Preliminary Roadway Soil Survey
Relative to Line and Grade Submittal
Wekiva Parkway (SR 429) from the
Wekiva River to S.R. 400 (I-4)
Seminole County, Florida
Financial Project No. 431081-4-32-01

DRAFT

Ardaman & Associates, Inc.

OFFICES

Orlando - 8008 S. Orange Avenue, Orlando, Florida 32809 - Phone (407) 855-3860
Alexandria - 3609 Mac Lee Drive, Alexandria, Louisiana 71302 - Phone (318) 443-2888
Bartow - 1525 Centennial Drive, Bartow, Florida 33830 - Phone (863) 533-0858
Baton Rouge - 316 Highlandia Drive, Baton Rouge, Louisiana 70884 - Phone (225) 752-4790
Cocoa - 1300 N. Cocoa Blvd., Cocoa, Florida 32922 - Phone (321) 632-2503
Fort Myers - 9970 Bavaria Road, Fort Myers, Florida 33913 - Phone (239) 768-6600
Miami - 2608 W. 84th Street, Hialeah, Florida 33016 - Phone (305) 825-2683
Monroe - 1122 Hayes Street, West Monroe, Louisiana 71292 - Phone (318) 387-4103
New Orleans - 1305 Distributors Row, Suite I, Jefferson, Louisiana 70123 - Phone (504) 835-2593
Port St. Lucie - 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986 - Phone (772) 878-0072
Sarasota - 78 Sarasota Center Blvd., Sarasota, Florida 34240 - Phone (941) 922-3526
Shreveport - 7222 Greenwood Road, Shreveport, Louisiana 71119 - Phone (318) 636-3673
Tallahassee - 3175 West Tharpe Street, Tallahassee, Florida 32303 - Phone (850) 576-6131
Tampa - 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619 - Phone (813) 620-3389
West Palm Beach - 2200 North Florida Mango Road, Suite 101, West Palm Beach, Florida 33409 - Phone (561) 687-8200

MEMBERS:
A.S.F.E.
American Concrete Institute
ASTM International
Florida Institute of Consulting Engineers

Ardaman & Associates, Inc.

Geotechnical, Environmental and Materials Consultants

May 16, 2012

DRAFT File No. 11-6501

ATKINS
482 S. Keller Road
Orlando, FL, 32810-6101

Attention: Mr. William Terwilleger, P.E.

DRAFT

Subject: Preliminary Roadway Soil Survey
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Dear Mr. Terwilleger:

As requested and authorized, we have completed a preliminary roadway soil survey for the referenced section of the Wekiva Parkway (S.R. 429) project. The purposes of performing this exploration were to preliminarily evaluate the general subsurface conditions at selected locations in the areas of proposed roadway improvements and to evaluate the general subsurface conditions within the proposed stormwater pond locations. In addition, we have provided geotechnical engineering information for use during design of the project. This report documents our findings and presents our engineering recommendations.

This report has been prepared in accordance with generally accepted geotechnical engineering practices for specific application to the project limits indicated in this report. No other warranty, expressed or implied, is made. The soils information and recommendations submitted herein are based on the data obtained from the soil borings presented on Figures 12 through 25. This 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 evident until during construction.

It is a pleasure assisting you with this project. If you have any questions, or when we may be of further assistance to you, please do not hesitate to contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Certificate of Authorization No. 5950

COLIN TREVOR JEWSBURY LICENSE No 58074 STATE OF FLORIDA PROFESSIONAL ENGINEER

Colin T. Jewsbury, P.E.
Senior Project Engineer
Florida License No. 58074

Zan C. Bates, P.E.
Chief Engineer - Transportation
Florida License No. 49917

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Cc: Mr. Zachary A. Sullivan, P.E. - FDOT

8008 S. Orange Avenue 32809, Post Office Box 593003, Orlando, Florida 32859-3003 Phone (407) 855-3860 FAX (407) 859-8121

Louisiana: Alexandria, Baton Rouge, Monroe, New Orleans, Shreveport
Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach

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1.0 INTRODUCTION

1.1 Site Location

The proposed roadway project is located in Sections 21, 22, 23, 25, 26, 27, 28, 30, 31 & 30 of Township 19 South, Ranges 29 and 30 East, in Seminole County, Florida. The project limits along the proposed S.R. 429 alignment extend from the Wekiva River to just east of the existing I-4/S.R. 417 interchange, between approximate Stations 921+00 and 1247+00, as referenced on the roadway PD&E documents.

The approximate limits of the project alignment are shown superimposed on a composite of the Sanford SW and Sanford, Florida, U.S.G.S. quadrangle maps presented on Figures 1 and 2.

1.2 Project Considerations

It is our understanding that the proposed construction includes a new four-lane parkway that may ultimately be expanded to six lanes wide. The portion of the parkway that is the subject of this report begins at the existing SR 46 Wekiva River bridge crossing, continuing east to just past the I-4 (S.R. 400) interchange.

It is our understanding that stormwater ponds are to be constructed along the proposed alignment at the following general locations:

Pond Designation	Approximate Station	Offset
WR2-S-1	936+00	Left
WR2-S-2	955+00	Left
YL1-S-1	973+00	Left
YL1-S-2	997+00	Left
YL2-S1-ALT-1	1005+00	Left
YL3-S-1	1037+00	Left
YL4-S-1	1062+00	Left
SJ4-S-1	100+00 (S.R. 46)	Left
YL5-S-1-ALT1	1090+00	Left
SJ5-S-1	1101+00	Left
YL6-S-1	1105+00	Right
SJ1-S-1	1125+00	Right
FP34-CP-1	1127+00	Left
SJ2-S-1	1150+00	Right
SJ2-S-2	1153+00	Left
SJ3-S-1	1165+00	Right
FPC	1167+00	Left

1.3 Purpose and Scope of Project

The purposes of this exploration were to preliminarily explore shallow subsurface conditions within the roadway improvement areas and stormwater ponds and to provide a preliminary geotechnical engineering evaluation of the conditions encountered.

We accomplished these purposes by:

1. Obtaining and evaluating readily available geologic and soil survey data.

2. Conducting auger borings and measuring groundwater levels in the roadway and stormwater pond areas. We note that this Roadway Soil Survey was limited in scope and was not performed according to full Florida Department of Transportation (FDOT) requirements. Additional exploration and analyses will be required at the design phase of the project.

3. Performing muck probes in suspect muck areas.

4. Observing recovered soil samples in our laboratory and performing tests on selected samples to aid in classification.

5. Collecting bulk soil samples for laboratory Resilient Modulus (RM) testing.

6. Analyzing and interpreting the field and laboratory data.

7. Performing geotechnical engineering analyses to develop recommendations for site preparation.

1.4 Review of Available Data

1.4.1 USGS Quadrangle Map

The approximate project alignment is shown superimposed on a composite of the Sanford SW and Sanford, Florida USGS quadrangle maps presented on Figures 1 and 2. The approximate ground surface elevations along the project alignment and based on 1929 National Geodetic Vertical Datum (NGVD) are presented in the following table.

Mainline Location/Intersection	Approximate Natural Ground Surface Elevation (Feet, NGVD)
Wekiva River	+5
Markham Road	+55
Lake Markham Road	+40
Orange Boulevard	+70
I-4 / S.R. 417 Interchange	+75

1.4.2 Soil Survey Map

Based on the 1990 Florida Soil Survey for Seminole County, Florida, as prepared by the U.S. Department of Agriculture Soil Conservation Service, various soil types exist along the proposed roadway alignment. The individual soil types and their characteristics are summarized and presented in Table 1. The type and location of the individual soils are also included on the Boring Location plans presented as Figures 3 through 8.

1.4.3 Potentiometric Map

Based on review of the "Potentiometric Surface of the Upper Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida" Map (dated May, 2009) published by the United States Geological Survey, the potentiometric elevation within the general project alignment is approximately +30 feet NGVD. This potentiometric surface is below the existing ground surface elevations of approximately +40 to +75 feet NGVD, as determined by a review of the U.S.G.S. quadrangle maps, with the exception of the immediate vicinity of the Wekiva River, where an upward gradient exists.

2.0 FIELD EXPLORATION PROGRAM

2.1 Auger Borings

The field exploration program relative to the roadway improvements consisted of performing auger borings at approximate 500-foot intervals along the proposed S.R. 429 (Wekiva Parkway) roadway alignment. The auger borings were conducted using a 4-inch diameter continuous-flite auger and were advanced to a depth of 20 feet below the existing ground surface. A summary of the auger boring procedure is included in Appendix I.

In addition, SPT borings conducted by Ardaman & Associates relative to the bridge portions of the subject project which are located within proposed roadway mainline improvement areas were used in our evaluation. The upper 20 feet of these borings were classified using the AASHTO Soil Classification System using soil strata numbers developed as part of this project.

The field exploration program relative to the stormwater ponds consisted of performing auger borings within the proposed stormwater pond areas. The auger borings were conducted using a 4-inch diameter continuous-flite auger and were advanced to a depth of 20 feet below the existing ground surface.

Upon completion of drilling, the auger borings were backfilled with soil cuttings.

2.2 Field Permeability Tests

Field permeability tests were performed at selected boring locations within the proposed stormwater pond areas. The field permeability tests were performed by installing a solid-walled PVC casing snugly fit into a 4-inch diameter auger borehole. The bottom of the pipe was open and raised 1 foot above the bottom of the borehole. The bottom 1 foot of the borehole was gravel-packed. The pipe was then filled to the top with water. The tests were performed as

"falling head" tests in which the rate of water drop within the pipe was measured. Results of the field permeability testing are presented in Section 4.4 of this report.

2.3 Muck Probes

Muck probes were performed at two general areas along the proposed project alignment where surfical organic laden soils were identifiable. Muck probes are conducted by hand pushing ½-inch diameter steel rod into the ground until penetration is refused. Generally, the probes can be pushed through very soft organic, silty and/or clayey soils, and terminate upon encountering sandy soils or relatively stiff clays. Probes can also terminate on obstructions such as roots or buried debris. It is possible that probes could terminate under one of the above scenarios, while muck could exist below the probed depth. Therefore, muck probe data should be considered preliminary.

The results of the muck probes are presented on Figures 9 and 10.

2.4 Resilient Modulus (RM) Bulk Soil Samples

Bulk soil samples were collected from selected locations and transferred to the State Materials Office for Resilient Modulus testing. The samples were obtained at approximate depths ranging from 0.5 to 2 feet below the existing ground surface.

2.5 Groundwater Level

Where encountered, the groundwater level was measured in the boreholes after stabilization of the downhole water level. The measured groundwater levels and water depths are shown adjacent to the soil boring profiles presented on Figures 12 through 25.

2.6 Test Locations

The locations of the auger borings were staked in the field by representatives of Ardaman and Associates using a hand-held GPS unit. These locations were subsequently surveyed by the project surveyor, Bowyer-Singleton & Associates. The surveyed boring locations including station, offset and existing ground surface elevation are shown on the boring profiles presented on Figures 12 through 25.

The boring locations should only be considered as accurate as implied by the method of measurement used. The stations and offsets presented on the boring profiles reference the centerline of construction of proposed S.R. 429 (Wekiva Parkway), as depicted on the PD&E plans.

3.0 LABORATORY TESTING PROGRAM

3.1 Visual Examination and Classification Testing

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual examination and classification to obtain more accurate descriptions of the existing soil strata. The soil samples were visually classified in general accordance with the AASHTO Soil Classification System. In addition, sieve analysis tests were conducted on representative soil samples to aid in classification. Atterberg limits tests were conducted on clayey soils and organic content tests were conducted on selected samples visually determined to contain organics. The resulting soil descriptions and the results of our tests are shown in Table 2 and are summarized on the Soil Survey sheet presented as Figure 11.

3.2 Resilient Modulus (RM) Tests

Please refer to Appendix II for results of the Resilient Modulus test program, as completed by the Florida State Materials Office.

3.3 Corrosion Series Testing

A total of five soil samples were collected at selected boring locations and returned to our laboratory for corrosion series testing. The samples were collected from between a depth of approximately 6 to 18 inches. The results of the tests are presented in the below table.

Location	Stratum	pH	Resistivity (ohm-cm)	Sulfate (mg/L)	Chloride (mg/L)
AB-940	2	4.9	37,000	69	30
AB-955	2	7.9	9,000	7	30
AB-970	1	6.2	31,000	67	30
AB-1040	1	8.2	22,000	20	15
AB-1095	1	4.9	38,000	52	15

4.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

4.1 General Soil Stratigraphy

The results of the field exploration and laboratory testing programs are graphically summarized on the Soil Survey sheet (Figure 11) and the Auger Boring Profile sheets (Figures 12 through 25). The stratification of the boring profiles represents our interpretation of the field boring logs and the results of the laboratory examination of the recovered samples. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

The results of our test borings indicate the following general soil types:

Stratum No.	Description	Classification	
		AASHTO	Index 505
1	Light brown to dark brown, grayish brown, orange-brown or light gray to gray fine sand to fine sand with silt.	A-3	S
2	Brown to very dark brown or gray to dark gray fine sand with silt to silty fine sand, occasional trace organic material	A-3 A-2-4	S
3	Light brown to brown, grayish brown, orange-brown or light gray to gray fine sand with clay to clayey fine sand or silty clayey fine sand	A-3 A-2-4	S
4	Dark to very dark brown mucky fine sand to muck	A-8	M
5	Reddish brown to dark reddish brown or dark brown slightly cemented to cemented fine sand to silty fine sand (Hardpan type)	A-3 A-2-4	S
6	Light brown to brown, orange-brown or light gray to gray clayey fine sand to sandy clay	A-2-6 A-6 A-7-6	P

The results of our exploration indicate that the soil conditions encountered in the borings presented on Figures 12 through 25 are appropriate for construction of the proposed roadway, in accordance with standard FDOT design and construction practices, except where plastic soils are present.

Soil Strata 1 and 2 (A-3) and Strata 3 and 4 (A-3, A-2-4) may be considered as select materials based on FDOT criteria (Index 505). The use of these soils relative to embankment construction should be in accordance with Index 505.

Soil Stratum 4 (A-8) should be considered as non-select material based on organic content and is considered muck. Stratum 4, as encountered in the roadway borings is not suitable for use as fill material and should be removed in accordance with Index 505, unless otherwise shown on the plans. We note that the depths, organic content and thicknesses of Stratum 4 soils may be greater at unexplored locations.

Soil Stratum 6 (A-2-6, A-6) should also be considered as non-select material as this stratum is considered plastic. This soil typically consists of clayey fine sand. This plastic soil should be removed in accordance with Index 500, unless otherwise shown on the plans. The use of this soil relative to embankment construction should be in accordance with Index 505.

4.2 Groundwater Control

Where encountered, the groundwater level was measured in the boreholes after stabilization of the downhole water level. The absence of groundwater data at some of the boring locations indicates that groundwater was not encountered within the vertical reaches of the borings on the date drilled. However, this does not necessarily mean that groundwater would not be encountered at these locations or within the vertical reaches of the borings at some other time. Fluctuation in groundwater levels should be anticipated throughout the year primarily due to seasonal variations in rainfall and other factors that may vary from the time the borings were conducted. The groundwater levels, where encountered in the borings, are shown on Figures 12 through 25.

Some form of groundwater control (dewatering) may be required during construction in areas of high or perched groundwater conditions. Positive site drainage should be established early during construction in order to reduce ponding of surface water during heavy or prolonged rainfall. Means and methods of groundwater and surface water control should be the responsibility of the contractor.

4.3 Preliminary Estimated Seasonal High Water Table

The estimated seasonal high water table each year is the level in the August-September period at the end of the rainy season during a year of normal (average) rainfall. The water table elevations associated with a flood level would be much higher than the seasonal high water table elevations. The estimated high water levels would more approximate the seasonal high water table elevations.

The estimated seasonal high water table is affected by a number of factors. The drainage characteristic of the soils, the land surface elevation, relief points such as lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the seasonal high water table elevation.

Based on our interpretation of the site conditions using our boring log data, we have preliminarily estimated the seasonal high water table at the boring locations, assuming that the site drainage existing at the time the borings were conducted is maintained. If site drainage conditions are altered from those existing at the time of our borings, our estimate may not be valid. Our estimates of the estimated seasonal high groundwater levels at the boring locations are presented adjacent to the boring profiles on Figures 12 through 25. We note that groundwater may perch temporarily at higher levels atop the silty, clayey or hardpan type soils (Strata 3, 5 and 6) during periods of heavy and/or prolonged rainfall.

