

Figure 1 - Boring Locations (1/3)
Contract Drill
Various Locations - Eau Claire, WI
AET Project No. 31-20172
Date 11/15/2018



Figure 2 - Boring Locations (2/3)
Contract Drill
Various Locations - Eau Claire, WI
AET Project No. 31-20172
Date 11/15/2018



Figure 3 - Boring Locations (3/3)
Contract Drill
Various Locations - Eau Claire, WI
AET Project No. 31-20172
Date 11/15/2018





SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	FILL, silty sand with organics, fine to medium grained, a little gravel, dark brown, moist (SM)	TOPSOIL / FILL	10	M	SS	14					
2	FILL, sand with silt, fine to medium grained, a little gravel, brown, moist (SP-SM)	FILL									
3	SAND, fine to medium grained, brown, moist, loose to medium dense (SP)	COARSE ALLUVIUM	9	M	SS	3					
4											
5											
6			6	M	SS	18					
7											
8			12	M	SS	18					
9											
10	SAND, fine to medium grained, a little gravel, brown, moist, loose to medium dense (SP)		10	M	SS	18					
11											
12											
13			12	M	SS	14					
14											
15	No recovery. Possible cobbles present.		11		SS	0					
16											
17											
18	SAND, fine to medium grained, yellow and white, moist, very dense (SP)										
19											
20			80/9	M	SS	14					
End of boring at 20.9 feet											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-19.5'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		11/2/18	1205	21.5	19.5	20.9	None	None	
BORING COMPLETED: 11/2/18									
DR: GM LG: MH Rig: 67									

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SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	SILTY SAND with organics, fine grained, dark brown, moist, possible fill (SM)	TOPSOIL	11	M	SS	16					
2	SILTY SAND with gravel, fine grained, brown, moist, medium dense, possible fill (SM)	COARSE ALLUVIUM									
3	SAND, fine to medium grained, a little gravel, brown, moist, loose (SP)		8	M	SS	13					
4											
5	SAND with gravel, fine to medium grained, brown, moist, medium dense to dense, with apparent cobbles (SP)		18	M	SS	16					
6											
7			31	M	SS	14					
8											
9			50	M	SS	18					
10	Gravelly SAND, fine to medium grained, brown, moist, medium dense to very dense, with possible cobbles (SP)										
11			16	M	SS	14					
12											
13			56	M	SS	14					
14											
15											
16											
17											
18											
19	SAND, fine to medium grained, brown, moist, medium dense (SP)		13	M	SS	18					
20											
21											
End of boring at 21.5 feet											
DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG		
0-19.5' 3.25" HSA		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL			
		11/2/18	1135	21.5	19.5	21.2	None	None			
BORING COMPLETED: 11/2/18											
DR: GM LG: MH Rig: 67											

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18

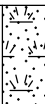







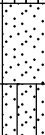



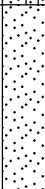



SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION		GEOLOGY	N	MC	SAMPLE TYPE		REC IN.	FIELD & LABORATORY TESTS					
	WC	qp				LL	PL		%-#200					
1	FILL, silty sand with organics, fine to medium grained, a little gravel, dark brown, moist, with wood debris (SM)			TOPSOIL / FILL	10	M		SS	4					
2	FILL, mixture of silt and silty sand, dark brown, moist			FILL	24	M		SS	22					
3														
4														
5	SILTY SAND, fine grained, dark brown to brown, moist, very loose to loose (SM)			COARSE ALLUVIUM	5	M		SS	20					
6														
7														
8														
9	Sandy SILT, brown, wet, very loose (ML)			FINE ALLUVIUM	3	W		SS	20					
10														
11														
12	SAND, fine grained, grayish brown, wet, very loose, with lenses of silt (SP)			COARSE ALLUVIUM	4	W		SS	17					
13														
14	SILTY SAND with gravel, fine grained, reddish brown, wet, very loose (SM)				36	M		SS	16					
15	SAND WITH SILT and gravel, fine to coarse grained, brown, moist, dense (SP-SM)													
16														
17	SAND, fine to medium grained, brown, moist to waterbearing, medium dense (SP)				18		M/W	SS	18					
18														
19														
20														
21														
End of boring at 21.5 feet														
DEPTH: DRILLING METHOD			WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG				
0-19.5' 3.25" HSA			DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL					
			11/2/18	1040	21.5	19.5	19.5	None	19.8					
			11/2/18	1100	21.5	19.5	19.9	None	19.8					
BORING COMPLETED: 11/2/18														
DR: GM LG: MH Rig: 67														

