

# **2007 ADS Stormwater Workshop**

January 19<sup>th</sup>, 2007

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**Geotechnical Engineering Design Pitfalls**

**and**

**Fundamentals of Ground Water/Surface Water  
Interaction**

**presented by Devo Seereeram, Ph.D., P.E.**

*PART 1A*

# **Geotechnical Pitfalls in Stormwater Design**

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# TOPICS

2007 ADS STORMWATER WORKSHOP

1. Dry Bottom Ponds Excavated into Clayey Soils
2. Pond Berm Failures & Flooding Consequences
3. Flooding of Land Locked Lakes
4. Land-Locked Basins Affected by Floridan Aquifer
5. Pavement Failure Due to Grades Cut into Water Table
6. Pavement Failure Due to Over Irrigation of Landscape Areas
7. Perched Water Table Due to Low Permeability Lot Fill
8. Seepage Through Pond Berms

# TOPICS

2007 ADS STORMWATER WORKSHOP

- 9a. Water Table Altitude Can Change Significantly Over Short Distances
- 09b. Seepage Faces
- 10. Failure of Erosion Control Measures and Impact to Wetlands
- 11. Load Testing of Natural Depressions
- 12. Side Slope Failures Due to Storm-Induced Wave Action
- 13. Water Table Drawdown Impact Due to Ditching
- 14. Drought
- 15. Relic Sock Drains and Irrigation Pipes Leading to Unexplained "Spring Seepage" After Development

# TOPIC # 01

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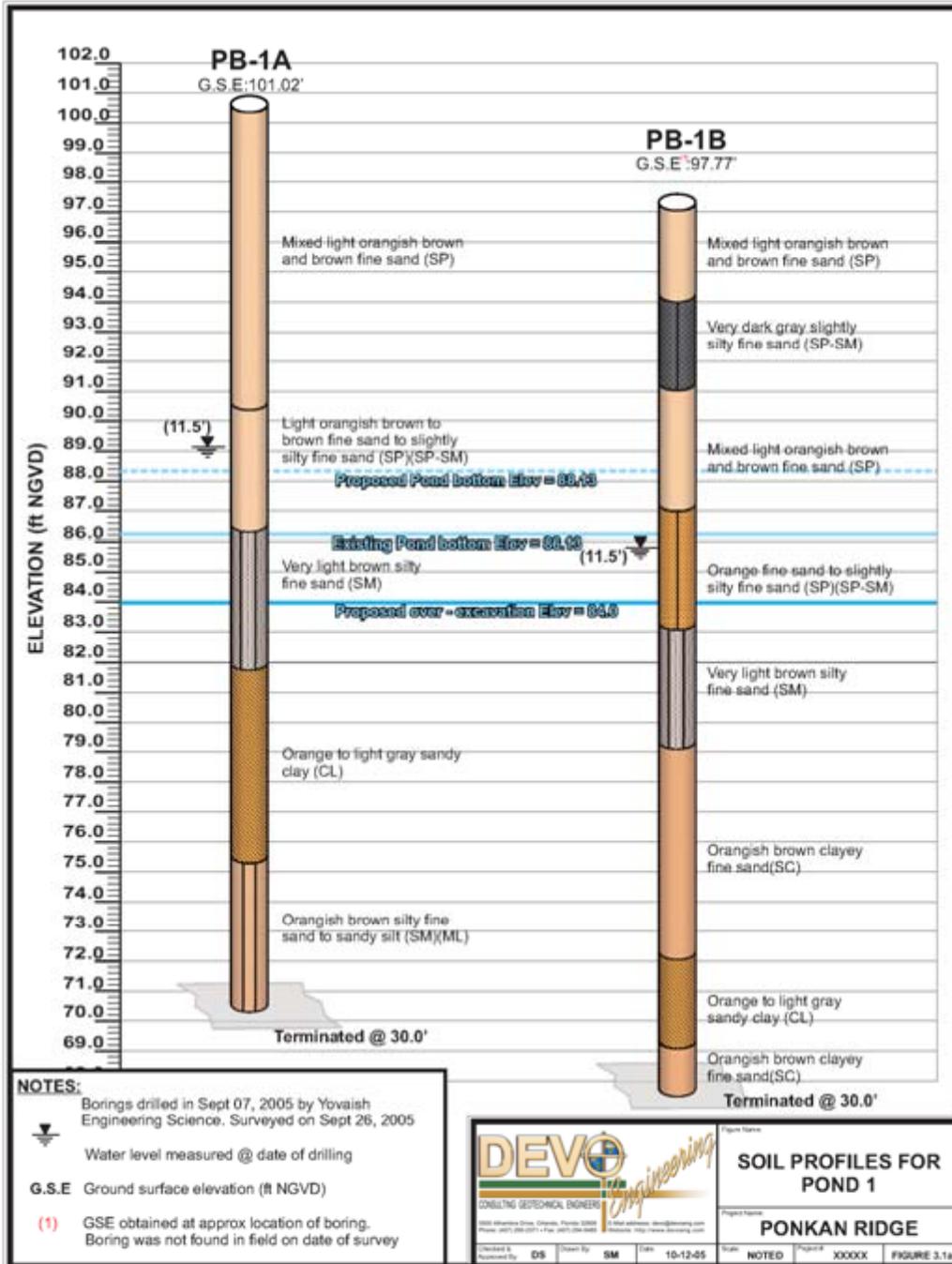
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## **Dry Bottom Ponds Excavated into Clayey Soils**

# Wekiva Run – Pond 1



Photo date: 2005



# Wekiva Run – Pond 2

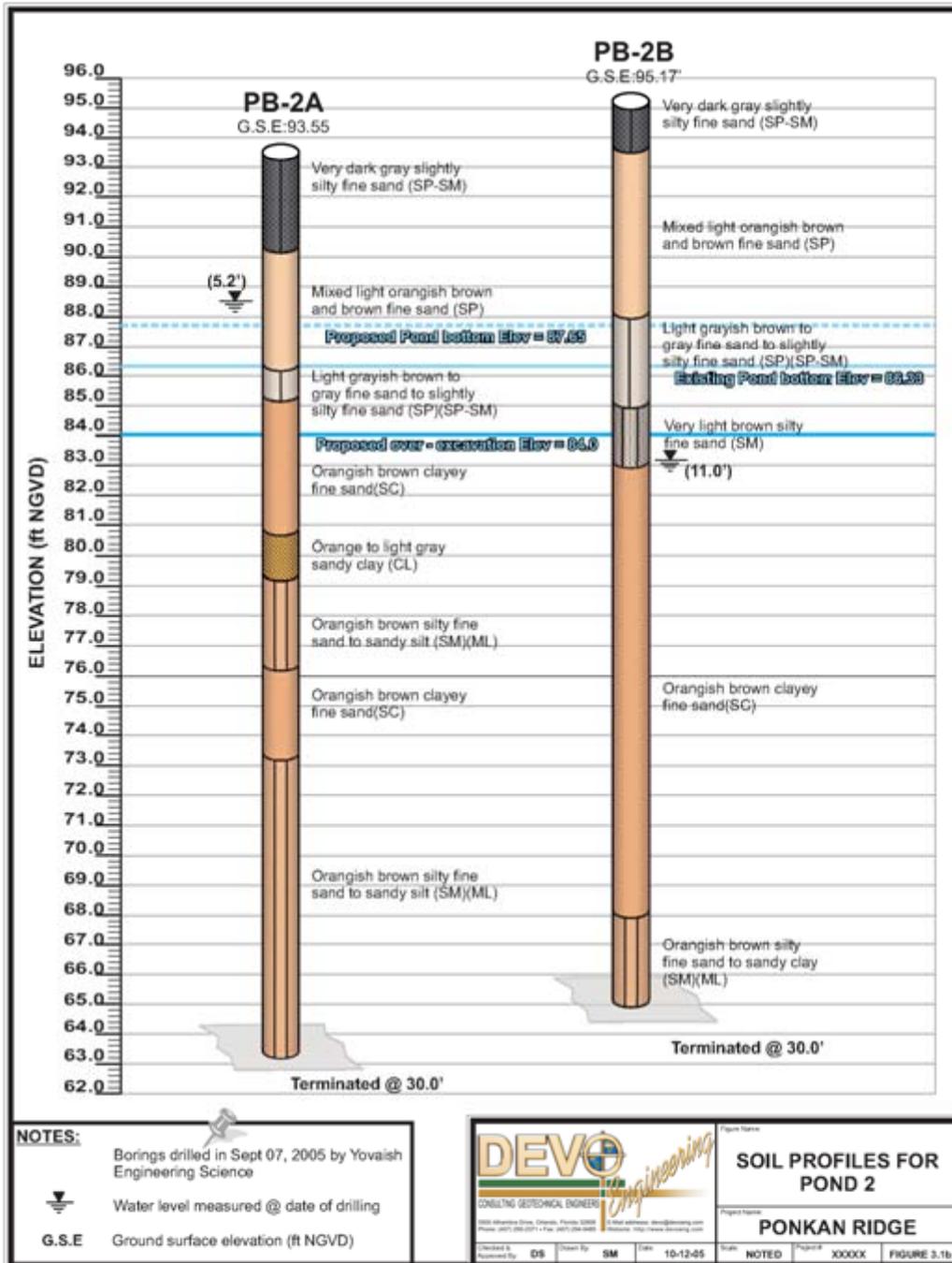


Photo date: 2005

# Wekiva Run – Pond 3

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Photo date: 2005

# TOPIC # 02

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## **Pond Berm Failures & Flooding Consequences**

# Site in Debarry

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Photo date: 2004

# Site in Debarry

2007 ADS STORMWATER WORKSHOP



Photo date: 2004

# Site in Debarry

2007 ADS STORMWATER WORKSHOP



Photo date: 2004

# Site in Debarry

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Photo date: 2004

# TOPIC # 03

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## Flooding of Land Locked Lakes

