UNIVERSAL ENGINEERING SCIENCES

GEOTECHNICAL EXPLORATION

PROPOSED RESTAURANT & DOLLAR STORE
CR 44 & HIGHWAY 19
EUSTIS, LAKE COUNTY, FLORIDA

UES PROJECT NO. 0130.1700302.0000
UES REPORT NO. 1494195

PREPARED FOR:

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October 2, 2017

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October 2, 2017

Italia Ventures International, LLC.
2883 South Osceola Avenue, Suite B
Orlando, FL 32806

Attention: Mr. John Piccione
italiaventures16@gmail.com

Reference: **Geotechnical Exploration**
Proposed Restaurant & Dollar Store
CR 44 & US Highway 19
Eustis, Lake County, Florida
UES Project No. 0130.1700302.0000
UES Report No. 1494195

Dear Mr. Piccione:

Universal Engineering Sciences, Inc. (Universal) has completed a geotechnical exploration at the referenced site in Lake County, Florida. Our exploration was planned in conjunction with and authorized by you. This exploration was performed in accordance our proposal No. 1477229 dated July 20, 2017 and with generally accepted soil and foundation engineering practices. No other warranty, 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 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, INC.
Certificate of Authorization No. 549

TIMOTHY D. TRIPLETT LICENSE NO. 79027 STATE OF FLORIDA PROFESSIONAL ENGINEER

Timothy D. Triplett P.E.
Senior Geotechnical Engineer
Date: 10/2/17
Florida Registration No. 79027

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Geotechnical Department Manager

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1.0 PROJECT DESCRIPTION

We understand this project will consist of constructing a new commercial development located on the west side of Highway 19, approximately 700 feet south of County Road 44 in Lake County, Florida. Based on the concept plan provided to us by the client on July 2017, the project will consist of a single story 3,889 square foot (SF) restaurant building, single story Dollar Store building, associated paved parking areas, and one stormwater pond as shown on the attached Figure B-1.

Preliminary structural loading information was not available at the time of this report. We have assumed the proposed buildings will consist of typical CMU construction with slab-on-grade and maximum column loads not to exceed 100 kips per column and maximum wall loads not to exceed 5 kips per lineal foot of bearing wall (klf).

We anticipate that the proposed improvements will be constructed very close to existing grades. Site cutting of up to 4 feet may be required in some areas where shallow clay soils were found and therefore structural fill in the order of 4 feet may be necessary to achieve finished grades in the proposed building and pavement areas of the site.

The recommendations presented within this report are based upon the above information and assumptions. If any of this information or assumptions is incorrect, please contact Universal immediately so that we may review, and possibly amend the recommendations contained herein.

No site or project facilities/improvements, other than those described herein, should be designed using the soil information presented in this report. Moreover, Universal 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 provide our estimates of the seasonal high groundwater level at the boring locations,
- to provide geotechnical engineering recommendations for foundation design, pavement design, and stormwater design parameters.

Our field exploration program 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 including geophysical studies and deep soil borings into the limestone formation. 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 property is located within Section 2, Township 19 South, Range 26 East in Lake County, Florida. More specifically, the site is located on the west side of Highway 19, approximately 700 feet south of County Road 44 in Eustis, Florida. The site currently consists of an undeveloped, partially wooded parcel. Please refer to the United States Geologic Survey (USGS) Site Location Plan in **Appendix A**.

3.1 SOIL SURVEY

There are two soil types mapped on the site according to the USDA NRCS Soil Survey of Lake County. A brief summary of the mapped surficial soil type(s) is presented in Table I.

TABLE I

SUMMARY OF PUBLISHED SOIL DATA [1]

Soil Symbol	Soil Type	Hydrologic Group	Drainage Characteristics	Depth of Published Seasonal High GWT (feet)
17	Arents	B	Somewhat poorly drained	2½ to 5
46	Orsino sand	A	Moderately well drained	2 to 3½
49	Wauchula sand	B/D	Poorly drained	½ to 1½

[1] **Data obtained from the NRCS online webpage, accessed on 09/28/17**

3.2 TOPOGRAPHY

According to information obtained from the USGS Eustis, FL quadrangle map, the native ground surface elevations across the site area range from approximately +70 to +75 feet National Geodetic Vertical Datum (NGVD). A copy of a portion of the USGS Map is included in Appendix A.

4.0 SCOPE OF SERVICES

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

- Advancing four (4) Standard Penetration Test (SPT) borings within the proposed restaurant and Dollar Store building footprints to 15 feet below existing grades.
- Performing eight (8) SPT borings within the proposed driveway and parking areas to 7 feet below existing grades.
- Advancing two (2) SPT borings within the proposed stormwater pond area to 15 feet below existing grades.

- Securing samples of representative soils encountered in the soil borings for review, laboratory analysis and classification by a Geotechnical Engineer.

- Measuring the existing site groundwater levels and providing an estimate of the seasonal high groundwater level at the boring locations.

- Conducting laboratory testing on selected soil samples obtained in the field to determine their engineering properties.

- Assessing the existing soils conditions with respect to the proposed construction.

- Preparation of a report which documents the results of our exploration, laboratory testing program and analysis with geotechnical engineering recommendations.

