

Exhibit Z. Calhoun Technology Park - South Site Preliminary Geotechnical Engineering Report



Calhoun Technology Park - South Site Preliminary Geotechnical Engineering Report

LIMITED SUBSURFACE EXPLORATION AND PRELIMINARY GEOTECHNICAL ENGINEERING EVALUATION FOR CALHOUN TECHNOLOGY PARK – SOUTH 321 U.S. HIGHWAY 80 OUACHITA PARISH, LOUISIANA



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**PREPARED
FOR:
OUACHITA PARISH POLICE JURY
C/O LAZENBY & ASSOCIATES, INC.
2000 NORTH 7TH STREET
WEST MONROE, LOUISIANA 71291**

**PREPARED
BY:
ARDAMAN & ASSOCIATES, INC.
7222 GREENWOOD ROAD
SHREVEPORT, LOUISIANA 71119**

**ARDAMAN PROJECT NO.: 113-15-94-8547
SHREVEPORT FILE NO.: 15.94.039
February 20, 2017**





Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

February 20, 2017

Ouachita Parish Police Jury
c/o Lazenby & Associates, Inc.
2000 N. 7th Street
West Monroe, Louisiana 71291

Attention: Kevin E. Crosby, P.E., P.L.S.
Vice President

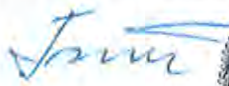
Reference: Limited subsurface Exploration and
Preliminary Geotechnical Engineering Evaluation
Calhoun Technology Park – South Tract
321 U.S. Highway 80
Ouachita Parish, Louisiana
Ardaman Project No.: 113-15-94-8547
Shreveport File No.: 15.94.039

Gentlemen:

Attached is Ardaman & Associates, Inc. (AAI) Preliminary Geotechnical Investigation Report for the above referenced property parcel. Per your request, AAI's has separated our original investigation report dated June 25, 2015 into two (2) reports; identified herein as the North Tract and the South Tract. This report represents our finding for the portion of the property identified as the *SOUTH TRACT*. AAI would be pleased to assist you further by furnishing any subsequent site or client specific geotechnical studies that may be needed on the property in the future. It has been a pleasure to perform this work for you. If we can be of any further assistance, please do not hesitate to call on us.

Very truly yours,

ARDAMAN & ASSOCIATES, INC.


James M. Belt, P.E.
Branch Manager
Shreveport Area Operations



cc: (3) client

Location: 7222 Greenwood Road, Shreveport, Louisiana 71119 Phone (318) 636-3673 Fax (318) 636-3723

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Louisiana: Alexandria, Baton Rouge, Monroe, New Orleans, Shreveport

Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach

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**LIMITED SUBSURFACE EXPLORATION
AND
PRELIMINARY GEOTECHNICAL ENGINEERING
EVALUATION FOR
CALHOUN TECHNOLOGY PARK – SOUTH
321 U.S. HIGHWAY 80
OUACHITA PARISH, LOUISIANA**

GENERAL

AAI's proposal P14.26.309, dated August 13, 2014 was approved on behalf of the Police Jury by Lazenby & Associates on March 9, 2013. The purposes of the study were to (1) explore the subsurface conditions present at this site, (2) determine the pertinent engineering properties of the materials encountered, (3) characterize site soil and groundwater conditions, and (4) determine if unfavorable soil conditions exist at the site. Item 4 is general in nature and each boring has brief analysis and conditions presented. Subsequent to this study AAI was requested to separate the study of the property into two (2) separate reports. This additional work was authorized by correspondence received from Lazenby & Associates dated January 30, 2017.

PROJECT DESCRIPTION

Boundary survey maps provided to AAI indicate the subject property consists of about 87.5 acres in area and lies south of U.S. Highway 80. The South Tract is one of two property parcels previously owned by the Louisiana State University system and operated as the Calhoun Research Station. The facility is on U.S. HWY 80 about one half mile east of the intersection with Louisiana Highway 151 in Calhoun, Louisiana. The Ouachita Parish Police Jury and the North Louisiana Economic Partnership are seeking to have this property certified for the Louisiana Economic Development (LED) "Certified Site" program. This report is, in part, a requirement of the program.

FIELD OPERATIONS

The geotechnical investigation on the North Tract consisted of performing a total of three (3) test borings, more or less randomly located on the property. All test borings were advanced to a depth of approximately twenty (20) feet below the existing ground surface. This investigation was conducted on May 1, 2015. Boring locations were pre-selected by the client, but not staked in the field. Our drill crew estimated boring placement using the maps provided, referencing identifiable landmarks, and



visually estimating positions on the property. Minor adjustments to the pre-selected map locations may have been made where site access was difficult or obstructions may have existed.