It is noted that preliminary cross sections were unavailable at the time of our estimation. The seasonal high water table estimates presented herein may warrant adjustment based on review of cross sections, once available.

4.4 Results of Field Permeability Tests

The results of the permeability tests are presented in Table 3. For the type of soils encountered at the test locations, a transformation ratio of 1 is considered appropriate. Therefore, the horizontal and vertical permeabilities are estimated to be approximately equal. A soil porosity of 0.3 (i.e. 30%) may also be used in design of the ponds.

4.5 Design Resilient Modulus

Based upon the testing and analyses performed by the State Materials Office, the resilient modulus for the embankment material corresponding to a 90th percentile is 12,500 psi. Please refer to Appendix II for additional details and findings pertaining to the test program.

4.6 Construction Considerations

Roadway construction should be performed in accordance with the appropriate sections of the FDOT current edition of the Standard Specifications for Road and Bridge Construction. If needed, backfill should generally consist of select material (A-3, A-2-4) compacted in accordance with the FDOT Standard Specification for Road and Bridge Construction. In accordance with these specifications, the removal of organic materials and any plastic soils should be accomplished in accordance with FDOT Standard Index 500 unless otherwise shown on the plans. In-place density tests should be performed on the fill soils to verify the specified degree of compaction. The minimum density test frequency should be in accordance with the FDOT Materials, Sampling, Testing, and Reporting Guide. Fill placement and side slopes for embankment construction are presented in the FDOT Standard Index 505.

We recommend that the designer add notes to the plans relative to removal of unsuitable soils, difficult excavation, dewatering, maintaining positive site drainage, and wrapping pipe joints.

TABLE 1
Review of Soil Survey Maps
Wekiva Parkway Line and Grade
Seminole County, Florida

Soil Map Unit	Description	Permeability		Approximate Depth to Normal Seasonal High Groundwater Level
		Depth (feet)	inch/hour	
2 - Adamsville-Sparr Fine Sands	Nearly level somewhat poorly drained sandy soil on low ridges on the uplands and on low knolls on the flatwoods.	0 – 80	6.0 - 20	Between 12 and 36 inches for up to 6 months.
6 - Astatula-Apopka fine sands, 0 to 5 percent slopes	Nearly level to gently sloping well drained soil on hillsides and ridges on the uplands. Slopes are smooth to convex.	0 - 64 64 - 80	6.0 - 20 0.6 - 2.0	Greater than 80 inches.
7 - Astatula-Apopka fine sands, 5 to 8 percent slopes	Sloping and well drained soil on hillsides on the uplands. Slopes are smooth to convex.	0 - 65 65 - 80	6.0 - 20 0.6 - 2.0	Greater than 80 inches.
10 - Basinger, Samsula and Hontoon soils, depressional	Nearly level and very poorly drained soils in swamps and depressions. The slopes are dominantly less than 2 percent.	0 - 80	6.0 - 20	Ponded for 6 to 9 months or more.
13 - Eau Gallie and Immokalee Fine Sands	Nearly level and poorly drained sandy soils on broad plains on the flatwoods.	0 - 18 18 - 30 30 - 45 45 – 64 64 - 80	6.0 – 20 0.6 – 6 6.0 – 20 0.06 – 2 0.6 - 6	Within 12 inches for 1 to 4 months.
16 - Immokalee Sand	Nearly level and poorly drained sandy soil on broad plains on the flatwoods.	0 – 36 36 – 56 56 - 80	6.0 – 20 0.6 – 2.0 6.0 - 20	Within 12 inches for 1 to 4 months.
24 - Paola-St. Lucie Sands, 0 to 5 percent slopes	Nearly level to gently sloping and excessively drained sandy soil on upland rides.	0 - 80	>20	80 inches or more.
27 - Pomello fine sand, 0 to 5 percent slopes	Nearly level to gently sloping and moderately well drained sandy soil on low ridges and knolls on the flatwoods.	0 – 31 31 – 40 40 - 80	>20 2.0 – 6.0 6.0 – 20	36 to 60 inches for 1 to 4 months.
28 - Pompano fine sand, occasionally flooded	Nearly level and poorly drained sandy soil on the floodplains	0 - 80	6.0 – 20	Within 12 inches for 2 to 6 months.
31 - Tavares-Millhopper fine sands, 0 to 5 percent slopes	Nearly level to gently sloping soil on low ridges and knolls on the uplands. The slopes are nearly smooth to slightly convex.	0 - 45 45 - 80	6.0 - 20 0.2 - 0.6	Between 36 and 60 inches for 2 to 6 months.
35 - Wabasso fine sand	Nearly level and poorly drained sandy soil on broad plains on the flatwoods.	0 – 18 18 – 25 25 – 27 27 – 70 70 - 80	6.0 – 20 0.6 – 2 6.0 – 20 <0.2 6.0 - 20	Within 12 inches for 2 to 6 months.

TABLE 2
Summary of Field Permeability Test Results
Wekiva Parkway Line and Grade
Seminole County, Florida

Pond Designation	Boring Designation	Test Depth	Stratum	Measured Permeability (Feet/Day)
WR2-S-1	WR2-S-1_AB-1	5-6	1	46.5
WR2-S-2	WR2-S-2_AB-1	3-4	1	19
YL1-S-1	YL1-S-1_AB-1	4-5	1	68.5
YL1-S-2	YL1-S-2_AB-1	6-7	1	17.5
YL2-S1-ALT-1	YL2-S-1-ALT-1_AB-1	4-5	5	2
YL3-S-1	YL3-S-1_AB-2	6-7	1	54.5
YL4-S-1	YL4-S-1_AB-1	5-6	1	1.5
SJ4-S-1	SJ4-S-1_AB-1	5-6	1	22
YL5-S-1-ALT1	YL5-S-1-ALT1_AB-1	5-6	1	25
SJ5-S-1	SJ5-S-1_AB-2	5-6	2	7.5
YL6-S-1	YL6-S-1_AB-1	4-5	1	48.5
SJ1-S-1	SJ1-S-1_AB-1	5-6	1	5
FP34-CP1	FP34-CP-1_AB-1	4-5	1	2
SJ2-S-1	SJ2-S-1_AB-1	5-6	1	53.5
SJ2-S-2	SJ2-S-2_AB-1	4-5	1	3.5
SJ3-S-1	SJ3-S-1_AB-1	5-6	3	8.5
FPC	FPC_AB-2	6-7	3	3
	FPC_AB-3	4-5	1	15

TABLE 3

Summary of Laboratory Test Results
Wekiva Parkway Line and Grade
Seminole County, Florida

Boring	Station No.	Offset (ft)	Depth (ft)	Stratum No.	Grain Size Distribution - Percent Passing					OC (%)	NM (%)	Atterberg Limits	
					#10 (%)	#40 (%)	#60 (%)	#100 (%)	#200 (%)			Liquid Limit	Plasticity Index
930	930+07	14L	4-7	1	100	98	82	14	2	---	---	---	---
945	945+04	9R	3-8	1	100	99	94	26	2	---	---	---	---
1025	1025+06	24L	6-11	1	100	99	90	22	4	---	---	---	---
1075	1075+05	45R	3-7	1	100	99	89	21	3	---	---	---	---
1085	1084+96	14L	6-7	1	100	99	87	15	1	---	---	---	---
1137	1137+60	CL	1-2.5	1	100	98	82	18	2	---	---	---	---
YL3-S1_AB-2	1037+95	205L	3-11	1	100	99	89	18	2	---	---	---	---
SJ1-S-1_AB-1	1123+20	130R	6-11	1	100	99	87	23	4	---	---	---	---
SJ1-S-1_AB-2	1125+54	170R	3-7	1	100	99	84	21	6	---	---	---	---
SJ2-S-1_AB-1	1148+86	449R	5-9	1	100	99	88	25	5	---	---	---	---
SJ2-S-1_AB-2	1150+02	238R	0-3	1	100	98	84	19	5	---	---	---	---
FP-34-CP1_AB-1	1126+06	230L	3-7	1	100	99	85	21	5	---	---	---	---
WR2-S-1_AB-1	934+63	234L	3-8	1	100	98	87	24	5	---	---	---	---
1015	1015+04	18L	0-3	2	100	99	91	42	14	3	13	---	---
SJ5-S-1_AB-2	1100+41	300L	3-8	2	100	99	83	23	10	---	---	---	---
YL6-S-1_AB-2	1104+62	257R	11-14	2	100	99	85	25	12	2	22	---	---
960	960+01	4R	10-12	3	100	99	89	19	6	---	---	---	---
980	979+91	11R	8-13	3	100	99	90	23	9	---	---	---	---
1060	1060+04	1R	7-12	3	---	---	---	---	14	---	11	NP	NP
1115	1115+10	4R	2-5	3	100	91	82	42	14	---	---	---	---
WR2-S-2_AB-1	954+13	369L	9-14	3	100	99	93	27	13	---	---	---	---

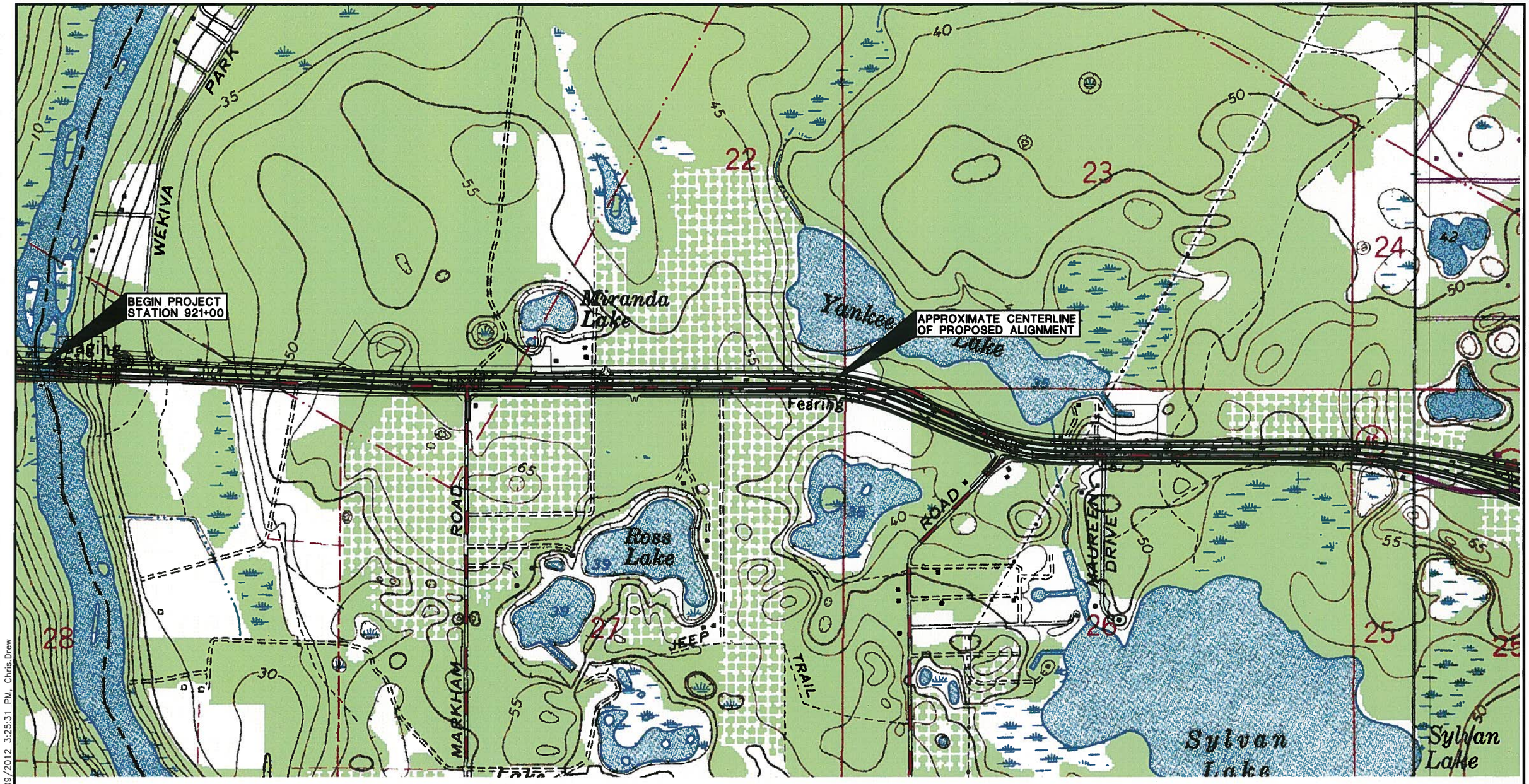
OC = Organic Content **NM = Natural Moisture Content** **--- = Property Not Measured** **NP = Non Plastic**

TABLE 3 (Continued)

Summary of Laboratory Test Results
Wekiva Parkway Line and Grade
Seminole County, Florida

Boring	Station No.	Offset (ft)	Depth (ft)	Stratum No.	Grain Size Distribution - Percent Passing					OC (%)	NM (%)	Atterberg Limits	
					#10 (%)	#40 (%)	#60 (%)	#100 (%)	#200 (%)			Liquid Limit	Plasticity Index
SJ2-S-2_AB-1	1151+75	188L	6-12	3	100	99	89	26	14	---	---	---	---
YL1-S-1_AB-2	973+92	278L	5-9	3	100	100	94	35	15	---	---	---	---
YL2-S-1-ALT-1_AB-1	1001+26	215L	6-11	3	---	---	---	---	---	---	---	27	10
YL2-S-1-ALT-1_AB-1	1001+26	215L	11-15	3	100	100	93	46	17	---	---	---	---
YL3-S-1_AB-1	1035+51	404L	3-7	3	100	97	78	23	16	---	---	---	---
FP-34-CP1_AB-2	1127+95	371L	7-17	3	100	99	88	25	5	---	---	---	---
YL2-S1-ALT1_AB-2	1006+74	259L	3-6	4	---	---	---	---	8	11	17	---	---
975	975+04	5R	10-15	5	100	99	92	29	13	---	---	---	---
1045	1045+06	4R	4-6	5	100	100	99	90	5	---	---	---	---
WR2-S-2_AB-2	956+93	266L	5-8	5	100	100	94	22	2	---	---	---	---
1035	1035+04	25R	3-8	6	---	---	---	---	21	---	14	28	13
1090	1089+92	31L	5-8	6	100	99	90	42	18	---	---	---	---
1090	1089+92	31L	8-10.5	6	---	---	---	---	---	---	18	28	12
SJ2-S-2_AB-2	1155+81	265L	3-5	6	100	100	93	44	25	---	11	37	21
SJ4-S-1_AB-2	1088+01	888L	7-11	6	---	---	---	---	26	---	---	---	---
YL1-S-2_AB-1	997+47	322L	12-17	6	100	100	94	51	23	---	---	---	---

OC = Organic Content **NM = Natural Moisture Content** **--- = Property Not Measured** **NP = Non Plastic**



N

0 500 1000

SCALE: 1"=1000'

SECTIONS 21, 22, 23, 25, 26, 27, 28, 30, 31 & 39
TOWNSHIP 19 SOUTH
RANGES 29 & 30 EAST

OBTAINED FROM U.S.G.S. QUAD MAP: SANFORD SW, FLORIDA 1970
AND SANFORD, FLORIDA 1980

QUADRANGLE LOCATION

SITE LOCATION MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 12/27/11
FILE NO. 11-6501	APPROVED BY:	FIGURE: 1

