

Geotechnical Engineering Report

Preliminary Site Study

Ellisville, Mississippi

March 31, 2014

Terracon Project No. EB145024

Prepared for:

Chas N. Clark Associates, Ltd.

Laurel, Mississippi

Prepared by:

Terracon Consultants, Inc.

Ridgeland, Mississippi

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Environmental



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Geotechnical



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March 31, 2014



Chas N. Clark Associates, Ltd.
714 Hillcrest Drive
Laurel, Mississippi 39440

Attn: Mr. Wiley Pickering, P.E., P.S.
P: [601] 649-5900
F: [601] 649-5963
E: wpickering@clarkengineers.com

Re: Geotechnical Engineering Report
Preliminary Site Study
Ellisville Mississippi
Terracon Project No. EB145024

Dear Mr. Pickering:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This preliminary study was performed in general accordance with our proposal number PEB130262 dated December 4, 2013, as authorized on February 27, 2014.

This report presents the findings of the subsurface exploration and provides preliminary geotechnical recommendations concerning earthwork and the preliminary design and construction of foundations for the proposed project. We recommend that additional geotechnical exploration and analysis be performed when plans showing the final layout and type of building construction are completed.

We appreciate the opportunity to be of service to you on this project. Materials services are provided by Terracon. We would be happy to discuss these services with you. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Christopher L. Camp, P.E.
Project Engineer
Geotechnical Services
Mississippi PE No. 18978



David A. Been, P.E.
Senior Consultant
Geotechnical Services

Enclosures cc: 1 – Client (PDF) & 1 – File

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TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 PROJECT INFORMATION	1
2.1 Project Description.....	1
2.2 Site Location and Description	1
3.0 SUBSURFACE CONDITIONS	2
3.1 Geology	2
3.2 Typical Profile	2
3.3 Groundwater	3
4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION	4
4.1 Preliminary Recommendations	4
5.0 GENERAL COMMENTS	5

APPENDIX A – FIELD EXPLORATION

Exhibit A-1	Site Location Plan
Exhibit A-2	Boring Location Plan
Exhibit A-3	Field Exploration Description
Exhibit A-4 to A-9	Boring Logs B-01 to B-06

APPENDIX B – SUPPORTING INFORMATION

Exhibit B-1	Laboratory Testing
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APPENDIX C – SUPPORTING DOCUMENTS

Exhibit C-1	General Notes
Exhibit C-2	Unified Soil Classification System

GEOTECHNICAL ENGINEERING REPORT
PRELIMINARY SITE STUDY
ELLISVILLE, MISSISSIPPI
Terracon Project No. EB145024
March 31, 2014

1.0 INTRODUCTION

This preliminary geotechnical investigation has been completed as a preliminary study for a site to be located on US Highway 11 near Howard Drive in Ellisville, Mississippi. Six (6) soil borings, designated Borings B-01 through B-06, were drilled to a depth of approximately 24 feet below existing grades within the development area. Logs of the borings along with a site location plan and boring location plan are included in Appendix A of this report.

2.0 PROJECT INFORMATION

The following sections present the project information that was available at the time this report was prepared. Should this information be incorrect, or change significantly, the project engineer should be contacted in order to evaluate the effect, if any, on our analysis and recommendations provided herein and make modifications if required.

2.1 Project Description

Item	Description
Site layout	Appendix A, Exhibit A-2: Boring Location Plan
Structure	Unknown at the time of this report. It is assumed that structures constructed on the project site will be industrial in nature.
Building Construction	Unknown at the time of this report
Maximum loads	Unknown at the time of this report
Grading	Unknown at the time of this report
Maximum allowable movement	Unknown at the time of this report

2.2 Site Location and Description

Item	Description
Location	US Highway 11 near Howard Drive in Ellisville Mississippi (Appendix A, Exhibit A-1: Site Location Plan)

Item	Description
Existing improvements	Undeveloped parcel of land
Current ground cover	Dense woods
Existing topography	Sloping with an elevation difference of approximately 20 to 30 feet

3.0 SUBSURFACE CONDITIONS

Soil and groundwater conditions at the site were investigated by means of six (6) soil borings. Borings B-01 through B-06 were drilled in the proposed development area. The soil boring logs in Appendix A provide details of the conditions encountered at each boring location and the field and laboratory data collected.

