



**APPENDIX A.2
PIEZOMETER BORING LOGS
ECPZ-1 THROUGH ECPZ-3**

PIEZOMETER BORING LOG

CLIENT: Confidential SITE NAME: Cottage Grove, MN Facility PROJECT NO.: 02181-002-050-0001 Area Name: East Cove Drilling Contractor: American Engineering Testing Drilling Equipment: Hollow Stem Auger/Mud Rotary Logged By: John Hunter Area Description: East Cove Boring on hill, along access road to East Cove, approximately 200 feet west of EWS	ELEVATION (LOC): 762.92 ELEVATION (GND): 760.79 NORTHING: 4959007.286350 EASTING: 508364.500710 Depth to Water (ft bgs): 71 Total Boring Depth (ft bgs): 182 Depth to Refusal (ft bgs): na Boring Diameter (inches): 8	Location Type: () GeoProbe () Well () Soil Boring (X) Other: PIEZOMETER Completion Zone: (X) Overburden () Bedrock Completion Type: () Monitoring Well () Abandoned by Grout (X) Other (Provide Comments): PIEZOMETER	Page 1 of 1 DATE / (TIME): 7 July 2008 SITE ID: ECPZ 01
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Interval	Blow Count			Recovery	Moisture	Color	Grain Size					Consistency	Sample Interval	Column	Lithologic Description	
	6"	6"	6"				Gr	S	SI	Cl	O					
0-0.5	5	7	5	50	Dry	Munsell	10YR	3/6	25	75					Firm	Dark yellowish brown sandy silt TOPSOIL, rooty
0.5-2	5	8	10	75	Dry	7.5YR	7/8	90	10						Firm	Dark yellowish brown sandy silt
4-6	5	8	10	75	Dry	7.5YR	7/8	10	90						Firm	Reddish yellow f.g. SAND
10-12	5	12	15	60	Mst			10	90						Loose	Reddish yellow f.g. SAND with gravel
15-18	4	4	6	8	75	Mst			99	1					Loose	Reddish yellow f.g. SAND
20-22	4	9	11	18	75	Mst			99	1					Loose	Reddish yellow f.g. SAND
25-27	4	4	12	16	75	Mst			99	1					Loose	Reddish yellow f.g. SAND
30-32	8	8	8	11	75	Mst			99	1					Loose	Reddish yellow f.g. SAND
35-37	8	16	20	24	75	Mst			99	1					Loose	Reddish yellow f.g. to mg SAND
40-42	8	10	12	14	75	Mst			99	1					Loose	Reddish yellow f.g. to mg SAND
45-47	5	7	8	10	75	Mst			99	1					Loose	Reddish yellow f.g. to mg SAND
50-52	14	20	32	36	75	Mst			99	1					Loose	Reddish yellow f.g. SAND
55-57	8	12	21	32	75	Mst			99	1					Loose	Reddish yellow f.g. to mg SAND, trace gravel
60-62	11	17	22	29	75	Mst			99	1					Loose	Reddish yellow f.g. to mg SAND, trace gravel
65-67	11	18	19	24	75	Mst			99	1					Loose	Reddish yellow f.g. to mg SAND, trace gravel
70-72	14	14	16	18	75	Wet			99	1					Loose	Reddish yellow f.g. to mg SAND, trace gravel
75-77	2	10	17	18	75	Wet			99	1					Loose	Reddish yellow f.g. to mg SAND, trace gravel
80-82	19	20	20	22	50	Wet			99	1					Loose	Reddish yellow f.g. to mg SAND, trace gravel
85-87	12	16	24	25	50	Wet			40	60					Loose	Reddish yellow f.g. to mg SAND, trace gravel
90-92	13	16	12	8	40	Wet			50	50					Loose	Reddish yellow f.g. to mg SAND, trace gravel
95-97	20	12	10	11	50	Wet			50	50					Loose	Reddish yellow gravelly SAND, gravel large, angular to sub-angular
100-102	11	10	18	19	100	Wet	7.5YR	7/4	95	5					Loose	Reddish yellow gravelly SAND, gravel large, angular to sub-angular
105-107	10	13	12	14	75	Wet			5	95					Loose	Pink f.g. to mg SAND, grading to f.g. at 102 fbs
110-112	26	34	44	47	100	Wet			99	1					Loose	Pink f.g. to mg SAND, trace gravel
115-117	26	51	75	RF	10	Wet			50	50					Loose	Pink f.g. to mg SAND, trace gravel
120-122	19	18	27	43	50	Wet			25	75					Loose	Pink sandy GRAVEL, cobble size gravel in stone of spoon
125-127	24	23	26	42	100	Wet	5YR	3/4	99	1					Loose	Pink gravelly f.g. to mg SAND, poorly sorted
130-132	32	33	37	100	Wet				99	1					Loose	Dark reddish brown f.g. to mg SAND, speckled (possibly due to poly lithic grains)
135-137	41	34	37	40	100	Wet			99	1					Loose	Dark reddish brown f.g. to mg SAND, speckled (possibly due to poly lithic grains)
140-142	46	31	27	26	100	Wet	7.5YR	3/4	99	1					Loose	Dark brown v.e.g. to mg, speckled SAND (suspected to be poly lithic - Drift Sediments)
145-147	25	30	24	25	100	Wet			99	1					Loose	Dark brown v.e.g. to mg, speckled SAND, GOING TO 10 FOOT SAMPLE INTERVALS
155-157	26	32	34	38	100	Wet			99	1					Loose	Dark brown v.e.g. to mg, speckled SAND (suspected to be poly lithic - Drift Sediments)
165-167	119	120	RF	RF	10	Wet									Firm	Drillers Note: Bedrock at 162 fbs, SANDSTONE, white to very pale brown f.g. sand, well sorted, friable
170-172	22	28	33	54	100	Mst	10YR	5/8	50	50					Firm	Yellowish brown clayey SILT with gray interbeds
175-177	159	56	35	29	75	Dry			10	50	40				Firm	Very pale brown silty CLAY with sandstone and limestone fragments, possible near contact mix zone
180-182	24	44	RF	RF	10	Dry			30	35	35				Firm	Very pale brown sandy silty CLAY with weathered SANDSTONE fragments

