ECS Florida, LLC

Geotechnical Engineering Report

River Landing Lot 103

216 Shell Ridge Lane
Nocatee, Florida

ECS Project Number 35:35675

June 21, 2024

ECS FLORIDA, LLC
Geotechnical • Construction Materials • Environmental • Facilities

June 21, 2024

Mr. Maurice Rudolph
HYDRY Company, LLC
4314 Pablo Oaks Court
Jacksonville, Florida 32224

ECS Project No. 35:35675

Reference: Geotechnical Engineering Report
River Landing Lot 103
216 Shell Ridge Lane
Nocatee, Florida

Dear Mr. Rudolph:

ECS Florida, LLC. (ECS) has completed the subsurface exploration and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration conducted, and our design and construction recommendations.

It has been our pleasure to be of service to you during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,
ECS Florida, LLC.

Robert W. Clark, State of Florida Professional Engineer, License No. 52210

This item has been digitally signed and sealed by Robert W. Clark on the date indicated here

Printed copies of this document are not considered Signed and sealed and the signature must be verified On any electronic copies

Digitally signed by Robert W Clark
Date: 2024.06.21 12:26:57 -04'00'

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"ONE FIRM. ONE MISSION."

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APPENDICES

EXECUTIVE SUMMARY

This Executive Summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from the Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

- Three of the borings encountered sands with few to many organic fines at depths of about 6 to 8 feet below the existing ground surface. Removal of the material by over excavation will be required.

- Subsequent to the over-excavation and replacement of these materials, the planned structure can be supported by a conventional shallow foundation system with a maximum allowable bearing pressure of 2,500 psf. Provided the site preparation and earthwork construction recommendations outlined in Section 5.0 of this report are performed, the parameters presented in Section 4.0 of this report may be used for foundation design.

- The borings encountered groundwater at a depth of about 4 feet below the existing ground surface at the time of our exploration. Dewatering will probably be required to remove and replace the underlying organic soils.

- We recommend that ECS be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented. ECS should also be retained to perform the construction materials testing and observations required for this project, to verify that our recommendations have been implemented.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design of foundations for the single-family residential structure. The recommendations developed for this report are based on project information supplied by you.

Our services were provided in accordance with our Proposal No. 22250-GP, dated May 21, 2024, and the work agreement dated May 23, 2024.

This report contains the procedures and results of our subsurface exploration program, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items:

- A brief review and description of our field procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Final copies of our soil boring logs.
- Recommendations for foundation design.
- Evaluation and recommendations relative to groundwater control.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE

The project site is located west of Shell Ridge Lane in Nocatee, St. Johns County, Florida. The site is bordered to the north by an existing residential structure, to the south by undeveloped lots, to the east by wooded undeveloped land, and to the east by a paved road. The general site location is shown on Figure 1 in Appendix A and in Figure 2.1.1 below.

Figure 2.1.1. Site Location

At the time of our exploration, the site was undeveloped, with surface cover consisting of trees and some underbrush. A site survey was not available to our office at the time of this report preparation. However, based on publicly available information, we understand that the site generally slopes downward to the west. Surface water was not observed near planned structural areas at the time of our exploration.

2.2 PROPOSED CONSTRUCTION

The following information explains our understanding of the planned development including proposed buildings and related infrastructure.

SUBJECT	DESIGN INFORMATION / ASSUMPTIONS
# of Stories	1 to 3 stories above grade
Usage	Residential
Framing	Reinforced concrete block or wood with interior columns
Column Loads(1)	40 kips (Full Dead and Factored Live)
Wall Loads(1)	4 kips per linear foot (klf) maximum
Floor Loads(1)	150 pounds per square foot (psf) maximum
Fill and Cut Heights	Assumed a maximum of 3 feet of fill and only minor cuts, from existing site grades

(1) If actual structural loads differ from these estimated loads ECS must be contacted immediately in order to revise building foundation recommendations and settlement calculations, as needed.

If actual project information varies from these conditions, then the recommendations in this report may need to be re-evaluated. We should be contacted if any of the above project information is incorrect so that we may reevaluate our recommendations.

3.0 FIELD EXPLORATION

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling five Standard Penetration Test (SPT) borings. Our borings were located using our handheld GPS units and their approximate locations are shown on the Field Exploration Diagram (Figure 2) in Appendix A.

3.1 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil strata. Please refer to the boring logs in Appendix B.

