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GEOTECHNICAL EXPLORATION

MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 WEST MAITLAND BOULEVARD (SR 414)
MAITLAND, ORANGE COUNTY, FLORIDA

UES PROJECT NO. 0130.1500104.0000
UES REPORT NO. 1222610

PREPARED FOR:

RELATED Development, LLC
315 South Biscayne Boulevard
Miami, Florida 33131

BPL Maitland Concourse North, LLC
221 South Knowles Avenue
Winter Park, Florida 32789

PREPARED BY:

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April 28, 2015

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April 28, 2015

RELATED Development, LLC
315 South Biscayne Boulevard
Miami, Florida 33131

BPL Maitland Concourse North, LLC
221 South Knowles Avenue
Winter Park, Florida 32789

Attention: Mr. Max Cruz
mcruz@relatedgroup.com

Mr. W.P. Battaglia
bill@battagliagroup.com

Reference: **Geotechnical Exploration**
Maitland Concourse North, Multi-Family Residential
511 West Maitland Boulevard (SR 414)
Maitland, Orange County, Florida
UES Project No. 0130.1500104.0000
UES Report No. 1222610

Dear Mr. Cruz and Mr. Battaglia:

Universal Engineering Sciences, Inc. (Universal) has completed a geotechnical exploration at the above referenced site in Orange 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, 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 and pavement design.

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

Andrew S. Wilderotter, P.E.
Geotechnical Project Manager

GUY H. RABENS LICENSE No 60917 STATE OF FLORIDA PROFESSIONAL ENGINEER

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1.0 PROJECT DESCRIPTION

We understand that the proposed project will include the construction of a new mixed-use (residential and commercial) development in Maitland, FL. Based on review of site plans provided by the client, we understand that the residential portion of the development will consist of approximately eight (8) 2-story residential buildings, six (6) 3-story residential buildings, a clubhouse building, a pool house, and associated parking/drive areas. The commercial portion of the project will be constructed as a separate phase.

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 provide our estimates of the seasonal high groundwater level at the boring locations and
- to provide geotechnical engineering recommendations for site preparation, foundation design, and pavement design.

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 glad 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 25, Township 21 South, Range 29 East in Orange County, Florida. More specifically, the site is located on the north side of Maitland Boulevard (SR 414), between Interstate 4 and US Highway 17/92, as shown on the attached Figure A-1. At the time of drilling, the majority of the site was covered by citrus groves. Lake Hope borders the north side of the property, Lake Faith is located to the east, and Lake Charity to the west.

3.1 SOIL SURVEY

There are six (6) native soil types mapped within the general area of the site according to the USDA NRCS Soil Survey of Orange County. A brief summary of the mapped surficial (native) soil type(s) is presented in Table I.

TABLE I
SUMMARY OF PUBLISHED SOIL DATA

Soil Symbol	Soil Type	Hydrologic Group	Drainage Characteristics	Depth of Published Seasonal High GWT (feet)
3	***Basinger fine sand, depressional***	***A/D***	***Very poorly drained***	***0+***
8	Candler-Urban land complex, 5 to 12 percent slopes	A	Excessively drained	>6
28	Florahome fine sand, 0 to 5 percent slopes	A	Moderately well drained	4 to 6
43	Seffner fine sand	A/D	Somewhat poorly drained	1½ to 3½
46	Tavares fine sand, 0 to 5 percent slopes	A	Moderately well drained	3½ to 6
47	Tavares-Millhopper fine sand, 0 to 5 percent slopes	A	Moderately well drained	3½ to 6

Please note that soils mapped as Basinger fine sand, depressional were identified along the northern boundary of the property (adjacent to Lake Hope). These depressional soils occasionally consist of up to 5+ feet of surficial organic soils. Based on the provided site plan, it appears that these depressional soils are mapped outside of the proposed construction areas.

3.2 TOPOGRAPHY

According to information obtained from the United States Geologic Survey (USGS) Casselberry, FL quadrangle map, and partial topographic survey data provided by the project civil engineer, the ground surface elevation across the site area ranges from approximately +75 feet National Geodetic Vertical Datum (NGVD)within the northern portions of the site to +90 feet NGVD within the southern portions. A copy of a portion of the USGS Map is included in Appendix A.

Based on review of USGS maps and the Orange County Lake Index, normal high groundwater elevations for the Lake Hope, Lake Charity, Lake Faith chain ranges from about +67 to +69 feet NGVD.

4.0 SCOPE OF SERVICES

The services conducted by Universal during the geotechnical exploration performed as part of the residential phase of the project are as follows:

- Drill twenty-seven (27) Standard Penetration Test (SPT) borings, twenty (20) within the proposed residential building footprints to depths of 20 and 25 feet below land surface (bls),

two (2) within the clubhouse/pool house areas to a depth of 15 feet bls, and five (5) within the parking/drive areas to a depth of 10 feet bls.

- Perform twelve (12) shallow test pits scattered throughout the project site to a depth of 5 feet bls.
- Secure samples of representative soils encountered in the soil borings for review, laboratory analysis and classification by a Geotechnical Engineer.
- Measure the existing site groundwater levels and provide an estimate of the seasonal high groundwater level at the boring locations.
- Conduct laboratory testing on selected soil samples obtained in the field to determine their engineering properties.
- Assess the existing soil conditions with respect to the proposed construction.
- Prepare a report which documents the results of our exploration and analysis with geotechnical engineering recommendations.

5.0 FIELD EXPLORATION

The SPT soil borings and test pits were performed using ATV and truck mounted drilling rigs and associated excavation equipment. Horizontal and vertical survey control was not provided for the test locations prior to our field exploration program. Universal located the test borings by using the provided site plan, measuring from existing on-site landmarks shown on an aerial photograph, and by using handheld GPS devices. The indicated test locations should be considered accurate to the degree of the methodologies used. The approximate boring locations are shown in Appendix B.

5.1 STANDARD PENETRATION TEST BORINGS

The SPT borings, designated RS-1 through RS-20, CB-1, CB-2, and P-1 through P-5 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 to 10 feet to detect variations in the near surface soil profile and on approximate 5 feet centers thereafter.