The test borings were advanced utilizing continuous-flight, solid stem augers and samples were obtained for laboratory evaluation in general accordance with provisions of *ASTM D1586* and *ASTM D1587*. Standard, thin-walled, seamless Shelby tube samplers were used to obtain specimens of cohesive materials. These specimens were taken continuously to a depth of ten (10) feet below the existing ground surface. Below this depth, samples were obtained at intervals of five (5) feet as the borings were advanced.

Soils which contained enough cohesionless material or were sufficiently dense to prevent recovery of undisturbed specimens with Shelby Tube samplers were evaluated by means of the Standard Penetration test. This test consists of determining the number of blows required by a 140 pound hammer dropped thirty (30) inches to achieve one foot penetration of the soil. This number or "N" value, is then related to "in situ" density or strength consistency of the soils.

All samples obtained were logged, sealed and packaged in the field to protect them from disturbance and maintain their in situ moisture content during transportation to our laboratory. The results of our boring program (Logs of Boring) are included as Appendix "A" of this report.

LABORATORY TESTING

Upon return to our laboratory selected samples were subjected to standard laboratory tests under the supervision of a soils engineer. The Atterberg Limits, in situ unit weights, percent of material passing a #200 sieve, and moisture contents of the different subsurface soils were determined. These soil properties were used to classify the soils and evaluate their potential for volumetric change. Unconfined compression tests performed on selected undisturbed samples were used to evaluate the shear strength of the different subsurface materials. The results of our testing program are included on the Logs of Boring in Appendix "A" of this report.

SOIL CONDITIONS

Soil conditions described in this section are of a generalized nature and intended to emphasize key features and characteristics. For a more detailed description of the subsurface materials



encountered refer to the soil profile on each Log of Boring in Appendix "A". Strata contacts indicated on our Logs are approximate. Actual transitions may be gradual in nature. The soils described are at the specific boring locations within the depths explored. Soils at other locations or depths may be different than those encountered during this exploration. Considering the substantial distances between the boring locations, soil conditions are summarized for each individual test boring location.

Test Boring B-6. Geotechnical laboratory testing performed on selected samples collected from this location indicates sandy soils with variable plasticity exist to a depth of about twenty (20) feet below the existing ground surface. The sandy strata generally classify *silty sand (SM) to sand (SP-SM) with silt* per ASTM D2487, *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soils Classification System)*. Relative density is generally medium dense. The boring was terminated in sand at a depth of twenty (200 feet below the existing ground surface.

Test Boring B-7. Geotechnical laboratory testing performed on selected samples collected from this location indicates sandy soils with low plasticity exist to a depth of about twenty (20) feet below the existing ground surface. The sandy strata generally classify *clayey silty sand (SC-SM)* per ASTM D2487, *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soils Classification System)*. Relative density varies from dense to medium dense with depth. The boring was terminated in sand at a depth of twenty (20) feet below the existing ground surface.

Test Boring B-8. Geotechnical laboratory testing performed on selected samples collected from this location indicates sandy soils with no plasticity exist to a depth of about twenty (20) feet below the existing ground surface. The sandy strata generally classify *silty sand (SM)* per ASTM D2487, *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soils Classification System)*. Relative density varies from medium dense to dense with depth. The boring was terminated in sand at a depth of twenty (20) feet below the existing ground surface.

GROUNDWATER

Shallow groundwater was observed in all of the test borings performed on the South Tract. Our water level observations, in feet below ground surface (bgs), are summarized in Table 1. The test borings were backfilled shortly after completion of sampling activities therefore the observed



groundwater levels should not be construed as static or equilibrium levels. Static levels may in fact be higher than our initial observations.

It must be understood shallow groundwater levels will fluctuate with site elevation, climatic conditions/seasons of the year, and the levels of any nearby streams and ponds. Based on the stratigraphy encountered at these sites, shallow groundwater will likely adversely impact excavation operations below a depth of about five (5) feet. If groundwater levels are critical to specific construction activities, the contractor should verify the presence of groundwater at that time.

TABLE 1.

