

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
1	ISSUED FOR INFORMATION	JVB	TR	01/20/16

SEAL

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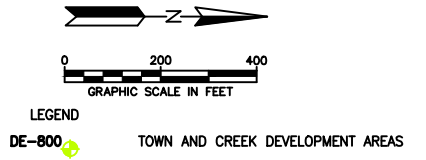
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1800 PIONEER CREEK CENTER P 763-479-4200
MAPLE PLAIN, MINNESOTA F 762-479-4242

PROJECT TITLE
GEOTECHNICAL INVESTIGATION REPORT

SHEET TITLE
REGIONAL TRAIL BOREHOLE LOCATION MAP

DWN BY JVB	CHK'D JW	APP'D TR	DWG DATE JANUARY 2016
PROJECT NO. 1382-0001	SHEET NO. FIGURE 7	SCALE AS NOTED	REV NO. 1



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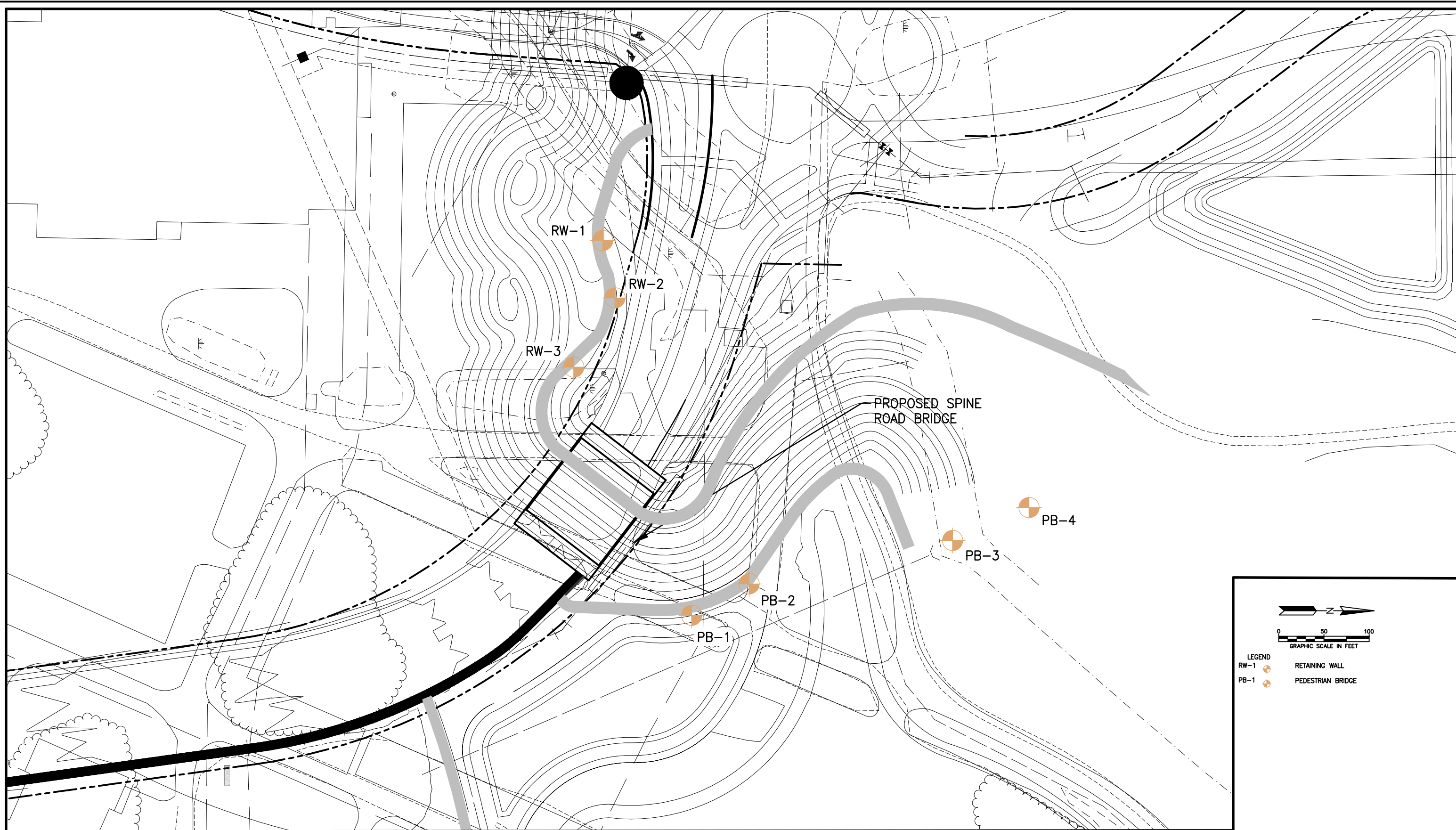
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PROJECT TITLE	GEOTECHNICAL INVESTIGATION REPORT
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SHEET TITLE			
TOWN AND CREEK DEVELOPMENT AREA BOREHOLE LOCATION MAP			
DWN BY	CHK'D	APP'D	DWG DATE
JVB	JW	TR	JANUARY 2016
PROJECT NO.	SHEET NO.	SCALE	AS NOTED
1382-0001	FIGURE 8		
			REV NO.
			1



REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR bid	JVB	TR	03/19/15

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PROJECT TITLE

GEOTECH REPORT

SHEET TITLE

PEDESTRIAN BRIDGE AND
RETAINING WALL SOIL BORINGS

DWN BY	CHK'D	APP'D	DWG DATE
JVB	JW	TR	JULY 2016
PROJECT NO.	SHEET NO.	SCALE	AS NOTED
1382-0001	FIGURE 9		
			REV NO.
			0

*Interim Report-Preliminary Geotechnical
Evaluation (AET and Braun, 2007)*

PREVIOUSLY SUBMITTED

Spine Road Bridge Soil Boring Logs



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BORING NUMBER BR-600

PAGE 1 OF 3

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 884.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.30 ft / Elev 867.35 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose, trace gravel (Fill)	SS 1	78	3-4-3 (7)							
5.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, medium dense, trace gravel	SS 2	67	4-5-6 (11)							
7.0		SILTY SAND, (SM) gray, fine grained, moist, dense	SS 3	56	4-4-6 (10)							
9.5		SILTY SAND, (SM) gray, fine grained, moist, medium dense, little organics	SS 4	117	6-11-10 (21)							
12.0		NOTE: Organic materials encountered at 11.0 feet.	SS 5	100	4-3-6 (9)							
14.5		LEAN CLAY, (CL) gray, moist, medium, little organics	SS 6	67	2-2-4 (6)							
15.0		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SS 7	78	2-2-3 (5)							
20.0			SS 8	100	2-3-4 (7)							
25.0			SS 9	100	3-3-5 (8)							
30.0			SS 10	89	4-5-5 (10)							

(Continued Next Page)



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BORING NUMBER BR-600

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:1-P-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30												
		CLAYEY SAND, (SC) gray, fine grained, saturated, medium dense, trace fine gravel	SH 11					16	28	13	15	50
35	35.0	849.7 SANDY LEAN CLAY, (CL) gray, wet, medium to very stiff, trace fine gravel	SS 12	33	3-4-5 (9)							
40			SS 13	100	4-4-5 (9)							
45			SS 14	83	5-5-34 (39)							
50			SS 15	100	4-4-4 (8)							
55			SH 16									
60			SS 17	33	5-5-5 (10)							

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BORING NUMBER BR-600

CLIENT Carl Bolander and Sons, Co.

PROJECT NAME Ramsey County Re-Development Site (TCAAP)

PROJECT NUMBER 15.60936.100

PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SANDY LEAN CLAY, (CL) gray, wet, medium to very stiff, trace fine gravel (<i>continued</i>) NOTE: Driller over-spun auger at 65.0 feet. N values based on disturbed soil.	SS 18	78	1-2-2 (4)							
70		POORLY GRADED SAND WITH GRAVEL, (SP) gray, fine to coarse grained, saturated, very dense, fine to coarse gravel	SS 19	100	57-62-65 (127)							
75		SILTY SAND, (SM) brown, fine to medium grained, saturated, very dense, trace gravel	SS 20	100	21-25-34 (59)							

Borehole backfilled with grout.
 Bottom of borehole at 76.5 feet.



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BORING NUMBER BR-601

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/9/15 **COMPLETED** 6/9/15 **GROUND ELEVATION** 884.82 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.00 ft / Elev 880.82 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, wet, trace gravel (Fill) 884.6	SS 1	100	7-7-5 (12)							
2.0		ORGANIC SOIL WITH SAND, (SP) brown, fine grained, wet, (wood chip debris) (Fill) 882.8	SS 2	44	6-9-9 (18)							
4.0		ORGANIC SOIL, brown, saturated, decaying wood (Fill) NOTE: Hydrocarbon odor based on human perception. 880.8	SS 3	56	6-8-7 (15)							
6.0		SILTY SAND, (SM) dark gray to gray, fine grained, saturated (Fill) 878.8	SS 4	67	6-7-9 (16)							
10			SS 5	56	8-4-3 (7)							
12.0		PEAT, (Pt) dark gray to black, saturated, medium 872.8	SS 6	22	2-2-3 (5)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense 870.3	SS 7	100	4-3-4 (7)							
20			SS 8	100	7-7-5 (12)							
25			SS 9	100	5-6-6 (12)							
30			SS 10	100	5-5-5 (10)							

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BORING NUMBER BR-601

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense (continued)	SS 11	100	2-3-4 (7)							
35		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace gravel	SS 12	56	4-5-5 (10)							
40		SANDY LEAN CLAY, (CL) gray, fine grained, wet, rather stiff, trace gravel	SH 13					16				51
45		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace fine to coarse gravel	SS 14	100	4-7-7 (14)							
50			SS 15	100	6-6-8 (14)							
55			SS 16	100	5-5-6 (11)							
60			SS 17	100	6-6-7 (13)							

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BORING NUMBER BR-601

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace fine to coarse gravel (<i>continued</i>) NOTE: Silty sand (SM) seams at 65.0 feet.	SS 18	100	4-6-7 (13)							
70			SS 19	100	6-7-9 (16)							
75			SS 20	100	11-19-29 (48)							

76.0
76.5

POORLY GRADED SAND, (SP) gray to brown, fine to medium grained, saturated, very dense

Borehole backfilled with grout.
 Boring terminated at 76.5 feet due to heaving sands in auger.

Bottom of borehole at 76.5 feet.



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BORING NUMBER BR-602

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 884.41 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.00 ft / Elev 867.41 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 5 ft. E **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5.0	[Cross-hatched pattern]	SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist	SS 1	44	5-6-7 (13)							
5.0 - 879.4	[Dotted pattern]	SILTY SAND, (SM) brown to dark gray, fine to medium grained, moist, very dense to dense	SS 2	78	11-14-15 (29)							
879.4 - 872.4			SS 3	89	8-12-15 (27)							
872.4 - 869.9			SS 4	83	9-16-16 (32)							
869.9 - 867.4			SS 5	67	6-8-9 (17)							
867.4 - 864.9			SS 6	89	3-3-1 (4)							
864.9 - 860.4			SS 7	78	3-3-4 (7)							
860.4 - 857.0			SS 8	100	9-5-7 (12)							
857.0 - 854.5			SS 9	100	5-6-7 (13)							
854.5 - 860.4			SH 10					15	28	12	16	48
860.4 - 25	[Diagonal hatched pattern]	LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to stiff, trace to a little gravel	SS 11	100	3-5-7 (12)							
25 - 30												

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BORING NUMBER BR-602

CLIENT Carl Bolander and Sons, Co.

PROJECT NAME Ramsey County Re-Development Site (TCAAP)

PROJECT NUMBER 15.60936.100

PROJECT LOCATION Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to stiff, trace to a little gravel (continued)	SS 12	100	3-5-5 (10)							
35			SS 13	100	4-6-7 (13)							
40			SS 14	100	4-5-7 (12)							
45			SS 15	100	5-8-12 (20)							
50			SS 16	83	7-8-12 (20)							
54.5		829.9										
55		SANDY LEAN CLAY, (CL) gray, wet, stiff, trace gravel	SS 17	67	9-9-10 (19)							
59.5				824.9								
60		SILTY LEAN CLAY, (CL-ML) gray brown, wet, stiff	SS 18	78	7-8-9 (17)							

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PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SILTY LEAN CLAY, (CL-ML) gray brown, wet, stiff <i>(continued)</i>	SS 19	100	9-10-11 (21)							
70		CLAYEY SAND, (SC) gray brown, fine to medium grained, wet, dense, trace gravel	SS 20	89	11-10-9 (19)							
75		SILTY SAND, (SM) gray, fine grained, saturated, very dense, trace gravel	SS 21	89	40-50-60 (110)							
Borehole backfilled with grout. Bottom of borehole at 76.0 feet.												



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BORING NUMBER BR-603

PAGE 1 OF 3

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/1/15 **COMPLETED** 6/1/15 **GROUND ELEVATION** 883.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ---
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft. E **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		882.3	SS 1	100	4-8-9 (17)							
		SILTY SAND, (SM) light brown, fine to medium grained, moist, dense to medium dense	SS 2	78	5-6-6 (12)							
4.5		878.8	SS 3	67	6-10-12 (22)							
		SILTY SAND, (SM) gray, fine grained, moist, dense to loose	SS 4	89	4-8-12 (20)							
10			SS 5	100	3-3-3 (6)							
12.0		871.3	SS 6	33	1-0-0 (0)							
		SILTY SAND, (SM) gray, fine grained, saturated, very loose to medium dense, trace gravel	SS 7	100	5-5-3 (8)							
15			SS 8	100	5-5-5 (10)							
20			SS 9	100	5-6-7 (13)							
24.5		858.8	SS 10	100	5-6-5 (11)							
25		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace gravel										
30												

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BORING NUMBER BR-603

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace gravel (continued)	X SS 11	56	5-6-8 (14)							
35			X SS 12	100	4-3-7 (10)							
40			X SS 13	100	6-7-10 (17)							
45			X SS 14	100	6-7-10 (17)							
50			X SS 15	100	7-8-10 (18)							
55												
60		SILTY LEAN CLAY, (CL-ML) brown, moist to wet, very stiff, trace gravel	X SS 17	100	18-22-24 (46)							

59.5 823.8

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SILTY LEAN CLAY, (CL-ML) brown, moist to wet, very stiff, trace gravel <i>(continued)</i> NOTE: Sand (SP) lenses at 65.0 feet.	SS 18	67	20-20-17 (37)							
70		POORLY GRADED SAND WITH GRAVEL, (SP) gray to brown, fine to coarse grained, saturated, very dense	SS 19	33	19-21-24 (45)							
75			SS 20									

Borehole backfilled with grout.
 Bottom of borehole at 76.0 feet.

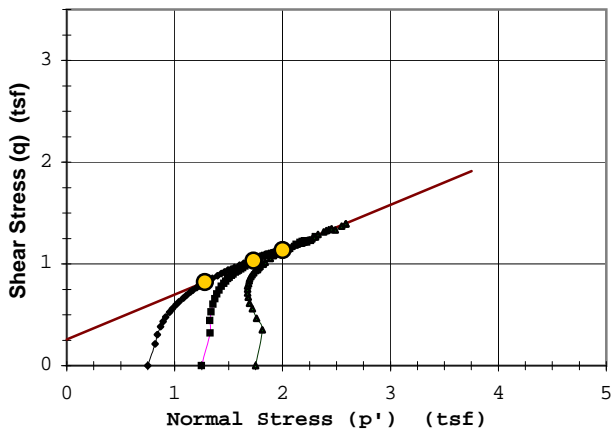
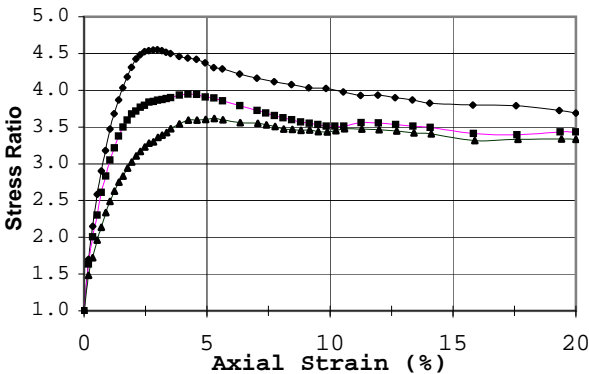
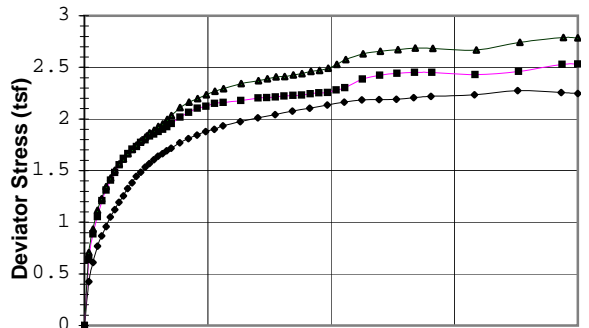
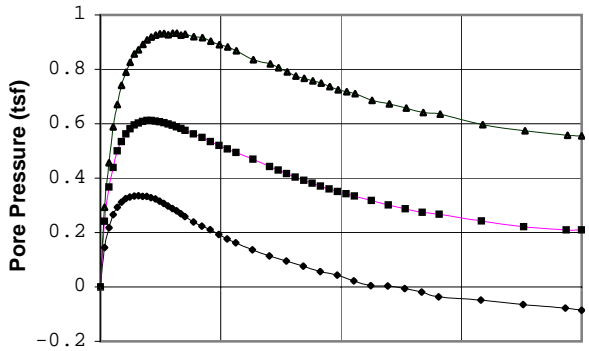
Spine Road Bridge Triaxial Compression Test Results

TRIAXIAL TEST ASTM: D 4767

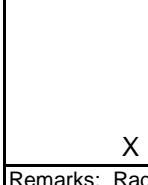
Job No. 9919

Date: 7/14/15

Project: **TCAAP - #15.60936.100**
 Boring #: **BR-602** Sample #: **SH-10** Type: **3T** Depth (ft): **22**
 Soil Type: **Sandy Lean Clay w/a trace of gravel (CL/SC)**



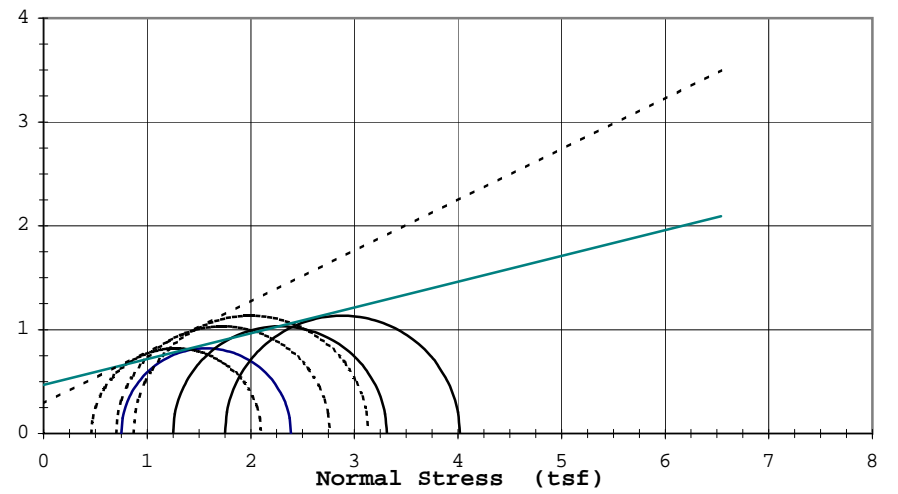
Rupture Envelope at Failure
 = 23.8° a = 0.3 (tsf)



Failure Criterion: Max. Stress Ratio	
Angle of internal friction, $\phi' = 26.1^\circ$	
Apparent Cohesion, $c' = 0.29$ (tsf)	
Test Date: 7/7/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.68
Strain Rate (%/min): 0.025	
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.43 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	15.9 16.3 16.2
Void Ratio	113.8 113.1 112.3
After Consolidation	
Diameter (in)	0.47 0.48 0.49
Height (in)	1.42 1.42 1.41
Water Content (%)	2.85 2.84 2.83
Dry Density (pcf)	16.4 16.0 16.0
Void Ratio	116.2 117.0 117.1
Back Pressure (tsf)	0.44 0.43 0.43
Minor Principal Stress (tsf)	4.6 4.0 4.2
Max. Deviator Stress (tsf)	0.75 1.25 1.75
Ultimate Deviator Stress (tsf)	2.27 2.53 2.79
Deviator Stress at Failure (tsf)	2.25 2.53 2.79
Max. Pore Pressure Buildup (tsf)	1.64 2.06 2.27
Pore Pressure Parameter "B"	0.34 0.61 0.93
Pct. Axial Strain at Failure	0.95 0.95 0.95
	3.0 4.2 5.3

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective $\phi' : 26.1^\circ$ $c' = 0.29$ (tsf)
 _____ Total $\phi : 14.0^\circ$ $c = 0.47$ (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

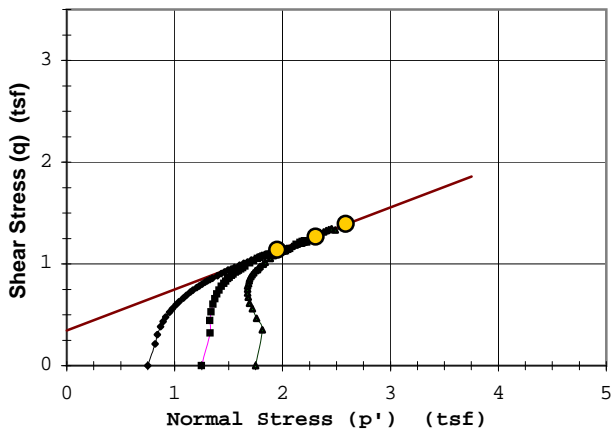
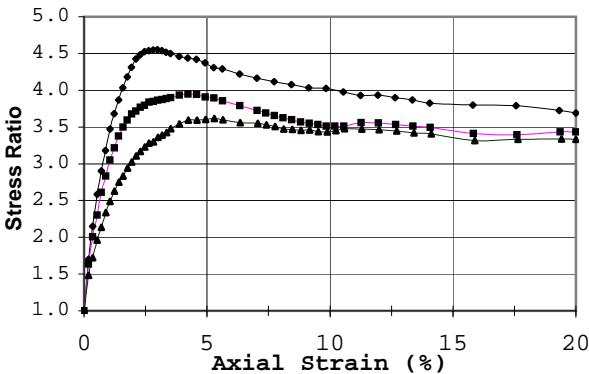
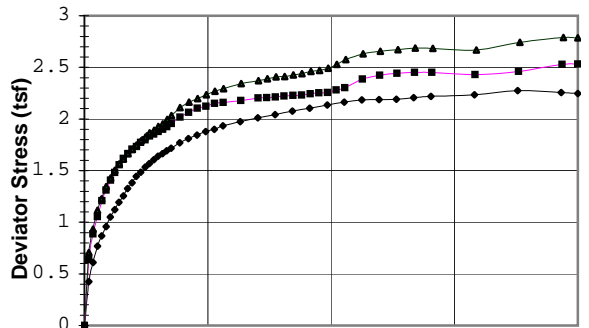
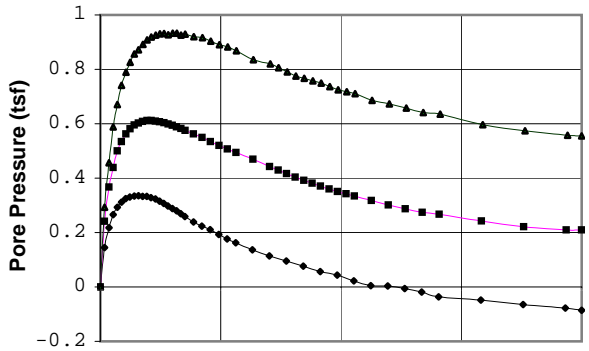
Project: TCAAP - #15.60936.100

Boring #: BR-602

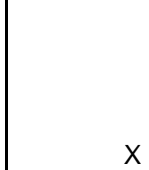
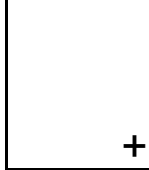
Sample #: SH-10 Type: 3T

Depth (ft): 22

Soil Type: Sandy Lean Clay w/a trace of gravel (CL/SC)



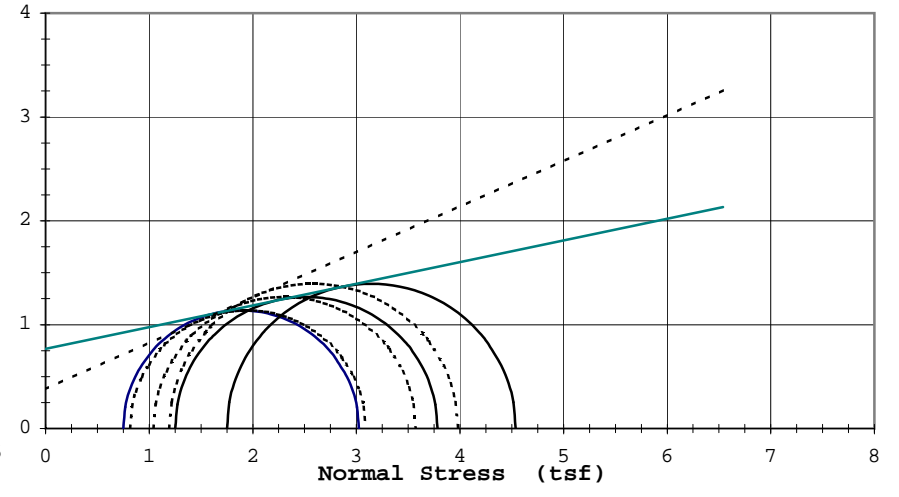
Rupture Envelope at Failure
= 22.0° a = 0.3 (tsf)



Failure Criterion: Max. Deviator Stress	
Angle of internal friction, $\phi' = 23.8^\circ$	
Apparent Cohesion, $c' = 0.38$ (tsf)	
Test Date: 7/7/15	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.68
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.43 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	15.9 16.3 16.2
Void Ratio	113.8 113.1 112.3
After Consolidation	
Diameter (in)	0.47 0.48 0.49
Height (in)	1.42 1.42 1.41
Water Content (%)	2.85 2.84 2.83
Dry Density (pcf)	16.4 16.0 16.0
Void Ratio	116.2 117.0 117.1
Back Pressure (tsf)	0.44 0.43 0.43
Minor Principal Stress (tsf)	4.6 4.0 4.2
Max. Deviator Stress (tsf)	0.75 1.25 1.75
Ultimate Deviator Stress (tsf)	2.27 2.53 2.79
Deviator Stress at Failure (tsf)	2.25 2.53 2.79
Max. Pore Pressure Buildup (tsf)	2.27 2.53 2.79
Pore Pressure Parameter "B"	0.34 0.61 0.93
Pct. Axial Strain at Failure	0.95 0.95 0.95
	17.6 20.0 19.4

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective $\phi' : 23.8^\circ$ $c' = 0.38$ (tsf)
 _____ Total $\phi : 11.8^\circ$ $c = 0.77$ (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

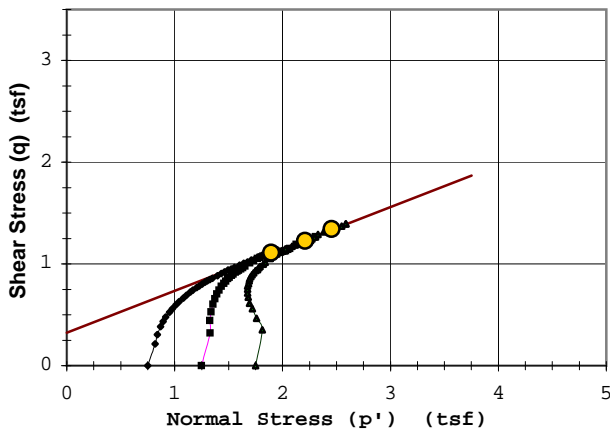
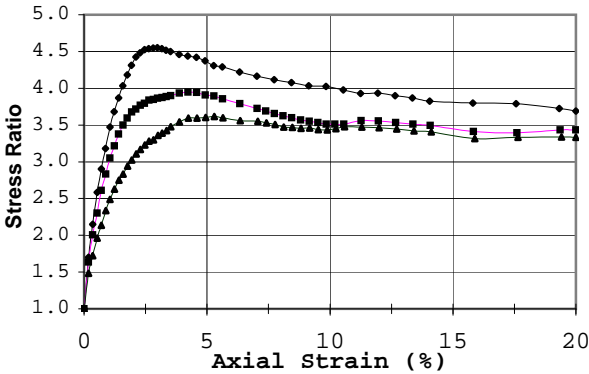
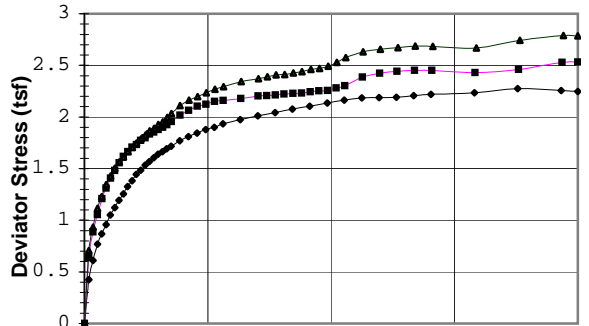
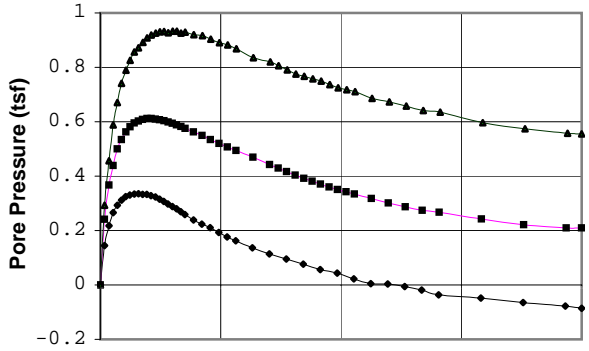
Project: TCAAP - #15.60936.100

Boring #: BR-602

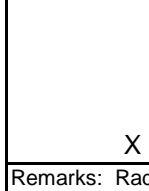
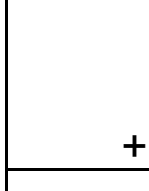
Sample #: SH-10 Type: 3T

Depth (ft): 22

Soil Type: Sandy Lean Clay w/a trace of gravel (CL/SC)



