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ENGINEERING SCIENCES

REPORT OF A
GEOTECHNICAL EXPLORATION

St. Augustine - Golf
St. Johns County, Florida

July 27, 2021

PROJECT NO. 0930.2100162.0000
REPORT NO. 1887682

Prepared for:

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July 27, 2021

Capstone Collegiate Communities, LLC
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Attention: Mr. J. Davis Maxwell

Reference: **REPORT OF A GEOTECHNICAL EXPLORATION**
St. Augustine - Golf
St. Johns County, Florida
UES Project No. 0930.2100162.0000 and Report No. 1887682

Dear Mr. Maxwell:

Universal Engineering Sciences, LLC has completed the subsurface exploration at the proposed development in St. Johns County, Florida. These services were provided in general accordance with our Proposal No. 1865667, dated May 10, 2021. This report contains the results of our exploration, an engineering evaluation with respect to the project characteristics described to us, and recommendations for groundwater considerations, foundation and pavement design, stormwater management, and site preparation. A summary of our findings is as follows:

- The borings generally encountered very loose to loose fine sand (SP) and fine sand with silt (SP-SM) in the upper 1.8 to 5.0 feet. Loose to very loose fine sand with clay (SP-SC) and clayey fine sand (SC) was then penetrated to depths of 13 to 22.3 feet. Loose to medium dense fine sand (SP) then extended to the deepest boring termination depths of 25 feet below existing grade.

- We measured the groundwater level at the boring locations between depths of 1.0 to 3.5 feet below the existing grade. It is our option that the approximate seasonal high groundwater will be encountered 1.0 to 1.5 feet above the measured groundwater level at the time of our exploration.

- Assuming the building areas will be constructed in accordance with our Site Preparation Recommendations, we have recommended the proposed structures be supported on conventional, shallow spread foundations with an allowable soil bearing pressure of 2,000 pounds per square foot.

- A rigid or flexible pavement section could be used on this project. Flexible pavement combines the strength and durability of several layer components to produce an appropriate and cost-effective combination of available construction materials. Concrete pavement has the advantage of the ability to "bridge" over isolated soft areas, and it typically has a longer service life than asphalt pavement. Disadvantages of rigid pavement include an initial higher cost and more difficult patching of distressed areas than occurs with flexible pavement.

- Based on the boring results and classification of the soil samples, the soil described as fine sands (SP), fine sand with silt (SP-SM), and fine sand with clay (SP-SC), as shown in Appendix A: Soil Profiles, are considered suitable for use as structural fill. It should be understood that soils excavated from below the water table may be excessively wet and may require stockpiling or spreading to dry prior to placement and compaction. Soils described as fine sand with silt (SP-SM) and fine sand with clay (SP-SC) may take longer to dry than those described as fine sand (SP). Soils described as clayey fine sand (SC) are not considered suitable for use as structural fill due to high fines content and moisture sensitivity.

- We recommend only normal, good practice site preparation techniques to prepare the existing subgrade to support the proposed structures. These techniques include clearing the construction areas, removing/relocating existing utilities, dewatering if warranted, removing any existing utilities, stripping any remaining topsoil and vegetation, compacting the subgrade, proof-rolling to locate zones of soft soil, and placing engineered fill to the desired grades followed by a brief waiting period prior to vertical construction, if warranted.

We trust this report meets yours needs and addresses the geotechnical issues associated with the proposed construction. We appreciate the opportunity to have worked with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,

UNIVERSAL ENGINEERING SCIENCES, LLC
Certificate of Authorization No. 549

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Geotechnical Services Manager
FL P.E. Number 37389
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SRW/pm

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1.0 INTRODUCTION

1.1 GENERAL

In this report, we present the results of the subsurface exploration of the site for the proposed new development located in St. Johns County, St. Augustine, Florida. We have divided this report into the following sections:

- SCOPE OF SERVICES - Defines what we did
- FINDINGS - Describes what we encountered
- RECOMMENDATIONS - Describes what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- APPENDICES - Presents support materials referenced in this report

2.0 SCOPE OF SERVICES

2.1 PROJECT DESCRIPTION

Project information was provided to us in recent correspondence with you. We were provided with a copy of the property boundary plan. This plan shows the boundary limits for the property and the roadways located adjacent to the site.

We understand that the proposed construction will consist of a new cottage development in St. Augustine, Florida. The development would likely include one- or two-story residential structures, associated pavement, and stormwater areas. Proposed grading information has not been provided, therefore we have assumed that a maximum of two feet of elevating fill will be required for site development. Anticipated structural loadings are not available at the time of this proposal, therefore we have assumed that maximum loads for load bearing walls and columns will not exceed 3 klf and 100 kips, respectively.

We note that since the applicability of geotechnical recommendations is very dependent upon project characteristics, most specifically: improvement locations, grade alterations, and actual structural loads applied, UES must review the preliminary and final site and grading plans, and structural design loads to validate all recommendations rendered herein. Without such review our recommendations should not be relied upon for final design or construction of any site improvements.

2.2 PURPOSE

The purposes of this exploration were:

- to explore the general subsurface conditions at the site;

- to interpret and evaluate the subsurface conditions with respect to the proposed construction; and

- to provide geotechnical engineering recommendations for groundwater considerations, foundation design, pavement design, fill suitability, and site preparation.

This report presents an evaluation of site conditions on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. Universal Engineering Sciences would be pleased to perform these services, if you desire.

Our exploration was confined to the zone of soil likely to be stressed by the proposed construction. Our work did not address the potential for surface expression of deep geological conditions. This evaluation requires a more extensive range of field services than performed in this study. We will be pleased to conduct an investigation to evaluate the probable effect of the regional geology upon the proposed construction, if you desire.

2.3 FIELD EXPLORATION

A field exploration was initiated on July 9th and completed July 13th, 2021. The approximate boring locations are shown on the attached Boring Location Plan in Appendix A. The approximate boring locations were determined in the field by our personnel using a hand-held GPS unit and should be considered accurate only to the degree implied by the method of measurement used. Samples of the soils encountered will be held in our laboratory for your inspection for 60 days unless we are notified otherwise.

To explore the subsurface conditions within the proposed development, we located and drilled eighteen (18) Standard Penetration Test (SPT) borings to depths of approximately 20 to 25 feet below the existing ground surface in general accordance with the methodology outlined in ASTM D 1586. A summary of this field procedure is included in Appendix A. Split-spoon soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory for further evaluation.

2.4 LABORATORY TESTING

Representative soil samples obtained during our field exploration were returned to our office and classified by a geotechnical engineer. The samples were visually classified in general accordance with ASTM D 2488 (Unified Soil Classification System).

Nineteen (19) fines content tests and nineteen (19) moisture content tests were conducted in the laboratory on representative soil samples obtained from the borings. These tests were performed to aid in classifying the soils and to help quantify and correlate engineering properties. The results of these tests are presented on the Boring Logs in Appendix A. A brief description of the laboratory procedures used is also provided in Appendix A.

3.0 FINDINGS

3.1 SOIL SURVEY

Based on the Soil Survey for St. Johns County, Florida, as prepared by the US Department of Agriculture Soil Conservation Service, the predominant predevelopment soil types at the site are identified as Tocoi (34), Placid (63), and Bakersville (69).

A summary of characteristics of this soil series was obtained from the Soil Survey and is included in Table 1.

TABLE 1
Summary of Soil Survey Information

Soil Type	Constituents	Hydrologic Group	Natural Drainage	Soil Permeability (Inches/Hr)	Seasonal High Water Table
Tocoi (34)	0-13” Fine sand 13-23” Sand, fine sand, loamy fine sand 23-45” Sand, fine sand 45-76” Loamy sand, loamy fine sand 76-80” Sand, fine sand, loamy fine sand	B/D	Poorly Drained	0-13” 6.0-20 13-23” 2.0-20 23-45” 6.0-20 45-76” 2.0-6.0 76-80” 0.6-20	0-1.0
Sapelo (63)	0-23” Fine sand 23-32” Fine sand, loamy fine sand 32-56” Fine sand 56-80” Sandy clay loam, fine sandy loam	B/D	Poorly Drained	0-23” 6.0 – 20 23-32” 0.6 – 2.0 32-56” 6.0 – 20 56-80” 0.2 – 2.0	0.5 – 1.5
Bakersville (69)	0-5” Muck 5-41” Sand, fine sand, loamy fine sand 41-59” Sandy loam, fine sandy loam 59-86” Sand, fine sand, loamy fine sand	A/D	Very Poorly Drained	0-5” 6.0 – 20 5-41” 2.0 – 6.0 41-59” 0.6 – 2.0 59-86” 2.0 – 6.0	0.0 – 1.0

3.2 SURFACE CONDITIONS

The site of the proposed construction is located east of the intersection of Rues Landing Road and Highway 16 in St. Augustine, St. Johns County, Florida. The site is partially developed with two single-family residences, a pasture, one retention pond, and bordered by wooded areas consisting of pine and oak trees. In addition, a wet retention pond is located adjacent to the site approximately 350 feet south of the pond located on site. The ground cover consisted of maintained grass with loose dry sand. In addition, the site's topography visually appears to be relatively level.

3.3 SUBSURFACE CONDITIONS

The boring locations and detailed subsurface conditions are illustrated in Appendix A: Boring Location Plan and Boring Logs. It should be noted that soil conditions may vary away from and between the boring locations. The classifications and descriptions shown on the logs are generally based upon visual characterizations of the recovered soil samples and a limited number of laboratory tests. Also, see Appendix A: Key to Boring Logs, for further explanation of the symbols and placement of data on the Boring Logs.

TABLE 2
General Soil Profile

Typical depth (ft)		Soil Descriptions
From	To	
0.0	1.8-5.0	Very loose to loose fine sand (SP) and fine sand with silt (SP-SM)
1.8-5.0	13.0-22.3	Loose to very loose fine sand with clay (SP-SC) and clayey fine sand (SC)
13.0-22.3	25.0	Loose to medium dense fine sand (SP)

* Termination Depth of Deepest Boring
( ) Indicates Unified Soil Classification

The groundwater level was recorded between depths of 1.0 to 3.5 feet below the existing ground surface. The variation in groundwater level is likely contributed to topographical differentials. It should be anticipated the groundwater level may fluctuate due to topography, seasonal climatic variations, surface water runoff patterns, construction operations, and other interrelated factors.

4.0 RECOMMENDATIONS

4.1 GENERAL

In this section of the report, we present our detailed recommendations for groundwater control, building foundation and pavement design, stormwater management, site preparation, and construction related services. The following recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. We recommend that we be provided the opportunity to review the project plans and specifications to confirm that our recommendations have been properly interpreted and implemented. If the structural loadings or the building locations change significantly from those discussed previously, we request the opportunity to review and possibly amend our recommendations with respect to those changes. The discovery of any subsurface conditions during construction which deviate from those encountered in the borings should be reported to us immediately for observation, evaluation and recommendations.

It should be noted that our recommendations are based on the assumption that two feet or less of elevating fill will be needed. Fill heights exceeding this amount could result in intolerable settlements in the very loose soils encountered across the site. If fill heights exceed two feet, the need for two-week waiting period between fill placement and vertical construction is warranted.

4.2 GROUNDWATER CONSIDERATIONS

The groundwater table will fluctuate seasonally depending upon local rainfall. The rainy season in Northeast Florida is normally between June and September. We measured the groundwater level at the boring locations between depths of 1.0 to 3.5 feet below the existing grade. The variation in groundwater level is likely attributed to topographical differentials. Based upon our review of U.S.G.S data, St. Johns County Soil Survey, regional hydrogeology, and our site exploration, it is our option that the approximate seasonal high groundwater level will be encountered at depths 1.0 to 1.5 feet above the measured groundwater level.

Note, it is possible the estimated seasonal high groundwater levels will temporarily exceed these estimated levels during any given year in the future. Should impediments to surface water drainage exist on the site, or should rainfall intensity and duration, or total rainfall quantities exceed the normally anticipated rainfall quantities, groundwater levels may exceed our seasonal high estimates. We recommend positive drainage be established and maintained on the site during construction. We further recommend permanent measures be constructed to maintain positive drainage from the site throughout the life of the project. We recommend all foundation grade designs be based on the seasonal high groundwater conditions.

4.3 BUILDING FOUNDATIONS

Based on the results of our exploration, we consider the subsurface conditions at the site adaptable for support of the proposed structure when constructed on a properly designed conventional shallow foundation system. Provided the site preparation and earthwork construction recommendations outlined in Section 4.5 of this report are performed, the following parameters may be used for foundation design.

4.3.1 Bearing Pressure

The maximum allowable net soil bearing pressure for use in shallow foundation design should not exceed 2,000 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 which could be imposed by all loading conditions.

4.3.2 Foundation Size

The minimum widths recommended for any isolated column footings and continuous wall footings 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 minimum size of the foundations.

4.3.3 Bearing Depth

The exterior foundations should bear at a depth of at least 18 inches below the finished exterior grades and the interior foundations should bear at a depth of at least 12 inches below the finish floor elevation to provide confinement to the bearing level soils. It is recommended that stormwater be diverted away from the building exteriors to reduce the possibility of erosion beneath the exterior footings.

4.3.4 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 at least 95 percent of the Modified Proctor maximum dry density (ASTM D 1557) to a depth of at least two feet below the foundation bearing level.

4.3.5 Settlement Estimates

Post-construction settlements of the structures 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 structures are based on the use of site preparation/earthwork construction techniques as recommended in Section 4.5 of this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlements of the structures.

Using the recommended maximum bearing pressure, the assumed maximum structural loads and the field data which we have correlated to geotechnical strength and compressibility characteristics of the subsurface soils along with the recommended waiting period, if warranted, we estimate that total settlements of the structures should be on the order of one inch or less.

Differential settlements result from differences in applied bearing pressures and variations in the compressibility characteristics of the subsurface soils. Because of the general uniformity of the subsurface conditions and the recommended site preparation and earthwork construction techniques outlined in Section 4.5, we anticipate that differential settlements of the structures should be within tolerable magnitudes (½ inch or less).

4.3.6 Floor Slabs

The floor slabs can be constructed as slab-on-grade members using a modulus of subgrade reaction (K) of 100 pci provided the subgrade materials are compacted as outlined in Section 4.5. It is recommended the floor slabs bearing soils be covered with an impervious membrane to reduce moisture entry and floor dampness in accordance with the 2017 Florida Building Code, 6th Edition. A 10-mil thick plastic membrane is commonly used for this purpose. Care should be exercised not to tear the membranes during placement of reinforcing steel and concrete.

4.4 PAVEMENTS

4.4.1 General

A rigid or flexible pavement section could be used on this project. Flexible pavement combines the strength and durability of several layer components to produce an appropriate and cost-effective combination of available construction materials. Concrete pavement has the advantage of the ability to “bridge” over isolated soft areas, it requires less security lighting, and it typically has a longer service life than asphalt pavement. Disadvantages of rigid pavement include an initial higher cost and more difficult patching of distressed areas than occurs with flexible pavement.

4.4.2 Asphalt (Flexible) Pavements

We have recommended a flexible pavement section with a 20-year design life for use on this project. Because traffic loadings are commonly unavailable, we have generalized our pavement design into two groups. The group descriptions and the recommended component thicknesses are presented in Table 3: Summary of Pavement Component Recommendations. The thicknesses in Table 3 are based on a structural number analysis with the stated estimated daily traffic volume for a 20-year replacement design life. We have conservatively assumed a design subgrade LBR of 20 (Resilient Modulus of 7,500 psi) for this analysis and have additionally assumed a separation of at least 2 feet between the bottom of base and the seasonal high groundwater level.

TABLE 3
Summary of Pavement Component Recommendations

Traffic Group	Maximum Traffic Loading	Component Thickness (inches)		
		Stabilized Subgrade	Base Course	Surface Course
Automobile parking lots and driveways - **standard duty**	Up to 300,000 $E_{18}SAL$	12	6	1.5
Truck parking lots and driveways - **heavy duty**	Up to 800,000 $E_{18}SAL$	12	8	2.0

4.4.2.1 Stabilized Subgrade

We recommend that subgrade materials be compacted in place according to the requirements in the "Site Preparation" section of this report. Further, beneath limerock base course, stabilize the subgrade materials to a minimum Limerock Bearing Ratio (LBR) of 40, as specified by Florida Department of Transportation (FDOT) requirements for Type B Stabilized Subgrade. The subgrade material should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557, AASHTO T-180) value.

The stabilized subgrade can be a blend of existing soil and imported material such as limerock. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions.

The primary function of stabilized subgrade beneath the base course is to provide a stable and firm subgrade so that the limerock can be properly and uniformly placed and compacted. Depending upon the soil type, the subgrade material may have sufficient stability to provide the needed support without additional stabilizing material. Generally, sands with silt or clay should have sufficient stability and may not require additional stabilizing material. Conversely, relatively “clean” sand will not provide sufficient stability to adequately construct the limerock base course. Universal Engineering Sciences should observe the soils exposed on the finish grades to evaluate whether or not additional stabilization will be required beneath the base course.

4.4.2.2 Base Course

We recommend the base course consist of locally available limerock complying with the requirements of the most recent version of the FDOT Standard Specifications for Road and Bridge Construction (SSRBC), Section 200 and Section 911. The limerock should be mined or supplied from an FDOT approved source. Place the limerock in maximum 6-inch thick loose lifts and compact each lift to a minimum density of 98 percent of the Modified Proctor maximum dry density (ASTM D1557/AASHTO T-180).

Alternatively, we believe locally available crushed concrete base of equal thickness could be substituted for the limerock. Crushed concrete should be supplied by an FDOT approved plant with quality control procedures. Crushed concrete should meet the requirements for Recycled Concrete Aggregate (RCA) of the most recent version of FDOT SSRBC Sections 200 and 911.

The base shall have an average LBR of not less than 100 and should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557, AASHTO T-180) value. The LBR value of material produced at a particular source shall be determined in accordance with an approved quality control procedure.

Testing shall be performed at the following frequencies:

- Perform in-place density on the base at a frequency of 1 test per 300 linear foot of roadway or 5,000 square feet of pavement.

- Perform Limerock Bearing Ratio tests at a frequency of 1 test per visual change in material and a minimum of 1 test per 15,000 square feet of pavement.

- Engineer should perform a final visual base inspection prior to placement of prime or tack coat and paving.

4.4.2.3 Wearing Surface

For the roadways, we recommend that the surfacing consist of FDOT SuperPave (SP) asphaltic concrete. The surface course should consist of FDOT SP-9.5 fine mix for the proposed light-duty area. The heavy duty area can consist of a single 2-inch lift of SP-12.5 or 2 layers of SP-9.5 placed in 1-inch lifts. The asphalt concrete should be placed within the allowable lift thicknesses for fine Type SP mixes per the latest edition of FDOT, Standard Specifications for Road and Bridge Construction, Section 334-1.4 Thickness.

The asphaltic concrete should be compacted to an average field density of 93 percent of the laboratory maximum density determined from specific gravity (G_{mm}) methods, with an individual test tolerance of **+2 percent and -1.2% of the design G_{mm}**. Specific requirements for the SuperPave asphaltic concrete structural course are outlined in the latest edition of FDOT, Standard Specifications for Road and Bridge Construction, Section 334-5.2.4.

Please note, if the Designer (or Contract Documents) limits compaction to the static mode only or lifts are placed one-inch thick, then the average field density should be 92 percent, with an individual test tolerance of + 3 percent, and -1.2% of the design G_{mm}.

After placement and field compaction, the wearing surface should be cored to evaluate material thickness and density. Cores should be obtained at frequencies of at least one (1) core per 5,000 square feet of placed pavement, every 250 feet of lineal roadway, or a minimum of two (2) cores per day’s production.

4.4.3 Concrete (Rigid) Pavements

Concrete pavement is a rigid pavement that transfers much lighter wheel loads to the subgrade soils than a flexible asphalt pavement. For a concrete pavement subgrade, we recommend using the existing surficial sands or recommend clean fine sand fill (SP), densified to at least 98 percent of Modified Proctor test maximum dry density (ASTM D 1557) without additional stabilization, with the following stipulations:

1. Subgrade soils must be densified to at least 98 percent of Modified Proctor test maximum dry density (ASTM D 1557) to a depth of at least 2 feet prior to placement of concrete.

2. The surface of the subgrade soils must be smooth, and any disturbances or wheel rutting corrected prior to placement of concrete.

3. The subgrade soils must be moistened prior to placement of concrete.

4. Concrete pavement thickness should be uniform throughout, with exception to thickened edges (curb or footing).

5. The bottom of the pavement should be separated from the estimated typical wet season groundwater level by at least 18 inches.

Our recommendations for slab thickness for standard duty and heavy duty concrete pavements are based on a) subgrade soils densified to 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) b) modulus of subgrade reaction (k) equal to 200 pounds per cubic inch, c) a 20-year design life, and d) previously stated traffic conditions in Section 4.4.2, we recommend using the design shown in Table 4 for standard duty concrete pavements.

TABLE 4 Standard Duty (Unreinforced) Concrete Pavement		
Minimum Pavement Thickness	Maximum Control Joint Spacing	Recommended Sawcut Depth
5 Inches	10 Feet x 10 Feet	1¼ Inches

Our recommended design for heavy duty concrete pavement is shown in Table 5 below.

TABLE 5 Heavy Duty (Unreinforced) Concrete Pavement		
Minimum Pavement Thickness	Maximum Control Joint Spacing	Recommended Sawcut Depth
6 Inches	12 Feet x 12 Feet	1½ Inches

We recommend using concrete with minimum 28-day compressive strength of 4,000 psi and a minimum 28-day flexural strength (modulus of rupture) of at least 600 pounds per square inch, based on 3rd point loading of concrete beam test samples. Layout of the sawcut control joints should form square panels, and the depth of sawcut joint should be at least ¼ of the concrete slab thickness. The joints should be sawed within six hours of concrete placement or as soon as the concrete has developed sufficient strength to support workers and equipment. We recommend allowing Universal to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction.

For further details on concrete pavement construction, please reference the "Guide to Jointing on Non-Reinforced Concrete Pavements" published by the Florida Concrete and Products Associates, Inc., and "Building Quality Concrete Parking Areas", published by the Portland Cement Association.

4.4.4 Effects of Groundwater

One of the most critical factors influencing pavement performance in Northeast Florida is the relationship between the pavement subgrade and the seasonal high groundwater level. Many roadways and parking areas have been damaged as a result of deterioration of the base conditions and/or the base/surface course bond. We recommend that the seasonal high groundwater and the bottom of the flexible pavement limerock base course be separated by at least 24 inches. We recommend a separation of at least 18 inches below the bottom of a rigid concrete pavement or below a flexible pavement with a crushed concrete base. If this separation cannot be established and maintained by grading and surface drainage improvements, permanent groundwater control measures (underdrains) will be required.

4.4.5 Curbing

We recommend that curbing around the landscaped sections adjacent to the parking areas and driveways be constructed with full-depth curb sections. Using extruded curb sections which lie directly on top of the final asphalt level, or eliminating the curbing entirely, can allow migration of irrigation water from the landscape areas to the interface between the asphalt and the base. This migration often causes separation of the wearing surface from the base and subsequent rippling and pavement deterioration. Topsoil placed behind curbing in landscaped areas should be limited to 6-inch vertical thickness within five feet of flexible pavement.

4.4.6 Construction Traffic

Light duty roadways and incomplete pavement sections will not perform satisfactorily under construction traffic loadings. We recommend that construction traffic (construction equipment, concrete trucks, sod trucks, garbage trucks, dump trucks, etc.) be re-routed away from these roadways or that the pavement section be designed for these loadings.

4.5 SITE PREPARATION

We recommend only normal, good practice site preparation techniques to prepare the existing subgrade to support the proposed structures. These techniques include clearing the construction areas of any utilities, stripping/root raking topsoil and vegetation, dewatering as warranted, compacting the subgrade, proof-rolling to locate zones of soft soil, and placing engineered fill to the desired grades followed by a waiting period prior to vertical construction, if warranted. A more detailed synopsis of this work is as follows:

1. Prior to construction, the location of any existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may subsequently lead to excessive settlement of the overlying structure(s).

2. We measured the groundwater level at the boring locations between depths of 1.0 to 3.5 feet below the existing grade. It is our option that the approximate seasonal high groundwater level will occur 1.0 to 1.5 feet above the measured groundwater level. We recommend the groundwater level be maintained at least two feet below any excavations during construction and two feet below the level of any vibratory compaction operation. We anticipate that surface water management could be needed if the construction occurs during a relatively wet climatic period. If required, temporary groundwater control can probably be achieved by pumping from sumps located in perimeter ditches. Each sump should be located outside the bearing area to avoid loosening of the fine sandy bearing soils.

3. Strip the proposed construction limits of any topsoils, vegetation, and other deleterious materials within and 5 feet beyond the perimeter of the proposed building areas and within and 3 feet beyond the perimeter of the proposed pavement areas. Expect typical stripping at this site to a depth of 12 inches more or less. Some isolated areas may require more than 12 inches of stripping or undercutting to remove the root systems of large trees.

4. Compact the subgrade from the surface with a medium weight vibratory roller operating until you obtain a minimum density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557), to a depth of 2 feet below the compacted surface. A minimum of eight (8) complete coverages (in perpendicular directions) should be made in the structure construction area with the roller to improve the uniformity and increase the density of the underlying sandy soils. Typically, the soils should exhibit moisture contents within ±2.0% of the Modified Proctor optimum moisture content during compaction. Should the subgrade soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils which are then compacted, or (2) the excess pore pressures within the disturbed soils allowed to dissipate before recompaction.

5. Care should be exercised to avoid damaging any nearby structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing conditions of the structures be documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures. Universal Engineering Sciences can provide vibration monitoring services to help document and evaluate the effects of the surface compaction operation on existing structures. In the absence of vibration monitoring it is recommended the vibratory roller remain a minimum of 50 feet from existing structures. Within this zone, use of a bulldozer or a vibratory roller operating in the static mode is recommended.

6. We recommend the subgrade be proof-rolled with a heavily loaded, rubber-tired vehicle under the observation of a geotechnical engineer or his/her representative. Proof-rolling will help delineate areas of especially loose or soft soils not encountered in the soil test borings. We recommend the areas that experience pumping or otherwise appear unstable be undercut to firm soils. Placement and compaction of backfill in undercut areas and preparation of the subgrade and base should be placed and compacted in accordance with the recommendations below.

7. Test the subgrade for compaction at a minimum of two test locations or one location for every 5,000 square feet in each building area, whichever is greater and at one location for every 10,000 square feet of pavement or a minimum of two test locations, whichever is greater.

8. Place fill material, as required. The fill should consist of "clean," fine sand with less than 5 percent soil fines. You may use fill materials with soil fines between 5 and 12 percent, but strict moisture control may be required. Typically, the soils should exhibit moisture contents within ± 2 percent of the Modified Proctor optimum moisture content during compaction. Place fill in uniform 10 to 12-inch loose lifts and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum dry density.

   The top 12 inches of fill beneath flexible pavement or the top 24 inches of fill beneath rigid pavement areas should be compacted to 98 percent of the Modified Proctor maximum dry density. For flexible pavement areas, stabilize this zone as necessary as recommended in Section 4.4.2, to obtain a minimum LBR of 40.

9. Perform compliance tests within the fill/backfill at a frequency of not less than one test per 5,000 square feet per lift in each building area, or at a minimum of two tests per building, whichever is greater. In paved areas, perform compliance tests at a frequency of not less than one test per 10,000 square feet per lift, or at a minimum of two test locations, whichever is greater.

10. Test all footing cuts for compaction to a depth of 2 feet. We recommend you conduct density testing in every column footing, and every 100 linear feet in wall footings. Recompaction of the foundation excavation bearing level soils, if loosened by the excavation process, can probably be achieved by making several coverages with a light weight walk-behind vibratory sled or roller.

11. If total fill heights exceed 2 feet, the need for a 14-day waiting period between fill placement and vertical construction is warranted.

4.6 RETENTION POND CONSIDERATIONS

Stormwater management borings are typically planed, in part, to provide an indication of the suitability of excavated soils for use as structural fill. Based on the boring results and classification of the soil samples, the soil described as fine sands (SP), fine sand with silt (SP-SM), and fine sand with clay (SP-SC), as shown in Appendix A: Soil Profiles, are considered suitable for use as structural fill. It should be understood that soils excavated from below the water table may be excessively wet and may require stockpiling or spreading to dry prior to placement and compaction. Soils described as fine sand with silt (SP-SM) and fine sand with clay (SP-SC) may take longer to dry than those described as fine sand (SP) to higher fines content. Soils described as clayey fine sand (SC) are not considered suitable for use as structural fill due to high fines content and moisture sensitivity.

