Florida Department of TRANSPORTATION

Report of Preliminary Geotechnical Investigation for Ponds

Malabar Road (SR 514) PD&E Study
From East of Babcock Street (SR 507) to US 1
Brevard County, Florida

FPID: 430136-1-22-01

ETDM: 13026

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. §327 and a Memorandum of Understanding (MOU) dated December 14, 2016 and executed by the Federal Highway Administration and FDOT.

October 2013

October 31, 2013

Atkins North America, Inc.
482 South Keller Road
Orlando, Florida 32810

Attention: Mr. Lance Decuir, P.E.
Senior Transportation Engineer

Subject: Report of Preliminary Geotechnical Investigation for Ponds
SR 514 (Malabar Road) PD&E Study
From SR 507 (Babcock Street) to US 1
Brevard County, Florida
FDOT Financial Project No. 430136-1-22-01
GEC Project No. 3491G

Dear Mr. Decuir:

Geotechnical and Environmental Consultants, Inc. (GEC) is pleased to provide this Report of Preliminary Geotechnical Engineering Investigation for Ponds for the above-referenced project. The purpose of this investigation was to evaluate soil and groundwater conditions at the proposed pond locations and develop preliminary geotechnical engineering recommendations to aid in the initial planning and design of the ponds. This report describes our exploration procedures, exhibits the data obtained and presents our preliminary conclusions and recommendations regarding the geotechnical engineering aspects of this project.

GEC appreciates the opportunity to be of service to you on this project and trusts that the information contained herein is sufficient for your needs. Should you have any questions concerning the contents of this report, or if we may be of further assistance, please contact us.

Very truly yours,

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS, INC.
Certificate of Authorization No. 5882

JOSEPH M. GOVERNALE LICENSE No. PG2422 STATE OF FLORIDA PROFESSIONAL GEOLOGIST

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TABLE OF CONTENTS

APPENDIX

1.0 SITE AND PROJECT DESCRIPTION

This Report of Preliminary Geotechnical Investigation for Ponds has been prepared as a part of the SR 514 Project Development and Environment (PD&E) Study. The PD&E Study is being performed for the proposed improvements of SR 514 from SR 507 (Babcock Street) to US 1. SR 514 currently consists of a two-lane undivided highway with 12-foot lanes and 4-foot shoulders between SR 507 and US 1. The PD&E study will analyze alternatives for widening SR 514 from a two-lane facility to a four-lane facility to address future capacity needs.

The project includes the evaluation of 20 potential pond alternative sites. The pond alternatives are located in areas that consist of commercial services, wet prairies, vegetated non-forested wetlands, mixed rangeland, pine flatwoods, unimproved pastures, wet pinelands hydric pine, field crops, institutional, other light industry, disturbed land, woodland pastures, and medium density residential developments. The majority of the pond alternatives are located within undeveloped, vegetated land.

The project study area is shown on a United States Geological Society (USGS) Quadrangle Map and the United States Department of Agriculture (USDA) National Resource Conservation Services (NRCS) Soil Survey Map provided on **Figure 1**.

2.0 REVIEW OF AVAILABLE INFORMATION

GEC reviewed available data including the USGS Quadrangle map and USDA NRCS Soil Survey map to obtain information on soil and groundwater conditions along the proposed alignment. The results of our review are presented in the following report sections.

2.1 USGS Quadrangle Map

The pond alternatives are depicted on the USGS Grant and Melbourne, Florida Quadrangle maps shown on **Figure 1**. Review of the USGS Quadrangle maps indicate that the natural ground surface elevation along the alignment and at the pond alternatives range from approximately +20 feet NGVD to +30 feet NGVD.

2.2 NRCS Soil Survey Review

The Natural Resources Conservation Service (NRCS) (formerly SCS) Soil Survey of Brevard County, Florida was reviewed for near-surface soil and groundwater information at the site. The NRCS Soil

Survey map of the site vicinity is shown on **Figure 1** in the **Appendix**. The NRCS soil units at the project site are summarized in **Table 1** below:

Table 1
Brevard County NRCS Soil Survey Review

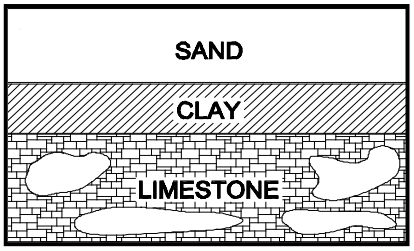
Unit No.	Soil Name	Depth (inches)	Soil Description	Unified Classification Symbol	AASHTO Classification Symbol	Depth to Seasonal High Groundwater (feet)
2	Anclote sand, depressional	0 - 19 19 - 72	Sand Sand, Fine sand, loamy fine sand	SP, SP-SM SP-SM, SP	A-3 A-3	+2.0 - 0
3	Anclote sand, frequently flooded	0 - 19 19 - 72	Sand Sand, Fine sand, loamy fine sand	SP, SP-SM SP-SM, SP	A-3 A-3	0 - 1.0
6	Basinger sand, depressional	0 - 80	Sand, Fine sand	SP, SP-SM	A-3	+2.0 - 0
7	Basinger sand	0 - 2 2 - 80	Sand Sand, fine sand	SP SP-SM, SP	A-3 A-2-4, A-3	0 - 1.0
15	Cocoa sand	0 - 32 32 - 38 38 - 42	Sand Loamy sand, sand, loamy fine sand Unweathered bedrock	SP-SM SM, SP-SM ---	A-3 A-2-4 ---	>6.0
17	EauGallie sand	0 - 22 22 - 35 35 - 55 55 - 61 61 - 80	Sand, fine sand Sand, fine sand Sand, fine sand Sandy clay loam, sandy loam, fine sandy loam Loamy sand, sand, sandy loam	SP, SP-SM SM, SP-SM SP, SP-SM SM, SC, SC-SM SM, SC-SM	A-3 A-3, A-2-4 A-3 A-2-4 A-2-4	0.5 - 1.5
20	Riviera	0 - 30 30 - 49 49 - 62	Sand Sandy loam, sandy clay loam Sandy loam, sand, loamy fine sand	SP, SP-SM SC-SM, SM, SC SM, SC-SM	A-3 A-2-4 A-3, A-2-4	0 - 1.0
	Winder	0 - 12 12 - 17 17 - 65	Loamy sand Sandy loam, loamy sand, fine sandy loam Sandy clay loam	SM SM SC, SC-SM	A-2-4 A-2-4 A-6, A-2	

Unit No.	Soil Name	Depth (inches)	Soil Description	Unified Classification Symbol	AASHTO Classification Symbol	Depth to Seasonal High Groundwater (feet)
28	Immokalee sand	0 - 33 33 - 65 65 - 80	Sand Sand Sand	SP-SM, SP SM, SP-SM SP, SP-SM	A-3 A-3, A-2 A-3	0.5 - 1.5
36	Myakka sand	0 - 22 22 - 46 46 - 63	Sand Sand Sand	SP, SP-SM SM, SP-SM SP, SP-SM	A-3 A-2-4, A-3 A-3	0.5 - 1.5
38	Myakka sand, depressional	0 - 22 22 - 46 46 - 63	Sand Sand Sand	SP, SP-SM SM, SP-SM SP, SP-SM	A-3 A-2, A-3 A-3	+2.0 - 0
40	Oldsmar sand	0 - 34 34 - 51 51 - 80	Sand Sand, fine sand Sandy clay loam, sandy loam	SP-SM, SP SM, SP-SM SC, SC-SM	A-3 A-3, A-2 A-2	0.5 - 1.5
43	Paola fine sand, 0 to 5 percent slopes	0 - 80	Fine sand, sand	SP	A-3	>6.0
49	Pomello sand	0 - 50 50 - 62 62 - 80	Sand Sand Sand	SP-SM, SP SM, SP-SM SP, SP-SM	A-3 A-3, A-2 A-3	2.0 - 3.5
55	St. Johns sand, depressional	0 - 19 19 - 31 31 - 70	Sand Sand Sand	SP, SP-SM SM, SP-SM SP, SP-SM	A-3 A-2, A-3 A-3	+2.0 - 0
56	St. Lucie fine sand, 0 to 5 percent slopes	0 - 80	Fine sand	SP	A-3	---
67	Tomoka muck, undrained	0 - 27 27 - 35 35 - 46 46 - 55	Muck Sand, loamy sand Sandy clay loam, sandy loam Sandy loam, sandy clay loam	PT SP-SM, SP SC, SC-SM, SM SM, SC-SM	A-8 A-3 A-2 A-2	+2.0 - 0

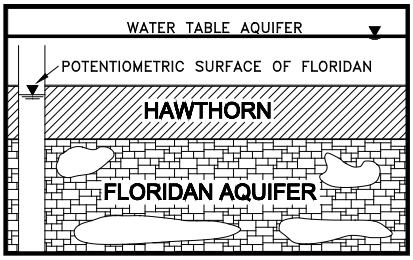
Based on review of the NRCS soil survey map, the vast majority of soils within the area of the selected alternative ponds are characterized as sands with variable silt content (A-3, A-2-4). For the majority of the soils within the pond footprints the soil survey lists seasonal high water table levels ranging from 0 to 3.5 feet below the existing ground surface. However, the estimated seasonal high groundwater levels do not account for changes in groundwater due to development and are only relevant for the soil's natural, undisturbed condition.

Information contained in the NRCS Soil Survey should be considered general and may be outdated. Therefore, it may not be reflective of actual soil and groundwater conditions, particularly if recent development in the site vicinity has modified soil conditions or surface/subsurface drainage. The information obtained from the soil borings presented in this report should be considered a more current and accurate characterization of actual site conditions.

