

**FOUNDATION INVESTIGATION REPORT  
C.P.R. OVERHEAD AT SCHREIBER (MILEAGE 115.85)  
HIGHWAY 17  
DISTRICT OF THUNDER BAY, ONTARIO**

**G.W.P. 6102-10-00, SITE NO: 48 E-16**

**Geocres Number: 42D-33**

**Report to:**

**MMM Group Limited**

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April 4, 2014  
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**G.W.P. 6102-10-00, SITE NO: 48 E-16**

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**PART 1: FACTUAL INFORMATION**

**1 INTRODUCTION**

This report presents the factual findings obtained from a foundation investigation conducted at the existing CPR Overhead structure (Mileage 115.85) on Highway 17 in Schreiber, Ontario.

The purpose of this 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 written descriptions 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 MMM Group Limited (formerly McCormick Rankin), under the Ministry of Transportation Ontario (MTO) Agreement Number 6010-E-0011.

**2 SITE DESCRIPTION**

The CPR Overhead grade separation is located on Highway 17 approximately 3 km east of the village of Schreiber and 9 km west of Terrace Bay. The existing structure has three spans, a total length of 51.4 m, a width of 11.6 m, and a skew of approximately 35°. At the crossing, the railway runs in a cut with a depth of approximately 8.0 m below highway grade.

The surrounding lands are generally undeveloped and forested. The terrain comprises high rounded hills, and a large hill with bedrock exposures is located immediately to the northeast of the site.

Photographs in Appendix C show the general nature of the site and the existing structure.

The site lies within the physiographic region known as the Wawa Subprovince of the Superior Province of the Canadian Shield. The area is underlain by igneous to intermediate metavolcanic bedrocks which are overlain by glaciofluvial deposits of sand and gravel.

### **3 SITE INVESTIGATION AND FIELD TESTING**

The site investigation and field testing for this project were carried out between June 12 and 16, 2013. The investigation comprised drilling and sampling four boreholes, identified as Boreholes SCH-01 to SCH-04, to depths between 10.1 m and 30.5 m below existing road grade.

Boreholes SCH-01 and SCH-02 were drilled at the west approach and near the west abutment, respectively. Boreholes SCH-03 and SCH-04 were drilled near the east abutment and at the east approach, respectively. The approximate borehole locations are shown on the attached Borehole Locations and Soil Strata Drawing in Appendix D.

The borehole locations were marked in the field and utility clearances were obtained prior to drilling. The coordinates and ground surface elevations at the boreholes were determined from base plan drawings provided by MMM Group.

A truck-mounted CME75 drill rig was used to advance the boreholes using a combination of hollow-stem augers and wash-boring with NW casing. NQ coring was employed to penetrate cobbles locally. Soil samples were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT). Dynamic cone penetration tests (DCPTs) were undertaken at the base of Boreholes SCH-02 and SCH-03 to depths of 20.1 m and 31.7 m. In addition, DCPTs were carried out adjacent to Boreholes SCH-02 and SCH-03 to refusal at depths of 11.9 m and 7.0 m.

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 samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions in the open boreholes were observed throughout the drilling operations. Observations at completion of drilling may not be representative of groundwater conditions as wash-boring methods introduced water into the boreholes. Standpipe piezometers were installed in two boreholes to monitor the groundwater level at the site. The piezometers were decommissioned following monitoring and the boreholes without piezometers were backfilled in general accordance with MOE Regulation 903. Completion details of the piezometers and boreholes are summarized in Table 3.1.

**Table 3.1 – Borehole Completion Details**

<b>Foundation Unit</b>	<b>Borehole</b>	<b>Piezometer Tip Depth/ Elevation (m)</b>	<b>Completion Details</b>
West Approach	SCH-01	None installed	Borehole backfilled with bentonite holeplug to 0.6 m, concrete from 0.6 m to 0.1 m, then asphalt cold patch to surface.
West Abutment	SCH-02	19.5/ 284.8	Borehole backfilled with sand to 16.2 m, bentonite holeplug from 16.2 m to 0.6 m, sand from 0.6 m to 0.1 m, then asphalt cold patch to surface.
East Abutment	SCH-03	31.7/ 272.6	Borehole backfilled with sand to 28.4 m, bentonite holeplug from 28.4 m to 0.5 m, sand and gravel from 0.5 m to 0.15 m, then asphalt cold patch to surface.
East Approach	SCH-04	None installed	Borehole backfilled with bentonite holeplug to 0.9 m, concrete from 0.9 m to 0.2 m, then asphalt cold patch to surface.

#### **4 LABORATORY TESTING**

All recovered soil samples were subjected to Visual Identification (VI) and natural moisture content determination. Selected samples were also subjected to grain size distribution analyses (sieve and hydrometer). The results of this testing program are summarized on the Record of Borehole sheets included in Appendix A and on the figures presented in Appendix B.

#### **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 these sheets and on the “Borehole Locations and Soil Strata” drawing included in Appendix D. 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 site stratigraphy typically comprises an asphalt layer over sand and gravel fill, overlying native sands and gravels. More detailed descriptions of the individual strata are presented below.