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	FILL, silty sand with organics, fine to medium grained, a little gravel, dark brown, moist (SM)	TOPSOIL / FILL FILL	5	M	SS	18					
2	FILL, sand, fine to medium grained, brown, moist, with lenses of fine grained clayey sand near 5.5 feet (SP)										
3			10	M	SS	18					
4											
5		COARSE ALLUVIUM	14	M	SS	20					
6											
7	SAND WITH SILT, fine grained, reddish brown, moist, loose (SP-SM)		6	M	SS	24					
8											
9											
10	Gravelly SAND WITH SILT, fine to coarse grained, dark brown, moist, very dense (SP-SM)		66	M	SS	8					
11											
12											
13	SAND with gravel, fine to medium grained, brown, moist, dense (SP)		33	M	SS	12					
14											
15	No recovery. Possible cobbles present.		23		SS	0					
16											
17											
18	SAND with gravel, fine to medium grained, brown, moist, dense (SP)		47	M	SS	10					
19											
20											
21											
End of boring at 21.5 feet											
DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG		
0-19.5' 3.25" HSA		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL			
		11/2/18	0945	21.5	19.5	21.4	None	None			
BORING COMPLETED: 11/2/18											
DR: GM LG: MH Rig: 67											

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



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SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-5A (p. 1 of 2)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	FILL, silty sand with organics, fine to medium grained, very dark brown, moist (SM) FILL, silty sand, fine to medium grained, very dark brown, moist, with slag debris (SM)	TOPSOIL / FILL FILL	7	M	SS	20					
2											
3			3	M	SS	4					
4											
5	FILL, silty sand, fine grained, dark brown, moist, with glass debris (SM)		3	M	SS	12					
6											
7	SAND, fine to medium grained, a little gravel, brown, moist, medium dense (SP)	COARSE ALLUVIUM									
8			14	M	SS	14					
9											
10			16	M	SS	18					
11											
12											
13			24	M	SS	10					
14											
15	SAND, fine to medium grained, brown, moist to waterbearing, loose to medium dense (SP)		14	M	SS	16					
16											
17											
18											
19											
20											
21			6	W	SS	20					
22											
23											
24											
	Sandy SILT, brown, waterbearing, medium dense (ML)	FINE ALLUVIUM									

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-19.5'	3.25" HSA								
19.5-49.5'	RD w/DM	11/1/18	1245	21.5	19.5	18.0	None	17.0	
		11/1/18	1315	21.5	19.5	17.8	None	15.8	
BORING COMPLETED: 11/1/18									
DR: GM LG: MH Rig: 67									

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-5A (p. 2 of 2)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
26	Sandy SILT, brown, waterbearing, medium dense (ML) <i>(continued)</i>	FINE ALLUVIUM <i>(continued)</i>	13	W	SS	19					
27											
28	SAND, fine to medium grained, brown, waterbearing, medium dense (SP)	COARSE ALLUVIUM	18	W	SS	14					
29											
30											
31											
32											
33											
34											
35											
36			15	W	SS	10					
37											
38											
39											
40											
41			18	W	SS	12					
42											
43											
44											
45											
46			23	W	SS	12					
47											
48											
49											
50											
51			26	W	SS	14					
51.5											
	End of boring at 51.5 feet										

