

**FOUNDATION INVESTIGATION REPORT
OXTONGUE LAKE NARROWS BRIDGE REPLACEMENT
HIGHWAY 60, SITE 40-001
G.W.P 93-89-00**

Geocres Number: 31E-312

Report to

McCormick Rankin Corporation

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted for the proposed replacement of the Oxtongue Lake Narrows Bridge on Highway 60, located approximately 9.7 km east of Highway 35 in the Township of McClintock.

The purpose of the investigation was to explore the subsurface conditions at the site, and based on the data obtained, to provide a borehole location plan, record of borehole sheets, a stratigraphic profile, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained in the course of the investigation.

Thurber carried out the investigation as a sub-consultant to McCormick Rankin Corporation, under the Ministry of Transportation Ontario (MTO) Assignment Number 5009-E-0032.

2 SITE DESCRIPTION

The bridge site is located on Highway 60 approximately 9.7 km east of Highway 35 in the Township of McClintock, Ontario. At present, Highway 60 crosses the Oxtongue Lake Narrows on an eleven span structure with a total length of 113.5 m. The water depth at the crossing is approximately 5 m.

The area surrounding the site is gently undulating and heavily treed, with occasional low rock outcrops. Private cottages and resort/motel establishments line the lakeshore. Photographs of the bridge and surrounding area are presented in Appendix D.

Physiographically, the site lies within the Canadian Shield, which is characterized by Pre-Cambrian igneous and metamorphic bedrock typically occurring as rounded knobs and ridges where exposed. At this site, the bedrock generally consists of the granitic gneiss. The bedrock is overlain by a discontinuous cover of sand and gravel (bedrock drift complex) and sand (glaciofluvial outwash).

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project were carried out during the period of September 8 to October 16, 2010. A total of twenty boreholes, identified as OX-01 to OX-20, were advanced to depths ranging from 9.2 m to 40.9 m below the drilling datum. Details of the borehole locations and depths were as follows:

Table 3.1 – Borehole Summary

Location	Boreholes	Water Depth (m)	Drilling/Coring Depth (m)	Drilling Datum
West Abutment	OX-01	-	36.1	Existing Highway 60 Pavement
West Abutment	OX-07	-	35.5	
East Abutment	OX-05	-	18.4	
East Abutment	OX-16	-	18.6	
West Pier	OX-02	4.8	18.6	Existing Highway 60 Bridge Deck
West Pier	OX-08	4.9	17.0	
Centre Pier	OX-03	5.1	21.3	
East Pier	OX-04	4.9	17.3	
East Pier	OX-10	4.9	19.6	
West Approach	OX-06	-	11.3	Existing Highway 60 Pavement
East Approach	OX-11	-	15.9	
Detour Bridge:				Ground Surface
West Approach	OX-12	-	9.8	
West Abutment	OX-13	-	40.9	
East Abutment	OX-17	-	19.5	
East Approach	OX-18	-	9.2	
Detour Bridge:				Water Surface
West Pier	OX-14	5.1	20.8	
Centre Pier	OX-09	5.4	23.3	
East Pier	OX-15	5.3	23.5	
RSS Wall	OX-19	-	9.8	Ground Surface
	OX-20	-	9.8	

The approximate locations of the boreholes are shown on the attached Borehole Locations and Soil Strata Drawing included in Appendix E.

Boreholes drilled from the existing Highway 60 roadway and bridge deck were advanced using a CME75 truck-mounted drill rig. Drilling located off of the road utilized a CME55 track-mounted drill rig, which was also mounted on a barge to drill the boreholes over water. Each drill rig used hollow stem augers and HW casing/washboring methods to advance the boreholes in the overburden.

Samples of the overburden soils were obtained from the boreholes at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT). To supplement the SPT data, Dynamic Cone Penetration Testing (DCPT) was carried out adjacent to Boreholes OX-01, OX-06 and OX-17, approximately 7 m east of Borehole OX-18 (OX-18A), and within Boreholes OX-10, OX-11 and OX-13. The DCPT tests were conducted to confirm the relative density of the cohesionless soils

where hydraulic disturbance may have affected the SPT results, and to aid assessment of the driveability of piles in material containing cobbles and boulders.

Core samples of the underlying bedrock were recovered from selected boreholes using HQ rock coring equipment. All rock cores were logged, and the Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) and the Fracture Indices (FI) were determined. The coring equipment was also used to penetrate 0.2 to 0.9 m of cobbles and boulders overlying the bedrock surface in Boreholes OX-09, OX-10, OX-13 and OX-17, and for the bottom 2.6 m (below 33.5 m depth, Elev. 334.2 m) of Borehole OX-01.

Groundwater conditions in the open boreholes were observed during the drilling operations. Standpipe piezometers consisting of 19 mm PVC pipe with a slotted screen were installed in boreholes OX-01, OX-03, OX-13, and OX-17. The completion details of the boreholes and piezometers are summarized in Table C1, Appendix C. Following the final water level reading, the piezometers were decommissioned in accordance with MOE Regulation 903 by filling the standpipe with Benseal grout, removing the protective casing, pulling the upper 2 to 3 m length of pipe, and restoring the ground surface.

The drilling and sampling operations were supervised on a full time basis by a member of Thurber's technical staff. The supervisor logged the boreholes and processed the recovered soil and rock samples for transport to Thurber's laboratory for further examination and testing.

4 LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and to natural moisture content determination. The results of this testing are shown on the Record of Borehole sheets included in Appendix A. Selected samples were also subjected to gradation analysis and the results of this testing program are summarized on the Record of Borehole sheets in Appendix A and shown on the figures included in Appendix B.

Point load testing was conducted on rock core samples retrieved from the boreholes. The results of the point load tests are shown on the borehole logs in Appendix A.

The completed laboratory testing is summarized in Table 4.1.

Table 4.1 – Summary of Completed Laboratory Testing

Laboratory Test	Number of Samples Tested	Material Type
Moisture Content	229	Soil
Sieve	44	Soil
Sieve and Hydrometer	17	Soil
Point Load	38	Rock

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets included in Appendix A. Details of the encountered soil stratigraphy are presented in this appendix and on the “Borehole Locations and Soil Strata” drawings in Appendix E. An overall description of the stratigraphy is given in the following paragraphs. However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions.

The subsurface stratigraphy encountered at the site generally consists of a pavement structure and embankment fill at the abutments and approaches, an organic silt layer on the lake bottom, and an underlying silt to silty clay layer, overlying a major sand to sand and gravel deposit. The sand and gravel deposit contains cobbles and boulders, and overlies bedrock. More detailed descriptions of the individual strata are presented below.

5.1 Asphalt and Concrete

Asphalt and concrete were encountered in Boreholes OX-01 to OX-05, OX-07, OX-08, OX-10 and OX-16 drilled through the existing bridge deck and approach slab. The thickness of the asphalt layer ranged from 80 to 100 mm. The thickness of the concrete ranged from 165 to 300 mm.

5.2 Fill

Existing embankment fill was encountered below the concrete in Boreholes OX-01, OX-05, OX-07 and OX-16, and at the ground surface in Boreholes OX-06 and OX-11 drilled on the roadway shoulder. The fill generally consists of sand, some gravel to sand and gravel. The fill extends to depths of 2.1 to 4.4 m (Elev. 363.4 to 365.6 m).

SPT ‘N’ values recorded in the embankment fill generally ranged from 11 to 48 blows/0.3 m penetration, indicating a compact to dense relative density. ‘N’ values of 2 to 7 blows/0.3 m were encountered in Borehole OX-06 and below 3.0 m depth in Borehole OX-01, indicating loose to very loose conditions. Measured moisture contents ranged from 3 to 12%, locally 20% in Borehole OX-06.

The results of grain size analyses conducted on samples of the sand fill are provided on the Record of Borehole sheets in Appendix A and illustrated in Figure B1 of Appendix B. The results are summarized as follows:

Gravel %	34 to 50
Sand %	46 to 62
Silt and Clay %	4

5.3 Topsoil

A 50 to 150 mm thick layer of topsoil was encountered surficially in Boreholes OX-18 to OX-20 drilled near the east shoreline. The topsoil thickness may vary between and beyond the borehole locations, and the data is not intended for quantity estimation purposes.

5.4 Organic Silt

Dark brown organic silt with occasional sand seams was encountered on the lake bottom. The thickness of the organic deposit generally increased towards the centre of the lake, and ranged from 3.3 m in Borehole OX-04 to 8.2 m in Borehole OX-03. The lower boundary was encountered at Elev. 350.6 to 355.8 m.

In all cases, the split spoon sampler sank under the self-weight of the rods ('N' = 0), indicating a very soft condition. Measured moisture contents ranged from 83 to 479%.

The results of grain size analyses conducted on samples of the organic silt with sand seams are provided on the Record of Borehole sheets in Appendix A and plotted in Figure B2 of Appendix B. The results are summarized as follows:

Gravel %	0
Sand %	2 to 57
Silt %	35 to 84
Clay %	8 to 14

5.5 Silt to Silty Clay

A layer of native silt typically containing some clay and trace sand was encountered below the organic deposit in all boreholes drilled in the lakebed, below the fill in Boreholes OX-01, OX-07 and OX-11 drilled in the existing bridge approaches, and below the topsoil in Boreholes OX-18 to OX-20 drilled on the east bank. In Boreholes OX-09, OX-14 and OX-15, this deposit graded to a silty clay/clayey silt.

The silt layer ranged from 1.1 to 5.5 m in thickness. In the lakebed, the lower boundary of the silt was encountered at depths of 13.0 to 18.3 m below the drilling datum, at Elev. 348.5 to 354.3 m. In the boreholes drilled in the bridge approaches and east bank, the lower boundary was at 3.0 to 7.2 m depth, Elev. 359.9 to 362.7 m.

SPT N-values recorded in the silt below the lakebed typically ranged from 0 to 5 blows/0.3 m, indicating a very loose to loose condition or very soft to firm consistency. Values of 19 and 24 (very stiff) were obtained locally in Borehole OX-15. The undrained shear strength measured by in situ vane testing in the cohesive zones ranged from 18 to 38 kPa. SPT N-values obtained in the boreholes on land varied from 6 to 32 blows/0.3 m, indicating a loose to dense condition.

Moisture contents measured in the silt varied from 11 to 37%, locally 132% in one sample from Borehole OX-09. The higher values are believed to reflect a higher clay content or the

presence of organics, and the lower values likely result from the existence of sand seams within the silt.

The results of grain size analyses conducted on samples of the silt to silty clay are provided on the Record of Borehole sheets in Appendix A and plotted in Figures B3 to B5 of Appendix B. The results are summarized as follows:

	<u>Silt</u>	<u>Silty Clay/Clayey Silt</u>
Gravel %	0 to 2	0 to 2
Sand %	2 to 28	1 to 5
Silt %	61 to 84	62 to 81
Clay %	10 to 14	12 to 35

5.6 Sand to Sand and Gravel

A thick deposit of cohesionless sand to sand and gravel was encountered surficially in Boreholes OX-12, OX-13 and OX-17, and below the fill and silt layers in all remaining boreholes. The gradation of this deposit varies with depth and location; however the coarser sand and gravel material appears to be more prevalent at greater depths and towards the east end of the site. Localized zones of silty sand were also present. Cobbles and boulders were encountered within this deposit at varying frequency.

The sand and gravel deposit overlies bedrock. Where bedrock was contacted, the thickness of this deposit ranged from 7.6 to 37.3 m, typically thickest at the west abutment. The boreholes that were not extended to bedrock were terminated in the sand and gravel at depths of 9.2 to 36.1 m (Elev. 331.6 to 356.5 m).

The upper boundary of the sand and gravel deposit was encountered at depths below drilling datum of 0.0 to 18.3 m (Elev. 348.5 to 365.8 m). The lower boundary (bedrock) was encountered at depths of 14.2 to 37.3 m (Elev. 328.2 to 352.8 m).

SPT N-values recorded in the sand to sand and gravel ranged from 3 blows/0.3 m (very loose) to 100 blows/0.025 m (very dense). In some cases, the low N-values may have resulted from hydraulic disturbance during drilling and sampling. High values may have resulted from driving on cobbles and boulders within the sand and gravel.

Moisture contents in the sand and gravel generally ranged from 8 to 23%.

The results of grain size analyses conducted on samples of the sand/gravel are provided on the Record of Borehole sheets in Appendix A and plotted in Figures B6 to B13 of Appendix B. The results are summarized as follows:

	<u>Silty Sand</u>	<u>Sand</u>	<u>Sand and Gravel/Gravelly Sand</u>
Gravel %	0 to 3	0 to 15	24 to 70
Sand %	65 to 67	83 to 97	23 to 70
Silt & Clay %	31 to 33	2 to 11	2 to 15

5.7 Bedrock

The overburden soils described above are underlain by granitic gneiss bedrock which was proven by coring at the foundation elements. Cobbles and boulders were encountered in Borehole OX-01 and the bedrock surface was not contacted. Table 5.1 summarizes the depth to bedrock and the bedrock surface elevations determined in the boreholes.

The bedrock is generally described as slightly weathered, medium grained, and pink/white and grey/black banded.

Total Core Recovery (TCR) in the bedrock was typically 100%, locally 90 and 98% in two core runs. TCR values of 60 to 81% were obtained in three initial runs where coring recovered cobbles and boulders above the bedrock surface.

The Rock Quality Designation (RQD) determined from the cores generally ranged from 57 to 100%, indicating fair to excellent rock quality. Lower RQD values of 29 to 42% were encountered in core runs from Boreholes OX-04 (Runs 1 and 2 at 23.2 to 24.1 m), OX-14 (Run 1 at 22.9 to 24.4 m) and OX-15 (Runs 3 and 4 at 26.7 to 28.8 m), indicating poor quality.

The Fracture Index (FI) of the rock, expressed as fractures per 0.3 m of core, typically ranged from 0 to 5. Two values of 10 or more were determined from each of Boreholes 10-09 and 10-14.

Table 5.1: Depth to Bedrock at Borehole Locations

Foundation Element	Borehole	Depth to Bedrock (m)	Bedrock Elevation (m)
Permanent Structure:			
West Abutment	OX-07	32.4	335.4
West Pier	OX-02	23.0	344.7
	OX-08	22.3	345.6
Centre Pier	OX-03	27.0	340.9
	OX-09	25.0	339.0
East Pier	OX-04	23.2	344.7
	OX-10	24.6	343.3
East Abutment	OX-05	15.3	352.7
	OX-16	15.3	352.8
Temporary Structure:			
West Abutment	OX-13	37.3	328.2
West Pier	OX-14	22.9	341.1
East Pier	OX-15	24.3	339.7
East Abutment	OX-17	14.2	351.3

The unconfined compressive strength of the rock, estimated from the results of point load tests conducted on the rock core samples, ranges between 100 and 225 MPa, indicating a very strong intact rock. One result of 75 MPa (strong) was recorded on a sample from Borehole OX-04. The point load test results are included on the borehole logs in Appendix A.

5.8 Water Levels

The majority of the boreholes were drilled through the lake bottom and/or the borehole sidewalls caved upon removal of the drill casing. In Borehole OX-06, groundwater was measured at 3.6 m depth (Elev. 364.1 m) upon completion of drilling.

Standpipe piezometers were installed in boreholes OX-01, OX-03, OX-13, and OX-17. The water levels measured in the piezometers upon completion and up to two months later are summarized in Table 5.2.

Table 5.2: Water Level Measurements

Borehole	Date	Water Level (m)	
		Depth Below Surface	Elevation
OX-01	14-Sep-2010	3.8	363.9
	15-Sep-2010	3.8	363.9
	17-Sep-2010	3.8	363.9
	18-Sep-2010	3.7	364.0
	19-Sep-2010	3.7	364.0
	20-Sep-2010	3.7	364.0
	15-Oct-2010	3.5	364.2
OX-03	20-Sep-2010	3.8	364.0
	15-Oct-2010	3.8	364.0
OX-13	02-Oct-2010	0.9	364.6
	14-Oct-2010	1.1	364.4
	15-Oct-2010	1.0	364.5
	02-Nov-2010	0.9	364.6
	22-Nov-2010	0.9	364.6
OX-17	20-Sep-2010	1.5	364.0
	23-Sep-2010	1.5	364.0
	24-Sep-2010	1.5	364.0
	25-Sep-2010	1.5	364.0
	26-Sep-2010	1.4	364.1
	27-Sep-2010	1.4	364.1
	02-Oct-2010	1.3	364.2
	14-Oct-2010	1.5	364.0
	15-Oct-2010	1.5	364.0
	02-Nov-2010	1.4	364.1
	22-Nov-2010	1.4	364.1

The water level in the lake varied from Elev. 363.9 to 364.2 m during the time of the fieldwork. The groundwater levels measured in the piezometers are essentially at or slightly above the water level in the lake. The lake and groundwater levels are expected to fluctuate seasonally and subject to precipitation patterns, and may vary from the levels presented in this report.

6 MISCELLANEOUS

George Downing Estate Drilling Limited of Hawkesbury, Ontario supplied the drill rig and conducted the drilling, sampling and in-situ testing operations. A truck-mounted CME #75 drill rig was used for the duration of the investigation and a track-mounted CME#55 drill rig was used where the truck mounted machine could not access.

Attainable Solutions Incorporated of Hunstville, Ontario supplied the barge that facilitated drilling from the lake surface.

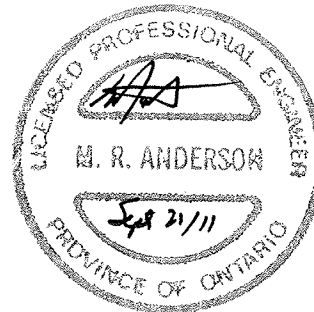
The co-ordinates and ground elevations at the boreholes were determined by McCormick Rankin Corporation following completion of the site investigation.

The drilling and sampling operations were supervised in the field by Mr. Ryan Kromer and Mr. Lukasz Gilarski E.I.T. of Thurber. Mr. Jason Lee, P.Eng. and Mr. Alastair E. Gorman, P.Eng. directed the field operations.

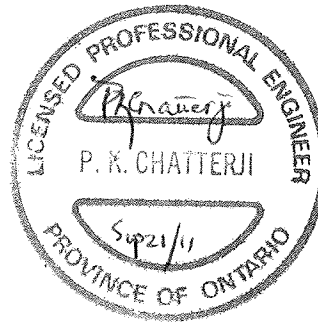
The report was prepared by Mr. Murray Anderson, P.Eng. and reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects.

THURBER ENGINEERING LTD.

