Subsurface Exploration and Geotechnical Engineering Report

American Muslim Leadership Center
Stormwater Area
Kissimmee, Osceola County, Florida
Native Geoscience Report No.: R0373.0

Prepared for:
American Muslim Leadership Center

Prepared by:
Native Geoscience, Inc.
Orlando, Florida

May 9, 2017

May 9, 2017

Imam Abufarah Helmi Elagha
Executive Director & Imam
American Muslim Leadership Center
4990 W. Irlo Bronson Memorial Highway
Kissimmee, Florida 34746

Re: Subsurface Exploration and Geotechnical Engineering
American Muslim Leadership Center Stormwater Area
Kissimmee, Osceola County, Florida
Native Geoscience Project No.: R0373.0

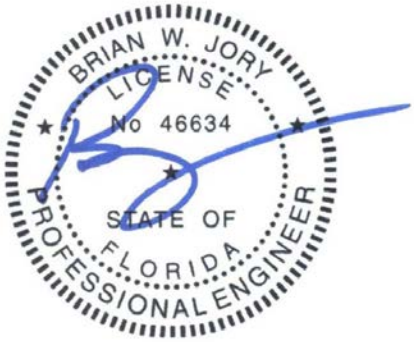
Dear Imam Abufarah Helmi Elagha:

Native Geoscience, Inc. (NGI) has completed the Subsurface Exploration and Geotechnical Engineering for the above-referenced stormwater management project. The proposed stormwater management area is located on the southern portion of the property of 4990 W. Irlo Bronson Memorial Highway in Kissimmee, Osceola County, Florida.

This report provides the results of our field exploration and desktop studies and provides geotechnical considerations relating to the design and construction of the stormwater management area.

We appreciate the opportunity to be of service to you on this project and look forward to a continued relationship. Should you have any questions or concerns regarding this report, please feel free to call us at (407) 342-1443.

Sincerely,
Native Geoscience, Inc.
Certificate of Authorization No. 30474



John C. Diehl, P.G.
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Appendix:

1.0 Purpose and Methodologies

The purpose of this geotechnical exploration was to obtain information on the general subsurface soil and groundwater conditions within the proposed stormwater management area. The subsurface conditions encountered at our boring location were then evaluated with respect to the project characteristics in order to develop considerations regarding design of the stormwater management area. We did not include a deep exploration, sinkhole risk study, ecological study, or testing for environmental contamination.

2.0 Field Exploration and Testing

The field exploration was accomplished with four (4) Standard Penetration Test (SPT) borings to depths of 15 feet below existing grade within the proposed stormwater management area. In addition, a constant head permeability test was conducted at each boring location.

The approximate boring locations are provided in Figure 1 in the Appendix. A site plan showing the proposed stormwater management area was provided by Mr. Raymond Stangle, P.E. with The Jordan Companies.

The *SPT boring* was performed in general accordance with ASTM D-1586 guidelines. The top 10 feet was sampled continuously in an effort to observe slight variations in the soil profile. Below 10 feet, the soil was sampled at five foot intervals to the boring termination depth. During the SPT process, a standard split-barrel sampler is driven into the soil using a 140-pound hammer freefalling 30 inches. The number of hammer blows required to drive the sampler 12 inches, after first seating it 6 inches, is called the blow count, or N-value. This value is used as an empirical index to evaluate soil strength, relative density and/or consistency.

The *Constant head permeability tests* were conducted in open boreholes. The tests were conducted in general accordance with the well permeameter method as provided in the U.S. Bureau of Reclamation Earth Manual, Part 2, dated 1990. The test method consists of measuring the rate at which water flows out of an open borehole under a constant gravity head. The permeability rate of the soil is calculated using the relatively constant flow rate which is reached after a period of time, the water temperature, the constant height of water in the borehole, and the radius of the borehole.

2.1 Laboratory Testing

The soil samples collected from the test borings were returned to our office for visual classification by our trained staff. Soils were classified using the Unified Soil Classification System (USCS) in general accordance with ASTM D2487-11. Laboratory tests conducted on representative soil samples included moisture content, percent fines (-200), and organic content testing. Soil classifications are provided in the boring logs located in the Appendix. Laboratory test results are provided below.