3.1 Geology

Soils encountered at this site appear to be sediments of the Hattiesburg-Pascagoula formation. This formation is present throughout the southern quarter of Mississippi and is underlain by the Miocene age Catahoula formation and overlain by the Pleistocene age Citronelle formation. The Hattiesburg-Pascagoula formation is generally characterized as a gray homogenous marine clay deposit occurring at thicknesses of 150 feet or more. The formation may also contain localized areas of sandy clay or sand layers, lenses or beds. In some areas, these sandy deposits within the formation can have a thickness of 40 or 50 feet. Additionally, these sands may also become indurated into siltstone and/or sandstone deposits. The weathered clays found within the upper oxidized portion of the surface outcrop of the Hattiesburg-Pascagoula formation typically reveal moderate amounts of expansion and contraction due to changes in moisture content.

3.2 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
Surface	0.3	Topsoil	N/A
1	4 to Termination ¹	Lean Clay (CL)	Medium stiff to very stiff
2	22 to Termination ²	Sandy Lean Clay (CL) or Fat Clay (CH) with sand	Medium stiff to very stiff

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
3	Termination ³	Lean Clay (CL)	Very stiff to hard
4	Termination ⁴	Poorly Graded Sand with Silt (SP-SM)	Medium dense

1. Borings B-03 and B-04 were terminated in this stratum.
2. Boring B-06 was terminated in this stratum.
3. Borings B-01 and B-05 were terminated in this stratum.
4. Boring B-2 was terminated in this stratum.

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A.

3.3 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed are noted on the attached boring logs, and are summarized below.

Boring Location	Depth to Groundwater During Drilling (feet)	Depth to Groundwater After Drilling (feet)
B-01	None encountered	None encountered
B-02	20	16 after 15 minutes
B-03	None encountered	None encountered
B-04	None encountered	None encountered
B-05	None encountered	None encountered
B-06	22	19 after 15 minutes

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may differ than indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

The purpose of this preliminary investigation has been to evaluate the general subsurface soil and ground water conditions on a preliminary basis and to make preliminary recommendations regarding future development of the site. The preliminary investigation has included drilling widely spaced soil borings, performing limited laboratory testing, analyzing engineering and geologic data, and preparing the preliminary report.

4.1 Preliminary Recommendations

The exact nature of future development of the site is unknown. However, we assume that the development will most likely consist of industrial buildings with associated site pavement, subject to modification. Depending upon building size and loading conditions, foundations could consist of either a shallow foundation system, or for more heavily loaded structures requiring greater support a deep foundation system may be used.

The upper soils encountered at the boring locations generally indicated a stiff to very stiff consistency at the time of our investigation and, dependent upon finished grades, should be capable of support of fill, pavement, or light to moderately loaded foundations. A layer of medium stiff silty clays (CL-ML) was encountered to a depth of 4 ft in Borings B-02 and B-05. The stability of the soils encountered at the site will be dependent upon the moisture content at the time of construction. If the soils are subject to significant increases in moisture content, the strength of the material could be affected requiring some mitigation at the time of construction.

Fat clays (CH) with a moderate potential for expansion were also encountered in Borings B-01, B-05, and B-06 at depths ranging from 6 to 18 feet below the existing ground surfaces. These expansive clays (CH) should not adversely affect foundation performance unless grades are significantly lowered. Typical buffer thicknesses of low volume change soil above expansive clays found in this region consist of 4 feet underneath building foundations and 2 feet under pavements. If fat clays are encountered within any proposed future construction, we should be contacted to further investigate to determine more detailed mitigation recommendations.

A shallow foundation system could consist of conventional column and wall footings, monolithic slab and grade-beam system or a slab-on-grade foundation with turn down footings. We anticipate allowable bearing pressures on the order of 2,000 to 3,000 lbs per sq ft. A deep foundation associated with more heavily loaded and/or settlement sensitive structures could consist of a ground-supported floor slab coupled with drilled and cast-in-place concrete piers, driven H-piles, or auger-cast piles.

The recommendations presented above are preliminary in nature and not intended for use in specific design. Pending finalized plans and building locations, an additional geotechnical

investigation consisting of additional soil borings will be required to provide specific earthwork, remediation, and foundations and pavement recommendations.

