Submitted To MMM GROUP
180 Commerce Valley Drive East
Thornhill, Ontario L3T 7N4

Southbound Passing Lane – TWP of Eby
Stations 10+500 to 11+000
GWP 5217-08-00
WP 5217-08-01

Highway 11 – Passing Lane No. 1 from
2.4 km South of Highway 66, Southerly 2.5 km
New Liskeard Area

FINAL FOUNDATION INVESTIGATION AND DESIGN REPORT

Date: January 30, 2012
Ref. Nº: 10/07/10131-F1

Geocres No. 42A-86

LVM | MERLEX

2-120 Progress Court, North Bay (Ontario) Canada P1A 0C2 – T 705.476.2550 | F 705.476.8882 – northbay@lvm.ca - www.lvm.ca

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1.0 INTRODUCTION

LVM | MERLEX has been retained by MMM Group Ltd., on behalf of the Ministry of Transportation of Ontario (MTO), to carry out a foundation investigation at an embankment fill widening over a swamp area, for the construction of the proposed southbound passing lane. This passing lane work project (WP 5217-08-01 - Passing Lane No. 1) is located on Highway 11 and passes through parts of the Townships of Eby and Otto, and the location is described as: from 1.9 km South of the Highway 66 intersection at Station 12+300 Eby Township, Southerly 2.4 km to Station 16+510 Otto Township. The foundation investigation for this project involves the investigation for the widening of the existing highway embankment over an area identified as swamp, between Stations 10+500 and 11+000, Eby Township.

The foundation investigation location was specified by the MTO in the RFP/TPM documentation Agreement No. 5009-E-0044. The terms of reference for the scope of work are outlined in LVM | MERLEX's proposal P-10-006, dated January 27, 2010. The purpose of the investigation was to determine the subsurface conditions along a select section of the proposed passing lane. LVM | MERLEX investigated the foundation area by the drilling of boreholes, carrying out in-situ tests, and performing laboratory testing on select samples.

2.0 SITE DESCRIPTION

The proposed southbound passing lane (Passing Lane No. 1) foundation investigation site is located between Stations 10+500 and 11+000 on the left in the Township of Eby. The topography at the site is generally of moderate relief, with a low swamp area between the above referenced stations. The existing highway embankment currently supports two undivided lanes of highway, running in a north south direction.

The existing highway, between Stations 10+500 to 11+000, is constructed initially through a rock cut with transition to a fill embankment, with a centerline elevation between 313.8 and 324.0 m, throughout the section under investigation.

Within the area of investigation there are no entrances (side road, commercial, field, etc.) and infrastructure is limited to overhead power and communication wires, which are located on the opposite (east/right) side of the highway.

2.1 Site Physiography and Surficial Geology

This project is located in the Geomorphic Sub-province known as the Eastern Sandy Uplands. The topography on this section of Highway 11 is generally rolling. There are exposed bedrock ridges. At many locations, layers of earth overlay the bedrock. Significant deposits of organic terrain were also observed in this investigation area. Within the project area mineral overburden consists primarily of silts.

Bedrock in the area, as indicated on OGS Map 2506, is of the Early Precambrian Era. At the location of the southbound passing lane foundation section, the bedrock comprises of Metavolcanics including basaltic and andesitic flows, tuffs and breccias.

3.0 INVESTIGATION PROCEDURES

The field work for this investigation was carried out between September 15 and 23, 2010, during which time eleven (11) sampled boreholes (Borehole Nos. 1 to 11, inclusive) were advanced. One additional borehole (Borehole No. 4B) was advanced some 1 m left of Borehole No. 4 to retrieve one Shelby tube sample of the fine grained soils at a depth of 7.6 m. Additionally, ten (10) Dynamic Cone Penetration Tests (DCPT) were advanced between the borehole locations.

Each borehole and DCPT was advanced at a location to the west (left) of the existing embankment at the toe of slope along the alignment of the proposed passing lane.

The field investigation was carried out using a Bombardier mounted CME 45B drilling rig equipped with hollow stem augers, standard augers, and routine geotechnical sampling equipment. Soil samples were obtained at the borehole locations at regular intervals of depth using the standard 50 mm O.D. split spoon sampler (37 mm internal diameter) advanced in accordance with the Standard Penetration Test (SPT) procedures (ASTM D-1586). The SPT method involves advancing a 50 mm O.D. split spoon sampler with the force of a 63.5 kg hammer freely dropping 760 mm mounted in a trip (automatic) hammer. The number of blows per 300 mm penetration was recorded as the “N” value. Between the borehole locations, Dynamic Cone Penetration Tests (DCPT) were carried out to give a continuous plot of the soil resistance with depth. When peat and cohesive (fine grained) deposits were encountered, the in-situ strength was measured using an “N” size field vane, vane collar, and calibrated torque meter. Relatively undisturbed samples of fine grained deposits were retrieved using a 75 mm diameter Shelby Tube, where applicable. All samples taken during this investigation were stored in labeled airtight containers for transport to our North Bay laboratory for visual examination and select laboratory testing.

Groundwater conditions in the open boreholes were observed during the advancement of and immediately following completion of the individual boreholes. All open boreholes were backfilled upon completion with compacted auger cuttings in the general order they were removed and, where necessary, bentonite pellet backfill was added to the boreholes to bring them up to grade. The field work for this investigation was under the full time direction of a senior member of our engineering staff, who was responsible for locating the boreholes, clearing the borehole locations of underground services, in-situ sampling and testing operations, logging of the

boreholes, labeling and preparation of samples for transport to our North Bay laboratory, plus overall drill supervision. All samples received a visual confirmatory inspection in our laboratory. Laboratory testing of select samples included routine testing for natural moisture content determination, Atterberg Limit determination, and particle size analysis. Advanced laboratory testing included hydrometer analysis, specific gravity, and one-dimensional consolidation testing. The results of the laboratory testing are presented on the individual Record of Borehole Sheets (Appendix B), with a summary of results presented on the laboratory sheets in Appendix C (Figure Nos. L-1 to L-8).

The location of the individual boreholes were staked and initially determined in the field using highway chainage (established by others) and offset relative to highway centerline. The final locations of the borings were established by the survey forces of the MMM Group Ltd. The MTO co-ordinates, northing and easting, were then established for the boring locations. Elevations contained in this report are referenced to a geodetic datum.

4.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions revealed by the investigation program are presented on the enclosed Record of Borehole Logs No. 1 to 11, inclusive and Record of DCPT No. 1 to 10, inclusive (Appendix B) and on Figure No. F1-1 (Appendix C). Please note that stratigraphic delineation presented on the borehole logs and soil strata plot are the results of non-continuous sampling, response to drilling progress, the results of SPT and Dynamic Cone Penetration Test (DCPT) plus field observations. Typically such boundaries represent transitions from one zone to another and are not an exact demarcation of specific geological unit. Additional consideration should be given to the fact that subsurface conditions may vary markedly between adjacent boreholes and beyond any specific boring location, and are shown on the drawings for illustration purposes only.

4.1 Passing Lane, Station 10+500 to 11+000, TWP of Eby

A plan and profile showing the borehole locations and stratigraphic sequences is shown on Figure No. F1-1, Appendix C. During the course of the exploration program, eleven (11) sampled boreholes and ten (10) DCPT were put down at this site, with Borehole Nos. 1 to 11 and DCPT Nos. 1 to 10, advanced to the west (left) of the existing embankment, generally at the toe of slope. At the time of the subsurface investigation, the existing ground surface elevations at Boreholes Nos. 1 to 11 inclusive were recorded between 312.0 and 326.8 m (elevations 312.1, 312.1, 312.1, 312.0, 312.2, 312.1, 312.2, 312.2, 317.8, 324.0, and 326.8 m, respectively). The existing ground surface elevations at DCPT Nos. 1 to 10 inclusive were recorded between 311.9 and 325.7 m (elevations 312.0, 312.1, 311.9, 312.0, 312.1, 312.1, 312.0, 313.8, 318.4, and 325.7 m).

4.1.1 Peat

At the surface of Borehole Nos. 1 to 8 inclusive, a deposit of black fibrous peat with woody inclusions was penetrated. The natural moisture content obtained from samples of this deposit varied between 139 to 930%. The in-situ shear strength of this deposit plotted against depth is shown on Figure No. L-6, Appendix C. The shear strength varied between 12 to 88 kPa with an average of 25 kPa. This deposit extended to depths of some 0.6 to 4.6 m below ground surface (elevations 311.6 to 307.5 m).

4.1.2 Silt

Underlying the peat at Borehole Nos. 1 and 8, a deposit of silt trace to some clay trace sand was penetrated. This deposit contained some gravel at Borehole No. 8. The natural moisture content obtained from samples of this deposit was in the order of 15 to 35%. A hydrometer analysis was carried out on a single sample of this deposit, the results of which indicated 0% gravel size particles, 2% sand size particles, 84% silt size particles, and 14% clay size particles

(see Figure No. L-1, Appendix C). An Atterberg Limits test was carried out on one (1) sample of this deposit, the results indicating a non-plastic material classification (i.e. possibly ML or inorganic silt of slight plasticity). Based on SPT values of 7 to 25, the compactness of this deposit was described as loose to compact. This deposit was encountered to depths of 4.5 and 1.5 m below ground surface at Borehole Nos. 1 and 8, respectively (elevations 307.6 and 310.7 m, respectively).

4.1.3 Clayey Silt

Underlying the peat at Borehole Nos. 2 to 7, and underlying the silt at Borehole No. 1, a deposit of grey clayey silt to silty clay trace to some sand was penetrated. The natural moisture content obtained from samples of this deposit was in the order of 18 to 48%. Hydrometer analyses were carried out on 12 samples of this deposit, the results of which indicated 0% gravel size particles, 0 to 20% sand size particles, 60 to 81% silt size particles, and 2 to 26% clay size particles (see Figure Nos. L-2 and L-3, Appendix C). Atterberg Limit testing was carried out on the 12 samples of this deposit, the results of which indicated a Liquid Limit varying between 20 to 27% and a Plastic Limit varying between 14 to 20%, indicating a USCS classification varying between a borderline classification of clayey silt of low plasticity (ML-CL to CL) (see Figure No. L-5, Appendix C). Based on in-situ field vane tests, resulting in shear strengths of 30 to greater than 100 kPa, the consistency of this deposit was described as firm to very stiff. A chart illustrating the shear strengths plotted against elevation is included as Figure No. L-7, Appendix C. This deposit was encountered to a depth of 7.4 m at Borehole No. 7 (elevation 304.8 m). Auger refusal was encountered, in this deposit, at depths of 5.7 and 10.0 m below ground surface at Borehole Nos. 1 and 6 (elevations 306.4 and 302.1 m, respectively). The clay content tended to increase with depth in this deposit. At Boreholes Nos. 2 to 5 a gradual transition to silty clay was observed in this deposit around elevation 298.0 m.

A single one-dimensional oedometer (consolidation) test was carried out on a sample of this deposit obtained from Borehole No. 4B (see Figure Nos. L-8a to L-8c, Appendix C). The preconsolidation pressure was estimated to be in the order of 70 kPa and the over-consolidation ratio, which is the ratio of the preconsolidation pressure to the existing overburden pressure, was in the order of 3. Based on the results of the oedometer (consolidation) tests, vane shear strength data, and the relationship of the moisture content to liquid limit, this deposit is considered to be lightly overconsolidated.

4.1.4 Silty Clay

Underlying the clayey silt at Borehole Nos. 2 to 5 inclusive, a gradual transition to a grey silty clay trace sand was observed. The natural moisture content obtained from samples of this silty clay deposit was in the order of 30 to 53%. Hydrometer analyses were carried out on 5 samples of this deposit, the results of which indicated 0% gravel size particles, 0 to 1% sand size particles, 50 to 71% silt size particles, and 29 to 50% clay size particles (see Figure Nos. L-2 and L-3, Appendix C). Atterberg Limit testing was carried out on 5 samples of this deposit, the results of which indicated a Liquid Limit varying between 31 to 39% and a Plastic Limit varying between 18 to 20%, indicating a USCS classification of silty clay of medium to low plasticity (CI to CL) (see Figure No. L-5a, Appendix C). Based on in-situ field vane tests, resulting in shear strengths of 30 to 60 kPa, the consistency of this deposit was described as firm to stiff. A chart containing the shear strengths plotted against depth is included as Figure No. L-7, Appendix C. Auger refusal was encountered in this deposit at a depth of 15.7 m below ground surface at Borehole No. 2 (elevation 296.4 m). Sampling was terminated in this deposit at a depth of 19.1 m at Borehole Nos. 3 to 5 (elevations 292.9 to 293.1 m).

4.1.5 Sandy Silt

Underlying the silty clay at Borehole No. 7, a deposit of sandy silt trace gravel was penetrated. . The natural moisture content obtained from a sample of this deposit was in the order of 11%. Auger refusal was encountered in this deposit at a depth of 7.8 m (elevation 304.4 m).

4.1.6 Sand

Underlying the silt at Borehole No. 8 and at the surface of Borehole No. 9, a deposit of sand containing some to with silt some gravel was penetrated. The natural moisture content from samples of this deposit was in the order of 15 to 24%. Hydrometer analyses were carried out on two (2) samples of this deposit, the results of which indicated 15 to 16% gravel size particles, 60 to 66% sand size particles, 17 to 22% silt size particles, and 2% clay size particles (see Figure No. L-4, Appendix C). Based on SPT values of 37 to 52, the compactness of this deposit was described as dense to very dense. Auger refusal was encountered in this deposit at depths of 3.3 and 0.8 m below ground surface at Borehole Nos. 8 and 9, respectively (elevations 308.9 and 317.0 m, respectively).

DCPT refusal was encountered at DCPT Nos. 1 to 10 at depths of 12.4, 20.7, 27.4, 23.1, 15.5, 6.8, 8.0, 0.8, 2.4, and 0.0 m, respectively (elevations 299.6, 291.4, 284.5, 288.9, 296.6, 305.3, 304.0, 313.0, 316.0, and 325.7 m, respectively). Refusal was likely encountered in the relatively thin sand deposit or possibly on bedrock.

4.1.7 Bedrock

Bedrock was exposed at ground surface at the locations of Borehole Nos. 10 and 11. Ground surface elevations at Borehole Nos. 10 and 11 were measured at 324.0 and 326.8 m, respectively.

4.2 Subsurface Conditions – Existing Embankment

LVM | MERLEX has carried out a geotechnical investigation along this section of highway, for the full length of this proposed passing lane. Within the limits of this foundation investigation, the geotechnical boreholes indicated that the embankment, constructed under Contract No. 69-68, is composed of a surficial pavement structure consisting of asphalt overlying crushed gravel overlying granular fill, consisting of sand with gravel. The fill was encountered to depths varying between 0.3 to 2.4 m below grade, and is supported on rock fill from Stations 10+600 to 11+000 (see Geotechnical Borehole Logs, Appendix B).

During a rehabilitation, under Contract No. 97-214, surplus rock fill was placed to flatten the left slope between Stations 10+750 to 11+000. As such, the embankment foreslope in this area was relatively shallow, generally at an angle of 5H:1V, with some shallower areas.

4.3 Groundwater Conditions

Groundwater and cave-in levels in the open boreholes were measured, where possible, during the advance of the individual borings and upon completion. These levels are recorded on the individual Record of Borehole Log Sheets (Appendix B). The groundwater level was recorded between 0 (surface) and 0.7 m depth below surface at Borehole Nos. 1 to 8 (elevations 312.1, 312.1, 311.4, 312.0, 312.2, 312.1, 312.2, and 312.2 m respectively). Borehole No. 9 was dry at the time of the completion. These groundwater levels will fluctuate seasonally.

LVM | MERLEX

M. A. Merleau, P. Eng.
Principal Engineer
MTO Designate

J. R. Berghamer, P. Eng.
Regional Manager

5.0 DESIGN COMMENTS AND RECOMMENDATIONS
5.1 General

A southbound passing lane, WP 5217-08-01 - Passing Lane No. 1, is proposed from 2.4 km South of the Highway 66 intersection at Station 12+300 Eby Township, Southerly 2.5 km to Station 16+510 Otto Township. A section of the proposed southbound passing lane was identified as requiring a foundation investigation in the RFP. The foundation site is located between Stations 10+500 and 11+000, on the left (west). The embankment supporting the existing pavement structure passes through a rock cut between Stations 10+500 and 10+560. Between Stations 10+560 and 11+000, the highway embankment passes through a low lying swamp area. Based on data from this foundation investigation and the geotechnical investigation, which was also carried out by LVM | MERLEX, the highway embankment at this site has been constructed using granular materials (pavement structure) over rock fill. Typical cross sections of the left half of the embankment, in the area of the foundation investigation, are shown on Figure Nos. F1-2, and F1-3, Appendix C. Enclosure No. 24, Appendix B shows photos of the existing embankment.

As detailed in the geotechnical report prepared by LVM | MERLEX, it is anticipated that the rock cut will be widened by rock excavation/controlled blasting operations to allow for 1.5 m of granular material to provide adequate drainage for the pavement structure. The embankment fill will be widened to match the existing embankment fill height and rock fill is suggested to be used to construct the widening. Details on the pavement design are contained in the Pavement Design Report as prepared by LVM | MERLEX - Reference No. 10/07/10131-P1.

5.2 Embankment Widening Considerations

5.2.1 Stations 10+500 to 10+560, TWP of Eby

This section of the existing highway in this area is constructed on granular material, some 1 m thick, underlain by bedrock. Embankment widening throughout this section will require a bedrock cut on the left side. In order to insure drainage of the granular materials the Pavement Design Report, prepared by LVM | MERLEX, specifies 1.5 m of granular over the rock cut subgrade, constructed as per OPSS 206. Since the rock cut will be less than 10 m in height the rock face can be cut back to a vertical face as per NRE Directive 2000-204. No issues from a foundation perspective will develop in this area.

As bedrock was encountered at surface, bedrock excavation and/or blasting operations will be required at this site. Even though the area is rural and isolated, a blast design, as per OPSS 120, is required to be provided by the blasting contractor before blasting operations are carried out. Based on available plan review, infrastructure is limited to a pole line on the opposite (right) side of the highway. However, if any sensitive structures (utilities, communication lines, water wells, etc.) are located within 150 m of the blast area, a pre-blast survey would be required, as per OPSS 120.07.03. Blast monitoring would have to be carried out, during blasting operations, by a blast monitoring consultant provided by the contractor.

5.2.2 Stations 10+560 to 11+000, TWP of Eby

This section of the existing highway embankment is constructed using rock fill and the new passing lane will be constructed in a similar manner, as per OPSD 203.020. The relationship between the existing highway centerline profile relative to the existing grade at the boreholes is shown on Figure No. F1-1, Appendix C.

The native soils between Stations 10+560 and 10+630, consist of sands, with shallow refusal on bedrock. Between Stations 10+630 and 11+000, the native soils consist of a surficial peat deposit some 0.6 to 4.6 m thick overlying silts to clayey silt underlain at depth by silty clay. It is recommended the peat be removed from below the area of influence of the embankment widening, instead of floating the widening over the swamp, as compression of the peat would result in differential settlement of the embankment and passing lane. The peat should be removed down to the nativel mineral soil.

