PRELIMINARY
FOUNDATION INVESTIGATION AND DESIGN REPORT
HIGH FILL EMBANKMENTS AND DEEP CUTS
FROM KITCHENER-WATERLOO EXPRESSWAY TO EAST OF REGIONAL ROAD 17
HIGHWAY 7-NEW, KITCHENER TO GUELPH
G.W.P. 408-88-00

V O L U M E 2

Geocres Number: 40P8-172

Report to

Ministry of Transportation Ontario
Southwestern Region

Thurber Engineering Ltd.
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Oakville, Ontario
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October 6, 2009
File: 15-64-17

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Appendices

Appendix K	KWE Expressway N-E Ramp, Station 15+020 –15+060 (Borehole 08-006)
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Appendix S	Regional Road 17, N/S-W Ramp, Station 10+000 –10+340 (Boreholes 08-108, 08-111, 08-112, 08-113, 08-117)
Appendix T	Regional Road 17, N/S-W Ramp, Station 10+300 –10+485 (Boreholes 08-108, 08-109, 08-110)

Appendices include:

- Record of Borehole Sheets
- Foundation Comparison
- Slope Stability Output
- Site Photograph
- Drawing titled "Borehole Locations and Soil Strata"

Appendix K

KWE Expressway N-E Ramp, Station 15+020 –15+060 (Borehole 08-006)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-006 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 647.59 E 225 992.18 ORIGINATED BY LG
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.12.01 - 2008.12.01 CHECKED BY MEF

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
311.2											
0.0	Clayey **SILT**, sandy, trace gravel, occasional organics Firm to Stiff Brown to Black (FILL)		1	SS	7		311		○		
			2	SS	10		310		○		
308.9			3	SS	11	▼			○		1 41 41 17
2.3	**SAND** and **GRAVEL** Very Dense Brown Moist (FILL)		4	SS	100/ 0.025		309		○		
308.2											
3.0	Clayey **SILT**, sandy, possible boulder, occasional organics, odour Stiff Black		5	SS	12		308		○		
307.1											
4.1	Silty **CLAY**, trace gravel, some decayed wood pieces Very Stiff Grey		6	SS	26		307		○		
							306				
304.5			7	SS	22		305		○		
6.7	END OF BOREHOLE AT 6.7m. WATER OBSERVED AT 3.0m DURING DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.3 308.9 2009.02.12 1.9 309.3										

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

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

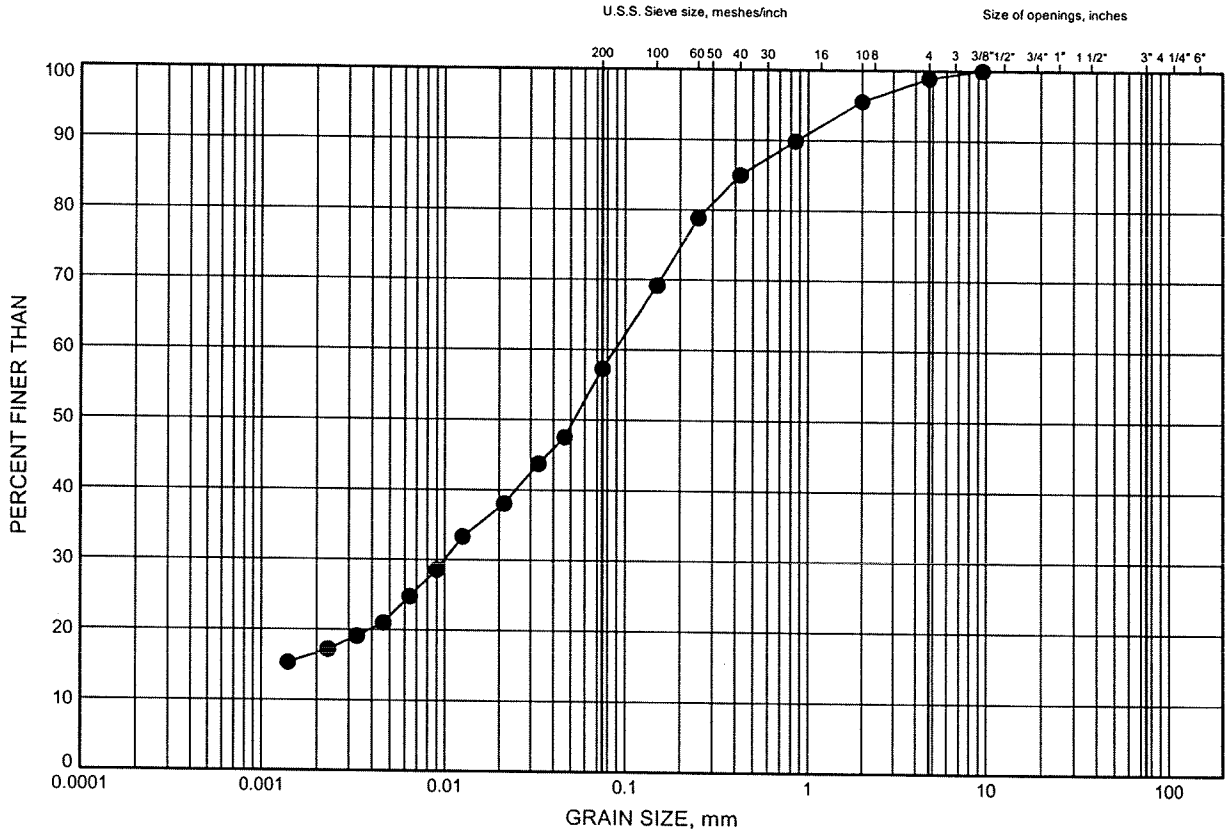
ONTMT4S 6417R.GPJ 8/17/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE K1

CLAYEY SILT FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-006	1.83	309.40

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Earth Fill	21	0	30	1
Silty Clay	18.5	100	0	1

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
KW Expressway - N-E Ramp
October 6, 2009
Fill Embankment, Station 15+020 -15+060
15.0 m high

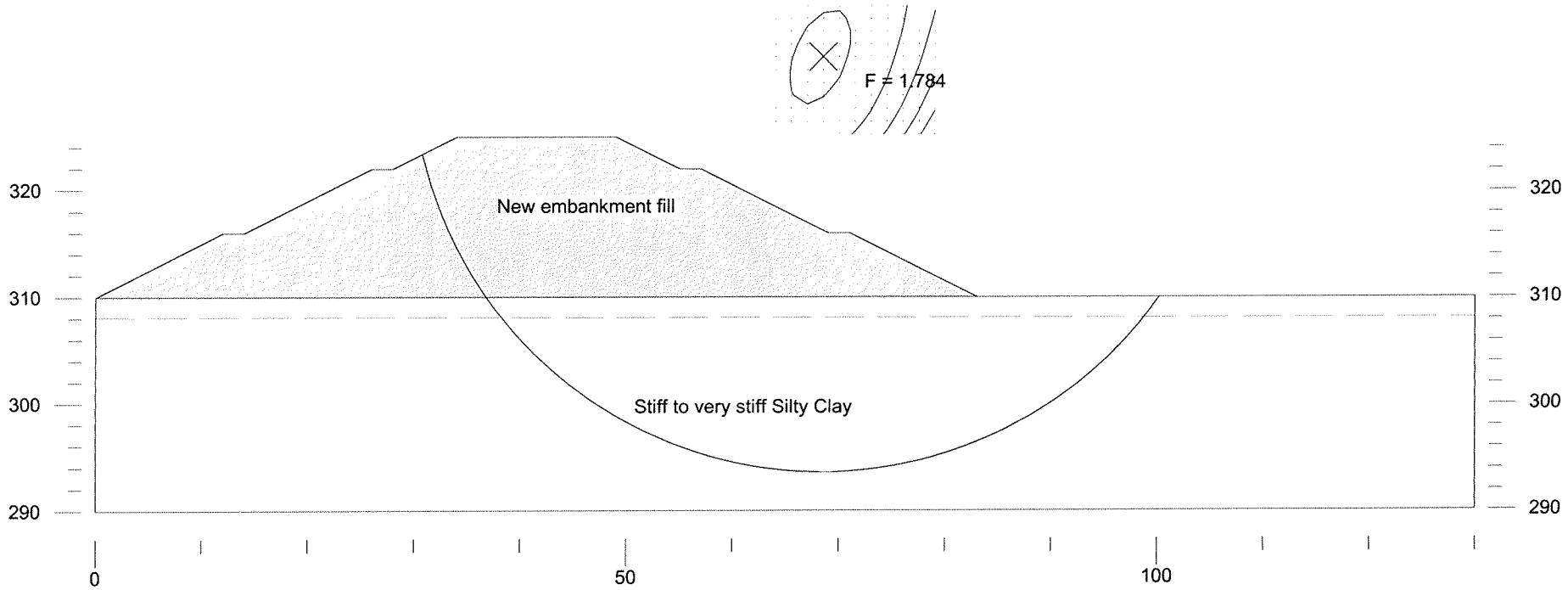
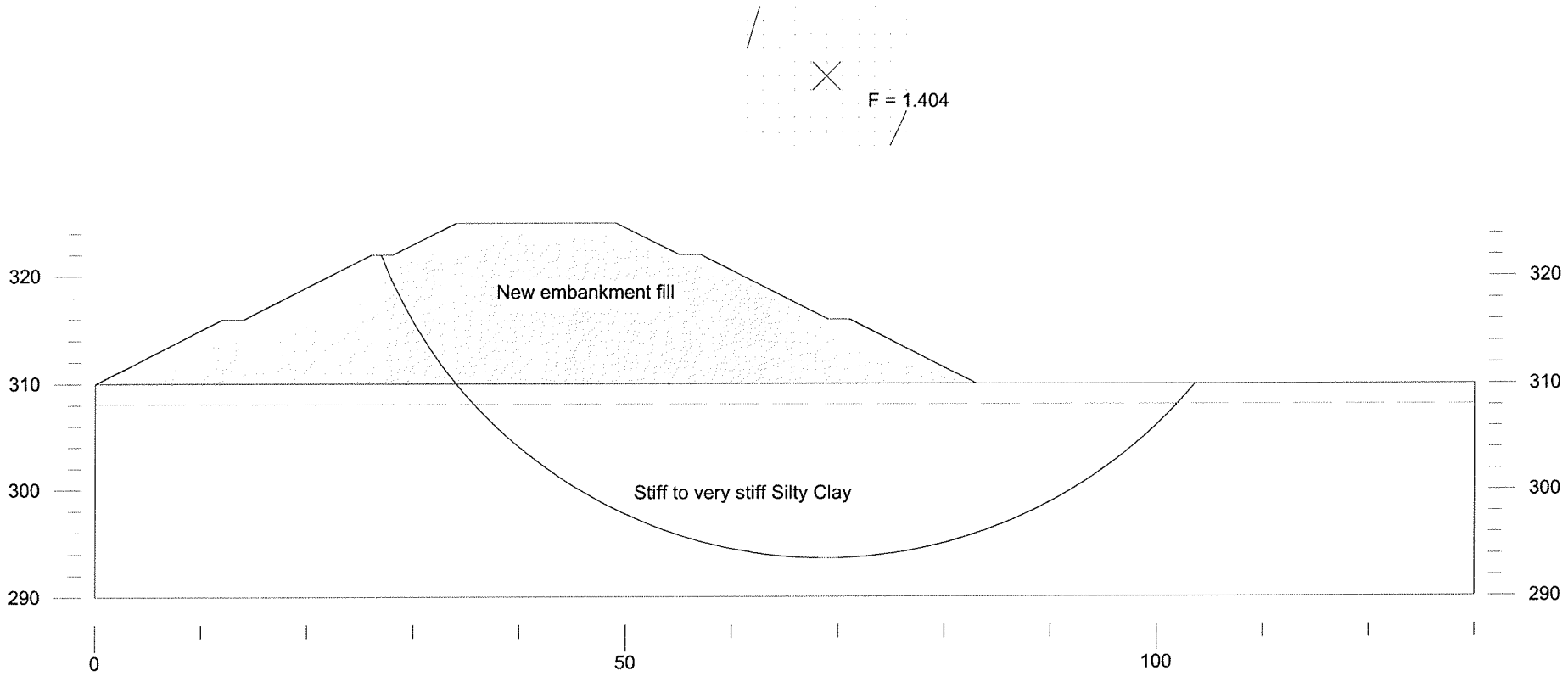


FIGURE K1

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Earth Fill	21	0	30	1
Silty Clay	18.5	100	0	1

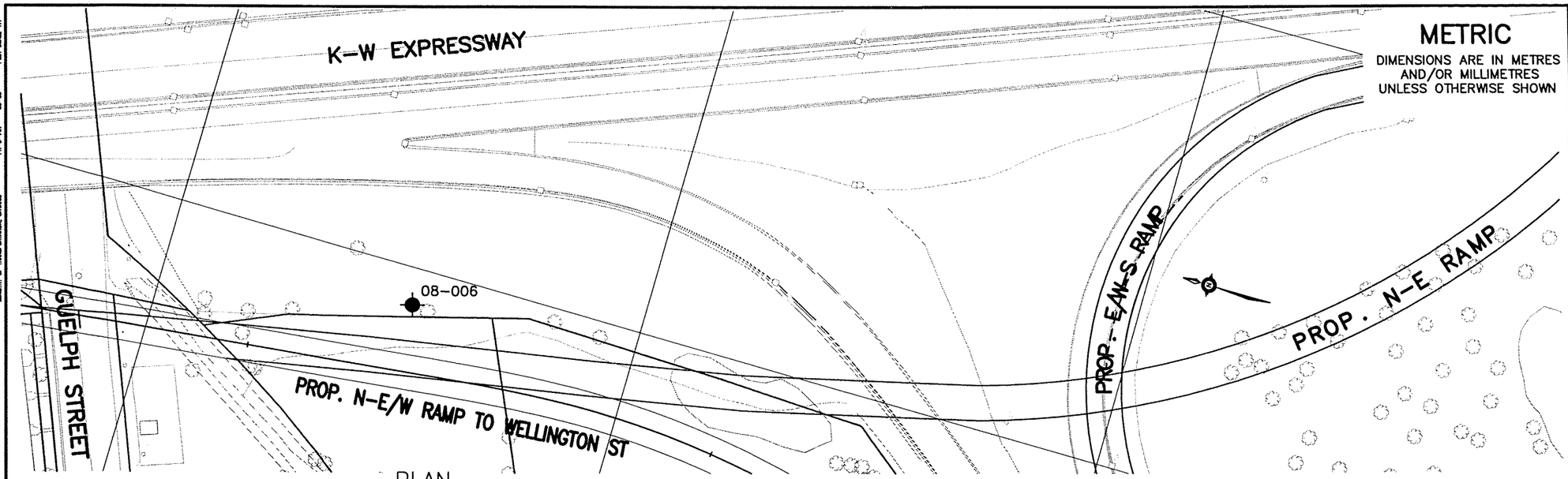
Seismic coefficient = 0.08

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
KW Expressway - N-E Ramp
October 6, 2009
Fill Embankment, Station 15+020 -15+060
15.0 m high - Seismic



10/6/2009 10:27:58 AM H:\15\64\17HWY7~1\REPORT~1\EMBANK~1\EMBANK~1\KS4S.GSL Thurber Engineering Ltd. - Toronto F = 1.404

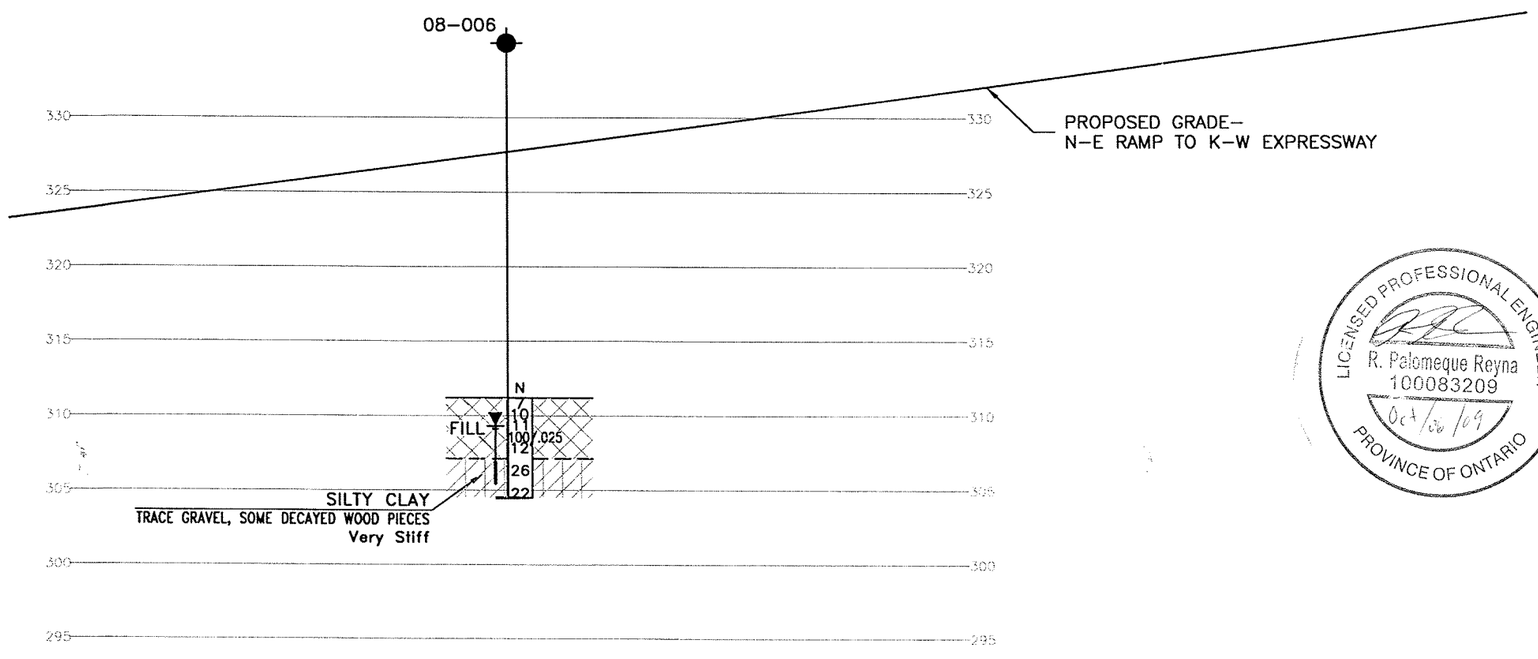
FIGURE K2



PLAN

0 20 40 60m

SCALE 1:1000



PROFILE ALONG ℄ OF PROP. N-E RAMP TO K-W EXPRESSWAY

0 20 40 60m HOR 1:1000

0 8 16 24m VER 1:400

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

METRIC

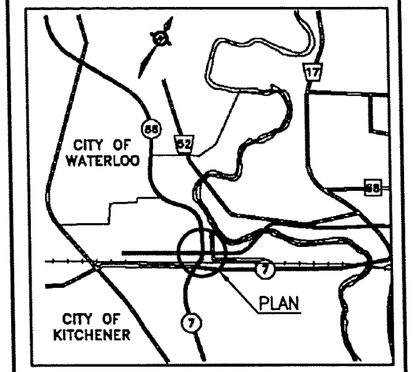
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 408-88-00

SHEET

HIGHWAY 7
RECOMMENDED ROUTE
KW EXPRESSWAY N-E RAMP, 15+020 TO 15+060
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

✦	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-006	311.2	4 814 647.6	225 992.2

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 2B of the E.A. Study.

GEOCRES No. 40P8-172

LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
Oct/06/09
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHAITERJI
Oct 6/09
PROVINCE OF ONTARIO

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	RPR	CHK	PKC	CODE		LOAD	DATE AUG. 2009
DRAWN	MFA	CHK	AEG	SITE		STRUCT	DWG

Appendix L

KWE Expressway N-E Ramp, Station 15+080 –15+270 (Boreholes 08-008, 08-010, 08-012)

Record of Borehole Sheets
Laboratory Test Results
Site Photograph
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-008 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 588.68 E 226 002.14 ORIGINATED BY LG
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.12.02 - 2008.12.02 CHECKED BY MEF

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 (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
314.3											
0.0	Clayey **SILT**, some sand, occasional rootlets Stiff Brown to Black (FILL)		1	SS	13		314				
			2	SS	10						
312.8							313				
1.5	Silty **CLAY**, trace sand Soft to Stiff Brown (TILL)		3	SS	12						
			4	SS	9		312				0 8 31 61
			5	SS	4		311				
310.2											
4.1	**SAND** and **GRAVEL**, some silt, some clay Very Dense Brown Wet		6	SS	61		310				34 47 19 (SI+CL)
308.7							309				
5.6	Silty **CLAY**, trace sand Hard Grey (TILL)		7	SS	44		308				
							307				
			8	SS	41						0 5 41 54
306.1											
8.2	END OF BOREHOLE AT 8.2m. WATER LEVEL OBSERVED AT 4.5m DURING DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

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

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

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-010 1 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 523.45 E 226 013.77 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.14 - 2008.07.15 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
317.4									
0.0	**TOPSOIL:** (100mm), with roots and rootlets								
0.1 / 317.0	**SAND**, trace silt Brown Moist								
0.5	Silty **CLAY**, some sand to sandy, trace gravel, occasional rootlets Very Stiff Brown (TILL)		1	SS	27		317		
			2	SS	16		316		
	Hard Grey		3	SS	56		315		1 33 38 28
2.7	Silty **SAND**, trace gravel, trace clay Very dense Grey Moist to Wet (TILL)		4	SS	101		314		5 65 21 9
313.6									
3.8	Silty **CLAY** Hard Grey		5	SS	34		313		0 0 36 64
311.3							312		
6.1	**SAND**, trace to some silt, trace clay Very Dense Grey Moist to Wet		6	SS	100/ 250		311		
	Loose		7	SS	4		310		0 90 10 (SI+CL)
							309		
	trace to some gravel Very Dense		8	SS	100/ .125		308		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa 20 40 60 80 100
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

Continued Next Page

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

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

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
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THURBER

RECORD OF BOREHOLE No 08-010 2 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 523.45 E 226 013.77 ORIGINATED BY SLL

HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA

DATUM Geodetic DATE 2008.07.14 - 2008.07.15 CHECKED BY RPR

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, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND, some silt, trace clay Very Dense Grey Wet						307				
			9	SS	100/ .150				o o		0 87 13 (SI+CL)
305.2							306				
12.3 304.9	Sandy **SILT**, some clay Very Dense Grey Moist (TILL)		10	SS	100/ .225		305		o o		
12.6	END OF BOREHOLE AT 12.6m. Piezometer installation consists of 25mm diameter schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.07.16	6.3	311.1
2008.08.20	5.9	311.5

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

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

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-012 1 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 492.60 E 226 030.18 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.15 - 2008.07.16 CHECKED BY RPR

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: ○ 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
317.7											
0.0	**TOPSOIL:** (100mm), with roots and rootlets										
0.1	Silty **CLAY**, trace sand, trace rootlets Very Stiff to Hard Brown						317				
			1	SS	17				○		
			2	SS	21		316		○		
			3	SS	15		315		●		0 4 37 59
	sand seams Mottled Brown to Grey		4	SS	17				○		
							314				
			5	SS	34		313		○		0 0 45 55
							312				
			6	SS	29				○		
310.0							311				
7.6	**SAND**, trace silt Very Dense Grey Wet		7	SS	60		310		○		3 90 7 (SI+CL)
309.1											
8.5	Silty **CLAY**, trace sand Hard Grey						309				
			8	SS	93				○		
							308				

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

20 15 10 5 (%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-012 2 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 492.60 E 226 030.18 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.15 - 2008.07.16 CHECKED BY RPR

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Silty **CLAY**, trace sand Hard Grey										
			9	SS	51		307				0 1 44 55
							306				
	Layer of sand: (100mm)		10	SS	79		305				
			11	SS	48		304				
			12	SS	33		303				0 3 36 61
			13	SS	67		302				
			14	SS	42		301				
							300				
							299				
							298				

Continued Next Page

$+^{3}$. $\times^{3}$ Numbers refer to Sensitivity

20
15 ⊕ 5 (%) STRAIN AT FAILURE
10

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Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-012 3 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 492.60 E 226 030.18 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.15 - 2008.07.16 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
	Silty **CLAY** Hard Grey		15	SS	47		297		o		
							296				
			16	SS	67		295		o		
293.6							294				
24.1	Sandy **SILT**, some clay, trace gravel Very Dense Grey Wet (TILL)		17	SS	52		293		o		9 47 33 11
			18	SS	100/ .150		292		o		
			19	SS	100/ .175		291		o		
	Layer of sand: (200mm)						290				7 54 30 9
288.3			20	SS	100/ .225		289		o		
29.3	END OF BOREHOLE AT 29.3m. BOREHOLE BACKFILLED WITH BENTONITE BENSEAL TO 0.3m THEN HOLEPLUG TO SURFACE.										

+ 3 . × 3 : Numbers refer to Sensitivity

20
15 ⊕ 5 (%) STRAIN AT FAILURE
10

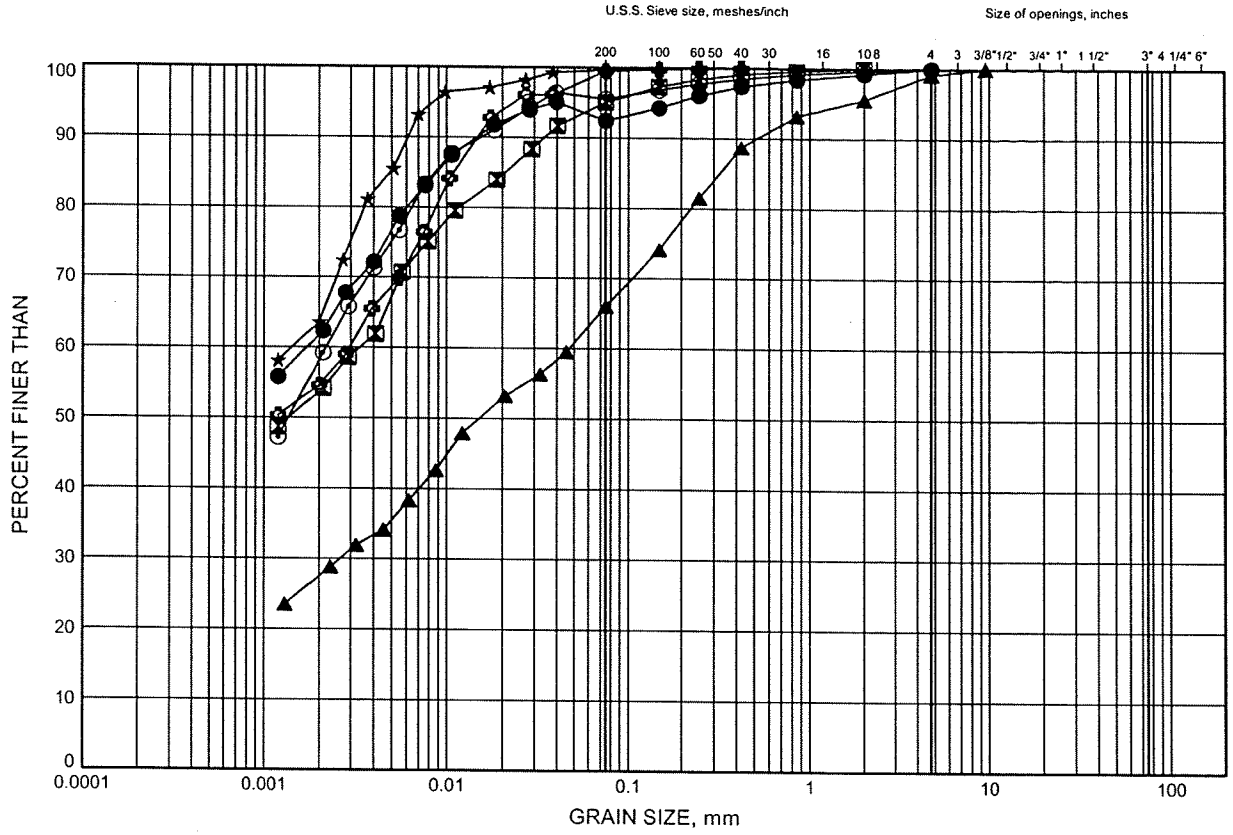
ONTMT4S 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE L1

SILTY CLAY & SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-008	2.59	311.69
⊠	08-008	7.92	306.36
▲	08-010	2.50	314.94
★	08-010	4.88	312.57
⊙	08-012	2.59	315.08
✿	08-012	4.88	312.79

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

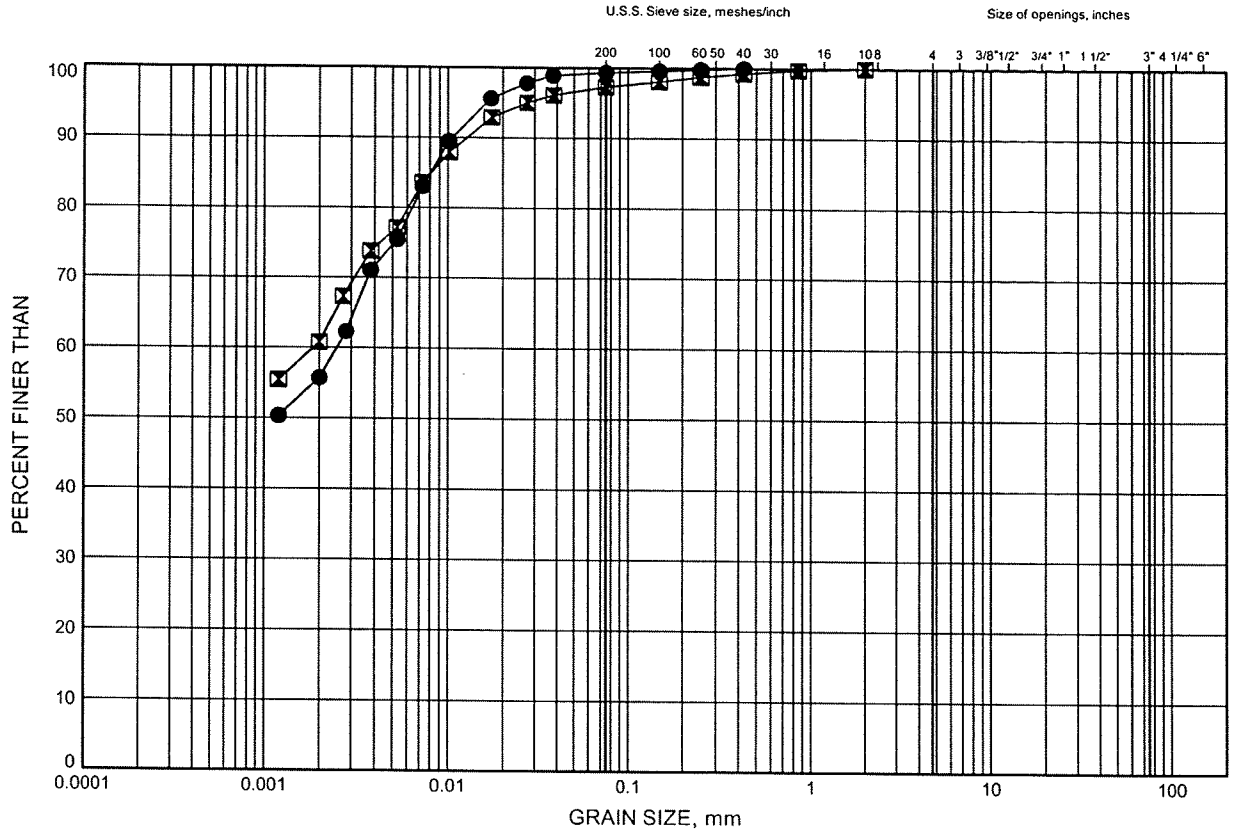
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE L2

SILTY CLAY & SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-012	10.90	306.77
⊠	08-012	15.54	302.13

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

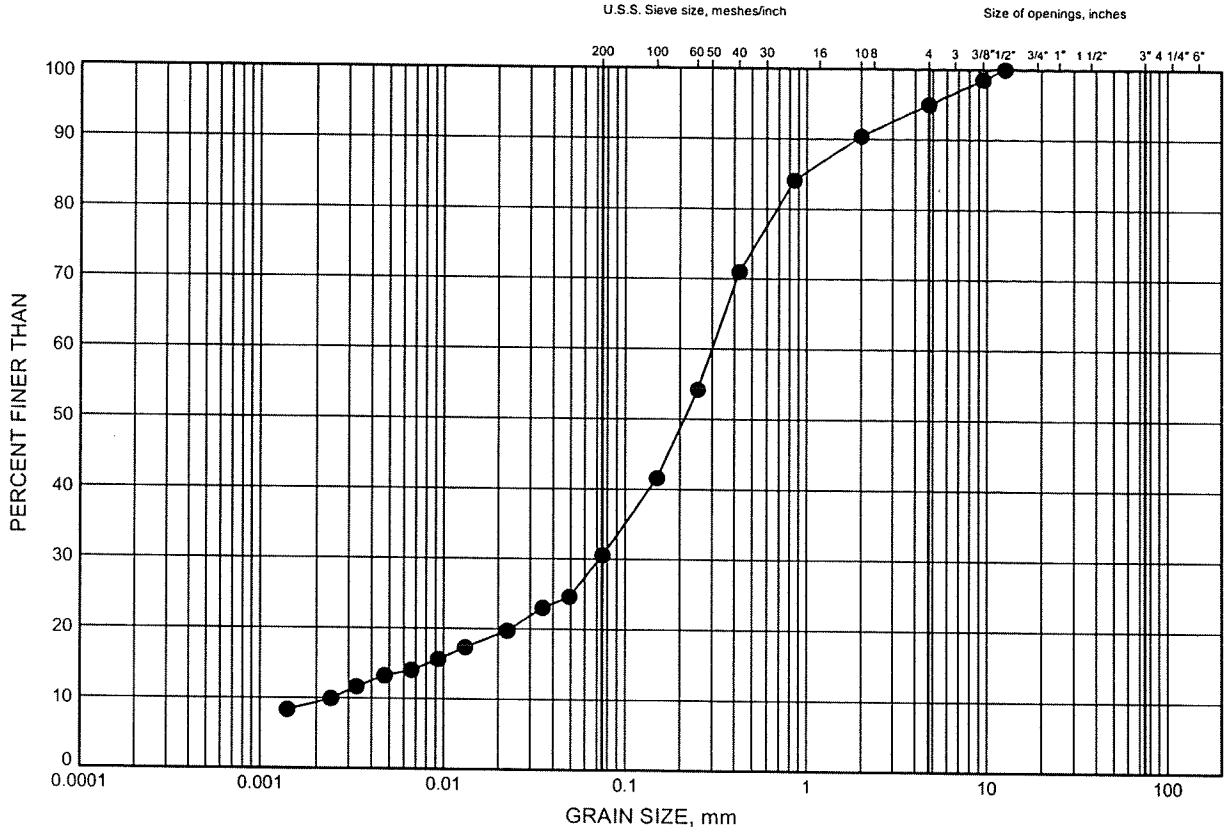
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE L3

SILTY SAND TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-010	2.80	314.65

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

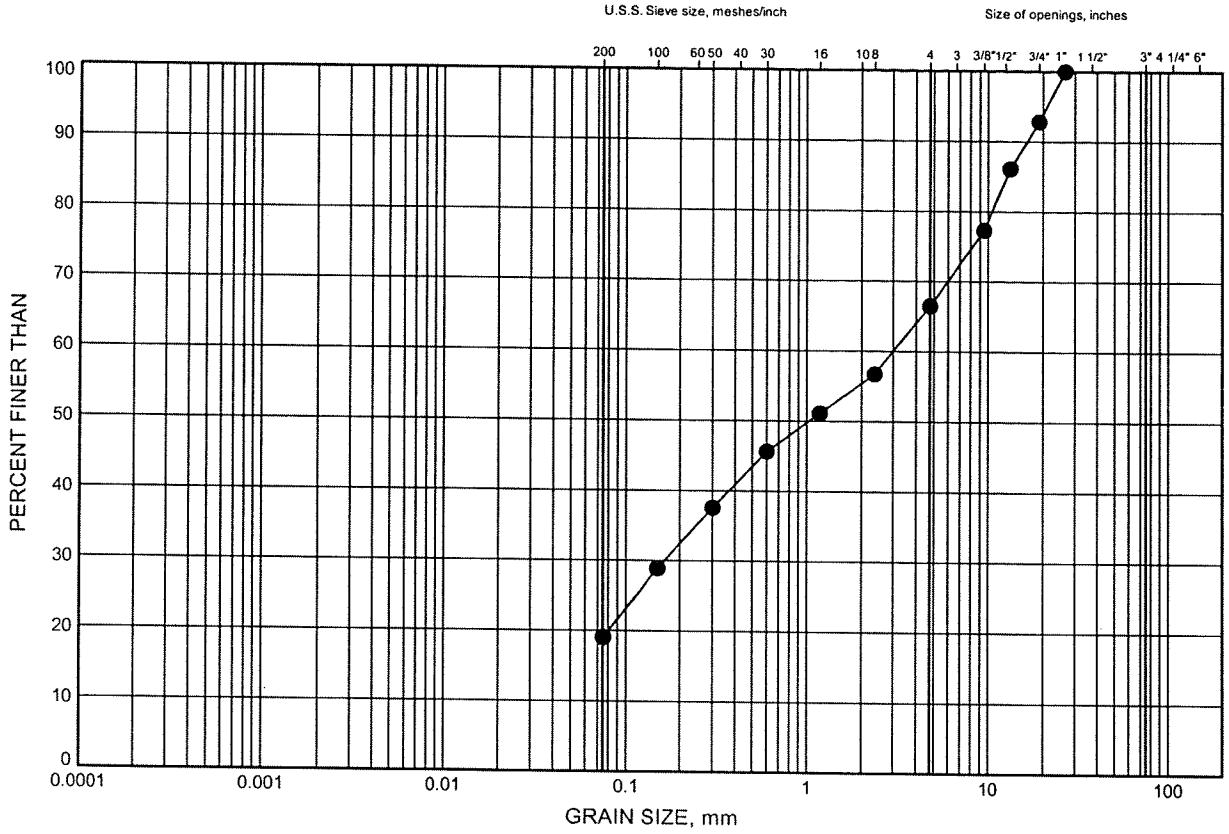
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE L4

SAND & GRAVEL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-008	4.88	309.40

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

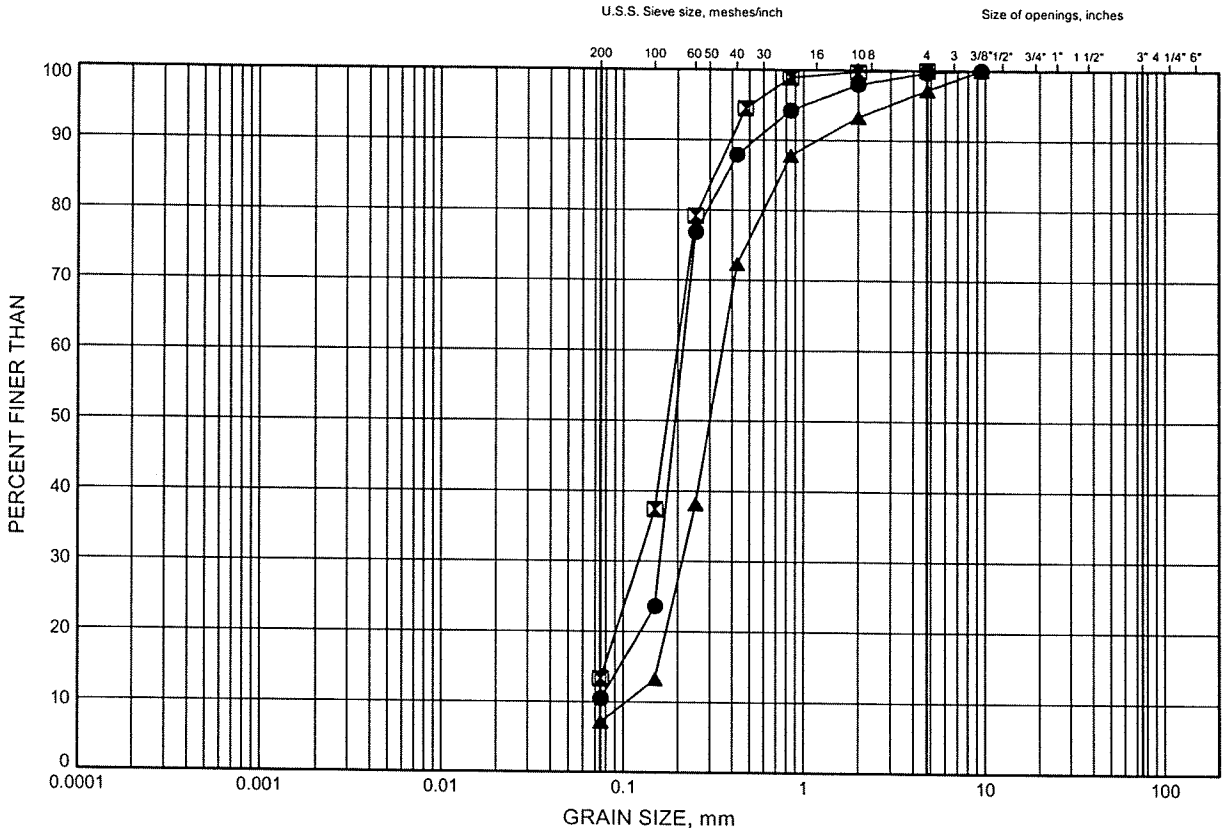
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE L5

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-010	7.92	309.52
⊠	08-010	10.77	306.67
▲	08-012	8.09	309.58

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

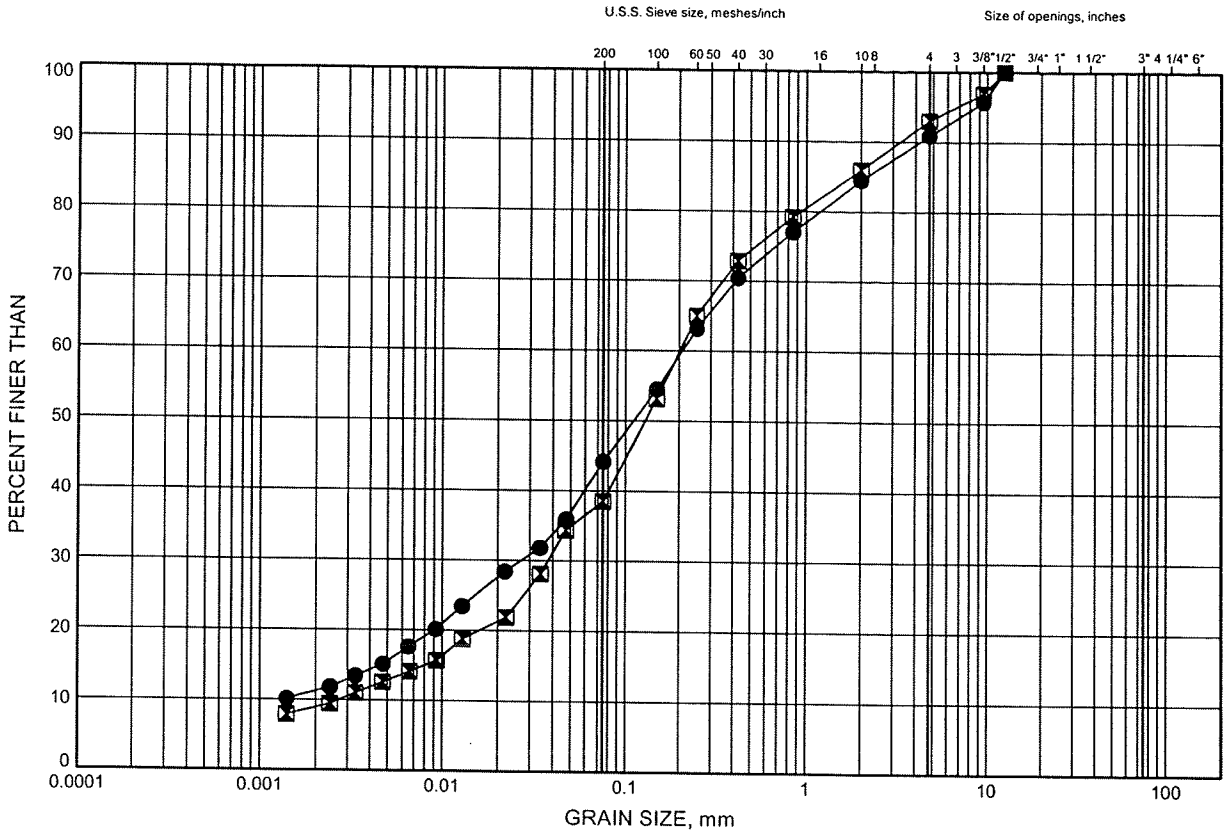
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE L6

