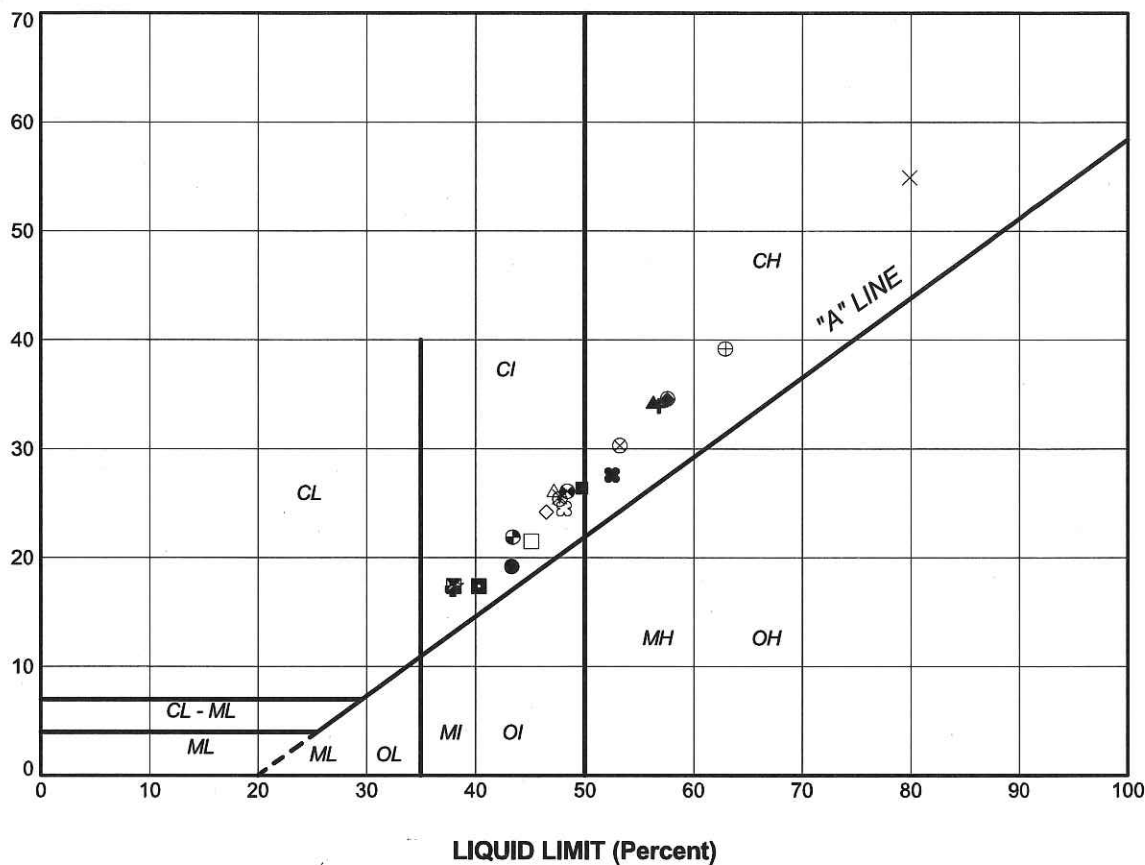


PLASTICITY INDEX (Percent)




**SOIL TYPE**  
 C = Clay  
 M = Silt  
 O = Organic

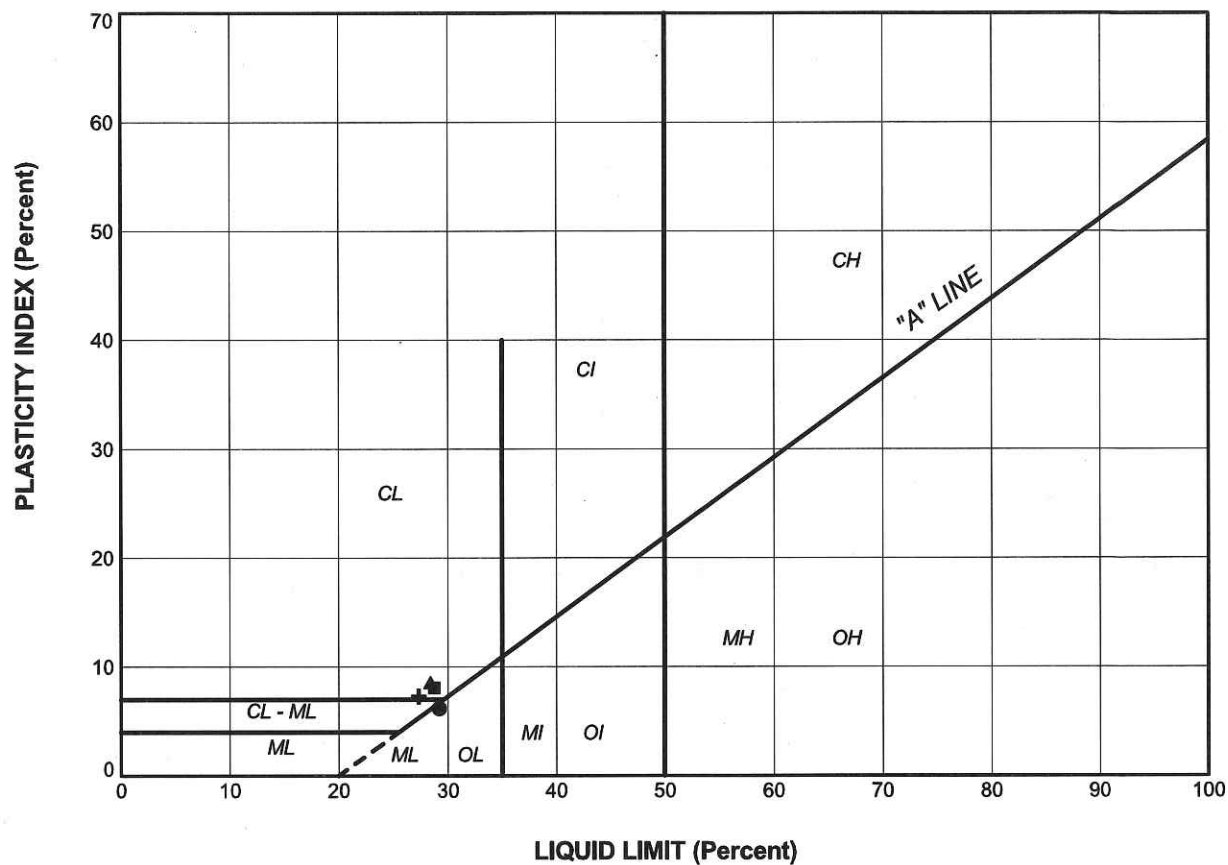
**PLASTICITY**  
 L = Low  
 I = Intermediate  
 H = High

### LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H2-3	4	43.3	24.1	19.2
■	H2-4	6	49.7	23.3	26.4
▲	H2-5	6	56.3	22.0	34.3
+	H2-6	7	56.8	22.9	33.9
◆	H2-7	7	57.6	23.1	34.5
◇	H2-7	8	46.5	22.3	24.2
○	H2-8	8	57.6	23.0	34.6
△	H2-9	8	47.2	21.0	26.2
⊗	H2-10	6	53.2	22.9	30.3
⊕	H2-11	6	62.9	23.7	39.2
□	H2-12	3B	45.1	23.6	21.5
⊙	H2-12	5	48.4	22.3	26.1
⊗	H2-13	7	43.4	21.5	21.9
☆	H2-14	8	38.3	20.8	17.5
⊗	H2-15	4	48.1	23.6	24.5
⊗	H2-16	3	38.0	20.6	17.4
⊗	H2-17	4	47.7	22.3	25.4
⊗	H2-17	6	37.9	20.8	17.1
×	H2-18	3	79.9	25.0	54.9
■	H2-19	4	52.5	24.9	27.6
■	H2-20	2	40.3	22.9	17.4
*	H2-21	3	47.7	22.1	25.6


PROJECT			
HIGHWAY 17 STA 13+140 TO 13+390 (WBL)			
TITLE			
PLASTICITY CHART SILTY CLAY to CLAY			
PROJECT No. 11-1191-0007		FILE No. 11-1191-0007.GPJ	
DRAWN TB	Mar 2014	SCALE N/A	REV.
CHECK SEMP	Mar 2014		
APPR	Mar 2014		
 <b>Golder Associates</b> SUDBURY, ONTARIO		<b>FIGURE B3</b>	



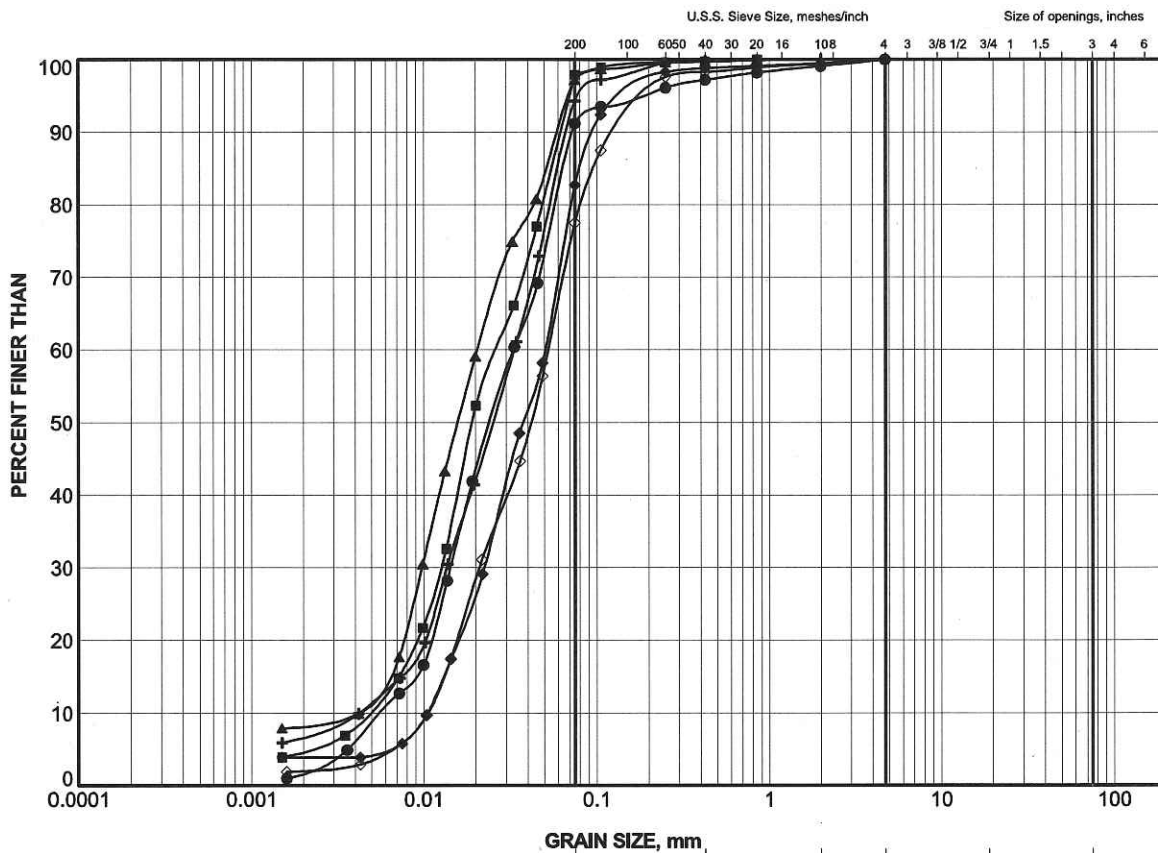


### LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H2-8	10	29.2	23.0	6.2
■	H2-11	8	28.7	20.6	8.1
▲	H2-18	7	28.4	19.8	8.6
+	H2-20	5	27.3	20.0	7.3

PROJECT					
HIGHWAY 17 STA 13+140 TO 13+390 (WBL)					
TITLE					
PLASTICITY CHART CLAYEY SILT to SILT					
PROJECT No.		11-1191-0007		FILE No.	
DRAWN		TB		Mar 2014	
CHECK		SEMP		Mar 2014	
APPR				Mar 2014	
 <b>Golder Associates</b> SUDBURY, ONTARIO				SCALE N/A REV.	
<b>FIGURE B5</b>					





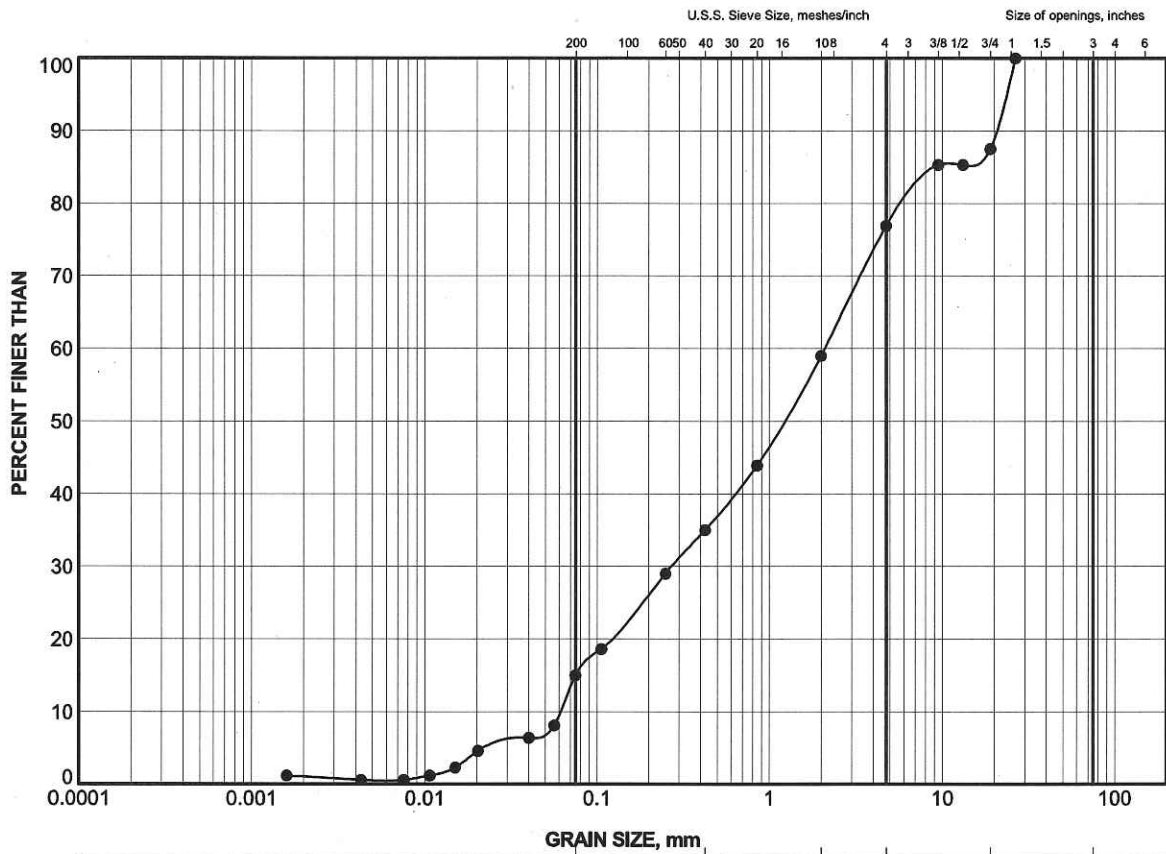
CLAY AND SILT	SAND SIZE, mm			GRAVEL SIZE, mm		Cobble Size
	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

#### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-16	7	233.6
■	H2-17	7	232.0
▲	H2-18	8	232.2
+	H2-19	8	232.3
◆	H2-20	8	231.0
◇	H2-21	7	233.9

PROJECT					
HIGHWAY 17 STA 13+140 TO 13+390 (WBL)					
TITLE					
GRAIN SIZE DISTRIBUTION SILT to SANDY SILT					
PROJECT No.		11-1191-0007		FILE No. 11-1191-0007.GPJ	
DRAWN	TB	Mar 2014	SCALE	N/A	REV.
CHECK	SEMP	Mar 2014	FIGURE B6.2		
APPR		Mar 2014			
 <b>Golder Associates</b> SUDBURY, ONTARIO					





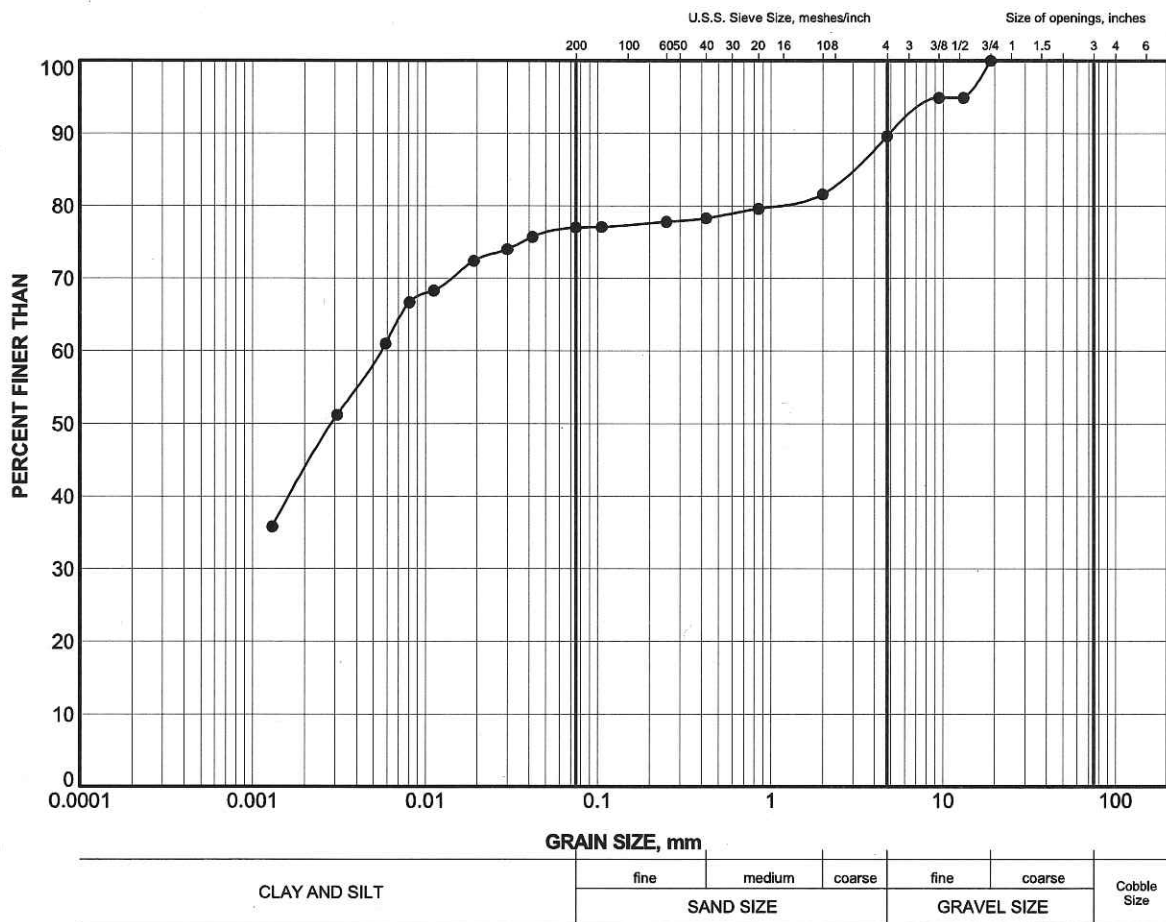
CLAY AND SILT	fine	medium	coarse	fine	coarse	Cobble Size
	SAND SIZE			GRAVEL SIZE		

#### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-19	12	226.2


PROJECT					HIGHWAY 17 STA 13+140 TO 13+390 (WBL)				
TITLE					GRAIN SIZE DISTRIBUTION GRAVELLY SAND				
PROJECT No.		11-1191-0007			FILE No.		11-1191-0007.GPJ		
DRAWN	TB	Mar 2014			SCALE	N/A	REV.		
CHECK	SEMP	Mar 2014			FIGURE B8				
APPR		Mar 2014							
 <b>Golder Associates</b> SUDBURY, ONTARIO									



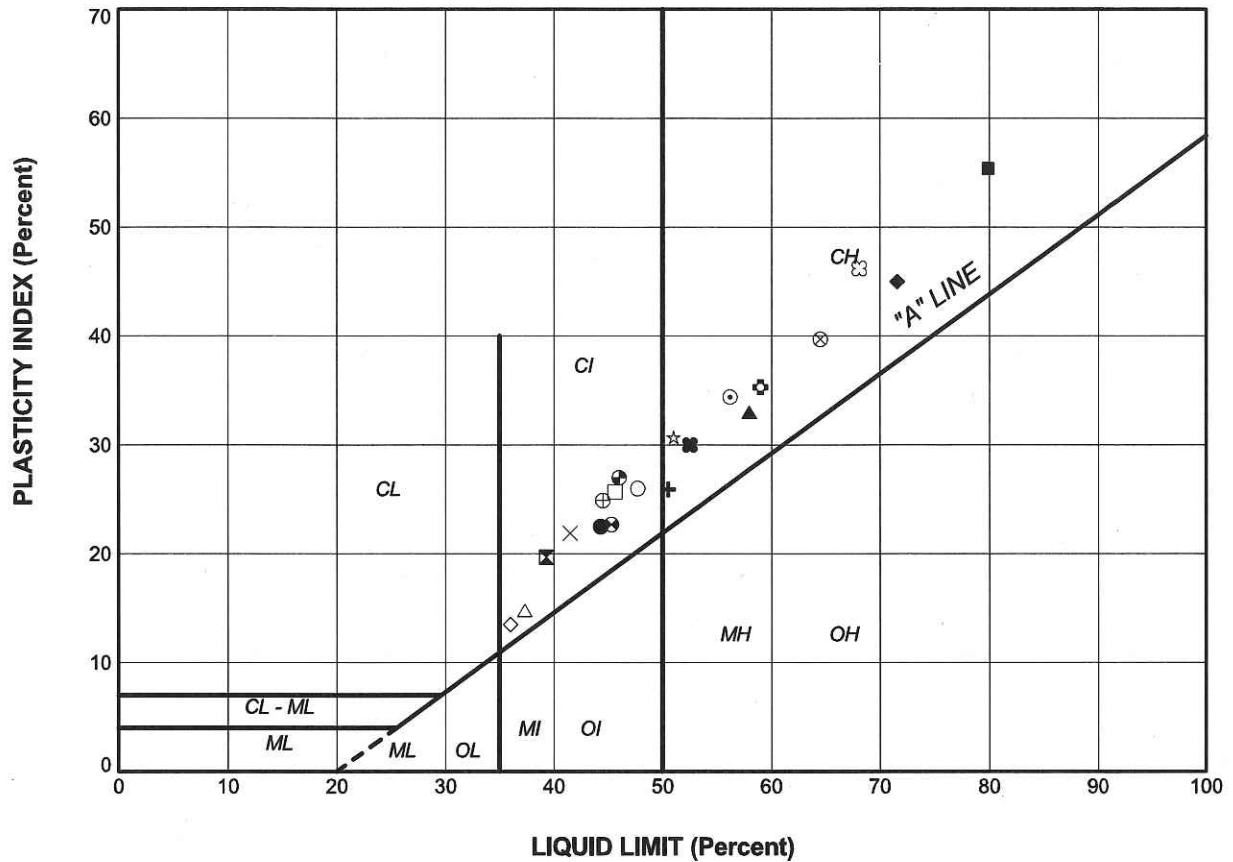


#### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-35	7A	235.0

PROJECT					
HIGHWAY 17 STA 13+140 TO 13+390 (EBL)					
TITLE					
GRAIN SIZE DISTRIBUTION CLAYEY SILT					
PROJECT No.		11-1191-0007		FILE No.	
DRAWN		TB		Mar 2014	
CHECK		SEMP		Mar 2014	
APPR				Mar 2014	
 <b>Golder Associates</b> SUDBURY, ONTARIO				SCALE	N/A
				REV.	
				<b>FIGURE B10</b>	





### LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	H2-25	6	44.3	21.8	22.5
■	H2-26	6	79.9	24.5	55.4
▲	H2-26	7	58.0	25.0	33.0
+	H2-27	6	50.5	24.6	25.9
◆	H2-28	7	71.6	26.6	45.0
◇	H2-28	9	36.0	22.5	13.5
○	H2-29	6	47.7	21.7	26.0
△	H2-29	10	37.3	22.5	14.8
⊗	H2-31	8	64.5	24.8	39.7
⊕	H2-32	7	44.5	19.6	24.9
□	H2-33	7	45.6	19.9	25.7
⊙	H2-34	7	45.3	22.6	22.7
⊗	H2-34	8	46.0	19.0	27.0
☆	H2-35	7B	51.0	20.3	30.7
⊗	H2-35	8	68.1	21.9	46.2
⊗	H2-36	5B	39.3	19.6	19.7
⊗	H2-36	8	56.2	21.8	34.4
⊗	H2-36	8A	59.0	23.7	35.3
×	H2-37	6	41.5	19.6	21.9
■	H2-38	6	52.5	22.5	30.0

PROJECT				
HIGHWAY 17 STA 13+140 TO 13+390 (EBL)				
TITLE				
PLASTICITY CHART SILTY CLAY to CLAY				
PROJECT No.		11-1191-0007		FILE No.
DRAWN		TB		Mar 2014
CHECK		SEMP		Mar 2014
APPR				Mar 2014
SCALE		N/A		REV.
FIGURE B12				

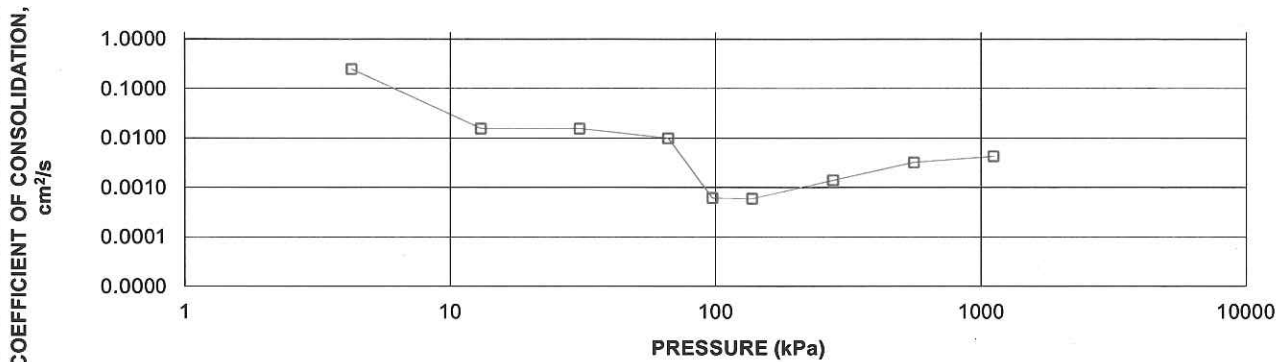




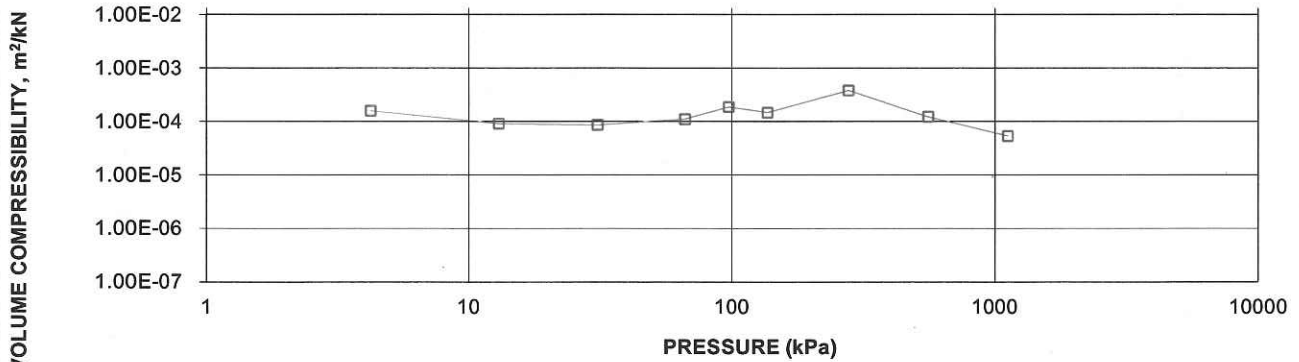
# CONSOLIDATION TEST SUMMARY

FIGURE B13  
Pg. 2 of 4

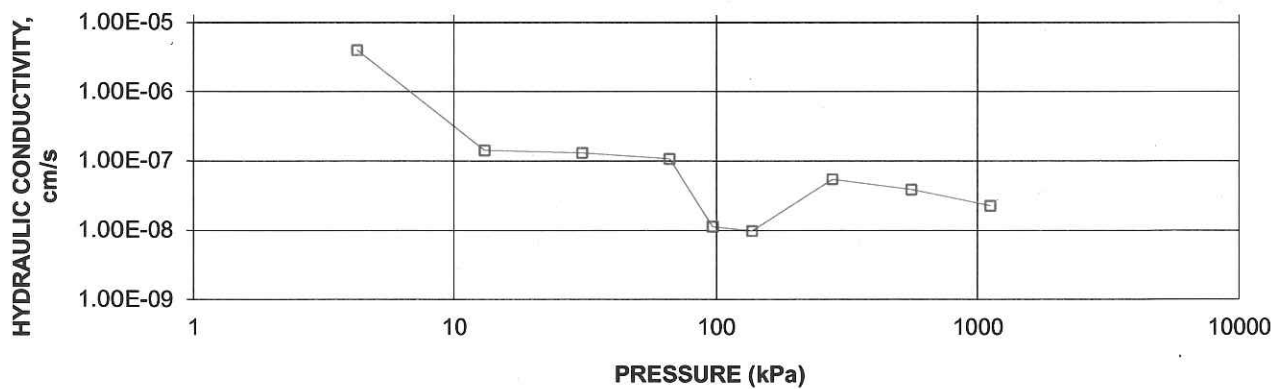
CONSOLIDATION TEST  
CV cm<sup>2</sup>/s VS PRESSURE (kPa)  
BH H2-26 SA 7



