SR 400 (I-4) Project Development and Environment (PD&E) Study

FM No.: 432100-1-22-01

Report of Preliminary Geotechnical Engineering Investigation for Ponds

Segment 2: State Road 400 (SR 400)/Interstate 4 (I-4) from West of SR 528 (Beachline Expressway) to West of SR 435 (Kirkman Road)

Orange County (75280), Florida

December 16, 2015

Geotechnical and Environmental Consultants, Inc.
919 Lake Baldwin Lane
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HNTB Corporation
610 Crescent Executive Court
Suite 400
Lake Mary, FL 32746

September 16, 2013
Revised February 13, 2015
Revised December 16, 2015

HNTB
610 Crescent Executive Court, Suite 400
Lake Mary, Florida 32746

Attention: Mr. Luis Diaz, P.E.

Subject: Report of Preliminary Geotechnical Engineering Investigation for Ponds
SR 400 (I-4) FROM US 27 TO KIRKMAN ROAD AND FROM E OF SR 434 TO SR 472
SEGMENT 2
Polk, Osceola, Orange, Seminole and Volusia Counties, Florida
FPN 432100-1-22-01
GEC Project No. 3492G

Dear Mr. Diaz:

Geotechnical and Environmental Consultants, Inc. (GEC) is pleased to provide this Report of Preliminary Geotechnical Engineering Investigation for Ponds for the above-referenced project. This revised report incorporates minor updates to pond shapes (Pond 201). No new ponds or new borings are included. 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

12/16/15

V. Eugene Williford IV, E.I.
Geotechnical Engineer

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STATE OF FLORIDA
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VEW/CPM/dbj

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APPENDIX

1.0 Project Description and Purpose

The Florida Department of Transportation (FDOT) is proposing to reconstruct and widen I-4 as part of the I-4 Ultimate concept. This involves the build-out of I-4 to its ultimate condition through Central Florida, including segments in Polk, Osceola, Orange, Seminole, and Volusia Counties. The concept design proposed the addition of two (2) new express lanes in each direction giving it a total of ten (10) dedicated lanes. The study area in this section from south of SR 528 to SR 435 (Kirkman Road) includes the interchanges at SR 528, Sand Lake Road, and Universal Boulevard, and provides for the required stormwater treatment with twenty one pond sites along the corridor. The typical section will ensure that the design will be contained within the existing right-of-way with the exception of several offsite ponds.

This Report of Preliminary Geotechnical Investigation has been prepared as a part of the SR 400 (I-4) Project Development and Environment (PD&E) Study. The PD&E Study is being performed for the proposed improvements to an approximately 40 mile long stretch of SR 400 (I-4) from US 27 to Kirkman Road and from east of SR 434 to SR 472. This PD&E project is divided into five separate segments (Segment 1, 2, 3, 4 and 5).

Segment 2 of the project is located in southwest Orange County, Florida. The approximate Segment 2 project limits begin approximately ½ mile south of SR 528 and extend to Kirkman Road. The typical section for this segment includes a 10-lane divided grassed median interstate with grassed right-of-way and stormwater ponds/roadside swales within the right-of-way. This Report of Preliminary Geotechnical Investigation includes geotechnical investigation and analyses at the thirteen requested alternative stormwater pond locations within Segment 2.

The Segment 2 project alignment is bordered by mostly commercial buildings with sparse sections of undeveloped land consisting of pine flatwoods and palmetto bushes. Many of the proposed ponds are located in areas that are already developed with either private development or around I-4 roadway/ramps and thus drainage patterns may have been affected. 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 locations for Segment 2 are depicted on the USGS Lake Jessamine, Florida Quadrangle map shown on **Figure 1**. Review of the USGS Lake Jessamine, Florida Quadrangle map indicates that the natural ground surface elevation for the ponds in Segment 2 ranges from approximately +100 feet NGVD to +135 feet NGVD. Big Sand Lake and several smaller adjacent lakes are located in close proximity to most of the proposed ponds.

2.2 NRCS Soil Survey Review

The Natural Resources Conservation Service (NRCS) (formerly SCS) Soil Survey of Orange 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:

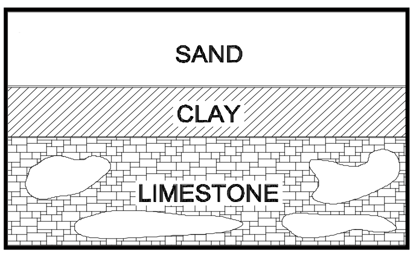
Table 1
Orange County NRCS Soil Survey Review