5.2 TEST PITS

A total of twelve (12) test pit excavations, designated TP-1 through TP-12 on the attached Figure B-1, were performed throughout the project site to a depth of approximately 5 feet below existing grade. The recovered soil samples were visually examined in the field to determine the presence of any buried deleterious or unsuitable materials. The soils at the test pit locations consist primarily of fine sands [SP] to the termination depth of 5 feet. **No buried pockets of deleterious materials were encountered within the tested depths at any of the test pit locations.**

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 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
Grain Size Analysis (#200 wash only)	20	ASTM D 1140 "Amount of Material in Soils Finer than the No. 200 (75 - µm) sieve"
Moisture Content	20	ASTM D 2216 "Laboratory Determination of Water (Moisture) Content of Soil by Mass"

7.0 SUBSURFACE CONDITIONS

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 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

Typical Depth (feet, bls)		Soil Description	Range of SPT "N" Values (blows/ft)
From	To		
Surface	25*	Very loose to medium dense fine sands [SP], clayey fine sands [SC] and silty fine sands [SM]	2 to 24

* denotes maximum termination depth of the borings

8.0 GROUNDWATER CONDITIONS

8.1 EXISTING GROUNDWATER LEVEL

We measured the water levels in the boreholes on April 9 through 13, 2015 at the time of our exploration. The encountered groundwater levels ranged from approximately 7½ to 22 feet below existing grade. The large variations in groundwater levels can be attributed to significant topographic relief across the project site. The encountered groundwater level at each of the

boring locations is 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 Central Florida is between June and October 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 & 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, stripping, etc.)

Based on the results of our field exploration and the factors listed above, we estimate that the seasonal high groundwater level at the boring locations may form roughly 4 feet bls to below a depth of 10 feet. The large variation in seasonal high groundwater levels can be attributed to topographic relief across the site and the presence/depth of hydraulically restrictive clayey soils.

Please note that the presence of hydraulically restrictive clayey sands may form a transient perched groundwater condition at borings RS-4, RS-7, RS-9 through RS-12 P-2 and P-3, especially after periods of heavy rainfall and/or irrigation. *Perched groundwater levels can generally be expected to occur about 6 inches to 2 feet above the top of hydraulically restrictive soils, where present, if the groundwater table is unable to drain and/or percolate into a more pervious layer. It should be noted that undercutting of the hydraulically restrictive materials will impact the depth of the perched water table. The potential for groundwater to perch will be directly related to rainfall and irrigation amounts, as well as site grading.* ***The potential for transient perched groundwater levels should be considered during the design of the site grades and during construction.***

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 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 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. UES 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 that the proposed project will include the construction of a new multi-family residential development in Maitland, Orange County, Florida. The residential buildings will be two and three-story timber-framed structures supported on post-tensioned slab foundations. ***Although detailed loading conditions were not provided, we have assumed that maximum loading for the proposed buildings will not exceed 8 kips per linear foot for structural walls and 75 kips for individual columns. We have assumed minimal grades changes (±3 feet).***

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 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 silty-clayey sands to depths of 20 to 25 feet below grade. It is our opinion that proposed structures can be supported on properly designed and constructed shallow foundation systems. 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 shallow footing foundations for a **maximum allowable net soil bearing pressure of 2,500 pounds per square foot (psf)**. The allowable net bearing pressure is that 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

For post-tensioned slab foundations, we recommend a minimum bottom width of 12 inches for the turned down edge footing, with a 45 degree chamfer to the slab. For continuous wall

foundations, the minimum footing width should comply with the current FLBC, but under no circumstances should be less than 12 inches. The minimum width recommended for an isolated column footing is 24 inches. 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 footings should be at least 12 inches below finished grade elevation 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 backfill. 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 2 feet below foundation level** as described in Section 11.0 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 off site 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 adherence to our recommended site preparation procedures presented in Section 11.0 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 structure to 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 recommendations are followed, **we anticipate post-construction differential settlement of less than ½ inch.**

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. For the slab design, we recommend using a subgrade modulus (k) of 75 pounds per cubic inches, which can be achieved by compacting 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-grade to help control moisture migration through the slab.

9.9 RETAINING WALLS

We assume that retaining walls may be constructed to account for grade changes. If constructed, we assume that the walls will be smooth cast-in-place concrete with level backfill and have a maximum exposed height of about 5 feet.

Table IV shows our recommended parameters for the retaining wall design (which will be performed by others). The recommended design parameters are based on the following criteria:

1. At least 2 feet of suitable soils, compacted to at least 95 percent of the Modified Proctor test maximum dry density, beneath the wall foundation.

2. The walls will be smooth, cast-in-place concrete with level backfill.

3. All backfill soils are free draining, clean sandy soil compacted to at least 95 percent of the Modified Proctor test maximum dry density.

TABLE IV
RECOMMENDED SOIL PARAMETERS FOR WALL DESIGN (Level Backfill)*

Design Parameter	Recommended Value
Maximum Allowable Net Soil Bearing Pressure Beneath Foundation	2,500 psf
Internal Angle of Friction of Backfill Soils (Φ)	30 degrees
Estimated Active Earth Pressure Coefficient (K_a)	0.33
Estimated Passive Earth Pressure Coefficient (K_p)	3.00
Moist Soil Unit Weight for Compacted Sand Backfill (pcf)	110
Coefficient of Friction (sliding)	0.4

* For sloping backfill or backfill with clayey sands the table values must be adjusted.

Please note that the Table IV values do not include a factor of safety and therefore, the designer should incorporate an appropriate factor of safety.

Retaining walls should be designed to resist pressures exerted by the adjacent soils, hydrostatic head, as well as any potential surcharge load (i.e. wind, construction equipment, vehicle traffic, etc.). For walls that are not restrained during backfilling but are free to rotate at the top, active earth pressures should be used in the design.

Retaining walls should be constructed with appropriate wall drains/underdrains to prevent surface water from accumulating and exerting excessive hydrostatic pressures. Also, retaining walls with adjacent sloping earth embankments or structural loadings may require special considerations.