##### **5.1 Asphalt**

Asphalt was encountered on the roadway surface in all boreholes drilled. The asphalt was 100mm to 125mm thick.

## 5.2 Sand to Sand and Gravel Fill

The asphalt layer is underlain by brown sand to sand and gravel fill. The fill extended to a depth of 1.5 m (Elev. 302.7 to 302.8) at the west approach and 2.9 to 3.0 m (Elev. 301.2 to 301.3) at the east approach. Rock coring equipment was used to penetrate cobbles within the fill in Borehole SCH-03.

SPT N-values recorded in the fill ranged from 13 to 62 blows for 0.3 m penetration, indicating a compact to very dense relative density. The moisture content for the granular fill ranged from 4% to 21%.

The results of laboratory grain size analysis testing of two samples of fill are presented on the Record of Borehole sheets included in Appendix A and on the grain size distribution curves shown in Figure B1 of Appendix B. The results are also summarized below.

Gravel %	61 to 63
Sand %	35 to 38
Silt & Clay %	1 to 2

## 5.3 Sand to Sand and Gravel

A native cohesionless deposit varying in gradation from sand to sand and gravel was encountered beneath the fill in all boreholes. The native deposit contains occasional cobbles and was described as brown to grey. A layer of silt and sand was encountered in the deposit at 28.9 m depth in Borehole SCH-03.

All boreholes were terminated within this deposit at depths of 10.1 m to 30.5 m (Elev. 294.1 to 273.8). DCPT testing was advanced to refusal a further 0.6 m and 1.2 m below the base of Boreholes SCH-02 and SCH-03.

SPT N-values between 11 and 86 blows per 0.3 m penetration were recorded, indicating a compact to very dense relative density. Higher values of 50 blows for 0.0 to 0.15 m of penetration were obtained locally on probable cobbles. The moisture content of the layer ranged from 1% to 26%.

Grain size distribution curves for tested samples of the deposit are shown on Figures B2 to B5 of Appendix B. The results are summarized on the Record of Borehole sheets included in Appendix A, and in the following table:

Soil Particles	Sand (%)	Sand & Gravel (%)	Silt & Sand (%)
Gravel	0 to 10	27 to 63	0
Sand	82 to 94	35 to 69	54
Silt	6 to 12	2 to 8	44
Clay			2

#### 5.4 Water Levels

The water levels in the boreholes were measured upon completion of drilling. Wash boring methods were used to advance the boreholes and therefore these levels may not be stabilized. Standpipe piezometers were installed in two boreholes to measure the groundwater level after drilling. The measured water levels are summarized in Table 5.1.

**Table 5.1 – Water Level Measurements**

Borehole	Date	Water Level		Comment
		Depth (m)	Elev. (m)	
SCH-01	June 12, 2013	9.4	294.8	In open borehole
SCH-02	June 17, 2013	15.2	289.1	In piezometer upon completion
SCH-03	June 13, 2013	24.6	279.7	In open borehole
	June 14, 2013	24.6	279.7	In piezometer
SCH-04	June 15, 2013	9.4	294.7	In open borehole

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

## 6 MISCELLANEOUS

Borehole locations were selected and established in the field by Thurber Engineering Ltd. The coordinates and the ground surface elevations at the boreholes were determined from base plan information provided by MMM Group.

Thurber obtained utility clearances for the borehole locations prior to drilling.

Eastern Ontario Diamond Drilling Ltd from Hawkesbury, Ontario supplied a truck mounted CME75 drill rig and conducted the drilling, sampling and in-situ testing operations. The drilling operations were supervised by Mr. George Azzopardi.

Overall supervision of the field program was conducted by Mr. Mark Farrant, P.Eng. Interpretation of the data and preparation of the report were carried out by Ms. Mei Cheong, P.Eng.

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

### Thurber Engineering Ltd.



Mei Cheong, P.Eng., M.Phil.  
Project Engineer



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Senior Foundation Engineer



P. K. Chatterji, P.Eng.  
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 <sup>(1)</sup> '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  
 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			

# RECORD OF BOREHOLE No SCH-01

1 OF 2

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 581.9 E 288 228.7 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.12 - 2013.06.12 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT  $\gamma$  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100						
304.2														
0.0	ASPHALT: (125mm)													
0.1	SAND and GRAVEL Dense Brown		1	SS	31		304							
303.4	Dry (FILL)													
0.8	SAND, trace gravel Compact Brown		2	SS	23		303							
302.7	Dry (FILL)													
1.5	SAND and GRAVEL Dense Brown		3	SS	35		302							46 49 5 (SI+CL)
	Dry													
	Occasional cobbles		4	SS	50/ 0.150									
301.2														
3.0	SAND, trace to some gravel, occasional cobbles Very Dense Brown		5	SS	86		301							
	Wet													
	Gravel layer at 4.6m		6	SS	65		300							49 47 4 (SI+CL)
							299							
298.1														
6.1	SAND and GRAVEL Compact Brown		7	SS	18		298							
	Wet													
			8	SS	24		297							
							296							
	Grey/Brown		9	SS	18		295							48 44 8 (SI+CL)

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15  
10  
(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No SCH-01

2 OF 2

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 581.9 E 288 228.7 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.12 - 2013.06.12 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					W <sub>p</sub> W W <sub>L</sub> 20 40 60					
294.1 10.1	Continued From Previous Page  END OF BOREHOLE AT 10.1m. BOREHOLE OPEN TO 10.1m AND WATER LEVEL AT 9.4m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.6m, CONCRETE TO 0.1m THEN ASPHALT PATCH TO SURFACE.																