Moisture: Dry, Moist (Mst), Wet, Saturated (Sat) f.g., m.g., e.g.: Fine, Medium, and Course-grained
 RF: Spoon refusal
 fbs.: feet below ground surface or subunit surface
 Consistency: Very Soft (V. SF), Soft, Firm, Very Firm (V. Fm), Loose

PIEZOMETER BORING LOG

SITE ID: ECPZ 02

Page 1 of 1 DATE (TIME): 28 June 2006

CLIENT:	Confidential
SITE NAME:	Cottage Grove, MN
PROJECT NO.:	02181-002-050-0001
Area Name:	East Cove
Drilling Contractor:	American Engineering Testing
Drilling Equipment:	Hollow Stem Auger
Logged By:	T. Fritsak
Area Description:	East Cove
ELEVATION (TOC):	691.75
ELEVATION (GND):	689.09
NORTHING:	4956935.471820
EASTING:	508452.100801
Depth to Water (ft bgs):	0.53 above grade
Total Boring Depth (ft bgs):	46.5
Depth to Refusal (ft bgs):	na
Boring Diameter (inches):	8
Location Type: () Geoprobe () Well	
() Soil Boring (X) Other: PIEZOMETER	
Completion Zone: (X) Overburden () Bedrock	
Completion Type: () Monitoring Well	
() Abandoned by Grout	
(X) Other (Provide Comments) PIEZOMETER	