GROUNDWATER OBSERVATIONS

Test Boring	Water Depth (feet bgs)
B-6	2.5
B-7	11.0
B-8	6.0

GENERAL SUBGRADE PREPARATION PROCEDURES

Prior to subsequent construction activity trees, stumps, roots, any existing foundations, pavements, or any other buried structure encountered within proposed construction areas, should be removed and wasted. Abandoned utilities should be completely removed or plugged in-place. Top soil stripping in grassed areas should be expected. The contractor should anticipate stripping and de-grassing will require removal of the upper four (4) to six (6) inches of surface material. The contractor should provide drainage of the exposed subgrade by sloping grades and ditching away from the construction site.

After any required demolition and rough site grading are complete, the exposed surface of areas where fill or paving are to be placed should be proof rolled to identify any weak areas. Proof rolling can be accomplished with a loaded twenty to thirty ton tandem axle dump truck or similarly weighted equipment under the observation of the geotechnical engineer or his designated representative. Weak areas should be investigated, removed, and/or repaired under the supervision of the geotechnical engineer prior to subsequent construction activity.



After verification of a stable subgrade layer, the exposed subgrade should be scarified to a minimum of eight (8) inches, the moisture content adjusted to within one (1) percent below to three (3) percent above optimum and recompact to ninety (90) percent of the laboratory maximum as determined by *ASTM D1557, Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)* prior to placement of any fill or base materials.

It is imperative the contractor understand the importance of establishing and maintaining proper site drainage to maintain the prepared subgrade's suitability for subsequent construction activity. Failure to follow good site water control practices may result in construction delays and additional costs for reconditioning or replacing saturated materials. Earthwork performed during wet periods of the climatic cycle may warrant special considerations. The use of hydrated lime, fly ash or Portland cement stabilization should be considered to provide a working platform if work is expected to occur during these periods. The need for such techniques is dependent upon earthwork scheduling with respect to weather patterns and good site management of drainage during the construction phase. The suitability of any area left exposed to the elements should be verified by proofroll prior to subsequent construction activity.

FILL MATERIAL CONSIDERATIONS

Where fill materials may be required to achieve the desired finished grade elevations of any future projects, the material should be placed in controlled lifts. Lifts should be placed in thin horizontal layers not exceeding eight (8) inches *compacted* thickness. In steeply sloped areas, horizontal lifts should be benched or stair stepped into the slope as the fill is constructed. Each lift of fill should be moisture conditioned to within two (2) percentage points of optimum moisture and compacted to a minimum of ninety-five (95) percent of the laboratory maximum as determined by *ASTM D1557*.

Onsite soils classifying CL, SC, SC-SM, SM, or SP-SM, free of organic materials or construction debris, are suitable for use as fill with adequate processing and moisture conditioning. Soils classifying ML, CH or those otherwise of suitable classification, but containing organics, construction debris or excessive moisture are not recommended for reuse as fill under structures or pavements.

Where insufficient quantities of suitable onsite soils exist to balance cut/fill site work, off site materials can be imported to the site. All imported fill material should "select soil. Select soils



classify *clayey sand (SC)* or *sandy lean clay (CL)* in accordance with ASTM D2487. Select fill materials placed below grade should have liquid limits (LL) no greater than thirty-five (35), plasticity indices (PI) between eight (8) and eighteen (18), and have no more than sixty (60) percent passing the U.S. Standard No. 200 Sieve. Where fills will be drained and erosion can be controlled, the use of non to low plasticity sands classifying (SP), (SP-SM), (SM), or (SC-SM) may be feasible. Where sands are used for fill, minimum density should be increased to ninety-eight (98) percent ASTM D 1557.

CONSTRUCTION QUALITY ASSURANCE CONSIDERATIONS

The use of correct fill and/or base materials and their proper placement and compaction are critical for any sitework where subsequent construction of a structure and/or pavements are planned. The project Construction Quality Control Plan should include requirements for construction observations and construction materials testing be performed by the Geotechnical Engineer of Record or his representative to verify suitability of exposed foundation bearing surfaces, that proper site preparation, and compaction have been executed.

PRELIMINARY RECOMMENDATIONS FOR FOUNDATION SUPPORT

The recommendations contained in this section are our opinion based on the limited amount of information available and are intended for preliminary planning purposes only. Prior to any final design, a thorough site/project specific geotechnical study should be made to finalized design parameters for specific areas of the Technology Park North Tract property.

The soils discovered at the test boring locations on this site are of fair to good bearing quality and generally have only slight potential for shrink and swell. These type of soils are not considered expansive. It appears feasible to support light to moderately loaded future developments on shallow foundation systems. The Geotechnical Engineer of Record should retained to inspect the exposed subgrade and verify the assumptions of this report before proceeding with fill material placement.