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



P.K. Chatterji, P.Eng., Ph.D.
Review Principal



Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample	TP Thin Wall Piston Sample	
	PH Sampler Advanced by Hydraulic Pressure	PM Sampler Advanced by Manual Pressure	
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$



Water Level

C_{pen}






Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. $(W_L < 30\%)$.
		CI	Inorganic clays of medium plasticity, silty clays. $(30\% < W_L < 50\%)$.
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION		SYMBOLS	
Fresh (FR)	No visible signs of weathering.		
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.		CLAYSTONE
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.		SILTSTONE
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.		SANDSTONE
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.		COAL
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.		Bedrock (general)

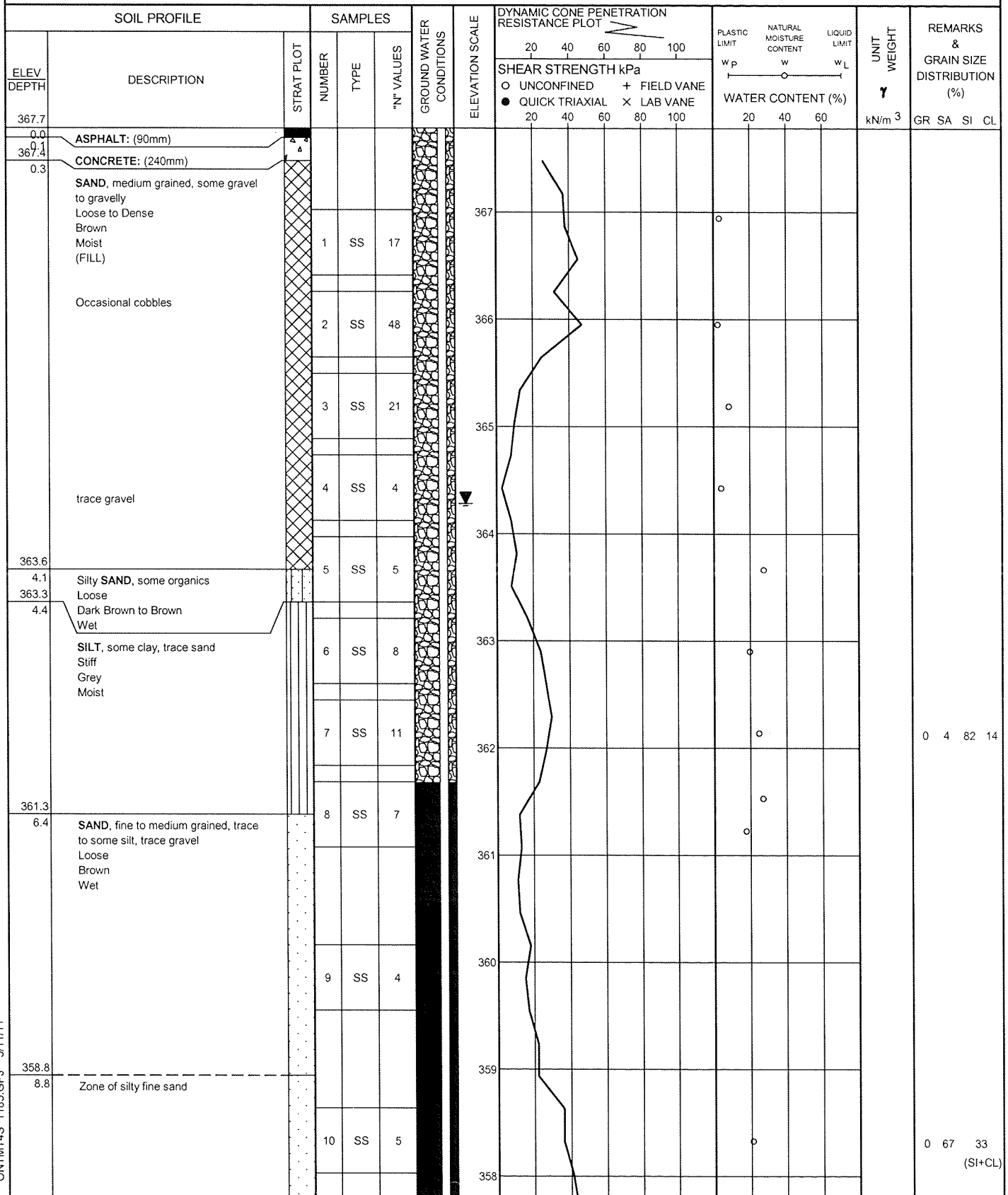
DISCONTINUITY SPACING		STRENGTH CLASSIFICATION			
Bedding	Bedding Plane Spacing	Rock Strength	Approximate Uniaxial Compressive Strength		Field Estimation of Hardness*
			(MPa)	(psi)	
Very thickly bedded	Greater than 2m	Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Thickly bedded	0.6 to 2m				
Medium bedded	0.2 to 0.6m	Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Thinly bedded	60mm to 0.2m				
Very thinly bedded	20 to 60mm	Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Laminated	6 to 20mm				
Thinly Laminated	Less than 6mm	Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
<u>TERMS</u>					
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.	Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.	Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.	Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen				
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.				

RECORD OF BOREHOLE No OX-01

1 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 804.7 E 349 957.9 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers and NQ/NW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.09 - 2010.09.12 CHECKED BY JL



Continued Next Page

+³, ×³: Numbers refer to
Sensitivity
20
15
10
(%) STRAIN AT FAILURE

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-01

2 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 804.7 E 349 957.9 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers and NQ/NW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.09 - 2010.09.12 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%) 20 40 60			GR SA SI CL
357.0			11	SS	6		357					
10.7							356					
			12	SS	5		355					
							354					
			13	SS	6		353					
							352					
	Becoming compact		14	SS	5		351					
							350					
			15	SS	16		349					
							348					
			16	SS	11							
			17	SS	14							

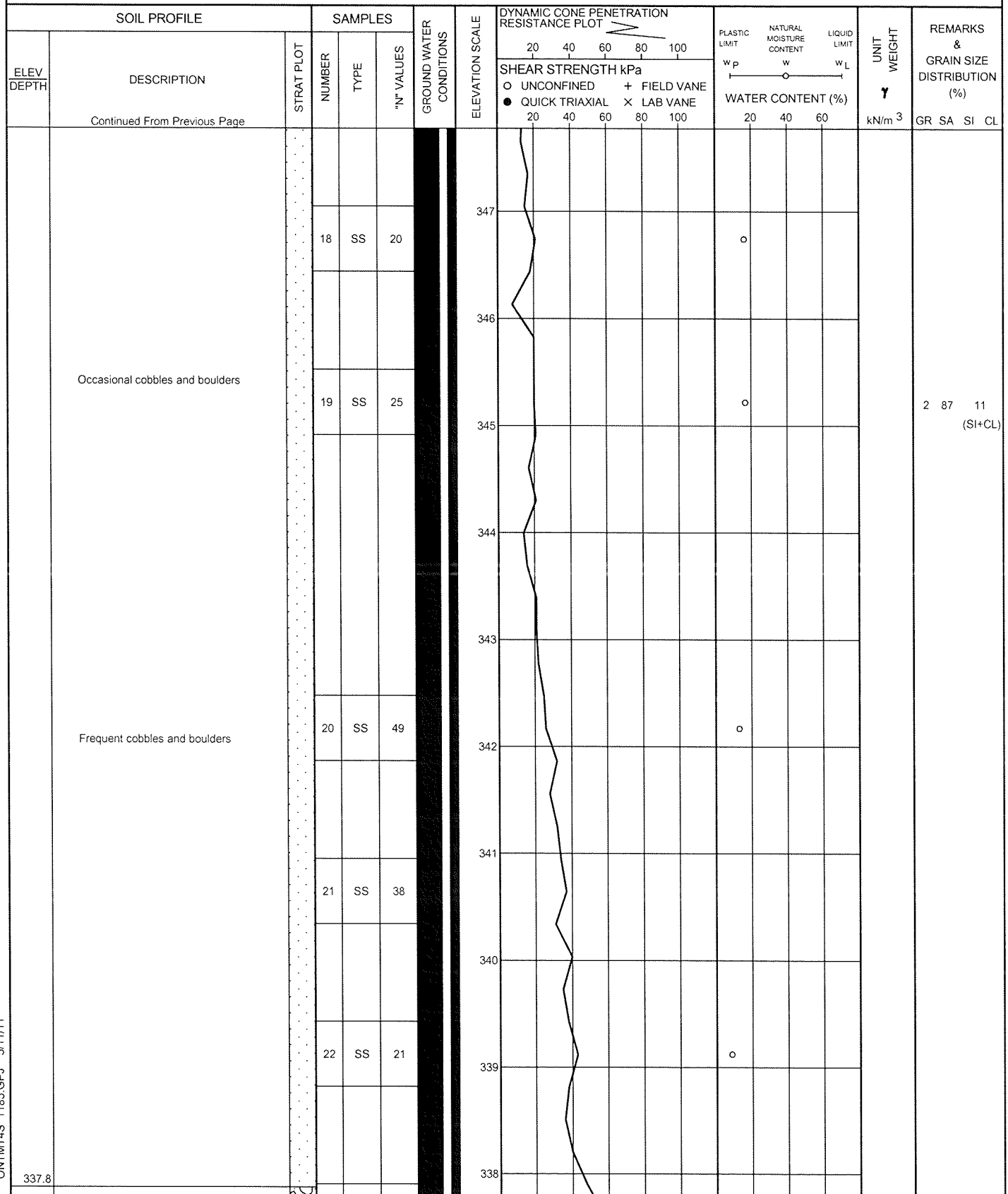
Continued Next Page

+³ × 3³ Numbers refer to
Sensitivity

20
15
10
5
0
5
10
15
20
(%) STRAIN AT FAILURE

METRIC

W.P.	93-89-00	LOCATION	Oxtongue Lake N 5 026 804.7 E 349 957.9	ORIGINATED BY	RK
HWY	17	BOREHOLE TYPE	Hollow Stem Augers and NQ/NW Mud Rotary	COMPILED BY	AN
DATUM	Geodetic	DATE	2010.09.09 - 2010.09.12	CHECKED BY	JL



Continued Next Page

+ ³, X ³: Numbers refer to Sensitivity

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-01

4 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 804.7 E 349 957.9 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers and NQ/NW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.09 - 2010.09.12 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
29.9	Continued From Previous Page SAND, GRAVEL, COBBLES and BOULDERS Very Dense Brown Wet		23	SS	65									
			24	SS	57									
			1	RUN										
			2	RUN										
331.6			25	SS	100/1000									
36.1	END OF BOREHOLE AT 36.1m. DCPT CONDUCTED 0.5m WEST OF BOREHOLE. END OF DCPT AT 33.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.09.14 3.8 363.9 2010.09.15 3.8 363.9 2010.09.17 3.8 363.9 2010.09.18 3.7 364.0 2010.09.19 3.7 364.0 2010.09.20 3.7 364.0 2010.10.15 3.5 364.2													

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-02

2 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 810.6 E 349 985.8 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.14 - 2010.09.15 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
	Continued From Previous Page													
355.7							357							
12.0	SILT, some clay Soft Grey Wet		2	SS	2		356					113		
							355							
							354							
							353	1.3						
352.4							352							
15.4	SAND and GRAVEL, with cobbles and boulders Loose to Compact Brown Wet		3	SS	12		351							
							350							
			4	SS	8		349							
							348							
			5	SS	23									53 45 2 (SI+CL)

ONTMT4S 1185.GPJ 6/17/11

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15 10 5
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-02

3 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 810.6 E 349 985.8 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.14 - 2010.09.15 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					
	Continued From Previous Page							20 40 60 80 100					
346.8			6	SS	12		347						
20.9	SAND, fine grained, trace silt, trace gravel, occasional cobbles Dense Brown Wet		7	SS	38		346						1 89 10 (SI+CL)
344.7			8	SS	100/.025		345					FI	
23.0	GRANITIC GNEISS, slightly weathered, thinly banded, white/grey bands, medium grained Joints at 23.1, 23.3m, 23.7m, 23.9m, 24.1m, 24.3m		1	RUN			344					1	RUN #1 TCR=100% SCR=100% RQD=100% UCS=196MPa
	Joints at 25.5m, 25.6m		2	RUN			343					0	RUN #2 TCR=100% SCR=85% RQD=85% UCS=158MPa
	Joints at 26.2m, 26.7m, 26.9m, 27.0m, 27.1m		3	RUN			342					0	RUN #3 TCR=100% SCR=93% RQD=93% UCS=190MPa
340.5							341					2	
27.2	END OF BOREHOLE AT 27.2m. BOREHOLE CAVED TO 9.0m WHILE PULLING CASING.											1	

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-03

1 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.7 E 350 016.8 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.17 - 2010.09.19 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
367.8	BRIDGE DECK													
0.0	ASPHALT: (80mm)													
0.1														
367.5	CONCRETE: (190mm)													
0.3														
							367							
							366							
							365							
							364							
363.9							363							
3.9	WATER 3.9m below top of bridge deck on Sep. 17, 2010						362							
							361							
							360							
							359							
358.9							358							
9.0	Organic SILT Soft Dark Brown Wet													

Continued Next Page

+ 3 . X 3 : Numbers refer to
Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-03

2 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.7 E 350 016.8 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.17 - 2010.09.19 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60					
Continued From Previous Page															
			1	SS	0		357								
			2	SS	0		356								
			3	SS	0		355								
			4	SS	0		354								
			5	SS	0		353								
			6	SS	0		352								
			7	SS	0		351								
			8	SS	0		350								
350.6	17.2														
349.6	18.3														
			9	SS	30		349								
							348								

Continued Next Page

+ 3, X 3: Numbers refer to Sensitivity
 20 15 10 5 (%) STRAIN AT FAILURE

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-03

3 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.7 E 350 016.8 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.17 - 2010.09.19 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			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 80 100	20 40 60 80 100		
	Continued From Previous Page											
345.6			10	SS	21		347					
22.3	Zone of loose, fine to medium grained sand		11	SS	19		346					
			12	SS	7		345					
343.8							344					
24.1			13	SS	37		343					
							342					
340.9							341					
27.0	GRANITIC GNEISS, slightly weathered, grey-white and black bands, medium grained Joints at 27.1m, 27.2m, 27.4m		1	RUN			340					
	Joints at 27.7m, 28.0m, 28.2m, 28.3m, 28.5m Joints at 29.3m, 29.5m, 29.6m, 29.7m, 29.8m, 30.1m		2	RUN			339					
			3	RUN			338					

Continued Next Page

+ 3, X 3: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

ONTMT4S 1185.GPJ 7/8/11

RECORD OF BOREHOLE No OX-03

4 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.7 E 350 016.8 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.17 - 2010.09.19 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
337.5	Continued From Previous Page														1		
30.3	<p>END OF BOREHOLE AT 30.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen.</p> <p>WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.09.20 3.8 364.0 2010.10.15 3.8 364.0</p>						337										

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-04

3 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 822.8 E 350 048.7 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.20 - 2010.09.22 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page													
			11	SS	15									
			12	SS	40									
344.7	Cobbles		13	SS	100									
23.2	GRANITIC GNEISS, slightly to moderately weathered, dark grey, medium grained Joints at 23.9m, 24.0m, 24.1m, 24.2m Joints at 24.5m, 24.6m, 24.9m, 25.1m, 25.3m, 25.4m, 25.5m, 25.6m, 25.7m, 26.0m		1	RUN										
			2	RUN										
			3	RUN										
341.8			4	RUN										
26.1	END OF BOREHOLE AT 26.1m. BOREHOLE CAVED TO 8.8m WHILE PULLING CASING.													

+ 3, X 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-05

1 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 827.9 E 350 075.7 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.10.16 - 2010.10.16 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
368.0								20	40	60	80	100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											</

Continued Next Page

+ ³ × ³ : Numbers refer to
Sensitivity

20
15
10
5
0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-05

2 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 827.9 E 350 075.7 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.10.16 - 2010.10.16 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
								20 40 60 80 100					
								20 40 60 80 100					
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ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-06

1 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 806.5 E 349 922.8 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.27 - 2010.09.27 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			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 80 100	20 40 60 80 100		
367.7 0.0	SAND, medium grained, some fine to loose to Compact Brown Moist (FILL)	X	1	SS	16	▽	367					3 92 4 (SI+CL)
			2	SS	7		366					
			3	SS	2		365					
365.6 2.1	SAND, fine to medium grained, trace silt to silty Very Loose to Dense Brown Moist to Wet	.	4	SS	37		364					
			5	SS	26		363					
			6	SS	14		362					
			7	SS	9		361					
			8	SS	3		360					
			9	SS	6		359					
			10	SS	3		358					
			11	SS	6							
												0 97 3 (SI+CL)

Continued Next Page

+³, X³: Numbers refer to
Sensitivity 20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-06

2 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 806.5 E 349 922.8 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.27 - 2010.09.27 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page													
356.5			12	SS	38		357							
11.3	END OF BOREHOLE AT 11.3m. WATER LEVEL AT 3.6m. BOREHOLE CAVED TO 4.7m WHILE PULLING CASING, THEN BACKFILLED WITH HOLEPLUG TO 2.0m, THEN CUTTINGS TO SURFACE. DCPT CONDUCTED 0.5m EAST OF BOREHOLE. END OF DCPT AT 13.7m.													

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-07

1 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 810.6 E 349 956.1 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.29 - 2010.10.01 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			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 80 100	20 40 60 80 100		
367.8												
0.0	ASPHALT: (100mm)											
0.1												
367.4	CONCRETE: (300mm)											
0.4												
	SAND and GRAVEL Compact to Dense Brown Moist (FILL)		1	SS	30		367					
			2	SS	45							45 51 4 (SI+CL)
			3	SS	42		366					
			4	SS	18							
							365					
			5	SS	11							
							364					
363.4			6	SS	17							
4.4							363					
	SILT, some clay, trace sand Very Stiff Grey Wet		7	SS	22							
			8	SS	23							0 2 84 14
361.7							362					
6.1												
	Silty SAND, fine grained Loose to Compact Brown Wet		9	SS	7		361					
			10	SS	10		360					
							359					
			11	SS	11							2 67 31 (SI+CL)
							358					

Continued Next Page

+ 3, X 3; Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-07

2 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 810.6 E 349 956.1 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.29 - 2010.10.01 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	WATER CONTENT (%) w p w w L			
357.6												
10.2	SAND and GRAVEL, trace silt Compact to Dense Brown Wet		12	SS	30		357		○			
							356					
			13	SS	18		355		○			
354.6												
13.3	SAND, fine to medium grained, trace to some gravel Compact to Very Dense Brown Wet		14	SS	20		354		○			
							353					
			15	SS	26		352					
							351		○			
			16	SS	18		350					
							349		○			
			17	SS	15		348					

Continued Next Page

+³, x³: Numbers refer to Sensitivity
20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-07

3 OF 4

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 810.6 E 349 956.1 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.29 - 2010.10.01 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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+ 3, X 3: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

METRIC

ELEV. DEPTH	SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w_p w w_L	WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI
	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE				
	Continued From Previous Page							20 40 60 80 100 					

[illegible]

ONTMT4S 1185.GPJ 5/11/11

+ ³, × ³: Numbers refer to Sensitivity

METRIC

ONTMT4S 1185.GPJ 5/11/11

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-08

2 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 815.1 E 349 984.4 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.10.02 - 2010.10.04 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	W _p	W	W _L	
								20 40 60 80 100	WATER CONTENT (%)			GR SA SI CL
355.4	with sand seams		2	SS	0		357				155	
12.5	SILT, some clay Very Soft Grey Wet		3	SS	0		356				125	0 48 43 9
352.5							355					
15.4	SAND and GRAVEL, occasional cobbles and boulders Compact to Dense Brown Wet		4	SS	15		354	+				
							353					
							352					
			5	SS	11		351					
							350					
			6	SS	16		349					
							348					

Continued Next Page

+³ x³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-08

3 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 815.1 E 349 984.4 ORIGINATED BY RK
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.10.02 - 2010.10.04 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page													
345.6			7	SS	21		347							
22.3	GRANITIC GNEISS, slightly weathered, pink/white and black/grey banded, medium grained Joints at 22.4m		8	SS	34		346							26 62 12 (SI+CL)
	Joints at 23.2m, 23.5m, 23.7m		1	RUN			345							RUN #1 TCR=100% SCR=100% ROD=100% UCS=113MPa (Average)
	Joints at 24.4m, 24.8m, 25.1m, 25.2m		2	RUN			344							RUN #2 TCR=100% SCR=100% ROD=63% UCS=171MPa (Average)
342.2			3	RUN			343							RUN #3 TCR=100% SCR=97% ROD=88% UCS=125MPa (Average)
25.6	END OF BOREHOLE AT 25.6m. BOREHOLE CAVED TO 8.6m WHILE PULLING CASING.													

