November 7, 2017

Report of Geotechnical Exploration
Norriego Point
Escambia, Florida
LMJ File # 15-215

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1.0 INTRODUCTION

This report forwards the results of our geotechnical exploration for the proposed **Norriego Point Project** in Destin, Florida. The purpose of this exploration was to determine the general subsurface conditions in the proposed buildings, walkways, pavement and stormwater pond areas and use this information to provide recommendations for earthwork, pile foundation design, pavement design and stormwater pond design. Our exploration consisted of twenty Standard Penetration Test (SPT) borings, classification of the samples obtained in the field, laboratory testing of selected samples, and analysis by our engineering staff.

2.0 SITE AND PROJECT CONDITIONS

The project site is located at Norriego Point in Destin, Florida. The area is mostly uplands and a white sand beach. Reportedly, the project is planned to consist of the construction of an off grade pile supported (timber or concrete) restroom and shelter, along with a timber pile supported boardwalk. We understand that the boardwalk piles will be 6x6 inch square timber or round 8 inch tip timber piling. Reportedly, these pilings are jetted and driven several feet. The project is planned to have an asphalt paved access drive and associated stormwater ponds. LMJ has assumed little to no fill in the building or pavement areas. If this information changes or is incorrect, the geotechnical engineer should be notified, and changes to our recommendations may be needed.

3.0 SUBSURFACE EXPLORATION

To examine the subsurface conditions at the site, we drilled two Standard Penetration Test (SPT) borings to a depth of 50-51 feet below grade in the proposed restroom and gazebo/shelter, eight SPT borings to a depth of 20-21 feet in the boardwalk area, six SPT borings to a depth of 8-11 feet in the roadways, and four SPT borings to a depth of 16 feet in the pond areas. The location and number of the borings was selected by our client. The SPT consists of driving a 2-inch diameter split spoon sampler into the ground using a 140-pound hammer dropped 30-inches. The number of blows required to drive the sampler one foot after seating it 6-inches is referred to as the blow count or “N” value and is considered a measure of the relative density of soils. “N” values can be found in **Figure #2** adjacent to the soil descriptions. Five SPT samples were taken to a depth of eleven feet, and the borings were sampled at five-foot intervals thereafter. The soil borings were drilled in general accordance with ASTM D1586 using a tripod mounted drilling rig and the mud jetting drilling method. Each sample was removed from the sampler, classified in the field by the driller, and packaged for visual classification by our engineering staff and for laboratory testing. A bulk sample was taken from one of the pond borings for laboratory permeability testing.

4.0 SUBSURFACE CONDITIONS

Boring locations are shown in the attached **Figure #1** and should be considered approximate. The borings were located in the field by a hand held GPS unit. The subsurface conditions encountered in the borings are shown in **Figure #2**, and descriptions of the soils encountered are accompanied by their Unified Classification symbol (SP, SM, etc.) based on a visual examination unless accompanied by laboratory results. Boundaries between soil layers and soil depths should be considered approximate, since the actual transition between soil layers may be gradual. The following is a generalized summary of the conditions encountered in the test borings. For a detailed description of the subsurface conditions encountered in the borings, the reader is directed to **Figure #2**.

Groundwater levels noted below will vary with local rainfall, the tide and changes in site drainage characteristics and will be different at other times. This site could flood in hurricanes or other heavy storm events. The variation in water level depth between the borings is primarily due to variation in topography.

The restroom boring (B-1) and the shelter boring (B-2) generally encountered white loose to medium dense sand in the upper two feet, underlain by white medium dense to dense sand to a depth of 24-29 feet, over white, brown and dark brown medium dense, dense and very dense sand to the bottom of the borings at the 50-51 foot depth. Groundwater was encountered at 8-9 feet below existing grade at the time of drilling.

The boardwalk borings (B-3 to B-10) generally encountered white very loose to loose sand in the upper 2-6 feet, underlain by white medium dense to dense sand to the bottom of the borings at the 20-21 foot depth. Note that boring B-9 encountered trace organics, organic fibers and peat seams between 9.8-16.5 feet, and parts of this layer were very loose. Groundwater was encountered at 1-3 feet below existing grade at the time of drilling, except for boring B-3 which was 7 feet below grade.

The borings in the pavement areas (B-11 to B-16) generally encountered white loose, medium dense and dense sand in the upper 2 feet, underlain by white medium dense, dense and very dense sands to the bottom of the borings at 8-11 feet. Groundwater was encountered at 3.5-9 feet below existing grade at the time of drilling.

The stormwater pond borings (B-17 to B-20) generally encountered white very loose to loose sand in the upper 2-6 feet, over white to light gray medium dense to dense sand to the bottom of the borings at the 16 foot depth. Groundwater was encountered at 4.5-6 feet below existing grade at the time of drilling. We estimate the normal seasonal high groundwater table in the pond borings to be roughly 1/2 foot above the current water levels.

5.0 LABORATORY TEST RESULTS

Laboratory testing for this project included one falling head permeability test and corresponding grainsize analysis test run on a remolded bulk sample. The bulk sample was remolded to a density near that of the in place soils. Laboratory testing also consisted of wash #200 sieve tests and natural moisture content tests run on selected split spoon samples to assist in classification and document basic soil properties. The results of the laboratory tests are shown on the logs of boring (**Figure #2**) adjacent to the samples tested. The results of the falling head permeability test are also summarized in the following **Table #1**. The plotted grainsize curve for the permeability soil sample is attached as **Figure #3.**

Table #1: Permeability Test Results Summary

Boring	Sample Depth (ft)	Sample Description	Dry Unit Weight (pcf)	Saturated Vertical Hydraulic Conductivity (K_{vs}) (ft/day)	Percent Fines
B-17	2-4	White fine sand	94.7	49.3	0.1

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 Basis of Recommendations

Recommendations rendered herein are based on assumed and/or design information available at the time of this report, the subsurface conditions encountered in the test borings, commonly accepted Geotechnical Engineering principles and practices, and our experience with similar soil/groundwater conditions. Should the final project design information differ from the design information used in this report or should any soil conditions not discussed in this report be encountered during construction, our office should be notified and retained so that this report can be modified as needed.

Regardless of the care exercised in performing a Geotechnical Exploration, the possibility always exists that soil and/or groundwater conditions between the test borings will differ from those encountered at the specific boring locations. In addition, construction operations may alter the soil conditions. Therefore, it is recommended that a representative from Larry M. Jacobs & Associates, Inc. (LMJ) be involved throughout the construction phases addressed in this report. Furthermore, considering our familiarity with the project and subsurface conditions, the intent of the design and recommendations, and the benefits of keeping the Geotechnical Engineer of Record (GER) involved during construction, we recommend that LMJ be retained as the testing laboratory for this project.

