Appendix A

Contract 8359

Burr Jones Park - Geotechnical Report and Soil Borings

CGC, Inc.

Construction • Geotechnical
Consulting Engineering/Testing

November 12, 2018
C18051-13

Ms. Sarah Close
City of Madison – Parks Division
City-County Building Room 104
210 Martin Luther King Jr. Blvd.
Madison, WI 35703

Re: Geotechnical Exploration Report
Burr Jones Park Improvements
Madison, Wisconsin

Dear Ms. Close:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the subsurface exploration program for the propose lighting system at Burr Jones Park in Madison, Wisconsin. The lighting system will be built in conjunction with two new athletic fields that are planned. In addition a stormwater detention basin and a parking lot will be constructed. The purpose of the exploration program was to evaluate the site's subsurface conditions from a geotechnical engineering viewpoint and to provide soil parameters for the drilled shafts envisioned for the tower foundations. Further, opinions related to detention basin and parking lot construction are provided. An electronic copy of this report is being submitted for your use.

PROJECT DESCRIPTION

We understand that there will be a lighting system associated with new athletic fields installed at Burr Jones Park. There were a total of six borings (B-1 to B-6) performed at locations selected by the City for the light towers. The illumination towers will have a relatively small axial load, and the foundation design will be predominately governed by lateral loading parameters. It is anticipated that drilled shafts with prefabricated reinforcement cages will be used for the foundations. Furthermore, a parking lot and detention basin are planned north and east of the athletic fields. Four borings (B-7 to B-10) were drilled in these areas. Please refer to Appendix B for plan specifics.

SUBSURFACE CONDITIONS

The geotechnical exploration program consisted of drilling ten Standard Penetration Test (SPT) soil borings within a open, grass-covered field to depths as great as 35 ft below the existing ground surface on September 24 to 26, 2018. The borings were drilled at locations stipulated by the City. More information regarding the drilling program is included in Appendix A of this report, with the boring locations presented on the Soil Boring Location Exhibit found in Appendix B.

2921 Perry Street, Madison WI 53713
Telephone: 608/288-4100
FAX: 608/288-7887

The subsurface conditions encountered at each boring are as follows:

- 4 to 10 ft± of ***fill*** involving miscellaneous materials; over
- Very loose to loose ***sand*** and/or ***silt*** that is about 3.5 ft to 10 ft thick; over
- Medium stiff to very stiff ***clay*** that is 6.5 ft to about 22 ft thick; over
- Medium dense to very dense ***sand*** to the maximum depth explored (considered highly weathered to competent sandstone bedrock).

As exceptions:
1) Not all layers described above were encountered in each boring;
2) Some borings did not terminate in sands depending on overall drilling depths;
3) Loose sands were encountered below the clays in B-5 and B-6; and
4) A layer of ***peat*** was encountered near 7 ft in Borings 3, 8, 9 and 10.

Groundwater encountered at depths during drilling or shortly after that ranged from about 3 to 5 ft (i.e., corresponding to about EL 846 to EL 849). Groundwater levels can be anticipated to fluctuate based on seasonal variations in lake level, precipitation, infiltration, and other factors. More detailed information regarding soil and groundwater conditions at the sites is presented in the Boring Logs found in Appendix B.

DISCUSSION AND RECOMMENDATIONS

Drilled Shafts

Based on the results of the geotechnical exploration, it is our opinion that the soils are suitable for the proposed drilled shaft foundations *provided that the base of the shafts terminate in the firm sand or clay soils at depths of 25 ft or greater.* We conservatively estimate that the allowable end bearing will be a minimum of 4,000 psf for the shafts that will bear at 25 ft or deeper. Recommendations and pertinent geotechnical design parameters for the lateral loading of shafts are presented on Table 1. Appropriate safety factors need to be applied. Additional information regarding this report is discussed in Appendix C.

Due to the presence of granular soils below the groundwater level in the borings, temporary casing will be required during drilled shaft construction to both control groundwater and prevent collapse of the shaft through the sand/clay strata. If groundwater collects to a depth of more than 2 inches in the base of the shaft, it should be removed before concrete placement. If the use of casing does not effectively control groundwater seepage, drilling under slurry conditions (or use of positive head of

water inside the casing) and placement of concrete by tremie methods may be required to reduce the risk of compromising the integrity of the soils.

