in Appendix B.

The TCR ranges between 85 per cent and 100 per cent and the SCR ranges from 0 per cent to 100 per cent. The RQD measured on the core samples ranges from 21 per cent to 100 per cent, but is generally less than 73 per cent, indicating a rock mass of very poor to fair quality with sections of excellent quality.

Laboratory UCS tests were carried out on selected bedrock core samples. The UCS values are presented on the Record of Drillhole sheets in Appendix B and are summarized below, and indicate that the bedrock is medium strong to strong (Grade R3 to R4).



Borehole	Elevation (m)	UCS (MPa)
BC1A-3	297.2	63
BC1A-4	292.0	25
BC1A-5	292.2	44
BC1A-6	293.6	77

4.4.7 Groundwater Conditions

Groundwater levels were measured in the open boreholes during and upon completion of drilling at between 1.1 m and 4.5 m below ground surface, ranging between Elevation 303.3 m and 299.6 m. Boreholes H5-1 and H5-2 were dry. A piezometer was installed in Borehole BC1A-1, sealed within the silt and gravel deposits, to monitor the groundwater levels. The measured groundwater level in the piezometer is presented below.

Borehole	Installation	Time and/or Date	Groundwater Depth (m)	Groundwater Elevation (m)
BC1A-1	Piezometer	November 17, 2012	0.6	303.7
	Piezometer	May 17, 2013	0.8	303.5

Groundwater elevations as encountered in the boreholes may not be representative of static groundwater levels since the groundwater levels in the boreholes may not have stabilized on completion of drilling. Furthermore, groundwater elevations will vary depending on seasonal fluctuations, precipitation and local soil permeability.

4.5 Highway 66 – STA 14+020 to 14+650 (Swamp Crossing H6/H7)

The plan and profiles along the centreline and toes of the proposed Highway 66 realignment embankment showing the borehole and CPT locations and interpreted stratigraphy between about STA 14+020 and 14+650 are shown on Drawings C1 to C4 in Appendix C. The realignment of the proposed Highway 66 embankment limits extends across a low-lying swamp, with ponded water in places due to blockage of a creek by a beaver dam. The proposed embankment along this section of the highway realignment is up to about 3.5 m high relative to the existing ground surface.

A total of forty-nine (49) boreholes (H6-1 to H6-19, H6-7A, H6-S1 to H6-S5, H7-1 to H7-15, BC2-1 to BC2-3, BC3-1 to BC3-3 and BC4-1 to BC4-3), seven (7) CPTs (H6-CPT1 to H6-CPT7) and nineteen (19) DCPTs (H6-D1 to H6-D11 and H7-D1 to H7-D8) were completed to investigate the subsurface conditions within this high fill area. The topography in this section of the proposed highway realignment slopes slightly downward from west to east, and the terrain contains swampy areas, a beaver pond, moderate to dense tree cover and multiple ATV trails.

The subsurface soils along the Highway 66 realignment in High Fill H6 and High Fill H7 areas generally consist of surficial layers of fill, peat or topsoil, underlain by an extensive cohesive deposit consisting of an upper zone of clayey silt to silty clay, a middle zone of silty clay to clay and a lower zone of clayey silt to silty clay. The cohesive deposit is generally underlain by a deposit of silt to sandy silt which in turn is underlain by a deposit of



silty sand to sand and gravel to gravel underlain by inferred bedrock. Refusal to further auger and/or casing advancement and dynamic cone penetration was encountered at depths of up to about 29.3 m, being deepest in the vicinity of about STA 14+125.

4.5.1 Peat / Topsoil

A deposit of black fibrous peat ranging in thickness from 0.2 m to 4.0 m was encountered from ground surface or below ponded water, between Elevation 304.1 m and Elevation 309.7 m in Boreholes H6-1 to H6-19, H7-5, H7-6, BC2-1 to BC2-3, BC3-1 to BC3-3 and BC4-1 to BC4-3. In Boreholes H7-1, H7-3, H7-4 and H7-8 to H7-15, black topsoil was encountered from ground surface between Elevation 307.8 m and 305.1 m with thicknesses ranging from less than 0.1 m to 0.3 m.

SPT 'N'-values measured within the peat deposit range between 0 blows (i.e., weight of hammer) and 4 blows per 0.3 m of penetration, suggesting a very soft to soft consistency. One SPT 'N'-value of 4 blows per 0.15 m of penetration was measured within the topsoil deposit in Borehole H7-11 on refusal to further advancement.

The natural water content measured on twenty-three samples of the peat ranges from about 55 per cent to 991 per cent. The natural water content measured on one sample of the topsoil is about 61 per cent.

4.5.2 Sand and Silt to Silty Sand

A deposit of brown to grey sand and silt to silty sand, trace to some clay, trace organics was encountered underlying the peat deposit in Boreholes H6-1, H6-4 and BC2-1 to BC2-3. The sand and silt to sand and silt deposit was encountered between Elevation 309.0 m and 306.0 m with thickness ranging from 0.4 m to 2.3 m.

SPT 'N'-values measured within the sand and silt to silty sand deposit range between 0 blows (i.e., weight of hammer) and 26 blows per 0.3 m of penetration, indicating a very loose to compact relative density. An SPT 'N'-value of 15 blows per 0.15 m of penetration was recorded on inferred cobbles within this deposit in Borehole BC2-3.

The natural water content measured on five samples of the sand and silt to silty sand deposit ranges from about 13 per cent to 28 per cent.

A grain size distribution of one sample of the sand and silt portion of the deposit is shown on Figure C1 in Appendix C.

4.5.3 Clayey Silt to Clay

A cohesive deposit, generally consisting of an upper zone of clayey silt to silty clay, a middle zone consisting of silty clay to clay and a lower zone transitioning to clayey silt, was encountered underlying the fill, topsoil or peat in the boreholes. The total thickness of the cohesive deposit is between about 0.7 m and 17.2 m and the surface of the deposit was encountered between Elevation 307.8 m and 303.7 m.

The upper zone of the cohesive deposit consists of brown to grey clayey silt to silty clay, trace to some sand, trace organics and is between 0.4 m and 5.6 m thick. Within this upper zone of the cohesive deposit silt seams



were frequently encountered and the deposit is considered to be varved. Sand seams and pockets of organic material were occasionally encountered within this upper zone.

The middle zone of the cohesive deposit consists of brown to grey silty clay to clay, trace sand and is between 0.9 m and 11.8 m thick. Pockets of organic material were also encountered in the middle zone of this deposit on occasion in split spoon samples and in the extruded Shelby tube samples. The pockets of organic material encountered were up to 250 mm thick, and were encountered to depths up to about 5 m below ground surface, corresponding to about Elevation 300 m. The pockets of organic material generally consist of black, fibrous peat mixed with clay. Although this zone of the cohesive deposit is not considered varved, occasional irregular varves were encountered, as noted in the extruded Shelby tube samples, at irregular orientations, varying from horizontal to near vertical, and thicknesses between 1 mm and 25 mm.

The lower zone of the cohesive deposit consists of grey clayey silt to silty clay, some sand and is between 0.3 m and 7.6 m thick. Within the lower zone of the deposit silt seams were frequently encountered and this portion of the deposit is considered varved.

4.5.3.1 Clayey Silt to Silty Clay

SPT 'N'-values measured within the upper clayey silt to silty clay portion of the deposit range between 0 blows (i.e., weight of hammer) and 15 blows per 0.3 m of penetration. In situ field vane tests carried out within the clayey silt to silty clay portion of the deposit measured undrained shear strengths ranging from about 17 kPa to 85 kPa. The field vane test results together with the CPT testing indicate that the deposit has a soft to stiff consistency. The sensitivity is calculated to range between about 2 and 9.

The natural water content measured on fifty-two samples of the clayey silt to silty clay portion of the deposit ranges from about 20 per cent to 51 per cent.

The organic content measured on three samples of the clayey silt to silty clay portion of the deposit is between about 1 per cent and 8 per cent.

Grain size distributions of seventeen samples of the clayey silt to silty clay deposit are shown on Figure C2 in Appendix C.

Atterberg limits tests were carried out on forty (40) samples of the clayey silt to silty clay portion of the deposit and measured liquid limits ranging from about 24 per cent to 49 per cent, plastic limits ranging from about 14 per cent to 22 per cent and plasticity indices ranging from about 8 per cent to 27 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure C3 in Appendix C and indicate that the material is classified as clayey silt of low plasticity to silty clay of intermediate plasticity.

Laboratory consolidation tests were carried out on two specimens of the clayey silt to silty clay deposit obtained from Shelby tube samples in Boreholes H6-7A and H6-S1. A preconsolidation pressure of 62 kPa and 67 kPa were estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 16.9 kN/m³ and 18.9 kN/m³ and a specific gravity of about 2.74 and 2.76 were measured on the consolidation test specimens. Details of the test results are shown on Figure C4 and C5 in Appendix C, and the test results are summarized below.



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Borehole Sample No.	Sample Depth/Elevation	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_p' - \sigma_{vo}'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)
Borehole H6-7A Sample 1	6.4 m / 302.7 m	27	62	35	2.3	0.46	0.03	1.50	1.8×10^{-3}
Borehole H6-S1 Sample 1	4.8 m / 304.4 m	15	67	52	1.8	0.22	0.01	0.89	3.8×10^{-3}

*For stress range between approximately effective overburden stress and final stress due to 3 m high embankment, that is $31 \text{ kPa} \leq \sigma_v' \leq 156 \text{ kPa}$

where: σ_{vo}' is the effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 C_c is the compression index
 C_r is the recompression index
 e_o is the initial void ratio
 c_v is the coefficient of consolidation in cm²/s

A total of seven cone penetration tests (H6-CPT1 to H6-CPT7) were performed in this swamp crossing for determination of the pore pressure dissipation at specific horizons within the clayey silt to silty clay deposit. The range of the coefficient of consolidation in the horizontal direction (c_h) obtained from a total of four CPT pore pressure dissipation tests is summarized below.

C_h CPT-Field (cm²/s)		
Upperbound	Lowerbound	Average
9.9×10^{-2}	1.7×10^{-2}	4.2×10^{-2}

Laboratory consolidated isotropic undrained triaxial CIU triaxial tests with pore pressure measurement were carried out on three samples of the cohesive deposit obtained from Shelby tube samples in Boreholes H6-S2, H6-S4 and H6-S5. In total, one specimen and two sets of two specimens were tested in the clayey silt to silty clay deposit. The details of the test results are shown on Figures C6/C16 and C7 in Appendix C and the results are summarized below.

Borehole Sample No.	Sample Depth/Elevation	Effective Cohesion, c' (kPa)	Effective Angle of Internal Friction, ϕ' (degrees)
Borehole H6-S2 Sample 1	4.6 m / 304.1 m	0	35
Borehole H6-S4 Sample 1	3.0 m / 303.7 m		
Borehole H6-S5 Sample 1	1.8 m / 303.4 m		

Note: Assessed shear strength parameters are only valid over range of stress conditions used in the laboratory test.

The triaxial test samples were consolidated to pressures representative of the estimated in situ effective stresses and maximum effective stresses under the proposed embankment loads, at the respective sample depths. The interpreted effective strength parameters provided above are applicable only to design situations for which the



stress conditions during testing are representative. Reference should be made to individual test results for details of the testing conditions.

4.5.3.2 Silty Clay to Clay

SPT 'N'-values measured within the silty clay to clay portion of the deposit typically range between 0 blows (i.e., weight of rods or hammer) and 7 blows per 0.3 m of penetration, and generally 2 blows or less per 0.3 m of penetration. In situ field vane tests carried out within the silty clay to clay portion of the deposit measured undrained shear strengths ranging between about 12 kPa and 68 kPa, and generally less than 35 kPa. The field vane test results together with the CPT testing indicate that the deposit has a very soft to stiff consistency, and generally a very soft to firm consistency. The sensitivity is calculated to range between 1 and 10.

The natural water content measured on eighty samples of the silty clay to clay deposit range from about 30 per cent to 78 per cent.

The organic content measured on one sample of the silty clay to clay portion of the deposit is about 8 per cent. The sample contained a root from surface vegetation, resulting in a high organic content, which is not typical of this zone.

Grain size distributions of seventeen samples from the silty clay to clay portion of the deposit are shown on Figure C8 in Appendix C.

Atterberg limits tests were carried out on seventy-seven (77) samples of the silty clay to clay portion of the deposit and measured liquid limits ranging from about 37 per cent to 69 per cent, plastic limits ranging from about 19 per cent to 27 per cent and plasticity indices ranging from about 17 per cent to 45 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure C9 in Appendix C and indicate that the material is classified as silty clay of intermediate plasticity to clay of high plasticity.

Out of the samples tested, two samples were separated into the clayey silt to silty clay laminae and the silty clay to clay laminae. The test results on the silty clay to clay laminae indicate liquid limits of about 48 per cent and 73 per cent, plastic limits of about 21 per cent and 27 per cent and plasticity indices of about 27 per cent and 46 per cent. For the clayey silt to silty clay laminae, the liquid limits are about 32 per cent and 40 per cent, the plastic limits are about 20 per cent and 22 per cent and the plasticity indices are about 13 per cent and 18 per cent. The test results confirm that the 'silty' varves are classified as clayey silt of low plasticity to silty clay of intermediate plasticity and the 'clayey' varves are classified as silty clay of intermediate plasticity to clay of high plasticity.

Laboratory consolidation tests were carried out on five specimens of the silty clay to clay deposit obtained from Shelby tube samples in Boreholes BC4-1 and H6-S1. Preconsolidation pressures ranging between 60 kPa to 134 kPa were estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. Bulk unit weights ranging from about 16.1 kN/m³ to 18.8 kN/m³ and a specific gravity between about 2.73 and 2.76 were measured on the consolidation test specimens. Details of the test results are shown on Figure C10 to C14 in Appendix C, and the test results are summarized below.



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Borehole Sample No.	Sample Depth/ Elevation	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_p' - \sigma_{vo}'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)
Borehole BC4-1 Sample 4	3.4 m/ 301.8 m	18	125	107	6.9	1.04	0.04	1.87	1.4×10^{-2}
Borehole BC4-1 Sample 5	4.9 m/ 300.3 m	30	92	62	3.1	0.68	0.05	1.74	1.3×10^{-2}
Borehole BC4-1 Sample 6	6.4 m/ 298.8 m	40	134	94	3.4	0.90	0.05	1.62	1.6×10^{-2}
Borehole H6-S1 Sample 2	7.8 m/ 301.4 m	35	60	25	1.7	1.20	0.02	1.80	4.0×10^{-3}
Borehole H6-S1 Sample 4	14.2 m/ 295.0 m	76	80	4	1.1	0.82	0.02	1.61	5.7×10^{-3}

*For stress range between approximately effective overburden stress and final stress due to 3 m high embankment, that is $30 \text{ kPa} \leq \sigma_v' \leq 156 \text{ kPa}$

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 C_c is the compression index
 C_r is the recompression index
 e_o is the initial void ratio
 c_v is the coefficient of consolidation in cm²/s

In addition to the tests on the horizontally trimmed specimens noted above, consolidation tests were also carried out on a vertically trimmed orientation (VTO) specimen of the silty clay to clay from Borehole H6-S1 to assess the horizontal coefficient of consolidation, c_h . Details of the test results are shown on Figure C15 in Appendix C. The results of the test indicate a c_h value of $7.0 \times 10^{-3} \text{ cm}^2/\text{s}$ for the stress range of about 35 kPa to 145 kPa.

A total of seven cone penetration tests (H6-CPT1 to H6-CPT7) were performed in this swamp crossing for determination of the pore pressure dissipation at specific horizons within the silty clay to clay deposit. The range of the coefficient of consolidation in the horizontal direction (c_h) obtained from a total of twenty-four CPT pore pressure dissipation tests is summarized below.

C_h CPT-Field (cm²/s)		
Upperbound	Lowerbound	Average
1.3×10^{-1}	2.9×10^{-3}	1.9×10^{-2}

Laboratory CIU triaxial tests with pore pressure measurement were carried out on three samples of the cohesive deposit obtained from Shelby tube samples in Borehole H6-S2. In total, two specimens and one set of two specimens were tested in the clayey silt deposit. The details of the test results are shown on Figure C16 in Appendix C and the results are summarized below.



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Borehole Sample No.	Sample Depth/Elevation	Effective Cohesion, c' (kPa)	Effective Angle of Internal Friction, ϕ' (degrees)
Borehole H6-S2 Sample 2	7.9 m / 300.8 m	3	24
Borehole H6-S2 Sample 3	10.8 m / 297.9 m		
Borehole H6-S2 Sample 4	14.0 m / 294.7 m		

Note: Assessed shear strength parameters are only valid over range of stress conditions used in the laboratory test.

A laboratory consolidated drained direct shear test measurement was carried out on one sample of the silty clay to clay deposit obtained from Shelby tube samples in Borehole H6-S2. In total, one specimen and one set of three specimens were tested in the silty clay to clay deposit. The details of the test results are shown on Figure C17 in Appendix C and the results are summarized below.

Borehole Sample No.	Sample Depth/Elevation	Effective Cohesion, c' (kPa)	Effective Angle of Internal Friction, ϕ' (degrees)
Borehole H6-S5 Sample 3	7.6 m / 297.6 m	0	30

The triaxial test and direct shear test samples were consolidated to pressures representative of the estimated in situ effective stresses and maximum effective stresses under the proposed embankment loads, at the respective sample depths. The interpreted effective strength parameters provided above are applicable only to design situations for which the stress conditions during testing are representative. Reference should be made to individual test results for details of the testing conditions.

4.5.3.3 Clayey Silt

SPT 'N'-values measured within the clayey silt portion of the deposit range between 0 blows (i.e., weight of rods or hammer) and 8 blows per 0.3 m of penetration. In situ field vane tests carried out within the clayey silt deposit measured undrained shear strengths ranging from 19 kPa and 69 kPa. The field vane test results together with the CPT testing indicate that the deposit has a soft to stiff consistency. The sensitivity is calculated to range between 2 and 8.

The natural water content measured on twenty samples of the clayey silt portion of the deposit ranges from about 25 per cent to 64 per cent.

Grain size distributions of six samples from the clayey silt portion of the deposit are shown on Figure C18 in Appendix C.

Atterberg limits tests were carried out on seventeen (17) samples of the clayey silt portion of the deposit and measured liquid limits ranging between about 24 per cent and 35 per cent, plastic limits ranging between about



17 per cent and 20 per cent and plasticity indices ranging between about 6 per cent and 17 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure C19 in Appendix C and indicate that the material is classified as clayey silt of low plasticity.

A Laboratory consolidation test was carried out on one specimen of the clayey silt deposit obtained from a Shelby tube sample in Borehole H6-S1. A preconsolidation pressure of 96 kPa were estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 18.8 kN/m³ and a specific gravity of about 2.74 were measured on the consolidation test specimen. Details of the test results are shown on Figure C20 in Appendix C, and the test results are summarized below.

Borehole Sample No.	Sample Depth/Elevation	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_p' - \sigma_{vo}'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)
Borehole H6-S1 Sample 5	17.1 m/ 292.1 m	96	130	34	1.4	0.31	0.01	0.97	5.4×10^{-2}

*For stress range between approximately effective overburden stress and final stress due to 3 m high embankment, that is $30 \text{ kPa} \leq \sigma_v' \leq 156 \text{ kPa}$

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
 OCR is the overconsolidation ratio
 C_c is the compression index
 C_r is the recompression index
 e_o is the initial void ratio
 c_v is the coefficient of consolidation in cm²/s

A total of seven cone penetration tests (H6-CPT1 to H6-CPT7) were performed in this swamp crossing for determination of the pore pressure dissipation at specific horizons within the clayey silt deposit. The range of the coefficient of consolidation in the horizontal direction (c_h) obtained from a total of five CPT pore pressure dissipation tests is summarized below.

C_h CPT-Field (cm ² /s)		
Upperbound	Lowerbound	Average
6.4×10^{-2}	9.9×10^{-3}	4.0×10^{-2}

4.5.4 Silt to Sand and Silt

A deposit of grey to brown silt to sandy silt to sand and silt, trace to some clay, trace to some gravel, and in one borehole, gravelly silt was encountered underlying the cohesive deposit in Boreholes H6-1, H6-4 to H6-19, H7-1 to H7-10, H7-12, H7-15, BC2-1, BC3-1 to BC3-3 and BC4-1 to BC4-3. The sand and silt to silt deposit was encountered between Elevation 307.0 m and 287.9 m and the thickness of the deposit ranges from 0.2 m to 8.7 m.

SPT 'N'-values measured within the silt to sand and silt deposit range between 0 blows (i.e., weight of hammer) and 36 blows per 0.3 m of penetration, indicating a very loose to dense relative density. Five SPTs did not penetrate the full sampler depth indicative of the underlying gravel deposit or inferred refusal conditions.



The natural water content measured on thirty-four samples of the silt to sand and silt deposit ranges from about 11 per cent to 37 per cent.

Grain size distributions of twenty-three samples from the silt to sand and silt deposit are shown on Figure C21 in Appendix C.

Atterberg limits tests were carried out on ten samples of the silt to sand and silt deposit and all indicate that the material is non-plastic.

4.5.5 Silty Sand to Gravel

A deposit of grey to brown silty sand to sand to gravelly sand to sand and gravel to gravel, trace to some clay was encountered underlying the cohesive deposit in Boreholes H6-2, H6-3, H7-13 and BC2-2 and underlying the silt to sand and silt deposit in Boreholes H6-1, H6-4 to H6-8, H6-12, H6-13, H6-15 to H6-17, H6-19, H7-1 to H7-8, H7-10, BC3-2, BC3-3 and BC4-1. The silty sand to gravel deposit was encountered between Elevation 306.5 m and 281.0 m and the thickness of the deposit ranges from 0.6 m to 8.0 m.

SPT 'N'-values measured within the silty sand to gravel deposit range between 4 blows and 47 blows per 0.3 m of penetration, indicating a loose to dense relative density. Several SPTs did not penetrate the full sample depth on refusal conditions.

The natural water content measured on twenty-two samples of the silty sand to gravel deposit ranges from about 7 per cent to 26 per cent.

Grain size distributions for ten samples from the silty sand to gravel are shown on Figure C22 in Appendix C.

4.5.6 Refusal/Bedrock

Refusal to further split spoon, auger and/or casing advancement and dynamic cone penetration was encountered in all boreholes and DCPTs except Boreholes H6-14 and H6-17 at depths ranging from 0.3 m to 29.3 m below existing ground surface, ranging from Elevation 306.5 m to 279.7 m.

Bedrock was encountered in Boreholes BC2-1 to BC2-3 at depths ranging from 2.1 m to 7.4 m below existing ground surface, respectively, corresponding to Elevations 307.2 m and 302.3 m, and was cored for lengths ranging from 2.9 m to 3.4 m.

The retrieved bedrock core is described as fine grained, moderately weathered to fresh, moderately to highly foliated, green to grey, metasediment. Photographs of the retrieved bedrock cores are shown on Figure C23 in Appendix C.

The TCR ranges between 91 per cent and 100 per cent and the SCR ranges between 47 per cent and 89 per cent. The RQD measured on the core samples ranges from 51 per cent to 100 per cent, indicating a rock mass of fair to excellent quality.

Laboratory UCS tests were carried out on two core samples of the bedrock and the UCS values are presented on the Record of Drillholes sheets in Appendix C and are summarized below. The metasediment bedrock in Boreholes BC2-1 and BC2-3 is classified as strong (Grade RA).



Borehole	Elevation (m)	UCS (MPa)
BC2-1	305.6	72
BC2-3	304.6	58

4.5.7 Groundwater Conditions

Groundwater levels were measured in the open boreholes during and upon completion of drilling and range between ground surface and 5.2 m below ground surface, ranging between Elevations 309.7 m and 302.2 m. Up to 0.7 m of ponded water was encountered above the ground surface in some boreholes. Boreholes H7-11 to H7-15 were dry upon completion of drilling. A piezometer was installed in Borehole BC2-2 sealed within the gravelly sand deposit, to monitor the groundwater level. The measured groundwater level in the piezometer is presented below.

Borehole	Installation	Time and/or Date	Depth to Groundwater Below Ground Surface (m)	Groundwater Elevation (m)
BC2-2	Piezometer	November 15, 2012	-0.3 ¹	310.0
	Piezometer	May 15, 2013	-0.4 ¹	310.1

¹ Groundwater level measured above ground surface at the same level (elevation) as the surface water ponded around the piezometer pipe.

Artesian groundwater conditions were encountered in Borehole H7-5 upon penetrating into the sand deposit and the groundwater level was measured 1.5 m above ground surface, corresponding to Elevation 306.5 m, upon completion of drilling. The borehole was backfilled by tremie grouting from the bottom of the borehole using cement grout.

Groundwater elevations as encountered in the boreholes may not be representative of static groundwater levels since the groundwater levels in the boreholes may not have stabilized on completion of drilling. Furthermore, groundwater elevations will vary depending on seasonal fluctuations, precipitation and local soil permeability.

4.6 Highway 66 – STA 14+840 to 15+060 (High Fill H3)

The plan and profiles along the centreline and toes of the proposed Highway 66 realignment embankment showing the borehole locations and interpreted stratigraphy between about STA 14+840 and 14+060 are shown on Drawings D1 and D2 in Appendix D. The realignment extends across undulating terrain with rock outcrops present along the proposed Highway 66 embankment limits at some locations. The proposed embankment in this section of the highway realignment is up to about 6.5 m high relative to the existing ground surface.

A total of twenty-one (23) boreholes (H3-1 to H3-15, BC5-1 to BC5-3 and BC6-1 to BC6-5) and seven (7) DCPTs (H3-D1 to H3-D7) were completed to investigate the subsurface conditions within this high fill area. The



topography in this section of the proposed highway realignment is undulating but generally sloping slightly upward from west to east. This section of the proposed realignment has moderate to dense tree cover and multiple ATV trails.

The subsurface soils along the Highway 66 realignment in the High Fill H3 area generally consist of surficial layers of topsoil, underlain by a cohesive deposit consisting of clayey silt. The cohesive deposit is underlain by a deposit of silt, which in turn is underlain by deposits of sand and silt to gravelly silty sand and/or sand and gravel, underlain by inferred bedrock. Refusal to further split spoon and/or auger advancement and dynamic cone penetration was encountered at depths up to about 9.6 m below ground surface, being deepest in the vicinity of about STA 14+860 along the Highway 66 realignment.

4.6.1 Topsoil

A layer of black topsoil was encountered from ground surface between Elevation 311.5 m and 305.3 m in all boreholes except Borehole BC6-4. Typically, the topsoil layer is between about 30 mm and 150 mm thick and 0.8 m thick in Borehole BC6-2.

One SPT 'N'-value measured within the topsoil layer is 6 blows per 0.3 m of penetration, suggesting a firm consistency.

The natural water content measured on one sample of the topsoil is about 45 per cent.

4.6.2 Clayey Silt

A deposit of brown to grey clayey silt, trace sand, trace rootlets/organics in the upper portion of the deposit was encountered underlying the topsoil deposit in Boreholes H3-2, H3-4, H3-6 to H3-11, BC5-2, BC5-3, BC6-1 and BC6-3. The deposit in Borehole BC5-2 is described as gravelly silty clay. The surface of the clayey silt deposit was encountered between Elevation 309.7 m and 306.0 m and the thickness of the deposit ranges from 0.3 m to 1.8 m.

SPT 'N'-values measured within the clayey silt deposit range between 3 blows and 27 blows per 0.3 m of penetration, suggesting a soft to very stiff consistency. Three SPTs near the base of the deposit did not penetrate the full sampler depth indicative of the lower gravelly deposit or refusal conditions.

The natural water content measured on eleven samples of the clayey silt deposit ranges from about 17 per cent to 37 per cent.

Grain size distributions of seven samples of the clayey silt deposit are shown on Figure D1 in Appendix D.

Atterberg limits tests were carried out on ten samples of the clayey silt deposit and measured liquid limits ranging from about 21 per cent to 35 per cent, plastic limits ranging from about 15 per cent to 25 per cent and plasticity indices ranging from about 5 per cent to 13 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure D2 in Appendix D and indicate that the material is generally classified as clayey silt of low plasticity. The Atterberg limits test results for the sample from Borehole H3-7 and BC5-2 measured liquid limits of about 32 per cent and 47 per cent, plastic limits of about 7 per cent and 22 per cent and corresponding plasticity indices of about 25 per cent, classifying the material as organic silt of low plasticity silty



clay of intermediate plasticity, respectively. It is noted that the sample from Borehole H3-7 was mixed with topsoil as a result of the split spoon sampling operation.

4.6.3 Silt

A deposit of brown to grey silt, trace to some clay, trace to some sand, trace to some gravel was encountered from surface, underlying the topsoil or clayey silt in Boreholes H3-1, H3-2, H3-4 to H3-6, H3-8, H3-10, H3-12 to H3-15, BC5-3 and BC6-2 to BC6-5. The surface of the silt deposit was encountered between Elevation 311.5 m and 304.5 m and the thickness of the deposit ranges from 0.5 m to 4.0 m.

SPT 'N'-values measured within the silt deposit range between 1 blow and 31 blows per 0.3 m of penetration, indicating a very loose to dense relative density.

The natural water content measured on eleven samples of the silt deposit ranges from about 17 per cent to 33 per cent.

Grain size distributions of eleven samples of the silt deposit are shown on Figure D3 in Appendix D.

Atterberg limits testing was carried out on ten samples of the silt deposit, all of which indicate that the material is non-plastic.

4.6.4 Sand and Silt to Gravelly Silty Sand

A deposit of brown to grey sand and silt to gravelly silty sand, trace to some clay was encountered underlying the silt deposit or topsoil in Boreholes H3-1 to H3-5, H3-8, H3-10, BC5-1, BC6-2 and BC6-3. The surface of the deposit was encountered between Elevation 308.5 m and 302.6 m and the thickness of the deposit ranges from 0.4 m to 2.5 m.

SPT 'N'-values measured within the sand and silt to gravelly silty sand deposit range between 5 blows and 65 blows per 0.3 m of penetration, indicating a loose to very dense relative density. Several SPTs did not penetrate the full sampler depth as a result of encountering the underlying gravelly deposit or refusal conditions.

The natural water content measured on eleven samples of the sand and silt to gravelly silty sand deposit ranges from about 7 per cent to 28 per cent.

Grain size distributions of eight samples of the sand and silt to gravelly silty sand are shown on Figure D4 in Appendix D.

4.6.5 Sand and Gravel

A deposit of brown to grey sand and gravel, trace to some silt, trace clay was encountered underlying the clayey silt in BC6-1, underlying the silt deposit in Boreholes H3-12, H3-15, BC5-3, BC6-4 and BC6-5 and underlying the sand and silt to gravelly silty sand deposit in Boreholes H3-10, and BC5-1. Cobbles were inferred present in Borehole BC6-1. The deposit was described as silty sand and gravel in Borehole BC6-5. The sand and gravel deposit was encountered between Elevation 310.2 m and 300.1 m with thickness ranging from 0.2 m to 4.9 m.



SPT 'N'-values measured within the sand and gravel deposit range between 19 blows and 75 blows per 0.3 m of penetration, indicating a compact to very dense relative density. Several SPTs did not penetrate the full sampler depth indicative of refusal conditions or the presence of cobbles

The natural water content measured on eight samples of the sand and gravel deposit ranges from about 1 per cent to 12 per cent.

Grain size distributions of four samples of the sand and gravel deposit are shown on Figure D5 in Appendix D.

4.6.6 Refusal/Bedrock

Refusal to further split spoon, and/or auger advancement and dynamic cone penetration was encountered in 11 boreholes and DCPTs at depths ranging from about 0.5 m to 8.2 m below existing ground surface, ranging from Elevation 310.4 m and 299.1 m. Bedrock was encountered at depths ranging from 0.5 m to 9.6 m below existing ground surface, ranging between Elevation 306.1 m and 299.4 m in Boreholes BC5-1 to BC5-3 and BC6-1 to BC6-5.

Bedrock core samples were obtained for lengths ranging from 3.0 m to 3.6 m. The retrieved bedrock core is described as very fine grained to very coarse grained, completely weathered to fresh, grey to greenish grey, metasediment or metasediment siltstone. Photographs of the retrieved bedrock core samples are shown on Figure D6 in Appendix D.

The TCR from Boreholes BC5-1 to BC5-3 and BC6-1 to BC6-5 ranges between 89 per cent and 100 per cent and the Solid Core Recovery ranges from 0 per cent to 100 per cent. The RQD measured on the core samples ranges from 0 per cent to 100 per cent, indicating a rock mass of very poor to excellent quality. Typically, the RQD is greater than 68 per cent indicating that the rock is of fair to excellent quality. The top run in Borehole BC6-2 has an RQD of 0 per cent due to numerous irregular joints.

Laboratory UCS tests were carried out on five selected bedrock core samples. The UCS values are presented on the Record of Drillholes sheets in Appendix D and are summarized below. The metasediment/metasediment siltstone bedrock in Boreholes BC5-1 to BC5-3 and BC6-1 to BC6-3 is considered strong to very strong (Grade R4 to R5).

Borehole	Elevation (m)	UCS (MPa)
BC5-1	301.9	143
BC5-3	297.3	166
BC6-1	299.1	64
BC6-2	299.8	174
BC6-3	302.2	177
BC6-4	302.3	116
BC6-5	302.5	138



4.6.7 Groundwater Conditions

Groundwater levels were measured in the open boreholes during and upon completion of drilling at depths ranging between 1.8 m and 4.9 m below ground surface, ranging between Elevations 306.5 m and 302.2 m. Boreholes H3-1, H3-3, H3-5 to H3-9 and H3-11 to H3-15 were dry upon completion of drilling. Piezometers were installed in Boreholes BC5-2 and BC6-2 sealed within the bedrock and within the silt/silty sand deposit, respectively. The measured groundwater levels in the piezometers are presented below.

Borehole	Installation	Date	Depth to Groundwater Below Ground Surface (m)	Groundwater Elevation (m)
BC5-2	Piezometer	November 15, 2012	-0.5 ¹ (i.e., above ground surface)	307.1
	Piezometer	May 15, 2013	-0.6 ¹ (i.e., above ground surface)	307.2
BC6-2	Piezometer	November 15, 2012	-0.2 ² (i.e., above ground surface)	305.5
	Piezometer	May 15, 2013	-0.2 ² (i.e., above ground surface)	305.5

¹ Piezometer screen noted to be plugged upon removal of well casing.

² Groundwater level measured above ground surface at the same level (elevation) as the surface water ponded around the piezometer pipe.

Groundwater elevations as encountered in the boreholes may not be representative of static groundwater levels since the groundwater levels in the boreholes may not have stabilized on completion of drilling. Furthermore, groundwater elevations will vary depending on seasonal fluctuations, precipitation and local soil permeability.

4.7 Highway 66 – STA 15+590 to 15+610 (Deep Cut)

The plan, profile along the north toe of the proposed deep cut (offset 20 m from the cut centreline) and cross-sections through the deep cut area of the Highway 66 realignment, showing the borehole locations and interpreted stratigraphy between about STA 15+590 and 15+610 are shown on Drawings E1 and E2 in Appendix E. The realigned section of the highway reconnects with the existing Highway 66 at the west end of the realignment, extending through a cut up to about 8.5 m deep relative to the existing ground surface. The north side of the alignment will cut through a bedrock outcrop; whereas, the south side of the alignment (towards the existing highway) will be in an earth cut. In this area, both permanent and temporary cut slopes are required to accommodate detours and staging.

A total of five (5) boreholes (C1 to C5) were completed to investigate the subsurface conditions within the earth cut section of the realignment, along the south toe of the bedrock outcrop. The topography in this section of the



proposed cut in general slopes downward from west to east. This section of the proposed realignment contains moderate to dense tree cover, and is crossed by various walking/ATV trails and the existing Highway 66.

The subsurface soils along the south toe of the Highway 66 realignment in this Deep Cut section generally consist of granular fill at the ground surface underlain by a cohesive deposit of clayey silt to silty clay. The cohesive deposit is underlain by a deposit of silt, which in turn is underlain by a deposit of silty gravelly sand to sand and gravel to sandy gravel, underlain by inferred bedrock. Refusal to split spoon and further auger advancement and dynamic cone penetration was encountered at depths of up to about 10.8 m below ground surface, being deepest in the vicinity of about STA 15+610 along the Highway 66 realignment.

4.7.1 Embankment Fill

Borehole C5 was advanced through the existing Highway 66 embankment and encountered a 200 mm thick layer of asphalt, with the road surface at Elevation 316.8 m. A deposit of silty sand to gravelly sand fill was encountered below the asphalt in Borehole C5 and from ground surface in Boreholes C1 to C3, which were advanced adjacent to the existing roadway. The fill deposit was encountered between Elevation 316.6 m and 317.5 m and the thickness of the deposit ranges from 0.7 m to 1.8 m.

The SPT 'N'-values measured within the fill deposit are 18 blows and 22 blows per 0.3 m of penetration, indicating a compact relative density.

The natural water content measured on two samples of the fill deposit is about 5 per cent.

A grain size distribution of one sample of the fill deposit is shown on Figure E1 in Appendix E.

4.7.2 Clayey Silt to Silty Clay

A deposit of brown to grey clayey silt to silty clay, trace to some sand, trace organics was encountered underlying the fill in Boreholes C1 to C3 and C5 and from ground surface in Borehole C4. The surface of the clayey silt to silty clay deposit was encountered between Elevation 316.4 m and 315.7 m and the thickness of the deposit ranges from 1.0 m to 2.1 m.

The SPT 'N'-values measured within the clayey silt to silty clay deposit range between 3 blows and 12 blows per 0.3 m of penetration. One in situ field vane test carried out within the clayey silt to silty clay deposit near the bottom of the deposit measured an undrained shear strength greater than 100 kPa. The SPT 'N'-values together with the field vane shear strength suggest that the deposit has a soft to very stiff consistency.

The natural water content measured on five samples of the clayey silt to silty clay deposit ranges from about 18 per cent to 40 per cent.

Grain size distributions of two samples of the clayey silt to silty clay deposit are shown on Figure E2 in Appendix E.

Atterberg limits tests were carried out on four samples of the cohesive deposit and measured liquid limits ranging from about 32 per cent to 49 per cent, plastic limits ranging from about 20 per cent to 24 per cent and plasticity indices ranging from about 12 per cent to 25 per cent. The result of the Atterberg limits tests are shown on the plasticity chart on Figure E3 in Appendix E and indicate that the material is classified as clayey silt of low plasticity to silty clay of intermediate plasticity.



4.7.3 Silt

A deposit of grey silt, trace to some clay, trace to some sand was encountered underlying the clayey silt to silty clay deposit in all boreholes. The surface of the silt deposit was encountered between Elevation 314.6 m and 313.8 m and the thickness of the deposit ranges from 4.0 m to 5.0 m.

The SPT 'N'-values measured within the silt deposit range between 0 blows (i.e., weight of hammer) and 17 blows per 0.3 m of penetration, indicating a very loose to compact relative density.

The natural water content measured on eleven samples of the silt deposit ranges from about 19 per cent to 28 per cent.

Grain size distributions of six samples of the silt deposit are shown on Figure E4 in Appendix E.

An Atterberg limits test was carried out on one sample of the silt deposit and indicates that the material is non-plastic.

4.7.4 Silty Gravelly Sand to Sand and Gravel

A deposit of grey to brown silty gravelly sand to sand and gravel, trace to some clay was encountered underlying the silt in all the boreholes. The surface of the deposit was encountered between Elevation 310.6 m and 308.8 m and the thickness of the deposit ranges from 0.6 m to 4.6 m.

The SPT 'N'-values measured within the silty gravelly sand to sand and gravel deposit range between 8 blows and 60 blows per 0.3 m of penetration, indicating a loose to very dense relative density.

The natural water content measured on four samples of the silty gravelly sand to sand and gravel deposit ranges from about 6 per cent to 10 per cent.

Grain size distributions of three samples of the silty gravelly sand to sand and gravel deposit are shown on Figure E5 in Appendix E.

4.7.5 Refusal/Bedrock

Refusal to further split spoon/auger advancement and dynamic cone penetration was encountered in Boreholes C1 to C3 and C5 and Borehole C4, respectively, at depths ranging from about 7.8 m to 10.8 m below existing ground surface, ranging from Elevation 309.1 m to 306.0 m.

4.7.6 Groundwater Conditions

Groundwater levels were measured in open Boreholes C1, C3 and C5 during and upon completion of drilling at depths ranging between 2.2 m and 3.0 m below ground surface, corresponding to between Elevation 314.6 m and 314.1 m. Boreholes C2 and C4 caved at 0.6 m and 1.8 m below ground surface, respectively.

Groundwater elevations as encountered in the boreholes may not be representative of static groundwater levels since the groundwater levels in the boreholes may not have stabilized on completion of drilling. Furthermore, groundwater elevations will vary depending on seasonal fluctuations, precipitation and local soil permeability.



4.8 Highway 66 - Excess Material Management Area

The plan and profile in the proposed excess material management (EMM) area showing the borehole locations and interpreted stratigraphy are shown on Drawing F1 in Appendix F. The proposed Highway 66 EMM area extends across a low-lying swamp, adjacent to swamp crossing H6/H7.

A total of nine (9) boreholes (EMM1 to EMM9) were completed to investigate the subsurface conditions within the EMM area. The topography in this section of the proposed highway realignment slopes slightly downward from west to east and from south to north and the terrain contains swampy areas, moderate to dense tree cover and multiple ATV trails.

The subsurface soils within the EMM area generally consist of peat underlain by a cohesive deposit consisting of an upper zone of clayey silt, a middle zone of silty clay to clay and a lower zone of clayey silt. The cohesive deposit is generally underlain by a deposit of silt which in turn is underlain by a deposit of silty sand to sand and gravel. Refusal to further casing advancement and/or split spoon penetration was encountered at depths of up to about 23.3 m, being deepest in the vicinity of Borehole EMM1.

4.8.1 Peat

A deposit of black fibrous peat ranging in thickness from 0.5 m to 4.3 m was encountered from ground surface, from Elevation 311.3 m to Elevation 308.0 m.

SPT 'N'-values measured within the peat deposit generally ranged between 0 blows (i.e., weight of hammer) and 5 blows per 0.3 m of penetration, suggesting a very soft to firm consistency. Two SPT 'N'-values at 2.4 m depth of 11 and 38 blows per 0.3 m of penetration were measured within the peat deposit in Boreholes EMM1 and EMM2, however these 'N' values are inferred to be due to the presence of frozen material and thus not representative. In situ field vane tests carried out within the peat deposit measured undrained shear strengths ranging from 10 kPa to 96 kPa. The SPT 'N'-values together with the field vane shear strength suggest that the deposit has a very soft to stiff consistency.

The natural water content measured on twelve samples of the peat ranges from about 13 per cent to 1,124 per cent. The organic content measured on one sample of the peat is about 59 per cent.

A laboratory consolidation test was carried out on one specimen of the peat deposit obtained from a Shelby tube sample in Boreholes EMM5. A preconsolidation pressure of 48 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of 10.2 kN/m³ and a specific gravity of 1.58 was measured on the consolidation test specimen. Details of the test results are shown on Figure F1 in Appendix F, and the test results are summarized below.



FOUNDATION REPORT – SWAMP CROSSING/HIGH FILL AREAS REALIGNMENT OF HIGHWAY 66, AT VIRGINIATOWN, GWP 5091-07-00

Borehole Sample No.	Sample Depth/ Elevation	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_p' - \sigma_{vo}'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)
Borehole EMM5 Sample 2	1.8 m/ 308.8 m	4.0	48	44.0	12.0	2.4	0.5	5.8	7.7×10^{-3}

*For stress range between approximately effective overburden stress and approximate final stress, that is $6 \text{ kPa} \leq \sigma_v' \leq 20 \text{ kPa}$

where:

- σ_{vo}' is the effective overburden stress in kPa
- σ_p' is the preconsolidation stress in kPa
- OCR is the overconsolidation ratio
- C_c is the compression index
- C_r is the recompression index
- e_o is the initial void ratio
- c_v is the coefficient of consolidation in cm²/s

4.8.2 Sandy Silt

A deposit of brown sandy silt was encountered underlying the peat deposit in Borehole EMM9. The sandy silt deposit is of 1.0 m thick and was encountered at Elevation 307.5 m.

4.8.3 Clayey Silt to Clay

A cohesive deposit generally consisting of an upper zone of clayey silt, a middle zone consisting of silty clay to clay and a lower zone transitioning to clayey silt was encountered underlying the peat. The total thickness of the cohesive deposit is between 6.8 m and 15.4 m and the surface of the deposit was encountered between Elevation 309.7 m and 305.0 m.

The upper zone of the cohesive deposit consists of grey clayey silt, trace to some sand, trace organics and is between 1.7 m and 3.8 m thick. Within this upper zone of the cohesive deposit silt seams were frequently encountered and the deposit is considered to be varved.

The middle zone of the cohesive deposit consists of grey silty clay to clay, trace sand and is between 4.5 m and 9.5 m thick. Pockets of organic material were also encountered in the middle zone of this deposit on occasion in split spoon samples. Although this zone of the cohesive deposit is not considered varved, irregular varves were occasionally encountered.

The lower zone of the cohesive deposit consists of grey clayey silt, trace sand and is between 1.3 m and 4.8 m thick.

4.8.3.1 Clayey Silt

SPT 'N'-values measured within the clayey silt upper zone of the cohesive deposit range between 0 blows (i.e., weight of hammer) and 6 blows per 0.3 m of penetration. In-situ field vane tests carried out within the clayey silt portion of the deposit measured undrained shear strengths ranging from about 17 kPa to 77 kPa, indicating that the deposit has a soft to stiff consistency. The sensitivity is calculated to range between about 2 and 14.

The natural water content measured on ten samples of the clayey silt portion of the deposit ranges from about 28 per cent to 35 per cent.



A grain size distribution of one sample of the clayey silt upper zone of the cohesive deposit are shown on Figure F2 in Appendix F.

Atterberg limits tests were carried out on seven samples of the clayey silt portion of the deposit and measured liquid limits ranging from about 24 per cent to 31 per cent, plastic limits ranging from about 15 per cent to 18 per cent and plasticity indices ranging from about 9 per cent to 14 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure F3 in Appendix F and indicate that the material is classified as clayey silt of low plasticity.

A laboratory consolidation test was carried out on a specimen of the clayey silt deposit obtained from a Shelby tube in Borehole EMM1. A preconsolidation pressure of 110 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight and a specific gravity of 18.9 kN/m³ and 2.76, respectively, were measured on the consolidation test specimen, respectively. Details of the test results are shown on Figure F4 in Appendix F, and the test results are summarized below.

Borehole Sample No.	Sample Depth/ Elevation	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_p' - \sigma_{vo}'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)
Borehole EMM1 Sample 5	6.4 m/ 304.2 m	20	110	90	5.5	0.235	0.007	0.89	1.4×10^{-2}

*For stress range between approximately effective overburden stress and final stress due to 3 m high embankment, that is 40 kPa $\leq \sigma_v' \leq 156$ kPa

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is overconsolidation ratio
 e_o is initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s

4.8.3.2 Silty Clay to Clay

SPT 'N'-values of 0 blows (i.e., weight of rods or hammer) per 0.3 m of penetration were measured within the silty clay to clay portion of the deposit. In situ field vane tests carried out within the silty clay to clay portion of the deposit measured undrained shear strengths ranging between about 12 kPa and 45 kPa, indicating that the deposit has a very soft to firm consistency. The sensitivity is calculated to range between about 2 and 12. One SPT 'N'-value of 51 blows per 0.3 m of penetration was encountered at the base of the cohesive deposit in Borehole EMM5, likely influenced by the underlying silty sand deposit.

The natural water content measured on twenty-one samples of the silty clay to clay portion of the deposit range from about 32 per cent to 85 per cent.

Grain size distributions of three samples from the silty clay to clay portion of the deposit are shown on Figure F5 in Appendix F.

Atterberg limits tests were carried out on thirteen samples of the silty clay to clay portion of the deposit and measured liquid limits ranging from about 35 per cent to 59 per cent, plastic limits ranging from about 19 per cent to 26 per cent and corresponding plasticity indices ranging from about 16 per cent to 33 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure F6 in Appendix F and indicate that the material is classified as silty clay of intermediate plasticity to clay of high plasticity.



4.8.3.3 Clayey Silt

SPT 'N'-values measured within the clayey silt lower zone of the cohesive deposit range between 0 blows (i.e., weight of rods or hammer) and 8 blows per 0.3 m of penetration. In situ field vane tests carried out within the clayey silt deposit measured undrained shear strengths ranging from 25 kPa and 34 kPa, indicating that the deposit has a soft to firm consistency. The sensitivity is calculated to range between 2 and 4.

The natural water content measured on seven samples of the clayey silt portion of the deposit ranges from about 33 per cent to 62 per cent.

Grain size distributions of two samples from the clayey silt lower zone of the cohesive deposit are shown on Figure F7 in Appendix F.

Atterberg limits tests were carried out on three samples of the clayey silt portion of the deposit and measured liquid limits ranging between of about 23 per cent and 31 per cent, plastic limits ranging between about 16 per cent and 20 per cent and corresponding plasticity indices ranging between about 7 per cent and 12 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure F8 in Appendix F and indicate that the material is classified as clayey silt of low plasticity.

4.8.4 Silt

A deposit of grey silt, trace to some clay, trace sand was encountered underlying the cohesive deposit in Boreholes EMM1, EMM2, and EMM6 to EMM9. The surface of the silt deposit was encountered between Elevation 300.1 m and 292.8 m and the thickness of the deposit ranges from 1.5 m to 4.6 m.

SPT 'N'-values measured within the silt deposit range between 2 blows and 10 blows per 0.3 m of penetration, indicating a very loose to compact relative density.

The natural water content measured on eight samples of the silt deposit ranges from about 23 per cent to 31 per cent.

Grain size distributions of three samples from the silt deposit are shown on Figure F9 in Appendix F.

Atterberg limits tests were carried out on three samples of the silt deposit. One of the samples was non-plastic and the other two samples measured liquid limit of about 24 per cent, plastic limits of about 20 per cent and 21 per cent, and corresponding plasticity indices of about 3 per cent and 4 per cent, indicating silt of slight plasticity as shown in Figure F10 in Appendix F.

4.8.5 Silty Sand to Sand and Gravel

A deposit of grey silty sand to sand and gravel, trace clay was encountered underlying the cohesive deposit in Boreholes EMM3 and EMM4 and underlying the silt deposit in Boreholes EMM1, EMM2 and EMM5 to EMM9. In Borehole EMM3, only a small amount of material was recovered from the one sample in this deposit indicative of the presence of gravel. The surface of the silty sand to sand and gravel deposit was encountered between Elevation 300.2 m and 289.5 m and the thickness of the deposit ranges from 0.3 m to 5.4 m.



SPT 'N'-values measured within the silty sand to sand and gravel deposit range between 4 blows and 48 blows per 0.3 m of penetration, indicating a very loose to dense relative density. Four SPTs did not penetrate the full sample depth on refusal conditions.

The natural water content measured on six samples of the silty sand to sand and gravel deposit ranges from about 7 per cent to 42 per cent.

Grain size distributions for three samples from the silty sand to sand and gravel deposit are shown on Figure F11 in Appendix F.

4.8.6 Refusal

Refusal to further split spoon and/or casing advancement was encountered in all boreholes except Borehole EMM6 at depths ranging from 10.7 m to 23.3 m below existing ground surface, ranging from Elevation 299.9 m to 286.1 m.

4.8.7 Groundwater Conditions

Groundwater levels were measured in the open boreholes upon completion of drilling at the ground surface in all boreholes except EMM9, in which the groundwater level was at a depth of 2.3 m below ground surface, ranging between Elevation 311.3 m and 305.7 m. Groundwater elevations as encountered in the boreholes may not be representative of static groundwater levels since the groundwater levels in the boreholes may not have stabilized on completion of drilling. Furthermore, groundwater elevations will vary depending on seasonal fluctuations, precipitation and local soil permeability.

5.0 CLOSURE

The field drilling program was supervised by Mr. Gabriel Mathieu, Mr. Alex Mayot, Mr. Billy Murphy, Mr. Mat Riopelle, Mr. Ed Savard, Mr. Matt Soderman, and Mr. Matthew Thibeault over the three years that the investigation took place. This report was prepared by Mr. Matthew Thibeault, a geotechnical engineering intern and reviewed by Ms. Sarah Coyne, P.Eng., a senior geotechnical engineer and Associate with Golder. Mr. Jorge Costa, P.Eng., Principal and Golder's Designated MTO Foundations Contact, conducted an independent review of this report.



Report Signature Page

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Hwy 66 Virginiatown HF, SW, Cut Areas.docx



LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
$\ln x$,	natural logarithm of x
\log_{10}	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time
FoS	factor of safety

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta \sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a)	Index Properties
$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
C_v	coefficient of consolidation (vertical direction)
C_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = $\tan \delta$
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

* Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

Notes: 1
2

$$\tau = c' + \sigma' \tan \phi'$$

$$\text{shear strength} = (\text{compressive strength})/2$$



LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I. SAMPLE TYPE

AS	Auger sample
BS	Block sample
CS	Chunk sample
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Split-spoon
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

II. PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg. (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 300 mm (12 in.)

Dynamic Cone Penetration Resistance; N_d :

The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure

PM: Sampler advanced by manual pressure

WH: Sampler advanced by static weight of hammer

WR: Sampler advanced by weight of sampler and rod

Piezo-Cone Penetration Test (CPT)

A electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

III. SOIL DESCRIPTION

(a) Non-Cohesive (Cohesionless) Soils

Density Index	N
Relative Density	Blows/300 mm or Blows/ft
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) Cohesive Soils Consistency

	C_u, S_u	
	kPa	psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very stiff	100 to 200	2,000 to 4,000
Hard	over 200	over 4,000

IV. SOIL TESTS

w	water content
w_p	plastic limit
w_l	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test ¹
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
D_R	relative density (specific gravity, G_s)
DS	direct shear test
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V	field vane (LV-laboratory vane test)
γ	unit weight

Note: 1 Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

V. MINOR SOIL CONSTITUENTS

Per cent by Weight	Modifier	Example
0 to 5	Trace	Trace sand
5 to 12	Trace to Some (or Little)	Trace to some sand
12 to 20	Some	Some sand
20 to 30	(ey) or (y)	Sandy
over 30	And (non-cohesive (cohesionless)) or With (cohesive)	Sand and Gravel Silty Clay with sand / Clayey Silt with sand



LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERINGS STATE

Fresh: no visible sign of weathering

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, measured relative to the length of the total core run. RQD varied from 0% for completely broken core to 100% for core in solid sticks.

DISCONTINUITY DATA

Fracture Index

A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

JN Joint	PL Planar
FLT Fault	CU Curved
SH Shear	UN Undulating
VN Vein	IR Irregular
FR Fracture	K Slickensided
SY Stylolite	PO Polished
BD Bedding	SM Smooth
FO Foliation	SR Slightly Rough
CO Contact	RO Rough
AXJ Axial Joint	VR Very Rough
KV Karstic Void	
MB Mechanical Break	



**FOUNDATION REPORT – SWAMP CROSSING/HIGH FILL AREAS
REALIGNMENT OF HIGHWAY 66, AT VIRGINIATOWN, GWP 5091-07-00**

**Table 1: Summary of Swamp Crossings/High Fill Areas, Deep Cut and Excess Material Management Area
Highway 66 Realignment, Virginiatown**

Foundation Investigation Area	Foundation Investigation Area Designation	Maximum Proposed Embankment Height ¹	Boreholes/DCPT	Appendix
Highway 66 STA 13+080 to 13+185 Highway 66 Connection STA 10+000 to 10+100	High Fill H4 High Fill H1	5.7 m	17 Boreholes (H1-4 to H1-7, H1-6a, H1-9, H1-10, H4-1 to H4-6, C1-2, BC1-1 to BC1-3) 5 DCPTs (H1-D1, H1-D3, H1-D4, H4-D1 and H4-D2)	A
Highway 66 STA 13+300 to 13+345	High Fill H5	7.1 m	8 Boreholes (H5-1, H5-2, BC1A-1 to BC1A-6) 2 DCPTs (H5-D1 and H5-D2)	B
Highway 66 STA 14+020 to 14+650	Swamp Crossing H6/H7	3.0 m	49 Boreholes (H6-1 to H6-19, H6-7A, H6-S1 to H6-S5, H7-1 to H7-15, BC2-1 to BC2-3, BC3-1 to BC3-3, BC4-1 to BC4-3) 19 DCPTs (H6-D1 to H6-D11, H7-D1 to H7-D8) 7 CPTs (CPT1 to CPT7)	C
Highway 66 STA 14+840 to 15+060	High Fill H3	6.5 m	23 Boreholes (H3-1 to H3-15, BC5-1 to BC5-3, BC6-1 to BC6-5) 7 DCPTs (H3-D1 to H3-D7)	D
Highway 66 STA 15+590 to 15+610	Deep Cut	8.5 m Cut	5 Boreholes (C1 to C5)	E
Highway 66 STA 14+050 to 14+675 (o/s right)	Excess Material Management Area	n/a	9 Boreholes (EMM1 to EMM9)	F

Prepared By: MT

Reviewed By: SEMC/JMAC

Note: 1. Based on centreline profile of highway alignment and existing ground surface profiles provided by MRC. Embankment height is approximate and is relative to top of peat/original ground surface at the borehole locations.



**FOUNDATION REPORT – SWAMP CROSSING/HIGH FILL AREAS
REALIGNMENT OF HIGHWAY 66, AT VIRGINIATOWN, GWP 5091-07-00**

**Table 2: Summary of Consolidation Test Parameters and Triaxial Test Results
Highway 66 Realignment**

Foundation Investigation Area	Borehole and Sample No.	Depth/Elevation (m)	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_{vo}' - \sigma_p'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)	c' (cm ² /s)	ϕ' (cm ² /s)
High Fill H1/H4	Borehole H1-6A Sample 4	4.9/299.3	87	130	43	1.5	1.20	0.06	2.16	3.9×10^{-3}	-	-
High Fill H1/H4	Borehole H1-9 Sample 7	6.3/297.6	78	78	0	1.0	0.57	0.04	1.92	8.6×10^{-3}	-	-
Swamp Crossing H6/H7	Borehole H6-7A Sample 1	6.4/302.7	27	62	35	2.3	0.46	0.03	1.50	1.8×10^{-3}	-	-
Swamp Crossing H6/H7	Borehole H6-S1 Sample 1	4.8/304.4	15	67	52	1.8	0.22	0.01	0.89	3.8×10^{-3}	-	-
Swamp Crossing H6/H7	Borehole BC4-1 Sample 4	3.4/301.8	18	125	107	6.9	1.04	0.04	1.87	1.4×10^{-2}	-	-
Swamp Crossing H6/H7	Borehole BC4-1 Sample 5	4.9/300.3	30	92	62	3.1	0.68	0.05	1.74	1.3×10^{-2}	-	-
Swamp Crossing H6/H7	Borehole BC4-1 Sample 6	6.4/298.8	40	134	94	3.4	0.90	0.05	1.62	1.6×10^{-2}	-	-
Swamp Crossing H6/H7	Borehole H6-S1 Sample 2	7.8/301.4	35	60	25	1.7	1.20	0.02	1.80	4.0×10^{-3}	-	-
Swamp Crossing H6/H7	Borehole H6-S1 Sample 4	14.2/ 295.0	76	80	4	1.1	0.82	0.02	1.61	5.7×10^{-3}	-	-
Swamp Crossing H6/H7	Borehole H6-S1 Sample 5	17.1/ 292.1	96	130	34	1.4	0.31	0.01	0.97	5.4×10^{-2}	-	-
Swamp Crossing H6/H7	Borehole H6-S2 Samples 1	4.6 /304.1	-	-	-	-	-	-	-	-	0	35
	Borehole H6-S2 Sample 2	7.9/300.8	-	-	-	-	-	-	-	-	3	24



**FOUNDATION REPORT – SWAMP CROSSING/HIGH FILL AREAS
REALIGNMENT OF HIGHWAY 66, AT VIRGINIATOWN, GWP 5091-07-00**

**Table 2: Summary of Consolidation Test Parameters and Triaxial Test Results
Highway 66 Realignment**

Foundation Investigation Area	Borehole and Sample No.	Depth/Elevation (m)	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_{vo}' - \sigma_p'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)	c' (cm ² /s)	ϕ' (cm ² /s)
Swamp Crossing H6/H7	Borehole H6-S4 Sample 1	3.0/ 303.7	-	-	-	-	-	-	-	-	0	35
	Borehole H6-S5 Sample 1	1.8/303.4	-	-	-	-	-	-	-	-	0	35
Swamp Crossing H6/H7	Borehole H6-S2 Sample 3	10.8/297.9	-	-	-	-	-	-	-	-	3	24
	Borehole H6-S2 Sample 4	14.0/294.7	-	-	-	-	-	-	-	-	3	24
EMM Area	Borehole EMM5 Sample 2 (peat)	1.8/308.8	4	48	44	12	2.4	0.5	5.8	7.0×10^{-3}	-	-
EMM Area	Borehole EMM1 Sample 5	6.4/ 304.3	20	110	90	5.5	0.24	0.007	0.89	1.4×10^{-2}	-	-

Note: *For stress range between approximately in situ effective overburden stress and final stress as indicated in Section 4 for the individual tests.

where: σ_{vo}' is the effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 C_c is the compression index
 C_r is the recompression index
 e_o is the initial void ratio
 c_v is the coefficient of consolidation in cm²/s
 c' is the effective cohesion in kPa
 ϕ' is the effective friction angle (degrees)

Prepared By: MT

Reviewed By: SEMC

N 5335000

N 5334500

N 5334000

N 5333500

E 409500

E 410000


E 410500


E 411000

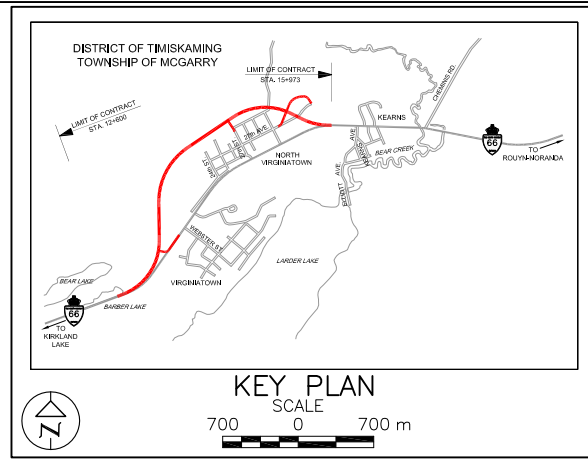
METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

HIGHWAY 66
Swamp Crossings / High Fill /
Excess Material Management Areas,
Culverts and Foundation Deep Cut
INDEX PLAN


SHEET

**Golder Associates Ltd.**
SUDBURY, ONTARIO, CANADA



LEGEND

- H1** High Fill/Swamp Crossing Area
- BC1** Culvert
- C** Deep Cut
- EMM** Excess Material Management Area

NOTES

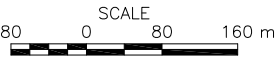
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.



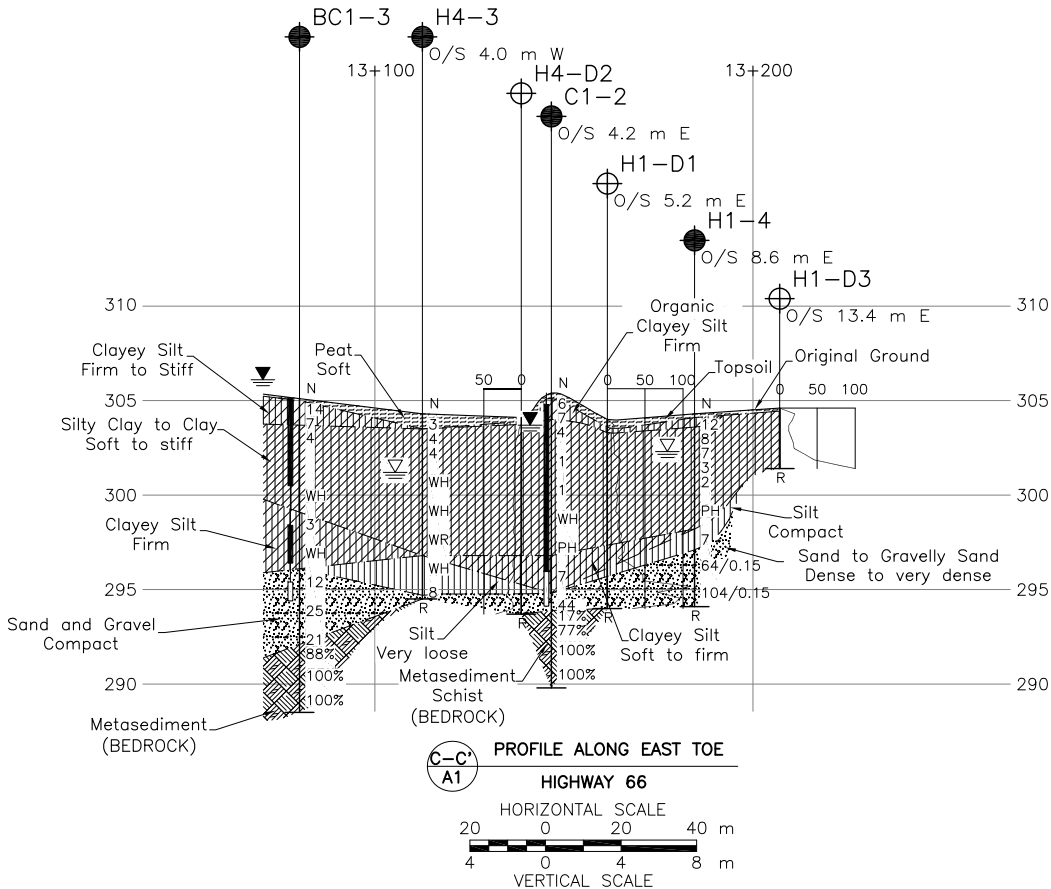
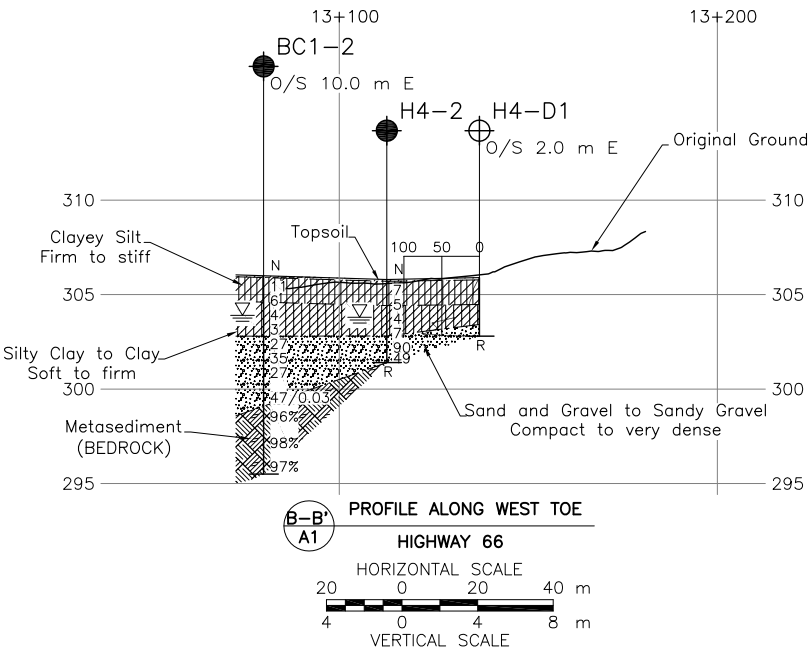
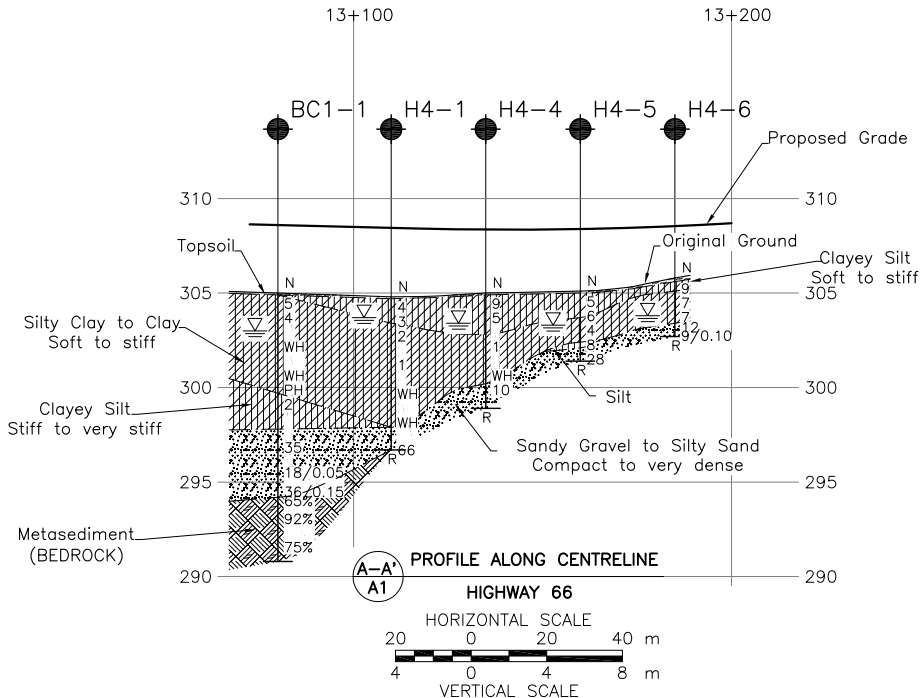
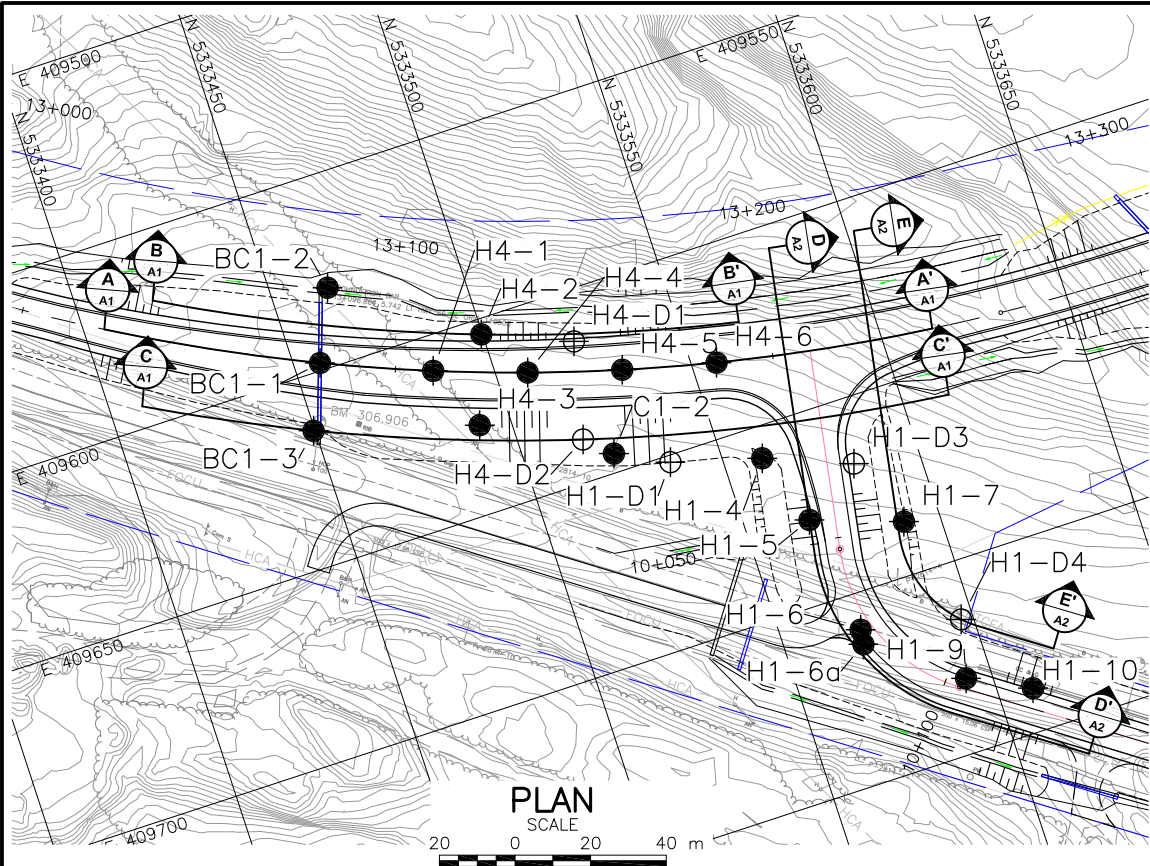
NO.	DATE	BY	REVISION
Geocres No.			
HWY. 66		PROJECT NO. 10-1191-0044	DIST.
SUBM'D. MT	CHKD.	DATE: DEC 2013	SITE:
DRAWN: JJJ	CHKD. SEMC	APPD. JMAC	DWG. 1



APPENDIX A

Highway 66 – STA 13+080 to 13+185 (High Fill H4)

Highway 66 Connection – STA 10+000 to 10+125 (High Fill H1)



REFERENCE
Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.

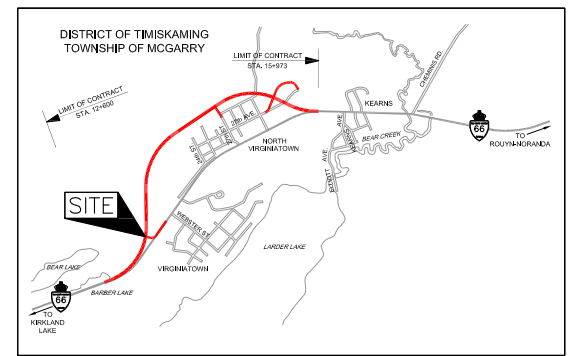
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METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No. GWP No. 5091-07-00
HIGHWAY 66
HWY 66 - STA 13+080 TO 13+185 AND
HWY 66 CONNECTION - STA 10+100 TO 10+125
BOREHOLE LOCATIONS AND
SOIL STRATA



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA



- LEGEND**
- Borehole
 - ⊕ Dynamic Cone Penetration Test
 - N Standard Penetration Test Value
 - 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
 - 100% Rock Quality Designation (RQD)
 - R Refusal
 - ▽ WL upon completion of drilling
 - ▽ WL in piezometer, measured on NOV 17, 2012

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
BC1-1	305.0	5333456.8	409598.0
BC1-2	306.0	5333464.9	409579.7
BC1-3	305.1	5333449.6	409614.5
C1-2	305.4	5333523.2	409645.0
H1-4	304.3	5333560.1	409658.4
H1-5	303.5	5333566.9	409677.8
H1-6	304.2	5333570.7	409709.6
H1-6a	304.2	5333570.2	409713.5
H1-7	303.8	5333590.5	409686.0
H1-9	303.9	5333593.2	409730.5
H1-10	303.6	5333609.2	409738.5
H1-D1	304.0	5333536.7	409651.8
H1-D3	304.6	5333582.7	409667.3
H1-D4	302.5	5333596.8	409715.3
H4-1	304.8	5333484.6	409609.3
H4-2	305.8	5333499.7	409604.1
H4-3	304.3	5333491.8	409626.8
H4-4	305.0	5333508.2	409617.5
H4-5	305.1	5333532.2	409624.6
H4-6	305.8	5333556.5	409630.6
H4-D1	305.9	5333522.4	409613.5
H4-D2	304.1	5333516.6	409638.9

NO.	DATE	BY	REVISION
Geocres No. 32D-17			
HWY. 66		PROJECT NO. 10-1191-0044	
SUBM'D. MT		CHKD.	DATE: DEC 2013
DRAWN: JJJ		CHKD. SEMC	APPD. JMAC
		DIST.	
		SITE:	
		DWG. A1	

METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

HIGHWAY 66
HWY 66 - STA 13+080 TO 13+185 AND
HWY 66 CONNECTION - STA 10+100 TO 10+125
SOIL STRATA

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA

LEGEND

- Borehole
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated
(Std. Pen. Test, 475 j/blow)
- 100% Rock Quality Designation (RQD)
- R Refusal
- WL upon completion of drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
H1-4	304.3	5333560.1	409658.4
H1-5	303.5	5333566.9	409677.8
H1-6	304.2	5333570.7	409709.6
H1-7	303.8	5333590.5	409686.0
H1-9	303.9	5333593.2	409730.5
H1-10	303.6	5333609.2	409738.5
H1-D3	304.6	5333582.7	409667.3
H1-D4	302.5	5333596.8	409715.3

NOTES

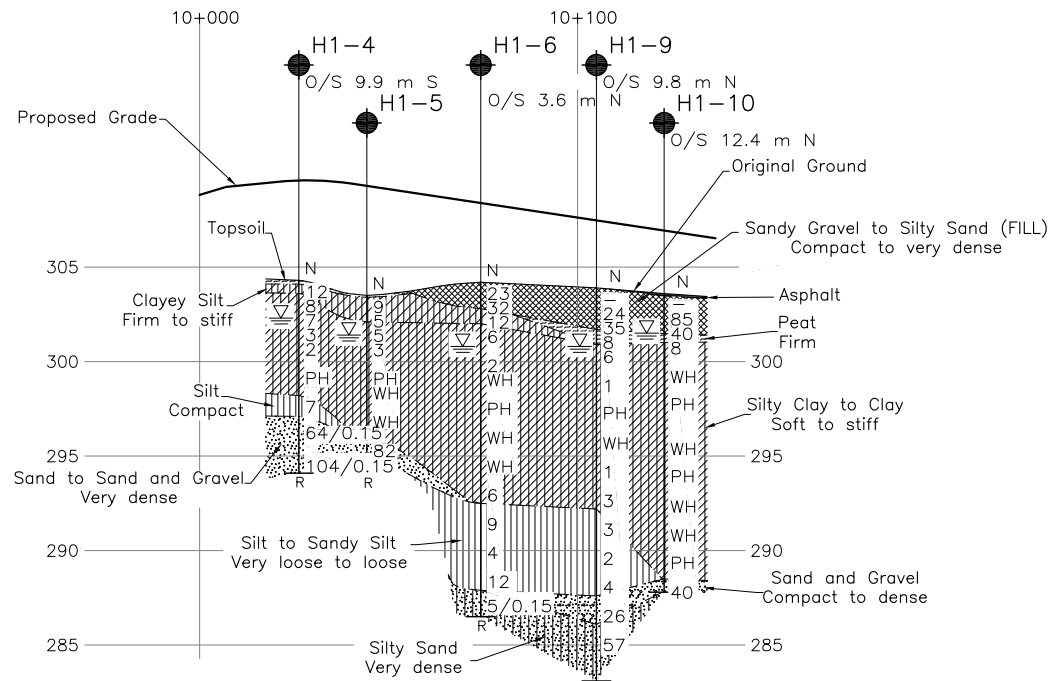
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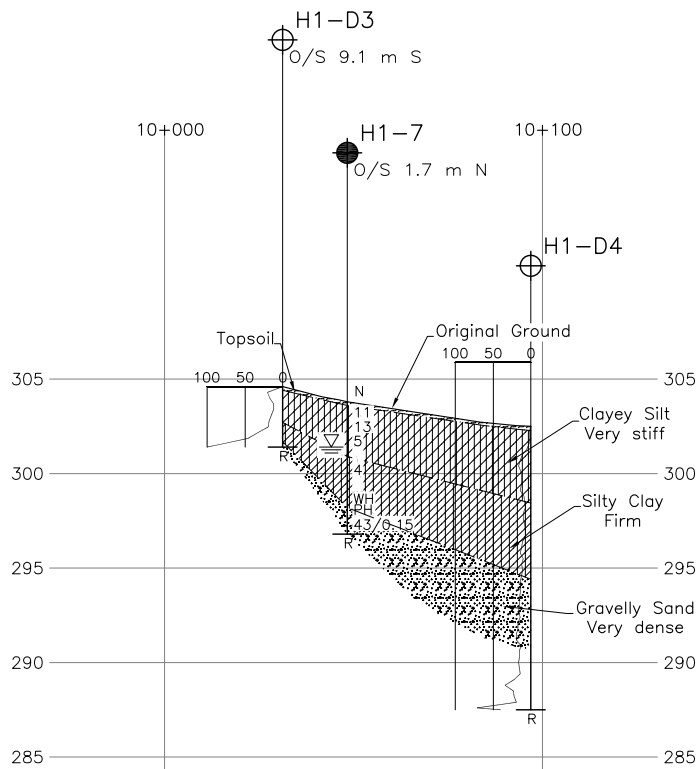
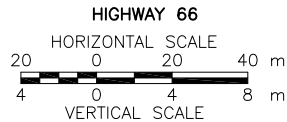
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REFERENCE

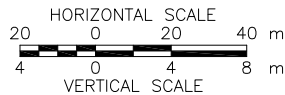
Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.



D-D'
A1 PROFILE ALONG HIGHWAY 66 CONNECTOR SOUTH TOE



E-E'
A1 PROFILE ALONG HIGHWAY 66 CONNECTOR NORTH TOE



NO.	DATE	BY	REVISION
Geocres No. 32D-17			
HWY. 66	PROJECT NO. 10-1191-0044		DIST.
SUBM'D. MT	CHKD.	DATE: DEC 2013	SITE:
DRAWN: JJL	CHKD. SEMC	APPD. JMAC	DWG. A2

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H1-5				1 OF 1 METRIC								
G.W.P. 5091-07-00			LOCATION N 5333566.9; E 409677.8				ORIGINATED BY MT								
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT								
DATUM GEODETIC			DATE July 28, 2011				CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)				
303.5	GROUND SURFACE														
0.0	TOPSOIL		1	SS	9										
	CLAYEY SILT, trace to some sand, trace rootlets Firm to stiff Grey and brown Moist		2	SS	5										
302.1	SILTY CLAY, trace sand		3	SS	5										
1.4	Soft to stiff Grey Wet		4	SS	3										
			5	TO	PH										
			6	SS	WH										
			7	SS	WH										
295.9	SAND and GRAVEL, some silt		8	SS	82										
7.6	Very dense Grey Wet Spoon attempted at 8.7 m depth, bouncing.														
294.8	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)														
8.7	Note: 1. Water level at a depth of 2.1 m below ground surface (Elev. 301.4 m) upon completion of drilling.														

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H1-6				1 OF 2 METRIC						
G.W.P. 5091-07-00				LOCATION N 5333570.7; E 409709.6				ORIGINATED BY MT						
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT						
DATUM GEODETIC				DATE July 26, 2012				CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
304.2	GROUND SURFACE													
0.0	Sandy gravel, trace silt (FILL) Compact to dense Brown Moist		1	SS	23									
			2	SS	32									
302.8														
1.4	Sandy CLAYEY SILT, trace to some gravel Stiff Brown Moist		3	SS	12									
302.0														
2.2	SILTY CLAY, trace sand Soft to stiff Grey Moist to wet		4	SS	6									
			5	SS	2									
			6	SS	WH									
			7	TO	PH									
			8	SS	WH									
			9	SS	WH									
			10	SS	6									
	Silt seams encountered between 10.7 m and 11.3 m depth.													
292.5														
11.7	Sandy SILT, trace to some gravel, trace to some clay Loose to compact Grey Wet		11	SS	9									
			12	SS	4									

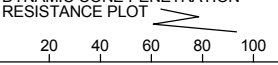
Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT		10-1191-0044				RECORD OF BOREHOLE No H1-6				2 OF 2 METRIC							
G.W.P.		5091-07-00		LOCATION		N 5333570.7; E 409709.6				ORIGINATED BY		MT					
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY		MT					
DATUM		GEODETIC		DATE		July 26, 2012				CHECKED BY		SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PILOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
	--- CONTINUED FROM PREVIOUS PAGE ---																
287.9	Sandy SILT, trace to some gravel, trace to some clay Loose to compact Grey Wet		13	SS	12		289										11 27 45 7
16.3	Silty SAND, some gravel Loose Grey Wet		14	SS	5/0.15		288										
286.5							287										
17.7	END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 3.4 m below ground surface (Elev. 300.8 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H1-6a			1 OF 1 METRIC						
G.W.P. 5091-07-00			LOCATION N 5333570.2; E 409713.5			ORIGINATED BY MR						
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY AC						
DATUM GEODETIC			DATE May 21, 2013			CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES							
304.2	GROUND SURFACE						304					
0.0	Hollow stem augers advanced from ground surface to 1.5 m depth without sampling (See Borehole H1-6).						303					
302.7	1.5 Silty sand and gravel (FILL), trace organics, trace to some clay		1	SS	9		302					
302.0	Loose Brown Moist						301					
2.2	SILTY CLAY to CLAY Soft to stiff Grey Wet		2	TO	PH		300					
			3	TO	PH		299					
			4	TO	PH		298					
			5	TO	PH		297					
			6	TO	PH		296					
			7	TO	PH		295					
			8	TO	PH		294					
							293					
292.3	END OF BOREHOLE											
11.9	Note: 1. Borehole dry upon completion of drilling.											






SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H1-7			1 OF 1 METRIC								
G.W.P. 5091-07-00			LOCATION N 5333590.5; E 409686.0			ORIGINATED BY AM								
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT								
DATUM GEODETIC			DATE July 28, 2011			CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
303.8	GROUND SURFACE													
0.0	TOPSOIL													
0.2	CLAYEY SILT, trace to some sand, trace gravel Very stiff Brown Moist to wet		1	SS	11									
			2	SS	13									
			3	SS	5									
300.9	SILTY CLAY, trace sand													
2.9	Firm Grey Wet		4	SS	4									
			5	SS	WH									
			6	TO	PH									
298.2	Gravelly SAND, some silt, trace clay Very dense Grey Wet													
5.6			7	SS	43/0.15									
	Spoon attempted at 7.0 m depth, bouncing.													
296.8	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)													
7.0	1. Water level at a depth of 2.3 m below ground surface (Elev. 301.5) upon completion of drilling.													



SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

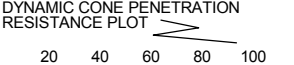
PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H1-9				2 OF 2 METRIC						
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5333593.2; E 409730.5</u>				ORIGINATED BY <u>MR</u>						
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>AC</u>						
DATUM <u>GEODETIC</u>		DATE <u>May 21, 2013</u>				CHECKED BY <u>SEMC</u>						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa				WATER CONTENT (%)
	--- CONTINUED FROM PREVIOUS PAGE ---							20 40 60 80 100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	W _p W W _L		
287.6	SILT, trace to some clay, trace to some sand Very loose Grey Wet		13	SS	4		288					
16.3	SAND and GRAVEL, some silt Compact Grey Wet		14	SS	26		287					
286.1	Silty SAND Very dense Grey Wet		15	SS	57		286					
283.1	Spoon attempted at 20.8 m depth; spoon bouncing.						285					
20.8	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 3.1 m below ground surface (Elev. 300.8 m) upon completion of drilling.						284					

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H1-10				2 OF 2 METRIC					
G.W.P. 5091-07-00			LOCATION N 5333609.2; E 409738.5				ORIGINATED BY MR					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY AC					
DATUM GEODETIC			DATE May 22, 2013				CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES							
288.5 15.1	--- CONTINUED FROM PREVIOUS PAGE ---		12	SS	40		288					30 58 10 2
287.8 15.8	SAND and GRAVEL, trace to some silt, trace clay Dense Grey Wet END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 2.1 m below ground surface (Elev. 301.5 m) upon completion of drilling.											

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H4-1			1 OF 1 METRIC					
G.W.P. 5091-07-00			LOCATION N 5333484.6; E 409609.3			ORIGINATED BY MT					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT					
DATUM GEODETIC			DATE August 28, 2012			CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
304.8	GROUND SURFACE										
0.0	TOPSOIL		1	SS	4						
	CLAYEY SILT, trace gravel, trace sand, trace organics Soft Brown Moist		2	SS	3						
303.4	SILTY CLAY to CLAY		3	SS	2						
1.4	Firm Grey Moist to wet		4	SS	1						
	Silt seams encountered between 3.0 m and 6.9 m depth.		5	SS	WH						
297.9	SAND and GRAVEL, trace silt, trace clay Very dense Grey Wet		6	SS	WH						
6.9			7	SS	66						
296.7	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)										
8.1	Note: 1. Water level at a depth of 1.1 m below ground surface (Elev. 303.7 m) upon completion of drilling.										

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

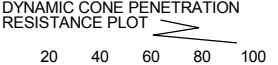
PROJECT 10-1191-0044			RECORD OF BOREHOLE No H4-2			1 OF 1 METRIC								
G.W.P. 5091-07-00			LOCATION N 5333499.7; E 409604.1			ORIGINATED BY MT								
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT								
DATUM GEODETIC			DATE August 28, 2012			CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
305.8	GROUND SURFACE							20 40 60 80 100	20 40 60					
0.0	TOPSOIL		1	SS	7		305						OC=1.1	14 22 46 18
	Sandy CLAYEY SILT, some gravel Firm Brown Moist		2	SS	5									
304.4							304							
1.4	CLAY Soft to firm Brown to grey Moist		3	SS	4									
	Silt seams encountered between 1.5 m and 2.1 m depth.		4	SS	7		303							
302.8														
3.0	SAND and GRAVEL, some silt, trace clay Dense to very dense Grey Wet		5	SS	90		302							34 49 14 3
			6	SS	49									
301.4	END OF BOREHOLE AUGER REFUSAL													
4.4	Note: 1. Water level at a depth of 2.0 m below ground surface (Elev. 303.8 m) upon completion of drilling.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

[illegible]

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H4-5			1 OF 1 METRIC					
G.W.P. 5091-07-00			LOCATION N 5333532.2; E 409624.6			ORIGINATED BY MT					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT					
DATUM GEODETIC			DATE August 29, 2012			CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
305.1	GROUND SURFACE										
0.0	TOPSOIL		1a		5						
	CLAYEY SILT, some sand, trace organics		1b	SS							
	Firm										
	Brown		2	SS	6						
	Moist										
303.7	CLAY, trace organics		3	SS	4						
1.4	Soft to firm										
	Grey to brown										
	Moist to wet		4a	SS	8						
302.4			4b								
	SILT, trace to some clay										
302.1	Grey to brown										
3.0	Wet										
	SAND and GRAVEL, trace silt		5	SS	28						
	Compact										
301.4	Brown										
3.7	Wet										
	Spoon bouncing at 3.6 m depth.										
	END OF BOREHOLE										
	AUGER REFUSAL										
	Note:										
	1. Water level at a depth of 1.8 m below ground surface (Elev. 303.3 m) upon completion of drilling.										

PROJECT		10-1191-0044				RECORD OF BOREHOLE No H4-6				1 OF 1 METRIC							
G.W.P.		5091-07-00		LOCATION		N 5333556.5; E 409630.6				ORIGINATED BY		MT					
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY		MT					
DATUM		GEODETIC		DATE		September 4, 2012				CHECKED BY		SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
305.8	GROUND SURFACE																
0.0	TOPSOIL																
0.2	CLAYEY SILT, some sand, trace gravel, trace organics		1	SS	9												
305.1	Stiff																
0.7	Brown																
	Moist																
	CLAY, trace sand		2	SS	7												
	Firm																
	Grey																
	Moist		3	SS	7												
303.4																	
2.4	Silty SAND, trace to some gravel, trace clay		4	SS	12												
	Compact																
	Brown																
302.7	Moist to wet		5	SS	9/0.10												
3.1	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)																
Note: 1. Water level at a depth of 2.0 m below ground surface (Elev. 303.8 m) upon completion of drilling.																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No C1-2				1 OF 2 METRIC					
G.W.P. 5091-07-00				LOCATION N 5333523.2; E 409645.0				ORIGINATED BY MS					
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY MT					
DATUM GEODETIC				DATE August 6, 2011				CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT W _p W W _L		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED		WATER CONTENT (%)			
305.4	GROUND SURFACE												
0.0	PEAT (Fibrous)		1a	SS	6								
0.3	Organic CLAYEY SILT, trace to some sand Firm Grey Moist		1b									OC=8.0%	
304.0	SILTY CLAY Soft to firm Grey Wet		2	SS	7								
1.4			3	SS	4								
			4	SS	1								
			5	SS	1								
			6	SS	WH								
	Silt seams encountered below 6.1 m depth.		7	TO	PH								
296.8	CLAYEY SILT, some sand Soft to firm Grey Wet		8	SS	7								
294.8	Gravelly SAND, some silt Dense Grey Wet		9	SS	44								
293.9	METASEDIMENT (SCHIST) (BEDROCK) Bedrock cored from 11.5 m depth to 15.6 m depth. For bedrock coring details, refer to Record of Drillhole C1-2		1	RC	REC 86%								
			2	RC	REC 100%								
			3	RC	REC 100%								
			4	RC	REC 100%								

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: C1-2

SHEET 1 OF 1

LOCATION: N 5333523.2 ; E 409645.0

DRILLING DATE: August 6, 2011

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D50

DRILLING CONTRACTOR: Walker Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR FLUSH % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION
							RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diameter Point Load Index (MPa)	RMC -Q AVG.																								
							TOTAL CORE %	SOLID CORE %			TYPE AND SURFACE DESCRIPTION										k, cm/s																											
							8 																																									

DEPTH SCALE

1 : 50



LOGGED: MS

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

[illegible]

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SHEET 1 OF 1

DATUM: GEODETIC

DRILLING CONTRACTOR: Landcore Drilling Inc.

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SHEET 1 OF 1

DATUM: GEODETIC

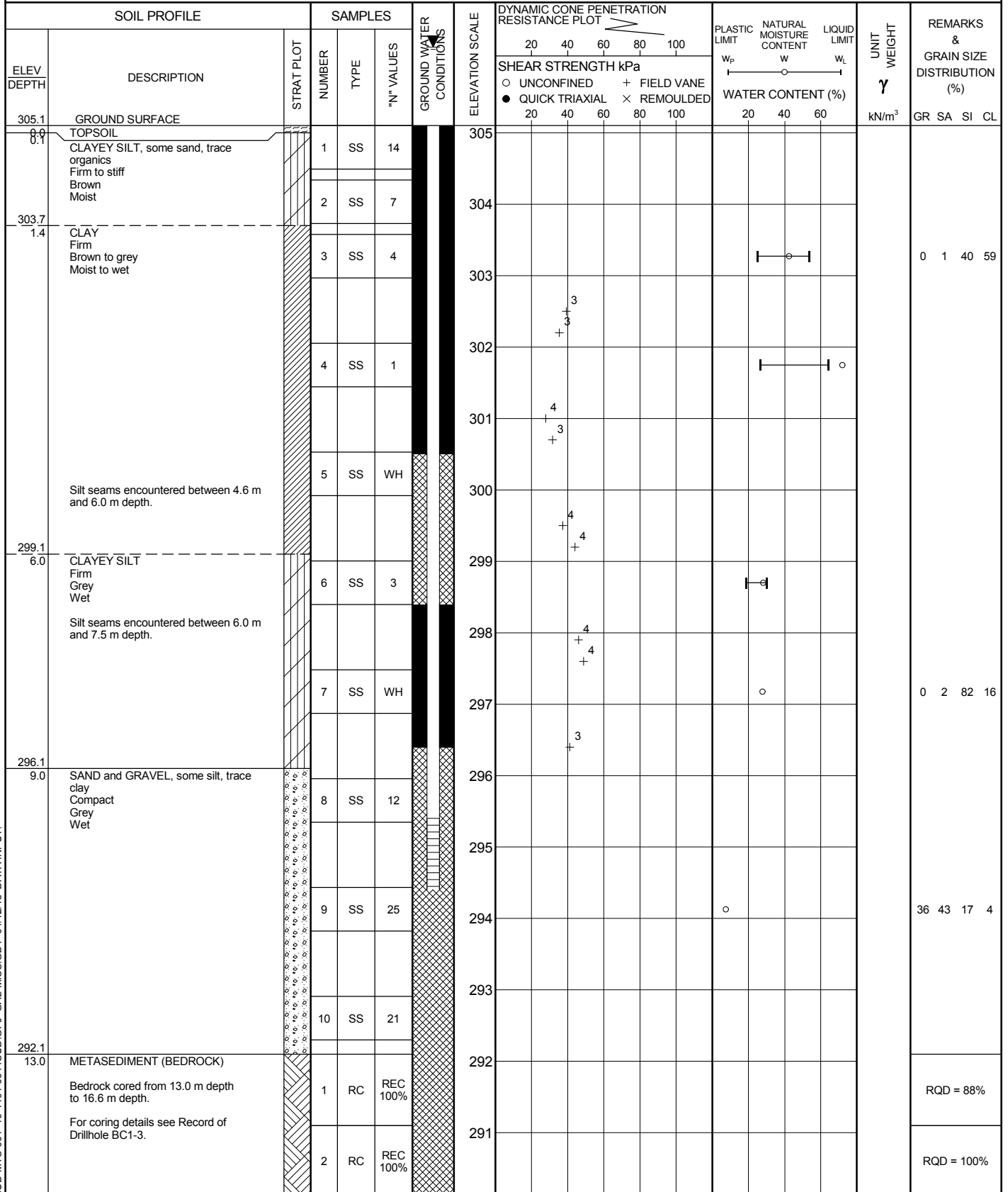
DRILLING CONTRACTOR: Landcore Drilling Inc.

CHECKED: SEMC

RECORD OF BOREHOLE No BC1-3

1 OF 2 **METRIC**


PROJECT 10-1191-0044
 G.W.P. 5091-07-00 LOCATION N 5333449.6; E 409614.5 ORIGINATED BY MT
 DIST HWY 66 BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring COMPILED BY MT
 DATUM GEODETIC DATE September 10, 2012 CHECKED BY SEMC



Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No BC1-3				2 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5333449.6; E 409614.5				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY MT									
DATUM GEODETIC				DATE September 10, 2012				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100					
	METASEDIMENT (BEDROCK)		2	RC			290										RQD = 100%
	Bedrock cored from 13.0 m depth to 16.6 m depth. For coring details see Record of Drillhole BC1-3.		3	RC	REC 100%		289										RQD = 100%
288.5 16.6	END OF BOREHOLE Note: 1. Water level at a depth of 1.0 m below ground surface (Elev. 304.1 m) upon completion of drilling. 2. Water level in piezometer measured at 1.0 m above ground surface (Elev. 306.1 m) on November 17, 2012 and at 1.1 m above ground surface (Elev. 306.2 m) on May 19, 2013. 3. Piezometer installed within heaving sand and gravel.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC1-3

SHEET 1 OF 1

LOCATION: N 5333449.6 ; E 409614.5

DRILLING DATE: September 10, 2012

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Landcore Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	RECOVERY			FRACT. INDEX METRES	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY			Diametral Point Load Index (MPa)	RMC -Q' AVG.	NOTES WATER LEVELS INSTRUMENTATION						
							FLUSH	TOTAL CORE %	SOLID CORE %		R.Q.D. %	B Angle	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn				k, cm/s					
																						JN - Joint	BD - Bedding	PL - Planar	PO - Polished	BR - Broken Rock
																						FLT - Fault	FO - Foliation	CU - Curved	K - Slickensided	
SHR - Shear	CO - Contact	UN - Undulating	SM - Smooth																							
VN - Vein	OR - Orthogonal	ST - Stepped	Ro - Rough																							
CJ - Conjugate	CL - Cleavage	IR - Irregular	MB - Mechanical Break																							
NOTE: For additional abbreviations refer to list of abbreviations & symbols.																										