6.2 Summary and General Comments

The subsurface conditions encountered in the borings appear to be suitable for the support of the proposed structures on foundations of jetted and driven timber or concrete piling. The primary geotechnical concerns encountered at the boring locations are the seams of peat soils encountered at the B-9 boring from 9.5-16.5 feet in the boardwalk area, the low strength white very loose and loose surficial sands in the pavement areas, and shallow groundwater levels in some areas.

Peat is highly organic and potentially compressible soil that can be erratic in horizontal and vertical extent, and may be encountered between boring locations on site. Seams of peat at the noted depth and location are a potential concern because the peat deposit could be thicker and/or deeper/shallower at other locations. Pile tips for the boardwalk should be placed below the peat seams, and fill could cause adverse settlement if peat is present. Fill should be placed as early during construction as practical to cause most of the peat settlement to occur before construction is complete. We have assumed no fill in the boardwalk area, and if fill is proposed we may need to revise our report.

Due to the very loose and low strength sands at the ground surface, the pavement areas will need to be compacted with a large vibratory roller and then stabilized to support construction traffic and provide a suitable surface to compact base materials. Soil conditions were well suited for long and narrow ponds due to the high permeability white sand soils. Groundwater levels could be shallower in high rainfall periods, particularly during high tide. The following sections separately discuss recommendations for site preparation, pile foundations, asphalt pavement design and stormwater ponds.

6.3 Site Preparation and Fill Recommendations

The proposed construction areas and five feet beyond the limits of construction should be stripped of any vegetation, major root systems, debris, topsoil or any soil with a significant amount of organics or other deleterious materials. The exposed subgrade should be compacted to a minimum of 95% of the soil's maximum density as determined by the Modified Proctor Test (ASTM D1557) with a traffic sized vibratory roller. Imported fill material needed to bring the site up to design grade should be clean white sand (SP) and meet all color code and/or grainsize requirements for the area. Excavated or undercut native clean sand soils that are free of significant organic content, debris or other deleterious materials can be used as fill when at or near optimum moisture content. Note those excavated native soils also have to meet any color codes for the area if they are to be reused on site. Fill materials should be placed as early in the construction process as practical and near their optimum moisture content in lifts with a maximum loose lift thickness of 12 inches for traffic sized vibratory equipment and 6 inches for hand operated plate tampers. Each lift of fill should be compacted to a minimum of 95% of the soil's maximum density as determined by the Modified Proctor Test (ASTM D1557). Backfill for excavations made in the pavement areas, such as for the placement of utilities, should be placed and compacted in the same manner as fill. LMJ technicians should be allowed to evaluate any areas with rutting or pumping.

Dry white sand soils should be wetted prior to any compaction efforts. Water should be available during the compaction process as required to facilitate compaction, as the white sand soils will drain excess water rapidly. Note that the native white sand soils will typically loosen when they dry out, and these soils should be kept moist until placing overlying pavement. Soils that dry out and loosen should be rewetted and compacted to the above requirement again. After stripping and filling if required, the pavement subgrade to at least two feet outside the limits of pavement/curb should be compacted to a minimum of 98% of the soil's maximum density as determined by the Modified Proctor Test (ASTM D1557) and stabilized per section 6.5 below. The stabilized subgrade should be compacted to a minimum of 98% of the stabilized soil's maximum density as determined by the Modified Proctor Test (ASTM D1557) to a minimum depth of 12-inches.

6.3.1 Earthwork Quality Control Testing

We recommend running in place density tests to verify compaction on the subgrade in the pavement area at a minimum frequency of one test per 5,000 square feet with a minimum of four density tests on the subgrade. Compaction of fill material should be tested at the same frequency on every 12-inch increment of fill. Compaction of backfill for utility excavations or other excavations in pavement areas should be tested on every 12-inch increment of fill at a minimum frequency of 1 test per 75 linear feet. We recommend that a representative from our office perform the density testing for this project to provide continuity to the project and to promote quality construction.

6.4 Foundation Design Recommendations

The site is suitable for supporting the proposed structures on timber or concrete pile foundations. **Tables #2 to 4** below provide the theoretical allowable pile capacities for jetted and driven concrete piles and treated timber piles. The allowable pile capacities account for flooding during an extreme storm event (i.e. hurricane) for all pile supported structures and an extra allowance for an estimated five feet scour in the restroom and shelter. The boardwalk pile capacities are not reduced for scour, and scoured soils should be replaced before use of the boardwalk. If a scour analysis is performed, LMJ should be advised to change our report as needed. Google Earth indicated existing ground surface elevations near +14 feet at the restroom facility and +10 feet at the shelter. We have assumed that the pile tips should be placed at the -12 foot elevation required by code for the beach for these two structures. Please advise if we need to revise our report if these elevations are incorrect.

All piles should be jetted from the ground surface to within 2-3 feet of the pile tip and then driven to bearing with an approved hammer. Piles with a 20 foot embedment depth should be selected for the boardwalk around the B-9 location due to the presence of peat in our boring, and the contactor should be prepared to drive those piles 5-10 feet if needed to get capacity. Peat soils can have large wood deposits or tree trunks in the soil matrix, and the contractor should be prepared to advance the pile through these materials with a chopping bit or other means if encountered.

Table #2: Restroom Allowable Pile Capacities

Pile Size/Description	Pile Tip Depth (1) (ft)	Allowable Pile Capacity (2) (Kips)	
		Compression	Tension
12 inch Square Concrete	26	67	7.1
8-inch Tip Diameter Timber	26	24	3.7
10-inch Tip Diameter Timber	26	37	4.6

Table #3: Shelter Allowable Pile Capacities

Pile Size/Description	Pile Tip Depth (1) (ft)	Allowable Pile Capacity (2) (Kips)	
		Compression	Tension
12 inch Square Concrete	22	32	4.6
8-inch Tip Diameter Timber	22	12	2.4
10-inch Tip Diameter Timber	22	18	3.0

Table #4: Boardwalk Allowable Pile Capacities

Pile Size/Description	Pile Tip Depth (1) (ft)	Allowable Pile Capacity (2) (Kips)	
		Compression	Tension
6x6 inch Square Timber	15	5.0	1.0
8-inch Tip Diameter Timber	15	6.5	1.1
10-inch Tip Diameter Timber	15	10.0	1.4
6x6 inch Square Timber	20	4.5	1.4
8-inch Tip Diameter Timber	20	6.0	1.5
10-inch Tip Diameter Timber	20	8.5	1.9

(1) Depth below existing grade at the time of drilling.

(2) Theoretical Factor of Safety = 2 for compression and tension capacity.

