



AMERICAN
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CONSULTANTS
• GEOTECHNICAL
• MATERIALS
• ENVIRONMENTAL

May 26, 2004

Yaggy Colby Associates
717 3rd Avenue SE
Rochester, MN 55904

Attn: Dale Allen

RE: Geotechnical Services
Stewartville Industrial Park
Stewartville, MN
YCA#8473
AET #11-02858

Dear Mr. Allen:

Introduction

This report concerns the subsurface exploration program we recently completed for the above reference project in Stewartville, Minnesota.

Scope of Services

The scope of the work as requested by you on May 5, 2004 and summarized in this report consisted of advancing fourteen (14) borings at the staked locations as indicated on the attached sketch and completing the typed boring logs.

Subsurface Exploration

General

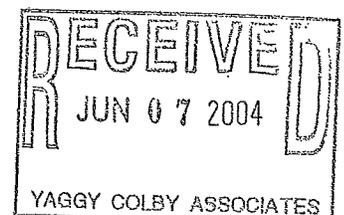
The subsurface exploration program included advancing fourteen (14) borings at the project site. Ground surface elevation at the boring locations were provided by the project surveyor.

Drilling Methods

The flight auger test borings were drilled using 6" solid-stem flight augers.

Boring Closure

Bore holes were backfilled with on-site materials or grouted as indicated. Some settlement may occur; final closure of the holes is the responsibility of the client.



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Sampling Methods

Flight Auger (FA)

Soil samples were taken directly from the flights of the auger, which results in the samples being disturbed. Because of the disturbed method of sampling, the layering of soil types and contact depths between these layers should be considered approximate.

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.

Classification Methods

Soil classifications shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM:D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, classifications per ASTM:D2487 are possible. Otherwise, soil classifications shown on the boring logs are visual-manual judgments. We have attached charts (Appendix A) illustrating the USC system, the descriptive terminology, and the symbols used on the boring logs.

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.

Stewartville Industrial Park
Stewartville, MN
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Sample Storage

We will retain representative samples of the soils recovered from the borings for a period of 30 days. The samples will then be discarded unless you notify us otherwise.

Limitations

The data derived through this sampling and observation program have been used to develop our opinions about the subsurface conditions at your site. However, because no exploration program can reveal totally what is in the subsurface, conditions between borings and between samples and at other times, may differ from conditions described in this report. The exploration we conducted identified subsurface conditions only at those points where we took samples or observed ground water conditions. Depending on the sampling methods and sampling frequency, every soil layer may not be observed, and some materials or layers which are present in the ground may not be noted on the boring logs.

If conditions encountered during construction differ from those indicated by our borings, it may be necessary to alter our conclusions and recommendations, or to modify construction procedures, and the cost of construction may be affected.

The extent and detail of information about the subsurface condition is directly related to the scope of the exploration. It should be understood, therefore, that more information may be obtained by means of additional exploration.

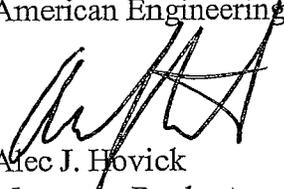
Standard of Care

Our services for your project have been conducted to those standards considered normal for services of this type at this time and location. Other than this, no warranty, either expressed or implied, is intended.

Closure

We appreciate being giving the opportunity to work with you on your project. If you have any questions concerning this report or we can be of further assistance, please contact us at (507) 281-3547.

Sincerely,
American Engineering Testing, Inc.