To carry out widening through the swamp area (Station 10+560 to Station 11+000) excavation of the existing foreslope (which has been flattened with rock fill in a previous rehabilitation (see Section 4.2)) should commence at the existing shoulder rounding and be cut down on a 1H:1V slope as per OPSD 203.020 to the top of swamp (elevation 312.0 m). From this point the excavation should be advanced vertically downward, through the slope flattening fill material, to the underside of the swamp (peat deposit) which was penetrated to elevation 307.5 m at Borehole No. 3. Excavation through the swamp material should be carried out in a submerged condition, as such dewatering will not be required.

All excavations along the existing foreslope must be carried out in narrow “windows”, 2 to 3 m wide, and be backfilled immediately to maintain stability of the excavated foreslope. The excavation must be followed up immediately with backfilling and at no time should the width of excavation exceed 3 m (longitudinally). If delays develop in the excavation and simultaneous backfilling operations, due to say equipment breakdown, delays in material supply, meal breaks, etc. then the excavation must be closed up immediately to preserve the stability (integrity) of the existing foreslope.

During excavation and backfilling, minor distortion or localized sloughing of the foreslope's vertically excavated face may develop. Therefore, traffic and construction equipment must be kept back from the zone of influence to the top of the excavation. This zone of influence is described as the area defined by a line drawn from the proposed base of the excavation up at a 45^{o} to where it intersects the existing shoulder/lane. This zone of influence will intersect beyond the existing left shoulder and into the lane where the peat is greater than some 2 m thick (Stations 10+750 to 10+950) as such, traffic should be reduced to a single lane (right lane) using traffic control until the excavation advances beyond this area.

5.3 Foundation Considerations – Stations 10+560 to 11+000

The embankment in the swamp area will be some 6 m in height, with up to 4.6 m below the water table. As such, the embankment fill will exert an effective pressure on the underlying (founding) native soil of approximately 75 kPa. The anticipated effective pressure increase is less than the factored bearing resistance at ULS of 125 kPa for the clayed silt deposit. Where silts and sands were encountered at surface or below the peat deposit, a factored bearing resistance at ULS of 200 kPa can be used for design purposes.

Distortion due to frost penetrating the low to highly frost heave susceptible subgrade soils (clayey silts) will not be an issue since the fill depth over the silt and clayey silt will be greater than the frost penetration depth of 2.5 m as provided in the RFP (Section 6.10.2.3).

5.4 Embankment Stability

As noted above, the maximum height of new fill, replacing the peat and slope flattening material, to be supported on the underlying clayey silt stratum will be in the order of 6 m. A stability analysis has been carried out using the current version of the computer software Slope/W. The factor of safety obtained from the stability analysis is defined as the ratio of the resisting forces

to the forces driving the rotational slip. The embankment widening has been modeled using rock fill constructed on a 1.25H:1V foreslope at Station 10+850. As can be seen from the stability analysis shown on Figure No. S-1 (Appendix D), the factor of safety is in the order of 2.5 developing through the embankment fill at the edge of the shoulder into the rock fill. Forcing the failure arc lower, through the founding native clayey silt, results in a higher factor of safety in the order of 3.7, as can be seen on Figure No. S-2 (Appendix D). Lower factors of safety will occur during excavation and backfilling of the widening as discussed in Section 5.2.2. In consideration of the above, the long term stability of the new embankment slope will not be an issue provided it is properly constructed.

5.5 Embankment Settlement

The existing highway embankment has been constructed using rock fill and the widening for the proposed passing lane will be constructed in a similar manner. It is understood that the existing alignment and centerline elevation of the highway will be maintained. The existing embankment and slope flattening material has preloaded the soils below the area of the new passing lane (see Figure No F1-2). As noted, since there will be no appreciable change in the height of the embankment, and therefore no increased embankment load, excessive settlement will not develop beneath the new lane. However, as the widening will be constructed for the proposed passing lane, a new load will be added to the west side of the embankment. This new load will cause settlement due to consolidation of the clayey silt deposits. The widening will extend from the edge of the existing shoulder, some 4 m to the new rounding, then will be sloped at an angle of 1.25H:1V down to existing grade. The “wedge” of fill will be thinnest adjacent the existing highway shoulder, becoming thicker progressing to the left (i.e. transversely) and thickest below the new shoulder.

Along the embankment in the swamp area, the thickest portion of the wedge of new fill being placed for the widening will be a maximum of 1.5 m. The net vertical pressure increase associated with the addition of this 1.5 m of new rock fill will be in the order of 30 kPa.

To establish estimates of the magnitude of settlement for this section of the highway, one (1) one dimensional consolidation test was carried out by Golder Associates Ltd. on a representative sample of the lower clayey silt obtained from the area of Borehole No. 4 at a depth of 7.6 m (Borehole No. 4B, Sample 1). Results from the consolidation test are shown on enclosed Figure Nos. L-18a, L-18b, and L-18c (Appendix C) and plots the void ratio to increasing vertical pressure. As noted above, when considering the net increase in vertical pressure of up to 30 kPa associated with the addition of new embankment (rock) fill it is estimated that primary consolidation associated with the load increase will be in the order of 25 to 65 mm and will occur over a period of 14 years to achieve 90% consolidation.

5.6 Excavation and Embankment Reconstruction

All excavations greater than 1.2 m in depth must be sloped or shored in accordance with the Occupational Health and Safety Act Regulations for Construction Projects, if workers are to enter the area of excavation. Temporary open excavations in the embankment will be stable above the groundwater table at an angle of 1H: 1V.

Since no workers will be required to enter or work within the area of the excavation, steeper temporary excavation slopes can be used in construction of the fill widening as previously discussed. However, it is imperative that the construction be carried out as a simultaneous excavation and backfill operation, in narrow windows to maintain the integrity of the existing embankment.

The embankment widening should be designed as specified in the MTO Northeastern Region Engineering Directive NRE 98-200. The widening will be constructed of rock fill, as such embankments must be 2 m wider than design standard on the left, in swamp areas. Embankment slopes should be established at an angle of 1.25H:1V in rock fill.

The rock fill material was used to flatten the left slope under Contract No. 97-214. This material can be re-used during the construction of the embankment provided it is properly separated from the peat and/or other deleterious materials. If this material is reused, continuous monitoring would be required to ensure the rock fill is properly separated.

5.7 Construction Concerns

No major issues are anticipated with construction of and the embankment widening provided it is carried out in general conformance with the procedures discussed above. It is emphasized again, that the peat excavation, between Stations 10+560 to 11+000, must be carried out in narrow windows (2 to 3 m maximum width) and backfilled immediately to maintain the stability of the embankment.

6.0 CLOSURE

Information provided in this report is valid only at the locations described above. Any assumptions of continuity of soil stratigraphy between boreholes, as shown on the enclosed cross-sections, is intended as an aid for design purposes only and does not constitute a statement of existing conditions for contractual or construction purposes. Field investigation was carried out using a CME drill rig mounted on a Bombardier carrier owned by Chrisdamat Management Ltd. The report was prepared by Mr. J. R. Berghamer, P. Eng and reviewed by the firm's principal and MTO designate Mr. M. A. Merleau, P. Eng.

Details of the investigation, the material analysis and recommendation in this report are considered to be complete. However, should any questions arise, please do not hesitate to contact the undersigned.

LVM | MERLEX

M. A. Merleau, P. Eng.
Principal Engineer
MTO Designate

J. R. Berghamer, P. Eng.
Regional Manager

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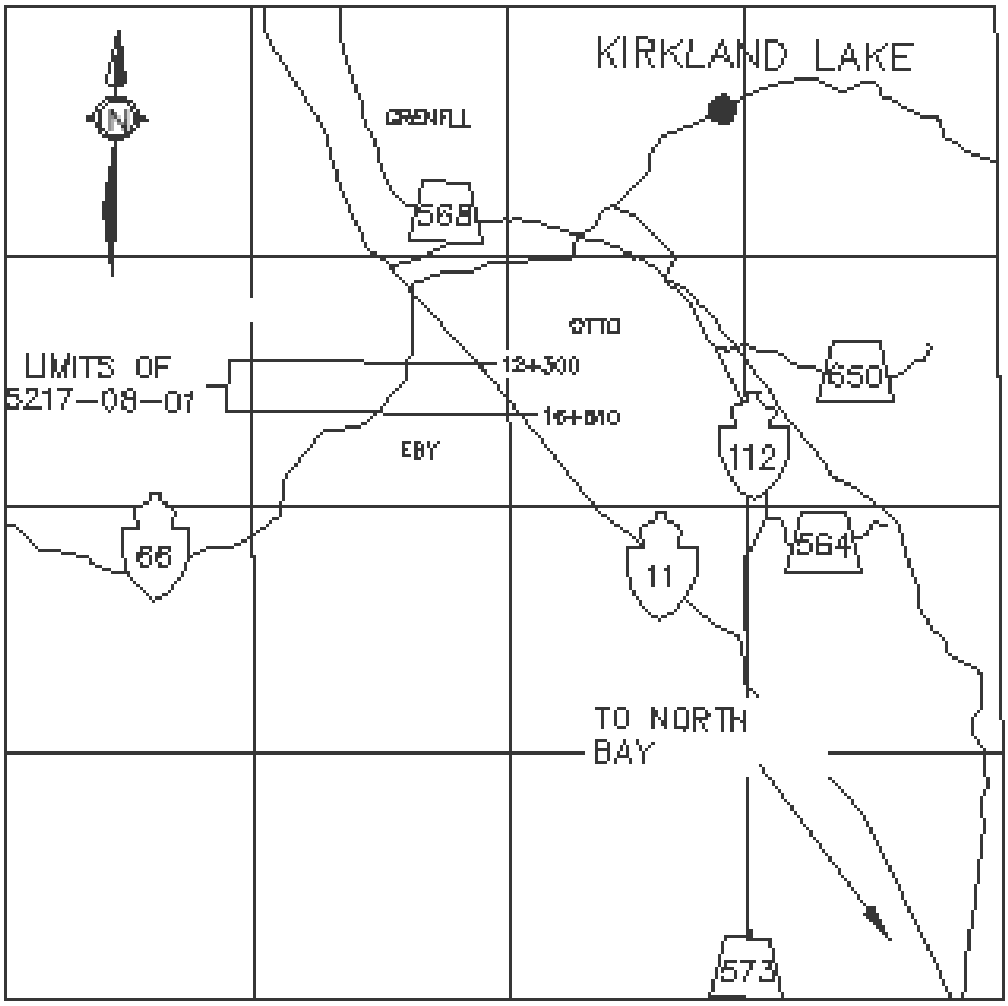
Appendix A Key Plan

Figure No. 1: Key Plan

KEY PLAN

Figure No. 1

NOT TO SCALE



FINAL
FOUNDATION INVESTIGATION
AND DESIGN REPORT
GWP 5217-08-00
WP 5217-08-01

Highway 11, Southbound Passing Lane
1.9 km South of Highway 66,
Southerly 2.4 km

Ref. No.: 10/07/10131-F1 January 2012

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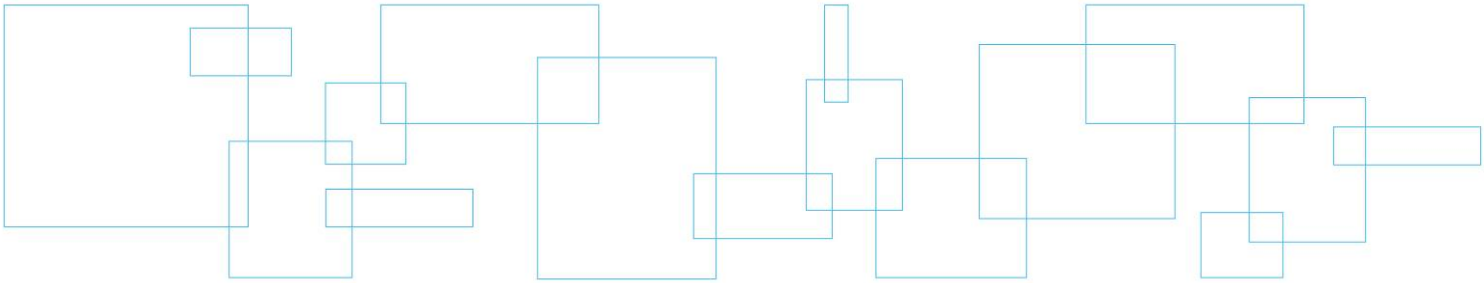
Appendix B Abbreviations
Record of Borehole Sheets

Enclosure No. 1: List of Abbreviations and Symbols
Enclosure Nos. 2 to 22: Record of Borehole Sheets
Enclosure No. 23: Geotechnical Borehole Logs
Enclosure No. 24: Photo Essay



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LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms, used to describe retrieved samples and commonly employed on the borehole logs, on the figures and in the report are as follows:

1. ABBREVIATIONS

AS Auger Sample
CS Chunk Sample
DS Denison type sample
FS Foil Sample
NP Non Plastic
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
RC Rock core with size & percentage of recovery
SS Split Spoon
ST Slotted Tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash Sample

2. PENETRATION RESISTANCE/"N"

Dynamic Cone Penetration Test (DCPT):

A continuous profile showing the number of blows for each 300 mm of penetration of a 50 mm diameter 60° cone attached to AW rod driven by a 63 kg hammer falling 760 mm.

Plotted as —•—•—•—•

Standard Penetration Test (SPT) or "N" Values

The number of blows of a 63 kg hammer falling 760 mm required to advance a 50 mm O.D. drive open sampler 300 mm.

3. SOIL DESCRIPTION

a) *Cohesionless Soils:*

"N" (blows/0.3 m)	*Relative Density*
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

3. SOIL DESCRIPTION (Cont'd)

b) *Cohesive Soils:*

Undrained Shear Strength (kPa)	*Consistency*
Less than 12	very soft
12 to 25	soft
25 to 50	firm
50 to 100	stiff
100 to 200	very stiff
over 200	hard

c) *Method of Determination of Undrained Shear Strength of Cohesive Soils:*

+ 3.2 - Field Vane test in borehole. The number denotes the sensitivity to remoulding.

D - Laboratory Vane Test

¨ - Compression test in laboratory

For a saturated cohesive soil the undrained shear strength is taken as one-half of the undrained compressive strength.

4. TERMINOLOGY

Terminology used for describing soil strata is based on the proportion of individual particle sizes present in the samples (please note that, with the exception of those samples subject to a grain-size analysis, all samples were classified visually and the accuracy of visual examination is not sufficient to determine exact grain sizing):

Trace, or occasional	Less than 10%
Some	10 to 20%
With	20 to 30%
Adjective (i.e. silty or sandy)	30 to 40%
And (i.e. sand and gravel)	40 to 60%

5. LABORATORY TESTS

P Standard Proctor Test
A Atterberg Limit Test
GS Grain Size Analysis
H Hydrometer Analysis
C Consolidation

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

SAMPLE DESCRIPTION NOTES:

1. **FILL:** The term fill is used to designate all man-made deposits of natural soil and/or waste materials. The reader is cautioned that fill materials can be very heterogeneous in nature and variable in depth, density and degree of compaction. Fill materials can be expected to contain organics, waste materials, construction materials, shot rock, rip-rap, and/or larger obstructions such as boulders, concrete foundations, slabs, abandoned tanks, etc.; none of which may have been encountered in the borehole. The description of the material penetrated in the borehole therefore may not be applicable as a general description of the fill material on the site as boreholes cannot accurately define the nature of fill material. During the boring and sampling process, retrieved samples may have certain characteristics that identify them as 'fill'. Fill materials (or possible fill materials) will be designated on the Borehole Logs. If fill material is identified on the site, it is highly recommended that testpits be put down to delineate the nature of the fill material. However, even through the use of testpits defining the true nature and composition of the fill material cannot be guaranteed. Fill deposits often contain pockets or seams of organics, organically contaminated soils or other deleterious material that can cause settlement or result in the production of methane gas. It should be noted that the origins and history of fill material is frequently very vague or non-existent. Often fill material may be contaminated beyond environmental guidelines and the material will have to be disposed of at a designated site (i.e. registered landfill). Unless requested or stated otherwise in this report, fill material on this site has not been tested for contaminants however, environmental testing of the fill material can be carried out at your request. Detection of underground storage tanks cannot be determined with conventional geotechnical procedures.

2. **TILL:** The term till indicates a material that is an unstratified, glacial deposit, heterogeneous in nature and, as such, may consist of mixtures and pockets of clay, silt, sand, gravel, cobbles and/or boulders. These heterogeneous deposits originate from a geological process associated with glaciation. It must be noted that due to the highly heterogeneous nature of till deposits, the description of the deposit on the borehole log may only be applicable to a very limited area and therefore, caution must be exercised when dealing with a till deposit. When excavating in till, contractors may encounter cobbles/boulders or possibly bedrock even if they are not indicated on the borehole logs. It must be appreciated that conventional geotechnical sampling equipment does not identify the nature or size of any obstruction.

3. **BEDROCK:** Auger refusal may be due to the presence of bedrock, but possibly could also be due to the presence of very dense underlying deposits, boulders or other large obstructions. Auger refusal is defined as the point at which an auger can no longer be practically advanced. It must be appreciated that conventional geotechnical sampling equipment does not differentiate between nature and size of obstructions that prevent further penetration of the boring below grade. Bedrock indicated on the borehole logs will be labeled 'possibly' or 'probable' etc. based on the response of the boring and sampling equipment, surrounding topography, etc. Bedrock can be proven at individual borehole locations, at your request, by diamond core drilling operations or, possibly, by testpits. It must also be appreciated that bedrock surfaces can be, and most times are, very erratic in nature (i.e. sheer drops, isolated rock knobs, etc.) and caution must be used when interpreting subsurface conditions between boreholes. A bedrock profile can be more accurately estimated, at the clients' request, through a series of closely positioned unsampled auger probes combined with core drilling.

4. **GROUNDWATER:** Although the groundwater table may have been encountered during this investigation and the elevation noted in the report and/or on the record of boreholes, it must be appreciated that the elevation of the groundwater table will fluctuate based upon seasonal conditions, localized changes, erratic changes in the underlying soil profile between boreholes, underlying soil layers with highly variable permeabilities, etc. These conditions may affect the design and type and nature of dewatering procedures. Cave-in levels recorded in borings give a general indication of the groundwater level in cohesionless soils however, it must be noted that cave-in levels may also be due to the relative density of the deposit, drilling operations etc.