# RECORD OF BOREHOLE No SCH-02

1 OF 3

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 569.2 E 288 236.9 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.15 - 2013.06.16 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W <sub>p</sub>	W	W <sub>L</sub>		
304.3								20 40 60 80 100						
0.0	ASPHALT: (125mm)							20 40 60 80 100						
0.1	SAND Compact Brown Wet (FILL)		1	SS	26		304							
	Occasional gravel		2	SS	18		303							
302.8	SAND, trace gravel Compact Brown Wet		3	SS	11		302							
1.5			4	SS	16		301							
	Gravel layer at 3.9m		5	SS	25		300							
			6	SS	18		299							
298.2							298							
6.1	SAND and GRAVEL, trace silt Dense to Compact Brown Wet		7	SS	38		297							
			8	SS	25		296							
			9	SS	29		295							

Continued Next Page

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

## METRIC

[illegible]

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

# RECORD OF BOREHOLE No SCH-02

3 OF 3

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 569.2 E 288 236.9 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.15 - 2013.06.16 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
284.2	Continued From Previous Page																
20.1	END OF BOREHOLE AT 20.1m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun. 17/13 15.2 289.1																



# RECORD OF BOREHOLE No SCH-03

1 OF 4

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 517.9 E 288 255.6 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE NW Casing/Coring COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.12 - 2013.06.13 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		<div><div>PLASTIC LIMIT</div><div>NATURAL MOISTURE CONTENT</div><div>LIQUID LIMIT</div></div> <div><div>W<sub>P</sub></div><div>W</div><div>W<sub>L</sub></div></div> <div>WATER CONTENT (%)</div>	UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
							<div>○ UNCONFINED      + FIELD VANE</div> <div>● QUICK TRIAXIAL    × LAB VANE</div>						
304.3								20 40 60 80 100					
0.0	ASPHALT: (100mm)							20 40 60 80 100					
0.1	SAND and GRAVEL, with cobbles (coring required) Compact Brown Wet (FILL)		1	SS	15		304						61 38 1 (SI+CL)
			2	SS	19		303						
302.0													
2.3	SAND, trace gravel Compact Brown Wet (FILL)		3	SS	13		302						
301.3			4	SS	18		301						0 91 9 (SI+CL)
3.0	SAND, trace gravel Compact Brown Wet												
			5	SS	16		300						
							299						
298.2													
6.1	SAND and GRAVEL, trace silt Dense Brown Wet		6	SS	44		298						
							297						
	Grey		7	SS	36		296						
	Occasional cobbles cored from 9.1m to 10.6m		8	SS	49		295						

Continued Next Page

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

# RECORD OF BOREHOLE No SCH-03

2 OF 4

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 517.9 E 288 255.6 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE NW Casing/Coring COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.12 - 2013.06.13 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT  W <sub>P</sub>	NATURAL MOISTURE CONTENT  W	LIQUID LIMIT  W <sub>L</sub>	UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    × LAB VANE												
	Continued From Previous Page							20	40	60	80	100								
293.6							294													
10.7	SAND, trace gravel Dense Grey Wet		9	SS	39		293							○						
292.1																				
12.2	SAND and GRAVEL, trace to some silt Very Dense Grey Wet		10	SS	40		292							○						
	Cobbles		11	SS	50/ 0.0		291													
							290													
			12	SS	82		289							○						
							288													
			13	SS	51		287							○						
							286							○						
			14	SS	50/ 0.150		285													
284.5																				
19.8	SAND, trace gravel																			

Continued Next Page

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

RECORD OF BOREHOLE No SCH-03

3 OF 4

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 517.9 E 288 255.6 ORIGINATED BY GA  
HWY 17 BOREHOLE TYPE NW Casing/Coring COMPILED BY AN  
DATUM Geodetic DATE 2013.06.12 - 2013.06.13 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
	Continued From Previous Page		15	SS	34		284							
	SAND, trace gravel, trace silt to silty Dense Grey Wet						283							
							282							
			16	SS	49		281							0 88 12 (SI+CL)
							280							
							279							
			17	SS	16		278							
							277							
							276							
	Silt and sand layer		18	SS	15		275							0 54 44 2

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No SCH-03

4 OF 4

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 517.9 E 288 255.6 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE NW Casing/Coring COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.12 - 2013.06.13 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	W <sub>p</sub>	W	W <sub>L</sub>			
	Continued From Previous Page													
273.8 30.5	End of sampling at 30.4m and start DCPT						274 273							
272.6 31.7	END OF BOREHOLE AT 31.7m. BOREHOLE OPEN TO 31.7m AND WATER LEVEL AT 24.6m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun. 14/13 24.6 279.7													