TABLE 1 - LABORATORY SUMMARY
American Muslim Leadership Center Stormwater Area
NGI Project No. R0373.0

Boring	Sample Depth (ft)	Percent Fines (-200)	Moisture Content (%)	Organic Content (%)	Soil Description	USCS
B-1	2	6.5	7.3	--	Sand with silt	SP-SM
B-2	15	11.7	21.4	--	Sand with silt	SP-SM
B-3	4	8.1	11.8	--	Sand with silt	SP-SM
B-4	2	--	52.6	20.5	Organic Sand	SP-OH
B-4	8	3.5	23.8	--	Sand	SP

3.0 Findings

The findings relating to this geotechnical study are based on our site observations and subsurface conditions as researched through publicly available documents and soil boring program, as well as groundwater observations made during drilling operations.

3.1 Site Observations

NGI personnel observed the site before drilling operations. The site was occupied by an existing building that was being used by the American Muslim Leadership (AML) Center. South of the building, portable classroom structures were observed in a gravel area. Based on our understanding, the gravel area around the existing portable classroom structures will be utilized for stormwater management.

A stormwater management pond was observed to the west of the property and a hotel/motel was observed to the east. US Highway 192 bordered the property to the north and undeveloped low-lying areas as well as Lake Cecile bordered the property to the south. The topography of the site generally sloped to the south, towards Lake Cecile.

3.2 Subsurface Conditions

Subsurface conditions were evaluated by reviewing publically available information as well as conducting a soil boring program.

3.2.1 Soil Survey

The "Soil Survey of Osceola County, Florida," published by the US Department of Agriculture National Resources Conservation Service (NRCS) was reviewed. The subject property is mapped with two soil types. Below is a table providing a description of the soil types.

Mapped Soil Unit on American Muslim Leadership Center Site		
NRCS Soil Survey, Osceola County, Florida		
Map Unit Name	**Map Unit Symbol**	**Description**
Myakka fine sand, 0-2% slopes	22	Poorly drained. Depth to water table is about 6 to 18 inches.
Placid fine sand, depressional	32	Very poorly drained. Depth to water table is about 0 inches.

3.2.2 Soil Borings

Four (4) SPT borings were conducted to depths of 15 feet below existing grade in accessible areas on the site. The borings were conducted within the vicinity of the proposed stormwater management area. In general, the borings encountered interbedded layers of sand to sand with silt. Borings B-3 and B-4 both encountered a layer of organic sand ranging from zero to four feet below existing grade. Boring B-2 encountered some roots from two to four feet below existing grade, and gravel was observed at the surface of all the borings ranging from two to six inches in thickness. N-values ranged from 7 to 22 blows per foot indicating a relative density of loose to medium dense.

For detailed soil information at each boring location, please review the Soil Boring Logs (Figure 4) in the Appendix. Please note that strata changes are indicated by a definite line on the boring logs which accompany this report. The actual change in the ground may be more gradual.

3.2.3 Groundwater Observations

Groundwater was encountered at depths ranging from 3.9 to 4.1 feet below grade at our boring locations. For groundwater observations at each boring location, please see the Soil Boring Logs in the Appendix.

Water level readings were made in the open bore holes during drilling operations. It must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, construction/dewatering activities, stormwater runoff modifications, and other factors not evident at the time the measurements were made.

4.0 Geotechnical Considerations

We have prepared the following geotechnical considerations based solely on the field exploration, testing and desktop review discussed herein. It is our opinion that the soils encountered in the borings for this exploration, are generally compatible with the proposed development (with the exception of the limitations discussed in the following sections).

4.1 Average Wet Season and Seasonal High Water Table Estimates

Based upon our visual observation of the recovered soil samples, review of the NRCS Soil Survey for Osceola County, and our knowledge of local and regional hydrogeology, below are estimated depths to the Seasonal High Water Table (SHWT) and the Average Wet Season Water Table (AWSWT) at our boring locations.