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

Accep	Acceptable	**Hi**	Highly	**RSS**	Remoulded Shear Strength
Agg	Aggregate	**HP**	High Plasticity	**RF**	Rock Fill
Amor	Amorphous	**HM**	Hot Mix	**Sa**	Sand
Asph	Asphalt	**Ip**	Plasticity Index	**Sat**	Saturated
AP	Auger Probe	**L**	Loose	**SH**	Shale
BR	Bedrock	**Lt**	Light or Left	**Sh Rk**	Shot Rock
Blk	Black	**Liq**	Liquid	**Si (y)**	Silt (y)
Bl	Blue	**Lo**	Loam	**Sl (y)**	Slight (ly)
BH	Borehole	**Matl**	Material	**(L,M,H)SFH**	Susceptibility to Frost Heave (L – Low, M – Med, H – High)
Bld (y)	Boulder (y)	**Max**	Maximum		
Blds	Boulders	**Med**	Medium		
Br	Brown	**Mod**	Moderate	**SP**	Slight Plasticity
CF	Channel Face	**Mott**	Mottled	**SSM**	Select Subgrade Material
Cl	Clay	**Mrl**	Marl	**St**	Sensitivity
Co	Coarse	**Mul**	Mulch	**Stn (y)**	Stoney
Cob	Cobbles	**Num**	Numerous	**Stks**	Streaks
Comp	Compact	**MDD**	Maximum Dry Density	**Surf**	Surface
Conc	Concrete	**MWD**	Maximum Wet Density	**Temp**	Temperature
Contam	Contaminated	**MP**	Medium Plasticity	**TH**	Test Hole
Cr	Crushed	**NFP**	No Further Progress	**TP**	Test Pit
Dk	Dark	**NFP (Blds)**	No Further Progress (Boulders)	**Tps**	Topsoil
Decomp	Decomposed	**NMC**	Natural Moisture Content	**Tr**	Trace
D	Dense	**OCC**	Occasional	**USS**	Undisturbed Shear Strength
D_R	Relative Density	**Ora**	Orange	**Unreinf**	Unreinforced
E	Earth	**Org**	Organic	**Varv**	Varved
Fib	Fibrous	**Org M**	Organic Matter	**VF**	Very Fine
F	Fine	**Ob**	Overburden	**WT**	Water Table
Fr Wat	Free Water	**Pavt**	Pavement	**Weath**	Weathered
FB	Frost Boil	**Pedo**	Pedological	**W**	With
FH	Frost Heave	**Pen Mac**	Penetration Macadam	**w**	Field Moisture Content
Gran	Granular	**Psty**	Polystyrene	**Wd (y)**	Wood (y)
Gr	Gravel (ly)	**Poss**	Possible	**Wopt**	Optimum Moisture Content
Grn	Green	**PST**	Prime & Surface Treated	**Wp**	Plastic Limit
Gry	Grey	**Quant**	Quantity	**W_L**	Liquid Limit
H	Heavy	**Reinf**	Reinforced	**Yel**	Yellow

Example of an Abbreviated Borehole

10+000		On C/L	Station	Offset from Centerline (C/L) (Rt – Right; Lt – Left)
0	- 300	Rooty Peat Fr Wat @ 200	Depth below	Abbreviated Soil Description
300	- 800	Br F Sa Tr Gr Tr Si **20ELS107** NOT Accep Granular 'B' Type I 21% PASSING 75 µm Accep SSM	Grade*	Groundwater Data (where encountered) Abbreviated Lab Data (where applicable) - Sample No., Type of Test(s) and Test Results - Relation to Ontario Provincial Standards and Specifications (OPSS) included (i.e. pass or fail; reason) where applicable
800	- 4.0	Gry Si F Sa Tr Gr **20ELS108** w @ 3.6 = 20.0 % % Passing 2.00 mm = 91 425 µm = 80 75 µm = 34 LSFH		
4.0		NFP Bld or BR	* Depths are measured in millimeters from 0 up to 1 meter and in meters for depths equal to greater than 1 meter	

ENCLOSURE NO.:2 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 1

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325917.0 E 367746.2 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 15, 2010 TIME 9:50:00 AM CHECKED BY MAM

DATE (Completed) September 16, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
312.1	200 mm Free Water					▼					
0.0	PEAT - black fine fibrous peat with wood inclusions		1	AS	N/A		312	+ 6	NMC=625		
			2	SS	WH				NMC=612		
310.3			3	SS	WH		311	+ 3	NMC=470		
1.8	SILT - dark grey to grey silt some clay trace sand (loose/compact)		4	SS	7		310	+>100			
			5	SS	25		309				0 2 84 14 NP
			6	SS	10	▼	308				
307.6											
4.5	CLAYEY SILT - grey clayey silt trace fine sand (very soft)		7	SS	WH		307				0 2 75 23
306.4											
5.7	Auger Refusal End of Borehole										

COMMENTS

Borehole advanced at Station 11+000, 23 m Left of Centerline. NP -Atterberg Limits Tests indicated non-plastic (NP), Sample 5.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

$\circ^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/16/10 9:50:00 AM	0 ▼	4.3 ▼
2)	- ▽	-
3)	- ▽	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:3 (Pg. 1 of 2)

METRIC

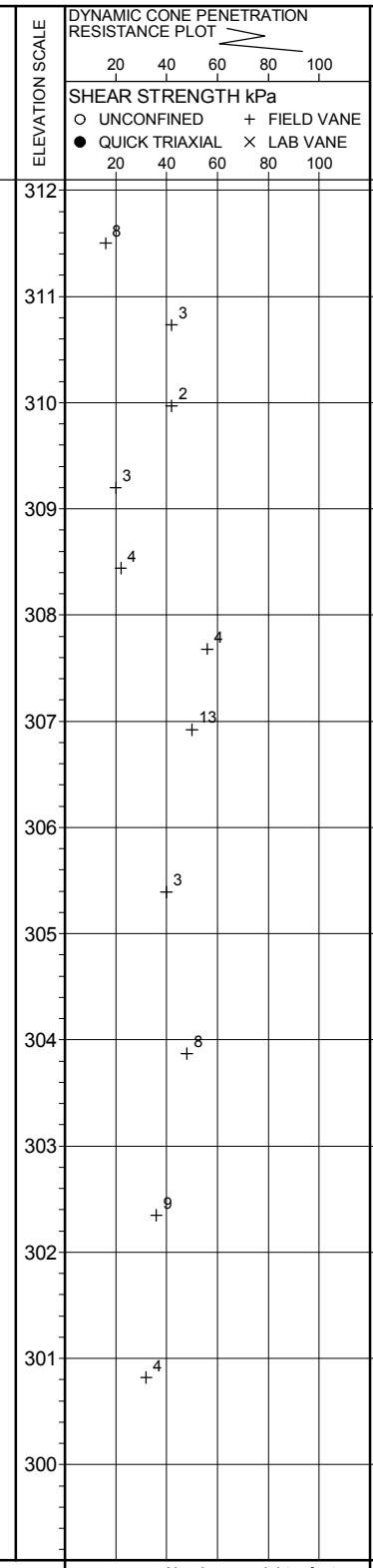
RECORD OF BOREHOLE NO. 2

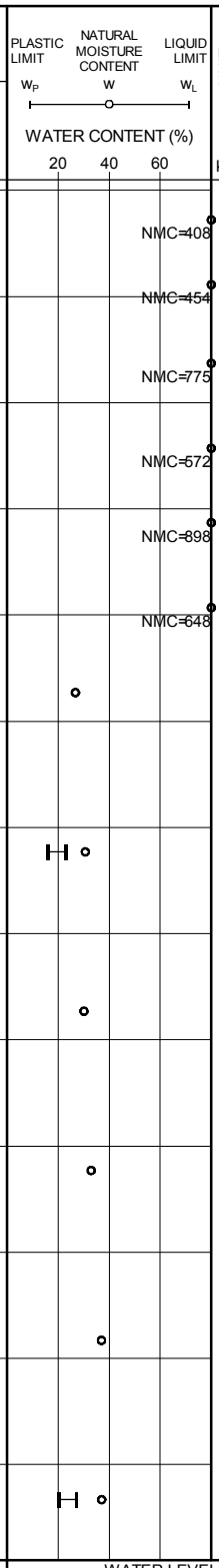
REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325881.6 E 367783.6 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 15, 2010 DATE (Completed) September 15, 2010 TIME 2:30:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS
312.1	200 mm Free Water					
0.0	PEAT - black fine fibrous peat with wood inclusions		1	AS	N/A	
			2	SS	4	
			3	SS	2	
			4	SS	2	
			5	SS	PM	
			6	SS	PM	
307.8						
4.3	CLAYEY SILT to SILTY CLAY - grey clayey silt to silty clay trace sand clay content generally increases with depth (firm/stiff)		7	SS	WH	
			8	SS	2	
			9	SS	2	
			10	SS	WH	
			11	SS	WH	
			12	SS	8	
	Continued Next Page					





UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
	0 10 66 24
	0 2 76 22

COMMENTS

Borehole advanced at Station 10+950, 18 m Left of Centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^{3}, \times^{3}$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

$\circ^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/16/10 2:25:00 PM	0	9.9
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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METRIC

RECORD OF BOREHOLE NO. 2

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325881.6 E 367783.6 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 15, 2010 TIME 2:30:00 PM CHECKED BY MAM

DATE (Completed) September 15, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
	Continued from Previous Page							DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100; SHEAR STRENGTH kPa 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60		
298.5							299				
13.6	SILTY CLAY - grey silty clay (firm)		13	SS	1						
							298	5			
			14	SS	28/250 mm		297				
296.4											
15.7	Auger Refusal End of Borehole										

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ENCLOSURE NO.:4 (Pg. 1 of 2)

METRIC

RECORD OF BOREHOLE NO. 3

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325845.3 E 367817.8 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 16, 2010 DATE (Completed) September 17, 2010 TIME 10:25:00 AM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
312.1	150 mm Free Water										
0.0	PEAT - black fine fibrous peat with wood inclusions		1	AS	N/A		312	6	NMC=687		
			2	SS	1						
							311	5	NMC=848		
			3	SS	6				NMC=602		
							310	4			
			4	SS	WH				NMC=652		
								3			
			5	SS	PM		309		NMC=619		
								7			
			6	SS	PM		308		NMC=567		
307.5								14			
4.6	CLAYEY SILT to SILTY CLAY - grey clayey silt to silty clay trace sand clay content generally increasing with depth (firm/very stiff)		7	SS	3		307				
			8	SS	2		306	4			0 7 73 20
			9	SS	2		305				
							304	>100			
			10	SS	1		303	4			0 3 78 19
			11	SS	9		302				
							301	>100			
			12	SS	5		300				
	Continued Next Page							>100			

COMMENTS

Borehole advanced at Station 10+900, 16 m Left of Centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/17/10 10:25:00 AM	0.7	6.5
2)	-	-
3)	-	-

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METRIC

RECORD OF BOREHOLE NO. 3

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325845.3 E 367817.8 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 16, 2010 DATE (Completed) September 17, 2010 TIME 10:25:00 AM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
298.5	Continued from Previous Page						299				
13.6	SILTY CLAY - grey silty clay (firm/stiff)		13	SS	10		298				
			14	SS	1		297	7			0 1 70 29
			15	SS	WH		296				
							295	5			
			16	SS	WH		294	7			0 0 51 49
293.0							293				
19.1	End of Sampling End of Borehole										

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ENCLOSURE NO.:5 (Pg. 1 of 2)

METRIC

RECORD OF BOREHOLE NO. 4

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325811.4 E 367848.8 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 20, 2010 DATE (Completed) September 20, 2010 TIME 5:30:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
312.0	225 mm Free Water										
0.0	PEAT - black fine fibrous peat with wood inclusions		1	AS	N/A				NMC=504		
			2	SS	PM		311		NMC=722		
			3	SS	WH				NMC=663		
			4	SS	WH		310		NMC=590		
			5	SS	WH		309		NMC=669		
			6	SS	WH		308		NMC=930		
307.4											
4.6	CLAYEY SILT to SILTY CLAY - grey clayey silt to silty clay trace to some sand clay content increases with depth (stiff)		7	SS	5		307				0 2 81 17
			8	SS	1		306				
			9	SS	WH		305				
			10	SS	WH		304				0 17 60 23
			11	SS	9		303				
			12	SS	10		302				
	Continued Next Page						301				
							300				

COMMENTS

Borehole advanced at Station 10+850, 14 m Left of Centerline. Additional BH advanced 1 m Lt of BH to obtain SH sample at 7.6 m depth for consolidation testing.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/20/10 5:35:00 PM	0	6.5
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:5 (Pg. 2 of 2)

METRIC

RECORD OF BOREHOLE NO. 4

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325811.4 E 367848.8 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 20, 2010 DATE (Completed) September 20, 2010 TIME 5:30:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
298.5											
13.5	SILTY CLAY - grey silty clay (firm/stiff) Continued from Previous Page		13	SS	8		298				
			14	SS	3		297	8			0 0 66 34
			15	SS	WH		296				
							295	7			
			16	SS	WH		294				
292.9							293	6			
19.1	End of Sampling End of Borehole										

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:6 (Pg. 1 of 2)

METRIC

RECORD OF BOREHOLE NO. 5

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325768.2 E 367881.2 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 22, 2010 DATE (Completed) September 22, 2010 TIME 12:35:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS
312.2	150 mm Free Water					
0.0	PEAT - black fine fibrous peat with wood inclusions		1	AS	N/A	
			2	SS	WH	
			3	SS	PM	
			4	SS	PM	
			5	SS	PM	
308.5						
3.7	CLAYEY SILT to SILTY CLAY - grey clayey silt to silty clay clay content increases with depth (firm/very stiff)		6	SS	WH	
			7	SS	7	
			8	SS	WH	
			9	SS	PM	
			10	SS	4	
			11	SS	9	
			12	SS	6	
	Continued Next Page					

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

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

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

WATER CONTENT (%) (20 40 60)

ELEVATION SCALE: 312, 311, 310, 309, 308, 307, 306, 305, 304, 303, 302, 301, 300

NMC=881 NMC=618 NMC=600 NMC=669 NMC=374

UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
	0 0 79 21

COMMENTS
Borehole advanced at Station 10+800, 17 m Left of Centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa
○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/22/10 2:00:00 PM	0	1.9
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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METRIC

RECORD OF BOREHOLE NO. 5

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325768.2 E 367881.2 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 22, 2010 DATE (Completed) September 22, 2010 TIME 12:35:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
298.5	Continued from Previous Page						299				
13.7	SILTY CLAY - grey silty clay (firm)		13	SS	6		298				0 0 71 29
			14	SS	3		297				
			15	SS	WH		296				0 0 50 50
			16	SS	WH		295	+ 6			
293.1							294	+ 7			
19.1	End of Sampling End of Borehole										

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:7 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 6

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325726.2 E 367915.7 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 22, 2010 DATE (Completed) September 22, 2010 TIME 4:50:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
312.1	100 mm Free Water										
0.0	PEAT - black fine fibrous peat with wood inclusions		1	AS	N/A		312	+ 12	NMC=665		
			2	SS	WH						
							311	+ 4	NMC=637		
			3	SS	2				NMC=552		
							310	+ 6			
309.4			4	SS	WH				NMC=139		
2.7	CLAYEY SILT to SILTY CLAY - grey clayey silt to silty clay trace to some sand (stiff/very stiff)							100			
			5	SS	9		309				
			6	SS	1		308				
			7	SS	3		307				0 9 68 23
			8	SS	WH		306	+ 5			0 20 78 2
			9	SS	11		305				
							304				
			10	SS	26		303				
302.1											
10.0	Auger Refusal End of Borehole										

COMMENTS

Borehole advanced at Station 10+750, 19 m Left of Centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

$\circ^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/22/10 4:50:00 PM	0	4.4
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:8 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 7

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325687.0 E 367939.5 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME 9:30:00 AM CHECKED BY MAM

DATE (Completed) September 23, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS
312.2	100 mm Free Water					
0.0	PEAT - black fine fibrous peat with wood inclusions		1	AS	N/A	
			2	SS	WH	
310.2			3	SS	WH	
2.0	CLAYEY SILT - grey silty clay trace sand (firm/stiff)		4	SS	11	
			5	SS	2	
			6	SS	WH	
			7	SS	WH	
			8	SS	WH	
304.8						
7.4	SANDY SILT - grey sandy silt trace gravel		9	SS	10/150 mm	
304.4						
7.8	Auger Refusal End of Borehole					

ELEVATION SCALE: 312, 311, 310, 309, 308, 307, 306, 305

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

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

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

WATER CONTENT (%): 20 40 60

NMC=795 NMC=639 NMC=214

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%)

GR SA (SI CL)

0 5 75 20

0 1 73 26

COMMENTS
Borehole advanced at Station 10+700, 27 m Left of Centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa
○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/23/10 9:20:00 AM	0	2.8
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:9 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 8

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325639.4 E 367971.3 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME 11:25:00 AM CHECKED BY MAM

DATE (Completed) September 23, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
312.2	300 mm Free Water					▼					
0.0 / 311.6	PEAT - black fine fibrous peat		1	AS	N/A		312		NMC=292		
0.6 / 310.7	SILT - grey silt trace sand some gravel (compact)		2	SS	19		311				
1.5	SAND - grey sand some to with silt some gravel trace clay (dense/very dense)		3	SS	52						15 66 17 2
			4	SS	37		310				16 60 22 2
308.9			5	SS	32/175 mm		309				
3.3	Auger Refusal End of Borehole										

COMMENTS

Borehole advanced at Station 10+646, 34 m Left of Centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/23/10 11:20:00 AM	0 ▼	1.2 ▼
2)	- ▽	-
3)	- ▽	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:10 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 9

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325622.8 E 368006.6 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME 4:00:00 PM CHECKED BY MAM

DATE (Completed) September 23, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
317.8	Ground Surface										
0.0	SAND - brown sand with silt some gravel		1	AS	N/A						
317.0							317				
0.8	Auger Refusal End of Borehole										

COMMENTS

Borehole advanced at Station 10+600, 18 m Left of Centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1) 9/23/10 3:48:00 PM	DRY	0.6
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:11 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 10

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325580.7 E 368045.8 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME 4:35:00 PM CHECKED BY MAM

DATE (Completed) September 23, 2010

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
324.0	Exposed Bedrock										
0.0											

COMMENTS

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ $^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:12 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 11

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325541.6 E 368075.6 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME 4:45:00 PM CHECKED BY MAM

DATE (Completed) September 23, 2010

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
326.8	Exposed Bedrock										
0.0											

COMMENTS

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:13 (Pg. 1 of 1)

METRIC

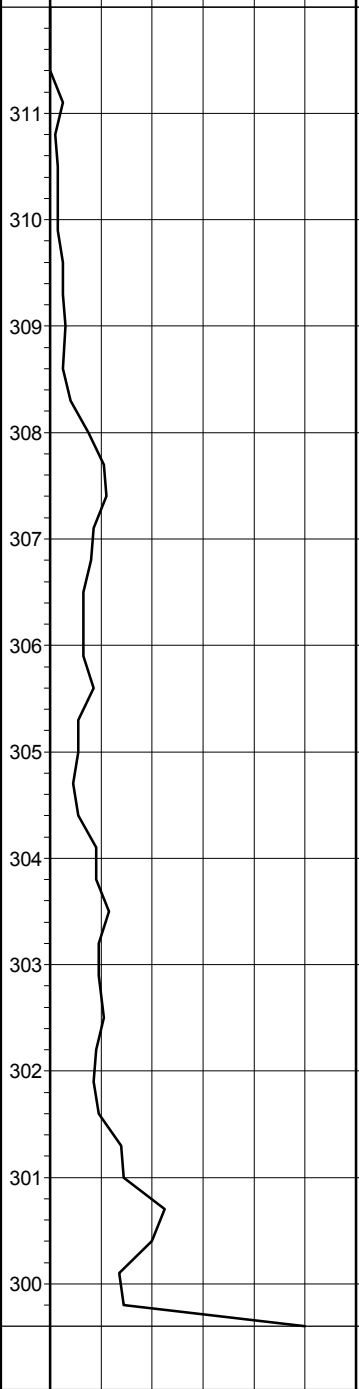
RECORD OF DCPT NO. 1

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325896.4 E 367764.2 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 15, 2010 DATE (Completed) September 16, 2010 TIME 3:20:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
312.0	Ground Surface										
0.0											
299.6	DCPT Refusal End of Borehole										
12.4											



