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GEOTECHNICAL EXPLORATION REPORT

THE CROSSROADS – COMMERCIAL DEVELOPMENT
FREEPORT, WALTON COUNTY, FLORIDA

UES PROJECT NO. 2030.2000012.0000
UES REPORT NO. 1757786

PREPARED FOR:

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March 24, 2020

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March 24, 2020

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Attention: Mr. Tracy L. Jernigan – Vice President
jernigan@jpengfl.com

Reference: **Geotechnical Exploration Report**
The Crossroads – Commercial Development
Freeport, Walton County, Florida
UES Project No. 2030.2000012.0000
UES Report No. 1757786

Dear Mr. Jernigan:

Universal Engineering Sciences, LLC (UES) has completed a geotechnical exploration at the referenced site in Walton County, Florida. The scope of our exploration was planned in conjunction with and authorized by you. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, either express or implied, is made.

The following report presents the results of our field exploration with a geotechnical engineering interpretation of those results with respect to the project characteristics as provided to us. We have included our estimates of the seasonal high groundwater level at the boring locations and geotechnical recommendations for site preparation, foundation design, pavement design, and stormwater design parameters.

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

BRANDON J. TARR LICENSE No. 83259 STATE OF FLORIDA PROFESSIONAL ENGINEER

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TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

1.0 PROJECT DESCRIPTION

Project information was provided to us by the Client via email on February 14 and February 28, 2020. We understand that the project will include constructing a new two-story building (50′ x 80′) and new paved parking lot and onsite stormwater area in Walton County, Florida. We understand that the site plan is subject to change with respect to slightly enlarging the building footprint to the south and east. A preliminary site plan showing the layout of the site including the location of the building footprint, parking areas and on-site stormwater area was provided for our use prior to initiating the field exploration program.

Structural loading and site grading information was not provided at the time of this report. Based on prior experience with similar structures, we have assumed that structural loads for the proposed building will be carried by load bearing walls (assumed maximum load of 5 kips per linear foot) and isolated columns (assumed maximum load of 50 kips per column). We have also assumed that less than 2 feet of structural fill will be necessary to achieve finished grades in the proposed building and pavement areas of the site.

Should any of the above information or assumptions made by UES be inconsistent with the planned development and construction, we request that you contact us immediately to allow us the opportunity to review the new information in conjunction with our report and revise or modify our engineering recommendations accordingly, as needed.

No site or project facilities/improvements, other than those described herein, should be designed using the soil information presented in this report. Moreover, UES will not be responsible for the performance of any site improvement so designed and constructed.

2.0 PURPOSE

The purposes of this exploration were:

- to explore and evaluate the subsurface conditions at the site with special attention to potential problems that may impact the proposed development;
- to measure the existing groundwater level and provide our estimates of the seasonal high groundwater level at the boring locations;
- to provide geotechnical engineering recommendations for site preparation, foundation, pavement, and stormwater design parameters.

This report presents an evaluation of site conditions on the basis of geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. We would be pleased to provide you with a proposal for these services at your request.

Our exploration was not designed to specifically address the potential for surface expression of deep geological conditions, such as sinkhole development related to karst activity. This evaluation requires a more extensive range of field services than those performed in this study. We would be pleased to conduct an exploration to evaluate the probable effect of the regional geology upon the proposed construction, if you so desire.

3.0 SITE DESCRIPTION

The subject site is located within Section 15, Township 1 South, Range 19 West in Freeport, Walton County, Florida. Specifically the site is located within Walton County Parcel ID's 15-1S-19-23040-006-001A and 15-1S-19-23040-006-0011 in Freeport, Walton County, Florida, as shown on the attached Figure A-1. At the time of drilling the site consisted of previously developed land. The parcels contained an existing ±4,000 SF structure adjacent to SR-20 and asphaltic pavements to the north with the majority of the western and southern parcels consisting of recently cleared land.

3.1 SOIL SURVEY

There was one (1) soil type mapped within the general area of the site according to the USDA NRCS Soil Survey of Walton County. A brief summary of the mapped surficial (native) soil type has been presented in Table I. Please note that the soils types and their associated engineering properties may have been altered by past development activities on the subject site.

TABLE I
SUMMARY OF PUBLISHED SOIL DATA

Soil Symbol	Soil Type	Hydrologic Group	Drainage Characteristics	Depth of Published Seasonal High GWT (feet)
4	Chipley sand, 0 to 5 percent slopes	C	Somewhat Poorly Drained	2.0 – 3.0 (apparent)

3.2 TOPOGRAPHY

According to information obtained from Google Earth Pro, pre-development ground surface elevation across the site area ranged from approximately +31 to +25 feet WGS84 EGM96 Geoid.

4.0 SCOPE OF SERVICES

The services conducted by UES during our geotechnical exploration were as follows:

- Drilled five (5) Standard Penetration Test (SPT) borings within the proposed building and stormwater area to depths ranging from 15 feet to 30 feet below existing land surface (bls).
- Performed two (2) hand auger borings within the proposed pavement areas to a depth fo 5 feet below existing land surface (bls).
- Secured samples of representative soils encountered in the soil borings for review, laboratory analysis and classification by a geotechnical engineer.
- Measured the existing site groundwater levels and provided an estimate of the seasonal high groundwater level at the boring locations.
- Conducted laboratory testing on selected soil samples obtained in the field to determine their engineering properties.

- Assessed the existing soil conditions with respect to the proposed construction.

- Prepared a report which documents the results of our exploration and analysis with geotechnical engineering recommendations.

5.0 FIELD EXPLORATION

The soil borings were performed with a truck mounted drill rig and manual hand auger on March 13 and March 16, 2020. Horizontal and vertical survey control was not provided for the test boring locations during our field exploration program. UES performed the soil test borings at the approximate locations shown on the attached boring location plan. UES personnel located the borings by using the provided site plan and measuring from existing on-site landmarks shown on the site plan and an aerial photograph. The indicated boring locations should be considered accurate to the degree of the methodologies used. The approximate boring locations have been presented in Appendix A. Samples of the soils recovered will be held in our laboratory for 60 days unless we are notified otherwise.

5.1 SPT BORINGS

To explore the subsurface conditions present within the areas of the proposed structure and stormwater management facility, we located and drilled a total of five (5) Standard Penetration Test (SPT) borings. Within the area of the proposed structure, three (3) SPT borings were performed to depths of approximately 20 to 30 feet below the existing ground surface. Within the area of the proposed stormwater management facility, two (2) SPT borings were performed to a depth of 15 feet below the existing ground surface. The SPT borings were performed in general accordance with the procedures of ASTM D 1586 "Standard Method for Penetration Test and Split-Barrel Sampling of Soils." SPT sampling was performed continuously to 10 feet to detect variations in the near surface soil profile and on approximate 5 feet centers thereafter.

5.2 AUGER BORINGS

To determine the subsurface conditions present within the areas of the proposed pavements, we located and performed two (2) hand auger borings to a depth of approximately 5 feet below the existing ground surface in general accordance with the methodology outlined in ASTM D 1452. A summary of this field procedure has been included in Appendix B.

5.3 DOUBLE RING INFILTROMETER (DRI) TESTING

One (1) Double Ring Infiltrometer (DRI) test was conducted at the site at test location SW-2 in the proposed stormwater area of the site at a depth of approximately 1 foot below existing grade. The DRI test was performed in general accordance with ASTM D 3385, "Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer." This test was performed to help establish the soil infiltration value and drainage characteristics for use in the stormwater retention and recovery design. The results indicated an infiltration rate of approximately 6 inches/hour. A graphical representation of the test results has been presented in Appendix B.

Per Sections 8.7.3 and 8.7.4 of ASTM D 3385, "for average soils, record the volume of liquid that is added to maintain a constant head in the inner ring and annular space at intervals of 15 minutes for the first hour, 30 minutes for the second hour, and 60 minutes during the remainder of a period of at least 6 hours, **or until a relatively constant rate is obtained**. The appropriate schedule of readings may be determined only through experience. For high-permeability materials, readings may be more frequent, while for low-permeability materials, the reading interval may be 24 hours, or more. In any event, the volume of liquid used in any one reading interval should not be less than approximately 25 cm^3." For this project, a relatively constant rate was obtained prior to reaching the maximum 6-hour test time recommendation. It should be noted that the coefficients of saturated horizontal and vertical permeability are not equivalent to the short term infiltration rate obtained from a Double Ring Infiltration (DRI) test. The DRI value is sometimes considered an unsaturated vertical infiltration value and is estimated from relationships established by research conducted for various Florida Water Management Districts or from published USDA (NCSS) Soil Conservation Survey data. The unsaturated infiltration rate is applicable during the early stages of a storm event when waters are infiltrating vertically until soil saturation occurs creating a mounding effect after which time horizontal flow dominates the infiltration process.

If a dry pond is determined feasible, we recommend that post-pond-construction DRI testing be performed in the dry pond bottom to verify the design vertical unsaturated infiltration rates used for the pond designs. Please note that it is the responsibility of the Design Professional submitting to the NWFWMD for a stormwater retention pond permit, not UES, to ensure that the post-pond-construction DRI tests are actually performed.

6.0 LABORATORY TESTING

The soil samples recovered from the test borings were returned to our laboratory and visually classified in general accordance with ASTM D 2487, "Standard Classification of Soils for Engineering Purposes" (Unified Soil Classification System). Laboratory soil tests were performed to aid in the classification of the soils, and to help in the evaluation of pertinent geohydrologic engineering characteristics of the soils. Representative soil samples were selected for percent fines determination, natural moisture content, and falling head permeability. The test results have been presented on the attached Boring Logs in Appendix B.