5.0 FIELD EXPLORATION

The SPT soil borings were performed using an ATV mounted drilling rig. No horizontal or vertical survey control was provided for the boring locations prior to our field exploration program. Universal located the test borings by using the provided site plan and measuring from existing on-site landmarks and by using a hand held GPS device. Therefore, the test boring locations should be considered accurate to the degree of the methodologies employed. The approximate boring locations are shown in **Appendix B**.

The fourteen (14) SPT borings, designated B-1 through B-4, R-1 through R-8, SW-1 and SW-2 on the attached Boring Location Plan in **Appendix B**, 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 from the surface to 10 feet to detect variations in the near surface soil profile and on approximate 5 feet centers thereafter. The SPT logs are presented in **Appendix B.**

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). We selected representative soil samples from the borings for laboratory testing to aid in classifying the soils and to help to evaluate the general engineering characteristics of the site soils. The results of these tests are shown on the SPT boring logs in **Appendix B**. A summary of the tests performed is shown in Table II.

TABLE II
LABORATORY METHODOLOGIES

Test Performed	Number Performed	Reference
Moisture Content	8	ASTM D 2216 "Laboratory Determination of Water (Moisture) Content of Soil by Mass"
Grain Size Analysis (#200 wash only)	8	ASTM D 1140 "Amount of Material in Soils Finer than the No. 200 (75 - µm) sieve"
Organic Content	1	ASTM D 2974 "Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils"

7.0 GENERALIZED SOIL PROFILE

7.1 GENERALIZED SOIL PROFILE

The results of our field exploration and laboratory analysis, together with pertinent information obtained from the SPT boring, such as soil profiles, penetration resistance, and groundwater levels are shown on the boring logs included in **Appendix B**. The Key to Boring Logs, Soil Classification Chart is 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. A generalized profile of the soils encountered at our boring locations is presented in Table III. For detailed soil profiles, please refer to the attached boring logs.

TABLE III
GENERALIZED SOIL PROFILE

Stratum No.	Typical Depth (feet, bls)		Soil Description	Typical Range of SPT "N" Values
	From	To		
1	0	15*	Loose to very dense, fine SAND [SP] to clayey and silty SAND [SC, SM] with shallow interbedded firm to very stiff sandy CLAY [CL].	5 to 65

[1] Denotes maximum termination depth of the borings.

7.2 NOTABLE FINDINGS - ORGANIC SOILS

Unsuitable, organic soils were found at boring locations B-1, R-2, and R-4. The organic soils were encountered between depths of about the existing surface to 4 feet below current site grades. A single representative sample of the organic material was tested and found to have an

organic content of 10 percent with corresponding moisture contents of 46 percent. **We caution that the depth and thickness of the organic soils may vary between the widely spaced borings.**

The general state of geotechnical practice is that soils with organic contents greater than about 5 percent are considered unsuitable to remain in-place to support structures and soils with organic contents greater than about 10 percent are considered unsuitable to remain in-place to support pavements. **The organic soils found on site exceed these criteria and should be considered unsuitable to remain in-place below the proposed site improvements without special design considerations.**

8.0 GROUNDWATER CONDITIONS

8.1 EXISTING GROUNDWATER LEVEL

We measured the water levels in the boreholes on September 18, 2017 during and upon completion of the drilling operations. Groundwater was encountered at depths ranging between approximately 1½ to 6½ feet below existing grades. 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 Central Florida is between June and October of the year. 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 & 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.)

Based on the results of our field exploration and the factors listed above, we estimate that **given the shallow hydraulically restrictive clayey soils encountered across the site** a perched seasonal high groundwater level could form near existing grades to 1½ feet below grade at the specific test boring locations following periods of heavy rainfall and/or irrigation (i.e. during the rainy season). The estimated stabilized seasonal high groundwater level at each of the boring locations is shown on the attached boring logs. The estimated seasonal high groundwater level at each of the boring locations is shown on the individual boring logs in Appendix B.

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 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 might exceed our seasonal high estimates. Further, 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 are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. The applicability of geotechnical recommendations is very dependent upon project characteristics such as improvement locations, and grade alterations. Universal must review the final site and grading plans to validate all recommendations rendered herein.

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

9.1 STRUCTURAL AND GRADING INFORMATION

We understand this project will consist of constructing a new single story restaurant building and separate single story retail Dollar Store building in Lake County, Florida. Preliminary structural loading information was not available at the time of this report. We have assumed the proposed buildings will consist of typical CMU construction with slab-on-grade and maximum column loads not to exceed 100 kips per column and maximum wall loads not to exceed 5 kips per lineal foot of bearing wall (klf).

We anticipate removal of shallow clay soils in some areas under the buildings, of up to 4 feet below existing grades. Clean structural fill should be expected to backfill these areas.

Prior to finalizing any design, the structural/grading information outlined above should be confirmed by a structural/civil engineer. 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. immediately so that we may review and modify our recommendations as appropriate.

9.2 GEOTECHNICAL ANALYSIS

Based on the results of the soil borings performed within the proposed building footprints, the near surface soils appear to be mostly **loose to medium dense clayey sands underlain with firm to hard clay soils.** It is our opinion that proposed structure can be supported on properly designed and constructed shallow foundation systems provided the clayey sand soils are excavated and replaced with compacted structural fill as outlined in Section 9.9.

Provided that the site preparation recommendations outlined in this report are followed, the parameters outlined below may be used for foundation design.

9.3 BEARING PRESSURE

Provided our suggested site preparation procedures are followed, we recommend designing conventional, shallow footing foundations for a **maximum allowable bearing pressure of**

2,000 psf, or less, as dictated by the project loads. 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 Florida Building Code.

9.4 FOUNDATION SIZE

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

9.5 BEARING DEPTH

The base of all slab on grade footings should be at least 12 inches below finished grade elevation. For conventional spread footings, a minimum bearing depth of 18 inches is recommended. 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 bearing level soils should exhibit a 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 **4 feet** below foundation level as described in Section 9.9 of this report. In addition to compaction, the bearing soils must exhibit stability and be free of "pumping" conditions.

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 offsite sources and groundwater fluctuations beyond those normally anticipated for the naturally-occurring site and soil conditions which are present.

Our settlement estimates for the structures are based upon the adherence to our recommended site preparation procedures presented in Section 9.9 of this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlement of the structures. Furthermore, should building loads change from those assumed by us, greater settlements may be expected.

Due to the sandy nature of the surficial soils following the compaction operations, we expect the majority of settlement to be elastic in nature and occur relatively quickly, on application of the loads, during and immediately following construction. Using the recommended maximum allowable bearing pressure, the assumed maximum structural loads, and the field and laboratory test data which we have correlated into the strength and compressibility characteristics of the subsurface soils, we estimate the total post-construction vertical settlement of the proposed building to be less than about 1 inch.

Differential settlement results from differences in applied bearing pressures and the variations in the compressibility characteristics of the subsurface soils. Assuming our site preparation recommendations are followed, we anticipate post-construction differential settlement to be on the order of about ½ inch or less.

9.8 FLOOR SLABS

Conventional floor slabs may be supported upon the compacted fill and should be structurally isolated from other foundation elements or adequately reinforced to prevent distress due to differential movements. The floor slab can be designed using a subgrade reaction modulus of 100 pounds per cubic inch for slabs founded on suitable sands compacted to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557) to **at least 1½ foot below the bottom of slab level**. We recommend using a sheet vapor barrier (in accordance with Florida Building Code requirements) beneath the building slab-on-grade to help control moisture migration through the slab.

9.9 SITE PREPARATION FOR BUILDING AREAS

We recommend normal, good practice site preparation techniques to prepare the existing subgrade for the proposed construction. These procedures include: stripping/demolition of the site to remove existing structures/foundation, utilities, tanks, vegetation, debris, etc. Following stripping, the exposed subgrade soils and all subsequent fill soils will need to be properly densified.

A more detailed description of this work is as follows:

1. Prior to construction, existing underground utility lines within the construction areas should be located (if applicable). It should be noted that if underground tanks/pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may lead to excessive settlement of overlying structures.

2. After demolition of the existing structure, strip the proposed construction limits of vegetation, debris, and other deleterious materials within and 5 feet beyond the perimeter of proposed buildings. We strongly recommend that the stripped/excavated surfaces be observed and probed by representatives of Universal.

3. The highly cohesive clays (-200 greater than 50 percent) should be removed from the building areas **under the full-time observation of Universal personnel**, including a margin of at least 5 feet beyond foundation edges (at the base of the excavation). **Failure to properly remove the clay soils as recommended may lead to excessive settlement distress within the structures over the useful life.** After approval of the excavated surface, backfill to surrounding grades with approved clean sand backfill (less than 12 percent fines). Backfill should be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D 1557) value.

4. Proof-roll the exposed subsurface soils under the observation of Universal, to locate any soft areas of unsuitable soils, and to increase the density of the shallow loose soils. If deemed necessary by Universal, in areas that continue to "yield", remove any deleterious materials and replace with a clean, compacted sand backfill [SP].

5. After approval of the stripped and proof-rolled surface, compact the exposed subgrade soils (including the 5 feet margin) to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557). Subgrade compaction should be achieved to a

depth of **at least 1½ foot below** the bottom of slab level and **4 feet** below the bottom of foundation level.

6. Place fill/backfill as necessary. Structural fill should consist of clean fine sands [SP] (less than 5 percent fines) placed in maximum 12 inch uniform loose lifts. Fill soils containing between 5 and 12 percent fines (SP-SM or SP-SC) may be also be used, however, strict moisture control may be required. Each lift of structural fill should be densified to at least 95 percent of the Modified Proctor test maximum dry density of the soil (ASTM D 1557) and tested for compaction and approved before the placement of subsequent lifts.

7. Test the subgrade and each lift of fill for compaction at a frequency of not less than one test per 2,500 square feet in the building areas and one test per 10,000 square feet in the pavement areas, with a minimum of 4 tests in each area.

8. Prior to the placement of reinforcing steel and concrete, verify compaction within the footing trenches to a depth of **4 feet**. We recommend testing every column footing and at least one test every 100 feet of wall footing, with a minimum of 4 tests. Re-compaction of the foundation excavation bearing level soils, if loosened by the excavation process, can typically be achieved by making several passes with a walk-behind vibratory sled or jumping jack.

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. Earthwork activities are actually attempting to compact the interstitial water and not the soil. The disturbed soils should be dried in place by scarification and aeration prior to any additional earthwork activities.

No. 57 stone can be used to stabilize the bottom the excavations. Graded aggregate (FDOT 57 stone or washed RCA) can be placed in 6 inch lifts in the bottom of the excavation and “beat-in” to the saturated subgrade with compaction equipment (i.e. jumping jack) until a firm, non-yielding subgrade is achieved. The non-yielding aggregate/soil subgrade should be probed to verify compaction in lieu of density testing. Thereafter, relatively dry suitable sandy fill material can be placed within the excavation in uniform 6-inch compacted lifts until the proposed final elevation is reached. Test the compacted lifts of sandy fill in 12-inch depth intervals to confirm a minimum density of 95 percent of the modified proctor maximum dry density.

Vibrations produced during vibratory compaction operations at the sites 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. Universal Engineering Sciences 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 plate compactors is recommended.

9.10 REMOVAL OF ORGANIC MATERIAL

Clayey sand with organics were encountered within the proposed building footprints and roadways in Borings B-1, R-2, and R-4 at depths ranging from existing grade to about 4 feet. The contractor should be prepared to over-excavate localized pockets of unsuitable soils to their full depth and width beginning in the vicinity of these borings and working in a radial pattern outward so as to remove and replace all material within the building footprint with an organic content greater than 5 percent. Due to the potential variable nature of subsurface conditions, we recommend that adequate contingency be allowed in the budget for any unforeseen deeper pockets of unsuitable soils.

Failure to properly remove and replace the organic materials as recommended may lead to excessive settlement and potential cracking of structures and pavements within their useful life.

The removal of unsuitable soils and subsequent backfilling operations ***must*** be performed under the ***full-time*** observation of a Universal Engineering Sciences representative for the duration of removal operations. The purpose of the full-time observation is not only to ensure total removal of the unsuitable soils, but also to prevent excess suitable material from being excavated.

Once the unsuitable soil deposits are completely removed, the backfill material consisting of clean dry sands (less than 10 percent fines) must be placed in thin lifts of 10 to 12 inches thick, and each lift must be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557). Perform compliance tests within the fill at a frequency of not less than one test per 5,000 square feet per lift, or at a minimum of two test locations, whichever is greater. More detailed recommendations are presented within Sections 9.9 and 10.4 of this report.

10.0 PAVEMENT RECOMMENDATIONS

10.1 DISCUSSION AND ASSUMPTIONS

We assume that a combination of flexible asphaltic and rigid concrete pavement sections will be used for the pavement areas on this project and have provided recommendations for both pavement types in the following sections. The following recommendations are based on the pavement areas being prepared as recommended in this report.

At the time of this exploration, specific traffic loading information was not provided to us. We have assumed the following conditions for our recommended minimum pavement design.

- the subgrade soils are prepared as described in Section 10.4 of this report
- a twenty (20) year design life
- terminal serviceability index (P_t) of 2.5
- reliability of 85 percent
- total equivalent 18 kip single axle loads (E_{18}SAL) up to 35,000 for light duty pavements - car and pickup truck traffic (parking stalls, etc.)
- total equivalent 18 kip single axle loads (E_{18}SAL) up to 150,000 for heavy duty pavements – occasional heavy truck traffic (delivery, trash collection, service lanes, etc.)

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 2016 FDOT Flexible Pavement Design Manual, our minimum recommended pavement component thicknesses are presented in Table IV.

TABLE IV
MINIMUM ASPHALTIC PAVEMENT COMPONENT THICKNESSES

Service Level	Layer Component		
	Surface Course (inches)	Base Course (inches)	Stabilized Subgrade (inches)
Light Duty	1½	6	12
Heavy Duty	2½	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 compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) 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.

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

10.2.3 Base Course

We recommend the pavement base course be limerock, soil cement, or crushed concrete.

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 Florida Department of Transportation (FDOT) Road and Bridge Construction specifications.

For a soil-cement base, we recommend the contractor perform a soil-cement design with a minimum seven-day strength of 300 pounds per square inch (psi) on the materials he intends to use. Place soil-cement in maximum 6-inch lifts uniform and compact in place to a minimum density of 95 percent of the maximum dry density according to specifications in ASTM D-558,"Moisture Density Relations of Soil Cement Mixtures".

Place and finish the soil-cement according to Portland Cement Association requirements. Final review of the soil-cement base course should include manual "chaining" and/or "soundings" seven days after placement. Shrinkage cracks will form in the soil-cement mixture and you should expect reflection cracking on the surface course.

Recycled crushed concrete may provide a cost-effective alternative material in lieu of limerock or soil cement base courses. 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 (stronger than limerock), resistance to groundwater related distress, and lack of reflection 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 100 percent of the Modified Proctor maximum dry density and exhibit a minimum LBR of 120. The base material should comply and be placed in accordance with the latest edition of the FDOT Road and Bridge Construction Specifications Supplemental Section 204-2.2 – "Reclaimed Concrete Aggregate Base Materials". 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.

Compaction testing of the base course should be performed to full depth at a frequency of at least one test per 10,000 square feet, or a minimum of three tests, whichever is greater.

10.2.4 Surface Course

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 asphalt concrete should be placed within the allowable lift thicknesses for fine Type SP mixes per the latest edition of FDOT, Standard Specifications for Road and Bridge Construction, Section 334-1.4 Thickness.

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

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

After placement and field compaction, the surfacing should be cored to evaluate material thickness and density. Cores should be obtained at frequencies of at least one core per 5,000 square feet of placed pavement or a minimum of two cores per day's production.

10.2.5 Effects of Groundwater

One of the most critical influences on the pavement performance in Central Florida is the relationship between the pavement base course and the seasonal high groundwater level. Sufficient separation will need to be maintained between the bottom of base course 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.

We do not anticipate that meeting this separation criteria will be an issue for this site provided the site is not cut below current grades during final grading.

10.2.6 Landscape Areas

In the event that landscape areas adjacent to the pavements include mounds of poorly draining organic laden topsoil 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 causes 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; therefore, requiring less subgrade preparation. Concrete pavement is recommended under dumpster areas, and 10 feet in front of the trash enclosures, at a minimum.

We recommend using the existing surficial sands and approved structural fill densified to at least 95 percent of Modified Proctor test maximum dry density (ASTM D 1557) without additional stabilization, with the following stipulations.

1. Prior to placement of concrete, the subgrade soils should be prepared as recommended in Section 10.4 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 the assumed loading information and provided that the site is prepared as recommended in this report, our recommended minimum concrete pavement design is shown in Table V.

TABLE V
MINIMUM CONCRETE PAVEMENT THICKNESSES

Service Level	Minimum Pavement Thickness	Maximum Control Joint Spacing	Recommended Saw Cut Depth
Light Duty	6 inches	12 feet x 12 feet	2 inches
Heavy Duty	7 inches	14 feet x 14 feet	2⅓ inches

We recommend using concrete with a minimum 28-day compressive strength of at least 4,000 pounds per square inch. Layout of the saw cut control joints should form square panels, and the depth of saw cut joints should be made to a depth of 1/3rd of the concrete slab thickness.

We recommend allowing Universal to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction.

For further details on concrete pavement construction, please reference the "Guide to Jointing 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.

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

10.4 SITE PREPARATION FOR PAVEMENT AREAS

Following is a list of our recommended site preparation procedures to prepare pavement areas for the proposed construction.

1. Perform any necessary dewatering prior to any earthwork operations.

2. Strip the pavement areas of vegetation, roots, organics, topsoil, debris, rubble, etc. Stripping should be performed at least three feet beyond pavement edges. We strongly recommend that the stripped surface be observed and probed by representatives of Universal.

3. Proof-roll the exposed subsurface soils under the observation of Universal, to locate any soft areas of unsuitable soils, and to increase the density of the shallow loose and soft soils. If deemed necessary by Universal, in areas that continue to "yield", remove any deleterious materials and replace with a clean, compacted sand backfill [SP].

4. Within the pavement areas, compact the exposed subgrade soils (including the three feet margin) to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557) to a depth of at least one foot below the stripped surface and full depth of fill, or at least one foot below bottom of base course (or concrete pavement) levels, whichever is greater.

5. Soil density testing to verify the uniformity of compactive efforts should be performed at a frequency of at least one test for every 10,000 square feet per foot of compacted increment, or at a minimum of three test locations, whichever is greater.

6. Place fill in maximum 12 inch lifts with each lift compacted to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557) and tested for compaction as described above. Fill should consist of clean fine sands [SP] (less than 5 percent fines) Fill soils containing between 5 and 12 percent fines (SP-SM or SP-SC) may be also be used, however, strict moisture control may be required.

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.

11.0 STORMWATER POND DESIGN

We understand that the proposed project will include a single "wet" stormwater pond. Two (2) borings (designated SW-1 and SW-2) on the attached Boring Location Plan in Appendix B) were performed within the proposed stormwater pond area. Our recommended design parameters are summarized in Table VI.

TABLE VI
STORMWATER MANAGEMENT DESIGN PARAMETERS

Design Parameter	Estimated Values
Relevant Boring Logs	SW-1 / SW-2
Estimated Seasonal High Groundwater Depth (feet, bls)	1
Estimated Average Wet Season Groundwater Level (feet, bls)	2
Estimated Seasonal Low Groundwater Level (feet, bls)	5

Please note that the depths listed in Table VI are based on depth below existing ground surface at the time of our exploration. No survey control was provided at our borings locations.

The stormwater management pond bottom and side slopes should be stabilized according to applicable Water Management District and local municipality guidelines.

12.0 SUITABILITY OF EXCAVATED SOIL FOR USE AS FILL

The soils excavated from stormwater management areas are usually re-used as structural fill throughout the development. Table VII lists the suitability of excavated materials for use as structural fill based on percent fines content.

TABLE VII
SUITABILITY OF EXCAVATED MATERIAL FOR USE AS FILL

Designation	USCS Soil Classification	% Fines Passing No. 200 Sieve	Suitability for Use as Structural Fill
Group A	SP	0-5	Favorable, freely draining, "clean" sands
Group B	SP-SC, SP-SM	6-12	Suitable, will require aeration and moisture control

TABLE VII
SUITABILITY OF EXCAVATED MATERIAL FOR USE AS FILL

Designation	USCS Soil Classification	% Fines Passing No. 200 Sieve	Suitability for Use as Structural Fill
Group C	SM, SC, SC-SM	13-20	Poor, impedes infiltration, limit overall use, extremely sensitive to water, do not use in pavement or pond areas
Group D	SM, SC, SC-SM, CH, MH	>20	Very Poor, not recommended for structural fill, may be used as stabilizing material in pavement subgrade
Group E	PT, OL, SM-OL	Organic	Unsuitable, must be completely removed and replaced with Group A or B soils

Based on the results of our soil borings and laboratory testing program, the soils encountered at the pond borings (SW-1 & SW-2) consist of reusable fine sands [SP] ("Group A") underlain with clayey and silty sands [SC & SM] and sandy clay [CL] ("Groups C and D") which are not recommended for use as structural fill due their extreme sensitivity to moisture and difficulty to compact may be encountered in isolated areas during excavation.

Clean sandy soils (Group A) with less than 5 percent soil fines are best suited for fill usage, since they are typically free-draining and require minimal moisture control during placement and compaction. The sands with silt and clay (Group B), with contents of 6 to 12 percent soil fines, will require some extra care during placement and compaction. These soils are less freely-draining and might require aeration and drying prior to usage, during use in the rainy season, and when placed near the groundwater table. We recommend that imported fill material meet the Group A and Group B qualifications.

Soils classified as silty or clayey, Group C and D (greater than 12 percent fines), will impede infiltration and cause a perched water condition. We do not recommend using these soils as structural fill material as they will require stringent moisture control during stockpiling, placement and compaction.

13.0 DEWATERING AND EXCAVATION CONSIDERATIONS

Based on the groundwater level conditions encountered, some dewatering may be required for the successful construction of this project. Where excavations will extend only a few feet below the groundwater table, a sump pump may be sufficient to control the groundwater table. Deeper excavations may require well points and/or sock drains to control the groundwater table. Regardless of the method(s) used, we recommend drawing down the water level at least 2 feet below the bottom of the excavation. 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 workman safety within excavations is the sole responsibility of the contractor.

14.0 CONSTRUCTION RELATED SERVICES

We recommend the owner retain Universal to provide inspection services during the site preparation procedures for confirmation of the adequacy of the earthwork operations. Field tests and observations include verification of foundation by monitoring earthwork operations and performing quality assurance tests of the placement of compacted structural fill courses.

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.

15.0 LIMITATIONS

This report has been prepared for the exclusive use of **Italia Ventures International, 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, Universal 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 Universal Engineering Sciences. Unauthorized third parties that rely upon the information contained herein without the expressed written consent of Universal Engineering Sciences, Inc. assume all risk and liability for such reliance.

The recommendations submitted in this report are 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 the course of 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, Universal 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, Universal 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 Universal 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 Universal to locate or identify such concerns. Universal 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 Geotechnical Business Council (GBC) publication, "Important Information About This Geotechnical Engineering Report" appears in Appendix C, and will help explain the nature of geotechnical issues.

Further, 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

UNIVERSAL
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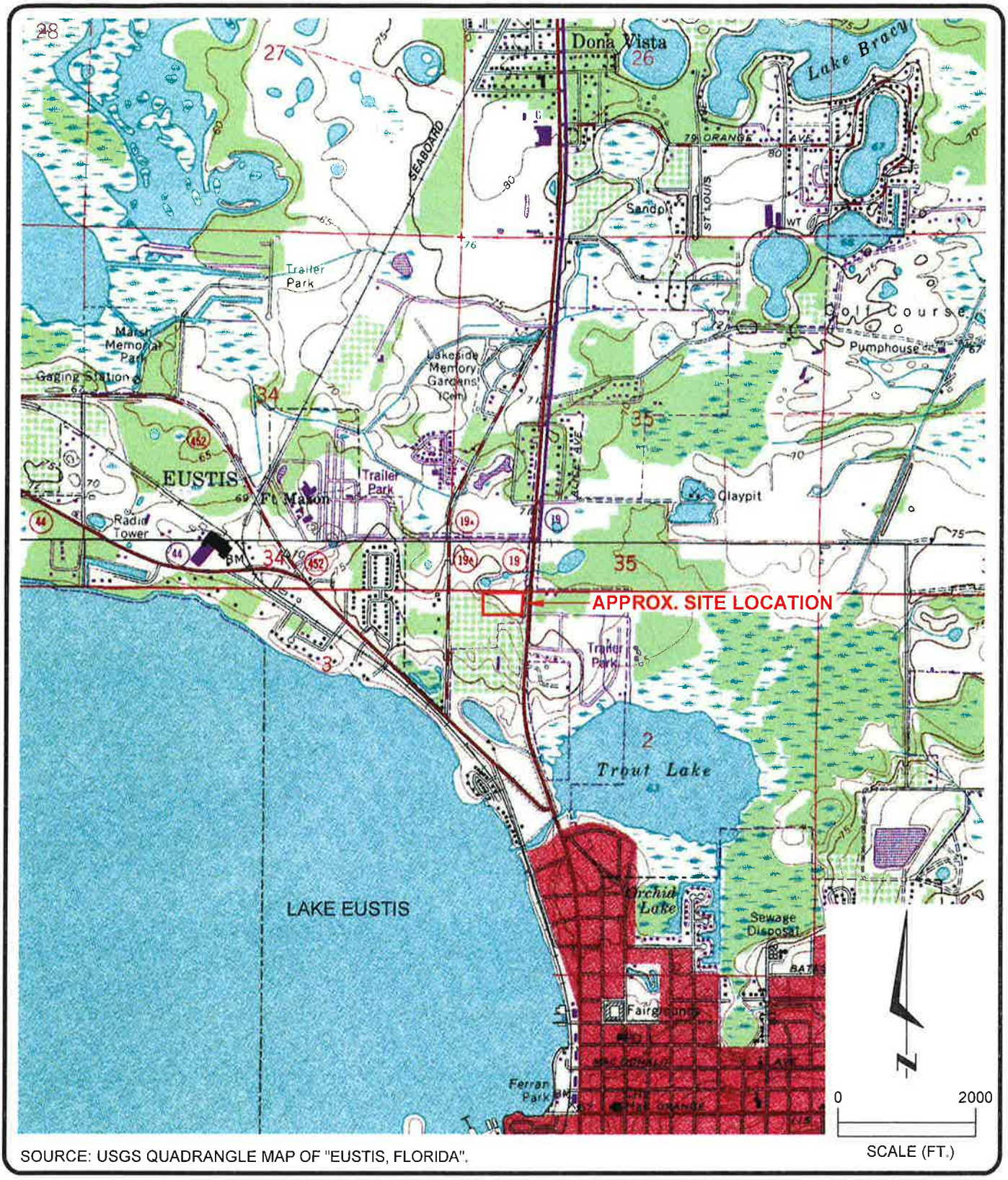

SOURCE: USGS QUADRANGLE MAP OF "EUSTIS, FLORIDA".

UNIVERSAL
ENGINEERING SCIENCES

GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

U.S.G.S. SITE LOCATION MAP

DRAWN BY:	R.K.S.	DATE:	9 - 21 - 17	CHECKED BY:	T.T.	DATE:	9 - 29 - 17
SCALE:	AS SHOWN	PROJECT NO:	0130.1700302.0000	REPORT NO:	1494195	PAGE NO:	A-1

17-0424-01

APPENDIX B

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LEGEND

APPROX. STANDARD PENETRATION TEST BORING LOCATION (SPT)

BORINGS PERFORMED 9/18/17

0 100

SCALE (FT.)

N

THIS DRAWING CREATED USING PLAN PROVIDED BY CLIENT.

UNIVERSAL
ENGINEERING SCIENCES

GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

USDA - NRCS SOIL SURVEY MAP

DRAWN BY:	R.K.S.	DATE:	9 - 21 - 17	CHECKED BY:	T.T.	DATE:	9 - 29 - 17
SCALE:	AS SHOWN	PROJECT NO:	0130.1700302.0000	REPORT NO:	1494195	PAGE NO:	B-1

17-0424-01

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.1

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **B-1** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S. DATE STARTED: 9/18/17
WATER TABLE (ft): 3.8 DATE FINISHED: 9/18/17
DATE OF READING: 9/18/17 DRILLED BY: WESTECH
EST. SHGWT (ft): 0.0 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Very dark gray brown clayey fine SAND with organics [SC]		46				10
				▼		-- dark gray brown						
						Loose very dark gray brown fine SAND with silt [SP-SM]						
5		4-2-7-11	9									
		2-3-3-7	6			-- dark gray brown						
10		3-3-4-6	7									
						Dense dark gray brown clayey fine SAND [SC]						
15		20-21-24	45			BORING TERMINATED AT 15.0 FT.						
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
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PAGE:	B-2.2

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

BORING I.D.: **B-2** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

G.S. ELEVATION (ft): N.S. DATE STARTED: 9/18/17
WATER TABLE (ft): 2.8 DATE FINISHED: 9/18/17
DATE OF READING: 9/18/17 DRILLED BY: WESTECH
EST. SHGWT (ft): 1.5 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Very dark gray brown fine SAND [SP]						
				▼		Dark gray brown clayey fine SAND [SC]						
						-- medium dense, dark gray brown to red						
5		5-5-7-5	12			Stiff very dark gray brown to red sandy CLAY [CL]	52	21				
		3-5-6-6	11			Medium dense very dark gray brown clayey fine SAND [SC]						
10		9-12-15-16	27			-- dark gray brown						
15		8-9-10	19			BORING TERMINATED AT 15.0 FT.						
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
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PAGE:	B-2.3

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **B-3** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 1.7
DATE OF READING: 9/18/17
EST. SHGWT (ft): 1.0

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽ ▼		Very dark gray brown fine SAND [SP]						
						Dark gray brown clayey fine SAND [SC]						
						-- loose, dark gray brown to red						
5		6-6-4-6	10				46	25				
		4-4-5-4	9			Very stiff red sandy CLAY [CL]						
10		5-8-16	24									
						Medium dense gray clayey fine SAND [SC]						
15		5-10-16	26			BORING TERMINATED AT 15.0 FT.						
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.4

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **B-4**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E
SHEET: **1 of 1**

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 2.3
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.0

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Very dark gray brown clayey fine SAND [SC]						
						Dark gray brown fine SAND with phosphates [SP]						
				▼								
5						Firm dark gray brown to red CLAY with phosphates [CL]						
		1-3-4-5	7									
						Loose dark gray brown to red clayey fine SAND with phosphates [SC]						
		2-4-4-6	8									
10		2-6-9-16	15			Stiff dark gray brown to red CLAY with phosphates [CL]						
						Dense dark gray brown clayey fine SAND [SC]						
15		13-17-26	43			BORING TERMINATED AT 15.0 FT.						
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
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PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-1** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 6.3
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.0

