

Exhibit W. Beauregard Airport Industrial  
Site Preliminary Geotechnical Engineering  
Report



**Beauregard Airport Industrial Site  
Preliminary Geotechnical  
Engineering Report**

**Preliminary  
Geotechnical Engineering Report**

**Beauregard Regional Airport – 2,120 Acre Tract  
U.S. Highway 190 and Old Airport Road  
DeRidder, Louisiana**

for

**SJB Group, LLC  
P.O. Box 1751  
Baton Rouge, LA 70821**

prepared by

**Daniel J. Holder, P.E., Inc.  
Consulting Civil / Geotechnical Engineer  
2767 Scarborough Drive  
Lake Charles, LA 70615**

**DJH File 15-086  
20 November 2015**

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**Daniel J. Holder, P.E., Inc.**  
**Consulting Civil / Geotechnical Engineer**

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Lake Charles, LA 70615  
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337-274-4125

20 November 2015

SJB Group, LLC  
P.O. Box 1751  
Baton Rouge, LA 70821

Attn: Mr. Andy Hursey, PLA, MBA

RE: Preliminary Geotechnical Engineering Report  
Beauregard Regional Airport – 2,120 Acre Tract  
U.S. Highway 190 and Old Airport Road  
DeRidder, Louisiana  
DJH File 15-086

Dear Mr. Hursey:

I have completed the Preliminary Geotechnical Engineering Report for the referenced project, and am submitting the same herewith. This work was performed in general accordance with my written scope of work dated 10 August 2015, and was authorized by your Purchase Order No. 3215 dated 12 October 2015.

Please advise if you have any questions regarding this information, or if I may be of any additional assistance. It has been a pleasure working with you on this project.

Sincerely,



Daniel J. Holder, P.E.  
Louisiana P.E. Reg. No. 26532



Report Distribution:

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# Preliminary Geotechnical Engineering Report

Beauregard Regional Airport – 2,120 Acre Tract  
U.S. Highway 190 and Old Airport Road  
DeRidder, Louisiana

DJH File 15-086; 20 November 2015

## PROJECT INFORMATION

**1. Description of Project.** Based on the information provided, it is understood that this project will consist of the preliminary geotechnical evaluation of a 2,120 acre property for the purpose of initial planning for the economic development of this site. No specific development plans are available for the property at present. Thus, the intent of this study is to make a number of widely spaced soil borings at representative locations to provide an overview of soils and ground water conditions and discuss probable earthwork issues, possible foundation types, and provide preliminary geotechnical recommendations for the general economic development of this site. It is understood that additional studies will be made for specific foundation recommendations once more detailed design information is available.

The 2,120 acre tract is an irregularly shaped parcel situated immediately west of the Beauregard Regional Airport, in DeRidder, Louisiana. Refer to the Site Vicinity Map (Figure 1) and Google Earth® Aerial Photograph and Boring Location Plan (Figure 2) in the Appendix.

## RESULTS OF INVESTIGATION

**2. General.** This investigation included the following work activities.

- a review of available geologic information,
- a site reconnaissance by the project technician,
- five (5) soil borings to the 25 foot depth,
- laboratory testing of selected soil samples,
- engineering analyses and evaluations, and,
- the preparation of this report by the Geotechnical Engineer.

The locations of the soil borings are shown on Figures 1 and 2, and the Soil Boring Logs are included in the Appendix. The results of the field and laboratory testing programs are shown on the Soil Boring Logs, and on other figures in the Appendix, where applicable. Finally, a Description of the Field and Laboratory Testing Procedures is also included in the Appendix.

**3. Site Conditions.** The 2,120 acre property essentially consists of an undeveloped parcel that is largely covered with relatively young forest growth, primarily pine wood. Several areas are open with low grass and shrub cover, and a number of unpaved roads and paths criss-cross the site. Brushy Branch Creek runs from north to south across the middle of the site; it is essentially a shallow, tree covered drainage swale. One small area of the site is (or was) occupied by a tree farm. In general, the site is bounded by the Beauregard Regional Airport to the east, Graybow Road and a railroad to the south, Seth Cole Road (Parish Road 998) to the west, and U.S. Highway 190 to the north. Overall, the site appeared to be relatively flat and level, dropping off some 10 to 15 feet or so to the Brushy Branch. Drainage elsewhere on the site appears to be fair to poor; some wet areas were observed that made access difficult.

According to the Geologic Map of Louisiana (*Pope, et al, 1984*), the site is underlain by Intermediate Terraces of Pleistocene Age. These soils are described as "*Light gray to orange-brown clay, sandy clay, and silt...*" A portable GPS unit indicated that the center of the site is located at an approximate latitude and longitude of N30° 49' 15.5" and W 93° 21' 32.9", respectively. The appropriate U.S.G.S. Topographic Map indicates that the site is at an elevation of about +190 MSL. Refer to Figures 1 and 2 in the Appendix.

**4. Soil and Ground Water Conditions.** In general, the soils encountered in the borings made at this site may be described as about 1 foot of dark brown very silty clay (CL-ML) with roots underlain by silty to sandy clays and clays to the limit of the exploration at about the 25 foot depth. Some large deposits of silt were encountered within the clayey soils described above, and several of the borings terminated in silty fine sand.

The borings were advanced using dry augering methods to determine the presence of and the hydrostatic conditions of ground water in the boreholes. Ground water was only encountered in Boring No. B-4 (in the deeper sands) at about the 20 foot depth, and appeared to rise to the 15½ foot depth during a brief (about 15 minute) observation period (although this apparent rise may have been due to borehole cave-in). One of the borings (B-3) was made in an area of standing water, making ground water readings impractical. The depth to ground water can fluctuate with seasonal variations in rainfall and evaporation, etc.; the actual depth to ground water should be determined more accurately at the time of construction.

It should be emphasized that the actual soil and ground water conditions encountered in the relatively few soil borings made for this preliminary investigation varied widely. The information contained in this section has been generalized from the data obtained from all of the soil borings made for this investigation, and is meant to provide a general overview of the soil and ground water conditions. For more specific information, refer to the Boring Logs in the Appendix.

## **GEOTECHNICAL RECOMMENDATIONS**

**5. General Considerations.** The soil conditions encountered in the very widely spaced soil borings made for this investigation consisted of about 1 foot or so of silty surface soils, followed by firm to stiff natural clayey soils and some sandy soils to the limit of the exploration at about the 25 foot depth.

These soil conditions should be suitable for a wide variety of development options, including single story metal buildings to wood or steel frame buildings of several stories. Conventional shallow spread footings or reinforced slab-on-grade foundations should be suitable for the support of these structures, or drilled, cast-in-place concrete shafts may be considered for relatively heavy buildings or where settlement movements are less tolerable.

Typical site preparation and earthwork procedures (e.g., stripping the top 1 foot or more of silty soils and placing select fill to achieve the desired subgrade) should be expected at this site.

Although recommendations for foundations, etc., for specific buildings is beyond the scope of this preliminary investigation, typical recommendations for Site Preparation and Earthwork, Shallow Foundations, and Drilled Shaft Foundations are provided in Sections 6, 7, and 8, respectively. It is understood that additional study, including more field exploration and laboratory testing will be required to provide detailed design information once more specific building information is available.