AET_CORP_31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-5B (p. 1 of 2)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	FILL, silty sand with organics, fine grained, very dark brown, moist, with slag debris (SM) SILTY SAND, fine grained, dark brown, moist, very loose to loose, with trace roots, possible fill (SM)	TOPSOIL / FILL COARSE ALLUVIUM	5	M	SS	19					
2											
3			3	M	SS	16					
4											
5	SAND, fine to medium grained, reddish brown, moist, very loose to medium dense (SP)		4	M	SS	18					
6											
7											
8	Gravelly SAND, fine to coarse grained, brown, moist, medium dense to dense (SP)		13	M	SS	18					
9											
10			34	M	SS	16					
11											
12	No recovery. Possible cobbles present.										
13			17		SS	0					
14											
15	Gravelly SILTY SAND, fine to coarse grained, reddish brown, moist, dense (SM)		38	M	SS	12					
16											
17	SAND, fine to medium grained, a little gravel, brown, moist to waterbearing, medium dense to dense (SP)										
18											
19											
20			26	M	SS	18					
21											
22											
23	SAND, fine to medium grained, brown, waterbearing, medium dense (SP)										
24											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-19.5'	3.25" HSA								
19.5-49.5'	RD w/DM	11/1/18	1450	21.5	19.5	20.9	None	20.8	
		11/1/18	1510	21.5	19.5	20.9	None	20.8	
BORING COMPLETED: 11/1/18									
DR: GM LG: MH Rig: 67									

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-5B (p. 2 of 2)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
26	SAND, fine to medium grained, brown, waterbearing, medium dense (SP) <i>(continued)</i>		25	W	SS	16					
27											
28	No recovery. Apparent cobbles.										
29											
30											
31			33		SS	0					
32											
33											
34	SAND, fine to medium grained, brown, waterbearing, medium dense to dense (SP)										
35											
36			40	W	SS	14					
37											
38											
39											
40											
41			15	W	SS	112					
42											
43											
44											
45											
46			16	W	SS	12					
47											
48											
49											
50											
51			43	W	SS	9					
	End of boring at 51.5 feet										

AET_CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



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SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-5C (p. 1 of 2)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	FILL, silty sand with organics, fine to medium grained, dark brown, moist (SM)	TOPSOIL / FILL FILL	4	M	SS	18					
2	FILL, sand, fine to medium grained, a little gravel, brown, moist (SP)										
3	FILL, silty sand, fine to medium grained, a little gravel, dark brown, moist, with shingle and cinder debris (SM)		3	M	SS	10					
4											
5	FILL, silt, gray and reddish brown, moist (ML)	FINE ALLUVIUM	5	M	SS	20					
6											
7	SILT with sand, dark brown, moist, loose, with trace roots, possible fill (ML)		5	M	SS	20					
8											
9		COARSE ALLUVIUM									
10	Gravelly SAND WITH SILT, fine to medium grained, brown, moist, very dense (SP-SM)		56	M	SS	14					
11											
12	SAND, fine to medium grained, a little gravel, reddish brown, moist to waterbearing, medium dense (SP)		21	M	SS	16					
13											
14											
15											
16			18	M	SS	20					
17											
18											
19											
20											
21			12	W	SS	12					
22											
23											
24											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-19.5'	3.25" HSA								
19.5-49.5'	RD w/DM	11/1/18	0900	21.5	19.5	19.0	None	18.4	
		11/1/18	0910	21.5	19.5	18.8	None	17.6	
BORING COMPLETED: 11/1/18									
DR: GM LG: MH Rig: 67									

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-5C (p. 2 of 2)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
								WC	qp	LL	PL	%-#200	
26	SILTY SAND, fine grained, brown, waterbearing, medium dense (SM)			19	W		SS	15					
27													
28	SAND, fine to medium grained, brown, waterbearing, medium dense (SP)												
29													
30				20	W		SS	16					
31													
32													
33													
34													
35													
36				15	W		SS	14					
37													
38													
39													
40				11	W		SS	12					
41													
42													
43													
44													
45													
46				15	W		SS	12					
47													
48													
49													
50				24	W		SS	12					
51													
End of boring at 51.5 feet													

AET_CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



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SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	FILL, silty sand with organics, fine to medium grained, dark brown, moist (SM)	TOPSOIL / FILL FILL	4	M	SS	15					
2	FILL, mixture of sand and silty sand, fine to medium grained, a little gravel, brown, moist										
3			5	M	SS	15					
4	FILL, silty sand, fine to medium grained, a little gravel, dark brown to brown, moist, with concrete debris near 9 feet (SM)										
5											
6			2	M	SS	15					
7											
8			3	M	SS	15					
9											
10	SAND WITH SILT, fine to medium grained, brown, moist, loose, with wood debris, possible fill (SP-SM)	COARSE ALLUVIUM	5	M	SS	12					
11											
12	SAND, fine to medium grained, light brown, moist, loose, possible fill (SP)		9	M	SS	15					
13											
14											
15	SILTY SAND, fine grained, brown with reddish brown mottling, moist to wet, very loose (SM)		4	M/W	SS	18					
16											
17											
18	SAND, fine to medium grained, brown, waterbearing, loose (SP)										
19											
20			5	W	SS	18					
21											
End of boring at 21.5 feet											
DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG		
0-19.5' 3.25" HSA		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL			
		11/12/18	1020	21.5	19.5	19.9	None	19.8			
		11/12/18	1025	21.5	19.5	19.9	None	19.8			
BORING COMPLETED: 11/12/18											
DR: GM LG: TP Rig: 30											

