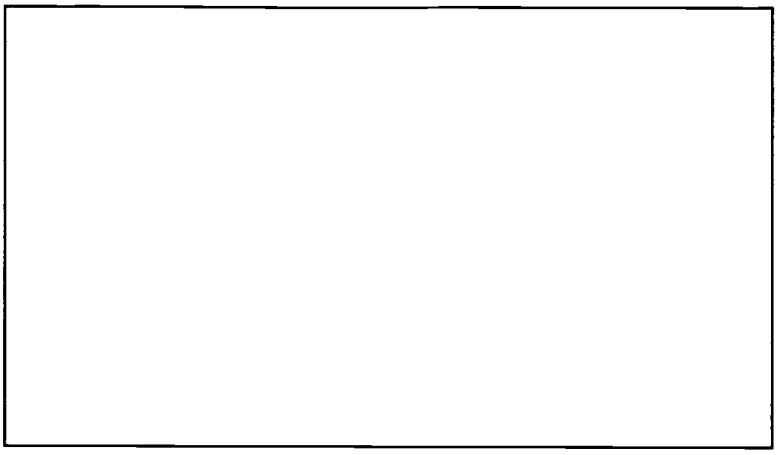

Ardaman & Associates, Inc

Subsurface Soil Exploration and
Geotechnical Engineering Evaluation
New Pond 2 - Hartwood Marsh Road
Lake County, Florida

Ardaman & Associates, Inc

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Geotechnical Environmental and
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August 6 2009
File No 09-6397
Reference File No 05-6844

Lake County Department of Public Works - Engineering Division
437 Ardice Avenue
Eustis Florida 32726

Attention Mr Paterno Magno Jr P E

Subject Subsurface Soil Exploration and Geotechnical Engineering Evaluation
New Pond 2 - Hartwood Marsh Road
Lake County Florida

Dear Mr Magno

As requested and authorized we have completed a Subsurface Soil Exploration for the New Pond 2 at Hartwood Marsh Road The purpose of performing this exploration was to explore the soil stratigraphy in the New Pond 2 area In addition, we have estimated the normal seasonal high groundwater level at the boring locations This report documents our findings

SITE LOCATION AND BACKGROUND INFORMATION

The site for the proposed New Pond 2 is located south of Hartwood Marsh Road and east of the proposed South Hancock Road in Lake County Florida (Section 9 Township 23 South Range 26 East) The general site location is shown superimposed on the Clermont East and Lake Louis Florida U S G S quadrangle maps presented on Figure 1

Ardaman & Associates previously performed a Subsurface Soil Exploration relative to Pond 2 located east of the proposed New Pond 2, and submitted the results to HNTB in reports dated September 6 2007 and April 16 2008 (A&A File No 05-6844) The Roadway Soil Survey summary sheet and the soil boring profiles from our previous explorations are included in Appendix I

REVIEW OF SOIL SURVEY MAPS

Based on the 1973 Soil Survey for Lake County Florida as prepared by the U S Department of Agriculture Soil Conservation Service, the site is located in an area mapped as the "Astatula sand dark surface 0 to 5 percent slopes" and the "Astatula sand dark surface, 5 to 12 percent slopes" soil series as presented in Figure 2 The "Astatula sand dark surface, 0 to 5 percent slopes" soil series consists of nearly level to gently sloping soil on the undulating upland ridge The internal drainage of the "Astatula sand, dark surface 0 to 5 percent slopes" is excessive and the soil permeability is very rapid throughout According to the Soil Survey the seasonal high water table for the "Astatula sand dark surface 0 to 5 percent slopes" soil series is typically at a depth of more than 120 inches of the natural ground surface

The "Astatula sand dark surface 5 to 12 percent slopes" soil series consists of sloping to strongly sloping soil on the undulating upland ridge The internal drainage of the "Astatula sand dark surface 5 to 12 percent slopes" is excessive and the soil permeability is very rapid throughout According to the Soil Survey, the seasonal high water table for the "Astatula sand, dark surface 5 to 12 percent slopes" soil series is typically at a depth of more than 120 inches of the natural ground surface

FIELD EXPLORATION

The field exploration program consisted of performing two auger borings at selected locations inside the proposed pond footprint They were drilled using a truck-mounted, 4-inch diameter, continuous flight auger to a depth of 25 feet below the ground surface A summary of this field procedure is included in Appendix II Representative soil samples were recovered from the auger borings and transported to our laboratory for further analysis

The approximate locations of the borings are schematically illustrated on a site plan shown on Figure 3 These locations were determined in the field using a hand-held GPS unit and coordinates obtained from Google Earth The locations should be considered accurate only to the degree implied by the method of measurement used