SANDY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-012	24.69	292.98
⊠	08-012	27.74	289.93

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

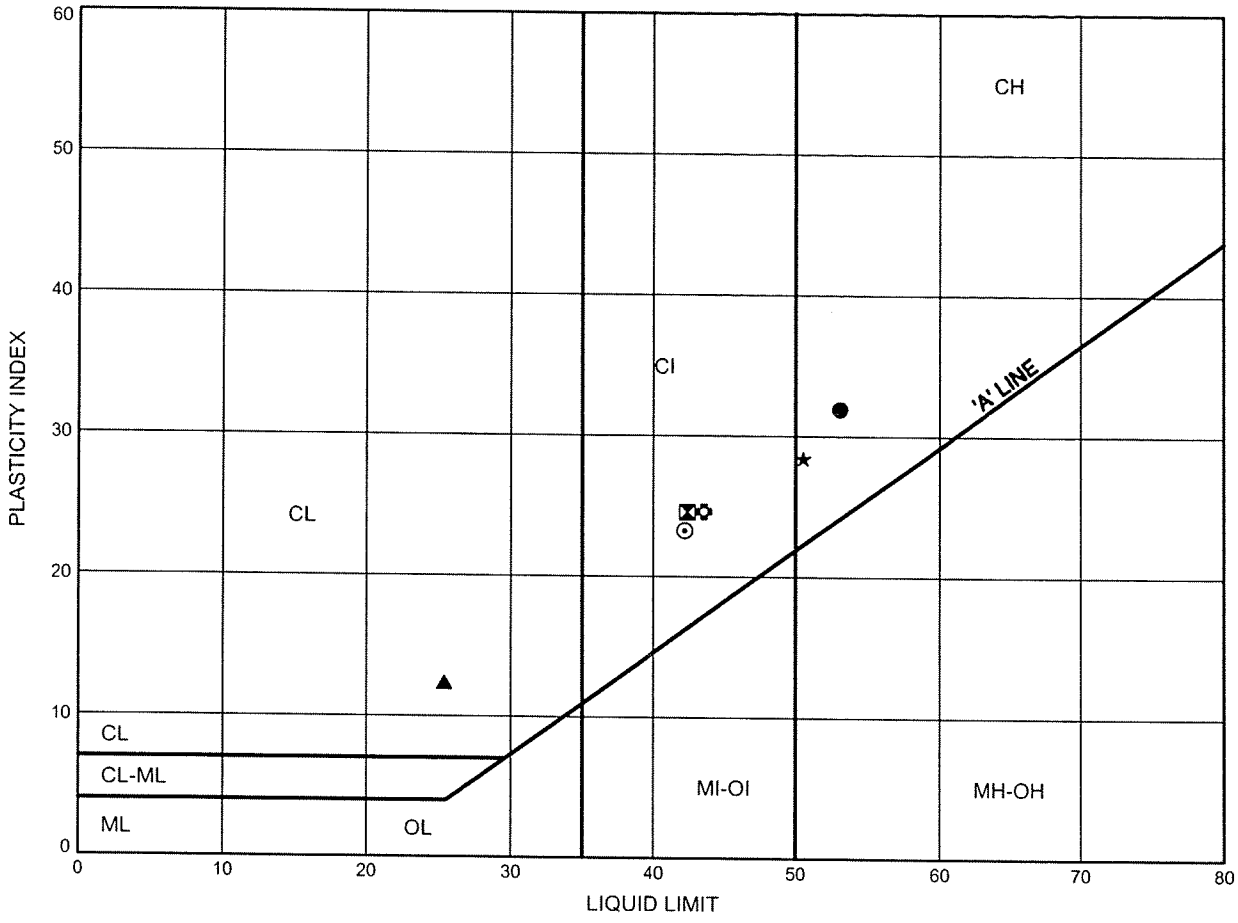
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE L7

SILTY CLAY & SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-008	2.59	311.69
⊠	08-008	7.92	306.36
▲	08-010	2.53	314.92
★	08-010	4.88	312.57
⊙	08-012	2.59	315.08
✿	08-012	4.88	312.79

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

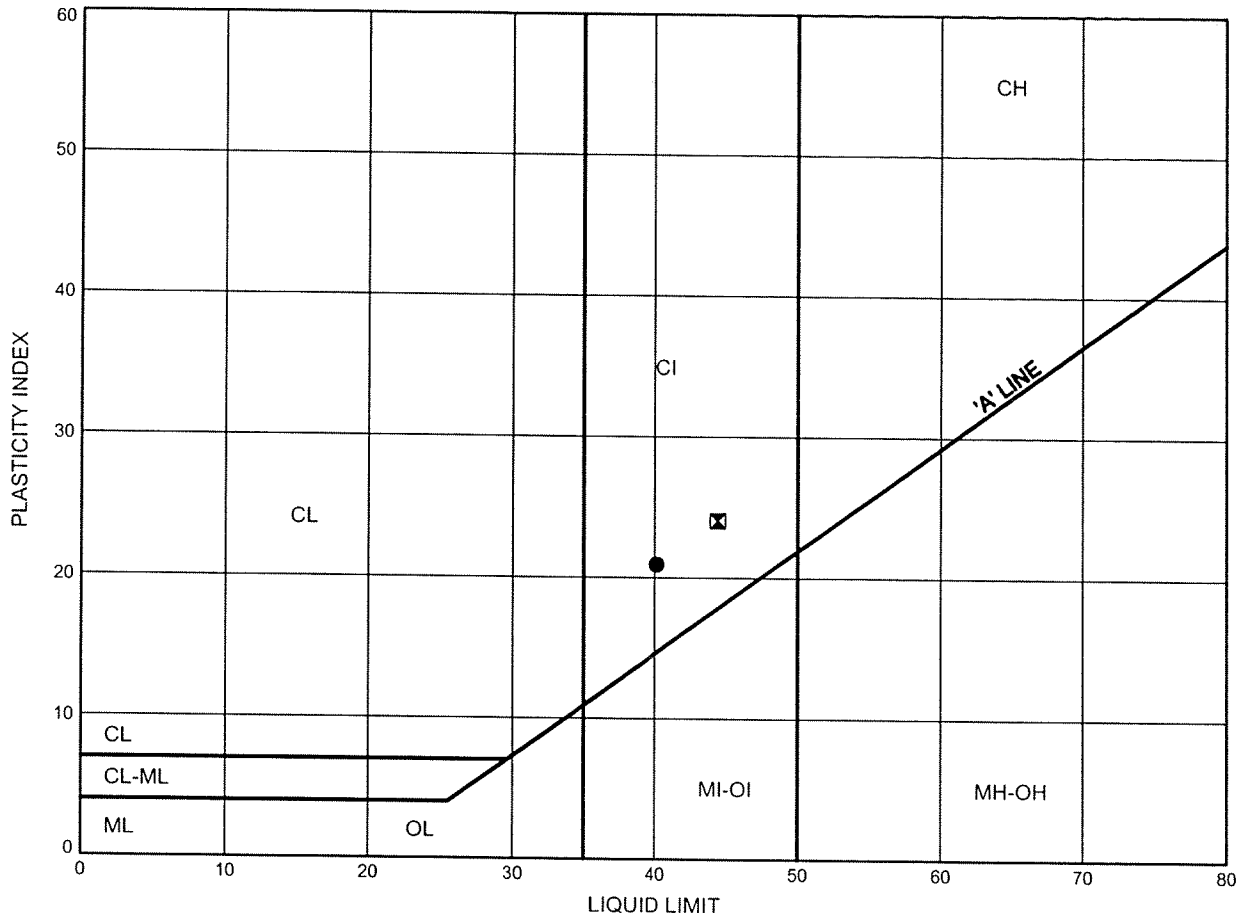
THURBALT 6417R.GPJ 3/13/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE L8

SILTY CLAY & SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-012	10.90	306.77
⊠	08-012	15.54	302.13

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

THURBALT 6417R.GPJ 3/13/09

	Gamma	C	Phi	Piezo
	kN/m3	kPa	deg	Surf.
Earth Fill	21	0	30	1
Silty Clay	19	85	0	1

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
N-E Ramp over E-S Ramp over E/W-S Ramp
August 27, 2008
North and South Approach Earth Fill

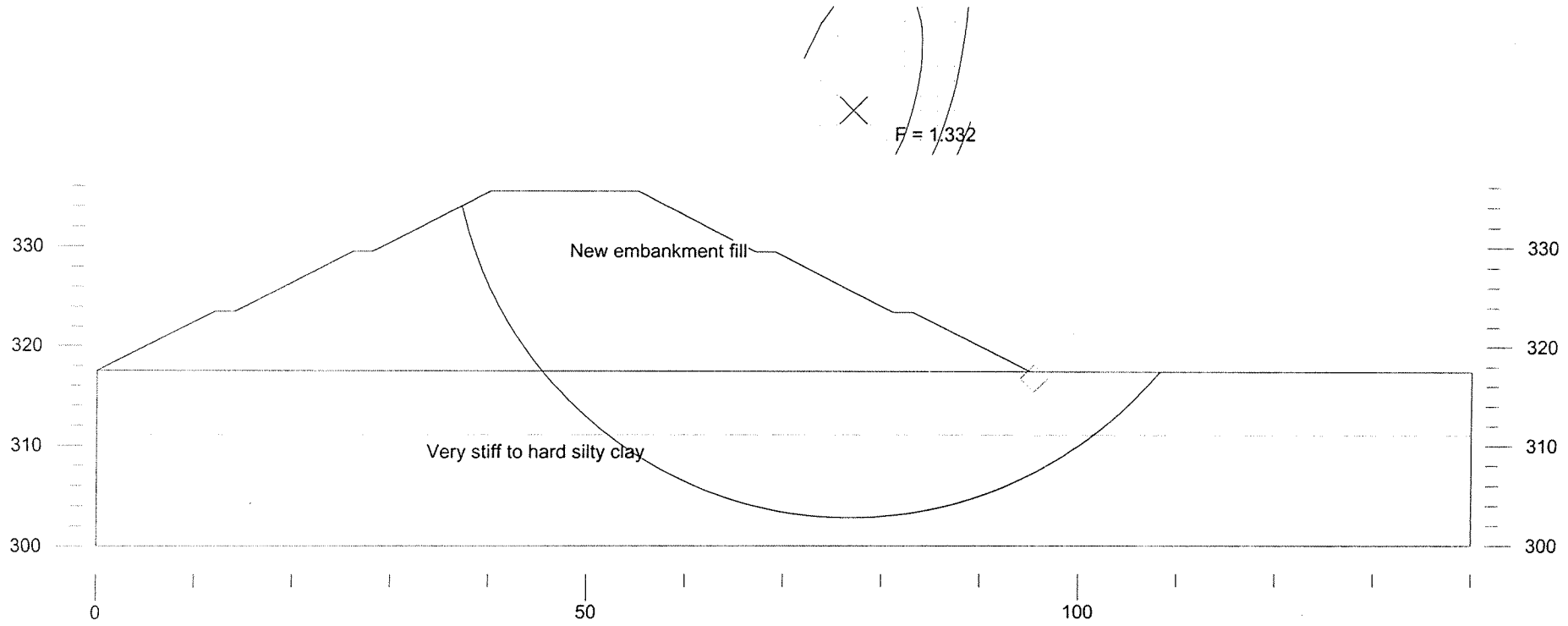
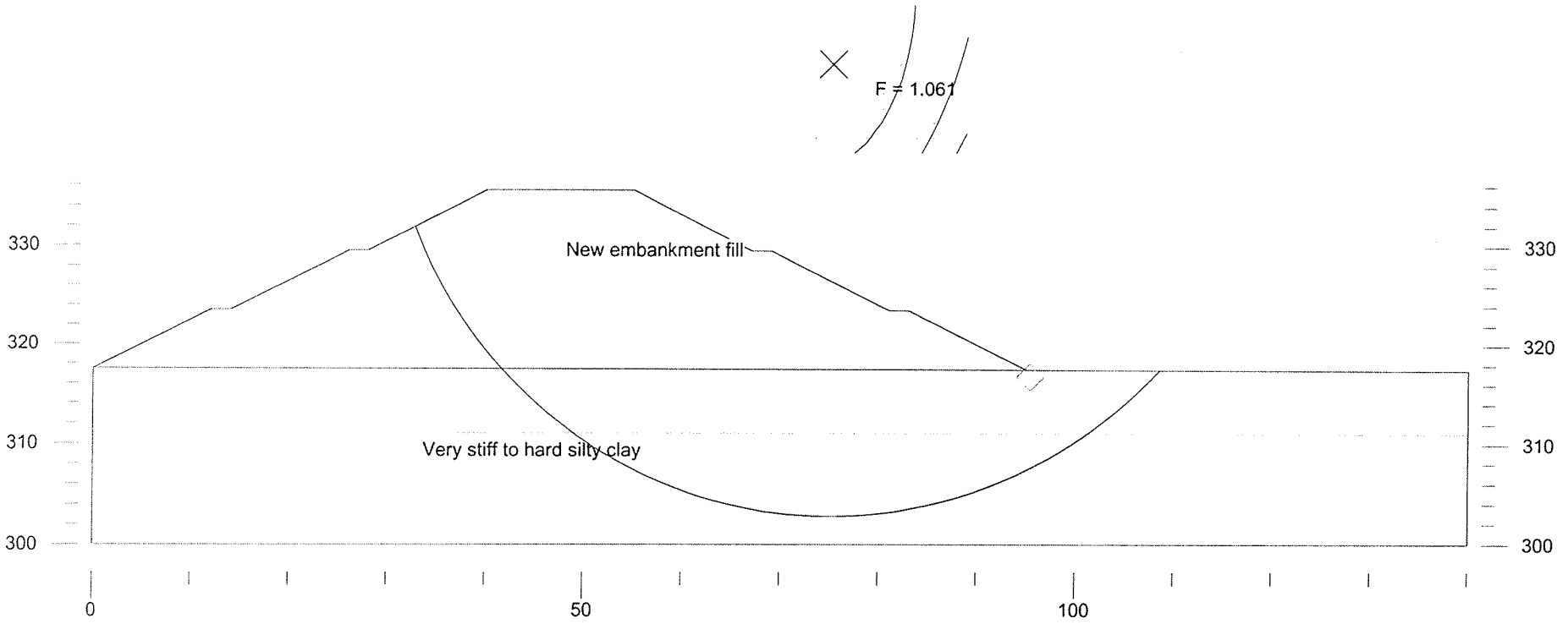


FIGURE L1

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Earth Fill	21	0	30	1
Silty Clay	19	85	0	1

Seismic coefficient = 0.08

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
N-E Ramp over E-S Ramp over E/W-S Ramp
August 27, 2008
North and South Approach Earth Fill



3/17/2009 8:59:15 AM \\Torserver1\Projects\15\64\17HWY7~1\STRUCT~1\N-ERAM~3\NAB1A.GSL Thurber Engineering Ltd. - Toronto F = 1.061

FIGURE L2

Photo. Looking to the north side of Borehole 08-010
Existing exit ramp from KWE NBL to Wellington Street East/West

KWE

Photo. Looking to the east side of Borehole 08-010
KWE

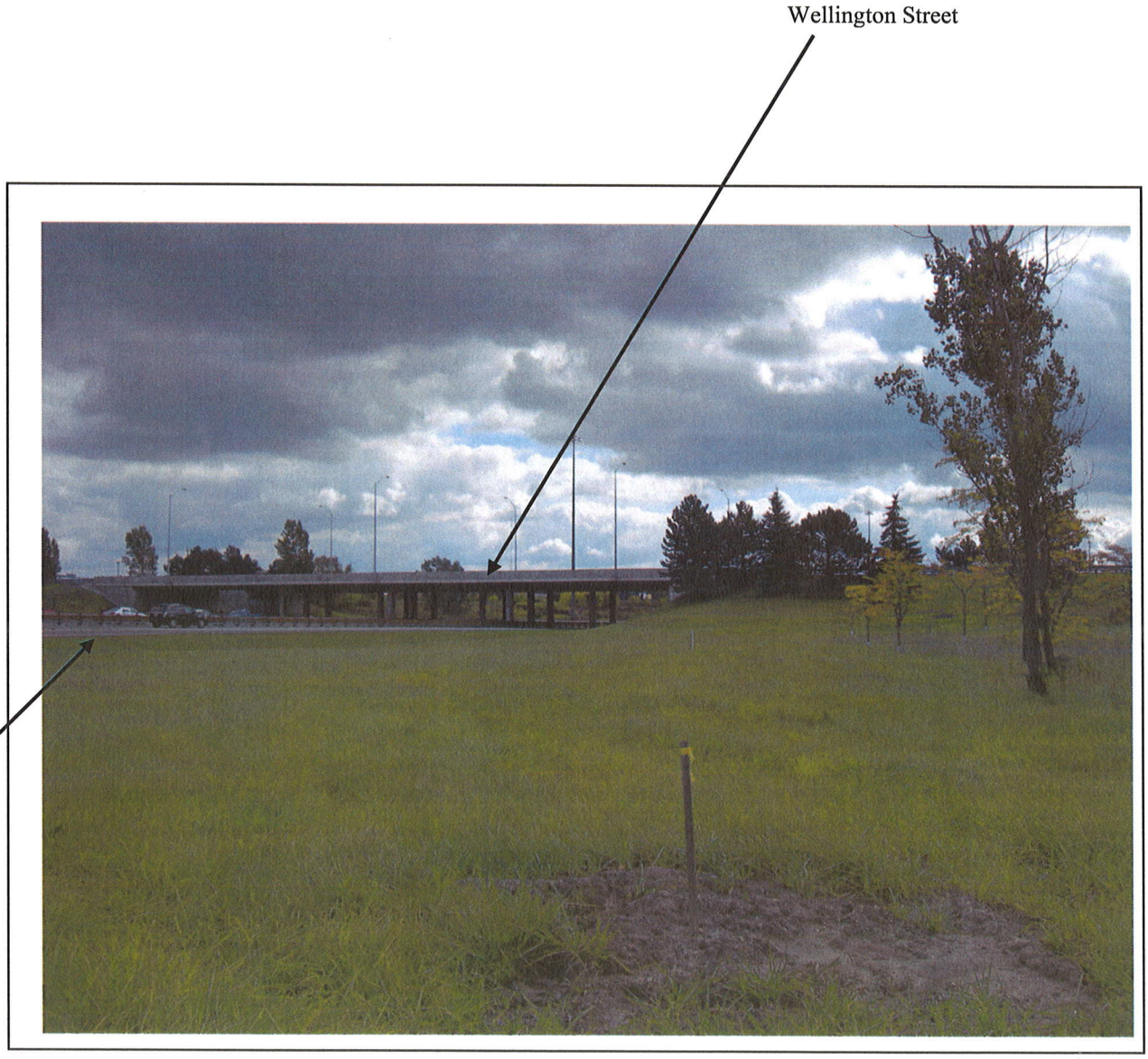
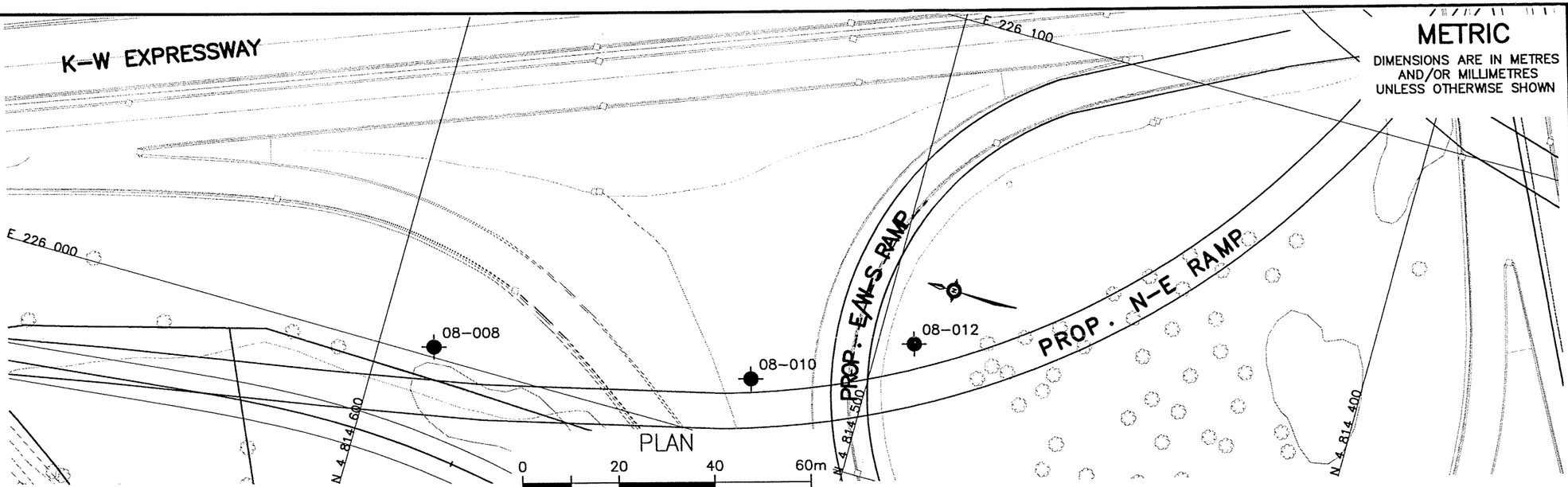


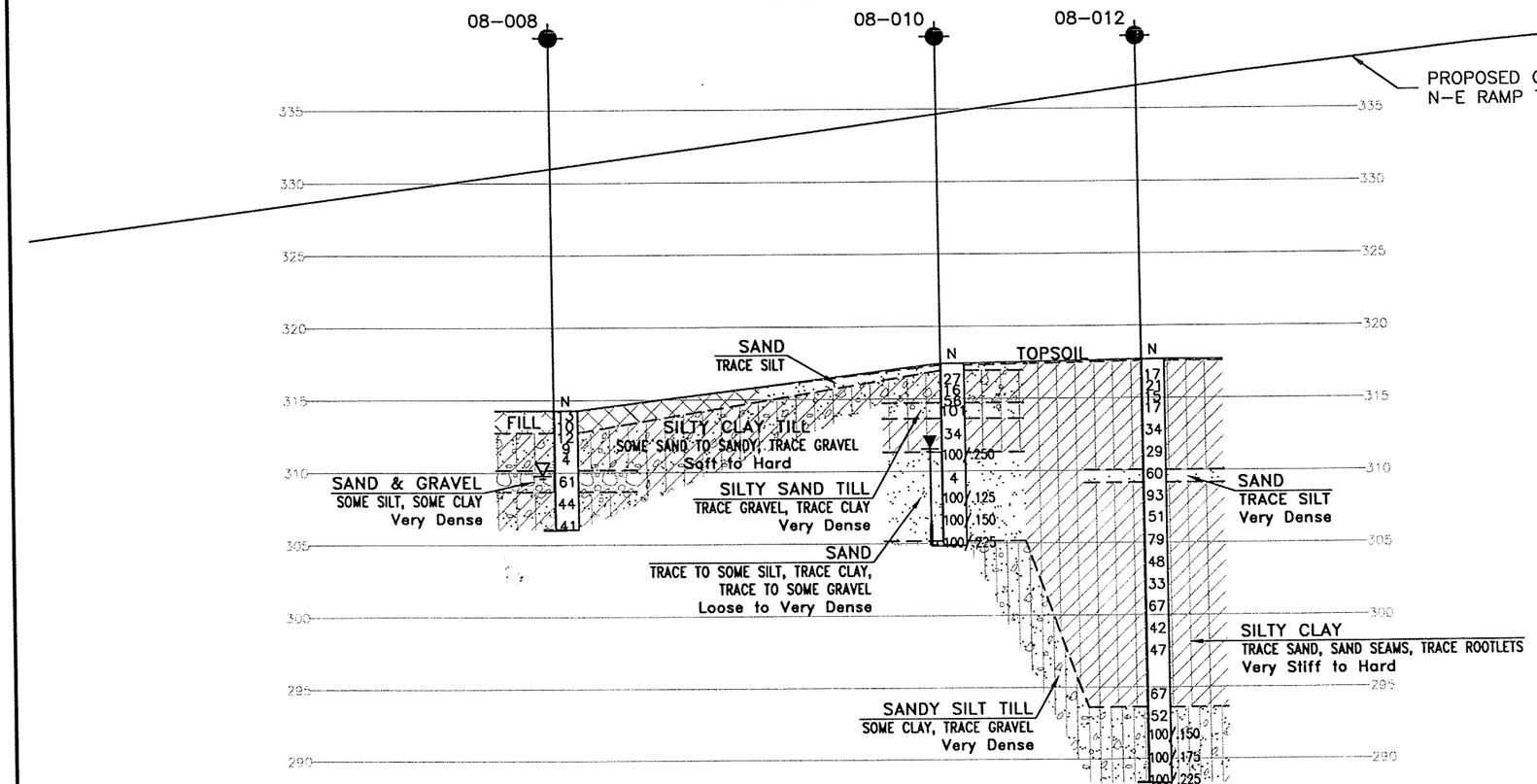
Photo. Looking to the south side of Borehole 08-012
KWE & Wellington Street bridge

PLOT SCALE 1:1
PLOT DATE 08-05
PW-D-707
MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN





PROFILE ALONG ℄ OF PROP. N-E RAMP TO K-W EXPRESSWAY

0 20 40 60m HOR 1:1000

0 8 16 24m VER 1:400

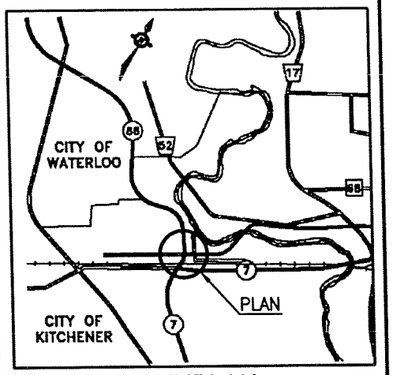
DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

CONT No
GWP No 408-88-00

SHEET

HIGHWAY 7
RECOMMENDED ROUTE
KW EXPRESSWAY TO N-E RAMP, 15+080 TO 15+270
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

	Borehole
	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
	Water Level
	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-008	314.3	4 814 588.7	226 002.1
08-010	317.4	4 814 523.4	226 013.8
08-012	317.7	4 814 492.6	226 030.2

LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
Oct/06/09
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Oct 6/09
PROVINCE OF ONTARIO

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 2B of the E.A. Study.

GEOCRES No. 40P8-172

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN RPR	CHK PKC	CODE	LOAD — DATE AUG. 2009
DRAWN MFA	CHK AEG	SITE	STRUCT — DWG

Appendix M

KWE Expressway N-E Ramp, Station 15+290 –15+395
(Boreholes 08-013, 08-014, 08-020, 5, 9)

Record of Borehole Sheets
Laboratory Test Results
Site Photograph
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-013 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 456.60 E 226 061.17 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.15 - 2008.07.15 CHECKED BY RPR

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
317.4											
0.0	**TOPSOIL** (125mm), with roots and rootlets										
0.1	**SAND**, trace silt, occasional rootlets Dark brown Wet										
316.8											
0.6	Silty **CLAY**, trace gravel Very Stiff to Hard Brown (TILL)		1	SS	29		317				
			2	SS	19		316				0 3 28 69
			3	SS	65		315				14 55 31 (SI+CL)
	Layer of sand: (300mm)										
	Layer of sandy silt: (200mm)		4	SS	25		314				8 83 9 (SI+CL)
313.2											
4.3	Silty **SAND**, trace to some clay Very dense Grey Moist (TILL)		5	SS	100/275		313				0 21 68 11
	Moist to Wet		6	SS	100/275		312				
	Wet						311				
			7	SS	68		310				0 46 49 5
309.2											
8.2	END OF BOREHOLE AT 8.2m. Piezometer installation consists of 19mm diameter schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.07.16	4.6	312.8
2008.08.20	4.5	312.9

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

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-014 1 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 412.13 E 226 078.93 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.16 - 2008.07.17 CHECKED BY RPR

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 (○ 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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
319.4											
0.0	**TOPSOIL:** (125mm), with roots and rootlets										
0.1	Sandy **SILT**, trace gravel, occasional rootlets and organics Loose Brown Moist (FILL)		1	SS	8		319		○		
	Dense		2	SS	38		318		○		
317.2											
2.2	Silty **CLAY**, trace gravel Very Stiff Brown		3	SS	20		317		○		
			4	SS	22		316		○		0 5 39 56
			5	SS	27		315		○		
	Sand seams Hard		6	SS	32		314		○		
312.2							313				
7.2	Sandy **SILT**, trace clay Dense to Very Dense Brown to Grey Wet (TILL)		7	SS	40		312		○		0 47 48 5
			8	SS	100/225		311		○		
							310		○		0 34 62 4

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-014 2 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 412.13 E 226 078.93 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.16 - 2008.07.17 CHECKED BY RPR

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 (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
309.0	Sandy **SILT**, trace clay Very Dense Brown to Grey Wet (TILL)						309				
10.4	Silty **CLAY**, trace sand Very Stiff to Hard Grey Moist		9	SS	40		308				
			10	SS	65		307				
			11	SS	29		306				0 3 42 55
			12	SS	38		305				
			13	SS	53		304				
			14	SS	34		303				0 1 32 67
							302				
							301				
							300				

Continued Next Page

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

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

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Ontario

THURBER

RECORD OF BOREHOLE No 08-014 3 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 412.13 E 226 078.93 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.16 - 2008.07.17 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
	Silty **CLAY**, trace gravel, trace sand Hard Grey		15	SS	39		299				
							298				
							297				
	Dark Grey		16	SS	89						
	some gravel						296				
294.2							295				
25.1	Sandy **SILT**, trace gravel, some clay Very Dense Grey Moist (TILL)		17	SS	100/ .125		294				3 41 43 13
							293				
			18	SS	100/ .150		292				
							291				
290.3			19	SS	100/ .150						
29.1	END OF BOREHOLE AT 29.1m. BOREHOLE BACKFILLED WITH GROUT TO SURFACE.										

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

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
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THURBER

RECORD OF BOREHOLE No 08-020 1 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 380.98 E 226 219.28 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.09 - 2008.07.11 CHECKED BY RPR

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 (○ 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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
320.0											
0.0	**TOPSOIL:** (600mm), some gravel Dark brown Moist		1	SS	21		320		○		
319.4											
0.6	Silty **SAND**, some gravel Dense Grey Moist (FILL)		2	SS	8		319		○		
			3	SS	42		318		○		
317.8											
2.2	Silty **CLAY**, trace sand Very Stiff to Hard Grey		4	SS	31		317		○		
			5	SS	27		316		○		0 10 26 64
315.3											
4.7	Sandy **SILT**, trace gravel, trace clay Dense Grey Wet (TILL)		6	SS	37		315		○		
			7	SS	32		314		○		0 14 78 8
	Very Dense		8	SS	100/ .225		313		○		
310.5							312				
9.5	Silty **CLAY**, trace gravel, trace sand Hard Grey		9	SS	102		311		○		

Continued Next Page

+ ^{3}, × ^{3} : Numbers refer to Sensitivity

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-020 2 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 380.98 E 226 219.28 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.09 - 2008.07.11 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60		GR SA SI CL
	Continued From Previous Page										
	Silty **CLAY**, trace sand Firm to Hard Grey						310				
			10	SS	8		309				
							308				
			11	SS	63						0 4 42 54
							307				
			12	SS	41		306				
						▼					
							305				
			13	SS	69						
							304				
	sand seems		14	SS	76		303				0 2 29 69
	wet silt seams										
							302				
			15	SS	45						
300.8							301				
19.2	SAND, trace silt, trace clay Dense Grey Wet										

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-020 3 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 380.98 E 226 219.28 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.09 - 2008.07.11 CHECKED BY RPR

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 From Previous Page										
	SAND, trace silt, trace clay Dense Grey Wet		16	SS	32		300		○		0 93 7 (SI+CL)
298.6							299				
21.4	Sandy **SILT**, trace to some clay, trace gravel Very Dense Grey Moist (TILL)		17	SS	100/ .150		298		○		7 77 16 (SI+CL)
	occasional cobbles at 23.1m Auger grinding.		18	SS	100/ .075		297				
295.5							296				
			19	SS	100				○		3 39 43 15
24.5	END OF BOREHOLE AT 24.5m.□ Piezometer installation consists of 25mm diameter schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:□

DATE	DEPTH (m)	ELEV. (m)
2008.07.15	14.6	305.4
2008.08.20	14.4	305.6

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S 6417R.GPJ 3/16/09

FORM OB-MT-126 (FORMERLY OB-ML-126)
65-1831

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS – ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 66-F-43 | LOCATION N 203,193.616 E210,698.331 | ORIGINATED BY D. Wan
W.P. 637-64 | BORING DATE May 9, 1966 | COMPILED BY W.E.
DATUM 1048.04 | BOREHOLE TYPE Penetration and Washboring | CHECKED BY W.D.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
1048.04	Ground Level				
0.0	Topsoil Fine to Medium Sand with Traces of Silt Loose to Very Dense		1	SS	16
			2	SS	52
			3	SS	46
			4	SS	11
1031.5			5	SS	7
16.5	Sandy Silt Loose to Very Dense		6	SS	4
			7	SS	12
			8	SS	72
1018.04					
30.0	Silty Clay with Trace of Sand Hard		9	SS	52
			10	SS	46
1006.54			11	SS	43
41.5	End of Borehole				

ELEV. SCALE: 1040, 1030, 1020, 1010

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT % 0 10 20 30 40

BULK DENSITY γ P.C.F.

W.L. 1033.3

REMARKS
Gr. 2 Sa.50 Si.36 Cl.12
Sa. 82 Si.Cl. 18
Sa.89 Si.Cl. 11
Sa. 20 Si. 75 Cl. 5

FORM 08-MT-126 (FORMERLY 08-ML-126)
65-1831

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

JOB 66-F-43 LOCATION N203,235.177 E210,786.321 ORIGINATED BY D. Wan
W.P. 637-64 BORING DATE May 10, 1966 COMPILED BY W.E.
DATUM 1048.74 BOREHOLE TYPE Penetration and Washboring CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
1048.74	Ground Level					
0.0	Topsoil Silty Sand Traces of Gravel Compact to Dense		1	SS	29	1040
			2	SS	34	
			3	SS	24	
1036.76			4	SS	26	
12.0	Silty Clay Very Stiff to Hard		5	SS	32	
1032.20			6	SS	55	1030
16.5	Sandy Silt to Silty Sand Dense to Very Dense		7	SS	46	
			8	SS	98/6"	
						1020
1017.44			10	SS	160/3"	
31.3	End of Borehole					1010

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
w_P w w_L
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS

W.L. 1038.7

Gr.2 Sa.71 Si.Cl. 27

Gr.7 Sa.62 Si. 31

Si. 41 Cl. 59

Gr. 2 Sa. 25 Si.62 Cl.11

Sa. 95 Si.Cl. 5

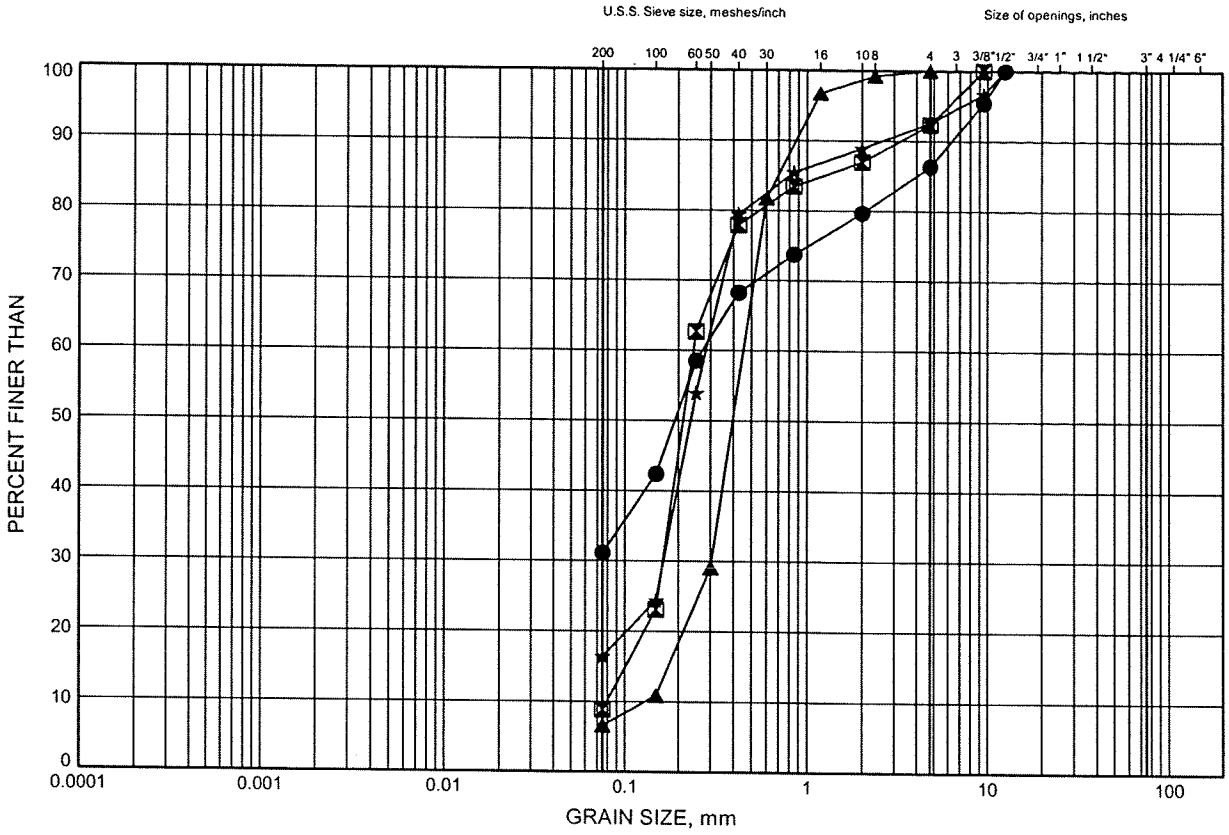
Sa. 68 Si. 29 Cl. 3

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE M1

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-013	2.59	314.85
⊠	08-013	2.82	314.62
▲	08-020	20.12	299.90
★	08-020	21.41	298.60

W.P.# 408-88-00

Prepared By AN

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THURBER

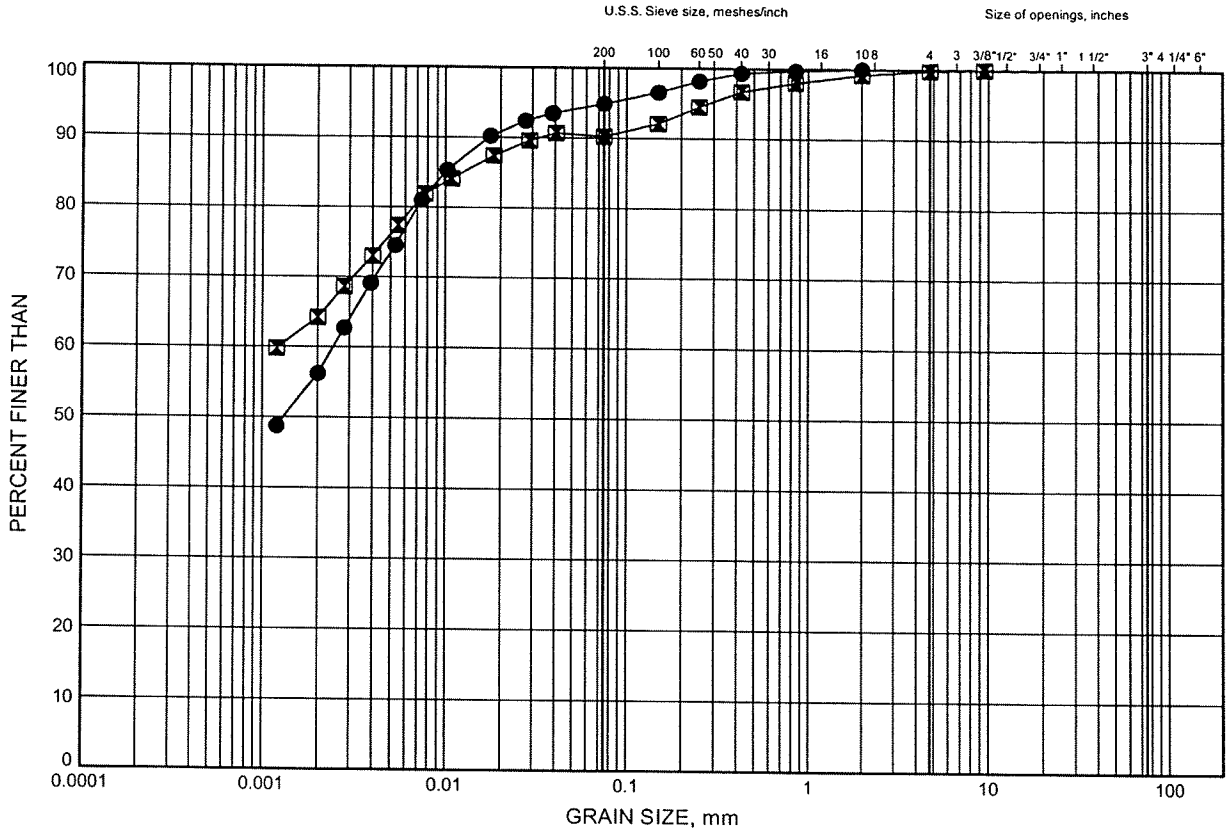
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE M2

Upper SILTY CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-014	3.35	316.04
⊠	08-020	3.35	316.66

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

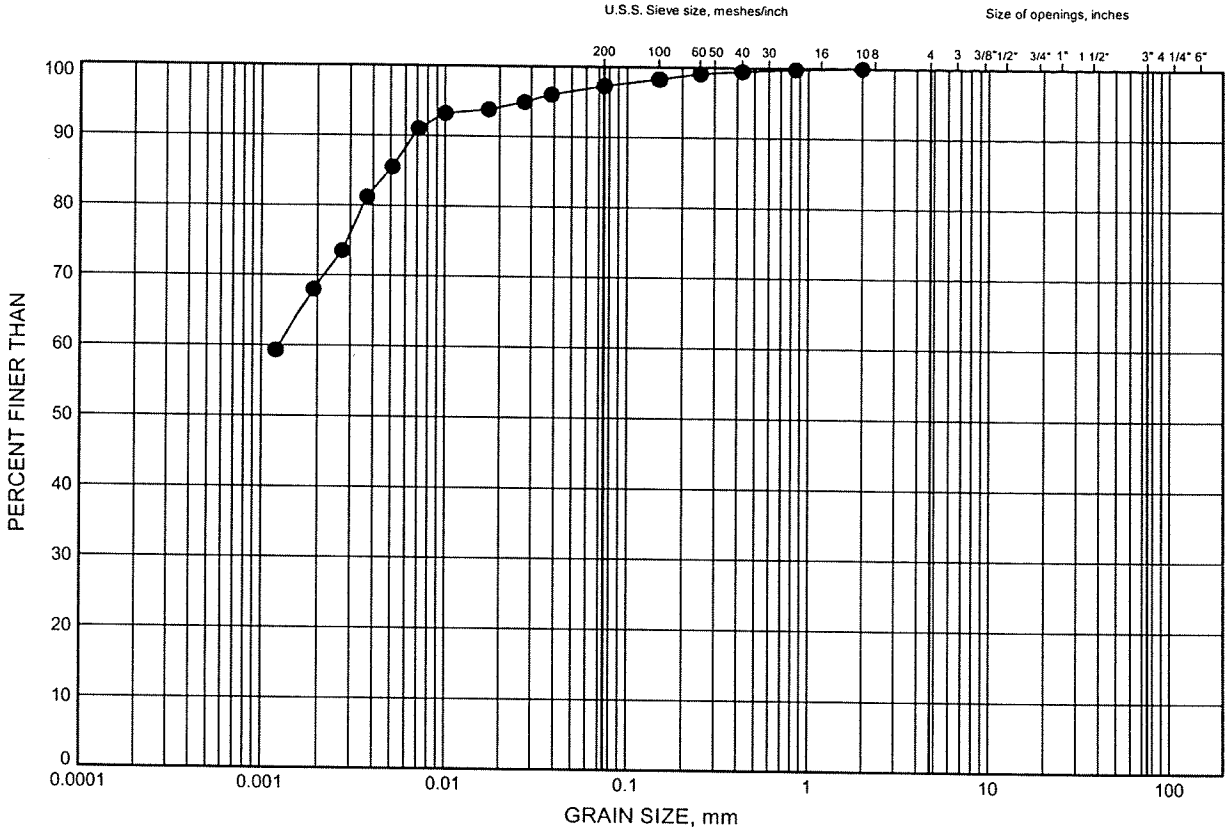
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE M3

SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-013	1.83	315.61

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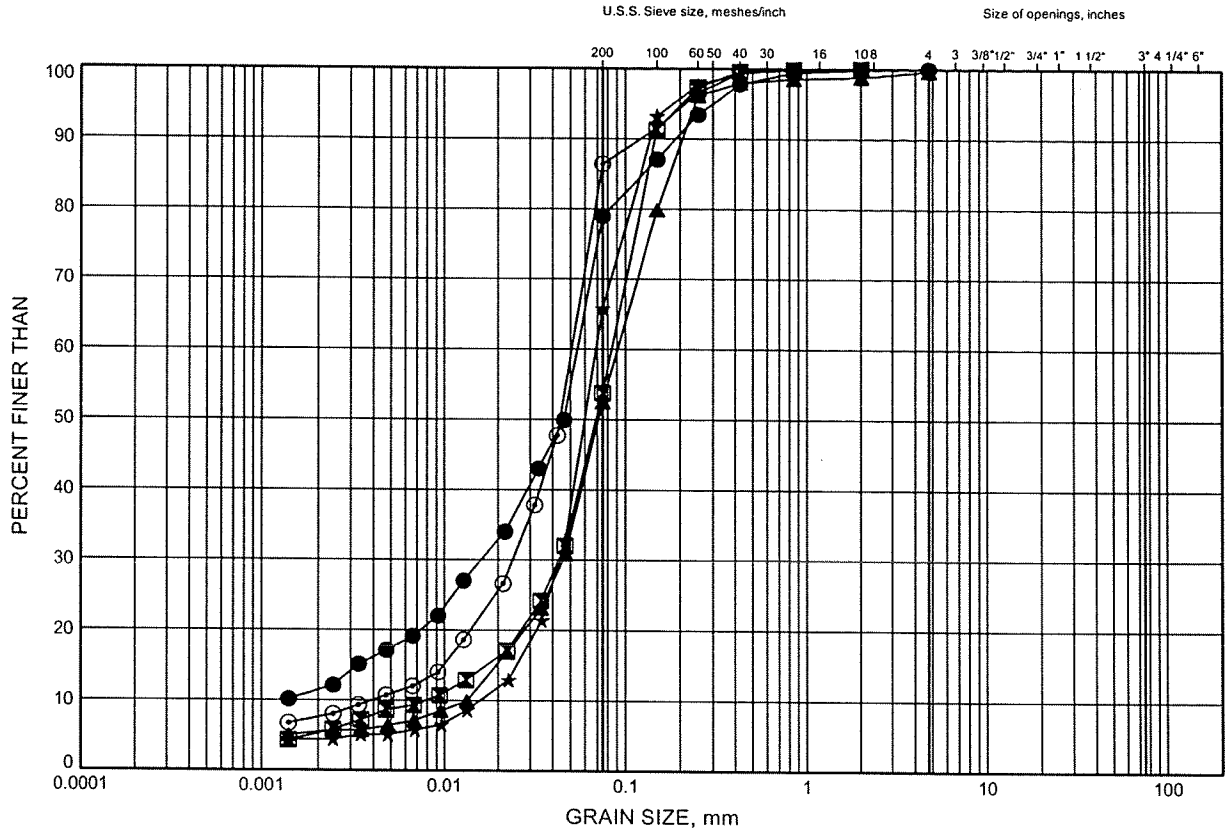
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE M4

Upper SILTY SAND TILL & Upper SANDY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-013	4.79	312.65
⊠	08-013	7.92	309.52
▲	08-014	7.90	311.49
★	08-014	9.40	309.99
⊙	08-020	6.40	313.61

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

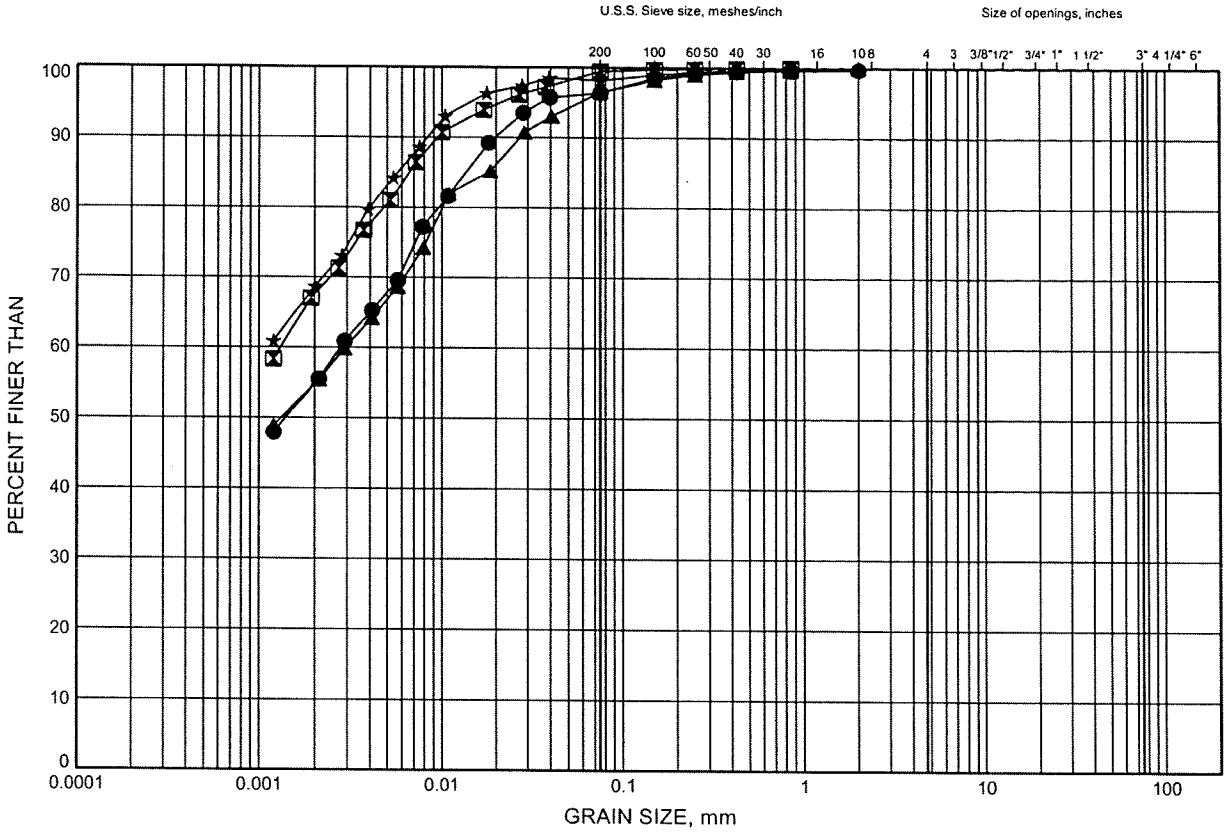
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/17/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE M5

Lower SILTY CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-014	14.02	305.37
⊠	08-014	18.59	300.80
▲	08-020	12.50	307.52
★	08-020	17.07	302.94

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

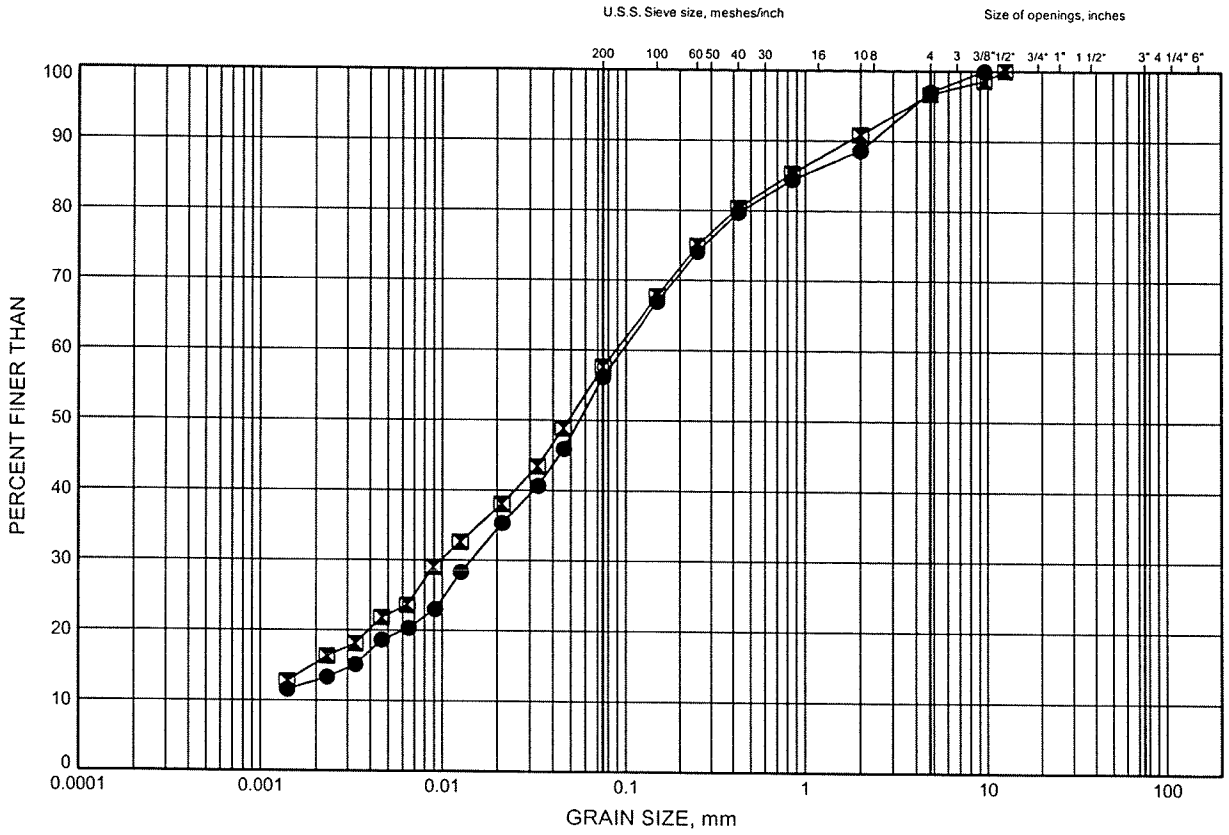
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE M6

Lower SANDY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-014	25.97	293.42
⊠	08-020	24.46	295.55

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

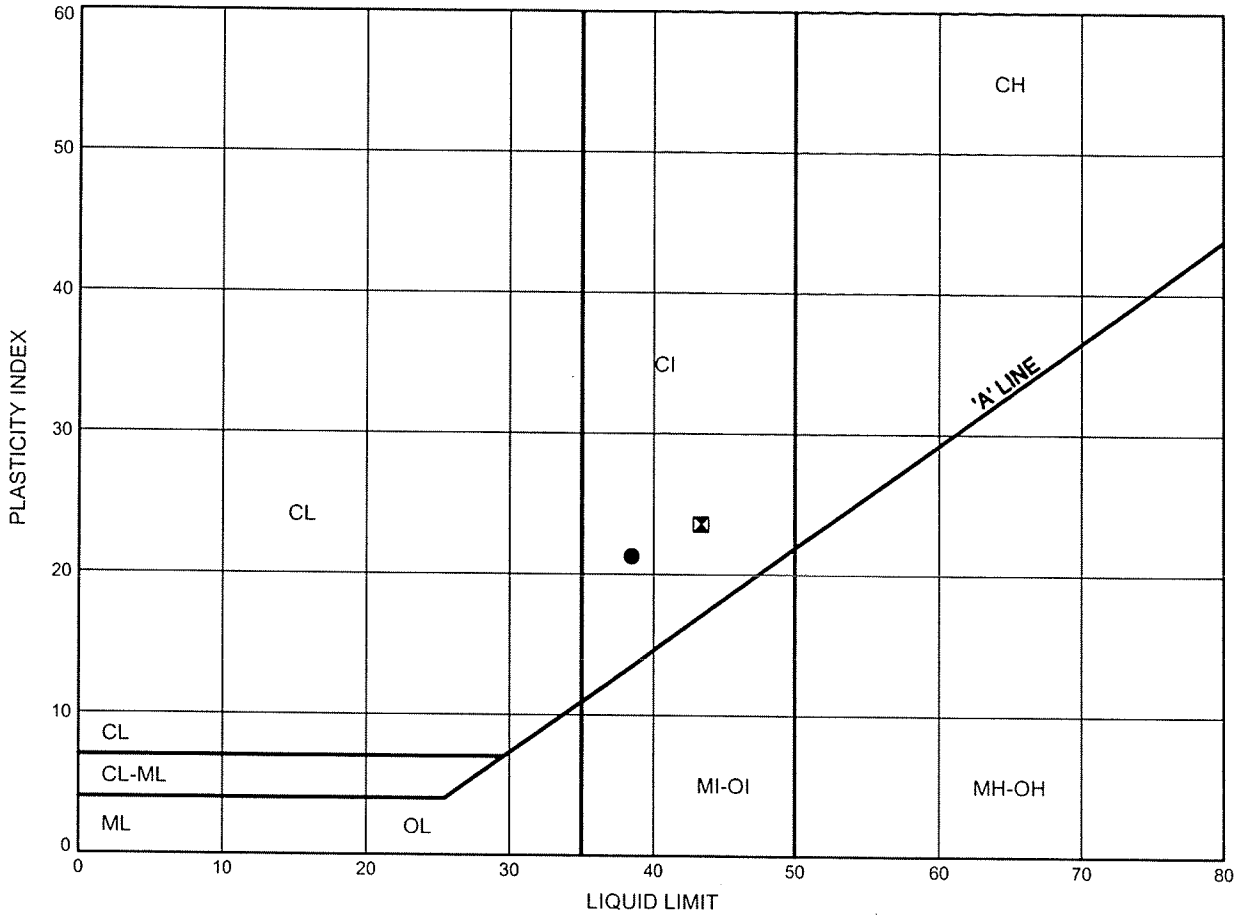
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE M7

Upper SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-014	3.35	316.04
⊠	08-020	3.35	316.66

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

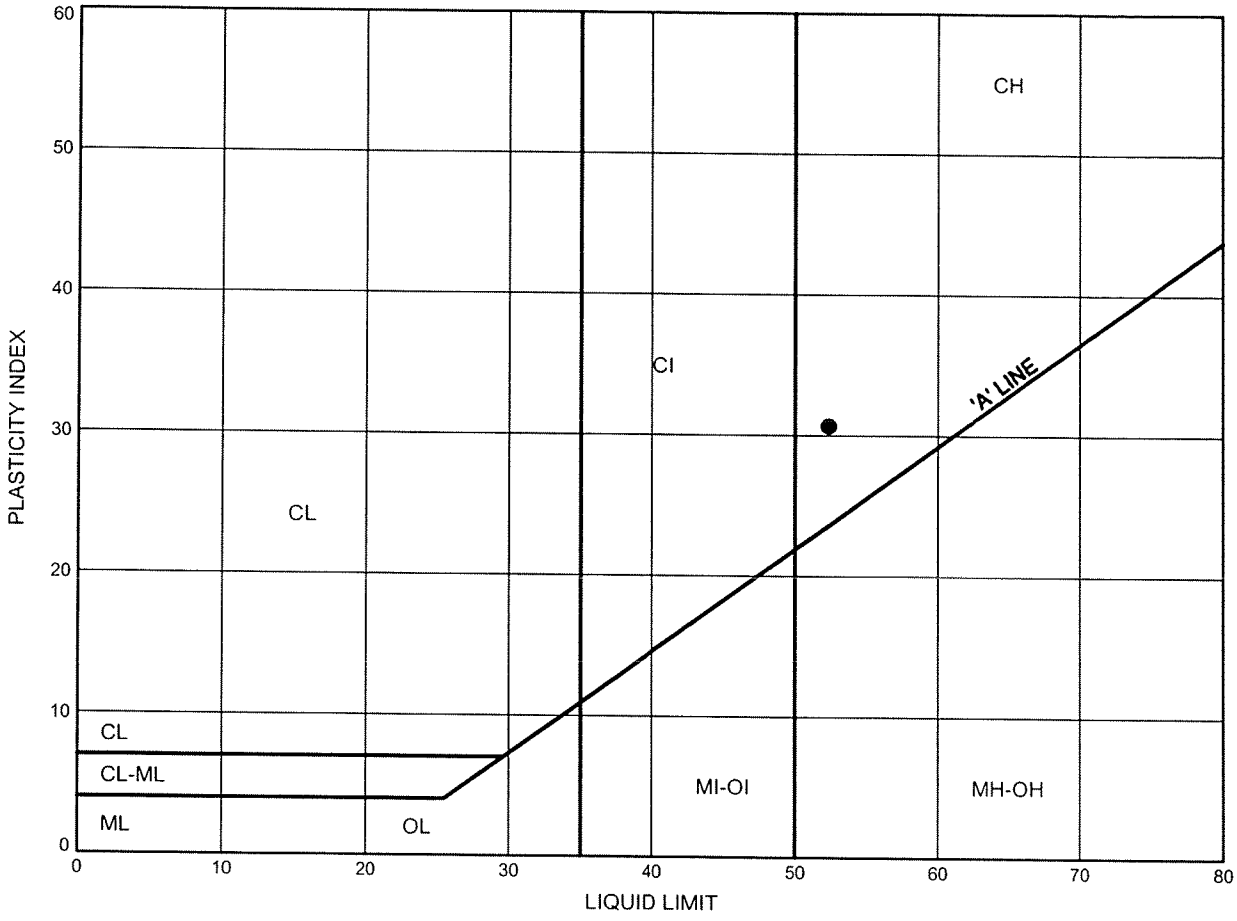
THURBALT 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE M8

SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-013	1.83	315.61

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

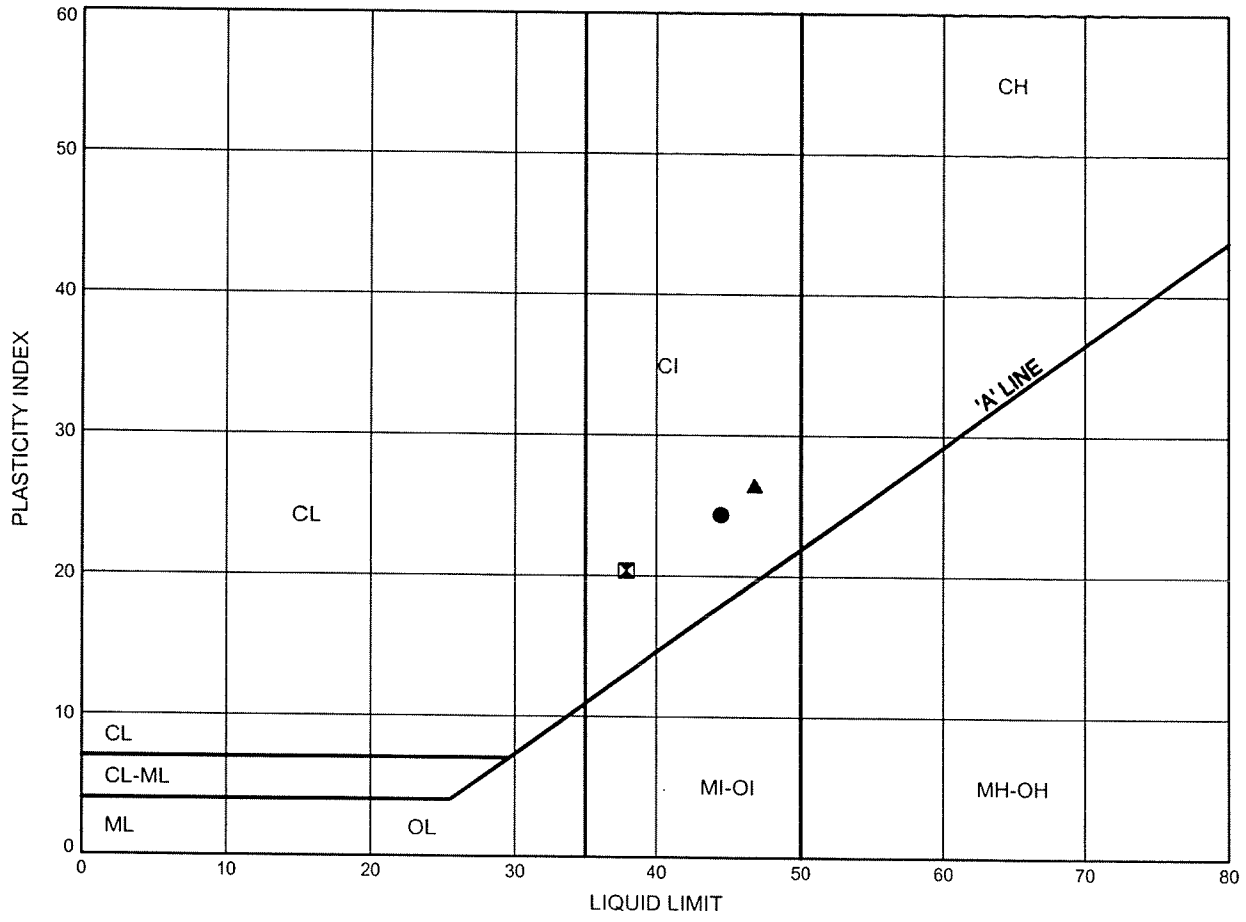
THURBALT 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE M9

Lower SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-014	18.59	300.80
⊠	08-020	12.50	307.52
▲	08-020	17.07	302.94

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

THURBALT 6417R.GPJ 3/16/09

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Earth Fill	21	0	30	1
Silty Clay	19	100	0	1

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
N-E Ramp over E-S Ramp, Wellington St. & KWE
August 19, 2008
North and South Approach Earth Fill
Embankment height: 22m

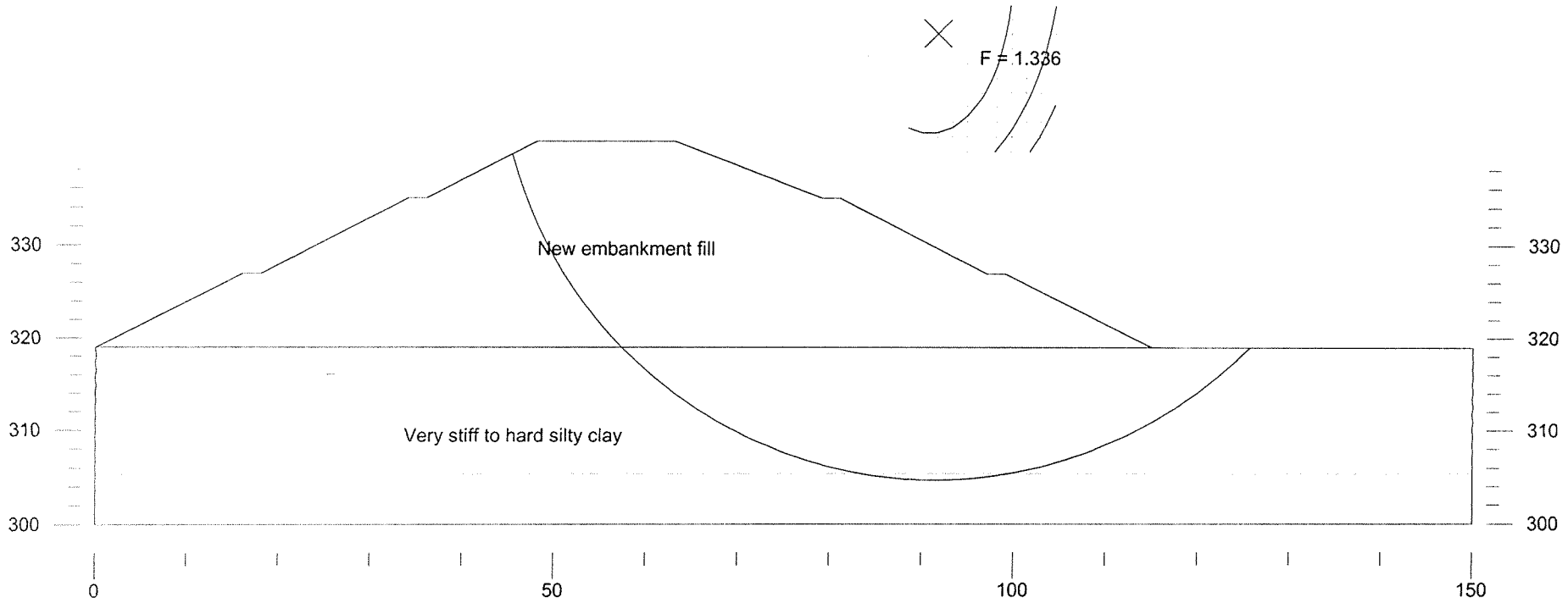
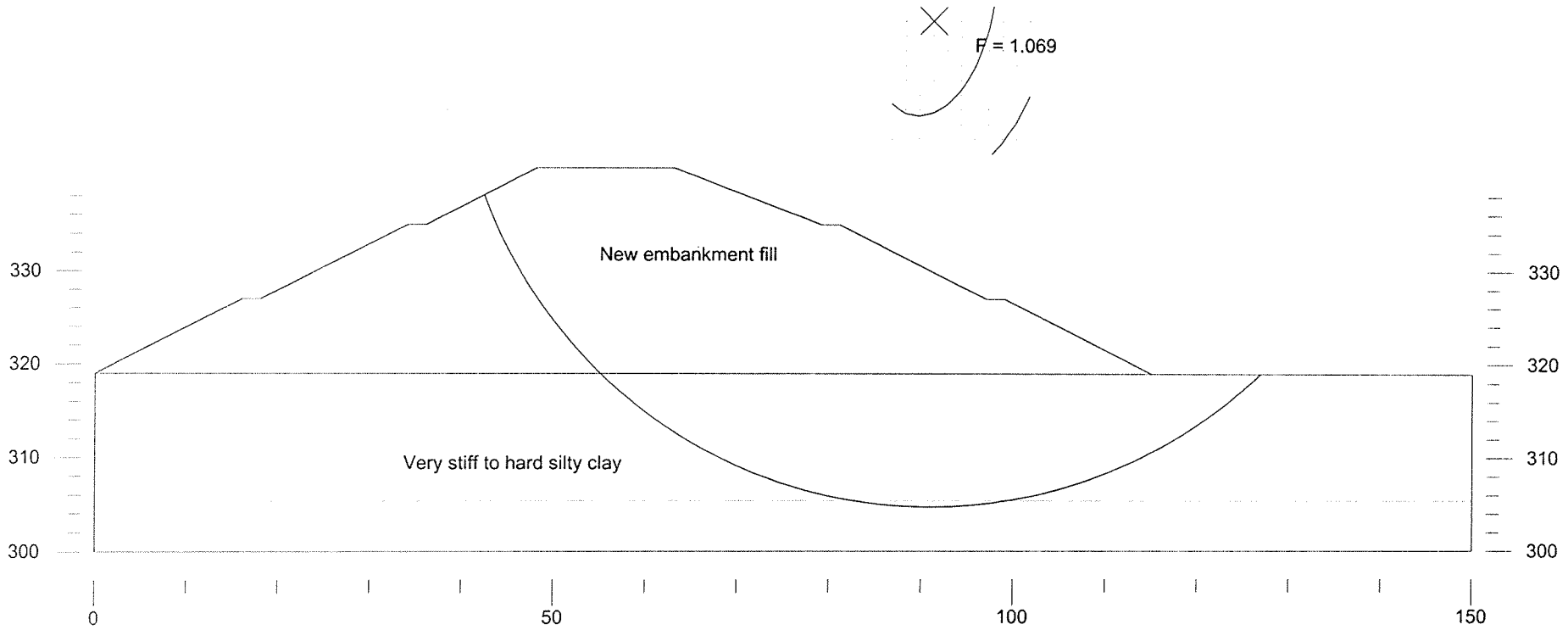


FIGURE M1

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Earth Fill	21	0	30	1
Silty Clay	19	100	0	1

Seismic coefficient = 0.08

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
N-E Ramp over E-S Ramp, Wellington St. & KWE
August 19, 2008
North and South Approach Earth Fill
Embankment height: 22m



3/17/2009 9:16:29 AM \\Torserver1\Projects\15\64\17HWY7~1\STRUCT~1\N-ERAM~2\NA1CS.GSL Thurber Engineering Ltd. - Toronto F = 1.069

FIGURE M2

Photo . Looking to the east side of Borehole 08-014, towards the KWE

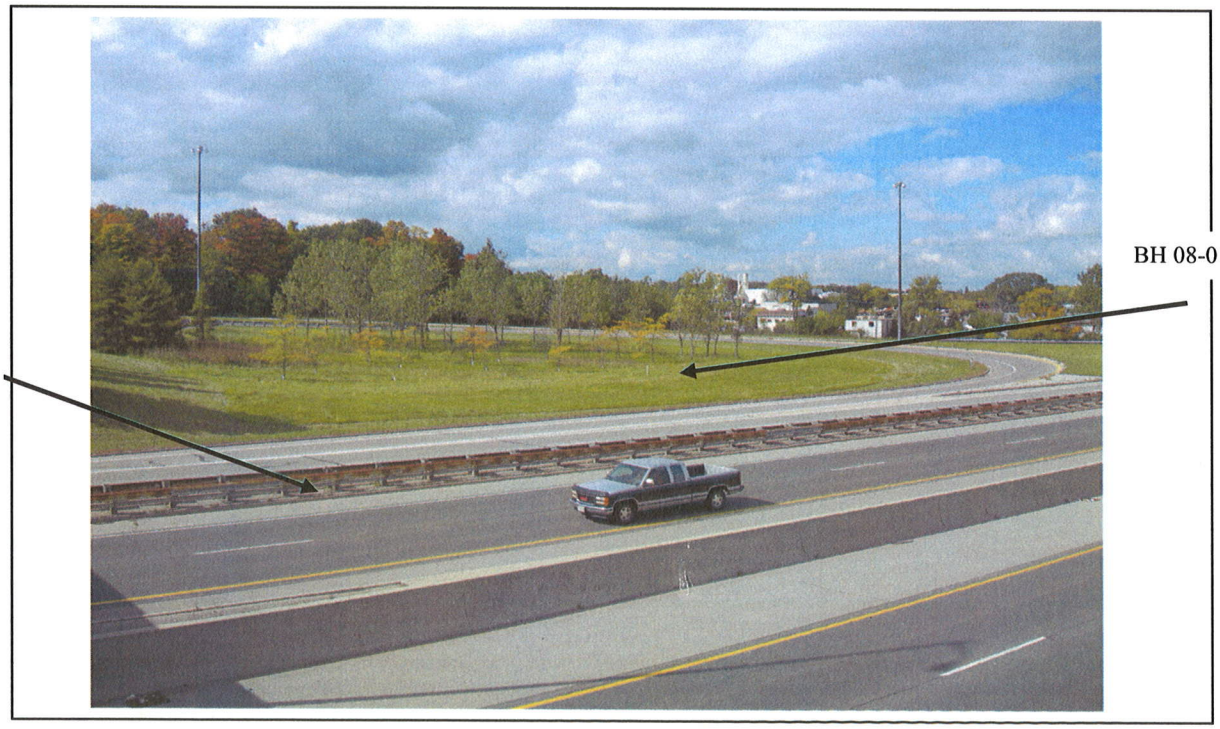


Photo . Picture taken from Wellington Street and KWE bridge, looking northwest. Borehole 08-014

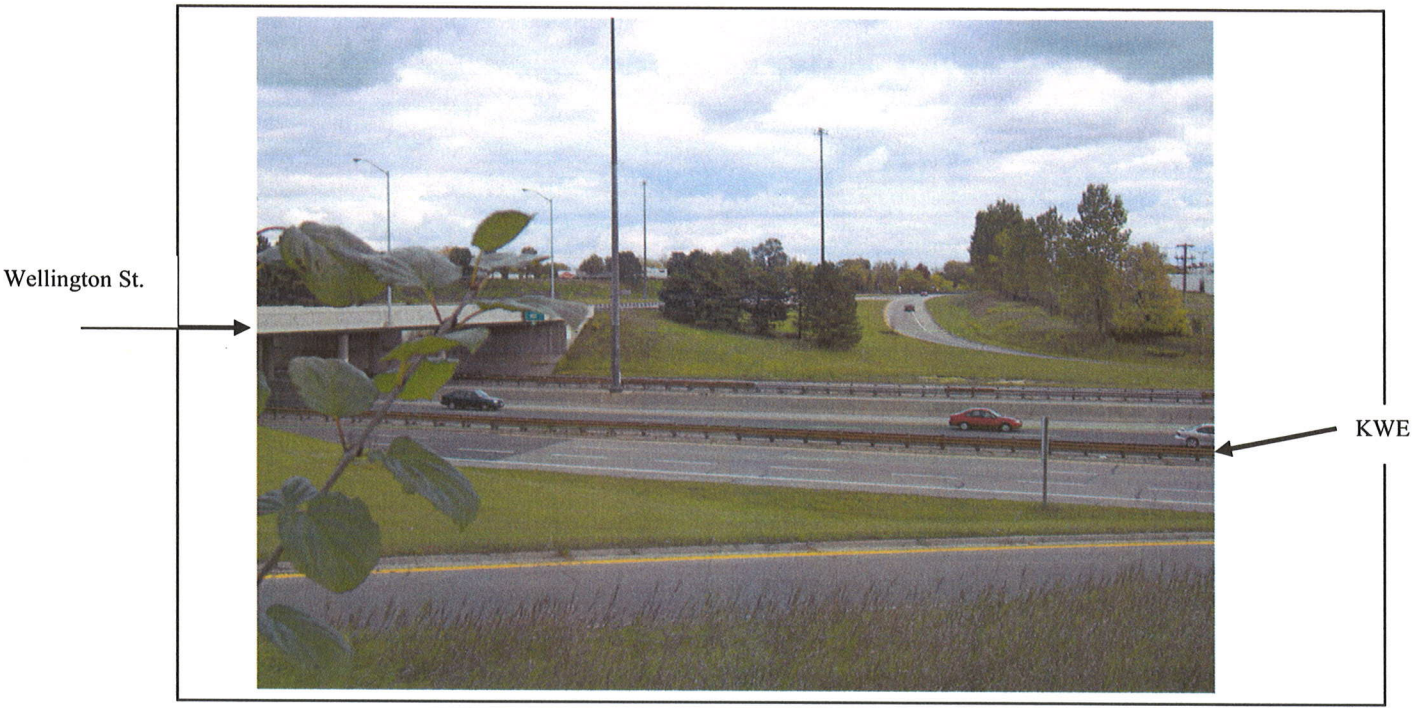


Photo . Looking to the southeast quadrant of Wellington Street and KWE interchange. Borehole 08-020

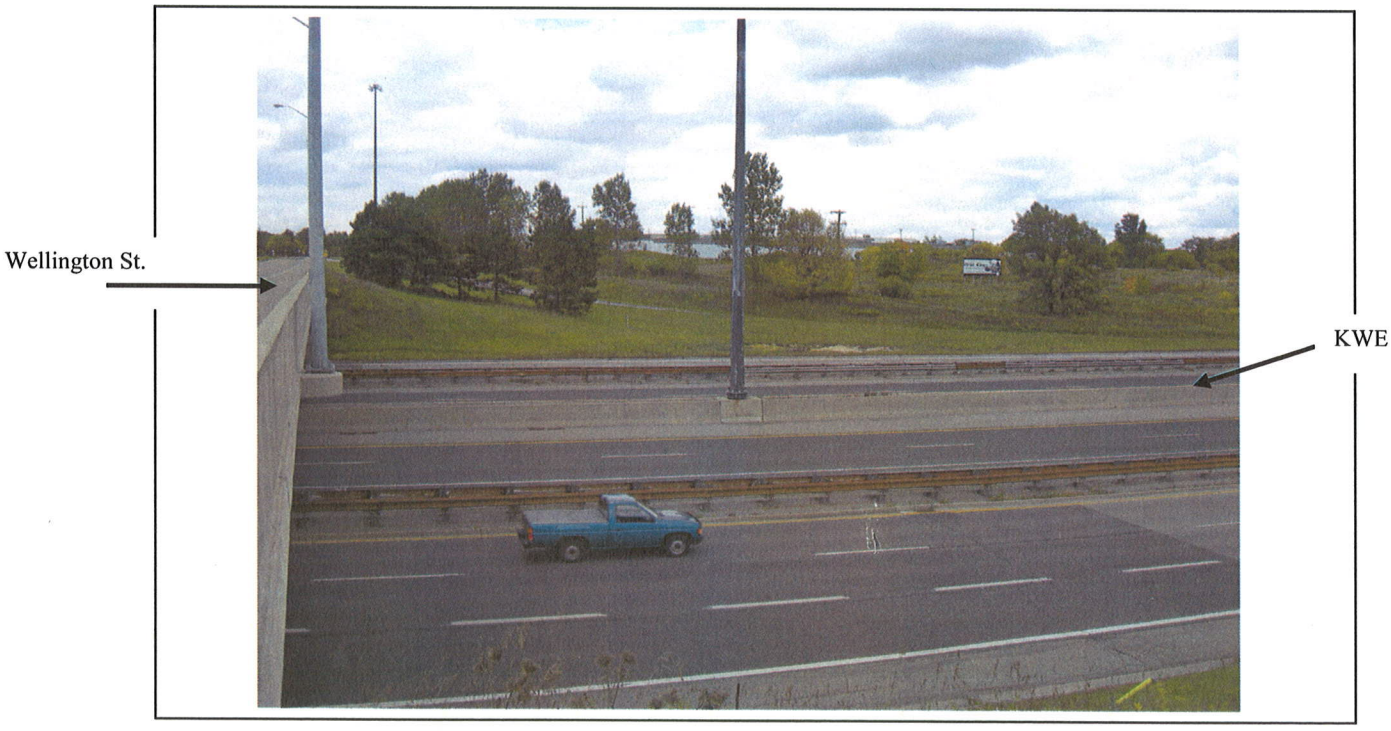


Photo . Picture taken from Wellington Street and KWE bridge, looking southeast. Borehole 08-020

PLOT SCALE 1:1
PLOT DATE 09-09
PW-0-707
MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

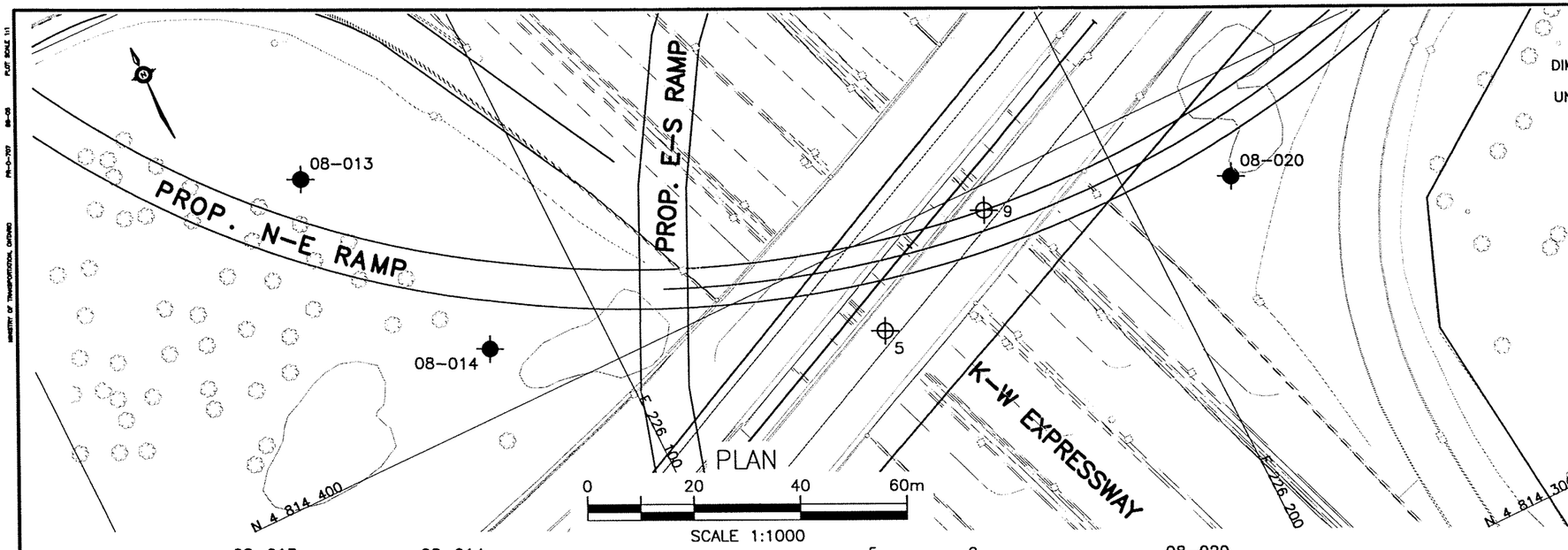
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

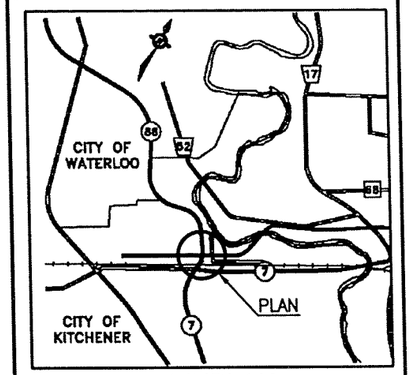
CONT No
GWP No 408-88-00

HIGHWAY 7
RECOMMENDED ROUTE
KW EXPRESSWAY TO N-E RAMP, 15+290 TO 15+395
BOREHOLE LOCATIONS AND SOIL STRATA

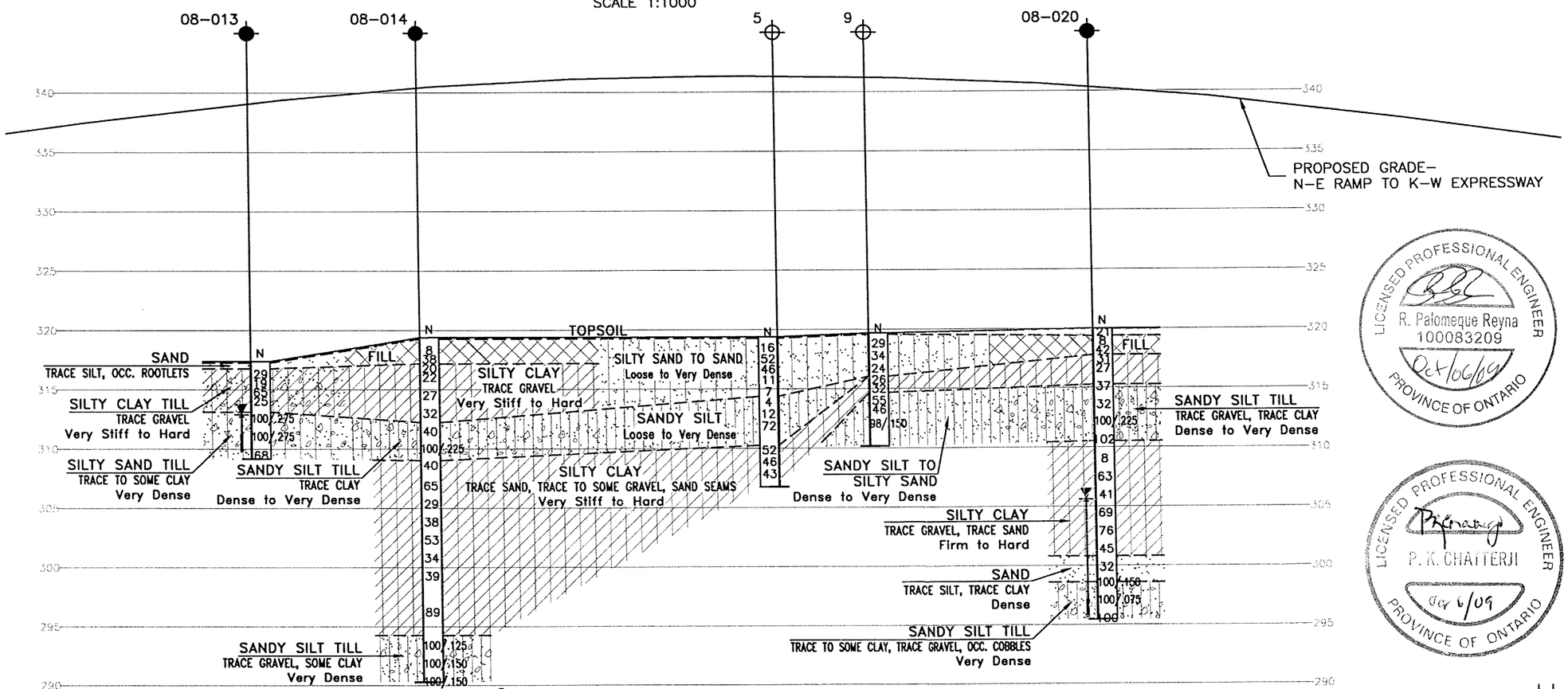
SHEET

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS





KEYPLAN



PROFILE ALONG ℄ OF PROP. N-E RAMP TO K-W EXPRESSWAY

0 20 40 60m HOR 1:1000
0 8 16 24m VER 1:400

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
Oct/06/09
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Oct 6/09
PROVINCE OF ONTARIO

LEGEND

✦	Borehole
⊕	Previous Borehole by others
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-013	317.4	4 814 456.6	226 061.2
08-014	319.4	4 814 412.1	226 078.9
08-020	320.0	4 814 381.0	226 219.3
5	319.4	4 814 382.9	226 147.4
9	319.7	4 814 395.5	226 174.3

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 2B of the E.A. Study.