+ ³, × ³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-09

1 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 829.1 E 350 019.5 ORIGINATED BY LG
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.24 - 2010.09.24 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	20	40					
364.0															
0.0	WATER						364								
							363								
							362								
							361								
							360								
							359								
358.6							358								
5.4	Organic SILT Very Soft Dark Brown Wet						357								
							356								
							355								
			1	SS	0										

Continued Next Page

+³ ×³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-09

2 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 829.1 E 350 019.5 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.24 - 2010.09.24 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page													
			2	SS	0		354							
							353							
			3	SS	0		352							
351.0							351							
13.0	Silty CLAY to clayey SILT, trace Sand Soft Grey Wet		4	SS	0		350							0 3 62 35
							349							
348.8			5	SS	8		348							0 1 81 18
15.2	SAND, fine grained, trace to some Impact Grey to Brown Wet		6	SS	23		347							
							346							
345.7			7	SS	16		345							
18.3	Silt lense													
345.1														
18.9	SAND and GRAVEL, occasional cobbles and boulders Compact to Very Dense Brown Wet		8	SS	21									33 53 14

Continued Next Page

+ 3, X 3: Numbers refer to
Sensitivity 20
15 5
10 (%) STRAIN AT FAILURE

METRIC

[illegible]

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-10

2 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 827.3 E 350 047.3 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.10.04 - 2010.10.06 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
	Continued From Previous Page														
355.8															
12.2	SILT, some clay Very Soft Grey Wet		2	SS	0										
354.3			3	SS	40/										
13.7	SAND and GRAVEL, occasional cobbles and boulders Dense to Compact Brown Wet				.050										
			4	SS	49										63 30 7 (SI+CL)
			5	SS	40										
			6	SS	14										70 26 4 (SI+CL)
348.6															
19.4	SAND, fine to medium grained Compact Brown Wet														

Continued Next Page

+ ³ , × ³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-10

3 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 827.3 E 350 047.3 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.10.04 - 2010.10.06 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		GR	SA	SI	CL
	Continued From Previous Page		7	SS	17		348										
							347										
			8	SS	18		346										
345.6																	
22.4	SAND and GRAVEL, with cobbles and boulders Very Dense Brown Wet		9	SS	100/ .100		345										
							344										
343.3																	
24.6	GRANITIC GNEISS, slightly weathered, pink/white and black/grey banded, medium grained		1	RUN			343										
	Joints at 24.8m, 25.0m, 25.3m, 25.4m, 25.5m, 25.7m																
							342										
	Joints at 26.2m, 26.3m		2	RUN													
							341										
	Joints at 27.3m, 27.4m, 27.8m, 28.0m, 28.3m		3	RUN			340										
339.6																	
28.4	END OF BOREHOLE AT 28.4m. BOREHOLE CAVED TO 8.8m WHILE PULLING CASING.																

ONTMT4S 1185 GPJ 9/21/11

+³ . X³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-11

1 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 837.2 E 350 081.1 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2010.10.06 - 2010.10.06 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
								20	40	60			80	100	20	40	60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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+³, ×³, Numbers refer to
Sensitivity 20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-11

2 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 837.2 E 350 081.1 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2010.10.06 - 2010.10.06 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										
Continued From Previous Page								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE										
								20	40	60	80	100						

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-12

1 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 812.7 E 349 921.7 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2010.09.25 - 2010.09.25 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			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 80 100	20 40 60 80 100		
365.8 0.0	SAND, fine to coarse grained, trace gravel Compact to Loose Brown Moist to Wet											
			1	SS	23		365					
			2	SS	18		364					9 88 3 (SI+CL)
			3	SS	8		363					
			4	SS	8		362					
			5	SS	13		361					
361.3 4.5	SAND and GRAVEL, trace silt Compact to Very Dense Brown Wet		6	SS	40		360					
			7	SS	28		359					
			8	SS	28		358					41 55 4 (SI+CL)
			9	SS	36		357					
			10	SS	66							29 67 4 (SI+CL)
356.1 9.8	END OF BOREHOLE AT 9.8m.											

ONTMT4S 1185.GPJ 5/11/11

Continued Next Page

+³ ×³: Numbers refer to Sensitivity
 20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-12

2 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 812.7 E 349 921.7 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2010.09.25 - 2010.09.25 CHECKED BY JL

SOIL PROFILE			SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	20 40 60 80 100			20 40 60 80 100	W _P W W _L	20 40 60							
	Continued From Previous Page BOREHOLE BACKFILLED WITH HOLEPLUG TO 3.0m, THEN CUTTINGS TO SURFACE.																	

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RECORD OF BOREHOLE No OX-13

1 OF 5

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.0 E 349 933.5 ORIGINATED BY RK/LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers, HQ/HW and NQ/NW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.25 - 2010.09.26 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			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 80 100	20 40 60 80 100		
365.5 0.0	SAND, fine grained, some silt Loose to Compact Brown Moist to Wet		1	SS	21		365					0 90 10 (SI+CL)
			2	SS	20		364					
			3	SS	12		363					
			4	SS	15		362					
			5	SS	6		361					
			6	SS	12		360					
359.9 5.6	SAND, fine to coarse grained, trace silt, trace gravel Compact to Dense Brown Wet		7	SS	20		359					1 96 3 (SI+CL)
			8	SS	17		358					
			9	SS	18		357					
							356					

Continued Next Page

+ 3 X 3: Numbers refer to
Sensitivity

20
15 10 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-13

2 OF 5

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.0 E 349 933.5 ORIGINATED BY RK/LG
HWY 17 BOREHOLE TYPE Hollow Stem Augers, HQ/HW and NQ/NW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.25 - 2010.09.26 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60					
	Continued From Previous Page														
352.3			10	SS	40										
			11	SS	27										
13.3	SAND and GRAVEL, trace silt Compact to Very Dense Brown Wet		12	SS	55										62 33 5 (SI+CL)
			13	SS	41										
			14	SS	23										
			15	SS	53										
346.2	Silty SAND, fine grained Compact to Dense Brown Wet														
19.4															

Continued Next Page

+ ³ . X ³ : Numbers refer to
Sensitivity 20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-13

3 OF 5

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.0 E 349 933.5 ORIGINATED BY RK/LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers, HQ/HW and NQ/NW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.25 - 2010.09.26 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page		16	SS	38									0 66 34 (SI+CL)
							345							
			17	SS	31		344							
							343							
			18	SS	47		342							
							341							
			19	SS	28		340							
340.0							339							
25.5	SAND, fine to coarse grained, trace gravel Dense Brown Wet		20	SS	32		338							
							337							
337.0			21	SS	38		336							
28.5	SAND and GRAVEL, with cobbles and boulders Dense to Very Dense Brown Wet		22	SS	83									69 27 4 (SI+CL)

Continued Next Page

+ 3, X 3: Numbers refer to Sensitivity 20 15 10 (% STRAIN AT FAILURE

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RECORD OF BOREHOLE No OX-13

4 OF 5

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.0 E 349 933.5 ORIGINATED BY RK/LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers, HQ/HW and NQ/NW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.25 - 2010.09.26 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
	Continued From Previous Page							20 40 60 80 100						
	frequent cobbles and boulders		23	SS	49			335						
									334					
										333				
					24	SS	76			332				
										331				
								330						
								329						
328.2			1	RUN				328						
37.3	GRANITIC GNEISS, slightly weathered, banded, white/pink and black quartz, medium grained Joints at 37.4m, 37.5m		2	RUN				327						
	Joints at 37.9m								326					
			3	RUN										
	Joints at 39.6m, 39.8m, 40.1m, 40.2m, 40.5m													

Continued Next Page

+ 3. x 3. Numbers refer to
Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-13

5 OF 5

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 816.0 E 349 933.5 ORIGINATED BY RK/LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers, HQ/HW and NQ/NW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.25 - 2010.09.26 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page		4	RUN													
324.6	Rubble zone from 40.6m to 40.7m					325											
40.9	END OF BOREHOLE AT 40.9m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.10.02 0.9 364.6 2010.10.14 1.1 364.4 2010.10.15 1.0 364.5 2010.11.02 0.9 364.6 2010.11.22 0.9 364.6																

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-14

2 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 829.8 E 349 979.1 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.22 - 2010.09.23 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
								20 40 60 80 100					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					
Continued From Previous Page						20 40 60 80 100			PLASTIC LIMIT w _p NATURAL MOISTURE CONTENT w LIQUID LIMIT w _L WATER CONTENT (%)				
353.2	Silty CLAY , trace sand Very Soft to Firm Grey Wet		2	SS	0	354							0 4 72 24
10.8							353						
			3	SS	5		352						
351.0	SAND , fine to coarse grained, some gravel, trace silt, occasional cobbles Compact to Very Dense Brown Wet					351							10 87 3 (SI+CL)
13.0			4	SS	10		350						
			5	SS	60		349						
			6	SS	29	348							
						347							
346.0	SAND and GRAVEL , with cobbles and boulders Very Dense Brown Wet		7	SS	100/ .025	346							
18.0							345						
			8	SS	100/ .025								

Continued Next Page

+ ³, × ³; Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-14

3 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 829.8 E 349 979.1 ORIGINATED BY LG
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.22 - 2010.09.23 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	W _P W W _L	20 40 60	WATER CONTENT (%)				
	Continued From Previous Page														
					.125		344								
			9	SS	100/ .175		343								
							342								
341.1							341						FI		
22.9	GRANITIC GNEISS, moderately to slightly weathered, black/red, medium grained, strong to very strong		1	RUN			340						15		RUN #1 TCR=100% SCR=73% RQD=33% UCS=100MPa
	Joints every 100 to 150mm between 22.8m to 25.0m												3		
	Joints at 25.5 and 25.7m		2	RUN			339						3		RUN #2 TCR=100% SCR=100% RQD=90% UCS=151MPa
338.1													10		
													1		
													2		
													3		
25.9	END OF BOREHOLE AT 25.9m. BOREHOLE CAVED TO 5.1m WHILE PULLING CASING.												3		

+ 3, × 3: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-15

1 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 838.4 E 350 024.0 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.20 - 2010.09.22 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
364.0 0.0	WATER													
363														
362														
361														
360														
359														
358.7 5.3	Organic SILT Very Soft Dark Brown Wet		1	SS	0								475	
357														
356														
355			2	SS	0								404	

Continued Next Page

+³ × 3³ Numbers refer to 20
Sensitivity 15 10 6 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-15

2 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 838.4 E 350 024.0 ORIGINATED BY LG
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.20 - 2010.09.22 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W P W L	W P W L	20 40 60		
353.4	Continued From Previous Page		3	SS	0									
10.6	Silty CLAY to clayey SILT, trace sand Very Soft to Very Stiff Grey Wet		4	SS	4									
			5	SS	19									0 1 75 24
348.5			6	SS	24									2 5 81 12
15.5	SAND, fine to coarse grained, some gravel, trace silt Compact Brown Wet		7	SS	12									
			8	SS	18									15 83 2 (SI+CL)
344.2														
19.8	SAND and GRAVEL, with cobbles													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity 20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OX-15

3 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 838.4 E 350 024.0 ORIGINATED BY LG
HWY 17 BOREHOLE TYPE HQ/HW Mud Rotary COMPILED BY AN
DATUM Geodetic DATE 2010.09.20 - 2010.09.22 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
	Continued From Previous Page													
339.7	and boulders Very Dense Brown Wet		9	SS	100/ .075		344							
							343							
							342							
							341							
							340							
24.3	GRANITE GNEISS, fresh, black/pink banded, medium grained, very strong Joints at 24.7m, 25.1m		1	RUN			339						FI 1	RUN #1 TCR=100% UCS=107MPa
	Joints at 25.7m, 26.0m, 26.1m, 26.2m, 26.7m		2	RUN			338						1	RUN #2 TCR=100% SCR=100% RQD=58% UCS=148MPa
	Joints at 26.7m, 27.0m, 27.2m, 27.3m, 27.5m, 27.6m, 27.7m, 27.8m, 27.9m, 28.0m		3	RUN			337						5	RUN #3 TCR=100% SCR=97% RQD=35% UCS=143MPa
335.2	Joint at 28.4m Highly jointed from 28.5m to 28.8m		4	RUN			336						3	RUN #4 TCR=100% SCR=75% RQD=29% UCS=215MPa
28.8	END OF BOREHOLE AT 28.8m. BOREHOLE CAVED TO 5.3m WHILE PULLING CASING.													

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-16

1 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 832.4 E 350 072.0 ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers and HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.10.07 - 2010.10.13 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
368.1								20 40 60 80 100							
0.0	ASPHALT: (100mm)						368								
0.1	CONCRETE: (300mm)														
367.7															
0.4	SAND and GRAVEL Compact to Dense Brown Moist (FILL)		1	SS	13		367								
			2	SS	27										
							366								
			3	SS	31										34 62 4 (SI+CL)
			4	SS	21		365								
364.4															
3.7	Gravelly SAND, medium to coarse grained, trace to some silt, occasional cobbles and boulders Compact to Very Dense Brown Moist to Wet		5	SS	86/ 125		364								
			6	SS	100/ 100		363								27 63 10 (SI+CL)
			7	SS	12										24 70 6 (SI+CL)
			8	SS	23		362								
							361								
			9	SS	22		360								
			10	SS	100		359								

Continued Next Page

+ ³ , X ³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

METRIC

SOIL PROFILE					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES	GROUND WATER CONDITIONS	ELEVATION SCALE
			NUMBER	TYPE	"N" VALUES
Continued From Previous Page					
352.8			11	SS	39/ .075
356			12	SS	56
355			13	SS	51
353			14	SS	100, 100
352	GRANITIC GNEISS, slightly weathered, dark grey and white/pink, banded, medium grained Joints at 15.5m, 15.6m, 15.8m, 15.9m, 16.1m, 16.2m, 16.3m Joints at 17.0m, 17.3m, 17.5m, 17.7m, 17.8m Joints at 18.1m 18.3m, 18.5m		1	RUN	
351			2	RUN	
350			3	RUN	
349.5	END OF BOREHOLE AT 18.6m. BOREHOLE CAVED TO 4.6m WHILE PULLING CASING, THEN BACKFILLED WITH HOLEPLUG TO 3.3m, THEN CUTTINGS TO 0.4m, CONCRETE TO 0.1m THEN ASPHALT COLD PATCH TO SURFACE.				
18.6					

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No OX-17

1 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 847.1 E 350 068.9 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers and HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.17 - 2010.09.19 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)						
365.5															
0.0	SAND and GRAVEL to SAND, some gravel, trace to some silt, occasional cobbles and boulders Compact to Very Dense Brown Moist DCPT conducted 0.5m South of Borehole OX-17 from 1.5m to 4.2m														
			1	SS	31										34 51 15 (SI+CL)
			2	SS	44										
			3	SS	46										
			4	SS	100/ .050										
			5	SS	23										
			6	SS	21										50 44 6 (SI+CL)
			7	SS	100/ .075										
			8	SS	53										
			9	SS	58										

Continued Next Page

+ 3, X 3: Numbers refer to Sensitivity
 20
 15 10 5 0
 (%) STRAIN AT FAILURE

ONTMT4S 1185.GPJ 5/11/11

METRIC

+³, ×³: Numbers refer to Sensitivity

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-17

3 OF 3

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 847.1 E 350 068.9 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers and HQ/HW Mud Rotary COMPILED BY AN
 DATUM Geodetic DATE 2010.09.17 - 2010.09.19 CHECKED BY JL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL																																			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20 40 60 80 100						20 40 60 80 100																																		
	Continued From Previous Page with a 1.52m slotted screen.																																															
	WATER LEVEL READINGS: <table border="1"> <thead> <tr> <th>DATE</th> <th>DEPTH (m)</th> <th>ELEV. (m)</th> </tr> </thead> <tbody> <tr><td>2010.09.20</td><td>1.5</td><td>364.0</td></tr> <tr><td>2010.09.23</td><td>1.5</td><td>364.0</td></tr> <tr><td>2010.09.24</td><td>1.5</td><td>364.0</td></tr> <tr><td>2010.09.25</td><td>1.5</td><td>364.0</td></tr> <tr><td>2010.09.26</td><td>1.4</td><td>364.1</td></tr> <tr><td>2010.09.27</td><td>1.4</td><td>364.1</td></tr> <tr><td>2010.10.02</td><td>1.3</td><td>364.2</td></tr> <tr><td>2010.10.14</td><td>1.5</td><td>364.0</td></tr> <tr><td>2010.10.15</td><td>1.5</td><td>364.0</td></tr> <tr><td>2010.11.02</td><td>1.4</td><td>364.1</td></tr> <tr><td>2010.11.22</td><td>1.4</td><td>364.1</td></tr> </tbody> </table>	DATE	DEPTH (m)	ELEV. (m)	2010.09.20	1.5	364.0	2010.09.23	1.5	364.0	2010.09.24	1.5	364.0	2010.09.25	1.5	364.0	2010.09.26	1.4	364.1	2010.09.27	1.4	364.1	2010.10.02	1.3	364.2	2010.10.14	1.5	364.0	2010.10.15	1.5	364.0	2010.11.02	1.4	364.1	2010.11.22	1.4	364.1											
DATE	DEPTH (m)	ELEV. (m)																																														
2010.09.20	1.5	364.0																																														
2010.09.23	1.5	364.0																																														
2010.09.24	1.5	364.0																																														
2010.09.25	1.5	364.0																																														
2010.09.26	1.4	364.1																																														
2010.09.27	1.4	364.1																																														
2010.10.02	1.3	364.2																																														
2010.10.14	1.5	364.0																																														
2010.10.15	1.5	364.0																																														
2010.11.02	1.4	364.1																																														
2010.11.22	1.4	364.1																																														

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-18

1 OF 1

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 850.2 E 350 084.4 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers and HQ/HW Washbore COMPILED BY AN
 DATUM Geodetic DATE 2010.09.17 - 2010.09.17 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
365.5	TOPSOIL: (50mm)													
365.5	SILT, some clay, trace sand Dense to Compact Grey Moist		1	SS	38									
364			2	SS	23									0 4 84 12
363	Occasional sand seams		3	SS	18									
362			4	SS	16									
361.6			5	SS	6									
361	SILT, occasional layers of sand, some clay Loose to Compact Grey Wet		6	SS	12									0 28 61 11
359.9			7	SS	22									
359	SAND and GRAVEL, trace silt, with cobbles and boulders Compact to Very Dense Grey Wet		8	SS	100/ 275									70 23 7 (SI+CL)
358			9	SS	100/ .050									
357														
356.3														
9.2	END OF BOREHOLE AT 9.2m. BOREHOLE BACKFILLED WITH CUTTINGS AND BENTONITE TO SURFACE.													

+³ ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

ONTMT4S 1185.GPJ 7/6/11

RECORD OF BOREHOLE No OX-18A

2 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 849.9 E 350 089.7 ORIGINATED BY LG
HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
DATUM Geodetic DATE 2010.09.17 - 2010.09.17 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page							20 40 60 80 100						
353.8							355							
11.7	END OF DCPT AT 11.7m.						354							

ONTMT4S 1185.GPJ 5/11/11

RECORD OF BOREHOLE No OX-19

1 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 851.0 E 350 119.1 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2010.09.16 - 2010.09.16 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
365.6														
0.0	TOPSOIL: (150mm)													
0.2	SILT, some clay, with fine sand seams Compact Brown Moist		1	SS	30									
			2	SS	28									0 16 73 11
			3	SS	11									
362.7														
3.0	SAND and GRAVEL Compact to Very Loose Brown Wet		4	SS	11									
			5	SS	2									
360.0														
5.6	SAND, fine to coarse grained, some gravel, occasional cobbles and boulders Loose to Dense Brown Wet		6	SS	5									0 97 3 (SI+CL)
			7	SS	10									
			8	SS	46									
355.9														
9.8	END OF BOREHOLE AT 9.8m.													