The results of the auger borings indicate a general soil profile consisting of fine sand to fine sand with silt (A-3) to the boring termination depth of 25 feet The Roadway Soil Survey sheet in Appendix I should be referred to when reviewing the soil stratigraphy information presented on Figure 3

Groundwater was not encountered in the auger borings on the date drilled 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

LABORATORY PROGRAM

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual examination and classification The soil samples were visually classified in general accordance with the AASHTO Classification The resulting soil descriptions are shown on the soil boring profiles presented on Figure 3

In addition we conducted 2 natural moisture content tests (ASTM D2216) and 3 percent fines analyses (ASTM D1140) on selected soil samples obtained from the borings The results of these tests are presented adjacent to the sample depth on the boring profiles on Figure 3

ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL

The normal seasonal high groundwater level 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 higher than normal rainfall and in the extreme case flood would be higher to much higher than the normal seasonal high groundwater level The normal high water levels would more approximate the normal seasonal high groundwater levels

The seasonal high groundwater level is affected by a number of factors The drainage characteristics of the soils the land surface elevation relief points such as drainage ditches lakes, rivers, swamp areas etc , and distance to relief points are some of the more important factors influencing the seasonal high groundwater level

Based on our interpretation of the site conditions using our boring logs we estimate the normal seasonal high groundwater level at the boring locations to be below the bottom of the borings as indicated on the soil boring profiles presented on Figure 3

SOIL PERMEABILITY

Two field permeability tests were performed at the locations of Borings AB-1 and AB-2 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 Since relatively high permeability soils are present the tests were performed as "falling head" tests in which the rate of water drop within the pipe was measured

The results of the falling head field permeability tests are presented in the following table The fine sand to fine sand with silt (Stratum 1 on Figure 3) as encountered in the borings is considered to be relatively permeable

Test Location	Test Depth (feet)	Measured Permeability (inches/hour)
AB-1	9 - 10	18
AB-2	9 - 10	7

It is noted that a suitable factor of safety should be used with these values In addition for the type of soils tested a transformation ratio of 1 horizontal to 1 vertical is appropriate (i e the estimated ratio of horizontal to vertical permeability)

CLOSURE

This report has been prepared for the exclusive use of Lake County Department of Public Works – Engineering Division in accordance with generally accepted geotechnical engineering practices for specific application to the project area indicated in this letter 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 Figure 3 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 phase of the project If you have any questions or when we may be of further assistance to you please do not hesitate to contact us

