

May 21, 2014

## Exhibit X. Carville Riverfront Development Preliminary Geotechnical Engineering Report

Attention : Jim A. Cavanaugh  
Site Development Director  
Email: jim@brac.org  
Phone: (225) 339-1163

Re: **Geotechnical Site Evaluation Report**  
**St. Gabriel Site Evaluation**  
**Iberville Parish, Louisiana**  
**PSI Project No. 0193578**

Dear Mr. Cavanaugh:

Professional Service Industries, Inc. is pleased to submit this Geotechnical Site Evaluation Report for the St. Gabriel project site. This report includes the results of field and laboratory testing, and information regarding the compatibility of this site with industrial development, suitability of soils for building foundations and on-site roadways, requirements of soil augmentation for construction of a typical 100,000 square feet (sf) industrial manufacturing building and depth of groundwater.

We appreciate the opportunity to perform this Geotechnical Site Evaluation Study. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,

**PROFESSIONAL SERVICE INDUSTRIES, INC.**



Leslie C. Chandler, P.E.  
Project Engineer  
Geotechnical Services

Name: Leslie C. Chandler, P.E.  
Date: May 21, 2014  
License No.:

THIS PRELIMINARY DOCUMENT IS  
NOT TO BE USED FOR  
CONSTRUCTION, BIDDING,  
RECORDATION, CONVEYANCE,  
SALES, OR AS THE BASIS FOR THE  
ISSUANCE OF A PERMIT.

Distribution: Addressee (3)  
File (1)

**GEOTECHNICAL SITE EVALUATION REPORT**

**ST. GABRIEL SITE STUDY  
IBERVILLE PARISH, LOUISIANA  
PSI PROJECT NO.: 0193574**

**PREPARED FOR**

**BATON ROUGE AREA CHAMBER  
564 LAUREL STREET  
BATON ROUGE, LA 70801**

**MAY 21, 2014**

**BY  
PROFESSIONAL SERVICE INDUSTRIES, INC.  
11950 INDUSTRIPLEX BLVD.  
BATON ROUGE, LOUISIANA 70809**

## TABLE OF CONTENTS

	Page No.
PROJECT INFORMATION .....	1
Project Authorization .....	1
Project Description.....	1
Purpose and Scope of Services.....	1
 SITE AND SUBSURFACE CONDITIONS .....	2
Site Location and Description.....	2
Field Exploration.....	2
Laboratory Testing.....	2
Subsurface Conditions.....	3
Groundwater Information.....	3
 EVALUATION AND DISCUSSIONS .....	4
 REPORT LIMITATIONS .....	4
 <b>APPENDIX</b>	
• Site Vicinity Map	
• Boring Location Plan	
• Boring Logs	
• Key to Terms and Symbols Used on Logs	

## **PROJECT INFORMATION**

### **Project Authorization**

Professional Service Industries, Inc. (PSI) has completed a 'General Geotechnical Characterization' for the St. Gabriel site, located in general vicinity northwest of Carville, Louisiana. Our services were provided in general accordance with PSI Proposal No. 193-120164-02 Revised, dated April 3, 2014. Authorization to provide our services was provided by Mr. Iain Vasey (Executive Director Baton Rouge Area Chamber) who signed our Proposal on April 16, 2014.

### **Project Description**

The site for the requested geotechnical evaluation is approximately 723 acres in size and is located west and north of Carville, Louisiana within a bend of the Mississippi River. Primary objectives for this preliminary report are to provide information regarding the compatibility of this site with industrial development, suitability of soils for building foundations and on-site roadways, requirements of soil augmentation for construction of a typical 100,000 square feet (sf) industrial manufacturing building, and the depth of the free groundwater table.

This geotechnical site evaluation report will provide an initial baseline of the site subsurface conditions that will likely be encountered during future site development. However, as with any geotechnical investigation, particularly given the size of this project site and relatively limited number of borings performed, variations between borings may and should be expected to exist, and there remains a distinct possibility that other conditions may exist on site that were not encountered within the scope of this exploration.

The opinions and information to be presented in this report are estimates for preliminary consideration only, are based on limited geotechnical exploration, and are not to be used for final design and construction.