Concrete used to construct the drilled shafts should have a minimum slump of 5 to 6 inches. Higher slumps may be used, if desired, but should be achieved in a manner that does not reduce concrete strength. A positive head of concrete should be kept in the casing, if used, to prevent the development of voids in the shafts.

Note that some of the cuttings from the shaft drilling operation may require landfilling where existing fill is present.

Pavement Design

We anticipate that pavement design will be controlled by existing non-engineered fill soils encountered across the site. Subgrades should be prepared by proof-rolling with a loaded quad-axle dump truck and soft areas undercut and replaced with compacted 3-in. dense graded base (in conjunction with possible geo grid use), with proof-rolling completed prior to base course placement and paving. We expect that asphalt pavement on this site will primarily be exposed to automobile traffic with less than one 18-kip equivalent single axle load (ESAL) per day. In view of this, we have assumed Traffic Class I following Wisconsin Asphalt Pavement Association (WAPA) recommendations for parking areas and driveways that are mainly used by light passenger vehicles. However, main sections of driveways, as well as the drive through lanes, are likely to experience heavier traffic loads. For pavement areas where buses or higher volume car traffic will routinely travel, we have assumed a traffic load of less than 10 ESALs per day and Traffic Class II according to WAPA.

The pavement sections summarized in Table 2 below were selected assuming a Soil Support Value "SSV" of about 2.5 to 4.0 for a firm or adequately stabilized subgrade and a design life of 20 years. Based on the widespread presence of the variable fill, including possible organic soils, we anticipate that undercutting/stabilization will be required within most pavement areas to develop a stable subgrade, which is reflected in the stabilization and geogrid layers included in the recommended pavement sections in Table 2. If subgrade conditions prove better than anticipated, the thickness of the stabilization layer may be able to be reduced. However, deeper undercutting may also be required if softer or highly organic fills are present.

Note that leaving some non-engineered fill soils and underlying peat in-place within pavement areas represents a risk that some settlement (including differential) may occur, additional maintenance may be required and a reduced pavement lifetime may be experienced. The risk the owner's responsibility. The inclusion of a stabilization layer is intended to reduce, but not eliminate, the risk of unacceptable pavement performance. Also, if pavement grades are to be raised by a foot or more, we recommend that paving be delayed 2 to 3 months to allow for some consolidation of the underlying highly compressible peats to occur.

TABLE 2 – Recommended Pavement Sections

Material	Thicknesses (in.)		WDOT Specification[1]
	Parking Lots (Traffic Class I)	Main Driveways & Bus Traffic Areas (Traffic Class II)	
Bituminous Upper Layer[2,3]	1.5	2.0	Section 460, Table 460-1, 9.5 mm, 12.5 mm
Bituminous Lower Layer[2,3]	2.0	3.0	Section 460. Table 460-1, 12.5 mm, 19 mm
Dense Graded Base Course[2,4]	10.0	10.0	Sections 301 and 305, 3 in. and 1¼ in.
Stabilization Layer	12.0	12.0	Sections 301 and 305, 3 in.
Biaxial Geogrid	-	-	Tensar BX Type 1 or equal
Total Thickness	25.5	27.0	

Notes:

1. Wisconsin DOT *Standard Specifications for Highway and Structure Construction*, latest edition, including supplemental specifications, and Wisconsin Asphalt Pavement Association *2016 Asphalt Pavement Design Guide*.

2. Compaction requirements:
   - Bituminous concrete: Refer to Section 460-3.
   - Base course: Refer to Section 301.3.4.2, Standard Compaction

3. Mixture Type LT (or E-0.3) bituminous is recommended in light-duty pavement areas and truck traffic areas with 50 ESALs or fewer; an MT mix may be required in truck traffic areas for higher traffic loads, and a heavier duty H mix (for either LT or MT) is recommended if high lateral wheels are expected; refer to Section 460, Table 460-2 of the *Standard Specifications.*

4. The upper 4 in. should consist of 1¼-in. dense graded base; the bottom part of the layer can consist of 3-in. dense graded base.

The recommended pavement sections assume regular maintenance (crack sealing, etc.) will occur, as needed. Note that if traffic volumes are greater than those assumed, CGC should be allowed to review the recommended pavement sections and adjust them accordingly. Alternative pavement designs may prove acceptable and should be reviewed by CGC. If there is a delay between subgrade preparation and placing the base course, the subgrade should be recompacted.