2.3 Geology/Hydrology

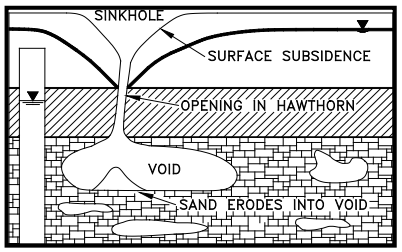


Geologic conditions in this area of Brevard County can generally be described in terms of three basic sedimentary layers. The upper layer is primarily comprised of sands containing varying amounts of silt and clay. These sands are underlain by a layer of clay, clayey sand, phosphate and limestone which is locally referred to as the Hawthorn formation. The third layer underlies the Hawthorn formation and is comprised of limestone. The thickness of these three strata varies throughout Brevard County. In general, the surficial sands typically extend to depths of 40 to 70 feet, while the Hawthorn formation ranges from nearly absent in some locations to thicknesses greater than 100 feet. The groundwater hydrogeology can be described in terms of the nature and relationship of the three basic geologic strata. The near-surface sand stratum is fairly permeable and comprises the water table (unconfined) aquifer.



The limestone formation, known as the Floridan aquifer, is highly permeable due to the presence of large interconnected channels and cavities throughout the rock. The Floridan aquifer is the primary source of drinking water in Central Florida. These two permeable strata are separated by the relatively low permeability clays of the Hawthorn formation. The amount of groundwater flow between the two aquifer systems is dependent on the thickness and consistency of the Hawthorn clay confining beds which, as previously stated, varies widely throughout Brevard County.

The geology and hydrogeology described above can be conducive to collapses of the ground surface resulting in circular depressions known as "sinkholes." Sinkholes usually occur due to the downward movement of the near surface sands through openings in the Hawthorn formation into the limestone cavities. This process can be likened to the movement of sand through an hourglass. Sinkholes are most likely to occur in areas where the Hawthorn formation is thin or absent, allowing free downward movement of sands into the limestone.



Groundwater also flows freely from the surficial aquifer into the Floridan aquifer in areas where the Hawthorn formation is thin or breached. This phenomenon is called recharge. Therefore, high recharge areas are typically prone to sinkhole activity. An evaluation of sinkhole risk would include performing deep borings to evaluate the nature and thickness of the surficial sands and Hawthorn formation.

No method of geological, geotechnical, or geophysical exploration is known that can accurately predict the occurrence of sinkholes. It is common geotechnical practice in Central Florida to make a qualitative prediction of sinkhole risk on the basis of local geological conditions in the vicinity of a particular site.

Based on the U.S. Geological Survey Map entitled "Recharge and Discharge Areas of the Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida," 1984, the project lies in a known low recharge area and, therefore, we can conclude based solely on this data that it also lies in an area where the relative risk of sinkhole formation is low compared to the overall risk across Brevard County.

2.4 Potentiometric Surface

The potentiometric level of the Floridan Aquifer in the vicinity of the project alignment ranges from about +30 to 40 feet NGVD. Ground surface elevations vary approximately between +20 and +30 feet NGVD; therefore, deep excavations may be impacted by artesian flow conditions if underlying confining layer(s) are penetrated during construction.

3.0 SUBSURFACE EXPLORATION

In addition to consulting the sources of information previously discussed for regional and site-specific soils data, GEC conducted a subsurface exploration to evaluate soil and groundwater conditions at the selected pond locations provided to us by Atkins. The subsurface exploration for this study generally consisted of performing two hand auger borings to a maximum depth of 10 feet below the existing ground surface at each of the selected pond locations. Subsurface exploration was performed at the following selected pond alternatives:

- Pond C
- Pond F
- Pond G
- Pond H
- Pond M
- Pond O
- Pond P
- Pond Q
- Pond R
- Pond T

The locations of the borings were established at the site by using the aerial plan view and taping distances from existing site features. GEC utilized a hand-held Global Position System (GPS) unit to aid in locating each boring. The boring locations were later surveyed by Atkins in order to obtain ground surface elevations. The approximate boring locations are shown on **Figures 2** through **4.**

3.1 Manual Auger Borings

Our engineering technician performed standard barrel manual auger borings in general accordance with ASTM D-4700, by manually turning a 3-inch diameter, 6-inch long sampler into the soil until it was full. He then retrieved the sampler and visually examined and classified the soil. This procedure was repeated until the desired termination depth was achieved. A field manual auger boring log was completed by the technician that described the soils penetrated, recorded depth to groundwater, if encountered, and described other details of the boring, methods used, and selected other site conditions at the time of drilling. Our technician collected representative samples for further visual examination and classification in our laboratory.

3.2 Groundwater Measurement

A GEC engineering technician measured the depth to the groundwater in the boreholes at the time of drilling and again after approximately 24 hours. Once the groundwater measurements were recorded, the boreholes were backfilled with soil cuttings to prevailing ground surface.

4.0 LABORATORY TESTING

Selected soil samples retrieved from the borings were tested in accordance with Florida Standard Testing Methods (FM). Florida Standard Testing Methods are adaptations of recognized standard methods, e.g., ASTM and AASHTO, which have been modified to accommodate Florida's geological conditions. The laboratory testing program for this project is summarized on the following table:

Table 2
Summary of Laboratory Testing Program

Type of Test	Number of Tests
Grain size analysis (FM 1 - T88)	11
Percent fine (FM 1 – T88)	4
Natural Moisture Content (FM 1-T 265)	8
Organic Content (FM 1-T267)	7
Atterberg limits (FM 1 - T89/90)	1
Laboratory Soil Permeability (FM 1-T215)	6

The results of our testing are summarized on the Pond Soil Survey Sheet (**Figure 5**) and the Summary of Laboratory Testing Results (**Table 5**) in the **Appendix.**

5.0 DESCRIPTION OF SUBSURFACE CONDITIONS

The results of our borings are presented on the Pond Auger Boring Results sheet (**Figure 6**). The soils encountered in the auger borings were classified using the AASHTO Soil Classification System (A-3, A-2-4, etc.). All soils were described using the ASTM soil descriptions (e.g., sand with silt). GEC based the soil classifications on visual examination and the limited laboratory test results shown on **Figure 5**.

