GeoCon
Engineering & Materials Testing, Inc.

Report of Geotechnical Exploration

Proposed Public Works Facility
Roscoe Road and Russian Road
Orange Beach, Alabama

GeoCon Project No. DL 1813-19

Prepared For:

City of Orange Beach
Mr. Tim Tucker
Post Office Box 458
Orange Beach, Alabama 36561

Date: August 19, 2019

Prepared By:
GeoCon Engineering & Materials Testing, Inc.
22885 McAuliffe Drive
Robertsdale, Alabama 36567

GeoCon
Engineering & Materials Testing, Inc.

August 19, 2019

City of Orange Beach
Post Office Box 458
Orange Beach, Alabama 36561

Attn: Mr. Tim Tucker

RE: **Report of Geotechnical Exploration**
Proposed Public Works Facility
Roscoe Road and Russian Road
Orange Beach, Alabama
GeoCon Project No. DL 1813-19

Dear Mr. Tucker:

GeoCon Engineering & Materials Testing, Inc. is pleased to submit this report of geotechnical exploration for the above referenced project. Included in this report is a summary of our understanding of the project, results of the field exploration, and our recommendations for site grading and foundation design. Recommended pavement build-ups are also provided. This testing has been performed in general accordance with our signed proposal and our earlier discussions with you.

Enclosed please find our report with evaluations and recommendations followed by an Appendix which includes a Site Location Map, Test Location Plan, Soil Survey Map, graphical logs of the soundings and borings, laboratory data sheets, a Unified Soils Classification Chart, important notes about your Geotechnical Report and the terms and conditions that govern our work.

We appreciate the opportunity to have provided you with our geotechnical engineering services. If you have any questions concerning this report, or if we can be of any further assistance, please contact our office.

Sincerely,

GeoCon, Inc.

Jason J. Christian, P.E.

22885 McAuliffe Drive Robertsdale, Alabama 36567
Phone (251) 947-1035

Geotechnical Engineer

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1.0 Project Description

The project subject to this report is the construction of a new facility for the City of Orange Beach Public Works Department. The subject site is located just southeast of the intersection of Roscoe Road and Russian Road in Orange Beach, Alabama. The location of the subject site is shown on the attached Site Location Map (Figure 1). During our August 2019 field exploration, the site was wooded and had been forestry mowed.

We understand that the main building will include a three-story structure with metal framing, a slab-on-grade concrete floor and be supported on shallow foundations. We anticipate that maximum column loads will be less than about 75 kips and wall loads will be less than about 2 kips per linear foot. Several miscellaneous small structures will also be located on the southeast portion of the site.

The project also includes passenger vehicle parking on the west side of the main building and a concrete apron that will wrap around the building. An access drive will also be located along the south side of the site. We anticipate that the project will include exposed gravel storage areas.

Based on the provided topographic information, existing ground elevations across the site ranged from about 45 feet on the east side to about 48 feet on the west side. The provided Site Plan indicated that the main structure's finished floor elevation (FFE) will be about 50 feet and the FFE of the miscellaneous structures will be about 1 foot above the existing ground surface.

> Note: If our understanding of the above project information differs from the actual project plans and specifications or if revisions to the project plans are made after this report, we should be contacted for analysis and comment as needed.

2.0 Geotechnical Exploration

Soil conditions were investigated by performing the requested five (5) Cone Penetration Test (CPT) soundings to depths of about 20 feet below the existing ground surface and two (2) borings at the main building in the proposed building area. We also performed six (6) manual hand auger borings in the area of the miscellaneous structures, six (6) manual hand auger borings in the proposed parking and access drive areas and two (2) manual hand auger borings in the potential stormwater management areas. The soundings and borings were located in the field by GeoCon engineering personnel using the provided Site Plan as reference. The general sounding and boring locations are shown on the attached Test Location Plan (Figure 2).

CPT testing was performed in accordance with ASTM D-5778 using a Vertek S4 electronic CPT rig. CPT testing includes pushing an electronic cone on a series of rods into the ground at a constant rate. The electronic cone collects continuous measurements of the resistance to penetration of the cone tip and side friction sleeve. Correlations between Cone Resistance values and Standard Penetration Test (SPT) "N" values were performed using methods

developed by Robertson, Campanella and Wightman. The CPT logs attached in the appendix shows the cone tip friction, sleeve friction, pore pressure, correlated "N" value and the soil behavior type (SBT). At each test sounding location, samples were collected of the soils encountered in the upper 4 feet of the soil-profile. Selected samples of deeper soils penetrated in the CPT soundings were also collected using a down-the-hole sampler.

The hand auger test borings included Dynamic Cone Penetrometer (DCP) soundings to evaluate relative soil density/consistency characteristics. With the DCP, a 1½-inch diameter cone is seated to penetrate any loose cuttings, and then driven in 1¾-inch increments with blows from a 15 pound weight falling 20 inches. The number of blows required to drive the cone the 1¾-inch increments is an index of relative soil strength and compressibility. Samples from both the soil test soundings and hand auger borings were visually classified by GeoCon, Inc. personnel, placed in containers and transported to our laboratory for further testing and for further review by our engineering staff. Samples will be retained at our lab for a period of 60 days after the date of this report. If no written instructions are given to GeoCon, we will discard the samples after 60 days.

3.0 Soil Conditions Encountered

In general, the test soundings and borings initially encountered about 10 to 12 inches of organic topsoil material. Below the topsoil material, the test soundings and borings encountered fine-grained silty-clayey sand and silty sand soils to depths of about 4 to 4½ feet below the existing ground surface. Below depths of about 4 to 4½ feet, the soundings encountered a layer of sand stone/iron rock followed by cohesive sandy clay soils to depths of about 15 to 16 feet below the existing ground surface. Below depths of about 15 to 16 feet, the soundings penetrated non-cohesive sand soils with varying amounts of silt to sounding termination at depths of about 20 feet below the existing ground surface.

Correlated N-Values indicated that the soils penetrated in the upper 3 to 4 feet of the soil-profile were in a loose condition. The deeper soils encountered were generally in a firm to very firm condition. The soil conditions encountered are described in more detail on the Boring Logs and CPT Sounding Logs attached in the Appendix.

4.0 Ground Water Conditions Encountered

During our August 2019 field exploration, ground water was encountered at depths of about 12½ to 14 feet at the sounding locations. "Perched ground water" was encountered at borings B-2 and B-15 at depths of about 1½ to 3½ feet. Ground water conditions are subject to seasonal variations and are expected to fluctuate in response to local variations in precipitation and drainage conditions. Considering the relatively short time frame of the field exploration, ground water levels may not have had sufficient time to stabilize. Therefore, actual depths to ground water may vary. Based on the test data, we do not anticipate that natural ground water will affect shallow foundation construction. However, the contractor should be aware that the fine-grained subgrade soils at this site are prone to creating and holding near-surface "perched ground water" following rain events. During our preliminary subsurface investigation at the site in June 2019, "perched ground water" was encountered in the proposed building area at depths of about 2 to 3 feet below the existing ground surface.

5.0 Laboratory Testing

The soil samples taken from the site were visually classified in general accordance with the guidelines of ASTM D-2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). The quantity and type of laboratory tests performed for this geotechnical study were determined and adjusted by GeoCon engineering personnel based on the uniformity and characteristics of the subsurface soil conditions encountered and our experience and knowledge of local soil conditions.

Laboratory soil tests were performed to aid in the classification of the soils and to help in the evaluation of engineering characteristics of the soils. Representative soil samples recovered from the soil test soundings and borings were selected for grain-size analysis (8 tests) and Atterberg limit determination (8 tests).

6.0 Site Preparation Recommendations

6.1 General Site Preparation

Areas beneath and 5 feet beyond the building footprints and 2 feet beyond pavements should be designated as "controlled areas". The widely-spaced borings and soundings encountered about 10 to 12 inches of organic topsoil material. The subgrade soils to a depth of about 3 to 4 feet below the existing ground surface were in a loose condition. We recommend that the initial phase of site preparation include a level 24 inch undercut to completely remove surface vegetation, organic topsoil and soft near-surface soils, etc. from within the building pads.

We recommend that the pavement controlled areas be undercut to a depth of at least 12 inches or to a depth that will allow for placement of 18 inches of structural fill below the bottom of the base course (whichever undercut depth is deeper). Some additional undercut may be required in isolated areas to remove old tree stumps, root ball systems, organic material or pockets of unsuitable soils (if any). A GeoCon representative should be present to observe the initial undercut process and make additional undercut recommendations as needed. Debris should be properly disposed of beyond the "controlled areas" or off-site.

Following the minimum undercut along with the removal of organic topsoil, debris, unsuitable soils, etc., the exposed subgrade should be proof-rolled with a static smooth drum roller. The exposed subgrade and proof-roll tests should be observed by a GeoCon earthwork technician. Subgrade soils that exhibit excessive rutting or pumping should be undercut as per the recommendation of the project geotechnical engineer of record. The resulting excavation should be backfilled with structural fill that meets the requirements outlined in Section 6.4 of this report.

> Note: The amount of rain that the site receives prior to and during site grading/foundation construction will directly impact the condition of the subgrade soils and the amount of subgrade processing and/or undercut required to provide a

stable subgrade to support the planned construction. We also recommend that low ground pressure track mounted equipment be used in the topsoil removal and general site preparation. The use of heavy rubber tire equipment will deteriorate the subgrade soil conditions and increase the risk for excessive rutting or pumping.

6.2 Unit Costs

Considering the fine-grained and moisture sensitive subgrade soils at this site, we recommend that the contract documents establish a unit cost (per cubic yard) for undercutting and replacing unsuitable soils. We recommend that the budget account for some additional undercut beyond the initial excavation. An additional undercut quantity of about 2,500 cubic yards in-place could be used for potential additional undercut in the building and pavement areas.

6.3 Site Drainage

Positive drainage should also be established during the early stages of site grading and maintained throughout the project construction process. The "controlled areas" should be maintained in a well-drained condition that will promote the continual removal of surface water that may flow over the construction areas. This drainage is critical for the fine-grained soils that are predominate at the site. Saturation of subgrade soils can result in substantial time delays in construction and significant decreases in soil strengths. During construction (both site grading and building), the contractor should exercise caution during inclement weather to ensure the subgrade and structural fill courses are not degraded by construction traffic. Water should not be allowed to pond against the buildings during and following construction. Ponding water adjacent to the building foundations can lead to settlement due to deterioration of the foundation bearing soils.

6.4 Placement of Structural Fill

The undercut excavations should be replaced with select sand fill and capped with structural fill. The select sand fill should exhibit less than 50% passing the No. 50 sieve and less than 10% passing the No. 200 sieve (fines). The select sand fill layer should be placed in an 18 inch thick loose lift and compacted to 95% ASTM D-698 standard density by "tracking" the material in with low ground pressure tracked equipment (to prevent pumping of the underlying saturated material). The remaining lifts of fill required to achieve final subgrade elevations should consist of approved structural fill meeting the following minimum requirements:

1) Exhibit SM classification according to the Unified Soil Classification System
2) Have a minimum of 12% to maximum of 20% soil fines passing the No. 200 sieve
3) Have a maximum Liquid Limit (LL) of 25%
4) Have a Plasticity Index (PI) less than 2%
5) Have a minimum standard Proctor (ASTM D-698) maximum dry density of 110 pcf

Structural fill should be placed in 8 inch loose lifts and compacted to 98% ASTM D-698 standard compaction at moisture contents within +/- 3% of the material's optimal moisture content. Once the surface of each lift of structural fill is ready for the next lift, the exposed soil should be maintained at the placed moisture content until the next lift of fill is placed. The surface of the lifts should not be exposed to weather, especially drying, for an extended period of time.

