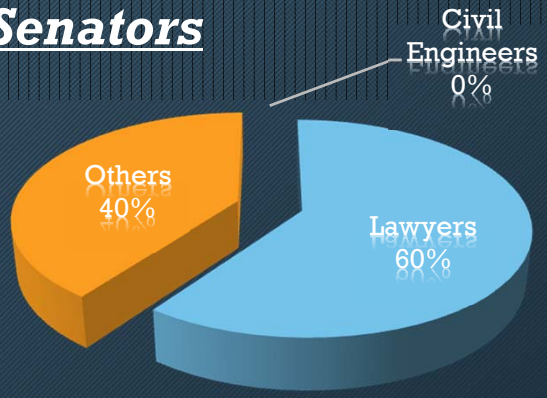
Current Issues in Storm Water Regulation in Florida

29th Annual ASCE-EWRI Water Resources Seminar

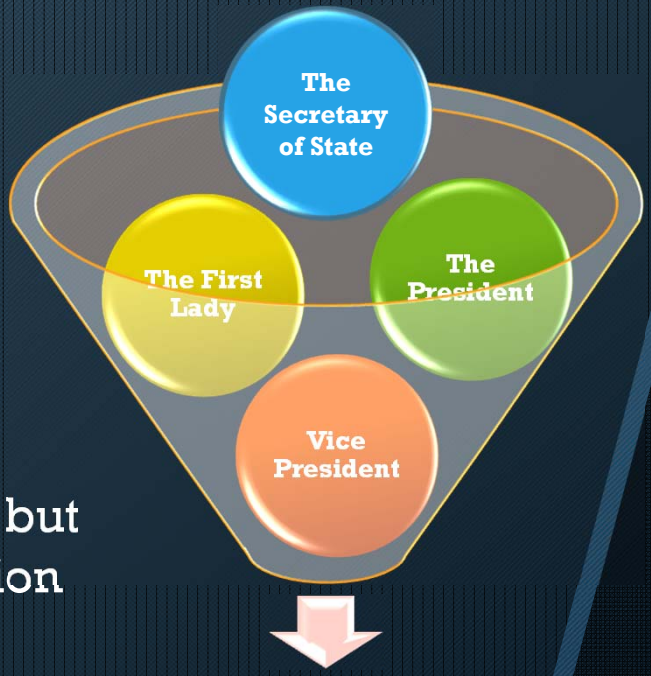
Speaker: Devo Seereeram Ph.D., P.E.

Topic: Litigation Prone Areas of Stormwater Management With Illustrated Case Studies

US Senators



60% of US Senate is lawyers but less than 1% of the population comprises lawyers.



LAWYERS

* the President is a lawyer, the first lady is a lawyer, and the vice president is a lawyer. 57 lawyers in US Senate out of 100. **There are zero Civil Engineers.**

LAWYERS VS. ENGINEERS IN GOVERNMENT

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STANDARD OF CARE FOR A DRAINAGE PROFESSIONAL

This is the operating definition for standard of care in the drainage engineering profession:

In performing professional services for a client, a drainage engineer has the duty to have that degree of learning and skill ordinarily possessed by reputable drainage engineers, practicing in the same or similar locality and under similar circumstances. It is the drainage engineer's further duty to use the care and skill ordinarily used in like cases by reputable members of the drainage engineering profession practicing in the same or similar locality under similar circumstances, and to use reasonable diligence and the drainage engineer's best judgment in the exercise of professional skill and in the application of learning, in an effort to accomplish the purpose for which the drainage engineer was employed.

STANDARD OF CARE FOR A DRAINAGE PROFESSIONAL

The four key items in this definition are as follows:

- have learning and skill ordinarily possessed by reputable engineers practicing in the same or similar locality and under similar circumstances;
- use care and skill ordinarily possessed by reputable engineers practicing in the same or similar locality and under similar circumstances;
- use reasonable diligence and best judgment; and
- to accomplish the purpose for which the engineer was employed.

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LITIGATION TRENDS IN STORMWATER CASES

- Sue all professional firms which are listed on the plans (civil engineer, wetland ecologist, geotech, surveyor), especially those with deep pockets and significant liability insurance coverage.

- In addition to suing the firm, the trend now is to sue the individual engineer(s) involved with the project. In 1999, the Florida Supreme Court' decision in "Moransais vs. Heathman" allowed Plaintiffs to personally sue the engineer in cases of "negligence" which result in economic loss. Review the Failed Senate Bill 288 for background information on this issue affecting engineers; the attempt to limit tort liability for design professionals was not passed.

- Inclusion of the P.E. in the litigation is sometimes a ploy by Plaintiffs to:
  1. get around the professional insurance liability limits of the company, and
  2. includes the engineer personally in the Litigation to add a fear factor so the "sued engineer" will urge the insurance company to settle and "get him/her out of this personal mess".

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LITIGATION TRENDS IN STORMWATER CASES

- The majority of the Plaintiffs expect a settlement at mediation (for a substantial sum or a sum deemed to be nuisance by the insurance company) and they do not expect to go to trial where they can lose. Many cases settle on the courthouse steps.
- A lot of the posturing during litigation proceedings is simply a shake-down of the insurance company. A thick report by the plaintiff is one way an opportunistic plaintiff can inject fear into an insurance adjuster and yield a settlement.
- Implications of Arbitration in the Process. If arbitrator's decision is not accepted, then the losing side at trial becomes responsible for the victor's attorney fees.
- If you are personally sued, do not panic although that is a natural reaction as there is supposed shame associated with it. It is part of business in our increasingly litigation-prone culture.
- An agency permit is not an endorsement of your calculations. This is not a defense.

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NEWS FLASH – INDIVIDUAL FLORIDA P.E.'s CAN NOW BE PROTECTED

Under the newly created Florida Statute 558.0035, effective July 1, 2013, an individual professional engineer can be protected from individual liability for negligence under each of the following circumstances:

1. the contract is made between the business entity and a claimant or with another entity for the provision of professional services to the claimant
2. the contract does not name as a party to the contract the individual employee or agent who will perform the professional services
3. the contract includes a prominent statement, in uppercase font that is at least five point sizes larger than the rest of the text, that, pursuant to this section, an individual employee or agent may not be held individually liable for negligence
4. the business entity maintains any professional liability insurance required under the contract
5. any damages are solely economic in nature and the damages do not extend to personal injuries or property not subject to the contract

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Design/Construction Pitfalls - SJRWMD

- Survey information – NGVD, NAVD, match grade to adjacent properties
- Geotechnical information – WT, soil properties, confining layer/BOA.
- Sheet flow to Point Discharge.
- Poor stabilization, eroded banks, erosion from lots, inadequate Erosion & Sediment Control measures.
- Remove the erosion & sediment control measures and provide permanent stabilization.
- Missing parts of the system, ie underdrain pipe, clay core, impermeable membrane, weir inside structure.
- Construction debris in pond berms.

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OBSTRUCTION OF NATURAL FLOW PATHS DURING CONSTRUCTION

Topic #1: First, during construction, the contractor may not have considered the natural flow paths for stormwater runoff through his work site with the result that some flow lines are obstructed leading to upstream blockages and impoundments, some of which may fail with a "tidal wave" effect. These failures cause significant erosion and environmental damage since they release a lot of sediment-laden water.

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Obstruction of Natural Drainage Flow Path During Construction

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Obstruction of Natural Drainage Flow Path During Construction

PERMANENT ALTERATIONS TO DRAINAGE PATTERNS & PATHS:

Topic #2: **After the system is constructed, the drainage flow pattern may become altered where stormwater is now diverted into areas where it was not intended or may be impounded in upstream areas causing flooding. Some badly designed diversions can also dehydrate wetland ecosystems.**

UNDERSIZING OF STORAGE AND/OR CONVEYANCE:

Topic #3: **Stormwater storage and/or conveyance systems may be under-sized in some cases due to calculation errors by the design engineer or some other design deficiency which affects system performance (such as a mis-estimate of the water table in the ground or accounting for too much ground infiltration in the stormwater holding pond).**

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STATE LAW ON DISCHARGE TO LAND-LOCKED LAKES

- 10.4.2 Systems discharging to land-locked lakes which are adjacent to properties of more than one ownership shall not cause an increase in the total pre-development flood stage. This can be accomplished through retention with percolation or, if the soil conditions are not sufficient for percolation, then through detention for a duration sufficient to mitigate adverse impacts on flood stages. In determining the volume of direct runoff, 96-hour duration storm is to be used.

The actual results for the 25yr/96hr storm (12 inches of rain)

Pond	Predevelopment (cubic feet)	Postdevelopment (cubic feet)
RAI 1	149,612	256,423
RAI 2	39,181	114,773
RAI 3	16,559	31,475
Total	**205,352**	**402,671**

Consultant used an incorrect procedure which resulted in over 400,000 cubic feet of infiltration into the ground for this storm event

2002 PERMIT CALCULATIONS BY CONSULTANT CONTAINED AN ERROR

Discharge For 100Yr/24Hr Storm (10.6 Inches of Rain)

Pond	Predevelopment (cubic feet)	Postdevelopment (cubic feet)
RAI 1	112,547	193,240
RAI 2	29,475	31,646
RAI 3	12,457	24,737
Total	**154,478**	**249,623**

2002 PERMIT CALCULATIONS BY CONSULTANT CONTAINED AN ERROR

Berm Failure

During the early days of Tropical Storm Fay, Project X stormwater pond experienced a berm failure as a result of uncontrolled discharge over the berm

Flooding at Downstream Building

Water entering building

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Flooding at Downstream Building

Sandbags stacked against entrance door.