Typical Depth (ft)		Stratum	Description
From	To		
Existing Ground Surface	0.5 -1	n/a	Topsoil
0.5 - 1	3 - 6	I	Very Loose to Loose Fine SAND (SP)
3 - 6	6 - 8	II	Very Loose to Loose Fine SAND (SP), Fine SAND with Clay (SP-SC), and Silty or Clayey Fine SAND (SM, SC)(1)
8 - 15	37	III	Medium Dense to Dense Fine SAND (SP) and Silty Fine SAND (SP)
37	50	IV	Medium Dense Fine SAND with Clay (SP-SC) and Soft to Stiff CLAY (CH)

(1) Borings B1, B2 and B3 encountered fine sands with few to many organic fines at depths of about 6 to 8 feet.

A graphical presentation of the subsurface conditions is shown on the Generalized Subsurface Profiles included in Appendix A.

3.2 GROUNDWATER OBSERVATIONS

3.2.1 Encountered Groundwater

Water levels were measured during our field exploration and are presented in our boring logs in Appendix B. The groundwater depth measured at the time of drilling was about 4 feet below the ground surface. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

3.2.2 Estimated Seasonal High Groundwater

The normal seasonal high groundwater level is affected by a number of factors. The drainage characteristics of the soils, land surface elevation, relief points such as drainage ditches, lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the seasonal high groundwater level.

Based on our interpretation of the site conditions, including the boring logs and Web Soil Survey, we estimate the normal seasonal high groundwater level at the boring locations to be approximately 1½ feet above the groundwater levels measured at the time of our field exploration. It is possible that groundwater levels may exceed the estimated normal seasonal high groundwater level as a result of significant or prolonged rains.

3.3 LABORATORY TESTING

The laboratory testing consisted of selected tests performed on samples obtained during our field exploration operations. Classification and index property tests were performed on representative soil samples. The laboratory testing determined the moisture, fines, and organic contents of selected soil samples. The results of the laboratory testing are summarized in Appendix C.

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

4.0 DESIGN RECOMMENDATIONS

The recommendations presented in this report are based on the project information provided to us, the results of the soil test borings, and our engineering analyses. Considering the results of our field exploration, we do not consider the subsurface conditions at the site suitable for support of the house on traditional shallow foundations without over-excavation of the underlying organic material.

4.1 OVER-EXCAVATION AND SHALLOW FOUNDATIONS

As encountered in the borings, soils with a high organic fines content are present at depths between approximately 6 feet and 8 feet below existing grades. We recommend the organic soils be completely over-excavated within and to a distance of at least 10 feet beyond the building and pavement areas. The replacement soils should be placed and compacted in accordance with Section 5.2.1. Excavation and replacement operations will probably encounter groundwater. Therefore, temporary dewatering will be required to properly remove the material.

4.1.1 Foundations

Provided the organic materials are over-excavated and the subgrade is prepared as outline in Section 5.0, the proposed structure can be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameters:

Design Parameter	Column Footing	Wall Footing
Minimum Width	24 inches	18 inches
Minimum Footing Embedment Depth (below slab or finished grade)	12 inches	12 inches
Estimated Maximum Total Settlement[1]	1 inch	1 inch
Estimated Maximum Differential Settlement[2]	Less than ½ inch between columns	Less than ½ inch over 50 feet
Maximum Net Allowable Soil Bearing Pressure[3]	2,500 psf	
Acceptable Bearing Soil Material	Compacted Stratum I or Compacted Fill	

1. Based on estimated structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
2. Based on maximum column/wall loads and variability in borings. Differential settlement can be re-evaluated once the foundation plans are more complete.
3. Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

Depending on the final floor elevations of the building, we anticipate that most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure, after prepared in accordance with Section 5.0 of this report. The bearing level soils, after compaction, should exhibit densities equivalent to 95 percent of the modified Proctor maximum dry density (ASTM D 1557) to a depth of at least one foot below foundation bearing levels.

For turn down slabs and interior wall footings the minimum width should also be 18 inches, however the sloped transition portion of the turn-down may be included when determining the footing width. Even though the maximum allowable soil bearing pressure may not be achieved, these width recommendations should control the size of the foundations.

4.2 SLABS ON GRADE

The floor slabs can be constructed as a slab-on-ground, provided the site is prepared as outlined in Section 5.0. A minimum clearance of 2 feet is recommended between the estimated seasonal high groundwater table and the bottom of the floor slab. It is recommended the floor slab bearing soils be covered with an impervious membrane to reduce moisture entry and floor dampness. A 6-mil thick plastic membrane is commonly used for this purpose. Care should be exercised not to tear large sections of the membrane during placement of reinforcing steel and concrete.

Subgrade Modulus: Provided the placement of engineered fill per the recommendations discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 150 pci (lbs/cu. inch). The modulus of subgrade reaction value is based on a 1 ft by 1 ft plate load test basis.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

Prior to construction, the location of existing underground utilities within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. Underground pipes that are not properly removed or plugged may serve as conduits for subsurface erosion, which may subsequently lead to excessive settlement of overlying structures.

Site preparation should consist of clearing the existing vegetation and near surface organic topsoil. The clearing/stripping operations should extend within and to a distance of at least five feet beyond the perimeter of the proposed building areas and three feet beyond pavement areas. During grubbing operations, roots with a diameter greater than 0.5-inch, stumps, or small roots in a concentrated state, should be grubbed and completely removed.

Based on the results of our field exploration, it should be anticipated that 6 inches to 12 inches of topsoil and soils containing significant amounts of organic materials may be encountered across the site. The actual depths of the organic soils should be determined by ECS using visual observation and judgment during earthwork operations. Any topsoil removed from the building and parking/drive areas can be stockpiled and used subsequently in non-structural areas.

5.1.2 Over-Excavation

As discussed in Section 3.1, soils containing organics will need to be removed within the proposed building and hardscaped areas and should be over-excavated in their entirety from below the proposed construction, plus a horizontal margin of approximately 10 feet beyond the building “footprint” plan areas and pavement areas. The over-excavated unsuitable soils should be replaced with compacted structural fill soils as discussed below in Section 5.2.1. Removal and backfilling operations should be monitored continuously to verify all unsuitable materials are removed to the required depth and that backfill soils are suitable and compacted. Although highly organic soils were only encountered at one boring location, the area of over-excavation may extend beyond the area of that boring. The lateral extent of the removal should be determined during the excavation process. Excavation and replacement operations will likely encounter groundwater. Therefore, temporary dewatering will be required to check that deleterious materials are satisfactorily removed and also to achieve proper compaction of backfill soils.

Excavation side slopes should be in accordance with OSHA requirements for loose sandy soils. Temporary slopes cut back at 1.5 horizontal to 1 vertical (1.5H:1V) may be used. The 1.5H:1V slopes are contingent upon the dewatering system adequately controlling slope groundwater seepage.

5.1.3 Temporary Groundwater Control

The borings encountered groundwater at a depth of approximately 4 foot below the existing ground surface at the time of our exploration. Because of the need for over-excavation, it will be necessary to install temporary groundwater control measures to dewater the area.

Dewatering methods should be determined by the contractor. We recommend the groundwater control measures, if necessary; remain in place until compaction of the existing soils is completed. The dewatering method should be maintained until backfilling has reached a height of 2 feet above the groundwater level at the time of construction. The site should be graded to direct surface water runoff from the construction area.

5.2 EARTHWORK OPERATIONS

5.2.1 Engineered Backfill and Fill Soils

Engineered fill is defined as a non-plastic, inorganic, granular soil having less than 15 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The near surface fine sands and fine sands with silt, without roots, as encountered in the borings, are acceptable for use as fill materials and, with proper moisture control, should densify using conventional compaction methods. Soils with more than 10 to 12 percent passing the No. 200 sieve will be more difficult to compact, due to their nature to retain soil moisture, and may require drying.

Engineered Fill Compaction Requirements: Materials satisfactory for use as engineered fill should consist of soils with the following compaction requirements.

ENGINEERED FILL COMPACTION REQUIREMENTS

Subject	Requirement
Compaction Standard	Modified Proctor, ASTM D1557
Required Compaction	95% of Max. Dry Density (general engineered fill)
Loose Thickness prior to compaction	12 inches if vibratory drum roller compaction equipment is used 8 inches if vibratory drum roller is used in static mode 8 inches if track-mounted compaction equipment is used 6 inches if hand-held compaction equipment is used

Fill materials should not be placed on excessively wet soils. Excessively wet soils should be moisture conditioned, which may include scarifying and aerating. Proper drainage should be maintained during the earthwork phases of construction in an attempt to prevent ponding of water which has a tendency to degrade subgrade soils. The contractor should minimize dusting or implement dust control measures, as required.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. Moisture control may be difficult during extended periods of rain. The control of moisture content of soils containing more than 10% fines may be difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

5.2.2 Foundation Areas

After satisfactory placement and compaction of the required engineered fill, the foundation areas may be excavated to the planned bearing levels. The foundation bearing level soils, after compaction, should exhibit densities equivalent to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) to a depth of one foot below the bearing level. For confined areas, such as the footing excavations, any compactive effort should be provided by a lightweight vibratory sled or roller having a total weight on the order of 500 to 2,000 pounds.

5.3 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: We anticipate that typical moisture conditioning for soils in this area should be anticipated. The sandy surface soils may require wetting during dry periods or periods of high heat. Drying of soils containing more than 10% fines or excavated from below the water table may be required to be within ±2 percentage points of the modified Proctor optimum moisture content (ASTM D 1557).

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and can likely be used in pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of at least 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to limit infiltration of surface water.

Excavation Safety: All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Erosion Control: The surface soils may be erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

6.0 CLOSING

Our geotechnical exploration has been performed, our findings presented, and our recommendations prepared, in accordance with generally accepted geotechnical engineering principles and practices. ECS is not responsible for any independent conclusions, interpretation, opinions, or recommendations made by others based on the data contained in this report.

Our scope of services was intended to evaluate the soil conditions within the zone of soil influenced by the foundation system. Our scope of services does not address geologic conditions, such as sinkholes or soil conditions existing below the depth of the soil borings.

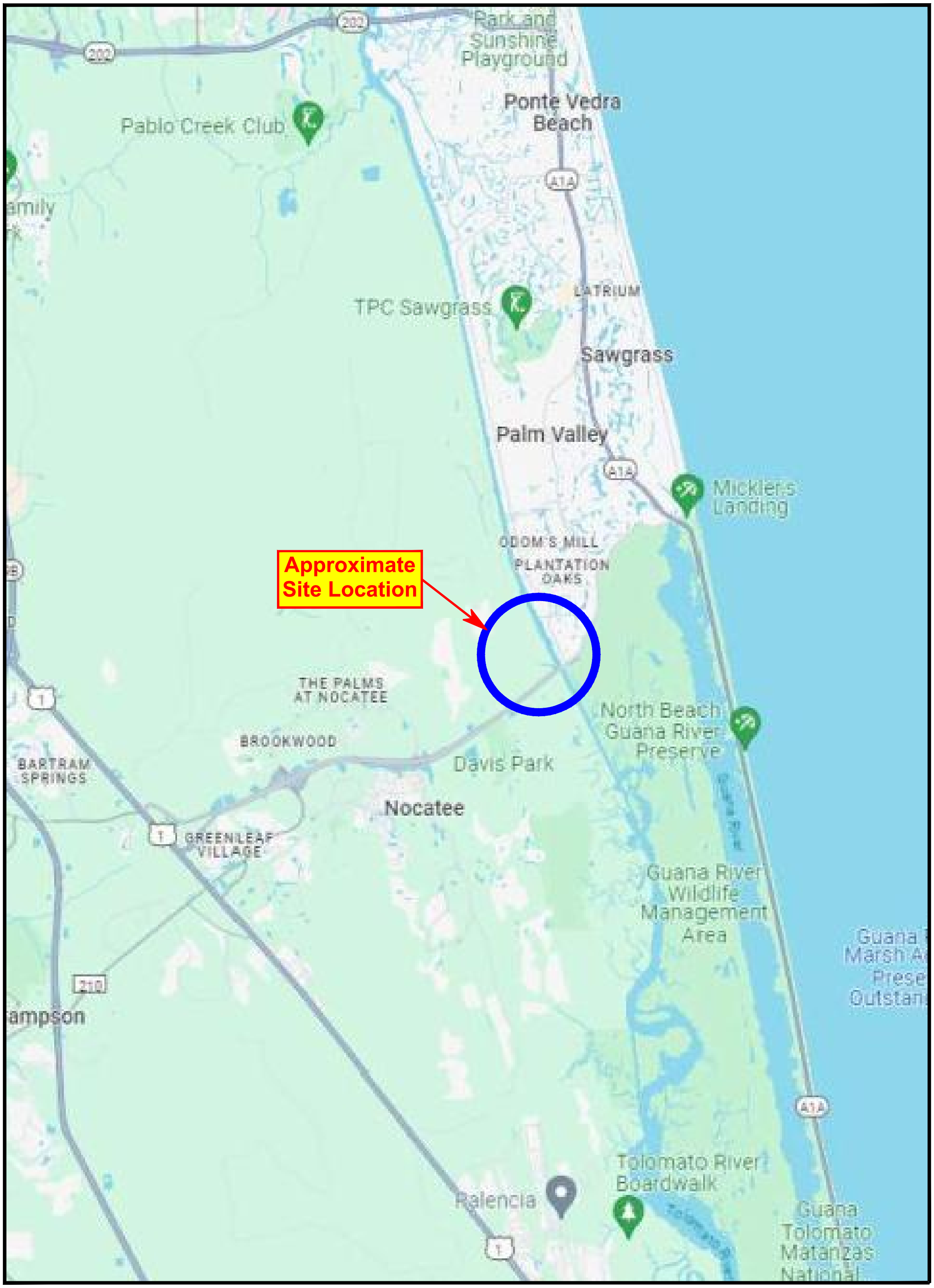
If any of the project description information discussed in this report is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

We recommend that ECS be retained to review the project’s plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be retained to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Diagrams & Reports



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Site Location Diagram

River Landing Remaining Lots

Nocatee, Florida

Date: 06/20/24	Project No.: 35-35675	Figure 1

JAS - 35-35675

Lot 103

LEGEND

◐ Approximate Location of Standard Penetration Test (SPT) Boring

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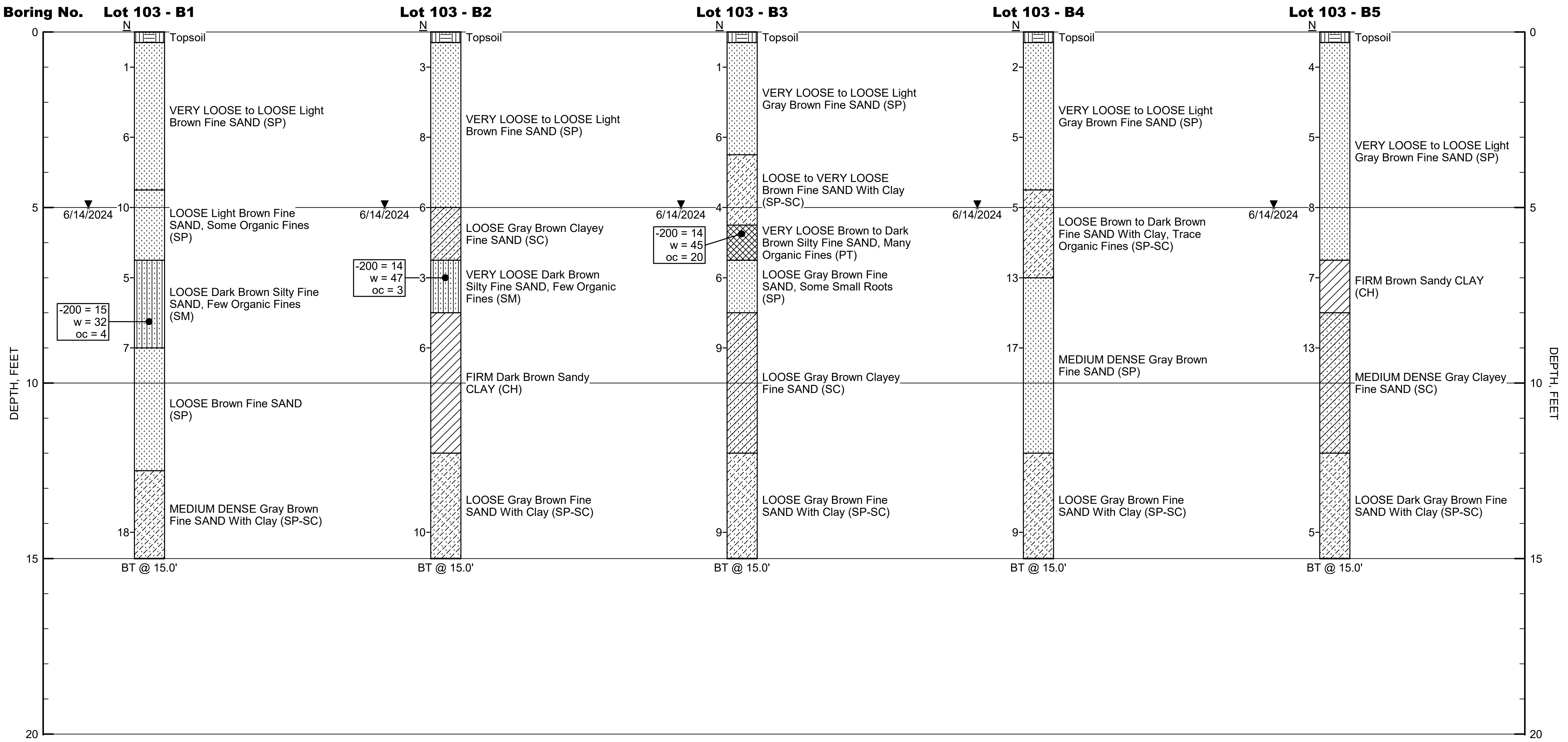
Field Exploration Diagram

River Landing Remaining Lots

Nocatee, Florida

Date: 06/20/24	Project No.: 35-35675	Figure 2

JAS - 35-35675



LEGEND

▥ Topsoil	░ Fine SAND (SP)	N Standard Penetration Resistance, Blows/Foot	-200 % Passing No. 200 U.S. Standard Sieve
▩ Silty Fine SAND, Many Organic Fines (PT)	░ Fine SAND With Clay (SP-SC)	SP Unified Soil Classification System	w Natural Moisture Content (%)
▥ Silty Fine SAND (SM)	▨ Clayey Fine SAND (SC)	▼ Groundwater Level at Time of Drilling	oc Organic Content (%)
		BT Boring Terminated at Depth Below Grade	