6.5 Weather Considerations

Again, weather conditions at the time of site preparation will directly impact earthmoving activities. Exposed subgrade soils and structural fill soils can be expected to degrade during wet weather conditions. Additional soil processing/drying efforts and/or additional undercuts are typically required during wet weather conditions.

6.6 Testing Requirements

The geotechnical consultant should monitor and document the results of the topsoil stripping, debris removal, subgrade proof-rolling, correction of weak soil conditions and the conditions of the final subgrades, foundation construction, and floor slab bearing soils.

During fill placement, field density testing should be performed to confirm that the specified compaction criteria is being achieved. We recommend that at least 1 compaction test per 2,500 square feet be performed for each lift of fill in the building areas and at least 1 test per 5,000 square feet be performed in the pavement areas. Sufficient samples of on-site soils should be collected for Proctor compaction tests to provide the moisture-density relationships needed for compaction control. Sufficient samples of structural fill materials also should be submitted by the contractor for classification and Proctor density tests to show substantial compliance with the specifications and to provide the moisture-density relationships needed for compaction control. It is important that proper quality assurance testing be performed during site grading.

A minimum of one field density test should be performed per each 150 linear feet (per each 2 ft. of vertical thickness) of fill placed at utility trenches extending through the "controlled areas". Current OSHA regulations should be followed with respect to excavations for this project. Heavy construction traffic and stockpiling of excavated earth should not be permitted near the top of open unsupported excavations.

7.0 Shallow Foundation Recommendations

Foundation Design. Provided the building "controlled areas" are prepared in accordance with this report, the proposed buildings can be supported by typical reinforced concrete spread foundations bearing at shallow depths in properly compacted native soils or structural fill. Foundations can be designed using a net allowable soil bearing pressure up to 1,500 psf. The allowable soil bearing pressure applies to dead loads plus design live loads. The allowable soil bearing pressure may be increased by one-third when considering total loads that include

transient loads such as wind and seismic. Perimeter wall foundations should bear at a minimum depth of 18 inches below finished subgrade levels. The bottom of interior foundations should bear at a minimum depth of 12 inches below the top of the concrete floor slabs.

Lateral and uplift loads can be resisted by passive pressure of the soil acting against the side of the individual footings and/or the friction developed between the base of the footings and the underlying soil. For compacted backfill and firm native soils, the passive pressure may be taken as the equivalent to the pressure exerted by a fluid weighing 300 pounds per cubic foot (pcf). A coefficient of friction equal to 0.32 may be used for calculating the frictional resistance at the base of spread footings. These lateral resistance values are based on the assumption that the foundations can withstand horizontal movements on the order of ¼ inch. Spread foundation depths can be increased for uplift resistance as required. A soil unit weight of 100 pcf can be used for backfill atop foundations.

Provided foundations bear atop properly compacted soils, we anticipate that total settlements will be less than about one inch. We anticipate that differential settlements will be less than about ½ inch.

The "frost penetration" depth in the area of this project is generally taken to be less than 10 inches. Provided our recommendations for the development of the foundations, floor slabs and pavements are followed, we do not expect that the "frost penetration" will have any detrimental effects on the performance of foundations or floor slabs.

Foundation Construction. Following foundation excavation, the footing bearing soils should be thoroughly compacted with mechanical compaction equipment prior to placement of reinforcing steel (rebar) and concrete. Footing bearing soils should be compacted to at least 95% standard density. Proper compaction of footing bearing soils is important to help limit excessive foundation settlement.

GeoCon, Inc. should be called to observe and perform compaction testing on the footing excavations prior to the placement of reinforcing steel (rebar) and concrete to determine if the bearing soils are satisfactory for support of the foundations. Excessively loose footing bearing soils will require re-compaction or stabilization as per the recommendations of GeoCon's geotechnical engineer.

We recommend that all footing excavations be extended to final grade and the footings constructed as soon as possible to reduce the potential for disturbance of the bearing soils. The foundation bearing area should be level or suitably benched and be free of loose soil, ponded water, mud and debris.

Soils exposed in the bottom of all satisfactory excavations should be protected against disturbance, excessive drying, freezing or rain. Surface runoff should be drained away from excavations and not allowed to pond. The saturation of soils at the footing bearing elevation level can reduce their strength and load carrying ability. Foundation concrete should not be placed on soils that have been disturbed by ground water seepage or rain water. If the bearing soils are softened by ground water intrusion or exposure, the softened soils must be

removed from the foundation excavation bottom prior to placement of concrete. Concrete for foundations should be placed as soon after completion of the excavations as possible. If a delay in concrete placement is expected or if exposed to wet weather, a 2 to 3 inch "mud mat" consisting of lean concrete should be placed in the footing excavations to protect the bearing soils.

8.0 Ground Floor Slabs

The subgrade soil beneath all ground supported floor slabs should consist of properly compacted structural fill as described in the Grading Section of this report. A plastic vapor barrier should be installed over the subgrade prior to installation of the floor slab. The plastic vapor barrier should be properly lapped and all joints and intrusions properly taped and sealed. Special attention should be given to properly compacting utility trenches in the building areas. Utility trenches below the slab areas should be compacted to 95% ASTM D-698 standard density.

9.0 Pavements

9.1 Pavement Subgrade

The pavement grading section of this report has described the grading of pavement areas to finished subgrade levels. We understand that the project includes typical standard-duty parking areas (passenger vehicles) and medium-duty access drives. The pavement recommendations provided below are based on a low volume of passenger vehicles (standard-duty traffic) and typical delivery truck traffic (medium-duty).

The recommended site and subgrade preparation outlined in this report should be followed in the pavement areas. Prior to base placement, subgrade improvements should also include thoroughly mixing the top 6 inches of exposed soil throughout and 3 feet beyond the pavement areas to form a relatively uniform layer. This mixed soil layer should be compacted to 100% ASTM D-698 standard density. Drainage improvements at subgrade levels should include slopes, 2% minimum, which are designed to discharge water (which may tend to pond over the subgrade) toward low collection points which are provided with positive relief to side drainage ditches or buried storm drainage. Areas which exhibit unsuitable materials or which fail to compact properly should be corrected as per the geotechnical consultant's recommendations.

9.2 Asphalt Pavement

We anticipate the proposed access drive areas will be subject to medium-duty traffic conditions. The following medium-duty pavement build-up could be used for this project:

Medium-Duty Asphalt Pavement Section

1"	ALDOT Section 424A, Bituminous Wearing Surface (110 lb/sy)
-	ALDOT Section 405 Tack Coat
2"	ALDOT Section 424B, Bituminous Binder (220 lb/sy)
6"	ALDOT Section 825 Crushed Aggregate Base Material (100% standard density)
18"	A-2-4 Structural Fill (top 6 inches compacted to 100% standard density)

The following standard-duty pavement build-up could be used in areas subject to light-duty traffic (passenger vehicle parking areas):

Standard-Duty Asphalt Pavement Section

2"	ALDOT Section 424A, Bituminous Wearing Surface (220 lb/sy)
6"	ALDOT Section 825 Crushed Aggregate Base Material (100% standard density)
18"	A-2-4 Structural Fill (top 6 inches compacted to 100% standard density)

Provided the moisture content of the base layer is at or within 2% above the base material's optimal moisture content at the time of paving, a prime coat over the base is not required. The 6 inch layer of crushed aggregate base course could be replaced with 8 inches of granular base ("Sand/Clay") material; however, we highly recommend that crushed aggregate base be considered for this project. Periodic maintenance should be performed on the pavement section to help pro-long the pavement's life-span.

9.3 Concrete Pavement

Standard-duty Portland Cement Concrete (PCC) pavement could be used in the building apron area, in the dumpster pad and approach areas. We also recommend that concrete be considered for pavement areas subjected to truck turning or prolonged parking. Final PCC pavement grades should be adequately sloped for positive drainage. Subgrade below concrete pavement areas should be prepared in accordance with the grading section of this report to include 18 inches of compacted structural fill.

Standard-Duty Concrete Pavement Section

7" Portland Cement Concrete - 4,000 psi minimum compression strength
Minimal 500 psi flexural strength

18" A-2-4 Structural Fill (top 6 inches compacted to 100% standard density)

Final pavement grades should be adequately sloped for positive drainage. Subgrade below concrete pavement areas should be prepared in accordance with the Grading Section of this report. PCC pavements should be placed at a slump of 4 inches or less.

Joints should be installed in the PCC pavements to limit stresses resulting from expansion and contraction. Contraction joints should be formed by sawing as soon as the concrete has hardened enough to prevent raveling. These joints should extend to a depth of at least ¼ inch of the pavement thickness and be placed on a 12 to 15 foot spacing. The design and location of all pavement joints should be in accordance with recommendations of the Portland Cement Association (PCA) and ACI 330.

Isolation joint material should comply with ASTM D-1571 or D-1752. The upper one inch of the joint material should be removed and the joint sealed with a self-leveling elastomeric joint sealant immediately after the curing period and prior to opening to traffic. Construction joints should be properly cleaned and sealed with the same type of joint sealant. Dowel sizing and spacing for construction joints should conform to the recommendations of ACI 330.

9.4 Exposed Aggregate Parking Area

We also understand that some of the parking and access drive areas may consist of exposed gravel. The subgrade in these areas should be treated the same as the other pavement sections including compacting the top 6 inches of subgrade to 100% standard density. We also recommend that the gravel areas consist of at least 6 inches of compacted aggregate base material and that a Geotextile separation fabric (similar to Mifari 500X) be placed between the compacted final subgrades and aggregate material in the exposed areas.

10.0 Closure

This report has been prepared for the exclusive use of the City of Orange Beach, Sawgrass Consulting, LLC (project Civil Engineers) and their project design professionals for specific application to the above referenced project in accordance with generally accepted current standards of geotechnical engineering practice common to the local area.

The comments and recommendations of this report provide manageable and reasonable solutions to the advancement of the project based on the collected test data and the provided design information. Significant changes in site conditions or project design may result in

alternative solutions to the design required or may permit more manageable and economical construction techniques. Should such significant changes occur, we will be available to offer supplemental comment.

The comments and recommendations of this report are based upon our interpretation of the information supplied by the client, the data collected at the five (5) CPT soundings, the sixteen (16) hand auger borings and the site conditions observed at the time of testing. A significant amount of interpolation was necessary. Because it is not possible to know or predict detailed conditions hidden beneath the ground surface, our comments and recommendations are presented as opinions and judgements, as opposed to statements of fact.

Improper site preparation, extremes in climatic conditions, significant changes in grade, time, etc., can affect the ground water, surface and subsurface conditions. If conditions are encountered as the construction advances which vary significantly from those described by this report, we should be contacted for additional comment.

We have not intended to reflect specific volumes of subsurface conditions at the site. Volumetric estimates often require a large number of borings placed on a close grid with the collected data associated with civil engineering cross-sections. If volume estimates are required of us for the design/development of this project to advance, please contact us for further comment.

Again, we appreciate the opportunity to provide our geotechnical engineering services for this project. To ensure that our recommendations are correctly interpreted and followed during construction, we recommend that the owner retain GeoCon, Inc. to provide construction observation and construction materials testing for the project.

