APPENDIX A

GEOTECHNICAL EXPLORATION REPORT

CGC, Inc.

Construction • Geotechnical
Consulting Engineering/Testing

December 22, 2009
C09306

Mr. Dave Nelsen, P.E.
Ruedebusch Development & Construction
4605 Dovetail Drive
Madison, WI 53704

Re: Geotechnical Exploration Report
Liberty Park-Infrastructure Development
Verona, Wisconsin

Dear Mr. Nelsen:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the subsurface exploration program for the above-referenced project. The purpose of this exploration program was to evaluate the subsurface conditions at the site and to provide geotechnical recommendations for infrastructure development, including utility and pavement design/construction and stormwater infiltration potential. Note that geotechnical recommendations for the individual lots are not included in this report, and we assume that site-specific geotechnical work will be completed as the lots are developed. Two copies of this report are submitted for your use.

PROJECT DESCRIPTION

We understand that a 140-acre site on the southeast side of Verona will be developed for industrial and commercial use. The development will ultimately include about 50 lots, 15,000 ft of roadway and multiple stormwater infiltration and/or retention basins. Recommendations for pavement and utility design and an evaluation of the potential for infiltrating stormwater are required.

SITE CONDITIONS

The site consists of a smaller, approximately 19-acre parcel at the northwest quadrant of the intersection of Whalen Road and USH 18 and about 120 acres south of Whalen to CTH 'M' and from USH 18 and CTH 'PB' west about 3500 ft. The area is primarily agricultural land with some wooded areas. A concrete contractor has a facility located in the south-central portion of the larger parcel, and a residence is located in the northeast corner. Wetlands are delineated in northwest and southwest portions of the larger parcel. Site topography ranges from fairly level to moderately steep with ground surface elevations ranging from about EL 1008 ft to 1076 ft (USGS datum). At the time of the field exploration, the site was covered in approximately 12 to 18 in. of snow.

2921 Perry Street, Madison WI 53713
Telephone: 608/288-4100
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SUBSURFACE CONDITIONS

Subsurface conditions at this site were explored by drilling 20 Standard Penetration Test (SPT) borings to 15 to 20 ft below existing site grades within the proposed roadways and stormwater infiltration/detention areas. Borings SW-1 through SW-5 were drilled in proposed stormwater areas, and the other borings were drilled in proposed roadways. Boring locations and numbering were selected Ruedebusch, in consultation with CGC, and located in the field by Williamson Surveying & Associates. Badger State Drilling (under subcontract to CGC) completed the soil borings on December 4, 7, 16, 17 and 18, 2009 using ATV-mounted CME-750 and CME-850 rotary drill rigs equipped with hollow stem augers and automatic hammers. The specific procedures used for drilling and sampling are described in Appendix A. The boring locations are shown in plan on the Soil Boring Location Map presented in Appendix B. Boring elevations were surveyed by Williamson.

Overall, the subsurface profile at the boring locations is somewhat similar and can be described in general terms by the following strata (in descending order):

- 8 to 15 in. of ***clayey topsoil*** in areas not recently chisel plowed; the topsoil thickness in the plowed areas was difficult to determine; over

- 3 to 12 ft of very soft to very stiff ***lean clay*** with variable sand content and very loose to loose ***clayey sand***; note that the upper portion of the clay was generally stiff to very stiff, and the clay softened with depth; followed by

- Loose to very dense ***sand*** strata with various amounts of silt and gravel, and scattered cobbles/boulders to the maximum depth explored.

An exception to the generalized soil profile includes a 2.5-ft thick stiff to very stiff lean to fat clay layer between sand layers in Boring SW-2. The bottom sand layer in this boring was interpreted to be possible weathered dolomite bedrock. Additionally, Borings 12 and 35 terminated in stiff lean to fat clay, and this layer was also interpreted to be possible weathered dolomite bedrock in Boring 35.

Groundwater was not detected in the borings during or shortly after the completion of drilling. However, redoximorphic features (i.e., mottling) were encountered in the clay layer in most of the borings which could indicate seasonal or past saturation. Additionally, the clay layer generally softened with depth and several samples in the 5 to 8 ft depth range were moist to wet, which could indicate a perched condition. Water levels can be expected to fluctuate based on seasonal variations in precipitation, infiltration, evapotranspiration and other factors. A more detailed description of the site soil and groundwater conditions is presented on the boring logs contained in Appendix B.

According to the *Soil Survey of Dane County, Wisconsin*, the soils at this site are primarily mapped as Dodge silt loam (DnB, DnC2 and DoC2), McHenry silt loam (MdC2 and MdD2), St. Charles silt loam (ScA and ScB), with lesser amounts of Kidder loam (KdD2) and Troxel silt loam (TrB). The Dodge, McHenry, St. Charles and Kidder soils are generally described as moderately well-drained and well-drained, nearly level and moderately steep soils on glaciated uplands. A typical profile consists of (in descending order) loam or silt loam, silty clay loam, sandy clay loam, occasionally loam and sandy loam. The seasonal high water table is generally below 5 ft. Troxel silt loam is described as well-drained and moderately well-drained soils on draws of fans and in drainage ways, and a typical profile consists of silt loam, silty clay loam and silt loam. The seasonal high water table is usually deeper than 3 ft. Note that the engineering properties of Troxel silt loam are generally less favorable for road and building support compared to the other soils series. However, Troxel silt loam appears to be concentrated in the area mapped as wetland in the northwest portion of the site.

DISCUSSION AND RECOMMENDATIONS

Subject to the limitations discussed below and based on the subsurface exploration, it is our opinion that the site is generally suitable for construction. Our recommendations for site preparation, pavement, utility and infiltration basin design/construction are presented in the following subsections. Additional information regarding the conclusions and recommendations presented in this report is discussed in Appendix C.