Map Symbol	Soil Name	Depth (in)	Soil Description	AASHTO Soil Classification	Seasonal High Groundwater Depth (ft)	Hydrologic Group
2	Archbold fine sand, 0 to 5 percent slopes	0 - 80	Fine sand, sand	A-3	3.5 - 5.0	A
3	Basinger fine sand, depressional	0 - 7 7 - 80	Fine sand Fine sand, sand	A-3 A-2-4, A-3	+2.0 - 0.0	A/D
6	Candler fine sand, 5 to 12 percent slopes	0 - 69	Fine sand, sand	A-3	> 6	A
		69 - 80	Fine sand, sand	A-3, A-2-4		
	Apopka fine sand, 5 to 12 percent slopes	0 - 69	Fine sand, sand	A-3		
		69 - 80	Sandy clay loam, sandy loam	A-4, A-6, A-2-4, A-2-6		
20	Immokalee fine sand	0 - 5 5 - 35 35 - 67 67 - 80	Fine sand Fine sand, sand Fine sand, sand Fine sand, sand	A-3 A-3 A-2-4, A-3 A-3	0.5 - 1.0	B/D
34	Pomello fine sand, 0 to 5 percent slopes	0 - 3 3 - 40 40 - 55 55 - 80	Fine sand Fine sand, sand Fine sand, sand Fine sand, sand	A-3 A-3 A-2-4, A-3 A-3	2.0 - 3.5	A
37	St. Johns fine sand	0 - 12 12 - 24 24 - 44 44 - 80	Fine sand Fine sand, sand Fine sand, sand Fine sand, sand	A-3 A-3 A-2-4, A-3 A-3	0.5 - 1.0	B/D
38	St. Lucie fine sand, 0 to 5 percent slopes	0 - 2 2 - 80	Fine sand Fine sand, sand	A-3 A-3	> 6	A
44	Smyrna fine sand	0 - 27 27 - 80	Fine sand, sand Fine sand, sand	A-2-4, A-3 A-3	0.5 - 1.5	A/D
46	Tavares fine sand, 0 to 5 percent slopes	0 - 6 6 - 80	Fine sand Fine sand, sand	A-3 A-3	3.5 - 6.0	A
47	Tavares fine sand, 0 to 5 percent slopes	0 - 80	Fine sand, sand	A-3	3.5 - 6.0	A
	Millhopper fine sand, 0 to 5 percent slopes	0 - 64	Fine sand, sand	A-3, A-2-4	5.0 - 5.5	
		64 - 76	Sandy loam, loamy sand, loamy fine sand	A-2-4		
		76 - 80	Sandy clay loam, sandy loam, fine sandy loam	A-4, A-2-4		
50	Urban land	---	---	---	---	A

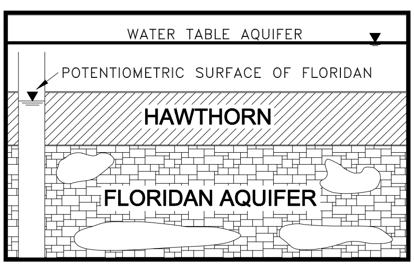
Based on review of the NRCS soil survey map, the soils within the area of the proposed ponds in Segment 2 are characterized as sands with variable silt content (A-3, A-2-4). For the majority of the soils within the pond footprints the soil survey lists seasonal high water table levels ranging from 0.5 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

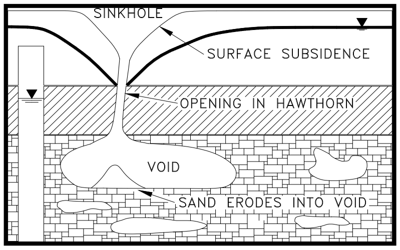


Central Florida geologic conditions can generally be described in terms of three basic sedimentary layers. The upper layer is primarily comprised of sands containing varying amounts of silt and clay. These sands are underlain by a layer of clay, clayey sand, phosphate and limestone which is locally referred 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 Central Florida. 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 of Central Florida 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 Central Florida.

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 high 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 high compared to the overall risk across Central Florida.

2.4 Potentiometric Surface

The potentiometric level of the Floridan Aquifer in the vicinity of the project alignment ranges from about +60 to +65 feet NGVD. Ground surface elevations vary approximately between +100 and +135 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 pond locations provided to us by HNTB. The subsurface exploration for this study generally consisted of performing 2 machine auger borings to a depth of 20 feet below the existing ground surface, along with one field permeability test at each of the proposed pond locations. However, due to access issues at the Pond 200-B and Pond 205-B locations, only hand auger borings were performed to depths ranging from 5 to 14 feet below the existing ground surface and a laboratory permeability test was performed on a selected soil sample from one of the hand auger borings at each pond location. Some ponds were not drilled during this study as the drainage engineering had existing nearby water table data to use for preliminary planning.

The approximate locations of the borings performed for this study are shown on **Figures 2** through **4** in the **Appendix**. Some of the pond locations were moved slightly, thus causing the boring locations to be outside the pond footprints. These locations were not surveyed, but rather by using a handheld, sub-meter accuracy global positioning satellite (GPS) unit (Trimble Geo XH Series). Although these locations are given only approximately, the methods used to locate them are, in GEC’s opinion, sufficient to meet the intent of our study. If greater accuracy is desired, a registered Professional Land Surveyor should be retained to survey these locations.

3.1 Machine Auger Borings

Machine auger borings were performed in general accordance with ASTM Procedure D-4700. Machine auger borings were performed by hydraulically turning continuous flight, solid-stem, auger into the ground in 5-foot increments until the desired boring termination depth was achieved. The auger flights were retrieved in 5-foot increments, without further rotation of the auger, and the retrieved soil was examined by our technician prior to collection of representative samples. A field auger boring log was prepared that detailed the soils penetrated, records the groundwater depth at the time of drilling, if encountered, and includes other details of the boring, methods used, and selected other boring and/or site conditions at the time of drilling. The samples were placed in sealed jars and transported to GEC's laboratory for further examination and limited laboratory testing as needed.

3.2 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.

3.3 Field Permeability Tests

Constant and falling head permeability tests were performed in the field at this site. The field permeability tests were performed by driving a 3-inch diameter casing into the ground to the desired test depth and washing the soil out of the casing with water. The casing was backfilled with quartz gravel to 24 inches above the bottom of the casing and was then raised a distance of 18 inches.

When a constant head permeability test was conducted, water was added to the casing to achieve a stable water level. Once the water level stabilized, the flow required to maintain the stable water level over time was measured.

When a falling head permeability test was conducted, water was added to the casing to achieve a stable water level. Once the water level stabilized, the water source was taken away and the drop in water level in the casing with respect to time was recorded.

These relationships were used to calculate the permeability of the soil. Field permeability tests and calculations were performed in general conformance with NAVFAC DM-7.1-108.

3.4 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)	18
Natural Moisture Content (FM 1-T 265)	6
Organic Content (FM 1-T267)	5
Atterberg limits (FM 1 - T89/90)	1
Laboratory Soil Permeability (FM 1-T215)	2

The results of our testing are summarized on the 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** and **Table 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	Light brown to brown to light gray to gray fine sand and fine sand with silt	A-3
2	Brown to dark brown to dark gray fine sand with silt to silty fine sand, occasional trace organic material	A-2-4
3	Light brown clayey fine sand	A-2-6
4	Dark brown mucky fine sand	A-8

The auger borings typically encountered sand with varying amounts of silt content (Strata 1 and 2; A-3, A-2-4). In addition, mucky fine sand (Stratum 4; A-8) was encountered in borings PB-4, PB-6, PB-7, PB-11 PB-13, PB-14 and PB-22 at varying depths and thicknesses. A buried layer clayey fine sand (Stratum 3; A-2-6) was encountered in borings PB-12 and PB-19 from 15.5 feet to the boring termination depth of 20 feet below the existing ground surface. 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 depths at the boring locations range from 0 to 13.1 feet below the existing ground surface. 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 "AAGS" shown adjacent the boring profile, to approximately 11.0 feet below the existing 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 (A-8) to the boring termination depths of 20 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. Stratum 3 (A-2-6) has limitations for use as embankment fill, and Stratum 4 (A-8) is not suitable for use as roadway embankment. 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 one permeability test at each of the proposed pond locations. The following table summarizes the result of our field and laboratory permeability tests.

Table 4
Summary of Permeability Tests Results

Pond No.	Boring No.	Depth (ft)	Encountered Water Table (ft)	Soil Type (AASHTO)	Horizontal Permeability, K (ft/day)	Perm Type
200-A	PB-1	12 - 14	12.1	A-3	2.9	Falling Head
200-B	PB-	5 - 8.5	13.1	A-3	22.5	Constant Head
201	PB-4	6 - 8	4.4	A-3	22.5	Falling Head
202A	PB-6	6 - 8	2.1	A-3	1.4	Constant Head
202B	PB-7	4 - 6	2.8	A-3	24.3	Falling Head
202D	PB-10	7 - 9	5.5	A-3	3.3	Falling Head
205-A	PB-12	7 - 9	7.7	A-2-4	14.9	Falling Head
205-B	PB-18	4 - 11	11.7	A-3	22.5	Constant Head
205-D	PB-19	8 - 10	5.6	A-3	9.8	Falling Head
205-D	PB-22	7 - 9	7.0	A-3	10.9	Falling Head
206	PB-14	8 - 10	2.2	A-3	1.8	Constant Head
206-A	PB-23	3 - 5	3.1	A-3	15.3	Falling Head
206-B	PB-24	5 - 7	0.8	A-2-4	3.7	Constant Head

