SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

Exhibit BB. Livingston Industrial Park Preliminary Geotechnical Engineering Report

GEOTECHNICAL ENGINEERING STUDY REPORT

For

PROPOSED LIVINGSTON LOUISIANA ECONOMIC DEVELOPMENT SITE
LIVINGSTON PARISH, LOUISISANA
SESI FILE NO: B13-095

Presented to

BATON ROUGE AREA CHAMBER
564 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

Prepared by

SOUTHERN EARTH SCIENCES, INC.
11638 SUNBELT CT.
BATON ROUGE, LA 70809
(225) 751-1727

NOVEMBER 26, 2013

Baton Rouge Office

11638 Sunbelt Court
Baton Rouge, LA 70809

Tel: (225) 751-1727
Fax: (225) 752-1467
www.soearth.com

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

November 26, 2013

Baton Rouge Area Chamber
564 Laurel Street
Baton Rouge, Louisiana 70801

Attn.: Mr. Jim Cavanaugh

Re: Geotechnical Engineering Study for
Proposed Livingston LED Site
Highway 190 and N. Corbin Avenue
Livingston Parish, Louisiana
SESI File No.: B13-095

Dear Mr. Cavanaugh,

Southern Earth Sciences, Inc. (SESI) is pleased to submit our Geotechnical Subsurface Exploration Report for the above referenced project. The report includes the results of field and laboratory testing, recommendations for the foundation design, and general site preparation as related to soils.

We appreciate the given opportunity to perform this Geotechnical Study and look forward to continue participating during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
SOUTHERN EARTH SCIENCES, INC.

Joseph Cobena
Geotechnical Staff Intern

M. Rajasekhar

Raja Madhyannapu, PhD., P.E.
Geotechnical Project Engineer

STATE OF LOUISIANA
MICHAEL J. JUNEAU, JR.
License No. 37242
PROFESSIONAL ENGINEER
IN CIVIL ENGINEERING

11/26/2013

Mike Juneau, P.E.
Baton Rouge Branch Manager

TABLE OF CONTENTS

Page No.

1.0 Project Information

1.1 Project Authorization

Southern Earth Sciences, Inc. (SESI) has completed a subsurface exploration for the proposed preliminary site evaluation for marketing the project site in the Louisiana Economic Development Program (LEDP) for future development in Livingston Parish, LA. Our geotechnical engineering services were performed in general accordance with our Geotechnical Proposal No: P13-145.11 Revised dated November 11, 2013. Authorization to proceed with this investigation was received from Mr. Jim Cavanaugh with Baton Rouge Area Chamber through a signed proposal dated 11/12/2013.

1.2 Project Description

It is our understanding that the project site will be marketed in the Louisiana Economic Development Program (LEDP) for future industrial development, which is not defined at this time. Based on the provided information, the proposed Livingston Industrial Site will encompass approximately 95 acres and is divided into two (2) tracts (i.e., LEDC Tract B-1 and LEDC Tract 1,2,A-E). LEDC Tract B-1 will encompass approximately 6.8 acres and LEDC Tract 1,2 A-E will encompass approximately 87.5 acres. In addition, the majority of the project site is densely wooded and the remaining portion is grass covered.

Furthermore, it is understood that in order to market the project site in the LEDP, preliminary evaluation of subsoil characteristics of the project site verifying the compatibility with industrial development is required. Generally, for this purpose, we understand LEDP requires at least one (1) soil boring to a depth of 100 feet for an area of 50 acres. However, the field exploration for this project was performed as directed by client. In addition, LEDP requirements state that once the type of development is determined and a site plan is developed, additional subsurface investigations should be performed in order to provide project specific, geotechnical engineering recommendations.

2.0 Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to provide preliminary evaluation subsoil characteristics for future industrial development. As directed by client, one (1) soil boring to a depth of about 25 feet below existing grade located within LEDC Tract B-1; and one (1) soil boring to a depth of about 75 feet, and one (1) soil boring to a depth of about 25 feet below existing grade located within LEDC Tracts 1,2, A-E were drilled and sampled.

The scope of services also included conducting laboratory tests on selected samples recovered from the soil borings. These tests included visual description and classification, moisture content, liquid limit, plastic limit, and unconfined compressive strength. Both field and laboratory testing procedures are briefly discussed in this report.

This report includes a site description, discusses the conditions of the existing subsoil materials at the site, and presents the following:

- Soil boring logs including identification, and physical and engineering characteristics of subsurface materials encountered during the sampling and testing;
- General discussion on subsoils' conditions and their engineering characteristics; and
- Discussion on the suitability of existing subsurface soils for future industrial development including a "typical" 100,000 square foot warehouse building and associated roadways.

The scope of geotechnical services did not include an environmental site assessment for determining the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or around the site. Any statement in this report or on the *Boring Log* sheets regarding odors, colors, and unusual or suspicious items or conditions is strictly for informational purposes.

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

3.0 Site Location and Description

The proposed project site is located adjacent to Highway 190 and N. Corbin Avenue in Covington, Louisiana. At the time of our field exploration, the proposed project site is generally is covered with trees and low lying brush, with certain areas being densely wooded. It is our understanding that the project site will be cleared and leveled prior to any construction activities.

4.0 Field Exploration

The field exploration performed to evaluate the engineering characteristics of the subsurface materials, included a reconnaissance visit to the project site by a SESI representative, drilling the soil borings and recovering soil samples.