1. Site Preparation for Roadways

We recommend that topsoil and vegetation be stripped within the limits of the proposed roadways. The topsoil should be stripped to at least 5 ft beyond the construction limits and stockpiled on-site for re-use as fill in landscape areas. The topsoil thickness in non-plowed areas was generally 8 to 15 in., and the topsoil thickness in plowed areas was more difficult to determine. Therefore, variable topsoil thickness should be expected. Tree roots (if any) should also be removed in proposed construction areas.

The exposed soils after topsoil removal are generally expected to consist of lean clay subgrades. The clay subgrade soils in areas requiring filling should be proof-rolled with a heavy rubber-tired piece of construction equipment (e.g., tri-axle dump truck or scraper) to check for soft/yielding soil conditions. If soft/yielding soil conditions exist, they should be undercut/removed. Granular backfill compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557) should be used to re-establish subgrade levels. As an alternative, the soft/yielding subgrade soils could be stabilized using breaker rock that is compacted until deflection ceases. Fill placement (where required) to establish site grades may then proceed.

As mentioned above, the clay layer generally softened with depth in numerous borings, and where this softer zone is exposed in cut areas additional undercutting/replacement may be required.

We recommend using granular soils as fill in building and pavement areas, as sand/gravel are generally easier to place and compact compared to clays/silts, particularly in adverse weather conditions. Although best used in landscape areas, clay/silt soils can be considered for use below pavements, but some moisture conditioning should be expected, which could delay construction progress. The deeper, softer clays will likely require significant drying before adequate compaction can be achieved. Fill/backfill should be placed in accordance with the Recommended Compacted Fill Specifications presented in Appendix D.

2. Pavement Design

Based on the soil borings and soil mapping, we have assumed the clay soils will control the pavement design, as we anticipate that the pavement subgrades will primarily consist of native clays after topsoil stripping. Standard earthwork-related techniques that should be used during roadway construction after stripping include proof-rolling/recompaction, undercutting/stabilization and compaction control of fill/backfill as discussed in the Site Preparation section of this report. Note that based on the presence of deeper pockets of soft clayey soils, undercutting/replacement may be required in roadway areas cut to grade. The shallower clay soils generally had a more favorable stiff to very stiff consistency, but these soils could become disturbed by repetitive construction traffic. We recommend that the budget include a generous contingency for undercutting/stabilization.

Based on the soil borings and regional soil mapping, we recommend that the following parameters be used to develop the design pavement section:

AASTHO classification	A-4
Frost group index	F-3
Design group index	12
Soil support value	4.2
Subgrade modulus, k (pci)	125
Estimated percent shrinkage	20 - 30
Estimated CBR value	2 - 5

Based on anticipated industrial and commercial subdivision traffic (i.e., which we assume includes less than 50 equivalent single-axle loads (ESALs) per day), a typical pavement design per WDOT Standard Specifications is typically about 4 to 5 in. of asphalt pavement and 10 to 12 in. of compacted aggregate base course. Note that heavier truck traffic loads will likely require a thicker pavement section. Alternative pavement designs for different traffic count data are also acceptable providing they are based on the given design parameters.

3. Utility Construction

Based on the available soil and groundwater information, it appears that utility construction can proceed using traditional open-cut methods. Dewatering is generally not expected for utility installations. It is expected that excavation sidewalls will be sloped back for relatively shallow installations (i.e., less than 4 ft in depth) and that a trench shield and/or internal bracing will be used for deeper excavations. The following are our recommendations regarding trench excavation, dewatering, and backfilling:

- Excavation: Open cuts should be sloped and/or braced in accordance with OSHA guidelines. The softer clays and pockets of cleaner sands (SP or SP-SM) are classified as OSHA "Type C" soils, and slopes of 1.5H:1V are expected to be at least temporarily stable. Note that flatter side slopes may be required if very soft clay pockets or perched water lenses are encountered. Slopes of 1H:1V or flatter through the on-site silty sand (SM) soils and stiff to very stiff clay soils above the water table (OSHA "Type B") are expected to be at least temporarily stable. A stabilizing layer consisting of 12 in. of 3-in. clear stone compacted into the base soils may be required to stabilize the soft sandy clay/clayey sand soil encountered in several borings. Temporary bracing should be designed by a registered professional engineer.

- Rock Removal: Possible weathered dolomite bedrock was encountered near 16 ft in Boring SW-2 and near 12 ft in Boring 35. Bedrock was not detected in the other borings to the maximum depth explored. Although the bedrock depth should be expected to vary across the site, we generally do not expect bedrock removal to be a major concern for shallow utility excavations.

- Dewatering: Based on observations made during the field exploration, groundwater infiltration into shallow excavations is generally not expected at this site. However, perched groundwater lenses or groundwater in deep utility excavations on lower portions of the site could be encountered, especially during wet seasons. For groundwater drawdowns of less than about 1 to 2 ft, dewatering can typically be accomplished using pumps operating from filtered sump pits. For groundwater drawdowns of more than 2 ft, well points or deep wells will likely be required to adequately lower the water table. Where well points or deep wells will be required, *supplemental* dewatering can be accomplished using submersible pumps operating from the stone layer used to stabilize the soils at the base of the excavation. Dewatering means and methods are the responsibility of the utility contractor.

- <u>Backfilling</u> - Excavation backfilling may proceed using the following guidelines:

  -- Although silty/clayey excavation spoils may be used to backfill the utility trenches above the pipe and associated granular bedding material in landscaped areas, we recommend that sand soils be used as backfill below paved areas because they are easier to place and compact in most weather conditions. The silty/clayey soils will likely require some moisture conditioning prior to placement and compaction, which could delay construction progress. The soft clayey soils will likely require *significant* drying prior to being used as trench backfill. Granular soils with cobbles and boulders should not be used in direct contact with utility lines.

  -- Backfill material should be placed in accordance with Appendix D guidelines or applicable City of Verona requirements.