ONTMT4S 1197.GPJ 2012TEMPLATE(MTO).GDT 3/5/14

# RECORD OF BOREHOLE No SCH-04

1 OF 2

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 505.6 E 288 264.9 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.14 - 2013.06.15 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT      NATURAL MOISTURE CONTENT      LIQUID LIMIT			UNIT WEIGHT  <b>γ</b>  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				GR	SA	SI	CL	
								○ UNCONFINED      + FIELD VANE												
								● QUICK TRIAXIAL      × LAB VANE	20	40	60	80	100	20		40	60			
304.1																				
0.0	ASPHALT: (125mm)																			
0.1	SAND and GRAVEL Dense to Very Dense Brown/Grey Wet (FILL)		1	SS	49							○								
			2	SS	31							○								
			3	SS	57							○				63	35			
301.8																	2 (SI+CL)			
2.3	GRAVEL, trace sand Very Dense Grey Wet (FILL)		4	SS	62							○								
301.2																				
2.9	SAND, trace gravel, trace silt Compact Grey Wet		5	SS	25							○				4	89			
																	7 (SI+CL)			
			6	SS	15							○								
298.0																				
6.1	SAND and GRAVEL, trace silt Dense Grey Wet		7	SS	37							○				27	69			
																	4 (SI+CL)			
			8	SS	50							○								
			9	SS	33							○								

Continued Next Page

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

# RECORD OF BOREHOLE No SCH-04

2 OF 2

METRIC

W.P. 6102-10-01 LOCATION CPR Overhead at Schreiber N 5 406 505.6 E 288 264.9 ORIGINATED BY GA  
 HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN  
 DATUM Geodetic DATE 2013.06.14 - 2013.06.15 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			<div>PLASTIC LIMIT</div> <div>NATURAL MOISTURE CONTENT</div> <div>LIQUID LIMIT</div> <div>W P                      W                      W L</div>	UNIT WEIGHT  γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL				
294.0 10.1	Continued From Previous Page  END OF BOREHOLE AT 10.1m. BOREHOLE OPEN TO 10.1m AND WATER LEVEL AT 9.4m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.9m, CONCRETE TO 0.2m THEN ASPHALT PATCH TO SURFACE.													