# Big Sand Lake

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Photo date: 2004

# Big Sand Lake

2007 ADS STORMWATER WORKSHOP



Photo date: 2004

# Big Sand Lake

2007 ADS STORMWATER WORKSHOP



Photo date: 2004

# Big Sand Lake

2007 ADS STORMWATER WORKSHOP



Photo date: 2004

# Big Sand Lake

2007 ADS STORMWATER WORKSHOP



Photo date: 2004

# Big Sand Lake

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Photo date: 2004

# Debary Plantation

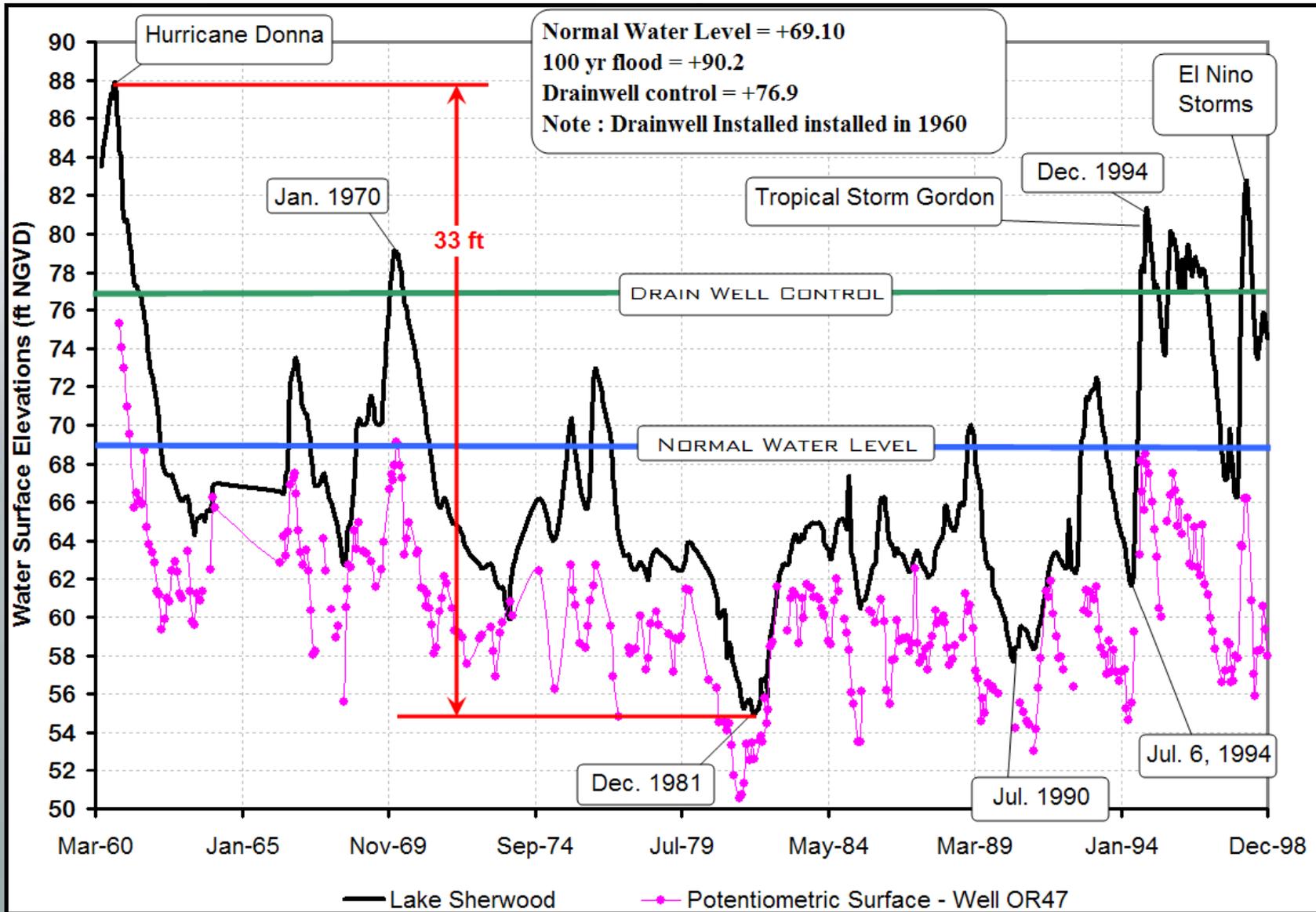
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Photo date: 2004

# Lake Sherwood

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# Lake Sherwood

2007 ADS STORMWATER WORKSHOP



Photo date: 2004

# Lake Sherwood

2007 ADS Stormwater Workshop



Photo date: 2004

# Lake Sherwood

2007 ADS Stormwater Workshop



Photo date: 2004

# Lake Sherwood

2007 ADS Stormwater Workshop



Photo date: 2004

# Lake Sherwood

2007 ADS Stormwater Workshop



Photo date: 2004

# Lake Sherwood

2007 ADS Stormwater Workshop



Photo date: 2004

# Lake Sherwood

2007 ADS Stormwater Workshop



Photo date: 2005

# Lake Sherwood

2007 ADS Stormwater Workshop



Photo date: 2005

# TOPIC # 04

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## **Land-Locked Basins Affected by Floridan Aquifer**

# Lake Rexford and Lake Osage, Orange County

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Photo date: 2003

# Lake Rexford and Lake Osage

2007 ADS Stormwater Workshop



Photo date: 2003

# Lake Rexford and Lake Osage

2007 ADS Stormwater Workshop



Photo date: 2003

# Lake Rexford and Lake Osage

2007 ADS Stormwater Workshop



Photo date: 2003

# Lake Rexford and Lake Osage

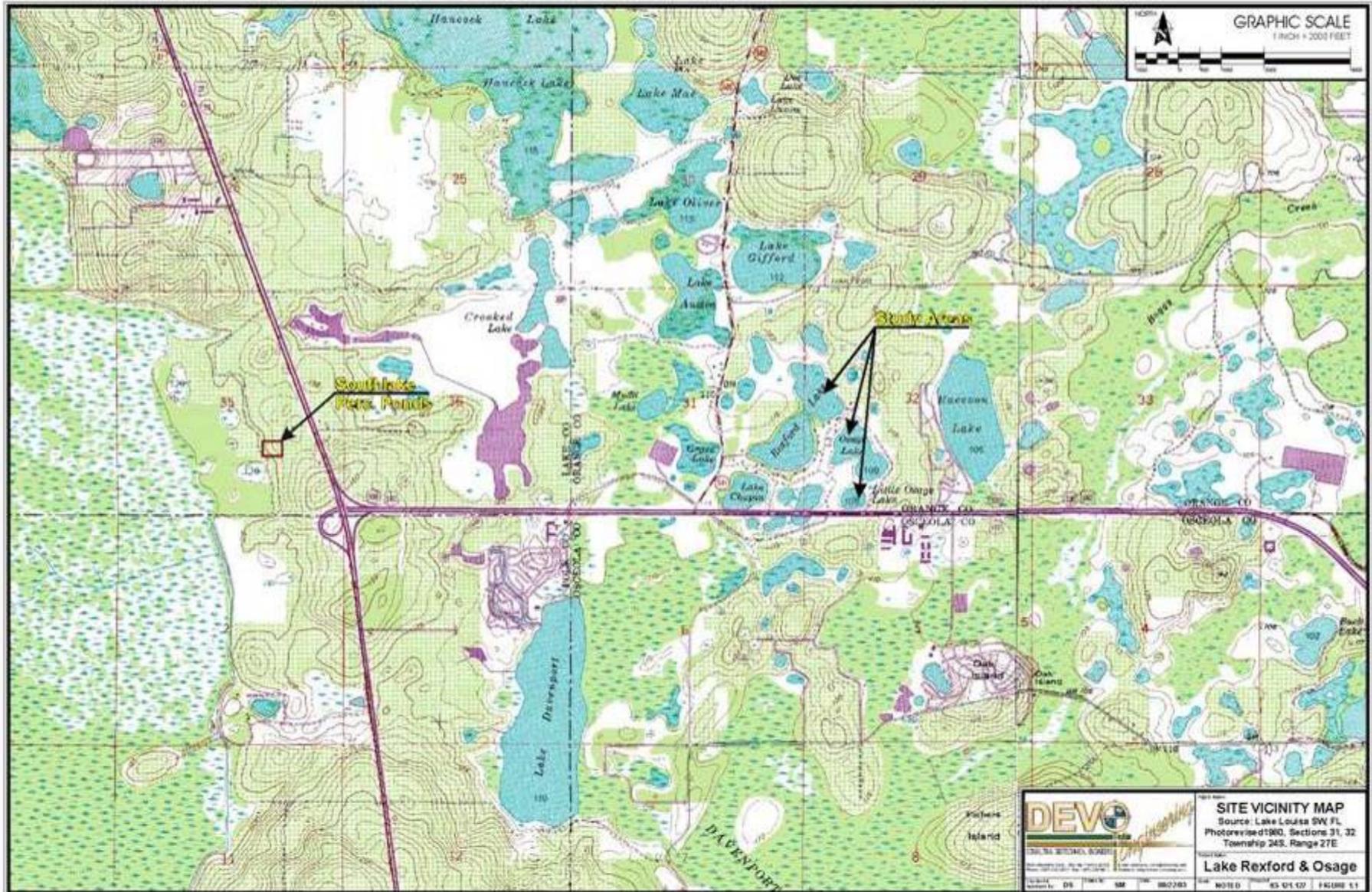
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Photo date: 2003

# Lake Rexford and Lake Osage – Site Vicinity

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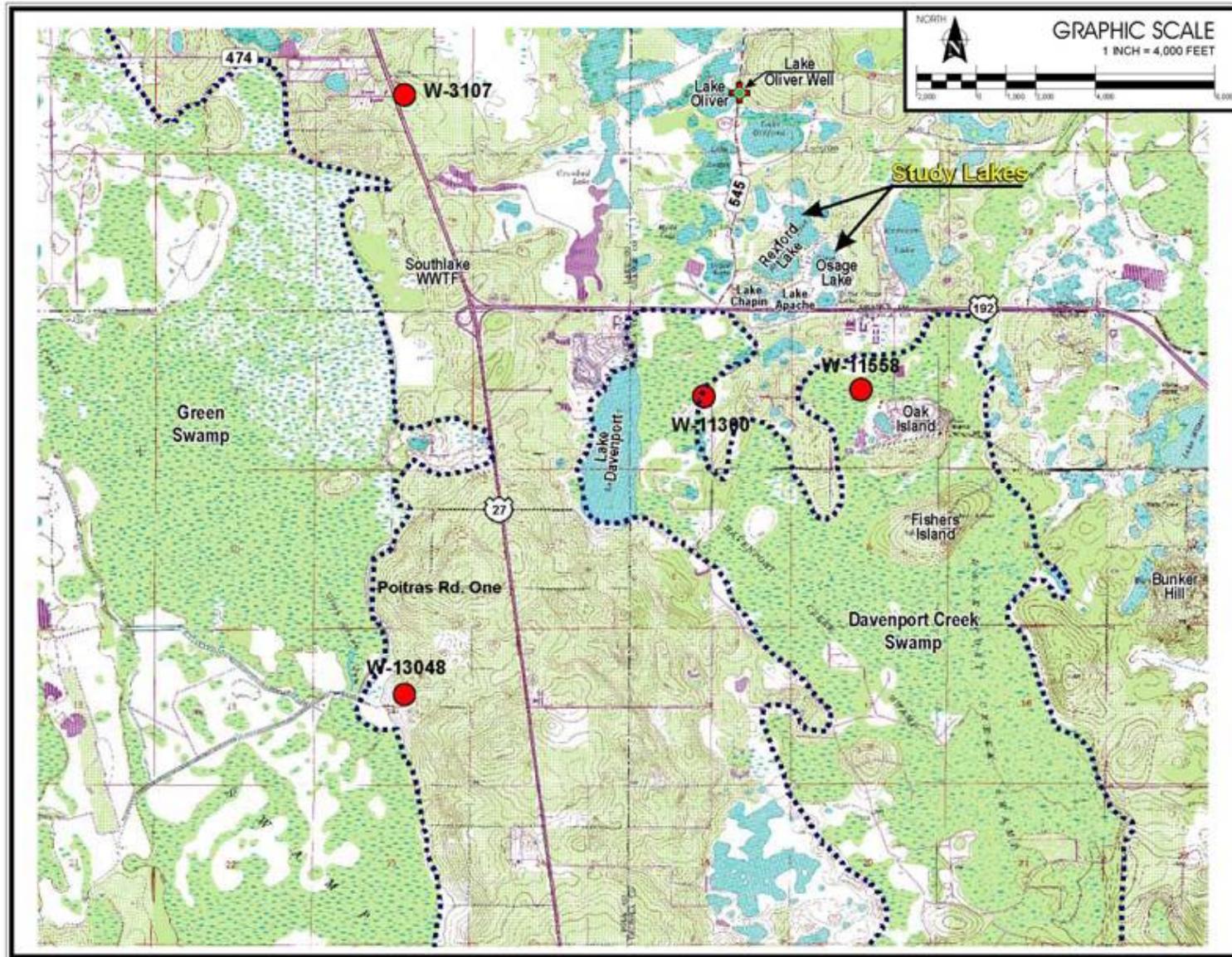
# Lake Rexford and Lake Osage