APPENDIX

Figure 1	NOT TO SCALE **SITE LOCATION MAP** Proposed Orange Beach Public Works Roscoe Road Orange Beach, AL DL 1813-19	***GEOCON, INC.*** 22885 McAuliffe Drive Robertsdale, Alabama 36567
Date 8/9/2019		

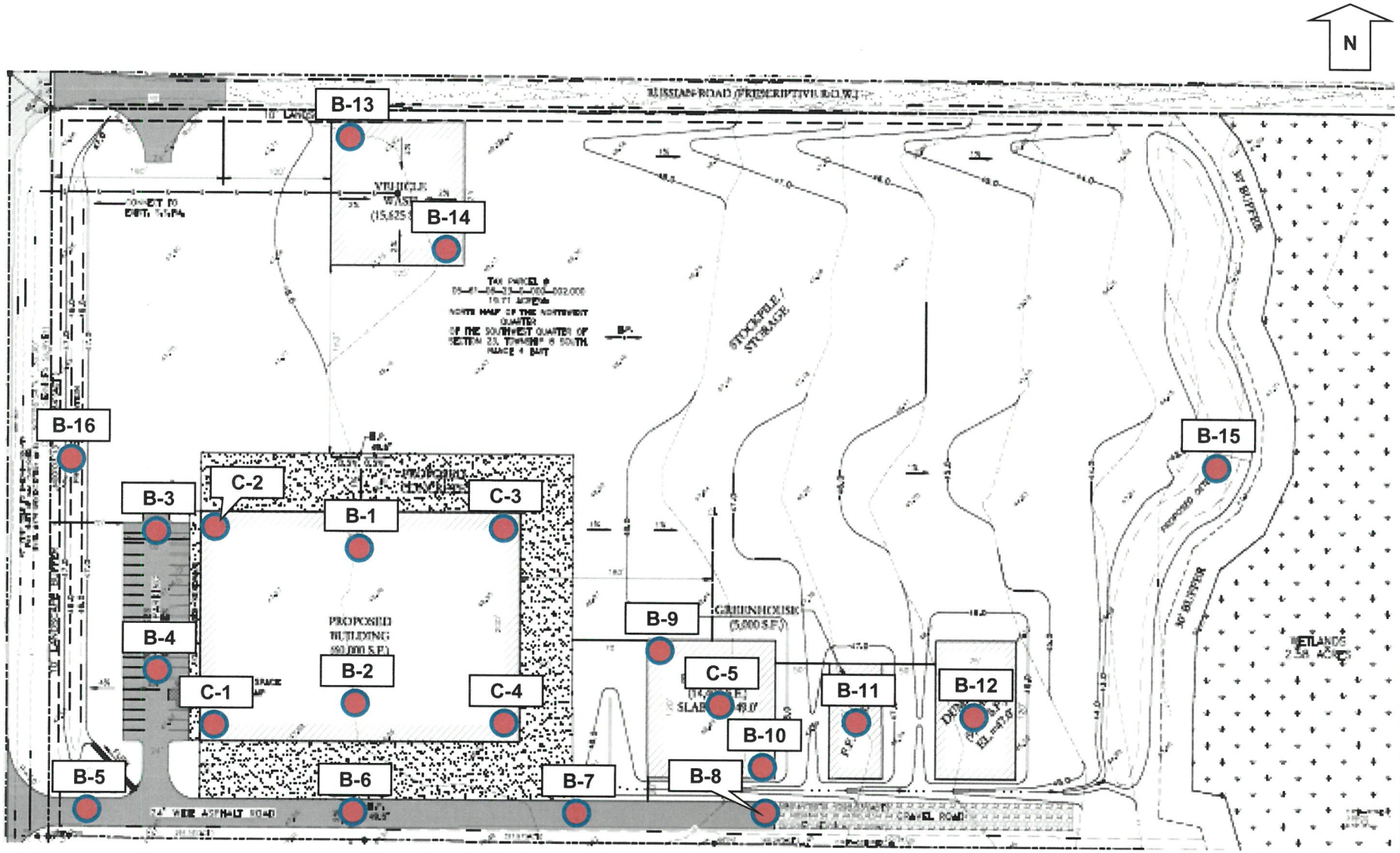
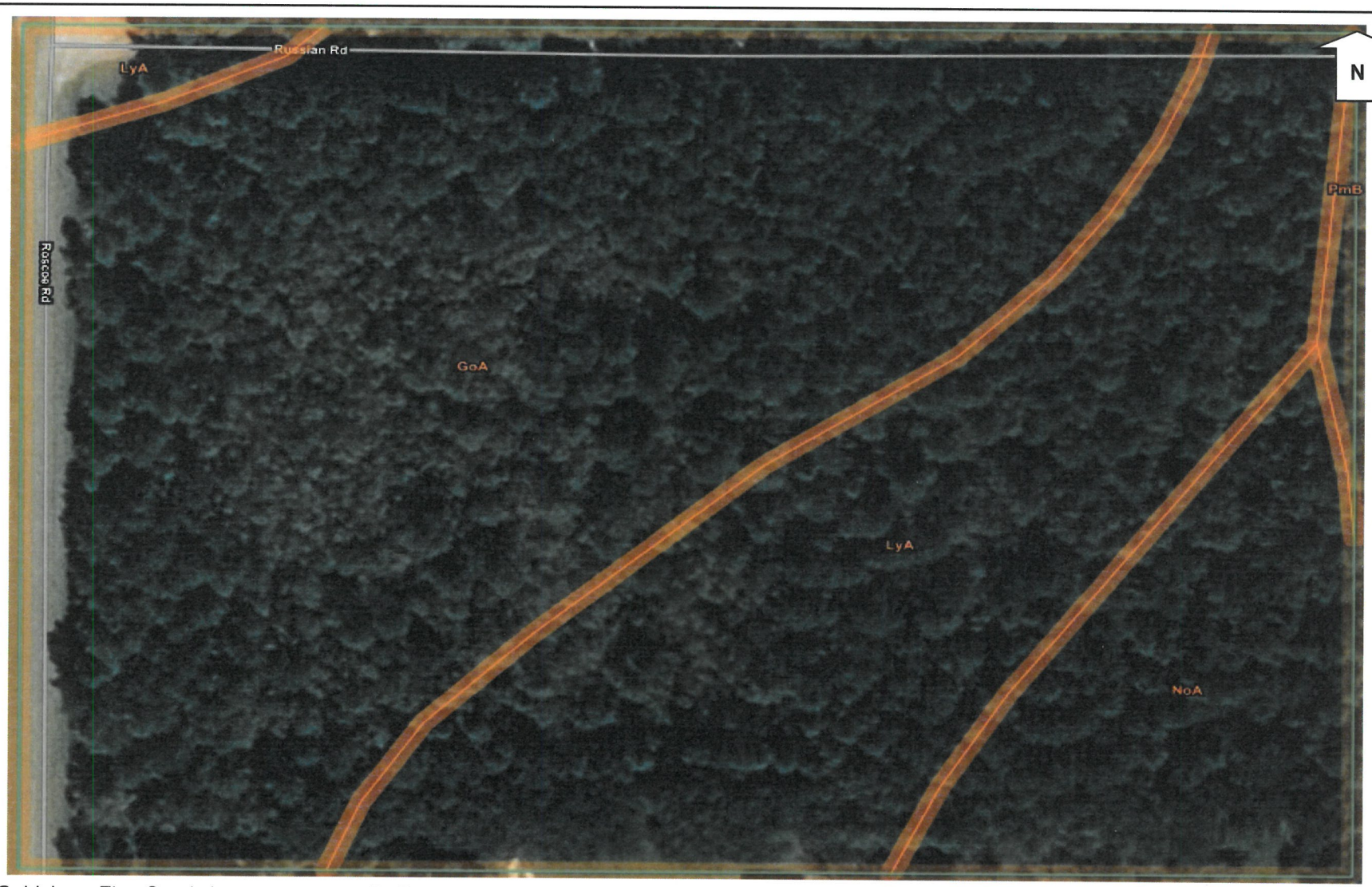


Figure 2	NOT TO SCALE **TEST LOCATION PLAN** Proposed Orange Beach Public Works Roscoe Road Orange Beach, AL DL 1813-19	***GEOCON, INC.*** 22885 McAuliffe Drive Robertsdale, AL 36567
Date 8/9/2019		



GoA- Goldsboro Fine Sandy Loam

LyA- Lynchburg Fine Sandy Loam

NoA- Norfolk Fine Sandy Loam

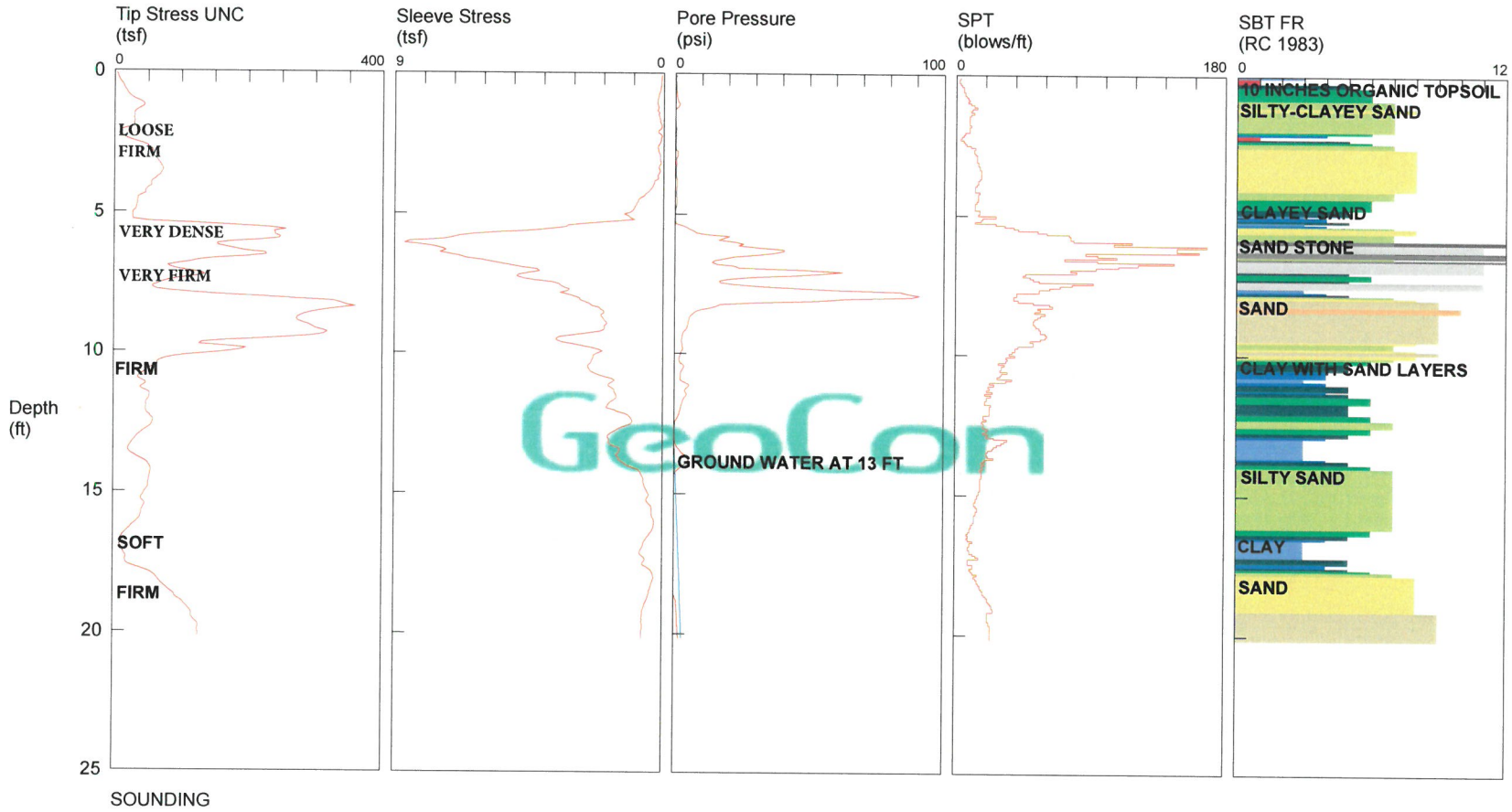
PmB- Lummer Loamy Sand

Figure 3 Date 8/9/2019	NOT TO SCALE **Published Soil Survey Map** **Proposed Orange Beach Public Works** Orange Beach, AL	***GEOCON, INC.*** 22885 McAuliffe Drive Robertsdale, AL 36567