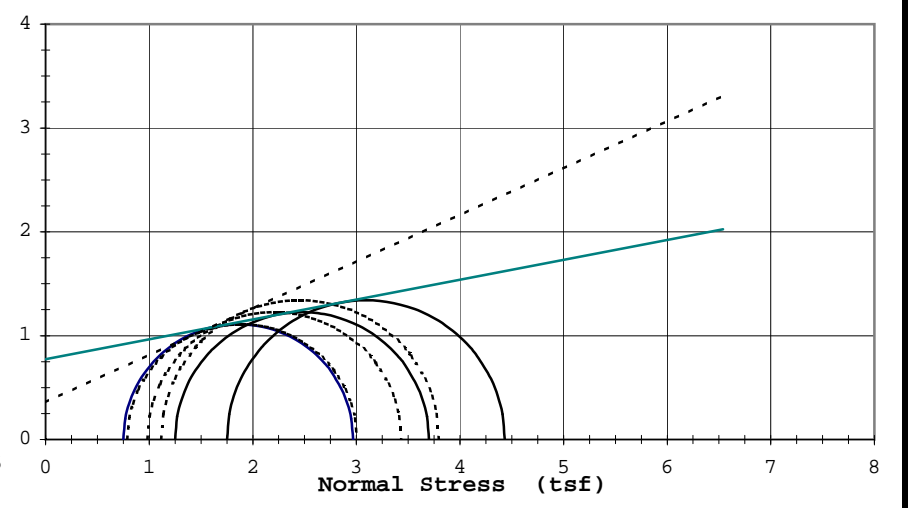
Rupture Envelope at Failure
= 22.4° a = 0.3 (tsf)



Failure Criterion: Given Strain of: 15%	
Angle of internal friction, $\phi' = 24.3^\circ$	
Apparent Cohesion, $c' = 0.36$ (tsf)	
Test Date: 7/7/15	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.68
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.43 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	15.9 16.3 16.2
Void Ratio	113.8 113.1 112.3
After Consolidation	
Diameter (in)	1.42 1.42 1.41
Height (in)	2.85 2.84 2.83
Water Content (%)	16.4 16.0 16.0
Dry Density (pcf)	116.2 117.0 117.1
Void Ratio	0.47 0.48 0.49
Back Pressure (tsf)	0.44 0.43 0.43
Minor Principal Stress (tsf)	4.6 4.0 4.2
Max. Deviator Stress (tsf)	0.75 1.25 1.75
Ultimate Deviator Stress (tsf)	2.27 2.53 2.79
Deviator Stress at Failure (tsf)	2.25 2.53 2.79
Max. Pore Pressure Buildup (tsf)	2.22 2.45 2.68
Pore Pressure Parameter "B"	0.34 0.61 0.93
Pct. Axial Strain at Failure	0.95 0.95 0.95

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective $\phi' : 24.3^\circ$ $c' = 0.36$ (tsf)
 _____ Total $\phi : 10.8^\circ$ $c = 0.77$ (tsf)

Triaxial Data

Job: 9919

Boring: BR-602

Sample: SH-10

Depth: 22

Date: 7/14/15

Sample 1			Sample 2			Sample 3			Sample 4			Sample 5		
Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
0.18	0.42	0.14	0.18	0.64	0.24	0.18	0.71	0.29						
0.35	0.61	0.22	0.36	0.89	0.37	0.35	0.93	0.46						
0.53	0.77	0.27	0.53	1.05	0.44	0.53	1.12	0.59						
0.71	0.87	0.29	0.71	1.21	0.50	0.71	1.23	0.67						
0.88	0.96	0.31	0.88	1.31	0.53	0.88	1.35	0.74						
1.05	1.05	0.32	1.06	1.41	0.56	1.06	1.43	0.79						
1.23	1.12	0.33	1.24	1.48	0.58	1.24	1.50	0.83						
1.40	1.19	0.33	1.41	1.56	0.60	1.41	1.56	0.86						
1.58	1.26	0.34	1.59	1.62	0.60	1.59	1.61	0.87						
1.76	1.33	0.33	1.76	1.66	0.61	1.77	1.66	0.89						
1.93	1.38	0.33	1.94	1.71	0.61	1.94	1.70	0.91						
2.11	1.45	0.33	2.11	1.73	0.61	2.12	1.75	0.92						
2.28	1.48	0.32	2.29	1.77	0.61	2.29	1.79	0.93						
2.46	1.54	0.31	2.46	1.80	0.61	2.47	1.83	0.93						
2.63	1.57	0.31	2.64	1.84	0.60	2.65	1.87	0.93						
2.81	1.61	0.30	2.82	1.85	0.60	2.82	1.89	0.93						
2.99	1.64	0.29	3.00	1.88	0.59	3.00	1.93	0.93						
3.16	1.67	0.28	3.17	1.90	0.59	3.18	1.95	0.93						
3.34	1.69	0.27	3.35	1.93	0.58	3.35	2.00	0.93						
3.51	1.72	0.26	3.52	1.96	0.58	3.53	2.03	0.93						
3.86	1.77	0.24	3.88	2.02	0.56	3.88	2.11	0.92						
4.21	1.81	0.22	4.23	2.06	0.55	4.24	2.16	0.92						
4.57	1.84	0.21	4.58	2.10	0.53	4.59	2.20	0.90						
4.92	1.88	0.19	4.93	2.12	0.52	4.94	2.24	0.89						
5.27	1.90	0.18	5.28	2.15	0.51	5.30	2.27	0.88						
5.62	1.93	0.16	5.64	2.16	0.49	5.65	2.29	0.87						
6.32	1.98	0.14	6.34	2.18	0.47	6.35	2.34	0.83						
7.02	2.01	0.11	7.04	2.20	0.44	7.06	2.37	0.82						
7.73	2.04	0.10	7.39	2.21	0.43	7.41	2.39	0.81						
8.43	2.08	0.08	7.74	2.21	0.42	7.77	2.41	0.79						
9.13	2.10	0.06	8.10	2.22	0.40	8.12	2.41	0.78						
9.84	2.14	0.04	8.45	2.23	0.39	8.47	2.43	0.77						
10.54	2.16	0.02	8.80	2.23	0.38	8.83	2.44	0.76						
11.24	2.18	0.00	9.16	2.24	0.37	9.18	2.46	0.75						
11.94	2.19	0.00	9.51	2.25	0.36	9.53	2.47	0.74						
12.65	2.19	-0.01	9.86	2.26	0.35	9.88	2.49	0.73						
13.35	2.21	-0.02	10.21	2.28	0.34	10.24	2.53	0.72						
14.05	2.22	-0.04	10.56	2.30	0.33	10.59	2.58	0.71						
15.81	2.24	-0.05	11.27	2.39	0.32	11.30	2.63	0.69						
17.56	2.27	-0.06	11.97	2.42	0.30	12.00	2.65	0.67						
19.32	2.26	-0.08	12.67	2.44	0.29	12.71	2.67	0.66						
20.00	2.25	-0.09	13.38	2.45	0.27	13.41	2.69	0.64						
			14.08	2.45	0.27	14.12	2.68	0.64						
			15.84	2.43	0.24	15.89	2.67	0.60						
			17.60	2.46	0.22	17.65	2.74	0.57						
			19.36	2.53	0.21	19.42	2.79	0.56						
			20.00	2.53	0.21	20.00	2.79	0.56						

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

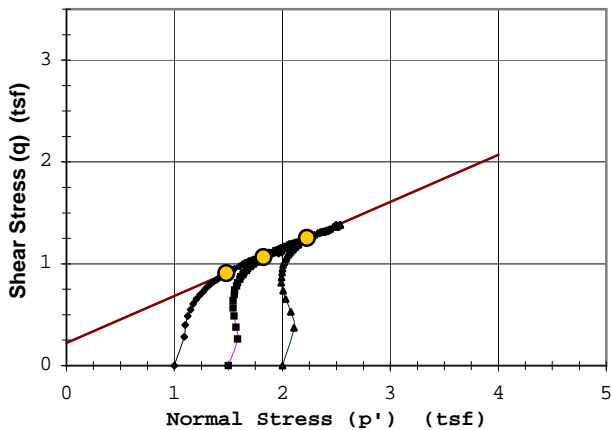
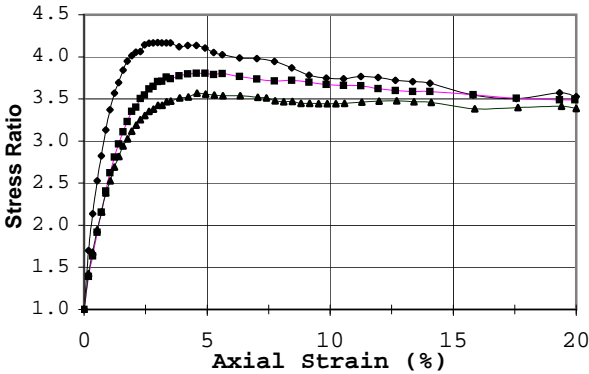
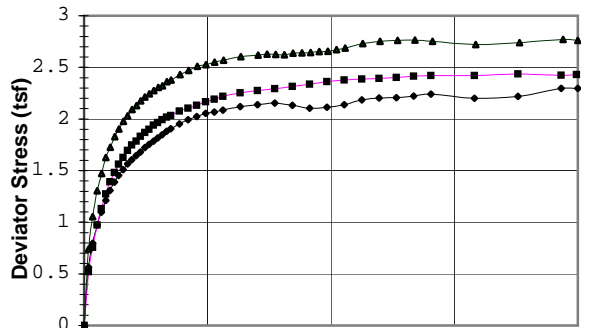
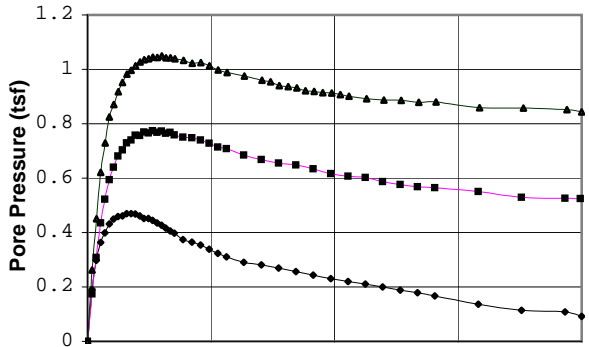
Project: TCAAP - #15.60936.100

Boring #: BR600

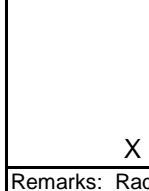
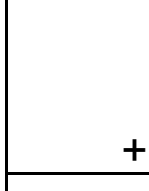
Sample #: SH-11 Type: 3T

Depth (ft): 30

Soil Type: Clayey Sand w/a little gravel (SC/CL)



Rupture Envelope at Failure
= 24.8° a = 0.2 (tsf)



Failure Criterion: **Max. Stress Ratio**

Angle of internal friction, $\phi' = 27.5^\circ$
Apparent Cohesion, $c' = 0.25$ (tsf)

Test Date: 7/3/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.67
Strain Rate (%/min): 0.025	

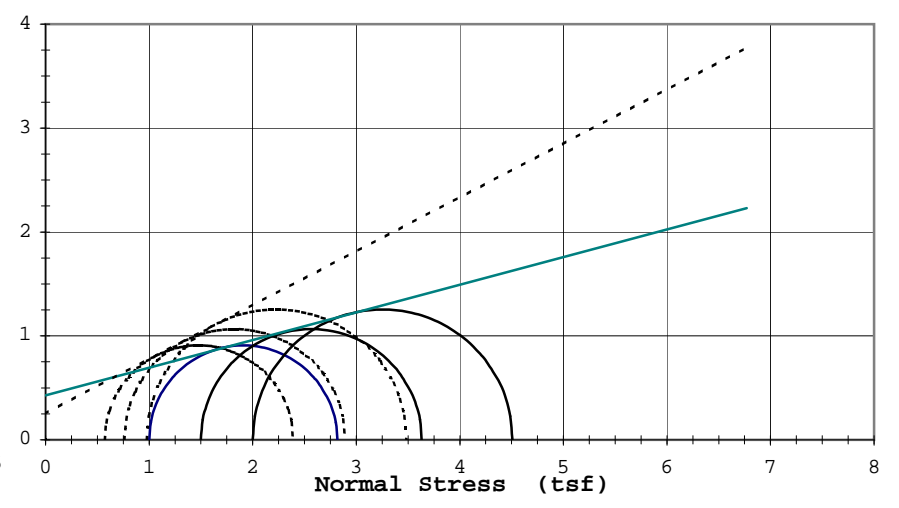
Before Consolidation		A	B	C	D	E
Diameter (in)		1.44	1.44	1.44		
Height (in)		2.86	2.86	2.86		
Water Content (%)		16.5	16.6	16.7		
Dry Density (pcf)		111.6	111.9	111.4		
Void Ratio		0.49	0.49	0.50		

After Consolidation		A	B	C	D	E
Diameter (in)		1.42	1.42	1.41		
Height (in)		2.85	2.85	2.84		
Water Content (%)		16.8	16.7	15.8		
Dry Density (pcf)		115.0	115.3	117.2		
Void Ratio		0.45	0.45	0.42		

Back Pressure (tsf)	9.1	4.4	4.0		
Minor Principal Stress (tsf)	1.00	1.50	2.00		
Max. Deviator Stress (tsf)	2.30	2.44	2.77		
Ultimate Deviator Stress (tsf)	2.30	2.43	2.76		
Deviator Stress at Failure (tsf)	1.82	2.13	2.51		
Max. Pore Pressure Buildup (tsf)	0.47	0.77	1.05		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	3.0	4.6	4.6		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



-----	Effective ϕ' : 27.5°	c' = 0.25 (tsf)
_____	Total ϕ : 14.9°	c = 0.43 (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

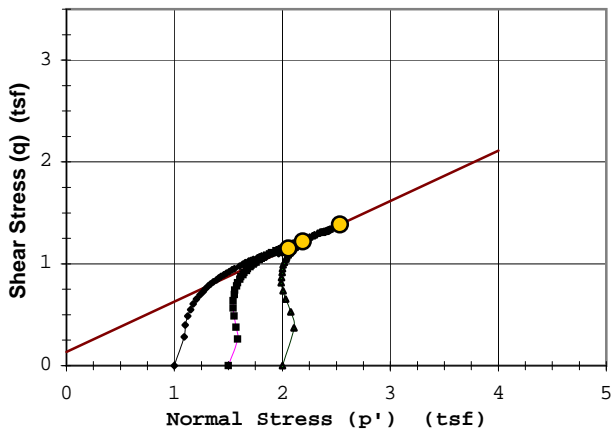
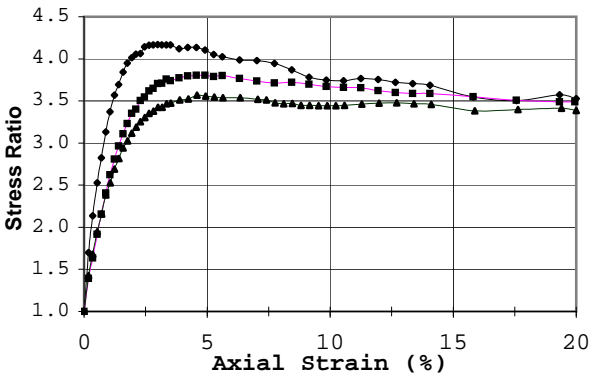
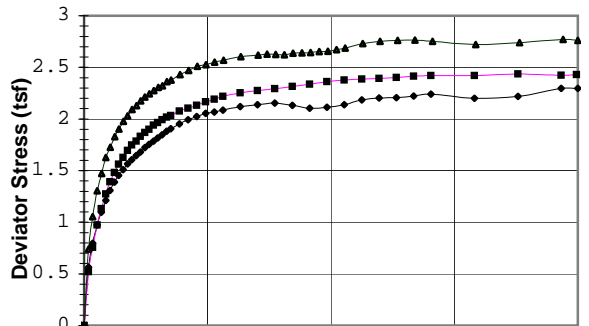
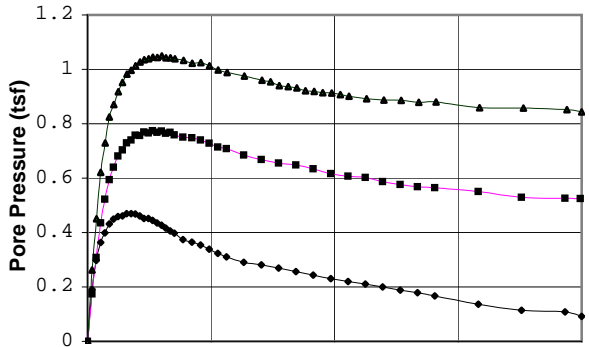
Project: TCAAP - #15.60936.100

Boring #: BR600

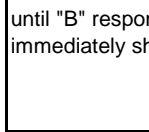
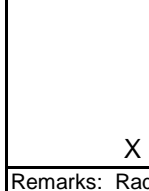
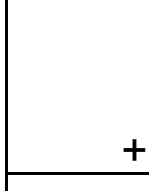
Sample #: SH-11 Type: 3T

Depth (ft): 30

Soil Type: Clayey Sand w/a little gravel (SC/CL)



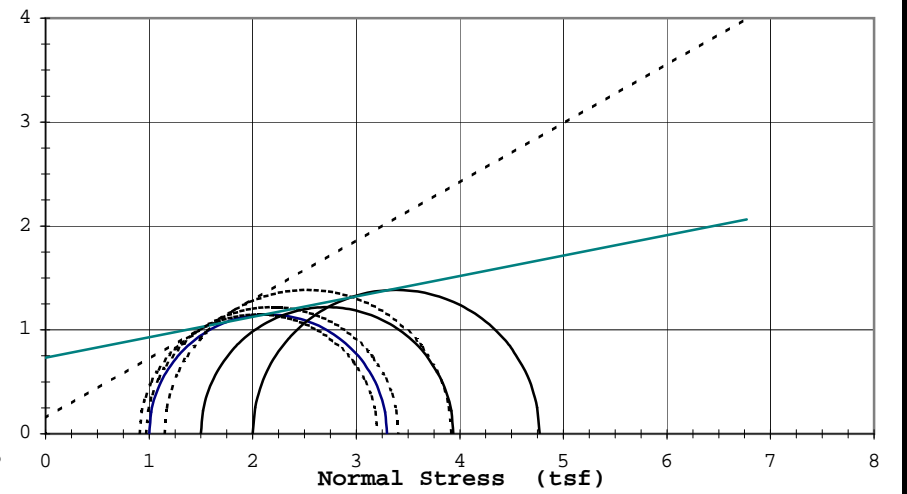
Rupture Envelope at Failure
= 26.3° a = 0.1 (tsf)



Failure Criterion: Max. Deviator Stress	
Angle of internal friction, $\phi' = 29.6^\circ$	
Apparent Cohesion, $c' = 0.15$ (tsf)	
Test Date: 7/3/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.67
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	16.5 16.6 16.7
Void Ratio	111.6 111.9 111.4
After Consolidation	
Diameter (in)	0.49 0.49 0.50
Height (in)	1.42 1.42 1.41
Water Content (%)	2.85 2.85 2.84
Dry Density (pcf)	16.8 16.7 15.8
Void Ratio	115.0 115.3 117.2
Back Pressure (tsf)	0.45 0.45 0.42
Minor Principal Stress (tsf)	9.1 4.4 4.0
Max. Deviator Stress (tsf)	1.00 1.50 2.00
Ultimate Deviator Stress (tsf)	2.30 2.44 2.77
Deviator Stress at Failure (tsf)	2.30 2.43 2.76
Max. Pore Pressure Buildup (tsf)	2.30 2.44 2.77
Pore Pressure Parameter "B"	0.47 0.77 1.05
Pct. Axial Strain at Failure	0.95 0.95 0.95
	20.0 17.6 19.4

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective $\phi' : 29.6^\circ$ $c' = 0.15$ (tsf)
 _____ Total $\phi : 11.1^\circ$ $c = 0.73$ (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

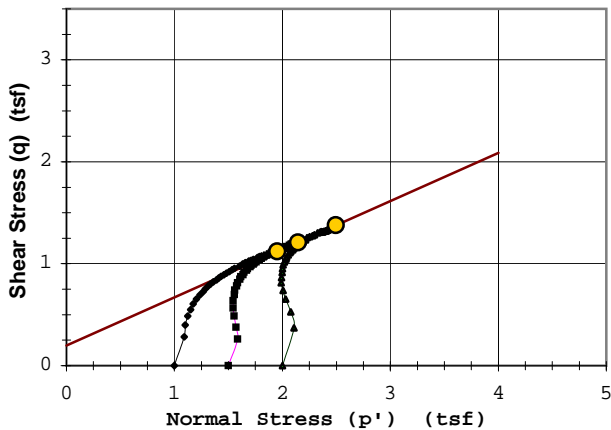
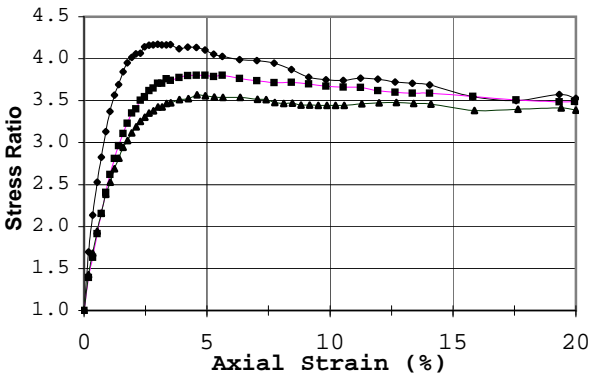
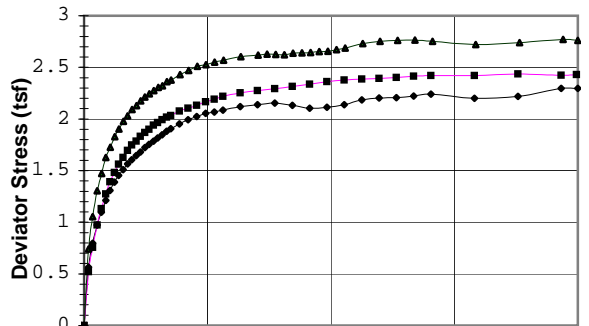
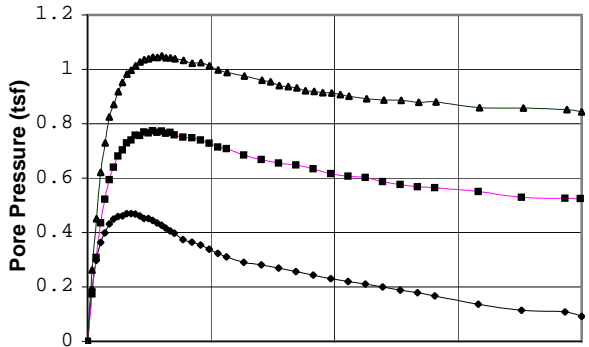
Project: TCAAP - #15.60936.100

Boring #: BR600

Sample #: SH-11 Type: 3T

Depth (ft): 30

Soil Type: Clayey Sand w/a little gravel (SC/CL)



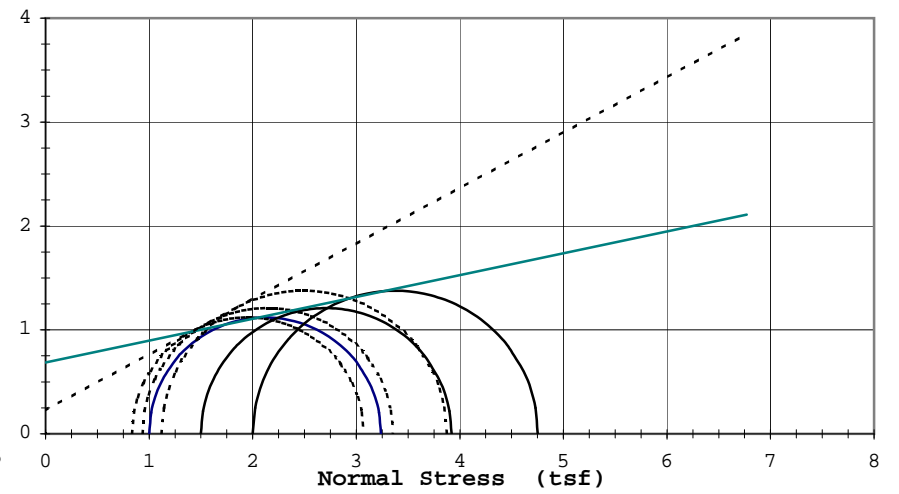
Rupture Envelope at Failure
= 25.3° a = 0.2 (tsf)



Failure Criterion: Given Strain of: 15%	
Angle of internal friction, $\phi' = 28.2^\circ$	
Apparent Cohesion, $c' = 0.22$ (tsf)	
Test Date: 7/3/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.67
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	16.5 16.6 16.7
Void Ratio	111.6 111.9 111.4
After Consolidation	
Diameter (in)	0.49 0.49 0.50
Height (in)	1.42 1.42 1.41
Water Content (%)	2.85 2.85 2.84
Dry Density (pcf)	16.8 16.7 15.8
Void Ratio	115.0 115.3 117.2
Back Pressure (tsf)	0.45 0.45 0.42
Minor Principal Stress (tsf)	9.1 4.4 4.0
Max. Deviator Stress (tsf)	1.00 1.50 2.00
Ultimate Deviator Stress (tsf)	2.30 2.44 2.77
Deviator Stress at Failure (tsf)	2.30 2.43 2.76
Max. Pore Pressure Buildup (tsf)	2.24 2.42 2.75
Pore Pressure Parameter "B"	0.47 0.77 1.05
Pct. Axial Strain at Failure	0.95 0.95 0.95
	15.0 15.0 15.0

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective $\phi' : 28.2^\circ$ $c' = 0.22$ (tsf)
 _____ Total $\phi : 11.9^\circ$ $c = 0.69$ (tsf)

Triaxial Data

Job: 9919

Boring: BR600

Sample: SH-11

Depth: 30

Date: 7/14/15

Sample 1			Sample 2			Sample 3			Sample 4			Sample 5		
Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
0.18	0.57	0.19	0.18	0.52	0.17	0.18	0.74	0.26						
0.35	0.80	0.30	0.35	0.76	0.31	0.36	1.06	0.45						
0.53	0.97	0.36	0.53	0.97	0.44	0.53	1.30	0.62						
0.70	1.10	0.40	0.70	1.13	0.52	0.71	1.47	0.73						
0.88	1.21	0.43	0.88	1.27	0.59	0.89	1.63	0.82						
1.05	1.31	0.45	1.05	1.39	0.64	1.06	1.72	0.87						
1.23	1.39	0.46	1.23	1.48	0.68	1.24	1.83	0.92						
1.41	1.45	0.46	1.41	1.56	0.70	1.41	1.90	0.95						
1.58	1.51	0.47	1.58	1.63	0.73	1.59	1.98	0.98						
1.76	1.57	0.47	1.76	1.70	0.74	1.77	2.03	1.00						
1.93	1.60	0.47	1.93	1.75	0.76	1.94	2.09	1.01						
2.11	1.65	0.46	2.11	1.79	0.76	2.12	2.13	1.03						
2.28	1.68	0.45	2.28	1.83	0.77	2.29	2.18	1.03						
2.46	1.72	0.45	2.46	1.87	0.77	2.47	2.21	1.04						
2.64	1.75	0.44	2.64	1.90	0.77	2.65	2.24	1.05						
2.81	1.79	0.44	2.81	1.94	0.77	2.83	2.28	1.04						
2.99	1.82	0.43	2.99	1.97	0.77	3.00	2.31	1.05						
3.16	1.85	0.42	3.16	1.99	0.76	3.18	2.32	1.04						
3.34	1.88	0.41	3.34	2.02	0.77	3.35	2.36	1.04						
3.51	1.91	0.40	3.51	2.03	0.76	3.53	2.38	1.04						
3.87	1.95	0.37	3.87	2.08	0.75	3.88	2.43	1.03						
4.22	1.99	0.36	4.22	2.10	0.75	4.24	2.47	1.02						
4.57	2.02	0.35	4.57	2.13	0.74	4.59	2.51	1.02						
4.92	2.05	0.34	4.92	2.16	0.73	4.94	2.53	1.01						
5.27	2.07	0.32	5.27	2.19	0.71	5.29	2.55	1.00						
5.62	2.08	0.31	5.62	2.22	0.71	5.65	2.57	0.99						
6.33	2.12	0.29	6.33	2.25	0.69	6.35	2.60	0.97						
7.03	2.14	0.28	7.03	2.28	0.67	7.06	2.62	0.96						
7.73	2.15	0.27	7.73	2.29	0.66	7.41	2.63	0.95						
8.43	2.13	0.26	8.43	2.31	0.65	7.76	2.62	0.94						
9.14	2.10	0.24	9.14	2.34	0.63	8.12	2.62	0.94						
9.84	2.11	0.23	9.84	2.36	0.62	8.47	2.64	0.93						
10.54	2.14	0.22	10.54	2.38	0.61	8.82	2.64	0.92						
11.25	2.18	0.21	11.25	2.38	0.60	9.17	2.64	0.92						
11.95	2.20	0.20	11.95	2.39	0.59	9.53	2.65	0.91						
12.65	2.21	0.19	12.65	2.40	0.58	9.88	2.66	0.91						
13.35	2.22	0.18	13.35	2.41	0.57	10.23	2.67	0.91						
14.06	2.24	0.17	14.06	2.42	0.57	10.58	2.69	0.90						
15.81	2.20	0.14	15.81	2.42	0.55	11.29	2.73	0.89						
17.57	2.22	0.11	17.57	2.44	0.53	12.00	2.75	0.89						
19.33	2.30	0.11	19.33	2.42	0.53	12.70	2.76	0.89						
20.00	2.30	0.09	19.95	2.43	0.52	13.41	2.76	0.88						
						14.11	2.75	0.88						
						15.87	2.72	0.86						
						17.64	2.74	0.86						
						19.40	2.77	0.85						
						20.00	2.76	0.84						

Spine Road Soil Boring Logs



Northern Technologies Inc.
 1408 Northland Dr. Ste 107
 Mendota Heights, MN, 55120
 Telephone: 651-389-4191

BORING NUMBER SR-200

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/5/15 09:34 - H:\RAMSEY11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\SR SPINE ROAD.GPJ

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/30/15 **COMPLETED** 6/30/15 **GROUND ELEVATION** 925.18 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.00 ft / Elev 911.18 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 31 ft S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		SILTY SAND, (SM) brown, fine grained, moist, loose to very loose, trace gravel	SS 1	33	2-3-2 (5)							
			SS 2	56	3-3-3 (6)							
5			SS 3	33	2-2-1 (3)							
7.0		SILTY LEAN CLAY, (CL-ML) dark gray, moist, soft NOTE: Weight of Hammer at 7.0 feet.	SS 4	78	0-1-2 (3)							
9.5		PEAT, (Pt) black, moist to wet, soft	SH 5									
		NOTE: Sand (SP) lenses at 12.0 feet.	SS 6	67	1-2-2 (4)							
15			SS 7	44	1-2-2 (4)							
17.5		POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, very loose	SS 8	56	1-1-2 (3)							
20		POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, very loose, trace gravel	SS 9	78	1-2-2 (4)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER SR-201

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 951.1 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	950.6									
1.5		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, moist (Fill)	949.6	78	6-8-3 (11)							
3.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	948.1	78	4-5-6 (11)							
5.0		SANDY LEAN CLAY, (CL) gray, moist, medium to stiff, trace gravel		33	3-4-4 (8)							
10.0			SH 4									
12.0			SS 5	89	3-4-6 (10)							
14.0			SS 6	89	5-7-11 (18)							
16.0			SS 7	78	8-11-12 (23)							
18.0			SS 8	72	7-9-12 (21)							
20.0			SS 9	67	8-10-13 (23)							
21.0		POORLY GRADED SAND WITH GRAVEL, (SP) gray to brown, fine to medium grained, moist, dense	931.1									
			930.1									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-202