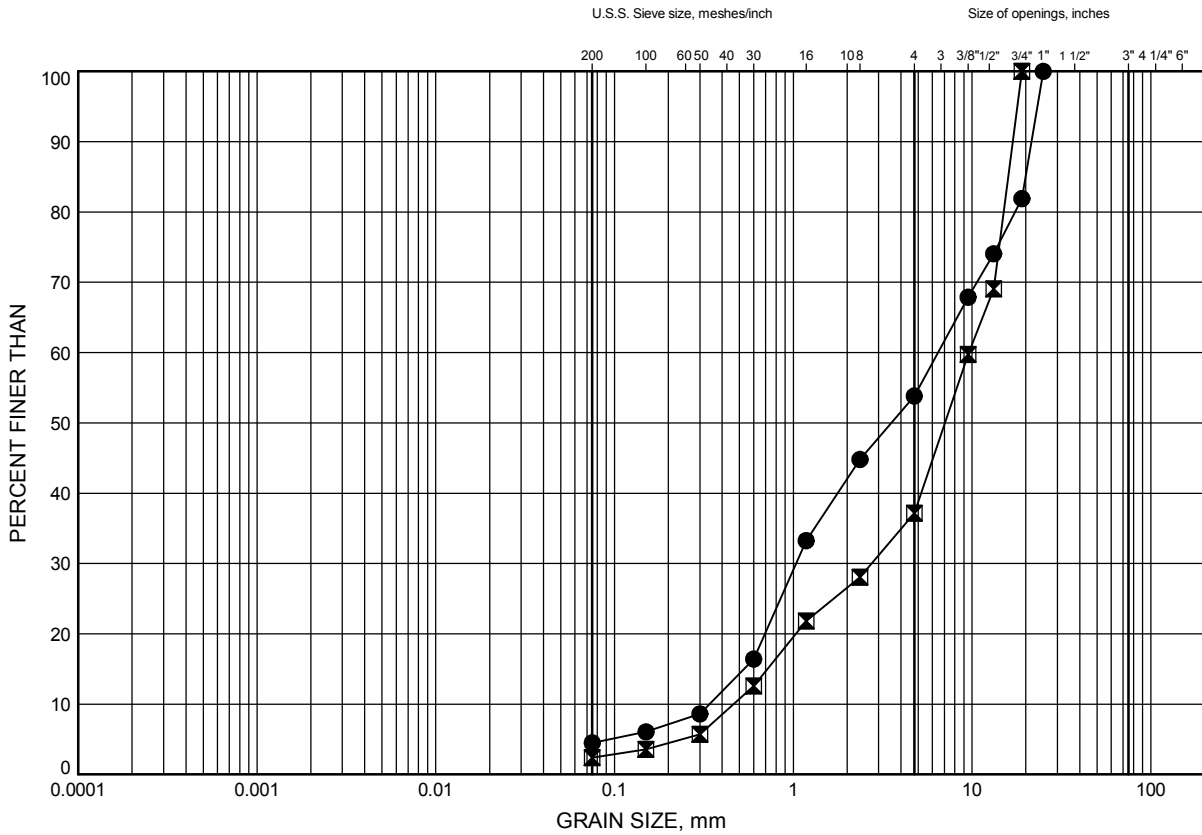
## **Appendix B**

### **Laboratory Test Results**

CPR Overhead at Schreiber  
**GRAIN SIZE DISTRIBUTION**

FIGURE B1

**SAND & GRAVEL FILL**



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SCH-01	1.83	302.37
⊠	SCH-04	1.83	302.27

Date March 2014  
W.P. 6102-10-01



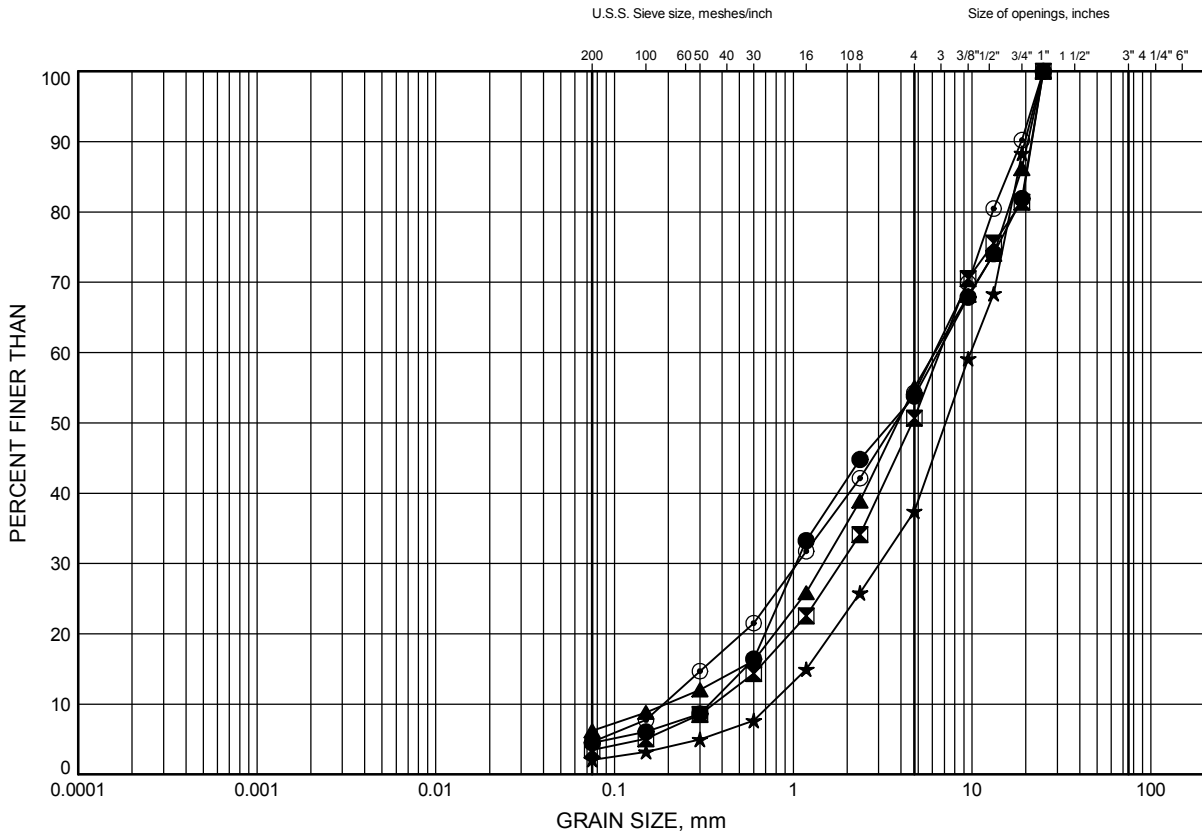
Prep'd AN  
Chkd. MC



CPR Overhead at Schreiber  
GRAIN SIZE DISTRIBUTION

FIGURE B2

SAND & GRAVEL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SCH-01	1.83	302.37
⊠	SCH-01	4.88	299.32
▲	SCH-02	6.40	297.90
★	SCH-02	10.97	293.33
⊙	SCH-03	12.50	291.80