CONSOLIDATION TEST  
MV m<sup>2</sup>/kN vs PRESSURE (kPa)  
BH H2-26 SA 7



CONSOLIDATION TEST  
HYDRAULIC CONDUCTIVITY vs PRESSURE  
BH H2-26 SA 7



Project No. 11-1191-0007

Prepared By: TG

**Golder Associates**

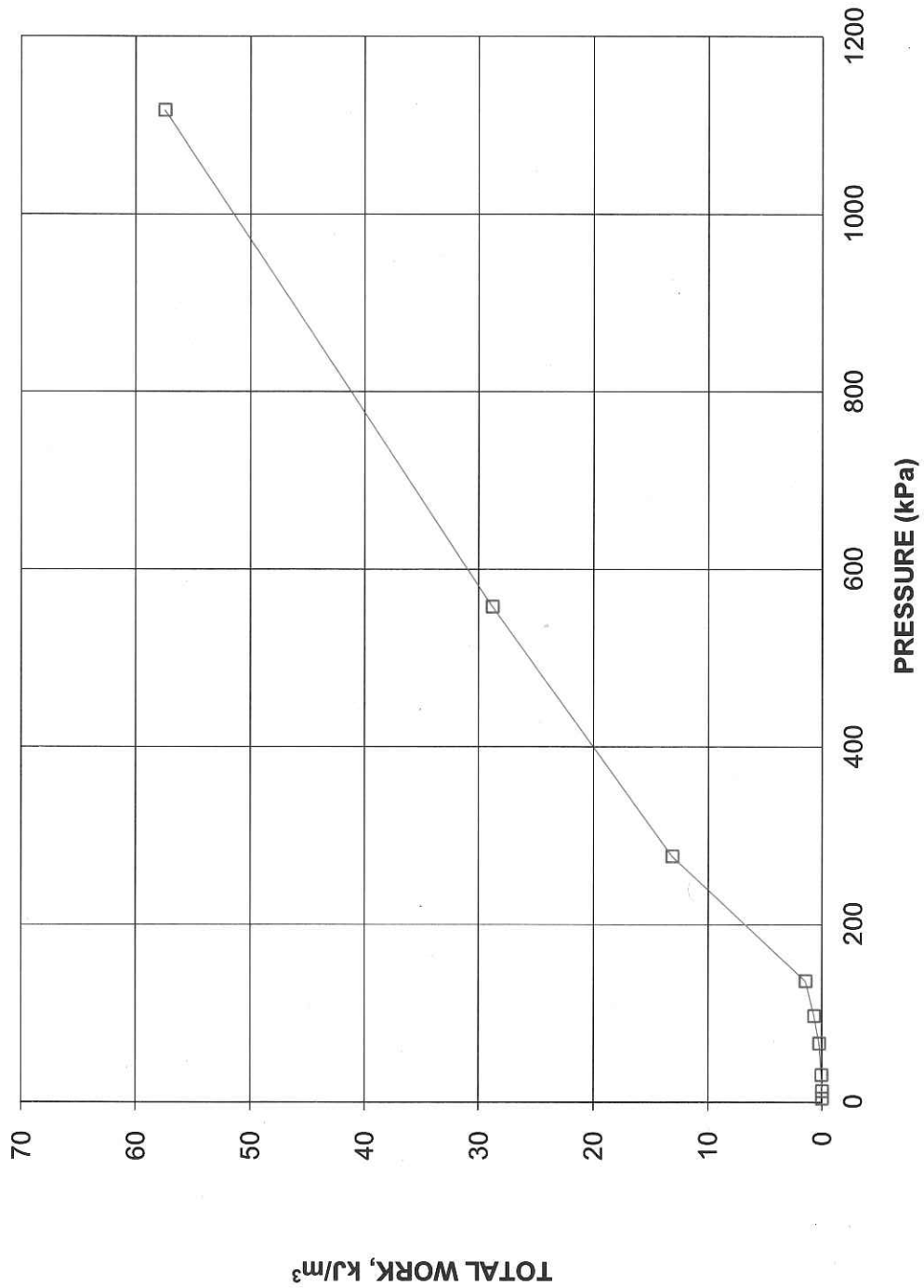
Checked By:



**CONSOLIDATION TEST  
TOTAL WORK VS PRESSURE**

**FIGURE B13**  
Pg. 4 of 4

**CONSOLIDATION TEST  
TOTAL WORK,  $\text{kJ/m}^3$  vs PRESSURE  
BH H2-26 SA 7**



Project No: 11-1191-0007

Prepared By: TG

**Golder Associates**

Checked By:



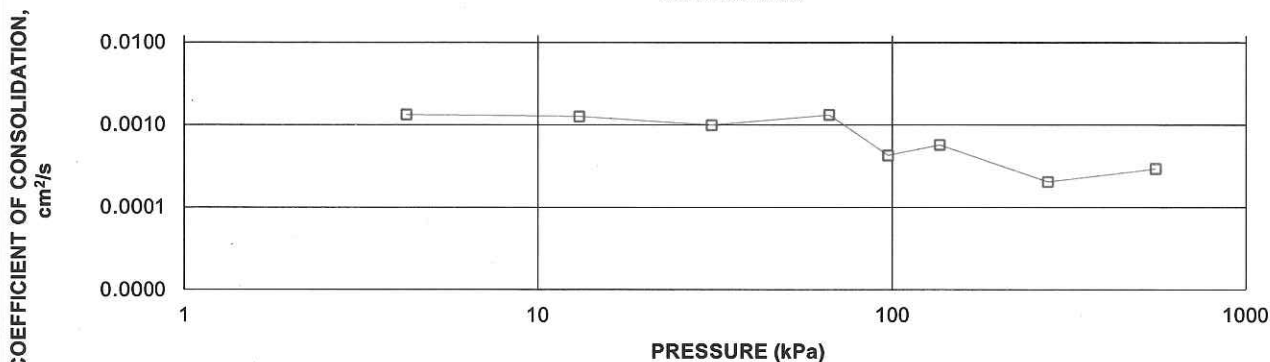
# CONSOLIDATION TEST SUMMARY

FIGURE B14

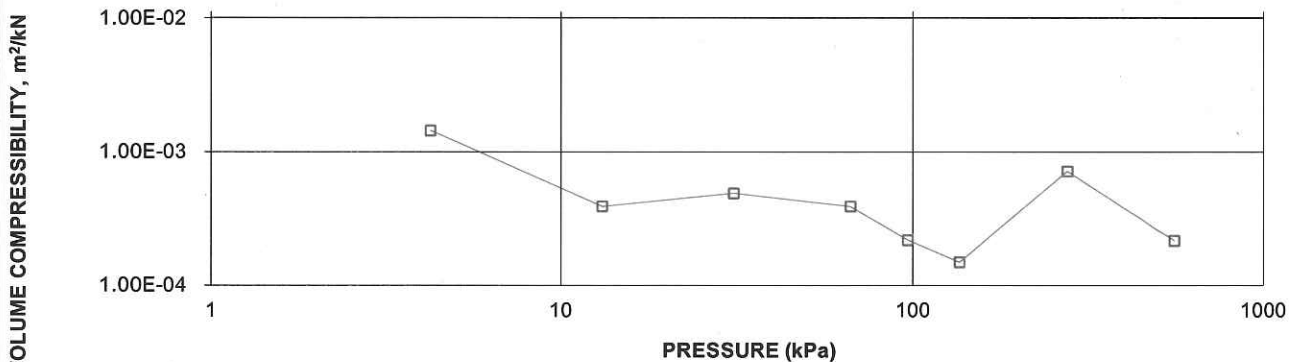
Pg. 2 of 4

8

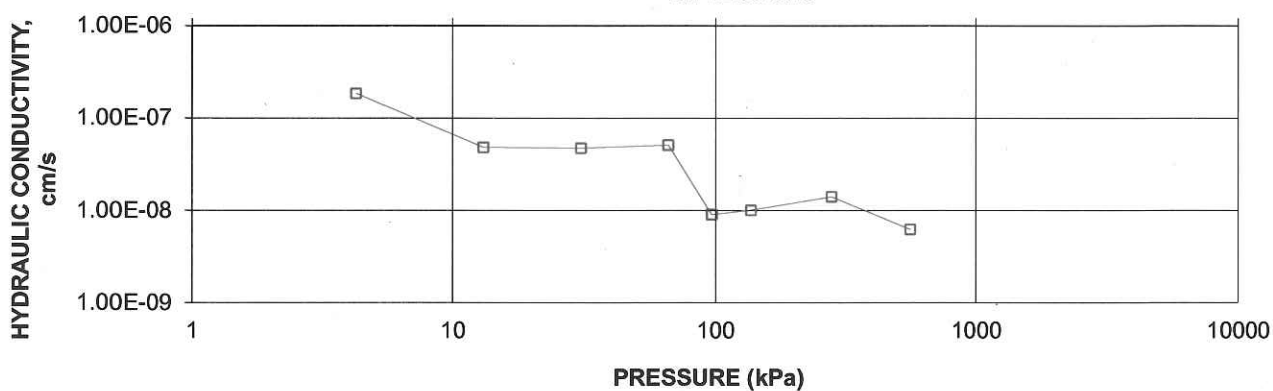
CONSOLIDATION TEST  
CV cm<sup>2</sup>/s VS PRESSURE (kPa)  
BH H2-36 Sa 8



CONSOLIDATION TEST  
MV m<sup>2</sup>/kN vs PRESSURE (kPa)  
BH H2-36 Sa 8



CONSOLIDATION TEST  
HYDRAULIC CONDUCTIVITY vs PRESSURE  
BH H2-36 Sa 8



Project No. 11-1191-0007

Prepared By: SL

**Golder Associates**

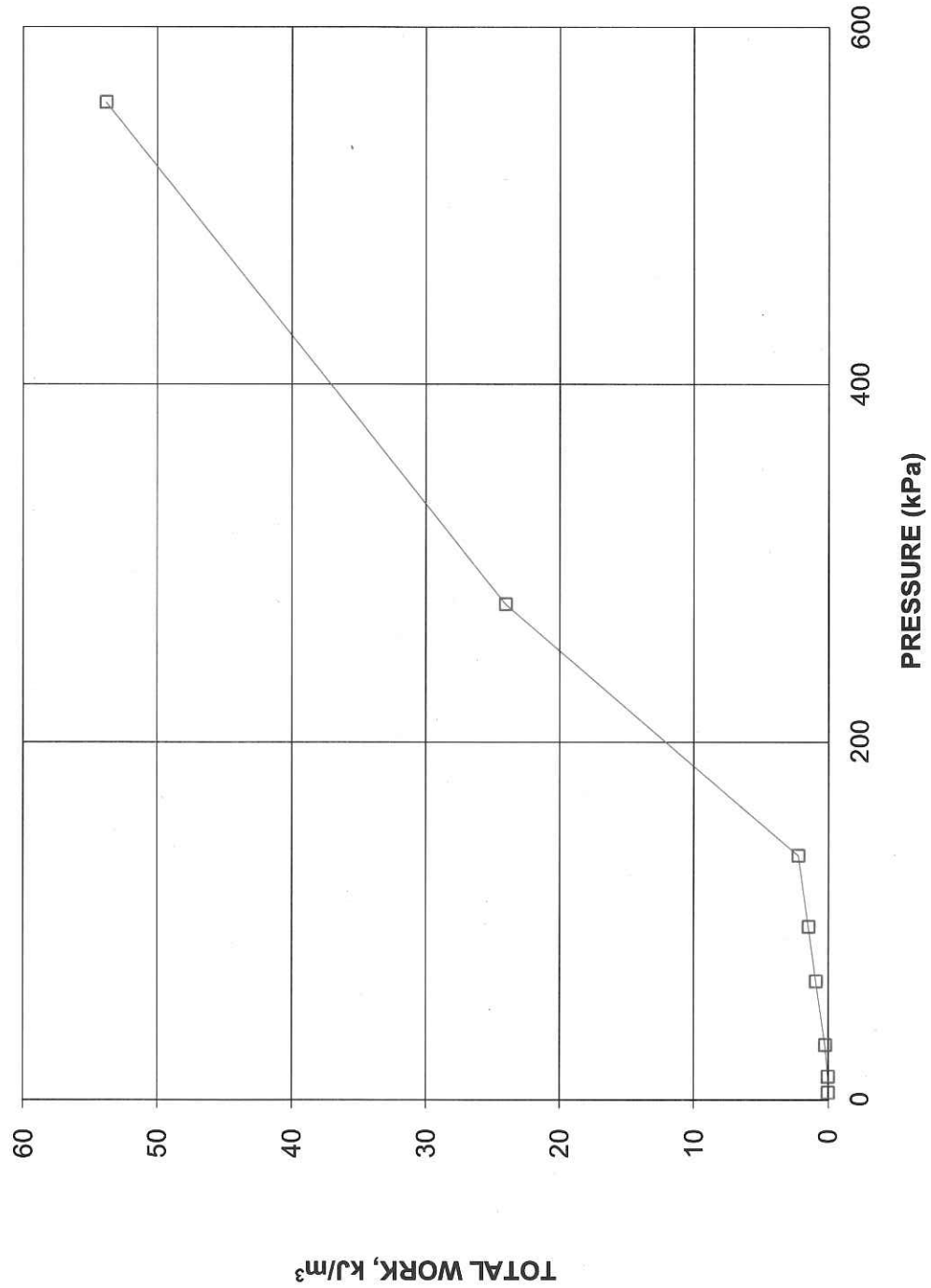
Checked By:



**CONSOLIDATION TEST  
TOTAL WORK VS PRESSURE**

**FIGURE B14**  
Pg. 4 of 4

**CONSOLIDATION TEST  
TOTAL WORK, kJ/m<sup>3</sup> vs PRESSURE  
BH H2-36 Sa 8**



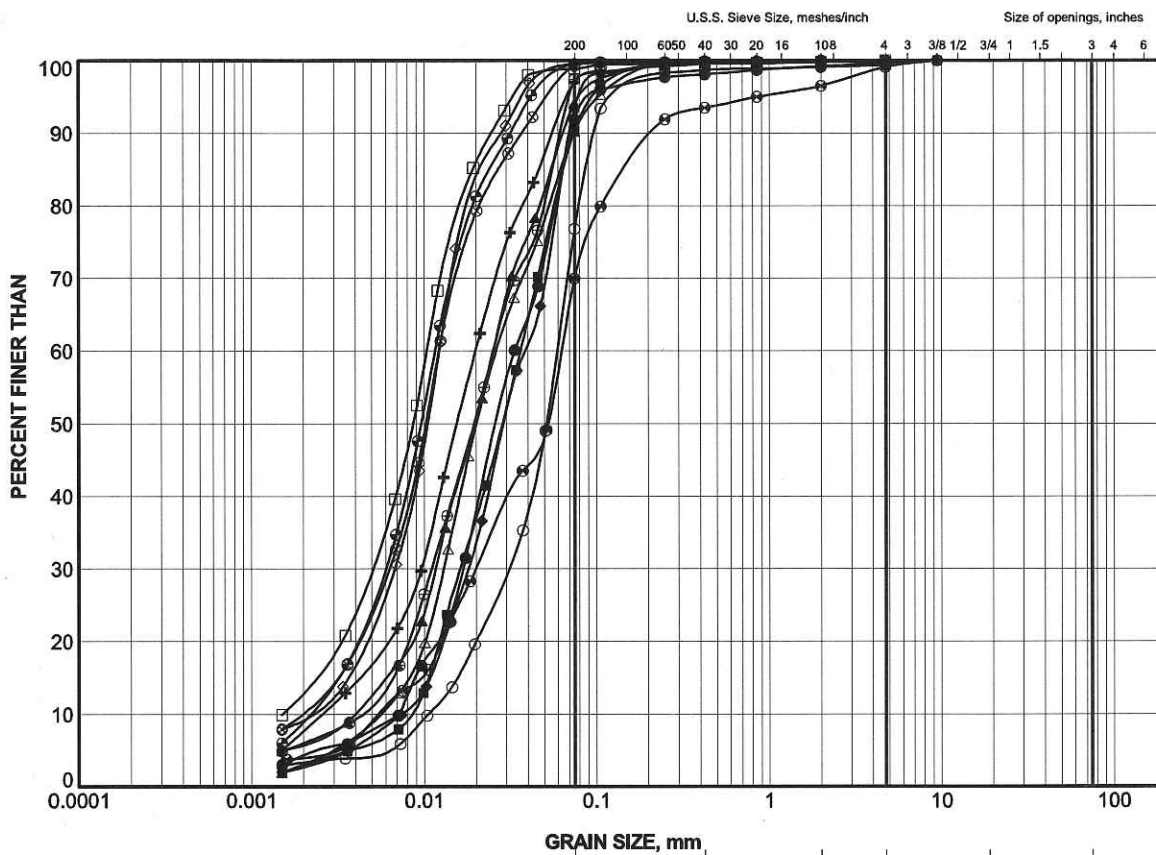
Project No: 11-1191-0007

Prepared By: SL

**Golder Associates**

Checked By:





GRAIN SIZE, mm						Cobble Size
CLAY AND SILT	fine	medium	coarse	fine	coarse	
	SAND SIZE			GRAVEL SIZE		

#### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-22	4	237.7
■	H2-24	4	237.0
▲	H2-28	11	227.3
+	H2-29	13	225.8
◆	H2-30	16	221.1
◇	H2-31	12	225.7
○	H2-32	14	224.3
△	H2-33	14	222.4
⊗	H2-34	13	225.7
⊕	H2-35	12	225.7
□	H2-36	10	228.8
⊙	H2-36	12	225.8
⊛	H2-37	11	228.9

PROJECT

HIGHWAY 17  
STA 13+140 TO 13+390 (EBL)

TITLE

### GRAIN SIZE DISTRIBUTION

SILT to SANDY SILT

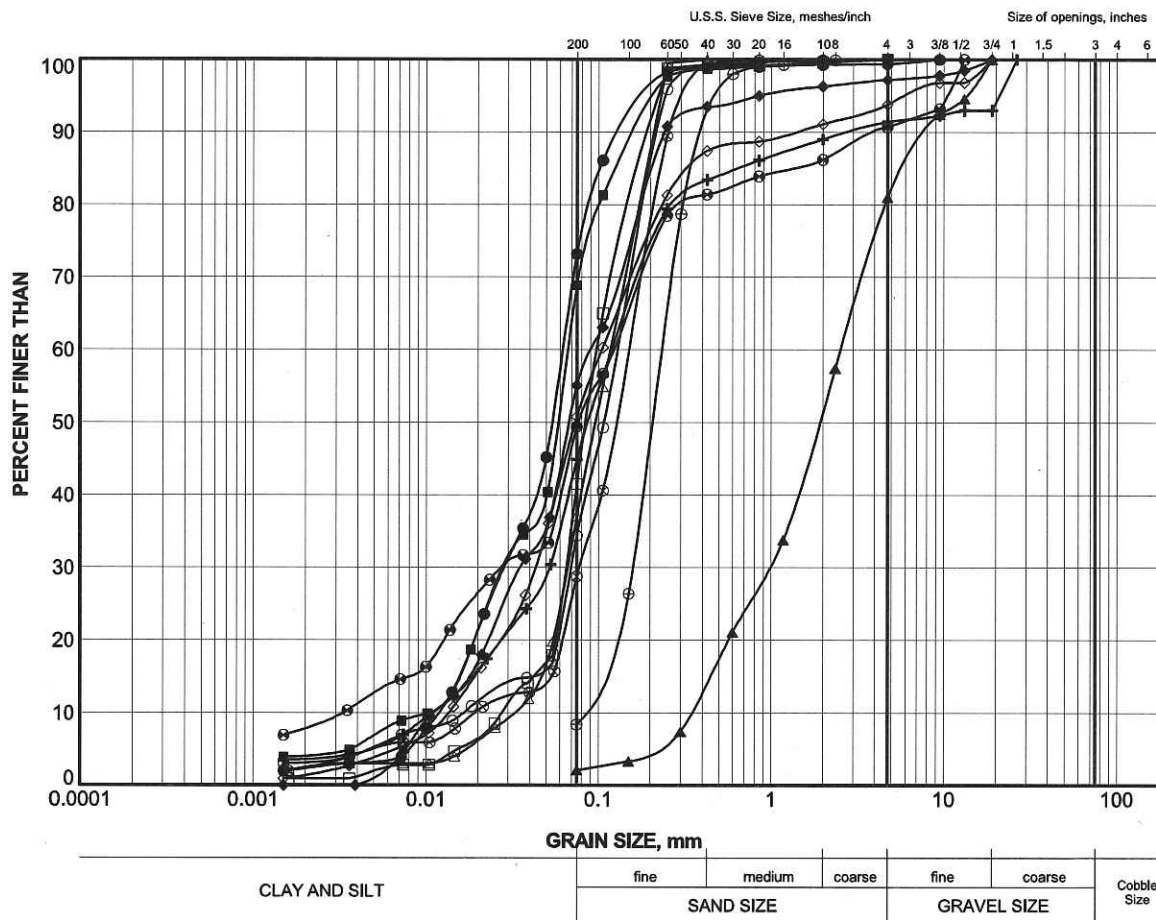


**Golder Associates**  
SUDBURY, ONTARIO

PROJECT No.	11-1191-0007	FILE No.	11-1191-0007.GPJ
DRAWN	TB	Mar 2014	SCALE N/A REV.
CHECK	SEMP	Mar 2014	
APPR		Mar 2014	

**FIGURE B16.1**





### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-23	5	236.3
■	H2-30	19	216.5
▲	H2-32	16	221.2
+	H2-34	17	219.6
◆	H2-37	14	224.4
◇	H2-38	12	227.3
○	H2-39	10	230.4
△	H2-40	8	231.9
⊗	H2-41	6	233.7
⊕	H2-42	7	236.9
□	H2-42	10	232.4
⊙	H2-43	4	239.5

PROJECT

HIGHWAY 17  
STA 13+140 TO 13+390 (EBL)

TITLE

## GRAIN SIZE DISTRIBUTION

SAND and SILT to SAND

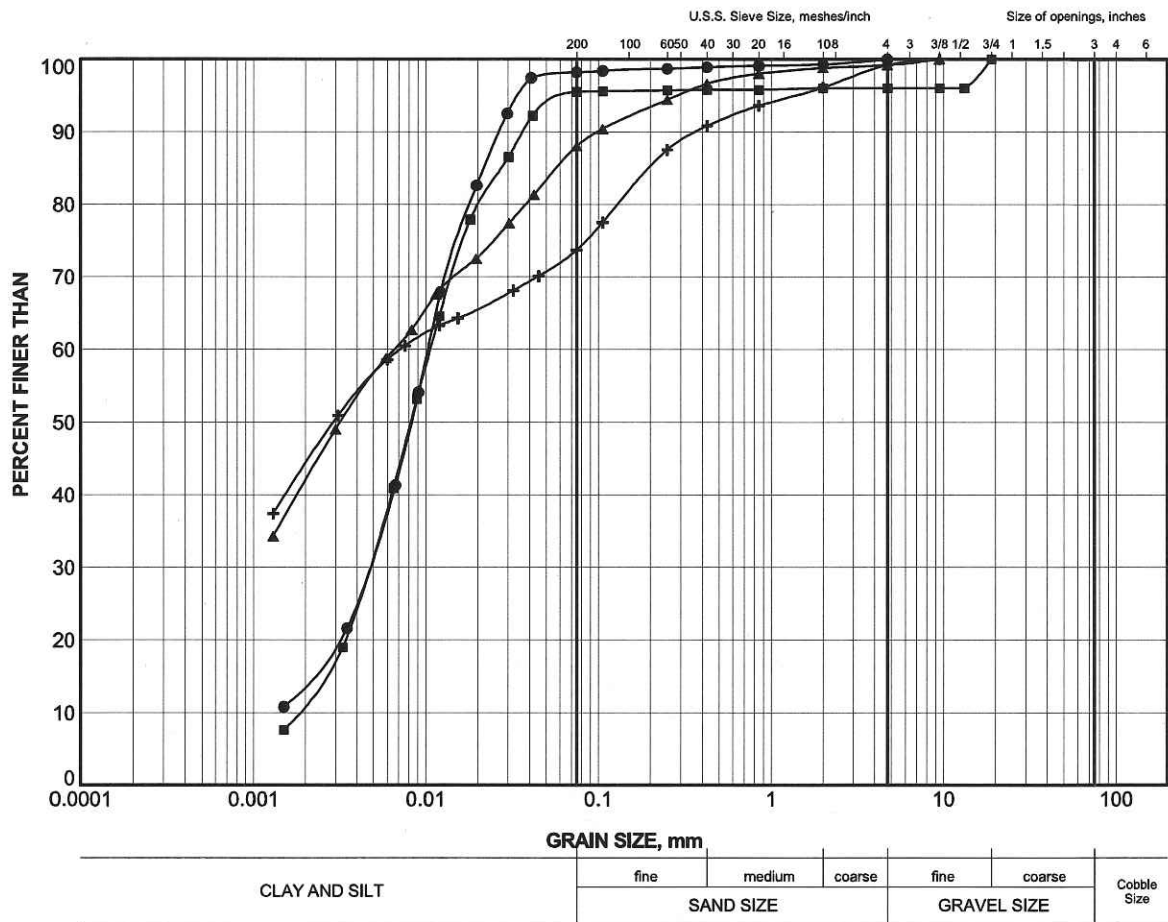


**Golder  
Associates**  
SUDBURY, ONTARIO

PROJECT No.	11-1191-0007	FILE No.	11-1191-0007.GPJ
DRAWN	TB	Mar 2014	SCALE N/A REV.
CHECK	SEMP	Mar 2014	
APPR		Mar 2014	

**FIGURE B17**





#### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-44	6	234.7
■	H2-46	9	231.6
▲	H2-49	6	235.5
+	H2-51	6A	235.5

PROJECT

HIGHWAY 17  
ST. POTHIER ROAD  
STA 9+400 TO 9+600

TITLE

### GRAIN SIZE DISTRIBUTION

CLAYEY SILT to SILT

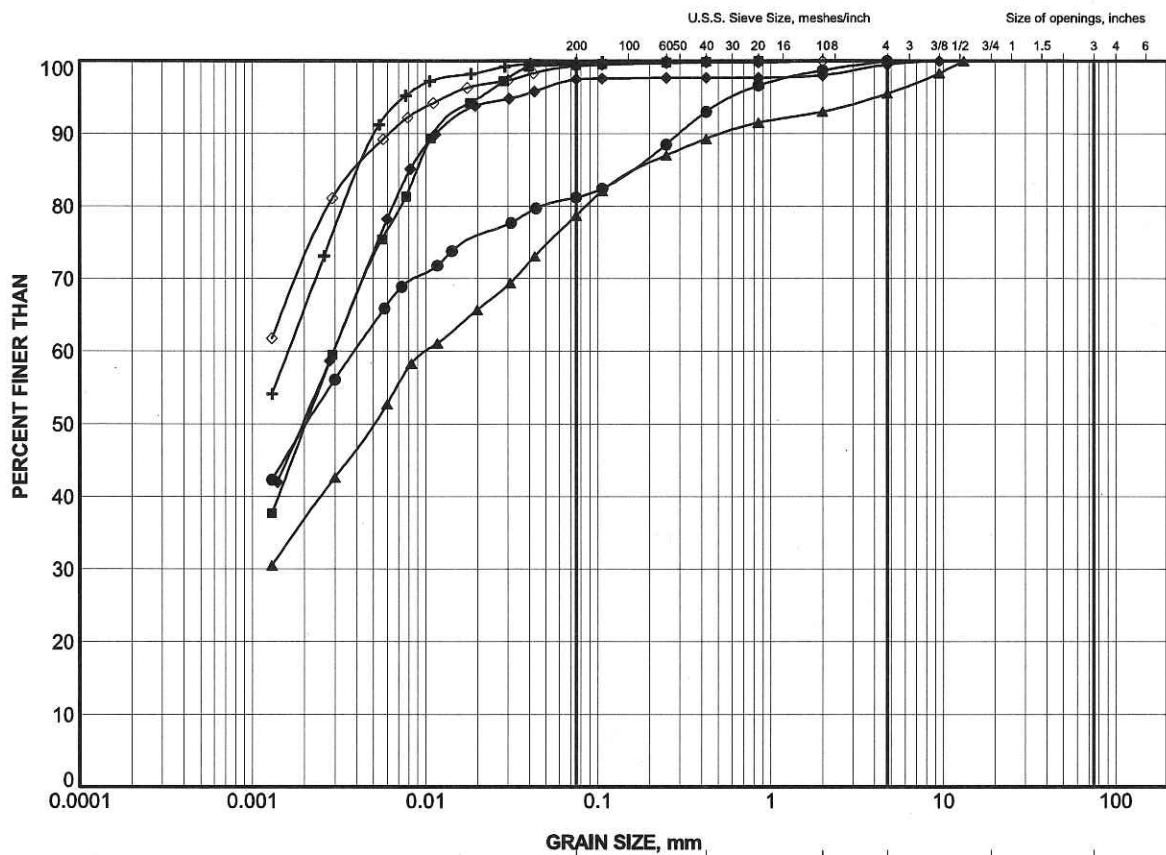


**Golder  
Associates**  
SUDBURY, ONTARIO

PROJECT No.	11-1191-0007	FILE No.	11-1191-0007.GPJ
DRAWN	TB	Mar 2014	SCALE N/A REV.
CHECK	SEMP	Mar 2014	
APPR		Mar 2014	

**FIGURE B19**





#### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-45	6	235.4
■	H2-48	7	234.6
▲	H2-50	6	235.4
+	H2-54	9	231.7
◆	H2-55	7	234.8
◇	H2-58	4	237.0