6.1 GRAINSIZE ANALYSIS (PERCENT PASSING NO. 200 SIEVE)

Certain recovered soil samples were selected to determine the percentage of fines. In these tests the soil samples were initially dried and then washed over a No. 200 mesh sieve. The percent of soil by weight passing the sieve was termed the percentage of fines or portion of the sample in the silt and clay size range. These tests were conducted in accordance with ASTM D 1140, "Amount of Material in Soils Finer Than the #200 Sieve."

6.2 NATURAL MOISTURE CONTENT

The water content of the samples 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.

6.3 PERMEABILITY

Representative soil samples were selected to evaluate the permeability rate of the soils. Two (2) falling head permeability tests were performed on a representative remolded samples of the pre-dominant near surface soils from the proposed stormwater management area. This test was conducted following the concepts outlined in FM 5-513, "Florida Method of Test for Coefficient of Permeability – Falling Head Method". The results can be found in Table V in Section 13.1 of this report.

7.0 SUBSURFACE CONDITIONS

7.1 GENERALIZED SOIL PROFILES

The results of our field exploration and laboratory analysis, together with pertinent information obtained from the SPT borings, such as soil profiles, penetration resistance and groundwater levels, have been presented on the boring logs included in Appendix B. The Key to Boring Logs, Soil Classification Chart has also included in Appendix B. The soil profiles were prepared from field logs after the recovered soil samples were examined by a geotechnical engineer. The stratification lines shown on the boring logs represent the approximate boundaries between soil types, and may not depict exact subsurface soil conditions. The actual soil boundaries may be more transitional than depicted. Generalized profiles of the soils encountered at our boring locations have been presented in Table II. For detailed soil profiles, please refer to the attached boring logs.

TABLE II
GENERALIZED SOIL PROFILE

Typical Depth (feet, bls)		Soil Description	Range of SPT "N" Values (blows/ft)
From	To		
Surface	2	Very loose to medium dense SAND with silt, SAND with clay, and clayey SAND [SP-SM, SP-SC, SC]	3 to 19
2	12	Loose to medium dense SAND, SAND with clay, and clayey SAND [SP, SP-SC, SC]	4 to 27
12	30*	Very loose to medium dense SAND with clay, and clayey SAND [SP-SC, SC]	2 to 24

* denotes maximum termination depth of the borings

7.2 NOTABLE FINDINGS – VERY LOOSE SOIL CONDITIONS

A notable finding during the exploration program was the presence of very loose soil conditions within the upper 2 feet of the soil horizon below the existing ground surface. The very loose soils found at the boring location had a SPT "N" blow count value of 3 blows per foot. Very loose soil conditions encountered at the depth noted above will need to be improved through normal, good practice site preparation procedures (explained in further detail in Section 12.0 of this report), **prior to adding any fill soil**.

If it is determined that the structural loads or site grades will exceed our assumptions contained within this report, then the zone of soil that is significantly influenced by the applied foundation and soil surcharge loads should be determined. This analysis will determine whether the structure may be supported by conventional shallow foundations without experiencing excessive total or differential settlements.

8.0 GROUNDWATER CONDITIONS

8.1 EXISTING GROUNDWATER LEVEL

We measured the water levels in the boreholes on March 16, 2020 following our exploration. The encountered groundwater levels were found to range from 1.6 feet to 4 feet below existing grades in the test borings. The encountered groundwater level at each boring location has been shown on the attached boring logs. Fluctuations in groundwater levels should be anticipated throughout the year, primarily due to seasonal variations in rainfall, surface runoff, and other factors that may vary from the time the borings were conducted.

8.2 SEASONAL HIGH GROUNDWATER LEVEL

Based on historical data, the rainy season in Northwest Florida occurs between June and September of the year. In order to estimate the seasonal high water level at the boring locations, many factors are examined, including the following:

- Measured groundwater level
- Drainage characteristics of existing soil types
- Current and historical rainfall data
- Natural relief points (such as lakes, rivers, wetlands, etc.)
- Man-made drainage systems (ditches, canals, retention basins, etc.)
- On-site types of vegetation
- Review of available data (soil surveys, USGS maps, etc.)
- Redoximorphic features (mottling, striping, etc.)

Based on the results of our field exploration and the factors listed above, we estimate that the normal, stabilized seasonal high groundwater level will form at depths ranging from 1 foot to 3 feet below existing site grades at the specific test boring locations. Please refer to the boring logs attached in Appendix B for more information at the specific test boring locations.

It should be noted that the estimated seasonal high water levels do not provide any assurance that groundwater levels will not exceed these estimated levels during any given year in the future. Should the impediments to surface water drainage be present, or should rainfall intensity and duration, or total rainfall quantities, exceed the normally anticipated rainfall quantities, groundwater levels may exceed our seasonal high estimates. Furthermore, it should be understood that changes in the surface hydrology and subsurface drainage from on-site and/or off-site improvements could have significant effects on the normal and seasonal high groundwater levels.

9.0 FOUNDATION DESIGN RECOMMENDATIONS

The following recommendations have been based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. The applicability of geotechnical recommendations is very dependent upon project characteristics such as improvement locations and grade alterations. UES must review the final site and grading plans to validate all recommendations rendered herein.

Very loose soil conditions were encountered within the upper 2 feet of the soil horizon below the existing ground surface. These soil conditions noted above will require improvement through normal, good practice site preparation procedures (explained in further detail in Section 12.0 of this report), prior to adding fill soils.

Additionally, if subsurface conditions are encountered during construction which were not encountered in the borings, those conditions should be immediately reported to us for observation and recommendations.

9.1 STRUCTURAL AND GRADING INFORMATION

Structural loading and site grading information was not provided at the time of this report. Based on prior experience with similar structures, we have assumed that structural loads for the proposed building will be carried by load bearing walls (assumed maximum load of 5 kips per linear foot) and isolated columns (assumed maximum load of 50 kips per column). We have also assumed that less than 2 feet of structural fill will be necessary to achieve finished grades in the proposed building and pavement areas of the site.

Prior to finalizing any design, the structural/grading information outlined above should be confirmed by the Structural/Civil Engineer for the project. This is crucial to our evaluation and estimates of settlements. If any of this information is incorrect or if you anticipate any changes, please inform Universal Engineering Sciences, Inc. <u>immediately</u> so that we may review and modify our recommendations as appropriate.

If it is determined that the structural loads or site grades will exceed our assumptions contained within this report, then the zone of soil that is significantly influenced by the applied foundation and soil surcharge loads should be determined. This analysis will determine whether the structure may be supported by conventional shallow foundations without experiencing excessive total or differential settlements.

9.2 ANALYSIS

Based on the results of the soil borings, the near surface soils within the proposed building areas appear to be mostly very loose to medium dense sands and are considered suitable to support the proposed structure with normal, good practice site preparation procedures outlined within Section 12 below.

9.3 BEARING PRESSURE

Provided our suggested site preparation procedures are followed, we recommend designing shallow foundations for a **maximum allowable net soil bearing pressure of 2,000 pounds per square foot (psf)**. The allowable net bearing pressure is the pressure that may be transmitted to the soil in excess of the minimum surrounding overburden pressure. The allowable bearing pressure should include dead load plus sustained live load. Per Section 1805.4.1 of the Florida Building Code (FLBC), the foundations should be designed for the most unfavorable effects due to the combinations of loads specified in Section 1605.3 of the FLBC.

9.4 FOUNDATION SIZE

The minimum width recommended for an isolated column footing is 24 inches. For continuous wall or slab on grade foundations, the minimum footing width should comply with the current FLBC, but under no circumstances should be less than 18 inches. Even though the maximum allowable soil bearing pressure may not be achieved, these minimum width recommendations should control the size of the foundations.

9.5 BEARING DEPTH

The exterior foundations should bear at a depth of at least 18 inches below the finished exterior grade and the interior foundations should bear at a depth of at least 12 inches below finished floor elevation to provide confinement to the bearing level soils in accordance with the FLBC. We recommend stormwater and surface water be diverted away from the building exterior, both during and after construction, to reduce the possibility of erosion beneath the exterior footings.

9.6 BEARING MATERIAL

The foundations may bear on either the compacted suitable native soils or compacted structural fill. The bearing level soils should exhibit an equivalent density of at least 95 percent of the maximum dry density as determined by ASTM D 1557 (modified Proctor) **to a depth of at least 2 feet below foundation level** as described in Section 12.0 of this report. In addition to compaction, the bearing soils must exhibit stability and be free of "pumping" conditions.

Compaction verification of the soils below the upper foot could be verified with either static cone pentrometer (SCP) or dynamic cone penetrometer (DCP) testing **to a depth of 2 feet below foundation level** to evaluate the suitability of the bearing level soils as described in Section 12.0 of this report.

9.7 SETTLEMENT ESTIMATES

Post-construction settlement of the structures will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics of the bearing soils to a depth of approximately twice the width of the footing; (2) footing size, bearing level, applied loads, and resulting bearing pressures beneath the foundation; (3) site preparation and earthwork construction techniques used by the Contractor, and (4) external factors, including but not limited to vibration from off site sources and groundwater fluctuations beyond those normally anticipated for the naturally-occurring site and soil conditions which are present. **We estimate the total post-construction vertical settlement of the proposed structures will be on the order of 1 inch or less.**

Differential settlement results from differences in applied bearing pressures and the variations in the compressibility characteristics of the subsurface soils. Assuming our site preparation procedures outlined in this report are followed, **we anticipate post-construction differential settlement of less than ½ inch over 40 feet.**

9.8 FLOOR SLABS

Conventional floor slabs may be supported upon the suitable native soil or compacted fill and should be structurally isolated from other foundation elements or adequately reinforced to prevent distress due to differential movements. For the slab design, we recommend using a subgrade modulus (k) of 125 pounds per cubic inch (pci), which can be achieved by preparing the subgrade soils as recommended in this report. We recommend using a sheet vapor barrier (in accordance with Florida Building Code requirements) beneath the building slab-on-grades to help control moisture migration through the slab.

10.0 PAVEMENT RECOMMENDATIONS

10.1 GENERAL ASSUMPTIONS

We have assumed that a flexible asphaltic pavement section will be used for the new parking areas at this project.

At the time of this exploration, specific traffic loading information and design parameters were not provided to us. Therefore, we have assumed the following conditions for our recommended minimum pavement design.

- the subgrade soils are prepared as described in Section 12.0 of this report
- a twenty (20) year design life
- total equivalent 18 kip single axle loads ($E_{18}SAL$) up to 40,000 for light duty pavements – primarily car and pickup truck traffic
- total equivalent 18 kip single axle loads ($E_{18}SAL$) up to 500,000 for heavy duty pavements – occasional heavy truck traffic

It should be noted that a specific pavement analysis can be performed once traffic loading information is available.

10.2 ASPHALTIC PAVEMENTS

10.2.1 Layer Components

Based on the results of our soil borings, the assumed traffic loading information and review of the current edition of the Florida Department of Transportation (FDOT) *Flexible Pavement Design Manual*, our minimum recommended pavement component thicknesses have been presented in Table III.

TABLE III
MINIMUM ASPHALTIC PAVEMENT COMPONENT THICKNESSES

Service Level	Maximum Traffic Loading	Layer Component		
		Surface Course (inches)	Base Course (inches)	Stabilized Subgrade (inches)
Light Duty	up to 40,000 $E_{18}SAL$	1.5	6	12
Heavy Duty	up to 500,000 $E_{18}SAL$	2	8	12

10.2.2 Stabilized Subgrade

We recommend that the stabilized subgrade materials immediately beneath the base course exhibit a minimum Limerock Bearing Ratio (LBR) of 40 as specified by FDOT. The stabilized subgrade should be compacted to at least 98 percent of the modified Proctor (AASHTO T-180) maximum dry density value.

Stabilized subgrade can be imported materials or a blend of on-site and imported materials. If a blend is proposed, we recommend that the Contractor perform a mix design to find the optimum mix proportions. ***Limerock or crushed concrete base material could be used to stabilize the subgrade soils to meet the recommended LBR values stated previously.***

Compaction testing of the stabilized subgrade should be performed to full depth at a frequency of at least one (1) test per 10,000 square feet, or a minimum of 3 tests, whichever is greater.

10.2.3 Base Course

Limerock or recycled crushed concrete are both considered suitable materials for the pavement base course for this project. However, local municipalities often limit the use of certain base course materials. We recommend the Civil Engineer consult with the local municipality prior to selecting the base course material for this project.

For a limerock base, the base course should be compacted to a minimum density of 98 percent of the modified Proctor maximum dry density and exhibit a minimum LBR of 100. The limerock material should comply with the latest edition of the FDOT *Standard Specifications for Road and Bridge Construction*.

Recycled crushed concrete may provide a cost-effective alternative material in lieu of a limerock base. Local availability, along with municipality standards, typically governs the use of crushed concrete use as an alternative base course material. The advantages of using crushed concrete as a pavement base course include its high strength and resistance to groundwater related distress, and lack of reflective cracking caused by thermal expansion and contraction.

If a crushed concrete base is used, the base course material should be sourced from an FDOT approved supplier. The base should be compacted to a minimum density of 98 percent of the modified Proctor maximum dry density and exhibit a minimum LBR of 100. The base material should comply and be placed in accordance with the latest edition of the FDOT *Standard Specifications for Road and Bridge Construction* Supplemental Section 204-2.2 – “Reclaimed Concrete Aggregate Base Materials.” In order to ensure consistency of the crushed concrete material, additional LBR and sieve gradation tests should be performed at a minimum frequency of one test per 15,000 square feet, and for each visual change in material.

10.2.4 Surface Course

For the new pavement areas, 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 light-duty areas and FDOT SP-12.5 and/or SP-9.5 fine mix for heavy duty areas. The asphaltic 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 percent 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 that 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 percent of the design G_{mm}.

After placement and field compaction, the surfacing should be cored to evaluate material thickness and density. Cores should be obtained at frequencies of at least one (1) core per 10,000 square feet of placed pavement or a minimum of two (2) cores per day's production.

10.2.5 Effects of Groundwater

One of the most critical influences on the pavement performance in Northwestern Florida is the relationship between the pavement base course and the seasonal high groundwater level. Sufficient separation should be maintained between the bottom of the base course layer and the anticipated seasonal high groundwater level. We recommend that the seasonal high groundwater and the bottom of the base course be separated by at least 18 inches. If the required separation is not provided by grading, the installation of underdrains will be required.

10.2.6 Landscape Areas

In the event that landscape areas adjacent to the pavements include large mounds (>1 foot) of poorly draining organic topsoils or silty/clayey sands, we recommend that landscape drains be provided to protect the roadway against adverse effects from over-irrigation or excess rainfall. Poorly draining silty and clayey material cause the irrigation and rainwater to perch and migrate laterally into the pavement components, which eventually compromises the integrity of the pavement section.

10.3 CONCRETE "RIGID" PAVEMENTS

Concrete pavement is a rigid pavement that transfers much lighter wheel loads to the subgrade soils than a flexible asphalt pavement, thus requiring less subgrade preparation. At a minimum, concrete pavement is recommended under the dumpster area, and 10 feet in front of the trash enclosures.

We recommend using the existing surficial sands or approved structural fill densified to at least 98 percent of modified Proctor maximum dry density (ASTM D 1557) without additional stabilization under concrete pavement, with the following stipulations:

1. Prior to placement of concrete, the subgrade soils should be prepared as recommended in Section 12.0 of this report.

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 the thickened edges (curb or footing).

5. The bottom of the pavement should be separated from the seasonal high groundwater level by at least 12 inches.

Based on review of the FDOT *Rigid Pavement Design Manual*, our recommended minimum concrete pavement design has been shown in Table IV.

TABLE IV
MINIMUM CONCRETE PAVEMENT THICKNESSES

Service Level	Minimum Pavement Thickness	Maximum Control Joint Spacing	Recommended Saw Cut Depth
Light Duty	5 inches	12 feet x 12 feet	1.5 inches
Heavy Duty	6 inches	14 feet x 14 feet	2 inches

We recommend using concrete having a minimum 28-day design compressive strength of 4,000 pounds per square inch and a modulus of rupture value of 650 psi. Layout of the saw cut control joints should form square panels, and the depth of saw cut joints should be ⅓ of the total concrete slab thickness.

We recommend UES 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. In addition, specimens to verify the compressive strength of the pavement concrete should be obtained for at least every 50 cubic yards, or at least once for each day's placement, whichever is greater.

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

11.0 UTILITY LINE BACKFILL

11.1 GENERAL

We assume that proposed sewer and other deep utility lines at the site may have invert elevations several feet below existing grades. In general, the soils at this approximate level are sand [SP], sand with clay [SP-SC], and clayey SAND [SC].

11.2 TRENCH EXCAVATION AND BACKFILL

The following are our recommendations for construction of proposed underground utility lines.

1. If considered necessary by the Contractor, install a dewatering system capable of maintaining a groundwater level at least 2 feet below bottom of pipe level.

2. After excavating to design invert elevations, the in-situ bedding soils should be compacted to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) to a depth of 12 inches below the bedding level. Compaction in confined areas can probably be achieved using jumping jacks or light weight walk-behind vibratory sleds and/or rollers.

3. After constructing the utility lines, backfill with suitable sandy fill (SP-SM, SP-SC) placed in 4 to 6 inch thick loose lifts. Each lift of backfill should be compacted to at least 95 percent of the modified Proctor maximum dry density. Beneath pavement areas, the top 12 inches of backfill should be compacted to at least 98 percent. Additionally, local jurisdictional compaction requirements should be followed when stricter than the recommendations herein.

4. If difficult compaction operations are encountered beneath the utilities due to excessive fines and/or wet conditions, the Geotechnical Engineer should be contacted.

All excavation work must meet OSHA Excavation Standard Subpart P regulations, Type C Soils. Either a trench box, braced sheet pile structure or an excavation with temporary side slopes cut back at 1.5 horizontal to 1.0 vertical can be implemented. The side slope of 1.5 horizontal to 1.0 vertical is contingent upon the dewatering system adequately controlling slope seepage. Sheet piling should be designed according to OSHA sheeting and bracing requirements. We recommend a Florida licensed Professional Engineer design any required sheeting/bracing system. Provisions for maintaining worker safety within excavations is the sole responsibility of the Contractor.

12.0 SITE PREPARATION

We recommend normal, good practice site preparation procedures for the new construction areas. ***These procedures include: stripping the site of trees, stumps, as well as root systems greater than 0.5 inch in diameter, previous development, surficial vegetation, topsoil, and any other deleterious materials present in the proposed building and pavement areas of the site.*** Following stripping, the exposed subgrade soils should be proof-rolled, and all subgrade and subsequent fill/backfill soils should be properly densified. A more detailed description of this work has been presented in this section.

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 overlying structure.

2. Strip the proposed construction limits of all deleterious materials noted above present within and 5 feet beyond the perimeter of the proposed building footprint areas and present within and 3 feet beyond the perimeter of the proposed pavement areas. Expect typical stripping at this site to be a minimum of 6 to 12 inches, with greater depths being necessary to remove large root systems/tree stumps left from the previous forestry use of the site.

3. Perform any necessary remedial dewatering prior to any earthwork operations. Dewatering should be performed to a depth of at least 2 feet below the bottom of any excavations or compacted surface. Dewatering means and methods are the sole responsibility of the Contractor.

4. Proof-roll the exposed subgrade soils under the observation of UES to locate any areas of unsuitable soils and to increase the density of the shallow loose soils. The proof-roll should be performed using a loaded tandem axle dump truck, or similar rubber-tired

equipment, weighing between 15 and 20 tons. The vehicle should make passes in perpendicular directions in the construction areas. The actual number of passes should be determined in the field, but should be no less than two passes in each direction. Areas that wave, rut, or deflect significantly and continue to do so after several passes of the proof-roller should be undercut to firmer soils or the compaction operations should be immediately halted to allow time for the excess pore water pressures built up within the disturbed soils to dissipate before re-compacting. Undercut areas should be backfilled in thin lifts with approved, compacted fill materials. Proof-roll and any undercutting operations should be monitored carefully by the Geotechnical Engineer of Record or his designated representative.

5. Compact the native subgrade in building and pavement areas from the surface until you obtain a minimum equivalent density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557), to a depth of **1 foot** below the compacted surface. A minimum of two (2) complete coverages (in perpendicular directions) should be made in the building construction areas with the compaction equipment to improve the uniformity and increase the density of the underlying soils. The actual number of passes required to achieve the minimum compaction should be determined in the field, but should be no less than two passes in each direction. It should be noted that vibratory compaction equipment operated within 2 feet of the groundwater level can induce unstable/pumping conditions. Within this zone we recommend that vibratory compaction equipment be operated in “static mode”.

   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 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 re-compacting.

6. Test the subgrade for compaction at a frequency of not less than one test per 2,500 square feet in the building areas, or a minimum of three test locations, whichever is greater. Additionally, test the subgrade for compaction at a frequency of not less than one test per 10,000 square feet in the pavement areas, or a minimum of three test locations, whichever is greater.

7. Place fill/backfill material, as required. The fill should consist of clean sand with less than 12 percent soil fines and be free of organics, debris and other deleterious materials. Place fill in uniform 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.

8. Perform compliance tests within the fill/backfill at a frequency of not less than one test per 2,500 square feet per lift in the building areas, or a minimum of three test locations, whichever is greater. In pavement areas, perform compliance tests at a frequency of not less than one test per 10,000 square feet per lift, or a minimum of three test locations, whichever is greater.

9. The footing excavations should be compacted to a minimum equivalent density of at least 95 percent of the modified Proctor maximum dry density to a **depth of 2 feet**

below foundation bearing elevation. Soils below the upper foot could be verified for compaction by means of static cone pentrometer (SCP) or dynamic cone penetrometer (DCP) tests. We recommend performing compliance tests at a frequency of one test per 50 lineal feet of wall footing and/or every column footing. Re-compaction of the foundation excavation bearing level soils, if loosened by the excavation process, can probably be achieved by making several passes with a light weight walk-behind vibratory sled or jumping jack compactor.

Stability of the compacted soils is essential and independent of compaction and density control. If the near surface soils or the structural fill experience "pumping" conditions, terminate all earthwork activities in that area. Pumping conditions occur when there is too much water present in the soil-water matrix. The disturbed soils should be dried in place by scarification and aeration prior to any additional earthwork activities.

As noted above, vibratory equipment operated within 2 feet of the groundwater level can cause soil degradation/unstable conditions and should be performed with care. Within this zone we recommend that the compaction equipment be operated in static mode. **Vibrations produced during vibratory compaction operations at the site may be significantly noticeable within 100 feet and may cause distress to adjacent structures if not properly regulated.** Provisions should be made to monitor these vibrations so that any necessary modifications in the compaction operations can be made in the field before potential damages occur. UES can provide vibration monitoring services to help document and evaluate the effects of the surface compaction operation on existing structures. It is recommended that large vibratory rollers remain a minimum of 50 feet from existing structures. Within this zone, the use of a static roller or small hand guided compactors is recommended.

13.0 STORMWATER MANAGEMENT FACILTIES

13.1 SUBSURFACE SOIL DESIGN PARAMETERS

UES performs hydraulic conductivity tests, including the two most common, i.e., DRI and remolded laboratory permeability testing, using generally accepted practices of the local engineering community. These common tests are the quickest and most economical for stormwater management system design. However, the User of this information is cautioned that the potential variability of results and reproducibility associated with these types of tests can be significant. It is important to note that there are many factors influencing the permeability of a soil. These factors include, but are not limited to, soil grain size, soil particle arrangement and structure, dispersion of soil fines, density, and degree of saturation, soil heterogeneity, and soil anisotropy. Also, the permeability measured by such tests may not be representative of that of the total effective aquifer thickness. Factors of safety can compensate for part of the inherent test limitations but the Designer must exercise judgment regarding final selection and applicability of provided soil design input parameters.

Should the modeling analysis indicate marginally acceptable compliance with Water Management District design criteria, it may be advisable to perform more extensive and representative in-situ permeability testing by collecting "undisturbed" horizontal and vertical soil samples and/or installing grouted piezometers or wells for slug testing. UES can perform these field tests, if desired.

Additionally, the actual exfiltration rates from the pond may be influenced by pond geometry, natural soil variability, in-situ depositional characteristics and soil density, retention volume, and groundwater mounding effects. Also, it is important to note that the upper in-situ soil zone is usually altered during the excavation and grading operations by heavy, vibrating earthwork equipment. Due to these numerous factors cited above, published literature suggests that the permeability of a soil can only be estimated to within an order of magnitude. **Therefore, appropriate factors of safety should be incorporated into the design process.**

The parameters associated with the field and laboratory tests for the boring locations within the pond area have been presented below in Table V: Stormwater Management Soil Design Parameters.

TABLE V
STORMWATER MANAGEMENT SOIL DESIGN PARAMETERS

Corresponding Soil Boring Test Locations	SW-1	SW-2
Average Depth to Confining Layer, feet	15*	15*
Approximate Test Depth, feet below existing grade	3	1
Measured Field Vertical Unsaturated Infiltration Rate (DRI), in/hr	---	6
Estimated Saturated Horizontal Hydraulic Conductivity, ft/day	1.5	2.5
Estimated Saturated Vertical Hydraulic Conductivity, ft/day	1	2
Remolded Dry Density, lb/ft^3	101.9	97.2
Remolded Moisture Content, percentage	12	11
Percent Passing No. 200 Sieve, percentage	13	13
Estimated Fillable Porosity, percentage	20	20
Measured Depth of Groundwater, feet below existing grade	2	2
Estimated Depth of Normal Seasonal High Water Level, feet below existing grade	1	1
* - Termination depth of test boring		

14.0 DEWATERING AND EXCAVATION CONSIDERATIONS

Where excavations will extend only a few feet below the groundwater level, a sump pump may be sufficient to control the groundwater level. Deeper excavations may require ditching, well points, and/or sock drains to control the groundwater level. Regardless of the method(s) used, we recommend drawing down the water level at least 2 feet below the bottom of the excavation or compacted surface. The actual method(s) of dewatering should be determined by the Contractor. The design and discharge of the dewatering system must be performed in accordance with applicable regulatory criteria (i.e., water management district, etc.) and compliance with such criteria is the sole responsibility of the Contractor.

Excavations should be sloped as necessary to prevent slope failure and to allow backfilling. As a minimum, temporary excavations below 4-foot depth should be sloped in accordance with OSHA regulations. Where lateral confinement will not permit slopes to be laid back, the excavation should be shored in accordance with OSHA requirements. During excavation, excavated material should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth. Provisions for maintaining worker safety within excavations is the sole responsibility of the Contractor.

15.0 CONSTRUCTION RELATED SERVICES

We recommend the Owner retain UES to provide construction monitoring and testing services during the site preparation procedures for confirmation of the adequacy of the earthwork operations. Field tests and observations include verification of foundation subgrades by monitoring earthwork operations and performing quality assurance tests of the placement of compacted structural fill courses. We can also provide concrete testing, structural steel inspections, 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 site problems or construction changes, which may arise during construction, in a timely and cost-effective manner.

16.0 LIMITATIONS

This report has been prepared for the exclusive use of ***JP Engineering, LLC*** and other designated members of their Design/Construction Team associated with the proposed construction for the specific project discussed in this report. No other site or project facilities should be designed using the soil information contained in this report. As such, UES will not be responsible for the performance of any other site improvement designed using the data in this report.

This report should not be relied upon for final design recommendations or professional opinions by unauthorized third parties without the expressed written consent of UES. Unauthorized third parties that rely upon the information contained herein without the expressed written consent of UES assume all risk and liability for such reliance.

The recommendations submitted in this report have been based upon the data obtained from the soil borings performed at the locations indicated on the Boring Location Plan and from other information as referenced. This report does not reflect any variations which may occur between the boring locations. The nature and extent of such variations may not become evident until construction. If variations become evident, it will then be necessary for a re-evaluation of the recommendations of this report after performing on-site observations during the construction period and noting the characteristics of the variations.

Borings for a typical geotechnical report are widely spaced and generally not sufficient for reliably detecting the presence of isolated, anomalous surface or subsurface conditions, or reliably estimating unsuitable or suitable material quantities. Accordingly, UES does not recommend relying on our boring information for estimation of material quantities unless our contracted services ***specifically*** include sufficient exploration for such purpose(s) and within the report we so state that the level of exploration provided should be sufficient to detect anomalous conditions or estimate such quantities. Therefore, UES will not be responsible for any extrapolation or use of our data by others beyond the purpose(s) for which it is applicable or intended.

All users of this report are cautioned that there was no requirement for UES to attempt to locate any man-made buried objects or identify any other potentially hazardous conditions that may exist at the site during the course of this exploration. Therefore no attempt was made by UES to locate or identify such concerns. UES cannot be responsible for any buried man-made objects or environmental hazards which may be subsequently encountered during construction that are not discussed within the text of this report. We can provide this service, if requested.

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 GBC/The Geotechnical Business Council publication, "Important Information About This Geotechnical Engineering Report," appears in Appendix C, and will help explain the nature of geotechnical issues.

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

*** * * * * * * * ***

APPENDIX A

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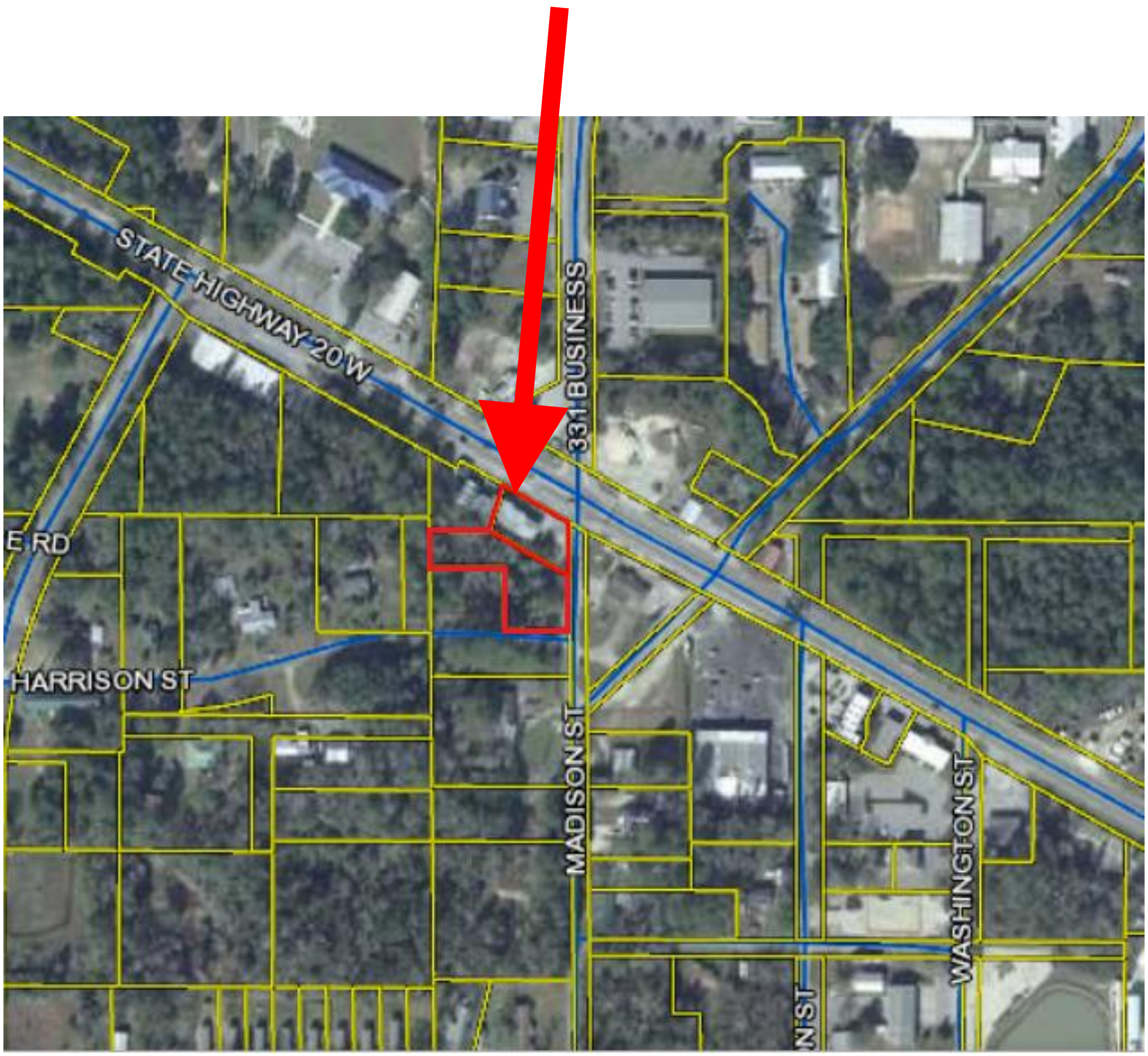
SITE LOCATION

N

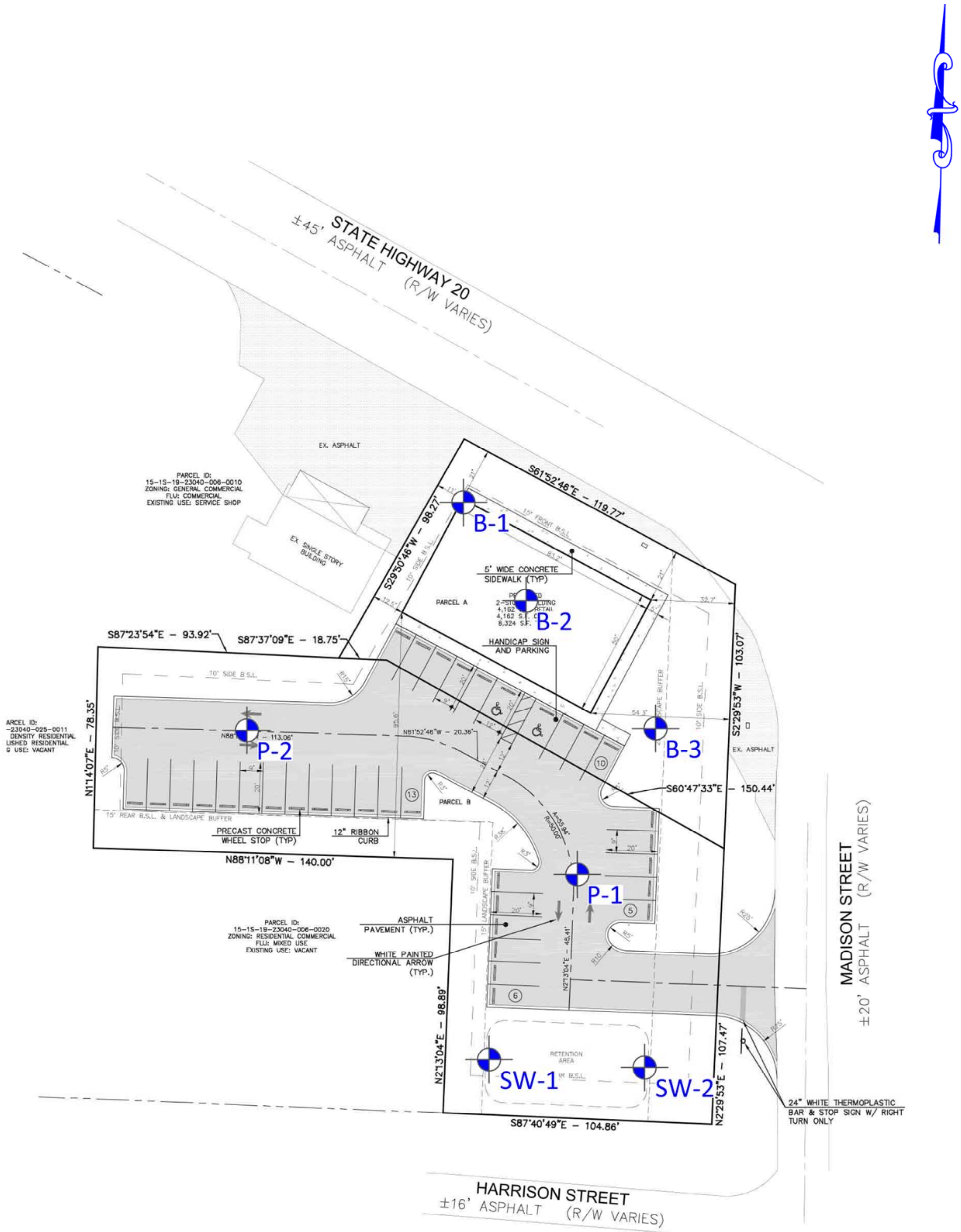


UNIVERSAL
ENGINEERING SCIENCES

THE CROSSROADS – COMMERCIAL DEVELOPMENT
FREEPORT, WALTON COUNTY, FLORIDA

SITE LOCATION MAP

DRAWN BY: BT	CHECKED BY: GR	PROJECT NO: 2030.2000012.0000	SCALE: NTS
DATE: 3/24/2020	DATE: 3/24/2020	REPORT NO: 1757786	PAGE NO: A-1



LEGEND

BORING LOCATION

BORING LOCATION PLAN

SCALE: NTS

NOTE: BASE MAP PROVIDED BY OTHERS

UNIVERSAL ENGINEERING SCIENCES, LLC
1712 AIRPORT ROAD
PANAMA CITY, FL 32405

PROJECT NAME	THE CROSSROADS - COMMERCIAL DEVELOPMENT		
PROJECT NUMBER	2030.2000012.0000	U.E.S. DOCS #	1757786
PROJECT LOCATION	FREEPORT, WALTON COUNTY, FLORIDA		
PROJECT ENGINEER	BRANDON TARR, P.E.		
DATE OF SUB-SURFACE EXPLORATION	MARCH 13 AND MARCH 16, 2020	SHEET NUMBER	A-2

Soil Map—Walton County, Florida

Map Scale: 1:712 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 10, 20, 40, 60

Feet: 0, 30, 60, 120, 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Walton County, Florida
Survey Area Data: Version 19, Sep 17, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Dec 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4	Chipley sand, 0 to 5 percent slopes	1.0	100.0%
Totals for Area of Interest		**1.0**	**100.0%**

APPENDIX B

UNIVERSAL
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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	2030.2000012.0000
REPORT NO.:	1757786
PAGE:	1

PROJECT: The Crossroads - Commercial Development
Freeport, Walton County, Florida

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

CLIENT: JP Engineering, LLC
LOCATION: Per Boring Location Plan
REMARKS:

G.S. ELEVATION (ft): NG
WATER TABLE (ft): 3.2
DATE OF READING: 3/16/2020
EST. W.S.W.T. (ft): 2

DATE STARTED: 3/13/20
DATE FINISHED: 3/13/20
DRILLED BY: M.Strampe
TYPE OF SAMPLING: SPT

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						2.75" Asphalt						
						Dark gray/brown medium dense slightly clayey SAND (SP-SC)						
2		8-9-10-12	19	▽		Gray/brown medium dense slightly clayey SAND (SP-SC)						
3				▼								
4		8-13-14-15	27				11	16				
6		8-8-10-10	18			Gray/brown medium dense clayey SAND (SC)						
8		8-8-7-8	15				13	19				
10		5-7-6-6	13									
12						Light gray loose slightly clayey SAND (SP-SC)						
15		5-4-5	9				8.8	34				
17						Gray/tan very loose slightly clayey SAND (SP-SC)						
20		1-1-1	2			Boring terminated at 20 feet						
21												
22												

BORING_LOG START.GPJ UNIENGSC.GDT 3/24/20

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	2030.2000012.0000
REPORT NO.:	1757786
PAGE:	2

PROJECT: The Crossroads - Commercial Development
Freeport, Walton County, Florida

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

CLIENT: JP Engineering, LLC
LOCATION: Per Boring Location Plan
REMARKS:

G.S. ELEVATION (ft): NG
WATER TABLE (ft): 4
DATE OF READING: 3/16/2020
EST. W.S.W.T. (ft): 3

DATE STARTED: 3/13/20
DATE FINISHED: 3/13/20
DRILLED BY: M.Strampe
TYPE OF SAMPLING: SPT

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						2.75" Asphalt						
0–2		6-6-9-9	15			Gray/brown medium dense slightly silty SAND (SP-SM)						
2–4		8-9-9-9	18	3 (▽), 4 (▼)		Gray/tan medium dense SAND (SP)						
4–6		9-9-9-9	18			Gray/tan medium dense slightly clayey SAND (SP-SC)						
6–8		11-9-10-10	19									
8–10		7-6-8-8	14									
13.5–15		8-9-9	18									
18.5–20		6-12-12	24									
20						Boring terminated at 20 feet						

BORING_LOG START.GPJ UNIENGSC.GDT 3/24/20

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	2030.2000012.0000
REPORT NO.:	1757786
PAGE:	3

PROJECT: The Crossroads - Commercial Development
Freeport, Walton County, Florida

BORING DESIGNATION **B-3** SHEET: **1 of 1**

SECTION: TOWNSHIP: RANGE:

CLIENT: JP Engineering, LLC
LOCATION: Per Boring Location Plan
REMARKS:

G.S. ELEVATION (ft): NG
WATER TABLE (ft): 2.5
DATE OF READING: 3/16/2020
EST. W.S.W.T. (ft): 1.5

DATE STARTED: 3/13/20
DATE FINISHED: 3/13/20
DRILLED BY: M.Strampe
TYPE OF SAMPLING: SPT

DEPTH (FT.)	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0				3" Asphalt						
1			▽	Dark gray/tan very loose slightly clayey SAND (SP-SC)						
2	5-2-1-1	3	▼	Gray/tan loose slightly clayey SAND (SP-SC)						
4	1-2-3-5	5		Gray medium dense slightly clayey SAND (SP-SC)						
6	7-7-9-12	16		Light gray loose to medium dense slightly clayey SAND (SP-SC)	9.5	16				
8	6-8-8-8	16								
10	12-2-4-4	6			6.7	20				
12				Light gray very loose clayey SAND (SC)						
15	2-1-1	2			13	30				
17				Tan very loose slightly clayey SAND (SP-SC)						
20	1-1-1	2								
22				Brown/orange loose slightly clayey SAND (SP-SC)						
25	3-4-4	8								
27				Dark gray very loose slightly clayey SAND (SP-SC)						
30	2-1-1	2		Boring terminated at 30 feet						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	2030.2000012.0000
REPORT NO.:	1757786
PAGE:	4

PROJECT: The Crossroads - Commercial Development
Freeport, Walton County, Florida

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

CLIENT: JP Engineering, LLC
LOCATION: Per Boring Location Plan
REMARKS:

G.S. ELEVATION (ft): NG
WATER TABLE (ft): 4
DATE OF READING: 3/16/2020
EST. W.S.W.T. (ft): 3

DATE STARTED: 3/16/20
DATE FINISHED: 3/16/20
DRILLED BY: M.Strampe
TYPE OF SAMPLING: SPT

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						Gray/tan/orange slightly clayey SAND (SP-SC)						
1						Gray/brown slightly clayey SAND (SP-SC)						
2												
3				▽		Tan/orange slightly clayey SAND (SP-SC)						
4				▼		Tan slightly clayey SAND (SP-SC)						
5						Boring terminated at 5 feet						
6												

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.: 2030.2000012.0000
REPORT NO.: 1757786
PAGE: 5

PROJECT: The Crossroads - Commercial Development
Freeport, Walton County, Florida

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

CLIENT: JP Engineering, LLC
LOCATION: Per Boring Location Plan
REMARKS:

G.S. ELEVATION (ft): NG
WATER TABLE (ft): 1.6
DATE OF READING: 3/16/2020
EST. W.S.W.T. (ft): 1

DATE STARTED: 3/16/20
DATE FINISHED: 3/16/20
DRILLED BY: M.Strampe
TYPE OF SAMPLING: SPT

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						Dark gray slightly clayey SAND (SP-SC)						
1						Dark gray/tan slightly clayey SAND (SP-SC)						
2						Gray clayey SAND (SC)						
3												
4												
5						Boring terminated at 5 feet						
6												

BORING_LOG START.GPJ UNIENGSC.GDT 3/24/20

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	2030.2000012.0000
REPORT NO.:	1757786
PAGE:	6

PROJECT: The Crossroads - Commercial Development
Freeport, Walton County, Florida

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

CLIENT: JP Engineering, LLC
LOCATION: Per Boring Location Plan
REMARKS:

G.S. ELEVATION (ft): NG
WATER TABLE (ft): 2
DATE OF READING: 3/16/2020
EST. W.S.W.T. (ft): 1

DATE STARTED: 3/13/20
DATE FINISHED: 3/13/20
DRILLED BY: M.Strampe
TYPE OF SAMPLING: SPT

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS		K (FT./ DAY)	ORG. CONT. (%)
									LL	PI		
0						Dark gray/brown loose slightly clayey SAND (SP-SC)						
1				▽								
2		2-2-2-3	4	▼		Gray/tan medium dense clayey SAND (SC)						
3							13	19			1.5	
4		6-6-5-5	11			Dark gray loose slightly clayey SAND (SP-SC)						
5												
6		3-3-5-9	8			Gray/brown medium dense slightly clayey SAND (SP-SC)						
7												
8		8-9-13-10	22			Gray loose to medium dense slightly clayey SAND (SP-SC)						
9												
10		8-8-8-5	16				5.8	19				
11												
12												
13												
14												
15		3-3-3	6			Boring terminated at 15 feet						
16												
17												

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	2030.2000012.0000
REPORT NO.:	1757786
PAGE:	7

PROJECT: The Crossroads - Commercial Development
Freeport, Walton County, Florida

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

CLIENT: JP Engineering, LLC
LOCATION: Per Boring Location Plan
REMARKS:

G.S. ELEVATION (ft): NG
WATER TABLE (ft): 2
DATE OF READING: 3/16/2020
EST. W.S.W.T. (ft): 1

DATE STARTED: 3/13/20
DATE FINISHED: 3/13/20
DRILLED BY: M.Strampe
TYPE OF SAMPLING: SPT

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						Dark gray loose clayey SAND (SC)						
1				▽								
2		2-2-2-2	4	▼			13	14			2.5	
4		2-2-2-3	4			Dark gray loose slightly clayey SAND (SP-SC)						
6		2-2-8-11	11			Gray/tan medium dense SAND (SP)						
8		4-10-13-12	23				4.1	16				
10		9-7-9-8	16									
12						Tan/orange very loose slightly clayey SAND (SP-SC)						
15		2-1-2	3			Boring terminated at 15 feet						
16												
17												

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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)
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)
NP	Non-Plastic (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%

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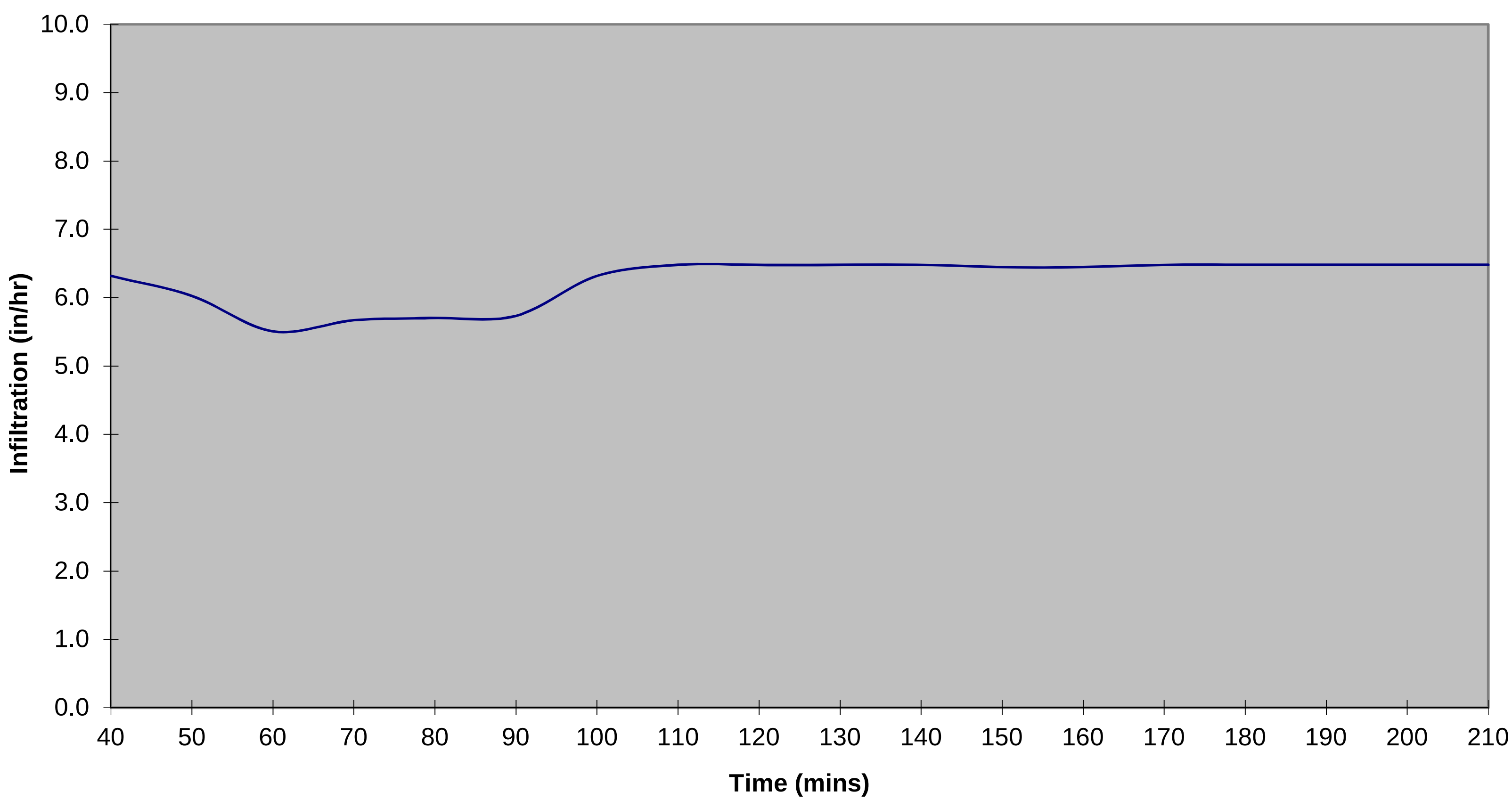
DOUBLE RING INFILTROMETER TEST (ASTM D3385-88)