COMMENTS

DCPT advanced at Station 10+975, 25 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ ³, × ³ : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:14 (Pg. 1 of 2)

METRIC

RECORD OF DCPT NO. 2

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325863.5 E 367798.4 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 15, 2010 DATE (Completed) September 16, 2010 TIME 10:00:00 AM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS
312.1	Ground Surface					
0.0						
	Continued Next Page					

ELEVATION SCALE: 312, 311, 310, 309, 308, 307, 306, 305, 304, 303, 302, 301, 300

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

WATER CONTENT (%)
20 40 60

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA (SI CL)

COMMENTS
DCPT advanced at Station 10+925, 22 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

$\circ^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:14 (Pg. 2 of 2)

METRIC

RECORD OF DCPT NO. 2

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325863.5 E 367798.4 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 15, 2010 DATE (Completed) September 16, 2010 TIME 10:00:00 AM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	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)
	Continued from Previous Page						299	20 40 60 80 100	20 40 60		
							298				
							297				
							296				
							295				
							294				
							293				
							292				
291.4											
20.7	DCPT Refusal End of Borehole										

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:15 (Pg. 1 of 3)

METRIC

RECORD OF DCPT NO. 3

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325829.6 E 367833.9 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 16, 2010 DATE (Completed) September 17, 2010 TIME CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	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)
311.9 0.0	Ground Surface										
	Continued Next Page										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

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

WATER CONTENT (%): 20 40 60

ELEVATION SCALE: 311 310 309 308 307 306 305 304 303 302 301 300 299

COMMENTS

DCPT advanced at Station 10+875, 17 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ $^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:15 (Pg. 2 of 3)

METRIC

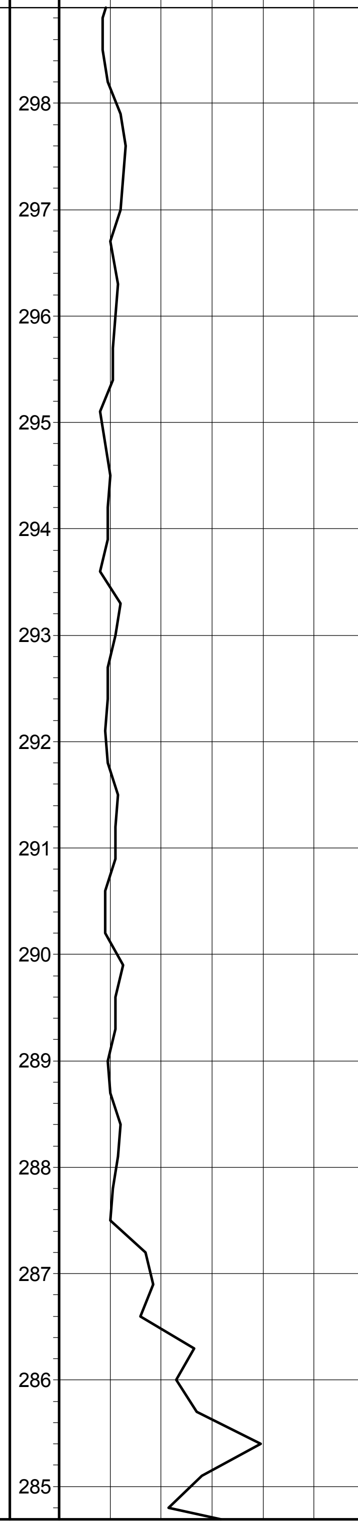
RECORD OF DCPT NO. 3

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325829.6 E 367833.9 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 16, 2010 DATE (Completed) September 17, 2010 TIME CHECKED BY MAM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT W, LIQUID LIMIT W_L; WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
	Continued from Previous Page										
	Continued Next Page										



METRIC

RECORD OF DCPT NO. 3

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325829.6 E 367833.9 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 16, 2010 TIME CHECKED BY MAM

DATE (Completed) September 17, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
284.5	Continued from Previous Page										
27.4	DCPT Refusal End of Borehole										

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:16 (Pg. 1 of 2)

METRIC

RECORD OF DCPT NO. 4

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325789.0 E 367864.9 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 20, 2010 DATE (Completed) September 20, 2010 TIME 1:05:00 AM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS
312.0	Ground Surface					
0.0	DCPT Refusal End of Borehole					

ELEVATION SCALE: 311, 310, 309, 308, 307, 306, 305, 304, 303, 302, 301, 300

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

WATER CONTENT (%)
20 40 60

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA (SI CL)

Continued Next Page

COMMENTS
DCPT advanced at Station 10+825, 17 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa
○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:16 (Pg. 2 of 2)

METRIC

RECORD OF DCPT NO. 4

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325789.0 E 367864.9 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 20, 2010 DATE (Completed) September 20, 2010 TIME 1:05:00 AM CHECKED BY MAM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
	Continued from Previous Page										
							298				
							297				
							296				
							295				
							294				
							293				
							292				
							291				
							290				
288.9							289				
23.1											

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:17 (Pg. 1 of 2)

METRIC

RECORD OF DCPT NO. 5

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325748.1 E 367898.4 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 22, 2010 DATE (Completed) September 22, 2010 TIME 2:00:00 PM CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
312.1	Ground Surface										
0.0							312				
							311				
							310				
							309				
							308				
							307				
							306				
							305				
							304				
							303				
							302				
							301				
							300				

Continued Next Page

COMMENTS

DCPT advanced at Station 10+775, 22 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

	Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)		-	-
2)		-	-
3)		-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:17 (Pg. 2 of 2)

METRIC

RECORD OF DCPT NO. 5

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325748.1 E 367898.4 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 22, 2010 TIME 2:00:00 PM CHECKED BY MAM

DATE (Completed) September 22, 2010

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
	Continued from Previous Page										
							299				
							298				
							297				
296.6											
15.5	DCPT Refusal End of Borehole										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

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

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L

WATER CONTENT (%): 20 40 60

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:18 (Pg. 1 of 1)

METRIC

RECORD OF DCPT NO. 6

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325709.7 E 367926.8 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 22, 2010 TIME CHECKED BY MAM

DATE (Completed) September 22, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS
312.1	Ground Surface					
0.0						
305.3						
6.8	DCPT Refusal End of Borehole					

ELEVATION SCALE: 312, 311, 310, 309, 308, 307, 306

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

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

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

WATER CONTENT (%): 20 40 60

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA (SI CL)

COMMENTS
DCPT advanced at Station 10+750, 24 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ $^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:19 (Pg. 1 of 1)

METRIC

RECORD OF DCPT NO. 7

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325671.5 E 367952.4 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 DATE (Completed) September 23, 2010 TIME CHECKED BY MAM

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	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)
312.0	Ground Surface										
0.0							311				
							310				
							309				
							308				
							307				
							306				
							305				
304.0							304				
8.0	DCPT Refusal End of Borehole										

COMMENTS

DCPT advanced at Station 10+675, 34 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

$+^3$, $\times^3$: Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ $^{3\%}$ STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:20 (Pg. 1 of 1)

METRIC

RECORD OF DCPT NO. 8

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325624.2 E 367985.7 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME CHECKED BY MAM

DATE (Completed) September 23, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	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)
313.8	Ground Surface							20 40 60 80 100	20 40 60		
0.0											
313.0							313				
0.8	DCPT Refusal End of Borehole										

COMMENTS

DCPT advanced at Station 10+625, 34 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:21 (Pg. 1 of 1)

METRIC

RECORD OF DCPT NO. 9

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325594.7 E 368021.2 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME CHECKED BY MAM

DATE (Completed) September 23, 2010

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	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)
318.4	Ground Surface										
0.0							318				
							317				
316.0							316				
2.4	DCPT Refusal End of Borehole										

COMMENTS

DCPT advanced at Station 10+575, 21 m left of centerline.

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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ENCLOSURE NO.:22 (Pg. 1 of 1)

METRIC

RECORD OF DCPT NO. 10

REFERENCE 10/07/10131-F1 DATUM Geodetic LOCATION N 5325561.1 E 368060.1 - Eby Township ORIGINATED BY JL

PROJECT GWP 5217-08-00, Highway 11 N, WP 5217-08-01 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY RG

CLIENT MMM Group Ltd. DATE (Started) September 23, 2010 TIME CHECKED BY MAM

DATE (Completed) September 23, 2010

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
325.7	Exposed Bedrock										
0.0											

COMMENTS

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, × 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (yy/mm/dd)/Time	Water Depth (m)	Cave In (m)
1)	-	-
2)	-	-
3)	-	-

MEL-GEO 10131 - AREA 1 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 1/30/12

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10+500	15.0 Lt C/L	D+3.0
0	NFP BR	
10+500	10.0 Lt C/L	D-1.2
0 - 200	F Sa Tr Org & Si	
200	NFP Sh Rk/BR	
10+500	5.3 Lt C/L	
0 - 250	Cr Gr	
250 - 800	F-Med Sa W Gr	
800	NFP Sh Rk/BR	
10+500	1.8 Lt C/L	
0 - 250	Asph	
250 - 500	Cr Gr	
500 - 800	F-Med Sa W Gr	
800	NFP Sh Rk/BR	
10+510	10.0 Lt C/L	D-1.0
0 - 150	F Sa Tr Org & Si	
150	NFP Sh Rk/BR	
10+510	6.9 Lt C/L	
0 - 150	Cr Gr	
150 - 1.0	F-Med Sa W Gr	
1.0	NFP Sh Rk/BR	
10+510	4.0 Lt C/L	
0 - 60	Asph	
60 - 210	Cr Gr	
210 - 1.1	F-Med Sa W Gr	
1.1	NFP Sh Rk/BR	
10+530	11.0 Lt C/L	D-1.8
0 - 500	Med F Sa Tr Si Tr Gr	
500	NFP BR	
10+530	7.2 Lt C/L	
0 - 180	Cr Gr	
180 - 900	F-Med Sa W Gr	
900	NFP Sh Rk/BR	
10+530	4.0 Lt C/L	
0 - 70	Asph	
70 - 240	Cr Gr	
240 - 1.0	F-Med Sa W Gr	
1.0	NFP Sh Rk/BR	
10+550	11.0 Lt C/L	D-1.7
0 - 500	Med F Sa Tr Si Tr Gr Occ Cob	
500	NFP BR	
10+550	7.3 Lt C/L	
0 - 100	Cr Gr	
100 - 1.3	F-Med Sa W Gr Occ Cob	
1.3	NFP Sh Rk/BR	
10+550	4.0 Lt C/L	
0 - 70	Asph	
70 - 300	Cr Gr	
300 - 900	F-Med Sa W Gr Occ Cob	
900	NFP Sh Rk/BR	
10+570	12.0 Lt C/L	D-1.7
0 - 900	F Sa W Si Tr Gr Occ Cob	
900	NFP BR	
10+570	7.2 Lt C/L	
0 - 280	Cr Gr	
280 - 880	F-Med Sa W Gr	
880 - 1.5	F Sa Tr Si	
1.5	NFP RF	
10+570	4.0 Lt C/L	
0 - 70	Asph	
70 - 320	Cr Gr	
320 - 1.3	F-Med Sa W Gr	
1.3	NFP RF	
10+600	12.0 Lt C/L	D-2.0
0 - 1.2	F Sa Some Si Tr Gr Occ Cob	
1.2	NFP BR	
10+600	6.8 Lt C/L	
0 - 200	Cr Gr	
200 - 800	F-Med Sa W Gr	
800	NFP RF	

10+600 4.0 Lt

0 - 70 Asph
70 - 280 Cr Gr
280 - 850 F-Med Sa W Gr Occ Cob
850 NFP RF

10+625 12.0 Lt D-1.8

0 - 400 Med F Sa Tr Si Tr Gr
400 NFP Sh Rk

10+650 12.0 Lt D-1.7

0 - 300 Med F Sa Tr Si Tr Gr
300 NFP Sh Rk

10+650 6.1 Lt

0 - 200 Cr Gr
200 - 1.0 F-Med Sa W Gr
1.0 NFP RF

10+650 4.1 Lt

0 - 70 Asph
70 - 240 Cr Gr
240 - 800 F-Med Sa W Gr Occ Cob
800 NFP RF

10+675 12.0 Lt D-1.7

0 - 800 Med F Sa Tr Si Tr Gr Occ Sh Rk
800 NFP Sh Rk

10+675 6.0 Lt

0 - 240 Cr Gr
240 - 900 F-Med Sa W Gr
900 NFP RF

10+675 4.2 Lt

0 - 70 Asph
70 - 210 Cr Gr
210 - 800 F-Med Sa W Gr Occ Cob
800 NFP RF

10+700 12.0 Lt D-2.0

0 - 600 Med F Sa Tr Si Tr Gr
600 NFP Sh Rk

10+700 4.2 Lt C/L

0 - 80 Asph
80 - 410 Cr Gr
410 - 1.6 F-Med Sa W Gr
1.6 NFP RF

10+700 1.7 Lt C/L

0 - 300 Asph
300 - 510 Cr Gr
510 - 1.4 F-Med Sa W Gr Occ Cob
1.4 NFP RF

10+725 12.0 Lt C/L D-1.8

0 - 400 Med F Sa Tr Si Tr Gr
400 NFP Sh Rk

10+725 5.8 Lt C/L

0 - 300 Cr Gr
300 - 1.4 F-Med Sa W Gr
1.4 NFP RF

10+725 4.1 Lt C/L

0 - 70 Asph
70 - 300 Cr Gr
300 - 1.4 F-Med Sa W Gr
1.4 NFP RF

10+750 12.0 Lt C/L D-1.6

0 - 400 Med F Sa Tr Si Tr Gr
400 NFP Sh Rk

10+750 6.8 Lt C/L

0 - 300 Cr Gr
300 - 1.4 F-Med Sa W Gr
1.4 NFP RF

10+750 4.1 Lt C/L

0 - 70 Asph
70 - 300 Cr Gr
300 - 1.4 F-Med Sa W Gr
1.4 NFP RF

10+775 11.0 Lt C/L D-1.5

0	- 600	Med-F Sa Tr Si Tr Gr
600	- 2.2	Med-F Sa Tr Si Tr Gr & Sh Rk
2.2	- 5.3	Blk F Fib Peat
5.3	- 15.0	Si Some Cl, Soft

10+775 7.1 Lt C/L

0	- 330	Cr Gr
330	- 1.3	F-Med Sa W Gr
1.3	- 2.0	F-Med Sa W Gr Tr
		Si Fr Wat @ 1.5
2.0		NFP RF

10+775 4.1 Lt C/L

0	- 60	Asph
60	- 300	Cr Gr
300	- 1.5	F-Med Sa W Gr
1.5		NFP RF

10+800 11.0 Lt C/L D+1.4

0	- 600	Med F Sa Tr Si Tr Gr
600	- 2.6	Med F Sa Tr Si Tr Gr, Wet
2.6	- 4.7	Blk F Fib Peat
4.7	- 15.0	Si Some Cl, Soft

10+800 7.1 Lt C/L

0	- 300	Cr Gr
300	- 1.5	F-Med Sa W Gr
1.5		NFP RF

10+800 4.0 Lt C/L

0	- 70	Asph
70	- 300	Cr Gr
300	- 1.8	F-Med Sa W Gr Fr Wat @ 1.3
1.8		NFP RF

10+825 10.0 Lt C/L D-1.0

0	- 700	Med F Sa Tr Si Tr Gr
700	- 2.4	Mix Si Med-F Sa Tr Gr & Sh Rk
2.4		NFP Sh Rk

10+825 6.9 Lt C/L

0	- 350	Cr Gr
350	- 1.1	F-Med Sa W Gr
1.1	- 1.5	F Sa W Si Tr Gr
1.5		NFP RF

10+825 4.0 Lt C/L

0	- 80	Asph
80	- 310	Cr Gr
310	- 1.7	F-Med Sa W Gr
1.7		NFP RF

10+850 10.0 Lt C/L D-1.0

0	- 700	Med F Sa Tr Si Tr Gr
700	- 2.5	Mix Si Med-F Sa Tr Gr
2.5	- 5.5	Blk F Fib Peat
5.5	- 8.0	Si Some Cl, Soft

10+850 7.0 Lt C/L

0	- 340	Cr Gr
340	- 1.2	F-Med Sa W Gr
1.2	- 1.5	F-Med Sa W Gr & Si
1.5		NFP RF

10+850 4.0 Lt C/L

0	- 80	Asph
80	- 320	Cr Gr
320	- 1.5	F-Med Sa W Gr
1.5		NFP RF

10+875 11.0 Lt C/L D-1.6

0	- 700	Med F Sa Tr Si Tr Gr
700	- 2.5	Mix Si Med-F Sa Tr Gr & Sh Rk
2.5	- 5.0	Blk F Fib Peat
5.0	- 7.0	Si Some Cl, Soft

10+875 6.9 Lt C/L

0	- 300	Cr Gr
300	- 1.4	F-Med Sa W Gr Fr Wat @ 610
1.4	- 1.6	F-Med Sa W Gr & Si, Wet
1.6		NFP RF

10+875 4.0 Lt C/L

0	- 70	Asph
70	- 300	Cr Gr
300	- 1.4	F-Med Sa W Gr
1.4		NFP RF

10+900 12.0 Lt C/L D-1.6

0	- 700	F Sa Tr Si Tr Gr
700		NFP Sh Rk

10+900 5.2 Lt C/L

0 - 310 Cr Gr
310 - 1.1 F-Med Sa W Gr
1.1 NFP RF

10+900 1.5 Lt C/L

0 - 140 Asph
140 - 300 Cr Gr
300 - 450 Asph
450 - 660 Cr Gr
660 - 1.5 F-Med Sa W Gr Occ Cob
1.5 NFP RF

10+925 12.0 Lt C/L D-1.7

0 - 300 Med F Sa Tr Si Tr Gr & Sh Rk
300 - 1.5 Si Some F Sa Tr Gr Tr Cl, Firm

10+925 7.2 Lt C/L

0 - 350 Cr Gr
350 - 1.0 F-Med Sa W Gr & Si
1.0 NFP RF

10+925 4.0 Lt C/L

0 - 70 Asph
70 - 250 Cr Gr
250 - 700 F-Med Sa W Gr
700 - 1.3 F-Med Sa W Gr & Si
1.3 NFP RF

10+950 12.0 Lt C/L D-1.9

0 - 1.3 Med-F Sa Tr Si Tr Gr Occ Sh Rk
1.3 - 2.0 Med-F Sa W Si Tr Gr
2.0 - 4.0 F Fib Peat
4.0 - 8.0 Si Some Cl, Soft