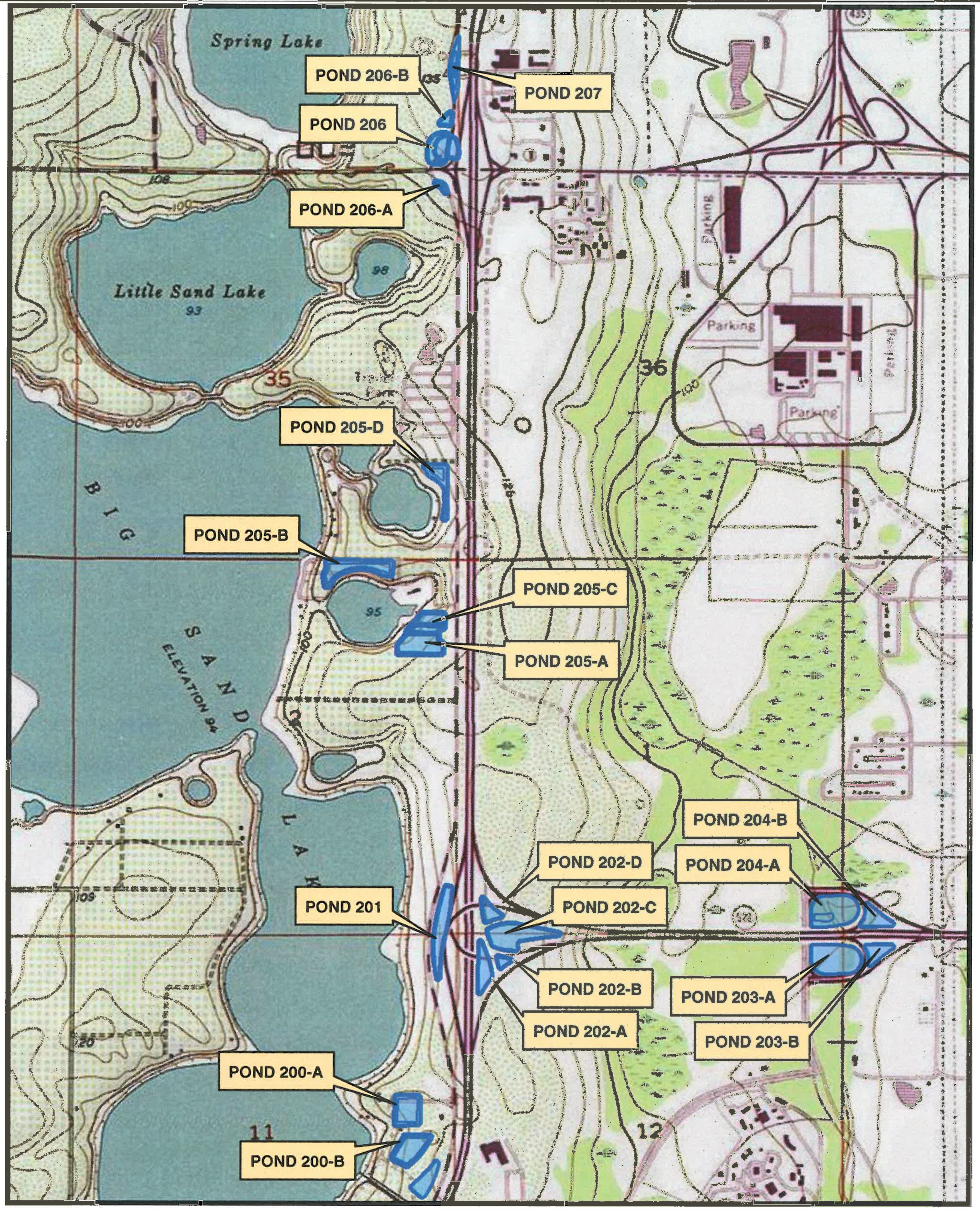
7.0 Use of This Report

GEC has prepared this preliminary report for the exclusive use of HNTB, 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.