### **Purpose and Scope of Services**

The purposes of PSI's geotechnical services are to:

- Per the clients' request, drill and sample three soil borings at the site. Two borings were drilled and sampled to a depth of approximately 25 feet and one boring was drilled and sampled to a depth of approximately 75 feet below the existing grades;
- Evaluate subsurface soil conditions and groundwater depths at the project site;
- Perform limited laboratory testing on selected soil samples recovered from the project site; and,
- Provide information regarding the compatibility of this site with industrial development, suitability of soils for building foundations and on-site roadways, requirements of soil augmentation for construction of a typical 100,000 sf industrial manufacturing building and depth of groundwater.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. Prior to development of this site, an environmental assessment is advisable.

Additionally, PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. Client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

## **SITE AND SUBSURFACE CONDITIONS**

### **Site Location and Description**

The project site is located approximately one-quarter mile northwest of Carville, Louisiana, bounded generally by the Mississippi River to the north and south, Syngenta to the west and undeveloped property to the east (as illustrated on the Site Vicinity Map provided on Figure No. 1 in the Appendix). The site was undeveloped and covered by grass at the time of PSI's field exploration, and the ground surface appeared to be topographically level. PSI's ATV-mounted drill rig was required in order to perform this field exploration.

### **Field Exploration**

The field exploration included mobilization to the site by a PSI drilling crew, drilling of the soil borings, and recovering soil samples. Boring B-1 was drilled and sampled to a depth of approximately 75 feet below the existing grade. Borings B-2 and B-3 were drilled and sampled to a terminal depth of approximately 25 feet below existing grade (as illustrated in the Boring Location Plan on Figure No. 2 in the Appendix). As noted previously, the borings were advanced using an ATV-mounted drill rig equipped with a rotary head and hollow-stem flight augers. Boring B-1 was drilled utilizing wet-rotary drilling techniques, while Borings B-2 and B-3 were drilled and sampled utilizing hollow-stem augers. Drilling and sampling activities were performed in general accordance with referenced ASTM procedures or other accepted methods. The shallower soil borings (i.e., 25 feet deep) were backfilled with soil cuttings upon completion of drilling and groundwater observations while the deeper soil boring (i.e., 75 feet deep) was backfilled with a cement/bentonite grout mixture per LA DOTD requirements.

Undisturbed samples of cohesive soils were generally obtained using three-inch-diameter, thin-wall tube samplers (Shelby tube) in general accordance with the procedures for "Thin-Walled Tube Geotechnical Sampling of Soils" (ASTM D1587). These samples were extruded in the field with a hydraulic ram and were identified according to boring number and depth, wrapped in aluminum foil, placed in polyethylene plastic wrapping to protect against moisture loss and transported to the laboratory in containers to minimize disturbance.

### **Laboratory Testing**

Selected soil samples were tested in the laboratory to determine material properties for our evaluation. Visual classifications were performed in the laboratory. Physical testing included determination of moisture contents, Atterberg limits classification testing and unconfined compressive strength tests and unconsolidated undrained triaxial strength tests (to supplement the field pocket penetrometer testing). The laboratory testing was performed in general accordance with ASTM procedures. Samples not altered by laboratory testing will be retained for

sixty (60) days from the date of this report and then be discarded.

### **Subsurface Conditions**

Boring B-1 disclosed about 2 inches of topsoil underlain by soft to very stiff, fat clay to about 23 feet below grade. From a depth of approximately 23 feet to about 33 feet, soft silt was disclosed, which was underlain by approximately thirty feet of soft to stiff fat clay. Beneath the fat clay about 5 feet of soft silt was disclosed overlying firm to stiff fat clay to boring termination depth of approximately 75 feet below grade.

Boring B-2 disclosed about 2 inches of topsoil underlain by about four feet of hard fat clay followed by approximately 3 feet of firm lean clay. This lean clay was underlain by firm, fat clay to a depth of about 24 feet; the fat clay was in turn underlain by firm silt to the boring termination depth of about 25 feet below existing grade, the maximum depth explored in this boring.

Boring B-3 disclosed about 2 inches of topsoil underlain by very stiff fat clay to a depth of about 6 feet. Underlying this fat clay layer is a 2-foot-thick layer of stiff lean clay. A firm, fat clay was disclosed from a depth of approximately 8 to 19 feet, which was underlain by very soft lean clay to the boring termination depth of about 25 feet below existing grade, the maximum depth explored in this boring.