  -- Compaction recommendations:
    - o Depths greater than 3 ft below grade: 90% modified Proctor (ASTM D1557)
    - o Final 3 ft: 95% modified Proctor
    - o Landscaped areas: 85% modified Proctor

4. **<u>Infiltration Potential</u>**

The soils encountered in Borings SW-1 through SW-5 below the topsoil (where present) generally consisted of relatively low permeability silty clay loam and sandy clay loam overlying slightly more permeable sandy loam. Note that the clay soils generally contained redoximorphic features (i.e., mottling) which suggests seasonal or past saturation or a perched condition. Mottling is considered a limiting layer to stormwater infiltration. The following parameters should be considered as infiltration basin design progresses:

Infiltration Potential: The following infiltration parameters were estimated using Table 2 of the WDNR Conservation Practice Standard 1002, *Site Evaluation for Storm Water Infiltration*. The estimated infiltration rates are as follow:

• Clay loam	0.03 in./hr
• Silty clay loam	0.04 in./hr
• Sandy clay loam	0.11 in./hr
• Silt loam	0.13 in./hr
• Sandy loam	0.5 in./hr
• Loamy sand	1.63 in./hr

Note that the infiltration rates should be considered very approximate.

Groundwater: Although free groundwater was not encountered in the borings during or shortly after drilling, the presence of redoximorphic features in the borings indicates either a perched groundwater condition or seasonal or past saturation. Groundwater levels should be expected to fluctuate, as previously discussed.

Bedrock: Possible weathered dolomite bedrock was encountered near 16 ft in Boring SW-2 and near 12 ft in Boring 35. Bedrock was not detected in the other borings to the maximum depth explored, and the bedrock depth should be expected to vary across the site.

According to NR151.12 (*Runoff Management)*, this site may be classified as "excluded" based on less than 3 to 5 ft of separation between the bottom of the infiltration basin and the seasonal high water table. Additionally, the site may be classified as "exempt" based on infiltration rates of less than 0.6 in./hr. in most of the soils at this site.

During construction of the proposed buildings, roads and related site work, appropriate erosion control should be provided to prevent eroded soil from contaminating infiltration areas. Where appropriate, the basin design should include pretreatment to remove fine-grained soils (silt/clay) from storm water prior to entering the infiltration area. Additionally, a regular maintenance plan should be developed to remove silt/clay soils that may accumulate in the bottom of the infiltration basin over time. Failure to adequately control fine-grained soils from entering the infiltration area or failure to regularly remove fine-grained soils that accumulate at the base of the infiltration basin will likely cause the basin to fail. Refer to WDNR Conservation Practice Standard 1002 and NR 151 for additional information.

CONSTRUCTION CONSIDERATIONS

Due to variations in weather, construction methods and other factors, specific construction problems are difficult to predict. Soil related difficulties that could be encountered on the site are discussed below:

- Earthwork construction during the early spring or late fall could be complicated as a result of wet weather and freezing temperatures. During cold weather, exposed subgrades should be protected from freezing before and after footing construction. Fill should never be placed while frozen or on frozen ground.
- If the project schedule requires that construction proceed during adverse weather, typically encountered during fall through spring, the budget should include a contingency for undercutting disturbed soils during roadway subgrade preparation.

- To the extent practical, traffic should be avoided on prepared subgrades to minimize further disturbance.

RECOMMENDED CONSTRUCTION MONITORING

The quality of the pavement subgrades will be largely determined by the level of care exercised during site development. To check that earthwork construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

- Proof-rolling within roadway areas;
- Fill/backfill placement and compaction; and
- Asphalt or concrete placement.

FOLLOW-UP EXPLORATION

The exploration program described in this report is preliminary in nature and is not intended to provide sufficient detail on subsurface conditions for the individual building lots. Follow-up soil borings are recommended in the future to develop structure-specific geotechnical recommendations. We can provide specific recommendations and a proposal for the additional exploration at the appropriate time.

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It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

CGC, Inc.

David A. Staab, P.E.
Consulting Professional

William W. Wuellner, P.E.
Senior Geotechnical Engineer

Encl: Appendix A - Subsurface Exploration
Appendix B - Boring Location Map
Logs of Test Borings (20)
Log of Test Boring-General Notes
Unified Soil Classification System
Appendix C - Document Qualifications
Appendix D - Recommended Compacted Fill Specifications

APPENDIX A

SUBSURFACE EXPLORATION

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A total of 20 Standard Penetration Test (SPT) borings were drilled to 15 to 20 ft below existing site grades within the proposed roadways and stormwater infiltration/detention areas. Borings SW-1 through SW-5 were drilled in proposed stormwater areas, and the other borings were drilled in proposed roadways. Boring locations were selected Ruedebusch, in consultation with CGC, and located in the field by Williamson Surveying & Associates. Badger State Drilling (under subcontract to CGC) completed the soil borings on December 4, 7, 16, 17 and 18, 2009 using ATV-mounted CME-750 and CME-850 rotary drill rigs equipped with hollow stem augers and automatic hammers. The boring locations are shown in plan on the Soil Boring Location Map presented in Appendix B. Boring elevations were surveyed by Williamson.

In each SPT boring, soil samples were obtained at 2.5 foot intervals to a depth of 10 ft and at 2.5 ft to 5 ft intervals thereafter. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

   The boring is extended downward, between samples, by a hollow-stem auger.