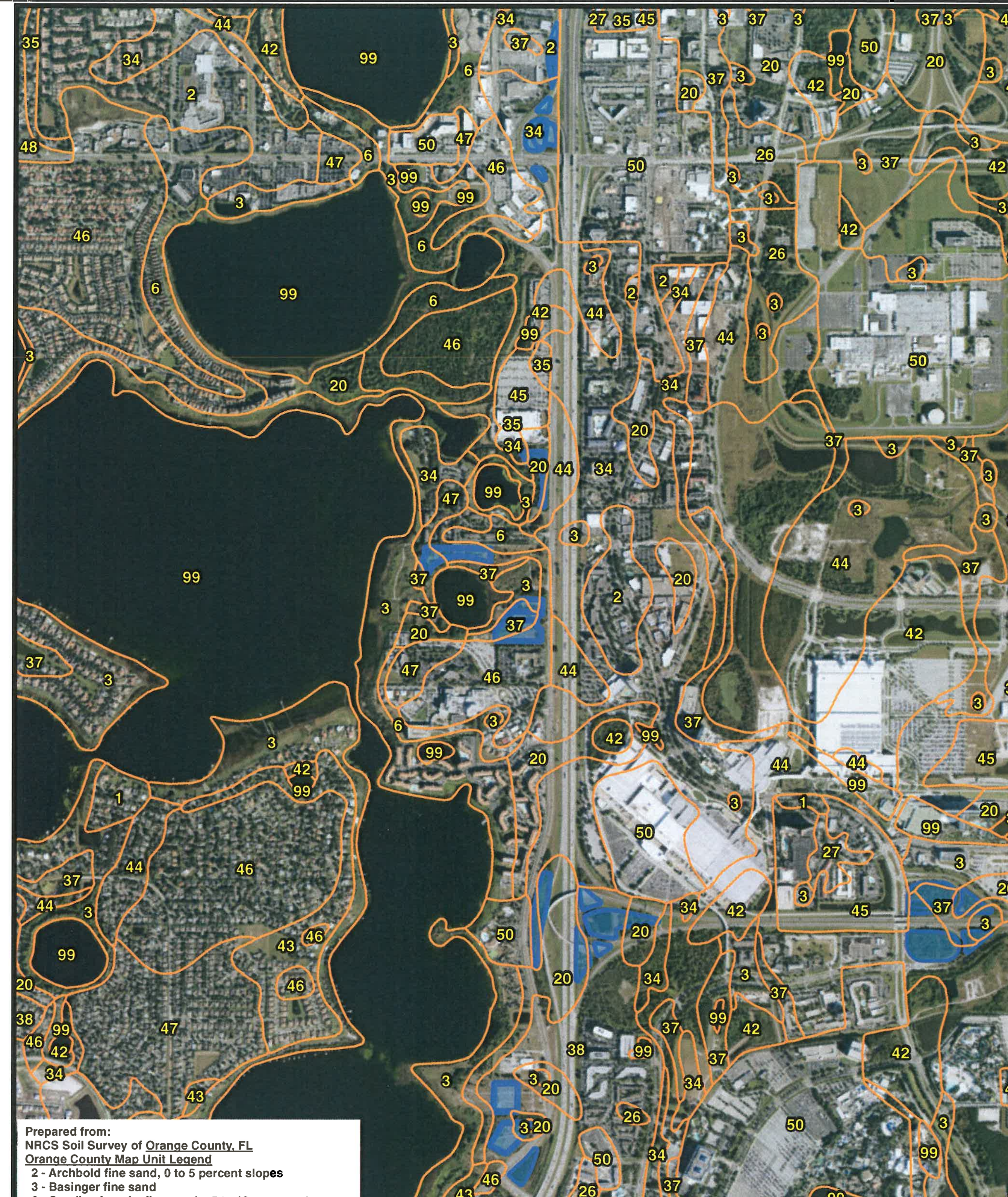
GEC has strived to provide the services described in this report in a manner consistent with that level of care and skill ordinarily exercised by members of our profession currently practicing in Central Florida. No other representation is made or implied in this document.

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.



Prepared from:
USGS Lake Jessamine, FL Quadrangle Map

Sections: 35, 36	Sections: 1, 2, 11, 12
Townships: 23 South	Townships: 24 South
Range: 28 East	Range: 28 East



Prepared from:
NRCS Soil Survey of Orange County, FL
Orange County Map Unit Legend

- 2 - Archbold fine sand, 0 to 5 percent slopes
- 3 - Basinger fine sand
- 6 - Candler-Apopka fine sands, 5 to 12 percent slopes
- 20 - Immokalee fine sand
- 34 - Pomello fine sand, 0 to 5 percent slopes
- 37 - St. Johns fine sand
- 38 - St. Lucie fine sand, 0 to 5 percent slopes
- 44 - Smyrna fine sand
- 46 - Tavares fine sand, 0 to 5 percent slopes
- 47 - Tavares-Millhopper fine sands, 0 to 5 percent slopes
- 50 - Urban land

N W E S

0 1,000 2,000
Feet

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FIGURE 1 - USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS

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FIGURE 2 - BORING LOCATION PLAN

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FIGURE 3 - BORING LOCATION PLAN

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FIGURE 4 - BORING LOCATION PLAN

DATE OF SURVEY: JULY, AUGUST 2013, FEBRUARY 2014
SURVEY MADE BY: GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.
SUBMITTED BY: CHRISTOPHER P. MEYER, P.E.

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH

DISTRICT: 5
ROAD NO.: SR 400
COUNTY: SEMINOLE

FINANCIAL PROJECT ID : 432100-1-22-1
PROJECT NAME: SR 400 (I-4) PROJECT DEVELOPMENT AND ENVIRONMENTAL (PD&E) STUDY
CROSS SECTION SOIL SURVEY FOR THE DESIGN OF PONDS
STATIONS REFERENCE CENTERLINE OF CONSTRUCTION

STRATUM NO.	ORGANIC CONTENT NO. OF TESTS	ORGANIC CONTENT % ORGANIC	MOISTURE CONTENT NO. OF TESTS	MOISTURE CONTENT MOISTURE CONTENT	SIEVE ANALYSIS RESULTS PERCENT PASS (%) NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	ATTERBERG LIMITS (%) NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	AASHTO GROUP	DESCRIPTION	CORROSION TEST RESULTS NO. OF TESTS	RESISTIVITY ohm-cm	CHLORIDE ppm	SULFATES ppm	pH
1	0	-	0	-	11	100	86-97	44-61	8-14	1-5	0	-	-	A-3	LIGHT BROWN TO BROWN TO LIGHT GRAY TO GRAY FINE SAND TO FINE SAND WITH SILT	0	-	-	-	-
2	0	-	0	-	1	100	96	64	26	12	0	-	-	A-2-4	BROWN TO DARK BROWN TO DARK GRAY FINE SAND WITH SILT TO SILTY FINE SAND, OCCASIONAL TRACE ORGANIC MATERIAL	0	-	-	-	-
3	0	-	1	16	1	100	100	98	93	34	1	32	12	A-2-6	LIGHT BROWN CLAYEY FINE SAND	0	-	-	-	-
4	5	6-8	5	18-22	5	100	79-96	24-66	8-32	6-19	0	-	-	A-8	DARK BROWN MUCKY FINE SAND	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. THE SYMBOL "NP" REPRESENTS NON-PLASTIC.
5. STRATA 1 AND 2 SHALL BE TREATED AS SELECT (S) MATERIAL IN ACCORDANCE WITH FDOT INDEX NO. 505.
6. STRATUM 3 SHALL BE TREATED AS PLASTIC (P) MATERIAL IN ACCORDANCE WITH FDOT INDEX NO. 505.
7. STRATUM 4 SHALL BE TREATED AS MUCK (M) IN ACCORDANCE WITH FDOT INDEX NO. 505.
8. STRATUM 2 MAY RETAIN EXCESS MOISTURE AND MAY BE DIFFICULT TO DRY AND COMPACT.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS, INC. (GEC)
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Certificate of Authorization No. 5882
CHRISTOPHER P. MEYER PE NO. 49328

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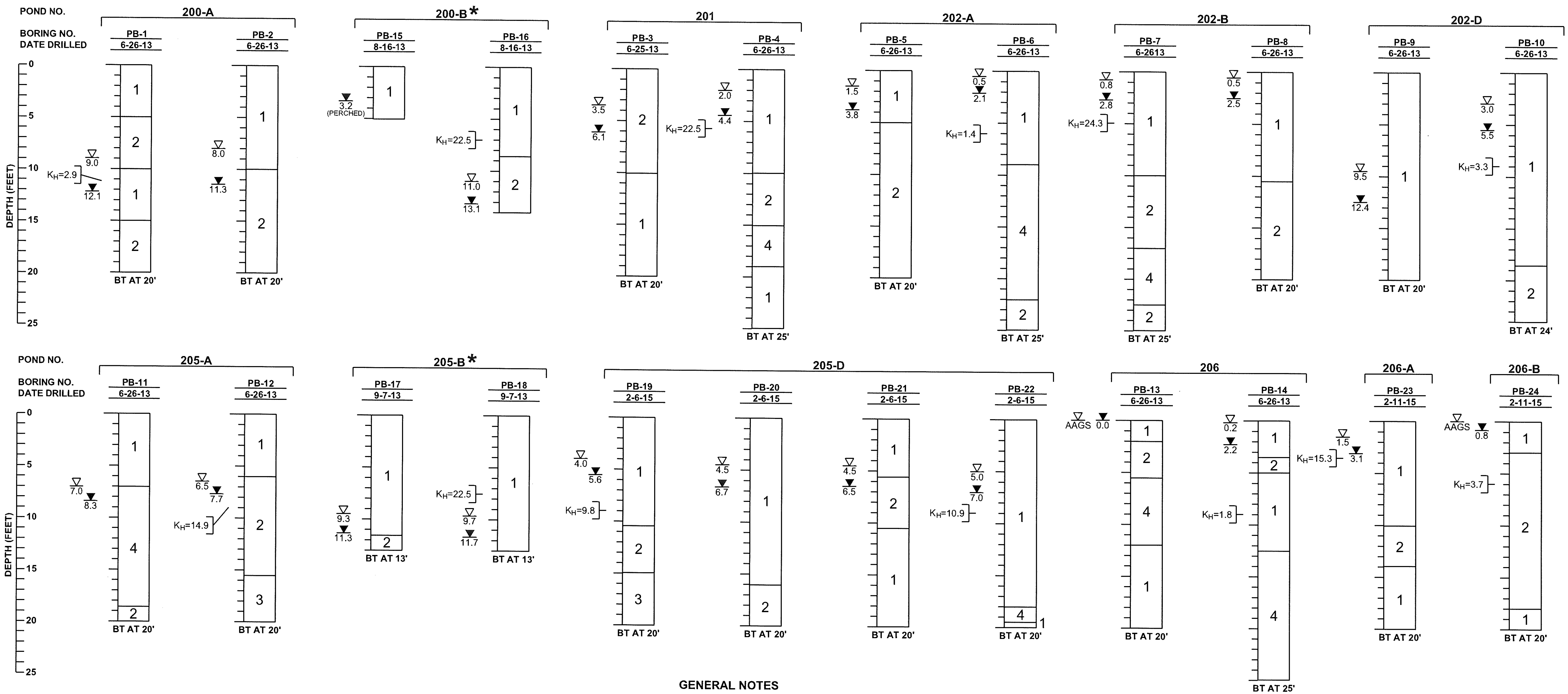
FIGURE 5 - POND SOIL SURVEY