Detention Basin Considerations

Based on the borings performed in the basin area (B-9 and B-10), we anticipate that appropriate liner will be necessary if the stormwater management areas are designed as wet ponds. Our experience has shown that a 2 ft thick clay liner typically sufficient for lining detention ponds such as the ponds that may be used for this project. However, a "sacrificial" layer of clayey fill may be required to be placed along the sidewalls and base where granular fills and/or soils are encountered prior to commencing with actual liner placement/construction to aid attaining a satisfactorily compacted liner section. The placement of a "sacrificial" layer is particularly beneficial in creating a stable subbase in the event dewatering measures taken are not totally effective and slight groundwater seepage occurs and/or due to the sensitivity of the exposed subgrade to disturbance due to construction traffic. Note that means and methods of dewatering are the contractor's responsibility, with dewatering necessary prior to liner construction to lower groundwater levels to at least 2 ft below liner base grades.

It is our opinion that clay liner materials should be compacted to a minimum of 90 percent of the maximum dry density as determined by modified Proctor (ASTM D1557). The on-site lean clays (classified as "CL") appear most suitable for re-use as liner quality material during liner construction; however, further testing of the soils is recommended to confirm their suitability for use as a liner material. The moisture content of the cohesive soils at the time of compaction should be within about 3 percent of the wet side of the optimum moisture content. In general, fill placement/compaction should proceed in general accordance with our Recommended Compacted Fill Specifications presented in Appendix D.

RECOMMENDED CONSTRUCTION MONITORING

To check that earthwork and foundation construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

- Drilling during shaft construction to document that the subsurface conditions are consistent with those anticipated from the borings;
- Placement of concrete and use of casing/slurry, if needed;
- Concrete evaluation (including test cylinders); and
- Soil testing during basin and parking lot construction.

* * * * *

It has been a pleasure to serve you on this project. We look forward to continuing our project involvement by providing testing services during the construction phase of the project. If you have any questions or need additional consultation, please contact us.

Sincerely,

CGC, Inc.

Michael N. Schultz, P.E.
Principal/Consulting Professional

Encl: Table 1 - Recommended Soil Parameters for Drilled Shaft Foundations
Appendix A - Field Investigation
Appendix B - Soil Boring Location Exhibit
Logs of Test Borings (10)
Log of Test Boring-General Notes
Unified Soil Classification System
Appendix C - Document Qualifications

Appendix D - Recommended Compacted Fill Specifications

Table 1
Recommended Soil Parameters for Drilled Shaft Foundations
Burr Jones Park Light Towers

Soil Layer	Soil Type A (2) FILL	Soil Type B Very Loose to Loose SAND and/or SILT (3)	Soil Type C Medium Stiff to Very Stiff CLAY	Soil Type D Medium Dense SAND	Soil Type E PEAT	Soil Type F Very Dense SAND
Estimated Soil Parameters						
Short-term Loading Conditions						
Angle of internal friction, ϕ	0 degrees	28 degrees	0 degrees	33 degrees	0 degrees	40 degrees
Cohesion	250 lb/sq ft	0 lb/sq ft	500 lb/sq ft	0 lb/sq ft	75 lb/sq ft	0 lb/sq ft
Long-term Loading Conditions						
Angle of internal friction, ϕ	26 degrees	28 degrees	22 degrees	33 degrees	15 degrees	40 degrees
Cohesion	0 lb/sq ft	0 lb/sq ft	0 lb/sq ft	0 lb/sq ft	0 lb/sq ft	0 lb/sq ft
Moist unit weight	120 lb/cu ft	115 lb/cu ft	120 lb/cu ft	126 lb/cu ft	90 lb/cu ft	125 lb/cu ft
Submerged unit weight	58 lb/cu ft	53 lb/cu ft	58 lb/cu ft	63 lb/cu ft	28 lb/cu ft	63 lb/cu ft
Earth pressure coefficients(1)						
Active, Ka	1.0	0.36	1.0	0.30	1.0	0.22
Passive, Kp	1.0	2.77	1.0	3.39	1.0	4.60

Notes:
(1) Does not include a factor of safety (i.e., FS = 1)
(2) Refer to soil boring logs for additional soil type designations.
(3) Includes intermixed medium dense sand layers

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Ten Standard Penetration Test (SPT) soil borings were drilled to a depths as great as 35 ft below existing site grades. The boring locations were selected by the City of Madison and located in the field by CGC. The borings were drilled on September 24 to 26, 2018 by Soil Essentials (under subcontract to CGC) using an ATV-mounted Geoprobe 7822DT rotary drill rig equipped with hollow-stem augers and an automatic SPT hammer. Ground surface elevations at the boring locations were estimated using topographic information from Dane County DCiMap.