10+950 6.2 Lt C/L

0 - 400 Cr Gr
400 - 900 F-Med Sa W Gr
900 - 1.6 F-Med Sa W Gr & Si
1.6 NFP RF

10+950 4.2 Lt C/L

0 - 70 Asph
70 - 300 Cr Gr
300 - 850 F-Med Sa W Gr
850 - 1.4 F-Med Sa W Gr & Si
1.4 NFP RF

10+975 12.0 Lt C/L D-1.9

0 - 500 F Sa Tr Si W Sh Rk
500 NFP Sh RK

10+975 6.2 Lt C/L

0 - 450 Cr Gr
450 - 1.1 F-Med Sa W Gr &
Sh Rk Tr Si Mixed
1.1 NFP RF

10+975 4.2 Lt C/L

0 - 70 Asph
70 - 330 Cr Gr
330 - 1.0 F-Med Sa W Gr &
Sh Rk Tr Si Mixed
1.0 NFP RF

11+000 12.0 Lt C/L D-2.5

0 - 500 F Sa Tr Si W Sh Rk
500 NFP Sh Rk

11+000 6.5 Lt C/L

0 - 800 Cr Gr
800 NFP RF

11+000 4.0 Lt C/L

0 - 80 Asph
80 - 300 Cr Gr
300 - 600 F-Med Sa W Gr
600 - 900 F-Med Sa W Gr & Si
900 NFP RF

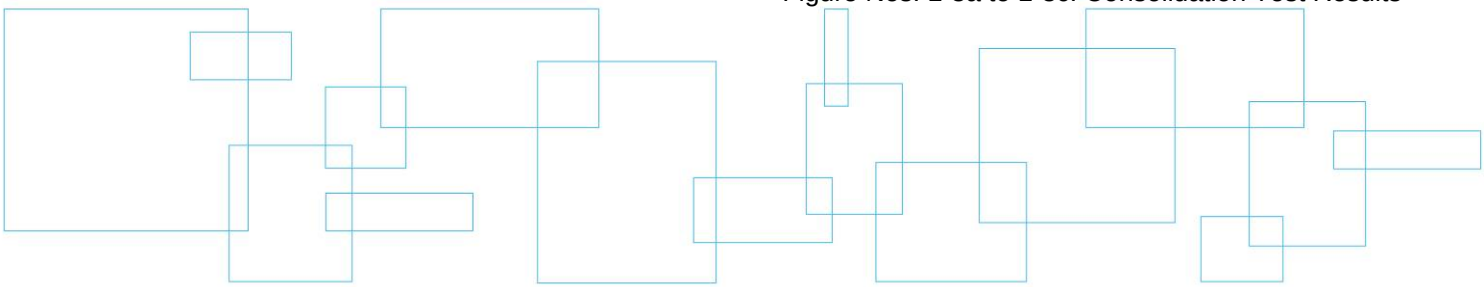
Station 10+500 looking north - left side of embankment	Photo: 1

Station 11+000 looking south – left side of embankment	Photo: 2

Reference No.: 10/07/10131-F1 Project: Hwy 11 – Passing Lane Station 10+500 to 11+000, Twp of Eby	Date: August, 2011

Appendix C Borehole Location Plan Labwork

Figure No. F1-1: Borehole Location and Soil Strata
Figure Nos. F1-2 and F1-3: Typical Half Sections
Figure Nos. L-1 to L-4: Summary Grain Size Analysis Graph
Figure Nos. L-5 and L-5a: Atterberg Limits
Figure Nos. L-6 and L-7: In-Situ Shear Strength Chart
Figure Nos. L-8a to L-8c: Consolidation Test Results



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CONT No
WP No 5217-08-01
Geocres No 42A-86

N

HWY NO. 11 – Township of Eby
Passing Lane No. 1
Embankment Widening – Sta. 10+500 to 11+000
BOREHOLE LOCATIONS & SOIL STRATA

Figure F1-1

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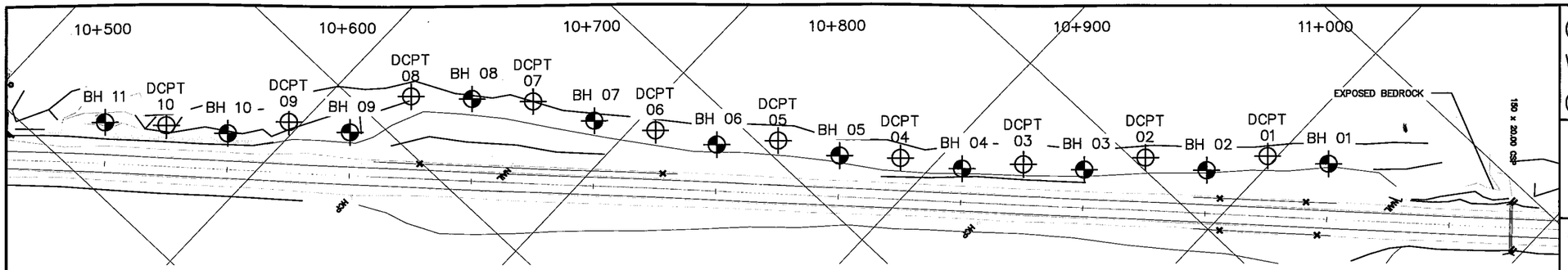
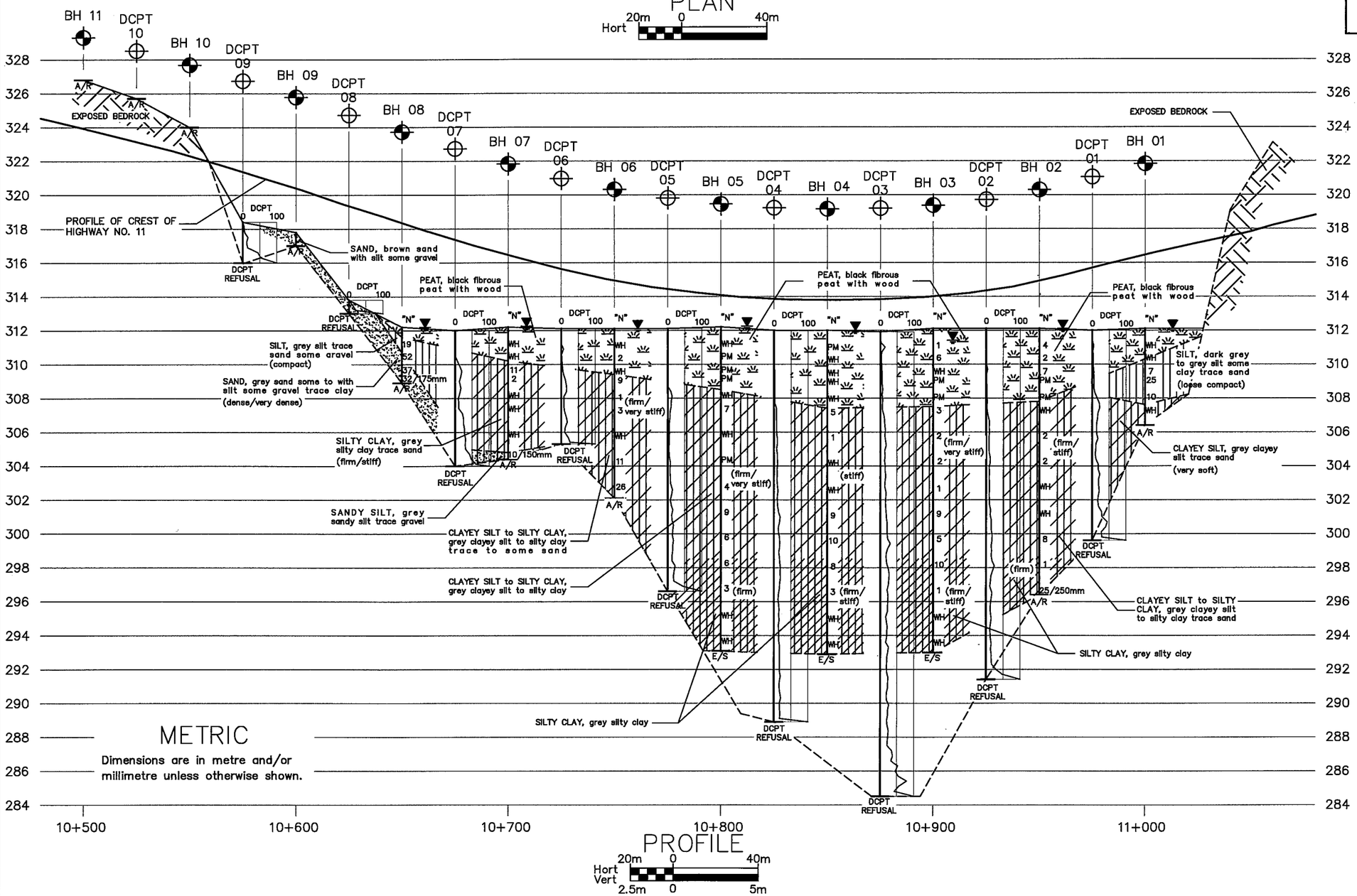
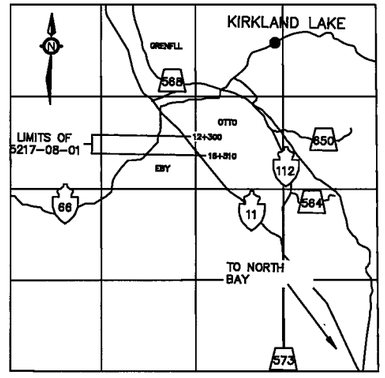


PLAN
Hort 20m 0 40m



METRIC
Dimensions are in metre and/or millimetre unless otherwise shown.

PROFILE
Hort 20m 0 40m
Vert 2.5m 0 5m



KEY PLAN – NOT TO SCALE

LEGEND

- Borehole
- Dynamic Cone Penetration Test
- "N" Blows/0.3 m (Std Pen Test, 475 J/blow)
- DCPT Blows/0.3 m (60° Cone, 475 J/blow)
- Water Level at Time of Investigation
- A/R Auger Refusal
- E/S End of Sampling

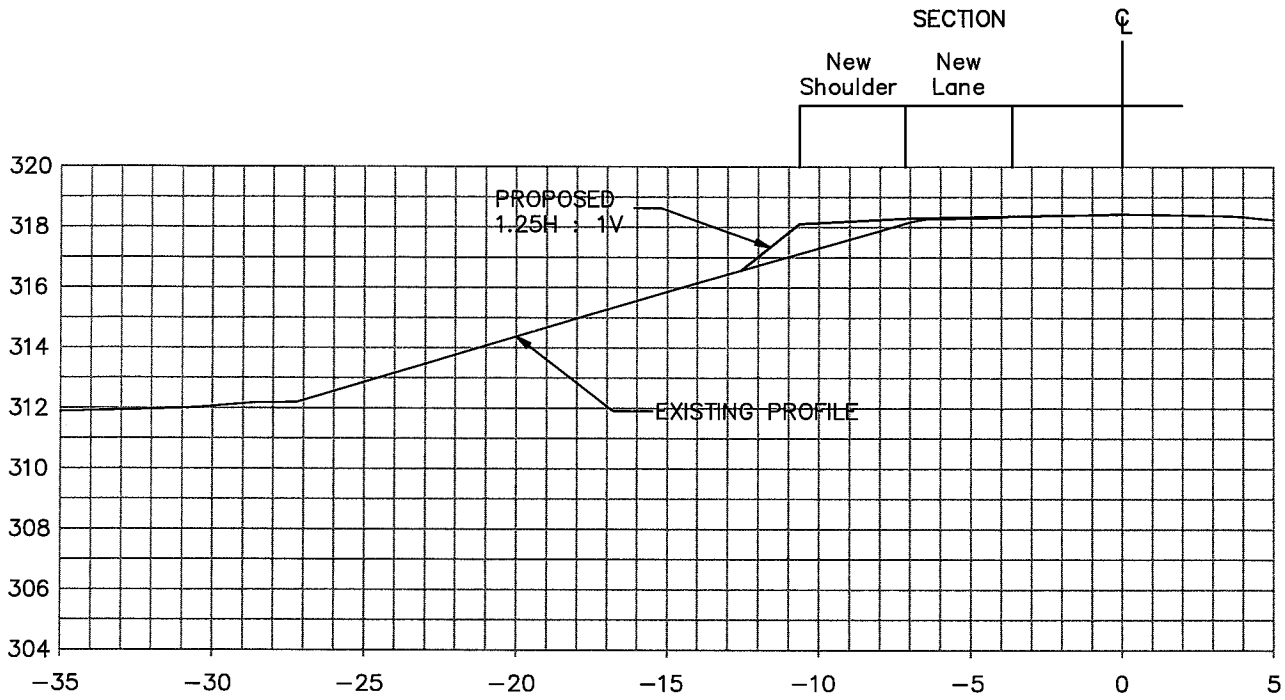
Borehole No.	Elev.	O/S	Co-ordinates Northerly	Co-ordinates Easterly
BOREHOLE NO. 1	312.1	23m Lt	5325917.0	367746.2
BOREHOLE NO. 2	312.1	18m Lt	5325881.8	367783.6
BOREHOLE NO. 3	312.1	16m Lt	5325845.3	367817.8
BOREHOLE NO. 4	312.0	14m Lt	5325811.4	367848.8
BOREHOLE NO. 5	312.2	17m Lt	5325788.2	367881.2
BOREHOLE NO. 6	312.1	19m Lt	5325726.2	367915.7
BOREHOLE NO. 7	312.2	27m Lt	5325687.0	367939.5
BOREHOLE NO. 8	312.2	34m Lt	5325639.4	367971.3
BOREHOLE NO. 9	317.8	18m Lt	5325622.8	368006.8
BOREHOLE NO. 10	324.0	15m Lt	5325580.7	368045.8
BOREHOLE NO. 11	326.8	17m Lt	5325541.8	368075.6
DCPT NO. 1	312.0	25m Lt	5325898.4	367764.2
DCPT NO. 2	312.1	22m Lt	5325883.5	367798.4
DCPT NO. 3	311.9	17m Lt	5325829.6	367833.9
DCPT NO. 4	312.0	17m Lt	5325789.0	367864.9
DCPT NO. 5	312.1	22m Lt	5325748.1	367898.4
DCPT NO. 6	312.1	24m Lt	5325709.7	367926.8
DCPT NO. 7	312.0	34m Lt	5325671.5	367952.4
DCPT NO. 8	313.8	34m Lt	5325624.2	367985.7
DCPT NO. 9	318.4	21m Lt	5325584.7	368021.2
DCPT NO. 10	325.7	17m Lt	5325561.1	368060.1

NOTE 1:
The boundaries between soil strata have been established at the borehole locations only. The boundaries illustrated and stratigraphy between boreholes on this drawing are assumed based on borehole data and may vary and they are intended for design purposes only.

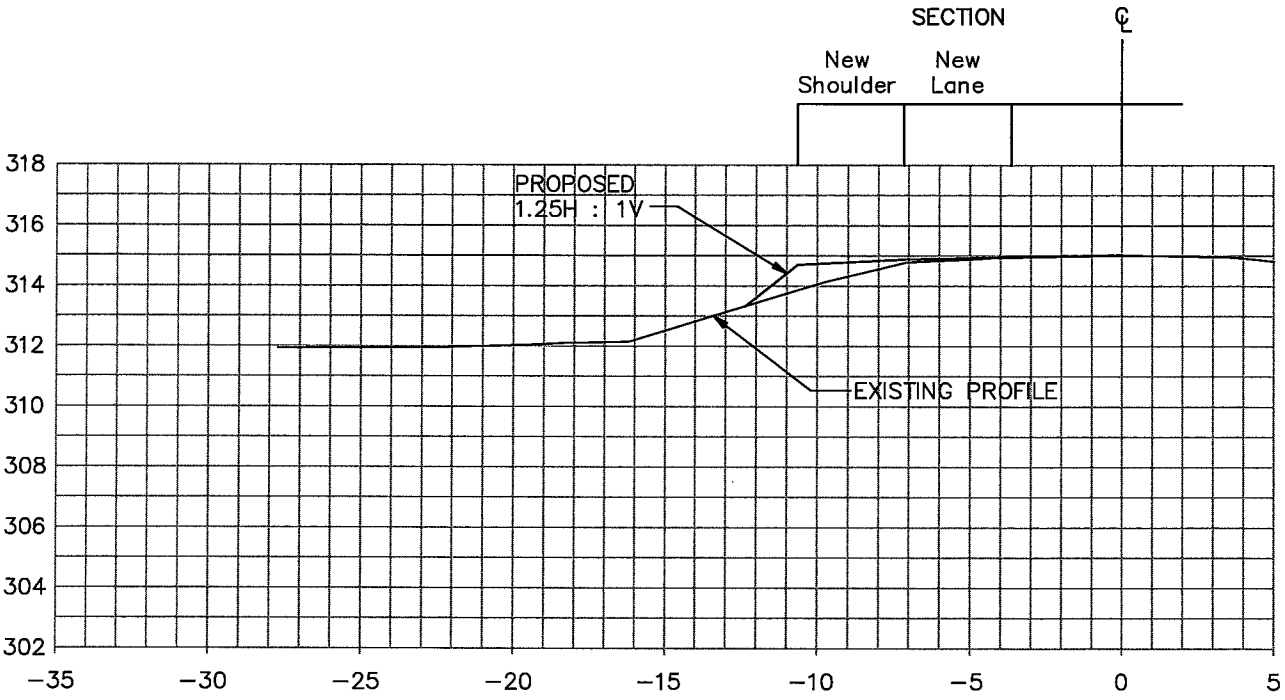
REVISIONS	DATE	BY	DESCRIPTION
	12/01/26	RG	FINAL

HWY No. 11 – Sta. 10+500–11+000 – Eby Twp			DIST
SUBM'D			SITE: PL-1
DRAWN RG	CHK MAM	DATE June 2011	FIG F1-1

FIGURE No. F1–2



TYPICAL HALF SECTION STA. 10+650



TYPICAL HALF SECTION STA. 10+750

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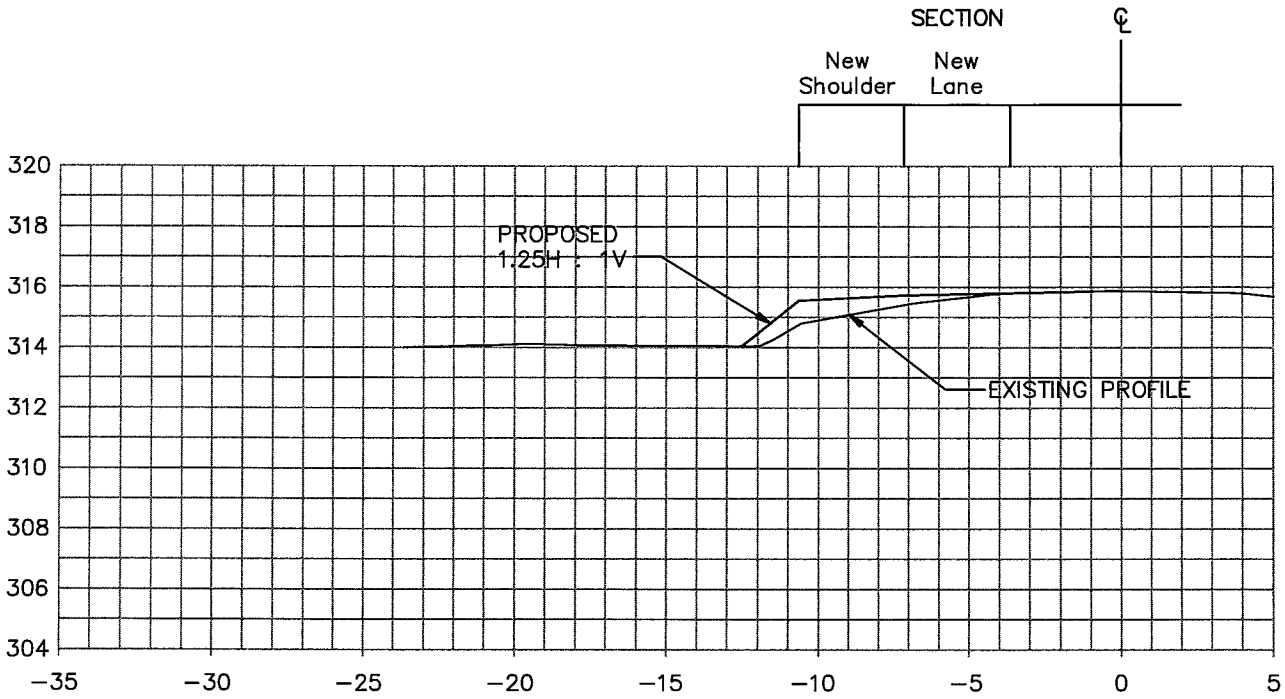
2-120 Progress Court,
North Bay Ontario, P1B 8G4
TEL: (705) 476 2550
FAX: (705) 476 8882