13		REFER TO PREVIOUS PAGE		292.1															
	NQ Coring September 10, 2012	METASEDIMENT Strong Fine grained Fresh Greenish Grey		13.0	1	GREY 100%													
14		Sheared zone between 13.0 m and 16.6 m depth.			2	GREY 100%												62 MPa	
15																			
16					3	GREY 100%													
		END OF DRILLHOLE		288.5 16.6															
17																			
18																			
19																			
20																			
21																			
22																			
23																			

DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H1-D3				1 OF 1 METRIC							
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5333582.7; E 409667.3</u>				ORIGINATED BY <u>MT</u>							
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>							
DATUM <u>GEODETIC</u>		DATE <u>July 28, 2011</u>				CHECKED BY <u>SEMC</u>							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
304.6 0.0	GROUND SURFACE						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>						
301.4 3.2	END OF DCPT REFUSAL TO FURTHER PENETRATION 100 BLOWS / 0.15 m (HAMMER BOUNCING)												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H1-D4		1 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5333596.8; E 409715.3</u>		ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>		COMPILED BY <u>MT</u>	
DATUM <u>GEODETIC</u>		DATE <u>August 5, 2011</u>		CHECKED BY <u>SEMC</u>	

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20 40 60 80 100	20 40 60 80 100	W _p W W _L	20 40 60		
302.5 0.0	GROUND SURFACE												
302													
301													
300													
299													
298													
297													
296													
295													
294													
293													
292													
291													
290													
289													
288													
287.5													


SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H1-D4				2 OF 2 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5333596.8; E 409715.3</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 5, 2011</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)				
	--- CONTINUED FROM PREVIOUS PAGE ---																
15.0	END OF DCPT REFUSAL TO FURTHER PENETRATION 40 BLOWS / 0.10 m (HAMMER BOUNCING)																

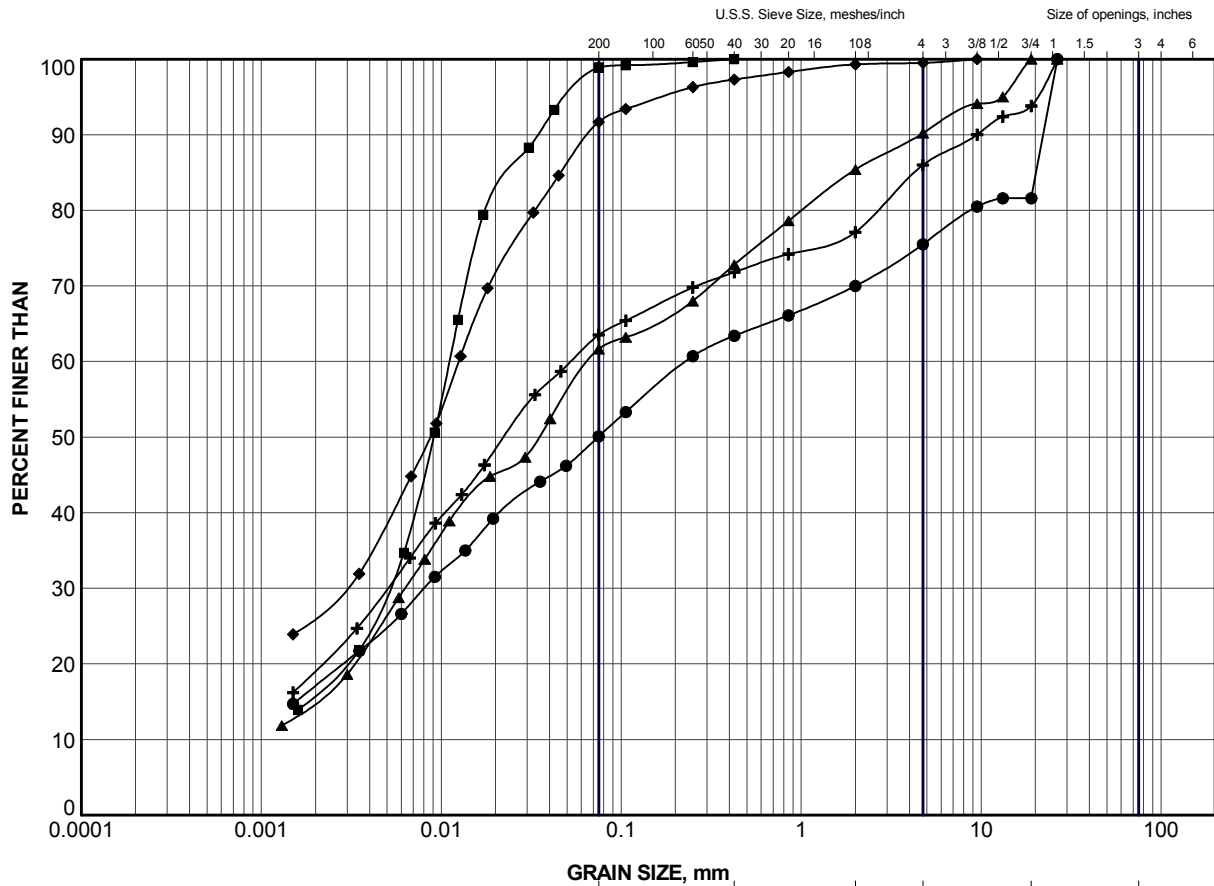
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H4-D1				1 OF 1 METRIC				
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5333522.4; E 409613.5</u>				ORIGINATED BY <u>MT</u>				
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>				
DATUM <u>GEODETIC</u>		DATE <u>August 29, 2012</u>				CHECKED BY <u>SEMC</u>				
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
305.9 0.0	GROUND SURFACE									
302.8 3.1	END OF DCPT REFUSAL TO FURTHER PENETRATION 22 BLOWS / 0.03 m (HAMMER BOUNCING)									

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



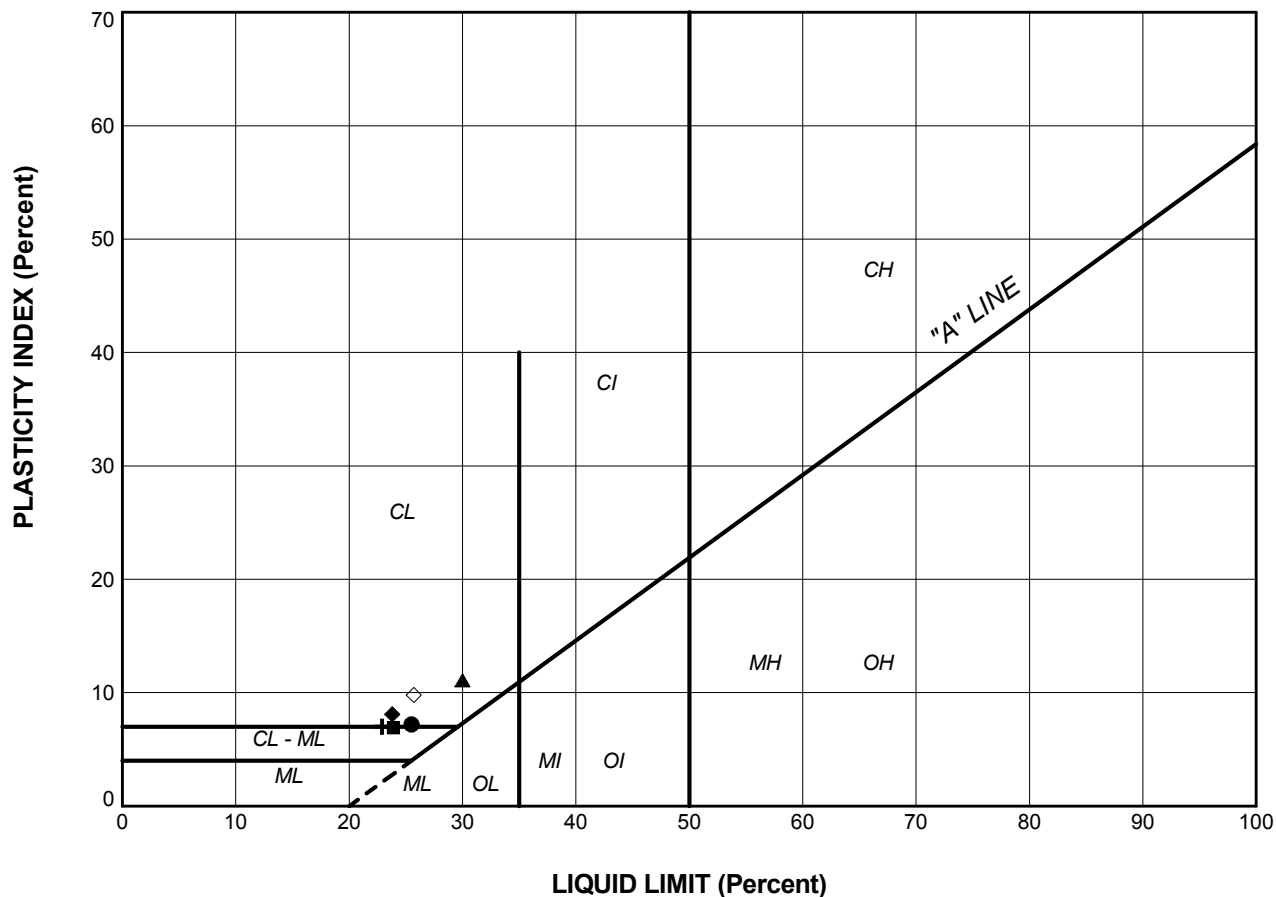
CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC1-2	1b	305.7
■	BC1-3	7	297.2
▲	H1-6	3	302.4
+	H4-2	1	305.5
◆	H4-4	1b	304.6

PROJECT					HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125				
TITLE					GRAIN SIZE DISTRIBUTION CLAYEY SILT				
PROJECT No.		10-1191-0044		FILE No.		10-1191-0044SUD.GPJ			
DRAWN	JJL	Aug 2013		SCALE	N/A	REV.			
CHECK	SEMC	Aug 2013		FIGURE A1					
APPR	JMAC	Aug 2013							



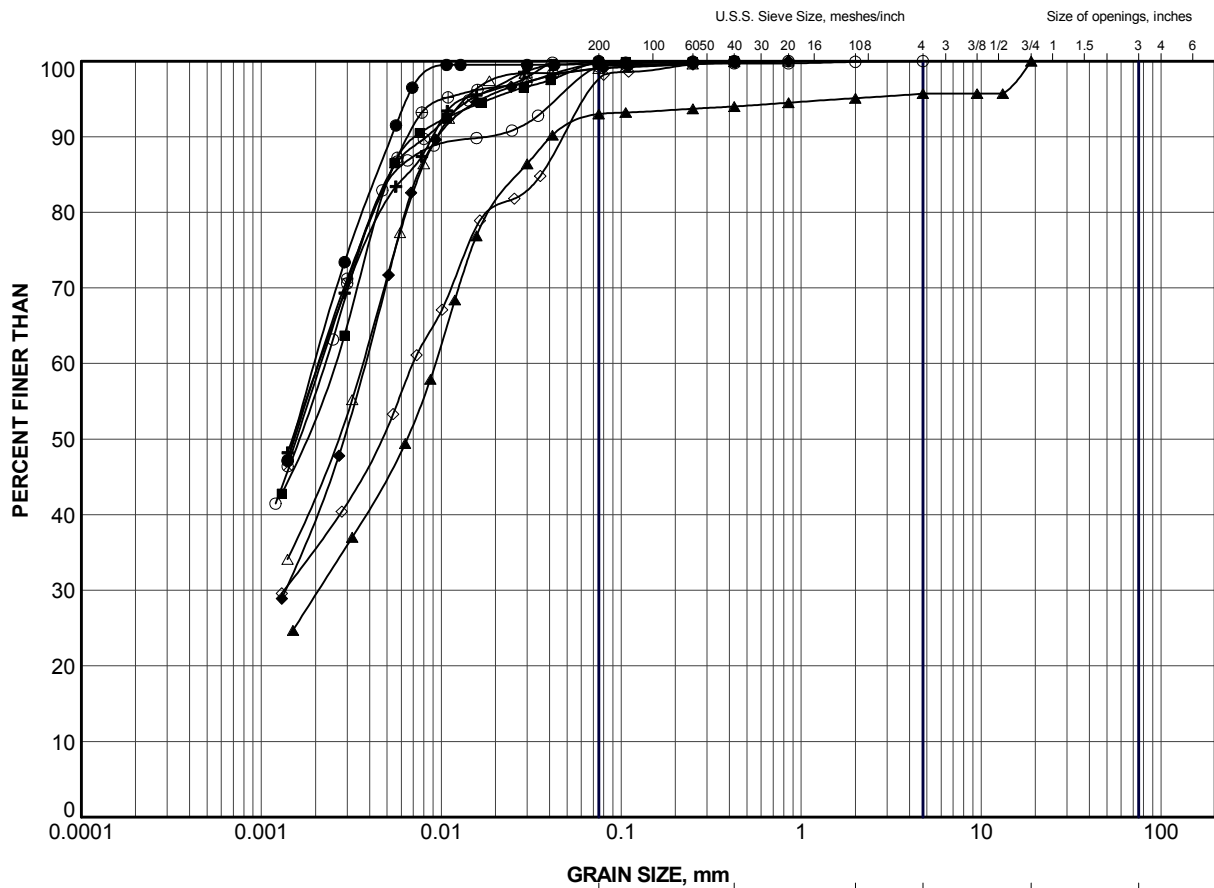


LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	BC1-1	6	25.5	18.3	7.2
■	BC1-2	1b	23.9	17.0	6.9
▲	BC1-3	6	30.0	18.9	11.1
+	H4-2	1	22.9	15.9	7.0
◆	H4-4	1b	23.8	15.7	8.1
◇	H4-5	1b	25.7	15.9	9.8

PROJECT					HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125				
TITLE					PLASTICITY CHART CLAYEY SILT				
PROJECT No.			10-1191-0044		FILE No.			10-1191-0044SUD.GPJ	
DRAWN	JJL	Aug 2013	CHECK	SEMC	Aug 2013	SCALE	N/A	REV.	
APPR	JMAC	Aug 2013				FIGURE A2			




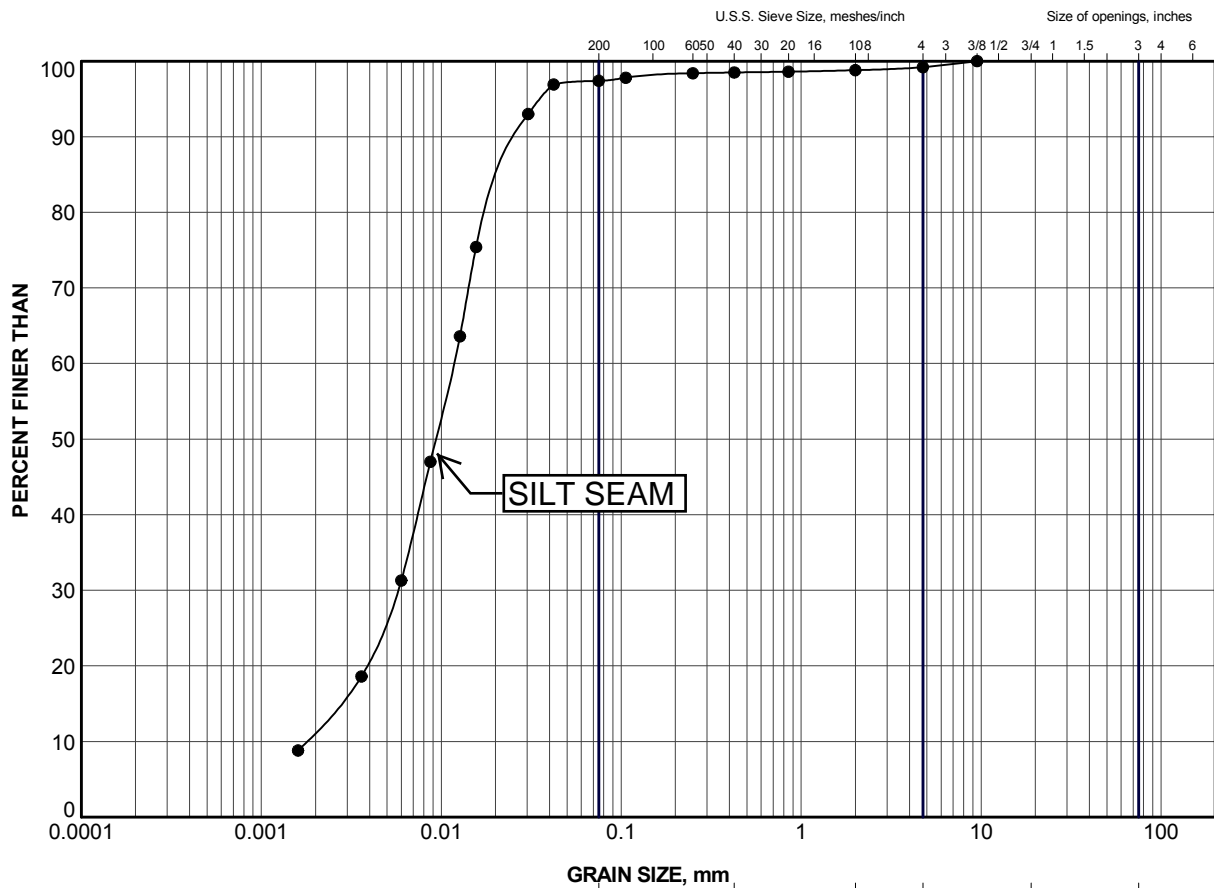


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC1-1	4	300.9
■	BC1-1	5	300.2
▲	BC1-2	5a	302.9
+	BC1-3	3	303.3
◆	C1-2	6	299.0
◇	H1-4	2	303.2
○	H1-5	4	300.9
△	H1-10	7	295.7
⊗	H4-1	3	303.0
⊕	H4-3	4	300.9


PROJECT						HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125					
TITLE						GRAIN SIZE DISTRIBUTION SILTY CLAY to CLAY					
PROJECT No.			10-1191-0044			FILE No.			10-1191-0044SUD.GPJ		
DRAWN		JJL		Aug 2013		SCALE		N/A		REV.	
CHECK		SEMC		Aug 2013							
APPR		JMAC		Aug 2013							
 Golder Associates SUDBURY, ONTARIO						FIGURE A3.1					

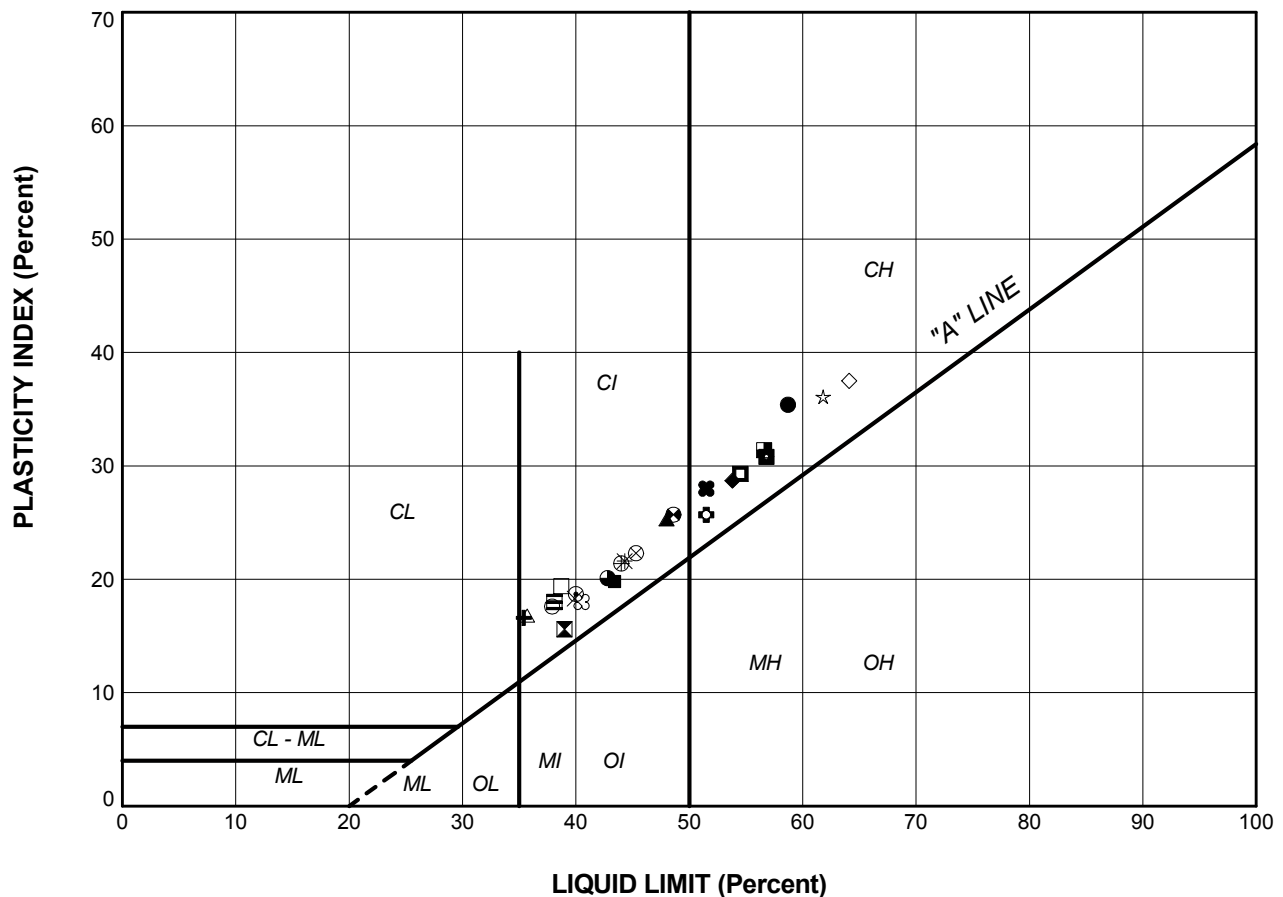


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND


SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H4-4	5	300.3

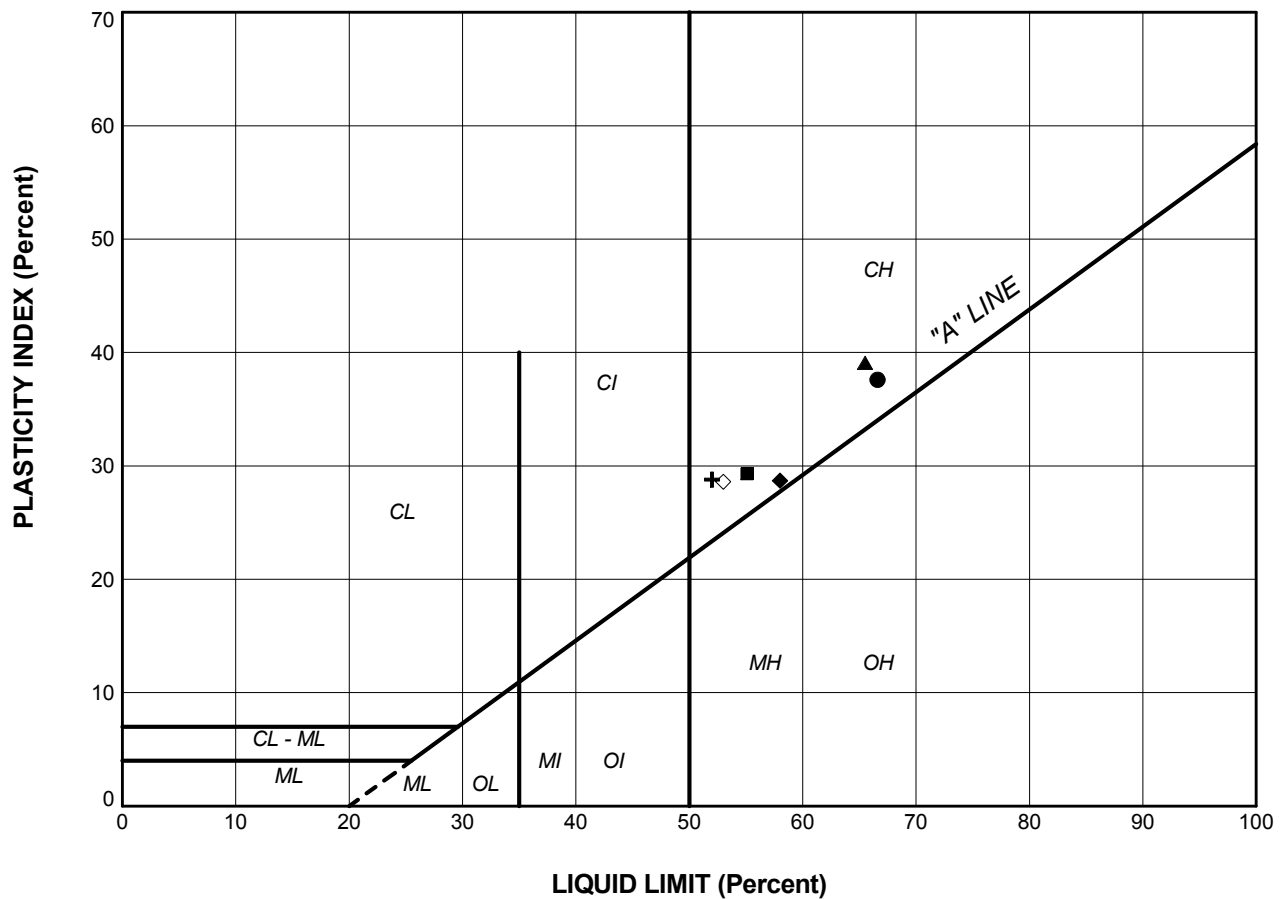
PROJECT						HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125					
TITLE						GRAIN SIZE DISTRIBUTION SILTY CLAY to CLAY					
PROJECT No.			10-1191-0044			FILE No.			10-1191-0044SUD.GPJ		
DRAWN	JJL	Aug 2013	SCALE	N/A	REV.						
CHECK	SEMC	Aug 2013									
APPR	JMAC	Aug 2013									
 Golder Associates SUDBURY, ONTARIO			FIGURE A3.2								



LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	BC1-1	4	58.7	23.3	35.4
■	BC1-1	5	43.4	23.6	19.8
▲	BC1-2	3	48.0	22.7	25.3
+	BC1-2	5a	35.4	18.8	16.6
◆	BC1-3	3	53.8	25.1	28.7
◇	BC1-3	4	64.1	26.6	37.5
○	C1-2	6	37.9	20.3	17.6
△	H1-4	2	35.7	18.9	16.8
⊗	H1-5	4	45.3	23.0	22.3
⊕	H1-5	6	44.0	22.6	21.4
□	H1-6	4	38.7	19.3	19.4
⊗	H1-6	6	48.6	22.9	25.7
⊕	H1-6a	3	42.8	22.7	20.1
☆	H1-6a	4	61.8	25.7	36.1
⊗	H1-7	5	40.5	22.5	18.0
⊕	H1-9	5	39.0	23.4	15.6
⊗	H1-9	6	40.0	21.3	18.7
⊕	H1-9	7	51.5	25.8	25.7
×	H1-9	8	39.9	21.6	18.3
⊗	H1-10	4b	51.5	23.5	28.0
■	H1-10	5	56.8	26.0	30.8
*	H1-10	7	44.3	22.7	21.6
□	H4-1	3	54.5	25.2	29.3
■	H4-1	4	56.6	25.2	31.4
■	H4-1	6	38.1	20.1	18.0

PROJECT					
HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125					
TITLE					
PLASTICITY CHART SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Aug 2013	SCALE	N/A	REV.
CHECK	SEMC	Aug 2013			
APPR	JMAC	Aug 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE A4.1		



LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H4-2	3	66.6	29.0	37.6
■	H4-3	2	55.1	25.8	29.3
▲	H4-3	4	65.5	26.4	39.1
+	H4-4	4	52.0	23.2	28.8
◆	H4-5	3	58.0	29.3	28.7
◇	H4-6	3	53.0	24.4	28.6

PROJECT					HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125				
TITLE					PLASTICITY CHART SILTY CLAY to CLAY				
PROJECT No.			10-1191-0044		FILE No.			10-1191-0044SUD.GPJ	
DRAWN	JJL	Aug 2013	CHECK	SEMC	Aug 2013	SCALE	N/A	REV.	
APPR	JMAC	Aug 2013				FIGURE A4.2			



CONSOLIDATION TEST SUMMARY**FIGURE A5**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	4
Borehole Number	H1-6a	Sample Depth, m	4.88

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	1		
Date Started	May 30, 2013		
Date Completed	June 13, 2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.544	Unit Weight, kN/m ³	15.12
Sample Diameter, cm	6.349	Dry Unit Weight, kN/m ³	8.49
Area, cm ²	31.66	Specific Gravity, measure	2.733
Volume, cm ³	80.53	Solids Height, cm	0.805
Water Content, %	78.14	Volume of Solids, cm ³	25.50
Wet Mass, g	124.13	Volume of Voids, cm ³	55.03
Dry Mass, g	69.68		

TEST COMPUTATIONS

Pressure kPa	Primary Consolidation	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s	Total Work kJ/m ³
0	0.00	2.544	2.158	2.544					
9	0.02	2.542	2.156	2.543	194	0.00705	9.24E-05	6.39E-08	0.004
18	0.03	2.538	2.152	2.540	194	0.00704	1.50E-04	8.36E-08	0.019
35	0.11	2.527	2.138	2.533	317	0.00428	2.46E-04	1.03E-07	0.132
69	0.19	2.509	2.115	2.518	290	0.00463	2.16E-04	9.79E-08	0.517
143	0.52	2.457	2.051	2.483	470	0.00278	2.77E-04	7.53E-08	2.700
285	2.76	2.181	1.708	2.319	2089	0.00055	7.63E-04	4.08E-08	26.720
570	1.54	2.027	1.517	2.104	960	0.00098	2.12E-04	2.03E-08	56.920
1140	1.05	1.922	1.387	1.975	866	0.00095	7.22E-05	6.75E-09	101.003
570	-0.09	1.932	1.399	1.927					
143	-0.26	1.958	1.431	1.945					
35	-0.36	1.994	1.476	1.976					
9	-0.27	2.022	1.510	2.008					

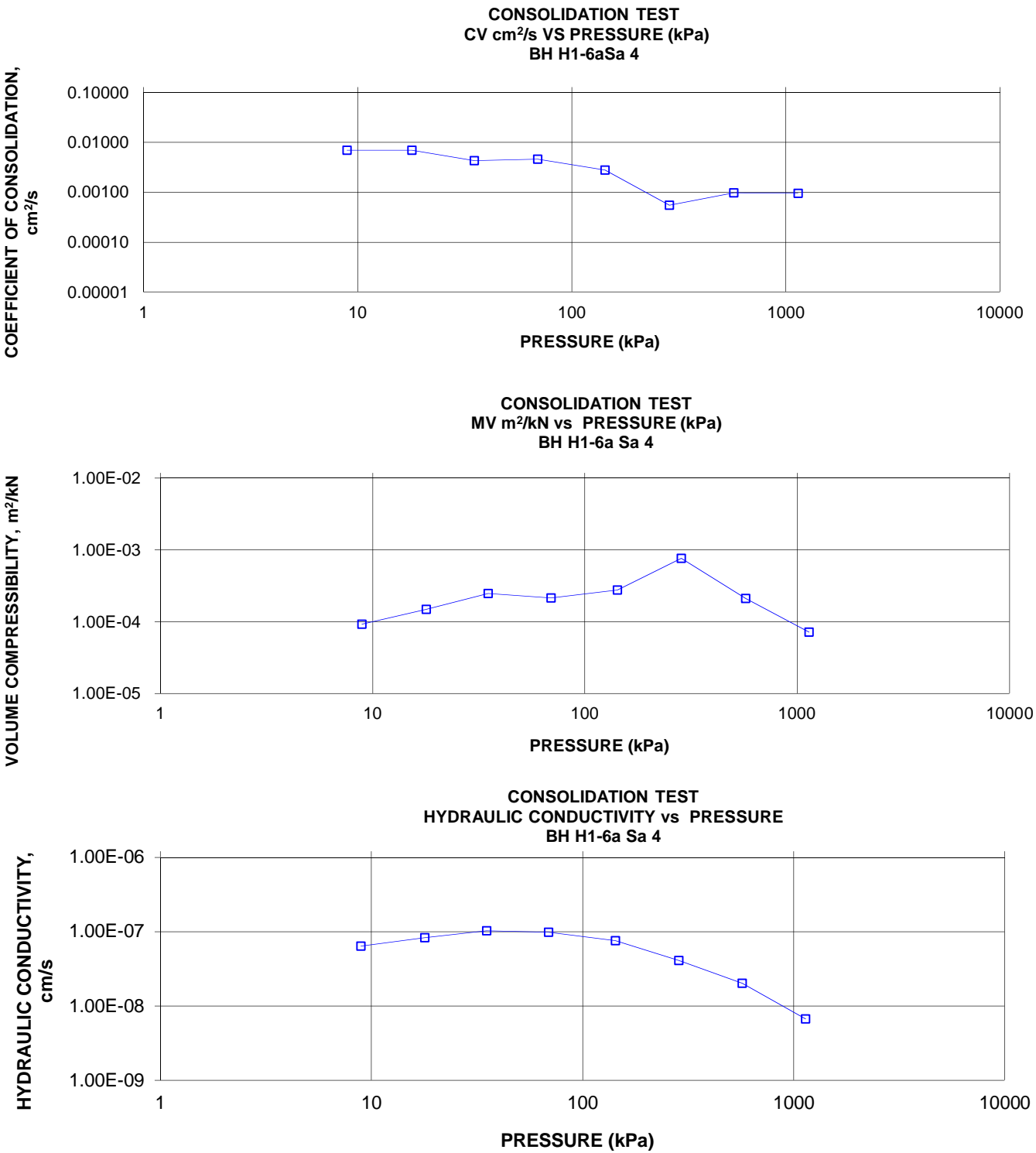
Note:

k calculated using α based on t_{90} values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	2.022	Unit Weight, kN/m ³	15.38
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	10.68
Area, cm ²	31.66	Specific Gravity, measure	2.733
Volume, cm ³	64.00	Solids Height, cm	0.805
Water Content, %	44.04	Volume of Solids, cm ³	25.50
Wet Mass, g	100.37	Volume of Voids, cm ³	38.50
Dry Mass, g	69.68		

CONSOLIDATION TEST SUMMARY

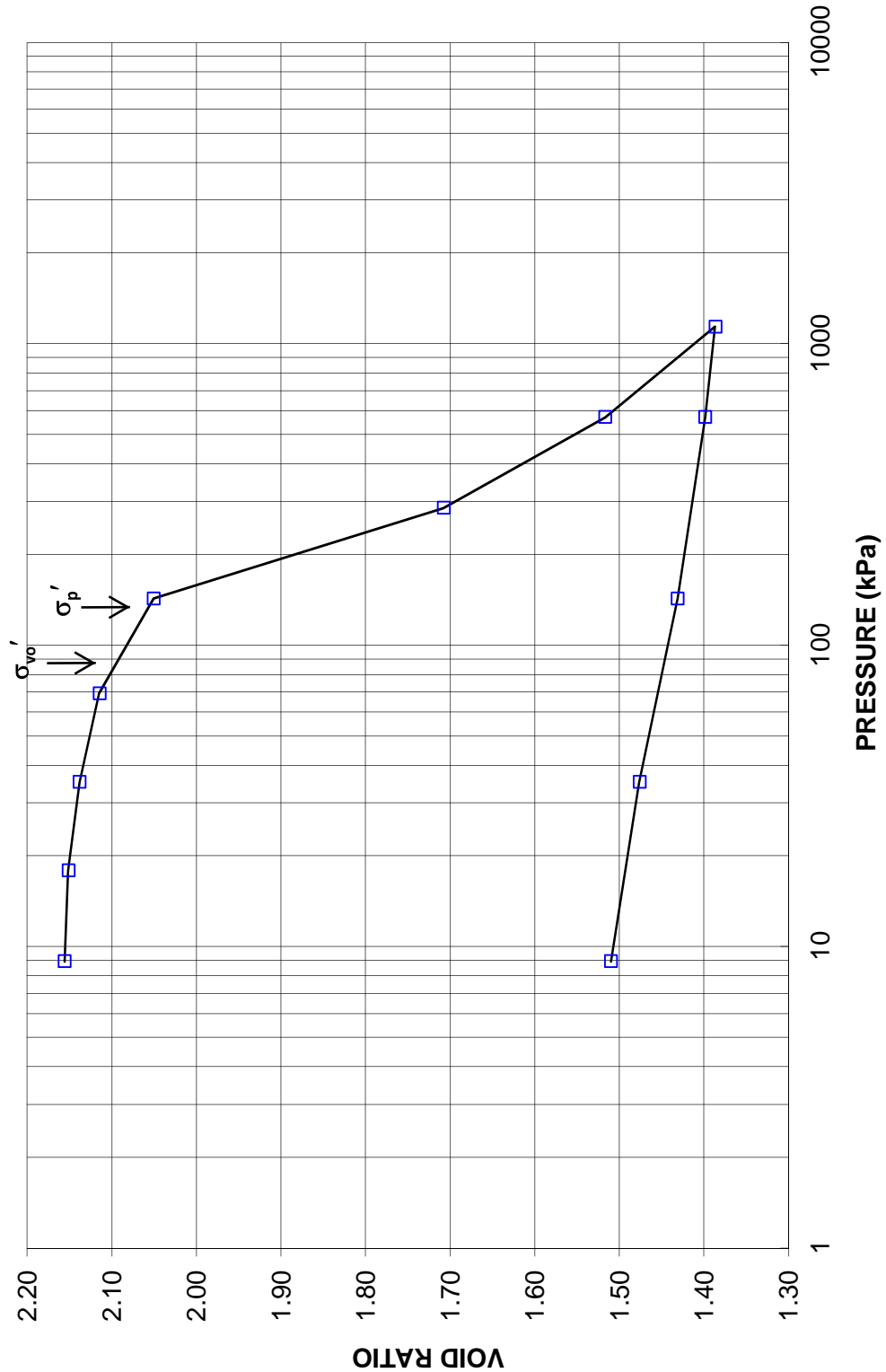
FIGURE A5
Pg. 2 of 4



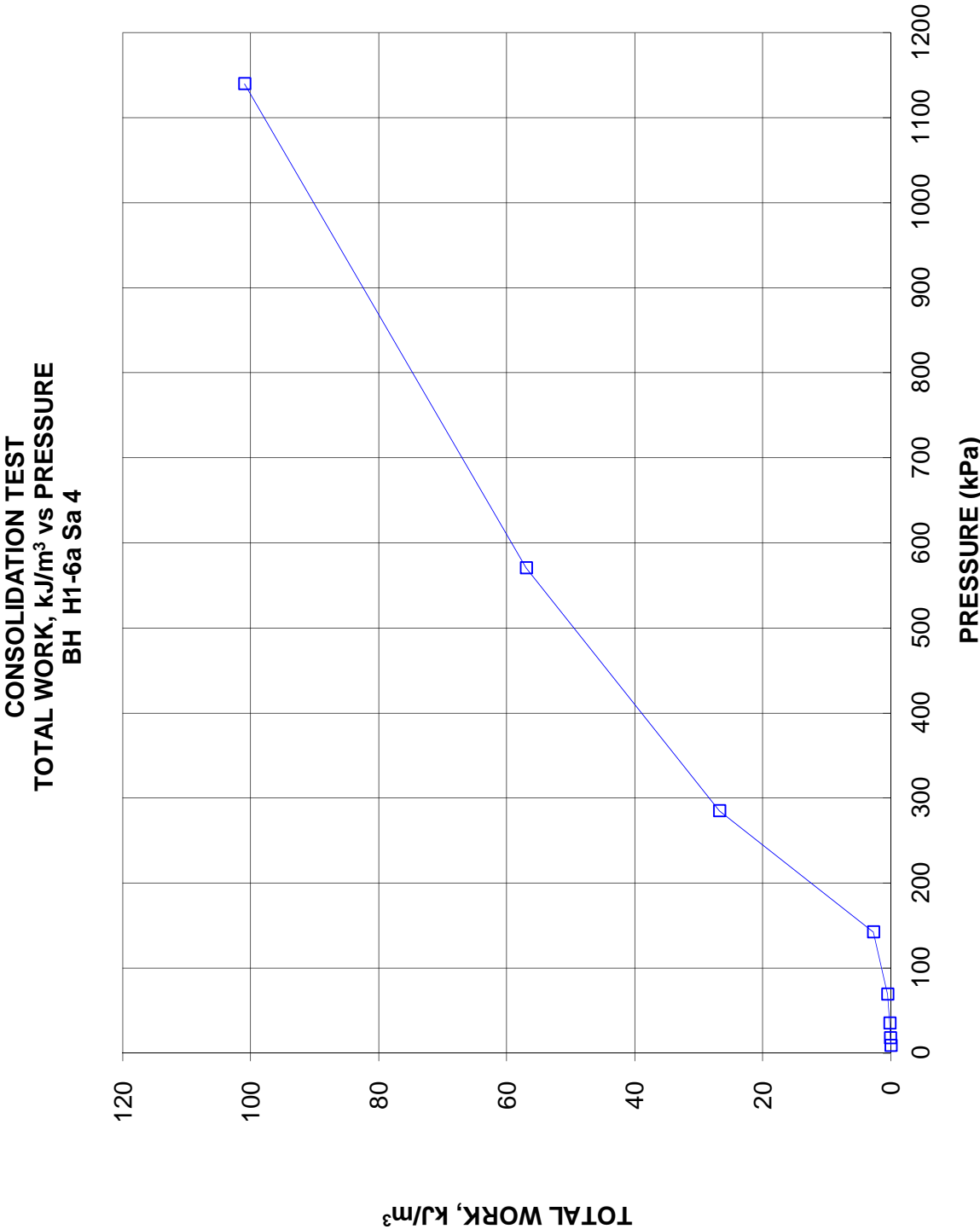
CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE A5
Pg. 3 of 4

CONSOLIDATION TEST
VOID RATIO vs PRESSURE
BH H1-6a Sa 4



CONSOLIDATION TEST
TOTAL WORK VS PRESSURE



CONSOLIDATION TEST SUMMARY

FIGURE A6

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number: 10-1191-0044 Sample Number: 7
Borehole Number: H1-9 Sample Depth, m: 6.25

TEST CONDITIONS

Test Type Standard Load Duration, hr 24
Oedometer Number 2
Date Started May 30, 2013
Date Completed June 13, 2013

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm 2.517 Unit Weight, kN/m³ 15.64
Sample Diameter, cm 6.347 Dry Unit Weight, kN/m³ 9.24
Area, cm² 31.64 Specific Gravity, Measured 2.748
Volume, cm³ 79.64 Solids Height, cm 0.863
Water Content, % 69.30 Volume of Solids, cm³ 27.29
Wet Mass, g 126.97 Volume of Voids, cm³ 52.35
Dry Mass, g 75.00

TEST COMPUTATIONS

Pressure	Primary	Corr.		Average					Total
kPa	Consolidation	Height	Void	Height	t ₉₀	cv.	mv	k	Work
		cm	Ratio	cm	sec	cm ² /s	m ² /kN	cm/s	kJ/m ³
0	0	2.517	1.918	2.517					
4	0.03	2.514	1.914	2.516	38	0.0349	3.19E-04	1.09E-06	0.003
13	0.04	2.510	1.910	2.512	73	0.0184	1.73E-04	3.13E-07	0.016
31	0.08	2.502	1.900	2.506	66	0.0201	1.84E-04	3.63E-07	0.088
66	0.24	2.478	1.872	2.490	265	0.0050	2.72E-04	1.32E-07	0.558
137	1.60	2.318	1.687	2.398	1500	0.0008	9.00E-04	7.17E-08	7.088
277	1.46	2.172	1.517	2.245	735	0.0015	4.14E-04	5.89E-08	20.146
558	0.81	2.090	1.423	2.131	240	0.0040	1.15E-04	4.53E-08	35.795
1117	0.63	2.028	1.350	2.059	101	0.0089	4.45E-05	3.87E-08	60.919
558	-0.07	2.035	1.359	2.031					
137	-0.20	2.054	1.381	2.045					
31	-0.24	2.079	1.409	2.067					
4	-0.21	2.100	1.434	2.089					

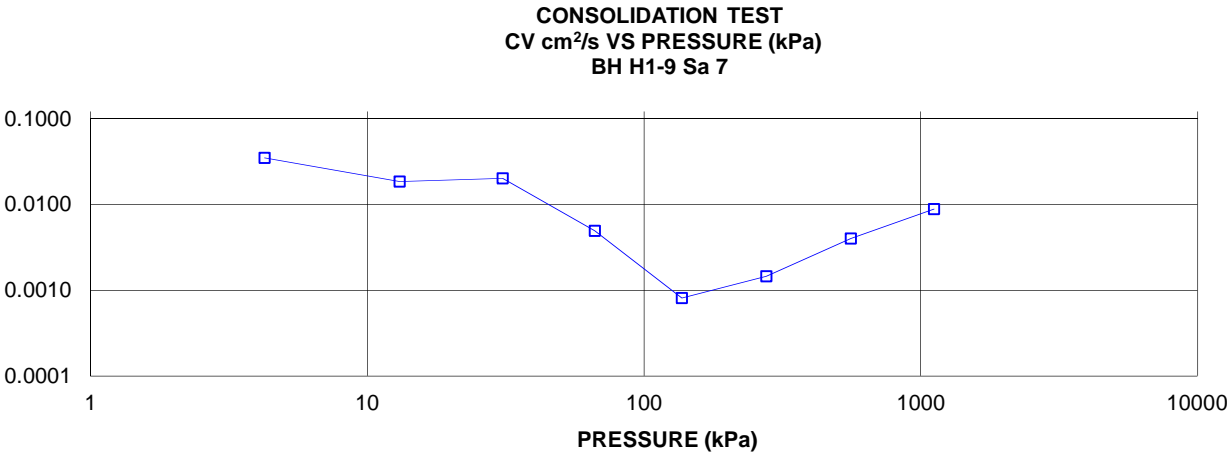
Note:

k calculated using α based on t₉₀ values.

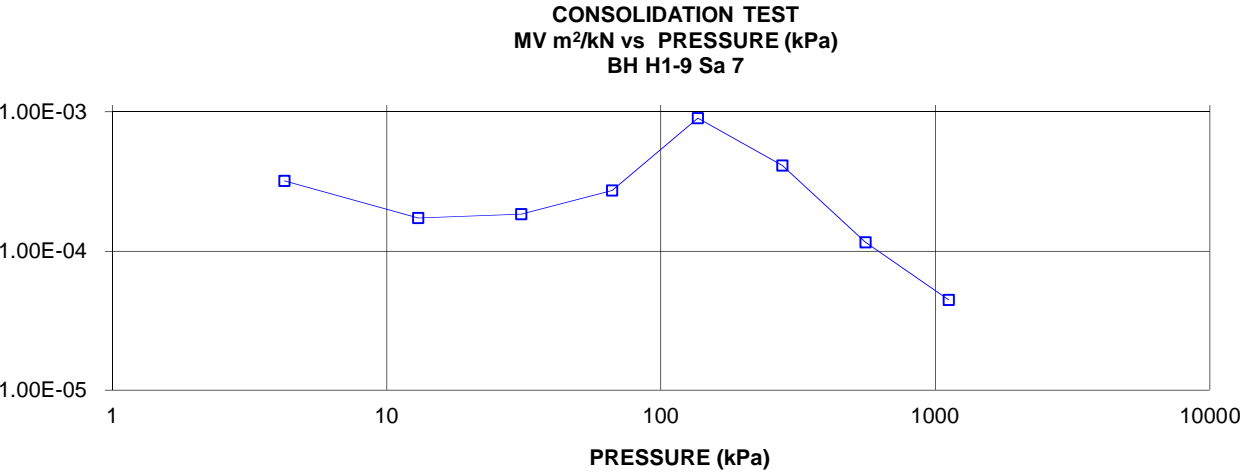
SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm 2.100 Unit Weight, kN/m³ 15.53
Sample Diameter, cm 6.35 Dry Unit Weight, kN/m³ 11.07
Area, cm² 31.64 Specific Gravity, Measured 2.748
Volume, cm³ 66.43 Solids Height, cm 0.863
Water Content, % 40.26 Volume of Solids, cm³ 27.29
Wet Mass, g 105.19 Volume of Voids, cm³ 39.14
Dry Mass, g 75.00

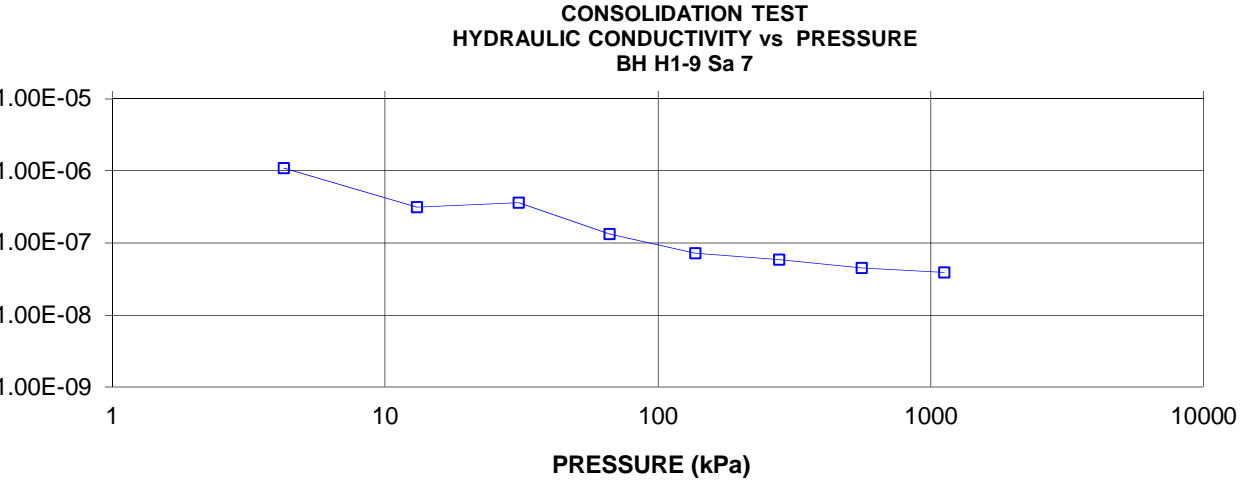
COEFFICIENT OF CONSOLIDATION,
cm²/s



VOLUME COMPRESSIBILITY, m²/kN



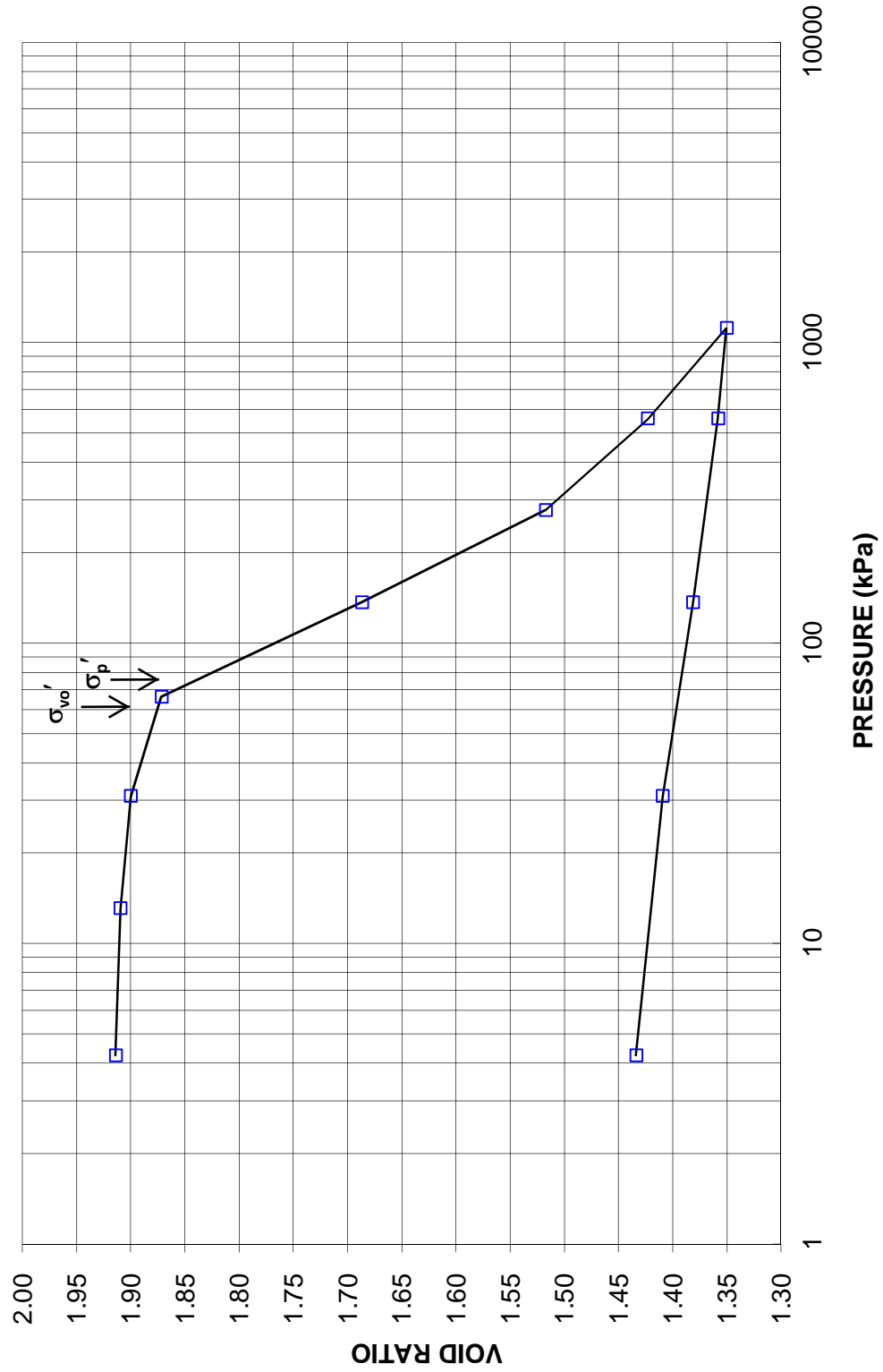
HYDRAULIC CONDUCTIVITY,
cm/s



CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

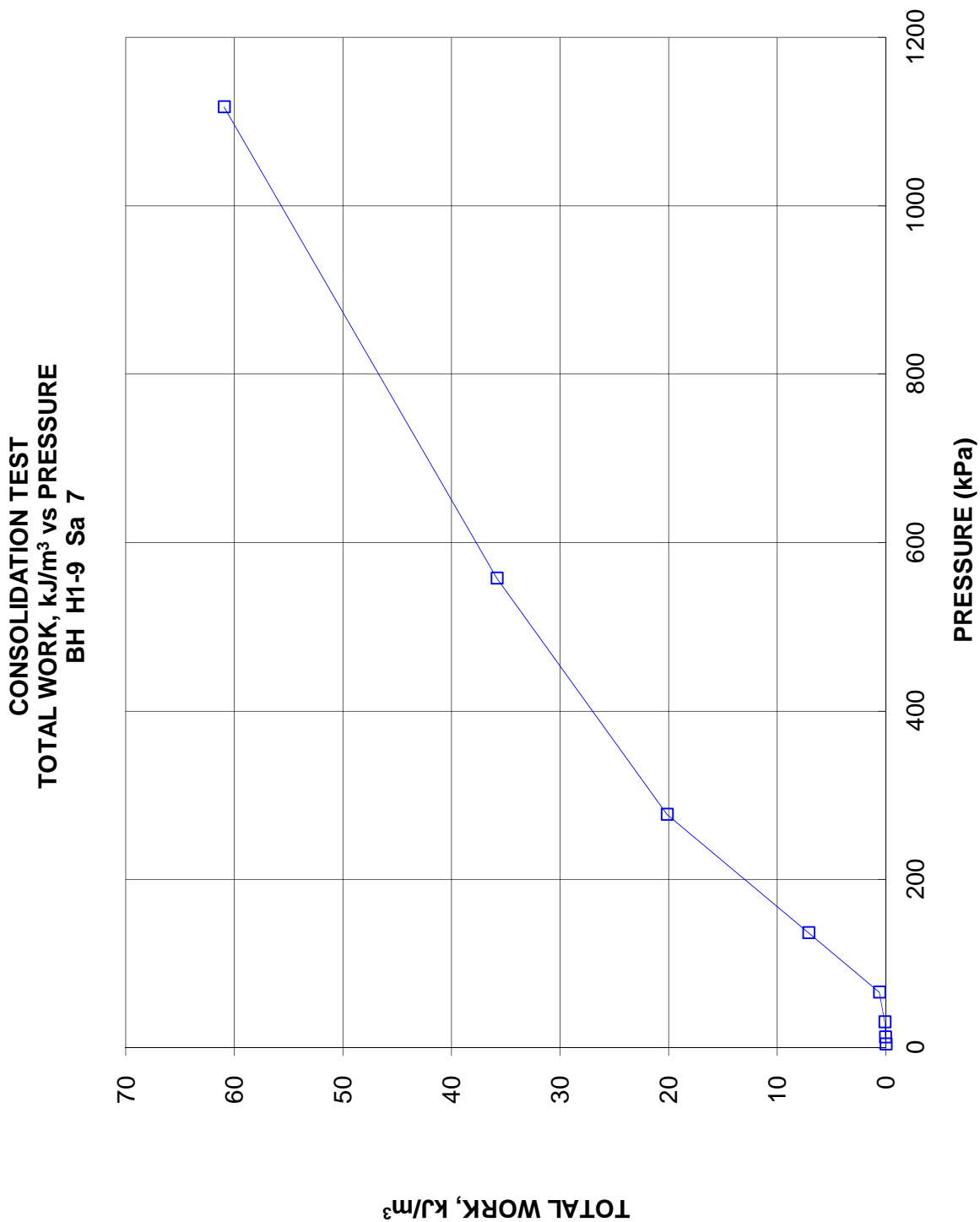
FIGURE A6
Pg. 3 of 4

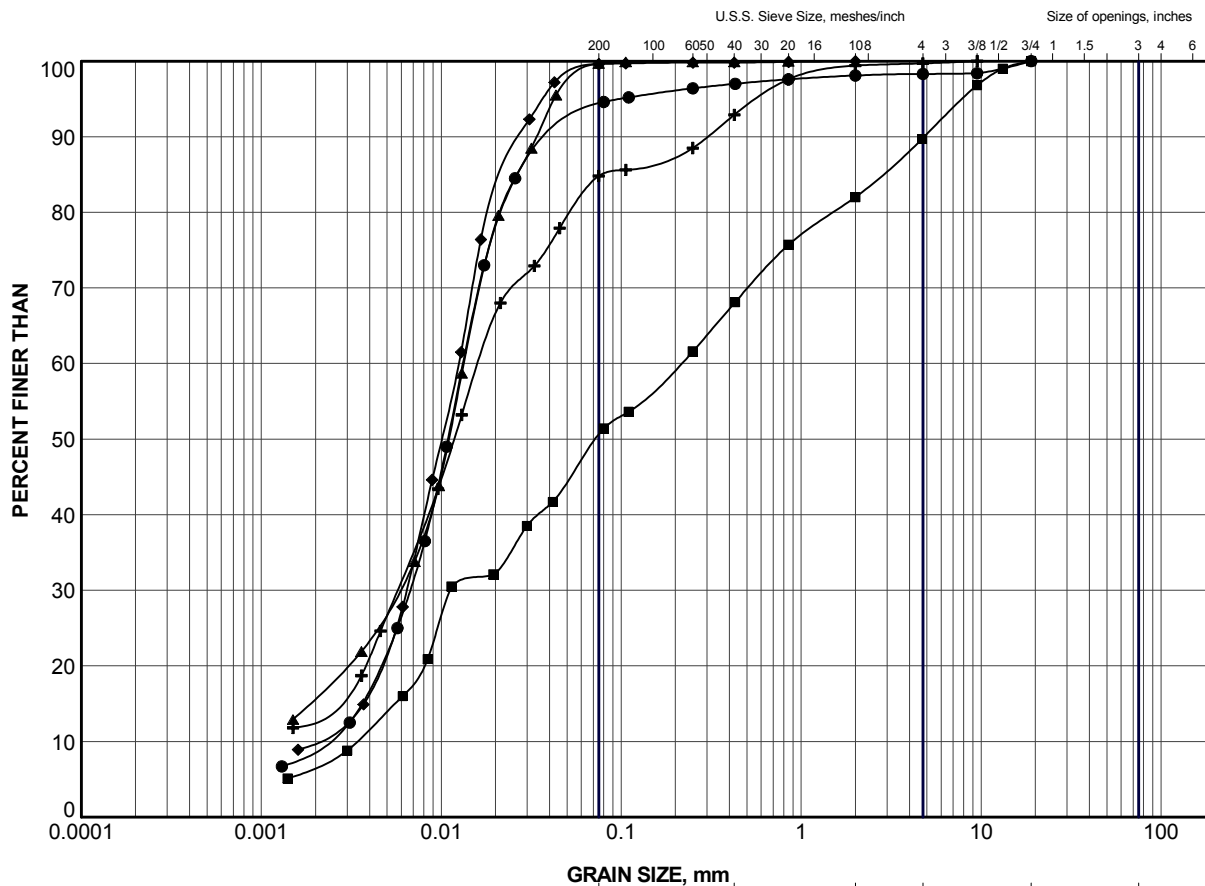
CONSOLIDATION TEST
VOID RATIO vs PRESSURE
BH H1-9 Sa 7



CONSOLIDATION TEST TOTAL WORK VS PRESSURE

FIGURE A6
Pg. 4 of 4




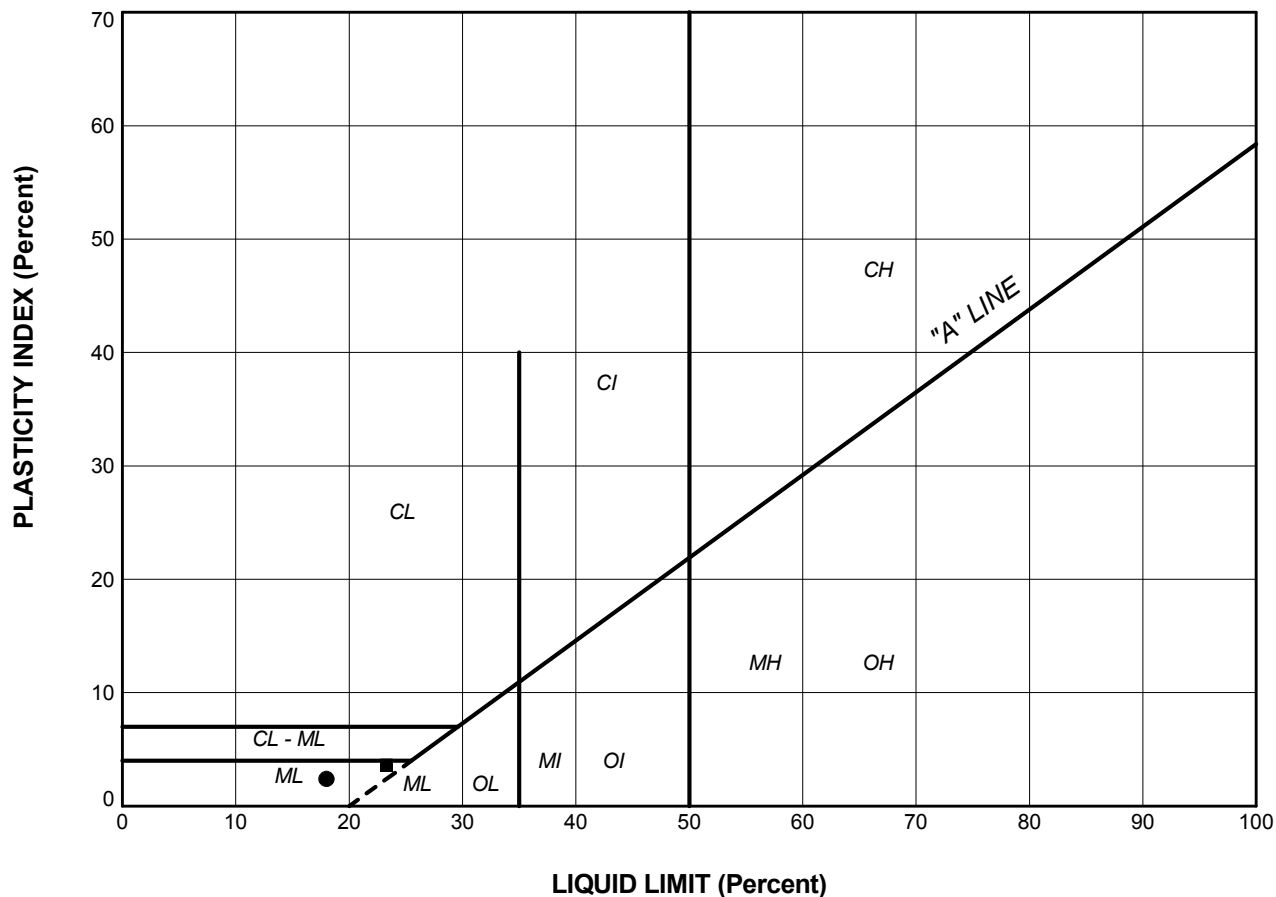


GRAVEL SIZE, mm						Cobble Size
CLAY AND SILT	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

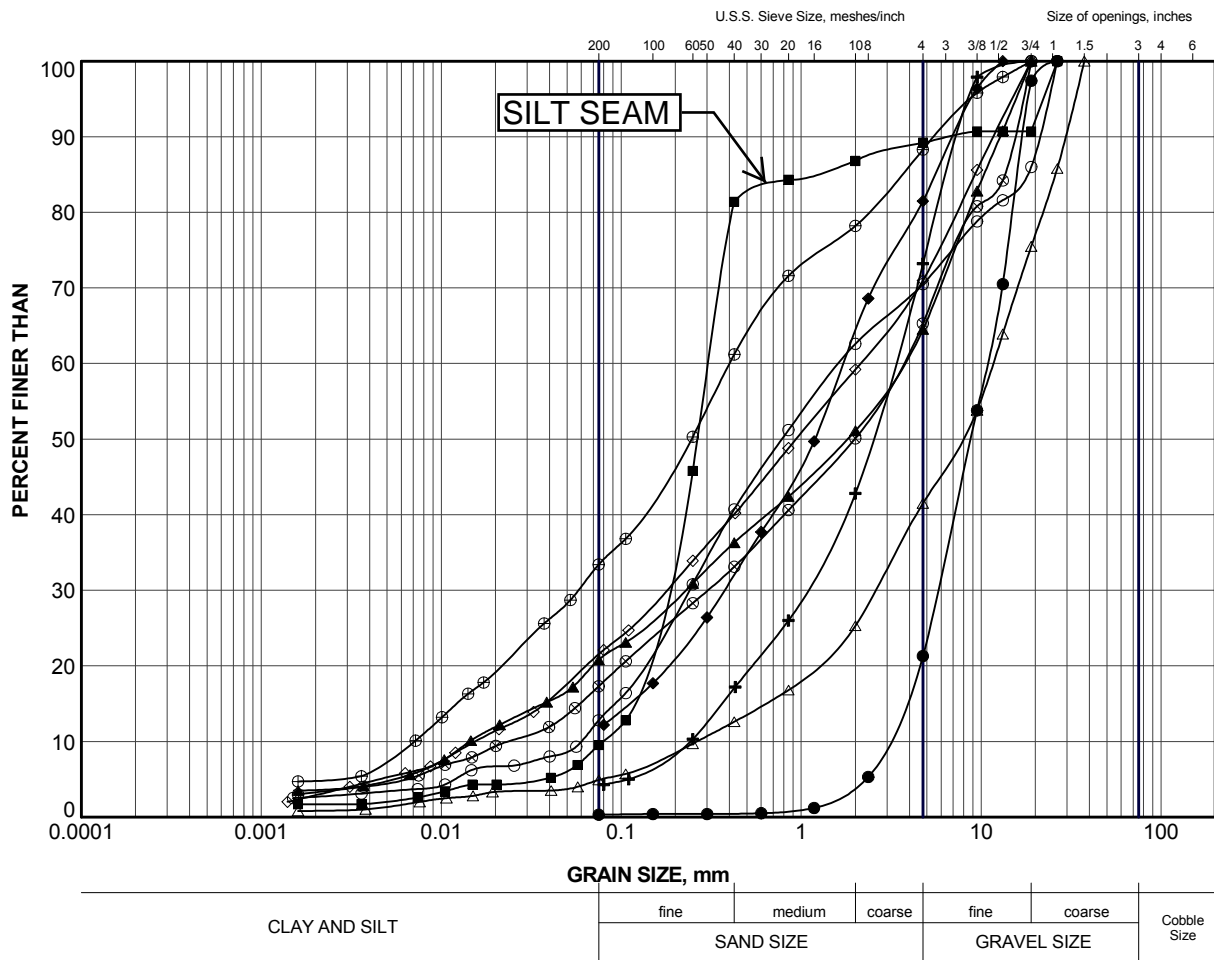
SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H1-4	7	297.9
■	H1-6	13	288.7
▲	H1-9	11	291.4
+	H1-9	13	288.4
◆	H4-5	4b	302.3

PROJECT						HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125					
TITLE						GRAIN SIZE DISTRIBUTION SILT to SANDY SILT					
PROJECT No.			10-1191-0044			FILE No.			10-1191-0044SUD.GPJ		
DRAWN	JJL	Aug 2013	SCALE	N/A	REV.						
CHECK	SEMC	Aug 2013									
APPR	JMAC	Aug 2013									
 Golder Associates SUDBURY, ONTARIO			FIGURE A7								



PROJECT			HIGHWAY 66/ HWY 66 CONNECTION HIGH FILL H1 / H4 STA 13+110 TO 13+185 / STA 10+000 TO 10+125		
TITLE			PLASTICITY CHART SILT to SANDY SILT		
PROJECT No.		10-1191-0044	FILE No.		10-1191-0044SUD.GPJ
DRAWN	JJL	Aug 2013	SCALE	N/A	REV.
CHECK	SEMC	Aug 2013	FIGURE A8		
APPR	JMAC	Aug 2013			





LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC1-1	7	297.1
■	BC1-2	7a	301.2
▲	BC1-3	9	294.1
+	C1-2	9	294.4
◆	H1-4	8	296.4
◇	H1-7	7	297.4
○	H1-10	12	288.1
△	H4-1	7	296.9
⊗	H4-2	5	302.5
⊕	H4-6	4	303.2

PROJECT

HIGHWAY 66/ HWY 66 CONNECTION
HIGH FILL H1 / H4
STA 13+110 TO 13+185 / STA 10+000 TO 10+125

TITLE

GRAIN SIZE DISTRIBUTION
SILTY SAND to SANDY GRAVEL



PROJECT No.	10-1191-0044	FILE No.	10-1191-0044SUD.GPJ
DRAWN	JJL	Aug 2013	SCALE N/A
CHECK	SEMC	Aug 2013	REV.
APPR	JMAC	Aug 2013	

FIGURE A9



Borehole C1-2
Elevation 293.9 m to 289.8 m



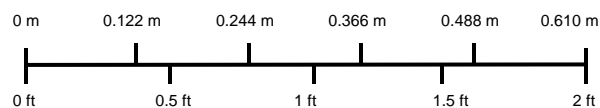
Borehole BC1-1
Elevation 294.2 m to 290.8 m




Borehole BC1-2
Elevation 299.1 m to 295.5 m



Borehole BC1-3
Elevation 292.1 m to 288.5 m

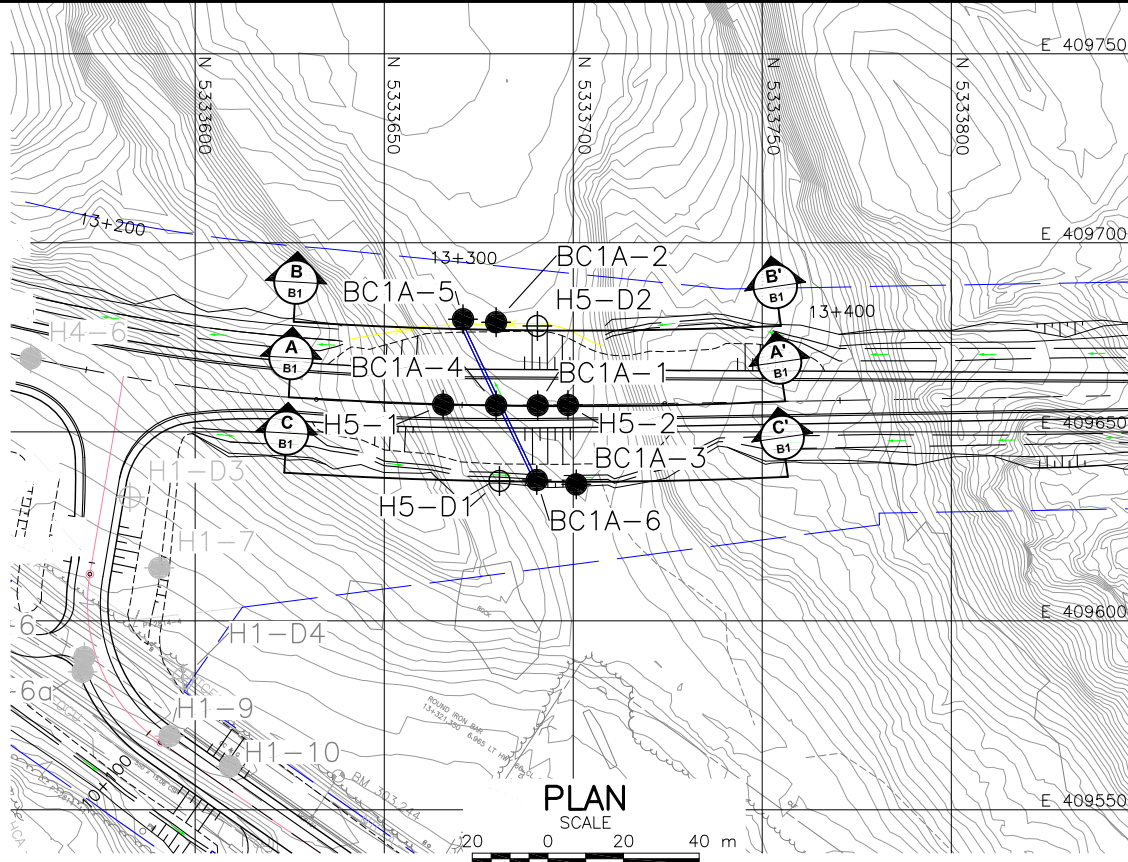


PROJECT				HIGHWAY 66 / HIGHWAY 66 CONNECTION HIGH FILL H1 & HIGH FILL H4 STA 13+080 to 13+185 / STA 10+000 to 10+100			
TITLE				BEDROCK CORE PHOTOGRAPHS			
		PROJECT No.		10-1191-0044		FILE No.	
		DESIGN	MT	APR 2013	SCALE	AS SHOWN	REV.
		CADD	--		FIGURE A10		
		CHECK	SEMC	APR 2013			
		REVIEW	JMAC	APR 2013			



APPENDIX B

Highway 66 – STA 13+300 to 13+345 (High Fill H5)



METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

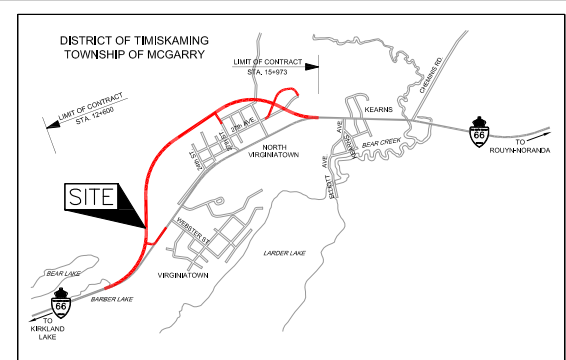


HIGHWAY 66
HWY 66 - STA 13+300 TO 13+345
BOREHOLE LOCATIONS AND
SOIL STRATA

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA



KEY PLAN

SCALE
0 700 m

LEGEND

- Borehole
- Dynamic Cone Penetration Test
- Seal
- Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- 100% Rock Quality Designation (RQD)
- R Refusal
- WL upon completion of drilling
- WL in piezometer, measured on NOV 17, 2012

BOREHOLE CO-ORDINATES

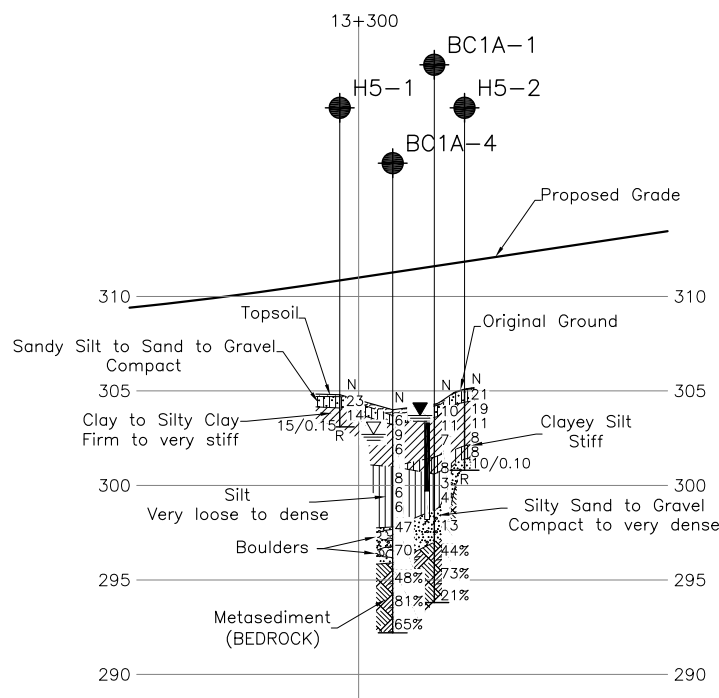
No.	ELEVATION	NORTHING	EASTING
BC1A-1	304.3	5333690.6	409643.0
BC1A-2	303.1	5333679.6	409621.0
BC1A-3	305.7	5333700.8	409663.9
BC1A-4	304.0	5333679.6	409643.0
BC1A-5	303.0	5333670.9	409620.2
BC1A-6	304.9	5333690.4	409662.8
H5-1	304.8	5333665.6	409642.8
H5-2	305.1	5333698.6	409642.9
H5-D1	305.1	5333680.5	409663.0
H5-D2	303.5	5333690.5	409622.0

NOTES

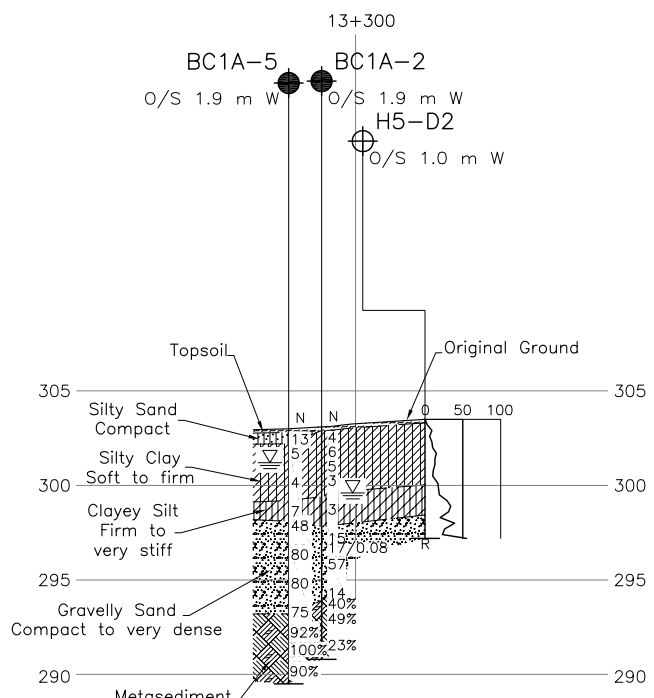
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

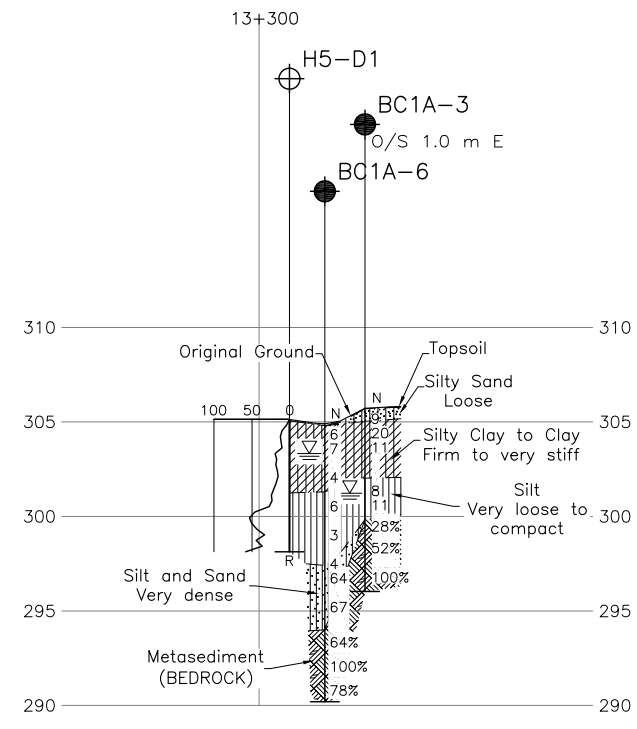
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of GPS General Conditions.



A-A' B1
PROFILE ALONG CENTRELINE
HIGHWAY 66
HORIZONTAL SCALE
0 20 40 m
VERTICAL SCALE
0 4 8 m



B-B' B1
PROFILE ALONG NORTH TOE
HIGHWAY 66
HORIZONTAL SCALE
0 20 40 m
VERTICAL SCALE
0 4 8 m



C-C' B1
PROFILE ALONG SOUTH TOE
HIGHWAY 66
HORIZONTAL SCALE
0 20 40 m
VERTICAL SCALE
0 4 8 m

REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.








NO.	DATE	BY	REVISION
1	DEC 3, 2012	JUL	ISSUED FOR PERMIT
2	JAN 24, 2013	JUL	KEYPLAN
3	DEC 3, 2013	JUL	FINAL

Geocres No. 32D-17

HWY. 66	PROJECT NO. 10-1191-0044	DIST.
SUBM'D. MT	CHKD.	DATE: DEC 2013
DRAWN: J.J.L.	CHKD. SEMC	APPD. JMAC
SITE:		DWG. B1

PROJECT		10-1191-0044				RECORD OF BOREHOLE No H5-1				1 OF 1 METRIC								
G.W.P.		5091-07-00		LOCATION		N 5333665.6; E 409642.8				ORIGINATED BY								
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY								
DATUM		GEODETIC		DATE		September 5, 2012				CHECKED BY								
SEM																		
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p — W — W _L					
304.8	GROUND SURFACE																	
0.0	TOPSOIL																	
304.1	Sandy SILT, trace to some gravel Compact Grey to brown Moist		1	SS	23													
0.7	CLAY, trace sand Stiff Brown Moist		2	SS	14													
303.1	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)		3	SS	15/0.15													
1.7	Note: 1. Borehole dry upon completion of drilling.																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H5-2			1 OF 1 METRIC								
G.W.P. 5091-07-00			LOCATION N 5333698.6; E 409642.9			ORIGINATED BY MT								
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT								
DATUM GEODETIC			DATE September 5, 2012			CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
305.1	GROUND SURFACE							20 40 60 80 100	20 40 60					
0.0	TOPSOIL		1	SS	21		305							
304.4	GRAVEL, some sand, trace silt, trace organics Compact Grey to brown Moist		2	SS	19		304							
0.7	CLAY, trace sand Stiff to very stiff Grey to brown Moist		3	SS	11		303							
			4	SS	8		302							
302.1	CLAYEY SILT, trace sand Stiff Grey Moist		5	SS	8		301							
301.4	SAND and GRAVEL, some silt Compact Brown Moist		6	SS	10/0.10									
300.8														
4.3	Spoon bouncing at 4.1 m depth. END OF BOREHOLE AUGER REFUSAL													
Note: 1. Borehole dry upon completion of drilling.														

PROJECT 10-1191-0044		RECORD OF BOREHOLE No BC1A-1				1 OF 1 METRIC						
G.W.P. 5091-07-00		LOCATION N 5333690.6; E 409643.0				ORIGINATED BY MT						
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY MT						
DATUM GEODETIC		DATE September 6 and 7, 2012				CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH kPa	W _p	W			W _L
304.3	GROUND SURFACE											
0.0	TOPSOIL		1	SS	10	304						
303.6	SAND, some silt, some gravel, trace clay, trace organics Compact Brown Moist		2	SS	11	303						
0.7	CLAY, trace sand Firm to stiff Grey to brown Moist		3	SS	7	302						
301.5	CLAYEY SILT, trace sand Stiff Grey to brown Moist to wet		4	SS	8	301						
300.6	SILT, some clay, trace sand Very loose Grey Wet		5	SS	3	300						
			6	SS	4	299						
298.7	GRAVEL, some sand, some silt Compact Grey Wet		7	SS	13	298						
	Spoon bouncing at 6.6 m depth. Broken rock encountered between 6.6 m and 7.3 m depth.					297						
297.0	METASEDIMENT (BEDROCK)		1	RC	REC 100%	296						RQD = 44%
	Bedrock cored from 7.3 m depth to 10.5 m depth. For coring details see Record of Drillhole BC1A-1.		2	RC	REC 100%	295						RQD = 73%
			3	RC	REC 85%	294						RQD = 21%
293.8	END OF BOREHOLE											
10.5	Note: 1. Water level at a depth of 1.1 m below ground surface (Elev. 303.2 m) upon completion of drilling. 2. Water level in piezometer at a depth of 1.1 m below ground surface (Elev. 303.2 m) after installation of piezometer, at 0.6 m below ground surface (Elev. 303.7 m) on November 17, 2012 and at 0.8 m below ground surface (Elev. 303.5 m) on May 17, 2013.											

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC1A-1

SHEET 1 OF 1

LOCATION: N 5333690.6 ; E 409643.0

DRILLING DATE: September 7, 2012

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Landcore Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
							RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diametral Point Load Index (MPa)	RMC -Q' AVG.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
							TOTAL CORE %	SOLID CORE %			B Angle		DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION		Jr	Ja	Jn	k, cm/s																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT		RECORD OF BOREHOLE				No BC1A-2		1 OF 1		METRIC				
G.W.P. 5091-07-00		LOCATION				N 5333679.6; E 409621.0		ORIGINATED BY		MT				
DIST _____ HWY 66		BOREHOLE TYPE				108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring		COMPILED BY		MT				
DATUM GEODETIC		DATE				September 5 and 6, 2012		CHECKED BY		SEMC				
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
303.1	GROUND SURFACE													
0.0	TOPSOIL													
0.2	SILTY CLAY, trace sand Soft to firm Brown Moist		1	SS	4									
			2	SS	6									
			3	SS	5									
			4	SS	3									
299.4	CLAYEY SILT, trace sand Firm Grey Wet		5	SS	3									
3.7														
297.8	Gravelly SAND, some silt, trace clay Compact to very dense Grey Wet Spoon bouncing at 6.2 m depth. Auger refusal at 6.2 m depth. Casing grinding between 5.9 m and 6.7 m depth.		6	SS	15									
5.3			7	SS	17/0.08									
			8	SS	57									
			9	SS	14									
293.9	METASEDIMENT (BEDROCK)		1	RC	REC 100%									RQD = 40%
9.2	Bedrock cored from 9.2 m depth to 12.3 m depth. For coring details see Record of Drillhole BC1A-2.		2	RC	REC 100%									RQD = 49%
			3	RC	REC 100%									RQD = 23%
290.8	END OF BOREHOLE													
12.3	Note: 1. Water level at a depth of 3.5 m below ground surface (Elev. 299.6 m) upon completion of drilling.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC1A-2

SHEET 1 OF 1

LOCATION: N 5333679.6 ; E 409621.0

DRILLING DATE: September 6, 2012

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Landcore Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	FLUSH	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate	BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage	PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular	PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break	BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.	RECOVERY TOTAL CORE %	SOLID CORE %	R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY k, cm/s				Diameter Point Load Index (MPa)	RMC -Q AVG.	NOTES WATER LEVELS INSTRUMENTATION
		REFER TO PREVIOUS PAGE		293.9																							
		METASEDIMENT Sheared Fine grained Slightly to completely weathered Grey		9.2	1	GREY	100%																				
10					2	GREY	100%																				
11	September 6, 2012 NQ Coring	Highly fractured (sheared) zones, between 9.4 m and 9.5 m, between 10.3 m and 10.8 m and between 11.2 m and 11.7 m depth.			3	GREY	100%																				
12		END OF DRILLHOLE		290.8 12.3																							
13																											
14																											
15																											
16																											
17																											
18																											
19																											

DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT		10-1191-0044		RECORD OF BOREHOLE No BC1A-3		1 OF 1 METRIC								
G.W.P.		5091-07-00		LOCATION		N 5333700.8; E 409663.9								
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring								
DATUM		GEODETIC		DATE		September 8, 2012								
				ORIGINATED BY		MT								
				COMPILED BY		MT								
				CHECKED BY		SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
305.7	GROUND SURFACE							20 40 60 80 100	20 40 60					
0.0	TOPSOIL		1	SS	9									
305.0	Silty SAND, some gravel, trace organics Loose Brown to black Moist		2	SS	20									0 2 24 74
0.7	SILTY CLAY to CLAY, trace sand Firm to very stiff Brown Moist		3	SS	11									
			4	SS	5									
302.0														
3.7	SILT, trace to some clay, trace sand Loose to compact Grey Wet		5	SS	8									
			6	SS	11									0 1 90 9
299.8	METASEDIMENT (BEDROCK)													
5.9	Bedrock cored from 5.9 m depth to 9.7 m depth. For coring details see Record of Drillhole BC1A-3.		1	RC	REC 100%									RQD = 28%
			2	RC	REC 91%									RQD = 52%
			3	RC	REC 100%									RQD = 100%
296.0	END OF BOREHOLE													
9.7	Note: 1. Water level at a depth of 4.5 m below ground surface (Elev. 301.2 m) upon completion of drilling.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC1A-3

SHEET 1 OF 1

LOCATION: N 5333700.8 ; E 409663.9

DRILLING DATE: September 8, 2012

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Landcore Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock	NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
							RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diametral Point Load Index (MPa)	RMC -Q' AVG.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
							TOTAL CORE %	SOLID CORE %			TYPE AND SURFACE DESCRIPTION										k, cm/s																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
							FLUSH				B Angle	DIP w.r.t CORE AXIS	Jr	Ja	Jn	10°	10°	10°																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
6	NW	REFER TO PREVIOUS PAGE METASEDIMENT Strong Weak to moderately foliated Fine grained Moderately weathered to fresh Grey Highly fractured between 5.9 m and 6.4 m depth.		299.8 5.9	1	GREY - LIGHT GREY 100%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			

DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT		10-1191-0044		RECORD OF BOREHOLE No BC1A-4		1 OF 1 METRIC							
G.W.P.		5091-07-00		LOCATION		N 5333679.6; E 409643.0							
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers							
DATUM		GEODETIC		DATE		May 17, 2013							
				ORIGINATED BY		MR							
				COMPILED BY		MT							
				CHECKED BY		SEMC							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)		
304.0	GROUND SURFACE												
0.0	TOPSOIL		1	SS	6								
0.3	Silty SAND Loose Brown Moist		2	SS	9								
303.7			3	SS	6								
303.2	SILTY CLAY, trace sand Firm to very stiff Brown/grey Wet												
0.8													
301.0													
3.0	SILT, trace to some sand, trace to some clay, trace gravel Loose to dense Grey Wet		4	SS	8								
			5	SS	6								
			6	SS	6								
			7	SS	47								
297.8													
6.2	Silty SAND Very dense Grey Wet		8	SS	70								
	Boulder encountered between 6.2 m and 6.9 m and between 7.6 m and 8.1 m depth.												
295.9													
8.1	METASEDIMENT (BEDROCK)		1	RC	REC 100%								
	Bedrock cored from 8.1 m depth to 11.8 m depth.		2	RC	REC 100%								
	For coring details see record of drillhole BC1A-4.		3	RC	REC 100%								
292.2													
11.8	END OF BOREHOLE												
	Note: 1. Water level at a depth of 1.3 m below ground surface (Elev. 302.7 m) upon completion of drilling.												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC1A-4

SHEET 1 OF 1

LOCATION: N 5333679.6 ; E 409643.0

DRILLING DATE: May 17, 2013

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: George Downing Estate Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR FLUSH % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock	NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
							RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diameter Point Load Index (MPa)	RMC -Q' AVG.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
							TOTAL CORE %	SOLID CORE %			B Angle		DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION		Jr	Ja	Jn	k, cm/s																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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DEPTH SCALE

1 : 50



LOGGED: MR

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT		10-1191-0044		RECORD OF BOREHOLE No BC1A-5		1 OF 1 METRIC											
G.W.P.		5091-07-00		LOCATION		N 5333670.9; E 409620.2											
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring											
DATUM		GEODETIC		DATE		May 18, 2013											
				ORIGINATED BY		MR											
				COMPILED BY		MT											
				CHECKED BY		SEMC											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60	W _p W W _L	γ	GR SA SI CL					
303.0	GROUND SURFACE																
0.0	TOPSOIL		1a	SS	13												
0.2	Silty SAND		1b	SS													
302.2	Compact Brown/grey Moist																
0.8	SILTY CLAY to CLAY		2	SS	5												
	Firm to very stiff Grey/brown Wet																
			3	SS	4												
299.2	SILT, trace to some clay		4	SS	7												
3.8	Loose Grey Wet																
			5a	SS													
298.1	Gravelly Silty SAND, trace clay		5b	SS	48												
4.9	Dense to very dense Brown/grey Wet																
	Cobbles encountered from 5.6 m to 5.8 m depth.																
			6	SS	80												
			7	SS	80												
			8	SS	75												
293.2	METASEDIMENT (BEDROCK)		1	RC	REC 100%												
9.8	Bedrock cored from 9.8 m depth to 13.5 m depth.																
	For coring details see record of borehole BC1A-5.		2	RC	REC 100%												
			3	RC	REC 100%												
289.5	END OF BOREHOLE																
13.5	Note: 1. Water level at a depth of 1.8 m below ground surface (Elev. 301.2 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SHEET 1 OF 1

DATUM: GEODETIC

DRILLING CONTRACTOR: George Downing Estate Drilling Ltd.

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

[illegible]

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SHEET 1 OF 1

DATUM: GEODETIC

DRILLING CONTRACTOR: George Downing Estate Drilling Ltd.