Compaction adjacent to the wall should be performed using small hand guided plate compactors. We recommend a qualified field representative of Universal Engineering Sciences be present during the construction of the proposed wall to ensure that the foundation soils are properly prepared. The final wall design plans should be reviewed by Universal to ensure that appropriate surcharge loads and parameters were taken into consideration. Further, a complete stability analysis of the wall(s) should be performed based on the actual soil, fill, and loading conditions.

10.0 PAVEMENT RECOMMENDATIONS

10.1 GENERAL

We assume that the proposed roadways and parking areas will consist of a combination of flexible asphaltic and rigid concrete pavement sections with typical multi-family residential traffic. Our recommendations for both pavement types are listed in the following sections. The following recommendations are based on the pavement areas being prepared as recommended in this report.

10.2 ASPHALTIC PAVEMENTS

10.2.1 Layer Components

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 11.0 of this report
- a twenty (20) year design life
- terminal serviceability index (P_t) of 2.5
- reliability of 90 percent
- total equivalent 18 kip single axle loads (E_{18}SAL) up to 35,000 for light duty pavements - car and pickup truck traffic
- total equivalent 18 kip single axle loads (E_{18}SAL) up to 350,000 for heavy duty pavements – occasional heavy truck traffic (delivery, trash collection, service lanes, etc.)

We recommend using a three layer pavement section for the proposed asphaltic parking/drive areas consisting of stabilized subgrade, base course, and surface course. Based on the results of our soil borings, the assumed traffic loading information and review of the 2008 FDOT Flexible Pavement Design Manual, our minimum recommended pavement component thicknesses are presented in Table V. Where applicable, the local municipality minimum standards should be followed when more stringent than the recommendations herein.

TABLE V
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 35,000 E_{18}SAL	1½	6	12
Heavy Duty	up to 350,000 E_{18}SAL	2½	8	12

10.2.2 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, or a minimum Florida Bearing Value (FBV) of 60 psi, 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 subgrade should be performed to full depth at a frequency of at least one (1) test per 10,000 square feet.

10.2.3 Base Course

Limerock, recycled crushed concrete and soil cement are all deemed suitable materials for the pavement base course at this project. However, local municipalities often limit the use of certain base course materials. We recommend the civil engineer consult with the local municipalities 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 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 (7)-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". 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.

Compaction testing of the base course should be performed to full depth at a frequency of at least one (1) test per 10,000 square feet.

10.2.4 Surface Course

For the pavements, we recommend that the surface course consist of FDOT SP-9.5 fine mix asphaltic concrete. 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% 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 wearing surface 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 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 12 inches for soil-cement or crushed concrete base course, and at least 18 inches for a limerock base course.

Based on the anticipated seasonal high groundwater conditions, it appears that the separation criteria should not be an issue for pavements constructed at or above existing grades. ***However, perched groundwater may present an issue where pavement areas are cut into***

or near the hydraulically restrictive clayey soils. If adequate separation is not provided by grading, the installation of pavement underdrains will be required to protect the pavement base course from the adverse affects of perched water.

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 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 the dumpster area, and 10 feet in front of the trash enclosures, at a minimum.

We recommend using the existing surficial sands or approved structural fill densified to at least 98 percent of Modified Proctor test 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 11.0 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 the results of exploration and review of the FDOT Rigid Pavement Design Manual, our recommended minimum concrete pavement design is shown in Table VI.

TABLE VI
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 ⅓ 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 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.

11.0 SITE PREPARATION

We recommend normal, good practice site preparation procedures for the new construction areas. These procedures include: stripping/clearing of the site to remove vegetation, roots, topsoil, existing improvements, debris, etc. 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 is presented in this section.

1. Prior to construction, existing underground utility/irrigation lines and other below grade structures within the construction area should be located. Provisions should be made to relocate interfering utilities to appropriate locations. **It should be noted that if underground improvements are not properly removed or plugged, they may serve as conduits for subsurface erosion which may lead to excessive settlement of overlying structures.**

2. Strip the proposed construction limits of vegetation, topsoil, existing improvements, roots, debris and other deleterious materials within and 5 feet beyond the perimeter of the new construction areas. Expect clearing and grubbing to depths of 6 to 12 inches. Deeper clearing and grubbing depths may be encountered in heavily vegetated or depressional areas where major root systems and/or organic soils are encountered. We strongly recommend that the stripped/excavated surfaces 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 fine sand soils. If deemed necessary by Universal, in areas that continue to "yield", remove any deleterious materials and replace with a clean, compacted sand backfill.

4. In the areas to be raised, place fill in maximum 12-inch loose, uniform lifts and compact each lift at least 95 percent of the Modified Proctor maximum dry density. All fill should consist of clean sand with less than 12 percent soil fines and be free of organics, debris and other deleterious materials. Fill soils containing between 5 and 12 percent fines may require strict moisture control.

5. Within the at-grade (or below grade) improvement areas, subgrade compaction of at least 95 percent of the Modified Proctor should be achieved to a depth of at least 2 feet below bottom of foundation/slab levels in the building areas, and at least 1 foot below bottom of stabilized subgrade elevation in the parking areas.

6. Within the pavement areas, the upper 12 inches of subgrade beneath the base course (sub-base) or concrete slabs should be compacted to at least 98 percent of the Modified Proctor maximum dry density. Within the asphaltic pavement areas, the subgrade should be stabilized as recommended in Section 10.2.2.

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 2 feet. 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. We recommend testing every column footing and at least one test every 100 feet of wall footing, with a minimum of 4 tests per building.

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 water and not the soil. The disturbed soils should be dried in place by scarification and aeration prior to any additional earthwork activities.

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. 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.

12.0 UTILITY TRENCH RECOMMENDATIONS

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

1. Perform any necessary remedial dewatering prior to excavation operations. Dewatering should be performed to a depth of at least 2 feet below the bottom of trench excavation.