4.7 CONSTRUCTION RELATED SERVICES

We recommend the owner retain Universal Engineering Sciences to perform construction materials tests and observations on this project. Field tests and observations include verification of foundation and pavement subgrades by performing quality assurance tests on the placement of compacted structural fill and pavement courses. We can also provide concrete testing, pavement section testing, structural steel testing, and general construction observation services.

The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner.

5.0 LIMITATIONS

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. A Geotechnical Business Council (GBC) publication, "Important Information About This Geotechnical Engineering Report" appears in Appendix B, and will help explain the nature of geotechnical issues.

Further, we present documents in Appendix B: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

APPENDIX A

BORING LOCATION PLAN
SOIL PROFILES
BORING LOGS
KEY TO BORING LOGS
FIELD EXPLORATION PROCEDURES
LABORATORY TESTING PROCEDURES

GRAPHIC SCALE

150’ 0 75’ 150’ 300’

(IN FEET)

LEGEND

SPT BORING LOCATION

CLIENT:
CAPSTONE COLLEGIATE COMMUNITIES, LLC

DRAWN BY: TW	DATE: 7/20/21
CHECKED BY: PM	DATE: 7/20/21
SCALE: 1"= 150’	
PROJECT NO: 0930.2100162.0000	REPORT NO: 1887682

GEOTECHNICAL EXPLORATION
ST. AUGUSTINE – GOLF
ST. AUGUSTINE, ST. JOHNS COUNTY, FLORIDA

BORING LOCATION PLAN

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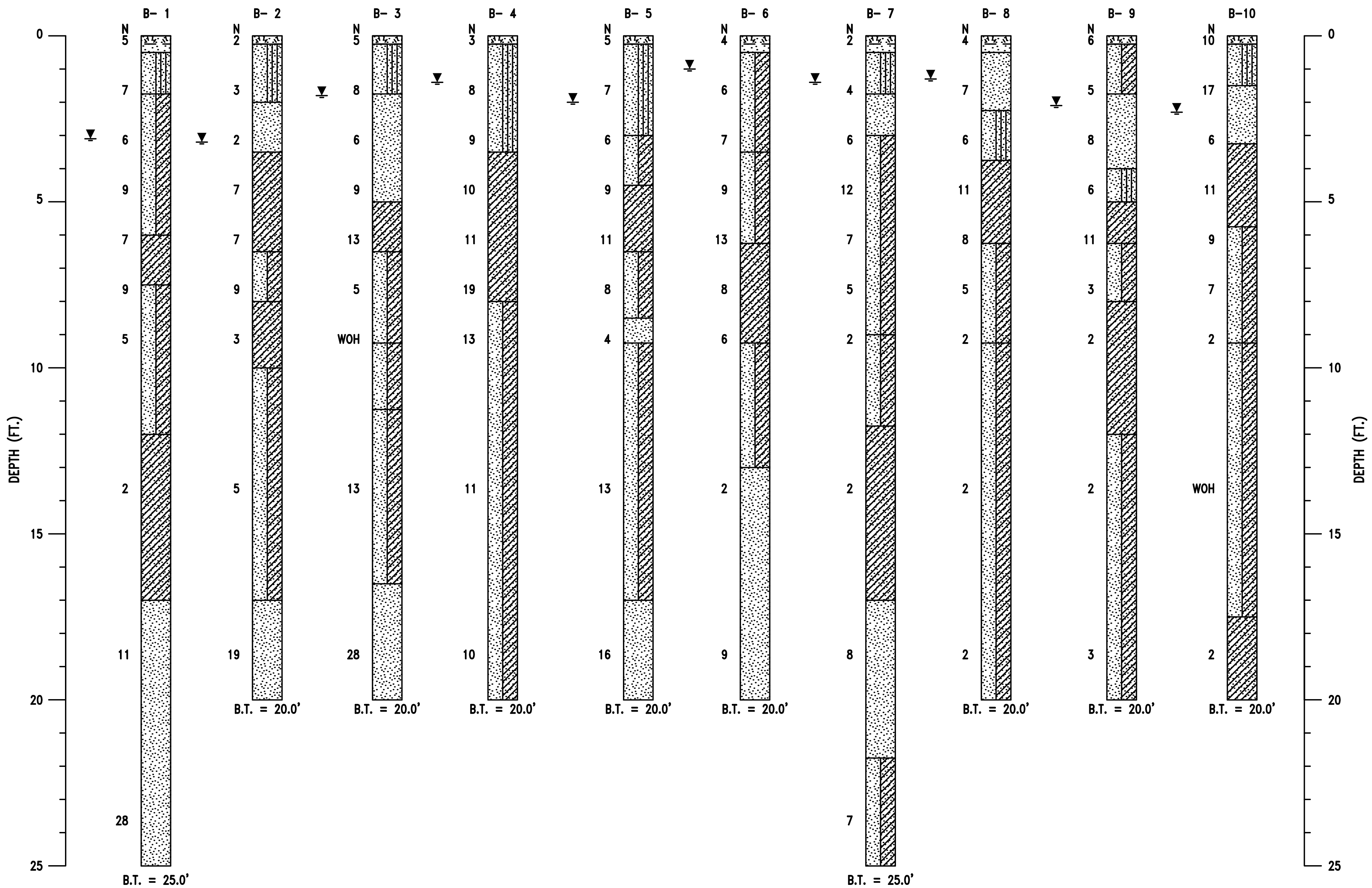
PAGE NO:
FIGURE A–1



LEGEND

- Topsoil
- Sand (SP)
- Clayey Sand (SC)
- Sand with Silt (SP–SM)
- Sand with Clay (SP–SC)
- Groundwater Table
- BT Boring Termination Depth
- N SPT Blow Count
- WOH Weight of Hammer

CLIENT:
CAPSTONE COLLEGIATE COMMUNITIES, LLC

DRAWN BY: TW | DATE: 7/20/21
CHECKED BY: PM | DATE: 7/20/21
SCALE: AS SHOWN
PROJECT NO: 0930.2100162.0000 | REPORT NO: 1887682

GEOTECHNICAL EXPLORATION
ST. AUGUSTINE – GOLF
ST. AUGUSTINE, ST. JOHNS COUNTY, FLORIDA

SOIL BORING PROFILES

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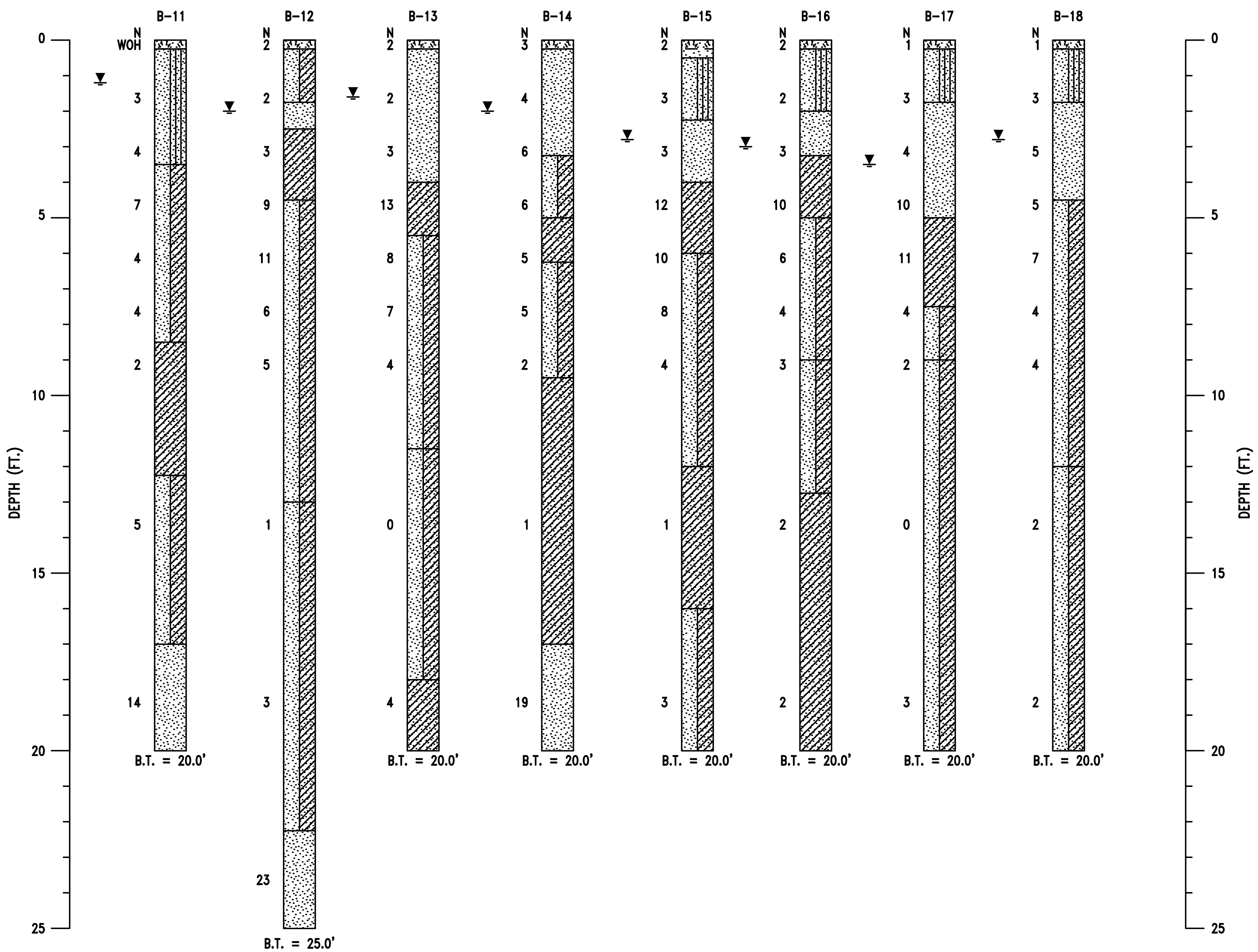
PAGE NO:
FIGURE A–2



LEGEND

- Topsoil
- Sand (SP)
- Clayey Sand (SC)
- Sand with Silt (SP–SM)
- Sand with Clay (SP–SC)
- Groundwater Table
- BT Boring Termination Depth
- N SPT Blow Count
- WOH Weight of Hammer

CLIENT:
CAPSTONE COLLEGIATE COMMUNITIES, LLC

DRAWN BY: TW | DATE: 7/20/21
CHECKED BY: PM | DATE: 7/20/21
SCALE: AS SHOWN
PROJECT NO: 0930.2100162.0000 | REPORT NO: 1887682

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ST. AUGUSTINE – GOLF
ST. AUGUSTINE, ST. JOHNS COUNTY, FLORIDA

SOIL BORING PROFILES

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PAGE NO:
FIGURE A–3

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BORING LOG

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REPORT NO.:	1887682
PAGE:	A-1

PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 1** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.1
DATE OF READING: 7/10/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/9/21
DATE FINISHED: 7/9/21
DRILLED BY: ST/BT
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Loose gray-brown fine SAND with Silt (SP-SM)						
	X	1-2-3	5									
						Loose brown to orange-brown fine SAND with Clay (SP-SC)						
	X	3-3-4	7	▼								
	X	3-3-3	6									
5	X	3-4-5	9									
						Loose orange-brown Clayey fine SAND (SC)						
	X	3-4-3	7									
						Loose light orange-brown fine SAND with Clay (SP-SC)						
	X	3-4-5	9									
10	X	4-3-2	5									
						Very loose orange-brown Clayey fine SAND (SC)						
15	X	1-1-1	2				12.4	26.2				
						Medium dense light brown fine SAND (SP)						
20	X	4-5-6	11									
25	X	9-13-15	28									

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BORING LOG

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ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 2** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.2
DATE OF READING: 7/10/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/10/21
DATE FINISHED: 7/10/21
DRILLED BY: BT
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
		1-1-1	2			Very loose gray-brown fine SAND with Silt (SP-SM)						
		1-1-2	3	▼		Very loose brown fine SAND (SP)						
		1-1-1	2			Very loose to loose orange-brown Clayey fine SAND (SC)	16.8	24.3				
5		2-3-4	7									
		3-4-3	7			Loose orange-brown fine SAND with Clay (SP-SC)						
		4-5-4	9			Loose to very loose light brown Clayey fine SAND (SC)						
10		1-2-1	3			Very loose to loose light brown to light orange-brown fine SAND with Clay (SP-SC)						
15		2-1-4	5									
						Medium dense orange-brown fine SAND (SP)						
20		7-8-11	19									

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BORING LOG

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ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 3** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.8
DATE OF READING: 7/10/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/9/21
DATE FINISHED: 7/9/21
DRILLED BY: ST/BT
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Loose gray-brown fine SAND with Silt (SP-SM)						
		1-2-3	5	▼								
						Loose light gray fine SAND (SP)						
		3-4-4	8									
		4-3-3	6									
5						Loose orange-red Clayey fine SAND (SC)	16.3	23.7				
		3-4-5	9									
						Medium dense to loose orange-brown to light gray fine SAND with Clay (SP-SC)						
		8-6-7	13									
		4-3-2	5									
						Very loose brown fine SAND with Clay (SP-SC)	9.9	33.4				
10		WOH/18"	WOH									
						Medium dense brown fine SAND with Clay (SP-SC)						
15		7-7-6	13									
						Medium dense light brown fine SAND (SP)						
20		8-10-18	28									

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BORING LOG

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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 4** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.4
DATE OF READING: 7/10/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/9/21
DATE FINISHED: 7/9/21
DRILLED BY: ST/BT
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Very loose to loose brown to dark brown fine SAND with Silt and trace Roots (SP-SM)						
	X	1-1-2	3	▼								
	X	3-4-4	8									
						Loose gray to dark gray Clayey fine SAND (SC)						
	X	3-4-5	9				16.0	17.9				
5	X	5-5-5	10									
	X	2-4-7	11									
						Medium dense to loose gray-brown to light gray fine SAND with Clay (SP-SC)						
	X	6-9-10	19									
10	X	6-6-7	13									
15	X	4-5-6	11									
20	X	2-4-6	10									