GEOCRES No. 40P8-172

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	RPR	CHK	PKC	CODE		LOAD	DATE AUG. 2009
DRAWN	MFA	CHK	AEG	SITE		STRUCT	DWG

Appendix N

KWE Expressway N-E Ramp, Station 15+525 –15+580 (Boreholes 08-021, 08-022)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-021 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 395.14 E 226 273.41 ORIGINATED BY SA
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.07 - 2008.07.07 CHECKED BY RPR

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 (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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
320.7											
0.0	**TOPSOIL**, occasional roots: (150mm)										
0.2	Dark Brown Moist		1	SS	21						
	SAND and **GRAVEL**, trace silt Compact Grey Moist (FILL)		2	SS	28		320				
319.3											
1.3	Silty **CLAY**, some sand, trace gravel Very Stiff to Hard Grey (TILL)		3	SS	31		319				
	occasional silty sand seams		4	SS	18		318				1 25 39 35
			5	SS	16	▼					
							317				
			6	SS	25		316				0 6 46 48
315.0											
5.7	Sandy **SILT**, trace gravel, trace clay, occasional clayey silt seams Very Dense Grey Wet to Moist (TILL)		7	SS	58		315				0 38 52 10
314.0											
6.7	END OF BOREHOLE AT 6.7m. WATER WAS OBSERVED AT 3.3m DURING DRILLING. Piezometer installation consists of 25mm diameter schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.07.15	3.4	317.3
2008.08.20	3.2	317.5

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

(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-022 1 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 421.49 E 226 319.68 ORIGINATED BY SA

HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA

DATUM Geodetic DATE 2008.07.07 - 2008.07.08 CHECKED BY RPR

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
322.3											
0.0	**TOPSOIL**, occasional roots (200mm)										
0.2	Dark Brown Moist		1	SS	26		322				
321.4	Silty **SAND**, trace gravel, occasional roots Compact Brown to Grey Moist (FILL)		2	SS	22		321				
0.9	**SAND**, trace gravel Compact Grey Wet		3	SS	14						0 96 4 (SI+CL)
319.5			4	SS	20		320				
2.7	Silty **CLAY**, some sand, trace gravel Very Stiff to Hard Brown To Grey (TILL)		5	SS	17		319				
	Occasional silty sand seams		6	SS	37		318				0 14 52 34
315.1			7	SS	27		317				
7.2	**SAND**, some silt, trace clay Very Dense Grey Wet		8	SS	56		316				
			9	SS	100/ ~~225~~		315				
							314				
							313				0 80 20 (SI+CL)

Continued Next Page

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

(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-022 2 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 814 421.49 E 226 319.68 ORIGINATED BY SA
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SA
DATUM Geodetic DATE 2008.07.07 - 2008.07.08 CHECKED BY RPR

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 + 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
	Continued From Previous Page										
	SAND, some silt, trace clay Very Dense Grey Wet						312				
			10	SS	100						
							311				
309.8			11	SS	100/		310				
309.6					.275						0 46 51 3
12.6	Sandy **SILT**, trace clay Very Dense Grey Moist (TILL)										
	END OF BOREHOLE AT 12.6m.□ WATER LEVEL OBSERVED AT 0.9m DURING DRILLING. BOREHOLE BACKFILLED WITH BENSEAL TO 0.6m THEN HOLEPLUG TO SURFACE.										

+ 3 , × 3 : Numbers refer to Sensitivity

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

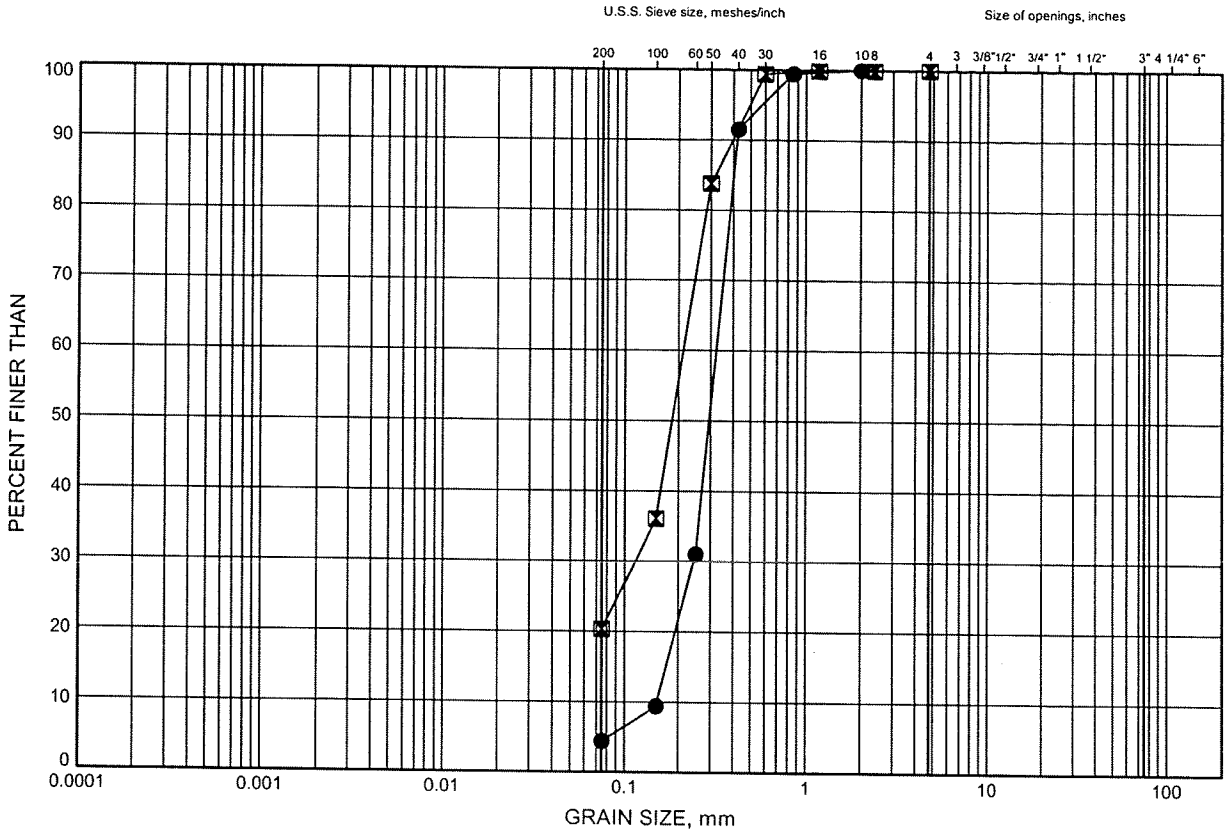
ONTMT4S 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE N1

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-022	1.83	320.42
⊠	08-022	9.45	312.80

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

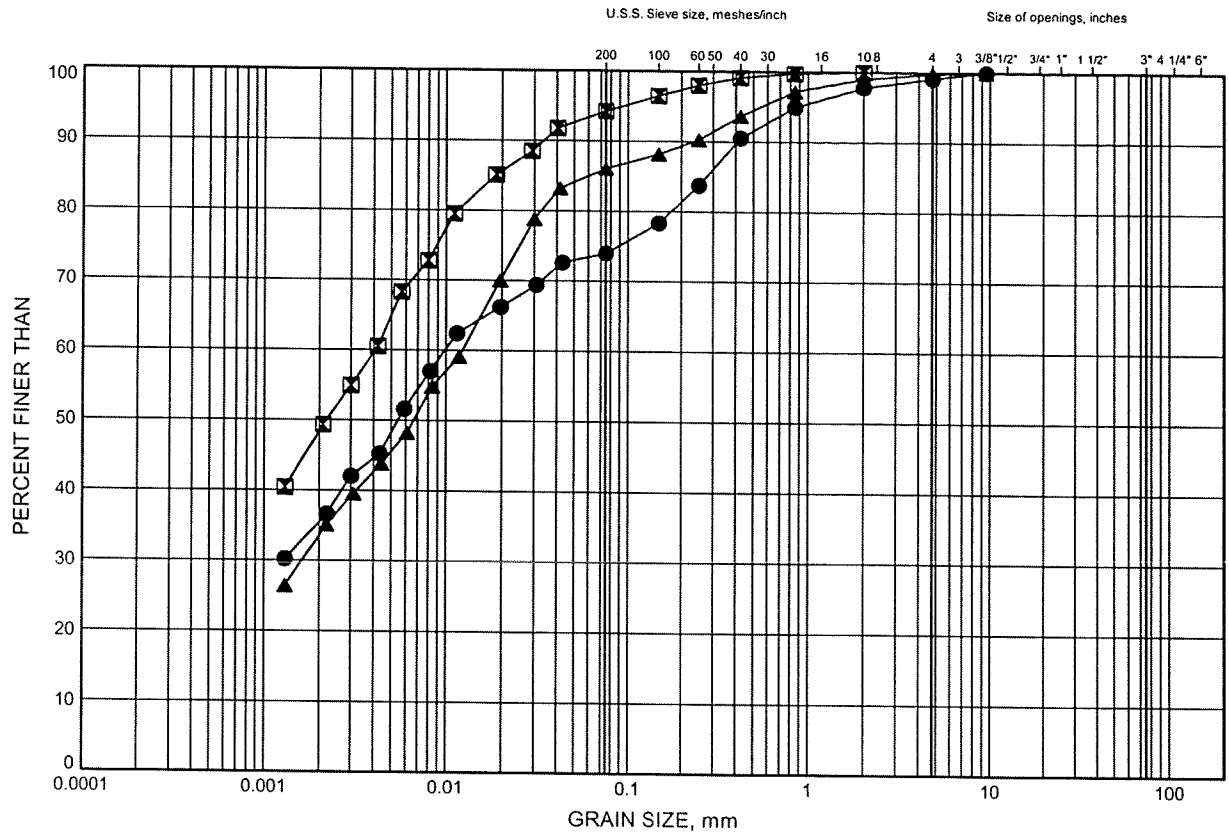
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE N2

SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-021	2.59	318.07
⊠	08-021	4.88	315.78
▲	08-022	4.88	317.38

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

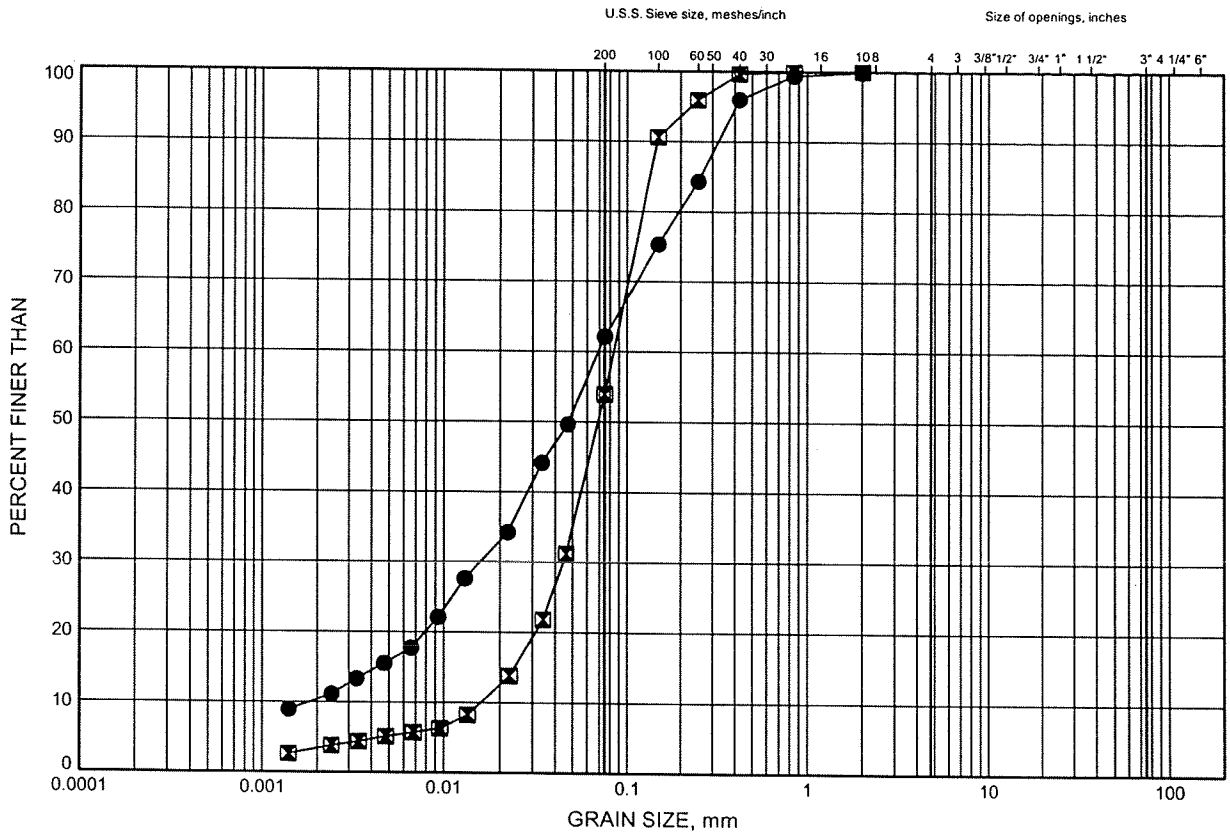
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE N3

SANDY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-021	6.40	314.26
⊠	08-022	12.38	309.87

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

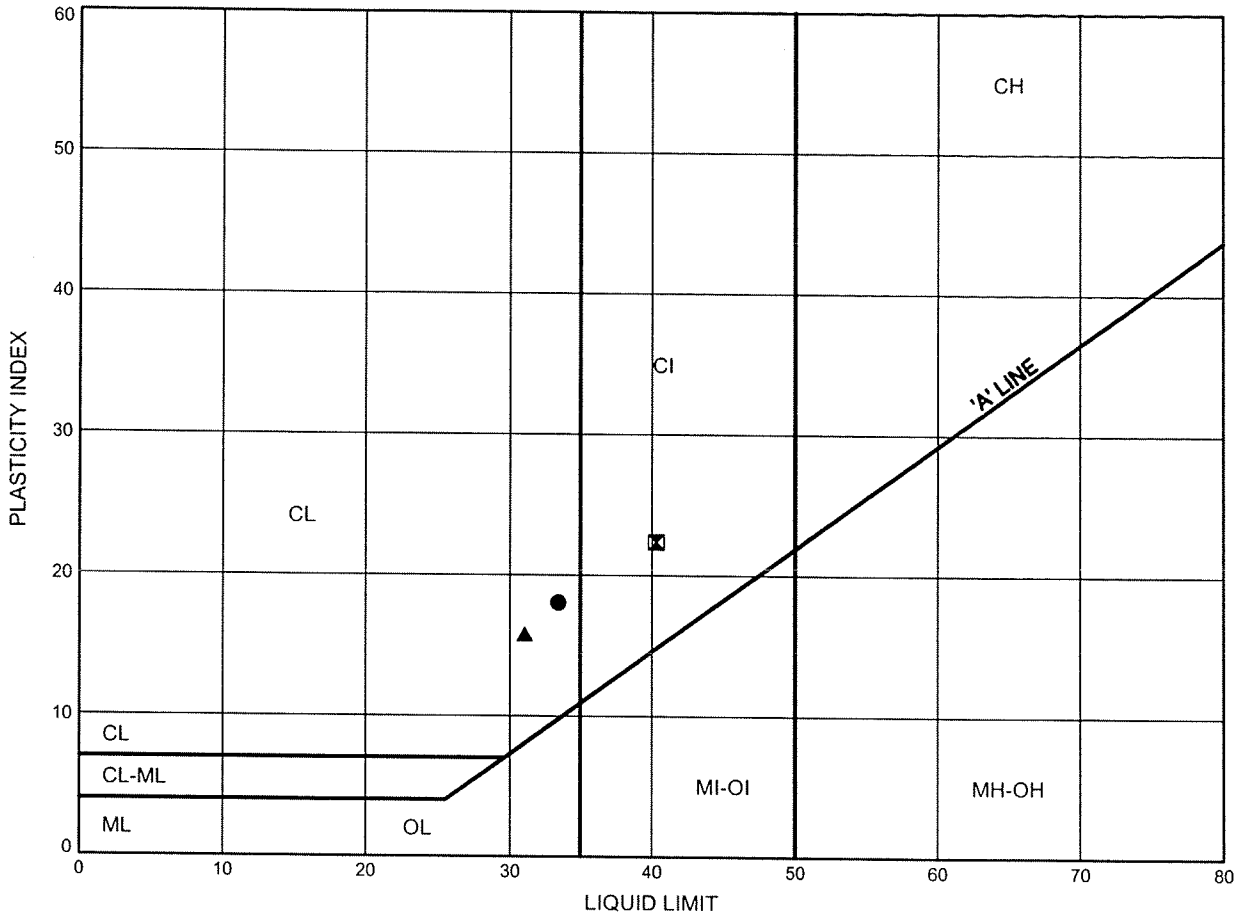
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE N4

SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-021	2.59	318.07
⊠	08-021	4.88	315.78
▲	08-022	4.88	317.38

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

THURBALT 6417R.GPJ 3/13/09

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Earth Fill	21	0	30	1
Silty Clay	19	100	0	1

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
KW Expressway - N-E Ramp
October 6, 2009
High Fill - Station 15+525 15+580
Embankment height: 22m

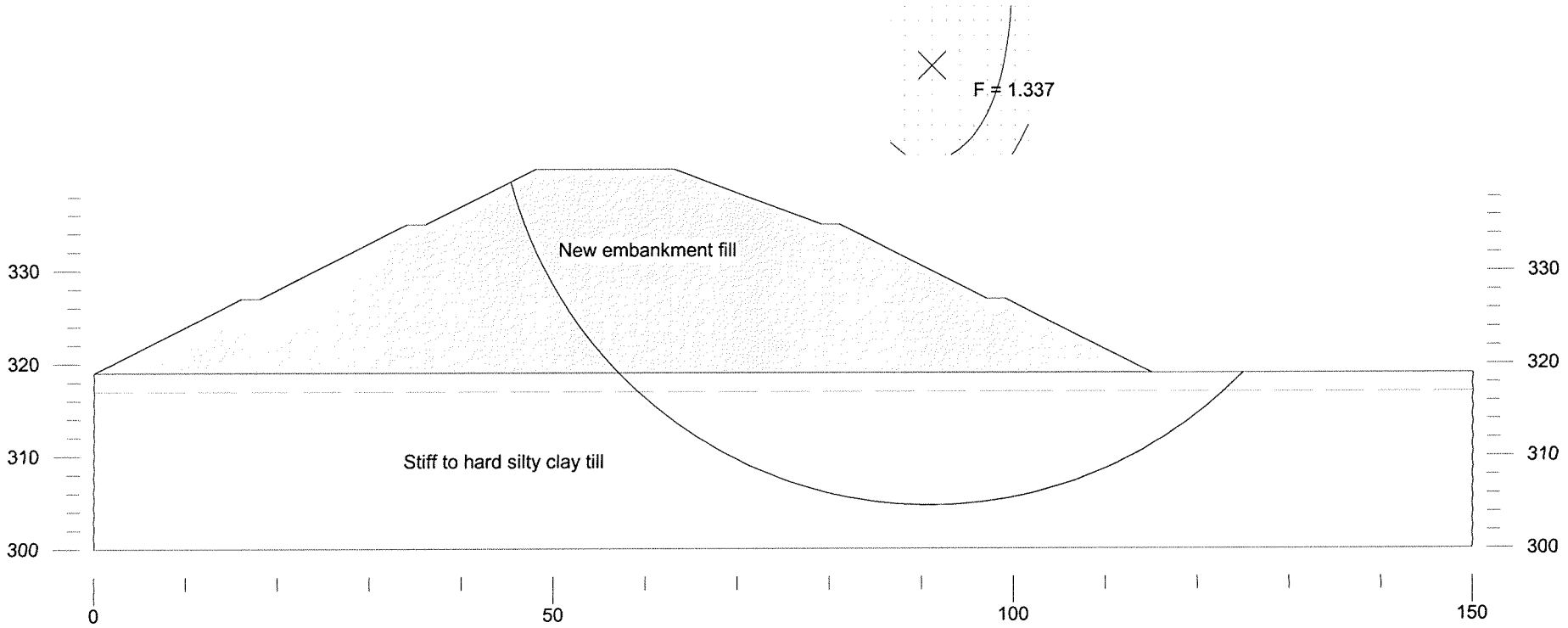
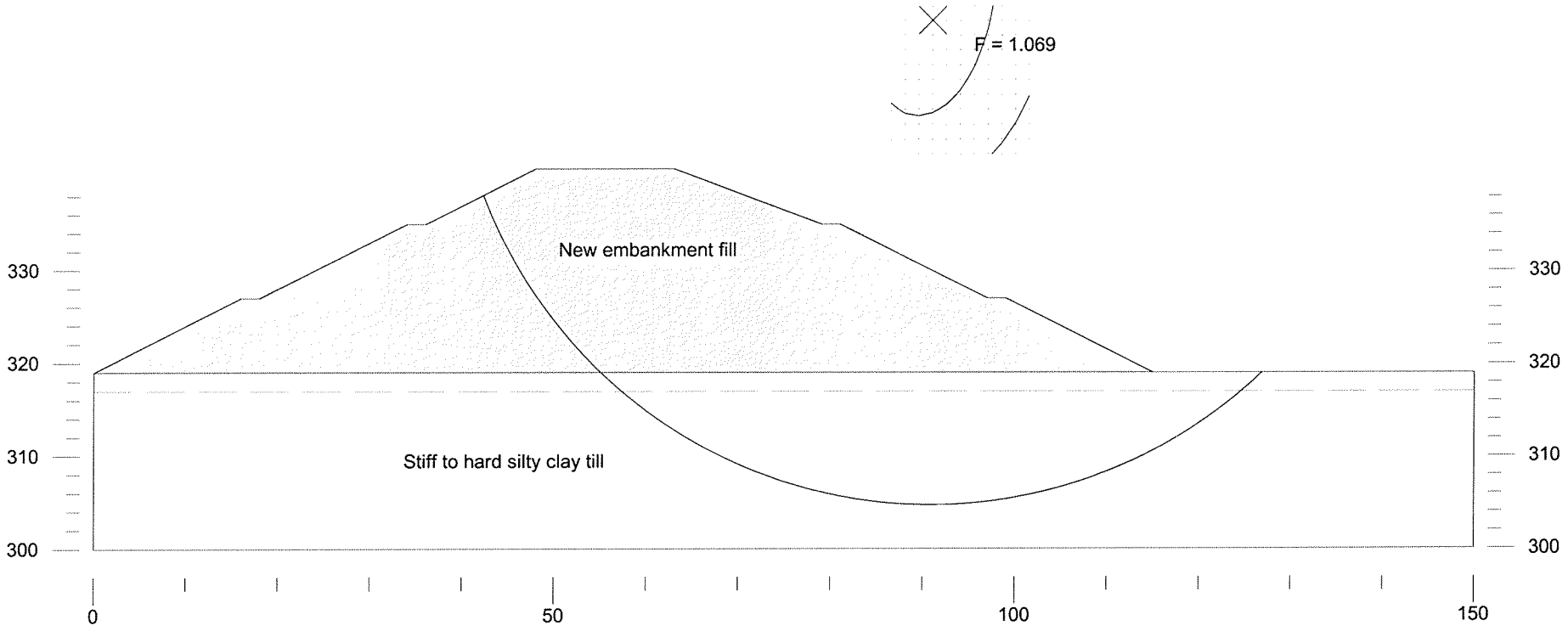


FIGURE N1

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.
Earth Fill	21	0	30	1
Silty Clay	19	100	0	1

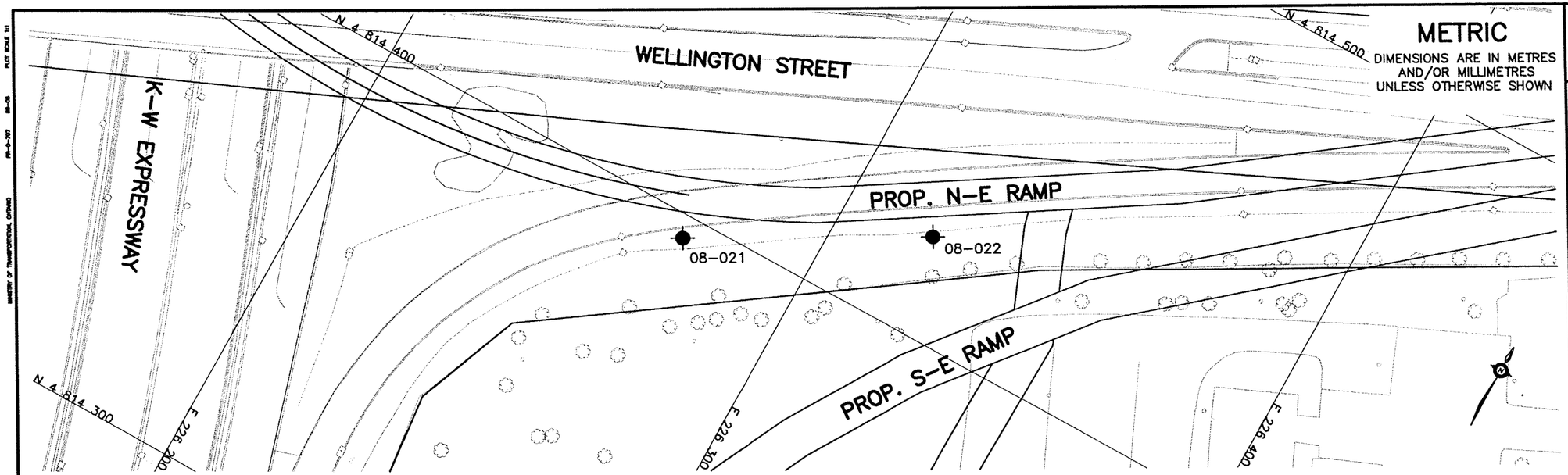
Seismic coefficient = 0.08

Thurber Engineering Ltd. - Toronto
15-64-17 Highway 7 - New
KW Expressway - N-E Ramp
October 6, 2009
High Fill - Station 15+525 15+580
Embankment height: 22m



10/6/2009 10:40:15 AM H:\15\64\17HWY7~1\REPORT~1\EMBANK~1\EMBANK~1\NCSS.GSL Thurber Engineering Ltd. - Toronto F = 1.069

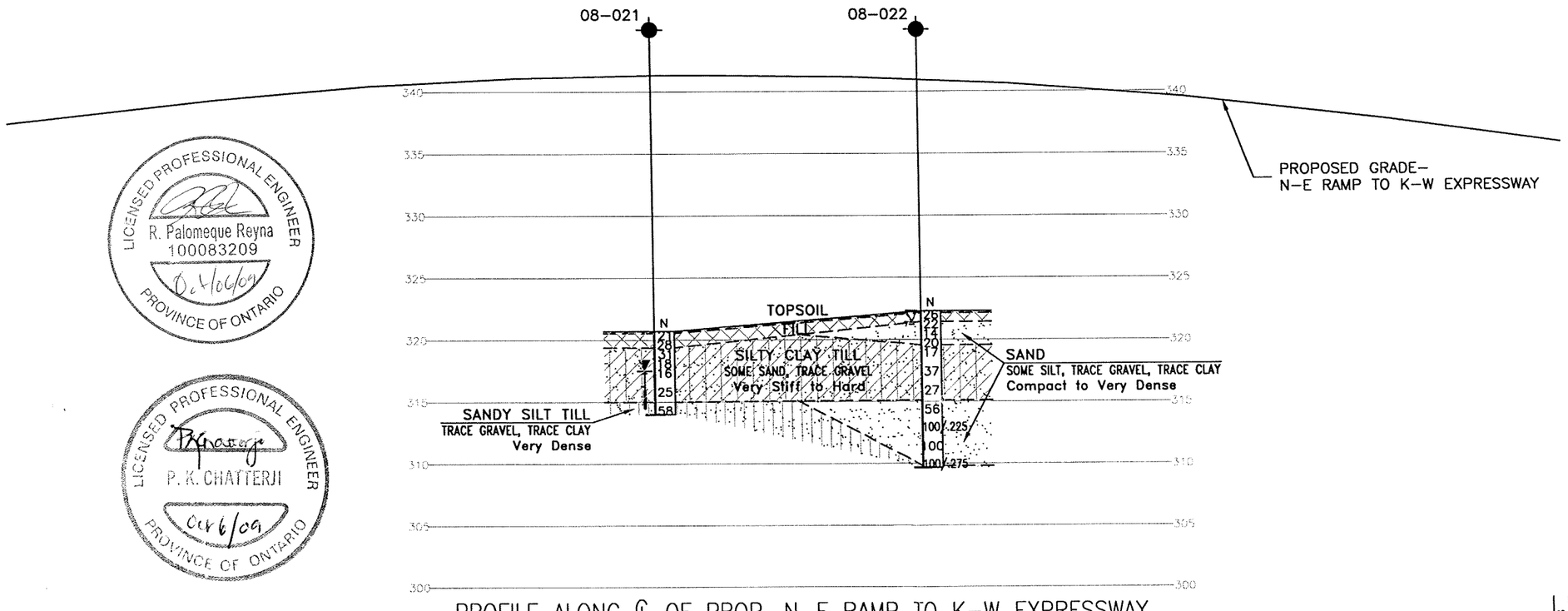
FIGURE N2



PLAN

0 20 40 60m

SCALE 1:1000



PROFILE ALONG ℄ OF PROP. N-E RAMP TO K-W EXPRESSWAY

0 20 40 60m HOR 1:1000

0 8 16 24m VER 1:400

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
Oct/06/09
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Oct 6/09
PROVINCE OF ONTARIO

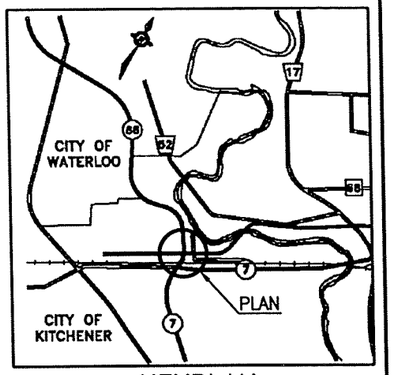
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 408-88-00

SHEET

HIGHWAY 7
RECOMMENDED ROUTE
KW EXPRESSWAY TO N-E RAMP, 15+525 TO 15+580
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-021	317.4	4 814 456.6	226 061.2
08-022	319.4	4 814 412.1	226 078.9

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 2B of the E.A. Study.

GEOCRES No. 40P8-172

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN RPR	CHK PKC	CODE	LOAD
DRAWN MFA	CHK AEG	SITE	STRUCT

DATE AUG. 2009
DWG

MINISTRY OF TRANSPORTATION, ONTARIO
PR-A-707 88-06
PLOT SCALE 1:1

Appendix O

Regional Road 52, S-E/W Ramp, Station 10+000 –10+155
(Boreholes 08-070, 08-071, 08-072, 08-073, 08-075)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-070

1 OF 3

METRIC

G.W.P. 408-88-00 | LOCATION N 4 816 095.20 E 227 943.38 | ORIGINATED BY SLL
HWY 7 | BOREHOLE TYPE Hollow Stem Augers | COMPILED BY LG
DATUM Geodetic | DATE 2008.07.23 - 2008.07.23 | CHECKED BY RPR

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
315.0							315				
0.0	**TOPSOIL**, occasional organics, roots and rootlets: (125mm)										
0.1	**SAND** and **GRAVEL**, trace silt, trace clay Dense to Very Dense Brown Moist		1	SS	35		314		○		
	occasional cobbles Wet		2	SS	54		313		○		36 55 9 (SI+CL)
312.5											
2.4	Silty **CLAY**, trace sand Very Stiff to Hard Brown to Grey (TILL)		3	SS	22				○ ○		
			4	SS	23		312		○		
			5	SS	42		311		⊢○⊣		0 8 43 49
			6	SS	30		310		○		
			7	SS	22		309		○		
			8	SS	44		308		○		
							307				
							306				

Continued Next Page

+ ^{3}, × ^{3} : Numbers refer to Sensitivity

15 ⊕ 5 (20, 10) (%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-070 2 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 095.20 E 227 943.38 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.23 - 2008.07.23 CHECKED BY RPR

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Silty **CLAY**, trace sand Very Stiff to Hard Grey (TILL)						305				
			9	SS	57		304				0 7 39 54
							303				
			10	SS	46						
							302				
			11	SS	55		301				
							300				
	thin sand seams		12	SS	24						
							299				
			13	SS	42		298				0 2 27 71
297.2											
17.8	Sandy **SILT**, trace to some gravel, trace clay, occasional cobbles Very Dense Grey Moist to Wet (TILL)						297				
			14	SS	100/.150		296				

Continued Next Page

+ ³ . × ³ : Numbers refer to Sensitivity

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

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-070 3 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 095.20 E 227 943.38 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.23 - 2008.07.23 CHECKED BY RPR

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
	Sandy **SILT**, trace to some gravel, trace clay Very Dense Grey Wet (TILL)		15	SS	100/.150		295				11 51 28 10
	Layer of sand: (400mm)						294				
293.5			16	SS	100/.150				o o		
21.5	END OF BOREHOLE AT 21.5m. BOREHOLE BACKFILLED WITH BENTONITE BENSEAL TO 0.2m, THEN HOLEPLUG TO SURFACE.										

+ ^{3} . × ^{3} : Numbers refer to Sensitivity

20
15 ⊕ 5 (%) STRAIN AT FAILURE
10

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-071 1 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 060.14 E 227 953.28 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.24 - 2008.07.24 CHECKED BY RPR

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
312.4											
0.0	**TOPSOIL:** (125mm)										
0.2	Sandy **SILT**, some clay, trace gravel Compact Brown Wet		1	SS	12		312				
311.0											
1.5	Silty **CLAY**, trace sand Very Stiff Brown (TILL)		2	SS	16		311				
			3	SS	14		310				0 2 36 62
	Brown to Grey		4	SS	22		309				
			5	SS	28		308				
							307				
	Hard Grey		6	SS	34		306				
			7	SS	46		305				0 11 45 44
							304				
			8	SS	37		303				

Continued Next Page

+ ^{3}, × ^{3} Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-071 2 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 060.14 E 227 953.28 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.24 - 2008.07.24 CHECKED BY RPR

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, × 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
	Continued From Previous Page										
	Silty **CLAY**, trace sand Very Stiff to Hard Grey (TILL)						302				
			9	SS	25		301				
			10	SS	42		300				
			11	SS	25		299				0 1 16 83
297.8							298				
14.7	Sandy **SILT**, some clay to clayey, trace gravel Very Dense Grey Moist (TILL)		12	SS	100/.250		297				1 34 38 26
			13	SS	100/.125		296				
294.8							295				
17.7	**SAND**, trace to some silt, trace gravel Very Dense Grey Wet										
293.7			14	SS	100/.250		294				
18.7	END OF BOREHOLE AT 18.7m. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2008.08.06 12.8 299.6 2008.08.20 12.4 300.0										

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

(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-072 1 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 030.59 E 227 968.23 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.25 - 2008.07.25 CHECKED BY RPR

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, + 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
310.4											
0.0	**TOPSOIL**, occasional organics:						310				
0.2	(150mm)										
	SAND, trace silt, occasional rootlets Compact Brown Moist										
309.4							309				
1.1	Silty **CLAY**, trace sand Stiff to Very Stiff Brown (TILL) sand seams Brown to Grey		1	SS	11						
			2	SS	29						
			3	SS	12		308				0 1 30 69
			4	SS	15						
	Layer of silt: (200mm) Grey						307				
			5	SS	24		306				0 5 41 54
							305				
			6	SS	23		304				
	occasional cobbles Hard to Very Stiff										
			7	SS	30		303				
							302				
			8	SS	24		301				

Continued Next Page

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

(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-072 2 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 030.59 E 227 968.23 ORIGINATED BY SLL
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.25 - 2008.07.25 CHECKED BY RPR

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
	Continued From Previous Page										
	Silty **CLAY**, trace sand Very Stiff to Hard Grey (TILL)						300				
			9	SS	42						0 7 37 56
							299				
			10	SS	24		298				
296.4											
14.0	Sandy **SILT**, some clay to clayey, trace sand Compact Grey Moist (TILL) Layer of wet sand: (700mm)		11	SS	15		297				
							296				1 37 40 22
			12	SS	12		295				0 85 15 (SI+CL)
294.0											
16.4	**SAND**, trace silt, trace clay Very Dense Grey Wet						294				
			13	SS	100						
							293				
			14	SS	100/.175						
							292				0 89 11 (SI+CL)
			15	SS	100/		291				

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-072 3 OF 3 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 030.59 E 227 968.23 ORIGINATED BY SLL

HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG

DATUM Geodetic DATE 2008.07.25 - 2008.07.25 CHECKED BY RPR

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
290.3	Continued From Previous Page				.125						
20.1	END OF BOREHOLE AT 20.1m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.						290				

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

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

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-073 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 815 997.82 E 227 986.53 ORIGINATED BY WB
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.28 - 2008.07.28 CHECKED BY RPR

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
308.6											
0.0	**TOPSOIL:** (600mm)		1	AS							
308.0							308				
0.6	**SAND** and **GRAVEL**, some silt, trace clay Loose to Compact Brown Moist		1	SS	14						
			2	SS	9		307				
	Very Dense		3	SS	55		306				54 33 13 (SI+CL)
305.2											
3.4	Silty **CLAY**, trace gravel, trace to some sand Hard to Very Stiff Grey		4	SS	30		305				
			5	SS	15		304				
			6	SS	15		303				0 13 46 41
			7	SS	25		302				
300.3							301				
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE BACKFILLED WITH GROUT TO 0.3m, THEN SAND TO SURFACE.										