Our preliminary estimate of net allowable bearing capacities for continuous and spread footings placed in the native undisturbed soils at depths of about two (2) feet below the existing ground surface are summarized in Table 2 for each test boring location. Capacities include a minimum safety factor of three (3) against shear failure of the bearing stratum as is recommended for design.



TABLE 2.

ALLOWABLE BEARING CAPACITIES FOR SHALLOW FOUNDATIONS

Test Boring Location	Allowable Net Bearing for Continuous Footings (psf)	Allowable Net Bearing for Spread Footings (psf)
B-6	1,200	1,200
B-7	2,000	2,600
B-8	2,000	2,000

Where the sites are properly prepared and maintained, and allowable bearing capacities are not exceeded, total settlement from consolidation should be limited to an inch or less for typical spread footings with widths less than about five (5) feet and continuous footings with widths less than about (3) feet.

For heavy loading, where consolidation settlements may be critical, a deep foundation system would be more suitable. Probably the most economical deep foundation system to support heavily loaded structures is with an auger-cast-in-place (ACIP) pile system. The test boring sites are ideal for utilizing ACIP piles to support heavier loads or to minimize settlement. All areas explored can support heavily loaded structures on an ACIP pile foundation. Although generally less economical, driven timber piles, concrete piles, or steel piles can also be used. For moderate loads, straight sided drilled and cast-in-place concrete caissons (drilled shafts) or helical screw anchor type piers can also be considered. To evaluate load carrying capacity of deep foundations, additional borings advanced to a minimum depth of fifty (5) feet would be required.

A seismic site classification of Class D, as defined in the International Building Code Section 1613, can be assumed for this site due to the lack of specific soil data to a depth of one hundred (100) feet.

PRELIMINARY PAVEMENT INFORMATION

The pavement section recommendations for this site are based upon subsurface conditions implied by the test borings and the assumption use will be limited to commercial or light industrial use. No specific pavement analyses was performed as there is no known specific usage at this time.



Recommendations outlined here in are in our opinion, "typical" for the assumed site use and intended for preliminary planning purposes only.

The existing sandy lean clay and clayey sand subgrade soils, prepared and maintained as recommended in the Subgrade Preparation Section of this report should have a laboratory soaked California Bearing Ratio (CBR) values in the order of ten (10) or Modulus of Subgrade Reaction (k_s) in the order of 125 to 150 PCI.

Rigid Pavement - AAI recommends rigid pavement be considered for all heavy duty pavement applications. However we understand the need to make cost effective decisions for the facility. At a minimum turnout aprons, trash collection areas, and any parking aprons adjacent to the truck docks be constructed of rigid pavement.

Minimum flexural strength of the concrete should be 650 pounds per square inch (PSI) at twenty-eight (28) days of age or have compressive strength value of 4,000 PSI. AAI recommends the use of air entrainment chemicals that improve workability of the concrete mix and improve durability of the pavement surface. Control joint spacing should not exceed fifteen (15) feet for un-reinforced pavement of the thicknesses outlined below. All concrete paving should include provisions to mechanically control temperature induced shrinkage cracking and provide for load transfer across construction joints. Rigid pavement sections suggested for this site are summarized in Table 3.

Flexible Pavement – Flexible paving structurally similar to the above rigid sections are provided for your cost comparison. Hot mixed asphaltic concrete (HMAC) mixtures should meet applicable requirements for materials, production, placement and acceptance as outlined in the *Louisiana Standard Specifications for Roads and Bridges, 2000 Edition*, Section 501 for Marshall mixtures or *LSSRB, 2006*, Section 502 for Level 1 Superpave mixtures. For parking lot and light duty drive applications we recommend utilizing the ½ inch Nominal HMAC mix of either type. This mix produces a more aesthetic surface finish and generally holds up well under automobile parking lot use. Flexible pavement sections suggested for this site are summarized in Table 4.