Functioning High Level Outfall Structure in a Nearby Pond During Tropical Storm Fay

WASTEWATER RECHARGE IMPACT ON LAKE

Topic #28: Impact of Rapid-Rate Artificial Recharge Basins on Hydroperiod of Adjacent Lake

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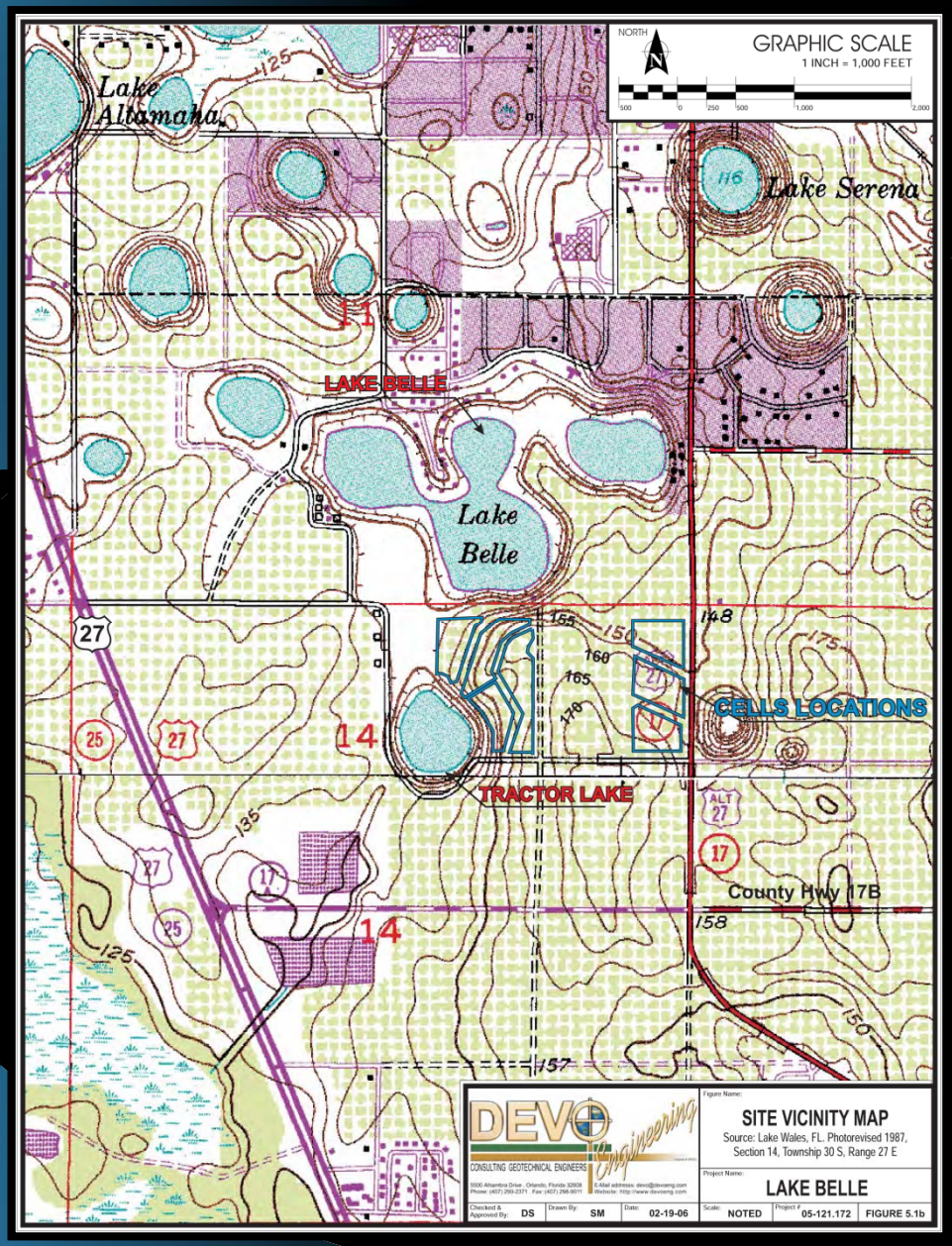

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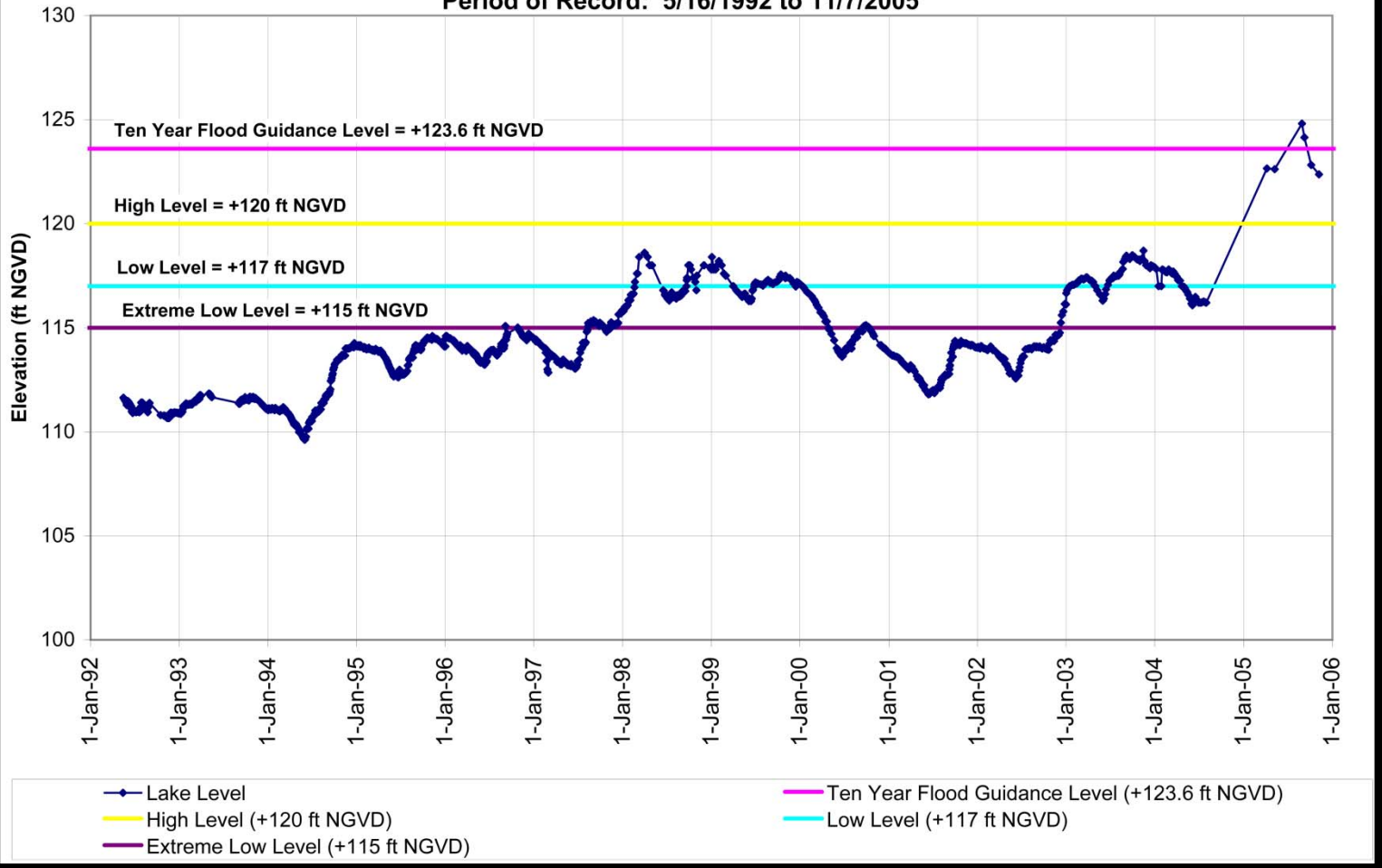
Figure 2.1
Lake Levels for Lake Belle
Period of Record: 5/16/1992 to 11/7/2005



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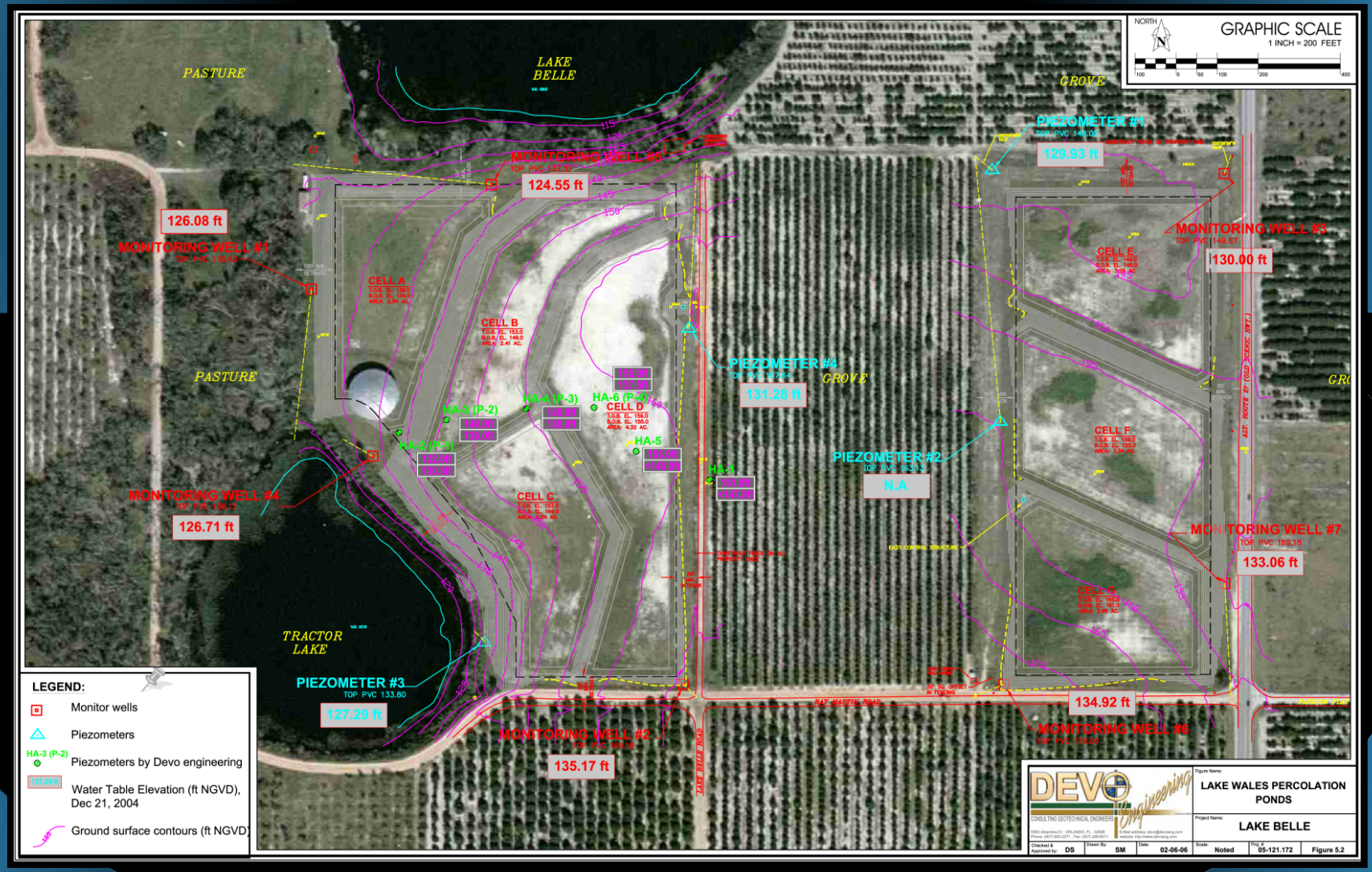

