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FINAL REPORT

Foundation Investigation Report
Almaguin Highlands Information Centre, Township of Perry
Huntsville Area
Fern Glen Road, Highway 11
G.W.P. 5380-02-00

AINLEY & ASSOCIATES LTD.

PROJECT NO. 1037243
GEOCRES #31E-291

Jacques Whitford

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PROJECT NO. 1037243

REPORT TO	**Ainley & Associates Ltd.** **280 Pretty River Parkway** **Collingwood, Ontario** **L9Y4J5**
FOR	**Foundation Investigation Report**
ON	**New Almaguin Highlands Information Centre, Township of Perry** **Fern Glen Road, Highway 11** **Huntsville Area, Ontario** **G.W.P. 5380-02-00** **Geocres #31E-291**

May 6, 2009

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Record of Borehole Sheets
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1.0 INTRODUCTION

Jacques Whitford Limited (Jacques Whitford) was retained by Ainley & Associates Ltd. to complete a Foundation Investigation and Design Report for the new Almaguin Highlands Information Centre to be located at Fern Glen Road on Highway 11, approximately 25 km north of Huntsville, Ontario, (GWP No. 5380-02-00), Township of Perry.

The work was carried out under Agreement No. 5006-E-0050. Authorization to proceed with the investigation was provided by Mr. Mike Neumann, P.Eng., of Ainley & Associates Ltd., the prime consultant on this TPM-design assignment.

This foundation investigation report has been prepared specifically and solely for the project described herein. It contains the factual results of the foundation investigation and the laboratory testing.

2.0 SITE DESCRIPTION

The site is located south east of the interchange of Highway 11 and Fern Glen Road which is approximately 25 km north of Huntsville, Ontario.

Highway 11 is generally oriented in a north south direction with two northbound lanes and two southbound lanes. Highway 11 at Fern Glen Road is built on embankments to a rural highway section with wide gravel shoulders and is generally higher than the surrounding lands.

The subject property which is currently undeveloped is approximately 330 m long and varies in width from approximately 100 m in the north half to approximately 160 m in the south half.

The northern two thirds of the site is currently covered with approximately 5 m of fill material. It is understood that the site was stripped of organic materials and backfilled with compacted earth fill and select subgrade material (SSM) in accordance with MTO Specifications 501.07.03 Compacting and 501.08 Quality Assurance. The top of the fill material has a 1.4% slope down toward the east. The edge of the fill slopes down to the natural grades to the south, east and north at approximately 3H:1V. Drainage for the site is provided by the slopes surrounding the base of the fill pile which slopes down away from the pile at a 1.5 to 2.0% slope.

3.0 PHYSIOGRAPHY

Based on “The Physiography of Southern Ontario”, dated 1984 and issued by the Ministry of Natural Resources, the site is located in area 55 called the Number 11 Strip. There are two sources of sediments in this area: sands, silts and clays from glacial Lake Algonquin and its tributaries and a glacier formed esker. Based on data from the Ontario Geological Survey, the bedrock at the site is noted as migmatitic rocks and gneisses.

4.0 BACKGROUND

A preliminary investigation was carried out by DST Consulting Engineers. The results of the preliminary investigation were provided in the following Preliminary Foundation Investigation and Design report:

Preliminary Foundation Investigation and Design Report
Agreement No. 5005-A-000433
Proposed Almaguin Highlands Information Centre Huntsville, Ontario
Geocres #31E-223, DST Project No. TG04314
Report Dated: March 2, 2005

The factual results from the preliminary investigation, including the Record of Borehole Sheets have been incorporated into this report. It is noted that the compaction records for the fill were appended to the DST Preliminary Report and have been reviewed during the preparation of this report.

5.0 INVESTIGATION PROCEDURES

5.1 Field Program

Test hole locations are indicated on Drawing No. 1 in Appendix A.

The fieldwork for the preliminary investigation was carried out between December 17 and 22, 2004. It is reported by DST Consulting Engineers Inc. that the four 2004 boreholes were drilled with a CME-55 drill rig to depths ranging from 8.2 m to 15.8 m below existing ground surface. Soil samples were acquired from off the augers and from split spoon samplers during Standard Penetration Testing (SPT). Borehole location coordinates were provided by MTO personnel. Ground surface elevations were surveyed by DST relative to a benchmark with a geodetic elevation of 330.295 m.

The field work for the detailed foundation investigation was carried out on November 3 and 4, 2008. A total of 7 boreholes were advanced in 2008 using a truck mounted drill rig equipped with 250 mm (outside diameter) continuous flight hollow-stem augers.

In addition, a water well was drilled at this site on December 3, 2008. The well was drilled using a conventional rotary/air percussion water well rig operated by F.C Hammond Well Drilling Ltd.

Prior to commencing the 2008 field investigation, the borehole locations were cleared of underground utilities by the various utility companies. The borehole locations were established in the field by Jacques Whitford personnel.

Soil samples were recovered from the boreholes at regular intervals using a 50 mm Outside Diameter split-tube sampler by conducting Standard Penetration Tests (SPTs) in general accordance with the procedures outlined in ASTM specification D1586-08a. A dynamic cone penetration test (DCPT) was advanced beyond the depth penetrated with a hollow stem auger in Boreholes BH08-3 and BH08-5 in accordance with ASTM D3441-05. A DCPT was advanced from surface in an area next to Boreholes BH08-2 and BH08-5. They are labelled as BH08-2A and BH08-5A, respectively.

Near surface samples of existing fill were acquired during the pavement investigation at this site at locations identified on Drawing No. 1 as BH 08-26, BH 08-44, BH 08-52 and BH 08-55.

Jacques Whitford field personnel recorded the conditions encountered in all boreholes at the time of the investigation. Soils were described in accordance with the MTO Soils Classification System for foundation reports. All soil samples recovered from the boreholes were placed in moisture-proof bags and transported to our laboratory for detailed classification and testing as required.

Standpipes consisting of 50 mm outside diameter polytube were installed in Boreholes BH08-2 and BH08-7. Groundwater levels were measured in the boreholes during and on completion of drilling. All boreholes were backfilled in accordance with the Ontario Ministry of the Environment Regulation 903, using a cement/bentonite slurry.

Table 5.1 summarizes the test hole locations and depths.

Table 5.1: Borehole Investigation Summary

Borehole No.	Location	Borehole Depth Below Existing Grade	Comments
2004-1	Building	15.8 m	From Preliminary Investigation
2004-2	Building	15.8 m	From Preliminary Investigation
2004-3	Building	15.8 m	From Preliminary Investigation
2004-4	Bus/RV Parking Lot	8.2 m	From Preliminary Investigation

Table 5.1: Borehole Investigation Summary

Borehole No.	Location	Borehole Depth Below Existing Grade	Comments
BH 08-1	Building	9.8 m	-
BH 08-2	Building	9.8 m	-
BH 08-2A	Building	CPT to 10.7 m	Adjacent to BH 08-2
BH 08-3	Building	Sampled to 9.8 m CPT to 19.5 m	-
BH 08-4	Building	9.8 m	-
BH 08-5	Access Road Slope	Sampled to 7.6 m CPT to 18.0 m	-
BH 08-5A	Access Road Slope	CPT to 9.1 m	Adjacent to BH 08-5
BH 08-6	Access Road Slope	12.8 m	-
BH 08-7	Access Road Slope	7.6 m	-
BH 08-26	Access Road	Proctor Sample	Pavement Borehole
BH 08-44	Bus/RV Parking Lot	Proctor Sample	Pavement Borehole
BH 08-52	Car Parking Lot	Proctor Sample	Pavement Borehole
BH 08-55	Car Parking Lot	Proctor Sample	Pavement Borehole
PW 08-1	Near Building	30.5 m	Water Well

5.2 Survey

The borehole locations were established by Jacques Whitford personnel by a GPS device with sub-metre accuracy and were established with respect to the location of proposed building and retaining wall. The site location and borehole locations are provided on Drawing No. 1 in Appendix A.

The ground surface elevation at the borehole locations were measured in the field by Jacques Whitford personnel. The Geodetic datum was a cut cross (stn. #106) on the concrete sidewalk on the north side of the bridge crossing over Highway 11 (Bridge 44-391 2005). The benchmark was provided by J.D. Barnes Limited and has an elevation of 341.877 m geodetic.

5.3 Laboratory Testing

All samples returned to the laboratory were subjected to detailed visual examination and classification. Approximately 25% of the soil samples were submitted for routine testing including moisture content determination, Proctor density, grain size distribution and Atterberg Limits testing. The laboratory results are noted on the Record of Borehole sheets in Appendix B and fully documented in Appendix C. Unless requested in advance, all samples will be stored in our laboratory for a period of 12 months from the issue date of this report.

6.0 RESULTS OF THE INVESTIGATION

6.1 Subsurface Conditions

A Borehole Location Plan and Soil Strata Plots of the soils encountered in the boreholes are provided on Drawing Nos. 1, 2 and 3 in Appendix A.

