UNIVERSAL ENGINEERING SCIENCES

PRELIMINARY SUBSURFACE EXPLORATION
Enclave of Satellite Beach
NWC Shearwater Parkway & State Route A1A
Satellite Beach, Brevard County, Florida
Universal Project No. 0330.1700138.0000

December 29, 2017

PREPARED FOR:
Woodshire-Brevard, LLC
c/o Coldwell Banker Commercial Properties
232 Fifth Avenue
Indialantic, Florida 32903

PREPARED BY:
Universal Engineering Sciences, Inc.
820 Brevard Avenue
Rockledge, Florida 32955
(321) 638-0808
Woodshire-Brevard, LLC
C/O Coldwell Banker Commercial Properties
232 Fifth Avenue
Indialantic, Florida 32903

Attention: Mr. Mike Jaffe

Reference: Preliminary Subsurface Exploration
Enclave of Satellite Beach
NWC Shearwater Parkway & State Route A1A
Satellite Beach, Brevard County, Florida
Universal Project No. 0330.1700138.0000

Dear Mr. Jaffe:

Universal Engineering Sciences, Inc. (Universal) has completed a preliminary subsurface exploration at the above referenced site in Satellite Beach, Brevard County, Florida. Our exploration was authorized by Mr. Mark Fontaine of Woodshire-Brevard, LLC and was conducted as outlined in Universal’s Proposal No. 0330.117.00022. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed 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 typical wet season high groundwater levels at the boring locations, general comments concerning anticipated soil support characteristics for typical residential buildings and pavements, suitability of excavated materials for use as fill, and general comments concerning the anticipated infiltration characteristics of the retention basin subsoils.

Please note that occasional cemented rock (coquina) layers were encountered below depths of approximately 5 to 12 feet bsl at all of the boring locations, perhaps forming dense boulders and/or ledges. Shallower rock layers may exist between boring locations and within unexplored areas of the site. Where cementation is the greatest these layers may hinder installation of auger cast piles and/or excavation with typical backhoe or similar equipment.

We appreciate the opportunity to have worked with you on this project and look forward to a continued association.

December 29, 2017
Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Sincerely yours,

Brad Faucett, M.S. P.E.
Regional Engineer
Florida Professional Engineer No. 33123

1 – Addressee (by e-mail)

UESDOCS #1519793
APPENDICES

Key to Boring Logs ................................................................. Appendix A
Boring Logs ........................................................................ Appendix A

EXHIBITS

GBA Document ..................................................................... Exhibit 1
1.0 INTRODUCTION

Universal Engineering Sciences, Inc. (Universal) has completed a preliminary subsurface exploration for the proposed Enclave of Satellite Beach residential complex in Satellite Beach, Brevard County, Florida. Our exploration was authorized by Mr. Mark Fontaine of Woodshire-Brevard, LLC and was conducted as outlined in Universal's Proposal No. 0330.117.00022. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

2.0 PROJECT DESCRIPTION

Universal understands from tentative information provided by the client, that the proposed project will include the construction of a residential complex, with various low rise residences, mid-rise residential condominium buildings, and paved parking lots & drives in Satellite Beach, Florida. We assume that the first floor levels of the proposed buildings will be roughly 1 to 3 feet above existing grades. The stormwater runoff from the new impervious surfaces will be retained within proposed "wet" retention basins to be located within the central sections of the site.

For additional information concerning the configuration of the proposed project elements, please see the attached Figure No. 3, "Boring Location Diagram".

Please note that our subsurface exploration was preliminary in nature and conducted to acquire general subsurface information only. Once specified site configuration, building detail and structural and traffic loading information are available a final subsurface exploration should be performed.

3.0 PURPOSE

The purposes of this exploration were:

- to explore the subsurface conditions at general locations and depths as requested by the client and
- to provide our estimates of the typical wet season high groundwater levels at the boring locations and
- to provide general comments concerning the anticipated soil support characteristics for typical low-rise residential construction, mid-rise residential structures, and pavements
- to provide general comments concerning the suitability of excavated materials for use as fill, and
- to provide general comments concerning the anticipated infiltration characteristics of the retention basin subsoils.
4.0 SITE DESCRIPTION

The proposed Enclave of Satellite Beach complex will be located within Section 26, Township 26 south, Range 37 East in Brevard County, Florida. More specifically, the project consists of a total of about 27.4 acres of improved land situated on the northwest corner (NWC) of the intersection of State Route (SR) A1A with Shearwater Parkway. It is currently developed with mostly vacant residential structures, a public park, paved interior roads and associated infrastructure. The subject property was historically undeveloped land from at least 1943 until construction upon it of the presently existing residential complex between 1951 and 1958.