Continued Next Page

+ 3 . × 3 : Numbers refer to
Sensitivity 20
15 5
10 (%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No OX-20

1 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 851.5 E 350 095.7 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2010.09.17 - 2010.09.17 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
							20 40 60 80 100							
365.7														
0.0	TOPSOIL: (150mm)													
0.2	SILT, some clay, trace sand, with occasional fine sand layers Compact to Loose Grey Moist		1	SS	11									
			2	SS	19									
			3	SS	14									
			4	SS	15									0 3 84 13
			5	SS	9									
			6	SS	9									0 14 76 10
360.1														
5.6	Gravelly SAND, fine to coarse grained, trace to some silt, occasional cobbles Loose to Dense Brown Wet		7	SS	6									
			8	SS	17									31 58 11 (SI+CL)
			9	SS	42									
355.9														
9.8	END OF BOREHOLE AT 9.8m UPON													

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

ONTMT4S 1185.GPJ 9/19/11

RECORD OF BOREHOLE No OX-20

2 OF 2

METRIC

W.P. 93-89-00 LOCATION Oxtongue Lake N 5 026 851.5 E 350 095.7 ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2010.09.17 - 2010.09.17 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
							20	40	60	80	100	W _P	W	W _L			
	Continued From Previous Page																
	AUGER REFUSAL. BOREHOLE BACKFILLED WITH CUTTINGS AND HOLEPLUG TO SURFACE.																

ONTMT-4S 1185.GPJ 9/19/11

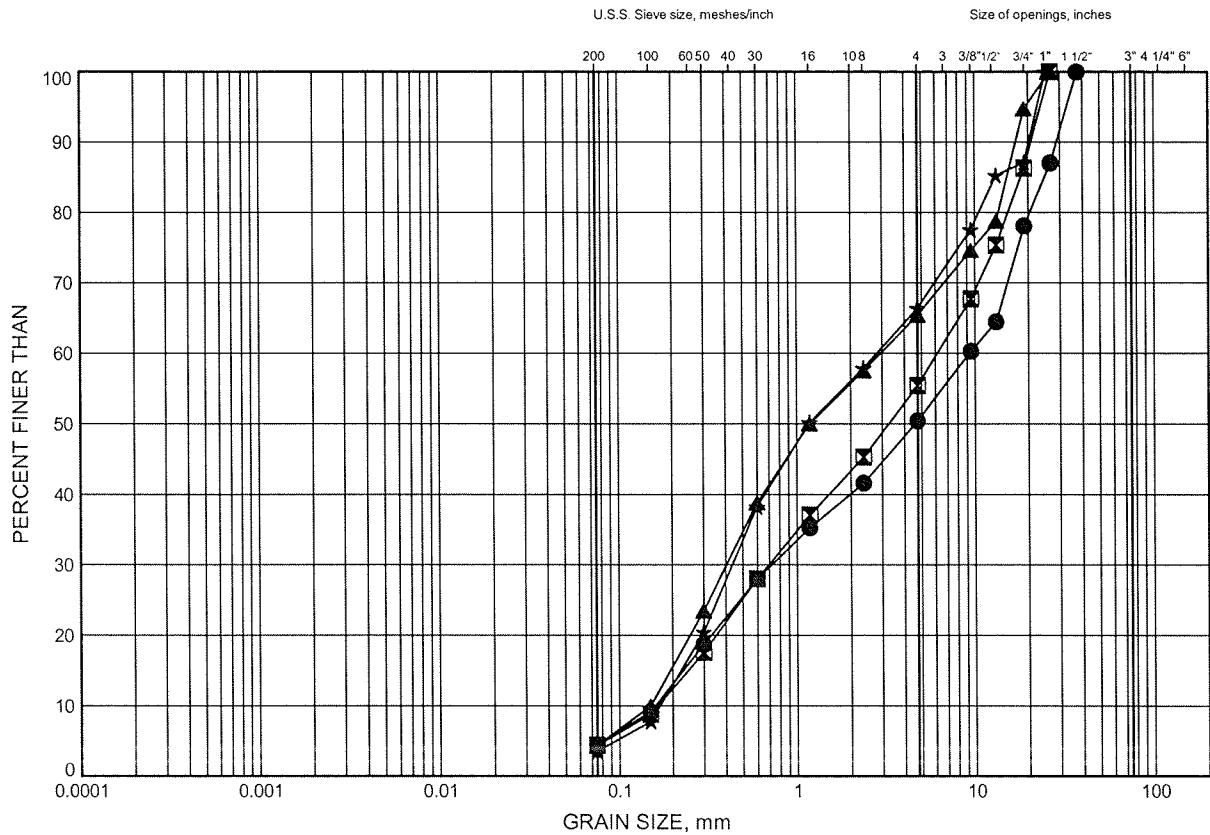
Appendix B

Laboratory Test Results

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B1

Sand to Sand & Gravel Fill



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-05	1.32	366.63
■	OX-07	1.32	366.50
▲	OX-11	1.07	367.44
★	OX-16	2.59	365.47

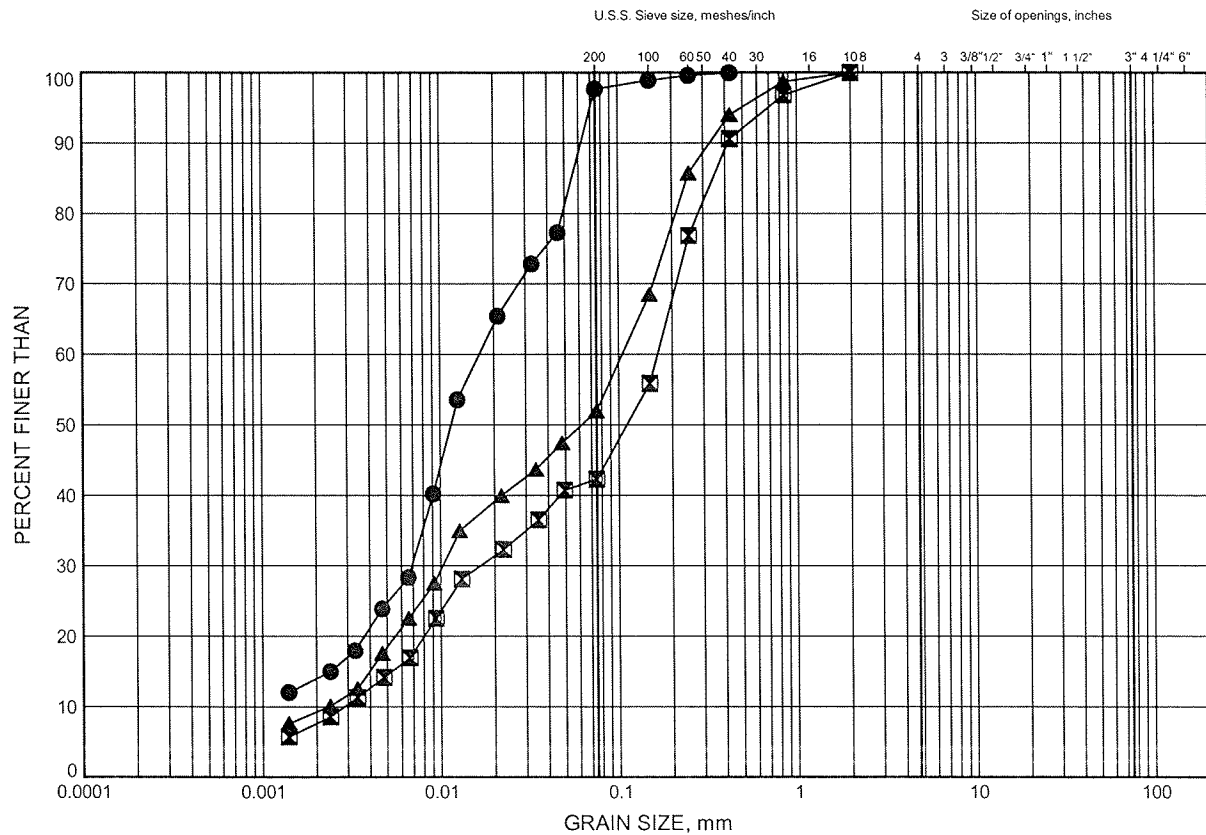


W.P.# 93-89-00
Prepared By MFA
Checked By MRA

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B2

Organic Silt



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

LEGEND

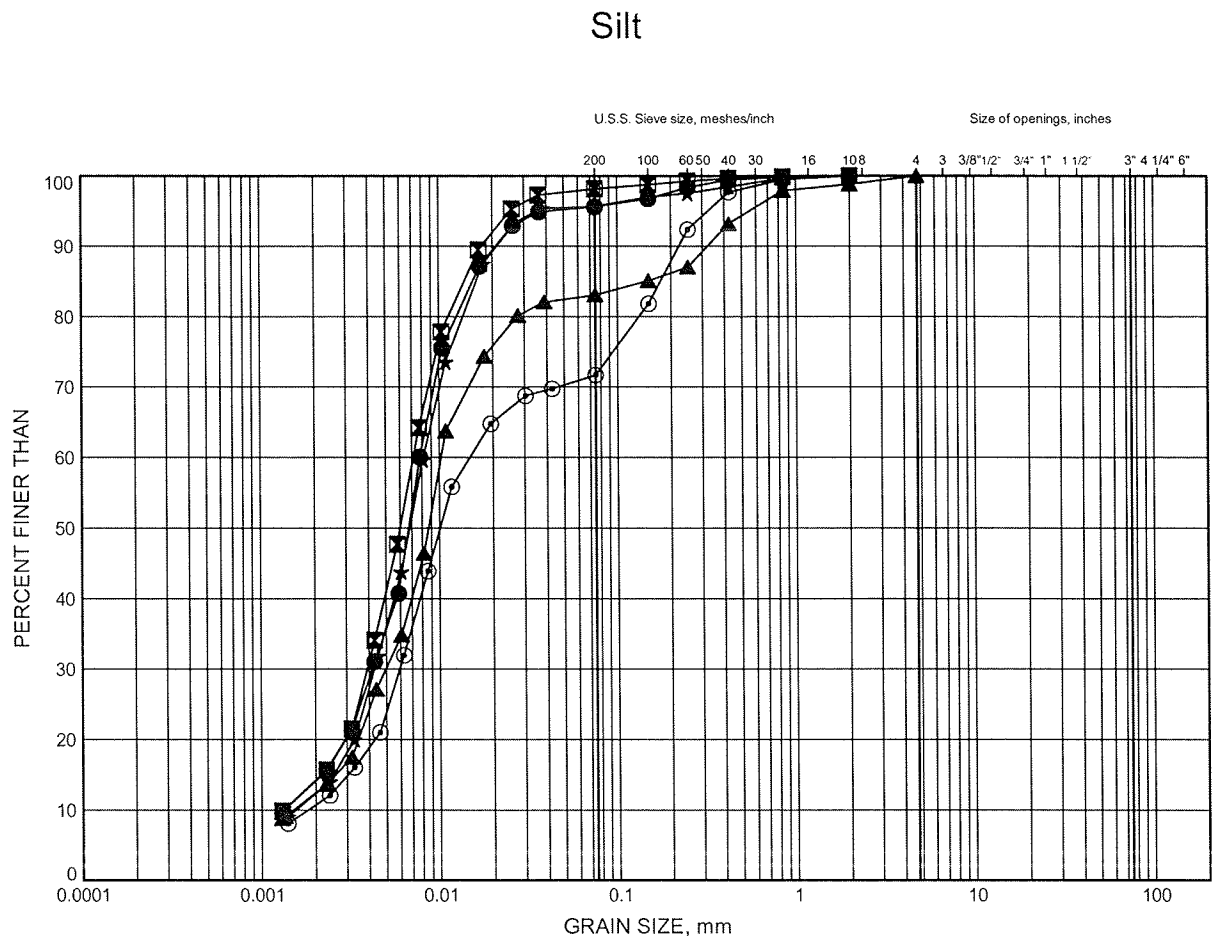
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-03	16.99	350.85
■	OX-04	11.73	356.14
▲	OX-08	12.34	355.51



W.P.# 93-89-00
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Checked By MRA

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B3



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-01	5.64	362.05
⊠	OX-07	5.49	362.34
▲	OX-11	4.88	363.63
★	OX-18	1.83	363.67
⊙	OX-18	4.88	360.62

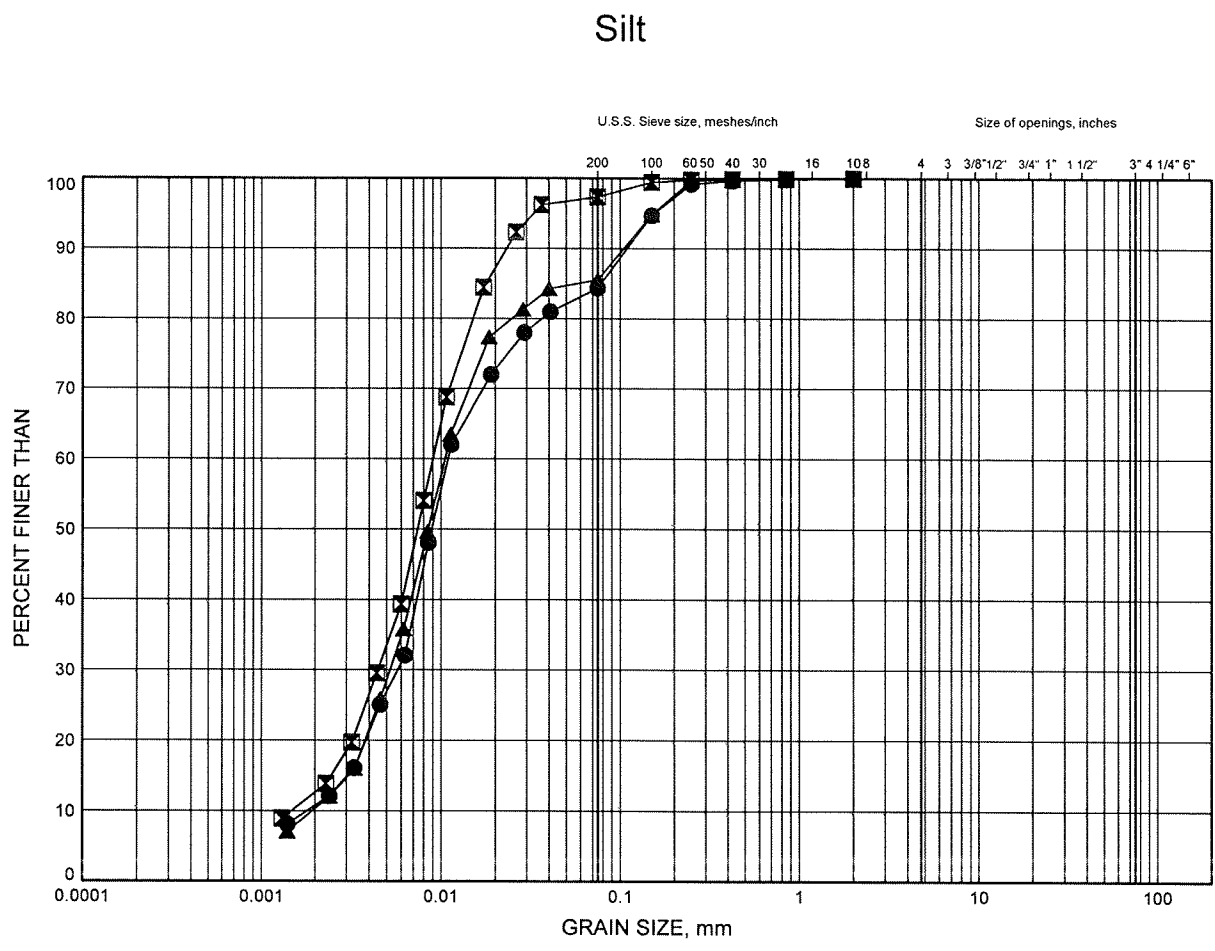


W.P.# 93-89-00
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Checked By MRA

Oxtongue Lake Bridge Replacement

GRAIN SIZE DISTRIBUTION

FIGURE B4



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-19	1.83	363.79
⊠	OX-20	3.35	362.35
▲	OX-20	4.88	360.82



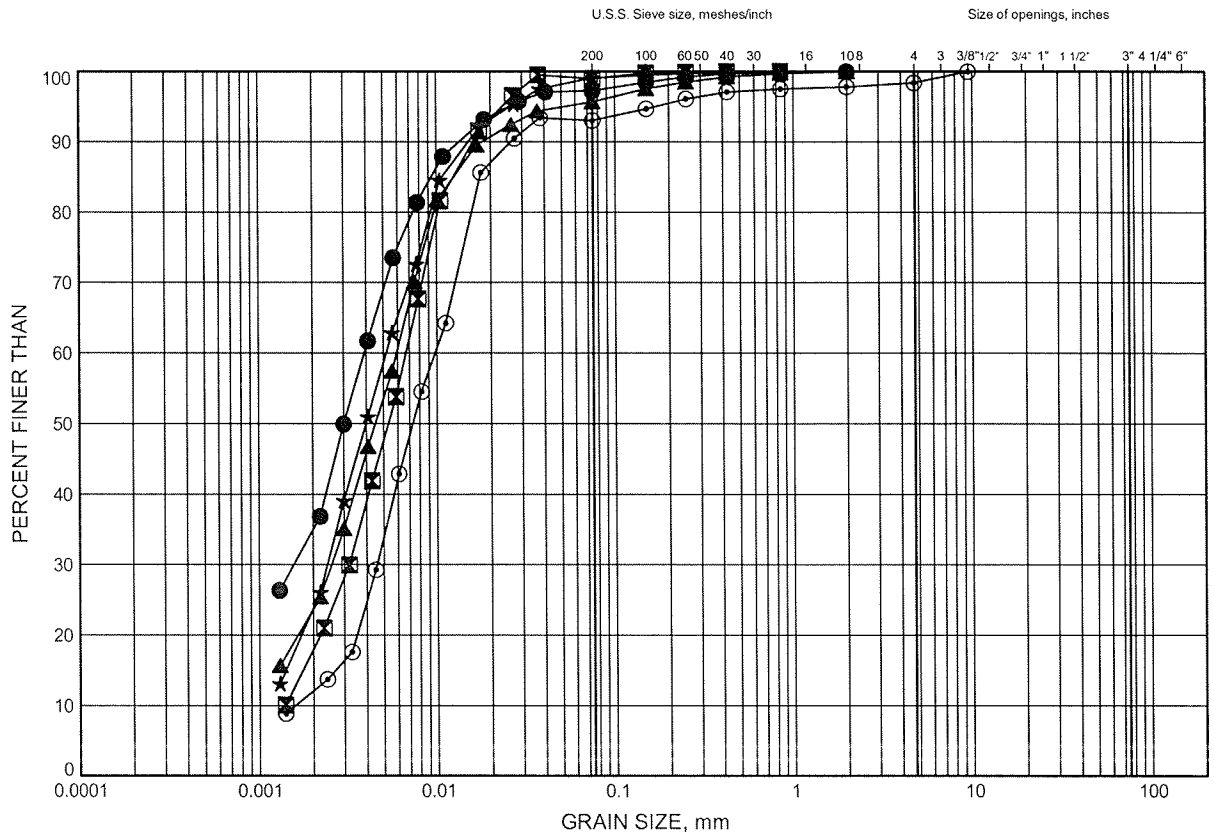
W.P.# 93-89-00
 Prepared By MFA
 Checked By MRA

GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 9/19/11

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B5

Silty Clay to Clayey Silt



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-09	13.72	350.28
■	OX-09	15.24	348.76
▲	OX-14	12.19	351.81
★	OX-15	13.72	350.28
⊙	OX-15	15.20	348.80