PROJECT

HIGHWAY 17  
ST. POTHIER ROAD  
STA 9+400 TO 9+600

TITLE

### GRAIN SIZE DISTRIBUTION

SILTY CLAY to CLAY

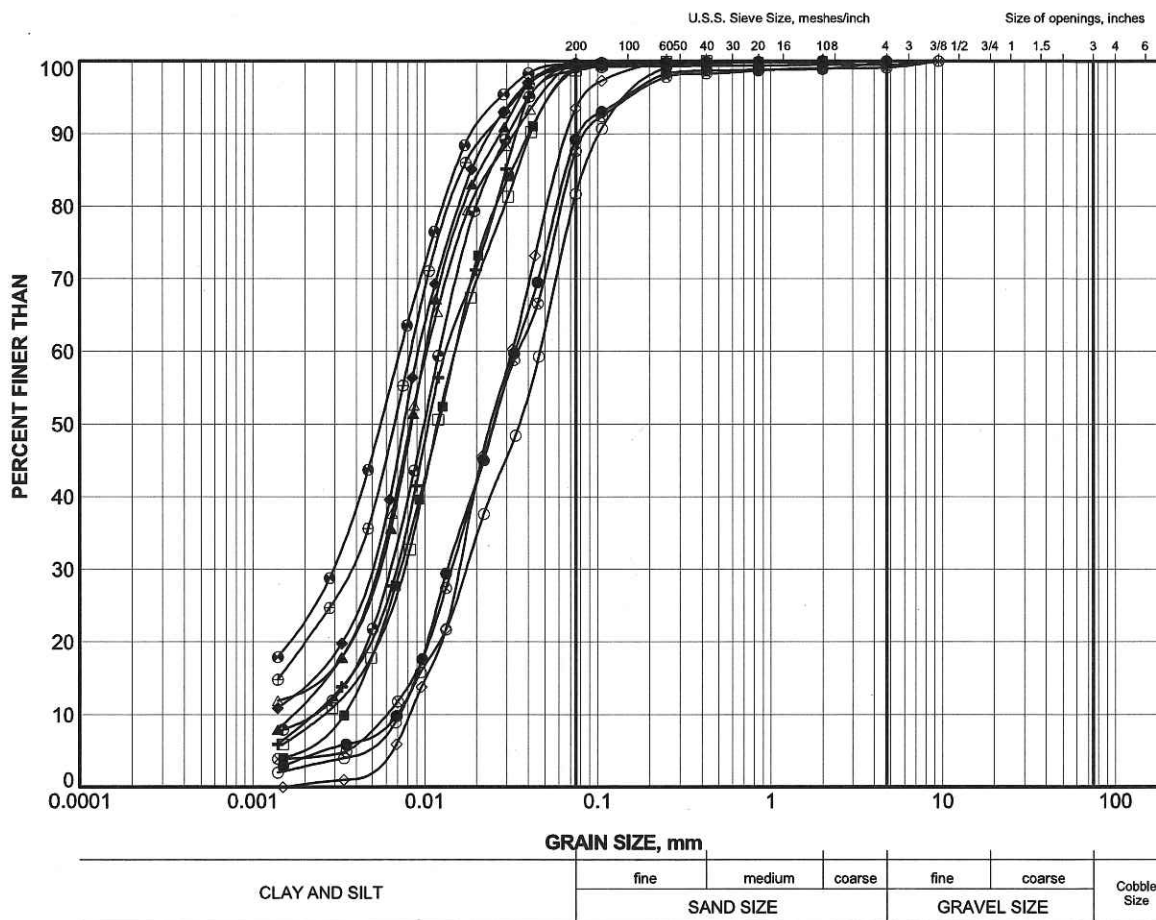


**Golder  
Associates**  
SUDBURY, ONTARIO

PROJECT No.	11-1191-0007	FILE No.	11-1191-0007.GPJ
DRAWN	TB	Mar 2014	SCALE N/A REV.
CHECK	SEMP	Mar 2014	
APPR		Mar 2014	

**FIGURE B21**





### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-45	10	230.1
■	H2-47	13	225.5
▲	H2-48	13	225.5
+	H2-49	14	224.1
◆	H2-50	13	225.5
◇	H2-50	16	220.9
○	H2-50	19	216.3
△	H2-51	13	225.5
⊗	H2-51	16	220.9
⊕	H2-52	12	227.0
□	H2-52	14	224.0
⊙	H2-53	12	227.0
⊛	H2-53	13	225.5

PROJECT

HIGHWAY 17  
ST. POTHIER ROAD  
STA 9+400 TO 9+600

TITLE

## GRAIN SIZE DISTRIBUTION

SILT to SANDY SILT

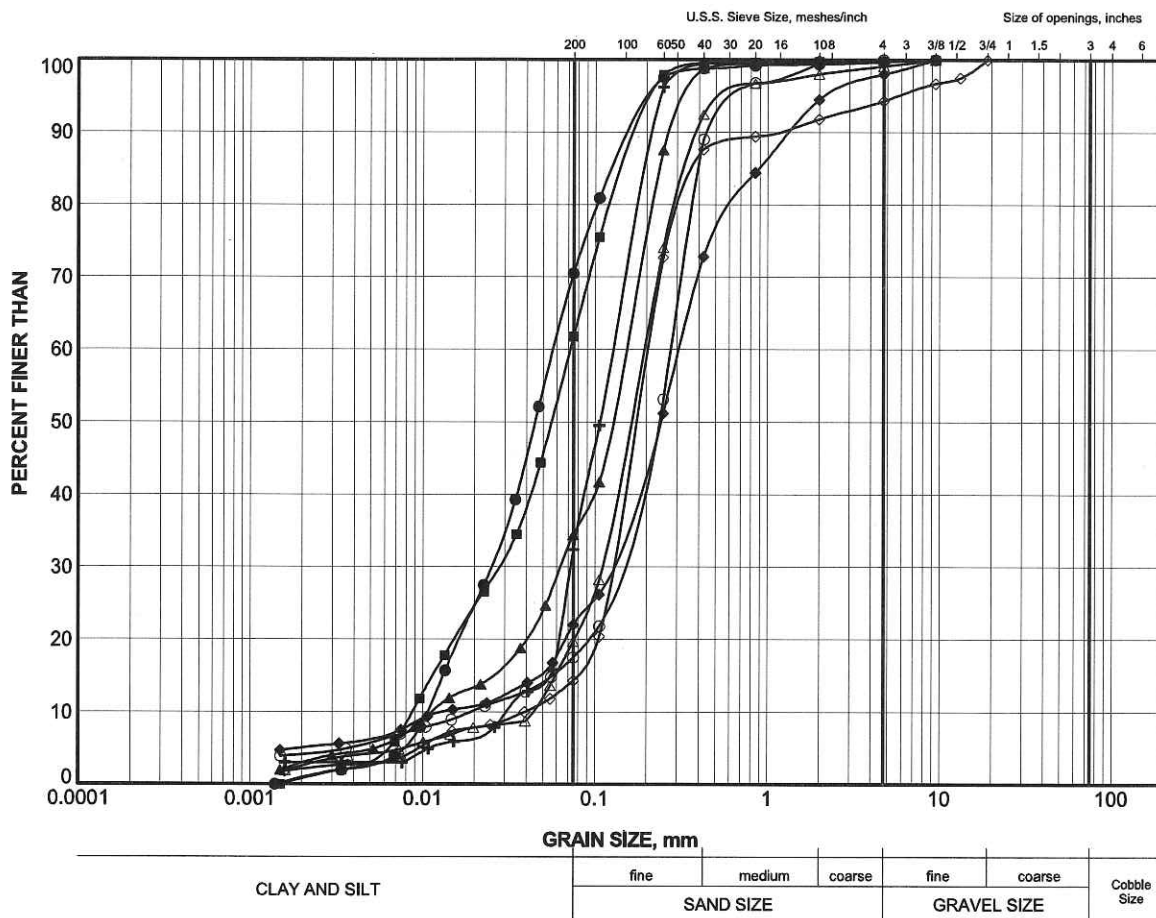


**Golder Associates**  
SUDBURY, ONTARIO

PROJECT No.	11-1191-0007	FILE No.	11-1191-0007.GPJ
DRAWN	TB	Mar 2014	SCALE N/A
CHECK	SEMP	Mar 2014	REV.
APPR		Mar 2014	

**FIGURE B23.1**





### LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	H2-48	16	220.9
■	H2-49	19	216.4
▲	H2-52	17	219.4
+	H2-56	11	228.7
◆	H2-57	12	227.1
◇	H2-58	11	228.6
○	H2-59	9	230.3
△	H2-60	9	230.4

PROJECT

HIGHWAY 17  
ST. POTHIER ROAD  
STA 9+400 TO 9+600

TITLE

## GRAIN SIZE DISTRIBUTION

SAND and SILT to SAND



**Golder Associates**  
SUDBURY, ONTARIO

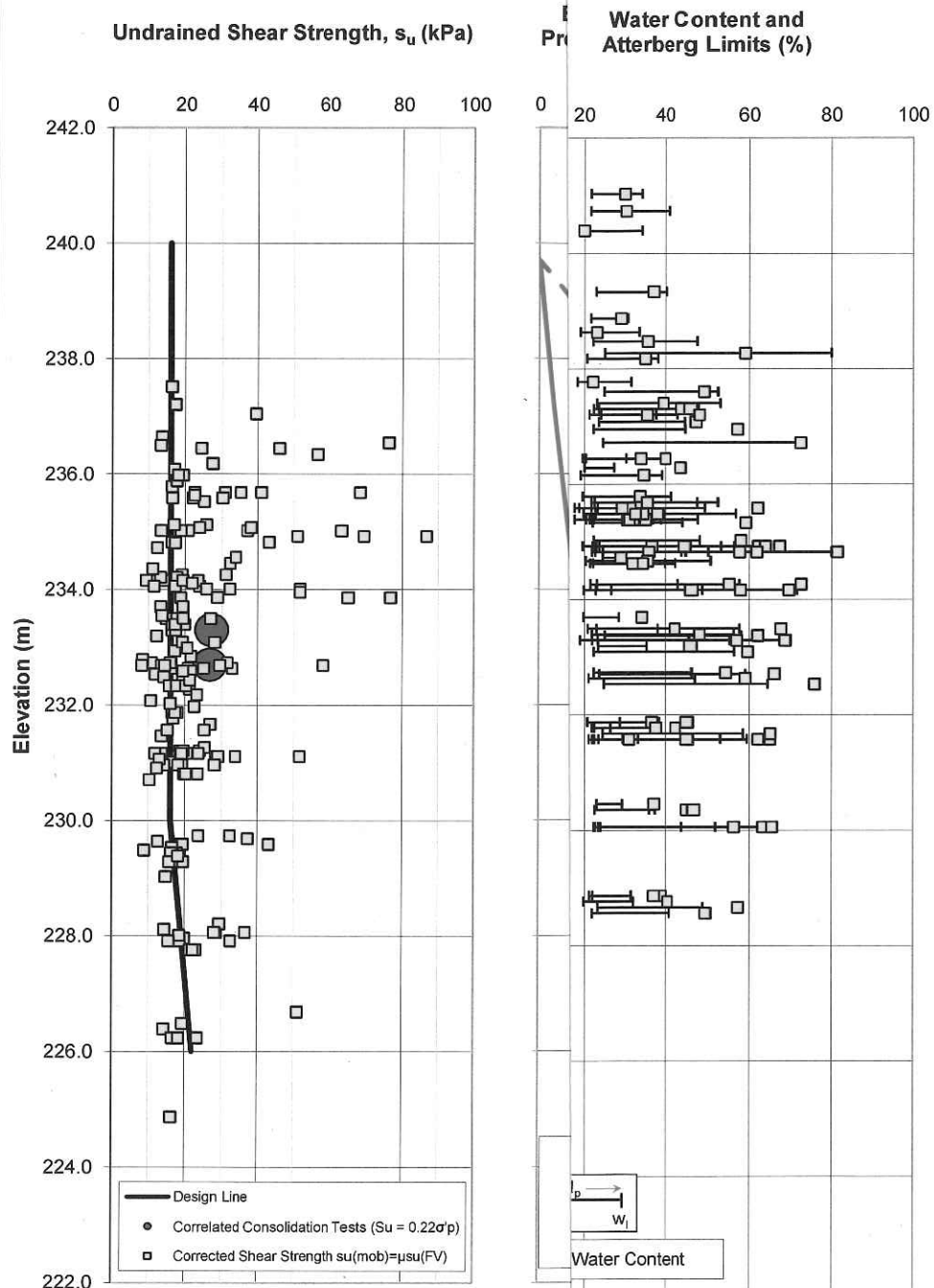
PROJECT No.	11-1191-0007	FILE No.	11-1191-0007.GPJ
DRAWN	TB	Mar 2014	SCALE N/A REV.
CHECK	SEMP	Mar 2014	
APPR		Mar 2014	

**FIGURE B24**



PARAMETERS FOR  
SITS  
Township of Louise (H2)  
Township of Louise (H2)

