CGC, Inc.

Construction • Geotechnical
Consulting Engineering/Testing

EXHIBIT "D"

January 29, 2021
C20051-39

Ms. Kathleen Kane
City of Madison Parks Division
City-County Building, Room 104
210 Martin Luther King Jr. Blvd.
Madison, WI 53703

Re: Geotechnical Exploration Report
Tenney Park Beach Shelter
Sherman Avenue
Madison, WI

Dear Ms. Kane:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the subsurface exploration program for the above-referenced project. The purpose of this program was to evaluate the subsurface conditions within the proposed construction area and to provide geotechnical recommendations regarding site preparation, foundation and floor slab design/construction. We are sending you an electronic copy of this report, and we can provide a paper copy upon request

PROJECT DESCRIPTION AND SITE CONDITIONS

We understand that the City is planning to construct a new beach shelter at Tenney Park located along the eastern shore of Lake Mendota in Madison. Based on a site plan provided, the slab-on-grade building will be located near the location where the present shelter exists northwest of Sherman Avenue. The above-grade portion of the structure is expected to bear on cast-in-place footings and foundation walls.

Although grades were not provided, we anticipate that the floor slab of the new building will be established near current site grades. Perimeter footings are expected to bear about 4 ft below slab elevations, with interior footings (if any), slightly shallower. It is our understanding that the shelter structure could be unheated and exterior concrete sitework is planned around the building.

SUBSURFACE CONDITIONS

Subsurface conditions for this study were explored by drilling two (2) Standard Penetration Test (SPT) soil borings to depths of 20 to 25 ft below current site grades. The boring locations were selected by the project team and located in the field by CGC based on maps provided. Ground surface elevations at the boring locations were estimated by CGC using publicly-available topographic site maps (Dane County DCi, 1-ft contours) and should therefore be considered approximate. The borings were drilled by Badger State Drilling (under subcontract to CGC) on January 19, 2021 using a track-mounted CME-55 ATV rotary drill rig equipped with hollow stem

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augers and an automatic SPT hammer. The specific procedures used for drilling and sampling are described in Appendix A, and the boring locations are shown in plan on the Boring Location Exhibit presented in Appendix B.

The subsurface profiles at the boring locations were fairly consistent and the typical profile can be described in general terms by the following strata, in descending order:

- About 8 in. of surficial ***topsoil fill***; underlain by
- About 4 to 5 ft of ***fill/possible fill***, generally comprised of loose to medium dense granular soils, with varying clay, silt and gravel; followed by
- About 0 to 3 ft of medium stiff ***lean clay***; over
- Very loose to medium dense ***granular* soils** (sand and/or silt) extending to the maximum depths explored.

Although the granular fill/possible fill soils encountered in the borings appear to be fairly uniform and reasonably well-compacted (based on SPT blow counts (N-values)), looser zones may potentially be encountered. Further, variability in the composition of the fill material should be expected between and beyond boring locations.

Groundwater was encountered in the borings during and upon the completion of drilling at depths as shallow as 3.5 ft. It should be recognized that groundwater levels can be expected to fluctuate with seasonal variations in precipitation, infiltration, the water level in nearby Lake Mendota, evapotranspiration, and other factors. For reference the water level in Lake Mendota during drilling on January 19 was EL. 848.7 (USGS datum). A more detailed description of the site soil and groundwater conditions is presented on the Soil Boring Logs in Appendix B, which also contain laboratory test results

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 the proposed construction and that the proposed building can be supported by a conventional spread footing foundation system bearing in natural clay or properly evaluated, suitable existing granular fill soils. *Some undercutting/stabilization of existing fill and/or softer natural clay soils is required during foundation construction.* Our recommendations for site preparation, foundation and floor slab 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

After the existing building is demolished, including footings and other concrete structural components, we recommend that topsoil be stripped at least 10 ft beyond the building areas, including areas requiring fill beyond the building footprint. The topsoil can be stockpiled on-site and later re-used as fill in landscaped areas. After topsoil stripping within proposed building footprint, the exposed soils are generally expected to consist of existing granular fill soils. In areas remaining at grade or requiring fill, we recommend that the exposed granular subgrade be thoroughly recompacted with a vibratory compactor to check for loose, soft or yielding areas. Unstable soils or soils which remain loose following recompaction should be undercut and replaced with suitable granular backfill compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557). in accordance with our Recommended Compacted Fill Specifications presented in Appendix D. Alternatively, 3-in. dense graded base (DGB) that is placed in loose 10-in. lifts and compacted until deflection ceases can also be used to restore grades in undercut areas. As noted, although the existing near-surface fill soils appear to be uniform and well-compacted, we recommend that the exposed subgrades be carefully evaluated for their footing and floor slab support suitability prior to fill placement, where required.