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BORING LOG

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ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 5** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.0
DATE OF READING: 7/10/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/10/21
DATE FINISHED: 7/10/21
DRILLED BY: B. TRUITT
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
	X	1-2-3	5			Loose dark brown fine SAND with Silt (SP-SM)						
				▼								
	X	2-3-4	7			Loose brown fine SAND with Clay (SP-SC)						
	X	3-3-3	6			Loose gray Clayey fine SAND (SC)						
5	X	2-3-6	9				15.1	21.8				
	X	3-6-5	11			Medium dense to loose light gray fine SAND with Clay (SP-SC)						
	X	4-4-4	8			Loose light gray fine SAND (SP)						
10	X	1-2-2	4			Loose to medium dense gray-brown fine SAND with Clay (SP-SC)						
15	X	5-6-7	13									
						Medium dense light gray fine SAND (SP)						
20	X	6-7-9	16									

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ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 6** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.0
DATE OF READING: 7/10/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/9/21
DATE FINISHED: 7/9/21
DRILLED BY: ST/BT
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
	X	1-1-3	4	▼		Loose gray-brown fine SAND with Clay (SP-SC)						
	X	2-3-3	6									
	X	2-3-4	7			Loose dark gray-brown fine SAND with Clay and trace Roots (SP-SC)						
5	X	4-4-5	9									
	X	3-6-7	13			Medium dense to loose gray Clayey fine SAND (SC)						
							14.6	26.1				
	X	4-4-4	8									
10	X	3-3-3	6			Loose brown fine SAND with Clay (SP-SC)						
						Very loose to loose gray fine SAND (SP)						
15	X	1-1-1	2				4.2	26.1				
20	X	3-4-5	9									

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ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 7** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.4
DATE OF READING: 7/10/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/10/21
DATE FINISHED: 7/10/21
DRILLED BY: B. TRUITT
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
	X	WOH-1-1	2	▼		Very loose brown fine SAND with Silt (SP-SM)						
	X	2-2-2	4			Loose light brown fine SAND (SP)						
	X	1-2-4	6			Loose to medium dense orange-brown to light brown fine SAND with Clay (SP-SC)						
5	X	5-6-6	12									
	X	4-4-3	7									
	X	3-3-2	5									
10	X	1-1-1	2			Very loose light gray fine SAND with Clay (SP-SC)	8.6	29.4				
						Very loose gray Clayey fine SAND (SC)						
15	X	1-1-1	2				14.1	30.6				
						Loose gray fine SAND (SP)						
20	X	3-4-4	8									
						Loose dark gray fine to medium SAND with Clay (SP-SC)						
25	X	3-3-4	7									

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REPORT NO.: 1887682
PAGE: A-8

PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 8** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.3
DATE OF READING: 7/11/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/11/21
DATE FINISHED: 7/11/21
DRILLED BY: BT/SV
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Loose gray fine SAND (SP)						
	X	1-1-3	4	▼								
	X	3-3-4	7			Loose dark brown fine SAND with Silt (SP-SM)						
	X	3-2-4	6			Loose to medium dense brown to orange-brown Clayey fine SAND (SC)	19.9	24.4				
5	X	3-6-5	11									
	X	3-3-5	8			Loose orange-brown to brown fine SAND with Clay (SP-SC)						
	X	4-3-2	5									
10	X	1-1-1	2			Very loose gray-brown fine SAND with Clay (SP-SC)						
15	X	1-1-1	2									
20	X	1-1-1	2				7.6	27.1				

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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B- 9** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.1
DATE OF READING: 7/12/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/12/21
DATE FINISHED: 7/12/21
DRILLED BY: BT/BH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Loose gray-brown fine SAND with Clay (SP-SC)						
	X	1-3-3	6									--
				▼		Loose light gray fine SAND (SP)						
	X	3-3-2	5									
						Loose brown fine SAND with Silt (SP-SM)						
	X	5-4-4	8									
5						Loose orange-brown Clayey fine SAND (SC)						
	X	2-2-4	6									
						Loose to medium dense orange-brown fine SAND with Clay (SP-SC)						
	X	4-5-6	11									
						Very loose light gray Clayey fine SAND (SC)						
	X	1-1-2	3									
10	X	2-1-1	2				14.3	28.3				
						Very loose gray fine SAND with Clay (SP-SC)						
15	X	1-1-1	2									
20	X	1-1-2	3									

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0930.2100162.0000
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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-10** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.3
DATE OF READING: 7/13/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/13/21
DATE FINISHED: 7/13/21
DRILLED BY: BT/BH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
	X	1-4-6	10			Loose brown fine SAND with Silt (SP-SM)						
	X	6-8-9	17	▼		Medium dense light brown fine SAND (SP)						
	X	4-3-3	6			Loose to medium dense orange-brown Clayey fine SAND (SC)	18.4	24.0				
5	X	4-5-6	11			Loose light gray fine SAND with Clay (SP-SC)						
	X	2-4-5	9									
	X	3-3-4	7									
10	X	3-1-1	2			Very loose light gray to gray fine SAND with Clay (SP-SC)						
15	X	WOH/18"	WOH									
						Very loose gray Clayey fine SAND (SC)						
20	X	1-1-1	2									

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BORING LOG

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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-11** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.2
DATE OF READING: 7/13/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/13/21
DATE FINISHED: 7/13/21
DRILLED BY: BT/BH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
		WOH/18"	WOH	▼		Very loose dark brown to brown fine SAND with Silt (SP-SM)						
		1-1-2	3									
		2-2-2	4			Loose light brown fine SAND with Clay (SP-SC)						
5		2-3-4	7									
		3-2-2	4									
		1-2-2	4			Loose to very loose gray Clayey fine SAND (SC)						
10		1-1-1	2									
						Loose light gray fine SAND with Clay (SP-SC)						
15		2-3-2	5									
						Medium dense light gray fine SAND (SP)						
20		4-5-9	14									

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BORING LOG

PROJECT NO.:	0930.2100162.0000
REPORT NO.:	1887682
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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-12** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.0
DATE OF READING: 7/11/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/11/21
DATE FINISHED: 7/11/21
DRILLED BY: BT/SV
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Very loose brown fine SAND with Clay (SP-SC)						
	X	1-1-1	2	▼		Very loose light brown fine SAND (SP)						
	X	1-1-1	2			Very loose orange-brown to brown Clayey fine SAND (SC)	17.2	24.4				
	X	2-1-2	3			Loose to medium dense gray to orange-brown fine SAND with Clay (SP-SC)						
5	X	3-3-6	9									
	X	5-5-6	11									
	X	3-4-2	6									
10	X	3-1-4	5									
						Very loose gray-brown to gray fine SAND with Clay (SP-SC)						
15	X	WOH/12"-1	1				10.8	31.9				
20	X	1-1-2	3									
						Medium dense light gray to dark gray fine SAND (SP)						
25	X	4-10-13	23									

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BORING LOG

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REPORT NO.:	1887682
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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-13** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.6
DATE OF READING: 7/11/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/11/21
DATE FINISHED: 7/11/21
DRILLED BY: BT/SV
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Very loose light gray to brown fine SAND (SP)						
	X	1-1-1	2	▼								
	X	1-1-1	2				4.6	26.3				
	X	1-1-2	3			Medium dense orange-brown Clayey fine SAND (SC)						
5	X	4-6-7	13			Loose light orange-brown fine SAND with Clay (SP-SC)						
	X	4-4-4	8									
	X	5-4-3	7									
10	X	2-2-2	4									
						Very loose gray fine SAND with Clay (SP-SC)						
15	X	1/18"	0									
						Loose gray Clayey fine SAND (SC)						
20	X	1-2-2	4									