As previously mentioned, two (2) soil borings to a depth of about 25 feet and one (1) soil boring to a depth of about 75 feet within the proposed project footprint were drilled and sampled for this project. The depths and locations of the borings were as proposed by SESI and understood by client following the RFP. The *Boring Location Plan*, included in the Appendix, presents the approximate location of the borings.

Descriptions of soil and groundwater conditions encountered in the borings are shown on their respective logs in Appendix. The *Boring Log* sheets are labeled with their initial letter followed by boring number. For example, log "B-1" represents boring '1' drilled for this project.

5.0 Drilling and Sampling Procedures

The borings were drilled with an ATV (all terrain vehicle) mounted drill rig using auger and rotary head wash drilling techniques to advance the borehole. Undisturbed samples were continuously obtained from the ground surface to a depth of ten (10) feet, then at five-foot intervals to the depth of the boring. They were obtained using thin-walled tube sampling procedures in general accordance with ASTM D-1587 *Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*. These samples were extruded in the field with a hydraulic ram, and were identified according to project number, boring number and depth, wrapped in aluminum foil and placed in plastic bags to preserve the natural moisture condition; then, they were transported to the laboratory in containers to prevent disturbance.

When undisturbed samples could not be recovered, disturbed samples were obtained in accordance to the procedures of ASTM D-1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. These samples were also identified according to project number, boring number and depth, and were placed in plastic bags to preserve the natural moisture condition.

6.0 Laboratory Testing Program

A supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of the subsurface materials. This program included visual description and classification and determination of the moisture content (ASTM D2216 *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*) on all samples. Furthermore, selected samples were subjected to ASTM D4318 *Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils,* ASTM D1140 *Standard Test Method for Amount of Material in Soils Finer than the No. 200,* ASTM D2166 *Standard Test Method for Unconfined Compressive Strength of Cohesive Soils,* and ASTM D2850 *Standard Test Method for Unconsolidated Undrained Triaxial Compression Test on Cohesive Soils*. The results of these tests are found in the accompanying boring logs located in the Appendix. Please note that the samples obtained and not tested will be retained for a period of thirty (30) days; if further instructions are not received they will be disposed at that time.

7.0 Subsurface Conditions

7.1 Subsurface Materials

As directed by the client, subsurface exploration for this project included one (1) soil boring to a depth of about 25 feet below existing grade located within LEDC Tract B-1 of about 6.8 acres; and one (1) soil boring to a depth of about 75 feet, and one (1) soil boring to a depth of about 25 feet below existing grade located within LEDC Tracts 1, 2, A-E of about 87.5 acres.
Boring 1: Boring 1, drilled within LEDC Tract B-1, revealed the presence of stiff consistency lean clay from existing ground surface to a depth of about eight (8) feet. Following this, medium to dense silty sand and sands were found to a depth of about 25 feet, the maximum depth explored.

Boring 2: Boring 2, drilled within LEDC Tracts 1, 2, A-E, revealed the presence of stiff consistency lean and fat clays from existing ground surface to a depth of about eight (8) feet. This is underlain by medium dense to dense silty sand to a depth of about 25 feet, the maximum depth explored.

Boring 3: Boring 3, drilled within LEDC Tracts 1, 2, A-E, revealed the presence of stiff consistency lean and fat clays from existing ground surface to a depth of about 75 feet, the maximum depth explored. Please note that a pocket of soft clay was disclosed between depths of about 38 to 40 feet.

Generally, the clay material was sampled in gray and tan colors with variable amounts of silt, sand lenses/pockets, and traces of organics. Silty and sandy soils are also sampled in gray and tan colors. All references to depth are made with respect to the existing ground surface at the time the borings were performed.

The above subsurface description is a generalized nature to highlight the major subsurface materials features and characteristics. The *Boring Log* sheets, included in the Appendix, present specific information at individual boring location including: soil description, stratification, ground water level, unconfined compressive strength, samples' location, and laboratory tests results. This information represents the actual conditions at the boring locations. Variations may occur and should be expected between boring locations. The stratification represents the approximate boundary between subsurface materials and the actual transition may be gradual.

7.2 Groundwater

The groundwater levels were detected as follows:

GROUND WATER TABLES		
Borehole	**Initial Reading (feet)**	**16 hr Reading (feet)**
B-1	11	4.6
B-2	10	5.3
B-3	NR[1]	7.7

Note: NR – not recorded; [1] not recorded due to wet rotary drilling;

It should be noted that the groundwater conditions are likely to change due to topography, permeability, weather, and other soil and terrain properties. Therefore, we recommend that the contractor determine the actual groundwater levels at the site at the time of the construction activities.

8.0 General Recommendations

8.1 Site Discussion

Generally, the encountered subsoil materials provided fair to good strength parameters; this is based on the laboratory and field test results. Essentially clays at all borings locations tend to be predominately stiff in consistency; and silty and sandy soils at all locations tend to be predominately medium to dense in nature. Please refer to the boring logs attached to this report for strength and consistency characteristics of subsoils with depth.

Based on our review of the existing subsoil conditions, and analysis of laboratory and field test results, we consider that the proposed project is feasible from a geotechnical point of view for future commercial development. However, it is recommended that based on the proposed future commercial development and project requirement, the project site should be further explored to provide appropriate recommendations related to site preparation, foundation design, pavement design, and construction considerations. Please note that this report should be considered only for preliminary site evaluation, and is not intended for any design purposes.