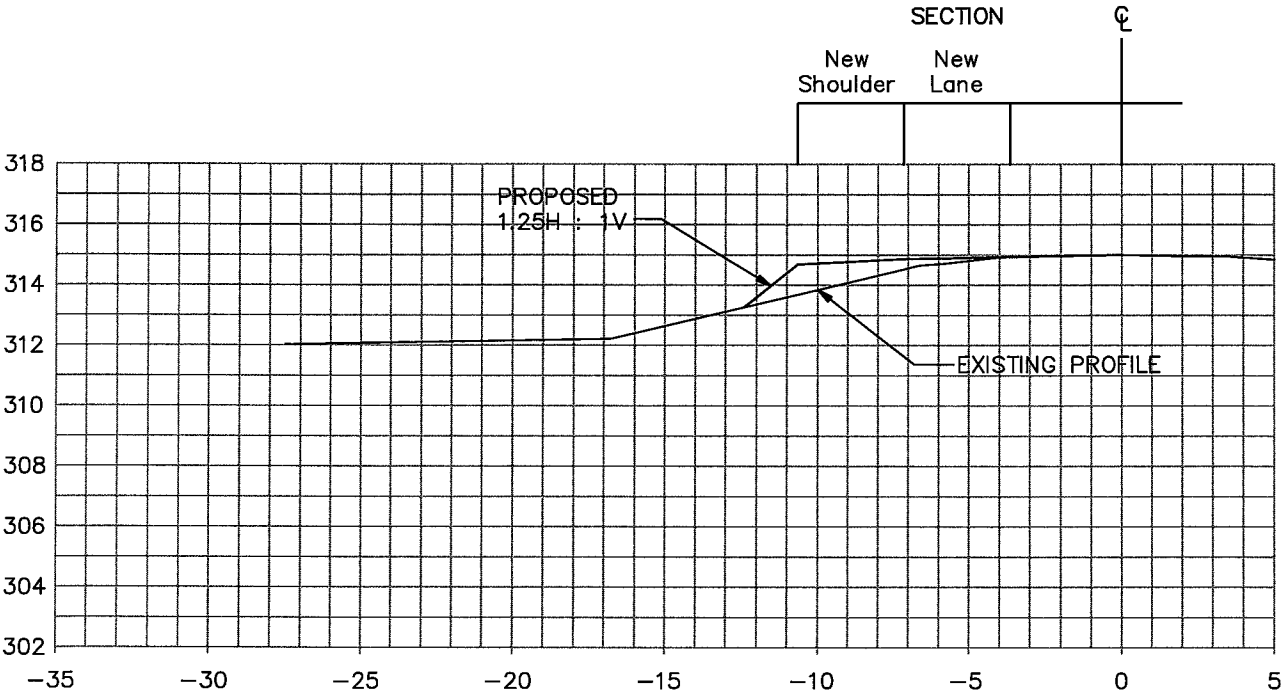
HWY NO. 11 – TWP. OF EBY
Passing Lane No. 1
Embankment Widening
Sta. 10+500 to 11+000

WP No.:	5217–08–01
Date:	June 2011
Scale:	1:250
Drawn By:	RG

FIGURE No. F1–3



TYPICAL HALF SECTION STA. 10+850



TYPICAL HALF SECTION STA. 10+950

LVM | MERLEX

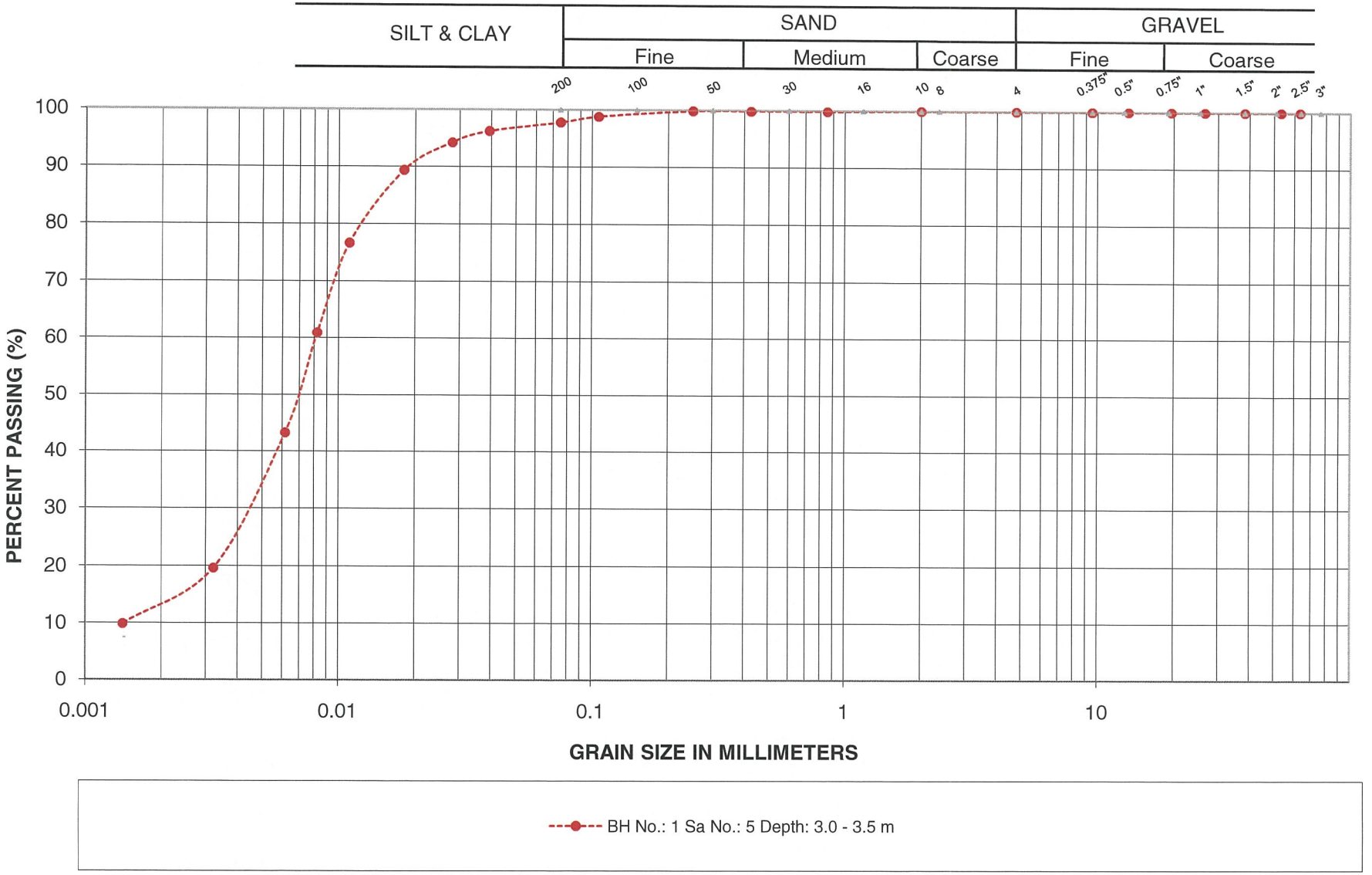
2-120 Progress Court,
North Bay Ontario, P1B 8G4
TEL: (705) 476 2550
FAX: (705) 476 8882

HWY NO. 11 – TWP. OF EBY
Passing Lane No. 1
Embankment Widening
Sta. 10+500 to 11+000

WP No.:	5217–08–01
Date:	June 2011
Scale:	1:250
Drawn By:	RG

Reference No.: 10/07/10131-F1
Date: January 2012

GRAIN SIZE ANALYSIS



PROJECT: W.P. 5217-08-01
LOCATION: Hwy 11 Passing Lane 1

SILTS - Silt, Trace to Some Clay

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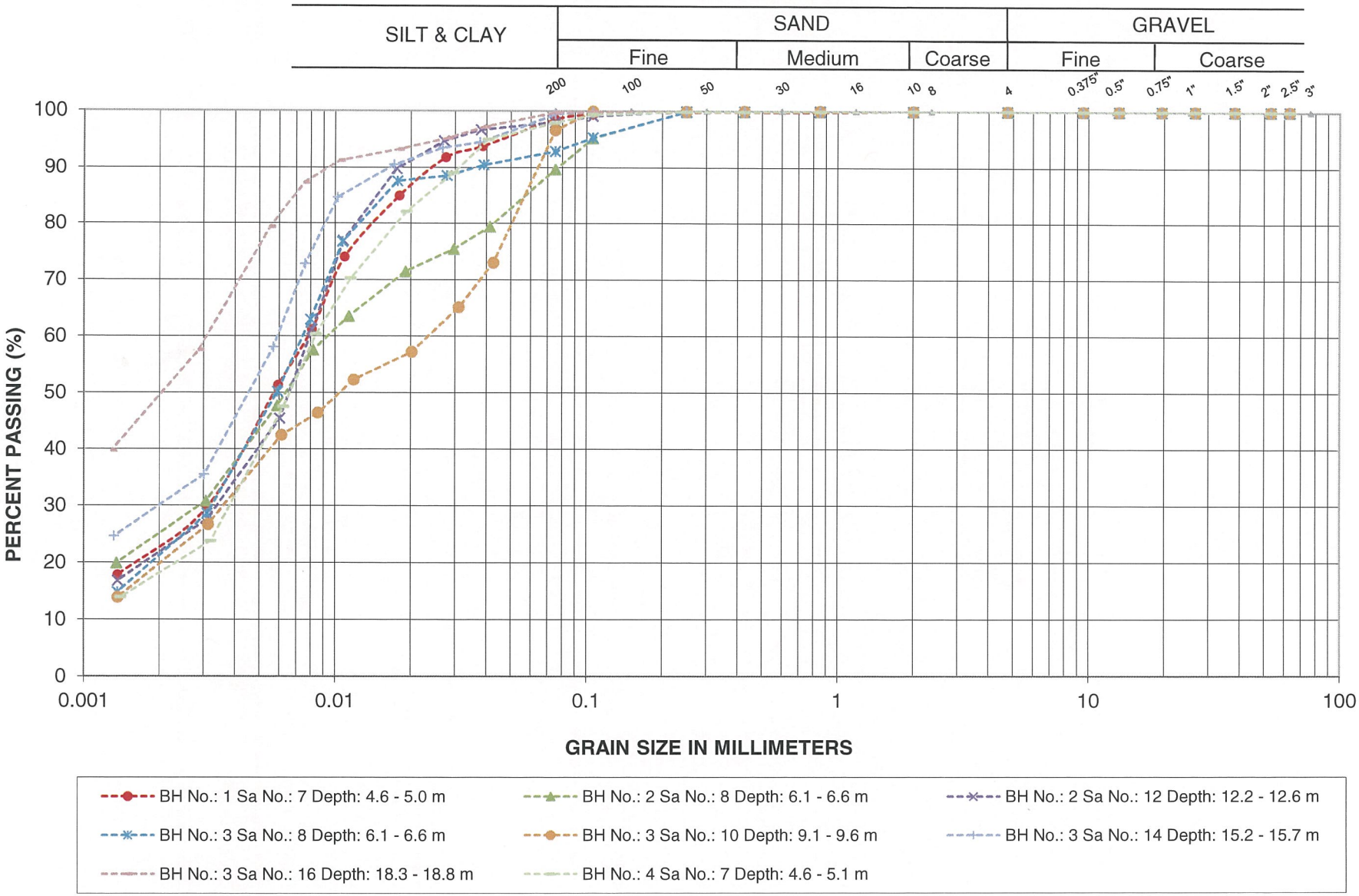
FIGURE L-1

Reference No.: 10/07/10131-F1
Date: January 2012

GRAIN SIZE ANALYSIS



PROJECT: W.P. 5217-08-01
LOCATION: Hwy 11 Passing Lane 1

CLAYEY SILT to SILTY CLAY

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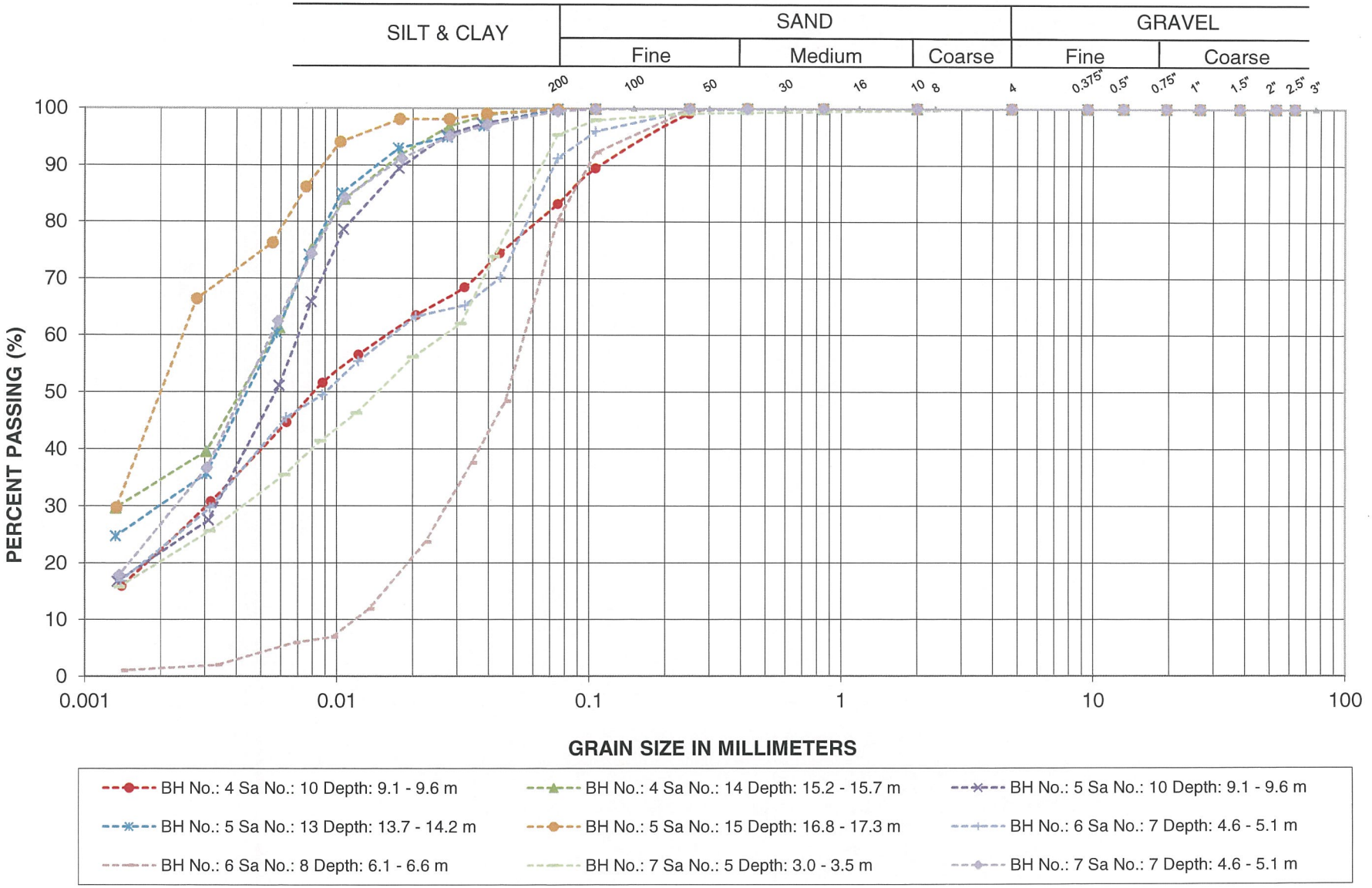
FIGURE L-2