2. Excavate the trenches in accordance with design configuration and install utility lines. Any unsuitable soils encountered at trench bottom level should be removed and replaced within compacted approved sand backfill. If the bottom of excavation is unstable due to excessive fines and/or wet conditions, an option would be to over-

excavate and replace the saturated soils with compacted graded aggregate (FDOT 57 stone) until a firm, non-yielding subgrade is achieved.

3. After constructing the utility lines, backfill with suitable sand fill placed in 6 to 12 inch thick loose lifts. Each lift of backfill should be compacted to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557). Beneath pavement areas, the top 12 inches of backfill should be compacted to at least 98 percent (see Section 10.2.2).

Backfill above and around thrust blocks should consist of clean fine sands [SP, SP-SM] compacted at least 98 percent of Modified Proctor maximum dry density (ASTM D 1557).

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 and pavement subgrades 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 ***RELATED Development, LLC, BPL Maitland Concourse North, 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 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, 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 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. An Association of Engineering Firms Practicing in the Geosciences (ASFE) publication, "Important Information About Your 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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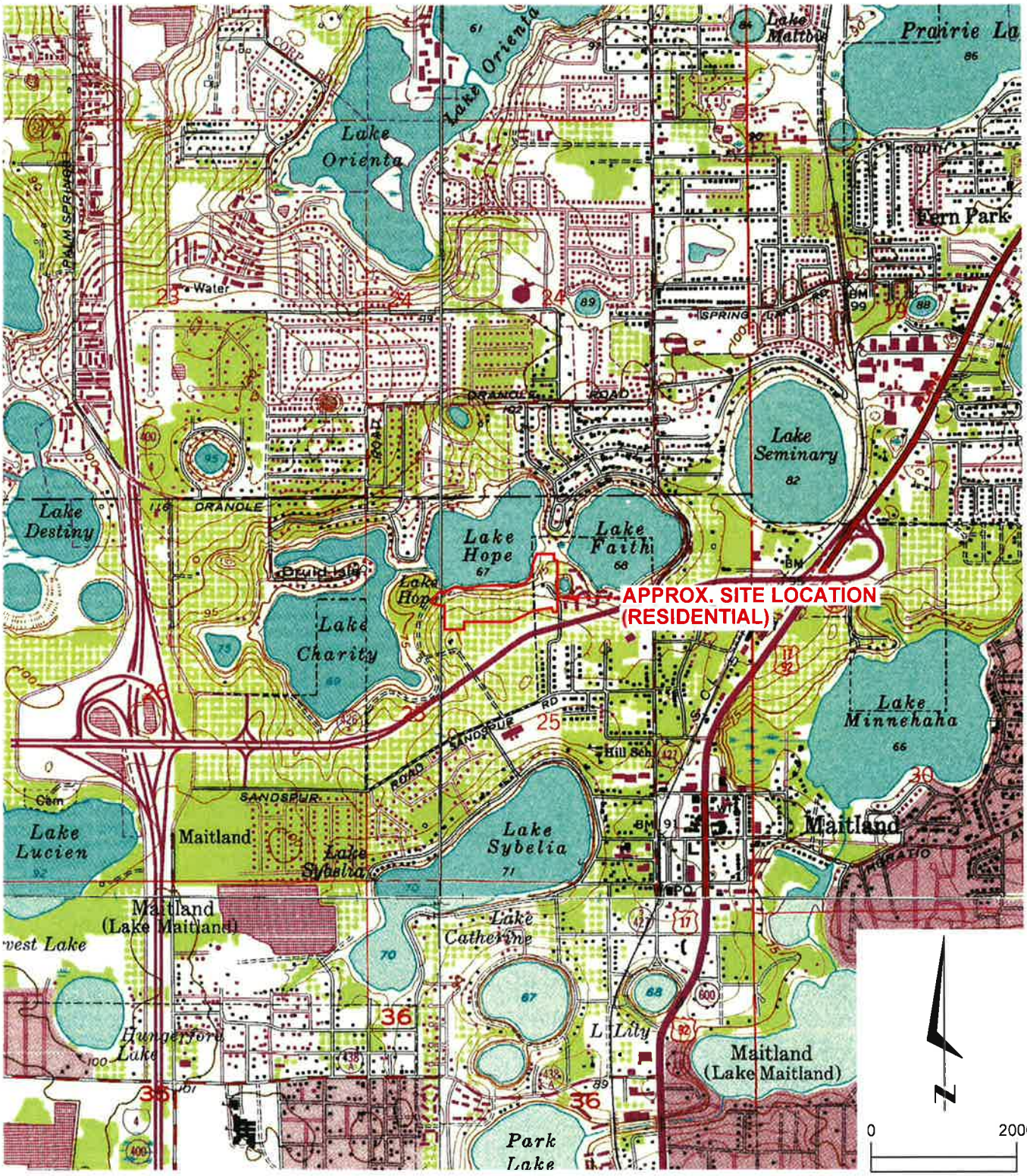

SOURCE: USGS QUADRANGLE MAP OF "CASSELBERRY, FL" & "FOREST CITY, FL".

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GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH, RESIDENTIAL
511 W. MAITLAND BOULEVARD (S.R. 414)
MAITLAND, ORANGE COUNTY, FLORIDA