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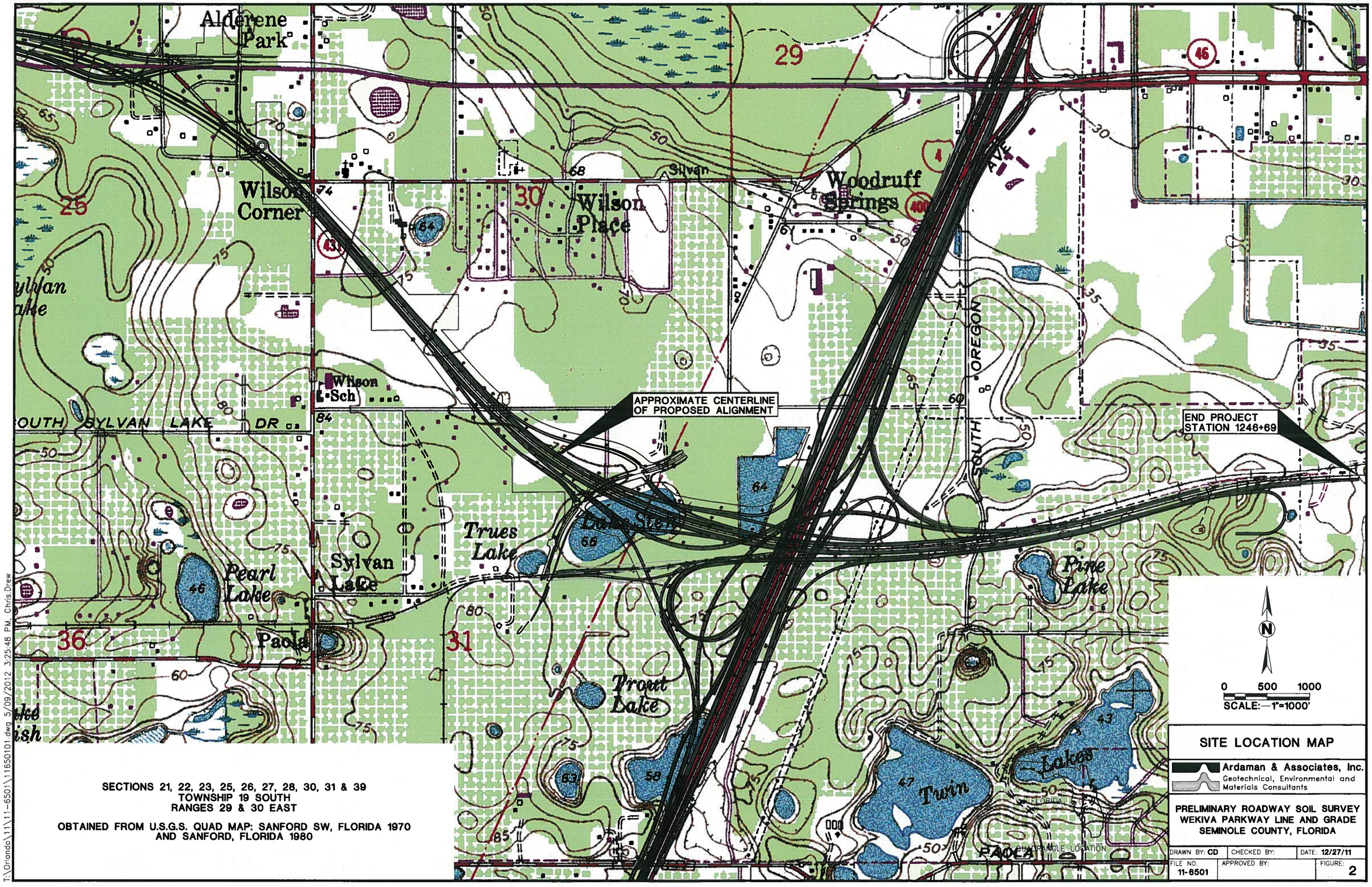

SECTIONS 21, 22, 23, 25, 26, 27, 28, 30, 31 & 39
TOWNSHIP 19 SOUTH
RANGES 29 & 30 EAST

OBTAINED FROM U.S.G.S. QUAD MAP: SANFORD SW, FLORIDA 1970
AND SANFORD, FLORIDA 1980

SITE LOCATION MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 12/27/11
FILE NO. 11-6501	APPROVED BY:	FIGURE: 2

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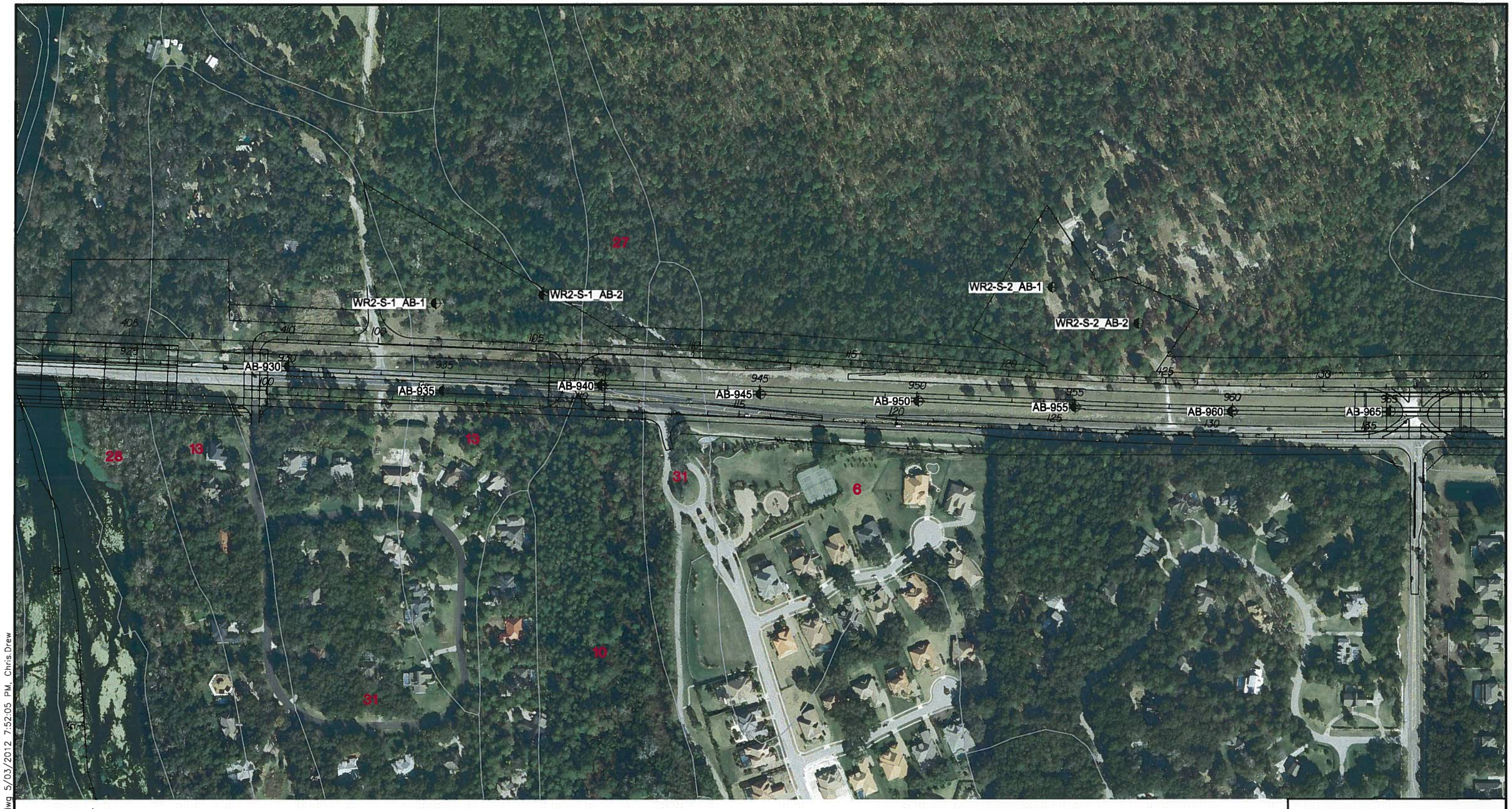

N

0 150 300

SCALE: 1"=300'

LEGEND

AUGER BORING LOCATION

NOTES:

1. AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.
2. SOIL SURVEY INFORMATION OBTAINED FROM U.S. DEPARTMENT OF AGRICULTURAL, NATURAL RESOURCES CONSERVATION SERVICE, DATED 08/28/07.

SOIL LEGEND

2 - ADAMSVILLE-SPARR FINE SANDS
6 - ASTATULA-APOPKA FINE SANDS, 0 TO 5 PERCENT SLOPES
7 - ASTATULA-APOPKA FINE SANDS, 5 TO 8 PERCENT SLOPES
10 - BASINGER, SAMSULA, AND HONTOON SOILS, DEPRESSIONAL
13 - EAU GALLIE AND IMMOKALEE FINE SANDS
16 - IMMOKALEE SAND
24 - PAOLA-ST. LUCIE SANDS, 0 TO 5 PERCENT SLOPES
27 - POMELLO FINE SAND, 0 TO 5 PERCENT SLOPES
28 - POMPANO FINE SAND, OCCASIONALLY FLOODED
31 - TAVARES-MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES
35 - WABASSO FINE SAND

BORING LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 3

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N

0 150 300

SCALE:—1"=300'

LEGEND

AUGER BORING LOCATION

NOTES:

1. AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.
2. SOIL SURVEY INFORMATION OBTAINED FROM U.S. DEPARTMENT OF AGRICULTURAL, NATURAL RESOURCES CONSERVATION SERVICE, DATED 08/28/07.

SOIL LEGEND

2 - ADAMSVILLE-SPARR FINE SANDS
6 - ASTATULA-APOPKA FINE SANDS, 0 TO 5 PERCENT SLOPES
7 - ASTATULA-APOPKA FINE SANDS, 5 TO 8 PERCENT SLOPES
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27 - POMELLO FINE SAND, 0 TO 5 PERCENT SLOPES
28 - POMPANO FINE SAND, OCCASIONALLY FLOODED
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35 - WABASSO FINE SAND

BORING LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 4

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LEGEND

AUGER BORING LOCATION

NOTES:

1. AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.
2. SOIL SURVEY INFORMATION OBTAINED FROM U.S. DEPARTMENT OF AGRICULTURAL, NATURAL RESOURCES CONSERVATION SERVICE, DATED 08/28/07.

0 150 300
SCALE:— 1"=300'

SOIL LEGEND

2 - ADAMSVILLE-SPARR FINE SANDS
6 - ASTATULA-APOPKA FINE SANDS, 0 TO 5 PERCENT SLOPES
7 - ASTATULA-APOPKA FINE SANDS, 5 TO 8 PERCENT SLOPES
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16 - IMMOKALEE SAND
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28 - POMPANO FINE SAND, OCCASIONALLY FLOODED
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35 - WABASSO FINE SAND

BORING LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 5

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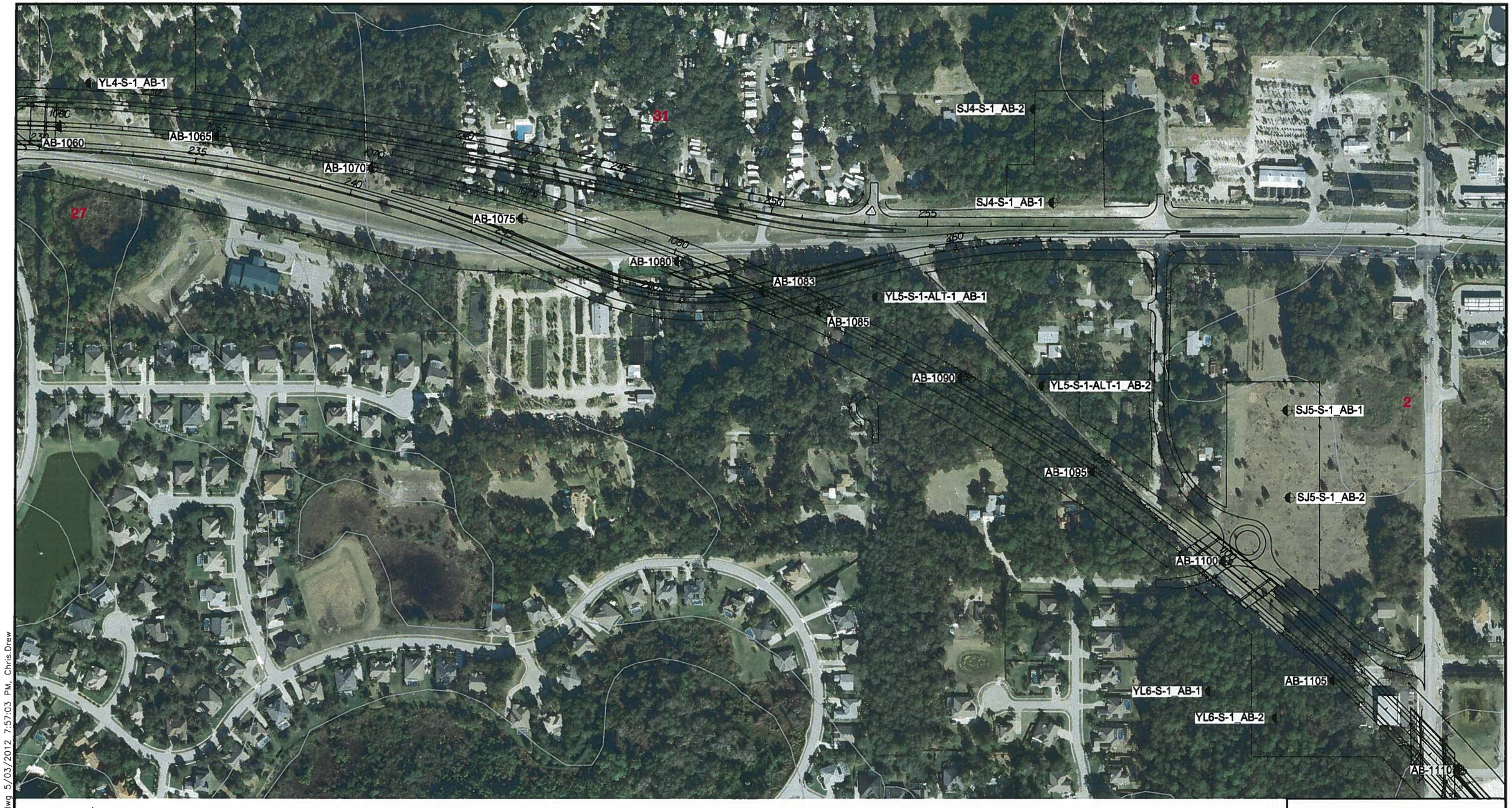

LEGEND

⊕ AUGER BORING LOCATION

NOTES:
1. AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.
2. SOIL SURVEY INFORMATION OBTAINED FROM U.S. DEPARTMENT OF AGRICULTURAL, NATURAL RESOURCES CONSERVATION SERVICE, DATED 08/28/07.