Interval	Sample Interval (ft bgs)	Blow Count	Recovery	Moisture	Color	Grain Size					Consistency	Sample Interval (ft bgs)	Column	Lithologic Description
						Gr	S	SI	Cl	O				
0-2	0 1.4 1 4 1 2 1.4	1 2 1.4	Dry	10YR 4/4	2 85 10 3	Firm						Dark yellowish brown SAND, rooty 0-0.4.		
2-4	2 2.8 3 3 2 4 1.4	3 2 4 1.4	Wet	10YR 4/4	5 90 4 1	Soft						Dark yellowish brown c.g. SAND, poorly sorted, with gravel to 1 inch.		
4-6	2.8 3.4 4 4.2 R H 0.2	R H 0.2	Sat	10YR 5/4	95 4 1	Soft						Yellowish brown m.g. to c.g. SAND		
6-8	6 6.4 1 1 1 1.8	1 1 1.8	Sat	10YR 2/1	95 4 1	Soft						Black m.g. to c.g. SAND in shoe		
8-10	8 9.7 H 1 1 2 1.7	H 1 1 2 1.7	Sat	10YR 2/1	80 10 5 5	Soft						Black m.g. to c.g. SAND with few silt, locally sludge-like texture, odors		
10-12	10 10.8 H 1 2 3 1.8	H 1 2 3 1.8	Sat	10YR 2/1	95 4 1	Loose						Black m.g. to c.g. SAND, well sorted, slight odor		
12-14	10.8 11.8 12 13.1 2 2 3 4 1.7	2 2 3 4 1.7	Sat	10YR 3/2	60 15 5 20	Soft						Black silt, organic SAND, organics fine-grained, locally, fibrous		
14-16	13.1 13.7 14 15.8 4 3 3 3 1.8	3 3 3 1.8	Sat	10YR 3/4	60 15 5 20	Soft						As above		
19.5-21.5	19.5 20.5 H 1 1 2 1	H 1 1 2 1	Sat	10YR 4/4	60 15 5 20	Soft						Very dark grayish brown m.g. to c.g. SAND to silt, SAND, moderate to well sorted		
24.5-26.5	24.5 24.9 3 3 4 2 0.4	3 3 4 2 0.4	Sat	10YR 5/4	80 15 2 3	Soft						As above		
29.5-31.5	29.5 30.5 5 3 4 4 1	5 3 4 4 1	Sat	10YR 5/4	80 15 2 3	Soft						Dark yellowish brown m.g. to c.g. SAND with trace gravel to 0.25 inches.		
34.5-36.5	34.5 34.9 11 13 14 18 1.3	11 13 14 18 1.3	Sat	10YR 3/4	2 90 6 2	Soft						Dark yellowish brown m.g. to c.g. SAND with trace gravel to 0.25 inches.		
39.5-41.5	39.5 40.6 8 9 10 14 1.4	8 9 10 14 1.4	Sat	10YR 5/4	2 90 6 2	Soft						Dark yellowish brown f.g. to v.c.g. SAND, polyhedral with trace gravel (DRIFT)		
44.5-46.5	40.6 40.9 44.5 46.3 14 26 26 23 1.8	14 26 26 23 1.8	Sat	5YR 3/4	94 3	Loose						Yellowish brown gravelly m.g. to v.c.g. SAND, polyhedral, rounded to subangular		
					30 68 2	Loose						Yellowish brown gravelly m.g. to v.c.g. SAND, polyhedral, rounded to subangular		
					10 88 2	Loose						Yellowish brown gravelly m.g. to v.c.g. SAND, polyhedral, rounded to subangular		
					50 48 22	Loose						Yellowish brown sandy gravel up to 1.5 inches, rounded to sub-rounded, sand polyhedral, m.g. to c.g.		
					1 98 1	Loose						Yellowish brown m.g. to c.g. sand, polyhedral and quartz, well sorted, rounded to sub-rounded.		
					2 97 1	Loose						Note: drilling across 37-39 feet indicated high percentage of gravel in soil.		
					50 48 2	Loose						Yellowish brown m.g. to c.g. sand, polyhedral and quartz, well sorted, rounded to sub-rounded.		
					99 1	Loose						Yellowish brown sandy gravel up to 1.5 inches, abundant angular clasts of oolitic dolostone, sand with black FeO staining. Suspected to be near lithologic contact. Will drill another five feet to evaluate.		
						Loose						Dark reddish brown, well sorted m.g. polyhedral sand		
						Loose						Boring terminated at 46.5 ft bgs		

Comments: PZ 02 was originally proposed to be constructed within the cove. After evaluation of the groundwater monitoring system, it was decided to move the point closer to EW 02, resulting in movement of the piezometer out of the cove onto the west bank. Groundwater is artesian at this location.

ft bgs - feet below ground surface or sediment surface

ft bgs - feet below ground surface or sediment surface

ft bgs - feet below ground surface or sediment surface

Consistency: Very Soft (V. St), Soft, Firm, Very Firm (V. Firm), Loose

PIEZOMETER BORING LOG

SITE ID: ECPZ 03

Page 1 of 1 DATE / (TIME): 27 June 2006

CLIENT: Confidential
 SITE NAME: Cottage Grove, MN
 PROJECT NO.: 02181-002-050-0001
 Area Name: East Cove
 Drilling Contractor: American Engineering Testing
 Drilling Equipment: Hollow Stem Auger
 Logged By: T. Frinak
 Area Description: East Cove
 Depth to Sediment = 0.35 ft below top-of-water
 Boring on east side of cove. Groundwater artesian approximately 2.09 feet above top-of-sediment.