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TABLE 2 - SEASONAL HIGH WATER TABLE ESTIMATES
American Muslim Leadership Center, Osceola County, Florida
NGI Project No. R0373.0

Boring Location	Depth to Encountered Groundwater (ft)	Estimated Depth to AWSWT (ft)	Estimated Depth to SHWT (ft)
B-1	4.1	3	2
B-2	4.1	3	2
B-3	3.9	3	2
B-4	4	3	2

4.2 Site Preparation

We anticipate normal, good practice site preparation for the stormwater management area. These procedures include: stripping of the site to remove existing organic soils, debris, etc. Following stripping, the exposed subgrade soils and all subsequent fill soils will require proper compaction efforts.

4.2.1 Existing Utilities, Pipes, and Underground Structures

Prior to construction, existing underground utility lines, irrigation pipes, wells, and other underground improvements within the construction area should be located and properly removed/abandoned if not planned for use. It should be noted that improper removal/abandonment of underground improvements may lead to excessive settlement of overlying structures.

4.2.2 Stripping

The proposed construction limits should be completely stripped. We recommend that stripping extend at least five feet beyond the planned construction limits. We also recommend that the stripped surface be observed by the Geotechnical Engineer or authorized representative prior to any fill placement or other construction activity.

4.2.3 Proof-Rolling

Once the site is stripped, we recommend proof-rolling the exposed soils with an appropriate piece of equipment to identify any areas of loose, yielding or unsuitable near-surface soils. We recommend that the Geotechnical Engineer or authorized representative observe the proof-rolling. If unsuitable or deleterious materials are identified during proof-rolling, they should be properly replaced with compacted sand backfill containing less than 10% fines passing the #200 sieve.

4.2.4 Fill Placement

All fill should consist of clean sand material with less than 10% passing the #200 sieve. All fill should be free of organics, debris, or deleterious material. Fill should be placed in loose, uniform lifts not exceeding 12 inches and compacted to a minimum of 95% of the maximum dry density determined by the Modified Proctor (ASTM D1557).

4.3 Stormwater Management Areas

In general, the site appears to be suitable for dry stormwater management areas. Please note that a typical separation of 12 to 24 inches is recommended between the bottom of a dry stormwater pond and the estimated seasonal high groundwater elevation and/or base of aquifer.

Borings B-1 through B-4 were conducted to depths of 15 feet below existing grade within the proposed stormwater management area. Constant head permeability tests were conducted in the open boreholes. Below are the horizontal permeability test results, estimated vertical permeability rates, recommended

porosity, base of aquifer and seasonal high water table depths based on the field testing and soil borings conducted on the site.

Recommended Existing Soil and Groundwater Parameters for Dry Stormwater Swale Design							
American Muslim Leadership Center, Kissimmee, Osceola County, Florida							
Boring	Permeability Test Depth Interval (ft)	Horizontal Permeability Test Results (ft/day)	Estimated Vertical Permeability Rate (ft/day)*	Recommended Porosity (%)	Recommended Base of Aquifer Depth (ft)	Recommended AWSWT Depth (ft)	Recommended SHWT Depth (ft)
B-1	0-4	8	4	25	15**	3	2
B-2	0-4	9	4.5	25	15**	3	2
B-3	0-4	8	4	25	15**	3	2
B-4	0-4	9	4.5	25	15**	3	2
*	Estimated vertical permeability rate is 1/2 the horizontal permeability test result.						
**	Base of aquifer was estimated at boring termination depth.						
Note:	Horizontal and vertical permeability rates do not include a factor of safety.						

4.4 Borrow Suitability and Unsuitable Soils

Based on the soils encountered in our soil borings, we have prepared the following considerations for borrow suitability.

Stratum 1

Sand to sand with silt (as denoted by Stratum 1) is generally suitable to be used as structural fill in structure and pavement areas, and (with proper moisture control) should densify using conventional compaction equipment. Please note that these materials may experience moisture-related pumping if the moisture content is too high. Therefore, control of groundwater and stormwater will be important during compaction.

