APPENDIX B:

SOIL BORINGS

Kane, Kathleen

From: Grimalkin, Sarah J
Sent: Thursday, November 17, 2022 3:33 PM
To: Kane, Kathleen
Subject: FW: C22051-27 Maple Prairie Park soil boring
Attachments: 22051-27 Maple Prairie Park Playground Improvements.pdf; Doc Qualifications as of 7-1-17.pdf

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From: Mike Schultz <mschultz@cgcinc.net>
Sent: Thursday, November 17, 2022 3:39 PM
To: Grimalkin, Sarah J <SGrimalkin@cityofmadison.com>
Subject: C22051-27 Maple Prairie Park Playground Improvements

At your request, CGC conducted a soil boring at the proposed location where a playground project is planned in Maple Prairie Park. The soil boring was performed by America's Drilling Company (under subcontract to CGC) on October 21, 2022 at a location selected by City of Madison personnel (location map attached). CGC staked out the boring location. The soil profile observed at Boring 1 consisted of about 7-in. of topsoil followed by about 2.5 ft of loose silt fill, over about 8 ft of very stiff lean clay that grades to very soft with depth. At a depth of about 11 ft a medium dense to dense sand was encountered that contained some silt, some gravel and scattered cobbles/boulders to the maximum depth explored of 15 ft. Groundwater was not observed during or shortly after drilling. Please refer to the attached soil boring log for additional information.

In our opinion, the observed very stiff to medium stiff clays at a minimum design footing bearing depth of 4 ft are acceptable for spread footing foundation support. They are also satisfactory for support of a drilled shaft bearing at 4 ft if that is the preferred foundation type. In our opinion a maximum allowable design soil bearing pressure of 1500 psf should be implemented to account for the noted soils near footing grade. Footings exposed to weather should be founded at a depth of 4 ft for frost protection, with strip footings to be a minimum of 18-in. wide and column pads a minimum of 24-in. square. Footing subgrades should be cut with a smooth-edged bucket and soil subgrades compacted before concrete placement. Any soft areas should be removed and replaced with compacted granular soils densified to a minimum 95% based on modified Proctor methods (ASTM D1557). As an alternate, crushed aggregate such as 3-in. dense graded base could be used as undercut backfill that is densified with a heavy vibratory plate compactor until deflection ceases. Similarly, loose/soft soils below rubberized chip placement if encountered in the playground area should be replaced as described above. Also note that disturbed soils possibly created at the base of the drill shaft option if implemented should be removed.

We trust this brief report addresses your present needs. Please CGC if we can be of further service or should questions develop upon review of this transmittal. Information regarding limitations pertaining to opinions presented in this submittal is attached. Thank you.

Michael N. Schultz, P.E.
President - CGC, Inc.
2921 Perry St.
Madison, WI 53713
Phone: 608-288-4100
Fax: 608-288-7887

Cell: 608-712-0571
Web Site: www.cgcinc.net

Legend

⊕ Denotes Boring Location

Notes

1. Soil Boring performed by America's Drilling Co. in October 2022
2. Boring location is approximate

Scale: Reduced

Job No. C22051-27	CGC, Inc.	**SOIL BORING LOCATION MAP** **Maple Prairie Park** **Madison, Wisconsin**
Date: 10/2022		

CGC Inc.

LOG OF TEST BORING

Project **Maple Prairie Park**
Playground Improvements
Location **Madison, Wisconsin**

Boring No. **1**
Surface Elevation (ft) **1044±**
Job No. **C22051-27**
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	LOI
					0	7 in. TOPSOIL					
						FILL: Loose Brown Silt with Clay, Sand and Gravel					
1		10	M	8							
						Very Stiff to Medium Stiff, Brown Lean CLAY (CL)					
2		12	M	7			(2.5)				
					5						
3		10	M	4		Reddish-Brown and Mottled near 6 ft	(0.75)				
4		14	M	2		Very Soft near 9 ft	(0.25)				
					10						
						Medium Dense to Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles and Boulders (SM)					
5		12	M	30							
					15	End of Boring at 15 ft					
						Backfilled with bentonite chips					
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** 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 **10/21/22** End **10/21/22**
Driller **ADC** Chief **KD** Rig **CME-55**
Logger **DB** Editor **ESF**
Drill Method **2.25" 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	¾" to 3"	¾" to 3"
Fine	4.76 mm to ¾"	#4 to ¾"
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 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 Designation
RB – Rock Bit/Roller Bit
FT – Fish Tail
DC – Drove Casing
C – Casing: Size 2 ½", 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" Dia. Split-Barrel Sample
2ST – 2" Dia. Thin-Walled Tube Sample
3ST – 3" Dia. Thin-Walled Tube Sample
PT – 3" Dia. 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_a – 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 – Cave 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.

