Peto MacCallum Ltd.
CONSULTING ENGINEERS

FOUNDATION INVESTIGATION REPORT
FOR
HIGH MAST LIGHT FOUNDATIONS
HIGHWAY 6 (NEW)
FROM HIGHWAY 403 SOUTHERLY
TO EXISTING HIGHWAY 6
CITY OF HAMILTON, ONTARIO
G.W.P. 9-91-00

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PML Ref: 00HF108B

July, 2002

PetoMacCallum Ltd.
CONSULTING ENGINEERS

FOUNDATION INVESTIGATION REPORT

For
High Mast Light Foundations
Highway 6 (New)
From Highway 403 Southerly
to Existing Highway 6
City of Hamilton, Ontario
G.W.P. 9-91-00

INTRODUCTION

This report summarizes the results of the foundation investigation carried out for construction of High Mast Light Foundations within the Highway 403/Highway 6 (New) interchange, from approximately 500 m east and west of the interchange south to Garner Road in the former Town of Ancaster, now in the City of Hamilton, Ontario. The investigation was conducted for Delcan Corporation on behalf of the Ministry of Transportation.

The purpose of this investigation was to define the subsurface conditions at the site and to provide geotechnical parameters for design of the high mast light foundations within the project limits (Station 21+850 to 22+850 Hwy 403 chainage, and Station 24+600 to 25+800 Highway 6 (New) chainage).

SITE DESCRIPTION

The site comprises the existing Highway 403/Highway 6 (New) interchange constructed in advance of the full Highway 6 (New) interchange. It extends southerly to approximately 700 m south of Highway 403 at Garner Road in the City of Hamilton, Ontario. Partial construction of the 403W-6(New)S access ramp from approximate chainage 10+400 to 10+700 was evident during the investigation. A stormwater detention pond has been constructed in the low area on the southwest quadrant of the interchange location.

The site is located in the broad physiographic region known as the Norfolk Sand Plain. In general, the topography is relatively flat to undulating.

The overburden is some 30 m thick and primarily consists of deposits of glaciolacustrine silts and sand. Bedrock consists of dolostone of the Guelph Formation.

INVESTIGATION PROCEDURES

The field work for the current investigation was carried out during the period April 12 to 18, 2001 and comprised seven boreholes drilled within the Highway 403/Highway 6 (New) interchange area. The boreholes were extended to a depth of 9.6 m. The borehole locations are shown on Drawing 1.

The borehole locations were selected to supplement the existing subsurface information obtained during previous investigations in the area. The existing borehole locations are shown on Drawing 1, and the existing Record and Log of Borehole Sheets (Appendix A) were used during preparation of this report.

The borehole locations were located in the field by J.D. Barnes Limited, subject to access limitations. The MTO co-ordinates and ground surface elevations at the boreholes were interpolated from the "High Mast Lighting Layout" drawing prepared by UMA Engineering Ltd. and provided by Delcan Corporation.

The boreholes were advanced using continuous flight hollow and solid stem augers, powered by a track-mounted CME-75 drill rig, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of our engineering staff.

Representative samples of the overburden were recovered at frequent depth intervals using a conventional split spoon sampler during drilling. Standard penetration tests were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata. Dynamic cone penetration testing was carried out at one location (borehole 6) to confirm the relative density of the soils.

The groundwater conditions in the boreholes were closely monitored during the course of the field work.

All of the recovered samples were returned to our laboratory for detailed visual examination, classification and routine moisture content determinations. Grain size distribution analyses and Atterberg Limit tests were carried out on selected samples and are presented on the Record of Borehole Sheets and Figures 1 to 6 attached.

EXISTING SUBSURFACE INFORMATION

Information contained within the following reports for investigations carried out within the vicinity of the proposed high mast lights was utilized in the preparation of this report:

- Foundation Investigation Report for
  Proposed Culvert and Culvert Extensions
  Hwy 6N – Highway 403 to Highway 53
  W.P. 7-91-00
- Foundation Investigation Report for
  Highway 6 New Underpass
  Highway 403, Town of Ancaster
  W.P. 5-91-01, Site 36-478
- Foundation Investigation Report for
  Highway 6 New at Highway 53 Structures
  Ancaster, Ontario
  W.P. 9-91-02

- Record of Borehole Sheets and
  Dwg 2779901 – A
  Dated Nov. 10, 1999
  Titled "Ramp Hwy 403W – Hwy 6 (New)
  Bore Hole Locations & Soil Strata"
  W.P. No. 277-99-01

The subsurface stratigraphy revealed within these reports/drawings generally comprised topsoil/fill over layered deposits of silt and sand, with localized units of layered silts and clays mantling dolostone bedrock.

The following was noted from the available existing information:

- The information revealed in the existing boreholes is consistent with that of the current investigation.
- Very loose to loose deposits of silt and sand were noted in the central and western regions of the site.
- Dolostone bedrock was encountered at depths of 25.9 to 33.2 m (elevation 213.3 to 216.0), rising to the south.
- The groundwater level ranged from approximate elevation 234.3 to 239.4, generally rising to the south.
- It is noted that the Easting co-ordinate for borehole 9 (W.P. 7-91-00) shown on the Record of Borehole Sheet should be E 266 768.0. The correct co-ordinates and location of the borehole are shown on Drawings 1 and 1A.

SUMMARIZED SUBSURFACE CONDITIONS FROM CURRENT INVESTIGATION

Reference is made to the Record of Borehole sheets for details of the subsurface conditions including soil classifications, inferred stratigraphy, boundary elevations, standard penetration test "N" values, dynamic cone penetration values and groundwater observations. The results of laboratory grain size distribution analyses and moisture content determinations are also shown.

The subsurface stratigraphy revealed along the site generally comprised topsoil/fill over layered silts, sands and clays overlying deposits of silt and sand. The strata encountered are summarized below:

Topsoil

Topsoil was encountered surficially in boreholes 6 and 7. The topsoil was 500 and 200 mm thick and comprised silty sand and clayey silt.

Fill

Fill was encountered surficially in boreholes 1, 3, 4 and 5, and beneath the topsoil in borehole 6. The fill comprised a matrix of mixed cohesive clayey silt, non-cohesive silt, sand and gravel. In general, the fill was very loose to compact with "N" values ranging from 2 to 29. The moisture content of the fill ranged from 9 to 24%, typically 11 to 16%.

The results of the grain size distribution analysis conducted on one sample of the silt, sand and gravel fill is presented on Figure 1, and recorded on the record of borehole sheet. The fill was penetrated at depths of 2.0 to 9.1 m, (elevation 232.1 to 248.0) in all boreholes encountered.

Layered Silts, Sands and Clays

A deposit of layered non cohesive silts, sands and cohesive clays was encountered in boreholes 3 and 4 beneath the fill at depths of 2.0 and 2.1 m respectively. The unit was compact/stiff, with "N" values ranging from 12 to 21. The moisture content of the layered deposit ranged from 6 to 22%. The results of the grain size distribution analyses conducted on samples of the sand and clay are presented on Figures 3 and 5, and recorded on the record of borehole sheet. Liquid and plastic limits of 41 and 22 indicate the clay material is medium plastic. The results of Atterberg Limits tests conducted on one sample of clay are presented on Figure 6. The unit was penetrated in both boreholes at depths of 2.9 and 4.0 m.

Localized Clayey Silt Deposit

A localized unit of firm cohesive clayey silt was encountered beneath the surficial topsoil in borehole 7. One "N" value in the clayey silt was 8. The moisture content of one sample was 23%. The layer was 1.5 m thick and was penetrated at a depth of 1.7 m (elevation 241.6).

Silt and Sand

Native non-cohesive silt and sand deposits were contacted surficially in borehole 2 and below the fill, clayey silt and layered deposits in all remaining boreholes at depths of 1.7 to 9.1 m. The silt and sand units were compact to very dense, with "N" values ranging from 12 to 64. Localized areas of loose to very loose silt and sand exist as exemplified by the pattern of the dynamic cone test results in borehole 6 and with "N" values of 7 to 2 noted in boreholes 2, 3, 6 and 7.

Moisture contents ranged from 5 to 28%, typically 6 to 14%, increasing to 18 to 28% below 3 to 6 m depth. The results of grain size distribution analyses conducted on selected samples of the silt and sand are presented on Figures 2 to 4.

Drilling was terminated within the silt and sand at 9.6 m depth in all boreholes.

Groundwater

Water was observed in boreholes 2, 3, 4, 6 and 7 at depths of 0.7 to 8.7 m, typically 5.1 to 8.7 m (elevation 235.3 to 243.2) during and upon completion of augering. The native silt and sand became wet below depths of about 3 to 6 m in all boreholes. Cave was noted in borehole 6 at a depth of 1.4 m. Water or cave was not encountered in the remaining boreholes during or upon completion of augering.

Observed groundwater levels are subject to seasonal variations and rainfall patterns.

CLOSURE

The field work was carried out under the supervision of Mr. M. Rapsey and Mr. P. Cullen, B.Eng., and direction of Mr. M.R. Anderson, M.Eng., P.Eng. The drilling equipment was supplied by Malone's Soil Sampling.

The report was prepared by Mr. P. Cullen, B.Eng., and Mr. M.R. Anderson, M.Eng., P.Eng., Senior Foundation Engineer and reviewed by Mr. D.W. Kerr, M.Eng., P.Eng., Chief Foundation Engineer. Mr. B.R. Gray, M.Eng., P.Eng., President, carried out an independent review of the report.

Yours very truly

Peto MacCallum Ltd.