The above subsurface description is generalized in nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in the Appendix should be reviewed for specific information at the individual boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples, and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.

### **Groundwater Information**

The free groundwater table was encountered as shown in the Table below:

Boring No.	Depth to Groundwater During Drilling (Feet)	Depth to Groundwater at End of Drilling (Feet)
B-1	10	8
B-2	9	8
B-3	13	4

\*Boring was drilled using wet rotary drilling techniques; therefore the initial depth to groundwater was not measured in this boring.

\*\* Not measured due to drilling fluid used to drill soil boring and short project duration.

It should be noted that groundwater level fluctuations at this site may occur due to seasonal and climatic variations, the stage of the Mississippi River due to its relative close proximity to the project site, alteration of drainage patterns, land usage and ground cover. We recommend the Contractor determine the actual groundwater levels at the time any future construction activities begin.

## **EVALUATION AND DISCUSSIONS**

The type and depth of foundation suitable for a given structure primarily depends on several factors including the subsurface conditions, the function of the structure, the loads it may carry, the cost of the foundation and the criteria set by the Design Engineer with respect to vertical and differential movement which the structure can withstand without damage.

Based on the limited number of soil borings, field data and laboratory test results, the proposed site is generally feasible for industrial development. The subsurface soils explored are suitable for building foundations and site roadways, although due to the presence of fat clay (CH) soil in the upper 4 to 23 feet of the soil profile of the borings, potential vertical rise (PVR) would need to be further evaluated. PVR at this site could be alleviated by undercutting the fat clay soils to a predetermined depth and replacing with moisture conditioned, properly compacted lean clay (CL) soils, or with the addition of chemical treatment such as lime mixing. Detailed column loads for a typical 100,000 sq. ft. industrial manufacturing building were not provided at the time of this study; however, the structural column loads are anticipated to be on the order of 60 to 100 kips, with wall loads on the order of 3.0 kips per lineal foot.

Foundation systems may include shallow foundations (for lightly-loaded structures with allowance for some settlement), mat foundations, deep foundations such as driven piles, auger cast-in-place (ACIP) piles or drilled piers for this project. Pile/pier foundations are recommended for the support of any heavy structures or settlement sensitive structures at this site. The choice of type of deep foundation should be based on the tolerance criteria for the performance of the structures and economics of construction. Lightly-loaded structures can generally be supported on shallow spread footings/grade beam system, or mat foundations, as long as the PVR issues described above are mitigated. These foundations will be governed by the anticipated load and settlement tolerances.

As stated previously, PSI's opinions and information presented in this site evaluation report are provided for planning purposes and preliminary considerations only; they are based on a very limited geotechnical exploration, and are not to be used for final design and construction.