At the time of our exploration, the subject property was developed with a residential complex that was mostly vacant and in overall disrepair. The complex consisted of individual duplex and single family dwelling units, a public park and playground, interior paved roadways and utility infrastructure.

4.1 SOIL SURVEY

A majority of the soils within the general site area are mapped as Galveston-Urban land complex (Ga) according to the Brevard County Soil Survey (BCSS), dated 1974. Galveston-Urban land complex (Ga) is described as well drained sandy soils that consist of reworked and leveled sandy materials where 25 to 40 percent of the surface area is covered with buildings or pavements. A copy of a portion of the BCSS is included as Figure No. 1.

4.2 TOPOGRAPHY

According to information obtained from the United States Geological Survey (USGS) Tropic, Florida 7.5-minute topographic quadrangle map, dated 1949 and photo-revised 1980, average ground surface elevation within the site area is approximately +10 to +15 feet National Geodetic Vertical Datum (NGVD). A copy of the relevant portion of the USGS map is included as Figure No. 2.

5.0 SCOPE OF SERVICES

The services conducted by Universal during our preliminary subsurface exploration program are as follows:

- Drill three (3) Standard Penetration Test (SPT) borings within the proposed low-rise residential areas to a depth of 15 feet below the existing land surface (bls).
- Drill three (3) SPT borings within the proposed mid-rise condominium building areas to a depth of 50 feet below the existing land surface (bls).
- Drill two (2) SPT borings within the proposed central retention basin footprints to a depth of 20 feet below the existing land surface (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 typical wet season high groundwater levels.
• Conduct soil gradation tests on selected soil samples obtained in the field to help determine their engineering properties.

• Assess the existing soil conditions with respect to the proposed construction.

• Preparing a geotechnical engineering report which documents the results of our preliminary subsurface exploration and laboratory testing program with analysis and general comments.

6.0 LIMITATIONS

Please note that this report is based on a preliminary subsurface exploration program with the scope of services, general boring locations and depths as requested by the client. The information submitted in this report is based on data obtained from the soil borings performed at the locations indicated on the Boring Location Plans and from other information as referenced. This report has not been prepared to meet the full needs of design professionals, contractors, or any other parties, and any use of this report by them without the guidance of the soil and foundation engineer who prepared it constitutes improper usage which could lead to erroneous assumptions, faulty conclusions, and other problems.

This report does not reflect any variations which may occur across the site. The nature and extent of such variations may not become evident until the course of future explorations or actual construction. If variations then become evident, it will be necessary for re-evaluation of the recommendations in this report after performing on-site observations during the construction period and noting the characteristics of any variations. This report does not reflect the full vertical or horizontal extents of the occasional cemented rock layers encountered at this site; and therefore, this report should not be used for estimating such items as cut and fill quantities.

Borings for a typical geotechnical report are widely spaced and generally not sufficient for reliably detecting the presence of isolated, anomalous surface or subsurface conditions, or reliably estimating unsuitable or suitable material quantities. Accordingly, Universal does not recommend relying on our boring information to negate presence of anomalous materials or 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 such anomalous conditions or estimate such quantities. Therefore, Universal will not be responsible for any extrapolation or use of our data by others beyond the purpose(s) for which it is applicable or intended.

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

For a further description of the scope and limitations of this report please review the document attached within Exhibit 1, "Important Information About Your Geotechnical Engineering Report", prepared by GBA/The Geoprofessional Business Association.
7.0 FIELD METHODOLOGIES

7.1 STANDARD PENETRATION TEST BORINGS

The eight (8) SPT borings, designated B1 through B8 on the attached Figure No. 3, were performed in general accordance with the procedures of ASTM D 1586 (Standard Method for Penetration Test and Split-Barrel Sampling of Soils). The SPT drilling technique involves driving a standard split-barrel sampler into the soil by a 140 pound hammer, free falling 30 inches. The number of blows required to drive the sampler 1 foot, after an initial seating of 6 inches, is designated the penetration resistance, or N-value, an index to soil strength and consistency.