The subsurface conditions encountered in the boreholes are summarized on the Record of Borehole sheets provided in Appendix B. An explanation of the terms used on the Record of Borehole sheets is also provided in Appendix B.

Laboratory Test Results are provided in Appendix C.

A summary of the soil and groundwater conditions encountered in the 2008 boreholes is provided below.

6.2 Soil

6.2.1 Sand Fill

Sand fill was encountered in Boreholes BH08-1 to BH08-6. The thickness of the sand fill was approximately 1.8 m to 6.7 m, extending to Geodetic elevations of about 326.8 m to 327.9 m.

The sand contained some silt, and trace gravel. Gravel content is higher near the surface of the hole and decreases with depth.

Laboratory testing performed on selected samples consisted of moisture content and grain size distribution tests. The test results are as follows:

- Moisture Content:
  - 5% to 17%
- Grain Size Distribution
  - 0% to 9% gravel;
  - 77% to 94% sand;
  - 5% to 21% fines (silt and clay)

The results of the moisture content tests and grain size distribution are provided on the Record of Borehole sheets in Appendix B. The results of the grain size distribution test are provided on Figure 1 in Appendix C.

A review of the compaction records of the fill as provided in the Preliminary Foundation Investigation and Design Report has been carried out. While it is not possible to pinpoint the individual test locations with respect to the footprint of the proposed building, the general observations in Table 6.1 can be made.

Table 6.1: Compaction Testing Summary

Parameter	Material	
	Earth Fill	SSM
Dry Density (kg/m^3)	1651 to 2012	1695 to 1777
Moisture Content (%)	7.4 to 12.6	8.0 to 12.6
Number of Lots Tested	44	6
Lot Mean %	96.3	97.4

All test results indicated that the target densities corresponding to 95% of Standard Proctor Maximum Dry Density were achieved at initial testing or after recompaction. However, it is noted that maximum dry densities used to control compaction ranged from 1691 kN/m^3 to 1998 kN/m^3; the minimum value being 85% of the maximum value.

Standard Proctor Density Testing was carried out by Jacques Whitford on samples acquired near ground surface at four locations. The results are summarized in Table C1 in Appendix C. The Maximum Dry Density (MDD) was observed to range from 1712 kg/m^3 to 1847 kg/m^3 and the Optimum Moisture Content (OMC) varied from 12.4% to 15.5%. The range in results is likely due to the tight gradation of this material. Significant deviations to MDD and OMC should be anticipated for minor shifts to fines content.

Chemical testing was carried out on three samples of the fill materials by Paracel Laboratories Ltd. The results are provided in Appendix C and summarized in Table 6.2 below:

Table 6.2: Chemical Test Results

Parameter	Sample Units	BH 08-2 SS 1	BH 08-3 SS 2	BH 08-6 SS 9
pH	-	7.77	6.87	6.31
Resistivity	ohm-m	99	549	445
Chloride	µg/g	<5	<5	<5
Sulphate	µg/g	55	<5	9

6.2.2 Organic Material

A 100 mm layer of topsoil was observed at ground surface at BH 08-7.

A 200 mm thick layer of non-fibrous, dark brown peat and organic silt was encountered in Borehole BH08-3 at a depth of approximately 6.0 m to 6.2 m below existing grade, elevations of about 327.0 m to 327.2 m. The non-fibrous peat contained some silty clay, trace sand and was saturated.

Based on the N-values obtained from the SPTs, the compactness of the non-fibrous peat and organic silt was determined to be loose.

Laboratory testing performed on selected samples consisted of moisture content and organic content. The tests results are as follows:

- Moisture content:
  - 113%
- Organic content:
  - 9.2%

The results of the moisture content and organic content test are provided on the Record of Borehole sheets in Appendix B. The results of the grain size distribution tests are provided in Appendix C.

6.2.3 Sand With Silt (SP-SM) to Sandy Silt (ML)

Sand with silt to sandy silt was encountered below the fill and organics in all boreholes. The thickness of sand was sampled to depths up to 12.8 m below ground surface, equal to 320.3 m Geodetic elevation. Dynamic cone penetration tests (DCPT) were advanced after auguring in Boreholes BH08-3 and BH08-5. DCPT testing was performed from surface adjacent to Boreholes BH08-2 and BH08-5 and are labelled as BH08-2A and BH08-5A, respectively. The results of the DCPT testing are provided on the Record of Borehole sheets in Appendix B. The sand with silt to sandy silt layer was inferred to extend to as much as 19.5 m below ground surface or 310.7 m Geodetic elevation based on the DCPT results. The water well drilled on the site (PW08-1) noted overburden extending to a depth of 30.5 m or a Geodetic elevation of 302.9 m.

Discrete yet discontinuous intervals of sandy silt were noted throughout the deposit. These siltier layers were observed to be as much as 2.3 m in thickness.

A summary of the observed SPT-N values as well as the DCPT results is provided in a figure in Appendix C. The N values ranged from 1 blow/0.3 m to 17 blows/0.3 m indicating a very loose to compact deposit. The DCPT results in the native soils within 10 m of ground surface range from 1 blow/0.3 m to 34 blows/0.3 m. The DCPT results from deeper than 10 m below ground surface range from 5 blows/0.3 m to 65 blows/0.3 m.

Laboratory testing performed on selected samples consisted of moisture content, grain size distribution and Atterberg Limits tests. The test results are as follows:

- Moisture Content:
  - 16% to 24%
- Grain Size Distribution
  - 0% gravel;
  - 31% to 95% sand;
  - 5% to 69% fines (silt and clay)

Three samples were submitted for Atterberg Limits testing. The test results indicated that the samples were non-plastic.

The results of the moisture content tests, grain size distribution tests and Atterberg limit tests are provided on the Record of Borehole sheets in Appendix B as well as in Appendix C.

6.3 Groundwater

Groundwater levels were measured in the standpipes installed in BH08-2 and BH08-7. In addition, groundwater levels were estimated in the open augers in the remaining boreholes. Groundwater was observed at the depths and elevations provided in Table 6.3.

Table 6.3: Groundwater Observations

Borehole Number	Measured Groundwater	
	Depth Below Existing Grade (m)	Elevation (m)
BH08-1	5.2	328.1
BH08-2	4.9	328.7
BH08-3	4.6	328.6
BH08-4	5.2	328.1
BH08-5	0.6	328.1
BH08-6	5.2	327.9
BH08-7	0.4	328.0

It should be noted that groundwater levels are subject to seasonal fluctuations and responses to precipitation events.

6.4 Bedrock

Bedrock was not observed to the planned termination depth of the boreholes drilled at this site. Overburden was observed to extend to a depth of 30.5 m below ground surface or Geodetic Elevation 302.9 m in the water well, PW08-1.

7.0 CLOSURE

A soil investigation is a limited sampling of a site. The information is gathered at specific borehole locations and can only be extrapolated to an undefined limited area around the borehole locations. The extent of the limited area depends on the variability of the soil and ground water conditions as influenced by geological processes, as well as the history of the site reflecting natural conditions, construction activities and site use. Should any conditions at the site be encountered that differ from those at the borehole locations, we request that we be notified immediately in order to assess the additional information.

We trust the above information meets with your present requirements. Should you have any questions or require further information, please do not hesitate to contact us at your convenience.

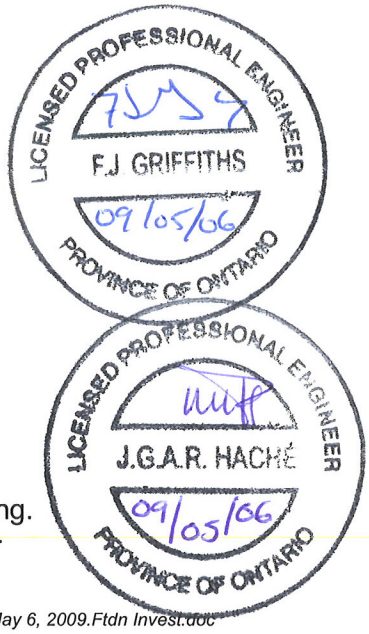
Regards,

JACQUES WHITFORD LIMITED

Elizabeth A. Garven, A.Sc.T., B.Eng.