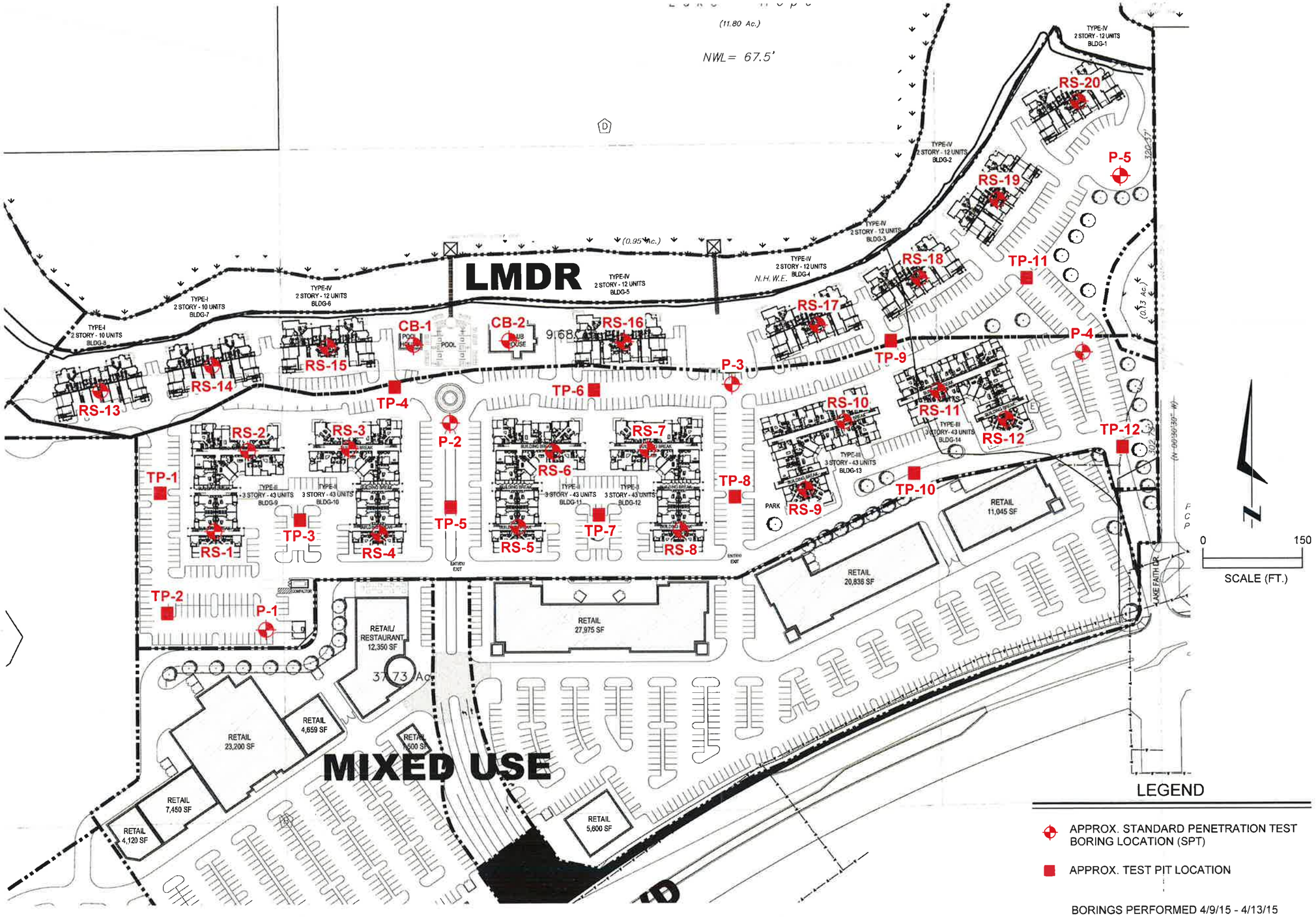
SITE LOCATION MAP

DRAWN BY:	R.K.S.	DATE:	4 - 16 - 15	CHECKED BY:	A.S.W.	DATE:	4 - 27 - 15
SCALE:	AS SHOWN	PROJECT NO:	0130.1500104.0000	REPORT NO:	1222610	PAGE NO:	A-1

15-00160-01

APPENDIX B

UNIVERSAL
ENGINEERING SCIENCES



15-0160-01

FOR: RELATED DEVELOPMENT, LLC
BPL MAITLAND CONCOURSE NORTH, LLC

DRAWN BY:	R.K.S.	DATE:	4 - 16 - 15
CHECKED BY:	A.S.W.	DATE:	4 - 22 - 15
REPORT NO:	1222610	SCALE:	AS SHOWN
PROJECT NO:	0130.15001104.0000		

GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH, RESIDENTIAL
511 W. MAITLAND BOULEVARD (S.R. 414)
MAITLAND, ORANGE COUNTY, FLORIDA

BORING LOCATION PLAN

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **CB-1** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/13/15
WATER TABLE (ft):	9	DATE FINISHED:	4/13/15
DATE OF READING:	4/13/15	DRILLED BY:	ORL - KR/DW
EST. SHGWT (ft):	6.5	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						Loose dark brown fine SAND [SP]						
		4-3-3	6									
		3-4-4	8									
5		4-5-4	9			-- brown						
		7-9-8	17	▽		-- medium dense, very light brown						
		6-6-5	11	▼								
		2-3-2	5			-- loose, light brown						
10												
		3-3-4	7									
15						BORING TERMINATED AT 15.0 FT.						
20												
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **CB-2** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/10/15
WATER TABLE (ft):	9	DATE FINISHED:	4/10/15
DATE OF READING:	4/10/15	DRILLED BY:	ORL - KR/DW
EST. SHGWT (ft):	6.5	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						Loose dark brown fine SAND [SP]						
		2-3-2	5									
		3-4-4	8									
5						-- light brown						
		4-5-4	9									
		4-4-4	8	▽		-- shade lighter						
		3-3-3	6	▼								
		2-3-2	5									
10												
		3-4-4	8			BORING TERMINATED AT 15.0 FT.						
15												
20												
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-1** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): N.E.
DATE OF READING: 4/9/15
EST. SHGWT (ft): >6

DATE STARTED: 4/9/15
DATE FINISHED: 4/9/15
DRILLED BY: ORL - JB/JC/JB
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						Loose orange brown fine SAND [SP]						
		2-3-2	5									
		2-2-3	5									
5						-- very loose						
		2-1-1	2									
		1-2-1	3									
		2-2-2	4									
						-- loose						
10		3-3-3	6			BORING TERMINATED AT 10.0 FT.						
15												
20												
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-2** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): N.E.
DATE OF READING: 4/10/15
EST. SHGWT (ft): 8