Stratum 2

Organic sand (as denoted by Stratum 2) is not suitable for use as structural fill to support structures. Sandy soils with organic content greater than 5% to 10% can typically be used as fill in green areas. Sandy soils with organic content greater than 10% are generally not suitable for fill but can be mixed and used as top dressing in green areas in order to promote plant growth. Laboratory testing of organic soils encountered at boring B-4 resulted in an organic content of 20.5 percent by weight. Based on the relatively high fines content, the organic soils may lead to settlement of the ground surface over time. If that is undesirable, we recommend the complete removal of organic soils with fines content greater than 5% from the stormwater area.

5.0 Other Construction and Design Considerations

Based on the groundwater level conditions encountered and seasonal high groundwater estimates, **it is possible that control of the groundwater will be required** to achieve the necessary excavation, construction, backfilling and compaction activities discussed in this report. We recommend lowering the water table to a minimum of two feet below the bottom of the excavations. Dewatering activities will likely consist of well points, sock drains, and/or sumps. We have not included a dewatering evaluation or application for dewatering permit in this scope.

The exposed subgrade is anticipated to be relatively stable upon initial exposure; however, unstable subgrade conditions could develop during normal construction operations, particularly if the soils are

subjected to frequent construction traffic in a wet state. Should unstable subgrade conditions develop, stabilization measures will be necessary. If this is the case, the Geotechnical Engineer should be contacted for consultation.

Trees or other vegetation whose root systems may heave and/or crack the pavement systems should not be planted adjacent to the roadways, sidewalks or structures. As a general rule of thumb, trees and shrubbery should generally be planted a minimum distance of 1.5 times their expected mature height.

Safe working conditions are necessary. Temporary excavations should be sloped and/or braced as required by applicable local, state, and federal safety regulations, as well as the current Occupational Safety and Health Organization (OSHA) Excavation and Trench Safety Standards. Generally, the grading contractor is responsible for constructing stable, temporary excavations that are dewatered, shored, sloped and/or benched to maintain stability of the sides and bottom of the trench.

The Geotechnical Engineer should be retained to observe the construction phase of this project and perform the necessary tests and observations during sub-grade preparation, proof-rolling, fill placement and compaction.

6.0 Limitations

This report has been prepared in accordance with generally accepted geotechnical engineering and geologic practices. The report is for the exclusive use of the American Muslim Leadership Center. No other warranty, expressed or implied, is made. NGI is not responsible for any claims, damages, or liability associated with any other third party's interpretation or reuse of this report without the express written authorization of NGI.