FIGURE B25



Prepared By: EC  
Checked By: SEMP





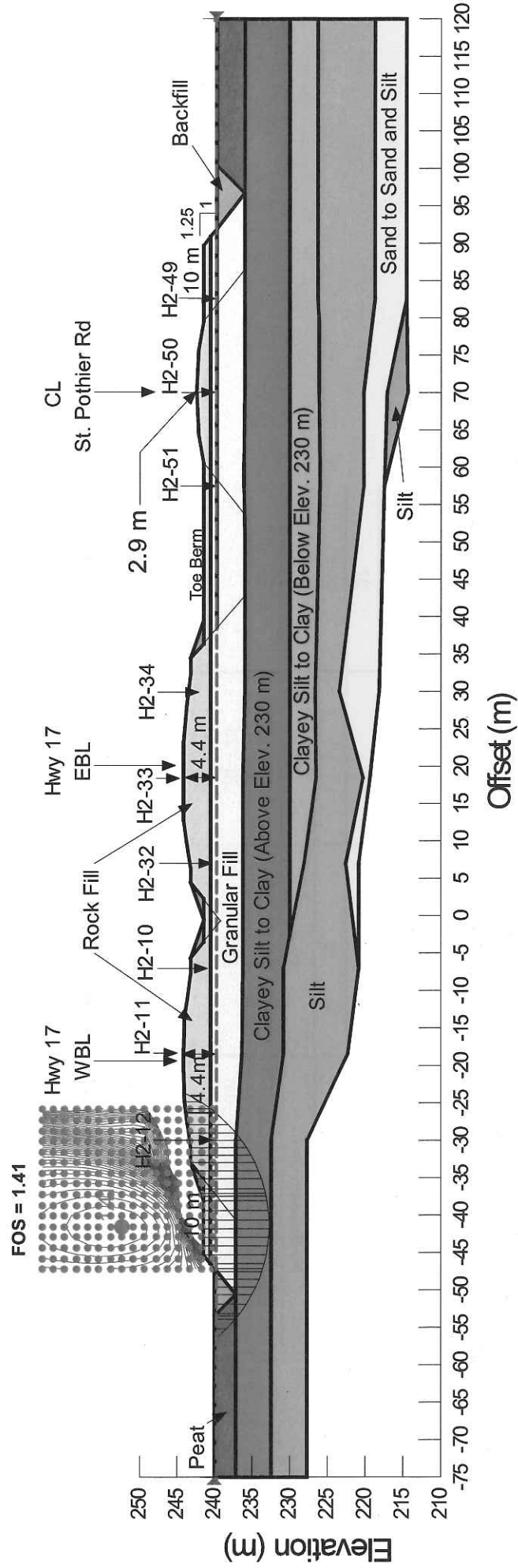
# Stability Analysis

STA 13+260 – WBL North Side

Stage 1 Embankment Height (10 m Toe Berms)

Figure B26

Material Name	Unit Weight (kN/m <sup>3</sup> )	Cohesion (kPa)	Friction Angle (°)
New Granular Fill (BWT)	20	-	35
New Rock Fill	19	-	40
Peat	12	1	27
Backfill	12	1	27
Clayey Silt to Clay (Above Elev. 230 m)	16.2	16	-
Clayey Silt to Clay (Below Elev. 230 m)	16.2	16 – 22	-
Silt	18	-	28
Sand to Sand and Silt	18	-	28



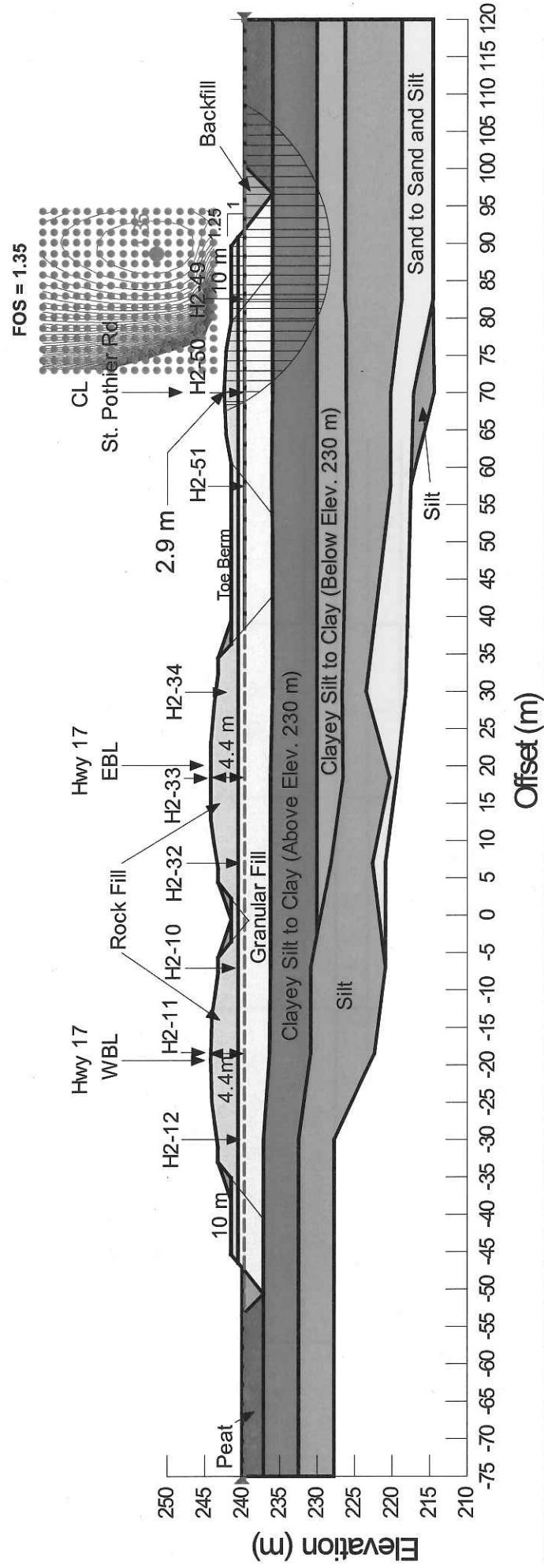


# Stability Analysis

STA 9+480 – St. Pothier Road South Side  
Stage 1 Embankment Height (10 m Toe Berms)

Figure B28

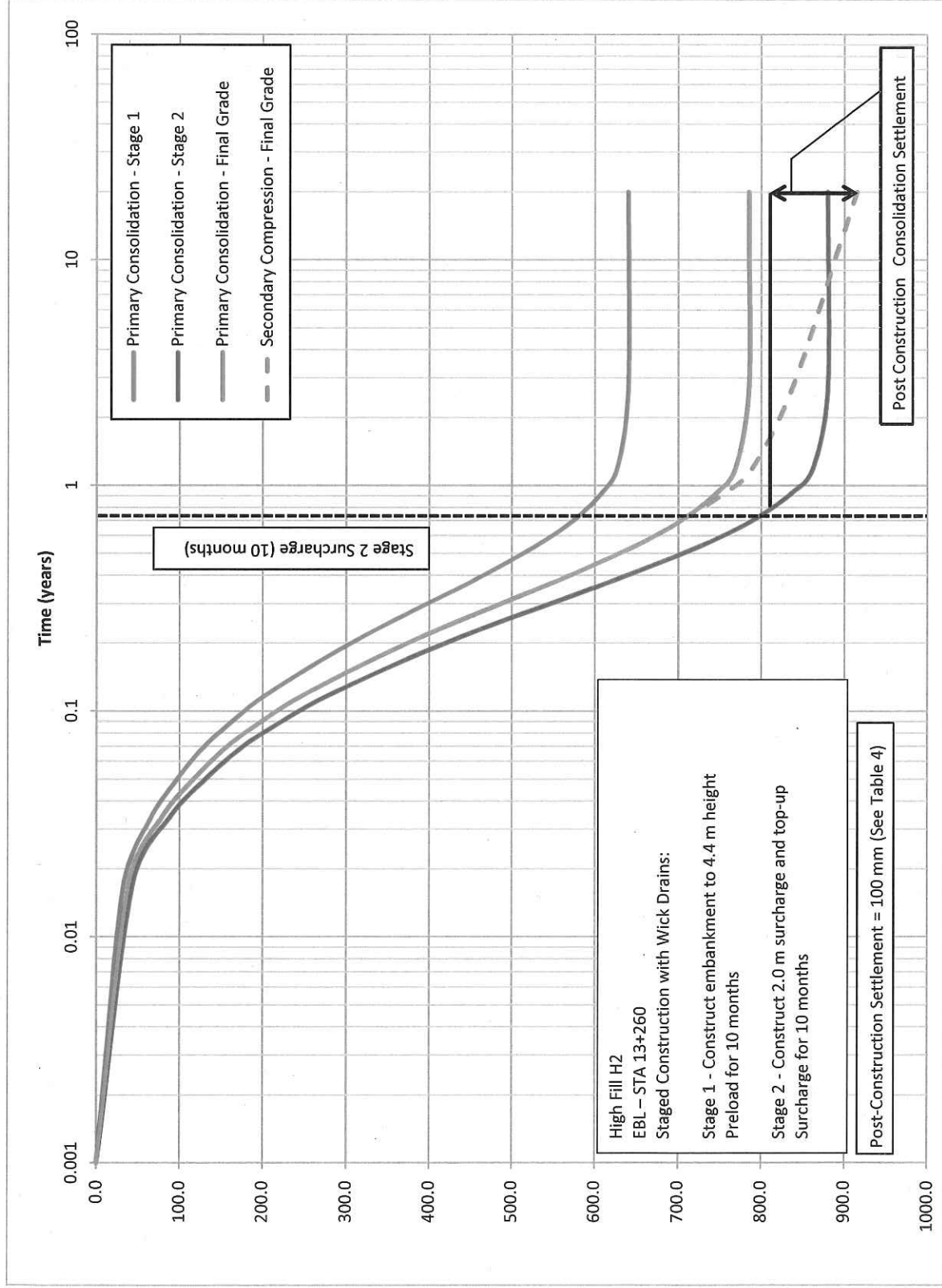
Material Name	Unit Weight (kN/m <sup>3</sup> )	Cohesion (kPa)	Friction Angle (°)
New Granular Fill (BWT)	20	-	35
New Rock Fill	19	-	40
Peat	12	1	27
Backfill	12	1	27
Clayey Silt to Clay (Above Elev. 230 m)	16.2	16	-
Clayey Silt to Clay (Below Elev. 230 m)	16.2	16 – 22	-
Silt	18	-	28
Sand to Sand and Silt	18	-	28





Settlement Analysis  
STA 13+260 – EBL  
Settlement vs. log Time – Staged Construction

Figure B30







## **APPENDIX C**

**HIGHWAY 17 WBL – STA 13+900 TO 14+200 AND  
HIGHWAY 17 EBL – STA 13+900 TO 14+200 (HIGH FILL H3)**



**Table C1: Evaluation of Settlement Mitigation Options  
Highway 17 – STA 13+900 to 14+200 (High Fill Area H3)**

Stability/Settlement Mitigation Option	Option No.	Rank	Advantages	Disadvantages	Relative Costs	Risks/Consequences
Consolidation and Maintenance  ■ 6 year preload period	A	1	<ul style="list-style-type: none"> <li>■ Standard embankment construction operation – no need for specialized material or equipment.</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Does not meet MTO's Settlement Criteria</b></li> <li>■ Contractor will have to remobilize to site in order to re-grade.</li> <li>■ Significant wait period is required before settlement is mitigated.</li> <li>■ Instrumentation and monitoring program required to assess end of preload period.</li> </ul>	<ul style="list-style-type: none"> <li>■ Remobilization costs required for re-grading.</li> </ul>	<ul style="list-style-type: none"> <li>■ There will be no impact on the construction schedule</li> <li>■ Very low risk of not achieving stability of preload embankments on weak/soft foundation soils.</li> <li>■ Low risk of experiencing unexpected post-construction settlements (i.e. creep).</li> <li>■ Low risk that unexpected post-construction settlements create an unsafe travelled laneway.</li> </ul>
Partial Embankment Sub-Excavation and Lightweight Fill (EPS)  ■ A 2.0 m zone of EPS	B	NP	<ul style="list-style-type: none"> <li>■ <b>Meets MTO's Settlement Criteria</b></li> <li>■ Creates a negligible load on subsoils thereby inducing negligible settlement of foundations soils.</li> <li>■ Re-grading is not required</li> </ul>	<ul style="list-style-type: none"> <li>■ Expensive material compared to conventional embankment fill.</li> <li>■ Will need to sub-excavate some of the existing embankment material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Relative cost of EPS fill is about an order of magnitude higher than fill required for the other options.</li> <li>■ <math>7,500 \text{ m}^3 \times \\$200/\text{m}^3 = \\$1,500,000.</math></li> </ul>	<ul style="list-style-type: none"> <li>■ There will be a minimal impact on the construction schedule</li> <li>■ Very low risk of not achieving stability of preload embankments and final EPS embankments on weak/soft foundation soils.</li> <li>■ Low risk of experiencing unexpected post-construction settlements (i.e. creep).</li> </ul>

NP: Not Practical

Prepared By: SEMC Reviewed By: JMAC

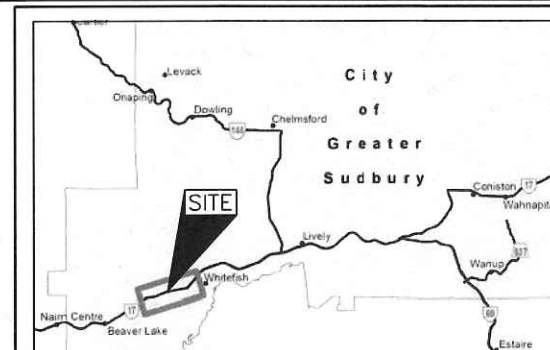




SHEET





**Golder Associates Ltd**  
SUDBURY, ONTARIO, CANADA



## KEY PLAN



### LEGEND

-  Borehole
-  Dynamic Cone Penetration Test

## NOTES

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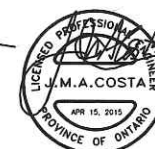
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

## REFERENCE

Base plans provided in digital format by DM Wills, drawing files EBL & WBL PROFILES.dwg received on Feb 28, 2013 and 581\_contours.dwg received Jan 17, 2012.