CGC, Inc.

Madison - Milwaukee

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
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 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

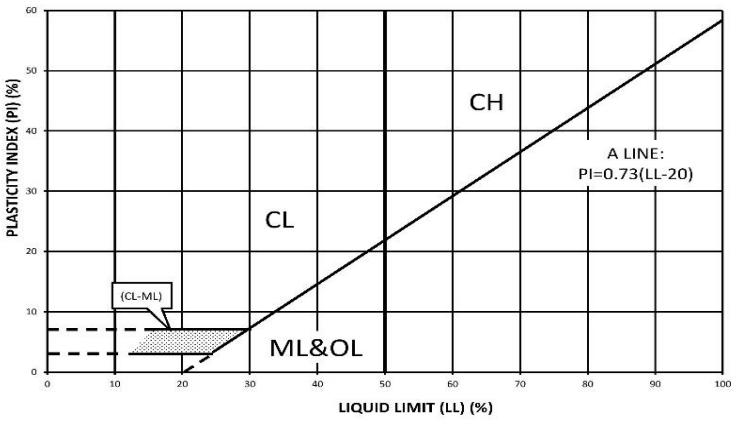
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limts below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limts above "A" line or P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

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

PLASTICITY CHART



Kane, Kathleen

From: Grimalkin, Sarah J
Sent: Thursday, November 17, 2022 2:50 PM
To: Kane, Kathleen
Subject: FW: 22051-29 Oak Park Heights soil boring
Attachments: 22051-29 Oak Park Heights Park Playground Improvements.pdf; Doc Qualifications as of 7-1-17.pdf

Soil boring reports are coming through. –SG

From: Mike Schultz <mschultz@cgcinc.net>
Sent: Thursday, November 17, 2022 2:53 PM
To: Grimalkin, Sarah J <SGrimalkin@cityofmadison.com>
Subject: FW: 22051-29 Oak Park Heights Park Playground Improvements

At your request, CGC conducted a soil boring at the proposed location where a playground project is planned in Oak Park Heights Park. The soil boring was performed by America's Drilling Company (under subcontract to CGC) on October 21, 2022 at a location selected by City of Madison personnel (location map attached). CGC staked out the boring location. The soil profile observed at Boring 1 consisted of about 6-in. of topsoil followed by about 5 ft of medium dense grading to loose silt, over about 3.5 ft of medium stiff grading to very soft lean clay. Very loose/loose grading to medium dense sand soils were encountered at 9 ft+/- that contained varying percentages of silt, gravel and cobbles/boulders to the maximum depth explored of 15 ft. Groundwater was not observed during or shortly after drilling. Please refer to the attached soil boring log for additional information.

In our opinion, the observed loose silt and/or medium stiff clays at a minimum design footing bearing depth of 4 ft are acceptable for spread footing foundation support. They are also satisfactory for support of a drilled shaft bearing at 4 ft if that is the preferred foundation type. In our opinion a maximum allowable design soil bearing pressure of 1000 psf should be implemented to account for the noted soils near footing grade. Footings exposed to weather should be founded at a depth of 4 ft for frost protection, with strip footings to be a minimum of 18-in. wide and column pads a minimum of 24-in. square. Footing subgrades should be cut with a smooth-edged bucket and soil subgrades compacted before concrete placement. Any soft areas should be removed and replaced with compacted granular soils densified to a minimum 95% based on modified Proctor methods (ASTM D1557). As an alternate, crushed aggregate such as 3-in. dense graded base could be used as undercut backfill that is densified with a heavy vibratory plate compactor until deflection ceases. Similarly, loose/soft soils below rubberized chip placement in the playground area should be replaced as described above. Also note that disturbed soils possibly created at the base of the drill shaft option if implemented should be removed.