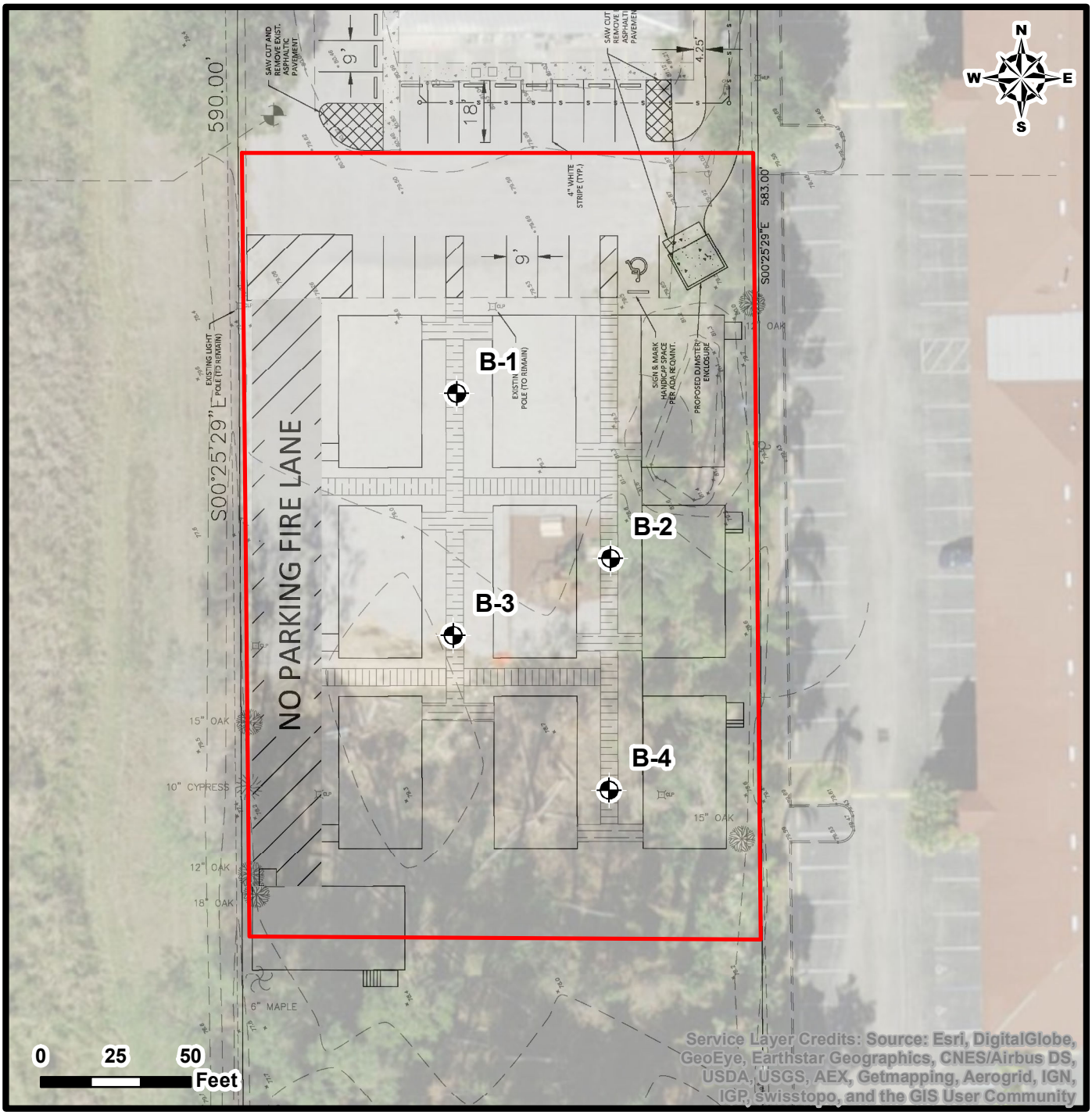
The geotechnical evaluation herein is based solely on the information submitted within this report including the soil borings conducted during our field exploration. The report does not reflect any variations which may occur adjacent to or between the borings. The nature and extent of the variations between the borings may not become apparent until further exploration and/or construction activities are performed. If variations appear, we may have to re-evaluate our recommendations after performing in-site observations and noting the characteristics of any variations.

This scope of work included geotechnical testing confined to the zone of influence of the proposed construction. We did not include a deep exploration, sinkhole risk study, ecological study or testing for environmental contamination.

Lastly, bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the buyer and designers of the project only. Bidders are urged to conduct their own soil borings, test pits or other field exploration to determine those conditions that may affect construction operations. NGI cannot be responsible for any interpretations made from this report with regard to its adequacy in reflecting subsurface conditions which will affect construction operations.

Appendix

Boring Location Plan



Legend:

- Approximate SPT Boring Location
- Approximate Project Area

Notes:

Boring locations were approximated in the field using a Trimble model GeoXH GPS system.

Site plan courtesy of The Jordan Companies.

