unabridged Architecture

Grand Bay NERR Outdoor Classrooms

Addendum #2 12 January 2017

Please see the attached Geotechnical report prepared by W Geotechnical and Testing, Inc. dated January 10, 2017.

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Please acknowledge receipt of this Addendum on your Bid Form.

Allison Anderson

Allison H. Anderson FAIA, LEED-AP

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REPORT OF GEOTECHNICAL EXPLORATION

GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE

MOSS POINT, MISSISSIPPI

FOR

MS. ALLISON H. ANDERSON FAIA, LEED-AP
UNABRIDGED ARCHITECTURE PLLC

JANUARY 10, 2017

W GEOTECHNICAL AND TESTING, INC.

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January 10, 2017

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RE: Report of Geotechnical Exploration
Grand Bay National Estuarine Research Reserve – Moss Point, MS

W Geotechnical Project No. G-3028

Dear Ms. Anderson:

Thank you for retaining W Geotechnical and Testing, Inc. to complete a geotechnical exploration for the above referenced site. The results of the subsurface exploration, along with boring logs, and our engineering report are attached to this letter.

To explore the subsurface conditions at this site, one (1) Standard Penetration Test (SPT) boring was performed at a depth of 30 feet below existing ground surface in the general area of the proposed structure.

In general, fair soil conditions were encountered on this site for this area. We recommend the ramp and bird blind be supported by a deep foundation system consisting of either helical piles or timber piles. The helical piles are a more proprietary product and the designer/installer can provide design loads based on our soil boring. The loads can also be verified through field measurements during installation. The timber piles analyzed were 6” x 6” and 8” x 8” treated piles due to these being the maximum size we considered able to be easily transported to the site. Piles capacities are provided in the appropriate section of this report as well as more detailed recommendations.

Thank you for the opportunity to provide geotechnical engineering services on this project. Should you have questions regarding our findings or need additional consultations, please do not hesitate to contact our office.

Respectfully,
W Geotechnical and Testing, Inc. represented by:

1/10/17

Heath S. Williams, P.E.
Project Engineer
MS Registration No. 17702

REPORT OF GEOTECHNICAL EXPLORATION
GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE
MOSS POINT, MS

TABLE OF CONTENTS

INTRODUCTION

General

This report presents the results of our geotechnical exploration findings and our geotechnical recommendations for the proposed construction of nature pavilion at the Grand Bay National Estuarine Research Reserve.

Project Information

The information presented in this section is based on information provided and our own site reconnaissance. The site is located at 6005 Bayou Heron Road in Moss Point, MS.

We understand the proposed project will consist of the construction of a ramp and bird blind as well as associated decks for the purpose of outdoor instruction and classroom space. The structural loading supplied are a maximum column loading of 6 kips downward and 5 kips upward and a minimum loading of 2 kips downward. The project had been designed using helical piles. One of the major concerns is the ability to be built with minimal impact to the environment during construction. At the time of our fieldwork, the site was at the transition between wooded pine savannah and marsh, with standing water at the boring location.

If any of the information presented is incorrect or has changed, please advise W Geotechnical and Testing, Inc. to allow us to reevaluate our recommendations in the light of changes in the present project concept.

Purposes of Exploration

The purposes of this preliminary exploration were to explore the soil and groundwater conditions at the site and to identify any foreseeable special geotechnical considerations needed for the proposed development. We accomplished the purposes of the study by:

1. Performing a general site reconnaissance,
2. Drilling borings to explore the subsurface soil and groundwater conditions,
3. Performing laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties,
4. Evaluating the field and laboratory data to develop appropriate engineering considerations.

FIELD & LABORATORY EXPLORATION

Field Exploration

To explore the subsurface conditions at this site, one Standard Penetration Test (SPT) boring was performed to a depth of 30 feet below the existing ground surface with the anticipated structure footprints. Boring locations were determined in the field by a W Geotechnical representative who measured distances and estimated right angles from existing site features. The boring locations should be considered approximate and boring elevations should be considered from the ground surface elevation at the time of our fieldwork, December 29, 2016.

The soil test borings were performed with a track mounted drill rig, which wet rotary methods to advance the boreholes. Representative soil samples were obtained by means of the split-barrel sampling procedure in general accordance with ASTM Specification D-1586 using a manual drive hammer. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18-24 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval (Blows Per Foot – bpf) is termed the Standard Penetration Test (SPT) N-value and is indicated for each sample on the boring logs. This value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils.