ELEVATION (TOC) 689.22
 ELEVATION (GND) 686.54
 NORTHING: 4958934.945160
 EASTING: 508518.322616
 Depth to Water (ft bgs) 2.09 above grade
 Total Boring Depth (ft bgs) 41
 Depth to Refusal (ft bgs) na
 Boring Diameter (inches) 8

Location Type: () Geoprobe () Well
 () Soil Boring (X) Other: PIEZOMETER
 Completion Zone: (X) Overburden () Bedrock
 Completion Type: () Monitoring Well
 () Abandoned by Owner
 (X) Other (Provide Comments) PIEZOMETER

Interval	Sample Interval (ft bgs)	Blow Count			Recovery (ft)	Moisture	Color	Grain Size					Consistency	Sample Interval	Column	Lithologic Description
		6"	6"	6"				Gr	S	SI	CI	O				
0-2	0	H	H	H	1	Sat	10YR 2/1	90	6	2	2	2	Soft	ftgs		Black c.g. to v.c.g. SAND with few silt and trace clay and organic particles, slight odor, roots at surface.
2-4	2	R	R	R	0.1											No Recovery, believed to have intercepted the silt-like sediment.
4-6	4	R	R	R	0.1	Sat	Gley 2.5/N	80	15	5	5	5	V. soft			Black mucky SILT with few clay and trace organics, very low consistency, odor
6-8	6	R	H	4	1	Sat	Gley 4/N	80	10	5	5	5	Soft			Dark Gray f.g. to v.f.g. SAND with few amounts of silt and trace clay and organics
8-10	8	H	H	1	1.8	Sat	Gley 4/N	90	5	1	1	1	Loose			Dark gray c.g. to v.c.g. SAND with trace amounts of gravel, silt, clay, and organics, graded bedding
10-12	10	H	H	1	1.2	Sat	10YR 3/1	90	6	2	2	2	Loose			Dark gray m.g. to c.g. SAND grading with depth to v.c.g. SAND with trace amounts of gravel at 9 ftgs
12-14	12	H	H	1	1	Sat	10YR 3/1	90	6	2	2	2	Loose			Dark gray m.g. to c.g. SAND
14-16	14	H	H	2	1.5	Sat	10YR 3/1	70	15	5	10	10	Soft			Very dark gray interbedded m.g. SAND, m.g. to c.g. SAND, and m.g. to c.g. SAND with few organics (peat)
	14.3							4	92	3	1	1	Loose			v.c.g. SAND with trace amounts of gravel
	14.7							2	95	2	1	1	Loose			Very dark gray v.c.g. SAND with trace amounts of gravel to 0.4 inches
	14.7							5	60	5	30	30	Soft			Very dark gray SILT, organic, silty texture interbedded with f.g. to m.g. organic SAND
	19	20.2	1	2	4	Sat	2.5YR 3/2	52	20	3	25	25	Loose			Very dark gray v.c.g. SAND with trace amounts of gravel, sharp lower contact
	20.2	20.8						30	15	55	55	Soft				Very dark gray c.g. SAND, organic, silty grading to
	24	24.2	9	12	11	8	0.2	10YR 4/6	40	50	8	2	Loose			Dark gray peaty SAND with interbeds of sandy PEAT
	29	29.4	1	3	2	1	1.8	10YR 4/4	60	60	10	10	Loose			Dusky red v.f.g. sandy SILT, trace organics transitioning to brown f.g. to m.g. SAND with interbeds of sandy silt
	34	34.2	3	2	3	0.2	10YR 4/4	50	50	5	5	5	Loose			Brown v.c.g. SAND, polythitic, well sorted, gravel polythitic with some Plateville Limestone gravel.
	37							10YR 4/3					Loose			Dark yellowish brown v.c.g. gravelly SAND, gravel up to 1.5 inches, block shoe. Drilling indicated gravelly drilling at approximately 25 to 26 ftgs, polythitic sand
	39	40.5	4	6	7	1.5	2.5YR 4/4	98	2				Soft			Dark yellowish brown c.g. SAND, poorly sorted and polythitic with gravel up to 0.5 inches
													Loose			Dark yellowish brown c.g. SAND grading to very poorly sorted m.g. to c.g. silty SAND
													Loose			Dark yellowish brown v.c.g. SAND with gravel, polythitic
													Soft			Drillers indicate a change in drilling at this depth
													Soft			Reddish brown m.g. SAND well sorted, polythitic (20% lithics / 80% quartz)
													Soft			BORING TERMINATED AT 41 FTGS.

Comments: PZ 03 is located within the East Cove, approximately 40 feet from the east shore. Groundwater is artesian at this location.

Fig.: ft below ground surface or sediment surface
 E.g., m.g.: c.g.: f.nc.: Midnum- and Cause-grained
 Moisture: Dry, Moist (Mst), Wet, Saturated (Sat)
 Consistency: Very Soft (V. Stf), Soft, Firm, Very Firm (V. Frm), Loose