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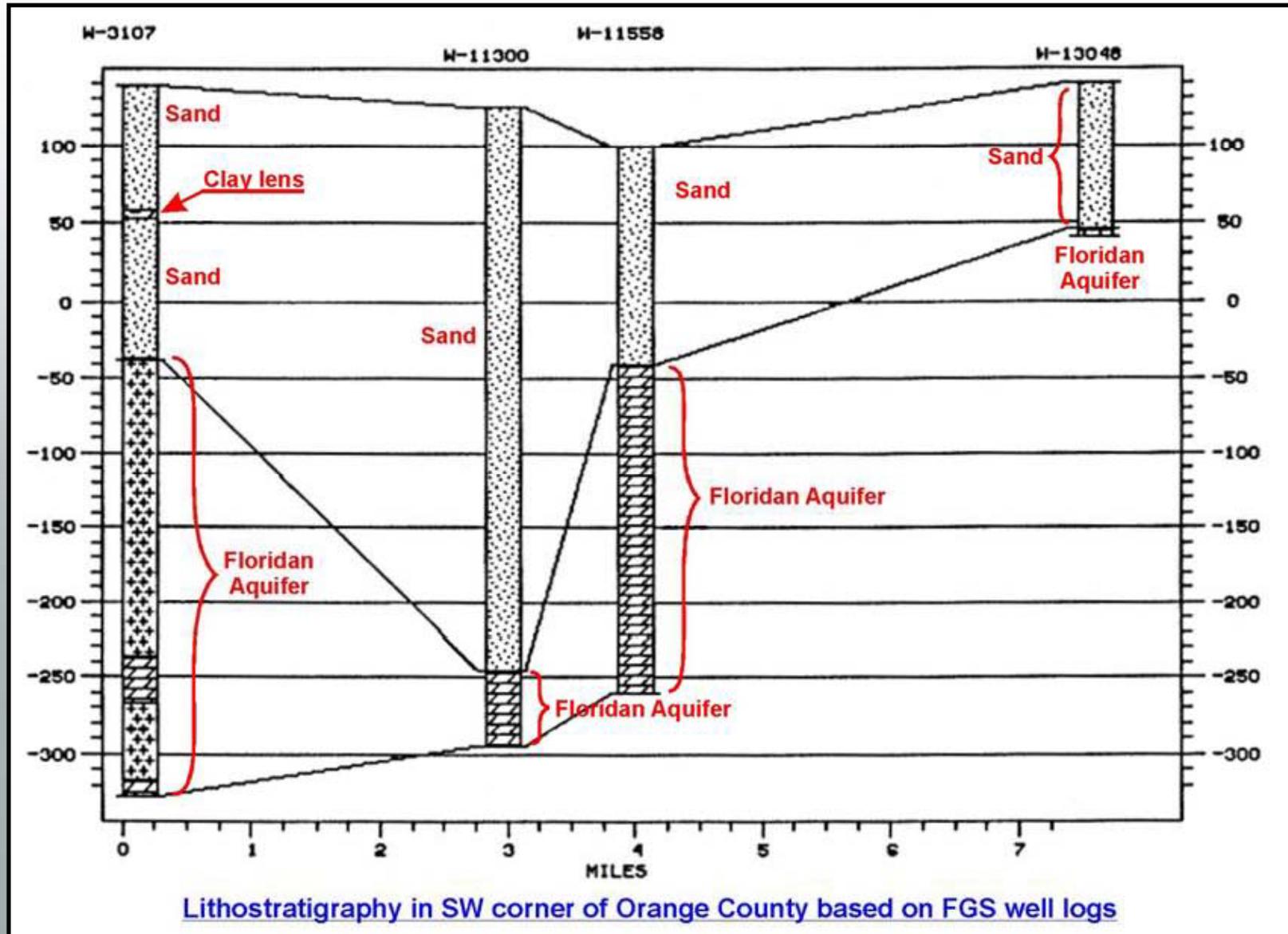
# Lake Rexford and Lake Osage – Well Locations

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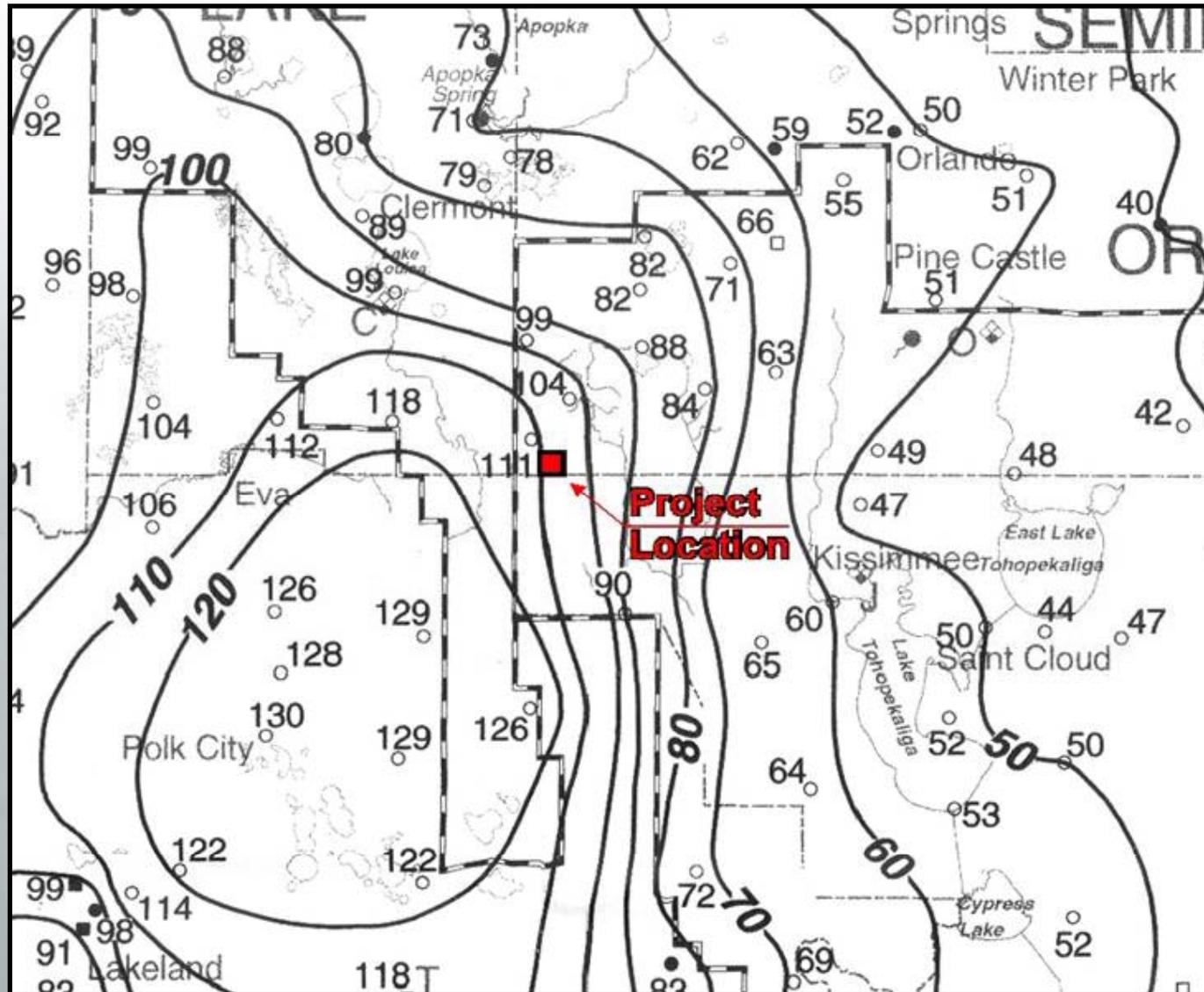
# Lake Rexford and Lake Osage -Lithostratigraphy

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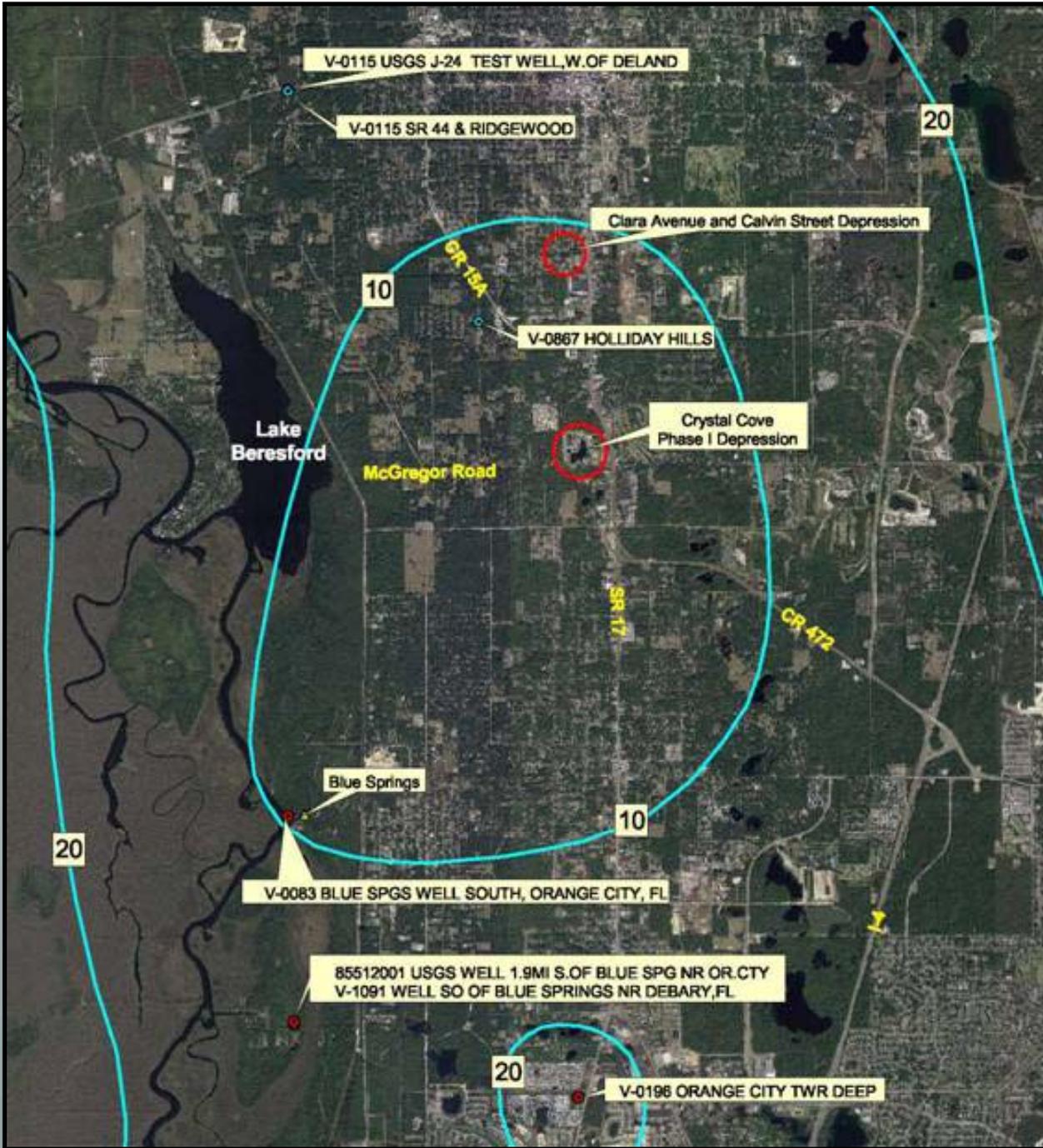