Alec J. Hovick
Manager - Rochester

AJH/acl

Enclosures



SUBSURFACE BORING LOG

AET JOB NO: 11-02858

LOG OF BORING NO. FA-1 (p. 1 of 1)

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1234.9'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, dark brown (CL)	Topsoil		M	FA						
2											
3	Lean Clay, brown (CL)	Fine Alluvium possibly Loess		M	FA						
4											
5	Silt, brown (ML)	Loess		M	FA						
6											
7											
8	Sand with a little gravel, brown (SM)	Weathered Bedrock		M	FA						
9											
10											
11											
12											
13	Weathered Carbonate Bedrock	Stewartville Formation		M	FA						
14	Continious rock from 14' to 14.9'			M	FA						
END OF BORING <i>Obstructed at 14.9'</i>											

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
14.9'	6" FA	5/26/04	10:00	14.9'		14.9'			None
BORING COMPLETED: 5/26/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

ABT JOB NO: 11-02858

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

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1242.7'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, black (CL)	Topsoil		M	FA						
2	Lean Clay, brown (CL)	Fine Alluvium		M	FA						
3	Clayey Sand, brown (SC)	Coarse Alluvium		M	FA						
4											
5	Sandy Lean Clay with a little gravel, brown (CL)	Till		M	FA						
6											
7											
8											
9											
10											
11	Silty Sand, yellowish (SM)	Coarse Alluvium		M	FA						
12											
13	Silty sand with broken limestone gravel, yellowish (SM)	Weathered Bedrock		M	FA						
14											
15	Carbonate Bedrock	Stewartville Formation		M	FA						
16	END OF BORING <i>Obstructed at 16.5'</i>										

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
16.5'	6" FA	5/26/04	10:25	16.5'		16.5'			None
BORING COMPLETED: 5/26/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858

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

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FBET	SURFACE ELEVATION: <u>1254.9'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-200	
1	Lean Clay with roots, dark brown (CL)	Topsoil		M	FA							
2	Sandy Lean Clay with a little gravel, brown, lenses and layers of Sand (CL)	Till		M	FA							
3				M	FA							
4												
5				M	FA							
6												
7												
8												
9				M	FA							
10												
11												
12	Sandy Lean Clay with a little gravel, gray, lenses and layers of Sand (CL)			M	FA							
13												
14												
15				M	FA							
16												
17												
18												
19												
20												
21	Fat Clay, brown (CH)			M	FA							
22												
23	Silty Sand, brown (SM)	Coarse Alluvium		M	FA							
24												
25												
26	Silty Sand, tan (SM)			M	FA							
27												
28												
29												
30	END OF BORING											

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
30'	6" FA	5/26/04	11:00	30'		30'			None
BORING COMPLETED: 5/26/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: **11-02858**

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

PROJECT: **Stewartville Industrial Park; Stewartville, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>1258.4'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with trace roots, dark brown (CL)	Topsoil		M	FA						
2	Sandy Lean Clay with a little gravel, brown mottled, lenses and layers of Sand (CL)	Till		M	FA						
3											
4	Sand, fine grained, brown (SP)	Coarse Alluvium		M	FA						
5	Clayey Sand with a few cobbles, brown (SC)			M	FA						
6											
7											
8											
9											
10	Sandy Lean Clay with a little gravel, brown, lenses and layers of Sand (CL)	Till		M	FA						
11											
12											
13											
14	Sandy Lean Clay with a little gravel, gray (CL)			M	FA						
15											
16											
17											
18											
19											
20				M	FA						
21											
22											
23											
24											
25	END OF BORING										

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
25'	6" FA	5/25/04	4:10	25'		25'			None
BORING COMPLETED: 5/25/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858

LOG OF BORING NO. FA-5 (p. 1 of 1)

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1254.5'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, black (CL)	Topsoil		M	FA						
2	Lean Clay, brown (CL)	Fine Alluvium		W	FA						
3	Silty Sand, brown (SM)	Coarse Alluvium		M	FA						
4			M	FA							
5			W	FA							
6	Clayey Sand, brown (SC)			W	FA						
7											
8				W	FA						
9											
10											
11											
12	Sandy Lean Clay with a little gravel, gray mottled, lenses and layers of Sand (CL)	Till		M	FA						
13											
14											
15											
16											
17											
18											
19											
20	END OF BORING										