Although we anticipate that only minor amounts of filling will be required, after development of stable subgrade, fill placement to establish site and building grades can then proceed. To the extent possible, we recommend using granular soils (i.e., sands/gravels, including granular soils excavated on-site) as structural fill within the building envelope and the upper 2± ft in exterior concrete areas because these soils are relatively easy to place and compact in most weather conditions compared to clay/silt soils. The on-site granular soils, including the existing surficial fill, are generally considered suitable for re-use as structural fill provided they are selectively separated from clay soils during excavation. Clay soils excavated on-site are generally not recommended as structural fill because moisture conditioning by discing and drying (aeration) will typically be required to achieve desired compaction levels, which is highly weather-dependent (i.e., dry, warm and windy conditions), and could delay construction progress. Instead, clay/silt soils are best used as fill in green space/landscaping areas. We recommend that structural fill be compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557) following Appendix D guidelines. Periodic field density tests should be taken by CGC staff within the fill to document the adequacy of compactive effort.

2. Foundation Design

Based on the subsurface profile encountered in the borings and assuming that the floor slab of the building will be near existing site grades, typical frost depth footings are generally anticipated to bear within properly evaluated and recompacted existing granular fill soils or underlying medium stiff natural clay. *Although the existing fill observed in the borings appears to be fairly uniform and reasonably well-compacted, we recommend that undercutting of 12-in. of existing soil occur followed by replacement with 3-in. Dense Graded Base (DGB) that is densified with a heavy* *vibratory compactor until deflection ceases.* We recommend the following parameters be used for foundation design after a stable stone subgrade is established:

- Maximum net allowable bearing pressure: 1,000 psf

- Minimum foundation widths:
  - Continuous wall footings: 18 in.
  - Column pad footings: 30 in.

- Minimum footing depths below finish site grades:
  - Exterior/perimeter footings: 4 ft below grade
  - Interior footings:
    - Unheated 4 ft below adjacent grade
    - Heated 2± ft

Footing subgrades should be checked by a CGC field representative to document that the subgrade soils are suitable for footing support and advise on additional corrective measures, if necessary. Undercutting to deeper depths below footing grade may be required if unsuitable existing fill or natural clays with pocket penetrometer readings (an estimate of the unconfined compressive strength of clay soils) less than 0.5 tsf are encountered at or just below footing grade. If required, the base of undercut excavations should be widened beyond the footing edges at least 0.5 ft in each direction for each foot of undercut depth for stress distribution purposes. In order to re-establish footing grade in undercut areas, granular backfill could be used that is compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557), in accordance with the Recommended Compacted Fill Specifications presented in Appendix D. Alternatively, additional 3-in. DGB that is placed in loose 10-in. lifts and compacted until deflection ceases can also be used to restore grades in deeper undercut areas.

We recommend using a smooth-edged backhoe bucket for footing/undercut excavations. Granular soils exposed at footing grade should be thoroughly recompacted with a large vibratory plate compactor or an excavator-mounted hoe-pack prior to formwork/concrete placement to densify soils loosened during the excavation process. Loosened clay soils (if any), which can potentially be susceptible to disturbance from vibratory compaction should be hand-trimmed. OSHA slope guidelines should be followed if workers need to enter footing excavations.

Provided the foundation design/construction recommendations discussed above are followed, we estimate that total and differential settlements should be on the order of 1.0 and 0.5 in., respectively.

3. Floor Slab

Assuming finished first floor of the structure will be near existing site grades, we generally expect the floor slab subgrade to consist of existing granular fill or newly-placed engineered granular fill. Prior to slab construction, subgrade soils should be prepared as described in the Site Preparation section of this report, including recompaction, proof-rolling and undercutting/stabilization, as needed.