**6. Site Preparation and Earthwork Activities.** Typically, all vegetation, organic matter, and roots, etc., is removed from the site to expose the firm to stiff clayey subgrade. An undercut of about 1 foot or so should be anticipated at this site, with deeper undercuts in some areas, particularly in low, wet areas and around Brushy Branch Creek; or if wet conditions exist at the time of the earthwork. The exposed subgrade surface should be inspected to ensure that a suitable surface exists upon which to place select fill. This inspection may include proofrolling the subgrade with a loaded, tandem-axle dump truck or other means as determined by the inspector. Any areas that are determined to be unsuitable for fill placement should be further undercut or stabilized to achieve a stable subgrade surface. Proper subgrade preparation and inspection is essential for the development of this project.

Once a firm subgrade exists upon which to conduct fill operations, select fill may be placed to achieve the desired building pad elevation, if required. Select fill should consist of a silty or sandy clay with a Liquid Limit of 30 to 42 and a Plasticity Index of 12 to 22. The fill should be placed in 6 inch thick loose lifts or less and compacted to 95% of the Standard Proctor Maximum Dry Density at  $\pm 2\%$  of the Optimum Moisture Content (ASTM D 698). Each lift should be tested to ensure compliance with these recommendations prior to placing subsequent lifts. A minimum testing frequency of one

test per 2,500 square feet, but not less than 3 tests, per lift is recommended. All subgrade preparation and earthwork activities should be observed and tested by qualified personnel experienced in earthwork inspection.

Good surface drainage should be established prior to and during the earthwork activities. Standing water on the subgrade or in any excavations should be promptly drained or pumped off.

**7. Shallow Foundations.** The shallow soils at this site or properly placed and compacted select fill should be suitable for the support of shallow foundations for lightly loaded buildings. The following general recommendations for shallow foundations can be used for planning purposes for this site.

**7.1 Reinforced Slab (or "Ribbed") Foundation.** A reinforced slab foundation consists of a monolithic slab-on-grade with turned-down edges (perimeter grade beams); interior grade beams may be included if required by the building loads and/or stiffness considerations. The perimeter grade beams function as shallow foundations to carry the exterior wall loads and serve to cutoff moisture fluctuations in the soils supporting the slab from the surrounding environment. Interior grade beams serve to stiffen the slab system, allowing it to better accommodate movements in the supporting soils. Interior grade beams should be located beneath any load bearing interior walls and/or columns, in which case they should be designed as a shallow foundation. The spacing of the interior grade beams should be determined by the structural engineer; typically, a maximum spacing of 15 feet or less (each way) is utilized. Adequate reinforcement, as determined by the structural engineer, should be provided in the slab-on-grade foundation and grade beams. The entire slab system should be placed monolithically (in one pour), or dowelled to provide equivalent rigidity.

The slab foundation may be reinforced with conventional reinforcing steel (rebar and welded wire mesh) or post tensioned steel tendons (i.e., a post-tensioned slab). The grade beam dimensions and reinforcement of either foundation system should be determined by a qualified design professional knowledgeable in the design of slabs-on-grade.

It is recommended that consideration be given to placing a suitable vapor barrier (e.g., Visqueen) and a granular leveling layer beneath the floor slab. Experience suggests that the vapor barrier is usually placed directly on the subgrade and extends beneath the grade beams, and that the granular layer is placed on top of the vapor barrier just beneath the slab-on-grade. However, the practice of and the details of using a vapor barrier and/or granular leveling layer beneath slabs are far from being universally accepted, so this detail is left to the discretion of the designer of record.

7.2 Bearing Capacity and Settlement Estimates. Shallow foundations should bear within the undisturbed, stiff clayey soils or properly placed and compacted select fill at a depth of at least 2 feet. Typically, a net allowable soil bearing pressure of 2,000 pounds per square foot (psf) is recommended for continuous footings, and 2,600 psf for isolated column footings in the stiff, shallow natural soils and/or properly placed and compacted fills in this area.

The allowable bearing pressures recommended in the preceding paragraph are net values, which means that the weight of the footing and overlying backfill has already been accounted for. Regardless of the computed footing width, a minimum footing width of 18 inches and 24 inches is recommended for continuous and isolated footings, respectively, to minimize the possibility of localized “shear punch” failure.

The long term settlement of shallow foundations is typically on the order of 1 inch or less for foundations designed for the recommended bearing pressures.

7.3 Rectangular Footings and Overturning. Capacities for rectangular footings may be increased according to the following formula:

$$q_r = q_w (1 + 0.3 B/L)$$

where  $q_r$  = net allowable bearing pressure for rectangular footings (psf)  
 $q_w$  = net allowable bearing pressure for continuous footings given in Section 7.2 (psf)  
 $B$  = footing width  
 $L$  = footing length ( $L > B$ )

Resistance to overturning loads should only consider the **effective** footing area, i.e., the portion of the footing centered beneath and effective in carrying the load. The equivalent footing dimensions  $B'$  and  $L'$  of the effective footing area are defined as:

$$B' = B - 2e_B \quad \text{and} \quad L' = L - 2e_L$$

where  $e_B$  and  $e_L$  are the eccentricity in each direction. Eccentricity is defined as the moment ( $M$ ) divided by the axial load ( $P$ ), or

$$e_B = M_B / P_B \quad \text{and} \quad e_L = M_L / P_L$$

7.4 Lateral Loads. Lateral loads on foundations will be resisted by lateral earth pressure against the side of the foundation and skin friction (or adhesion) between the base of the foundation and the underlying soil. The lateral earth pressure resistance should be neglected for shallow (i.e., 4 feet deep or less)

foundations, and, in any case, the sliding resistance should be more than adequate for the anticipated lateral loads. The allowable sliding resistance may typically be taken as 250 psf for foundations bearing on undisturbed natural soils. This value includes a factor of safety of about 2 against shear failure of the foundation soils.

**7.5 Construction Considerations.** Shallow (i.e., less than about 6 to 8 feet deep) excavations in clayey soils should remain stable (i.e., not cave) for short periods of time in the absence of surface or ground water. The reinforcing steel and concrete should be placed expeditiously following the completion of the excavation. The excavation should not be permitted to stand open any longer than necessary. Any water that may accumulate in the excavation should be pumped out immediately.

The foundation excavations should be inspected by a qualified representative of the geotechnical engineer to ensure that the bearing surface is properly prepared prior to placing the reinforcing steel or concrete for the foundation. The soils at this site can become significantly weaker if wetted or disturbed during the construction operations. Traffic in the excavation should be prohibited, and drainage should be provided to direct surface and ground water (if any) away from the excavation. If the concrete for the foundation will not be placed on the same day as the excavation, a “mud mat” of lean concrete should be placed to protect the bearing surface.

According to OSHA regulations (CFR 1926.650 through 1926.652, and Appendix A to Subpart P), the contractor is responsible for developing and maintaining the appropriate safety systems for excavations on the project. The soils should be classified as Type C for this purpose. Recommendations for temporary slopes and/or shoring are beyond the scope of this investigation, but can be provided upon request once more specific design details are available.

After the foundation is placed, the excavations should be properly backfilled. The on-site soils should be suitable for this purpose, following some processing (e.g., mixing and moisture control, etc.) to achieve the specifications previously provided in this section. The fill should be placed in thin lifts (6 inches thick or less before compaction) and compacted thoroughly (to at least 95% of the Standard Proctor Dry Density value) before the next lift is placed. All backfill operations should be monitored and approved by the geotechnical engineer’s representative as part of the Construction Inspection Services.