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18



SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
1	FILL, silty sand with organics, fine to medium grained, dark brown, moist (SM)	TOPSOIL / FILL FILL	7	M	SS	12					
2	FILL, silty sand with gravel, fine to coarse grained, very dark brown, moist (SM)										
3	FILL, silty sand, fine to medium grained, a little gravel, brown, moist (SM)		12	M	SS	4					
4											
5	FILL, silty sand, fine to medium grained, very dark brown, moist (SM)	COARSE ALLUVIUM	3	M	SS	12					
6											
7	FILL, silty sand, fine to medium grained, dark brown and brown, waterbearing, with wood debris near 10 feet and lenses of clay (SM)		3	W	SS	15					
8											
9											
10	Wire encountered (wrapped around auger) within the fill soils at unknown depth.		3	W	SS	8					
11											
12	SILTY SAND, fine to medium grained, a little gravel, dark brown, waterbearing, medium dense, with trace roots (SM)		11	W	SS	6					
13											
14	Gravelly SAND WITH SILT, fine to medium grained, grayish brown, waterbearing, medium dense (SP-SM)		25	W	SS	12					
15											
16											
17											
18	SAND, fine to coarse grained, a little gravel, grayish brown, waterbearing, loose (SP)		9	W	SS	12					
19											
20											
21											
End of boring at 21.5 feet											
DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG		
0-19.5' 3.25" HSA		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL			
		11/12/18	1150	21.5	19.5	18.3	None	15.0			
		11/12/18	1200	21.5	19.5	18.3	None	15.0			
BORING COMPLETED: 11/12/18											
DR: GM LG: TP Rig: 30											

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18















SUBSURFACE BORING LOG

AET JOB NO: **31-20172**

LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **Contract Drill; Various Locations; Eau Claire, Wisconsin**

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS						
							WC	qp	LL	PL	%-#200		
1	FILL, silty sand with gravel, fine to medium grained, brown, moist (SM)	FILL	8	M		SS	15						
2	FILL, sand, fine to medium grained, brown, moist (SP)												
3	FILL, sand with silt, fine to medium grained, brown, moist (SP-SM)												
4													
5	SAND, fine to medium grained, grayish brown to gray, moist to wet, very loose (SP)	COARSE ALLUVIUM	4	M		SS	24						
6													
7													
8													
9			2	W		SS	18						
10	SILT, dark brown to brown to gray, moist to waterbearing, very loose to loose at 15 feet, with laminations of sand (ML)	FINE ALLUVIUM	2	M		SS	20						
11													
12													
13													
14			2	W		SS	20						
15													
16	Gravelly SILTY SAND, fine to medium grained, grayish brown, waterbearing, medium dense (SM)	COARSE ALLUVIUM	24	W		SS	20						
17													
18													
19	Gravelly SAND, fine to coarse grained, grayish brown, waterbearing, medium dense (SP)												
20													
21			21	W		SS	16						
End of boring at 21.5 feet													
DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG				
0-19.5' 3.25" HSA		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL					
		11/12/18	1250	21.5	19.5	18.6	None	12.0					
		11/12/18	1310	21.5	19.5	18.3	None	11.5					
BORING COMPLETED: 11/12/18													
DR: GM LG: TP Rig: 30													

AET CORP 31-20172 - CONTRACT DRILL - CITY EC.GPJ AET+CPT+WELL.GDT 11/15/18

FIELD EXPLORATION NOTES

A.1 FIELD EXPLORATION

The subsurface conditions at the site(s) were explored by drilling standard penetration test borings. The boring locations are shown on the attached figure(s).