Generalized Subsurface Profiles

River Landing Remaining Lots

Nocatee, Florida

ECS

DATE: 6/20/24 | PROJ. NO.: 35-35675 | Figure 3

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
Boring Logs

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

■		**ASPHALT**
▨		**CONCRETE**
▨		**GRAVEL**
▨		**TOPSOIL**
□		**VOID**
▨		**BRICK**
▨		**AGGREGATE BASE COURSE**
▨	**GW**	**WELL-GRADED GRAVEL** **gravel-sand mixtures, little or no fines**
▨	**GP**	**POORLY-GRADED GRAVEL** **gravel-sand mixtures, little or no fines**
▨	**GM**	**SILTY GRAVEL** **gravel-sand-silt mixtures**
▨	**GC**	**CLAYEY GRAVEL** **gravel-sand-clay mixtures**
▨	**SW**	**WELL-GRADED SAND** **gravelly sand, little or no fines**
▨	**SP**	**POORLY-GRADED SAND** **gravelly sand, little or no fines**
▨	**SM**	**SILTY SAND** **sand-silt mixtures**
▨	**SC**	**CLAYEY SAND** **sand-clay mixtures**
▨	**ML**	**SILT** **non-plastic to medium plasticity**
▨	**MH**	**ELASTIC SILT** **high plasticity**
▨	**CL**	**LEAN CLAY** **low to medium plasticity**
▨	**CH**	**FAT CLAY** **high plasticity**
▨	**OL**	**ORGANIC SILT or CLAY** **non-plastic to low plasticity**
▨	**OH**	**ORGANIC SILT or CLAY** **high plasticity**
▨	**PT**	**PEAT** **highly organic soils**

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, QP[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS[6]

▽	WL (First Encountered)
▼	WL (Completion)
▼	WL (Seasonal High Water)
▽	WL (Stabilized)

FILL AND ROCK

🟥	🟪	◻	🟩
FILL	POSSIBLE FILL	PROBABLE FILL	ROCK

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[1] Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2] To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3] Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4] Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5] Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6] The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7] Minor deviation from ASTM D 2488-17 Note 14.

[8] Percentages are estimated to the nearest 5% per ASTM D 2488-17.

SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT)
ASTM D 1586
Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 18-24 inches (in 3 or 4 Increments of 6 inches each)

- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet. An approximate 1.5 inch diameter soil sample is recovered.

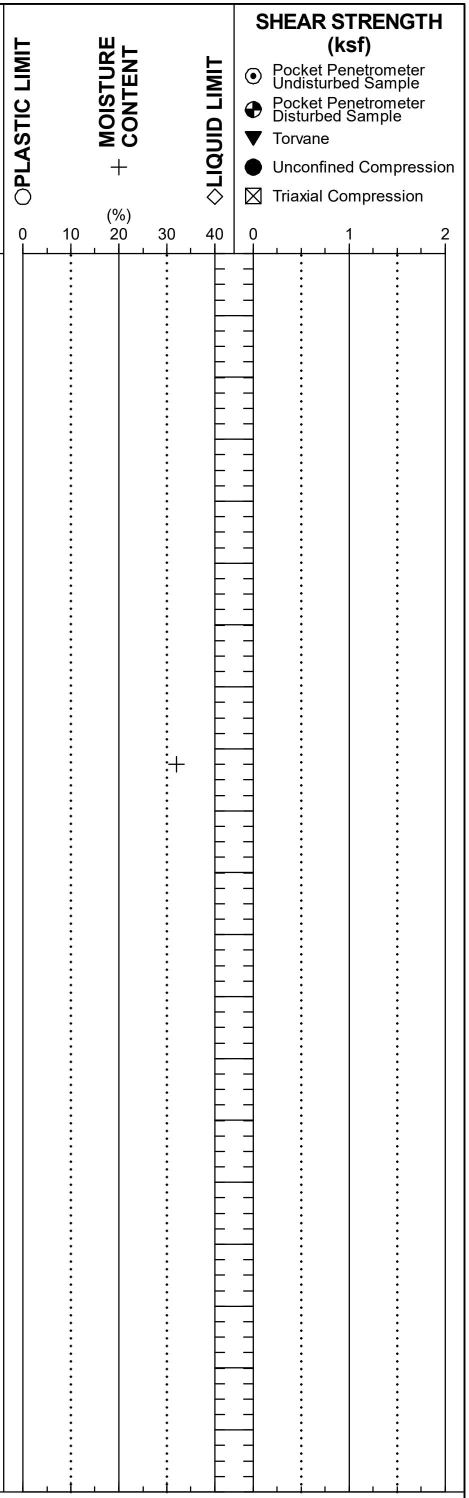
Drilling Methods May Vary— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

Project No.: 35-35675
Boring No.: Lot 103 - B1
Sheet 1 of 1

LOG OF BORING

Project: River Landing Remaining Lots
Client: HyDry Company
Drill Rig: 100A
Driller: M. Letchworth
Boring Location: See Field Exploration Plan
Hammer Type: Safety
Drill Rod: AWJ
Casing Size:
Length of Casing:
Groundwater Depth: 5 ft Time: Drilling Date: 6/14/24
Boring Begun: 6/14/24
Boring Completed: 6/14/24

SAMPLE NO.	DEPTH, FEET	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	0	Topsoil	1/12"			
		VERY LOOSE to LOOSE Light Brown Fine SAND (SP)				
1			1	1		
			2			
			3			
			3			
2			3	6		
			4			
			4			
		LOOSE Light Brown Fine SAND, Some Organic Fines (SP) ▼	6			
3	5		4	10		
			4			
			2			
		LOOSE Dark Brown Silty Fine SAND, Few Organic Fines (SM)	2			
4			3	5		
			3			
			2		4	15
			4			
5		LOOSE Brown Fine SAND (SP)	3	7		
			3			
	10					
		MEDIUM DENSE Gray Brown Fine SAND With Clay (SP-SC)				
			6			
6			8			
			10	18		
	15	Boring Terminated @ 15 ft.				
	20					



Remarks

Project No.: 35-35675
Boring No.: Lot 103 - B2
Sheet 1 of 1

LOG OF BORING

Project: River Landing Remaining Lots
Client: HyDry Company
Drill Rig: 100A
Driller: M. Letchworth
Boring Location: See Field Exploration Plan
Hammer Type: Safety
Drill Rod: AWJ
Casing Size:
Length of Casing:
Groundwater Depth: 5 ft Time: Drilling Date: 6/14/24
Boring Begun: 6/14/24
Boring Completed: 6/14/24

SAMPLE NO.	DEPTH, FEET	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	○PLASTIC LIMIT + MOISTURE CONTENT (%) ◇LIQUID LIMIT (0 15 30 45 60)	SHEAR STRENGTH (ksf) (0 1 2)
	0	Topsoil	1					
		VERY LOOSE to LOOSE Light Brown Fine SAND (SP)	1					
1			2	3				
			3					
			3					
			4					
2			4	8				
			6					
			4					
			4					
3	5	LOOSE Gray Brown Clayey Fine SAND (SC)	2	6				
			2					
			1					
		VERY LOOSE Dark Brown Silty Fine SAND, Few Organic Fines (SM)	1					
4			2	3	3	14	+	
			2					
		FIRM Dark Brown Sandy CLAY (CH)	3					
			3					
5			3	6				
			4					
	10							
		LOOSE Gray Brown Fine SAND With Clay (SP-SC)						
			4					
6			5					
			5	10				
	15	Boring Terminated @ 15 ft.						
	20							

SHEAR STRENGTH (ksf)
- ⊙ Pocket Penetrometer Undisturbed Sample
- ◕ Pocket Penetrometer Disturbed Sample
- ▼ Torvane
- ● Unconfined Compression
- ☒ Triaxial Compression

Remarks

Project No.: 35-35675
Boring No.: Lot 103 - B3
Sheet 1 of 1

LOG OF BORING

Project: River Landing Remaining Lots
Client: HyDry Company
Drill Rig: 100A
Driller: M. Letchworth
Boring Location: See Field Exploration Plan
Hammer Type: Safety
Drill Rod: AWJ
Casing Size:
Length of Casing:
Groundwater Depth: 5 ft Time: Drilling Date: 6/14/24
Boring Begun: 6/14/24
Boring Completed: 6/14/24

SHEAR STRENGTH (ksf)
⊙ Pocket Penetrometer Undisturbed Sample
◕ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
☒ Triaxial Compression

