midwest engineering services, inc.

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July 21, 2005

Mr. John Siepmann
Siepmann Realty Corporation
W240 N1221 Pewaukee Road
Waukesha, WI 53188

Subject: Subsurface Exploration and Infiltration Evaluation
Tallgrass Condominiums
Northview Road
Waukesha, Wisconsin
MES Project No. 7-53102

Dear Mr. Siepmann,

In accordance with your request, Midwest Engineering Services, Inc. (MES) performed a subsurface exploration to provide a preliminary evaluation of the soil and groundwater conditions for proposed stormwater infiltration basins at the above referenced site. Two (2) copies of this report are provided herein. In addition, two (2) copies have been forwarded to Mr. Tony Zanon with Jahnke & Jahnke Associates, Inc. The work was performed for Siepmann Realty Corporation, at the request of Mr. John Siepmann. The scope of services was performed in accordance with a signed agreement (MES Proposal No. 7-5219, dated May 9, 2005), between Midwest Engineering Services, Inc. (MES) and Siepmann Realty Corporation.

The purpose of the subsurface exploration was to evaluate the soil and groundwater conditions encountered and provide subsurface information for preliminary design planning for the stormwater infiltration basins associated with the proposed condominium development. The field and laboratory work for classification of the subgrade soils was performed to provide information for use by the basin design personnel when considering requirements of Chapter NR151 of the Wisconsin Administrative Code, and of WDNR Technical Standard 1002 "Site Evaluation for Stormwater Infiltration" guidelines. The design of the proposed basins was beyond the scope of services for this project. Additionally, field infiltration testing was not requested or performed.

SITE AND PROJECT DESCRIPTION

The proposed condominium development site is located on the south side of Northview Road, immediately east of Pebble Creek, in the City of Waukesha, Wisconsin. The property is currently vacant and consists of an agricultural field. The site topography is hilly and the site slopes from the east property line (approximately El 135) down to the west to Pebble Creek (approximately El. 85). An existing 12-inch interceptor sewer extends through the western portion of the property from north to south. Neighboring properties consist of residences to the north and west (across Pebble Creek), a wooded area to the south and a farm to the east.

From the information provided by the client, it is understood that storm water infiltration basins are planned for the property; however, their location and elevation design information was not known at the time of this report. The subsurface exploration was performed to allow a general evaluation of subsurface conditions across the property to assist in placement and design of the infiltration basins.

SOIL SURVEY MAP REVIEW

The USDA Soil Conservation Survey for Milwaukee & Waukesha Counties Wisconsin indicated the near surface soils in the vicinity of the site consist of Hochheim Loam (HmC2 and HmD2), Knowles Silt Loam (KwB), Theresa Silt Loam (ThB) and the Pella Silt Loam (Pm), along Pebble Creek. The Hochheim, Knowles and Theresa soils reportedly can have a seasonal high water table at greater than 5 feet below the ground surface, while the Pella soils can reportedly have a seasonal high water table from 0 to 1 foot below the ground surface. Dolomite bedrock was indicated to be present within the Knowles and Pella soil areas at a depth ranging from 27 to 60 inches below the ground surface.

FIELD EXPLORATION AND LABORATORY TESTING

Seventeen (17) soil borings were drilled for this project. The borings were performed in an approximate grid pattern across the property to allow for a general evaluation of subsurface conditions. The test borings were planned to be extended to a depth of about 20 feet below existing grade. However, all of the borings, with the exception of Boring B-10, were terminated at depths ranging from 2 to 17½ feet below existing grade due to auger refusal on probable cobbles and boulders or bedrock. Jahnke & Jahnke Associates, Inc. determined the approximate boring locations and MES personnel staked the boring locations in the field relative to existing site features. Upon completion of the borings, Jahnke & Jahnke Associates, Inc. determined the actual boring locations and ground surface elevations. The soil borings were performed with truck-mounted drill rigs, utilizing continuous flight hollow stem

augers to advance the test holes. Soil samples were obtained using split-barrel samplers with continuous 2-foot sampling intervals to the boring termination depths. The locations of the borings and the ground surface elevations are indicated on the Boring Location Plan, Figure 1, enclosed with this report.

The soils encountered in the borings were classified in general accordance with USDA National Resources Conservation Service textural soil classification procedures. Standard laboratory testing was also performed on representative soils collected from the boring locations in order to further estimate the soil characteristics.

A description of the subgrade conditions encountered at each boring location is shown on the attached Soil Boring Logs. The soil descriptions are considered representative for the specific boring locations; however, variations may occur between and beyond the test locations. A summary of the major soil profile components at the boring locations is described in the following paragraphs. Upon completion of drilling operations and water level observations, the borings were backfilled to ground surface with bentonite chips.