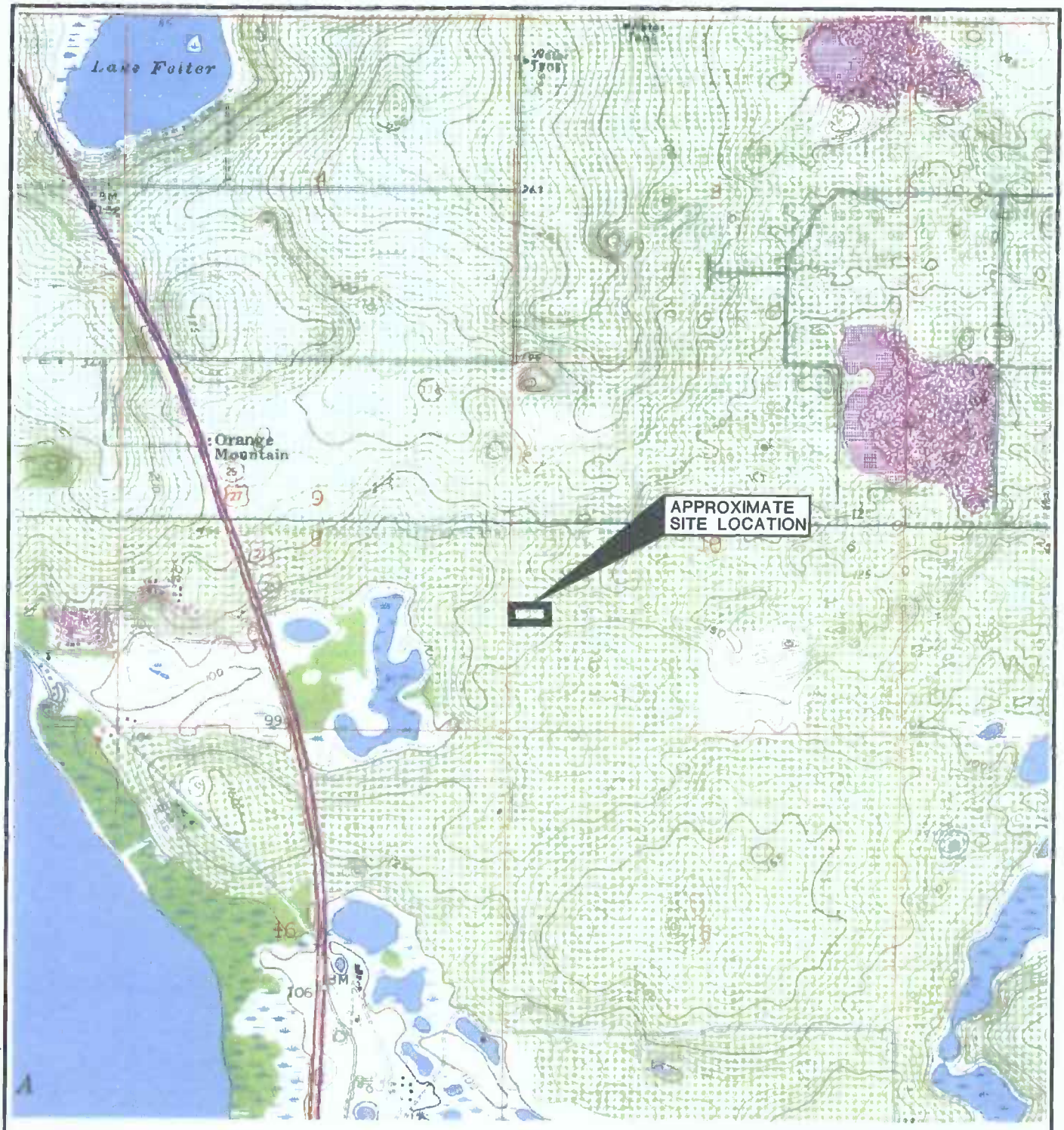
Very truly yours,
ARDAMAN & ASSOCIATES, INC
Certificate of Authorization No 5950

8/6/09

M Aries B Cunningham PhD, P E
Project Engineer
Florida License No 65668

Charles H Cunningham, P E
Division Manager
Florida License No 38189

ABP/CHC/nfm/ksb
09 6397 SSE NEW POND 2 APC DOCX (2009 Geo)



SECTION 10
TOWNSHIP 23 SOUTH
RANGE 26 EAST

OBTAINED FROM SUREIMAPS RASTER U.S.G.S. QUAD MAPS: CLERMONT EAST, FLORIDA AND LAKE LOUISA, FLORIDA

N

QUADRANGLE LOCATION

SITE LOCATION MAP

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

SUBSURFACE SOIL EXPLORATION
NEW POND 2 - HARTWOOD MARSH ROAD
LAKE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 08/04/09
FILE NO. 09-6397	APPROVED BY:	FIGURE: 1