The soil samples recovered from the split-barrel sampler were visually inspected and classified in general accordance with the guidelines of ASTM D 2487 (Standard Classification of Soils for Engineering Purposes [Unified Soil Classification System]).

The SPT soil borings were performed with a CME 55 truck mounted drilling rig. Universal located the test borings in the field by using the provided conceptual site plan and by plotting in the field with a hand held GPS receiver. No survey control was provided on-site, and our boring locations should be considered only as accurate as implied by the methods of measurement used. The approximate boring locations are shown on the attached Figure No. 3.

8.0 LABORATORY METHODOLOGIES

8.1 PARTICLE SIZE ANALYSIS

We completed #200 sieve particle size analyses on six (6) representative soil samples. These samples were tested according to the procedures listed ASTM D 1140 (Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieve). In part, ASTM D 1140 requires a thorough mixing the sample with water and flushing it through a No. 200 sieve until all of the particles smaller than the sieve size leave the sample.

The percentage of the material finer than the No. 200 sieve helps determines the textural nature of the soil sample and aids in evaluating its engineering characteristics. The percentage of materials passing the #200 sieve is shown on the attached boring logs.

9.0 SOIL STRATIGRAPHY

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 stabilized groundwater levels are shown on the boring logs included in Appendix A. The Key to Boring Logs, Soil Classification Chart is also included in Appendix A. 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 on the following Table I. For more detailed soil profiles, please refer to the attached boring logs.
<table>
<thead>
<tr>
<th>Depth Encountered (feet, bils)</th>
<th>Approximate Thickness (feet)</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>5 to 12</td>
<td>Fine sands with varying amounts of broken shell [SP], loose to medium dense. At some boring locations these surficial strata are overlain by thin layers of fine sands with silt [SP-SM] (fill/topsoil).</td>
</tr>
<tr>
<td>5 to 12</td>
<td>13 to 14</td>
<td>Fine sands with silt, broken shell and occasional cemented rock layers [SP-SM]; medium dense to very dense.</td>
</tr>
<tr>
<td>17</td>
<td>33+</td>
<td>Highly interlayered strata with varying amounts of broken shell and consisting of fine sands with clay [SP-SC], fine sands [SP], fine sands with silt [SP-SM], and silty fine sands [SM]; medium dense to very dense.</td>
</tr>
</tbody>
</table>

NOTE: [] denotes Unified Soil Classification system designation. + indicates strata encountered at boring termination, total thickness undetermined.

10.0 GROUNDWATER CONDITIONS

10.1 EXISTING GROUNDWATER CONDITIONS

We measured the water levels in the SPT boreholes on December 26, 2017 after the groundwater was allowed to stabilize. The groundwater levels are shown on the attached boring logs. The groundwater level depths ranged from 5.3 feet bils at boring location B3 to 7.6 feet bils at boring location B6. 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.

10.2 TYPICAL WET SEASON HIGH GROUNDWATER LEVEL

The typical wet season high groundwater level is defined as the highest groundwater level sustained for a period of 2 to 4 weeks during the "wet" season of the year, for existing site conditions, in a year with average normal rainfall amounts. Based on historical data, the rainy season in Brevard County, Florida is between June and October of the year. In order to estimate the wet season water level at the boring locations, many factors are examined, including the following:

a. Measured groundwater level
b. Drainage characteristics of existing soil types
c. Season of the year (wet/dry season)
d. Current & historical rainfall data (recent and year-to-date)
e. Natural relief points (such as lakes, rivers, swamp areas, etc.)
f. Man-made drainage systems (ditches, canals, etc.)
g. Distances to relief points and man-made drainage systems
h. On-site types of vegetation
i. Area topography (ground surface elevations)
Groundwater level readings were taken on December 26, 2017. According to data from the Southeast Regional Climate Center and the National Weather Service, the total rainfall in the previous month of November for Central Brevard County was approximately 2½ inches, about at the normal levels for November. Year-to-date rainfall for 2017 through December 26th was approximately 65½ inches, roughly 14 inches above the normal levels for this time period.