DATE STARTED: 4/10/15
DATE FINISHED: 4/10/15
DRILLED BY: ORL - KR/DW
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 loose light brown fine SAND [SP]						
		2-2-2	4			-- shade lighter						
		1-2-1	3									
5		2-2-2	4			-- very light brown						
		2-1-2	3									
		2-2-3	5	▽		-- loose						
		2-3-3	6			Loose light orange brown clayey fine SAND [SC]						
10						BORING TERMINATED AT 10.0 FT.						
15												
20												
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-3** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): N.E.
DATE OF READING: 4/9/15
EST. SHGWT (ft): 8

DATE STARTED: 4/9/15
DATE FINISHED: 4/9/15
DRILLED BY: ORL - KR/DW
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 loose brown fine SAND [SP]						
		1-1-2	3									
		1-2-1	3			-- very light brown						
5		2-1-2	3									
		2-2-2	4									
		2-2-2	4	▽		-- light brown						
		2-3-3	6			Loose light orange brown clayey fine SAND [SC]						
10						BORING TERMINATED AT 10.0 FT.						
15												
20												
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
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PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-4** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): N.E.
DATE OF READING: 4/13/15
EST. SHGWT (ft): >6

DATE STARTED: 4/13/15
DATE FINISHED: 4/13/15
DRILLED BY: ORL - JB/BP/SP
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 loose brown to light brown fine SAND [SP]						
		2-2-2	4			-- light brown						
		2-2-2	4									
5		2-3-3	6			-- loose, shade lighter -- gray						
		4-4-6	10									
		6-5-5	10									
		5-5-6	11			-- medium dense						
10						BORING TERMINATED AT 10.0 FT.						
15												
20												
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-5** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/10/15
WATER TABLE (ft):	9	DATE FINISHED:	4/10/15
DATE OF READING:	4/10/15	DRILLED BY:	ORL - JB/JC/JB
EST. SHGWT (ft):	6	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 loose dark brown fine SAND [SP]						
		2-2-2	4									
		2-3-3	6			-- loose, brown						
5		3-3-3	6	▽		-- gray light brown						
		3-3-4	7									
		5-5-6	11	▼		Medium dense gray orange brown clayey fine SAND [SC]						
10		5-6-6	12			BORING TERMINATED AT 10.0 FT.						
15												
20												
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-1** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/9/15
WATER TABLE (ft):	19	DATE FINISHED:	4/9/15
DATE OF READING:	4/9/15	DRILLED BY:	ORL - JB/JC/JB
EST. SHGWT (ft):	>10	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						Loose brown fine SAND [SP]						
		2-3-2	5									
		2-2-2	4			-- very loose						
5		2-1-2	3			-- orange brown						
		2-2-2	4									
		2-2-2	4									
		1-1-2	3									
10												
						-- loose, gray brown						
		3-3-3	6				2	8				
15												
				▼		-- medium dense						
20		5-6-7	13									
						-- gray						
25		7-8-8	16			BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-2** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/9/15
WATER TABLE (ft):	16	DATE FINISHED:	4/9/15
DATE OF READING:	4/9/15	DRILLED BY:	ORL - JB/JC/JB
EST. SHGWT (ft):	>10	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						Loose light brown fine SAND [SP]						
		2-2-3	5				3	3				
		2-2-3	5									
5		2-1-2	3			-- very loose, shade lighter						
		2-2-2	4									
		3-3-3	6			-- loose						
10		3-3-3	6									
		4-3-4	7	▼								
15						-- trace clay						
		3-4-5	9									
20						-- medium dense						
		6-6-7	13									
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.10

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-3** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/9/15
WATER TABLE (ft):	18	DATE FINISHED:	4/9/15
DATE OF READING:	4/9/15	DRILLED BY:	ORL - JB/JC/JB
EST. SHGWT (ft):	>10	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 loose brown fine SAND [SP]						
		2-2-2	4									
		2-3-2	5			-- loose, orange brown						
5						-- very loose						
		1-2-1	3									
		2-1-2	3									
		2-3-3	6			-- loose	3	3				
		3-2-3	5									
10												
						-- brown						
		2-3-3	6									
15				▼								
						-- gray light brown, trace clay						
		4-4-4	8									
20												
						-- medium dense, shade lighter						
		5-7-6	13									
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.11

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-4** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): 21
DATE OF READING: 4/9/15
EST. SHGWT (ft): 8

DATE STARTED: 4/9/15
DATE FINISHED: 4/9/15
DRILLED BY: ORL - JB/JC/JB
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						Loose brown fine SAND [SP]						
		2-3-3	6									
		3-2-3	5									
5						-- very loose, light brown						
		1-1-2	3									
		2-2-3	5			-- loose						
		2-3-2	5	▽								
						Loose orange brown clayey fine SAND [SC]						
10		2-3-3	6				15	10				
15		3-4-4	8									
						Loose light brown fine SAND [SP]						
20		4-5-5	10	▼								
						-- medium dense, gray brown, trace clay						
25		6-8-9	17									
						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.12

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-5** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/9/15
WATER TABLE (ft):	22	DATE FINISHED:	4/9/15
DATE OF READING:	4/9/15	DRILLED BY:	ORL - KR/DW
EST. SHGWT (ft):	>10	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 loose brown fine SAND [SP]						
		3-2-1	3									
		1-1-1	2									
5		1-1-1	2			-- light orange brown						
		1-1-1	2									
		1-1-1	2									
10		1-1-2	3									
		2-2-2	4									
15						-- medium dense, light mixed, orange brown						
		7-8-8	16				3	6				
20				▼								
		6-6-8	14			Medium dense orange gray clayey fine SAND [SC]						
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-6** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): 18
DATE OF READING: 4/10/15
EST. SHGWT (ft): >10