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

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

ONTMT4S 6417R.GPJ 3/13/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-075 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 815 939.60 E 228 029.28 ORIGINATED BY WB
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.28 - 2008.07.28 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
306.4									
0.0 / 305.9	**TOPSOIL:** (450mm) Brown		1	AS					
0.5 / 304.1	Silty **SAND**, some topsoil, some gravel, some clay Loose to Compact Brown Damp (FILL)		1	SS	7		306		
			2	SS	10		305		
2.3 / 302.3	**SAND** and **GRAVEL**, trace silt, trace clay Dense Brown Moist Auger grinding at 3.6m, occasional cobbles		3	SS	40		304		
			4	SS	45		303		55 36 9 (SI+CL)
4.1 / 298.1	Silty **CLAY**, trace sand, trace gravel Stiff to Very Stiff Grey		5	SS	18		302		
			6	SS	28		301		
			7	SS	14		300		0 13 45 42
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE BACKFILLED WITH GROUT TO SURFACE. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2008.08.06 2.8 303.6 2008.08.20 2.0 304.4						299		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa 40 80 120 160 200
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

$+^3$, $\times^3$: Numbers refer to Sensitivity
(%) STRAIN AT FAILURE

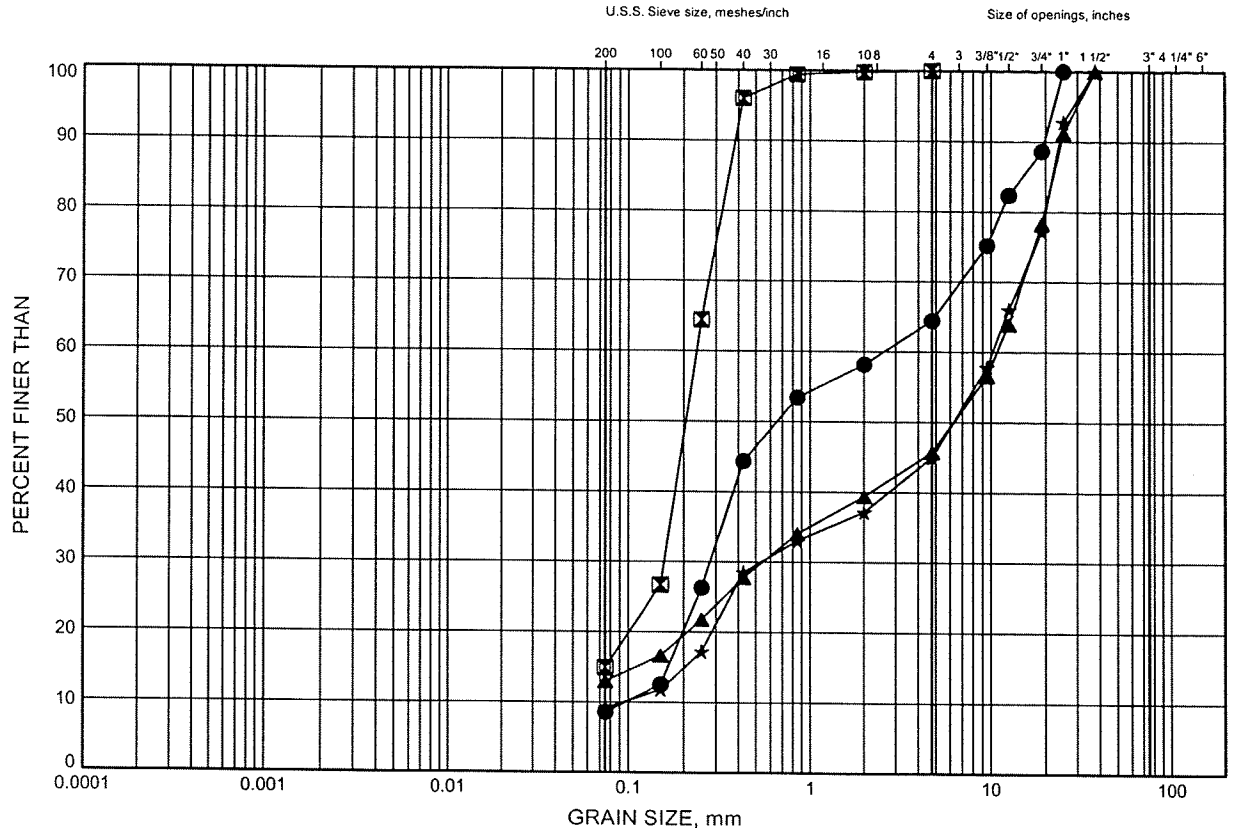
ONTMT4S 6417R.GPJ 8/17/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE O-1

SAND & GRAVEL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-070	1.83	313.13
⊠	08-072	15.44	294.99
▲	08-073	2.59	305.97
★	08-075	3.35	303.01

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

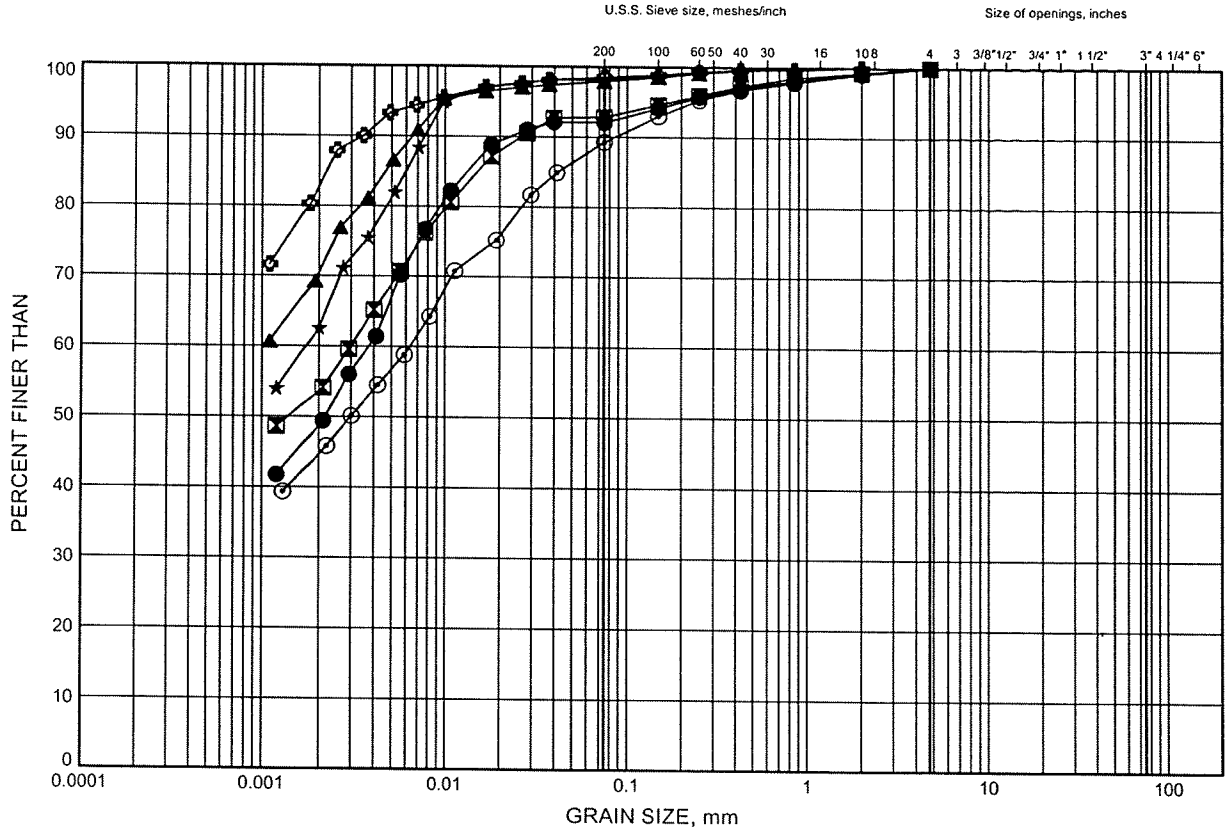
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE O-2

SILTY CLAY & SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-070	4.88	310.09
⊠	08-070	10.97	303.99
▲	08-070	17.07	297.89
★	08-071	2.59	309.85
⊙	08-071	7.92	304.52
✿	08-071	13.96	298.49

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

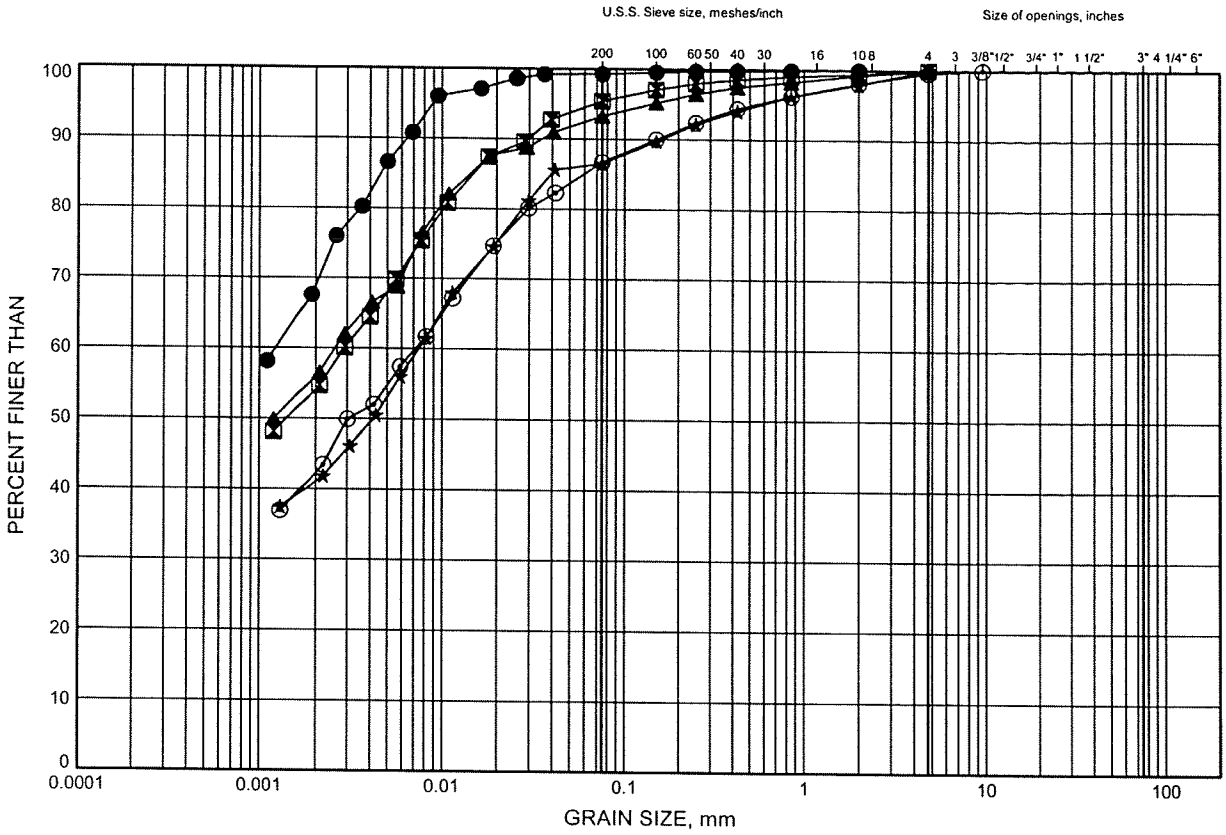
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE O-3

SILTY CLAY & SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-072	2.59	307.84
⊠	08-072	4.88	305.55
▲	08-072	10.97	299.46
★	08-073	6.40	302.16
⊙	08-075	6.40	299.96

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

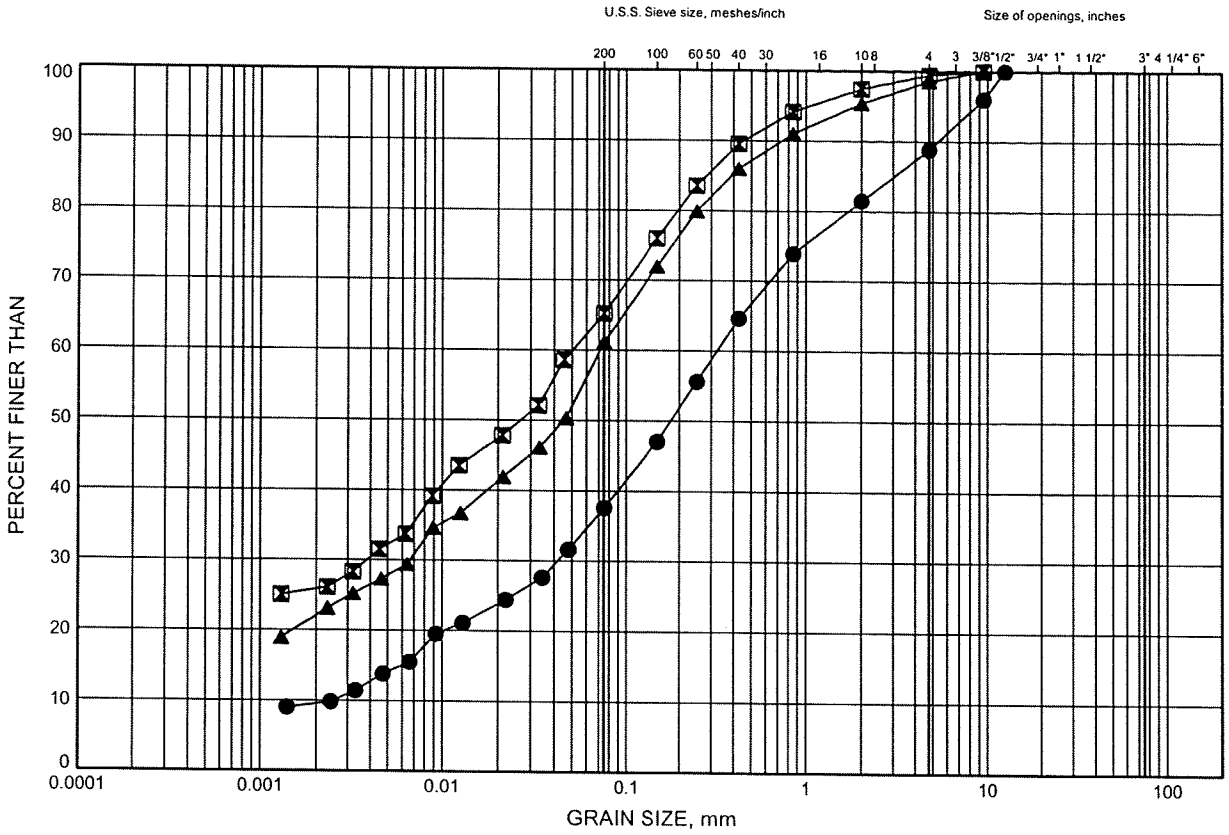
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE O-4

SANDY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-070	19.96	295.00
⊠	08-071	15.49	296.95
▲	08-072	14.23	296.21

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Checked By RPR

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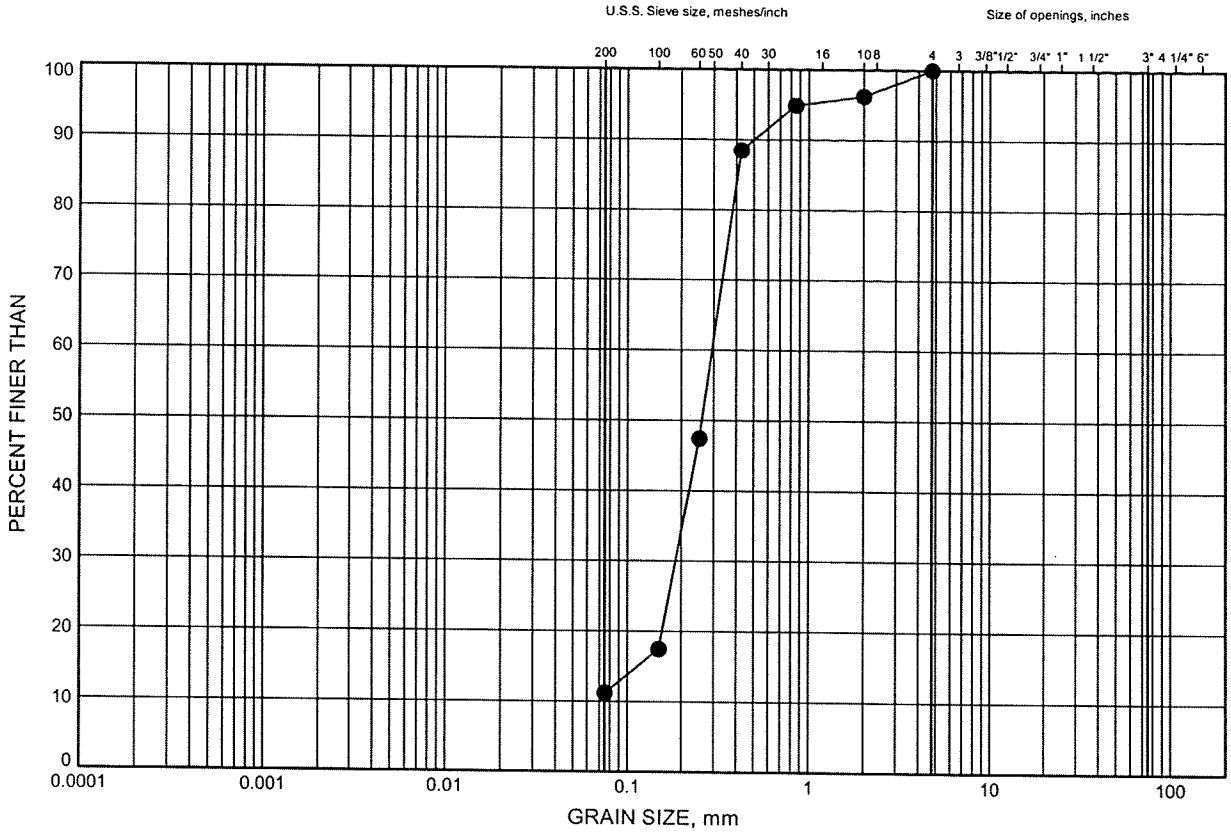
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE O-5

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-072	18.38	292.05

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

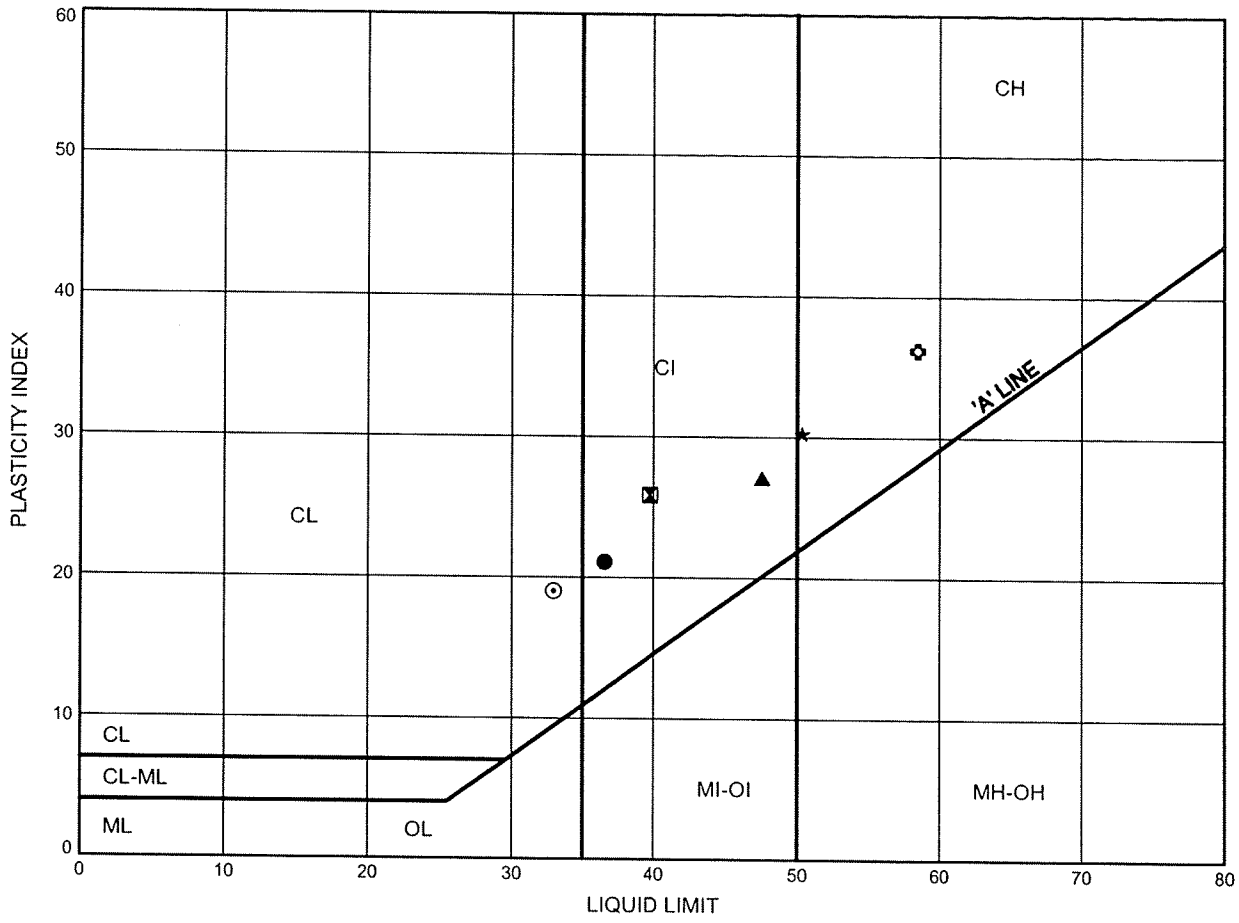
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/13/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE O-6

SILTY CLAY & SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-070	4.88	310.09
⊠	08-070	10.97	303.99
▲	08-070	17.07	297.89
★	08-071	2.59	309.85
⊙	08-071	7.92	304.52
✿	08-071	13.96	298.49

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

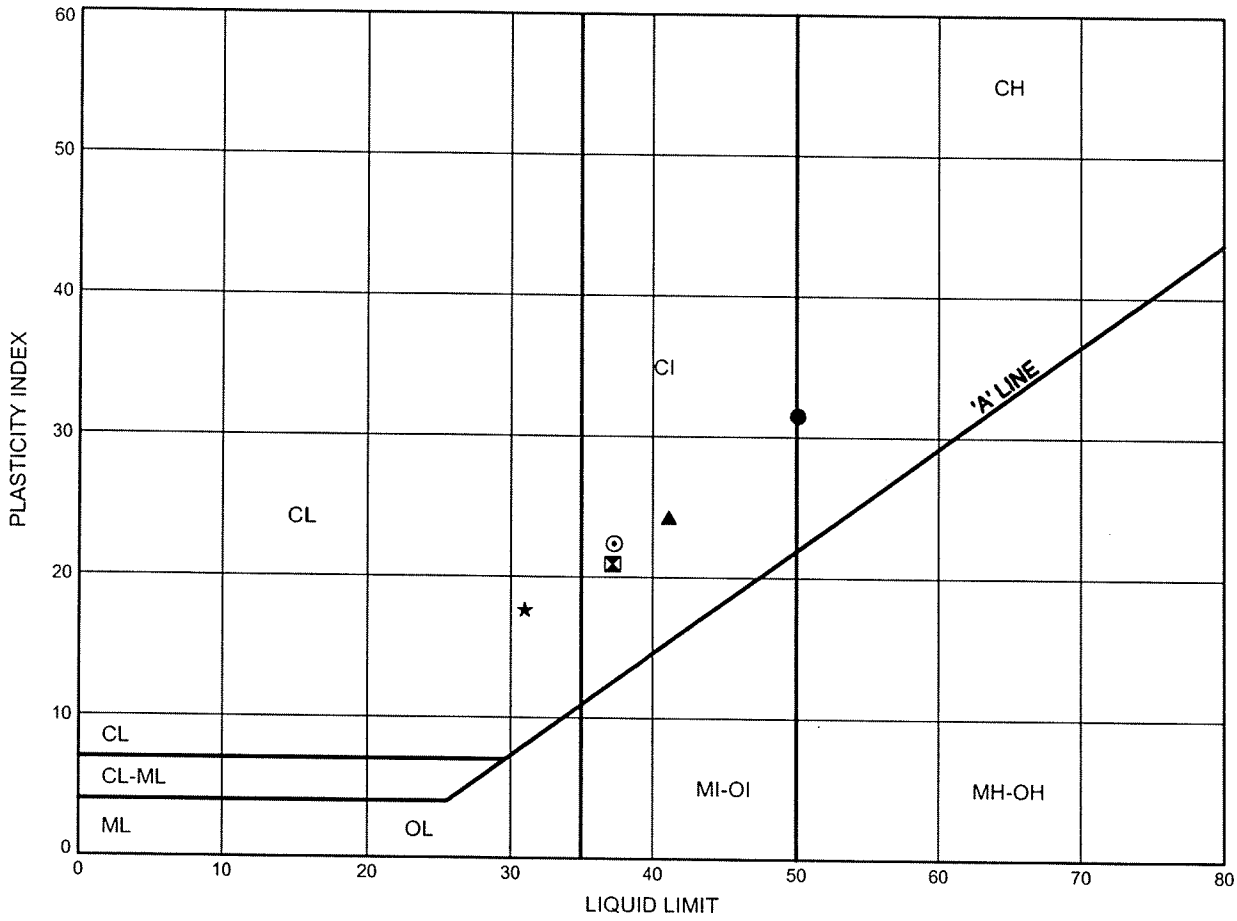
THURBALT 6417R.GPJ 3/13/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE O-7

SILTY CLAY & SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-072	2.59	307.84
⊠	08-072	4.88	305.55
▲	08-072	10.97	299.46
★	08-073	6.40	302.16
⊙	08-075	6.40	299.96

Date March 2009

Project 408-88-00

THURBER

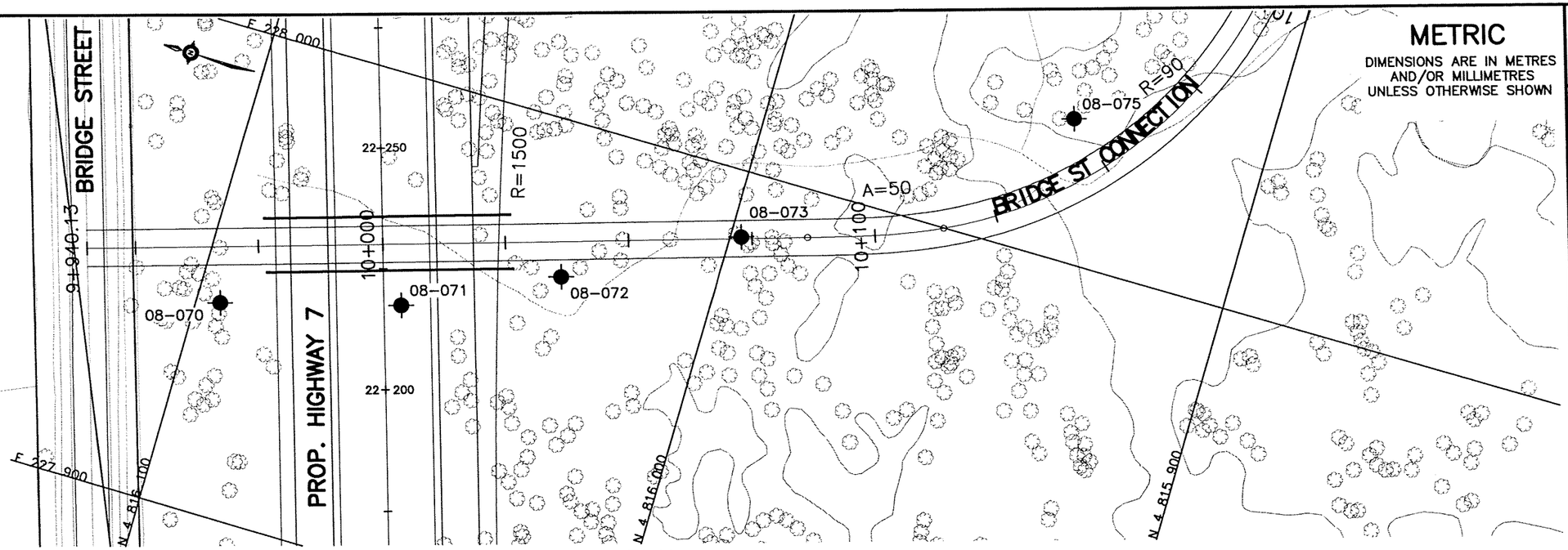
Prep'd AN

Chkd. RPR

THURBALT 6417R.GPJ 3/13/09

METRIC

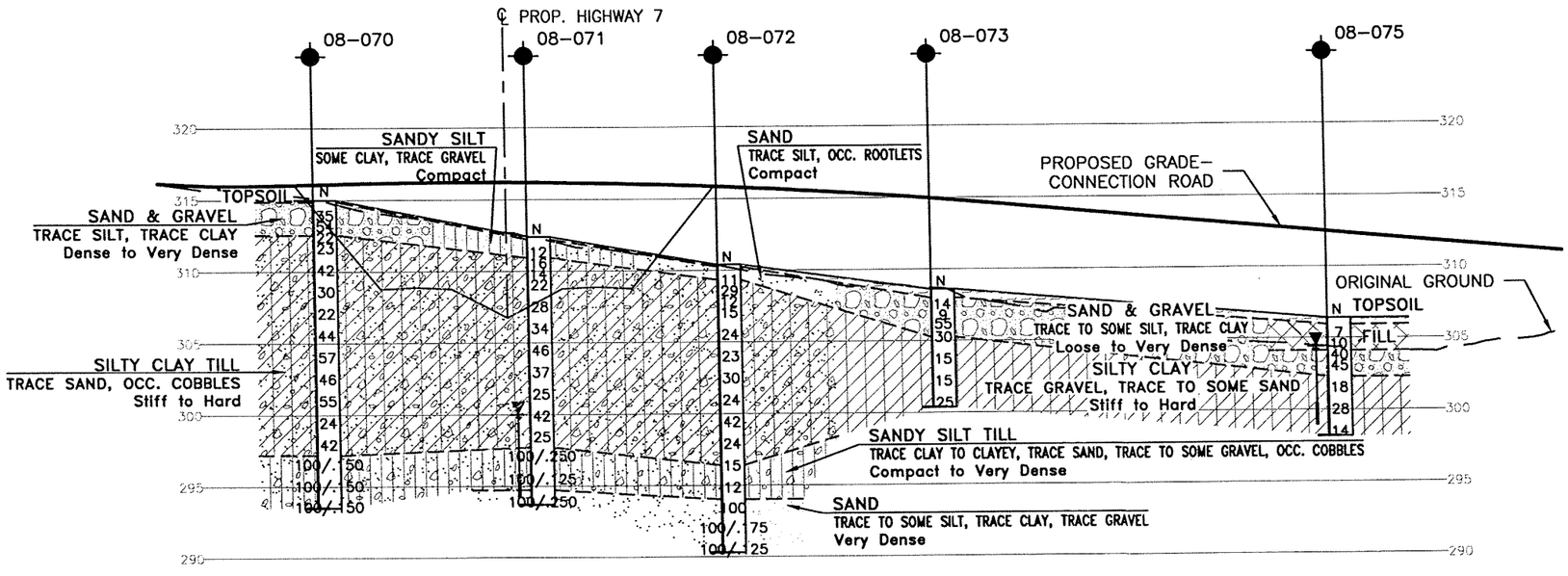
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN



PLAN

0 20 40 60m

SCALE 1:1000



PROFILE ALONG ℄ OF PROP. REGIONAL ROAD 52 S-E/W RAMP

0 20 40 60m HOR 1:1000

0 8 16 24m VER 1:400

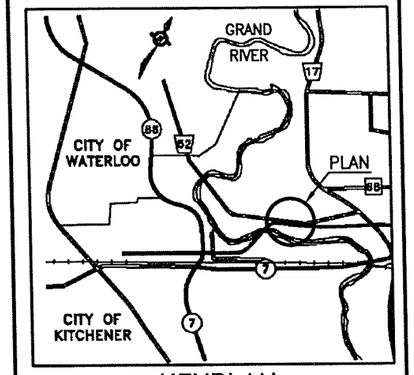
DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

CONT No
GWP No 408-88-00

SHEET

HIGHWAY 7
RECOMMENDED ROUTE
REG. RD. 52 S-E/W RAMP, 10+000 TO 10+155
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▽ |	Head Artesian Water
|	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-070	315.0	4 816 095.2	227 943.4
08-071	312.4	4 816 060.1	227 953.3
08-072	310.4	4 816 030.6	227 968.2
08-073	308.6	4 815 997.8	227 986.5
08-075	306.4	4 815 939.6	228 029.3

LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
Oct/06/09
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Oct 6/09
PROVINCE OF ONTARIO

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 5 of the E.A. Study.

GEOCRES No. 40P8-172

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN RPR	CHK PKC	CODE	LOAD
DRAWN MFA	CHK AEG	SITE	STRUCT
			DWG
			DATE OCT. 2009

Appendix P

Regional Road 52, W-S Ramp, Station 10+160 –10+185
(Boreholes 08-074)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-074 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 024.09 E 228 164.36 ORIGINATED BY WB
HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY LG
DATUM Geodetic DATE 2008.07.30 - 2008.07.30 CHECKED BY RPR

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
308.1											
0.0	**SAND** and **GRAVEL**, some silt, trace clay Compact to Dense Brown Moist (FILL)		1	AS			308		o		
			1	SS	27		307		o		
	Concrete slab at 1.5m, borehole moved 1m north of original location.		2	SS	13				o		
	Auger grinding at 2.1m						306				
	Concrete slab at 2.4m, borehole moved 2m east of original location.		3	SS	50				o		
			4	SS	21		305		o		36 45 19 (SI+CL)
			5	SS	16		304		o		
	Very Dense		6	SS	68	▼	303		o		
	Wet		7	SS	62		302		o		37 55 8 (SI+CL)
299.8							301				
8.2	END OF BOREHOLE AT 8.2m. WATER OBSERVED AT 6.4m DURING DRILLING. BOREHOLE BACKFILLED WITH GROUT TO SURFACE.						300				

$+^{3}$. $\times^{3}$. Numbers refer to Sensitivity

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

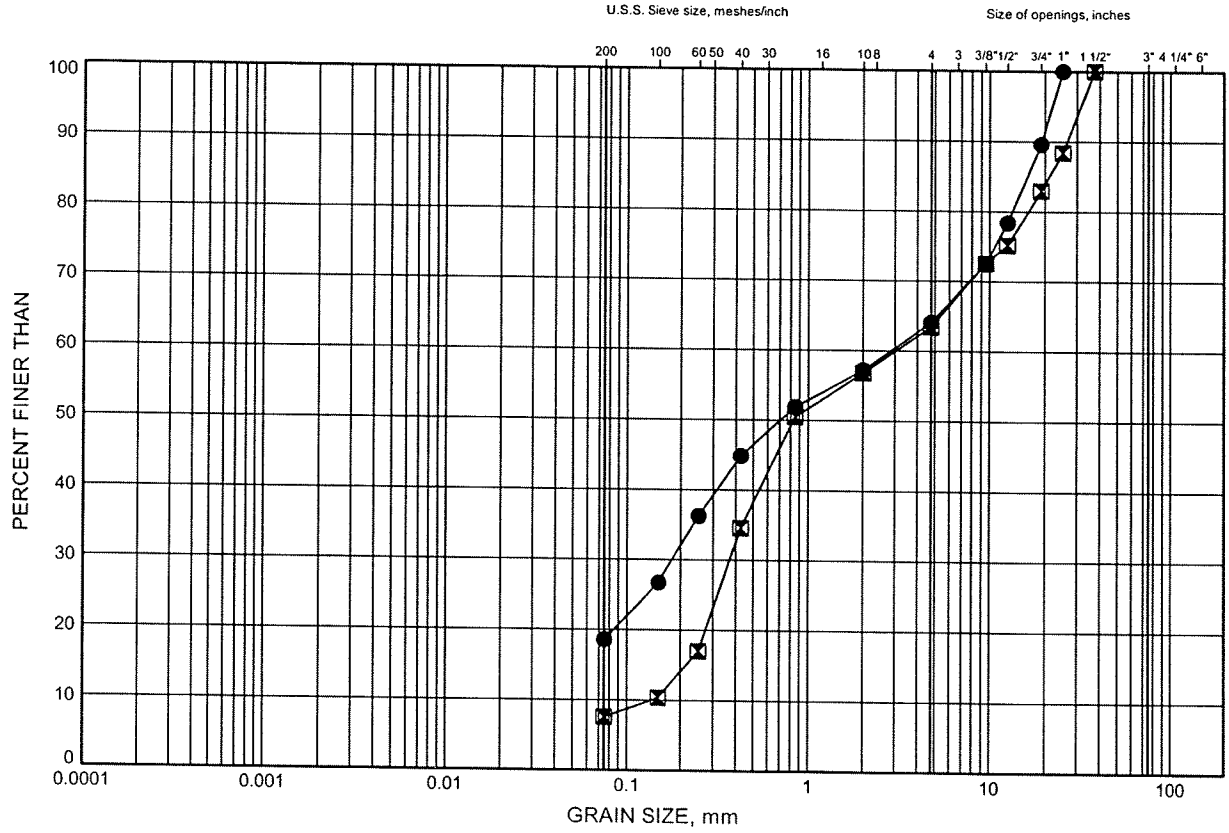
ONTMT4S 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE P1

SAND & GRAVEL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-074	3.35	304.71
⊠	08-074	7.92	300.14

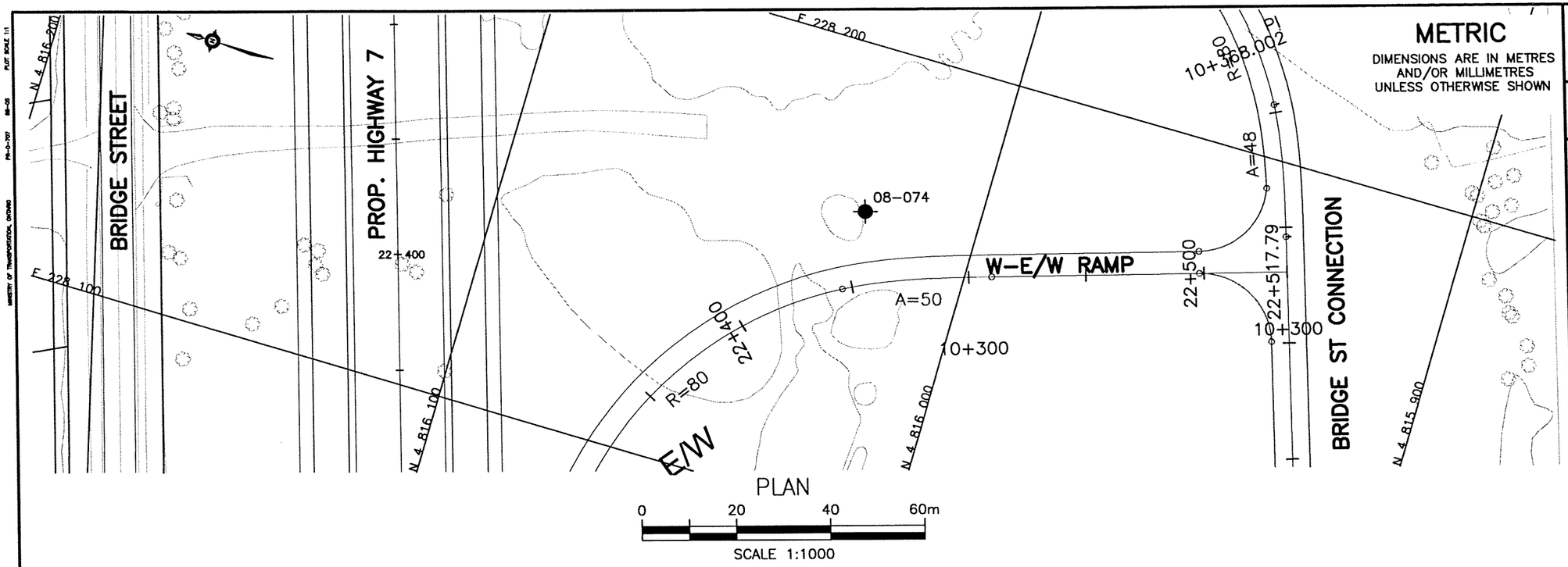
W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

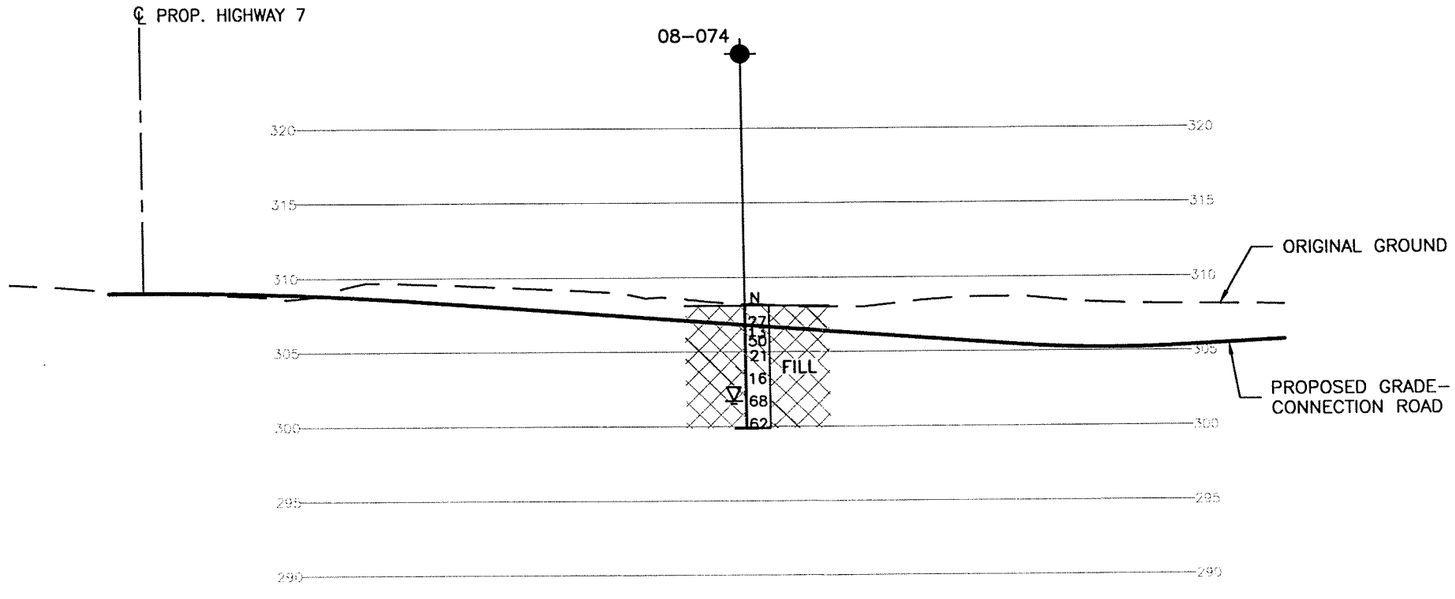
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09



PLAN

0 20 40 60m

SCALE 1:1000



PROFILE ALONG ℄ OF PROP. REGIONAL ROAD 52 W-S RAMP

0 20 40 60m HOR 1:1000

0 8 16 24m VER 1:400

LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
PROVINCE OF ONTARIO

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

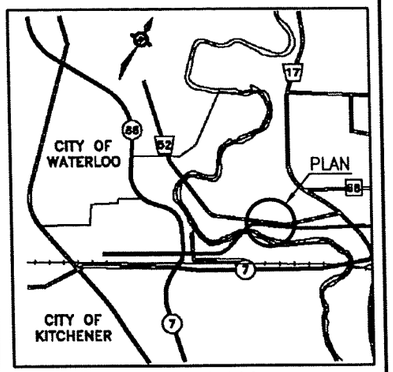
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 408-88-00

SHEET

HIGHWAY 7
RECOMMENDED ROUTE
REG. RD. 52 W-S RAMP, 10+160 TO 10+185
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

◆	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-074	308.1	4 816 024.1	228 164.4

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 5 of the E.A. Study.

GEOCRES No. 40P8-172

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN RPR	CHK PKC	CODE	LOAD
DRAWN MFA	CHK AEG	SITE	STRUCT
			DATE AUG. 2009
			DWG

MINISTRY OF TRANSPORTATION, ONTARIO PH-O-707 88-08 PLOT SCALE 1:1

Appendix Q

Regional Road 17, N/S-E Ramp, Station 10+000 –10+245
(Boreholes 08-107, 08-114 08-115, 08-116)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-107 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 850.48 E 229 891.91 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.25 - 2008.11.25 CHECKED BY RPR

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
326.4											
0.0 / 325.9	**TOPSOIL** (500mm)		1	SS	9		326				
0.5 / 325.3	Silty **SAND**, occasional organics and rootlets Loose to Compact Dark Brown Moist		2	SS	15						
1.1 / 324.1	**SILT**, some sand, trace clay Compact Brown Wet		3	SS	15		325				0 11 83 6
2.3 / 321.8	**SAND**, some silt, trace clay, trace gravel, oxidized staining Compact Brown Wet		4	SS	26		324				
			5	SS	19		323				9 76 15 (SI+CL)
4.6 / 321.2	**SAND** and **SILT**, some clay, trace gravel Compact Grey Moist (TILL)		6	SS	17		322				3 42 45 10
5.2	END OF BOREHOLE AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.2 324.2 2009.02.09 1.2 325.2										

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

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-114 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 889.03 E 229 744.37 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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 (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	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
330.0											
0.0 / 329.6	**TOPSOIL** (350mm)						330				
0.4 / 328.6	Clayey **SILT**, trace gravel, trace sand, occasional organics Firm to Stiff Dark Brown to Brown		1	SS	5		329				
			2	SS	11						
1.4 / 323.3	**SAND**, trace gravel, trace silt, trace clay Compact to Dense Brown Moist to Wet		3	SS	26		328				0 91 9 (SI+CL)
			4	SS	27		327				
			5	SS	47		326				
			6	SS	36		325				0 92 8 (SI+CL)
			7	SS	46		324				
6.7	END OF BOREHOLE AT 6.7m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2008.11.27 4.5 325.5 2009.01.09 2.0 328										

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

(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-115 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 814.46 E 229 735.91 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
329.7											
0.0 / 329.4	**TOPSOIL:** (300mm)										
0.3	Clayey **SILT**, some sand, trace gravel, occasional cobbles Firm to Stiff Brown (TILL)		1	SS	6		329		○		
			2	SS	14				○		
328.1							328				
1.5	Sandy **SILT**, trace gravel Compact Brown Moist		3	SS	27				○		
327.4							327		○		
2.3	**SAND**, some silt, some clay, oxidized staining Dense Brown Moist to Wet		4	SS	36						
			5	SS	47		326		○		0 85 15 (SI+CL)
			6	SS	43		325		○		
			7	SS	49		324		○		
323.0											
6.7	END OF BOREHOLE AT 6.7m. WATER LEVEL AT 4.8m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.										

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

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-116 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 832.69 E 229 837.24 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60		GR SA SI CL
326.6											
0.0 / 326.0	**TOPSOIL**: (600mm)		1	SS	5				○		
0.6 / 324.6	Clayey **SILT**, sandy, trace gravel, sandy silt layers Very Stiff Brown (TILL)		2	SS	23		326		○		
			3	SS	21		325		⊣○⊢		5 41 39 15
2.0 / 322.5	**SAND** and **SILT**, trace clay, oxidized staining Compact Brown Wet (TILL)		4	SS	12		324		○		
			5	SS	12		323		○		0 44 54 2
4.1 / 320.1	Silty **CLAY**, some sand to sandy Very Stiff to Hard Brown to Grey (TILL)		6	SS	25		322		⊢○		0 25 51 24
			7	SS	100		321		○		
6.5	END OF BOREHOLE AT 6.5m. WATER LEVEL AT 1.2m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.										