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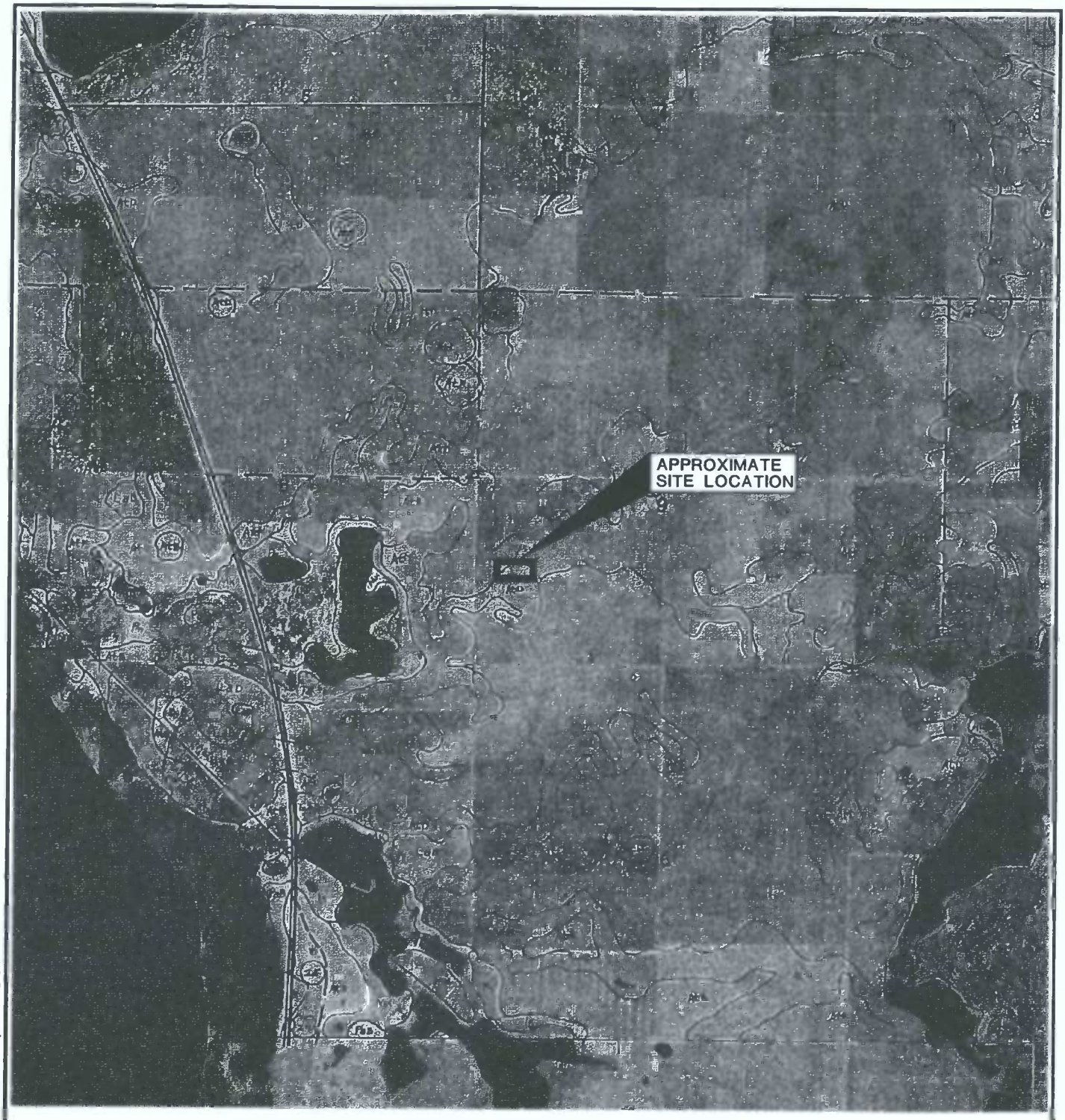

OBTAINED FROM: 1973 SOIL SURVEY OF LAKE COUNTY, FLORIDA

LEGEND

AtB - ASTATULA SAND, DARK SURFACE, 0 TO 5 PERCENT SLOPES

AtD - ASTATULA SAND, DARK SURFACE, 5 TO 12 PERCENT SLOPES

N

SOIL SURVEY MAP

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

SUBSURFACE SOIL EXPLORATION
NEW POND 2 - HARTWOOD MARSH ROAD
LAKE COUNTY, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 08/04/09
FILE NO. 09-6397	APPROVED BY:	FIGURE: 2

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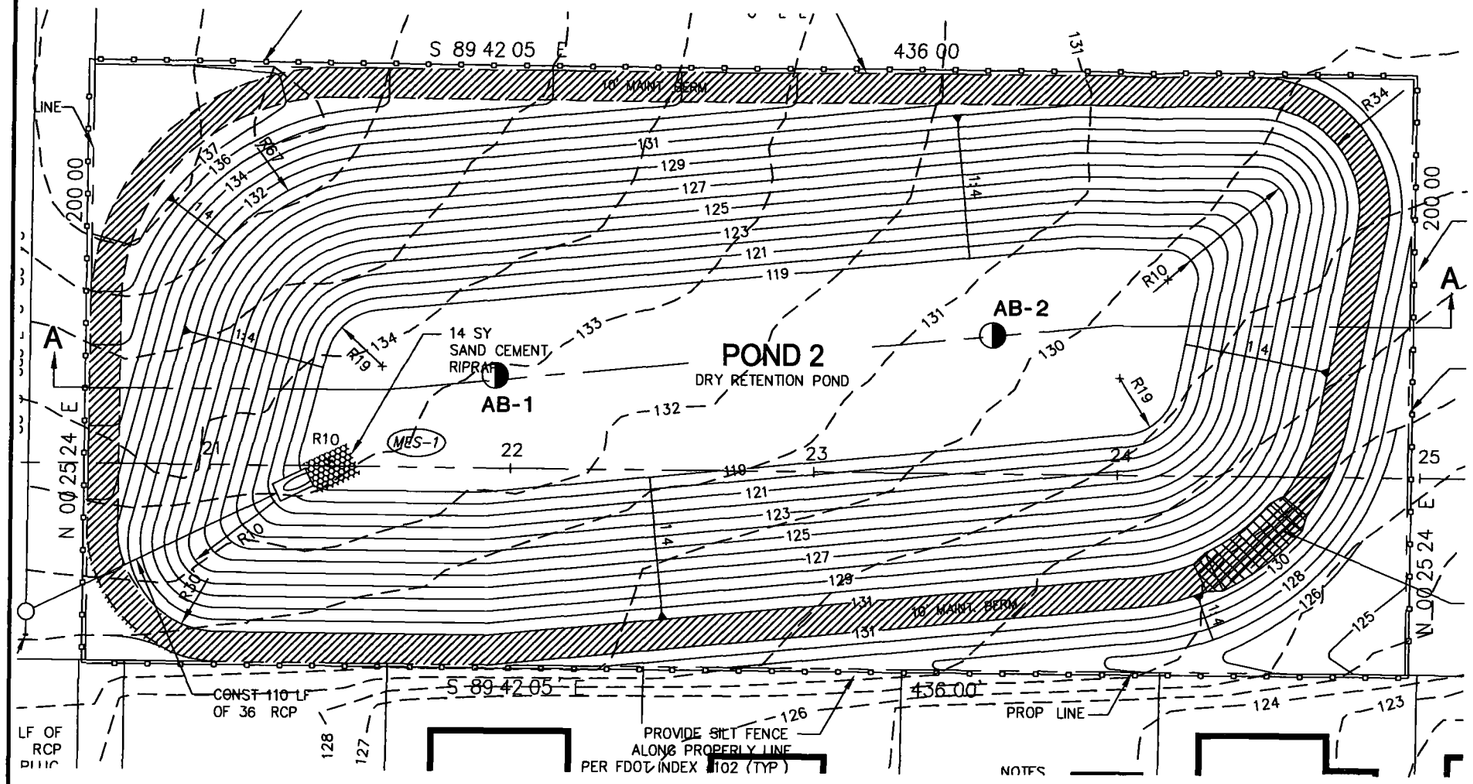
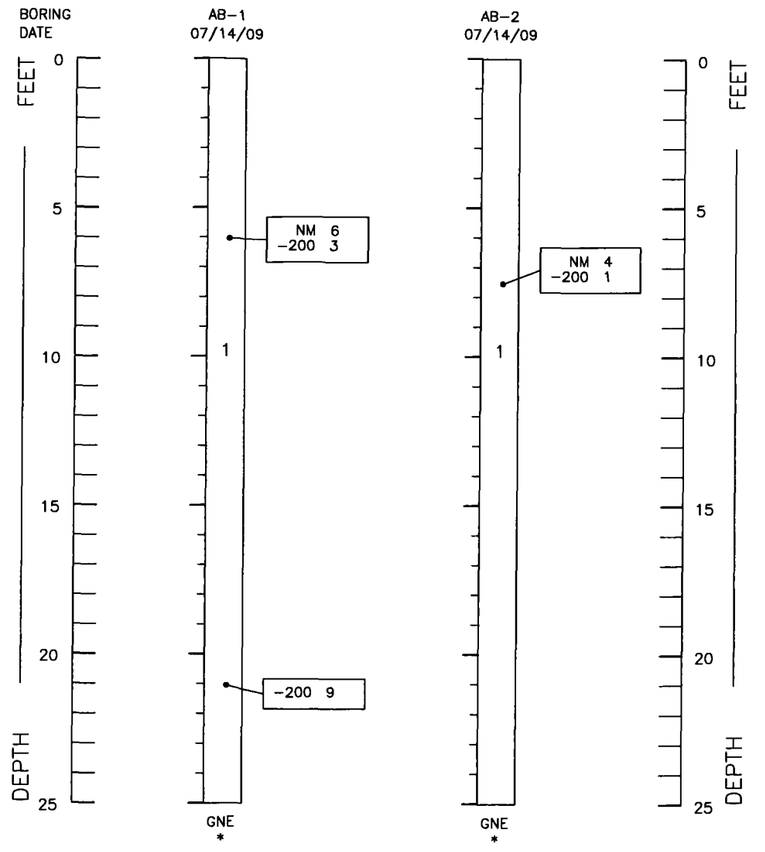
BORING LOCATION PLAN