DATE STARTED: 4/10/15
DATE FINISHED: 4/10/15
DRILLED BY: ORL - KR/DW
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 loose light brown fine SAND [SP]						
		2-2-1	3									
		1-2-1	3									
5		1-2-1	3									
		1-1-1	2			-- very light brown						
		1-2-2	4									
		2-3-3	6			-- loose	2	4				
10												
						-- light brown						
		3-3-4	7									
15				▼								
						Medium dense very light brown silty fine SAND [SM]						
20		5-6-6	12									
						Medium dense light orange, gray & brown clayey fine SAND [SC]						
25		6-7-9	16			BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-7** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/9/15
WATER TABLE (ft):	20	DATE FINISHED:	4/9/15
DATE OF READING:	4/9/15	DRILLED BY:	ORL - KR/DW
EST. SHGWT (ft):	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 loose brown fine SAND [SP]						
		2-2-1	3			-- mixed, brown						
		1-1-1	2									
5		2-1-1	2	▽								
		2-1-1	2			Very loose orange brown clayey fine SAND [SC]	17	12				
		2-2-3	5			-- loose						
10		3-3-4	7									
						Loose brown fine SAND [SP]						
15		3-4-6	10									
						Loose light gray clayey fine SAND [SC]						
20		5-4-5	9	▼								
						Medium dense light orange brown silty fine SAND [SM]						
25		9-10-9	19			BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-8** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): 22
DATE OF READING: 4/9/15
EST. SHGWT (ft): >10

DATE STARTED: 4/9/15
DATE FINISHED: 4/9/15
DRILLED BY: ORL - KR/DW
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 loose brown fine SAND [SP]						
		2-2-1	3			-- light brown						
		1-1-1	2									
5		2-1-2	3				3	4				
		1-2-2	4			-- very light brown						
		2-4-3	7			-- loose						
		3-3-4	7			-- light brown						
10												
						-- brown						
		3-4-4	8									
15												
						-- medium dense, shade darker						
		6-6-7	13									
20				▼								
						-- loose, very light brown						
		4-5-5	10									
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-9** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft): N.S. DATE STARTED: 4/9/15
WATER TABLE (ft): 20 DATE FINISHED: 4/9/15
DATE OF READING: 4/9/15 DRILLED BY: ORL - KR/DW
EST. SHGWT (ft): 9 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 loose brown fine SAND [SP]						
		2-1-1	2			-- light brown						
		1-1-1	2									
5		1-1-2	3			-- shade lighter						
		1-2-1	3			-- very light brown						
		1-2-2	4	▽								
		3-4-3	7			-- loose						
10						Medium dense light brown clayey fine SAND [SC]						
		4-7-8	15				21	12				
15						-- loose, very light gray						
		5-6-4	10	▼								
20						Medium dense very light orange brown silty fine SAND [SM]						
		11-9-10	19									
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.17

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-10** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/10/15
WATER TABLE (ft):	17	DATE FINISHED:	4/10/15
DATE OF READING:	4/10/15	DRILLED BY:	ORL - KR/DW
EST. SHGWT (ft):	10	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 loose light brown fine SAND [SP]						
		2-2-2	4									
						-- shade lighter						
		1-1-1	2									
5						-- very light brown						
		1-2-1	3									
		1-2-1	3									
						-- loose						
		2-3-2	5									
10		2-3-3	6	▽								
						Medium dense light brown clayey fine SAND [SC]						
15		6-8-8	16				34	18				
				▼		-- orange gray brown						
20		4-7-10	17									
						Medium dense light orange brown silty fine SAND [SM]						
25		6-6-9	15			BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.18

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-11** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 13
DATE OF READING: 4/10/15
EST. SHGWT (ft): 4

DATE STARTED: 4/10/15
DATE FINISHED: 4/10/15
DRILLED BY: ORL - KR/DW
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 loose brown fine SAND [SP]						
		2-1-2	3									
						-- light brown						
		1-1-1	2	▽								
5						Very loose light orange brown clayey fine SAND [SC]						
		2-2-2	4				16	8				
						-- loose						
		3-3-3	6									
		3-3-4	7									
		3-3-2	5			Loose light brown fine SAND [SP]						
10												
				▼		-- very light brown						
		3-3-4	7									
15												
						-- very loose						
		2-2-2	4									
20												
						-- loose						
		3-4-5	9									
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.19

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-12** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 15
DATE OF READING: 4/13/15
EST. SHGWT (ft): 6

DATE STARTED: 4/13/15
DATE FINISHED: 4/13/15
DRILLED BY: ORL - JB/BP/SP
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 loose gray brown fine SAND [SP]						
		1-2-1	3									
		2-2-1	3									
5						-- light gray						
		2-1-2	3	▽								
		2-3-3	6			-- loose						
		4-5-6	11			Medium dense gray brown clayey fine SAND [SC]						
10		6-7-8	15			-- orange brown						
						-- light orange brown						
15		9-11-11	22	▼			16	13				
						Medium dense light orange brown fine SAND with silt [SP-SM]						
20		16-12-10	22									
						-- gray light brown						
25		11-11-13	24			BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.20

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-13** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/13/15
WATER TABLE (ft):	9	DATE FINISHED:	4/13/15
DATE OF READING:	4/13/15	DRILLED BY:	ORL - KR/DW
EST. SHGWT (ft):	6	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						Loose dark brown fine SAND [SP]						
		3-2-3	5									
		2-2-3	5									
5		3-5-4	9	▽		-- light brown						
		4-4-3	7				2	4				
		3-3-3	6	▼								
10		3-2-2	4			-- very loose						
						-- loose, shade lighter						
15		3-4-4	8									
						-- medium dense, very light brown						
20		7-8-7	15			BORING TERMINATED AT 20.0 FT.						
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-14** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): 9.5
DATE OF READING: 4/13/15
EST. SHGWT (ft): 7

DATE STARTED: 4/13/15
DATE FINISHED: 4/13/15
DRILLED BY: ORL - KR/DW
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						Loose dark brown fine SAND [SP]						
		3-3-3	6									
		2-2-2	4			-- very loose, light brown						
5						-- loose						
		2-3-3	6									
		3-2-2	4	▽		-- very loose						
		3-3-3	6			-- loose						
		2-2-2	4	▼		-- very loose, light brown, trace silt	5	18				
10												
						-- loose, very light gray						
15		2-3-3	6									
						Medium dense light orange gray brown clayey fine SAND [SC]						
20		6-7-7	14			BORING TERMINATED AT 20.0 FT.						
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.22