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Figure 3.4
3 yr Antecedent Cumulative Rainfall
Period of Record: Jan 1, 1935 to Oct 31, 2005

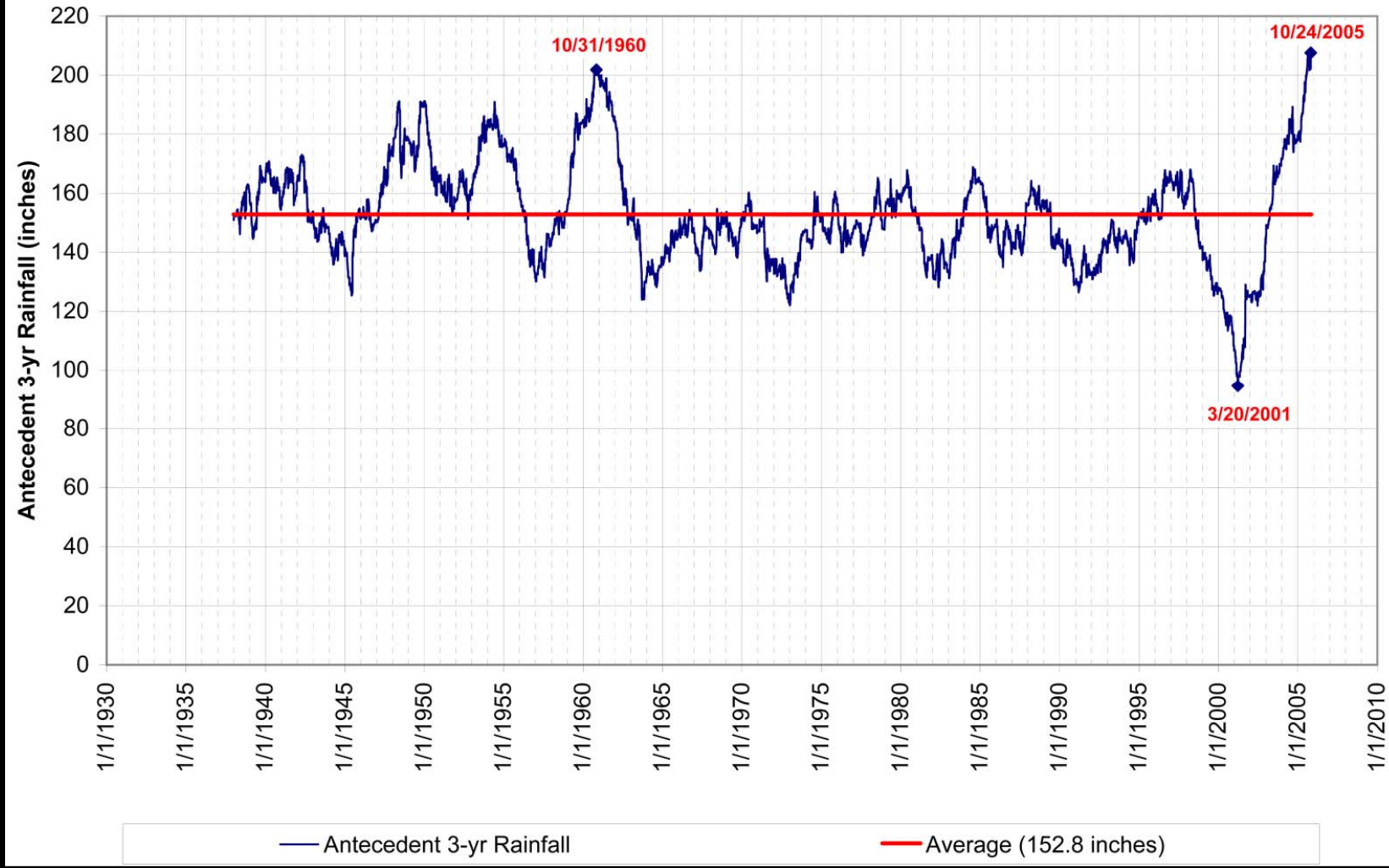

Figure 3.4
3 yr Antecedent Cumulative Rainfall
Period of Record: Jan 1, 1935 to Oct 31, 2005

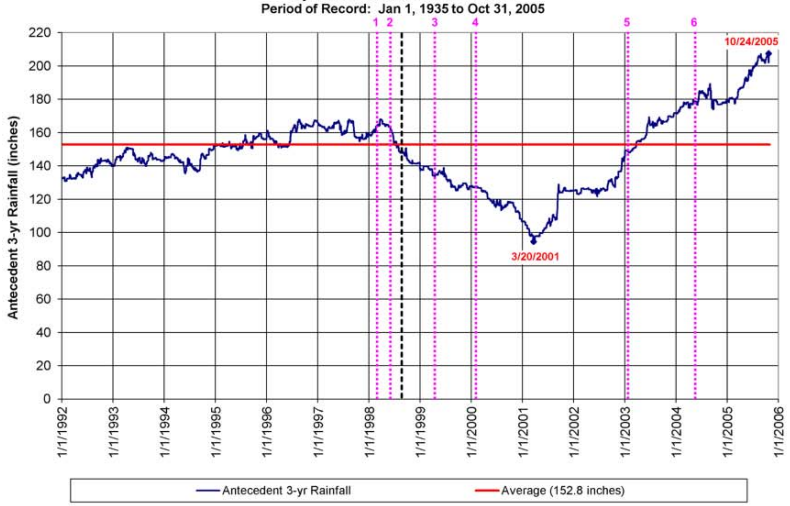

Figure 2.1
Lake Levels for Lake Belle
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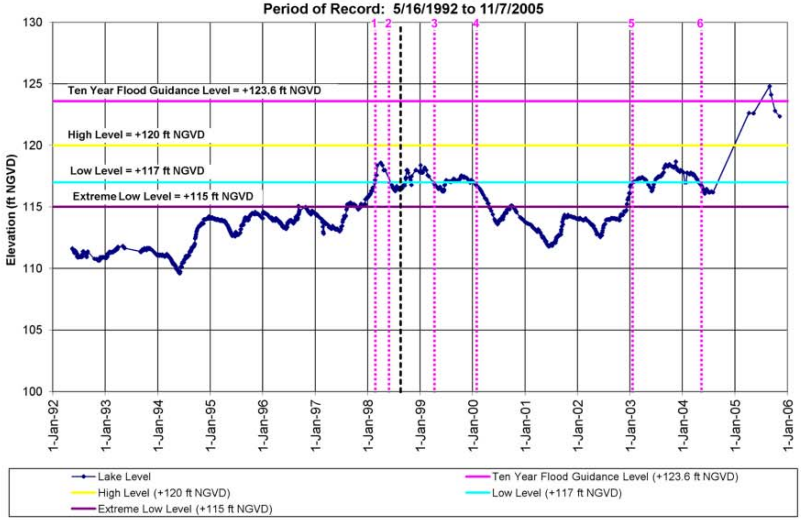

Event #	Approximate Date	Before Or After Infiltration Ponds Were Activated	Rising or Falling Water Table	Stage (ft)	3-Year Rainfall (inches)
1	2/18/1998	Before	Rising	117	161.58
2	6/8/1998	Before	Falling	117	161.69
3	3/31/1999	After	Falling	117	134.68
4	1/10/2000	After	Falling	117	127.3
5	1/17/2003	After	Rising	117	149.17
6	4/21/2004	After	Falling	117	177.39