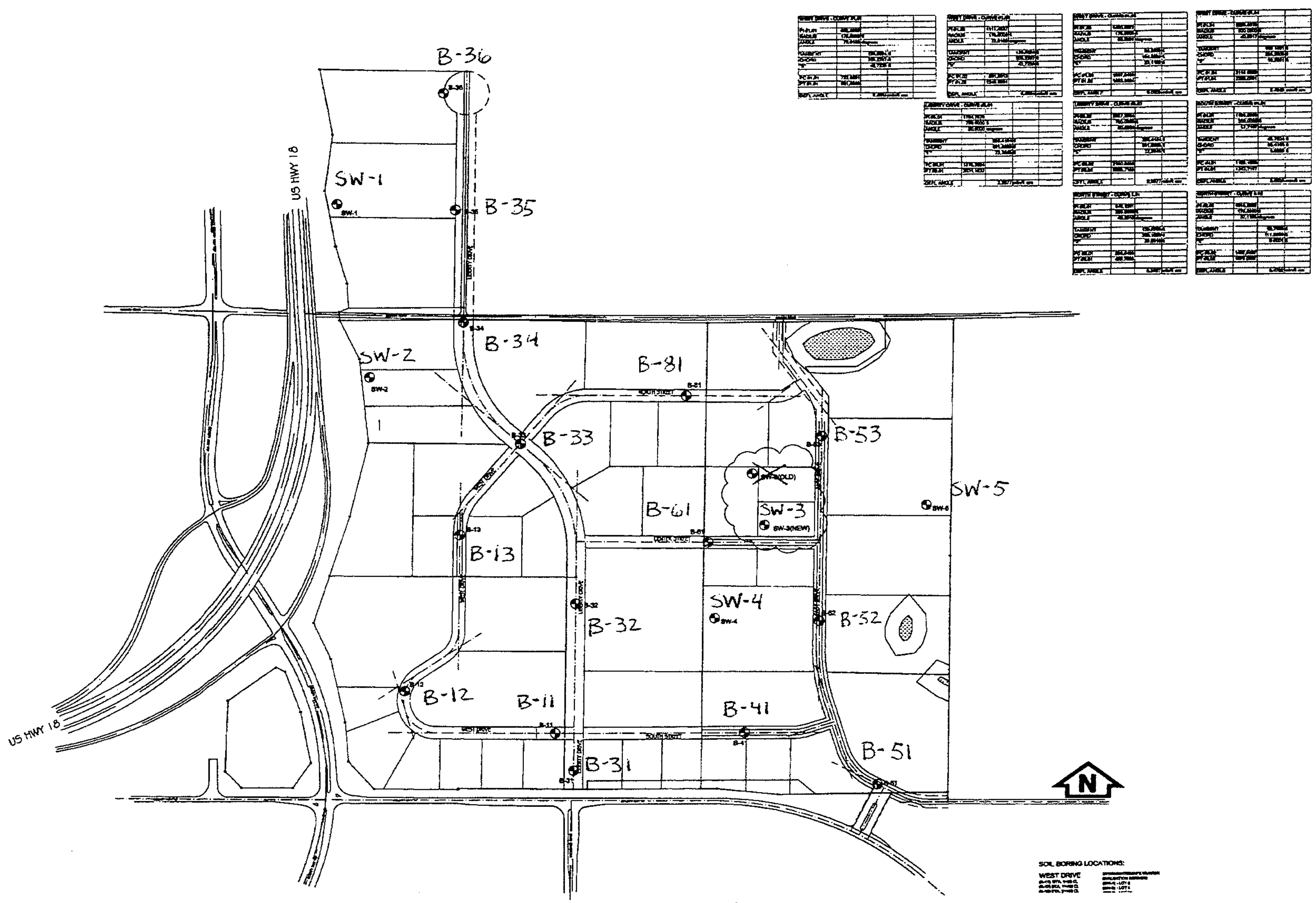
2. Standard Penetration Test and Split-Barrel Sampling of Soils
   (ASTM Designation: D 1586)

   This method consists of driving a 2-inch outside diameter split-barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance. Recovered samples are first classified as to texture by the driller.

During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the soil samples for possible environmental contaminants was not conducted by the drillers, as environmental site assessment activities is beyond CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the boreholes were backfilled in accordance with WDNR regulations, and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soils were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer and a description of the Unified Soil Classification System are presented in Appendix B.

APPENDIX B

BORING LOCATION MAP
LOGS OF TEST BORINGS (20)
LOG OF TEST BORING-GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM



Legend

Denotes Soil Boring Location and Number

Scale: Unknown

Notes
1. Soil borings were drilled by Badger State Drilling in December 2009.
2. Base map provided by Ruedebusch Development & Construction
3. Boring locations are approximate.

Date: 12/09	CGC, Inc.	SOIL BORING LOCATION MAP Proposed Liberty Park Development Verona, Wisconsin
Job No. C09306		

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No. 11
Surface Elevation (ft) 1047.1
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						Very Stiff, Brown Lean CLAY, Trace Sand (CL)					
1	■	14	M	5			(2.25)				
2	■	12	M	11		Medium Dense to Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Cobbles/Boulders (SM)					
					5						
3	■	14	M	16							
4	■	16	M	21							
					10						
5	■	14	M	39							
					15	End Boring at 15 ft					
						Borehole backfilled with bentonite chips					
						Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ⊻ NW   Upon Completion of Drilling NW
Time After Drilling 10 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 12/4/09 End 12/4/09
Driller Badger Chief JR Rig CME-750
Logger RM Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No. 12
Surface Elevation (ft) 1045.8
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		12	M	8		Stiff to Very Stiff, Brown Lean CLAY, Trace Sand (CL) Increasing sand with depth	(2.25-2.5)				
2		12	M	6	5		(1.0-1.5)	20.4			
3		16	M	5		Loose, Orange-Brown Fine SAND, Some Silt and Clay (SM/SC) Graded with less clay with depth					
4		16	M	16	10	Medium Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Cobbles/Boulders (SM)					
5		16	M	18	15	Stiff, Brown Lean to Fat CLAY, Some Sand, Trace Gravel and Chert Fragments (CL/CH)	(1.25-1.5)	24.5			
					20, 25	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					

WATER LEVEL OBSERVATIONS

While Drilling NW
Upon Completion of Drilling NW
Time After Drilling 10 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 12/4/09 End 12/4/09
Driller Badger Chief JR Rig CME-750
Logger RM Editor DAS
Drill Method 2 1/4" HSA; Autohammer

LOG OF TEST BORING

CGC Inc.