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS)

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. After an initial set of 6 inches, the number of hammer blows to drive the sampler the next 12 inches is known as the standard penetration resistance or N-value.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of its potential energy due to the friction inherent in that system. That converted energy provided what is known as an N_{60} blow count.

Most drill rigs today incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional N_{60} values. We use a Pile Driving Analyzer (PDA) and an instrumented rod to measure the actual energy generated by the automatic hammer system. The drill rigs (AET rig numbers 30 and 67) we used for this project have measured energy transfer ratios of 90%. The N-values reported on the boring logs and the corresponding relative densities and consistencies are from the field blow counts and have not been adjusted to N_{60} values.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as “DS” or “SU” on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of “topsoil” layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification System (USCS). The USCS is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USCS, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

FIELD EXPLORATION NOTES

A.4 WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under “Water Level Measurements” on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

A.5 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.6 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS	
Symbol	Definition
B, H, N:	Size of flush-joint casing
CA:	Crew Assistant (initials)
CAS:	Pipe casing, number indicates nominal diameter in inches
CC:	Crew Chief (initials)
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RD:	Rotary drilling with fluid and roller or drag bit
REC:	In split-spoon (see notes) and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
REV:	Revert drilling fluid
SS:	Standard split-spoon sampler (steel; 1" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid
WH:	Sampler advanced by static weight of drill rod and 140-pound hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS	
Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q _p :	Pocket Penetrometer strength, tsf (<u>approximate</u>)
q _c :	Static cone bearing pressure, tsf
q _u :	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VS _R :	Vane shear strength, remolded (field), psf
VS _U :	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES

The standard penetration test consists of driving the sampler with a 140 pound hammer and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

UNIFIED SOIL CLASSIFICATION SYSTEM

ASTM Designations: D 2487, D2488

**AMERICAN
ENGINEERING
TESTING, INC.**



Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well graded gravel ^F
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel ^F
	Gravels with Fines more than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F,G,H}	
		Fines classify as CL or CH	GC	Clayey gravel ^{F,G,H}	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand ^I
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly-graded sand ^I
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Sils and Clays Liquid limit less than 50	inorganic	Fines classify as ML or MH	SM	Silty sand ^{G,H,I}
			Fines classify as CL or CH	SC	Clayey sand ^{G,H,I}
		organic	PI > 7 and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}
			PI < 4 or plots below "A" line ^J	ML	Silt ^{K,L,M}
	Sils and Clays Liquid limit 50 or more	inorganic	Liquid limit – oven dried < 0.75 Liquid limit – not dried	OL	Organic clay ^{K,L,M,N}
					Organic silt ^{K,L,M,O}
		organic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}
			PI plots below "A" line	MH	Elastic silt ^{K,L,M}
Highly organic soil		Liquid limit – oven dried < 0.75 Liquid limit – not dried	OH	Organic clay ^{K,L,M,P}	
				Organic silt ^{K,L,M,Q}	
			PT	Peat ^R	

^ABased on the material passing the 3-in (75-mm) sieve.

^BIf field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^CGravels with 5 to 12% fines require dual symbols:

GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

^DSands with 5 to 12% fines require dual symbols:

SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

^E $Cu = D_{60} / D_{10}$, $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

^FIf soil contains $\geq 15\%$ sand, add "with sand" to group name.

^GIf fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^HIf fines are organic, add "with organic fines" to group name.

^IIf soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^JIf Atterberg limits plot is hatched area, soil is a CL-ML silty clay.

^KIf soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.

^LIf soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.

^MIf soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^NPI ≥ 4 and plots on or above "A" line.

^OPI < 4 or plots below "A" line.

^PPI plots on or above "A" line.

^QPI plots below "A" line.

^RFiber Content description shown below.

SIEVE ANALYSIS

Equation of "A"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Equation of "U"-line
Vertical at LL = 16 to PI = 7,
then PI = 0.9 (LL-8)

$Cu = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{2.5^2}{0.075 \times 15} = 5.6$

Plasticity Chart

For classification of fine-grained soils and fine-grained fraction of coarse-grained soils.