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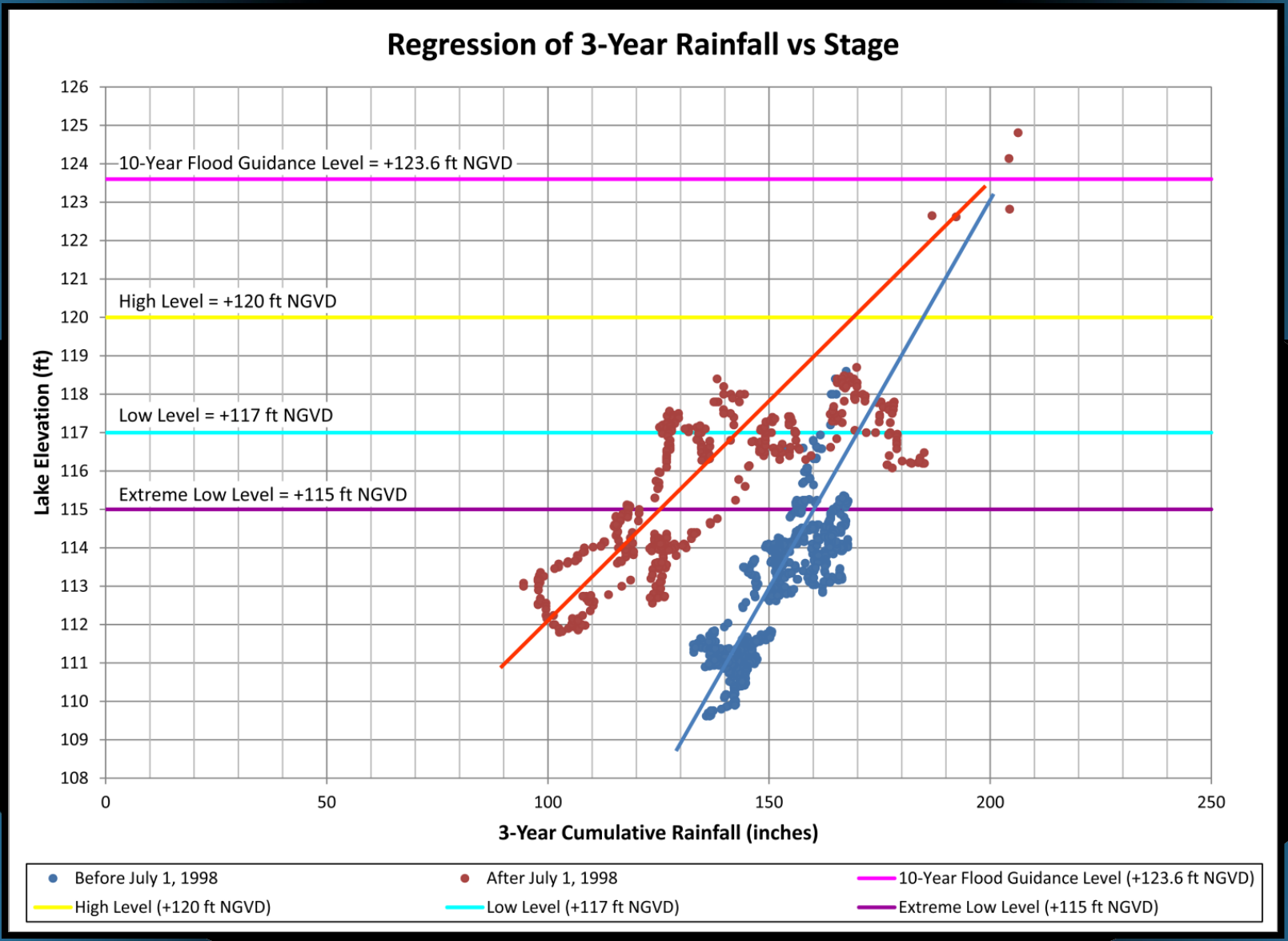
Figure Name: 3-Year Cumulative Rainfall And Lake Stage Plots
Project Name: Lake Belle
Checked & Approved By: DS | Drawn By: RDC | Date: 10/02/2012 | Scale: NOTED | Project # | FIGURE 1


Regression of 3-Year Rainfall vs Stage
Lake Elevation (ft)
126
125
124
123
122
121
120
119
118
117
116
115
114
113
112
111
110
109
108
10-Year Flood Guidance Level = +123.6 ft NGVD
High Level = +120 ft NGVD
Low Level = +117 ft NGVD
Extreme Low Level = +115 ft NGVD
0
50
100
150
200
250
3-Year Cumulative Rainfall (inches)
Before July 1, 1998
After July 1, 1998
10-Year Flood Guidance Level (+123.6 ft NGVD)
High Level (+120 ft NGVD)
Low Level (+117 ft NGVD)
Extreme Low Level (+115 ft NGVD)

SUDDEN FAILURES OF STORMWATER IMPOUNDMENTS:

Topic #4: Stormwater impoundment failures leading to sudden releases of stormwater causing flooding and damage to downstream properties.

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Pond Berms Failures (Tropical Storm Fay)

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Miller Road Pond Outfall

(Photo 1 of 4)

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Glen Club Drive Pond
Berm Failure (Photo 2 of 4)

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Grande Ville Apartments

(Photo 3 of 4)

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Saxon Trace Apartments

(Photo 4 of 4)

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OFFSITE SEEPAGE & WATER TABLE MOUNDING IMPACTS FROM NEW STORMWATER FACILITIES

Topic #5: Seepage through pond berms or an artificial rise in the water table in the locality of a stormwater storage system which causes nuisance flooding or chronic wetness/seepage/flooding to adjacent land owners. Some lake level modification projects which raise lake levels can impact lakeshore residents, especially those on septic tanks.

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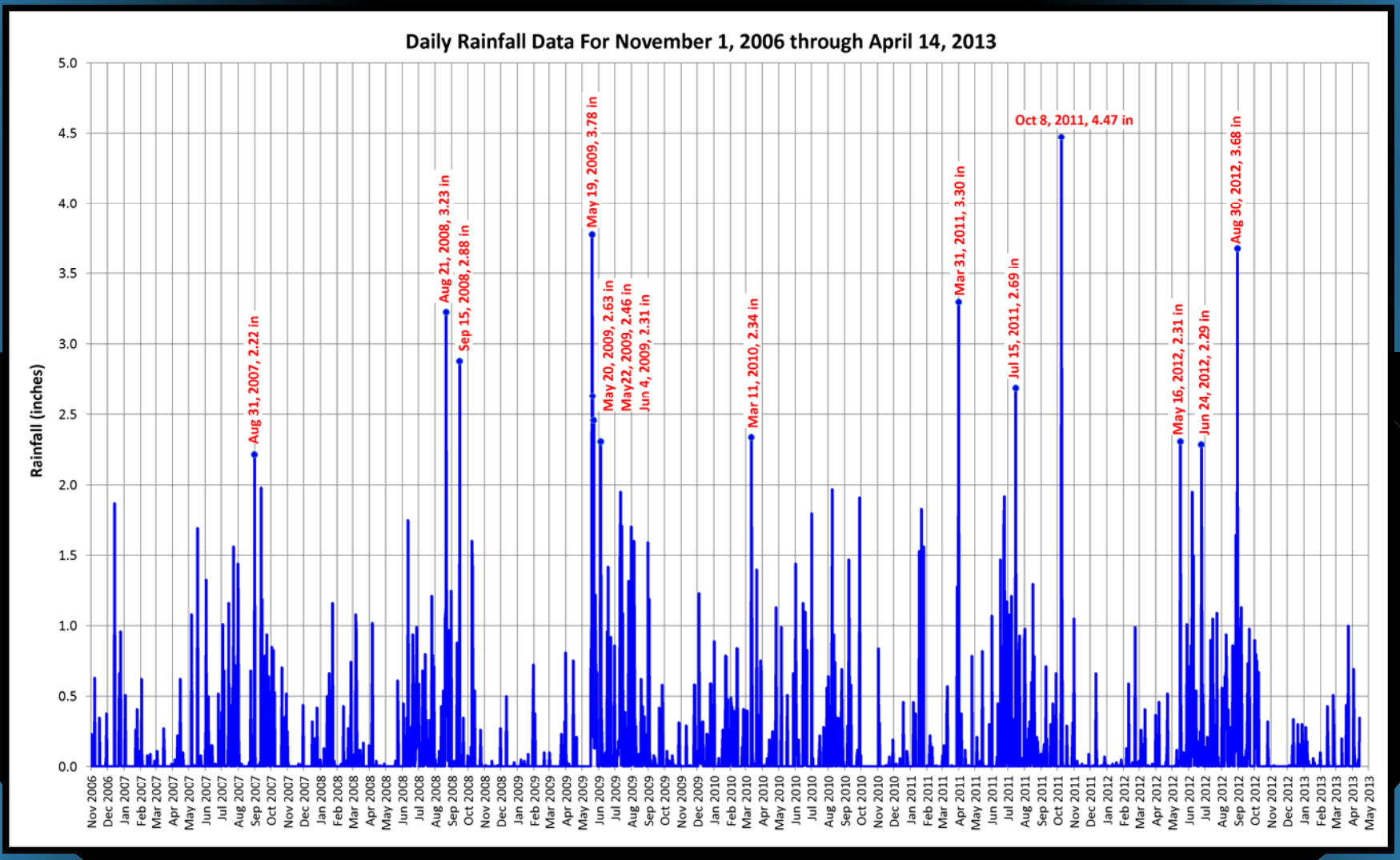

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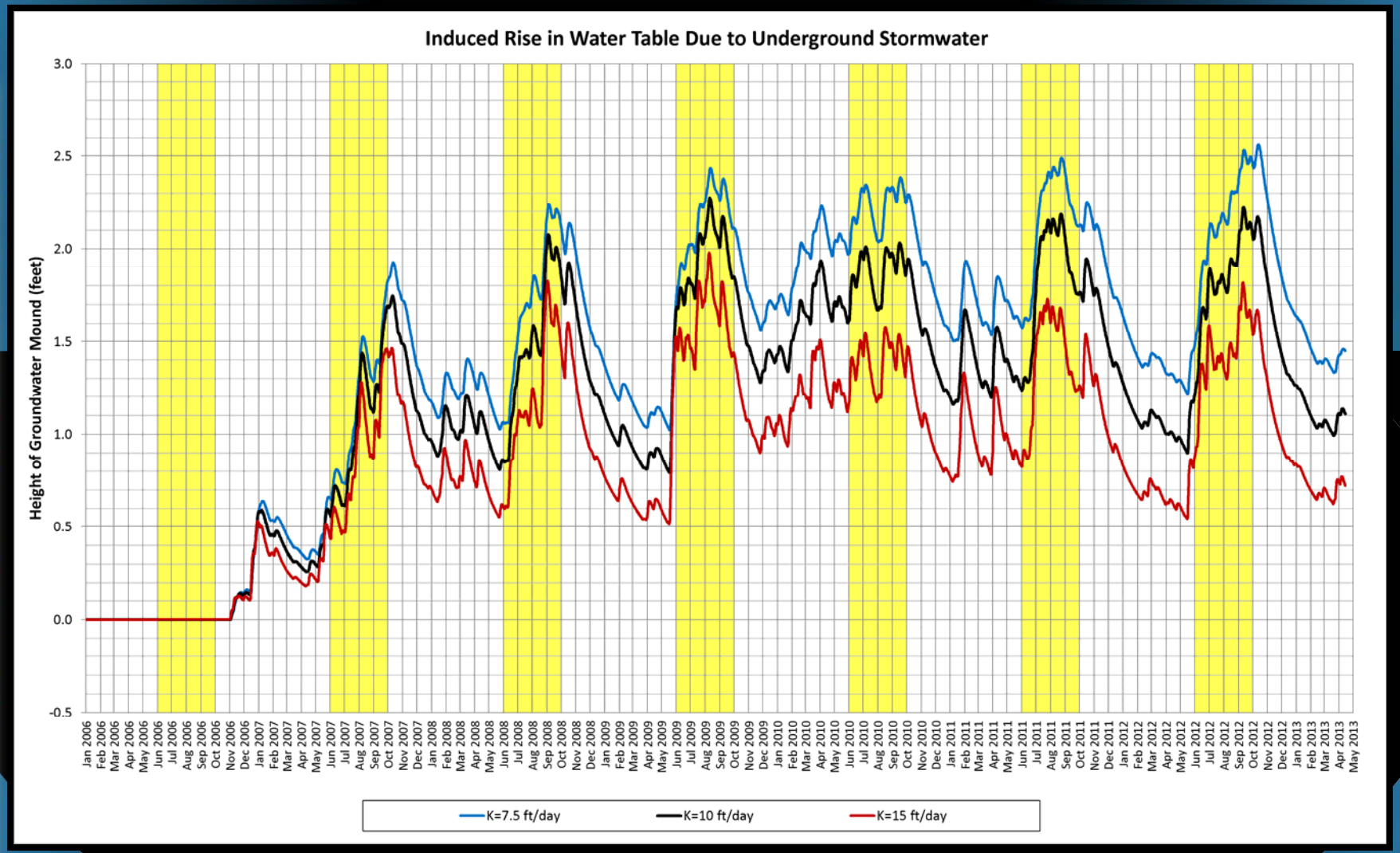