**8. Drilled Shaft Foundations.** The deeper, natural soils at this site should be suitable for the support of drilled shaft foundations for relatively heavily loaded buildings or those that have strict settlement criteria. Drilled shafts are especially suitable for resisting the relatively large axial and shear loads and overturning moments typical of steel frame

structures. As long as the site preparation and earthwork activities described in Section 6 are followed, grade supported reinforced floor slabs should be able to be used with the drilled shafts. The following general recommendations for shallow foundations can be used for planning purposes for this site.

Straight-sided drilled shafts should be utilized at this site; belled (underreamed) shafts may experience construction difficulties due to the presence of sandy soils and ground water at this site. Excavations for drilled shafts may require the use of full depth drilling slurry and/or temporary steel casing to maintain the sides of the excavations (i.e., prevent caving). Temporary steel casing can be effective if it is extended into the deeper clayey soils and used to “seal off” the shallow water bearing sandy soils, if applicable. The contractor should be thoroughly experienced with the use of these drilling techniques or significant construction difficulties and/or inadequate shaft sections could result. Refer to Section 8.5 for construction considerations.

8.1 Axial Capacity. The compressive axial capacity of drilled shafts is derived from skin friction at the soil-shaft interface and end bearing. Uplift resistance is provided by skin friction and the buoyant weight of the shaft.

Numerous shaft diameters and embedment depths may be considered in order to allow the project designer to select the most suitable shaft geometry for the specific loading conditions. Representative values for drilled shafts in this area are tabulated below. The allowable shaft capacities include factors of safety of 2 and 2.5 for skin friction and end bearing in compression, respectively, and 2.5 for skin friction in uplift. The buoyant unit weight of the shaft is also included in the provided uplift capacities, along with a factor of safety of 1.1. Capacities for intermediate diameters and/or depths may be interpolated from the table. Extrapolation beyond the specified diameters and depths is not recommended without further consultation.

**Typical Allowable Compression/Uplift Loads for Single Drilled Shaft Foundations (kips)**

<b><u>Depth* (ft)</u></b>	<b><u>18 Inch Diameter</u></b>	<b><u>24 Inch Diameter</u></b>	<b><u>30 Inch Diameter</u></b>
10	23 / 14	34 / 19	47 / 25
15	36 / 25	52 / 34	69 / 44
20	49 / 36	69 / 49	90 / 63

\* Depth refers to depth below existing site grades.

All shaft capacities cited above are based on good quality construction procedures being utilized. Sufficient full depth reinforcement, as determined by the structural engineer, is required to develop the full tensile capacity of the shaft.

8.2 Settlement. Total settlements for drilled shaft foundations designed and constructed in accordance with these recommendations are estimated to be about one-quarter inch or less. Differential settlements between adjacent shafts should be about one-half to three-quarters of the observed total settlement.

8.3 Lateral Loads and Overturning Moments. It is not known if the tops of the drilled shafts will be subject to lateral loads and/or overturning moments, or if these forces will be resisted by the structure itself. The evaluation of lateral loading and overturning moments on drilled shafts can be complex and time consuming for a large number of shaft geometries, such as that provided in Section 8.1. Once the final loading conditions on the drilled shafts are known, this office should be contacted for further evaluation.

8.4 Shaft Spacing and Group Effects. Shafts should be spaced a minimum of 2.5 to 3 diameters center-to-center or 5% of the shaft length, whichever is greater. Large groups of shafts are not anticipated; however, if groups of 5 or more shafts are utilized, the Geotechnical Engineer should be permitted to evaluate group efficiencies.

8.5 Construction Considerations. Excavations for drilled shafts may require the use of full depth drilling slurry and/or temporary steel casing to maintain the sides of the excavations (i.e., prevent caving). Temporary steel casing can be effective if it is extended into the deeper clayey soils and used to “seal off” the shallow water bearing sandy soils. The contractor should be thoroughly experienced with the use of these drilling techniques or significant construction difficulties and/or inadequate shaft sections could result.

Drilling slurry, if utilized, should be introduced into the excavation immediately upon drilling, and maintained at full depth during the drilling and concreting operations. The excavation and concrete placement should proceed as expeditiously as possible. Once the excavation is started, it should be completed and concrete placed without delay. The slurry should be premixed and brought to the proper consistency, etc., before introducing into the excavation. The drilling tools (augers) should be designed such that the slurry can pass freely around or through the tool as the auger is withdrawn, and the auger should be operated slowly enough that suction does not develop beneath the auger and cause caving. The bottom of the excavation should be cleaned out with an air lift pump or similar device; a clean-out bucket is not recommended. Prior to cleanout, the slurry should be allowed to stand undisturbed for about 15 to 30 minutes to allow all suspended solids to settle out.

The reinforcing steel and concrete for the shaft should be placed immediately after the clean out operations are complete. The reinforcing cage should be fixed in place with centralizers or other means so that it is not disturbed by the

concrete placement. If temporary steel casing is used to achieve a dry excavation, the concrete may be dropped freely through the excavation, provided it is not permitted to strike any obstructions on the way down and does not land in standing water. If this cannot be achieved, a full depth tremie should be utilized to place the concrete. A "head" of concrete of at least 5 feet above the bottom of the casing should be maintained while the temporary casing is withdrawn.

If drilling slurry is utilized, the concrete should be placed by means of a full depth, water-tight tremie with a valve or other means of separating the slurry from the concrete (e.g., a pig). The concrete should be proportioned so that it has the proper strength as determined by the project designers, while maintaining a slump of 6 to 8 inches at the time of placement. This is critical to ensure that the slurry is completely displaced, and that no voids remain within the completed shaft. All drilling and concreting operations should be observed by qualified personnel experienced in drilled shaft inspection techniques.

**8.6 Floor Slabs.** The floor slabs should consist of ground supported slab-on-grade placed monolithically with exterior and interior grade beams. The grade beams should be designed to rest upon and span across the drilled shaft foundations. The exterior grade beams should extend to a minimum depth of 2 feet below exterior finished grade to help minimize moisture fluctuations of the soils supporting the floor slab. The interior grade beams may be placed at any convenient depth as required by the structural considerations for the floor slab system. Sufficient reinforcement (for both positive and negative moments) and control joint spacing, as determined by the Structural Engineer, should be utilized.

It is recommended that consideration be given to placing a suitable polyethylene vapor barrier (e.g., Visqueen) and a granular leveling layer beneath the floor slab. Experience suggests that the vapor barrier is usually placed directly on the subgrade and extends beneath the grade beams, and that the granular layer is placed on top of the vapor barrier just beneath the slab-on-grade. However, the practice of and the details of using a vapor barrier and/or granular leveling layer beneath the slab are far from being universally accepted, so this detail is left to the discretion of the designer of record.

## **OTHER GEOTECHNICAL CONSIDERATIONS**

**9. Drainage.** Proper long term drainage should be provided to direct surface water away from the completed building foundations. Gutters and downspouts, as well as positive site grading, should be utilized for this purpose as required.

**10. Additional Consulting Services.** The Geotechnical Engineer should be kept informed of and permitted to address all aspects of the soils-related aspects of the project. Often, concerns may arise that are not specifically addressed by the Geotechnical Engineering Report. A brief conference can often address any such concerns, and can identify any other issues not anticipated by the design team.