In each boring, soil samples were obtained at 2.5 ft intervals to a depth of 10 ft and 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.

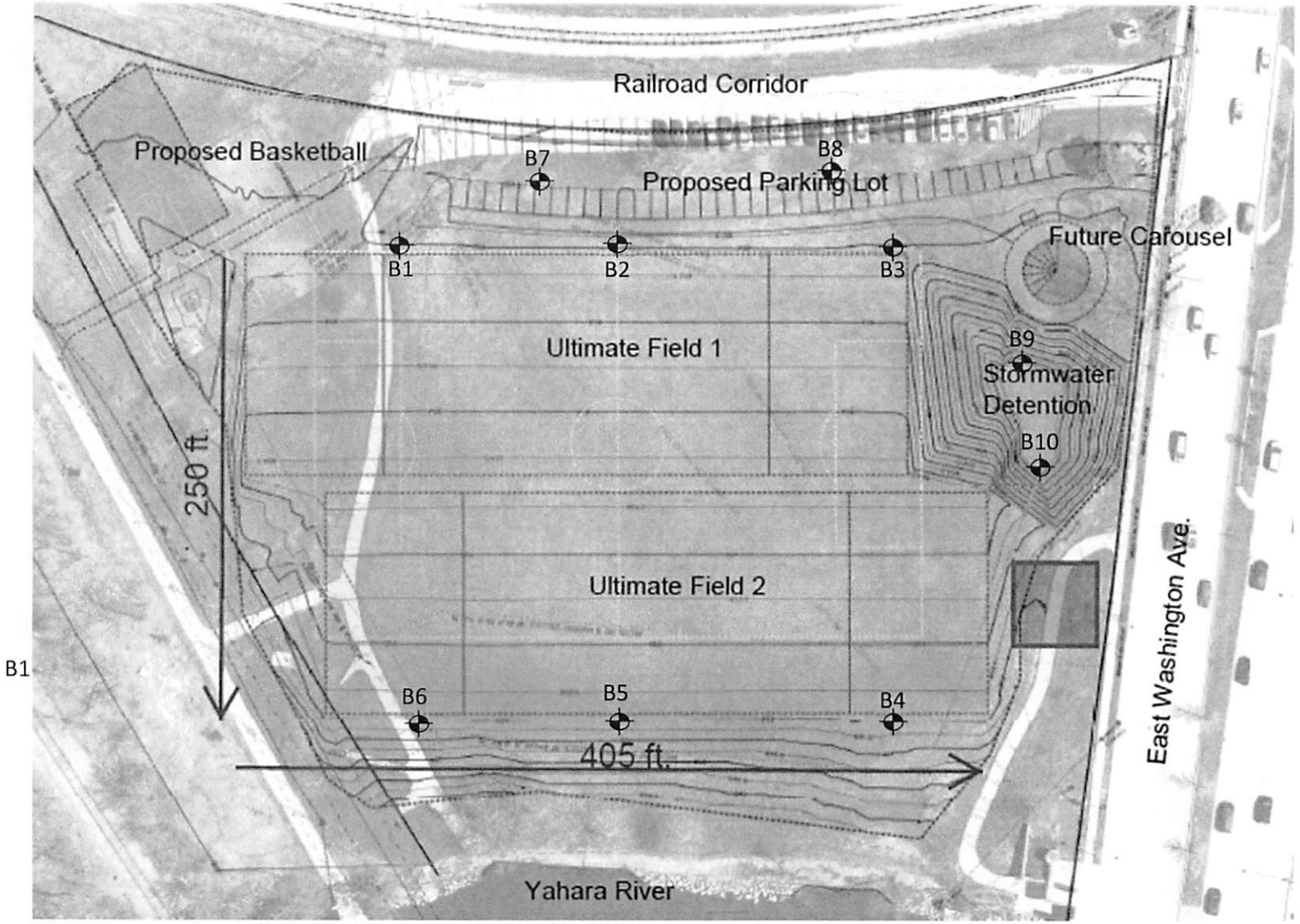
2. Standard Penetration Test and Split-Barrel Sampling of Soils
   (ASTM Designation: D 1586)

   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.