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 955.31 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	954.8									
1.5		SILTY SAND WITH GRAVEL, (SM) brown, moist (Fill)	953.8	33	3-4-5 (9)							
		LEAN CLAY WITH SAND, (CL) brown to gray, fine grained, moist, rather stiff to very stiff, trace gravel		78	4-6-8 (14)							
5			SS 2	78	4-6-8 (14)							
			SS 3	78	5-7-8 (15)							
			SS 4	100	4-7-9 (16)							
10			SS 5	100	5-7-8 (15)							
			SS 6	100	5-10-12 (22)							
15			SS 7	100	5-9-11 (20)							
			SS 8	100	5-15-25 (40)							
20			SH 9									
21.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER SR-203

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 956.01 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0													
4.5		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist, occasional clayey sand (SC) seams (Fill) NOTE: Rock in tip of Split-Spoon	SS 1	44	1-1-1 (2)								
			SS 2	56	8-6-6 (12)								
5		951.5	POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	SS 3	56	7-9-10 (19)							
7.0		949.0	CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense to loose	SS 4	67	2-4-7 (11)							
10		10.0	LEAN CLAY WITH SAND, (CL) brown to gray, moist, medium to stiff, trace gravel, sand lenses	SS 5	67	4-4-4 (8)							
15				SH 6									
				SS 7	56	2-3-4 (7)							
20				SS 8	100	4-8-10 (18)							
21.0				SS 9									
		935.0											

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-205

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 951.02 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft SE **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)	SS 1	67	5-6-6 (12)							
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist, medium dense	SS 2	56	6-6-8 (14)							
4.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense	SS 3	67	4-7-10 (17)							
		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff to very stiff, trace gravel, sand lenses at 12.0 feet	SS 4	83	6-8-8 (16)							
			SS 5	78	6-8-12 (20)							
			SS 6	100	6-8-10 (18)							
			SS 7	100	5-7-7 (14)							
			SH 8									
21.0			SS 9	100	9-15-19 (34)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-206

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 942.32 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft N **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist (Fill)	SS 1	44	9-10-10 (20)							
			SS 2	56	8-8-6 (14)							
5		937.8										
7.0		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 3	100	5-6-6 (12)							
			SS 4	78	3-5-6 (11)							
10		935.3										
9.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense	SS 5									
			SH 5									
		932.8										
15		LEAN CLAY WITH SAND, (CL) brown, moist, stiff to very stiff, little gravel	SS 6	89	7-9-10 (19)							
			SS 7	100	8-10-11 (21)							
			SS 8	0	13-20-25 (45)							
20		NOTE: No Recovery due to coarse gravel at 17.0 feet. Sampled auger cuttings.	SS 9	0	13-22-27 (49)							
			SS 9	0	13-22-27 (49)							
21.0		921.3										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-207

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 938.51 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	SS 1	44	9-9-10 (19)							
3.0		CLAYEY SAND, (SC) gray, moist, medium dense	SS 2	56	5-9-12 (21)							
5			SH 3					16	29	14	15	43
10			SS 4	89	3-4-5 (9)							
10			SS 5	89	4-5-4 (9)							
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to stiff, trace gravel	SS 6	100	3-3-3 (6)							
15			SS 7	44	4-5-6 (11)							
20			SS 8	44	7-12-11 (23)							
21.0			SS 9	33	5-8-10 (18)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-208

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 935.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill) 933.6	SS 1	39	4-6-7 (13)							
4.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill) 931.6	SS 2	100	5-5-5 (10)							
5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose to medium dense, trace gravel	SS 3	17	2-3-4 (7)							
			SH 4									
10			SS 5	67	3-5-6 (11)							
12.0		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff to stiff, trace gravel 923.6	SS 6	89	4-5-5 (10)							
15			SS 7	89	5-6-6 (12)							
			SS 8	78	5-7-10 (17)							
20			SS 9	56	9-12-12 (24)							
20.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, dense, trace gravel 915.6										
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-209

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 911.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 3.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, moist, trace gravel (Fill)	SS 1	33	2-3-4 (7)							
3.0 - 908.0		SANDY LEAN CLAY, (CL) brown to gray, moist, medium to rather stiff, trace gravel	SS 2	67	3-4-4 (8)							
5			SS 3	67	4-4-5 (9)							
10			SS 4	100	3-4-4 (8)							
15			SH 5									
			SS 6	100	1-3-4 (7)							
			SS 7	100	2-3-5 (8)							
			SS 8	100	2-3-4 (7)							
20			SS 9	89	2-4-6 (10)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-210

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 913.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.50 ft / Elev 909.14 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft NE **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) some gravel (Fill)	SS 1	33	1-2-3 (5)							
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) fine to medium grained, dense, trace gravel	SS 2	78	5-12-14 (26)							
5.0		CLAYEY SILT, (SC) saturated, trace gravel										
6.0		POORLY GRADED SAND WITH SILT, (SP-SM) saturated, trace gravel	SS 3	17								
8.5		CLAYEY SAND, (SC) gray, saturated, loose to dense, trace gravel	SS 4	22								
10.0			SS 5	33	4-6-6 (12)							
12.0			SS 6	89	3-3-4 (7)							
14.0			SS 7	89	4-5-7 (12)							
16.0			SS 8	17	5-7-8 (15)							
18.0			SS 9	11	5-8-10 (18)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-212

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 894.22 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 879.72 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft NW **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		FILL/TOPSOIL, (SC) black, very loose to loose, with organics	SS 1	78	1-1-1 (2)							
3.5		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SS 2	33	2-2-2 (4)							
5			SS 3	78	1-3-3 (6)							
			SS 4	100	3-4-5 (9)							
10		NOTE: Trace gravel below 9.5 feet.	SS 5	100	3-5-5 (10)							
15			SH 6					14	23	10	13	52
			SS 7	78	2-2-3 (5)							
			SS 8	100	2-3-4 (7)							
20			SS 9	100	3-4-5 (9)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-213

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 890.76 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 878.76 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SILTY SAND WITH GRAVEL, (SM) fine grained, moist (Fill) NOTE: Sampled auger cutting.	SS 1	0	8-4-6 (10)							
4.0		886.8	SS 2	78	16-12-15 (27)							
5		LEAN CLAY WITH SAND, (CL) moist, stiff to rather stiff, trace gravel	SS 3	44	8-9-11 (20)							
8.5		882.3	SS 4	83	2-6-8 (14)							
10		SILTY SAND, (SM) fine grained, moist, loose, trace gravel	SS 5	78	3-3-5 (8)							
11.0		879.8	SS 6	89	3-3-4 (7)							
15		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SH 7									
20			SS 8	100	2-4-5 (9)							
21.0		869.8	SS 9	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-214

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 890.28 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 880.78 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	67	4-4-3 (7)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 2	56	4-5-5 (10)							
5												
4.5		SILTY SAND, (SM) brown to gray, fine grained, moist to saturated, medium dense to dense	SS 3	67	6-7-6 (13)							
10												
			SS 4	56	4-4-5 (9)							
			SS 5	56	6-7-7 (14)							
			SS 6	89	5-5-5 (10)							
			SS 7	100	6-8-7 (15)							
15												
18.5			SS 8	56	8-8-9 (17)							

Borehole backfilled soil cuttings.
 Bottom of borehole at 18.5 feet.



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BORING NUMBER SR-215

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 889.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 882.66 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND, (SP-SM) brown, fine to coarse grained, moist, trace gravel (Fill) 888.2	SS 1	44	3-4-3 (7)							
3.5		SILTY SAND, (SM) gray to brown, fine grained, moist (Fill) 886.2	SS 2	56	5-4-6 (10)							
5		SILTY SAND, (SM) brown, fine grained, moist to saturated, medium dense NOTE: Borehole wet cave-in at 5.7 feet.	SS 3	78	4-5-4 (9)							
10			SS 4	67	6-6-7 (13)							
12.0			SS 5	100	6-8-6 (14)							
15			SS 6	100	6-8-9 (17)							
19.5			SS 7	100	6-4-10 (14)							
20			SS 8	100	4-10-5 (15)							
21.0			SS 9	100	5-6-6 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-216

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 887.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 880.29 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		SILTY SAND, (SM) brown, fine to medium grained, moist, trace gravel (Fill)	887.0									
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist (Fill)	885.8	SS 1	67	3-5-5 (10)						
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist (Fill)	883.8	SS 2	56	3-6-6 (12)						
5		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist, medium dense		SS 3	67	5-7-6 (13)						
6.0		SILTY SAND, (SM) light brown, fine grained, moist, medium dense, trace gravel	881.3	SS 4	44	3-3-4 (7)						
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, moist to saturated, loose, trace gravel		SS 5	44	1-2-2 (4)						
11.0			876.3									

NOTE: Boring terminated at 11.0 feet due to borehole cave-in.

Borehole backfilled with auger cuttings.
 Bottom of borehole at 11.0 feet.



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BORING NUMBER SR-217

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 886.05 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 879.05 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 8.5		SILTY SAND, (SM) brown, fine grained, moist to saturated, loose to medium dense, trace gravel	SS 1	56	4-6-5 (11)							
			SS 2	67	4-9-7 (16)							
5			SS 3	78	4-5-4 (9)							
8.5		877.6	SS 4	100	3-3-2 (5)							
8.5 - 14.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, saturated, medium dense, trace gravel	SS 5	89	5-7-6 (13)							
14.5		871.6	SH 6									
14.5 - 17.0		SILTY SAND, (SM) brown, medium to coarse grained, saturated, medium dense, trace gravel	SS 7	100	4-6-7 (13)							
17.0		869.1										
17.0 - 18.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, loose	SS 8	78	3-3-2 (5)							
18.5		867.6										
18.5 - 20.0		SANDY LEAN CLAY, (CL) gray, saturated, medium, trace gravel										
20.0		865.1	SS 9	67	3-3-4 (7)							
20.0 - 21.0		NOTE: Silty sand seam at 20.0 feet.										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-218

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/5/15 09:35 - H:\RAMSEY11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\SR SPINE ROAD.GPJ

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 883.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 869.17 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist (Fill)	SS 1	56	6-7-6 (13)							
5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 2	56	8-8-9 (17)							
7.0		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, moist, dense	SS 3	67	7-6-9 (15)							
9.5		PEAT, (Pt) black to dark gray, moist, rather stiff	SS 4	56	10-11-13 (24)							
14.5		SILTY SAND, (SM) gray, fine to medium grained, saturated, medium dense	SS 5	67	4-5-6 (11)							
			SH 6									
			SS 7	56	4-4-5 (9)							
			SS 8	100	6-7-7 (14)							
			SS 9	89	7-6-6 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies Inc.
 1408 Northland Dr. Ste 107
 Mendota Heights, MN, 55120
 Telephone: 651-389-4191

BORING NUMBER SR-219

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/5/15 09:35 - H:\RAMSEY11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\SR SPINE ROAD.GPJ

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 898.15 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT (1.5 Inches)										
0.1		BASE (4 Inches)										
0.5		POORLY GRADED SAND WITH SILT, (SP-SM) light brown to brown, fine to medium grained, dry to moist, trace gravel (Fill)	SS 1	44	8-11-11 (22)							
			SS 2	67	10-11-12 (23)							
5			SS 3	67	9-10-12 (22)							
			SS 4	89	10-8-9 (17)							
10			SS 5	78	10-11-13 (24)							
		POORLY GRADED SAND, (SP-SM) brown, fine to medium grained, moist, little gravel, apparent roadway base material (Fill)	SS 6	100	13-15-16 (31)							
15		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, dry, dense, trace gravel	SS 7	56	8-12-11 (23)							
			SS 8	89	6-8-6 (14)							
20		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, medium dense	SS 9	100	6-7-7 (14)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies Inc.
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 Mendota Heights, MN, 55120
 Telephone: 651-389-4191

BORING NUMBER SR-220

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 884.33 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		TOPSOIL (2 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, trace gravel (Fill)	SS 1	67	8-10-11 (21)							
		SILTY SAND, (SM) light brown to gray, fine grained, moist (Fill)	SS 2	56	9-13-15 (28)							
5			SS 3	67	8-11-12 (23)							
			SS 4	67	3-5-5 (10)							
9.5		SILTY SAND, (SM) gray, fine grained, moist, asphalt pieces (Fill)	SS 5	100	32/6"							
12.0		SILTY SAND, (SM) gray, fine grained, moist, trace gravel (Fill)	SS 6	67	6-6-7 (13)							
14.5		SILTY SAND, (SM) dark gray to gray, fine grained, moist, loose, organic stain	SS 7	56	2-2-3 (5)							
			SS 8	100	4-3-4 (7)							
20			SS 9	56	3-3-5 (8)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-221

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 892.07 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 15.30 ft / Elev 876.77 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		TOPSOIL (2 Inches)										
		SILTY SAND, (SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	4-2-4 (6)							
			SS 2	89	3-3-4 (7)							
3.5		SILTY SAND, (SM) light brown, fine grained, moist, loose to medium dense										
			SS 3	67	3-4-4 (8)							
			SS 4	78	4-6-8 (14)							
			SS 5	100	4-6-8 (14)							
12.0		SILTY SAND, (SM) light brown, fine grained, moist to saturated, loose to medium dense										
			SS 6	89	3-5-4 (9)							
			SS 7	78	3-3-5 (8)							
			SS 8	78	4-5-7 (12)							
21.0			SS 9	56	5-7-9 (16)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-222

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 897.17 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.70 ft / Elev 879.47 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, very loose, trace gravel	SS 1	56	2-2-2 (4)							
		SILTY SAND, (SM) brown to light brown, fine grained, moist, very loose to dense	SS 2	78	2-3-2 (5)							
5			SS 3	56	2-1-2 (3)							
			SS 4	78	5-9-9 (18)							
10			SS 5	78	4-5-7 (12)							
			SS 6	67	4-6-7 (13)							
15		SILTY SAND, (SM) light brown, fine grained, moist to saturated, loose to medium dense	SS 7	78	2-3-5 (8)							
			SS 8	56	4-6-7 (13)							
20			SS 9	78	5-6-7 (13)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-223

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 898.48 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.20 ft / Elev 881.28 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
			SS 1	67	1-3-2 (5)							
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, loose, trace gravel										
			SS 2	78	2-2-3 (5)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, loose, trace medium to coarse gravel										
			SS 3	67	1-2-2 (4)							
			SS 4	78	1-2-2 (4)							
			SS 5	67	1-1-3 (4)							
			SS 6	78	2-3-4 (7)							
			SS 7	22	2-3-3 (6)							
			SS 8	67	5-8-10 (18)							
21.0			SS 9	78	8-10-10 (20)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-224

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 899.93 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 16.00 ft / Elev 883.93 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose	SS 1	78	3-3-2 (5)							
		SILTY SAND, (SM) brown to light brown, fine grained, moist to saturated, very loose to dense	SS 2	67	2-2-2 (4)							
5			SS 3	56	2-2-3 (5)							
		NOTE: Trace gravel at 7.0 feet.	SS 4	44	1-2-2 (4)							
10			SS 5	78	3-5-6 (11)							
			SS 6	67	3-4-5 (9)							
15			SS 7	67	2-2-3 (5)							
			SS 8	56	5-9-9 (18)							
20			SS 9	56	5-9-12 (21)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies Inc.
 1408 Northland Dr. Ste 107
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BORING NUMBER SR-225

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 898.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
5		POORLY GRADED SAND WITH SILT, (SP-SM) light brown to dark brown, fine to medium grained, moist, medium dense to very loose	SS 1	56	3-4-3 (7)							
			SS 2	78	5-5-5 (10)							
			SS 3	89	3-3-3 (6)							
			SS 4	78	5-6-6 (12)							
			SS 5	78	4-5-6 (11)							
			SS 6	67	2-2-2 (4)							
			SS 7	56	2-3-3 (6)							
			SS 8	56	3-2-3 (5)							
19.5												
20		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose	SS 9	67	4-4-3 (7)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

Rice Creek Re-Meander Bridge Soil Boring Logs



Northern Technologies, Inc.
 1408 Northland Drive, Suite 107
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 Telephone: 651-389-4191

BORING NUMBER RC-500

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 883.81 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 4.50 ft / Elev 879.31 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		POORLY GRADED GRAVEL WITH SAND, (GP) brown, fine to medium grained, coarse gravel (Fill)	SS 1	44	4-5-4 (9)							
3.0		880.8	SS 2	56	6-6-8 (14)							
5		∇ SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, medium dense to dense	SS 3	67	8-11-10 (21)							
7.0		876.8	SS 4	78	5-6-7 (13)							
10		SILTY SAND, (SM) gray, fine to medium grained, saturated, medium dense	SS 5	100	5-6-5 (11)							
14.5		869.3	SS 6	100	4-4-5 (9)							
15		SILTY SAND, (SM) gray, fine to medium grained, saturated, loose, trace gravel	SS 7	78	2-3-3 (6)							
20		862.8	SS 8	89	3-4-3 (7)							
21.0		862.8	SS 9	100	4-4-3 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 13:44 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTRC - RICE CREEK REMEASUR.GPJ



Northern Technologies, Inc.
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 Mendota Heights, MN 55120
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BORING NUMBER RC-501

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 884.4 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 874.90 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 13:44 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTRC - RICE CREEK REMEASUR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, trace gravel (Fill) 882.9	SS 1	78	5-5-7 (12)							
		SILTY SAND, (SM) brown, fine to medium grained, moist, dense to medium dense, trace gravel	SS 2	78	6-7-10 (17)							
5			SS 3	89	7-10-11 (21)							
8.0		PEAT, (Pt) dark gray to black, dry, rather stiff 876.4	SS 4	78	4-5-7 (12)							
8.5		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense, trace coarse gravel 875.9	SS 5	67	4-5-3 (8)							
			SS 6	100	4-7-7 (14)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel 869.9	SS 7	100	2-2-3 (5)							
			SS 8	100	3-4-4 (8)							
21.0		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose, trace gravel 863.4	SH 9					16	26	11	15	51
22.0		862.4										26

Borehole backfilled with auger cuttings.
 Bottom of borehole at 22.0 feet.



Northern Technologies, Inc.
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BORING NUMBER RC-502

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 884.24 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 877.24 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 15 ft. W **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 13:44 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTRC - RICE CREEK REMEASUR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry (Fill) 882.2	SS 1	78	7-9-10 (19)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist (Fill) 879.7	SS 2	56	8-9-9 (18)							
5		SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, dense to very loose	SS 3	100	7-9-11 (20)							
		<input checked="" type="checkbox"/> 879.7	SS 4	100	3-1-1 (2)							
10			SS 5	67	1-1-1 (2)							
			SS 6	78	2-2-3 (5)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, very loose to medium dense, trace gravel 869.7	SS 7	56	2-2-1 (3)							
			SS 8	100	6-7-6 (13)							
20			SS 9	89	4-4-5 (9)							
21.0		863.2										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER RC-503

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 881.95 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ---
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 15 ft. SW **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 13:44 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTRC - RICE CREEK REMEASUR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry (Fill)	SS 1	67	3-2-3 (5)							
5.0		SILTY SAND, (SM) brown, fine grained, moist, loose, trace gravel	SS 2	67	3-3-3 (6)							
7.0		SILTY SAND, (SM) gray to dark gray, fine grained, saturated, very loose to medium dense, trace organics	SS 3	67	3-3-3 (6)							
10.0		Note: Organic content at 10 feet = 2.6%	SH 5					15				16
15.0			SS 6	56	3-3-2 (5)							
17.0		NOTE: Borehole wet cave-in at 17.0 feet.	SS 7	78	2-2-2 (4)							
18.5			SS 8	78	2-4-6 (10)							
19.5		POORLY GRADED GRAVEL, (GP) gray, saturated, medium dense, fine to medium gravel										
21.0		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, saturated, medium dense	SS 9	100	4-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

Water Main Soil Boring Logs



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BORING NUMBER WM-400

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 965.77 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	964.9									
		CLAYEY SAND, (SC) brown, moist, loose to medium dense, trace gravel	SS 1	56	4-5-6 (11)							
			SS 2	100	6-4-5 (9)							
4.5		SANDY LEAN CLAY, (CL) brown, moist, medium to very stiff, trace gravel	961.3									
			SS 3	67	3-2-3 (5)							
			SS 4	100	3-4-3 (7)							
10			SH 5					17	29	13	16	51
		NOTE: No recovery. Sampled auger cuttings.										
13.5			952.3									
			SS 6	0	32							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ



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BORING NUMBER WM-401

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 954.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINTWM - WATER MAIN.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		SILTY SAND, (SM) brown, fine to medium grained, moist, little gravel (Fill)	953.1	SS 1	67	5-10-7 (17)						
3.0		CLAYEY SAND, (SC) brown, fine grained, moist, trace gravel (Fill)	951.6	SS 2	56	5-6-7 (13)						
4.5		CLAYEY SAND, (SC) brown, fine grained, moist, medium dense, trace gravel	950.1	SS 3	67	4-3-4 (7)						
		CLAYEY SAND, (SC) brown, fine grained, moist, medium dense to stiff, trace gravel		SS 4	100	5-5-7 (12)						
10				SH 5				12	23	13	10	30
												45
13.5			941.1	SS 6	100	7-8-8 (16)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-402

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 915.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 12.00 ft / Elev 903.63 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)	914.8									
0.8		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist (Fill)	SS 1	78	3-3-2 (5)							
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist, loose	SS 2	100	4-6-5 (11)							
5			SS 3	89	4-5-3 (8)							
7.0		CLAYEY SAND, (SC) moist, loose, trace gravel	908.6									
8.0		SILTY SAND, (SM) brown, fine to medium grained, moist, medium, trace clay (CL) lenses	907.6	78	4-3-4 (7)							
10			SH 5					11				30
12.8	∇		902.8									
13.5		CLAYEY SAND, (SC) gray, saturated, medium dense, trace gravel	902.1	100	4-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-403

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 907.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ▽ 7.50 ft / Elev 900.16 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		TOPSOIL (5 inches)	907.2									
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace coarse gravel (Fill)	906.2	SS 1	67	5-4-4 (8)						
2.7		SANDY LEAN CLAY, (CL) brown, moist, rather stiff	905.0	SS 2	100	7-6-7 (13)						
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist to saturated, medium dense		SS 3	100	5-6-6 (12)						
7.7	▽	LEAN CLAY WITH SAND, (CL) brown, wet, medium	900.0	SS 4	78	2-3-3 (6)						
9.5		CLAYEY SAND, (SC) blue gray, saturated, very loose	898.2	SS 5	100	2-2-2 (4)						
12.5		LEAN CLAY, (CL) blue gray, wet, trace gravel	895.2	SH 6								
15.0			892.7									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 15.0 feet.



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BORING NUMBER WM-404

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/5/15 **COMPLETED** 6/5/15 **GROUND ELEVATION** 907.25 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 895.25 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		POORLY GRADED SAND WITH CLAY, (SP-SC) dark brown, fine grained, moist, trace gravel (Fill)	906.3	SS 1	78	6-5-6 (11)						
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, dense, trace gravel	903.8	SS 2	89	7-8-8 (16)						
5				SS 3	89	11-10-8 (18)						
7.0		SILTY SAND, (SM) light brown, fine grained, moist to saturated, dense to medium dense, trace gravel	900.3	SH 4	100							
10				SS 5	100	10-10-8 (18)						
13.5			893.8	SS 6	89	7-6-7 (13)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-405

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/5/15 **COMPLETED** 6/5/15 **GROUND ELEVATION** 899.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 889.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 40 ft. E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown to light brown, fine to medium grained, moist to saturated, medium dense to loose, trace gravel	SS 1	56	7-7-6 (13)							
			SS 2	89	6-9-7 (16)							
5			SS 3	78	3-3-4 (7)							
			SS 4	100	8-6-7 (13)							
10			SS 5	100	7-5-5 (10)							
			SS 6	100	4-4-4 (8)							
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/2/11 15:44:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ



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BORING NUMBER WM-406

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/23/15 **COMPLETED** 6/23/15 **GROUND ELEVATION** 891.68 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 879.68 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown, fine to medium grained, moist, very loose to loose	SS 1	44	1-2-3 (5)							
3.0		PEAT, (Pt) black, moist, soft, trace gravel	SS 2	78	3-3-4 (7)							
5			SH 3									
			SS 4	83	2-2-2 (4)							
10			SH 5									
12.5		NOTE: Weight of Hammer at 12.0 feet. SILTY SAND WITH GRAVEL, (SM) gray, fine grained, saturated, loose, fine gravel	SS 6	44	0-2-4 (6)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 7	83	4-5-6 (11)							
16.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 16.0 feet.



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BORING NUMBER WM-407

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 889.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 6.25 ft / Elev 882.87 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 10 ft. E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill) 887.6	SS 1	56	8-9-11 (20)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill) 884.6	SS 2	56	6-10-11 (21)							
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist to saturated, dense, little organics, iron oxide staining 882.1	SS 3	89	6-11-12 (23)							
7.0		SILTY SAND, (SM) light brown to gray, fine grained, saturated, medium dense 879.6	SS 4	78	7-6-8 (14)							
9.5		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, saturated, loose to medium dense 875.6	SS 5	67	3-3-4 (7)			15				6
13.5			SS 6	67	5-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ



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BORING NUMBER WM-408

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 888.74 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 5.00 ft / Elev 883.74 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 15 ft. E **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINTWM - WATER MAIN.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little fine to medium gravel (Fill)	SS 1	33	8-9-8 (17)							
5.5		POORLY GRADED SAND, (SP) brown, moist to saturated, loose, little fine gravel	SS 2	22	10-13-12 (25)							
5.5		SILTY SAND, (SM) gray, fine grained, saturated, very loose to loose, trace gravel	SS 3	44	3-4-3 (7)							
			SS 4	44	1-1-1 (2)							
			SS 5	44	2-1-2 (3)							
13.5			SS 6	89	3-4-4 (8)							

Borehole backfilled with soil cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-409

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 886.87 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 879.87 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, trace gravel (Fill)	SS 1	78	4-3-4 (7)							
		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 2	100	4-7-6 (13)							
5												
6.0												
		SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, medium dense to loose, iron oxide staining	SS 3	89	3-5-5 (10)							
			SS 4	78	3-5-4 (9)							
10			SS 5	56	2-4-4 (8)							
			SS 6	56	2-2-3 (5)							
13.5												

Borehole backfilled with soil cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SIT/CAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ



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 Mendota Heights, MN 55120
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BORING NUMBER WM-410

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/25/15 **COMPLETED** 6/25/15 **GROUND ELEVATION** 877.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 870.04 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	SS 1	78	2-3-4 (7)							
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose to dense, trace fine to coarse gravel, trace roots, iron oxide staining, clay (CL) pieces	SS 2	89	8-8-8 (16)							
5		NOTE: Hard drilling at 5.0 feet due to coarse gravel.	SS 3	56	9-20-10 (30)							
7.0			SS 4	78	7-4-4 (8)							
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to coarse grained, saturated, loose, trace fine gravel	SS 5	89	4-3-2 (5)							
			SS 6	89	2-2-3 (5)							
14.5			SS 7	100	4-4-5 (9)							
		SANDY LEAN CLAY, (CL) gray, wet, medium, trace fine gravel	SH 8									
21.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/2/15 15:44:43 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ

Natural Resources Corridor Soil Boring Logs



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BORING NUMBER NR-101

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 914.14 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)										
		CLAYEY SAND, (SC) brown to dark brown, fine grained, moist, very loose to medium dense, trace gravel, lenses of silt, iron oxide staining	SS 1	44	1-2-2 (4)							
			SS 2	89	4-6-6 (12)							
5			SS 3	89	5-7-7 (14)							
			SS 4	89	3-3-3 (6)							
9.5		PEAT, (Pt) black, moist, rather stiff to soft, trace gravel	SS 5	78	4-6-5 (11)							
13.3		LEAN CLAY WITH SAND, (CL) gray and brown, moist to wet, rather stiff, trace gravel, organic material seams	SS 6	44	2-2-1 (3)							
15			SS 7	89	3-5-6 (11)							
			SS 8	100	3-6-5 (11)							
21.5			SH 9									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-102

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 915.35 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 12.00 ft / Elev 903.35 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---
O/S 20 ft NE

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.6		TOPSOIL (7 Inches)	914.8									
2.0		CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, loose	913.4	56	2-2-3 (5)							
		SILTY SAND, (SM) brown and dark brown, fine grained, moist, loose		67	3-3-5 (8)							
4.5		SILTY SAND, (SM) reddish brown, fine grained, moist, medium dense	910.9	56	4-8-8 (16)							
7.0		CLAYEY SAND, (SC) black, fine grained, dry to moist, loose, some organics, organic stain	908.4	67	4-4-4 (8)							
10.5		PEAT, (Pt) black, dry to moist, rather stiff	904.9	67	4-5-5 (10)							
12.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	903.4	78	5-6-6 (12)							
15				67	4-5-5 (10)							
				89	6-6-8 (14)							
20				100	3-4-5 (9)							
21.0			894.4									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-103

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 924.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 6 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		CLAYEY SAND, (SC) brown, fine grained, moist, loose	SS 1	56	3-3-3 (6)							
2.0		SANDY LEAN CLAY, (CL) brown, moist, medium to rather stiff	SS 2	56	4-4-4 (8)							
5		NOTE: Sampled auger cuttings at 4.5 feet.	SS 3	17	4-5-5 (10)							
7.0		SILTY SAND, (SM) dark brown to dark gray, fine grained, moist, dense, clay (CL) lenses	SS 4	67	4-7-12 (19)							
10			SH 5									
12.0		SILTY SAND, (SM) brown, moist, medium dense, trace gravel	SS 6	78	6-8-8 (16)							
15			SS 7	56	7-7-7 (14)							
15.5		CLAYEY SAND, (SC) gray, fine grained, moist, medium dense, trace gravel										
17.0		SILTY SAND, (SM) gray, fine grained, dry to moist, loose	SS 8	44	2-2-3 (5)							
19.5			SS 9	100	5-5-7 (12)							
20		LEAN CLAY WITH SAND, (CL) dark brown, moist, rather stiff										
21.0												

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-104

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 932.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 8 ft NE

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, dry, fine to coarse gravel (Fill) 930.6	SS 1	56	10-14-15 (29)							
4.0		CLAYEY SAND WITH GRAVEL, (SC) reddish brown, fine to coarse grained, moist, fine to coarse gravel (Fill) 928.6	SS 2	78	9-10-10 (20)							
5		SANDY LEAN CLAY, (CL) reddish brown to light brown, moist, medium, trace fine to coarse gravel	SS 3	56	5-3-5 (8)							
8.3		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace fine to medium gravel 924.4	SS 4	33	4-4-4 (8)							
10			SH 5									
14.5		SANDY LEAN CLAY, (CL) brown, moist, stiff, trace fine gravel, iron oxide staining 918.1	SS 6	78	9-10-13 (23)							
15			SS 7	89	5-7-9 (16)							
17.0		SANDY LEAN CLAY, (CL) brown to reddish brown, dry, very stiff, little fine to coarse gravel 915.6	SS 8	56	7-14-19 (33)							
20			SS 9	78	8-16-16 (32)							
21.0		911.6										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-106