The boring logs indicate subsurface conditions only at the specific boring locations at the time of our field exploration. Subsurface conditions, including groundwater levels, at other locations of the project site may differ from conditions we encountered at the boring locations. Moreover, conditions at the boring locations can change over time. Groundwater levels fluctuate seasonally, and soil conditions can be altered by earthmoving operations.

The depths and thicknesses of the subsurface strata indicated on the boring logs were interpolated between samples obtained at different depths in the borings. The actual transition between soil layers may be different than indicated. *These stratification lines were used for our analytical purposes and actual earthwork quantities measured during construction should be expected to vary from quantities calculated based on the information in this report.*

5.1 Pond Auger Boring Results

The soil description and stratum numbers used for the pond auger borings are summarized as follows:

Table 3
Soil Stratigraphy

Stratum No.	Soil Description	AASHTO Classification
1	Brown to orange fine sand and fine sand with silt, occasional trace organic material	A-3
2	Brown fine sand with silt to silty fine sand	A-2-4
3	Dark brown mucky fine sand to muck	A-8

The auger borings typically encountered fine sand with varying amounts of silt content (Strata 1 and 2; A-3, A-2-4). In addition, mucky fine sand to muck (Stratum 3; A-8) was encountered in borings AB-2, AB-8, AB-9, AB-11, AB-12, AB-17, and AB-18 at varying depths and thicknesses. Please refer to the Pond Auger Boring Results sheet (**Figure 6**) for detailed soil and groundwater information at a specific boring location.

5.2 Groundwater Levels

Groundwater levels were measured at least 24 hours after completion of the borings. Encountered groundwater elevations at the boring locations ranged from + 13.1 to 19.9 feet NGVD. However, the groundwater table was not encountered to a depth of 10 feet at Borings AB-19 and AB-20 at Pond T. Groundwater levels can vary seasonally and with changes in subsurface conditions between boring locations. Alterations in surface and/or subsurface drainage brought about by site development can also affect groundwater levels. *Therefore, groundwater depths measured at different times or at different locations on the site can be expected to vary from those measured by GEC during this investigation.*

For purposes of this report, estimated seasonal high groundwater levels are defined as groundwater levels that are anticipated at the end of the wet season during a "normal rainfall" year under pre-development site conditions. We define a "normal rainfall" year as a year in which rainfall quantity and distribution were at or near historical averages.

We estimate that seasonal high groundwater depths will range from at or above the ground surface, indicated by "AGS" shown adjacent the boring profile, to greater than 6 feet below ground surface. Our encountered and estimated seasonal high groundwater levels are presented on the Pond Auger Boring Results sheet (**Figure 6**) and **Table 6** in the **Appendix**.

6.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

The preliminary analyses and recommendations contained in this report are based in part on the data obtained from a limited number of soil samples and groundwater measurements obtained from widely-spaced borings. The investigation methods used indicate subsurface conditions only at the specific boring locations, only at the time they were performed, and only to the depths penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations and these variations may not become evident until construction. These recommendations are provided to aid in alignment selection and preliminary construction costs. A final geotechnical engineering evaluation will be required after the alignment, ponds and typical section have been selected.

6.1 Stormwater Ponds

The pond borings generally encountered fine sands with varying amounts of silt (A-3, A-2-4) with occasional layers of mucky fine sand to muck (A-8) to the maximum boring termination depth of 10 feet below the existing ground surface. The majority of the soils encountered in the pond borings appear suitable for use as roadway embankment in accordance with Index 505 of the FDOT Standard. Sands excavated below the water table will need to be dried to moisture content near optimum to achieve the required degree of compaction.

GEC performed constant head laboratory permeability test on six representative soil samples. The following table summarizes the result of the laboratory permeability tests.

Table 4
Summary of Permeability Tests Results

Pond No.	Boring No.	Depth Interval of Soil Sample (ft)	Soil Type (AASHTO)	Horizontal Permeability, K (ft/day)	Perm Type
Pond G	AB-5	4.5 - 8	A-3	14.0	Lab Perm – Constant Head
Pond H	AB-7	0 -2.5	A-3	8.5	Lab Perm – Constant Head
Pond M	AB-9	2 – 5.5	A-8	2.4	Lab Perm – Constant Head
Pond O	AB-12	2 - 5	A-3	9.6	Lab Perm – Constant Head
Pond Q	AB-14	0 -5	A-3	11.9	Lab Perm – Constant Head
Pond T	AB-20	1.5 – 6.5	A-3	32.4	Lab Perm – Constant Head

7.0 USE OF THIS REPORT

GEC has prepared this preliminary report for the exclusive use of Atkins, and FDOT, and for specific application to our client's project. GEC will not be held responsible for any third party's interpretation or use of this report's subsurface data or engineering analysis without our written authorization.