[illegible]

DEPTH SCALE

1 : 50

LOGGED: MR

CHECKED: SEMC



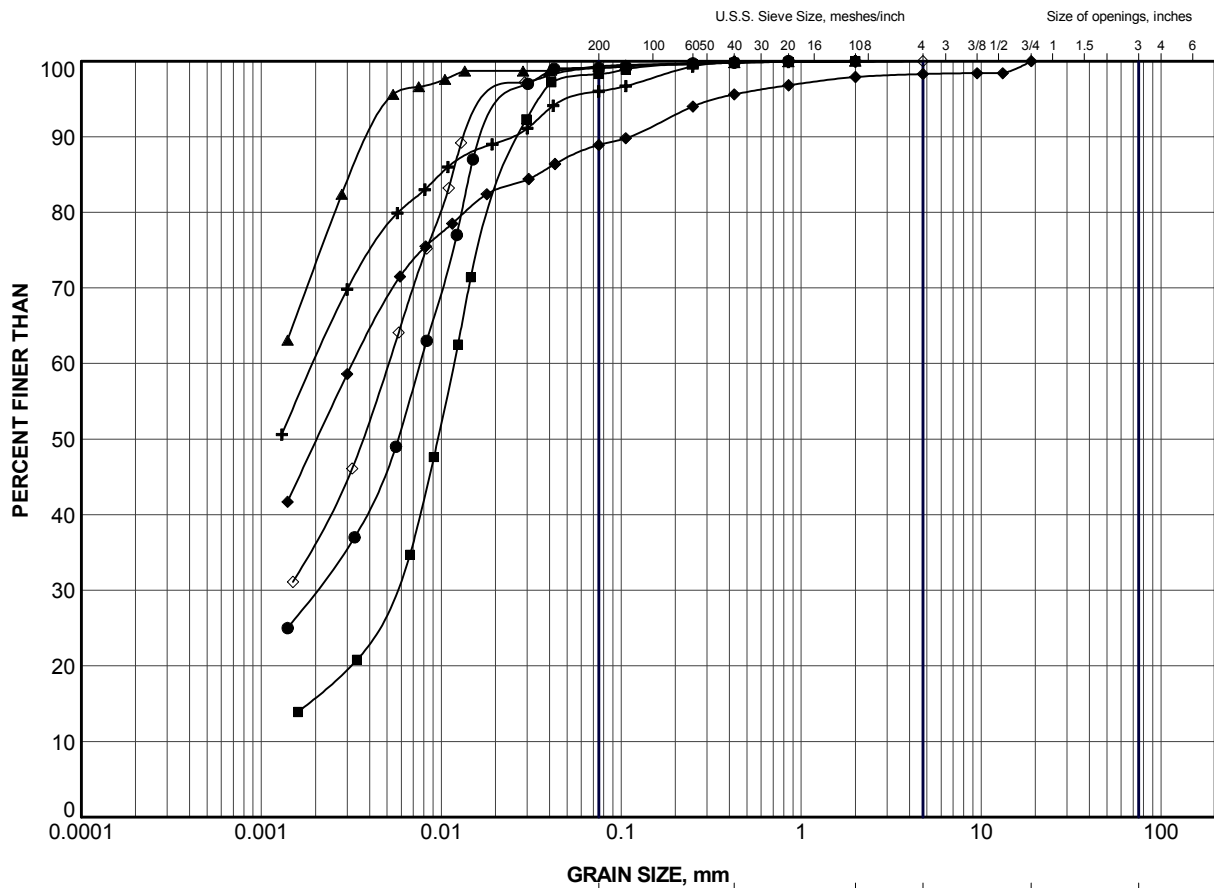
+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H5-D1				1 OF 1 METRIC									
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5333680.5; E 409663.0</u>				ORIGINATED BY <u>MT</u>									
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>									
DATUM <u>GEODETIC</u>		DATE <u>September 5, 2012</u>				CHECKED BY <u>SEMC</u>									
SOIL PROFILE		SAMPLES				DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED		W _p	W	W _L	WATER CONTENT (%)	γ	GR SA SI CL
305.1 0.0	GROUND SURFACE						305	20 40 60 80 100					20 40 60		
							304								
							303								
							302								
							301								
							300								
							299								
298.1 7.0	END OF DCPT REFUSAL TO FURTHER PENETRATION 58 BLOWS / 0.28 m (HAMMER BOUNCING)														

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H5-D2				1 OF 1 METRIC							
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5333690.5; E 409622.0</u>				ORIGINATED BY <u>MT</u>							
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>							
DATUM <u>GEODETIC</u>		DATE <u>September 5, 2012</u>				CHECKED BY <u>SEMC</u>							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
303.5 0.0	GROUND SURFACE						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>						
303													
302													
301													
300													
299													
298													
297.2 6.3	END OF DCPT REFUSAL TO FURTHER PENETRATION 71 BLOWS / 0.23 m (HAMMER BOUNCING)												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



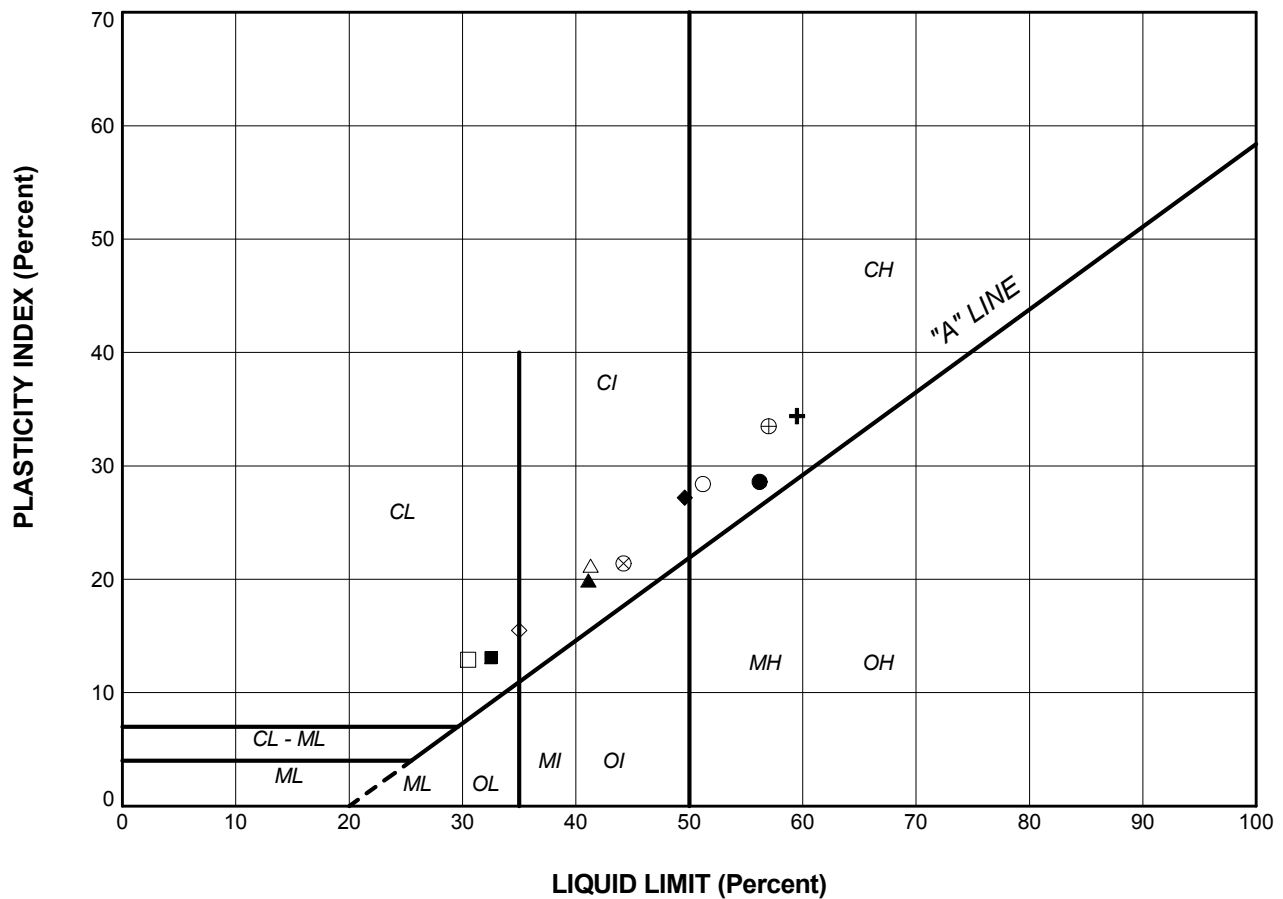
GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC1A-1	4	300.9
■	BC1A-2	5	299.0
▲	BC1A-3	2	304.7
+	BC1A-4	2	302.9
◆	BC1A-6	1	304.4
◇	H5-1	2	303.7


PROJECT					
HIGHWAY 66 - HIGH FILL H5 STA 13+300 TO 13+345					
TITLE					
GRAIN SIZE DISTRIBUTION CLAYEY SILT to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013	FIGURE B1		
APPR	JMAC	Jul 2013			

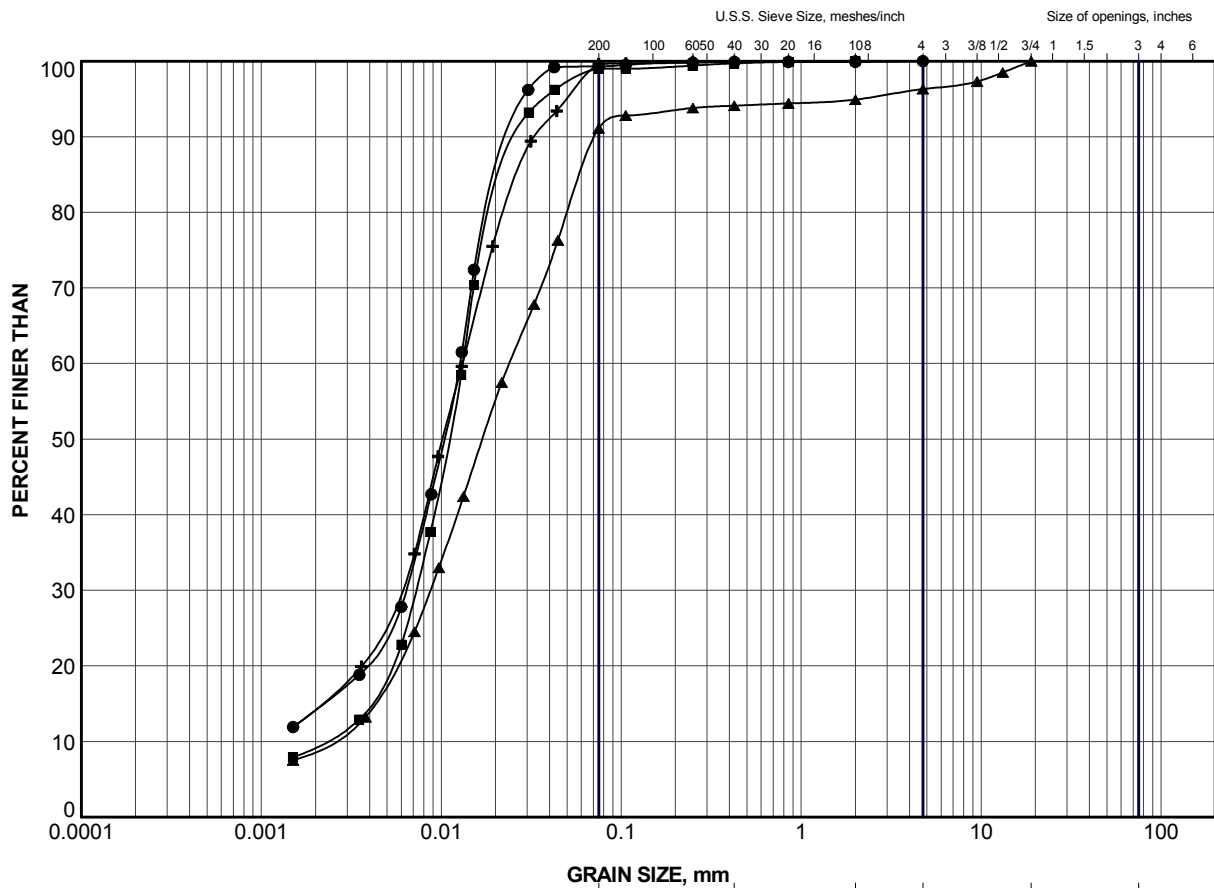




LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	BC1A-1	2	56.2	27.6	28.6
■	BC1A-1	4	32.5	19.4	13.1
▲	BC1A-2	3	41.1	21.2	19.9
+	BC1A-3	2	59.5	25.1	34.4
◆	BC1A-3	4	49.6	22.4	27.2
◇	BC1A-4	2	35.0	19.5	15.5
○	BC1A-5	3	51.2	22.8	28.4
△	BC1A-6	1b	41.3	20.1	21.2
⊗	BC1A-6	3	44.2	22.8	21.4
⊕	H5-2	3	57.0	23.5	33.5
□	H5-2	5	30.5	17.6	12.9

PROJECT					
HIGHWAY 66 - HIGH FILL H5 STA 13+300 TO 13+345					
TITLE					
PLASTICITY CHART CLAYEY SILT to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE B2		



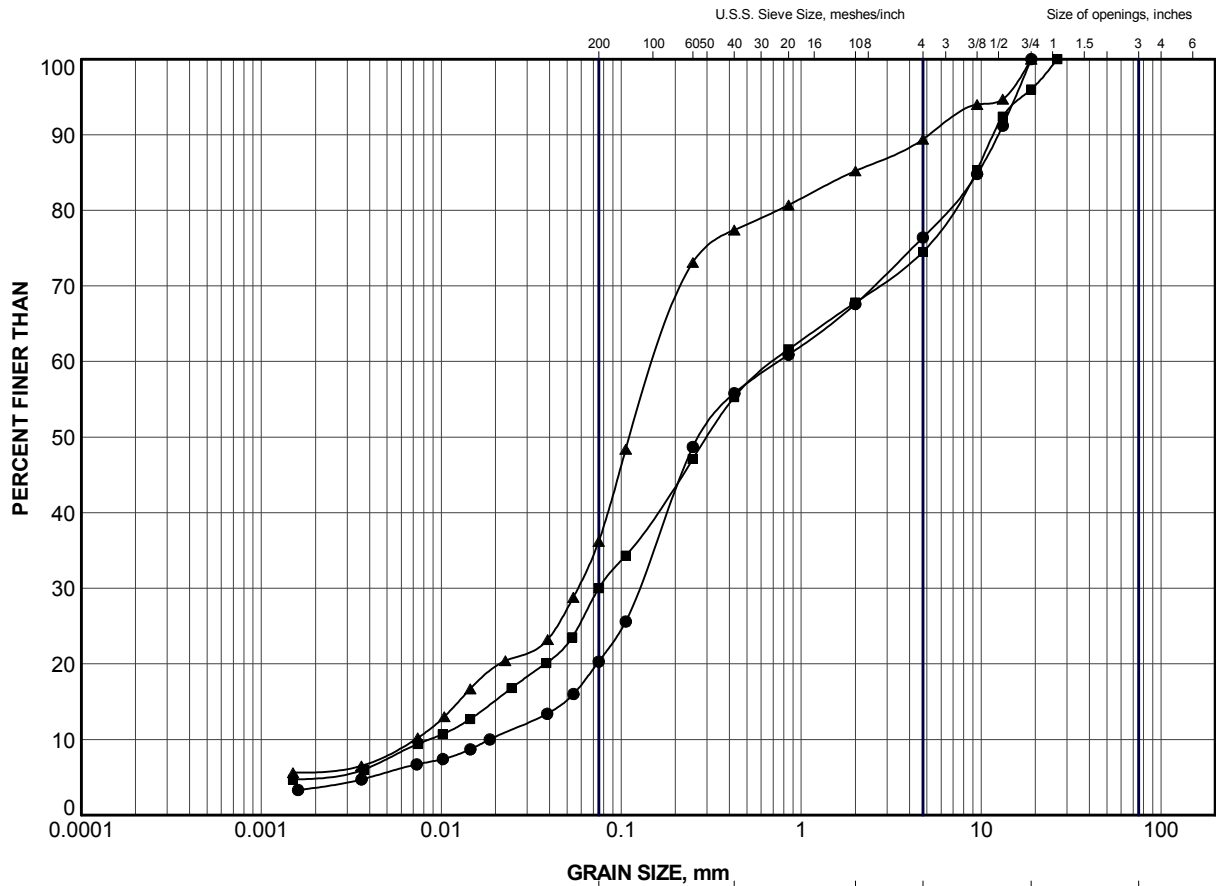
CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC1A-1	6	299.4
■	BC1A-3	6	300.8
▲	BC1A-4	7	298.1
+	BC1A-6	5	299.3

PROJECT					
HIGHWAY 66 - HIGH FILL H5 STA 13+300 TO 13+345					
TITLE					
GRAIN SIZE DISTRIBUTION SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
			FIGURE B3		






CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC1A-2	8	296.1
■	BC1A-5	7	295.1
▲	BC1A-6	7	297.0

PROJECT					
HIGHWAY 66 - HIGH FILL H5 STA 13+300 TO 13+345					
TITLE					
GRAIN SIZE DISTRIBUTION SILTY SAND to GRAVELLY SAND					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE B4		



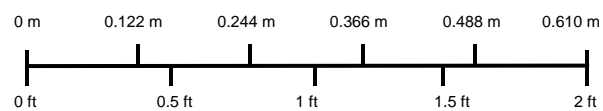
Borehole BC1A-1
Elevation 297.0 m to 293.8 m




Borehole BC1A-2
Elevation 293.9 m to 290.8 m



Borehole BC1A-3
Elevation 299.8 m to 296.0 m



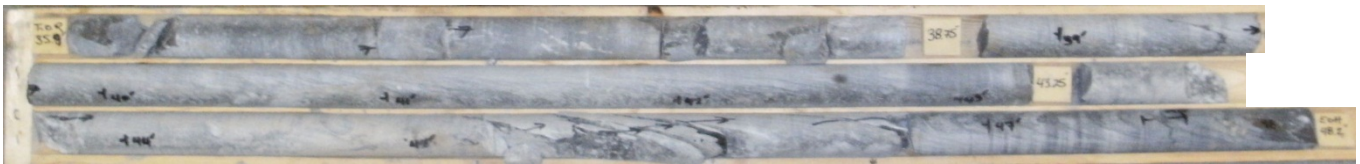
PROJECT		HIGHWAY 66 HIGH FILL H5 STA 13+300 to 13+345			
TITLE		BEDROCK CORE PHOTOGRAPHS			
		PROJECT No. 10-1191-0044		FILE No. ----	
		DESIGN	MT	AUG 2013	SCALE AS SHOWN
		CADD	--		REV.
		CHECK	SEMC	AUG 2013	FIGURE B5.1
		REVIEW	JMAC	AUG 2013	



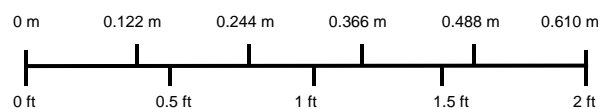
Borehole BC1A-4
Elevation 295.9 m to 292.2 m




Borehole BC1A-5
Elevation 293.2 m to 289.5 m



Borehole BC1A-6
Elevation 294.0 m to 290.2 m

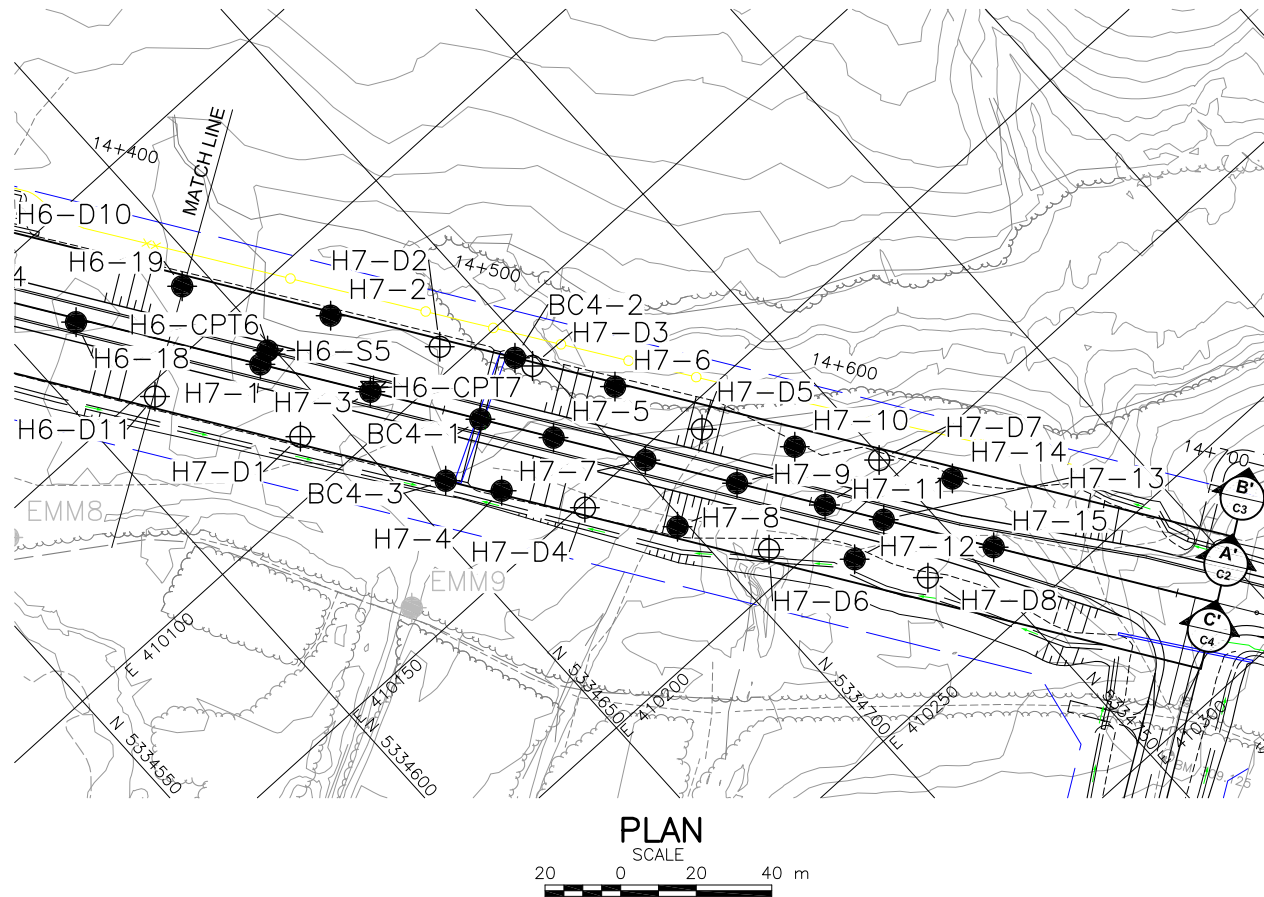
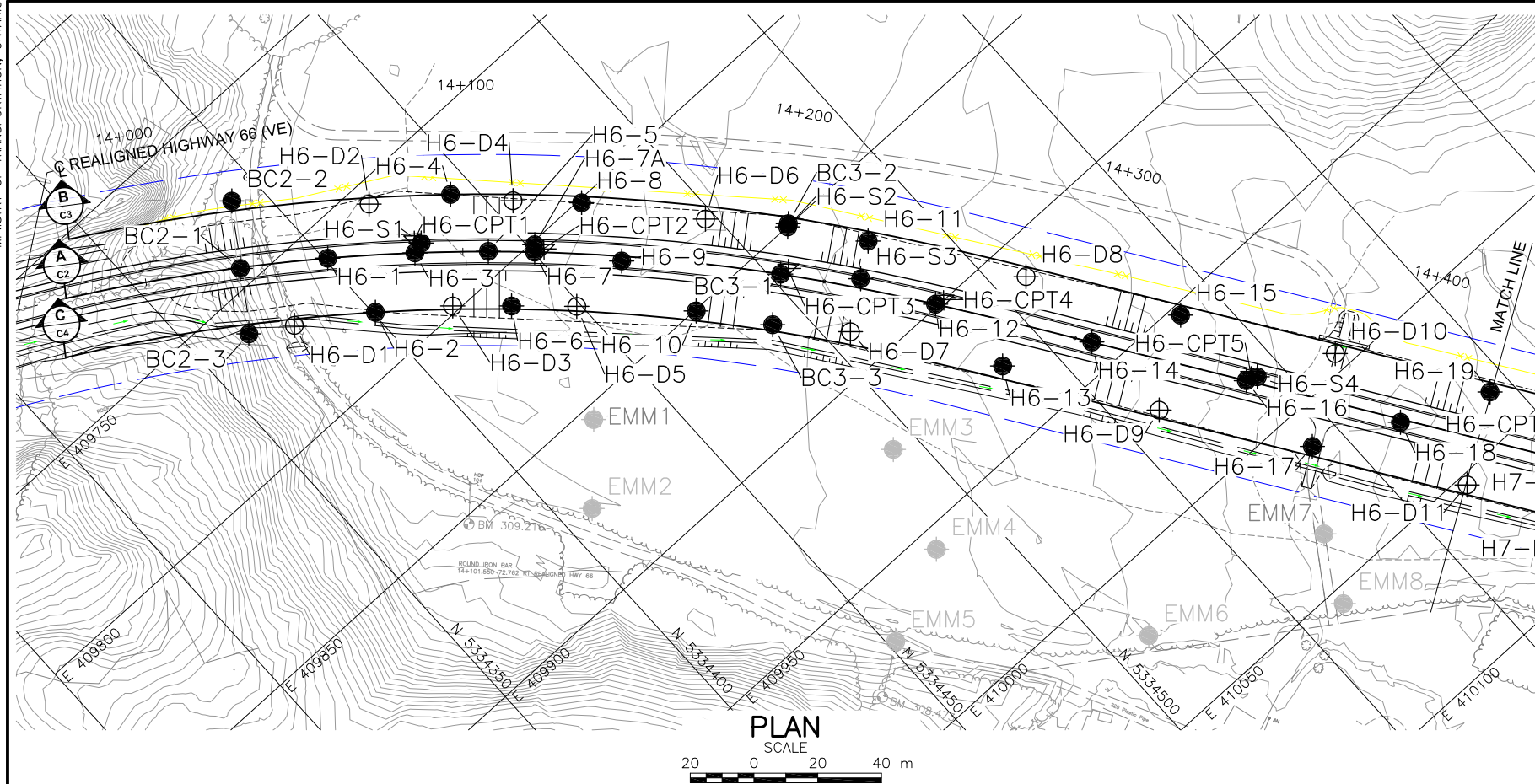


PROJECT		HIGHWAY 66 HIGH FILL H5 STA 13+300 to 13+345			
TITLE		BEDROCK CORE PHOTOGRAPHS			
	PROJECT No. 10-1191-0044			FILE No. ----	
	DESIGN	MT	Aug 2013	SCALE AS SHOWN	
	CADD	--		REV.	
	CHECK	SEMC	Aug 2013	FIGURE B5.2	
	REVIEW	JMAC	Aug 2013		



APPENDIX C

Highway 66 – STA 14+020 to 14+650 (Swamp Crossing H6/H7)



METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
H6-18	305.7	5334616.0	410024.5
H6-19	305.3	5334643.2	410036.3
H6-CPT1	309.2	5334425.0	409774.7
H6-CPT2	309.0	5334452.9	409803.7
H6-CPT3	308.7	5334505.8	409859.9
H6-CPT4	307.8	5334535.5	409899.8
H6-CPT5	306.7	5334591.1	409982.2
H6-CPT6	305.2	5334648.3	410065.5
H6-CPT7	305.1	5334662.5	410090.2
H6-D1	309.6	5334379.1	409769.2
H6-D2	309.2	5334422.0	409756.7
H6-D3	309.0	5334420.0	409798.0
H6-D4	308.9	5334456.2	409786.2
H6-D5	308.9	5334448.8	409824.2
H6-D6	308.8	5334497.1	409831.0
H6-D7	308.3	5334507.1	409887.7
H6-D8	307.7	5334559.6	409911.8
H6-D9	307.0	5334562.4	409970.9
H6-D10	305.9	5334615.3	409994.8
H6-D11	305.4	5334618.3	410053.1
H6-S1	309.2	5334425.9	409776.7
H6-S2	308.7	5334514.6	409850.1
H6-S3	308.3	5334520.6	409877.5
H6-S4	306.7	5334592.2	409983.8
H6-S5	305.2	5334648.5	410064.1
H7-1	305.2	5334644.7	410065.5
H7-2	305.1	5334667.1	410068.4
H7-3	305.1	5334661.4	410090.4
H7-4	305.3	5334669.6	410133.1
H7-5	305.2	5334689.2	410131.9
H7-6	305.0	5334710.3	410132.8
H7-7	305.4	5334703.2	410152.6
H7-8	306.2	5334697.7	410171.4
H7-9	306.0	5334717.1	410173.4
H7-10	305.5	5334734.9	410176.5
H7-11	306.6	5334730.5	410193.3
H7-12	307.8	5334726.7	410209.2
H7-13	307.5	5334739.4	410206.6
H7-14	306.9	5334760.2	410210.7
H7-15	307.5	5334756.1	410231.5
H7-D1	305.5	5334639.7	410086.8
H7-D2	304.9	5334683.0	410093.9
H7-D3	304.4	5334697.8	410114.1
H7-D4	305.7	5334682.9	410151.2
H7-D5	304.5	5334719.8	410156.6
H7-D6	307.0	5334711.6	410192.1
H7-D7	306.4	5334749.1	410194.1
H7-D8	307.8	5334737.8	410225.8

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.

CONT No.
GWP No. 5091-07-00

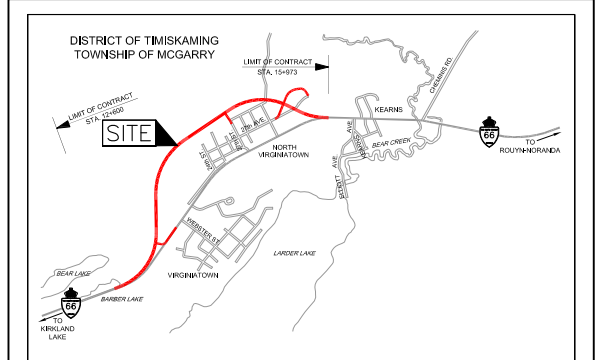


HIGHWAY 66
HWY 66 - STA 14+020 TO 14+650
BOREHOLE LOCATIONS

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA



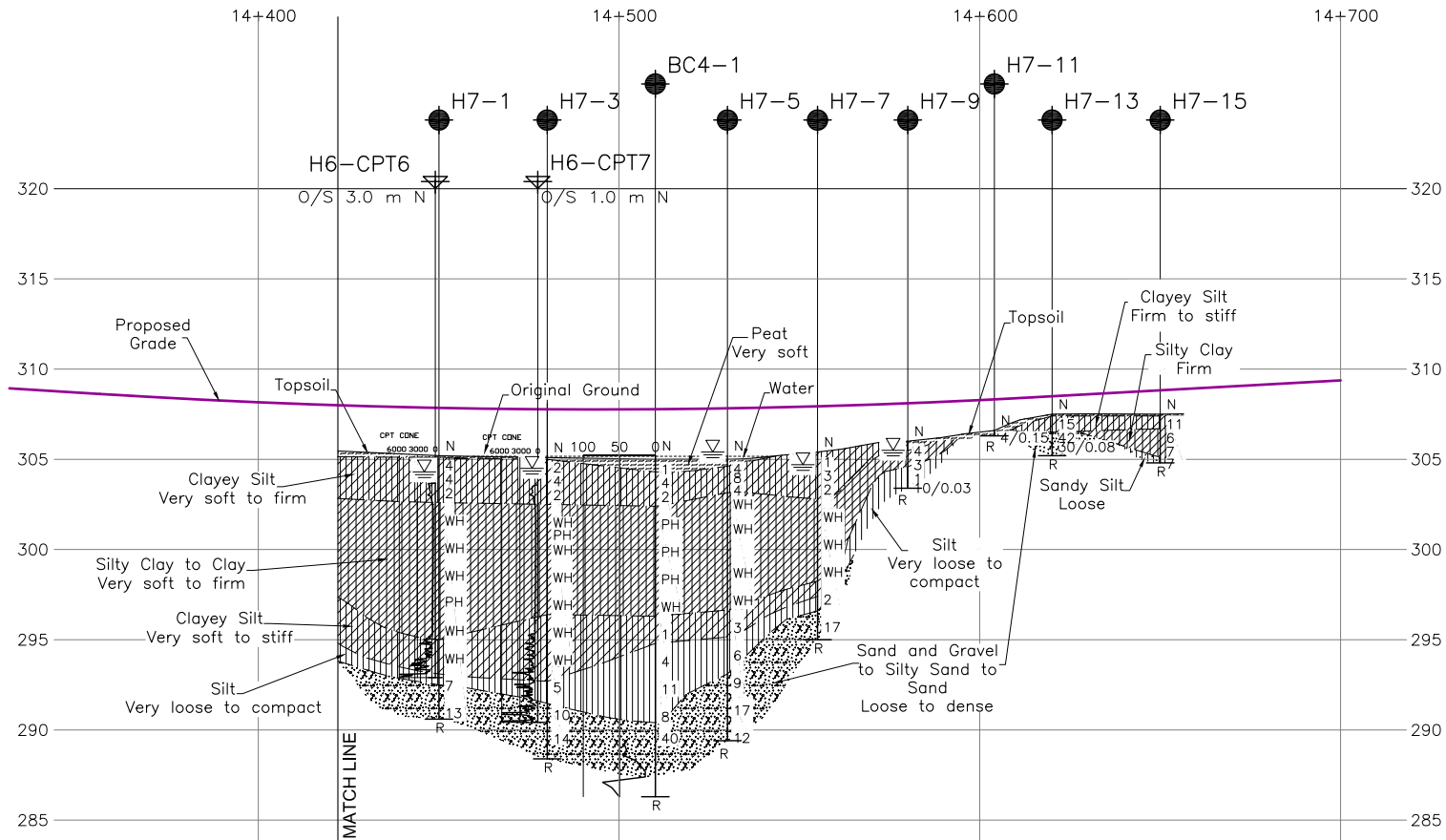
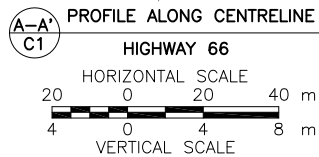
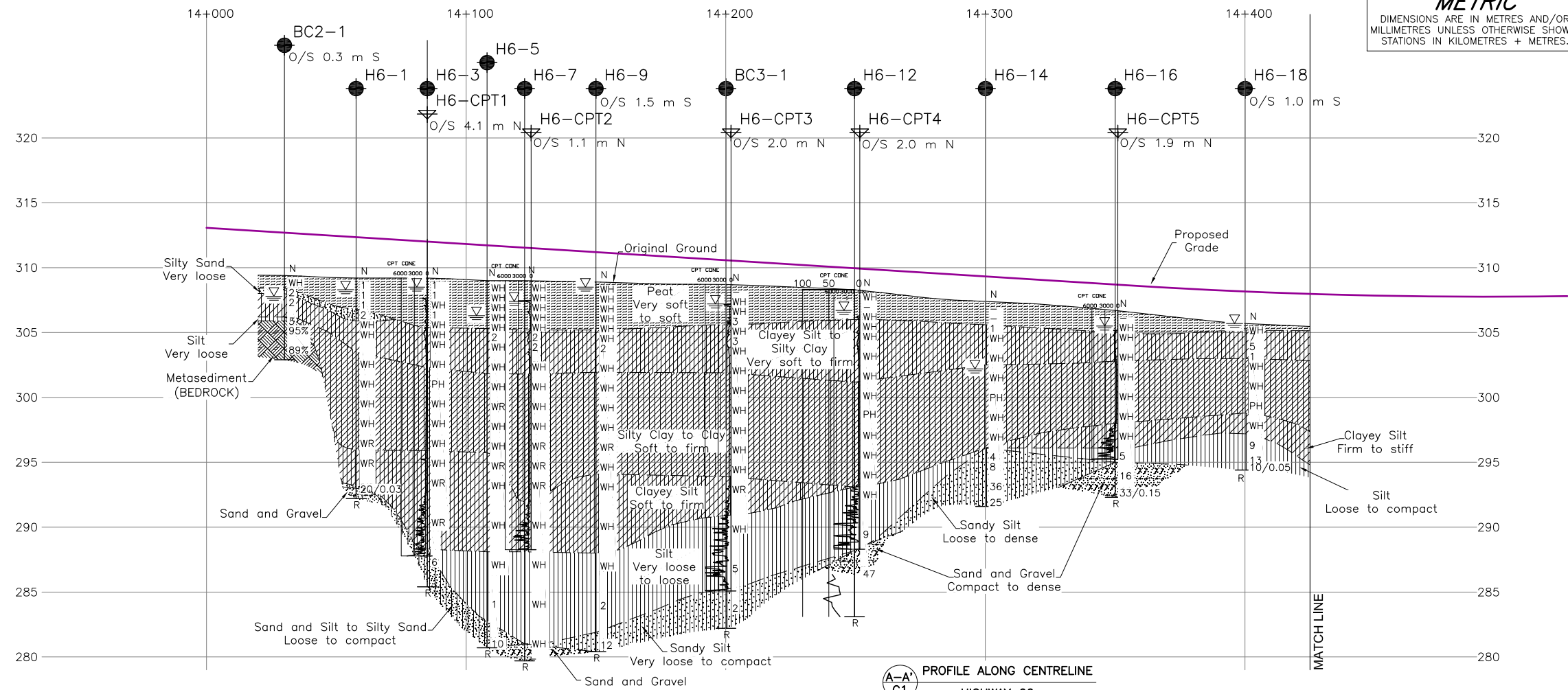
KEY PLAN
SCALE
700 0 700 m

LEGEND

- Borehole
- Dynamic Cone Penetration Test
- CPT

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
BC2-1	309.4	5334378.5	409744.6
BC2-2	309.7	5334390.7	409727.1
BC2-3	309.3	5334366.7	409761.6
BC3-1	308.7	5334503.0	409859.6
BC3-2	308.8	5334515.4	409849.5
BC3-3	308.6	5334490.5	409869.7
BC4-1	305.2	5334678.1	410115.3
BC4-2	304.8	5334695.8	410109.4
BC4-3	305.2	5334660.4	410121.2
H6-1	309.2	5334401.0	409760.6
H6-2	309.0	5334400.7	409783.2
H6-3	309.2	5334422.4	409777.7
H6-4	309.1	5334443.0	409771.6
H6-5	309.0	5334439.8	409792.8
H6-6	308.9	5334433.7	409810.4
H6-7	309.0	5334450.4	409802.7
H6-7A	309.1	5334452.0	409801.0
H6-8	308.9	5334471.7	409801.1
H6-9	308.9	5334468.8	409823.1
H6-10	308.8	5334475.6	409850.4
H6-11	308.4	5334530.3	409870.3
H6-12	308.3	5334532.7	409899.2
H6-13	307.9	5334535.3	409927.7
H6-14	307.4	5334561.1	409940.9
H6-15	306.8	5334587.4	409953.3
H6-16	306.7	5334588.9	409982.4
H6-17	306.2	5334590.4	410011.6

NO.	DATE	BY	REVISION
Geocres No. 32D-17			
HWY. 66	PROJECT No. 10-1191-0044		DIST.
SUBM'D. MT	CHKD.	DATE: DEC 2013	SITE:
DRAWN: JJJ	CHKD. SEMC	APPD. JMAC	DWG. C1



METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

HIGHWAY 66
HWY 66 - STA 14+020 TO 14+650
SOIL STRATA

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA

LEGEND

- Borehole
- CPT
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- 100% Rock Quality Designation (RQD)
- R Refusal
- WL upon completion of drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
BC2-1	309.4	5334378.5	409744.6
BC3-1	308.7	5334503.0	409859.6
BC4-1	305.2	5334678.1	410115.3
H6-1	309.2	5334401.0	409760.6
H6-3	309.2	5334422.4	409777.7
H6-5	309.0	5334439.8	409792.8
H6-7	309.0	5334450.4	409802.7
H6-9	308.9	5334468.8	409823.1
H6-12	308.3	5334532.7	409899.2
H6-14	307.4	5334561.1	409940.9
H6-16	306.7	5334588.9	409982.4
H6-18	305.7	5334616.0	410024.5
H6-CPT1	309.2	5334425.0	409774.7
H6-CPT2	309.0	5334452.9	409803.7
H6-CPT3	308.7	5334505.8	409859.9
H6-CPT4	307.8	5334535.5	409899.8
H6-CPT5	306.7	5334591.1	409982.2
H6-CPT6	305.2	5334648.3	410065.5
H6-CPT7	305.1	5334662.5	410090.2
H7-1	305.2	5334644.7	410065.5
H7-3	305.1	5334661.4	410090.4
H7-5	305.2	5334689.2	410131.9
H7-7	305.4	5334703.2	410152.6
H7-9	306.0	5334717.1	410173.4
H7-11	306.6	5334730.5	410193.3
H7-13	307.5	5334739.4	410206.6
H7-15	307.5	5334756.1	410231.5

NOTES

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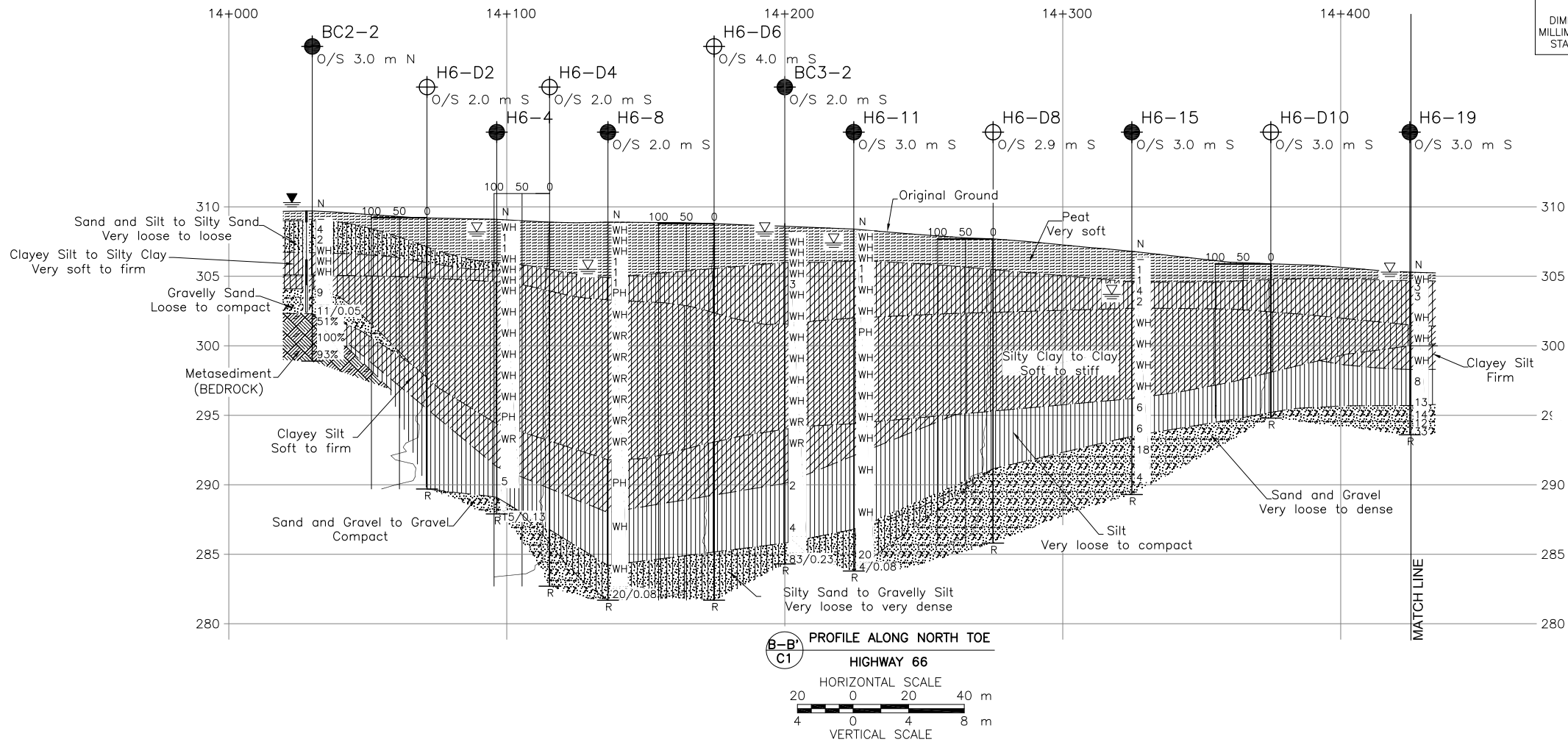
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.



REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.

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METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

HIGHWAY 66
HWY 66 - STA 14+020 TO 14+650
SOIL STRATA

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA

LEGEND

- Borehole
- Dynamic Cone Penetration Test
- Seal
- Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- 100% Rock Quality Designation (RQD)
- R Refusal
- WL upon completion of drilling
- WL in piezometer, measured on Nov. 15, 2012

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
BC2-2	309.7	5334390.7	409727.1
BC3-2	308.8	5334515.4	409849.5
BC4-2	304.8	5334469.8	410109.4
H6-4	309.1	5334443.0	409771.6
H6-8	308.9	5334471.7	409801.1
H6-11	308.4	5334530.3	409870.3
H6-15	306.8	5334587.4	409953.3
H6-19	305.3	5334643.2	410036.3
H6-D2	309.2	5334422.0	409756.7
H6-D4	308.9	5334456.2	409786.2
H6-D6	308.8	5334497.1	409831.0
H6-D8	307.7	5334559.6	409911.8
H6-D10	305.9	5334615.3	409994.8
H7-2	305.1	5334667.1	410068.4
H7-6	305.0	5334710.3	410132.8
H7-10	305.5	5334734.9	410176.5
H7-14	306.9	5334760.2	410210.7
H7-D2	304.9	5334683.0	410093.9
H7-D3	304.4	5334697.8	410114.1
H7-D5	304.5	5334719.8	410156.6
H7-D7	306.4	5334749.1	410194.1

NOTES

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REFERENCE

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NO.	DATE	BY	REVISION
1			
Geocres No. 32D-17			
HWY. 66		PROJECT No. 10-1191-0044	DIST.
SUBM'D. MT	CHKD.	DATE: DEC 2013	SITE:
DRAWN: JJJ	CHKD. SEMC	APPD. JMAC	DWG. C3

METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

HIGHWAY 66
HWY 66 - STA 14+020 TO 14+650
SOIL STRATA

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA

LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- R Refusal
- ▽ WL upon completion of drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
BC2-3	309.3	5334366.7	409761.6
BC3-3	308.6	5334490.5	409869.7
BC4-3	305.2	5334660.4	410121.2
H6-2	309.0	5334400.7	409783.2
H6-6	308.9	5334433.7	409810.4
H6-10	308.8	5334475.6	409850.4
H6-13	307.9	5334535.3	409927.7
H6-17	306.2	5334590.4	410011.6
H6-D1	309.6	5334379.1	409769.2
H6-D3	309.0	5334420.0	409798.0
H6-D5	308.9	5334448.8	409824.2
H6-D7	308.3	5334507.1	409887.7
H6-D9	307.0	5334562.4	409970.9
H6-D11	305.4	5334618.3	410053.1
H7-4	305.3	5334669.6	410133.1
H7-8	306.2	5334697.7	410171.4
H7-12	307.8	5334726.7	410209.2
H7-D1	305.5	5334639.7	410086.8
H7-D4	305.7	5334682.9	410151.2
H7-D6	307.0	5334711.6	410192.1
H7-D8	307.8	5334737.8	410225.8

NOTES

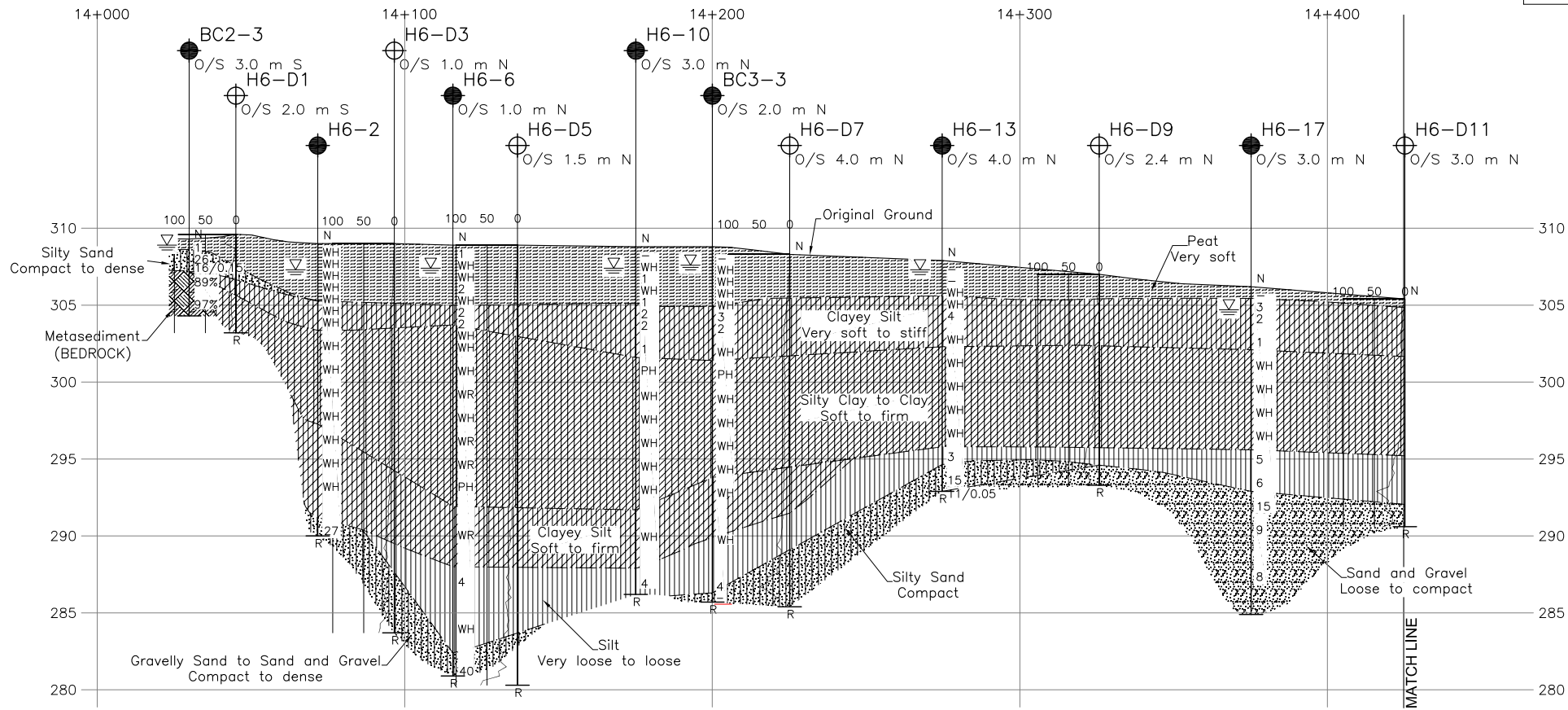
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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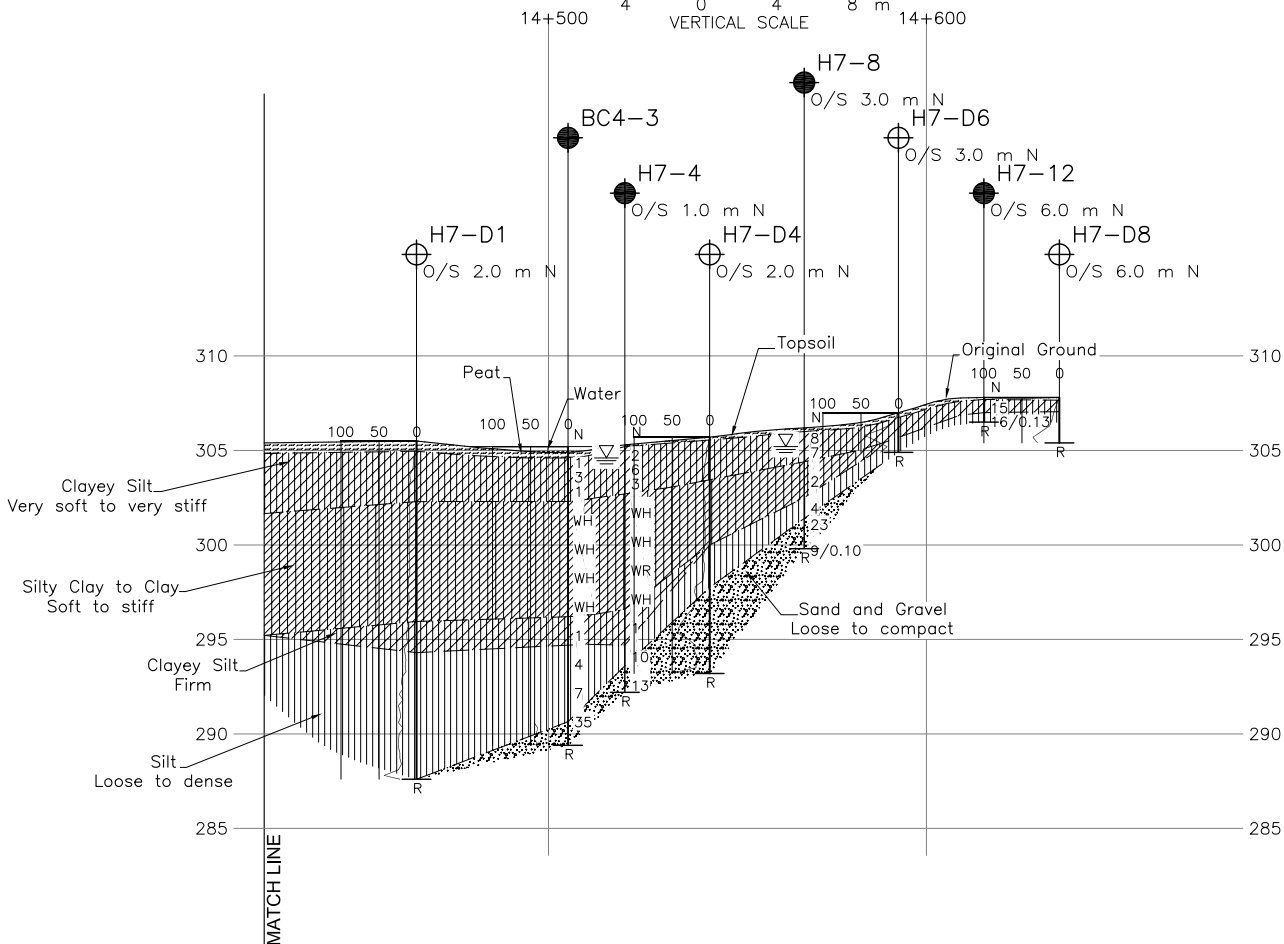
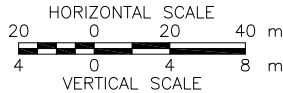
REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.



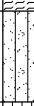




C-C' PROFILE ALONG SOUTH TOE

HIGHWAY 66




NO.	DATE	BY	REVISION
Geocres No. 32D-17			
HWY. 66		PROJECT NO. 10-1191-0044	
SUBM'D. MT		CHKD.	DIST.
DRAWN: JJJ		CHKD. SEMC	SITE:
		APPD. JMAC	DWG. C4

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H6-1			1 OF 2 METRIC														
G.W.P. 5091-07-00			LOCATION N 5334401.0; E 409760.6			ORIGINATED BY MT														
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT														
DATUM GEODETIC			DATE July 26, 2012			CHECKED BY SEMC														
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ kN/m³	GR SA SI CL			
							20 40 60 80 100	○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × REMOULDED	W _p W W _L	20 40 60									
309.2 0.0	GROUND SURFACE PEAT (Fibrous) Very soft Black Moist		1	SS	1		309													
			2	SS	1		308													
			3	SS	1		307													
306.8 2.4	Silty SAND, some clay Very loose Grey Moist to wet		4	SS	2		306													
305.9 3.3	CLAYEY SILT Very soft Grey Wet Silt seams encountered between 3.3 m and 4.6 m depth.		5a	SS	WH		306													
		5b	SS	WH		305														
		6	SS	WH		304														
						303														
303.5 5.7	SILTY CLAY to CLAY Soft to firm Grey Wet Silt seams encountered between 9.1 m and 13.3 m depth.		7	SS	WH		303													
							302													
			8	SS	WH		301													
							300													
			9	SS	WH		299													
							298													
						297														
295.9 13.3	CLAYEY SILT, trace sand Firm Grey Wet Silt seams encountered between 13.3 m and 16.0 m depth.		10	SS	WH		296													
			11	SS	WR		295													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H6-1				2 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334401.0; E 409760.6				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT									
DATUM GEODETIC				DATE July 26, 2012				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100					WATER CONTENT (%) 20 40 60					
293.2	SAND and SILT, some clay, trace to some gravel Compact Grey Wet		13	SS	200.0												
16.2																	
292.2	SAND and GRAVEL, trace clay Grey Wet		14	AS	-												
17.0	END OF BOREHOLE AUGER REFUSAL																
Note: 1. Water level at a depth of 0.9 m below ground surface (Elev. 308.3 m) upon completion of drilling.																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

1 OF 2 **METRIC**

ORIGINATED BY MT

COMPILED BY MT

CHECKED BY SEMC

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:


PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H6-3		1 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334422.4; E 409777.7</u>		ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>		COMPILED BY <u>MT</u>	
DATUM <u>GEODETIC</u>		DATE <u>July 30, 2012</u>		CHECKED BY <u>SEMC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × REMOULDED					
309.2	GROUND SURFACE							20 40 60 80 100	20 40 60					
0.0	PEAT (Fibrous) Very soft Black Moist to wet		1	SS	1									
			2	SS	1									
			3	SS	WH									
			4	SS	1									
			5	SS	WH									
305.4			6	SS	WH									
3.8	CLAYEY SILT Soft to firm Grey Wet		7	SS	WH									
	Silt and sand seams encountered between 3.8 m and 5.3 m depth.													
	Silt seams encountered between 5.3 and 6.9 m depth.													
			8	SS	WH									
302.3														
6.9	SILTY CLAY to CLAY Soft Grey Wet		9	TO	PH									
			10	SS	WH									
			11	SS	WH									
			12	SS	WH									
	Silt seams encountered between 12.2 m and 13.3 m depth.													
295.9														
13.3	CLAYEY SILT Soft to firm Grey Wet		13	SS	WH									
	Silt seams encountered between 13.3 m and 20.9 m depth.													
	Sand seam at 13.8 m depth.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H6-3		2 OF 2 METRIC													
G.W.P.		5091-07-00		LOCATION		N 5334422.4; E 409777.7													
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers													
DATUM		GEODETIC		DATE		July 30, 2012													
				ORIGINATED BY		MT													
				COMPILED BY		MT													
				CHECKED BY		SEMC													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa			WATER CONTENT (%)			γ					
	--- CONTINUED FROM PREVIOUS PAGE ---							20 40 60 80 100	○ UNCONFINED + FIELD VANE	W _p	W	W _L							
								20 40 60 80 100	● QUICK TRIAXIAL × REMOULDED	20 40 60			kN/m ³			GR SA SI CL			
288.3	CLAYEY SILT Soft to firm Grey Wet Silt seams encountered from 13.3 m and 20.9 m depth.		14	SS	WR		294	+											
							293												
							292	4 + 4 +											
							291												
				15	SS	WR		290											
288.3	Silty SAND, some gravel, trace to some clay Loose Grey Wet						289	5 + 5 +											
20.9			16	SS	6		288												
							287												
							286												
285.4	END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 0.7 m below ground surface (Elev. 308.5 m) upon completion of drilling.																		




SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H6-4			1 OF 2 METRIC															
G.W.P. 5091-07-00			LOCATION N 5334443.0; E 409771.6			ORIGINATED BY MT															
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT															
DATUM GEODETIC			DATE July 31, 2012			CHECKED BY SEMC															
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ			GR SA SI CL		
309.1	GROUND SURFACE							20 40 60 80 100	20 40 60 80 100	20 40 60	W _p W W _L										
0.0	PEAT (Fibrous) Very soft Black Wet		1	SS	WH		309														
			2	SS	1		308														
			3	SS	1		307														
			4	SS	WH		306														
306.0																					
3.1	Silty SAND, trace to some clay Very loose Grey Wet		5	SS	WH		306														
305.4																					
3.7	CLAYEY SILT Very soft Grey Wet		6	SS	WH		305														
304.6																					
4.5	Silt seams encountered between 3.7 m and 4.5 m depth. SILTY CLAY to CLAY Soft Grey Wet Root encountered at 4.8 m depth.		7	SS	WH		304														
							303														
			8	SS	WH		302														
							301														
			9	SS	WH		300														
							299														
			10	SS	WH		298														
							297														
			11	SS	WH		296														
							295														
			12	SS	WH																
			13	TO	PH																
294.4																					
14.7																					

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H6-4			2 OF 2 METRIC											
G.W.P. 5091-07-00			LOCATION N 5334443.0; E 409771.6			ORIGINATED BY MT											
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT											
DATUM GEODETIC			DATE July 31, 2012			CHECKED BY SEMC											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ kN/m³	GR SA SI CL
							20 40 60 80 100	○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × REMOULDED	W _p W W _L	20 40 60						
	--- CONTINUED FROM PREVIOUS PAGE ---																
291.3	CLAYEY SILT Soft to firm Grey Wet Silt seams encountered between 14.7 m and 17.8 m depth.		14	SS	WR		294										
								293									
							292		4								
17.8	SILT, trace to some clay Loose Grey Wet		15	SS	5		291										
								290									
289.1	GRAVEL, some sand, trace to some silt Compact Grey Wet						289										
20.0								288									
287.9	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 0.9 m below ground surface (Elev. 308.2 m) upon completion of drilling.		16	SS	15/0 13												
21.2																	

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H6-5		1 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334439.8; E 409792.8</u>		ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>		COMPILED BY <u>MT</u>	
DATUM <u>GEODETIC</u>		DATE <u>August 7 and 8, 2012</u>		CHECKED BY <u>SEMC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100	20 40 60 80 100					
309.0	GROUND SURFACE													
0.0	PEAT (Fibrous) Very soft Black Wet		1	SS	WH									
			2	SS	WH									
			3	SS	WH									
			4	SS	WH									
			5	SS	WH									
305.3	CLAYEY SILT, trace organics Firm Grey Wet Silt seams encountered between 3.7 m and 7.2 m depth.		6	SS	2									
3.7			7	SS	WH									
			8	SS	WH									
301.8	CLAY Soft Grey Wet		9	SS	WH									
7.2			10	SS	WR									
			11	SS	WH									
			12	SS	WH									
295.7	CLAYEY SILT Firm Grey Wet Silt seams encountered from 13.3 m to 20.9 m depth.		13	SS	WR									
13.3														

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H6-5				2 OF 2 METRIC							
G.W.P. 5091-07-00		LOCATION N 5334439.8; E 409792.8				ORIGINATED BY MT							
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT							
DATUM GEODETIC		DATE August 7 and 8, 2012				CHECKED BY SEMC							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	20 40 60					
288.1	CLAYEY SILT Firm Grey Wet		14	SS	WH		20 40 60 80 100 + 3	20 40 60 40					
						293							
						292	20 40 60 80 100 + 3 + 3						
						291							
			15	SS	WH	290							
						289	20 40 60 80 100 + 3 + 3						
288.1 20.9	SILT, trace to some clay, trace sand Very loose Grey Wet		16	SS	WH	288						NP	0 1 86 13
						287							
						286							
						285							
			17	SS	1	284							
						283							
282.8 26.2	Silty SAND, some gravel, trace clay Compact Grey to brown Wet		18	SS	10	282							
						281							
280.7 28.3	END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 2.7 m below ground surface (Elev. 306.3 m) upon completion of drilling.												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H6-6		1 OF 2 METRIC											
G.W.P.		5091-07-00		LOCATION		N 5334433.7; E 409810.4											
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers											
DATUM		GEODETIC		DATE		August 9 and 10, 2012											
				ORIGINATED BY		MT											
				COMPILED BY		MT											
				CHECKED BY		SEMC											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60	W _p W W _L	γ	GR SA SI CL					
308.9 0.0	GROUND SURFACE PEAT (Fibrous) Very soft Black Wet		1	SS	1		308										
			2	SS	WH		307										
			3	SS	WH		306										
			4	SS	2		305										
			5	SS	WH		304										
305.0 3.9	CLAYEY SILT, trace organics Very soft Grey Wet		6	SS	2		303										
	Silt seams encountered between 3.9 m and 5.2 m depth.		7	SS	2		302										
303.7 5.2	SILTY CLAY TO CLAY, trace sand Soft to firm Grey Wet		8	SS	WH		301										
	Sand seams encountered between 5.3 m and 6.2 m and at 7.5 m depth.		9	SS	WH		300										
			10	SS	WH		299										
			11	SS	WR		298										
			12	SS	WH		297										
			13	SS	WR		296										
			14	SS	WR		295										
							294										

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H6-6		2 OF 2 METRIC											
G.W.P.		5091-07-00		LOCATION		N 5334433.7; E 409810.4											
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers											
DATUM		GEODETIC		DATE		August 9 and 10, 2012											
				ORIGINATED BY		MT											
				COMPILED BY		MT											
				CHECKED BY		SEMC											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)	γ	GR SA SI CL				
--- CONTINUED FROM PREVIOUS PAGE ---																	
	SILTY CLAY TO CLAY, trace sand Soft to firm Grey Wet		15	TO	PH		293										
291.9	CLAYEY SILT Firm Grey Wet Silt seams encountered between 17.0 m and 20.9 m depth.						292										
17.0							291										
								290									
			16	SS	WR		289										
288.0	SILT, trace to some clay, trace sand Very loose Grey Wet						288										
20.9							287										
							286										
							285										
			17	SS	4		284										
			18	SS	WH		283										
282.4	SAND and GRAVEL, some silt, trace clay Dense Grey to brown Wet						282										
26.5							281										
280.9	END OF BOREHOLE AUGER REFUSAL		19	SS	40												
28.0	Note: 1. Water level at a depth of 1.5 m below ground surface (Elev. 307.4 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H6-7		3 OF 3 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334450.4; E 409802.7</u>		ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>		COMPILED BY <u>MT</u>	
DATUM <u>GEODETIC</u>		DATE <u>August 12 and 13, 2012</u>		CHECKED BY <u>SEMC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L		GR	SA	SI	CL	
								○ UNCONFINED	+	FIELD VANE	● QUICK TRIAXIAL	×	REMOULDED	WATER CONTENT (%)							
	END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 1.6 m below ground surface (Elev. 307.4 m) upon completion of drilling.																				

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H6-7A				1 OF 1 METRIC							
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334452.0; E 409801.0</u>				ORIGINATED BY <u>MT</u>							
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>							
DATUM <u>GEODETIC</u>		DATE <u>August 23, 2012</u>				CHECKED BY <u>SEMC</u>							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
309.1	GROUND SURFACE						20 40 60 80 100						
0.0	For stratigraphy see Record of Borehole H6-7.						20 40 60 80 100						
303.0													
6.1	CLAYEY SILT		1	TO	PH							16.9	
301.9	Faint irregular layering noted throughout Shelby tube sample.												
7.2	CLAY		2	TO	PH								
	Pockets of organics noted in Shelby tube samples 2 and 4.												
			3	TO	PH								
			4	TO	PH								
			5	TO	PH								
296.5	END OF BOREHOLE												
12.6	Note: 1. Water level at a depth of 1.2 m below ground surface (Elev. 307.9 m) upon completion of drilling.												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

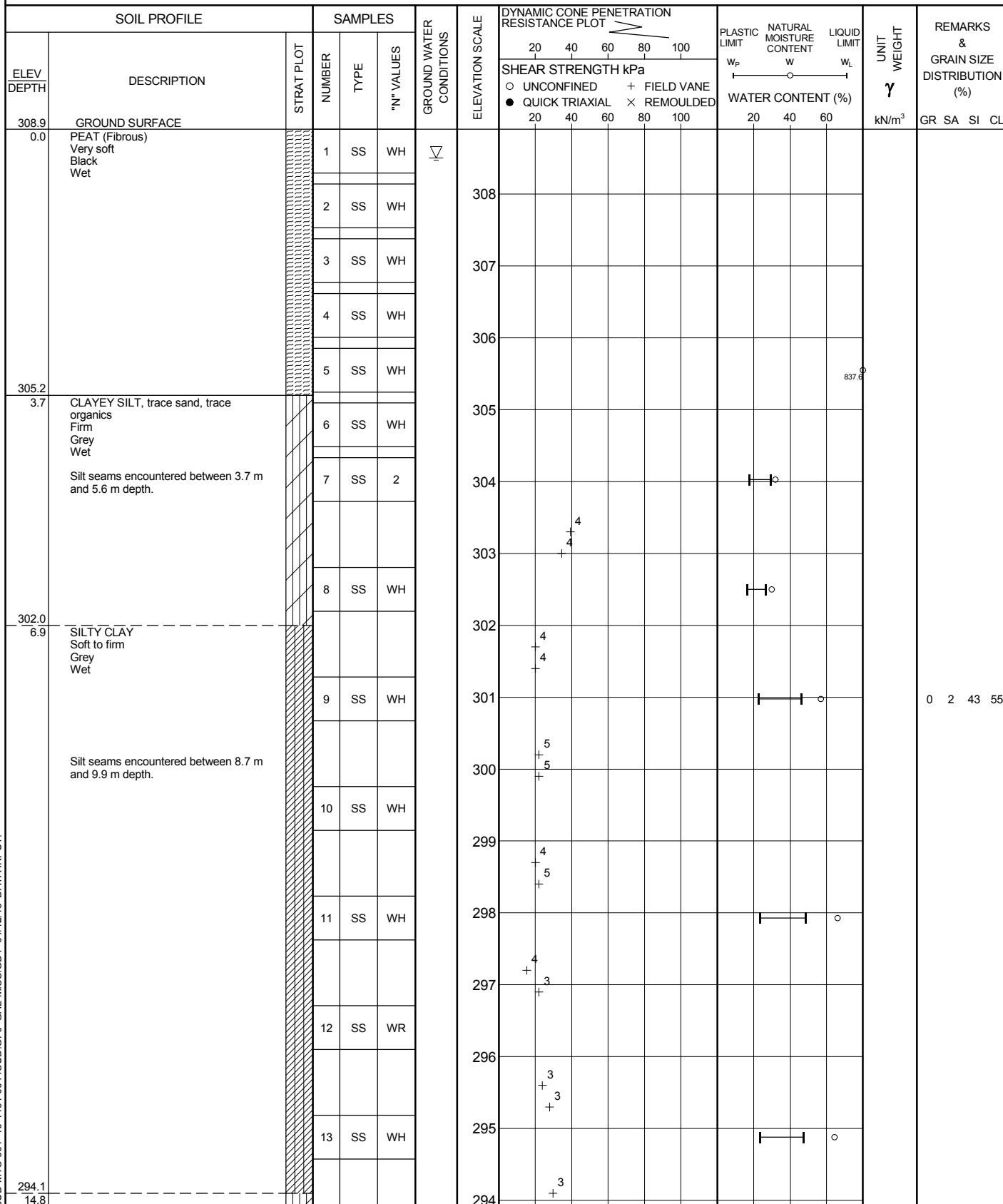
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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H6-8		2 OF 2 METRIC													
G.W.P.		5091-07-00		LOCATION		N 5334471.7; E 409801.1													
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers													
DATUM		GEODETIC		DATE		August 13 and 14, 2012													
				ORIGINATED BY		MT													
				COMPILED BY		MT													
				CHECKED BY		SEMC													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa			WATER CONTENT (%)			γ					
	--- CONTINUED FROM PREVIOUS PAGE ---							20 40 60 80 100	○ UNCONFINED + FIELD VANE	W _p	W	W _L							
								20 40 60 80 100	● QUICK TRIAXIAL × REMOULDED										
291.8	SILTY CLAY to CLAY Soft to firm Grey Wet Silt seams encountered between 15.2 m and 17.1 m depth.		14	SS	WR		293												
291.8							292												
17.1	CLAYEY SILT Firm Grey Wet						291												
			15	TO	PH		290												
							289												
288.0							288												
20.9	SILT Very loose Grey Wet		16	SS	WH		287												
							286												
							285												
284.2			17a	SS	WH		284												
24.7	Silty SAND, trace to some clay Very loose Grey Wet		17b	SS	WH		283												
							282												
281.8																			
27.2	SAND and GRAVEL Compact Grey to brown Wet END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 3.4 m below ground surface (Elev. 305.5 m) upon completion of drilling.		18	SS	20/0.08														

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H6-9		1 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334468.8; E 409823.1</u>		ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>		COMPILED BY <u>MT</u>	
DATUM <u>GEODETIC</u>		DATE <u>September 23 and 24, 2012</u>		CHECKED BY <u>SEMC</u>	



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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H6-9			2 OF 2 METRIC															
G.W.P. 5091-07-00			LOCATION N 5334468.8; E 409823.1			ORIGINATED BY MT															
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT															
DATUM GEODETIC			DATE September 23 and 24, 2012			CHECKED BY SEMC															
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ			GR SA SI CL		
	--- CONTINUED FROM PREVIOUS PAGE ---							20 40 60 80 100	20 40 60 80 100	W _p W W _L	20 40 60	γ									
	CLAYEY SILT Firm Grey Wet Silt seams between 14.8 m and 20.9 m depth.		14	SS	WH		293	+													
							292	3 + 3 +													
							291														
			15	SS	WH		290														
							289	3 + 2 +													
288.0							288														
20.9	SILT, some clay, trace sand Very loose Grey Wet		16	SS	WH		287														
							286														
							285														
			17	SS	2		284														
							283														
281.9							282														
27.0	Sandy SILT, trace to some gravel Compact Grey Wet		18	SS	12		281														
280.4																					
28.5	END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 0.4 m below ground surface (Elev. 308.5 m) upon completion of drilling.																				


SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H6-10				2 OF 2 METRIC						
G.W.P. 5091-07-00		LOCATION N 5334475.6; E 409850.4				ORIGINATED BY MT						
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT						
DATUM GEODETIC		DATE September 25, 2012				CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	W _p W W _L			
--- CONTINUED FROM PREVIOUS PAGE ---												
291.7 17.1	SILTY CLAY to CLAY Soft to firm Grey Wet		14	SS	WH			293				
	CLAYEY SILT Soft to firm Grey Wet Silt seams encountered between 17.1 m and 20.9 m depth.		15	SS	WH			292				
								291				
								290				
								289				
								288				
287.9 20.9	SILT, trace to some clay Loose Grey Wet Wood fibre in tip of spoon. Spoon attempted at 22.6 m depth, bouncing.		16	SS	4			287				
286.2 22.6	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 1.4 m below ground surface (Elev. 307.4 m) upon completion of drilling.											

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT		10-1191-0044	
G.W.P.		5091-07-00	
DIST		HWY 66	
DATUM		GEODETIC	
		LOCATION	
		N 5334530.3; E 409870.3	
		BOREHOLE TYPE	
		108 mm I.D. Continuous Flight Hollow Stem Augers	
		DATE	
		October 16, 2012	
		ORIGINATED BY	
		MT	
		COMPILED BY	
		MT	
		CHECKED BY	
		SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						WATER CONTENT (%)
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED						
308.4	GROUND SURFACE													
0.0	PEAT (Fibrous) Very soft Black Wet		1	SS	WH		308							
			2	SS	WH		307							
			3	SS	WH		306							
306.1	CLAYEY SILT, trace sand, trace gravel Firm Grey Wet		4	SS	1		305							
2.3	Trace organics above 3.6 m depth. Silt seams encountered between 3.7 m and 4.9 m depth.		5	SS	1		304							
			6	SS	WH		303							
			7	SS	WH		302							
302.0	SILTY CLAY to CLAY Soft to firm Grey Wet		8	TO	PH		301							
6.4			9	SS	WH		300							
			10	SS	WH		299							
			11	SS	WH		298							
			12	SS	WH		297							
			13	SS	WH		296							
294.4	CLAYEY SILT Firm Grey Wet						295							
14.0							294							

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H6-11				2 OF 2 METRIC									
G.W.P. 5091-07-00		LOCATION N 5334530.3; E 409870.3				ORIGINATED BY MT											
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT											
DATUM GEODETIC		DATE October 16, 2012				CHECKED BY SEMC											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100					
292.1	CLAYEY SILT Firm Grey Wet Silt seams encountered between 14.0 m and 16.3 m.						293		3								
16.3	SILT, trace clay, some sand Very loose Grey Wet		14	SS	WH		292										
							291										
							290										
							289										
			15	SS	WH		288										
							287										
286.8	Gravelly SILT, trace to some sand, trace to some clay Compact Grey Wet						286										
21.6			16	SS	20		285										27 10 51 12
							284										
283.8	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)		17	SS	4/0.08												
24.6	Note: 1. Water level at a depth of 1.0 m below ground surface (Elev. 307.4 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H6-12		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334532.7; E 409899.2		ORIGINATED BY MT	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY MT	
DATUM GEODETIC		DATE October 17 and 18, 2012		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p	W	W _L		
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × REMOULDED					
308.3	GROUND SURFACE													
0.0	PEAT (Fibrous) Very soft Black Wet		1	SS	WH									
			2	AS	-									
			3	SS	WH									
306.0														
2.3	SILTY CLAY, trace sand, trace organics Soft to firm Grey Wet		4	SS	WH									
			5	SS	WH									
	Silt seams encountered between 4.1 m and 5.6 m depth.													
			6	SS	WH									
302.7														
5.6	SILTY CLAY to CLAY Soft to firm Grey Wet		7	SS	WH									
			8	SS	WH									
	Root encountered at 9.5 m depth.		9	TO	PH									
			10	SS	WH									
	Silt seams encountered between 12.2 m and 15.2 m depth.		11	SS	WH									
			12	SS	WH									

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H6-12				2 OF 2 METRIC						
G.W.P. 5091-07-00				LOCATION N 5334532.7; E 409899.2				ORIGINATED BY MT						
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT						
DATUM GEODETIC				DATE October 17 and 18, 2012				CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
	--- CONTINUED FROM PREVIOUS PAGE ---							<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>	<div style="display: flex; justify-content: space-between;"> W_p W W_L </div>					
293.1														
15.2	SILT, some clay Very loose to loose Grey Wet		13	SS	WH		293						NP	0 0 84 16
							292							
							291							
							290							
			14	SS	9		289							
							288							
288.2							287							
20.1	SAND and GRAVEL, some silt, trace clay Dense Grey Wet						286							
							285							
			15	SS	47		284							
286.4	END OF BOREHOLE START OF DCPT													
21.9														
283.1														
25.2	END OF DCPT REFUSAL TO FURTHER PENETRATION 28 BLOWS / 0.24 M (HAMMER BOUNCING) Note: 1. Water level at a depth of 1.6 m below ground surface (Elev. 306.7 m) upon completion of drilling.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H6-13		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334535.3; E 409927.7		ORIGINATED BY MT	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY MT	
DATUM GEODETIC		DATE October 18 and 19, 2012		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa							WATER CONTENT (%)		
307.9	GROUND SURFACE						20 40 60 80 100		W _p	W	W _L					
0.0	PEAT (Fibrous) Very soft Black Wet		1	AS	-											
			2	AS	-											
			3	SS	WH											
305.6																
2.3	CLAYEY SILT, trace organics Firm Grey Wet		4	SS	WH											
	Trace organics above 4.1 m depth.		5	SS	4											
	Silt seams encountered between 4.1 m and 5.6 m depth.															
			6	SS	WH											
302.3																
5.6	CLAY Soft to firm Grey Wet		7	SS	WH											
			8	SS	WH											
	Silt seams encountered between 8.7 m and 12.1 m depth.															
			9	SS	WH											
295.8																
12.1	SILT Very loose Grey Wet		11	SS	3											
294.6																
13.3	Silty SAND, trace to some gravel, trace clay Compact Grey Wet		12	SS	15											
292.9			13	SS	11/0.05											

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H6-13				2 OF 2 METRIC										
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334535.3; E 409927.7</u>				ORIGINATED BY <u>MT</u>										
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>										
DATUM <u>GEODETIC</u>		DATE <u>October 18 and 19, 2012</u>				CHECKED BY <u>SEMC</u>										
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)			
	--- CONTINUED FROM PREVIOUS PAGE ---															
15.0	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 0.6 m below ground surface (Elev. 307.3 m) upon completion of drilling.															

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H6-14			1 OF 2 METRIC																
G.W.P. 5091-07-00			LOCATION N 5334561.1; E 409940.9			ORIGINATED BY MT																
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT																
DATUM GEODETIC			DATE October 19 and 22 and November 3, 2012			CHECKED BY SEMC																
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)							
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ						
								20 40 60 80 100	20 40 60 80 100	20 40 60	W _p W W _L	20 40 60	20 40 60	20 40 60	20 40 60	20 40 60	20 40 60	20 40 60	20 40 60	20 40 60	20 40 60	
307.4	GROUND SURFACE																					
0.0	PEAT (Fibrous) Very soft Black Wet		1	AS	-		307															
			2	AS	-																	
305.6							306															
1.8	CLAYEY SILT, trace sand Stiff Grey Wet Trace organics above 3.8 m depth.		3	SS	1																	
			4	SS	WH		305															
	Silt seams encountered between 3.8 m and 4.9 m depth.																					
			5	SS	WH		304															
302.5							303															
4.9	SILTY CLAY to CLAY Soft to firm Grey Wet		6	SS	WH		302															
			7	TO	PH		301															
	Silt seams encountered at 7.5 m depth.						300															
			8	SS	WH		299															
	Silt seams encountered between 9.9 m and 11.3 m depth.		9	SS	WH		298															
296.1							297															
11.3	Sandy SILT, some gravel, trace to some clay Loose to dense Grey Wet No recovery in Sample 10.		10	SS	4		296															
			11	SS	8		295															
			12	SS	36		294															
							293															

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>				RECORD OF BOREHOLE No H6-14				2 OF 2 METRIC									
G.W.P. <u>5091-07-00</u>				LOCATION <u>N 5334561.1; E 409940.9</u>				ORIGINATED BY <u>MT</u>									
DIST <u> </u> HWY <u>66</u>				BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>									
DATUM <u>GEODETIC</u>				DATE <u>October 19 and 22 and November 3, 2012</u>				CHECKED BY <u>SEMC</u>									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100	W _p	W	W _L		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					20 40 60				
291.6			13	SS	25		292						○				
15.8	END OF BOREHOLE Note: 1. Water level at a depth of 5.2 m below ground surface (Elev. 302.2 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

[illegible]

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H6-16		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334588.9; E 409982.4		ORIGINATED BY MT	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY MT	
DATUM GEODETIC		DATE November 4 and 5, 2012		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								20	40	60	80	100			W _p	W	W _L
306.7	GROUND SURFACE																
0.0	PEAT (Fibrous) Very soft Black Wet		1	AS	-												
			2	SS	WH												
305.0																	
1.7	CLAYEY SILT, trace organics Stiff Grey Wet		3	SS	WH												
	Silt seams encountered between 3.0 m and 3.9 m depth.																
			4	SS	WH												
302.8																	
3.9	CLAY Soft to firm Grey Wet																
			5	SS	WH												
			6	SS	WH												
			7	SS	WH												
298.0																	
8.7	CLAYEY SILT Firm to stiff Grey Wet																
	Silt seams encountered between 9.1 m and 10.6 m depth.		8	SS	WH												
296.1																	
10.6	SILT, trace to some clay Loose Grey Wet		9	SS	5												
295.0																	
11.7	Silty SAND and GRAVEL, trace clay Compact to dense Grey Wet		10	SS	16												
			11	SS	33/0.15												
	Spoon bouncing at 13.9 m depth.																
292.3																	
14.4																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H6-16		2 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334588.9; E 409982.4</u>		ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>		COMPILED BY <u>MT</u>	
DATUM <u>GEODETIC</u>		DATE <u>November 4 and 5, 2012</u>		CHECKED BY <u>SEMC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL	
								20	40	60	80	100	20	40	60						
	END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 1.2 m below ground surface (Elev. 305.5 m) upon the completion of drilling.																				

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>			RECORD OF BOREHOLE No H6-17			2 OF 2 METRIC									
G.W.P. <u>5091-07-00</u>			LOCATION <u>N 5334590.4; E 410011.6</u>			ORIGINATED BY <u>MT</u>									
DIST <u> </u> HWY <u>66</u>			BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>			COMPILED BY <u>MT</u>									
DATUM <u>GEODETIC</u>			DATE <u>November 5 and 6, 2012</u>			CHECKED BY <u>SEMC</u>									
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT									
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
								20	40	60	80	100	W _p		
	--- CONTINUED FROM PREVIOUS PAGE ---														
	SAND and GRAVEL, trace to some silt, trace clay Loose to compact Grey Wet		12	SS	9		291								
							290								
							289								
							288								
			13	SS	8										
							287								
							286								
284.9	Approximately 2.4 m of heave inside augers at 21.3 m depth.						285								
21.3	END OF BOREHOLE Note: 1. Water level at a depth of 1.5 m below ground surface (Elev. 304.7 m) upon completion of drilling.														

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H6-18		1 OF 1 METRIC							
G.W.P.		5091-07-00		LOCATION		N 5334616.0; E 410024.5							
DIST		HWY 66		BOREHOLE TYPE		Portable Equipment, NW Casing, Wash Boring							
DATUM		GEODETIC		DATE		November 6, 2012							
				ORIGINATED BY		GM							
				COMPILED BY		MT							
				CHECKED BY		SEMC							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p W W _L			
305.7	GROUND SURFACE												
0.0	PEAT (Fibrous) Very soft Black Wet		1	SS	WH								
305.2													
0.5	CLAYEY SILT Very soft to firm Grey Wet		2	SS	7								
	Silt seams encountered between 2.0 m and 2.7 m depth.		3	SS	5								
			4	SS	1								
303.0													
2.7	CLAY Soft to firm Grey Wet		5	SS	WH								
			6	SS	WH								
			7	TO	PH								
298.8													
6.9	CLAYEY SILT Firm Grey Wet		8	SS	WH								
	Silt seams encountered between 6.9 m and 8.5 m depth.												
297.2													
8.5	SILT, some clay Loose to compact Grey Wet		9	SS	9								
			10	SS	13								
294.4													
11.3	END OF BOREHOLE SPOON REFUSAL AND REFUSAL TO FURTHER CASING PENETRATION (HAMMER BOUNCING)		11	SS	10/0.05								
	Note: 1. Water level at ground surface upon completion of drilling.												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No H6-19

1 OF 1 **METRIC**

PROJECT 10-1191-0044

G.W.P. 5091-07-00

LOCATION N 5334643.2; E 410036.3

ORIGINATED BY GM

DIST HWY 66

BOREHOLE TYPE Portable Equipment, NW Casing, Wash Boring

COMPILED BY MT

DATUM GEODETIC

DATE November 4 and 5, 2012

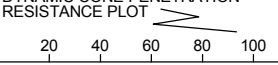


CHECKED BY SEMC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L		
305.3	GROUND SURFACE							20	40	60	80	100					
0.0	PEAT (Fibrous) Very soft Black Wet		1	SS	WH		305										
304.7																	
0.6	CLAYEY SILT, silt seams Firm Grey Wet		2	SS	3												
			3	SS	3		304										
			4	SS	WH		303										
301.5							302										
3.8	CLAY Firm Grey Wet		5	SS	WH		301										
300.0							300										
5.3	CLAYEY SILT, silt seams Firm Grey Wet		6	SS	WH		299										
298.3							298										
7.0	SILT, some clay Loose to compact Grey Wet		7	SS	8		297										
			8	SS	13		296										
295.7							295										
9.6	SAND and GRAVEL Compact to dense Grey Wet		9	SS	14		294										
			10	SS	12												
			11	SS	33												
293.6	Spoon attempted at 11.7 m depth, bouncing.																
11.7	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Note: 1. Water level at ground surface upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H6-S1				2 OF 2 METRIC					
G.W.P. 5091-07-00			LOCATION N 5334425.9; E 409776.7				ORIGINATED BY BM					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing and Wash Boring				COMPILED BY AC					
DATUM GEODETIC			DATE May 1, 2013				CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES							
293.6 15.6	CLAYEY SILT Soft to stiff Grey Wet					294	2				18.8	
						293	3					
			6	TO	PH	292	4					
						291	2					
			7	SS	1	290						
288.5 20.7	Silty SAND, trace clay Loose Grey Wet					289	2					
287.3 21.9			8	SS	7	288						
END OF BOREHOLE Note: 1. Water level at ground surface upon completion of drilling.												

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H6-S2				2 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334514.6; E 409850.1				ORIGINATED BY BM									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY AC									
DATUM GEODETIC				DATE May 2, 2013				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100			
--- CONTINUED FROM PREVIOUS PAGE ---																	
	SILTY CLAY Soft to firm Grey Wet						293										
							292										
							291										
			5	TO	PM		290										
289.3	CLAYEY SILT, trace sand Firm Grey Wet						289										
19.4			2	SS	WH		288										
							287										
286.3	SILT, trace clay, trace sand Grey Wet						286										
22.4			3	SS													
285.2	END OF BOREHOLE																
23.5	Note: 1. Water level at ground surface upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H6-S3		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334520.6; E 409877.5		ORIGINATED BY BM	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing and Wash Boring		COMPILED BY AC	
DATUM GEODETIC		DATE May 3, 2013		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								20	40	60	80	100			20	40	60
308.3	GROUND SURFACE																
0.0	Hollow stem augers advanced from ground surface to 2.7 m depth without sampling.																
305.6																	
2.7	CLAYEY SILT, trace sand Soft Grey Wet		1	SS	3												
304.5																	
3.8	SILTY CLAY Soft to firm Grey Wet		2	TO	PM												
			3	TO	PM												

No recovery in Shelby tube Sample 4.

No recovery in Shelby tube Sample 5.

Continued Next Page

+ 3, x 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H6-S3				2 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334520.6; E 409877.5				ORIGINATED BY BM									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing and Wash Boring				COMPILED BY AC									
DATUM GEODETIC				DATE May 3, 2013				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100					
290.6	SILTY CLAY Soft to firm Grey Wet		5	TO	PH		293										
								292									
								291									
289.7	SILT, trace clay, trace sand Compact Grey Wet		6	SS	10		290										
18.6	END OF BOREHOLE Note: 1. Water level at ground surface upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H6-S4				1 OF 1 METRIC							
G.W.P. 5091-07-00		LOCATION N 5334592.2; E 409983.8				ORIGINATED BY BM							
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY AC							
DATUM GEODETIC		DATE May 3, 2013				CHECKED BY SEMC							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
306.7	GROUND SURFACE												
0.0	Hollow stem augers advanced from ground surface to 2.7 m depth without sampling.												
304.0	CLAYEY SILT Firm to stiff Grey Wet		1	TO	PH							19.5	
302.4	SILT CLAY Firm Grey Wet		2	TO	PM								
298.2	CLAYEY SILT Firm to stiff Grey Wet		3	TO	PM								
296.8	SILT, trace to some clay, trace to some sand Loose to compact Grey Wet		4	SS	6								
294.2	END OF BOREHOLE		5	SS	11								
12.5	Note: 1. Water level at ground surface upon completion of drilling.												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H7-1		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334644.7; E 410065.5		ORIGINATED BY MT	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY MT	
DATUM GEODETIC		DATE August 27, 2012		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED									
305.2	GROUND SURFACE						20 40 60 80 100									GR SA SI CL	
0.9	TOPSOIL		1	SS	4	▽										0 0 60 40	
	CLAYEY SILT, trace to some sand, trace organics, layered Soft to firm Grey to brown Moist		2	SS	4												
	Silt seams encountered between 1.5 m and 2.6 m depth.		3	SS	2												
302.6																	
2.6	CLAY Soft to firm Grey Wet		4	SS	WH												
	Silt seams encountered between 2.6 m and 10.2 m depth.																
			5	SS	WH												
			6	SS	WH												
			7	TO	PH												
			8	SS	WH												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



+³, ×³: Numbers refer to Sensitivity ○³% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H7-2			1 OF 1 METRIC															
G.W.P. 5091-07-00			LOCATION N 5334667.1; E 410068.4			ORIGINATED BY GM															
DIST _____ HWY 66			BOREHOLE TYPE Portable Equipment, NW Casing, Wash Boring			COMPILED BY MT															
DATUM GEODETIC			DATE November 13, 2012			CHECKED BY SEMC															
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ			GR SA SI CL		
305.1	WATER SURFACE							20 40 60 80 100	20 40 60 80 100	20 40 60											
0.0	WATER																				
0.2	CLAYEY SILT, trace organics Soft Brown Wet		1	SS	3																
			2	SS	4																
	Silt seams encountered between 1.4 m and 2.6 m depth.		3	SS	1																
302.3																					
2.8	CLAY Soft to firm Grey Wet		4	SS	WH																
			5	TO	PH																
	Silt seams encountered between 5.6 m and 8.7 m depth.		6	SS	WH																
296.2			7	SS	1																
8.9	CLAYEY SILT Soft Grey Wet		8	SS	4																
294.7			9	SS	7																
10.4	SILT Loose Grey Wet																				
293.2			10	SS	28																
11.9	SAND and GRAVEL, some silt, tace clay Compact to very dense Grey Wet		11	SS	50/0.08																
292.0																					
13.1	END OF BOREHOLE SPOON REFUSAL AND REFUSAL TO FURTHER CASING PENETRATION (HAMMER BOUNCING)																				

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H7-3			1 OF 2 METRIC								
G.W.P. 5091-07-00			LOCATION N 5334661.4; E 410090.4			ORIGINATED BY MT								
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT								
DATUM GEODETIC			DATE August 26, 2012			CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
305.1	GROUND SURFACE							20 40 60 80 100	20 40 60					
0.9	TOPSOIL		1	SS	2									
	CLAYEY SILT, trace to some sand Very soft to soft Brown Moist		2	SS	4									
	Trace organics above 0.6 m depth.		3	SS	2									
	Silt seams encountered between 0.6 m and 2.6 m depth.													
302.5														
2.6	CLAY Firm Grey Wet		4	SS	WH									
			5	TO	PH									
	Silt seams encountered between 4.6 m and 5.6 m depth.		6	SS	WH									
			7	SS	WH									
	Silt seams encountered between 7.6 m and 8.7 m depth.		8	SS	WH									
296.4														
8.7	CLAYEY SILT Firm Grey Wet		9	SS	WH									
	Silt seams encountered between 8.7 m to 12.4 m depth.													
			10	SS	WH									
292.7														
12.4	SILT, trace to some clay Loose to compact Grey Wet		11	SS	5									
			12	SS	10									
290.3														
14.8														

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H7-4		1 OF 1 METRIC								
G.W.P.		5091-07-00		LOCATION		N 5334669.6; E 410133.1								
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers								
DATUM		GEODETIC		DATE		August 25, 2012								
				ORIGINATED BY		MT								
				COMPILED BY		MT								
				CHECKED BY		SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
305.3	GROUND SURFACE							20 40 60 80 100	20 40 60					
0.0	TOPSOIL		1	SS	2	▽	305							
	CLAYEY SILT to SILTY CLAY, trace organics, layered Firm Brown Moist		2	SS	6		304							
			3	SS	3		303							
302.7							302							
2.6	CLAY Firm Grey Wet		4	SS	WH		301							
			5	SS	WH		300							
	Silt seams encountered between 6.1 m and 8.5 m depth.		6	SS	WR		299							
			7	SS	WH		298							
							297							
296.6							296							
8.7	CLAYEY SILT Firm Grey Wet		8	SS	1	295								
	Silt seams encountered between 8.7 m to 10.6 m depth.					294								
294.7						293								
10.6	SILT, trace to some clay Loose Grey Wet		9	SS	10									
293.6														
11.7	SAND and GRAVEL, trace to some silt Compact Grey Wet		10	SS	13									
292.2														
13.1	END OF BOREHOLE AUGER REFUSAL													
	Note: 1. Water level at a depth of 0.7 m below ground surface (Elev. 304.6 m) upon completion of drilling.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H7-6		1 OF 1 METRIC											
G.W.P.		5091-07-00		LOCATION		N 5334710.3; E 410132.8											
DIST		HWY 66		BOREHOLE TYPE		Portable Equipment, NW Casing, Wash Boring											
DATUM		GEODETIC		DATE		November 3, 2012											
						ORIGINATED BY GM											
						COMPILED BY MT											
						CHECKED BY SEMC											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60	Wp W WL	γ	GR SA SI CL				
305.0	0.0	WATER SURFACE															
304.4	0.6	PEAT (Fibrous)		1	SS	WH		304									
303.7	1.3	CLAYEY SILT to SILTY CLAY		2	SS	2		303									
301.8	3.2	SILTY CLAY to CLAY		3	SS	3		302									
		Silt seams encountered between 4.1 m and 9.3 m depth.		4	SS	WH		301									
				5	SS	WH		300									
				6	SS	1		299									
				7	SS	WH		298									
				8	SS	7		297									
295.8	9.2	CLAYEY SILT		9	SS	10		296									
294.3	10.7	SILT		10	SS	40		295									
292.7	12.3	SAND and GRAVEL, trace to some silt, trace clay						294									
291.5	13.5	Spoon attempted at 13.5 m depth, bouncing.						293									
		END OF BOREHOLE SPOON REFUSAL AND REFUSAL TO FURTHER CASING PENETRATION (HAMMER BOUNCING)						292									

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H7-7				1 OF 1 METRIC						
G.W.P.		5091-07-00		LOCATION		N 5334703.2; E 410152.6		ORIGINATED BY MT						
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY MT						
DATUM		GEODETIC		DATE		August 24 and 25, 2012		CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
305.4	GROUND SURFACE							20 40 60 80 100	20 40 60					
0.0	CLAYEY SILT, trace to some organics, trace sand, layered Very soft to soft Black to brown Moist		1	SS	1	▽	305							OC=8.1%
			2	SS	3		304							
			3	SS	2									
302.8							303							
2.6	CLAY Firm Grey Moist to wet		4	SS	WH		302							
	Silt seams encountered between 4.1 m and 7.2 m depth.						301							
			5	SS	WH		300							
			6	SS	WH		299							
298.2														
7.2	CLAYEY SILT, silt seams Firm Grey Wet		7a	SS	2	298								
297.4			7b			297								
8.0	SILT, trace to some clay Very loose Grey Wet													
296.6			8	SS	17	296								
8.8	SAND and GRAVEL, trace to some silt Compact Grey Wet													
295.0	END OF BOREHOLE AUGER REFUSAL					295								
10.4	Note: 1. Water level at a depth of 0.7 m below ground surface (Elev. 304.7 m) upon completion of drilling.													


SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H7-8				1 OF 1 METRIC							
G.W.P. 5091-07-00		LOCATION N 5334697.7; E 410171.4				ORIGINATED BY MT							
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT							
DATUM GEODETIC		DATE August 24, 2012				CHECKED BY SEMC							
SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
306.2	GROUND SURFACE						20 40 60 80 100		20 40 60				
0.0	TOPSOIL		1a	SS	8								
0.2	CLAYEY SILT, layered Stiff Brown Moist		1b										
			2	SS	7								
304.4													
1.8	SILTY CLAY Soft to stiff Grey Wet												
			3	SS	2								
302.5													
	SILT, trace to some clay, trace sand Loose Grey Wet		4	SS	4								
3.7													
			5a										
301.4			5b	SS	23								
4.8	SAND and GRAVEL, some silt, trace clay Loose to compact Grey Wet												
299.8			6	SS	9/0.10								
6.4	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 1.0 m below ground surface (Elev. 305.2 m) upon completion of drilling.												

PROJECT		10-1191-0044				RECORD OF BOREHOLE No H7-9				1 OF 1 METRIC							
G.W.P.		5091-07-00		LOCATION		N 5334717.1; E 410173.4				ORIGINATED BY MT							
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT							
DATUM		GEODETIC		DATE		August 24, 2012				CHECKED BY SEMC							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
306.0	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL																
305.5	CLAYEY SILT, layers Soft Brown Moist		1	SS	4	▽											
0.5	SILTY CLAY, silt seams Soft Grey to brown Moist		2	SS	3												
304.6	SILT Very loose to compact Grey Moist		3	SS	1												
1.4																	
303.4	END OF BOREHOLE AUGER REFUSAL		4	SS	10/0.03												
2.6	Note: 1. Water level at a depth of 0.5 m below ground surface (Elev. 305.5 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H7-10			1 OF 1 METRIC														
G.W.P. 5091-07-00			LOCATION N 5334734.9; E 410176.5			ORIGINATED BY MT														
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT														
DATUM GEODETIC			DATE August 24, 2012			CHECKED BY SEMC														
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ kN/m³	GR SA SI CL			
							20 40 60 80 100	○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × REMOULDED	W _p W W _L	20 40 60									
305.5	GROUND SURFACE																			
0.0	TOPSOIL		1a		3															
0.7	CLAYEY SILT, trace sand, trace organics Very soft Brown Moist CLAY Firm to stiff Grey Moist to wet		1b	SS			305													
304.8			2	SS	3		304													
	Silt seams encountered between 1.8 m and 3.7 m depth.																			
			3	SS	WH		303													
301.8							302													
3.7	SILT, trace to some clay Loose Grey Wet		4	SS	10		301													
300.7							300													
4.8	Silty SAND, some gravel Loose to compact Grey Wet		5	SS	8															
			6	SS	11		299													
298.8	END OF BOREHOLE AUGER REFUSAL																			
6.7	Note: 1. Water level at a depth of 1.2 m below ground surface (Elev. 304.3 m) upon completion of drilling.																			

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H7-11				1 OF 1 METRIC						
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334730.5; E 410193.3</u>				ORIGINATED BY <u>MT</u>						
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>						
DATUM <u>GEODETIC</u>		DATE <u>August 24, 2012</u>				CHECKED BY <u>SEMC</u>						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	W _p W W _L			
306.6	GROUND SURFACE											
0.0 306.3 0.3	TOPSOIL		1	SS	4/0.15							
	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)											
	Note: 1. Borehole dry upon completion of drilling.											

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>				RECORD OF BOREHOLE No H7-12				1 OF 1 METRIC									
G.W.P. <u>5091-07-00</u>				LOCATION <u>N 5334726.7; E 410209.2</u>				ORIGINATED BY <u>MT</u>									
DIST <u> </u> HWY <u>66</u>				BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>									
DATUM <u>GEODETIC</u>				DATE <u>August 24, 2012</u>				CHECKED BY <u>SEMC</u>									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
307.8	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL																
0.1	CLAYEY SILT		1	SS	15												
307.0	Stiff																
0.8	Brown																
0.8	Moist																
306.5	SILT, some sand, trace to some clay, trace gravel		2	SS	16/0.13												5 18 66 11
1.3	Compact																
	Grey to brown																
	Moist																
	END OF BOREHOLE AUGER REFUSAL																
	Note: 1. Borehole dry upon completion of drilling.																

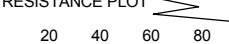
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H7-13				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334739.4; E 410206.6</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 23, 2012</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
307.5	GROUND SURFACE																
0.0	TOPSOIL		1	SS	15												0 2 72 26
306.5	CLAYEY SILT Stiff Brown Dry to moist																
1.0	Silty SAND to SAND and GRAVEL Dense to very dense Brown Moist		2	SS	42												
			3	SS	30/0.08												
305.2	END OF BOREHOLE AUGER REFUSAL																
2.3	Note: 1. Borehole dry upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H7-14				1 OF 1 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334760.2; E 410210.7				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT									
DATUM GEODETIC				DATE August 23, 2012				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
306.9	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL		1	SS	8												
306.2	CLAYEY SILT Firm Brown Dry to moist		2	SS	6												
0.7	CLAY, layered Soft to firm Brown Moist		3	SS	4												
304.8	CLAYEY SILT, silt seams		4	SS	3/0.08												
304.5	Soft Brown Moist																
2.4	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)																
Note: 1. Borehole dry upon completion of drilling.																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H7-15			1 OF 1 METRIC					
G.W.P. 5091-07-00			LOCATION N 5334756.1; E 410231.5			ORIGINATED BY MT					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT					
DATUM GEODETIC			DATE August 23, 2012			CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
307.5	GROUND SURFACE										
0.0	TOPSOIL		1	SS	11		307				
306.7	CLAYEY SILT, trace organics Stiff Brown Dry to moist		2	SS	6		306				
0.8	SILTY CLAY, silt seams Firm Brown Moist		3	SS	7						
305.1											
304.8	Sandy SILT, trace to some clay Loose Brown Moist		4	SS	7		305				
2.7	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)										
Note: 1. Borehole dry upon completion of drilling.											

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC2-1

SHEET 1 OF 1

LOCATION: N 5334378.5 ; E 409744.6

DRILLING DATE: September 12, 2012

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Landcore Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate	BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage	PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular	PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break	BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION	
				DEPTH									
				(m)									
4	NW	REFER TO PREVIOUS PAGE		305.9	1	GREY 100%	100%	100%	100%	100%	100%	100%	72 MPa
		3.5											
5	NQ Coring	METASEDIMENT Strong Fine grained Moderatley weathered to fresh Grey to green		302.9	2	GREY 100%	100%	100%	100%	100%	100%	100%	
6		Mechanical breaks below 5.7 m depth.											
END OF DRILLHOLE													
7				6.5									
8													
9													
10													
11													
12													
13													

DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 02/12/13 DATA INPUT:

[illegible]





+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SHEET 1 OF 1

DATUM: GEODETIC

DRILLING CONTRACTOR: Landcore Drilling Inc.

CHECKED: SEMC

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No BC2-3				1 OF 1 METRIC												
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334366.7; E 409761.6</u>				ORIGINATED BY <u>MT</u>												
DIST <u></u> HWY <u>66 - HIGH FILL H6</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring</u>				COMPILED BY <u>MT</u>												
DATUM <u>GEODETIC</u>		DATE <u>September 11, 2012</u>				CHECKED BY <u>SEMC</u>												
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
309.3	GROUND SURFACE							20	40	60	80	100						
0.0	PEAT (Fibrous) Very soft Black Wet		1	SS	1		309											
308.6																		
0.7	Silty SAND Compact to dense Grey to brown Wet		2	SS	26		308											
			3	SS	16/0.15													
307.2																		
2.1	METASEDIMENT (BEDROCK) Bedrock cored from 2.1 m depth to 5.0 m depth. For coring details see Record of Drillhole BC2-3.		1	RC	REC 100%		307										RQD = 89%	
			2	RC	REC 100%		306											
							305										RQD = 97%	
304.3																		
5.0	END OF BOREHOLE Note: 1. Water level at a depth of 0.4 m below ground surface (Elev. 308.9 m) upon completion of drilling.																	

SUD_MTO 003 10-1191-0044SUD.GPJ GAL-MISS.GDT 02/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC2-3

SHEET 1 OF 1

LOCATION: N 5334366.7 ; E 409761.6

DRILLING DATE: September 11, 2012

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Landcore Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock	NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
							RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diametral Point Load Index (MPa)	RMC -Q AVG.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
							TOTAL CORE %	SOLID CORE %			B Angle	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	k, cm/s	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
							888888	888888													888888	888888			888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888				888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888	888888

DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 02/12/13 DATA INPUT:

[illegible]

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No BC3-1			2 OF 2 METRIC																		
G.W.P. 5091-07-00			LOCATION N 5334503.0; E 409859.6			ORIGINATED BY MT																		
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT																		
DATUM GEODETIC			DATE August 15 and 20, 2012			CHECKED BY SEMC																		
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)									
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ			GR SA SI CL					
	--- CONTINUED FROM PREVIOUS PAGE ---							20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					W _p — W — W _L W _p — W — W _L			20 40 60 W _p — W — W _L			20 40 60 W _p — W — W _L			20 40 60 W _p — W — W _L		
290.9	CLAYEY SILT Soft to firm Grey Wet Silt seams encountered between 14.8 m and 17.8 depth.		14	SS	WR		293	+					I — I			NP			0 0 75 25					
17.8	SILT, trace to some clay Very loose to loose Grey Wet		15	SS	WH		292	3 + 2 +																
285.2	Sandy SILT, trace to some clay Very loose Grey Wet		16	SS	5		291																	
23.5			17	SS	2		290						○			NP								
282.2							289																	
26.5	END OF BOREHOLE AUGER REFUSAL Note: 1. Water level at a depth of 1.5 m below ground surface (Elev. 307.2 m) upon completion of drilling.						288																	
							287																	
							286																	
							285																	
							284						○											
							283																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

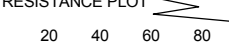



PROJECT 10-1191-0044		RECORD OF BOREHOLE No BC3-2		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334515.4; E 409849.5		ORIGINATED BY MT	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY MT	
DATUM GEODETIC		DATE August 22, 2012		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p	W	W _L			WATER CONTENT (%)
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED							
308.8	GROUND SURFACE						20 40 60 80 100								
0.0	PEAT (Fibrous) Very soft Black Wet		1	AS	-								52	0 3 37 60	
			2	SS	WH		308								
			3	SS	WH		307						47.5		
			4	SS	WH		306								
306.0	CLAYEY SILT to SILTY CLAY, trace sand Soft to firm Grey Wet		5	SS	WH		305			4					
2.8	Silt seams encountered between 3.8 m and 7.2 m depth.		6	SS	3		304			4					
	Trace organics above 5.2 m depth.		7	SS	WH		303								
			8	SS	WH		302								
							301								
301.6	SILTY CLAY to CLAY Soft to firm Grey Wet		9	SS	WH		300								
7.2							299								
	Sand seam encountered between 9.5 m and 9.6 m depth.		10	SS	WH		298								
	Silt seams encountered between 10.2 m and 14.8 m depth.		11	SS	WH		297								
			12	SS	WH	296									
			13	SS	WR	295									
294.0						294									
14.8															

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044			RECORD OF BOREHOLE No BC3-2				2 OF 2 METRIC					
G.W.P. 5091-07-00			LOCATION N 5334515.4; E 409849.5				ORIGINATED BY MT					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT					
DATUM GEODETIC			DATE August 22, 2012				CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES							
--- CONTINUED FROM PREVIOUS PAGE ---												
290.1 18.7	CLAYEY SILT Firm Grey Wet		14	SS	WR		293	+				0 0 70 30
							292					
							291					
							290					
							289					
285.8 23.0	SILT, trace to some clay Very loose to loose Grey Wet		15	SS	2		288					0 0 90 10
							287					
							286					
284.3 24.5	Silty SAND, trace to some gravel, trace clay Very dense Grey Wet		16	SS	4		285					
	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 0.6 m below ground surface (Elev. 308.2 m) upon completion of drilling.		17	SS	83/0.23							

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

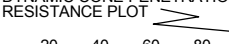
PROJECT 10-1191-0044		RECORD OF BOREHOLE No BC3-3		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334490.5; E 409869.7		ORIGINATED BY MT	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY MT	
DATUM GEODETIC		DATE August 21, 2012		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p	W	W _L		
								20 40 60 80 100	20 40 60 80 100					
308.6	GROUND SURFACE													
0.0	PEAT (Fibrous) Very soft Black Wet		1	AS	-									
			2	SS	WH									
			3	SS	WH									
			4	SS	WH									
			5	SS	WH									
304.9														
3.7	CLAYEY SILT Soft to firm Grey Wet Silt seams encountered between 4.5 m and 7.2 m depth.		6	SS	3									
			7	SS	2									
			8	SS	WH									
301.4														
7.2	CLAY Soft to firm Grey Wet		9	TO	PH									
			10	SS	WH									
			11	SS	WH									
			12	SS	WH									
			13	SS	WH									
293.8														
14.8														

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No BC3-3			2 OF 2 METRIC					
G.W.P. 5091-07-00			LOCATION N 5334490.5; E 409869.7			ORIGINATED BY MT					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT					
DATUM GEODETIC			DATE August 21, 2012			CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	--- CONTINUED FROM PREVIOUS PAGE ---										
289.9	CLAYEY SILT Firm Grey Wet		14	SS	WH		293				
							292				
							291				
							290				
18.7	SILT, trace clay Very loose to loose Grey Wet		15a 15b	SS	WH		289				
							288				
							287				
286.3	Silty SAND, trace gravel, trace clay Grey Wet		16	SS	4		286				
22.3											
285.7			17	AS	-						
22.9	END OF BOREHOLE Note: 1. Water level at a depth of 1.2 m below ground surface (Elev. 307.4 m) upon completion of drilling.										


SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No BC4-1			1 OF 2 METRIC						
G.W.P. 5091-07-00			LOCATION N 5334678.1; E 410115.3			ORIGINATED BY GM						
DIST _____ HWY 66			BOREHOLE TYPE Portable Equipment, NW Casing, Wash Boring			COMPILED BY MT						
DATUM GEODETIC			DATE November 16, 2012			CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID UNIT REMARKS			
ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)	γ	GR SA SI CL
305.2	WATER SURFACE											
0.0	WATER											
0.2	PEAT (Amorphous) Very soft Black Moist		1	SS	1		305					
304.3												
0.9	CLAYEY SILT, layered Firm Brown Wet		2	SS	4		304					
			3	SS	2		303					0 1 70 29
302.4												
2.8	CLAY Soft to firm Grey Wet Clayey silt / silt and clay irregular varves between 1 mm and 25 mm thick noted in Shelby tubes samples 4, 5 and 6.		4	TO	PH		302				16.1	0 2 33 65
			5	TO	PH		301					
							300				16.2	
							299					
			6	TO	PH		298				16.6	0 5 39 56
							297					
296.3							296					
8.9	CLAYEY SILT Very soft Grey Wet		8	SS	1		295					
294.8							294					
10.4	SILT, trace to some clay Very loose to compact Grey Wet		9	SS	4		293					
			10	SS	11		292					0 0 88 12
			11	SS	8		291					
290.4												
14.8												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>				RECORD OF BOREHOLE No BC4-1				2 OF 2 METRIC									
G.W.P. <u>5091-07-00</u>				LOCATION <u>N 5334678.1; E 410115.3</u>				ORIGINATED BY <u>GM</u>									
DIST <u> </u> HWY <u>66</u>				BOREHOLE TYPE <u>Portable Equipment, NW Casing, Wash Boring</u>				COMPILED BY <u>MT</u>									
DATUM <u>GEODETIC</u>				DATE <u>November 16, 2012</u>				CHECKED BY <u>SEMC</u>									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100					
289.5	Gravelly SAND, some silt, trace clay Dense Grey Wet		12	SS	40		290										26 59 13 2
15.7	END OF BOREHOLE START OF DCPT						289										
							288										
							287										
286.3	END OF DCPT REFUSAL TO FURTHER PENETRATION 50 BLOWS / 0.08 m (HAMMER BOUNCING)																
18.9																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No BC4-2				1 OF 2 METRIC								
G.W.P. 5091-07-00				LOCATION N 5334695.8; E 410109.4				ORIGINATED BY GM								
DIST _____ HWY 66				BOREHOLE TYPE Portable Equipment, NW Casing, Wash Boring				COMPILED BY MT								
DATUM GEODETIC				DATE November 14, 2012				CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				
304.8	WATER SURFACE															
0.0	WATER															
304.1	PEAT (Amorphous)		1a	SS	2											
0.9	CLAYEY SILT, layered Soft Brown Wet		1b													
302.7			2	SS	4											
2.1	SILTY CLAY to CLAY Firm Grey Wet		3	SS	WH											
	Silt seams encountered between 2.1 and 4.8 m depth.															
			4	SS	1											
			5	SS	WH											
	Silt seams encountered between 6.3 and 9.4 m depth.															
			6	SS	WH											
			7	SS	1											
295.4																
9.4	SILT, some clay Loose to compact Grey Wet		8	SS	9											
			9	SS	5											
			10	SS	21											
290.5	Spoon attempted at 14.3 m depth, bouncing.															
14.3																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

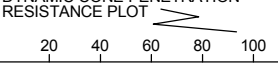
Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No BC4-2		2 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334695.8; E 410109.4</u>		ORIGINATED BY <u>GM</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Portable Equipment, NW Casing, Wash Boring</u>		COMPILED BY <u>MT</u>	
DATUM <u>GEODETIC</u>		DATE <u>November 14, 2012</u>		CHECKED BY <u>SEMC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL	
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100	20	40	60						
	END OF BOREHOLE SPOON REFUSAL AND REFUSAL TO FURTHER CASING ADVANCEMENT (HAMMER BOUNCING)																				

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No BC4-3			1 OF 2 METRIC					
G.W.P. 5091-07-00			LOCATION N 5334660.4; E 410121.2			ORIGINATED BY GM					
DIST _____ HWY 66			BOREHOLE TYPE Portable Equipment, NW Casing, Wash Boring			COMPILED BY MT					
DATUM GEODETIC			DATE November 17 and 18, 2012			CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
305.2	WATER SURFACE										
0.0	WATER										
304.9	PEAT (Fibrous)		1	SS	1						
304.6	CLAYEY SILT, layered Very soft to firm Grey to brown Wet		2	SS	3						
0.6	Trace organics above 0.9 m depth.		3	SS	1						
302.3	SILTY CLAY Soft to firm Grey Wet		4	SS	WH						
2.9			5	SS	WH						
			6	SS	WH						
			7	SS	WH						
	Silt seams encountered between 7.5 m and 9.0 m depth.		8	SS	1						
296.2	CLAYEY SILT Firm Grey Wet		9	SS	4						
9.0			10	SS	7						
294.7	SILT, trace to some clay Loose to dense Grey Wet		11	SS	35						
10.5											
290.6	END OF BOREHOLE START OF DCPT										
14.6											

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



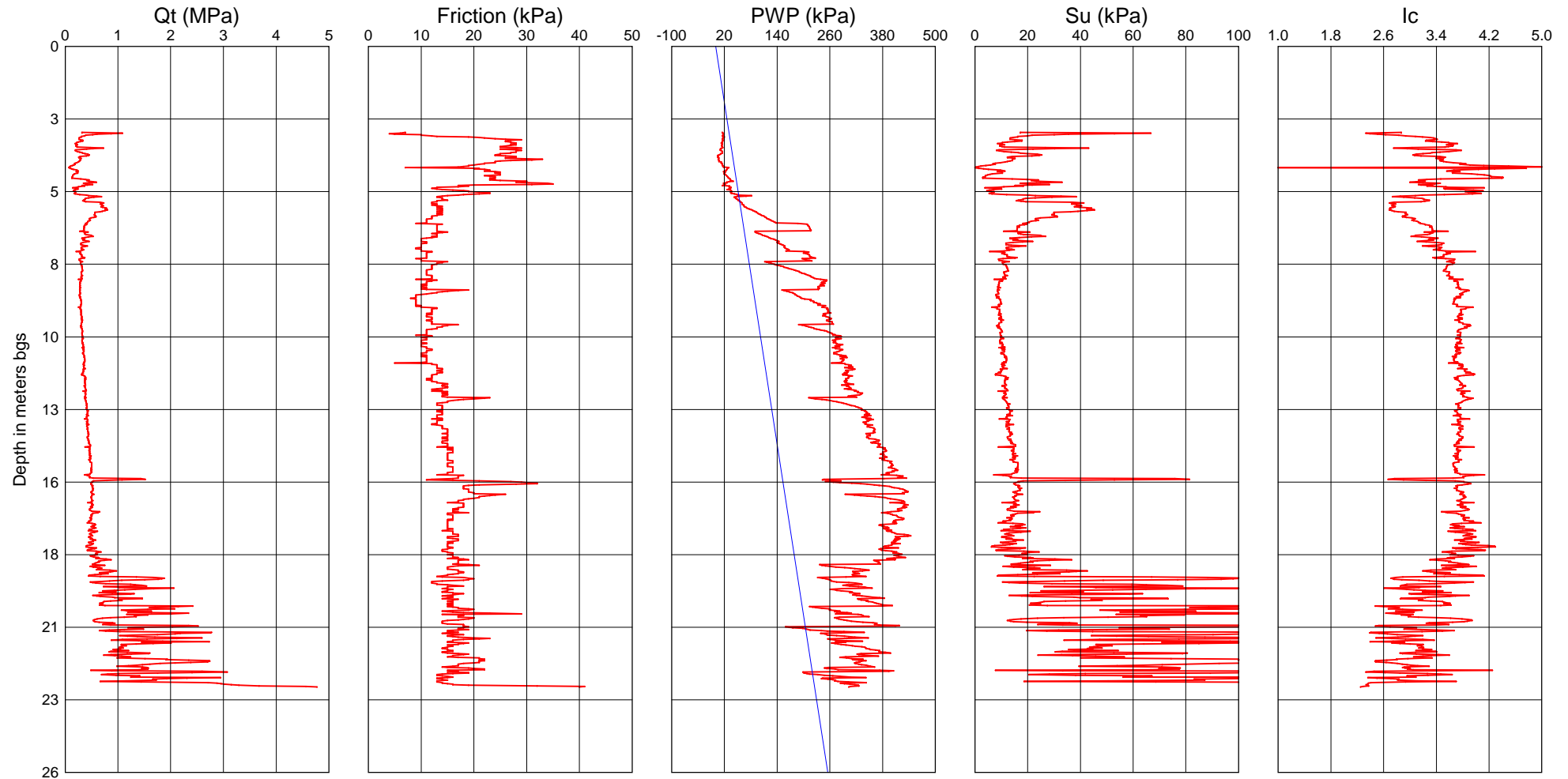
+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Cone Penetration Test - H6-CPT1

Test Date : April 30, 2013
Location : Highway 66 - STA 14+085 o/s 4.0m Left of CL

Operator : Golder Associates Ltd.

Ground Surf. Elev. : 309.20
Water Table Depth : 0.00



Qt normalized for
unequal end area effects

$S_u = (Q_t - \sigma_v) / N_k$
 $N_k = 15.5$
 $\gamma = 16.5 \text{ kN/m}^3$

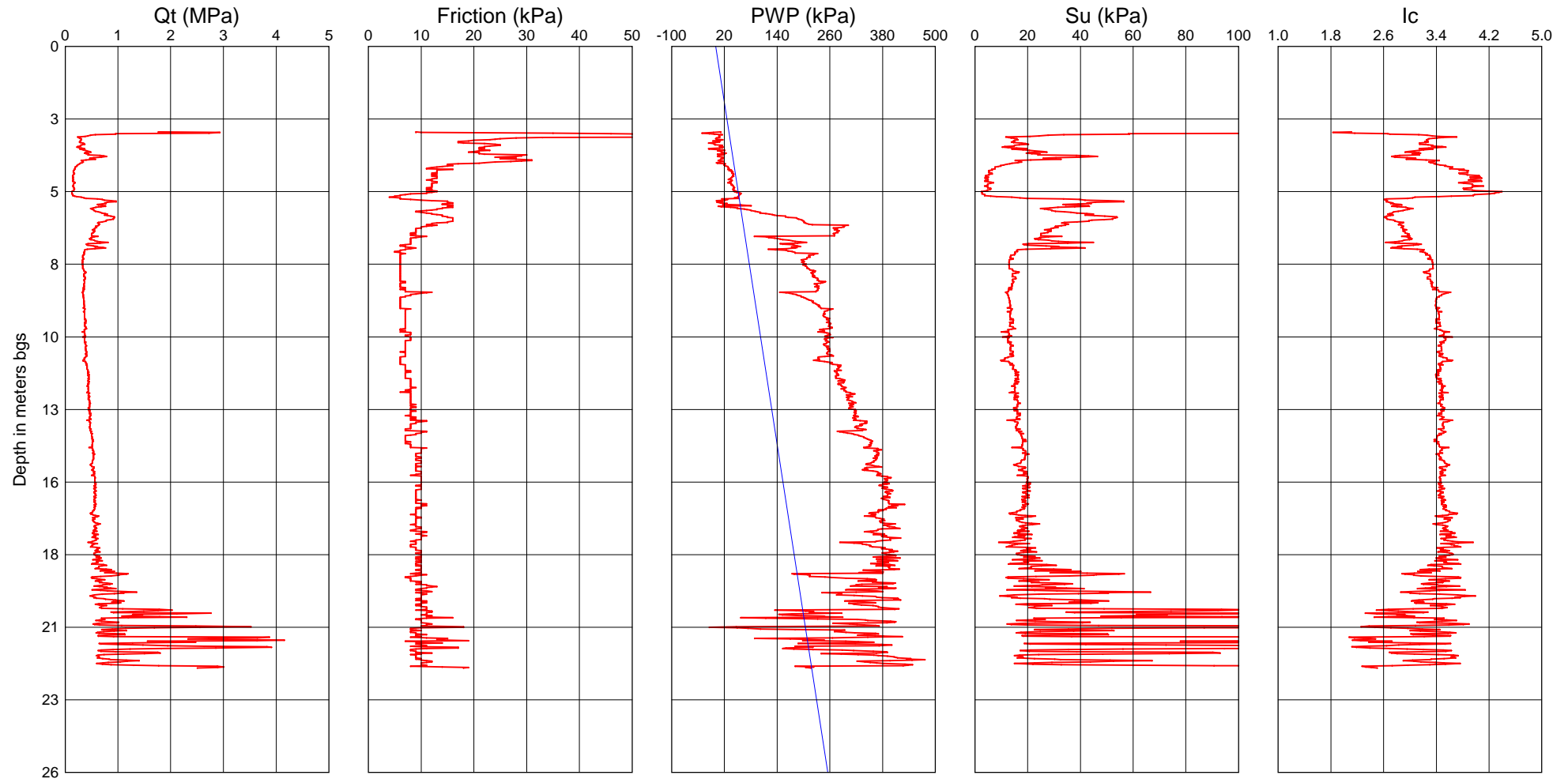
After Robertson and (Fear) Wride (1998)
 $I_c < 1.31$ - Gravelly sands
 $1.31 < I_c < 2.05$ - Clean to silty sand
 $2.05 < I_c < 2.60$ - Silty sand to sandy silt
 $2.60 < I_c < 2.95$ - Clayey silt to silty clay
 $2.95 < I_c < 3.60$ - Clays

Cone Penetration Test - H6-CPT2

Test Date : May 23, 2013
Location : Highway 66 - STA 14+125 o/s 1 m Left of CL

Operator : Golder Associates Ltd.

Ground Surf. Elev. : 309.00
Water Table Depth : 0.00



Qt normalized for
unequal end area effects

$S_u = (Q_t - \sigma_v) / N_k$
 $N_k = 15.5$
 $\gamma = 16.5 \text{ kN/m}^3$

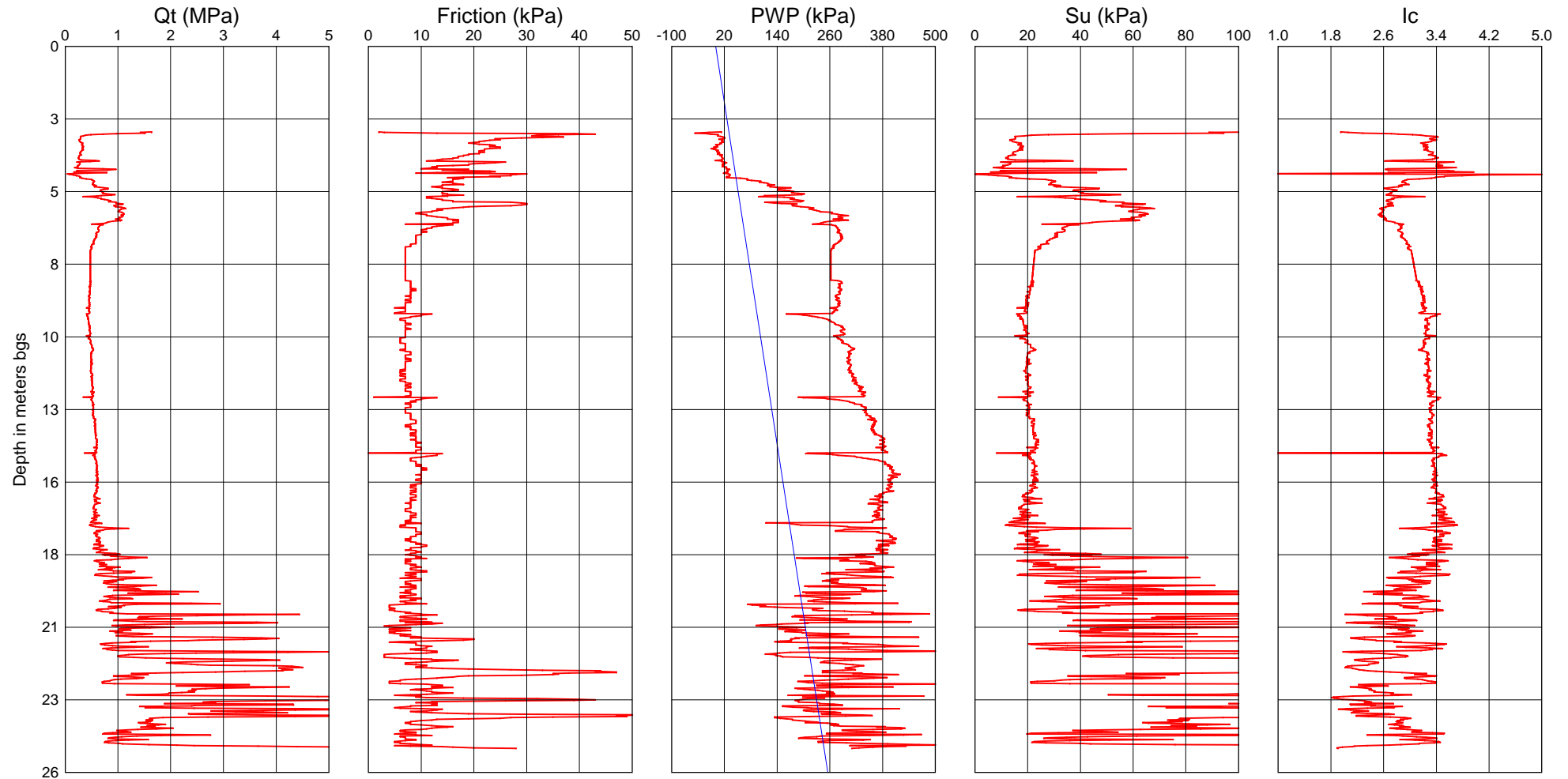
After Robertson and (Fear) Wride (1998)
 $I_c < 1.31$ - Gravelly sands
 $1.31 < I_c < 2.05$ - Clean to silty sand
 $2.05 < I_c < 2.60$ - Silty sand to sandy silt
 $2.60 < I_c < 2.95$ - Clayey silt to silty clay
 $2.95 < I_c < 3.60$ - Clays

Cone Penetration Test - H6-CPT3

Test Date : May 23, 2013
Location : Highway 66 - STA 14+202 o/s 2 m Left of CL

Operator : Golder Associates Ltd.

Ground Surf. Elev. : 308.70
Water Table Depth : 0.00



Qt normalized for
unequal end area effects

$S_u = (Q_t - \sigma_{av}) / N_k$
 $N_k = 15.5$
 $\gamma = 16.5 \text{ kN/m}^3$

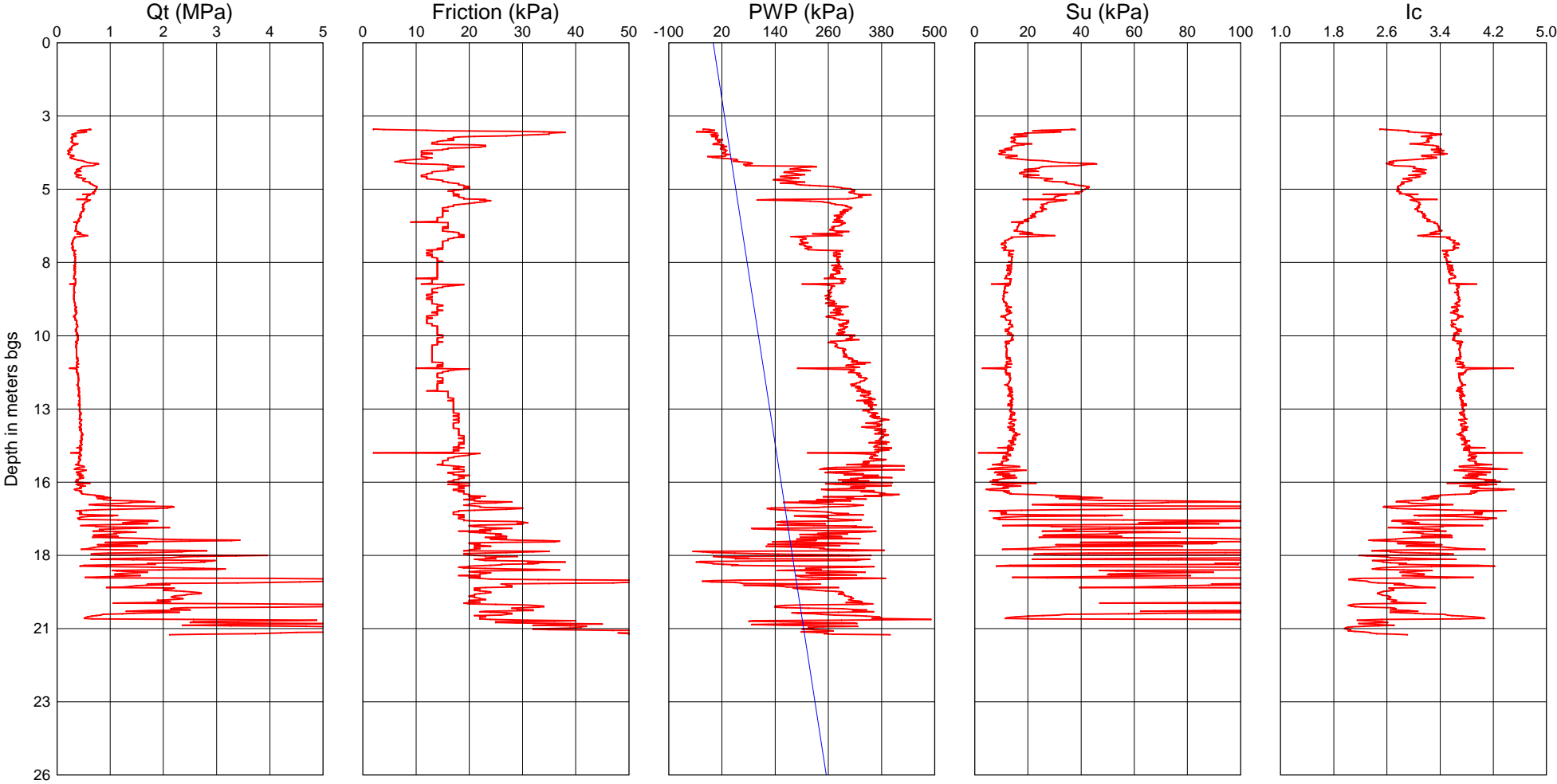
After Robertson and (Fear) Wride (1998)
Ic < 1.31 - Gravely sands
1.31 < Ic < 2.05 - Clean to silty sand
2.05 < Ic < 2.60 - Silty sand to sandy silt
2.60 < Ic < 2.95 - Clayey silt to silty clay
2.95 < Ic < 3.60 - Clays

Cone Penetration Test - H6-CPT4

Test Date : May 24, 2013
Location : Highway 66 - STA 14+251.5 o/s 2 m Left of CL

Operator : Golder Associates Ltd.

Ground Surf. Elev. : 307.80
Water Table Depth : 0.00



Qt normalized for
unequal end area effects

$S_u = (Q_t - \sigma_v) / N_k$
 $N_k = 15.5$
 $\gamma = 16.5 \text{ kN/m}^3$

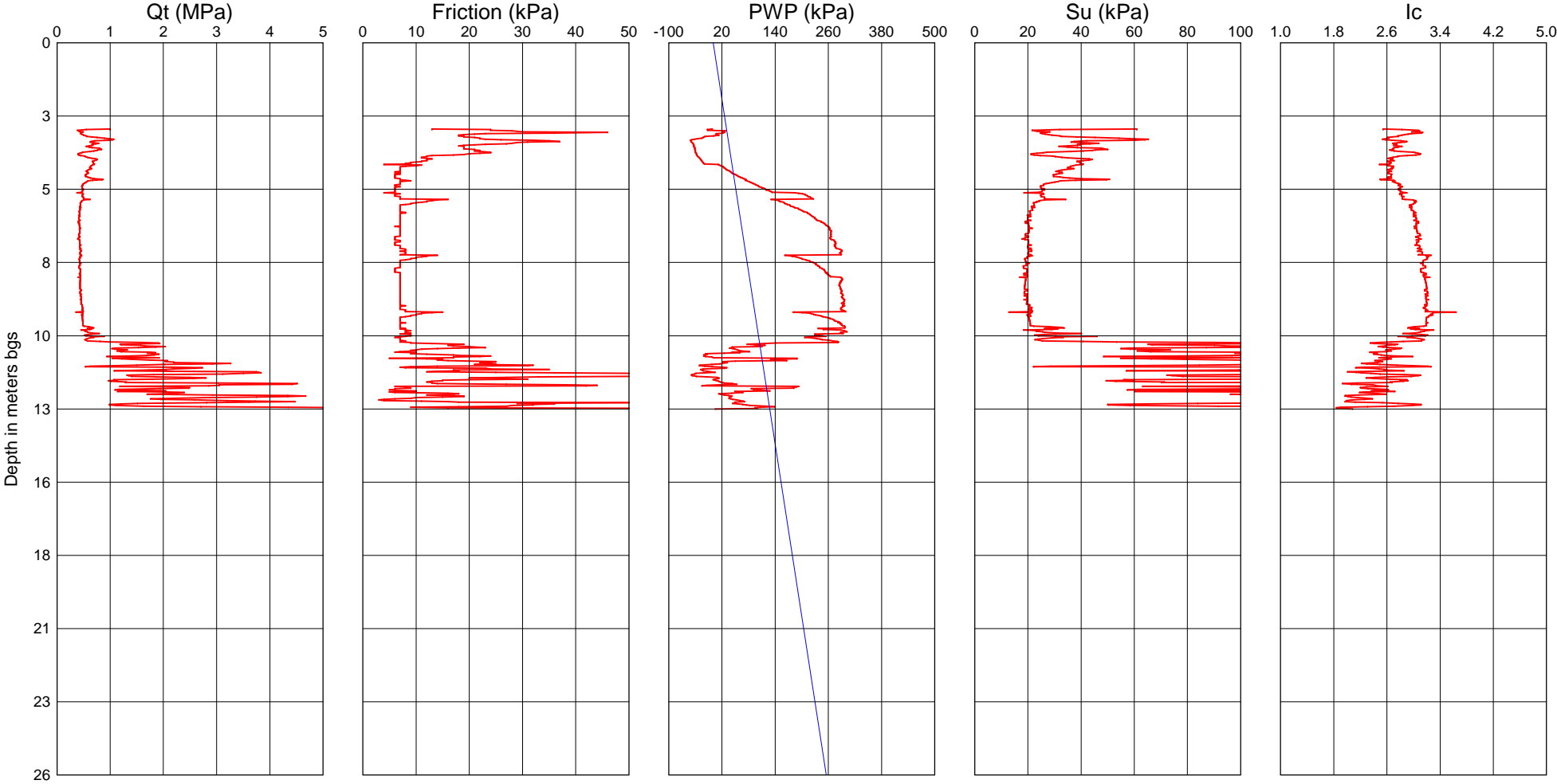
After Robertson and (Fear) Wride (1998)
Ic < 1.31 - Gravelly sands
1.31 < Ic < 2.05 - Clean to silty sand
2.05 < Ic < 2.60 - Silty sand to sandy silt
2.60 < Ic < 2.95 - Clayey silt to silty clay
2.95 < Ic < 3.60 - Clays

Cone Penetration Test - H6-CPT5

Test Date : May 24, 2013
Location : Highway 66 - STA 14+651 o/s 2 m Left of CL

Operator : Golder Associates Ltd.

Ground Surf. Elev. : 306.70
Water Table Depth : 0.00



Qt normalized for
unequal end area effects

$S_u = (Q_t - \sigma_v) / N_k$
 $N_k = 15.5$
 $\gamma = 16.5 \text{ kN/m}^3$

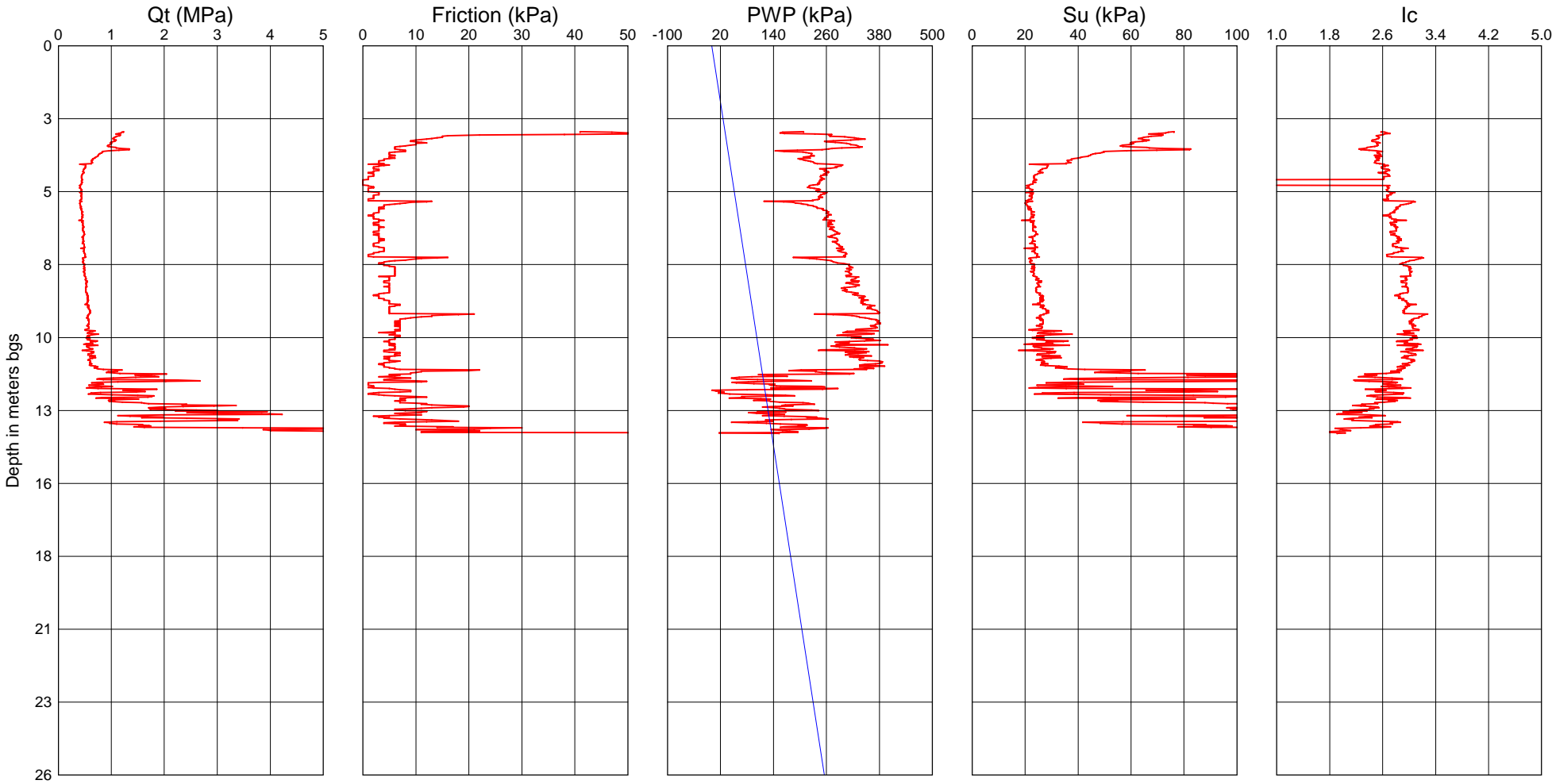
After Robertson and (Fear) Wride (1998)
Ic < 1.31 - Gravelly sands
1.31 < Ic < 2.05 - Clean to silty sand
2.05 < Ic < 2.60 - Silty sand to sandy silt
2.60 < Ic < 2.95 - Clayey silt to silty clay
2.95 < Ic < 3.60 - Clays

Cone Penetration Test - H6-CPT6

Test Date : May 25, 2013
Location : Highway 66 - STA 14+452 o/s 3 m Left of CL

Operator : Golder Associates Ltd.

Ground Surf. Elev. : 305.20
Water Table Depth : 0.00



Qt normalized for
unequal end area effects

$Su = (Qt - \sigma_v) / Nk$
 $Nk = 15.5$
 $\gamma = 16.5 \text{ kN/m}^3$

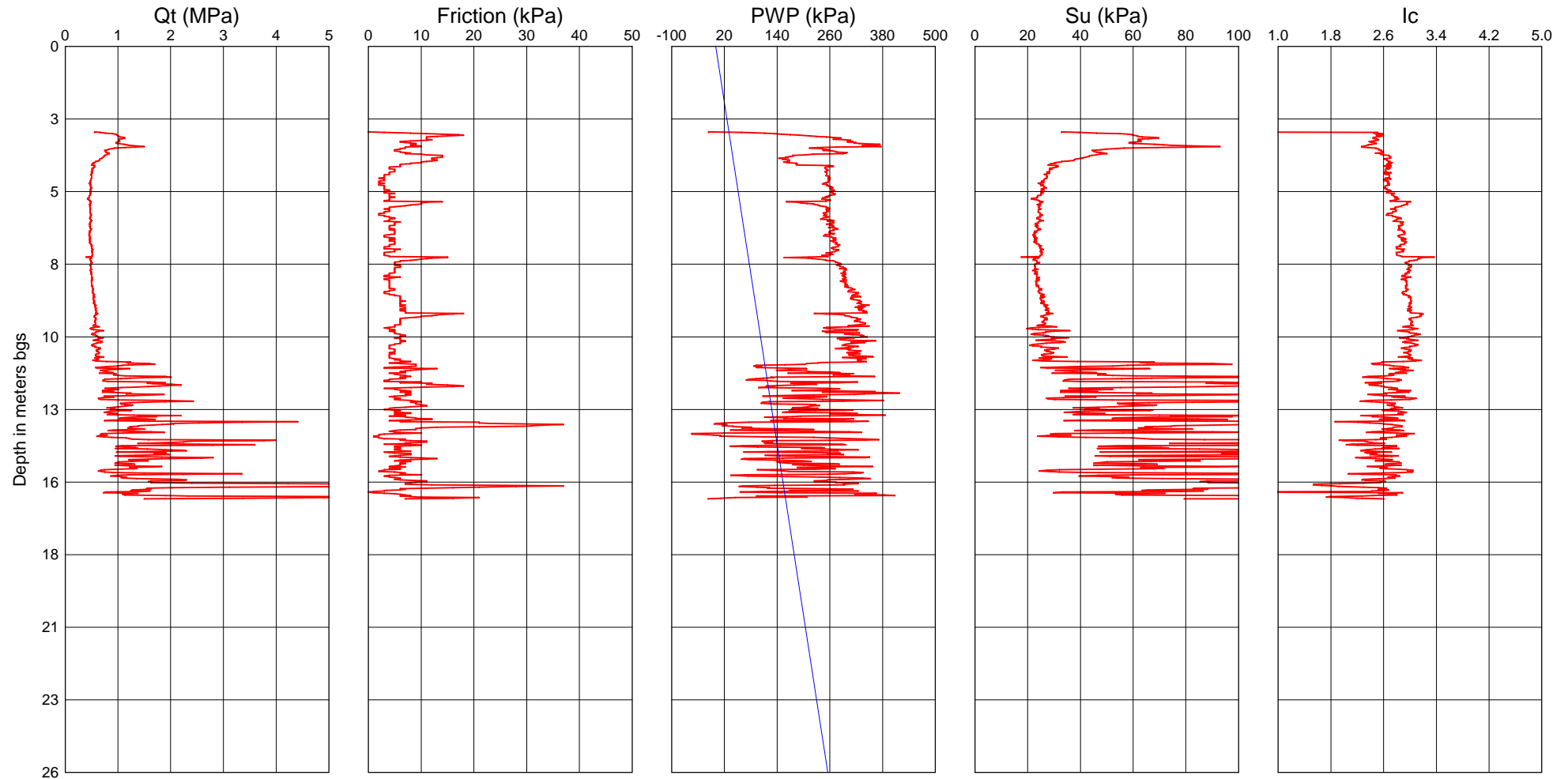
After Robertson and (Fear) Wride (1998)
 $Ic < 1.31$ - Gravelly sands
 $1.31 < Ic < 2.05$ - Clean to silty sand
 $2.05 < Ic < 2.60$ - Silty sand to sandy silt
 $2.60 < Ic < 2.95$ - Clayey silt to silty clay
 $2.95 < Ic < 3.60$ - Clays

Cone Penetration Test - H6-CPT7

Test Date : May 25, 2013
Location : Highway 66 - STA 14+480.5 o/s 1 m Left of CL

Operator : Golder Associates Ltd.

Ground Surf. Elev. : 305.10
Water Table Depth : 0.00



Qt normalized for
unequal end area effects

$S_u = (Q_t - \sigma_v) / N_k$
 $N_k = 15.5$
 $\gamma = 16.5 \text{ kN/m}^3$

After Robertson and (Fear) Wride (1998)
Ic < 1.31 - Gravelly sands
1.31 < Ic < 2.05 - Clean to silty sand
2.05 < Ic < 2.60 - Silty sand to sandy silt
2.60 < Ic < 2.95 - Clayey silt to silty clay
2.95 < Ic < 3.60 - Clays

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H6-D1				1 OF 1 METRIC								
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334379.1; E 409769.2</u>				ORIGINATED BY <u>MT</u>								
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>								
DATUM <u>GEODETIC</u>		DATE <u>July 26, 2012</u>				CHECKED BY <u>SEMC</u>								
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						WATER CONTENT (%)
309.6 0.0	GROUND SURFACE						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>							
309														
308														
307														
306														
305														
304														
303.2 6.4	END OF DCPT REFUSAL TO FURTHER PENETRATION 11 BLOWS / 0.25 m (HAMMER BOUNCING)													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



PROJECT		RECORD OF PENETRATION TEST				No H6-D2		1 OF 2		METRIC							
G.W.P.		LOCATION				N 5334422.0; E 409756.7		ORIGINATED BY		MT							
DIST		BOREHOLE TYPE				Dynamic Cone Penetration Test		COMPILED BY		TR							
DATUM		DATE				July 28, 2012		CHECKED BY		SEMC							
SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)	
309.2 0.0	GROUND SURFACE							20	40	60	80	100	20	40	60		GR SA SI CL
							309										
							308										
							307										
							306										
							305										
							304										
							303										
							302										
							301										
							300										
							299										
							298										
							297										
							296										
							295										

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H6-D2				2 OF 2 METRIC							
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334422.0; E 409756.7</u>				ORIGINATED BY <u>MT</u>							
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>							
DATUM <u>GEODETIC</u>		DATE <u>July 28, 2012</u>				CHECKED BY <u>SEMC</u>							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa		W _p	W		
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100	20 40 60 80 100					
							294						
							293						
							292						
							291						
							290						
289.7 19.5	END OF DCPT REFUSAL TO FURTHER PENETRATION 82 BLOWS / 0.30 m (HAMMER BOUNCING)												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

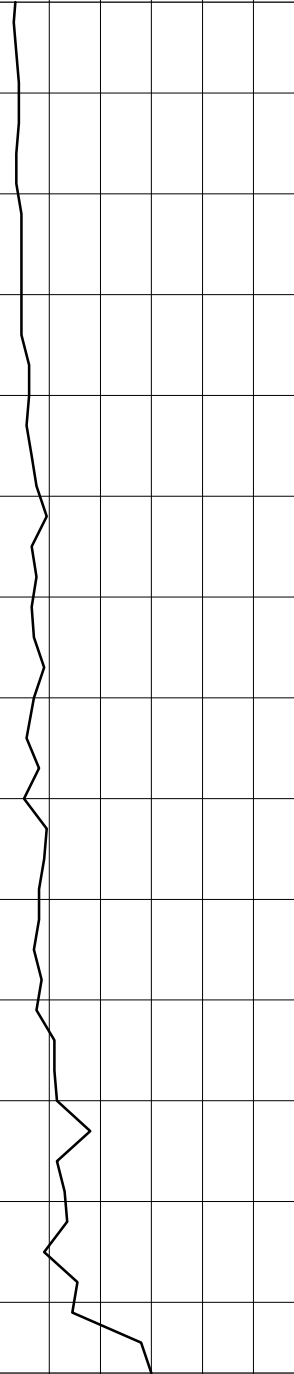


+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H6-D5				2 OF 2 METRIC							
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334448.8; E 409824.2</u>				ORIGINATED BY <u>MT</u>							
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>							
DATUM <u>GEODETIC</u>		DATE <u>August 10, 2012</u>				CHECKED BY <u>SEMC</u>							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa		W _p	W		
--- CONTINUED FROM PREVIOUS PAGE ---							<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div>						
293													
292													
291													
290													
289													
288													
287													
286													
285													
284													
283													
282													
281													
280.3 28.6	END OF DCPT REFUSAL TO FURTHER PENETRATION 60 BLOWS / 0.25 m (HAMMER BOUNCING)												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



PROJECT	10-1191-0044	RECORD OF PENETRATION TEST		No H6-D6	1 OF 2	METRIC
G.W.P.	5091-07-00	LOCATION	N 5334497.1; E 409831.0		ORIGINATED BY	MT
DIST	HWY 66	BOREHOLE TYPE	Dynamic Cone Penetration Test		COMPILED BY	TR
DATUM	GEODETIC	DATE	September 26, 2012		CHECKED BY	SEMC

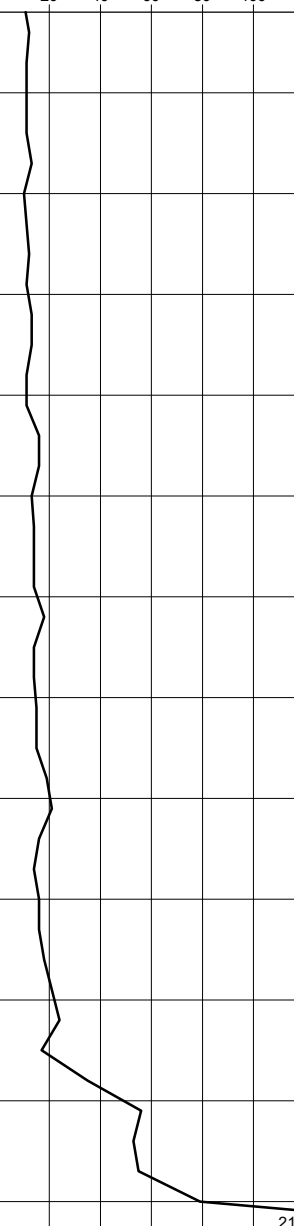
[illegible]

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H6-D6			2 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334497.1; E 409831.0</u>			ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>			COMPILED BY <u>TR</u>	
DATUM <u>GEODETIC</u>		DATE <u>September 26, 2012</u>			CHECKED BY <u>SEMC</u>	

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20 40 60 80 100	20 40 60	W _p W W _L			
--- CONTINUED FROM PREVIOUS PAGE ---							<div style="display: flex; justify-content: space-between;"> <div> SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div> <div>  </div> </div>						
281.7	END OF DCPT REFUSAL TO FURTHER PENETRATION (HAMMER BOUNCING)												
27.1													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



PROJECT		RECORD OF PENETRATION TEST				No H6-D7		1 OF 2		METRIC											
G.W.P.		LOCATION				N 5334507.1; E 409887.7		ORIGINATED BY		MT											
DIST		HWY				66		BOREHOLE TYPE		Dynamic Cone Penetration Test											
COMPILED BY		TR				DATE		September 26, 2012		CHECKED BY											
SEMCC																					
SOIL PROFILE		SAMPLES				DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT		NATURAL MOISTURE CONTENT		LIQUID LIMIT		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20	40	60	80	100	W _p	W	W _L	γ	GR	SA	SI	CL
308.3	0.0	GROUND SURFACE																			
								308													
								307													
								306													
								305													
								304													
								303													
								302													
								301													
								300													
								299													
								298													
								297													
								296													
								295													
								294													

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

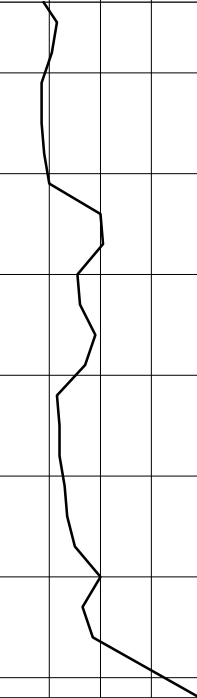
PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H6-D8		1 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334559.5; E 409911.8</u>		ORIGINATED BY <u>MT</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>		COMPILED BY <u>TR</u>	
DATUM <u>GEODETIC</u>		DATE <u>October 18, 2012</u>		CHECKED BY <u>SEMC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p	W	W _L		
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × REMOULDED					
307.7 0.0	GROUND SURFACE													
										</				

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H6-D8				2 OF 2 METRIC										
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334559.5; E 409911.8</u>				ORIGINATED BY <u>MT</u>										
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>										
DATUM <u>GEODETIC</u>		DATE <u>October 18, 2012</u>				CHECKED BY <u>SEMC</u>										
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					W _p	W		
	--- CONTINUED FROM PREVIOUS PAGE ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>									
																
285.8 21.9	END OF DCPT REFUSAL TO FURTHER PENETRATION 79 BLOWS / 0.28 m (HAMMER BOUNCING)															

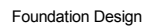
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H6-D9				1 OF 1 METRIC								
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334562.4; E 409970.9</u>				ORIGINATED BY <u>MT</u>								
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>								
DATUM <u>GEODETIC</u>		DATE <u>November 3, 2012</u>				CHECKED BY <u>SEMC</u>								
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa		W _p	W			W _L
307.0 0.0	GROUND SURFACE						20 40 60 80 100	20 40 60 80 100	20 40 60					
							306							
							305							
							304							
							303							
							302							
							301							
							300							
							299							
							298							
							297							
							296							
							295							
							294							
293.3 13.7	END OF DCPT REFUSAL TO FURTHER PENETRATION 15 BLOWS / 0.25 m (HAMMER BOUNCING)													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE



PROJECT		RECORD OF PENETRATION TEST				No H7-D1		1 OF 2		METRIC										
G.W.P.		LOCATION				ORIGINATED BY		MT												
DIST		BOREHOLE TYPE				COMPILED BY		TR												
DATUM		DATE				CHECKED BY		SEMC												
SOIL PROFILE		SAMPLES				DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT		NATURAL MOISTURE CONTENT		LIQUID LIMIT		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa		W _p		W		W _L		γ		GR SA SI CL	
305.5	0.0	GROUND SURFACE							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED		20 40 60		20 40 60		20 40 60		kN/m ³			
								305												
								304												
								303												
								302												
								301												
								300												
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								298												
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								296												
								295												
								294												
								293												
								292												
								291												

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H7-D1				2 OF 2 METRIC															
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334639.7; E 410086.8</u>				ORIGINATED BY <u>MT</u>															
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>															
DATUM <u>GEODETIC</u>		DATE <u>August 26, 2012</u>				CHECKED BY <u>SEMC</u>															
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					W _p	W			W _L				
	--- CONTINUED FROM PREVIOUS PAGE ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>														
287.6							290														
							289														
							288														
17.9	END OF DCPT REFUSAL TO FURTHER PENETRATION 22 BLOWS / 0.22 m (HAMMER BOUNCING)																				

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



PROJECT 10-1191-0044		RECORD OF PENETRATION TEST No H7-D2		1 OF 2	METRIC
G.W.P. 5091-07-00		LOCATION N 5334683.0; E 410093.9		ORIGINATED BY GM	
DIST HWY 66		BOREHOLE TYPE Dynamic Cone Penetration Test		COMPILED BY TR	
DATUM GEODETIC		DATE November 15, 2012		CHECKED BY SEMC	

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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE



+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H7-D5				1 OF 1 METRIC										
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334719.8; E 410156.6</u>				ORIGINATED BY <u>GM</u>										
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>										
DATUM <u>GEODETIC</u>		DATE <u>November 1, 2012</u>				CHECKED BY <u>SEMC</u>										
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
304.5 0.0	GROUND SURFACE						20	40	60	80	100					
							20	40	60	80	100					
							20	40	60	80	100					
							20	40	60	80	100					
							20	40	60	80	100					
							20	40	60	80	100					
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							20	40	60	80	100					

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H7-D6				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334711.6; E 410192.1</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 24, 2012</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa									WATER CONTENT (%)
307.0 0.0	GROUND SURFACE							20	40	60	80	100					
304.9 2.1	END OF DCPT REFUSAL TO FURTHER PENETRATION 24 BLOWS / 0.28 m (HAMMER BOUNCING)																

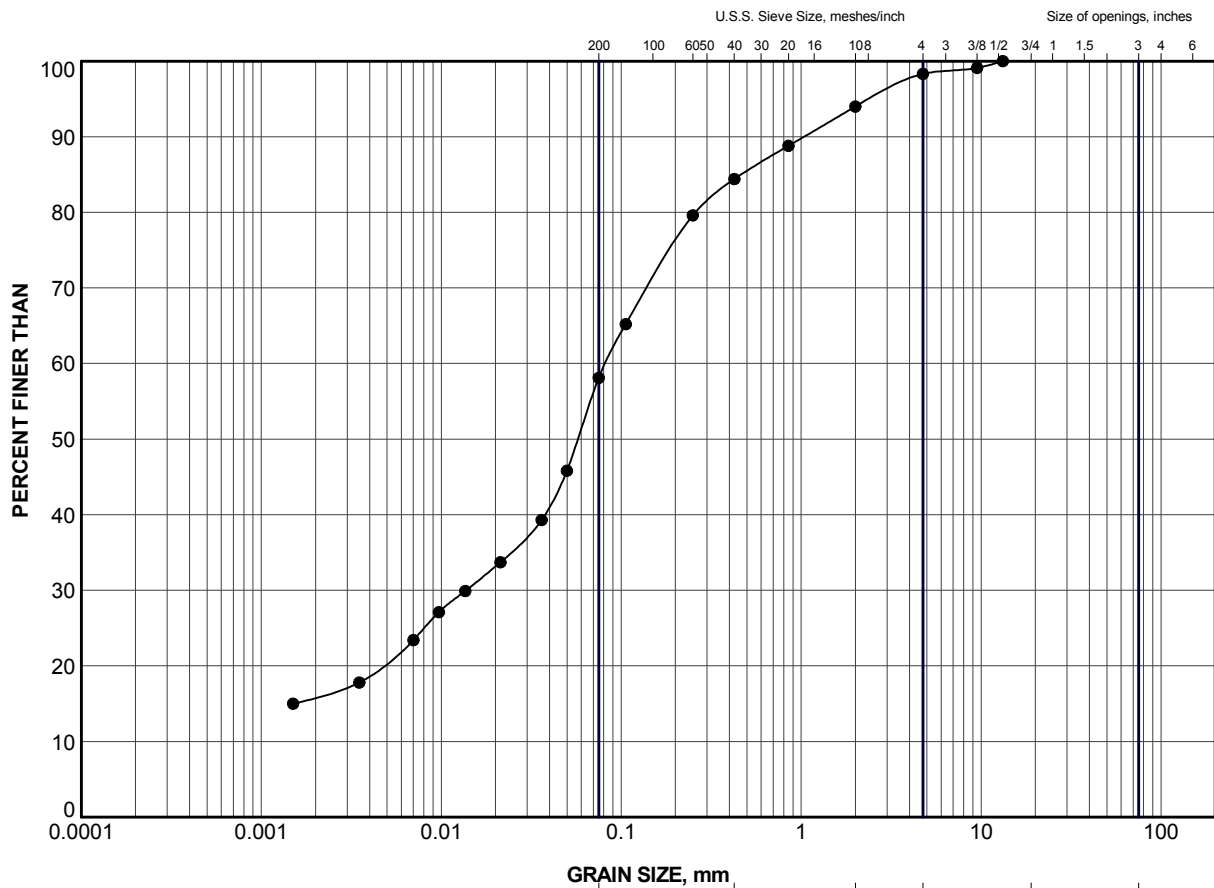
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT		10-1191-0044				RECORD OF PENETRATION TEST No H7-D7				1 OF 1		METRIC					
G.W.P.		5091-07-00		LOCATION		N 5334749.1; E 410194.1				ORIGINATED BY		MT					
DIST		HWY 66		BOREHOLE TYPE		Dynamic Cone Penetration Test				COMPILED BY		TR					
DATUM		GEODETIC		DATE		August 24, 2012				CHECKED BY		SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
306.4 0.0	GROUND SURFACE							20	40	60	80	100					
							306										
							305										
304.3 2.1	END OF DCPT REFUSAL TO FURTHER PENETRATION 11 BLOWS / 0.25 m (HAMMER BOUNCING)																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H7-D8				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334737.8; E 410225.8</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>TR</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 23, 2012</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa									WATER CONTENT (%)
307.8 0.0	GROUND SURFACE						20	40	60	80	100						GR SA SI CL
307																	
306																	
305.4 2.4	END OF DCPT REFUSAL TO FURTHER PENETRATION 29 BLOWS / 0.23 m (HAMMER BOUNCING)																


SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

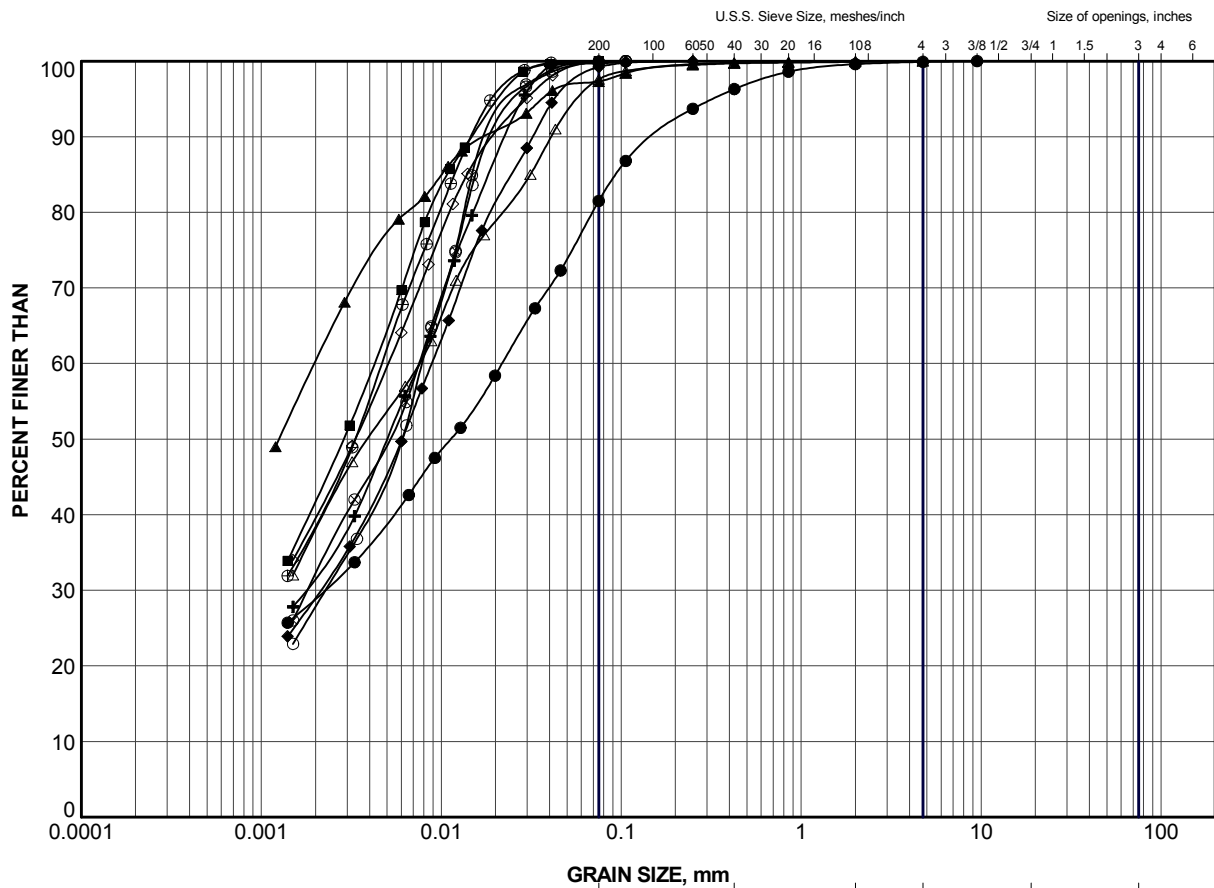


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC2-2	2	308.6

PROJECT				
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650				
TITLE				
GRAIN SIZE DISTRIBUTION SAND AND SILT				
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ
DRAWN	JJL	May 2013	SCALE	N/A
CHECK	SEMC	May 2013	REV.	
APPR	JMAC	May 2013		
 Golder Associates SUDBURY, ONTARIO				FIGURE C1



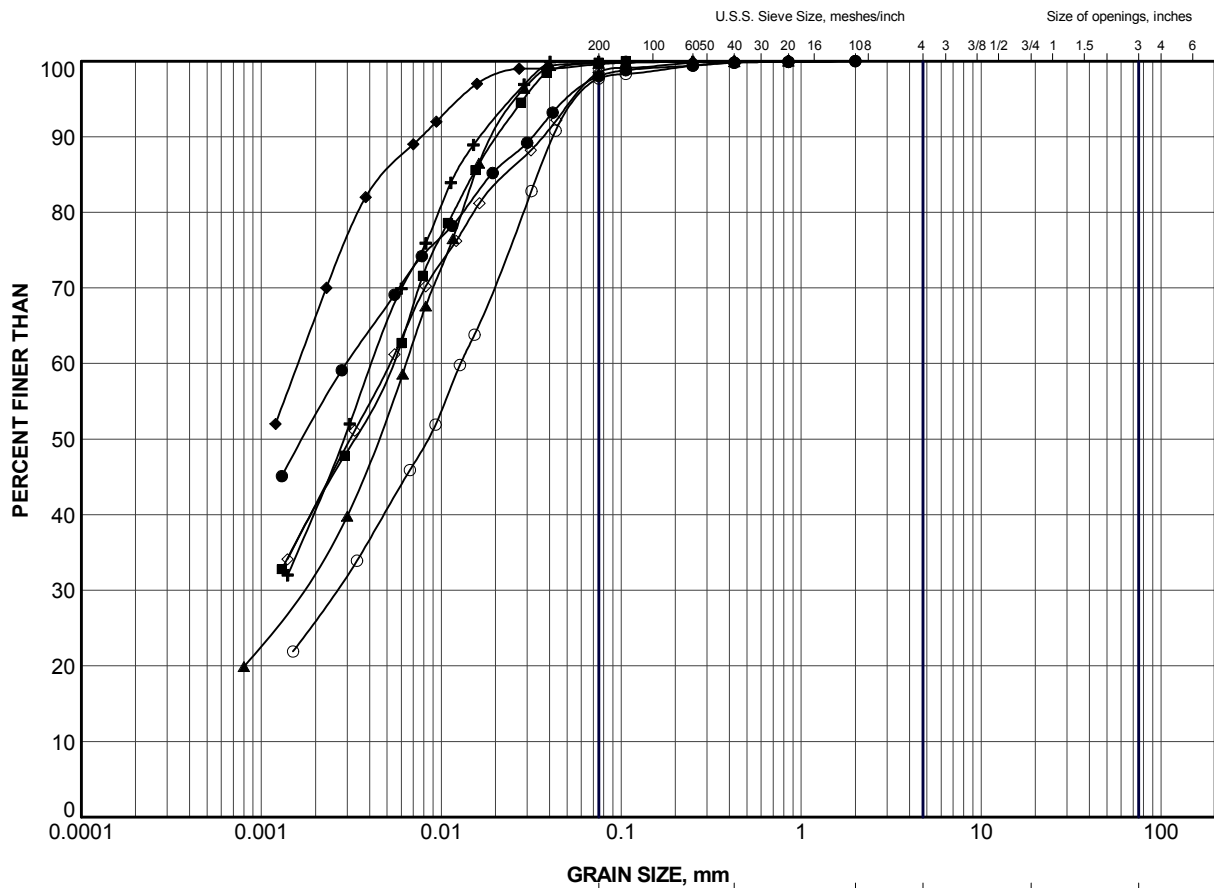
CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC2-2	5	306.3
■	BC3-1	6	304.6
▲	BC3-2	5	305.4
+	BC3-3	8	302.2
◆	BC4-1	3	303.2
◇	H6-2	6	304.9
○	H6-4	6	305.0
△	H6-7	8	302.6
⊗	H6-8	6b	304.7
⊕	H6-10	7	303.9

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION CLAYEY SILT to SILTY CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	May 2013	SCALE	N/A	REV.
CHECK	SEMC	May 2013			
APPR	JMAC	May 2013			
			FIGURE C2.1		





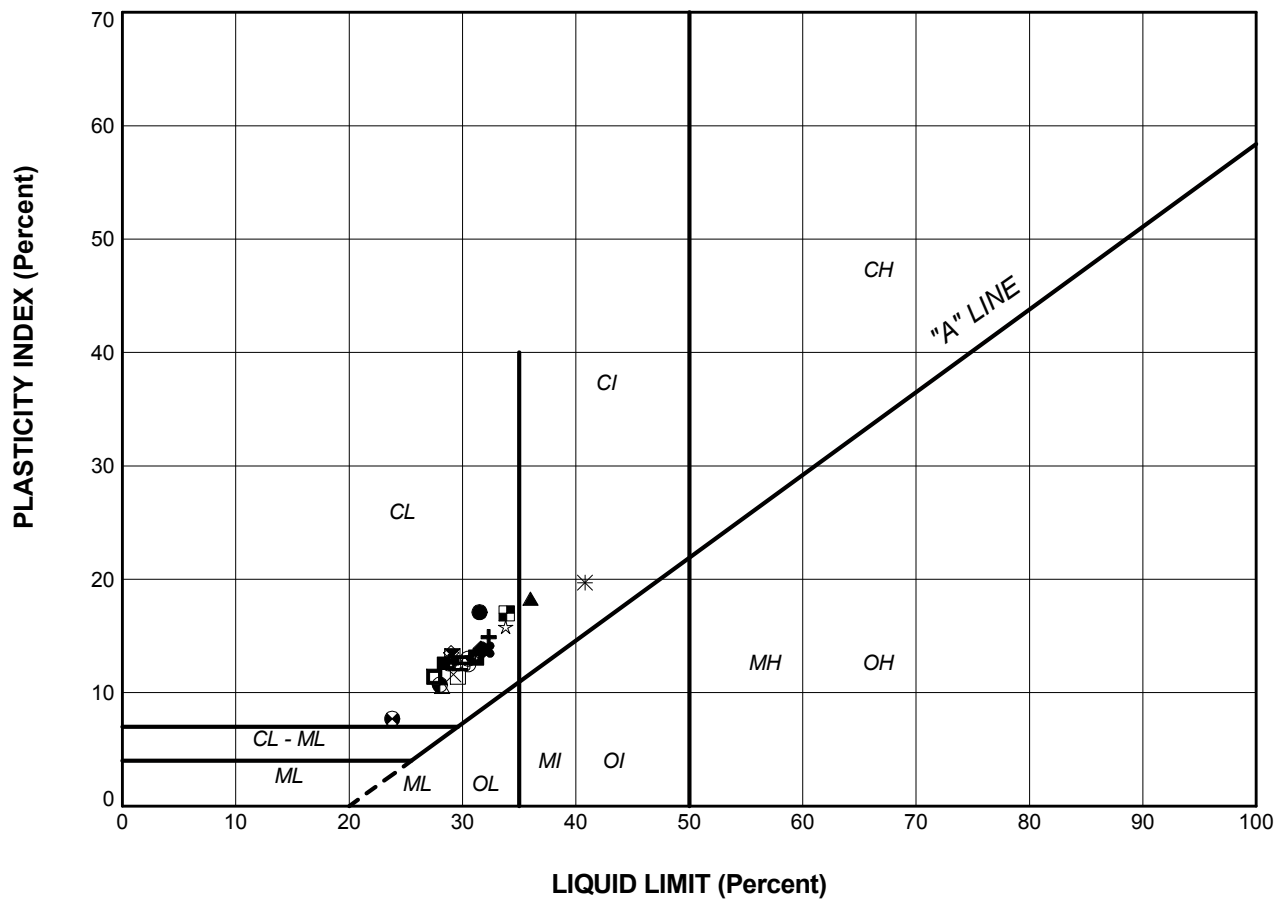
CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H6-12	4	305.7
■	H6-16	4	303.3
▲	H6-18	4	303.4
+	H7-1	2	304.1
◆	H7-6	3	302.6
◇	H7-10	1b	305.2
○	H7-13	1b	307.2


PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION CLAYEY SILT to SILTY CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	May 2013	SCALE	N/A	REV.
CHECK	SEMC	May 2013			
APPR	JMAC	May 2013			
			FIGURE C2.2		

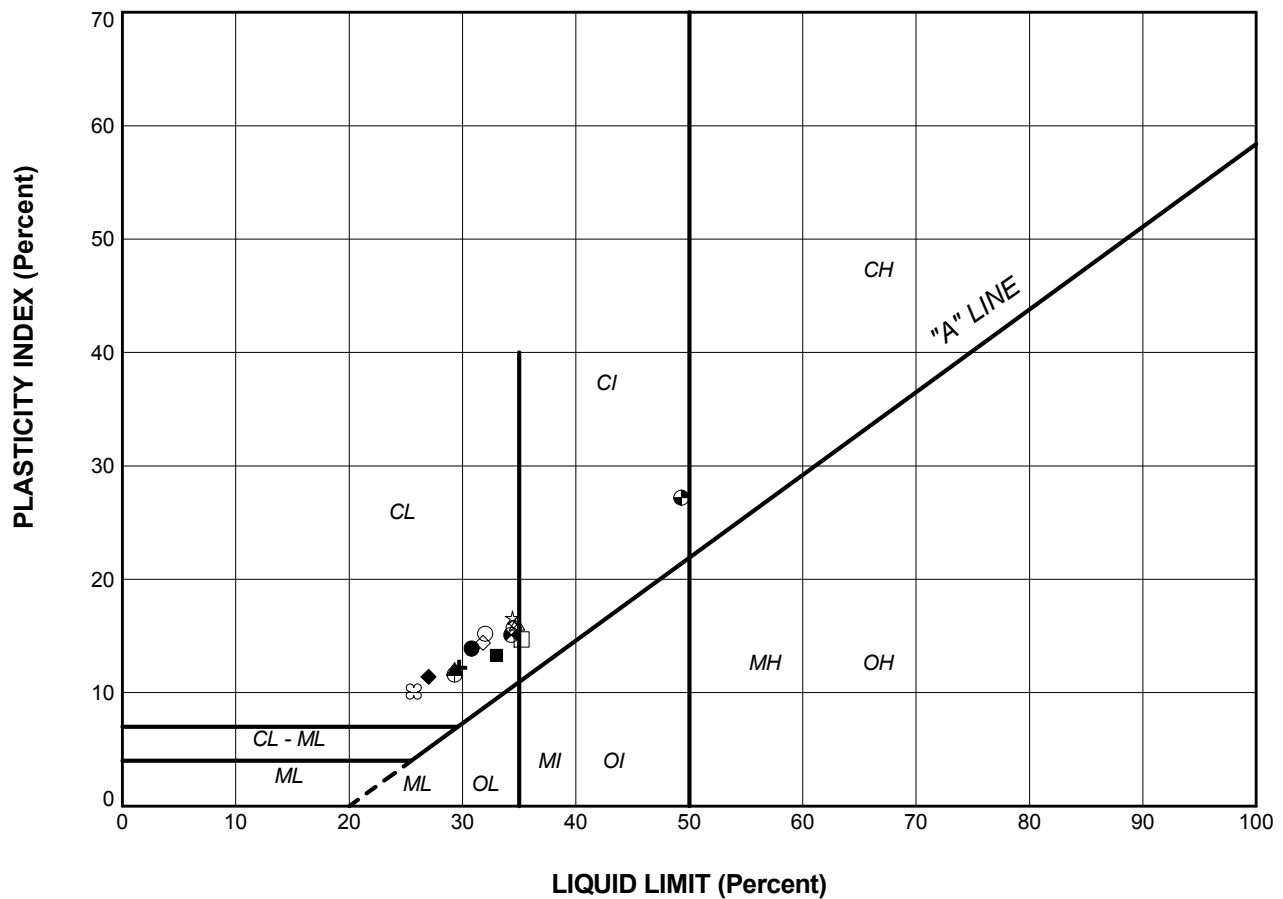




LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	BC3-1	6	31.5	14.4	17.1
■	BC3-1	8	28.3	15.7	12.6
▲	BC3-2	5	36.0	17.7	18.3
+	BC3-2	7	32.3	17.4	14.9
◆	BC3-3	6	31.6	17.7	13.9
◇	BC3-3	8	29.0	15.5	13.5
○	BC4-1	3	30.5	18.0	12.5
△	BC4-2	1b	28.2	17.7	10.5
⊗	BC4-3	3	31.2	18.0	13.2
⊕	H6-1	5b	28.8	16.2	12.6
□	H6-2	6	29.6	18.2	11.4
⊗	H6-2	7	23.8	16.1	7.7
⊕	H6-3	6	28.0	17.3	10.7
☆	H6-5	8	33.8	18.0	15.8
⊗	H6-6	7	30.0	17.4	12.6
⊗	H6-7	8	29.1	15.9	13.2
⊗	H6-7A	1	30.5	17.5	13.0
⊕	H6-8	6b	29.0	16.3	12.7
×	H6-9	7	29.2	17.6	11.6
⊗	H6-10	7	32.1	18.3	13.8
■	H6-11	7	31.2	18.1	13.1
*	H6-12	4	40.8	21.1	19.7
□	H6-13	6	27.5	16.1	11.4
⊗	H6-15	4	33.9	16.9	17.0
⊗	H6-16	4	29.8	17.2	12.6

PROJECT				
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650				
TITLE				
PLASTICITY CHART CLAYEY SILT to SILTY CLAY				
PROJECT No.		10-1191-0044		FILE No.
DRAWN		JJL	May 2013	SCALE
CHECK		SEMC	May 2013	N/A
APPR		JMAC	May 2013	REV.
 Golder Associates SUDBURY, ONTARIO		FIGURE C3.1		



LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H6-17	4	30.8	16.9	13.9
■	H6-18	2	33.0	19.7	13.3
▲	H6-18	4	29.3	17.2	12.1
+	H6-19	3	29.7	17.5	12.2
◆	H6-S1	1	27.0	15.6	11.4
◇	H6-S4	1	31.8	17.4	14.4
○	H6-S5	1	32.0	16.8	15.2
△	H7-1	2	34.8	18.7	16.1
⊗	H7-2	1	34.5	18.8	15.7
⊕	H7-3	3	29.3	17.7	11.6
□	H7-4	2	35.2	20.5	14.7
⊙	H7-5	2	34.3	19.2	15.1
⊛	H7-6	3	49.3	22.1	27.2
☆	H7-8	2	34.4	17.8	16.6
⊗	H7-10	1b	25.7	15.6	10.1

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
PLASTICITY CHART CLAYEY SILT to SILTY CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013	FIGURE C3.2		
APPR	JMAC	Jul 2013			

CONSOLIDATION TEST SUMMARY**FIGURE C4****Pg. 1 of 4****SAMPLE IDENTIFICATION**

Project Number:	10-1191-0044	Sample Number:	1
Borehole Number:	H6-7A	Sample Depth, m:	6.4

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	2		
Date Started	9/12/12		
Date Completed	9/24/10		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.526	Unit Weight, kN/m ³	16.88
Sample Diameter, cm	6.351	Dry Unit Weight, kN/m ³	10.75
Area, cm ²	31.68	Specific Gravity, Measured	2.74
Volume, cm ³	80.02	Solids Height, cm	1.010
Water Content, %	56.91	Volume of Solids, cm ³	32.01
Wet Mass, g	137.70	Volume of Voids, cm ³	48.02
Dry Mass, g	87.76	Degree of Saturation, %	104.0

TEST COMPUTATIONS

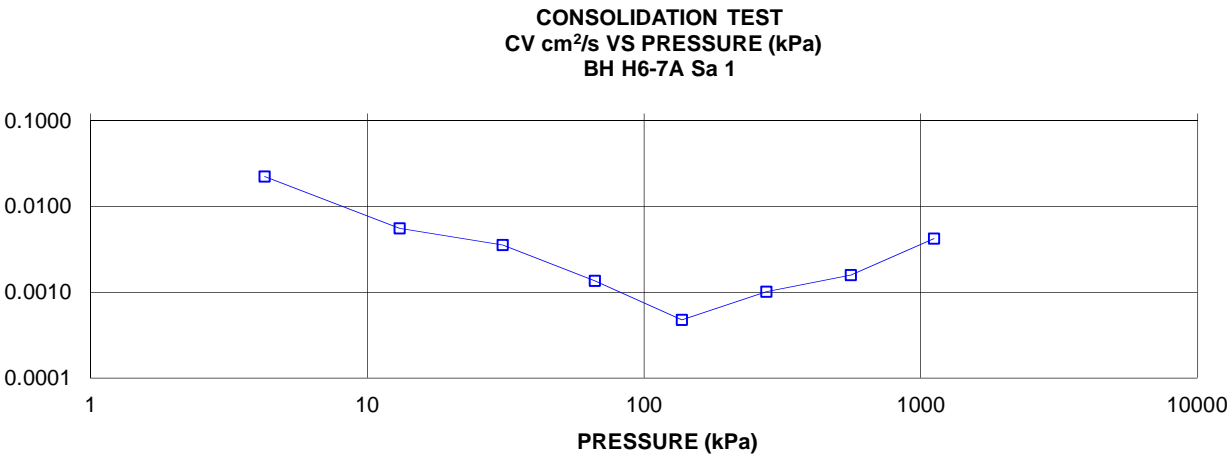
Pressure kPa	Primary Consolidation	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s	Total Work kJ/m ³
0	0	2.526	1.500	2.526					
4	0.09	2.517	1.492	2.522	60	0.0225	8.22E-04	1.81E-06	0.007
13	0.06	2.512	1.486	2.514	240	0.0056	2.47E-04	1.35E-07	0.026
31	0.17	2.495	1.470	2.503	375	0.0035	3.67E-04	1.27E-07	0.171
66	0.35	2.460	1.435	2.478	960	0.0014	3.94E-04	5.23E-08	0.856
137	1.38	2.322	1.298	2.391	2535	0.0005	7.76E-04	3.64E-08	6.546
277	1.25	2.197	1.175	2.260	1058	0.0010	3.52E-04	3.53E-08	17.683
558	0.88	2.109	1.087	2.153	614	0.0016	1.24E-04	1.95E-08	34.407
1117	0.61	2.048	1.027	2.079	217	0.0042	4.32E-05	1.79E-08	58.634
558	-0.05	2.053	1.032	2.051					
137	-0.21	2.074	1.052	2.063					
31	-0.25	2.099	1.077	2.086					
4	-0.27	2.126	1.104	2.112					

Note:

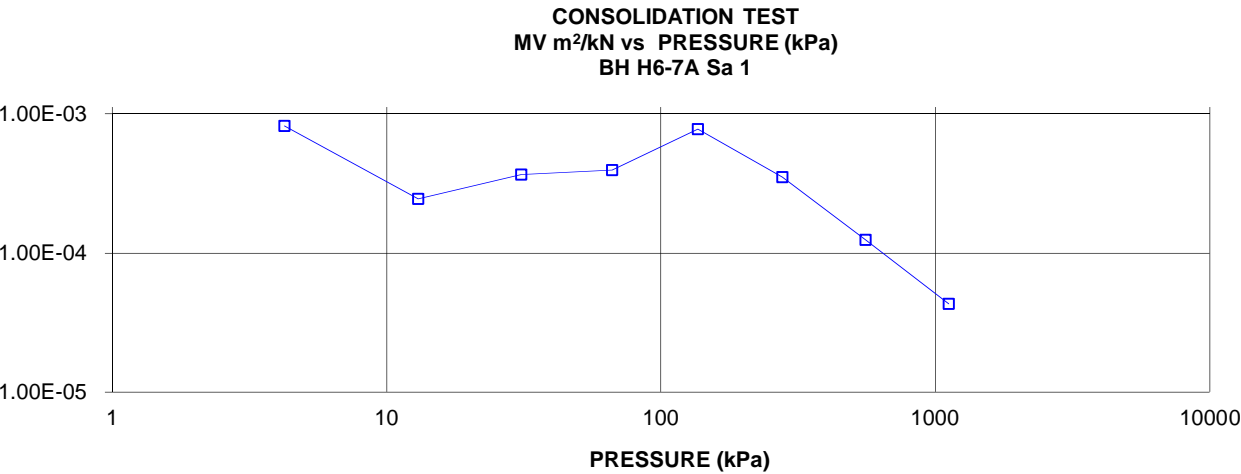
k calculated using α based on t₉₀ values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	2.126	Unit Weight, kN/m ³	17.19
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	12.78
Area, cm ²	31.68	Specific Gravity, Measured	2.74
Volume, cm ³	67.33	Solids Height, cm	1.010
Water Content, %	34.48	Volume of Solids, cm ³	32.01
Wet Mass, g	118.02	Volume of Voids, cm ³	35.33
Dry Mass, g	87.76		

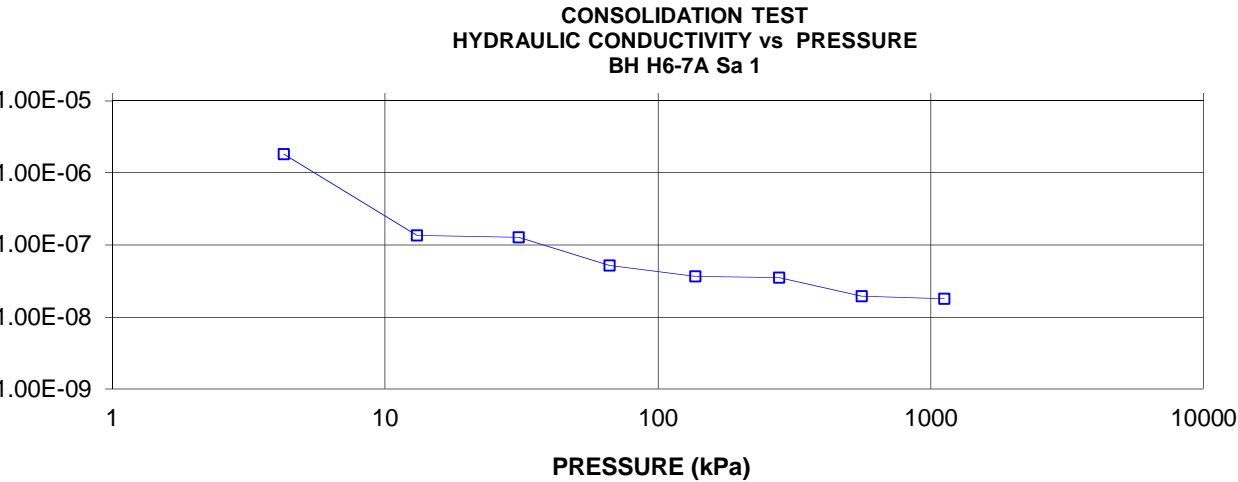
COEFFICIENT OF CONSOLIDATION,
cm²/s



VOLUME COMPRESSIBILITY, m²/kN



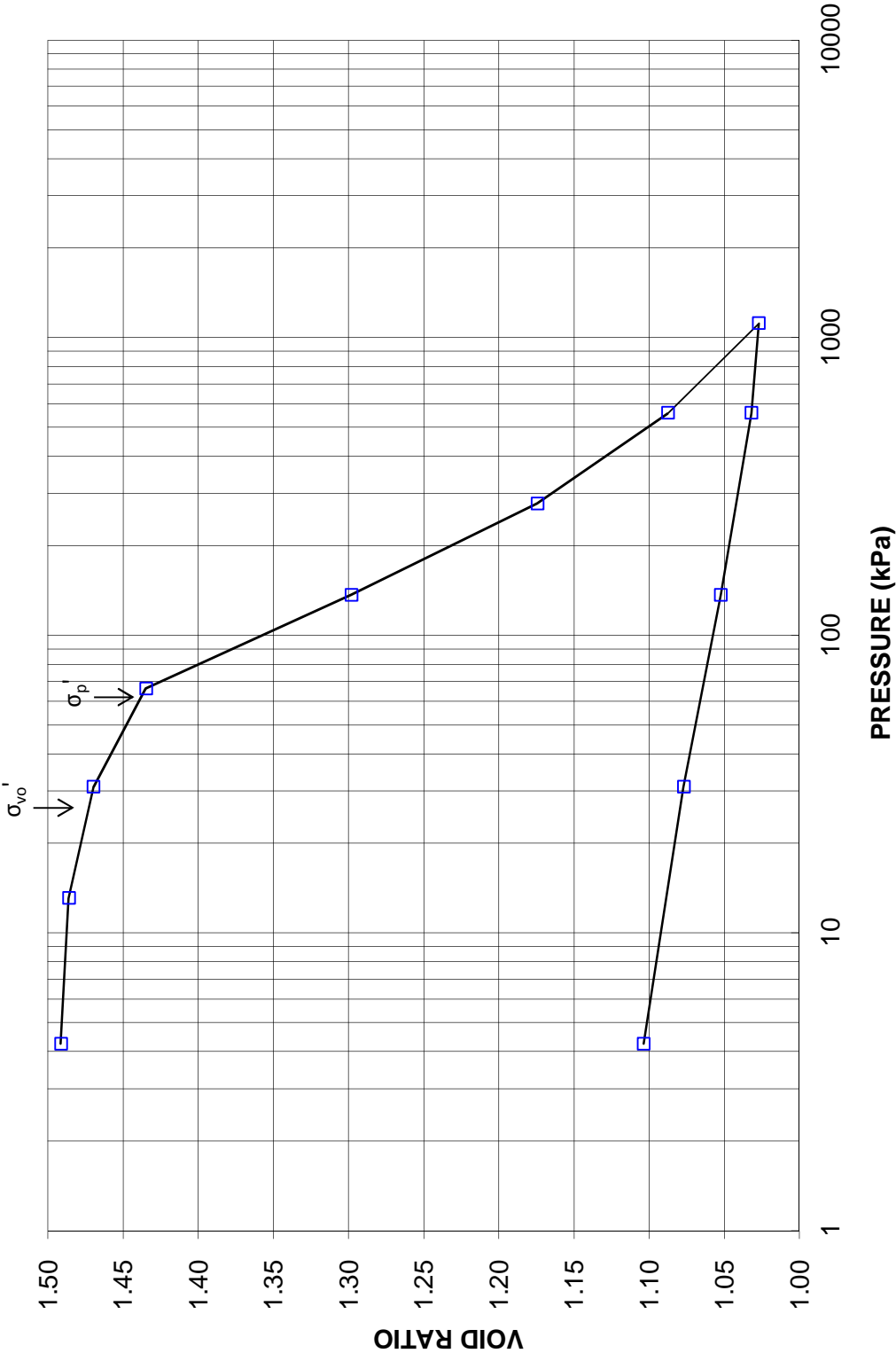
HYDRAULIC CONDUCTIVITY,
cm/s



CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE C4
Pg. 3 of 4

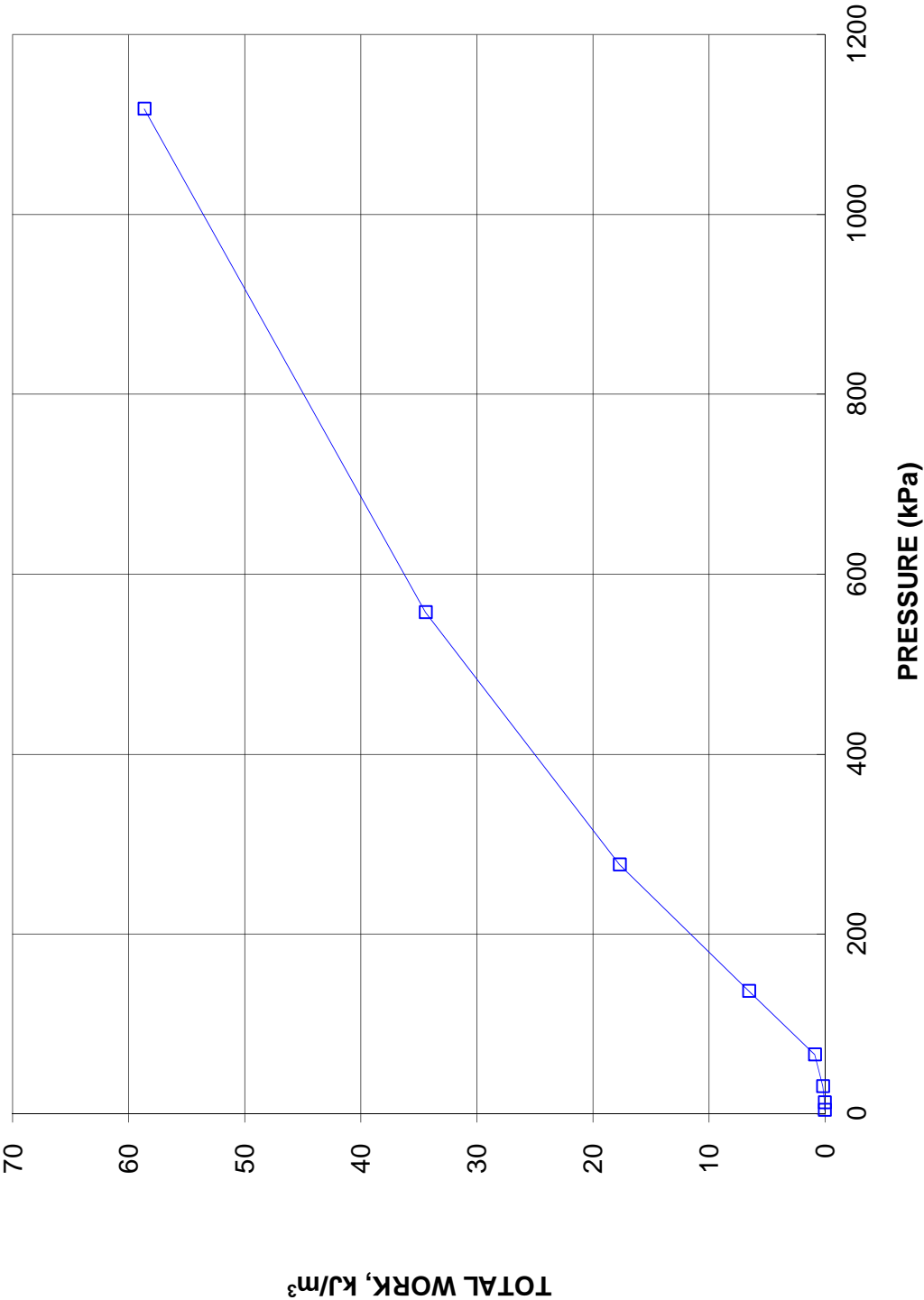
CONSOLIDATION TEST
VOID RATIO vs PRESSURE
BH H6-7A SA 1



CONSOLIDATION TEST
TOTAL WORK VS PRESSURE

FIGURE C4
Pg. 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m^3 vs PRESSURE
BH H6-7A Sa 1



CONSOLIDATION TEST SUMMARY**FIGURE C5**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	1
Borehole Number	H6-S1	Sample Depth, m	4.6-5.0

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	2		
Date Started	5/30/2013		
Date Completed	6/17/2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.53	Unit Weight, kN/m ³	18.92
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	14.32
Area, cm ²	31.71	Specific Gravity, measured	2.76
Volume, cm ³	80.26	Solids Height, cm	1.339
Water Content, %	32.17	Volume of Solids, cm ³	42.45
Wet Mass, g	154.86	Volume of Voids, cm ³	37.80
Dry Mass, g	117.17	Degree of Saturation, %	99.7

TEST COMPUTATIONS

Stress kPa	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s
0.00	2.531	0.890	2.531				
6.03	2.529	0.889	2.530	1	1.36E+00	1.31E-04	1.74E-05
10.63	2.527	0.888	2.528	73	1.86E-02	1.37E-04	2.50E-07
20.64	2.519	0.882	2.523	94	1.44E-02	3.32E-04	4.67E-07
10.63	2.523	0.884	2.521				
6.03	2.525	0.886	2.524				
20.80	2.518	0.881	2.522	60	2.25E-02	1.93E-04	4.24E-07
40.01	2.504	0.870	2.511	305	4.38E-03	2.90E-04	1.25E-07
78.58	2.470	0.845	2.487	296	4.43E-03	3.51E-04	1.53E-07
155.74	2.386	0.782	2.428	505	2.47E-03	4.30E-04	1.04E-07
308.37	2.298	0.716	2.342	265	4.39E-03	2.27E-04	9.77E-08
616.10	2.219	0.658	2.259	135	8.01E-03	1.01E-04	7.94E-08
1233.99	2.149	0.605	2.184	167	6.05E-03	4.50E-05	2.67E-08
2469.94	2.080	0.553	2.114	109	8.69E-03	2.21E-05	1.88E-08
1233.99	2.081	0.555	2.080				
308.37	2.102	0.570	2.092				
78.58	2.126	0.588	2.114				
20.64	2.149	0.605	2.137				
6.03	2.165	0.617	2.157				

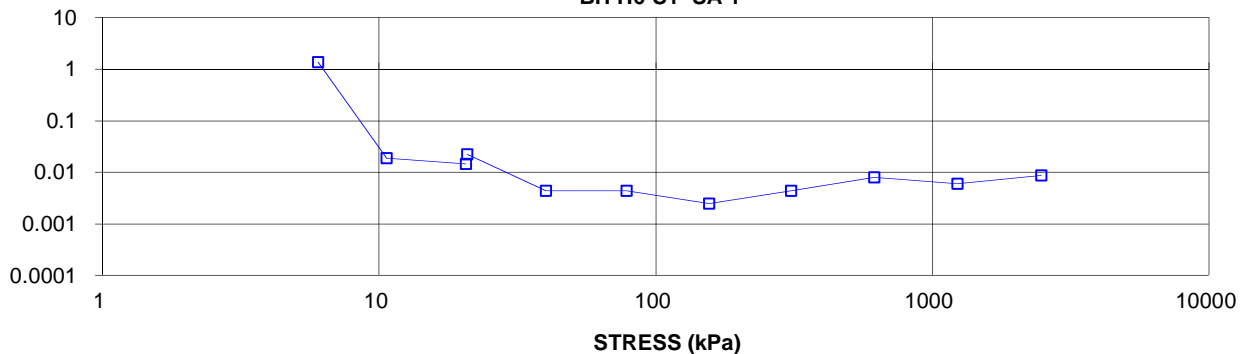
Specimen taken 28 to 36cm from top of the tube.
k calculated using cv based on t₉₀ values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.17	Unit Weight, kN/m ³	20.48
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	16.74
Area, cm ²	31.71	Specific Gravity, measured	2.76
Volume, cm ³	68.66	Solids Height, cm	1.339
Water Content, %	22.39	Volume of Solids, cm ³	42.45
Wet Mass, g	143.40	Volume of Voids, cm ³	26.20
Dry Mass, g	117.17		

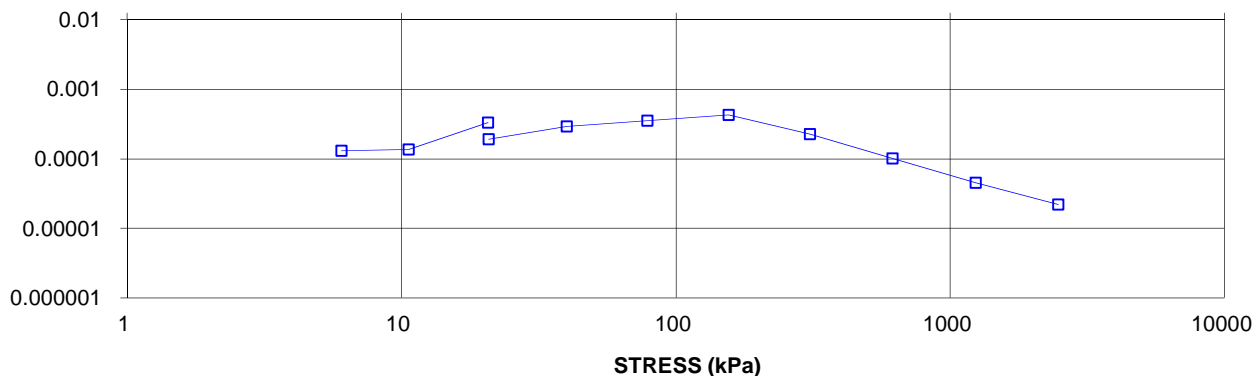
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS STRESS (kPa)
BH H6-S1 SA 1



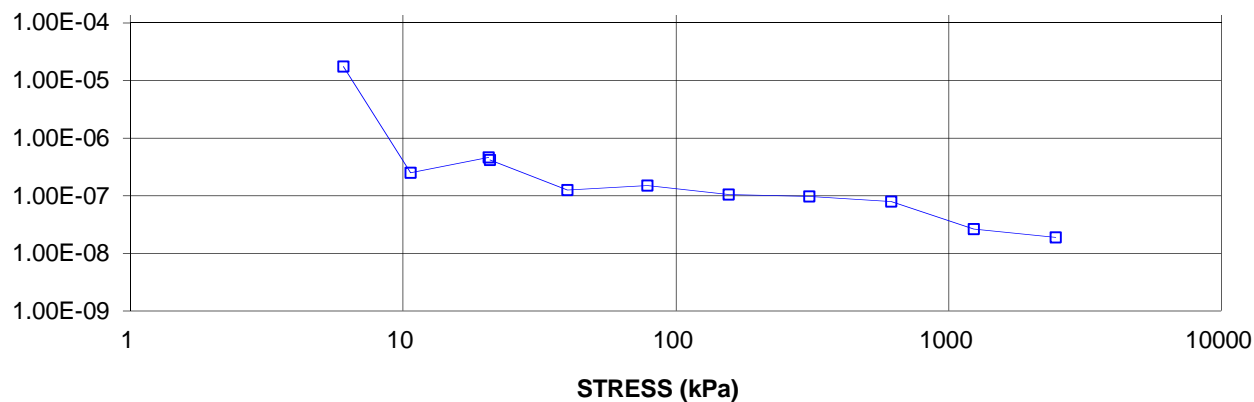
VOLUME COMPRESSIBILITY, m²/kN

CONSOLIDATION TEST
MV m²/kN vs STRESS (kPa)
BH H6-S1 SA 1



HYDRAULIC CONDUCTIVITY,
cm/s

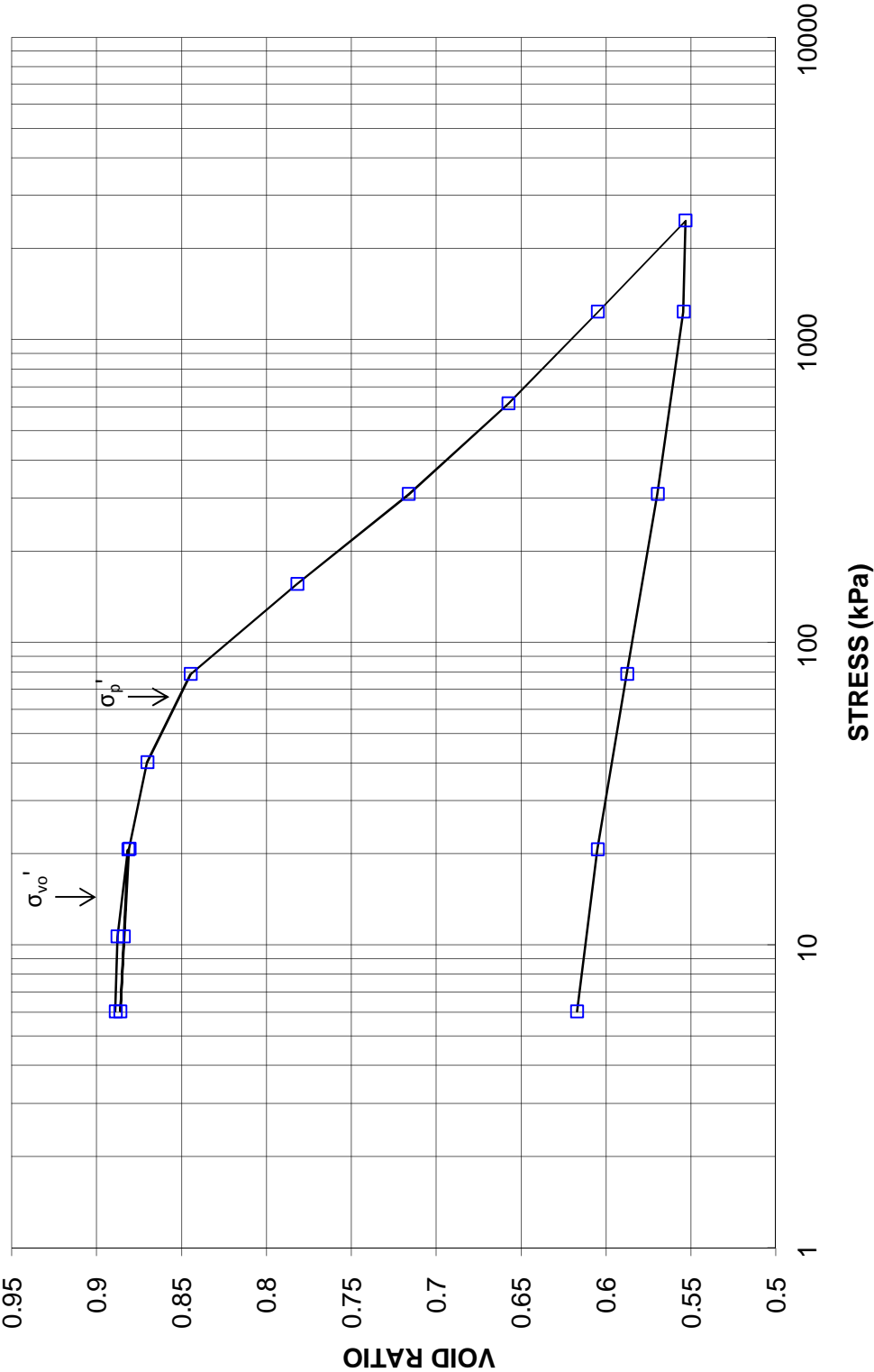
CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs STRESS
BH H6-S1 SA 1



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE C5
Pg. 3 of 4

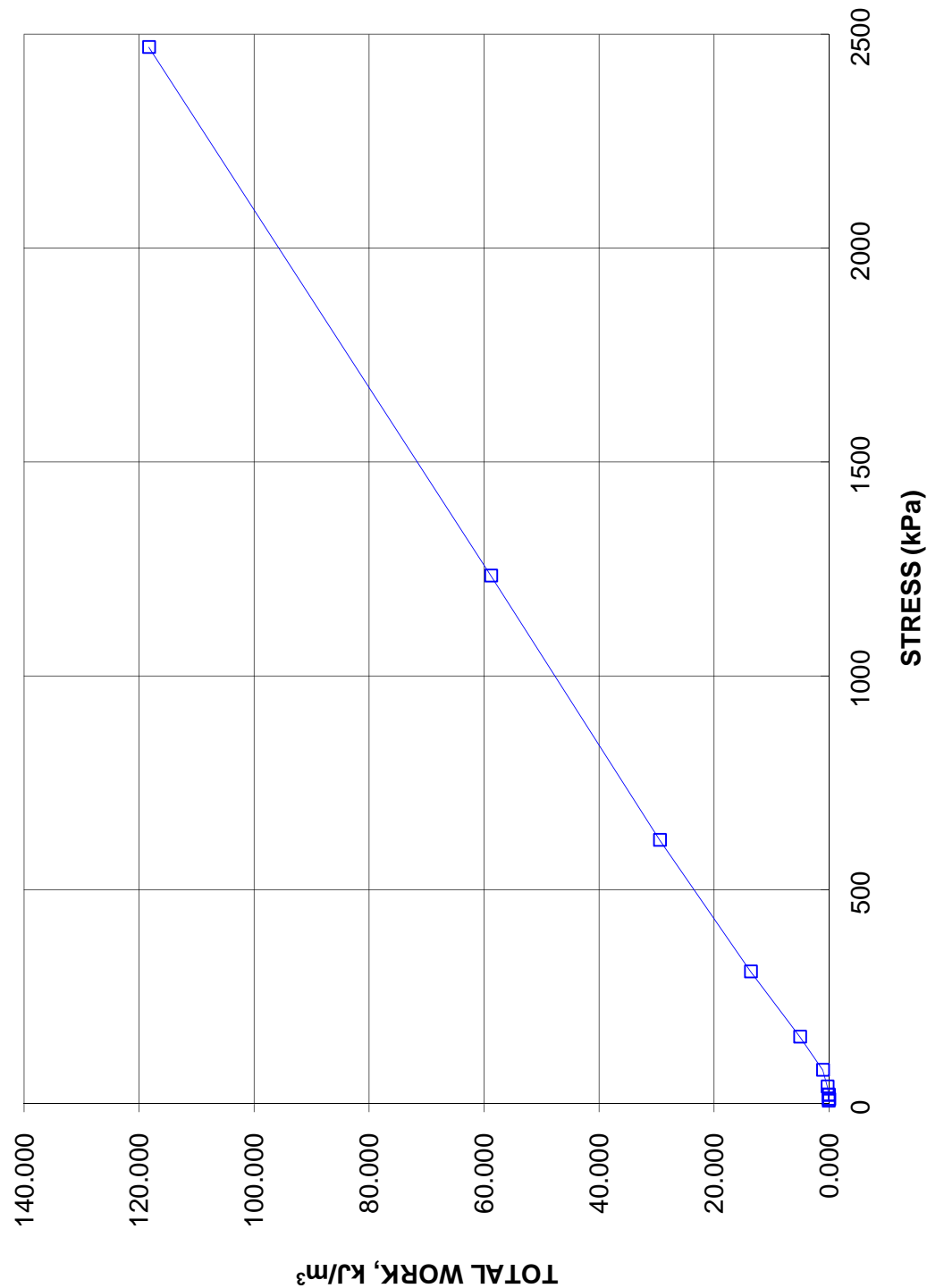
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH H6-S1 SA 1



CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE C5
Pg. 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m^3 vs STRESS
BH H6-S1 SA 1



**CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 1 OF 4**

FIGURE C6

TEST STAGE	A	B
BOREHOLE NUMBER	H6-S2	H6-S2
SAMPLE	1	1
DEPTH, m	4.57-5.03	4.57-5.03
SPECIMEN DIAMETER, cm	5.00	5.00
SPECIMEN HEIGHT, cm	10.11	10.08
NATURAL WATER CONTENT, %	29.3	31.8
DRY DENSITY, Mg/m ³	1.54	1.48
WATER CONTENT AFTER SATURATION, %	30.6	33.2
CELL PRESSURE, σ_3 , kPa	165.0	235.0
BACK PRESSURE, kPa	135.0	135.0
PORE PRESSURE PARAMETER "B"	0.99	0.97
CONSOLIDATION PRESSURE, σ_c , kPa	30.0	100.0
VOLUMETRIC STRAIN DURING CONSOLIDATION, %	3.8	4.3
WATER CONTENT AFTER CONSOLIDATION, %	28.2	30.3
AVERAGE RATE OF STRAIN, %/hr	0.5	0.5
TIME TO FAILURE, HOURS	27.1	22.2
WATER CONTENT AFTER TEST, %	27.5	28.4
MAX. DEVIATOR STRESS, $(\sigma_1 - \sigma_3)$, kPa	117.8	156.1
AXIAL STRAIN AT $(\sigma_1 - \sigma_3)$ maximum, %	13.5	11.1
MAX EFFECTIVE PRINCIPAL STRESS RATIO, (σ'_1 / σ'_3) maximum	3.8	3.5
DEVIATOR STRESS AT (σ'_1 / σ'_3) maximum, kPa	78.0	148.4
AXIAL STRAIN AT (σ'_1 / σ'_3) maximum, %	2.8	7.6
PORE PRESSURE PARAMETER, Af, AT $(\sigma_1 - \sigma_3)$ maximum	-0.13	0.24
PORE PRESSURE PARAMETER, Af, AT (σ'_1 / σ'_3) maximum	0.03	0.28
FILTER DRAINS USED, y/n	y	y
TEST NOTES:		
<p style="text-align: center;">Specimen A taken 10-23 cm from top of tube. Specimen B taken 23-36 cm from top of tube.</p>		
FAILURE PLANE NUMBER	1.0	1.0
ANGLE OF FAILURE, DEGREES	70.0	70.0