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
H3-1	248.2	5137366.3	277900.4
H3-2	243.5	5137394.0	277910.9
H3-3	246.2	5137398.3	277939.3
H3-4	246.0	5137408.2	277963.6
H3-5	244.9	5137430.2	277976.5
H3-6	242.8	5137455.2	277984.5
H3-7	244.0	5137464.1	278012.6
H3-8	244.7	5137474.5	278037.0
H3-9	243.8	5137499.1	278047.4
H3-10	242.4	5137526.2	278054.9
H3-11	243.8	5137534.4	278082.1
H3-12	242.4	5137541.7	278110.8
H3-13	243.9	5137571.4	278114.9
H3-14	248.1	5137341.5	277920.8
H3-15	243.1	5137362.4	277931.0
H3-16	246.4	5137370.0	277962.0
H3-17	246.3	5137379.3	277988.6
H3-18	245.2	5137400.4	278003.2
H3-19	241.8	5137426.7	278010.6
H3-20	244.3	5137433.7	278040.5

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
H3-21	244.4	5137445.4	278065.0
H3-22	244.0	5137470.7	278075.6
H3-23	241.9	5137498.4	278083.8
H3-24	243.8	5137519.3	278113.0
H3-25	242.2	5137516.0	278139.2
H3-26	243.8	5137549.1	278140.1
H3-DC1	242.9	5137372.2	277932.1
H3-DC2	242.9	5137422.8	277949.7
H3-DC3	244.6	5137439.6	278001.6
H3-DC4	242.4	5137493.3	278018.0
H3-DC5	244.2	5137509.4	278072.8
H3-DC6	241.9	5137560.9	278089.1
H3-DC7	244.2	5137339.2	277954.6
H3-DC8	241.8	5137394.5	277974.7
H3-DC9	245.2	5137412.1	278026.4
H3-DC10	241.9	5137463.4	278049.1
H3-DC11	243.4	5137480.3	278101.7
H3-DC12	242.4	5137541.5	278120.2



NO.	DATE	BY	REVISION				
Geocres No. 411-323							
HWY. 17			PROJECT NO. 11-1191-0007				DIST.
SUBM'D. EC		CHKD.		DATE: APR 2015		SITE:	
DRAWN: TR		CHKD. SFMP		APPD. JMAC		DWG. C1	



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

CONT No.  
GWP No. 156-98-00

HIGHWAY 17 4 LANING

SHEET

HWY 17 WBL - STA 13+900 TO 14+200

SOIL STRATA



**Golder Associates Ltd.**  
SUDBURY, ONTARIO, CANADA

### LEGEND

- Borehole
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated  
(Std. Pen. Test, 475 j/blow)
- R Refusal
- ▽ WL upon completion of drilling

### BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
H3-1	248.2	5137366.3	277900.4
H3-2	243.5	5137394.0	277910.9
H3-3	246.2	5137398.3	277939.3
H3-5	244.9	5137430.2	277976.5
H3-6	242.8	5137455.2	277984.5
H3-7	244.0	5137464.1	278012.6
H3-9	243.8	5137499.1	278047.4
H3-10	242.4	5137526.2	278054.9
H3-11	243.8	5137534.4	278082.1
H3-13	243.9	5137571.4	278114.9
H3-DC2	242.9	5137422.8	277949.7
H3-DC4	242.4	5137493.3	278018.0
H3-DC6	241.9	5137560.9	278089.1

### NOTES

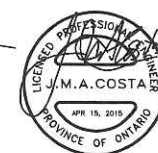
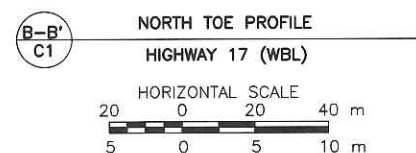
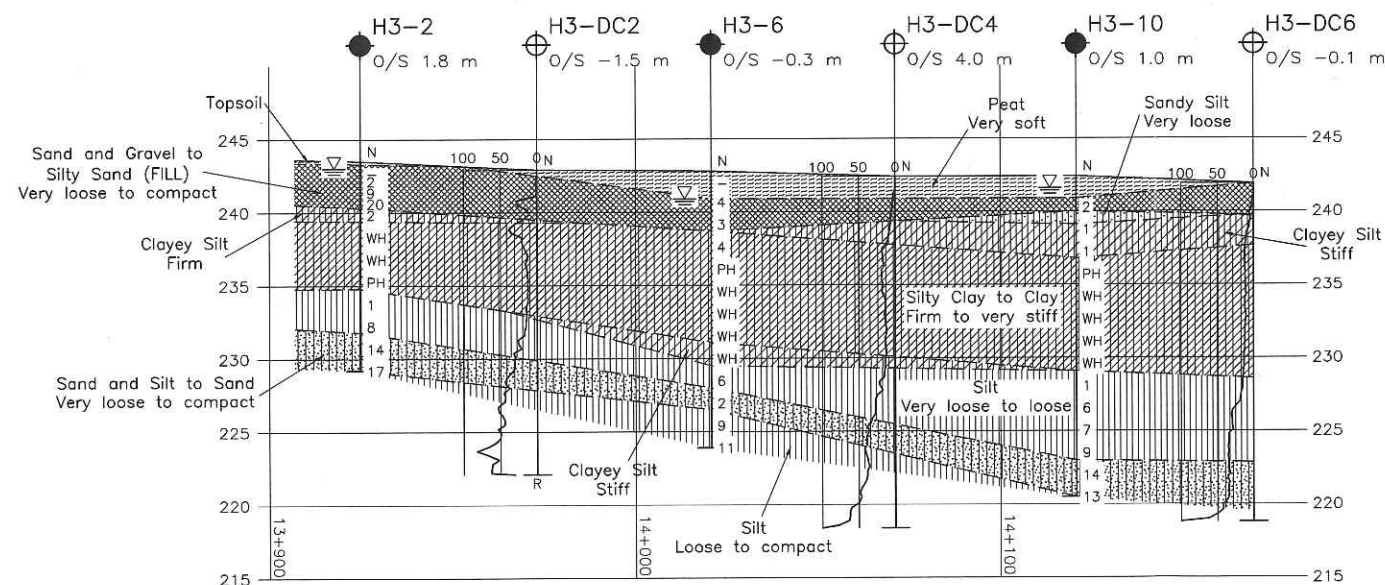
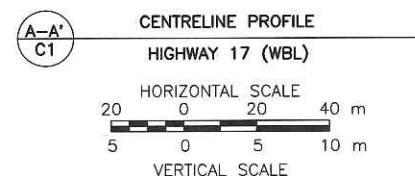
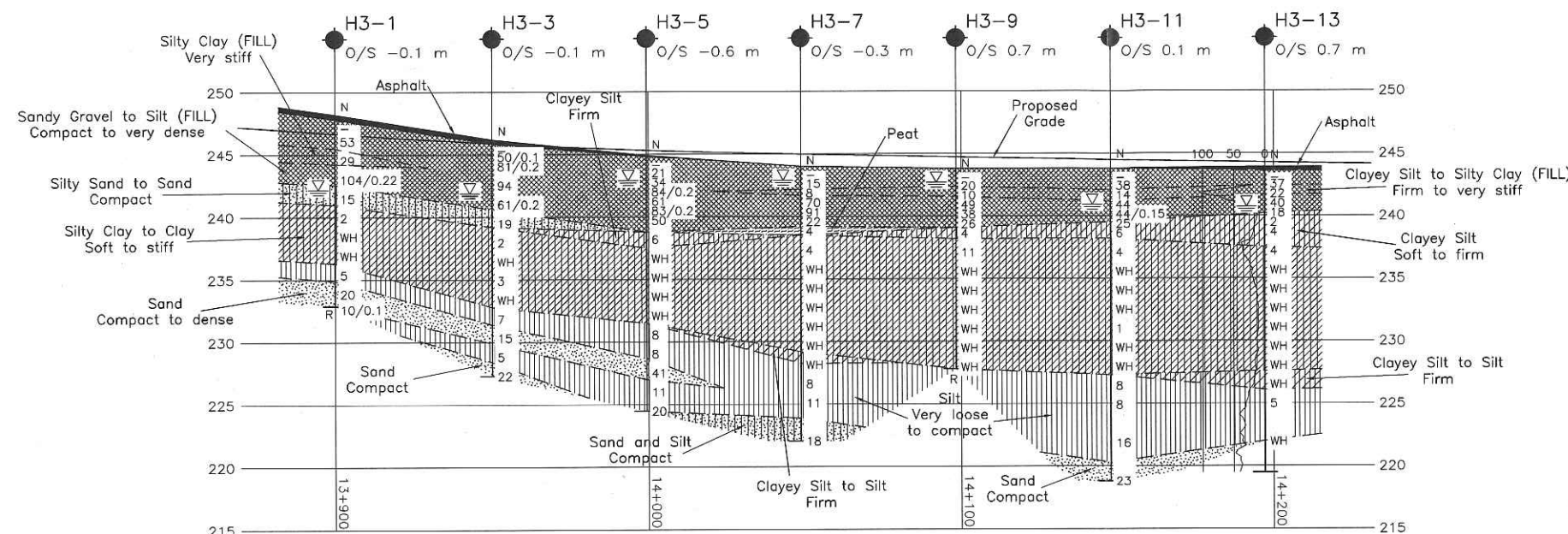
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### REFERENCE

Base plans provided in digital format by DM Wills, drawing files EBL & WBL PROFILES.dwg received on Feb 28, 2013 and 581\_contours.dwg received Jan 17, 2012.



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

CONT No.  
GWP No. 156-98-00

HIGHWAY 17 4 LANEING

HWY 17 WBL - STA 13+900 TO 14+200

HWY 17 EBL - STA 13+900 TO 14+200

SOIL STRATA

SHEET



**Golder Associates Ltd.**  
SUDBURY, ONTARIO, CANADA

### LEGEND

- Borehole
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated  
(Std. Pen. Test, 475 j/blow)
- R Refusal
- ▽ WL upon completion of drilling

### BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
H3-4	246.0	5137408.2	277963.6
H3-8	244.7	5137474.5	278037.0
H3-12	242.4	5137541.7	278110.8
H3-14	248.1	5137341.5	277920.8
H3-16	246.4	5137370.0	277962.0
H3-18	245.2	5137400.4	278003.2
H3-20	244.3	5137433.7	278040.5
H3-22	244.0	5137470.7	278075.6
H3-24	243.8	5137519.3	278113.0
H3-26	243.8	5137549.1	278140.1
H3-DC1	242.9	5137372.2	277932.1
H3-DC3	244.6	5137439.6	278001.6
H3-DC5	244.2	5137509.4	278072.8

### NOTES

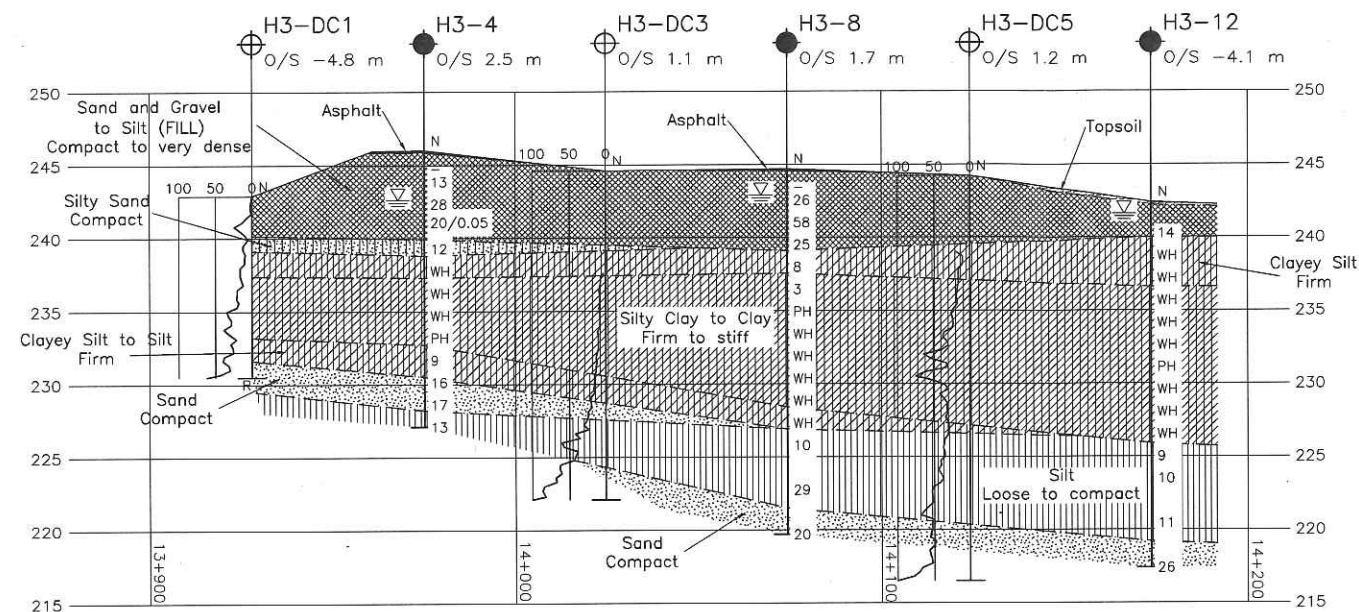
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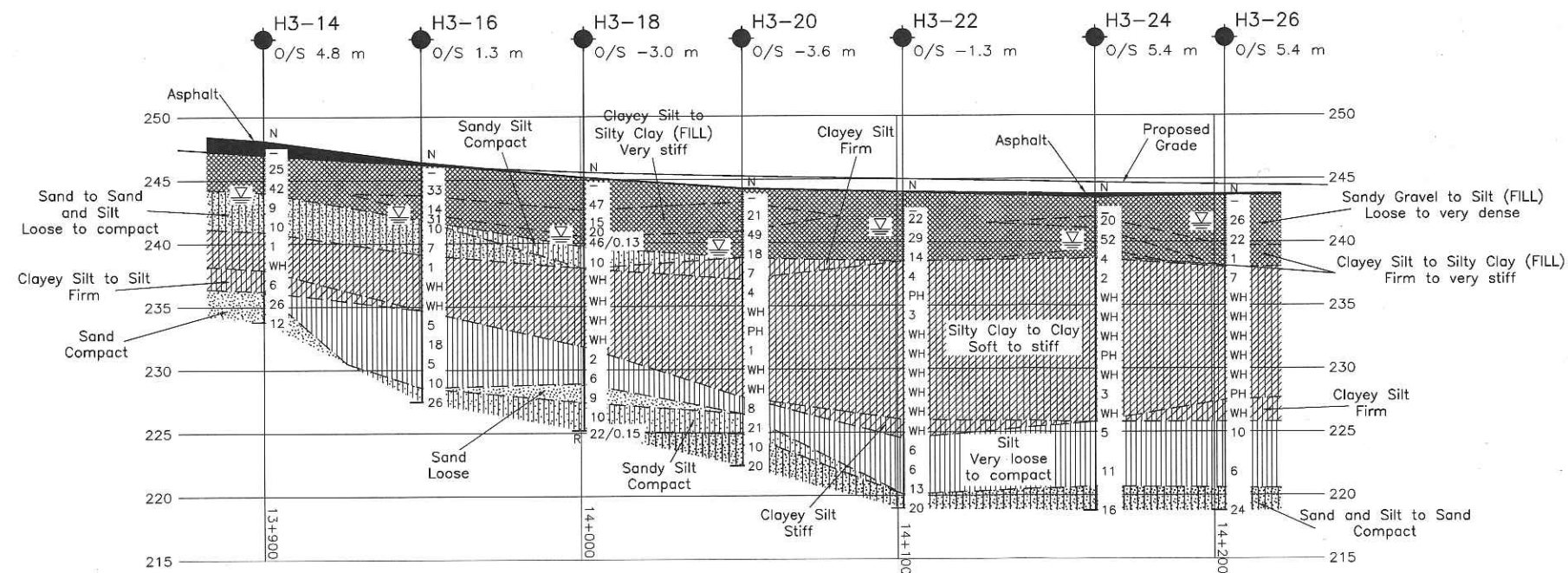
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### REFERENCE

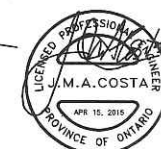
Base plans provided in digital format by DM Wills, drawing files EBL & WBL PROFILES.dwg received on Feb 28, 2013 and 581\_contours.dwg received Jan 17, 2012.