Date February 2014  
Project 6102-10-01

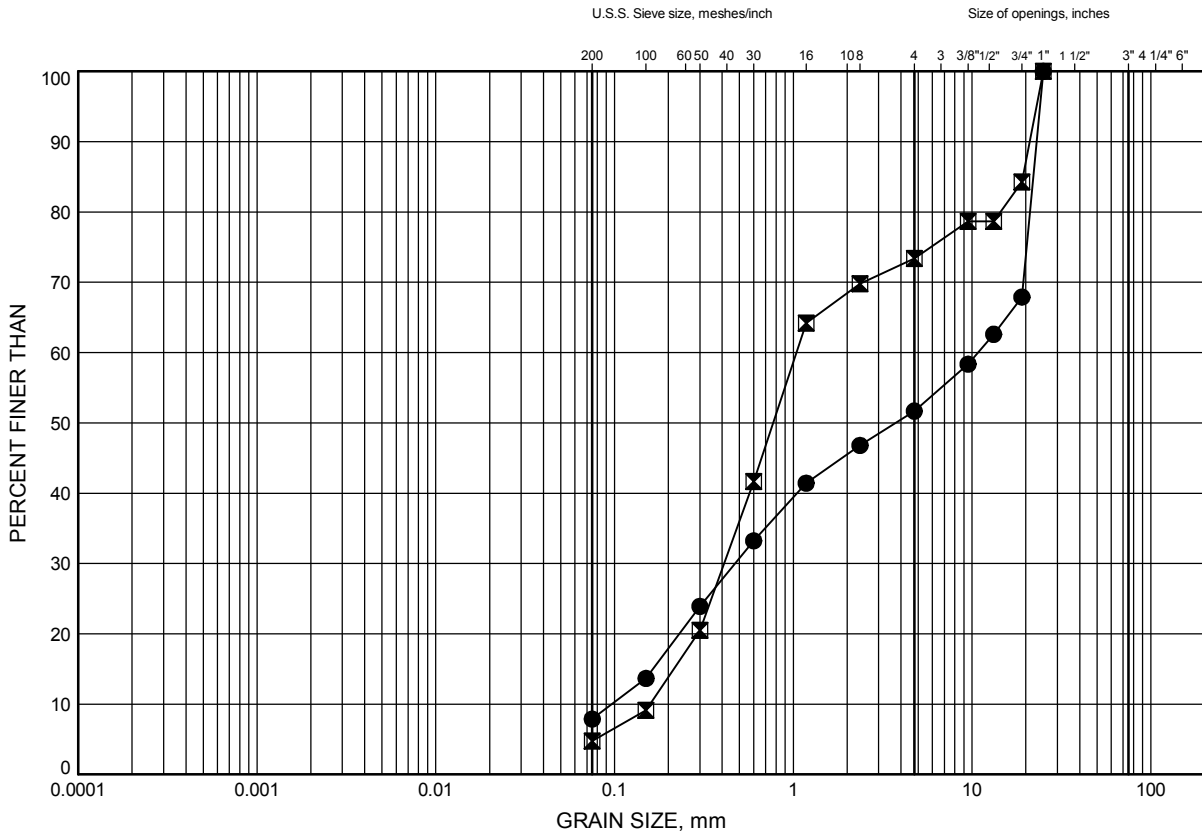


Prep'd AN  
Chkd. MC

CPR Overhead at Schreiber  
**GRAIN SIZE DISTRIBUTION**

FIGURE B3

**SAND AND GRAVEL**



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SCH-01	9.45	294.75
⊠	SCH-04	6.40	297.70