Fred J. Griffiths, Ph. D., P. Eng.
Designated Principal
MTO Foundations Contact

J.G. A. Raymond Haché, M.Sc., P.Eng.
Principal and Senior Service Director



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STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Jacques Whitford Limited and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Jacques Whitford's present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Jacques Whitford is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

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

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

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

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

Appendix A

Drawings

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

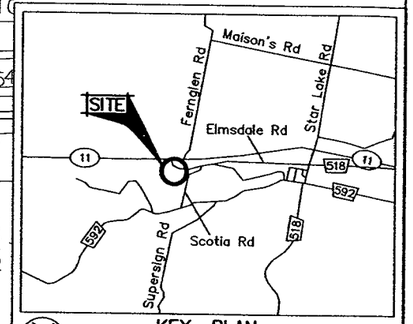
CONT No XX
WP No 5380-02-00

HIGHWAY 11 – ALMAGUIN HIGHLANDS INFORMATION CENTRE STATION
BORE HOLE LOCATIONS

SHEET –

Jacques Whitford

SEPTIC BED AREA
SEPTIC TANK
PICNIC AREA
GRASSED SWALE
PLAYGROUND EQUIPMENT
PLAYGROUND
STORAGE SHED
REFUSE BIN
WALKWAY
DOG WALK
ALMAGUIN HIGHLANDS INFORMATION CENTRE
CAR PARKING
BUS AND RV PARKING
SNOWMOBILE PULL-OFF
SEPTIC ACCESS
E-N RAMP
TBM
OPSD 912.14
OPSD 972.130
OPSD 600.110
CULVERT
RIP-RAP
PAVED
RFC
PROPERTY LINE
GRASSED FLAT BOTTOM DITCH
BH08-1
BH08-2
BH08-3
BH08-4
BH08-5
BH08-6
BH08-7
BH08-26
BH08-44
BH08-52
BH08-55
2004-1
2004-2
2004-3
2004-4
PW08-1
A
A'
B
B'
C
C'
D
D'



KEY PLAN
1 km 0 1 2 km

LEGEND
- Borehole
- Borehole & Cone Penetration Test
- Grab Sample
- Water Well
- Temporary Benchmark TBM 341.877 m Geodetic

No	ELEV	COORDINATES NORTH	EAST
BH08-1	333.3	5 041 264.6	320 193.8
BH08-2	333.6	5 041 284.1	320 181.3
BH08-3	333.2	5 041 277.1	320 213.3
BH08-4	333.3	5 041 296.6	320 200.8
BH08-5	328.7	5 041 335.0	320 221.0
BH08-6	333.1	5 041 381.1	320 196.7
BH08-7	328.4	5 041 422.0	320 168.3
BH08-26	333.1	5 041 398.6	320 176.5
BH08-44	333.7	5 041 369.0	320 146.2
BH08-52	333.3	5 041 306.6	320 208.7
BH08-55	333.4	5 041 302.2	320 193.0
2004-1	332.4	5 041 259.4	320 212.7
2004-2	332.6	5 041 291.5	320 209.3
2004-3	332.7	5 041 273.9	320 186.0
2004-4	332.7	5 041 346.5	320 156.3
PW08-1	333.3	5 041 297.9	320 215.3

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

REVISIONS	DATE	BY	DESCRIPTION

GEOCRES No 31E-291

HWY No 11			DIST XXX
SUBM'D EG	CHECKED	DATE 2009-04-24	SITE XX-XXX
DRAWN GBB	CHECKED	APPROVED	DWG 1

LICENSED PROFESSIONAL ENGINEER
F.J. GRIFFITHS
09/05/06
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
J.G.A.R. HACHÉ
09/05/06
PROVINCE OF ONTARIO

PLAN
SCALE
10 m 0 10 20 m

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METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No XX
WP No 5380-02-00

HIGHWAY 11 – ALMAGUIN HIGHLANDS INFORMATION CENTRE
–
SOIL STRATA

SHEET
–

Jacques Whitford

CROSS–SECTION A–A'

SCALE
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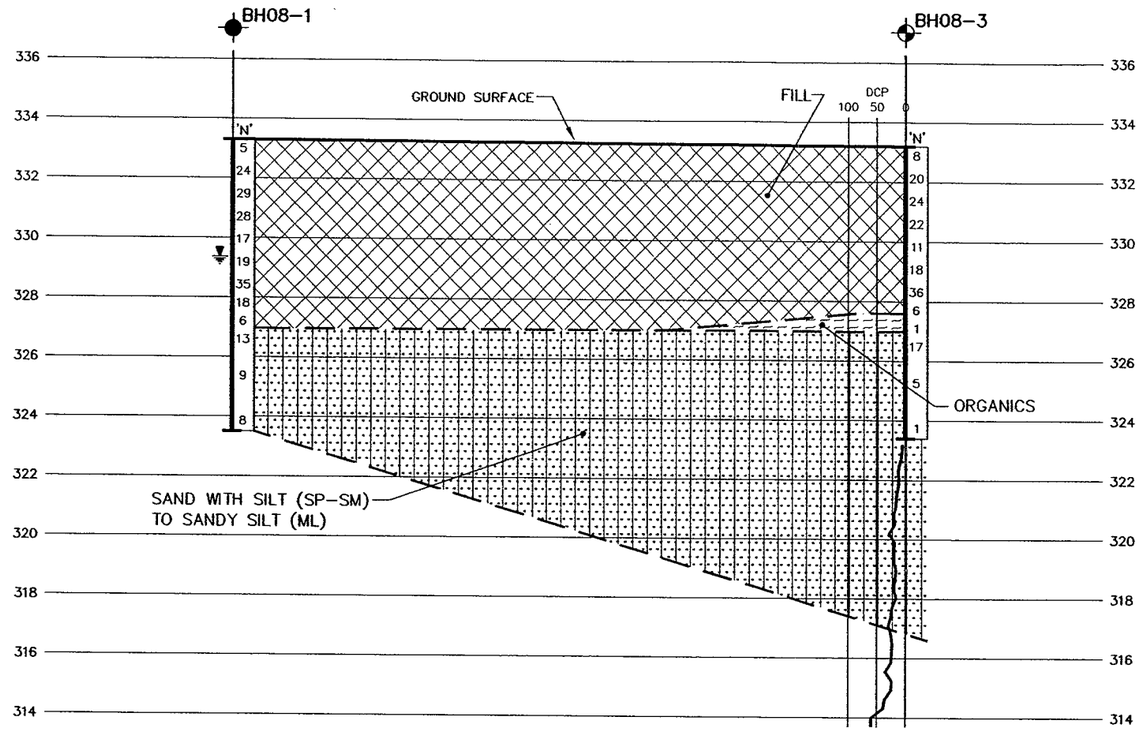

CROSS–SECTION B–B'

SCALE
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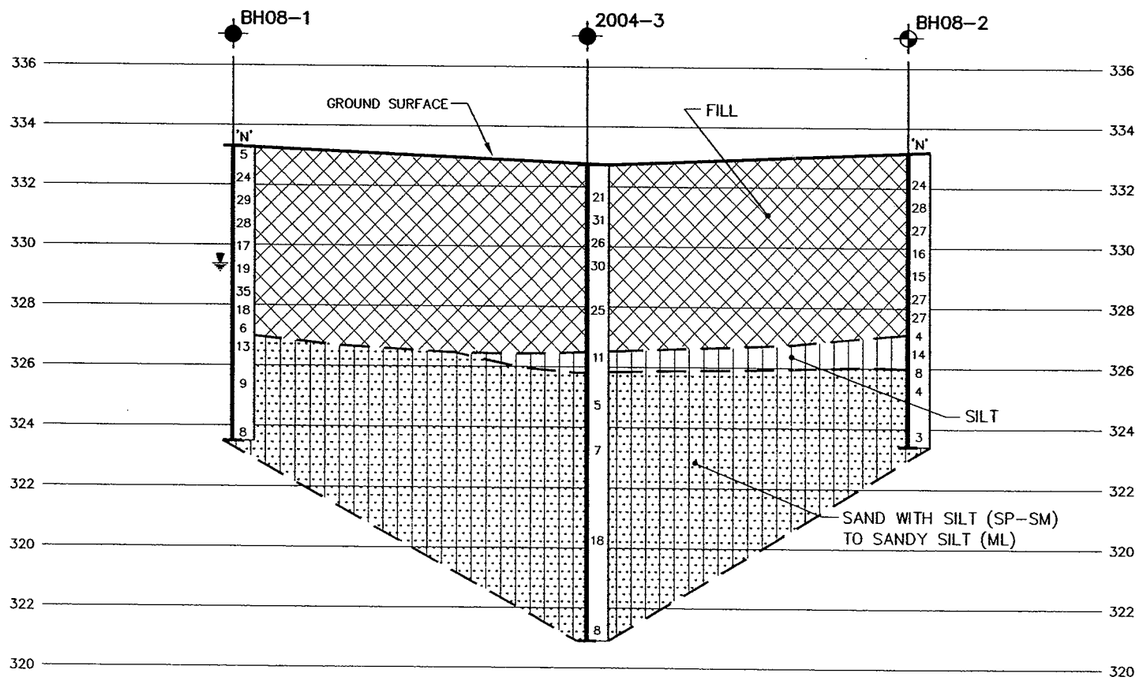

LICENSED PROFESSIONAL ENGINEER
F.J. GRIFFITHS
09/05/06
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
J.G.A.R. HACHÉ
09/05/06
PROVINCE OF ONTARIO