## **REPORT LIMITATIONS**

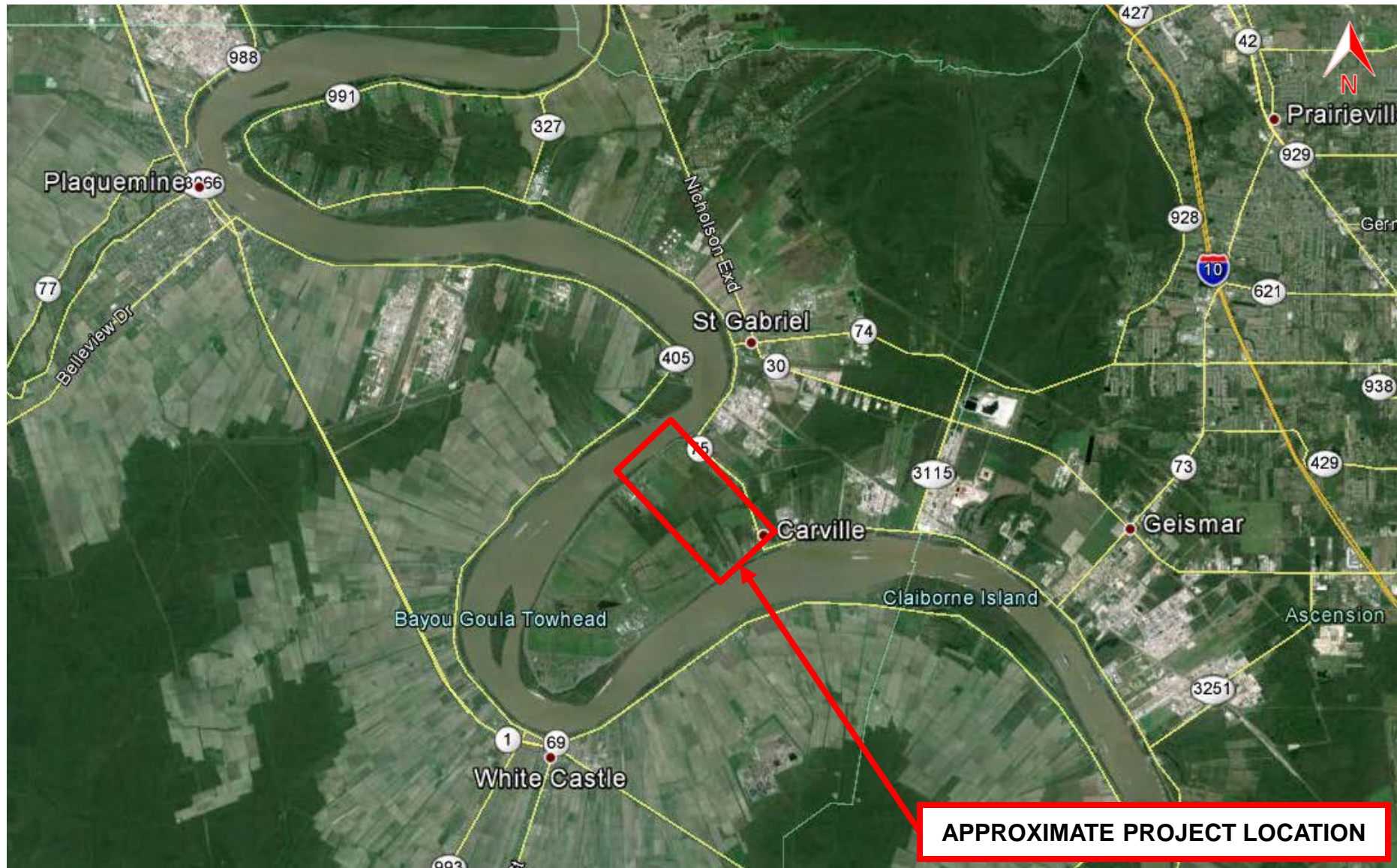
The preliminary information submitted in this report is based on the available subsurface data obtained by PSI at the time of our field exploration. PSI warrants that the preliminary findings contained herein have been made in accordance with generally accepted drilling procedures and visual soil classification methods in the local area. No other warranties are implied or expressed. This report has been prepared for the exclusive use of the Baton Rouge Area Chamber for the specific purpose of determining general subsurface information at the site of the referenced project. Upon authorization through a supplemental services agreement, PSI will be available to perform a thorough geotechnical study and provide complete and final recommendations.