Project No: R0373.0

Date: 4/28/17

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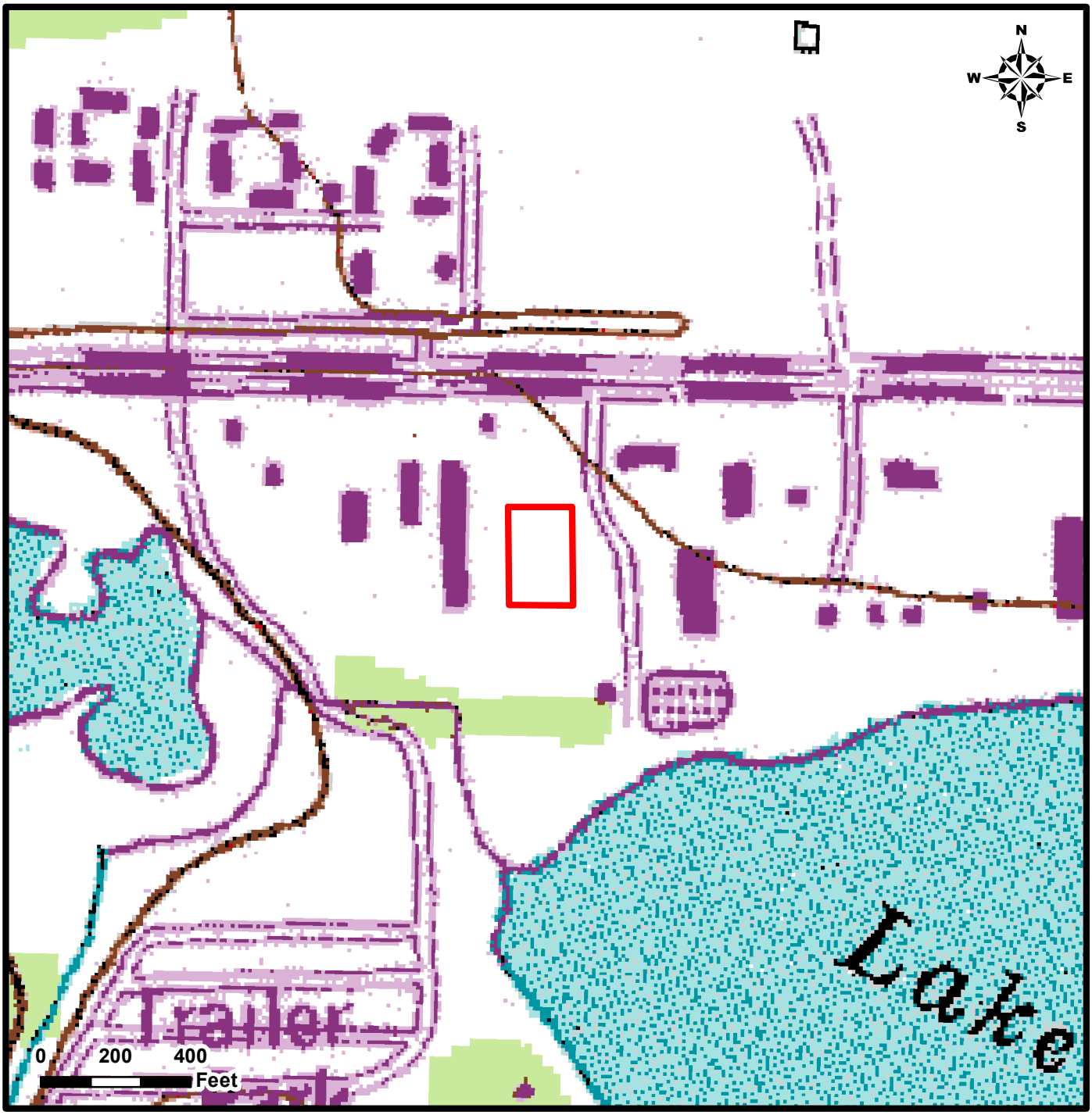
2014 Edgewater Drive, #246
Orlando, Florida 32804 (407) 342-1443

Subsurface Exploration and Geotechnical Engineering

AML Stormwater Area
Osceola County, Florida

FIGURE: 1

Topographic Map



Legend:

- Approximate Project Area

Notes:

Topographic maps courtesy of the U.S. Geological Survey, Kissimmee (NW) quadrangle map.

Project Area approximated from site plan courtesy of The Jordan Companies.