Murray R. Anderson, M.Eng., P.Eng.
Senior Foundation Engineer

Dennis W. Kerr, M.Eng., P.Eng.
Chief Foundation Engineer

Brian R. Gray, M.Eng., P.Eng.
President

MRA/PC:lad

FIGURES 1 TO 5 - GRAIN SIZE DISTRIBUTION CHARTS
FIGURE 6 - PLASTICITY CHART

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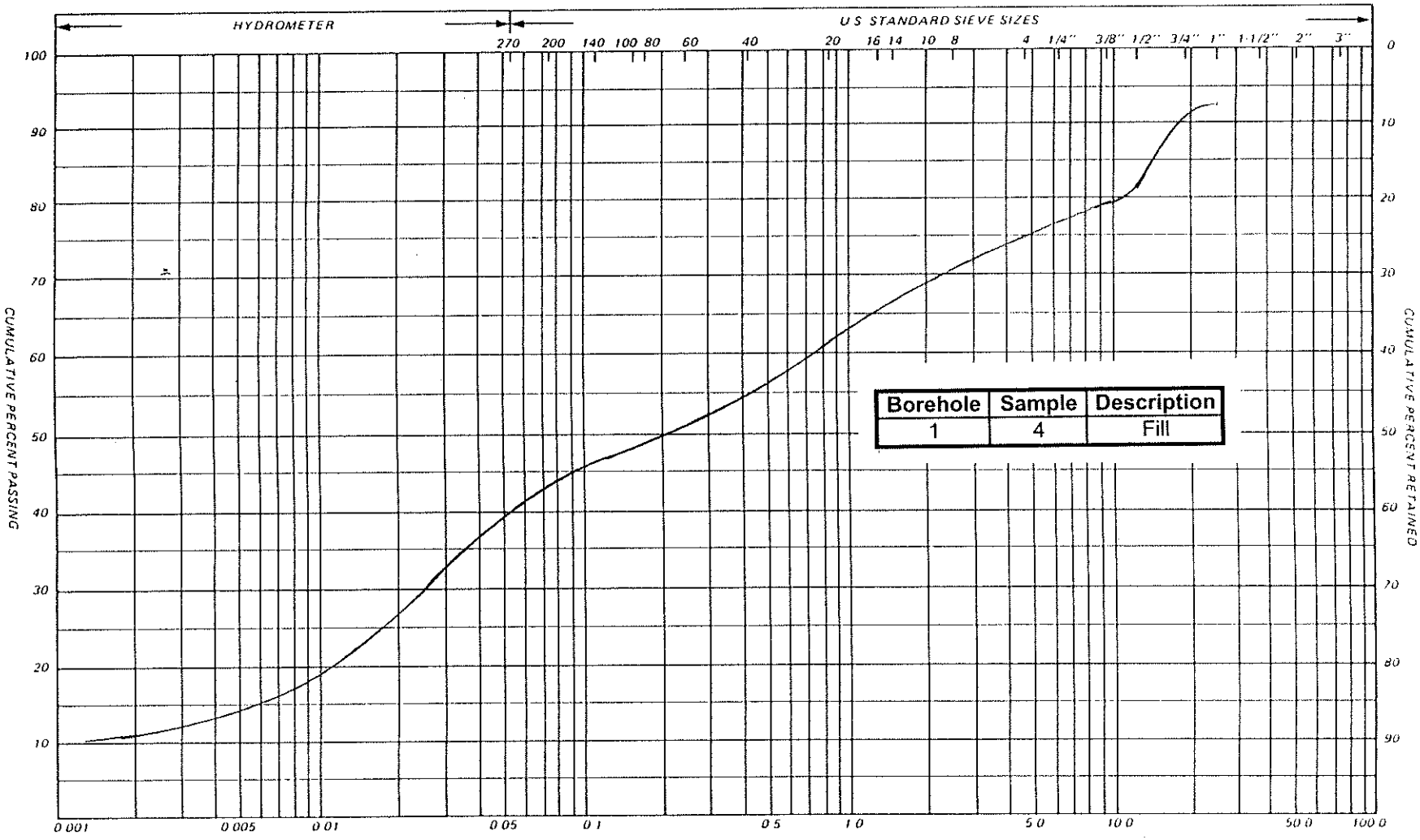
PARTICLE SIZE DISTRIBUTION CHART

PML REF. 00HF108B
REPORT NO.
FIGURE 1



Borehole	Sample	Description
1	4	Fill

REMARKS Fill

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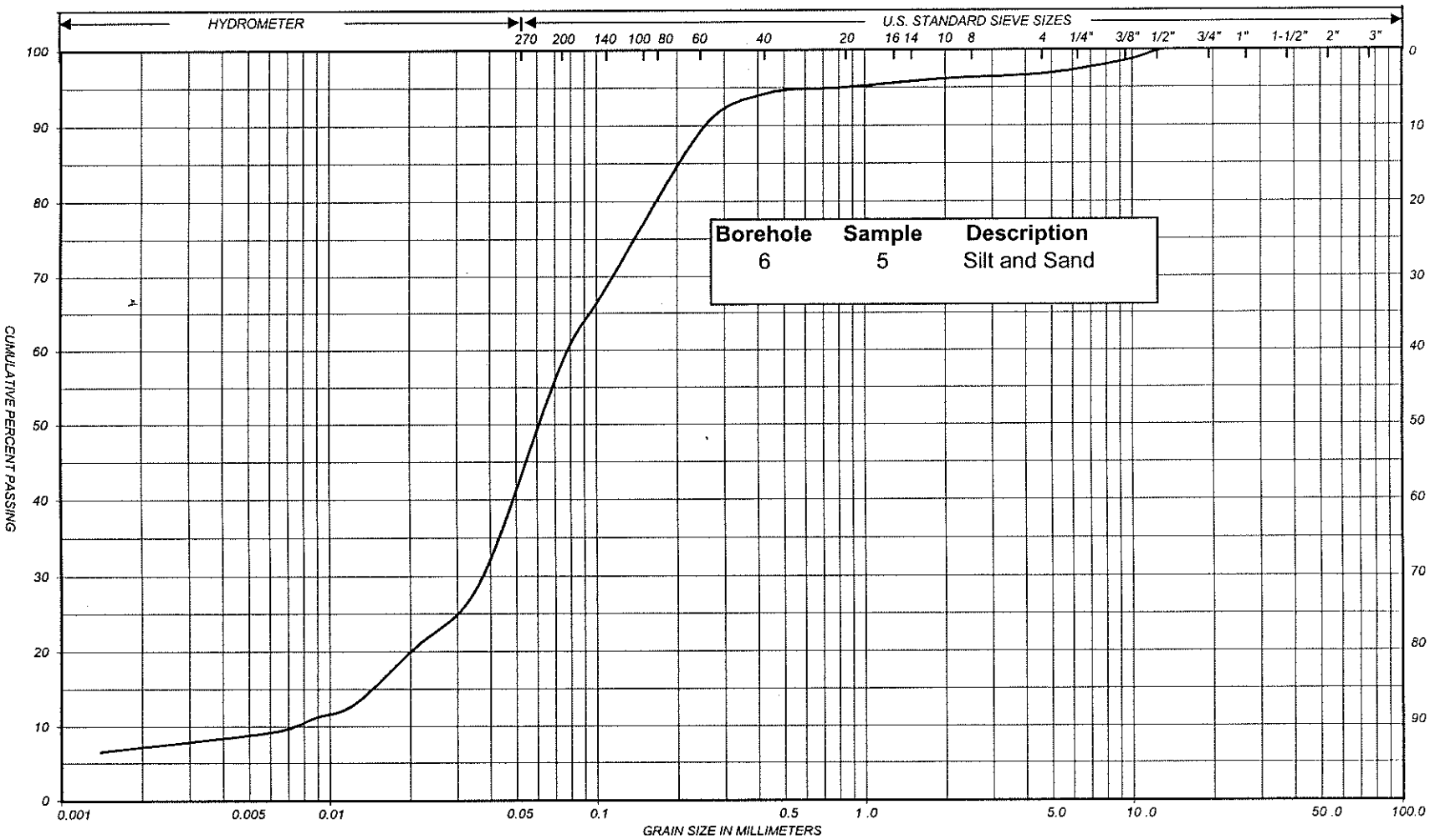
PML REF. 00HF108B
REPORT NO. 1
FIGURE 2

PARTICLE SIZE DISTRIBUTION CHART



SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL			COBBLES	UNIFIED
				SAND							
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL			COBBLES	M.I.T.
	SILT			SAND							
CLAY	SILT			VERY FINE	FINE	MEDIUM	COARSE	GRAVEL			U.S. BUREAU
				SAND							

REMARKS Silt and Sand

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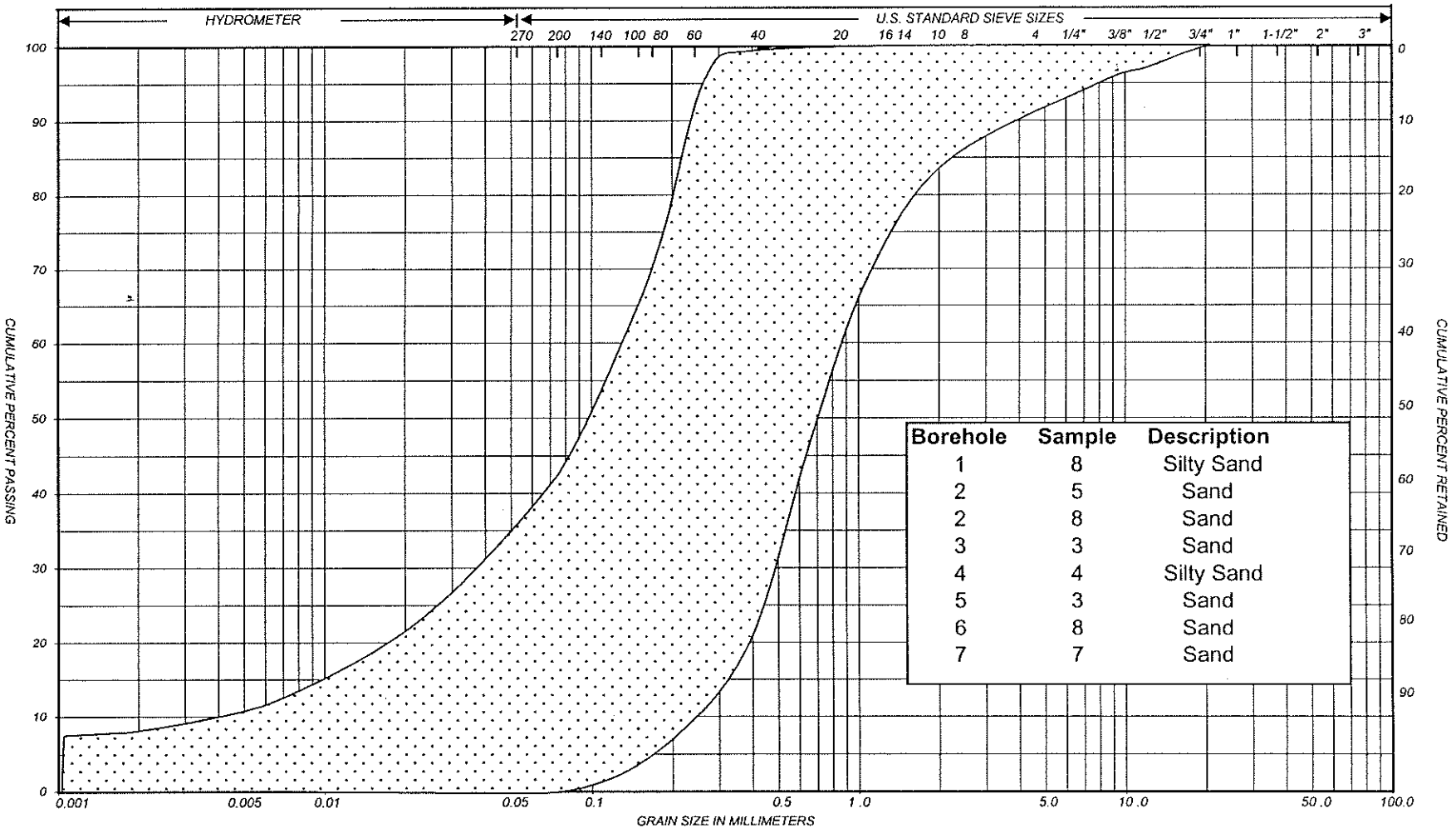
PML REF. 00HF108B
REPORT NO. 1
FIGURE 3

PARTICLE SIZE DISTRIBUTION CHART



Borehole	Sample	Description
1	8	Silty Sand
2	5	Sand
2	8	Sand
3	3	Sand
4	4	Silty Sand
5	3	Sand
6	8	Sand
7	7	Sand

SILT & CLAY			FINE	MEDIUM	COARSE	GRAVEL	COBBLES	UNIFIED
			SAND					
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL	COBBLES	M.I.T.
	SILT			SAND					
CLAY	SILT		VERY FINE	FINE	MEDIUM	COARSE	GRAVEL		U.S. BUREAU
			SAND						

REMARKS Sand to Silty Sand

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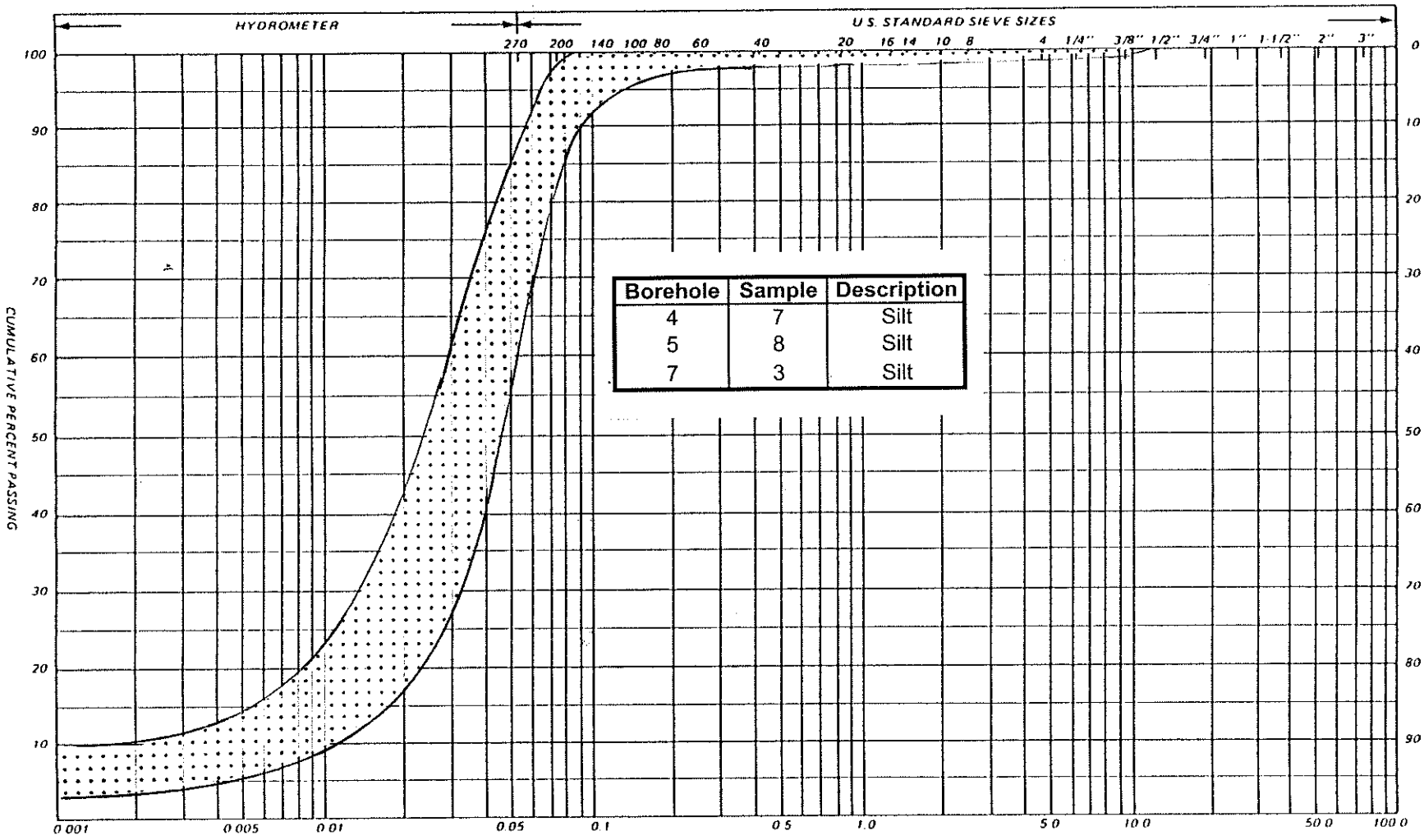
PARTICLE SIZE DISTRIBUTION CHART

PML REF. 00HF108B
REPORT NO.
FIGURE 4



Borehole	Sample	Description
4	7	Silt
5	8	Silt
7	3	Silt

SILT & CLAY			FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		COBBLES	UNIFIED
CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		COBBLES	M.I.T
CLAY	SILT			V. FINE SAND	FINE SAND	MED. SAND	COARSE SAND	GRAVEL		U.S. BUREAU

REMARKS Silt

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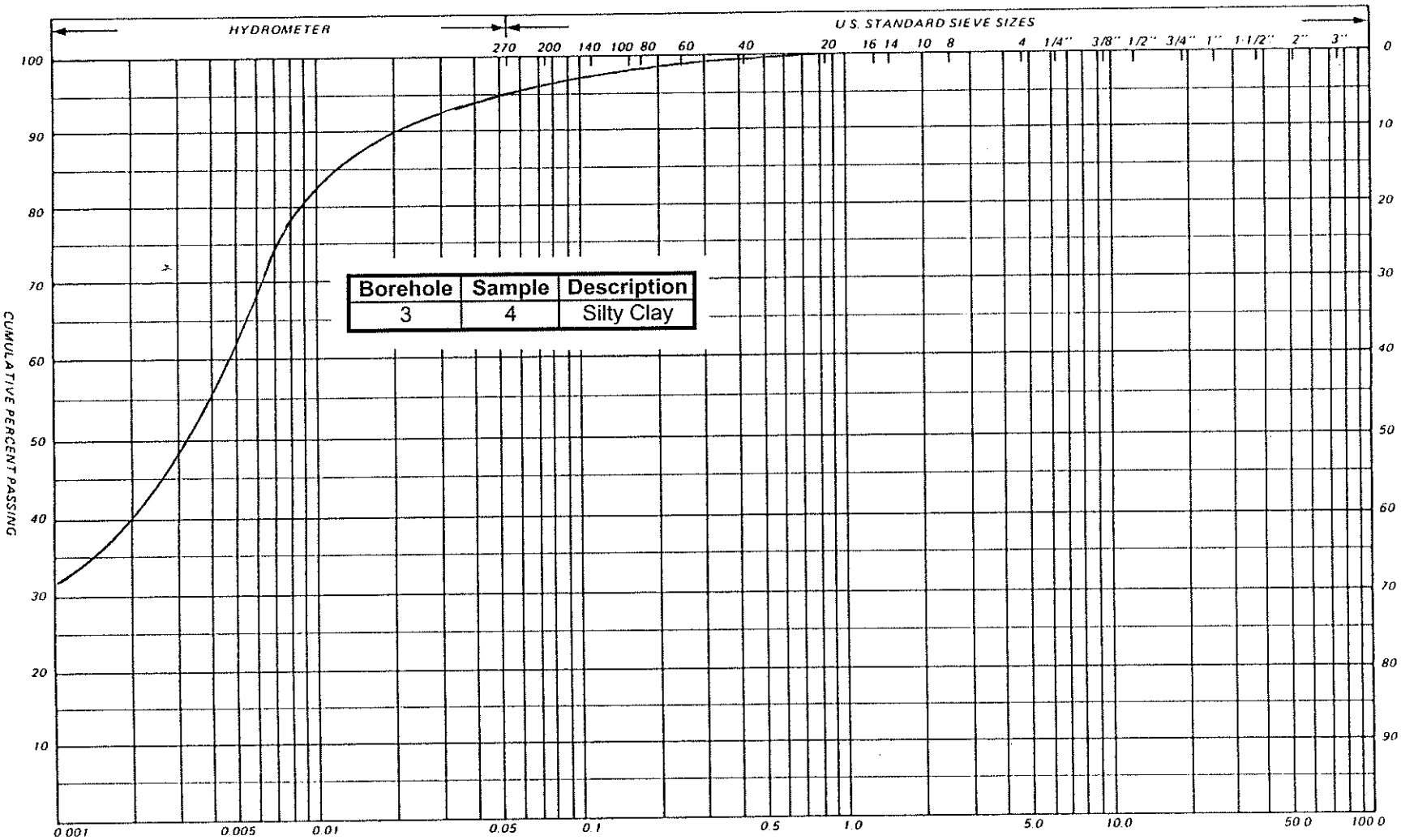
PARTICLE SIZE DISTRIBUTION CHART