6.4.1 Pile Installation Recommendations

Field determination of the actual pile capacities developed should be analyzed using a dynamic pile driving formula (i.e. Hiley, WAVE, etc.). This analysis will require knowledge of the pile driving equipment to be used on the site and grades at the time of driving. We would be pleased to calculate the required pile driving resistances (i.e. blow counts or blows/foot) to obtain the pile capacities given in the preceding table when the pile driving contractor's equipment to be used and design pile is known. This analysis will also help us determine if the contractor's hammer choice is appropriate for this project.

The allowable pile capacity was calculated assuming flood conditions and five feet of scour at the shelter and restroom. Because scour and flood will substantially reduce the capacities of the piles, piles will need to be driven beyond the dynamic resistance (blow counts) required for the design load in order to allow for those reductions in pile capacity, with an increased loading on the order of 150% of the design loading on the shelter and restroom, and 125% for the boardwalk piles at 15 feet. This assumes the site grades and groundwater depths are similar to the encountered depth at the time of drilling. It is *important* that the contractor consider this when making a hammer selection. Note that stained sand soils encountered near the proposed tip embedment depth can cause a lower dynamic resistance (blows/foot) than desired due to pore pressure effects when driving. Piles which do not appear to be reaching the minimum blows/foot during driving should be stopped roughly 6 inches short of the planned tip elevations, and these piles should be re-tapped at the end of the day or preferably the next day to evaluate the capacity achieved. B-6 encountered soil layering with erratic variations in the SPT hammer blows. This can result in erratic pile driving results with pile blows/foot varying downward and up as the pile is driven. If this condition is encountered the jetting depth should be reduced as needed to achieve sufficient driving resistance.

A field technician from our office should be on the site during pile driving so that an accurate evaluation and record of the pile driving resistances achieved and pile embedment depths can be made to verify the capacities of the piles and to relay information to our engineering staff. In the event that any unusual circumstances arise during construction, additional engineering recommendations could be provided. After the piles have been satisfactorily installed under the observation of our technician, we will provide a certification letter to certify that the piles have been installed properly and should achieve the design capacity with an acceptable factor of safety. We would be pleased to provide you with a cost proposal for providing these services during construction.

6.5 Pavement Recommendations

6.5.1 Subgrade Recommendations

The white sand soils encountered in the pavement borings have a low strength and subgrade stabilization will be needed to reach a typical design LBR of 40. Pavement areas should be compacted to a minimum of 98% of the soil's maximum density as determined by the Modified Proctor Test (ASTM D1557). The top of the compacted pavement subgrade should be mixed with graded aggregate base as required to stabilize the upper 12 inches (typically a 50/50 mix). Note that the mixing method can produce inconsistent results unless strict quality control is maintained. Site preparation in pavement areas should be in accordance with **Section 6.3** of this report, and the top 12 inches of stabilized pavement subgrade should be compacted to a minimum of 98% of the soil's maximum density as determined by the Modified Proctor Test (ASTM D1557).

6.5.2 Base Recommendations

We recommend providing at least 6 inches of graded aggregate base for light duty asphalt pavement areas and 8 inches of graded aggregate base for medium duty areas. Asphalt pavement base should be compacted to a minimum of 100% of the material's maximum dry density as determined by the Modified Proctor Test (ASTM D1557). We recommend using graded aggregate base with a minimum LBR value of 100. A sample of the proposed graded aggregate base should be submitted to our lab for testing and approval prior to shipment to the site.

6.5.3 Asphalt Pavement Recommendations

We recommend paving asphalt pavement areas with at least 1.5 inches of asphalt for light duty areas and 2-2.5 inches for medium duty areas, depending upon the anticipated traffic loads and service life. All asphalt should consist of FDOT structural course Superpave Asphaltic Concrete (SP-9.5, SP-12.5, or SP-19.0) meeting the requirements of the FDOT Standard Specifications for Road and Bridge Construction Section 334. Superpave asphalt fine mixes should be compacted to a minimum density of 93% of the laboratory maximum specific gravity (G_{mm} or Rice Specific Gravity) as determined by FM 1-T 209. Superpave asphalt coarse mixes should be compacted to a minimum density of 94.5% of the laboratory maximum specific gravity as determined by FM 1-T 209.

6.5.4 Concrete Pavement Recommendations

Concrete pavement may be considered for any dumpster pads or other areas to receive significant truck traffic. Concrete pavement should have at least 4,000 psi compressive strength at 28 days and be placed on 12 inches of compacted stabilized subgrade like the asphalt pavement.

6.5.5 Pavement Quality Control Testing

A sample of the proposed base material and stabilized mixture should be submitted to our lab for approval, and LBR tests should be performed on the selected materials for this project to check that they meets the project specifications. Proper compaction of the pavement subgrade and base is critical to the performance of the pavement, and we recommend running in place density tests to verify compaction. We recommend running density tests on compacted subgrade, stabilized subgrade and base at a frequency of one test per 5,000 square feet of pavement area, with a minimum of four tests on each layer. After the asphalt has been placed, the asphalt should be cored to determine the thickness that was placed and the density of the asphalt. The bulk specific gravity (G_{mb}) of the cores should be determined in accordance with FM 1-T 166.

6.6 Stormwater System Recommendations

The borings drilled in the proposed stormwater area on site (B-17 to B-20) encountered high permeability white sand soils. The results of the borings and laboratory tests indicate soil conditions that appear to be best suited for stormwater disposal using long and narrow ponds/swales. Our recommended parameters for designing the stormwater system are provided in the following **Table #5**. Appropriate safety factors should be used for the design of the stormwater system. We recommend analyzing the system by treating the bottom of the borings as the bottom of the aquifer, and this depth is noted in **Table #3** below. Fillable porosity was calculated from the unit weight of the remolded bulk sample and a moisture content of 6 percent. The hydraulic conductivity values are based on NWFWMD maximum values for fine sands. We estimate the seasonal high groundwater table to be roughly 1/2 foot above the current water levels in the pond borings, as these borings were drilled in an average rainfall period.

Table #5: Swale Design Parameters Summary

Equivalent Saturated Vertical Hydraulic Conductivity (K_{vs}) (ft/day)	Equivalent Saturated Horizontal Hydraulic Conductivity (K_{hs}) (ft/day)	Avg. Depth to Bottom of Aquifer from Existing grade (ft)	Fillable Porosity
40	40	16	0.34

We hope that this report provides sufficient information for your current requirements. If you have any questions or comments, please do not hesitate to call.

Respectfully yours,

LARRY M. JACOBS & ASSOCIATES, INC.

Terry Niemann

Terry D. Niemann
Project Manager

LARRY M. JACOBS
LICENSE
No 19690
STATE OF FLORIDA
PROFESSIONAL ENGINEER

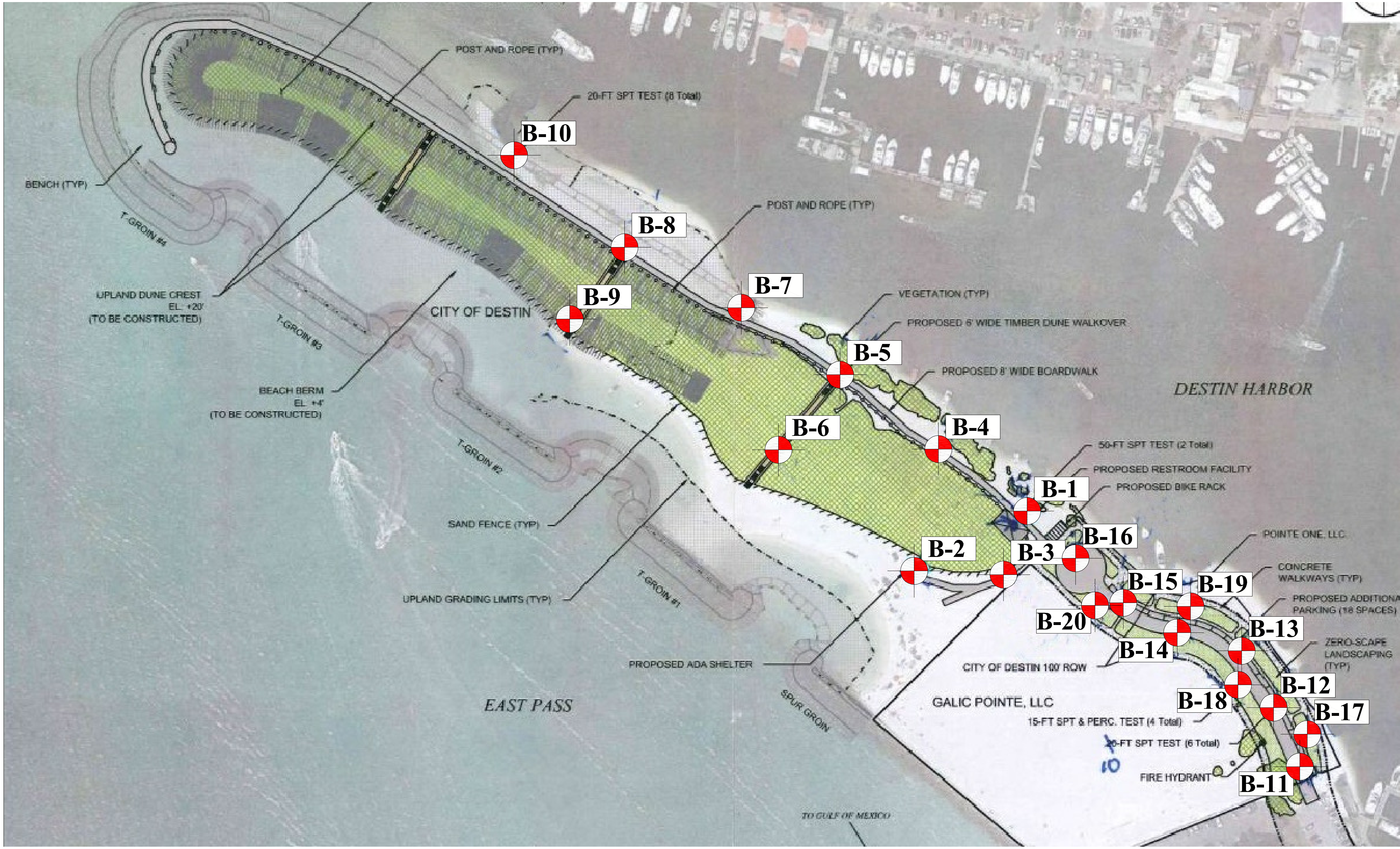
7 Nov 2017

Larry M. Jacobs, PE
Principal Geotechnical Engineer
Florida Reg. #19690

Attachments

Figure #1

BORING LOCATION PLAN



N

STANDARD PENETRATION TEST BORING

ALL BORING LOCATIONS ARE APPROXIMATE

Project #: 15-215	Scale: NTS
Date: 10/26/2017	Checked By: TDN
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Location: Escambia, Florida	

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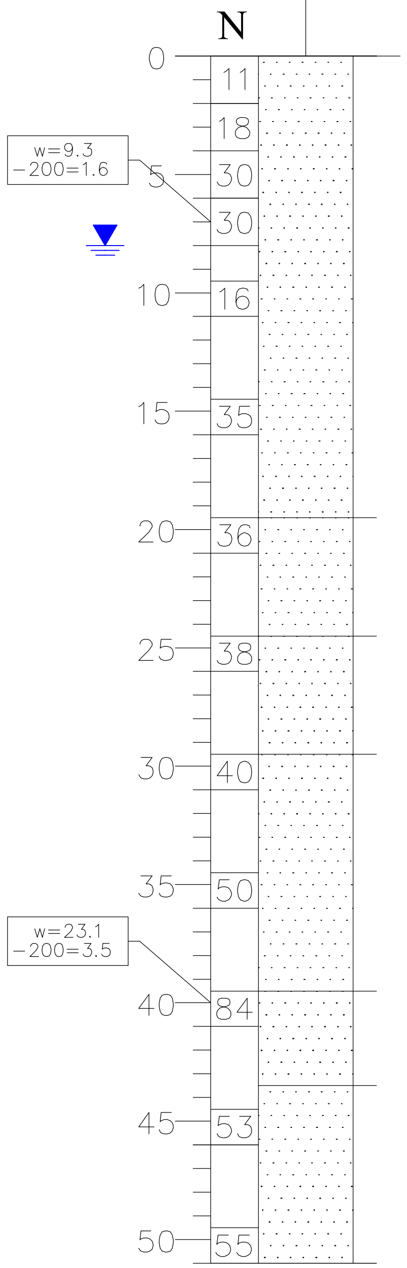
Figure #2

BORING LOGS

B-1

09-28-17



WHITE MEDIUM DENSE TO DENSE SAND (SP)

WHITE WITH POCKETS OF GRAY SLIGHTLY STAINED DENSE SAND (SP)

WHITE SLIGHTLY STAINED DENSE SAND WITH POCKETS OF GRAY SAND, TRACE SHELL (SP)

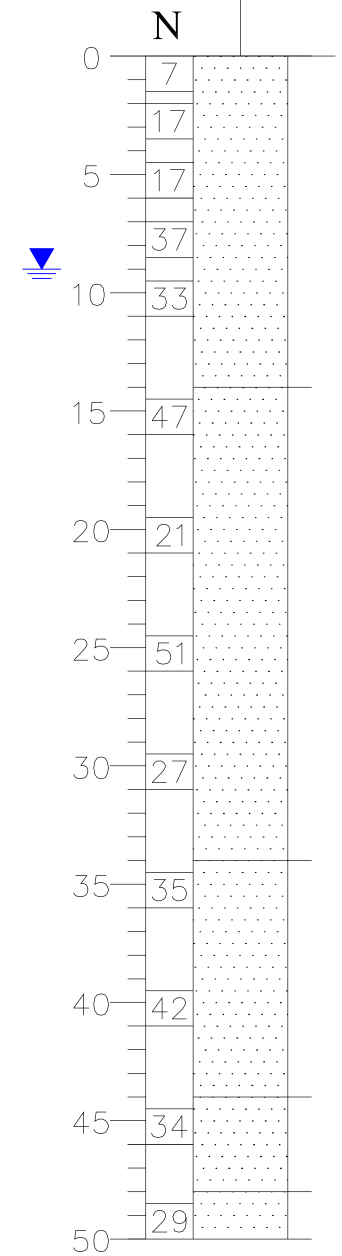
LIGHT BROWN/TAN WITH GRAY POCKETS DENSE SAND (SP)

BROWN SLIGHTLY STAINED VERY DENSE SAND (SP)

LIGHT BROWN/TAN WITH GRAY POCKETS VERY DENSE SAND (SP)

B-2

10-11-17



WHITE LOOSE TO MEDIUM DENSE TO DENSE SAND (SP)

WHITE SLIGHTLY STAINED DENSE TO MEDIUM DENSE TO VERY DENSE TO MEDIUM DENSE SAND (SP)

DARK BROWN SLIGHTLY STAINED DENSE SAND (SP)

BROWN SLIGHTLY STAINED DENSE SAND (SP)

WHITE WITH LIGHT BROWN POCKETS SLIGHTLY STAINED MEDIUM DENSE SAND (SP)

LEGEND

SAND; SLIGHTLY SILTY SAND; SILTY SAND; SILT; CLAY; CLAYEY SAND; PEAT; GRAVEL

GRANULAR MATERIALS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
GREATER THAN 50	VERY DENSE

SILTS AND CLAY

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-16	STIFF
17-32	VERY STIFF
GREATER THAN 32	HARD

SYMBOLS:

GNE= GROUNDWATER NOT ENCOUNTERED AT TIME OF DRILLING
N = STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
▼ = ENCOUNTERED GROUNDWATER LEVEL
▽ = ENCOUNTERED PERCHED WATER LEVEL
50/2" = NUMBER OF BLOWS REQUIRED (50) TO ADVANCE SPLIT SPOON SAMPLER A SPECIFIC DISTANCE (2) INCHES
HW= SPLIT SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
HA= HAND AUGER
▌= SHELBY TUBE SAMPLE
W= NATURAL MOISTURE CONTENT (%)
-200= FINES PASSING #200 SIEVE (%)
LL= ATTERBERG LIMITS (%)
LL=LIQUID LIMIT, PL=PLASTIC LIMIT
LI= LIQUIDITY INDEX
c= APPROXIMATE COHESION VALUE (PSF) BASED ON POCKET PENETROMETER READINGS
K_v= SATURATED VERTICAL HYDRAULIC CONDUCTIVITY (FT/DAY)
γ_d= DRY UNIT WEIGHT (pcf)
γ_m= ESTIMATED MOIST UNIT WEIGHT (PCF)
γ_b= ESTIMATED BOUYANT UNIT WEIGHT (PCF)
ϕ= ESTIMATED ANGLE OF INTERNAL FRICTION (DEGREES)

NOTES:

1) SPT BORINGS PERFORMED IN GENERAL ACCORDANCE WITH ASTM D1586
2) SUBSURFACE CONDITIONS ARE AT BORING LOCATIONS AND ACTUAL CONDITIONS BETWEEN BORINGS MAY VARY
3) ALL CLASSIFICATIONS ARE BASED ON VISUAL EXAMINATION UNLESS ACCOMPANIED BY LABORATORY TEST RESULTS
4) BOUNDARIES BETWEEN SOIL LAYERS SHOULD BE CONSIDERED APPROXIMATE AS THE ACTUAL TRANSITION MAY BE GRADUAL
5) DEPTH OF BORING IS BELOW EXISTING GRADE AT TIME OF DRILLING
6) ELEVATIONS ESTIMATED FROM PROVIDED TOPOGRAPHIC SURVEY