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	○PLASTIC LIMIT / MOISTURE CONTENT + (%) 0 15 30 45 60 / ◇LIQUID LIMIT	SHEAR STRENGTH (ksf) 0 1 2
	0		Topsoil	1/12"					
			VERY LOOSE to LOOSE Light Gray Brown Fine SAND (SP)						
1				1	1				
				2					
				2					
				3					
2				3	6				
			LOOSE to VERY LOOSE Brown Fine SAND With Clay (SP-SC)	4					
				5					
			▼	2					
3	5			2	4				
			VERY LOOSE Brown to Dark Brown Silty Fine SAND, Many Organic Fines (PT)	3		20	14	+	
				2					
			LOOSE Gray Brown Fine SAND, Some Small Roots (SP)	3					
4				3	6				
				4					
			LOOSE Gray Brown Clayey Fine SAND (SC)	1					
				4					
5				5	9				
				7					
	10								
			LOOSE Gray Brown Fine SAND With Clay (SP-SC)						
				3					
6				5					
				4	9				
	15		Boring Terminated @ 15 ft.						
	20								

Remarks

Project No.: 35-35675
Boring No.: Lot 103 - B4
Sheet 1 of 1

LOG OF BORING

Project: River Landing Remaining Lots
Client: HyDry Company
Drill Rig: 100A
Driller: M. Letchworth
Boring Location: See Field Exploration Plan
Hammer Type: Safety
Drill Rod: AWJ
Casing Size:
Length of Casing:
Groundwater Depth: 5 ft Time: Drilling Date: 6/14/24
Boring Begun: 6/14/24
Boring Completed: 6/14/24

SAMPLE NO.	DEPTH, FEET	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	○PLASTIC LIMIT	MOISTURE CONTENT + (%)	◇LIQUID LIMIT	SHEAR STRENGTH (ksf)
	0	Topsoil VERY LOOSE to LOOSE Light Gray Brown Fine SAND (SP)	1							
1			1							
			1	2						
			2							
			3							
2			2							
			3	5						
			4							
			4							
		LOOSE Brown to Dark Brown Fine SAND With Clay, Trace Organic Fines (SP-SC) ▼	3							
3	5		2	5						
			2							
			6							
4			6							
		MEDIUM DENSE Gray Brown Fine SAND (SP)	7	13						
			10							
			10							
5			10							
			7	17						
			10							
	10									
		LOOSE Gray Brown Fine SAND With Clay (SP-SC)								
			4							
6			5							
			4	9						
	15	Boring Terminated @ 15 ft.								
	20									

Moisture/limits scale: 0 10 20 30 40
Shear strength scale: 0 1 2

SHEAR STRENGTH (ksf)
⊙ Pocket Penetrometer Undisturbed Sample
◕ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
☒ Triaxial Compression

Remarks

Project No.: 35-35675
Boring No.: Lot 103 - B5
Sheet 1 of 1

LOG OF BORING

Project: River Landing Remaining Lots
Client: HyDry Company
Drill Rig: 100A
Driller: M. Letchworth
Boring Location: See Field Exploration Plan
Hammer Type: Safety
Drill Rod: AWJ
Casing Size:
Length of Casing:
Groundwater Depth: 5 ft Time: Drilling Date: 6/14/24
Boring Begun: 6/14/24
Boring Completed: 6/14/24

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	○PLASTIC LIMIT / MOISTURE CONTENT + (%) / ◇LIQUID LIMIT 0 10 20 30 40	SHEAR STRENGTH (ksf) 0 1 2
	0		Topsoil VERY LOOSE to LOOSE Light Gray Brown Fine SAND (SP)						
1				1 1 3 3	4				
2				3 3 2 2	5				
3	5		LOOSE Brown Fine SAND (SP) ▼	2 3 5 5	8				
4			FIRM Brown Sandy CLAY (CH)	2 2 5 5	7				
5			MEDIUM DENSE Gray Clayey Fine SAND (SC)	5 7 6 6	13				
	10								
			LOOSE Dark Gray Brown Fine SAND With Clay (SP-SC)						
6				3 3 2	5				
	15		Boring Terminated @ 15 ft.						
	20								

SHEAR STRENGTH (ksf)
- ⊙ Pocket Penetrometer Undisturbed Sample
- ◕ Pocket Penetrometer Disturbed Sample
- ▼ Torvane
- ● Unconfined Compression
- ☒ Triaxial Compression

Remarks

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary

ECS FLORIDA, LLC
Geotechnical • Construction Materials • Environmental • Facilities

SUMMARY OF LABORATORY TEST RESULTS

Project: River Landing Lot 103
Client: HyDry Company, LLC
Project No.: 35675

Boring/ Sample No.	Sample Depth (ft.)	Organic Content %	Fines Content %	Natural Moisture Content %	Atterberg Limits			Pocket Pen. (tsf)
					Liquid Limit %	Plastic Limit %	Plasticity Index	
B1-5	8-10	3.5	15.1	32				
B2-4	6-8	3.3	13.9	47				
B3-3	4-6	20.1	13.6	45				