Equation of "A"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Equation of "U"-line
Vertical at LL = 16 to PI = 7,
then PI = 0.9 (LL-8)

Equation of "CL"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Equation of "CH"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Equation of "ML"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Equation of "MH"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Equation of "OH"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

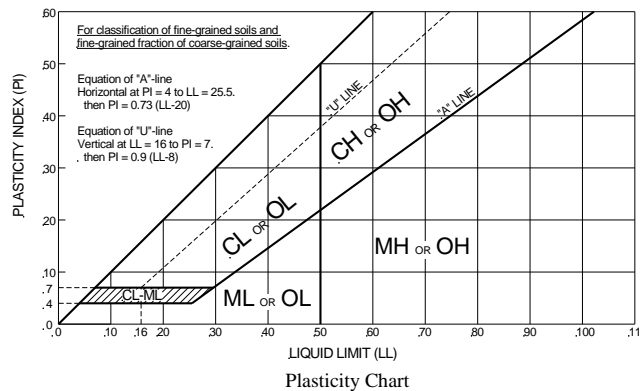
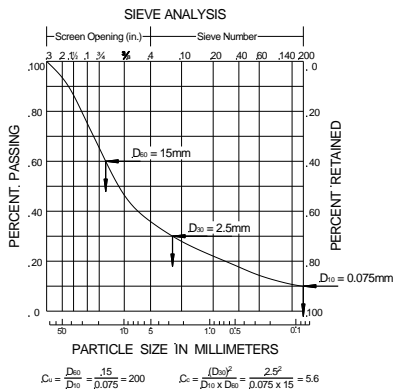
Equation of "OL"-line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Equation of "CL-ML" line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL-20)

Notes
^ABased on the material passing the 3-in (75-mm) sieve.
^BIf field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
^CGravels with 5 to 12% fines require dual symbols:
 GW-GM well-graded gravel with silt
 GW-GC well-graded gravel with clay
 GP-GM poorly graded gravel with silt
 GP-GC poorly graded gravel with clay
^DSands with 5 to 12% fines require dual symbols:
 SW-SM well-graded sand with silt
 SW-SC well-graded sand with clay
 SP-SM poorly graded sand with silt
 SP-SC poorly graded sand with clay

$$^E C_u = D_{60} / D_{10}, \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^FIf soil contains $\geq 15\%$ sand, add "with sand" to group name.
^GIf fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
^HIf fines are organic, add "with organic fines" to group name.
^IIf soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
^JIf Atterberg limits plot is hatched area, soil is a CL-ML silty clay.
^KIf soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.
^LIf soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
^MIf soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.
^NPI ≥ 4 and plots on or above "A" line.
^OPI < 4 or plots below "A" line.
^PPI plots on or above "A" line.
^QPI plots below "A" line.
^RFiber Content description shown below.



ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size		Gravel Percentages		Consistency of Plastic Soils		Relative Density of Non-Plastic Soils	
Term	Particle Size	Term	Percent	Term	N-Value, BPF	Term	N-Value, BPF
Boulders	Over 12"	A Little Gravel	3% - 14%	Very Soft	less than 2	Very Loose	0 - 4
Cobbles	3" to 12"	With Gravel	15% - 29%	Soft	2 - 4	Loose	5 - 10
Gravel	#4 sieve to 3"	Gravelly	30% - 50%	Firm	5 - 8	Medium Dense	11 - 30
Sand	#200 to #4 sieve			Stiff	9 - 15	Dense	31 - 50
Fines (silt & clay)	Pass #200 sieve			Very Stiff	16 - 30	Very Dense	Greater than 50
				Hard	Greater than 30		
Moisture/Frost Condition		Layering Notes		Peat Description		Organic Description (if no lab tests)	
(MC Column)							
D (Dry):	Absence of moisture, dusty, dry to touch.	Laminations:	Layers less than 1/2" thick of differing material or color.	Term	Fiber Content (Visual Estimate)	Soils are described as <i>organic</i> , if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. <i>Slightly organic</i> used for borderline cases.	
M (Moist):	Damp, although free water not visible. Soil may still have a high water content (over "optimum").			Fibric Peat:	Greater than 67%	Root Inclusions	
W (Wet/ Waterbearing):	Free water visible, intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.	Lenses:	Pockets or layers greater than 1/2" thick of differing material or color.	Hemic Peat:	33 - 67%	With roots: Judged to have sufficient quantity of roots to influence the soil properties.	
F (Frozen):	Soil frozen			Sapric Peat:	Less than 33%	Trace roots: Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.	