SUBSURFACE CONDITIONS

The surficial soils at the boring locations generally consisted of about 4 to 36 inches of silty clay, silty loam and silty clay loam topsoil. The underlying natural soils then generally consisted of dense to hard relative density gravelly loamy sand, sandy loam, and gravelly loam with cobbles and boulders extending to the maximum depths explored, ranging from 2 to 20 feet (El. 76.1 to El. 114.5) below existing grade. Exceptions to these soils were encountered at Borings B-2, B-5, B-9 and B-12 where silty clay and silty clay loam soils were encountered below the surficial topsoil to depths ranging from 4½ to 6 feet (El. 76.4 to El. 105.1) below existing grade, and within Boring B-16, where a silty clay layer was encountered between a depth of 8 to 12½ feet (El. 101.2 to El. 96.7) below existing grade.

Auger refusal on probable cobbles and boulders or dolomitic limestone bedrock was encountered at depths ranging from 2 to 17½ feet (El. 76.1 to El. 114.5) below existing grade.

Groundwater was encountered within Borings B-4, B-5 and B-17 at depths ranging from 6½ to 14 feet (El. 80.1 to El. 85.4) during auger advancement. No groundwater was encountered during auger advancement or upon completion of in the remaining boring locations. Based on the sample coloration and moisture content of the collected samples, the apparent static water level in the vicinity of the Borings B-4, B-5 and B-17, which were performed in the western portion of the property along Pebble Creek, was considered to be at depths ranging from 6.5 to 14 feet (El. 80.1 to El. 85.4) at the time of the subsurface exploration. The static water level in the remainder of the site was considered to be at depths greater than 2 to 20 feet (below El. 81.1 to below El. 118.4) below existing grade. The shallow water levels encountered within Borings B-4, B-5 and B-17 may represent perched water conditions within the gravelly sandy

loam and loam soils underlain by bedrock. It must also be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics.

The soil classifications for the subsurface materials encountered at other depths and locations are provided on the soil boring logs enclosed with this report.

CONCLUSIONS

The subgrade soils encountered in the borings have been classified in general accordance with the USDA textural soil classification system. Estimated infiltration rates for various soil types, are shown. Table 2 of the Site Evaluation for Stormwater Infiltration (1002) document, which is published by the Wisconsin Department of Natural Resources Conservation Practice Standards, is shown below.

Soil Texture[1]	Design Infiltration Rate Without Measurement Inches/hour
Coarse sand or coarser (COS)	3.60
Loamy coarse sand (LCOS)	3.60
Sand (S)	3.60
Loamy sand (LS)	1.63
Sandy loam (SL)	0.50
Loam (L)	0.24
Silt loam (Si, L)	0.13
Sandy clay loam (SCL)	0.11
Clay loam (CL)	0.03
Silty Clay loam (Si, CL)	0.04
Sandy clay (SC)	0.04
Silty clay (Si, C)	0.07
Clay (C)	0.07

[1]Use sandy loam design infiltration for fine sand, loamy fine sand, very fine sand, and loamy fine sand soil textures.

NR-151 guidelines indicate infiltration rates shall be based on the least permeable soil horizon within 5 feet of the bottom elevation of the proposed infiltration system.

The soils encountered in the majority of the borings consisted of gravelly loamy sand, and gravelly loam with cobbles and boulders extending to depths ranging from 2 to at least 20 feet below existing grade. Based upon the aforementioned Table 2, these soils are estimated to have infiltration rates of about 1.63 to 3.60 inches per hour. These rates are greater than 0.6 inches per hour, and such soils are generally not exempt from the infiltration requirements of NR151.12(5)(c) under NR151.12(5)(c)6a. However, areas of the site may be excluded under

other provisions, such as NR151.12(5)(c)5e or NR151.12(5)(c)5i, due to shallow groundwater or bedrock, or the lack of suitable fine soil strata, respectively.

The intermixed layers of silty clay and silty clay loam soils encountered within Borings B-2, B-5, B-9, B-12 and B-16 are anticipated to have infiltration rates ranging from about 0.04 to about 0.07 inches per hour. Such soils are generally considered to be exempt from the infiltration requirements of NR151.12(5)(c) under NR151.12(5)(c)6a. Where sandy loam soils are present, with an estimated infiltration rate of 0.5 inches per hour, it is understood that the WDNR has indicated that field verification testing of the actual in-situ infiltration rate for these materials may be required under Step C of the Site Evaluation for Stormwater Infiltration document to confirm they are exempt [under NR151.12(5)(c)6a].