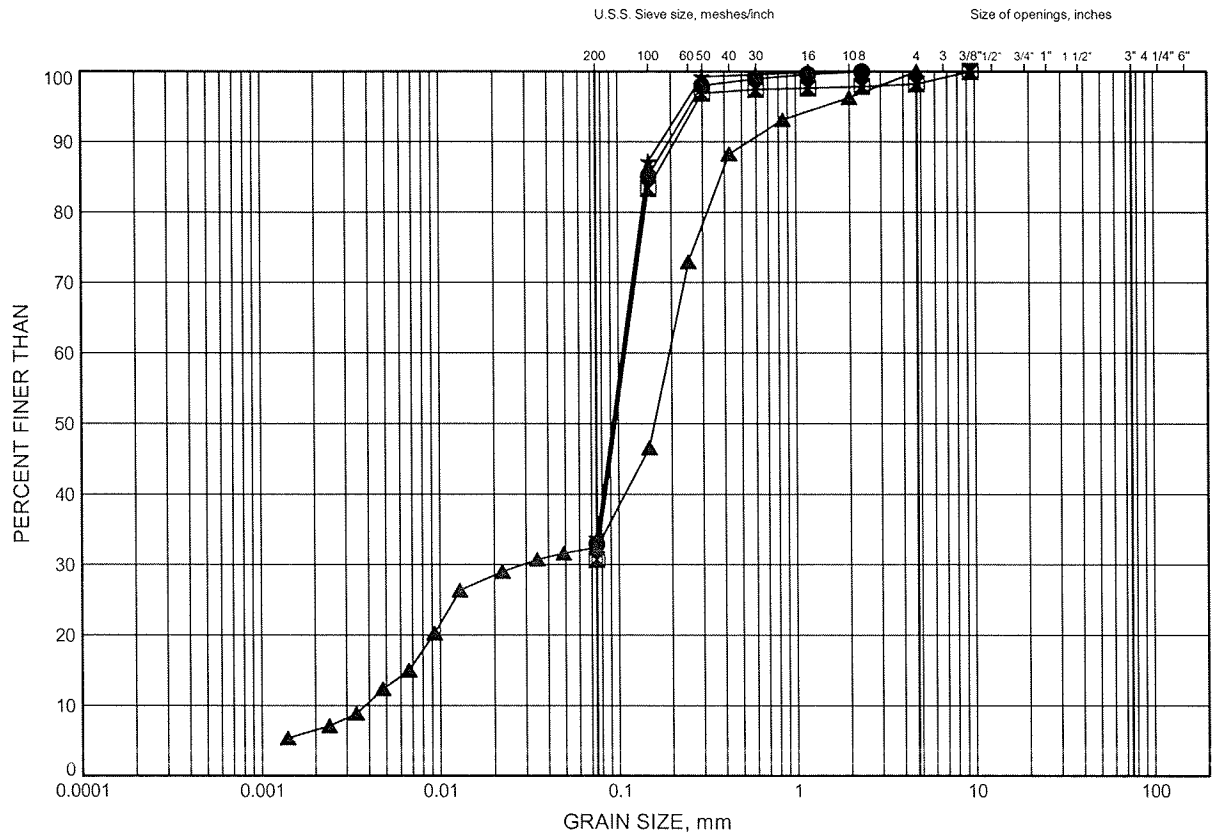


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Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B6

Silty Sand



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

LEGEND

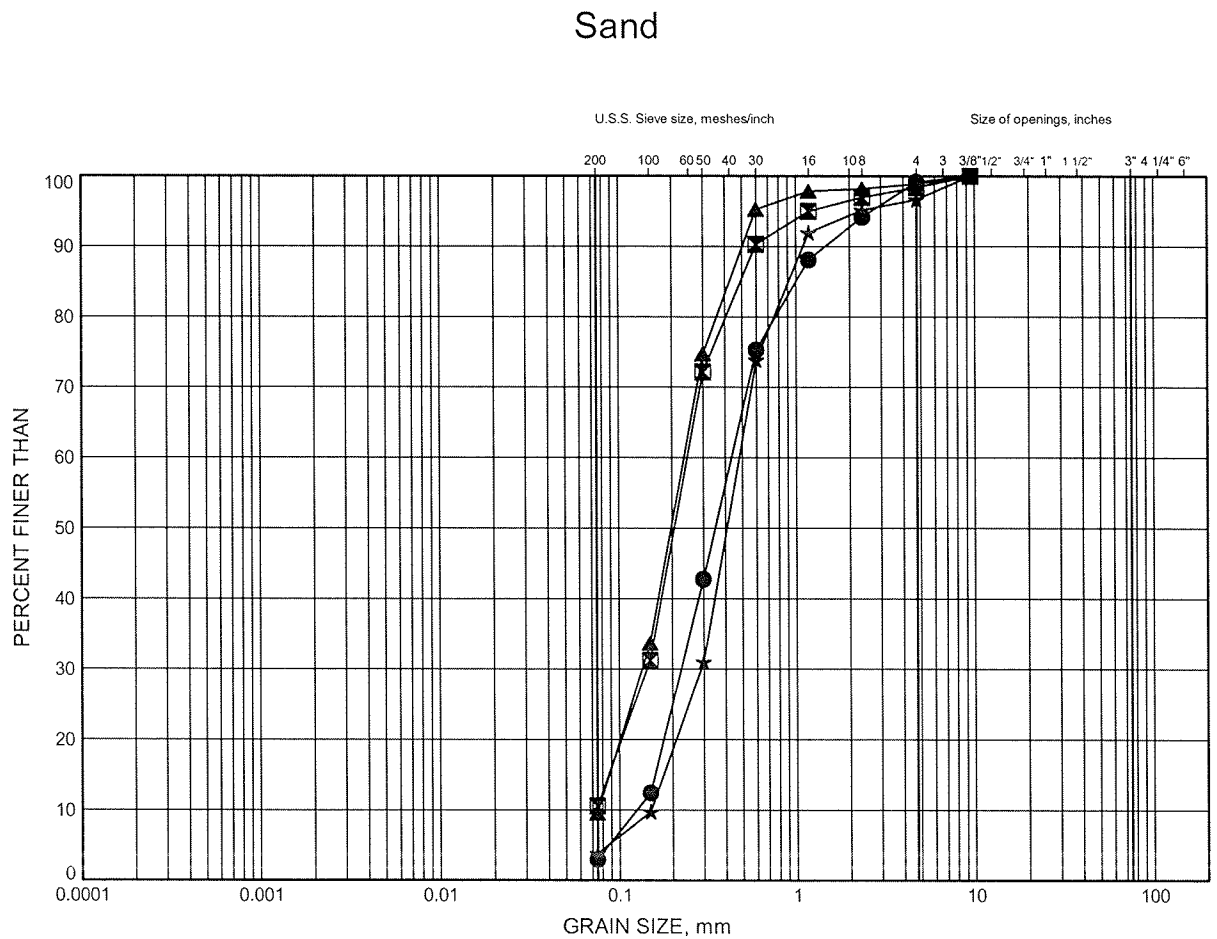
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-01	9.45	358.24
⊠	OX-07	9.45	358.37
▲	OX-11	7.92	360.58
★	OX-13	20.12	345.40



W.P.# 93-89-00
Prepared By MFA
Checked By MRA

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B7



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-01	16.46	351.23
■	OX-01	22.56	345.13
▲	OX-02	21.64	346.11
★	OX-03	23.16	344.68

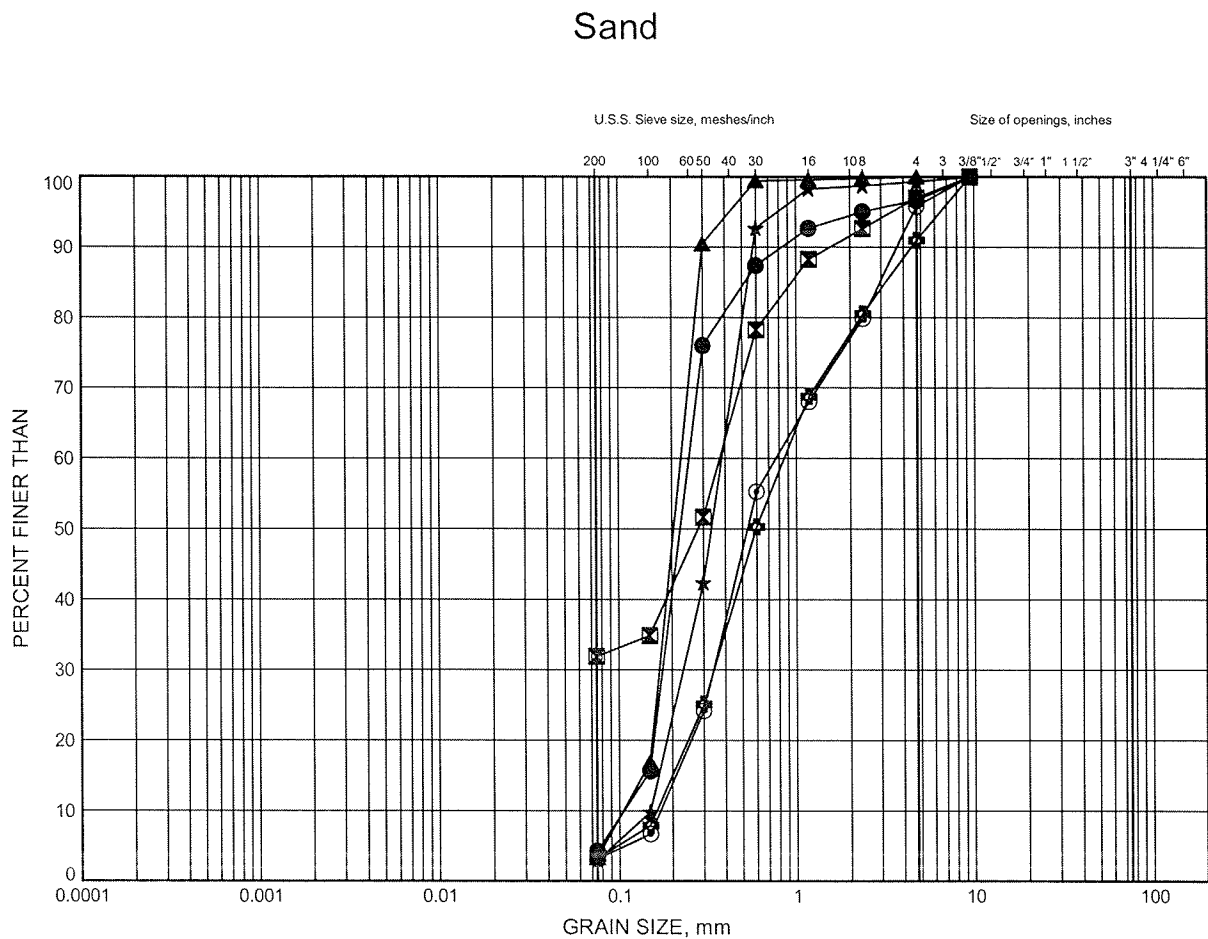
GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 6/17/11

W.P.# .93-89-00.....
Prepared By MFA.....
Checked By MRA.....



Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B8



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

LEGEND

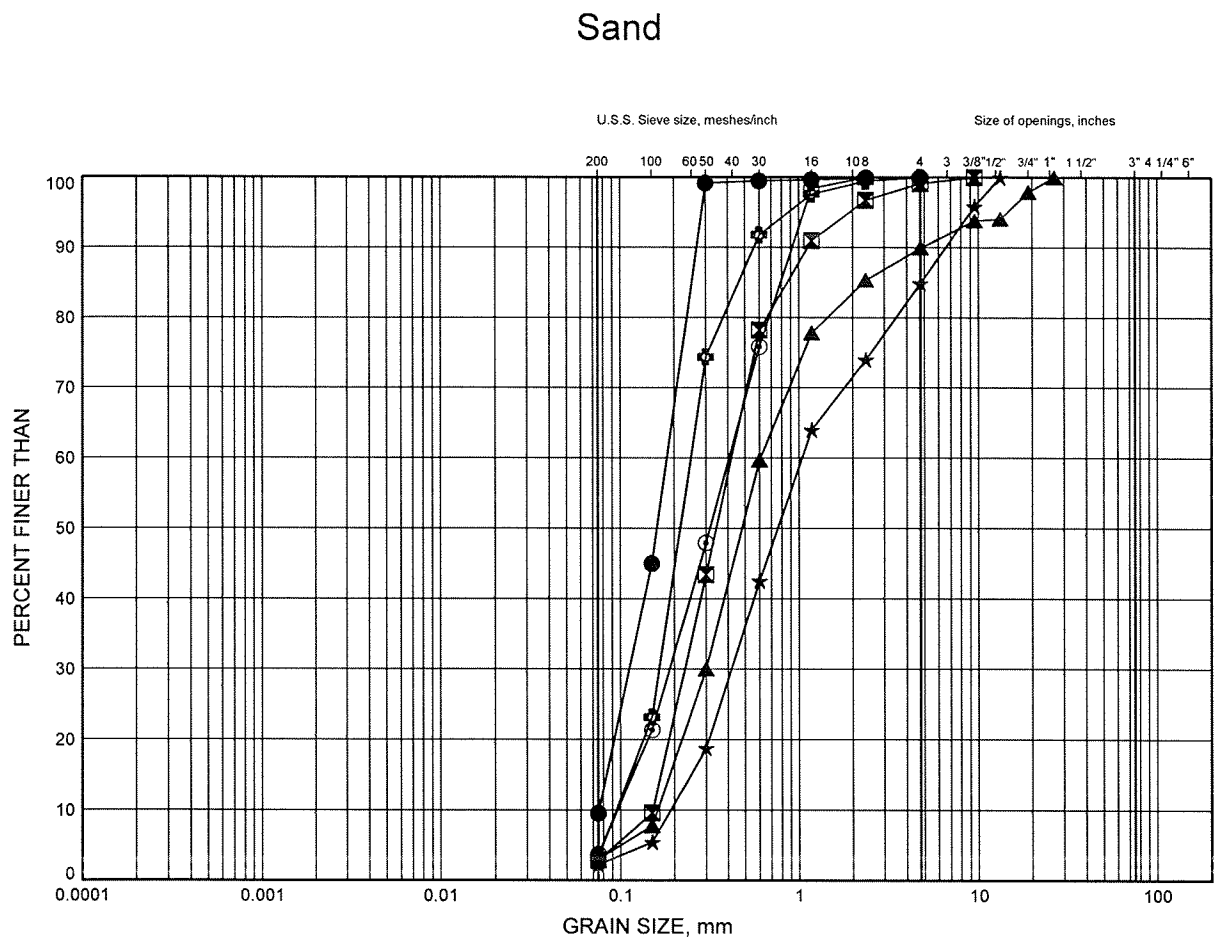
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-06	4.11	363.63
⊠	OX-06	6.40	361.34
▲	OX-06	9.45	358.30
★	OX-07	20.12	347.71
⊙	OX-10	20.12	347.86
⊗	OX-12	1.83	363.99



W.P.# 93-89-00
Prepared By MFA
Checked By MRA

Oxtongue Lake Bridge Replacement
GRAIN SIZE DISTRIBUTION

FIGURE B9



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-13	3.35	362.16
⊠	OX-13	9.45	356.06
▲	OX-14	15.24	348.76
★	OX-15	18.29	345.71
⊙	OX-16	12.50	355.57
⊞	OX-19	6.40	359.22

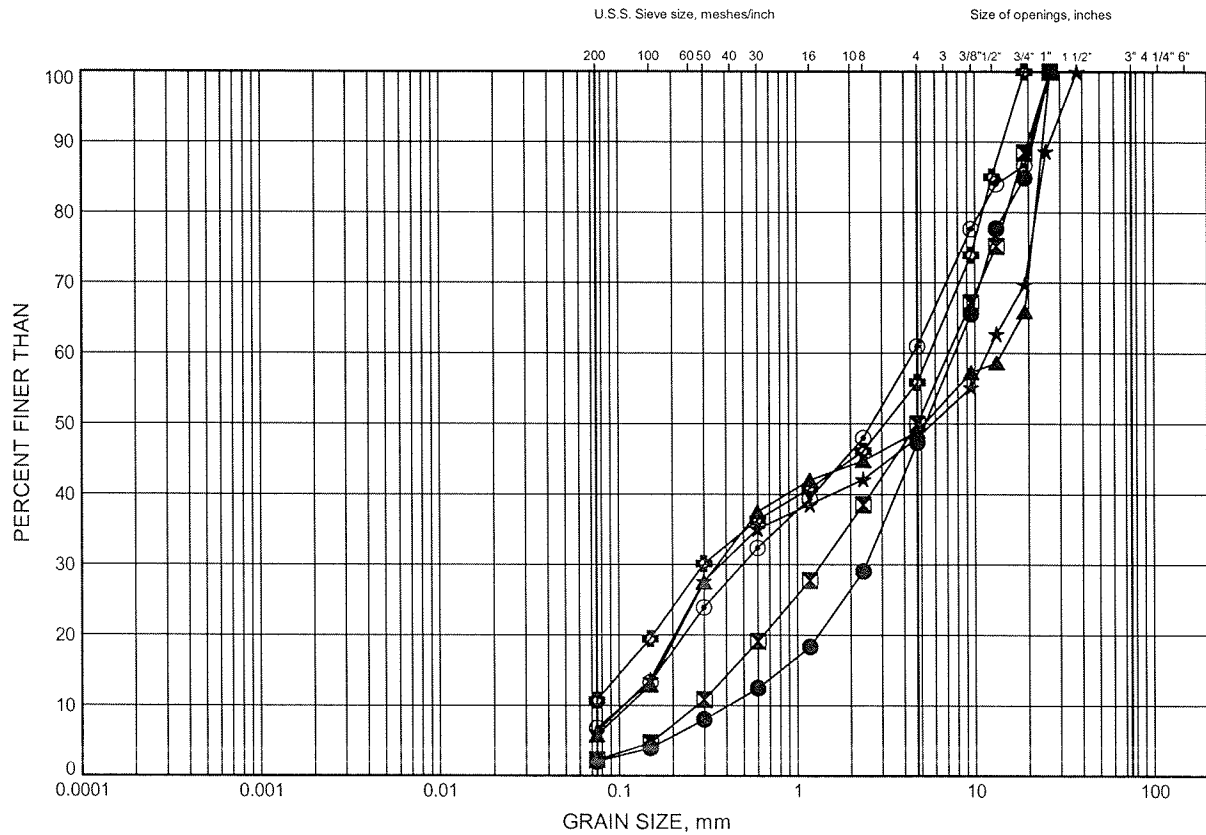


W.P.# 93-89-00.....
Prepared By MFA.....
Checked By MRA.....