Upon completion of design, and prior to the start of construction, the Geotechnical Engineer should be provided with the opportunity to review the design drawings and specifications to assure compliance with the Geotechnical Engineering Report. Such review is considered to be an integral part of the recommendations of this report.

**11. Construction Inspection Services.** Construction inspection services for this project are essential to assure that the soil conditions do not vary from that assumed in this report and to ensure that the recommendations in this report are followed. These services should be retained by the owner to assure that unbiased reporting is provided. The Geotechnical Engineer should be provided with timely copies of all test results.

**12. Limitations.** This report is based upon the preliminary information provided by the owner's representative, as well as the soil and ground water conditions encountered during the field investigation. Variations may occur away from or between the borehole locations. If such variations become apparent, or if the nature of the project changes significantly, the Geotechnical Engineer should be consulted for additional recommendations. It is understood that additional study will be required to provide specific foundation recommendations once more detailed design information is available.

The recommendations in this report pertain only to the soils-related aspects of the project. The structural design of the building foundations is beyond the scope of these services. Likewise, this report does not address the environmental aspects of the project. We would be pleased to assist with these additional services if requested.

**APPENDIX**

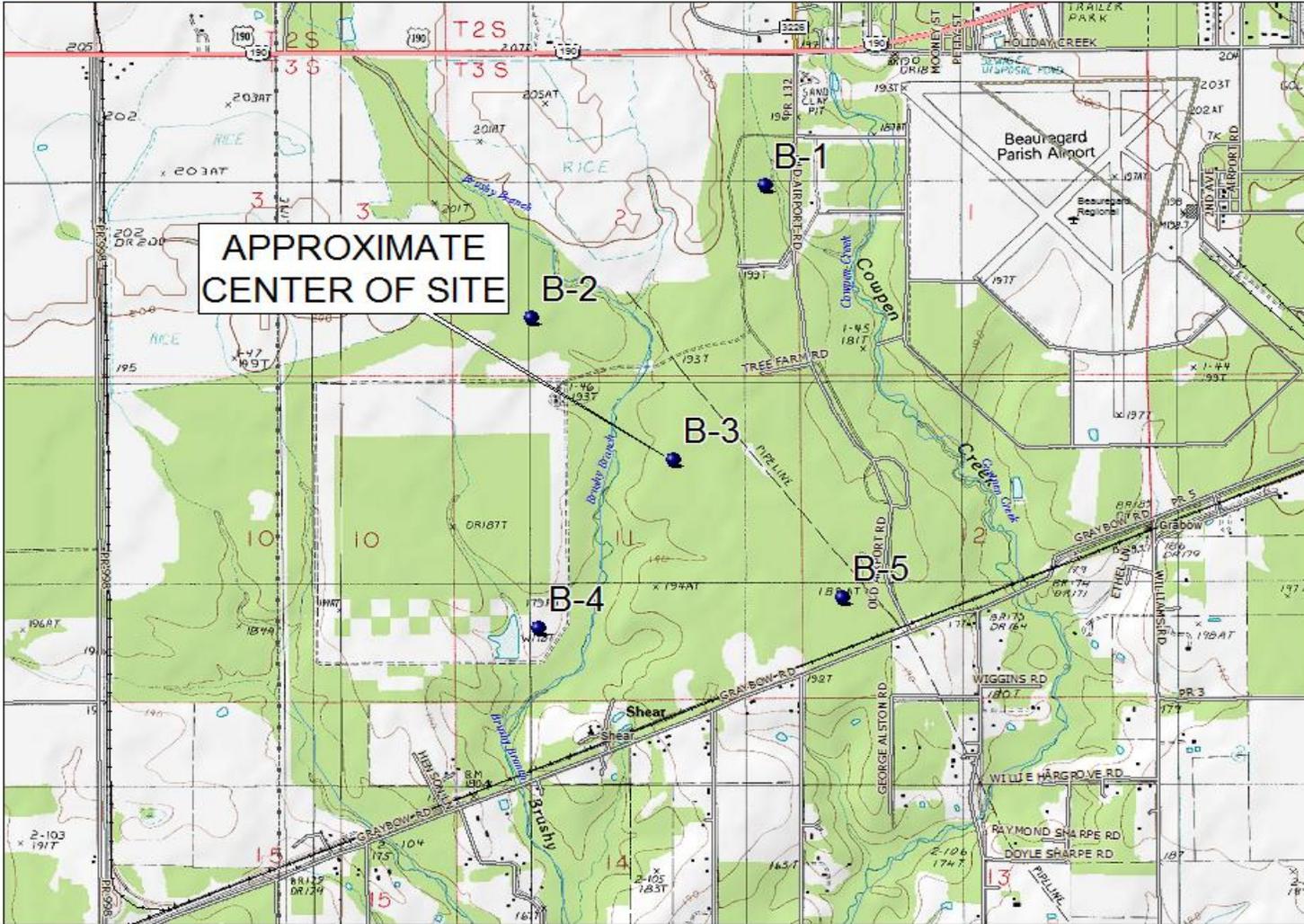
U.S.G.S. Topographic Map / Site Vicinity Map (Figure 1)

Google Earth® Aerial Photograph and Boring Location Plan (Figure 2)

Soil Boring Logs (5)

Particle Size Analyses (2)

Description of Field and Laboratory Testing Procedures



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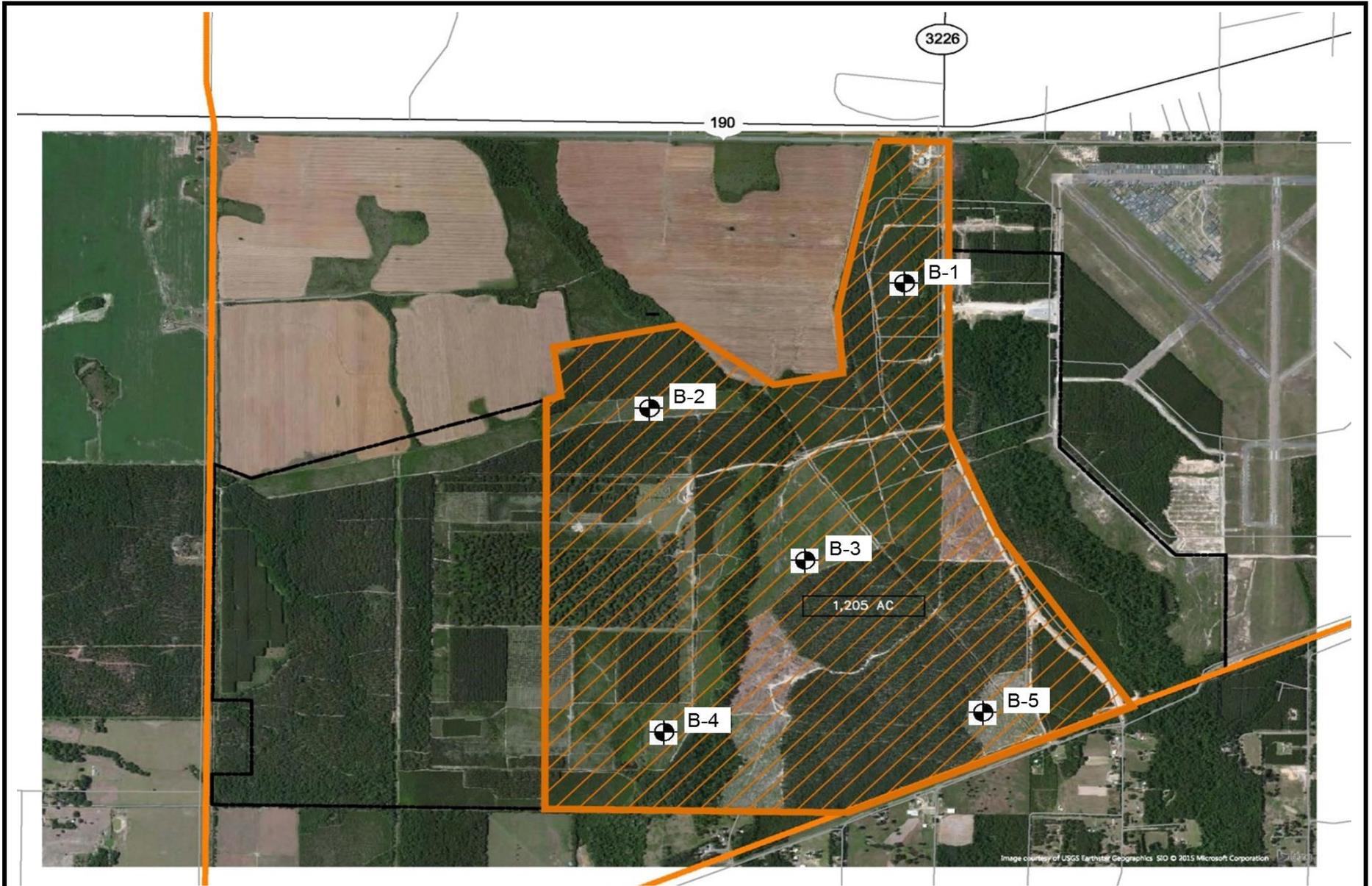
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Beaugard Regional Airport 2,120 Acre Site  
 Lake Charles, Louisiana  
 for  
 SJB Group, LLC  
 Baton Rouge, Louisiana