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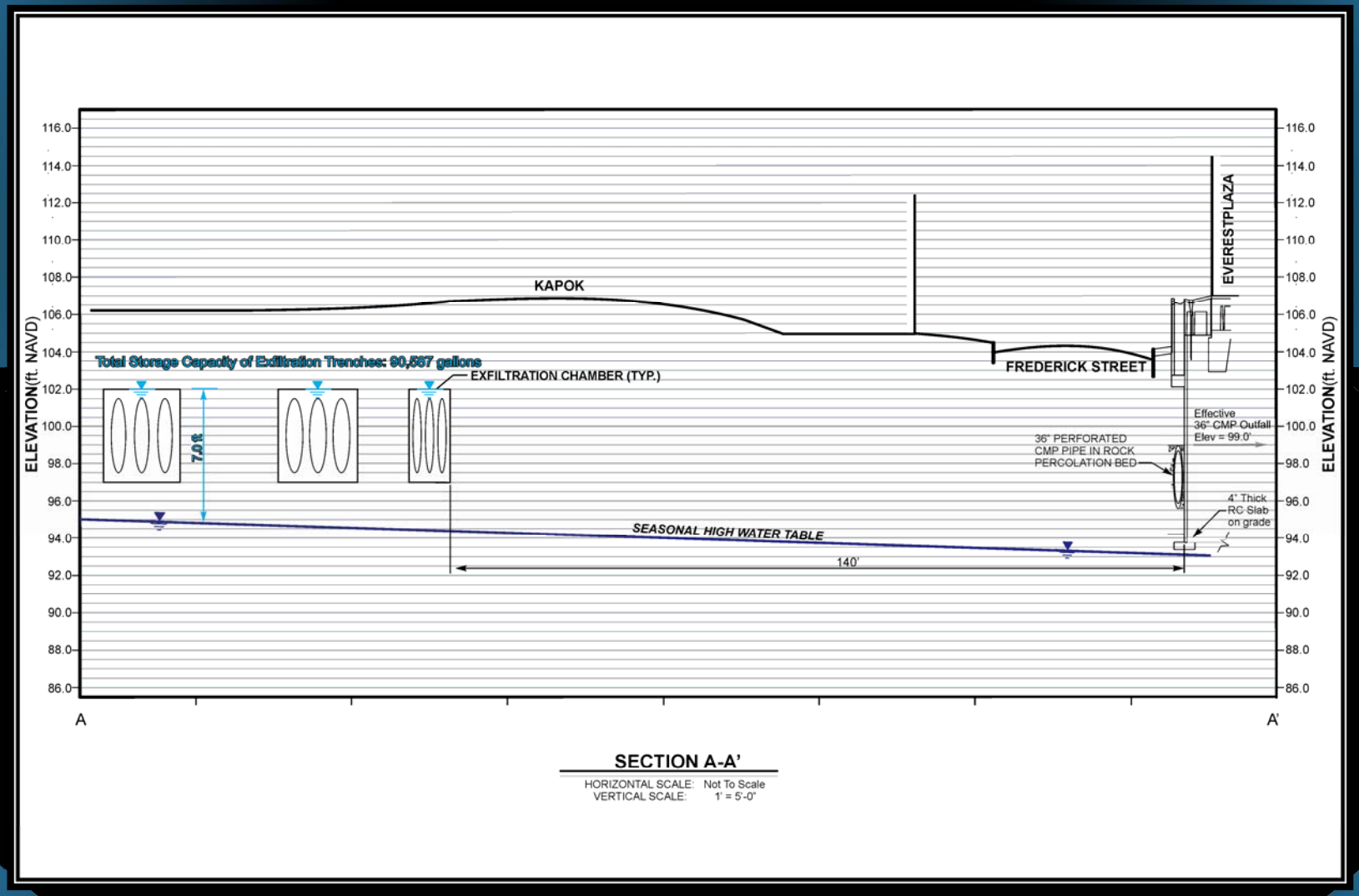

SECTION A-A'

HORIZONTAL SCALE: Not To Scale
VERTICAL SCALE: 1' = 5'-0"

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FDOT Saxon Pond

(Photo date: 2002)

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FDOT Saxon Pond

(Photo date: 2003)

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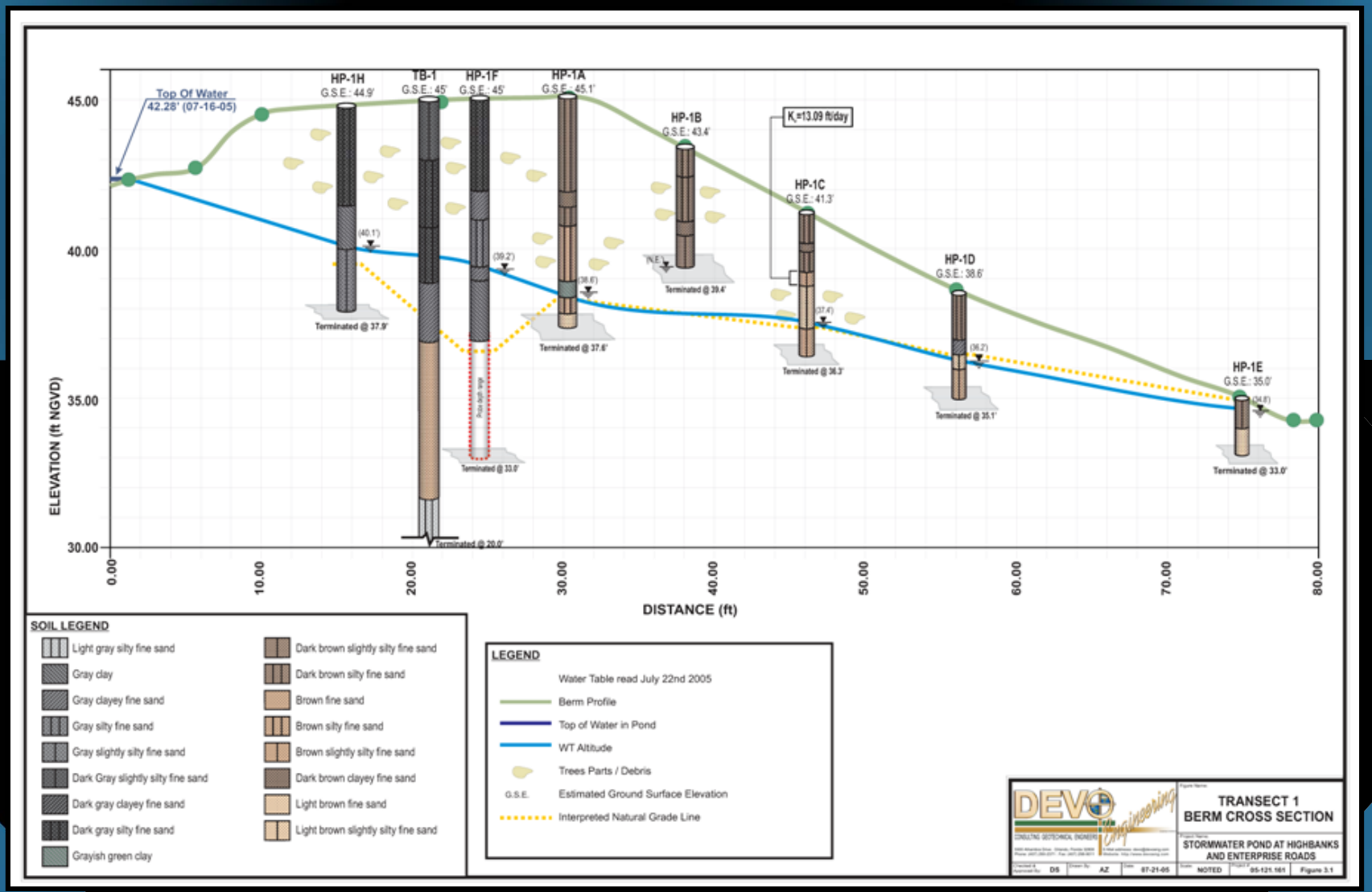

Highbanks and Enterprise Pond

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Highbanks and Enterprise Pond
(Photo date: 2005)

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The Overlook at Lake Louisa

(Photo date: 2004)

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The Overlook at Lake Louisa

(Photo date: 2004)

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The Overlook at Lake Louisa

(Photo date: 2004)

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The Overlook at Lake Louisa

(Photo date: 2004)

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ASSORTED CONSTRUCTION RELATED DEFECTS

Topic #6: Construction errors such as improper sand in filter systems, incorrect elevations for berms (too low), dumping debris in fill berms, no seepage collars on pipes to prevent blow-outs, etc.

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Site in Debary
(Photo date: 2004)

Site in Debary
(Photo date: 2004)

LAND-LOCKED LAKES & UPSTREAM PONDS:

Topic #9: Land-locked lakes are lakes without a positive outfall (or very limited discharge capacity) below the 100 year flood elevation. These water bodies can accumulate runoff over prolonged periods of excess rainfall with a startling and chronic rise in water level, especially during the multi-day storms. This type of stormwater management system is not forgiving and requires extra care in design. Except for FDOT regulations, current water management district criteria do not truly recognize the long-duration storm events which are most critical for management of these unforgiving systems.