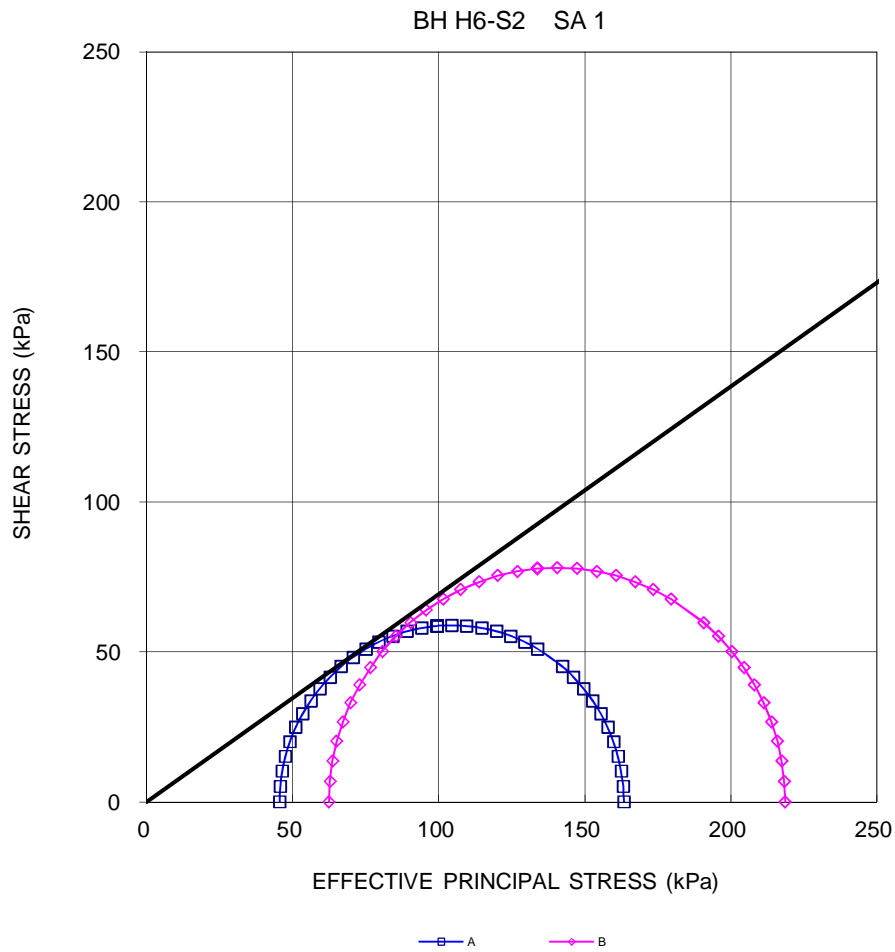
Date: 6/3/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 2 OF 4

FIGURE C6



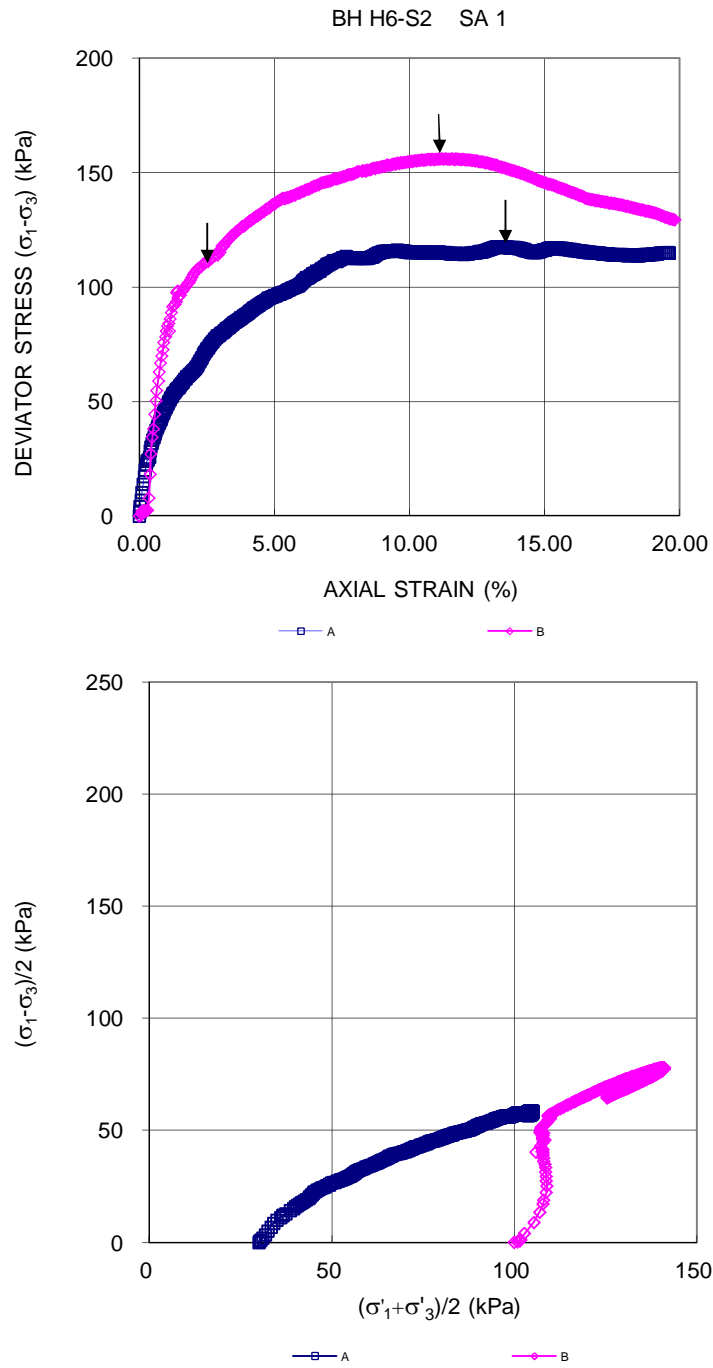
Date: 6/3/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 3 OF 4

FIGURE C6



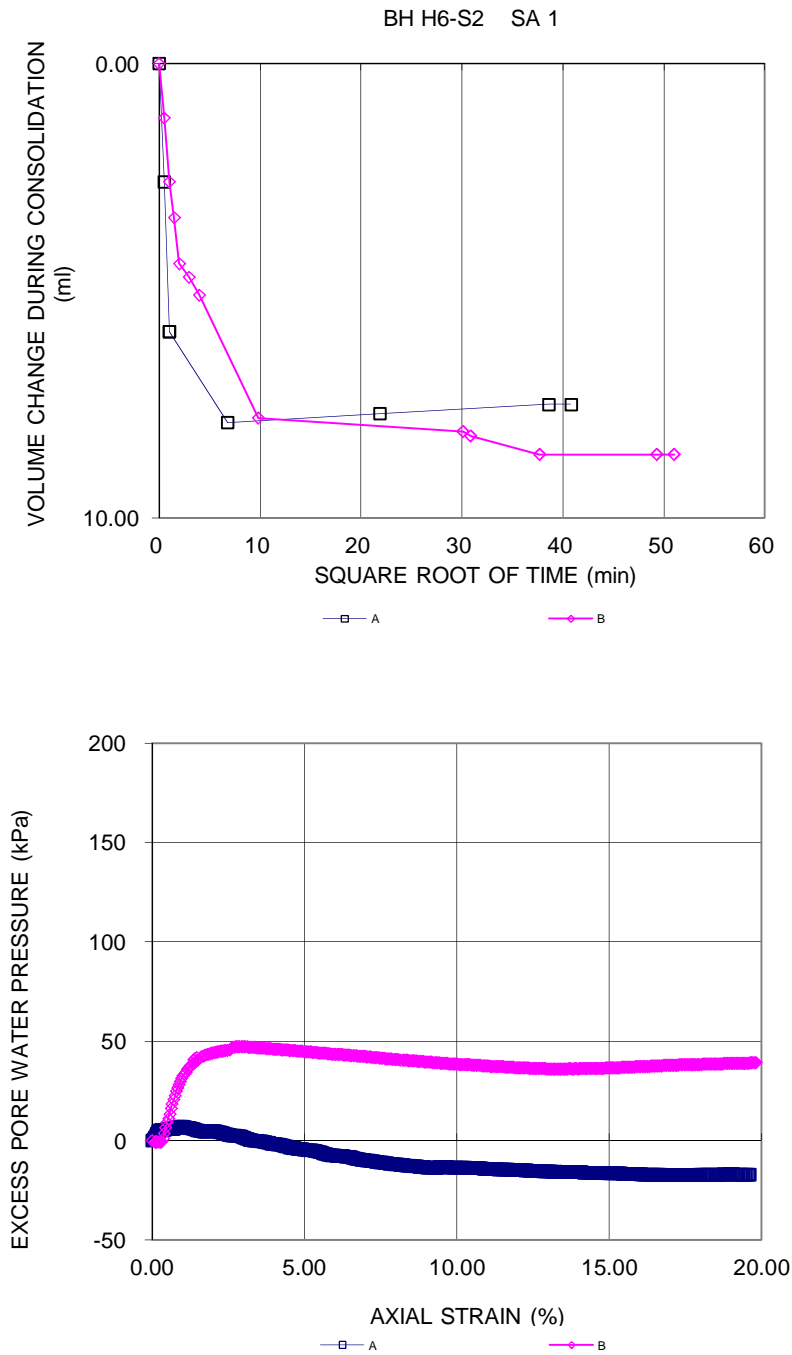
Date: 6/3/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

**CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 4 OF 4**

FIGURE C6



Date: 6/3/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

**CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 1 OF 4**

FIGURE C7

TEST STAGE	A	B	C
BOREHOLE NUMBER	H6-S5	H6-S5	H6-S4
SAMPLE	1	1	1
DEPTH, m	1.52-1.98	1.52-1.98	2.74-3.35
SPECIMEN DIAMETER, cm	5.03	4.98	4.96
SPECIMEN HEIGHT, cm	10.09	10.11	10.09
NATURAL WATER CONTENT, %	29.3	28.7	29.2
DRY DENSITY, Mg/m ³	1.53	1.54	1.54
WATER CONTENT AFTER SATURATION, %	32.0	30.3	29.3
CELL PRESSURE, σ_3 , kPa	375.0	460.0	415.0
BACK PRESSURE, kPa	275.0	275.0	65.0
PORE PRESSURE PARAMETER "B"	0.96	0.98	0.96
CONSOLIDATION PRESSURE, σ_c , kPa	100.0	185.0	350.0
VOLUMETRIC STRAIN DURING CONSOLIDATION, %	2.8	3.2	7.0
WATER CONTENT AFTER CONSOLIDATION, %	32.2	28.2	24.8
AVERAGE RATE OF STRAIN, %/hr	0.5	0.5	0.5
TIME TO FAILURE, HOURS	16.1	17.3	20.3
WATER CONTENT AFTER TEST, %	28.4	26.2	25.2
MAX. DEVIATOR STRESS, $(\sigma_1 - \sigma_3)$, kPa	207.7	248.9	332.7
AXIAL STRAIN AT $(\sigma_1 - \sigma_3)$ maximum, %	8.0	8.6	10.1
MAX EFFECTIVE PRINCIPAL STRESS RATIO, (σ'_1 / σ'_3) maximum	3.5	3.6	3.7
DEVIATOR STRESS AT (σ'_1 / σ'_3) maximum, kPa	183.8	246.1	324.5
AXIAL STRAIN AT (σ'_1 / σ'_3) maximum, %	3.4	6.9	7.2
PORE PRESSURE PARAMETER, Af, AT $(\sigma_1 - \sigma_3)$ maximum	0.12	0.36	0.67
PORE PRESSURE PARAMETER, Af, AT (σ'_1 / σ'_3) maximum	0.21	0.37	0.70
FILTER DRAINS USED, y/n	y	y	y
TEST NOTES:			
<p style="margin-left: 40px;">Specimen A taken 14-27 cm from top of tube.</p> <p style="margin-left: 40px;">Specimen B taken 27-40 cm from top of tube.</p> <p style="margin-left: 40px;">Specimen C taken 21-34 cm from top of tube.</p>			
FAILURE PLANE NUMBER	1.0	1.0	-
ANGLE OF FAILURE, DEGREES	70.0	65.0	bulged

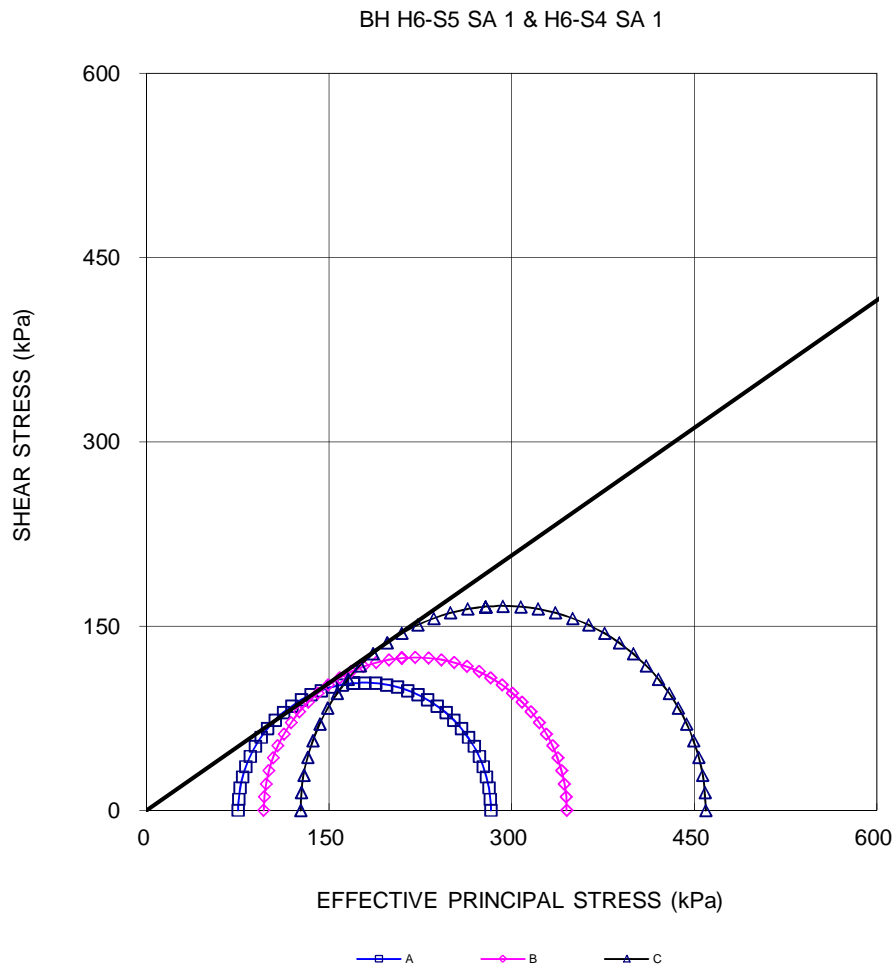
Date: 6/10/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 2 OF 4

FIGURE C7



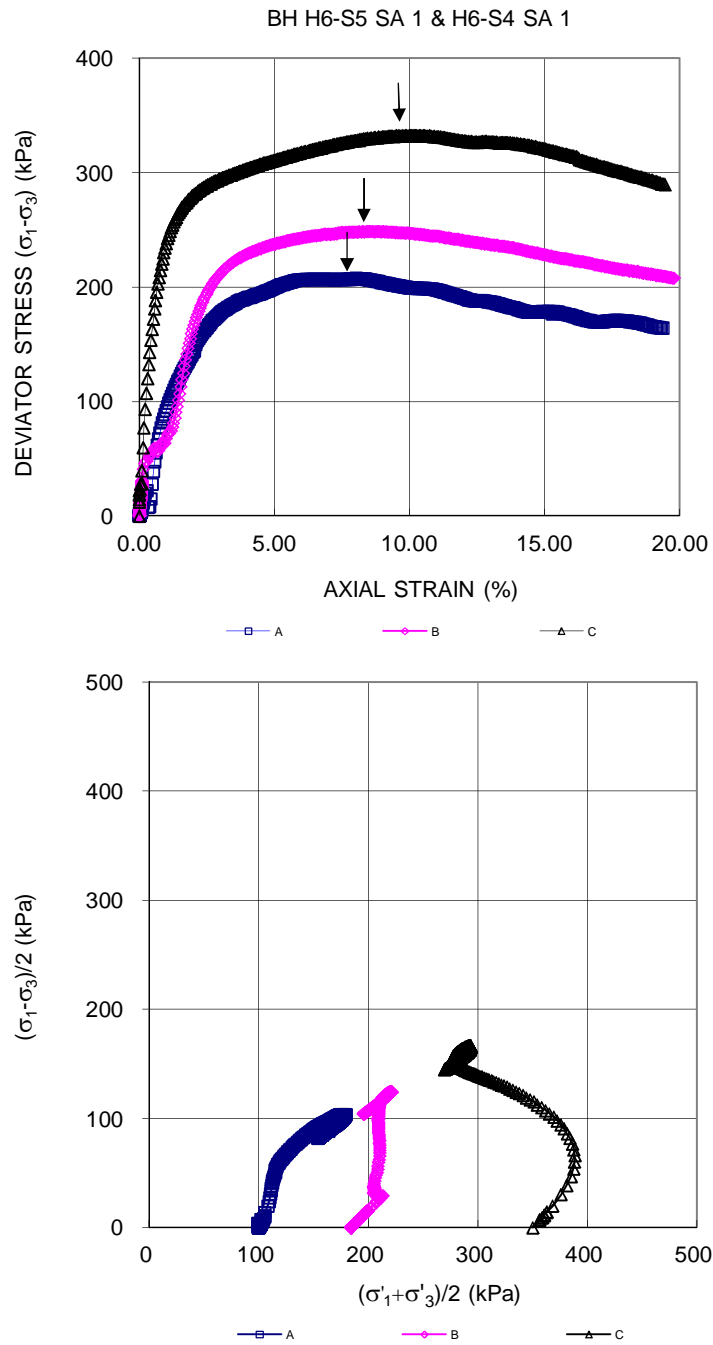
Date: 6/10/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

**CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 3 OF 4**

FIGURE C7



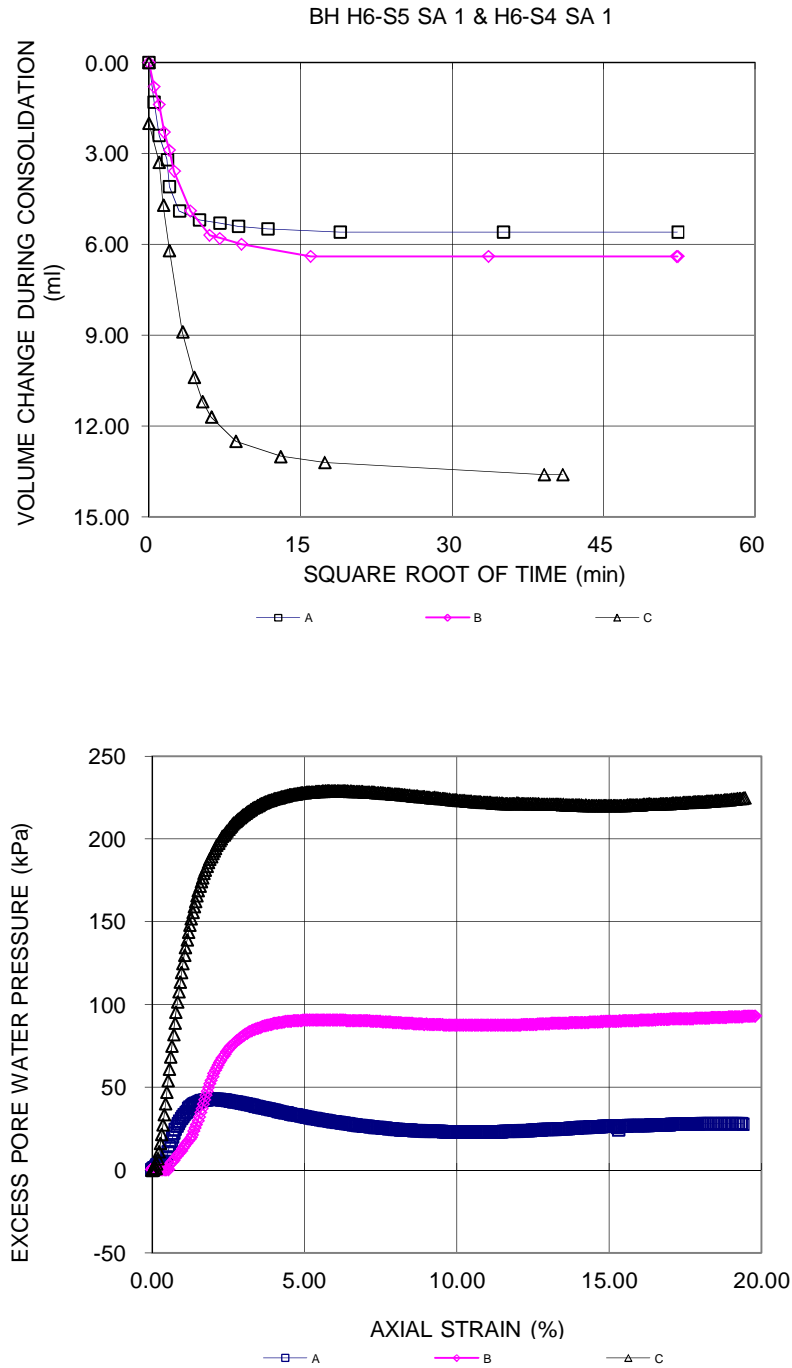
Date: 6/10/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

**CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 4 OF 4**

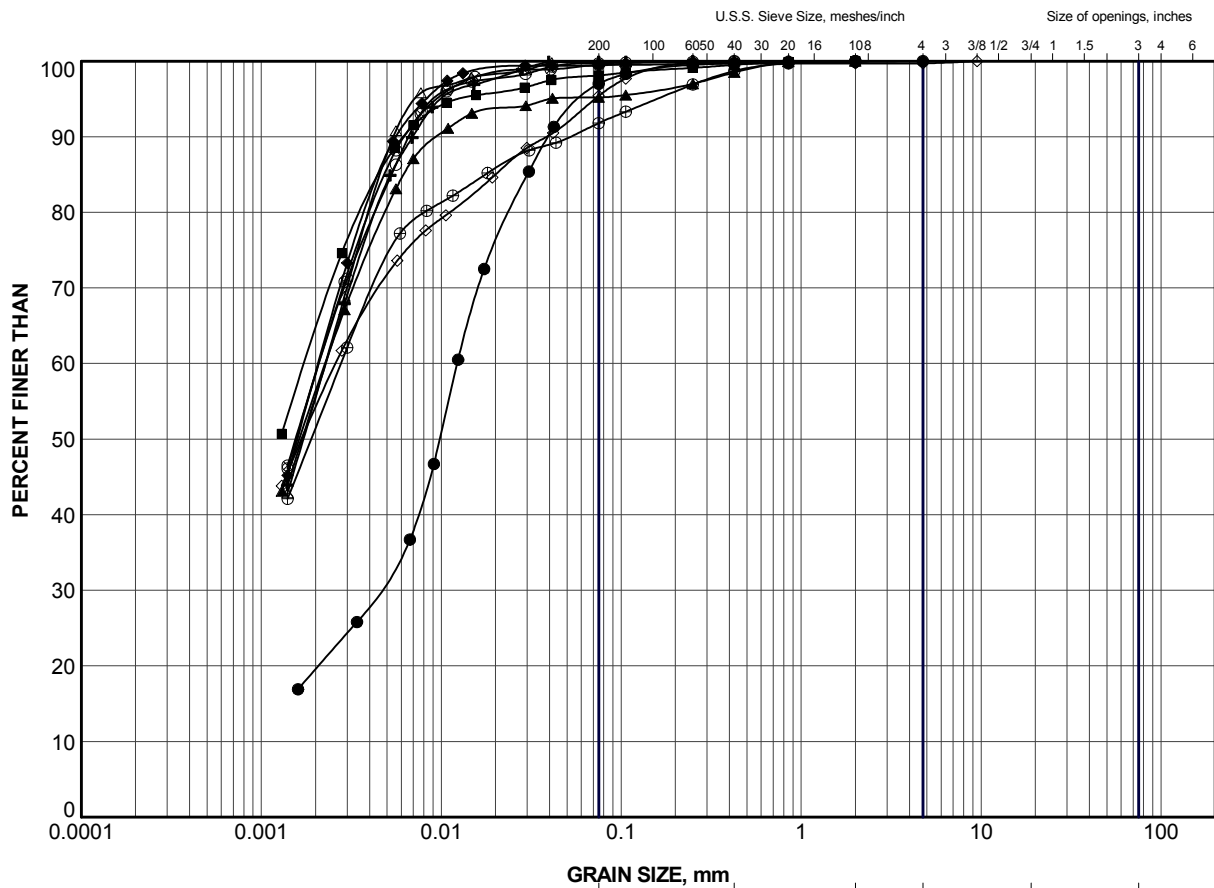
FIGURE C7



Date: 6/10/2013
Project No. 10-1191-0044

Golder Associates


Prepared By: LH
Checked By: MT

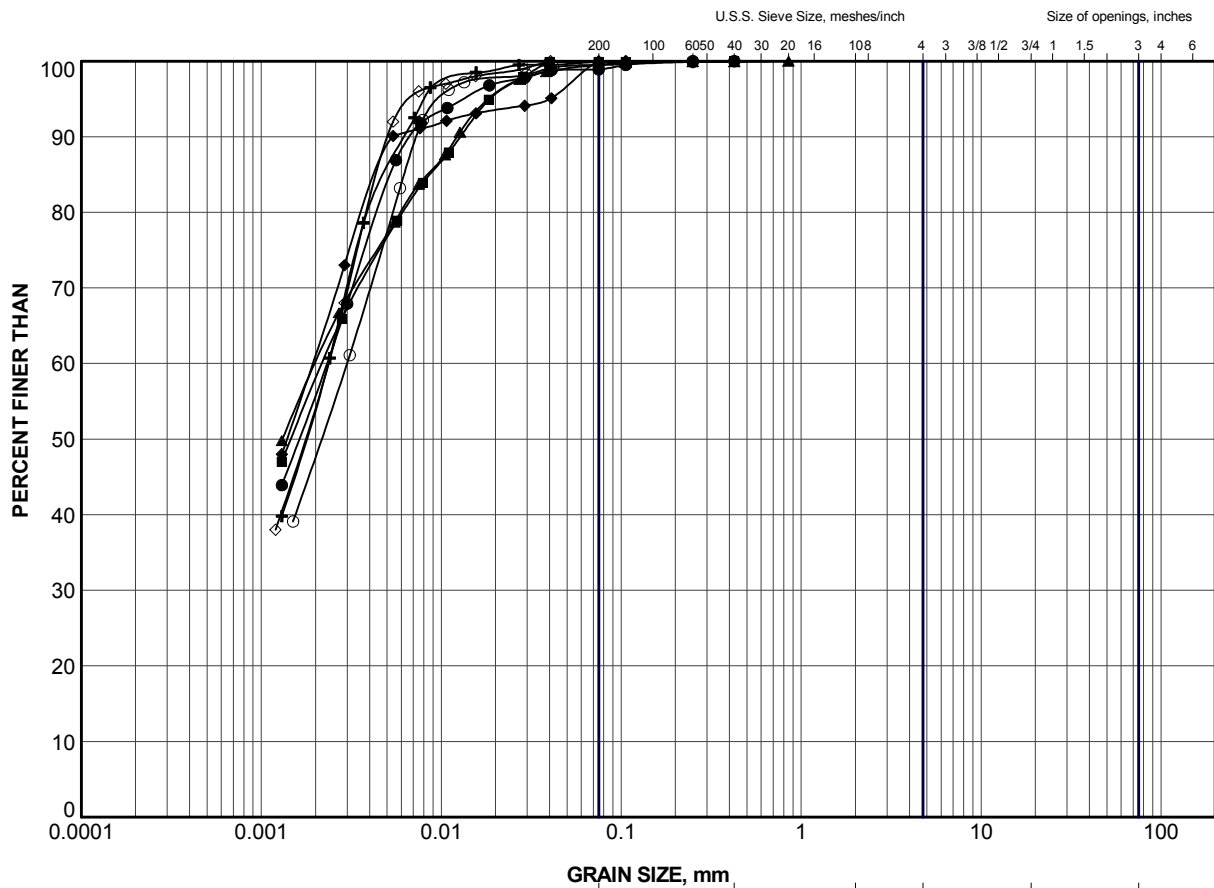


CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC2-1	4a	306.3
■	BC4-1	4	301.8
▲	BC4-1	6	298.8
+	BC4-2	5	299.2
◆	H6-2	9	301.1
◇	H6-3	9	301.3
○	H6-4	9	301.2
△	H6-5	12	296.5
⊗	H6-6	12	297.9
⊕	H6-8	10	299.5

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE C8.1		



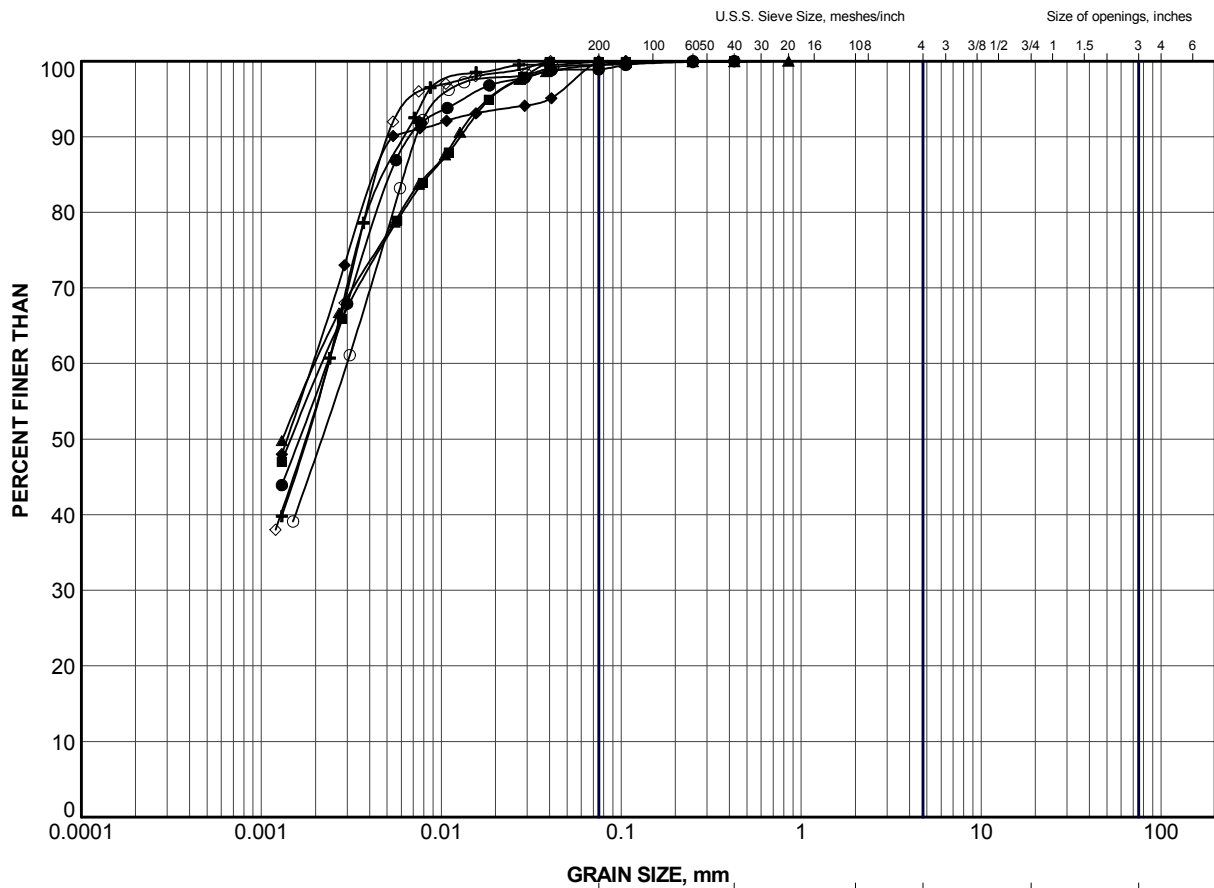
GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H6-9	9	301.0
■	H6-13	8	300.0
▲	H6-15	6	301.9
+	H6-19	5	300.8
◆	H7-3	6	300.2
◇	H7-7	5	300.5
○	H7-15	2	306.4

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
			FIGURE C8.2		




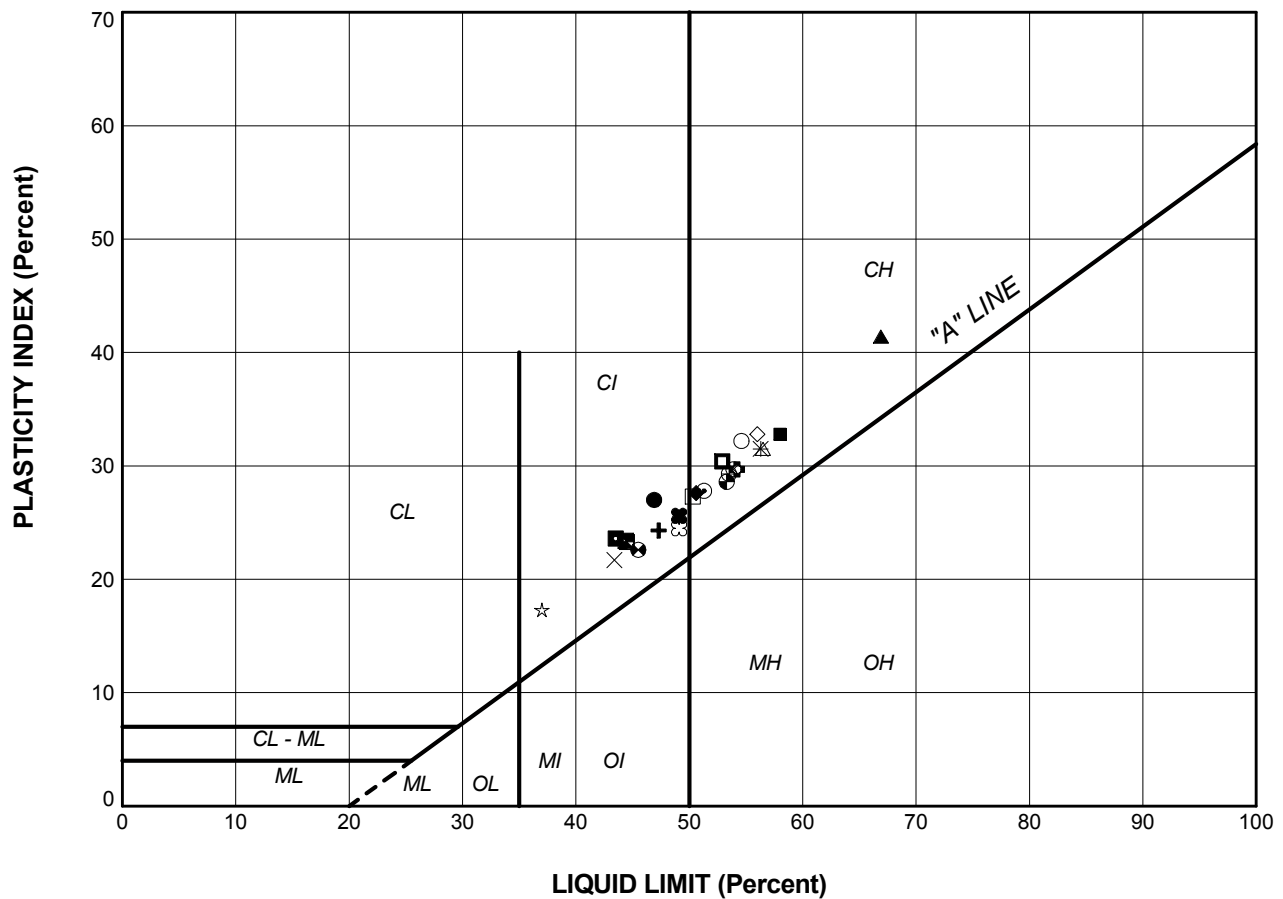


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H6-9	9	301.0
■	H6-13	8	300.0
▲	H6-15	6	301.9
+	H6-19	5	300.8
◆	H7-3	6	300.2
◇	H7-7	5	300.5
○	H7-15	2	306.4

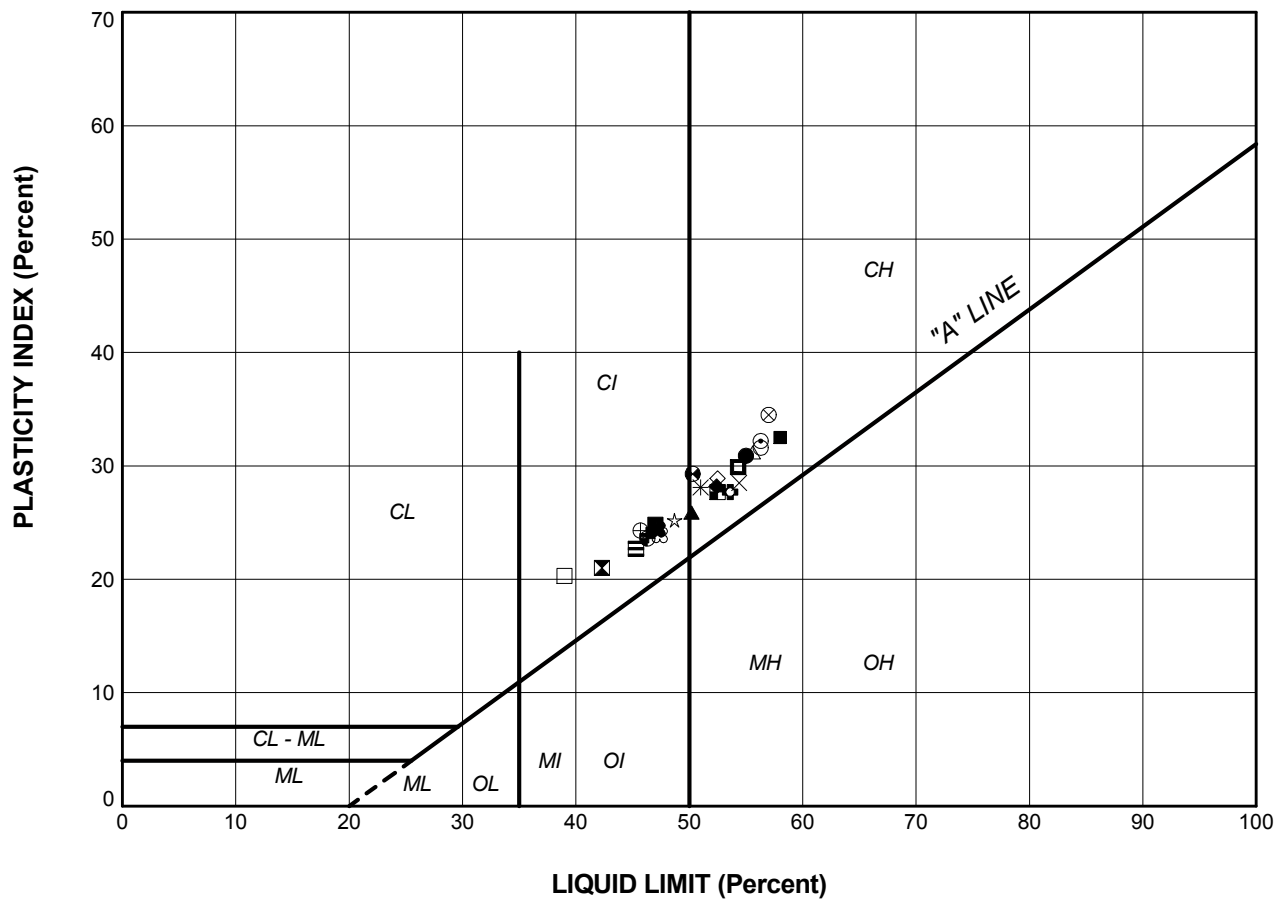
PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE C8.2		



LEGEND


SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	BC2-1	3	46.9	19.9	27.0
■	BC2-2	7a	58.0	25.2	32.8
▲	BC3-1	10	66.9	25.5	41.4
+	BC3-2	9	47.3	23.0	24.3
◆	BC3-2	11	50.6	23.0	27.6
◇	BC3-3	10	56.0	23.2	32.8
○	BC3-3	12	54.6	22.4	32.2
△	BC4-1	4	56.5	25.0	31.5
⊗	BC4-1	5	53.9	24.2	29.7
⊕	BC4-1	6	53.5	24.2	29.3
□	BC4-1	7	50.3	23.0	27.3
⊙	BC4-2	3	45.5	22.9	22.6
⊛	BC4-2	5	53.3	24.7	28.6
☆	BC4-2	7	37.0	19.7	17.3
⊘	BC4-3	5	49.1	24.6	24.5
⊗	H6-1	7	44.4	21.0	23.4
⊕	H6-1	9	51.3	23.5	27.8
⊛	H6-1	11	54.2	24.5	29.7
×	H6-2	9	43.4	21.7	21.7
⊗	H6-2	11	49.1	23.5	25.6
■	H6-3	9	43.5	19.9	23.6
*	H6-3	10	56.3	24.8	31.5
□	H6-3	12	52.9	22.5	30.4
■	H6-4	9	44.5	21.2	23.3

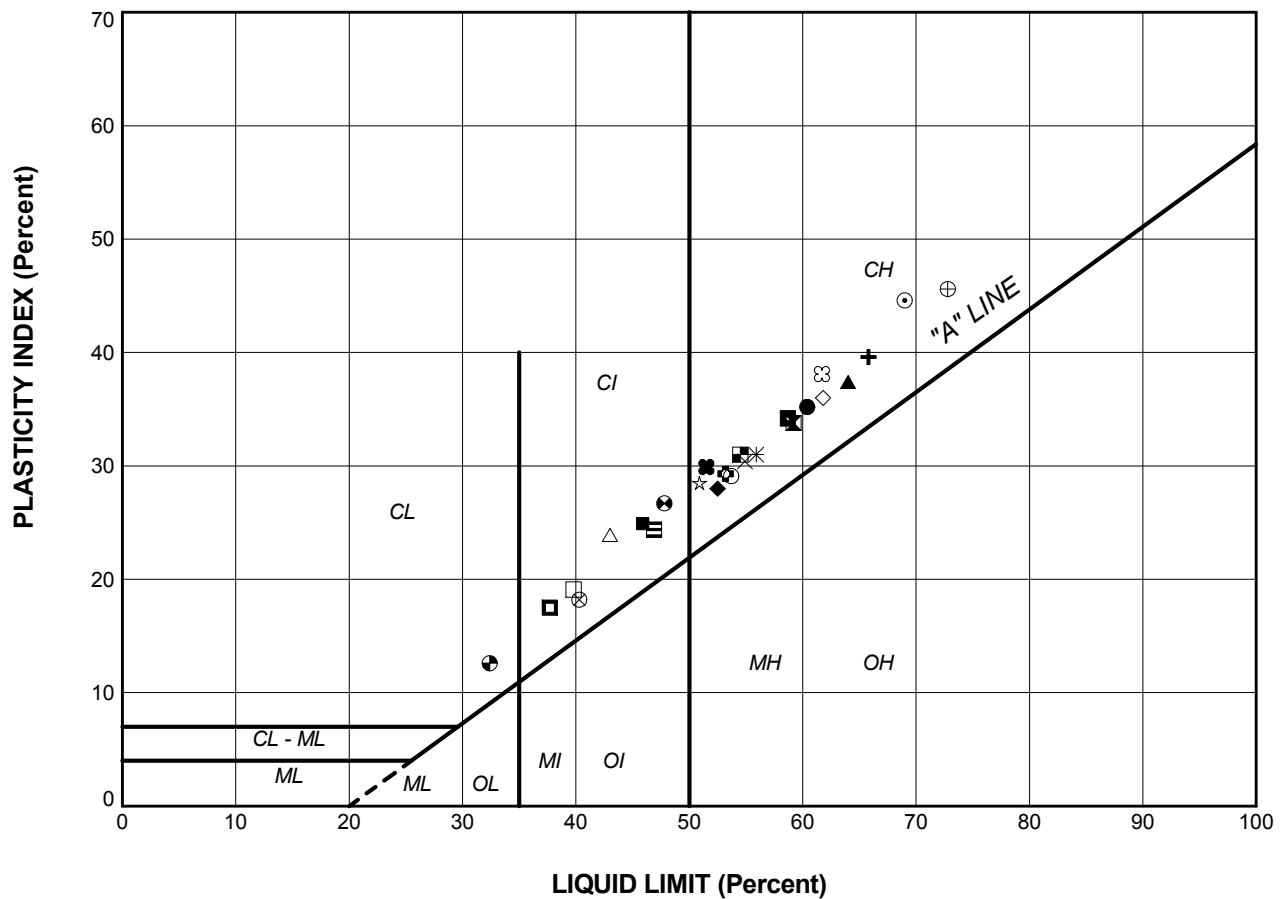
PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
PLASTICITY CHART SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013	FIGURE C9.1		
APPR	JMAC	Jul 2013			



LEGEND


SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H6-4	12	55.0	24.1	30.9
■	H6-5	10	58.0	25.5	32.5
▲	H6-5	12	50.2	24.3	25.9
+	H6-6	9	46.3	22.4	23.9
◆	H6-6	12	52.4	24.2	28.2
◇	H6-6	14	52.5	23.6	28.9
○	H6-7	10	56.3	24.7	31.6
△	H6-7	12	55.6	24.4	31.2
⊗	H6-7A	4	57.0	22.5	34.5
⊕	H6-8	8	45.7	21.4	24.3
□	H6-8	10	39.0	18.7	20.3
⊗	H6-8	13	50.3	21.0	29.3
⊕	H6-9	9	46.3	22.7	23.6
☆	H6-9	11	48.7	23.5	25.2
⊗	H6-9	13	47.4	23.5	23.9
⊗	H6-10	9	42.3	21.3	21.0
⊕	H6-10	10	56.3	24.1	32.2
⊕	H6-10	12	53.6	25.9	27.7
×	H6-11	10	54.4	25.9	28.5
⊗	H6-11	12	47.2	22.8	24.4
■	H6-12	7	47.0	22.2	24.8
*	H6-12	11	51.0	22.9	28.1
□	H6-13	8	54.3	24.4	29.9
⊗	H6-13	10	52.5	24.8	27.7
⊗	H6-14	6	45.3	22.6	22.7

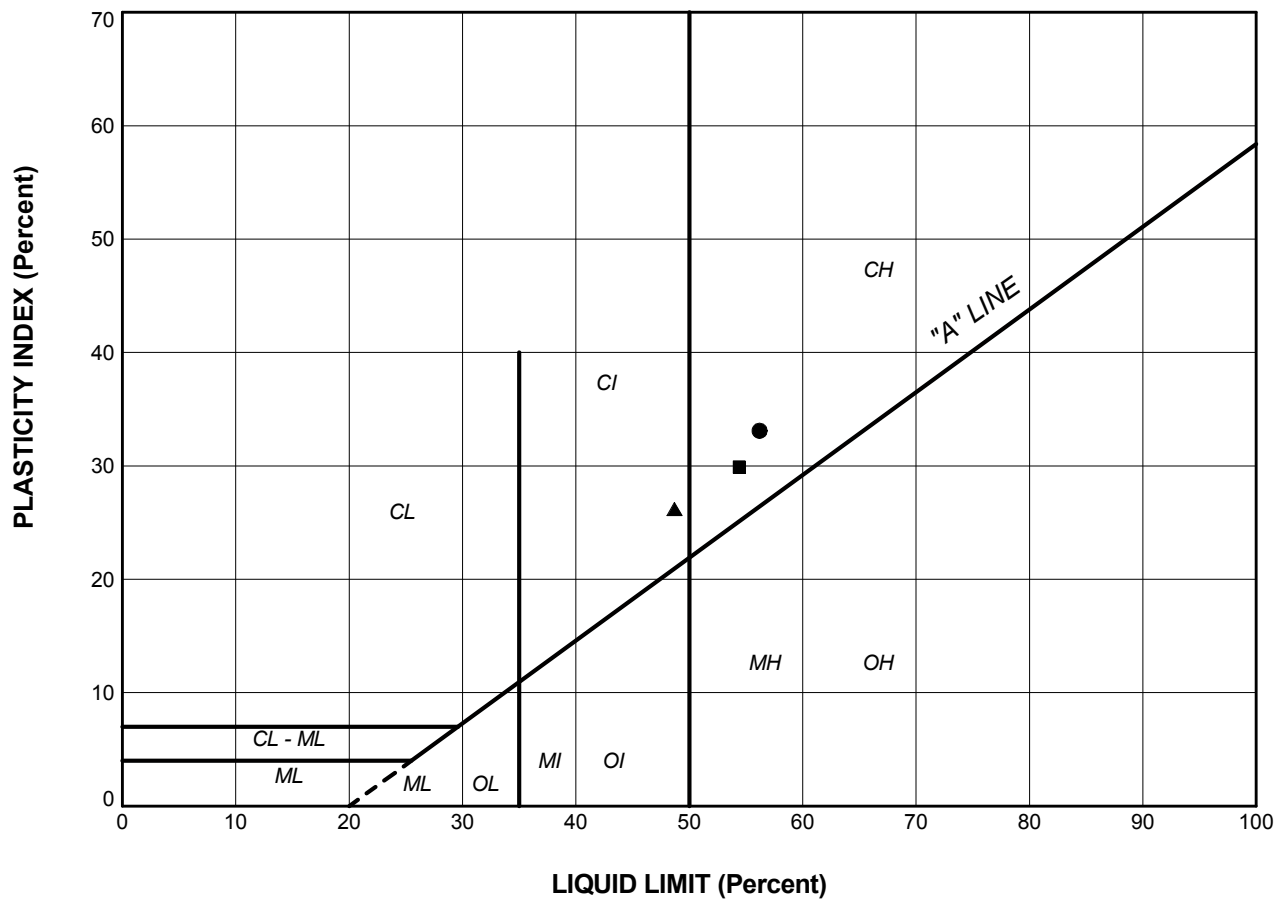
PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
PLASTICITY CHART SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE C9.2		



LEGEND


SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H6-14	8	60.4	25.2	35.2
■	H6-15	6	45.9	21.0	24.9
▲	H6-16	6	64.0	26.6	37.4
+	H6-17	6	65.8	26.2	39.6
◆	H6-17	7	52.5	24.5	28.0
◇	H6-18	6	61.8	25.8	36.0
○	H6-19	5	53.7	24.6	29.1
△	H6-S1	2	43.0	19.1	23.9
⊗	H6-S1	4a	40.3	22.1	18.2
⊕	H6-S1	4b	72.8	27.2	45.6
□	H6-S2	2	39.8	20.7	19.1
⊗	H6-S2	4a	47.8	21.1	26.7
⊕	H6-S2	4b	32.4	19.8	12.6
☆	H7-1	4	50.9	22.4	28.5
⊗	H7-1	6	61.7	23.6	38.1
⊗	H7-2	4	59.2	25.4	33.8
⊕	H7-3	6	69.0	24.4	44.6
⊕	H7-3	8	53.2	23.9	29.3
×	H7-4	4	54.9	24.5	30.4
⊗	H7-5	4	51.5	21.6	29.9
■	H7-5	6	58.7	24.5	34.2
*	H7-6	5	55.9	24.9	31.0
□	H7-6	7	37.7	20.2	17.5
■	H7-7	5	54.5	23.5	31.0
■	H7-8	3	46.9	22.5	24.4

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
PLASTICITY CHART SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE C9.3		



LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H7-10	3	56.2	23.1	33.1
■	H7-14	2	54.4	24.5	29.9
▲	H7-15	2	48.7	22.5	26.2

PROJECT						
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650						
TITLE						
PLASTICITY CHART SILTY CLAY to CLAY						
 Golder Associates SUDBURY, ONTARIO		PROJECT No. 10-1191-0044		FILE No. 10-1191-0044SUD.GPJ		
		DRAWN	JJL	Jul 2013	SCALE	N/A
		CHECK	SEMC	Jul 2013	REV.	
		APPR	JMAC	Jul 2013		
FIGURE C9.4						

CONSOLIDATION TEST SUMMARY**FIGURE C10****Pg. 1 of 4****SAMPLE IDENTIFICATION**

Project Number: 10-1191-0044
Borehole Number: BC4-1

Sample Number: 4
Sample Depth, m: 3.4

TEST CONDITIONS

Test Type Standard Load Duration, hr 24
Oedometer Number 2
Date Started Dec. 12/12
Date Completed Dec. 26/12

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.526	Unit Weight, kN/m ³	16.11
Sample Diameter, cm	6.351	Dry Unit Weight, kN/m ³	9.37
Area, cm ²	31.68	Specific Gravity, Measured	2.74
Volume, cm ³	80.02	Solids Height, cm	0.880
Water Content, %	72.04	Volume of Solids, cm ³	27.87
Wet Mass, g	131.47	Volume of Voids, cm ³	52.15
Dry Mass, g	76.42		

TEST COMPUTATIONS

Pressure kPa	Primary Consolidation	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s	Total Work kJ/m ³
0	0	2.526	1.871	2.526					
4	0.02	2.524	1.869	2.525	60	0.0225	1.96E-04	4.33E-07	0.002
13	0.03	2.521	1.865	2.522	73	0.0186	1.38E-04	2.51E-07	0.012
31	0.04	2.516	1.860	2.519	60	0.0224	9.78E-05	2.15E-07	0.051
66	0.09	2.508	1.850	2.512	86	0.0155	9.85E-05	1.49E-07	0.221
137	0.41	2.467	1.804	2.487	505	0.0026	2.29E-04	5.83E-08	1.867
277	2.64	2.203	1.504	2.335	1500	0.0008	7.44E-04	5.62E-08	24.007
558	1.13	2.090	1.375	2.146	694	0.0014	1.60E-04	2.20E-08	45.480
1117	0.88	2.002	1.275	2.046	406	0.0022	6.23E-05	1.33E-08	80.756
558	-0.08	2.010	1.285	2.006					
137	-0.29	2.039	1.318	2.024					
31	-0.36	2.075	1.358	2.057					
4	-0.31	2.105	1.393	2.090					

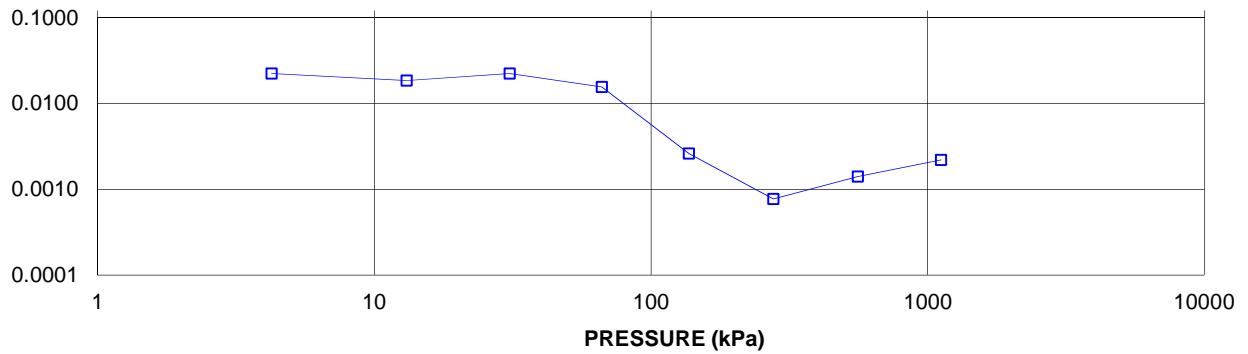
Note:
k calculated using α based on t₉₀ values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.105	Unit Weight, kN/m ³	15.89
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	11.24
Area, cm ²	31.68	Specific Gravity, Measured	2.74
Volume, cm ³	66.70	Solids Height, cm	0.880
Water Content, %	41.39	Volume of Solids, cm ³	27.87
Wet Mass, g	108.05	Volume of Voids, cm ³	38.83
Dry Mass, g	76.42		

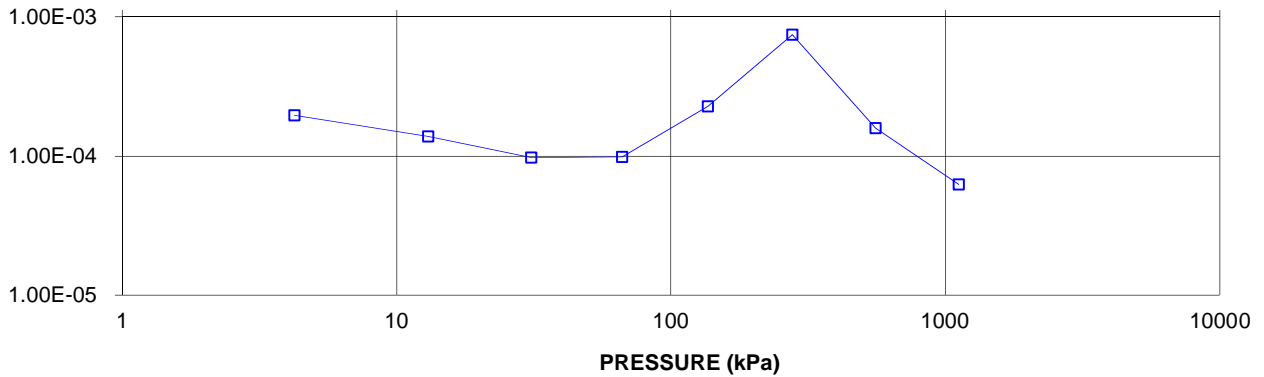
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS PRESSURE (kPa)
BH BC4-1 Sa 4



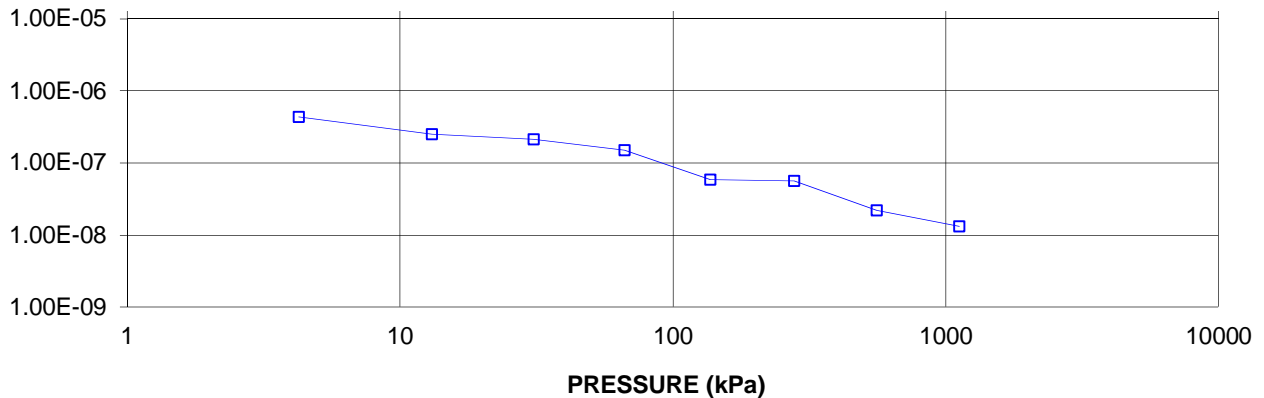
VOLUME COMPRESSIBILITY, m²/kN

CONSOLIDATION TEST
MV m²/kN vs PRESSURE (kPa)
BH BC4-1 Sa 4



HYDRAULIC CONDUCTIVITY,
cm/s

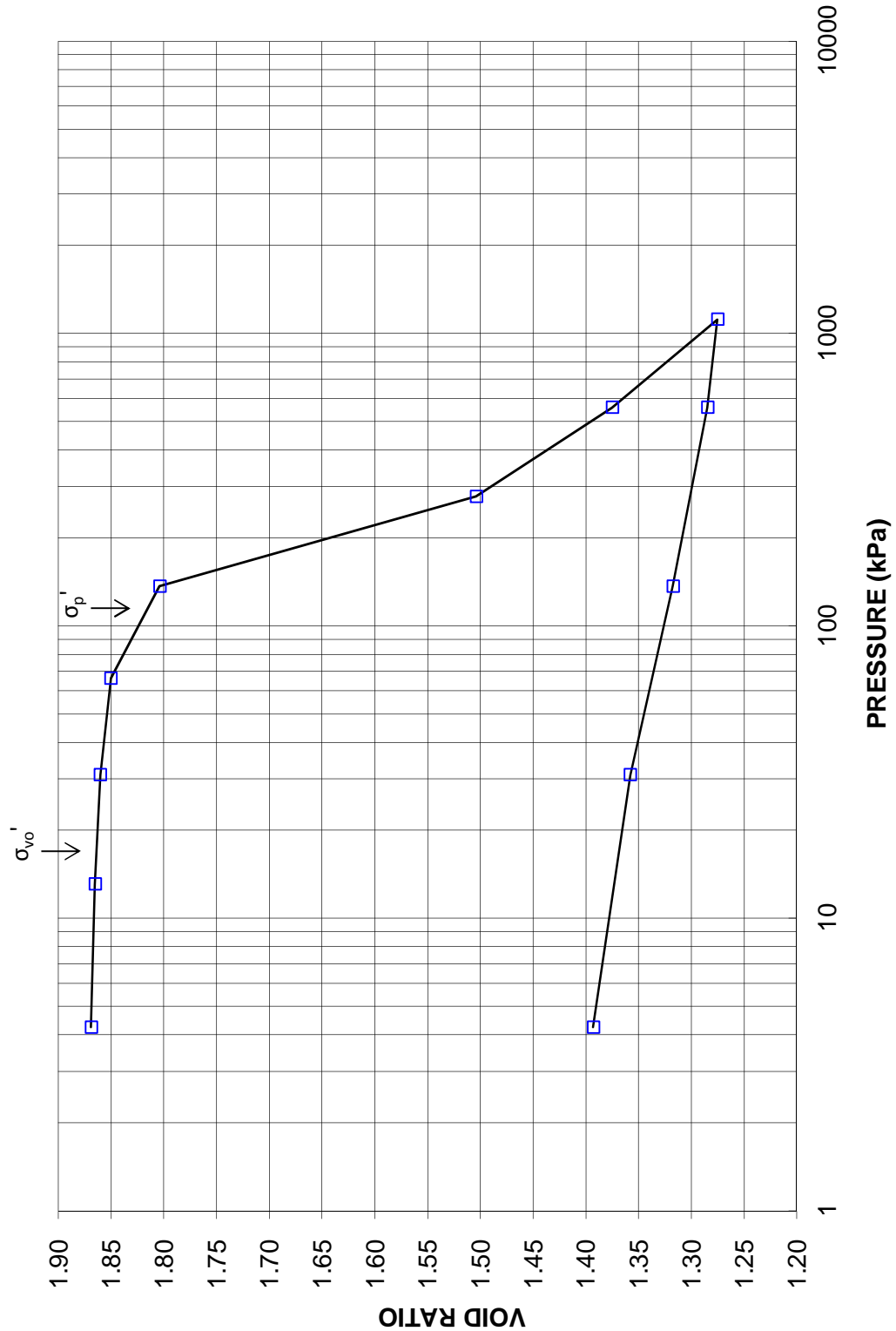
CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH BC4-1 Sa 4



CONSOLIDATION TEST VOID RATIO VS LOG PRESSURE

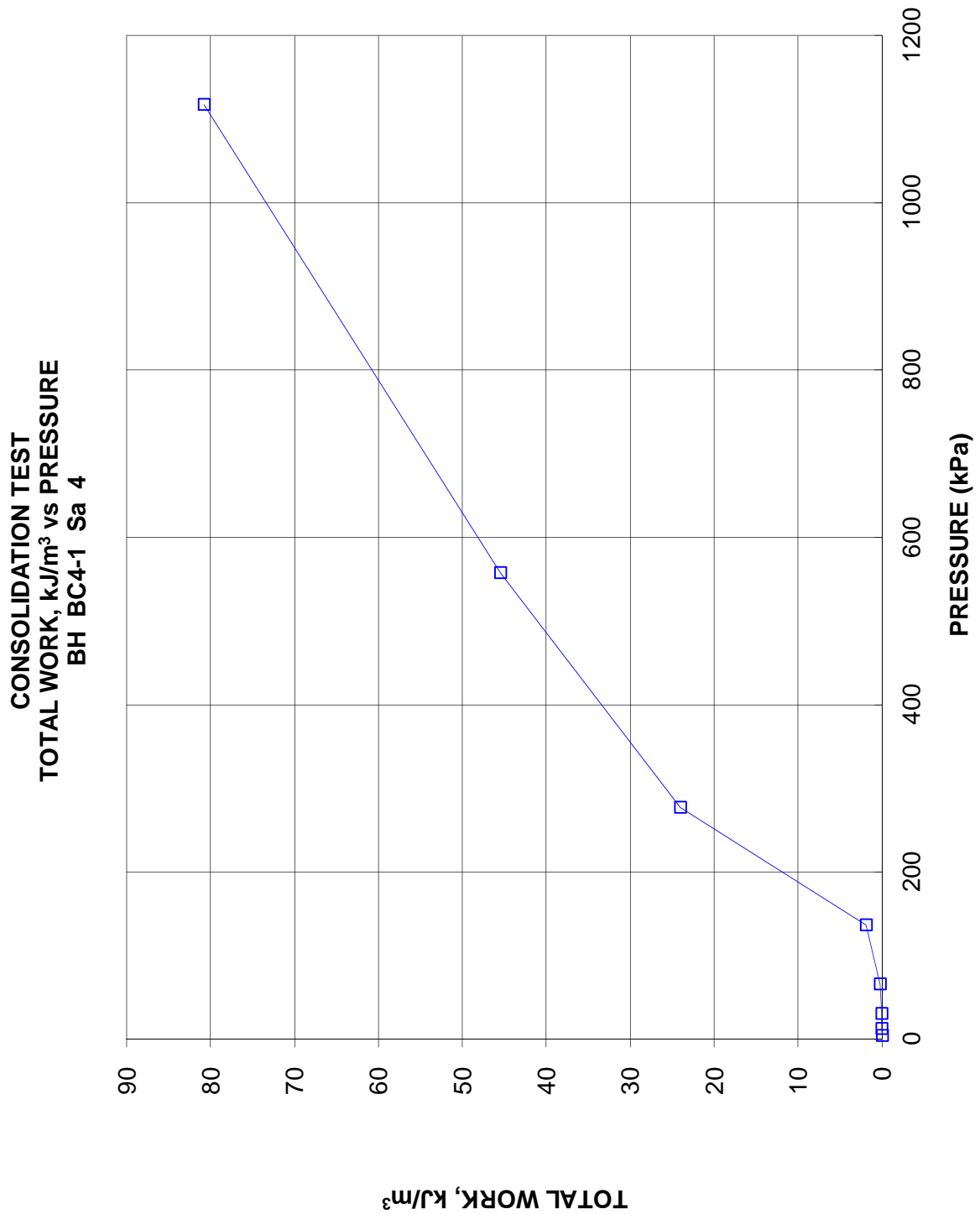
FIGURE C10
Pg. 3 of 4

CONSOLIDATION TEST
VOID RATIO VS PRESSURE
BH BC4-1 Sa 4



**CONSOLIDATION TEST
TOTAL WORK VS PRESSURE**

FIGURE C10
Pg. 4 of 4



CONSOLIDATION TEST SUMMARY**FIGURE C11****Pg. 1 of 4****SAMPLE IDENTIFICATION**

Project Number:	10-1191-0044	Sample Number:	5
Borehole Number:	BC4-1	Sample Depth, m:	4.9

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	2		
Date Started	Nov. 28/12		
Date Completed	Dec. 11/12		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.526	Unit Weight, kN/m ³	16.24
Sample Diameter, cm	6.351	Dry Unit Weight, kN/m ³	9.81
Area, cm ²	31.68	Specific Gravity, Measured	2.74
Volume, cm ³	80.02	Solids Height, cm	0.923
Water Content, %	65.50	Volume of Solids, cm ³	29.25
Wet Mass, g	132.48	Volume of Voids, cm ³	50.77
Dry Mass, g	80.05	Degree of Saturation, %	103.3

TEST COMPUTATIONS

Pressure kPa	Primary Consolidation	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s	Total Work kJ/m ³
0	0	2.526	1.736	2.526					
4	0.02	2.524	1.734	2.525	86	0.0156	2.05E-04	3.15E-07	0.002
13	0.02	2.521	1.731	2.523	60	0.0225	1.08E-04	2.39E-07	0.010
31	0.05	2.516	1.725	2.519	60	0.0224	1.17E-04	2.58E-07	0.056
66	0.11	2.505	1.714	2.511	86	0.0155	1.19E-04	1.81E-07	0.262
137	1.20	2.386	1.584	2.445	1622	0.0008	6.75E-04	5.17E-08	5.116
277	1.80	2.205	1.388	2.295	1109	0.0010	5.08E-04	5.01E-08	20.762
558	0.89	2.116	1.292	2.161	375	0.0026	1.26E-04	3.25E-08	37.632
1117	1.41	1.975	1.139	2.046	194	0.0046	9.96E-05	4.46E-08	93.368
558	-0.15	1.991	1.156	1.983					
137	-0.29	2.020	1.188	2.005					
31	-0.31	2.050	1.221	2.035					
4	-0.27	2.078	1.250	2.064					

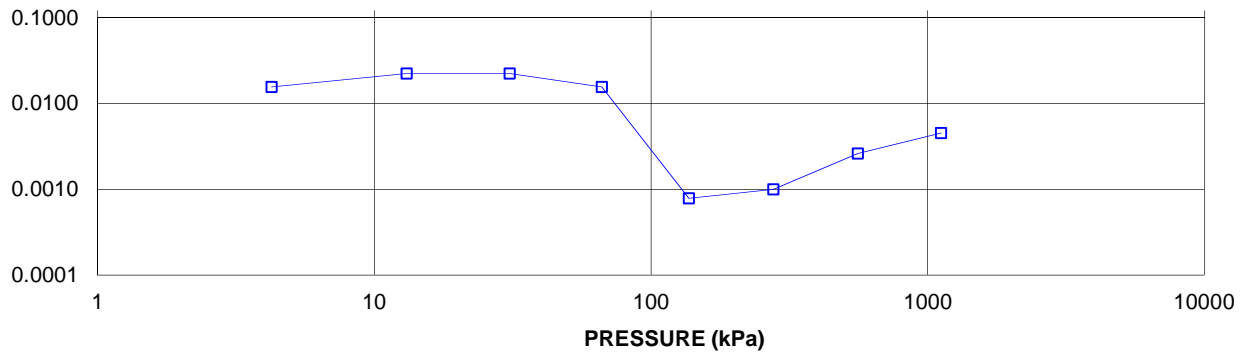
Note:

k calculated using α based on t₉₀ values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	2.078	Unit Weight, kN/m ³	16.38
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	11.93
Area, cm ²	31.68	Specific Gravity, Measured	2.74
Volume, cm ³	65.82	Solids Height, cm	0.923
Water Content, %	37.31	Volume of Solids, cm ³	29.25
Wet Mass, g	109.92	Volume of Voids, cm ³	36.57
Dry Mass, g	80.05		

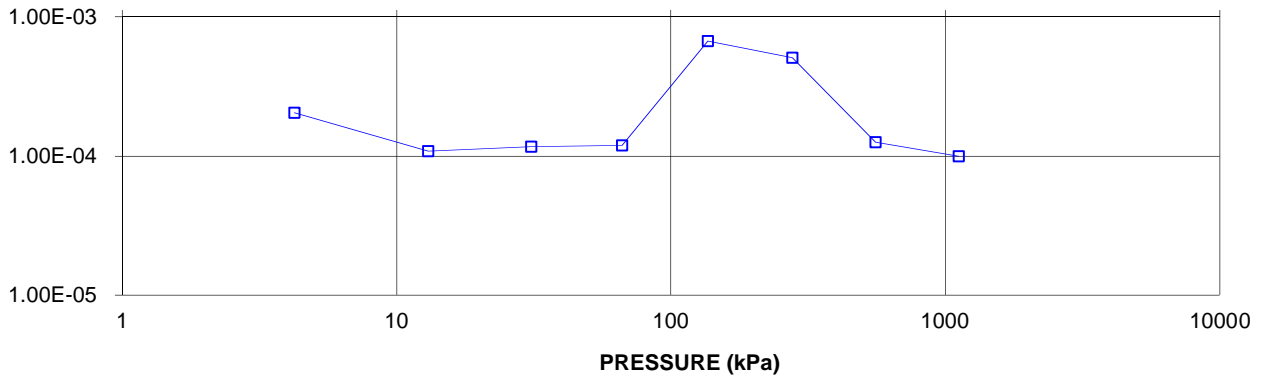
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS PRESSURE (kPa)
BH BC4-1 Sa 5



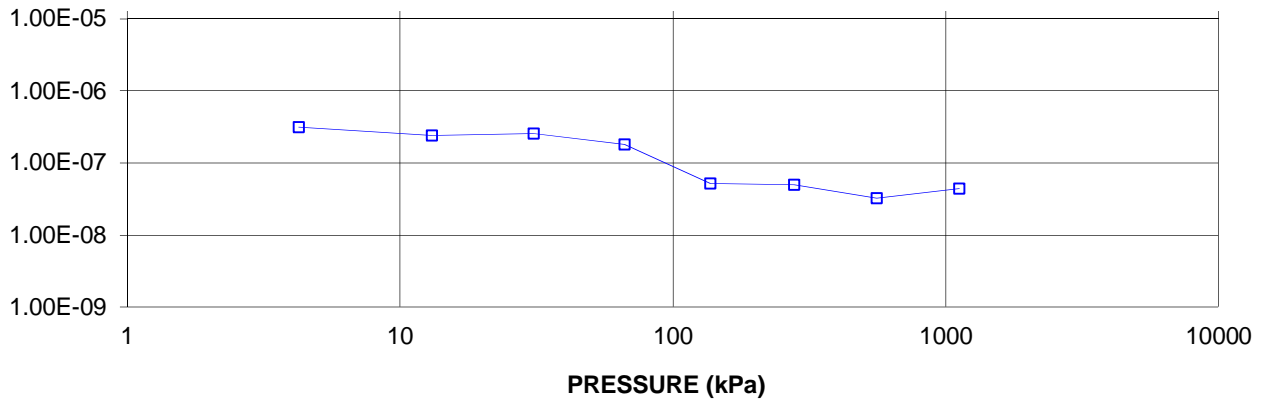
VOLUME COMPRESSIBILITY, m²/kN

CONSOLIDATION TEST
MV m²/kN vs PRESSURE (kPa)
BH BC4-1 Sa 5



HYDRAULIC CONDUCTIVITY,
cm/s

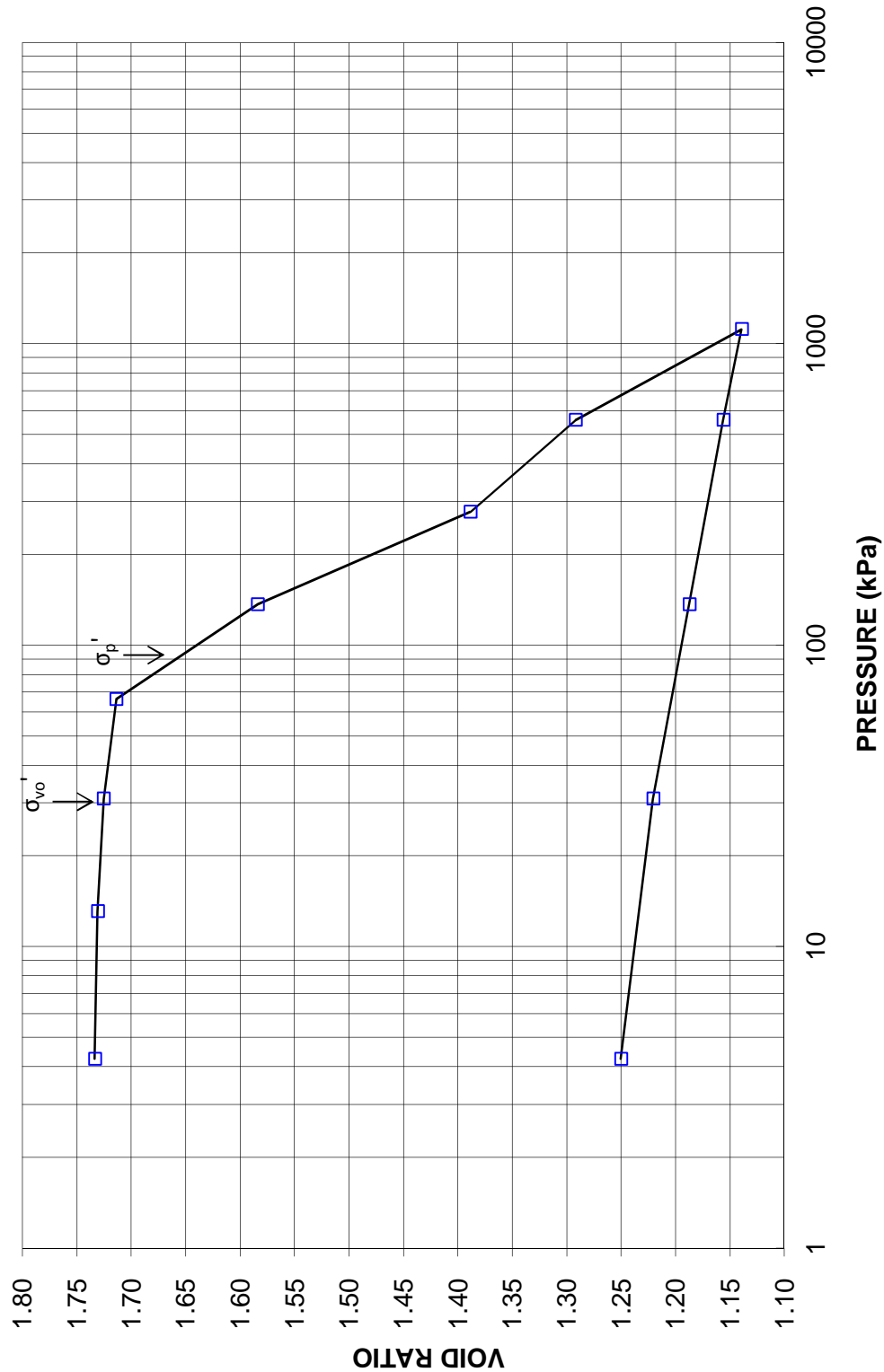
CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH BC4-1 Sa 5



CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

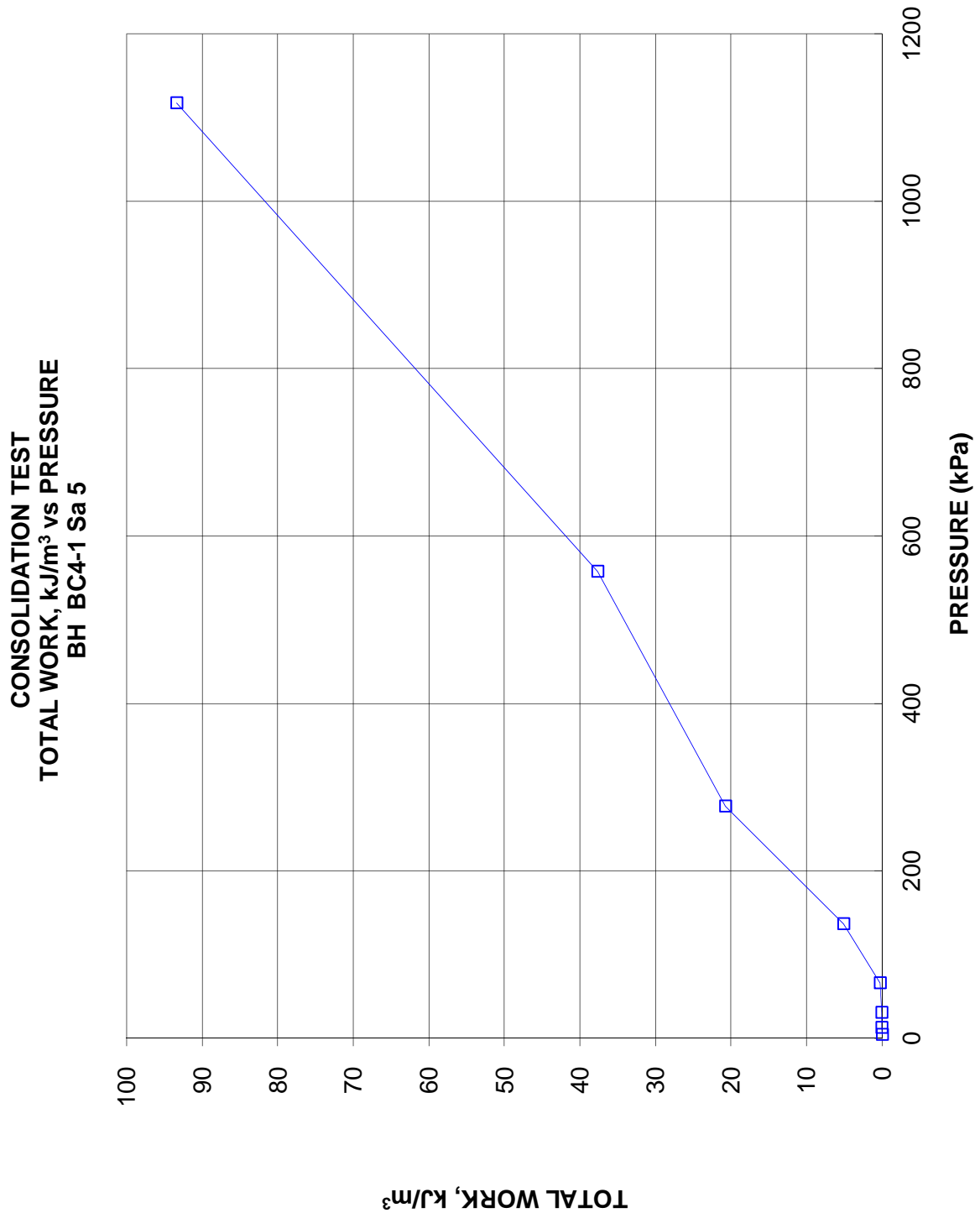
FIGURE C11
Pg. 3 of 4

CONSOLIDATION TEST
VOID RATIO vs PRESSURE
BH BC4-1Sa 5



**CONSOLIDATION TEST
TOTAL WORK VS PRESSURE**

FIGURE C11
Pg. 4 of 4



CONSOLIDATION TEST SUMMARY**FIGURE C12****Pg. 1 of 4****SAMPLE IDENTIFICATION**

Project Number	10-1191-0044	Sample Number	6
Borehole Number	BC4-1	Sample Depth, m	6.4

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	1		
Date Started	Dec. 12/12		
Date Completed	Dec. 26/12		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.544	Unit Weight, kN/m ³	16.63
Sample Diameter, cm	6.353	Dry Unit Weight, kN/m ³	10.32
Area, cm ²	31.70	Specific Gravity, measure	2.76
Volume, cm ³	80.64	Solids Height, cm	0.971
Water Content, %	61.04	Volume of Solids, cm ³	30.78
Wet Mass, g	136.71	Volume of Voids, cm ³	49.86
Dry Mass, g	84.89		

TEST COMPUTATIONS

Pressure kPa	Primary Consolidation	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s	Total Work kJ/m ³
0	0.00	2.544	1.620	2.544					
9	0.06	2.538	1.614	2.541	118	0.01164	2.42E-04	2.76E-07	0.010
18	0.04	2.535	1.611	2.536	101	0.01345	1.55E-04	2.62E-07	0.032
35	0.06	2.528	1.604	2.532	60	0.02265	1.43E-04	3.18E-07	0.097
69	0.10	2.519	1.594	2.524	60	0.02250	1.14E-04	2.52E-07	0.301
143	0.35	2.483	1.558	2.501	317	0.00418	1.88E-04	7.71E-08	1.781
285	2.53	2.230	1.297	2.357	960	0.00123	6.99E-04	8.40E-08	23.559
570	1.10	2.120	1.184	2.175	614	0.00163	1.51E-04	2.42E-08	44.653
1140	0.72	2.049	1.110	2.085	290	0.00317	4.94E-05	1.54E-08	73.486
570	-0.06	2.055	1.116	2.052					
143	-0.24	2.079	1.141	2.067					
35	-0.30	2.109	1.172	2.094					
9	-0.26	2.135	1.199	2.122					

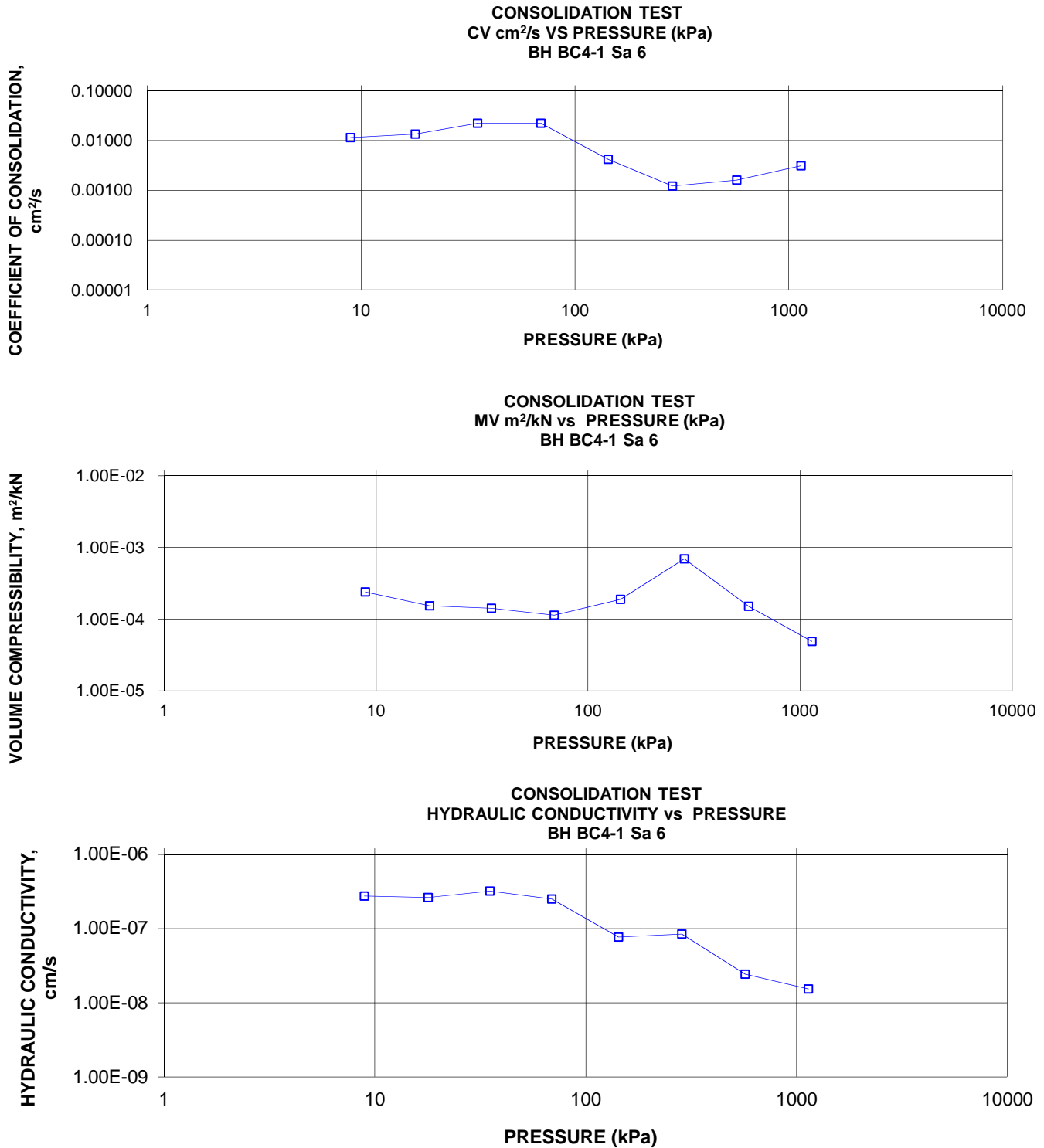
Note:

k calculated using α based on t_{90} values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	2.135	Unit Weight, kN/m ³	16.96
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	12.30
Area, cm ²	31.70	Specific Gravity, measure	2.76
Volume, cm ³	67.69	Solids Height, cm	0.971
Water Content, %	37.94	Volume of Solids, cm ³	30.78
Wet Mass, g	117.10	Volume of Voids, cm ³	36.91
Dry Mass, g	84.89		

CONSOLIDATION TEST SUMMARY

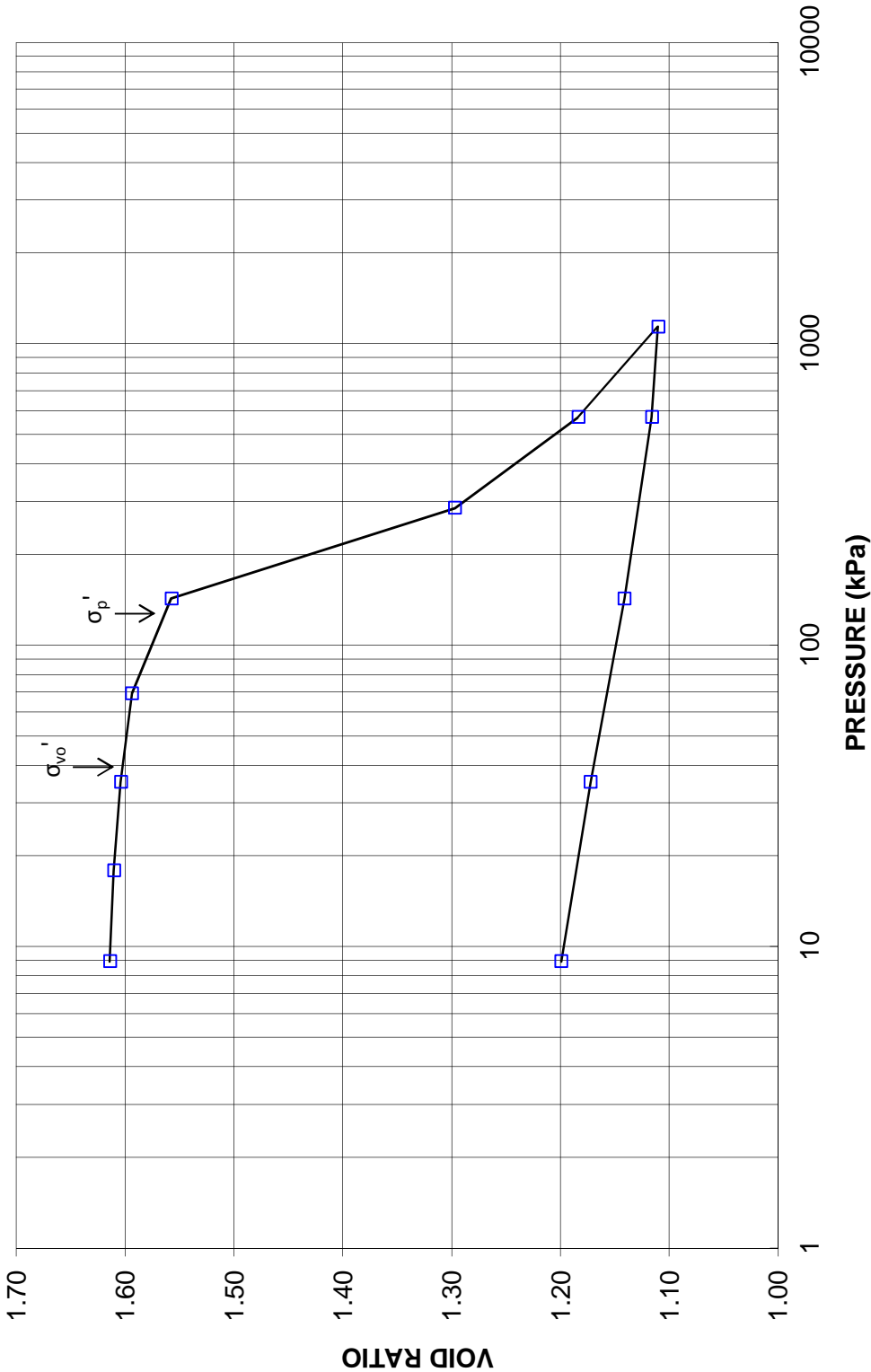
FIGURE C12
Pg. 2 of 4



CONSOLIDATION TEST VOID RATIO VS LOG PRESSURE

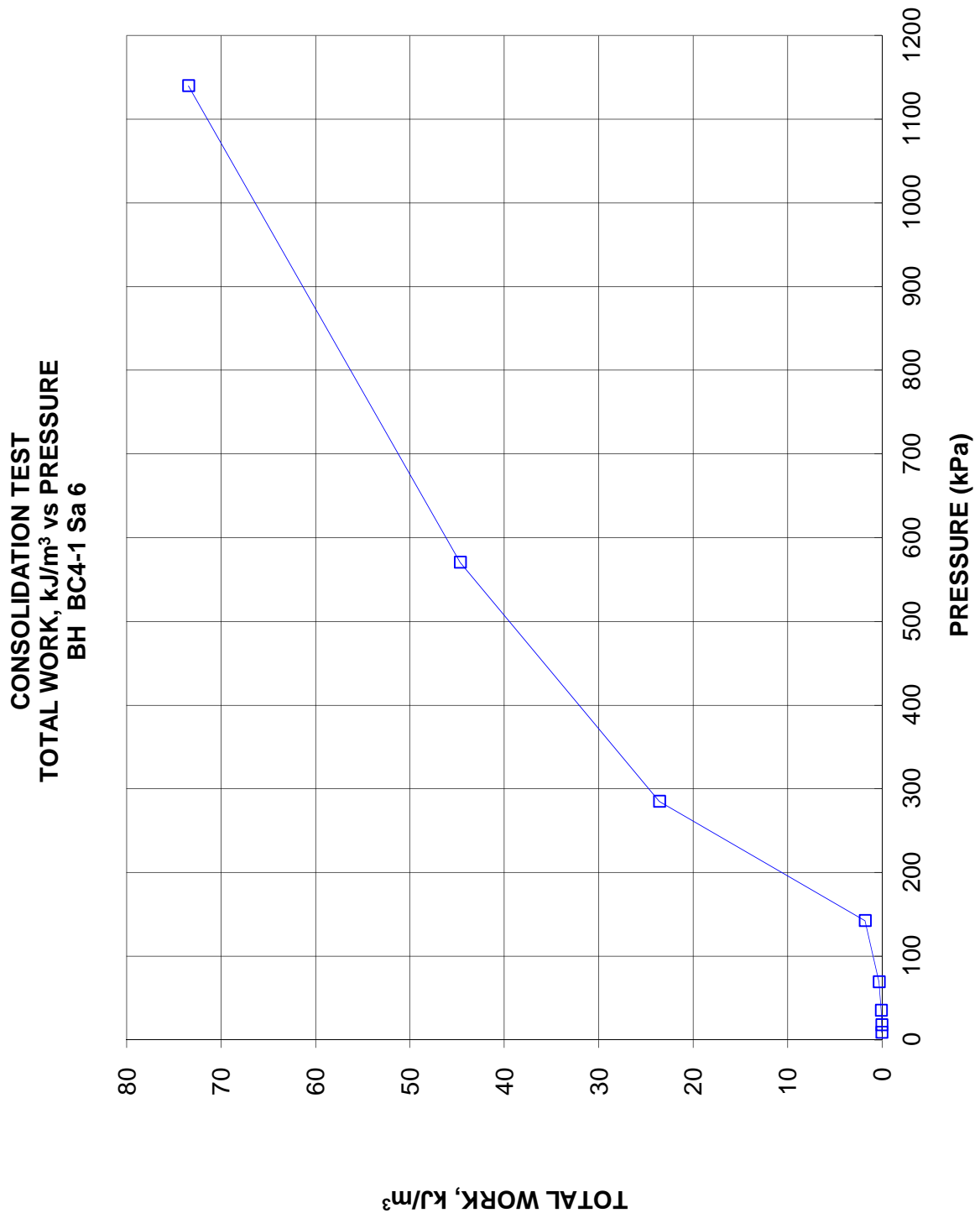
FIGURE C12
Pg. 3 of 4

CONSOLIDATION TEST
VOID RATIO vs PRESSURE
BH BC4-1 Sa 6



**CONSOLIDATION TEST
TOTAL WORK VS PRESSURE**

FIGURE C12
Pg. 4 of 4



CONSOLIDATION TEST SUMMARY**FIGURE C13**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	2
Borehole Number	H6-S1 Horizontally Trimmed	Sample Depth, m	7.80-7.87

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	4		
Date Started	5/30/2013		
Date Completed	6/19/2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.53	Unit Weight, kN/m ³	15.96
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	9.58
Area, cm ²	31.71	Specific Gravity, measured	2.73
Volume, cm ³	80.22	Solids Height, cm	0.905
Water Content, %	66.59	Volume of Solids, cm ³	28.71
Wet Mass, g	130.56	Volume of Voids, cm ³	51.52
Dry Mass, g	78.37	Degree of Saturation, %	101.3

TEST COMPUTATIONS

Stress kPa	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s
0.00	2.530	1.795	2.530				
6.24	2.528	1.793	2.529	2	6.78E-01	1.14E-04	7.58E-06
10.88	2.522	1.785	2.525	173	7.81E-03	5.71E-04	4.37E-07
20.77	2.510	1.772	2.516	154	8.71E-03	4.68E-04	3.99E-07
35.10	2.483	1.743	2.496	577	2.29E-03	7.42E-04	1.66E-07
20.77	2.486	1.746	2.484				
6.24	2.494	1.755	2.490				
20.77	2.487	1.747	2.491	36	3.65E-02	2.04E-04	7.30E-07
35.10	2.479	1.738	2.483	135	9.68E-03	2.18E-04	2.07E-07
78.79	2.318	1.561	2.399	694	1.76E-03	1.45E-03	2.51E-07
155.94	2.025	1.236	2.171	1500	6.66E-04	1.50E-03	9.82E-08
310.41	1.863	1.057	1.944	735	1.09E-03	4.15E-04	4.43E-08
619.20	1.738	0.920	1.800	437	1.57E-03	1.59E-04	2.46E-08
1237.22	1.631	0.801	1.684	173	3.48E-03	6.88E-05	2.34E-08
2472.94	1.537	0.698	1.584	194	2.74E-03		8.00E-09
619.20	1.556	0.719	1.547				
155.94	1.588	0.754	1.572				
35.10	1.624	0.794	1.606				
20.77	1.634	0.805	1.629				
6.24	1.652	0.825	1.643				

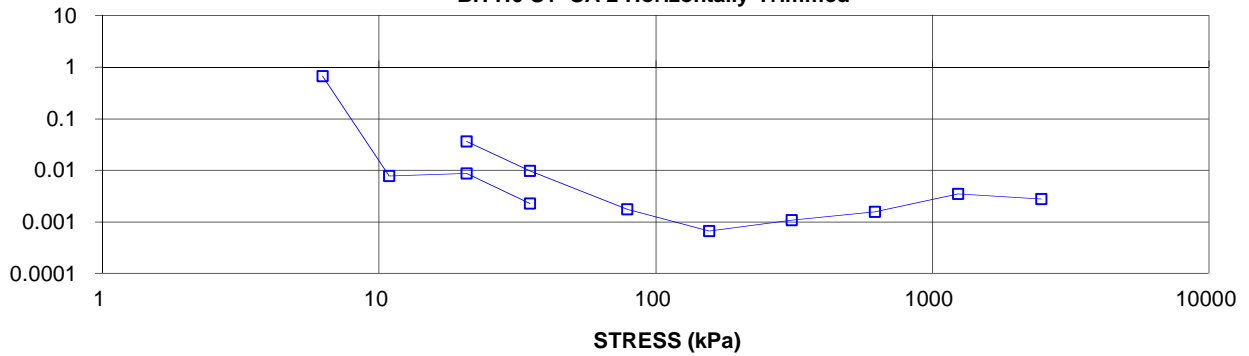
Specimen taken 21 to 28cm from bottom of the tube.
k calculated using cv based on λ_0 values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	1.65	Unit Weight, kN/m ³	19.42
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	14.67
Area, cm ²	31.71	Specific Gravity, measured	2.73
Volume, cm ³	52.39	Solids Height, cm	0.905
Water Content, %	32.37	Volume of Solids, cm ³	28.71
Wet Mass, g	103.74	Volume of Voids, cm ³	23.69
Dry Mass, g	78.37		

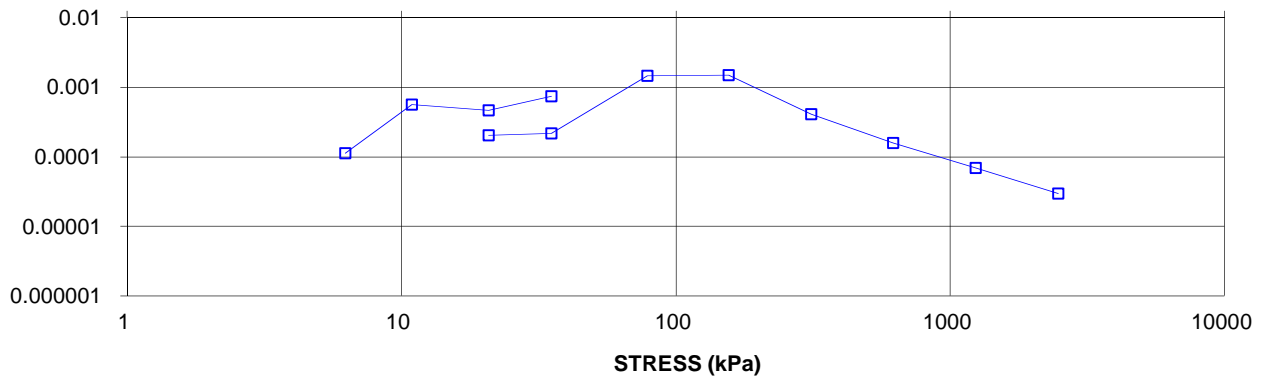
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS STRESS (kPa)
BH H6-S1 SA 2 Horizontally Trimmed