Project Engineer: DJH	DJH File No. 15-086
Drawn By: dan	Date: 19 Nov 15
Checked By: <i>DJH</i>	Figure No. 1

Site Vicinity Map /  
 U.S.G.S. Topographic Map

Source: U.S.G.S. 7.5 Minute Topographic Map, 1999 (3-D TopoQuads, DeLorme)



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Beauregard Regional Airport 2,120 Acre Site  
 Lake Charles, Louisiana  
 for  
 SJB Group, LLC  
 Baton Rouge, Louisiana

Project Engineer: DJH	DJH File No. 15-086
Drawn By: dan	Date: 19 Nov 15
Checked By: <i>DJH</i>	Figure No. 2

Google Earth® Aerial Photograph  
 and Boring Location Plan

Source: Site Plan Provided by SJB Group, LLC

# SOIL BORING LOG

## Boring No. B-1

Page 1 of 1

Project: Beaugard Regional Airport 2,120 Acre Site  
 Location: U.S. Highway 190 & Old Airport Road  
 DeRidder, Louisiana  
 Client: SJB Group, LLC  
 Baton Rouge, Louisiana

DJH File No: 15-086  
 Date Drilled: 10/28/2015  
 Logged By: Mike Fogarty  
 Drilled By: Masa Drilling, Inc.  
 Equipment: Ardco Top Drive (Buggy)

Depth (ft)	Field Tests			Laboratory Tests						Notes / Other Tests	Symbol	Description
	Sample Type	Penetrometer (tsf) or SPT (bpf)	Ground Water	Qu / UU (tsf)	Dry Density, $\gamma_d$ (pcf)	Moisture Content, $w$ (%)	Atterberg Limits					
							Liquid Limit, %	Plastic Limit, %	Plasticity Index, %			
1	ST	1¼ tsf	★			21	36	19	17	PSA 2		Firm brown very SILTY CLAY (CL-ML), w/ roots
2												
3	ST	3 tsf										Stiff tan & light gray w/ reddish brown SILTY to SANDY CLAY (CL), w/ brown oxides
4												- ditto
5	ST	2½ tsf		1.3	110	16	31	17	14	$\epsilon_f = 2.1\%$		- ditto
6												- ditto
7	ST	2½ tsf										- ditto, w/ reddish brown oxides
8												
9	ST	3½ tsf										- ditto, light gray & tan
10												
11	ST	3½ tsf		1.9	112	19	38	17	21	$\epsilon_f = 7.9\%$		- ditto, light gray & tan
12												
13												
14	ST	3¾ tsf										- ditto, light gray & tan
15												
16												
17												
18												Stiff light gray very SILTY to SANDY CLAY (CL-ML)
19	ST	3¾ tsf		1.5	107	20	26	17	9	$\epsilon_f = 7.9\%$		
20												
21												
22												
23												- very soft light gray CLAYEY SILT (CL-ML), wet
24	ST	No Test										
25												Boring Completed at 25' Depth
Boring Data						Ground Water Data				Notes / Other Tests		
Boring Advancement: Dry Auger: 0 - 25' Rotary Wash: n / a						★ No Ground Water Encountered				$\epsilon_f$ = Failure Strain PSA = Particle Size Analysis (ASTM D 422) (refer to Figure PSA 1 in Appendix)		
Boring Abandonment: Boring Backfilled w/ Soil Cuttings Upon Completion						Sample Type: ST: Shelby Tube (ASTM D 1587) SS: Split Spoon (ASTM D 1586)				Soil Stratification is Approximate		

# SOIL BORING LOG

## Boring No. B-2

Page 1 of 1

Project: Beaugard Regional Airport 2,120 Acre Site  
 Location: U.S. Highway 190 & Old Airport Road  
 DeRidder, Louisiana  
 Client: SJB Group, LLC  
 Baton Rouge, Louisiana

DJH File No: 15-086  
 Date Drilled: 10/27/2015  
 Logged By: Mike Fogarty  
 Drilled By: Masa Drilling, Inc.  
 Equipment: Ardco Top Drive (Buggy)

Depth (ft)	Field Tests			Laboratory Tests						Notes / Other Tests	Symbol	Description
	Sample Type	Penetrometer (tsf) or SPT (bpf)	Ground Water	Qu / UU (tsf)	Dry Density, $\gamma_d$ (pcf)	Moisture Content, w (%)	Atterberg Limits					
							Liquid Limit, %	Plastic Limit, %	Plasticity Index, %			
1	ST	3¼ tsf	★									Firm brown very SILTY CLAY (CL-ML), w/ roots
2												
3	ST	2 tsf		2.2	116	15	34	19	15	$\epsilon_f = 3.6\%$		Very stiff tan w/ light gray & reddish brown SILTY to SANDY CLAY (CL), w/ brown oxides & reddish brown oxide nodules
4												
5	ST	3¼ tsf										
6												
7	ST	3 tsf										- ditto
8												
9	ST	3½ tsf		2.2	105	21	58	22	36	$\epsilon_f = 2.9\%$		Very stiff tan w/ light gray & pink CLAY (CH), w/ brown & pink & red oxides
10												
11	ST	3 tsf										- ditto
12												
13												
14	ST	2½ tsf		2.1	108	21	60	20	40	$\epsilon_f = 5.7\%$		- ditto, pink & purple, w/ red oxide nodules
15												
16												
17												
18												
19	SS	28 bpf 9-12-16										Medium dense light gray to pink very SILTY fine SAND (SM)
20												
21												
22												
23												
24	SS	27 bpf 7-12-15										- ditto
25												Boring Completed at 24½' Depth
Boring Data						Ground Water Data				Notes / Other Tests		
Boring Advancement: Dry Auger: 0 - 24½' Rotary Wash: n / a						★ No Ground Water Encountered				$\epsilon_f =$ Failure Strain		
Boring Abandonment: Boring Backfilled w/ Soil Cuttings Upon Completion						Sample Type: ST: Shelby Tube (ASTM D 1587) SS: Split Spoon (ASTM D 1586)				Soil Stratification is Approximate		