The drill crew maintained a field log of the soils encountered in the borings. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample were then sealed and brought to our laboratory in Wiggins, Mississippi for further visual examination and laboratory testing.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check visual classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications of all soil samples; natural moisture content, Atterberg Limit, and sieve analysis testing of select samples. The laboratory test results are presented on the laboratory test summary sheet in the appendix.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in-situ, the transitions may be gradual.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposition.

SUBSURFACE CONDITIONS

Soil Conditions

Data from the soil test borings are included in the Appendix. The subsurface conditions discussed in the following paragraphs and those shown on the boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. We note that the transition between different soil strata is usually less distinct than those shown on the boring logs. Subsurface conditions in unexplored locations may vary somewhat from those reported herein.

The borings performed for this exploration generally encountered Surface Material, Sandy Clay, Clay with Sand, and Clay. These strata are generalized in the following paragraphs, for more specific information refer to the boring logs in the appendix.

Surface Material

The surficial material encountered on this site was about 10 inches of topsoil. Topsoil is a dark-colored surficial material with a high organic content and is generally unsuitable for structural support. We understand the topsoil will be left in place to minimize disturbance to the environment.

Sandy Clay

Material described as sandy clay was encountered from near the ground surface to a depth of about 5 feet below the existing ground surface. This material was generally considered very soft near the surface to stiff at a depth of 5 feet. SPT n-values ranged from 1 near the surface to 12 bpf at 5 feet.

Clay with Sand

Materials described as either clay with sand or clay with a trace of sand were encountered from beneath about 10 feet and extended to a depth of about 20 feet below the existing ground surface. These materials were generally considered medium stiff to stiff in consistency with SPT n-values typically in the 6 to 12 bpf range.

Clay

Very soft to soft marine clay was encountered from about 20 feet to the boring termination depth of 30 feet below the existing ground surface. This material had SPT n-values in the 2 to 4 bpf range.

Groundwater Conditions

Groundwater was encountered at the ground surface at the time of drilling. Observations for groundwater were made during sampling and upon completion of the drilling operations at each boring location. Visual observation of the soil samples retrieved during the drilling exploration can often be used in evaluating the groundwater conditions. Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, tidal fluctuations, and other factors not immediately apparent at the time of this exploration.

ANALYSIS AND RECOMMENDATIONS

General

The following geotechnical recommendations are based on our observations at the site, interpretation of the field data obtained during the exploration, laboratory test results, and our experience with similar subsurface conditions.

In general, fair soil conditions were encountered on this site for this area. Due to the nature of the project and the effort to minimize the impact on the environment in the area of construction, the proposed construction should be supported by a deep foundation system. The constructability of the deep foundations system and the required installation equipment should be considered for the environmental disturbance.

Deep Foundation Recommendations and Settlement

We recommend the ramp and bird blind be supported by a deep foundation system consisting of either helical piles or timber piles. The helical piles are a more proprietary product and the designer/installer can provide design loads based on our soil boring. The loads can also be verified through field measurements during installation. The timber piles analyzed were 6” x 6” and 8” x 8” treated piles due to these being the maximum size we considered able to be easily transported to the site. The following table provides the recommended allowable capacities of several piles:

Pile Size	Embedment (ft)	Downward Capacity (Kips)	Uplift Capacity (Kips)
6” x 6”	6	3.5	2.6
8” x 8”	5	3.4	2.5
6” x 6”	10	6.6	5.0
8” x 8”	8	6.8	5.1

These pile capacities are based on skin friction, thus it is allowable for the ends of the piles to be sharpened to ease in installation. Embedment depth is from to be measured from the full section of the pile to the ground surface and does not consider any reduced section due to sharpening of the pile or any amount of the pile above the ground surface left for connection to the structure. For example: if the structure is to be 3 feet above the ground surface, and a treated 6” x 6” is selected that is loaded at 5 kips uplift, a 14’ long timber pile should be used with 6” of the end of the pile sharpened on an approximately 45° angle, 10’ embedment, 3’ for structure, leaving about 6” of the pile to be cutoff if needed. Embedment depths of less than 5 feet is not recommended. For durability, the piles should be marine treated piles dosed at a minimum treatment rate of 2.5 CCA. Capacity calculations are based on full dimensions or “rough cut”, not planed dimensions. Interpolation for intermediate piles capacities is allowed. Additional pile types and sizes can be analyzed upon request. We anticipate these piles can be installed using conventional construction equipment, namely a moderate sized excavator.