Reference No.: 10/07/10131-F1
Date: January 2012

GRAIN SIZE ANALYSIS



PROJECT: W.P. 5217-08-01
LOCATION: Hwy 11 Passing Lane 1

CLAYEY SILT to SILTY CLAY

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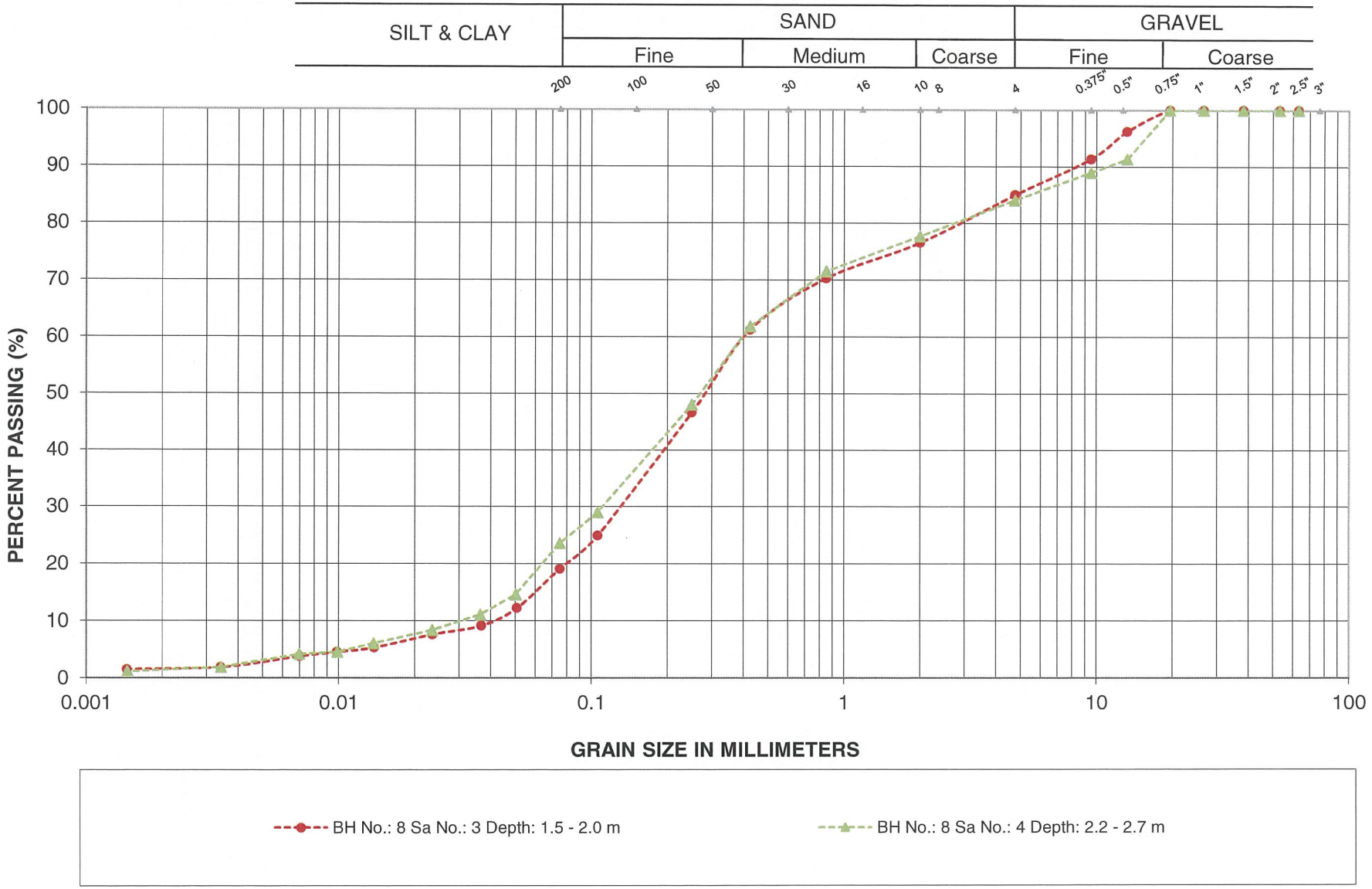
FIGURE L-3

Reference No.: 10/07/10131-F1
Date: January 2012

GRAIN SIZE ANALYSIS



PROJECT: W.P. 5217-08-01
LOCATION: Hwy 11 Passing Lane 1

SAND - Sand Some Gravel Some to With Silt Trace Clay

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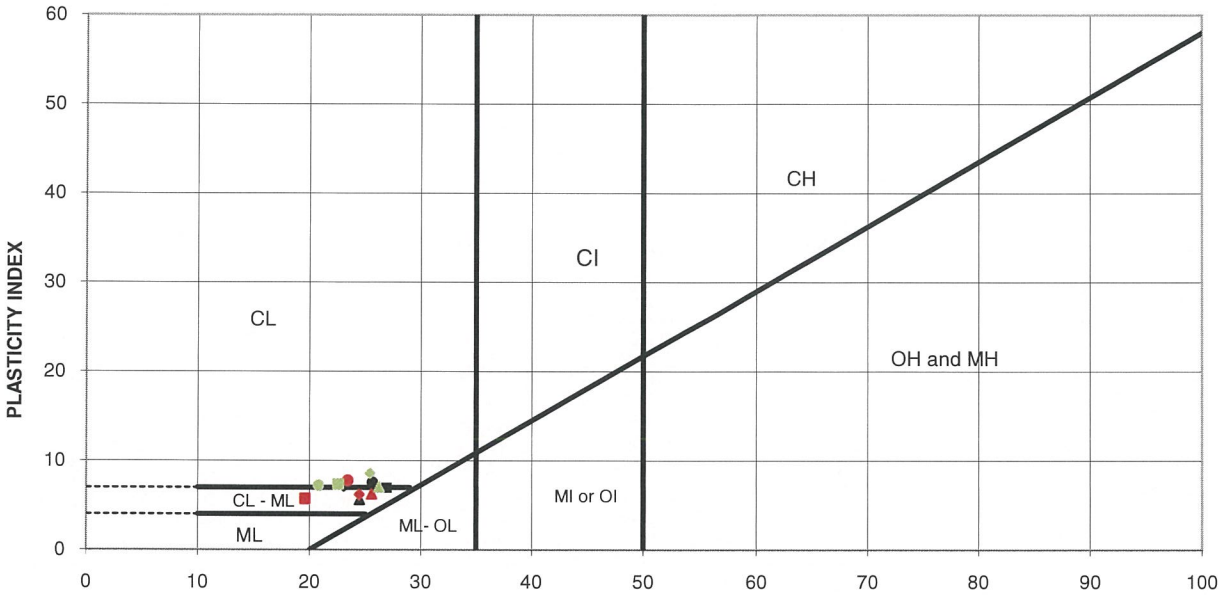
FIGURE L-4

ATTERBERG LIMITS TEST RESULTS

FIGURE L- 5

ATTERBERG INDICES



LIQUID LIMIT

SYMBOL	BH	Sa. No.	Depth(m)	Elev.(m)	Liquid Limit	Plastic Limit	Plasticity Index	NMC %
●	1	7	4.6	307.5	25.7	18.2	7.5	48.5
◆	2	8	6.1	306.0	23.1	16.0	7.1	30.6
■	2	12	12.2	299.9	26.9	20.0	7.0	37.0
▲	3	8	6.1	306.0	24.5	18.9	5.6	29.2
●	3	10	9.1	303.0	23.4	15.7	7.7	31.0
◆	4	7	4.6	307.4	24.5	18.3	6.2	29.0
■	4	10	9.1	302.9	19.6	13.9	5.7	29.5
▲	5	10	9.1	303.1	25.6	19.4	6.2	38.1
●	6	7	4.6	307.5	20.8	13.6	7.2	25.4
◆	6	8	6.1	306.0	25.4	16.9	8.6	30.5
■	7	5	3.1	309.1	22.6	15.3	7.3	27.0
▲	7	7	4.6	307.6	26.2	19.2	7.0	28.0

Date: Jan-12
Project: Southbound Passing Lane
W.P: 5217-08-01

Prep'd: AT
Chkd: RG
Ref. No.: 10131-F1

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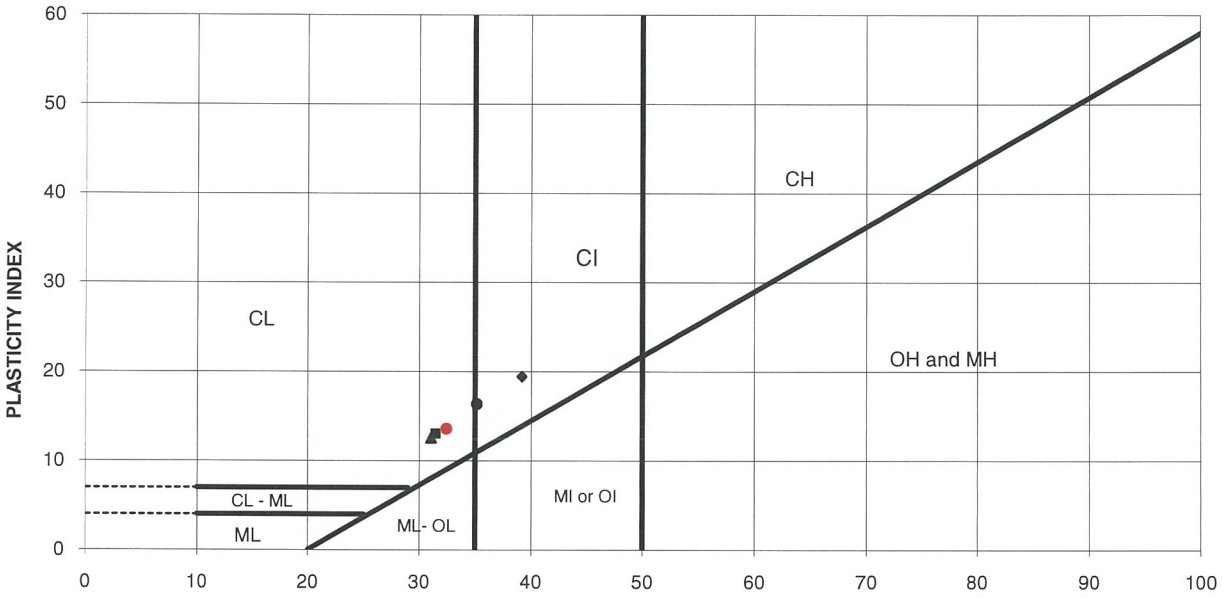
ATTERBERG LIMITS TEST RESULTS

FIGURE L- 5a

ATTERBERG INDICES



LIQUID LIMIT

SYMBOL	BH	Sa. No.	Depth(m)	Elev.(m)	Liquid Limit	Plastic Limit	Plasticity Index	NMC %
●	3	14	15.2	296.9	35.1	18.8	16.3	39.3
◆	3	16	18.3	293.8	39.1	19.7	19.4	45.5
■	4	14	15.2	296.8	31.5	18.4	13.1	28.0
▲	5	13	13.7	298.5	31.1	18.5	12.6	35.6
●	5	15	16.8	295.4	32.4	18.9	13.5	28.0

Date: Jan-12
Project: Southbound Passing Lane
W.P: 5217-08-01

Prep'd: AT
Chkd: RG
Ref. No.: 10131-F1

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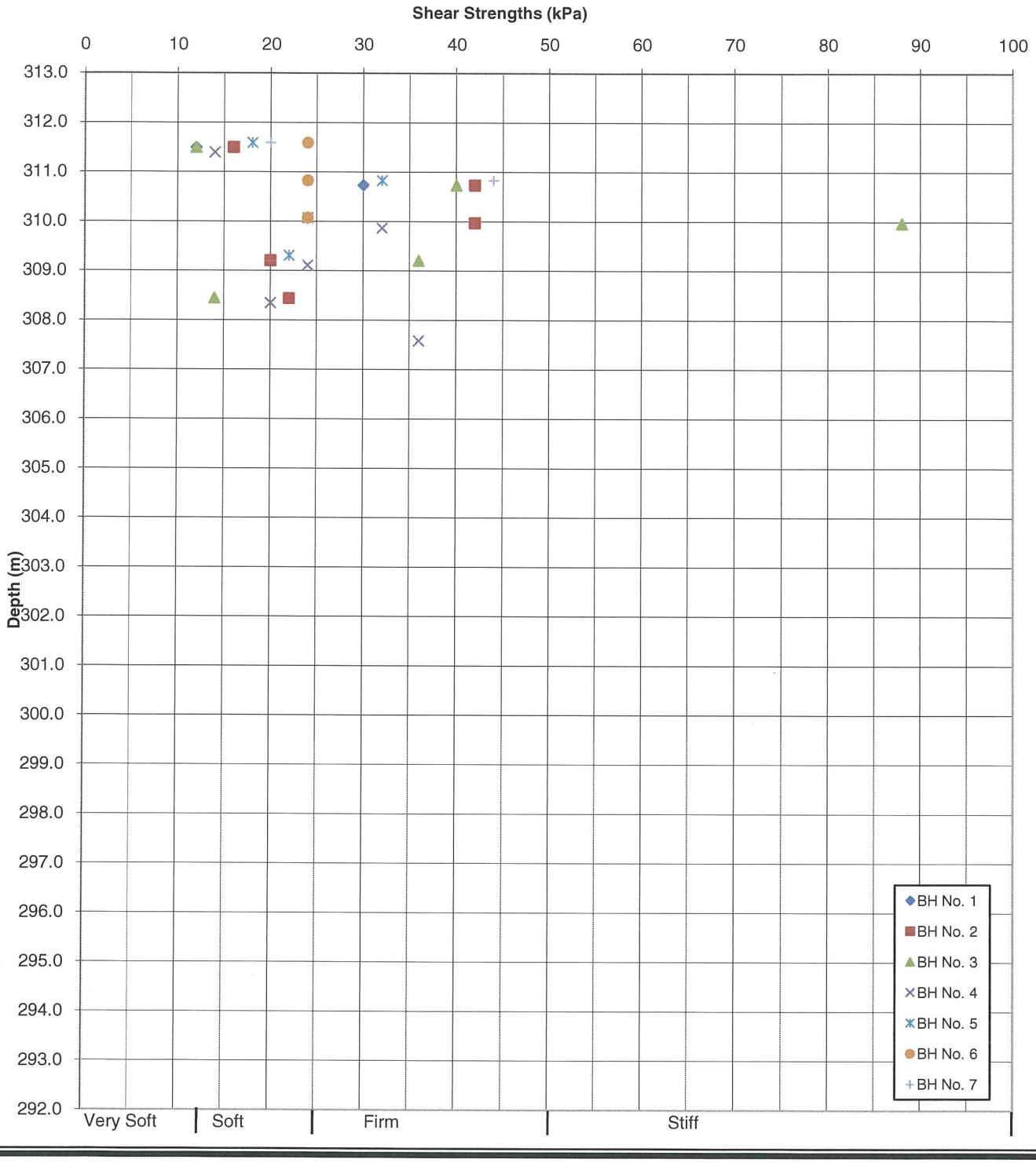
IN-SITU SHEAR STRENGTHS	Figure No. L-6

In-Situ Shear Strengths vs. Depth
Peat



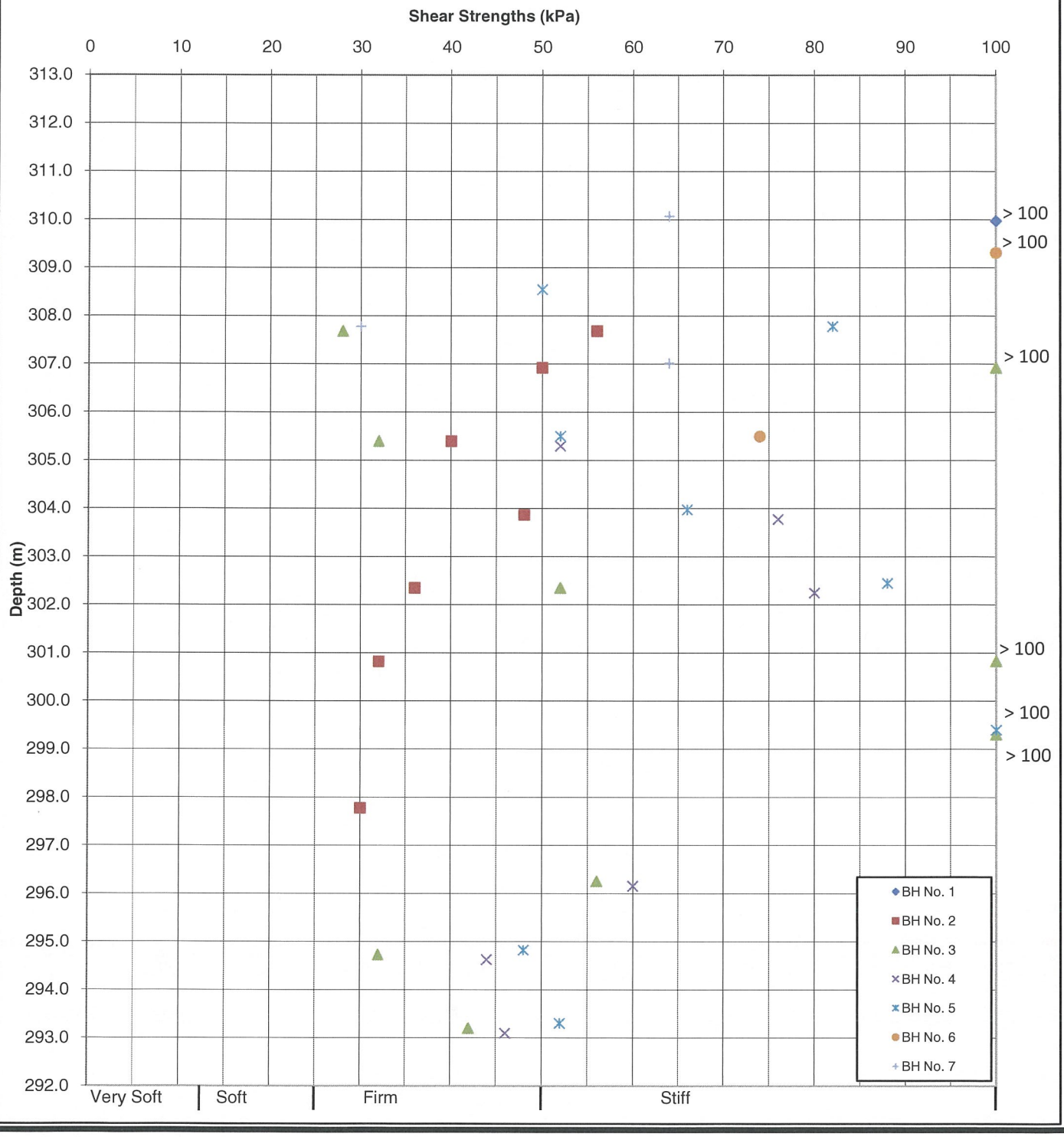
Date: January 2012
Project: 10/07/10131-F1
WP: 5217-08-01