C-1

CPT Testing Done By: GeoCon
Proposed : Orange Beach Public Works
CUSTOMER: City of Orange Beach
LOCATION: Orange Beach, AL
HOLE NUMBER: C-1

JOB NUMBER: DL 1813-19
TEST DATE: 8/12/2019
OPERATOR: Chris Rea



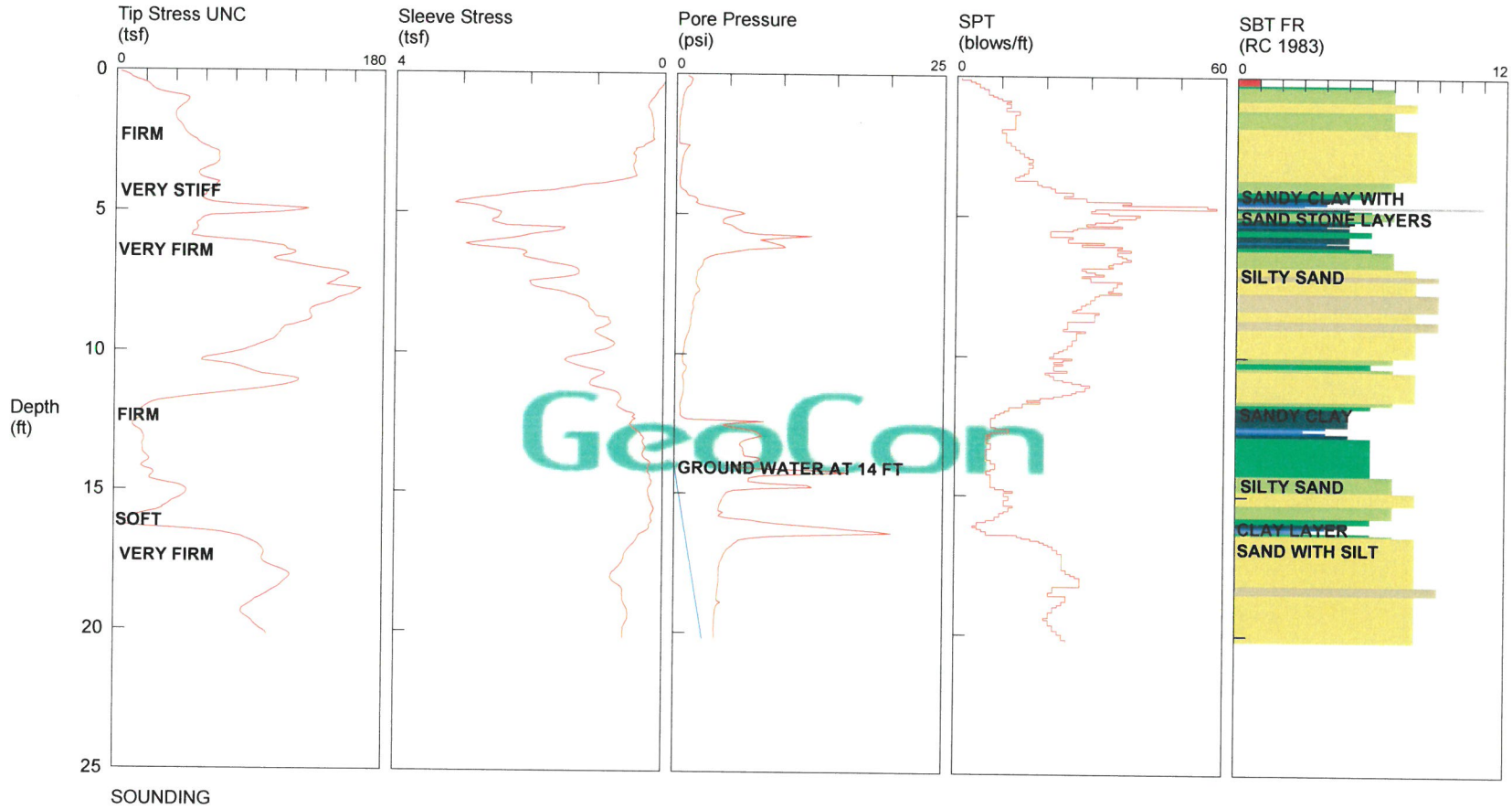
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

C-2

CPT Testing Done By: GeoCon
Proposed : Orange Beach Public Works
CUSTOMER: City of Orange Beach
LOCATION: Orange Beach, AL
HOLE NUMBER: C-2

JOB NUMBER: DL 1813-19
TEST DATE: 8/12/2019
OPERATOR: Chris Rea



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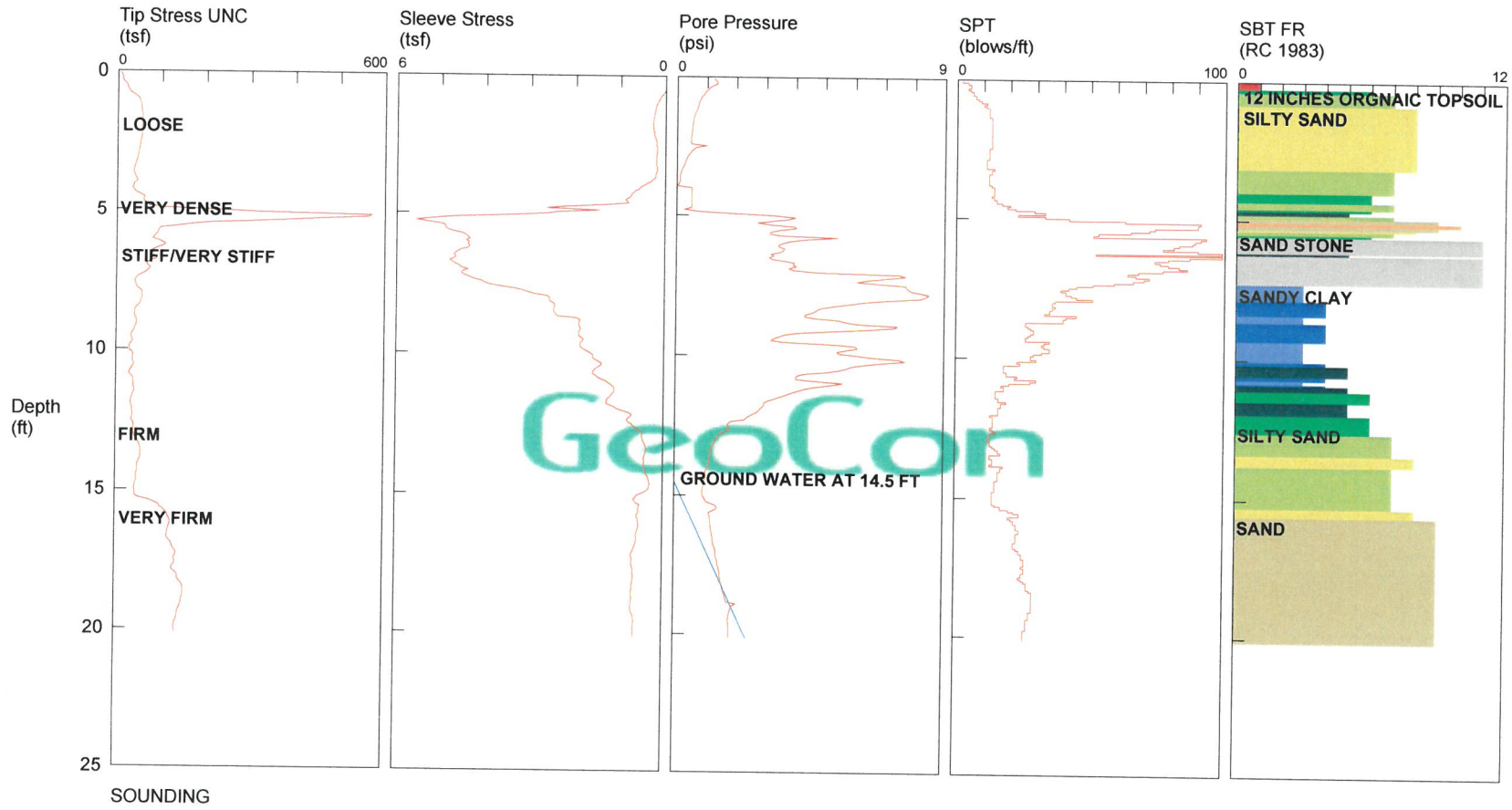
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

C-3

CPT Testing Done By: GeoCon
Proposed : Orange Beach Public Works
CUSTOMER: City of Orange Beach
LOCATION: Orange Beach, AL
HOLE NUMBER: C-3

JOB NUMBER: DL 1813-19
TEST DATE: 8/12/2019
OPERATOR: Chris Rea



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10 gravelly sand to sand
11 very stiff fine grained (*)
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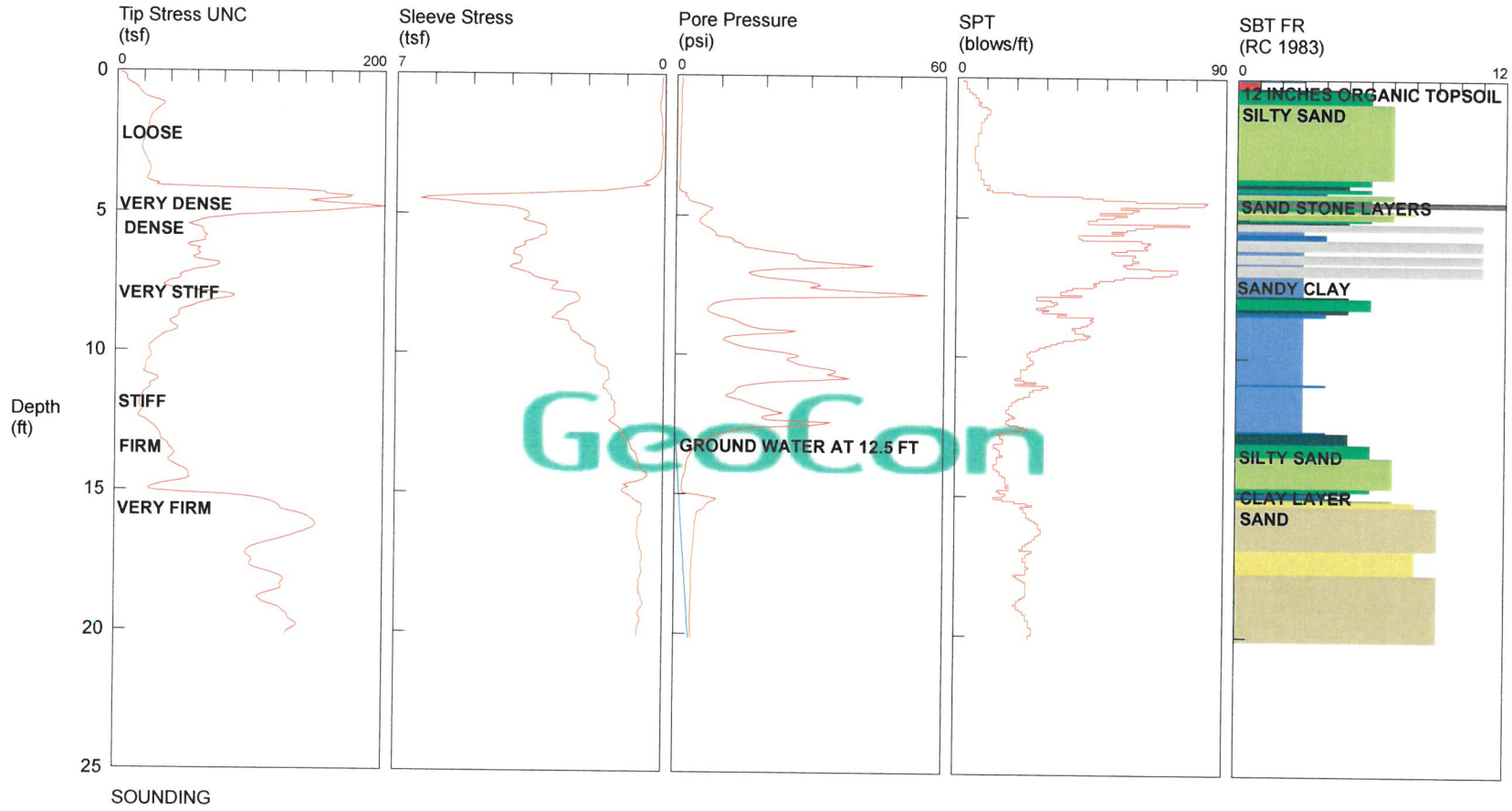
*SBT/SPT CORRELATION: UBC-1983