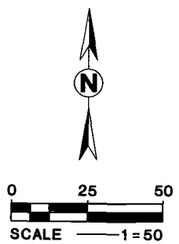


SOIL BORING PROFILES



LEGEND

◑ AB	AUGER BORING LOCATION
1	STRATUM NUMBER–REFER TO THE ROADWAY SOIL SURVEY IN APPENDIX I FOR SOIL DESCRIPTION
*	ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL (ESHWL) BELOW BOTTOM OF BORING
NM	NATURAL MOISTURE CONTENT IN PERCENT (ASTM D–2216)
-200	PERCENT PASSING NO 200 SIEVE SIZE (PERCENT FINES)(ASTM D–1140)



WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED

ABSENCE OF WATER SURFACE DATA ON CERTAIN BORINGS IMPLIES THAT NO GROUNDWATER DATA IS AVAILABLE BUT DOES NOT NECESSARILY MEAN THAT GROUNDWATER WILL NOT BE ENCOUNTERED AT THESE LOCATIONS OR WITHIN THE VERTICAL REACHES OF THESE BORINGS IN THE FUTURE

Ardaman & Associates Inc
Geotechnical Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
NEW POND 2 HARTWOOD MARSH ROAD
LAKE COUNTY FLORIDA

DRAWN BY	CHECKED BY	DATE	FIGURE
CD		08/04/09	3
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APPENDIX I

Roadway Soil Survey Sheet and Soil Boring Profiles
for Previous Pond 2 Borings (File No 05-6844)

PROJECT HARTWOOD MARSH ROAD FROM US-27 TO LAKE/ORANGE COUNTY LINE

PROJECT No P-41561

COUNTY OF LAKE
CROSS SECTION OF SOIL SURVEY
REPORT OF TESTS

MECHANICAL ANALYSIS

DATE OF SURVEY 12/05 TO 08/07 03/08

SURVEYED BY BENCHORON BOWDEN BRACKINS CIMINO FRENCH NELS RUIZ TINDALL WILLIAMS ZILE LOCATION

SURVEY BEGINS AT APPROXIMATE STA No 11+00

SURVEY ENDS AT APPROXIMATE STA No 310+00

DATE REPORTED 04/08

TOWNSHIP 23 SOUTH

RANGE 26 EAST

SECTIONS 1 2 3 9 10

STRATUM NO	LBR VALUE	% PASSING 10 MESH	% PASSING 40 MESH	% PASSING 60 MESH	% PASSING 100 MESH	% PASSING 200 MESH	CONSTANTS MATERIAL PASS NO 200 SIEVE LIQUID LIMIT	CONSTANTS MATERIAL PASS NO 200 SIEVE PLASTIC INDEX	NO LBR TESTS	NO GRAD TEST	NO LL-PI TEST	CLASSIFICATION GROUP	MATERIAL DESCRIPTION	pH	RESISTIVITY ohm-cm	CHLORIDES ppm	SULFATES ppm	ENVIRONMENTAL CLASSIFICATION STEEL	ENVIRONMENTAL CLASSIFICATION CONCRETE
1	27-51	100	51-86	12-51	4-23	1-10	---	---	8	22	0	A-3	LIGHT BROWN TO BROWN GRAYISH BROWN ORANGE ORANGE BROWN YELLOW BROWN PALE BROWN PALE GRAY FINE SAND TO FINE SAND WITH SILT WITH OCCASIONAL ROOTS	---	---	---	---	---	---	---
2	47	100	84-90	44-55	17-24	13-34	---	---	1	7	0	A-2-4	LIGHT BROWN TO BROWN ORANGE ORANGE BROWN FINE SAND WITH CLAY TO CLAYEY FINE SAND	---	---	---	---	---	---

NOTES

1 STRATA BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH TEST HOLE 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 LEGEND GSE APPROXIMATE GROUND SURFACE ELEVATION
LEGEND ▽ ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL (ESHWL)
LEGEND ▼ GROUNDWATER LEVEL MEASURED IN PIEZOMETER ON DATE INDICATED 04/07/08

3 THE SYMBOL --- REPRESENTS AN UNMEASURED PARAMETER

4 STRATUM 2 WILL RETAIN EXCESS MOISTURE AND BE DIFFICULT TO DRY AND COMPACT

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REVISIONS

Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	CD	09/07
Checked by		
Designed by		
Checked by		
Approved by		

ENGINEER OF RECORD
CHARLES H CUNNINGHAM P E
FL REG NO 38189

Ardaman & Associates Inc
8008 S ORANGE AVENUE
P O BOX 593003
ORLANDO FL 32859-3003
ENG AUTH NO 5950