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 939.86 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A AT TIME OF DRILLING --- No groundwater observed.
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 Inches)	939.0									
2.0		CLAYEY SAND, (SC) light brown and dark brown, fine grained, moist, loose	937.9	SS 1	67	1-2-4 (6)						
		CLAYEY SAND, (SC) brown, fine grained, moist, very loose		SS 2	22	1-1-1 (2)						
				SS 3	22	1-1-1 (2)						
				SH 4								
9.5		LEAN CLAY WITH SAND, (CL) reddish brown to light brown, moist, rather stiff to stiff, trace gravel	930.4	SS 5	100	3-5-7 (12)						
				SS 6	100	4-5-5 (10)						
				SS 7	89	5-10-7 (17)						
17.0		SANDY LEAN CLAY, (CL) reddish brown, moist, stiff, trace gravel	922.9	SS 8	67	12-13-15 (28)						
18.0		POORLY GRADED SAND, (SP) light brown, fine grained, dry, medium dense, little medium to coarse gravel	921.9	SS 9	33	7-8-8 (16)						
21.0			918.9									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-107

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 933.09 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 15 ft S

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
		CLAYEY SAND, (SC) brown, fine to medium grained, dry to moist, little gravel (Fill)	SS 1	44	3-5-9 (14)							
			SS 2	28	5-5-5 (10)							
5		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 3	67	3-4-5 (9)							
		SILTY SAND, (SM) light brown, fine grained, moist, medium dense to loose	SS 4	56	4-6-7 (13)							
			SS 5	67	4-4-2 (6)							
		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 6	100	3-5-6 (11)							
			SH 7									
		SANDY LEAN CLAY, (CL) reddish brown and brown, dry, stiff, iron oxide staining	SS 8	100	8-12-16 (28)							
		POORLY GRADED SAND, (SP) light brown, medium grained, dry, dense	SS 9	78	7-7-10 (17)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-108

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 915.92 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 10 ft E

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	915.4									
2.0		CLAYEY SAND, (SC) brown and dark brown, fine grained, moist, loose, trace fine gravel	913.9	56	1-2-4 (6)							
		LEAN CLAY WITH SAND, (CL) gray and brown, moist, medium, trace fine gravel, trace organics		67	3-4-4 (8)							
4.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace fine gravel, iron oxide staining	911.4	78	2-3-3 (6)							
7.0		SANDY LEAN CLAY, (CL) gray brown, moist, medium to rather stiff, trace fine gravel, iron oxide staining	908.9	78	3-3-5 (8)							
12.0		SANDY LEAN CLAY, (CL) dark gray, moist, rather stiff to medium, trace fine gravel	903.9	100	3-5-7 (12)							
15				78	2-3-4 (7)							
20				100	3-3-5 (8)							
21.5			894.4	67								

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-109

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 916.84 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)	916.2									
2.0		LEAN CLAY WITH SAND, (CL) brown, moist, medium	914.8	56	2-3-3 (6)							
5.5		SILTY SAND, (SM) light brown, fine to coarse grained, moist, medium dense to very loose, trace fine gravel, trace lenses of silt		67	2-4-5 (9)							
6.0		PEAT, (Pt) black, moist, soft	911.3 910.8	44	2-2-2 (4)							
		LEAN CLAY WITH SAND, (CL) brown and gray, moist, medium, trace fine to medium gravel		100	3-3-3 (6)							
				100	2-3-5 (8)							
12.0		SANDY LEAN CLAY, (CL) gray, moist, rather stiff, trace fine to medium gravel	904.8	100	3-5-5 (10)							
17.0		LEAN CLAY WITH SAND, (CL) dark gray, moist, rather stiff, trace fine to medium gravel	899.8	100	4-5-6 (11)							
21.0			895.8	100	5-5-5 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-110

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/19/15 COMPLETED 5/19/15 GROUND ELEVATION 919.86 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 19.50 ft / Elev 900.36 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---
O/S 20 ft N

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)		919.4								
		SILTY SAND, (SM) brown, fine to medium grained, moist, some gravel (Fill)	SS 1	67	2-3-3 (6)							
			SS 2	78	5-7-8 (15)							
			SS 3	100	5-6-7 (13)							
7.0		PEAT, (Pt) black, moist, soft	SH 4									
9.5		LEAN CLAY WITH SAND, (CL) gray brown, moist, soft to medium, trace gravel	SS 5	100	1-1-2 (3)							
			SS 6	100	2-3-4 (7)							
			SS 7	100	3-3-4 (7)							
17.5		LEAN CLAY WITH SAND, (CL) gray, moist to wet, rather stiff, trace gravel	SS 8	100	4-5-6 (11)							
21.0			SS 9	22	2-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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 Telephone: 651-389-4191

BORING NUMBER NR-111

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 918.95 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 inches)	918.3									
		CLAYEY SAND, (SC) brown and dark brown, fine grained, moist, trace fine to medium gravel (FILL)	SS 1	56	1-1-2 (3)							
			SS 2	100	4-6-7 (13)							
5		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace fine gravel, peat (Pt) lenses	914.0									
			SS 3	100	4-5-6 (11)							
		LEAN CLAY WITH SAND, (CL) blue gray, moist, medium, trace fine gravel	912.0									
			SS 4	89	3-3-3 (6)							
10		NOTE: Silty sand (SM) seam at 8.0 feet.	909.5									
		LEAN CLAY WITH SAND, (CL) gray and dark brown, moist, medium to stiff, trace fine to medium gravel, iron oxide staining	SS 5	67	3-3-4 (7)							
			SS 6	100	3-4-4 (8)							
15			SS 7	100	2-4-4 (8)							
			SS 8	33	6-8-8 (16)							
20			SH 9	75								
21.5			897.5									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-112

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 923.3 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.6		TOPSOIL (7 inches)										
		SILTY SAND, (SM) brown, fine grained, moist, loose to medium dense, trace clay	SS 1	78	1-1-3 (4)							
		NOTE: Sand seam (SP) at 2.0 feet.	SS 2	100	5-5-5 (10)							
4.0												
		SANDY LEAN CLAY, (CL) light brown to tan, moist, rather stiff, trace gravel, iron oxide staining	SH 3	83								
9.5			SS 4	100	3-4-5 (9)							
		LEAN CLAY WITH SAND, (CL) light brown, moist, rather stiff, trace fine to coarse gravel	SS 5	100	4-5-6 (11)							
			SS 6	100	3-4-6 (10)							
14.5			SS 7	100	4-6-8 (14)							
		LEAN CLAY WITH SAND, (CL) gray brown, moist, rather stiff, trace fine to coarse gravel	SS 8	100	3-5-7 (12)							
			SS 9	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-113

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CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 900.69 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 7.00 ft / Elev 893.69 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace clay (Fill) 898.7	SS 1	44	3-3-2 (5)							
4.5		SILTY SAND, (SM) dark gray, fine grained, moist, trace gravel, trace organics (Fill) 896.2	SS 2	67	4-4-3 (7)							
7.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium, trace fine to coarse gravel 893.7	SS 3	56	3-4-4 (8)							
7.0		LEAN CLAY WITH SAND, (CL) brown, wet, rather stiff, trace fine to medium gravel 893.7	SS 4	78	4-5-5 (10)							
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to medium, trace fine to medium gravel 888.7	SH 5									
15.0			SS 6	44	3-5-4 (9)							
17.0			SS 7	100	4-3-3 (6)							
19.0			SS 8	100	3-3-4 (7)							
21.0			SS 9	89	2-3-5 (8)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-114

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 921.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	920.8									
		CLAYEY SAND, (SC) brown, fine to medium grained, dry (Fill)	SS 1	78	3-3-3 (6)							
			SS 2	100	7-9-12 (21)							
4.0		917.7										
5		LEAN CLAY WITH SAND, (CL) light brown, dry, medium, trace fine to medium gravel	SS 3	78	2-3-4 (7)							
			SS 4									
7.0		914.7										
		SANDY LEAN CLAY, (CL) brown, moist, medium to rather stiff, trace fine to medium gravel, iron oxide staining	SS 4	89	2-3-5 (8)							
			SS 5	100	2-3-5 (8)							
			SH 6									
15			SS 7	100	3-5-7 (12)							
			SS 8	100	2-4-7 (11)							
19.5		902.2										
20		SANDY LEAN CLAY, (CL) gray brown, moist, rather stiff, trace fine to medium gravel	SS 9	100	3-5-9 (14)							
21.0		900.7										

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-115

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 912.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches)										
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist (Fill)	SS 1	56	1-2-3 (5)							
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	78	7-4-4 (8)							
5		LEAN CLAY WITH SAND, (CL) brown, moist, medium to rather stiff, trace gravel	SS 3	89	3-4-5 (9)							
			SH 4									
9.5		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 5	89	3-4-5 (9)							
		NOTE: Sand seam (SP) at 12.5 feet.	SS 6	100	3-5-7 (12)							
			SS 7	100	3-5-7 (12)							
			SS 8	100	3-5-7 (12)							
21.0			SS 9	100	4-6-9 (15)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-116

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 911.44 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.1		TOPSOIL (1 Inch)	911.4									
2.0		LEAN CLAY WITH SAND, (CL) brown, moist, soft, trace gravel, sand lense	909.4	78	2-2-2 (4)							
		LEAN CLAY WITH SAND, (CL) moist, medium, trace gravel		100	3-2-3 (5)							
5				89	2-2-3 (5)							
9.5		LEAN CLAY WITH SAND, (CL) moist, rather stiff to stiff, trace gravel	901.9	33	3-5-7 (12)							
				33	9-9-9 (18)							
14.5		LEAN CLAY WITH SAND, (CL) moist, rather stiff, trace gravel	896.9	100	3-5-7 (12)							
				100	4-6-8 (14)							
21.0			890.4	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-117

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 908.79 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 896.79 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	2-3-3 (6)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel	SS 2	67	3-6-6 (12)							
7.0		SILTY LEAN CLAY, (CL-ML) tan and gray, moist, rather stiff, trace gravel	SS 3	83	4-7-6 (13)							
9.0		LEAN CLAY WITH SAND, (CL) brown, moist to wet, rather stiff	SS 4	100	4-6-6 (12)							
12.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SH 5									
14.5		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose NOTE: No recovery at 17.0 feet. Sampled auger cuttings.	SS 6	100	3-5-6 (11)							
17.0			SS 7	0	3-3-4 (7)							
19.5		LEAN CLAY WITH SAND, (CL) dark gray, wet, rather stiff, trace gravel	SH 8									
21.0			SS 9	100	5-4-6 (10)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-118

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/28/15 COMPLETED 5/28/15 GROUND ELEVATION 0 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A AT TIME OF DRILLING 2.00 ft / Elev -2.00 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. not provided. AFTER DRILLING ---
Boring not staked. Estimated location from drawing.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)										
2.0		SILTY SAND, (SM) brown, fine to medium grained, saturated, very loose, trace gravel	SS 1	67	1-1-1 (2)							
		PEAT, (Pt) black and dark gray, saturated, soft	SS 2	78	2-2-2 (4)							
4.6		SILTY SAND, (SM) brown, fine grained, saturated, medium dense, trace fine to medium gravel	SS 3	67	2-6-5 (11)							
7.0		CLAYEY SAND, (SC) dark gray, fine grained, saturated, medium dense, trace fine gravel, trace roots	SS 4	28	6-7-5 (12)							
9.5		LEAN CLAY WITH SAND, (CL) brown and gray, wet, rather stiff, trace gravel	SS 5	100	4-6-7 (13)							
			SS 6	100	3-5-5 (10)							
17.0		SILTY LEAN CLAY, (CL-ML) gray, wet, rather stiff, trace fine gravel	SS 8	100	4-4-5 (9)							
19.5		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace fine gravel	SS 9	100	4-5-7 (12)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-119

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/23/15 **COMPLETED** 6/23/15 **GROUND ELEVATION** 0 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 2.60 ft / Elev -2.60 ft
LOGGED BY BH **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. not provided. **AFTER DRILLING** ---
Boring not staked. Estimated location from drawing.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
2.0		CLAYEY SAND, (SC) brown to dark brown, fine grained, moist, very loose, trace gravel, trace organics, iron oxide staining, trace roots NOTE: Weight of Hammer at Sample No. 1.	SS 1	33	0-1-2 (3)							
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, saturated, medium dense, trace gravel, iron oxide staining	SS 2	100	3-5-5 (10)							
			SS 3	100	4-6-6 (12)							
7.0		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel	SS 4	100	3-3-4 (7)							
			SH 5									
			SS 6	100	1-3-3 (6)	1.0						
			SS 7	100	1-3-3 (6)							
			SS 8	100	1-3-3 (6)	0.8						
			SS 9	100	1-3-3 (6)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-120

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 885.05 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, dry (Fill) 883.6	SS 1	56	4-4-3 (7)							
4.0	[Cross-hatched pattern]	SILTY SAND, (SM) brown, fine grained, moist (Fill) 881.1	SS 2	44	6-8-8 (16)							
5	[Dotted pattern]	SILTY SAND, (SM) gray, fine grained, moist, medium dense, little gravel 878.1	SS 3	78	4-6-4 (10)							
7.0	[Dotted pattern]	CLAYEY SAND, (SC) gray, fine to medium grained, moist, medium dense 878.1	SS 4	78	4-4-5 (9)							
9.5	[Dotted pattern]	LEAN CLAY WITH SAND, (CL) gray, moist, soft to medium, trace gravel 875.6	SS 5	78	3-3-2 (5)							
10	[Dotted pattern]		SS 6	100	2-3-2 (5)							
15	[Dotted pattern]		SS 7	100	2-1-3 (4)							
20	[Dotted pattern]		SS 8	100	3-3-4 (7)							
21.0	[Dotted pattern]		SS 9	100	2-2-3 (5)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-121

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 884.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 7.00 ft / Elev 877.12 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 26 ft NE

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill) 882.6	SS 1	44	3-2-1 (3)							
3.5	[Dotted pattern]	SILTY SAND, (SM) gray, fine grained, moist (Fill) 880.6 NOTE: Clay (CL) seam at 2.0 feet.	SS 2	67	2-2-2 (4)							
5	[Dotted pattern]	SILTY SAND, (SM) gray, fine grained, moist to saturated, medium dense to loose, trace gravel	SS 3	56	3-6-7 (13)							
8.0	[Horizontal line with inverted triangle symbol]	LEAN CLAY WITH SAND, (CL) dark gray, moist, medium, trace gravel 876.1	SS 4	56	2-2-3 (5)							
10	[Diagonal hatching]		SS 5	67	2-2-3 (5)							
15	[Diagonal hatching]		SS 6	100	3-3-3 (6)							
15	[Diagonal hatching]		SS 7	89	2-3-5 (8)							
20	[Diagonal hatching]		SS 8	100	3-3-4 (7)							
22.0	[Diagonal hatching]		SH 9									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 22.0 feet.



Northern Technologies, Inc.
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BORING NUMBER NR-122

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 886.04 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 14.50 ft / Elev 871.54 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (36 Inches)	SS 1	28	3-1-3 (4)							
3.0		883.0 POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose	SS 2	22	4-3-3 (6)							
5		7.0 879.0 SILTY SAND, (SM) black, fine grained, moist, very loose, little organics	SS 3	22	3-2-3 (5)							
10		9.5 876.5 PEAT, (Pt) black, moist, soft	SS 4	67	2-2-2 (4)							
15		14.5 ∇ 871.5 SH 6	SS 5	78	1-2-1 (3)							
15		SILTY SAND, (SM) gray, fine to coarse grained, saturated, very loose to loose NOTE: Hydrocarbon odor by human perception at 15.0 feet.	SS 7	78	2-2-2 (4)							
20		17.8 868.2 SILTY LEAN CLAY, (CL-ML) gray, wet, medium, trace gravel	SS 8	33	2-3-3 (6)							
20		21.0 865.0 NOTE: Sand (SP) seam at 20.0 feet.	SS 9	78	3-3-3 (6)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-123

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 885.83 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 8.50 ft / Elev 877.33 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		ASPHALT (2 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP) brown, fine to coarse grained, dry, some fine to coarse gravel (Fill)	SS 1	56	1-3-1 (4)							
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine grained, moist, trace fine gravel (Fill)	SS 2	56	10-12-13 (25)							
5		SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, dense to very loose	SS 3	67	6-11-19 (30)							
10			SS 4	78	7-9-9 (18)							
12.0			SS 5	89	2-1-1 (2)							
15			SS 6	100	2-3-4 (7)							
17.2		SILTY LEAN CLAY, (CL-ML) blue gray, wet, medium, little fine to coarse gravel, trace sand	SS 7	89	2-3-3 (6)							
20			SS 8	89	2-3-4 (7)							
20.5			SS 9	89	2-3-2 (5)							
21.0												

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-124

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 885.19 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 8.50 ft / Elev 876.69 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 1	56	3-3-4 (7)							
		SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, dense to medium dense	SS 2	89	4-8-10 (18)							
5			SS 3	56	8-11-10 (21)							
			SS 4	78	8-11-12 (23)							
10			SS 5	33	5-5-8 (13)							
11.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 6	89	4-3-2 (5)							
15			SH 7									
			SS 8	78	3-3-4 (7)							
20			SS 9	89	4-6-4 (10)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-125

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/20/15 COMPLETED 5/20/15 GROUND ELEVATION 885.98 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 11.00 ft / Elev 874.98 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 3.5		POORLY GRADED SAND, (SP) brown, fine grained, dry, little gravel (Fill)	SS 1	33	6-5-4 (9)							
3.5 - 5		SILTY SAND, (SM) brown, fine grained, moist, dense, trace gravel	SS 2	44	8-11-11 (22)							
5 - 9.5		SILTY SAND, (SM) brown, fine grained, moist, dense, trace gravel	SS 3	67	8-13-12 (25)							
9.5 - 10.5		SILTY SAND, (SM) dark gray to black, fine grained, moist, loose, trace gravel, organic stain	SS 4	78	9-12-12 (24)							
10.5 - 13.3		PEAT, (Pt) black, saturated, medium	SS 5	89	3-2-3 (5)							
13.3 - 15		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to loose	SS 6	89	4-4-3 (7)							
15 - 20		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to loose	SS 7	78	4-4-4 (8)							
20 - 21.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to loose	SS 8	100	3-5-4 (9)							
21.0			SS 9	100	4-4-3 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-126

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 883.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 871.67 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.5		POORLY GRADED SAND WITH SILT, (SP-SM) fine to medium grained, moist, trace gravel (Fill)	SS 1	56	3-4-4 (8)							
881.2												
5		SILTY SAND, (SM) brown, fine grained, moist, dense, trace gravel, clay (CL) lenses	SS 2	100	5-12-13 (25)							
8.0												
8.0		PEAT, (Pt) black, moist, rather stiff, trace gravel	SS 4	78	6-8-12 (20)							
10												
13.0			SH 5									
13.0		SILTY SAND, (SM) gray, fine grained, saturated, loose to dense, peat (Pt) lenses	SS 6	67	3-5-5 (10)							
15												
15			SS 7	78	5-4-4 (8)							
20												
20			SS 8	67	10-15-12 (27)							
21.0												
21.0			SS 9	89	10-11-11 (22)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-127

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CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/20/15 COMPLETED 5/20/15 GROUND ELEVATION 885.56 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 8.00 ft / Elev 877.56 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		ASPHALT (3 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, dry, trace gravel (Fill)	SS 1	56	6-7-6 (13)							
		SILTY SAND, (SM) brown to gray, fine grained, moist to saturated, dense	SS 2	67	8-11-12 (23)							
5			SS 3	89	8-11-11 (22)							
			SS 4	78	7-10-12 (22)							
9.5		SILTY SAND, (SM) dark gray, fine grained, saturated, dense to loose, silt (ML) lenses	SS 5	78	6-8-9 (17)							
			SS 6	67	4-3-2 (5)							
14.5		SILTY SAND, (SM) black and gray, saturated, loose, trace to some organic materials	SS 7	89	7-3-2 (5)							
			SH 8									
19.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 9	78	4-4-5 (9)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-128

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 912.47 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 2.00 ft / Elev 910.47 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft N

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (24 Inches)	SS 1	28	0-0-0 (0)							
2.0		NOTE: Weight of Hammer at Sample No. 1.										
2.0		SANDY LEAN CLAY, (CL) light brown and gray, wet, medium, trace fine gravel, iron oxide staining	SS 2	78	2-2-3 (5)							
5			SS 3	100	2-3-4 (7)							
10			SS 4	100	3-3-5 (8)							
12.0			SH 5									
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 6	100	3-3-5 (8)							
15			SS 7	100	2-4-4 (8)							
20			SS 8	100	3-4-6 (10)							
23.5			SS 9	100	3-4-4 (8)							
23.5			SS 10	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 23.5 feet.



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BORING NUMBER NR-129

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 903.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft E

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (24 Inches)										
2.0		NOTE: Weight of Hammer at Sample No. 1. No recovery. Sampled auger cuttings.	SS 1	0	0-0-0 (0)							
2.0		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SH 2	58								
5			SS 3	94	2-3-4 (7)							
10			SS 4	100	3-3-4 (7)							
15			SS 5	94	2-4-4 (8)							
15			SS 6	100	2-5-5 (10)							
20			SS 7	100	4-4-6 (10)							
20			SS 8	100	4-5-7 (12)							
21.0			SS 9	100	4-6-9 (15)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

882.1



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BORING NUMBER NR-130

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 915.53 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 10 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)		914.8								
		LEAN CLAY WITH SAND, (CL) light brown to brown, moist, soft to rather stiff, trace gravel	SS 1	44	0-0-1 (1)							
			SS 2	67	2-3-4 (7)							
		NOTE: Weight of Hammer at Sample No. 1.										
5			SS 3	100	3-3-5 (8)							
			SS 4	100	4-5-7 (12)							
10			SH 5	92								
			SS 6	100	3-5-7 (12)							
15			SS 7	100	3-6-7 (13)							
17.0		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 8	100	3-4-6 (10)							
20			SS 9	100	2-4-7 (11)							
21.0				894.5								

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-131

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 906.2 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		LEAN CLAY WITH SAND, (CL) brown, moist, soft to rather stiff, trace gravel	SS 1	0	0-0-0 (0)							
		NOTE: Weight of Hammer at Sample No. 1. No recovery. Sampled auger cuttings.	SS 2	78	7-5-5 (10)							
			SS 3	89	5-6-6 (12)							
			SS 4	94	3-5-5 (10)							
			SH 5									
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel	SS 6	83	2-4-5 (9)							
			SS 7	89	2-4-4 (8)							
			SS 8	100	2-4-6 (10)							
21.0			SS 9	100	2-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies, Inc.
 6160 Carmen Avenue East
 Inver Grove Heights, MN 55076
 Telephone: 651-389-4191

BORING NUMBER NR-132

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 894.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 12.50 ft / Elev 881.93 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft NW

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	893.6									
		LEAN CLAY WITH SAND, (CL) gray, moist, soft to rather stiff, trace gravel										
			SS 1	67	0-1-3 (4)							
3.5			890.9									
		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose, trace gravel										
			SS 2	56	5-5-7 (12)							
5												
			SS 3	78	5-4-4 (8)							
			SS 4	44	3-3-3 (6)							
10												
			SH 5									
12.0			882.4									
		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, medium dense, trace gravel										
			SS 6	89	4-6-7 (13)							
13.5			880.9									
		SILTY SAND, (SM) gray, fine grained, saturated, dense, trace gravel										
15												
			SS 7	56	8-9-11 (20)							
			SS 8	56	7-9-11 (20)							
20												
			SS 9	56	8-10-11 (21)							
21.0			873.4									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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 6160 Carmen Avenue East
 Inver Grove Heights, MN 55076
 Telephone: 651-389-4191

BORING NUMBER NR-133

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 887.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 6.00 ft / Elev 881.80 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) reddish brown, fine to medium grained, moist, fine to medium gravel (Fill) 885.8	SS 1	44	3-2-3 (5)							
4.5		SILTY SAND, (SM) brown, fine grained, moist (Fill) 883.3	SS 2	56	4-4-5 (9)							
5		SILTY SAND, (SM) gray and brown, fine grained, moist to saturated, loose to medium dense ∇ 878.3	SS 3	67	4-3-6 (9)							
9.5		SILTY SAND, (SM) brown, fine grained, saturated, loose 878.3	SS 5	78	2-3-2 (5)							
13.0		PEAT, (Pt) black, moist, soft 874.8	SS 6	56	3-3-4 (7)							
15			SS 7	89	3-2-2 (4)							
19.5			SH 8									
20		SILTY SAND, (SM) gray, fine grained, saturated, medium dense 868.3	SS 9	100	4-4-5 (9)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