N

0 150 300
SCALE: 1"=300'

SOIL LEGEND

2 - ADAMSVILLE-SPARR FINE SANDS
6 - ASTATULA-APOPKA FINE SANDS, 0 TO 5 PERCENT SLOPES
7 - ASTATULA-APOPKA FINE SANDS, 5 TO 8 PERCENT SLOPES
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27 - POMELLO FINE SAND, 0 TO 5 PERCENT SLOPES
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35 - WABASSO FINE SAND

BORING LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 6

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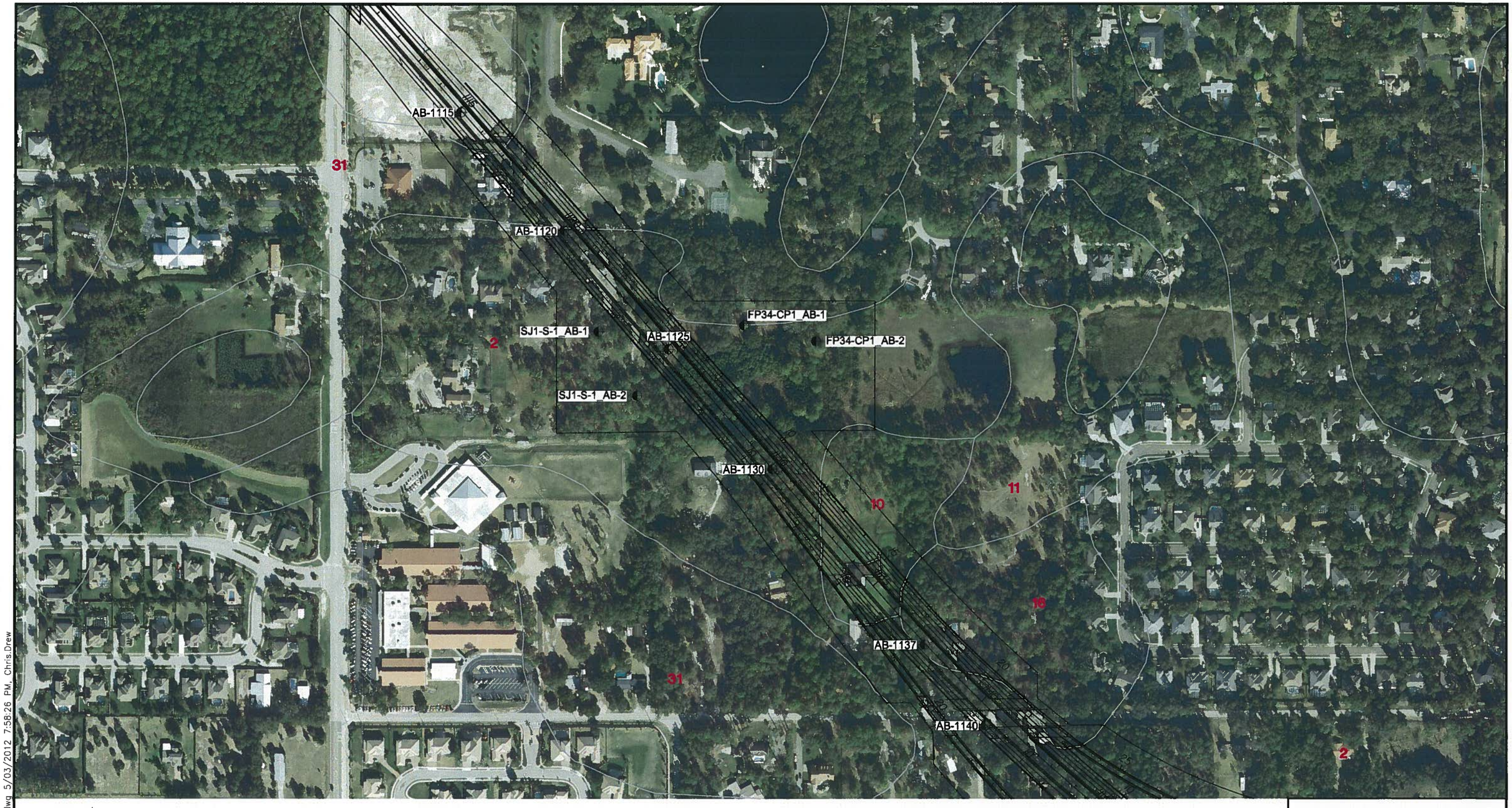

LEGEND

AUGER BORING LOCATION

NOTES:
1. AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.
2. SOIL SURVEY INFORMATION OBTAINED FROM U.S. DEPARTMENT OF AGRICULTURAL, NATURAL RESOURCES CONSERVATION SERVICE, DATED 08/28/07.

N

0 150 300
SCALE: 1"=300'

SOIL LEGEND

2 - ADAMSVILLE-SPARR FINE SANDS
6 - ASTATULA-APOPKA FINE SANDS, 0 TO 5 PERCENT SLOPES
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27 - POMELLO FINE SAND, 0 TO 5 PERCENT SLOPES
28 - POMPANO FINE SAND, OCCASIONALLY FLOODED
31 - TAVARES-MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES
35 - WABASSO FINE SAND

BORING LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 7

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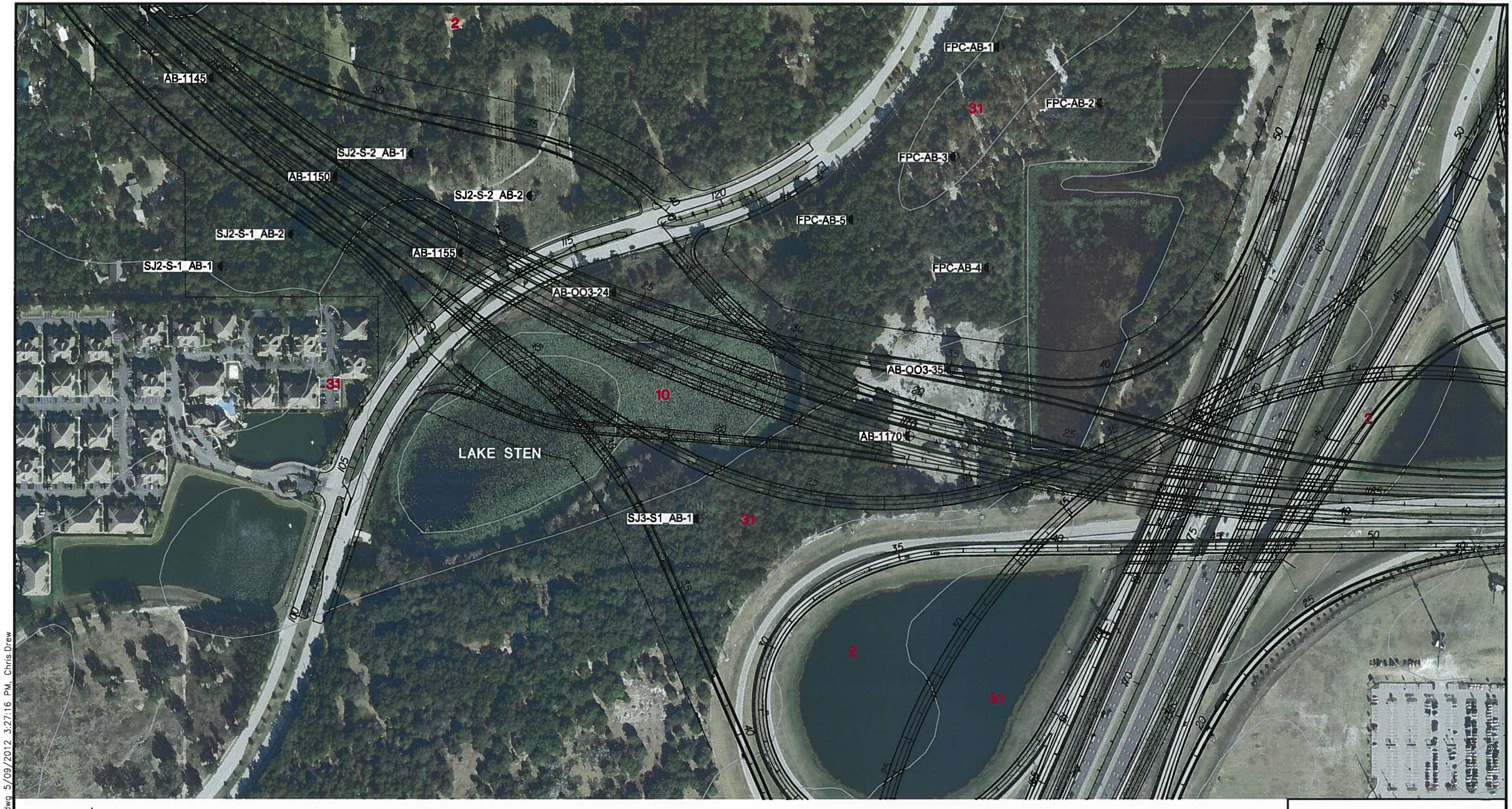

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N

0 150 300

SCALE:—1"=300'

LEGEND

⊕ AUGER BORING LOCATION

NOTES:

1. AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.
2. SOIL SURVEY INFORMATION OBTAINED FROM U.S. DEPARTMENT OF AGRICULTURAL, NATURAL RESOURCES CONSERVATION SERVICE, DATED 08/28/07.

SOIL LEGEND

2 - ADAMSVILLE-SPARR FINE SANDS
6 - ASTATULA-APOPKA FINE SANDS, 0 TO 5 PERCENT SLOPES
7 - ASTATULA-APOPKA FINE SANDS, 5 TO 8 PERCENT SLOPES
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31 - TAVARES-MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES
35 - WABASSO FINE SAND

BORING LOCATION PLAN

Ardaman & Associates, Inc.
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PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 8

N

0 30 60

SCALE: 1"=60'

LEGEND

● MUCK PROBE LOCATION (DEPTH OF WATER-FEET/DEPTH OF 'SOFT' SOILS-FEET)

NOTE: AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.

MUCK PROBE LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 9

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N

0 30 60

SCALE: 1"=60'

LEGEND

● MUCK PROBE LOCATION (DEPTH OF WATER-FEET/DEPTH OF 'SOFT' SOILS-FEET)

NOTE: AERIAL PHOTO OBTAINED FROM FLORIDA RESOURCES & ENVIRONMENTAL ANALYSIS CENTER, DATED 2009.

MUCK PROBE LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

PRELIMINARY ROADWAY SOIL SURVEY
WEKIVA PARKWAY LINE AND GRADE
SEMINOLE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 04/23/12
FILE NO. 11-6501	APPROVED BY:	FIGURE: 10

FIGURE II

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH

DATE OF SURVEY: APRIL 2012
SURVEY MADE BY: BOWDEN, TATE, WILLIAMS, TINDEL, BRACKINS
SUBMITTED BY: COLIN T. JEWSBURY, P.E.

FINANCIAL PROJECT ID : 431081-4-32-01

DISTRICT: FIVE
ROAD NO.: 429
COUNTIES: SEMINOLE

CROSS SECTION OF SOIL SURVEY
SR 429 SECTION 7A AND 8

SURVEY BEGINS STA. : 920+00 (SR 429) SURVEY ENDS STA. : 1200+00 (SR 429)

	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS PERCENTAGE PASSING						ATTERBERG LIMITS (%)			SOIL CLASSIFICATION		CORROSION TEST RESULTS				
STRATUM NO.	NO. OF TESTS	% ORGANIC	NO. OF TESTS	% MOISTURE	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTICITY INDEX	AASHTO GROUP	DESCRIPTION	NO. OF TESTS	RESISTIVITY ohms cm	CHLORIDE ppm	SULFATES ppm	pH
1	0	-	0	-	13	100	98-99	82-94	14-26	1-6	0	-	-	A-3	LIGHT BROWN TO DARK BROWN, GRAYISH BROWN, ORANGE-BROWN OR LIGHT GRAY TO GRAY FINE SAND TO FINE SAND WITH SILT	3	22,000-38,000	15-30	20-67	4.9-8.2
2	2	2-3	2	13-22	3	100	99	83-91	23-42	10-14	0	-	-	A-3 A-2-4	BROWN TO VERY DARK BROWN OR GRAY TO DARK GRAY FINE SAND WITH SILT TO SILTY FINE SAND, OCCASIONAL TRACE ORGANIC MATERIAL	2	9,700-37,000	30	7-69	4.9-7.9
3	0	-	1	11	9 (1)	100	91-100	78-94	19-46	5-17	2	NP-27	NP-10	A-3 A-2-4	LIGHT BROWN TO BROWN, GRAYISH BROWN, ORANGE-BROWN OR LIGHT GRAY TO GRAY FINE SAND WITH CLAY TO CLAYEY FINE SAND OR SILTY CLAYEY FINE SAND	0	-	-	-	-
4	1	11	1	17	(1)	-	-	-	-	8	0	-	-	A-8	DARK TO VERY DARK BROWN MUCKY FINE SAND TO MUCK	0	-	-	-	-
5	0	-	0	-	3	100	99-100	92-99	22-90	2-13	0	-	-	A-3, A-2-4	REDDISH BROWN TO DARK REDDISH BROWN OR DARK BROWN SLIGHTLY CEMENTED TO CEMENTED FINE SAND TO SILTY FINE SAND (HARDPAN TYPE)	0	-	-	-	-
6	0	-	3	11-18	3 (3)	100	99-100	90-94	42-51	18-26	3	28-37	12-21	A-2-6 A-6 A-7-6	LIGHT BROWN TO BROWN, ORANGE-BROWN OR LIGHT GRAY TO GRAY CLAYEY FINE SAND TO SANDY CLAY	0	-	-	-	-

EMBANKMENT AND SUBGRADE MATERIAL

STRATA BOUNDARIES ARE APPROXIMATE, MAKE FINAL CHECK AFTER GRADING

1. SOIL BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH BORING LOCATION ONLY. ANY SUBSOIL CONNECTING LINES 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. GNE DENOTES GROUNDWATER NOT ENCOUNTERED. ESTIMATED SEASONAL HIGH GROUNDWATER LEVELS SHOWN AS ▽ . ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL ABOVE EXISTING GROUND SURFACE SHOWN AS $\frac{\nabla}{AGS}$.
3. REMOVAL OF MUCK AND PLASTIC MATERIAL OCCURING WITHIN THE ROADWAY SHALL BE ACCOMPLISHED IN ACCORDANCE WITH INDEX NO. 500, UNLESS OTHERWISE SHOWN ON THE PLANS. THE MATERIAL USED IN EMBANKMENT CONSTRUCTION SHALL BE IN ACCORDANCE WITH INDEX NO. 505 FOR FDOT DESIGN STANDARDS.
4. SOIL PARAMETER NOT TESTED DENOTED AS "_" ABOVE.
5. STRATA NOS. 1, 2, 3 AND 5 SHALL BE TREATED AS SELECT (S) MATERIAL IN ACCORDANCE WITH FDOT INDEX 500 AND INDEX 505.
6. STRATA NOS. 2, 3 AND 5 MAY RETAIN EXCESS MOISTURE AND MAY BE DIFFICULT TO DRY AND COMPACT.
7. STRATUM NO. 6 SHALL BE TREATED AS PLASTIC (P) IN ACCORDANCE WITH FDOT INDEX 500 AND INDEX 505.
8. STRATUM NO. 4 SHALL BE TREATED AS MUCK (M) IN ACCORDANCE WITH FDOT INDEX 500 AND INDEX 505.
9. "NP" DENOTES NON-PLASTIC. () DENOTES PERCENT FINES TESTS ONLY.
10. LAYERS OF VERY HARD MATERIALS SUCH AS HARDPAN TYPE SOILS MAY BE ENCOUNTERED IN VARIOUS AREAS OF THE PROJECT. SUCH MATERIALS WILL BE DIFFICULT TO EXCAVATE OR PENETRATE. THE CONTRACTOR SHALL EXPECT TO ENCOUNTER THESE VERY HARD MATERIALS IN ALL EXCAVATIONS AND SHALL USE SPECIALIZED EQUIPMENT AND/OR PROCEDURES AS NECESSARY TO FACILITATE EXCAVATION/PENETRATION.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Ardaman & Associates, Inc.
8008 S. Orange Avenue
Orlando, Fl. 32808
E.O.R.-Colin T. Jewsbury, P.E. NO. 58074
Certificate of Authorization 5950

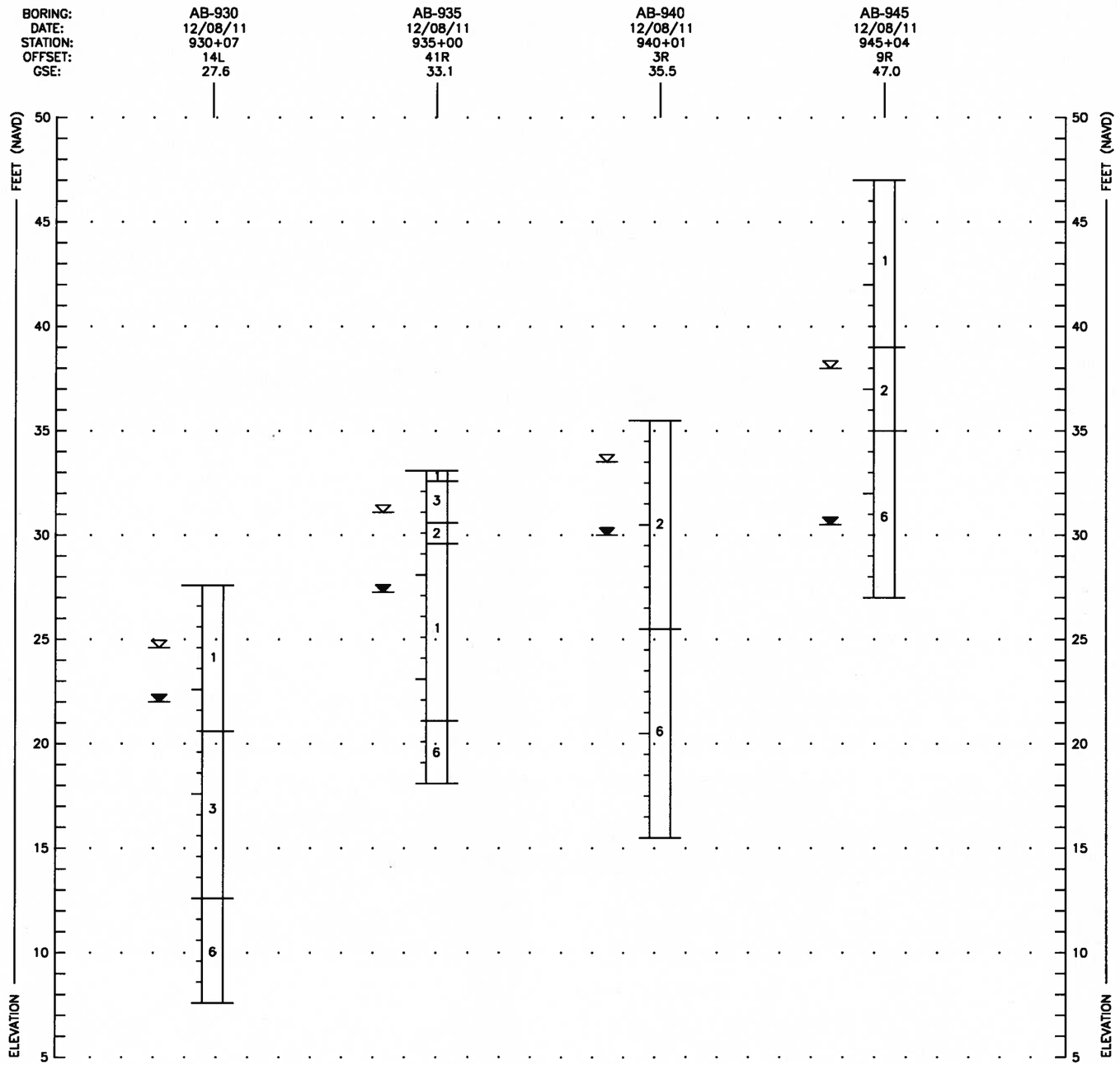
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
429	SEMINOLE	431081-4-32-01

ROADWAY SOIL SURVEY

SHEET NO.