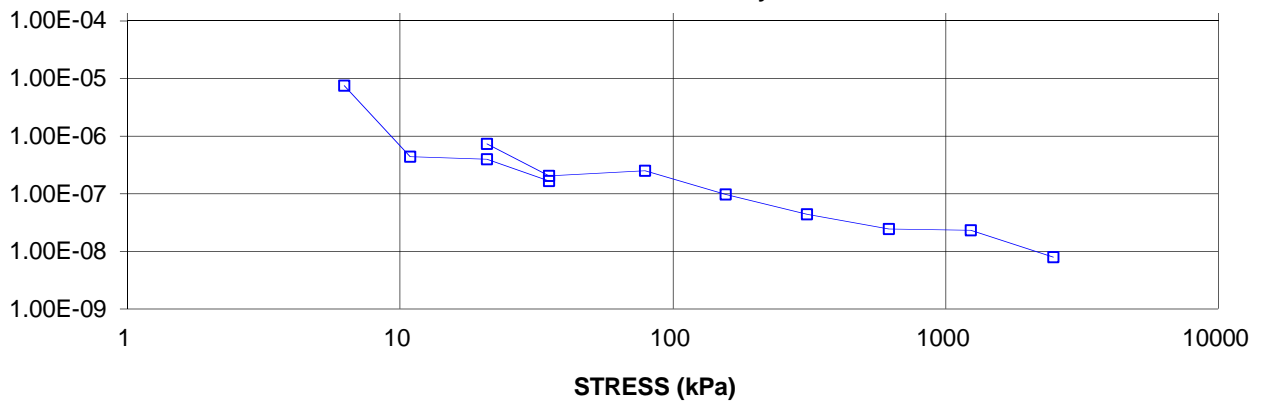
VOLUME COMPRESSIBILITY, m²/kN

CONSOLIDATION TEST
MV m²/kN vs STRESS (kPa)
BH H6-S1 SA 2 Horizontally Trimmed



HYDRAULIC CONDUCTIVITY,
cm/s

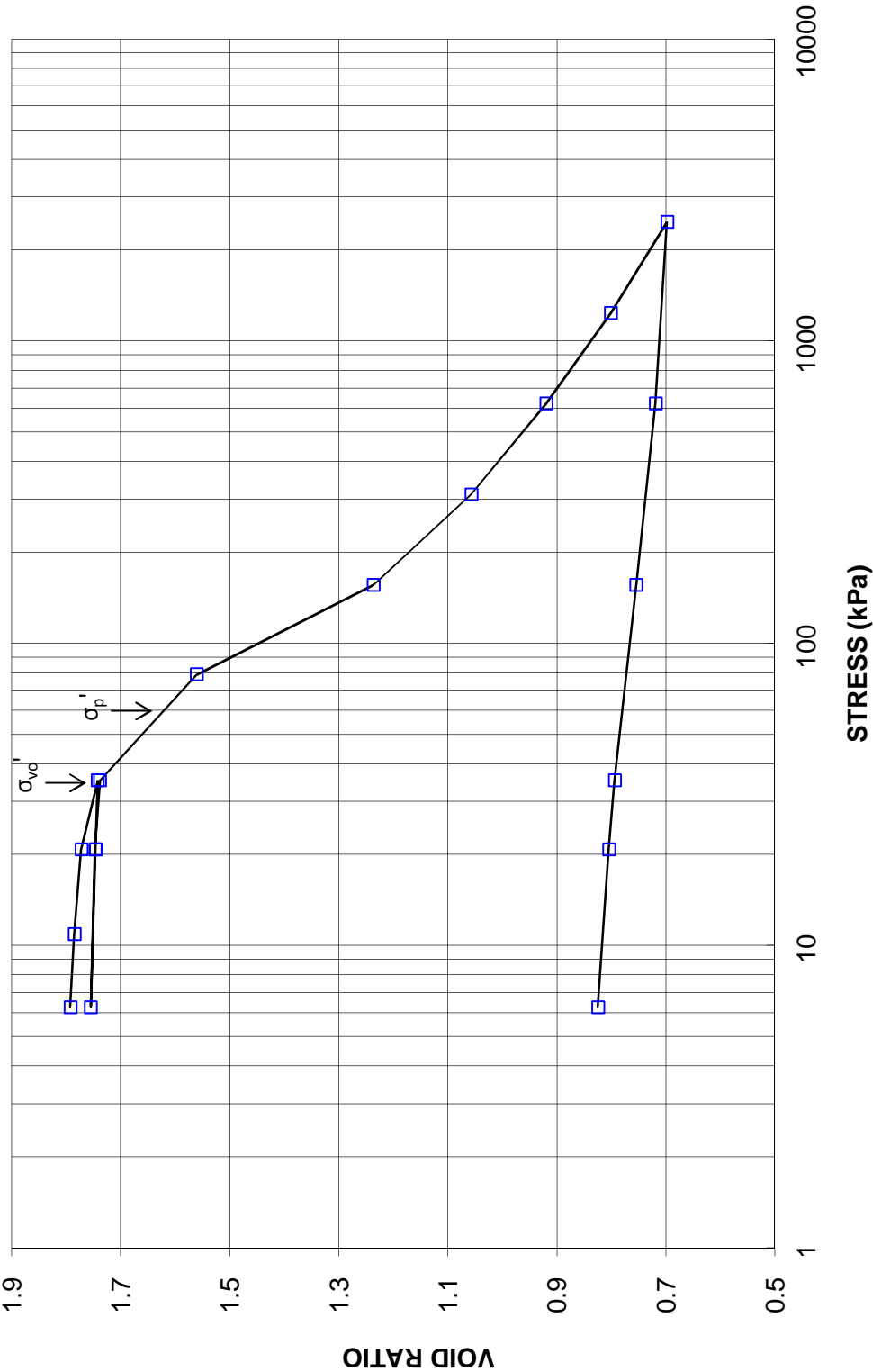
CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs STRESS
BH H6-S1 SA 2 Horizontally Trimmed



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE C13
Pg. 3 of 4

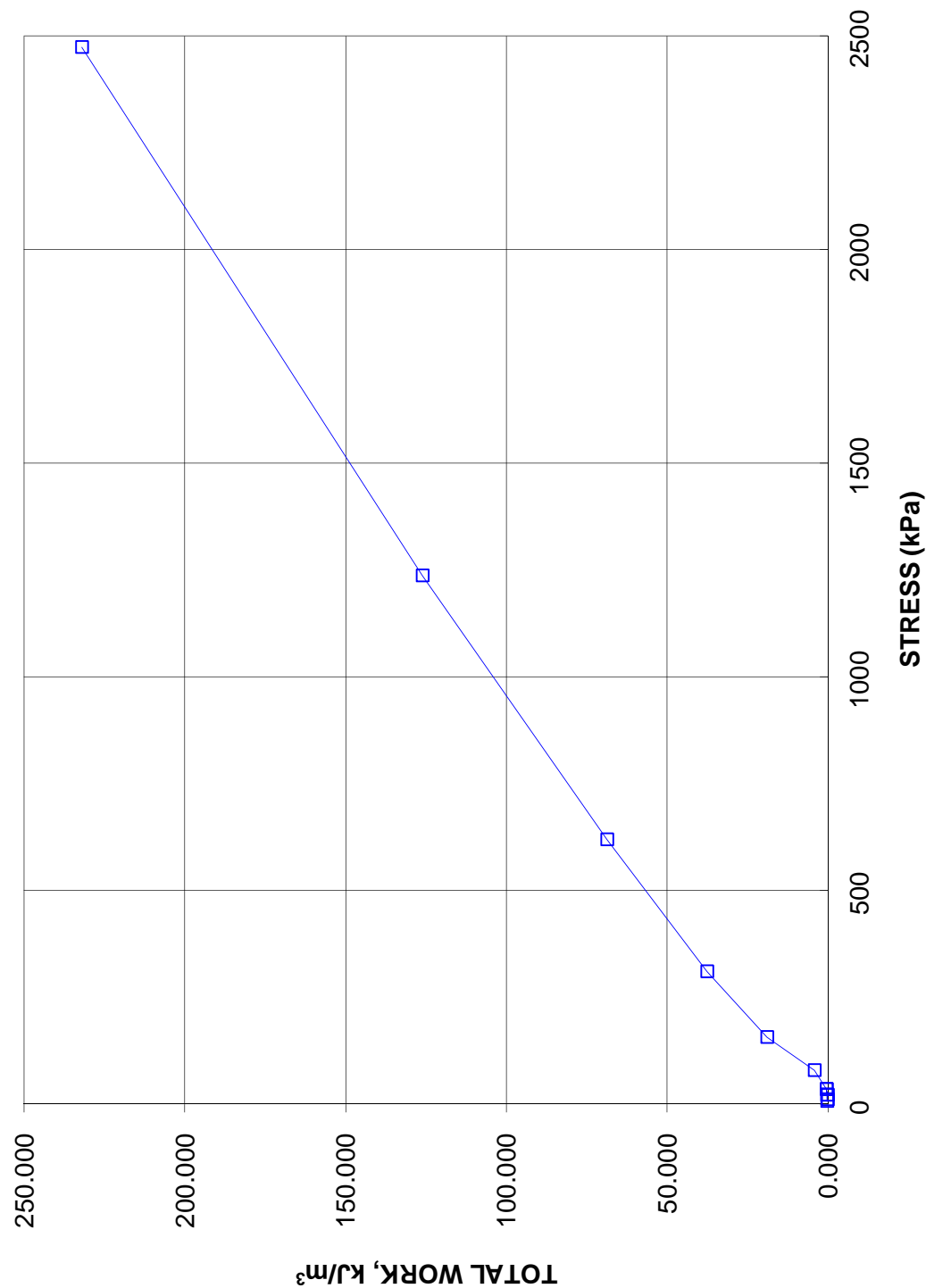
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH H6-S1 SA 2 Horizontally Trimmed



CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE C13
Pg. 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m^3 vs STRESS
BH H6-S1 SA 2 Horizontally Trimmed



CONSOLIDATION TEST SUMMARY**FIGURE C14**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	4
Borehole Number	H6-S1	Sample Depth, m	14.11-14.20

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	3		
Date Started	5/30/2013		
Date Completed	6/20/2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.53	Unit Weight, kN/m ³	16.36
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	10.33
Area, cm ²	31.68	Specific Gravity, measured	2.75
Volume, cm ³	80.28	Solids Height, cm	0.970
Water Content, %	58.41	Volume of Solids, cm ³	30.73
Wet Mass, g	133.89	Volume of Voids, cm ³	49.54
Dry Mass, g	84.52	Degree of Saturation, %	99.7

TEST COMPUTATIONS

Stress kPa	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s
0.00	2.534	1.612	2.534				
5.87	2.530	1.608	2.532	15	9.06E-02	2.62E-04	2.33E-06
10.71	2.527	1.604	2.528	296	4.58E-03	2.69E-04	1.21E-07
20.45	2.519	1.596	2.523	254	5.31E-03	3.28E-04	1.71E-07
39.85	2.499	1.576	2.509	178	7.50E-03	3.93E-04	2.88E-07
73.33	2.467	1.542	2.483	317	4.12E-03	3.88E-04	1.57E-07
20.45	2.477	1.553	2.472				
5.87	2.488	1.565	2.483				
20.45	2.481	1.557	2.485	90	1.45E-02	2.06E-04	2.93E-07
39.85	2.474	1.550	2.478	147	8.85E-03	1.28E-04	1.11E-07
78.65	2.459	1.534	2.466	167	7.72E-03	1.62E-04	1.22E-07
155.71	2.242	1.310	2.350	2076	5.64E-04	1.11E-03	6.14E-08
310.28	2.023	1.085	2.132	778	1.24E-03	5.58E-04	6.78E-08
618.29	1.889	0.947	1.956	359	2.26E-03	1.71E-04	3.80E-08
1236.56	1.784	0.839	1.837	265	2.70E-03	6.71E-05	1.78E-08
2473.38	1.691	0.743	1.737	184	3.48E-03	2.97E-05	1.01E-08
1236.56	1.696	0.748	1.693				
310.28	1.726	0.779	1.711				
78.65	1.764	0.818	1.745				
20.45	1.795	0.850	1.779				
5.87	1.813	0.869	1.804				

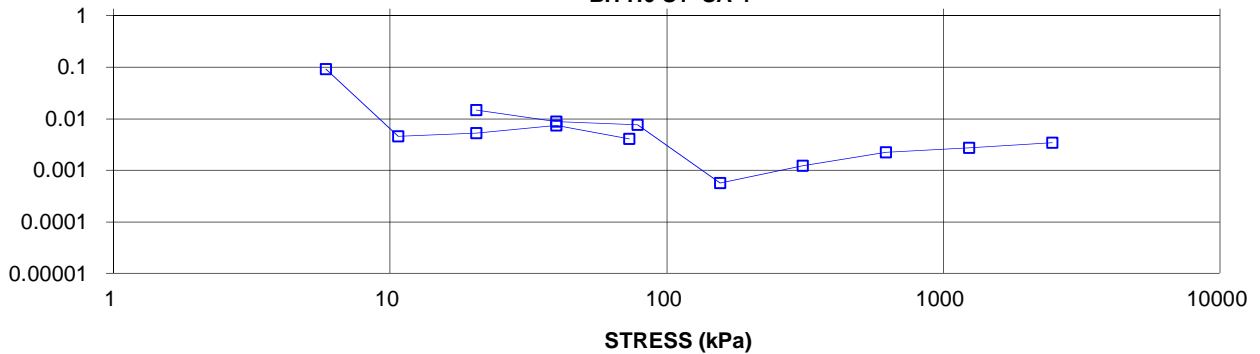
Note:

k calculated using cv based on $\dot{\epsilon}_0$ values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	1.69	Unit Weight, kN/m ³	20.48
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	15.47
Area, cm ²	31.68	Specific Gravity, measured	2.75
Volume, cm ³	53.57	Solids Height, cm	0.970
Water Content, %	32.32	Volume of Solids, cm ³	30.73
Wet Mass, g	111.84	Volume of Voids, cm ³	22.83
Dry Mass, g	84.52		

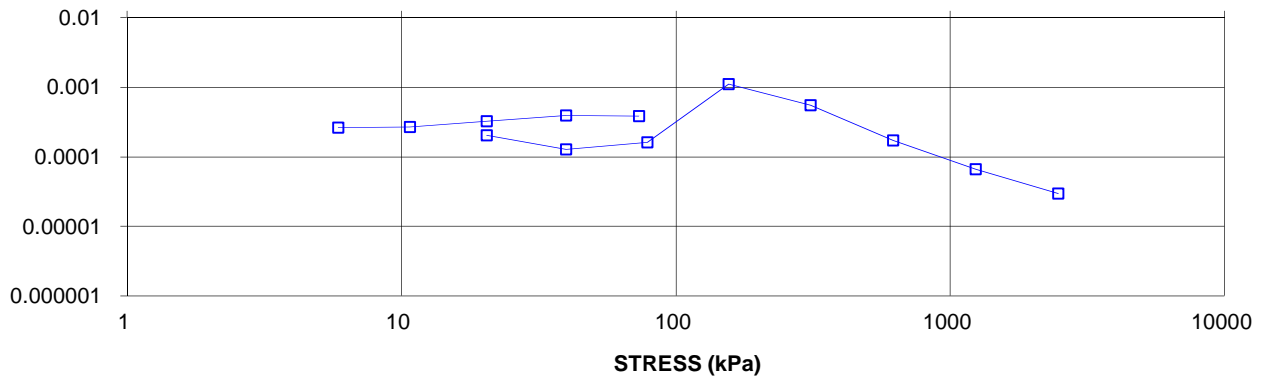
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS STRESS (kPa)
BH H6-S1 SA 4



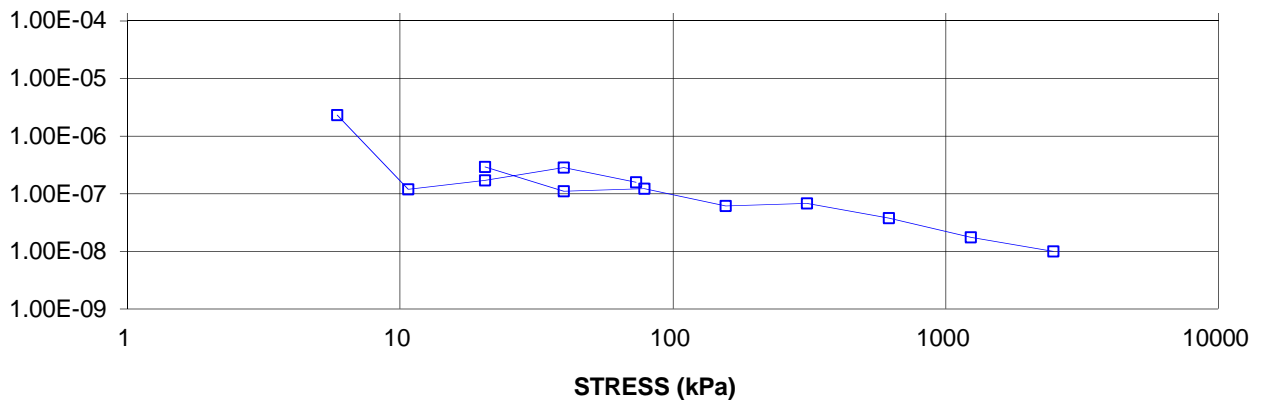
VOLUME COMPRESSIBILITY, m²/kN

CONSOLIDATION TEST
MV m²/kN vs STRESS (kPa)
BH H6-S1 SA 4

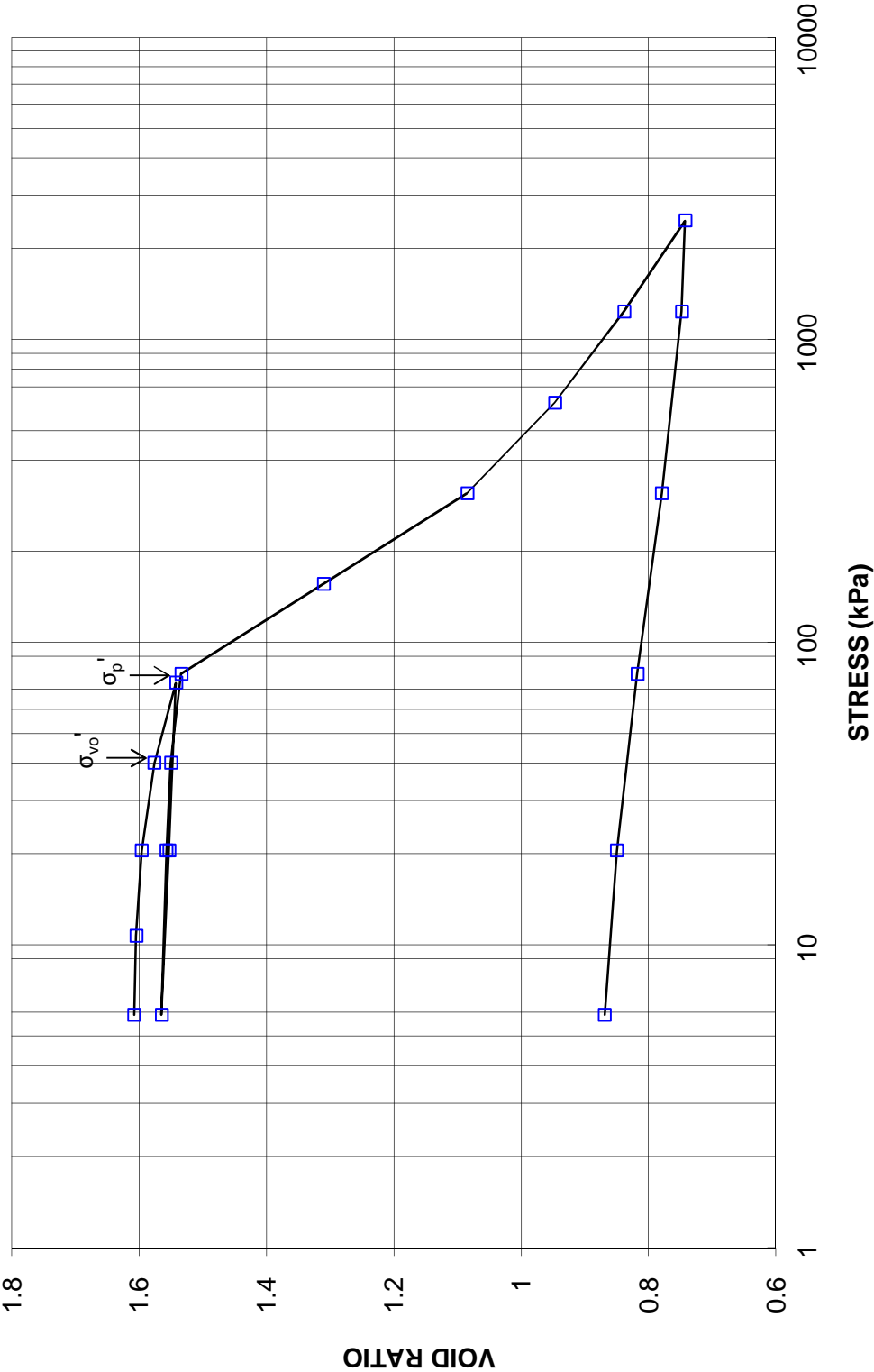


HYDRAULIC CONDUCTIVITY,
cm/s

CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs STRESS
BH H6-S1 SA 4



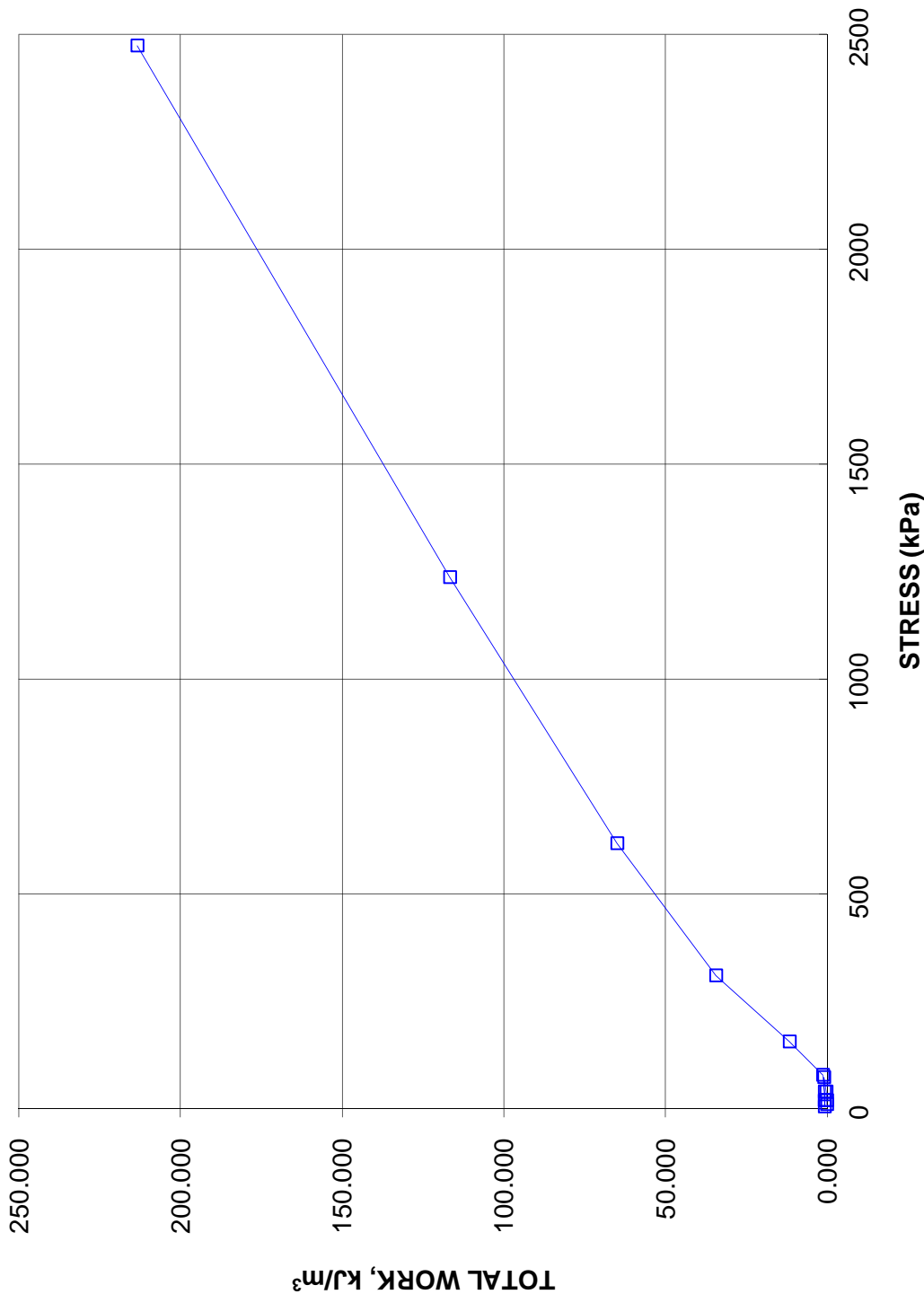
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH H6-S1 SA 4



CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE C14
Pg. 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m³ vs STRESS
BH H6-S1 SA 4



CONSOLIDATION TEST SUMMARY**FIGURE C15**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	2
Borehole Number	H6-S1 Vertically Trimmed	Sample Depth, m	7.87-7.97

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	2		
Date Started	5/30/2013		
Date Completed	6/17/2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	1.90	Unit Weight, kN/m ³	16.14
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	9.91
Area, cm ²	31.65	Specific Gravity, measured	2.73
Volume, cm ³	60.23	Solids Height, cm	0.704
Water Content, %	62.89	Volume of Solids, cm ³	22.30
Wet Mass, g	99.15	Volume of Voids, cm ³	37.93
Dry Mass, g	60.87	Degree of Saturation, %	100.9

TEST COMPUTATIONS

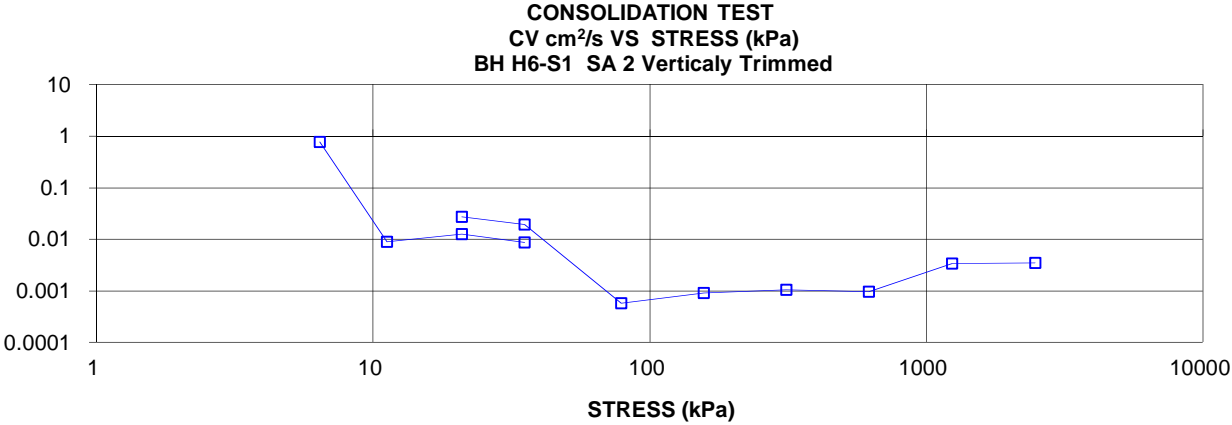
Stress kPa	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s
0.00	1.903	1.701	1.903				
6.41	1.903	1.701	1.903	1	7.68E-01	0.00E+00	0.00E+00
11.21	1.901	1.698	1.902	86	8.92E-03	2.41E-04	2.10E-07
20.92	1.893	1.687	1.897	60	1.27E-02	4.28E-04	5.33E-07
35.21	1.875	1.662	1.884	86	8.75E-03	6.51E-04	5.58E-07
20.92	1.883	1.673	1.879				
6.41	1.893	1.687	1.888				
20.92	1.880	1.668	1.886	28	2.69E-02	4.71E-04	1.24E-06
35.32	1.872	1.658	1.876	38	1.96E-02	2.81E-04	5.41E-07
79.08	1.723	1.446	1.798	1188	5.77E-04	1.79E-03	1.01E-07
156.43	1.566	1.223	1.644	634	9.04E-04	1.07E-03	9.47E-08
311.13	1.443	1.048	1.504	452	1.06E-03	4.17E-04	4.34E-08
620.52	1.349	0.915	1.396	427	9.68E-04	1.59E-04	1.51E-08
1238.08	1.272	0.805	1.311	109	3.34E-03	6.58E-05	2.15E-08
2476.05	1.203	0.707	1.237	94	3.45E-03	2.93E-05	9.93E-09
620.52	1.219	0.730	1.211				
156.43	1.242	0.764	1.231				
35.21	1.266	0.797	1.254				
20.92	1.272	0.806	1.269				
6.41	1.288	0.828	1.280				

Specimen taken 11 to 21cm from bottom of the tube.

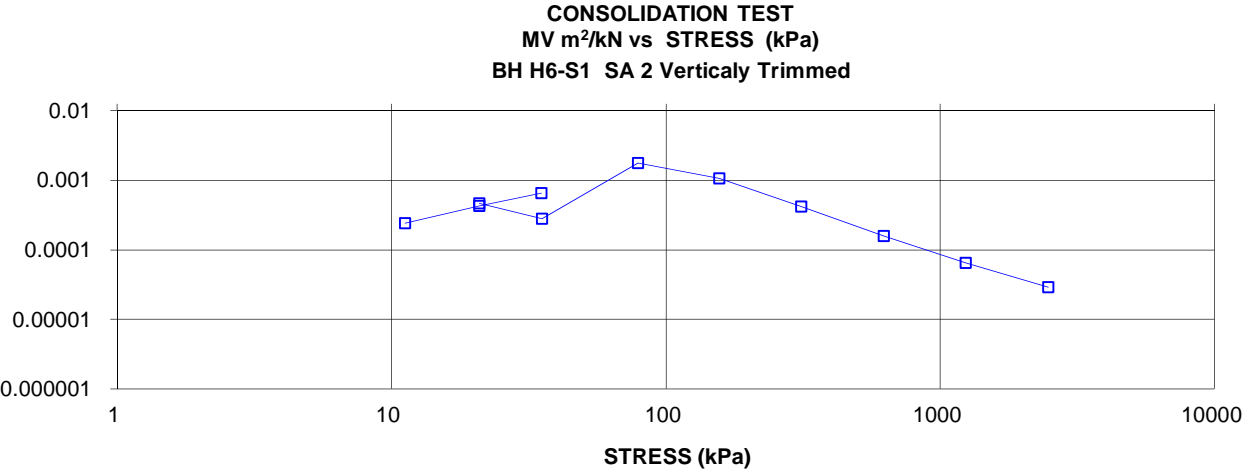
k calculated using cv based on t₉₀ values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	1.29	Unit Weight, kN/m ³	19.20
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	14.64
Area, cm ²	31.65	Specific Gravity, measured	2.73
Volume, cm ³	40.76	Solids Height, cm	0.704
Water Content, %	31.13	Volume of Solids, cm ³	22.30
Wet Mass, g	79.82	Volume of Voids, cm ³	18.46
Dry Mass, g	60.87		

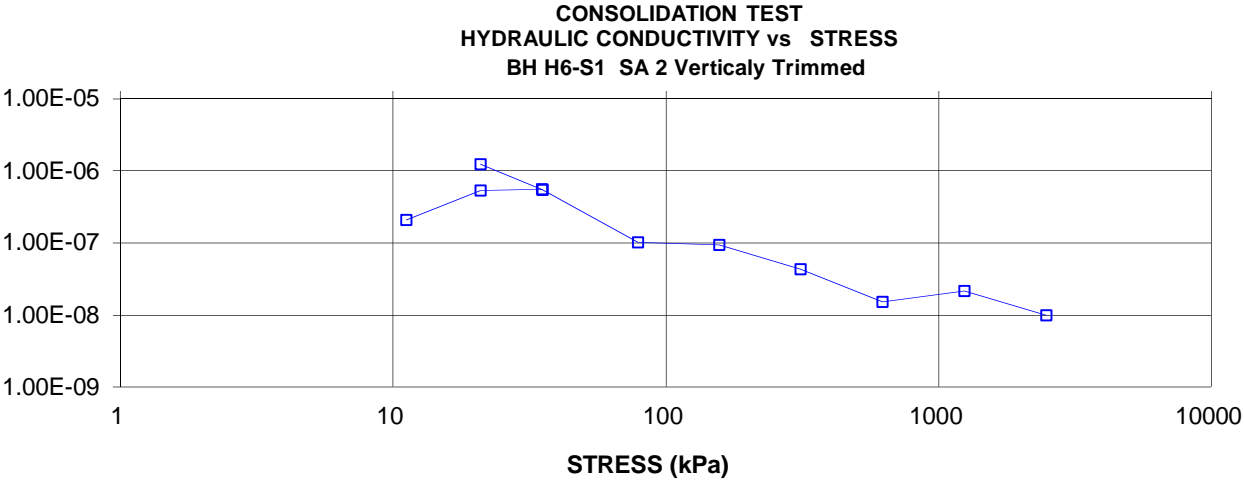
COEFFICIENT OF CONSOLIDATION,
cm²/s



VOLUME COMPRESSIBILITY, m²/kN

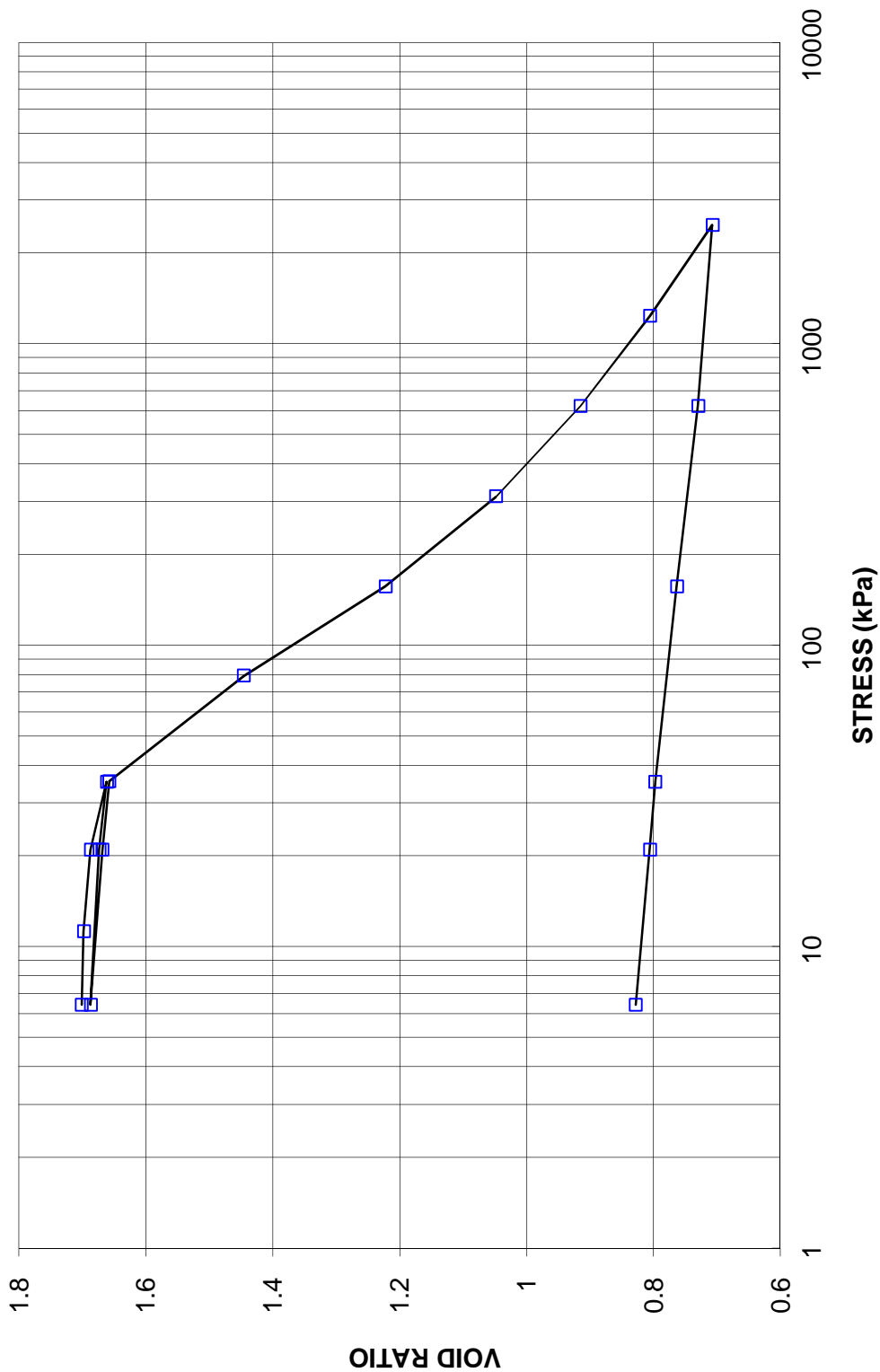


HYDRAULIC CONDUCTIVITY,
cm/s



**CONSOLIDATION TEST
VOID RATIO VS LOG STRESS**

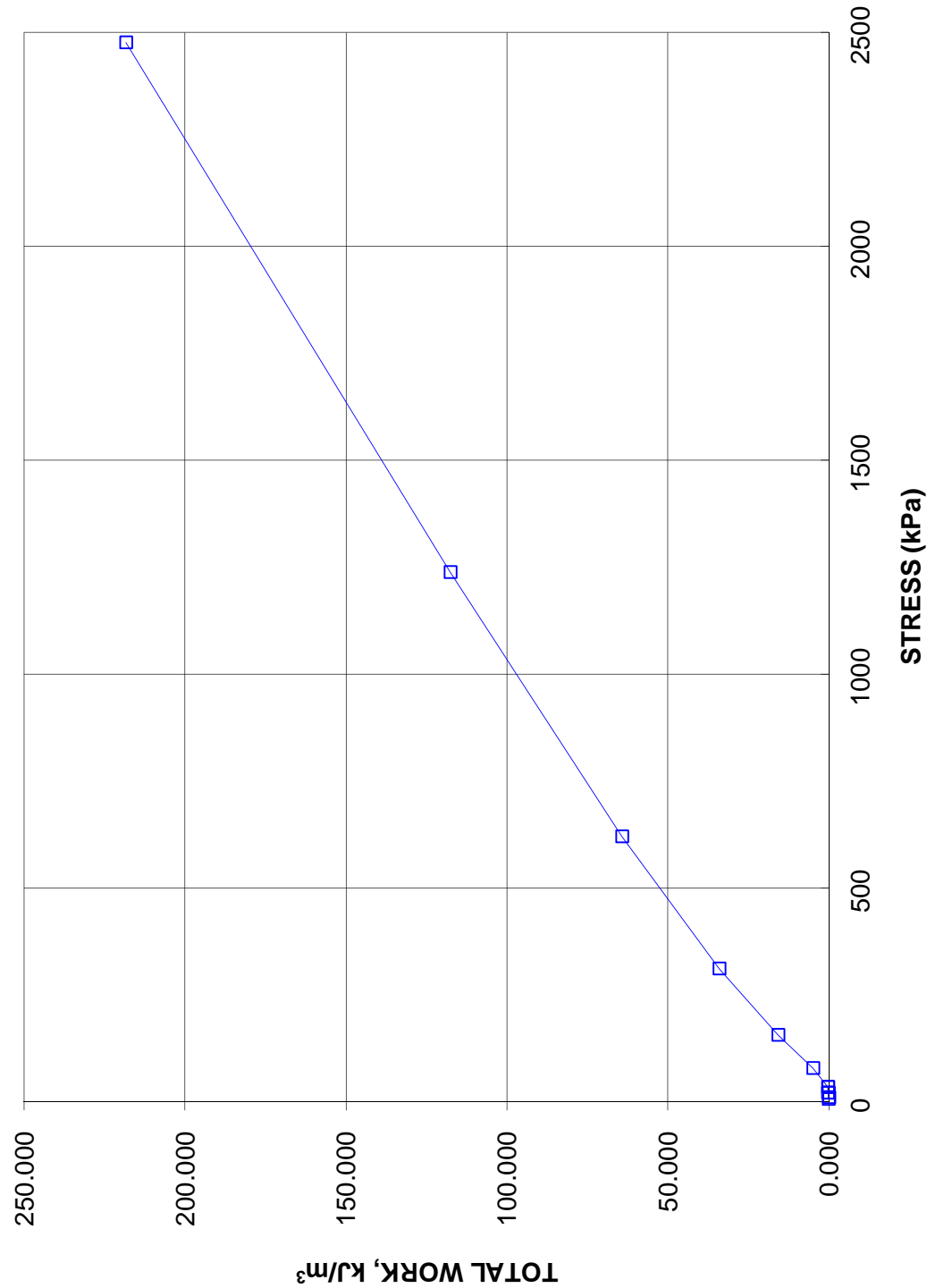
**CONSOLIDATION TEST
VOID RATIO vs STRESS
BH H6-S1 SA 2 Vertically Trimmed**



CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE C15
Pg. 4 of 4

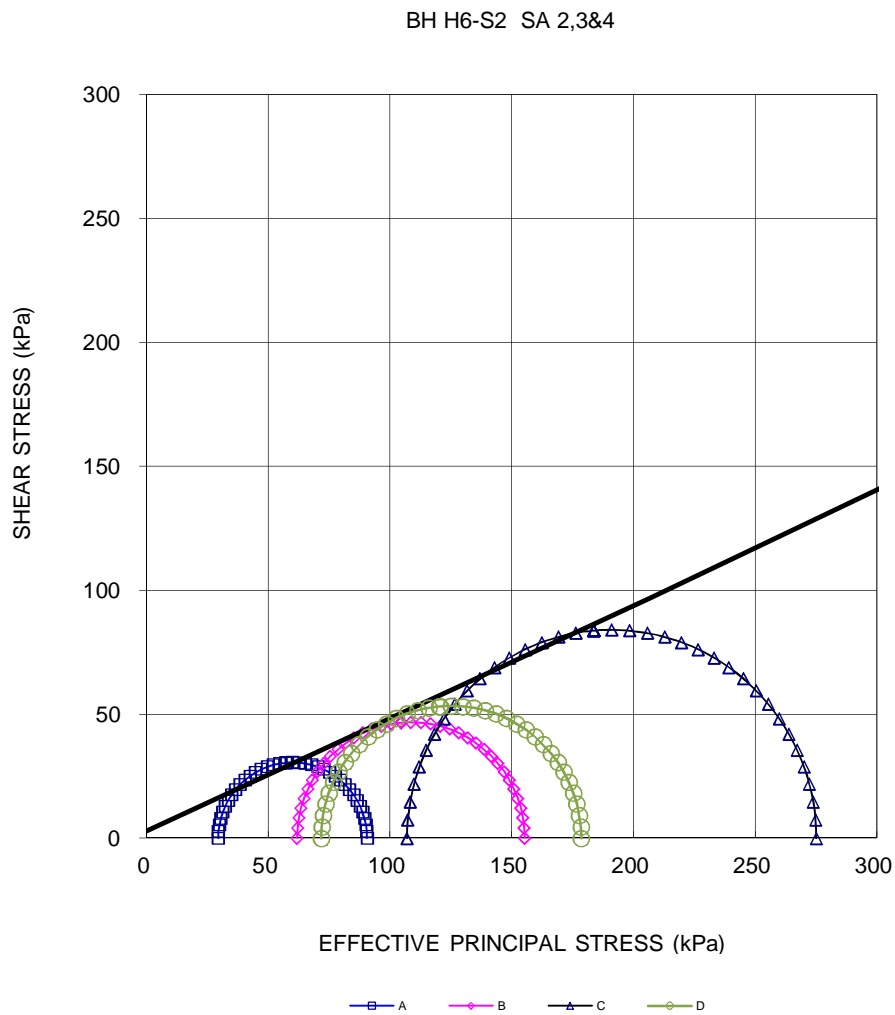
CONSOLIDATION TEST
TOTAL WORK, kJ/m³ vs STRESS
BH H6-S1 SA 2 Vertically Trimmed



CONSOLIDATED UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENTS SHEET 1 OF 4			FIGURE C16	
TEST STAGE	A	B	C	D
BOREHOLE NUMBER	H6-S2	H6-S2	H6-S2	H6-S2
SAMPLE	3	3	4a	2
DEPTH, m	10.67-10.98	10.67-10.98	13.72-14.25	7.62-8.10
SPECIMEN DIAMETER, cm	5.03	5.05	5.06	5.05
SPECIMEN HEIGHT, cm	10.09	10.06	9.97	10.12
NATURAL WATER CONTENT, %	64.0	61.5	54.5	56.1
DRY DENSITY, Mg/m ³	0.99	1.02	1.11	1.07
WATER CONTENT AFTER SATURATION, %	65.9	61.8	55.4	57.0
CELL PRESSURE, σ_3 , kPa	295.0	300.0	460.0	335.0
BACK PRESSURE, kPa	205.0	135.0	135.0	135.0
PORE PRESSURE PARAMETER "B"	0.99	0.96	0.97	0.97
CONSOLIDATION PRESSURE, σ_c , kPa	90.0	165.0	325.0	200.0
VOLUMETRIC STRAIN DURING CONSOLIDATION, %	10.2	14.8	16.1	18.5
WATER CONTENT AFTER CONSOLIDATION, %	55.6	47.7	40.8	39.7
AVERAGE RATE OF STRAIN, %/hr	0.5	0.5	0.5	0.5
TIME TO FAILURE, HOURS	5.0	4.3	4.8	5.0
WATER CONTENT AFTER TEST, %	52.7	43.2	35.1	37.9
MAX. DEVIATOR STRESS, $(\sigma_1 - \sigma_3)$, kPa	61.1	93.6	168.1	106.8
AXIAL STRAIN AT $(\sigma_1 - \sigma_3)$ maximum, %	2.5	2.2	2.4	2.5
MAX EFFECTIVE PRINCIPAL STRESS RATIO, (σ'_1 / σ'_3) maximum	4.2	3.8	3.6	3.1
DEVIATOR STRESS AT (σ'_1 / σ'_3) maximum, kPa	40.7	77.8	166.3	98.8
AXIAL STRAIN AT (σ'_1 / σ'_3) maximum, %	16.4	18.0	14.4	9.1
PORE PRESSURE PARAMETER, Af, AT $(\sigma_1 - \sigma_3)$ maximum	0.99	1.10	1.30	1.20
PORE PRESSURE PARAMETER, Af, AT (σ'_1 / σ'_3) maximum	1.90	1.76	1.57	1.55
FILTER DRAINS USED, y/n	y	y	y	y
TEST NOTES: <div style="margin-left: 40px;"> Specimen A taken 17-30 cm from top of tube. Specimen B taken 30-43 cm from top of tube. Specimen C taken 36-49 cm from top of tube. Specimen D taken 34-47 cm from top of tube. </div>				
FAILURE PLANE NUMBER	-	-	-	-
ANGLE OF FAILURE, DEGREES	bulged	bulged	bulged	bulged
<div style="display: flex; justify-content: space-between; align-items: flex-end; padding-top: 20px;"> <div> Date: 6/3/2013 Project No. 10-1191-0044 </div> <div style="text-align: center;"> Golder Associates </div> <div> Prepared By: LH Checked By: MT </div> </div>				

CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 2 OF 4

FIGURE C16



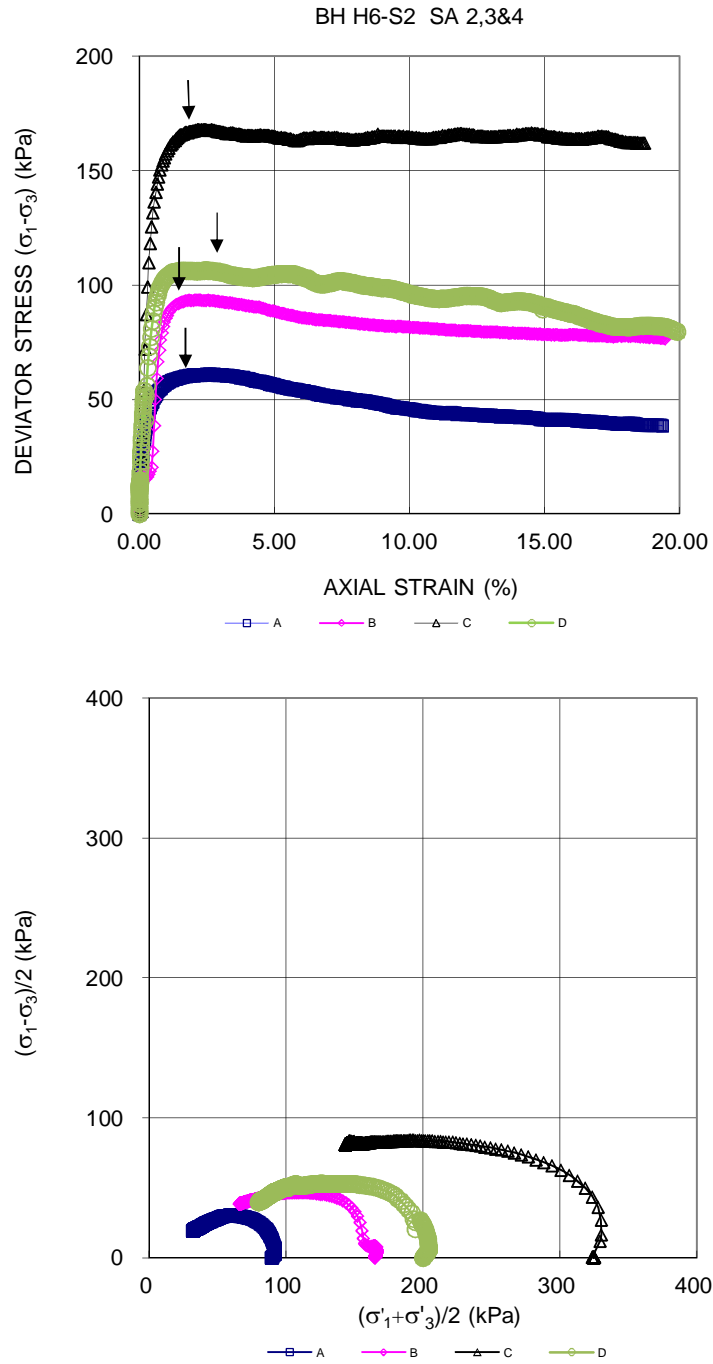
Date: 6/3/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

**CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 3 OF 4**

FIGURE C16



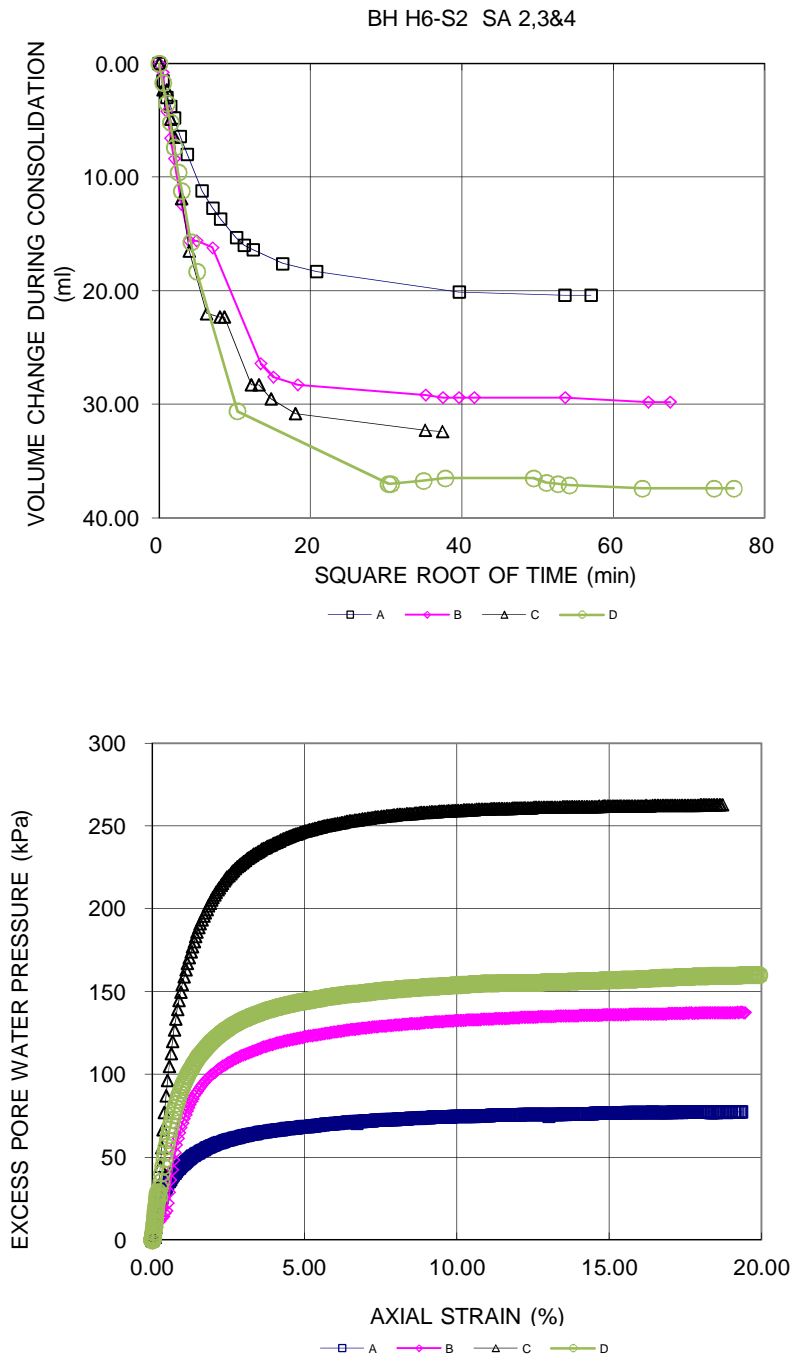
Date: 6/3/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

**CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
SHEET 4 OF 4**

FIGURE C16

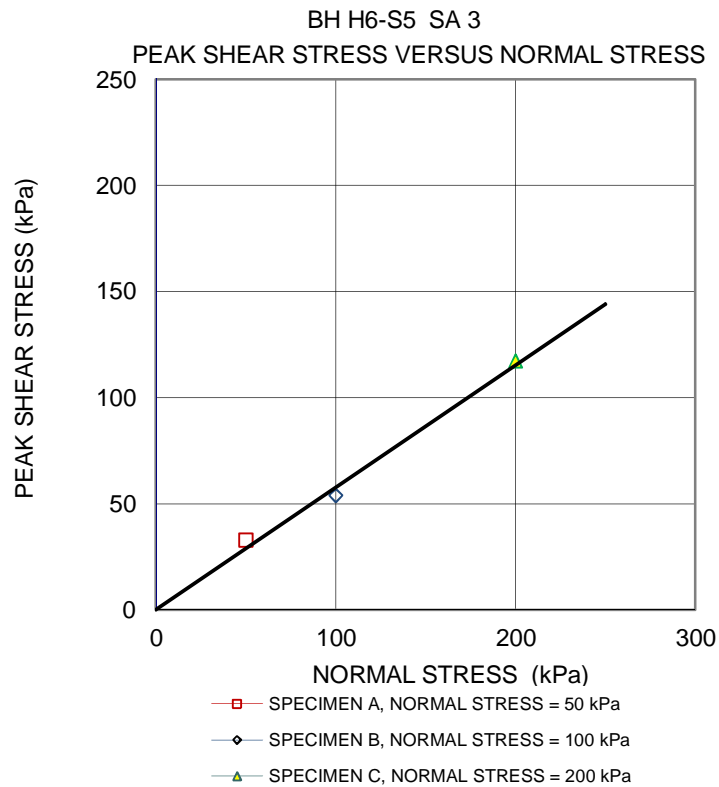
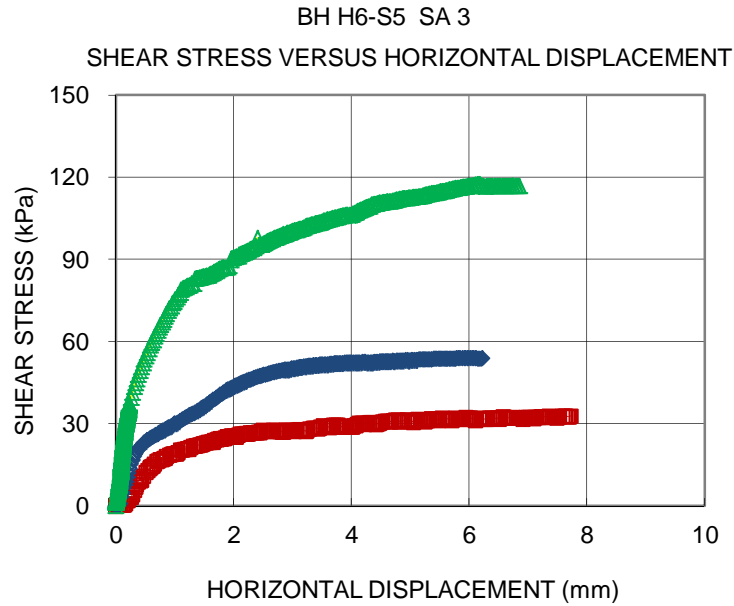


Date: 6/3/2013
Project No. 10-1191-0044

Golder Associates

Prepared By: LH
Checked By: MT

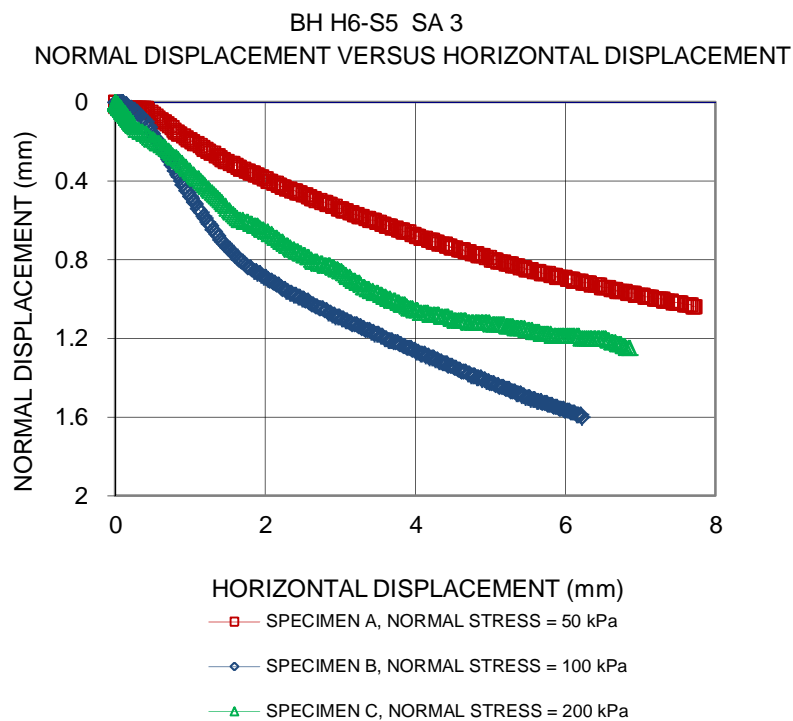
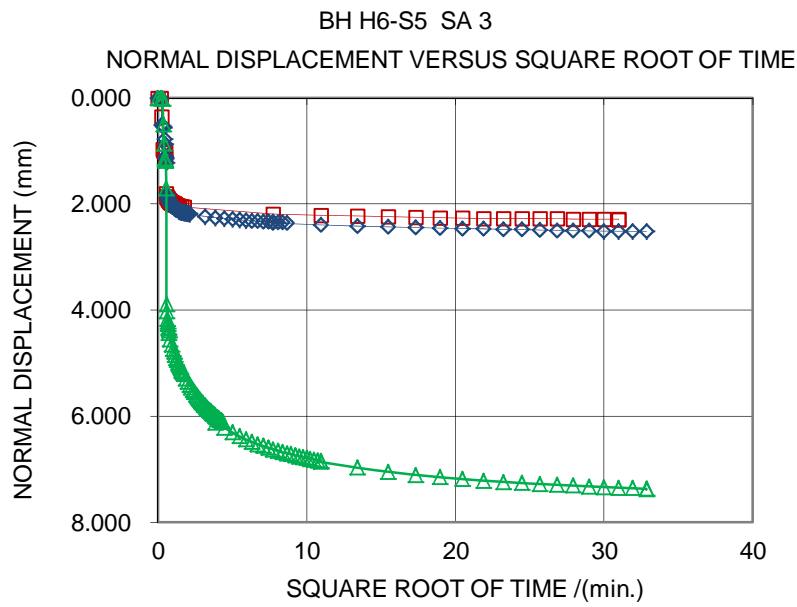
CONSOLIDATED DRAINED DIRECT SHEAR TEST SHEET 1 OF 3		FIGURE C17	
TEST STAGE	A	B	C
BOREHOLE NUMBER	H6-S5	H6-S5	H6-S5
SAMPLE NUMBER	3	3	3
SAMPLE DEPTH, (m)	7.32-7.80	7.32-7.80	7.32-7.80
SAMPLE HEIGHT, (mm)	25.00	25.00	25.20
SAMPLE LENGTH, (mm)	60.00	60.00	60.00
WATER CONTENT, BEFORE TEST, (%)	57.69	61.35	65.87
NORMAL (CONSOLIDATION) STRESS, (kPa)	50.00	100.00	200.00
WATER CONTENT, AFTER TEST, (%)	63.76	61.63	50.24
DISPLACEMENT RATE, mm/min	0.0048	0.0048	0.0048
TIME TO FAILURE, HOURS	26	20	21
PEAK SHEAR STRESS, (kPa)	32.88	53.88	117.35
HORIZONTAL DISPLACEMENT AT PEAK, (mm)	7.35	5.89	6.15
DRY DENSITY, initial, Mg/m ³	1.02	1.00	0.95
WET DENSITY, initial, Mg/m ³	1.61	1.61	1.57
TEST NOTES:			
<div> <div>Date: 6/14/2013</div> <div>Project No. 10-1191-0044</div> </div> <div> <div>Golder Associates</div> </div> <div> <div>Prepared By: LH</div> <div>Checked By: MT</div> </div>			



Date: 6/14/2013
Project No. 10-1191-0044

Golder Associates

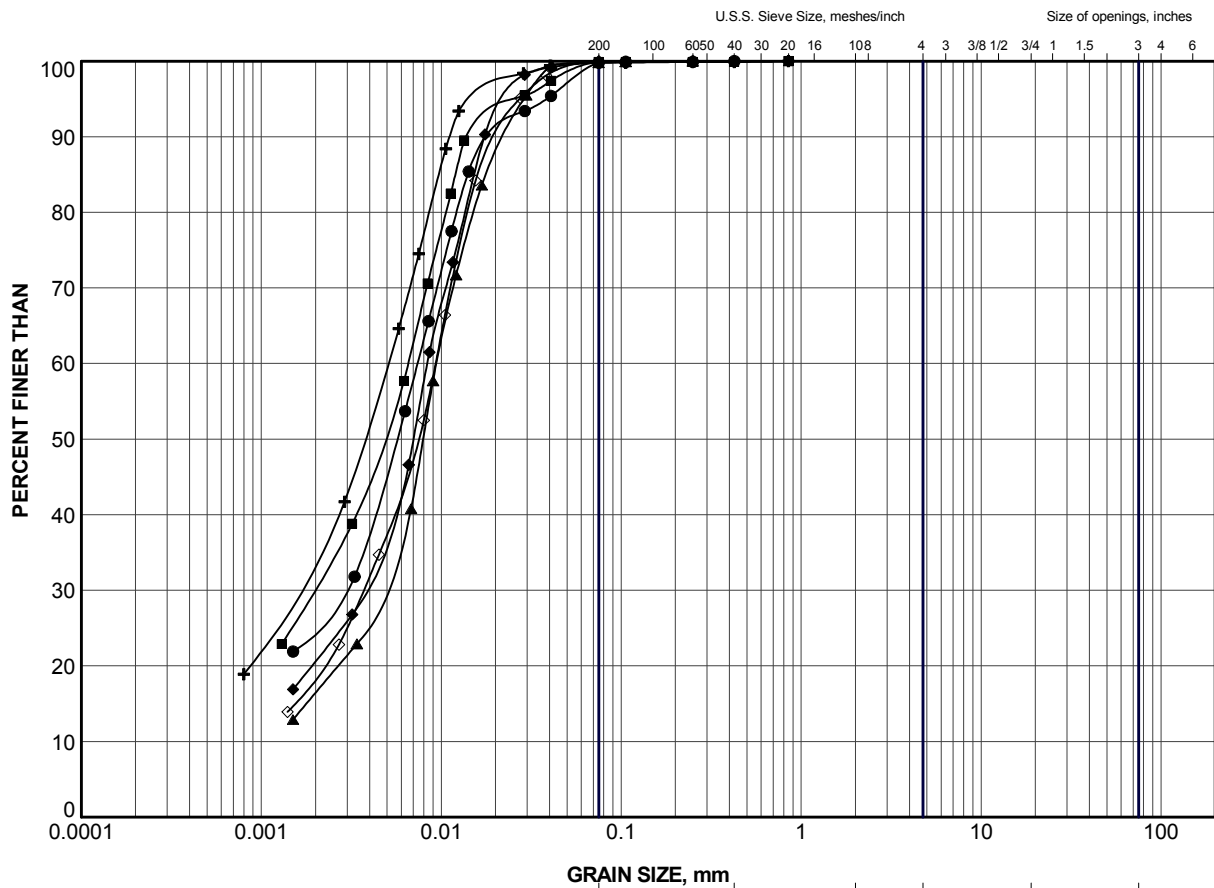
Prepared By: LH
Checked By: MT



Date: 6/14/2013
Project No. 10-1191-0044

Golder Associates


Prepared By: LH
Checked By: MT

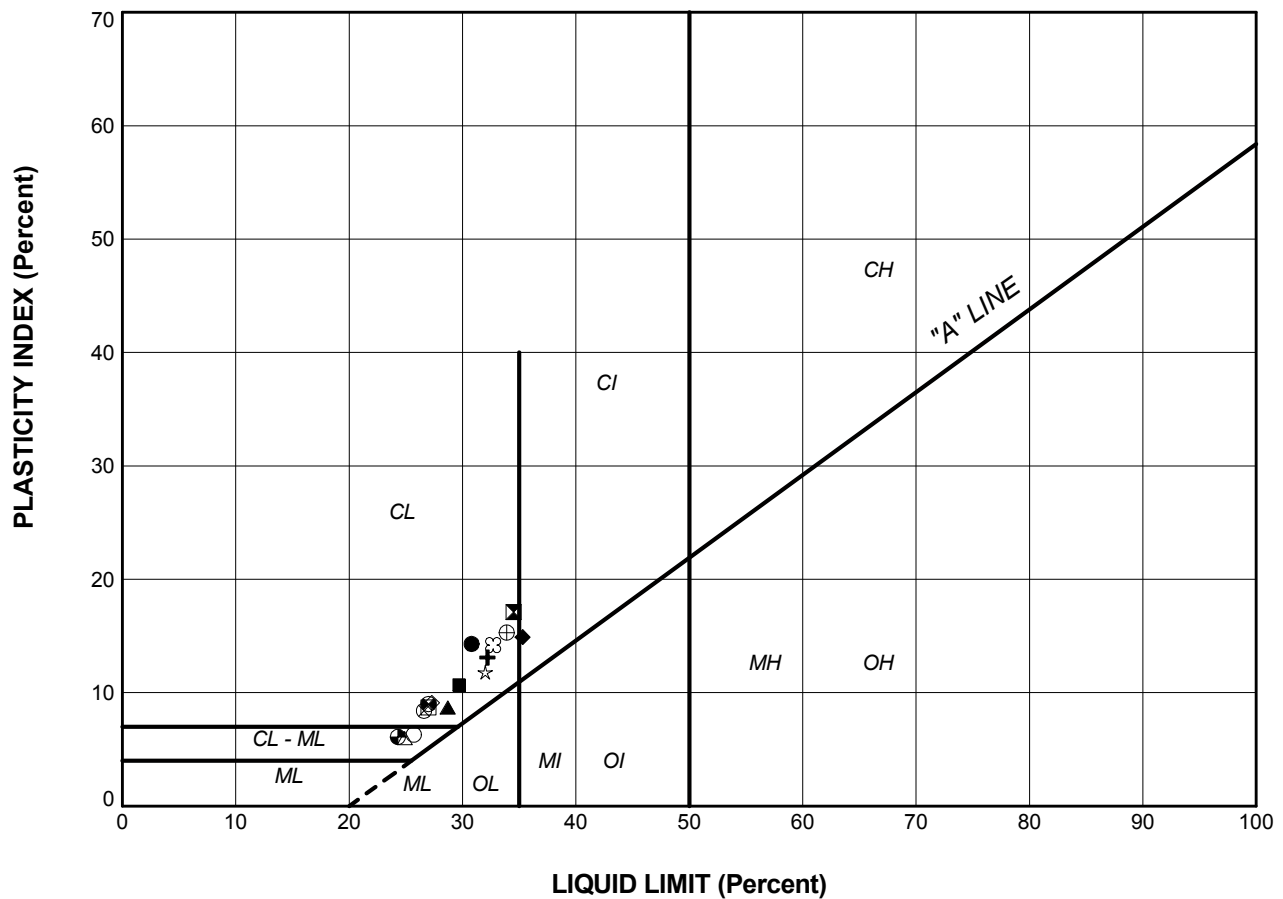


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC3-1	14	293.2
■	BC3-2	14	293.3
▲	H6-7	15	290.4
+	H6-16	8	297.3
◆	H7-2	8	295.5
◇	H7-5	8	295.8

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION CLAYEY SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE C18		



LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	BC3-1	14	30.8	16.5	14.3
■	BC3-2	14	29.7	19.0	10.7
▲	BC4-3	8	28.7	20.0	8.7
+	H6-2	14	32.2	19.1	13.1
◆	H6-5	14	35.3	20.4	14.9
◇	H6-6	16	27.3	18.2	9.1
○	H6-7	15	25.7	19.4	6.3
△	H6-9	15	24.9	18.9	6.0
⊗	H6-10	15	26.6	18.2	8.4
⊕	H6-16	8	33.9	18.6	15.3
□	H7-1	9	27.0	18.3	8.7
⊗	H7-2	8	27.0	18.0	9.0
⊕	H7-3	10	24.3	18.2	6.1
☆	H7-4	8	32.0	20.2	11.8
⊗	H7-7	7a	32.7	18.5	14.2
⊕	H7-14	4	34.5	17.4	17.1

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
PLASTICITY CHART CLAYEY SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
			FIGURE C19		



CONSOLIDATION TEST SUMMARY**FIGURE C20**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	5
Borehole Number	H6-S1	Sample Depth, m	17.02-17.10

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	10		
Date Started	5/31/2013		
Date Completed	6/19/2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.53	Unit Weight, kN/m ³	18.81
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	14.16
Area, cm ²	31.67	Specific Gravity, measured	2.74
Volume, cm ³	80.25	Solids Height, cm	1.335
Water Content, %	32.87	Volume of Solids, cm ³	42.28
Wet Mass, g	153.93	Volume of Voids, cm ³	37.97
Dry Mass, g	115.85	Degree of Saturation, %	100.3

TEST COMPUTATIONS

Stress kPa	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	cv. cm ² /s	mv m ² /kN	k cm/s
0.00	2.534	0.898	2.534				
5.95	2.524	0.890	2.529	94	1.44E-02	6.96E-04	9.84E-07
10.67	2.515	0.884	2.519	296	4.55E-03	6.94E-04	3.09E-07
20.40	2.503	0.875	2.509	231	5.78E-03	5.07E-04	2.87E-07
39.80	2.486	0.862	2.494	254	5.19E-03	3.48E-04	1.77E-07
78.51	2.463	0.845	2.474	187	6.94E-03	2.32E-04	1.58E-07
92.81	2.457	0.840	2.460	421	3.05E-03	1.60E-04	4.78E-08
39.80	2.462	0.844	2.460				
10.67	2.469	0.849	2.466				
39.80	2.462	0.844	2.465	15	8.59E-02	9.62E-05	8.10E-07
92.84	2.453	0.837	2.457	18	7.11E-02	6.40E-05	4.46E-07
155.77	2.427	0.818	2.440	360	3.51E-03	1.64E-04	5.64E-08
309.81	2.337	0.750	2.382	254	4.74E-03	2.30E-04	1.07E-07
619.22	2.216	0.660	2.277	214	5.13E-03	1.54E-04	7.74E-08
1241.26	2.136	0.600	2.176	113	8.88E-03	5.10E-05	4.44E-08
2479.48	2.063	0.545	2.100	73	1.28E-02	2.32E-05	2.91E-08
619.22	2.077	0.555	2.070				
155.77	2.100	0.573	2.088				
78.51	2.111	0.581	2.106				
20.38	2.136	0.600	2.123				
5.95	2.149	0.610	2.142				

Note:

k calculated using cv based on $\dot{\epsilon}_0$ values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	2.15	Unit Weight, kN/m ³	21.12
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	16.69
Area, cm ²	31.67	Specific Gravity, measured	2.74
Volume, cm ³	68.06	Solids Height, cm	1.335
Water Content, %	26.54	Volume of Solids, cm ³	42.28
Wet Mass, g	146.60	Volume of Voids, cm ³	25.78
Dry Mass, g	115.85		

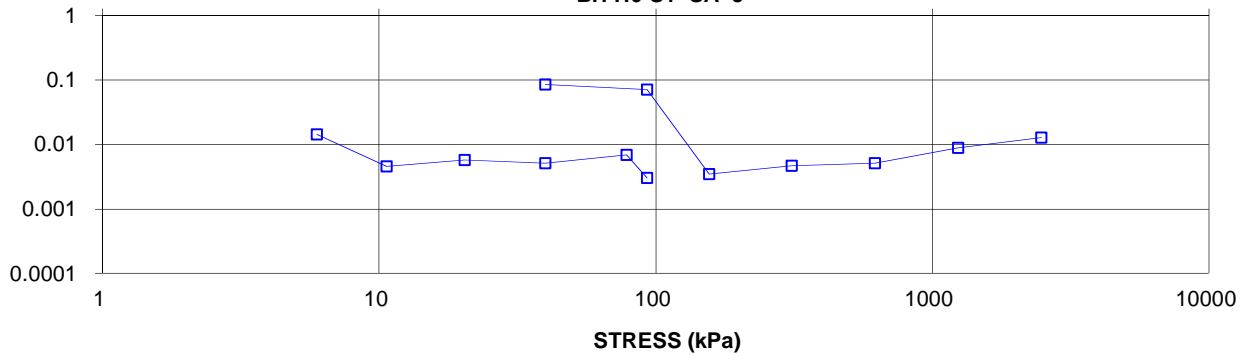
Prepared By:

Golder Associates

Checked By: MT

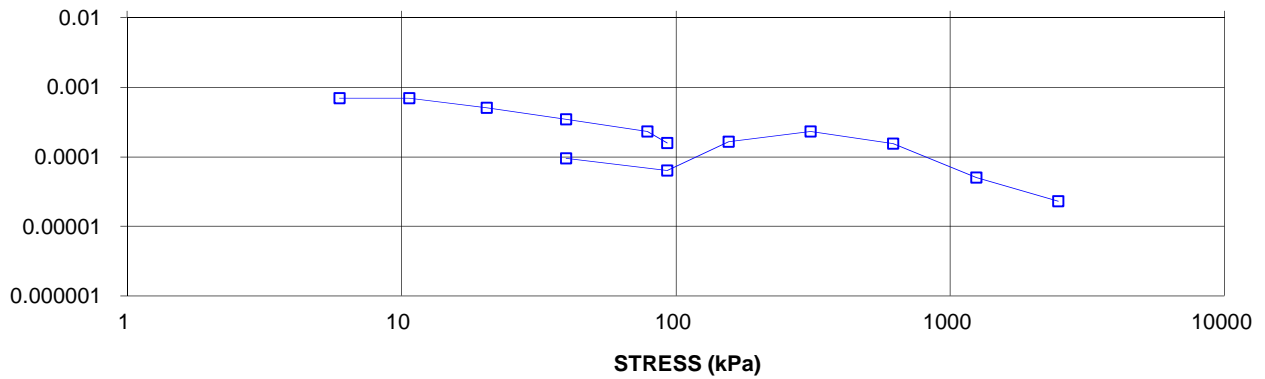
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS STRESS (kPa)
BH H6-S1 SA 5



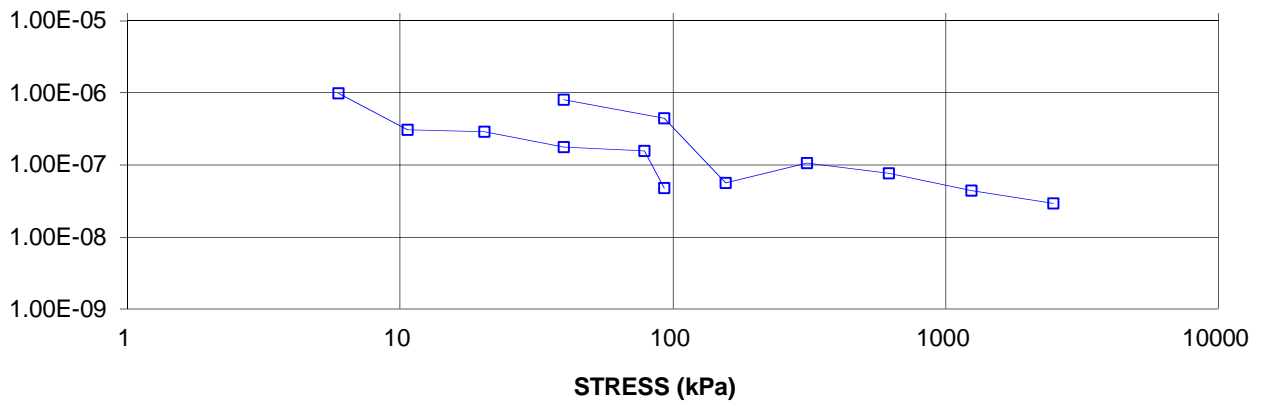
VOLUME COMPRESSIBILITY, m²/kN

CONSOLIDATION TEST
MV m²/kN vs STRESS (kPa)
BH H6-S1 SA 5



HYDRAULIC CONDUCTIVITY,
cm/s

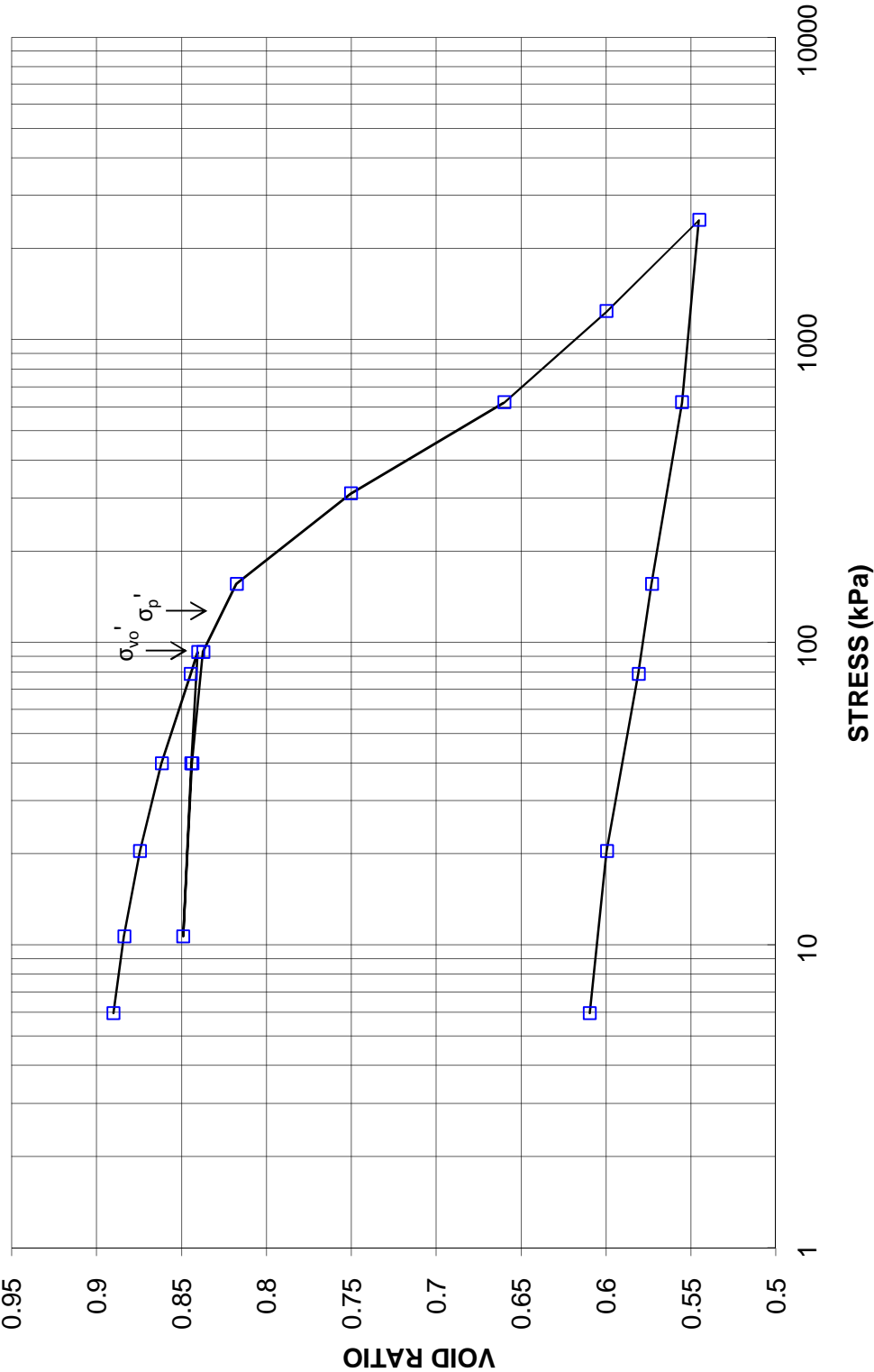
CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs STRESS
BH H6-S1 SA 5



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE C20
Pg. 3 of 4

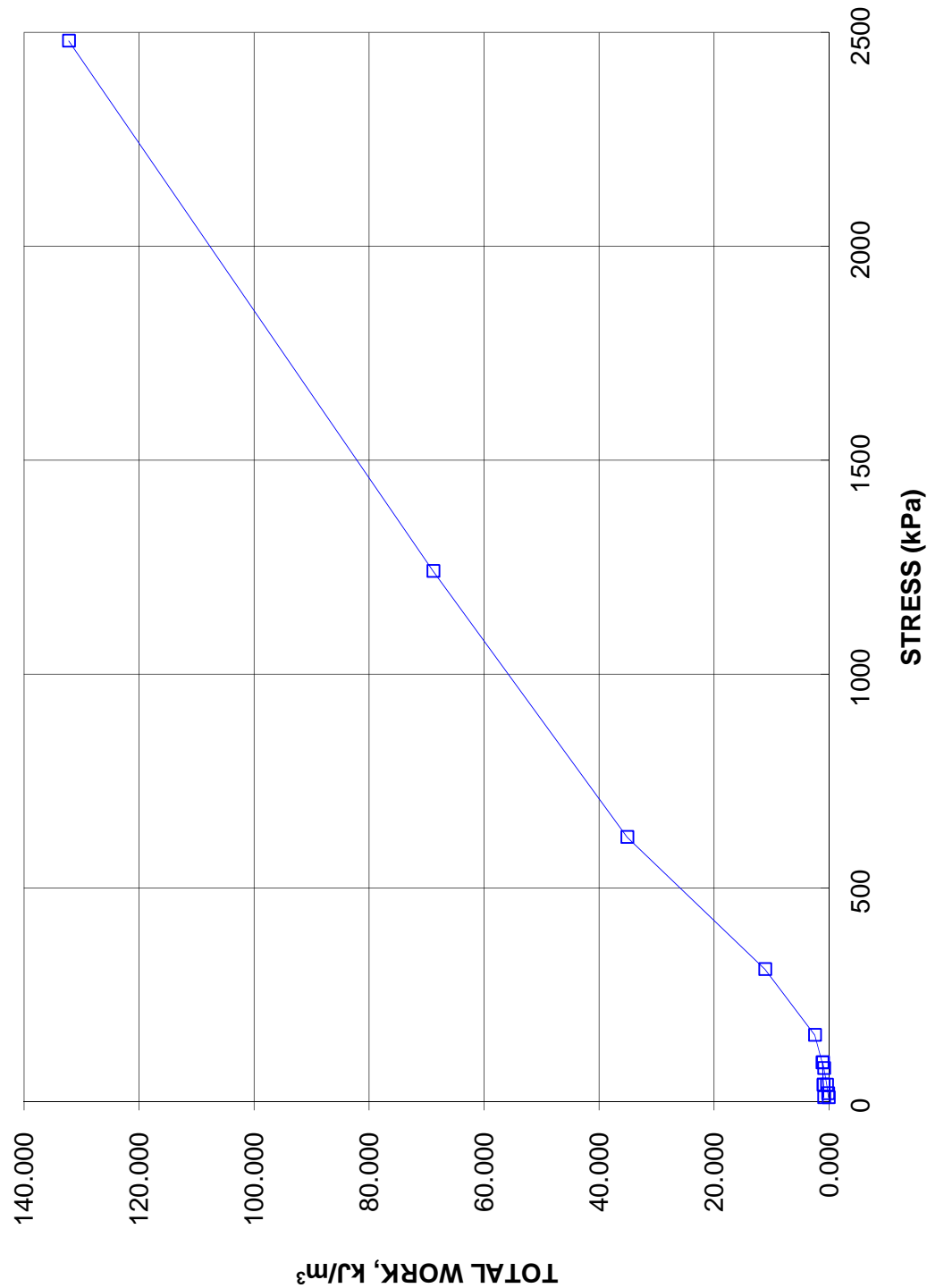
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH H6-S1 SA 5

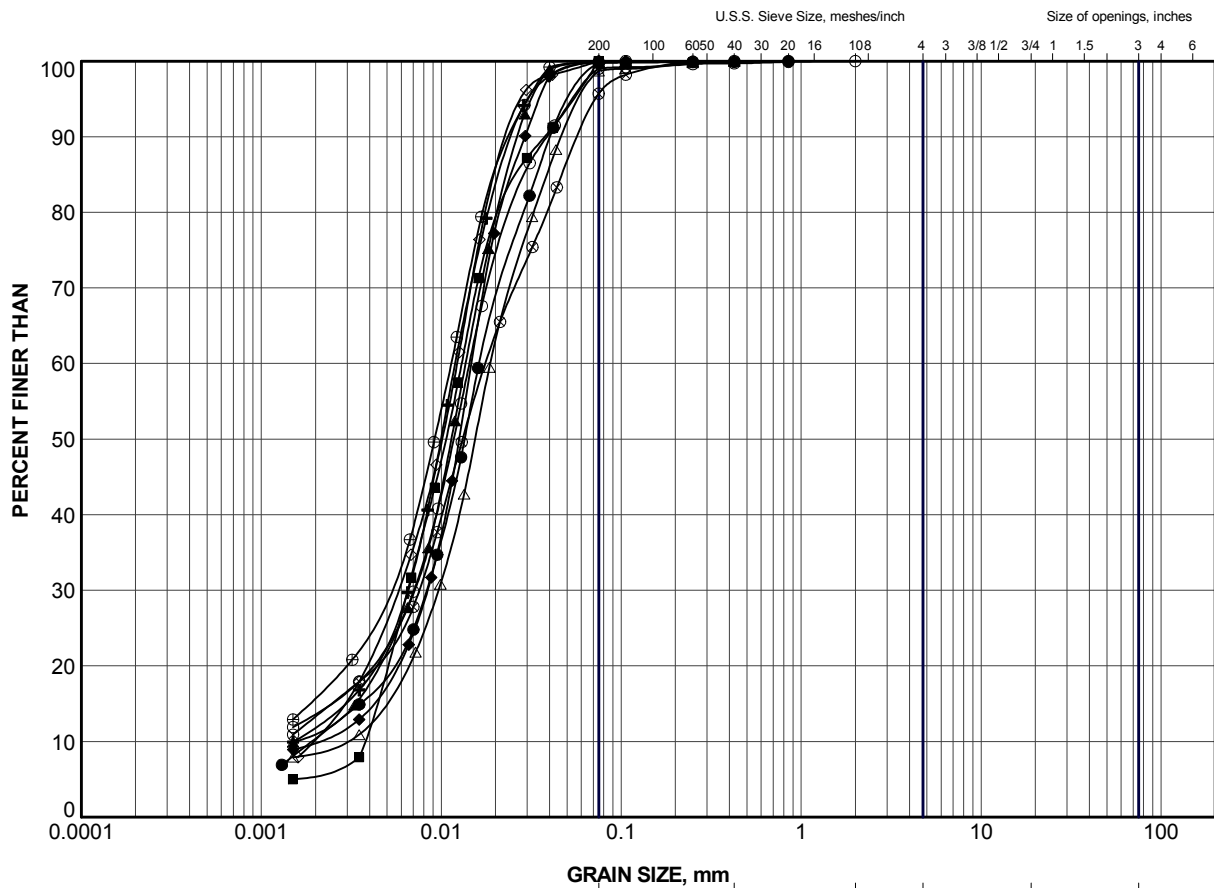


CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE C20
Pg. 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m^3 vs STRESS
BH H6-S1 SA 5





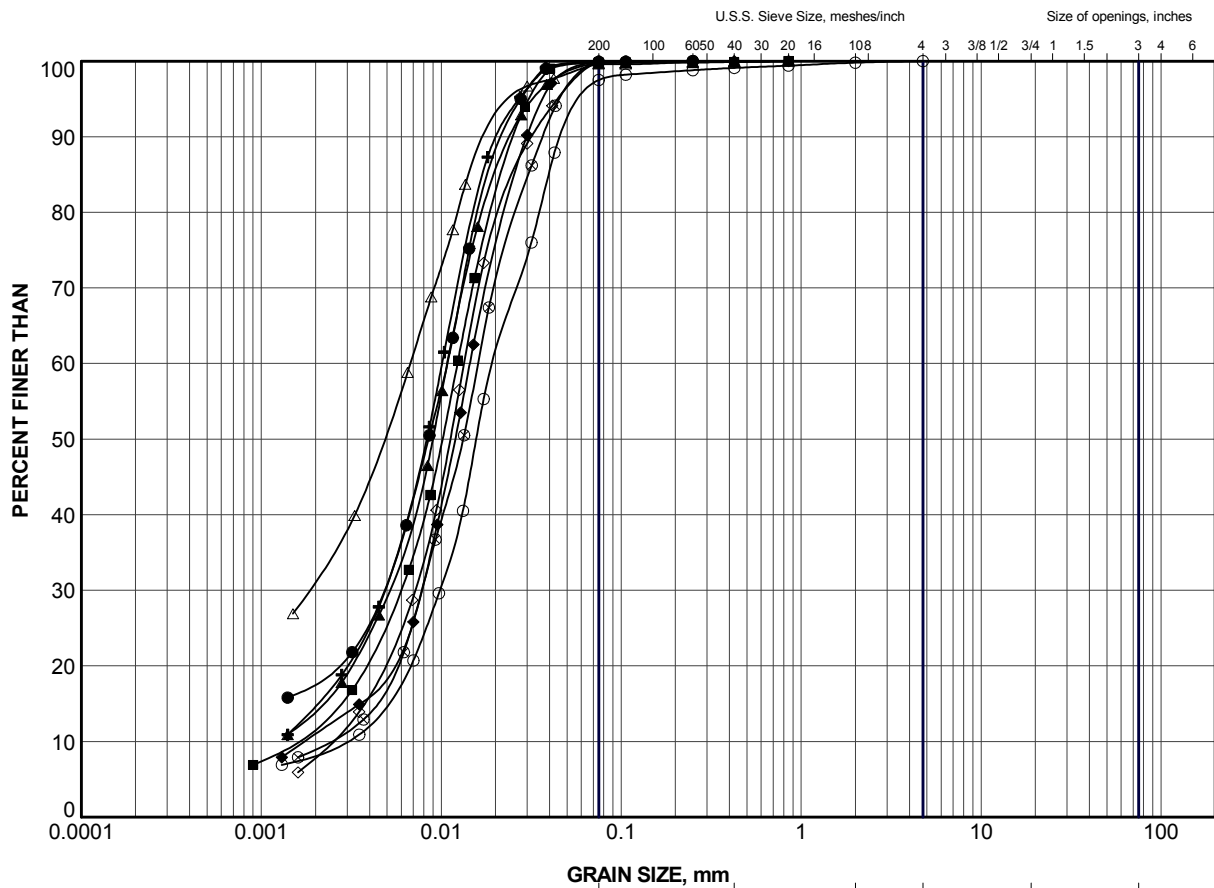
GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC3-2	16	287.2
■	BC3-3	15b	289.8
▲	BC4-1	10	292.5
+	BC4-2	8	294.7
◆	BC4-3	10	292.4
◇	H6-4	15	290.4
○	H6-5	16	287.4
△	H6-6	17	287.3
⊗	H6-9	17	284.2
⊕	H6-12	13	292.8

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013	FIGURE C21.1		
APPR	JMAC	Jul 2013			





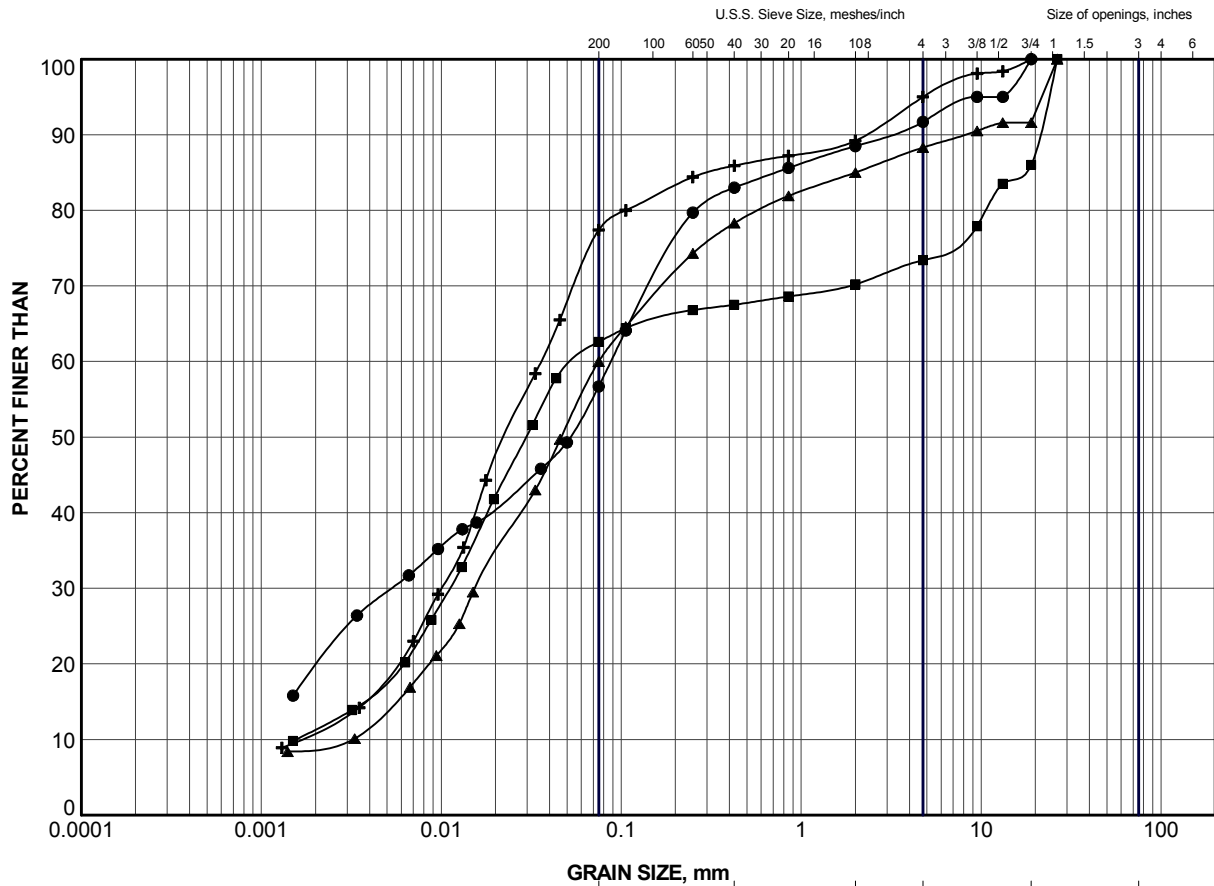
CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H6-15	10	295.8
■	H6-17	9	295.2
▲	H6-18	9	296.6
+	H6-19	7	297.7
◆	H7-3	12	291.1
◇	H7-4	9	294.3
○	H7-8	4	302.1
△	H7-9	3	304.2
⊗	H7-10	4	301.5

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
			FIGURE C21.2		




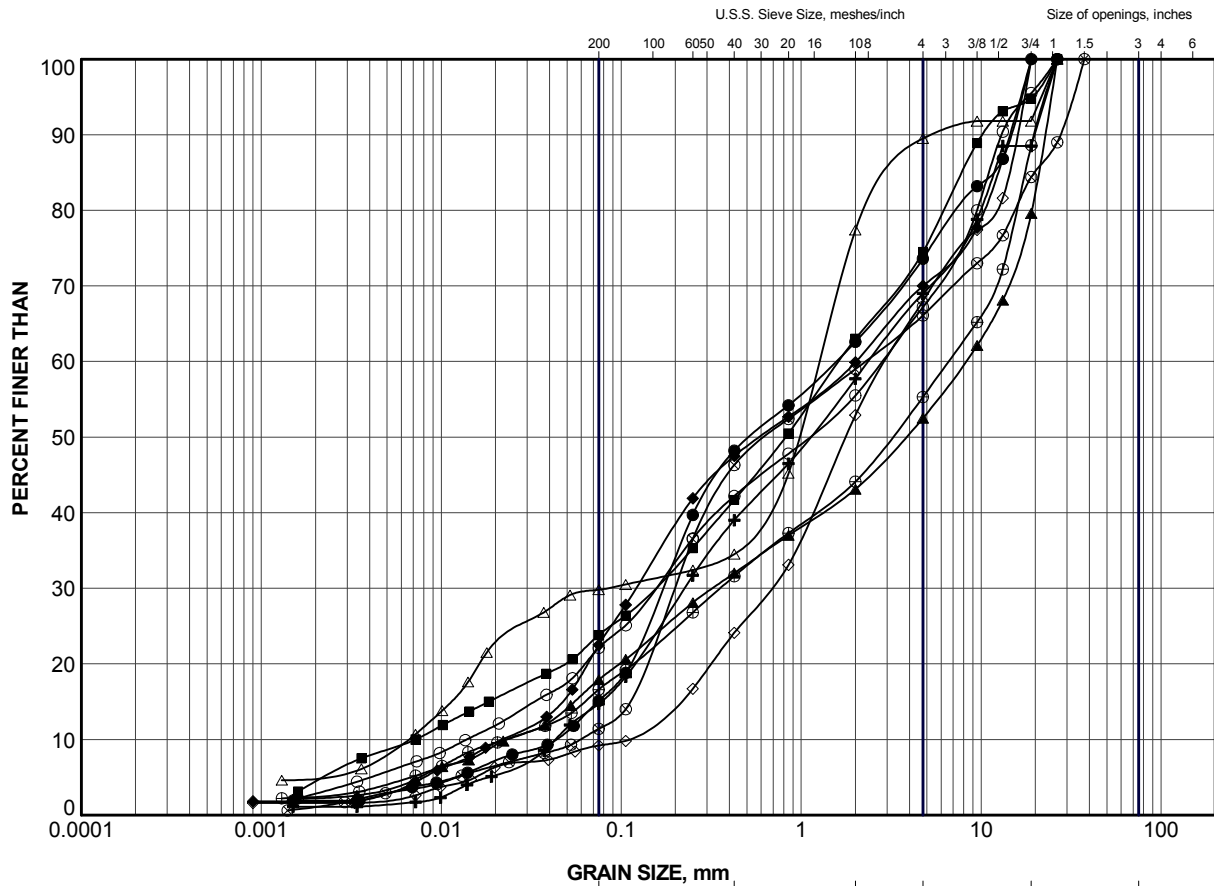


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H6-1	13	293.2
■	H6-11	16	285.2
▲	H6-14	11	294.9
+	H7-12	2	306.7

PROJECT					
HIGHWAY 66 - HIGH FILL H6 / H7 STA 14+020 TO 14+650					
TITLE					
GRAIN SIZE DISTRIBUTION SILT to SAND AND SILT to GRAVELLY SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE C21.3		



CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC4-1	12	289.8
■	H6-2	15	290.4
▲	H6-12	15	286.7
+	H6-15	12	292.8
◆	H6-16	11	292.9
◇	H6-17	11	292.2
○	H7-2	10	292.6
△	H7-3	13	289.7
⊗	H7-6	10	291.9
⊕	H7-8	5b	301.2

PROJECT

HIGHWAY 66 - HIGH FILL H6 / H7
STA 14+020 TO 14+650

TITLE

GRAIN SIZE DISTRIBUTION

SILTY SAND to SAND AND GRAVEL



Golder Associates
SUDBURY, ONTARIO

PROJECT No. 10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE N/A
CHECK	SEMC	Jul 2013	REV.
APPR	JMAC	Jul 2013	

FIGURE C22



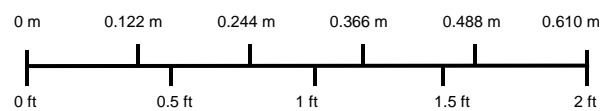
Borehole BC2-1
Elevation 305.9 m to 302.9 m




Borehole BC2-2
Elevation 302.3 m to 298.9 m



Borehole BC2-3
Elevation 307.2 m to 304.3 m

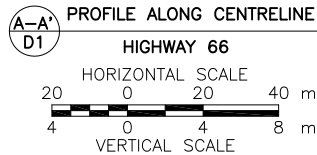
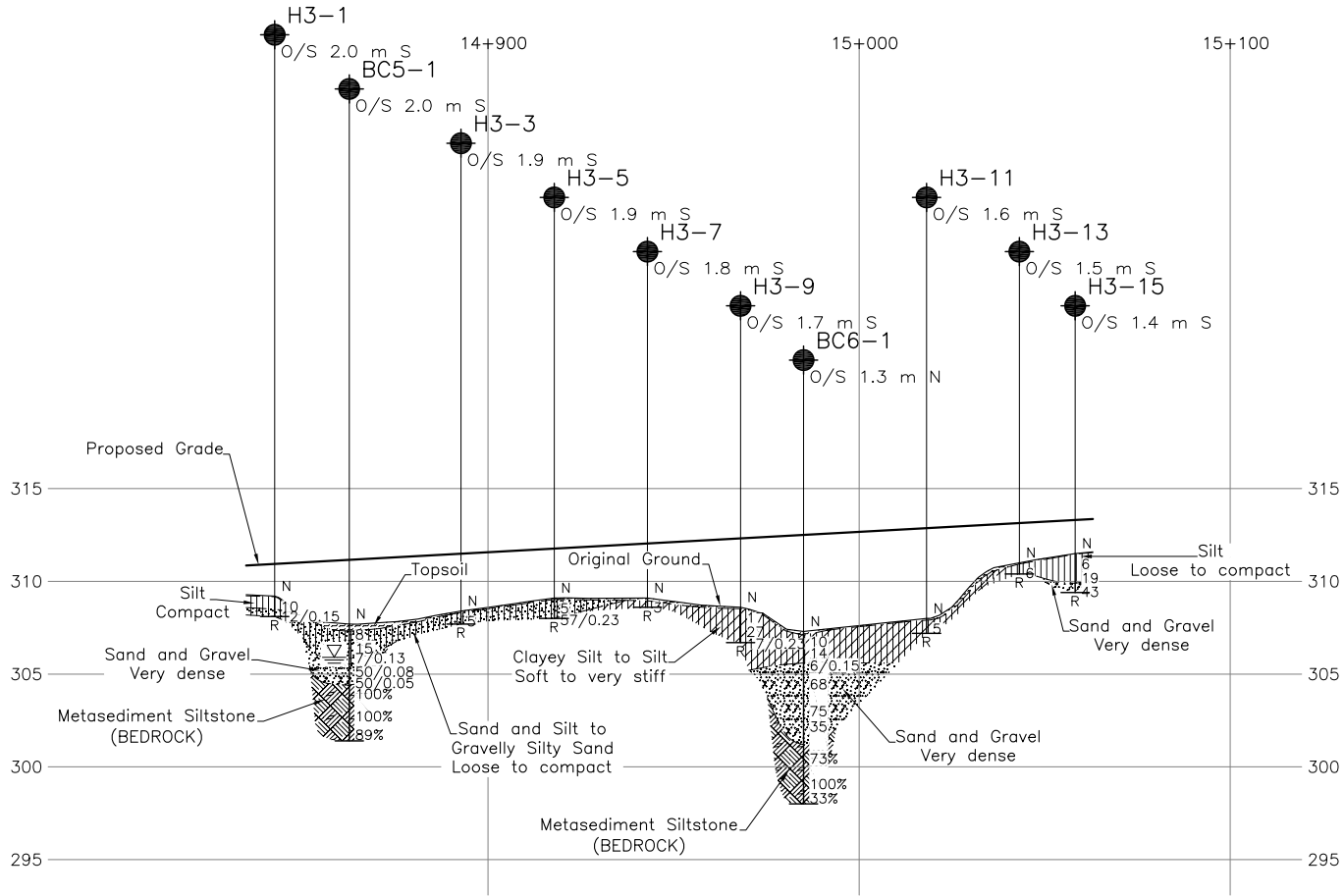
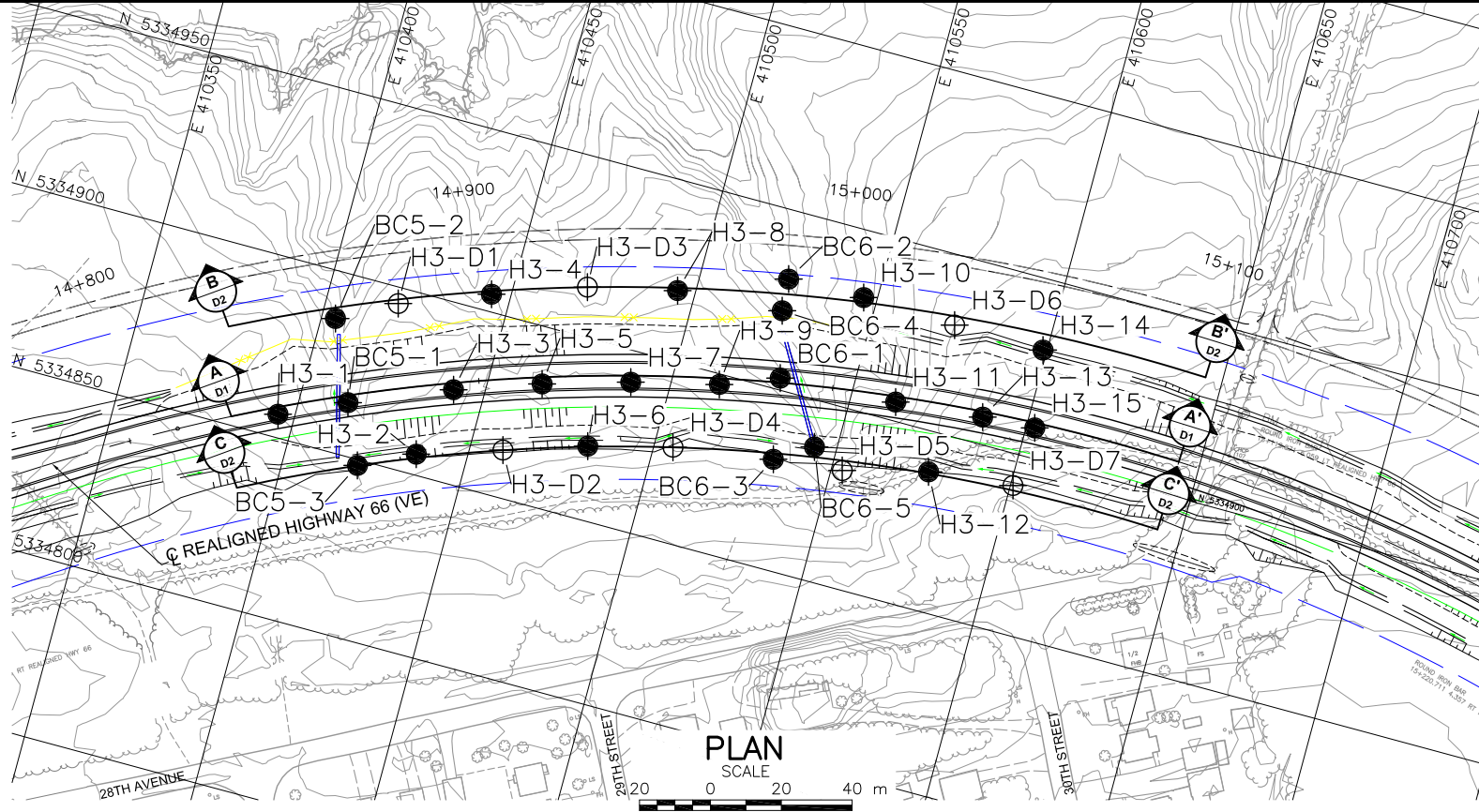


PROJECT		HIGHWAY 66 – HIGH FILL H6 / H7 STA 14+020 to 14+650			
TITLE		BEDROCK CORE PHOTOGRAPHS			
	PROJECT No.	10-1191-0044		FILE No. ----	
	DESIGN	MT	APR 2013	SCALE	AS SHOWN
	CADD	--		REV.	
	CHECK	SEMC	APR 2013	FIGURE C23	
	REVIEW	JMAC	JUN 2013		



APPENDIX D

Highway 66 – STA 14+840 to 15+060 (High Fill H3)



METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

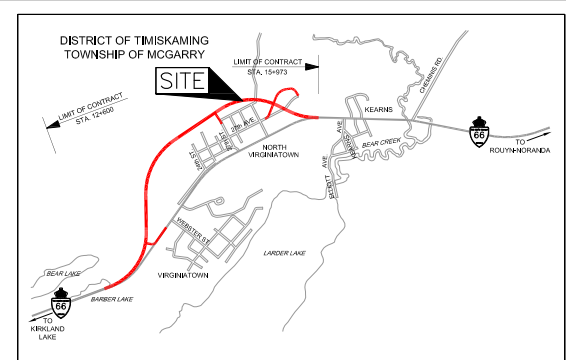


HIGHWAY 66
HWY 66 - STA 14+840 TO 15+060
BOREHOLE LOCATIONS AND
SOIL STRATA

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA



KEY PLAN
SCALE
700 0 700 m

LEGEND

- Borehole
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- R Refusal
- ≡ WL upon completion of drilling

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

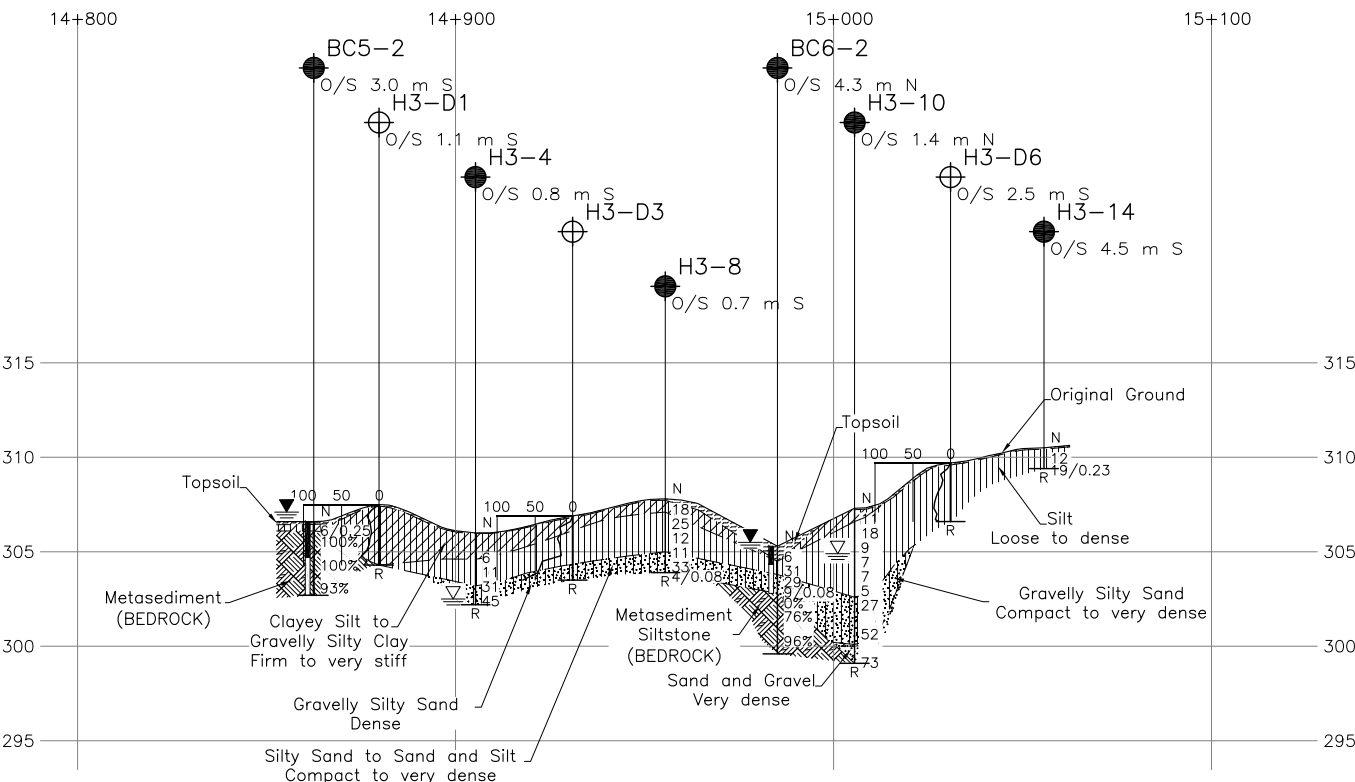
REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.