## APPENDIX

---



## SITE VICINITY MAP



GEOTECHNICAL ENGINEERING SERVICES  
ST. GABRIEL SITE STUDY  
IBERVILLE PARISH, LOUISIANA

DATE: 05/2014

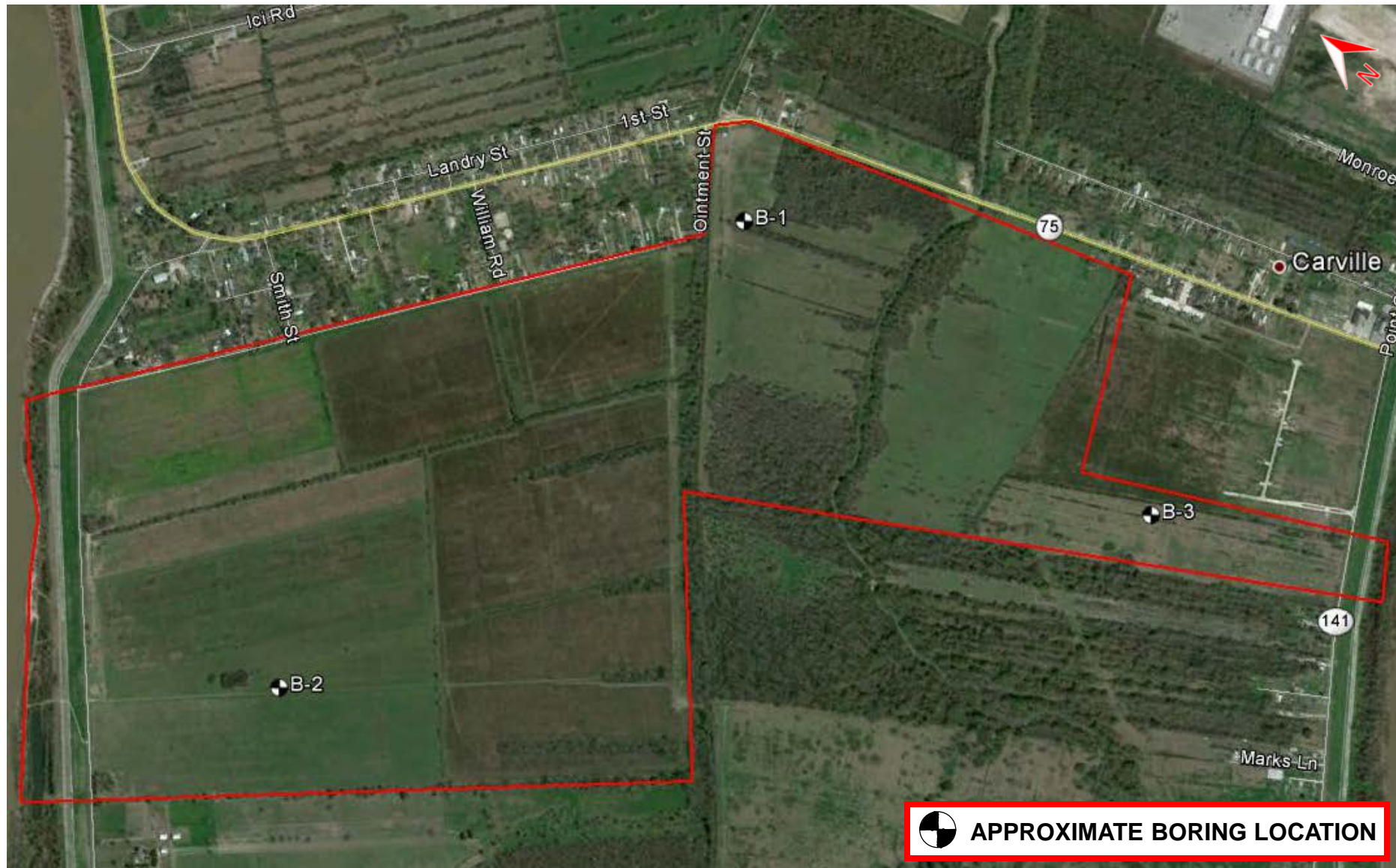
DRAWN: WV

CHKD: LC

**psi** Information  
To Build On  
Engineering • Consulting • Testing



# BORING LOCATION PLAN



GEOTECHNICAL ENGINEERING SERVICES  
ST. GABRIEL SITE STUDY  
IBERVILLE PARISH, LOUISIANA

DATE: 05/2014

DRAWN: WV

CHKD: LC

**psi** Information  
To Build On  
Engineering • Consulting • Testing

# LOG OF BORING B-1

St. Gabriel Site Study  
Iberville Parish, Louisiana

TYPE OF BORING: WET ROTARY

PSI Project No.: 0193571-1

DEPTH, FT.	SOIL TYPE	USCS SYMBOL	SAMPLES	LATITUDE: N 30° 13' 37.4" LONGITUDE: W 91° 6' 12.2"	N-BLOWS/FT.	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% PASSING No. 200 SIEVE	SHEAR STRENGTH (tsf)  ○ HP    ● UC △ TV    ▲ UU	SHEAR STRENGTH (tsf)				UNIT DRY WEIGHT (pcf)					
				BORING LOCATION PLAN: APPENDIX FIGURE NO. 2								SOIL DESCRIPTION	HAND PEN (tsf)	UC (tsf)	TORVANE (tsf)		UU (tsf)				
																		LL	PL	PI	0.0
		CH		2-INCH TOPSOIL		35									1.13						
				Soft to very stiff, brown fat CLAY w/ roots, and gravel		40	100	27	73								0.75				
5						42											0.50				
				-w/ ferrous nodules		41	64	17	47								0.25				
				-w/ silt, and sand		34											0.25				
10																					
		CH		-w/ organics		45									0.50						
15																					
20																	0.13		0.15		
		ML		Soft, gray SILT w/ sand		2	32														
25																					
		CH		Soft to stiff, gray fat CLAY																	
30																					
35																	0.25				
40																	0.75		0.30		
		CH		-w/ silt, and sand		59									0.50	0.40	0.25		72		
45																					
		CH		-w/ organics		41									0.50		0.30				
50																					

DEPTH OF BORING: 75 feet

DATE DRILLED: 5/3/14

GROUNDWATER DURING DRILLING (FT): 10

GROUNDWATER UPON COMPLETION (FT): 8










NOTES: The stratification lines represent approximate boundaries.

# LOG OF BORING B-1

St. Gabriel Site Study  
Iberville Parish, Louisiana

TYPE OF BORING: WET ROTARY