TABLE 3.
RIGID PAVEMENT SECTIONS

Pavement Layer	Light Duty Auto Parking	Medium Duty Channelized Auto Drives	Heavy Duty Truck Access Drive, Dumpster Pads, & Turnout Aprons
Portland Cement Concrete	5.0"	6.0"	8.0"
Base Course Layer	4" crushed stone base material	4" crushed stone base material	8" crushed stone base material
Subbase Course Layer	Density controlled fill per Fill Section of this report	Density controlled fill per Fill Section of this report	Density controlled fill per Fill Section of this report
Subgrade Layer	Density controlled subgrade prepared per the Subgrade Section of this report	Density controlled subgrade prepared per the Subgrade Section of this report	Density controlled subgrade prepared per the Subgrade Section of this report

TABLE 4.
FLEXIBLE PAVEMENT SECTIONS

Pavement Layer	Light Duty Auto Parking	Medium Duty Auto Drives	Heavy Duty Parking
Hot Mixed Asphaltic Concrete Wearing and Binder Course	2.0" WC	1.5" WC 1.5" BC	1.5" WC 3.0" BC
Base Course	8" crushed stone base material or 8" soil-cement base materials	8" crushed stone base material or 8" soil-cement base materials	12" crushed stone base material or 12" soil-cement base materials
Geotechnical Fabric Layer Requirement	Required under aggregate base material	Required under aggregate base material	Required under aggregate base material
Subbase Course	Density controlled fill per Fill Section of this report	Density controlled fill per Fill Section of this report	Density controlled fill per Fill Section of this report
Subgrade Layer	Density controlled subgrade prepared per the Subgrade Section of this report	Density controlled subgrade prepared per the Subgrade Section of this report	Density controlled subgrade prepared per the Subgrade Section of this report

Aggregate base layers recommended herein should meet or exceed material and grading requirements as outlined in the *Louisiana Standard Specifications for Roads and Bridges (LSSRB)*, 2006 Edition Section 1003.03 (b) or (c). We recommend aggregate base course layers in excess



of four (4) inches in thickness should be compacted to not less than 98% of the laboratory maximum as determined by *ASTM D1557, Method C*. Layers of four (4) inches or less can be compacted under the direction of the geotechnical engineer establishing a rolling pattern that produces the maximum density.

Where a soil-cement sub-base is considered, the type soils recommended for use as *select* fill or the prepared subgrade can be readily stabilized with Type I Portland cement. The cement stabilized soil or "soil-cement" sub-base layer should achieve a minimum unconfined compressive strength of 300 PSI at seven (7) days of age. Eight (8) percent by volume cement can be used for cost estimation for cement stabilization of select soils. The actual quantity required should be verified by the geotechnical engineer during the construction phase of the project in accordance with Louisiana Department of Transportation and Development Test Method TR 432.

Construction of the soil-cement subgrade layer should be in accordance with the provisions outlined in Section 303 of the *Louisiana Standard Specifications for Roads and Bridge, 2006 Edition*. Compaction of the finished subbase layer should not be less than 95% of the maximum laboratory density as determined by LDOTD TR 418. Heavy construction traffic should not utilize cement stabilized areas until the materials have cured sufficiently to obtain minimum specified strength.

If a soil-cement base layer is to be considered, be aware soil-cement materials develop tension cracks during the curing process and these cracks "reflect" through the overlying HMA paving over time. A general rule of thumb for crack propagation is about one (1) vertical inch per year (takes about 2 years to show up through a 2 inch overlay). Although not initially structurally detrimental to the pavement system, the cracks must be periodically sealed to minimize moisture infiltration into the base system. Failure to perform regular maintenance of the cracks can lead to saturated subgrade soils and premature base failures in the pavement.

Reflective cracking cannot be prevented; however a separation layer can be used to minimize the propagation of reflective cracking. There are commercially available engineered fabrics (underlayment) that claim to reduce crack propagation and a thin layer of crushed aggregate base layer can also be used between the base layer and binder course layers to reduce reflective cracking. Both approaches have pros and cons and the benefit of either must be weighed against installation costs.



CONSTRUCTION CONCERNS

The upper soils at the site are fine-grained materials composed of significant silt and clay fractions. Silty and/or clayey soils are subject to changes in shear strength with varying moisture conditions. If construction is initiated during wetter seasons of the year, it may be difficult to move equipment about the site. Once these type soils become saturated, compaction operations can be hampered by a tendency of the silt to "pump" and the clay to "shear".

Consequently it is recommended, adequate site drainage be established prior to, during, and following construction operations to prevent water ponding on or adjacent to construction areas. Compaction operations may be expedited by using light compaction equipment and thin lifts of soil. Rolling only as necessary to obtain compaction is advisable because further repetitive loading may cause the subgrade to "pump" or fail. Once soils begin to pump, it is usually necessary to either start the moisture conditioning process over or remove and replace the saturated material. AAI can provide experience soils technicians to monitor the contractor's compaction operations and assist in expediting the site work.