Based on this information and factors listed above, we estimate that the typical wet season high groundwater levels at the SPT boring locations will be approximately at the existing measured levels. Please note, however, that peak stage elevations immediately following various intense storm events, may be somewhat higher than the estimated typical wet season levels.

11.0 LABORATORY RESULTS

11.1 PARTICLE SIZE ANALYSIS

The soil samples submitted for analysis were classified as fine sands [SP] and fine sands with silt [SP-SM]. The percentage of soil sizes passing the #200 sieve size are shown on the boring logs at the approximate depth sampled.

12.0 ANALYSIS AND GENERAL COMMENTS

12.1 PROPOSED BUILDING AREAS

The removal of site vegetation, existing foundations, utilities, slabs, organic topsoils, and roots; along with other construction activities; will tend to further loosen surficial soils to various depths. To provide a homogeneous, compacted, sandy soil system underneath the proposed foundations and floor slabs for the proposed buildings, densification of at least the upper 2 feet of the existing surficial, loose soils and subsequent additional fill soils will be necessary. This should create a soil mat capable of dissipating the building loads over any remaining loose strata at depth.

We believe that this can be effectively accomplished using conventional site preparation procedures including a comprehensive root raking and stripping procedure to remove vegetation, root mats, debris, foundations, slabs, and organic topsoils; and then an extensive proof-rolling and densification program for the surficial soils and subsequent structural fill. Assuming that such procedures are properly performed, we anticipate that conventional, shallow spread footing foundations may be used to support conventional one to three story residential construction.

A similar methodology of surficial stripping & densification will also need to be performed for the support of the ground floor slabs of the mid-rise condominium buildings. However, the foundation loads typically associated with such structures might make surficial foundations excessively large & inefficient; particularly if they have to resist large uplift loadings during intense storm events.

Therefore, we suspect that the most expedient way to support the structural frames of the proposed mid-rise buildings would be the use of auger cast piling embedded into the underlying medium dense to dense sandy formations between the depths of approximately 25 to 40 feet bls. Auger cast-in-place piles are constructed by drilling into the soil with a crane operated
hollow core auger which is pulled up in short lifts while cement grout is pumped under pressure through the auger stem.

Depending upon the results of future SPT borings and other factors, we anticipate that 14 inch diameter auger cast piles would have allowable compressive capacities of between 60 to 90 tons each within the 25 to 40 feet bls embedment zone.

After building configurations and anticipated structural loadings are better known, additional test borings should be performed, on an individual building basis, so that specific recommendations for foundation design parameters can be formulated.

12.2 PROPOSED PAVEMENT AREAS

An extensive stripping of surficial roots, organic topsoils, foundations, existing pavements, utilities, and vegetation; and a densification of the loose surficial sands, along with subsequent select fill necessary to reach final grade levels, will be required in all roadway areas, in order to both increase subgrade capacity and to limit subsequent settlements due to traffic vibrations. Any local zones of soft or yielding surficial soil should be compacted or removed and replaced with structural fill prior to adding any new fill in the pavement areas.

We recommend designing pavements with at least 18 inches of clearance between the bottom of the pavement concrete or base courses and the estimated typical wet season high groundwater level. A thorough testing and inspection program should be incorporated during the pavement construction.

After roadway elevations/configurations, and anticipated traffic loadings are better known, additional test borings should be performed so that specific recommendations for pavement sections can be formulated.

12.3 PROPOSED RETENTION AREAS

We understand that most of the stormwater runoff from impervious surfaces to be developed at this site will be collected within proposed "wet" retention basins to be located within the central sections of the project area. Additional stormwater retention may be supplied by a series of shallow "dry" swales scattered across the project area.

The hydraulic capacity of storm water retention areas is principally a function of the ability of the surface soil to receive and percolate the storm water runoff. Upon reaching the groundwater table or a restrictive layer, the storm water runoff begins to mound. The amount and rate of rise in the recharge mound depends on several factors, including the thickness and permeability of the receiving stratum, the elevation of the groundwater table, and the geometry of the loaded area.

A majority of the near surface soils across the project area appear to be relatively permeable fine sands [SP] and fine sands with silt [SP-SM] to depths of up to 45 feet bls. Depending upon the final depth of the proposed ponds, and other factors, the permeabilities of the various strata may have a strong influence on such factors as the background groundwater seepage of the proposed central wet ponds through the basin bottoms during periods of low pond water levels.
We estimate that the site surficial sands (above the groundwater table) would exhibit a fillable porosity of approximately N = 25%. For any dry retention systems to be used at this project, we recommend that the site be filled/contoured to allow pond bottom levels of at least 1 foot above the estimated seasonal high groundwater levels.