The preceding infiltration rate estimates and groundwater elevations are based on the subgrade conditions encountered in the test borings, and soil characterization in accordance with the USDA Classification System and NR-151 guidelines. However, considering the presence of silty clay and silty clay loam soils, the relatively shallow bedrock across the property and the dense to hard relative density characteristics of the soils, it is recommended that the basin bottoms be observed by qualified geotechnical engineering personnel at the time of construction to verify the soil types. In-situ testing with a double ring infiltrometer, along with additional test pits or soil borings in the final infiltration basin areas, is also recommended to better classify the soils, further evaluate subsurface, groundwater, and/or bedrock conditions, and provide more representative infiltration rates for the basin designs.

The preceding infiltration rate estimates are intended only for use in preliminary planning. It must be recognized that actual infiltration rates will be somewhat variable depending upon the uniformity, in-place density and/or grading of the subsoils below the individual basin or trench footprint. It should also be recognized the performance of these basins could be affected by other factors such as soil densification by construction equipment and sedimentation. A maintenance program must be developed to address the removal of sedimentation and or organic materials should they develop. Additionally, it is recommended that an experienced civil engineering firm perform the pond design.

GENERAL COMMENTS

The limited evaluation has been prepared on the basis of the subsurface conditions encountered in the soil borings discussed above. Preliminary recommendations presented herein are based on available soil information and test data collected. This study has been conducted in the manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings and opinions contained herein have been promulgated in accordance with general accepted practices in the fields of soil mechanics and engineering geology. No other representations, expressed or applied, and no warranty or guarantee is included or intended in this report.

After you have had the opportunity of reading this report, please call at any time with any questions or comments you may have. MES appreciates the opportunity to be of service on this project.

Sincerely yours,

MIDWEST ENGINEERING SERVICES, INC.

Paul J. Giese (JL)
Paul J. Giese, P.E.
Department Manager
Geotechnical Services

James M. Becco, P.E.
Region Manager

Enclosures: Boring Location Plan, Figure 1
Soil Boring Logs (17)
General Notes

cc: Jahnke & Jahnke Associates, Inc., Attn.: Mr. Tony Zanon (2 copies)

TABLE 1
Estimated Topsoil, Groundwater and Auger Refusal Depths and Elevations
Proposed Tallgrass Condominiums
Waukesha, Wisconsin
MES Project No. 7-53102

Boring No. (c)	Boring Elevation (a)	Topsoil Depth (Inches) (b)	Estimated Groundwater Table Depth (feet) (b)	Estimated Groundwater Table Elevation (a)	Auger Refusal Depth (feet) (b)	Estimated Auger Refusal Elevation (a)
B-1	EL. 120.4	12±	>2±	< EL. 118.4±	2±	EL. 118.4±
B-2	EL. 109.0	24±	>4	<EL. 105±	4±	EL. 105±
B-3	EL. 90.1	36±	>9±	<EL. 81.1±	9±	EL. 81.1±
B-4	EL. 86.6	36±	6.5± (c)	EL. 80.1±	10.5±	EL. 76.1±
B-5	EL. 90.4	24±	9± (c)	EL. 81.4±	14±	EL. 76.4±
B-6	EL. 107.4	12±	>6±	<EL. 101.4±	6±	EL. 101.4±
B-7	EL. 119.5	4±	>8.5±	<EL. 111±	8.5±	EL. 111±
B-8	EL. 129.4	6±	>17.5±	<EL. 111.9±	17.5±	EL. 111.9±
B-9	EL. 116.1	24±	>11±	<EL. 105.1±	11±	EL. 105.1
B-10	EL. 109.1	24±	>20±	<EL. 89.1±	>20±	<EL. 89.1±
B-11	EL. 96.5	24±	>13.5±	<EL. 83±	13.5±	EL. 83±
B-12	EL. 99.7	24±	>14.5±	<EL. 85.2±	14.5±	EL. 85.2±
B-13	EL. 118.8	6±	>13.5±	<EL. 105.3±	13.5±	EL. 105.3±
B-14	EL. 129..0	24±	>14.5±	<EL. 114.5±	14.5±	EL. 114.5±
B-15	EL. 119.6	30±	>14±	<EL. 105.6±	14±	EL. 105.6±
B-16	EL. 109.2	24±	>13.5±	<EL. 95.7±	13.5±	EL. 95.7±
B-17	EL. 99.4	36±	14± (c)	EL. 85.4±	16.5±	EL. 82.9±

a) Ground surface elevations provided by Jahnke & Jahnke Associates, Inc..
b) Depth below existing grade.
c) Possible perched groundwater.

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SOIL BORING LOG: B-1

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 120.4	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 119.4	12"+/- 10YR 3/6 Dark Yellowish Brown Silty Clay LOAM, 0, mfr, Damp, (Topsoil)	1-SS	53/8"*			10		Note A
2 / 118.4	10YR 8/2 Very Pale Brown, Very Gravelly SAND, probable Cobbles and Boulders, 0, mvfi, Damp	2-SS	50/3"*			1		

End of Boring: 2' due to auger refusal on possible cobbles and boulders or bedrock

Notes:

Note A: Boring offset 5' north of original location and auger refusal encountered at 3½ feet

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 1.3 ± ft (El. 119.1±)

Additional Comments:

*N value may be elevate due to cobbles and boulders or bedrock

Lines of demarcation represent approximate boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.