PSI Project No.: 0193571-1

DEPTH, FT.	SOIL TYPE	USCS SYMBOL	SAMPLES	LATITUDE: N 30° 13' 37.4" LONGITUDE: W 91° 6' 12.2"	SOIL DESCRIPTION	N-BLOWS/FT.	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% PASSING No. 200 SIEVE	SHEAR STRENGTH (tsf)  ○ HP    ● UC △ TV    ▲ UU	SHEAR STRENGTH (tsf)				UNIT DRY WEIGHT (pcf)
				HAND PEN (tsf)									UC (tsf)	TORVANE (tsf)	UU (tsf)		
																0.0	
55							54						0.25				
60																	
65		ML		Soft, gray SILT w/ clay, and traces of fine sand			35						0.25		0.13		
70		CH		Firm to stiff, gray fat CLAY w/ organics, silt, and sand			45						0.38				
75																	
				Boring terminated at 75 feet.													
80																	
85																	
90																	
95																	
100																	

DEPTH OF BORING: 75 feet

DATE DRILLED: 5/3/14

NOTES: The stratification lines represent approximate boundaries.

# LOG OF BORING B-2

St. Gabriel Site Study  
Iberville Parish, Louisiana

TYPE OF BORING: HOLLOW STEM AUGER

PSI Project No.: 0193571-1

DEPTH, FT.	SOIL TYPE	USCS SYMBOL	SAMPLES	LATITUDE: N 30° 13' 43.2" LONGITUDE: W 91° 7' 12.5"	N-BLOWS/FT.	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% PASSING No. 200 SIEVE	SHEAR STRENGTH (tsf) ○ HP    ● UC △ TV    ▲ UU	SHEAR STRENGTH (tsf)				UNIT DRY WEIGHT (pcf)	
				BORING LOCATION PLAN: APPENDIX FIGURE NO. 2								SOIL DESCRIPTION	HAND PEN (tsf)	UC (tsf)	TORVANE (tsf)		UU (tsf)
		CH		2-INCH TOPSOIL Hard, brown fat CLAY w/ organics -becomes stiff		25 36						2.25	0.45			84	
5		CL		Firm, gray and brown lean CLAY w/ ferrous nodules and organics -becomes soft		28 31	49	17	32			0.50		0.30			
10		CH		Firm, gray and tan fat CLAY w/ ferrous nodules  -becomes gray  -becomes very soft and laminated w/ silt		31  54  62  38						0.50	0.53			90	
25		ML		Firm, gray SILT w/ fine sand Boring terminated at 25 feet.								0.38		0.18			
30																	
35																	
40																	
45																	

DEPTH OF BORING: 25 feet

DATE DRILLED: 5/1/14

GROUNDWATER DURING DRILLING (FT): 9

GROUNDWATER UPON COMPLETION (FT): 8

NOTES: The stratification lines represent approximate boundaries.