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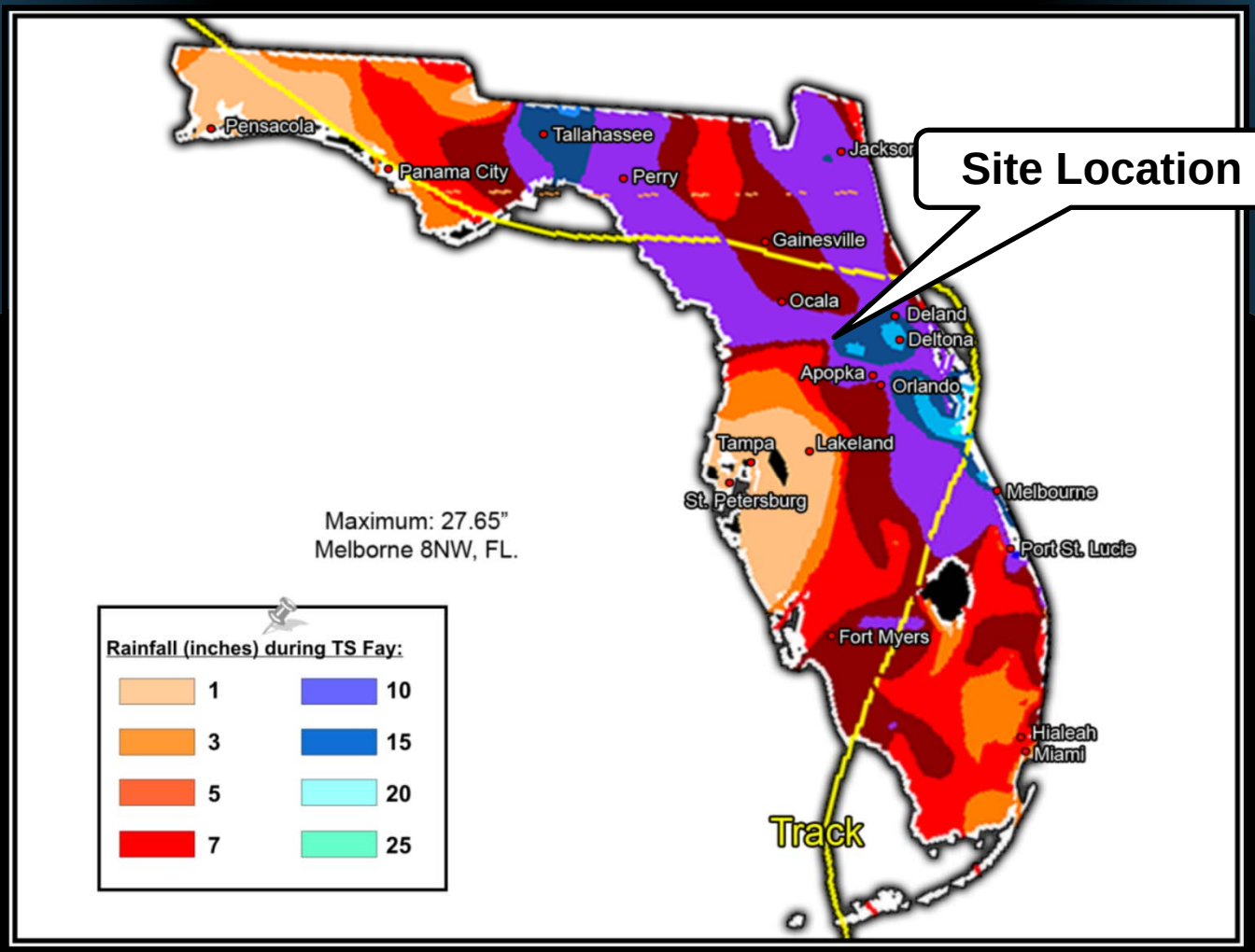

Highbanks Enterprise Road Pond

Rainfall Totals for TS Fay - NOAA Data

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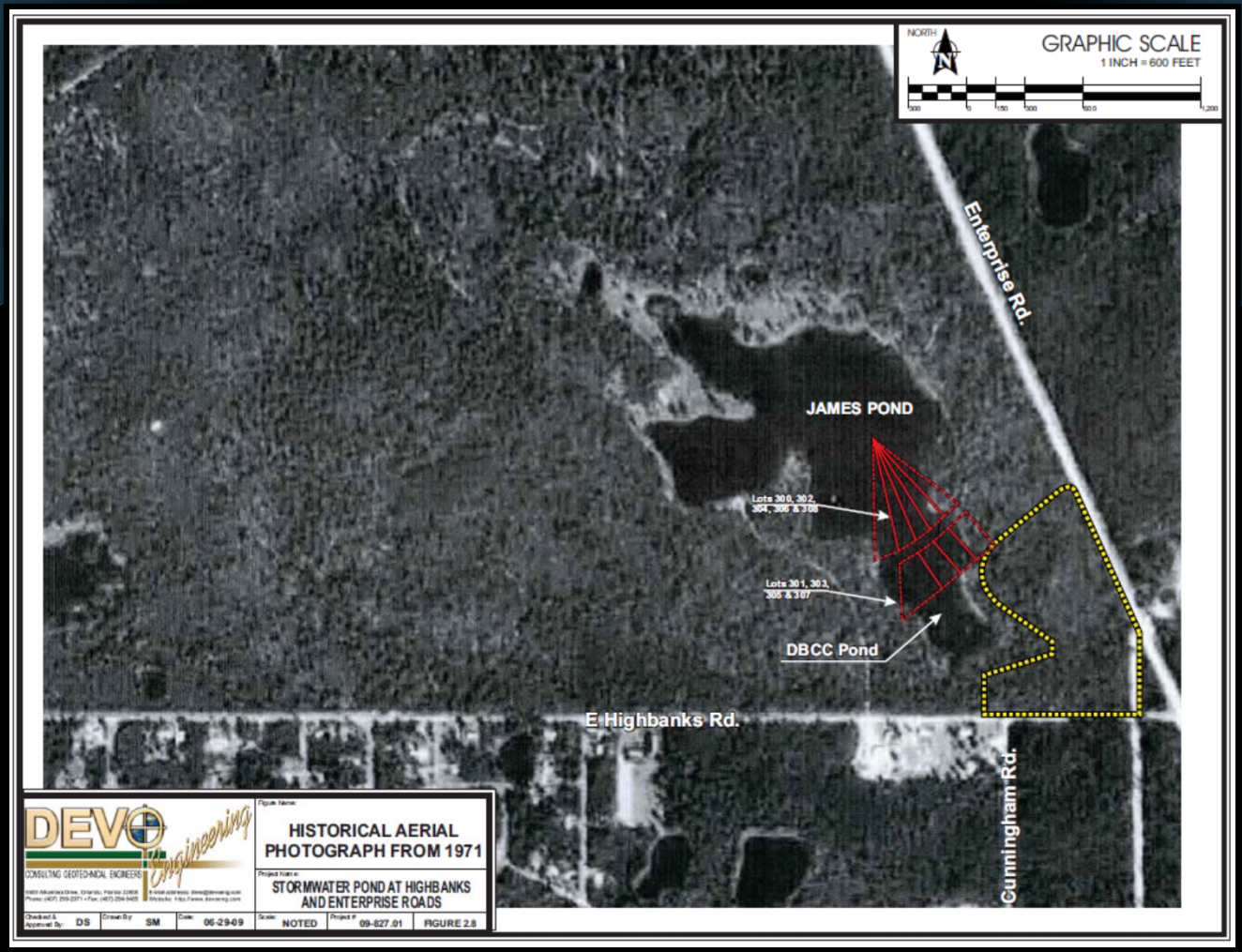

Highbanks Enterprise Road Pond

Aerial Photo Date: 1971

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Highbanks Enterprise Road Pond

Location

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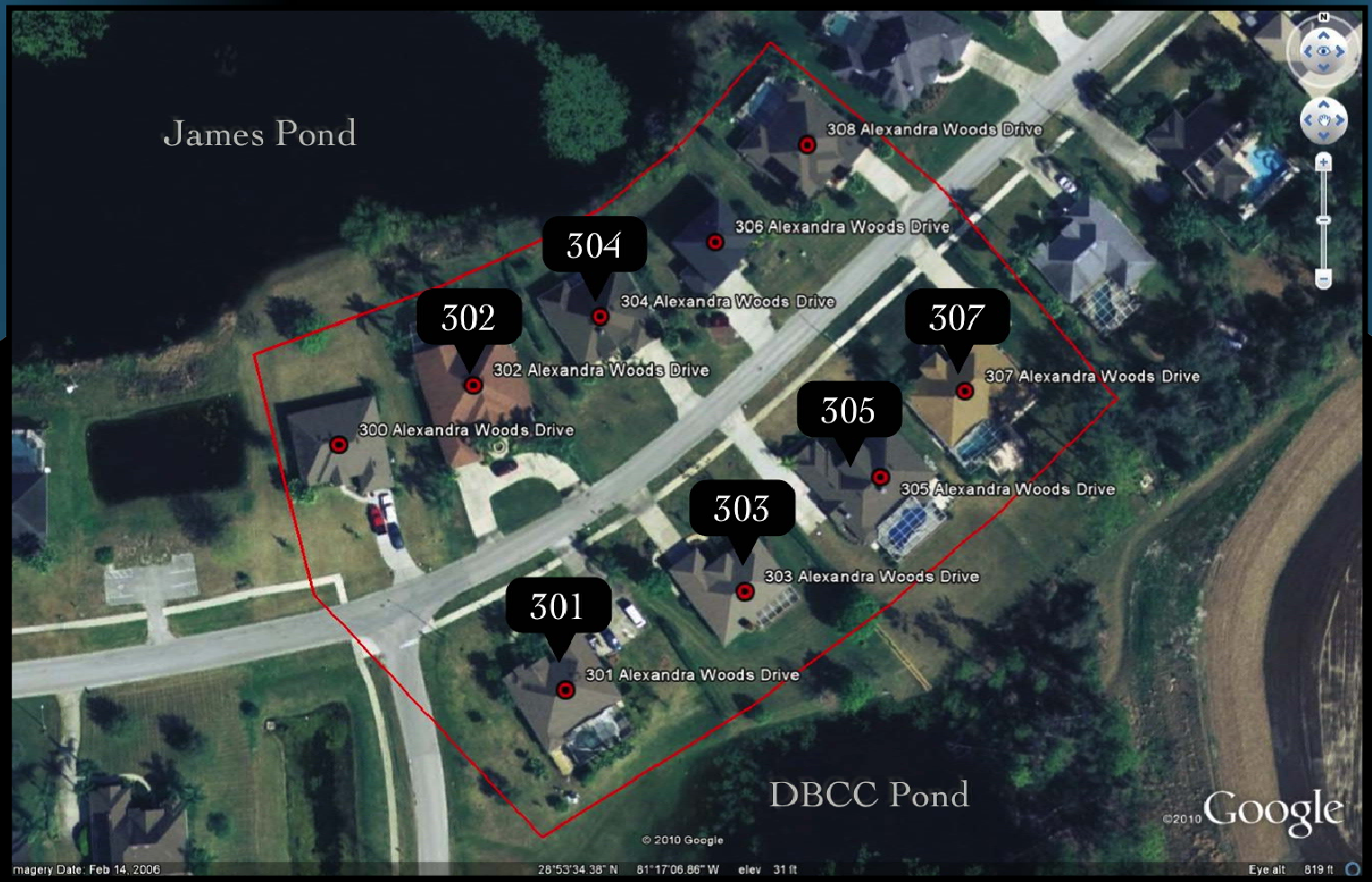