Compaction operations and installation of the foundations should be supervised by a qualified soils technician under the supervision of the Geotechnical Engineer. All foundation excavations should be inspected to verify cleanliness and adequate bearing. Concrete should be placed in foundation excavations as soon as practical after forming and final clean-up have been approved, to avoid prolonged exposure of the bearing stratum and possible disturbance due to standing water, desiccation or other construction operations.

LIMITATIONS

This study has been prepared in accordance with generally accepted preliminary geotechnical engineering principles and practices in this area at this time. We make no other warranty either express or implied.

The conclusions and recommendations submitted in this report are based upon the data obtained from the preliminary exploratory borings drilled at the location(s) indicated in Appendix A, the different possible type of construction, and our experience in the area. Our findings include interpolation and extrapolation of the subsurface conditions identified at the exploratory boring(s) and variations in the subsurface conditions may not become evident until excavations are performed.

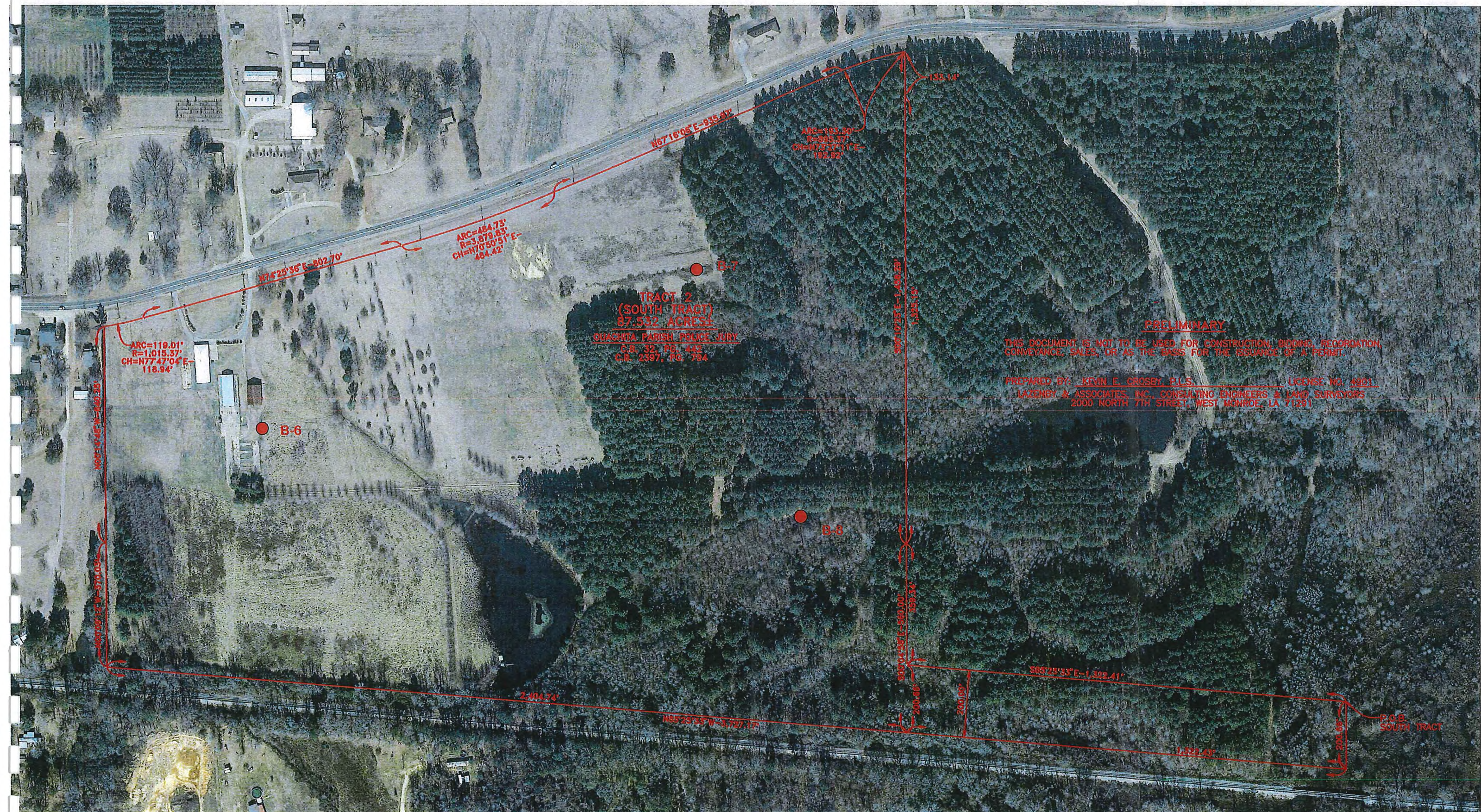


This study has been prepared for the exclusive use by our client for preliminary purposes only. We are not responsible for technical interpretations by others of our exploratory information, which has not been described or documented in this report. As the site is eventually developed additional borings should be taken. Significant design changes could be required or modifications of the recommendations presented herein. We recommend on-site observation of excavations and foundation bearing strata by a representative of the geotechnical engineer.



APPENDIX A
**SITE MAPS
AND
LOGS OF BORING**





TRACT 2
(SOUTH TRACT)
87.532 ACRES
ORACHTA PARISH POLICE JURY
C.B. 32, PG. 412
C.B. 2397, PG. 794

PRELIMINARY

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

PREPARED BY: KEVIN E. CROSBY, P.L.S. LICENSE NO. 4261
LAZENBY & ASSOCIATES, INC., CONSULTING ENGINEERS & LAND SURVEYORS