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽								
						Very dark gray brown clayey fine SAND [SC]						
						Firm dark gray brown to red CLAY [CL]						
		4-2-3-4	5									
						Medium dense dark gray brown to red clayey fine SAND [SC]						
5		5-14-16-26	30									
				▼		-- very dense						
		28-28-31-35	59									
						BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
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PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-2**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E
SHEET: **1 of 1**

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 6.7
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.0

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽								
						Very dark gray brown clayey fine SAND with organics [SC]	38	19				
						Medium dense very dark gray brown fine SAND [SP]						
		4-7-7-10	14									
						Stiff dark gray brown to red CLAY [CL]						
5		5-5-8-9	13									
						-- very stiff						
		5-9-10-22	19	▼								
						BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
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PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-3** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 6.9
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.0

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽								
						Very dark gray brown clayey fine SAND [SC]						
						Loose gray brown fine SAND [SP]						
		2-4-5-5	9									
						Stiff dark gray brown to red CLAY [CL]						
5		3-6-10-25	16			-- hard						
		15-16-16-23	32	▼								
						BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.8

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-4** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S. DATE STARTED: 9/18/17
WATER TABLE (ft): 3.1 DATE FINISHED: 9/18/17
DATE OF READING: 9/18/17 DRILLED BY: WESTECH
EST. SHGWT (ft): 0.0 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Very dark gray clayey fine SAND with organics [SC]						
						-- loose	26	16				
		2-3-7-7	10	▼		Stiff dark gray brown to red CLAY [CL]						
5		5-5-6-5	11			Loose dark gray brown to red clayey fine SAND [SC]						
		4-4-3-2	7			BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

W-09620.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
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PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-5** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 2.1
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.5

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Dark gray brown fine SAND [SP]						
				▼		Loose dark gray brown clayey fine SAND [SC]	12	14				
		1-2-3-3	5									
						-- dark gray brown						
5		5-5-5-11	10			Very stiff red sandy CLAY [CL]						
		7-10-13-15	23			BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.10

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-6** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 3.3
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.5

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Very dark gray brown fine SAND [SP]						
						Loose dark gray brown clayey fine SAND [SC]						
		3-4-6-8	10									
				▼		Loose dark gray fine SAND [SP]						
5		4-5-4-4	9									
						Firm dark gray brown to red CLAY [CL]						
		3-3-5-6	8									
						BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.11

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-7**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E
SHEET: **1 of 1**

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 1.4
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.5

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Very dark gray brown fine SAND [SP]						
				▼		Medium dense dark gray brown clayey fine SAND [SC]						
		2-4-7-7	11				24	19				
5		3-8-8-11	16									
						Stiff red sandy CLAY [CL]						
		8-7-8-8	15									
						BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

W-09620.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.12

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **R-8** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, POTENTIAL PERCHED GROUNDWATER CONDITION

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 1.7
DATE OF READING: 9/18/17
EST. SHGWT (ft): 0.0

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽								
				▼		Very dark gray brown clayey fine SAND [SC]						
						-- loose, dark gray brown						
		2-3-3-3	6									
5		5-5-4-8	9			Stiff red sandy CLAY [CL]						
		2-4-9-11	13			BORING TERMINATED AT 7.0 FT.						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.13

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **SW-1** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 1.8
DATE OF READING: 9/18/17
EST. SHGWT (ft): 1.0

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		Very dark gray fine SAND [SP] {GROUP A}						
				▼		-- dark gray brown						
						Medium dense dark gray brown to red clayey fine SAND [SC] {GROUP D}	39	18				
5		4-6-6-7	12			Medium dense gray brown silty fine SAND [SM] {GROUP C/D}						
		4-8-8-19	16			Stiff dark gray brown to red CLAY [CL] {GROUP C/D}						
						-- hard						
10		6-13-17-13	30									
						Very dense dark gray brown clayey fine SAND [SC] {GROUP C/D}						
15		25-32-33	65			BORING TERMINATED AT 15.0 FT.						
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700302.0000
REPORT NO.:	1494195
PAGE:	B-2.14

PROJECT: GEOTECHNICAL EXPLORATION
PROPOSED RESTAURANT & DOLLAR STORE
LAKE COUNTY, FLORIDA

BORING I.D.: **SW-2** SHEET: **1 of 1**
SECTION: 2 TOWNSHIP: 19 S RANGE: 26 E

CLIENT: ITALIA VENTURES INTERNATIONAL, LLC

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 2.3
DATE OF READING: 9/18/17
EST. SHGWT (ft): 1.5

DATE STARTED: 9/18/17
DATE FINISHED: 9/18/17
DRILLED BY: WESTECH
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽ ▼		Dark gray fine SAND [SP] {GROUP A} -- brown						
						Medium dense gray brown clayey fine SAND [SC] {GROUP C/D}						
5		5-5-11-20	16			Stiff dark gray brown to red CLAY [CL] {GROUP C/D}						
						Dense dark gray brown silty fine SAND [SM] {GROUP C/D}						
		19-26-32-50+	58			Hard dark gray brown to red CLAY [CL] {GROUP C/D}						
						Dense dark gray brown to red clayey fine SAND [SC] {GROUP C/D}						
10		13-17-30-50+	47									
15		14-14-16	30			BORING TERMINATED AT 15.0 FT.						
20												

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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%

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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