The sole purpose of the borings performed by GEC at this site was to obtain indications of subsurface conditions as part of a geotechnical exploration program. GEC has not evaluated the

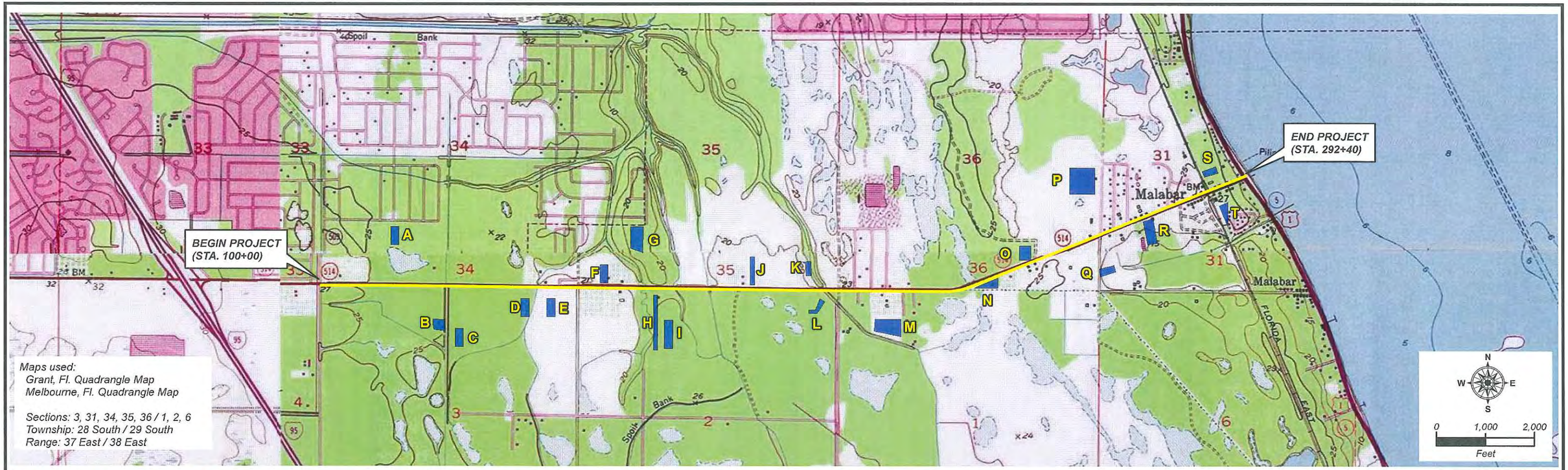
site for the potential presence of contaminated soil or groundwater, nor have we subjected any soil samples to analysis for contaminants.

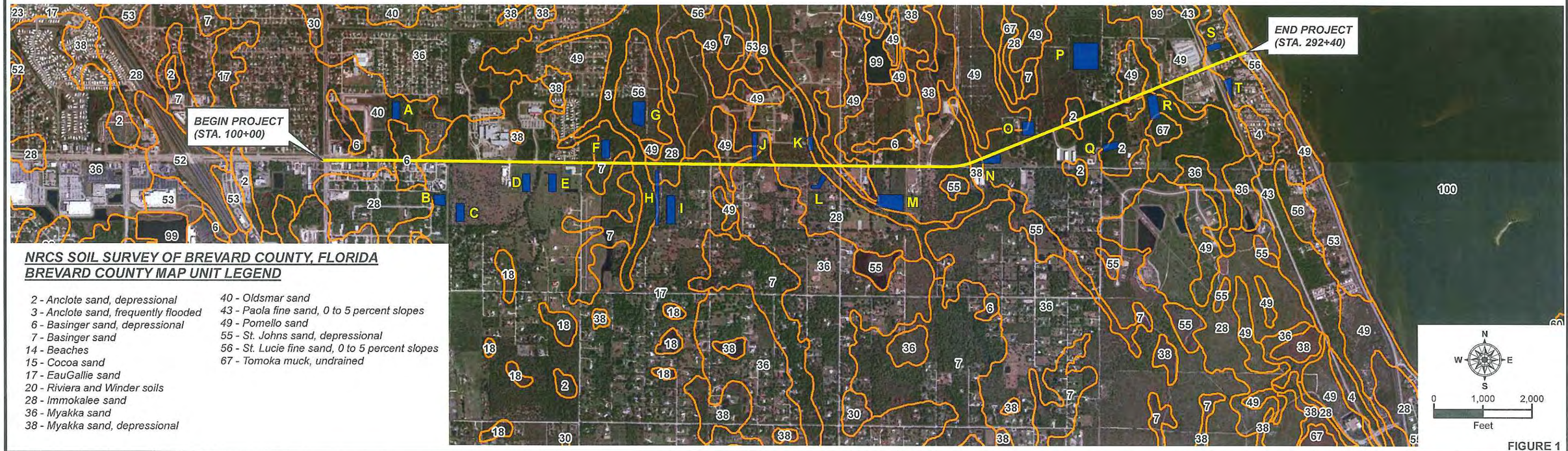
GEC has strived to provide the services described in this report in a manner consistent with that level of care and skill ordinarily exercised by members of our profession currently practicing in Central Florida. No other representation is made or implied in this document.