Project: The Crossroads - Freeport **Project #** 2030.2000012.0000

DRI Location: SW-2 **Test Depth:** 1 foot BEG

Inner Ring Infiltration vs Time



FIELD PROCEDURES

Standard Penetration Test Borings (Mud-Rotary Advanced)

To aid in evaluating the subsurface conditions present on the site, we located and drilled one or more Standard Penetration Test (SPT) borings to the depths indicated on the attached Boring Logs.

In this procedure, the boring was advanced by rotary drilling techniques using a circulating bentonite fluid for borehole flushing and stability. At 1½- to 5-foot intervals, the drilling tools were removed from the borehole and a split-barrel sampler was inserted to the borehole bottom and driven 18 inches into the soil using a 140-pound hammer falling an 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 extremely dense/hard materials), the sampler was retrieved from the borehole and a representative sample of the material within the split-barrel sampler was placed in a labeled plastic container and sealed. After completing the drilling operations, the samples obtained from the boring were transported to our laboratory where they were examined by a member of our geotechnical staff. This procedure was performed in general accordance with the latest revision of ASTM D 1586, Standard Test Method for Standard Penetration Test and Split-Barrel Sampling of Soils.

Auger Borings (Hand-Held Bucket)

To aid in evaluating the subsurface conditions present on the site, we located and drilled one or more hand-held bucket type auger borings to the depths indicated on the attached Boring Logs.

In the hand-held bucket auger procedure, the boring was advanced by rotating a hand-held bucket type auger until the receiving end of the auger filled with soil. Once the bucket was filled, the auger assembly was removed from the borehole and the sample was retrieved from the bucket, placed in a labeled plastic container, and sealed.

After completing the auger boring(s), the samples obtained were transported to our laboratory where they were examined by a member of our geotechnical staff. This procedure was performed in general accordance with the latest revision of ASTM D 1452, Standard Practice for Soil Investigation and Sampling by Auger Borings.

FIELD PROCEDURES

Double Ring Infiltrometer (DRI) Test

Double Ring Infiltrometer (DRI) testing was conducted in the field in the proposed stormwater management system area of the site. The depth and location of each DRI test was determined from the results of the test borings performed in the proposed stormwater management system area.

In this test, the test area is excavated with a flat blade shovel to the indicated test depth (typically 1 to 3 feet below existing grades). The test area was widened and smoothed such that the 24-inch outer ring could be easily placed in the excavated area and tamped 6 inches into the subsurface from a relatively level plane. Once the outer ring was in place and tamped into the subsurface, the inner ring was placed in the approximate center of the outer ring and driven 4 inches into the underlying soils.

Once the inner and outer rings were in place, presaturation of the subsurface soils was initiated. Tap water (in prefilled barrels) was placed in the inner and outer rings to 6 inches above the excavated surface in each ring. The water was placed such that “tunneling” of the soils between the inner and outer rings did not occur (this will cause stabilization of the water levels in the inner and outer rings, making the test useless). The water levels in the rings were kept at a constant 6-inch level by adding water as needed for a period of thirty minutes to an hour. Note that saturation times become longer in low permeability soils.

The DRI test was initiated once the saturation period was complete. The water levels in both rings were kept at the 6-inch level and time readings were started. The appropriate schedule of readings may be determined only through experience. Time reading intervals typically range from 2 to 60 minutes in sandy materials, while for low-permeability materials, the reading interval may be up to 24 hours, or more. During the designated time period, the water was kept at a constant 6-inch level in both rings. The volume of water (in mL) added to the inner ring during this procedure was recorded adjacent to the time period the reading was taken. This process was continued until the volume readings in the inner ring became stabilized. Once the test stabilized and the results were recorded, the DRI equipment was removed from the excavation area and the test area was backfilled with soil cuttings.

The DRI testing was performed in general accordance with ASTM D 3385, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Natural Moisture Content Test

One or more samples of the soils found during our subsurface exploration were chosen for natural moisture content testing. In this test, the soil sample is placed into a metal pan of known weight, weighed, dried for a minimum of 12 hours in a 110 ± 5°C oven, and then weighed again to record the weight of water released during drying. The natural moisture content of the soil is termed the ratio of "pore" or "free" water in a given mass of material to the mass of solid material particles. This test was conducted in general accordance with ASTM D 2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

Percent -200 Soil Fines Content Test

One or more samples of the soils found during our subsurface exploration were chosen to determine the percentage of silt and clay fines present in the individual samples. In this test, the Natural Moisture Content test (ASTM D 2216) was performed and the sample was then washed over a No. 200 mesh sieve. The materials present in the sample that did not pass through the No. 200 sieve was then placed back in its original pan and dried until the water retained from the wet-sieve process was totally evaporated. Once dried, the sample was weighed again to determine the weight of fines removed during the wet-sieve process. The percent of soil by weight passing the No. 200 sieve is termed the percentage of fines or portion of the sample in the silt and clay size range. This test was conducted in general accordance with ASTM D 1140, Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-μm) Sieve.

Falling-Head Permeability Test

One or more samples of the soils found during our subsurface exploration were chosen to determine the permeability rates (a.k.a., hydraulic conductivity values) of the soils. In this test, the sampled material was compacted in two or three lifts in a 4-in permeability mold of known weight and volume. Once the material was compacted into the mold, the mold and material were then weighed. In addition to weighing the mold and soil, the Natural Moisture Content test (ASTM D 2216) was performed on the trimmings left over from the sample compaction. The Dry Density of the material was then calculated using the volume, weight, and moisture content of the compacted sample.

Once the density procedure was performed, the permeability mold with the compacted material was then covered with a porous stone and spring system to control loosening of the materials during the permeability test. A support collar and top plate was then placed atop the permeability mold (the top plate is equipped with a vent port to allow air to escape the mold/sample as well as an influent port to allow water to saturate the compacted sample). Once the apparatus was assembled and properly tightened, a one-half inch diameter vertical tube, marked with one-foot increments, is attached to the influent port. The tubing was then filled with water and permitted to drain into the influent port, thru the sample, and out of the effluent tube at the bottom of the apparatus. Once the sample was saturated and nearly devoid of air, the tubing was filled with water to seven feet above the apparatus and allowed to drain thru the sample while the time (in seconds) it took for the water to drop each one foot increment was recorded. The hydraulic conductivity of the sample was then calculated using data obtained from the procedure. This test was conducted in general accordance with FM 5-513, Florida Method of Test for Coefficient of Permeability – Falling Head Method.

APPENDIX C

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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.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

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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Universal Engineering Sciences, LLC
GENERAL CONDITIONS

SECTION 1: RESPONSIBILITIES

1.1 *Universal Engineering Sciences, Inc*., ("UES"), has the responsibility for providing the services described under the Scope of Services section. The work is to be performed according to accepted standards of care and is to be completed in a timely manner. The term "UES" as used herein includes all of *Universal Engineering Sciences, Inc's* agents, employees, professional staff, and subcontractors.

1.2 The Client or a duly authorized representative is responsible for providing UES with a clear understanding of the project nature and scope. The Client shall supply UES with sufficient and adequate information, including, but not limited to, maps, site plans, reports, surveys and designs, to allow UES to properly complete the specified services. The Client shall also communicate changes in the nature and scope of the project as soon as possible during performance of the work so that the changes can be incorporated into the work product.

1.3 The Client acknowledges that UES's responsibilities in providing the services described under the Scope of Services section is limited to those services described therein, and the Client hereby assumes any collateral or affiliated duties necessitated by or for those services. Such duties may include, but are not limited to, reporting requirements imposed by any third party such as federal, state, or local entities, the provision of any required notices to any third party, or the securing of necessary permits or permissions from any third parties required for UES's provision of the services so described, unless otherwise agreed upon by both parties.

1.4 Universal will not be responsible for scheduling our services and will not be responsible for tests or inspections that are not performed due to a failure to schedule our services on the project or any resulting damages.