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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-14** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.0
DATE OF READING: 7/13/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/13/21
DATE FINISHED: 7/13/21
DRILLED BY: BT/BH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
	X	1-1-2	3			Very loose to loose gray to brown fine SAND (SP)						
				▼ (2.0)								
	X	2-2-2	4									
	X	2-3-3	6			Loose gray-brown fine SAND with Clay (SP-SC)						
5	X	1-3-3	6			Loose gray Clayey fine SAND (SC)						
	X	1-2-3	5			Loose gray-brown fine SAND with Clay (SP-SC)						
	X	1-2-3	5									
10	X	2-1-1	2			Very loose gray Clayey fine SAND (SC)	15.3	31.5				
15	X	1/9"-1/9"	1									
						Medium dense brown fine SAND (SP)						
20	X	8-9-10	19									

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BORING LOG

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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-15** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.8
DATE OF READING: 7/11/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/11/21
DATE FINISHED: 7/11/21
DRILLED BY: BT/SV
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
	X	1-1-1	2			Very loose brown fine SAND with Silt (SP-SM)						
	X	1-1-2	3	▼		Very loose light gray fine SAND (SP)						
	X	1-1-2	3			Medium dense orange-brown to brown Clayey fine SAND (SC)						
5	X	4-5-7	12									
	X	5-5-5	10			Loose light gray to gray fine SAND with Clay (SP-SC)						
	X	4-4-4	8									
10	X	3-3-1	4									
						Very loose orange-brown Clayey fine SAND (SC)						
15	X	1/12"-1	1									
						Very loose gray fine SAND with Clay (SP-SC)						
20	X	2-1-2	3									

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ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-16** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.0
DATE OF READING: 7/13/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/13/21
DATE FINISHED: 7/13/21
DRILLED BY: BT/BH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Very loose brown fine SAND with Silt (SP-SM)						
	X	1-1-1	2									
						Very loose light brown fine SAND (SP)						
	X	1-1-1	2	▼								
						Very loose to loose orange-brown Clayey fine SAND (SC)						
	X	1-1-2	3									
5						Loose light gray fine SAND with Clay (SP-SC)						
	X	4-5-5	10									
	X	1-2-4	6									
	X	2-2-2	4									
						Very loose light gray fine SAND with Clay (SP-SC)						
10	X	2-2-1	3									
						Very loose gray Clayey fine SAND (SC)						
15	X	1-1-1	2									
20	X	2-1-1	2									

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PROJECT: GEOTECHNICAL EXPLORATION
ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-17** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.5
DATE OF READING: 7/13/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/13/21
DATE FINISHED: 7/13/21
DRILLED BY: BT/BH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						TOPSOIL						
		1/9"-1/9"	1			Very loose brown fine SAND with Silt (SP-SM)						
		1-2-1	3			Very loose to loose light brown fine SAND (SP)						
				▼ (3.5)								
		2-2-2	4									
5		4-5-5	10			Loose to medium dense orange-brown Clayey fine SAND (SC)						
		4-5-6	11									
		3-2-2	4			Loose light orange-brown fine SAND with Clay (SP-SC)						
10		2-1-1	2			Very loose light orange-brown to gray fine SAND with Clay (SP-SC)						
15		1/18"	0									
20		1-2-1	3									

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ST. AUGUSTINE - GOLF
ST. JOHNS COUNTY, FLORIDA

BORING DESIGNATION: **B-18** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CAPSTONE COLLEGIATE COMMUNITIES, LLC
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.8
DATE OF READING: 7/13/21
EST. W.S.W.T. (ft):

DATE STARTED: 7/13/21
DATE FINISHED: 7/13/21
DRILLED BY: BT/BH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						TOPSOIL						
						Very loose brown fine SAND with Silt (SP-SM)						
	X	WOH/12"-1	1									
						Very loose to loose light brown fine SAND (SP)						
	X	1-1-2	3	▼								
	X	2-2-3	5									
5						Loose light gray fine SAND with Clay (SP-SC)						
	X	2-2-3	5									
	X	2-3-4	7									
	X	3-3-1	4									
10	X	2-2-2	4									
						Very loose gray fine SAND with Clay (SP-SC)						
15	X	1-1-1	2				8.9	29.7				
20	X	2-1-1	2									

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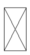
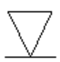
KEY TO BORING LOGS

SYMBOLS AND ABBREVIATIONS

SYMBOL	DESCRIPTION
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
	Sample from Auger Cuttings
	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
% REC	Percent Core Recovery from Rock Core Drilling
RQD	Rock Quality Designation
	Stabilized Groundwater Level
	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
K	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% retained on the No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS 5% or less passing No. 200 sieve	SW**	Well-graded sands and gravelly sands, little or no fines
			SP**	Poorly graded sands and gravelly sands, little or no fines
		SANDS with 12% or more passing No. 200 sieve	SM**	Silty sands, sand-silt mixtures
			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SIOLS 50% or more passes the No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diamicaceous fine sands or silts, elastic silts
			CH	Inorganic clays or clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils

*Based on the material passing the 3-inch (75 mm) sieve
** Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

RELATIVE DENSITY
(Sands and Gravels)
Very loose – Less than 4 Blow/Foot
Loose – 4 to 10 Blows/Foot
Medium Dense – 11 to 30 Blows/Foot
Dense – 31 to 50 Blows/Foot
Very Dense – More than 50 Blows/Foot

CONSISTENCY
(Silts and Clays)
Very Soft – Less than 2 Blows/Foot
Soft – 2 to 4 Blows/Foot
Firm – 5 to 8 Blows/Foot
Stiff – 9 to 15 Blows/Foot
Very Stiff – 16 to 30 Blows/Foot
Hard – More than 30 Blows/Foot

RELATIVE HARDNESS
(Limestone)
Soft – 100 Blows for more than 2 Inches
Hard – 100 Blows for less than 2 Inches

MODIFIERS

These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample
Trace – 5% or less
With Silt or With Clay – 6% to 11%
Silty or Clayey – 12% to 30%
Very Silty or Very Clayey – 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample
Trace – Less than 3%
Few – 3% to 4%
Some – 5% to 8%
Many – Greater than 8%

These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample
Trace – 5% or less
Few – 6% to 12%
Some – 13% to 30%
Many – 31% to 50%

FIELD EXPLORATION PROCEDURES

Standard Penetration Test Boring

The penetration boring was made in general accordance with the latest revision of ASTM D 1586, "Penetration Test and Split-Barrel Sampling of Soils". The boring was advanced by rotary drilling techniques using a circulating bentonite fluid for borehole flushing and stability. At 2 ½ to 5 foot intervals, the drilling tools were removed from the borehole and 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 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 placed in glass jars 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.

LABORATORY TESTING PROCEDURES

Natural Moisture Content

The water content of the sample tested was determined in general accordance with the latest revision of ASTM D 2216. The water content is defined as the ratio of “pore” or “free” water in a given mass of material to the mass of solid material particles.

Percent Fines Content

The percent fines or material passing the No. 200 mesh sieve of the sample tested was determined in general accordance with the latest revision of ASTM D 1140. The percent fines are the soil particles in the silt and clay size range.

APPENDIX B

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL ENGINEERING REPORT

CONSTRAINTS AND RESTRICTIONS

Important Information about This

Geotechnical-Engineering Report

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

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

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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CONSTRAINTS & RESTRICTIONS

The intent of this document is to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of exploration. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

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