LEGEND

- AAGS — SEASONAL HIGH GROUNDWATER LEVEL AT OR ABOVE GROUND SURFACE
- ▽ 9.0 — ESTIMATED SEASONAL HIGH GROUNDWATER DEPTH (FT.)
- ▼ 12.1 — ENCOUNTERED GROUNDWATER DEPTH (FT.) AT TIME OF DRILLING BORING
- BT — BORING TERMINATED AT DEPTH INDICATED
- K_H= — HORIZONTAL PERMEABILITY RATE (FT./DAY)

GENERAL NOTES

SUBSURFACE CONDITIONS SHOWN ON THE BORINGS REPRESENT THE CONDITIONS ENCOUNTERED AT THE BORING LOCATIONS. ACTUAL CONDITIONS BETWEN THE BORINGS MAY VARY FROM THOSE SHOWN. AASHTO SOIL CLASSIFICATIONS SHOWN ON THE BORINGS ARE BASED ON VISUAL EXAMINATION AND THE LABORATORY TESTING SHOWN.

*BORINGS NOT ACCESSIBLE TO TRUCK-MOUNTED DRILLING EQUIPMENT. HAND AUGER BORINGS CONDUCTED.

STRATUM NO.	AASHTO CLASSIFICATION	SOIL DESCRIPTION
1	A-3	LIGHT BROWN TO BROWN TO LIGHT GRAY TO GRAY FINE SAND TO FINE SAND WITH SILT
2	A-2-4	BROWN TO DARK BROWN TO DARK GRAY FINE SAND WITH SILT TO SILTY FINE SAND, OCCASIONAL TRACE ORGANIC MATERIAL
3	A-2-6	LIGHT BROWN CLAYEY FINE SAND
4	A-8	DARK BROWN MUCKY FINE SAND

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FIGURE 6 - POND AUGER BORING RESULTS

Table 5
Summary of Laboratory Test Results
SR 400 (I-4) PD&&E Study
From US 27 to Kirkman Road and From East of SR 434 to SR 472
FPID No. 432100-1-22-01
GEC Project No. 3492G

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		
200-A	1	PB-1	10 - 15	100	92	52	10	3	---	---	---	---	A-3
200-B	1	PB-16	5 - 8.5	100	92	56	9	2	---	---	---	---	A-3
201	1	PB-4	5 - 10	100	92	57	11	3	---	---	---	---	A-3
202A	1	PB-6	5.5 - 9	100	93	44	10	4	---	---	---	---	A-3
202B	1	PB-7	0 - 6	100	97	51	11	2	---	---	---	---	A-3
202D	1	PB-10	5.5 - 10	100	96	55	11	3	---	---	---	---	A-3
205-B	1	PB-17	9 - 11.5	100	96	55	8	5	---	---	---	---	A-3
205-B	1	PB-18	4 - 11	100	92	61	12	1	---	---	---	---	A-3
205-D	1	PB-19	5 - 10	100	86	52	9	2	---	---	---	---	A-3
205-D	1	PB-22	5 - 10	100	91	61	13	2	---	---	---	---	A-3
206	1	PB-14	5 - 10	100	95	59	14	3	---	---	---	---	A-3
205-A	2	PB-12	5 - 10	100	96	64	26	12	---	---	---	---	A-2-4
205-A	3	PB-12	15.5 - 20	100	100	98	93	34	16	32	12	---	A-2-6
201	4	PB-4	15 - 19	100	96	57	18	10	18	---	---	8	A-8
202A	4	PB-6	10 - 15	100	86	50	24	9	18	---	---	6	A-8
202B	4	PB-7	17 - 20	100	79	24	8	6	22	---	---	6	A-8
205-A	4	PB-11	10 - 15	100	94	66	32	19	20	---	---	7	A-8
205-D	4	PB-22	18 - 19.5	100	90	49	14	8	19	---	---	6	A-8