LEGEND

- Borehole
- Borehole & Cone Penetration Test
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- DCP Dynamic Cone Penetration
- WL at time of investigation (Nov 2008)
- WL in Piezometer
- Piezometer

No	ELEV	COORDINATES NORTH	EAST
BH08–1	333.3	5 041 264.6	320 193.8
BH08–2	333.6	5 041 284.1	320 181.3
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REVISIONS			
		–	
	DATE	BY	DESCRIPTION

GEOCRES No 31E–291

HWY No 11			DIST XXX
SUBM'D EG	CHECKED	DATE 2009–04–24	SITE XX–XXX
DRAWN GBB	CHECKED	APPROVED	DWG 2

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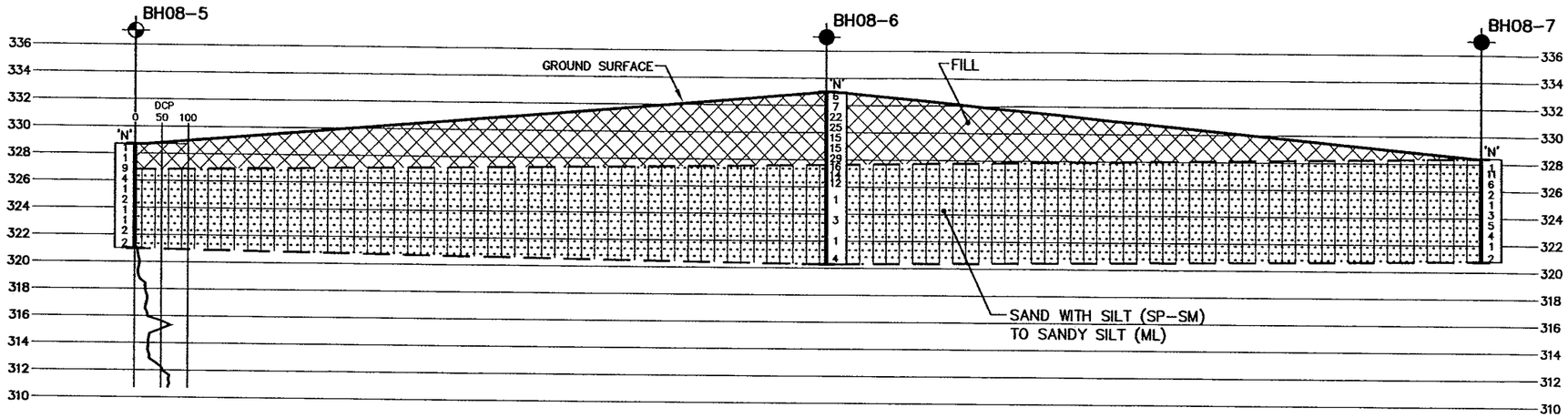
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No XX
WP No 5380-02-00

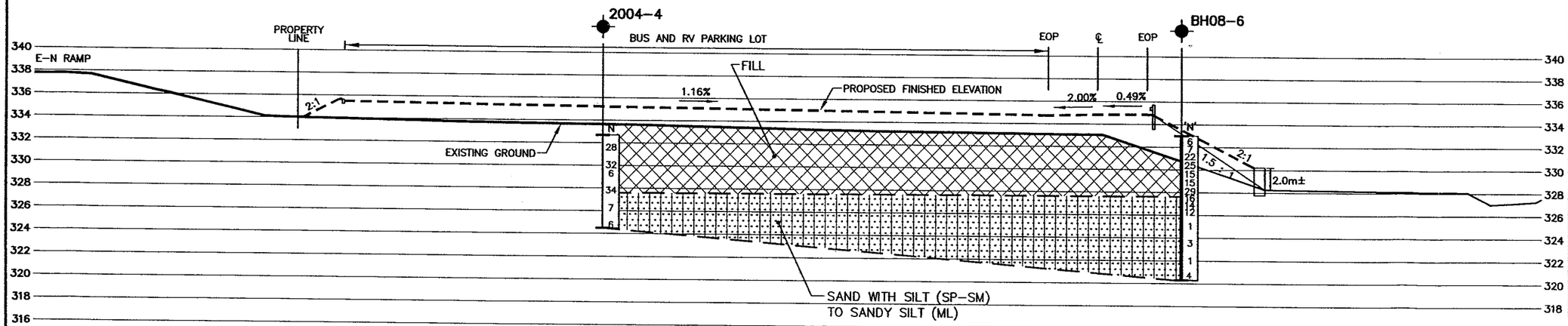
HIGHWAY 11 – ALMAGUIN HIGHLANDS INFORMATION CENTRE
–
SOIL STRATA

SHEET
–

Jacques Whitford



CROSS-SECTION C-C'
SCALE
4 m 0 4 8 m



CROSS-SECTION D-D'
SCALE
4 m 0 4 8 m

LEGEND

- Borehole
- Borehole & Cone Penetration Test
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- DCP Dynamic Cone Penetration
- WL at time of investigation (Nov 2008)
- WL in Piezometer
- Piezometer

No	ELEV	COORDINATES NORTH	EAST
BH08-1	333.3	5 041 264.6	320 193.8
BH08-2	333.6	5 041 284.1	320 181.3
BH08-3	333.2	5 041 277.1	320 213.3
BH08-4	333.3	5 041 296.6	320 200.8
BH08-5	328.7	5 041 335.0	320 221.0
BH08-6	333.1	5 041 381.1	320 196.7
BH08-7	328.4	5 041 422.0	320 168.3
BH08-26	333.1	5 041 398.6	320 176.5
BH08-44	333.7	5 041 369.0	320 146.2
BH08-52	333.3	5 041 306.6	320 208.7
BH08-55	333.4	5 041 302.2	320 193.0
2004-1	332.4	5 041 259.4	320 212.7
2004-2	332.6	5 041 291.5	320 209.3
2004-3	332.7	5 041 273.9	320 186.0
2004-4	332.7	5 041 346.5	320 156.3
PW08-1	333.3	5 041 297.9	320 215.3

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

REVISIONS		
DATE	BY	DESCRIPTION
—	–	

GEOCRES No 31E-291

HWY No 11			DIST XXX
SUBM'D EG	CHECKED	DATE 2009-04-24	SITE XX-XXX
DRAWN GBB	CHECKED	APPROVED	DWG 3

LICENSED PROFESSIONAL ENGINEER
F.J GRIFFITHS
09/05/06
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
J.G.A.R. HACHÉ
09/05/06
PROVINCE OF ONTARIO

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Appendix B

Terms and Symbols Used on the Record of Borehole Sheet

Record of Borehole Sheets

Record of Borehole Sheets from Preliminary Geotechnical Investigation

Jacques Whitford

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

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

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488). The classification excludes particles larger than 76 mm (3 inches). The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

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

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

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

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests.

Consistency	Undrained Shear Strength	
	kips/sq.ft.	kPa
Very Soft	<0.25	<12.5
Soft	0.25 - 0.5	12.5 - 25
Firm	0.5 - 1.0	25 - 50
Stiff	1.0 - 2.0	50 – 100
Very Stiff	2.0 - 4.0	100 - 200
Hard	>4.0	>200

ROCK DESCRIPTION

Terminology describing rock quality:

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

Rock quality classification is based on a modified core recovery percentage (RQD) in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on NW core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from *in situ* fractures. The terminology describing rock mass quality based on RQD is subjective and is underlain by the presumption that sound strong rock is of higher engineering value than fractured weak rock.

Terminology describing rock mass:

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

Terminology describing rock strength:

Strength Classification	Unconfined Compressive Strength (MPa)
Extremely Weak	< 1
Very Weak	1 – 5
Weak	5 – 25
Medium Strong	25 – 50
Strong	50 – 100
Very Strong	100 – 250
Extremely Strong	> 250

Terminology describing rock weathering:

Term	Description
Fresh	No visible signs of rock weathering. Slight discolouration along major discontinuities
Slightly Weathered	Discolouration indicates weathering of rock on discontinuity surfaces. All the rock material may be discoloured.
Moderately Weathered	Less than half the rock is decomposed and/or disintegrated into soil.
Highly Weathered	More than half the rock is decomposed and/or disintegrated into soil.
Completely Weathered	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.

STRATA PLOT

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

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

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
PS	Piston sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

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

N-VALUE / RQD

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and N-values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N value corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log. RQD is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to A size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (305 mm) into the soil. The DCPT is used as a probe to assess soil variability. Soil type may be inferred from adjacent boreholes and test pits.