Date February 2014  
 Project 6102-10-01

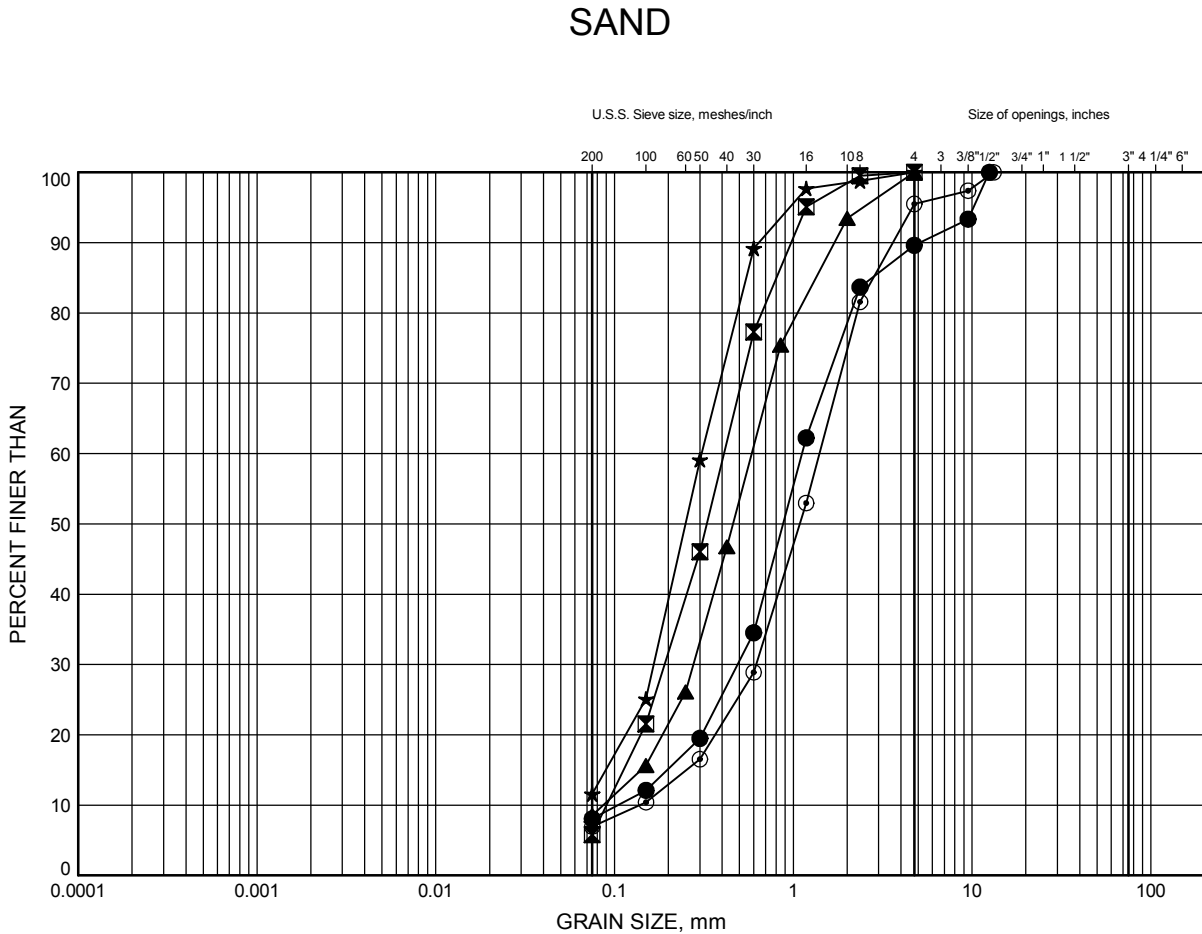


Prep'd AN  
 Chkd. MC

# CPR Overhead at Schreiber

## 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)
●	SCH-02	2.59	301.71
⊠	SCH-02	17.07	287.23
▲	SCH-03	3.35	300.95
★	SCH-03	23.16	281.14
⊙	SCH-04	3.35	300.75