Project #: 15-215 **Scale: NTS**

Date: 10/26/2017 **Checked By: TDN**

Project: Norriego Point

Location: Escambia, Florida

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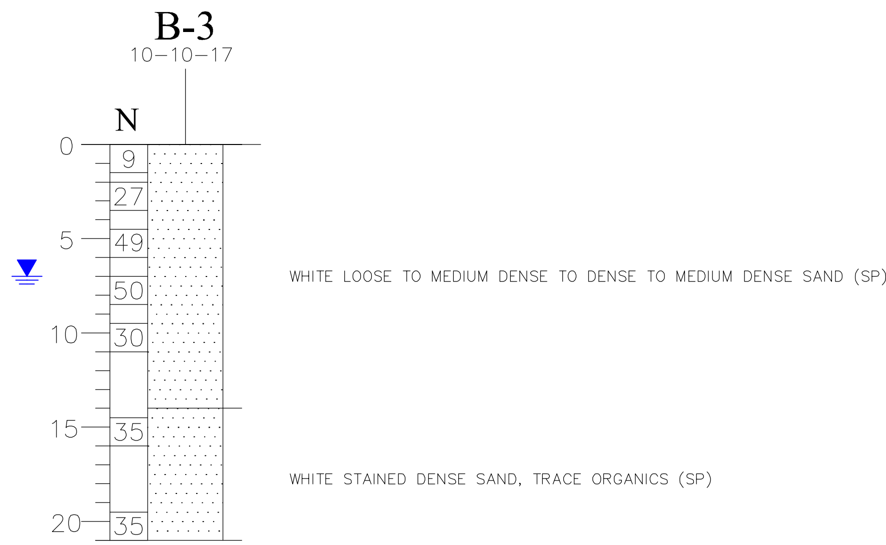
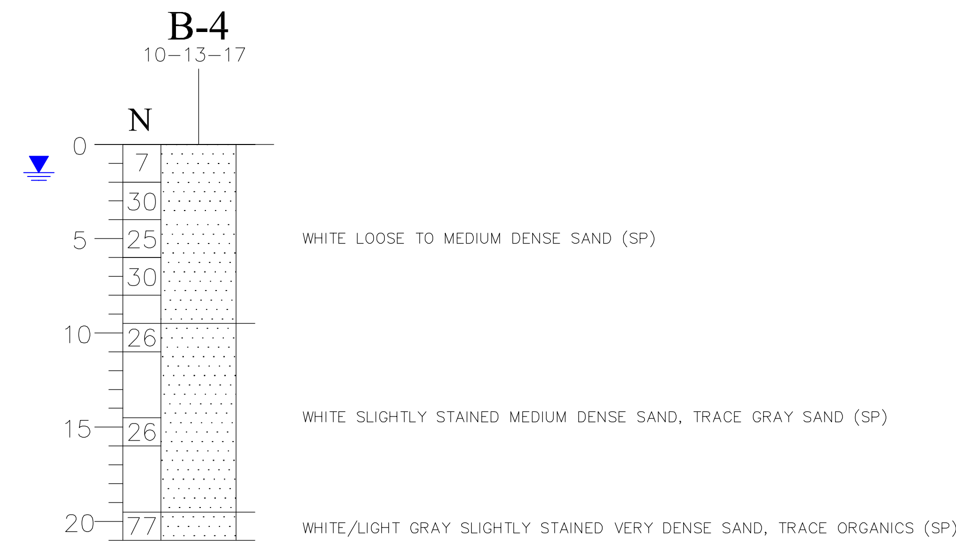
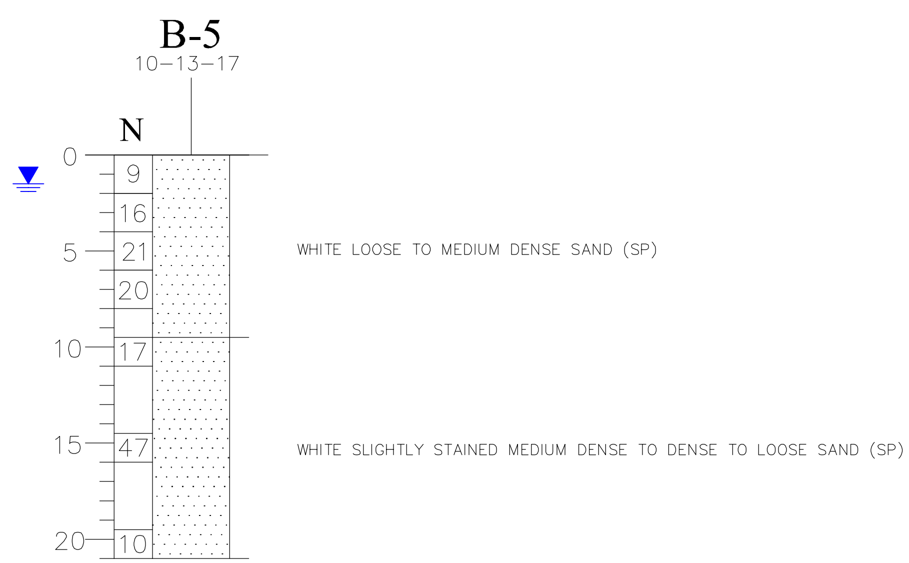
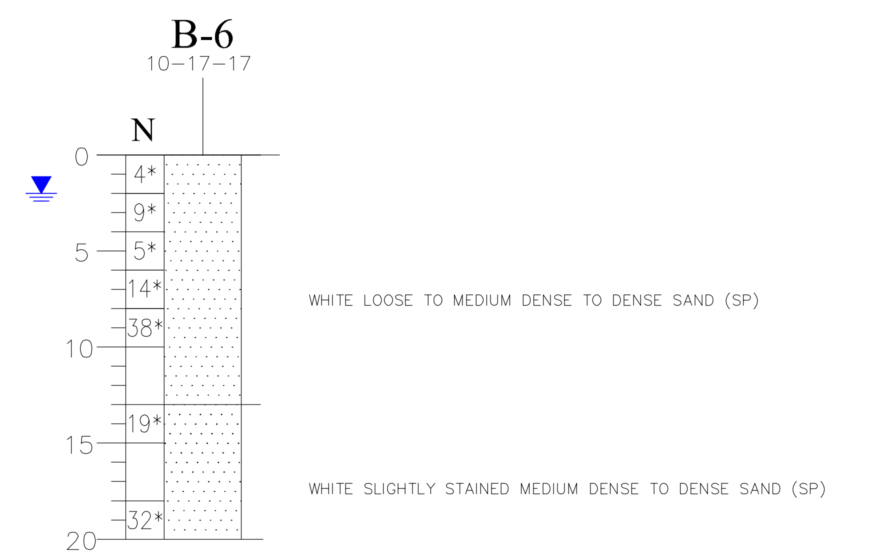
Figure #2

BORING LOGS









*HAMMER BLOWS:
1 FT SAMPLE: 1/1/3/5
3 FT SAMPLE: 3/4/5/6
5 FT SAMPLE: 4/3/2/2
7 FT SAMPLE: 4/4/10/12
9 FT SAMPLE: 12/18/20/25
14 FT SAMPLE: 10/9/10/13
19 FT SAMPLE: 10/14/18/28

LEGEND

- SAND
- SLIGHTLY SILTY SAND
- SILTY SAND
- SILT
- CLAY
- CLAYEY SAND
- PEAT
- GRAVEL

GRANULAR MATERIALS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
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ϕ= ESTIMATED ANGLE OF INTERNAL FRICTION (DEGREES)

NOTES:

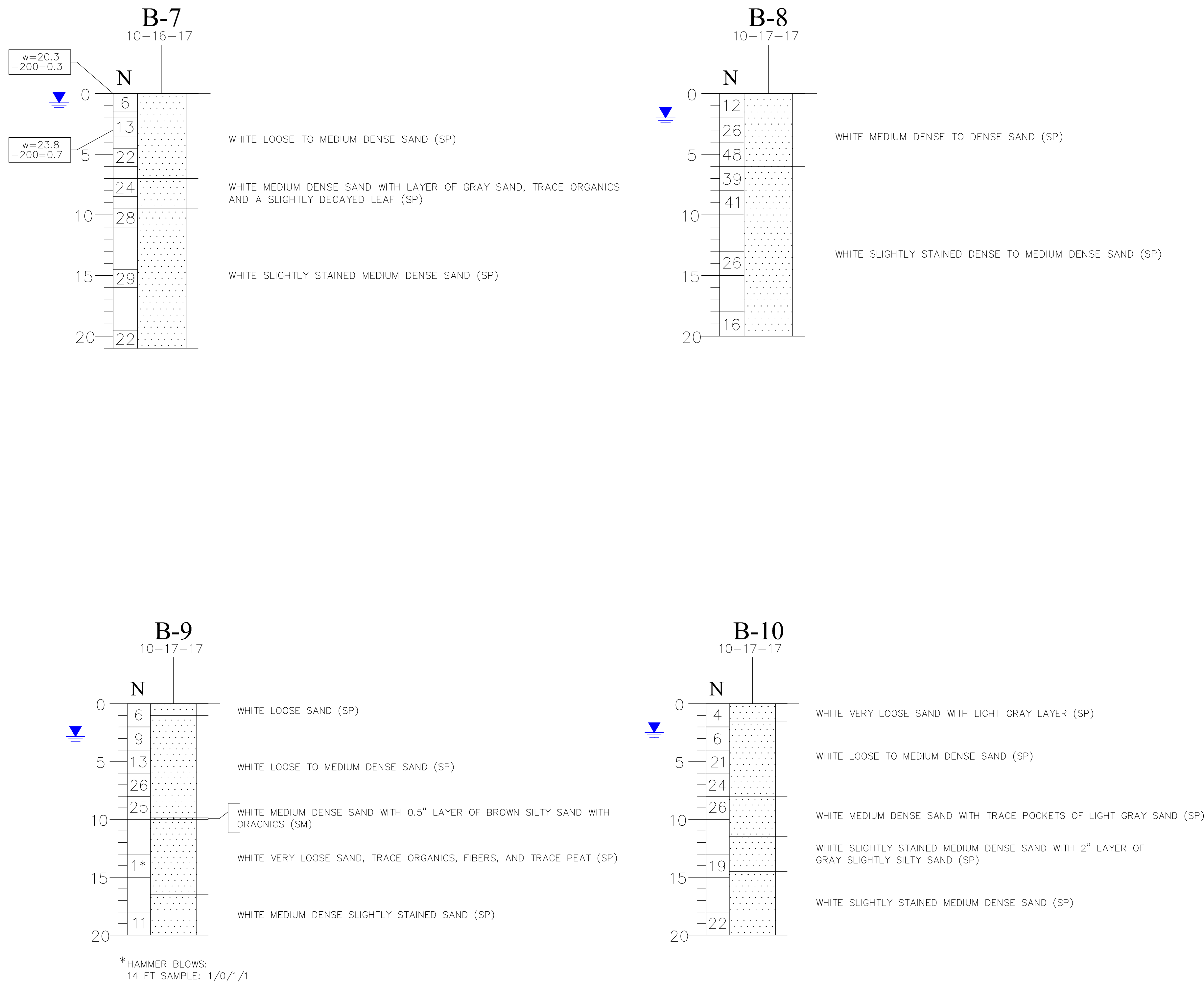
1) SPT BORINGS PERFORMED IN GENERAL ACCORDANCE WITH ASTM D1586
2) SUBSURFACE CONDITIONS ARE AT BORING LOCATIONS AND ACTUAL CONDITIONS BETWEEN BORINGS MAY VARY
3) ALL CLASSIFICATIONS ARE BASED ON VISUAL EXAMINATION UNLESS ACCOMPANIED BY LABORATORY TEST RESULTS
4) BOUNDARIES BETWEEN SOIL LAYERS SHOULD BE CONSIDERED APPROXIMATE AS THE ACTUAL TRANSITION MAY BE GRADUAL
5) DEPTH OF BORING IS BELOW EXISTING GRADE AT TIME OF DRILLING
6) ELEVATIONS ESTIMATED FROM PROVIDED TOPOGRAPHIC SURVEY

Project #: 15-215 **Scale: NTS**
Date: 06/14/2016 **Checked By: TDN**
Project: Norriego Pt.
Location: Escambia, Florida

Geotechnical Engineering
Drilling Services
Materials Testing

Figure #2

BORING LOGS



LEGEND

SAND, SLIGHTLY SILTY SAND, SILTY SAND, SILT, CLAY, CLAYEY SAND, PEAT, GRAVEL

GRANULAR MATERIALS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
GREATER THAN 50	VERY DENSE

SILTS AND CLAY

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-16	STIFF
17-32	VERY STIFF
GREATER THAN 32	HARD

SYMBOLS:

GNE= GROUNDWATER NOT ENCOUNTERED AT TIME OF DRILLING
N = STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
▼ = ENCOUNTERED GROUNDWATER LEVEL
▽ = ENCOUNTERED PERCHED WATER LEVEL
50/2"= NUMBER OF BLOWS REQUIRED (50) TO ADVANCE SPLIT SPOON SAMPLER A SPECIFIC DISTANCE (2) INCHES
HW= SPLIT SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
HA= HAND AUGER
▐ = SHELBY TUBE SAMPLE
W= NATURAL MOISTURE CONTENT (%)
-200= FINES PASSING #200 SIEVE (%)
LL= ATTERBERG LIMITS (%)
LL=LIQUID LIMIT, PL=PLASTIC LIMIT
LI= LIQUIDITY INDEX
c= APPROXIMATE COHESION VALUE (PSF) BASED ON POCKET PENETROMETER READINGS
K_v= SATURATED VERTICAL HYDRAULIC CONDUCTIVITY (FT/DAY)
γ_d= DRY UNIT WEIGHT (pcf)
γ_m= ESTIMATED MOIST UNIT WEIGHT (PCF)
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Project #: 15-215 **Scale: NTS**
Date: 10/26/2017 **Checked By: TDN**
Project: Norriego Point
Location: Escambia, Florida

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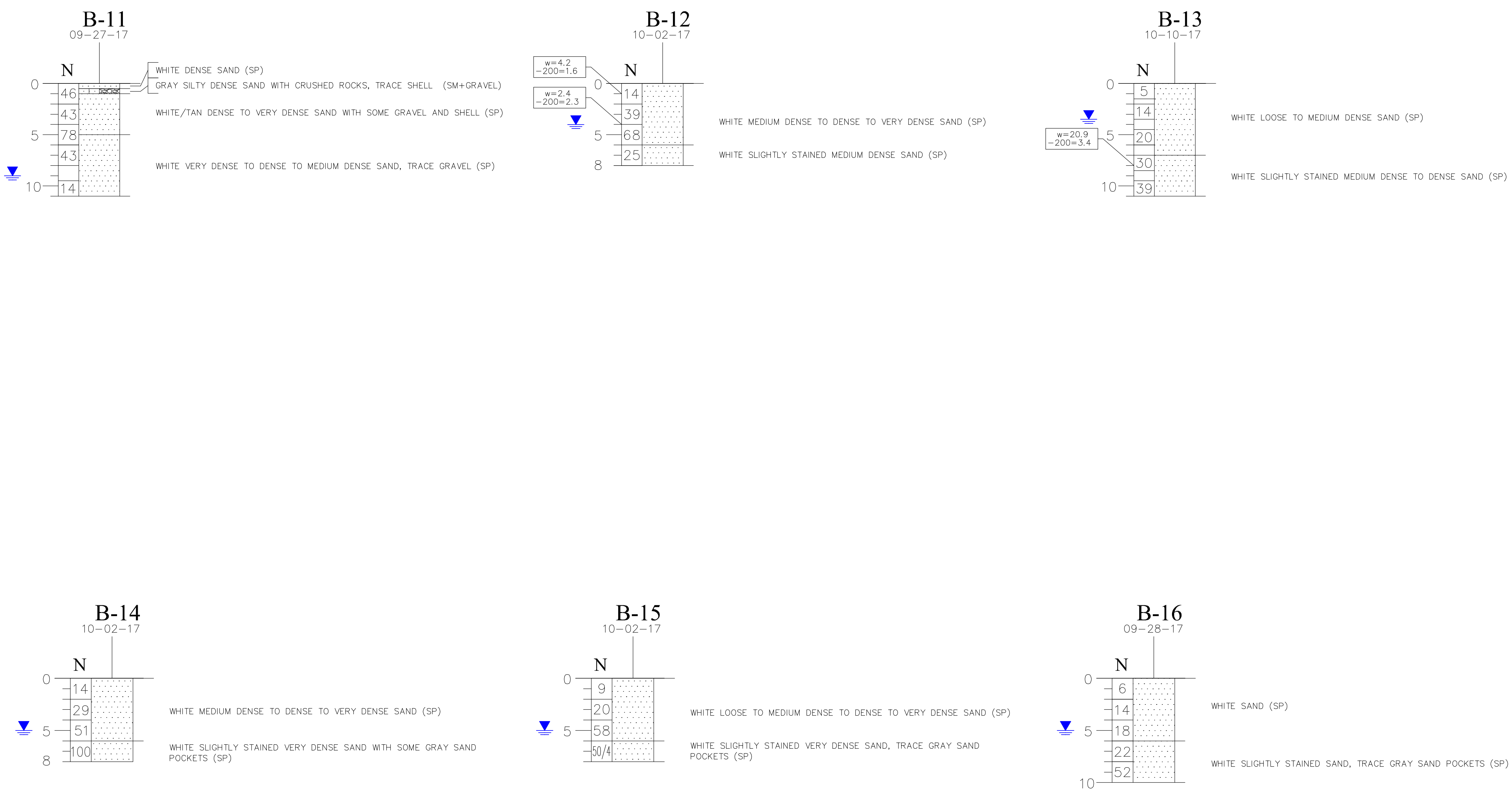
Figure #2