# Lake Rexford and Lake Osage Potentiometric Surface Contours

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# Calvin Street and Crystal Cove Depressions, Deland



# Calvin Street Depression, Deland Area

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Photo date: 2005

# Calvin Street Depression, Deland Area

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Photo date: 2005

# Calvin Street Depression, Deland Area

2007 ADS Stormwater Workshop



Photo date: 2005

# Calvin Street Depression, Deland Area

2007 ADS Stormwater Workshop



Photo date: 2005

# Calvin Street Depression, Deland Area

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Photo date: 2005

# Crystal Cove, Deland Area

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Photo date: 2005

# Crystal Cove, Deland Area

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Photo date: 2005

# Crystal Cove, Deland Area

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Photo date: 2005

# Calvin Street and Crystal Cove Depressions, Deland Area

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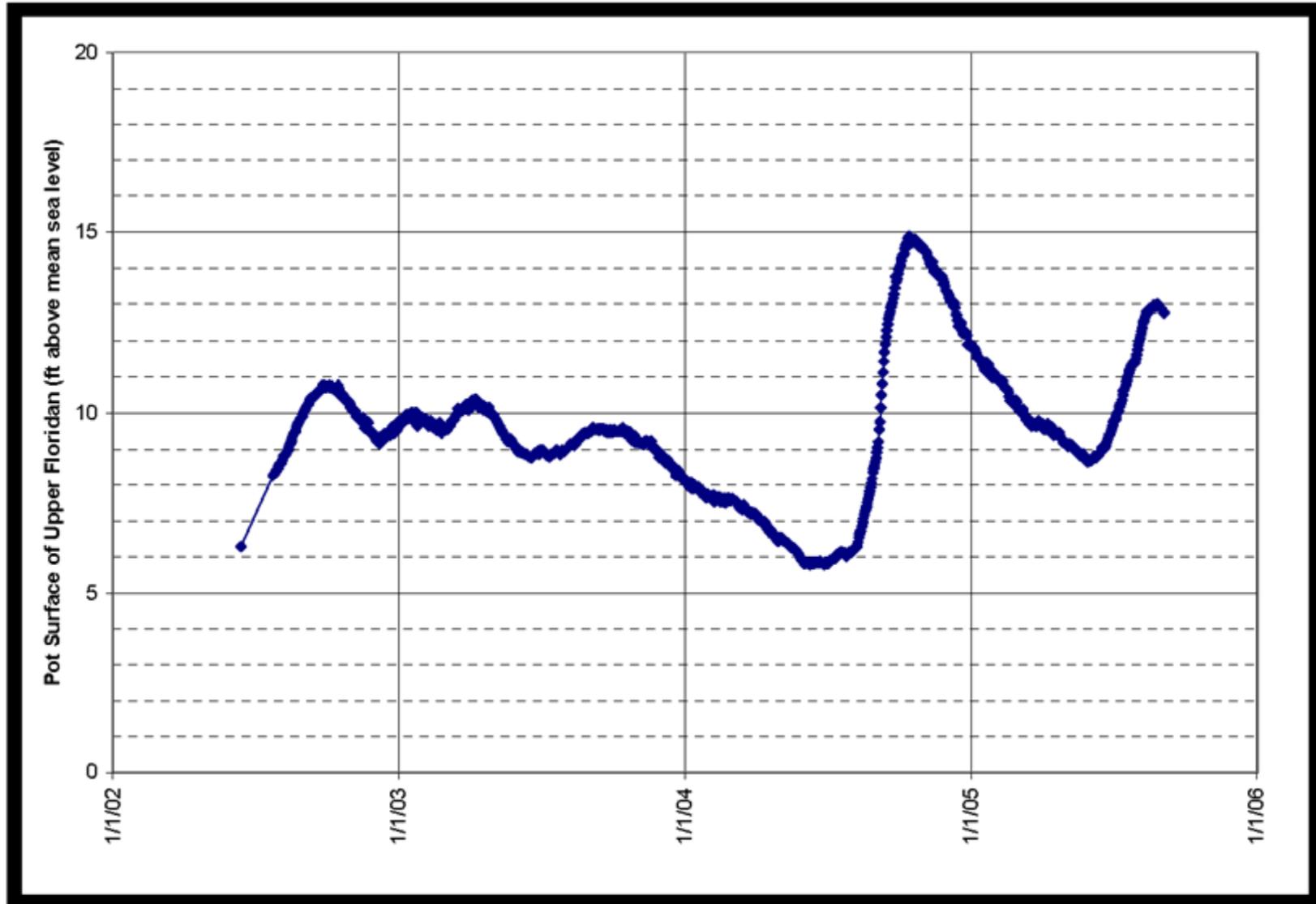


Exhibit 1. Holiday Hills Floridan well water level

# Calvin Street and Crystal Cove Depressions, Deland Area

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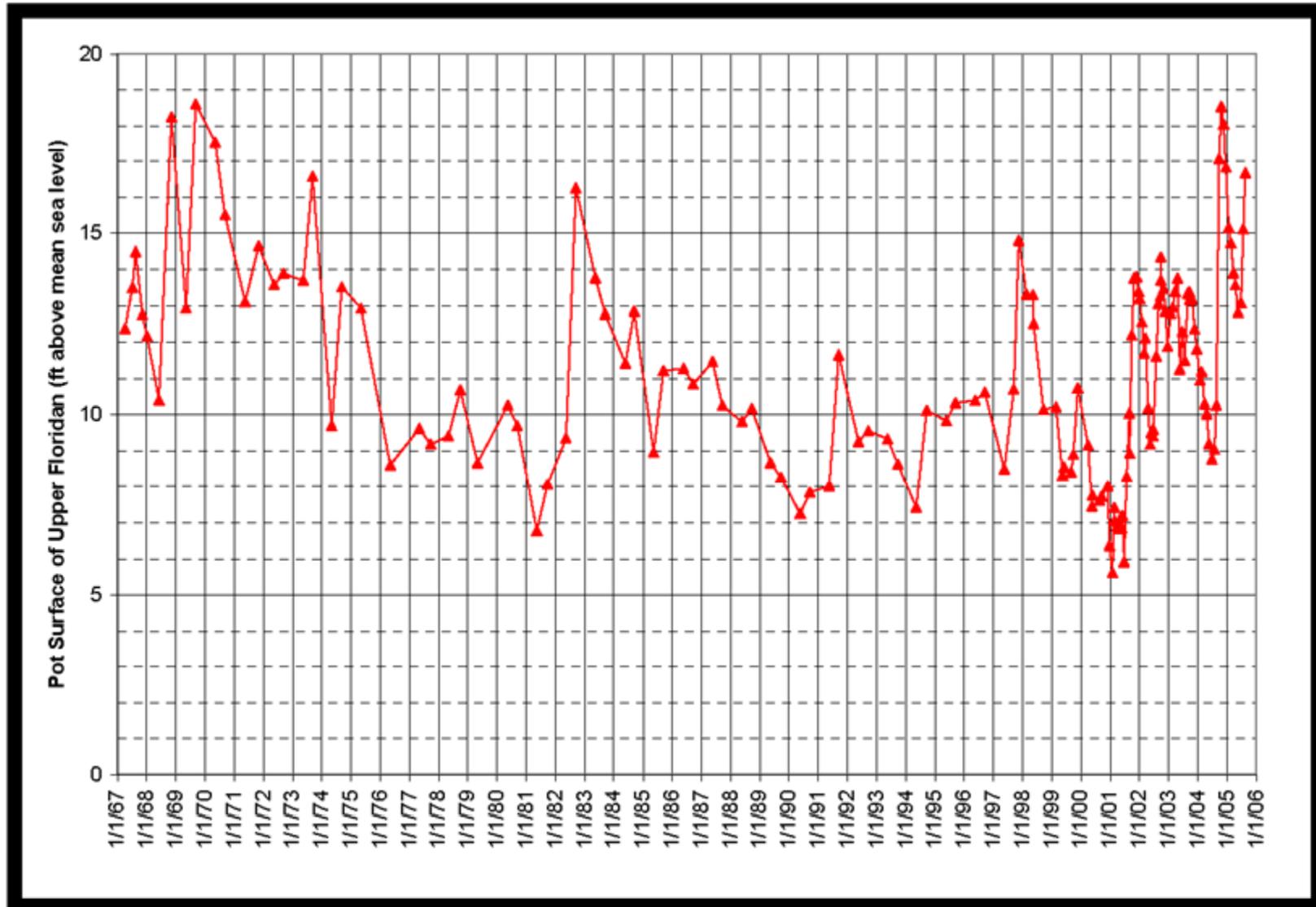


Exhibit 2. Water level in Floridan aquifer at Ridgewood/SR 44 well

# Calvin Street and Crystal Cove Depressions, DeLand Area

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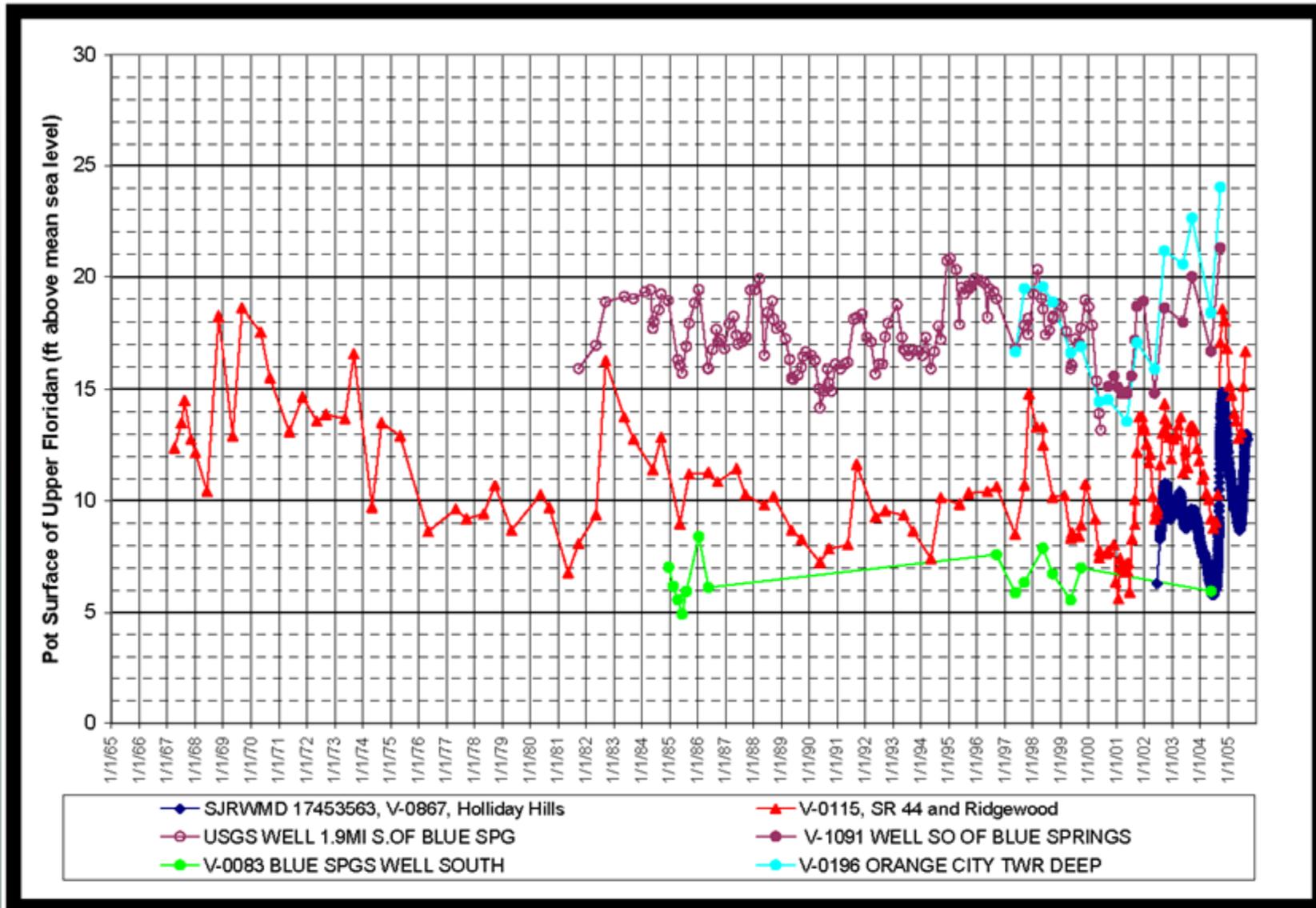


Exhibit 3. All Floridan aquifer wells in DeLand area for period of record

# TOPIC # 05

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## **Pavement Failure Due to Grades Cut into Water Table**

# Community Area - Reflections Subdivision in Ocoee

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Photo date: 2000 (during drought)

# Community Area - Reflections Subdivision in Ocoee

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Photo date: 2000 (during drought)

# Cool Spring Circle - Reflections Subdivision in Ocoee

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Photo date: 2000 (during drought)

# Econ River Estates in East orange County

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Photo date: 2000 (during drought)

# TOPIC # 06

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## **Pavement Failure Due to Over Irrigation of Landscape Areas**

# Central Florida Parkway

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Photo date: 2005

# Hiawassee Road

2007 ADS Stormwater Workshop



Photo date: 2005

# Hiawassee Road

2007 ADS Stormwater Workshop



Photo date: 2005

# Hiawassee Road

2007 ADS Stormwater Workshop



Photo date: 2005

# Hiawassee Road

2007 ADS Stormwater Workshop



Photo date: 2005

# TOPIC # 07

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## **Perched Water Table Due to Low Permeability Lot Fill**

# Site in Windermere

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Photo date: 2005

# Site in Windermere

2007 ADS Stormwater Workshop



Photo date: 2005

# Site in Windermere

2007 ADS Stormwater Workshop



Photo date: 2005

# Site in Windermere

2007 ADS Stormwater Workshop



Photo date: 2005

# Site in Windermere

2007 ADS Stormwater Workshop



# Site in Windermere

2007 ADS Stormwater Workshop



Photo date: 2005

# TOPIC # 08

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## Seepage Through Pond Berms

# FDOT Saxon Pond

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Photo date: 2002

# FDOT Saxon Pond

2007 ADS Stormwater Workshop



Photo date: 2003

# FDOT Saxon Pond

2007 ADS Stormwater Workshop



Photo date: 2003

# Highbanks and Enterprise Pond

2007 ADS Stormwater Workshop



Photo date: 2005

# Highbanks and Enterprise Pond

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Photo date: 2005

# Highbanks and Enterprise Pond

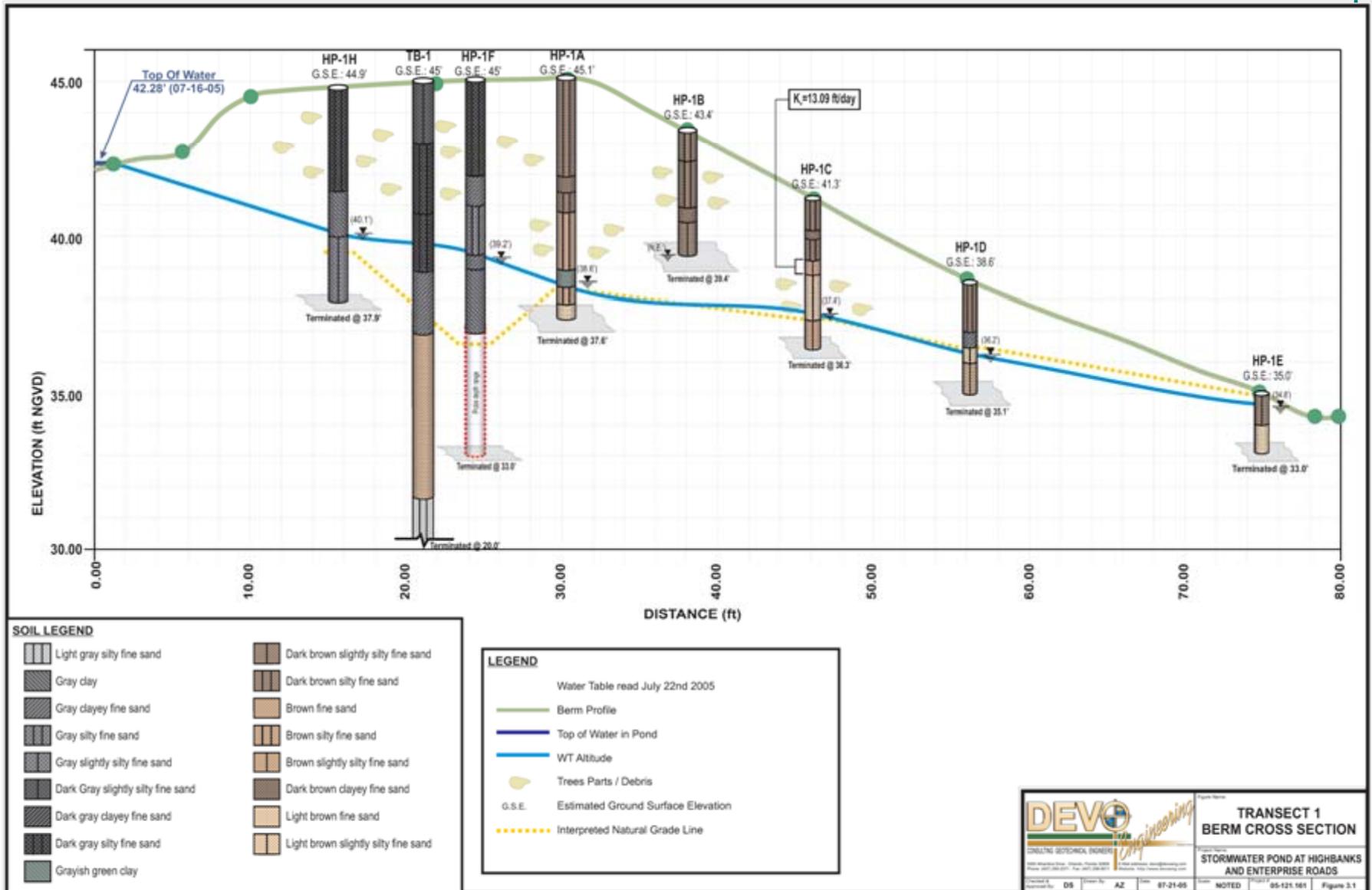
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Photo date: 2005

# Highbanks and Enterprise Pond

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# The Overlook at Lake Louisa

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Photo date: 2004

# The Overlook at Lake Louisa

2007 ADS Stormwater Workshop



Photo date: 2004

# The Overlook at Lake Louisa

2007 ADS Stormwater Workshop



Photo date: 2004

# The Overlook at Lake Louisa

2007 ADS Stormwater Workshop



Photo date: 2004

# TOPIC # 09a

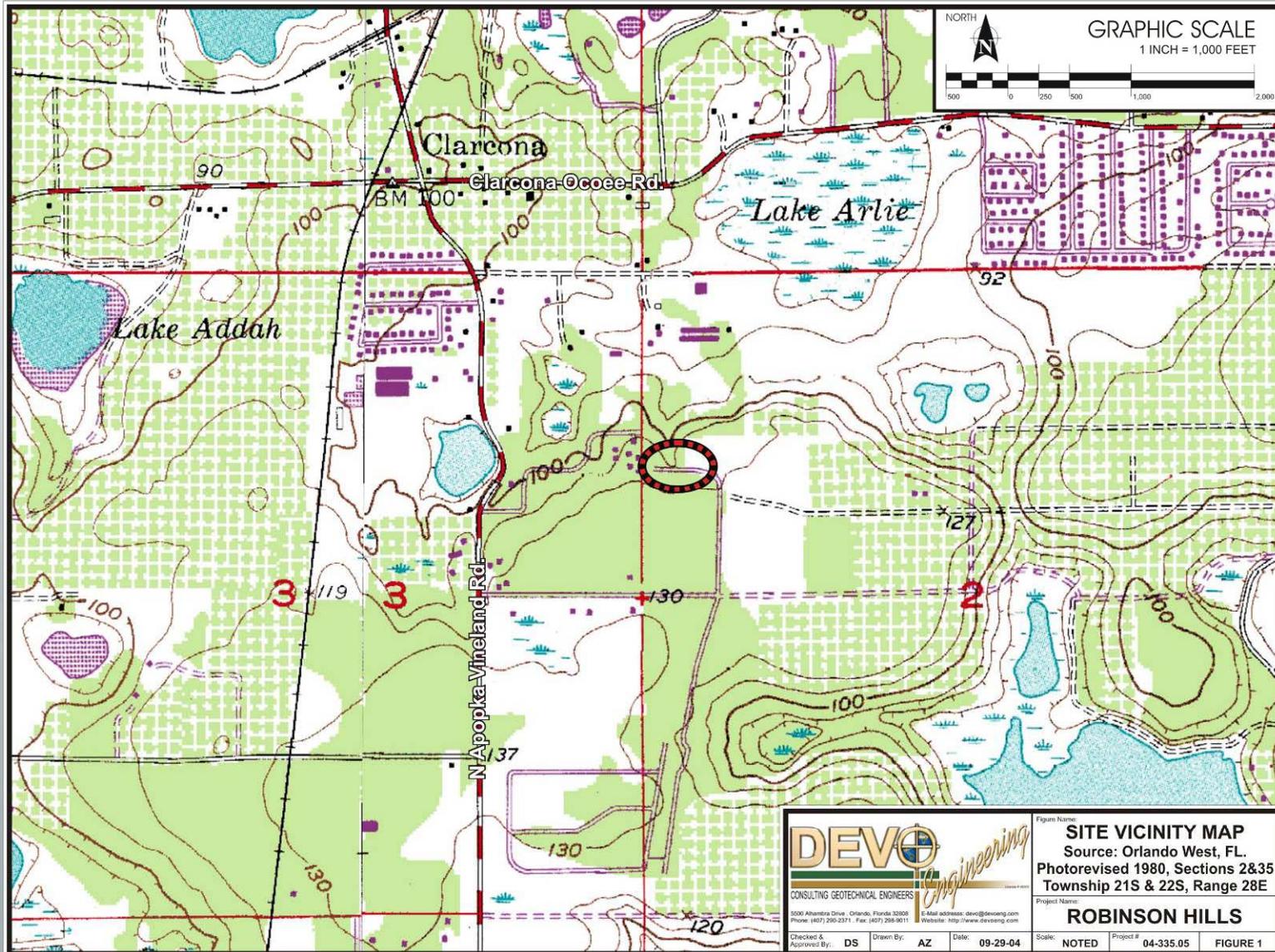
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**Water Table Altitude Can Change  
Significantly Over Short Distances**