We encourage contacting SESI to provide further geotechnical engineering and construction services, when the proposed commercial development is planned and ready to be implemented.

8.2 "Typical" Structure Recommendations

Considering the subsurface materials encountered, a "typical" 100,000 square foot warehouse building with associated parking and driveways would be possible from a geotechnical standpoint. Based on the assumed structural loads of 30 kip or less column loads and 3 kip per linear foot or less wall loads, the typical warehouse building may be supported on a shallow foundation system. Recommendations on shallow foundation systems will require further field exploration based on the site and project specific requirements.

9.0 Report Limitations

The analyses and recommendations presented in this report are based on the existing field conditions at the time of the investigation. Furthermore, they are based on the assumption that the exploratory borings are a representation of the subsoil conditions throughout the site. Please note that variations in the subsoil conditions may occur between and beyond borings. If variations in those conditions are encountered during construction, SESI shall be notified immediately in order to assess the situation, confirm the recommendations included in this report, or modify them according to their own judgment. If SESI is not notified of such variations, SESI will not be responsible for the impact of those variations on the project.

This report for the preliminary site evaluation has been prepared for the exclusive use Baton Rouge Area Chamber and their design/construction team associated to this specific project.

APPENDIX

N

LIVINGSTON LED SITE
LIVINGSTON PARISH, LA
SESI FILE NO.: B13-095

SOUTHERN EARTH SCIENCES, INC.
www.soearth.com
An Employee Owned Company
Geotechnical, Environmental & Construction Materials Testing

FIGURE 1
BORING LOCATION PLAN

BORING LOG

BORING NO.: | **PROJECT NO.:**
PROJECT: | **DATE DRILLED:**
PROJECT LOCATION: | **DATE COMPLETED:**
BORING LOCATION: | **WATER LEVEL:**
BORING ELEVATION: | **WATER LEVEL DATE:**
GEOL/ENGR: | **LOGGED BY:**
METHOD: | **DRILLER:**

DEPTH (FEET)	SAMPLE	Standard Penetration (Blows/Ft.) or Penetrometer (TSF)	Unconfined Compressive Strength (TSF)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	Symbol	MATERIAL CLASSIFICATION

5
10
15
20
25
30
35
40

Description of strata as follows:
Strength (or Consistency), Color, Minor Constituent, Major Constituent, additional observations, etc.

Field evaluation of shear strength/relative density:
Standard Penetration Test (ASTM D-1586) in Blows/Ft.
Pocket penetrometer readings in Tons/Sq. Ft.

Groundwater second reading

Groundwater first encountered

Graphical presentation of material type:

Fat CLAY	SILT	SAND	FILL
Lean CLAY	CLAYEY SILT	CLAYEY SAND	GRAVEL
ORGANIC CLAY	SANDY SILT	SILTY SAND	GRAVELLY SAND
PEAT	ORGANIC SILT	SANDY CLAY	

Laboratory Information

As determined by Unconfined Compression (ASTM D-2166) or Unconsolidated Undrained Triaxial (ASTM D-2850), if noted.

Determined using applicable portions of ASTM D-2166 and ASTM D-2216.

Determined using ASTM D-2216 or D-4959.

Determined using ASTM D-4318. Provides data for application of Unified Classification System (UCS).

COMMENTS:

Shelby Tube Sample
Auger Sample
Split-spoon Sample
No Recovery

Sample recovery method.

SOUTHERN EARTH SCIENCES, inc.

GENERAL NOTES FROM LITERATURE

Unified Soil Classification System

Coarse-grained soils. More than 50% retained on US # 200 Sieve	***Gravels: More than 50% retained on US # 4 Sieve***	*Clean Gravel (little or no fines)*	*GW*	*Well graded gravels and gravel-sand mixtures with little or no fines*
			GP	*Poorly graded gravels and gravel-sand mixtures with little or no fines*
		Gravels with fines	*GM*	*Silty gravels, gravel-sand-silt mixtures*
			GC	*Clayey gravels, gravel-sand-clay mixtures*
	Gravels: More than 50% passing through US # 4 Sieve	*Clean sand (little or no fines)*	*SW*	*Well graded sands and gravelly sands, little or no fines*
			SP	*Poorly graded sands and gravelly sands, little or no fines*
		Sands with fines	*SM*	*Silty sands, sand-silt mixtures*
			SC	*Clayey sands, sand-clay mixtures*
Fine-grained soils. More than 50% passed through US Sieve # 200	***Silts and Clays with liquid limit (LL) less than 50***		*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 and Clays with liquid limit (LL) greater than 50		*MH*	*Inorganic silts, micaceous diatomaceous fine sand or silty soil, elastic silts*
			CH	*Inorganic clays of high plasticity, fat clays*
			OH	*Organic clays of medium to high plasticity*
High organic soils			*PT*	*Peat, muck and other highly organic soils*

Classification of Granular Soils as per U.S. Standard Sieve Analysis

Description	*Boulders*	*Cobbles*	*Gravel*		*Sand*			*Silt or Clay*
			Coarse	*Fine*	*Coarse*	*Medium*	*Fine*	
Sieve Size	***>12 inches***	***3-12 inches***	***0.75 to 3inches***	***#4 to 0.75 iches***	***#10-#4***	***#40-#10***	***#200-#40***	***<#200***