1.5 **PURSUANT TO FLORIDA STATUTES §558.0035, ANY INDIVIDUAL EMPLOYEE OR AGENT OF UES MAY NOT BE HELD INDIVIDUALLY LIABLE FOR NEGLIGENCE.**

SECTION 2: STANDARD OF CARE

2.1 Services performed by UES under this Agreement will be conducted in a manner consistent with the level of care and skill ordinarily exercised by members of UES's profession practicing contemporaneously under similar conditions in the locality of the project. No other warranty, express or implied, is made.

2.2 The Client recognizes that subsurface conditions may vary from those observed at locations where borings, surveys, or other explorations are made, and that site conditions may change with time. Data, interpretations, and recommendations by UES will be based solely on information available to UES at the time of service. UES is responsible for those data, interpretations, and recommendations, but will not be responsible for other parties' interpretations or use of the information developed.

2.3 Execution of this document by UES is not a representation that UES has visited the site, become generally familiar with local conditions under which the services are to be performed, or correlated personal observations with the requirements of the Scope of Services. It is the Client's responsibility to provide UES with all information necessary for UES to provide the services described under the Scope of Services, and the Client assumes all liability for information not provided to UES that may affect the quality or sufficiency of the services so described.

2.4 Should UES be retained to provide threshold inspection services under Florida Statutes §553.79, Client acknowledges that UES's services thereunder do not constitute a guarantee that the construction in question has been properly designed or constructed, and UES's services do not replace any of the obligations or liabilities associated with any architect, contractor, or structural engineer. Therefore it is explicitly agreed that the Client will not hold UES responsible for the proper performance of service by any architect, contractor, structural engineer or any other entity associated with the project.

SECTION 3: SITE ACCESS AND SITE CONDITIONS

3.1 Client will grant or obtain free access to the site for all equipment and personnel necessary for UES to perform the work set forth in this Agreement. The Client will notify any and all possessors of the project site that Client has granted UES free access to the site. UES will take reasonable precautions to minimize damage to the site, but it is understood by Client that, in the normal course of work, some damage may occur, and the correction of such damage is not part of this Agreement unless so specified in the Proposal.

3.2 The Client is responsible for the accuracy of locations for all subterranean structures and utilities. UES will take reasonable precautions to avoid known subterranean structures, and the Client waives any claim against UES, and agrees to defend, indemnify, and hold UES harmless from any claim or liability for injury or loss, including costs of defense, arising from damage done to subterranean structures and utilities not identified or accurately located. In addition, Client agrees to compensate UES for any time spent or expenses incurred by UES in defense of any such claim with compensation to be based upon UES's prevailing fee schedule and expense reimbursement policy.

SECTION 4: SAMPLE OWNERSHIP AND DISPOSAL

4.1 Soil or water samples obtained from the project during performance of the work shall remain the property of the Client.

4.2 UES will dispose of or return to Client all remaining soils and rock samples 60 days after submission of report covering those samples. Further storage or transfer of samples can be made at Client's expense upon Client's prior written request.

4.3 Samples which are contaminated by petroleum products or other chemical waste will be returned to Client for treatment or disposal, consistent with all appropriate federal, state, or local regulations.

SECTION 5: BILLING AND PAYMENT

5.1 UES will submit invoices to Client monthly or upon completion of services. Invoices will show charges for different personnel and expense classifications.

5.2 Payment is due 30 days after presentation of invoice and is past due 31 days from invoice date. Client agrees to pay a finance charge of one and one-half percent (1 ½ %) per month, or the maximum rate allowed by law, on past due accounts.

5.3 If UES incurs any expenses to collect overdue billings on invoices, the sums paid by UES for reasonable attorneys' fees, court costs, UES's time, UES's expenses, and interest will be due and owing by the Client.

SECTION 6: OWNERSHIP AND USE OF DOCUMENTS

6.1 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by UES, as instruments of service, shall remain the property of UES.

6.2 Client agrees that all reports and other work furnished to the Client or his agents, which are not paid for, will be returned upon demand and will not be used by the Client for any purpose.

6.3 UES will retain all pertinent records relating to the services performed for a period of five years following submission of the report, during which period the records will be made available to the Client at all reasonable times.

6.4 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by UES, are prepared for the sole and exclusive use of Client, and may not be given to any other party or used or relied upon by any such party without the express written consent of UES.

SECTION 7: DISCOVERY OF UNANTICIPATED HAZARDOUS MATERIALS

7.1 Client warrants that a reasonable effort has been made to inform UES of known or suspected hazardous materials on or near the project site.

7.2 Under this agreement, the term hazardous materials include hazardous materials (40 CFR 172.01), hazardous wastes (40 CFR 261.2), hazardous substances (40 CFR 300.6), petroleum products, polychlorinated biphenyls, and asbestos.

7.3 Hazardous materials may exist at a site where there is no reason to believe they could or should be present. UES and Client agree that the discovery of unanticipated hazardous materials constitutes a changed condition mandating a renegotiation of the scope of work. UES and Client also agree that the discovery of unanticipated hazardous materials may make it necessary for UES to take immediate measures to protect health and safety. Client agrees to compensate UES for any equipment decontamination or other costs incident to the discovery of unanticipated hazardous waste.

7.4 UES agrees to notify Client when unanticipated hazardous materials or suspected hazardous materials are encountered. Client agrees to make any disclosures required by law to the appropriate governing agencies. Client also agrees to hold UES harmless for any and all consequences of disclosures made by UES which are required by governing law. In the event the project site is not owned by Client, Client recognizes that it is the Client's responsibility to inform the property owner of the discovery of unanticipated hazardous materials or suspected hazardous materials.

7.5 Notwithstanding any other provision of the Agreement, Client waives any claim against UES, and to the maximum extent permitted by law, agrees to defend, indemnify, and save UES harmless from any claim, liability, and/or defense costs for injury or loss arising from UES's discovery of unanticipated hazardous materials or suspected hazardous materials including any costs created by delay of the project and any cost associated with possible reduction of the property's value. Client will be responsible for ultimate disposal of any samples secured by UES which are found to be contaminated.

SECTION 8: RISK ALLOCATION

8.1 Client agrees that UES's liability for any damage on account of any breach of contract, error, omission or other professional negligence will be limited to a sum not to exceed $50,000 or UES’s fee, whichever is greater. If Client prefers to have higher limits on contractual or professional liability, UES agrees to increase the limits up to a maximum of $1,000,000.00 upon Client’s written request at the time of accepting our proposal provided that Client agrees to pay an additional consideration of four percent of the total fee, or $400.00, whichever is greater. The additional charge for the higher liability limits is because of the greater risk assumed and is not strictly a charge for additional professional liability insurance.

SECTION 9: INSURANCE

9.1 UES represents and warrants that it and its agents, staff and consultants employed by it, is and are protected by worker's compensation insurance and that UES has such coverage under public liability and property damage insurance policies which UES deems to be adequate. Certificates for all such policies of insurance shall be provided to Client upon request in writing. Within the limits and conditions of such insurance, UES agrees to indemnify and save Client harmless from and against loss, damage, or liability arising from negligent acts by UES, its agents, staff, and consultants employed by it. UES shall not be responsible for any loss, damage or liability beyond the amounts, limits, and conditions of such insurance or the limits described in Section 8, whichever is less. The Client agrees to defend, indemnify and save UES harmless for loss, damage or liability arising from acts by Client, Client's agent, staff, and other UESs employed by Client.

SECTION 10: DISPUTE RESOLUTION

10.1 All claims, disputes, and other matters in controversy between UES and Client arising out of or in any way related to this Agreement will be submitted to alternative dispute resolution (ADR) such as mediation or arbitration, before and as a condition precedent to other remedies provided by law, including the commencement of litigation.

10.2 If a dispute arises related to the services provided under this Agreement and that dispute requires litigation instead of ADR as provided above, then:

(a) the claim will be brought and tried in judicial jurisdiction of the court of the county where UES's principal place of business is located and Client waives the right to remove the action to any other county or judicial jurisdiction, and

(b) The prevailing party will be entitled to recovery of all reasonable costs incurred, including staff time, court costs, attorneys’ fees, and other claim related expenses.

SECTION 11: TERMINATION

11.1 This agreement may be terminated by either party upon seven (7) days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof. Such termination shall not be effective if that substantial failure has been remedied before expiration of the period specified in the written notice. In the event of termination, UES shall be paid for services performed to the termination notice date plus reasonable termination expenses.

11.2 In the event of termination, or suspension for more than three (3) months, prior to completion of all reports contemplated by the Agreement, UES may complete such analyses and records as are necessary to complete its files and may also complete a report on the services performed to the date of notice of termination or suspension. The expense of termination or suspension shall include all direct costs of UES in completing such analyses, records and reports.

SECTION 12: ASSIGNS

12.1 Neither the Client nor UES may delegate, assign, sublet or transfer their duties or interest in this Agreement without the written consent of the other party.

SECTION 13. GOVERNING LAW AND SURVIVAL

13.1 The laws of the State of Florida will govern the validity of these Terms, their interpretation and performance.

13.2 If any of the provisions contained in this Agreement are held illegal, invalid, or unenforceable, the enforceability of the remaining provisions will not be impaired. Limitations of liability and indemnities will survive termination of this Agreement for any cause.

SECTION 14. INTEGRATION CLAUSE

14.1 This Agreement represents and contains the entire and only agreement and understanding among the parties with respect to the subject matter of this Agreement, and supersedes any and all prior and contemporaneous oral and written agreements, understandings, representations, inducements, promises, warranties, and conditions among the parties. No agreement, understanding, representation, inducement, promise, warranty, or condition of any kind with respect to the subject matter of this Agreement shall be relied upon by the parties unless expressly incorporated herein.

14.2 This Agreement may not be amended or modified except by an agreement in writing signed by the party against whom the enforcement of any modification or amendment is sought.