The settlement of properly installed piles will be less than ½ inch. These settlement values are typically within the tolerable range for such structures. Differential settlement between adjacent piles is expected to be approximately half of the anticipated total settlement values.

CLOSING

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. The evaluations and recommendations presented in this report are based on the available project information, as well as on the results of the exploration. W Geotechnical and Testing, Inc. should be given the opportunity to review the final drawings and site plans for this project to determine if changes to the recommendations outlined in this report are needed. Should the nature of the project change, these recommendations should be reevaluated. No third party is given permission to rely on this report or data without the express written consent of W Geotechnical and Testing, Inc.

We recommend that the construction activities be observed by a qualified geotechnical engineer to provide the necessary overview and to check the suitability of the subgrade soils for supporting the footings. We would be pleased to provide an estimated cost for these services at the appropriate time.

APPENDIX

LEGEND

Approximate Boring Location

B-X Boring Designation

W Geotechnical and Testing, Inc.

Job No.	G-3028
Scale	NTS
Drawn By	HSW
Date	01/03/17

Figure Name: Boring Location Plan

Reference: Google Earth

Project Name: Grand Bay NERR
Moss Point, MS

Figure No.: 1

Reference Notes For Boring Logs

W Geotechnical and Testing, Inc.

DEPTH (FT)	Drilling Symbol	SAMPLE NO.	SAMPLE DIST. (IN)	LABORATORY TEST RESULTS	DESCRIPTION OF MATERIAL / SURFACE ELEVATION	WATER LEVELS ELEVATION (FT)	Boring No. **B-X** / ⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+
	Sample Data obtained at the depth indicated to the left.			Results of Laboratory Tests Performed	Description of Material Sampled. Including: Visual Color, Soil Description, Moisture, Consistency From N-Value (See Table to the right), and USCS Symbol (See Below).		Standard Penetration Test Blow Count (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. Split Spoon Sampler, as specified in ASTM D-1586. The Blow count is commonly referred to as the N-Value.

= Auger

= Wet Rotary

= Split Spoon Sampler

= Shelby Tube Sampler

Moisture Content = %M
Liquid Limit = LL
Plasticity Index = PI
Volume Change = VC
% Passing #40 = -#40
% Passing #200 = -#200

USCS Symbol

GP - Poorly Graded Gravel

GW - Well Graded Gravel

GM - Silty Gravel

GC - Clayey Gravel

SP - Poorly Graded Sand

SW - Well Graded Sand

SM - Silty Sand

SC - Clayey Sand

ML - Low Plasticity Silty

MH - High Plasticity Silt

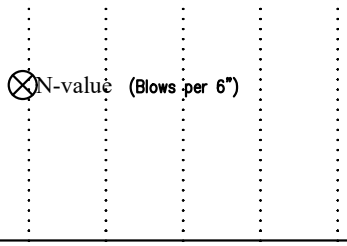
CL - Low Plasticity Clay

CH - High Plasticity Clay

OL - Low Plasticity Organics

OH - High Plasticity Organics

CL/ML - Dual Classification (Typical)



Consistency From N-Values:

For Sands and Silts

SPT N Value	Consistency
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-100	Very Dense

For Cohesive Soils - Clays

SPT N Value	Consistency
0-2	Very Soft
3-4	Soft
5-8	Medium Stiff
9-16	Stiff
17-29	Very Stiff
30-50	Hard
51-100	Very Hard

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

Boring information including: water levels, dates, and drilling equipment and methods.

