Andreyev Engineering, Inc.

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▼ Groundwater ▼ Environmental ▼ Geotechnical ▼ Construction Materials Testing

December 30, 2013
Project No.: CPGT-12-0062
Revised December 2, 2014

To: Griffey Engineering, Inc.
406 N. Center Street
Eustis, Florida 32726

Attention: Mr. Don Griffey, P.E.

Subject: Report of Geotechnical Engineering Services
Proposed Stormwater Management System
Final Selected Location
John's Lake Road Widening Project
Clermont, Lake County, Florida

Dear Mr. Griffey:

Pursuant to your request and authorization, Andreyev Engineering, Inc. (AEI) has completed a subsurface exploration program and geotechnical engineering evaluation for the above referenced project. The purpose of this study was to obtain geotechnical data at the above referenced site to assist in the design/permitting of the proposed stormwater management system. Presented herein are the results of our findings together with our conclusions and recommendations.

SITE LOCATION AND PROJECT DESCRIPTION

The subject site is located on the north side of John's Lake Road approximately 650 to 1000 feet east with the intersection of Eagle Lake Drive in Clermont, Lake County, Florida (Section 33, Township 22 South, Range 26 East). Please refer to the attached **Figure 1** (USGS Quadrangle Map) which shows the location of the subject site.

The final selection of the projects' stormwater management system consists of permitting an existing stormwater retention pond to store and infiltrate the additional stormwater runoff that will be generated from the planned road widening. The existing stormwater retention system is a dry bottom pond. Based on the topographic information provided to us, the elevation of the existing pond bottom is approximately 100 feet. We understand that the existing pond will be redesigned with a new bottom elevation set about 10 feet below the existing grade.

REVIEW OF AVAILABLE PUBLISHED INFORMATION

U.S.G.S. Topographic Map

According to the information presented on the U.S.G.S. Topographic Map presented as **Figure 1** in this report, the predevelopment ground surface elevation of the site ranges from approximately 100 to 125 feet, NGVD. The ground surface within the vicinity of the site generally slopes to the west-southwest. The closest off site water body is Lake Felter which is located several hundred feet south-southwest of the site. The water surface elevation of Lake Felter is 85 feet, NGVD as shown on the U.S.G.S. Map.

N.R.C.S. Soil Survey Map

The N.R.C.S. Soil Survey Map of the site is presented as **Figure 2** in this report. According to this map, there are two (2) soil map units identified within the site. General information regarding the mapped soil units for the project site is provided in the following table.

Soil Unit #	Name	High Water Table Depth (feet)	General Soil Profile
8	Candler Sand, 0 to 5% slopes	>6.0	0-95" Fine Sand, Sand 95"-99" Sandy Loam, Sandy Clay Loam
9	Candler Sand, 5 to 12% slopes	> 6.0	0-95" Fine Sand, Sand 95"-99" Sandy Loam, Sandy Clay Loam

SCOPE OF FIELD EXPLORATION

The scope of our field exploration included project coordination, subsurface exploration, collection of representative soil samples, measuring the depth to groundwater, and performing constant head field permeability tests. The initial subsurface exploration program for this study consisted of drilling three (3) auger borings each to a depth of 20 feet below existing grade. The initial borings were drilled on December 14, 2013 and are designated as AB-1, AB-2, and AB-3. A supplemental subsurface exploration program was carried out on November 30, 2014 and December 2, 2014. The supplemental investigation consisted of drilling three (3) auger borings (designated as AB-1A, AB-2A and AB-3A) which were performed adjacent to the original locations and two (2) Standard Penetration Test borings (designated as TB-1 and TB-2). Borings AB-1A, AB-2A and AB-3A were each drilled to a depth of 25 feet below grade and borings TB-1 and TB-2 were drilled to a depth of 40 feet below grade. All of the borings were drilled at the bottom level of the existing pond. The auger borings were conducted in general accordance with the procedures of ASTM D-1452. The SPT borings were conducted in general conformance with ASTM D-1586. Representative samples of each soil strata were collected from the split spoons

and auger flights, and were then packaged and sealed for transportation to our laboratory for further examination and visual classification.