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

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

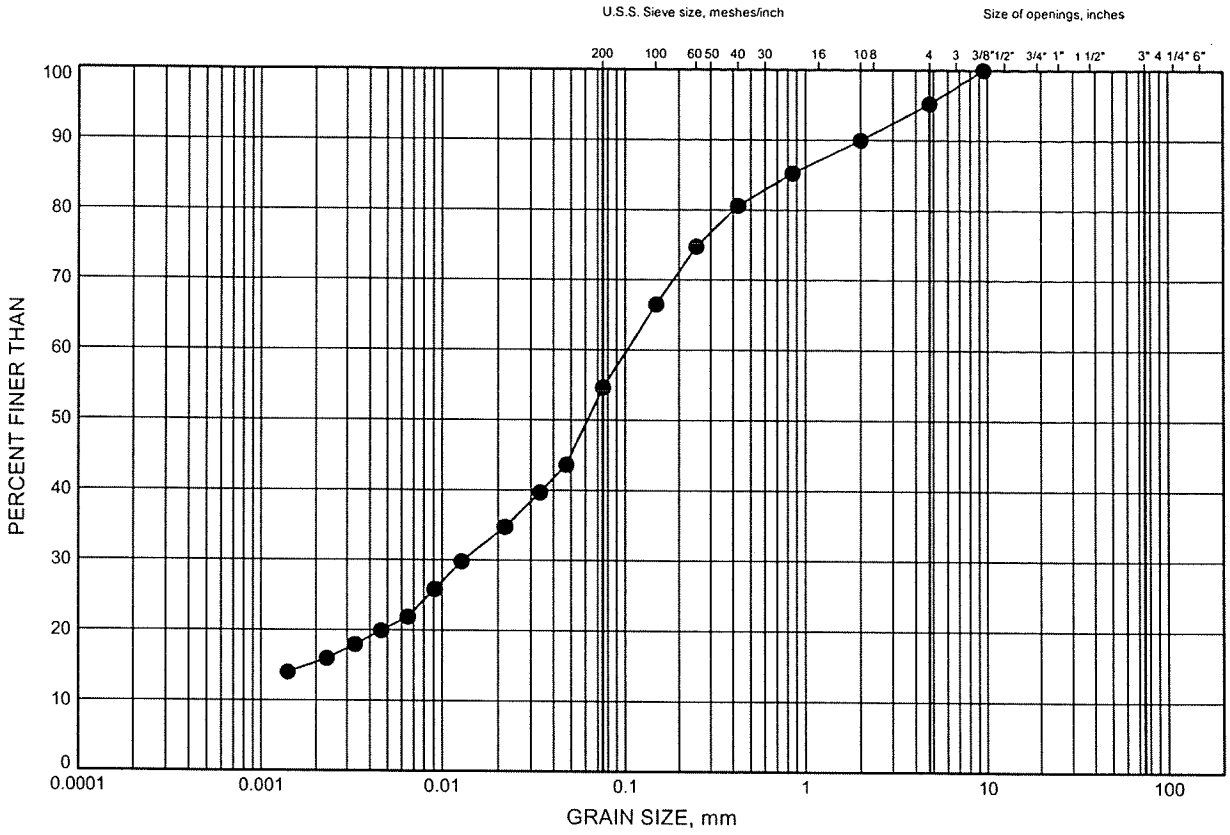
ONTMT4S 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE Q1

CLAYEY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-116	1.83	324.77

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

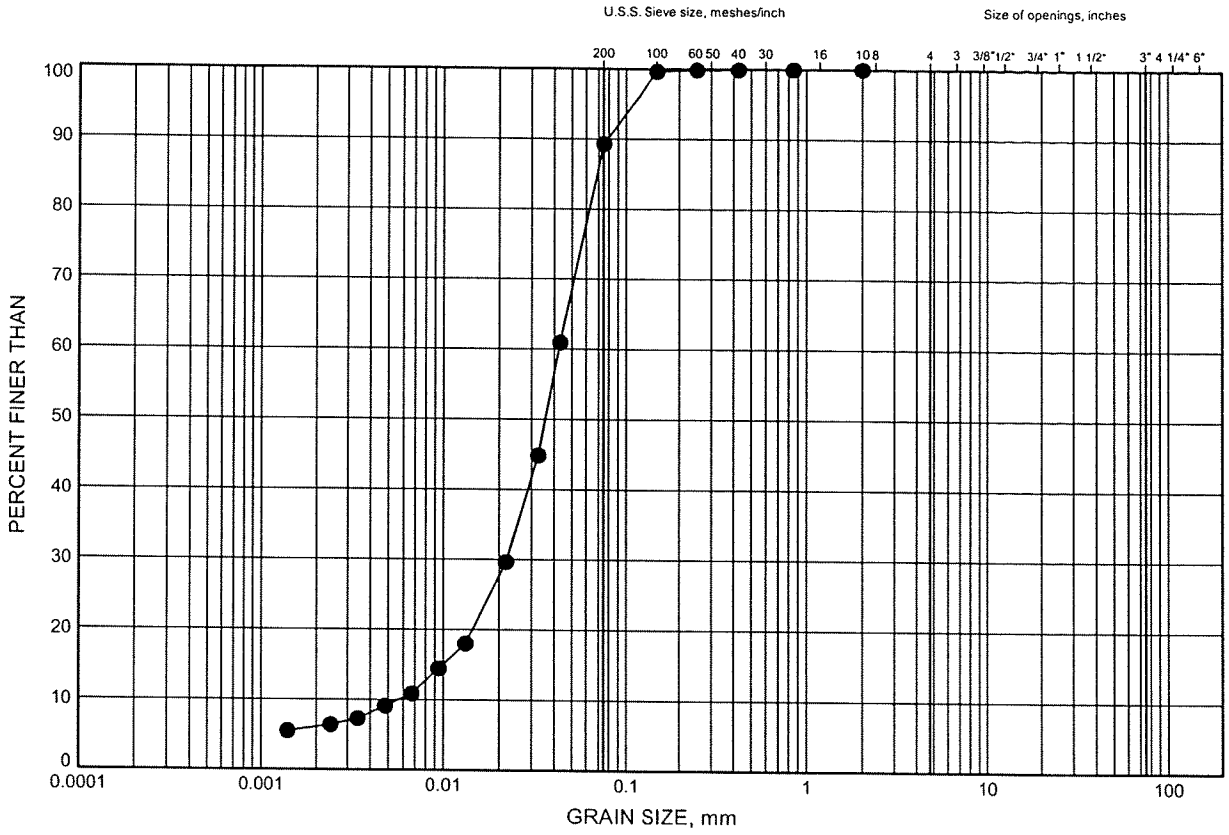
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE Q2

SILTY SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-107	1.22	325.16

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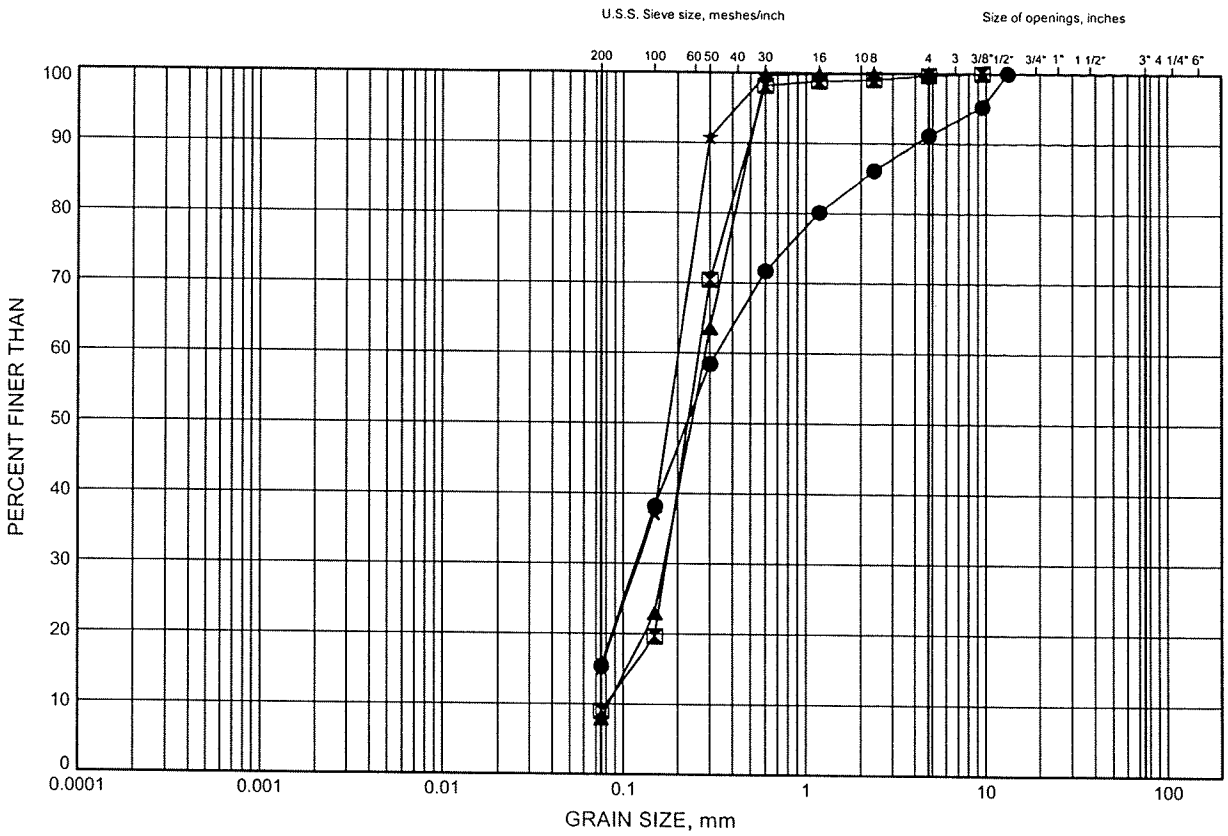
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE Q3

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-107	3.35	323.02
⊠	08-114	1.83	328.14
▲	08-114	4.88	325.09
★	08-115	3.35	326.32

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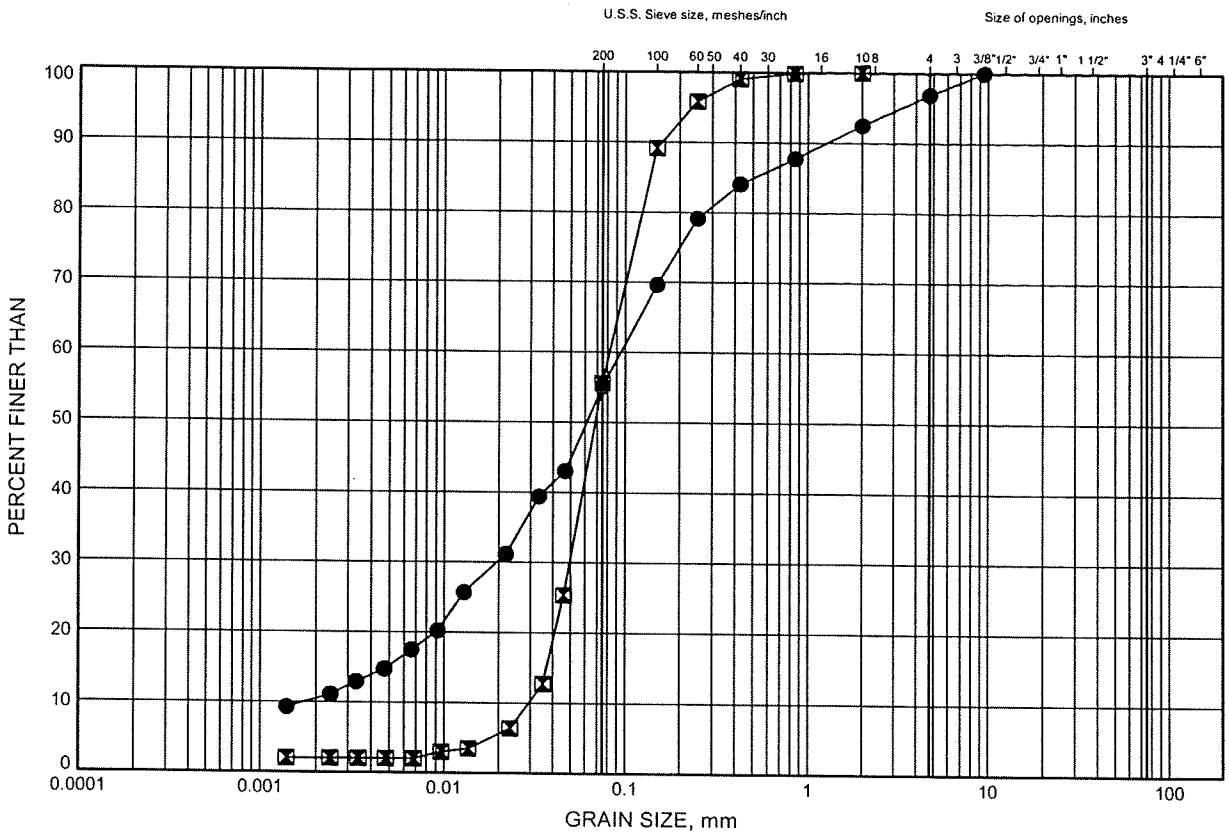
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE Q4

SAND & SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-107	4.88	321.50
⊠	08-116	3.35	323.25

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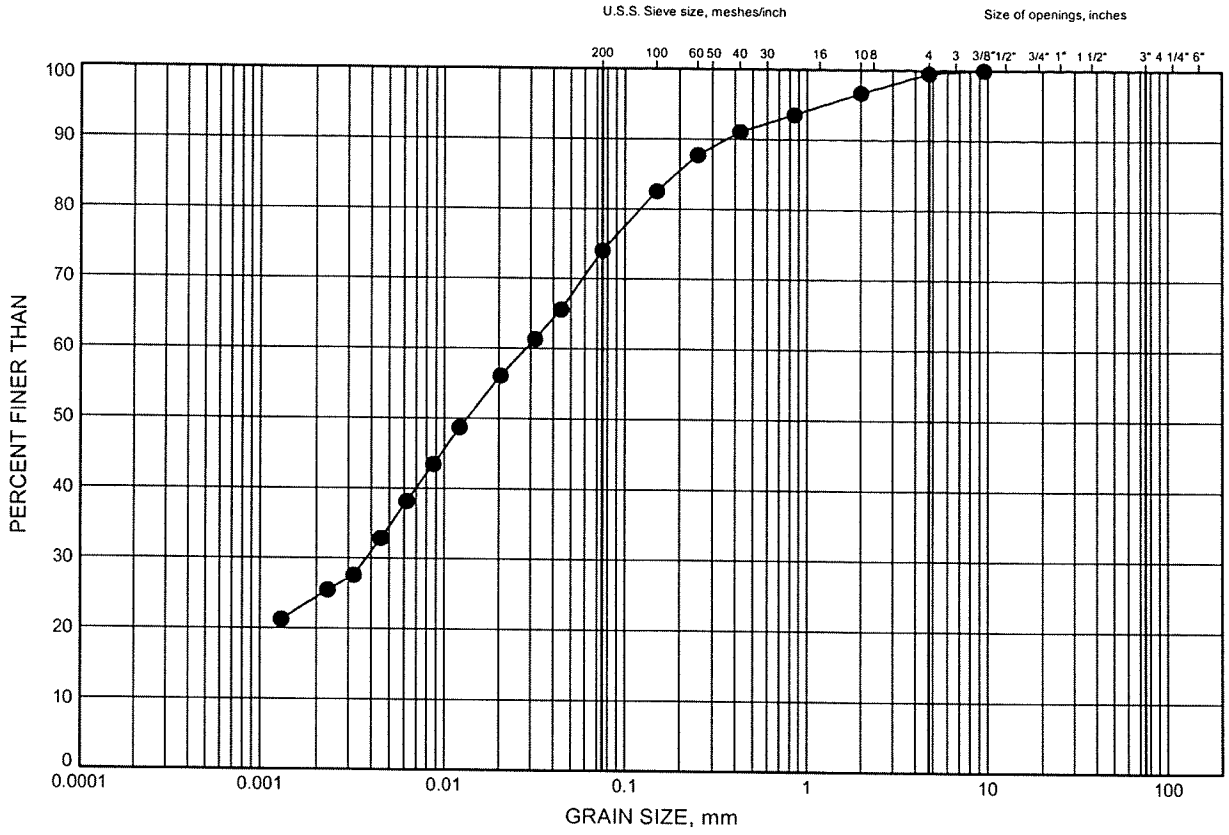
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE Q5

SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-116	4.88	321.72

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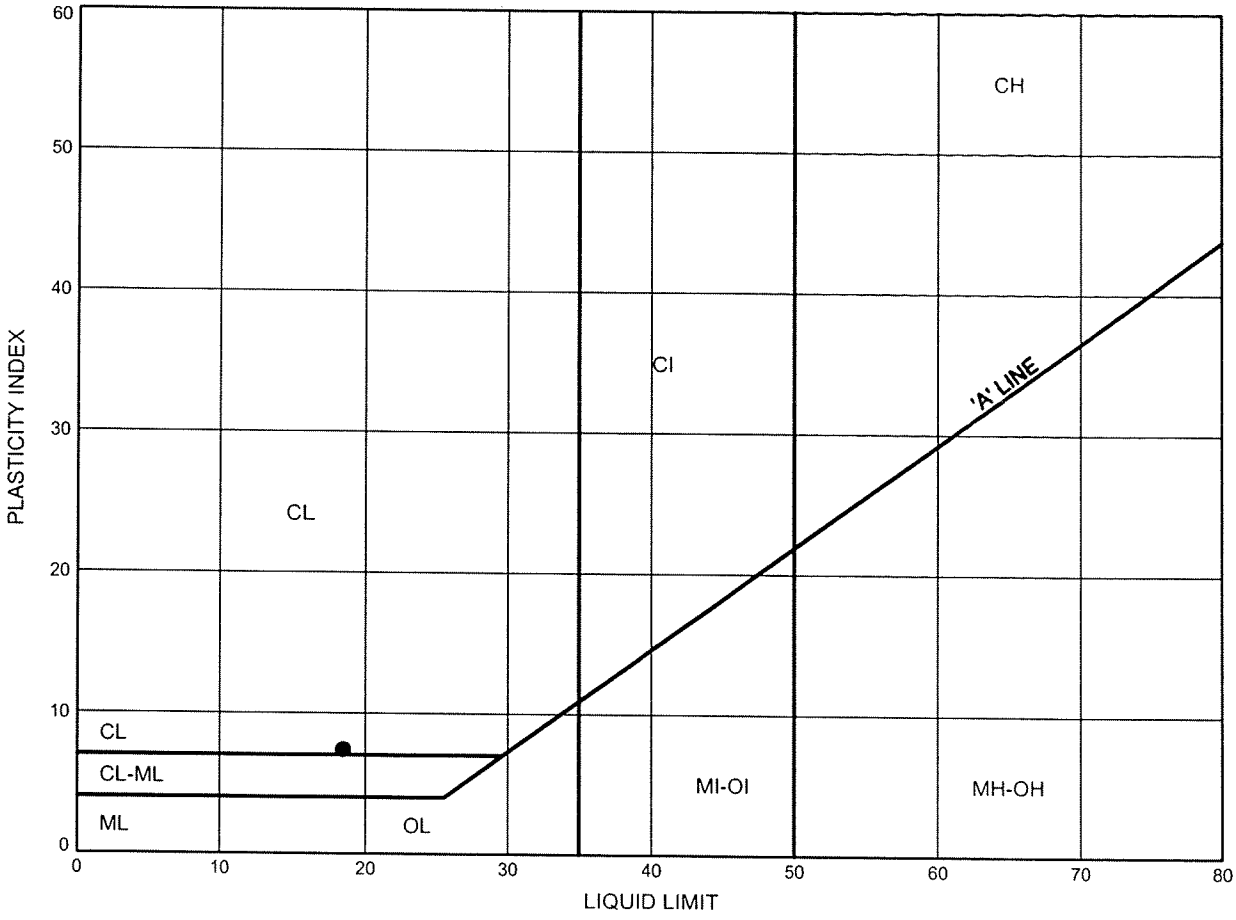
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE Q6

CLAYEY SILT TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-116	1.83	324.77

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

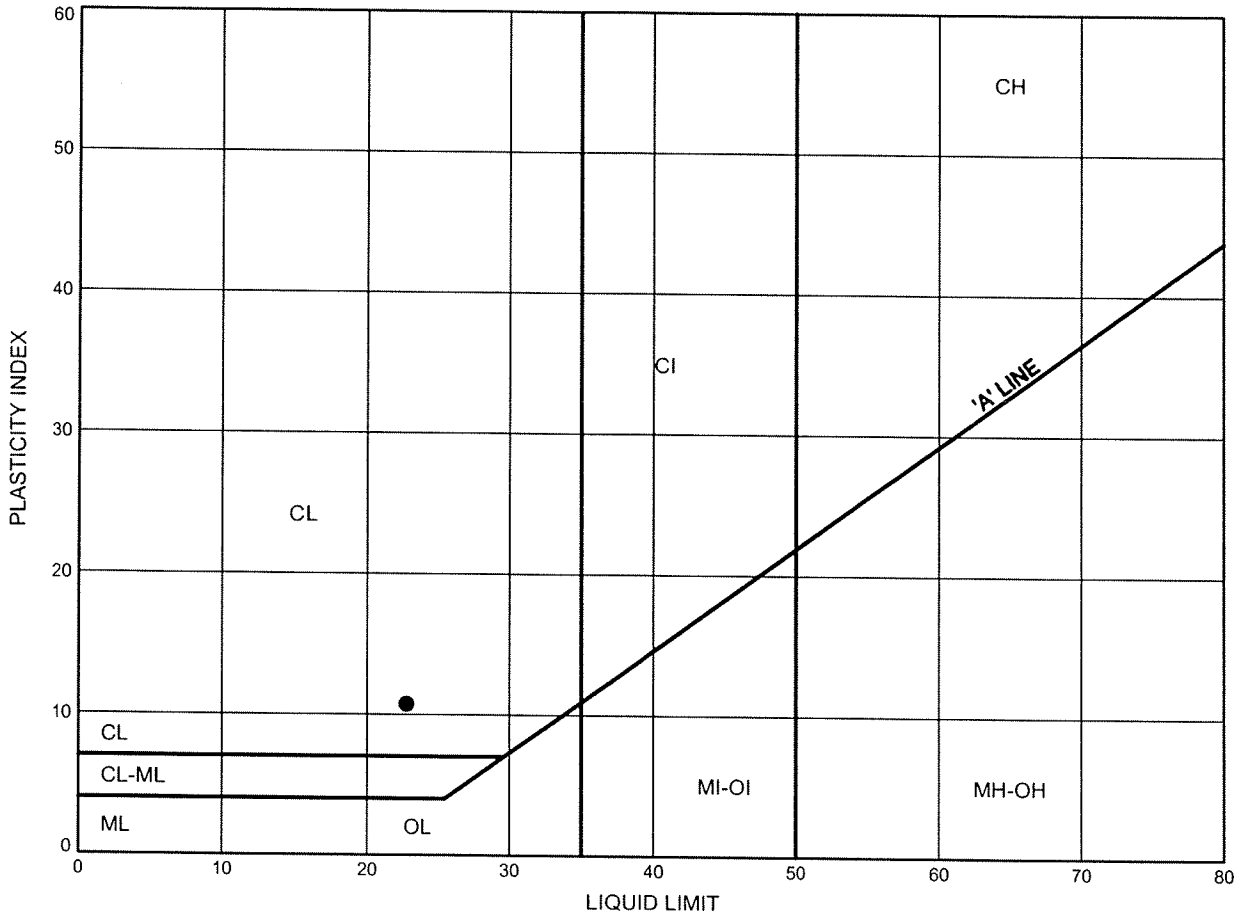
THURBALT 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE Q7

SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-116	4.88	321.72

Date March 2009

Project 408-88-00

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THURBALT 6417R.GPJ 3/16/09

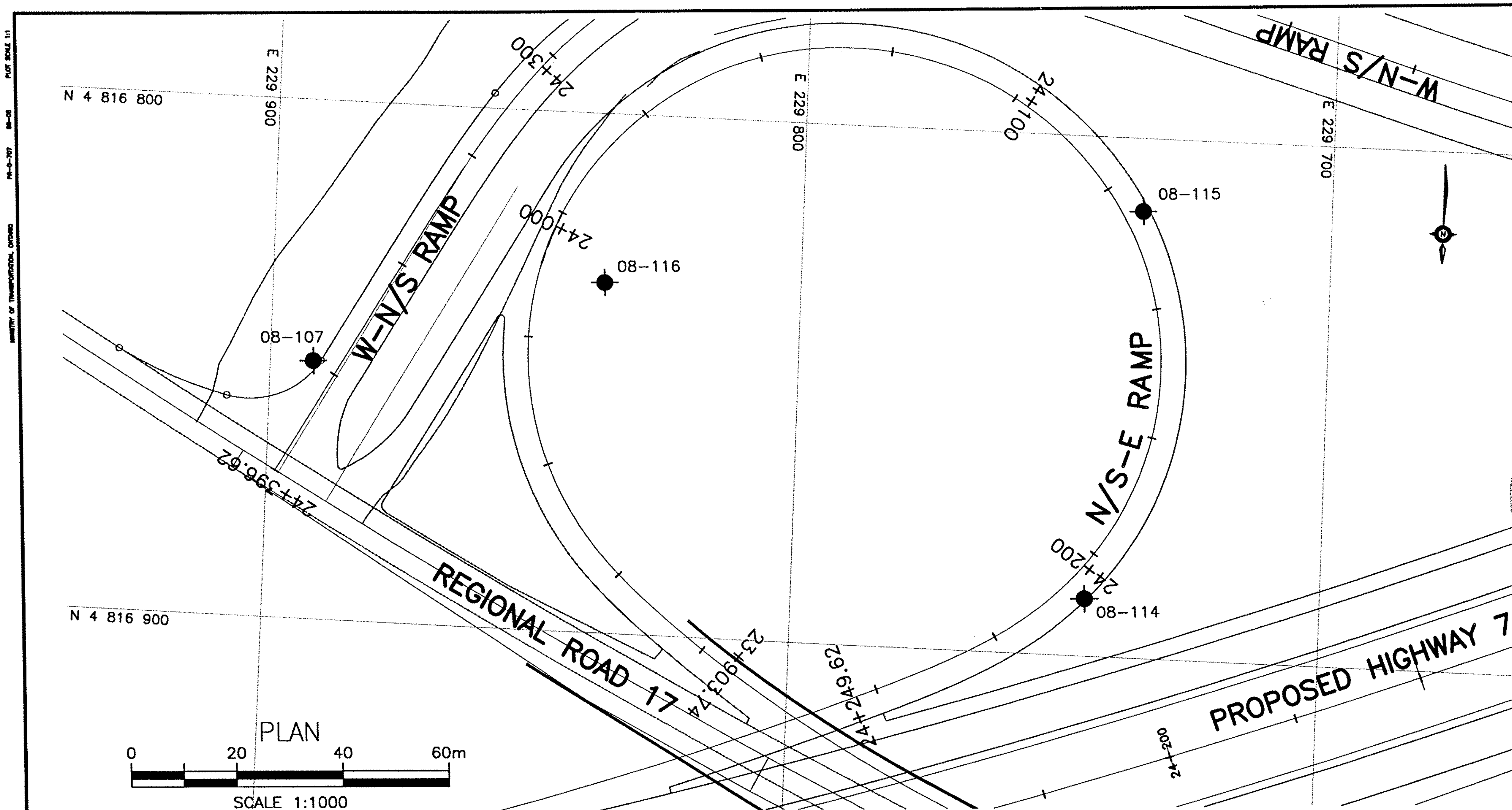
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 408-88-00

HIGHWAY 7
RECOMMENDED ROUTE
REG. RD. 17 N/S-E RAMP, 10+000 TO 10+245
BOREHOLE LOCATIONS AND SOIL STRATA

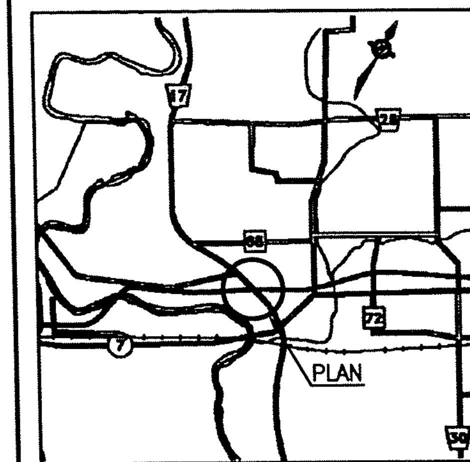
SHEET

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

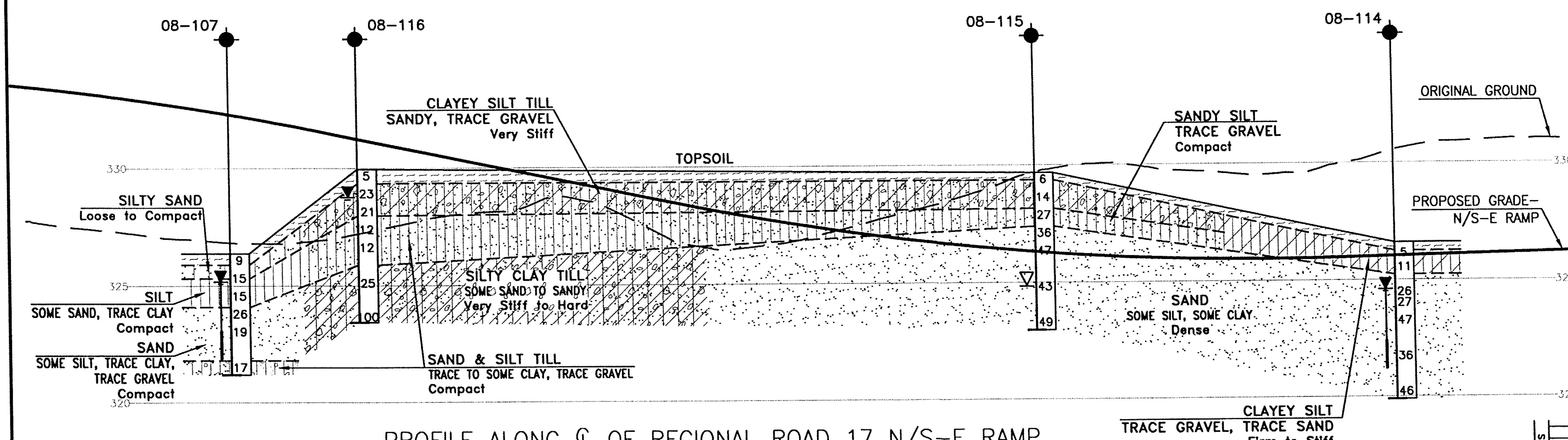


LICENSED PROFESSIONAL ENGINEER R. Palomeque Reyna 100083209 Oct/06/09 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER P. K. CHATTERJI Oct 6/09 PROVINCE OF ONTARIO



KEYPLAN



PROFILE ALONG ℄ OF REGIONAL ROAD 17 N/S-E RAMP

HOR 1:1000 (0, 20, 40, 60m)
VER 1:200 (0, 5, 10, 15m)

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-107	326.4	4 816 850.5	229 891.9
08-114	326.9	4 816 889.0	229 744.4
08-115	329.7	4 816 814.5	229 735.9
08-116	326.6	4 816 832.7	229 837.2

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 7 of the E.A. Study.

GEOCRES No. 40P8-172

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS	DATE	BY	DESCRIPTION

DESIGN RPR	CHK PKC	CODE	LOAD	DATE AUG. 2009	
DRAWN AN	CHK AEG	SITE	STRUCT	DWG	

Appendix R

Regional Road 17, W-N/S Ramp, Station 10+000 –10+485
(Boreholes 08-101, 08-103, 08-104, 08-105, 08-106, 08-107)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

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THURBER

RECORD OF BOREHOLE No 08-101 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 765.02 E 229 470.39 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.25 - 2008.11.25 CHECKED BY RPR

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
320.4											
0.0 / 319.9	**TOPSOIL** (500mm)		1	SS	5				o		
0.5 / 319.7	Silty **SAND**, trace gravel Compact Brown Moist (FILL)		2	SS	26		320		o		
0.8	**SAND** and **GRAVEL**, some silt, some clay, occasional cobbles Compact to Dense Brown Moist (FILL)		3	SS	38		319		o		37 44 19 (SI+CL)
318.2											
2.3	**SAND** and **GRAVEL**, some silt, some clay Compact to Dense Brown Wet		4	SS	32		318		o		35 55 10 (SI+CL)
			5	SS	31		317		o		
315.3			6	SS	23		316		o		
5.2	END OF BOREHOLE AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.9 317.5 2009.02.19 1.2 319.2										

+ ³, × ³: Numbers refer to Sensitivity

20
15 ⊕ 5
10
(%) STRAIN AT FAILURE

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Ontario

THURBER

RECORD OF BOREHOLE No 08-103 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 801.70 E 229 575.35 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.27 - 2008.11.27 CHECKED BY RPR

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 (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
323.0											
0.0 / 322.6	**TOPSOIL**: (400mm)						323				
0.4 / 322.2	**SAND** fine, trace silt, occasional organics Loose Dark Brown Wet		1	SS	7						
0.8	Silty **SAND**, trace clay, trace gravel, oxidized staining Compact to Dense Brown Wet		2	SS	18		322				
			3	SS	27		321				6 61 28 5
319.9			4	SS	37						
3.0	Silty **CLAY**, sandy, trace gravel Hard Grey (TILL)		5	SS	38		320				4 31 42 23
							319				
317.8			6	SS	33		318				
5.2	END OF BOREHOLE AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.3 320.7										

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

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

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THURBER

RECORD OF BOREHOLE No 08-104 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 790.47 E 229 673.31 ORIGINATED BY LH

HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Clayey **SILT**, sandy, trace gravel, occasional cobbles obstacle Stiff Dark Brown (TILL)		1	SS	6		329		O		
	Hard		2	SS	100				O		
327.8							328				
1.5	**SAND**, some silt, some clay, oxidized staining Dense to Very Dense Brown Moist to Wet		3	SS	32				O		0 57 43 (SI+CL)
			4	SS	48		327		O		
			5	SS	52		326		O		
	Trace silt, trace clay		6	SS	39		325		O		0 95 5 (SI+CL)
324.1											
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.										

+ ^{3} . × ^{3} : Numbers refer to Sensitivity

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

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THURBER

RECORD OF BOREHOLE No 08-105 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 763.53 E 229 762.31 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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 (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0 327.1	**TOPSOIL** (400mm)		1	SS	5		327				
0.4	**SAND**, trace silt, trace clay, trace gravel, oxidized staining Loose to Compact Brown Wet		2	SS	25	▼	326				
			3	SS	13						0 96 4 (SI+CL)
			4	SS	15		325				
			5	SS	11		324				1 93 6 (SI+CL)
							323				
322.0			6	SS	16						
5.2	END OF BOREHOLE AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.0 325.1 2009.02.19 1.0 326.1										

+ ³, × ³ Numbers refer to Sensitivity

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

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RECORD OF BOREHOLE No 08-106 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 793.65 E 229 847.60 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
327.9											
0.0	Clayey **SILT**, some sand to sandy, trace gravel, occasional rootlets and organics Firm Dark Brown (TILL)		1	SS	7		328		o		
			2	SS	14		327		o		
	Fine sand layers		3	SS	15		326		o		7 40 38 15
325.6											
2.3	Silty **SAND**, trace gravel, oxidized staining, occasioanl cobbles Dense Brown Wet (TILL)		4	SS	36				o		
			5	SS	21		325		o		0 52 45 3
	Fine sand layers						324				
			6	SS	21		323		o		
322.7											
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.										

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

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

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RECORD OF BOREHOLE No 08-107 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 850.48 E 229 891.91 ORIGINATED BY LH
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.25 - 2008.11.25 CHECKED BY RPR

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)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
326.4											
0.0 / 325.9	**TOPSOIL** (500mm)		1	SS	9		326		○		
0.5 / 325.3	Silty **SAND**, occasional organics and rootlets Loose to Compact Dark Brown Moist		2	SS	15	▼			○		
1.1 / 324.1	**SILT**, some sand, trace clay Compact Brown Wet		3	SS	15		325		○		0 11 83 6
2.3 / 321.8	**SAND**, some silt, trace clay, trace gravel, oxidized staining Compact Brown Wet		4	SS	26		324		○		
			5	SS	19		323		○		9 76 15 (SI+CL)
							322				
4.6 / 321.2	**SAND** and **SILT**, some clay, trace gravel Compact Grey Moist (TILL)		6	SS	17				○		3 42 45 10
5.2	END OF BOREHOLE AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.2 324.2 2009.02.09 1.2 325.2										

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

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

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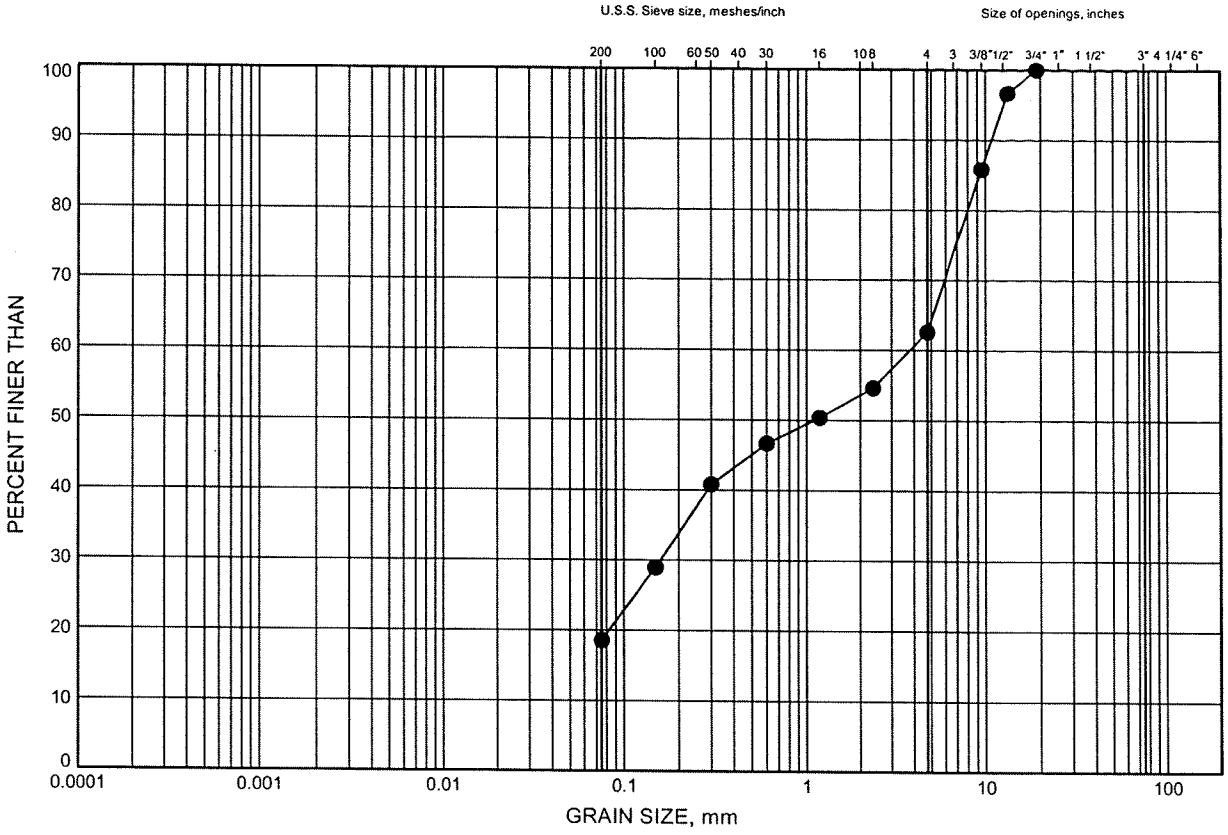
Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE R1

SAND & GRAVEL FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-101	1.83	318.61

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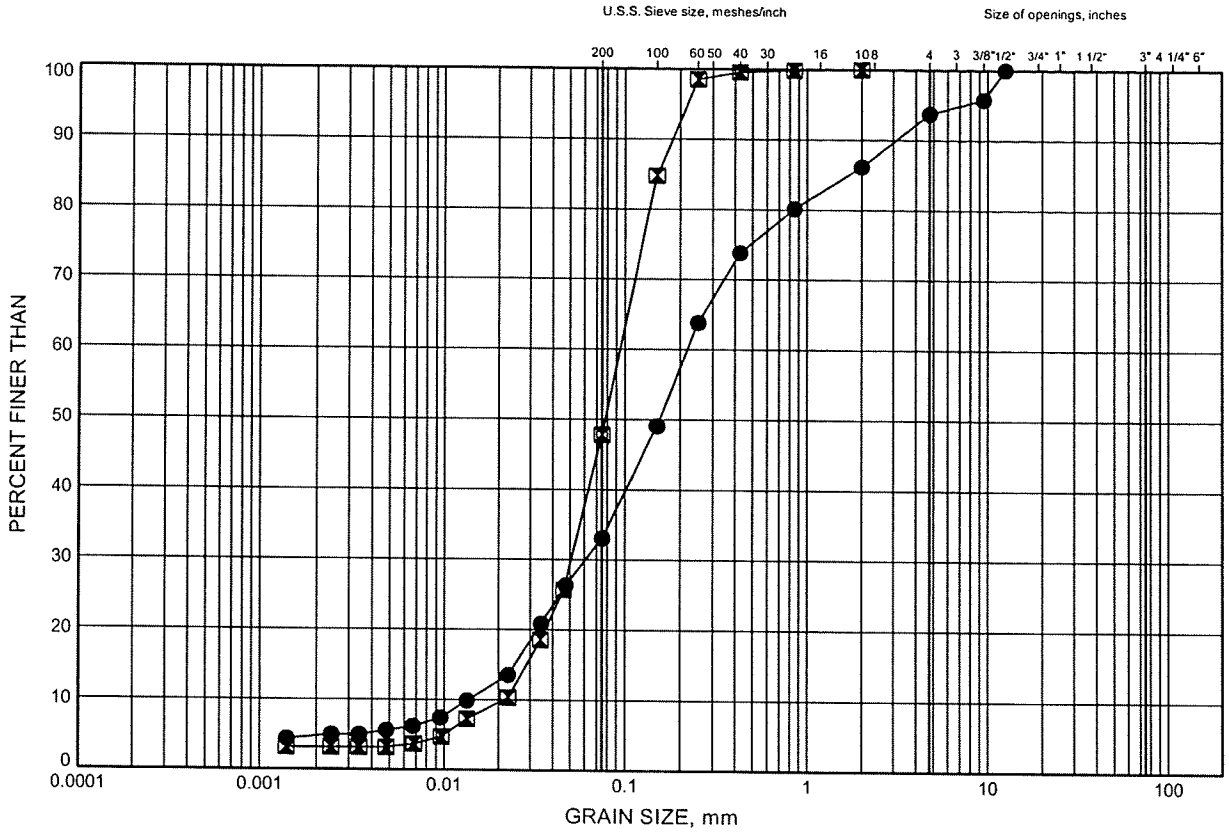
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE R2

SILTY SAND & SILTY SAND TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-103	1.83	321.14
⊠	08-106	3.35	324.58