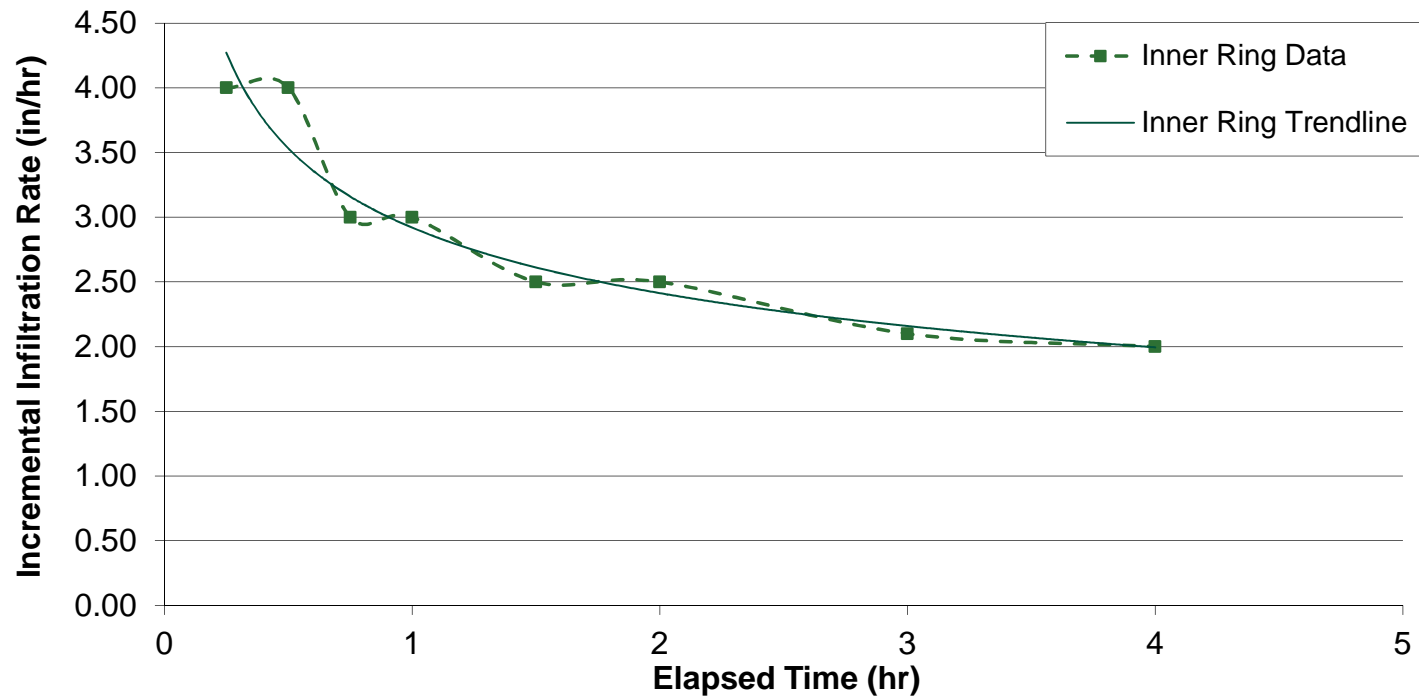
Infiltration Test Results



Infiltration Area Evaluations
IT-101

Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100

IT 101- Infiltration Rate vs Time

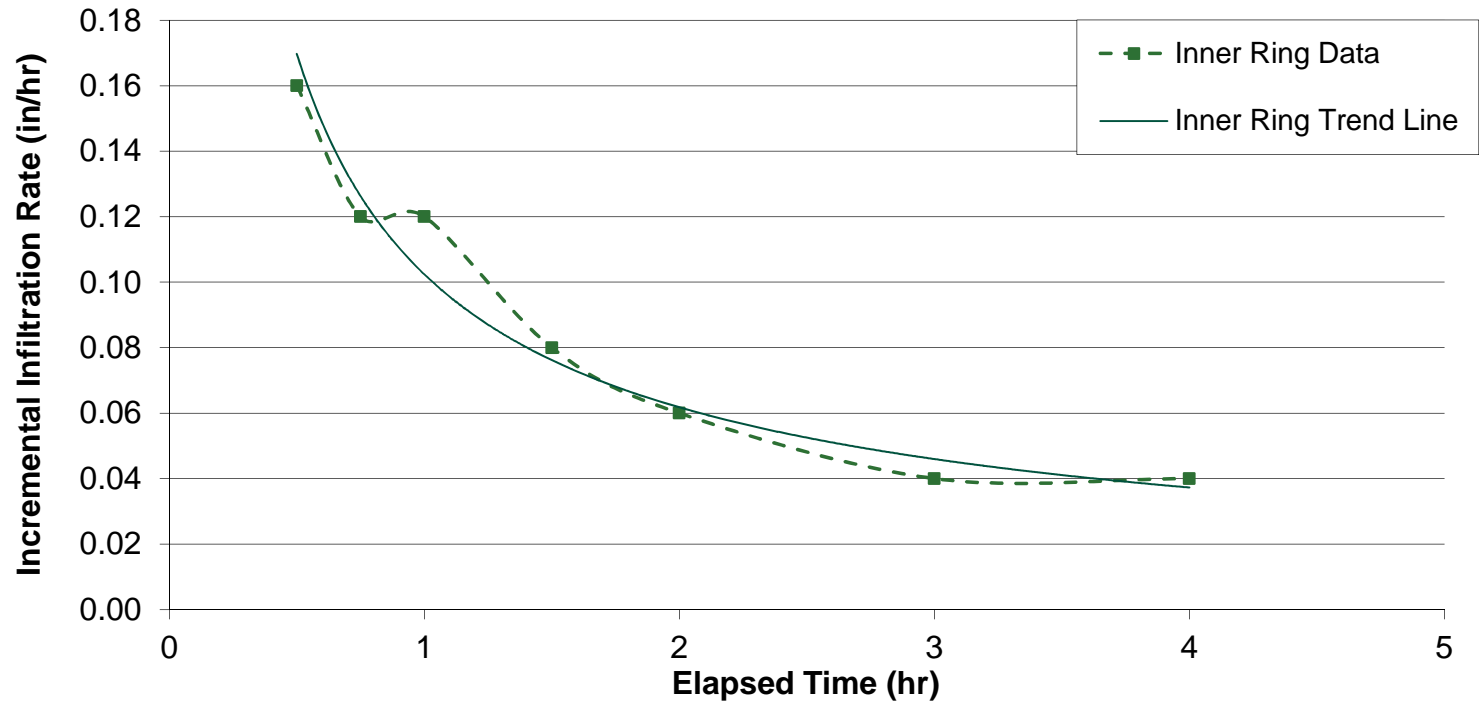




Infiltration Area Evaluations
IT-102

Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100

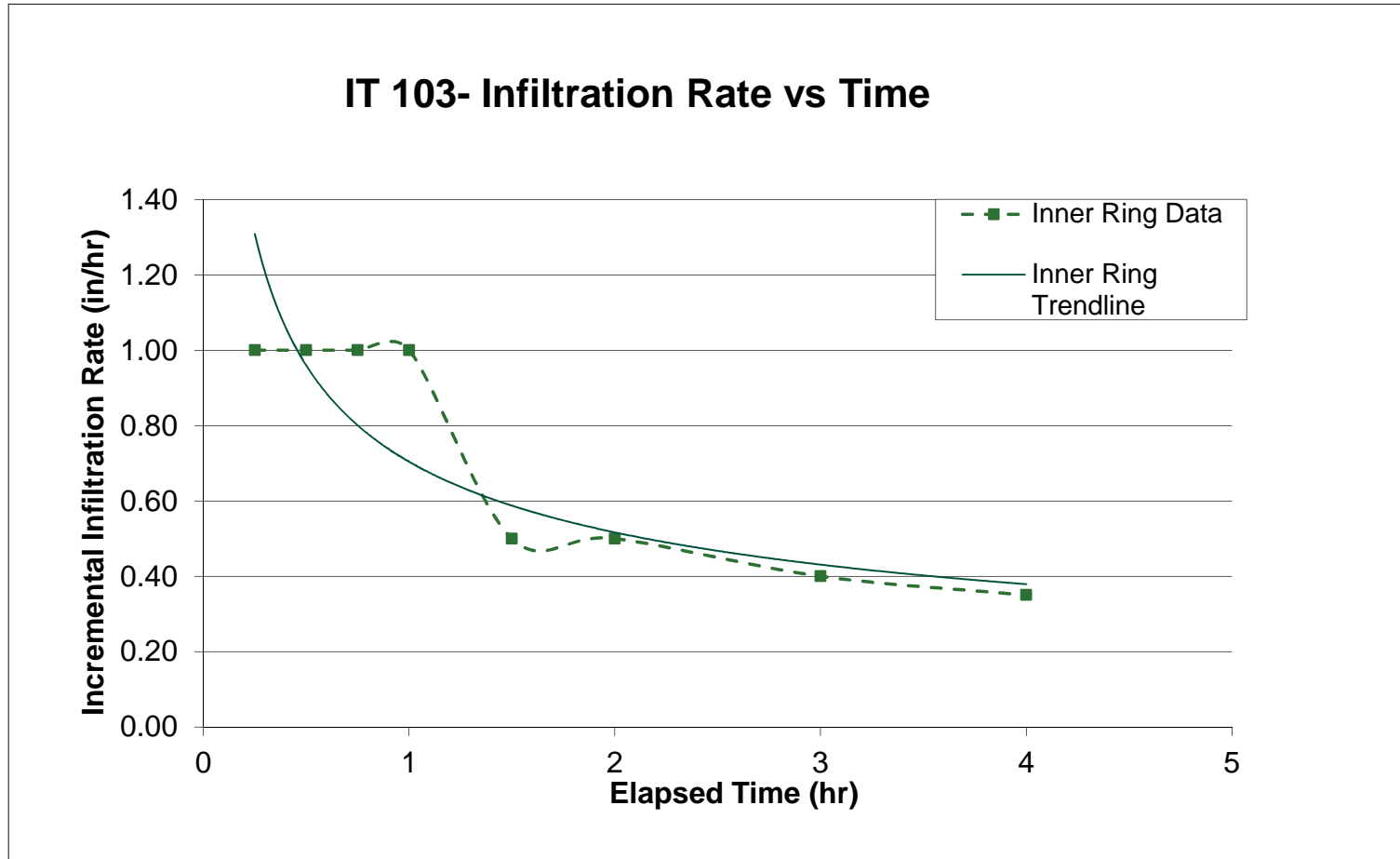
IT 102- Infiltration Rate vs Time





Infiltration Area Evaluations
IT-103

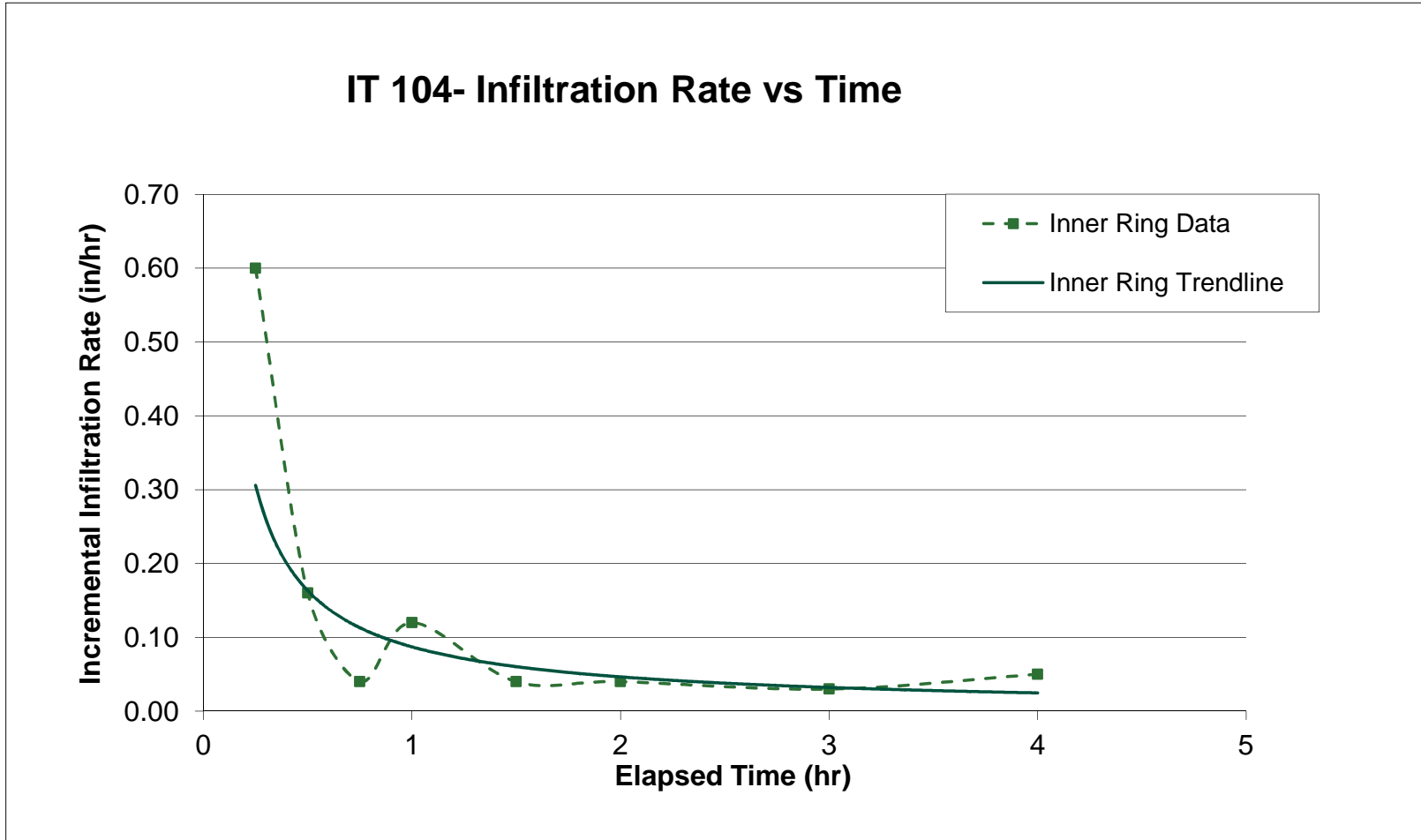
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-104

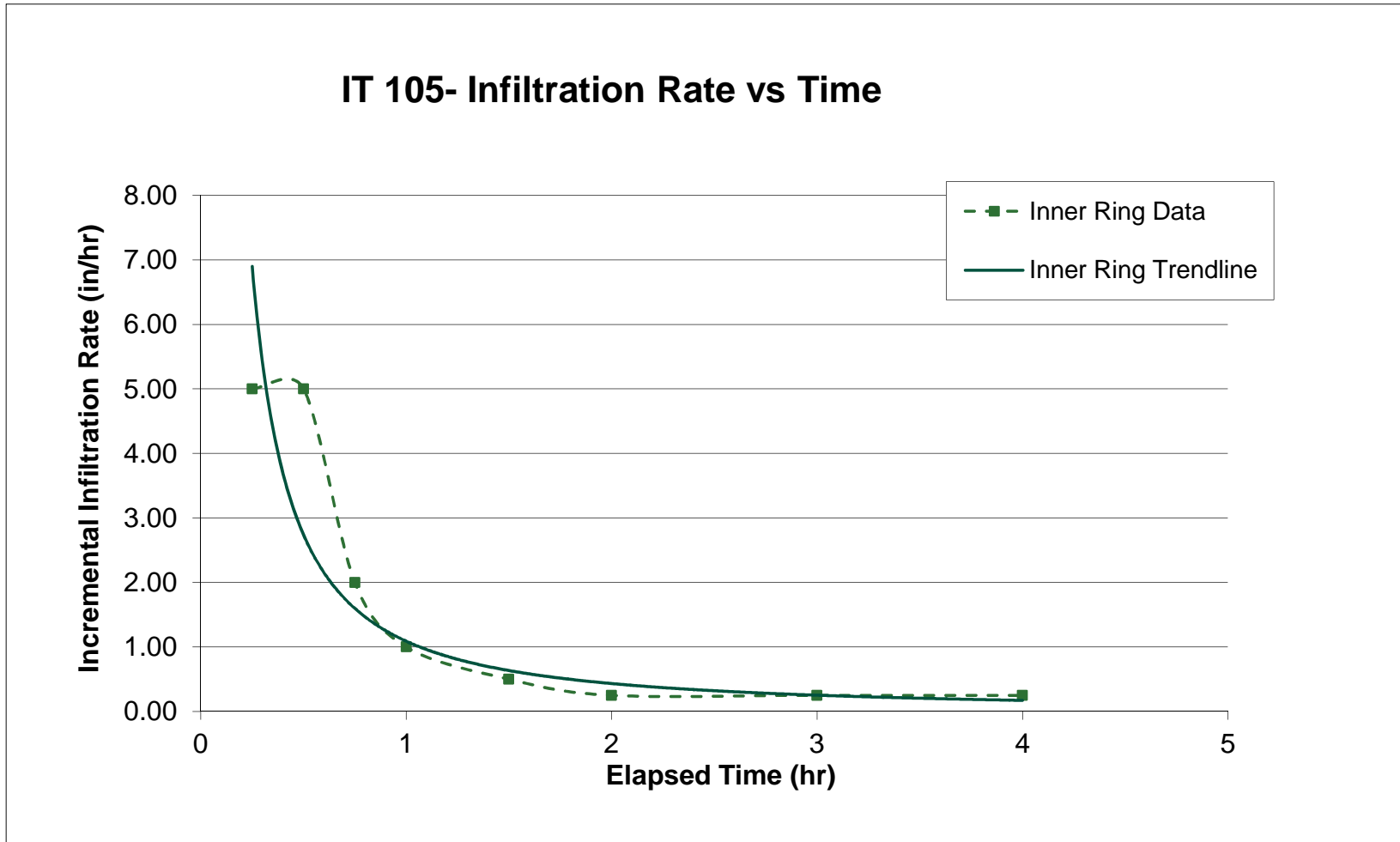
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-105

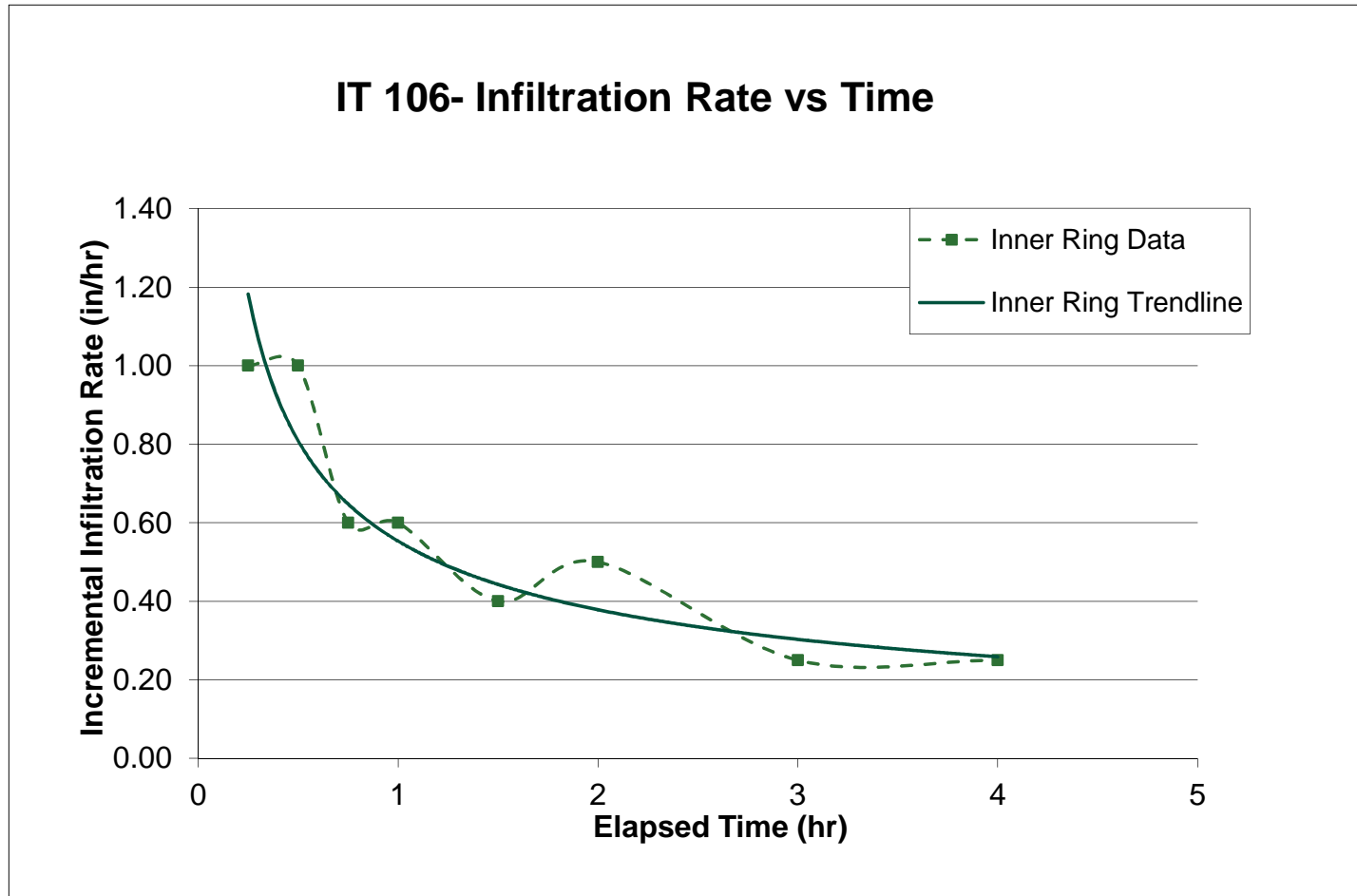
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-106

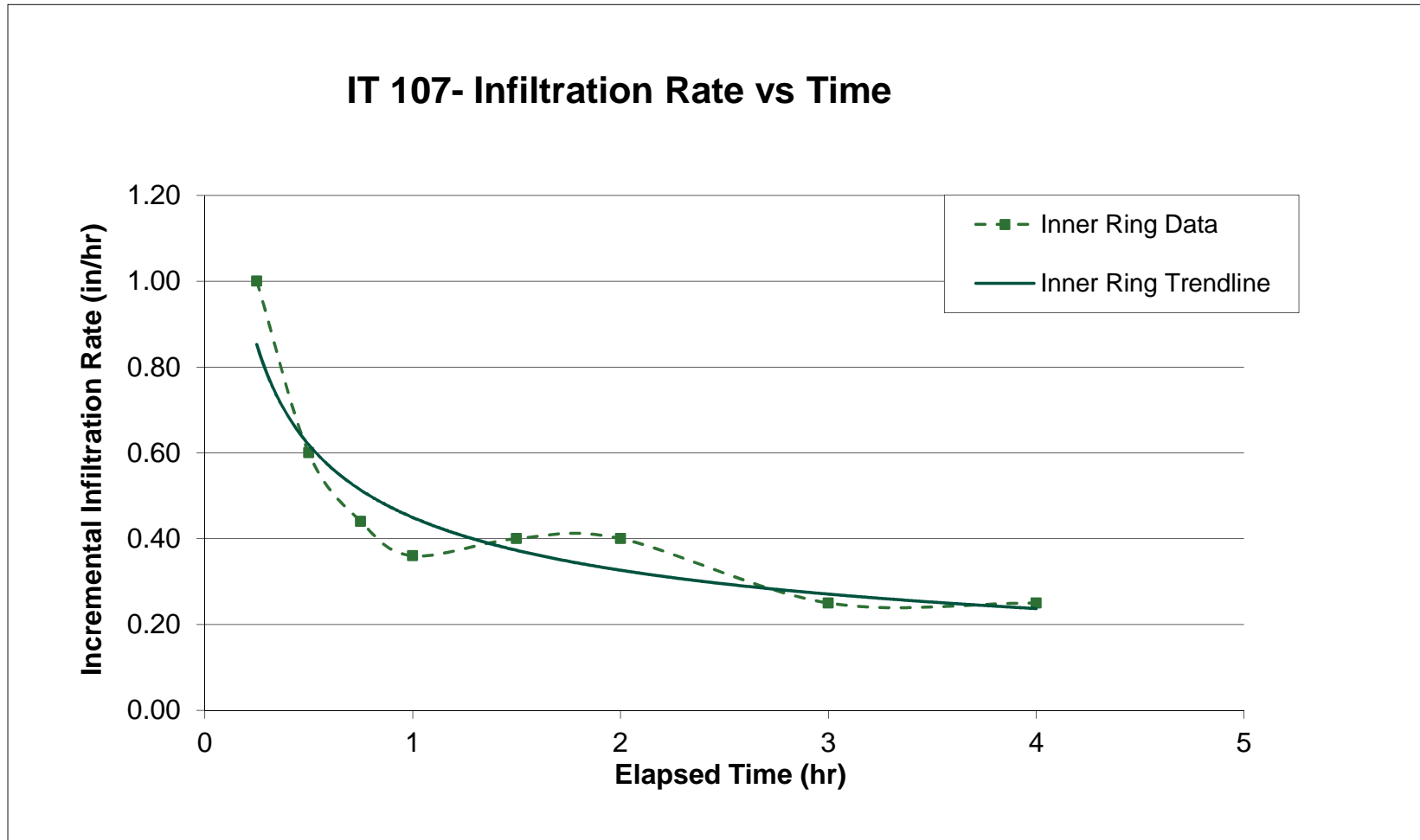
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-107

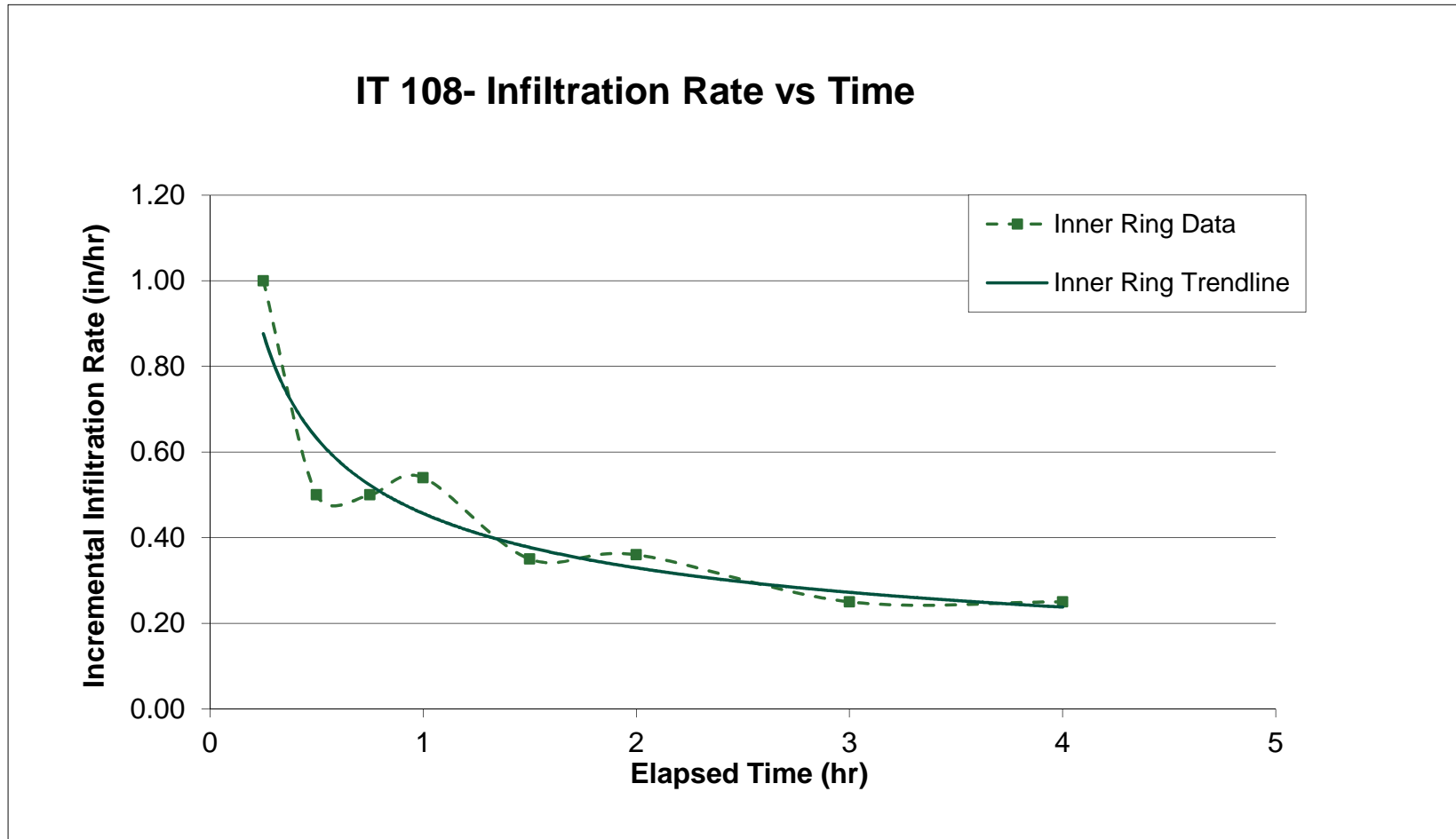
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-108

Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





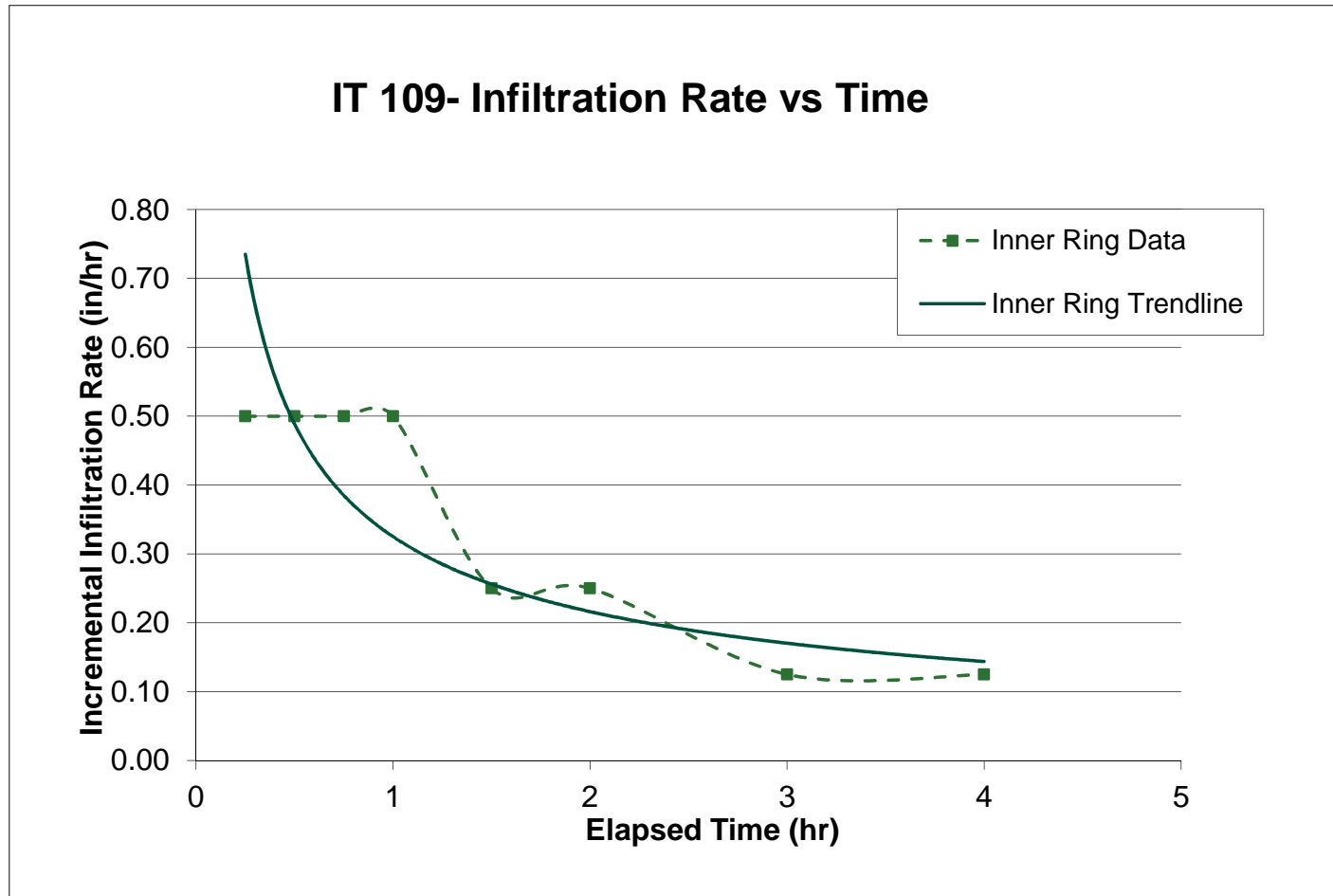
Infiltration Area Evaluations

IT-109

Ramsey County Re-Development Site (TCAAP)

Arden Hills, MN

NTI Project 15.60936.100



Appendix I

Rice Creek Regional Trail Soil Boring Logs



Northern Technologies, Inc.
 1408 Northland Drive, Suite 107
 Mendota Heights, MN 55120
 Telephone: 651-389-4191

BORING NUMBER TR-300

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 955.22 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		BITUMINOUS PAVEMENT (4 Inches)	AU 1									
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	67	4-4-7 (11)							
5		CLAYEY SAND, (SC) reddish brown, fine to coarse grained, moist, medium dense to dense, trace gravel, iron oxide staining	SS 3	100	6-6-7 (13)			10	31	13	18	42
9.5		LEAN CLAY WITH SAND, (CL) reddish brown, moist, stiff, trace medium to coarse gravel	SS 5	22	8-10-9 (19)							
12.0		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace gravel	SS 6	100	7-9-8 (17)							
13.5		Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.										



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 Mendota Heights, MN 55120
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BORING NUMBER TR-301

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 960.7 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H11-PROJECTS2015 PROJECT\B1TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		BITUMINOUS PAVEMENT (2.5 Inches)	AU 1									
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, trace fine to coarse gravel (Fill)	SS 2	44	10-15-15 (30)							
4.5		CLAYEY SAND, (SC) gray, fine grained, moist, trace gravel (Fill)	SS 3	67	9-10-10 (20)							
7.0		POORLY GRADED SAND, (SP) reddish brown, fine to medium grained, dry to moist, trace medium to coarse gravel (Fill)	SS 4	89	7-9-8 (17)							
9.5		SILTY SAND, (SM) reddish brown, fine grained, moist, dense, trace gravel	SS 5	67	10-11-12 (23)							
12.0		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist, dense, trace fine to medium gravel	SS 6	100	32							
12.5		LEAN CLAY WITH SAND, (CL) gray, moist, very stiff, trace coarse gravel										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 12.5 feet.



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BORING NUMBER TR-302

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 956.27 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)	955.6									
1.5		CLAYEY SAND, (SC) brown, fine grained, moist, loose, trace gravel, trace organics	954.8	67	2-3-3 (6)							
		SANDY LEAN CLAY, (CL) brown to tan, moist, medium to stiff, trace fine gravel, iron oxide staining		0	2-3-3 (6)							
5		NOTE: No recovery at Sample No. 2. Sampled auger cuttings.										
				56	3-4-4 (8)							
				100	5-5-7 (12)							
10				100	4-5-5 (10)							
13.5			942.8	94	5-11-12 (23)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15 60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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BORING NUMBER TR-303

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 943.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 20 ft. S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		CLAYEY SAND, (SC) brown, fine to coarse grained, moist, loose to dense, trace fine to medium gravel, iron oxide staining	SS 1	33	3-3-3 (6)							
			SS 2	44	4-4-4 (8)			11	30	13	17	35
			SS 3	39	3-3-4 (7)							
			SS 4	106	8-9-10 (19)							
			SS 5	133	10-12-12 (24)							
			SS 6	133	11-12-12 (24)							
13.0		POORLY GRADED SAND WITH CLAY AND GRAVEL, (SP-SC) brown, fine to medium grained, moist, dense, fine to coarse gravel										
13.5												
		Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.										

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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 Mendota Heights, MN 55120
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BORING NUMBER TR-304

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 944.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 30 ft. S **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, dry, loose, fine to coarse gravel	SS 1	44	3-3-3 (6)							
		NOTE: Sampled auger cuttings for Sample No. 2.	SS 2	6	3-2-3 (5)							
3.5		940.5 LEAN CLAY WITH SAND, (CL) brown, moist, medium to stiff, trace fine gravel	SS 3	83	3-3-3 (6)							
5			SS 4	78	10-14-14 (28)							
9.5		934.5 POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine grained, moist, medium dense, trace fine gravel, iron oxide staining	SS 5	44	5-7-7 (14)							
12.0		932.0 SILTY LEAN CLAY, (CL-ML) reddish brown, moist, rather stiff, trace fine gravel	SS 6	100	5-6-7 (13)							
13.5		930.5										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER TR-305

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 933.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 926.80 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 8 ft. SE **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECT\S2015 PROJECT\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist to saturated, medium dense to dense NOTE: Sand and gravel (SP) layer at 2.5 feet.	SS 1	44	3-4-5 (9)							
			SS 2	44	8-11-10 (21)							
5		NOTE: Sampled auger cuttings for Sample No. 3.	SS 3	22	11-11-8 (19)							
7.0												
		POORLY GRADED SAND, (SP) brown, fine grained, saturated, loose	SS 4	56	3-3-3 (6)							
8.5												
		LEAN CLAY WITH SAND, (CL) brown to gray, wet, medium	SS 5	56	2-2-3 (5)							
11.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 11.0 feet.