OTHER TESTS

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

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

RECORD OF BOREHOLE No BH 08-1 1 OF 1 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Building E320194 N5041265 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.04 - 08.11.04 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, × FIELD VANE, X LAB VANE) 20 40 60 80 100	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT / LIQUID LIMIT W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
333.3	Sand Fill										
0.0	Sand with silt, trace gravel, occasional cobbles, loose to dense, brown (FILL)		1	SS	5		333				
			2	SS	24		332				
			3	SS	29						
	- gravel decreasing with depth		4	SS	28		331				
			5	SS	17		330				
			6	SS	19		329				
			7	SS	35	▽					
			8	SS	18		328				
327.0			9	SS	6		327				
6.4	Sand with silt (SP-SM), loose to compact, grey		10	SS	13						
			11	SS	9		326				
			12	SS	8		325				
323.6							324				
9.8	End of Borehole										

$\times^3$, X^3: Numbers refer to Sensitivity $O^{3\%}$ STRAIN AT FAILURE

ONTARIO MTO 1037243.GPJ ONTARIO MOT.GDT 09/01/16

RECORD OF BOREHOLE No BH 08-2 1 OF 1 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Building E320181 N5041284 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.04 - 08.11.04 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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 ● QUICK TRIAXIAL ✖ FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
333.6	Sand Fill										
0.0	Sand with silt, trace gravel, occasional cobbles, loose to compact, brown (FILL)						333				
			1	SS	24				○		5 84 (11)
							332				
			2	SS	28						
	- gravel decreasing with depth										
			3	SS	27		331		○		3 89 (8)
			4	SS	16						
							330				
			5	SS	15				○		
							329				
			6	SS	27	▼					
			7	SS	27		328		○		0 86 (14)
			8	SS	4						
326.8							327				
6.7	Sandy silt (ML), loose, grey to brownish grey		9	SS	14						
	- non-plastic		10	SS	8				○		0 31 63 6
							326				
325.6			11	SS	4						
8.0	Sand with silt (SP-SM), very loose, grey to brownish grey						325				
	- non-plastic		12	SS	3				○		0 65 32 3
323.8							324				
9.8	End of Borehole Standpipe Installed										

ONTARIO MTO 1037243.GPJ ONTARIO MOT.GDT 09/01/29

RECORD OF BOREHOLE No BH 08-2A 1 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Building E320181 N5041284 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE Dynamic Cone Test from Surface COMPILED BY JF

DATUM Geodetic DATE 08.11.04 - 08.11.04 CHECKED BY FG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)		
333.6	Sand Fill									kN/m³	GR SA SI CL
0.0	Dynamic Cone Test from Ground Surface										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: 20 40 60 80 100
- O UNCONFINED
- ● QUICK TRIAXIAL
- ✖ FIELD VANE
- × LAB VANE

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

WATER CONTENT (%): 10 20 30

ELEVATION SCALE: 333 332 331 330 329 328 327 326 325 324

Continued Next Page

✖³, ×³: Numbers refer to Sensitivity

O^3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH 08-2A 2 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Building E320181 N5041284 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE Dynamic Cone Test from Surface COMPILED BY JF

DATUM Geodetic DATE 08.11.04 - 08.11.04 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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 ● QUICK TRIAXIAL ✖ FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Dynamic Cone Test from Ground Surface *(continued)* Dynamic Cone Test from Ground Surface										
322.9							323				
10.7	End of Test at 10.69 m										

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

RECORD OF BOREHOLE No BH 08-3 1 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Building E320213 N5041277 ORIGINATED BY DS

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.04 - 08.11.04 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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 ● QUICK TRIAXIAL × FIELD VANE X LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
333.2	Sand Fill										
0.0	Sand with silt, trace gravel, occasional cobbles, loose to dense, brown (FILL)		1	SS	8		333				
			2	SS	20		332		○		7 84 (9)
	- gravel decreasing with depth		3	SS	24						
331.2							331				
2.0	Lean silt, trace gravel, loose to dense, brown (FILL)		4	SS	22				○		0 79 (21)
			5	SS	11		330				
329.2											
4.0	Sand with silt, loose to dense, brown (FILL)		6	SS	18	▽	329		○		
			7	SS	36						
			8	SS	6		328		○		1 94 (5)
327.2											
6.0	Organic layer, loose, dark brown - organic content=9.2%		9	SS	1		327			112.5	0 51 (49)
327.0											
6.2	Silty SAND (SM), loose to compact, grey		10	SS	17				○		0 90 (10)
							326				
325.2			11	SS	5						
8.0	Sand with silt (SP-SM), very loose, grey						325				
			12	SS	1		324		○		
323.5											
9.8	- inferred Sand with silt (SP-SM)										

Continued Next Page

RECORD OF BOREHOLE No BH 08-3 2 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Building E320213 N5041277 ORIGINATED BY DS

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.04 - 08.11.04 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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 (O UNCONFINED, ● QUICK TRIAXIAL, ✖ FIELD VANE, × LAB VANE; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	- inferred Sand with silt (SP-SM) *(continued)*						323				
							322				
							321				
							320				
							319				
							318				
							317				
							316				
							315				
							314				
313.7 19.5	End of Borehole										

✖³, ×³: Numbers refer to Sensitivity O^3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH 08-4 1 OF 1 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Building E320201 N5041297 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.04 - 08.11.04 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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 ● QUICK TRIAXIAL ✕ FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
333.3	Sand Fill										
0.0	Sand with silt, trace gravel, occasional cobbles, loose to compact, brown (FILL)						333				
			1	SS	15						
							332				
			2	SS	29						
	- gravel decreasing with depth						331				
			3	SS	27						
							330				
			4	SS	22						
			5	SS	23		329				
			6	SS	32	▽					
			7	SS	13		328				
327.0			8	SS	4						
6.3	SAND with silt (SP-SM), loose to compact , grey		9	SS	13		327				
							326				
			10	SS	4						
							325				
			11	SS	5		324				
323.5											
9.8	End of Borehole										

$\times^{3}$, $\times^{3}$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

RECORD OF BOREHOLE No BH 08-5 1 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Retaining Wall E320221 N5041335 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.06 - 08.11.06 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE
328.7	Tall Grass						
0.0	Sand with silt, trace gravel, very loose, brown		1	SS	1	▽	328
328.1							
0.6	Sand, with high organic content, very loose, dark brown		2	SS	1		
326.8			3	SS	9		327
1.8	SAND with silt (SP-SM), loose, grey						
326.5	- gravel decreasing with depth						
2.1	SAND with silt (SP-SM), very loose, greyish brown		4	SS	4		326
			5	SS	1		325
			6	SS	2		
			7	SS	1		324
			8	SS	1		323
			9	SS	2		
							322
			10	SS	2		
321.1							321
7.6	- inferred SAND with silt (SP-SM)						
							320
							319

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 (%) 10 20 30

UNIT WEIGHT γ kN/m³

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

ONTARIO MTO 1037243.GPJ ONTARIO MOT.GDT 09/01/29

Continued Next Page

RECORD OF BOREHOLE No BH 08-5 2 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Retaining Wall E320221 N5041335 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.06 - 08.11.06 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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
	- inferred SAND with silt (SP-SM) *(continued)*						318				
							317				
							316				
							315				
							314				
							313				
							312				
							311				
310.7 18.0	End of Borehole										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

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

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

WATER CONTENT (%): 10 20 30

$\times^3$, $\times^3$: Numbers refer to Sensitivity

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

RECORD OF BOREHOLE No BH 08-5A 1 OF 1 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Retaining Wall E320221 N5041335 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE Dynamic Cone Test from Surface COMPILED BY JF

DATUM Geodetic DATE 08.11.06 - 08.11.06 CHECKED BY FG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL × FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
328.7	Tall Grass										
0.0	Dynamic Cone Test from Ground Surface						328				
							327				
							326				
							325				
							324				
							323				
							322				
							321				
							320				
319.5											
9.1	End of Test at 9.14m										

$\times^3, \times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

RECORD OF BOREHOLE No BH 08-6 1 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Retaining Wall E320197 N5041381 ORIGINATED BY DS

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.03 - 08.11.03 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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, QUICK TRIAXIAL, FIELD VANE, LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
333.1	Sand Fill										
0.0	Sand with silt, trace gravel, occasional cobbles, loose to compact, brown (FILL)		1	SS	6		333				
			2	SS	7		332				9 77 (14)
			3	SS	22						
	- gravel decreasing with depth						331				
			4	SS	25						
			5	SS	15		330				1 93 (6)
			6	SS	15		329				
			7	SS	29	▽					
327.9							328				
5.2	SAND with silt (SP-SM), compact, grey		8	SS	16						
			9	SS	14		327				0 90 9 1
	- non-plastic										
			10	SS	12		326				
325.5											
7.6	SAND with silt (SP-SM), very loose, brown		11	SS	1		325				0 88 (12)
			12	SS	3		324				

Continued Next Page

RECORD OF BOREHOLE No BH 08-6 2 OF 2 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Retaining Wall E320197 N5041381 ORIGINATED BY DS

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.03 - 08.11.03 CHECKED BY FG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, ● QUICK TRIAXIAL, × FIELD VANE, X LAB VANE, 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	SAND with silt (SP-SM), very loose, brown *(continued)*						323				
			13	SS	1		322		o		0 95 (5)
							321				
320.3			14	SS	4						
12.8	End of Borehole										