# SOIL BORING LOG

## Boring No. B-3

Page 1 of 1

Project: Beaugard Regional Airport 2,120 Acre Site  
 Location: U.S. Highway 190 & Old Airport Road  
 DeRidder, Louisiana  
 Client: SJB Group, LLC  
 Baton Rouge, Louisiana

DJH File No: 15-086  
 Date Drilled: 10/28/2015  
 Logged By: Mike Fogarty  
 Drilled By: Masa Drilling, Inc.  
 Equipment: Ardco Top Drive (Buggy)

Depth (ft)	Field Tests			Laboratory Tests						Notes / Other Tests	Symbol	Description
	Sample Type	Penetrometer (tsf) or SPT (bpf)	Ground Water	Qu / UU (tsf)	Dry Density, $\gamma_d$ (pcf)	Moisture Content, w (%)	Atterberg Limits					
							Liquid Limit, %	Plastic Limit, %	Plasticity Index, %			
1	ST	3¼ tsf	▽									Firm brown very SILTY CLAY (CL-ML), w/ roots
2												
3	ST	3 tsf		1.8	111	18	34	19	15	$\epsilon_f = 2.9\%$		Stiff light gray & tan SILTY to SANDY CLAY (CL), w/ brown oxides
4												- ditto, tan & light gray
5	ST	4½ tsf										
6												
7	ST	3½ tsf		1.8	106	21	44	19	25	$\epsilon_f = 4.3\%$		- ditto, w/ brown oxides & lots of silt streaks
8												
9	ST	3½ tsf										- ditto, w/ brown oxides & lots of silt streaks
10												
11	ST	3¼ tsf		2.6	104	22	47	21	26	$\epsilon_f = 10\%$		- ditto, slightly silty clay (CL-CH), very stiff, w/ brown oxides
12												
13												
14	ST	4 tsf										- ditto
15												
16												
17												
18												
19	SS	13 bpf 6-5-8										- ditto
20												Very stiff light gray w/ tan CLAY (CH), w/ brown oxides & large red oxide nodules on bottom
21	ST	3¼ tsf										- ditto, light gray w/ tan & red, w/ lots of brown & red oxide nodules
22												
23												
24	ST	3¼ tsf		2.8	98	28	66	26	40	$\epsilon_f = 5.0\%$		
25												Boring Completed at 25' Depth
Boring Data						Ground Water Data				Notes / Other Tests		
Boring Advancement: Dry Auger: 0 - 25' Rotary Wash: n / a						▽ Standing Water at Ground Surface				$\epsilon_f =$ Failure Strain		
Boring Abandonment: Boring Backfilled w/ Soil Cuttings Upon Completion						Sample Type: ST: Shelby Tube (ASTM D 1587) SS: Split Spoon (ASTM D 1586)				Soil Stratification is Approximate		

# SOIL BORING LOG

## Boring No. B-4

Page 1 of 1

Project: Beaugard Regional Airport 2,120 Acre Site  
 Location: U.S. Highway 190 & Old Airport Road  
 DeRidder, Louisiana  
 Client: SJB Group, LLC  
 Baton Rouge, Louisiana

DJH File No: 15-086  
 Date Drilled: 10/27/2015  
 Logged By: Mike Fogarty  
 Drilled By: Masa Drilling, Inc.  
 Equipment: Ardco Top Drive (Buggy)

Depth (ft)	Field Tests			Laboratory Tests						Notes / Other Tests	Symbol	Description
	Sample Type	Penetrometer (tsf) or SPT (bpf)	Ground Water	Qu / UU (tsf)	Dry Density, $\gamma_d$ (pcf)	Moisture Content, w (%)	Atterberg Limits					
							Liquid Limit, %	Plastic Limit, %	Plasticity Index, %			
1	ST	1 tsf				21	24	19	5	PSA 2		Firm dark brown CLAYEY SILT (CL-ML), w/ roots
2												
3	ST	1¼ tsf										Firm tan & light gray CLAYEY SILT (CL-ML), w/ brown oxides
4												
5	ST	1½ tsf		2.5	109	20	59	21	38	$\epsilon_f = 10\%$		Stiff light gray & tan CLAY (CH), w/ brown oxides
6												
7	ST	3 tsf										- ditto, very stiff, w/ brown oxides @ 5'
8												- ditto, w/ brown oxides & fine rootlets
9	ST	2½ tsf		1.7	105	21	48	20	28	$\epsilon_f = 10\%$		Stiff light gray w/ tan slightly SILTY CLAY (CL-CH), w/ brown oxides
10												
11	ST	2 tsf										- ditto
12												
13												
14	ST	2¾ tsf		1.7	104	24	48	20	28	$\epsilon_f = 10\%$		- ditto
15			▽									
16												
17												
18												Medium dense light gray very SILTY
19	SS	20 bpf 9-10-10										fine SAND (SM), wet
20			▽									
21												
22												
23												
24	SS	19 bpf 9-9-10										- ditto
25												Boring Completed at 24½' Depth
Boring Data						Ground Water Data				Notes / Other Tests		
Boring Advancement: Dry Auger: 0 - 24½' Rotary Wash: n / a						▽ First Encountered: 20' ▽ After 15 Minutes: 15½' Boring Caved to 15½' After 15 Mins.				$\epsilon_f$ = Failure Strain PSA = Particle Size Analysis (ASTM D 422) (refer to Figure PSA 2 in Appendix)		
Boring Abandonment: Boring Backfilled w/ Soil Cuttings Upon Completion						Sample Type: ST: Shelby Tube (ASTM D 1587) SS: Split Spoon (ASTM D 1586)						
										Soil Stratification is Approximate		

# SOIL BORING LOG

## Boring No. B-5

Page 1 of 1

Project: Beaugard Regional Airport 2,120 Acre Site  
 Location: U.S. Highway 190 & Old Airport Road  
 DeRidder, Louisiana  
 Client: SJB Group, LLC  
 Baton Rouge, Louisiana

DJH File No: 15-086  
 Date Drilled: 10/28/2015  
 Logged By: Mike Fogarty  
 Drilled By: Masa Drilling, Inc.  
 Equipment: Ardco Top Drive (Buggy)