Ardaman & Associates, Inc

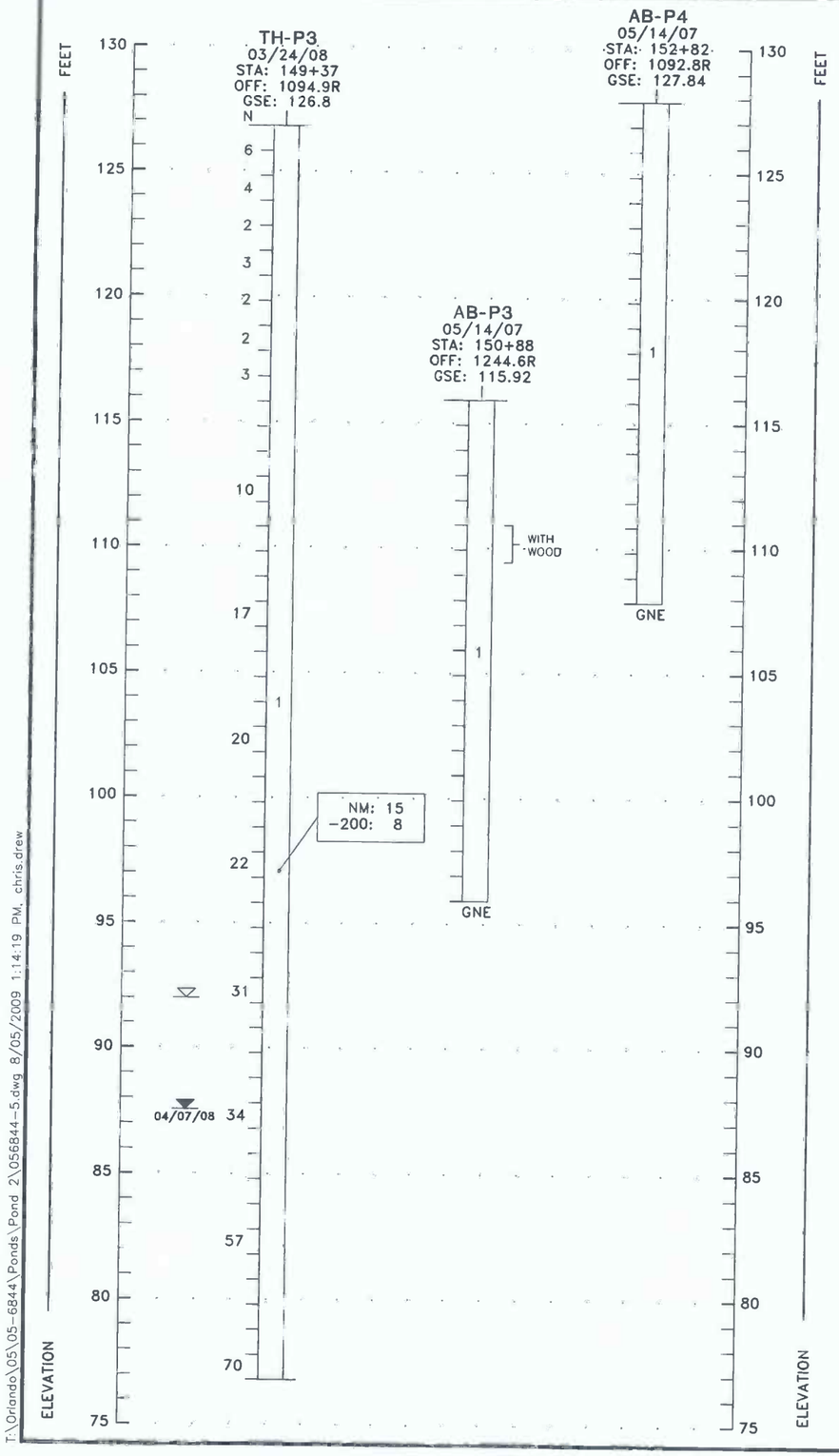
SEAL

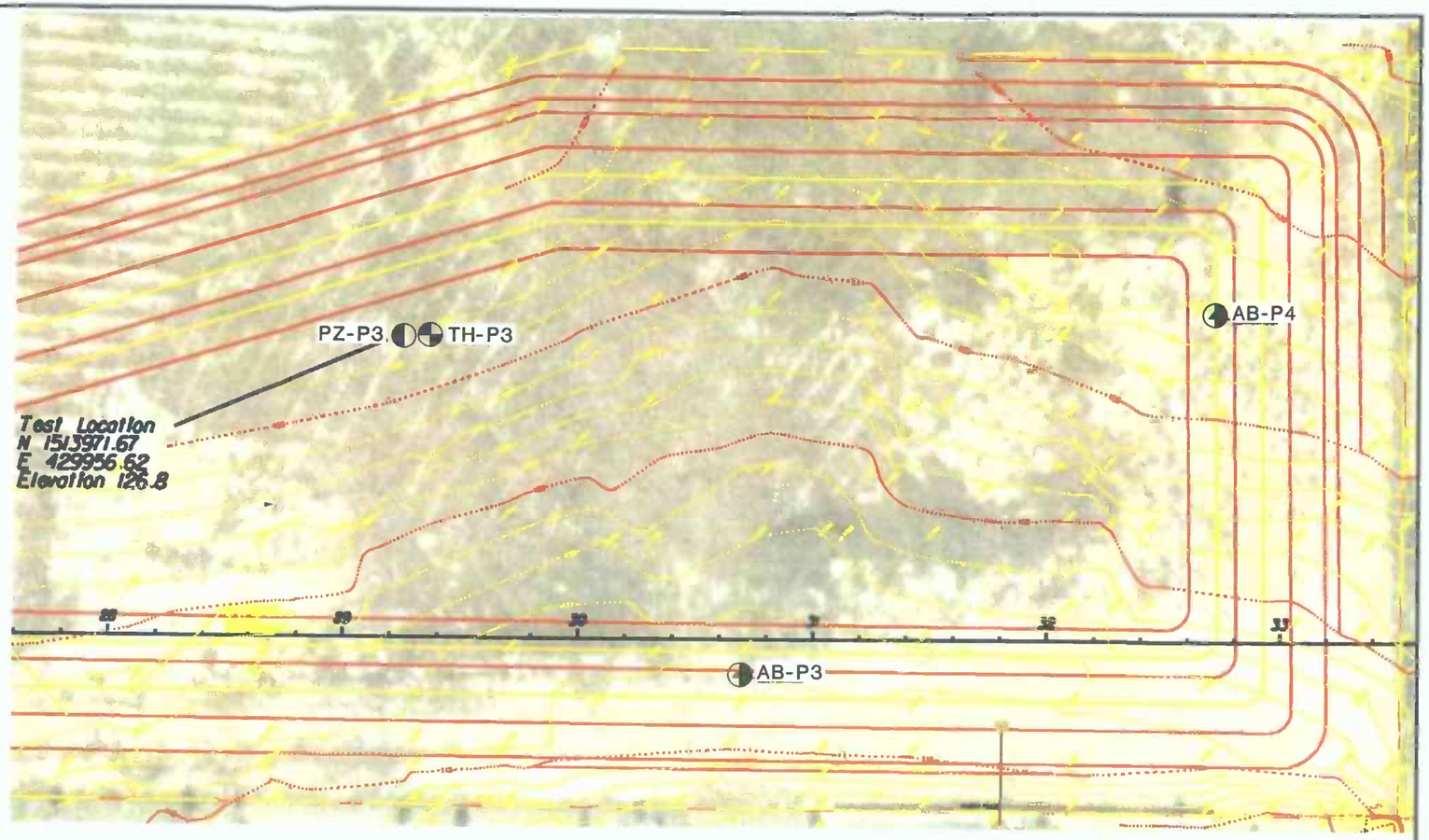
LAKE COUNTY

ROADWAY SOIL SURVEY
HARTWOOD MARSH ROAD
FROM US27 TO LAKE/ORANGE COUNTY LINE
LAKE COUNTY FLORIDA

SHEET NO

FIGURE 1





LEGEND

TH	STANDARD PENETRATION TEST (SPT) BORING LOCATION
AB	AUGER BORING LOCATION
PZ	PIEZOMETER LOCATION
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
NM	NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)
-200	PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)
GSE	APPROXIMATE GROUND SURFACE ELEVATION
GNE	GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED
04/07/08	GROUNDWATER LEVEL MEASURED IN PIEZOMETER ON DATE INDICATED
	ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER LEVEL

N

0 30 60

APPROXIMATE SCALE: 1"=60'

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED. GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR.

NOTE: BORING AB-P3 AND AB-P4 ARE PART OF THE SUBSURFACE SOIL EXPLORATION FOR POND 2 SUBMITTED IN A REPORT DATED SEPTEMBER 6, 2007 (A&A FILE NO. 05-6844).

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

SUBSURFACE SOIL EXPLORATION
HARTWOOD MARSH ROAD - POND 2
FROM U.S. 27 TO LAKE/ORANGE COUNTY LINE
LAKE COUNTY, FLORIDA

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FILE NO. 05-6844	APPROVED BY:	FIGURE: 2

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APPENDIX II

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