To act as a capillary break below the slab, we recommend including a minimum 4 to 6-in. thick layer of well-graded sand/gravel with less than 5% by weight passing the No. 200 U.S. standard sieve (P200). The on-site granular soils typically contain greater than 5% P200 and importing of suitable soils for this application is expected to be required. Note, however, that some structural engineers require a layer of DGB, such as 1¼-in. DGB, rather than sand/gravel below the floor slab to increase the subgrade modulus immediately below the slab. To further reduce the potential for moisture migration through the slab, a plastic vapor barrier can also be utilized. Fill and base layer material below the floor slab should be placed as described in the Site Preparation section of this report. Slabs constructed on a minimum 6-in. thick dense graded base layer may be designed utilizing a subgrade modulus of 150 pci, and a subgrade modulus of 100 pci should be used for the design of slabs that are constructed on a sand/gravel layer. The design subgrade moduli are based on a firm or adequately stabilized, recompacted subgrade such that non-yielding conditions are developed. The slab should be structurally separated from the footings with a compressible filler and have construction joints and reinforcement for crack control.

Because the structure could be unheated, consideration could be given to including up to 4 ft of non-frost susceptible fill below the slab in order to reduce the potential for movement due to freeze-thaw cycles. Examples of non-frost susceptible materials include ¾- or 1-in. clear stone or granular fill containing less than 5 percent passing the No. 200 sieve. If some movement is acceptable due to freeze-thaw, slabs in unheated areas may be supported on a thin layer of compacted clear stone (in lieu of the DGB or sand layer) over the existing granular fill soils.

CONSTRUCTION CONSIDERATIONS

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

- Due to the potentially sensitive nature of some of the on-site soils, we recommend that final site grading activities be completed during dry weather, if possible. Construction traffic should be avoided on prepared subgrades to minimize potential disturbance.

- Contingencies in the project budget for subgrade stabilization with coarse aggregate in pavement and floor slab areas should be increased if the project schedule requires that work proceed during adverse weather conditions.

- Earthwork construction during the late fall through early spring 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.

- Excavations extending greater than 4 ft in depth below the existing ground surface should be sloped or braced in accordance with current OSHA standards.

- Based on the observations made during our field exploration, we generally anticipate groundwater to be encountered during footing excavations. Water accumulating at the bottom of excavations as a result of precipitation or seepage should be quickly removed, with dewatering means and methods the contractor's responsibility. Typically pumping from sumps is adequate for drawdowns of 2 ft or less, with wells needed for greater drawdowns.

RECOMMENDED CONSTRUCTION MONITORING

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

- Topsoil stripping and subgrade proof-rolling/compaction;
- Fill/backfill placement and compaction;
- Foundation excavation/subgrade preparation; and
- Concrete placement.

* * * * *

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.

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

Encl: Appendix A - Field Exploration
Appendix B - Boring Location Exhibit
Logs of Test Borings (2)
Log of Test Boring-General Notes
Unified Soil Classification System
Appendix C - Document Qualifications
Appendix D - Recommended Compacted Fill Specifications

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Subsurface conditions for this study were explored by drilling two (2) Standard Penetration Test (SPT) soil borings to depths of 20 to 25 ft below current site grades. The boring locations were selected by the project team and located in the field by CGC based on maps provided. Ground surface elevations at the boring locations were estimated by CGC using publicly-available topographic site maps (Dane County DCi, 1-ft contours) and should therefore be considered approximate. The borings were drilled by Badger State Drilling (under subcontract to CGC) on January 19, 2021 using a track-mounted CME-55 ATV rotary drill rig equipped with hollow stem augers and an automatic SPT hammer. The boring locations are shown in plan on the Boring Location Exhibit presented in Appendix B.

The boring was sampled at 2.5-ft intervals to a depth of 10 ft, and at 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 (soil borings), 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 driller as these services 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 to satisfy WDNR regulations and the soil samples were delivered to our laboratory for visual classification and laboratory testing.

