

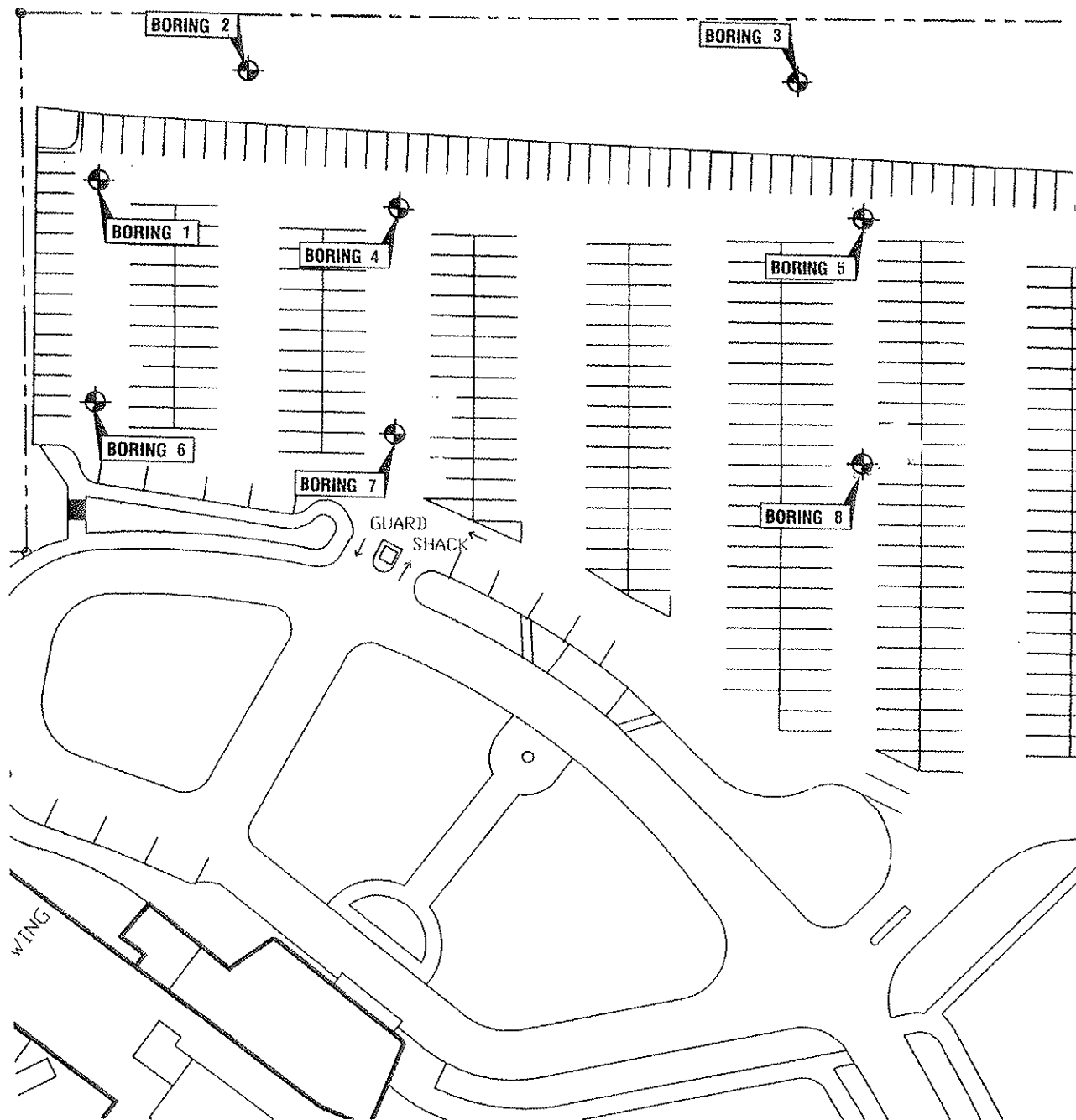
APPENDIX B

SOIL BORING LOCATION MAP

LOGS OF TEST BORINGS (8)

LOG OF TEST BORING-GENERAL NOTES

UNIFIED SOIL CLASSIFICATION SYSTEM



Legend

- ⊕ Denotes soil boring location and number

Notes

1. Soil borings performed by Badger State Drilling on May 7 and 8, 2010.
2. Base map provided by VA Medical Center personnel.
3. Boring locations are approximate.

Date:
05/10

Job No.
C10090

CGC, Inc.

SOIL BORING LOCATION MAP
VA Medical Center
Proposed Parking Ramp
Overlook Terrace
Madison, Wisconsin



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
 Location _____

Boring No. **1**
 Surface Elevation (ft) **905.4**
 Job No. **C10090**
 Sheet **1** of **2**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
					6 in. Asphalt Pavement/8 in. Base Course					
1	4	M	21		FILL: Medium Dense, Brown Fine to Medium Sand, Little Silt and Gravel					
2	13	M	19		FILL: Medium Dense, Light Brown Fine to Medium Sand, Trace Silt and Gravel					
3	10	M	14							
4	14	M	15							
5	14	M	18							
6	18	M	12		FILL: Medium Dense, Brown Fine to Medium Sand, Little Silt and Gravel					
7	18	M	10		Stiff, Brown Lean CLAY, Trace Sand (CL)	(1.0-1.5)				
8	12	M	39		Medium Dense, Brown SILT, Trace to Little Sand (ML)					
9	18	M	35		Dense to Very Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
10	14	M	62							
11	16	M	34							

WATER LEVEL OBSERVATIONS

While Drilling ☒ NW Upon Completion of Drilling _____
 Time After Drilling _____
 Depth to Water _____
 Depth to Cave in _____

GENERAL NOTES

Start **5/8/10** End **5/8/10**
 Driller **Badger** Chief **AP** Rig **CME-55**
 Logger **KD** Editor **ECN**
 Drill Method **2 1/4 in. HSA**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
Location

Boring No. **1**
Surface Elevation **905.4**
Job No. **C10090**
Sheet **2** of **2**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
12		12	M	32	45	Dense to Very Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
					50	End Boring at 50 ft					
					55	Borehole backfilled with bentonite chips					
					60						
					65						
					70						
					75						
					80						
					85						



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
Location _____

Boring No. **2**
Surface Elevation (ft) **883.4**
Job No. **C10090**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
1		8	M	6		TOPSOIL: 10 in. Dark Brown Silty Clay (OL) Stiff to Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(1.25-1.75)				
2		15	M	11		(1.75-2.25)					
3		16	M	7		Loose to Very Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
4		10	M	30							
5		12	M	21							
6		14	M	92							
7		10	M	49							
8		12	M	55							
9		15	M	41		Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel (SM)					
					End Boring at 35 ft						
					Borehole backfilled with bentonite chips						

WATER LEVEL OBSERVATIONS				GENERAL NOTES	
While Drilling	<input checked="" type="checkbox"/> NW	Upon Completion of Drilling		Start	5/7/10 End 5/7/10
Time After Drilling				Driller	Badger Chief JR Rig CME-55
Depth to Water				Logger	KD Editor ECN
Depth to Cave in				Drill Method	2 1/4 in. HSA

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
 Location _____

Boring No. **3**
 Surface Elevation (ft) **881.3**
 Job No. **C10090**
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	12	M	7		TOPSOIL: 10 in. Dark Brown Silty Clay (OL)					
2	10	M	7		FILL: Loose, Brown Fine to Medium Sand, Little Silt and Gravel					
3	12	M	6		Soft to Very Stiff, Brown Lean CLAY, Trace to Little Sand (CL)	(2.5-3.25)				
4	10	M	10		Medium Dense, Brown SILT, Trace to Little Sand (ML)	(0.25)				
5	11	M	30		Medium Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
6	16	M	11		Medium Dense, Brown SILT, Trace to Little Sand (ML)					
7	14	M	44		Dense, Brown Fine to Coarse SAND and GRAVEL, Trace Silt (SP/GP)					
8	3	M	50/3"		Very Dense, Light Brown/Yellow Weathered Sandstone BEDROCK					
9	1	M	50/1"							
					End Boring at 35 ft					
					Borehole backfilled with bentonite chips					

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ☒ NW Upon Completion of Drilling _____
 Time After Drilling _____
 Depth to Water _____
 Depth to Cave in _____

Start **5/7/10** End **5/7/10**
 Driller **Badger** Chief **JR** Rig **CME-55**
 Logger **KD** Editor **ECN**
 Drill Method **2 1/4 in. HSA**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



















LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
 Location _____

Boring No. **4**
 Surface Elevation (ft) **904.5**
 Job No. **C10090**
 Sheet **1** of **2**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							6 in. Asphalt Pavement/8 in. Base Course					
1		10	M	13			FILL: Dark Brown/Black Silty Clay, Trace Organics					
2		8	M	24			FILL: Loose to Medium Dense, Light Brown Fine to Medium Sand, Trace Silt and Gravel					
3		12	M	6								
4		12	M	12								
5		9	M	23								
6		10	M	13			Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(3.5)				
							Medium Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel (SM)					
7		12	M	15								
8		15	M	43			Dense to Very Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
9		10	M	45								
10		10	M	60								

WATER LEVEL OBSERVATIONS

GENERAL NOTES

While Drilling ☒ NW Upon Completion of Drilling _____
 Time After Drilling _____
 Depth to Water _____
 Depth to Cave in _____

Start **5/7/10** End **5/7/10**
 Driller **Badger** Chief **JR** Rig **CME-55**
 Logger **KD** Editor **ECN**
 Drill Method **2 1/4 in. HSA**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
 Location

Boring No. **4**
 Surface Elevation **904.5**
 Job No. **C10090**
 Sheet **2** of **2**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
11	12	M	44	45	Dense to Very Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
12	13	M	42	50						
				50						
					End Boring at 50 ft					
					Borehole backfilled with bentonite chips					
				55						
				60						
				65						
				70						
				75						
				80						
				85						






LOG OF TEST BORING

Project VA Hospital Parking Ramp
Madison, WI
 Location _____

Boring No. 5
 Surface Elevation (ft) 901.9
 Job No. C10090
 Sheet 1 of 2

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
						 3 in. Asphalt Pavement/6 in. Base Course FILL: Stiff to Very Stiff, Brown/Gray Silty Clay, Trace Sand/Gravel//Wood/Asphalt					
1		4	M	26							
2		10	M	14			(2.5)				
3		12	M	11			(2.0)				
4		12	M	14		(1.75)					
5		14	M	12		 Medium Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
6		10	M	16							
7		16	M	18		 Dense to Very Dense, Brown SILT, Trace to Little Sand, Little Gravel (ML)					
8		16	M	30							
9		16	M	31							
10		16	M	64							

WATER LEVEL OBSERVATIONS

While Drilling ☒ NW Upon Completion of Drilling 15 Min.
 Time After Drilling _____ NW
 Depth to Water _____
 Depth to Cave in _____

GENERAL NOTES

Start 5/7/10 End 5/7/10
 Driller Badger Chief RR Rig D-120
 Logger RM Editor ECN
 Drill Method 2 1/4 in. HSA

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
Location

Boring No. **5**
Surface Elevation **901.9**
Job No. **C10090**
Sheet **2** of **2**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
11	16	M	46	45	Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel (SM)					
12	3	M	50/3"	50	Very Dense, Light Brown/Yellow Weathered Sandstone Bedrock					
					End Boring at 50 ft					
					Borehole backfilled with bentonite chips					
				55						
				60						
				65						
				70						
				75						
				80						
				85						



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
Location _____

Boring No. **6**
Surface Elevation (ft) **907.5**
Job No. **C10090**
Sheet **1** of **2**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE (in.)	Rec (in.)	Moist	N		qu (qa) (tsf)	W	LL	PL	LI
1		6	M	4	3 in. Asphalt Pavement/8 in. Base Course FILL: Very Loose, Brown Fine to Medium Sand, Little Silt, Gravel and Wood					
2		1	M	0						
3		0	M	0						
4		8	M	4	Loose, Brown Fine to Medium SAND, Some Silt, Little Gravel (SM)					
5		10	M	6	Loose, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
6		12	M	17	Medium Dense, Light Brown SILT, Trace to Little Sand (ML)					
7		14	M	12	Medium Dense to Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
8		16	M	12						
9		16	M	24						
10		14	M	40						

WATER LEVEL OBSERVATIONS

While Drilling ☒ **NW** Upon Completion of Drilling _____
Time After Drilling _____ **15 Min.**
Depth to Water _____ **NW** ▼
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **5/8/10** End **5/8/10**
Driller **Badger** Chief **RR** Rig **D-120**
Logger **RM** Editor **ECN**
Drill Method **2 1/4 in. HSA**

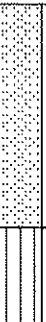


LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Madison, WI
 Location _____

Boring No. **6**
 Surface Elevation **907.5**
 Job No. **C10090**
 Sheet **2** of **2**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
							Dense, Brown SILT, Trace to Little Sand (ML)					
11		16	M	45	45							
								Dense, Brown SILT, Trace to Little Sand (ML)				
12		16	M	38	50							
						End Boring at 50 ft						
						Borehole backfilled with bentonite chips						



LOG OF TEST BORING

Project VA Hospital Parking Ramp
Madison, WI
Location _____

Boring No. 7
Surface Elevation (ft) 907.9
Job No. C10090
Sheet 1 of 2

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE (in.)	Rec (in.)	Moist	N		qu (qa) (tsf)	W	LL	PL	LI
					6 in. Asphalt Pavement/8 in. Base Course					
1		14	M	30	Probable FILL: Medium Dense to Dense, Light Brown Fine to Medium Sand, Trace Silt and Gravel					
2		12	M	31						
3		15	M	11						
4		14	M	12	Clay Seam Noted Near 7.5 ft					
					Medium Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
5			M	14						
6		16	M	12	Medium Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel (SM)					
7		15	M	26	Medium Dense to Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
8		14	M	26						
9		16	M	28						
10		15	M	38						

WATER LEVEL OBSERVATIONS

While Drilling ☒ NW Upon Completion of Drilling _____
Time After Drilling _____
Depth to Water _____
Depth to Cave in _____

GENERAL NOTES

Start 5/8/10 End 5/8/10
Driller Badger Chief AP Rig CME-55
Logger KD Editor ECN
Drill Method 2 1/4 in. HSA

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Location **Madison, WI**

Boring No. **7**
Surface Elevation **907.9**
Job No. **C10090**
Sheet **2** of **2**

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
11		17	M	40	45	Medium Dense to Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
12		12	M	30	50						
End Boring at 50 ft											
Borehole backfilled with bentonite chips											
					55						
					60						
					65						
					70						
					75						
					80						
					85						



LOG OF TEST BORING

Project **VA Hospital Parking Ramp**
Location **Madison, WI**

Boring No. **8**
Surface Elevation (ft) **906.3**
Job No. **C10090**
Sheet **1** of **2**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	10	M	3		3 in. Asphalt Pavement/6 in. Base Course					
					FILL: Stiff to Very Stiff, Brown/Gray Silty Clay, Trace Sand/Gravel/Wood/Asphalt	(1.0)				
2	12	M	7							
				5	Loose, Brown Fine to Medium SAND, Some Silt, Little Gravel (SM)	(1.5)				
3	16	M	14							
					Medium Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
4	16	M	10							
				10						
5		M	10							
				15						
6	16	M	15		Medium Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel (SM)					
				20	Dense, Brown SILT, Trace to Little Sand (ML)					
7	16	M	11							
				25						
8	16	M	14							
				30						
9	16	M	30		Medium Dense to Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
				35						
10	16	M	34							
				40						

WATER LEVEL OBSERVATIONS

While Drilling ☒ NW Upon Completion of Drilling _____
Time After Drilling _____ 15 Min. ▼
Depth to Water _____
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **5/7/10** End **5/7/10**
Driller **Badger** Chief **RR** Rig **D-120**
Logger **RM** Editor **ECN**
Drill Method **2 1/4 in. HSA**

SAMPLE					VISUAL CLASSIFICATION and Remarks		SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			Depth (ft)	qu (qa) (tsf)	W	LL	PL
						Medium Dense to Dense, Light Brown Fine to Medium SAND, Trace Silt and Gravel, Few Fine to Coarse Gravel Seams/Layers, Very Few Brown Silt Seams/Layers (SP)					
11		16	M	67	45						
12		16	M	11	50	End Boring at 50 ft					
						Borehole backfilled with bentonite chips					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

LOG OF TEST BORING

General Notes

Descriptive Soil Classification

GRAIN SIZE TERMINOLOGY

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	3" to 12"	3" to 12"
Gravel: Coarse	3/4" to 3"	3/4" to 3"
Fine	4.76 mm to 3/4"	#4 to 3/4"
Sand: Coarse	2.00 mm to 4.76 mm	#10 to #4
Medium	0.42 to mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm	#200 to #40
Silt	0.005 mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

GENERAL TERMINOLOGY

Physical Characteristics
Color, moisture, grain shape, fineness, etc.
Major Constituents
Clay, silt, sand, gravel
Structure
Laminated, varved, fibrous, stratified,
cemented, fissured, etc.
Geologic Origin
Glacial, alluvial, eolian, residual, etc.

RELATIVE DENSITY

Term	"N" Value
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

RELATIVE PROPORTIONS OF OF COHESIONLESS SOILS

Proportional Term	Defining Range by Percentage of Weight
Trace	0%-5%
Little	5%-12%
Some	12%-35%
And	35%-50%

CONSISTENCY

Term	q _u -tons/sq. ft.
Very Soft	0.0 to 0.25
Soft	0.25 to 0.50
Medium	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 4.0

ORGANIC CONTENT BY COMBUSTION METHOD

Soil Description	Loss on Ignition
Non Organic	Less than 4%
Organic Silt/Clay	4-12%
Sedimentary Peat	12-50%
Fibrous and Woody Peat	More than 50%

PLASTICITY

Term	Plastic Index
None to Slight	0-4
Slight	5-7
Medium	8-22
High to Very High	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

SYMBOLS

DRILLING AND SAMPLING

CS--Continuous Sampling
RC--Rock Coring: Size AW, BW, NW, 2"W
RQD--Rock Quality Designator
RB--Rock Bit
FT--Fish Tail
DC--Drove Casing
C--Casing: Size 2 1/2", NW, 4", HW
CW--Clear Water
DM--Drilling Mud
HSA--Hollow Stem Auger
FA--Flight Auger
HA--Hand Auger
COA--Clean-Out Auger
SS--2" Diameter Split-Barrel Sample
2ST--2" Diameter Thin-Walled Tube Sample
3ST--3" Diameter Thin-Walled Tube Sample
PT--3" Diameter Piston Tube Sample
AS--Auger Sample
WS--Wash Sample
PTS--Peat Sample
PS--Pitcher Sample
NR--No Recovery
S--Sounding
PMT--Borehole Pressuremeter Test
VS--Vane Shear Test
WPT--Water Pressure Test

LABORATORY TESTS

q_a--Penetrometer Reading, tons/sq. ft.
q_u--Unconfined Strength, tons/sq. ft.
W--Moisture Content, %
LL--Liquid Limit, %
PL--Plastic Limit, %
SL--Shrinkage Limit, %
LI--Loss on Ignition, %
D--Dry Unit Weight, lbs/cu. ft.
pH--Measure of Soil Alkalinity or Acidity
FS--Free Swell, %

WATER LEVEL MEASUREMENT

▽ --Water Level at time shown
NW--No Water Encountered
WD--While Drilling
BCR--Before Casing Removal
ACR--After Casing Removal
CW--Caved and Wet
CM--Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSE-GRAINED SOILS

(More than half of material is larger than No. 200 sieve size.)

GRAVELS

More than half of coarse fraction larger than No. 4 sieve size

Clean Gravels (Little or no fines)

GW Well-graded gravels, gravel-sand mixtures, little or no fines

GP Poorly graded gravels, gravel-sand mixtures, little or no fines

Gravels with Fines (Appreciable amount of fines)

GM^d_u Silty gravels, gravel-sand-silt mixtures

GC Clayey gravels, gravel-sand-clay mixtures

SANDS

More than half of coarse fraction smaller than No. 4 sieve size

Clean Sands (Little or no fines)

SW Well-graded sands, gravelly sands, little or no fines

SP Poorly graded sands, gravelly sands, little or no fines

Sands with Fines (Appreciable amount of fines)

SM^d_u Silty sands, sand-silt mixtures

SC Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS

(More than half of material is smaller than No. 200 sieve.)

SILTS AND CLAYS

Liquid limit less than 50%

ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity

CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

OL Organic silts and organic silty clays of low plasticity

SILTS AND CLAYS

Liquid limit greater than 50%

MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts

CH Inorganic clays of high plasticity, fat clays

OH Organic clays of medium to high plasticity, organic silts

HIGHLY ORGANIC SOILS

PT Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

GW $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10}D_{60}}$ between 1 and 3

GP Not meeting all gradation requirements for GW

GM Atterberg limits below "A" line or P.I. less than 4

Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

GC Atterberg limits above "A" line with P.I. greater than 7

SW $C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10}D_{60}}$ between 1 and 3

SP Not meeting all gradation requirements for SW

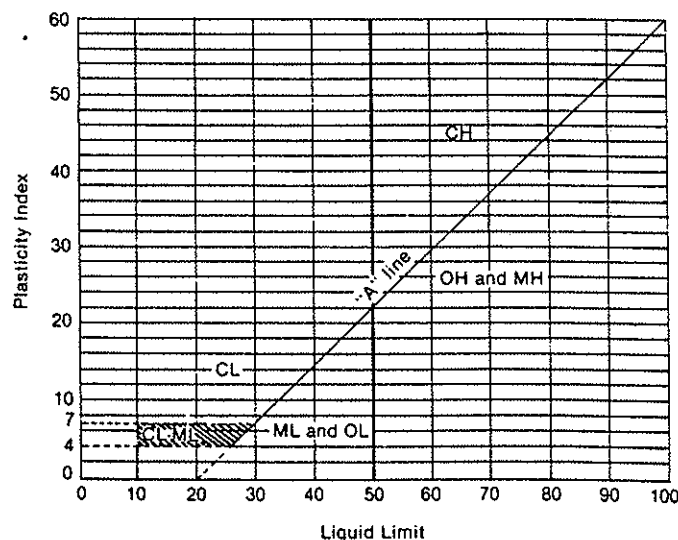
SM Atterberg limits below "A" line or P.I. less than 4

Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.

SC Atterberg limits above "A" line with P.I. greater than 7

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:
 Less than 5 per cent GW, GP, SW, SP
 More than 12 per cent GM, GC, SM, SC
 5 to 12 per cent Borderline cases requiring dual symbols

PLASTICITY CHART



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

Atterberg Limits plotting in hatched area are borderline classifications requiring use of dual symbols.

Equation of A-line: $PI = 0.73 (LL - 20)$