Depth (ft)	Field Tests			Laboratory Tests						Notes / Other Tests	Symbol	Description
	Sample Type	Penetrometer (tsf) or SPT (bpf)	Ground Water	Qu / UU (tsf)	Dry Density, $\gamma_d$ (pcf)	Moisture Content, w (%)	Atterberg Limits					
							Liquid Limit, %	Plastic Limit, %	Plasticity Index, %			
1	ST	1¼ tsf	★									Firm to soft dark brown very SILTY CLAY (CL-ML), w/ roots
2												
3	ST	2½ tsf		1.3	113	19	33	20	13	$\epsilon_f = 2.9\%$		Stiff tan & light gray SILTY to SANDY CLAY (CL), w/ brown oxides
4												
5	ST	1¾ tsf										- ditto
6												
7	ST	1¾ tsf		0.8	115	17	19	17	2	$\epsilon_f = 2.1\%$		- ditto, firm, w/ very large light gray silt pockets
8												
9	ST	3 tsf										- ditto, w/ very large light gray silt pockets
10												
11	ST	3½ tsf		2.9	112	19	45	19	26	$\epsilon_f = 6.4\%$		Very stiff light gray & tan SILTY CLAY (CL-CH), w/ brown oxides & gray silt pockets
12												
13												
14	ST	3¾ tsf										- ditto, w/ brown oxides & gray silt pockets & small calcium nodules
15												
16												
17												
18												
19	ST	4 tsf		3.3	105	21	54	23	31	$\epsilon_f = 6.4\%$		- ditto
20												
21												
22												
23												
24	ST	No Test										Firm light gray w/ tan very SANDY CLAY (CL), grading to CLAYEY SAND (SC)
25												Boring Completed at 25' Depth
Boring Data						Ground Water Data				Notes / Other Tests		
Boring Advancement: Dry Auger: 0 - 25' Rotary Wash: n / a						★ No Ground Water Encountered				$\epsilon_f =$ Failure Strain		
Boring Abandonment: Boring Backfilled w/ Soil Cuttings Upon Completion						Sample Type: ST: Shelby Tube (ASTM D 1587) SS: Split Spoon (ASTM D 1586)				Soil Stratification is Approximate		

# Particle Size Analysis (ASTM D 422)

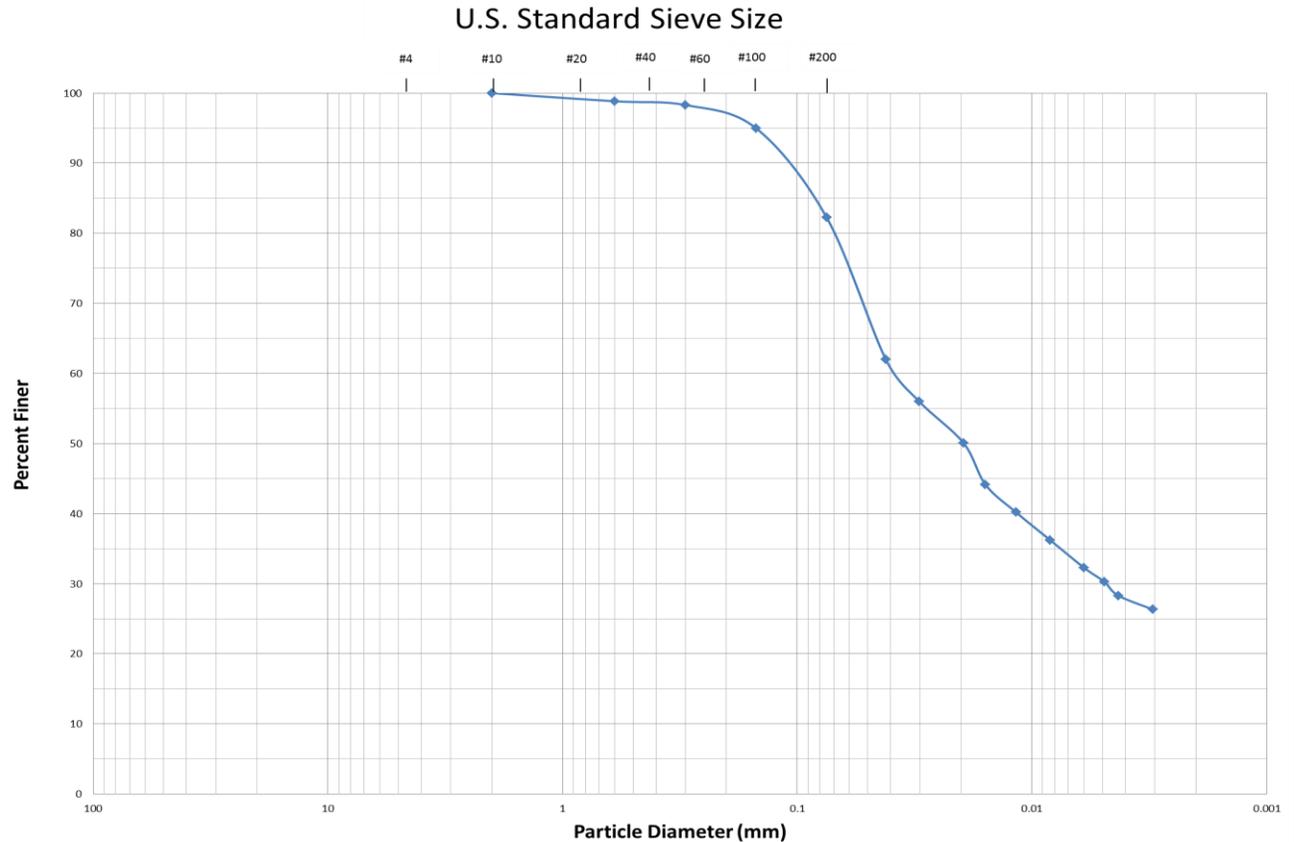
Sample Location: B-1, 1' to 2'

Sample Description: Firm brown very SILTY CLAY (CL-ML), w/ roots

Particle Size		Percent Finer By Wt.
(Sieve)	(mm.)	
1½"	38.100	
¾"	19.050	
⅜"	9.525	
#4	4.750	
#10	2.000	100
#30	0.600	99
#50	0.300	98
#100	0.150	95
#200	0.075	82
	0.042	62
	0.030	56
	0.020	50
	0.016	44
	0.012	40
	0.008	36
	0.006	32
	0.005	30
	0.004	28
	0.003	26

Atterberg Limits	
Liquid Limit, LL:	36
Plastic Limit, PL:	19
Plasticity Index, PI:	17
Moisture Content, w:	21

Gravel	Sand		Silt	Clay
	Coarse to Medium	Fine		



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Beauregard Regional Airport 2,120 Acre Site  
 DeRidder, Louisiana  
 for  
 SJB Group, LLC  
 Baton Rouge, Louisiana

Project Engineer: DJH	DJH File No. 15-086
Drawn By:	Date: 11 Nov 2015
Checked By: <i>[Signature]</i>	Figure No. PSA-1
Particle Size Analysis B-1, 1' to 2'	