Note:#4=5mm, #10=5mm, #40=0.4mm, #200=0.8mm

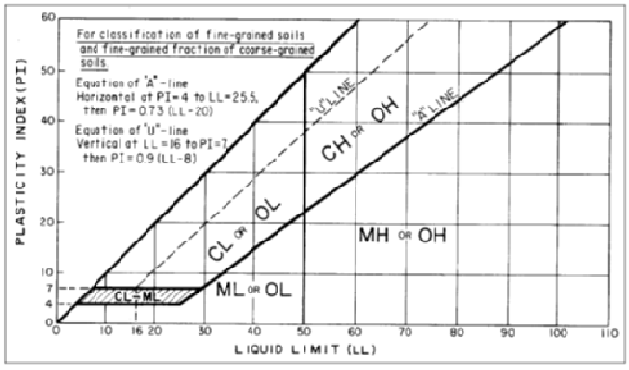
Consistency of Cohesive Soils

Consistency	Unconfined Compressive Strength, (tsf)	SPT* (N)
Very Soft	<0.25	<2
Soft	0.25 to 0.50	2 to 4
Medium Stiff	0.50 to 1.0	5 to 8
Stiff	1.0 to 2.0	9 to 15
Very Stiff	2.0 to 4.0	16 to 30
Hard	>4.0	>30

Relative Density of Granular Soils

Relative Density	SPT* (N)
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 24
Dense	25 to 50
Very Dense	>50

**Standard Penetration test (SPT) value (N-value) is a number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18 inches penetration with a 140-pound hammer falling from 30 in. height.*



Plasticity Characteristics

Plasticity	Plasticity Index (PI)
Non-Plastic	0
Slight	1 to 5
Low	5 to 10
Medium	11 to 20
High	21 to 40
Very high	> 40

BORING LOG

BORING NO.: B-1
PROJECT: LIVINGSTON SITE
PROJECT LOCATION: LIVINGSTON, LA
BORING LOCATION: N30 30', 13.0", W90 49', 22.1"
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER

PROJECT NO.: B13-095
DATE DRILLED: 11/13/13
DATE COMPLETED: 11/13/13
WATER LEVEL: 4'7"
WATER LEVEL DATE: 11/13/13
LOGGED BY: WW
DRILLER: DT

DEPTH (feet)	SAMPLE	Standard Penetration (Blows/Ft.)	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (pcf)	LL	PI	Symbol	MATERIAL CLASSIFICATION
			1.53	23	101				Stiff, Light Gray and Tan Lean CLAY with ferrous nodules (CL)
				23		35	17		
			1.95	14	122				-- stiff, with sand pockets
				15		19	8		
10			3.16 (1)	14	120				Very Stiff, Light Gray and Tan Silty SAND with clay (SM)
		43b/ft 13/19/24	(2)	20					Dense, Gray, Tan and Black Fine to Coarse SAND with silt (SP-SM)
20		23b/ft 11/11/12		20					-- medium, light gray and tan with trace gravel, silt, and clay
		18b/ft 9/8/10		20					-- medium
									Bottom at 25 Feet
									(1) UU Triaxial Test at 7.8 psi confining pressure
									(2) % Passing #200 = 8.5%
30									
40									

COMMENTS: Initial Water Level = 11'

SHELBY TUBE SPLIT SPOON

BORING LOG

BORING NO.: B-2
PROJECT: LIVINGSTON SITE
PROJECT LOCATION: LIVINGSTON, LA
BORING LOCATION: N30 30', 6.0", W90 49', 11.1"
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER

PROJECT NO.: B13-095
DATE DRILLED: 11/13/13
DATE COMPLETED: 11/13/13
WATER LEVEL: 5'4"
WATER LEVEL DATE: 11/13/13
LOGGED BY: WW
DRILLER: DT

DEPTH (feet)	SAMPLE	Standard Penetration (Blows/Ft.)	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (pcf)	LL	PI	Symbol	MATERIAL CLASSIFICATION
				22		29	10		Light Gray and Tan Lean CLAY with trace fine sand, roots and ferrous nodules (CL)
			1.27	22	105				-- stiff
▽				18		23	10		
			2.32	17	115				Very Stiff, Light Gray and Tan Fat CLAY with silt and sand pockets and streaks and ferrous nodules (CH)
				16					Light Gray and Tan Silty SAND with trace clay (SM)
10									
		36b/ft 15/15/21		17					-- dense with clay pockets
		32b/ft 14/15/17	(1)	20					-- dense and fine
20									
		21b/ft 12/11/10		18					-- medium
									Bottom at 25 Feet
									(1) % Passing #200 = 13.7%
30									
40									

COMMENTS: Initial Water Level = 10'

SHELBY TUBE SPLIT SPOON

BORING LOG

BORING NO.: B-3
PROJECT: LIVINGSTON SITE
PROJECT LOCATION: LIVINGSTON, LA
BORING LOCATION: N30 30', 17.4", W90 48', 49.8"
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER/WET ROTARY

PROJECT NO.: B13-095
DATE DRILLED: 11/13/13
DATE COMPLETED: 11/13/13
WATER LEVEL: 7'8"
WATER LEVEL DATE: 11/13/13
LOGGED BY: WW
DRILLER: DT

DEPTH (feet)	SAMPLE	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (pcf)	LL	PI	Symbol	MATERIAL CLASSIFICATION
			17					Light Gray and Tan Lean CLAY with trace fine sand and ferrous nodules (CL)
		1.53	20	107				-- stiff
			18		28	15		
▽		1.61	21	110				-- stiff with roots
			22		32	16		
10								
		1.52	25	100				-- stiff
			31					Light Gray and Tan Fat CLAY (CH)
20								
			35		68	45		
		1.36	37	87				-- stiff, light gray and greenish gray, jointed
30								
			37		60	40		-- with silt pockets
		0.40	32	89				Soft, Gray Lean CLAY with pockets of sand (CL)
40								