Chris.Drew 5/9/2012 3:29:30 PM T:\Orlando\IVI-6501\rdssge01.dgn

FIGURE 12



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Ardaman & Associates, Inc.
8008 S. Orange Avenue
Orlando, Fl. 32808
E.O.R.–Colin T. Jewsbury, P.E. NO. 58074
Certificate of Authorization: 5950

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
429	SEMINOLE	431081-4-32-01

ROADWAY BORING PROFILES

WEKIVA PARKWAY

SHEET NO.

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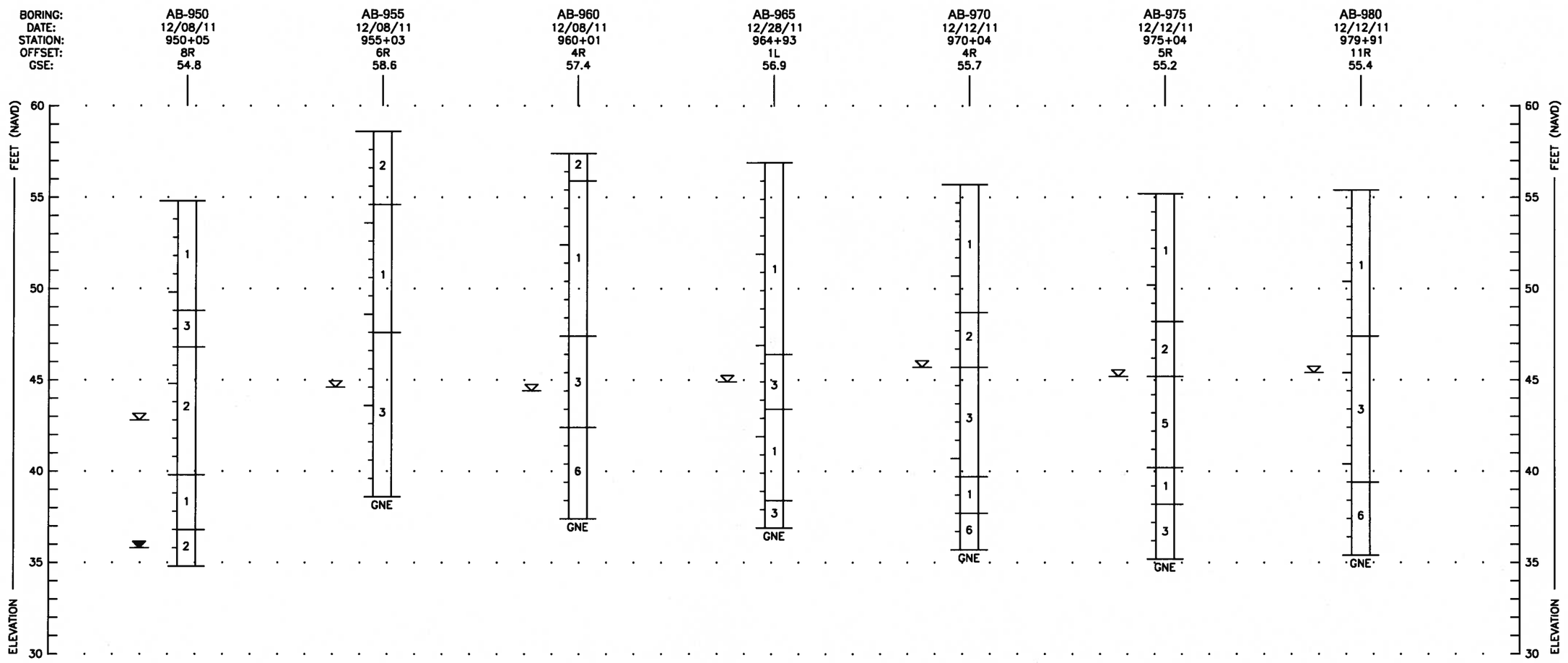
FIGURE 13



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Ardaman & Associates, Inc.
8008 S. Orange Avenue
Orlando, Fl. 32808
E.O.R.-Colin T. Jewsbury, P.E. NO. 58074
Certificate of Authorization: 5950

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
429	SEMINOLE	431081-4-32-01

ROADWAY BORING PROFILES

WEKIVA PARKWAY

SHEET NO.

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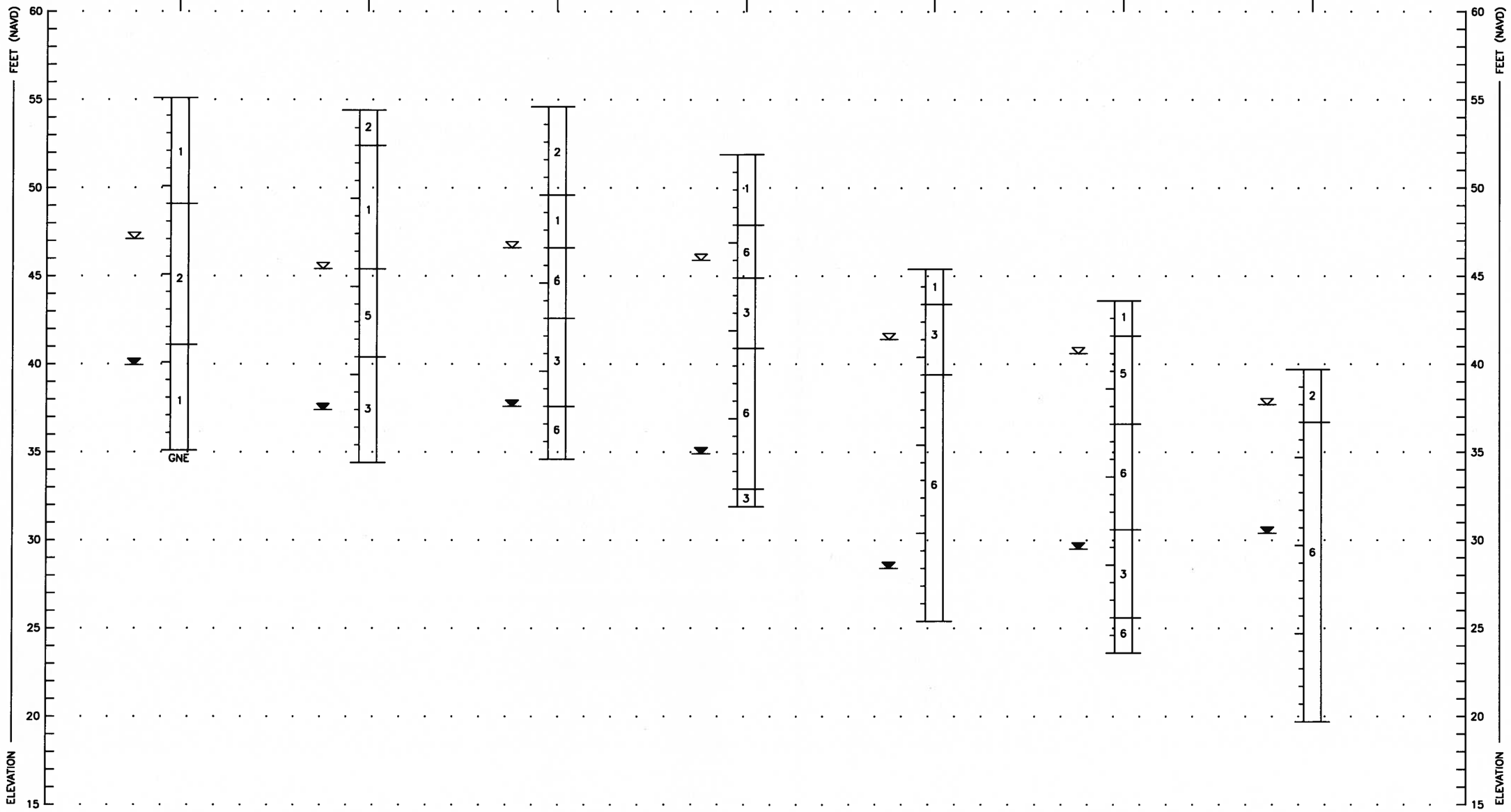
FIGURE 14

BORING:	AB-985	AB-990	AB-995	AB-1000	AB-1005	AB-1010	AB-1015
DATE:	01/12/12	01/12/12	01/12/12	01/12/12	01/12/12	01/12/12	01/12/12
STATION:	985+03	990+04	995+04	1000+04	1005+06	1010+07	1015+04
OFFSET:	4R	7R	7R	6R	6R	2R	18L
GSE:	55.1	54.4	54.6	51.9	45.4	43.4	39.7



*NOTE: BORING LOCATION ESTIMATED ONLY.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Ardaman & Associates, Inc.
8008 S. Orange Avenue
Orlando, Fl. 32809
E.O.R.-Colin T. Jewsbury, P.E. NO. 58074
Certificate of Authorization: 5950

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
429	SEMINOLE	431081-4-32-01

ROADWAY BORING PROFILES

WEKIVA PARKWAY

SHEET NO.

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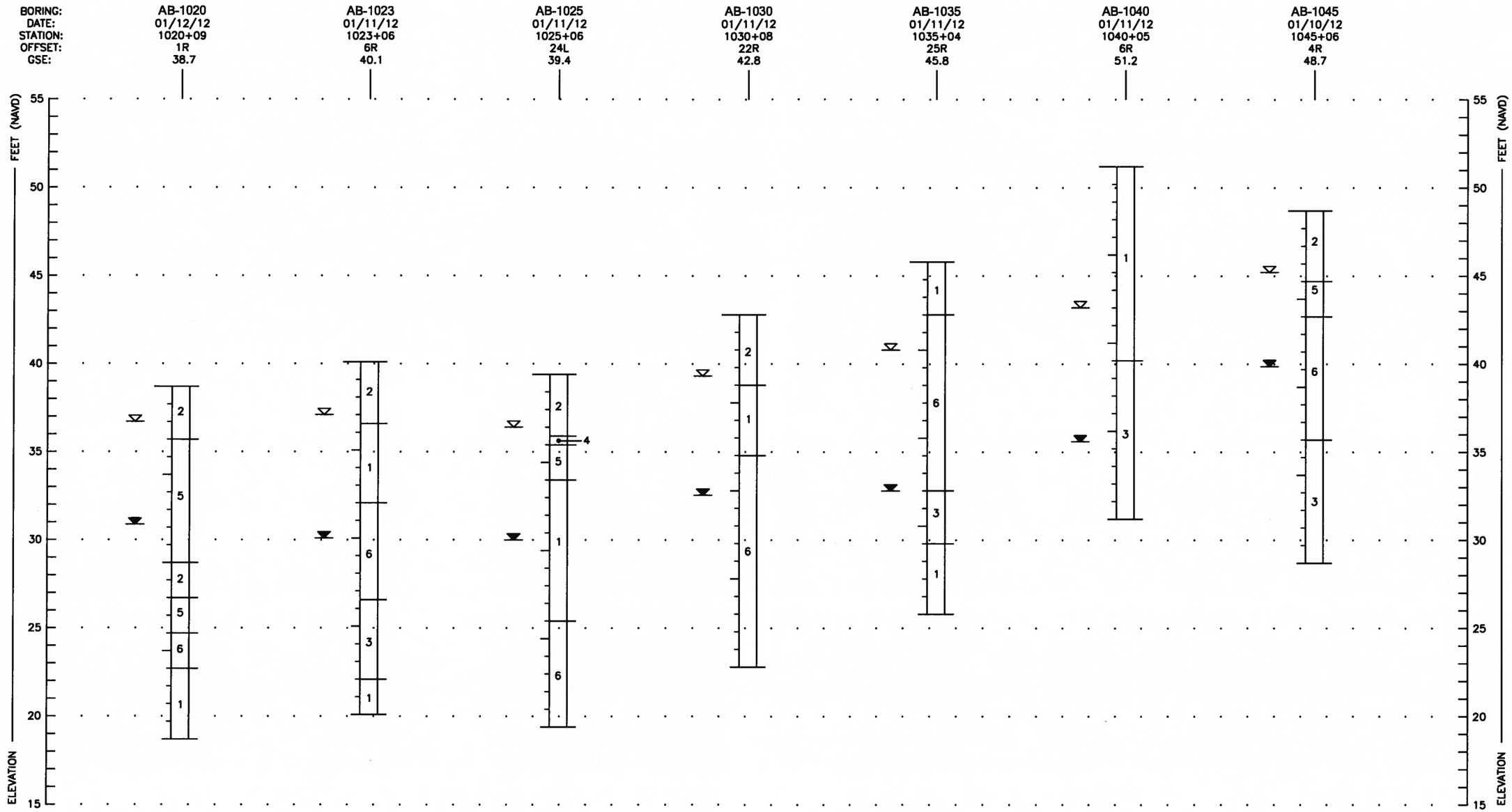
FIGURE 15



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E.O.R.–Colin T. Jewsbury, P.E. NO. 58074
Certificate of Authorization: 5950

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
429	SEMINOLE	431081-4-32-01

ROADWAY BORING PROFILES

WEKIVA PARKWAY

SHEET NO.