2000 NORTH 7TH STREET, WEST MONROE, LA 71291

P.O.B.
SOUTH TRACT

LOG OF BORING NO. B-6

PROJECT: Calhoun Technology Park

SHEET 1 of 1

CLIENT: Ouachita Parish Police Jury-% Lazenby & Associates

LOCATION: See Remarks

DATE: 5/1/15

SURFACE ELEV: 160' +/-

FIELD DATA			LABORATORY DATA									DRILLING METHOD(S): Auger		
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE	N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	GROUNDWATER INFORMATION: Water encountered at two and one-half (2.5) feet depth	
													DESCRIPTION OF STRATUM	
	5		P = 1.25	17		15	13	2	35				Medium dense gray silty sand (SM)	
			P = 0	27									--Red	
			P = 0	19		16	16	NP	35				--Reddish tan	
	6.0													
			P = 0.75	23									Medium dense reddish tan clayey silty sand (SC-SM)	
			P = 0.25	24		20	16	4	30				--Red	
	10													
			P = 0.50	22									--Gray	
	15													
			N = 26	24									Medium dense light gray sand with silt (SP-SM)	
	20												Bottom of boring at 20 feet	
	25													
								REMARKS: N 32 degrees 30'39.2" W 92 degrees 20'55.2"						
TUBE SAMPLE	AUGER SAMPLE	SPLIT- SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY									

LOG OF BORING NO. B-7												
PROJECT: Calhoun Technology Park						SHEET 1 of 1						
CLIENT: Ouachita Parish Police Jury-% Lazenby & Associates						LOCATION: See Remarks						
DATE: 5/1/15						SURFACE ELEV: 150' +/-						
FIELD DATA			LABORATORY DATA							DRILLING METHOD(S): Auger		
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	GROUNDWATER INFORMATION: Water encountered at eighteen (18) feet depth
DESCRIPTION OF STRATUM												
			9		15	14	1	40				Medium dense brown silty sand (SM)
		P = 4.5	11									2.0
	5		17	110	26	19	7	40	1.73	13.1		
		P = 4.0	18									
			14	117	22	16	6	46	2.04	6.2		
	10											
		P = 2.75	19									
	15											
												16.5
		P = 1.0	19									
	20											20.0
												Bottom of boring at 20 feet
	25											
TUBE SAMPLE	AUGER SAMPLE	SPLIT- SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY	REMARKS: N 32 degrees 30'43.8" W 92 degrees 20'40.5"						