COMMENTS: Initial Water Level = Not Recorded

SHELBY TUBE

BORING LOG

BORING NO.: B-3
PROJECT: LIVINGSTON SITE
PROJECT LOCATION: LIVINGSTON, LA
BORING LOCATION: N30 30', 17.4", W90 48', 49.8"
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER/WET ROTARY

PROJECT NO.: B13-095
DATE DRILLED: 11/13/13
DATE COMPLETED: 11/13/13
WATER LEVEL: 7'8"
WATER LEVEL DATE: 11/13/13
LOGGED BY: WW
DRILLER: DT

DEPTH (feet)	SAMPLE	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (pcf)	LL	PI	Symbol	MATERIAL CLASSIFICATION
			39					Gray Fat CLAY with organics and silty sand pockets (CH)
50			40					
		1.21	50	72				-- stiff
60			34		61	35		-- greenish gray with silt pockets, jointed
			30					Gray Sandy Lean CLAY (CL)
70		1.64	25	98				Stiff, Greenish Gray Fat CLAY with large sandy silt pockets and streaks (CH)
			25					-- gray and greenish gray
								Bottom at 75 Feet
80								

COMMENTS: Initial Water Level = Not Recorded

SHELBY TUBE

SOUTHERN EARTH SCIENCES, INC.
Geotechnical, Environmental & Construction Materials Testing

Baton Rouge, LA 225-356-4355

Mike Juneau, P.E.—Branch Manager
mjuneau@soearth.com

Danny Keller—Department Manager
dkeller@soearth.com

Barry Keller—Project Manager
bkeller@soearth.com

CONSTRUCTION MATERIALS TESTING

Full Range of Services and Unparalleled Response

Southern Earth Sciences, Inc. laboratories are certified by AASHTO, AMRL, CMEC and the U.S. Army Corps of Engineers to perform soil, concrete, asphalt and materials testing. Our professional inspectors and technicians continually participate in proficiency testing programs to ensure internal quality control.

FIELD TESTING AND INSPECTION

In addition to our laboratory testing facilities, SESI maintains a fully outfitted mobile field laboratory available for on-site testing. This allows our OSHA safety certified technicians to perform both call-out services on small projects or full-time quality control testing and inspection on major projects. The on-site testing lab offers a full range of services.

Services

- Dipstick technology for flatness testing of concrete slabs
- Soil testing—compaction, pile load testing, pile and caisson inspection, plate load bearing tests
- Asphaltic concrete testing—core density and thickness, evaluation of aggregates, mix designs, plant and field control
- Portland cement concrete—batch plant and field control, core drilling, molding, curing and testing cylinders
- Slump testing, air content and unit weight
- Pipe and block inspection
- Soundness and abrasion of aggregates
- Bridge inspection
- Pile integrity testing
- Pile dynamic analysis (PDA)
- Vibration monitoring
- Rebar location/depth of cover
- Post tensioning inspection
- Welding and steel framing inspections

LABORATORY TESTING OF MATERIALS

Strategically located laboratories make testing of soils, concrete, asphalt and metals quick and convenient. Branch managers supervise all lab operations in accordance with ASTM Specifications E-329 and E-699. All equipment is calibrated annually to ensure accurate data. SESI technicians are certified by appropriate accrediting agencies on a routine basis.

Services

- Consolidation testing
- Flexible wall permeability testing
- Triaxial testing
- Soil classification testing
- Concrete strength testing
- Steel strength testing

Environmental

Your Partner in Managing Ever-changing Environmental Requirements

With increasing federal, state and local scrutiny on environmental issues of all kinds, it is vital to have a partner who understands these pressures and remains on the leading edge of every issue. From Phase I Environmental Site Assessments to site analyses for large petroleum storage facilities and hazardous waste landfills, SESI has the necessary resources to solve client issues with modern efficiency.

Phase I Environmental Site Assessments

Phase I Environmental Site Assessments protect the purchaser and lender in commercial and industrial property transactions. New EPA requirements for All Appropriate Inquiry means contamination from off-site sources and vapor intrusion should be considered. SESI can also collect and analyze soil and groundwater samples, if required (Phase II).

Services

- Water quality evaluation
- Hydrogeological services
- Site inspections
- Stormwater / industrial discharge compliance
- Contamination assessments
- Remedial actions
- Risk assessments
- Phase I and II ESAs

Landfills and Solid Waste Management

SESI professionals are uniquely qualified to resolve landfill and hazardous waste issues. Our expertise in this area includes site selection and auditing, groundwater contamination testing, and closure services for landfills and energy-to-steam facilities. Our team has participated in the design of several – "Subtitle D" – solid waste landfills.

Our studies include the use of integrated computer graphics to create map displays, soil cross sections, boring logs and plume analysis. These technologies provide the most comprehensive evaluation and reporting of landfill conditions available.

Services

- Hydrogeological / geotechnical investigation
- Groundwater and gas monitoring / statistical analysis
- Technical support
- Design
- Leachate treatment
- Operations and management studies

Underground Storage Tanks

SESI is approved in Alabama (ADEM), Florida (FDEP) and Mississippi (MDEQ) as a qualified Underground Storage Tank Contractor. This gives our experts the ability to assist clients in every area including site assessment and site planning, permitting, remediation and corrective action plans, and compliance with regulatory requirements.