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SOIL BORING LOG: B-2

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 8, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 109.0	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 108.0	24"+/- 10YR 3/3 Dark Brown Silty CLAY, few Roots, 0, mvfi, Damp, (Topsoil)	1-SS	7	3.5		18		
		2-SS	8					
2 / 107.0		3-SS	6					
3 / 106.0	10YR 3/6 Dark Yellowish Brown Silty CLAY, 0, mvfi, Moist	4-SS	50/½"*	2.5		20		
4 / 105.0								

End of Boring: 4' due to auger refusal on possible cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 2.7 ± ft (El. 106.3±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-3

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 8, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 90.1	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 89.1	10YR 3/3 Dark Brown Silty Clay LOAM, 0, mvfr, Moist, (Topsoil)	1-SS	8	2.50		27		
		2-SS	14					
2 / 88.1		3-SS	20			4		
3 / 87.1		4-SS	47*					
4 / 86.1	10YR 5/4 Yellow Brown Very Gravelly Loamy SAND, probable Cobbles and Boulders, 0, mvfi, Damp	5-SS	18			4		
5 / 85.1		6-SS	37*					
6 / 84.1		7-SS	49*			4		
7 / 83.1	10YR 7/3 Very Pale Brown Gravelly Loamy SAND, probable Cobbles and Boulders, 0, mefi, Damp, (Probable Weathered Bedrock)	8-SS	43*					
8 / 82.1		9-SS	--			10		
9 / 81.1								

End of Boring: 9' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 4.1 ± ft (El. 86±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-4

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 8, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 86.6	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 — 85.6	10YR 3/2 Dark Brown Silty LOAM, 0, mfr, Moist, (Topsoil)	1-SS	4			23		
		2-SS	5					
2 — 84.6		3-SS	9			11		
3 — 83.6		4-SS	33*					
4 — 82.6	10YR 6/6 Brownish Yellow Gravelly Sand LOAM, probable Cobbles and Boulders, 0, mvfr, Damp	5-SS	16			8		
5 — 81.6		6-SS	17					
6 — 80.6		7-SS	20			5		▽
7 — 79.6		8-SS	27					
8 — 78.6	10YR 4/4 Dark Yellowish Brown Gravelly Sand LOAM, probable Cobbles and Boulders, mvfr, Very Moist to Wet	9-SS	45*			7		
9 — 77.6		10-SS	50/5½"					
10 — 76.6		11-SS	50/1"*			10		

End of Boring: 10½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: 6.5 ± ft (El. 80.1±) ▽

Water Level $_{\text{Upon Completion}}$: Dry

Caved at $_{\text{Upon Completion}}$: 4.5 ± ft (El. 82.1±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-5

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 8, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 90.4	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 89.40	24"+/- 10YR 2/2 Very Dark Brown Silt LOAM, few Roots, 0, mfr, Moist, (Topsoil)	1-SS	6	2.0		19		
		2-SS	6					
2 / 88.40	10YR 3/4 Dark Yellowish Brown Silty Clay LOAM, 0, mvfr, Moist	3-SS	8	2.75	2.80	29		
3 / 87.40		4-SS	11					
4 / 86.40		5-SS	5			13		
5 / 85.40	10YR 4/6 Dark Yellowish Brown Loamy SAND, 0, mfr, Damp to Moist	6-SS	8					
6 / 84.40	10YR 4/4 Dark Yellowish Brown Gravelly Sandy LOAM, probable Cobbles and Boulders, 0, mfr, Damp	7-SS	18			7		
7 / 83.40		8-SS	36*					
8 / 82.40		9-SS	25			8		V
9 / 81.40		10-SS	89/7"*					
10 / 80.40	10YR 4/6 Dark Yellowish Brown Gravelly Sandy LOAM, with Cobbles and Boulders, 0, mvfr, Wet	11-SS	50/2½"			13		
11 / 79.40								
12 / 78.40		12-SS	50/2"*			--		
13 / 77.40								
14 / 76.40								

End of Boring: 14' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level During Drilling: 9 ± ft (El. 81.4±) V
Water Level Upon Completion: Dry
Caved at Upon Completion: 8.5 ± ft (El. 81.9±)

Additional Comments:

Lines of demarcation represent approximate boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.