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BORING NUMBER TR-306

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 907.55 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 895.55 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
		CLAYEY SAND, (SC) gray brown, fine to medium grained, moist, medium dense, trace fine to medium gravel	SS 1	44	4-8-8 (16)							
			SS 2	56	3-5-5 (10)							
			SS 3	83	4-6-9 (15)							
			SS 4	33	5-7-8 (15)							
8.5		SANDY LEAN CLAY, (CL) blue gray, moist to wet, rather stiff, trace gravel, iron oxide staining										
			SS 5	78	5-6-7 (13)							
			SS 6	89	4-4-5 (9)							
13.5		Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.										

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\11-PROJECT\S2015 PROJECT\B\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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BORING NUMBER TR-307

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 898.93 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 5.00 ft / Elev 893.93 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill)	SS 1	44	2-4-7 (11)							
5			SS 2	56	12-24-24 (48)							
5 - 10	[Dotted pattern]	SILTY SAND, (SM) brown, fine to coarse grained, saturated, very dense to loose, trace gravel, few silt lenses	SS 3	67	17-23-24 (47)							
10			SS 4	44	3-3-5 (8)			6				14
10 - 12.0			SS 5	44	2-4-8 (12)							
12.0 - 12.5	[Diagonal lines]	POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense, little gravel										
12.5 - 13.0	[Horizontal lines]	CLAYEY SAND, (SC) brown, fine grained, saturated, medium dense										
13.0 - 13.5	[Vertical lines]	POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense	SS 6	56	5-6-6 (12)							
Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.												

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H11-PROJECT\S2015 PROJECT\TCAAP PROJECT ARDEN HILLS - GEO - (15 60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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BORING NUMBER TR-308

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 894.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 884.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1\PROJECT\S2015 PROJECT\B\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	893.9									
2.0		SILTY SAND, (SM) dark brown, fine grained, moist, loose, trace gravel	892.4	SS 1	56	2-3-3 (6)						
		POORLY GRADED SAND, (SP) brown, fine grained, moist, loose to medium dense, trace gravel		SS 2	56	4-4-4 (8)						
5				SS 3	33	3-7-9 (16)						
7.0		PEAT, (Pt) black, dry to moist, stiff	887.4									
8.0		SILTY SAND, (SM) gray, fine grained, moist to saturated, dense	886.4	SS 4	89	4-6-12 (18)						
10				SS 5	67	5-8-14 (22)						
13.5			880.9	SS 6		4-8-12 (20)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER TR-309

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 890.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 4.00 ft / Elev 886.43 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
1.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose, trace gravel NOTE: Weight of Hammer at Sample No. 1.	SS 1	100	0-3-4 (7)							
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, moist to saturated, medium dense, trace gravel, few clay lenses	SS 2	78	3-4-8 (12)			13				9
			SS 3	89	4-6-9 (15)							
			SS 4	44	2-5-5 (10)							
			SS 5	56	4-6-6 (12)							
12.0		SANDY LEAN CLAY, (CL) gray, saturated, medium, trace gravel, few sand lenses	SS 6		3-4-4 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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Town and Creek Development Area Soil Boring Logs



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BORING NUMBER DE-800

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 900.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 12.00 ft / Elev 888.65 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-45 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, trace gravel (Fill) 899.2	SS 1	56	4-4-3 (7)							
3.5		CLAYEY SAND, (SC) brown gray, fine to medium grained, moist, trace gravel, little organics (Fill) 897.2	SS 2	67	3-3-2 (5)							
5		SANDY LEAN CLAY, (CL) brown, moist to wet, medium to rather stiff, trace fine to coarse gravel, iron oxide staining	SS 3	78	3-3-2 (5)							
			SS 4	100	3-9-6 (15)							
9.5		LEAN CLAY WITH SAND, (CL) gray to dark gray, wet, rather stiff to medium, trace fine to coarse gravel 891.2	SS 5	100	4-6-6 (12)							
			SS 6	100	4-3-4 (7)							
15			SS 7	100	3-3-5 (8)							
			SS 8	100	3-4-4 (8)							
20			SS 9	56	3-4-3 (7)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-801

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 899.36 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 6.50 ft / Elev 892.86 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 1445 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist (Fill) NOTE: No recovery Sample No. 1. Sampled auger cuttings.	SS 1	0	4-4-4 (8)							
			SS 2	17	5-4-4 (8)							
4.5		SANDY LEAN CLAY, (CL) brown, moist to wet, medium, trace gravel	SS 3	22	2-4-3 (7)							
7.0												
		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to coarse grained, saturated, loose	SS 4	67	3-3-2 (5)							
8.4		LEAN CLAY WITH SAND, (CL) gray, wet, medium, trace fine to coarse gravel, iron oxide staining										
9.5		CLAYEY SAND, (SC) gray, fine to coarse grained, saturated, loose, trace fine to coarse gravel	SS 5	56	2-3-4 (7)							
12.0		SANDY LEAN CLAY, (CL) gray, wet, medium	SS 6	100	3-4-3 (7)							
			SS 7	100	2-3-5 (8)							
			SS 8	100	3-3-4 (7)							
19.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium	SS 9	100	3-2-5 (7)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-803

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 892.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 14.50 ft / Elev 878.47 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 25 ft East

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		SILTY SAND, (SM) brown, fine grained, moist, little gravel (Fill)	SS 1	44	2-3-5 (8)							
889.5			SS 2	44	7-12-14 (26)							
5		POORLY GRADED SAND WITH GRAVEL, (SP) brown, medium to coarse grained, moist (Fill)	SS 3	56	5-9-12 (21)							
10		NOTE: Sampled auger cuttings.	SS 4	11	3-4-6 (10)							
10.0		LEAN CLAY WITH SAND, (CL) gray, moist to saturated, medium to rather stiff, trace gravel	SS 5	67	3-3-4 (7)							
883.0			SS 6	6	7-7-7 (14)							
15		∇	SS 7	94	3-3-4 (7)							
			SS 8	89	3-5-7 (12)							
20			SS 9	100	4-6-9 (15)							
21.0		Borehole backfilled with auger cuttings. Bottom of borehole at 21.0 feet.										



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BORING NUMBER DE-804

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 897.51 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groudwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft North

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 1445 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill) 895.5	SS 1	56	2-2-1 (3)							
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill) 893.0	SS 2	44	2-3-2 (5)							
5		LEAN CLAY WITH SAND, (CL) light brown, moist, medium to rather stiff, trace gravel	SS 3	100	2-3-5 (8)							
			SS 4	100	3-6-7 (13)							
			SS 5	100	4-4-6 (10)							
			SS 6	100	5-6-6 (12)							
			SS 7	100	3-4-4 (8)							
15.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel 882.0	SS 8	100	3-4-3 (7)							
			SS 9	100	4-4-7 (11)							
21.0			876.5									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-805

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 893.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 6.00 ft / Elev 887.43 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 1445 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill) 891.4	SS 1	33	2-2-3 (5)							
2.7		LEAN CLAY WITH SAND, (CL) brown, moist, trace gravel (Fill) 890.8	SS 2	78	8-6-5 (11)							
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, trace gravel (Fill) 887.4	SS 3	22	5-8-8 (16)							
6.0												
7.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense, trace gravel 885.9	SS 4	67	7-5-6 (11)							
10		SANDY LEAN CLAY, (CL) brown, wet, medium to rather stiff	SS 5	100	3-3-2 (5)							
			SS 6	100	5-5-6 (11)							
15			SS 7	100	3-5-5 (10)							
			SS 8	89	4-5-4 (9)							
19.5												
20		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, sand lenses 873.9	SS 9	83	6-7-6 (13)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-806

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 901.27 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 889.27 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		TOPSOIL (5 inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	2-3-4 (7)							
			SS 2	33	8-10-9 (19)							
			SS 3	22	9-13-12 (25)							
			SS 4	56	4-6-5 (11)							
10.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, soft to rather stiff, trace gravel	SS 5	56	2-2-2 (4)							
			SS 6	100	3-3-6 (9)							
			SS 7	100	2-5-6 (11)							
			SS 8	100	5-5-8 (13)							
			SS 9	100	4-6-8 (14)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-807

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 898.18 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.50 ft / Elev 893.68 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 1445 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 inches)										
		CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, trace gravel, trace organics (Fill).	SS 1	78	2-2-3 (5)							
3.5		LEAN CLAY WITH SAND, (CL) brown, wet to moist, soft to medium, trace gravel	SS 2	72	3-5-5 (10)							
5			SS 3	39	2-1-3 (4)							
			SS 4	56	3-5-9 (14)							
9.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 5	100	3-4-5 (9)							
			SS 6	100	3-3-4 (7)							
15			SS 7	89	2-3-5 (8)							
			SS 8	100	2-3-4 (7)							
20			SS 9	100	3-3-5 (8)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-808

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 892.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 3.50 ft / Elev 888.79 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 inches). POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist (Fill).	SS 1	44	1-2-2 (4)							
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense	SS 2	56	4-5-7 (12)							
7.0		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace gravel	SS 3	67	5-7-6 (13)							
10.3		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 4	56	4-6-7 (13)							
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 5	44	5-6-5 (11)							
			SS 6	100	6-7-7 (14)							
			SS 7	100	2-4-5 (9)							
			SS 8	100	2-3-5 (8)							
			SS 9	89	3-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies, Inc.
 6160 Carmen Avenue East
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 Telephone: 651-389-4191

BORING NUMBER DE-809

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 890.82 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 883.82 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT- TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches).										
1.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill).	SS 1	56	3-5-5 (10)							
		SILTY SAND, (SM) brown, fine grained, moist, medium dense to dense NOTE: No recovery Sample No. 2. Sampled auger cuttings.	SS 2	0	4-6-7 (13)							
5			SS 3	67	4-8-9 (17)							
7.0		CLAYEY SAND, (SC) gray, fine grained, saturated, loose	SS 4	83	3-3-3 (6)							
9.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium to soft	SS 5	89	2-2-2 (4)							
15			SS 6	44	1-2-3 (5)							
			SS 7	100	2-2-3 (5)							
17.0		LEAN CLAY WITH SAND, (CL) gray, wet, soft, trace gravel NOTE: Weight of Hammer at Sample No. 8.	SS 8	100	0-2-2 (4)							
20			AU 9	100								
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-810

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 890.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 880.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT- TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches).										
2.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill).	SS 1	56	4-5-5 (10)							
		LEAN CLAY WITH SAND, (CL) brown, moist, trace gravel (Fill).	SS 2	78	6-8-8 (16)							
			SS 3	78	5-5-5 (10)							
7.0		SILTY SAND, (SM) brown to dark gray, fine grained, moist to saturated, medium dense to loose	SS 4	33	3-4-6 (10)							
			SS 5	83	5-6-8 (14)							
			SS 6	67	2-3-5 (8)							
13.5		POORLY GRADED SAND WITH CLAY, (SP-SC) light brown, fine grained, saturated, very loose to medium dense, clay lenses	SS 7	44	3-1-1 (2)							
			SS 8	56	5-5-6 (11)							
			SS 9	83	6-6-5 (11)							
21.0												

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-811

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 897.49 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill). 894.5	SS 1	44	1-3-5 (8)							
5.0		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel NOTE: No recovery. Sampled auger cuttings. 890.5	SS 2	56	4-4-5 (9)							
7.0		POORLY GRADED SAND, (SP) brown, fine to coarse grained, moist, loose, trace gravel 890.5	SS 3	0	6-6-5 (11)							
10.0		POORLY GRADED SAND, (SP) brown, fine to coarse grained, moist, loose, trace gravel 887.0	SS 4	44	2-3-5 (8)							
10.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel 887.0	SS 5	78	4-2-4 (6)							
15.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel	SS 6	100	2-2-3 (5)							
15.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel	SS 7	56	2-3-4 (7)							
20.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel	SS 8	100	2-3-4 (7)							
21.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel 876.5	SS 9	89	1-4-4 (8)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-812

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 891.84 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 8.00 ft / Elev 883.84 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ROADWAY BASE (30 inches).	SS 1	0	3-2-1 (3)							
2.5		NOTE: No recovery. Sampled auger cuttings.										
4.5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill)	SS 2	56	9-9-9 (18)							
6.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist (Fill)	SS 3	67	4-5-6 (11)							
9.5		POORLY GRADED SAND, (SP) brown, fine grained, moist to saturated, dense	SS 4	78	7-10-12 (22)							
12.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, medium dense	SS 5	44	4-7-8 (15)							
14.5		SILTY SAND, (SM) brown, fine grained, saturated, loose	SS 6	89	4-3-2 (5)							
21.0		LEAN CLAY WITH SAND, (CL) brown gray, wet, medium to rather stiff	SS 7	100	2-5-4 (9)							
			SS 8	78	3-4-3 (7)							
			SS 9	100	2-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-813

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CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/19/15 COMPLETED 5/19/15 GROUND ELEVATION 888.09 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 9.50 ft / Elev 878.59 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0			AU 1									
0-5	[Cross-hatched pattern]	POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, some fine to coarse gravel (Fill)	SS 2	100	8-9-9 (18)							
5		NOTE: No Recovery due to gravel. Sampled auger cuttings.	SS 3	0	4-4-5 (9)							
5-6.0	[Cross-hatched pattern]	SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 4	89	6-7-6 (13)							
6.0-8.5	[Cross-hatched pattern]	∇ SILTY SAND, (SM) gray, fine grained, moist to saturated, medium dense	SS 5	67	6-6-7 (13)							
8.5-10	[Dotted pattern]		SS 6	100	4-6-6 (12)							
10-15	[Dotted pattern]		SS 7	78	5-6-5 (11)							
15-20	[Dotted pattern]		SS 8	67	7-5-5 (10)							
20-21.0	[Dotted pattern]		SS 9	89	6-5-6 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-814

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/19/15 COMPLETED 5/19/15 GROUND ELEVATION 888.1 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 4.50 ft / Elev 883.60 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
		SILTY SAND, (SM) brown and tan, fine grained, moist (Fill)	AU 1									
			SS 2	56	3-3-4 (7)							
4.5	∇	883.6										
		SILTY SAND, (SM) reddish brown, fine grained, saturated (Fill)	SS 3	100	6-8-7 (15)							
6.0		882.1										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark gray, fine grained, saturated, loose, trace gravel	SS 4	83	3-2-3 (5)							
8.3		879.8										
		SANDY SILT, (ML) dark gray, wet, medium	SS 5	67	5-6-3 (9)							
9.5		878.6										
		SILTY SAND, (SM) dark gray, fine grained, saturated, medium dense, trace gravel	SS 6	56	2-4-3 (7)							
12.0		876.1										
		SANDY LEAN CLAY, (CL) dark gray, wet, medium to rather stiff, trace fine to coarse sand	SS 7	100	3-3-4 (7)							
15			SS 8	100	4-4-6 (10)							
			SS 9	100	5-6-5 (11)							
20												
21.0		867.1										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-815

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 892.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 5.00 ft / Elev 887.67 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0			AU 1									
5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist to saturated, some fine to coarse gravel (Fill). ▽	SS 2	44	2-2-3 (5)							
6.0		886.7	SS 3	33	1-1-1 (2)							
9.5		883.2	SS 4	78	4-5-5 (10)							
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, loose, trace gravel	SS 5	56	3-3-2 (5)							
12.0		880.7	SS 6	78	2-3-3 (6)							
15		LEAN CLAY WITH SAND, (CL) dark gray, wet, medium to rather stiff, trace gravel	SS 7	100	3-3-3 (6)							
20			SS 8	78	4-7-3 (10)							
21.0		871.7	SS 9	67	5-6-5 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-816

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 903.88 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 to 5.0		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, moist, fine to medium gravel (Fill) NOTE: No recovery. Sampled auger cuttings.	SS 1	44	2-6-8 (14)							
			SS 2	0	3-3-4 (7)							
5.0		898.9										
5.0 to 12.0		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 3	89	2-4-5 (9)							
			SS 4	100	3-5-6 (11)							
10			SS 5	100	4-6-8 (14)							
12.0		891.9										
12.0 to 21.0		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 6	100	4-5-6 (11)							
			SS 7	100	3-4-6 (10)							
15			SS 8	100	3-5-6 (11)							
20			SS 9	100	2-5-6 (11)							
21.0		882.9										

Borehole backfilled with soil cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-818

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CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/18/15 COMPLETED 5/18/15 GROUND ELEVATION 897.33 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 7.00 ft / Elev 890.33 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel, trace roots (Fill) 895.3	SS 1	44	1-3-4 (7)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist (Fill) 892.8	SS 2	67	5-8-7 (15)							
6.0		SANDY LEAN CLAY, (CL) gray, moist, stiff, trace gravel 891.3	SS 3	44	8-10-11 (21)							
8.3		∇ POORLY GRADED SAND, (SP) gray to brown, fine to medium grained, moist to saturated, medium dense, trace gravel 889.1	SS 4	78	2-3-6 (9)							
9.5		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel 887.8	SS 5	56	2-3-3 (6)							
12.8		PEAT, (Pt) black, moist, soft, fibrous 884.5	SS 6	83	2-3-3 (6)							
16.5		SILTY SAND, (SM) gray, fine grained, saturated, loose, trace gravel 880.8	SS 7	78	1-1-1 (2)							
21.0		876.3	SS 8	56	3-3-4 (7)							
			SS 9	83	1-6-2 (8)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-819

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 894.26 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 5.00 ft / Elev 889.26 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.0	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	44	2-4-6 (10)							
2.8	[Dotted pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, medium dense, trace gravel	SS 2	83	3-6-7 (13)							
4.5	[Diagonal lines /]	SANDY LEAN CLAY, (CL) gray brown, moist, rather stiff, trace gravel										
5.0	▽	SILTY SAND, (SM) brown to dark brown, fine grained, moist to saturated, medium dense, trace gravel	SS 3	56	3-8-6 (14)							
			SS 4	67	3-6-7 (13)							
10.0	▽	PEAT, (Pt) black, moist, medium	SS 5	78	2-4-1 (5)							
10.5		SILTY SAND, (SM) dark gray to gray, fine grained, saturated, loose, trace gravel	SS 6	56	1-3-2 (5)							
14.5		CLAYEY SAND, (SC) gray, fine grained, saturated, very loose, trace gravel	SS 7	67	2-1-1 (2)							
17.0		SANDY LEAN CLAY, (CL) gray, wet, medium to soft, trace gravel	SS 8	33	2-3-3 (6)							
21.0			SS 9	28	2-2-1 (3)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-820

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 894.31 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 5.00 ft / Elev 889.31 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, trace gravel (Fill)	SS 1	83	2-3-5 (8)							
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, dense, little gravel	SS 2	56	6-11-11 (22)							
5		SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, dense, trace gravel	SS 3	78	8-11-10 (21)							
8.0		SANDY LEAN CLAY, (CL) blue gray, wet, rather stiff, trace gravel	SS 4	78	3-7-5 (12)							
9.5		SILTY SAND, (SM) gray, fine grained, saturated, loose, trace gravel	SS 5	44	3-4-3 (7)							
10.5		PEAT, (Pt) black, moist, soft										
13.0		SILTY SAND, (SM) gray, fine grained, saturated, very loose, trace gravel	SS 6	67	1-1-1 (2)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 7	89	2-5-4 (9)							
17.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to very loose, trace gravel	SS 8	100	4-10-2 (12)							
20			SS 9	100	1-1-1 (2)							
24.5			SS 10	100	3-4-4 (8)							
25		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 11	100	4-4-6 (10)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 26.0 feet.



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BORING NUMBER DE-821

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 888.46 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 7.00 ft / Elev 881.46 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill) NOTE: No recovery. Sampled auger cuttings.	SS 1	33	1-1-2 (3)							
885.0			SS 2	0	2-3-5 (8)							
5		POORLY GRADED SAND WITH CLAY, (SP-SC) brown, fine to medium grained, moist, trace gravel, clay (CL) lenses (Fill)	SS 3	33	1-1-1 (2)							
6.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium, trace gravel	SS 4	56	2-2-4 (6)							
10			SS 5	94	2-3-3 (6)							
15			SS 6	100	2-3-5 (8)							
			SS 7	89	2-2-3 (5)							
			SS 8	100	2-3-4 (7)							
20			SS 9	100	2-3-5 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-822

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 890.4 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 883.40 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		SANDY SILT, (ML) brown, moist (Fill)	888.9 SS 1	44	1-2-2 (4)							
3.0		SILTY SAND, (SM) brown, fine to medium grained, moist (Fill)	887.4 SS 2	78	2-2-3 (5)							
5.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium	SS 3	28	2-3-2 (5)							
7.0		POORLY GRADED SAND, (SP) brown, fine grained, saturated, very loose, trace gravel	883.4 SS 4	56	2-1-3 (4)							
9.5		SILTY SAND, (SM) gray and brown, fine grained, saturated, very loose, trace gravel	880.9 SS 5	44	3-1-1 (2)							
12.5		LEAN CLAY WITH SAND, (CL) gray, wet, soft to medium, trace gravel, sand lenses	877.9 SS 6	100	2-2-2 (4)							
15.0			SS 7	83	2-3-4 (7)							
20.0			SS 8	100	2-3-4 (7)							
21.0			869.4 SS 9	100	2-3-4 (7)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-823

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 889.15 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 879.65 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 inches).	888.5									
2.0		SILTY SAND, (SM) brown, fine grained, moist (Fill)	887.2	56	1-3-4 (7)							
3.0		POORLY GRADED SAND, (SP) light brown, fine to medium grained, dry, trace gravel (Fill)	886.2	44	6-4-3 (7)							
5		SANDY LEAN CLAY, (CL) brown, moist, medium		56	4-2-4 (6)							
7.0		SANDY LEAN CLAY, (CL) gray, moist to wet, medium	882.2	100	3-3-3 (6)							
10				100	3-3-4 (7)							
15				100	3-4-4 (8)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, medium, little fine to coarse gravel	874.7	100	6-5-4 (9)							
20				89	5-4-4 (8)							
21.0			868.2	89	3-3-2 (5)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-824

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/18/15 COMPLETED 5/18/15 GROUND ELEVATION 888.51 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 4.50 ft / Elev 884.01 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
		SILTY SAND, (SM) brown, fine grained, moist, loose to very loose, trace gravel	SS 1	83	2-4-4 (8)							
			SS 2	56	2-2-2 (4)							
4.5	∇											
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, very loose	SS 3	56	3-2-1 (3)							
6.0												
		SILTY SAND, (SM) brown, fine grained, saturated, very loose, trace gravel	SS 4	67	2-1-2 (3)							
10.0												
		SILTY LEAN CLAY, (CL-ML) gray, wet, soft to medium, trace gravel, little sand	SS 5	78	2-2-2 (4)							
			SS 6	83	1-2-3 (5)							
15												
			SS 7	78	2-1-2 (3)							
			SS 8	100	2-3-3 (6)							
20												
			SS 9	83	2-1-2 (3)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-825

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 893.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 1	78	2-5-4 (9)							
			SS 2	44	5-5-5 (10)							
5		SILTY SAND, (SM) brown, fine to medium grained, moist, loose, trace gravel	SS 3	56	3-3-3 (6)							
7.5		SANDY LEAN CLAY, (CL) gray brown, moist, medium, trace gravel	SS 4	78	3-2-3 (5)							
			SS 5	56	4-4-4 (8)							
			SS 6	28	3-3-4 (7)							
14.5		LEAN CLAY WITH SAND, (CL) gray to dark gray, moist, medium, trace gravel	SS 7	94	3-3-3 (6)							
			SS 8	100	2-3-4 (7)							
21.0			SS 9	100	3-3-4 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

Pedestrian Bridge Soil Boring Logs



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BORING NUMBER PB-1

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/11/16 **COMPLETED** 5/16/16 **GROUND ELEVATION** 883.184 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.00 ft / Elev 866.18 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES South Pedestrian Bridge. Elevation at staked location provided by client. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 930016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10.0 Inches)	AU 1									
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown to dark brown, fine to medium grained, moist, trace gravel, trace organics	SS 2	100	8-8-7 (15)							
5			SS 3	100	9-11-10 (21)							
8.0		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, moist, medium dense to loose, trace gravel	SS 4	89	6-7-6 (13)							
10			SS 5	89	4-4-4 (8)							
12.0		SILTY SAND, (SM) gray, fine grained, moist to saturated, very loose, trace gravel, trace organics NOTE: Pushed Shelby Tube at 12.0 feet. No Recovery.	SPT 6									
15			SS 7	78	1-1-1 (2)			26				13
19.5		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, dense, trace gravel	SS 8	89	8-10-8 (18)							
24.5		SANDY LEAN CLAY, (CL) gray, wet, medium to rather stiff, trace gravel	SS 9	100	7-7-8 (15)							
30			SS 10	100	3-3-4 (7)			18	27	12	15	52

(Continued Next Page)



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BORING NUMBER PB-1

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 8/30/16 11:54 - INTIDATARAMSEY1-PROJECTS2016 PROJECTSITCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SANDY LEAN CLAY, (CL) gray, wet, medium to rather stiff, trace gravel (continued)	X SS 11	100	4-5-5 (10)							
40			X SS 12	100	4-4-5 (9)							
45			X SS 13	100	4-6-5 (11)							
50			X SS 14	100	5-5-6 (11)							
55			X SS 15	100	6-6-6 (12)							
60			X SS 16	100	6-5-7 (12)							
65			X SS 17	100	6-7-6 (13)							
70			X SS 18	100	5-6-6 (12)							

(Continued Next Page)



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BORING NUMBER PB-1

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75	[Hatched Box]	SANDY LEAN CLAY, (CL) gray, wet, medium to rather stiff, trace gravel (continued)										
76.0			SS 19	100	6-5-6 (11)							

Bottom of borehole at 76.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/30/16 11:54 - INT\DATA\RAMSEY\1\PROJECTS\2016 PROJECTS\TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)\ENGINEERING\ENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ



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BORING NUMBER PB-2

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/9/16 **COMPLETED** 5/9/16 **GROUND ELEVATION** 883.681 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 12.00 ft / Elev 871.68 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES South Pedestrian Bridge. Elevation at staked location provided by client AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 8/20/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTS2016 PROJECTS2016 NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (17.0 Inches)	AU 1									
1.4		882.3										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel	SS 2	67	9-13-14 (27)							
5			SS 3	83	10-12-15 (27)							
7.0		876.7										
		SILT WITH SAND, (ML) dark brown, fine grained, moist, medium, trace gravel, trace organics	SS 4	56	4-4-4 (8)							
10			SH 5	93				14				56
12.0	▽	871.7										
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, medium dense to very loose, trace gravel	SS 6	67	4-4-5 (9)							
15		NOTE: Pushed Shelby Tube at 14.5 feet. No Recovery.	SS 7	83	1-1-1 (2)							
			SS 8	100	3-1-6 (7)							
19.5		864.2										
		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, medium dense, trace gravel	SS 9	100	10-4-5 (9)							
24.5		859.2										
		CLAYEY SAND, (SC) gray, wet, loose to dense, little gravel	SS 10	100	4-4-4 (8)							
30			SH 11	97				15	24	12	12	46

(Continued Next Page)



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BORING NUMBER PB-2

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/30/16 11:54 - INTIDATARAMSEY1\PROJECTS\2016 PROJECTS\TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)\ENGINEERING\ENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
35		CLAYEY SAND, (SC) gray, wet, loose to dense, little gravel (continued)	X SS 12	100	4-5-5 (10)								
40			X SS 13	100	4-4-4 (8)			15	25	13	12	49	
45			X SS 14	100	4-5-6 (11)								
50			X SS 15	100	5-5-5 (10)								
55			X SS 16	100	10-9-9 (18)								
60			X SS 17	100	6-7-9 (16)								
65	X SS 18	100	7-7-9 (16)										
70	X SS 19	100	8-7-8 (15)										

(Continued Next Page)



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BORING NUMBER PB-2

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75		CLAYEY SAND, (SC) gray, wet, loose to dense, little gravel (continued)										
			SS 20	100	6-9-8 (17)							

76.0

807.7

Bottom of borehole at 76.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 83016 11:54 - INTDATA\RAMSEY\1\PROJECTS\2016 PROJECTS\TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)\ENGINEERING\ENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ



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BORING NUMBER PB-3

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/11/16 **COMPLETED** 5/11/16 **GROUND ELEVATION** 877.466 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 12.00 ft / Elev 865.47 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES North Pedestrian Bridge. Elevation at staked location provided by client. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 930/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (15.0 Inches)	AU 1									
1.3		876.2										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel	SS 2	56	4-4-4 (8)							
4.5		873.0										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, dense to medium dense, trace gravel	SS 3	67	8-10-11 (21)							
			SS 4	78	4-5-6 (11)							
9.5		868.0										
		SILTY SAND, (SM) dark brown, fine to medium grained, moist, medium dense, trace gravel, trace organics, occasional fine roots	SS 5	78	4-4-5 (9)							
12.0	▽	865.5										
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, very loose, trace gravel	SS 6	78	2-1-2 (3)							
			SS 7	78	2-2-2 (4)							
17.0		860.5										
		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose, trace gravel	SS 8	78	2-3-3 (6)							
20			SH 9	80				12				12
24.5		853.0										
		SANDY LEAN CLAY, (CL) gray, wet, rather stiff to stiff, trace gravel	SS 10	100	4-5-5 (10)							
30			SS 11	100	5-5-6 (11)							

(Continued Next Page)



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BORING NUMBER PB-3

CLIENT Wenck Associates PROJECT NAME Ramsey County Re-Development - (TCAAP)
 PROJECT NUMBER 16.61435.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 892016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SANDY LEAN CLAY, (CL) gray, wet, rather stiff to stiff, trace gravel (continued)	X SS 12	100	5-5-7 (12)							
40			X SS 13	100	6-7-7 (14)							
45			X SS 14	100	6-7-6 (13)							
50			X SS 15	78	8-8-8 (16)							
55			X SS 16	89	7-10-9 (19)							
60			X SS 17	100	8-8-8 (16)							
65			X SS 18	100	12-14-13 (27)							
70		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, dense, trace gravel	X SS 19	100	9-10-10 (20)							

69.5

808.0



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BORING NUMBER PB-3

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, dense, trace gravel <i>(continued)</i>	803.0									
		SANDY LEAN CLAY, (CL) brown, wet, stiff, trace gravel, occasional silt (ML) seams	801.5	SS 20	100	8-9-8 (17)						

Bottom of borehole at 76.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/30/16 11:54 - INTDATABRAMSEY11-PROJECTS2016 PROJECTSITCAMP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ



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BORING NUMBER PB-4

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/9/16 **COMPLETED** 5/10/16 **GROUND ELEVATION** 878.006 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 7.00 ft / Elev 871.01 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES North Pedestrian Bridge. Elevation at staked location provided by client. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 8/20/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTS2016 PROJECTS2016 NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (13.0 Inches)	AU 1									
1.1		CLAYEY SAND, (SC) dark brown, fine to medium grained, moist, very loose, trace gravel, trace organics, occasional fine roots	SS 2	56	1-1-2 (3)							
5			SS 3	67	1-2-1 (3)							
7.0	▽	SILTY SAND, (SM) gray, wet, very loose, trace gravel	SS 4	100	1-1-2 (3)							
10			SH 5	77				14	16	14	2	40
12.0		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, medium dense, trace gravel	SS 6	100	3-4-6 (10)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 7	100	3-4-5 (9)							
20			SS 8	100	5-5-6 (11)							
25			SS 9	100	6-5-6 (11)							
30			SS 10	100	6-6-6 (12)							
			SS 11	100	7-8-7 (15)							

(Continued Next Page)



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BORING NUMBER PB-4

CLIENT Wenck Associates PROJECT NAME Ramsey County Re-Development - (TCAAP)
 PROJECT NUMBER 16.61435.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 93016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTS/TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS/IGINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
35		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel (continued)	X SS 12	83	6-7-6 (13)								
40			X SS 13	100	6-4-10 (14)								
45			X SS 14	100	3-5-7 (12)								
50			49.5	828.5	X SS 15	83	6-9-9 (18)						
55					X SS 16	100	9-15-12 (27)						
60			SH 17	60				21	26	18	8	97	
65			X SS 18	100	6-8-9 (17)								
70	69.5	808.5	X SS 19	100	6-9-9 (18)								



(Continued Next Page)



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BORING NUMBER PB-4

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75		CLAYEY SAND, (SC) brown, fine to medium grained, saturated, dense, trace gravel <i>(continued)</i>	803.5									
75		POORLY GRADED SAND WITH SILT, (SP-SC) brown, fine to medium grained, saturated, dense, trace gravel	802.0	SS 20	100	8-10-9 (19)						

Bottom of borehole at 76.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 93016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

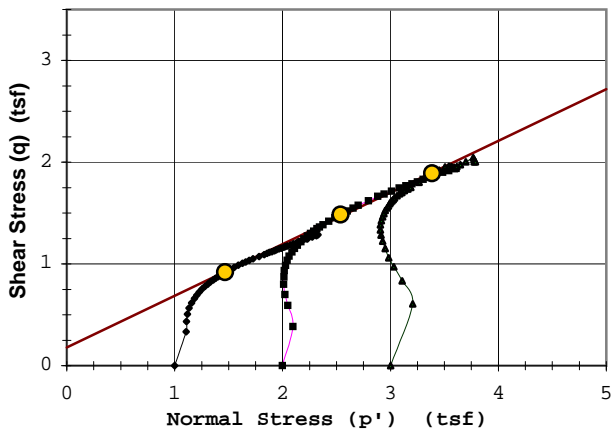
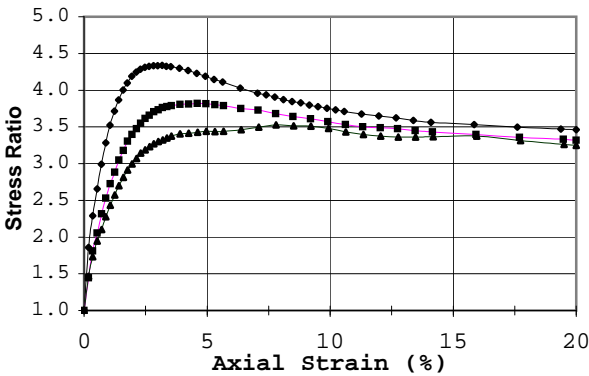
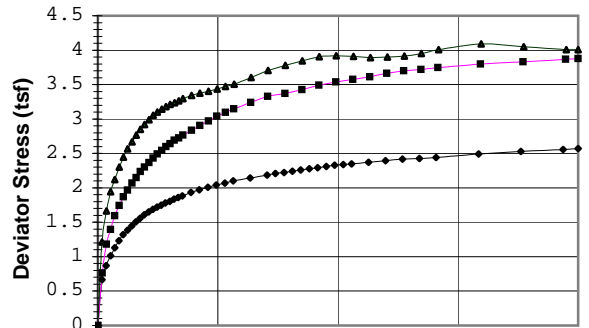
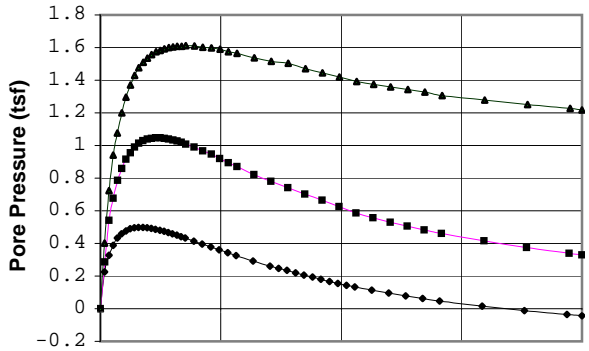
Pedestrian Bridge Triaxial Compression Test Results

TRIAXIAL TEST ASTM: D 4767

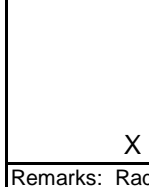
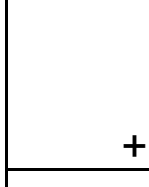
Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **PB-2/11** Sample #: Type: **3T** Depth (ft):
 Soil Type: **Sandy Lean Clay w/a little gravel (CL)**



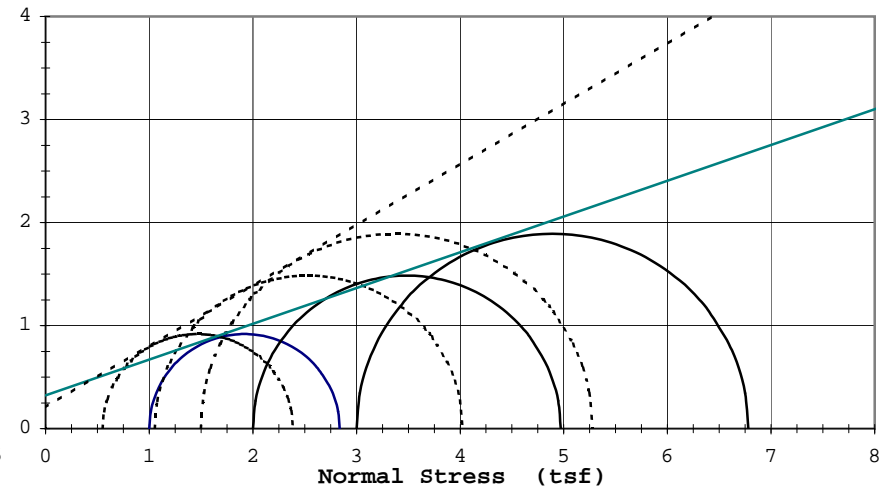
Rupture Envelope at Failure
 = 26.9° a = 0.2 (tsf)



Failure Criterion: Max. Stress Ratio	
Angle of internal friction, $\phi' = 30.5^\circ$	
Apparent Cohesion, $c' = 0.21$ (tsf)	
Test Date: 6/14/16	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.67
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.85 2.85 2.85
Dry Density (pcf)	15.6 15.2 15.9
Void Ratio	112.9 114.3 112.5
After Consolidation	
Diameter (in)	0.48 0.46 0.48
Height (in)	1.42 1.41 1.42
Water Content (%)	2.84 2.82 2.82
Dry Density (pcf)	16.3 15.1 15.9
Void Ratio	116.1 118.9 117.0
Back Pressure (tsf)	0.44 0.40 0.42
Minor Principal Stress (tsf)	5.6 9.1 9.1
Max. Deviator Stress (tsf)	1.00 2.00 3.00
Ultimate Deviator Stress (tsf)	2.57 3.87 4.09
Deviator Stress at Failure (tsf)	2.57 3.87 4.01
Max. Pore Pressure Buildup (tsf)	1.84 2.97 3.78
Pore Pressure Parameter "B"	0.50 1.05 1.61
Pct. Axial Strain at Failure	0.95 0.95 0.95
	3.2 4.6 7.8

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



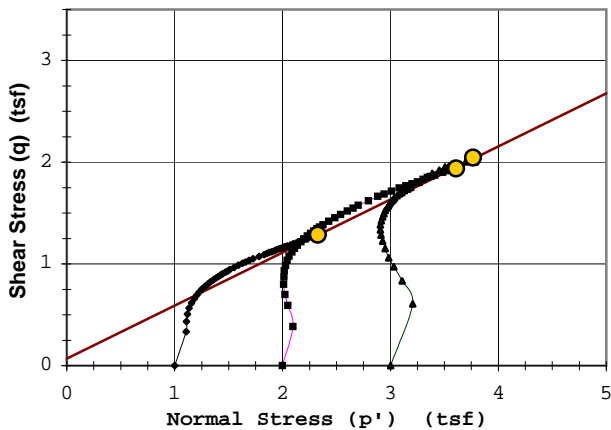
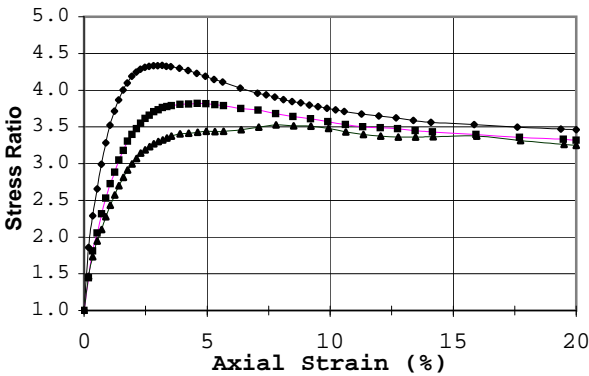
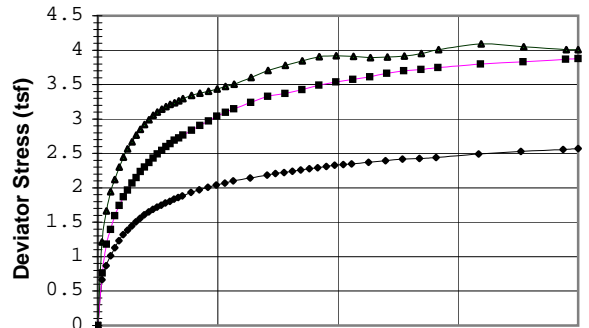
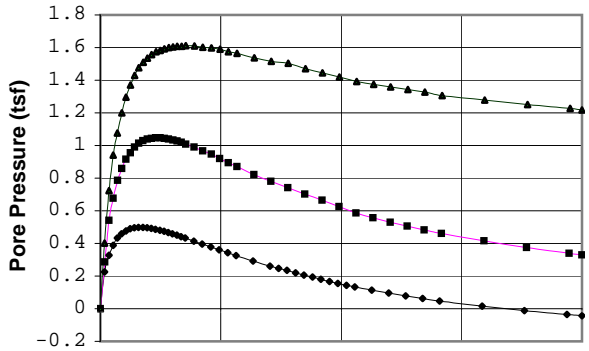
----- Effective $\phi' : 30.5^\circ$ $c' = 0.21$ (tsf)
 _____ Total $\phi : 19.1^\circ$ $c = 0.32$ (tsf)

TRIAXIAL TEST ASTM: D 4767

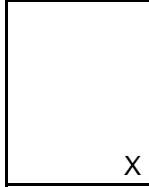
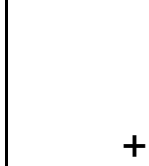
Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **PB-2/11** Sample #: Type: **3T** Depth (ft):
 Soil Type: **Sandy Lean Clay w/a little gravel (CL)**



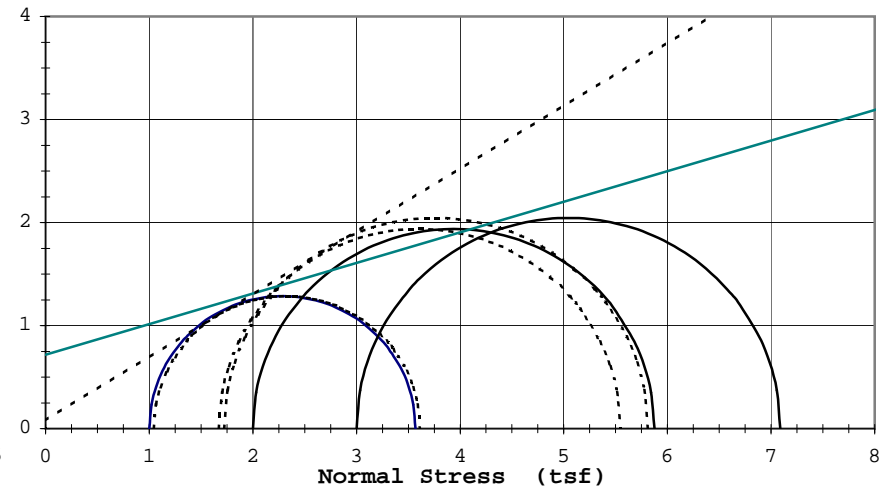
Rupture Envelope at Failure
 = 27.5° a = 0.1 (tsf)



Failure Criterion: Max. Deviator Stress					
Angle of internal friction, $\phi' = 31.4^\circ$					
Apparent Cohesion, $c' = 0.08$ (tsf)					
Test Date: 6/14/16	Liquid Limit:				
Test Type: CU w/pp	Plasticity Limit:				
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.67				
Strain Rate (%/min): 0.025					
Before Consolidation					
Diameter (in)	A	B	C	D	E
Height (in)	1.44	1.44	1.44		
Water Content (%)	15.6	15.2	15.9		
Dry Density (pcf)	112.9	114.3	112.5		
Void Ratio	0.48	0.46	0.48		
After Consolidation					
Diameter (in)	1.42	1.41	1.42		
Height (in)	2.84	2.82	2.82		
Water Content (%)	16.3	15.1	15.9		
Dry Density (pcf)	116.1	118.9	117.0		
Void Ratio	0.44	0.40	0.42		
Back Pressure (tsf)	5.6	9.1	9.1		
Minor Principal Stress (tsf)	1.00	2.00	3.00		
Max. Deviator Stress (tsf)	2.57	3.87	4.09		
Ultimate Deviator Stress (tsf)	2.57	3.87	4.01		
Deviator Stress at Failure (tsf)	2.57	3.87	4.09		
Max. Pore Pressure Buildup (tsf)	0.50	1.05	1.61		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	20.0	20.0	16.0		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



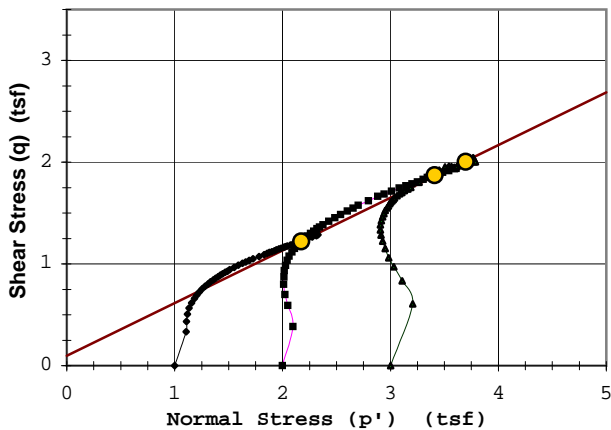
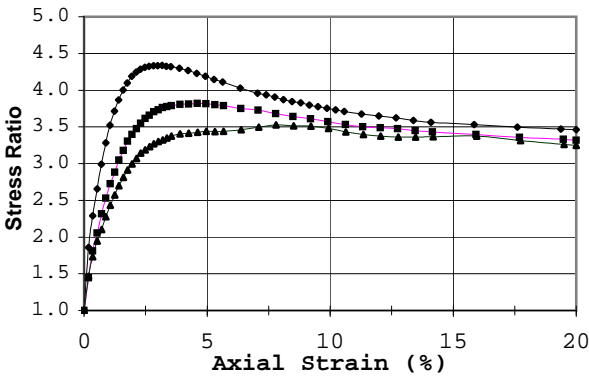
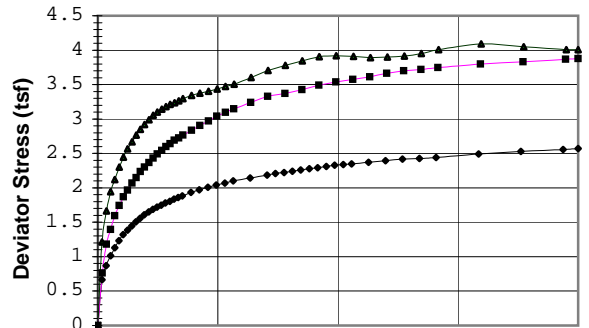
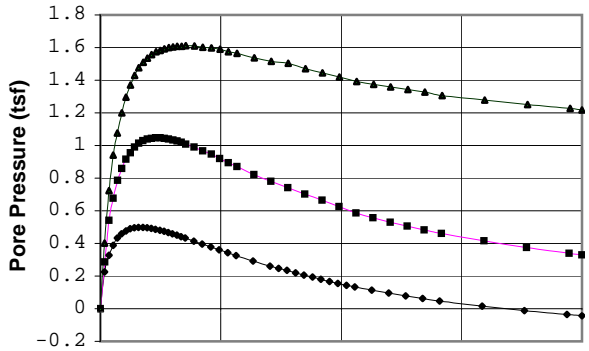
----- Effective $\phi' : 31.4^\circ$ $c' = 0.08$ (tsf)
 _____ Total $\phi : 16.5^\circ$ $c = 0.72$ (tsf)

TRIAxIAL TEST ASTM: D 4767

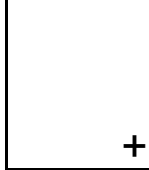
Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **PB-2/11** Sample #: Type: **3T** Depth (ft):
 Soil Type: **Sandy Lean Clay w/a little gravel (CL)**



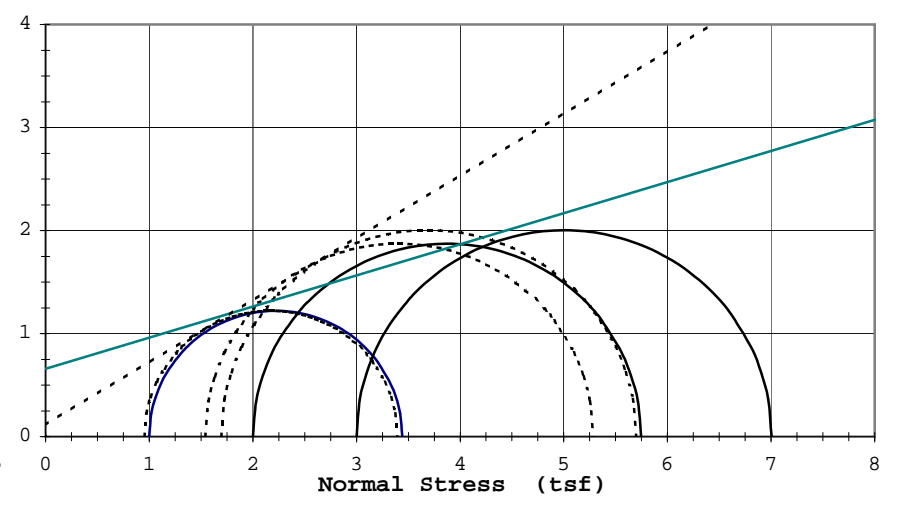
Rupture Envelope at Failure
 = 27.3° a = 0.1 (tsf)



Failure Criterion: Given Strain of: 15%	
Angle of internal friction, $\phi' = 31.1^\circ$	
Apparent Cohesion, $c' = 0.12$ (tsf)	
Test Date: 6/14/16	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.67
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.85 2.85 2.85
Dry Density (pcf)	15.6 15.2 15.9
Void Ratio	112.9 114.3 112.5
After Consolidation	
Diameter (in)	1.42 1.41 1.42
Height (in)	2.84 2.82 2.82
Water Content (%)	16.3 15.1 15.9
Dry Density (pcf)	116.1 118.9 117.0
Void Ratio	0.48 0.46 0.48
Back Pressure (tsf)	5.6 9.1 9.1
Minor Principal Stress (tsf)	1.00 2.00 3.00
Max. Deviator Stress (tsf)	2.57 3.87 4.09
Ultimate Deviator Stress (tsf)	2.57 3.87 4.01
Deviator Stress at Failure (tsf)	2.44 3.75 4.01
Max. Pore Pressure Buildup (tsf)	0.50 1.05 1.61
Pore Pressure Parameter "B"	0.95 0.95 0.95
Pct. Axial Strain at Failure	15.0 15.0 15.0

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



-----	Effective $\phi' : 31.1^\circ$	$c' = 0.12$ (tsf)
_____	Total $\phi : 16.8^\circ$	$c = 0.66$ (tsf)

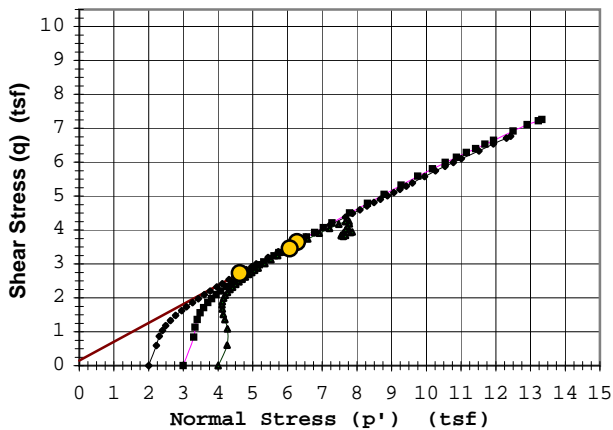
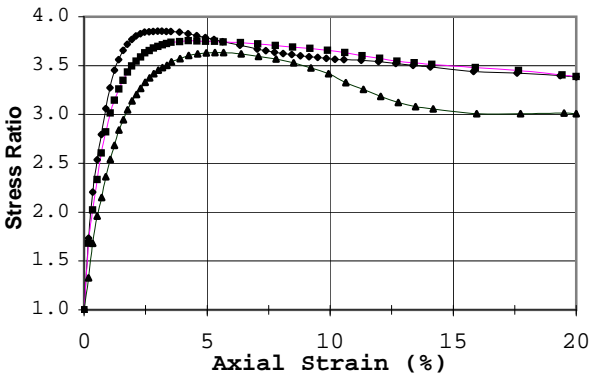
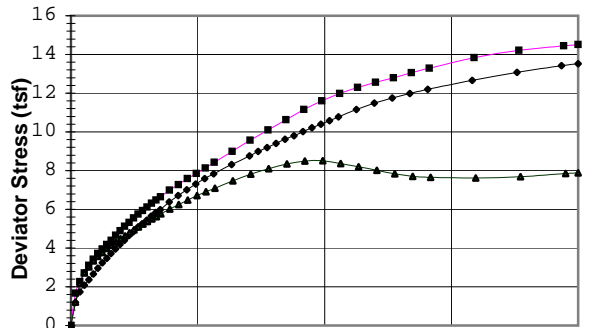
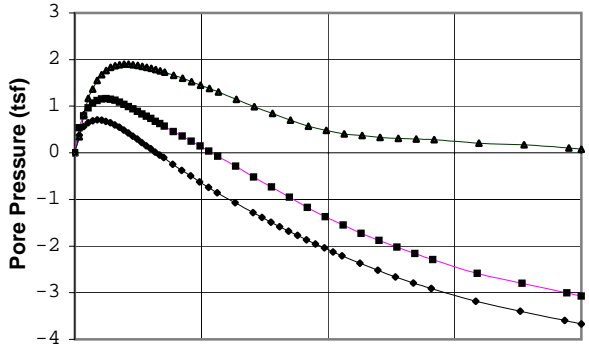
TRIAXIAL TEST ASTM: D 4767

Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **PB-4/17** Sample #:
 Soil Type: **Lean Clay w/pockets of silt (CL)**

Type: **3T** Depth (ft):



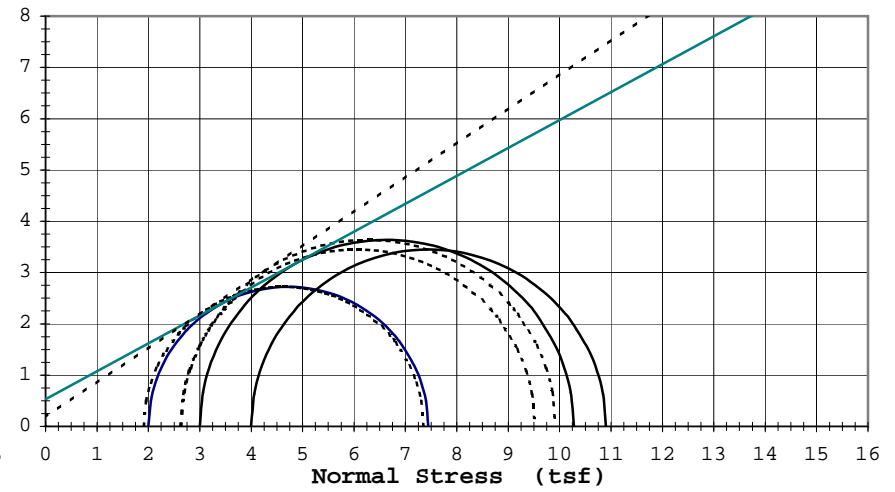
Rupture Envelope at Failure
 = 29.0° a = 0.2 (tsf)



Failure Criterion: Max. Stress Ratio	
Angle of internal friction, $\phi' = 33.7^\circ$	
Apparent Cohesion, $c' = 0.18$ (tsf)	
Test Date: 6/14/16	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.68
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.86 2.85 2.85
Dry Density (pcf)	17.5 17.3 23.3
Void Ratio	114.2 114.6 103.8
After Consolidation	
Diameter (in)	0.46 0.46 0.61
Height (in)	1.42 1.42 1.41
Water Content (%)	2.84 2.83 2.82
Dry Density (pcf)	16.1 15.7 20.1
Void Ratio	116.8 117.8 108.8
Back Pressure (tsf)	0.43 0.42 0.54
Minor Principal Stress (tsf)	6.0 7.1 6.0
Max. Deviator Stress (tsf)	2.00 3.00 4.00
Ultimate Deviator Stress (tsf)	13.52 14.51 8.51
Deviator Stress at Failure (tsf)	13.52 14.51 7.88
Max. Pore Pressure Buildup (tsf)	5.44 7.28 6.90
Pore Pressure Parameter "B"	0.71 1.16 1.90
Pct. Axial Strain at Failure	0.95 0.95 0.95
	3.0 4.2 5.3

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
 Specimen C was softer material and was excluded from the strength envelope determination.



-----	Effective $\phi' : 33.7^\circ$	$c' = 0.18$ (tsf)
_____	Total $\phi : 28.6^\circ$	$c = 0.53$ (tsf)

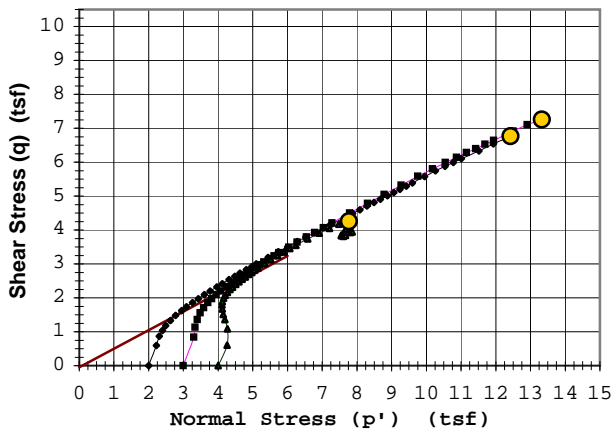
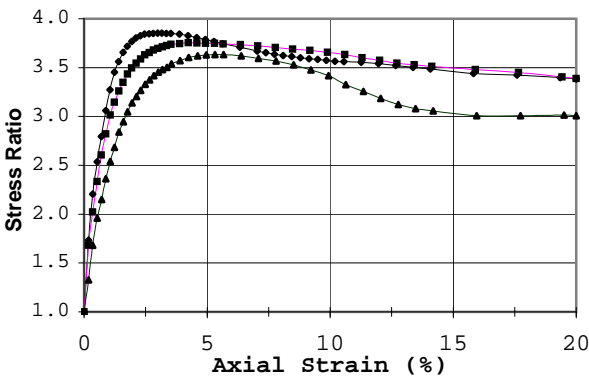
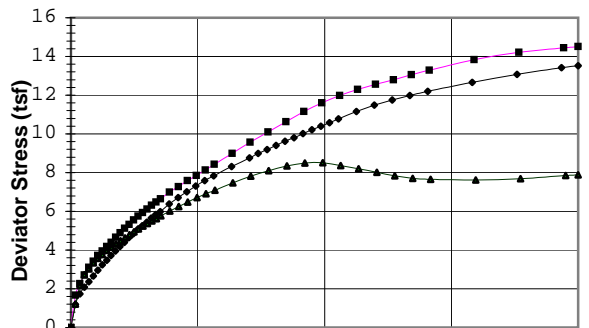
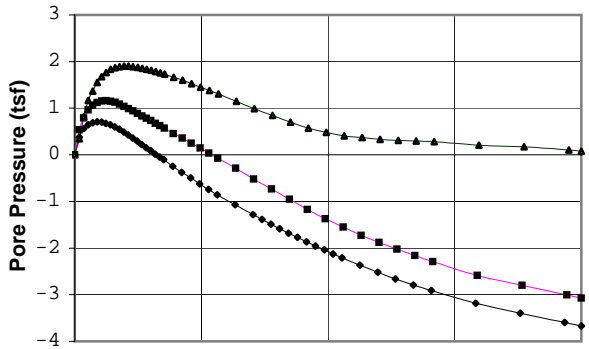
TRIAXIAL TEST ASTM: D 4767

Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **PB-4/17** Sample #:
 Soil Type: **Lean Clay w/pockets of silt (CL)**

Type: **3T** Depth (ft):



Rupture Envelope at Failure
 = 28.7° a = 0.0 (tsf)



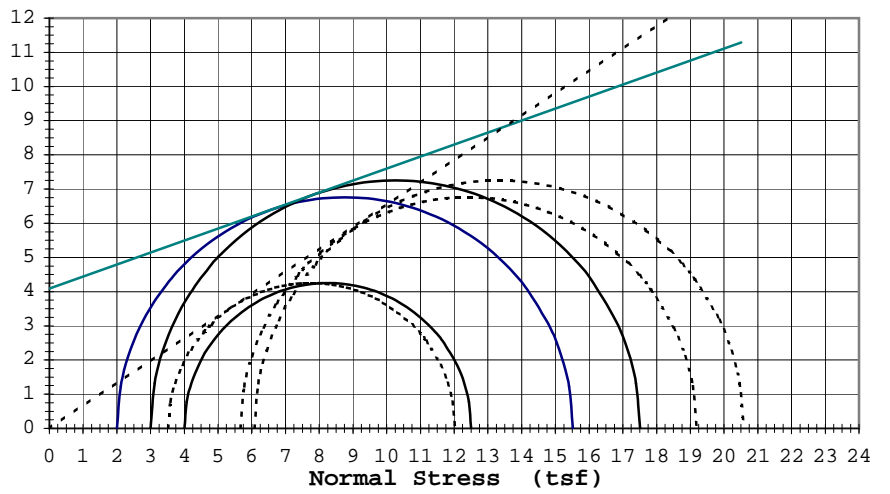
+

X

Failure Criterion: Max. Deviator Stress					
Angle of internal friction, $\phi' = 33.2^\circ$					
Apparent Cohesion, $c' = 0.00$ (tsf)					
Test Date: 6/14/16	Liquid Limit:				
Test Type: CU w/pp	Plastic Limit:				
Strain Rate (in/min): 0.00071	Plasticity Index:				
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed):		2.68		
Before Consolidation					
Diameter (in)	A	B	C	D	E
Height (in)	1.44	1.44	1.44		
Water Content (%)	2.86	2.85	2.85		
Dry Density (pcf)	17.5	17.3	23.3		
Void Ratio	114.2	114.6	103.8		
After Consolidation					
Diameter (in)	1.42	1.42	1.41		
Height (in)	2.84	2.83	2.82		
Water Content (%)	16.1	15.7	20.1		
Dry Density (pcf)	116.8	117.8	108.8		
Void Ratio	0.46	0.46	0.61		
Back Pressure (tsf)	6.0	7.1	6.0		
Minor Principal Stress (tsf)	2.00	3.00	4.00		
Max. Deviator Stress (tsf)	13.52	14.51	8.51		
Ultimate Deviator Stress (tsf)	13.52	14.51	7.88		
Deviator Stress at Failure (tsf)	13.52	14.51	8.51		
Max. Pore Pressure Buildup (tsf)	0.71	1.16	1.90		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	20.0	20.0	9.9		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
 Specimen C was softer material and was excluded from the strength envelope determination.