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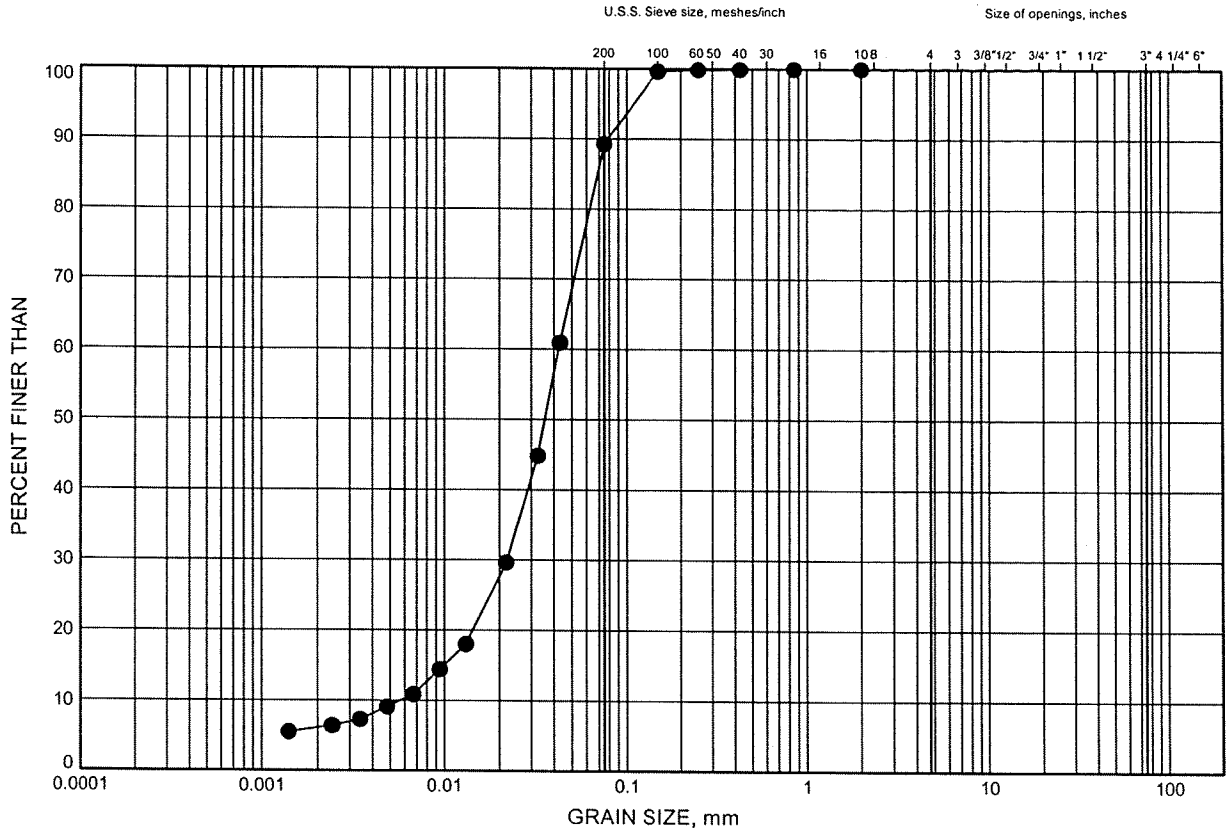
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE R3

SILT



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-107	1.22	325.16

W.P.# 408-88-00

Prepared By AN

Checked By RPR

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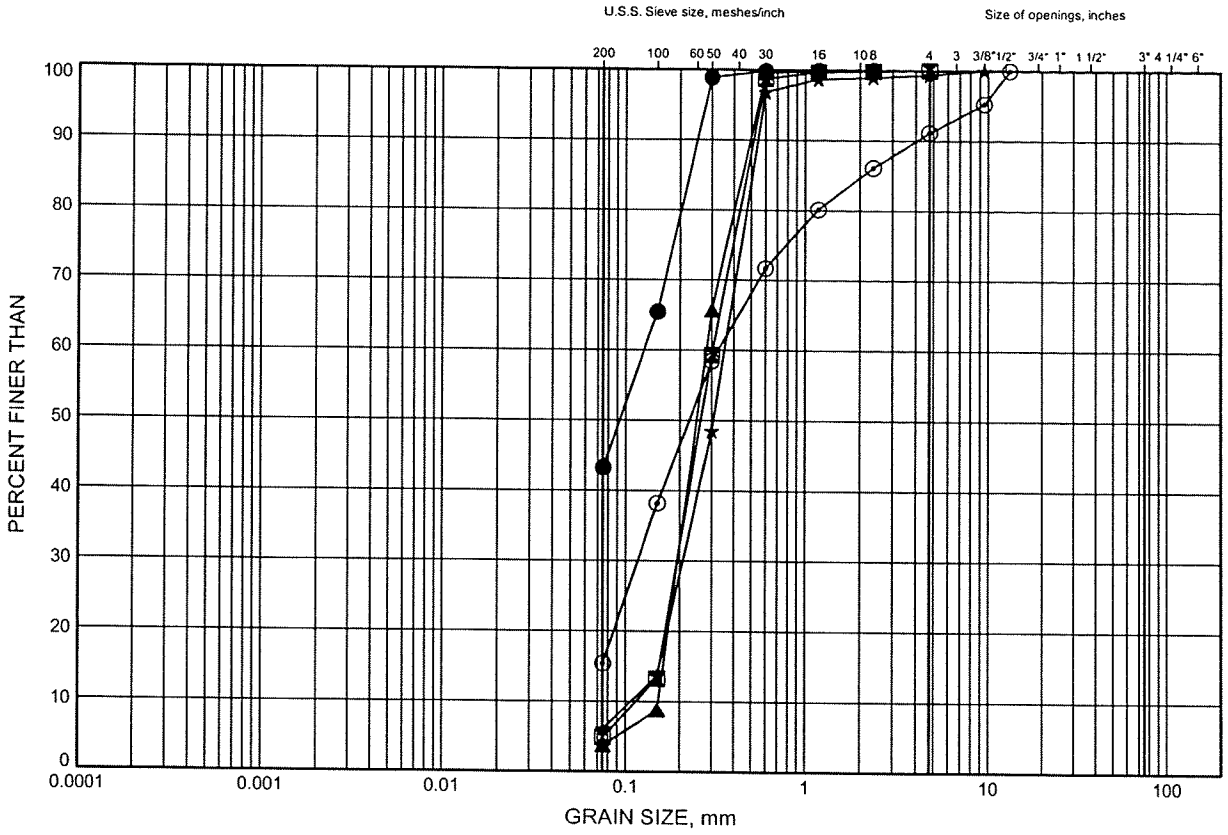
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE R4

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-104	1.83	327.49
⊠	08-104	4.88	324.44
▲	08-105	1.83	325.32
★	08-105	3.35	323.79
⊙	08-107	3.35	323.02

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

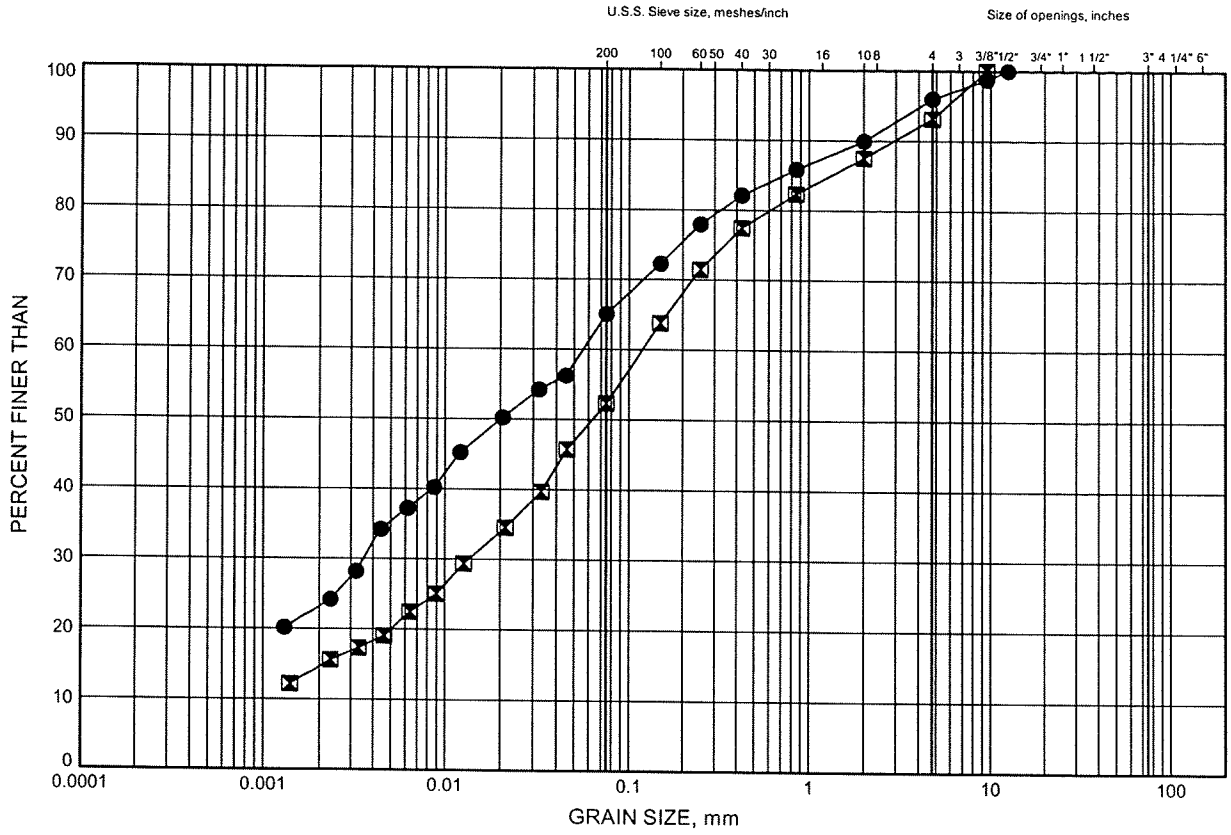
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE R5

SILTY CLAY TILL & CLAYEY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-103	3.35	319.62
⊠	08-106	1.83	326.10

W.P.# 408-88-00
Prepared By AN
Checked By RPR

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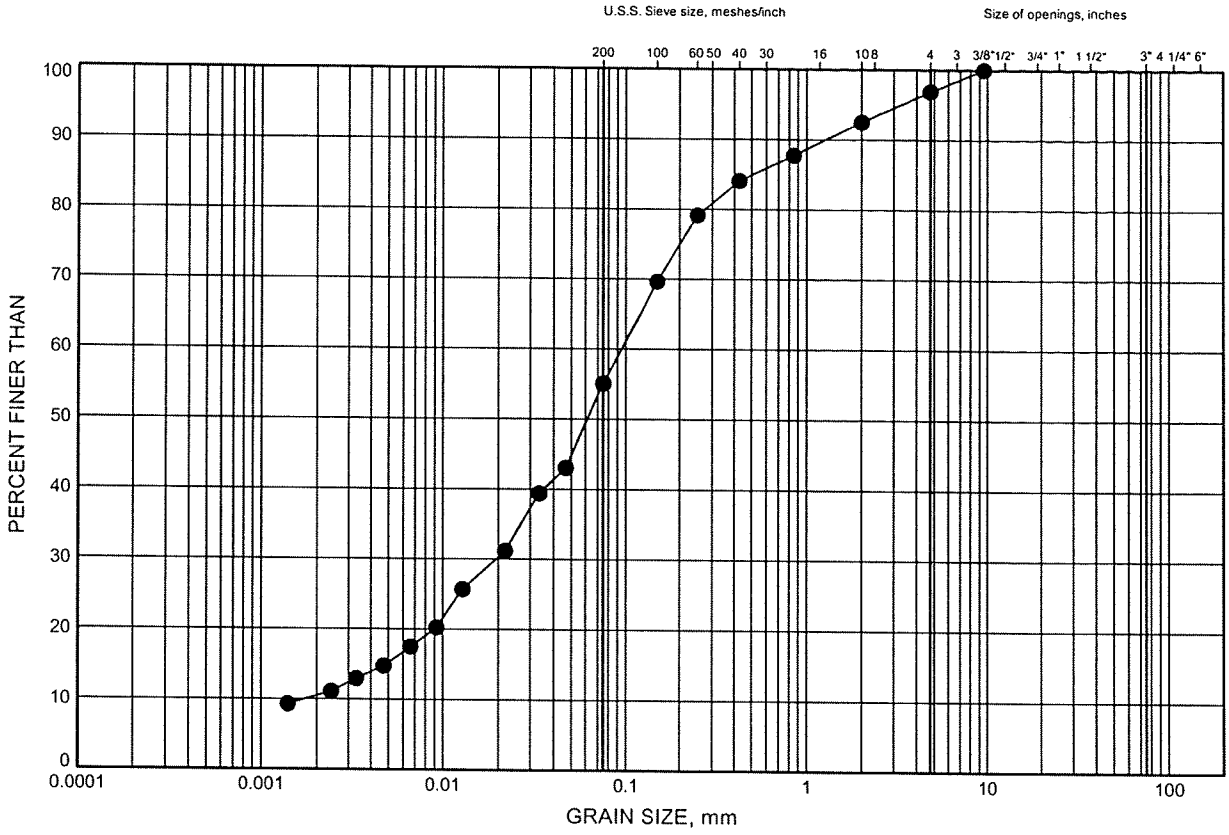
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE R6

SAND & SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-107	4.88	321.50

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

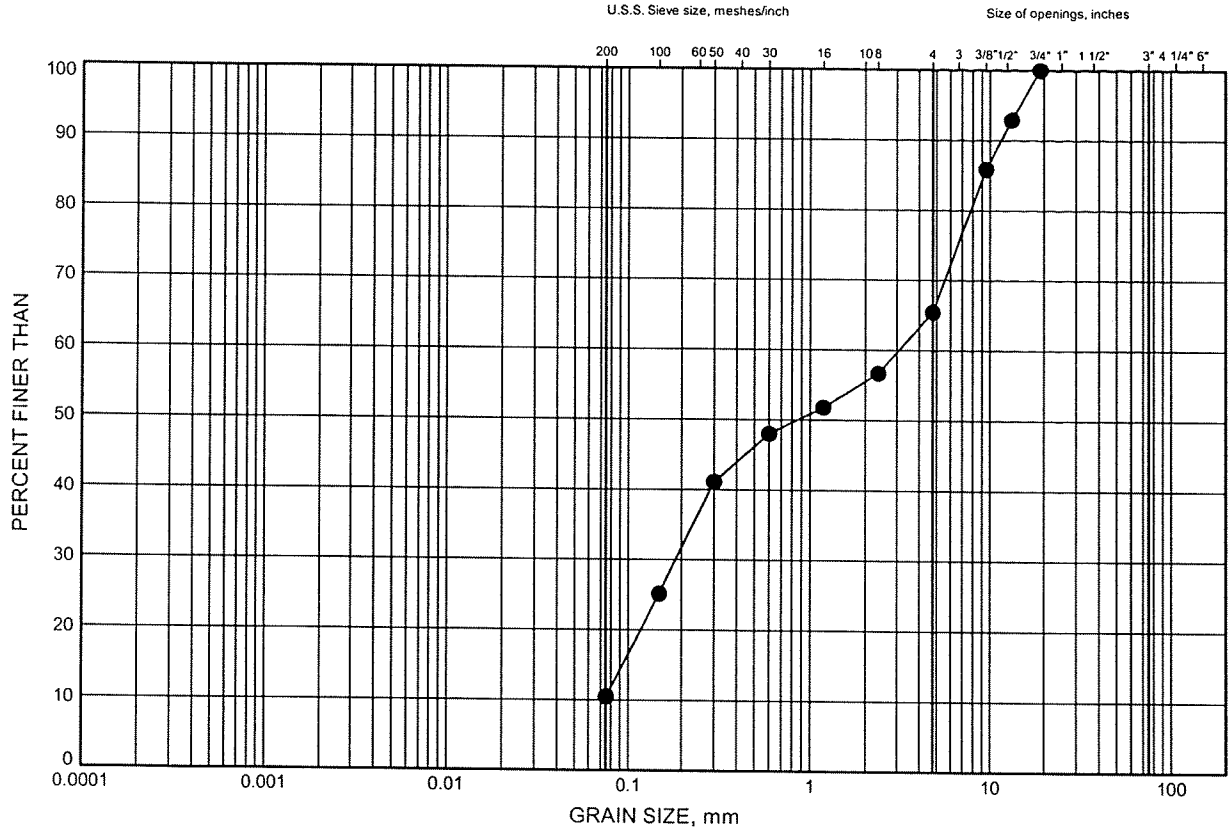
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE R7

SAND & GRAVEL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-101	2.59	317.85

W.P.# 408-88-00
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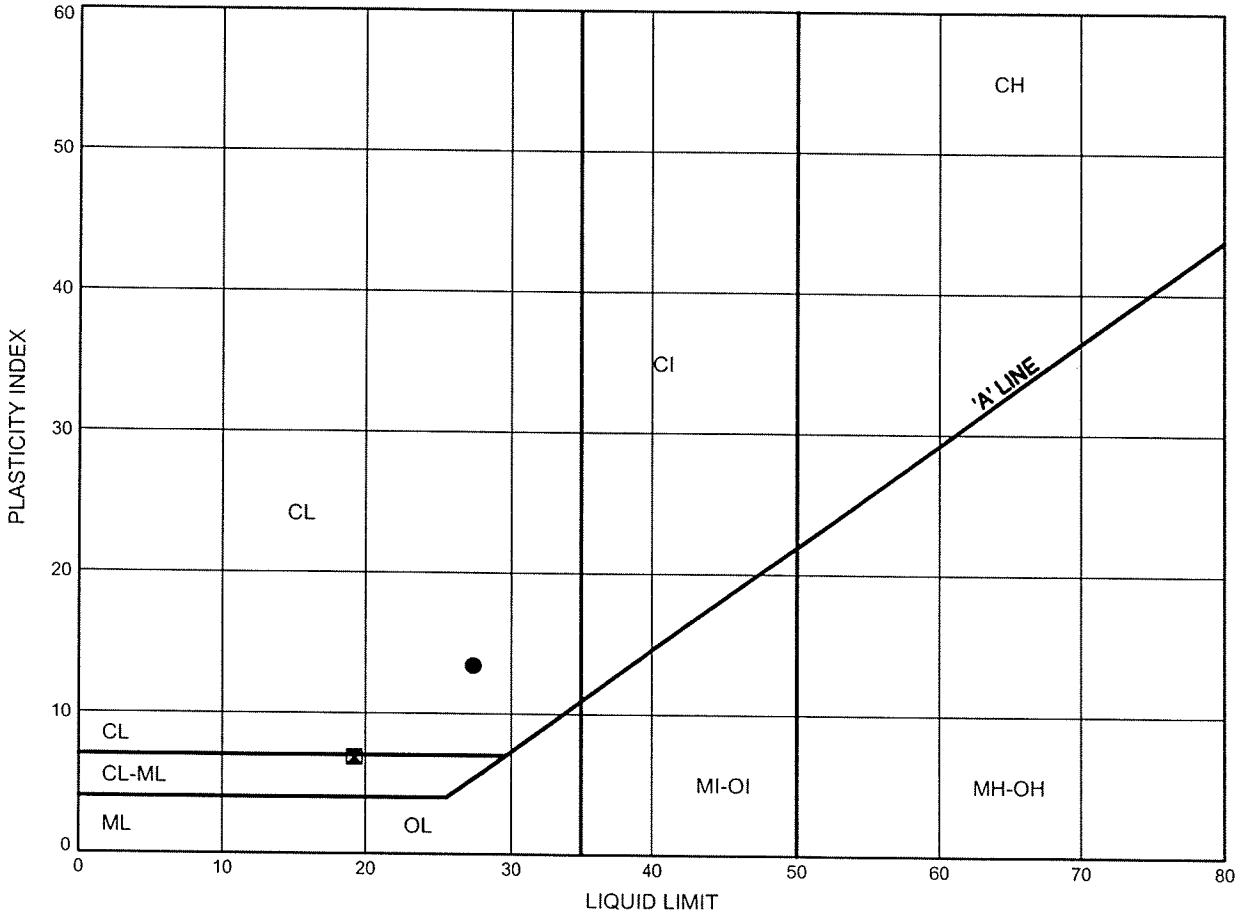
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE R8

SILTY CLAY TILL & CLAYEY SILT TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-103	3.35	319.62
⊠	08-106	1.83	326.10

Date March 2009

Project 408-88-00

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THURBALT 6417R.GPJ 3/16/09

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 408-88-00

SHEET

HIGHWAY 7
RECOMMENDED ROUTE
REG. RD. 17 W-N/S RAMP, 10+000 TO 10+485
BOREHOLE LOCATIONS AND SOIL STRATA

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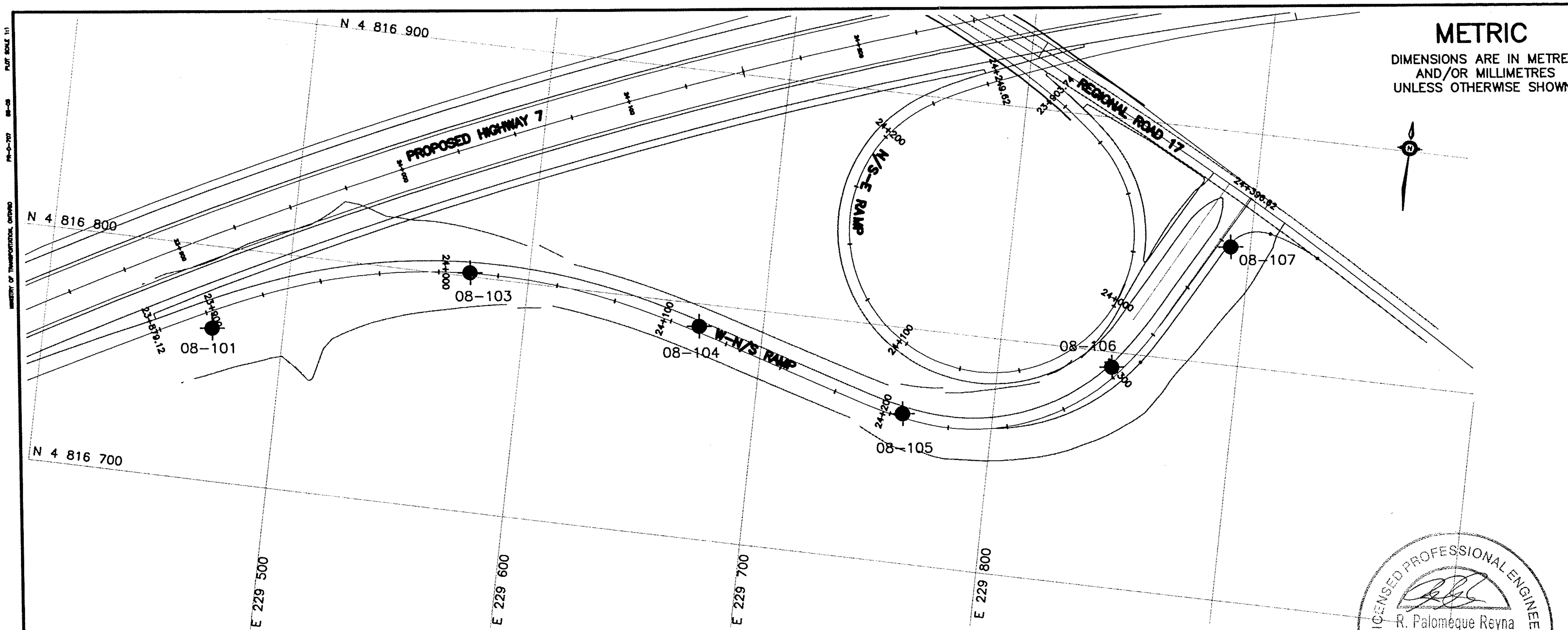
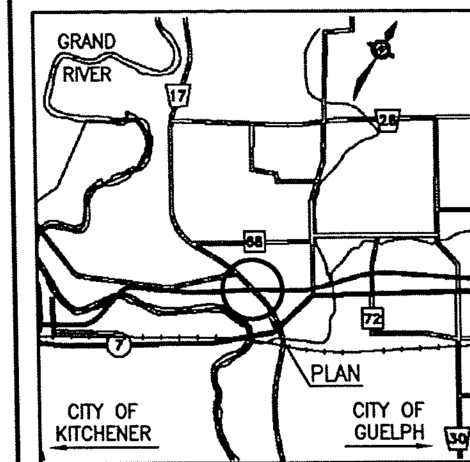


PLAN

0 40 80 120m

SCALE 1:2000



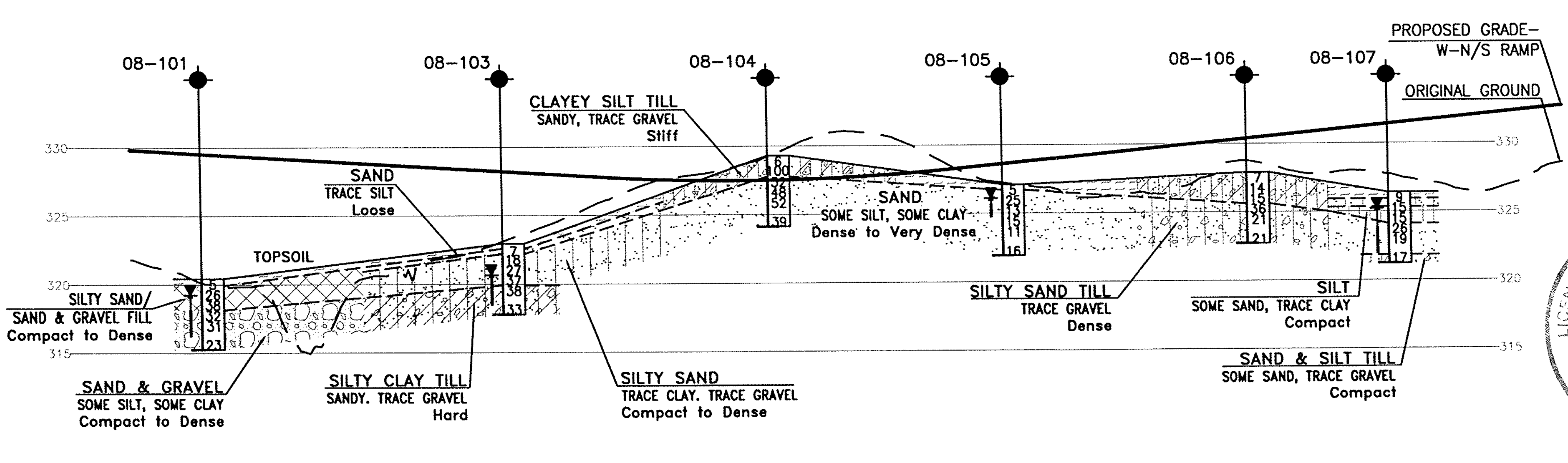
KEYPLAN

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
┬	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-101	320.4	4 816 765.0	229 470.4
08-103	322.9	4 816 801.7	229 575.4
08-104	329.3	4 816 790.5	229 673.3
08-105	327.1	4 816 763.5	229 762.3
08-106	327.9	4 816 793.6	229 847.6
08-107	326.4	4 816 850.5	229 891.9

LICENSED PROFESSIONAL ENGINEER
R. Paloméque Reyna
100083209
Oct/06/09
PROVINCE OF ONTARIO



LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Oct 6/09
PROVINCE OF ONTARIO

PROFILE ALONG ℄ OF REGIONAL ROAD 17 W-N/S RAMP

0 40 80 120m HOR 1:2000

0 5 10 15m VER 1:200

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 7 of the E.A. Study.

GEOCRES No. 40P8-172

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS	DATE	BY	DESCRIPTION			
DESIGN RPR	CHK PKC	CODE		LOAD		DATE OCT. 2009
DRAWN AN	CHK AEG	SITE		STRUCT		DWG

Appendix S

Regional Road 17, N/S-W Ramp, Station 10+000 –10+340
(Boreholes 08-108, 08-111, 08-112, 08-113, 08-117)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

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THURBER

RECORD OF BOREHOLE No 08-108 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 817 015.57 E 229 660.33 ORIGINATED BY LG

HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
331.5											
0.0	Clayey **SILT**, sandy, trace gravel, occasional rootlets Soft to Firm Brown (TILL)		1	SS	4		331				
			2	SS	7		330				
329.2			3	SS	7						2 44 39 15
2.3	Gravelly **SAND**, some silt, some clay Dense to Very Dense Brown Moist		4	SS	31		329				
			5	SS	33		328				24 61 15 (SI+CL)
							327				
326.3	Occasional cobbles		6	SS	57						
5.2	END OF BOREHOLE AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.3 329.2										

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

(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 8/18/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-111 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 817 037.42 E 229 710.75 ORIGINATED BY LG
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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
329.1											
0.0	Clayey **SILT**, some sand, trace gravel, occasional cobbles Firm Brown (TILL)		1	SS	6		329				
			2	SS	8		328				
			3	SS	5		327				
326.8											
2.3	**SAND**, trace to some silt, some clay, trace gravel Compact Brown Wet		4	SS	26						0 90 10 (SI+CL)
			5	SS	15		326				
			6	SS	17		325				
							324				
			7	SS	65		323				1 91 7 (SI+CL)
322.4											
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE CAVE IN AT 4.5m, WATER LEVEL OBSERVED AT 2.3m DURING DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.1 327.0 2009.02.02 3.1 326.0										

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

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-112 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 817 073.07 E 229 788.77 ORIGINATED BY LG
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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, + 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
328.8											
0.0	Clayey **SILT**, sandy, trace gravel Firm to Hard Brown (TILL)		1	SS	5				o		
			2	SS	31		328		⊖		0 43 40 17
327.3											
1.5	**SAND**, fine, trace silt, trace clay Loose to Compact Brown Moist		3	SS	20		327		o		0 96 4 (SI+CL)
			4	SS	16				o		
	Loose, coarse Wet		5	SS	6		326		o		
							325				
			6	SS	10		324		o		1 91 8 (SI+CL)
							323				
322.1			7	SS	28				o		
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.										

+ 3 , × 3 : Numbers refer to Sensitivity

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

ONTMT4S 6417R.GPJ 3/17/09

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THURBER

RECORD OF BOREHOLE No 08-113 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 988.56 E 229 793.71 ORIGINATED BY LG

HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100	WATER CONTENT (%): 20 40 60		GR SA SI CL
330.3											
0.0	Clayey **SILT**, sandy Stiff Brown (TILL)		1	SS	9		330				
			2	SS	13						
							329				
			3	SS	8						0 44 40 16
327.7											
2.6	**SAND**, trace gravel, trace silt, trace clay Loose to Compact Brown Moist to Wet		4	SS	13		328				
			5	SS	14		327				1 92 7 (SI+CL)
							326				
			6	SS	19						
							325				
			7	SS	8		324				1 96 3 (SI+CL)
323.6											
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.										

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

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

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RECORD OF BOREHOLE No 08-117 1 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 985.40 E 229 672.22 ORIGINATED BY SA
HWY 7 BOREHOLE TYPE Hollow Stem Augers/Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.06.16 - 2008.06.16 CHECKED BY RPR

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 (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
331.1											
0.0	**SAND** and **GRAVEL**, trace silt Brown to Grey Moist		1	AS			331		○		
330.5	(FILL)										
0.6	Sandy **SILT**, trace gravel, trace to some clay Compact to Dense Brown to Grey Moist (TILL)		1	SS	14		330		○		1 39 49 11
			2	SS	17		329		○		
			3	SS	49		328		○		
	occasional cobbles		4	SS	23				⊢○⊣		2 41 45 12
327.0							327				
4.1	**SAND**, medium grained, trace gravel, trace silt Very Dense Brown Moist To Wet		5	SS	80	▽	326		○		
	Compact		6	SS	13		325		○		3 95 2 (SI+CL)
			7	SS	30		324		○		
322.5							323				
8.6	Silty **CLAY**, some sand to sandy, trace gravel Hard Grey (TILL)		8	SS	34		322		○		

Continued Next Page

+ ^{3}, × ^{3} : Numbers refer to Sensitivity

20
15 ⊕ 5
10
(%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-117 2 OF 2 METRIC

G.W.P. 408-88-00 LOCATION N 4 816 985.40 E 229 672.22 ORIGINATED BY SA
HWY 7 BOREHOLE TYPE Hollow Stem Augers/Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.06.16 - 2008.06.16 CHECKED BY RPR

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): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Silty **CLAY**, some sand to sandy, trace gravel Hard Grey (TILL)						321				
			9	SS	65				○		1 22 49 28
							320				
							319				
317.9			10	SS	73				○		
13.3	Sandy **SILT**, trace gravel, trace to some clay Very Dense Grey Moist (TILL)						318				
			11	SS	108				○		
							317				
	occasional cobbles		12	SS	112/.225		316		○		3 37 51 9
							315				
313.9			13	SS	125		314		○		
17.2	END OF BOREHOLE AT 17.2m. WATER LEVEL OBSERVED AT 5.2m DURING DRILLING. BOREHOLE BACKFILLED WITH BENTONITE TO 0.6m THEN HOLEPLUG TO SURFACE.										

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

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

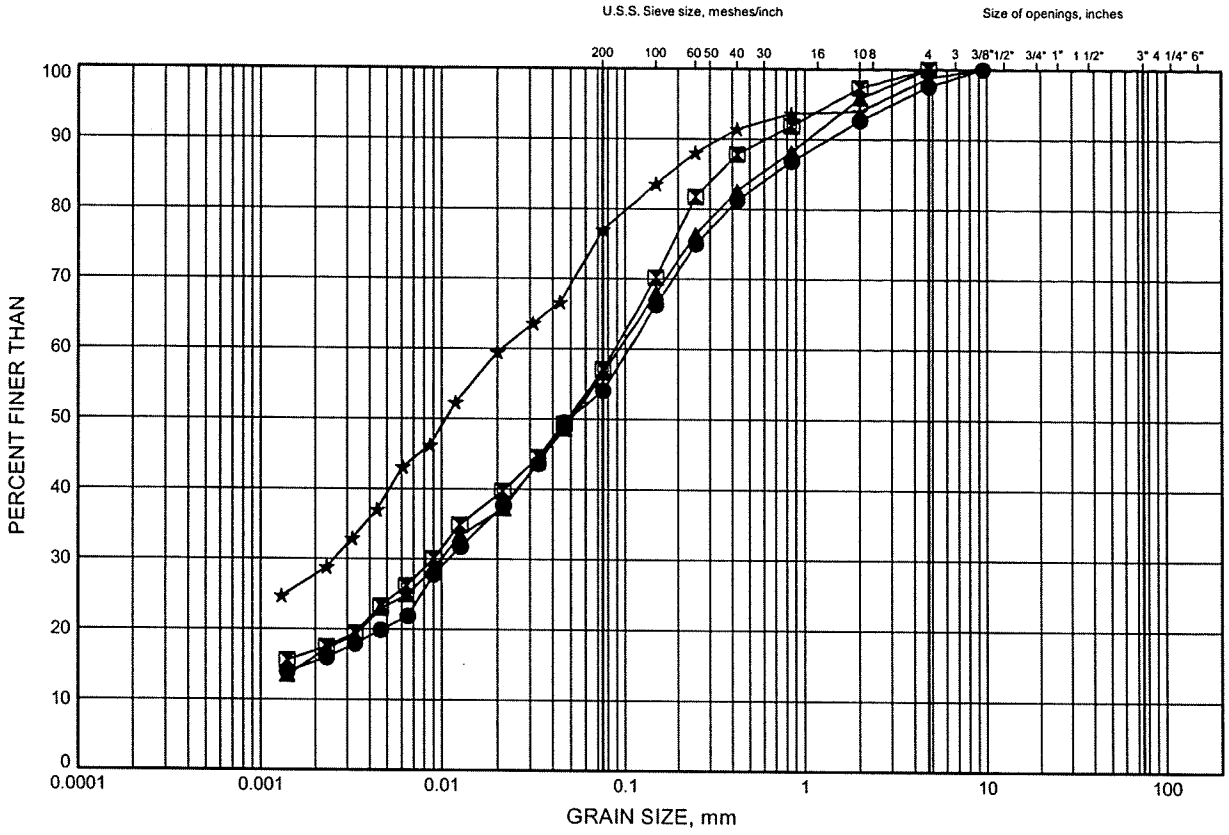
ONTMT4S 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE S1

CLAYEY SILT TILL & SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-108	1.83	329.71
⊠	08-112	1.07	327.77
▲	08-113	1.83	328.51
★	08-117	10.97	320.15

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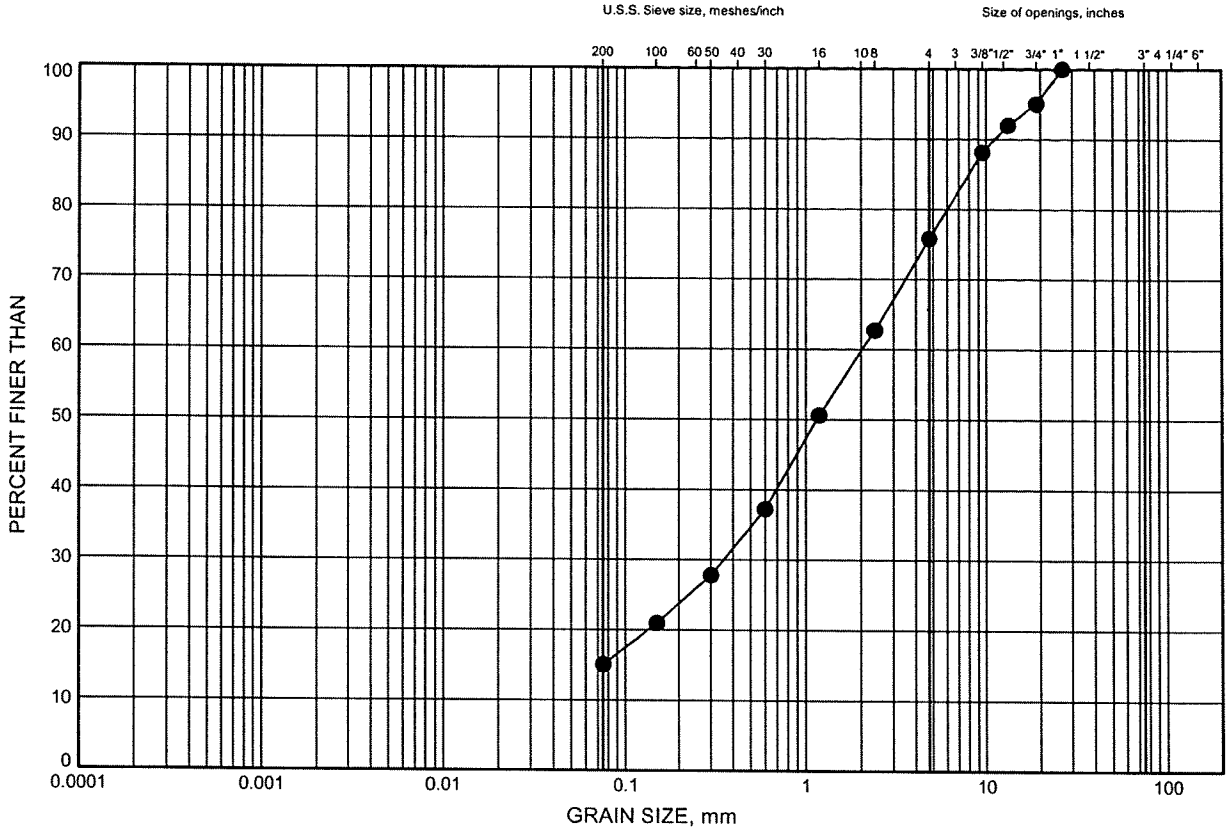
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE S2

GRAVELLY SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-108	3.35	328.19

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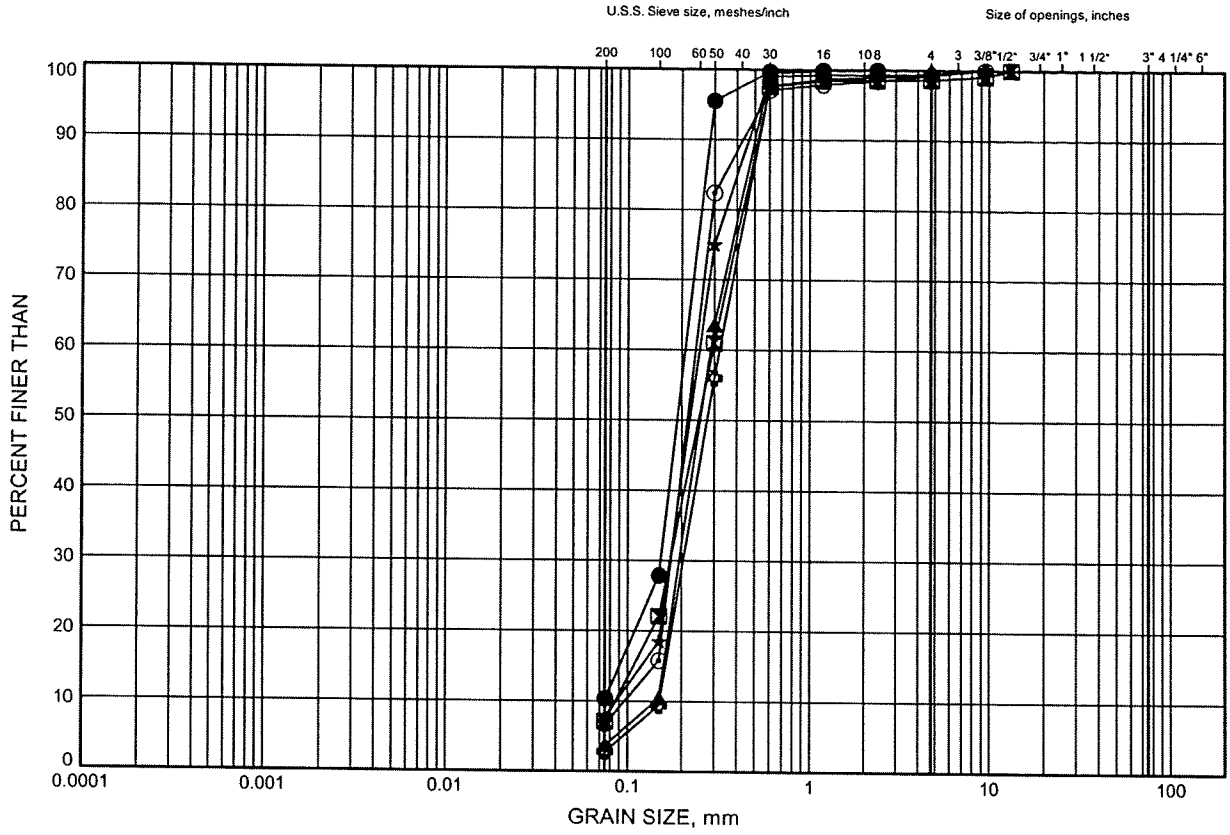
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE S3

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-111	2.59	326.51
⊠	08-111	6.40	322.70
▲	08-112	1.83	327.01
★	08-112	4.88	323.96
⊙	08-113	2.74	327.60
✿	08-113	6.40	323.94

W.P.# 408-88-00

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Checked By RPR

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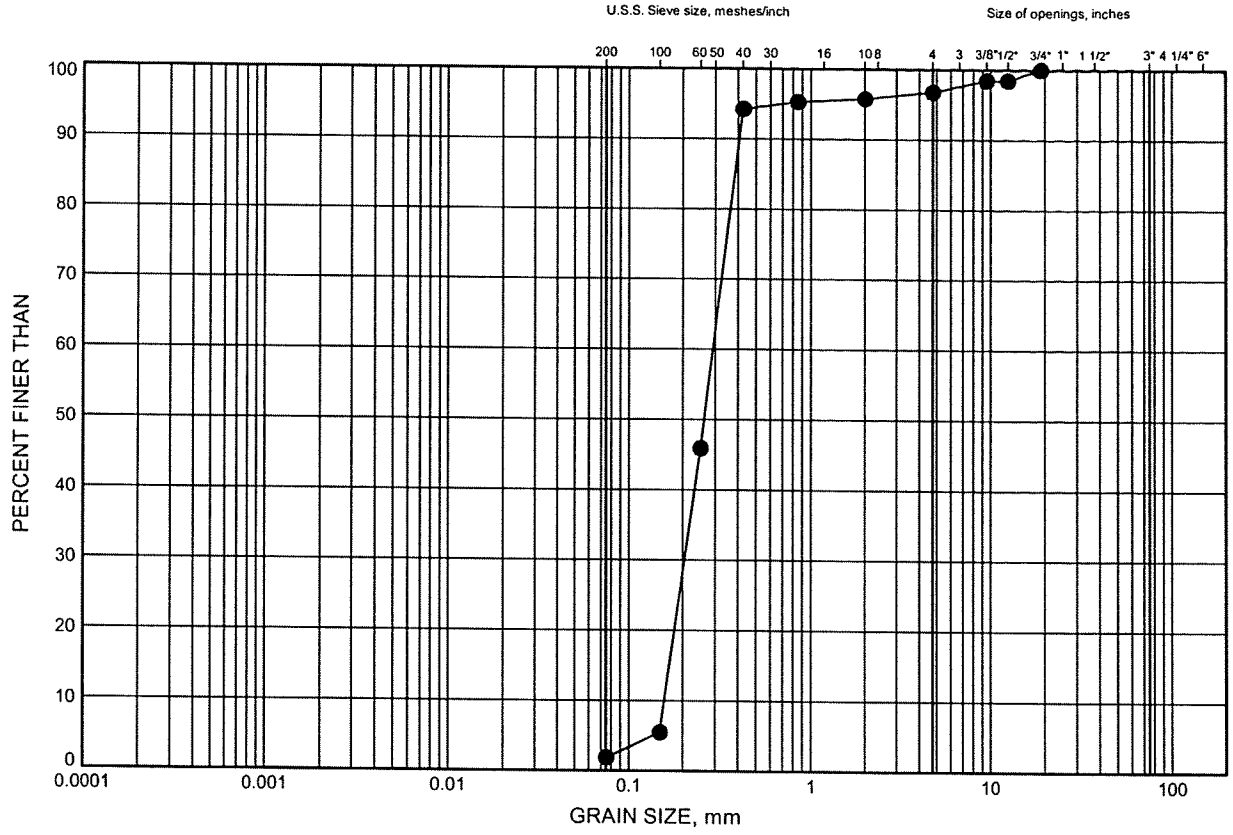
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE S4