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 were not part of 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 borings were backfilled with bentonite (where required) to satisfy WDNR regulations and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soil samples 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

SOIL BORING LOCATION EXHIBIT
LOGS OF TEST BORINGS (10)
LOG OF TEST BORING – GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM



Legend

Denotes Boring Location

N

Notes

1. Soil borings performed by Soil Essentials in September of 2018
2. Boring locations are approximate.

Scale: Reduced

Date: 10/2018	CGC, Inc.	**Soil Boring Location Plan** **Burr Jones Park Improvements** **Madison, WI**
Job No. C18051-13		

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.514', W 89° 21.741'
Location: Madison, WI

Boring No. 1
Surface Elevation (ft) 852±
Job No. C18051-13
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	2		FILL: Dark Brown Clayey Topsoil to 0.8'					
						Very Loose Industrial Byproduct (Ash, Cinders, Brick/Metal Fragments and Wood (Etc...) Mixed with Silt and Sand) to 4 ft					
2		5	W	<1		Loose Brown Sand with Silt, Gravel and Industrial Byproduct to 8 ft (A)					
					5						
3		10	W	5							
4		13	W	2		Very Loose, Gray Fine SAND, Little to Some Silt, Trace Organics and Shell Fragments (SP-SM/SM) (B)					
					10						
5		13	W	10		Medium Dense to Very Loose, Gray Silt, Trace Sand and Clay (ML)					
					15	Occasional Clay Seams/Lenses and Sand Partings Becoming More Numerous with Depth					
6		18	W	3		(B)					
					20						
7		18	W	3		Stiff to Very Stiff, Gray Lean CLAY (CL)	(1.5)				
					25						
8		18	W	9		(C)	(2.0)				
					30						
9		18	W	20		Medium Dense, Light Greenish-Brown Silty Fine SAND, Some Gravel, Scattered Cobbles (SM - Probable Highly Weathered Sandstone Bedrock) (D)					
					35	End Boring at 35 ft					
						Backfilled with Bentonite Chips and Covered with Sod Plug					
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 3.5' Upon Completion of Drilling 3.9'
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 9/24/18 End 9/24/18
Driller SE Chief CRJ Rig 7822-DT
Logger CRJ Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.502', W 89° 21.720'
Location: Madison, WI

Boring No. 2
Surface Elevation (ft) 853±
Job No. C18051-13
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	7		FILL: Dark Brown Clayey Topsoil to 0.8 ft Loose to Very Loose Light Brown Silt with glass, Clay and Cinders to 6 ft					
2		1	M/W	2	5	(A)					
3		1	W	<1		Soft to Very Soft Dark Gray Clay with Sand and Gravel to 8 ft	(0.25)				
4		9	M/W	2	10	Very Loose, Gray Fine SAND, Little to Some Silt, Trace Organics and Shell fragments (SP-SM/SM) (B)					
5		10	M/W	5	15	Stiff to Very Stiff, Gray Varved Lean and Silty CLAY, Occasional Sand Partings, Interbedded with Loose Gray Silt, Trace Sand (CL/CL-ML) (C)	(2.0)				
6		13	W	2	20	Medium Stiff to Very Stiff, Gray Varved Lean and Silty CLAY, Occasional Sand Partings (CL/CL-ML)	(0.75-1.0)				
7		14	M/W	7	25		(1.0-1.5)				
8		15	M/W	8	30		(2.25)				
						(C)					
9		18	M/W	9	35		(2.5)				
					40	End Boring at 35 ft Backfilled with Bentonite Chips and Covered with Sod Plug					

WATER LEVEL OBSERVATIONS

While Drilling ▽ 5.0' Upon Completion of Drilling _____
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 9/26/18 End 9/26/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.485', W 89° 21.694'
Location: Madison, WI