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SOIL BORING LOG: B-6

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 8, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 107.4	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
	12"+/- 10YR 3/6 Dark Yellow Brown Silty LOAM, few Roots, 0, mfr, Damp, (Topsoil)	1-SS	13					
1 / 106.4						10		
		2-SS	20					
2 / 105.4								
		3-SS	29					
3 / 104.4						2		
	10YR 6/3 Pale Brown Gravelly Loamy SAND, with Cobbles and Boulders, 0, mvfr, Damp	4-SS	48*					
4 / 103.4								
		5-SS	45*					
5 / 102.4						2		
		6-SS	50/5½"					
6 / 101.4								

End of Boring: 6' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 1.7 ± ft (El. 105.7±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-7

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 119.5	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
	Note A	1-SS	50/4"*			12		
1 / 118.5								
2 / 117.5	10YR 5/4 Yellowish Brown Gravelly SAND, 0, mvfr, Damp	2-SS	28			4		
3 / 116.5		3-SS	25					
4 / 115.5		4-SS	57*			4		
5 / 114.5	10YR 7/3 Very Pale Brown Gravelly SAND, 0, mvfr, Damp	5-SS	45*					
6 / 113.5		6-SS	31*			7		
7 / 112.5	10YR 5/6 Yellowish Brown Sandy LOAM, 0, mfr, Moist	7-SS	58/7"*					
8 / 111.5		8-SS	50/3"*			2		

End of Boring: 8½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Note A: 4"+/- 10YR 4/6 Dark Yellowish Brown Silty LOAM, few Roots, 0, mfr, Damp, (Topsoil)

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 4.3 ± ft (El. 115.2±)

Additional Comments:

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-8

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Joe Black
Logged by: Ryan Bartingale

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 129.4	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
	Note A	1-SS	23			12		
1 — 128.4		2-SS	16					
2 — 127.4		3-SS	13			4		
3 — 126.4		4-SS	21					
4 — 125.4		5-SS	16			11		
5 — 124.4	10YR 6/4 Light Yellowish Brown Very Gravelly SAND, probable Cobbles and Boulders, 0, mvfr, Damp	6-SS	34*					
6 — 123.4		7-SS	50/5"*			5		
7 — 122.4								
8 — 121.4		8-SS	36*			9		
9 — 120.4	10YR 4/6 Dark Yellowish Brown Very Gravelly Loamy SAND, probable Cobbles and Boulders, 0, mvfr, Damp	9-SS	41*					
10 — 119.4		10-SS	33*			7		
11 — 118.4		11-SS	42*					
12 — 117.4		12-SS	55*			5		
13 — 116.4	10YR 7/4 Very Pale Brown Very Gravelly SAND with Cobbles and Boulders, 0, mvfr, Damp	13-SS	74/10"*					
14 — 115.4		14-SS	98/9"*			4		
15 — 114.4								
16 — 113.4		15-SS	50/1"*			14		
17 — 112.4	10YR 6/4 Light Yellowish Brown Sandy LOAM, with Cobbles and Boulders, 0, mvfr, Damp to Moist							

End of Boring: 17½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Note A: 6"+/- 10YR 3/3 Dark Brown Silty LOAM, Common Roots, 0, mfr, Damp, (Moist)

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 8.3 ± ft (El. -8.3±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*

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SOIL BORING LOG: B-9

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 116.1	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 115.1	24"+/- 10YR 2/2 Very Dark Brown Silty LOAM, few Roots, 0, mfr, Moist, (Topsoil)	1-SS	5			19		
		2-SS	4					
2 / 114.1	10YR 3/4 Dark Yellowish Brown Silty CLAY, 0, mvfr, Moist	3-SS	4	2.5	2.79	21		
3 / 113.1		4-SS	5					
4 / 112.1		5-SS	3			21		
5 / 111.1		6-SS	4					
6 / 110.1	10YR 3/3 Dark Brown Gravelly Silty Clay LOAM, probable Cobbles and Boulders, 0, mfr, Moist	7-SS	7			15		
7 / 109.1		8-SS	6					
8 / 108.1		9-SS	52/9½"			8		
9 / 107.1								
10 / 106.1	10YR 7/3 Very Pale Brown Very Gravelly SAND with Cobbles and Boulders, 0, mvfr, Damp	10-SS	69/10"			4		
11 / 105.1								

End of Boring: 11' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 5 ± ft (El. 111.1±)

Additional Comments:

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

midwest engineering services, inc.