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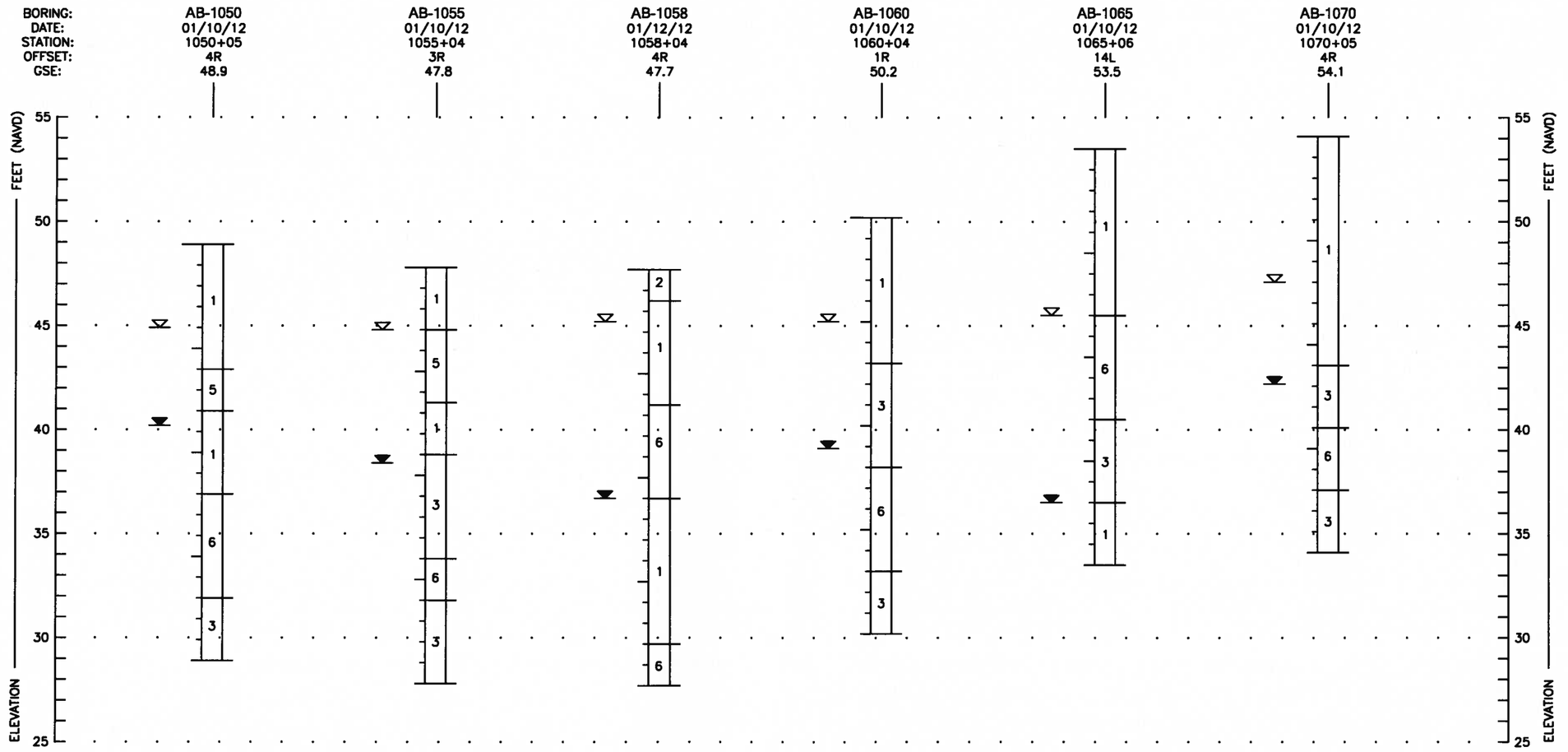
FIGURE 16



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ROADWAY BORING PROFILES

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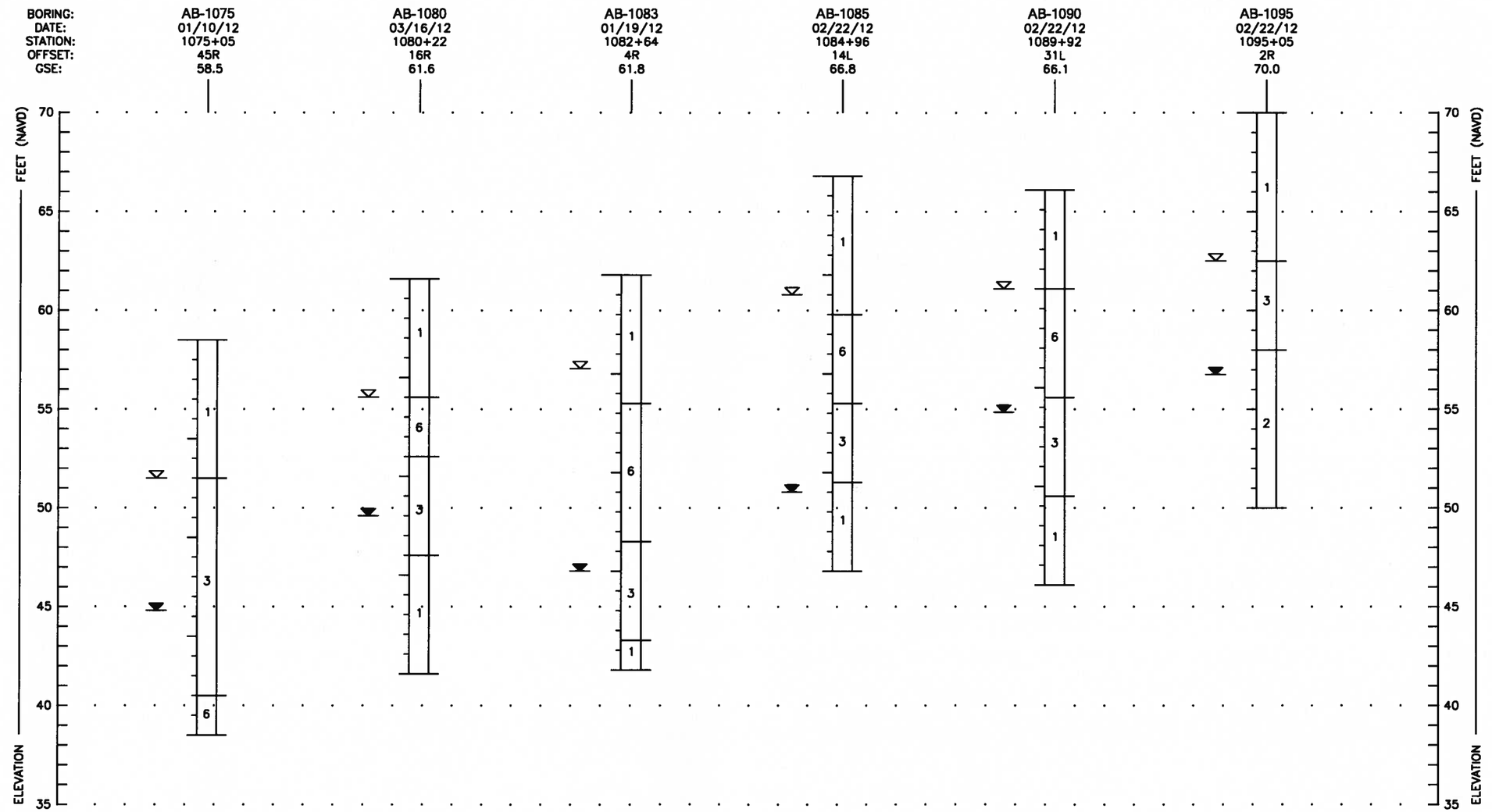
FIGURE 17



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ROADWAY BORING PROFILES

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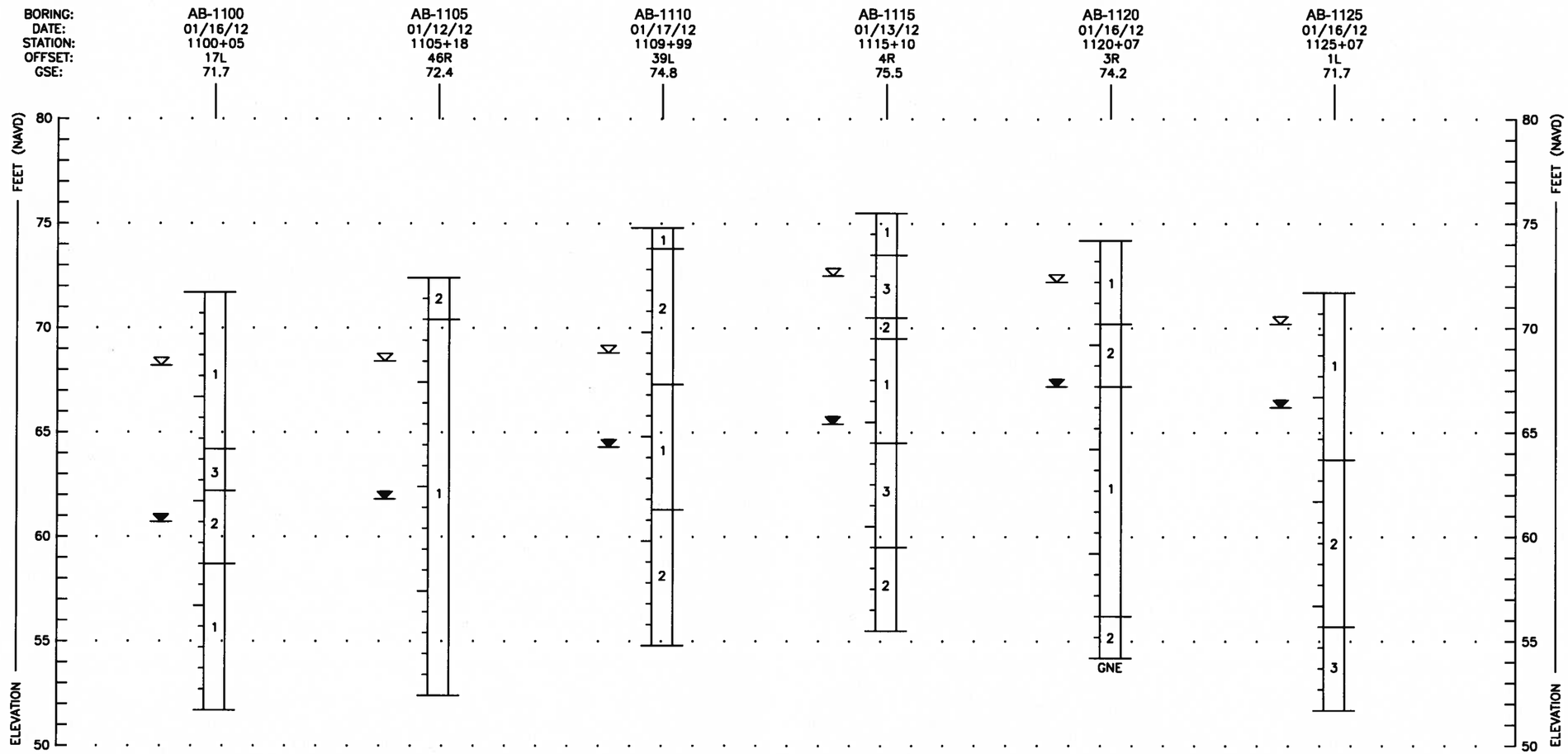
FIGURE 18



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ROADWAY BORING PROFILES

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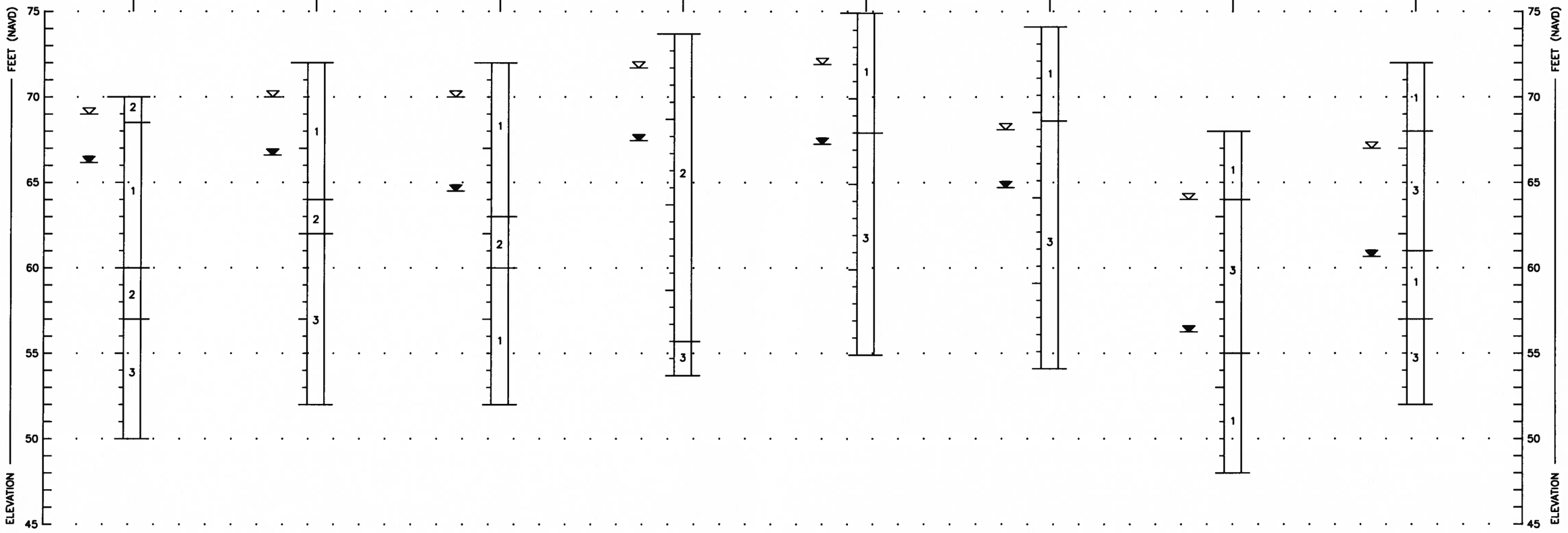
FIGURE 19

BORING:	AB-1130	AB-1137*	AB-1140	AB-1145	AB-1150	AB-1155	AB-1170	AB-OO3_35+00
DATE:	01/16/12	03/16/12	01/17/12	02/22/12	01/19/12	04/25/12	03/22/12	03/22/12
STATION:	1130+09	1137+60	1140+50	1145+11	1150+13	1154+60	1170+02	1170+89
OFFSET:	1R	CL	40R	4L	6R	35R	7R	237L
GSE:	70.0	72.0	72.0	73.7	74.9	74.1	72.7	72.0



*NOTE: BORING LOCATION ESTIMATED ONLY.

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DEPARTMENT OF TRANSPORTATION

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ROADWAY BORING PROFILES

WEKIVA PARKWAY

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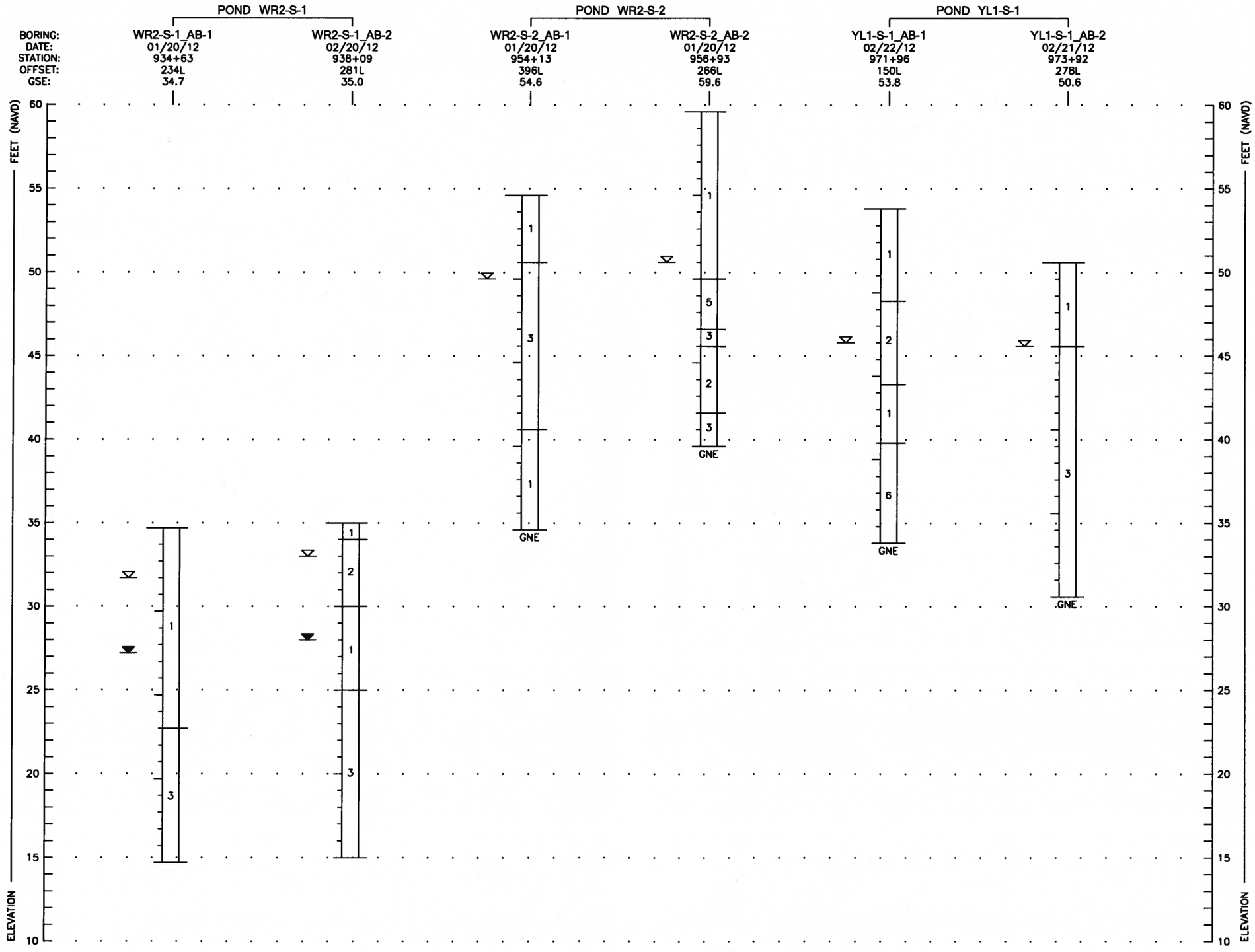
FIGURE 20