C-4

CPT Testing Done By: GeoCon
Proposed : Orange Beach Public Works
CUSTOMER: City of Orange Beach
LOCATION: Orange Beach, AL
HOLE NUMBER: C-4

JOB NUMBER: DL 1813-19
TEST DATE: 8/12/2019
OPERATOR: Chris Rea



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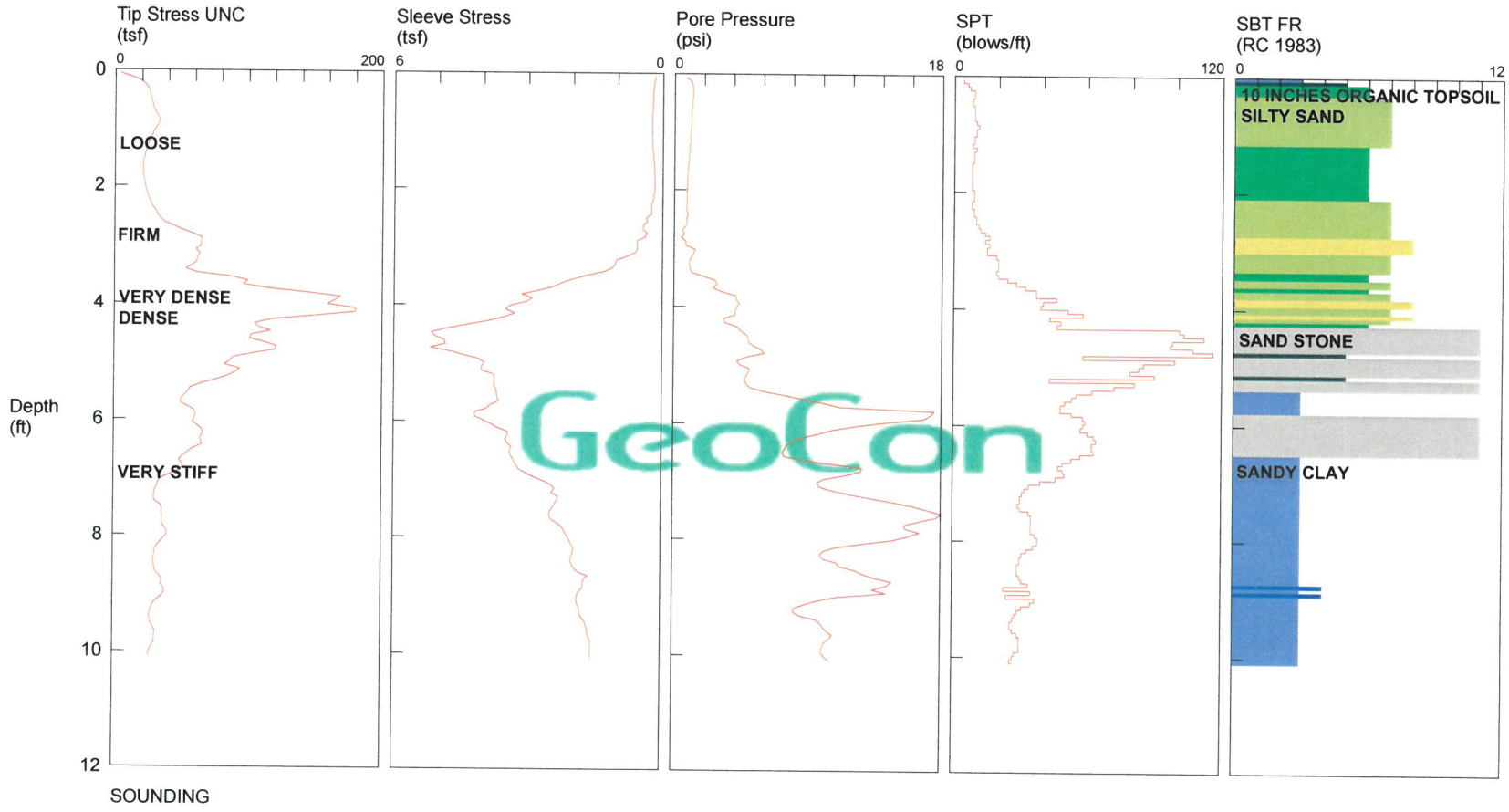
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

C-5

CPT Testing Done By: GeoCon
Proposed : Orange Beach Public Works
CUSTOMER: City of Orange Beach
LOCATION: Orange Beach, AL
HOLE NUMBER: C-5

JOB NUMBER: DL 1813-19
TEST DATE: 8/12/2019
OPERATOR: Chris Rea



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10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

DRILL HOLE LOG
BORING NO.: B-1

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				10 Inches Organic Topsoil					
1			SM	Tan, Gray Silty Sand, Loose				5	●
2									
3			SM	Tan Silty Sand with Iron Rock					
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-2

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : 1.5 AT COMPLETION ▽ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				10 Inches Organic Topsoil					
1		▽	SM	Gray, Tan Silty Sand, Loose Perched Water at 1.5 ft				4	●
2									
3			SM	Tan, Gray Silty Sand with Iron Rock					
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-3

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				10 Inches Organic Topsoil					
1			SM	Tan, Gray Silty Sand, Loose				8	
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-4

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				12 Inches Organic Topsoil					
1			SM	Gray, Tan Silty Sand, Loose				9	
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-5

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				12 Inches Organic Topsoil					
1			SM	Tan Silty Sand, Loose				9	
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-6

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				10 Inches Organic Topsoil					
1			SM	Gray, Tan Silty Sand, Firm				10	
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-7

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				6 Inches Organic Topsoil					
1			SM	Tan, Gray Silty Sand, Loose				8	●
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-8

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				12 Inches Organic Topsoil					
1			SM	Tan Silty Sand, Loose				8	
2									
3			SM	Tan Silty Sand with Iron Rock					
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-9

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				10 Inches Organic Topsoil					
1			SM	Tan Silty Sand, Loose				9	
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-10

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				8 Inches Organic Topsoil					
1			SM	Tan, Gray Silty Sand, Loose				9	
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-11

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				10 Inches Organic Topsoil					
1			SC-SM	Tan Silty-Clayey Sand, Loose				4	●
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-12

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				12 Inches Organic Topsoil					
1			SM	Tan Silty Sand, Loose				6	●
2			SM	Tan Silty Sand with Iron Rock					
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-13

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				12 Inches Organic Topsoil					
1			SM	Tan Silty Sand, Loose				8	
2									
3			SM	Tan Silty Sand with Iron Rock					
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-14

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE (10 30 50)
0				14 Inches Organic Topsoil					
1			SM	Gray, Tan Silty Sand with Iron Rock, Loose				5	●
2									
3									
4				Boring Terminated at 4 ft					
5									
6									
7									

"N Value" Equal to DCP Soundings

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-15

PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : 3.5 AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST N	STANDARD PENETRATION TEST CURVE 10 30 50
0				10 Inches Organic Topsoil					
1			SM	Gray Silty Sand					
2									
3		▽		Perched Water at 3.5 ft					
4				Boring Terminated at 4 ft					
5									
6									
7									

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-16

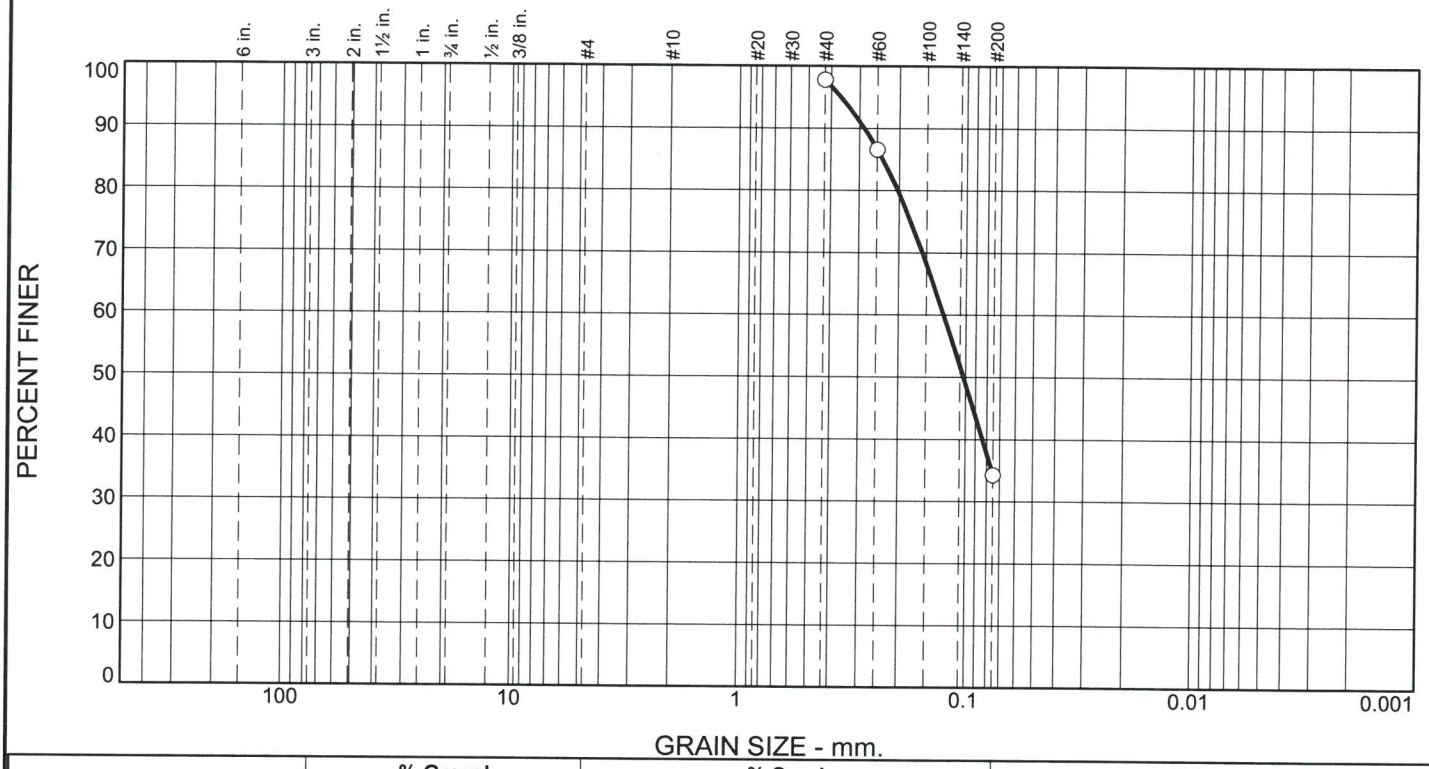
PROJECT: Proposed Orange Beach Public Works
CLIENT: City of Orange Beach
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ :

PROJECT NO.: DL 1813-19
DATE: 8/13/2019
ELEVATION:
LOGGED BY: Jason Christian

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				10 Inches Organic Topsoil					
1			SM	Tan Silty Sand					
2									
3			SC	Tan Clayey Sand with Iron Rock					
4				Boring Terminated at 4 ft					
5									
6									
7									