We trust this brief report addresses your present needs. Please CGC if we can be of further service or should questions develop upon review of this transmittal. Information regarding limitations pertaining to opinions presented in this submittal is attached. Thank you.

Michael N. Schultz, P.E.
President - CGC, Inc.
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Madison, WI 53713
Phone: 608-288-4100

Fax: 608-288-7887
Cell: 608-712-0571
Web Site: www.cgcinc.net

Legend

Denotes Boring Location

N

Scale: Reduced

Notes

1. Soil boring performed by America's Drilling Co. in October 2022
2. Boring location is approximate

Date: 10/2022	CGC, Inc.	**Soil Boring Location Map** **Oak Park Heights Park** **Madison, WI**
Job No. C22051-29		

CGC Inc.

LOG OF TEST BORING

Project **Oak Park Heights Park Playground Improvements**
Location **Madison, Wisconsin**

Boring No. **1**
Surface Elevation (ft) **1022±**
Job No. **C22051-29**
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	LOI
						6 in. TOPSOIL					
1		18	M	21		Medium Dense to Loose, Dark Brown SILT, Some Sand (ML)					
2		8	M	8							
					5						
3		14	M/W	5		Medium Stiff to Very Soft, Brown Lean CLAY, Trace to Little Sand (CL)	(0.5-0.25)				
4		14	M	4			(0.5)				
						Loose to Very Loose, Brown Silty Fine SAND, Trace Clay (SM)					
					10						
						Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles and Boulders (SM)					
5		16	M	26							
					15	End of Boring at 15 ft					
						Backfilled with bentonite chips					
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** 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 **10/21/22** End **10/21/22**
Driller **ADC** Chief **KD** Rig **CME-55**
Logger **DB** Editor **ESF**
Drill Method **2.25" 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	¾" to 3"	¾" to 3"
Fine	4.76 mm to ¾"	#4 to ¾"
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 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
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COA – Clean-Out Auger
SS - 2" Dia. Split-Barrel Sample
2ST – 2" Dia. Thin-Walled Tube Sample
3ST – 3" Dia. Thin-Walled Tube Sample
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NR – No Recovery
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PMT – Borehole Pressuremeter Test
VS – Vane Shear Test
WPT – Water Pressure Test

Laboratory Tests

q_a – Penetrometer Reading, tons/sq ft
q_a – 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
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BCR – Before Casing Removal
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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.

CGC, Inc.

Madison - Milwaukee

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

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GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
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	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
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 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

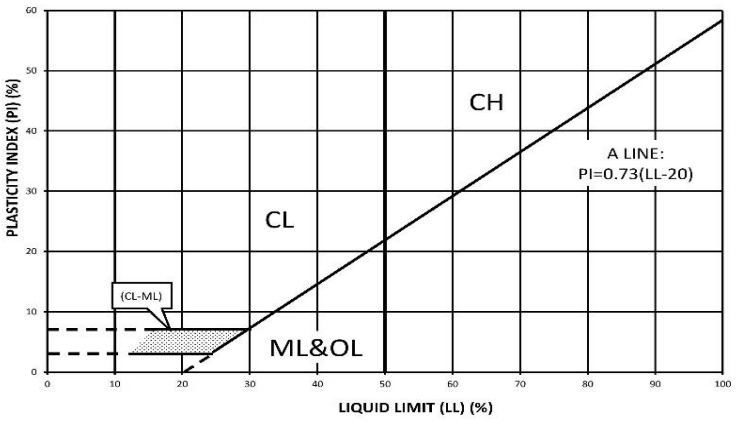
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limts below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limts above "A" line or P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

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

PLASTICITY CHART



Kane, Kathleen

From: Grimalkin, Sarah J
Sent: Thursday, November 17, 2022 3:07 PM
To: Kane, Kathleen
Subject: FW: C22051-28 Raemisch/Homestead Park soil boring
Attachments: 22051-28 Raemisch-Homestead Park Playground Improvements.pdf; Doc Qualifications as of 7-1-17.pdf