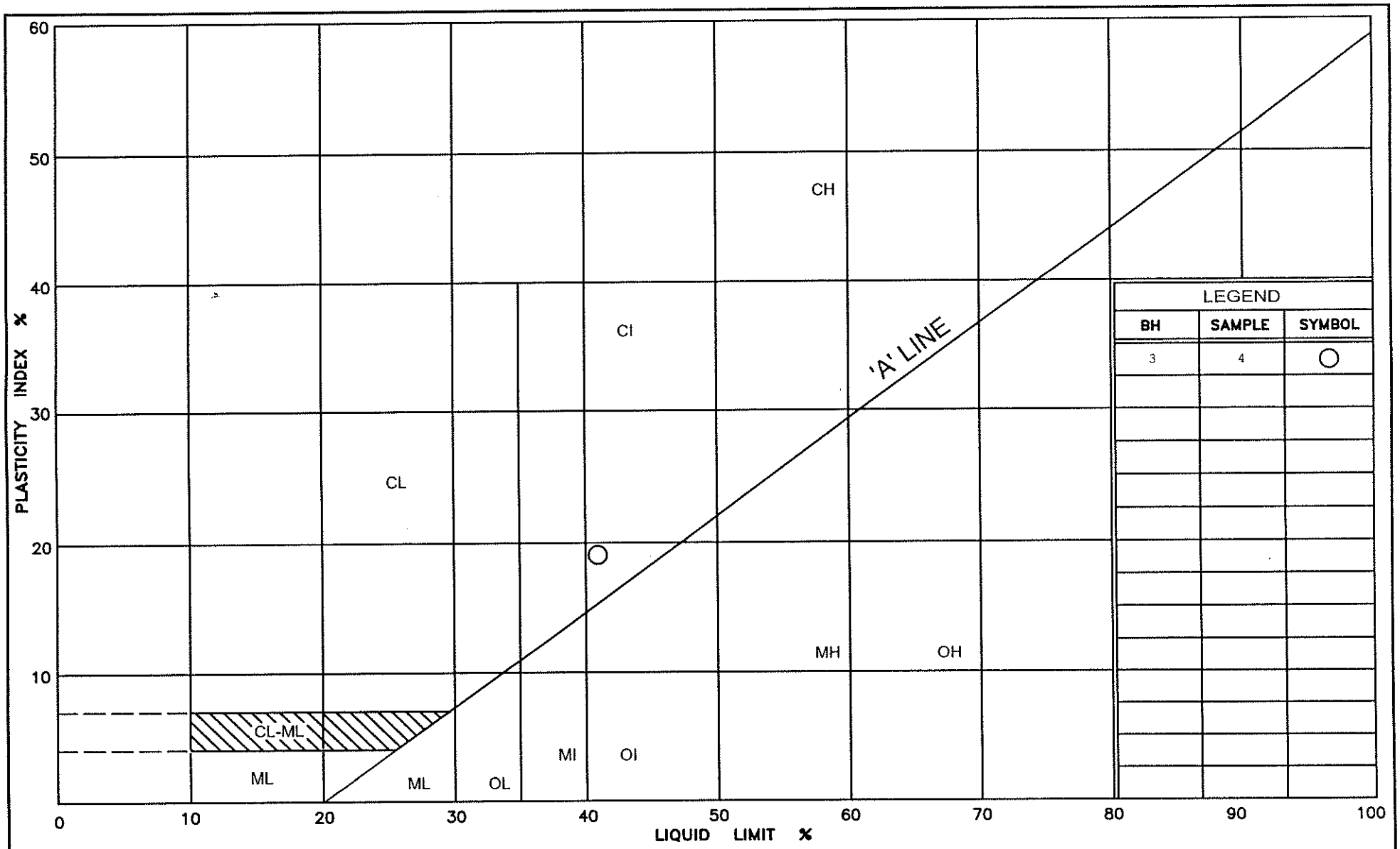
PML REF. 00HF108B
REPORT NO.
FIGURE 5



Borehole	Sample	Description
3	4	Silty Clay

Silty Clay

REMARKS



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PLASTICITY CHART

Silty Clay

FIG No 6

GWP 9-91-00

RECORD OF BOREHOLE SHEETS FROM CURRENT INVESTIGATION

DRAWING NO. 1

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LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N', - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 0.3m INTO THE SUBSOIL. DRIVEN BY MEANS OF A 63.5kg HAMMER FALLING FREELY A DISTANCE OF 0.76m.

DYNAMIC PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 51mm, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS. 0.3m INTO THE SUBSOIL. THE DRIVING ENERGY BEING 475 J PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

CONSISTENCY	'N' BLOWS/0.3 m	c kPa	DENSENESS	'N' BLOWS/0.3 m
VERY SOFT	0 - 2	0 - 12	VERY LOOSE	0 - 4
SOFT	2 - 4	12 - 25	LOOSE	4 - 10
FIRM	4 - 8	25 - 50	COMPACT	10 - 30
STIFF	8 - 15	50 - 100	DENSE	30 - 50
VERY STIFF	15 - 30	100 - 200	VERY DENSE	> 50
HARD	> 30	> 200		

W.T.P.L. WETTER THAN PLASTIC LIMIT D.T.P.L. DRIER THAN PLASTIC LIMIT

A.P.L. ABOUT PLASTIC LIMIT

TYPE OF SAMPLE

S.S	SPLIT SPOON	T.W	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T	SLOTTED TUBE SAMPLE		

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL		

▲,△ - Undisturbed and remoulded shear strength determined from in situ vane test.

■ - Undrained shear strength determined from pocket penetrometer test.

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RECORD OF BOREHOLE No 1

1 of 1 **METRIC**

G.W.P. 9-91-00 LOCATION Co-ords. 4 785 182 N; 266 194 E ORIGINATED BY M.R.

DIST CR HWY 6 (NEW) BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY P.C.

DATUM Geodetic DATE April 16, 2001 CHECKED BY M.R.A.

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
243.00											
0.00	Silt, Sand and Gravel Fill, some clay Compact Brown		1	SS	23		242				
			2	SS	23		241				
			3	SS	23						
			4	SS	20		240				25 31 33 11
			5	SS	27		239				
			6	SS	25		238				
	with sand		7	SS	22		237				
233.90							236				
9.10	Silty Sand, trace of gravel, trace of clay, with thin black layers		8	SS	13		235				
233.40							234				2 62 30 6
9.60	Compact Brown to wet grey End of borehole										
	* Groundwater level not determined										

ON_MOT HMLHWY6.GPJ ON_MOT.GDT 2002 07 03

$+^{7}$, $\times^{5}$: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

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p5

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RECORD OF BOREHOLE No 2 1 of 1 METRIC

G.W.P. 9-91-00 LOCATION Co-ords. 4 785 370 N; 266 468 E ORIGINATED BY M.R.

DIST CR HWY 6 (NEW) BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY P.C.

DATUM Geodetic DATE April 16, 2001 CHECKED BY M.R.A.

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
244.60 / 0.00	Sand, coarse, with gravel, some silt, trace of clay Compact to loose Brown		1	SS	17		244		○		
			2	SS	8		243		○		
	becoming fine without gravel Loose to compact Reddish brown		3	SS	6		242		○		
			4	SS	10		241		○		
			5	SS	12				○		0 86 10 4
			6	SS	36		240		○		
			7	SS	23		239				
	wet		8	SS	12	▽	238		○		
							237				0 83 13 4
235.00 / 9.60			9	SS	12		236		○		
	End of borehole *2001-04-16 ▽ Waterlevel observed during drilling						235				

ON_MOT HMLHWY6.GPJ ON_MOT.GDT 2002 07 03

+7, ×5: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

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P8.9.

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RECORD OF BOREHOLE No 3

1 of 1 **METRIC**

G.W.P. 9-91-00 | LOCATION Co-ords. 4 785 726 N; 266 790 E | ORIGINATED BY M.R.

DIST CR | HWY 6 (NEW) | BOREHOLE TYPE Continuous Flight Hollow Stem Augers | COMPILED BY P.C.

DATUM Geodetic | DATE April 16, 2001 | CHECKED BY M.R.A.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
247.50							247				
0.00	Clayey silt fill, with fine sand Very stiff Brown		1	SS	16				○		
245.50			2	SS	29		246		○		
2.00	Silt, trace of fine sand										
245.10			3	SS	12		245		○		0 79 16 5
2.40	Reddish brown Sand, fine, some silt, trace of clay										
244.35											
3.15	Compact Reddish brown Silty clay, trace of sand Stiff Brown		4	SS	13		244		●		0 4 55 41
243.50							243		○		
4.00	Sand, fine, with silt Dense to loose Brown		5	SS	37						
240.50			6	SS	7		242				
7.00	Silty sand, fine, with layers of brown silt, trace of fine sand Compact to loose Brown wet		7	SS	15	▽	241		○		
237.90			8	SS	7		240		○		
9.60	End of borehole *2001-04-16 ▽ Water level observed during drilling						239				
							238				

ON_MOT HMLHWY6.GPJ ON_MOT.GDT 2002 07 03

+7, ×5: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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P7

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RECORD OF BOREHOLE No 4

1 of 1 **METRIC**

G.W.P. 9-91-00 | LOCATION Co-ords. 4 785 691 N; 266 592 E | ORIGINATED BY M.R.

DIST CR | HWY 6 (NEW) | BOREHOLE TYPE Continuous Flight Hollow Stem Augers | COMPILED BY P.C.

DATUM Geodetic | DATE April 18, 2001 | CHECKED BY M.R.A.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	'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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
250.10											
0.00	Mixed fill, zones of fine sand, with silt and silt with fine sand Very loose to loose — Brown to reddish brown		1	SS	2		250				
			2	SS	4		249		○		
248.00							248		○		
2.10	Layered sand, fine, with silt, and fine sandy silt Compact — Reddish brown		3	SS	21				○		
247.25							247		○		2 56 35 7
2.85	Silty sand, fine to coarse, trace of gravel, trace of clay, with layers of brown silt, trace of fine sand, and brown silty clay, trace of sand Compact — Brown		4	SS	18						
			5	SS	13		246		○		
244.60							245				
5.50	Silt, some fine sand, trace of clay, trace of gravel Dense to very dense — Brown		6	SS	39	▽	244		○		
			7	SS	64		243				1 19 75 5
							242		○		
240.50			8	SS	56		241		○		
9.60	End of borehole *2001-04-18 ▽ Water level observed during drilling										

ON_MOT HMLHWY6.GPJ ON_MOT.GDT 2002 07 03

+7, ×5: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

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Peto MacCallum Ltd.
Foundation Design

RECORD OF BOREHOLE No 5

1 of 1 **METRIC**

G.W.P. 9-91-00 | LOCATION Co-ords. 4 785 425 N; 266 714 E | ORIGINATED BY M.R.

DIST CR | HWY 6 (NEW) | BOREHOLE TYPE Continuous Flight Hollow Stem Augers | COMPILED BY P.C

DATUM Geodetic | DATE April 18, 2001 | CHECKED BY M.R.A.

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
248.20											
0.00	Sand and silt fill, fine Loose Brown		1	SS	4		248				
			2	SS	4		247				
246.10											
2.10	Sand, fine to coarse, trace of gravel, trace of silt Compact Brown		3	SS	14		246				8 91 1 0
244.90			4	SS	18		245				
3.30	Silt, some fine sand, trace of clay Very dense Brown		5	SS	58		244				
			6	SS	48		243				
			7	SS	52		242				
	Grey						241				
238.60			8	SS	52		240				0 13 83 4
9.60	End of borehole * Groundwater level not determined						239				

ON_MOT HMLHWY6.GPJ ON_MOT.GDT 2002 07 03

+7, ×5: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

P4

Peto MacCallum Ltd.
Foundation Design

RECORD OF BOREHOLE No 6

1 of 1 METRIC

G.W.P. 9-91-00 LOCATION Co-ords. 4 785 116 N; 266 552 E ORIGINATED BY P.C.

DIST CR HWY 6 (NEW) BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY P.C.

DATUM Geodetic DATE April 12, 2001 CHECKED BY M.R.A.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS
236.00						
0.00	Topsoil					
235.50						
0.50	Sand and gravel fill, with silt, trace of clay Compact Brown saturated		1	SS	22	▼
			2	SS	9	
			3	NR		▽
			4	SS	14	
232.05						
3.95	Silt and sand, fine, trace of clay Compact Grey saturated		5	SS	6**	
			6	SS	2**	
			7	SS	7**	
227.50						
8.50	Sand, fine, some silt, trace of clay Very loose Grey		8	SS	2	
226.40						
9.60	End of borehole *2001-04-12 ▽ Water level observed during drilling ▼ Water level observed upon completion ** Possible low 'N' value due to hydraulic disturbance Cave at 1.4m					

ELEVATION SCALE: 235, 234, 233, 232, 231, 230, 229, 228, 227

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/m³

REMARKS & GRAIN SIZE DISTRIBUTION (%)	GR	SA	SI	CL
	3	38	52	7
	0	86	12	2

ON_MOT HMLHWY6.GPJ ON_MOT.GDT 2002 07 03

$+^{7}$, $\times^{5}$: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Peto MacCallum Ltd.
Foundation Design

RECORD OF BOREHOLE No 7

1 of 1 **METRIC**

G.W.P. 9-91-00 LOCATION Co-ords. 4 785 071 N; 266 856 E ORIGINATED BY M.R.

DIST CR HWY 6 (NEW) BOREHOLE TYPE Continuous Flight Hollow Stem augers COMPILED BY P.C.

DATUM Geodetic DATE April 18, 2001 CHECKED BY M.R.A.