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-117	6.40	324.72

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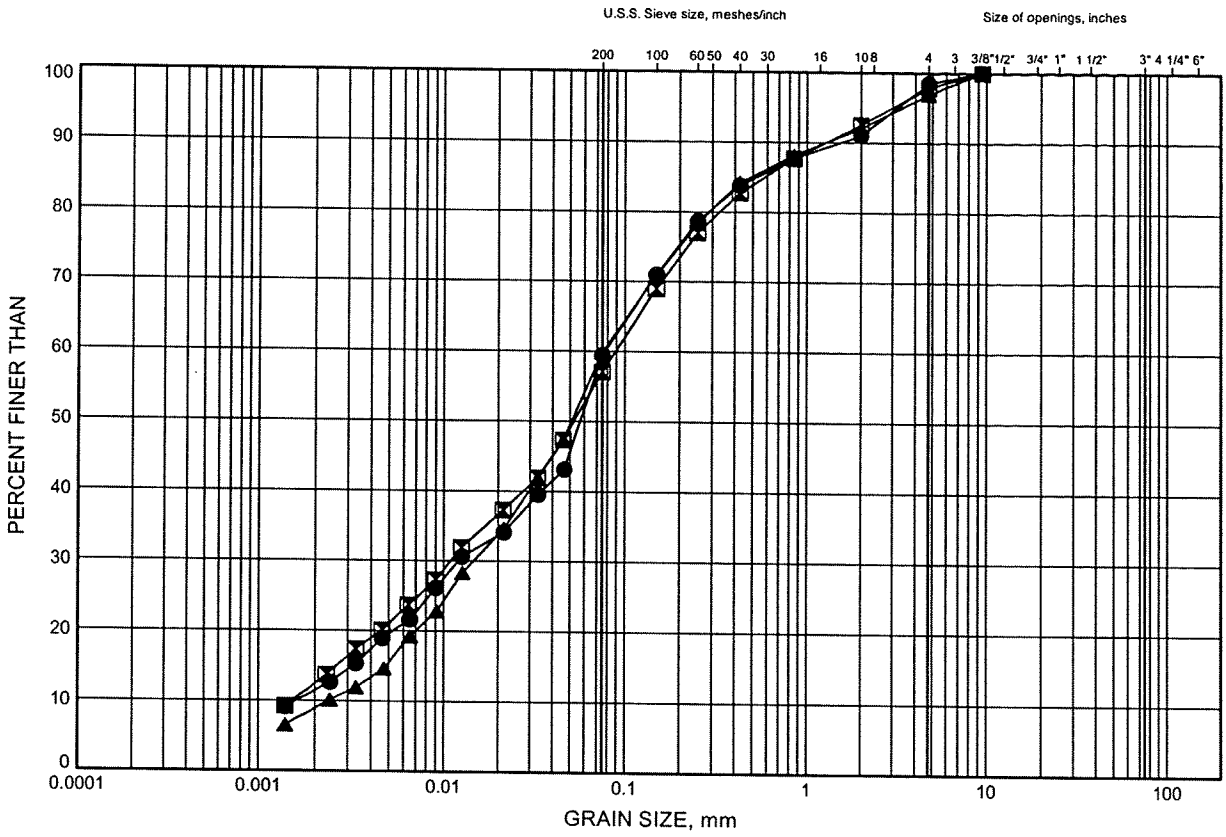
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE S5

SANDY SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-117	1.07	330.05
⊠	08-117	3.35	327.77
▲	08-117	15.35	315.77

W.P.# 408-88-00

Prepared By AN

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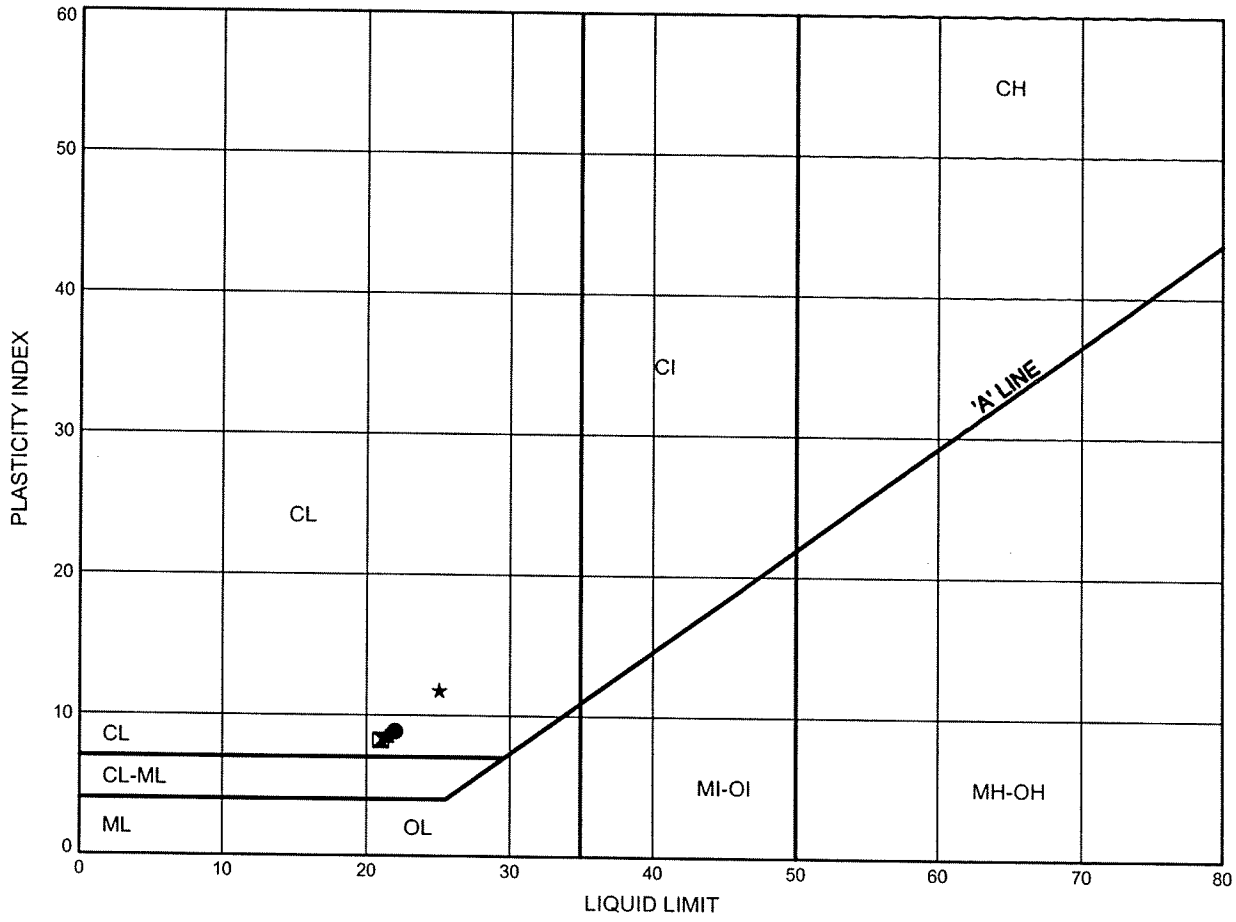
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE S6

SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-108	1.83	329.71
⊠	08-112	1.07	327.77
▲	08-113	1.83	328.51
★	08-117	10.97	320.15

Date March 2009

Project 408-88-00

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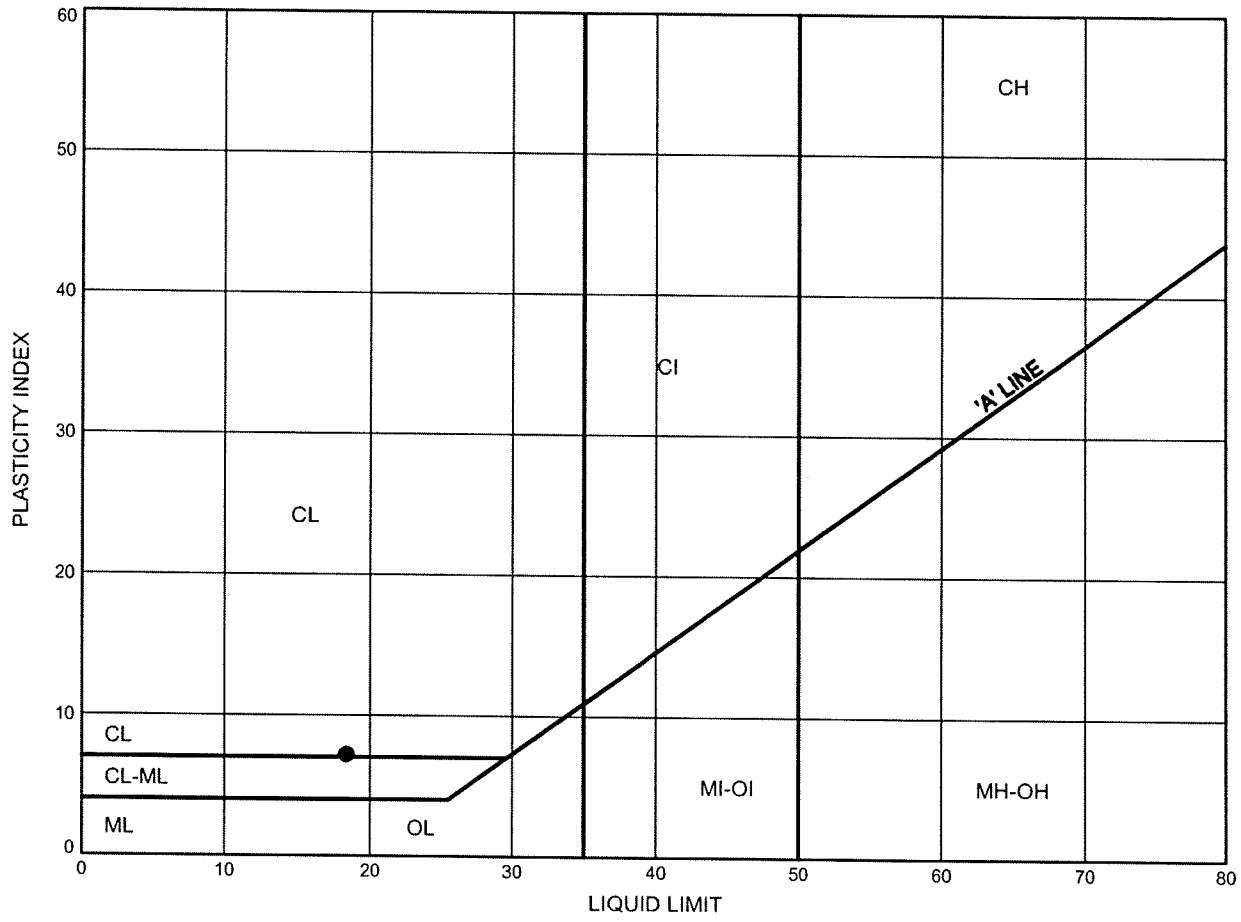
THURBALT 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE S7

SANDY SILT TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-117	3.35	327.77

Date March 2009

Project 408-88-00

THURBER

Prep'd AN

Chkd. RPR

THURBALT 6417R.GPJ 3/16/09

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No GWP No 408-88-00	
HIGHWAY 7 RECOMMENDED ROUTE REG. RD. 17 N/S-W RAMP, 10+000 TO 10+340 BOREHOLE LOCATIONS AND SOIL STRATA	SHEET

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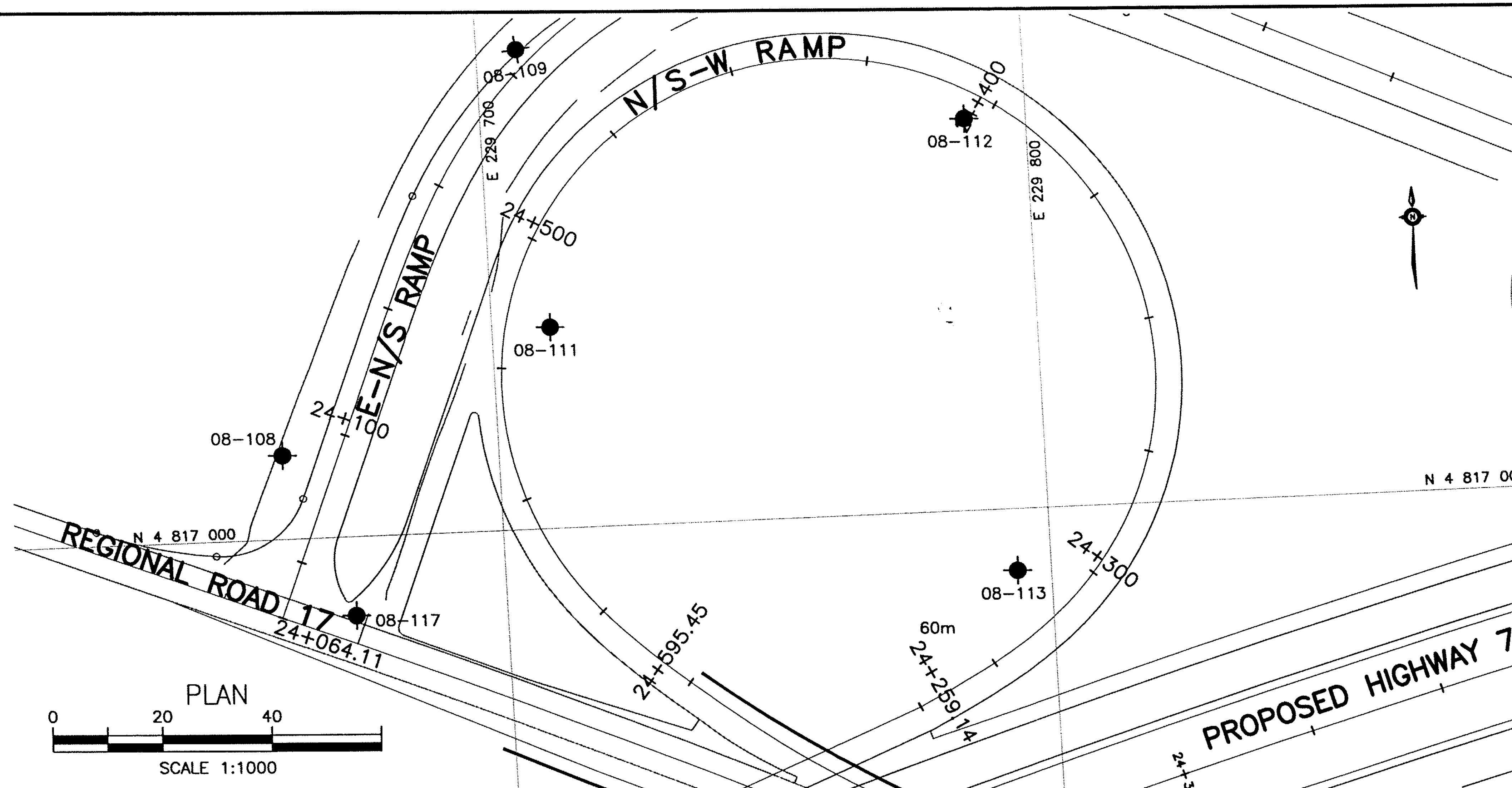
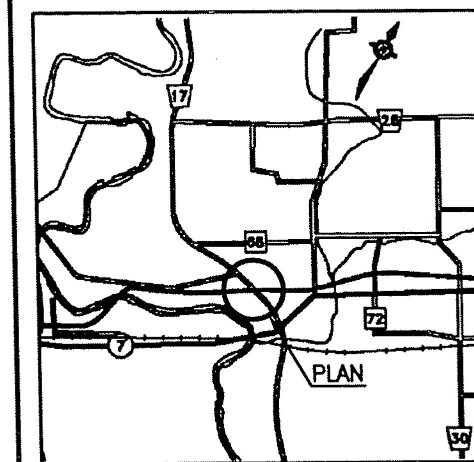


LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
Oct/06/09
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Oct 6/09
PROVINCE OF ONTARIO

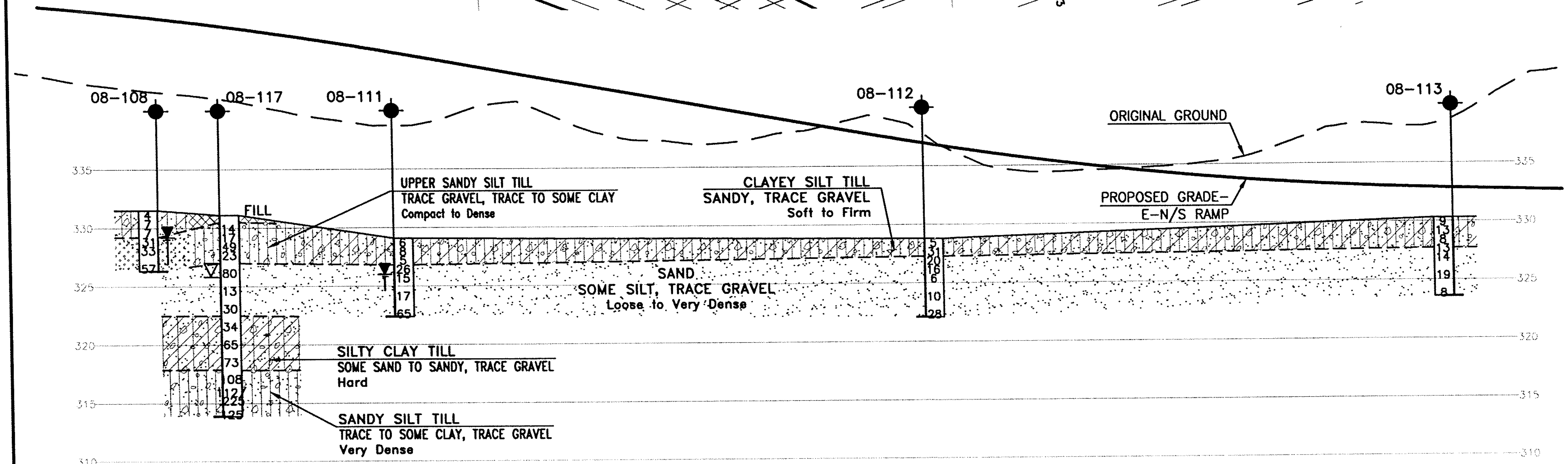


KEYPLAN

LEGEND

⯁	Borehole
⯁	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
┬	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-108	331.5	4 817 015.6	229 660.3
08-111	329.1	4 817 037.4	229 710.7
08-112	328.8	4 817 073.1	229 788.8
08-113	330.3	4 817 988.6	229 793.7
08-117	331.1	4 816 985.4	229 672.2



PROFILE ALONG ℄ OF REGIONAL ROAD 17 N/S-W RAMP

0 20 40 60m — HOR 1:1000

0 5 10 15m — VER 1:200

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

3) Proposed grades are from Plate 7 of the E.A. Study.

GEOCRES No. 40P8-172

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS	DATE	BY	DESCRIPTION		
DESIGN RPR	CHK PKC	CODE	LOAD	DATE AUG. 2009	
DRAWN AN	CHK AEG	SITE	STRUCT	DWG	

Appendix T

Regional Road 17, N/S-W Ramp, Station 10+300 –10+485
(Boreholes 08-108, 08-109, 08-110)

Record of Borehole Sheets
Laboratory Test Results
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-108 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 817 015.57 E 229 660.33 ORIGINATED BY LG

HWY 7 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR	SA	SI	CL
331.5															
0.0	Clayey **SILT**, sandy, trace gravel, occasional rootlets Soft to Firm Brown (TILL)		1	SS	4		331								
			2	SS	7										
			3	SS	7		330						2	44	39	15
329.2						▼									
2.3	Gravelly **SAND**, some silt, some clay Dense to Very Dense Brown Moist		4	SS	31		329								
			5	SS	33								24	61	15	(SI+CL)
							328								
							327								
326.3	Occasional cobbles		6	SS	57										
5.2	END OF BOREHOLE AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.3 329.2														

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

$\overset{20}{15}\oplus\overset{5}{10}$ (%) STRAIN AT FAILURE

ONTMT4S 6417R.GPJ 8/18/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-109 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 817 089.56 E 229 707.39 ORIGINATED BY LG
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
330.4											
0.0	Clayey **SILT**, sandy, trace gravel, occasional rootlets Firm to Soft Brown (TILL)		1	SS	8		330				
			2	SS	15		329				
			3	SS	12						
327.4			4	SS	15		328				0 40 44 16
3.0	**SAND**, some clay, some silt, trace gravel Compact Brown Moist to Wet		5	SS	15		327				1 88 11 (SI+CL)
325.2			6	SS	22		326				
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE BACKFILLED WITH HOLEPLUG HOLEPLUG TO SURFACE.										

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

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

ONTMT4S 6417R.GPJ 3/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-110 1 OF 1 METRIC

G.W.P. 408-88-00 LOCATION N 4 817 096.95 E 229 824.92 ORIGINATED BY LG
HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY RPR

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, ● 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
327.8											
0.0	Clayey **SILT**, sandy Stiff Brown (TILL)		1	SS	9				o		
327.0											
0.8	**SAND**, trace to some gravel, trace silt, trace clay Compact Dark Brown Wet		2	SS	27		327		o		
			3	SS	19		326		o		8 88 4 (SI+CL)
			4	SS	26		325		o		
			5	SS	27				o		13 81 6 (SI+CL)
							324				
323.0	Very dense		6	SS	79/ 0.225		323		o		
4.7 322.8	Silty **CLAY**, trace gravel Hard Grey (TILL)										
5.0	END OF BOREHOLE AT 5.0m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.01.09 2.4 325.4 2009.02.02 2.1 325.7										

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

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

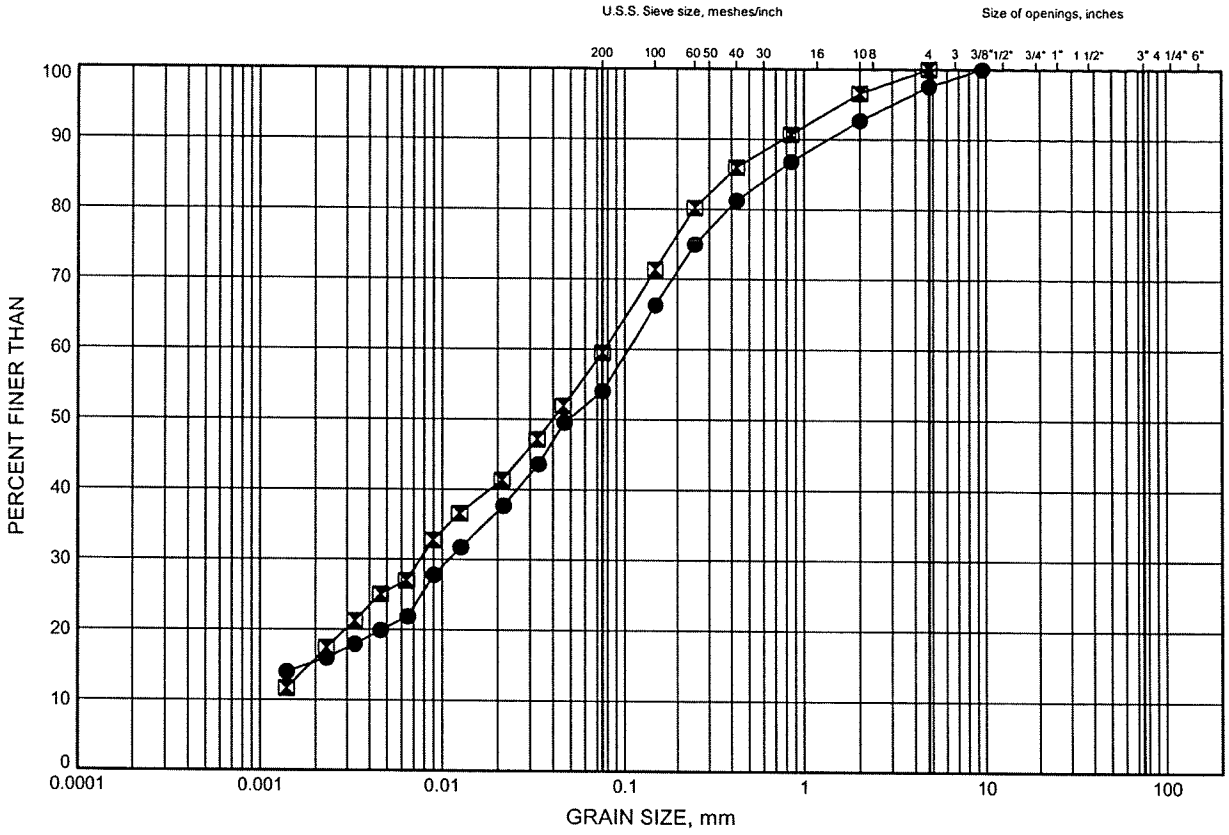
ONTMT4S 6417R.GPJ 3/17/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE T1

CLAYEY SILT TILL & SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-108	1.83	329.71
⊠	08-109	2.59	327.83

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

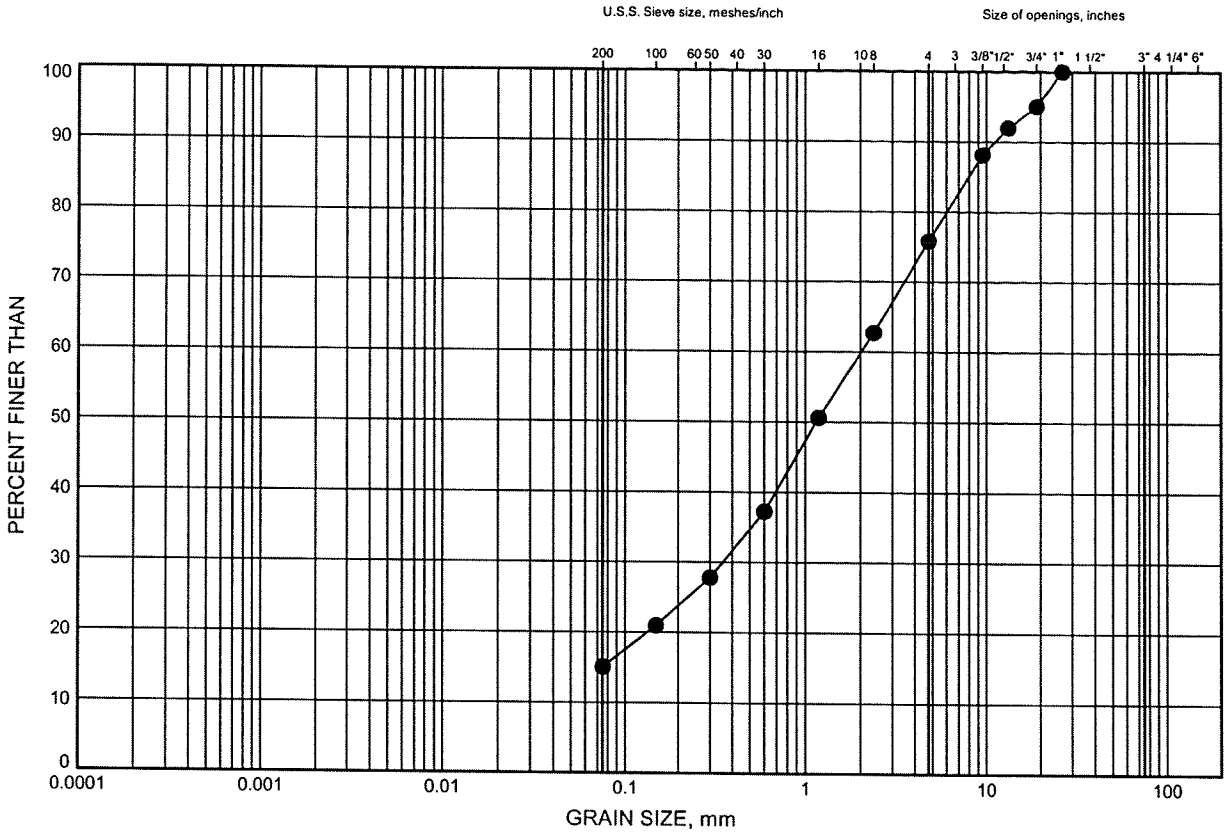
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE T2

GRAVELLY SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-108	3.35	328.19

W.P.# 408-88-00
Prepared By AN
Checked By RPR

THURBER

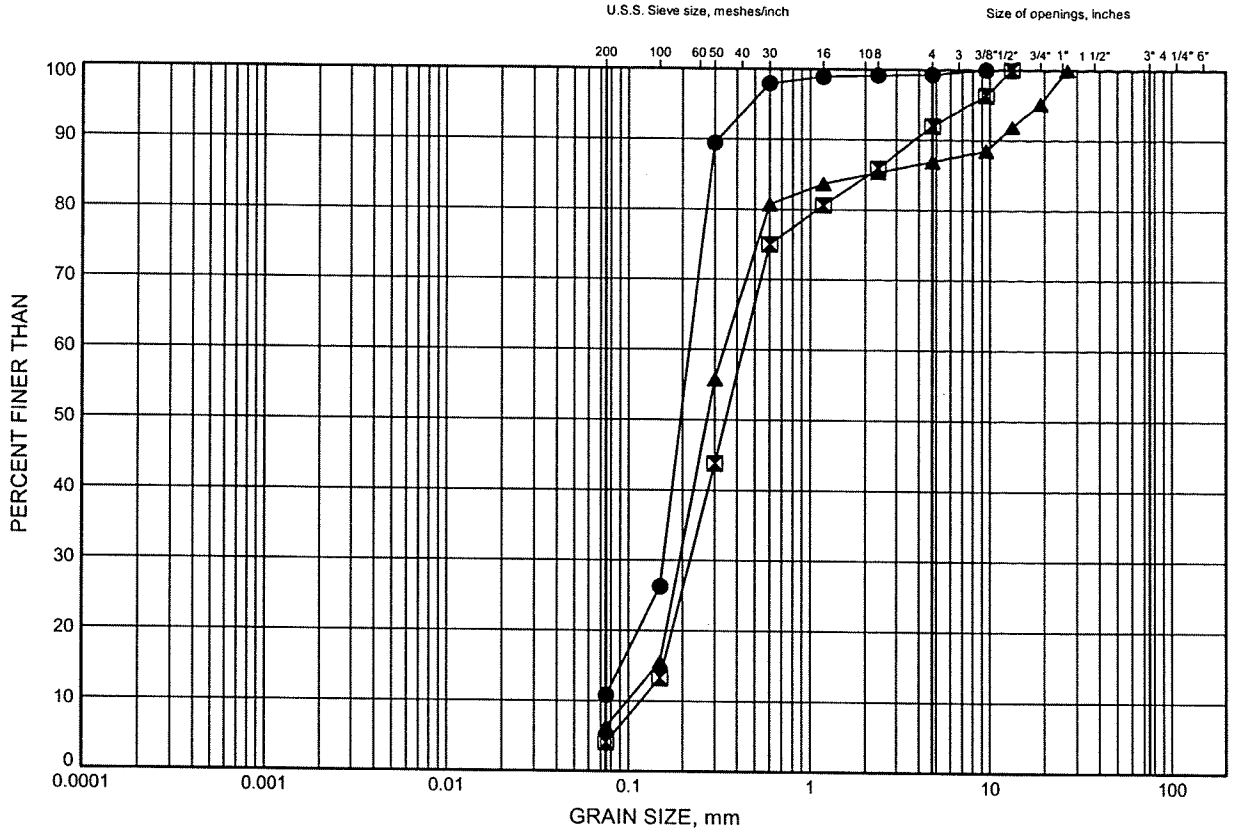
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

GRAIN SIZE DISTRIBUTION

FIGURE T3

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-109	3.35	327.07
⊠	08-110	1.83	325.94
▲	08-110	3.35	324.42

W.P.# 408-88-00

Prepared By AN

Checked By RPR

THURBER

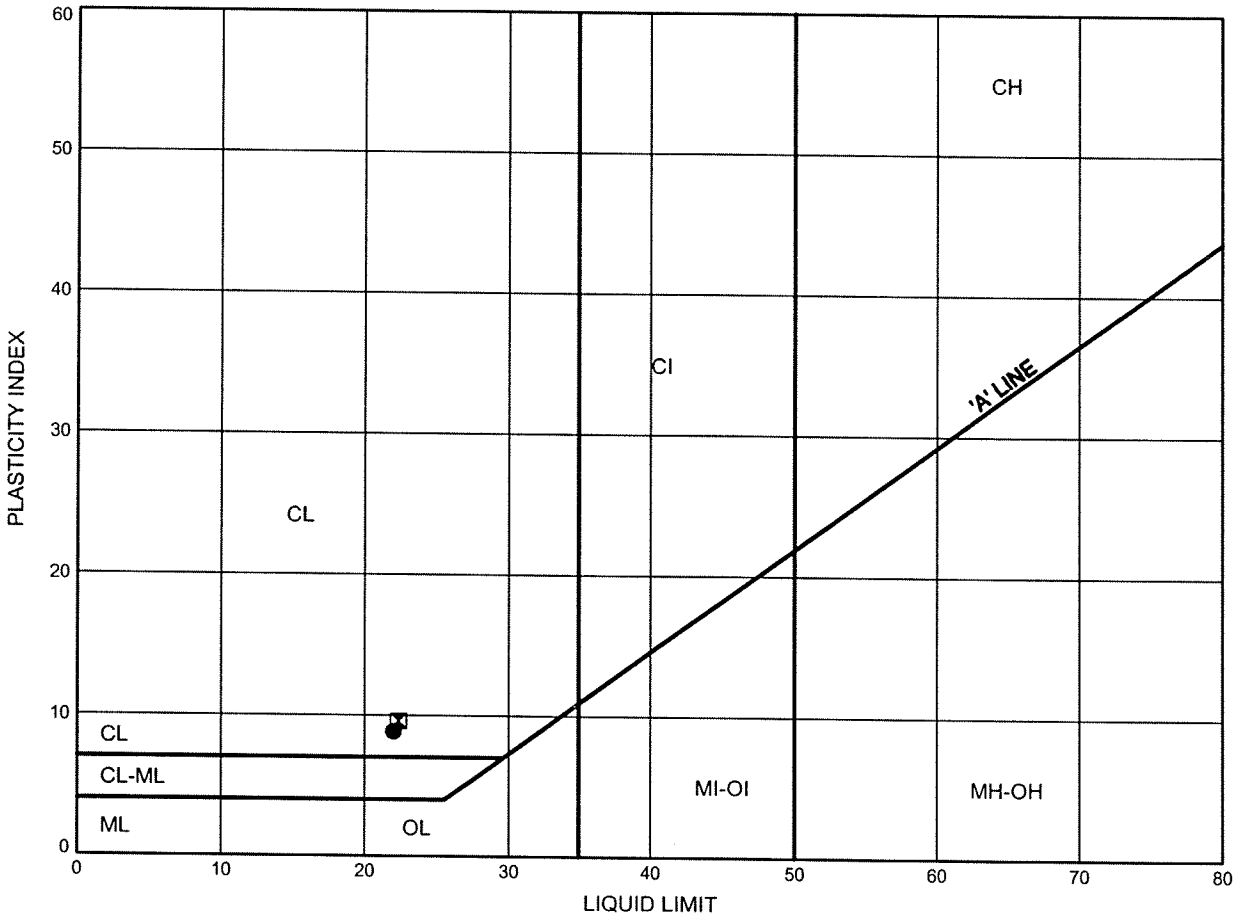
GRAIN SIZE DISTRIBUTION - THURBER 6417R.GPJ 3/16/09

Highway 7 - New

ATTERBERG LIMITS TEST RESULTS

FIGURE T4

CLAYEY SILT TILL & SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-108	1.83	329.71
⊠	08-109	2.59	327.83

Date March 2009

Project 408-88-00

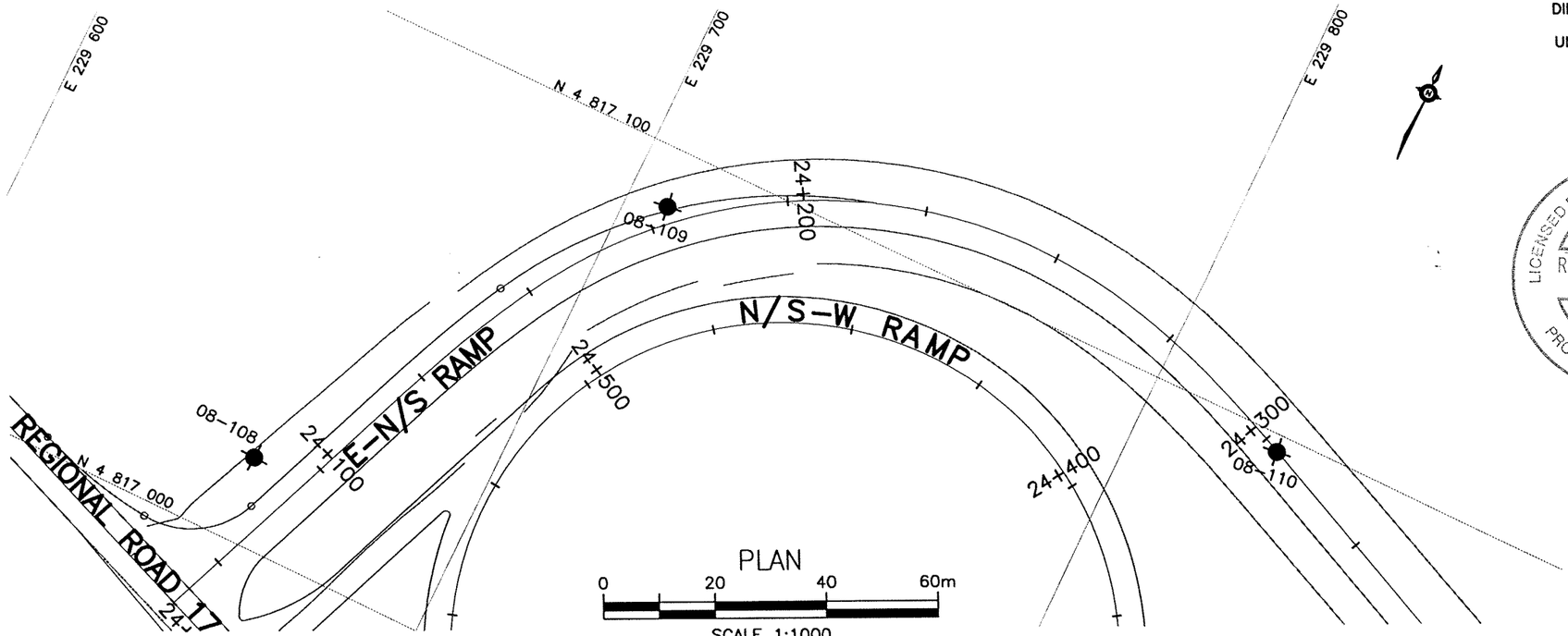
THURBER

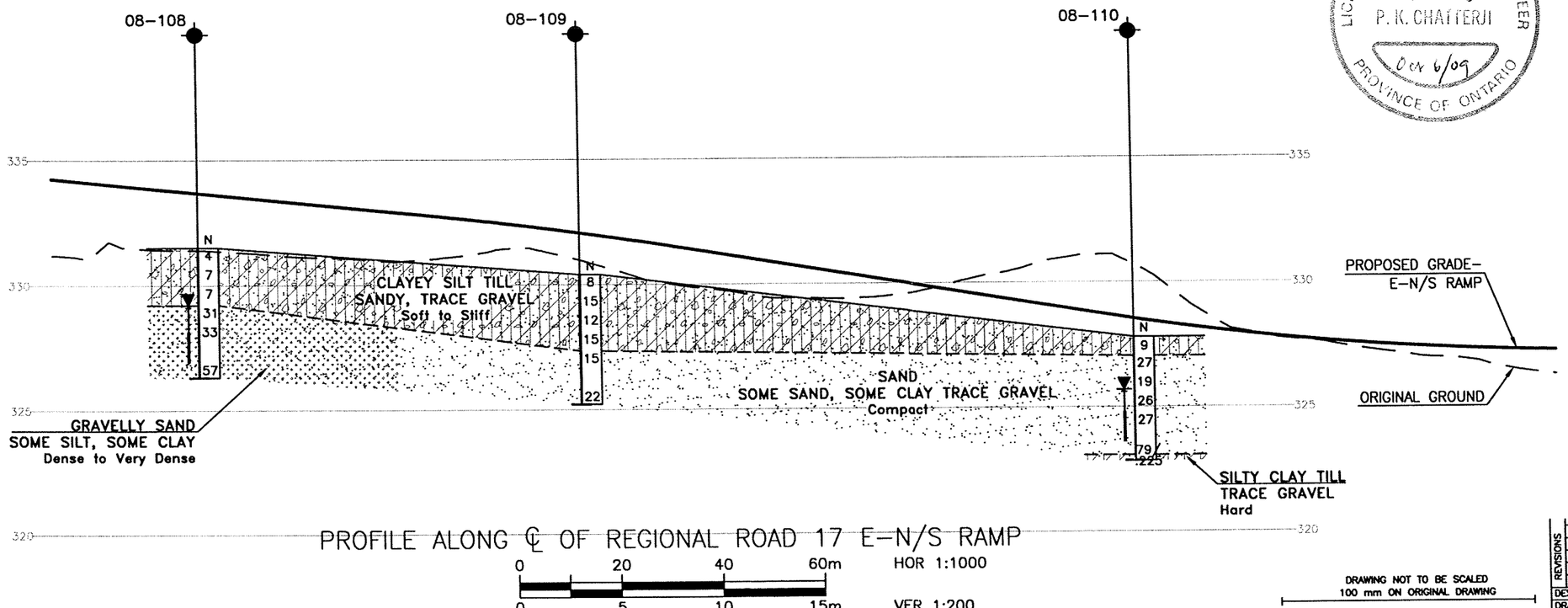
Prep'd AN

Chkd. RPR

THURBALT 6417R.GPJ 3/16/09

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





PROFILE ALONG ℄ OF REGIONAL ROAD 17 E-N/S RAMP

0 20 40 60m HOR 1:1000

0 5 10 15m VER 1:200

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

LICENSED PROFESSIONAL ENGINEER
R. Palomeque Reyna
100083209
PROVINCE OF ONTARIO

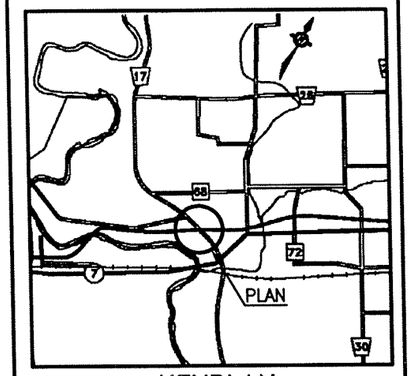
LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
PROVINCE OF ONTARIO

CONT No
GWP No 408-88-00

SHEET

HIGHWAY 7
RECOMMENDED ROUTE
REG. RD. 17 E-N/S RAMP, 10+300 TO 10+485
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

	Borehole
	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
	Water Level
	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-108	331.5	4 817 015.6	229 660.3
08-109	330.4	4 817 089.6	229 707.4
08-110	327.8	4 817 096.9	229 824.9

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Proposed grades are from Plate 7 of the E.A. Study.

GEOCRES No. 40P8-172

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	RPR	CHK PKC	CODE	LOAD	DATE AUG. 2009
DRAWN	AN	CHK AEG	SITE	STRUCT	DWG