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From: Mike Schultz <mschultz@cgcinc.net>
Sent: Thursday, November 17, 2022 3:07 PM
To: Grimalkin, Sarah J <SGrimalkin@cityofmadison.com>
Subject: C22051-28 Raemisch/Homestead Park Playground Improvements

At your request, CGC conducted a soil boring at the proposed location where a playground project is planned in Raemisch/Homestead Park. The soil boring was performed by America's Drilling Company (under subcontract to CGC) on October 21, 2022 at a location selected by City of Madison personnel (location map attached). CGC staked out the boring location. The soil profile observed at Boring 1 consisted of about 7-in. of pea gravel fill followed by about 5.5 ft of hard grading to stiff lean clay, over medium dense sand soils that contained varying percentages of silt, gravel and cobbles/boulders to the maximum depth explored of 15 ft. Groundwater was not observed during or shortly after drilling. Please refer to the attached soil boring log for additional information.

In our opinion, the observed stiff clays at a minimum design footing bearing depth of 4 ft are acceptable for spread footing foundation support. They are also satisfactory for support of a drilled shaft bearing at 4 ft if that is the preferred foundation type. In our opinion a maximum allowable design soil bearing pressure of 3000 psf should be implemented to account for the noted soils near footing grade. Footings exposed to weather should be founded at a depth of 4 ft for frost protection, with strip footings to be a minimum of 18-in. wide and column pads a minimum of 24-in. square. Footing subgrades should be cut with a smooth-edged bucket and soil subgrades compacted before concrete placement. Any soft areas should be removed and replaced with compacted granular soils densified to a minimum 95% based on modified Proctor methods (ASTM D1557). As an alternate, crushed aggregate such as 3-in. dense graded base could be used as undercut backfill that is densified with a heavy vibratory plate compactor until deflection ceases. Similarly, loose/soft soils below rubberized chip placement if encountered in the playground area should be replaced as described above. Also note that disturbed soils possibly created at the base of the drill shaft option if implemented should be removed.

We trust this brief report addresses your present needs. Please CGC if we can be of further service or should questions develop upon review of this transmittal. Information regarding limitations pertaining to opinions presented in this submittal is attached. Thank you.