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
243.30											
0.00	Topsoil										
0.20	Clayey silt, trace of sand Firm Brown		1	SS	8		243				
241.65							242				
1.65	Silt, some clay, trace of fine sand Loose to dense Brown		2	SS	5						
			3	SS	6		241				0 2 87 11
			4	SS	40		240				
	with layers of brown silty clay						239				
238.50			5	SS	18	▼					
4.80	Sand, fine, some silt, trace of clay, with layers of brown silt, with sand Compact Brown wet						238				
			6	SS	20		237				
			7	SS	18		236				0 79 17 4
							235				
233.70			8	SS	13		234				
9.60	End of borehole *2001-04-18 ▼ Water level observed upon completion										

ON_MOT HMLHWY6.GPJ ON_MOT.GDT 2002 07 03

$+^{7}$, $\times^{5}$: Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

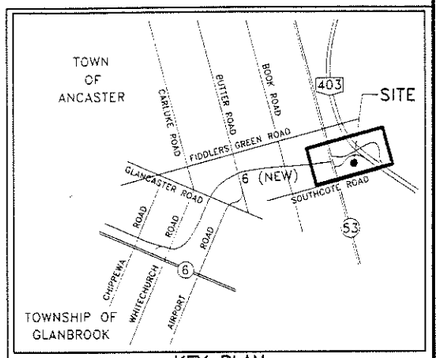
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES

CONT No.
GWP No. 9-91-00

SHEET

HWY 6 (NEW)
HIGH MAST LIGHT FOUNDATIONS
BOREHOLE LOCATIONS

Peto MacCallum Ltd.
CONSULTING ENGINEERS



LEGEND

- Borehole
- Dynamic Cone Penetration Test (Cone)
- Borehole & Cone
- 'N' Blows/0.3m (Std. Pen Test, 475 J / blow)
- CONE Blows/0.3m (60° Cone, 475 J / blow)
- W L at time of investigation or in piezometer
- Head ARTESIAN WATER Encountered
- Piezometer

Boreholes from previous investigation WP 9-91-02

BH W1	242.80	4 784 778	266 845
BH W2	242.11	4 784 797	266 835
BH W3A	241.86	4 784 833	266 825
BH W4	243.37	4 784 850	266 827
BH E1A	243.14	4 784 786	266 873
BH E2A	243.63	4 784 803	266 865
BH E3A	243.67	4 784 840	266 861
BH E4	244.00	4 784 856	266 856

Boreholes from previous investigation WP 277-91-01

BH 1	241.90	4 785 062	266 719
BH 2	241.10	4 785 044	266 721
BH 3	242.00	4 785 028	266 747
BH 4	240.80	4 785 010	266 746
BH 5	240.70	4 785 074	266 696
BH 6	240.40	4 784 995	266 784

Boreholes from previous investigation WP 5-91-01

BH S1	246.50	4 785 419	266 565
BH P1	245.80	4 785 444	266 548
BH N1	246.70	4 785 468	266 521

Boreholes from current investigation GWP 9-91-00

No	ELEVATION	CO-ORDINATES NORTH	EAST
BH 1	243.00	4 785 182	266 194
BH 2	244.60	4 785 370	266 468
BH 3	247.50	4 785 726	266 790
BH 4	250.10	4 785 691	266 592
BH 5	248.20	4 785 425	266 714
BH 6	236.00	4 785 116	266 552
BH 7	242.75	4 785 071	266 856

Boreholes from previous investigation WP 7-91-00

BH 1	242.70	4 785 194	266 691
BH 2	241.00	4 785 230	266 755
BH 3	239.70	4 785 255	266 801
BH 4	240.80	4 785 156	266 647
BH 5	239.60	4 785 129	266 605
BH 6	240.00	4 784 818	266 750
BH 7	237.70	4 785 181	266 418
BH 8	236.20	4 785 219	266 350
BH 9	240.00	4 784 787	266 768

PROPOSED ADVANCE STRUCTURES

PLAN
SCALE
40m 0 50m 100m

REFERENCE :

PLAN PREPARED FROM UNDATED "HIGH MAST LIGHTING LAYOUT" DRAWING BY UMA ENGINEERING LTD. AND PROVIDED BY DELCAN CORPORATION

HWY No. 6 (NEW)				DIST	CR
SUBM'D P.C.	CHECKED P.C.	DATE JULY 2002		SITE	
DRAWN C.B.	CHECKED M.R.A.	APPROVED D.W.K.		DWG	1

APPENDIX A

EXISTING RECORD OF BOREHOLE SHEETS FROM PREVIOUS INVESTIGATIONS

W.P. 7-91-00

RECORD OF BOREHOLE No 1 — 1 OF 1 — METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 785 194.0, E 266 691.0 ORIGINATED BY BB

DIST 4 HWY 6N BOREHOLE TYPE Solid Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 10 06 CHECKED BY DD

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 (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)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
242.7	Ground Surface										
0.0											
			1	SS	9		242				
			2	SS	7		241				0 83 17 0
			3	SS	4		240				
			4	SS	18		239				
	Silty Sand to Sand With Trace of Clay, Brown V. Loose to Compact		5	SS	22		238				
			6	SS	16		237				0 75 20 5
			7	SS	13		236				
	Probably Silty Sand					P1	235				
233.1							234				
9.6	End of Borehole										

Note:
Original Borehole was drilled to depth 8.1 m on 1994 10 06
The Borehole was redrilled on 1994 12 08 to depth 9.6 m to install a piezometer.

1995 01 30
• GROUND WATER CONDITIONS

PIEZO. NO.	GROUND WATER ELEVATION (Metres)
1	237.42

$+^3$, $\times^5$: Numbers refer to Sensitivity

20
15 ◇ S (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 2 1 OF 1 METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 785 229.0; E 266 754.0 ORIGINATED BY BB

DIST 4 HWY 6N BOREHOLE TYPE Solid Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 10 06 CHECKED BY DD

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
241.0	Ground Surface										
0.0	Clayey Silt to Silt Some Sand, Tr. Organics Brown, Moist, Firm		1	SS	8		240				
239.7											
1.3	Silt, Trace Sand, Trace Clay Brown, wet, Loose		2	SS	8						0 0 92 8
239.0							239				
2.0			3	SS	6						
			4	SS	2	▼	238				
			5	SS	2						0 78 18 4
							237				
			6	SS	4						
	Silty Sand to Sand Trace Clay, Brown Very Loose to Compact						236				
			7	SS	20		235				
							234				
			8	SS	10						
							233				
231.7			9	SS	24		232				
9.3	End of Borehole										

$+^3$, $\times^5$: Numbers refer to Sensitivity

$15 \diamond^{20}_{10} 5$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 3 — 1 OF 1 — METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 785 255.0; E 266 801.0 ORIGINATED BY BB

DIST 4 HWY 6N BOREHOLE TYPE Solid Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 10 06 CHECKED BY DD

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'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
239.7	Ground Surface										
0.0	Clayey Silt Some Sand, Tr. Organics Moist, Firm		1	SS	7		239				
238.3											
1.4	Silt Some Sand, Trace Clay Brown to Grey Very Loose to Compact		2	SS	4		238				
			3	SS	16		237				
			4	SS	18	▼					
			5	SS	14		236				3 63 30 4
			6	SS	15		235				
234.2											
5.5	Silty Sand to Sand Trace Clay, Grey Very Loose to Compact		7	SS	24		234				
							233				
231.6			8	SS	4		232				
8.1	End of Borehole										

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 4 1 OF 1 METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 785 156.0; E 266 647.0 ORIGINATED BY SA

DIST 4 HWY 6N BOREHOLE TYPE Hollow Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 12 06 CHECKED BY DD

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, × 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
240.8	Ground Surface										
0.0	Silty Sand to Sandy Silt Brown, Dry to Wet V. Loose to V. Dense		1	SS	8		240				
			2	SS	7		239				
			3	SS	4		238				
			4	SS	72		237				
			5	SS	35		236				
			6	SS	27		235				
			7	SS	35		234				
			8	SS	40	▼	233				0 56 40 4
			9	SS	13		232				
231.2			10	SS	12						
9.6	End of Borehole										

$+^3$, $\times^5$: Numbers refer to Sensitivity

$\frac{20}{15 \diamond 5}$ (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 5 1 OF 1 METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 785 129.0; E 266 604.5 ORIGINATED BY SA

DIST 4 HWY 6N BOREHOLE TYPE Hollow Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 12 06 CHECKED BY DD

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, 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
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
239.6	Ground Surface										
0.0	Silty Sand to Sandy Silt Trace of Clay, Trace of Gravel Brown to Grey Moist to Wet Loose to Compact		1	SS	7		239				
			2	SS	12		238				
			3	SS	6	▼	237				
			4	SS	6		236				
			5	SS	16						7 77 13 3
			6	SS	20		235				
			7	SS	16		234				
			8	SS	18		233				
			9	SS	17		232				
230.0			10	SS	16	P1	231				
9.6	End of Borehole						230				

1994 12 06
* GROUND WATER CONDITIONS

PIEZO. NO.	GROUND WATER ELEVATION (Metres)
1	237.1

+3, x5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 6 1 OF 1 METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 784 818.0; E 266 750.0 ORIGINATED BY SA

DIST 4 HWY 6N BOREHOLE TYPE Solid Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 12 07 CHECKED BY DD

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 (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
240.0	Ground Surface										
0.0	Silty Sand to Sandy Silt Trace of Gravel Grey, Wet Loose to compact		1	SS	4	▼	239				
			2	SS	7		238				
			3	SS	5						8 79 11 2
			4	SS	31		237				
			5	SS	9		236				
			6	SS	10		235				
			7	SS	8		234				
			8	SS	9						0 95 3 2
			9	SS	15		233				
							232				
230.4			10	SS	16		231				
9.6	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 7 1 OF 1 METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 785 181.0; E 266 417.5 ORIGINATED BY SA

DIST 4 HWY 6N BOREHOLE TYPE Solid Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 12 08 CHECKED BY DD

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
237.7	Ground Surface										
0.0	Silty Clay With Some Sand Brown, Moist Soft		1	SS	3	▼	237				
235.6			2	SS	2		236		w_L 27 w=57.5		
2.1	Silty Sand to Sandy Silt Brown to Grey Moist to Wet V. Loose to Compact		3	SS	2		235				
			4	SS	1		234				
			5	SS	11						
			6	SS	7		233				0 84 16 0
			7	SS	8		232				
			8	SS	8		231				
			9	SS	6		230				
							229				
228.1			10	SS	5						
9.6	End of Borehole										

$+^{3}$, $\times^{5}$: Numbers refer to Sensitivity

$\frac{20}{15}\diamond\frac{5}{10}$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 8 1 OF 1 METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 785 219.0; E 266 350.0 ORIGINATED BY SA

DIST 4 HWY 6N BOREHOLE TYPE Solid Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 12 08 CHECKED BY DD

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
236.2	Ground Surface										
0.0	Clayey Silt With Some Sand Brown, Moist Soft		1	SS	3	▼	236				
235.0											
1.2	Silty Sand to Sandy Silt Brown to Grey Moist to Wet V. Loose to Compact		2	SS	3		235				
			3	SS	6		234				
			4	SS	3		233				
			5	SS	8		232				
			6	SS	19		231				
			7	SS	13						
			8	SS	7		230				
			9	SS	6		229				
							228				
226.6			10	SS	13		227				
9.6	End of Borehole										