**C-C'**  
**C1**  
**SOUTH TOE PROFILE**  
**HIGHWAY 17 (WBL)**  
HORIZONTAL SCALE  
20 0 20 40 m  
5 0 5 10 m  
VERTICAL SCALE



**D-D'**  
**C1**  
**CENTRELINE PROFILE**  
**HIGHWAY 17 (EBL)**  
HORIZONTAL SCALE  
20 0 20 40 m  
5 0 5 10 m



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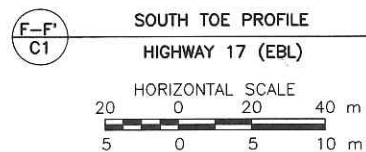
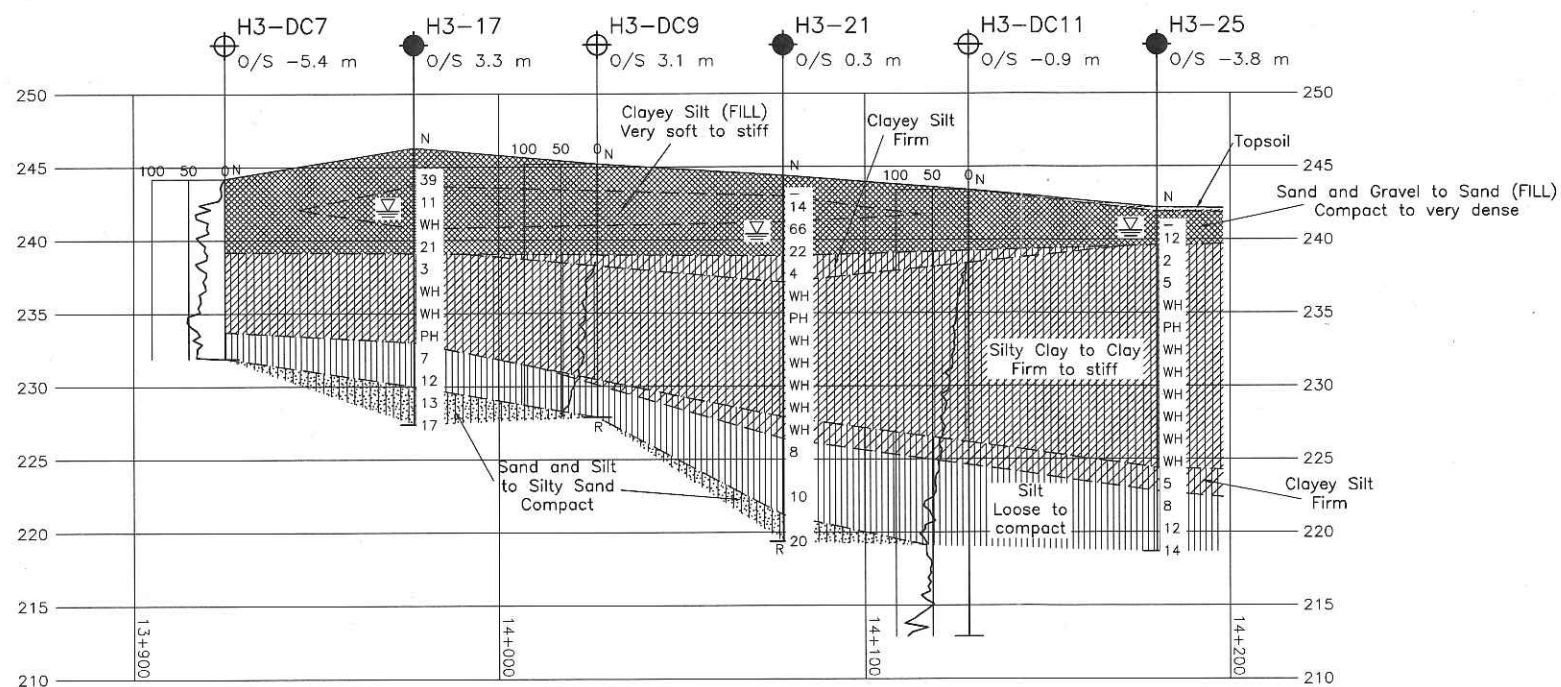
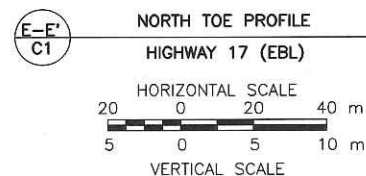
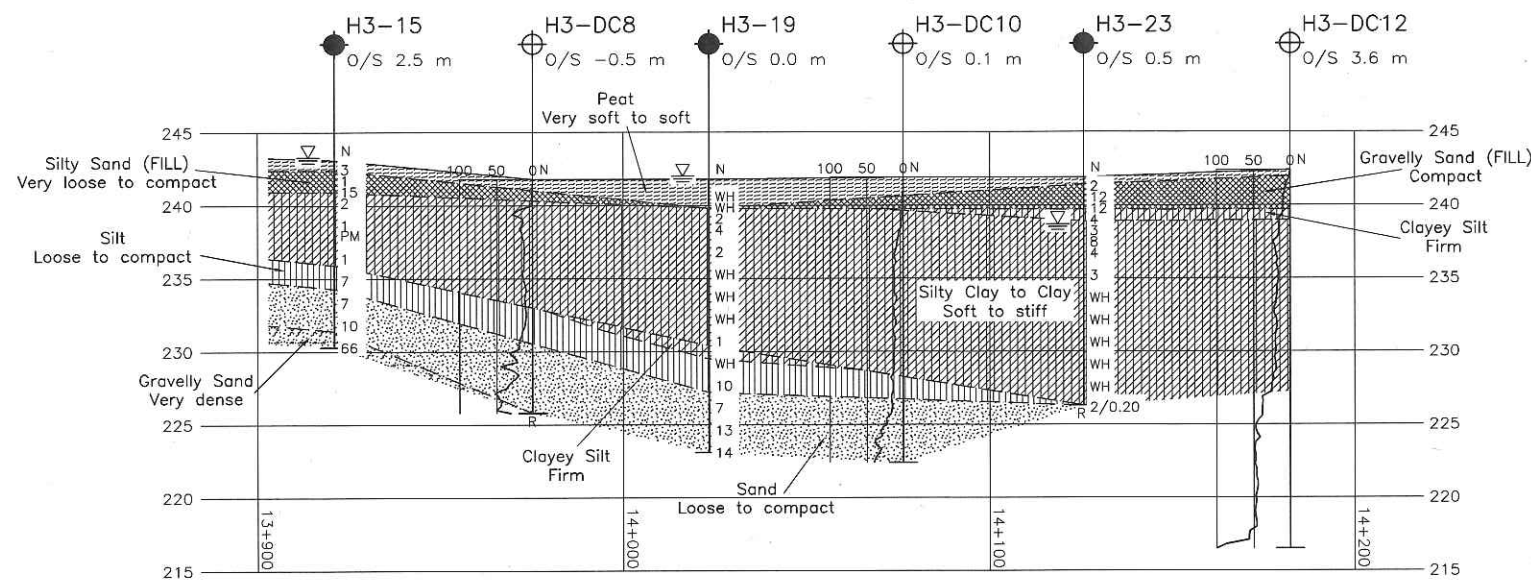
CONT No.  
GWP No. 156-98-00

HIGHWAY 17 4 LANING  
HWY 17 EBL - STA 13+900 TO 14+200  
SOIL STRATA

SHEET



**Golder Associates Ltd.**  
SUDBURY, ONTARIO, CANADA



## LEGEND

- Borehole
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated  
(Std. Pen. Test, 475 j/blow)
- R Refusal
- ▽ WL upon completion of drilling

## BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
H3-15	243.1	5137362.4	277931.0
H3-17	246.3	5137379.3	277988.6
H3-19	241.8	5137426.7	278010.6
H3-21	244.4	5137445.4	278065.0
H3-23	241.9	5137498.4	278083.8
H3-25	242.2	5137516.0	278139.2
H3-DC7	244.2	5137339.2	277954.6
H3-DC8	241.8	5137394.5	277974.7
H3-DC9	245.2	5137412.1	278026.4
H3-DC10	241.9	5137463.4	278049.1
H3-DC11	243.4	5137480.3	278101.7
H3-DC12	242.4	5137541.5	278120.2

## NOTES

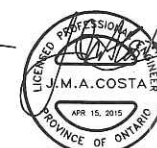
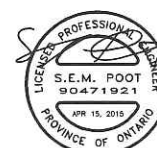
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## REFERENCE

Base plans provided in digital format by DM Wills, drawing files 581\_base.dwg, GWP156-98-00\_B & C Plans.dwg and 581\_contours.dwg received Jan 17, 2012.



NO.	DATE	BY	REVISION
Geocres No. 411-323			
HWY. 17		PROJECT NO. 11-1191-0007	DIST.
SUBM'D. EC	CHKD.	DATE: APR 2015	SITE:
DRAWN: TB	CHKD. SEMP	APPD. JMAC	DWG. C4






PROJECT 11-1191-0007			RECORD OF BOREHOLE No H3-1			1 OF 2 METRIC			
G.W.P. 156-98-00			LOCATION N 5137366.3; E 277900.4			ORIGINATED BY EHS			
DIST HWY 17			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring			COMPILED BY EC			
DATUM Geodetic			DATE May 22, 2012			CHECKED BY SEMC			
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100 PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W <sub>p</sub> W W <sub>L</sub> WATER CONTENT (%) 20 40 60 UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
248.2	GROUND SURFACE						248		
0.0	ASPHALT (370 mm)								
247.8									
0.4	Sandy gravel, trace silt (FILL) Brown Moist		1	AS	-				
247.1									
1.1	Silt, some gravel, trace to some sand, trace clay (FILL) Very dense Brown Moist		2	SS	53				
245.5									
2.7	Silty clay, some gravel (FILL) Very stiff Brown Moist		3	SS	29				
244.2									
4.0	Sandy gravel, trace silt (FILL) Very dense Brown Wet		4	SS	104/0.22				
242.6									
5.6	Silty SAND, trace to some clay, trace organics Compact Brown to grey Wet		5	SS	15				0 69 23 8
241.0									
7.2	SILTY CLAY, trace sand Firm Grey Wet		6	SS	2				
	Varved below 8.7 m depth.								
			7	SS	WH				
			8	SS	WH				
236.3									
11.9	SILT, trace to some clay Loose Grey Wet		9	SS	5				
234.9									
13.3	SAND, trace silt, trace gravel Compact Grey Wet		10	SS	20				
	Approximately 0.2 m of heave encountered at 15.2 m depth.								

SUD\_MTO 003 11-1191-0007.GPJ GAL-MISS.GDT 28/11/13 DATA INPUT:

Continued Next Page

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



PROJECT 11-1191-0007		<b>RECORD OF BOREHOLE No H3-2</b>		1 OF 2 <b>METRIC</b>		
G.W.P. 156-98-00		LOCATION N 5137394.0; E 277910.9		ORIGINATED BY LK		
DIST HWY 17		BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring		COMPILED BY EC		
DATUM Geodetic		DATE June 25, 2012		CHECKED BY SEMP		
SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE		"N" VALUES
243.5	GROUND SURFACE					
0.0	TOPSOIL					
0.2	Silty sand, trace to some gravel (FILL) Very loose to compact Brown Wet		1	AS	-	
			2	SS	2	
			3	SS	9	
			4	SS	20	
240.3			5A			
3.2	CLAYEY SILT Firm Grey Wet		5B	SS	2	
239.4						
4.1	CLAY Firm to stiff Grey Wet		6	SS	WH	
			7	SS	WH	
			8	TO	PH	
234.8						
8.7	SILT, trace to some sand, trace to some clay Very loose to loose Grey Wet		9	SS	1	
			10	SS	8	
231.8						
11.7	SAND, trace to some silt Compact Grey Wet		11	SS	14	
	Silt seam at 13.9 m depth.		12	SS	17	
229.2						
14.3						

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
SHEAR STRENGTH kPa					W <sub>p</sub> — W — W <sub>L</sub>			WATER CONTENT (%)				
○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					20 40 60 80 100			20 40 60				
243												11 68 (21)
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236												
235												
234												
233												
232												
231												0 93 (7)
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SUD-MTO 001 11-1191-0007.GPJ GAL-MISS.GDT 30/06/15 DATA INPUT:

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE



PROJECT 11-1191-0007			RECORD OF BOREHOLE No H3-3			1 OF 2 METRIC							
G.W.P. 156-98-00			LOCATION N 5137398.3; E 277939.3			ORIGINATED BY EHS							
DIST HWY 17			BOREHOLE TYPE 108 mm I.D. Continuous Flight Hollow Stem Augers, NW Casing, Wash Boring			COMPILED BY EC							
DATUM Geodetic			DATE May 17, 2012			CHECKED BY SEMC							
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	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES								
246.2	GROUND SURFACE												
0.0	ASPHALT (350 mm)												
245.8													
0.4	Gravelly sand, some silt (FILL) Very dense Brown Moist to wet  Encountered a 0.2 m cobble at 1.1 m depth.		1	AS	-								
			2	SS	50/0.1								
			3	SS	81/0.2								
243.6													
2.6	Silty sand, trace gravel (FILL) Very dense Brown Moist		4	SS	94								
242.1													
4.1	Gravelly sand, some silt (FILL) Very dense Brown Moist to wet		5	SS	61/0.2								
240.6													
5.6	SAND, trace to some silt, trace clay Compact Brown Wet		6	SS	19								
239.2													
7.0	SILTY CLAY, trace sand Firm to stiff Grey Wet		7	SS	2								
			8	SS	WH								
			9	SS	3								
			10	SS	WH								
			11	SS	7								
232.8													
13.4	SILT, trace to some clay Loose Grey Wet												
231.4													
14.8													

SUD\_MTO 003 11-1191-0007.GPJ GAL-MISS.GDT 28/11/13 DATA INPUT:

Continued Next Page

+ 3, x 3: Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE