GeoCon
Engineering & Materials Testing, Inc.

Pre-Design Geotechnical Testing

Proposed Parking Lot Expansion &
Storm Water Improvements
Arts Center and Library
Nancy Lane
Orange Beach, Alabama
GeoCon Project No. DL 772-17

Prepared For:
Sawgrass Consulting, LLC
11143 Old Highway 31
Spanish Fort, Alabama 36527

Attn: Mr. Tom Granger, P.E.

Date: February 22, 2017

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

GeoCon
Engineering & Materials Testing, Inc.

February 22, 2017

Mr. Tom Granger, P.E.
Sawgrass Consulting, LLC
11143 Old Highway 31
Spanish Fort, Alabama 36527

RE: **Pre-Design Geotechnical Testing**
Proposed Parking Lot Expansion & Storm Water Improvements
Arts Center and Library
Nancy Lane
Orange Beach, Alabama
GeoCon Project No. DL 772-17

Dear Mr. Granger:

GeoCon Engineering & Materials Testing, Inc. is pleased to submit this report of geotechnical testing 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 subgrade preparation. This testing has been performed in general accordance with our earlier discussions with you.

Enclosed please find our report with evaluations, and recommendations followed by an Appendix which includes a Site Location Plan, Test Location Plan, test boring logs, laboratory test data sheets, a Unified Soil Classification Chart, important notes about your Geotechnical Report and the Terms and Conditions that govern our work on this project.

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.
Geotechnical Engineer

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

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1.0 Project Information

The subject site is located on Nancy Lane in Orange Beach, Alabama. The site is shown on the attached Site Location Plan (Figure 1). The provided information indicated that this project will include new parking lots with access driveways. We understand that the parking lot by the Library will include asphalt paving while the parking lot south of the Art Center will include asphalt and concrete access drives with grass covered parking areas. The grass parking areas will include "GrassPave" to stabilize the parking surface area. We anticipate that final subgrade elevations in the pavement areas will be within 12 inches of the existing ground surface. The project also includes a storm water retention pond just north of the Library parking lot.

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 Site Conditions

At the time of the February 2017 field exploration, the site was generally open and included trees and grass ground cover. Based on the provided topographic information, existing ground elevations across the site range from about 13 feet msl in the proposed pond area on the northwest side of the site to about 16 feet msl on the south side of the site.

3.0 Geotechnical Exploration

Soil conditions along the proposed streets were investigated by sampling soil from nine (9) hand auger borings extended to a depth of 4 feet in the proposed pavement areas. One (1) hand auger boring was also extended to a depth of about 4 feet in the proposed storm water pond. The location of each boring is shown on the attached Test Location Plan. Our scope of work included test borings to a depth of 4 feet. If soil or ground water conditions below depths of 4 feet are needed for design of utility cuts, we can provide deeper borings at your request.

The hand auger borings along the roadway included dynamic cone penetration (DCP) soundings to evaluate soil density/consistency characteristics. A 1½-inch diameter cone is seated to penetrate any loose cuttings, 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 1 ¾-inch increments is an index to soil strength and compressibility.

4.0 Soil Conditions Encountered

The borings initially encountered about 6 to 12 inches of topsoil. Below the topsoil, the borings generally encountered non-cohesive sand with silt soils to boring termination at a depth of about 4 feet below the existing ground surface. In general, the soils within the upper 4 feet were in a loose but stable condition.

5.0 Ground Water Conditions Encountered

Natural ground water was encountered at depths of 2 to 3 feet below the existing ground surface at the time of the exploration. It is our opinion that the Seasonal High Ground Water Elevation at the proposed storm water pond area is about 11 feet msl. Due to the sandy nature of the surface soils, ground water elevations could fluctuate following long periods of heavy rain events.

6.0 Laboratory Testing

The soil samples taken from the hand auger sampler 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 borings were selected for grain-size analysis (5 tests) and Atterberg limit determination (5 tests). Results of these tests are shown on the attached data sheets.

7.0 Site Grading Recommendations

The initial phase in site grading should include the clearing and grubbing of surface vegetation and organic topsoil. The borings generally encountered about 6 to 12 inches of topsoil material; however, isolated areas will require deeper cuts to remove heavy organics (tree stumps or root ball systems). Topsoil and debris should be stockpiled away from the construction area or removed from the site.

The borings encountered relatively sandy soils at the anticipated subgrade elevation. When properly compacted, these sand soils would be suitable to support the planned pavement build-up.

Following clearing and grubbing, the top 12 inches of the subgrade soils should be scarified, moisture conditioned and compacted to 100% ASTM D-698 standard density. The exposed subgrade layer should also be thoroughly proof-rolled with a smooth drum roller in an attempt to identify areas of yielding subgrade soils. The project Geotechnical Engineer should observe the proof-roll testing and review the exposed subgrade. Areas which exhibit rutting/pumping or areas which fail to properly compact may require undercut and replacement with select fill as per the recommendations of the project Geotechnical Engineer.

Select fill below the roadways should consist of soils sandy in nature. The select fill material should exhibit no more than 12% passing the No. 200 mesh sieve (fines). The select fill placed in the roadway areas should be placed in 8 to 12 inch loose lifts and compacted to 100% standard Proctor density.

8.0 Unit Costs

We recommend that the contract documents establish a unit cost (per cubic yard) for undercutting and replacing unsuitable soils. We also recommend that a unit price be established for Geotextile subgrade stabilization fabric (typical of Mirafi N 140 or approved equal).

9.0 Site Drainage During Construction

The pavement "controlled areas" should be maintained in a drained condition that will promote the continual removal of surface water that may flow over the construction areas. During construction, the contractor should exercise caution during inclement weather to ensure the subgrade and select fill courses are not degraded by construction traffic. Areas graded and left undeveloped for an extended period of time should be crowned or sloped to deter the ponding of rainwater on prepared subgrades. Prepared subgrades subject to ponded water could require undercutting of saturated areas and reprocessing.

10.0 Pavements

The pavement recommendations provided below are based on a low volume of passenger vehicles and moving vans/trucks. The scope of this investigation did not include laboratory CBR testing for pavement design. Pavement design has been based on an estimated CBR value of 8 for compacted native material or structural fill soils.

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 2 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.

10.1 Asphalt Pavement

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

Medium-Duty Asphalt Pavement Section

1" ALDOT Section 424A, Bituminous Wearing Surface (110 lb/sy)
- ALDOT Section 405 Tack Coat
1½"ALDOT Section 424B, Bituminous Binder (165 lb/sy)
6" ALDOT Section 825 Crushed Aggregate Base (100% modified density)
- Separation Fabric (TerraTex GS or Approved Equal)
6" ALDOT Section 230 Improved or Modified Roadway Processing (100% standard density)

A light-duty pavement build-up could be used in area subject to light-duty traffic (parking areas):

Light-Duty Asphalt Pavement Section

1½" ALDOT Section 424A, Bituminous Wearing Surface (165 lb/sy)
6" ALDOT Section 825 Crushed Aggregate Base Material (100% modified density)
- Separation Fabric (TerraTex GS or Approved Equal)
6" ALDOT Section 230 Improved or Modified Roadway Processing (100% standard density)

10.2 Concrete Pavement

We understand that Portland Cement Concrete (PCC) pavement will be used for 2 of the access driveways. The following concrete pavement build-up is recommended for this project:

Concrete Pavement Section

6" Concrete Pavement (4,000 psi compressive strength, 450 psi flexural strength)
- Compact Native Subgrade or Structural fill (top 12 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.

10.3 Grass Parking Areas

We understand that the parking lot just south of the Arts Center will include a grass cover utilizing "GrassPave" or similar product to stabilize the surface. The provided typical "GrassPave" detail indicates a compacted base layer below the grass cell supported by compacted subgrade. We recommend that the subgrade be compacted to at least 95% standard density and a light-weight (6oz) non-woven geotextile separation fabric be placed between the subgrade and base layer. The base course should consist of a 6 inch thick layer of open graded crushed stone (No. 57 stone or similar). The stone layer should be lightly rolled with a small smooth drum roller compactor to seat the angular stone in-place. A 2nd layer of light-weight (6oz) non-woven geotextile separation should be placed above the stone layer and the sand filled "Grass/Pave" cells.

11.0 Storm Water Pond

The hand auger boring in the proposed storm water pond area encountered about 6 inches of topsoil followed by about 8 inches of relatively clean sand soils. Below a depth of about 14 inches, the boring encountered dark gray colored, fine sand with silt soils to boring termination at a depth of about 4 feet. Ground water was encountered at a depth of about 2 feet (elevation 11 feet msl).

A double-ring infiltration test was performed at a depth of about 12 inches below the ground surface in general accordance with ASTM D 3385-03 procedures. The location of the double-ring infiltration test is shown on the attached Test Location Plan. The purpose of this testing was to measure the rate of water infiltration of the in-situ silty sand soils. Testing indicated an infiltration rate of 0.25 inches per hour. Details of the test are shown on the attached Report of Double Ring Infiltration Testing.

12.0 Closure & Limitations

This report has been prepared for the exclusive use of Sawgrass Consulting for specific application to the above referenced project in accordance with generally accepted current standards of geotechnical engineering practices 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 nine (9) hand auger borings in the proposed pavement areas, the one (1) hand auger boring in the proposed pond area 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.

Figure 1	NOT TO SCALE **SITE LOCATION MAP** Proposed Orange Beach Library Parking Expansion Canal Road Orange Beach, AL DL 772-17	***GEOCON, INC.*** 22885 McAuliffe Drive Robertsdale, Alabama 36567
Date 2/20/2017		

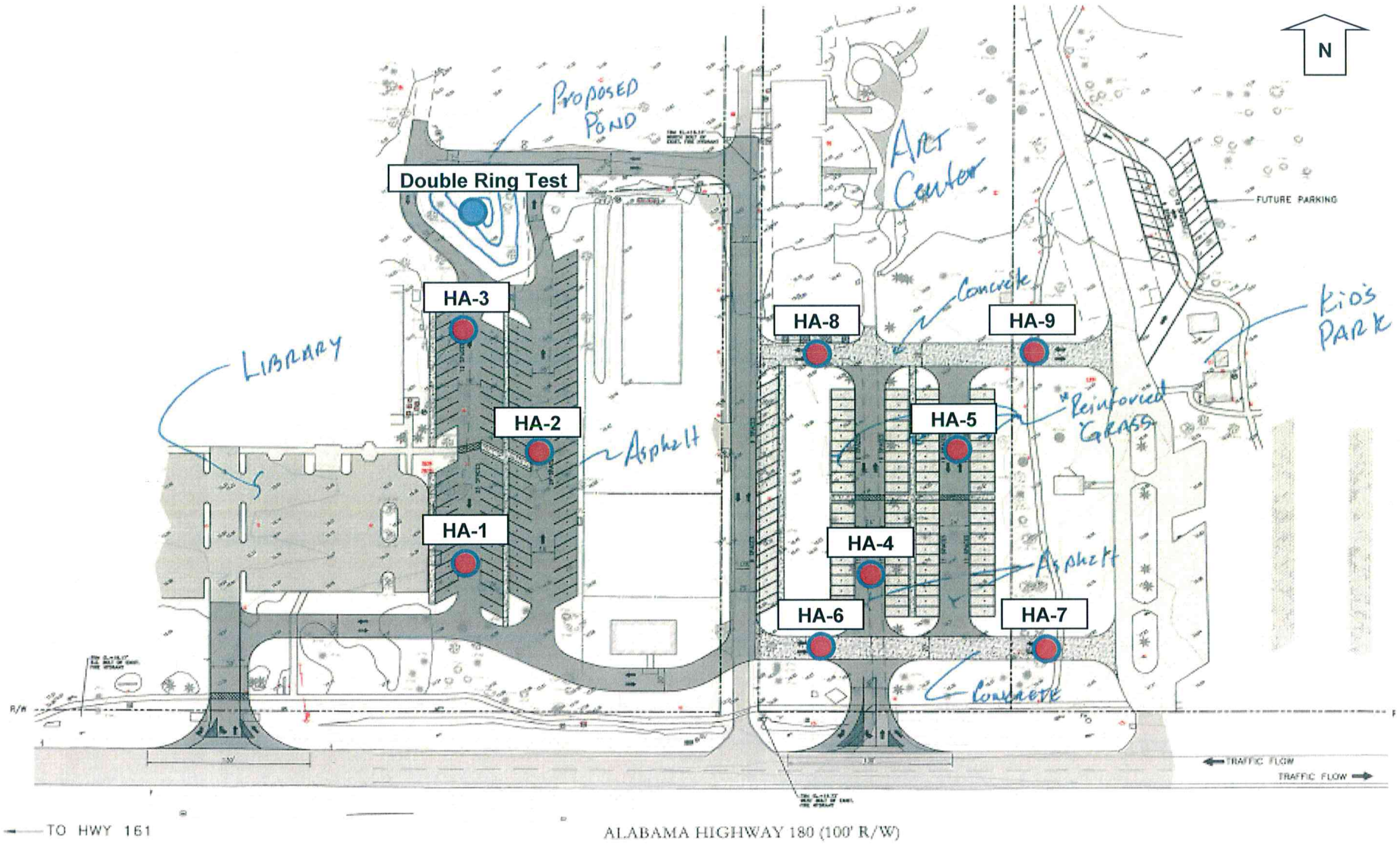


Figure 2	NOT TO SCALE **TEST LOCATION PLAN** Proposed Orange Beach Library Parking Expansion Canal Road Orange Beach, AL DL 772-17	***GEOCON, INC.*** 22885 McAuliffe Drive Robertsdale, Alabama 36567
Date 2/20/2017		

DRILL HOLE LOG
BORING NO.: Double Ring

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 2

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					
			SP	8 Inches Tan Sand					
1			SP-SM	Dark Gray Sand with Silt					
2		▽							
3									
4				Boring Termianted at 4 ft					
5									
6									
7									

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

DRILL HOLE LOG
BORING NO.: HA-1

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 2.5

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			SP-SM	Tan, Gray Sand with Silt, Very Loose				1	
2									
3									
4				Boring Termianted at 4 ft					
5									
6									
7									

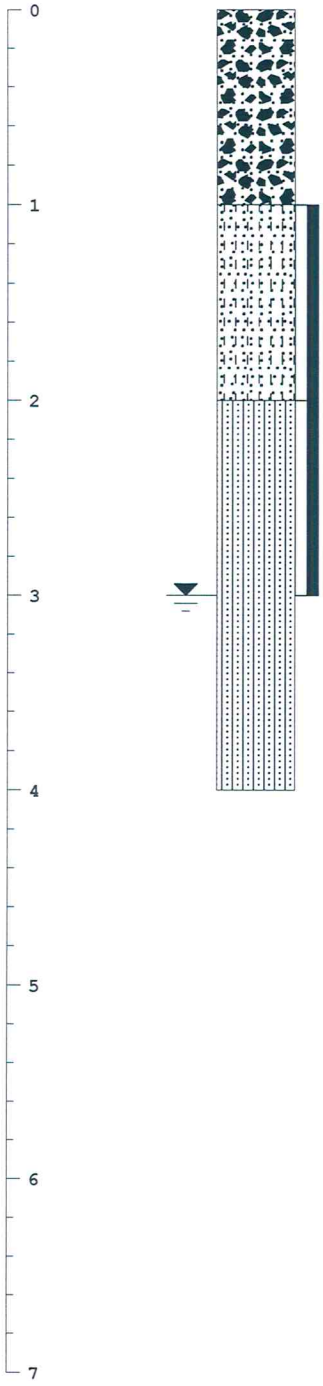
"N Value" Equal to DCP Soundings

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

DRILL HOLE LOG
BORING NO.: HA-2

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 3



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)
				12 Inches Inermixed Sand and Gravel					
			SP-SM	Tan, Gray Sand with Silt, Firm				12	
			SM	Tan Silty Sand, Loose				7	
				Boring Termianted at 4 ft					

"N Value" Equal to DCP Soundings

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

DRILL HOLE LOG
BORING NO.: HA-3

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 2

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				8 Inches Organic Topsoil					
1			SP-SM	Tan, Gray Sand with Silt				7	
2									
3								6	
4				Boring Termianted 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 indicitive of the site.

DRILL HOLE LOG
BORING NO.: HA-4

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Gulf Shores, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 2

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST DEPTH	N	CURVE 10 30 50
0				8 Inches Organic Topsoil					
1			SP-SM	Tan Silty Sand, Loose				9	
2									
3								6	
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 indicitive of the site.

DRILL HOLE LOG
BORING NO.: HA-5

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ : 3

PROJECT NO.: DL 772-17
DATE: 2/20/2017
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			SP-SM	Tan Sand with Silt, Firm				10	
2									
				Becomes Loose				8	
3		▽							
4				Boring Termianted at 4 ft					
5									
6									
7									

"N Value" Eqaul to DCP Soundings

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

DRILL HOLE LOG
BORING NO.: HA-6

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 2.5

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
0				12 Inches Organic Topsoil					10 30 50
1			SM	Tan Silty Sand, Firm				10	
2		▽		Becomes Loose				8	
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 indicitive of the site.

DRILL HOLE LOG
BORING NO.: HA-7

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 2.5

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									
		▽						8	
3									
4				Boring Termianted 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 indicitive of the site.

DRILL HOLE LOG
BORING NO.: HA-8

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ :

PROJECT NO.: DL 772-17
DATE: 2/20/2017
ELEVATION:
LOGGED BY: Jason Christian
AT COMPLETION ▼ : 2

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

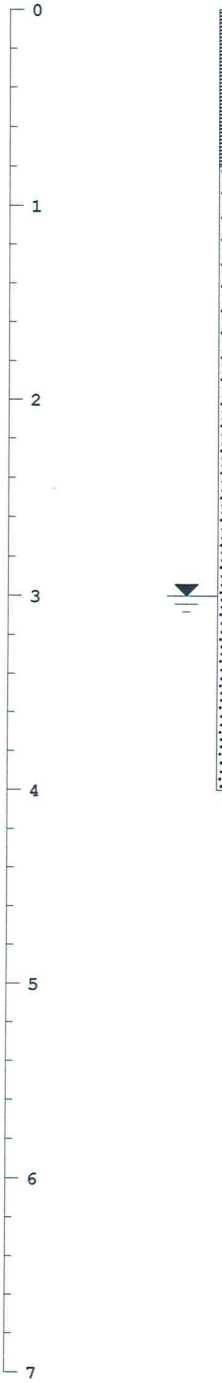
"N Value" Equal to DCP Soundings

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

DRILL HOLE LOG
BORING NO.: HA-9

PROJECT: Proposed Orange Beach Library Parking Expansion
CLIENT: Sawgrass
LOCATION: Orange Beach, AL
DRILLER: Chris Rea
DRILL RIG:
DEPTH TO WATER> INITIAL ▽ : AT COMPLETION ▼ : 3

PROJECT NO.: DL 772-17
DATE: 2/20/2017
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 Inches Organic Topsoil					
			SP-SM	Dark Tan Sand with Silt, Firm				12	
								10	
				Boring Termianted at 4 ft					

10 30 50

"N Value" Equal to DCP Soundings

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

GeoCon Engineering & Materials Testing, Inc.

Report of Double-Ring Infiltration Testing

Project: Proposed Orange Beach Library Parking
Location: Orange Beach, AL
GeoCon Job No.: DL 772-17

Report of Double-Ring Infiltrometer Test
Date Tested: 2/20/2017
Tested By: CR

Proposed Storm water Area
Client: Sawgrass
Submitted To: Sawgrass

Description
of Infiltration Soils:

Ground Water Depth: 24 Inches

Depth of Test: 12 inches below ground surface

Ring Penetration : 6 in

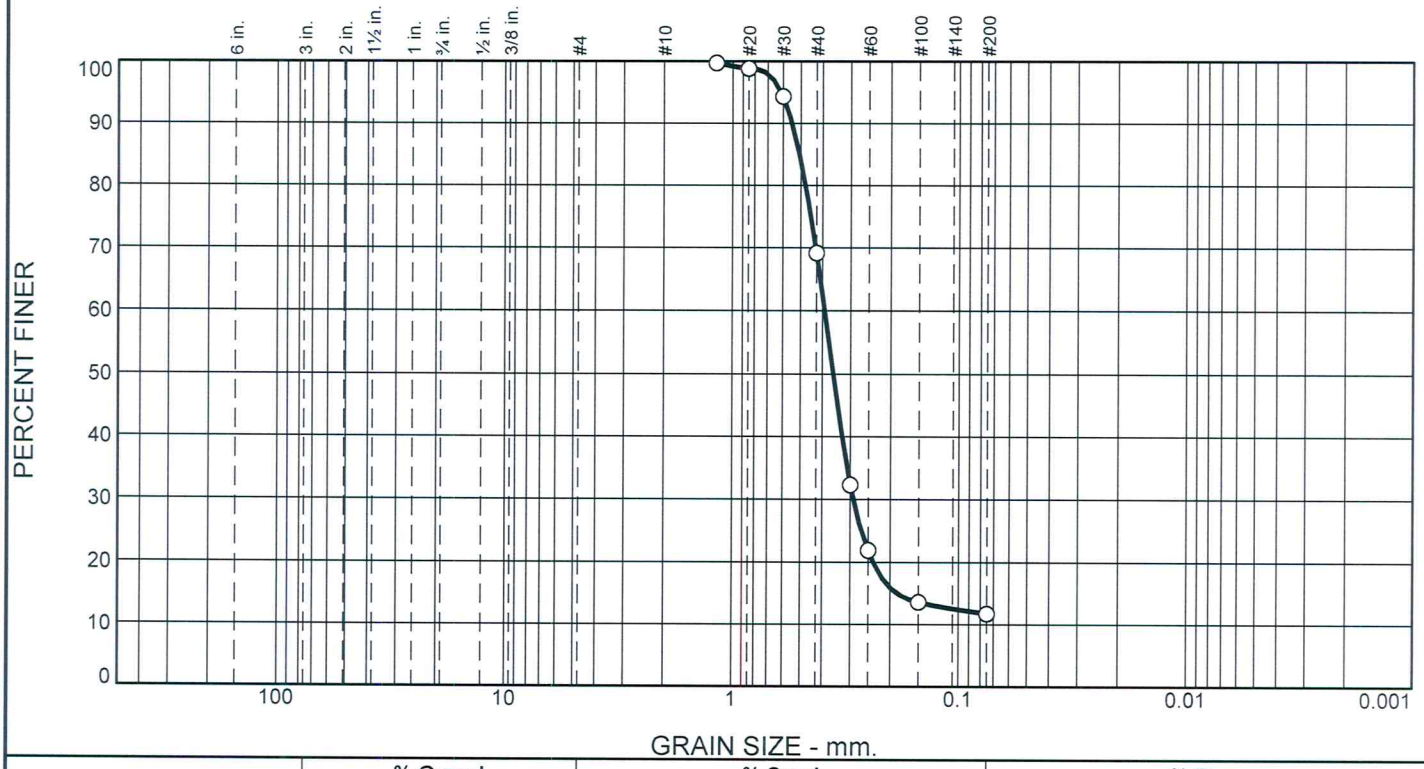
Constant Water Head Maintained Manually

Interval	Duration (min)	Elapsed Time (min)	Liquid Temp (F)	Inner Infiltration Reading (in.)	Outer Infiltration Reading (in.)	Inner Infiltration Rate (in/hr)	Outer Infiltration Rate (in/hr)
1	0	0	75	0	0	0	0
2	15	15	75	0.125	0.125	0.5	0.5
3	30	15	75	0.0625	0.0625	0.25	0.25
4	45	15	75	0.0625	0.0625	0.25	0.25
5	60	15	75	0.0625	0.0625	0.25	0.25
6	90	30	75	0.125	0.125	0.25	0.25
7	120	30	75	0.125	0.125	0.25	0.25
8	150	30	75	0.125	0.125	0.25	0.25
9	180	30	75	0.125	0.125	0.25	0.25
10	210	30	75	0.125	0.125	0.25	0.25
11	240	30	75	0.125	0.125	0.25	0.25
	4 hours						

Infiltration Rate: 0.25 in/hr

Jason J. Christian, P.E.
Geotechnical Engineer

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					57.4	11.8	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#16	99.7		
#20	98.9		
#30	94.3		
#40	69.2		
#50	32.3		
#60	21.9		
#100	13.6		
#200	11.8		

* (no specification provided)

Material Description

Dark Gray Sand with Silt

Atterberg Limits (ASTM D 4318)

PL= 12 LL= 12 PI= 0

Classification

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

Coefficients

D_{90}= 0.5481 D_{85}= 0.5077 D_{60}= 0.3910
D_{50}= 0.3582 D_{30}= 0.2909 D_{15}= 0.1858
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 2/21/2017

Tested By: DR

Checked By: JJC

Title:

Source of Sample: Double Ring **Depth:** 1.2

Sample Number: 2

Date Sampled:

GeoCon

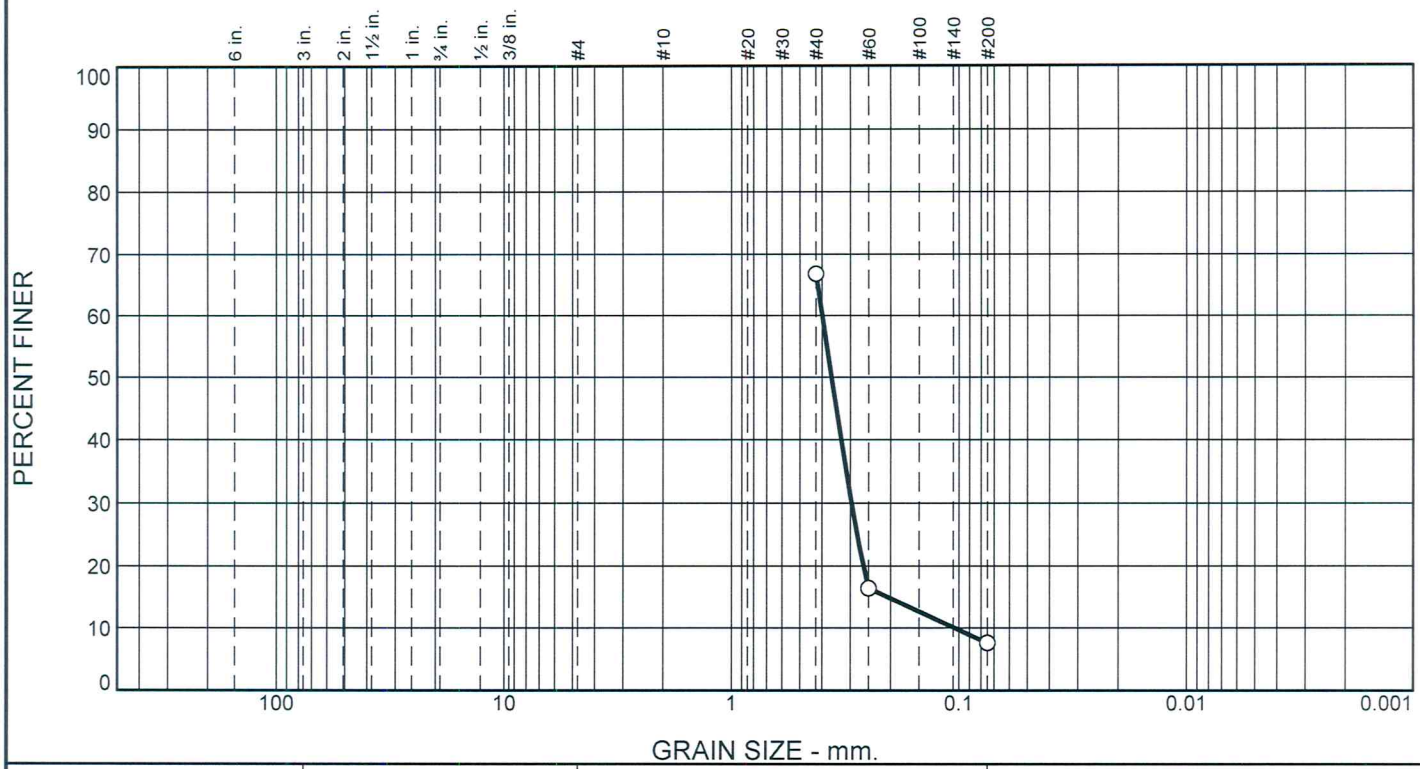
Robertsdale, Alabama

Client: Sawgrass

Project: Proposed Orange Beach Library Parking Expansion

Project No: DL 772-17 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					59.2	7.6	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	66.8		
#60	16.4		
#200	7.6		

* (no specification provided)

Material Description

Tan, Gray Sand with Silt

Atterberg Limits (ASTM D 4318)

PL= 12 LL= 12 PI= 0

Classification

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

Coefficients

D_{90}= D_{85}= D_{60}= 0.3991
D_{50}= 0.3634 D_{30}= 0.2965 D_{15}= 0.2063
D_{10}= 0.1039 C_u= 3.84 C_c= 2.12

Remarks

Date Received: **Date Tested:** 2/21/2017

Tested By: CR

Checked By: JJC

Title:

Source of Sample: HA-1 **Depth:** 1

Sample Number: 1 **Date Sampled:**

GeoCon

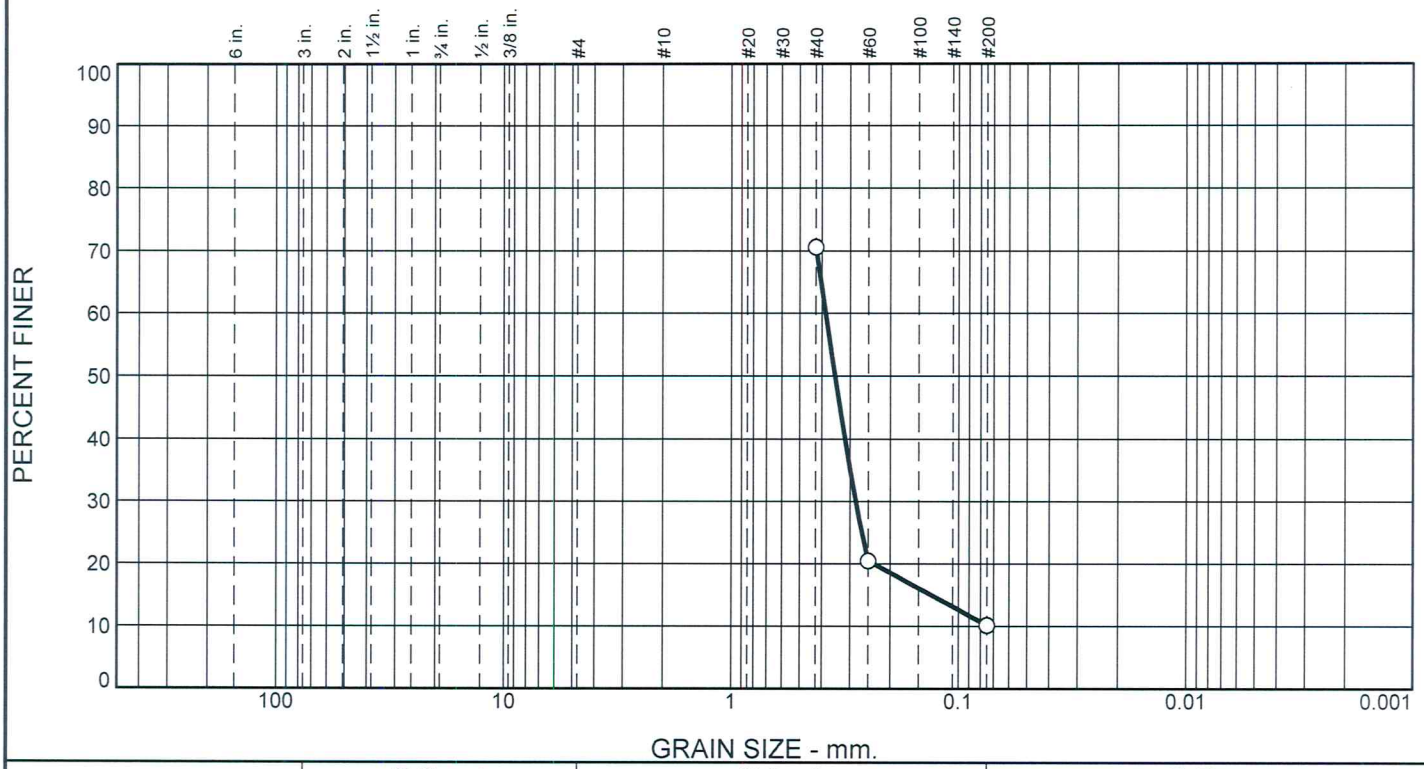
Robertsdale, Alabama

Client: Sawgrass

Project: Proposed Orange Beach Library Parking Expansion

Project No: DL 772-17 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					60.4	10.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	70.6		
#60	20.5		
#200	10.2		

* (no specification provided)

Material Description

Tan Sand with Silt

Atterberg Limits (ASTM D 4318)

PL= 12 LL= 12 PI= 0

Classification

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

Coefficients

D_{90}= D_{85}= D_{60}= 0.3849
D_{50}= 0.3498 D_{30}= 0.2831 D_{15}= 0.1318
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 2/21/2017

Tested By: CR

Checked By: JJC

Title:

Source of Sample: HA-5 **Depth:** 1

Sample Number: 1

Date Sampled:

GeoCon

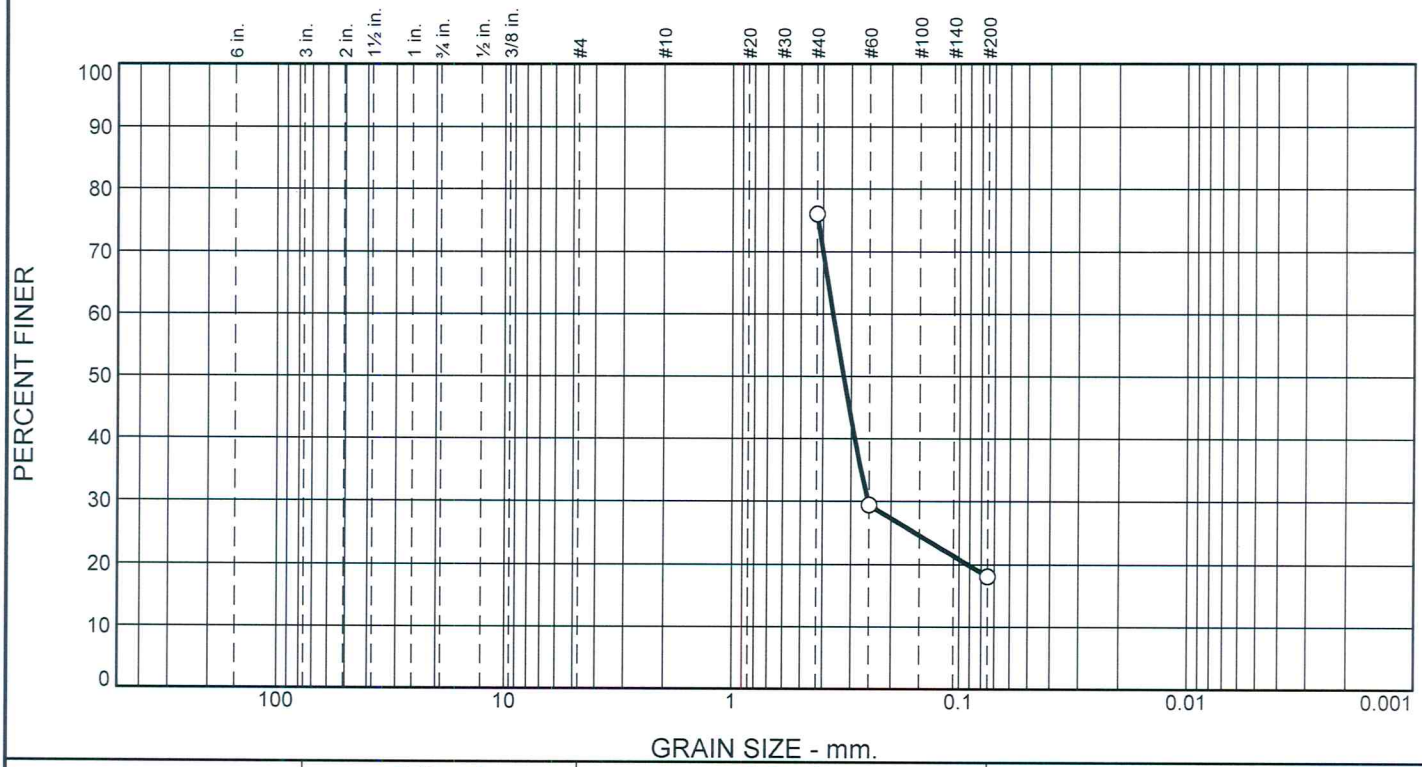
Robertsdale, Alabama

Client: Sawgrass

Project: Proposed Orange Beach Library Parking Expansion

Project No: DL 772-17 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					57.9	18.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	76.0		
#60	29.4		
#200	18.1		

* (no specification provided)

Material Description

Tan Silty Sand

Atterberg Limits (ASTM D 4318)

PL= 13 LL= 13 PI= 0

Classification

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

Coefficients

D_{90}= D_{85}= D_{60}= 0.3613
D_{50}= 0.3248 D_{30}= 0.2523 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:** 2/21/2017

Tested By: CR

Checked By: JJC

Title:

Source of Sample: HA-6 **Depth:** 1

Sample Number: 1 **Date Sampled:**

GeoCon

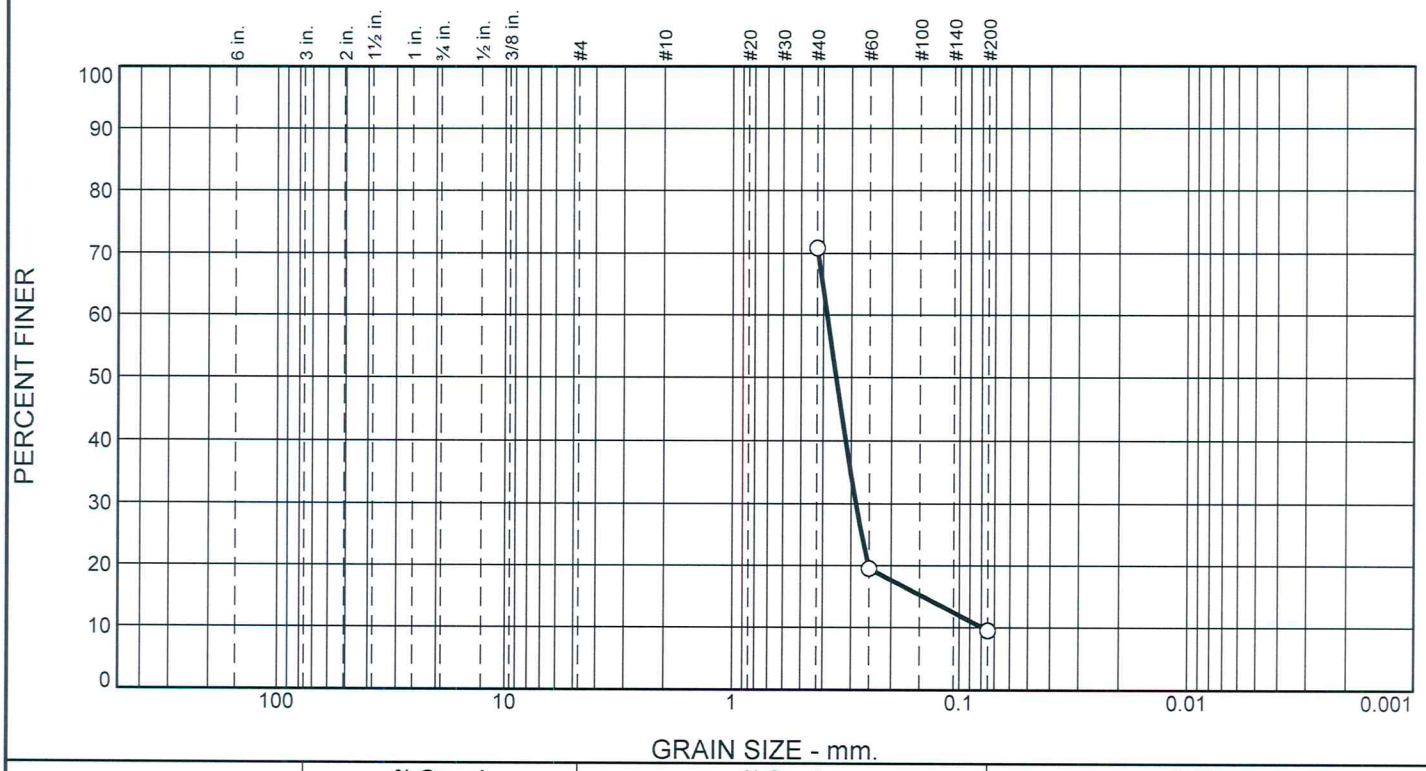
Robertsdale, Alabama

Client: Sawgrass

Project: Proposed Orange Beach Library Parking Expansion

Project No: DL 772-17 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
					61.3	9.6	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	70.9		
#60	19.5		
#200	9.6		

* (no specification provided)

Material Description

Dark Tan Sand with Silt

Atterberg Limits (ASTM D 4318)

PL= 12 LL= 12 PI= 0

Classification

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

Coefficients

D_{90}= D_{85}= D_{60}= 0.3849
D_{50}= 0.3506 D_{30}= 0.2855 D_{15}= 0.1447
D_{10}= 0.0789 C_u= 4.88 C_c= 2.68

Remarks

Date Received: **Date Tested:** 2/21/2017

Tested By: CR

Checked By: JJC

Title:

Source of Sample: HA-9 **Depth:** 1

Sample Number: 1 **Date Sampled:**

GeoCon

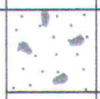
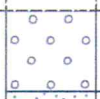
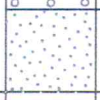
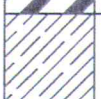
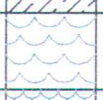
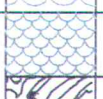
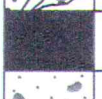
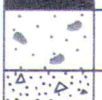
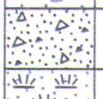
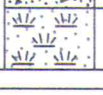
Robertsdale, Alabama

Client: Sawgrass

Project: Proposed Orange Beach Library Parking Expansion

Project No: DL 772-17 **Figure**

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION				TYPICAL NAMES
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve	CLEAN GRAVEL (little or no fines)		GW	Well graded gravels
			GP	Poorly graded gravels
	GRAVELS with fines		GM	Silty gravels
			GC	Clayey gravels
SANDS More than 50% of coarse fraction smaller than No. 4 sieve	CLEAN SAND (little or no fines)		SW	Well graded sands
			SP	Poorly graded sands
	SAND with fines		SM	Silty sands, sand/silt mixtures
			SC	Clayey sands, sand/clay mixtures
SILTS AND CLAYS Liquid Limit is less than 50			ML	Inorganic silts, sandy and clayey silts with slightly plasticity
			CL	Sandy or silty clays of low to medium plasticity
			OL	Organic silts of low plasticity
SILTS AND CLAYS Liquid Limit is greater than 50			MH	Inorganic silts, sandy micaceous or clayey elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils
MISCELLANEOUS MATERIALS				PWR (Partially Weathered Rock)
				Rock
				Asphalt
				ABC Stone
				Concrete
				Topsoil

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 GEOPROFESSIONAL BUSINESS ASSOCIATION

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 Jaw.

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.