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B10

Gravelly Sand to Sand & Gravel



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-02	18.59	349.16
⊠	OX-04	17.07	350.81
▲	OX-04	23.02	344.85
★	OX-05	4.11	363.84
⊙	OX-05	6.40	361.55
⊕	OX-05	9.45	358.50

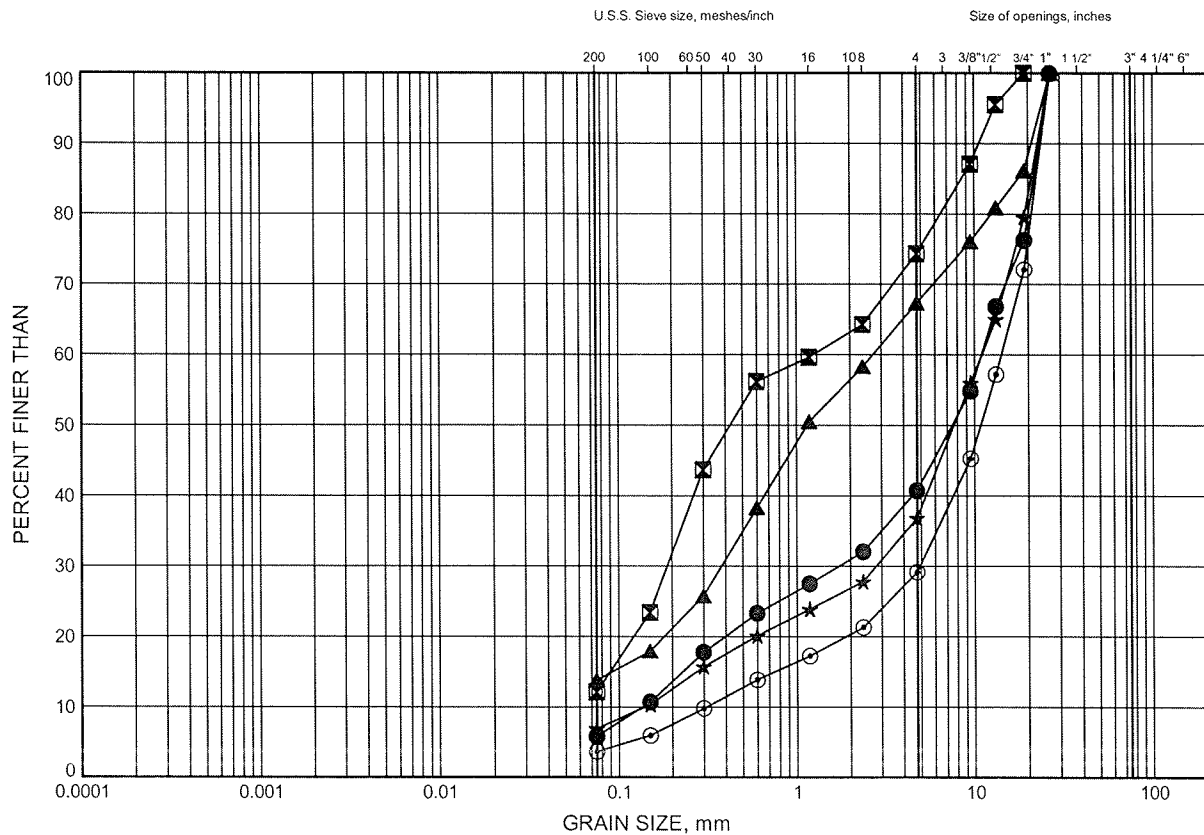


W.P.# 93-89-00
Prepared By MFA
Checked By MRA

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B11

Gravelly Sand to Sand & Gravel



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-07	29.26	338.56
⊠	OX-08	21.64	346.22
▲	OX-09	19.81	344.19
★	OX-10	15.54	352.43
⊙	OX-10	18.59	349.38

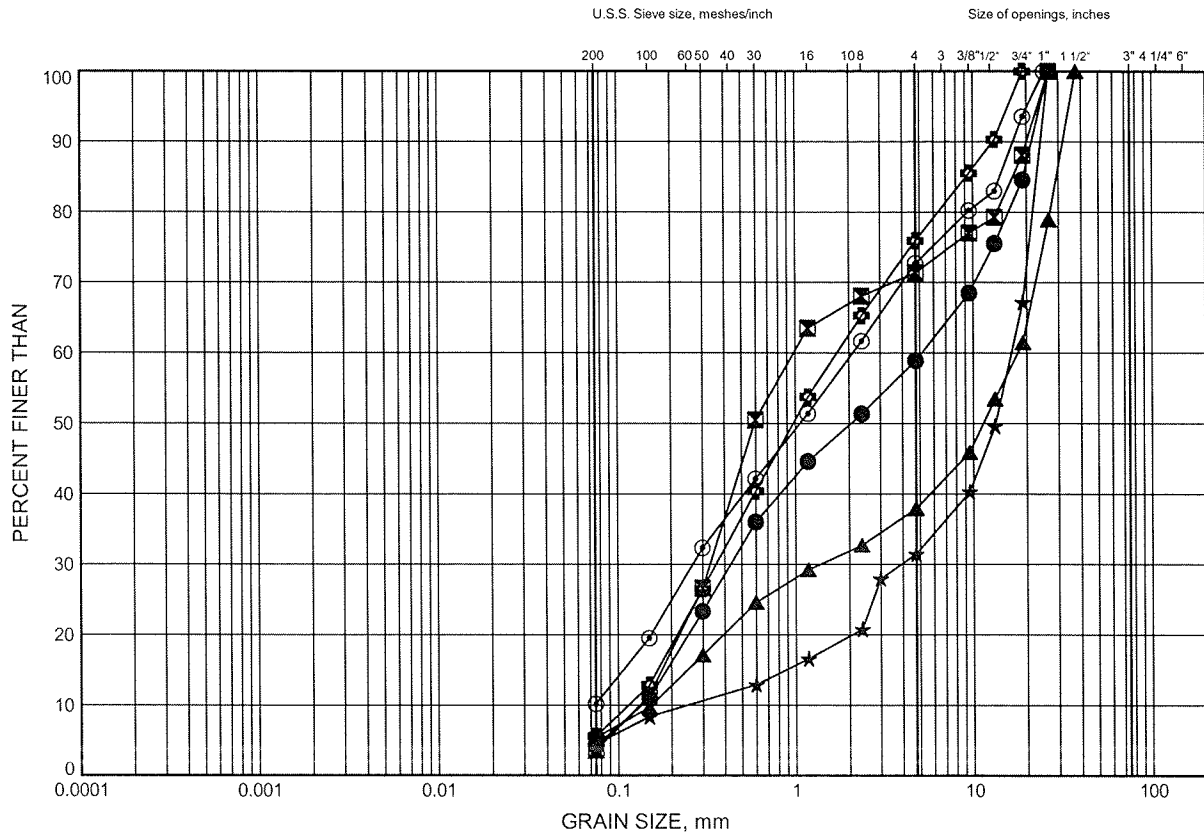


W.P.# 93-89-00
Prepared By MFA
Checked By MRA

Oxtongue Lake Bridge Replacement GRAIN SIZE DISTRIBUTION

FIGURE B12

Gravelly Sand to Sand & Gravel



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-12	6.40	359.42
⊠	OX-12	9.45	356.37
▲	OX-13	14.02	351.49
★	OX-13	29.26	336.25
⊙	OX-16	4.88	363.19
⊕	OX-16	5.64	362.42

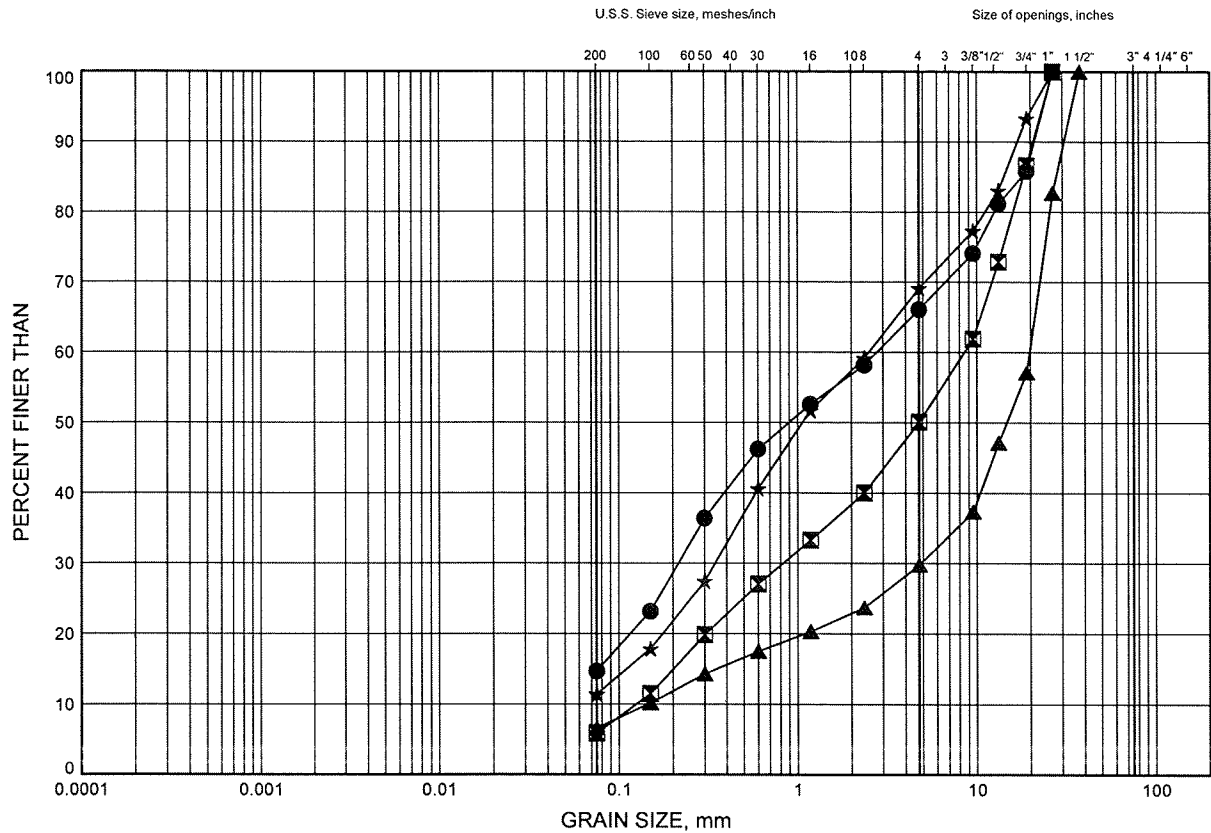


W.P.# 93-89-00
Prepared By MFA
Checked By MRA

Oxtongue Lake Bridge Replacement
GRAIN SIZE DISTRIBUTION

FIGURE B13

Gravelly Sand to Sand & Gravel



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	OX-17	1.07	364.43
⊠	OX-17	4.88	360.62
▲	OX-18	6.40	359.10
★	OX-20	7.92	357.78



W.P.# .93-89-00.....
Prepared By .MFA.....
Checked By .MRA.....

Appendix C

Borehole Completion Details

Table C1 – Borehole Completion Details

Borehole	Details		
	Piezometer Tip		Completion Details
	Depth (m)	Elevation (m)	
OX-01	36.0	331.7	3.0 m slotted screen at 36.0 m, sand filter to 30.5 m, bentonite from 30.5 to 6.1 m, cuttings to 0.15 m, and asphalt patch to surface. Flushmount casing installed.
OX-02	None Installed		Borehole caved to 9.0 m while pulling casing, then 0.3 m of concrete for bridge deck.
OX-03	27.4	340.4	3.0 m slotted screen at 27.4 m, sand filter to 23.8 m, bentonite from 27.4 to 9.1 m, then 0.3 m of concrete for bridge deck.
OX-04	None Installed		Borehole caved to 8.8 m while pulling casing, then 0.3 m of concrete for bridge deck.
OX-05	None Installed		Borehole caved to 3.2 m while pulling casing, bentonite from 3.2 to 0.4 m, and asphalt patch to surface.
OX-06	None Installed		Borehole caved to 4.7 m while pulling casing, bentonite from 4.7 to 2.0 m, then cuttings to surface.
OX-07	None Installed		Borehole caved to 3.2 m while pulling casing, bentonite from 3.2 to 1.5 m, cuttings to 0.3 m, then asphalt patch to surface.
OX-08	None Installed		Borehole caved to 8.6 m while pulling casing, then 0.3 m of concrete for bridge deck.
OX-09	None Installed		Borehole caved to 5.4 m while pulling casing.
OX-10	None Installed		Borehole caved to 8.8 m while pulling casing, then 0.3 m of concrete for bridge deck.
OX-11	None Installed		Borehole caved in to 4.4 m, bentonite holeplug from 4.4 m to 1.9 m, then cuttings to surface.
OX-12	None Installed		Borehole backfilled with bentonite holeplug and cuttings to surface.
OX-13	37.8	327.7	3.0 m slotted screen at 37.8 m, sand filter to 33.5 m, bentonite from 33.5 to surface. Protective casing installed.
OX-14	None Installed		Borehole caved to 5.1 m while pulling casing.
OX-15	None Installed		Borehole caved to 5.3 m while pulling casing.
OX-16	None Installed		Borehole caved to 4.6 m while pulling casing, bentonite from 4.6 m to 3.3m, cuttings to 0.3 m, then asphalt patch to surface.
OX-17	13.4	352.1	3.0 m slotted screen at 13.4 m, sand filter to 10.1 m, bentonite to 7.3 m, then cuttings to surface.
OX-18	None Installed		Borehole backfilled with cuttings and bentonite to surface.
OX-19	None Installed		Borehole backfilled with bentonite to 3.0 m, then cuttings to surface.
OX-20	None Installed		Borehole backfilled with cuttings and bentonite to surface.

Appendix D

Site Photographs



Photo 1 – Looking West at Oxtongue Lake Bridge from East Approach



Photo 2 – Looking East at Oxtongue Lake Bridge from West Approach

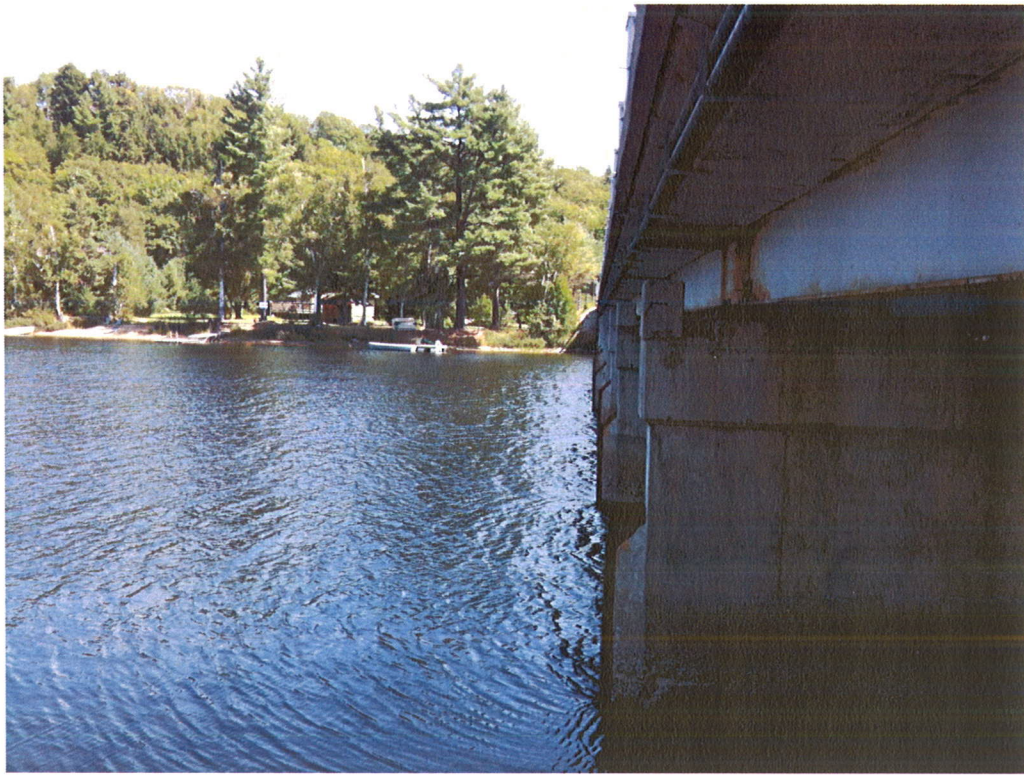


Photo 3 – North Side of Bridge Looking at East Shore



Photo 4 – North Side of Bridge Looking at West Shore



Photo 5 – North Side of Bridge Looking West



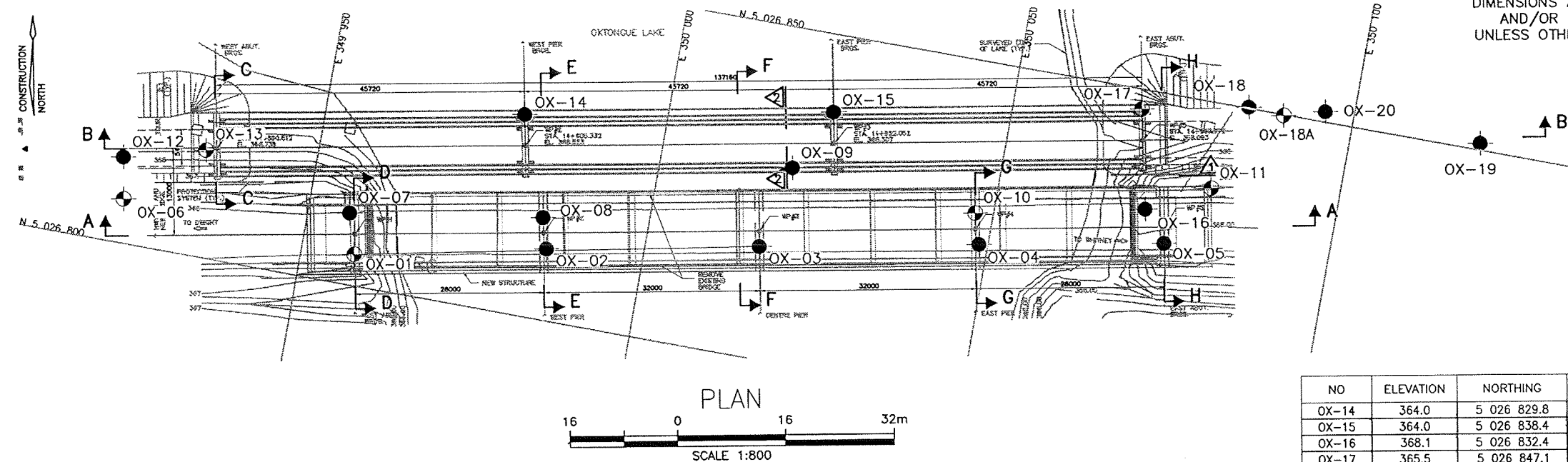
Photo 6 – North Side of Bridge Looking East

Appendix E

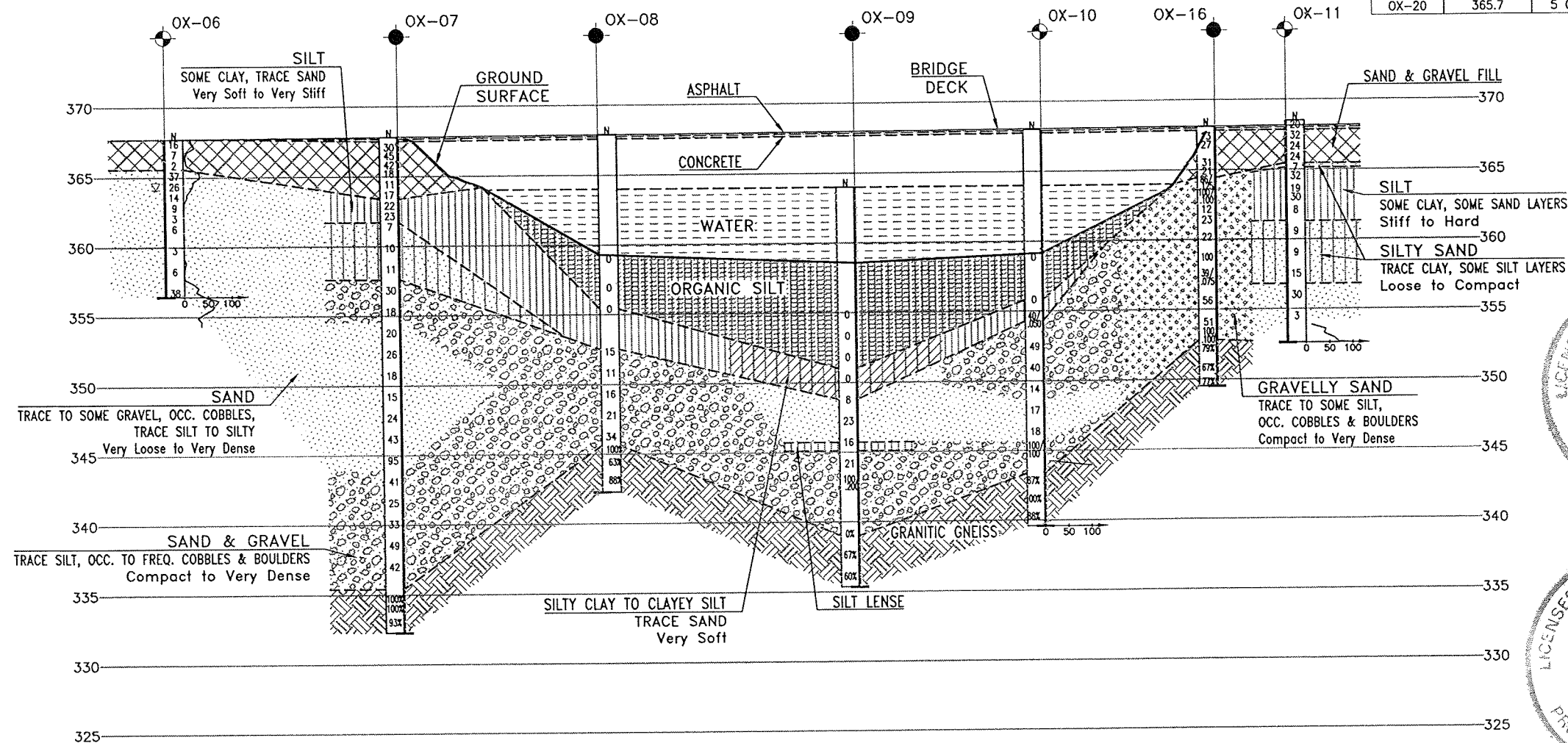
Borehole Locations and Soil Strata Drawings