$+^3$, $\times^5$: Numbers refer to Sensitivity

20
15 ◇ S (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 9 1 OF 1 METRIC

W.P. 7-91-00 LOCATION Co-ords.: N 4 784 787.0; E 266 780.0 ORIGINATED BY SA

DIST 4 HWY 6N BOREHOLE TYPE Solid Stem Auger COMPILED BY KA

DATUM Geodetic DATE 1994 12 09 CHECKED BY DD

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
240.0	Ground Surface										
0.0	Clayey Silt With Sand, Organics Brown, Wet Soft					▼					
238.8			1	SS	4		239				
1.2	Silty Sand to Sandy Silt With Some Gravel Brown to Grey, Wet Loose to Dense		2	SS	8		238				
			3	SS	7						6 62 28 4
			4	SS	26		237				
			5	SS	33		236				
			6	SS	26		235				
			7	SS	7		234				
			8	SS	17		233				
231.9			9	SS	11		232				
8.1	End of Borehole										

Corrected co-ordinates as per
B. Bennett on 3 July, 2002
N 4 784 787 E 266 768

W.P. 9-91-02

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. W1

N 4 784 778
E 266 845

PROJECT W. P. 9 - 91 - 02, HIGHWAY 6 / 53 STRUCTURES
OUR PROJECT 99HF073
LOCATION Ancaster, Ontario
BORING DATE October 18 & 19, 1999
ENGINEER P. Cullen
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	GROUNDWATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 242.80						
0	**SAND FILL** : Compact, dark brown to brown, fine to coarse sand, some gravel, trace of silt		242	1	SS	23	
1.40	becoming gravelly		241	2	SS	30	Grain Size Distribution %: GR 49, SA 42, SI 7, CL 2
1.5			240	3	SS	29	
2.90							
3.0	**SAND** : Compact, brown fine to medium sand with gravel, some silt		239	4	SS	16	GR 24, SA 54, SI 17, CL 5
4.30				5	SS	28	
4.5	BOREHOLE TERMINATED AT 4.30m		238				Upon completion of augering, no free water, no cave.
6.0							

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %
10 20 30

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. W2

N 4 784 797
E 266 835

PROJECT W.P. 9-91-02, HIGHWAY 6/53 STRUCTURES
OUR PROJECT 99HF073
LOCATION Ancaster, Ontario
BORING DATE October 13, 1999
ENGINEER P. Cullen
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N-VALUES	GROUNDWATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 242.11					
0	**SAND FILL** : Compact, brown fine to coarse sand, trace of gravel and silt, dry	241	1	SS	18	
1.40	becoming sand and gravel	240	2	SS	25	Grain Size Distribution %: GR 64, SA 26, SI 8, CL 0
1.5			3	SS	14	
3.00	with black sand and gravel	239	4	SS	27	
3.0						
3.60	**SAND** : Loose, brown fine sand, some silt, saturated	238	5	SS	7	
4.40	becoming compact, trace of clay					
4.5		237	6	SS	14	GR 0, SA 85, SI 10, CL 5
6.0		236	7	SS	12	
7.5		235	8	SS	13	
8.60	with trace of silt, grey	234				
9.0		233	9	SS	22	
10.5		232				
11.00	**SILT** : Dense, brown fine sandy silt, wet	231				
12.0		230	10	SS	43	
13.5		229				
14.00	becoming compact, some sand, trace of clay, saturated	228				
15.0		227				
		226	11	SS	12	GR 0, SA 13, SI 83, CL 4
16.50						
16.5	continued on next page					

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT —— W_L
PLASTIC LIMIT —— W_P
WATER CONTENT —— W
W_P W W_L
WATER CONTENT %
10 20 30

NOTES:
Dynamic Cone Test carried out 3.0m west of Borehole.

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. W2 (con't)

N 4 784 797
E 266 835

PROJECT W.P. 9-91-02, HIGHWAY 6/53 STRUCTURES — OUR PROJECT 99HF073
LOCATION Ancaster, Ontario — BORING DATE October 13, 1999 — ENGINEER P. Cullen
BORING METHOD Continuous Flight Solid Stem Augers — TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION (GROUND ELEVATION)	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N-VALUES
16.5						
17.00	**SILT** (con't): Compact, brown silt, some sand, trace of clay, saturated		225			
	becoming grey, with occasional thin layers of clay, medium to high plastic, W.T.P.L.		224	12	SS	20
18.0			223			
19.5						
20.10	**SILTS AND CLAYS**: Compact, layered brown silts and grey silty clays, medium to high plastic, W.T.P.L.		222			
21.0			221	13	SS	10
22.5			220			
23.20	becoming very dense/hard, reddish brown to grey silt, some clay, trace of sand		219			
24.0			218	14	SS	59
25.5			217			
26.50	**BOREHOLE TERMINATED AT 26.50m UPON REFUSAL TO AUGER. PROBABLE BEDROCK.**		216			
27.0			215			
28.5						
30.0						
31.5						
33.0						

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M: 20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %: 10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

Grain Size Distribution %

	GR	SA	SI	CL
14	1	5	72	22

Upon completion of augering, free water at 3.65m.

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. W3A

N 4 784 833
E 266 825

PROJECT W.P. 9 - 91 - 02, HIGHWAY 6 / 53 STRUCTURES — OUR PROJECT 99HF073
LOCATION Ancaster, Ontario — BORING DATE November 3 & 4, 1999 — ENGINEER P. Cullen
BORING METHOD Continuous Flight Hollow Stem Augers and NQ Coring — TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION (GROUND ELEVATION 241.86)	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0		241			
0.20	**TOPSOIL** : Dark brown clayey silt				
			1	SS	11
1.40	**SILT FILL** : Compact, brown fine sandy silt, trace of gravel, damp	240	2	SS	13
1.5					
2.10	with some clay				
		239	3	SS	8
2.90	**SILT** : Loose, brown sandy silt, with gravel, trace of clay, moist				
3.0			4	SS	10
3.20	**SAND** : Compact, brown silty fine to coarse sand, damp	238			
3.70	becoming saturated		5	SS	10
4.5	with some silt, thin layers of sandy silt, trace of clay	237	6	SS	12
		236			
6.0			7	SS	8
		235			
7.5		234	8	SS	22
		233			
9.0					
9.30	**SILT** : Dense, grey sandy silt, wet	232	9	SS	32
10.5		231			
		230			
12.0					
		229	10	SS	38
13.5		228			
13.80	with some sand, trace of clay				
		227			
15.0					
		226	11	SS	6
16.50					
16.5	continued on next page	225			

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %
10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

Grain Size Distribution %			
GR	SA	SI	CL
27	50	19	4
0	86	11	3
0	15	82	3

Free water encountered at SS4.

4m. heave in augers at SS11

NOTES:
Dynamic Cone Test carried out 3.0m west of borehole.

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. W3A (con't)

N 4 784 833
E 266 825

PROJECT W.P. 9-91-02, HIGHWAY 6/53 STRUCTURES — OUR PROJECT 99HF073
LOCATION Ancaster, Ontario — BORING DATE November 3 & 4, 1999 — ENGINEER P. Cullen
BORING METHOD Continuous Flight Solid Stem Augers and NQ Coring — TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION (GROUND ELEVATION)	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N-VALUES	SHEAR STRENGTH C_u / DYNAMIC CONE PENETRATION x / STANDARD PENETRATION TEST ● BLOWS/0.3M	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W / WATER CONTENT %	GROUNDWATER OBSERVATIONS AND REMARKS / Grain Size Distribution % GR SA SI CL
16.5			225						
17.00	**SILT** (con't): Dense, grey silt, some sand, trace of clay, wet								
	becoming compact, saturated with trace of fine sand		224						
18.0				12	SS	21			
			223						
19.5			222						
20.10	**SILTS AND CLAYS** : Stiff, grey silts and silty clays, layered, medium to high plastic, W.T.P.L.								
21.0			221						
				13	SS	12	■		0 1 47 52
			220						
22.5			219						
23.20	becoming dense, predominantly reddish brown to grey silts, non plastic, with occasional inclusions of grey silty clay, wet								
24.0			218						
			217	14	SS	44			
25.5									Upon completion of augering, no free water, no cave.
25.90			216						
	BEDROCK : Dolostone								
27.0			215	15	RC		1550 95 87 100 (End of Run)		
			214				Start of Run		
				16	RC		1450 97 73 100		
28.5			213						
28.90	**BOREHOLE TERMINATED AT 28.90m**								
			212						
30.0									
31.5									
33.0									

RUN (mm) | RECOVERY (%) | RQD (%) | DRILL WATER RETURN (%)

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. W4

N 4 784 850
E 266 827

PROJECT W. P. 9 - 91 - 02, HIGHWAY 6 / 53 STRUCTURES
OUR PROJECT 99HF073
LOCATION Ancaster, Ontario
BORING DATE October 15, 1999
ENGINEER P. Cullen
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 243.37					
0	0.25 **TOPSOIL** : Dark brown clayey silt		243			
	SILT FILL : Hard, brown silt, some clay and sand, trace of gravel, slightly plastic, D.T.P.L., mottled dark brown			1	SS	30
1.5	1.40		242			
	becoming compact, non to slightly plastic			2	SS	10
	2.10		241			
	2.60			3	SS	3
3.0	**SAND FILL** : Very loose, dark brown fine to coarse sand, trace to some silt, damp		240	4	SS	19
	3.10					
	3.70 **SILT** : Loose, brown silt, trace of fine sand, damp			5	SS	2
	4.30		239			
4.5	**SAND** : Compact, brown fine sand, some silt, trace clay, faintly stratified, dry to damp					
	becoming very loose, trace of silt, not stratified					
6.0	**BOREHOLE TERMINATED AT 4.30m**					

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT —— W_L
PLASTIC LIMIT —— W_P
WATER CONTENT —— W
W_P W W_L
WATER CONTENT %
10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

Grain Size Distribution %

NUMBER	GR	SA	SI	CL
1	10	25	47	18
5	0	73	19	8

Upon completion of augering, no free water, no cave.

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. E1A

N 4 784 786
E 266 873

PROJECT W. P. 9 - 91 - 02, HIGHWAY 6 / 53 STRUCTURES
LOCATION Ancaster, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE October 18 & 19, 1999

OUR PROJECT 99HF073
ENGINEER P. Cullen
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 243.14				
0					
0.20	**TOPSOIL** : Dark brown clayey silt				
	SILT : Stiff, brown clayey silt, trace of sand, slightly plastic, A.P.L.	242	1	SS	10
1.40					
1.5			2	SS	9
2.10	becoming loose with trace of clay, faintly stratified, damp	241			
			3	SS	5
2.90	**SILTS AND SANDS** : Loose silts and fine sands, occasional layer of silty clay				
3.0		240	4	SS	35
3.70	becoming dense, predominantly fine sand, trace to some silt, stratified, dry				
4.30	with trace of silt and clay	239	5	SS	48
4.5					
	BOREHOLE TERMINATED AT 4.30m	238			
6.0					

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT —— W_L
PLASTIC LIMIT —— W_P
WATER CONTENT —— W
W_P W W_L
WATER CONTENT %
10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

	Grain Size Distribution %			
	GR	SA	SI	CL
1.5	0	2	91	7
3.0	0	80	10	10

Upon completion of augering, no free water, no cave.