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No.: 13
Surface Elevation (ft): 1015.8
Job No.: C09306
Sheet 1 of 1

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

No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	Visual Classification and Remarks	qu (qa) (tsf)	W	LL	PL	LI
					0	Medium Stiff, Brown to Brown/Gray (Mottled) Lean CLAY, Trace Sand (CL)					
1		14	M	2			(0.75)	24.9			
2		12	M	8			(0.75-1.0)	22.2			
					5	Very Loose, Orange-Brown Fine SAND, Some Silt and Clay (SM/SC)					
3		16	M	4				20.1			
4		16	M/W	3							
					10						
						Medium Dense to Dense, Brown Fine to Medium SAND, Some Silt, Trace to Little Gravel, Scattered Cobbles/Boulders (SM)					
5		14	M	12							
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW   Upon Completion of Drilling NW
Time After Drilling: 10 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 12/4/09 End 12/4/09
Driller Badger Chief JR Rig CME-750
Logger RM Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No. 31
Surface Elevation (ft) 1048.9
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						Very Stiff, Brown Lean CLAY, Trace Sand (CL)					
1		10	M	7			(2.25-3.0)				
2		14	M	10		Loose to Medium Dense, Brown Fine SAND, Some Silt, Trace Clay and Gravel (SM)					
					5						
3		16	M	23		Medium Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Cobbles/Boulders (SM)					
4		16	M	26							
					10						
5		16	M	20							
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ⊻ NW — Upon Completion of Drilling NW

Time After Drilling				10 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 12/4/09 End 12/4/09
Driller Badger Chief JR Rig CME-750
Logger RM Editor DAS
Drill Method 2 1/4" HSA; Autohammer

LOG OF TEST BORING

CGC Inc.

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No. 32
Surface Elevation (ft) 1025.0
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1	■	12	M	5		Medium Stiff to Very Stiff, Brown (Lightly Mottled) Lean CLAY, Trace Sand (CL)	(2.0-2.25)	21.6			
2	■	18	M	5		Color changes to Brown/Gray (Mottled) with Depth	(0.75-1.5)				
3	■	18	M	5	5		(0.5-0.75)	28.3			
4	■	18	M	14		Medium Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Silt Seams (SP-SM/SM)					
5	■	18	M	16	10						
						Grades to Little Silt (SP-SM) with Depth					
6	■	18	M	45		Some Gravel near 14 ft					
					15	End Boring at 15 ft					
						Borehole backfilled with bentonite chips					
						Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW   Upon Completion of Drilling NW
Time After Drilling
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 12/16/09 End 12/16/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No.: 33
Surface Elevation (ft): 1022.7
Job No.: C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1	■	12	M	6		Stiff, Brown (Lightly Mottled) Lean CLAY, Trace Sand (CL)	(1.25-1.75)	24.3			
2	■	11	M	59		Drove stone at 3 ft	(1.5-1.75)				
3	■	8	M	22	5	Medium Dense, Brown Fine SAND, Some Silt, Trace Clay (SM)					
4	■	5	M	23		Medium Dense, Reddish Brown Silty Fine SAND, Little Gravel, Trace Clay (SM)					
5	■	18	M	19	10	Medium Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
6	■	12	M	22							
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW — Upon Completion of Drilling NW
Time After Drilling
Depth to Water ▼
Depth to Cave in

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GENERAL NOTES

Start 12/16/09 End 12/16/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No. 34
Surface Elevation (ft) 1044.0
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						8 in. Clayey TOPSOIL (OL)					
1		6	M	7		Stiff to Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.2)				
2		12	M	10	5		(1.5-2.0)				
3		14	M	12		Medium Dense, Reddish Brown to Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Cobbles/Boulders (SM)					
4		10	M	30	10						
5		12	M	25	15						
					20	End Boring at 15 ft Borehole backfilled with bentonite chips					
					25						

WATER LEVEL OBSERVATIONS

While Drilling	▽ NW	Upon Completion of Drilling			NW
Time After Drilling					10 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 12/7/09 End 12/7/09
Driller Badger Chief JR Rig CME-750
Logger RM Editor DAS
Drill Method 2 1/4" HSA; Autohammer

LOG OF TEST BORING

CGC Inc.

Project: **Liberty Park Development**

Location: **Verona, Wisconsin**

Boring No. **35**
Surface Elevation (ft) **1046.4**
Job No. **C09306**
Sheet **1** of **1**

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

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						9 in. Clayey TOPSOIL (OL)					
1		6	M	7		Medium Stiff to Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(1.5-2.0)				
2		16	M	10	5		(0.5)	23.3			
3		12	M	22		Medium Dense to Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Cobbles/Boulders (SM)					
4		18	M	34	10						
5		8	M	13		Stiff, Orange-Brown Lean to Fat CLAY, Some Gravel/Chert Fragments (CL/CH - Possible Highly Weathered Dolomite Bedrock)	(1.5-2.0)				
					15	End Boring at 15 ft Borehole backfilled with bentonite chips					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ⊻ NW   Upon Completion of Drilling NW
Time After Drilling
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 **12/7/09** End **12/7/09**
Driller **Badger** Chief **JR** Rig **CME-750**
Logger **RM** Editor **DAS**
Drill Method **2 1/4" HSA; Autohammer**

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No. 36
Surface Elevation (ft) 1041.2
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						8 in. Clayey TOPSOIL (OL)					
1		5	M	6		Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(1.5-2.0)				
2		10	M	6	5		(1.0)	26.4			
3		10	M	13		Medium Dense, Brown Fine SAND, Some Silt and Gravel, Trace Clay (SM)					
4		12	M	23	10	Medium Dense to Very Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Cobbles/Boulders (SM)					
5		6	M	50/5"		Drove stone or encountered cobble/boulder at 14 ft					
					15	End Boring/Split-Spoon Refusal at 14.5 ft Borehole backfilled with bentonite chips					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ⊻ NW   Upon Completion of Drilling NW
Time After Drilling
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 12/7/09 End 12/7/09
Driller Badger Chief JR Rig CME-750
Logger RM Editor DAS
Drill Method 2 1/4" HSA; Autohammer

LOG OF TEST BORING

CGC Inc.