SOIL BORING LOG: B-10

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 109.1	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 — 108.1	24"+/- 10YR 2/2 Very Dark Silty Clay LOAM, few Roots, 0, mfr, Damp, (Topsoil)	1-SS	11			8		
2 — 107.1		2-SS	15					
3 — 106.1	10YR 5/6 Yellowish Brownish Loamy SAND, 0, mfr, Damp	3-SS	12			3		
4 — 105.1		4-SS	18					
5 — 104.1	10YR 4/4 Dark Yellowish Brown Loamy SAND, probable Cobbles and Boulders, 0, mfr, Damp	5-SS	50/5½"*			4		
6 — 103.1								
7 — 102.1	10YR 7/4 Very Pale Brown Very Gravelly SAND, with Cobbles and Boulders, 0, mvfr, Damp	6-SS	37			8		
8 — 101.1		7-SS	46					
9 — 100.1		8-SS	41			3		
10 — 99.1		9-SS	50/6"*					
11 — 98.1		10-SS	50/5½"*			1		
12 — 97.1								
13 — 96.1		11-SS	42*			3		
14 — 95.1		12-SS	11*					
15 — 94.1		13-SS	34*			1		
16 — 93.1		14-SS	9					
17 — 92.1	10YR 5/4 Yellowish Brown Very Gravelly SAND, with Cobbles and Boulders, 0, mvfr, Damp	15-SS	9			7		
18 — 91.1		16-SS	8					
19 — 90.1		17-SS	17			2		
20 — 89.1		18-SS	28					

End of Boring: 20'

Notes:

Water Level / Caving Observations:
Water Level $_{\text{During Drilling:}}$ Dry
Water Level $_{\text{Upon Completion:}}$ Dry
Caved at $_{\text{Upon Completion:}}$ 12.4 ± ft (El. 96.7±)

Additional Comments:
*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*

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SOIL BORING LOG: B-11

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 7, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 96.5	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 95.5	24"+/- 10YR 3/3 Dark Brown Silty CLAY, 0, mvfr, Damp, (Topsoil)	1-SS	10	3.5	3.5	15		
		2-SS	10					
2 / 94.5	10YR 5/4 Yellowish Brown Gravelly Loamy SAND, 0, mfr, Damp	3-SS	13			12		
3 / 93.5		4-SS	31*					
4 / 92.5		5-SS	22			8		
5 / 91.5		6-SS	73/10"					
6 / 90.5	10YR 6/4 Light Yellowish Brown Gravelly Loamy SAND, with Cobbles and Boulders, 0, mvfr, Damp	7-SS	54*			4		
7 / 89.5		8-SS	59*					
8 / 88.5		9-SS	61*			6		
9 / 87.5		10-SS	97/10"*					
10 / 86.5	10YR 5/6 Yellowish Brown LOAM, with Cobbles and Boulders, 0, mvfr, Damp	11-SS	65*			8		
11 / 85.5		12-SS	50/2"*					
12 / 84.5		13-SS	63/10"*			3		
13 / 83.5								

End of Boring: 13½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:
Water Level During Drilling: Dry
Water Level Upon Completion: Dry
Caved at Upon Completion: 6 ± ft (El. 90.5±)

Additional Comments:
*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*

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SOIL BORING LOG: B-12

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 7, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 99.7	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 — 98.70	24"+/- 10YR 2/2 Very Dark Brown Silt LOAM, few Roots, 0, mfr, Damp, (Topsoil)	1-SS	6			21		
		2-SS	9					
2 — 97.70		3-SS	8			21		
3 — 96.70	10YR 3/4 Dark Yellow Brown Gravelly Silty CLAY, 0, mvfr, Moist	4-SS	19					
4 — 95.70		5-SS	24			4		
5 — 94.70		6-SS	29					
6 — 93.70		7-SS	44*			5		
7 — 92.70		8-SS	41*					
8 — 91.70		9-SS	44*			6		
9 — 90.70	10YR 5/4 Yellowish Brown Gravelly Loamy SAND with Cobbles and Boulders, 0, mvfr, Damp	10-SS	54*					
10 — 89.70		11-SS	46*			5		
11 — 88.70		12-SS	53*					
12 — 87.70		13-SS	53*			7		
13 — 86.70		14-SS	69*					
14 — 85.70								

End of Boring: 14½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 5 ± ft (El. 94.7±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-13

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Joe Black
Logged by: Ryan Bartingale

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 118.8	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
	Note A	1-SS	18			8		
1 — 117.80	10YR 7/3 Very Pale Brown Very Gravelly SAND with Cobbles and Boulders, 0, mvfr, Damp	2-SS	50/4"*					
2 — 116.80		3-SS	31*			8		
3 — 115.80		4-SS	45*					
4 — 114.80	10YR 6/4 Light Yellowish Brown Gravelly Loamy SAND with Cobbles and Boulders, 0, mvfr, Damp	5-SS	47*			8		
5 — 113.80		6-SS	30*					
6 — 112.80		7-SS	18			9		
7 — 111.80	10YR 5/6 Yellowish Brown Gravelly Loamy SAND, 0, mvfr, Damp	8-SS	15					
8 — 110.80		9-SS	17			1		
9 — 109.80		10-SS	42*					
10 — 108.80	10YR 7/1 Light Gray Very Gravelly SAND with Cobbles and Boulders, 0, mvfr, Damp	11-SS	36*			3		
11 — 107.80		12-SS	22*					
12 — 106.80		13-SS	32*			7		
13 — 105.80	10YR 5/6 Yellowish Brown Gravelly LOAM with Cobbles and Boulders, 0, mvfr, Moist	14-SS	50/6"*					