Services

- Regulatory compliance
- Permitting
- Remediation and corrective action planning
- Closure services
- Inspection and monitoring

Environmental Engineering and Consulting

Our engineers and geologist are capable of providing a variety of services to assist our clients in meeting project goals.

Services

- Wetlands Permitting
- On-site sewage systems
- Pond and lake design
- Small flow wastewater systems

Asbestos and Lead-Based Paint (LBP) Consulting

The SESI team of certified asbestos and lead professionals have considerable experience in this important discipline. Our laboratories have the capability to test air samples and provide monitoring and assessment information. All operations are supervised by a licensed asbestos consultant.

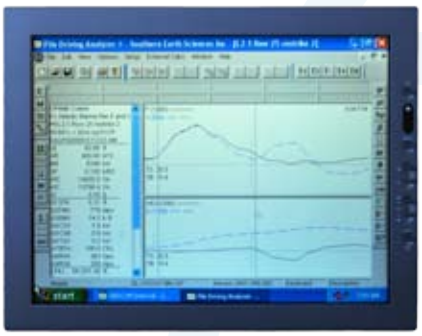
Services

- Risk assessments (LBP)
- Asbestos and LBP surveys
- Abatement plans and specs
- Abatement monitoring and inspections

Geotechnical

Comprehensive Geotechnical and Geological Services

The SESI multi-disciplined staff of professionals places the company in the unique position to combine efforts and give our clients the broad spectrum of geotechnical, environmental and construction consulting necessary to move a project forward quickly. We have drilling, cone penetration testing (CPT) and Geoprobe® equipment in-house to respond rapidly and efficiently to project schedules. Our team has assisted in thousands of projects ranging from single-story residential structures to multi-million dollar industrial facilities. SESI is truly your turn-key solution for site investigations.



Pile Driving Analyzer®

Engineering Analysis and Design

SESI registered professional engineers and geologists solve unusual foundation, engineering and environmental issues on a regular basis. We specialize in pinpointing the obstacles and presenting alternative design options. All foundation aspects are covered from pavement analysis, slope stability to deep and shallow foundation analysis.

Services

- Pile and drilled shaft systems
- Excavation bracing
- Geological mapping / soil profiles
- Soil stabilization studies
- Shallow foundation systems
- Retaining walls
- Slope stability

Field Drilling and Site Investigation

SESI Drilling, Cone Penetration Testing (CPT), and Geoprobe® crews have successfully completed the Hazardous Assessment and Resource Management Course (29 CFR 1910-120). Senior drillers are also required to maintain water well drilling licenses. Regardless of the area or terrain, our crews are prepared to go virtually anywhere to provide you with accurate and current data.

Services

- Groundwater monitor wells
- Sediment sampling
- SPT testing
- CPT testing

Laboratory Testing

In an effort to coordinate and expedite efforts across our geotechnical engineering, drilling and environmental projects, SESI maintains branch offices across the Southeast. These laboratories allow project engineers to receive results quickly and accurately. Routine tests are conducted at these facilities under the direction of responsible professionals.

Tests

- Compaction
- CBR and LBR
- Permeability
- Swell pressure measurements
- Triaxial strength testing
- ASTM testing of soils and rock
- Soil cement, classification, conductivity and resistivity
- Consolidation

Instrumentation

When land suitable for building is in short supply, it becomes necessary to evaluate innovative foundation solutions. Instrumentation of soil and rock plays a key role in overcoming building limitations. Over the years, SESI has developed an expertise in evaluating, identifying, planning and designing highly refined field instrumentation programs using pore pressure instrumentation, inclinometers, geophysical exploration equipment and vibration monitoring devices to limit engineering problems.

Equipment

- Inclinometers
- Piezometers
- Sondex units
- Settlement plates
- Strain gauges
- Pressure cells
- Vibration monitoring
- Pile integrity testing
- Pile dynamic analyzer (PDA)

Subsurface Investigations

Conventional Drilling
Cone Penetration Testing
Direct Push Technology

To support Southern Earth Sciences, Inc.'s geotechnical and environmental exploration objectives, SESI is staffed with experienced crews and equipped with a variety of Cone Penetration Testing, Drilling and Direct Push rigs. The equipment is mounted on a variety of carriers including two-wheel and four-wheel drive trucks and track vehicles. All crew members investigating contaminated sites have completed the 40-hour Hazardous Assessment and Response Management Course (29 CFR 1910-120), and senior drillers maintain required state water well contractors licenses.

Employing CPT technology, SESI, Inc. is able to provide high quality geotechnical and hydrogeological in-situ soil properties. Our in-house CPT equipment gives SESI a unique advantage to offer clients increased accuracy, speed of deployment and reduced costs.

CPT Technology

Cone Penetration Testing, commonly referred to as CPT, is an in-situ testing method used to determine the geotechnical engineering properties of soils and delineating soil stratigraphy. Today CPT is one of the most frequently used and accepted in-situ test methods for soil investigations worldwide although few CPT rigs are available in the Southeast area.

CPT works by pushing an instrumented cone into the ground at a controlled rate of 2 cm/sec. The data can be collected at any interval but is commonly collected every two-inches. Built-in load cells are used to continuously measure the cone tip and sleeve friction resistance. In addition to these values, a porous filter piezo-element, located behind the cone tip, is used to measure pore water pressure during penetration. All CPT field testing procedures are performed in accordance with ASTM D 5778-95 (2000).