The actual infiltration rate of retention pond subsoils is influenced by the coefficient of permeability as well as several factors, including the elevation of the pond bottom, water level in the pond, the elevation of the wet season water table, and the confining layer. These factors must be accounted for in an appropriate groundwater model to determine the infiltration rate of a given soil stratum. We recommend the designer use a commercial software program such as "Ponds" or "Modret" in order to evaluate these ponds.

After the configuration(s) of the proposed retention pond(s) is better defined, Universal should be allowed to review the proposed plans, so that recommendations for any necessary additional borings and/or laboratory testing can be formulated.

12.4 SUITABILITY OF THE SITE SOILS FOR USE AS FILL MATERIALS

Structural fill should be densified to at least 95 percent of the Modified Proctor test maximum dry density of the soil (ASTM D 1557) and tested for compaction and approved before the placement of subsequent lifts. A discussion of the types of soil typically encountered within the general area of the site and their requirements for reuse as fill is provided below. Please note that the soil type designations listed below (e.g. A, B, C, D, E) are based on guidelines developed by Universal and should not be confused with similar type designators used by other entities.

**TYPE A** - “Clean” fine sands [SP] which have less than 5 percent soil fines are the most desirable for as engineered fill because they drain freely when excavated from beneath the groundwater table, and they are not as susceptible to moisture related instability. These soils may be placed and compacted as structural fill for support of any proposed foundations, floor slabs, or pavement areas.

**TYPE B** - Fine sands with silt/clay [SP-SM, SP-SC] which contain between 5 and 12 percent fines are good sources of engineered fill, but require some extra care during placement and compaction. The moisture content of these soils should not be higher than optimum during placement and compaction in order to avoid problems caused by moisture related instability. These soils drain fairly well, but may require dewatering prior to excavation or some stockpiling and aeration time when excavated from below the groundwater level. These soils may be placed and compacted similarly to “clean” fine sands.

**TYPE C** – Clayey/silty fine sands [SC, SM] which contain between 12 and 35 percent fines may also be used as structural fill, however, when encountered below the water table, these soils are very difficult to use due to their extreme sensitivity to water. Extensive/excessive efforts may be required to dry these materials to near optimum moisture content, as determined by the modified proctor test (ASTM D-1557), prior to compactive efforts becoming effective. Moisture control and densification is typically very difficult when using these soils; therefore, alternate methods may be necessary to achieve the required compaction.
TYPE D – Clays [SC-CH] and silts [SM-MH] which contain over 35 percent fines are not recommended for use as structural fill in this geographical region. If desired, special considerations can be made if use of these soils is absolutely necessary.

TYPE E – Organic (muck) [OH] soils are not recommended for structural fill due to their compressibility and extreme sensitivity to high moisture conditions. However, these materials might be useful as fill in non-structural areas and as “topsoils” within landscaping areas after being adjusted for pH and other factors.

If materials at this site are to be used as sources of borrow fill, then we recommend that the existing layers of Type A soils be stockpiled for later use as structural fill in areas that are difficult to compact or require a higher permeability rate. The Type B soils can also be used as structural fill but may require considerable drying before use. Such materials are much more moisture sensitive and much less permeable than clean fine sands and will also require a more rigid monitoring and testing program during placement and compaction.

Type A and B soils were typically encountered from the surface to a depth of up to 47 feet (near the maximum termination depth of the borings; 20 feet bsl).

Please note, however, that cemented (coquina) rock layers were encountered below depths of 5 to 12 feet bsl at all of the boring locations; perhaps forming dense boulders and/or ledges. Shallower rock layers may exist between boring locations and within unexplored areas of the site. Where cementation is the greatest these layers may hinder installation of auger cast piles and excavation with typical backhoes or similar equipment. In addition, the coquina rock layers cannot be used as structural fill unless they are crushed down to sizes of less than ½ inch in diameter.