End of Boring: 13½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Note A: 6"+/- 10YR 3/3 Dark Brown Silty LOAM, Common Roots, 0, mfr, Damp, (Topsoil)

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 5.5 ± ft (El. 113.3±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-14

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Joe Black
Logged by: Ryan Bartingale

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 129.0	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 — 128.00	24"+/- 10YR 3/4 Dark Yellowish Brown Silty LOAM, Common Roots, 0, mfr, Damp, (Topsoil)	1-SS	16			12		
		2-SS	61*					
2 — 127.00		3-SS	29			6		
3 — 126.00		4-SS	18					
4 — 125.00	10YR 4/4 Dark Yellowish Brown Loamy SAND, 0, mfr, Damp	5-SS	22			6		
5 — 124.00		6-SS	28					
6 — 123.00		7-SS	25			8		
7 — 122.00		8-SS	29					
8 — 121.00		9-SS	12			8		
9 — 120.00	10YR 5/6 Yellowish Brown Gravelly LOAM with Cobbles and Boulders, 0, mfr, Moist	10-SS	54*					
10 — 119.00		11-SS	50*			9		
11 — 118.00		12-SS	40*					
12 — 117.00		13-SS	95/10"*			--		
13 — 116.00	10YR 7/3 Very Pale Brown Gravelly SAND with Cobbles and Boulders, 0, mvfr, Damp							
14 — 115.00		14-SS	50/1"*			--		

End of Boring: 14½' due to auger refusal on probable cobbles and boulder or bedrock

Notes:

Water Level / Caving Observations:
Water Level During Drilling: Dry
Water Level Upon Completion: Dry
Caved at Upon Completion: 6.8 ± ft (El. 122.2±)

Additional Comments:
*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

midwest engineering services, inc.

SOIL BORING LOG: B-15

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Joe Black
Logged by: Ryan Bartingale

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 119.6	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 118.60	30"+/- 10YR 3/3 Dark Brown Silty LOAM, few Roots, 0, mfr, Damp, (Topsoil)	1-SS	6			12		
		2-SS	9					
2 / 117.60		3-SS	9			6		
3 / 116.60		4-SS	20					
4 / 115.60		5-SS	21			5		
5 / 114.60	10YR 5/6 Yellowish Brown Gravelly Loamy SAND, 0, mvfr, Damp	6-SS	25					
6 / 113.60		7-SS	67*			3		
7 / 112.60		8-SS	50/3"*					
8 / 111.60		9-SS	50/4"*			2		
9 / 110.60								
10 / 109.60	10YR 7/3 Very Pale Brown Gravelly SAND with Cobbles and Boulders, 0, mvfr, Damp	10-SS	50/2"*			2		
11 / 108.60								
12 / 107.60		11-SS	50/1"*			3		
13 / 106.60		12-SS	50/2"*			--		
14 / 105.60								

End of Boring: 14' due to auger refusal on probable cobbles and boulder or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 6.8 ± ft (El. 112.8±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-16

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 9, 2005
Drilled by: Joe Black
Logged by: Ryan Bartingale

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 109.2	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 / 108.20	24"+/- 10YR 4/3 Brown Silty LOAM, few Roots, 0, mfr, Damp, (Topsoil)	1-SS	7			15		
		2-SS	18					
2 / 107.20		3-SS	13			13		
3 / 106.20		4-SS	15					
4 / 105.20		5-SS	17			5		
5 / 104.20	10YR 5/6 Yellowish Brown Very Gravelly Loamy SAND, with Cobbles and Boulders, 0, mvfr, Damp	6-SS	40*					
6 / 103.20		7-SS	24			5		
7 / 102.20		8-SS	23					
8 / 101.20		9-SS	14	2.0		24		
9 / 100.20		10-SS	38*					
10 / 99.20	7.5YR 6/4 Dark Brown Silty CLAY, with 10YR 6/2 Light Gray Brown, m, 2, p Mottle Streaks, 0, mvfr, Moist	11-SS	62/10"*	4.25		17		
11 / 98.20		12-SS	50/1"*					
12 / 97.20						8		
13 / 96.20	10YR 8/2 Very Pale Brown Weathered Limestone BEDROCK, Damp	13-SS	50/½"*					