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ROAD NO.	COUNTY	FINANCIAL PROJECT ID
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POND BORING PROFILES

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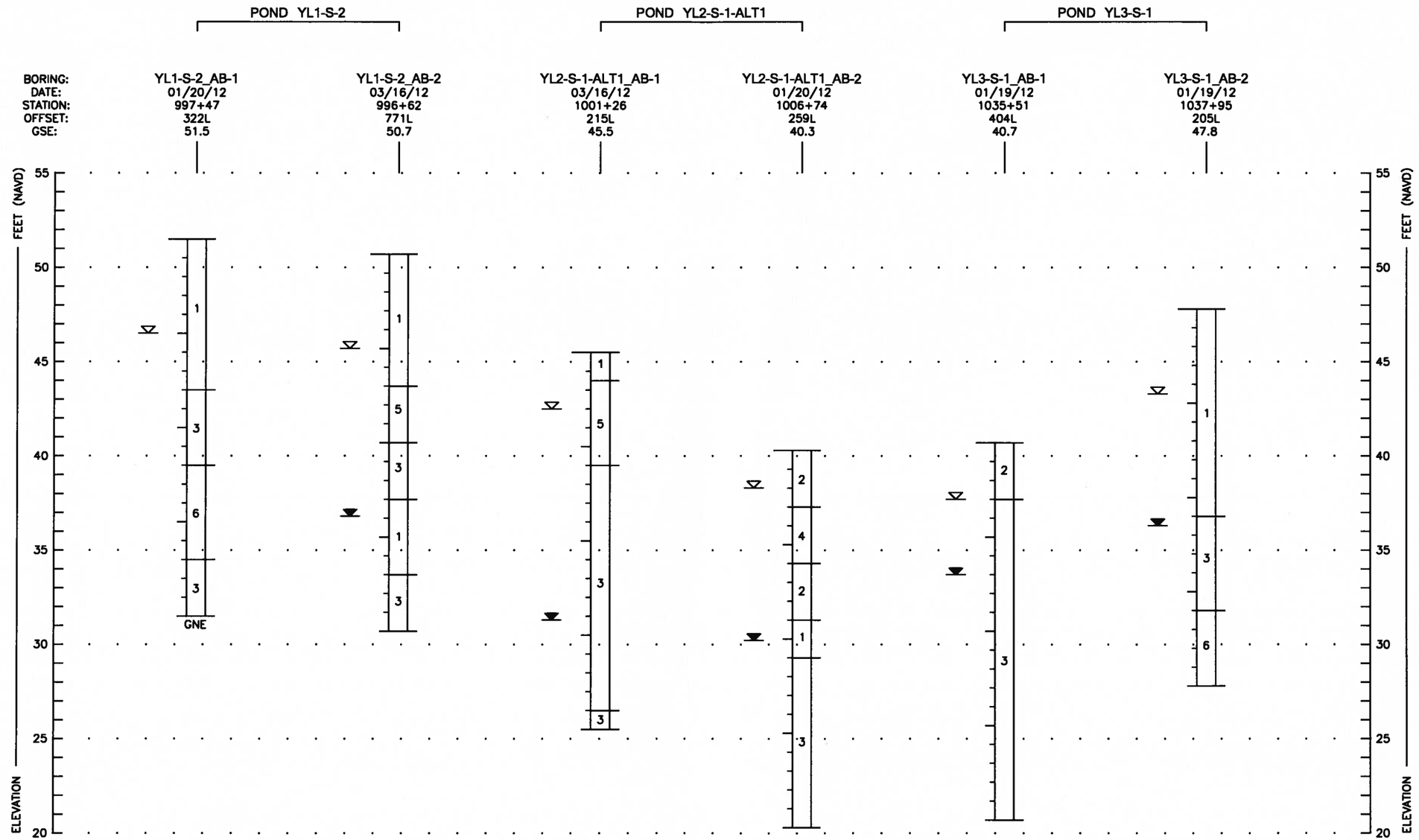
FIGURE 21



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POND BORING PROFILES

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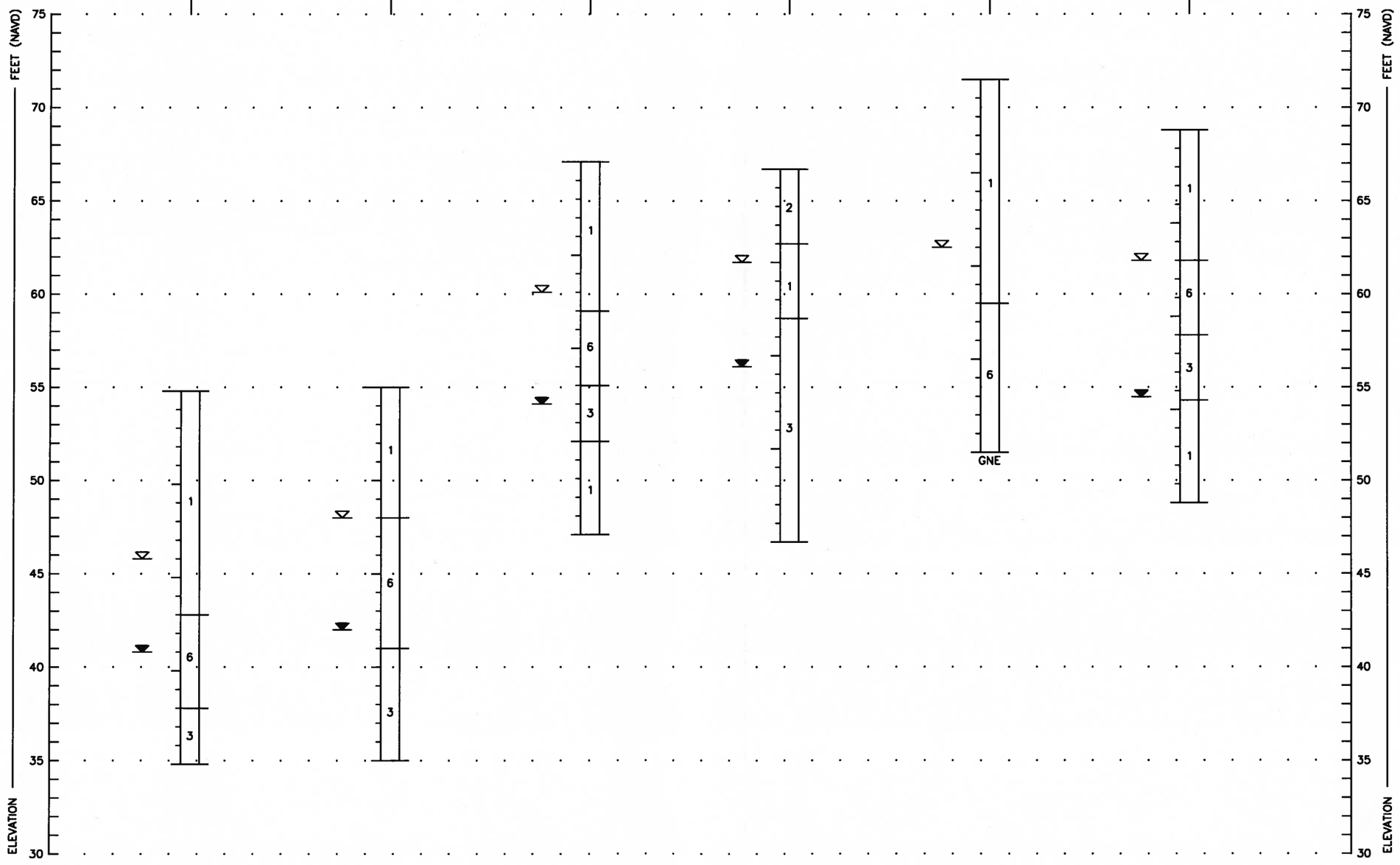
FIGURE 22

POND YL4-S-1 | POND YL5-S-1-ALT1 | POND SJ4-S-1

BORING:	YL4-S-1_AB-1	YL4-S-1_AB-2	YL5-S-1-ALT-1_AB-1	YL5-S-1-ALT-1_AB-2	SJ4-S-1_AB-1	SJ4-S-1_AB-2
DATE:	01/10/12	01/20/12	01/13/12	01/13/12	03/16/12	02/22/12
STATION:	1060+88	1063+02	1086+40	1092+25	1089+74	1088+01
OFFSET:	142L	499L	132L	140L	656L	888L
GSE:	54.9	55.0	67.1	66.7	71.5	68.8



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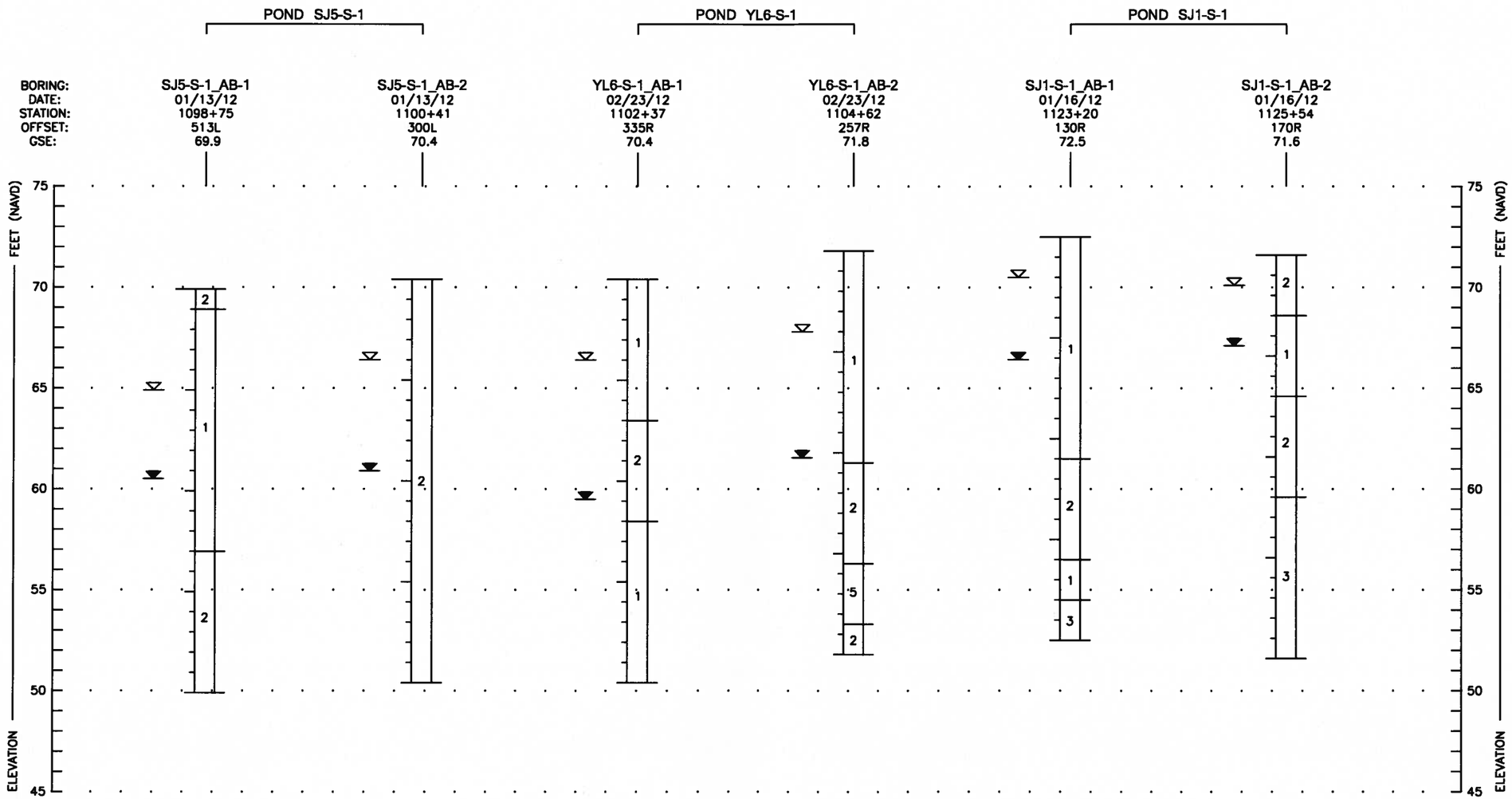
POND BORING PROFILES

WEKIVA PARKWAY

SHEET NO.

FIGURE 23



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POND BORING PROFILES

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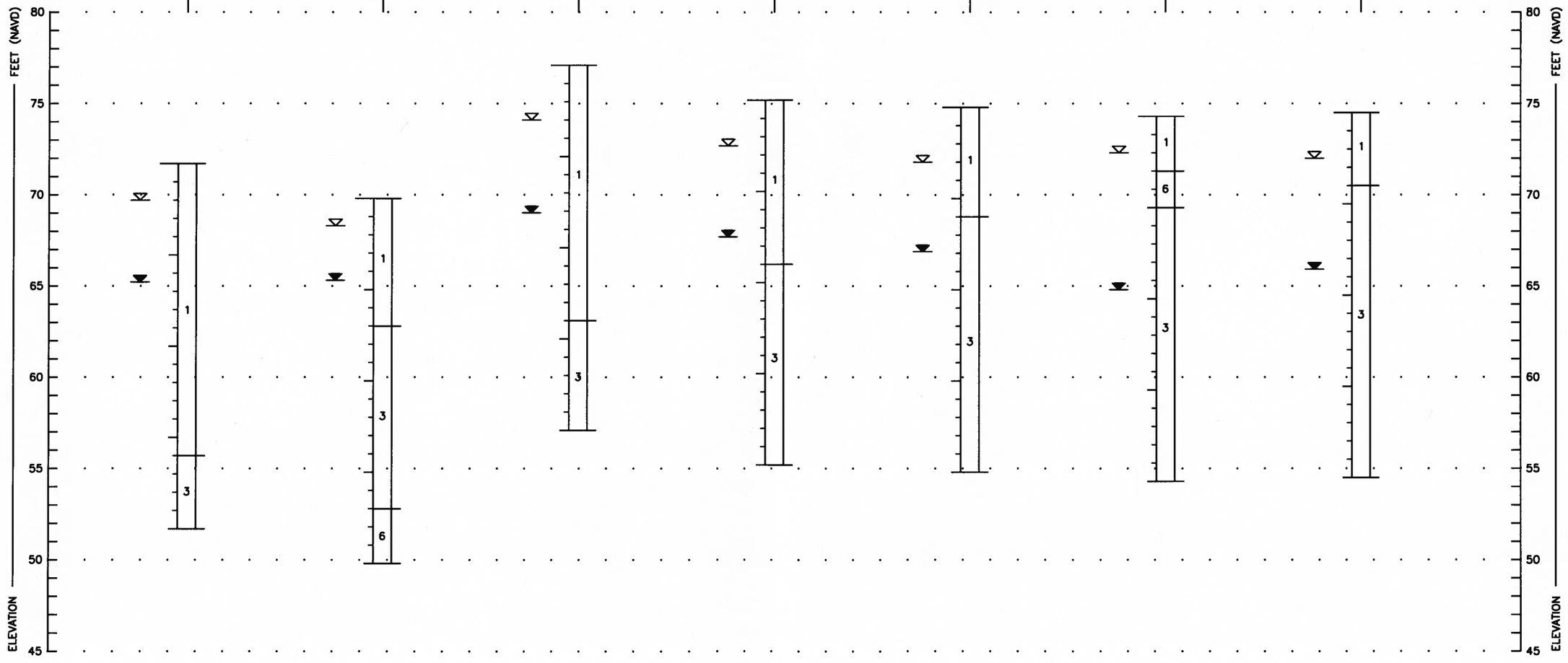
FIGURE 24

POND FP-34-CP1 | POND SJ2-S-1 | POND SJ2-S-2 | POND SJ3-S1

BORING:	FP-34-CP1_AB-1	FP-34-CP1_AB-2	SJ2-S-1_AB-1	SJ2-S-1_AB-2	SJ2-S-2_AB-1	SJ2-S-2_AB-2	SJ3-S1_AB-1
DATE:	02/24/99	02/24/99	01/19/12	01/19/12	01/19/12	01/19/12	03/22/12
STATION:	1126+06	1127+95	1148+86	1150+02	1151+75	1155+81	1164+71
OFFSET:	230L	371L	449R	238R	188L	265L	449R
GSE:	71.7	69.8	77.1	75.2	74.8	74.3	74.5



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POND BORING PROFILES

WEKIVA PARKWAY

SHEET NO.