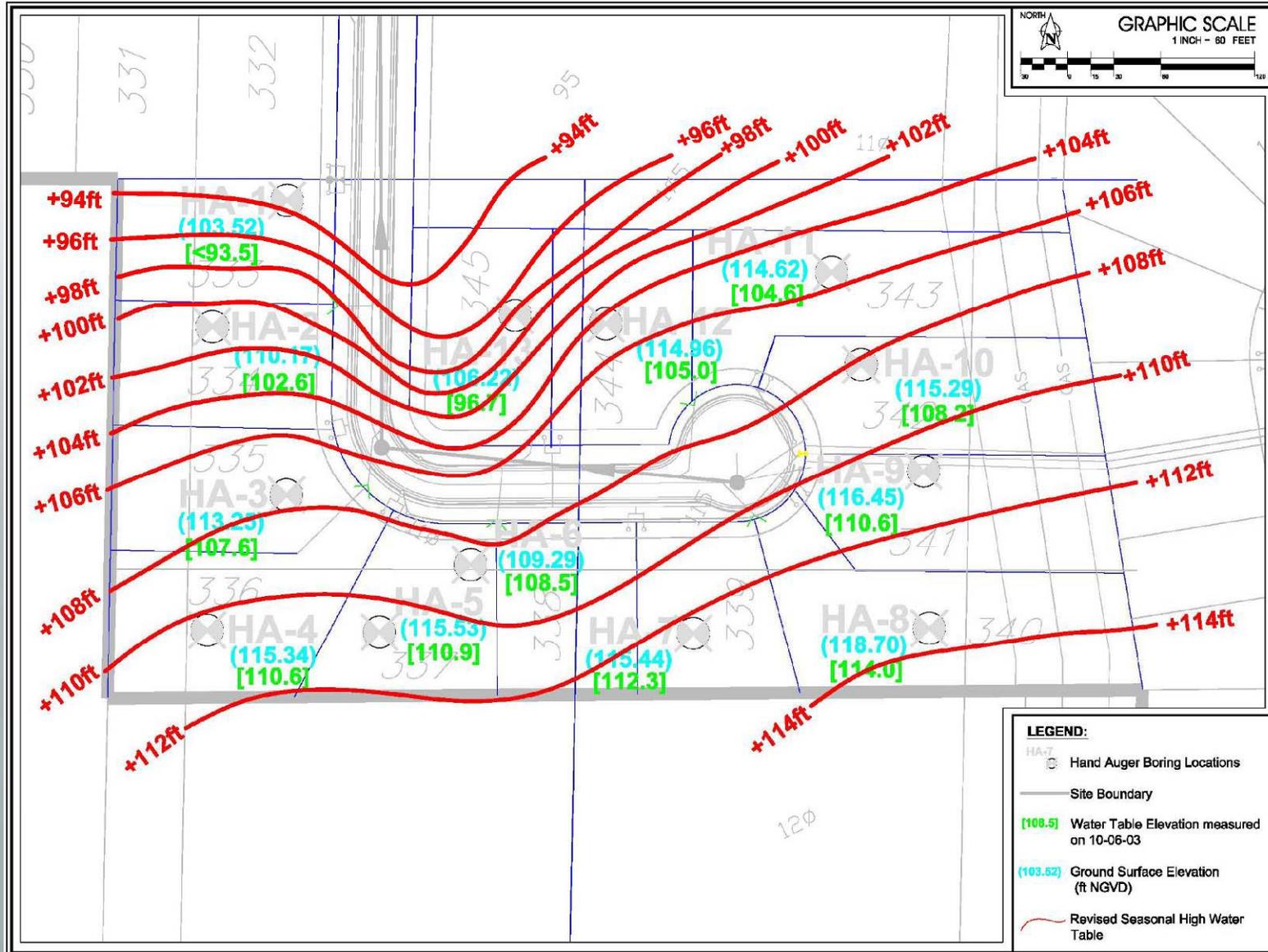
# Robinson Hills

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# Robinson Hills

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# TOPIC # 09b

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## Seepage Faces



# Steep upland adjacent to Lake Meadow in Ocoee

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Photo date: 2003

# TOPIC # 10

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## **Failure of Erosion Control Measures and Impact to Wetlands**

# Site in Seminole County

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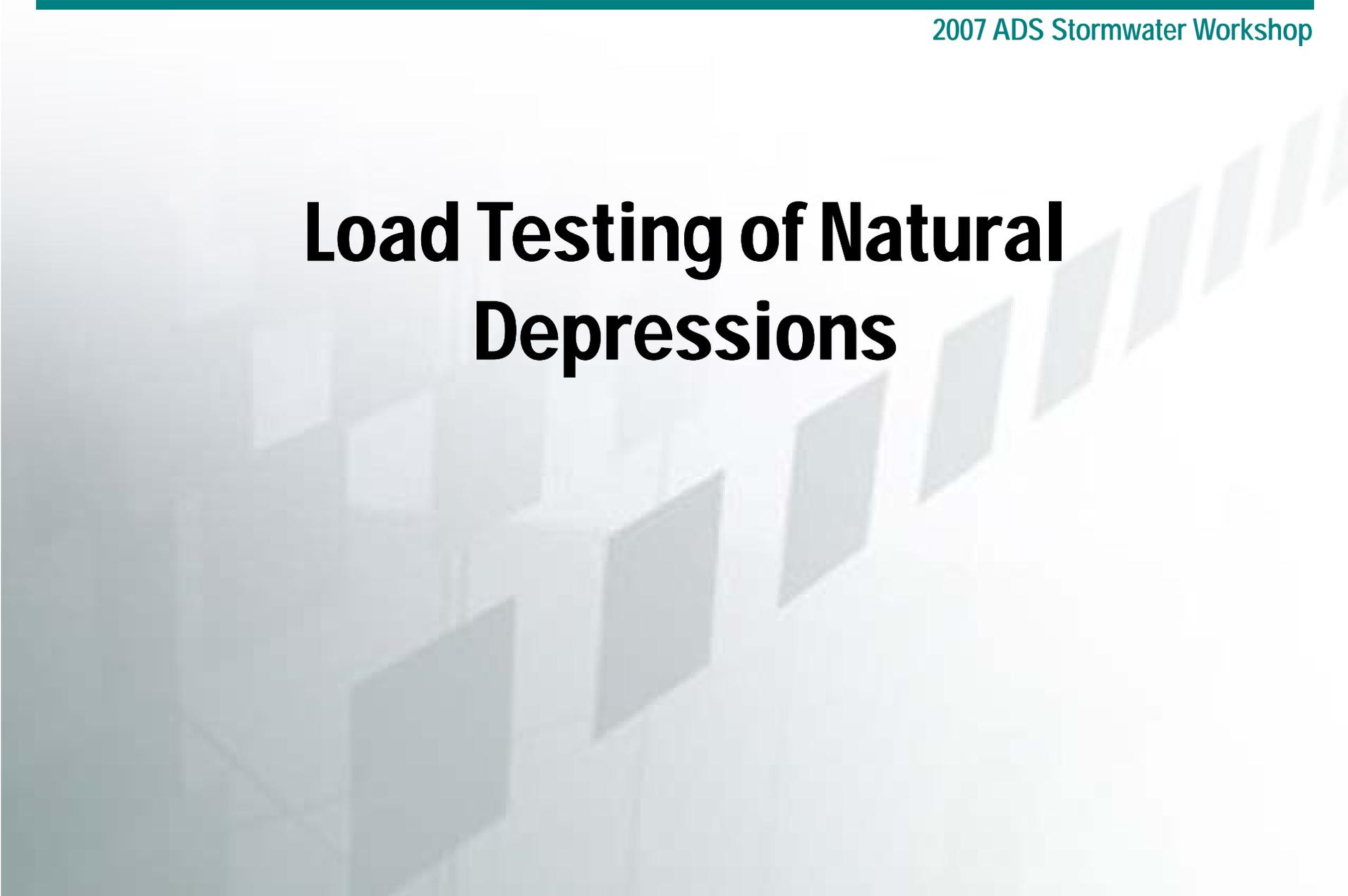
Photo date: 2004

# TOPIC # 11

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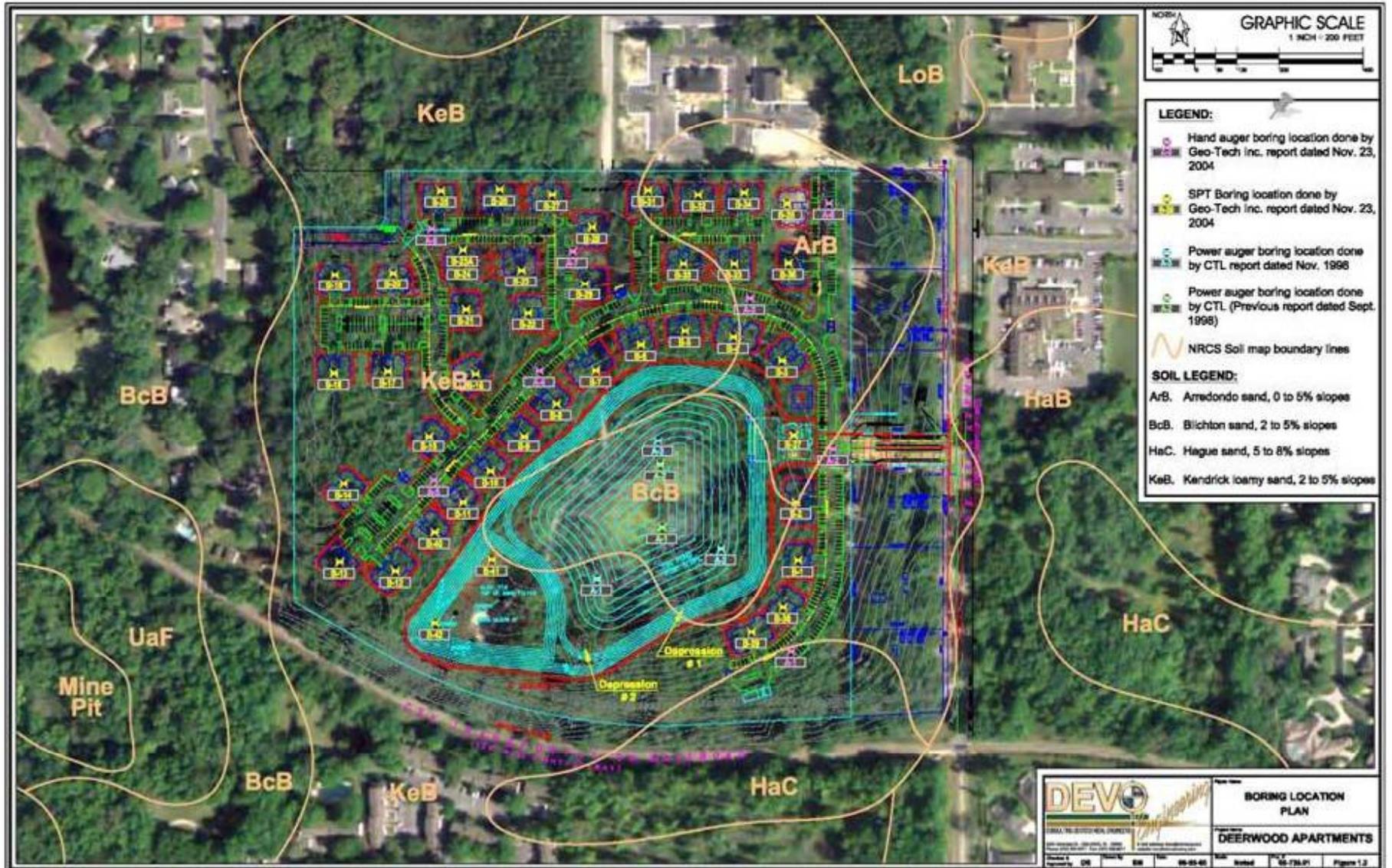
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## Load Testing of Natural Depressions