End of Boring: 13½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: Dry
Water Level $_{\text{Upon Completion}}$: Dry
Caved at $_{\text{Upon Completion}}$: 6.1 ± ft (El. 103.1±)

Additional Comments:

*N vaue may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

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SOIL BORING LOG: B-17

Project: Tallgrass Condominiums

Location: Northview Road
Waukesha, Wisconsin

Project No.: 7-53102
Drill Date: June 7, 2005
Drilled by: Pete Rotaru
Logged by: Warren Fillinger

Depth Below Surface/Elev. (ft)	VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 99.4	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)	Remarks
1 — 98.40	10YR 4/3 Brown Clayey LOAM, few Roots, 0, mvfr, Damp, (Topsoil)	1-SS	10	2.25		14		
		2-SS	12					
2 — 97.40		3-SS	13			16		
3 — 96.40		4-SS	23					
4 — 95.40		5-SS	18			6		
5 — 94.40		6-SS	25					
6 — 93.40	10YR 5/6 Yellowish Brown Gravelly Loamy SAND, probable Cobbles and Boulders, 0, mvfr, Damp to Moist	7-SS	48*			5		
7 — 92.40		8-SS	34*					
8 — 91.40		9-SS	16			9		
9 — 90.40		10-SS	27					
10 — 89.40		11-SS	15			13		
11 — 88.40	10YR 5/6 Yellowish Brown Loamy SAND, 0, mfr, Very Moist	12-SS	37*					
12 — 87.40		13-SS	40*			6		
13 — 86.40	10YR 5/6 Yellowish Brown Very Gravelly Loamy SAND, with Cobbles and Boulders, 0, mfr, Moist	14-SS	50*					▽
14 — 85.40		15-SS	86/10"*			--		
15 — 84.40	10YR 6/4 Light Yellowish Brown Very Gravelly LOAM with Cobbles and Boulders, 0, mfr, Wet							
16 — 83.40		17-SS	55*			10		

End of Boring: 16½' due to auger refusal on probable cobbles and boulders or bedrock

Notes:

Water Level / Caving Observations:

Water Level $_{\text{During Drilling}}$: 14 ± ft (El. 85.4±) ▽

Water Level $_{\text{Upon Completion}}$: Dry

Caved at $_{\text{Upon Completion}}$: 9.3 ± ft (El. 90.1±)

Additional Comments:

*N value may be elevated due to cobbles and boulders

*Lines of demarcation represent **approximate** boundaries between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil transitions.*

GENERAL NOTES

SAMPLE IDENTIFICATION

Visual soil classifications are made in general accordance with the Unified Soil Classification System on the basis of textural and particle size categorization, and various soil behavior characteristics. Visual classifications should be substantiated by appropriate laboratory testing when a more exact soil identification is required to satisfy specific project applications criteria.

PARTICLE SIZE ±

Boulders: 8 inches Cobbles: 3 to 8 inches Gravel: 5 mm to 3 inches	Coarse Sand: 2mm to 4mm Medium Sand: 0.42mm to 2mm Fine Sand: 0.074 to 0.42mm	Silt: 0.005mm to 0.074mm Clay: -0.005mm

DRILLING & SAMPLING SYMBOLS

SS: Split-spoon, 2" O.D. by 1 3/8" I.D.
ST: Shelby Tube, 2" O.D. or 3" O.D., as noted in text
AU: Auger Sample
DB: Diamond Bit
CB: Carbide Bit
RB: Roller Bit
WS: Wash Sample
BS: Bag Sample
HA: Hand Auger

SOIL PROPERTY SYMBOLS

N: Standard penetration count, indicating number of blows of a 140 lb. hammer with a 30 inch drop, required to advance a split-spoon sampler one foot.
Qu: Unconfined compressive strength, tons per square foot (tsf)
Qp: Calibrated hand penetrometer resistance, tsf
MC: moisture content, %
LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index
Dd: Dry Density, pounds per cubic foot (pcf)
PID: Photoionization Detector (Hnu meter) volatile vapor level, ppm

SOIL RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

NON-COHESIVE SOILS		COHESIVE SOILS		
Classifier	N-Value Range	Classifier	Qu Range (tsf)	N-Value Range
very loose	0 - 3	very soft	0 - 0.25	0 - 2
loose	3 - 7	soft	0.25 - 0.5	2 - 5
medium dense	7 - 15	medium stiff	0.5 - 1.0	5 - 10
dense	15 - 38	stiff	1.0 - 2.0	10 - 14
very dense	38 +	very stiff	2.0 - 4.0	14 - 32
		hard	4.0 +	32+

GROUNDWATER

▼ : Approximate Groundwater level at time noted on soil boring log, measured in open bore hole unless otherwise noted. Groundwater levels often vary with time, and are affected by soil permeability characteristics, weather conditions, & lateral drainage conditions.