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. E2A

N 4 784 803
E 266 865

PROJECT W.P. 9-91-02, HIGHWAY 6/53 STRUCTURES
OUR PROJECT 99HF073
LOCATION Ancaster, Ontario
BORING DATE October 18 & 19, 1999
ENGINEER P. Cullen
BORING METHOD Continuous Flight Hollow Stem Augers and NXL Coring
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N-VALUES
	GROUND ELEVATION 243.63				
0					
0.20	**TOPSOIL** : Dark brown clayey silt	243			
	SILT : Stiff, brown clayey silt, trace of sand, slightly plastic, D.T.P.L.		1	SS	12
1.40					
1.5		242	2	SS	9
2.10	with trace of clay, non to slightly plastic, wet				
	becoming very stiff, with layers of fine sand, trace of silt, dry	241	3	SS	20
2.90					
3.0			4	SS	100
3.70	**SILTS AND SANDS** : Very dense, brown fine sandy silt and fine sands, layered, dry	240			
			5	SS	39
4.40					
4.5	becoming dense, predominantly sands, some silt	239	6	SS	16
	becoming compact, with occasional layers of silt, wet				
5.60		238			
6.0	becoming loose, trace of clay, saturated		7	SS	7
		237			
7.5		236			
			8	SS	11
		235			
9.0					
9.50	becoming compact, grey, predominantly silts	234	9	SS	18
10.5		233			
11.00	becoming predominantly fine sands and silts, saturated				
		232			
12.0					
		231	10	SS	17
13.5		230			
		229			
15.0					
		228	11	SS	8
16.50		227			
16.5	continued on next page				

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %
10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

	Grain Size Distribution %			
	GR	SA	SI	CL
1.5	0	3	90	7
4.5	0	79	18	3
7.5	0	85	10	5
15.0	0	51	44	5

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. E2A (con't)

N 4 784 803
E 266 865

PROJECT W.P. 9 - 91 - 02, HIGHWAY 6 / 53 STRUCTURES — OUR PROJECT 99HF073
LOCATION Ancaster, Ontario — BORING DATE October 18 & 19, 1999 — ENGINEER P. Cullen
BORING METHOD Continuous Flight Solid Stem Augers and NXL Coring — TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION				
16.5	17.00 — **SILTS AND SANDS** (con't): Compact, grey, fine sands and silts, saturated	226			
	becoming predominantly silts		12	SS	18
18.0		225			
19.5		224			
	20.10 — becoming dense, with fine silty sands, trace of clay	223			
21.0		222	13	SS	38
22.5		221			
	23.20 — **SILTS AND CLAYS**: Very stiff, brown silts, with distorted layers of grey silty clays, medium plastic, W.T.P.L.	220			
24.0		219	14	SS	24
25.5		218			
	26.20 — becoming predominantly silts	217			
27.0		216			
	28.00 — **BEDROCK**: Dolostone		15	SS	70
28.5		215	16	RC	
		214			
30.0		213	17	RC	
	31.00 — BOREHOLE TERMINATED AT 31.00m	212			
31.5					
33.0					

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M: 20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %: 10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

Grain Size Distribution %

GR	SA	SI	CL
0	50	45	5

Upon completion of augering, free water at 5.47m.

RUN (mm)	RECOVERY (%)	RQD (%)	DRILL WATER RETURN (%)
1500	93	83	100
	End of Run / Start of Run		
1500	100	83	100

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. E3A

N 4 784 840
E 266 861

PROJECT W.P. 9-91-02, HIGHWAY 6/53 STRUCTURES
OUR PROJECT 99HF073
LOCATION Ancaster, Ontario
BORING DATE October 15, 1999
ENGINEER P. Cullen
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N-VALUES	GROUNDWATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 243.67					
0	0.25 **TOPSOIL** : Dark brown clayey silt	243				
	SILT : Compact, brown silt, some clay, trace of sand, slightly plastic, D.T.P.L.		1	SS	20	
1.40	becoming loose, khaki brown, trace of clay and fine sand, non to slightly plastic, moist, occasional thin lenses of silty clay	242	2	SS	9	Grain Size Distribution %: GR 0, SA 3, SI 82, CL 15
2.90	with thin layers of brown clay	241	3	SS	10	
3.40		240	4	SS	6	
3.70	**SILTS AND SANDS** : Loose, brown silts and fine sands, trace of clay, layered, moist		5	SS	5	Grain Size Distribution %: GR 0, SA 47, SI 29, CL 24
4.40	with layers of clays	239	6	SS	24	
	becoming compact					
5.60	becoming predominantly sands, saturated	238				
		237	7	SS	18	
		236	8	SS	16	
		235				
9.20	becoming brown to grey, predominantly sandy silts, trace of clay	234	9	SS	11	Grain Size Distribution %: GR 0, SA 37, SI 57, CL 6
		233				
11.00	becoming predominantly sands	232				
		231	10	SS	13	
		230				
		229				
		228	11	SS	15	
16.50		227				

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M: 20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %: 10 20 30

continued on next page

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. E3A (con't)

N 4 784 840
E 266 861

PROJECT W.P. 9-91-02, HIGHWAY 6/53 STRUCTURES
LOCATION Ancaster, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE October 13, 1999
OUR PROJECT 99HF073
ENGINEER P. Cullen
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N-VALUES	GROUNDWATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION					
16.5						
17.10	**SILTS AND SANDS** (con't): Compact, brown to grey silts and fine sands, layered, saturated	226				
18.0	becoming predominantly silts, trace of sand and clay	225	12	SS	15	0 6 88 6
19.5		224				
20.10	becoming dense, brownish grey, some fine sand	223				
21.0		222	13	SS	32	
22.5		221				
23.20	**SILTS AND CLAYS**: Very stiff, layered grey silts and silty clays, high plastic	220				
24.0		219	14	SS	26	0 0 72 28
25.5		218				
		217				
27.0		216				
28.00	**BOREHOLE TERMINATED AT 28.00m UPON REFUSAL TO AUGER. PROBABLE BEDROCK**	215				Upon completion of augering, free water at 5.53m.
28.5						
30.0						
31.5						
33.0						

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %
10 20 30

Grain Size Distribution %
GR SA SI CL

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. E4

N 4 784 856
E 266 856

PROJECT W. P. 9 - 91 - 02, HIGHWAY 6 / 53 STRUCTURES
OUR PROJECT 99HF073
LOCATION Ancaster, Ontario
BORING DATE October 15, 1999
ENGINEER P. Cullen
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
	GROUND ELEVATION 244.00				
0.25	**TOPSOIL** : Dark brown clayey silt				
	SILT : Compact, brown sandy silt, some clay, slightly plastic, D.T.P.L.	243	1	SS	19
1.40	becoming loose, trace of sand, non-plastic	242	2	SS	9
		241	3	SS	6
3.70			4	SS	15
4.30	**SAND** : Loose, brown fine sand some silt, wet	240	5	SS	7
	BOREHOLE TERMINATED AT 4.30m	239			

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %
10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

Grain Size Distribution %

	GR	SA	SI	CL
	0	38	46	16
	0	2	82	16

Upon completion of augering, no free water, no cave.

NOTES:

CHECKED BY:

W.P. 5-91-01

RECORD OF BOREHOLE No S1 1 OF 2 METRIC

W.P. 5-91-01 LOCATION Co-ords N 4 785 419.0 E 266 565.4 ORIGINATED BY DR

DIST 4 HWY 403 BOREHOLE TYPE HS Auger COMPILED BY BB

DATUM Geodetic DATE 94 02 25 CHECKED BY BB

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
246.5	Ground Surface										
0.0	SILT Trace Sand Trace Clay Brown Loose to Very Dense		1	SS	8		246				
			2	SS	30		244				
			3	SS	51		242				
239.8			4	SS	25		240		o		0 0 94 6
6.9			5	SS	44				o		3 76 (21)
	SAND to SILTY SAND Occasional silt zones Trace Clay Grey Loose to Dense		6	SS	25		238				
			7	SS	11	▼	236				
			8	SS	36		234				
			9	SS	32		232				
			10	SS	28				o		0 47 50 3
226.7			11	SS	8		228				
19.8	SANDY SILT to SILT Trace Clay Grey Compact to Dense		12	SS	28		226				
			13	SS	0 *		224				
	Occ. grey and red clayey silt layers		14	SS	35		222				
216.0							220		o		0 1 (99)
30.5							218				

Continued

Continued

$+^{3}$, $\times^{5}$: Numbers refer to Sensitivity

$\frac{20}{15}\diamond 5$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No S1 2 OF 2 METRIC

W.P. 5-91-00 LOCATION Co-ords N 4 785 419.0 E 266 565.4 ORIGINATED BY DR

DIST 4 HWY 403 BOREHOLE TYPE HS Auger COMPILED BY BB

DATUM Geodetic DATE 94 02 25 CHECKED BY BB

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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
30.5	Continued										
	SANDY SILT to SILT Trace Clay Very Loose to Dense Occasional Cobbles Probable Boulders		15	SS	37						
213.3	**						214				
33.2	End of Borehole										

* Disturbed Sample

** Probable dolostone bedrock

*** Groundwater level not stabilized

$+^3$, $\times^5$: Numbers refer to Sensitivity

$15 \diamond^{20}_{5}$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No P1 1 OF 2 METRIC

W.P. 5-91-00 LOCATION Co-ords N 4 785 443.6 E 266 548.3 ORIGINATED BY DR

DIST 4 HWY 403 BOREHOLE TYPE HS Auger COMPILED BY BB

DATUM Geodetic DATE 94 02 21 CHECKED BY BB

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 (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
245.8	Ground Surface										
0.0	SAND Trace/Some Silt Trace Gravel Brown Very Loose to Loose		1	SS	3						
			2	SS	2		244				
242.9	(Fill Material)		3	SS	6						
2.9	SAND Some Silt Trace Gravel Compact		4	SS	11				○		0 69 (31)
241.5			5	SS	10		242				
4.3	SILT Trace Sand Trace Clay Brown		6	SS	13				○		0 6 88 6
			7	SS	16						
238.9	Compact		8	SS	27		240		○		0 3 85 12
6.9			9	SS	60/13cm	▼	238		●		8 75 (17)
	SAND to SILTY SAND Trace Gravel Trace Clay Grey Compact to Very Dense		10	SS	56						
			11	SS	22		236				
			12	SS	19						
			13	SS	16		234				
228.3			14	SS	13				○		0 62 (38)
17.5			15	SS	10		232				
	SANDY SILT to SILT Trace Clay Grey Compact to Very Dense										
			16	SS	20		230				
	Occasional Cobbles Probable Boulders						228				
							226				
							224				
							222				
							220				
							218				
215.3							216				