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



NO	ELEVATION	NORTHING	EASTING
OX-14	364.0	5 026 829.8	349 979.1
OX-15	364.0	5 026 838.4	350 024.0
OX-16	368.1	5 026 832.4	350 072.0
OX-17	365.5	5 026 847.1	350 068.9
OX-18	365.5	5 026 850.2	350 084.4
OX-18A	365.5	5 026 849.9	350 089.7
OX-19	365.6	5 026 851.0	350 119.1
OX-20	365.7	5 026 851.5	350 095.7



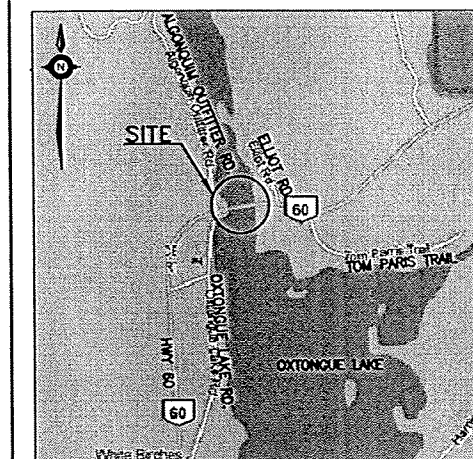
CONT No
WP No 93-89-00

HIGHWAY 60
OXTONGUE LAKE NARROWS
BRIDGE REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA I

SHEET
S2

MRC McCORMICK RANKIN
CORPORATION

THURBER ENGINEERING LTD.



LEGEND

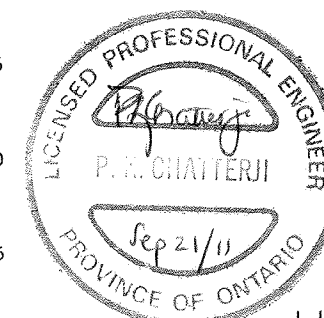
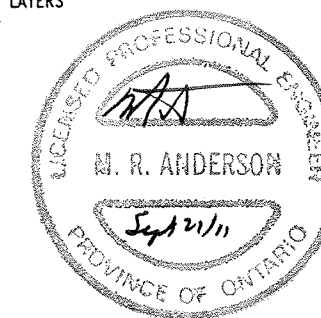
- Borehole
- Borehole and Cone / Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60' Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- HA Head Artesian Water
- PZ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
OX-01	367.7	5 026 804.7	349 957.9
OX-02	367.8	5 026 810.6	349 985.8
OX-03	367.8	5 026 816.7	350 016.8
OX-04	367.9	5 026 822.8	350 048.7
OX-05	368.0	5 026 827.9	350 075.7
OX-06	367.7	5 026 806.5	349 922.8
OX-07	367.8	5 026 810.6	349 956.1
OX-08	367.8	5 026 815.1	349 984.4
OX-09	364.0	5 026 829.1	350 019.5
OX-10	368.0	5 026 827.3	350 047.3
OX-11	368.5	5 026 837.2	350 081.1
OX-12	365.8	5 026 812.7	349 921.7
OX-13	365.5	5 026 816.0	349 933.5

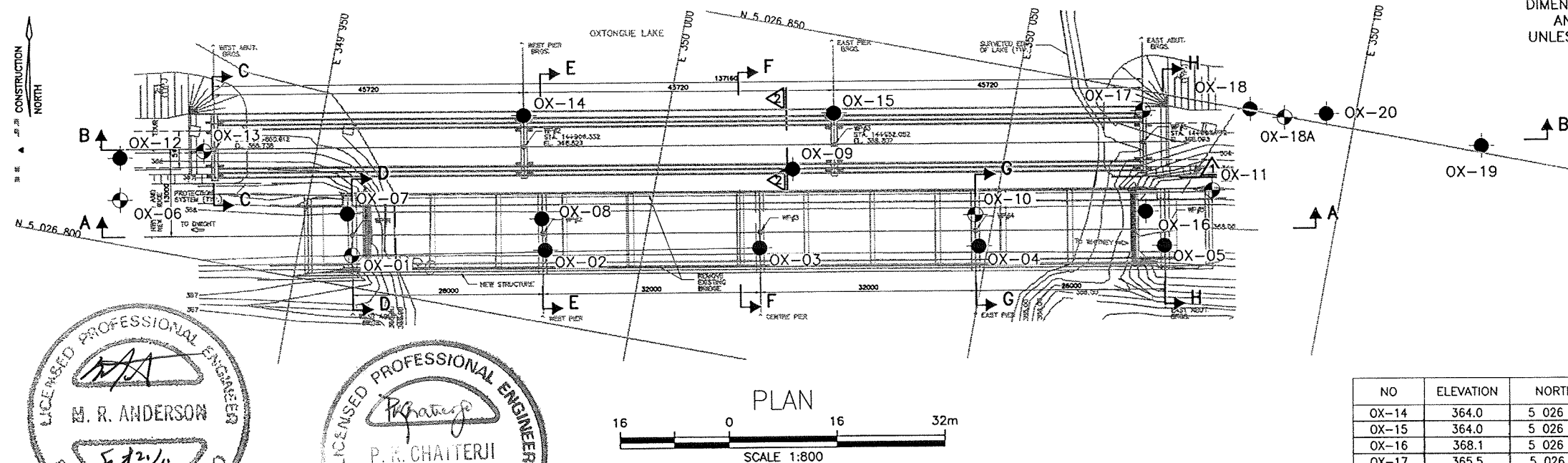
NOTES

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31E-312



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	MRA	CHK AEG	CODE
DRAWN	AN/MFA	CHK MRA	SITE 40-001
STRUCT			DWG 2
DATE	SEP. 2011		



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

CONT No
WP No 93-89-00

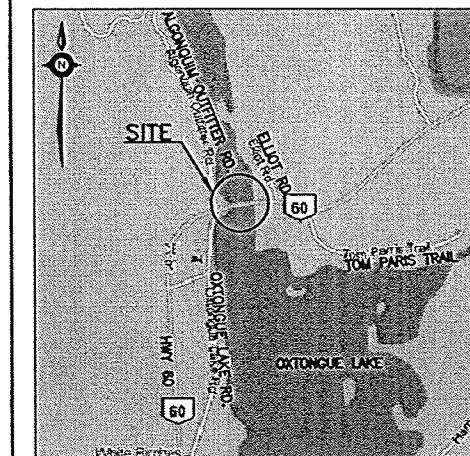
HIGHWAY 60
OXTONGUE LAKE NARROWS
BRIDGE REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA II



SHEET
S3

MRC McCORMICK RANKIN
CORPORATION

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

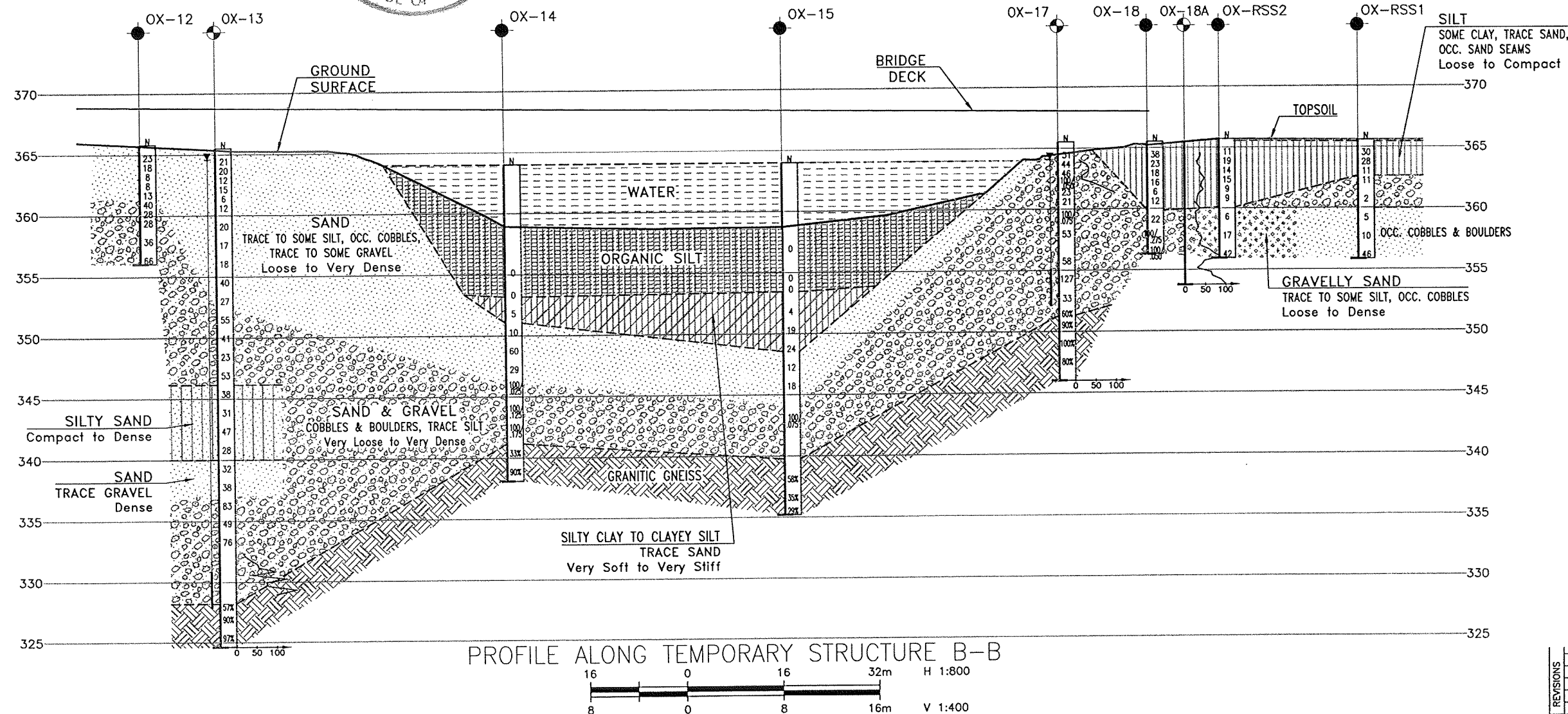
- ◆ Borehole
- ◆ Borehole and Cone / Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60' Cone, 475J/blow)
- PH Pressure, Hydraulic
- ☼ Water Level
- ☼ Head Artesian Water
- ☼ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
OX-01	367.7	5 026 804.7	349 957.9
OX-02	367.8	5 026 810.6	349 985.8
OX-03	367.8	5 026 816.7	350 016.8
OX-04	367.9	5 026 822.8	350 048.7
OX-05	368.0	5 026 827.9	350 075.7
OX-06	367.7	5 026 806.5	349 922.8
OX-07	367.8	5 026 810.6	349 956.1
OX-08	367.8	5 026 815.1	349 984.4
OX-09	364.0	5 026 829.1	350 019.5
OX-10	368.0	5 026 827.3	350 047.3
OX-11	368.5	5 026 837.2	350 081.1
OX-12	365.8	5 026 812.7	349 921.7
OX-13	365.5	5 026 816.0	349 933.5

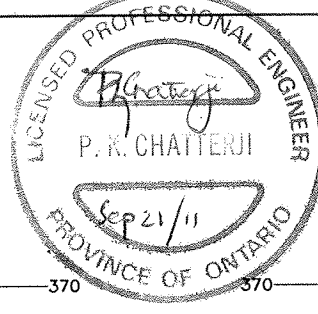
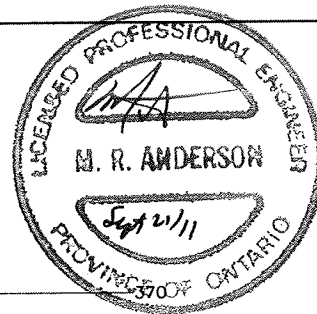
-NOTES-

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

GEOCRES No. 31E-312



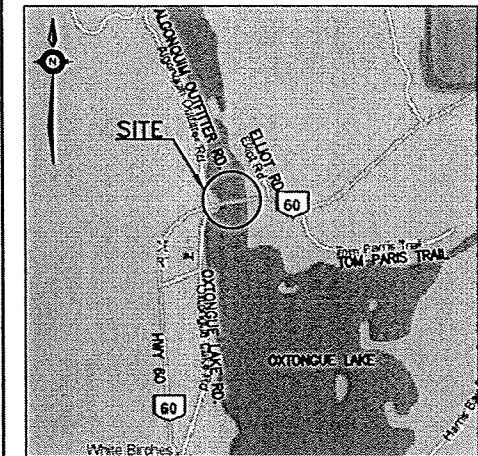
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DESIGN	MRA	CHK	AEG
DRAWN	AN/MFA	CHK	MRA
SITE	40-001	STRUCT	DWG 3
LOAD	DATE	SEP. 2011	



METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWNCONT No
WP No 93-89-00HIGHWAY 60
OXTONGUE LAKE NARROWS
BRIDGE REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA IIISHEET
S4McCORMICK RANKIN
CORPORATION

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

	Borehole
	Borehole and Cone / 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

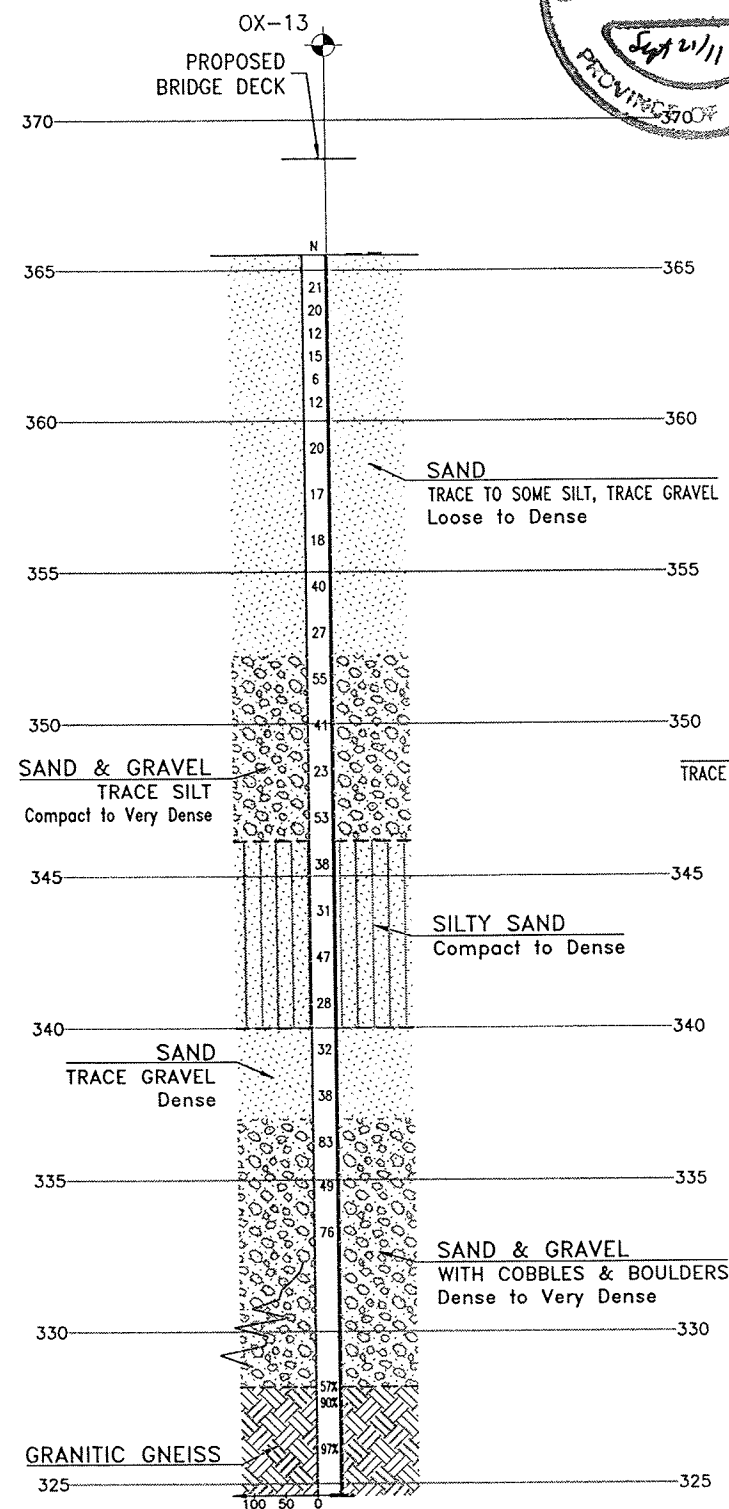
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OX-02	367.8	5 026 810.6	349 985.8
OX-03	367.8	5 026 816.7	350 016.8
OX-04	367.9	5 026 822.8	350 048.7
OX-05	368.0	5 026 827.9	350 075.7
OX-06	367.7	5 026 806.5	349 922.8
OX-07	367.8	5 026 810.6	349 956.1
OX-08	367.8	5 026 815.1	349 984.4
OX-09	364.0	5 026 829.1	350 019.5
OX-10	368.0	5 026 827.3	350 047.3
OX-11	368.5	5 026 837.2	350 081.1
OX-12	365.8	5 026 812.7	349 921.7
OX-13	365.5	5 026 816.0	349 933.5