RECORD OF BOREHOLE No BH 08-7 1 OF 1 METRIC

W.P. GWP 5380-02-00 LOCATION Proposed Retaining Wall E320168 N5041422 ORIGINATED BY JF

DIST Huntsville HWY 11 BOREHOLE TYPE HS Augers, Split Spoons COMPILED BY JF

DATUM Geodetic DATE 08.11.06 - 08.11.06 CHECKED BY FG

ELEV / DEPTH	DESCRIPTION	STRAT 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: O UNCONFINED, ● QUICK TRIAXIAL, ✕ FIELD VANE, × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
328.4	Tall Grass										
328.3	TOPSOIL										
0.1	SAND with silt (SP-SM), loose to compact, grey		1	SS	1	▼	328				
						▽					
			2	SS	11						
							327				
			3	SS	6						
	- gravel decreasing with depth										
326.1											
2.3	SAND with silt, very loose to loose, greyish brown		4	SS	2		326				
			5	SS	1		325				
			6	SS	3						
							324				
			7	SS	5						
			8	SS	4		323				
			9	SS	1		322				
			10	SS	2		321				
320.8											
7.6	End of Borehole										
	Standpipe Installed										

ONTARIO MTO 1037243.GPJ ONTARIO MOT.GDT 09/01/29

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 2004-1 1 OF 1 METRIC

W.P. 5005-A-000433 Assign 5 LOCATION MTM N 5041259.4 E 320212.7 ORIGINATED BY A.F.

DIST Huntsville HWY BOREHOLE TYPE Hollow Stem Auger COMPILED BY T.G.

DATUM Geodetic DATE 17.12.04 CHECKED BY R.C.

ELEV / DEPTH	DESCRIPTION	STRAT 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 (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
332.4											
0.0	FILL - SAND - trace gravel, trace silt, brown						332				Water level @ 3.7m on December 22, 2004. Cave @ 3.3m on completion.
			1	SS	26						
			2	SS	42		331				
			3	SS	25		330		o		1 91 (8)
			4	SS	31		329				
			5	SS	21		328				
326.0			6	SS	23		327				
6.4	SAND & SILT - layered, grey, compact						326		o		0 83 (37)
323.3							325				
9.1	SAND - Silty, grey/brown, loose to compact		7	SS	4		324				
			8	SS	10		323				
			9	SS	13		322				
316.6							321		o		0 76 (24)
15.8	End of Borehole @ 15.8m.						320				Well installed to 4.9m. Stickup Steel protector cemented in. Grout 0.3 - 2.0m. Holeplug 2.0 - 3.0m Sand Pack 3.0 - 4.9m. Screen/sock 3.4 - 4.9m.
							319				
							318				
							317				

✕³, ★³: Numbers refer to Sensitivity ○³% STRAIN AT FAILURE

ENCLOSURE 3

ONTARIO MOT - NE TG04314-LOGS.GPJ ONTARIO MOT.GDT 24/01/05

RECORD OF BOREHOLE No 2004-2 1 OF 1 METRIC

W.P. 5005-A-000433 Assign 5 LOCATION MTM N 5041291.5 E 320209.3 ORIGINATED BY A.F.

DIST Huntsville HWY BOREHOLE TYPE Hollow Stem Auger COMPILED BY T.G.

DATUM Geodetic DATE 19.12.04 CHECKED BY R.C.

ELEV / DEPTH	DESCRIPTION	STRAT 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 □ QUICK TRIAXIAL × FIELD VANE ★ LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_p / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
332.6											
0.0	FILL - SAND - trace silt, brown, compact to dense						332				Water level @ 4.1m on December 22, 2004. Cave @ 4.1m on completion. 25mm dia. standpipe installed to 4.6m, 1.5m North of borehole. Water level @ 4.1m on December 22, 2004.
	- trace gravel		1	SS	20		331				
			2	SS	32						
			3	SS	23		330				
			4	SS	31		329				
327.4			5	SS	56		328				
5.2	SILT - Sandy, trace gravel, grey, loose to compact		6	SS	24		327				1 28 (71)
325.0							326				
7.6	SAND & SILT - grey/brown, loose		7	SS	8		325				0 49 (51)
322.8							324				
9.8	SAND - some silt, grey, compact		8	SS	17		323				Well installed to 11.6m. Stickup Steel protector cemented in. Grout 0.3 - 9.0m. Holeplug 9.0 - 9.9m. Sand Pack 9.9 - 11.6m. Screen/sock 10.1 - 11.6m.
							322				
							321				
							320				
							319				
							318				
316.8			9	SS	13		317				
15.8	End of Borehole @ 15.8m.										

$\times^3$ $\star^3$: Numbers refer to $\circ^{3\%}$ STRAIN AT FAILURE

ENCLOSURE 4

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 2004-3

1 OF 1 **METRIC**

W.P. 5005-A-000433 Assign S | LOCATION MTM N 5041273.9 E 320186 | ORIGINATED BY A.F.

DIST Huntsville HWY | BOREHOLE TYPE Hollow Stem Auger | COMPILED BY T.G.

DATUM Geodetic | DATE 17.12.04 | CHECKED BY R.C.

ELEV / DEPTH	DESCRIPTION	STRAT 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)	PLASTIC LIMIT w_p / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
332.7											
0.0	FILL - SAND - brown, compact to dense		1	SS	21		332		○		Dry on completion. Cave @ 3.6m on completion.
			2	SS	31		331				0 92 (8)
			3	SS	28		330				
			4	SS	30		329				
			5	SS	25		328				
326.4							327				
6.3	SILT - grey, compact		6	SS	11		326				
325.2							325				
7.5	SAND & SILT - brown, loose		7	SS	5		324		○		0 43 (57)
			8	SS	7		323				
322.0							322				
10.7	SAND - brown, loose to compact		9	SS	18		321				
							320				
							319				
							318				
316.9			10	SS	6		317				
15.8	End of Borehole @ 15.8m.										

$\times^{3}$ $\star^{3}$: Numbers refer to Sensitivity ○$^{3\%}$ STRAIN AT FAILURE

ENCLOSURE 5

ONTARIO MOT - NE TG04314.LOGS.GPJ ONTARIO MOT.GDT 24/01/05

RECORD OF BOREHOLE No 2004-4

1 OF 1 **METRIC**

W.P. 5005-A-000433 Assign 5 LOCATION MTM N 5041346.5 E 320156.3 ORIGINATED BY A.F.

DIST Huntsville HWY _____ BOREHOLE TYPE Hollow Stem Auger COMPILED BY T.G.

DATUM Geodetic DATE 16.12.04 CHECKED BY R.C.

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 (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
332.7											
0.0	FILL - SAND - trace silt, trace gravel, brown, compact		1	SS	28		332				Water level @ 4.1m on December 21, 2004. Cave @ 4.1m on completion.
	- SAND & GRAVEL - brown, dense		2	SS			331				
	- SAND - trace silt, dense		3	SS	32		330				
			4	SS	40		329				
	- some silt, trace organics, grey		5	SS	34		328		○		0 86 (11)
327.6											
5.1	SAND - some silt, trace gravel, grey/brown, loose		6	SS	7		327		○		1 86 (13)
							326				
			7	SS	6		325				
324.5											
8.2	End of Borehole @ 8.2m.										Well installed to 5.0m. Steel protector cemented in. Grout 0 - 2.0m. Holeplug 2.0 - 3.2m Sand Pack 3.2 - 5.0m. Screen/sock 3.5 - 5.0m.