30.5

Continued

Numbers refer to 20

Continued

RECORD OF BOREHOLE No P1 2 OF 2 METRIC

W.P. 5-91-00 LOCATION Co-ords N 4 785 443.6 E 266 548.3 ORIGINATED BY DR

DIST 4 HWY 403 BOREHOLE TYPE HS Auger COMPILED BY BB

DATUM Geodetic DATE 94 02 21 CHECKED BY BB

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 (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
30.5	Continued										
213.8	SANDY SILT to SILT Trace Clay Occ. Cobbles / Prob. Boulders Compact to Very Dense		17	SS	79				o		0 2 84 14
				SS	60	Dam	214				
32.0	End of Borehole • Probable dolostone bedrock										

RECORD OF BOREHOLE No N1 1 OF 2 METRIC

W.P. 5-91-00 LOCATION Co-ords N 4 785 467.8 E 266 521.0 ORIGINATED BY DR

DIST 4 HWY 403 BOREHOLE TYPE HS Auger COMPILED BY BB

DATUM Geodetic DATE 94 02 24 CHECKED BY BB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	'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 (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
246.7	Ground Surface										
0.0	SILT Trace Sand Trace Gravel Trace Clay Brown Compact to Very Dense		1	SS	31		246				
			2	SS	43		244				
			3	SS	47		242		o		6 6 82 6
			4	SS	50		240				
238.3			5	SS	18		238				
8.4	SAND to SILTY SAND Trace Clay Red Brown Loose to Very Dense		6	SS	75				o		0 75 (25)
			7	SS	44		236				
			8	SS	32	▼	234				
			9	SS	7		232				
227.6			10	SS	13		230		o		0 50 (50)
19.1	SANDY SILT to SILT Trace Clay Grey Loose to Very Dense		11	SS	17		228				
			12	SS	23		226				
			13	SS	8		224		o		0 3 86 11
			14	SS	70	/13cm	222				
	Occasional Cobbles Probable Boulders						220				
216.2							218				

30.5 Continued

Continued

+3, ×5 : Numbers refer to Sensitivity

20
15-◇-5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No N1 2 OF 2 METRIC

W.P. 5-91-00 LOCATION Co-ords N 4 785 467.8 E 266 521.0 ORIGINATED BY DR

DIST 4 HWY 403 BOREHOLE TYPE HS Auger COMPILED BY BB

DATUM Geodetic DATE 94 02 24 CHECKED BY BB

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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
	Continued										
30.5	SANDY SILT to SILT Occasional clayey silt layers Grey Loose to Very Dense		15	SS	41		216				0 0 (100)
213.6						/Dam	214				
33.1	End of Borehole • Probable dolostone bedrock										

+³, ×⁵ : Numbers refer to Cumulative

20
15-◇-5 (%) STRAIN AT FAILURE

W.P. 277-99-01

RECORD OF BOREHOLE No 1 — 1 OF 1 — METRIC

W.P. 277-99-01 LOCATION Co-ords: N4 785 062.0; E 266 719.4 ORIGINATED BY TS

DIST CR HWY 6(New) BOREHOLE TYPE HS Auger, BX Core COMPILED BY DT

DATUM Geodetic DATE Sep 28 1999 CHECKED BY TS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, + FIELD VANE, • QUICK TRIAXIAL, x LAB VANE; 20 40 60 80 100)	WATER CONTENT (%) w_P — w — w_L (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
241.9	Ground Surface										
0.0	SILT, some Sand Brown Very Loose to Compact		1	SS	4		241				
239.9			2	SS	10				o		0 17 (83)
2.0			3	SS	27		239				
			4	SS	21						
	Brown Grey		5	SS	16				o		0 88 (12)
			6	SS	11		237				
	With Gravel, Dense		7	SS	45				o		39 53 (8)
							235				
	SAND TO SILTY SAND Very Loose to Compact		8	SS	9						
			9	SS	10		233		o		0 86 (14)
			10	SS	31						
			11	SS	8		231				
									p		1 54 (45)
			12	SS	12		229				
			13	SS	6		227				
222.1			14	SS	8		225				
19.8											
	SILT Grey Dense to Very Dense		15	SS	43		223				
							221				
							219				
215.4			18	SS	79		217		o		0 0 (100)
26.5	DOLOSTONE BEDROCK Grey Unweathered		17	RC	REC 100%		215				RQD=58%
213.9											
26.0	End of Borehole - WL Not Established										

+³, x³: Numbers refer to Sensitivity

20 / 15 ◇ 3 / 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 2 1 OF 1 METRIC

W.P. 277-99-01 LOCATION Co-ords: N4 785 043.5; E 286 721.1 ORIGINATED BY TS

DIST CR HWY 6 (New) BOREHOLE TYPE HS Auger, BX Core COMPILED BY DT

DATUM Geodetic DATE Sep 27 1999 CHECKED BY TS

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
241.1	Ground Surface										
0.0	SILT Brown Very Loose to Compact		1	SS	4		240				
			2	SS	12						8 19 69 6
			3	SS	13						
237.6			4	SS	17		238				0 16 (84)
3.5	Brown / Grey		5	SS	8						
			6	SS	9		236				
			7	SS	8						
			8	SS	2		234				0 70 (30)
	SAND TO SILTY SAND		9	SS	3		232				
			10	SS	14						
			11	SS	3		230				0 56 (44)
			12	SS	2		228				
	Very Loose to Compact / Dense		13	SS	37		226				
			14	SS	34		224				
221.3							222				
19.8	SILT Grey Dense to Very Dense		15	SS	34		220				0 2 82 16
							218				
			16	SS	86						0 0 (100)
215.5							216				
25.6	DOLOSTONE BEDROCK Grey Unweathered		17	RC	REC= 100%						RQD=63 %
214.0											
27.1											

▼ WL Not Established

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

$\frac{20}{15 \diamond 5}$ (%) STRAIN AT FAILURE
$\frac{10}{}$

RECORD OF BOREHOLE No 3 — 1 OF 1 — METRIC

W.P. 277-98-01 LOCATION Co-ords: N4 785 028.2; E 266 747.0 ORIGINATED BY TS

DIST CR HWY 6 (New) BOREHOLE TYPE HS Auger BX Core COMPILED BY DT

DATUM Geodetic DATE Sep 30 1989 CHECKED BY TS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'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
242.0	Ground Surface										
0.0	SILT Loose to Compact Brown / Grey		1	SS	12		240		○		0 6 (94)
			2	SS	8						
			3	SS	22						0 3 88 11
			4	SS	18						
237.7			5	SS	10		238		●		0 2 (98)
4.3	SAND TO SILTY SAND Grey Loose to Compact		6	SS	12						
			7	SS	12		236				
			8	SS	15		234		○		11 40 (49)
			9	SS	7						
			10	SS	21		232				
			11	SS	18		230				
			12	SS	17		228		○		4 66 (30)
			13	SS	13		226				
223.7											
18.3	SILT Compact Dense		14	SS	28		224		○		0 15 (85)
			15	SS	20		222				
							220		○		0 1 (99)
			16	SS	37		218				1 5 78 16
214.7							216				
27.3	DOLOSTONE BEDROCK Grey Unweathered		17	RC	REC = 100%		214				RQD = 60%
213.2											
28.8	End of Borehole										
	▼ WL Not Established										

+³, ×³ : Numbers refer to Sensitivity

$\frac{20}{15}\diamondsuit\frac{5}{10}$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 4 1 OF 1 METRIC

W.P. 277-99-01 LOCATION Co-ords: N4 785 009.6; E 266 746.6 ORIGINATED BY TS

DIST CR HWY 6 (New) BOREHOLE TYPE HS Auger, BX Core COMPILED BY DT

DATUM Geodetic DATE Oct 1 1998 CHECKED BY TS

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, + FIELD VANE, * QUICK TRIAXIAL, x LAB VANE) / WATER CONTENT (%) (PLASTIC LIMIT P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT L)	UNIT WEIGHT kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
240.8	Ground Surface									
0.0	Brown / Grey SILT Compact to Dense		1	SS	20	*	240		7	0 7 (93)
			2	SS	31					
			3	SS	19		238			0 12 74 14
			4	SS	24					
236.5			5	SS	16					0 8 (92)
4.3	SAND TO SILTY SAND Random Zones of Sandy Silt		6	SS	13		236			
			7	SS	15		234			
			8	SS	3					0 65 (35)
			9	SS	17		232			
			10	SS	16		230			0 21 (79)
			11	SS	13					
	Very Loose to Compact / Dense		12	SS	12		228			0 21 (79)
			13	SS	41		226			
			14	SS	40		224			
221.0							222			
19.8	SILT Grey Dense to Very Dense		15	SS	30		220			
							218			
			16	SS	82		216			0 0 (100)
214.9										
25.9	DOLOSTONE BEDROCK Grey Unweathered		17	RC	REC = 100%		214			RQD=60%
213.4										
27.4	End of Borehole									

* WL Not Established

$+^{3}$, $\times^{5}$; Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 5 1 OF 1 METRIC

W.P. 277-99-01 LOCATION Co-ords: N4785 073.9; E 256 696.0 ORIGINATED BY TS

DIST CR HWY 6 (New) BOREHOLE TYPE HS Auger COMPILED BY DF

DATUM Geodetic DATE Sep 29 1999 CHECKED BY TS

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 7 kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
240.7	Ground Surface										
0.0	SILT Some Sand Brown Very Dense		1	SS	8		240				
238.7			2	SS	7				○		0 30 (70)
2.0			3	SS	2		238				
			4	SS	3						
			5	SS	1*						
	Brown / Grey		6	SS	22		236				19 72 (9)
	SAND TO SILTY SAND Very Loose to Compact		7	SS	6		234				
			8	SS	2				○		0 85 (15)
231.1			9	SS	6		232				
9.6	End of Borehole										

September 29, 1999
* GROUND WATER CONDITIONS

PIEZO. NO.	GROUND WATER ELEVATION (Metres)
1	3.3

$+^{3}$, $\times^{5}$: Numbers refer to Sensitivity

$\frac{20}{15}\diamond 5$ (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 6 — 1 OF 1 — METRIC

W.P. 277-99-01 LOCATION Co-ords: N4 784 994.6; E 266 769.4 ORIGINATED BY TS

DIST CR HWY 6 (New) BOREHOLE TYPE HS Auger COMPILED BY DT

DATUM Geodetic DATE Oct 1 1999 CHECKED BY TS

SOIL PROFILE			SAMPLES								
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	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)	WATER CONTENT (%): PLASTIC LIMIT w_P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT w_L (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
240.4	Ground Surface						240				
0.0 / 238.9	SILT		1	SS	25						
1.5	Brown / Grey — SAND TO SILTY SAND, Very Loose to Compact		2	SS	5		238		o o		0 66 (34)
			3	SS	1						
			4	SS	6						0 88 (11)
			5	SS	10		236		o		
			6	SS	21						
			7	SS	11		234				
			8	SS	27		232		b		0 66 (34)
230.8			9	SS	16						
9.6	End of Borehole										

October 1, 1999
• GROUND WATER CONDITIONS

PIEZO. NO.	GROUND WATER ELEVATION (Metres)
1	2.6

$+^3$, $\times^3$; Numbers refer to Sensitivity

$\frac{20}{15}\diamond\frac{5}{10}$ (%) STRAIN AT FAILURE