Advantages Over Standard Penetration Testing

The CPT test offers an advantage over conventional sampling methods by providing a virtually continuous profile of subsurface stratigraphy. From the data collected, correlations can be made for the soil characteristics such as internal friction angle, undrained shear strength and estimated unit weight. In addition, pore water dissipation tests can be conducted in order to determine other properties, such as permeability of saturated soils. In an environmental application, soil/gas, soil and groundwater samples can be collected without producing cuttings that would require collection and disposal. Small wells (from 1 to 2 inches in diameter) can also be installed with this equipment.

Equipment Capabilities

- Climate controlled cabins
- 2.5, 5 and 10 ton cones
- Shear wave velocity measurement
- Video cone
- Instant feedback available through electronic logs

Equipment

- 20-ton track-mounted CPT rig
- 20-ton truck-mounted CPT rig
- Two (2) track-mounted GeoProbe 6625 equipped for CPT and MacroCore

Field Drilling

Southern Earth Sciences, Inc. has a variety of truck and track mounted drilling equipment to meet project objectives. SESI staff includes licensed well drillers in Louisiana, Mississippi and Florida.

Drilling methods include Flight Auger, Hollow Stem Auger, Rotary Wash and NQ Rock Coring. Specialty sampling equipment includes piston samplers up to 5," Dennison Samples, vane shear, etc.

Direct Push

SESI operates several direct push platforms including a dual purpose Geoprobe 6625 CPT. This equipment can utilize conventional macro core sampling and groundwater/vapor sampling tools or, by utilizing earth anchors, can be converted to a 20-ton Cone Penetration Testing Machine.

SOUTHERN EARTH SCIENCES, INC.

SOUTHERN EARTH SCIENCES, INC. (SESI) WAS FOUNDED IN 1976 AND PROVIDES GEOTECHNICAL ENGINEERING, CONSTRUCTION MATERIALS TESTING AND ENVIRONMENTAL SERVICES THROUGHOUT THE SOUTHEAST ON INDUSTRIAL, COMMERCIAL AND GOVERNMENT PROJECTS

EQUIPMENT LIST

BARGE-MOUNTED (35'X12') DIEDRICH D-50

SESI's 35 foot by 12 foot barge mounted drilling equipment is utilized for projects requiring subsurface investigations over the water. The Diedrich D-50 mounted on the barge is capable of borings in excess of 200 feet.

TRIPOD DRILLING

The tripod equipment is used in sensitive environmental areas to minimize the impact of drilling operations. The equipment is manually operated to depths generally less than 100 feet. Standard penetration tests, Shelby tube samples and vane shear test can be performed using the manual equipment.

CME-45 TRUCK-MOUNTED

The CME-45 is mounted on a four-wheel drive vehicle and is equipped with flight augers, hollow stem augers and mud rotary equipment.

Typical borehole depths are up to 120 feet.

BK-51 TRACK-MOUNTED VEHICLE

The BK-51 is a versatile drill platform with a very low contact pressure of approximately 3 psi. The rig can be configured with augers, mud rotary or NQ wireline.

JACK-UP BARGE

Our drilling and CPT equipment can be mounted on a Jack-Up barge for offshore projects where there is excessive wave action. Borings and CPT penetration have exceeded depths of 200 feet in areas where the water depths may be 50 feet.

20 TON CPT TRACK-MOUNTED

The 20 ton heavy-weight, track-mounted Penetrometer system is a self propelled hydraulic remote controlled CPT system designed for rough terrain or areas where low ground pressure is required for vehicle access. It has two double hydraulic cylinders coupled by a platen that pushes and pulls digital cones and other tools. It is powered by a 130 Hp diesel engine. The unit is equipped with hydraulic leveling jacks and a climate controlled operations center. The contact pressure is approximately 6 psi.

20 TON CPT TRUCK-MOUNTED

The 20 ton truck CPT rig is an ideal vehicle to provide quick, cost effective mobile platform for high production in geotechnical and environmental soils investigations. This system is equipped with 5 and 10 ton seismic piezo cones and vision cones. The operations center is climate controlled for maximum production, regardless of weather conditions or time of day.

SUPPORT EQUIPMENT CPT ON MARSH BUGGY

SESI's CPT system has the capability to be mounted on a marsh buggy for access in swampy conditions.

This setup has been extensively used in south Louisiana for exploration work associated with bridges, pipelines, levees, etc. We have performed CPTs from marsh buggies to depths over 100 feet.

BK-66 ON TWO-WHEEL DRIVE VEHICLE

The BK-66 is a high torque drill rig capable of turning 6.25" hollow stem augers to depths in excess of 100 feet. The rig is also equipped for mud rotary drilling with a Gardner Denver displacement pump.

DIEDRICH D-50 ON FOUR-WHEEL DRIVE VEHICLE

The CME-45 is mounted on a four-wheel drive vehicle and is equipped with flight augers, hollow stem augers and mud rotary equipment.

Typical borehole depths are up to 120 feet.

DIEDRICH D-50 TRACK-MOUNTED

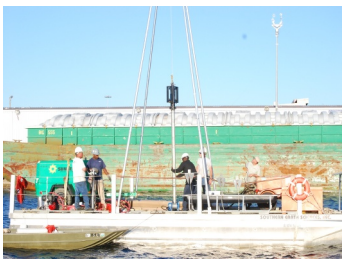
The Diedrich D-50 is a very versatile drilling rig and has a very low contact pressure of approximately 3 psi. This particular rig can be configured with augers, mud rotary or NQ wireline.