5.0 GENERAL COMMENTS

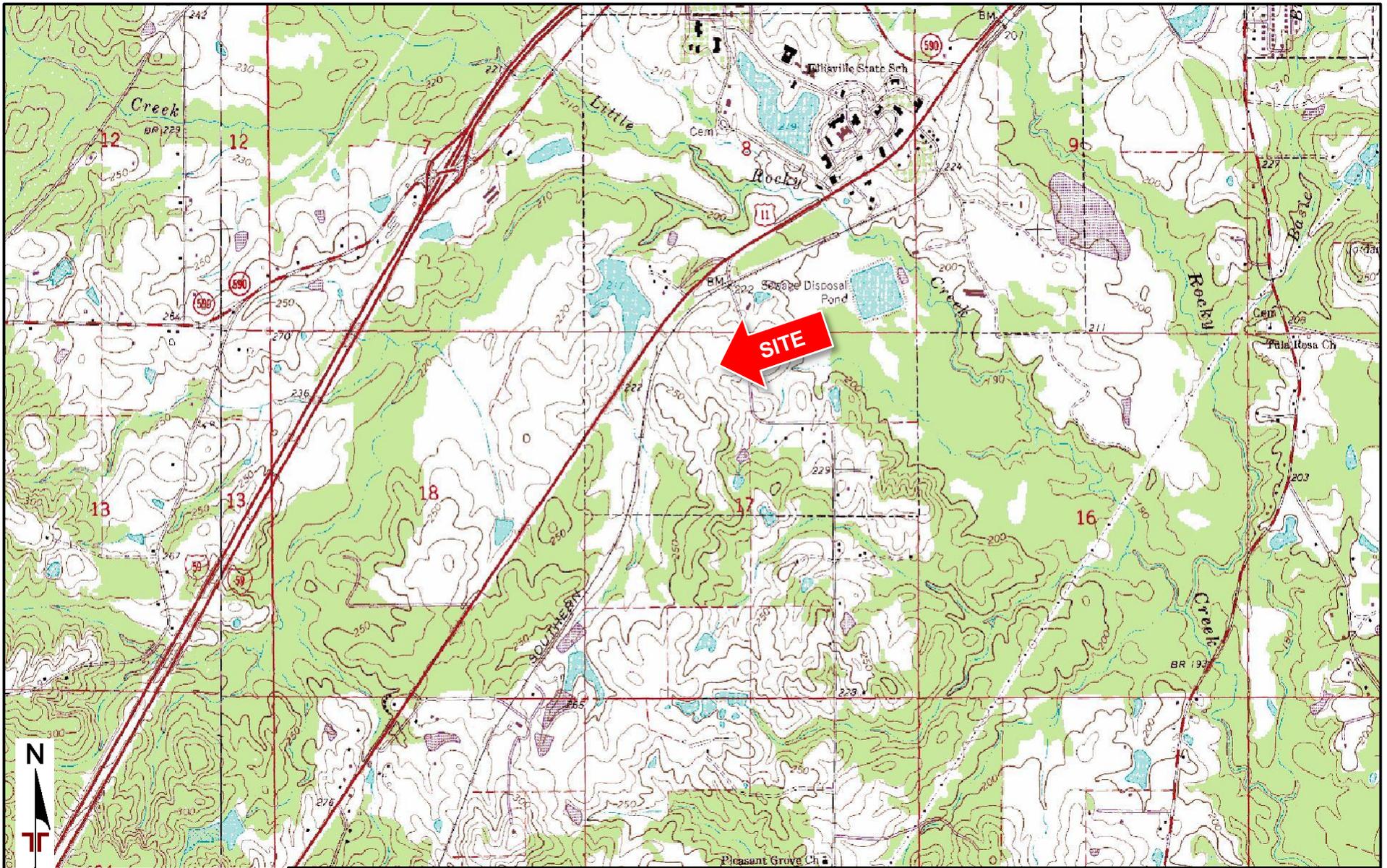
Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
 QUADRANGLES INCLUDE: MOSELLE, MS (1/1/1982) and ELLISVILLE, MS (1/1/1982).

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	CLC	Project No.	EB145024
Drawn by:	CLC	Scale:	1:24,000
Checked by:	DAB	File Name:	Exh A-1.pdf
Approved by:	DAB	Date:	MARCH 2014

Terracon
 859 Pear Orchard Road
 Ridgeland, MS

SITE LOCATION
Preliminary Site Study - Ellisville, MS Highway 11 near Howard Drive Ellisville, MS

Exhibit
A-1



AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: CLC
 Drawn by: CLC
 Checked by: DAB
 Approved by: DAB

Project No. EB145024
 Scale: AS SHOWN
 File Name: Exh A-1.pdf
 Date: MARCH 2014

Terracon
 859 Pear Orchard Road
 Ridgeland, MS

EXPLORATION PLAN

Preliminary Site Study - Ellisville, MS
 Highway 11 near Howard Drive
 Ellisville, MS

Exhibit

A-2

Field Exploration Description

The subsurface exploration consisted of drilling and sampling six (6) borings at the property. The boring locations were laid out by the drill crew using GPS coordinates. Ground surface elevations at the boring locations were not available and have been omitted from the boring logs. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with a tractor-mounted rotary drill rig using short-flight augers to advance the boreholes. Samples of the soil encountered in the borings were obtained using the undisturbed and split-barrel sampling procedures.