Highbanks Enterprise Road Pond

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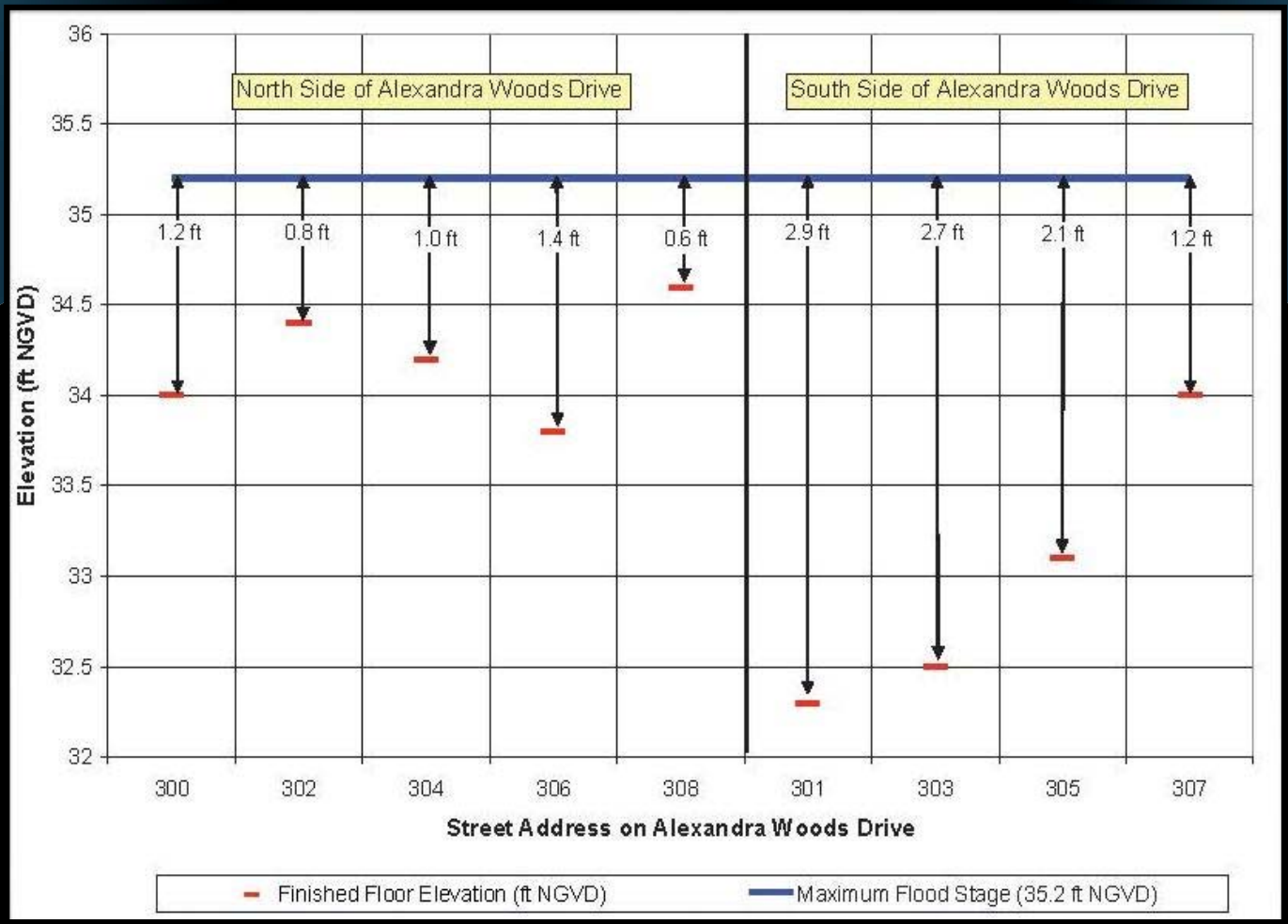
Highbanks Enterprise Road Pond

James Pond (9 structures flooded)

Highbanks Enterprise Road Pond

James Pond (9 structures flooded)



Highbanks Enterprise Road Pond

James Pond (9 structures flooded)

Table 15. Comparison of Predicted Flood Stages for "Predevelopment" Conditions		
Pond	Predicted Pond Stage (ft NGVD)	
	Devo Model 2 (with road widening)	Devo Model 3 (no road widening)
Gasline Lake	44.68	45.12
Enterprise Road Pond	44.47	N.A.
DBCC Pond	35.20	35.58
James Pond	35.20	35.58

Note:

1. The stages listed in the table above for Devo Model 2 assume an initial stage in Enterprise Road of +40 ft NGVD, i.e., no standing water in Enterprise Road Pond at the beginning of Tropical Storm Fay.

Comparison of Peak Flood Stage in James Pond, with and without roadway widening

Note that the flood stage in James Pond would have been higher if the Enterprise Road Pond had not been constructed

MIS-ESTIMATING CAPACITY OF DRAINAGE WELLS IN SOUTH FLORIDA:

Topic #10: Mis-estimating capacity of discharge facilities such as underground drainage wells, especially in South Florida where this is the primary drainage mechanism in many areas.

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DRAINAGE WELL DISCHARGE LIMITATIONS:

Topic #10: Key Facts About South Beach Storm:

- Date: Friday, June 5, 2009
- Started at 3:30 p.m.
- Ended at 6:00 p.m.
- 9.88 inches of rain recorded (Miami Beach City Hall rain gauge)
- Recurrence Interval: approximately once every 800 years
- Tide Conditions during rain event: Mid-Low Tide increasing to High Tide (8:15 p.m.)

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South Beach (FL) Storm of June 5, 2009

South Beach (FL) Storm of June 5, 2009

REDUCTION IN INFILTRATION CAPACITY DUE TO CONSTRUCTION TRAFFIC:

Topic #12: Failure to consider impacts of construction equipment trafficking stormwater basins which are designed to infiltrate into the ground the accumulated stormwater. Some types of soils seal off significantly with equipment traction and compaction, resulting in dramatic reductions in natural percolation capacity.

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Photo 1. Shows Some Standing Water in Pond SMF-1 on October 24, 2007

Photo 2. Shows Water Flowing Into The Sinkhole at the Toe of Slope on the Western Side of Pond SMF-1 on October 24, 2007

Photo 3. Shows Pond SMF-1 at its Highest Stage on July 9, 2008

Photo 4. Shows Pond SMF-1 Practically Dry on August 9, 2008

Pond Pictures

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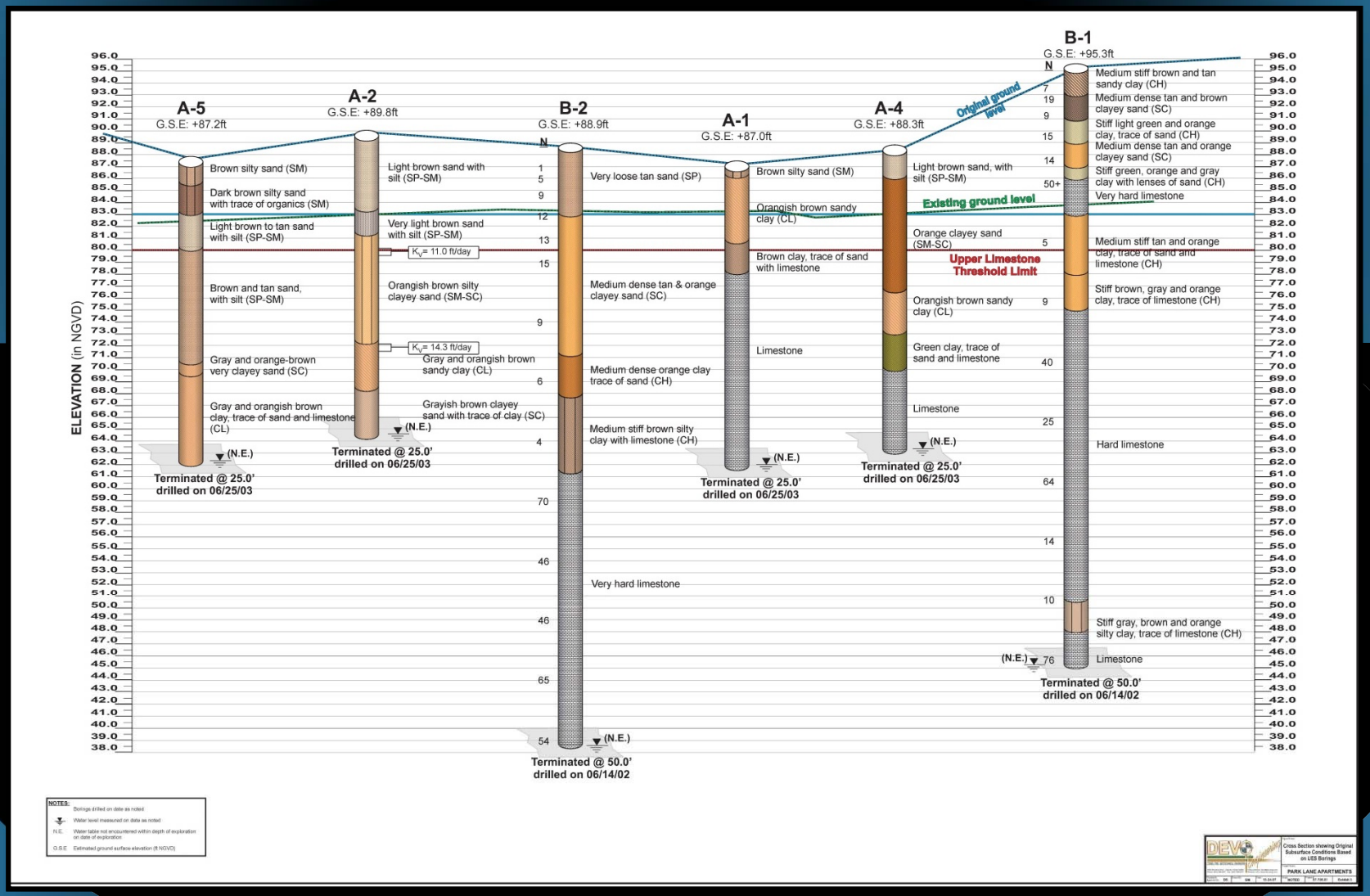