# LOG OF BORING B-3

St. Gabriel Site Study  
Iberville Parish, Louisiana

TYPE OF BORING: HOLLOW STEM AUGER

PSI Project No.: 0193571-1

DEPTH, FT.	SOIL TYPE	USCS SYMBOL	SAMPLES	LATITUDE: N 30° 12' 57.5"	LONGITUDE: W 91° 6' 10.0"	N-BLOWS/FT.	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% PASSING No. 200 SIEVE	SHEAR STRENGTH (tsf)					SHEAR STRENGTH (tsf)				UNIT DRY WEIGHT (pcf)
				BORING LOCATION PLAN: APPENDIX FIGURE NO. 2								SOIL DESCRIPTION					HAND PEN (tsf)	UC (tsf)	TORVANE (tsf)	UU (tsf)	
													0.0	0.5	1.0	1.5	2.0				
								LL	PL	PI											
		CH		2-INCH TOPSOIL			27										1.63				
				Very stiff, brown fat CLAY w/ roots			32										1.50				
-5				-becomes firm w/ ferrous nodules			30										0.38	0.40			91
		CL		Stiff, tan and gray lean CLAY w/ ferrous nodules			32										0.75				
-10		CH		Firm, gray fat CLAY w/ ferrous nodules, silt lenses			31	46	17	29							0.50				
				-becomes gray and tan w/ silt partings			39										0.38		0.38		
-15				-becomes very soft			40												0.10		
-20		CL		Very soft, gray lean CLAY w/ silt																	
				-becomes gray and tan			34												0.25		
-25				Boring terminated at 25 feet.																	
-30																					
-35																					
-40																					
-45																					
-50																					

DEPTH OF BORING: 25 feet

DATE DRILLED: 5/1/14

GROUNDWATER DURING DRILLING (FT): 13

GROUNDWATER UPON COMPLETION (FT): 4

NOTES: The stratification lines represent approximate boundaries.



CLIENT Baton Rouge Area Chamber

PROJECT NAME St. Gabriel Site Study

PROJECT LOCATION Iberville Parish, Louisiana

## LITHOLOGIC SYMBOLS

### (Unified Soil Classification System)



CH: Fat Clay  
(CH)



CL: Lean Clay  
(CL)



ML: Silt (ML)



TOPSOIL:  
Topsoil

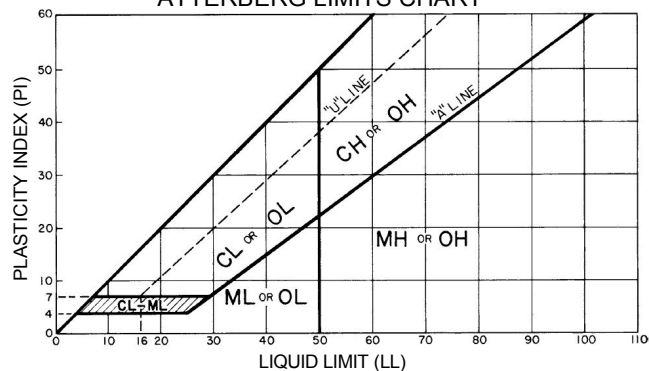
## CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	SHEAR STRENGTH IN TONS/FT <sup>2</sup> (tsf)
VERY SOFT	0.0 TO 0.125
SOFT	0.125 TO 0.25
FIRM	0.25 TO 0.5
STIFF	0.5 TO 1.0
VERY STIFF	1.0 TO 2.0
HARD	>2.0 OR 2.0+

## RELATIVE DENSITY OF GRANULAR SOILS

CONSISTENCY	N-VALUE IN BLOWS/FOOT
VERY LOOSE	0-4
LOOSE	4-9
MEDIUM DENSE	10-29
DENSE	30-49
VERY DENSE	>50 OR 50+

## ATTERBERG LIMITS CHART



## SAMPLER SYMBOLS



Split Spoon



Shelby Tube

## ABBREVIATIONS

NP - NON PLASTIC  
UC - UNCONFINED COMPRESSION  
UU - UNCONSOLIDATED UNDRAINED TRIAXIAL  
TV - TORVANE  
W/ - WITH

▼ Water Level at Time of Drilling, or as Shown  
▽ Water Level at End of Drilling, or as Shown  
▼ Water Level After 24 Hours, or as Shown