Date March 2014  
W.P. 6102-10-01



Prep'd AN  
Chkd. MC



## **Appendix C**

### **Site Photographs**



**Photograph 1 – North elevation of CPR Overhead, looking south**



**Photograph 2 – South elevation of the CPR Overhead, looking north**



**Photograph 3 - West abutment**

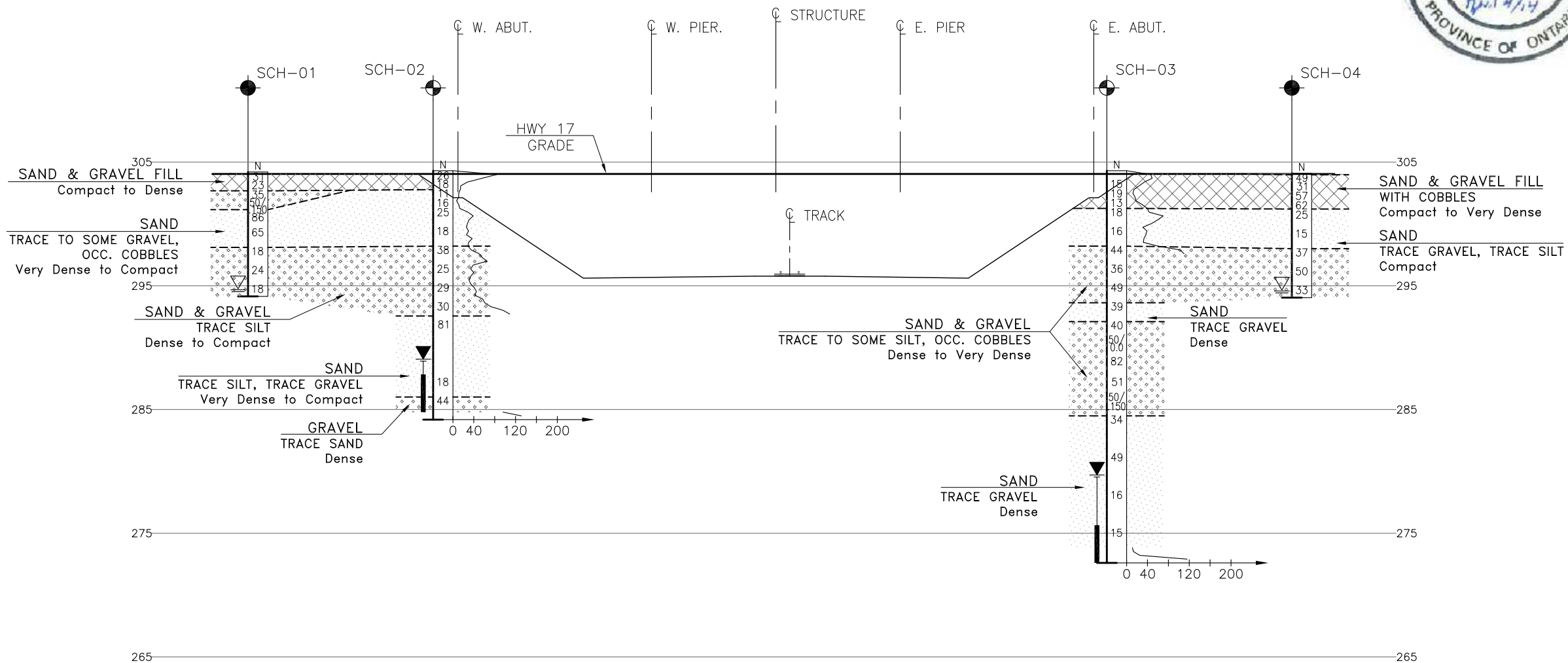
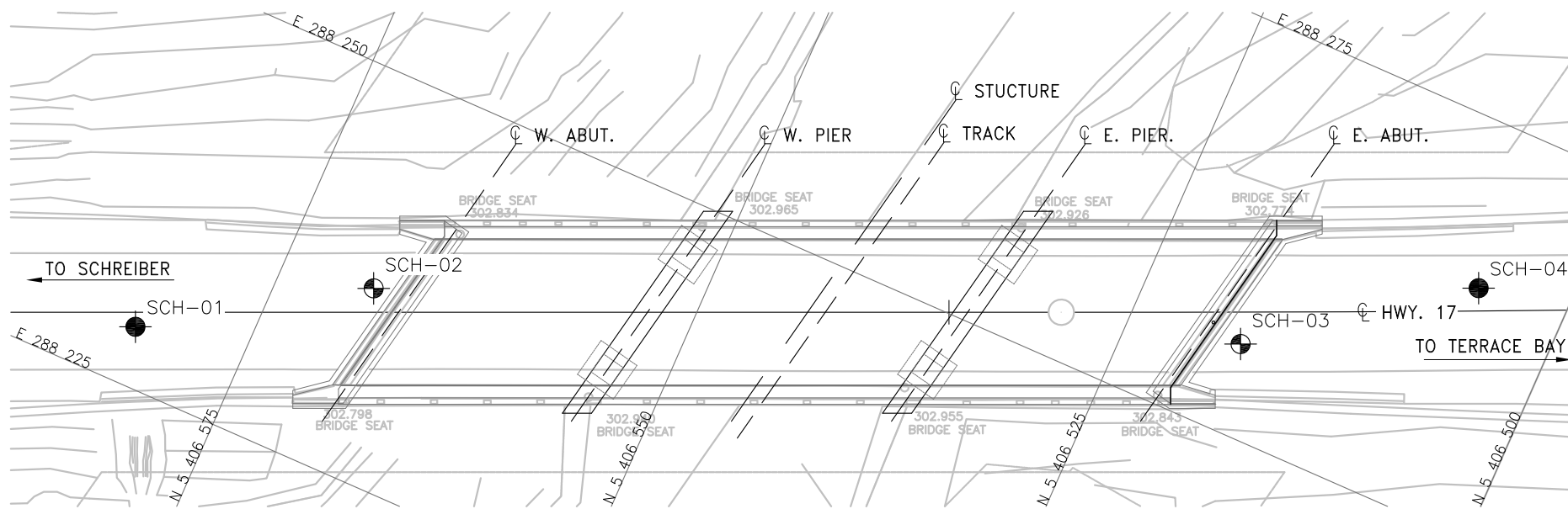


**Photograph 4 – West pier, looking east**

## **Appendix D**

### **Borehole Locations and Soil Strata Drawing**





PROFILE ALONG C HWY 17



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

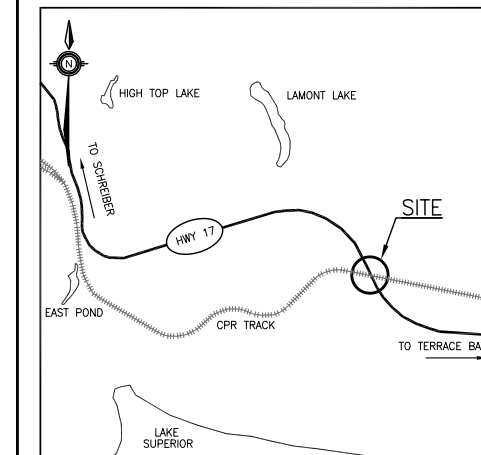


CONT No 2014-6007  
WP No 6102-10-01

HIGHWAY 17  
C.P.R. OVERHEAD  
AT SCHREIBER  
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET  
13



KEYPLAN  
LEGEND

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

NO	ELEVATION	NORTHING	EASTING
SCH-01	304.2	5 406 581.9	288 228.7
SCH-02	304.3	5 406 569.2	288 236.9
SCH-03	304.3	5 406 517.9	288 255.6
SCH-04	304.1	5 406 505.6	288 264.9

-NOTES-

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

GEOCRES No. 42D-33

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	MC	CHK	MC
DRAWN	AN	CHK	SITE
CODE	LOAD	DATE	APR 2014
SITE	48E-16	STRUCT	DWG 2