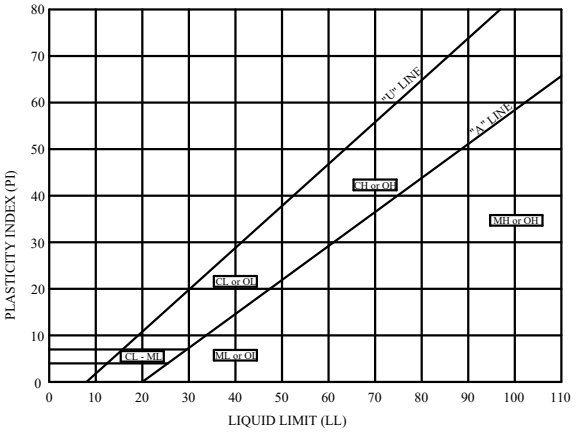
Unified Soil Classification System
(ASTM Designation D-2487)

Major Division		Group Symbol	Typical Names	Classification Criteria
Coarse-grained soils: More than 50% retaining on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	$C_U = D_{60}/D_{10}$ Greater than 4 $C_Z = (D_{30})^2/(D_{10} x D_{60})$ Between 1 and 3
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	Not meeting both criteria for GW
		GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4
		GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands: More than 50% of coarse fraction passes No. 4 sieve	SW	Well-graded sands and gravelly sands, little or no fines	$C_U = D_{60}/D_{10}$ Greater than 6 $C_Z = (D_{30})^2/(D_{10} x D_{60})$ Between 1 and 3
		SP	Poorly graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW
		SM	Silty sands, sand-silt mixtures	Atterberg limits plot below "A" line or plasticity index less than 4
		SC	Clayey sands, sand-clay mixtures	Atterberg limits plot above "A" line and plasticity index greater than 7
Fine grained soils: 50% or more passing No. 200 sieve	Silts or Clays: Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
		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 or Clays: Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
		CH	Inorganic clays of high plasticity, fat clays	
		OH	Organic clays of medium to high plasticity	
Highly organic soils		Pt	Peat, muck and other highly organic soils	Fibrous organic matter; will char, burn, or glow

Classification on basis of percentage of fines

Less than 5% Pass No. 200 sieve: GW, GP, SW, SP,
More than 12% Pass No. 200 sieve: GM, GC, SM, SC
5% to 12% Pass No. 200 sieve: Borderline classification requiring use of dual symbol

Note: U-line represents approximate upper limit of LL and PI combinations for natural soils (empirically determined). ASTM-D2487



Plasticity chart for the classification of fine-grained soils.
Tests made on fraction finer than No. 40 sieve.

W Geotechnical and Testing, Inc.

UNIFIED SOIL CLASSIFICATION SYSTEM

Project: Grand Bay NERR
Location: Moss Point, MS
Job No.: G-3028
Client: Unabridged Architecture

W Geotechnical and Testing, Inc.

Boring No. B-1

DEPTH (FT)	DRILLING SYMBOL	SAMPLE NO.	SAMPLE DIST. (IN)	LABORATORY TEST RESULTS	DESCRIPTION OF MATERIAL ENGLISH UNITS SURFACE ELEVATION	WATER LEVELS ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT. (10 20 30 40 50+)
0					- 10" Topsoil		
		1	24		Light Gray & Red Sandy Clay Very Soft to Stiff, (CL)		1 (WOH)
		2	24	M = 21.6% -#200 = 77.9% LL=36,PI=22			6 (1-2-4-6)
5		3	24	M = 29.1% -#200 = 90.4%	Light Gray & Brown Clay w/ Trace Sand Medium Stiff to Stiff, (CH)		12 (4-5-7-7)
		4	24	M = 38.6% -#200 = 98.3% LL=66,PI=47			6 (2-3-3-4)
10							
		5	18		- No Recovery		8 (3-4-4)
15					Gray Clay w/ Sand Medium Stiff, (CH)		
		6	18	M = 40.1% -#200 = 85.9% LL=56,PI=42			6 (2-3-3)
20					Gray Clay Very Soft to Soft, (CH)		
		7	18	M = 62.8% -#200 = 98.9% LL=83,PI=57			4 (2-2-2)
25							
		8	18				2 (2-1-1)
30					END OF BORING @ 30'		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL	BORING STARTED 12/29/16	BORING COMPLETED 12/29/16
Page 1 of 1	RIG Truck Company/Foreman G&E/Wyckoft	DRILLING METHOD Wet Rotary

Job Name: Grand Bay NEER

Job Number: G-3028

Date: 1/2/2017

Boring	Depth	%M	% Passing # 200	LL	PI
B-1	2-4'	21.6%	77.9%	36	22
B-1	4-6'	29.1%	90.4%	-	-
B-1	8-10'	38.6%	98.3%	66	47
B-1	18.5-20	40.1%	85.9%	56	42
B-1	23.5-25	62.8%	98.9%	83	57