Michael N. Schultz, P.E.
President - CGC, Inc.
2921 Perry St.
Madison, WI 53713
Phone: 608-288-4100
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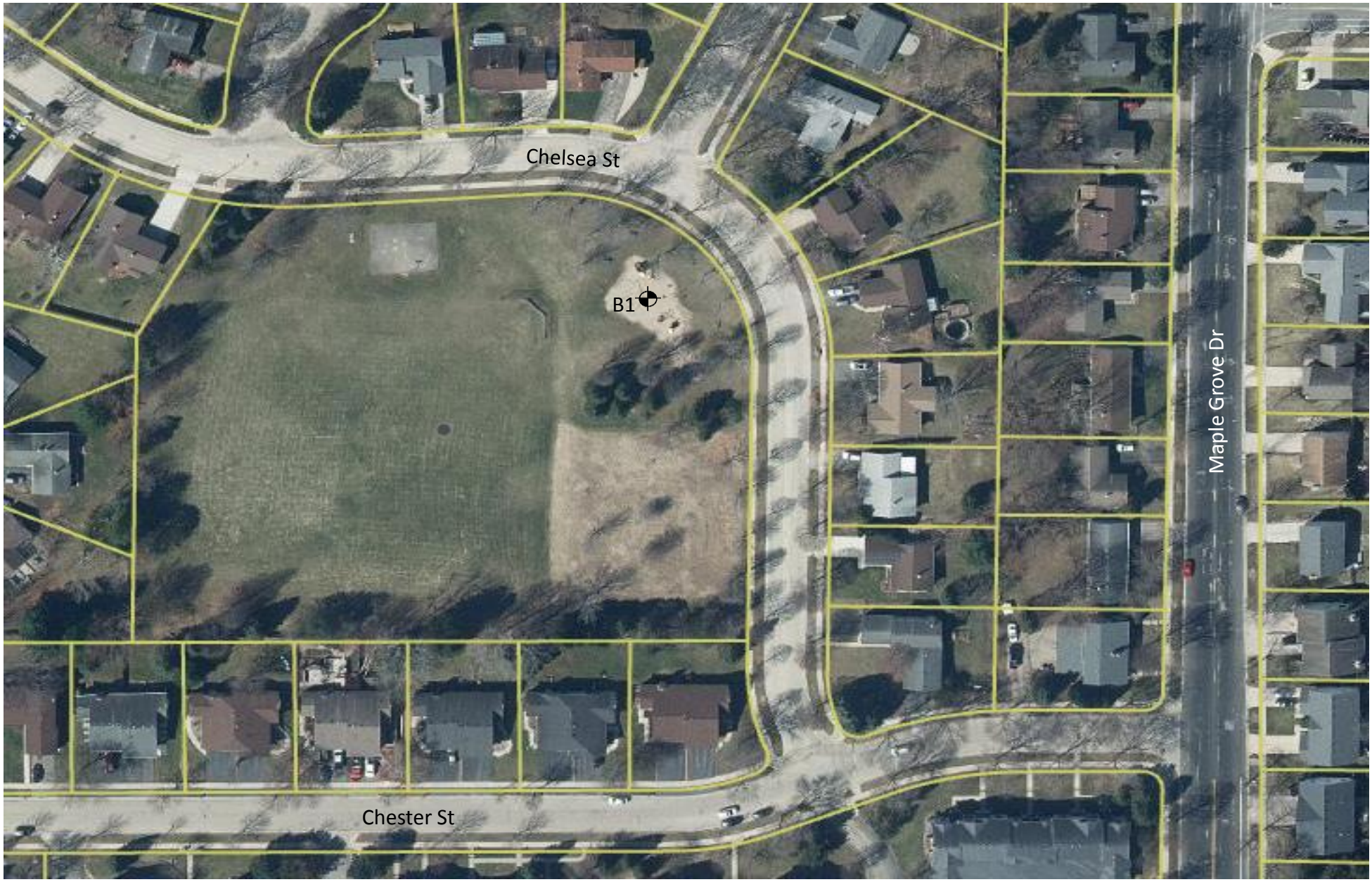
Web Site: www.cgcinc.net



Legend

Denotes Boring Location

N

Scale: Reduced

Notes

1. Soil boring performed by America's Drilling Co. in October 2022
2. Boring location is approximate

Date: 10/2022	CGC, Inc.	**Soil Boring Location Map** **Raemisch-Homestead Park** **Madison, WI**
Job No. C22051-28		

CGC Inc.

LOG OF TEST BORING

Project **Raemisch/Homestead Park Playground Improvements**
Location **Madison, Wisconsin**

Boring No. **1**
Surface Elevation (ft) **1041±**
Job No. **C22051-28**
Sheet **1** of **1**

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

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LOI
						FILL: 7 in. Pea Gravel					
1		8	M	8		Hard to Stiff, Brown Lean CLAY (CL)	(4.5+)				
2		10	M	12	5		(1.5)				
3		12	M	14		Medium Dense, Brown Fine to Coarse SAND, Some Gravel, Little to Some Silt (SP-SM/SM)					
4		16	M	19	10	Medium Dense, Light Brown Fine SAND, Trace Silt (SP)					
5		14	M	20		Medium Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Scattered Cobbles and Boulders (SM)					
					15	End of Boring at 15 ft Backfilled with bentonite chips					
					20						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **NW** 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 **10/21/22** End **10/21/22**
Driller **ADC** Chief **KD** Rig **CME-55**
Logger **DB** Editor **ESF**
Drill Method **2.25" 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	¾" to 3"	¾" to 3"
Fine	4.76 mm to ¾"	#4 to ¾"
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 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 Designation
RB – Rock Bit/Roller Bit
FT – Fish Tail
DC – Drove Casing
C – Casing: Size 2 ½", 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" Dia. Split-Barrel Sample
2ST – 2" Dia. Thin-Walled Tube Sample
3ST – 3" Dia. Thin-Walled Tube Sample
PT – 3" Dia. 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_a – 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 – Cave 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.

CGC, Inc.

Madison - Milwaukee

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
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 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limts below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limts above "A" line or P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

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

PLASTICITY CHART