Project No: R0373.0

Date: 5/1/17

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2014 Edgewater Drive, #246
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Subsurface Exploration and Geotechnical Engineering

AML Stormwater Area
Osceola County, Florida

FIGURE: 2

NRCS Soils Map

Mapped Soil Unit on American Muslim Leadership Center Site		
NRCS Soil Survey, Osceola County, Florida		
Map Unit Name	**Map Unit Symbol**	**Description**
Myakka fine sand, 0-2% slopes	22	Poorly drained. Depth to water table is about 6 to 18 inches.
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AML Stormwater Area
Osceola County, Florida

FIGURE: 1

LEGEND

① = ORANGE/BROWN/LIGHT BROWN SAND TO SAND WITH SILT (SP)/(SP–SM)

② = DARK BROWN ORGANIC SAND (SP–PT)

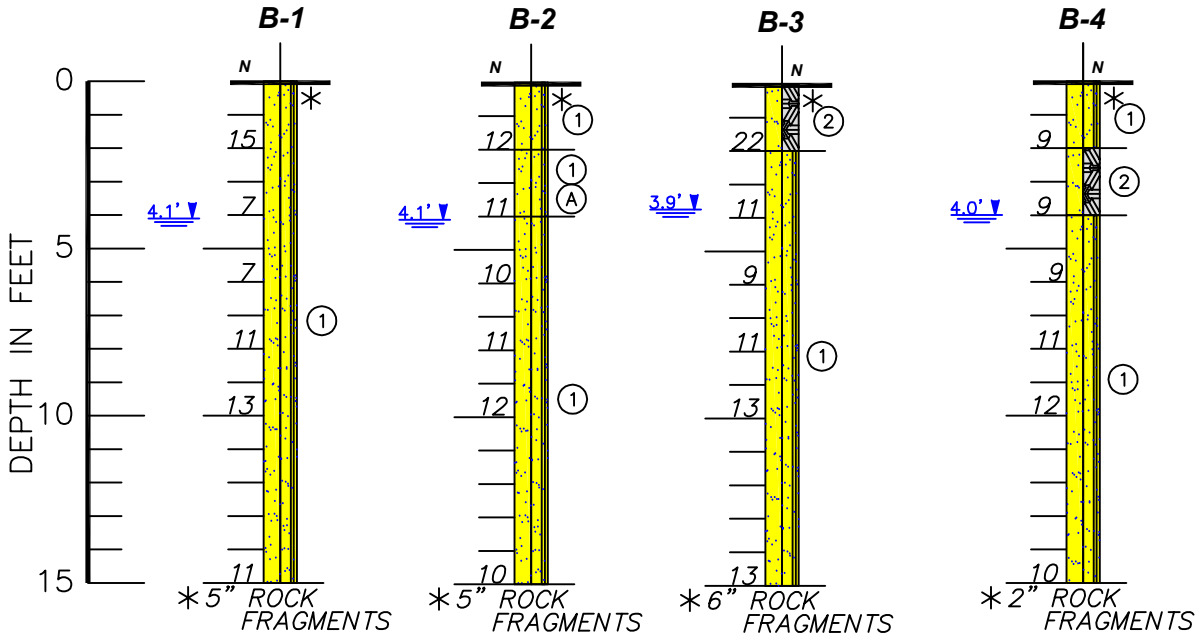
Ⓐ = ROOTS

(SP) = UNIFIED SOIL CLASSIFICATION GROUP SYMBOL

N = STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT

0.0' = DEPTH TO EXISTING GROUNDWATER

NOTE: BORINGS DRILLED ON MARCH 31, 2017.



NATIVE GEOSCIENCE
2014 EDGEWATER DRIVE #246
ORLANDO, FLORIDA 32804
PHONE: (407) 342-1443

AML STORMWATER AREA
SOIL BORING LOGS
KISSIMMEE, OSCEOLA COUNTY, FL

DATE:	SCALE:	JOB NO.
4-28-17	AS SHOWN	R0373.0

DRAWN BY: E. COLO'N
CK'D BY: C. DIEHL

FIGURE 4
SHEET 1 OF 1