-----	Effective $\phi' : 33.2^\circ$	$c' = 0.00$ (tsf)
_____	Total $\phi : 19.3^\circ$	$c = 4.09$ (tsf)

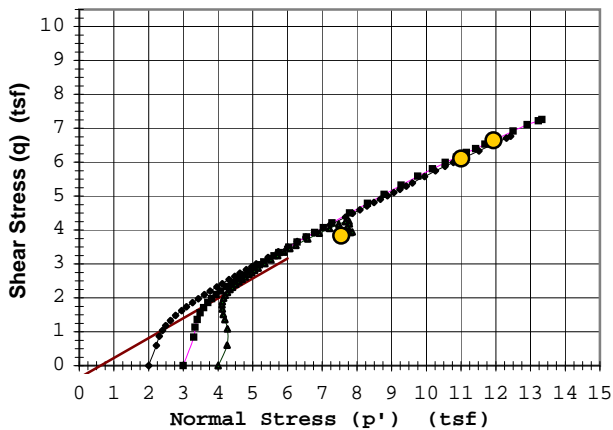
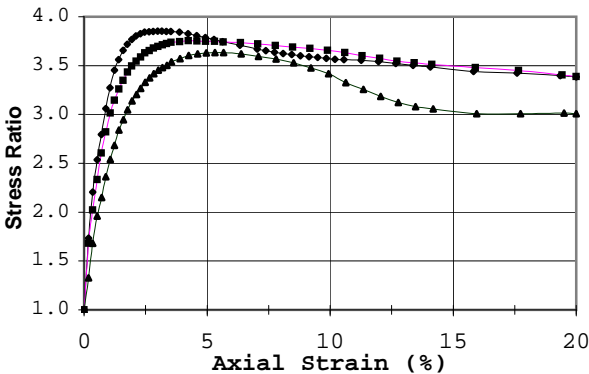
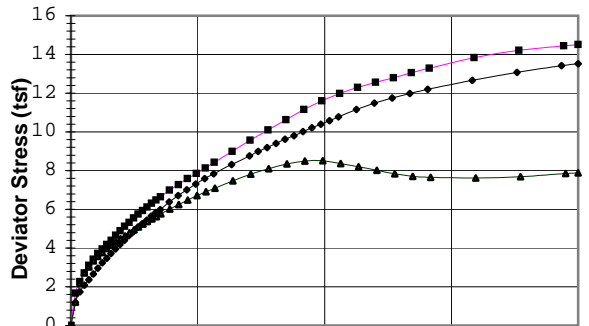
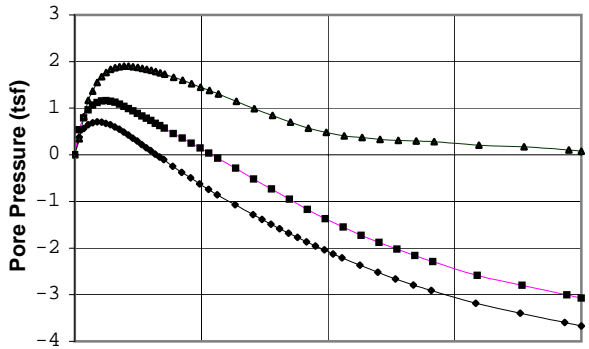
TRIAXIAL TEST ASTM: D 4767

Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **PB-4/17** Sample #:
 Soil Type: **Lean Clay w/pockets of silt (CL)**

Type: **3T** Depth (ft):



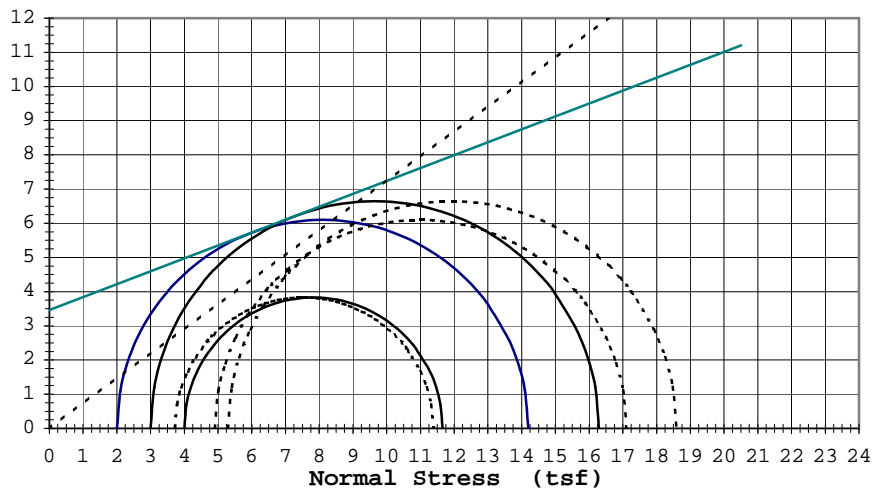
Rupture Envelope at Failure
 = 30.4° a = -0.4 (tsf)



Failure Criterion: Given Strain of: 15%	
Angle of internal friction, $\phi' = 35.9^\circ$	
Apparent Cohesion, $c' = 0.00$ (tsf)	
Test Date: 6/14/16	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.68
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.86 2.85 2.85
Dry Density (pcf)	17.5 17.3 23.3
Void Ratio	114.2 114.6 103.8
After Consolidation	
Diameter (in)	1.42 1.42 1.41
Height (in)	2.84 2.83 2.82
Water Content (%)	16.1 15.7 20.1
Dry Density (pcf)	116.8 117.8 108.8
Void Ratio	0.46 0.46 0.61
Back Pressure (tsf)	6.0 7.1 6.0
Minor Principal Stress (tsf)	2.00 3.00 4.00
Max. Deviator Stress (tsf)	13.52 14.51 8.51
Ultimate Deviator Stress (tsf)	13.52 14.51 7.88
Deviator Stress at Failure (tsf)	12.20 13.29 7.66
Max. Pore Pressure Buildup (tsf)	0.71 1.16 1.90
Pore Pressure Parameter "B"	0.95 0.95 0.95
Pct. Axial Strain at Failure	15.0 15.0 15.0

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
 Specimen C was softer material and was excluded from the strength envelope determination.



----- Effective $\phi' : 35.9^\circ$ $c' = 0.00$ (tsf)
 _____ Total $\phi : 20.7^\circ$ $c = 3.46$ (tsf)

Retaining Wall Soil Boring Logs



Inver Grove Heights
 6160 Carmen Avenue East
 Inver Grove Heights, MN 55076
 P: 651-389-4191
 www.NTIgeo.com

BORING NUMBER RW-1

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/6/16 **COMPLETED** 5/6/16 **GROUND ELEVATION** 880.775 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 4.50 ft / Elev 876.28 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Retaining Wall. Elevation at staked location provided by client. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 8/20/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTS/TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS/GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (15.0 Inches)	AU 1									
1.3		879.5										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist to saturated, trace gravel	SS 2	83	7-6-12 (18)							
5		▽	SS 3	100	5-4-4 (8)							
7.0		873.8	SS 4	100	2-5-6 (11)							
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown to gray, fine grained, saturated, medium dense, trace gravel, trace organics										
10			SH 5	25				25				7
		868.8	SS 6	100	2-4-2 (6)							
		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose, trace gravel										
15		866.3	SS 7	100	0-0-2 (2)							
		14.5	SS 8	100	1-2-4 (6)							
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, very loose to loose, trace gravel										
20		861.3	SH 9	93								
		19.5	SS 10	100	3-5-6 (11)							
		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel										
25			SS 11	100	3-6-6 (12)							
			SS 12	100	4-6-7 (13)							
30			SS 13	100	3-6-6 (12)							
31.0		849.8										

Bottom of borehole at 31.0 feet.



Inver Grove Heights
 6160 Carmen Avenue East
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BORING NUMBER RW-2

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/6/16 **COMPLETED** 5/6/16 **GROUND ELEVATION** 878.968 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 4.50 ft / Elev 874.47 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Retaining Wall. Elevation at staked location provided by client. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 892016 11:54 - INTD/TARAMSEY11-PROJECTS2016 PROJECTS/TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERING/ENGINEERING REPORTS/GINT/TCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (18.0 Inches)	AU 1									
1.5		877.5										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel	SS 2	83	2-5-8 (13)							
4.5	▽	874.5										
		CLAYEY SAND, (SC) black, fine grained, saturated, loose to very loose, trace gravel, trace organics	SS 3	100	3-2-5 (7)							
		NOTE: Pushed Shelby Tube at 7.0 feet. No Recovery.	SPT 4									
9.5		869.5										
		CLAYEY SAND, (SC) gray, wet, very loose to medium dense, little gravel	SS 5	44	1-2-7 (9)							
			SS 6	100	3-2-2 (4)							
15			SH 7	92				16	25	9	16	34
			SS 8	100	2-3-4 (7)							
20			SS 9	100	3-4-4 (8)							
			SS 10	100	2-3-6 (9)							
25			SS 11	100	3-4-6 (10)							
			SS 12	100	2-6-5 (11)							
30			SS 13	100	3-6-6 (12)							
31.0		848.0										

Bottom of borehole at 31.0 feet.



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 6160 Carmen Avenue East
 Inver Grove Heights, MN 55076
 P: 651-389-4191
 www.NTIgeo.com

BORING NUMBER RW-3

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/9/16 **COMPLETED** 5/9/16 **GROUND ELEVATION** 876.492 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 4.50 ft / Elev 871.99 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Retaining Wall. Elevation at staked location provided by client. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 8/30/16 11:54 - INTD\DATA\RAMSEY\1\PROJECTS\2016 PROJECTS\TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)\ENGINEERING\ENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.0		TOPSOIL (12.0 Inches)	AU 1									
1.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist to saturated, trace gravel	SS 2	100	7-4-4 (8)							
5.0	▽		SS 3	83	2-5-3 (8)							
7.0		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose, trace gravel	SS 4	89	2-3-3 (6)							
9.5		CLAYEY SAND, (SC) gray, saturated, loose to medium dense, trace gravel NOTE: Alternating layers of sand (SP) and sandy lean clay (CL) at 9.5 feet.	SS 5	100	3-5-5 (10)							
15.0			SH 6	67				18	29	14	15	49
15.0			SS 7	100	3-5-5 (10)							
20.0			SS 8	100	2-4-5 (9)							
20.0			SS 9	100	4-5-6 (11)							
25.0			SS 10	100	4-4-4 (8)							
25.0			SS 11	100	3-4-6 (10)							
30.0			SS 12	100	4-6-4 (10)							
31.0			SS 13	100	3-6-5 (11)							

Bottom of borehole at 31.0 feet.

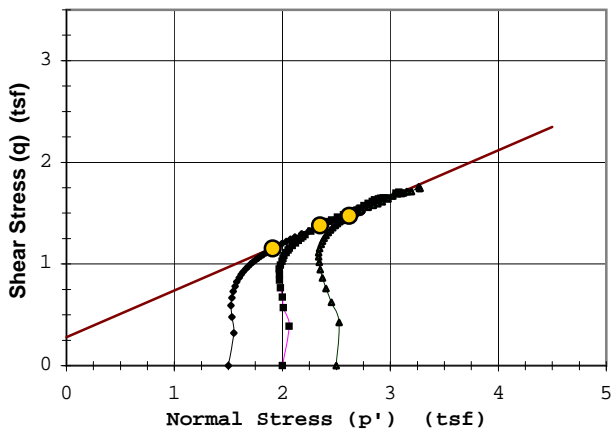
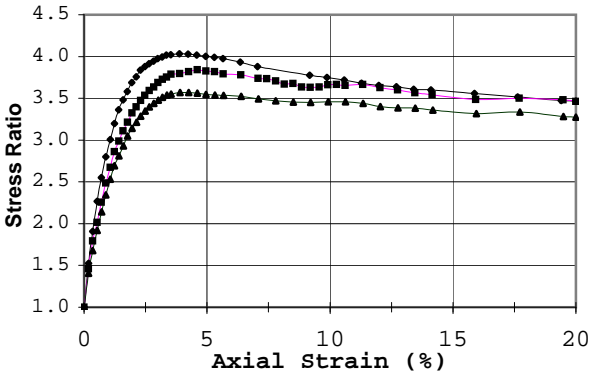
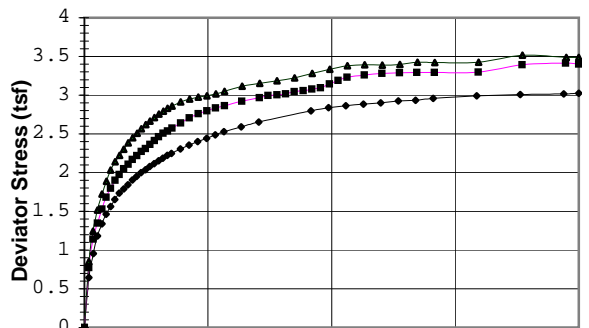
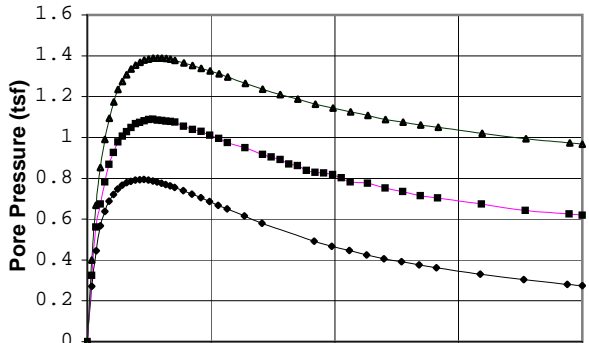
Retaining Wall Triaxial Compression Test Results

TRIAxIAL TEST ASTM: D 4767

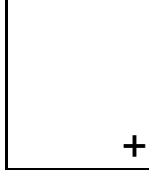
Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **RW-2/7** Sample #: Type: **3T** Depth (ft):
 Soil Type: **Sandy Lean Clay w/a little gravel (CL)**



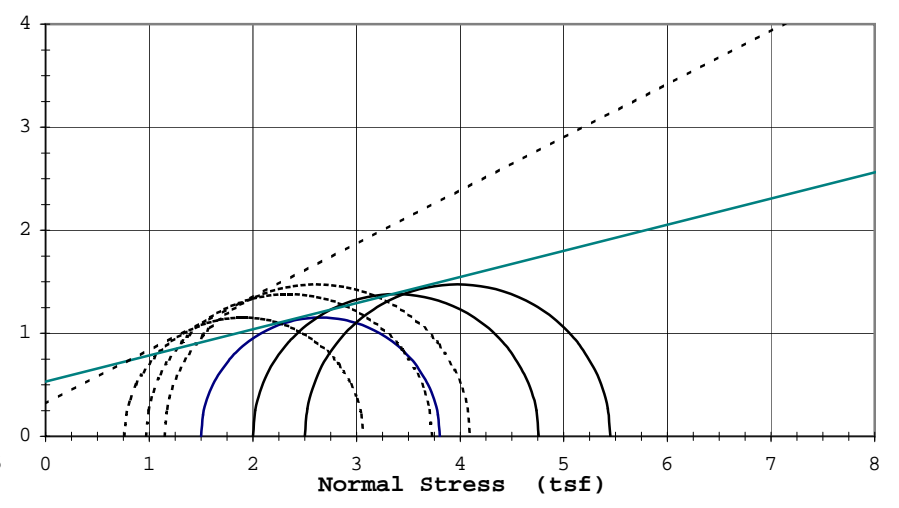
Rupture Envelope at Failure
 = 24.7° a = 0.3 (tsf)



Failure Criterion: Max. Stress Ratio	
Angle of internal friction, $\phi' = 27.4^\circ$	
Apparent Cohesion, $c' = 0.32$ (tsf)	
Test Date: 6/14/16	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.67
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.85 2.85 2.86
Dry Density (pcf)	15.6 16.0 16.3
Void Ratio	113.7 112.2 111.4
After Consolidation	
Diameter (in)	0.47 0.49 0.50
Height (in)	1.42 1.41 1.41
Water Content (%)	2.84 2.82 2.82
Dry Density (pcf)	15.6 15.8 15.9
Void Ratio	117.7 117.3 117.0
Back Pressure (tsf)	0.42 0.42 0.42
Minor Principal Stress (tsf)	6.0 4.0 5.3
Max. Deviator Stress (tsf)	1.50 2.00 2.50
Ultimate Deviator Stress (tsf)	3.03 3.41 3.52
Deviator Stress at Failure (tsf)	3.03 3.40 3.49
Max. Pore Pressure Buildup (tsf)	2.31 2.76 2.95
Pore Pressure Parameter "B"	0.79 1.09 1.39
Pct. Axial Strain at Failure	0.95 0.95 0.95
	3.9 4.6 4.3

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



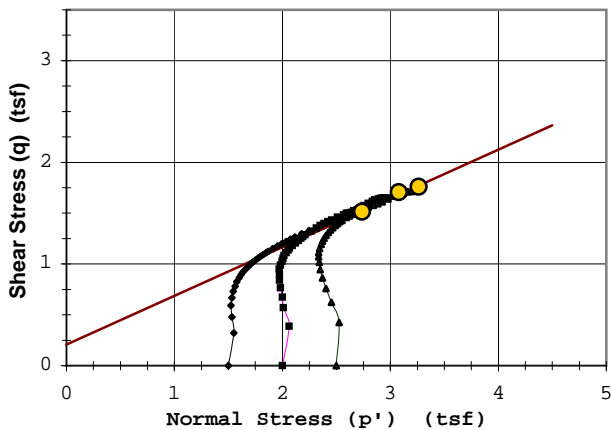
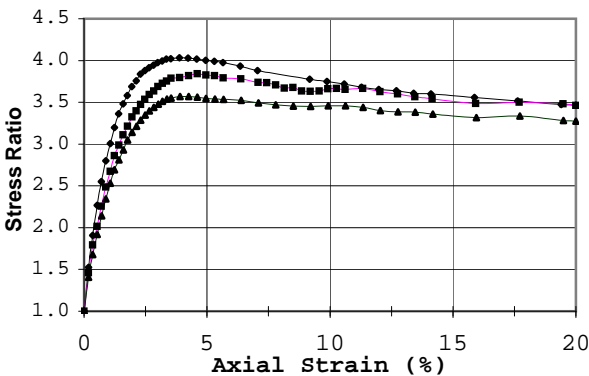
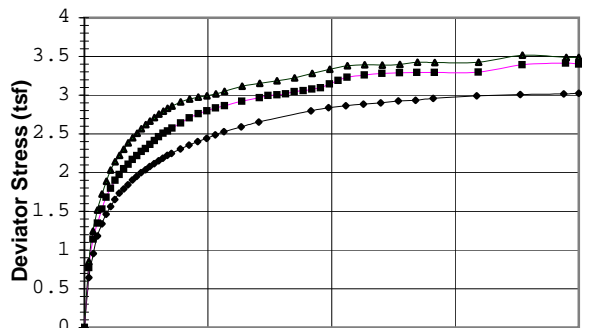
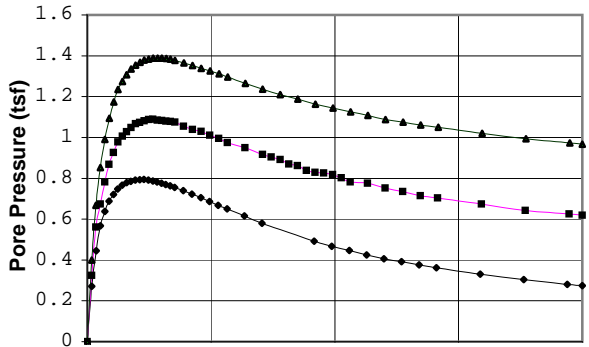
----- Effective $\phi' : 27.4^\circ$ $c' = 0.32$ (tsf)
 _____ Total $\phi : 14.2^\circ$ $c = 0.53$ (tsf)

TRIAXIAL TEST ASTM: D 4767

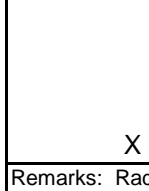
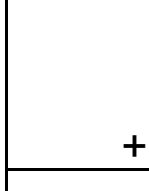
Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **RW-2 /7** Sample #: Type: **3T** Depth (ft):
 Soil Type: **Sandy Lean Clay w/a little gravel (CL)**



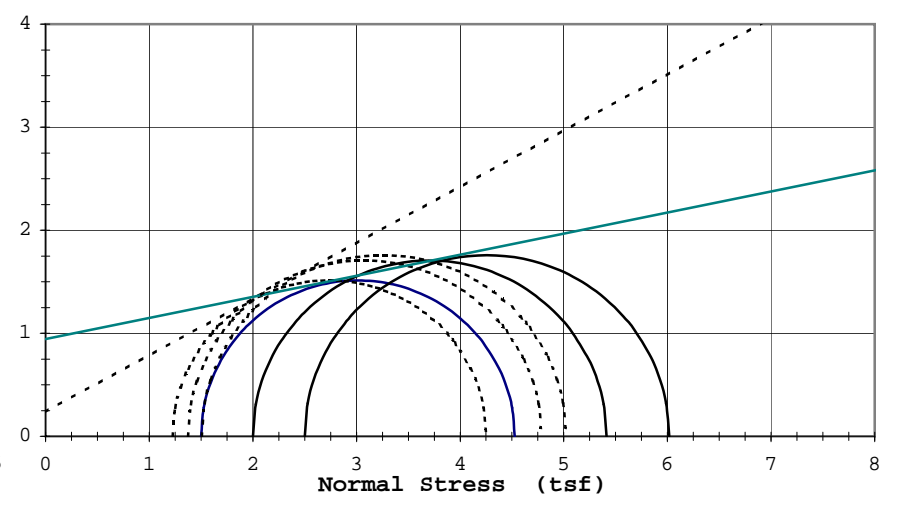
Rupture Envelope at Failure
 = 25.6° a = 0.2 (tsf)



Failure Criterion: Max. Deviator Stress	
Angle of internal friction, $\phi' = 28.7^\circ$	
Apparent Cohesion, $c' = 0.24$ (tsf)	
Test Date: 6/14/16	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.67
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.85 2.85 2.86
Dry Density (pcf)	15.6 16.0 16.3
Void Ratio	113.7 112.2 111.4
After Consolidation	
Diameter (in)	0.47 0.49 0.50
Height (in)	1.42 1.41 1.41
Water Content (%)	2.84 2.82 2.82
Dry Density (pcf)	15.6 15.8 15.9
Void Ratio	117.7 117.3 117.0
Back Pressure (tsf)	0.42 0.42 0.42
Minor Principal Stress (tsf)	6.0 4.0 5.3
Max. Deviator Stress (tsf)	1.50 2.00 2.50
Ultimate Deviator Stress (tsf)	3.03 3.41 3.52
Deviator Stress at Failure (tsf)	3.03 3.40 3.49
Max. Pore Pressure Buildup (tsf)	3.03 3.41 3.52
Pore Pressure Parameter "B"	0.79 1.09 1.39
Pct. Axial Strain at Failure	0.95 0.95 0.95
	20.0 19.5 17.7

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



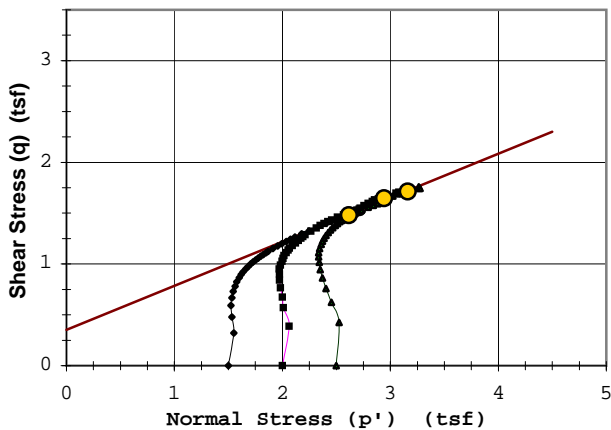
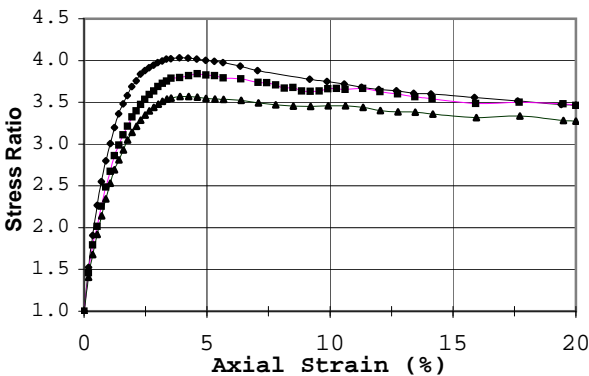
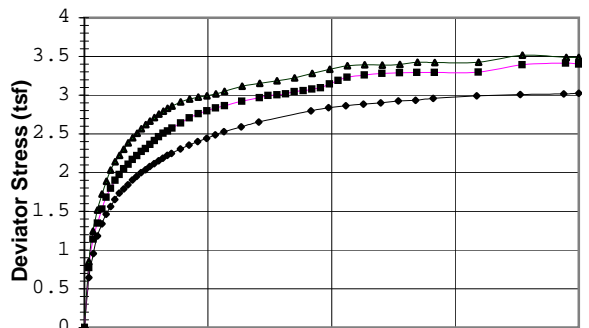
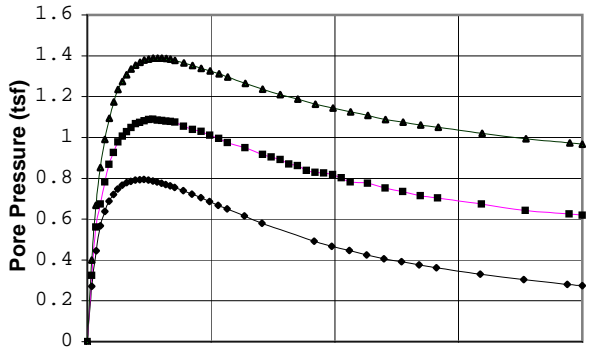
----- Effective $\phi' : 28.7^\circ$ $c' = 0.24$ (tsf)
 _____ Total $\phi : 11.6^\circ$ $c = 0.94$ (tsf)

TRIAxIAL TEST ASTM: D 4767

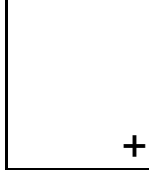
Job No. 10403

Date: 6/22/16

Project: **TCAAP**
 Boring #: **RW-2/7** Sample #: Type: **3T** Depth (ft):
 Soil Type: **Sandy Lean Clay w/a little gravel (CL)**



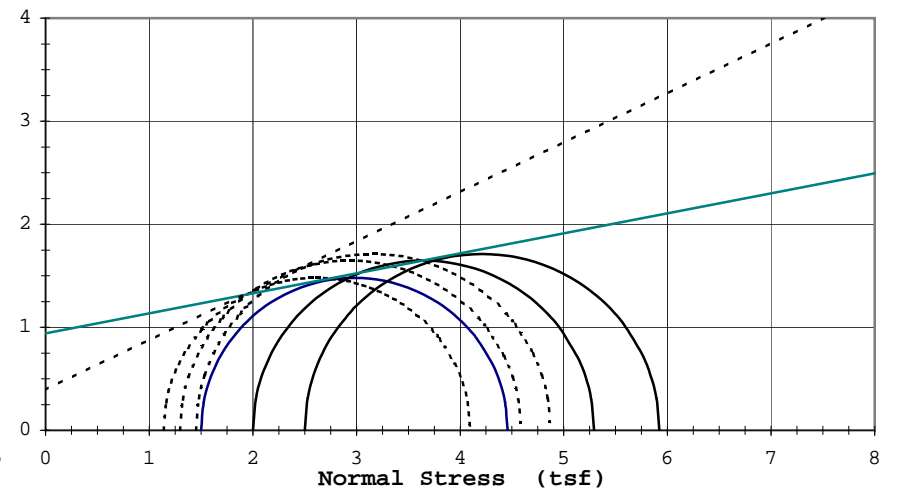
Rupture Envelope at Failure
 = 23.4° a = 0.4 (tsf)



Failure Criterion: Given Strain of: 15%	
Angle of internal friction, $\phi' = 25.7^\circ$	
Apparent Cohesion, $c' = 0.39$ (tsf)	
Test Date: 6/14/16	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00071	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.67
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.85 2.85 2.86
Dry Density (pcf)	15.6 16.0 16.3
Void Ratio	113.7 112.2 111.4
After Consolidation	
Diameter (in)	1.42 1.41 1.41
Height (in)	2.84 2.82 2.82
Water Content (%)	15.6 15.8 15.9
Dry Density (pcf)	117.7 117.3 117.0
Void Ratio	0.47 0.49 0.50
Back Pressure (tsf)	6.0 4.0 5.3
Minor Principal Stress (tsf)	1.50 2.00 2.50
Max. Deviator Stress (tsf)	3.03 3.41 3.52
Ultimate Deviator Stress (tsf)	3.03 3.40 3.49
Deviator Stress at Failure (tsf)	2.96 3.29 3.42
Max. Pore Pressure Buildup (tsf)	0.79 1.09 1.39
Pore Pressure Parameter "B"	0.95 0.95 0.95
Pct. Axial Strain at Failure	15.0 15.0 15.0

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



-----	Effective $\phi' : 25.7^\circ$	$c' = 0.39$ (tsf)
_____	Total $\phi : 11.0^\circ$	$c = 0.94$ (tsf)



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