Boring No. 3
Surface Elevation (ft) 853±
Job No. C18051-13
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	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
1		11	M	5		FILL: Dark Brown Clayey Topsoil to 0.3 ft Loose to Very Loose Industrial Byproduct (Ash, Cinders, Brick/Metal Fragments and Wood (Etc...) Mixed with Silt and Sand) to 5.5 ft (A)					
2		1	M	3	5						
3		11	W	<1		Medium Stiff and Gravelly Clay to 6.5 ft	(0.75)				
4		7	W	5	10	Very Loose, Black Sedimentary PEAT, Some Sand (PT) (E) Loose to Very Loose, Gray Fine SAND, Trace to Little Silt, Trace Organics and Shell fragments (SP/SP-SM) (B)					
5		8	W	3	15	Very Loose, Gray SILT, Trace to Little Sand (ML) (B)					
6		12	M/W	4	20	Medium Stiff, Gray Varved Lean and Silty CLAY, Occasional Sand Partings (CL/CL-ML) (C)	(0.75)				
7		14	M/W	8	25	Very Stiff, Gray Lean CLAY (CL) (C) End Boring at 25 ft Backfilled with Bentonite Chips and Covered with Sod Plug	(2.75)				
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 4.5' Upon Completion of Drilling _____
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 9/26/18 End 9/26/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.450', W 89° 21.736'
Location: Madison, WI

Boring No. 4
Surface Elevation (ft) 851±
Job No. C18051-13
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	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
1		12	M	10		FILL: Dark Brown Clayey Topsoil to 0.25 ft Brown Silty Sand with Gravel, Clay and Glass/Porcelain Refuse to 2.5 ft Medium Stiff Brown Clay with Sand and Gravel to 6 ft (A)					
2		11	M	9	5		(0.75)				
3		12	W	3		Very Loose, Gray Silty Fine SAND, Trace Shells and Organics (SM)					
4		13	W	2	10	(B)					
5		15	M/W	7	15	Stiff, Brown Lean CLAY (CL) (C)	(1.75)				
6		11	W	21	20	Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles and Boulders (SM) (D)					
7		7	W	23	25	Medium Dense, Light Brown Silty Fine SAND, Some Gravel, Scattered Cobbles (SM - Probable Weathered Sandstone Bedrock) (D) End Boring at 25 ft Backfilled with Bentonite Chips					
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 5.0' Upon Completion of Drilling _____
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 9/26/18 End 9/26/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.468', W 89° 21.763'
Location: Madison, WI

Boring No. 5
Surface Elevation (ft) 850±
Job No. C18051-13
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		11	M	7		FILL: Dark Brown Clayey Topsoil to 0.4 ft Stiff to Very Stiff Brown Sandy Clay with Gravel to 4 ft (A)	(2.0)				
2		12	M	10	5	Loose to Medium Dense, Gray Fine SAND, Trace to Little Silt, Trace Organics and Shell Fragments (B)	(1.0)				
3		10	W	4		Loose to Very Loose, Gray-Brown Sandy SILT, Trace Clay and Shell Fragments (ML) (B)					
4		11	W	2	10	Stiff, Gray Varved Lean and Silty CLAY, Occasional Sand Partings (CL/CL-ML)	(1.25)				
5		15	W	13	15	(C)	(1.25)				
6		6	W	5	20	Loose, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles and Boulders (SM) (B)					
7		10	W	18	25	Medium Dense to Very Dense, Light Brown Silty Fine SAND, Some Gravel, Scattered Cobbles (SM - Probable Weathered to Competent Sandstone Bedrock) (D)					
8		6	W	90	30	(F)					
						End Boring at 30 ft Backfilled with Bentonite Chips and Covered with Sod Plug					
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 3.5' Upon Completion of Drilling 3.0'
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 9/25/18 End 9/25/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.478', W 89° 21.782'
Location: Madison, WI