LOG OF BORING NO. B-8

PROJECT: Calhoun Technology Park

SHEET 1 of 1

CLIENT: Ouachita Parish Police Jury-% Lazenby & Associates

LOCATION: See Remarks

DATE: 5/1/15

SURFACE ELEV: 133' +/-

FIELD DATA			LABORATORY DATA									DRILLING METHOD(S): Auger	
SOIL & ROCK SYMBOL	DEPTH (FT)	SAMPLE TYPE N: SPT, BLOWS/FT T: THD, BLOWS/FT P: HAND PEN, TSF	MOISTURE CONTENT, %	DRY DENSITY POUNDS/CU.FT	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	MINUS NO. 200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN (%)	CONFINING PRESSURE PSI	GROUNDWATER INFORMATION: Water encountered at four (4) feet depth	
DESCRIPTION OF STRATUM													
	5	P = 1.25	20	106	NP	NP	NP	36	1.52	5.4		Medium dense brown to grayish tan silty sand (SM)	
			15	117	NP	NP	NP	39	0.86	4.3			
			17										
			14	121	NP	NP	NP	38	1.97	3.8			
		N = 36	17									--Dense gray silty sand (SM)	
	10												
		N = 49	26					14				--Dense gray silty sand (SM)	
	15												
		N = 35	20									--Dense gray silty sand (SM)	
	20											20.0	
												Bottom of boring at 20 feet	
	25												
						REMARKS: N 32 degrees 30'36.6" W 92 degrees 20'36.5"							
TUBE SAMPLE	AUGER SAMPLE	SPLIT- SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY								

DESCRIPTION OF TERMS AND SYMBOLS USED ON SOIL BORING LOGS

FIELD DATA			LABORATORY DATA						Soil Type	DISCRIPTION
GROUND WATER LEVEL	DEPTH (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits			
							LL	PL	PI	
	5									
	10									
	15									
	20									
	25									
	30									
	35									
	40									

Ground Water Levels

Long-Term Depth
Depth to water after boring is completed (time noted)

Short-Term Depth
Depth to water after initial water encountered prior to proceeding with boring (time noted)

Initially Encountered
Depth where free water was initially encountered during augering

Sampling/Field Data

Undisturbed
3' dia Tube Sample

Pocket Penetrometer
Penetration resistance (tons/sq ft)

Torvane (T)
Shearing resistance (tons/sq ft)

Split Spoon
Std. penetration test

Std. Penetration
No. of blows per foot (blows per each six inch increments)

Auger
Disturbed (auger) collected in accordance with ASTM D-1452

No Recovery
Sampling attempted but no sample retrieved

Compressive Strength
Value based on peak compressive strength Determined by unconfined compression test unless otherwise noted.

Dry Unit Weight
As determined by method similar to ASTM D-2937.

Water Content
As determined by pertinent portions of ASTM D-2216

Atterberg Limits
LL: Liquid Limit
PL: Plastic Limit
PI: Plasticity Index
(= Liquid Limit - Plastic Limit)

Other
Results of other test such as consolidation, permeability, grain size or notes associated with testing program

Soil Type
Graphical representation of soil type In accordance with USCS Symbols

Ground Water Level Data	Boring Advancement Method	Notes

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
		HIGHLY ORGANIC SOILS			PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO SOIL TERMS AND SYMBOLS

CONSISTENCY OF COHESIVE SOILS (MAJOR PORTION PASSING NO. 200 SIEVE)			RELATIVE DENSITY OF GRANULAR SOILS (MAJOR PORTION RETAINED ON NO. 200 SIEVE)		
CONSISTENCY	RANGE OF SPT RESISTANCE "N" BLOWS/FT	UNDRAINED SHEAR STRENGTH, KSF	DESCRIPTIVE TERM	RANGE OF SPT RESISTANCE "N" BLOWS/FT	RELATIVE DENSITY, %
Very Soft	< 2	Less than 0.25	Very Loose	< 4	Less than 15
Soft	2-4	0.5 TO 1.0	Loose	4-10	15 TO 35
Medium	4-8	1.0 TO 2.0	Medium Dense	10-30	35 TO 65
Stiff	8-15	2.0 TO 4.0	Dense	30-50	65 TO 85
Very Stiff	15-30	4.0 TO 8.0	Very Dense	>50	Greater than 85
Hard	>30	Greater than 8.0			

TERMS DESCRIBING SOIL STRUCTURE

Parting:	paper thin in thickness
Seam:	1/8" – 3" in thickness
Layer:	greater than 3" in thickness
Calcareous:	containing appreciable quantities of calcium carbonate
Ferrous:	containing appreciable quantities of iron
Well-graded:	having wide range in grain size and similar proportions of all intermediate sizes
Poorly graded:	predominately one grain size or having a range of sizes with few or no particles of some Intermediate sizes
Fissured:	containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical
Interbedded:	composed of alternate layers of different soil types
Laminated:	composed of thin layers of varying color and texture
Slickensided:	having inclined planes of weakness that are slick and glossy in appearance
NOTE:	Clays possessing slickensided or fissured structure may exhibit lower measured shear strength than indicated by the described consistency. The consistency of such soil is interpreted using the measured shear strength along with pocket penetrometer results.