APPENDIX B

SOIL BORING & TEST PIT LOCATION EXHIBIT
LOGS OF TEST BORINGS (2)
LOG OF TEST BORING-GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM

N

Soil Boring Location

Notes
1.) Boring locations are approximate.
2.) Soil Borings performed on January 19, 2021 by Badger State Drilling.
3.) Base map provided by Google

Drawn By: BSM	C20051-39	Date: 1/28/2021	CGC, Inc.	**Soil Boring Exhibit** Tenney Park Beach Shelter Building 1300 Sherman Avenue Madison, WI

CGC Inc.

LOG OF TEST BORING

Project: Tenney Park Beach Shelter Reconstruction

Location: Madison, Wisconsin

Boring No. 1
Surface Elevation (ft) 853±
Job No. C20051-39
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	LOI
						8 in. Topsoil Fill					
1		18	M	14		FILL: Medium Dense, Brown Fine to Medium Sand, Some Silt, Scattered Lean Clay Layers					
2		18	W	7	▽	Loose, Brown Fine SAND, Little Silt (SP-SM) (Possible Fill)					
3		18	W	3	5	Very Loose, Gray to Gray (Mottled) SILT, Trace Clay and Sand (ML)					
4		18	W	7	▼ 10						
5		18	W	9	15						
6		18	W	3	20	Very Loose, Gray Silty Fine SAND, Trace Clay (SM)					
7		18	W	37	25	Dense, Gray Fine to Medium SAND, Some Silt and Gravel (SM)					
					30	End of Boring at 25 ft Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS

While Drilling ▽ 3.5'   Upon Completion of Drilling 8.5'

Time After Drilling				1 Hr
Depth to Water				8.5' ▼
Depth to Cave in				18.5'

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

GENERAL NOTES

Start 1/19/21 End 1/19/21
Driller BSD Chief MC Rig
Logger DB Editor BSM
Drill Method 2.25" HSA; Autohammer

LOG OF TEST BORING

CGC Inc.

Project: Tenney Park Beach Shelter Reconstruction
Location: Madison, Wisconsin

Boring No. 2
Surface Elevation (ft) 853±
Job No. C20051-39
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	LOI
						8 in. Topsoil Fill					
1		18	M	19		FILL: Medium Dense, Brown Fine to Medium Sand, Little Silt and Gravel					
2		18	M	7		Loose, Gray Silty Fine SAND, Scattered Thin Silt Seams (SM - Possible Fill)					
					5	Medium Stiff, Dark Gray Lean CLAY, Trace Organics (CL)					
3		18	M	5			(0.5)	32.3			3.7
4		18	W	13		Medium Dense, Gray Silty Fine SAND (SM)					
					10						
						Very Loose, Gray Silty Fine to Medium SAND, Some Gravel, Trace Clay (SM)					
5		12	W	4							
					15						
6		18	W	4							
					20	End of Boring at 20 ft Borehole Backfilled with Bentonite Chips					
					25						
					30						

WATER LEVEL OBSERVATIONS

While Drilling ∇ 9.5' Upon Completion of Drilling 9'
Time After Drilling: 1 Hr
Depth to Water: 9' ▼
Depth to Cave in: 13'

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

GENERAL NOTES

Start 1/19/21 End 1/19/21
Driller BSD Chief MC Rig
Logger DB Editor BSM
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

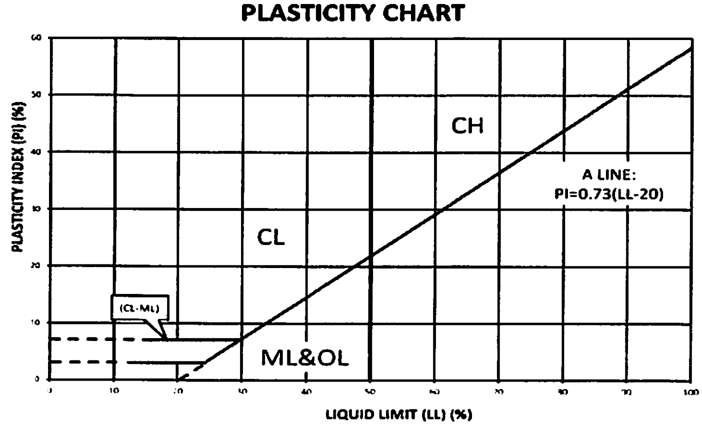
LABORATORY CLASSIFICATION CRITERIA

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



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
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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	Percent Compaction (1) 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)