In the thick-wall tube sampling procedure, the relatively undisturbed samples were obtained by pushing a three-inch diameter, Shelby tube sampler a distance of two feet into the soil in general accordance with ASTM D1587. Depths at which these undisturbed samples were obtained are indicated by a shaded portion in the "Samples" column of the attached boring logs.

In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch (from 6 to 18 inches of) penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N value). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled in accordance with Mississippi state regulations.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

BORING LOG NO. B-01

PROJECT: Preliminary Site Study

**CLIENT: Chas N. Clark Associates, Ltd.
Laurel, Mississippi**

**SITE: Highway 11
Ellisville, Mississippi**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 31.57845° Longitude: -89.2239°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
0.3	TOPSOIL											
0.3 - 2.0	CLAYEY SAND (SC) , brown, medium dense -tan 2'-4'				1.75 (HP)			14				
2.0 - 4.5	-with clay pockets below 4.5'				4.50 (HP)		0.47	14	101	20-15-5		
4.5 - 6.0		5		X	3-11-12 N=23			18				
6.0 - 22.0	FAT CLAY WITH SAND (CH) , tan and gray, stiff to very stiff				+4.50 (HP)			26				
22.0 - 24.0		10			4.50 (HP)			23		55-20-35		
24.0 - 25.0		15			4.25 (HP)			18				
25.0 - 26.0		20			+4.50 (HP)			18				
26.0 - 27.0		25			+4.50 (HP)			22				
27.0 - 28.0					+4.50 (HP)			16				
28.0 - 29.0	LEAN CLAY (CL) , with sand, grayish-tan, stiff to very stiff											
29.0 - 30.0												
30.0 - 31.0	Boring Terminated at 24 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid-Flight Auger: 0' to 24'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 3/5/2014

Boring Completed: 3/5/2014

Drill Rig: Tractor

Driller: C. Warren

Project No.: EB145024

Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE SLOGS.EB145024.GPJ TERRACON_STD_TEMPLATE.GDT 3/18/14

BORING LOG NO. B-02

PROJECT: Preliminary Site Study

CLIENT: Chas N. Clark Associates, Ltd.
Laurel, Mississippi

SITE: Highway 11
Ellisville, Mississippi

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 31.5742° Longitude: -89.22525°	DEPTH	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
0.3	TOPSOIL				4.50 (HP)			16				
4.0	SILTY CLAY (CL-ML) , red, brown, and gray, medium stiff				2.75 (HP)		0.85	16	105	24-17-7		
11.0	LEAN CLAY (CL) , with sand, red and grayish-brown, medium stiff to stiff				3.25 (HP)			18				
15.0	LEAN CLAY (CL) , gray and reddish-brown, hard				1.75 (HP)			17				
18.0	LEAN CLAY (CL) , gray and reddish-brown, hard				2.50 (HP)			17				
22.5	LEAN CLAY (CL) , gray and reddish-brown, hard				+4.50 (HP)		4.07	17	113	46-15-31		
24.0	SANDY LEAN CLAY (CL) , light red, medium stiff to stiff				+4.50 (HP)			18				
24.0	POORLY GRADED SAND WITH SILT (SP-SM) , light red, medium dense				1.75 (HP)			18				
24.0	POORLY GRADED SAND WITH SILT (SP-SM) , light red, medium dense				1-5-7 N=12			23				10
	Boring Terminated at 24 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid-Flight Auger: 0' to 24'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

- ▽ Initially encountered
- ▽ Rise after 15 mins



Boring Started: 3/5/2014

Boring Completed: 3/5/2014

Drill Rig: Tractor

Driller: C. Warren

Project No.: EB145024

Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE SLOGS.EB145024.GPJ TERRACON_STD_TEMPLATE.GDT 3/18/14