Project	Liberty Park Development
Location	Verona, Wisconsin
Boring No.	41
Surface Elevation (ft)	1047.3
Job No.	C09306
Sheet	1 of 1

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

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		16	M	4		Stiff, Dark Brown to Brown Lean CLAY, Trace Sand and Organics (CL)	(1.5)				
						Stiff, Brown (Lightly Mottled) Lean CLAY, Trace Sand (CL)					
2		18	M	7			(1.5)	25.7			
3		5	M/W	5	5	Soft, Dark Gray/Gray Sandy Lean CLAY to Clayey Fine SAND, Trace to Little Gravel (CL/SC)	(0.25-0.5)	19.9			
4		18	M	11		Medium Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
5		18	M	13	10						
6		18	M	18							
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ⊻ NW   Upon Completion of Drilling NW

Time After Drilling

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 12/18/09 End 12/18/09

Driller AECOM Chief BZ Rig CME-850

Logger JW Editor DAS

Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No. **51**

Surface Elevation (ft) 1075.8

Job No. C09306

Sheet 1 of 1

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

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		12	M	3		Stiff to Very Stiff, Brown Lean CLAY, Trace Sand (CL)	(2.0)				
						Stiff to Very Stiff, Brown (Lightly Mottled) Lean CLAY, Trace Sand (CL)					
2		18	M	7			(1.5-2.5)				
					5						
3		18	M/W	4		Very Soft, Brown Lean CLAY, Little to Some Sand, Trace Gravel (CL)	(<0.1)	19.4			
4		12	M	14		Medium Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
					10						
5		14	M	25							
6		18	M	25							
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling: NW; Upon Completion of Drilling: NW

Time After Drilling: ______

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 12/18/09 End 12/18/09

Driller AECOM Chief BZ Rig CME-850

Logger JW Editor DAS

Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No. 52
Surface Elevation (ft) 1031.5
Job No. C09306
Sheet 1 of 1

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

No.	Type	Rec (in.)	Moist	N	Depth (ft)	Visual Classification and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		12	M	2		Stiff, Brown Lean CLAY, Trace Sand (CL)	(1.5)				
						Increasing Sand near 4 ft					
2		11	M	5			(1.75)				
					5	Soft, Light Reddish Brown Sandy Lean CLAY, Trace to Little Gravel (CL)					
3		12	M/W	6			(0.25-0.5)	19.6			
4		8	M	11		Loose to Medium Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
5		11	M	8	10						
6		18	M	14							
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW   Upon Completion of Drilling NW
Time After Drilling
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 12/17/09 End 12/17/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No.: 53
Surface Elevation (ft): 1027.3
Job No.: C09306
Sheet 1 of 1

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

No.	Type	Rec (in.)	Moist	N	Depth (ft)	Visual Classification and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		14	M	3		12 in. of Dark Gray Clayey TOPSOIL (OL)					
						Medium Stiff to Stiff, Brown (Lightly Mottled) Lean CLAY, Trace Sand (CL)					
2		18	M	7			(1.75)				
3		18	M	5	5	Laminated with Sand Seams near 6 ft	(0.75-1.0)	22.4			
4		18	M/W	6		Loose, , Brown Fine SAND, Some Silt, Trace Clay, Scattered Soft Clay Seams (SM)					
5		18	M	4	10	Grades to Soft to Medium Stiff Sandy Silty Clay with Sand Seams near 10 ft					
						Very Dense, Brown Fine to Medium SAND, Some Gravel, Little Silt (SP-SM)					
6		18	M	53	15	End Boring at 15 ft					
					20	Borehole backfilled with bentonite chips					
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW   Upon Completion of Drilling NW
Time After Drilling
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 12/17/09 End 12/17/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No. 61
Surface Elevation (ft) 1024.5
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		12	M	3		Medium Stiff, Dark Gray Lean CLAY, Trace Organics (CL)	(0.5)	25.1			
						Very Stiff, Brown (Lightly Mottled) Lean CLAY, Trace Sand (CL)					
2		18	M	5			(2.5)				
3		18	M	5	5	Soft to Medium Stiff, Brown Sandy Lean CLAY to Clayey Fine SAND, Little to Some Gravel (CL/SC)	(0.5)	18.2			
4		12	M	19		Medium Dense to Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders and Silt Seams (SM)					
5		12	M	27	10						
6		18	M	31							
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW   Upon Completion of Drilling NW
Time After Drilling
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 12/17/09 End 12/17/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No.: 81
Surface Elevation (ft): 1030.3
Job No.: C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		18	M	4		Medium Stiff to Very Stiff, Dark Gray to Brown Lean CLAY, Trace Sand (CL)	(1.5)				
2		18	M	7			(2.25)				
3		18	M	5	5	Softens with Slight Mottling near 6 ft	(0.5)	27.7			
4		12	M	8		Loose, Brown Silty Fine SAND, Little Gravel, Trace Clay (SM)					
5		18	M	16	10	Medium Dense, Brown Fine to Medium SAND, Trace to Little Silt, Little Gravel, Scattered Clay Seams (SP/SP-SM)					
6		18	M	33		Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
					15	End Boring at 15 ft Borehole backfilled with bentonite chips Note: Chisel plowed cornfield, topsoil thickness difficult to determine.					
					20						
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW   Upon Completion of Drilling NW
Time After Drilling
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 12/17/09 End 12/17/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No. **SW-1**
Surface Elevation (ft) 1015.0
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
				0–0.7	8 in. Clayey TOPSOIL (OL) USDA: 10 YR 3/2 Silty Clay Loam					
1	6	M	9		Very Stiff to Stiff, Brown Lean CLAY, Trace Sand (CL) USDA: 10 YR 4/4 Silty Clay Loam (Faint Redox near 60 in. - flf 10 YR 6/6)	(2.2)				
2	12	M	9	5		(1.5)				
3	5	M	3		Soft to Medium Stiff, Brown Sandy Lean CLAY, Trace Gravel (CL) USDA: 10 YR 3/4 Silty Clay Loam (Redox: flf 10 YR 6/6)	(0.5)				
4	10	M	16	10	Medium Dense, Orange-Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Silt Seams (SM) USDA: 10 YR 3/4 Loamy Sand with Silt Loam Seams					
5	8	M	47	15	Dense, Brown Fine to Medium SAND, Some Silt, Little Gravel, Scattered Cobbles/Boulders (SM) USDA: 7.5 YR 4/4 Gravelly Sandy Loam					
6	3	M	33	20						
				25	End Boring at 20 ft Borehole backfilled with bentonite chips					

