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REPORT OF
GEOTECHNICAL EXPLORATION
SPRING PARK ROAD PUMP STATION
JACKSONVILLE, FLORIDA
E&A PROJECT NO. 35-26013
CLIENT ID: 3581

Prepared for:

J. Collins Engineering Associates, LLC
11516-3 San Jose Boulevard
Jacksonville, Florida 32223

Prepared by:

Ellis & Associates, Inc.
7064 Davis Creek Road
Jacksonville, Florida 32256

October 6, 2017

October 6, 2017

J. Collins Engineering Associates, LLC
11516-3 San Jose Boulevard
Jacksonville, Florida 32223

Attention: Mr. John Collins, P.E.

Reference: Report of Geotechnical Exploration
Spring Park Road Pump Station
Jacksonville, Florida
E&A Project No. 35-26013
Client ID: 3581

Dear Mr. Collins:

Ellis & Associates, Inc. has completed the requested geotechnical exploration in general accordance with our proposal dated December 30, 2017. The exploration was performed to evaluate the general subsurface conditions within the proposed building area and to provide recommendations for site preparation and foundation support.

We appreciate the opportunity to be your geotechnical consultant on this phase of the project and look forward to providing the materials testing and observation that will be required during the construction phase. If you have any questions, or if we may be of any further service, please contact us.

Very truly yours,

ELLIS & ASSOCIATES, INC.

Robert W. Clark, P.E.
Sr. Geotechnical Engineer
Registered, Florida No. 52210

Digitally signed by Robert W Clark
DN: c=US, o=IdenTrust ACES Business Representative, ou=ELLIS AND ASSOCIATES, cn=Robert W Clark, 0.9.2342.19200300.100.1.1=A01098 00000014D0050B4BA000015FB
Date: 2017.10.06 10:54:13 -04'00'

Colin A. Shaw, E.I.
Staff Engineer

Robert W. Clark, P.E.
Senior Project Engineer
Registered, Florida No. 52210

Distribution: Mr. John Collins, P.E. – J. Collins Engineering Associates, LLC 1 pdf

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1.0 PROJECT INFORMATION

1.1 Site Location and Project Description

The project site is located northeast of Spring Park Road south of the intersection of Ormewood Avenue in Jacksonville, Florida. The general site location is shown on Figure 1.

At the time of our exploration, the site was developed with an existing pump station building. The surrounding surface cover was grass and trees. The site was relatively level, and surface water was not observed near the planned structural area at the time of our exploration.

You provided project information via several discussions and emails. We were provided with a copy of a site plans C-1, C-3, C-4, C-6 and C-7 for the subject site. These plans indicated the layout of the existing facility and the location of the proposed construction.

We understand the proposed building includes a one-story precast concrete structure approximately 330 feet in plan area. The structure is designed with spread shallow foundations and ground supported floor slab. We were not provided detailed structural loading and grading information. For the purposes of this report, we expect maximum wall, and floor loads of 4 kips per linear foot (klf) and 250 pounds per square foot (psf), respectively. We also expect that less than 1 foot of fill (and only nominal cuts) will be required to achieve final grades in structural areas.

If actual building loads or fill/cut heights vary 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.

2.0 FIELD EXPLORATION

We performed a field exploration on September 25, 2017. The approximate boring location is indicated on the attached Field Exploration Plan (Figure 2). Our personnel determined the boring location using paced measurements from existing site features. The boring location on the referenced Field Exploration Plan should be considered accurate only to the degree implied by the method of measurement used.

2.1 SPT Borings

We located and performed one Standard Penetration Test (SPT) boring, drilled to a depth of approximately 35 feet below the existing ground surface, in general accordance with the methodology outlined in ASTM D 1586 to explore the subsurface conditions within the area of the proposed structure. Split-spoon soil samples recovered during performance of the boring were visually classified in the field and representative portions of the samples were transported to our laboratory for further evaluation. A summary of the field procedures is included in Appendix A.

3.0 VISUAL CLASSIFICATION

A geotechnical engineer classified representative soil samples obtained during our field exploration using the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. A Key to the Soil Classification System is included in Appendix A.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

A detailed boring record is included in Appendix A. It should be understood that the soil conditions will vary adjacent to the boring location. The following table summarizes the soil conditions encountered.

GENERAL SOIL PROFILE: BUILDING AREA			
TYPICAL DEPTH (ft)			
FROM	TO	SOIL DESCRIPTION	USCS(1)
0	0.5	Topsoil	---
0.5	17	Loose to Medium Dense Fine Sand	SP
17	35	Very Loose to Loose Clayey Fine Sand	SC
(1) Unified Soil Classification System			

4.2 Groundwater Level

Groundwater was encountered at the boring location and recorded at the time of drilling at a depth of about 4 feet below the existing ground surface. We note that groundwater levels will fluctuate due to seasonal climatic variations, surface water runoff patterns, construction operations, and other interrelated factors. The groundwater depth at each boring location is noted on the Generalized Subsurface Profiles and on the Log of Boring records.

5.0 DESIGN RECOMMENDATIONS

5.1 General

Our geotechnical engineering evaluation of the site and subsurface conditions at the property, with respect to the planned construction and our recommendations for site preparation and foundation support, are based on (1) our site observations, (2) the field data obtained, (3) our understanding of the project information and structural conditions as presented in this report, and (4) our experience with similar soil and loading conditions.

If the stated structural or grading conditions are incorrect, or should the location of the structure or pavement areas be changed, please contact us so that we can review our recommendations. Also, the discovery of any site or subsurface conditions during construction that deviate from the data obtained during this geotechnical exploration should also be reported to us for our evaluation.

The recommendations in the subsequent sections of this report present design and construction techniques that are appropriate for the planned construction. We recommend that E&A be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented.

5.2 Foundation Design Recommendations

Based on the results of our exploration, we consider the subsurface conditions at the site adaptable for support of the proposed structure on a properly designed conventional shallow foundation system. The following parameters may be used for foundation design, provided the site preparation and earthwork construction recommendations outlined in Section 6.0 of this report are performed.

5.2.1 Bearing Pressure

The maximum allowable net soil bearing pressure for use in shallow foundation design should not exceed 2,500 psf. Net bearing pressure is defined as the soil bearing pressure at the foundation bearing level in excess of the natural overburden pressure at that level. The foundations should be designed based on the maximum load that could be imposed by all loading conditions.

5.2.2 Foundation Size

The minimum widths recommended for any isolated column footing and continuous wall footing are 24 inches and 18 inches, respectively. Even though the maximum allowable soil bearing pressure may not be achieved, these width recommendations should control the size of the foundations.

5.2.3 Bearing Depth

The exterior foundations should bear at a depth of at least 12 inches below the exterior final grades, and the interior foundations should bear at a depth of at least 12 inches below the finish floor elevation. These embedment depths are to provide confinement to the bearing level soils. It is also recommended that stormwater be diverted away from the building exterior to reduce the possibility of erosion beneath the exterior footings.

5.2.4 Bearing Material

The foundations may bear in either the compacted suitable natural soils or compacted structural fill. 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.

5.2.5 Settlement Estimates

Post-construction settlements of the structure will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics; (2) footing size, bearing level, applied loads, and resulting bearing pressures beneath the foundations; and (3) site preparation and earthwork construction techniques used by the contractor. Our settlement estimates for the structure are based on the use of site preparation/earthwork construction techniques as recommended in Section 6.0 of this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlements of the structure.

Due to the sandy nature of the near-surface soils, we expect the majority of settlement to occur in an elastic manner and fairly rapidly during construction. Using the recommended maximum bearing pressure, the supplied/assumed maximum structural loads, and the field data that we have correlated to geotechnical strength and compressibility characteristics of the subsurface soils, we estimate that total settlements of the structure could be on the order of one inch or less.

Differential settlements result from variations in applied bearing pressures and compressibility characteristics of the subsurface soils. Because of the general uniformity of the soils encountered in our borings and the recommended site preparation and earthwork construction techniques outlined in Section 6.0, we anticipate that differential settlements of the structure should be within tolerable magnitudes.

5.2.6 Floor Slab

The floor slab can be constructed as a slab-on-ground, provided site preparation is performed as outlined in Section 6.0. It is recommended that 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. In addition, we recommend that a minimum separation of two feet be maintained between the finished floor levels and the estimated normal seasonal high groundwater level. We also recommend that densities of at least 98 percent of the Modified Proctor maximum dry density (ASTM D1557) should be obtained within the upper one foot of the materials immediately below the floor slab.

6.0 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

Site preparation as outlined in this section should be performed to provide more uniform foundation bearing conditions, to reduce the potential for post-construction settlements of the planned structure(s) and to maintain the integrity of a flexible pavement section.

6.1 Clearing and Stripping

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 to 12 inches of topsoil and soils containing significant amounts of organic materials may be encountered across the site. The actual depths of unsuitable soils and materials should be determined by Ellis & Associates, Inc. using visual observation and judgment during earthwork operations. Any topsoils removed from the building and parking/drive areas can be stockpiled and used subsequently in areas to be grassed.

6.2 Temporary Groundwater Control

Because of the need for densification of the soils within the upper 2 feet below the stripped surface, temporary groundwater control measures may be required if the groundwater level is within 2 feet below the stripped and grubbed surface at the time of construction. Should groundwater control measures become necessary, 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.

Note that discharge of produced groundwater to surface waters of the state from dewatering operations or other site activities is regulated and requires a permit from the State of Florida Department of Environmental Protection (FDEP). This permit is termed a *Generic Permit for the Discharge of Produced Groundwater From Any Non-Contaminated Site Activity*. If discharge of produced groundwater is anticipated, we recommend sampling and testing of the groundwater early in the site design phase to prevent project delays during construction. E&A can provide the sampling, testing, and professional consulting required to evaluate compliance with the regulations.

6.3 Compaction

After completing the clearing and stripping operations and installing the temporary groundwater control measures (if required), the exposed surface in the proposed building area should be compacted with a track-mounted bulldozer or relatively lightweight roller having a total weight on the order of 2,000 pounds. Compaction with a heavy vibratory drum roller should be avoided to prevent damaging the existing structure. Typically, the existing soil material should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within the upper 2 feet of the compacted natural soils at the site.

Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated, and (1) the disturbed soils should be removed and backfilled with compacted structural fill, or (2) the excess moisture content within the disturbed soils should be allowed to dissipate before recompacting.

6.4 Structural Backfill and Fill Soils

Structural backfill or fill required for site development should be placed in loose lifts not exceeding 8 inches if the roller operates in the static mode or if track-mounted compaction equipment is used. If hand-held compaction equipment is used, the lift thickness should be further reduced to 6 inches.

Structural fill is defined as a non-plastic, inorganic, granular soil having less than 10 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The fine sand and fine sand with silt or fine sand with clay, without roots, as encountered in the borings, are suitable 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. Typically, the material should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within each lift of the compacted structural fill.

6.5 Foundation Areas

After satisfactory placement and compaction of the required structural fill, the foundation areas may be excavated to the planned bearing levels. The foundation 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 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.

7.0 QUALITY CONTROL TESTING

Ellis & Associates, Inc. should be retained to perform the construction material testing and observations required for this project, to verify that our recommendations have been satisfied. We are the most qualified to address problems that may arise during construction, since we are familiar with the intent of our engineering design.

A representative number of field in-place density tests should be made in the upper 2 feet of compacted natural soils, in each lift of compacted backfill and fill, and in the upper 12 inches below the bearing levels in the footing excavations. Density tests are recommended to verify that satisfactory compaction operations have been performed. We recommend density testing be performed (1) at one location for every 5,000 square feet of building area, (2) at 25 percent of any isolated column footing locations, and (3) at one location for every 100 linear feet of continuous wall footings.

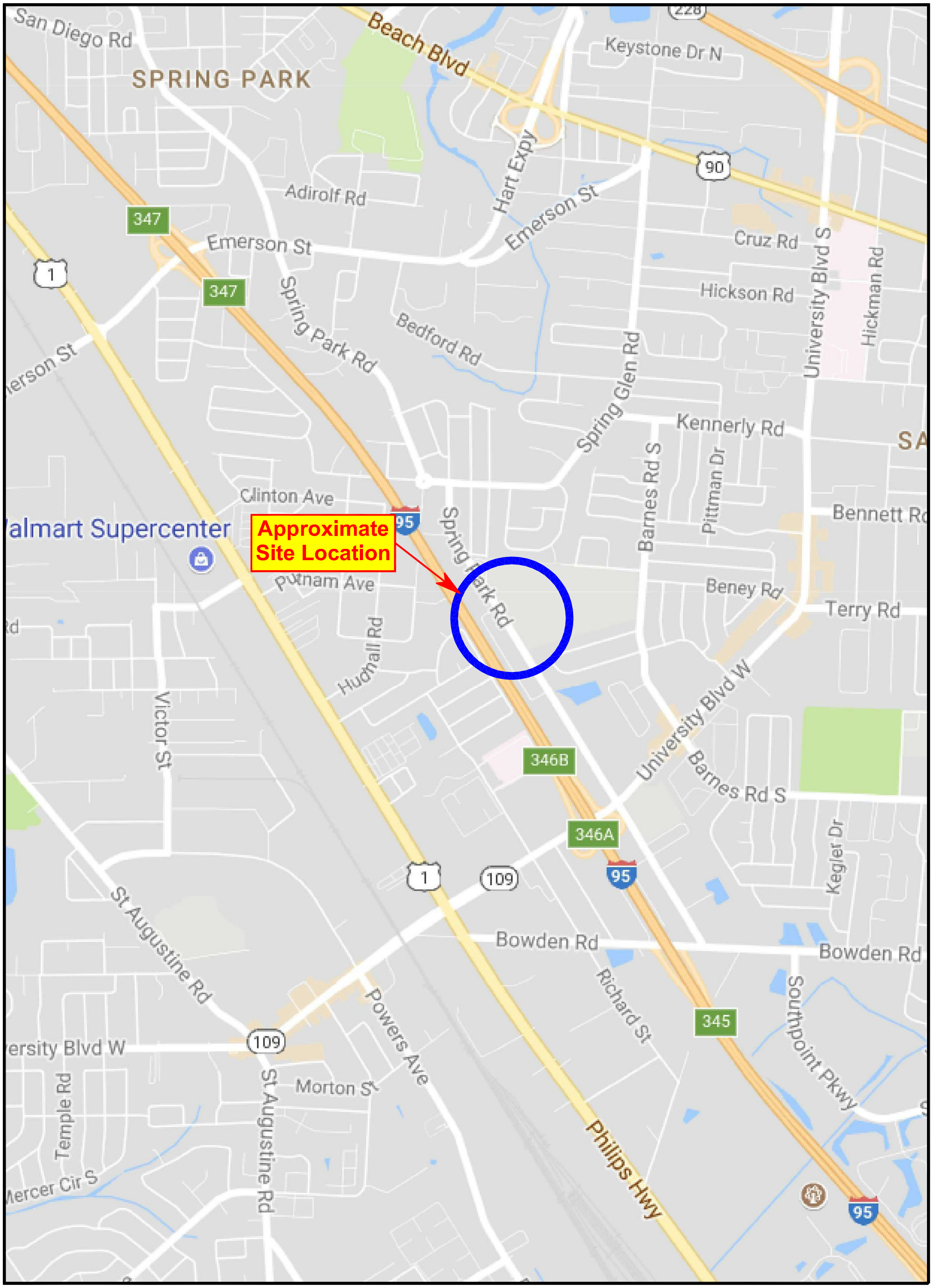
8.0 REPORT LIMITATIONS

Our geotechnical exploration has been performed, our findings obtained, and our recommendations prepared, in accordance with generally accepted geotechnical engineering principles and practices. Ellis & Associates, Inc. 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.

This report does not reflect any variations that may occur adjacent to or between soil borings. The discovery of any site or subsurface condition during construction that deviates from the data obtained during this geotechnical exploration should be reported to us for our evaluation. Also, in the event of any change to the supplied/assumed structural conditions or the locations of the structures, pavement, or pond areas, please contact us so that we can review our recommendations. We recommend that we be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented.

FIGURES



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Site Location Plan

Spring Park Road Pump Station

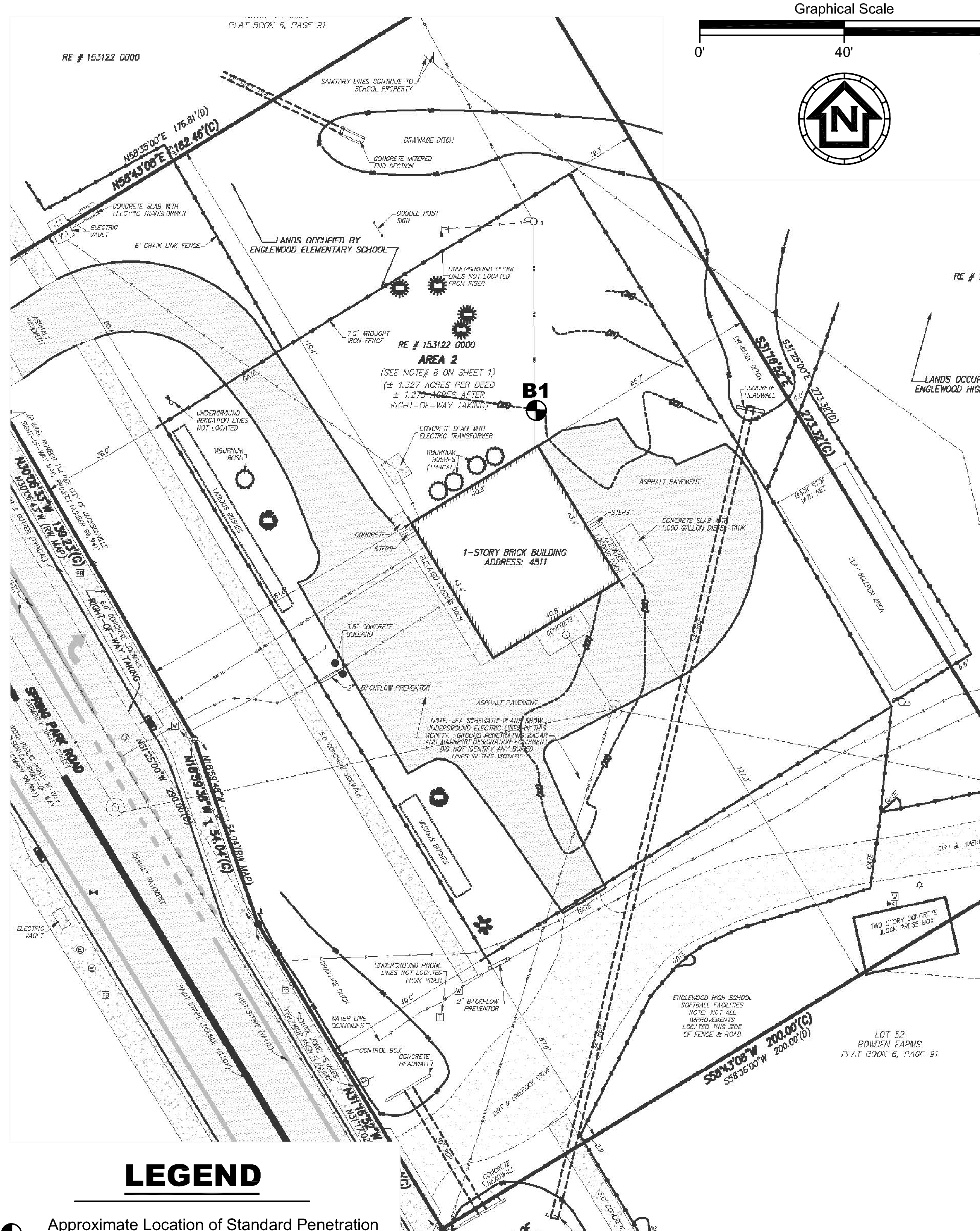
Jacksonville, Florida

Date: 10/03/17	Project No.: 35-26013	Figure 1

JAS - 35-26013

Graphical Scale

0' 40' 80'



LEGEND

◐ Approximate Location of Standard Penetration Test (SPT) Boring

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Field Exploration Plan

Spring Park Road Pump Station

Jacksonville, Florida

Date: 10/03/17	Project No.: 35-26013	Figure 2

JAS - 35-26013

APPENDIX A

SOIL BORING LOGS
FIELD EXPLORATION PROCEDURES
KEY TO SOIL CLASSIFICATION

Ellis & Associates inc.
ECS Group of Companies

Project No.: 35-26013
Boring No.: B1
Sheet 1 of 2

LOG OF BORING

Project: Spring Park Road Pump Station
Client: J. Collins Engineering
Drill Rig: ATV
Driller: S. Burns
Boring Location: See Field Exploration Plan
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 3.7 ft Time: Drilling Date: 9/25/17
Boring Begun: 9/25/17
Boring Completed: 9/25/17

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

○ PLASTIC LIMIT; + MOISTURE CONTENT (%) 0 10 20 30 40; ◇ LIQUID LIMIT; Shear strength scale 0 1 2

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	SHEAR STRENGTH (ksf)
	0		Topsoil						
1			MEDIUM DENSE Gray Brown Fine SAND (SP)	3, 5, 11, 13	16				
2			MEDIUM DENSE Gray Fine SAND (SP) ▼	8, 8, 11, 11	19				
3	5		MEDIUM DENSE Light Brown Fine SAND (SP)	9, 8, 10, 11	18				
4			MEDIUM DENSE to LOOSE Gray Fine SAND (SP)	6, 8, 9, 11	17				
5	10			5, 4, 4, 5	8				
6	15			3, 3, 3	6				
7	20		VERY LOOSE to LOOSE Gray Clayey Fine SAND (SC)	WOH/18"	WOH/18"				
8	25			WOH/12", 1	1				

Remarks

Ellis & Associates inc.
ECS Group of Companies

Project No.: 35-26013
Boring No.: B1
Sheet 2 of 2

LOG OF BORING

Project: Spring Park Road Pump Station
Client: J. Collins Engineering
Drill Rig: ATV
Driller: S. Burns
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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)
	25		VERY LOOSE to LOOSE Gray Clayey Fine SAND (SC) *(Continued)*						
9	30			WOH/18"	WOH/18"				
10	35			2 2 2	4				
			Boring Terminated @ 35 ft.						
	40								
	45								
	50								

SHEAR STRENGTH legend: ⊙ Pocket Penetrometer Undisturbed Sample; Pocket Penetrometer Disturbed Sample; ▼ Torvane; ● Unconfined Compression; ⊠ Triaxial Compression

Remarks

FIELD EXPLORATION PROCEDURES

Standard Penetration Test (SPT) Borings

The Standard Penetration Test (SPT) borings were made in general accordance with the latest revision of ASTM D 1586, "Penetration Test and Split-Barrel Sampling of Soils". The borings were advanced by rotary (or "wash-n-chop") drilling techniques. At 2 ½ to 5 foot intervals, a split-barrel sampler inserted to the borehole bottom and driven 18 inches into the soil using a 140 pound hammer falling on the average 30 inches per hammer blow. The number of hammer blows for the final 12 inches of penetration is termed the "penetration resistance, blow count, or N-value". This value is an index to several in-place geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler 18 inches (or less if in hard rock-like material), the sampler was retrieved from the borehole and representative samples of the material within the split-barrel were containerized and sealed. After completing the drilling operations, the samples for each boring were transported to our laboratory where they were examined by our engineer in order to verify the driller's field classification. The retrieved samples will be kept in our facility for a period of six (6) months unless directed otherwise.

Ellis & Associates inc.

KEY TO SOIL CLASSIFICATION

Description of Compactness or Consistency in Relation
To Standard Penetration Resistance

Granular Materials		
Relative Density	**Safety Hammer SPT N-Value (Blow/Foot)**	**Automatic Hammer SPT N-Value (Blow/Foot)**
Very Loose	Less than 4	Less than 3
Loose	4 – 10	3 – 8
Medium Dense	10 – 30	8 – 24
Dense	30 – 50	24 – 40
Very Dense	Greater than 50	Greater than 40

Silts and Clays		
Consistency	**Safety Hammer SPT N-Value (Blow/Foot)**	**Automatic Hammer SPT N-Value (Blow/Foot)**
Very Soft	Less than 2	Less than 1
Soft	2 – 4	1 – 3
Firm	4 – 8	3 – 6
Stiff	8 – 15	6 – 12
Very Stiff	15 – 30	12 – 24
Hard	Greater than 30	Greater than 24

DESCRIPTION OF SOIL COMPOSITION**

(Unified Soil Classification System)

MAJOR DIVISION		Group Symbol	LABORATORY CLASSIFICATION CRITERIA		SOIL DESCRIPTION
			FINER THAN 200 SIEVE %	SUPPLEMENTARY REQUIREMENTS	
Coarse grained (over 50% by weight coarser than No. 200 sieve)	Gravelly soils (over half of coarse fraction larger than No. 4)	GW	<5*	D_{60}/D_{10} greater than 4, $D_{30}^2 / (D_{60} \times D_{10})$ between 1 & 3	Well graded gravels, sandy gravels
		GP	<5*	Not meeting above gradation for GW	Gap graded or uniform gravels, sandy gravels
		GM	>12*	PI less than 4 or below A-line	Silty gravels, silty sandy gravels
		GC	>12*	PI over 7 above A-line	Clayey gravels, clayey sandy gravels
	Sandy soils (over half of coarse fraction finer than No. 4)	SW	<5*	D_{60}/D_{10} greater than 6, $D_{30}^2 / (D_{60} \times D_{10})$ between 1 & 3	Well graded sands, gravelly sands
		SP	<5*	Not meeting above gradation requirements	Gap graded or uniform sands, gravelly sands
		SM	>12*	PI less than 4 or below A-line	Silty sands, silty gravelly sands
		SC	>12*	PI over 7 and above A-line	Clayey sands, clayey gravelly sands
Fine grained (over 50% by weight finer than No. 200 sieve)	Low compressibility (liquid limit less than 50)	ML	Plasticity chart		Silts, very fine sands, silty or clayey fine sands, micaceous silts
		CL	Plasticity chart		Low plasticity clays, sandy or silty clays
		OL	Plasticity chart, organic odor or color		Organic silts and clays of low plasticity
	High compressibility (liquid limit more than 50)	MH	Plasticity chart		Micaceous silts, diatomaceous silts, volcanic ash
		CH	Plasticity chart		Highly plastic clays and sandy clays
		OH	Plasticity chart, organic odor or color		Organic silts and clays of high plasticity
Soils with fibrous organic matter		PT	Fibrous organic matter; will char, burn or glow		Peat, sandy peats, and clayey peat

* For soils having 5 to 12 percent passing the No. 200 sieve, use a dual symbol such as SP-SM.
** Standard Classification of Soils for Engineering Purposes (ASTM D 2487)

SAND/GRAVEL DESCRIPTION MODIFIERS	
Modifier	**Sand/Gravel Content**
Trace	<15%
With	15% to 29%
Sandy/Gravelly	>29%

ORGANIC MATERIAL MODIFIERS	
Modifier	**Organic Content**
Trace	1% to 2%
Few	2% to 4%
Some	4% to 8%
Many	>8%

SILT/CLAY DESCRIPTION MODIFIERS	
Modifier	**Silt/Clay Content**
Trace	<5%
With	5% to12%
Silty/Clayey	13% to 35%
Very	>35%