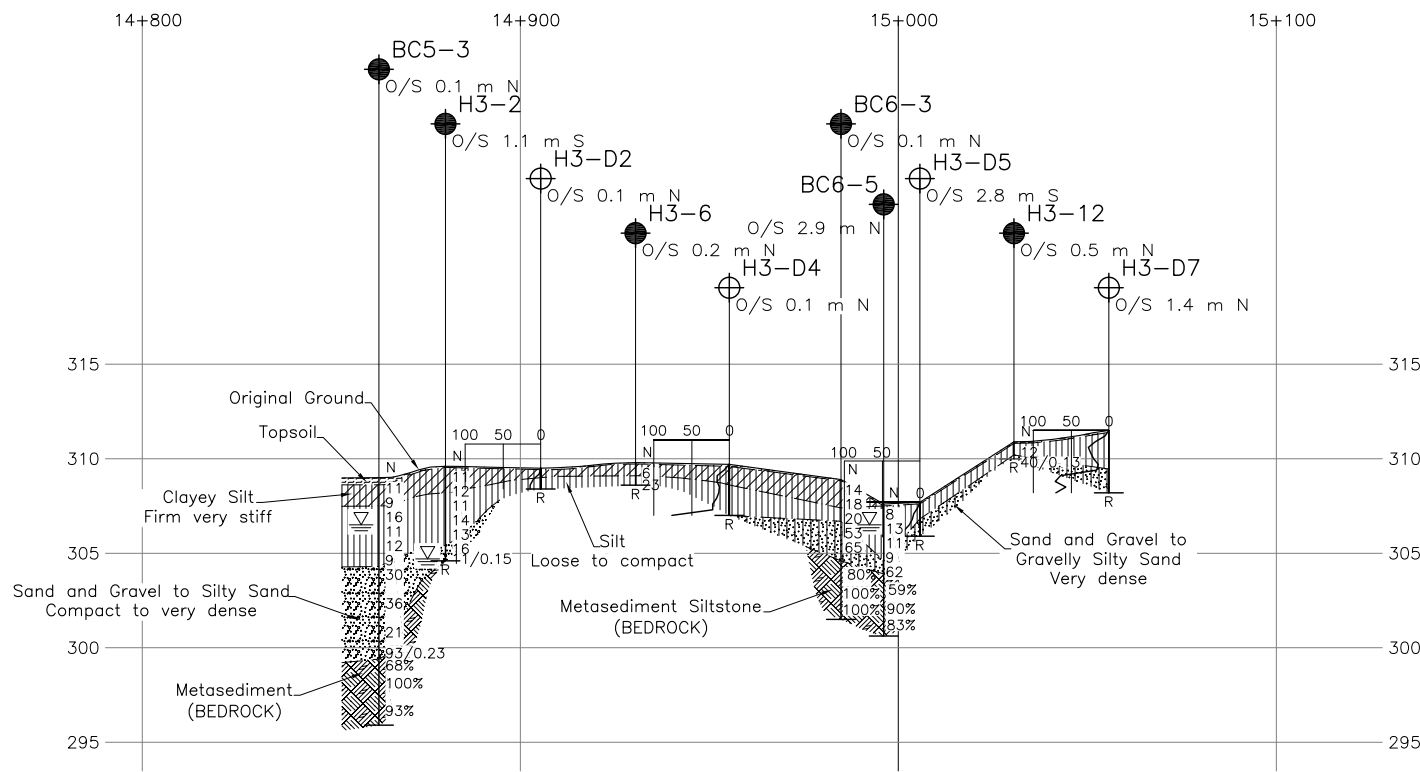
BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
BC5-1	307.7	5334864.8	410413.5
BC5-2	306.6	5334886.8	410403.9
BC5-3	309.0	5334848.4	410420.7
BC6-1	308.8	5334903.3	410529.4
BC6-2	306.8	5334930.9	410524.4
BC6-3	305.5	5334880.7	410533.5
BC6-4	305.7	5334921.8	410525.0
BC6-5	307.6	5334887.1	410543.8
H3-1	309.2	5334856.5	410395.3
H3-2	309.6	5334855.8	410435.9
H3-3	308.4	5334876.1	410441.3
H3-4	306.0	5334904.9	410444.6
H3-5	309.1	5334884.2	410465.0
H3-6	309.8	5334870.6	410482.0
H3-7	309.1	5334891.2	410489.0
H3-8	307.8	5334919.6	410495.0
H3-9	308.6	5334897.1	410513.3
H3-10	307.3	5334931.4	410546.2
H3-11	308.0	5334905.3	410562.6
H3-12	310.9	5334888.7	410576.7
H3-13	311.0	5334907.6	410587.4
H3-14	310.5	5334930.3	410598.9
H3-15	311.5	5334908.5	410602.4
H3-D1	307.5	5334895.5	410419.9
H3-D2	309.5	5334863.3	410459.2
H3-D3	306.9	5334913.9	410470.2
H3-D4	309.7	5334876.6	410505.3
H3-D5	307.7	5334882.7	410553.1
H3-D6	309.7	5334930.6	410573.0
H3-D7	311.5	5334891.2	410600.7



NO.	DATE	BY	REVISION
Geocres No. 32D-17			
HWY. 66	PROJECT NO. 10-1191-0044		DIST.
SUBM'D. TR	CHKD.	DATE: DEC 2013	SITE:
DRAWN: JJJ	CHKD. SEMC	APPD. JMAC	DWG. D1



B-B' PROFILE ALONG NORTH TOE
D1
HIGHWAY 66
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
4 0 4 8 m



C-C' PROFILE ALONG SOUTH TOE
D1
HIGHWAY 66
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
4 0 4 8 m

METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

HIGHWAY 66
HWY 66 - STA 14+840 TO 15+060
SOIL STRATA

Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA

LEGEND

Borehole

Dynamic Cone Penetration Test

Seal

Piezometer

Standard Penetration Test Value

Blows/0.3m unless otherwise stated
(Std. Pen. Test, 475 j/blow)

100% Rock Quality Designation (RQD)

R Refusal

WL upon completion of drilling

WL in piezometer, measured on Nov. 15, 2012

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
BC5-2	306.6	5334886.8	410403.9
BC5-3	309.0	5334848.4	410420.7
BC6-2	306.8	5334930.9	410524.4
BC6-3	305.5	5334880.7	410533.5
BC6-5	307.6	5334887.1	410543.8
H3-2	309.6	5334855.8	410435.9
H3-4	306.0	5334904.9	410444.6
H3-6	309.8	5334870.6	410482.0
H3-8	307.8	5334919.6	410495.0
H3-10	307.3	5334931.4	410546.2
H3-12	310.9	5334888.7	410576.7
H3-14	310.5	5334930.3	410598.9
H3-D1	307.5	5334895.5	410419.9
H3-D2	309.5	5334863.3	410459.2
H3-D3	306.9	5334913.9	410470.2
H3-D4	309.7	5334876.6	410505.3
H3-D5	307.7	5334882.7	410553.1
H3-D6	309.7	5334930.6	410573.0
H3-D7	311.5	5334891.2	410600.7

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.



NO.				REVISION			
Geocres No. 32D-17				PROJECT NO. 10-1191-0044			
HWY. 66		SUBM'D. TR		DATE: DEC 2013		SITE:	
DRAWN: JJJ		CHKD. SEMC		APPD. JMAC		DWG. D2	

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H3-1				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334856.5; E 410395.3</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 9, 2011</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
309.2	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL		1	SS	10		309										
308.5	SILT, trace clay Compact Grey Moist		2	SS	12/0.15												14 43 36 7
308.1	SAND and SILT, some gravel, trace to some clay Compact Grey Moist																
1.1	END OF BOREHOLE AUGER REFUSAL																
Note: 1. Borehole dry upon completion of drilling.																	

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H3-2				1 OF 1 METRIC										
G.W.P.		5091-07-00		LOCATION		N 5334855.8; E 410435.9		ORIGINATED BY		MT								
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers		COMPILED BY		MT								
DATUM		GEODETIC		DATE		August 9, 2011		CHECKED BY		SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
309.6	GROUND SURFACE							20	40	60	80	100						
8.9	TOPSOIL		1	SS	11		309											
	CLAYEY SILT, trace sand, trace rootlets		2	SS	12													
308.2	Stiff Brown to grey Moist																	
1.4	SILT, trace to some clay, trace sand		3	SS	11		308											
	Compact Grey Wet		4	SS	14		307											
			5	SS	13		306											
305.4			6	SS	16													
4.2	Silty SAND, some gravel, trace clay		7	SS	11/0.15		305											
304.6	Compact Brown Wet																	
5.0	END OF BOREHOLE AUGER REFUSAL																	
Note:																		
1. Water level at a depth of 4.9 m below ground surface (Elev. 304.7 m) upon completion of drilling.																		

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No H3-3				1 OF 1 METRIC								
G.W.P. 5091-07-00		LOCATION N 5334876.1; E 410441.3				ORIGINATED BY MT								
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT								
DATUM GEODETIC		DATE August 9, 2011				CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa		WATER CONTENT (%)		γ		GR SA SI CL
308.4	GROUND SURFACE							20 40 60 80 100	W _p W W _L	20 40 60	kN/m ³			
0.0	TOPSOIL		1a					○ UNCONFINED + FIELD VANE						
0.1	SAND and SILT, trace to some gravel, trace clay		1b	SS	5		308	● QUICK TRIAXIAL × REMOULDED					9 49 37 5	
307.7	Loose to compact Brown Moist													
0.7	Spoon attempted at 0.7 m depth, bouncing.													
	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)													
	Notes:													
	1. Borehole dry upon completion of drilling.													
	2. Auger refusal encountered at 0.5 m depth.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H3-4				1 OF 1 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334904.9; E 410444.6				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT									
DATUM GEODETIC				DATE August 8, 2011				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
306.0	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL		1	SS	9												
	CLAYEY SILT, trace sand Firm to stiff Grey Moist		2	SS	6												
304.6																	
1.4	SILT, trace to some clay, trace sand Compact to dense Wet Grey		3	SS	11												
			4	SS	31												
303.2																	
2.8	Gravelly Silty SAND, trace clay Dense Brown Wet		5	SS	45												
302.2	Spoon attempted at 3.8 m depth.																
3.8	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING) Note: 1. Water level at a depth of 3.5 m below ground surface (Elev. 302.5 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H3-5				1 OF 1 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334884.2; E 410465.0				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT									
DATUM GEODETIC				DATE August 8, 2011				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
309.1	GROUND SURFACE							20	40	60	80	100					
0.7	TOPSOIL		1	SS	5		309									NP	
308.4	SILT, trace to some clay, trace sand Loose Grey and brown Moist																
308.0	Gravelly Silty SAND, trace clay Very dense Brown and grey Moist		2	SS	57/0.23		308										26 43 26 5
1.1	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)																
Notes: 1. Borehole dry upon completion of drilling. 2. Auger refusal encountered at 0.8 m depth.																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H3-6				1 OF 1 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334870.6; E 410482.0				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT									
DATUM GEODETIC				DATE August 8, 2011				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
309.8	GROUND SURFACE							20	40	60	80	100					
0.7	TOPSOIL		1	SS	6												
309.1	CLAYEY SILT, trace sand, trace rootlets																
0.7	Firm																
	Grey Moist		2	SS	23												
308.6	SILT, some clay, trace sand																
1.2	Loose Grey Wet																
	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)																
Notes: 1. Borehole dry upon completion of drilling. 2. Auger refusal encountered at 1.1 m depth.																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H3-7				1 OF 1 METRIC								
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334891.2; E 410489.0</u>				ORIGINATED BY <u>MT</u>								
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>								
DATUM <u>GEODETIC</u>		DATE <u>August 8, 2011</u>				CHECKED BY <u>SEMC</u>								
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED		W _p	W	W _L	γ	GR SA SI CL
309.1	GROUND SURFACE							20 40 60 80 100						
0.0	TOPSOIL		1a	SS	3		309							
308.6	CLAYEY SILT, trace sand, trace rootlets		1b											
0.5	Soft Brown Moist END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Notes: 1. Borehole dry upon completion of drilling. 2. Auger refusal encountered at 0.4 m depth.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT		10-1191-0044		RECORD OF BOREHOLE No H3-8		1 OF 1 METRIC								
G.W.P.		5091-07-00		LOCATION		N 5334919.6; E 410495.0								
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers								
DATUM		GEODETIC		DATE		August 8, 2011								
						ORIGINATED BY MT								
						COMPILED BY MT								
						CHECKED BY SEMC								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
307.8	GROUND SURFACE													
0.0	TOPSOIL		1a											
0.1	CLAYEY SILT, trace sand		1b	SS	18									
307.1	Very stiff Grey Moist													
0.7	SILT, trace to some clay, trace sand		2	SS	25									
	Compact Grey Moist to wet													
			3	SS	12									
			4	SS	11									
305.0	SAND and SILT, some gravel, trace clay													
2.8	Dense Brown Wet		5	SS	33									
			6	SS	40.08									
303.9	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)													
3.9	Notes: 1. Borehole dry upon completion of drilling. 2. Auger refusal encountered at 3.8 m depth.													

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>				RECORD OF BOREHOLE No H3-9				1 OF 1 METRIC									
G.W.P. <u>5091-07-00</u>				LOCATION <u>N 5334897.1; E 410513.3</u>				ORIGINATED BY <u>MT</u>									
DIST <u> </u> HWY <u>66</u>				BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>									
DATUM <u>GEODETIC</u>				DATE <u>August 7, 2011</u>				CHECKED BY <u>SEMC</u>									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
308.6	GROUND SURFACE							20	40	60	80	100					
0.7	TOPSOIL		1	SS	17		308										
	CLAYEY SILT, trace sand		2	SS	27												0 1 78 21
	Very stiff																
	Grey																
	Moist																
306.7	END OF BOREHOLE		3	SS	17/0.23		307										
1.9	SPOON REFUSAL (HAMMER BOUNCING)																
	Notes:																
	1. Borehole dry upon completion of drilling.																
	2. Auger refusal encountered at 1.6 m depth.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No H3-10			1 OF 1 METRIC										
G.W.P. 5091-07-00			LOCATION N 5334931.4; E 410546.2			ORIGINATED BY MT										
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers			COMPILED BY MT										
DATUM GEODETIC			DATE August 7, 2011			CHECKED BY SEMC										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
307.3	GROUND SURFACE															
0.7	TOPSOIL		1	SS	11											
306.6	CLAYEY SILT, trace sand Stiff Grey Moist		2	SS	18											
0.7	SILT, some clay Loose to compact Grey Wet		3	SS	9											
			4	SS	7											
			5	SS	7											
			6	SS	5											
302.6	Gravelly Silty SAND, trace clay Compact to very dense Brown Wet		7	SS	27											
4.7																
			8	SS	52											
300.1	SAND and GRAVEL, trace to some silt, trace clay Very dense Brown Wet		9	SS	73											
7.2																
299.1	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)															
8.2	Note: 1. Water level at a depth of 2.4 m below ground surface (Elev. 304.9 m) upon completion of drilling. 2. Auger refusal at 7.9 m depth.															

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H3-11				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334905.3; E 410562.6</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 7, 2011</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100		W _p	W	W _L	γ	GR SA SI CL			
308.0	GROUND SURFACE							SHEAR STRENGTH kPa		WATER CONTENT (%)							
0.0	TOPSOIL		1a					○ UNCONFINED + FIELD VANE		○ QUICK TRIAXIAL × REMOULDED							
0.1	CLAYEY SILT, trace sand		1b	SS	5			20 40 60 80 100		20	40	60		0	4	62	34
307.2	Firm																
0.8	Grey Moist																
	Spoon attempted at 0.8 m depth. END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)																
	Note: 1. Borehole dry upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No H3-12				1 OF 1 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334888.7; E 410576.7				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT									
DATUM GEODETIC				DATE August 6, 2011				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
310.9	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL		1a														
0.1	SILT, trace clay, trace rootlets		1b	SS	12												0 9 82 9
310.2	Compact Brown Moist																
0.9	SAND and GRAVEL, some silt Very dense Brown and grey Moist		2	SS	40/0.13		310										
END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING)																	
Notes: 1. Borehole dry upon completion of drilling. 2. Auger refusal at 0.8 m depth.																	

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H3-13				1 OF 1 METRIC						
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334907.6; E 410587.4</u>				ORIGINATED BY <u>MT</u>						
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>						
DATUM <u>GEODETIC</u>		DATE <u>August 6, 2011</u>				CHECKED BY <u>SEMC</u>						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa				W _p W W _L
311.0	GROUND SURFACE							20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED		20 40 60		
0.0	TOPSOIL		1a									
0.1	SILT, some clay, some sand, trace gravel		1b	SS	6						○	
310.4	Loose Brown Moist											
0.6	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)											
Note: 1. Borehole dry upon completion of drilling.												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H3-14				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334930.3; E 410598.9</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 6, 2011</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
310.5	GROUND SURFACE							20	40	60	80	100					
0.7	TOPSOIL		1	SS	12		310										
	SILT, some clay, trace sand Compact Grey Moist																
309.4			2	SS	19/0.23												0 5 81 14
1.1	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)																
	Note: 1. Borehole dry upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No H3-15				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334908.5; E 410602.4</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 6, 2011</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
311.5	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL		1	SS	6		311										
	SILT, some gravel, trace to some clay, trace sand Loose to compact Brown to grey Moist		2	SS	19												12 3 79 6
309.9							310										
1.6	SAND and GRAVEL, some silt Very dense		3	SS	43												
309.4	Brown																
2.1	Moist																
	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)																
	Note: 1. Borehole dry upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No BC5-1				1 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334864.8; E 410413.5				ORIGINATED BY EHS									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY MT									
DATUM GEODETIC				DATE August 16, 2011				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
307.7	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL		1	SS	8												
307.3																	
0.4	SILT and SAND, trace clay, trace gravel Very dense Brown to grey Wet		2	SS	15												
			3	SS	7/0.13												
305.5																	
2.2	SAND and GRAVEL Very dense Brown to grey Wet		4	SS	50/0.08												
304.4			5	SS	50/0.05												
3.3	METASEDIMENT (SILTSTONE) (BEDROCK) Bedrock cored from depths of 3.3 m to 6.3 m For bedrock coring details, refer to Record of Drillhole C5-1		1	RC	REC 100%												
			2	RC	REC 100%												
			3	RC	REC 100%												
301.4																	
6.3	END OF BOREHOLE Note: 1. Water level at a depth of 1.8 m below ground surface (Elev. 305.9 m) on August 18, 2011. 2. Spoon bouncing at Samples 3, 4 and 5																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC5-1

SHEET 2 OF 2

LOCATION: N 5334864.8 ; E 410413.5

DRILLING DATE: August 16, 2011

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D50

DRILLING CONTRACTOR: Walker Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD		DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock	NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
								RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diameter Point Load Index (MPa)	RMC -Q' AVG.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
								TOTAL CORE %	SOLID CORE %			B Angle	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION												Jr	Ja	Jn	k, cm/s																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
								888888	888888					0-100	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90							0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90				0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90	0-90

PROJECT 10-1191-0044				RECORD OF BOREHOLE No BC5-2				1 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334886.8; E 410403.9				ORIGINATED BY EHS									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY MT									
DATUM GEODETIC				DATE August 16, 2011				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
306.6	GROUND SURFACE																
0.0	TOPSOIL		1a	SS	6/0.25												
306.1	Gravelly SILTY CLAY, trace to some sand, trace rootlets		1b														26 7 43 24
0.5	Firm Brown Wet METASEDIMENT (BEDROCK)		1	RC	REC 100%												RQD = 100%
	Bedrock cored from depths of 0.5 m to 3.9 m																
	For bedrock coring details, refer to Record of Drillhole C5-2		2	RC	REC 89%												RQD = 89%
			3	RC	REC 97%												RQD = 93%
302.7	END OF BOREHOLE																
3.9	Note: 1. Water level at a depth of 2.7 m below ground surface (Elev. 303.9 m) upon completion of drilling. 2. Water level at a depth of 1.0 m below ground surface (Elev. 305.6 m) upon completion of piezometer installation. 3. Water level in piezometer at 0.5 m above ground surface (Elev. 307.1 m) on November 15, 2012 and at 0.6 m above ground surface (Elev. 307.2 m) on May 15, 2013.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC5-2

SHEET 2 OF 2

LOCATION: N 5334886.8 ; E 410403.9

DRILLING DATE: August 16, 2011

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D50

DRILLING CONTRACTOR: Walker Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate	BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage	PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular	PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break	BR - Broken Rock	NOTES WATER LEVELS INSTRUMENTATION
		REFER TO PREVIOUS PAGE		306.1									
1	NW	METASEDEMENT Very fine grained Fresh Dark grey		0.5	1	GREY	100%						
2	August 16, 2011 NQ Coring				2	GREY	100%						
3					3	GREY	100%						
4		END OF DRILLHOLE		302.7									
5				3.9									
6													
7													
8													
9													
10													

DEPTH SCALE

1 : 50



LOGGED: EHS

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No BC5-3				1 OF 2 METRIC						
G.W.P. 5091-07-00		LOCATION N 5334848.4; E 410420.7				ORIGINATED BY EHS						
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY MT						
DATUM GEODETIC		DATE August 18, 2011				CHECKED BY SEMC						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	W _p W W _L			20 40 60
309.0	GROUND SURFACE											
0.0	TOPSOIL		1	SS	11							
308.6												
0.4	CLAYEY SILT, trace sand, trace organics, clay seams Stiff Brown Moist		2	SS	9							
307.5												
1.5	SILT, trace to some clay Loose to compact Brown to grey Wet		3	SS	16							
			4	SS	11							
			5	SS	12							
			6	SS	9							
304.3												
4.7	SAND and GRAVEL, some silt, trace clay Compact to very dense Grey to brown Wet		7	SS	30							
			8	SS	36							
			9	SS	21							
299.4			10	SS	93/0.23							
9.6	METASEDIMENT (BEDROCK) Bedrock cored from depths of 9.6 m to 13.1 m For bedrock coring details, refer to Record of Drillhole C5-3		1	RC	REC 100%							
			2	RC	REC 100%							
			3	RC	REC 93%							
295.9												
13.1	END OF BOREHOLE Note: 1. Water level inside casing at a depth of 2.5 m below ground surface (Elev. 306.5 m) upon completion of drilling.											

SHEET 2 OF 2

DATUM: GEODETIC

DRILLING CONTRACTOR: Walker Drilling Ltd.

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No BC6-1				1 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334903.3; E 410529.4				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY MT									
DATUM GEODETIC				DATE August 20 and 21, 2011				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
307.3	GROUND SURFACE							20	40	60	80	100					
0.9	TOPSOIL		1	SS	10		307										
	CLAYEY SILT, trace sand Stiff Grey Moist		2	SS	14												0 4 61 35
305.6			3	SS	6/0.15		306										
1.7	SAND and GRAVEL, some silt, trace clay Very dense Brown to grey Moist						305										41 44 12 3
	Cobble encountered between 3.0 m and 3.2 m depth.		4	SS	68		304										
			5	SS	75		303										
	Split spoon bouncing at 4.3 m depth.		6	SS	35		302										
	Cobble encountered between 5.2 and 5.3 m depth.						301										
301.2	METASEDIMENT (SILTSTONE) (BEDROCK)		1	RC	REC 100%		300										RQD = 73%
6.1	Bedrock cored from depths of 6.1 m to 9.3 m For bedrock coring details, refer to Record of Drillhole C6-1		2	RC	REC 100%		299										RQD = 100%
298.0			3	RC	REC 100%		298										RQD = 33%
9.3	END OF BOREHOLE Note: 1. Water level not recorded.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC6-1

SHEET 2 OF 2

LOCATION: N 5334903.3 ; E 410529.4

DRILLING DATE: August 20 and 21, 2011

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D50

DRILLING CONTRACTOR: Walker Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break BR - Broken Rock										CONDUCTIVITY k, cm/s	Diametral Point Load Index (MPa)	RMC -Q AVG.	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
							RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA					HYDRAULIC					Dip w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
							TOTAL CORE %	SOLID CORE %			B Angle	DIP	P	L	R	T										C	S																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

RECORD OF BOREHOLE No BC6-2

1 OF 2 **METRIC**

PROJECT 10-1191-0044
 G.W.P. 5091-07-00 LOCATION N 5334930.9; E 410524.4 ORIGINATED BY MT
 DIST HWY 66 BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring COMPILED BY MT
 DATUM GEODETIC DATE August 21 and 22, 2011 CHECKED BY SEMC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED												
305.3	GROUND SURFACE							20	40	60	80	100								
0.0	TOPSOIL		1	SS	6		305													
304.5																				
0.8	SILT, some sand, trace to some clay, trace gravel		2	SS	31		304													
303.8	Dense Grey to brown																			
1.5	Moist Silty SAND, some gravel, trace clay		3	SS	29		303										19 55 22 4			
302.8	Compact Brown Wet		4	SS	9/0.08															
2.5	METASEDIMENT (SILTSTONE) (BEDROCK)		1	RC	REC 100%		302										RQD = 0%			
	Bedrock cored from depths of 2.5 m to 5.7 m		2	RC	REC 100%		301										RQD = 76%			
	For bedrock coring details, refer to Record of Drillhole C6-2		3	RC	REC 100%		300										RQD = 96%			
299.6	END OF BOREHOLE																			
5.7	Note: 1. Water level in the casing at a depth of 1.2 m below ground surface (Elev. 304.1 m) upon completion of drilling. 2. Water level in piezometer at 0.2 m above ground surface (Elev. 305.5 m) on November 15, 2012 and on May 15, 2013.																			

+ ³, × ³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC6-2

SHEET 2 OF 2

LOCATION: N 5334930.9 ; E 410524.4

DRILLING DATE: August 22, 2012

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D50

DRILLING CONTRACTOR: Walker Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock	NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION
							RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diametral Point Load Index (MPa)	RMC -Q' AVG.																									
							TOTAL CORE %	SOLID CORE %			B Angle		DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION								Jr			Ja	Jn	k, cm/s																						
							0 0																																										

DEPTH SCALE

1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT		10-1191-0044		RECORD OF BOREHOLE No BC6-3				1 OF 2 METRIC										
G.W.P.		5091-07-00		LOCATION		N 5334880.7; E 410533.5		ORIGINATED BY MT										
DIST		HWY 66		BOREHOLE TYPE		108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring		COMPILED BY MT										
DATUM		GEODETIC		DATE		August 22, 2011		CHECKED BY SEMC										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
308.9	GROUND SURFACE							20	40	60	80	100						
8.9	TOPSOIL		1	SS	14													
	CLAYEY SILT Stiff to very stiff Brown to grey Moist		2	SS	18													
307.4																		
1.5	SILT, trace clay, trace sand Compact Grey Wet		3	SS	20													
306.7																		
2.2	Gravelly Silty SAND, trace clay Very dense Brown Moist		4	SS	53													
	Split spoon bouncing at 2.7 m depth.		5	SS	65													
304.6																		
4.3	METASEDIMENT (SILTSTONE) (BEDROCK)		1	RC	REC 100%													
	Bedrock cored from depths of 4.3 m to 7.4 m		2	RC	REC 100%													
	For bedrock coring details, refer to Record of Drillhole C6-2		3	RC	REC 100%													
301.5																		
7.4	END OF BOREHOLE																	
	Note: 1. Water level not recorded.																	

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC6-3

SHEET 2 OF 2

LOCATION: N 5334880.7 ; E 410533.5

DRILLING DATE: August 22, 2011

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D50

DRILLING CONTRACTOR: Walker Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.														NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
							FLUSH	RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA						HYDRAULIC CONDUCTIVITY				Diametral Point Load Index (MPa)	RMC -Q ⁺ AVG.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
								TOTAL CORE %	SOLID CORE %			B Angle	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	k, cm/s	10 ⁰	10 ¹				10 ²																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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DEPTH SCALE



1 : 50



LOGGED: MT

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT 10-1191-0044		RECORD OF BOREHOLE No BC6-4				1 OF 1 METRIC											
G.W.P. 5091-07-00		LOCATION N 5334921.8; E 410525.0				ORIGINATED BY MR											
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT											
DATUM GEODETIC		DATE May 16, 2013				CHECKED BY SEMC											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
305.7	GROUND SURFACE																
0.0	SILT, trace organics, trace to some sand, trace to some clay, trace to some gravel		1	SS	1												
305.1	Very loose Brown Wet		2	SS	35												
0.6	SAND and GRAVEL, trace to some silt, trace clay		3	SS	19												
303.6	Compact to dense Brown Wet																39 47 11 3
2.1	METASEDIMENT (BEDROCK)		1	RC	REC 100%												
	Bedrock cored from 2.1 m depth to 5.7 m depth.		2	RC	REC 100%												
	For coring details see record of Drillhole BC6-4.		3	RC	REC 100%												
300.0	END OF BOREHOLE																
5.7	Note: 1. Water level at a depth of 0.1 m below ground surface (Elev. 305.6 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC6-4

SHEET 1 OF 1

LOCATION: N 5334921.8 ; E 410525.0

DRILLING DATE: May 16, 2013

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME55

DRILLING CONTRACTOR: George Downing Estate Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate	BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage	PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular	PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break	BR - Broken Rock	NOTES WATER LEVELS INSTRUMENTATION
		REFER TO PREVIOUS PAGE		303.6									
	NW	METASEDIMENT		2.1	1	GREY	100%						
		Very strong											
		Fine grained											
		Slightly weathered											
		Grey											
3					2	GREY	100%						
4													
5					3	GREY	100%						
6		END OF DRILLHOLE		300.0									
				5.7									
7													
8													
9													
10													
11													
12													

DEPTH SCALE

1 : 50



LOGGED: MR

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT 10-1191-0044				RECORD OF BOREHOLE No BC6-5				1 OF 1 METRIC												
G.W.P. 5091-07-00				LOCATION N 5334887.1; E 410543.8				ORIGINATED BY MR												
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT												
DATUM GEODETIC				DATE May 16, 2013				CHECKED BY SEMC												
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								20	40	60	80	100						20	40	60
307.6	GROUND SURFACE																			
0.1	TOPSOIL		1	SS	8															
	SILT, trace to some clay, trace organics Loose to compact Grey Moist to wet		2	SS	13															
			3	SS	11															
			4	SS	9															
304.6																				
3.0	Silty SAND and GRAVEL Very dense Brown Wet		5	SS	62															
303.9																				
3.7	METASEDIMENT (BEDROCK)		1	RC	REC 100%												RQD = 59%			
	Bedrock cored from 3.7 m depth to 7.0 m depth.		2	RC	REC 100%												RQD = 90%			
	For coring details see Record of Drillhole BC6-5.		3	RC	REC 100%												RQD = 83%			
300.6																				
7.0	END OF BOREHOLE																			
	Note: 1. Water level at a depth of 1.1 m below ground surface (Elev. 306.5 m) upon completion of drilling.																			

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT: 10-1191-0044

RECORD OF DRILLHOLE: BC6-5

SHEET 1 OF 1

LOCATION: N 5334887.1 ; E 410543.8

DRILLING DATE: May 16, 2013

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME55

DRILLING CONTRACTOR: George Downing Estate Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate										BD- Bedding FO- Foliation CO- Contact OR- Orthogonal CL - Cleavage										PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular										PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Break										BR - Broken Rock	NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION
							FLUSH	RECOVERY		R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA										HYDRAULIC CONDUCTIVITY		Diametral Point Load Index (MPa)	RMC -Q' AVG.																								
								TOTAL CORE %	SOLID CORE %			B Angle	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	k, cm/s	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴																												
4 																																																	

DEPTH SCALE

1 : 50



LOGGED: MR

CHECKED: SEMC

SUD-RCK 10-1191-0044SUD.GPJ GAL-MISS.GDT 05/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H3-D1				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334895.5; E 410419.9</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 9, 2011</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa									WATER CONTENT (%)
307.5 0.0	GROUND SURFACE						20	40	60	80	100						
304.3 3.2	END OF DCPT REFUSAL TO FURTHER PENETRATION 20 BLOWS / 0.15 m (HAMMER BOUNCING)																


SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H3-D2				1 OF 1 METRIC											
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334863.3; E 410459.2</u>				ORIGINATED BY <u>MT</u>											
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>											
DATUM <u>GEODETIC</u>		DATE <u>August 9, 2011</u>				CHECKED BY <u>SEMC</u>											
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa									WATER CONTENT (%)
309.5 0.0	GROUND SURFACE						20	40	60	80	100						
308.4 1.1	END OF DCPT REFUSAL TO FURTHER PENETRATION 14 BLOWS / 0.15 m (HAMMER BOUNCING)						20	40	60	80	100						

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H3-D3				1 OF 1 METRIC							
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334913.9; E 410470.2</u>				ORIGINATED BY <u>MT</u>							
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>							
DATUM <u>GEODETIC</u>		DATE <u>August 8, 2011</u>				CHECKED BY <u>SEMC</u>							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
306.9 0.0	GROUND SURFACE						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>						
303.5 3.4	END OF DCPT REFUSAL TO FURTHER PENETRATION 66 BLOWS / 0.30 m (HAMMER BOUNCING)												

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H3-D4				1 OF 1 METRIC				
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334876.6; E 410505.3</u>				ORIGINATED BY <u>MT</u>				
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>				
DATUM <u>GEODETIC</u>		DATE <u>August 8, 2011</u>				CHECKED BY <u>SEMC</u>				
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
309.7 0.0	GROUND SURFACE									
307.0 2.7	END OF DCPT REFUSAL TO FURTHER PENETRATION 76 BLOWS / 0.30 m (HAMMER BOUNCING)									


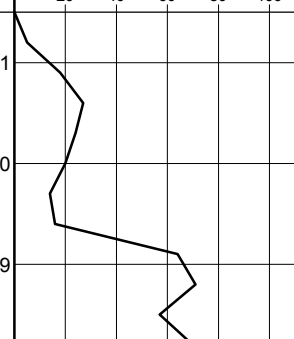
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H3-D5				1 OF 1 METRIC										
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334882.7; E 410553.1</u>				ORIGINATED BY <u>MT</u>										
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>										
DATUM <u>GEODETIC</u>		DATE <u>August 7, 2011</u>				CHECKED BY <u>SEMC</u>										
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
307.7 0.0	GROUND SURFACE						20	40	60	80	100					
307																
305.9 1.8	END OF DCPT REFUSAL TO FURTHER PENETRATION 20 BLOWS / 0.30 m (HAMMER BOUNCING)															

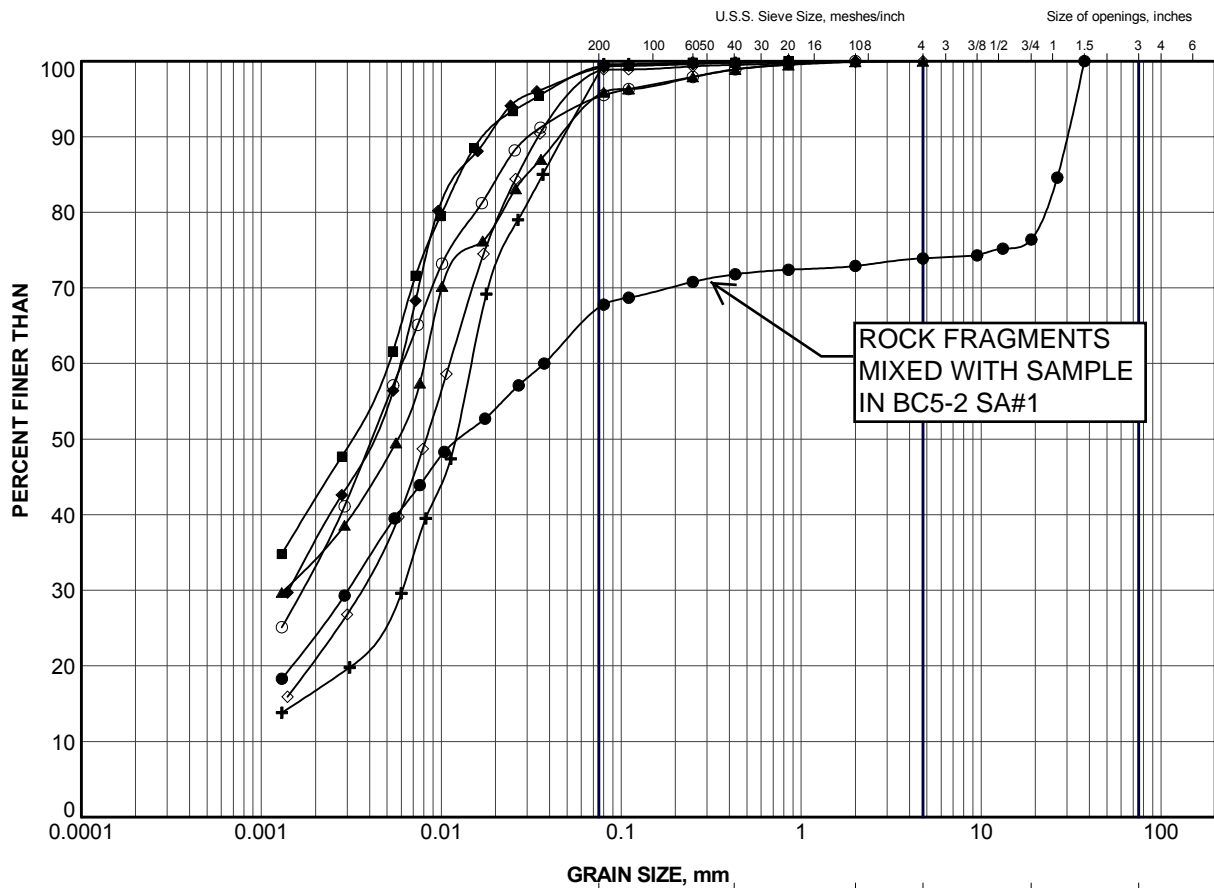
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF PENETRATION TEST No H3-D7				1 OF 1 METRIC				
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334891.2; E 410600.7</u>				ORIGINATED BY <u>MT</u>				
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u>				COMPILED BY <u>MT</u>				
DATUM <u>GEODETIC</u>		DATE <u>August 6, 2011</u>				CHECKED BY <u>SEMC</u>				
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
311.5 0.0	GROUND SURFACE									
										
308.2 3.3	END OF DCPT REFUSAL TO FURTHER PENETRATION 70 BLOWS / 0.23 m (HAMMER BOUNCING)									

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:



CLAY AND SILT	SAND SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC5-2	1b	306.3
■	BC5-3	2	307.9
▲	BC6-1	2	306.4
+	BC6-3	2	307.8
◆	H3-2	2	308.5
◇	H3-9	2	307.5
○	H3-11	1b	307.7

PROJECT

HIGHWAY 66 - HIGH FILL H3
STA 14+840 TO 15+060

TITLE

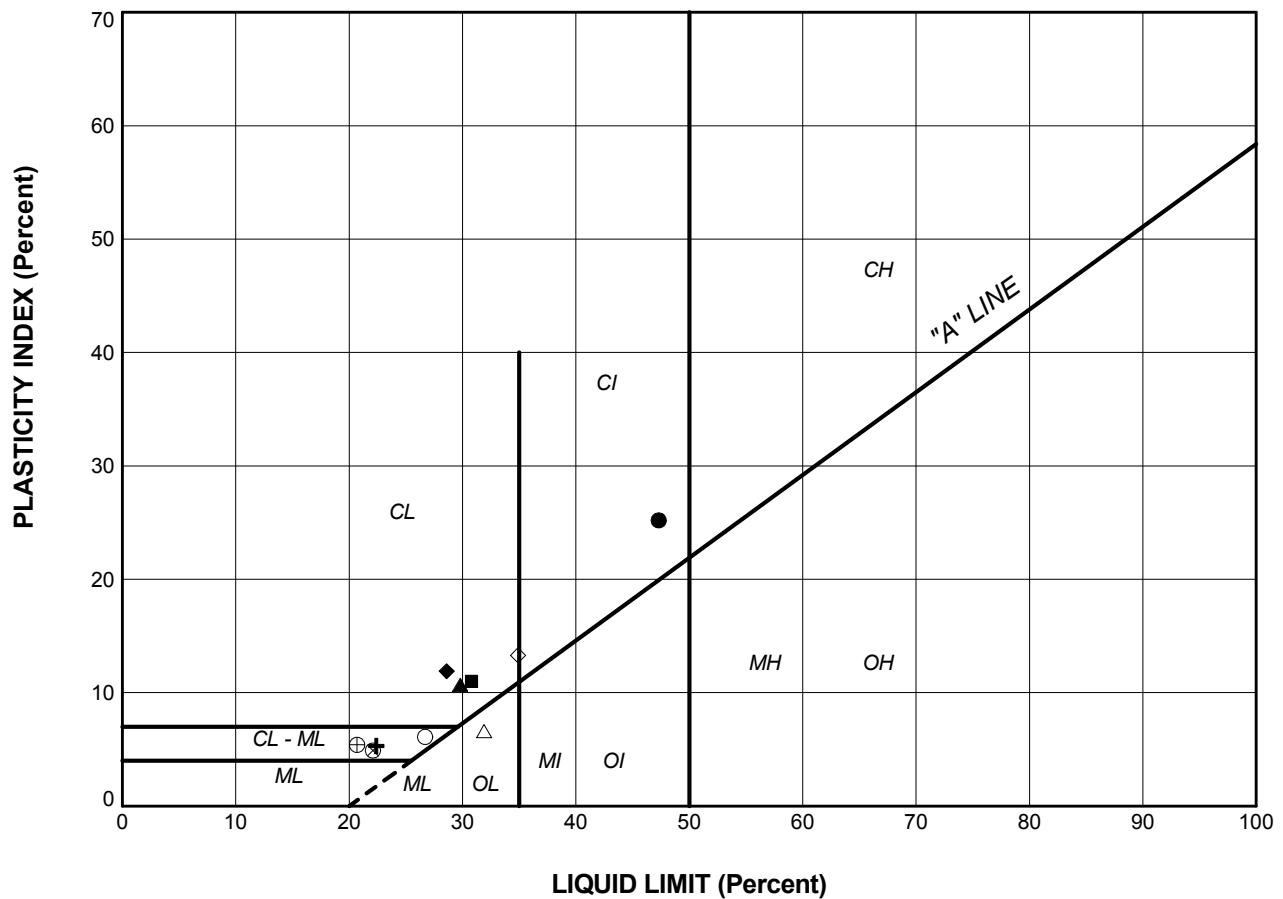
GRAIN SIZE DISTRIBUTION

CLAYEY SILT to SILTY CLAY



PROJECT No. 10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jun 2013	SCALE N/A
CHECK	SEMC	Jun 2013	REV.
APPR	JMAC	Jun 2013	

FIGURE D1

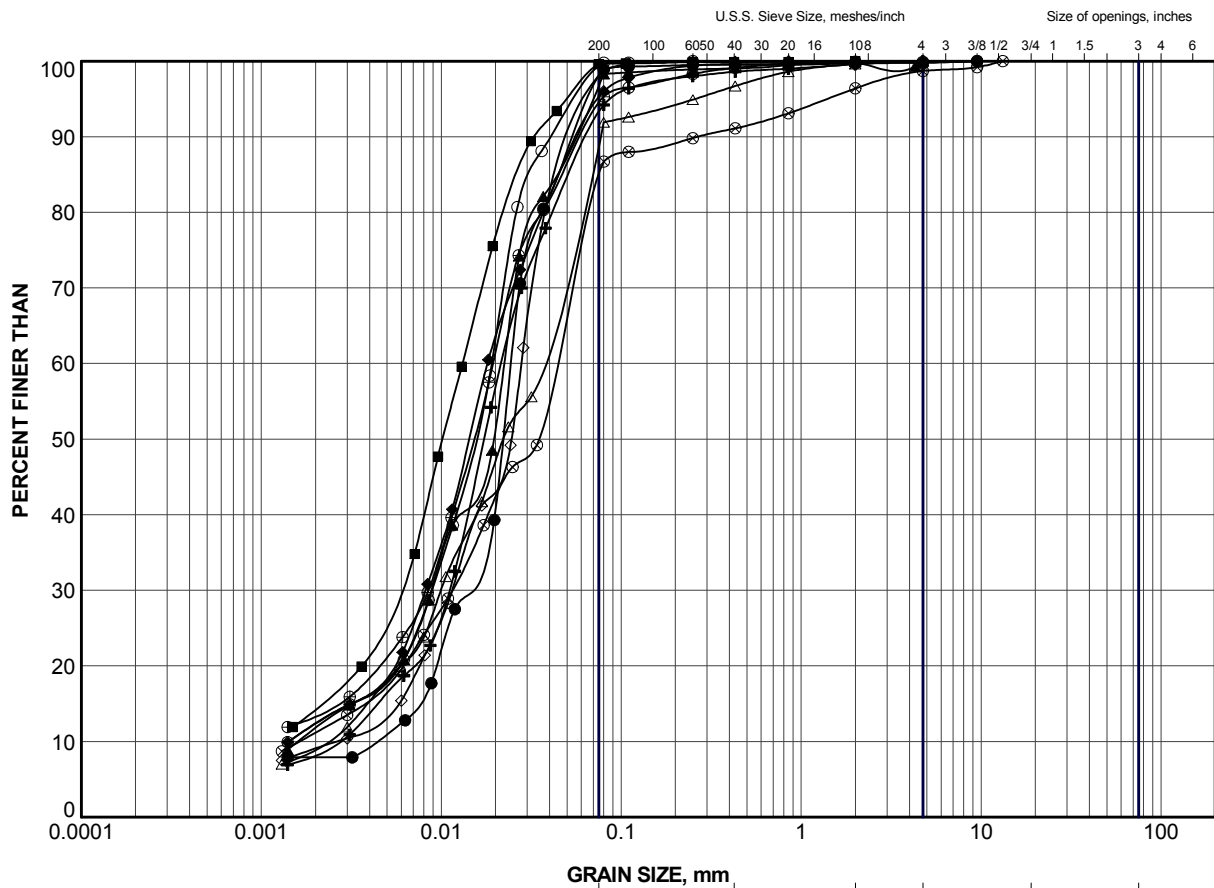


LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	BC5-2	1b	47.3	22.1	25.2
■	BC5-3	2	30.8	19.8	11.0
▲	BC6-1	2	29.8	19.1	10.7
+	BC6-3	2	22.4	17.1	5.3
◆	H3-2	2	28.6	16.7	11.9
◇	H3-4	2	34.9	21.6	13.3
○	H3-6	1	26.7	20.6	6.1
△	H3-7	1b	31.9	25.3	6.6
⊗	H3-8	1b	22.1	17.2	4.9
⊕	H3-9	2	20.7	15.3	5.4

PROJECT				
HIGHWAY 66 - HIGH FILL H3 STA 14+840 TO 15+060				
TITLE				
PLASTICITY CHART CLAYEY SILT to SILTY CLAY				
PROJECT No. 10-1191-0044		FILE No. 10-1191-0044SUD.GPJ		
DRAWN	JJL	May 2013	SCALE	N/A
CHECK	SEMC	May 2013	REV.	
APPR	JMAC	May 2013	FIGURE D2	





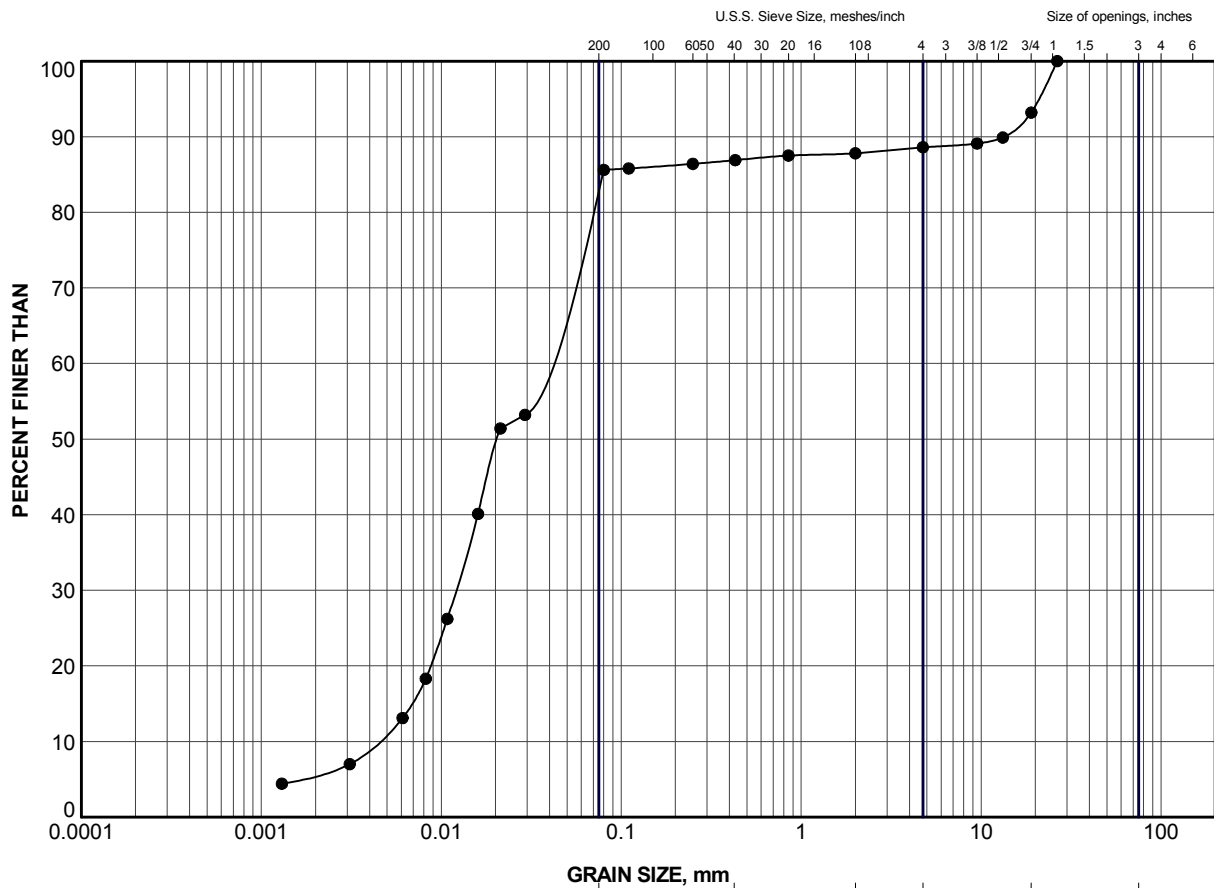
CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC5-3	5	305.6
■	BC6-5	3	305.8
▲	H3-2	5	306.2
+	H3-4	4	303.4
◆	H3-6	2	308.8
◇	H3-8	3	306.0
○	H3-10	3	305.5
△	H3-12	1b	310.6
⊗	H3-13	1b	310.7
⊕	H3-14	2	309.5

PROJECT					
HIGHWAY 66 - HIGH FILL H3 STA 14+840 TO 15+060					
TITLE					
GRAIN SIZE DISTRIBUTION SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013	FIGURE D3.1		
APPR	JMAC	Jul 2013			




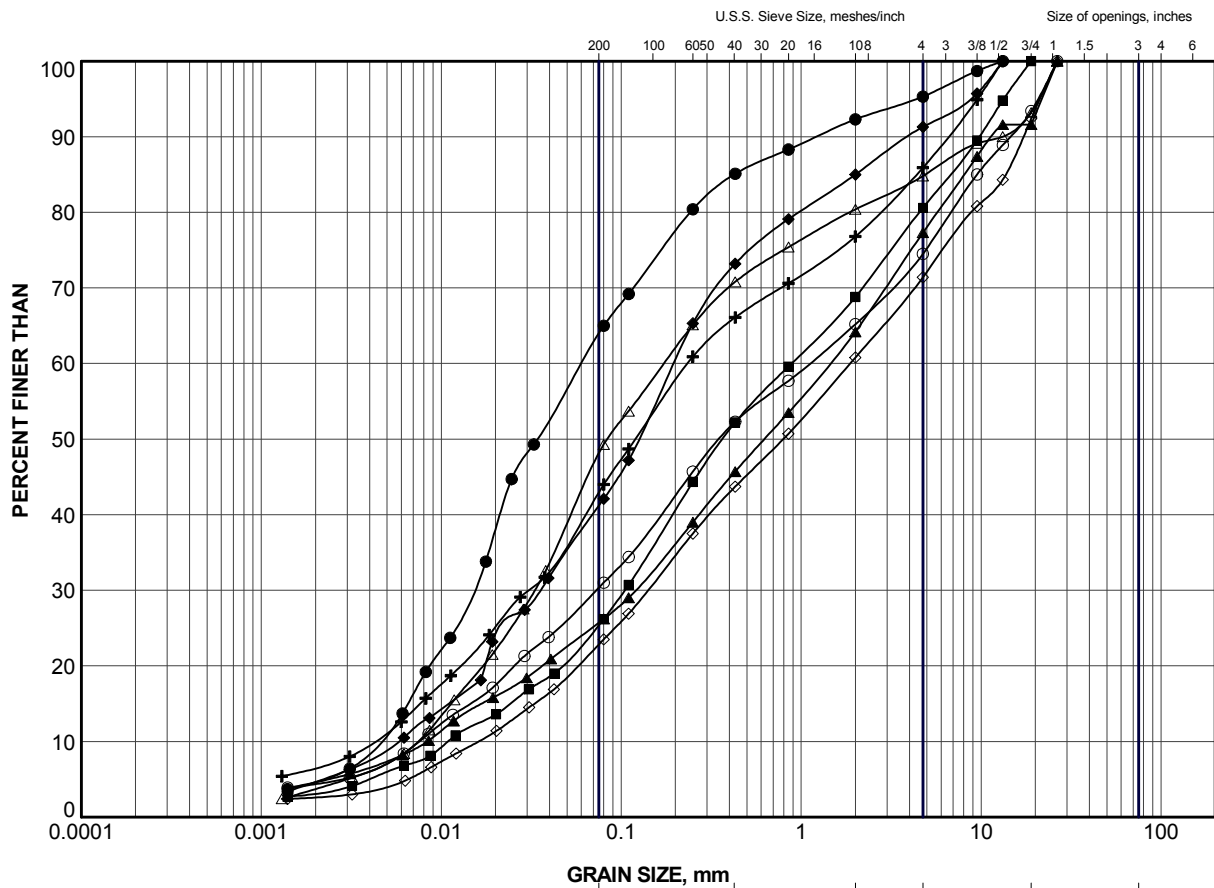


CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H3-15	2	310.4

PROJECT					
HIGHWAY 66 - HIGH FILL H3 STA 14+840 TO 15+060					
TITLE					
GRAIN SIZE DISTRIBUTION SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE D3.2		



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC5-1	3	306.1
■	BC6-2	3	303.5
▲	BC6-3	5	305.5
+	H3-1	2	308.4
◆	H3-3	1b	308.1
◇	H3-4	5	302.6
○	H3-5	2	308.1
△	H3-8	5	304.5

PROJECT

HIGHWAY 66 - HIGH FILL H3
STA 14+840 TO 15+060

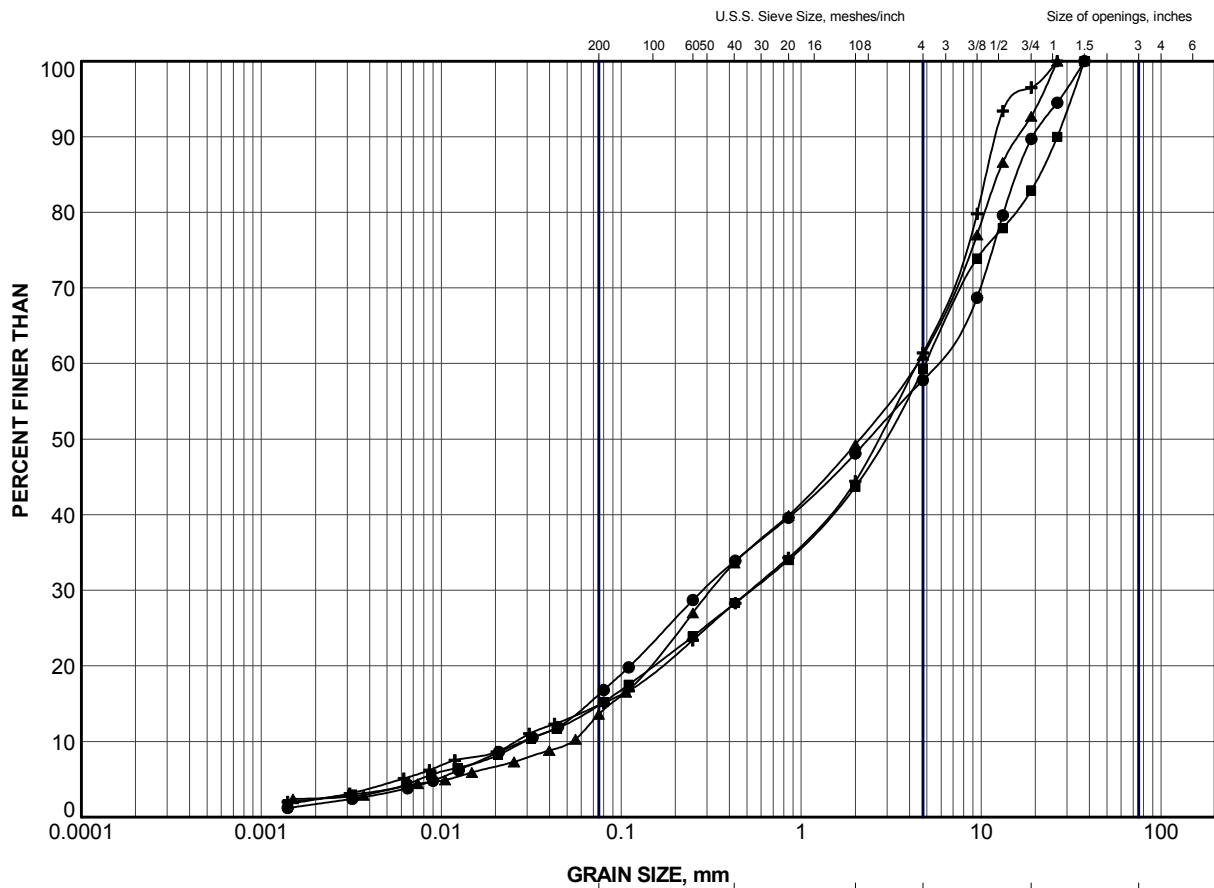
TITLE

GRAIN SIZE DISTRIBUTION
SAND AND SILT to GRAVELLY SILTY SAND



PROJECT No.	10-1191-0044	FILE No.	10-1191-0044SUD.GPJ
DRAWN	JJL	Jun 2013	SCALE N/A
CHECK	SEMC	Jun 2013	REV.
APPR	JMAC	Jun 2013	


FIGURE D4

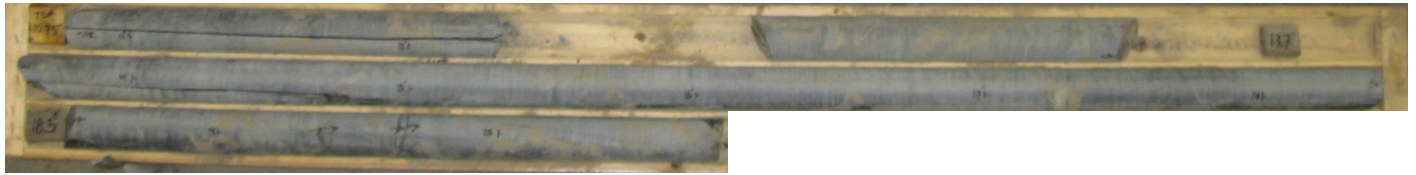


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

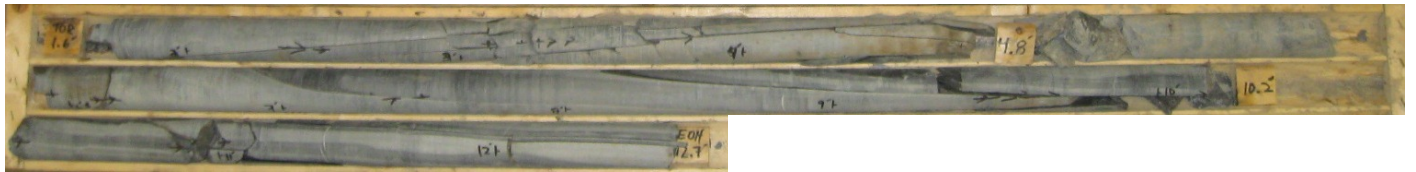
LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BC5-3	8	302.6
■	BC6-1	4	304.7
▲	BC6-4	3	304.0
+	H3-10	9	299.4

PROJECT					
HIGHWAY 66 - HIGH FILL H3 STA 14+840 TO 15+060					
TITLE					
GRAIN SIZE DISTRIBUTION SAND AND GRAVEL					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	Jul 2013	SCALE	N/A	REV.
CHECK	SEMC	Jul 2013			
APPR	JMAC	Jul 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE D5		



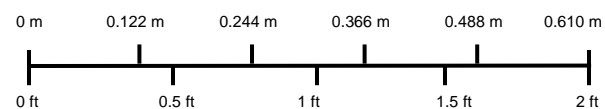
Borehole BC5-1
Elevation 304.4 m to 301.4 m




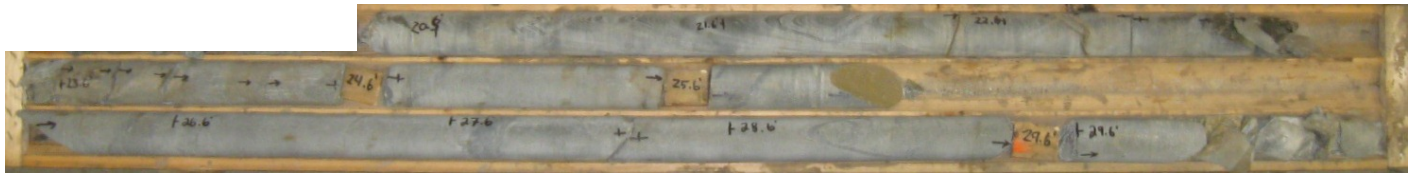
Borehole BC5-2
Elevation 306.1 m to 302.7 m



Borehole BC5-3
Elevation 299.4 m to 295.9 m



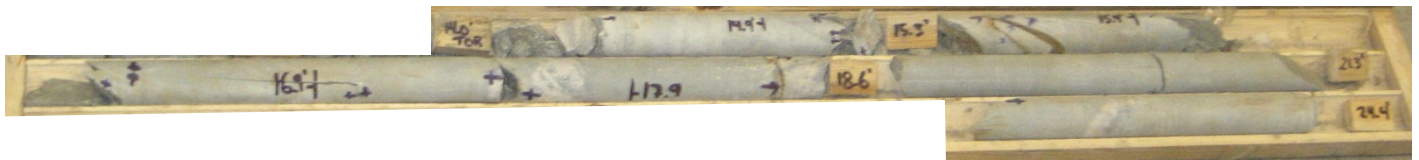
PROJECT		HIGHWAY 66 HIGH FILL H3 STA 14+840 to 15+060			
TITLE		BEDROCK CORE PHOTOGRAPHS			
		PROJECT No. 10-1191-0044		FILE No. ----	
		DESIGN	MT	Aug 2013	SCALE AS SHOWN
		CADD	--		REV.
		CHECK	SEMC	Aug 2013	FIGURE D6.1
		REVIEW	JMAC	Aug 2013	



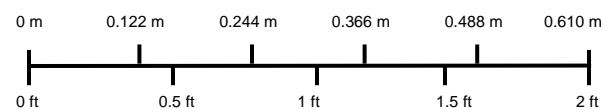
Borehole BC6-1
Elevation 302.7 m to 299.5 m




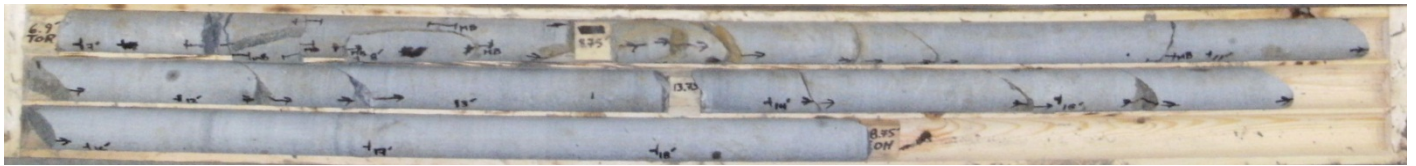
Borehole BC6-2
Elevation 304.3 m to 301.1 m



Borehole BC6-3
Elevation 301.2 m to 298.1 m



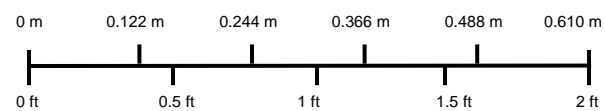
PROJECT		HIGHWAY 66 HIGH FILL H3 STA 14+840 to 15+060			
TITLE		BEDROCK CORE PHOTOGRAPHS			
		PROJECT No. 10-1191-0044		FILE No. ----	
		DESIGN	MT	Aug 2013	SCALE AS SHOWN
		CADD	--		REV.
		CHECK	SEMC	Aug 2013	FIGURE D6.2
		REVIEW	JMAC	Aug 2013	




Borehole BC6-4
Elevation 303.6 m to 300.0 m



Borehole BC6-5
Elevation 303.9 m to 300.6 m

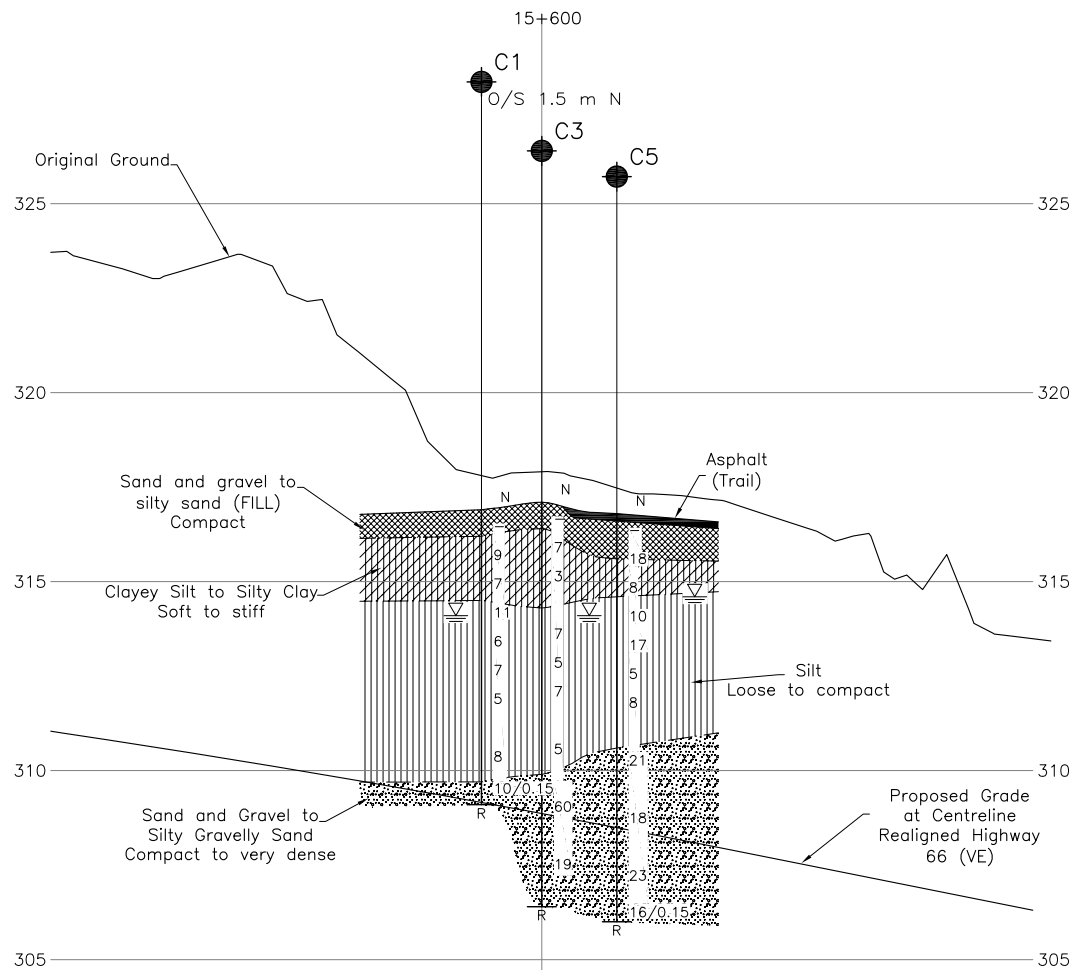
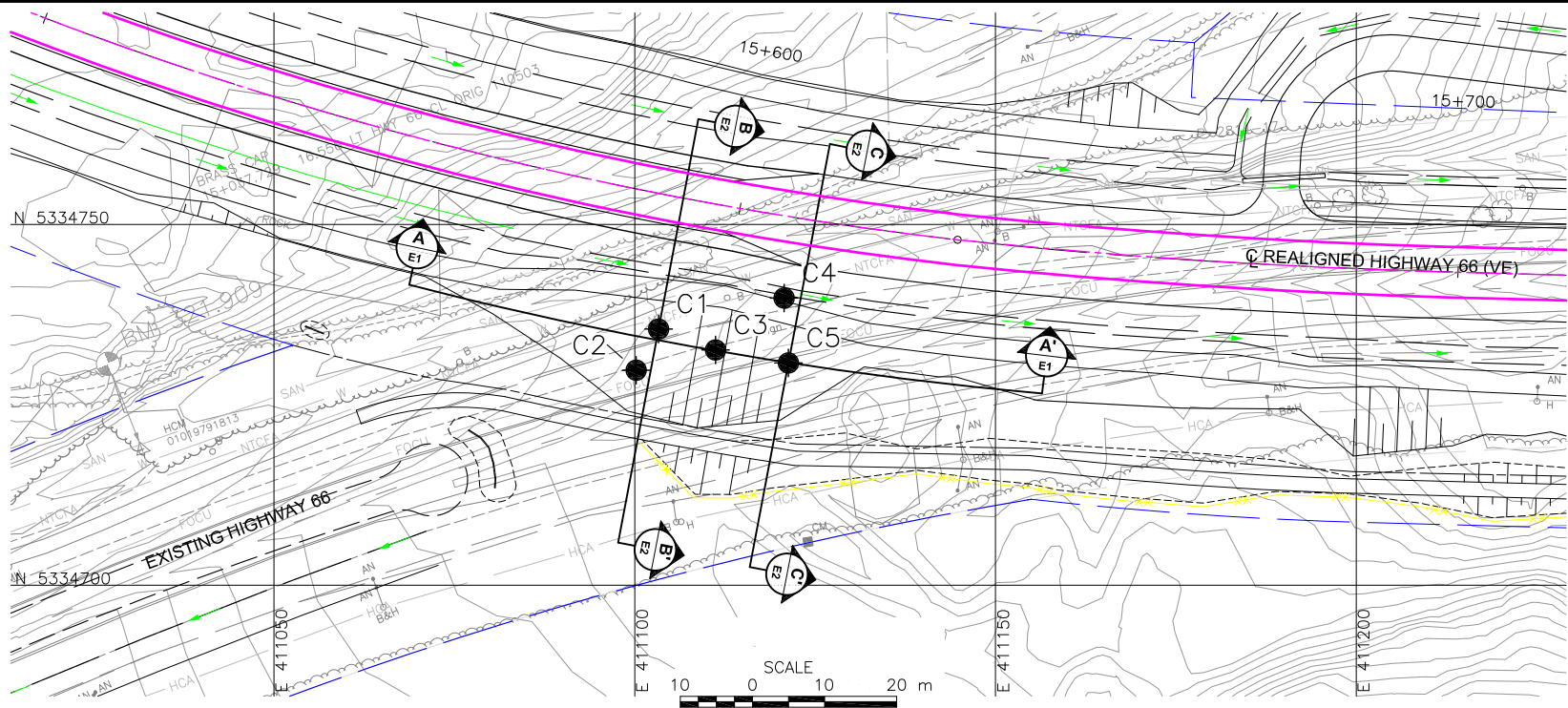


PROJECT		HIGHWAY 66 HIGH FILL H3 STA 14+840 to 15+060			
TITLE		BEDROCK CORE PHOTOGRAPHS			
	PROJECT No. 10-1191-0044			FILE No. ----	
	DESIGN	MT	Aug 2013	SCALE	AS SHOWN
	CADD	--		REV.	
	CHECK	SEMC	Aug 2013	FIGURE D6.3	
	REVIEW	JMAC	Aug 2013		



APPENDIX E

Highway 66 – STA 15+590 to 15+610 (Deep Cut)



CONT No.
GWP No. 5091-07-00



HIGHWAY 66
HWY 66 - STA 15+590 TO 16+610
SOIL STRATA

SHEET



Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA

LEGEND

- | | |
|---|--|
|  | Borehole |
| N | Standard Penetration Test Value |
| 16 | Blows/0.3m unless otherwise stated
(Std. Pen. Test, 475 j/blow) |
| R | Refusal |
|  | WL upon completion of drilling |

BOREHOLE CO—ORDINATES			
No.	ELEVATION	NORTHING	EASTING
C1	316.9	5334735.5	411103.3
C2	317.5	5334729.8	411100.2
C4	315.9	5334739.8	411120.7
C5	316.8	5334730.8	411121.3

NOTES

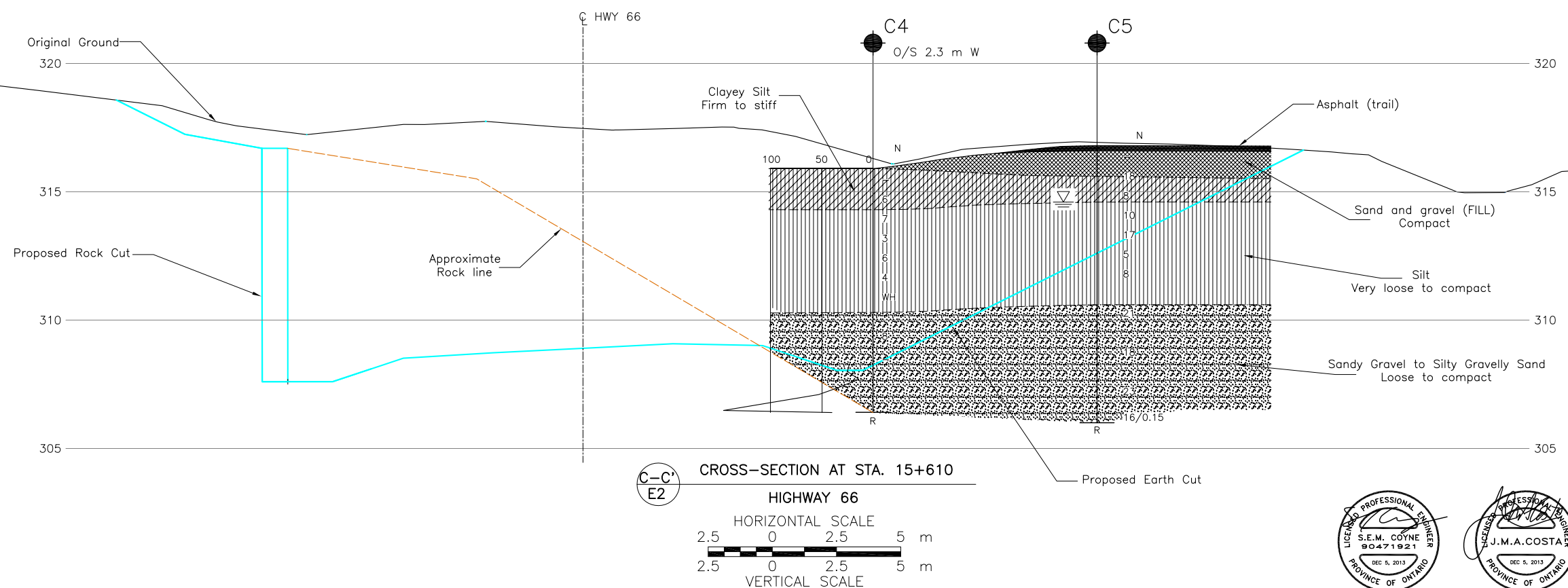
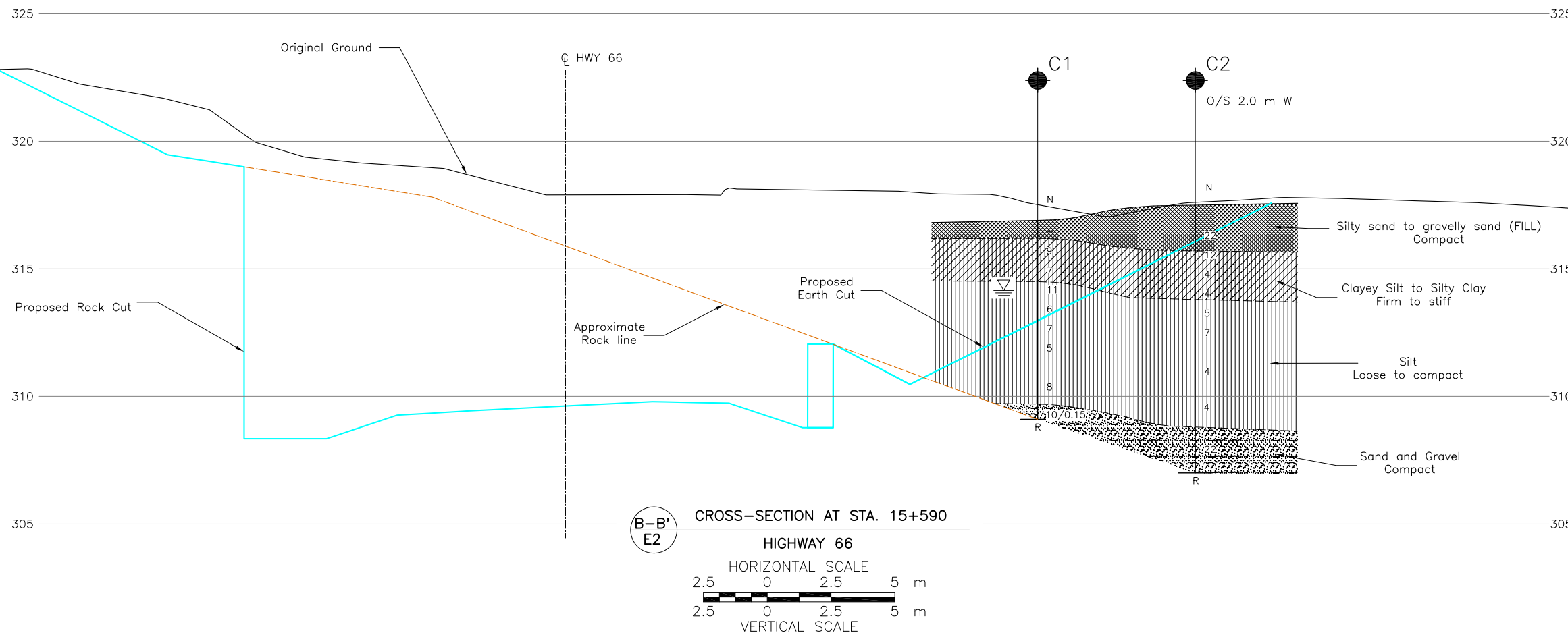
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN—ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.



NO.					
DATE					
BY					
REVISION					
Geocres No. 32D-17					
HWY. 66			PROJECT NO. 10-1191-0044		DIST.
SUBM'D. TR		CHKD.	DATE: DEC 2013		SITE:
DRAWN: J.J.L		CHKD. SEMC	APPD. JMACE		DWG. E2

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044		RECORD OF BOREHOLE No C2				1 OF 1 METRIC											
G.W.P. 5091-07-00		LOCATION N 5334729.8; E 411100.2				ORIGINATED BY MT											
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT											
DATUM GEODETIC		DATE November 14, 2012				CHECKED BY SEMC											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
317.5	GROUND SURFACE							20	40	60	80	100					
0.0	Gravelly sand (FILL) Compact Brown Moist		1	AS	-												28 67 2 3
			2	SS	22												
315.7																	
1.8	CLAYEY SILT, trace to some sand Firm Brown Moist		3	SS	12												
			4	SS	4												
			5	SS	4												
313.8																	
3.7	SILT, some clay, trace sand Loose Grey Wet		6	SS	5												
			7	SS	7												
			8	SS	4												
			9	SS	4												
308.8																	
8.7	SAND and GRAVEL, trace silt Compact Grey Wet		10	SS	22												
	Spoon attempted at 10.5 m depth, bouncing.																
307.0	END OF BOREHOLE SPOON AND AUGER REFUSAL (HAMMER BOUNCING)																
10.5	Note: 1. Borehole caved to 0.6 m below ground surface. Open borehole dry to 0.6 m depth.																

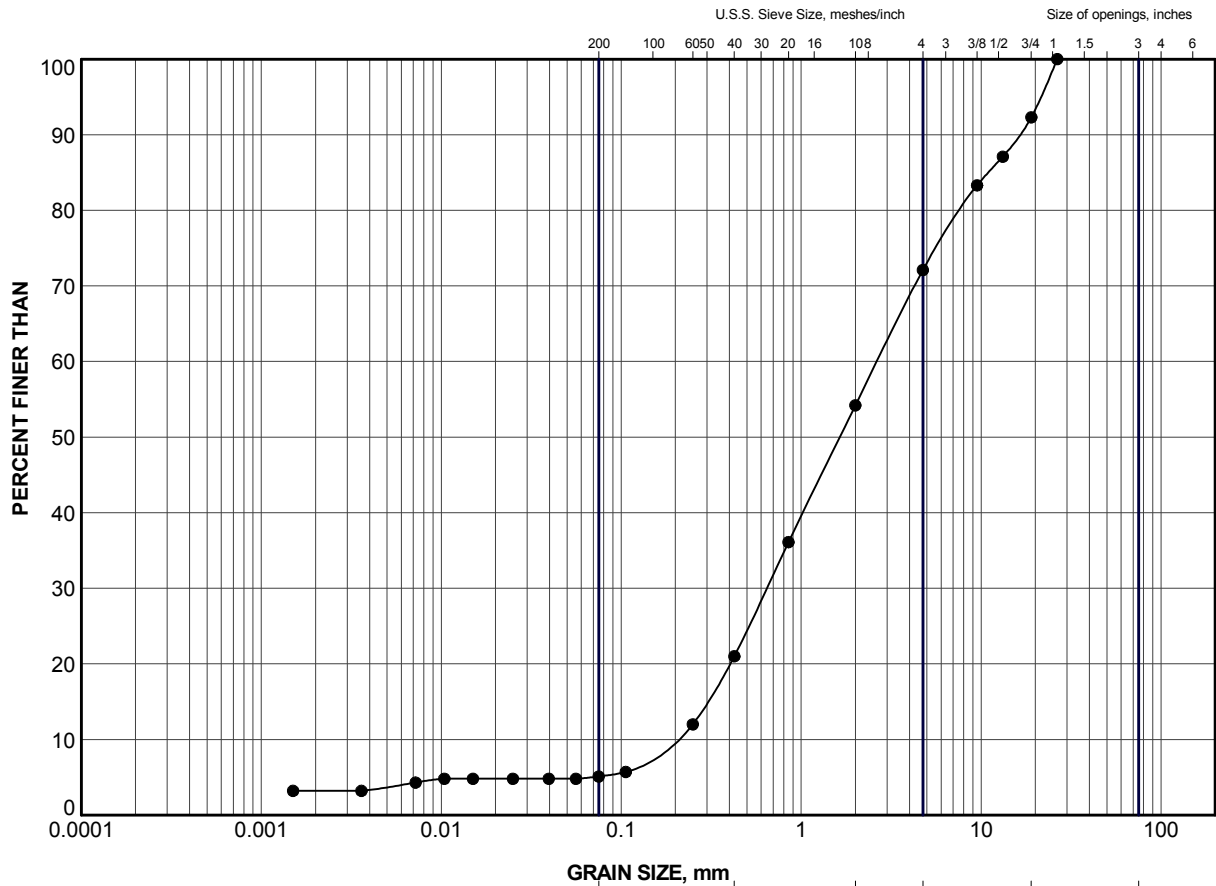
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044				RECORD OF BOREHOLE No C4				1 OF 1 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334739.8; E 411120.7				ORIGINATED BY MT									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers				COMPILED BY MT									
DATUM GEODETIC				DATE November 15, 2012				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
315.9	GROUND SURFACE							20	40	60	80	100					
0.0	CLAYEY SILT, trace sand, trace organics Firm Brown Moist Trace organics above 0.6 m depth.		1	AS	-												
			2	SS	6												0 1 75 24
314.3																	
1.6	SILT, trace to some sand, some clay Very loose to loose Grey Wet		3	SS	7												
			4	SS	3												0 0 87 13
			5	SS	6												
			6	SS	4												
			7	SS	WH												
310.3																	
5.6	Sandy GRAVEL, some silt, trace clay Loose Grey Wet		8	SS	8												61 23 13 3
			9	AS	-												
308.3	Approximately 0.9 m of heave in augers at 7.6 m depth.																
7.6	END OF BOREHOLE START OF DCPT																
306.4																	
9.5	END OF DCPT REFUSAL TO FURTHER PENETRATION 40 BLOWS / 0.05 M (HAMMER BOUNCING) Notes: 1. Borehole caved to 1.8 m depth below ground surface. Open borehole dry to 1.8 m depth.																


SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

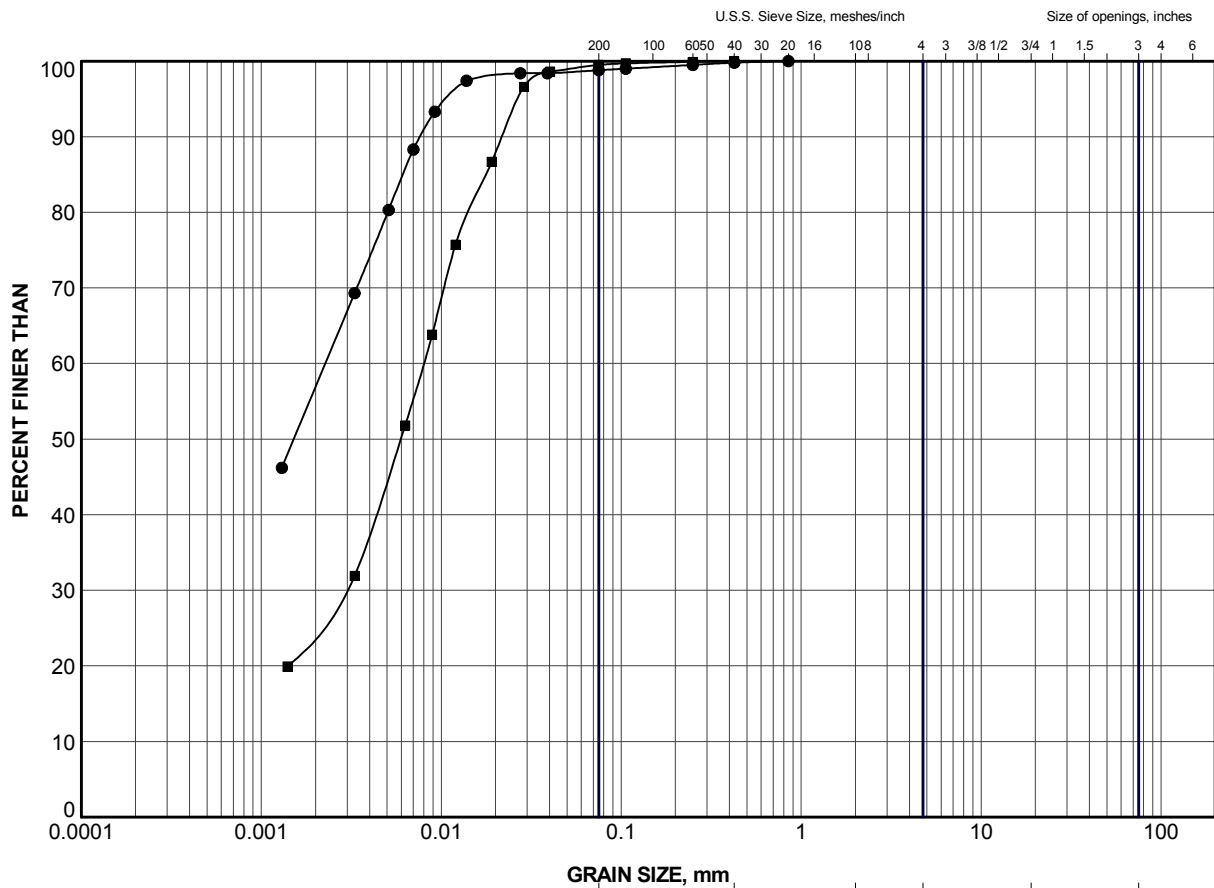


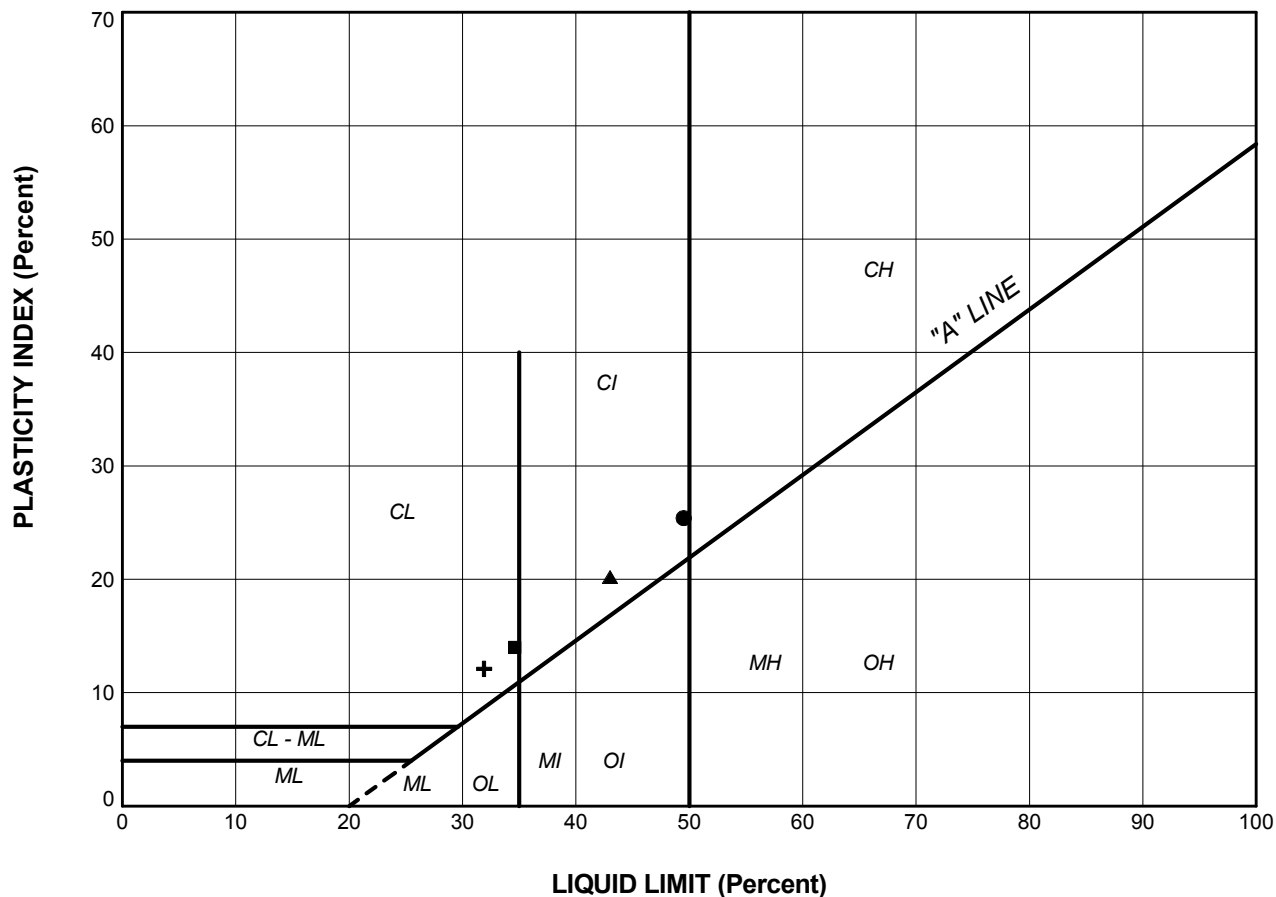
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND			
SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	C2	1	317.2

PROJECT					HIGHWAY 66 - CUT SECTION STA 15+590 TO 15+610				
TITLE					GRAIN SIZE DISTRIBUTION GRAVELLY SAND (FILL)				
PROJECT No.		10-1191-0044		FILE No.		10-1191-0044SUD.GPJ			
DRAWN	JJL	May 2013	SCALE	N/A	REV.				
CHECK	SEMC	May 2013							
APPR	JMAC	May 2013							
 Golder Associates SUDBURY, ONTARIO			FIGURE E1						


SUD-MTO GSD GLDR_LDN.GDT

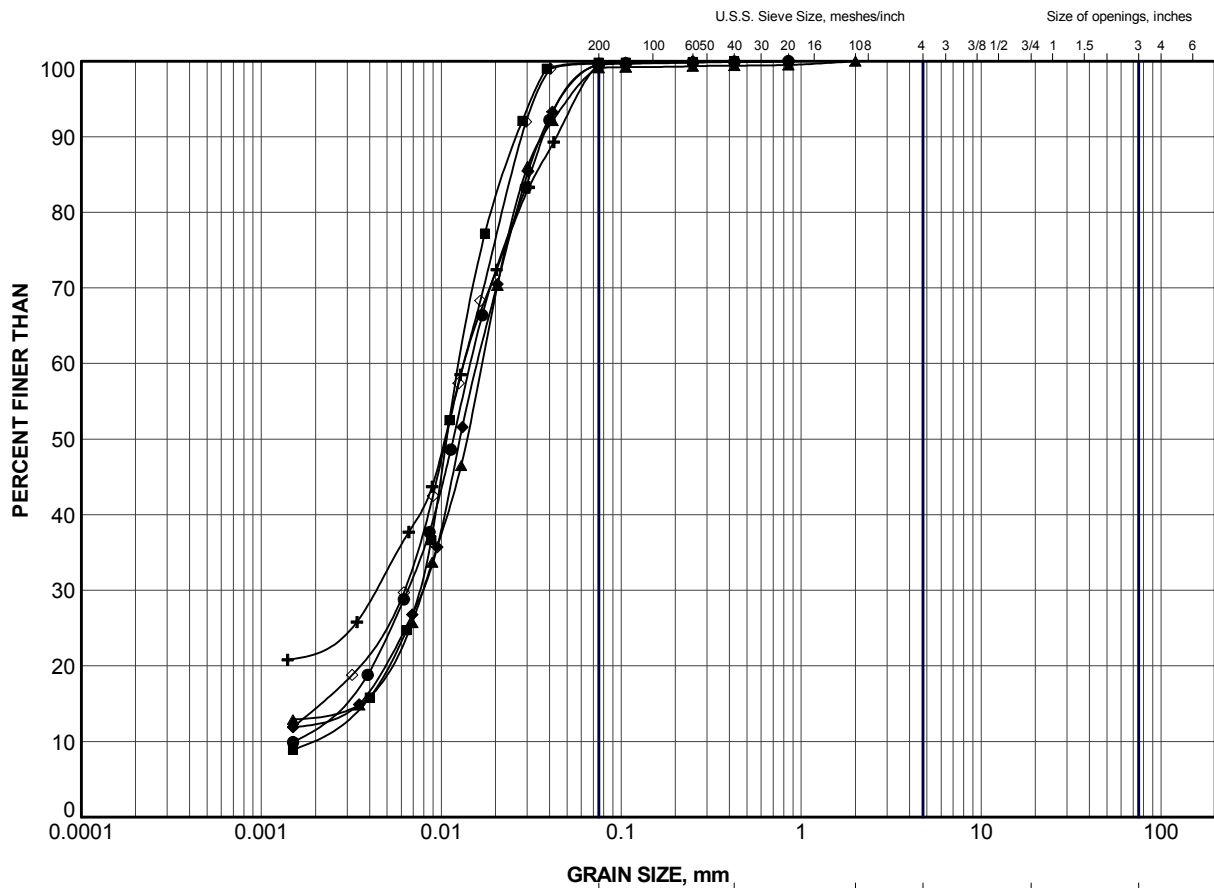




LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	C1	2	49.5	24.1	25.4
■	C2	4	34.6	20.6	14.0
▲	C3	2	43.0	22.8	20.2
+	C4	2	31.9	19.8	12.1


PROJECT					
HIGHWAY 66 - CUT SECTION STA 15+590 TO 15+610					
TITLE					
PLASTICITY CHART CLAYEY SILT to SILTY CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	May 2013	SCALE	N/A	REV.
CHECK	SEMC	May 2013			
APPR	JMAC	May 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE E3		

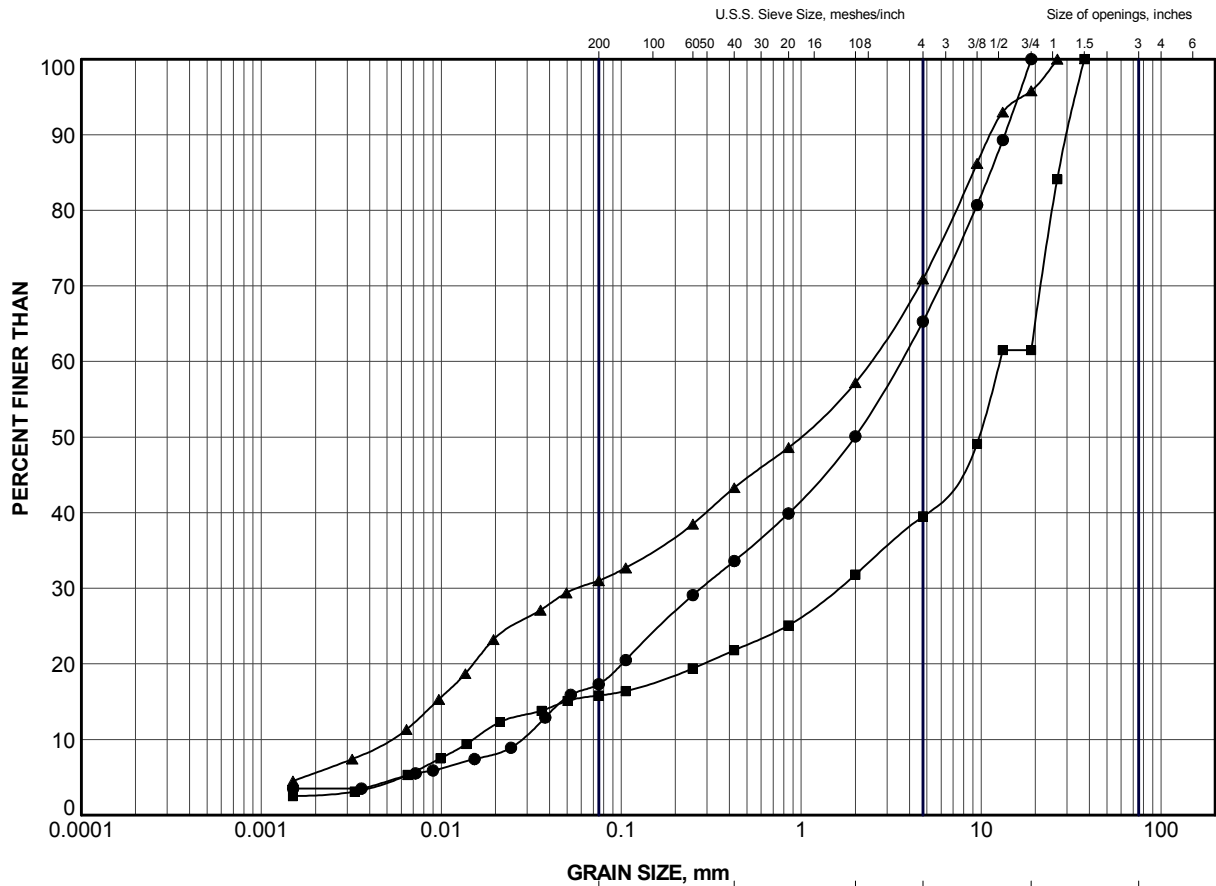


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	C1	4b	314.3
■	C1	7	312.0
▲	C2	8	311.1
+	C3	4	313.7
◆	C4	4	313.3
◇	C5	6	312.7


PROJECT					
HIGHWAY 66 - CUT SECTION STA 15+590 TO 15+610					
TITLE					
GRAIN SIZE DISTRIBUTION SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	May 2013	SCALE	N/A	REV.
CHECK	SEMC	May 2013			
APPR	JMAC	May 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE E4		



CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

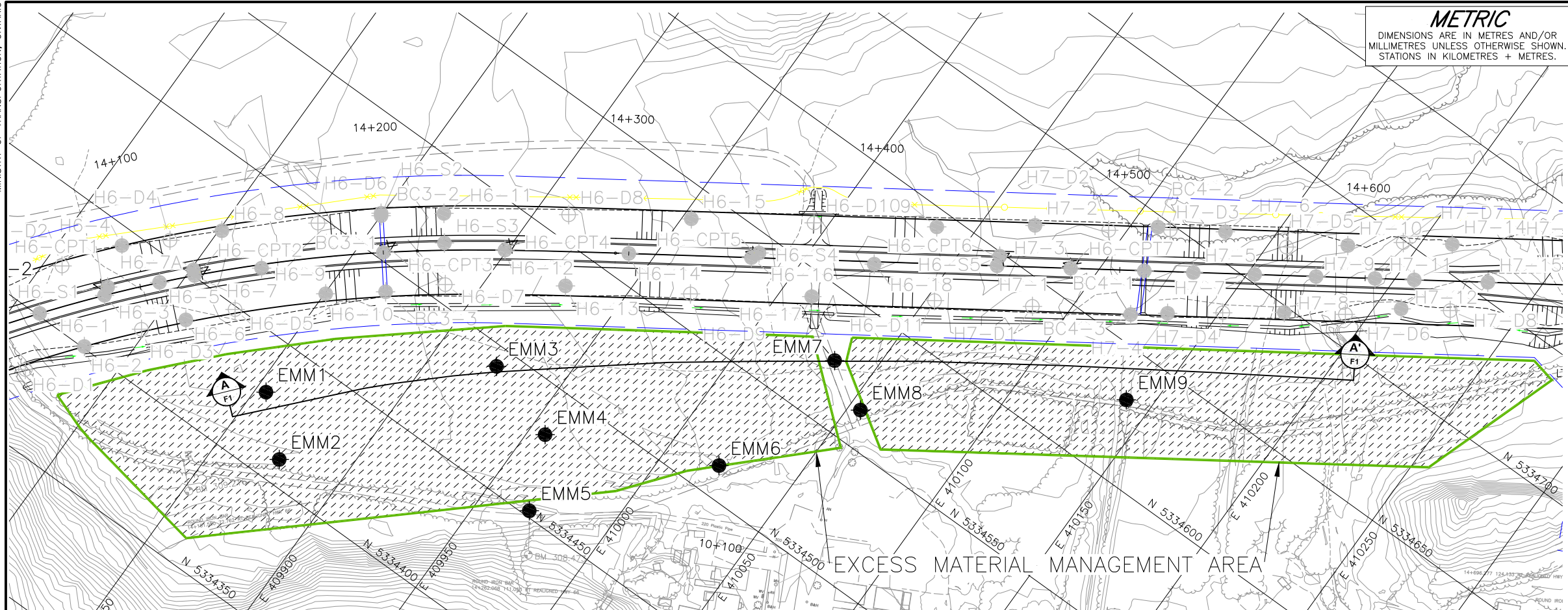
SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	C3	8	309.2
■	C4	8	309.5
▲	C5	9	308.9

PROJECT					
HIGHWAY 66 - CUT SECTION STA 15+590 TO 15+610					
TITLE					
GRAIN SIZE DISTRIBUTION SILTY GRAVELLY SAND to SAND AND GRAVEL					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	JJL	May 2013	SCALE	N/A	REV.
CHECK	SEMC	May 2013			
APPR	JMAC	May 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE E5		

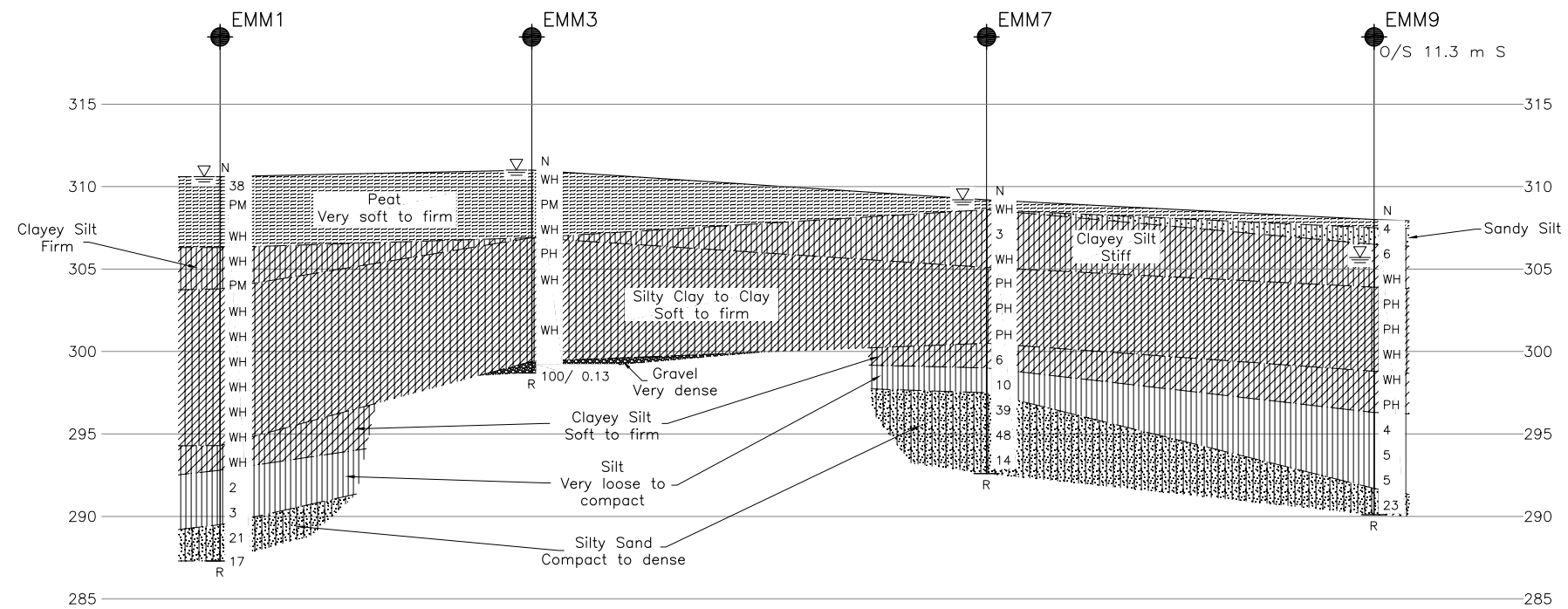


APPENDIX F

Excess Material Management Area



PLAN
SCALE
0 20 40 m



PROFILE
HIGHWAY 66
HORIZONTAL SCALE
0 20 40 m
VERTICAL SCALE
0 4 8 m

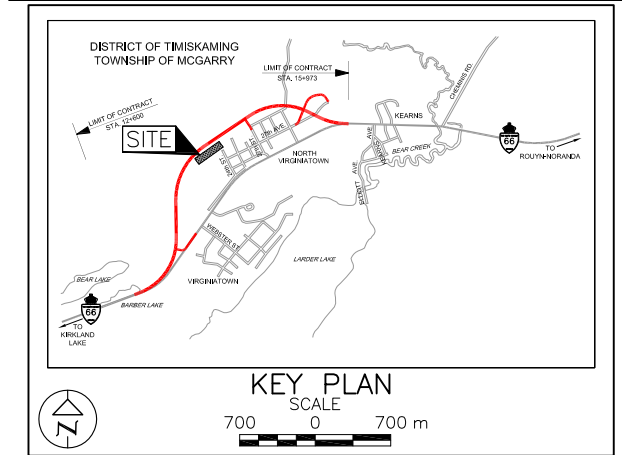
METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5091-07-00

HIGHWAY 66
Excess Material Management Area
STA 14+050 TO 14+675
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

Golder Associates
Golder Associates Ltd.
SUDBURY, ONTARIO, CANADA



- LEGEND**
- Borehole
 - ⊕ Dynamic Cone Penetration Test
 - ⚡ CPT
 - N Standard Penetration Test Value
 - 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
 - R Refusal
 - ≡ WL upon completion of drilling

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
EMM1	310.6	5334428.9	409854.1
EMM2	311.3	5334409.8	409874.5
EMM3	311.0	5334492.3	409924.1
EMM4	309.1	5334481.3	409956.4
EMM5	310.6	5334452.4	409969.3
EMM6	309.4	5334512.5	410021.2
EMM7	309.2	5334574.7	410034.4
EMM8	310.3	5334564.5	410054.7
EMM9	308.0	5334631.2	410140.1

NOTES

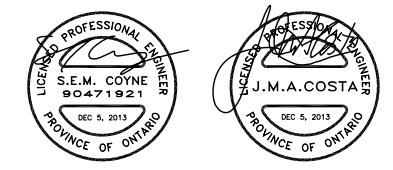
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

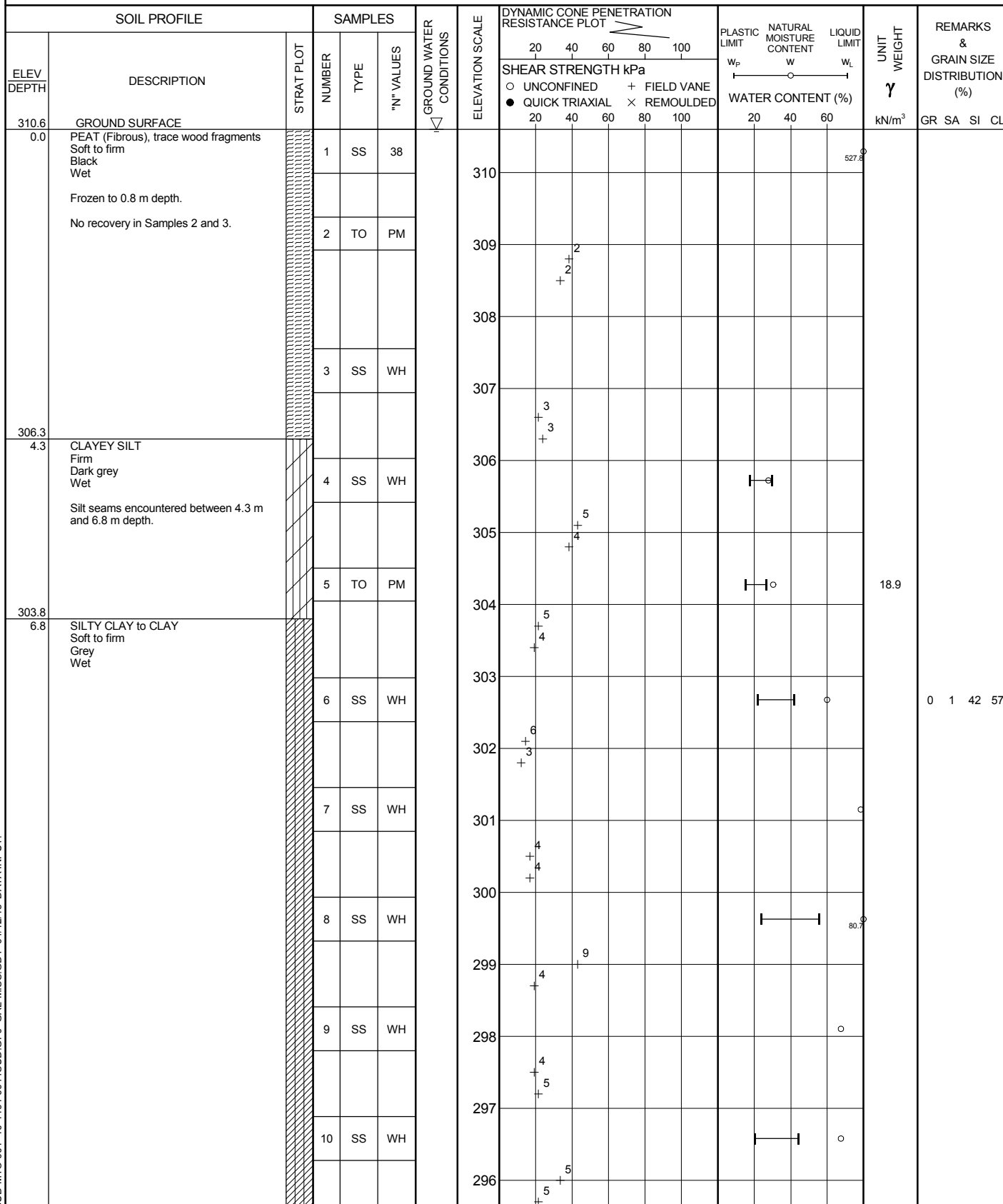
REFERENCE

Base plans provided in digital format by MMM, drawing file nos. H3211009D16 ROLL PLAN-ULTIMATE and PDR.dwg, received DEC 3, 2012. Keyplan drawing file nos. H3211009G02 received JAN 24, 2013.



NO.	DATE	BY	REVISION
Geocres No. 32D-17			
HWY. 66	PROJECT NO. 10-1191-0044		DIST.
SUBM'D. MT	CHKD.	DATE: DEC 2013	SITE:
DRAWN: TB	CHKD. SEMC	APPD. JMAC	DWG. F1



PROJECT 10-1191-0044		RECORD OF BOREHOLE No EMM1		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334428.9; E 409854.1		ORIGINATED BY BM	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring		COMPILED BY AC	
DATUM GEODETIC		DATE May 5, 2013		CHECKED BY SEMC	



Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No EMM1			2 OF 2 METRIC											
G.W.P. 5091-07-00			LOCATION N 5334428.9; E 409854.1			ORIGINATED BY BM											
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring			COMPILED BY AC											
DATUM GEODETIC			DATE May 5, 2013			CHECKED BY SEMC											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ kN/m³	GR SA SI CL
							20 40 60 80 100	20 40 60 80 100	W _p W W _L	20 40 60							
--- CONTINUED FROM PREVIOUS PAGE ---																	
294.3	SILTY CLAY to CLAY Soft to firm Grey Wet		11	SS	WH		295										
16.3	CLAYEY SILT, trace sand Soft to firm Grey Wet		12	SS	WH		294										
292.8	SILT, trace to some clay, trace sand Very loose Grey Wet		13	SS	2		293										
17.8			14	SS	3		292										
289.5	Silty SAND, some gravel, trace sand Compact Grey Wet		15	SS	21		289										
21.1	One 25 mm gravel piece recovered in Sample 16.		16	SS	17		288										
287.3	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Note: 1. Water level at ground surface (Elev. 310.6 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

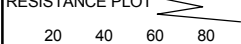
PROJECT 10-1191-0044		RECORD OF BOREHOLE No EMM2		1 OF 2 METRIC	
G.W.P. 5091-07-00		LOCATION N 5334409.8; E 409874.5		ORIGINATED BY BM	
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring		COMPILED BY AC	
DATUM GEODETIC		DATE May 5, 2013		CHECKED BY SEMC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								20	40	60	80	100			W _p	W	W _L
311.3	GROUND SURFACE																
0.0	PEAT (Fibrous) Soft Black Wet Frozen to 2.4 m depth.		1	SS	11												
			2	TO	PH												
	Vane at 2.4 m depth in frozen peat.																
307.9			3	SS	WH												
3.4	CLAYEY SILT, trace to some sand, trace organics Soft to firm Grey Wet																
			4	TO	PM												
	Silt seams encountered between 6.1 m and 7.2 m depth.		5	SS	WH												
304.1																	
7.2	SILTY CLAY, trace sand Soft Grey Wet		6	SS	WH												
			7	SS	WH												
			8	SS	WH												
			9	SS	WH												
298.1																	
13.2	CLAYEY SILT, trace sand Firm Grey Wet		10	SS	6												
296.8																	
14.5	SILT, trace clay, trace sand																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

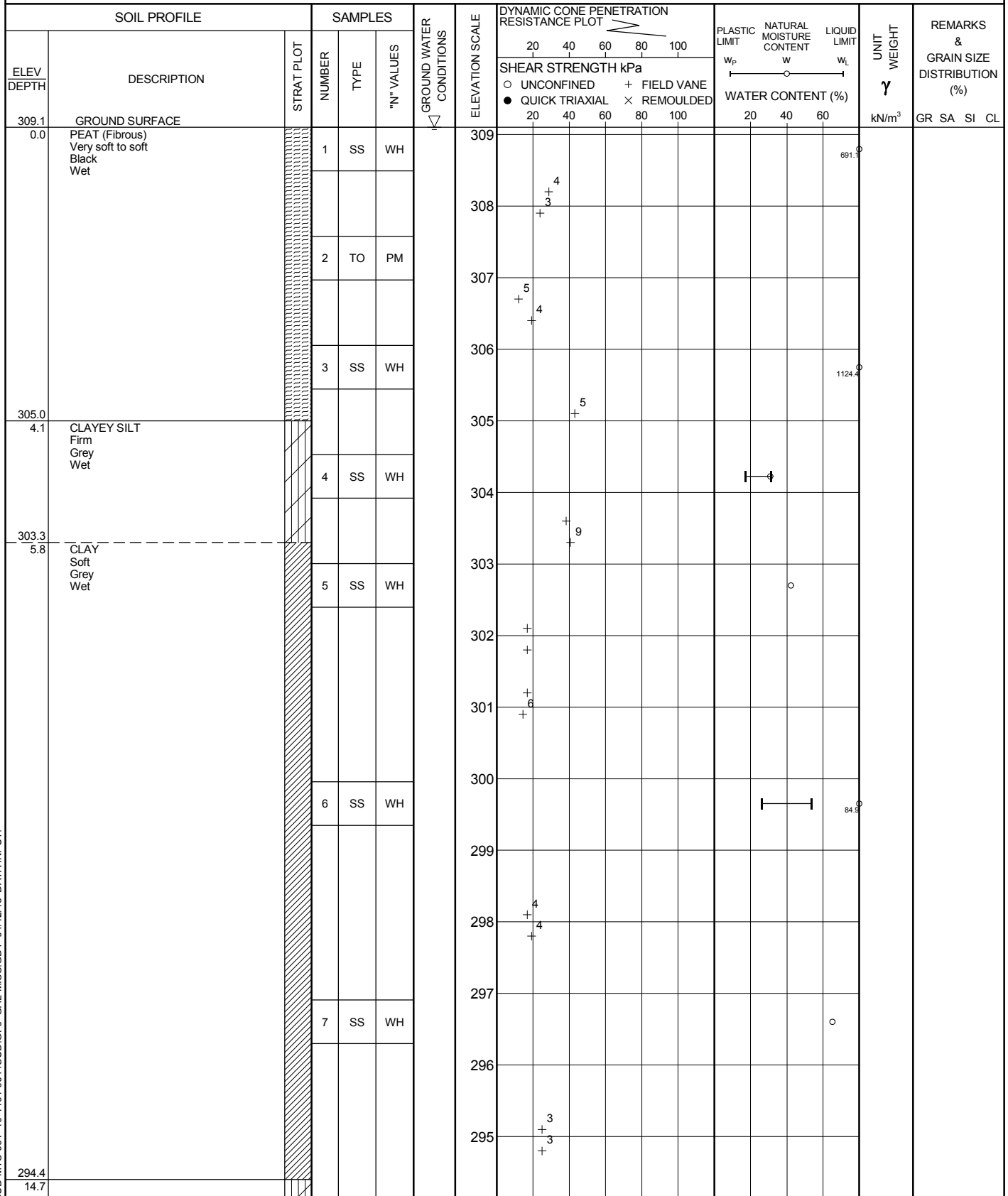
+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>			RECORD OF BOREHOLE No EMM2				2 OF 2 METRIC				
G.W.P. <u>5091-07-00</u>			LOCATION <u>N 5334409.8; E 409874.5</u>				ORIGINATED BY <u>BM</u>				
DIST <u> </u> HWY <u>66</u>			BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring</u>				COMPILED BY <u>AC</u>				
DATUM <u>GEODETIC</u>			DATE <u>May 5, 2013</u>				CHECKED BY <u>SEMC</u>				
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	--- CONTINUED FROM PREVIOUS PAGE ---										
294.8	SILT, trace clay, trace sand		11	SS	8		296				
295							295				
16.5	Silty SAND, some gravel, trace sand Compact Grey Wet		12	SS	27		294				
293.5	One 25 mm gravel piece recovered in Sample 13.		13	SS	100/ 0.08						
17.8	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Note: 1. Water level at ground surface (Elev. 311.3 m) upon completion of drilling.										

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No EMM4		1 OF 2 METRIC	
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334481.3; E 409956.4</u>		ORIGINATED BY <u>BM</u>	
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring</u>		COMPILED BY <u>AC</u>	
DATUM <u>GEODETIC</u>		DATE <u>May 6, 2013</u>		CHECKED BY <u>SEMC</u>	



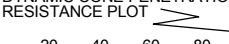
SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044		RECORD OF BOREHOLE No EMM4				2 OF 2 METRIC											
G.W.P. 5091-07-00		LOCATION N 5334481.3; E 409956.4				ORIGINATED BY BM											
DIST _____ HWY 66		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring				COMPILED BY AC											
DATUM GEODETIC		DATE May 6, 2013				CHECKED BY SEMC											
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					W _p W W _L				
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					20 40 60 WATER CONTENT (%)					
289.6	CLAYEY SILT, trace sand Soft to firm Grey Wet		8	SS	8												
			9	SS	3												
			10	SS	2												
289.5	Gravelly Silty SAND, trace clay Loose Grey Wet		11	SS	8												
			12	SS	5												
286.1	Gravel pieces recovered in Sample 13.		13	SS	100/ 0.13												
23.0	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Note: 1. Water level at ground surface (Elev. 309.1 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT 10-1191-0044			RECORD OF BOREHOLE No EMM5			1 OF 1 METRIC					
G.W.P. 5091-07-00			LOCATION N 5334452.4; E 409969.3			ORIGINATED BY BM					
DIST _____ HWY 66			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring			COMPILED BY AC					
DATUM GEODETIC			DATE May 6, 2013			CHECKED BY SEMC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
310.6	GROUND SURFACE										
0.0	PEAT (Fibrous), trace gravel, trace sand Very soft to firm Black Wet		1	SS	4		310				
							309	2 + 2 +			
			2	TO	PM					344.2	
							308	2 +			
307.6			3	SS	5					91	
3.0	CLAYEY SILT, trace sand, trace organics Soft Grey Wet						307				
			4	SS	1						
							306	7 + +			
305.3							305				
5.3	SILTY CLAY Soft Grey Wet										
			5	SS	WH		304				
							303	+ +			
			6	TO	PM						
							302	+ +			
							301	8 +			
300.2			7	SS	51						
299.9			8	SS	100/0.05		300				
10.7	Silty SAND, trace to some clay, trace gravel Very dense Grey Wet END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) Note: 1. Water level at ground surface (Elev. 310.6 m) upon completion of drilling.										

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

PROJECT <u>10-1191-0044</u>	RECORD OF BOREHOLE No EMM6		1 OF 2	METRIC
G.W.P. <u>5091-07-00</u>	LOCATION <u>N 5334512.5; E 410021.2</u>	ORIGINATED BY <u>MR</u>		
DIST <u> </u> HWY <u>66</u>	BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring</u>	COMPILED BY <u>AC</u>		
DATUM <u>GEODETIC</u>	DATE <u>May 14, 2013</u>	CHECKED BY <u>SEMC</u>		

[illegible]

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>10-1191-0044</u>		RECORD OF BOREHOLE No EMM8				2 OF 2 METRIC					
G.W.P. <u>5091-07-00</u>		LOCATION <u>N 5334564.5; E 410054.7</u>				ORIGINATED BY <u>BM</u>					
DIST <u> </u> HWY <u>66</u>		BOREHOLE TYPE <u>108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring</u>				COMPILED BY <u>AC</u>					
DATUM <u>GEODETIC</u>		DATE <u>May 8, 2013</u>				CHECKED BY <u>SEMC</u>					
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	W _p W W _L		
	--- CONTINUED FROM PREVIOUS PAGE ---										
	SAND and GRAVEL, some silt, trace clay Loose to dense Grey Wet		10	SS	11		295				
							294				
			11	SS	17		293				
			12	SS	41						
292.0	Spoon attempted at 18.3 m depth; spoon bouncing.						292				
18.3	END OF BOREHOLE SPOON REFUSAL Note: 1. Water level at ground surface (Elev. 310.3 m) upon completion of drilling.										

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 10-1191-0044				RECORD OF BOREHOLE No EMM9				2 OF 2 METRIC									
G.W.P. 5091-07-00				LOCATION N 5334631.2; E 410140.1				ORIGINATED BY MR									
DIST _____ HWY 66				BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing				COMPILED BY AC									
DATUM GEODETIC				DATE May 15, 2013				CHECKED BY SEMC									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	--- CONTINUED FROM PREVIOUS PAGE ---																
291.7	SILT, some clay Loose Grey Wet		11	SS	5		292										
16.3	Silty SAND Compact Grey Wet																
	No recovery in Sample 12.		12	SS	23		291										
290.1	Spoon attempted at 17.9 m depth; spoon bouncing.																
17.9	END OF BOREHOLE SPOON REFUSAL (HAMMER BOUNCING) AND REFUSAL TO FURTHER CASING ADVANCEMENT Note: 1. Water level at a depth of 2.3 m below ground surface (Elev. 305.7 m) upon completion of drilling.																

SUD-MTO 001 10-1191-0044SUD.GPJ GAL-MISS.GDT 04/12/13 DATA INPUT:

CONSOLIDATION TEST SUMMARY**FIGURE F1**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	2
Borehole Number	EMM-5	Sample Depth, m	1.52 - 2.13

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	6		
Date Started	05/24/2013		
Date Completed	07/09/2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	1.89	Unit Weight, kN/m ³	10.15
Sample Diameter, cm	6.37	Dry Unit Weight, kN/m ³	2.28
Area, cm ²	31.87	Specific Gravity, measured	1.58
Volume, cm ³	60.36	Solids Height, cm	0.279
Water Content, %	344.24	Volume of Solids, cm ³	8.90
Wet Mass, g	62.46	Volume of Voids, cm ³	51.46
Dry Mass, g	14.06	Degree of Saturation, %	94.1

TEST COMPUTATIONS

Stress	Corr. Height	Void	Average Height	t ₉₀	cv.	mv	k
kPa	cm	Ratio	cm	sec	cm ² /s	m ² /kN	cm/s
0.00	1.894	5.783	1.894				
5.91	1.873	5.709	1.884	83	9.06E-03	1.84E-03	1.63E-06
10.53	1.850	5.624	1.861	58	1.27E-02	2.73E-03	3.39E-06
20.37	1.799	5.442	1.824	540	1.31E-03	2.72E-03	3.48E-07
39.48	1.719	5.157	1.759	408	1.61E-03	2.20E-03	3.47E-07
78.02	1.591	4.697	1.655	1329	4.37E-04	1.76E-03	7.53E-08
154.75	1.408	4.041	1.499	1192	4.00E-04	1.26E-03	4.93E-08
307.71	1.201	3.300	1.304	1500	2.40E-04	7.14E-04	1.68E-08
638.16	1.014	2.633	1.108	1500	1.73E-04	2.98E-04	5.06E-09
1252.96	0.853	2.054	0.934	1220	1.51E-04	1.39E-04	2.06E-09
2481.79	0.713	1.552	0.783	1017	1.28E-04	6.02E-05	7.53E-10
1252.96	0.736	1.635	0.724				
307.71	0.824	1.951	0.780				
78.02	0.912	2.264	0.868				
20.37	0.988	2.539	0.950				
5.88	1.070	2.832	1.029				

Note:

Consolidation loading and unloading schedule assigned by the client.

Specimen taken 33cm from top of the tube

k calculated using cv based on ϕ_0 values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	1.07	Unit Weight, kN/m ³	11.80
Sample Diameter, cm	6.37	Dry Unit Weight, kN/m ³	4.04
Area, cm ²	31.87	Specific Gravity, measured	1.58
Volume, cm ³	34.10	Solids Height, cm	0.279
Water Content, %	191.82	Volume of Solids, cm ³	8.90
Wet Mass, g	41.03	Volume of Voids, cm ³	25.20
Dry Mass, g	14.06		

Prepared By: RD

Golder Associates

Checked By: MT

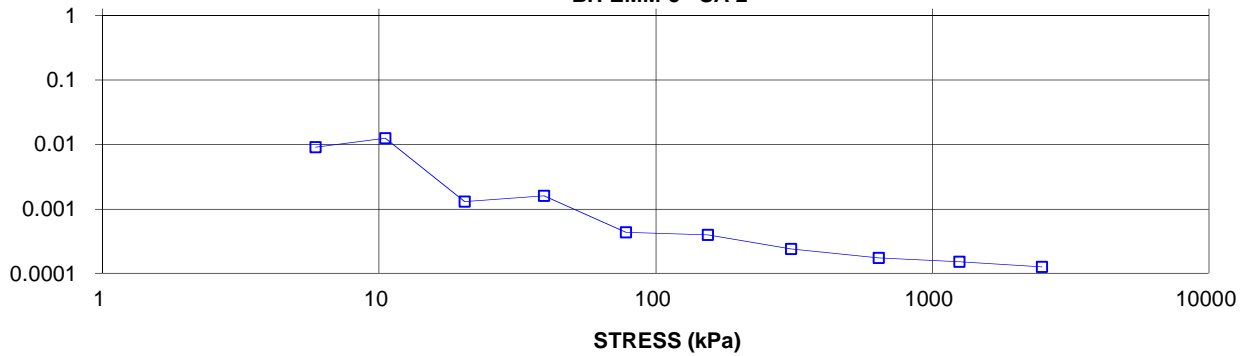
CONSOLIDATION TEST SUMMARY

FIGURE F1

Pg. 2 of 4

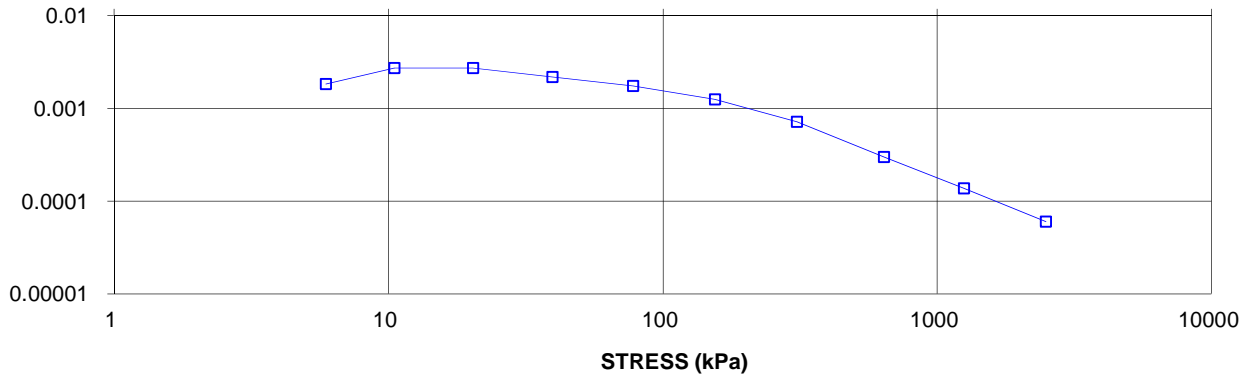
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS STRESS (kPa)
BH EMM-5 SA 2



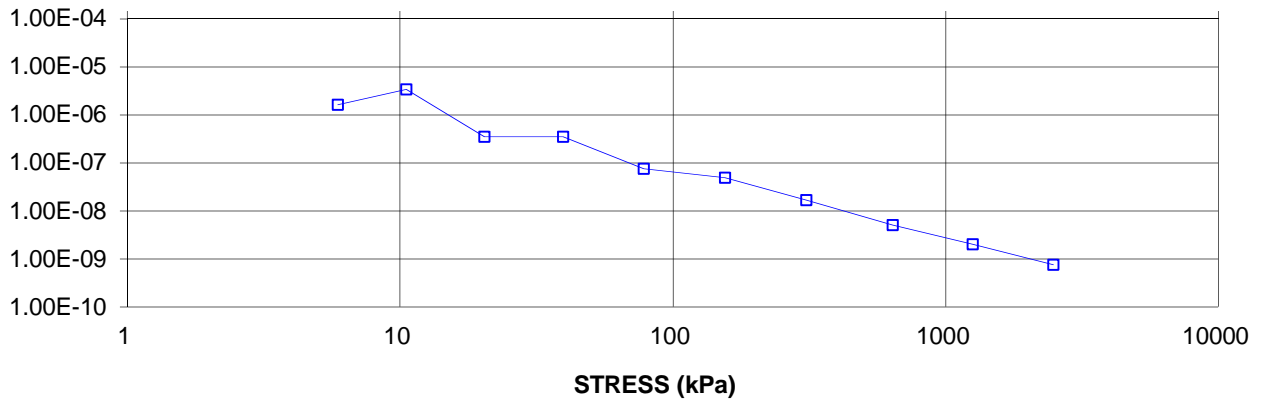
VOLUME COMPRESSIBILITY, m²/kN

CONSOLIDATION TEST
MV m²/kN vs STRESS (kPa)
BH EMM-5 SA 2



HYDRAULIC CONDUCTIVITY,
cm/s

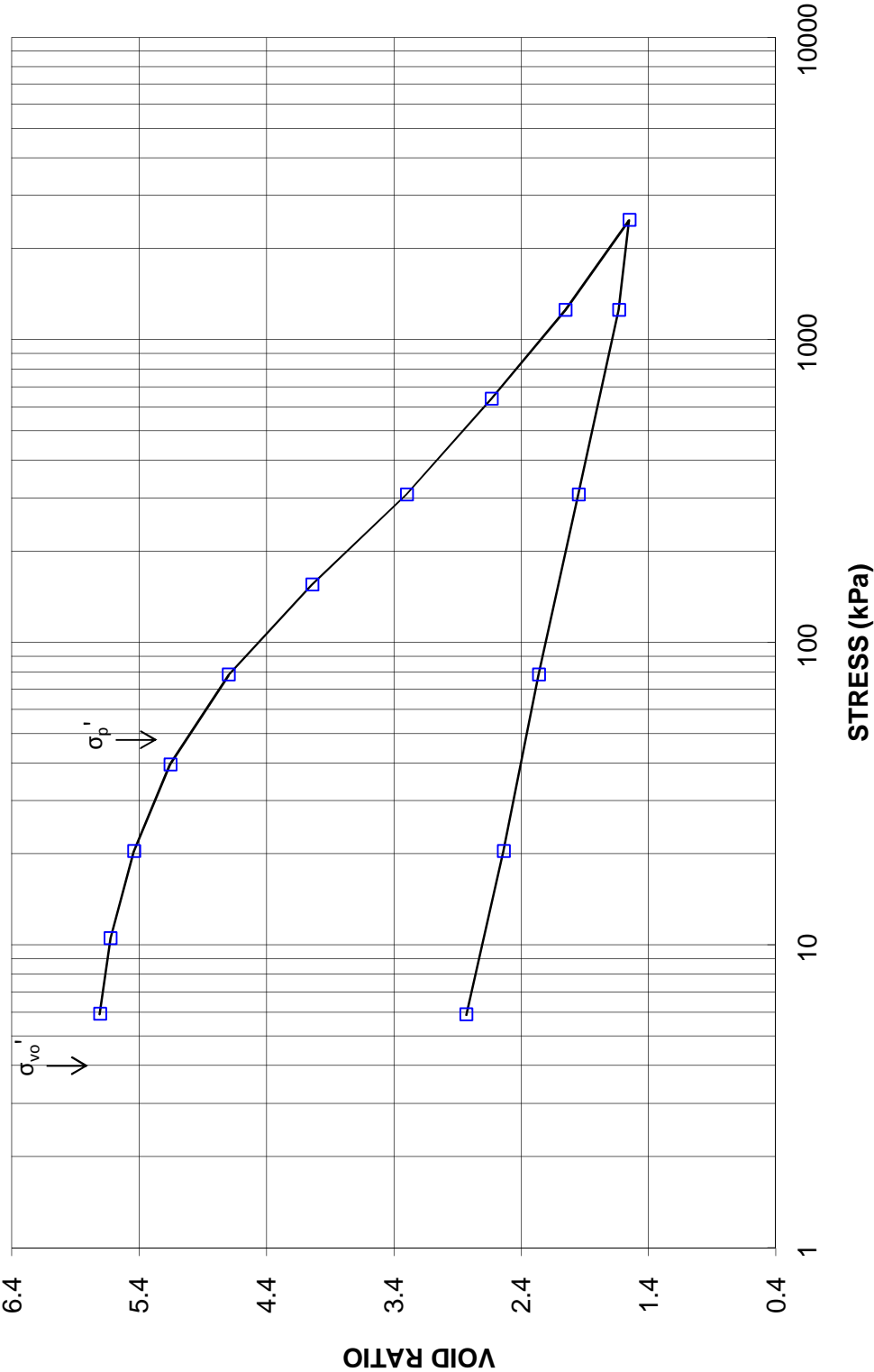
CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs STRESS
BH EMM-5 SA 2



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE F1
Pg. 3 of 4

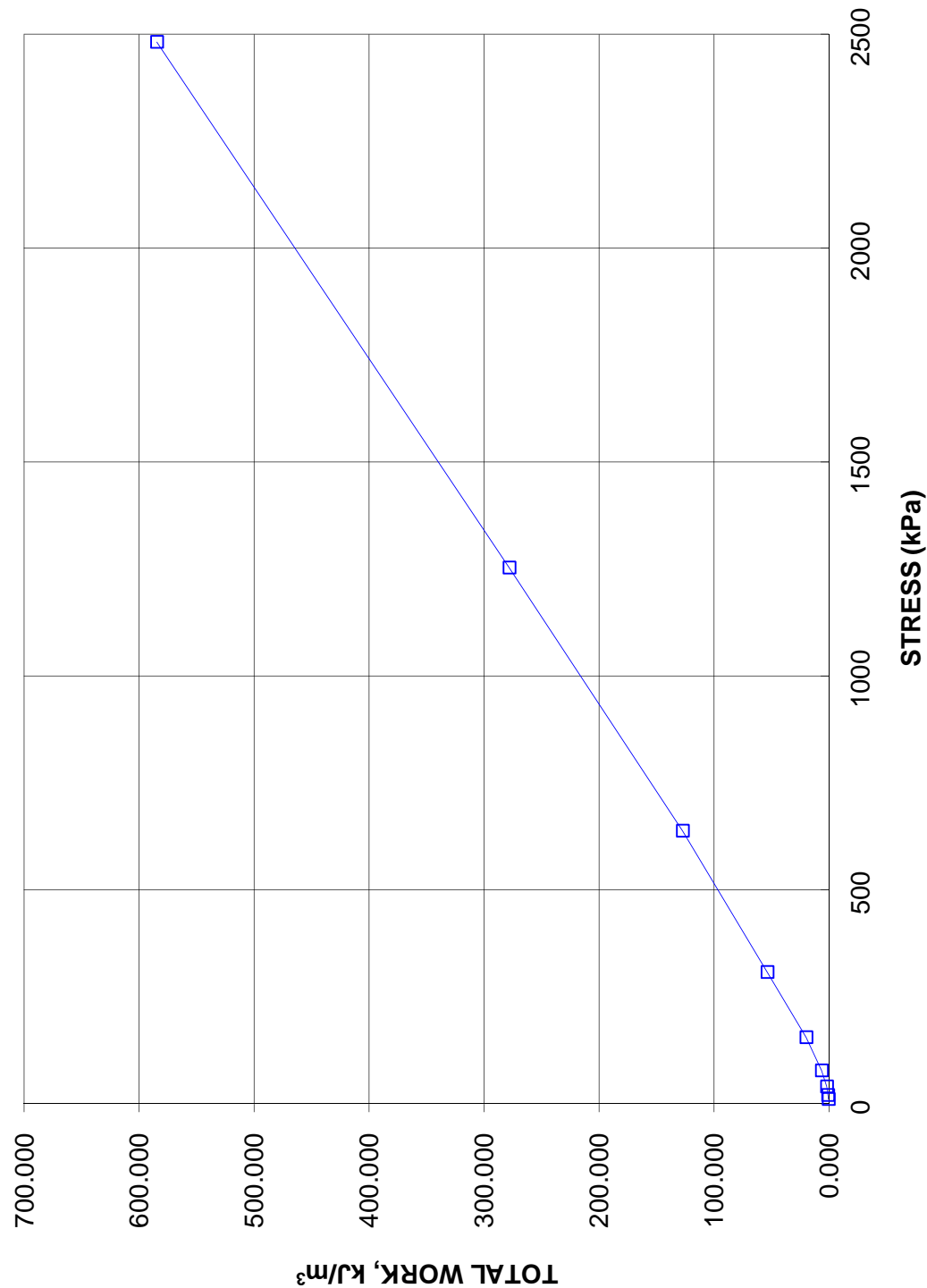
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH EMM-5 SA 2

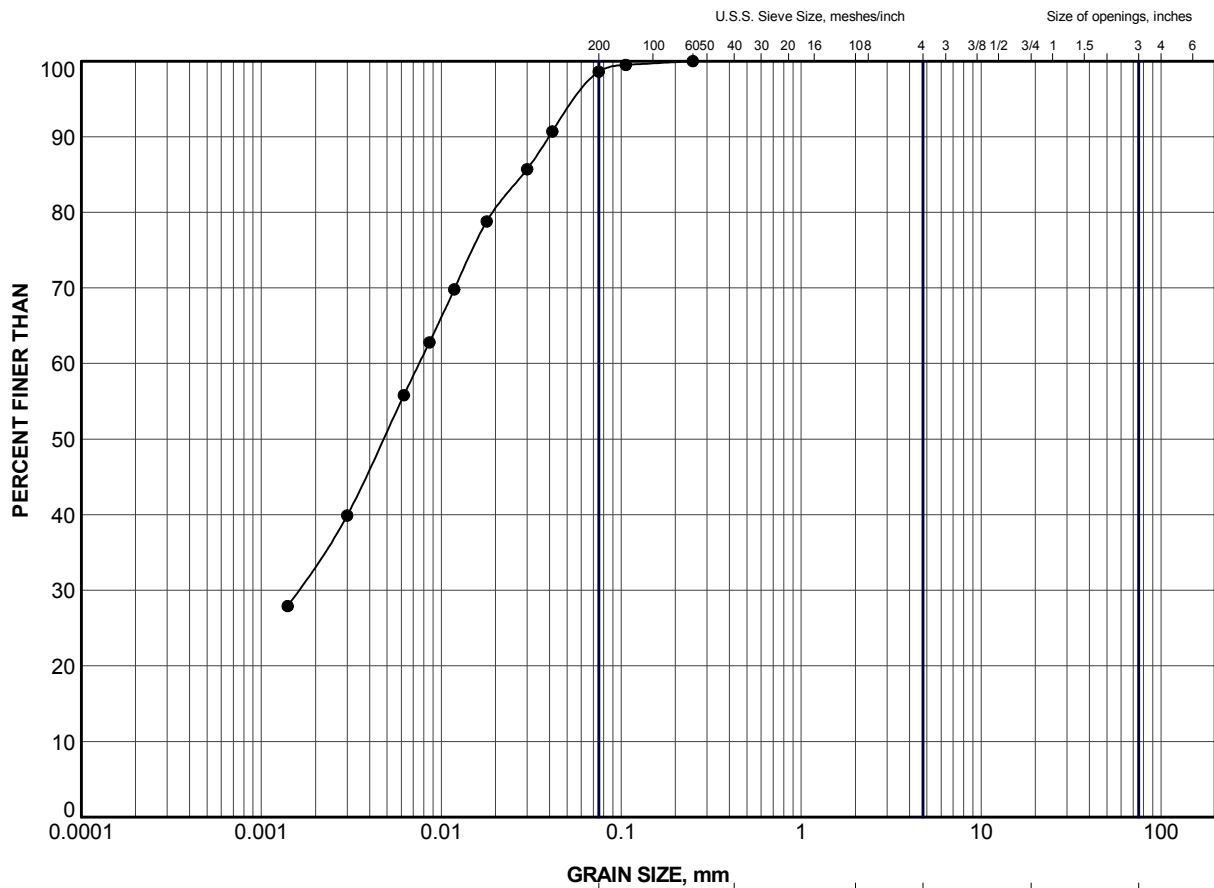


CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE F1
Pg. 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m^3 vs STRESS
BH EMM-5 SA 2




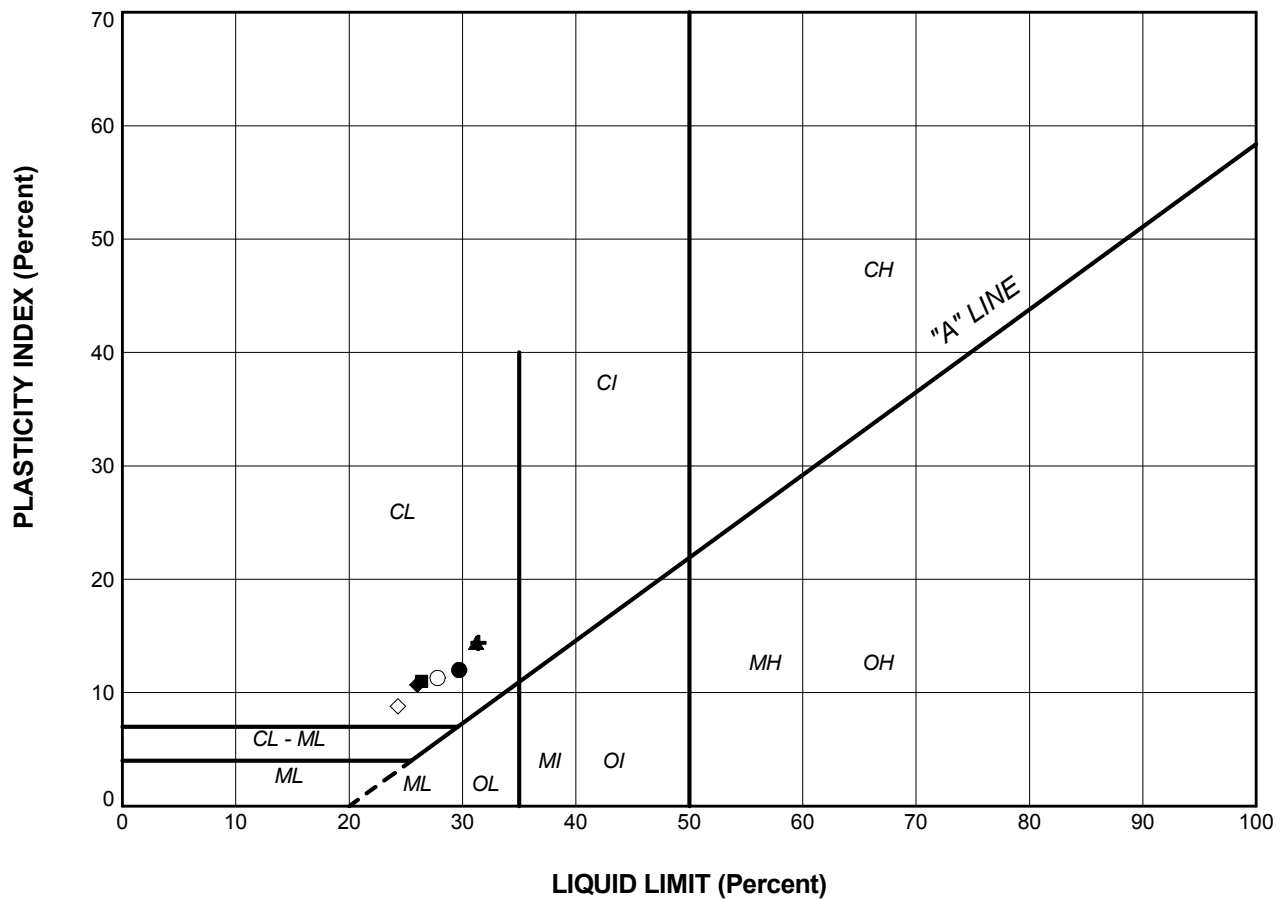


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	EMM7	3	305.9

PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
GRAIN SIZE DISTRIBUTION CLAYEY SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	TB	Nov 2013	SCALE	N/A	REV.
CHECK	SEMC	Nov 2013			
APPR	JMAC	Nov 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE F2		




SOIL TYPE
 C = Clay
 M = Silt
 O = Organic

PLASTICITY
 L = Low
 I = Intermediate
 H = High

LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	EMM1	4	29.7	17.7	12.0
■	EMM1	5	26.4	15.4	11.0
▲	EMM2	5	31.2	16.8	14.4
+	EMM4	4	31.4	17.0	14.4
◆	EMM5	4	26.0	15.3	10.7
◇	EMM7	3	24.3	15.5	8.8
○	EMM9	3	27.8	16.5	11.3

PROJECT				
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA				
TITLE				
PLASTICITY CHART CLAYEY SILT				
PROJECT No. 10-1191-0044		FILE No. 10-1191-0044SUD.GPJ		
DRAWN	TB	Nov 2013	SCALE	N/A
CHECK	SEMC	Nov 2013	REV.	
APPR	JMAC	Nov 2013		
 Golder Associates SUDBURY, ONTARIO			FIGURE F3	

CONSOLIDATION TEST SUMMARY**FIGURE F4**

Pg. 1 of 4

SAMPLE IDENTIFICATION

Project Number	10-1191-0044	Sample Number	5
Borehole Number	EMM-1	Sample Depth, m	6.1-6.6

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	5		
Date Started	5/24/2013		
Date Completed	6/10/2013		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	1.90	Unit Weight, kN/m ³	18.91
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	14.34
Area, cm ²	31.69	Specific Gravity, measured	2.76
Volume, cm ³	60.18	Solids Height, cm	1.006
Water Content, %	31.84	Volume of Solids, cm ³	31.88
Wet Mass, g	116.01	Volume of Voids, cm ³	28.30
Dry Mass, g	87.99	Degree of Saturation, %	99.0

TEST COMPUTATIONS

Stress	Corr. Height	Void	Average Height	t ₉₀	cv.	mv	k
kPa	cm	Ratio	cm	sec	cm ² /s	m ² /kN	cm/s
0.00	1.899	0.888	1.899				
10.59	1.899	0.887	1.899	73	1.05E-02	9.95E-06	1.02E-08
20.62	1.897	0.885	1.898	74	1.03E-02	1.05E-04	1.06E-07
40.00	1.895	0.883	1.896	38	2.01E-02	5.71E-05	1.12E-07
20.62	1.898	0.887	1.896				
10.59	1.900	0.888	1.899				
40.00	1.894	0.882	1.897	27	2.82E-02	1.04E-04	2.87E-07
78.59	1.882	0.871	1.888	60	1.26E-02	1.57E-04	1.94E-07
155.80	1.844	0.833	1.863	304	2.42E-03	2.61E-04	6.20E-08
309.06	1.769	0.758	1.806	173	4.00E-03	2.59E-04	1.01E-07
617.88	1.707	0.696	1.738	101	6.34E-03	1.05E-04	6.54E-08
1236.51	1.650	0.640	1.679	73	8.18E-03	4.79E-05	3.84E-08
2473.55	1.595	0.586	1.623	107	5.22E-03	2.35E-05	1.20E-08
1236.51	1.598	0.588	1.596				
309.06	1.618	0.608	1.608				
78.59	1.633	0.623	1.625				
20.62	1.650	0.640	1.641				
10.59	1.656	0.646	1.653				

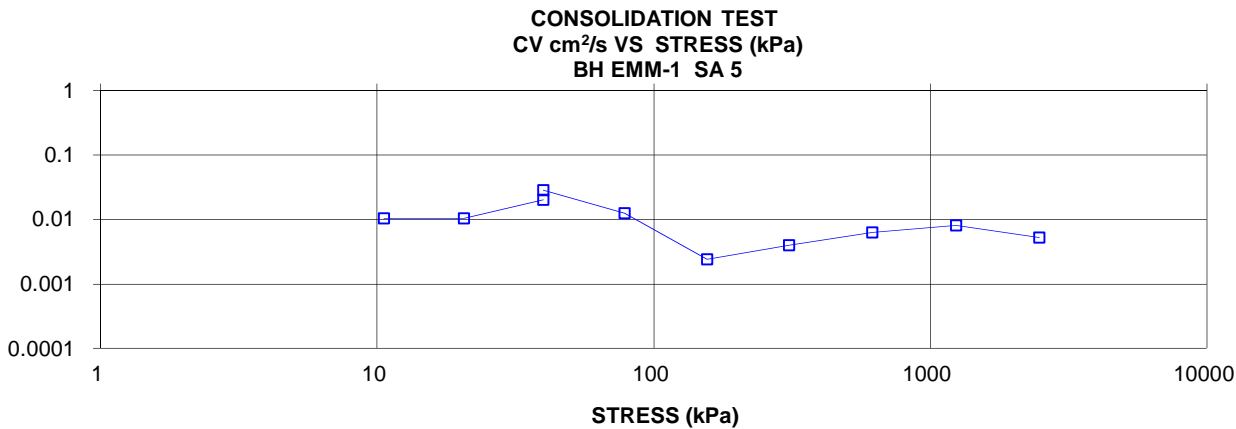
Note:

Specimen taken 6"-9" from top of the tube
k calculated using cv based on λ_0 values.

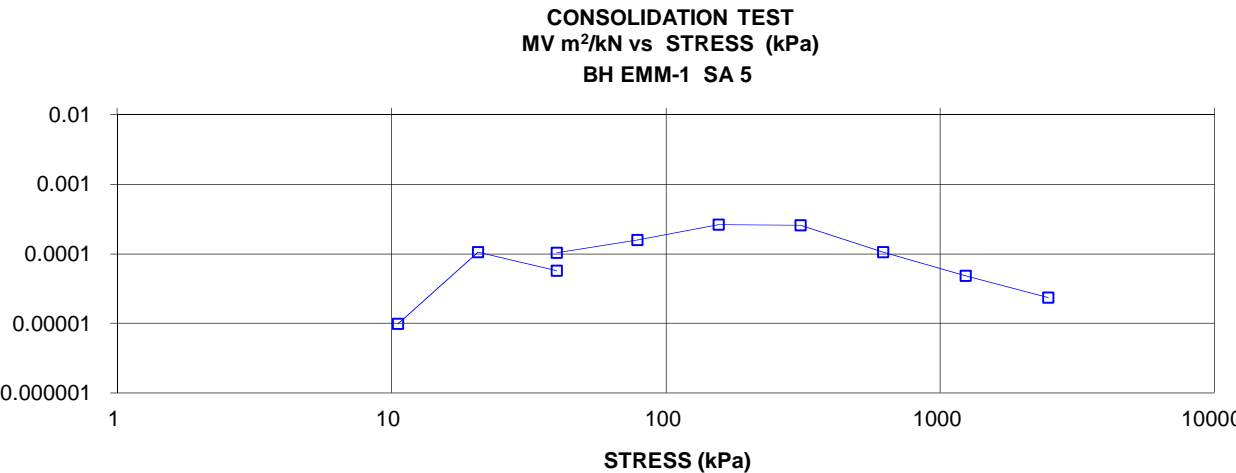
SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	1.66	Unit Weight, kN/m ³	20.08
Sample Diameter, cm	6.35	Dry Unit Weight, kN/m ³	16.45
Area, cm ²	31.69	Specific Gravity, measured	2.76
Volume, cm ³	52.46	Solids Height, cm	1.006
Water Content, %	22.10	Volume of Solids, cm ³	31.88
Wet Mass, g	107.44	Volume of Voids, cm ³	20.58
Dry Mass, g	87.99		

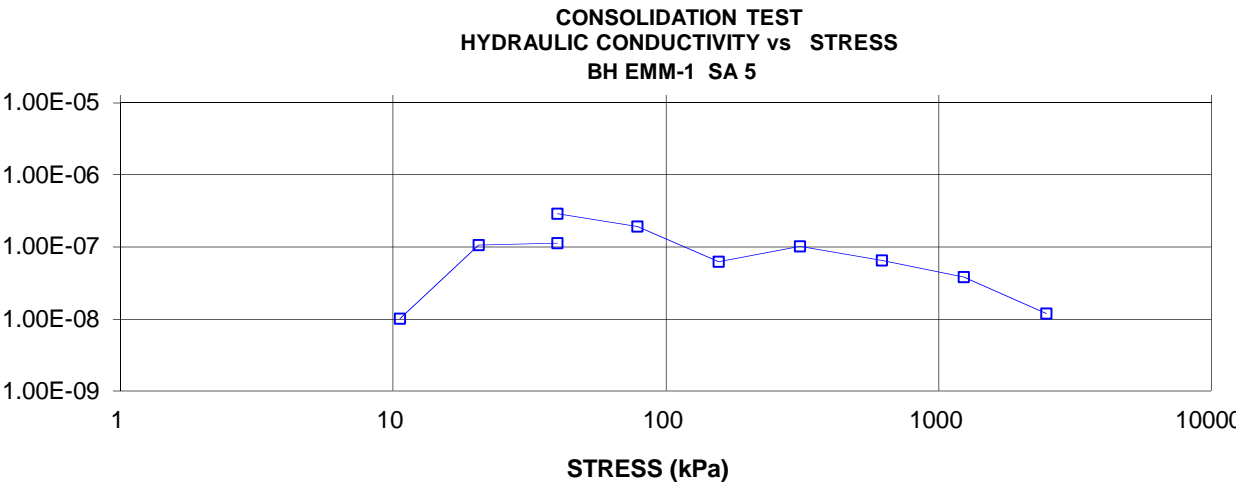
COEFFICIENT OF CONSOLIDATION,
cm²/s



VOLUME COMPRESSIBILITY, m²/kN



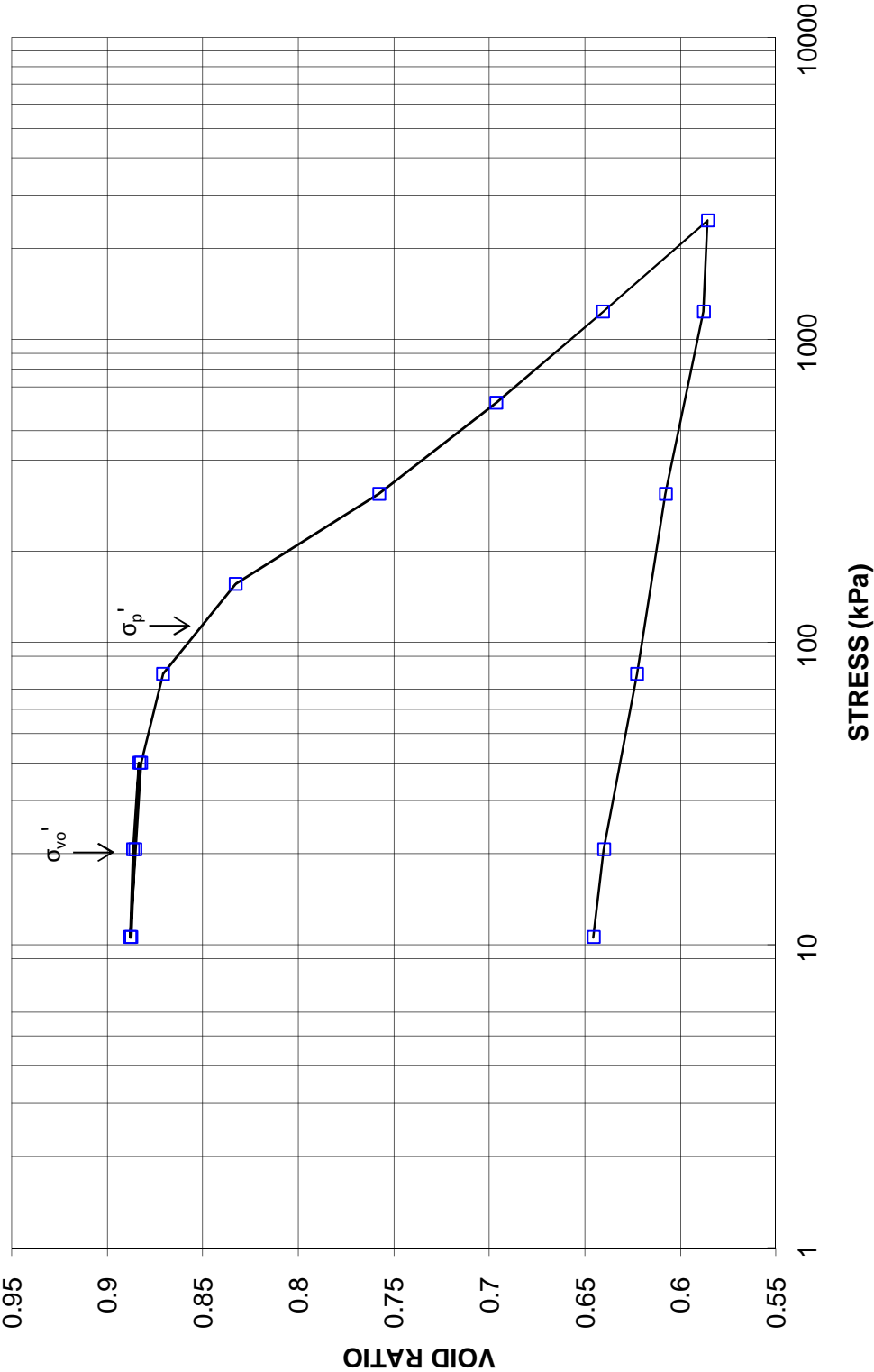
HYDRAULIC CONDUCTIVITY,
cm/s



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE F4
Pg. 3 of 4

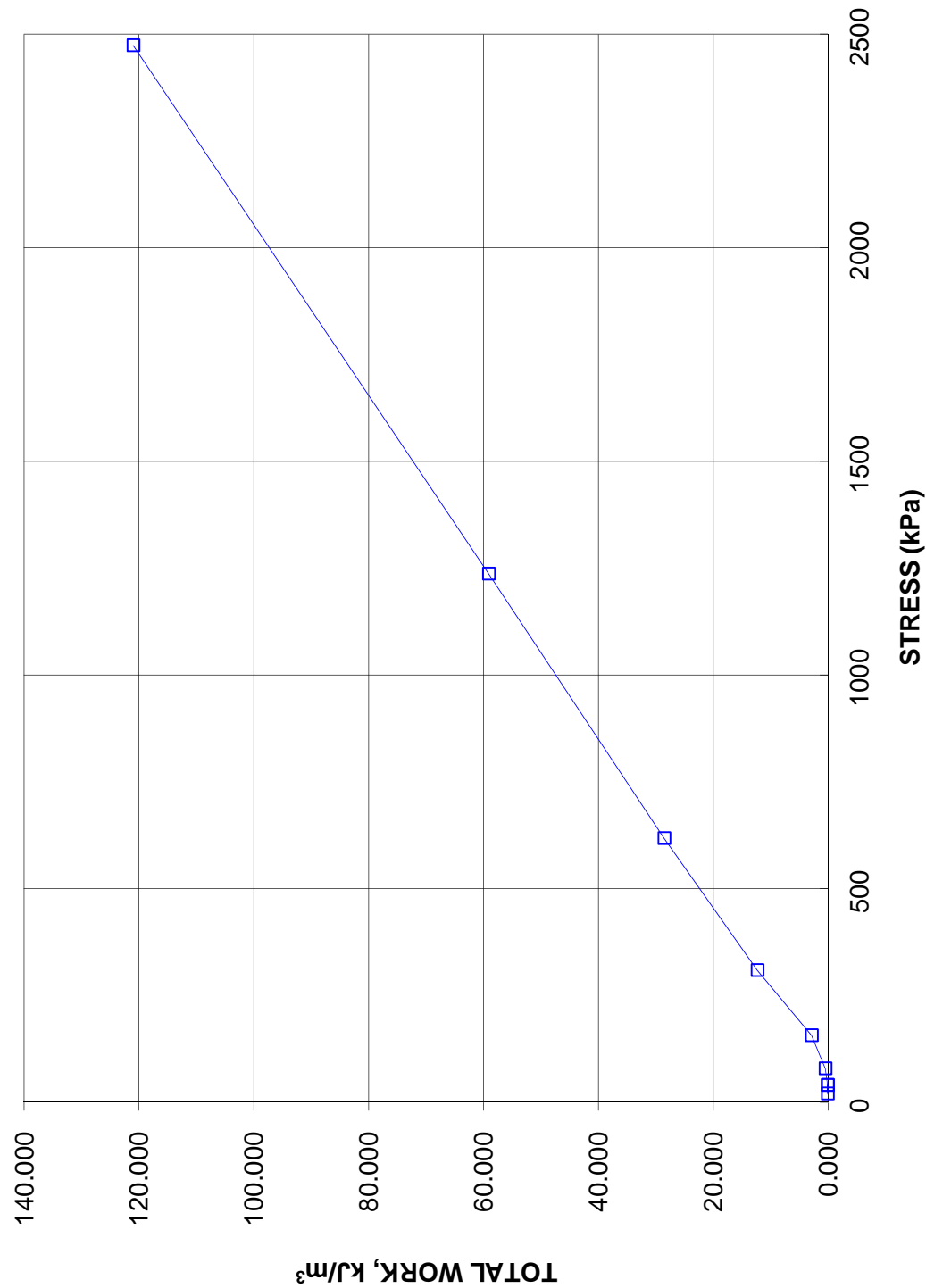
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH EMM-1 SA 5

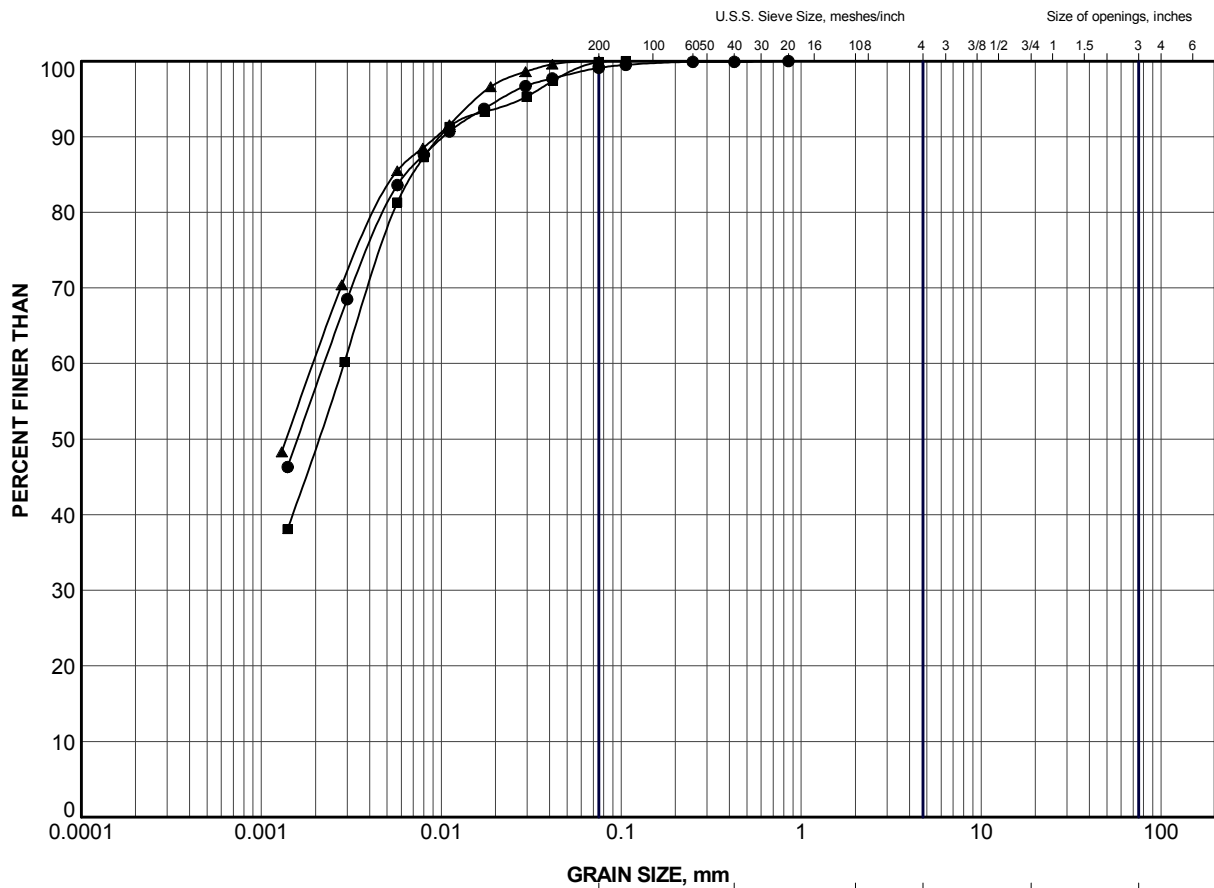


CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE F4
Pg. 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m^3 vs STRESS
BH EMM-1 SA 5




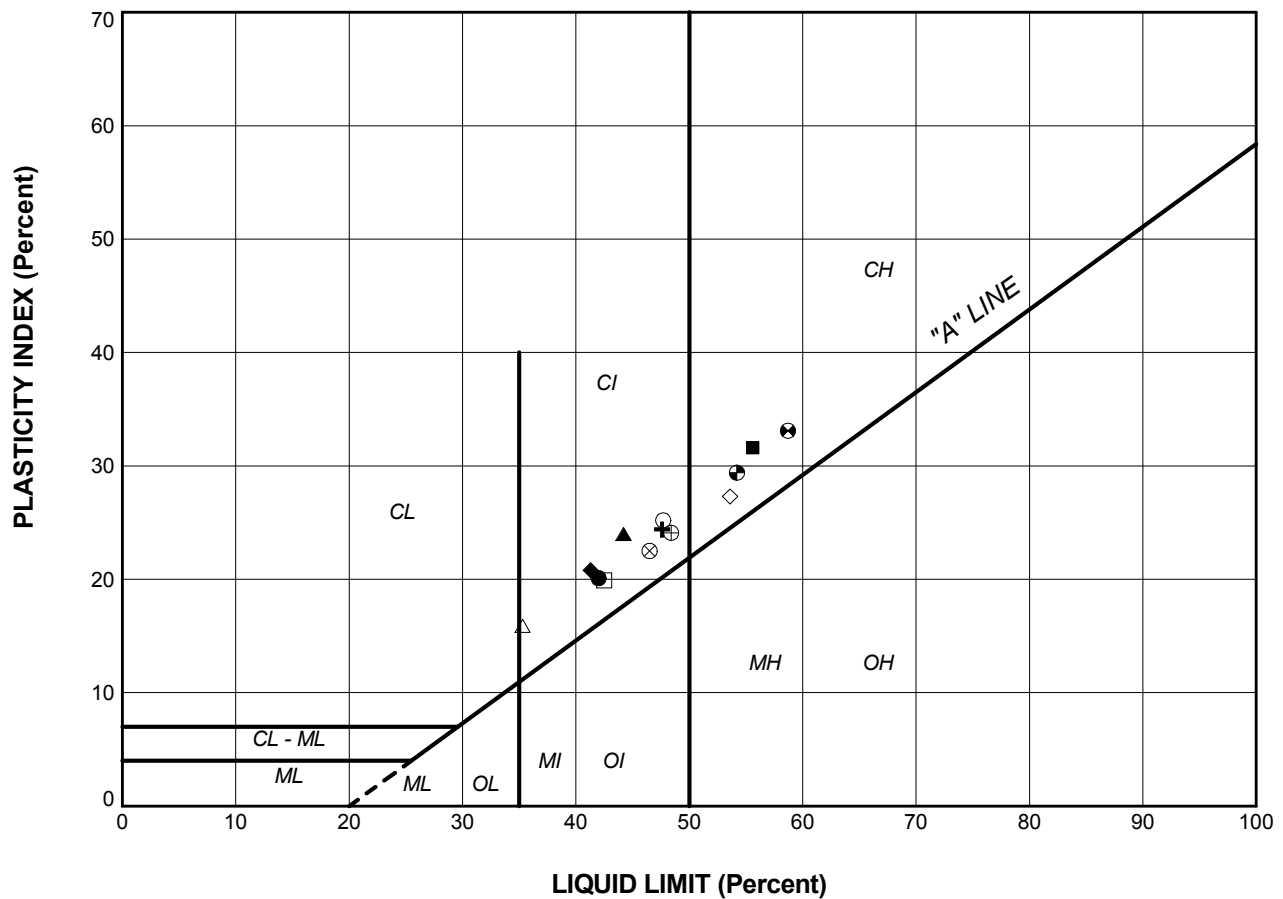


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND


SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	EMM1	6	302.7
■	EMM2	8	300.3
▲	EMM8	5	303.9

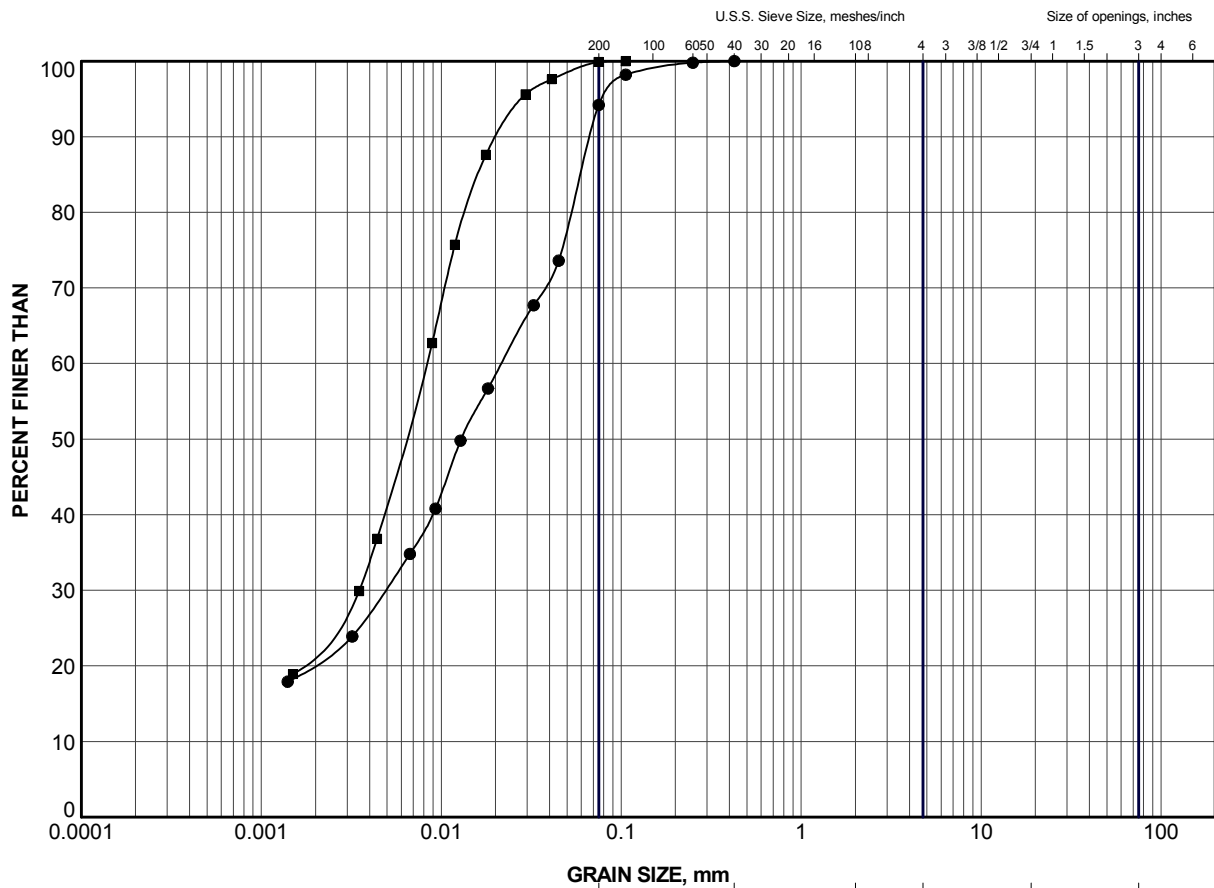
PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
GRAIN SIZE DISTRIBUTION SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	TB	Nov 2013	SCALE	N/A	REV.
CHECK	SEMC	Nov 2013			
APPR	JMAC	Nov 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE F5		



LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	EMM1	6	42.0	21.9	20.1
■	EMM1	8	55.6	24.0	31.6
▲	EMM1	10	44.2	20.2	24.0
+	EMM2	8	47.6	23.2	24.4
◆	EMM3	5	41.3	20.5	20.8
◇	EMM4	6	53.6	26.3	27.3
○	EMM5	5	47.7	22.5	25.2
△	EMM6	3	35.3	19.4	15.9
⊗	EMM6	6	46.5	24.0	22.5
⊕	EMM6	7	48.4	24.3	24.1
□	EMM8	4	42.5	22.6	19.9
⊗	EMM8	5	58.7	25.6	33.1
⊕	EMM9	6	54.2	24.8	29.4

PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
PLASTICITY CHART SILTY CLAY to CLAY					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	TB	Dec 2013	SCALE	N/A	REV.
CHECK	SEMC	Dec 2013			
APPR	JMAC	Dec 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE F6		



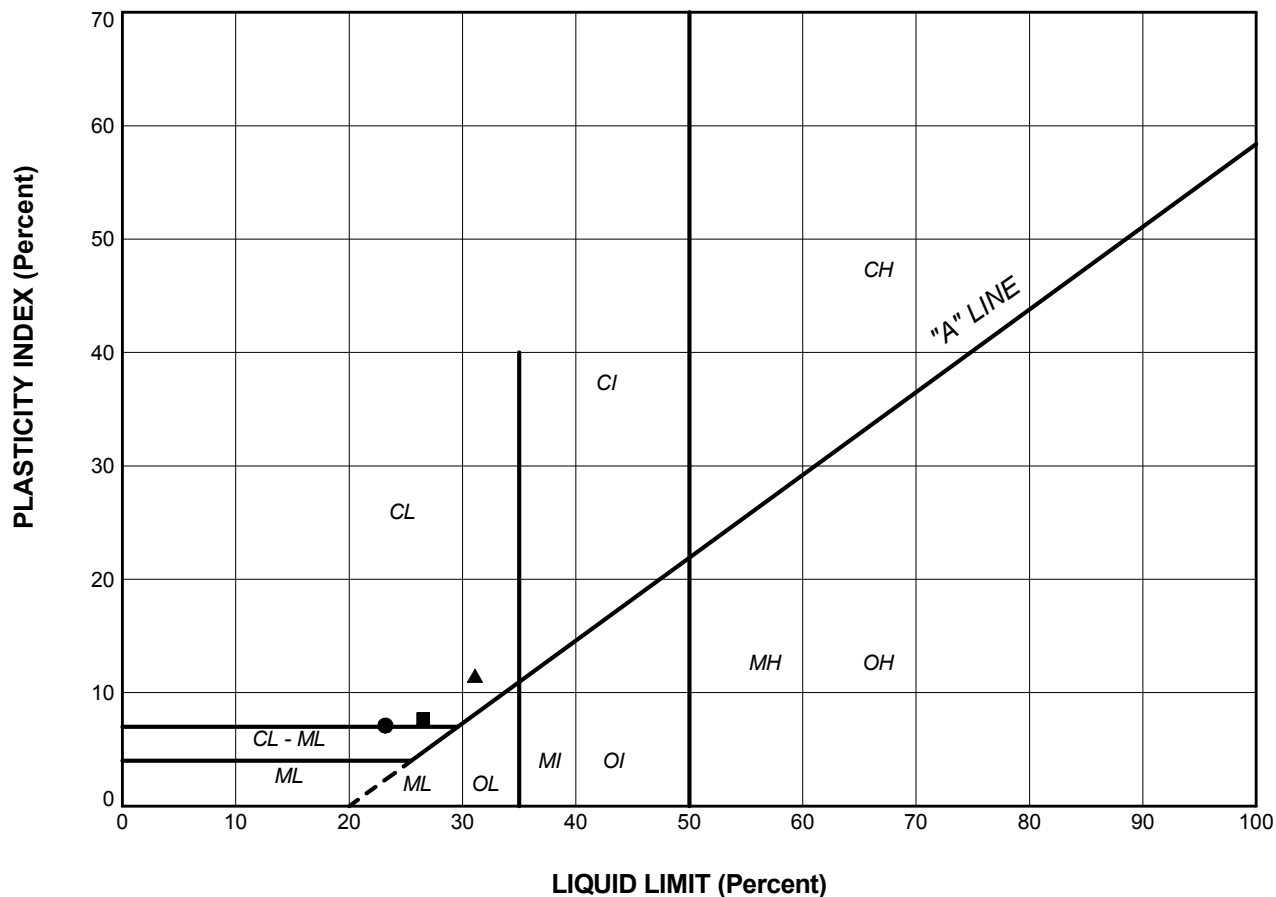
GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		


LEGEND

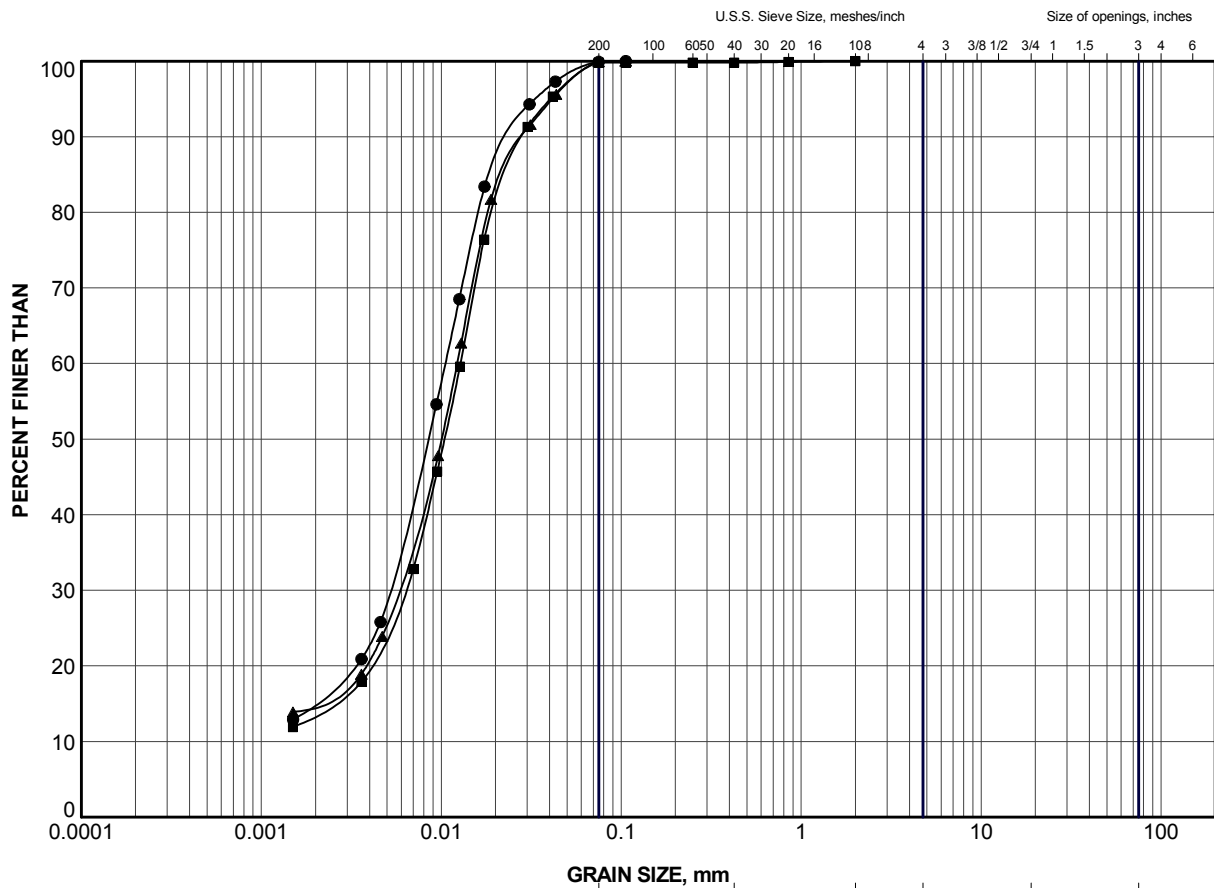
SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	EMM4	10	290.5
■	EMM7	7	299.8

PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
GRAIN SIZE DISTRIBUTION CLAYEY SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	TB	Nov 2013	SCALE	N/A	REV.
CHECK	SEMC	Nov 2013			
APPR	JMAC	Nov 2013			
			FIGURE F7		






PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
PLASTICITY CHART CLAYEY SILT					
PROJECT No. 10-1191-0044			FILE No. 10-1191-0044SUD.GPJ		
DRAWN	TB	Nov 2013	SCALE	N/A	REV.
CHECK	SEMC	Nov 2013			
APPR	JMAC	Nov 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE F8		

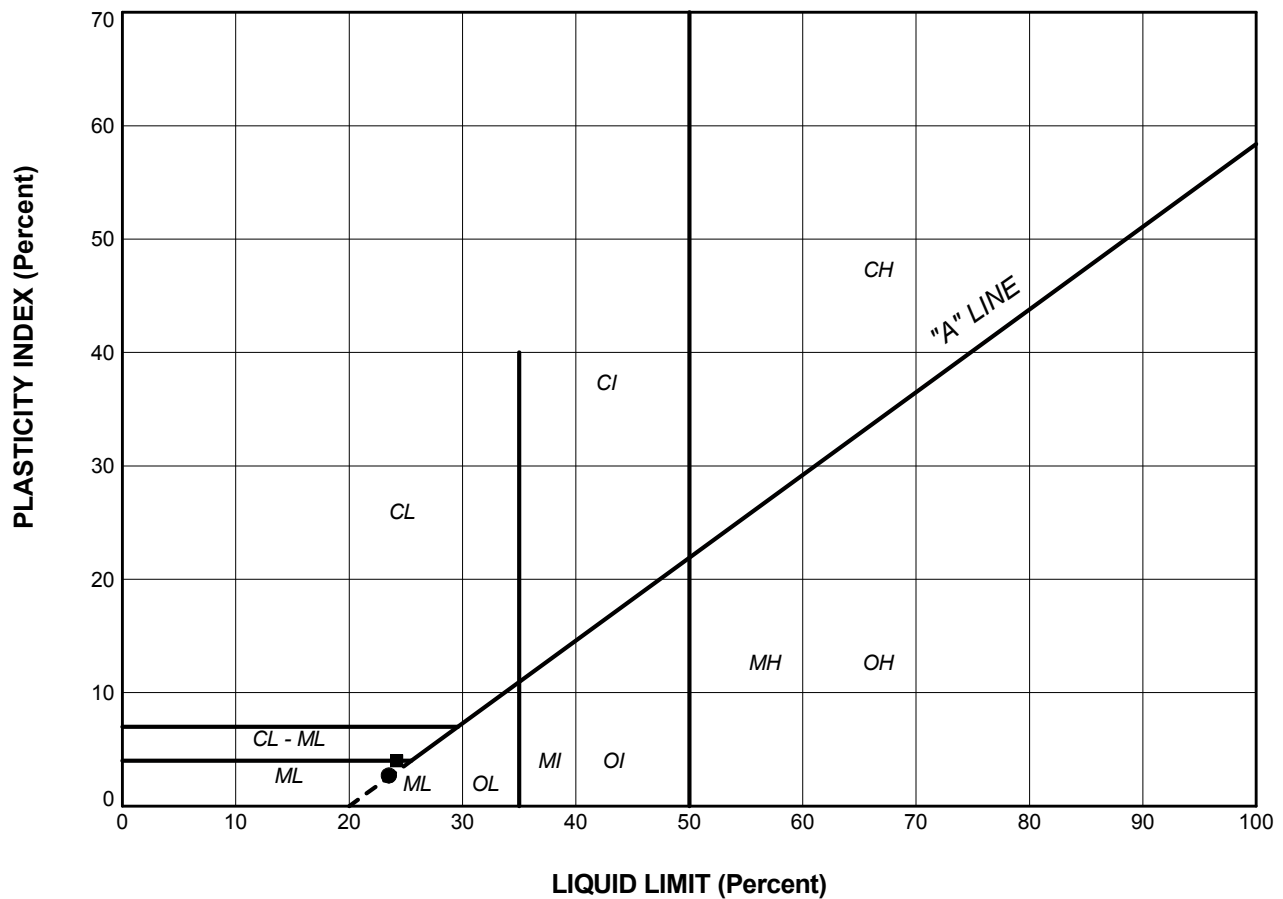


GRAIN SIZE, mm						
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

LEGEND

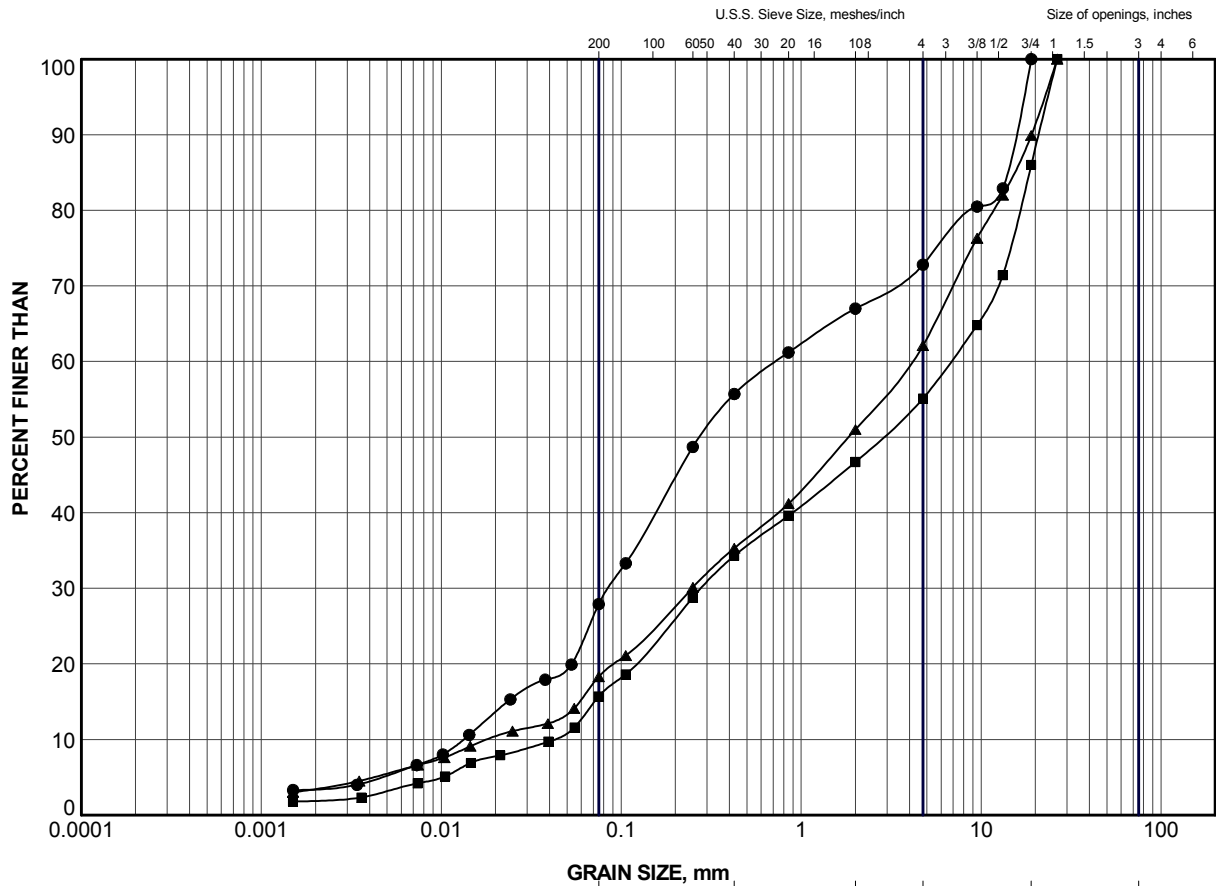
SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	EMM1	13	292.0
■	EMM6	9	296.9
▲	EMM9	9	295.5

PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
GRAIN SIZE DISTRIBUTION SILT					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	TB	Nov 2013	SCALE	N/A	REV.
CHECK	SEMC	Nov 2013			
APPR	JMAC	Nov 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE F9		



PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
PLASTICITY CHART SILT					
PROJECT No. 10-1191-0044			FILE No. 10-1191-0044SUD.GPJ		
DRAWN	TB	Nov 2013	SCALE	N/A	REV.
CHECK	SEMC	Nov 2013			
APPR	JMAC	Nov 2013			
			FIGURE F10		






CLAY AND SILT	GRAVEL SIZE, mm					Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	EMM4	12	287.5
■	EMM6	10	295.4
▲	EMM8	8	296.9

PROJECT					
HIGHWAY 66 EXCESS MATERIAL MANAGEMENT AREA					
TITLE					
GRAIN SIZE DISTRIBUTION GRAVELLY SILTY SAND to SAND and GRAVEL					
PROJECT No.		10-1191-0044		FILE No. 10-1191-0044SUD.GPJ	
DRAWN	TB	Nov 2013	SCALE	N/A	REV.
CHECK	SEMC	Nov 2013			
APPR	JMAC	Nov 2013			
 Golder Associates SUDBURY, ONTARIO			FIGURE F11		

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