Boring No. 6
Surface Elevation (ft) 849±
Job No. C18051-13
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
						FILL: Dark Brown Clayey Topsoil to 0.3 ft					
1		7	M	2		Brown Clay to 1.5 ft					
						Loose Brown Silty Sand with Gravel and Clay to 3.5 ft (A)					
2		9	M/W	6	5	Loose to Very Loose Gray Silty Sand with Organics, Wood and Shell Fragments to 6 ft (A)					
3		10	M/W	4		Very Soft, Brown Lean CLAY (CL - Possible Fill)	(<0.2)				
						Very Loose to Medium Dense, Gray Fine to Medium SAND, Trace to Little Sand and Shell Fragments (SP/SP-SM) (B)					
4		11	W	13	10	Medium Dense, Gray Sandy Silt, Trace Clay (ML) (A)					
						Stiff, Gray Varved Lean and Silty CLAY, Occasional Sand Partings (CL/CL-ML)					
5		14	M/W	13	15	(C)	(1.25)				
						Loose to Very Loose, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles and Boulders (SM) (B)					
6		11	W	4	20						
						Very Dense, Light Greenish-Brown Silty Fine SAND, Some Gravel, Scattered Cobbles (SM - Probable Weathered Sandstone Bedrock) (F)					
7		13	M/W	51	25						
						End Boring at 25 ft					
						Backfilled with Bentonite Chips and Covered with Sod Plug					
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 2.9' Upon Completion of Drilling _____
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 9/25/18 End 9/25/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.507', W 89° 21.721'
Location: Madison, WI

Boring No. 7
Surface Elevation (ft) 853±
Job No. C18051-13
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	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
1		10	M	11		FILL: Dark Brown Clayey Topsoil to 0.4 ft Very Stiff Brown Clay with Gravel and Sand to 2.5 ft	(3.0)				
2		12	M	4	5	Loose to Very Loose Industrial Byproduct (Ash, Cinders, Brick/Metal Fragments and Wood (Etc...) Mixed with Silt and Sand) to 10 ft					
3		7	W	1							
4		1	W	<1	10	End Boring at 10 ft Backfilled with Bentonite Chips and Covered with Sod Plug					
					15						
					20						
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 5.0' Upon Completion of Drilling
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 9/25/18 End 9/25/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.494', W 89° 21.696'
Location: Madison, WI

Boring No. 8
Surface Elevation (ft) 853±
Job No. C18051-13
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	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
1		12	M	7		FILL: Dark Brown Clayey Topsoil to 0.3 ft Brown Clay with Gravel to 1.3 ft Loose Light Brown Silt to 2 ft Very Loose Dark Gray to Dark Brown Sand with Silt and Clay to 6.5 ft					
2		1	W	2	5						
3		7	W	3		Very Loose, Black Sedimentary PEAT, Some Sand (PT)					
4		8	W	6	10	Loose, Gray Silty Fine SAND (SM) End Boring at 10 ft Backfilled with Bentonite Chips and Covered with Sod Plug					
					15						
					20						
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 4.0' Upon Completion of Drilling
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 9/26/18 End 9/26/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.468', W 89° 21.688'
Location: Madison, WI

Boring No. 9
Surface Elevation (ft) 852±
Job No. C18051-13
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
						FILL: Dark Brown Clayey Topsoil to 0.4 ft					
1		9	M	7		Stiff Brown Clay with Sand and Gravel to 3 ft					
						Very Loose Brown Silty Sand and Industrial Byproduct (Ash, Cinders, Brick/Metal Fragments and Wood (Etc...) to 6 ft					
2		1	M/W	3	5						
3		2	M/W	<1		Very Loose, Brown to Black Sedimentary PEAT, Trace Sand (PT)					
4		7	W	5		Loose, Gray Silty Fine SAND, Trace Clay and Shells (SM)					
					10	Soft to Stiff, Gray Lean CLAY, Trace Sand (CL)					
5		10	M/W	5			(0.5)				
					15	Occasional Sand Seams/Lenses Noted Near 15 ft					
6		12	M/W	10			(1.5)				
					20	End Boring at 20 ft					
						Backfilled with Bentonite Chips and Covered with Sod Plug					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 4.1' Upon Completion of Drilling
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 9/27/18 End 9/27/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

CGC Inc.