13.0 CLOSURE

We appreciate this opportunity to be of service as your geotechnical consultant on this phase of the project and look forward to providing follow up explorations and geotechnical engineering analyses as the project progresses through the design phase. If you have any questions concerning this report or when we may be of any further service, please contact us.

* * * * * * *
FIGURES
Approximate Boring Location
Figure is based on a drawing provided by the client.
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>BLOWS PER 6&quot; INCREMENT</th>
<th>N-VALUE</th>
<th>W.T.</th>
<th>SYMBOL</th>
<th>WELL DIAGRAM</th>
<th>DESCRIPTION</th>
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<td></td>
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</tr>
<tr>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>fine SAND with silt and traces of roots and gravel (Fill), brown, [SP-SM]</td>
</tr>
<tr>
<td>1-2-3</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>fine SAND with broken shell, grey, [SP]</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10</td>
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<td>15</td>
<td></td>
<td>53</td>
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<td>fine SAND with silt, broken shell, and occasional cemented rock layers, gray, [SP-SM]</td>
</tr>
<tr>
<td>20</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>BORING TERMINATED AT 15'</td>
</tr>
<tr>
<td>25</td>
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</table>
**UNIVERSAL ENGINEERING SCIENCES**

**BORING LOG**

**PROJECT:** Enclave of Satellite Beach  
Shearwater Parkway & SR A1A  
Satellite Beach, Florida

**CLIENT:**  
**LOCATION:** SEE BORING LOCATION PLAN  
**REMARKS:**

**BORING DESIGNATION:** B2  
**SECTION:**  
**TOWNSHIP:** SOUTH  
**RANGE:** EAST

**G.S. ELEVATION (ft):**  
**WATER TABLE (ft):** 5.5  
**DATE OF READING:** 12/28/2017  
**EST. W.S.W.T. (ft):**

**DATE STARTED:** 12/23/17  
**DATE FINISHED:** 12/23/17  
**DRILLED BY:** RP, MC  
**TYPE OF SAMPLING:**

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE</th>
<th>BLOWS PER 6&quot; INCREMENT</th>
<th>N/A VALUE</th>
<th>W.T.</th>
<th>SYMBOL</th>
<th>WELL DIAGRAM</th>
<th>DESCRIPTION</th>
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<td>fine SAND with silt and trace of roots, gravel, and broken shell (Fill), brown, [SP-SM]</td>
</tr>
<tr>
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<td>fine SAND with broken shell, grey, [SP]</td>
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<tr>
<td>2-3-5</td>
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<td>fine SAND with broken shell, brown, [SP]</td>
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<td>5-6-18</td>
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<tr>
<td>8-11-13</td>
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<td>fine SAND with silt, broken shell, and occasional cemented rock layers, gray, [SP-SM]</td>
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<tr>
<td>14-36-50</td>
<td>86</td>
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<td></td>
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<td>BORING TERMINATED AT 15'</td>
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</tbody>
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<table>
<thead>
<tr>
<th>K (IN/HR)</th>
<th>MC (%)</th>
<th>ORG. CONT. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td>DEPTH (FT)</td>
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<tr>
<td>-----------</td>
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-200 (%) | MC (%) | K (IN. HRS.) | ORG. CONT. (%) |
13.1 | 12.3 |   |   |
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G.S. ELEVATION (ft): 5.9
WATER TABLE (ft): 5.9
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DATE STARTED: 12/23/17
DATE FINISHED: 12/23/17
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**BORING LOG**

**PROJECT:** Enclave of Satellite Beach  
Shearwater Parkway & SR A1A  
Satellite Beach, Florida

**BOARING DESIGNATION:** B6  
**SECTION:** TOWNSHIP: SOUTH  
**RANGE:** EAST

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- BORING TERMINATED AT 50'

- silty fine SAND, gray. [SM]
# Universal Engineering Sciences

## Boring Log

**Project:** Enclave of Satellite Beach
Shearwater Parkway & SR A1A
Satellite Beach, Florida

**Client:**

**Location:** SEE BORING LOCATION PLAN

**Remarks:**

**Boring Designation:** B7

**Section:**

**Township:** SOUTH

**Range:** EAST

**G.S. Elevation (ft):**

**Water Table (ft):** 7.1

**Date of Reading:** 12/26/2017

**Date Started:** 12/22/17

**Date Finished:** 12/22/17

**Drilled By:** RP, MC

**Type of Sampling:**

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**Description:**

- Fine Sand with silt and traces of roots and clay lumps (Fill), brown, [SP-SM]
- Fine Sand, brown, [SP]
- Fine Sand with traces of broken shell, brown, [SP]
- Fine Sand with silt, broken shell, and occasional cemented rock layers, brown, [SP-SM]
- Fine Sand with broken shell, grey, [SP]