$\times^3$, $\star^3$: Numbers refer to Sensitivity ○$^{3\%}$ STRAIN AT FAILURE

ONTARIO MOT - NE TG04314-LOGS.GPJ ONTARIO MOT.GDT 24/01/05

ENCLOSURE 6

Appendix C

Geotechnical Laboratory Test Results

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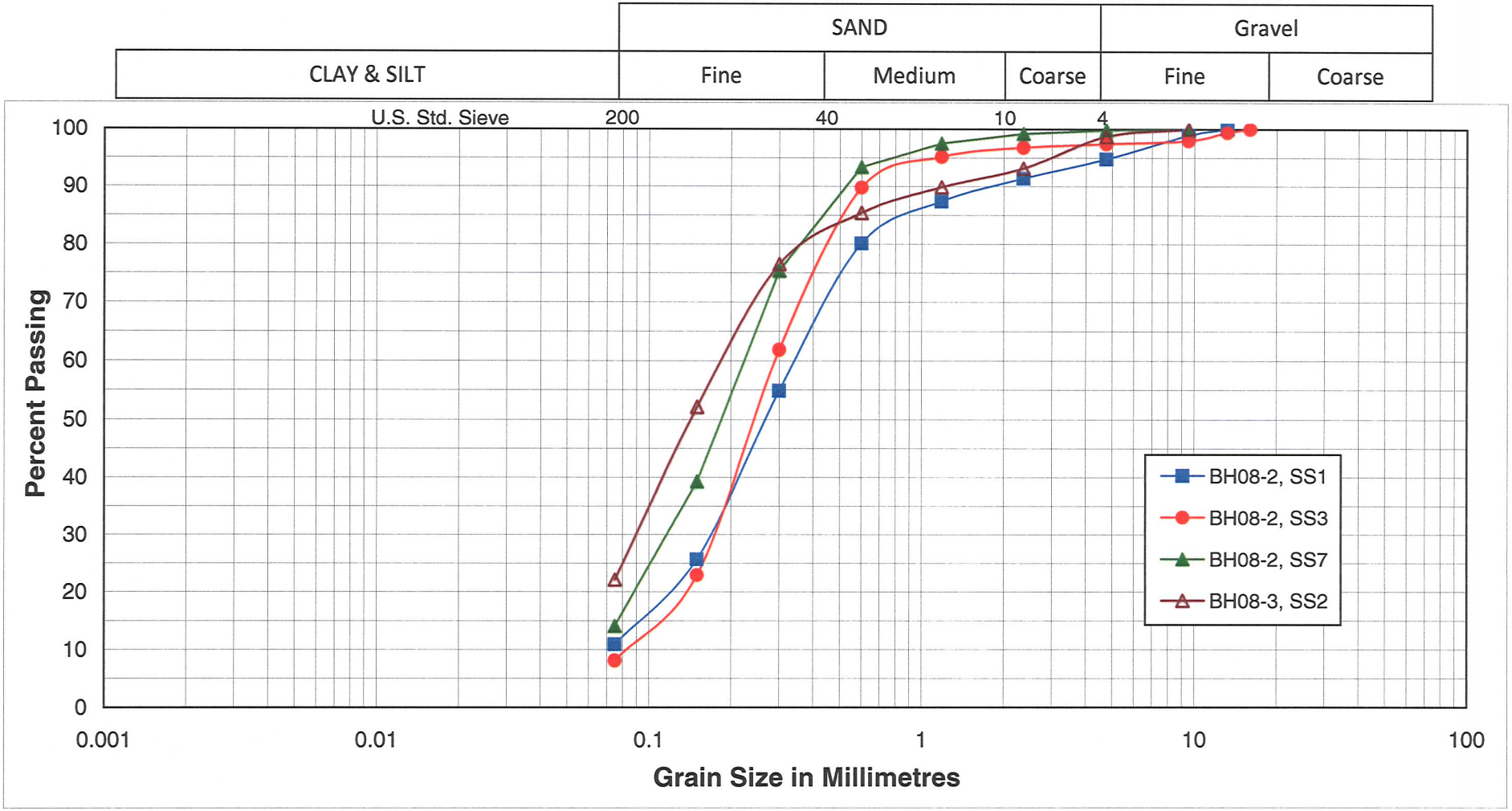
Table C.1. Summary of laboratory testing.

Sample	Elevation	Moisture Content	Sieve Analysis	Atterberg Limit	Other
	(m)	%	Gr/Sa/Fines	LL / PI	
BH08-2, SS1	332.5	10	5 / 84 / 11		
BH08-2, SS3	331.0	6	3 / 89 / 8		
BH08-2, SS5	329.5	7			
BH08-2, SS7	328.1	16	0 / 86 / 14		
BH08-2, SS10	326.3	23	0 / 31 / 69	NP	
BH08-2, SS12	324.2	24	0 / 65 / 35	NP	
BH08-3, SS2	332.3	6	7 / 84 / 9		
BH08-3, SS4	330.7	8	0 / 79 / 21		
BH08-3, SS6	329.1	11			
BH08-3, SS8	327.7	17	1 / 94 / 5		
BH08-3, SS9	327.1	113			Org = 9.2
BH08-3, SS10	326.5	16	0 / 51 / 49		
BH08-3, SS12	323.8	20	0 / 90 / 10		
BH08-6, SS2	332.1	10	9 / 77 / 14		
BH08-6, SS5	329.8	5	1 / 93 / 6		
BH08-6, SS9	327.1	22	0 / 90 / 10	NP	
BH08-6, SS11	325.2	21	0 / 88 / 12		
BH08-6, SS13	322.2	21	0 / 95 / 5		
BH08-26	333.0				MDD 1847, OM 12.4
BH08-44	333.6				MDD 1805, OM 13.2
BH08-52	333.2				MDD 1712, OM 15.5
BH08-55	333.3				MDD 1787, OM 13.7

Notes:
NP: Non-Plastic
Org: Organic Content, %
MDD: Maximum Dry Density, kg/m^3
OM: Optimum Moisture Content, %

Unified Soil Classification System



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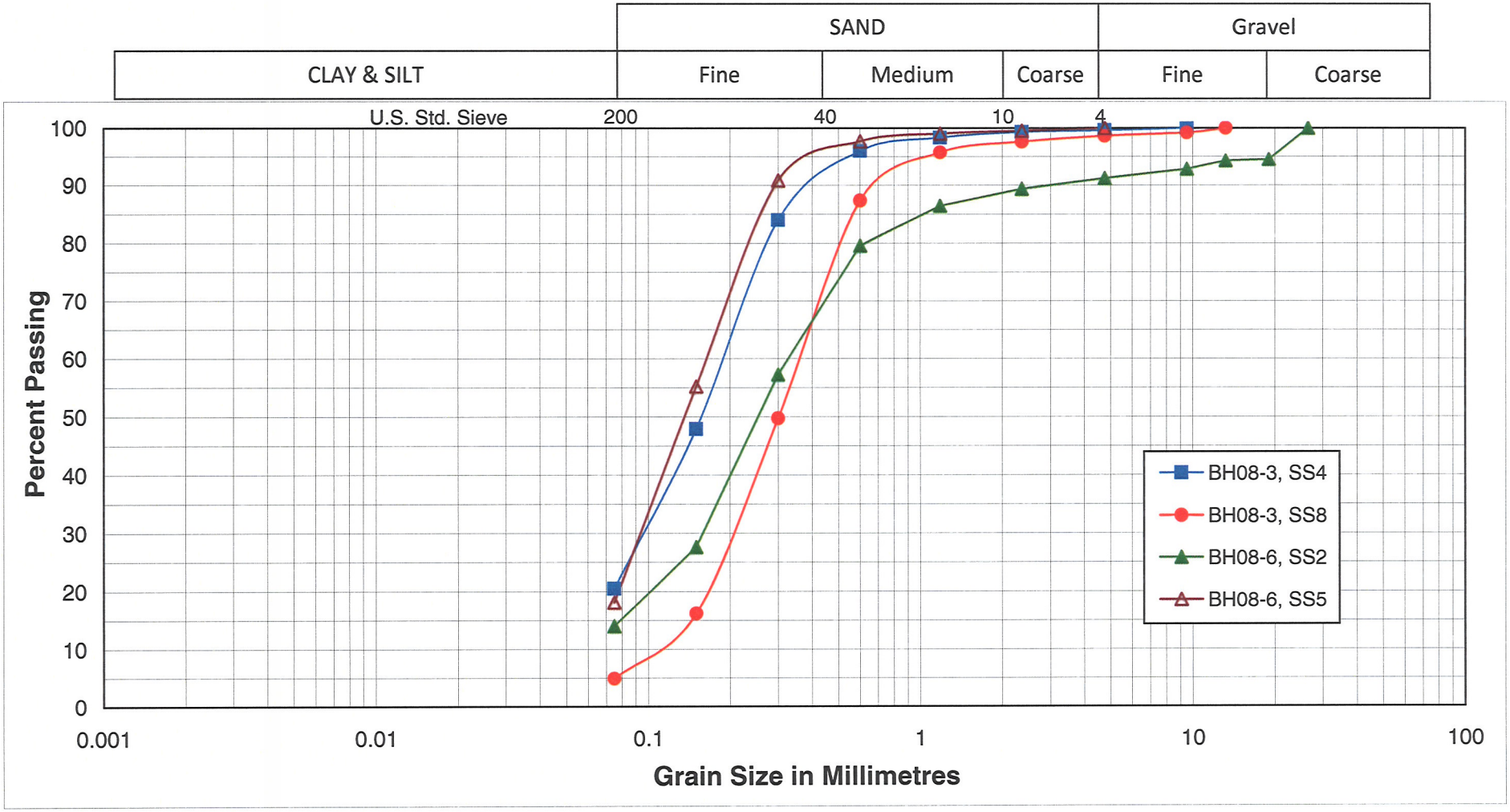
GRAIN SIZE DISTRIBUTION