BORING LOGS



LEGEND

SAND
SLIGHTLY SILTY SAND
SILTY SAND
SILT
CLAY
CLAYEY SAND
PEAT
GRAVEL

GRANULAR MATERIALS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
GREATER THAN 50	VERY DENSE

SILTS AND CLAY

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-16	STIFF
17-32	VERY STIFF
GREATER THAN 32	HARD

SYMBOLS:

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Project #: 15-215 **Scale: NTS**

Date: 06/14/2016 **Checked By: TDN**

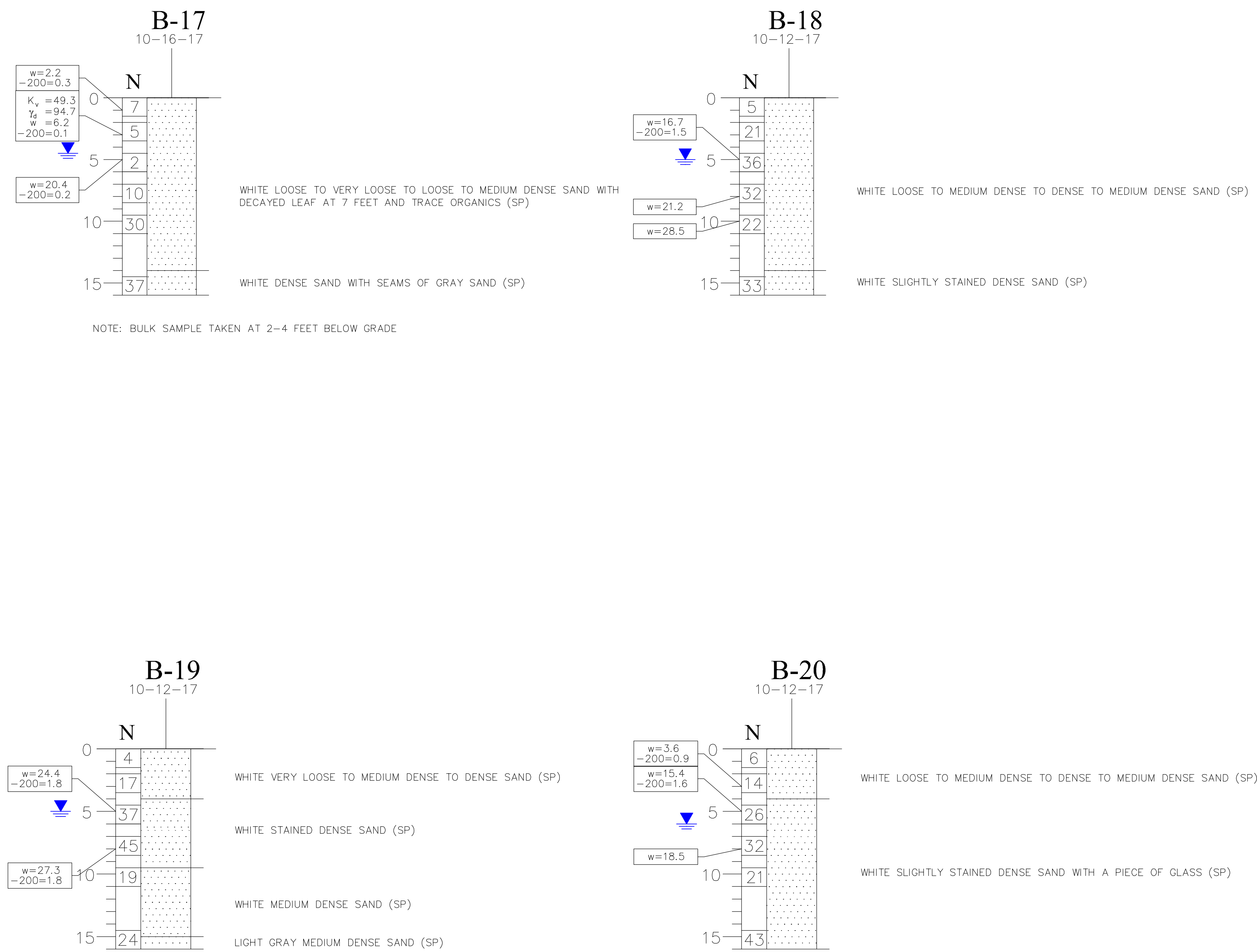
Project: Norriego Pt.

Location: Escambia, Florida

Geotechnical Engineering
Drilling Services
Materials Testing

Figure #2

BORING LOGS



LEGEND

SAND; SLIGHTLY SILTY SAND; SILTY SAND; SILT; CLAY; CLAYEY SAND; PEAT; GRAVEL

GRANULAR MATERIALS

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
GREATER THAN 50	VERY DENSE

SILTS AND CLAY

SPT BLOWS/FOOT (N)	RELATIVE DENSITY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
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