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW — Upon Completion of Drilling NW
Time After Drilling
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 12/7/09 End 12/7/09
Driller Badger Chief JR Rig CME-750
Logger RM Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No.: SW-2
Surface Elevation (ft): 1004.1
Job No.: C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		13	M	4		15 in. Dark Gray Clayey TOPSOIL (OL) 10 YR 3/2 Silty Clay Loam					
2		18	M	3		Very Loose, Gray SILT, Little to Some Sand (ML) USDA: 10 YR 4/2 Silt Loam					
3		18	M/W	6	5	Loose, Brown Fine to Medium SAND, Some Silt and Clay, Trace Gravel (SM/SC) USDA: 10 YR 3/3 Sandy Clay Loam (Redox flf 10 YR 6/6)					
4		12	M	10		Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
5		18	M	27	10	USDA: 10 YR 3/3 Sandy Loam					
6		15	M	11	15	Stiff to Very Stiff, Lean to Fat CLAY, Trace Sand and Gravel (CL/CH) USDA: 7.5 YR 4/4 Clay Loam	(2.0)				
7		7	M	52/6"		Very Dense, Brown Fine to Coarse SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM - Possible Weathered Dolomite Bedrock) USDA: 10 YR 5/4 Sandy Loam (Possible Dolomite Bedrock)					
					20	End Boring/Split-Spoon Refusal at 19.5 ft. Borehole backfilled with bentonite chips					
					25						

WATER LEVEL OBSERVATIONS

While Drilling ⊽ NW — Upon Completion of Drilling NW
Time After Drilling
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 12/16/09 End 12/16/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

LOG OF TEST BORING

CGC Inc.

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No.: SW-3
Surface Elevation (ft): 1022.5
Job No.: C09306
Sheet 1 of 1

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

No.	Type	Rec (in.)	Moist	N	Depth (ft)	Visual Classification and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		18	M	2	0–1.5	18 in. Dark Gray Clayey TOPSOIL (OL) USDA: 10 YR 3/2 Silty Clay Loam					
2		18	M	6		Stiff to Very Stiff, Gray Lean CLAY, Trace Sand (CL) USDA: 10 YR 5/2 Silty Clay Loam (Redox fld 10 YR 6/6)	(1.75-2.0)				
3		18	M	10	5		(2.5)				
4		18	M/W	3		Very Soft, Dark Gray/Gray Sandy Lean CLAY to Clayey Fine SAND, Little to Some Gravel (CL/SC) USDA: 10 YR 3/2 Sandy Clay Loam (Redox fld 10 YR 6/6)	(<0.1)				
5		8	M/W	3	10						
6		12	M	10	15	Medium Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM) USDA: 7.5 YR 5/4 Sandy Loam					
7		18	M	17	20						
						End Boring at 20 ft Borehole backfilled with bentonite chips					

WATER LEVEL OBSERVATIONS

While Drilling: NW
Upon Completion of Drilling: NW
Time After Drilling: ____
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 12/17/09 End 12/17/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development

Location: Verona, Wisconsin

Boring No. SW-4

Surface Elevation (ft) 1025.1

Job No. C09306

Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		12	M	5		Stiff, Brown Lean CLAY, Trace Sand (CL) USDA: 10 YR 3/2 and 10 YR 4/4 Silty Clay Loam	(1.0-1.25)				
2		18	M	6		Stiff, Brown (Lightly Mottled) Lean CLAY, Trace Sand (CL) USDA: 10 YR 4/4 Silty Clay Loam (Redox: fld 10 YR 6/6)	(1.5-2.5)				
3		2	M	12	5	Medium Dense to Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM) USDA: 7.5 YR 4/4 Sandy Loam					
4		18	M	34							
5		12	M	32	10						
6		18	M	27	15						
7		18	M	34	20						
					25	End Boring at 20 ft Borehole backfilled with bentonite chips Note: Chisel plowed corn field - topsoil thickness difficult to determine.					

WATER LEVEL OBSERVATIONS

While Drilling ▽ NW   Upon Completion of Drilling NW

Time After Drilling

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 12/17/09 End 12/17/09

Driller AECOM Chief BZ Rig CME-850

Logger JW Editor DAS

Drill Method 2 1/4" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Liberty Park Development
Location: Verona, Wisconsin

Boring No. **SW-5**
Surface Elevation (ft) 1030.2
Job No. C09306
Sheet 1 of 1

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

SAMPLE No.	Type	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
1		18	M	3		Stiff, Brown Lean CLAY, Trace Sand (CL) USDA: 10 YR 4/4 Silty Clay Loam	(1.25)				
2		18	M	6			(0.5-0.75)				
					5	Medium Stiff, Light Reddish Brown Sandy Lean CLAY, Trace to Little Gravel (CL) USDA: 10 YR 4/4 Sandy Clay Loam					
3		18	M/W	0		Very Soft, Gray-Brown Sandy Lean CLAY to Clayey Fine SAND, Little to Some Gravel (CL/SC) USDA: 10 YR 4/3 Silty Clay Loam (Redox C1D 10 YR 7/6)	(<0.1)	25.8			
4		18	M	16		Medium Dense, Brown Fine to Medium SAND, Little Silt and Gravel, Scattered Silt Seams (SP-SM)					
5		18	M	33	10	Dense to Very Dense, Reddish Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles/Boulders (SM)					
6		18	M	52		Apparent Cobble/Boulder near 14.5 ft					
					15						
7		18	M	48							
					20	End Boring at 20 ft Borehole backfilled with bentonite chips Note: Chisel plowed corn field - topsoil thickness difficult to determine					
					25						

WATER LEVEL OBSERVATIONS

While Drilling ∇ NW   Upon Completion of Drilling NW
Time After Drilling
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 12/17/09 End 12/17/09
Driller AECOM Chief BZ Rig CME-850
Logger JW Editor DAS
Drill Method 2 1/4" HSA; Autohammer

CGC, Inc.

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 seive size.)

Group	Symbol	Typical names	Laboratory classification criteria
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	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} X D_{60}}$ between 1 and 3
	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW
		Gravels with Fines (Appreciable amount of fines)	
	GM d/u	Silty gravels, gravel-sand-silt mixtures	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	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
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	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} X D_{60}}$ between 1 and 3
	SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with Fines (Appreciable amount of fines)	
	SM d/u	Silty sands, sand-silt mixtures	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	Clayey sands, sand-clay mixtures	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:

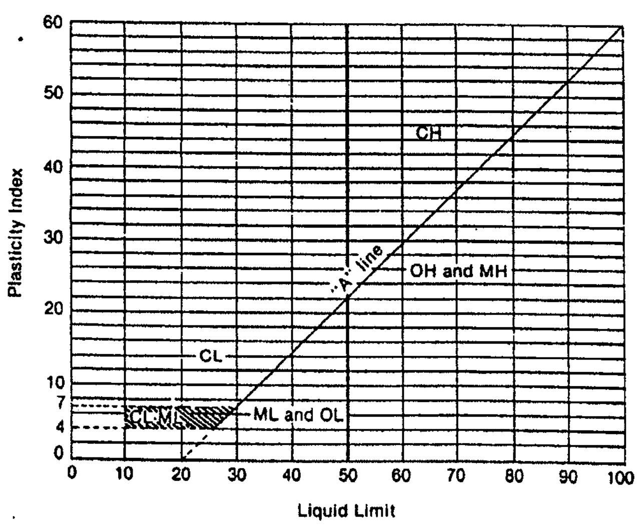
- Less than 5 per cent .... GW, GP, SW, SP
- More than 12 per cent .... GM, GC, SM, SC
- 5 to 12 per cent .... Borderline cases requiring dual symbols

FINE-GRAINED SOILS

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

Group	Symbol	Typical names
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

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: $PI = 0.73 (LL - 20)$

APPENDIX C

DOCUMENT QUALIFICATIONS

APPENDIX C
DOCUMENT QUALIFICATIONS

I. GENERAL RECOMMENDATIONS/LIMITATIONS

CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

II. IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the report for any purpose or project except the one originally contemplated.

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we were not informed.*

SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL OPINIONS

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgement to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ - sometimes significantly - from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A REPORT'S RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's recommendations if we do not perform construction observation.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having CGC participate in prebid and preconstruction conferences, and by providing construction observation.

DO NOT REDRAW THE ENGINEER'S LOGS

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited;
encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

READ RESPONSIBILITY PROVISIONS CLOSELY

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineer's responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

GEOENVIRONMENTAL CONCERNS ARE NOT COVERED

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

RELY ON YOUR GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with CGC, a member of ASFE, for more information.

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APPENDIX D

RECOMMENDED COMPACTED FILL SPECIFICATIONS

APPENDIX D

CGC, INC.

RECOMMENDED COMPACTED FILL SPECIFICATIONS

Fill Materials

Proposed fill shall contain no vegetation, roots, topsoil, peat, ash, wood or any other non-soil material which by decomposition might cause settlement. Also, fill shall never be placed while frozen or on frozen surfaces. Rock, stone or broken concrete greater than 6 in. in the largest dimension shall not be placed within 10 ft of the building area. Fill used greater than 10 ft beyond the building limits shall not contain rock, boulders or concrete pieces greater than a 2 sq ft area and shall not be placed within the final 2 ft of finish subgrade or in designated utility construction areas. The rock, boulders or concrete pieces should contain finer material to fill in void spaces between the larger material.

Placement Method

The approved fill shall be placed, spread and leveled in layers generally not exceeding 10 in. in thickness before compaction. The fill shall be placed at a moisture content capable of achieving the desired compaction level. For clay soils or granular soils containing an appreciable amount of cohesive fines, moisture conditioning will likely be required.

It is the Contractor's responsibility to provide all necessary compaction equipment and other grading equipment that may be required to attain the specified compaction. Hand-guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

Compaction Specifications

Maximum dry density and optimum moisture content of the fill soil shall be determined in accordance with modified Proctor methods (ASTM D1557). The recommended field compaction as a percentage of the maximum dry density is shown in Table 1.

Table 1
Compaction Guidelines

Area	Percent Compaction[+] Clay/Silt	Sand/Gravel
Within 10 feet of building lines		
• Footing bearing soils	93-95	95
• Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab & thicker fill zones	92	95
Beyond 10 feet of building lines		
• Under walks and pavements		
- Less than 2 ft below subgrade	92	95
- Greater than 2 ft below subgrade	90	90
• Landscaping	85	90

NOTES:

[+] Based on Modified Proctor (ASTM D 1557)

Testing Procedures

Representative samples of proposed fill shall be submitted to CGC, Inc. for optimum moisture-maximum density determination (ASTM D1557) prior to the start of fill placement. The sample size should be approximately 50 lb.

CGC, Inc. shall be retained to perform field density tests to determine the level of compaction being achieved in the fill. The tests shall generally be conducted on each lift at the beginning of fill placement and at a frequency mutually agreed upon by the project team for the remainder of the project.