BORING LOG NO. B-03

PROJECT: Preliminary Site Study

**CLIENT: Chas N. Clark Associates, Ltd.
Laurel, Mississippi**

**SITE: Highway 11
Ellisville, Mississippi**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 31.56979° Longitude: -89.22607°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
									DRY UNIT WEIGHT (pcf)	LL-PL-PI	
0.3	TOPSOIL				4.50 (HP)			16			
8.0	LEAN CLAY (CL) , with sand, reddish-brown, stiff to very stiff				4.50 (HP)			15			
8.0	LEAN CLAY (CL) , reddish-brown and gray, stiff, stiff				4.50 (HP)			17		26-12-14	
8.0	LEAN CLAY (CL) , reddish-brown and gray, stiff, stiff				4.50 (HP)			14			
24.0	LEAN CLAY (CL) , reddish-brown and gray, stiff, stiff -with traces of mica below 11'				2.50 (HP)	1.57		19	104	37-13-24	
24.0	LEAN CLAY (CL) , reddish-brown and gray, stiff, stiff				1.75 (HP)			22			
24.0	LEAN CLAY (CL) , reddish-brown and gray, stiff, stiff				3.00 (HP)			23			
24.0	LEAN CLAY (CL) , reddish-brown and gray, stiff, stiff				2.50 (HP)			25			
24.0	LEAN CLAY (CL) , reddish-brown and gray, stiff, stiff				1.50 (HP)			23			
24.0	Boring Terminated at 24 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid-Flight Auger: 0' to 24'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 3/5/2014

Boring Completed: 3/5/2014

Drill Rig: Tractor

Driller: C. Warren

Project No.: EB145024

Exhibit: A-6

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE SLOGS.EB145024.GPJ TERRACON STD_TEMPLATE.GDT 3/18/14

BORING LOG NO. B-04

PROJECT: Preliminary Site Study

**CLIENT: Chas N. Clark Associates, Ltd.
Laurel, Mississippi**

**SITE: Highway 11
Ellisville, Mississippi**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 31.58082° Longitude: -89.22427°	DEPTH	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
									DRY UNIT WEIGHT (pcf)	LL-PL-PI	
0.3	TOPSOIL				1.75 (HP)			23			83
	LEAN CLAY (CL) , with sand, reddish-brown and gray, stiff to very stiff				4.50 (HP)			23			
	-reddish-gray 6'-18'	5			+4.50 (HP)			21			
					+4.50 (HP)		1.48	23	97	43-23-20	
					+4.50 (HP)			24			
		10			3.00 (HP)			25			
					4.50 (HP)			25			
	-gray below 18'				3.00 (HP)			23			83
		20			3.25 (HP)			23			
	Boring Terminated at 24 Feet	24.0									
		25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid-Flight Auger: 0' to 24'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 3/5/2014

Boring Completed: 3/5/2014

Drill Rig: Tractor

Driller: C. Warren

Project No.: EB145024

Exhibit: A-7

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE SLOGS.EB145024.GPJ TERRACON_STD_TEMPLATE.GDT 3/18/14

BORING LOG NO. B-05

PROJECT: Preliminary Site Study

**CLIENT: Chas N. Clark Associates, Ltd.
Laurel, Mississippi**

**SITE: Highway 11
Ellisville, Mississippi**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 31.57595° Longitude: -89.22799°	DEPTH	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
0.3	TOPSOIL				2.75 (HP)			19				
	LEAN CLAY (CL) , with sand, brownish-gray, medium stiff				1.25 (HP)		0.89	18	105	30-17-13		
	-stiff to very stiff 4'-14'	5			+4.50 (HP)			16				
					4.25 (HP)			15				
					3.25 (HP)			13				
		10			+4.50 (HP)			17				
	-very stiff below 14'				+4.50 (HP)		3.27	16	115	32-13-19		
		15			4.50 (HP)			27				
		20			+4.50 (HP)			23				
		25										
		18.0										
	FAT CLAY WITH SAND (CH) , gray and reddish-brown, stiff to very stiff				4.50 (HP)			27				
		22.0										
	LEAN CLAY (CL) , with sand and traces of mica, reddish-gray, very stiff to hard				+4.50 (HP)			23				
		24.0										
	Boring Terminated at 24 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid-Flight Auger: 0' to 24'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 3/5/2014

Boring Completed: 3/5/2014

Drill Rig: Tractor

Driller: C. Warren

Project No.: EB145024

Exhibit: A-8

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE SLOGS.EB145024.GPJ TERRACON_STD_TEMPLATE.GDT 3/18/14