# Deerwood Apts in Ocala

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# Deerwood Apts in Ocala – Main Pond

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Photo date: 2000

# Deerwood Apts in Ocala – Main Pond

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 1 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 1 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 1 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 1 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 2 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 2 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 2 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 2 Load Test

2007 ADS Stormwater Workshop



Photo date: 2005

# Deerwood Apts in Ocala – Sinkhole 2 Load Test

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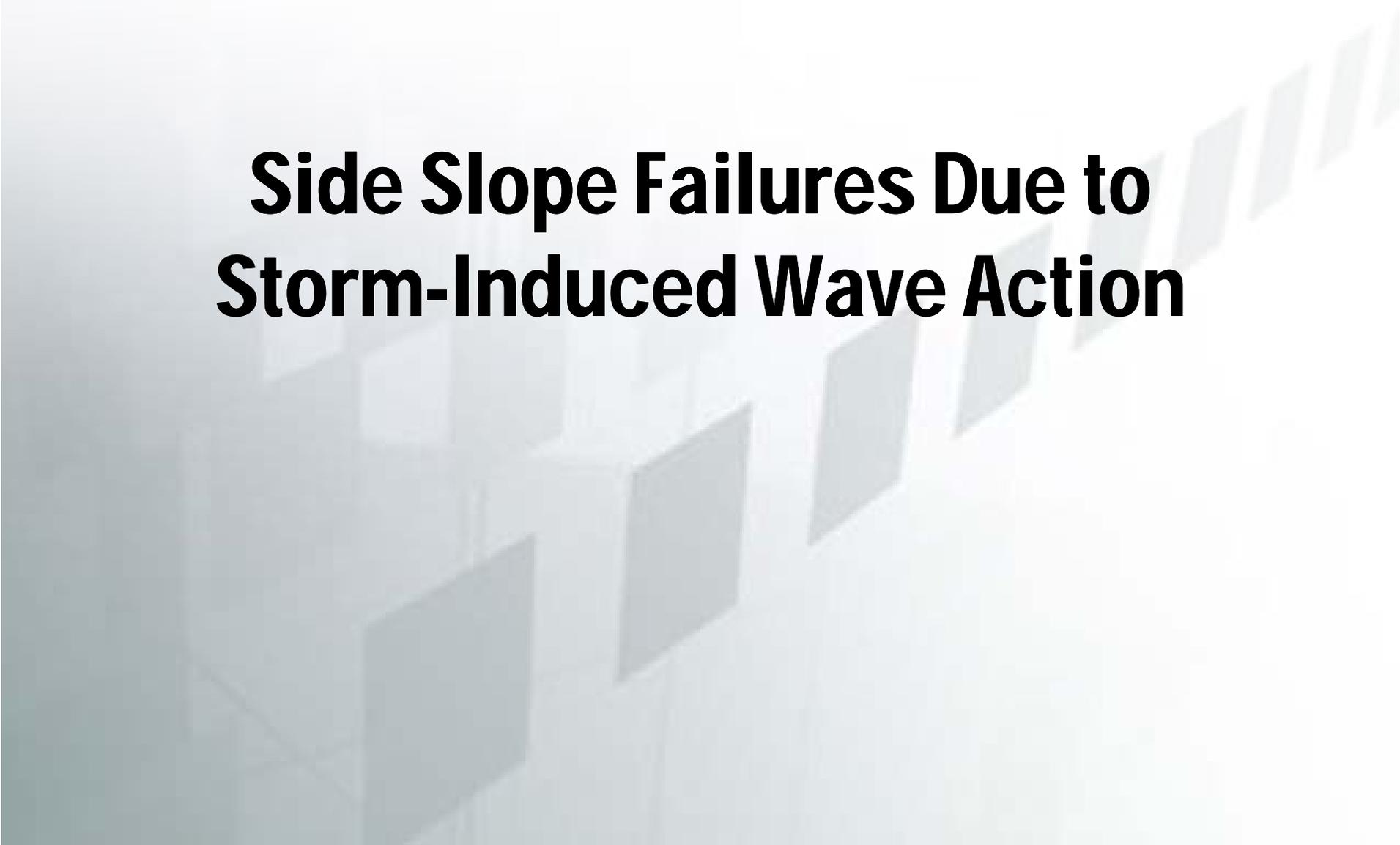
Photo date: 2005

# TOPIC # 12

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## **Side Slope Failures Due to Storm-Induced Wave Action**



# CR 561 Clermont

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Photo date: 2004 (Hurricane Jeanne)

# CR 561 Clermont

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Photo date: 2004 (Hurricane Jeanne)

# TOPIC # 13

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## **Water Table Drawdown Impact Due to Ditching**

# Site in Brevard County

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Photo date: 2005

# Site in Brevard County

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Photo date: 2005

# Site in Brevard County

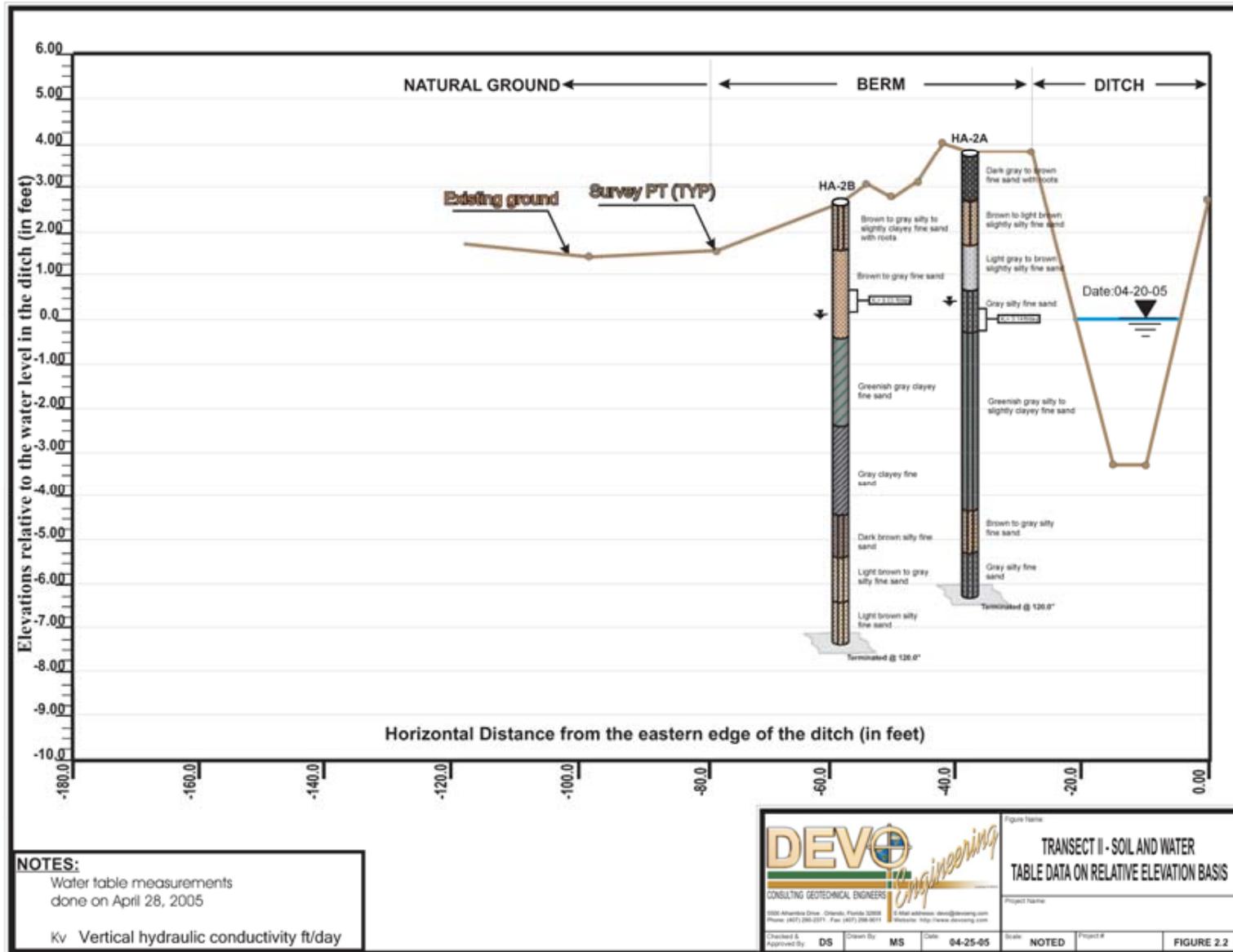
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Photo date: 2005

# Site in Brevard County – Soil Cross Section, Transect 2

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# Site in Brevard County – Drawdown Predictions, Transect 2