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					63.5	34.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	97.8		
#60	86.6		
#200	34.3		

* (no specification provided)

Material Description

Tan Silty-Clayey Sand

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 23 PI= 5

Classification

USCS (D 2487)= SC-SM AASHTO (M 145)=

Coefficients

D_{90}= 0.2854 D_{85}= 0.2365 D_{60}= 0.1257
D_{50}= 0.1023 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title:

Location: Orange Beach, AL
Sample Number: C-1 **Depth:** 2 ft

Date Sampled:

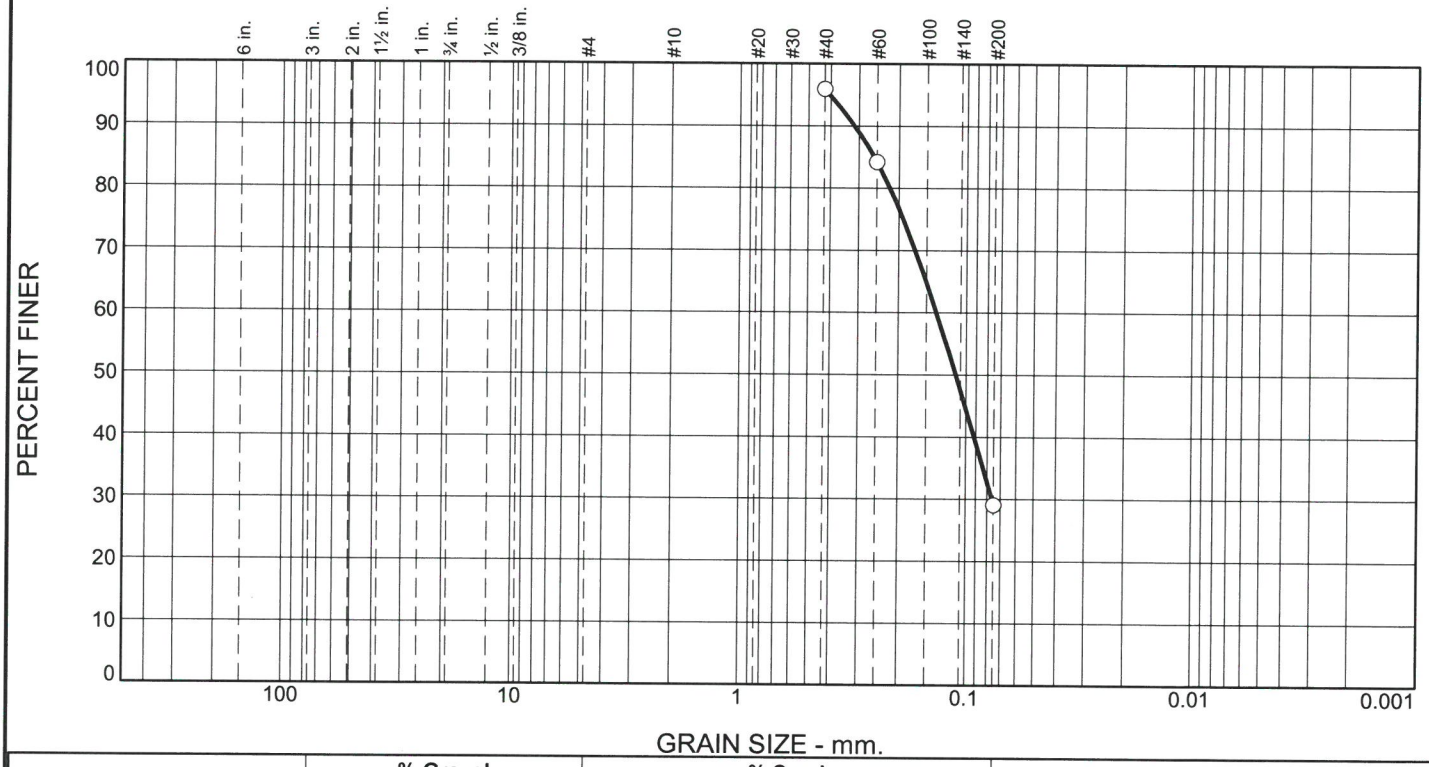
GeoCon

Robertsdale, Alabama

Client: City of Orange Beach
Project: Proposed Orange Beach Public Works

Project No: DL 1813-19 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					66.8	29.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	95.9		
#60	84.2		
#200	29.1		

* (no specification provided)

Material Description

Gray Silty Sand

Atterberg Limits (ASTM D 4318)

PL= 16 LL= 18 PI= 2

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 0.3144 D_{85}= 0.2570 D_{60}= 0.1359
D_{50}= 0.1112 D_{30}= 0.0763 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: _____ **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title: _____

Location: Orange Beach, AL
Sample Number: C-4 **Depth:** 2 ft

Date Sampled:

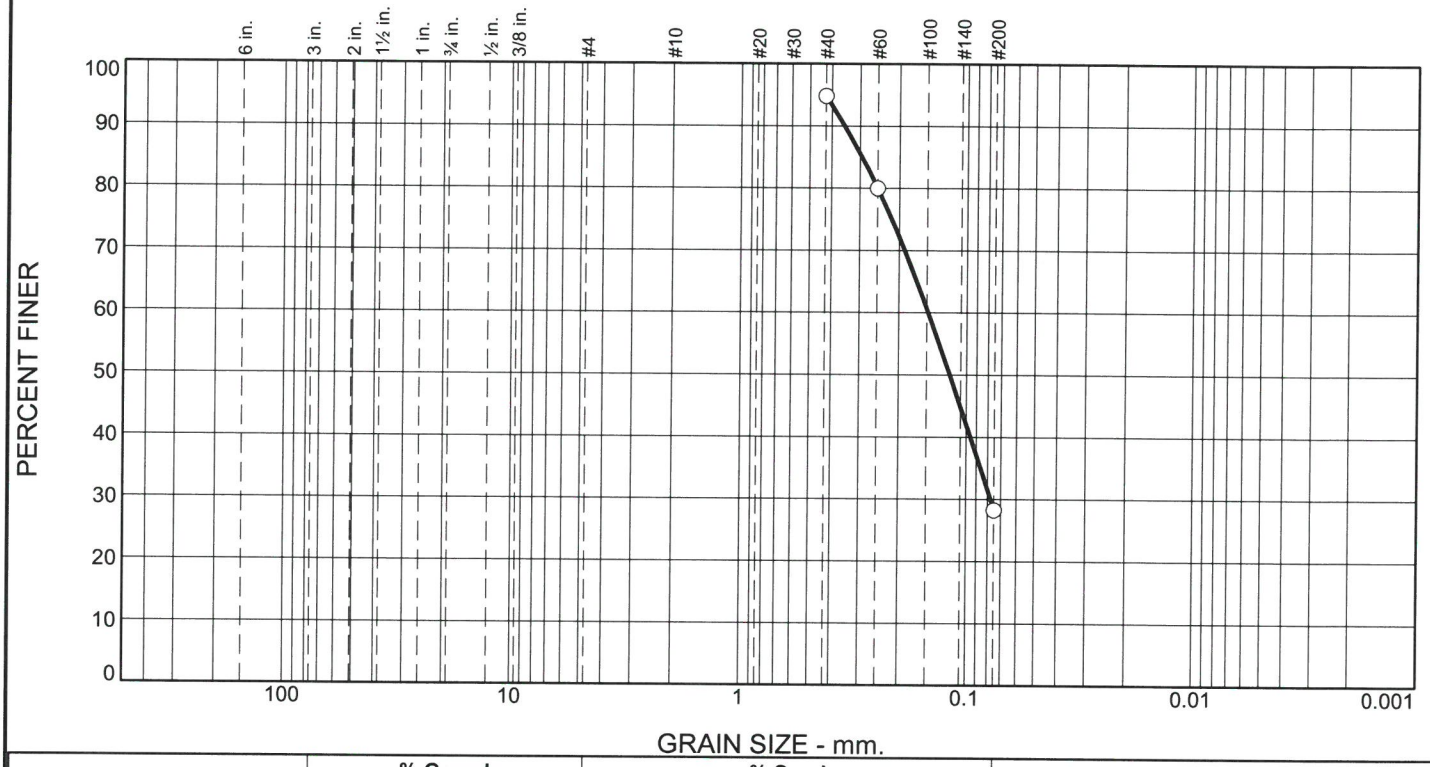
GeoCon

Robertsdale, Alabama

Client: City of Orange Beach
Project: Proposed Orange Beach Public Works

Project No: DL 1813-19 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					66.6	28.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	94.8		
#60	80.0		
#200	28.2		

* (no specification provided)

Material Description

Gray Silty Sand

Atterberg Limits (ASTM D 4318)

PL= 15 LL= 17 PI= 2

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 0.3528 D_{85}= 0.2943 D_{60}= 0.1484
D_{50}= 0.1186 D_{30}= 0.0778 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title:

Location: Orange Beach, AL
Sample Number: C-5 **Depth:** 4 ft

Date Sampled:

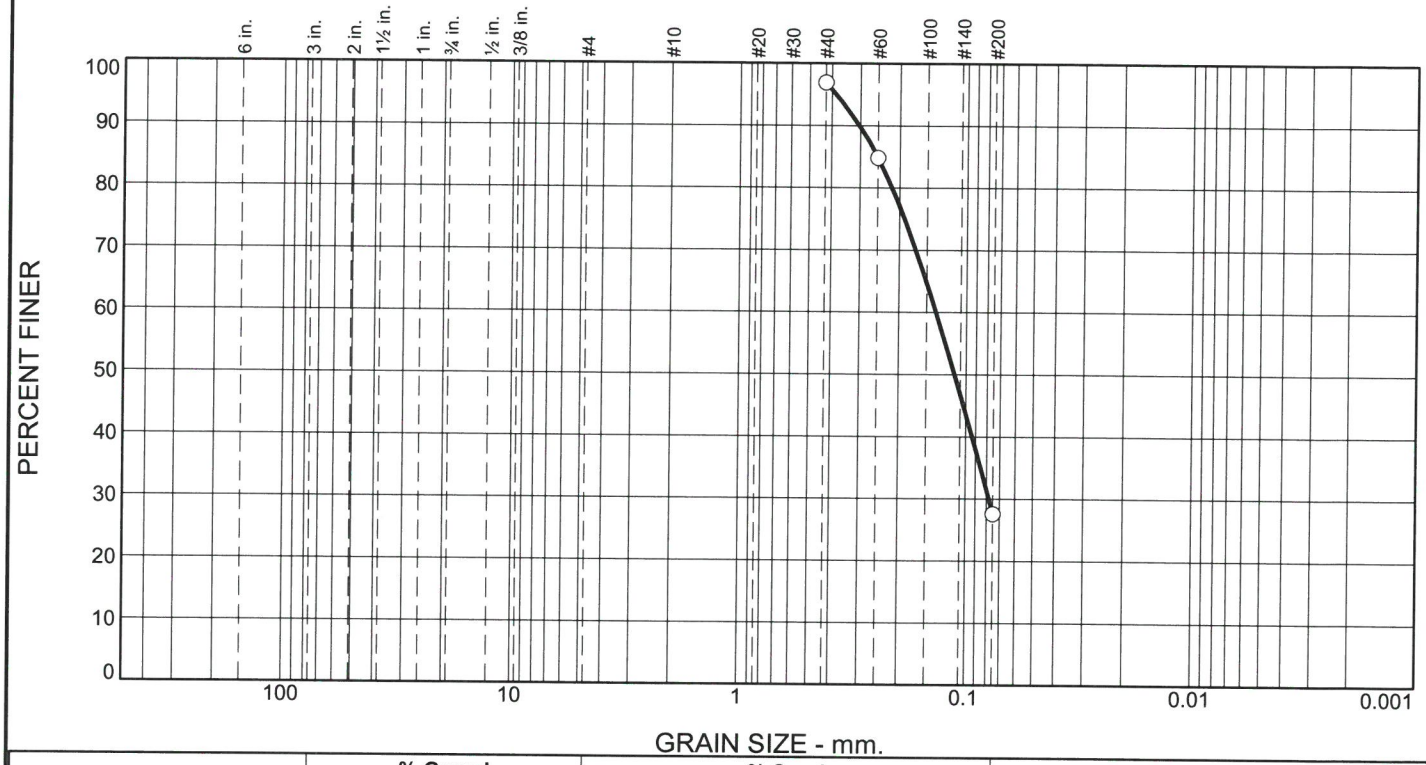
GeoCon

Robertsdale, Alabama

Client: City of Orange Beach
Project: Proposed Orange Beach Public Works

Project No: DL 1813-19 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					69.3	27.6	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	96.9		
#60	84.8		
#200	27.6		