LOG OF TEST BORING

Project: Burr Jones Park
N 43° 05.461', W 89° 21.697'
Location: Madison, WI

Boring No. 10
Surface Elevation (ft) 853±
Job No. C18051-13
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
						FILL: Dark Brown Clayey Topsoil to 0.4 ft					
1		10	M	10		Stiff Brown Clay with Sand and Gravel to 3 ft					
						Very Loose Brown Silty Sand, Industrial Byproduct (Ash, Cinders, Brick/Metal Fragments and Wood (Etc...) and Peat, Trace Glass) to 6 ft					
2		11	M	2	5						
3		9	W	<1		Very Loose, Dark Brown to Black Sedimentary PEAT, Trace Sand (PT)					
4		1	W	<1	10	Very Soft, Gray Lean CLAY Trace Sand and Shells (CL)	(<0.2)				
						Soft to Very Stiff, Light Gray to Light Brown Lean CLAY (CL)					
5		4	M/W	4	15		(0.5)				
6		13	M/W	9			(2.25)				
					20	End Boring at 20 ft					
						Backfilled with Bentonite Chips and Covered with Sod Plug					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling ▽ 5.1' Upon Completion of Drilling _____
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 9/26/18 End 9/26/18
Driller SE Chief MDB Rig 7822-DT
Logger MDB Editor ESF
Drill Method 2.25" HSA; Autohammer

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

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

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.

READ THE FULL REPORT

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 geotechnical engineer performed the study. *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 OPINION

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 confirmation-dependent recommendations included in your report. *Those confirmation-dependent 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 confirmation-dependent recommendations if we do not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront 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. Constructors can also misinterpret a geotechnical engineering report. Confront that risk by having CGC participate in prebid and preconstruction conferences, and by providing geotechnical 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 CONSTRUCTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors 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 constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors 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 constructors 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 the risk of such outcomes, 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.

ENVIRONMENTAL CONCERNS ARE NOT COVERED

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any environmental 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 environmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

OBTAIN PROFESSIONAL ASSISTANCE TO DEAL WITH MOLD

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

RELY ON YOUR GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Membership in the Geotechnical Business Council (GBC) of Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with CGC, a member of GBC, for more information.

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Geotechnical Business Council
of the Geoprofessional Business Association
8811 Colesville Road, Suite G 106
Silver Spring, MD 20910

APPENDIX D

RECOMMENDED COMPACTED FILL SPECIFICATIONS

APPENDIX D

CGC, INC.

RECOMMENDED COMPACTED FILL SPECIFICATIONS

General 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. Fill containing rock, boulders or concrete pieces should include sufficient finer material to fill voids among the larger fragments.

Special Fill Materials

In certain cases, special fill materials may be required for specific purposes, such as stabilizing subgrades, backfilling undercut excavations or filling behind retaining walls. For reference, WisDOT gradation specifications for various types of granular fill are attached in Table 1.

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 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 2. Note that these compaction guidelines would generally not apply to coarse gravel/stone fill. Instead, a method specification would apply (e.g., compact in thin lifts with a vibratory compactor until no further consolidation is evident).

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.

Table 1
Gradation of Special Fill Materials

Material	WisDOT Section 311	WisDOT Section 312	WisDOT Section 305			WisDOT Section 209		WisDOT Section 210
	Breaker Run	Select Crushed Material	3-in. Dense Graded Base	1 1/4-in. Dense Graded Base	3/4-in. Dense Graded Base	Grade 1 Granular Backfill	Grade 2 Granular Backfill	Structure Backfill
Sieve Size	Percent Passing by Weight							
6 in.	100							
5 in.		90-100						
3 in.			90-100					100
1 1/2 in.		20-50	60-85					
1 1/4 in.				95-100				
1 in.					100			
3/4 in.			40-65	70-93	95-100			
3/8 in.				42-80	50-90			
No. 4			15-40	25-63	35-70	100 (2)	100 (2)	25-100
No. 10		0-10	10-30	16-48	15-55			
No. 40			5-20	8-28	10-35	75 (2)		
No. 100						15 (2)	30 (2)	
No. 200			2-12	2-12	5-15	8 (2)	15 (2)	15 (2)

Notes:

1. Reference: Wisconsin Department of Transportation *Standard Specifications for Highway and Structure Construction.*
2. Percentage applies to the material passing the No. 4 sieve, not the entire sample.
3. Per WisDOT specifications, both breaker run and select crushed material can include concrete that is 'substantially free of steel, building materials and other deleterious material'.

Table 2
Compaction Guidelines

Area	Percent Compaction (1)	
	Clay/Silt	Sand/Gravel
Within 10 ft of building lines		
Footing bearing soils	93 - 95	95
Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab and thicker fill zones	92	95
Beyond 10 ft 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:

1. Based on Modified Proctor Dry Density (ASTM D 1557)