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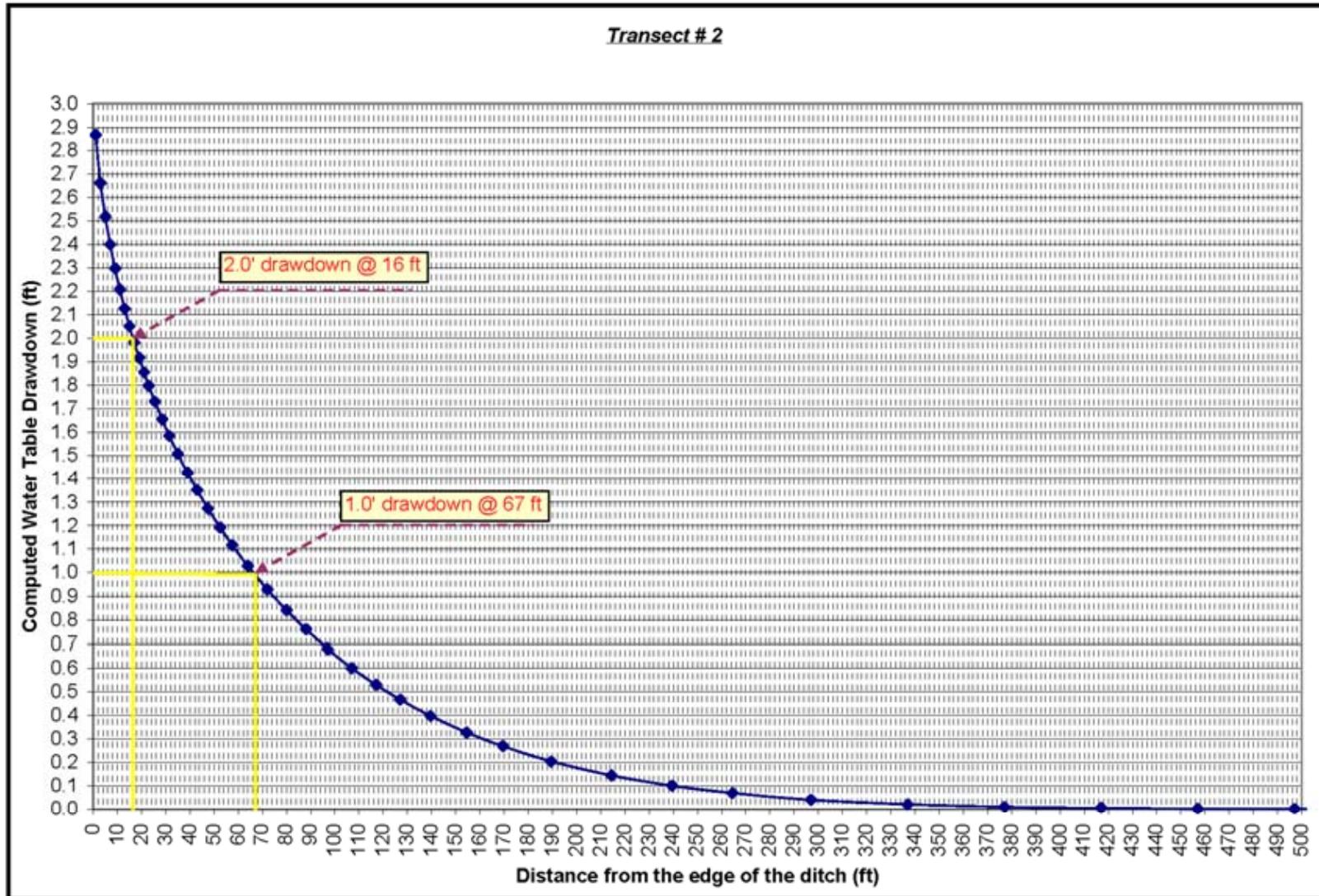


Exhibit 3. Predicted water table drawdown profile for transect 2

# TOPIC # 14

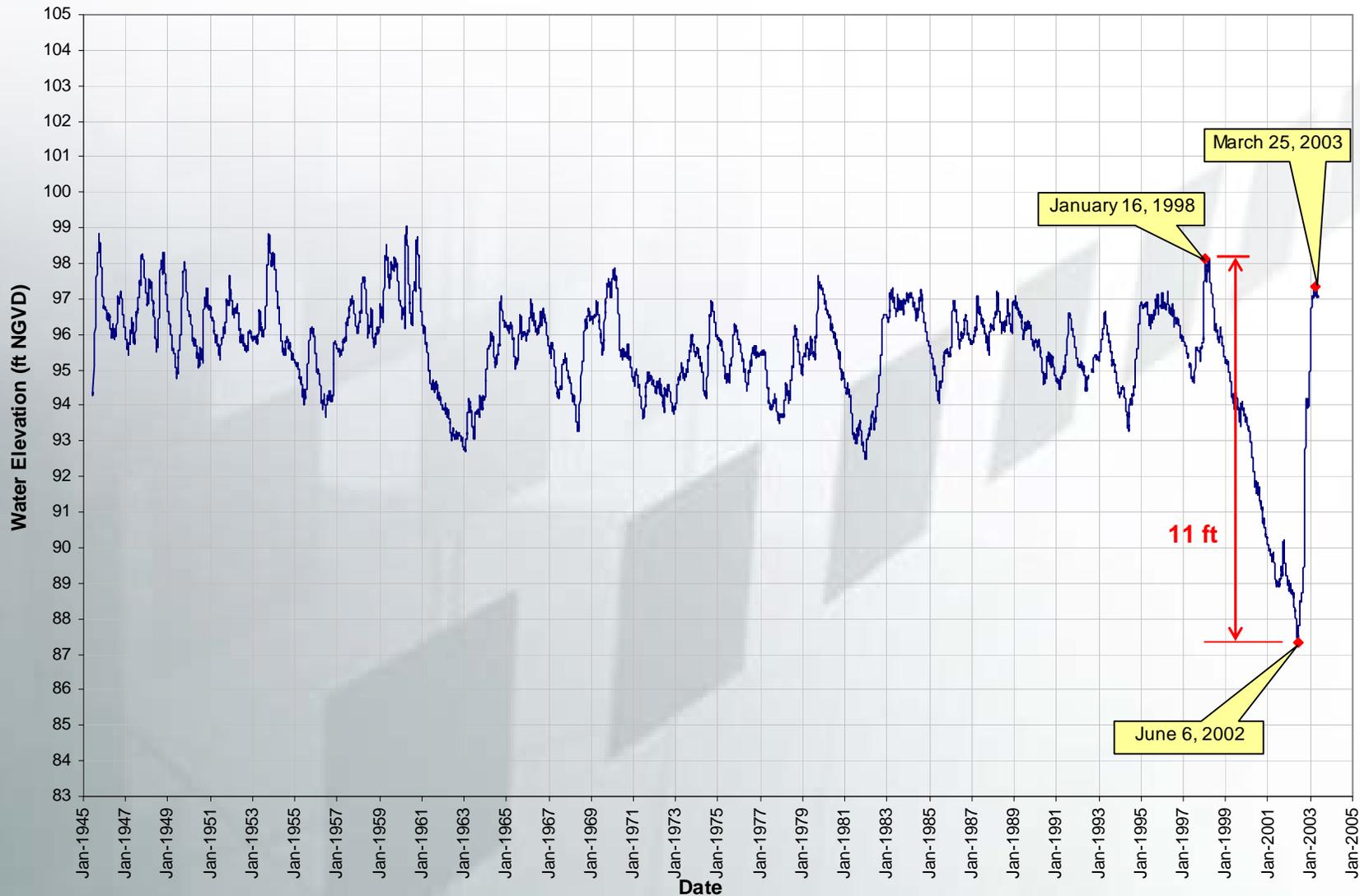
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## Drought

# Clermont Chain of Lakes – Lake Minnehaha

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Lake Minnehaha Water Levels - January 1, 1945 through May 14, 2003



# Clermont Chain of Lakes – CR 565A Bridge

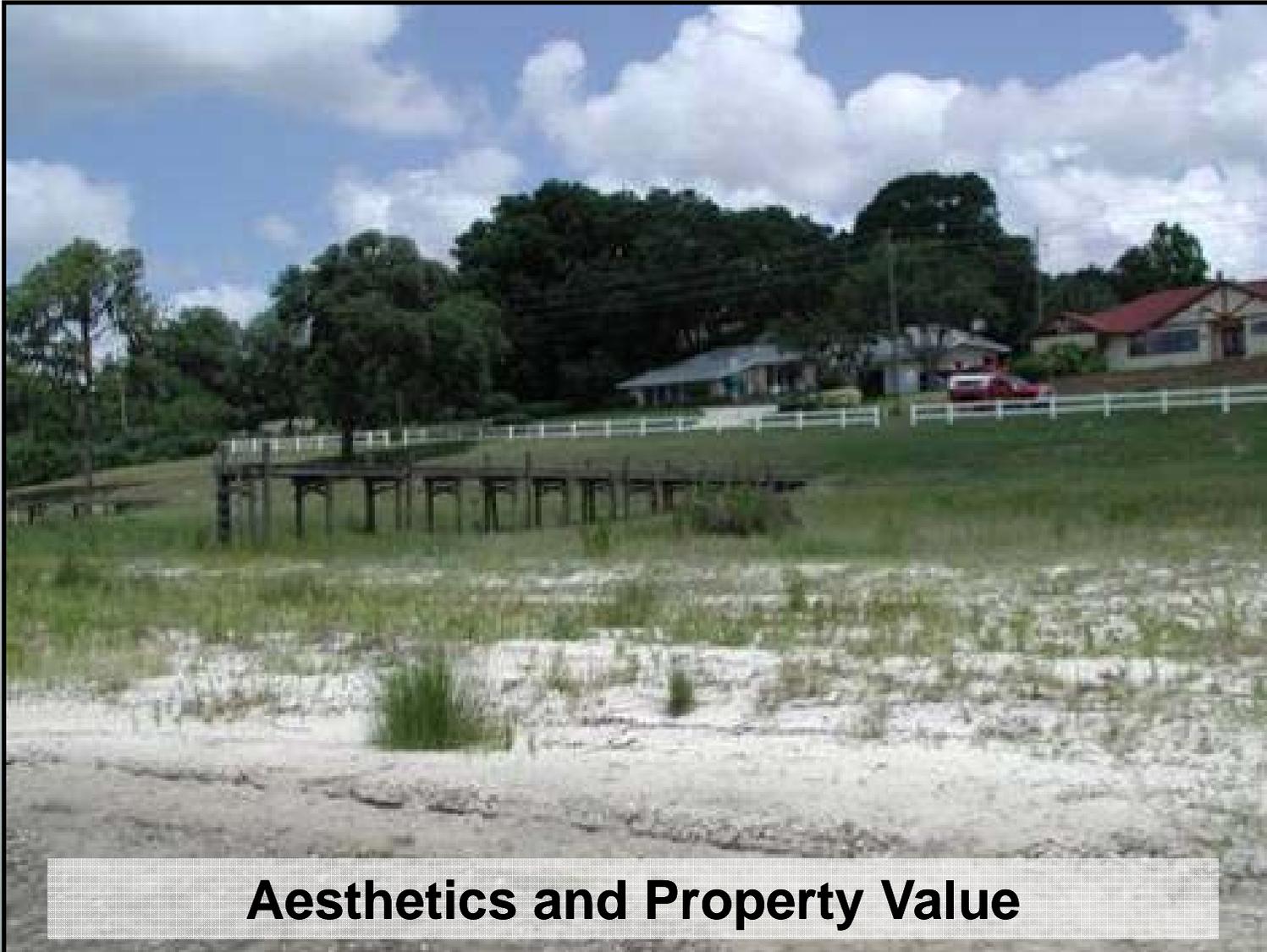
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**Navigability and Recreation**

# Clermont Chain of Lakes – Lake Minneola

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**Aesthetics and Property Value**

# Clermont Chain of Lakes – CR 561

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**Pavement Distress Due To Buried Peat**

# TOPIC # 14

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## **Relic Sock Drains and Irrigation Pipes Leading to Unexplained “Spring Seepage” After Development**

# Tully Wood Court

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**Upward Seepage Beneath Pavement**

# Tully Wood Court

2007 ADS Stormwater Workshop



**Field Investigation and Excavation**

# Tully Wood Court

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**Relic Sock Drain**