Table 6
Summary of Groundwater Tables and Permeability Results
SR 400 (I-4) PD&&E Study
From US 27 to Kirkman Road and From East of SR 434 to SR 472
FPID No. 432100-1-22-01
GEC Project No. 3492G

Pond No.	Pond Type	Boring No.	Date of Groundwater Measurement	Encountered Groundwater Depth (feet)	Estimated Seasonal High Groundwater Depth (feet)	NRCS Soil Survey Unit No.	NRCS Soil Survey Seasonal High Groundwater Depth Range (feet)	Field Permeability Test Results		
								Horizontal Permeability Rate (ft/day)	Test Depth (ft)	Soil Type
200-A	Alternative	PB-1	06/27/13	12.1	9.0	38	> 6.0	2.9	12 - 14	A-3
		PB-2	06/27/13	11.3	8.0	38	> 6.0	---	---	---
200-B	Recommended	PB-15	08/19/13	3.2 (Perched)	***	3	+2.0 - 0.0	---	---	---
		PB-16	08/19/13	13.1	11.0	38	> 6.0	22.5	5 - 8.5	A-3
201	Recommended	PB-3	06/27/13	6.1	3.5	34	2.0 - 3.5	---	---	---
		PB-4	06/27/13	4.4	2.0	20	0.5 - 1.0	22.5	6 - 8	A-3
202A	Recommended	PB-5	06/27/13	3.8	1.5	38	> 6.0	---	---	---
		PB-6	06/27/13	2.1	0.5	38	> 6.0	1.4	6 - 8	A-3
202B	Recommended	PB-7	06/27/13	2.8	0.8	38	> 6.0	24.3	4 - 6	A-3
		PB-8	06/27/13	2.5	0.5	38	> 6.0	---	---	---
202C	Recommended	---	---	---	---	---	---	---	---	---
202D	Recommended	PB-9	06/27/13	12.4**	9.5	38	> 6.0	---	---	---
		PB-10	06/27/13	5.5	3.0	34	2.0 - 3.5	3.3	7 - 9	A-3
203-A	Recommended	---	---	---	---	---	---	---	---	---
203-B	Recommended	---	---	---	---	---	---	---	---	---
204-A	Recommended	---	---	---	---	---	---	---	---	---
204-B	Recommended	---	---	---	---	---	---	---	---	---
205-A	Alternative	PB-11	06/27/13	8.3	7.0	37	0.0 - 1.0	---	---	---
205-C	Recommended	PB-12	06/27/13	7.7	6.5	46	3.5 - 6.0	14.9	7 - 9	A-2-4
205-B	Alternative	PB-17	09/07/13	11.3	9.3	46	3.5 - 6.0	---	---	---
		PB-18	09/07/13	11.7	9.7	46	3.5 - 6.0	22.5	4 - 11	A-3
205-D	Recommended	PB-19	02/06/15	5.6	4.0	44	0.5 - 1.5	9.8	8 - 10	A-3
		PB-20	02/06/15	6.7	4.5	20	0.5 - 1.0	---	---	---
		PB-21	02/06/15	6.5	4.5	20	0.5 - 1.0	---	---	---
		PB-22	02/06/15	7.0	5.0	34	2.0 - 3.5	10.9	7 - 9	A-3
206	Recommended	PB-13	06/27/13	0.0	AAGS*	34	2.0 - 3.5	---	---	---
		PB-14	06/27/13	2.2	0.2	34	2.0 - 3.5	1.8	8 - 10	A-3
206-A	Recommended	PB-23	02/12/15	3.1	1.5	34	2.0 - 3.5	15.3	3 - 5	A-3
206-B	Recommended	PB-24	02/12/15	0.8	AAGS*	34	2.0 - 3.5	3.7	5 - 7	A-2-4
207	Recommended	---	---	---	---	---	---	---	---	---

* AAGS: Estimated seasonal high groundwater level at or above existing ground surface. The elevation to which groundwater may rise should be determined by the drainage engineer.
** Boring conducted just off roadway edge of pavement.
*** SHWT to be determined after getting property access to drill rig equipment (preliminary hand auger conducted).