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
20'	6" FA	5/25/04	3:40	20'		20'			None

BORING COMPLETED: 5/25/04

CC: KJ CA: JK Rig: 43R



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858

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

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1252.7'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, black (CL)	Topsoil		M	FA						
2	Lean Clay, brownish gray (CL)	Fine Alluvium		M	FA						
3	Silty Sand, brown (SM)	Coarse Alluvium		M	FA						
4											
5	Sandy Lean Clay with a little gravel, brownish, lenses and layers of Sand (CL)	Till		M	FA						
6											
7											
8				M	FA						
9											
10											
11	Lean Clay with a little gravel, gray, lenses and layers of Sand (CL)			M	FA						
12											
13											
14											
15	END OF BORING										

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
15'	6" FA	5/25/04	3:15	15'		15'			None
BORING COMPLETED: 5/25/04									
CC: KJ CA: JK Rig: 43R									



SUBSURFACE BORING LOG

AET JOB NO: 11-02858

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

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1249.5'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, black (CL)	Topsoil		M	FA						
2	Lean Clay, brown (CL)		Fine Alluvium		M	FA					
3	Sandy Lean Clay with a little gravel, brown (CL)	Till		M	FA						
4											
5	Sandy Lean Clay with a little gravel, brown, lenses and layers of Sand (CL)				M	FA					
6											
7											
8											
9											
10											
11	Sandy Lean Clay with a little gravel, brown and gray mottled (CL)			M	FA						
12											
13											
14				M	FA						
15	END OF BORING										

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
15'	6" FA	5/25/04	2:55	15'		15'			None
BORING COMPLETED: 5/25/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858 LOG OF BORING NO. FA-8 (p. 1 of 1)
 PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1260'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, dark brown (CL)	Topsoil		M	FA						
2	Sandy Lean Clay, brown (CL)	Till		W	FA						
3	Sandy Lean Clay with a little gravel, brown, lenses and layers of Sand (CL)			M	FA						
4				M	FA						
5											
6											
7											
8											
9											
10											
11	Sandy Lean Clay with a little gravel, gray, lenses and layers of Sand (CL)			M	FA						
12				M	FA						
13											
14											
15	END OF BORING										

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
15'	6" FA	5/25/04	2:35	15'		15'			None
BORING COMPLETED: 5/25/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858 LOG OF BORING NO. FA-9 (p. 1 of 1)
 PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1254.4'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay, black (CL)	Topsoil		M	FA						
2			M	FA							
3	Clayey Sand, brown (SC)	Coarse Alluvium									
4			M	FA							
5	Weathered Carbonate Bedrock	Stewartville Formation									
6											
7											
8	Continious Bedrock										
9	END OF BORING <i>Obstructed at 9.1'</i>										

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
9.1'	6" FA	5/26/04	9:15	9.1'		9.1'			None
BORING COMPLETED: 5/26/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858 LOG OF BORING NO. FA-10 (p. 1 of 1)
 PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1248.2'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-200	
	Lean Clay with roots, dark brown (CL)	Topsoil		M	FA							
1	Lean Clay with roots, brown (CL)	Fine Alluvium		M	FA							
2				M	FA							
3	Weathered Carbonate Bedrock	Stewartville Formation		M	FA							
4				M	FA							
5												
6												
7												
8	Hard slab from 8.5' to 9.5;			M	FA							
9												
10				M	FA							
11												
12												
13												
14												
15	END OF BORING											

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
15'	6" FA	5/25/04	2:05	15'		15'			None
BORING COMPLETED: 5/25/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858 LOG OF BORING NO. FA-11 (p. 1 of 1)
 PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1244.1'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, dark brown (CL)	Topsoil		M	FA						
2	Sandy Lean Clay, brown (CL)	Till		M	FA						
4	Weathered Carbonate Bedrock	Stewartville Formation		M	FA						
END OF BORING											

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
8.5'	6" FA	5/26/04	9:35	8.5'		8.5'			None
BORING COMPLETED: 5/26/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858

LOG OF BORING NO. FA-12 (p. 1 of 1)

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1250.1'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, dark brown (CL)	Topsoil		M	FA						
2	Lean Clay, brown (CL)	Fine Alluvium		M	FA						
3	Silt, brown, loose (ML)	Weathered Bedrock									
4											
5	Silty Sand, brown (SM)				M	FA					
6											
7				M	FA						
8											
9											
10											
11											
12	Weathered Carbonate Bedrock	Stewartville Formation		M	FA						
13	END OF BORING										
14											

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
12.5'	6" FA	5/25/04	12:00	12.5'		12.5'			None

BORING COMPLETED: 5/25/04

CC: KJ CA: JK Rig: 43R



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858

LOG OF BORING NO. FA-13 (p. 1 of 1)

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, dark brown (CL)	Topsoil	3	M	SS	12					
2	Silty Sand, brown (SM)	Weathered Bedrock	30	M	SS	12					
3	Weathered Carbonate Bedrock	Stewartville Formation	50/5	M	SS	3					
4											
5											
6											
7											
8	18	M	SS	15							
9											
10											
11	50/3	M	SS	2							
12											
13	50/1	M	SS	0.1							
13					M	HSA					
END OF BORING											
		<i>observed at 13.7'</i>									

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
13.7'	3.25" HSA	5/25/04	11:00	13.7'		13.7'			None
BORING COMPLETED: 5/25/04									
CC: KJ CA: JK Rig: 43R									



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SUBSURFACE BORING LOG

AET JOB NO: 11-02858

LOG OF BORING NO. FA-14 (p. 1 of 1)

PROJECT: Stewartville Industrial Park; Stewartville, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>1268'</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-200
1	Lean Clay with roots, dark brown (CL)	Topsoil		M	FA						
2	Lean Clay, brown (CL)	Fine Alluvium		W	FA						
3	Sandy Lean Clay with a little gravel, brown, lenses and layers of Sand (CL)	Till		M	FA						
4											
5											
6				M	FA						
7											
8											
9											
10											
11											
12	Silty Sand, brown (SM)	Coarse Alluvium		M	FA						
13											
14											
15	END OF BORING										

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
15'	6" FA	5/26/04	11:25	15'		15'			None
BORING COMPLETED: 5/26/04									
CC: KJ CA: JK Rig: 43R									

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
AC:	At completion of boring
B,H,N:	Size of flush-joint casing
BX:	BX double tube core barrel
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
(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 1/2" is inside diameter; 2" outside diameter); unless indicated otherwise
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 Designator 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
VSR:	Vane shear strength, remoulded (field), psf
VSU:	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").

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS SOILS CLASSIFICATION SYSTEM

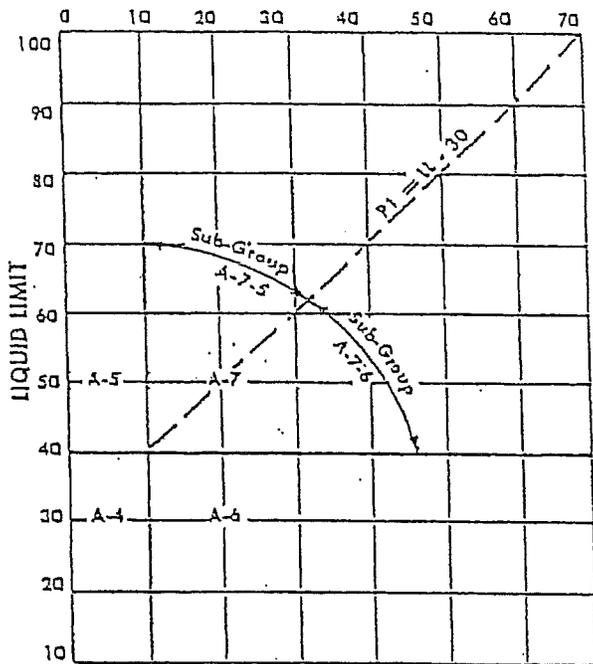
Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (25% or less passing No. 200)							Silt-Clay Materials (More than 25% passing No. 200)			
	A-1		A-2	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6
Sieve Analysis, Percent passing:											
No. 10 (2.00 mm)	50 max.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
No. 40 (0.425 mm)	30 max. 50 max.	.....	51 min.	.....	.....	.....	.....	.....	.....	.....	.....
No. 200 (0.075 mm)	15 max. 25 max.	.....	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of Fraction passing No. 40 (0.425 mm):											
Liquid limit .....	.....	.....	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	41 min.
Plasticity index	6 max.	N.P.	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.	11 min.
Usual Types of Significant Constituent Materials	Stone Fragments, Gravel and Sand		Fine Sand	Silty or Clayey Gravel and Sand				Silty Soils		Clayey Soils	
General Rating as Subgrade	Excellent to Good							Fair to Poor			

The placing of A-2 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-2 over A-2.

Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30

PLASTICITY INDEX PI



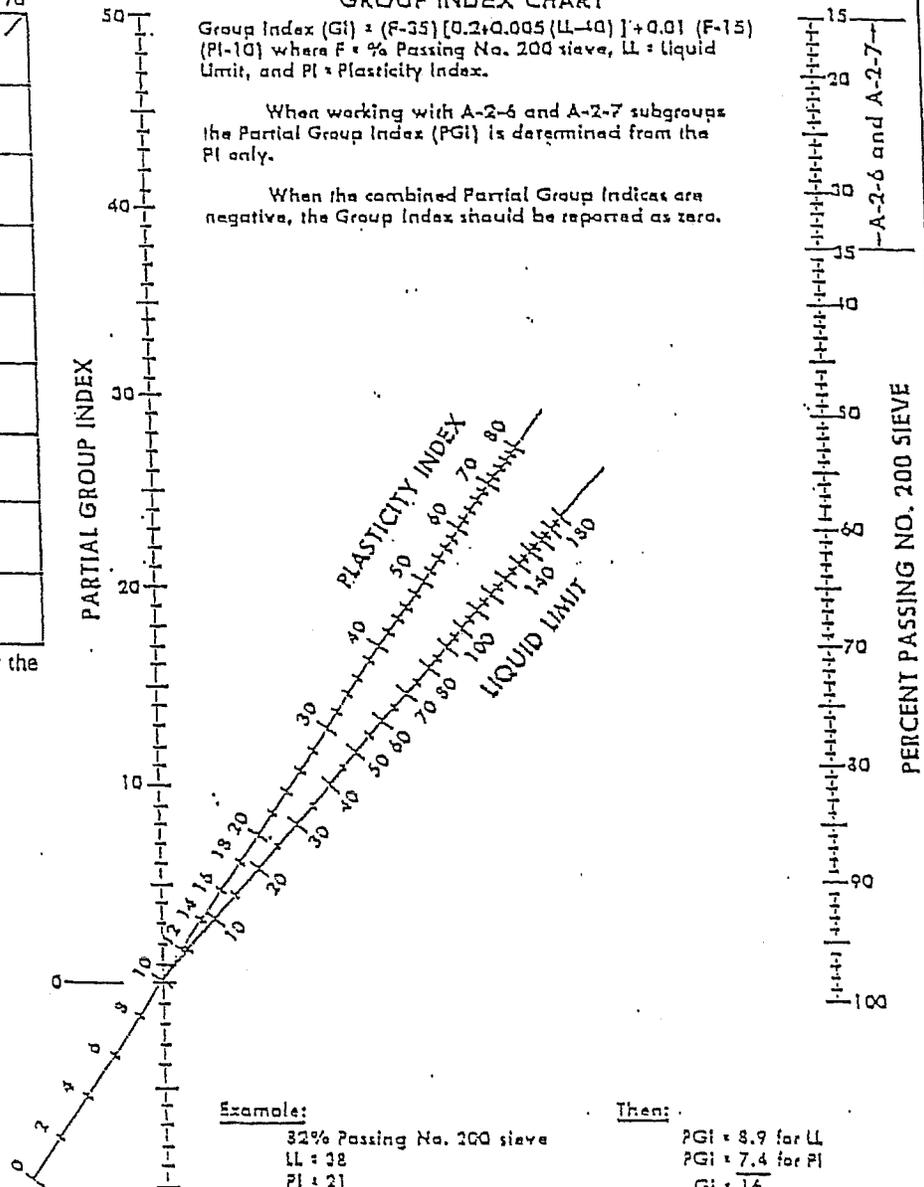
Liquid Limit and Plasticity Index Ranges for the A-4, A-5, A-6 and A-7 Subgroups

GROUP INDEX CHART

Group Index (Gi) = (F-35) [0.2+0.005(LL-40)] + 0.01(F-15) (PI-10) where F = % Passing No. 200 sieve, LL = Liquid Limit, and PI = Plasticity Index.

When working with A-2-6 and A-2-7 subgroups the Partial Group Index (PGI) is determined from the PI only.

When the combined Partial Group Indices are negative, the Group Index should be reported as zero.



Example:
32% Passing No. 200 sieve
LL = 38
PI = 21

Then:
PGI = 8.9 for LL
PGI = 7.4 for PI
Gi = 16

Definitions of Gravel, Sand, and Silt-Clay

The terms "gravel," "coarse sand," "fine sand," and "silt-clay," as determinable from the minimum test data required in this classification arrangement and as used in subsequent word descriptions, are defined as follows:

GRAVEL—Material passing sieve with 3-in. square openings and retained on the No. 10 sieve.

COARSE SAND—Material passing the No. 10 sieve and retained on the No. 40 sieve.

FINE SAND—Material passing the No. 40 sieve and retained on the No. 200 sieve.

COMBINED SILT AND CLAY—Material passing the No. 200 sieve.

BOULDERS (retained on 3-in. sieve) should be excluded (from the portion of the sample to which the classification is applied, but the percentage of such material, if any, in the sample should be recorded.

The term "silty" is applied to fine material having plasticity index of 10 or less and the term "clayey" is applied to fine material having plasticity index of 11 or greater.

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
	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 $1 > Cc > 3$ ^E	SP	Poorly-graded sand ^I
	Gravels with Fines more than 12% fines ^C	Fines classify as ML or MH		GM	Silty gravel ^{G,H}
		Fines classify as CL or CH		GC	Clayey gravel ^{G,H}
Sands with Fines more than 12% fines ^D	Fines classify as ML or MH		SM	Silty sand ^{G,H,I}	
	Fines classify as CL or CH		SC	Clayey sand ^{G,H,I}	
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Silt and Clays Liquid limit less than 50	inorganic	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}
	Silt 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}
		inorganic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}
		PI plots below "A" line	MH	Elastic silt ^{K,L,M}	
	organic	Liquid limit—oven dried < 0.75 Liquid limit — not dried	OH	Organic clay ^{K,L,M,P} Organic silt ^{K,L,M,Q}	
Highly organic soil		Primarily organic matter, dark in color, and organic in odor	PT	Peat ^K	

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

^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, soils 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.

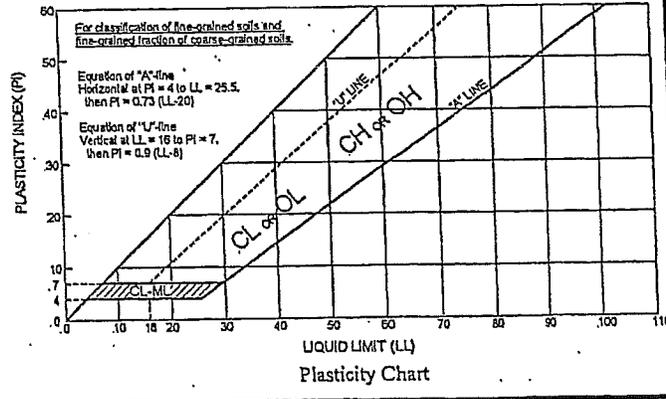
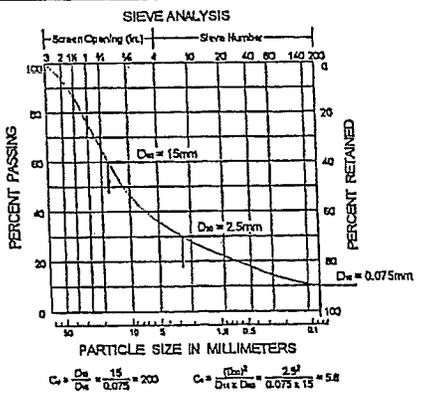
^NPI ≥ 4 and plots on or above "A" line.

^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 (MC Column)		Layering Notes		Fiber Content of Peat		Organic/Roots Description (if no lab tests)	
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 soil 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").	Lenses:	Pockets or layers greater than 1/4" thick of differing material or color.	Fibric Peat:	Greater than 67%	With roots:	Judged to have sufficient quantity of roots to influence the soil properties.
W (Wet/Waterbearing):	Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.			Hemic Peat:	33 - 67%	Trace roots:	Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.
F (Frozen):	Soil frozen			Sapric Peat:	Less than 33%		

ROCK DESCRIPTION TERMINOLOGY

Rock Property	Descriptive Term	Visual or Physical Properties
Weathering	Highly Weathered	Almost complete rock disintegration and decomposition. Soil-like texture with some small inclusions of hard rock.
	Very Weathered	Abundant fractures coated with oxides carbonates, sulfates, mud etc., thorough discoloration, rock disintegration, mineral decomposition.
	Moderately Weathered	Some fracture coating, moderate or localized discoloration, little to no effect on cementation, slight mineral decomposition.
	Slightly Weathered	A few stained fractures, slight discoloration, little to no effect on cementation, no mineral decomposition.
	Fresh	Unaffected by weathering agents, no appreciable change with depth.
Fracturing	Intensely Fractured	Less than 1" spacing.
	Very Fractured	1" to 6" spacing.
	Moderately Fractured	6" to 12" spacing.
	Slightly Fractured	12" to 36" spacing.
	Solid	36" spacing or greater.
Stratification	Thinly Laminated	less than 1/10".
	Laminated	1/10" to 1/2".
	Very Thinly Bedded	1/2" to 2".
	Thinly Bedded	2" to 2 feet.
	Thickly Bedded	more than 2 feet.
Hardness	Soft	Can be dug by hand and crushed by fingers.
	Moderately Hard	Friable, can be gauged deeply with knife and will crumble readily under light hammer blows.
	Hard	Knife scratch leaves dust trace, will withstand a few hammer blows before breaking.
	Very Hard	Scratched with knife with difficulty, difficult to break with hammer blows.
RQD*	Very Low	0 - 25 (%)
	Low	25 - 50 (%)
	Medium	50 - 75 (%)
	High	75 - 90 (%)
	Very High	90 - 100 (%)
CWR**	High	75 - 100 (%)
	Moderate	50 - 75 (%)
	Low	25 - 50 (%)
	Very Low	0 - 25 (%)

* Rock Quality Designation: Percent of core run consisting of hard, sound and unfractured rock core segments 4" or greater in length.

** Core Water Recovery