The preliminary conclusions or recommendations of this report should be disregarded if the nature, design, or location of the facilities is changed. If such changes are contemplated, GEC should be retained to review the new plans to assess the applicability of this report in light of proposed changes.

APPENDIX

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS





NRCS SOIL SURVEY OF BREVARD COUNTY, FLORIDA
BREVARD COUNTY MAP UNIT LEGEND

- 2 - Anclote sand, depressional
- 3 - Anclote sand, frequently flooded
- 6 - Basinger sand, depressional
- 7 - Basinger sand
- 14 - Beaches
- 15 - Cocoa sand
- 17 - EauGallie sand
- 20 - Riviera and Winder soils
- 28 - Immokalee sand
- 36 - Myakka sand
- 38 - Myakka sand, depressional
- 40 - Oldsmar sand
- 43 - Paola fine sand, 0 to 5 percent slopes
- 49 - Pomello sand
- 55 - St. Johns sand, depressional
- 56 - St. Lucie fine sand, 0 to 5 percent slopes
- 67 - Tomoka muck, undrained

FIGURE 1

REVISIONS					
DATE	BY		DATE	BY	

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STATE OF FLORIDA DEPARTMENT OF TRANSPORATATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
514	BREVARD	430136-1-22-01

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS

SHEET NO.

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BORING LOCATION PLAN

FIGURE 2

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DEPARTMENT OF TRANSPORATATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
514	BREVARD	430136-1-22-01

BORING LOCATION PLAN

SHEET NO.

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FIGURE 3

REVISIONS					
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
514	BREVARD	430136-1-22-01

BORING LOCATION PLAN

SHEET NO.

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FIGURE 4

REVISIONS					
DATE	BY		DATE	BY	

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DEPARTMENT OF TRANSPORATATION

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514	BREVARD	430136-1-22-01

BORING LOCATION PLAN

SHEET NO.

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POND SOIL SURVEY RESULT SHEET

DATE OF SURVEY: AUGUST, SEPTEMBER 2013
SURVEY MADE BY: B. STORMONT, R. ROBINSON
SUBMITTED BY: CHRISTOPHER P. MEYER, P.E.

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH

DISTRICT: 5
ROAD NO.: SR 514
COUNTY: BREVARD

FINANCIAL PROJECT ID : 430136-1-22-01
PROJECT NAME: SR 514 PROJECT DEVELOPMENT AND ENVIRONMENTAL (PD&E) STUDY
CROSS SECTION SOIL SURVEY FOR THE DESIGN OF PONDS

	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS PERCENT PASS (%)						ATTERBERG LIMITS (%)					CORROSION TEST RESULTS				
STRATUM NO.	NO. OF TESTS	% ORGANIC	NO. OF TESTS	MOISTURE CONTENT	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	AASHTO GROUP	DESCRIPTION	NO. OF TESTS	RESISTIVITY ohm-cm	CHLORIDE ppm	SULFATES ppm	pH
1	1	3	1	17	8	100	87-100	33-88	12-52	3-7	0	-	-	A-3	BROWN TO ORANGE FINE SAND TO FINE SAND WITH SILT, OCCASIONAL TRACE ORGANIC MATERIAL	0	-	-	-	-
2	0	-	1	19	1	100	88	62	41	23	1	25	9	A-2-4	BROWN FINE SAND WITH SILT TO SILTY FINE SAND	0	-	-	-	-
3	6	5-78	6	19-379	6	100	97-100	81-86	47-50	9-95	0	-	-	A-8	DARK BROWN MUCKY FINE SAND TO MUCK	0	-	-	-	-

NOTES

1. STRATA BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH BORING LOCATION ONLY. ANY STRATUM CONNECTING LINES THAT ARE SHOWN ARE FOR ESTIMATING EARTHWORK ONLY AND DO NOT INDICATE ACTUAL STRATUM LIMITS. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 2-4 OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION. FOR FURTHER DETAILS SEE SECTION 120-3.
2. WATER TABLE SHOWN AS ▼ WHERE ENCOUNTERED AT TIME OF SURVEY. ESTIMATED SEASONAL HIGH GROUNDWATER SHOWN AS ▽. ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL AT OR ABOVE GROUND SURFACE SHOWN AS ▽ AGS.
3. THE SYMBOL "-" REPRESENTS AN UNMEASURED PARAMETER.
4. STRATA 1 AND 2 SHALL BE TREATED AS SELECT (S) MATERIAL IN ACCORDANCE WITH FDOT INDEX NO. 505.
5. STRATUM 3 SHALL BE TREATED AS MUCK (M) IN ACCORDANCE WITH FDOT INDEX NO. 505.
6. STRATUM 2 MAY RETAIN EXCESS MOISTURE AND MAY BE DIFFICULT TO DRY AND COMPACT.