-NOTES-

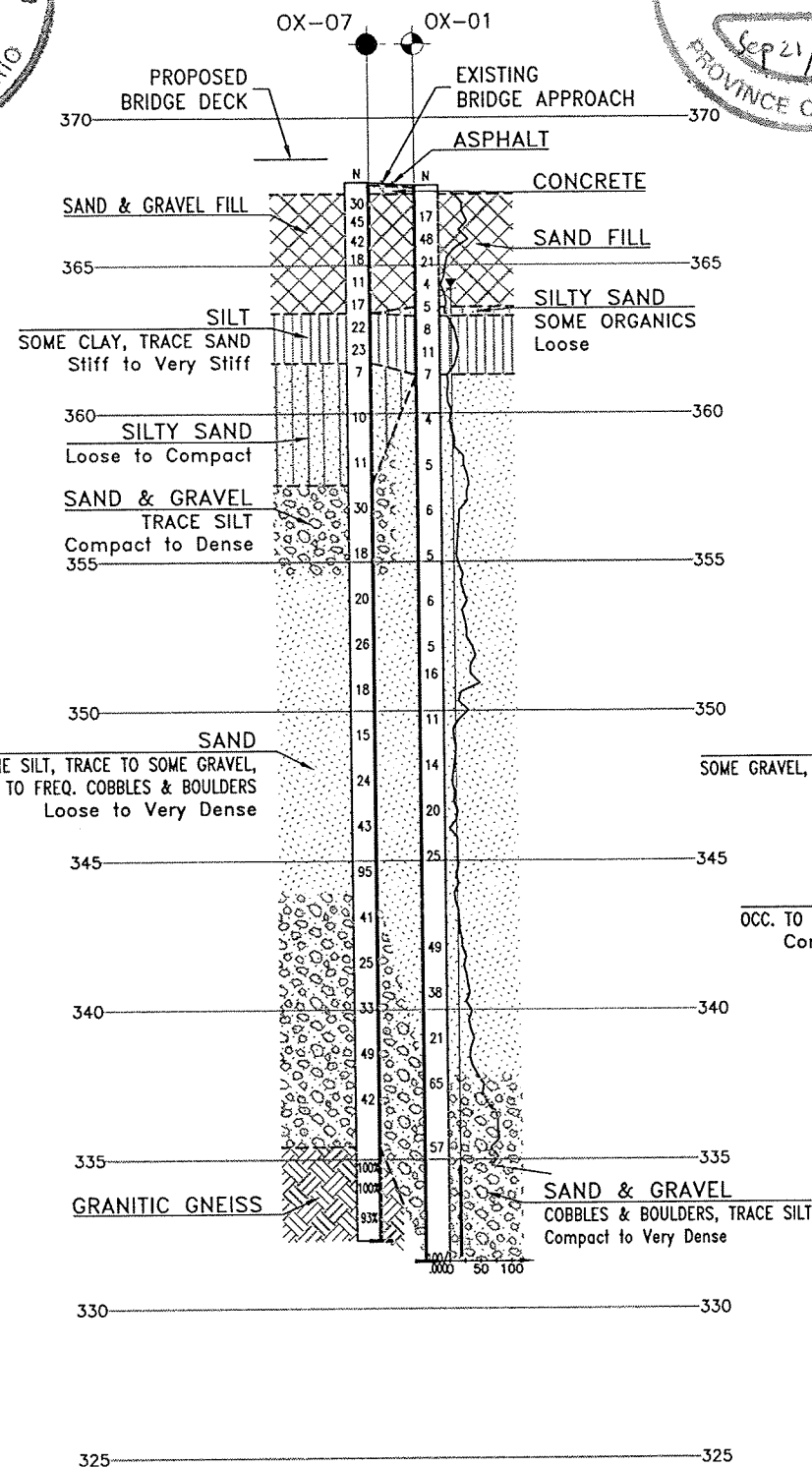
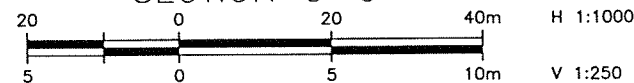
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCREs No. 31E-312

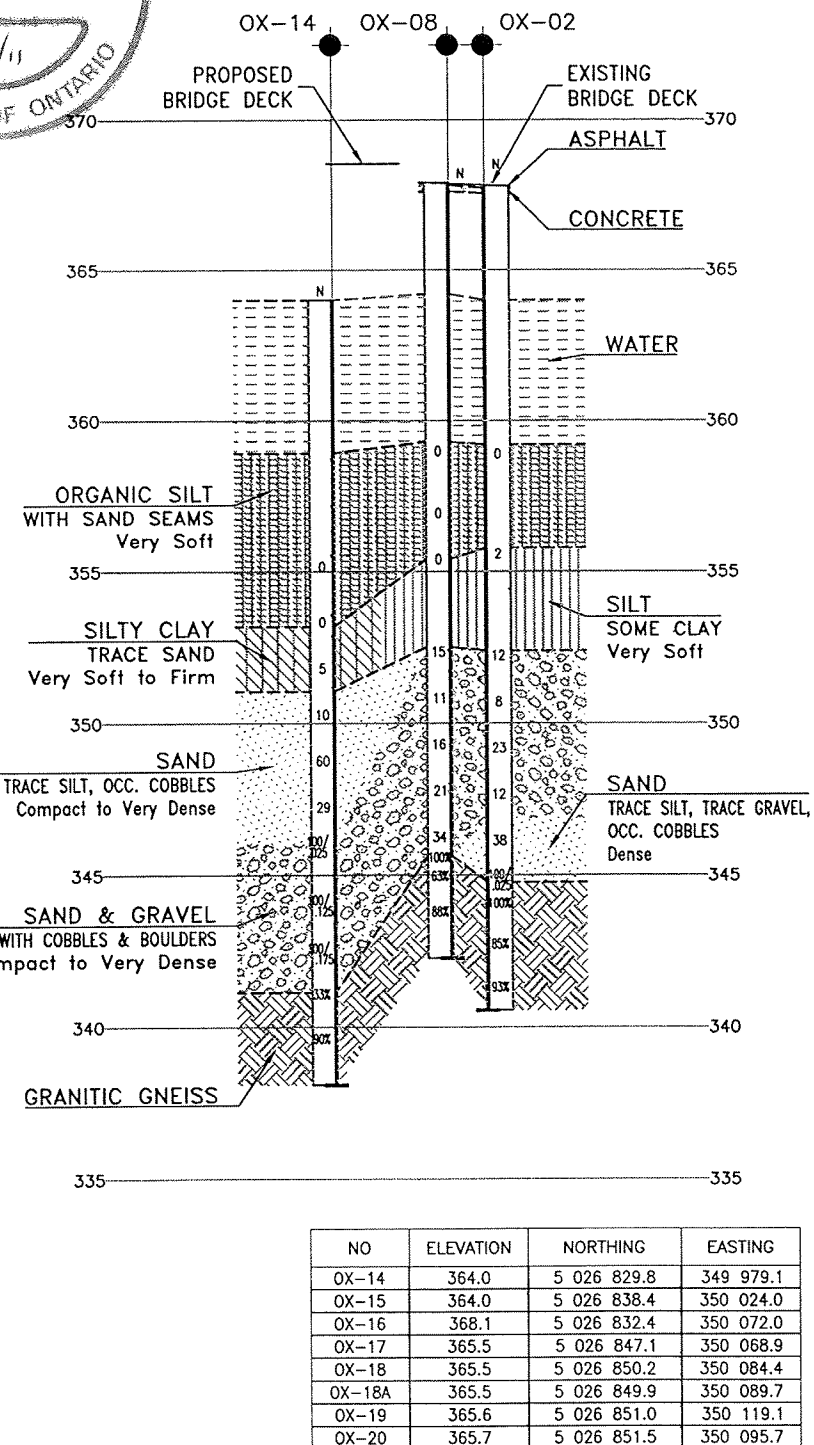
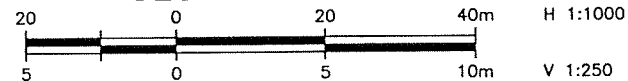
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SITE	40-001	STRUCT	DWG 4
DATE	SEP. 2011		



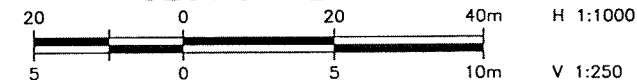
SECTION C-C



SECTION D-D



SECTION E-E



NO	ELEVATION	NORTHING	EASTING
OX-14	364.0	5 026 829.8	349 979.1
OX-15	364.0	5 026 838.4	350 024.0
OX-16	368.1	5 026 832.4	350 072.0
OX-17	365.5	5 026 847.1	350 068.9
OX-18	365.5	5 026 850.2	350 084.4
OX-18A	365.5	5 026 849.9	350 089.7
OX-19	365.6	5 026 851.0	350 119.1
OX-20	365.7	5 026 851.5	350 095.7

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

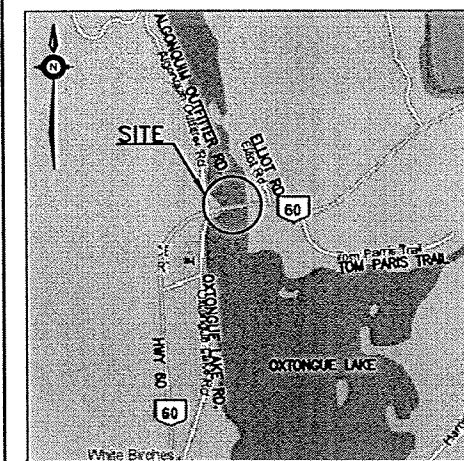
CONT No
WP No 93-89-00

HIGHWAY 60
OXTONGUE LAKE NARROWS
BRIDGE REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA IV

SHEET
S5

MRC McCORMICK RANKIN
CORPORATION

THURBER ENGINEERING LTD.



KEYPLAN LEGEND

●	Borehole
⊕	Borehole and Cone / 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

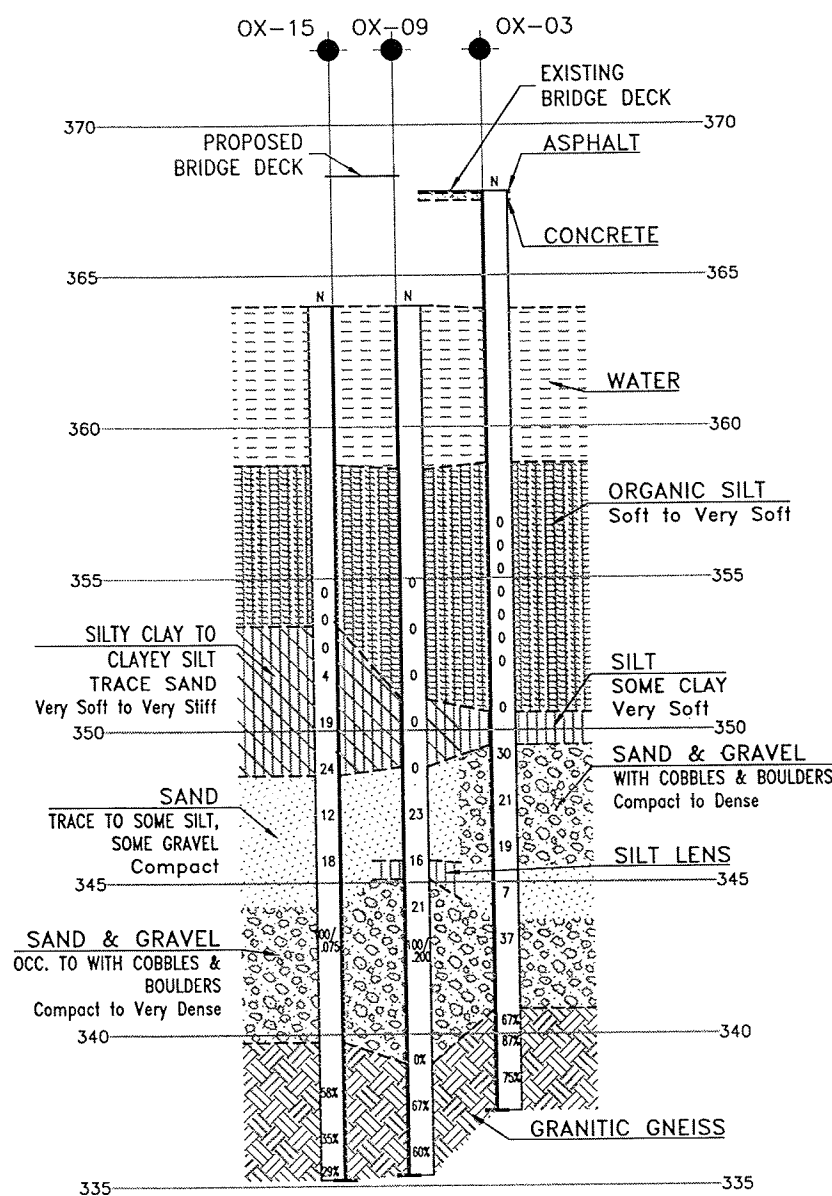
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OX-02	367.8	5 026 810.6	349 985.8
OX-03	367.8	5 026 816.7	350 016.8
OX-04	367.9	5 026 822.8	350 048.7
OX-05	368.0	5 026 827.9	350 075.7
OX-06	367.7	5 026 806.5	349 922.8
OX-07	367.8	5 026 810.6	349 956.1
OX-08	367.8	5 026 815.1	349 984.4
OX-09	364.0	5 026 829.1	350 019.5
OX-10	368.0	5 026 827.3	350 047.3
OX-11	368.5	5 026 837.2	350 081.1
OX-12	365.8	5 026 812.7	349 921.7
OX-13	365.5	5 026 816.0	349 933.5

-NOTES-

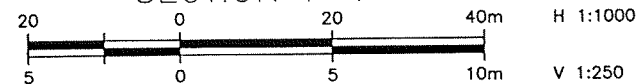
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- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31E-312

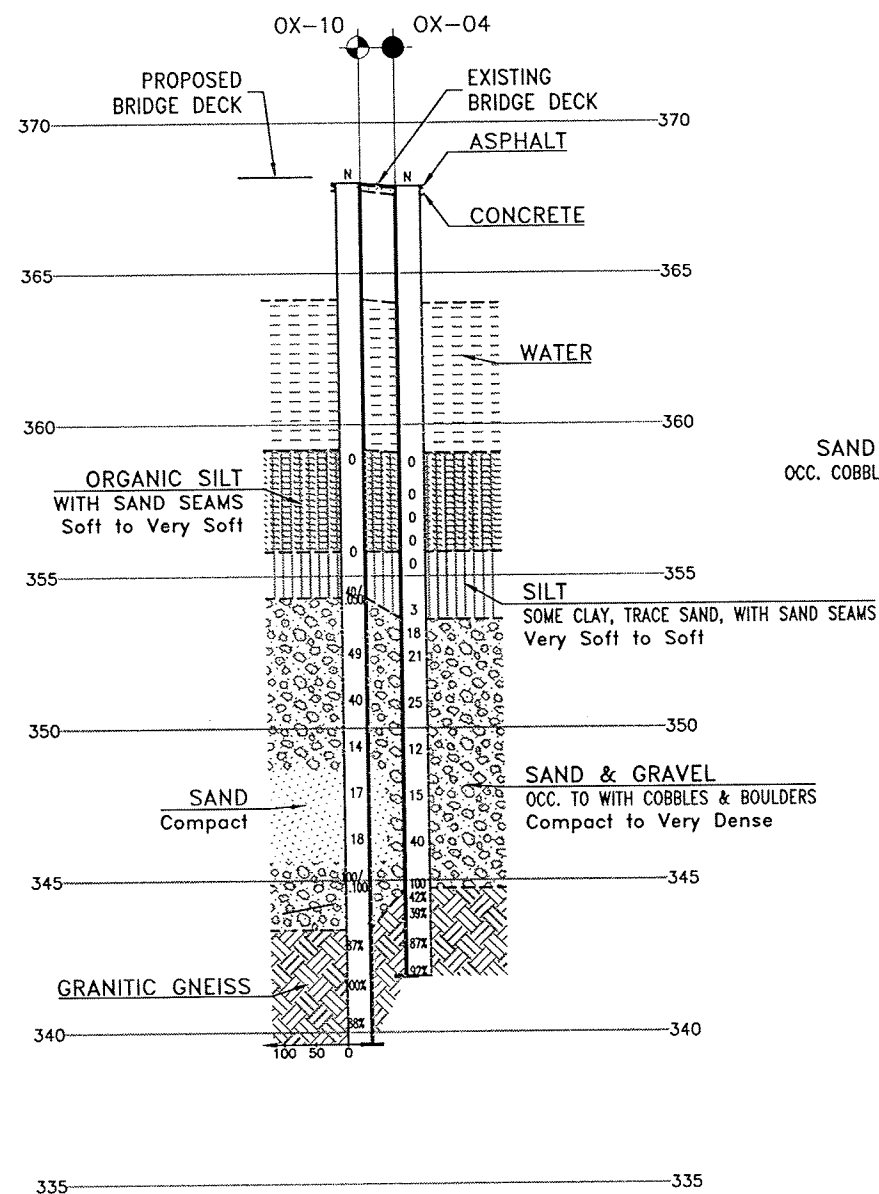
REVISIONS	DATE	BY	DESCRIPTION
DESIGN	MRA	CHK AEG	CODE
DRAWN	AN/MFA	CHK MRA	SITE 40-001
STRUCT			DWG 5
DATE	SEP. 2011		



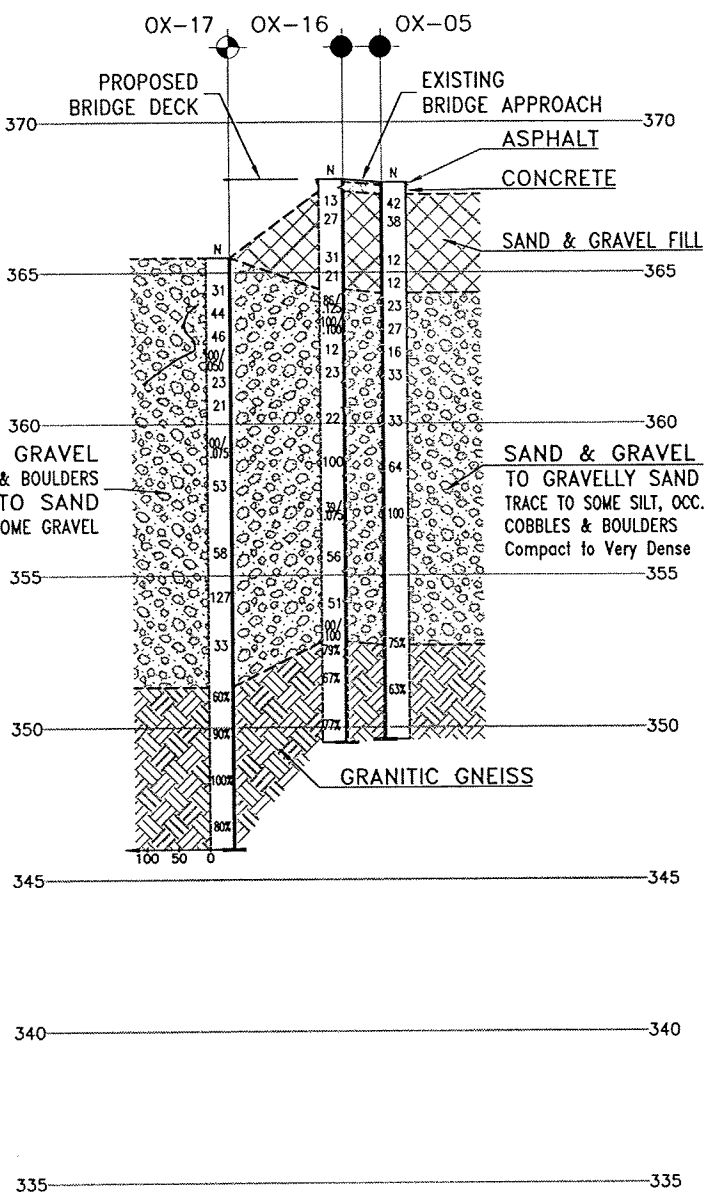
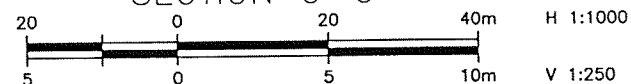
SECTION F-F



NO	ELEVATION	NORTHING	EASTING
OX-14	364.0	5 026 829.8	349 979.1
OX-15	364.0	5 026 838.4	350 024.0
OX-16	368.1	5 026 832.4	350 072.0
OX-17	365.5	5 026 847.1	350 068.9
OX-18	365.5	5 026 850.2	350 084.4
OX-18A	365.5	5 026 849.9	350 089.7
OX-19	365.6	5 026 851.0	350 119.1
OX-20	365.7	5 026 851.5	350 095.7



SECTION G-G



SECTION H-H