LVM | MERLEX

Checked:MAM

IN-SITU SHEAR STRENGTHS	Figure No. L-7

In-Situ Shear Strengths vs. Depth
Clayey Silt to Silty Clay



Date: January 2012
Project: 10/07/10131-F1
WP: 5217-08-01

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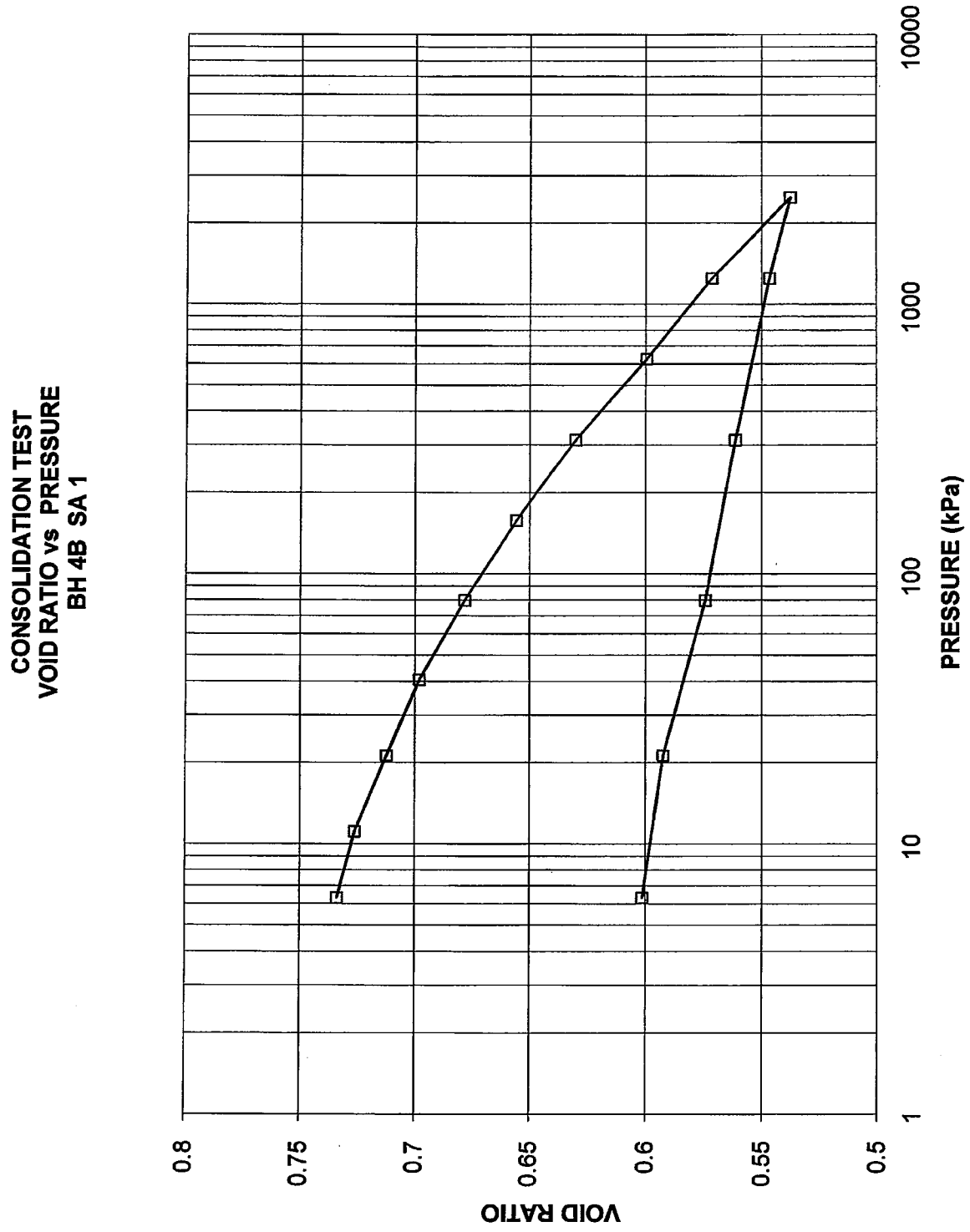
CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE L-8a



Project No. 11-1183-0004

Prepared By: LFG

Golder Associates

Checked By:

CONSOLIDATION TEST SUMMARY

FIGURE L-8b

SAMPLE IDENTIFICATION

Project Number	11-1183-0004	Sample Number	1
Borehole Number	4B	Sample Depth, m	7.6

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	9		
Date Started	2/9/2011		
Date Completed	2/24/2011		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	1.90	Unit Weight, kN/m^3	19.34
Sample Diameter, cm	6.33	Dry Unit Weight, kN/m^3	15.03
Area, cm^2	31.47	Specific Gravity, measured	2.73
Volume, cm^3	59.79	Solids Height, cm	1.065
Water Content, %	28.66	Volume of Solids, cm^3	33.53
Wet Mass, g	117.93	Volume of Voids, cm^3	26.27
Dry Mass, g	91.66	Degree of Saturation, %	100.0

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	c_v cm^2/s	m_v m^2/kN	k cm/s
0.00	1.900	0.783	1.900				
6.31	1.847	0.734	1.874	135	5.51E-03	4.42E-03	2.39E-06
11.10	1.839	0.726	1.843	156	4.62E-03	8.79E-04	3.98E-07
21.21	1.824	0.712	1.832	235	3.03E-03	7.81E-04	2.32E-07
40.51	1.809	0.698	1.817	228	3.07E-03	4.09E-04	1.23E-07
79.60	1.788	0.678	1.799	142	4.83E-03	2.83E-04	1.34E-07
157.35	1.764	0.656	1.776	187	3.58E-03	1.62E-04	5.69E-08
312.99	1.737	0.630	1.750	113	5.75E-03	9.16E-05	5.16E-08
624.50	1.704	0.600	1.720	106	5.92E-03	5.56E-05	3.22E-08
1246.81	1.674	0.571	1.689	88	6.87E-03	2.54E-05	1.71E-08
2490.25	1.638	0.537	1.656	128	4.54E-03	1.53E-05	6.80E-09
1245.23	1.648	0.547	1.643				
312.99	1.663	0.561	1.655				
79.60	1.677	0.574	1.670				
21.21	1.696	0.592	1.687				
6.31	1.706	0.601	1.701				

Note:
k calculated using cv based on t_{90} values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	1.71	Unit Weight, kN/m^3	20.58
Sample Diameter, cm	6.33	Dry Unit Weight, kN/m^3	16.74
Area, cm^2	31.47	Specific Gravity, measured	2.73
Volume, cm^3	53.69	Solids Height, cm	1.065
Water Content, %	22.92	Volume of Solids, cm^3	33.53
Wet Mass, g	112.67	Volume of Voids, cm^3	20.16
Dry Mass, g	91.66		

Prepared By: LFG

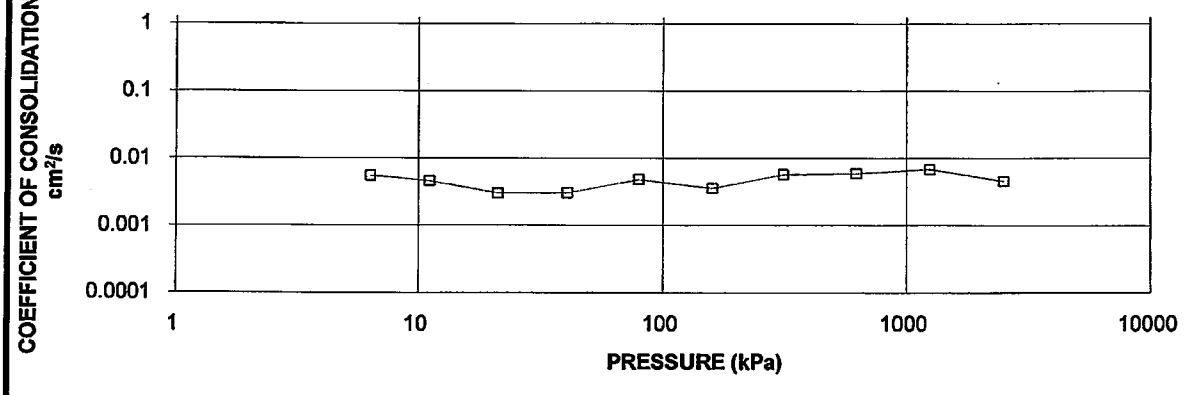
Golder Associates

Checked By:

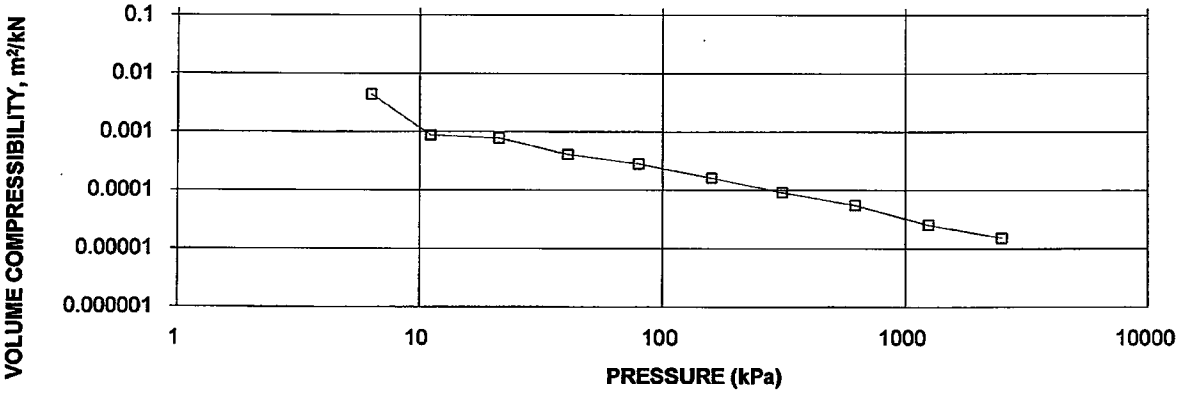
CONSOLIDATION TEST SUMMARY

FIGURE L-8c

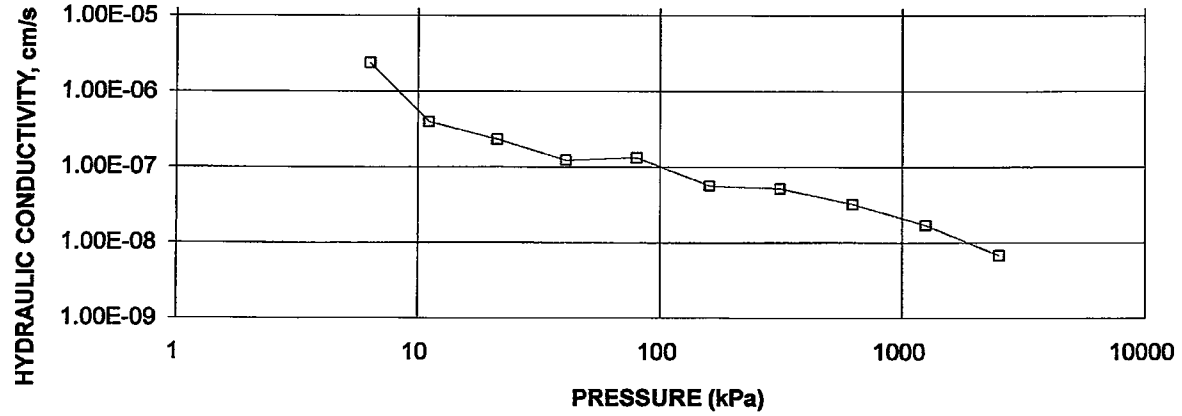
CONSOLIDATION TEST
C_V cm²/s VS PRESSURE (kPa)
BH 4B SA 1



CONSOLIDATION TEST
M_V m²/kN vs PRESSURE (kPa)
BH 4B SA 1



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH 4B SA 1



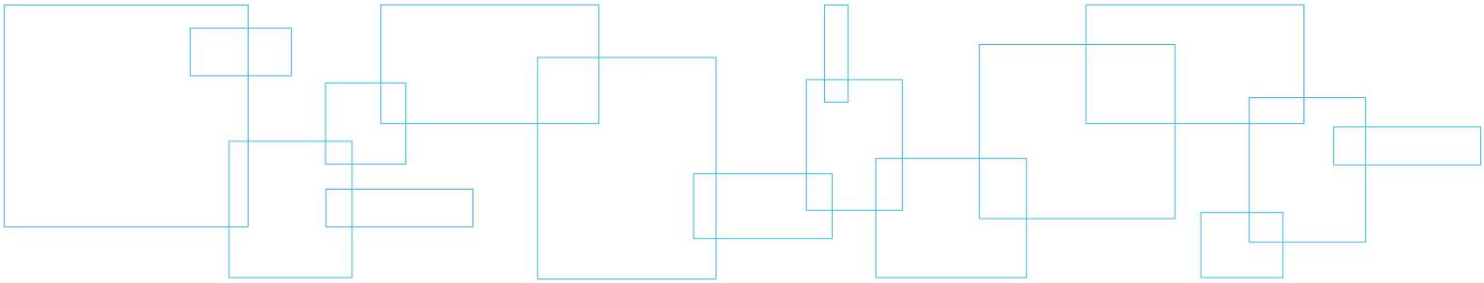
Project No. 11-1183-0004
Prepared By: LFG

Golder Associates

Checked By:

Appendix D Stability Analysis

Figure Nos. S-1 and S-2: Stability Analysis



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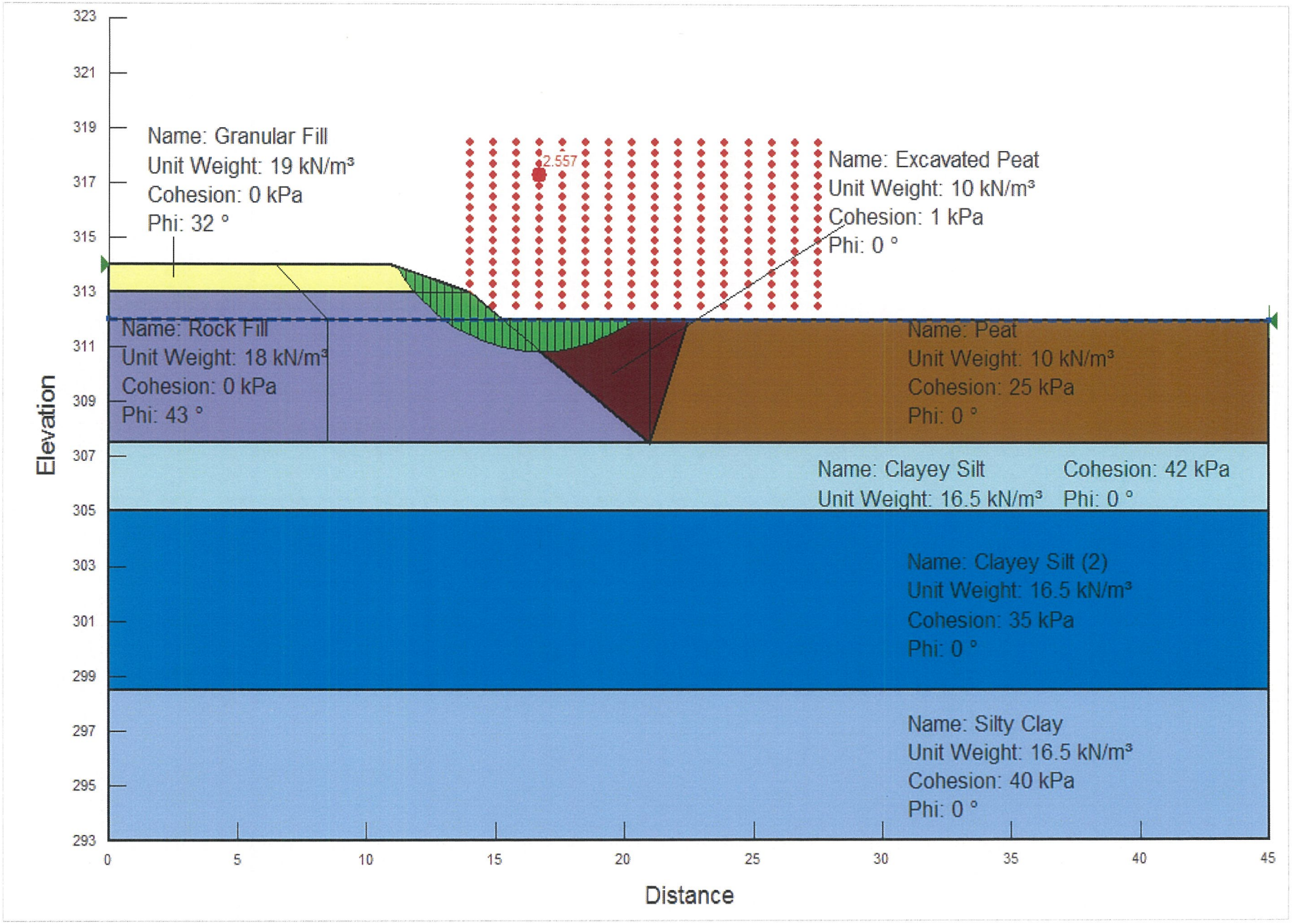
Reference No.: 10/07/10131-F1
Date: January 2012



Station 10+850

Project: G.W.P 5217-08-00
Location: Hwy 11, Passing Lane 1

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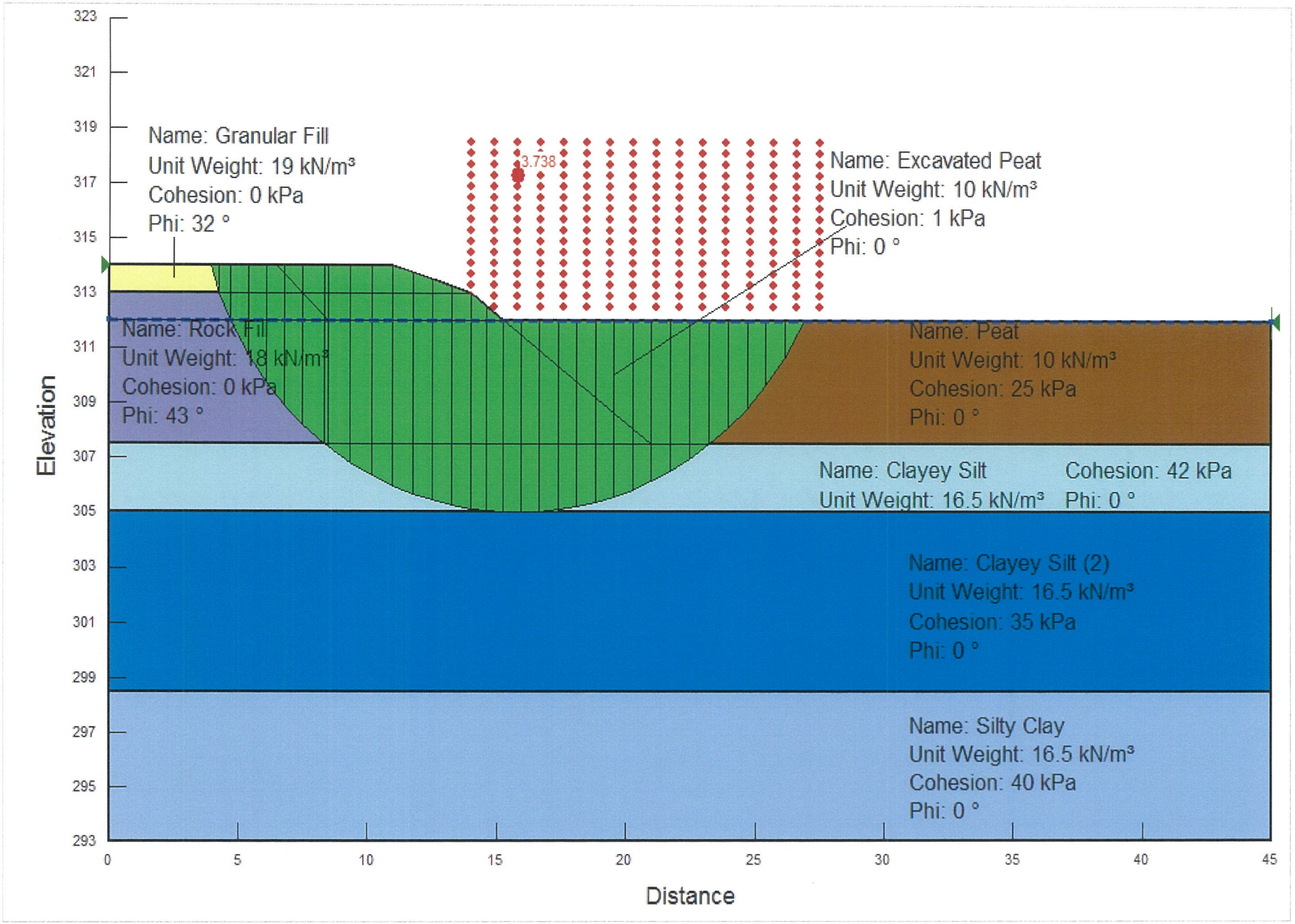
Figure No. S-1



Station 10+850