FIGURE 5

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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Orlando, FL. 32814
T 407-898-1818 F 407-898-1837
Certificate of Authorization No. 5882
CHRITOPHER P. MEYER P.E. NO. 49328

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

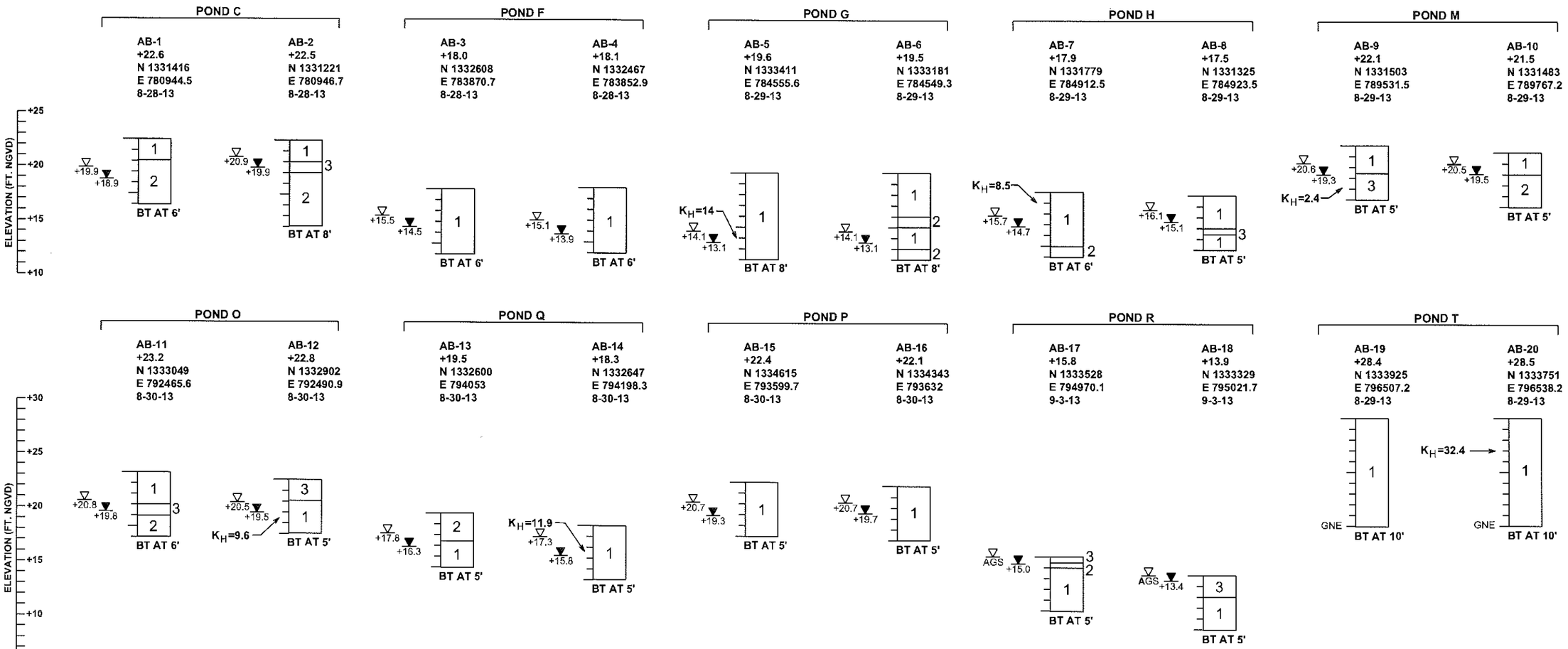
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
514	BREVARD	430136-1-22-01

SOIL SURVEY

SHEET NO.

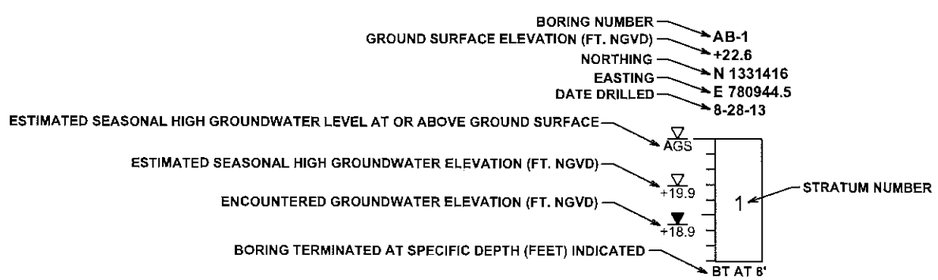
scott 10/31/2013 9:19:30 AM J:\D106\3491G\rdssgeo01.dgn

POND BORING RESULTS



STRATUM NO.	AASHTO CLASSIFICATION	SOIL DESCRIPTION
1	A-3	BROWN TO ORANGE FINE SAND TO FINE SAND WITH SILT, OCCASIONAL TRACE ORGANIC MATERIAL
2	A-2-4	BROWN FINE SAND WITH SILT TO SILTY FINE SAND
3	A-8	DARK BROWN MUCKY FINE SAND TO MUCK

BORING LEGEND



K_H= HORIZONTAL PERMEABILITY RATE (FT./DAY)

FIGURE 6

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS, INC. (GEC)
919 Lake Baldwin Lane
Orlando, FL. 32814
T 407-898-1818 F 407-898-1837
Certificate of Authorization No. 5882
CHRITOPHER P. MEYER P.E. NO. 49328

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
514	BREVARD	430136-1-22-01

POND BORING RESULTS

SHEET NO.