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-15** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/13/15
WATER TABLE (ft):	9	DATE FINISHED:	4/13/15
DATE OF READING:	4/13/15	DRILLED BY:	ORL - KR/DW
EST. SHGWT (ft):	6.5	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 loose dark brown fine SAND [SP]						
		2-3-1	4									
						-- light brown						
		1-2-2	4									
5						-- loose						
		2-2-3	5									
				▽								
		2-3-3	6			-- shade darker						
		3-4-3	7									
				▼		-- very loose, light brown						
10		3-2-2	4									
						Loose very light brown clayey fine SAND [SC]						
15		2-3-4	7				29	20				
						Medium dense very light gray silty fine SAND [SM]						
		5-6-6	12									
20						BORING TERMINATED AT 20.0 FT.						
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
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PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-16** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): 7.5
DATE OF READING: 4/10/15
EST. SHGWT (ft): 5

DATE STARTED: 4/10/15
DATE FINISHED: 4/10/15
DRILLED BY: ORL - KR/DW
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 loose dark brown fine SAND [SP]						
		2-2-2	4									
		2-2-2	4			-- light brown						
5		2-4-4	8	▽		-- loose, shade lighter	3	3				
		4-5-6	11			-- medium dense, very light brown						
		4-4-3	7	▼		-- loose, light brown						
		2-2-3	5									
10						-- medium dense, very light gray						
		6-7-6	13									
15						-- trace silt						
		5-8-8	16									
20						BORING TERMINATED AT 20.0 FT.						
25												
30												

W-08659.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.24

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-17** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, 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): 12
DATE OF READING: 4/9/15
EST. SHGWT (ft): 7

DATE STARTED: 4/9/15
DATE FINISHED: 4/9/15
DRILLED BY: ORL - KR/DW
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						Loose dark brown fine SAND [SP]						
		3-3-2	5									
		2-2-1	3			-- very loose, brown						
5		2-3-4	7			-- loose, light brown						
		4-4-4	8	▽		-- very light brown						
		5-6-6	12			-- medium dense						
10		4-6-7	13			Medium dense light brown clayey fine SAND [SC]	21	14				
				▼								
15		6-7-7	14									
						Loose light brown silty fine SAND [SM]						
20		3-3-3	6			BORING TERMINATED AT 20.0 FT.						
25												
30												

W-08659.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.25

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

BORING I.D.: **RS-18** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

G.S. ELEVATION (ft): N.S. DATE STARTED: 4/13/15
WATER TABLE (ft): 11 DATE FINISHED: 4/13/15
DATE OF READING: 4/13/15 DRILLED BY: ORL - JB/BP/SP
EST. SHGWT (ft): 8 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						Loose dark gray brown fine SAND [SP]						
		3-3-3	6									
		3-4-5	9			-- brown						
5						-- medium dense, trace clay, light gray brown						
		5-7-15	22									
		12-12-10	22									
		8-8-9	17	▽			5	2				
10		8-8-8	16	▼								
15		5-6-8	14									
20		4-5-7	12			BORING TERMINATED AT 20.0 FT.						
25												
30												

W-08659.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.26

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-19** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/10/15
WATER TABLE (ft):	9	DATE FINISHED:	4/10/15
DATE OF READING:	4/10/15	DRILLED BY:	ORL - JB/JC/JB
EST. SHGWT (ft):	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 loose brown fine SAND [SP]						
		2-2-2	4									
		2-2-2	4			-- light brown						
5		3-3-5	8	▽		-- loose, gray light brown						
		5-8-8	16			Medium dense gray orange brown clayey fine SAND [SC]	20	9				
		7-7-6	13	▼		-- orange brown						
10		6-5-6	11			Medium dense gray brown silty fine SAND [SM]						
						Loose gray brown fine SAND [SP]						
15		4-4-5	9									
		5-7-9	16			-- medium dense						
20						BORING TERMINATED AT 20.0 FT.						
25												
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1500104.0000
REPORT NO.:	1222610
PAGE:	B-2.27

PROJECT: MAITLAND CONCOURSE NORTH, MULTI-FAMILY RESIDENTIAL
511 W. MAITLAND BLVD.
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **RS-20** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 RANGE: 29

CLIENT: RELATED DEVELOPMENT + BPL MAITLAND CONCOURSE NORTH, LLC

LOCATION: SEE BORING LOCATION PLAN

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

G.S. ELEVATION (ft):	N.S.	DATE STARTED:	4/10/15
WATER TABLE (ft):	9	DATE FINISHED:	4/10/15
DATE OF READING:	4/10/15	DRILLED BY:	ORL - JB/JC/JB
EST. SHGWT (ft):	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						Loose dark brown fine SAND [SP]						
		2-2-3	5									
		3-2-3	5			-- brown, with roots						
5		3-3-5	8	▽								
		8-8-12	20			Medium dense gray brown clayey fine SAND [SC]	19	8				
		10-8-8	16	▼								
10		8-10-9	19									
						Medium dense gray brown fine SAND [SP]						
15		5-8-9	17									
		6-8-9	17									
20						BORING TERMINATED AT 20.0 FT.						
25												
30												

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UNIVERSAL ENGINEERING SCIENCES

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

UNIVERSAL
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Important Information about Your

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 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 your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the 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.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of 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,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- 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 study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the 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 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 construction recommendations included in your report. *Those 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 recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower 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. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing 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 Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors 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 contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors 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 contractors do not 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.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental 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 geoenvironmental 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, a number of 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 ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE THE GEOPROFESSIONAL BUSINESS ASSOCIATION

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

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CONSTRAINTS & RESTRICTIONS

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

WARRANTY

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

UNANTICIPATED SOIL CONDITIONS

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

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

CHANGED CONDITIONS

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

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

MISINTERPRETATION OF SOIL ENGINEERING REPORT

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

CHANGED STRUCTURE OR LOCATION

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

USE OF REPORT BY BIDDERS

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

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

STRATA CHANGES

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

OBSERVATIONS DURING DRILLING

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

WATER LEVELS

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

LOCATION OF BURIED OBJECTS

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

TIME

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

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