* (no specification provided)

Material Description

Tan, Gray Silty Sand

Atterberg Limits (ASTM D 4318)

PL= 13 LL= 15 PI= 2

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 0.3035 D_{85}= 0.2515 D_{60}= 0.1367
D_{50}= 0.1126 D_{30}= 0.0782 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title:

Source of Sample: B-1 **Depth:** 1.5

Sample Number: 1

Date Sampled:

GeoCon

Robertsdale, Alabama

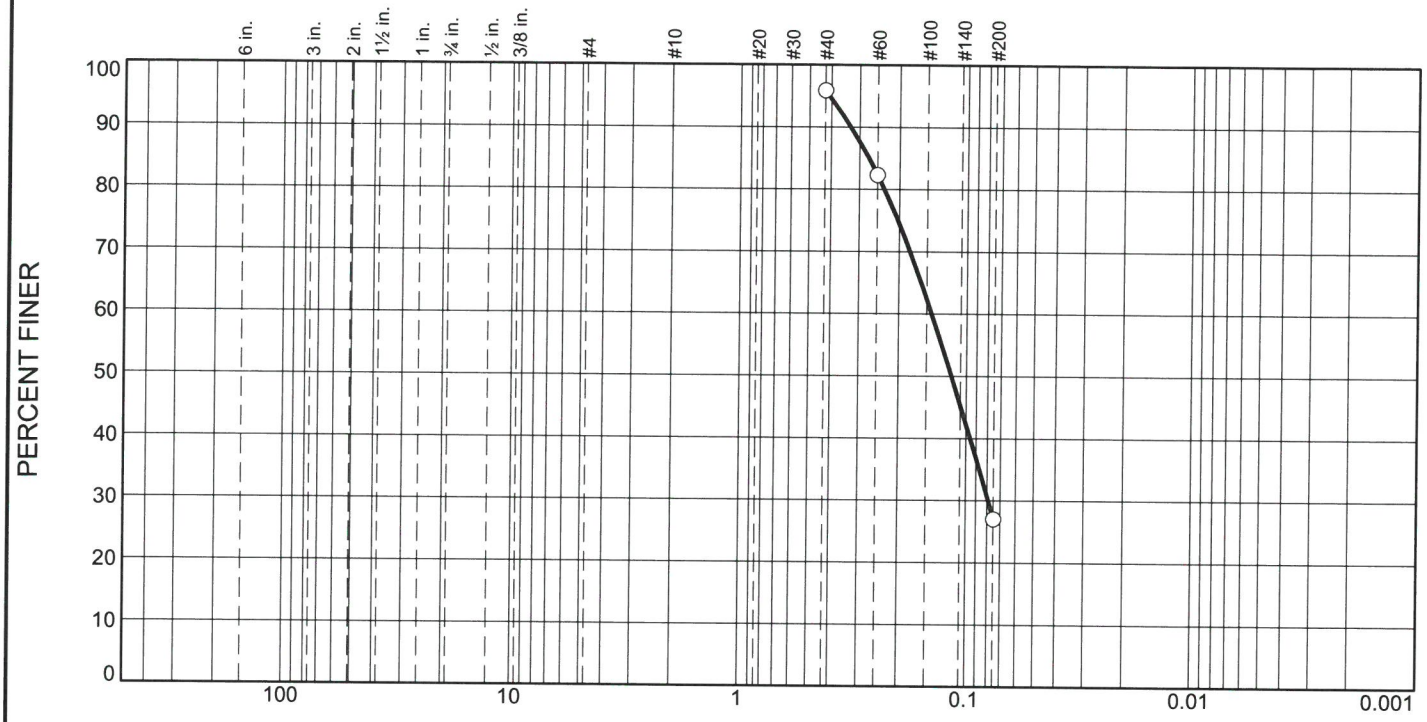
Client: City of Orange Beach

Project: Proposed Orange Beach Public Works

Project No: DL 1813-19

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					68.8	27.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	95.9		
#60	82.3		
#200	27.1		

* (no specification provided)

Material Description

Tan Silty Sand

Atterberg Limits (ASTM D 4318)

PL= 13 LL= 15 PI= 2

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 0.3296 D_{85}= 0.2729 D_{60}= 0.1431
D_{50}= 0.1165 D_{30}= 0.0793 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title:

Source of Sample: B-8 **Depth:** 1.5 **Date Sampled:**

Sample Number: 1

GeoCon

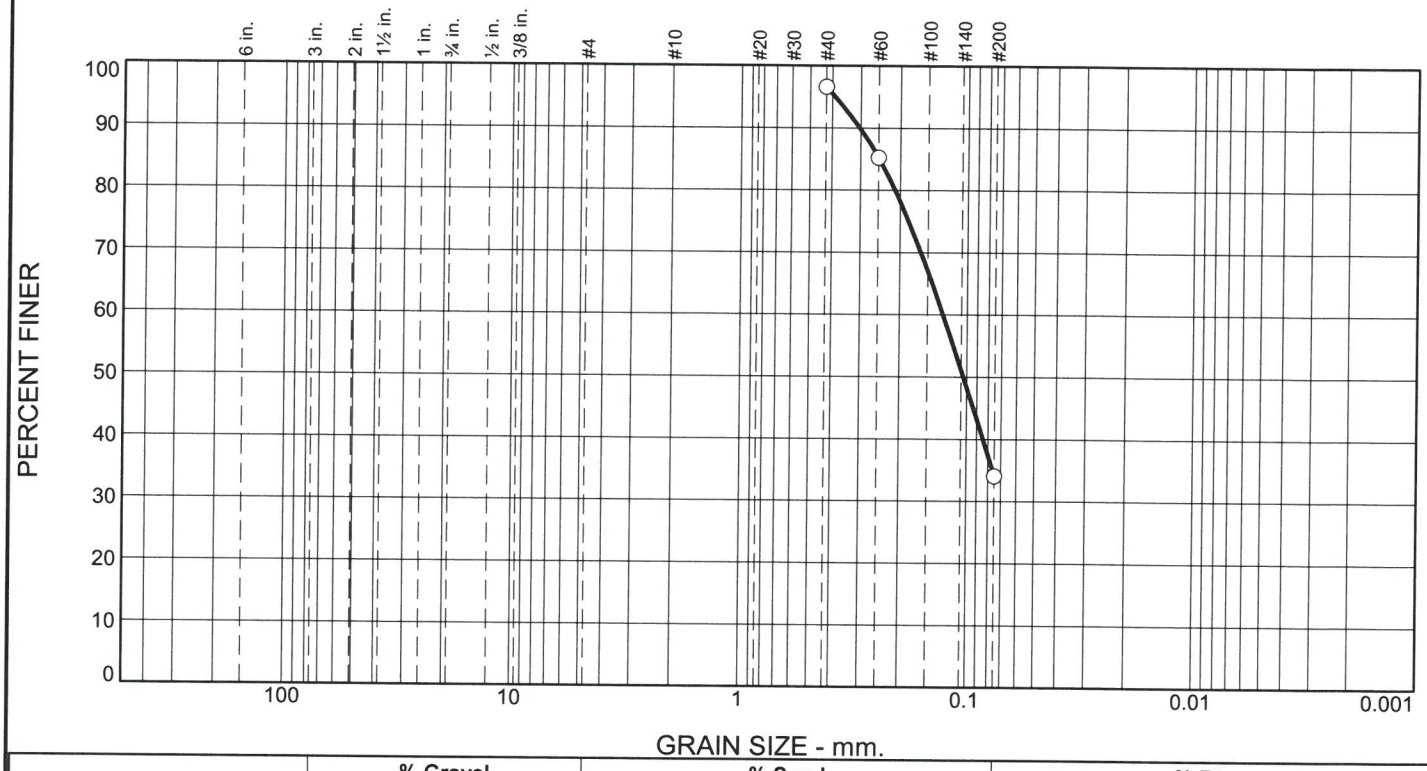
Robertsdale, Alabama

Client: City of Orange Beach

Project: Proposed Orange Beach Public Works

Project No: DL 1813-19 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					62.5	34.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	96.6		
#60	85.2		
#200	34.1		

* (no specification provided)

Material Description

Tan Silty-Clayey Sand

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 23 PI= 5

Classification

USCS (D 2487)= SC-SM AASHTO (M 145)=

Coefficients

D_{90}= 0.3030 D_{85}= 0.2480 D_{60}= 0.1282
D_{50}= 0.1036 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: _____ **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title: _____

Source of Sample: B-11 **Depth:** 1.5

Sample Number: 1

Date Sampled:

GeoCon

Robertsdale, Alabama

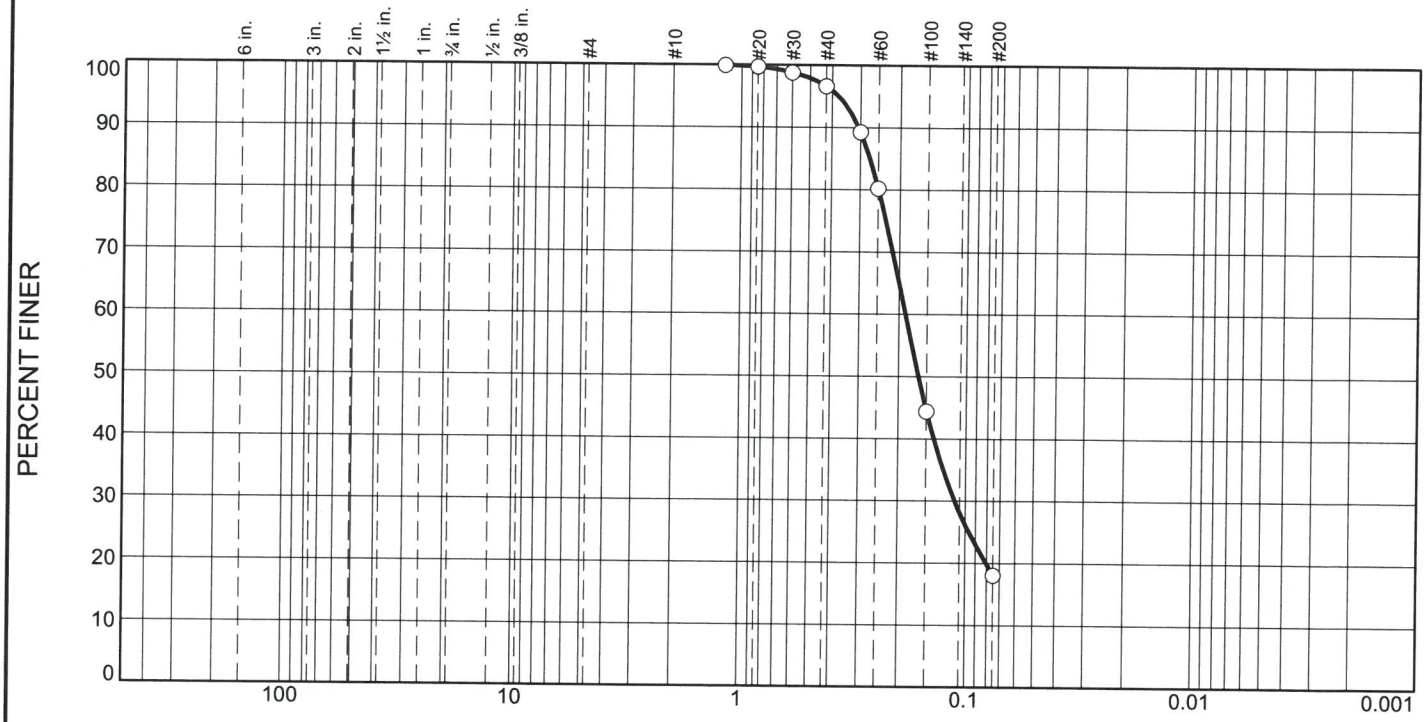
Client: City of Orange Beach

Project: Proposed Orange Beach Public Works

Project No: DL 1813-19

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					78.6	18.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#16	99.9		
#20	99.7		
#30	98.8		
#40	96.6		
#50	89.2		
#60	80.2		
#100	44.4		
#200	18.0		