# Particle Size Analysis (ASTM D 422)

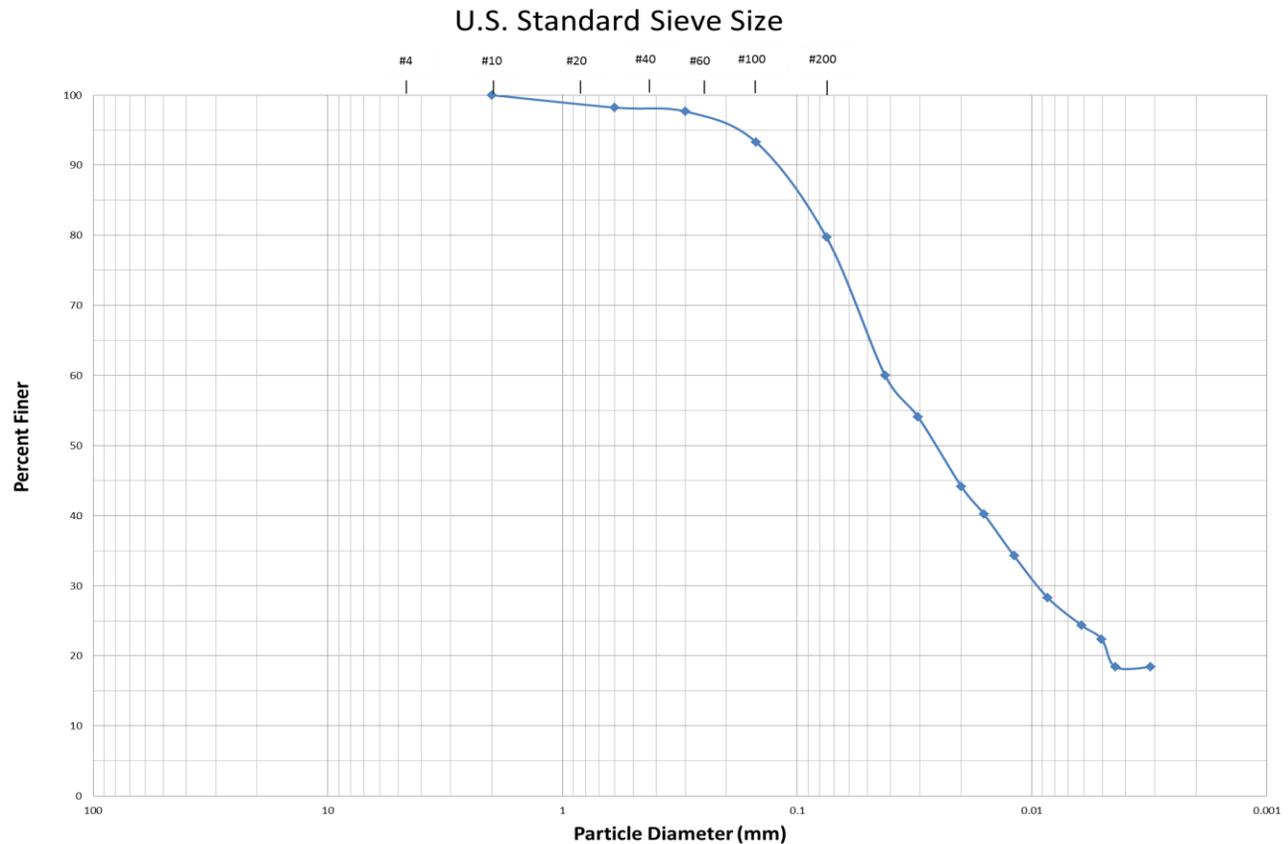
Sample Location: B-4, 1' to 2'

Sample Description: Firm tan & light gray CLAYEY SILT (CL-ML), w/ brown oxides

Particle Size		Percent Finer By Wt.
(Sieve)	(mm.)	
1½"	38.100	
¾"	19.050	
⅜"	9.525	
#4	4.750	
#10	2.000	100
#30	0.600	98
#50	0.300	98
#100	0.150	93
#200	0.075	80
	0.042	60
	0.031	54
	0.020	44
	0.016	40
	0.012	34
	0.009	28
	0.006	24
	0.005	22
	0.004	18
	0.003	18

Atterberg Limits	
Liquid Limit, LL:	24
Plastic Limit, PL:	19
Plasticity Index, PI:	5
Moisture Content, w:	21

Gravel	Sand		Silt	Clay
	Coarse to Medium	Fine		



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Beauregard Regional Airport 2,120 Acre Site  
 DeRidder, Louisiana  
 for  
 SJB Group, LLC  
 Baton Rouge, Louisiana

Project Engineer: DJH	DJH File No. 15-086
Drawn By:	Date: 11 Nov 2015
Checked By: <i>[Signature]</i>	Figure No. PSA-2

Particle Size Analysis  
 B-4, 1' to 2'

### **Description of Field and Laboratory Testing Procedures**

**Field Testing Procedures.** The borings were (initially) advanced using dry augering methods. Soil samples were obtained continuously in the upper 10 foot and on 5 foot centers thereafter. The sample depths and types are recorded on the soil boring logs.

In general, relatively undisturbed "Shelby" tube samples (ASTM D 1587) were taken in clays and silty clays. Undisturbed soil samples are required for strength and density tests, and other properties that are dependent upon the soil being close to its natural state. In this procedure, the boring is advanced to the desired sampling depth, then a 3 inch diameter, thin-walled "Shelby" tube is inserted into the borehole. The tube is then pushed hydraulically about 2 feet into the undisturbed soil. The tube is withdrawn, and the sample extruded with a hydraulic piston. The sample is visually classified and tested with a spring loaded penetrometer, which provides a crude estimate of the unconfined compressive strength. The penetrometer test result is recorded on the soil boring log, and a representative portion of the sample is secured for transport to the laboratory.

In sands and silts, Standard Penetration Tests (ASTM D 1586) are generally made. This test provides a measure of the in-situ density or stiffness of the soil and provides a relatively disturbed sample that may be used for classification testing. In this procedure, the boring is advanced to the desired sampling depth, and a relatively heavy walled "split spoon" sampler is inserted into the borehole. The sampler is driven into the soil using a 140 pound "drop" hammer with 30 inch strokes. The number of blows required to drive each 6 inch increment is recorded. The first increment is a seating drive; the number of blows required to drive the second and third increments are added together to determine the "N-value," which has units of blows per foot (bpf). The N-value and the number of blows per increment are recorded on the soil boring log. The sample is visually classified, and a representative portion secured for transport to the laboratory.

**Laboratory Testing Procedures.** Representative samples from the field investigation were selected by the project engineer for laboratory testing to determine their relevant engineering characteristics. These tests generally fall into one of the following categories.

**Strength Tests.** Strength tests generally consist of the Unconfined Compressive Strength, or Qu Test, (ASTM D 2166), and the Unconsolidated, Undrained Triaxial Compressive Strength, or UU Test, (ASTM D 2850). In each of these tests, a cylindrical sample of undisturbed soil is subjected to an axial load until failure occurs, yielding the compressive strength of the soil. The principal difference between the two tests is that the Qu is not confined laterally, which can lead to premature failure, and thus, lower compressive strength values. The UU test is confined laterally in a triaxial cell, typically to the lateral stress that the in-situ soil sample was subject to. The compressive strength and axial strain at failure ( $\epsilon_t$ ) are recorded on the soil boring log. The confining stress of UU tests is also recorded.

**Classification Tests.** Common classification tests include the Atterberg Limit Tests and Particle Size Analyses. Atterberg Limit Tests (ASTM D 4318) are performed to determine the consistency (or "clayeyness") of a soil. The Atterberg limits consist of the Liquid Limit (LL) and the Plastic Limit (PL), and the Plasticity Index (PI), which is the difference between the LL and the PL. These values are recorded on the soil boring log.

The Particle Size Analysis Test (ASTM D 422) is performed to determine the distribution of the individual particle sizes of a soil sample. The test is typically performed using mechanical sieves for soils containing gravel and sands, or a "hydrometer" for clayey and silty soils. The results of the Particle Size Analysis are typically plotted on a log scale.

**Physical Tests.** Common physical tests include the Moisture Content Test (ASTM D 2216) and the Dry Density Test. As the names indicate, these tests determine the moisture content and dry density (or dry unit weight) of a soil sample.