The locations where the borings were drilled are presented on the attached **Figure 3.** Please note that survey control was not provided for our field investigation. Therefore, the indicated boring locations should be considered approximate.

Additionally, we performed three (3) constant head field permeability tests to assess the hydraulic conductivity of the soils below the bottom of existing pond. The results of the tests are presented adjacent to the soil profiles on the attached **Figure 4**.

LABORATORY TESTING PROGRAM

Soil samples collected from the auger borings were returned to our laboratory facility where they were visually classified by an AEI geotechnical engineer. The samples were classified in general accordance with the Unified Soil Classification System (USCS). The soil classifications are included in the legend on the attached **Figure 4**.

SOIL AND GROUNDWATER CONDITIONS

Subsoil Stratigraphy

The borings disclosed relatively homogeneous soil conditions within the explored depths of 20, 25 and 40 feet below existing pond bottom elevation. From the existing grade to the maximum boring depths of 20, 25 and 40 feet, the vast majority of the soils encountered in the borings consist of light brown to orange brown to brown fine sand (SP materials). In boring TB-2, slightly clayey fine sand (SP-SC material) was encountered from about 38.5 to 40 feet below grade

Please refer to the soil profiles on the attached **Figure 4** for specific boring data. The information presented on the soil profiles represent the subsurface conditions encountered at the specific boring locations. Accordingly, the materials away from the boring locations may vary from those encountered in the borings. The strata boundaries presented on the soil profiles have been approximated. The actual boundaries may be gradual or otherwise not clearly defined.

Groundwater Table

On December 14, 2013 the groundwater table was not encountered within the explored depth of 20 feet in borings AB-1, AB-2 and AB-3. On November 30, 2014, the groundwater table was detected at a depth of 17 feet below grade in borings AB-1A, AB-2A and AB-3A. On December 2, 2014, groundwater was not encountered within 10 feet in SPT borings TB-1 and TB-2. Groundwater could not be detected below a depth of 10 feet in the SPT borings due to the introduction of drilling fluid. Fluctuation of the groundwater table should be anticipated throughout the year due to variations in seasonal rainfall. Based on the time of year, the measured groundwater level, and the amount of rainfall received to date it is our opinion that the normal wet season high groundwater table will be 17 feet below the existing pond bottom.

EVALUATION AND RECOMMENDATIONS

Pond Design Recommendations

The subsoil's beneath the existing pond bottom consist of very well draining fine sand to the maximum explored depth of 40 feet. The horizontal coefficient of permeability obtained from the field permeability tests ranged from 31.8 to 48.8 feet per day. Furthermore, the groundwater table is deep at this site. Based on the results of our findings, we did not encounter any conditions that would impede stormwater infiltration in a timely manner and in our opinion the site is considered conducive to successful performance of a dry bottom pond. The following table presents our recommended aquifer parameters to be used in the design of the proposed retention pond.

Bottom of Aquifer Elevation (feet)	Average Unsaturated Vertical Hydraulic Conductivity (ft./day)	Average Horizontal Hydraulic Conductivity (ft./day)	Normal Wet Season High Groundwater Elevation (feet)	Soil Storage Coefficient
60	17	39	83	0.25

Please note that the recommended hydraulic conductivity values presented in the above table do not include a factor of safety. For design and analysis of the pond, we recommend using a Factor of Safety of 2.0 for the unsaturated vertical hydraulic conductivity (for clogging consideration). For the horizontal hydraulic conductivity, we recommend using a Factor of Safety of 1.0.

Excavations

All excavations should be constructed in accordance with applicable local, state and federal regulations including those outlined by the Occupational Safety and Health Administration (OSHA). It is the contractor's sole responsibility for designing and constructing safe and stable excavations. Excavations should be sloped, benched or braced as required to maintain stability of the excavation sides and bottoms. Excavations should take into account loads resulting from equipment, fill stockpiles and existing construction. Any shoring needed to maintain a safe excavation should be designed by a professional engineer registered in the State of Florida in accordance with local, state and federal guidelines.

LIMITATIONS OF REPORT

The analyses and recommendations submitted in this report are based upon the data obtained from the soil boring performed at the location indicated, and do not reflect any variations which may occur beyond the boring. If any variations become evident during the course of construction, or if the pond location changes, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe and evaluate the characteristics of the conditions encountered. Shifting or moving the pond location will require additional evaluation.

GENERAL CONDITIONS

This report has been prepared for the exclusive use of Griffey Engineering, Inc. and its designers, based on our understanding of the project as stated in the section entitled "Site Location and Project Description". The recommendations presented in this report have been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made as to the professional advice presented herein. Statements regarding all geotechnical recommendations are for use by the designers and are not intended for use by potential contractors.

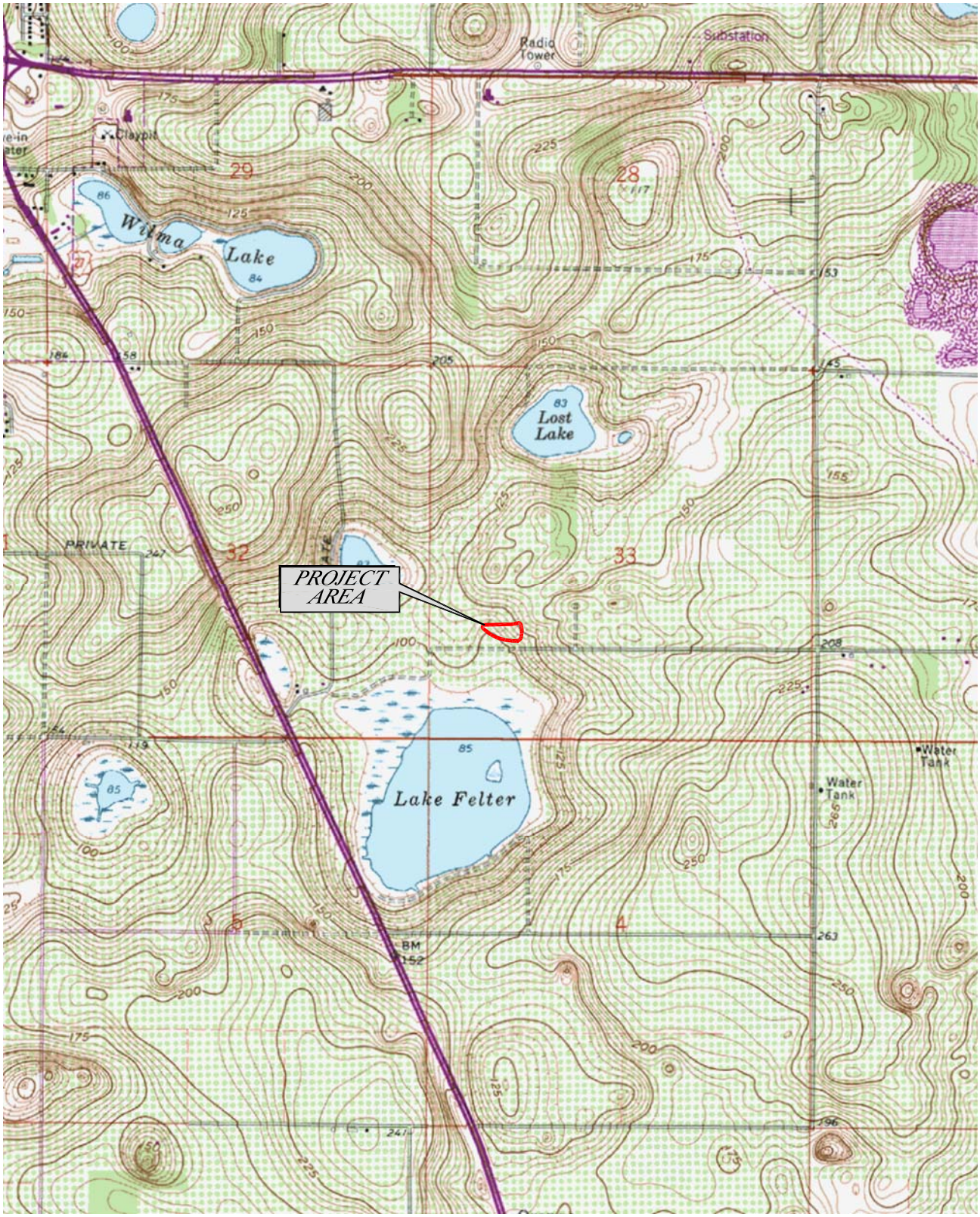
CLOSURE

AEI appreciates the opportunity to provide our services for this project, and we trust that the information herein is sufficient for your immediate needs. Should you have any questions or comments regarding the contents of this report, please do not hesitate to contact the undersigned at 352-241-0508.

Sincerely,
ANDREYEV ENGINEERING, INC.

Ed Miguens, P.E.
Vice President
Florida Registration No.: 47535

FIGURES



REFERENCE:
U.S.G.S. CLERMONT EAST, FLA.
QUADRANGLE MAP
DATED 1962
PHOTOREVISED 1980
SECTION 33
TOWNSHIP 22 SOUTH
RANGE 26 EAST

Andreyev Engineering, Inc.

APPROXIMATE SCALE:	DATE: 01/02/14	ENGINEER: EM
1"=2000'	PN: CPGT-12-0062	DRAWN BY: DLS

GEOTECHNICAL INVESTIGATION
PROPOSED STORMWATER MANAGEMENT SYSTEM
FINAL SELECTED LOCATION
JOHNS LAKE ROAD WIDENING PROJECT
CLERMONT, LAKE COUNTY, FL

U.S.G.S. TOPOGRAPHIC MAP

FIGURE 1

REFERENCE:
N.R.C.S. WEB SOIL SURVEY

LEGEND:

8 CANDLER SAND
0 TO 5 % SLOPES

9 CANDLER SAND
5 TO 12 % SLOPES

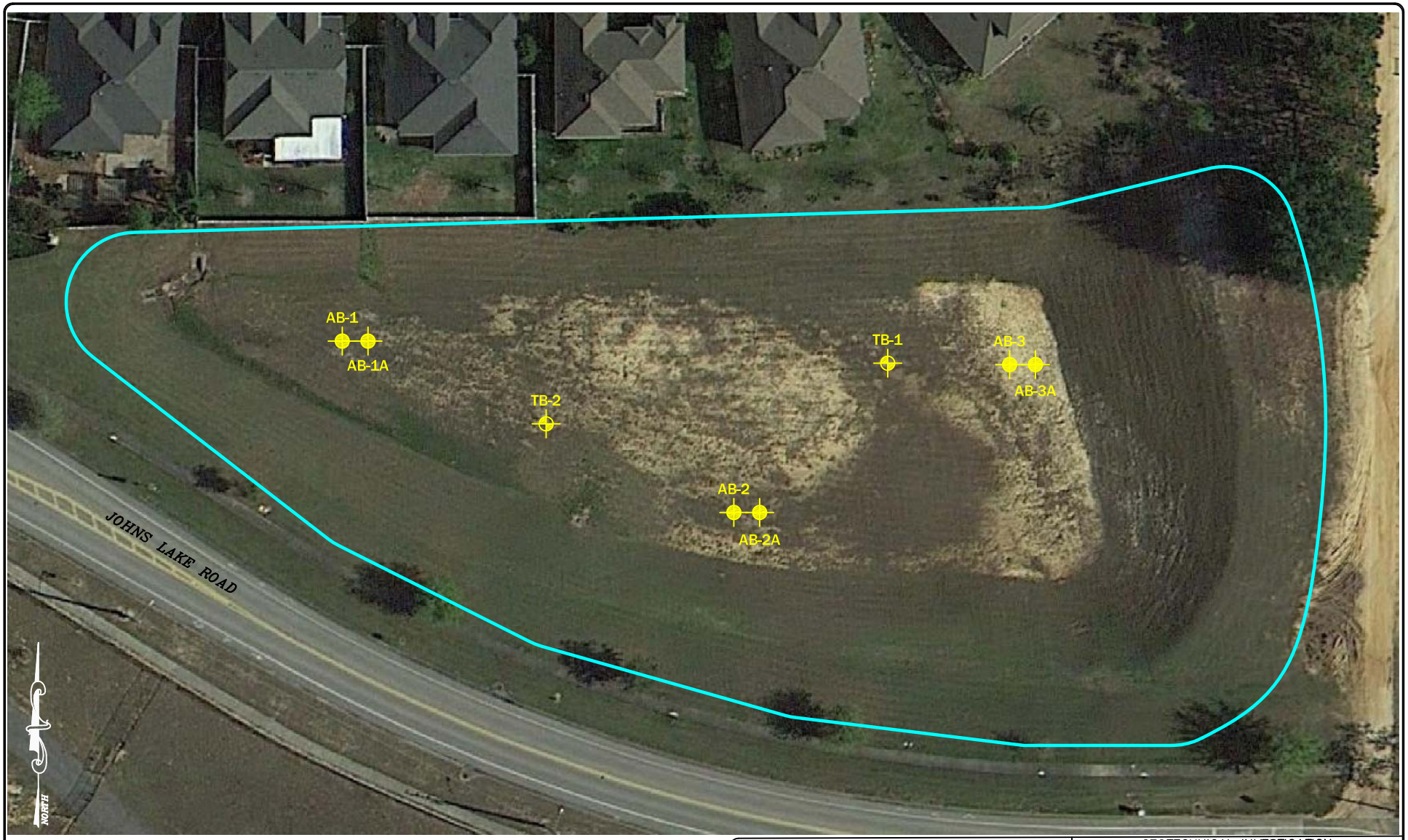
Andreyev Engineering, Inc.

APPROXIMATE SCALE:	DATE: 01/02/14	ENGINEER: EM
1"=300'	PN: CPGT-12-0062	DRAWN BY: DLS

GEOTECHNICAL INVESTIGATION
PROPOSED STORMWATER MANAGEMENT SYSTEM FINAL SELECTED LOCATION
JOHNS LAKE ROAD WIDENING PROJECT
CLERMONT, LAKE COUNTY, FL

N.R.C.S. SOIL SURVEY MAP

FIGURE 2



LEGEND:

- APPROXIMATE BOUNDARY OF POND
- APPROXIMATE LOCATION OF AUGER BORING
- APPROXIMATE LOCATION OF SPT BORING

0 30 60 120

GRAPHIC SCALE: 1"=60'

Andreyev Engineering, Inc.

APPROXIMATE SCALE:	DATE: 12/02/14	ENGINEER: EM
1"=60'	PN: CPGT-12-0062	DRAWN BY: DLS

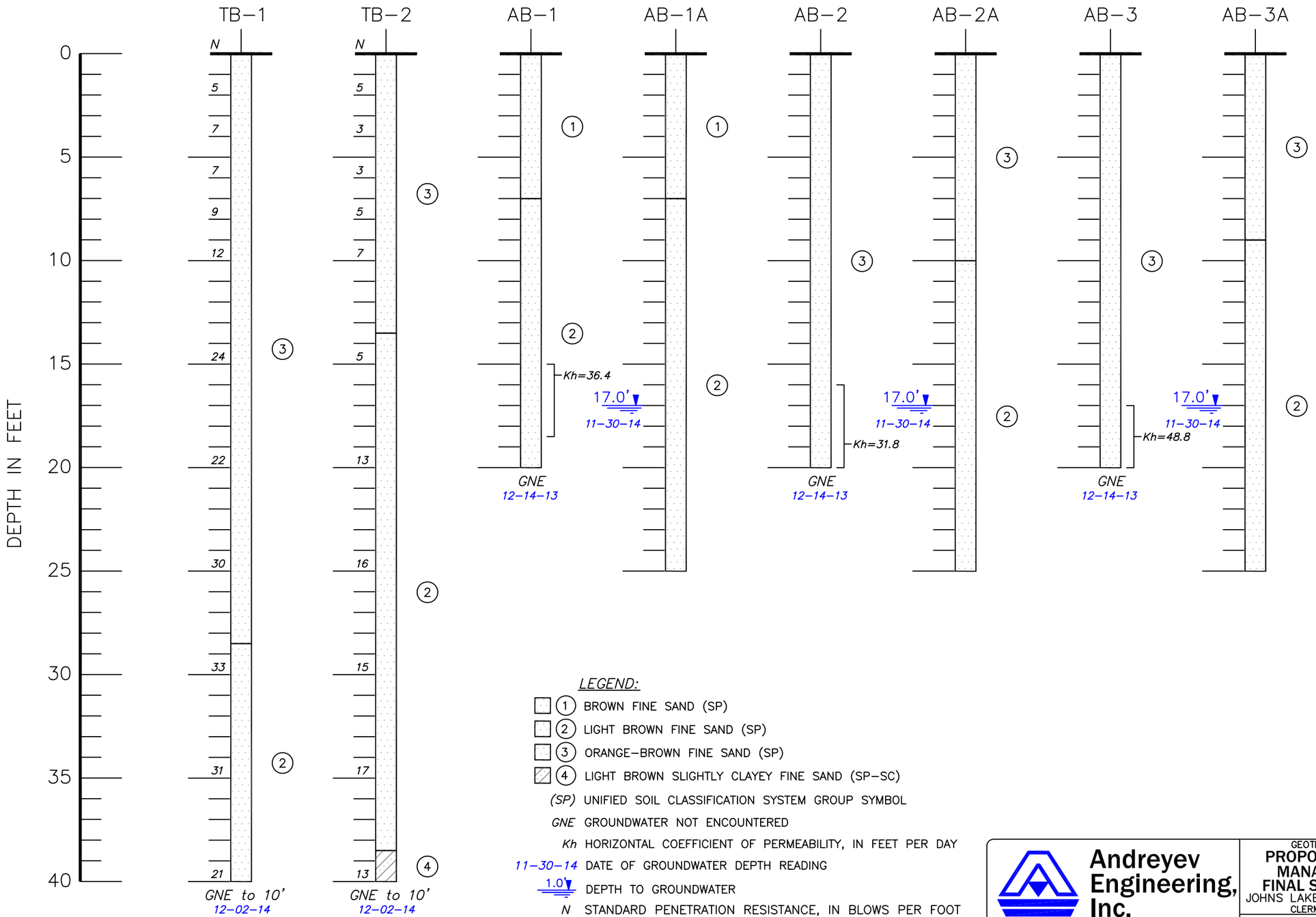
GEOTECHNICAL INVESTIGATION

PROPOSED STORMWATER MANAGEMENT SYSTEM FINAL SELECTED LOCATION

JOHNS LAKE ROAD WIDENING PROJECT
CLERMONT, LAKE COUNTY, FL

BORING LOCATION PLAN

FIGURE 3



LEGEND:

- (1) BROWN FINE SAND (SP)
- (2) LIGHT BROWN FINE SAND (SP)
- (3) ORANGE–BROWN FINE SAND (SP)
- (4) LIGHT BROWN SLIGHTLY CLAYEY FINE SAND (SP–SC)
- *(SP)* UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL
- *GNE* GROUNDWATER NOT ENCOUNTERED
- *Kh* HORIZONTAL COEFFICIENT OF PERMEABILITY, IN FEET PER DAY
- *11–30–14* DATE OF GROUNDWATER DEPTH READING
- 1.0' DEPTH TO GROUNDWATER
- *N* STANDARD PENETRATION RESISTANCE, IN BLOWS PER FOOT

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION
PROPOSED STORMWATER MANAGEMENT SYSTEM
FINAL SELECTED LOCATION
JOHNS LAKE ROAD WIDENING PROJECT
CLERMONT, LAKE COUNTY, FL

APPROXIMATE SCALE:	DATE: 12/02/14	ENGINEER: EM
1"=5'	PN: CPGT–12–0062	DRAWN BY: DLS

SOIL PROFILES

FIGURE 4