Sand FILL

Figure 1

Project No.: 1037243

Unified Soil Classification System



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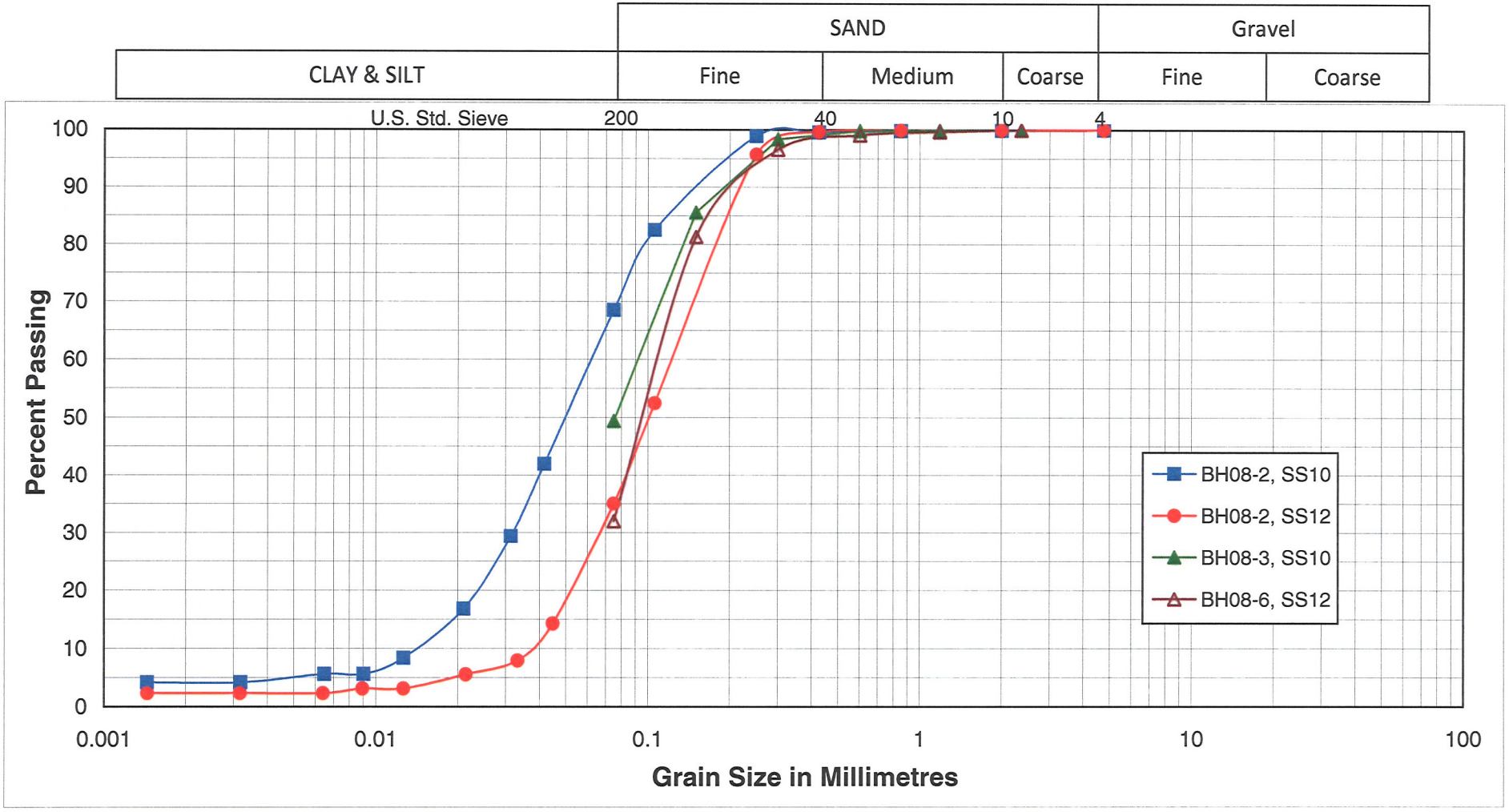
GRAIN SIZE DISTRIBUTION

Sand FILL

Figure 2

Project No.: 1037243

Unified Soil Classification System



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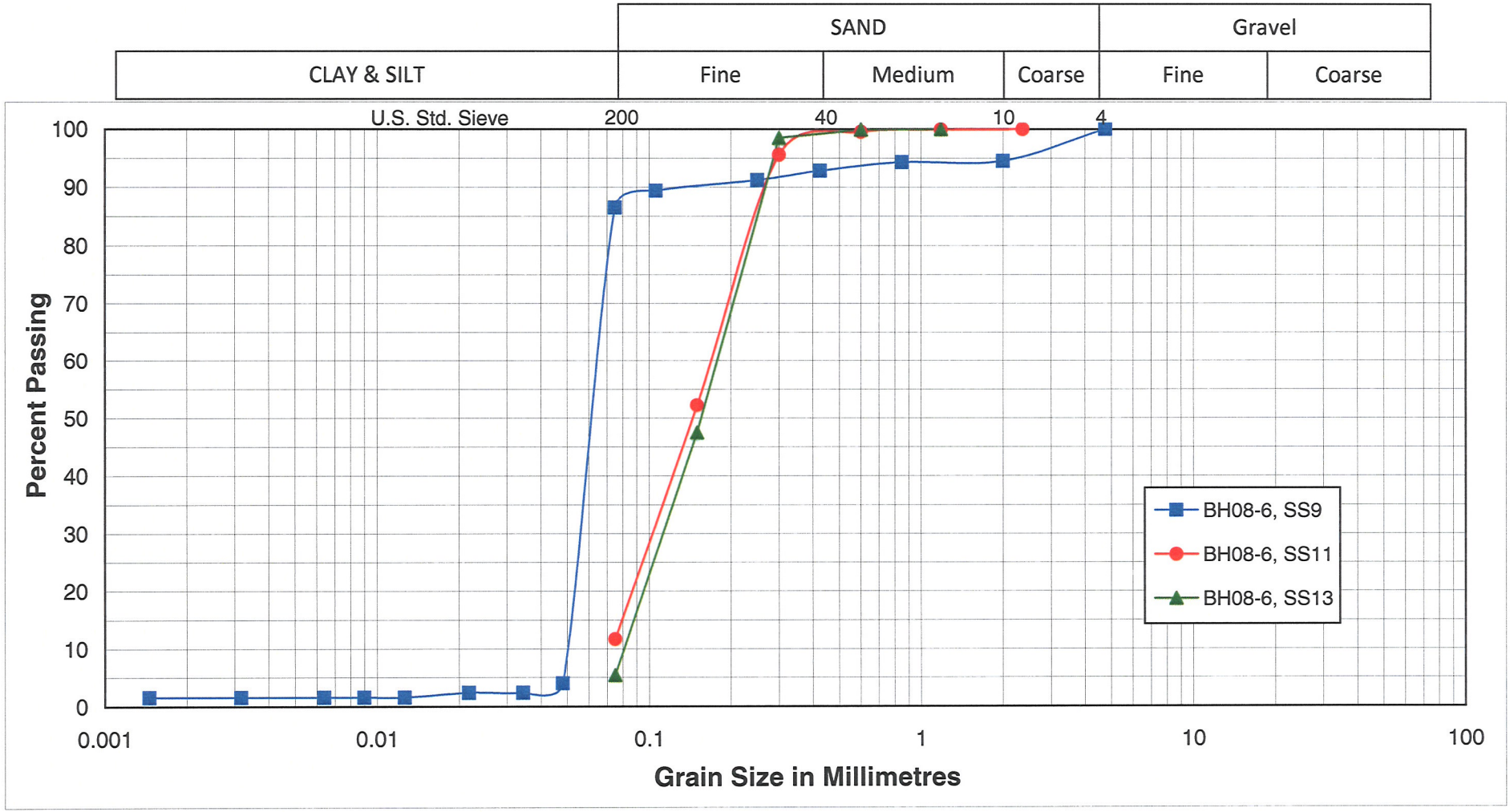
GRAIN SIZE DISTRIBUTION

Silty SAND

Figure 3

Project No.: 1037243

Unified Soil Classification System



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GRAIN SIZE DISTRIBUTION

Silty SAND

Figure 4

Project No.: 1037243

PARACEL LABORATORIES LTD.

Order #: 0847149

Certificate of Analysis

Report Date: 26-Nov-2008
Order Date:20-Nov-2008

Client: **Jacques Whitford Limited (Ottawa)**

Client PO: 1037243 Phase z9100 Project Description: 1037243

	Client ID:	BH08-2 SS1	BH08-3 SS2	BH08-6 SS9	-
	Sample Date:	04-Nov-08	04-Nov-08	04-Nov-08	-
	Sample ID:	0847149-01	0847149-02	0847149-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	91.4	93.7	82.4	-
General Inorganics					
pH	0.05 pH Units	7.77	6.87	6.31	-
Resistivity	0.10 Ohm.m	99.0	549	445	-
Anions					
Chloride	5 ug/g dry	<5	<5	<5	-
Sulphate	5 ug/g dry	55	<5	9	-