* (no specification provided)

Material Description

Gray Silty Sand

Atterberg Limits (ASTM D 4318)

PL= 13 LL= 14 PI= 1

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 0.3063 D_{85}= 0.2727 D_{60}= 0.1875
D_{50}= 0.1634 D_{30}= 0.1117 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: _____ **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title: _____

Location: Orange Beach, AL
Sample Number: B-15 **Depth:** 1-4 ft

Date Sampled:

GeoCon

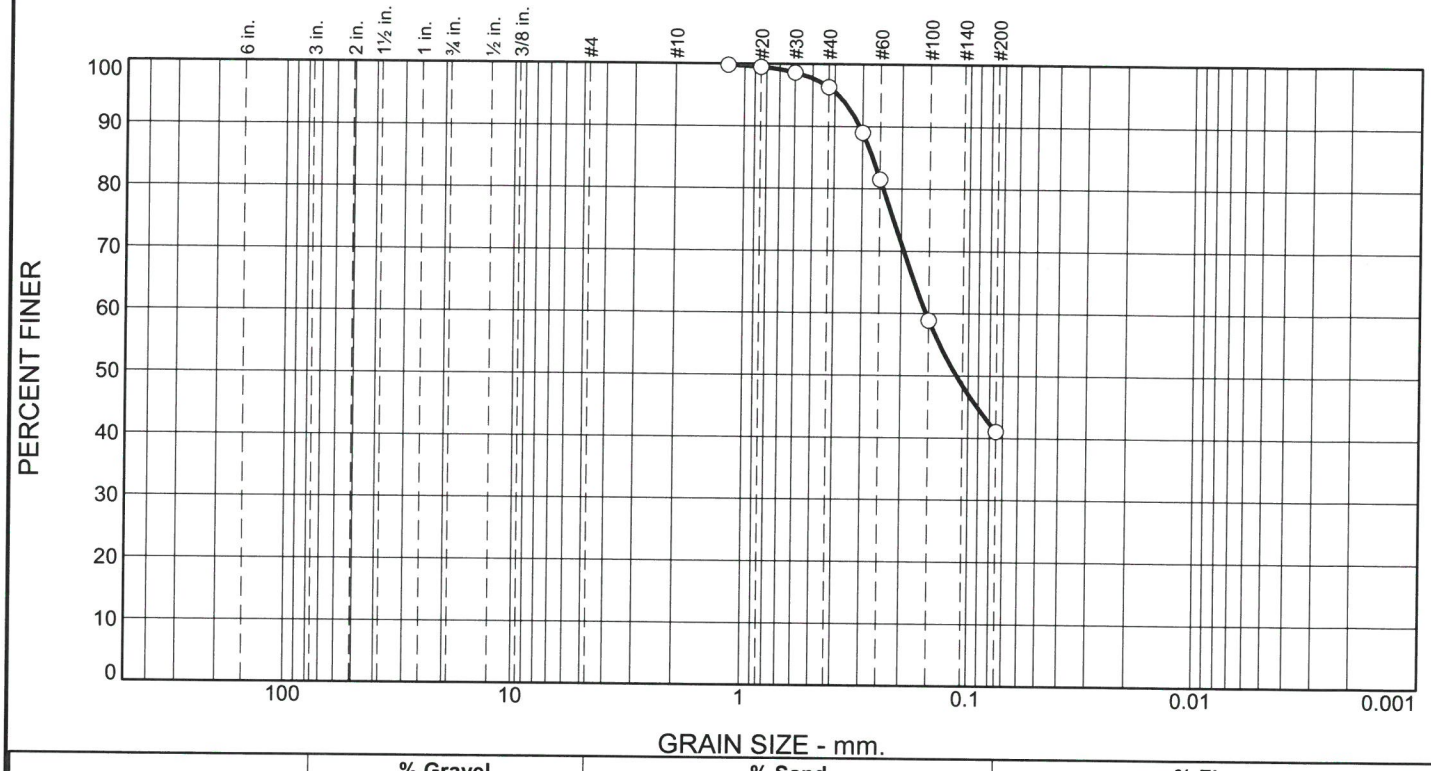
Robertsdale, Alabama

Client: City of Orange Beach
Project: Proposed Orange Beach Public Works

Project No: DL 1813-19

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					55.3	41.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#16	99.8		
#20	99.5		
#30	98.6		
#40	96.3		
#50	89.0		
#60	81.5		
#100	58.9		
#200	41.0		

* (no specification provided)

Material Description

Tan Clayey Sand

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 25 PI= 8

Classification

USCS (D 2487)= SC AASHTO (M 145)=

Coefficients

D_{90}= 0.3094 D_{85}= 0.2707 D_{60}= 0.1545
D_{50}= 0.1128 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 8/15/2019

Tested By: CR

Checked By: JJC

Title:

Source of Sample: B-16 **Depth:** 2.5

Sample Number: 2 **Date Sampled:**

GeoCon

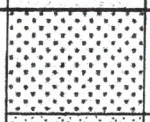
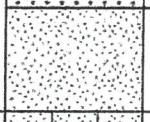
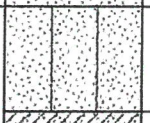
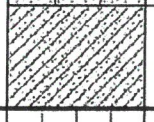
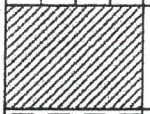
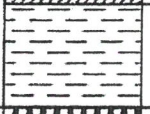
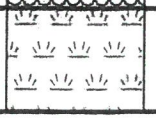
Robertsdale, Alabama

Client: City of Orange Beach

Project: Proposed Orange Beach Public Works

Project No: DL 1813-19 **Figure**

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	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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TERMS AND CONDITIONS

SERVICES TO BE PROVIDED. GeoCon Engineering & Material Testing, Inc. (hereinafter GeoCon) is an independent consultant and agrees to provide Client, for its sole benefit and exclusive use, consulting services set forth in our proposal.

PAYMENT TERMS. Client agrees to pay our Invoice upon receipt. If payment is not received within 30 days from the invoice date, Client agrees to pay a service charge on the past due amount at a rate of 1.5% per month, and GeoCon reserves the right to suspend all work until payment is received. No deduction shall be made from our invoice on account of liquidated damages or other sums withheld from payments to contractors or others.

TERMINATION. Either party may terminate this Agreement without cause upon 20 days advance notice in writing. In the event Client requests termination prior to completion of the proposed services, Client agrees to pay GeoCon for all costs incurred plus reasonable charges associated with termination of the work.

PROFESSIONAL LIABILITY. Notwithstanding any other provision of this Agreement, the Engineer's and GeoCon's total liability to the Owner for any loss or damages from claims arising out of or in connection with this Agreement from any cause including the Engineer's strict liability, breach of contract, or professional negligence, errors and omissions (whether claimed in tort, contract, strict liability, nuisance, by statute or otherwise) shall not exceed the lesser of the total contract price of this Agreement or the proceeds paid under Engineer's liability insurance in effect at the time such claims are made. The Owner hereby releases the Engineer from any liability exceeding such amount. In no event shall either party to this Agreement be liable to the other for special, indirect, incidental or consequential damages, whether or not such damages were foreseeable at the time of the commencement of the work under this Agreement.

SITE OPERATIONS. Client will arrange for right-of-entry to all applicable properties for the purpose of performing studies, tests and evaluations pursuant to the agreed services. Client represents that it possesses necessary permits and licenses required for its activities at the site.

OWNERSHIP AND USE OF PROJECT DOCUMENTS. All documents are instruments of service in respect to the Services, and Engineer shall retain an ownership and proprietary property interest therein {including the right of reuse at the discretion of the Engineer) whether or not the Services are completed. Client may make and retain copies of documents for information and reference in connection with the services by Client. Such documents are not intended or represented to be suitable for reuse by Client or others on extensions of the services or on any other project. Any such reuse or modification without written verification or adaptation by Engineer, as appropriate for the spedfic purpose intended, will be at Client's sole risk and without liability or legal exposure to Engineer or to Engineer's consultants. Client shall indemnify and hold harmless Engineer and Engineer's consultants from all claims, damages, and expenses including attorneys' fees arising out of or resulting therefrom.

ADDITIONAL SERVICES OF CONSULTANT. If authorized in writing by the Client, GeoCon shall furnish additional services that are not considered as an integral part of the Scope of Services outlined in the Proposal Acceptance Sheet. Under this Agreement, all costs for additional services will be negotiated as to activities and compensation. In addition, it is possible that unforeseen conditions may be encountered that could substantially alter the original scope of services. If this occurs, GeoCon will promptly notify and consult with Client and any additional services will be negotiated.

ASSIGNABI LITY, GeoCon shall not assign any interest on this Agreement, and shall not transfer any interest in the same (whether by assignment or novation), without the prior written consent of the Client; provided, however, that claims for money by GeoCon against Client under this Agreement may be assigned to a bank, trust company, or other financial institution without such approval. Written notice of any such assignment or transfer shall be promptly furnished to the Client.

SERVICES TO BE CONFIDENTIAL. All services, including opinions, designs, drawings, plans, specifications, reports and other services and information, to be furnished by GeoCon under this Agreement are confidential and shall not be divulged, in whole or in part, to any person, other than to duly authorized representatives of the client, without prior written approval of the Client, except by testimony under oath in a judicial proceeding or as otherwise required by law. GeoCon shall take all necessary steps to ensure that no member of its organization divulges any such information except as may be required by law.

CLAIMS. The parties agree to attempt to resolve any dispute without resort to litigation. However, in the event a claim is made that results in litigation, and the claimant does not prevail at trial, then the claimant shall pay all costs incurred in defending the claim, including reasonable attorney's fees. The claim will be considered proven if the judgment obtained and retained through any applicable appeal is at least ten percent greater than the sum offered to resolve the matter prior to the commencement of trial.

SEVERABILITY. It is understood and agreed by the parties hereto, that if any part, term or provision of this Agreement is held by any court of competent jurisdiction to be illegal or in conflict with any applicable law, the validity of the remaining portion or portions of this Agreement shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Agreement did not contain the particular part, term or provision held to be invalid.

SURVIVAL. All obligations arising prior to the termination of this Agreement and all provisions of this Agreement allocating responsibility or liability between Client and GEOCON shall survive the completion of the services and the termination of this Agreement.

INTEGRATION. This Agreement, the attached documents and those incorporated herein constitute the entire Agreement between the parties and cannot be changed except by a written instrument signed by both parties.

GOVERNING LAW. This Agreement shall be governed in all respects by the laws of the State of Alabama and venue shall be in Baldwin County, Alabama.