In addition, a Gardner Denver displacement pump is utilized for advancing large diameter boreholes to depths of 200 feet for 4" diameter by 4' long tube samples required for the Corps of Engineers (COE) levee projects.

DIEDRICH D-50 ON TWO-WHEEL DRIVE VEHICLE

This rig is mounted on a two-wheel drive vehicle and is equipped with flight augers, hollow stem augers, mud rotary equipment and NQ wireline.

Typical borehole depths are up to 120 feet.



VIBRACORE

SESI's 3-inch Vibracore is barge-mounted and consists of a submersible pneumatic vibrating motor attached to a four-inch steel casing with an internal clear acrylic sampling tube and is capable of sampling up to 20 feet.

GEOPROBE 6625 TRACK-MOUNTED CPT AND MACROCORE (SESI has two Geoprobes)

The Geoprobe 6625 CPT is a self-anchoring multi-purpose push platform. The system has 20 tons of push capacity when anchored even though the equipment weighs less than 5 tons. The system is capable of collecting CPT data or can be switched to conventional "Geoprobe" mode for Macro-Core soil and groundwater sampling.

ALABAMA

Mobile

P.O. Box 160745
Mobile, AL 36616

762 Downtowner Loop W.
Mobile, AL 36609

(251) 344-7711
(251) 341-9488 Fax

Summerdale

P.O. Box 155
Summerdale, AL 36580

(251) 989-7726
(251) 989-6722 Fax

Montgomery

1412 I-85 Parkway
Montgomery, AL 36106

(334) 260-6227
(334) 260-6229 Fax

FLORIDA

Destin

150 Industrial Park Rd., Ste. 6
Destin, FL 32541

(850) 837-9966
(850) 837-9967 Fax

Panama City

1438 Balboa Avenue
Panama City, FL 32401

(850) 769-4773
(850) 872-9967 Fax

Tallahassee

3642 Peddie Drive
Tallahassee, FL 32303

(850) 576-4652
(850) 576-4710 Fax

LOUISIANA

Baton Rouge

11638 Sun Belt Court
Baton Rouge, LA 70809

(225)356-4355 / (225) 751-1727
(225) 752-1467 Fax

Mandeville

1931 Surgi Drive, Ste. A
Mandeville, LA 70448

(985) 626-1314
(985) 626-1314 Fax

New Orleans

P.O. Box 19172
New Orleans, LA 70179

725 South Genois Street
New Orleans, LA 70119

(504) 486-5595
(504) 486-5598 Fax

SOUTHERN EARTH SCIENCES, INC.

WWW.SOEARTH.COM

QUALITY *Geotechnical* **VALUE** *Construction Materials Testing* **INNOVATIVE SOLUTIONS** *Environmental*

SOUTHERN EARTH SCIENCES, INC.

Southern Earth Sciences, Inc. is a member of the following organizations:

American Council of Engineering Companies (ACEC)

American Society of Civil Engineers (ASCE)

American Society for Testing of Materials (ASTM)

National Ground Water Association (NGWA)

American Concrete Institute (ACI)

American Association of State Highway and Traffic Officials (AASHTO)

ADEM Approved
Alabama Department of Environmental Management

FDEP Approved
Comprehensive Quality Assurance Plan

MDEQ Approved
Mississippi Department of Environmental Quality

OSHA Certified
Safety

NIOSH Certified
Asbestos

AASHTO and CMEC Accredited

US Army Corps of Engineers Validated

ALABAMA
Mobile
P.O. Box 160745
Mobile, AL 36616
tel: 251-344-7711
fax: 251-341-9488

Summerdale
P.O. Box 155
Summerdale, AL 36580
tel: 251-989-7726
fax: 251-989-6722

Montgomery
1412 I-85 Parkway
Montgomery, AL 36106
tel: 334-260-6227
fax: 334-260-6229

FLORIDA
Panama City
7500 McElvey Road, Suite A
Panama City, FL 32408
tel: 850-769-4773
fax: 850-872-9967

Tallahassee
3642 Peddie Drive.
Tallahassee, FL 32303
tel: 850-576-4652
fax: 850-576-4710

Destin
150 Industrial Park Road
Suite 6
Destin, FL 32541
tel: 850-837-9966
fax: 850-837-9967

LOUISIANA
Baton Rouge
11638 Sunbelt Ct.
Baton Rouge, LA 70809
tel: 225-751-1727
fax: 225-752-1467

New Orleans
P.O. Box 19172
New Orleans, LA 70179
tel: 504-486-5595
fax: 504-486-5598

Mandeville
1933 Surgi Drive
Suite A
Mandeville, LA 70448
tel: 985-626-1314

www.soearth.com

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

GEOTECHNICAL ENGINEERING SERVICES REPORT

For

PROPOSED LIVINGSTON LOUISIANA ECONOMIC DEVELOPMENT SITE
LIVINGSTON PARISH, LOUISISANA
SESI FILE NO: B13-095

Presented to

BATON ROUGE AREA CHAMBER
564 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

Prepared by

SOUTHERN EARTH SCIENCES, INC.
11638 SUNBELT CT.
BATON ROUGE, LA 70809
(225) 751-1727

NOVEMBER 26, 2013