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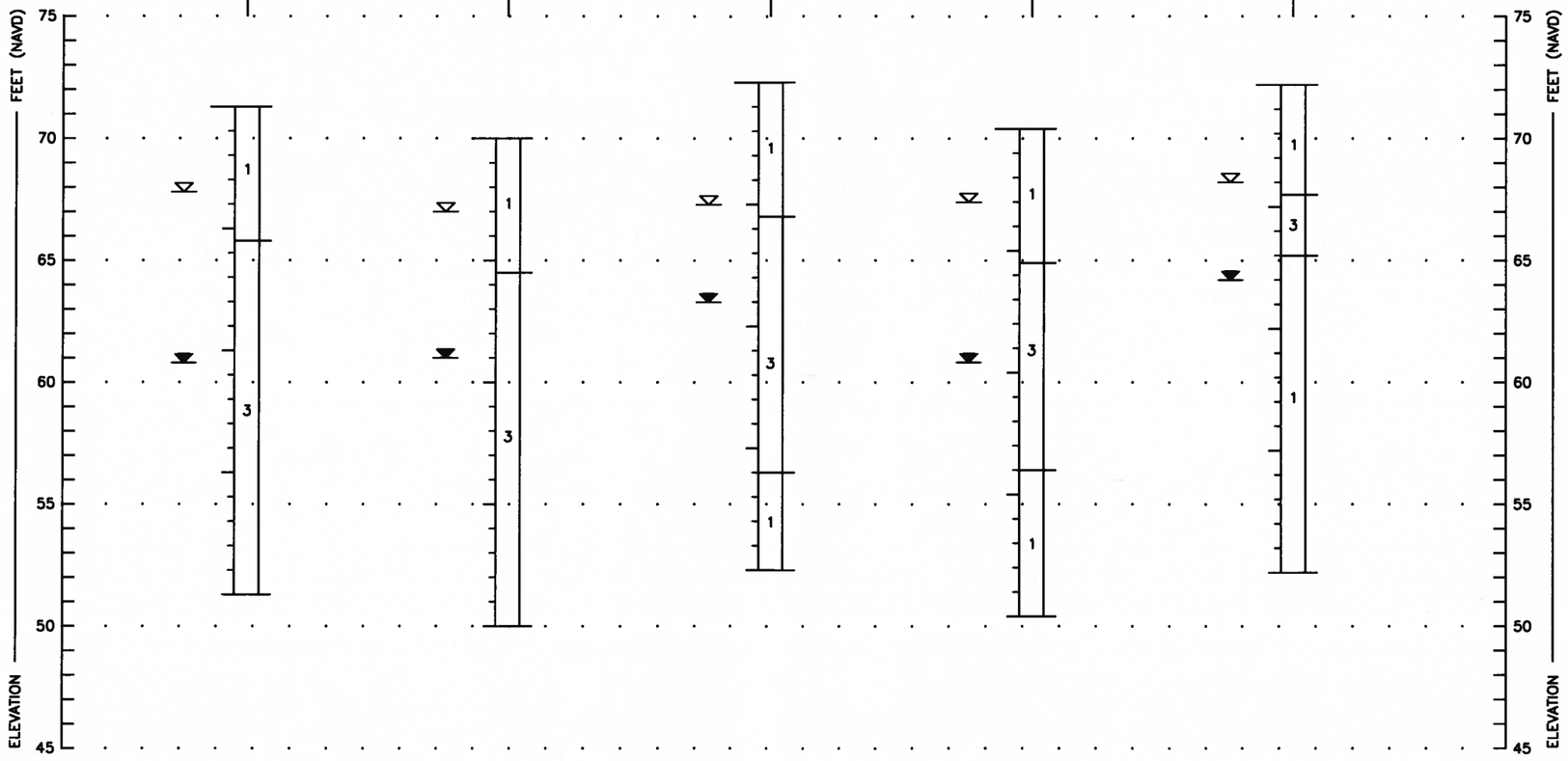
FIGURE 25

POND FPC

BORING:	FPC_AB-1	FPC_AB-2	FPC_AB-3	FPC_AB-4	FPC_AB-5
DATE:	03/22/12	03/22/12	03/22/12	03/22/12	03/22/12
STATION:	1169+67	1174+13	1169+14	1171+32	1166+27
OFFSET:	1263L	1159L	890L	578L	607L
GSE:	71.3	70.0	72.3	70.4	72.2



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POND BORING PROFILES

WEKIVA PARKWAY

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APPENDIX I

Auger Boring Procedure

AUGER BORINGS

Auger borings are used when a relatively large, continuous sampling of soil strata close to ground surface is desired. A 4-inch diameter, continuous flite, helical auger with a cutting head at its end is screwed into the ground in 5-foot sections. It is powered by the rotating action of the Kelly bar of a rotary drill rig. The sample is recovered by withdrawing the auger out of the ground without rotating it. The soil sample so obtained, is classified and representative samples put in bags or jars and brought back to the laboratory for classification testing.

APPENDIX II

Resilient Modulus Test Results (Provided by FDOT)

Florida Department of Transportation

RICK SCOTT
GOVERNOR

STATE MATERIALS OFFICE
5007 Northeast 39th Avenue, Gainesville, Florida 32609
Telephone: (352) 955-6600, Fax: (352) 955-6613

ANANTH PRASAD, P.E.
SECRETARY

MEMORANDUM

DATE: May 15, 2012

TO: Zachary Sullivan and Kathy Gray

FROM: David Horhota

SUBJECT: Embankment Resilient Modulus Pavement Design
District 5, Seminole County
FPN 431081-4: Wekiva Parkway (SR-429) – Sections 7A and 7B

Twenty seven (27), 2-bucket samples were received by the State Materials Office (SMO) for determination of an embankment (roadbed) resilient modulus for pavement design. After visual observation of the 27 samples, it was determined that the material from each sample looked visually similar and the material from each of the buckets were combined to form one sample from each location. After combining materials from the buckets, samples from each location were obtained for classification tests (Atterberg limits and sieve analysis), Proctor density, and resilient modulus. The classification test results are reported in Table 1. Based on the information on the sample bags submitted by Ardaman & Associates, it was noted that all samples were obtained from a depth of 1.0 to 3.0 feet.

Table 1. Summary of Initial Classification Results

Sample Number	Location	Passing No. 10, %	Passing No. 40, %	Passing No. 60, %	Passing No. 100, %	Passing No. 200, %	Class.	LL/PI
MR-1	SJ2-S-1 AB-1	100.0	98.6	84.3	24.2	5.5	A-3	N.P.
MR-2	1150+00	100.0	99.1	88.6	26.6	8.1	A-3	N.P.
MR-3	SJ2-S-2 AB-2	100.0	99.1	87.6	27.7	5.7	A-3	N.P.
MR-4	FP34-CP1 AB-1	100.0	99.0	87.1	24.5	5.7	A-3	N.P.
MR-5	SJ1-S-1 AB-1	100.0	99.0	86.7	24.4	5.2	A-3	N.P.
MR-6	SJ5-S-1 AB-2	100.0	98.9	87.4	24.0	5.0	A-3	N.P.
MR-7	SJ4-S-1 AB-2	100.0	98.9	87.4	24.5	2.2	A-3	N.P.
MR-8	YL5-S-1 AB-1	100.0	99.1	88.0	17.9	2.0	A-3	N.P.

MR-9	YL4-S-1 AB-1	100.0	99.2	91.5	31.6	2.0	A-3	N.P.
MR-10	YL3-S-1 AB-1	100.0	99.1	88.9	19.8	4.3	A-3	N.P.
MR-11	1030+00	99.1	98.1	89.0	23.6	2.4	A-3	N.P.
MR-12	YL1-S-2 AB-1	100.0	99.1	89.6	22.0	4.0	A-3	N.P.
MR-13	980+00	99.3	97.9	88.0	28.6	7.5	A-3	N.P.
MR-14	YL1-S-1 AB-1	99.8	98.7	88.5	25.0	7.6	A-3	N.P.
MR-15	955+00	100.0	99.0	91.2	26.8	4.8	A-3	N.P.
MR-16	WR2-S-1 AB-1	99.9	98.7	87.8	27.4	5.3	A-3	N.P.
MR-17	930+00	99.9	98.0	85.4	28.2	4.1	A-3	N.P.
MR-18	1080+20	100.0	98.4	86.0	19.3	2.6	A-3	N.P.
MR-19	1130+00	100.0	98.6	83.1	28.3	8.8	A-3	N.P.
MR-20	1005+00	100.0	99.3	91.7	33.4	2.7	A-3	N.P.
MR-21	1105+00	99.9	98.7	85.6	22.9	4.1	A-3	N.P.
MR-22	1055+00	98.2	96.5	86.4	23.5	3.1	A-3	N.P.
MR-23	YL2-S-1 AB-1	98.1	97.3	89.1	29.6	8.2	A-3	N.P.
MR-24	1170+00	99.8	99.1	89.8	25.2	3.8	A-3	N.P.
MR-25	FPC AB-3	99.9	99.1	87.8	24.9	3.4	A-3	N.P.
MR-26	WR2-S-2 AB-1	100.0	99.3	92.6	26.3	5.9	A-3	N.P.
MR-27	SJ3-S-1 AB-1	99.9	99.0	89.0	24.8	3.6	A-3	N.P.

In addition to the classification testing, the following test program was conducted:

(1) Standard Proctor, AASHTO T 99
(2) Resilient Modulus (M_R), AASHTO T 307.

Summaries of the laboratory test results are included in Table 2. The resilient modulus values listed in this table were obtained using the relationship developed from each individual test (resilient modulus versus bulk stress - with bulk stress, Θ, defined as $\Theta = \sigma_1 + \sigma_2 + \sigma_3$), and using a bulk stress of 11 psi, which is the recommendation from Dr. Ping's research work in modeling the embankment in-situ stresses for Florida pavement conditions. The resilient modulus samples were compacted to within 1 pcf of the maximum density and 0.5% of the optimum moisture content as determined by AASHTO T99.

Table 2. Summary of T-99 and M_R Test Results

Sample No.	Passing No. 200, %	Standard Proctor Density, pcf	Optimum Moisture Content, %	Resilient Modulus @ Θ=11psi, psi
MR-1	6	105.1	13.9	13,042
MR-2	8	105.4	13.5	13,367
MR-3	6	105.1	14.2	13,593
MR-4	6	104.9	13.8	12,742
MR-5	5	105.2	13.7	13,557
MR-6	5	104.3	13.5	12,875
MR-7	2	101.0	15.8	14,237
MR-8	2	101.3	15.3	13,692
MR-9	2	99.3	17.4	13,986
MR-10	4	101.2	15.0	14,708
MR-11	2	100.5	15.6	13,109
MR-12	4	103.5	14.8	11,715
MR-13	8	106.8	12.8	13,868
MR-14	8	101.7	11.5	11,337
MR-15	5	102.9	15.3	13,692
MR-16	5	100.5	16.3	13,958
MR-17	4	102.7	15.1	14,335
MR-18	3	101.7	15.8	13,519
MR-19	9	108.6	11.6	13,740
MR-20	3	99.5	15.0	13,025
MR-21	4	103.5	15.3	14,918
MR-22	3	101.0	16.1	12,737
MR-23	8	104.0	13.9	12,278
MR-24	4	102.3	14.6	14,142
MR-25	3	102.2	15.6	14,621
MR-26	6	104.2	15.3	12,626
MR-27	4	102.5	14.1	12,648

To obtain a design embankment resilient modulus for the embankment material, a 90 percent method was used as outlined in both the Flexible Pavement Design Manual and Soils and Foundations Handbook. The resilient modulus values were ranked in ascending order and the percentage of values which were greater than or equal to the individual value were determined. Table 3 and Figure 1 represent the results of this analysis.

Table 3. Ranked M_R Test Results for 90 Percent Method

Rank	Sample No.	% ≥	M_R (psi)
1	MR-14	100	11,337
2	MR-12	96	11,715
3	MR-23	93	12,278
4	MR-26	89	12,626
5	MR-27	85	12,648
6	MR-22	81	12,737
7	MR-4	78	12,742
8	MR-6	74	12,875
9	MR-20	70	13,025
10	MR-1	67	13,042
11	MR-11	63	13,109
12	MR-2	59	13,367
13	MR-18	56	13,519
14	MR-5	52	13,557
15	MR-3	48	13,593
16	MR-15	44	13,692
17	MR-8	41	13,692
18	MR-19	37	13,740
19	MR-13	33	13,868
20	MR-16	30	13,958
21	MR-9	26	13,986
22	MR-24	22	14,142
23	MR-7	19	14,237
24	MR-17	15	14,335
25	MR-25	11	14,621
26	MR-10	7	14,708
27	MR-21	4	14,918

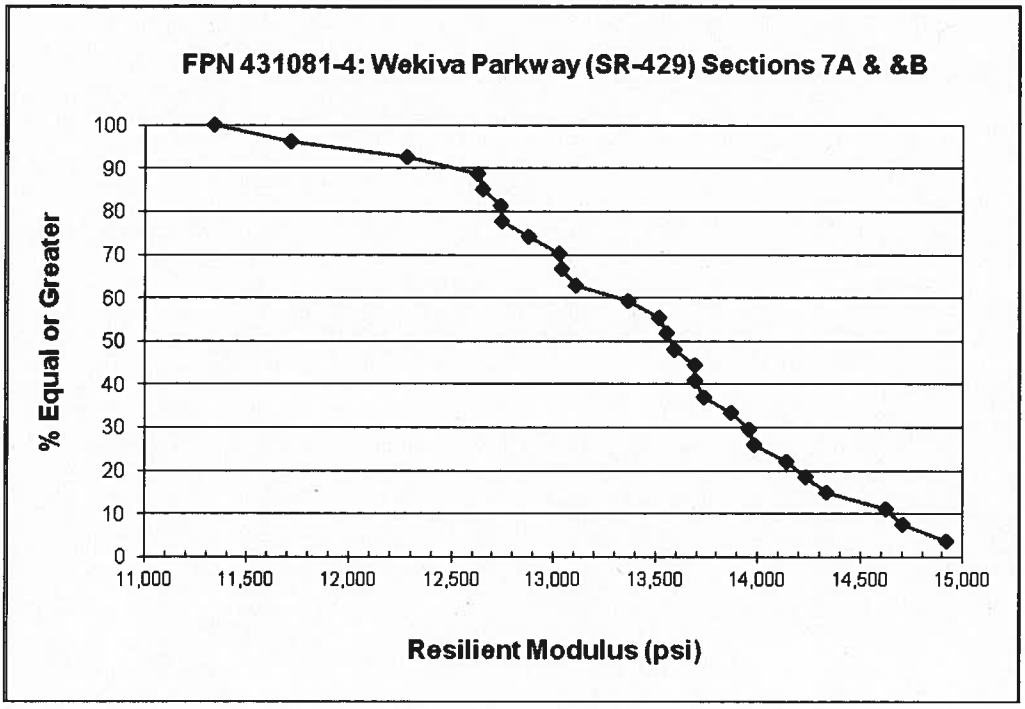

Figure 1. Ranked M_R Test Results for 90 Percent Method

Based on the results shown in Table 3 and Figure 1, the resilient modulus for the embankment material corresponding to a 90th percentile is 12,500 psi, which would represent the design embankment M_R value.