**Permeability:**

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<th>ORG. CONT. (%)</th>
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BORING TERMINATED AT 50'
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G.S. ELEVATION (ft):  
WATER TABLE (ft): 7.2  
DATE OF READING: 12/26/2017  
DATE STARTED: 12/22/17  
DATE FINISHED: 12/22/17  
DRILLED BY: RP, MC  
TYPE OF SAMPLING:  

K (%) ORG. CONT. (%)  
-269 (%) MC (%)
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| 55         |                       |         |      |        |              |             |
KEY TO BORING LOGS
SOIL CLASSIFICATION CHART

GROUP NAME AND SYMBOL

COARSE GRAINED SOILS

WELL-GRADED SANDS [SW]
POORLY-GRADED SANDS [SP]
POORLY-GRADED SANDS WITH SILT [SP-SC]
SILTY SANDS [SM]
CLAYEY SANDS [SC]
SILTY CLAYEY SANDS [SC-SM]

FINE GRAINED SOILS

WELL-GRATED GRAVELS [GW]
POORLY-GRATED GRAVELS [GP]
POORLY-GRATED GRAVELS WITH SILT [SP-GM]
SILTY GRAVELS [GM]
CLAYEY GRAVELS [GC]

INORGANIC SILTS SLIGHT PLASTICITY [ML]
INORGANIC SILTY CLAY LOW PLASTICITY [CL-ML]
INORGANIC CLAYS LOW TO MEDIUM PLASTICITY [CL]
INORGANIC SILT CLAY MEDIUM TO HIGH PLASTICITY [CL-ML]
INORGANIC CLAYS MEDIUM TO HIGH PLASTICITY [CL]
INORGANIC SILTS HIGH PLASTICITY [MH]
INORGANIC CLAYS HIGH PLASTICITY [CH]

HIGHLY ORGANIC SOILS

ORGANIC SILTS/CLAYS LOW PLASTICITY [OL]*
ORGANIC SILTS/CLAYS MEDIUM TO HIGH PLASTICITY [OL]*
PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS [PT]**

RELATIVE DENSITY
(SAND AND GRAVEL)
VERY LOOSE - 0 to 4 Blow/ft.
LOOSE - 5 to 10 Blow/ft.
MEDIUM DENSE - 11 to 30 Blow/ft.
DENSE - 31 to 50 Blow/ft.
VERY DENSE - more than 50 Blow/ft.

CONSISTENCY
(SILT AND CLAY)
VERY SOFT - 0 to 2 Blow/ft.
SOFT - 3 to 4 Blow/ft.
FIRM - 5 to 8 Blow/ft.
STIFF - 9 to 16 Blow/ft.
VERY STIFF - 17 to 30 Blow/ft.
HARD - more than 30 Blow/ft.

* CLASSIFICATION SYSTEM.
** LOCALLY MAY BE KNOWN AS MUCK.

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

APPENDIX A.1

NOTES:
F - DENOTES DYNAMIC CONE PENETROMETER (DCP) VALUE
R - DENOTES REFUSAL TO PENETRATION
P - DENOTES PENETRATION WITH ONLY WEIGHT OF DRIVE HAMMER
NWE - DENOTES GROUNDWATER TABLE NOT ENCOUNTERED
Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

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

Geotechnical-Engineering 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 given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared solely for the client. Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it in its entirety. Do not rely on an executive summary. Do not read selected elements only. Read this report in full.

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client’s goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure’s location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

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

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

This Report May Not Be Reliable

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

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

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If your geotechnical engineer has not indicated an “apply-by” date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the “Findings” Related in This Report Are Professional Opinions

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

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

This Report Could Be Misinterpreted

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

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals’ plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

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

Give Constructors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study — e.g., a “phase-one” or “phase-two” environmental site assessment — differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer’s services were designed, conducted, or intended to prevent uncontrolled migration of moisture — including water vapor — from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.

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