BORING LOG NO. B-06

PROJECT: Preliminary Site Study

**CLIENT: Chas N. Clark Associates, Ltd.
Laurel, Mississippi**

**SITE: Highway 11
Ellisville, Mississippi**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 31.57282° Longitude: -89.22823°	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		PERCENT FINES
											LL-PL-PI		
0.3	SANDY LEAN CLAY (CL) , brown and reddish-gray, stiff to very stiff -medium stiff below 4'					+4.50 (HP)			20				
						1.50 (HP)			20				
6.0			5				1.25 (HP)			20			61
6.0	LEAN CLAY (CL) , with sand, gray, stiff					2.00 (HP)			16				
						4.50 (HP)	1.29		18	108	43-16-27		
11.0			10										
11.0	FAT CLAY WITH SAND (CH) , gray, stiff to very stiff					+4.50 (HP)			18				
						+4.50 (HP)			20				
22.0			15										
22.0	SANDY LEAN CLAY (CL) , gray, stiff to very stiff			▽		4.25 (HP)			24				
24.0			20		▽		3.00 (HP)			13			60
	Boring Terminated at 24 Feet		25										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid-Flight Auger: 0' to 24'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

- ▽ Initially encountered
- ▽ Rise after 15 mins



Boring Started: 3/5/2014

Boring Completed: 3/5/2014

Drill Rig: Tractor

Driller: C. Warren

Project No.: EB145024

Exhibit: A-9

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE. SLOGS.EB145024.GPJ TERRACON_STD_TEMPLATE.GDT 3/18/14

APPENDIX B
SUPPORTING INFORMATION

Geotechnical Engineering Report

Preliminary Site Study ■ Ellisville, Mississippi
March 31, 2014 ■ Terracon Project No. EB145024



Laboratory Testing

The laboratory testing program consisted of performing water content tests, Atterberg Limits, grain size determination tests, and unconfined compression tests on representative soil samples. Information from these tests was used in conjunction with field penetration test data to evaluate soil strength in-situ, volume change potential, and soil classification. Results of these tests are provided on the boring logs included in Appendix A.

Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is attached to this report in Appendix C.

Atterberg Limits provide a quantitative measure of the soil plasticity and are useful in evaluating the potential for the soil to change volume with variation in water content. The calibrated hand penetrometer has been correlated with unconfined compression tests and provides a better estimate of soil consistency than visual examination alone. Information from these tests was used in conjunction with field penetration test data to evaluate in-situ soil strength and volume change potential.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING			WATER LEVEL		Water Initially Encountered	FIELD TESTS	(HP) Hand Penetrometer	
	Auger	Split Spoon			Water Level After a Specified Period of Time		(T) Torvane	
					Water Level After a Specified Period of Time		(b/f) Standard Penetration Test (blows per foot)	
	Shelby Tube	Macro Core		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.			(PID) Photo-Ionization Detector	
							(OVA) Organic Vapor Analyzer	
								
Grab Sample	No Recovery							

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS	RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, tsf	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification			
				Group Symbol	Group Name ^B		
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F		
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GP	Poorly graded gravel ^F		
			Fines classify as CL or CH	GM	Silty gravel ^{F,G,H}		
		Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	GC	Clayey gravel ^{F,G,H}	
			Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SW	Well-graded sand ^I	
	Fines classify as CL or CH			SP	Poorly graded sand ^I		
	Fine-Grained Soils: 50% or more passes the No. 200 sieve		Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots on or above "A" line ^J	SM	Silty sand ^{G,H,I}
					$PI < 4$ or plots below "A" line ^J	SC	Clayey sand ^{G,H,I}
		Organic:		Liquid limit - oven dried	< 0.75	CL	Lean clay ^{K,L,M}
				Liquid limit - not dried		ML	Silt ^{K,L,M}
Inorganic:				PI plots on or above "A" line	OL	Organic clay ^{K,L,M,N}	
		PI plots below "A" line	OH	Organic silt ^{K,L,M,O}			
Silts and Clays: Liquid limit 50 or more		Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}		
			PI plots below "A" line	MH	Elastic Silt ^{K,L,M}		
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K,L,M,P}	
			Liquid limit - not dried		PT	Organic silt ^{K,L,M,Q}	
	Primarily organic matter, dark in color, and organic odor		PT		Peat		

^A Based on the material passing the 3-inch (75-mm) sieve

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$E \quad Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.