SUMMARY OF LABORATORY TEST RESULTS

Table 5

Summary of Laboratory Test Results

SR 514 PD&E Study

From SR 507 to US 1

FPID No. 430136-1-22-01

GEC Project No. 3491G

Pond Number	Stratum Number	Boring Number	Sample Depth (feet)	Percent Passing by Weight					Moisture Content (%)	Atterberg Limits		Organic Content (%)	AASHTO Class.
				#10 Sieve	#40 Sieve	#60 Sieve	#100 Sieve	#200 Sieve		Liquid Limit	Plasticity Index		
F	1	AB-3	2 - 4	100	100	84	49	4	---	---	---	---	A-3
F	1	AB-4	3 - 6	100	97	84	49	7	---	---	---	---	A-3
G	1	AB-5	4.5 - 8	100	100	88	52	4	---	---	---	---	A-3
H	1	AB-7	0 - 2.5	100	96	84	48	5	17	---	---	3	A-3
O	1	AB-12	2 - 5	100	96	81	43	6	---	---	---	---	A-3
Q	1	AB-14	0 - 5	100	100	73	37	4	---	---	---	---	A-3
P	1	AB-16	0 - 5	100	93	67	30	3	---	---	---	---	A-3
T	1	AB-20	1.5 - 6.5	100	87	33	12	4	---	---	---	---	A-3
C	2	AB-1	3 - 6	100	88	62	41	23	19	25	9	---	A-2-4
C	3	AB-2	2 - 3	---	---	---	---	14	19	---	---	8	A-8
H	3	AB-8	3 - 3.5	---	---	---	---	9	67	---	---	8	A-8
M	3	AB-9	2 - 5.5	100	97	86	50	10	32	---	---	5	A-8
O	3	AB-11	3 - 4	---	---	---	---	14	38	---	---	10	A-8
O	3	AB-12	0 - 2	100	100	81	47	12	35	---	---	9	A-8
R	3	AB-18	0 - 2	---	---	---	---	95	379	---	---	78	A-8

SUMMARY OF GROUNDWATER TABLES AND PERMEABILITY RESULTS

Table 6

Summary of Groundwater Tables and Permeability Results

SR 514 PD&E

From SR 507 to US 1

FPID No. 430136-1-22-01

GEC Project No. 3491G

Pond No.	Boring No.	Date of Groundwater Measurement	Ground Surface Elevation (ft NGVD)	Encountered Groundwater Depth (feet)	Encountered Groundwater Elevation (ft NGVD)	Estimated Seasonal High Groundwater Depth (feet)	Estimated Seasonal High Groundwater Elevation (ft NGVD)	NRCS Soil Survey Seasonal High Groundwater Depth Range (feet)	Lab Permeability Test Results	
									Horizontal Permeability Rate (ft/day)	Soil Type
Pond C	AB-1	08/29/13	22.6	3.8	18.9	2.8	19.9	1.0-3.5	--	--
	AB-2	08/29/13	22.5	2.7	19.9	1.7	20.9		---	---
Pond F	AB-3	08/29/13	18.0	3.5	14.5	2.5	15.5	0-1.5	---	---
	AB-4	08/29/13	18.1	4.3	13.9	3.0	15.1		---	---
Pond G	AB-5	08/30/13	19.6	6.5	13.1	5.5	14.1	> 6.0	14.0	A-3
	AB-6	08/30/13	19.5	6.5	13.1	5.5	14.1		---	--
Pond H	AB-7	08/30/13	17.9	3.2	14.7	2.2	15.7	1.0-3.5	8.5	A-3
	AB-8	08/30/13	17.5	2.4	15.1	1.4	16.1		--	---
Pond M	AB-9	08/29/13	22.1	2.9	19.3	1.5	20.6	0-1.0	2.4	A-8
	AB-10	08/29/13	21.5	2.0	19.5	1.0	20.5		---	---
Pond O	AB-11	09/03/13	23.2	3.4	19.8	2.4	20.8	2.5-3.5	---	---
	AB-12	09/03/13	22.8	3.4	19.5	2.4	20.5		9.6	A-3
Pond Q	AB-13	09/03/13	19.5	3.2	16.3	1.7	17.8	0-1.0	---	---
	AB-14	09/03/13	18.3	2.5	15.9	1.0	17.3		11.9	A-3
Pond P	AB-15	09/03/13	22.4	3.2	19.3	1.7	20.7	0-1.0	---	---
	AB-16	09/03/13	22.1	2.4	19.7	1.4	20.7		---	---
Pond R	AB-17	09/04/13	15.8	0.8	15.0	AGS	AGS	0-1.0	---	---
	AB-18	09/04/13	13.9	0.5	13.4	AGS	AGS		---	---
Pond T	AB-19	08/30/13	28.4	GNE	--	--	--	> 6.0	---	---
	AB-20	08/30/13	28.5	GNE	--	--	--		32.4	A-3

Notes:

GNE - Groundwater not encountered below 10 feet of the ground surface

AGS - At or Above Ground Surface