Cross section showing original subsurface conditions

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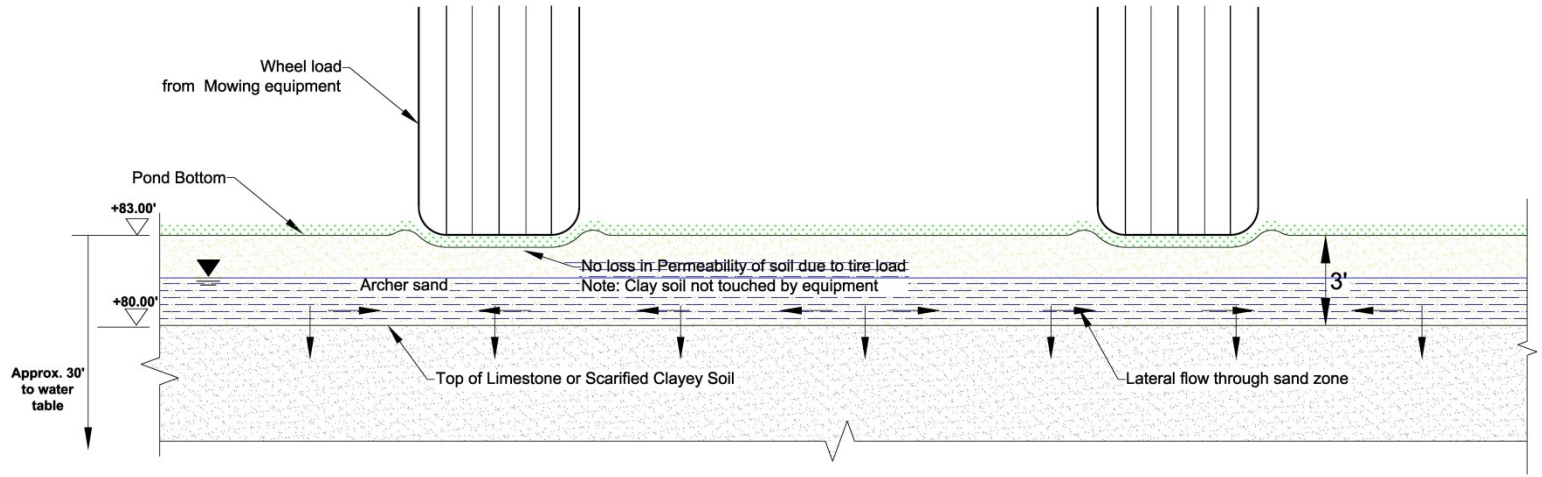

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IMPACT OR LACK THEROF OF MAINTENANCE EQUIPMENT ON SAND WITHIN BOTTOM OF POND

Project Name: Park Lane Apartments Gainesville

Checked & Approved by: DS	Drawn By: AZ	Date: 08-15-06	Scale: NOTED	Proj. #: 07-795.01	EXHIBIT 6

Impact or Lack thereof of maintenance Equipment on Sand within bottom of pond

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NOT ENOUGH PUMPS MOBILIZED BY PUBLIC AGENCY RESPONSIBLE FOR FLOOD PROTECTION & NOT TIMELY

Topic #13: Allegation that County (or public agency responsible for emergency management) fails to respond to a structural flood threat in a timely manner with a sufficient number of pumps.

GEYSERING BUSINESS

Topic #16: Some closed conduit drainage conveyance pipes (stormwater tunnels) and aquifer drainage well systems can undergo violent geysering when they fill rapidly during storm events. Such powerful geysering forces can blow off heavy manhole covers and turn them into projectiles. Geysering of gravity injection wells can hurl out rock fragments and create frightening roaring noises to nearby residents. The analysis of such air/water flow systems is complicated and the theoretical analysis of these air-entrapped forces is still embryonic and not in the current practitioners' toolbox. These geyser situations are now mainly analyzed and rectified by trial and error field adjustments and these situations are treated as anomalous as opposed to defective.

Drainage Failure

Drainage Failure

Geyser

Keystone Drive Drainage Well

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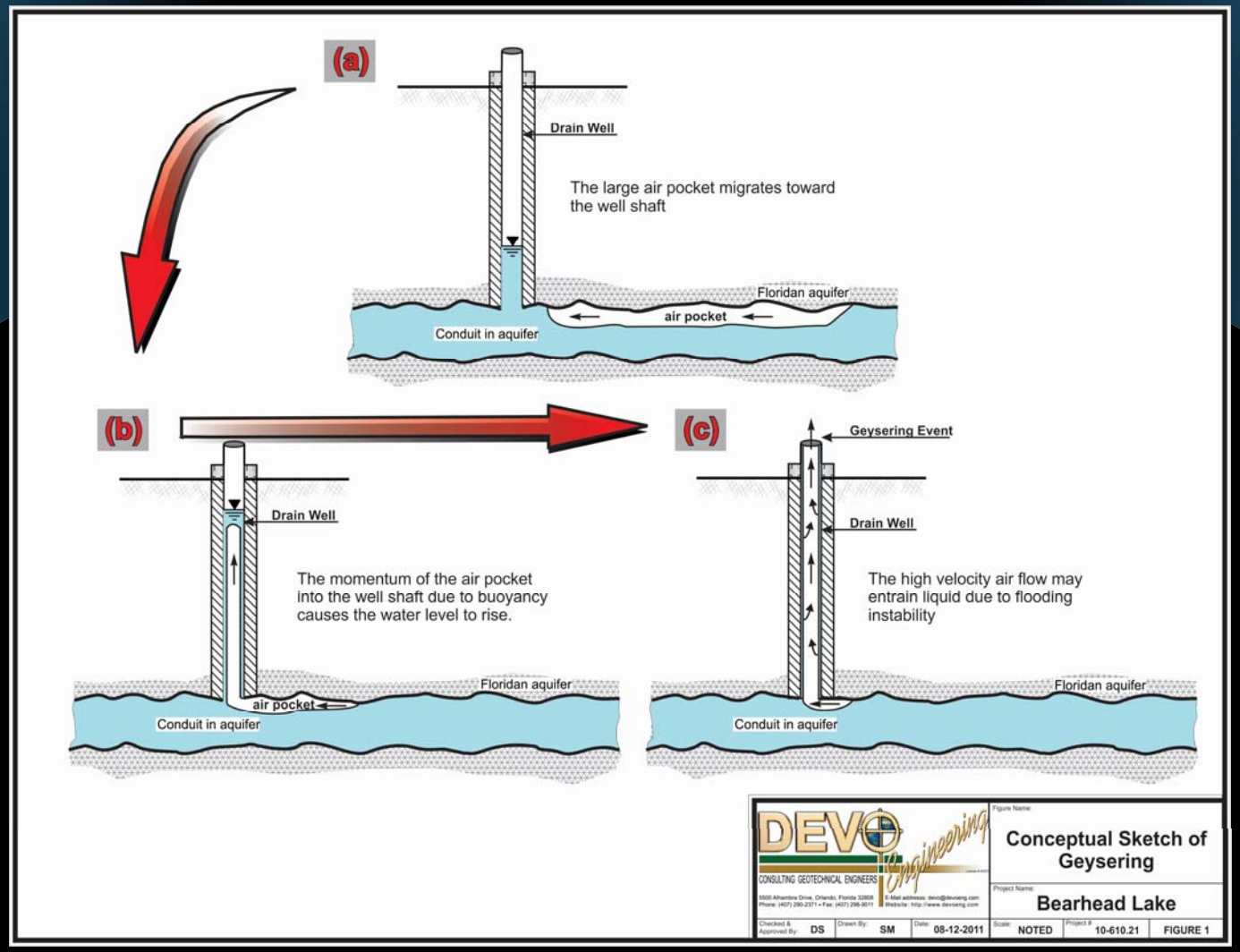

Bearhead Lake Geysering

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DIVERSION IMPACTS DURING EMERGENCY PUMPING

Topic #17: Sometimes, during or right after flood events, county crews pump water out of one lake or water body (donor) into another less flooded lake or water body (recipient). The land owners around the recipient water body sometimes claim such transfer of water:

a). lowers water quality in the recipient (especially if the donor water body is surrounded by septic tanks or land use with high fertilizer application) and/or

b). adversely increases the stage in the recipient water body.

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IMPACT OF DITCHING ON SITE-WIDE CURVE NUMBER

Topic #19: Claims that ditching (or adjustments to control levels on ditches) within agency property has effectively drawn down the water table for large distances from the bank of the edge, thus increasing the infiltration potential and reducing stormwater runoff.

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Site in Brevard County

Photo Date: 2005

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Site in Brevard County

Photo Date: 2005

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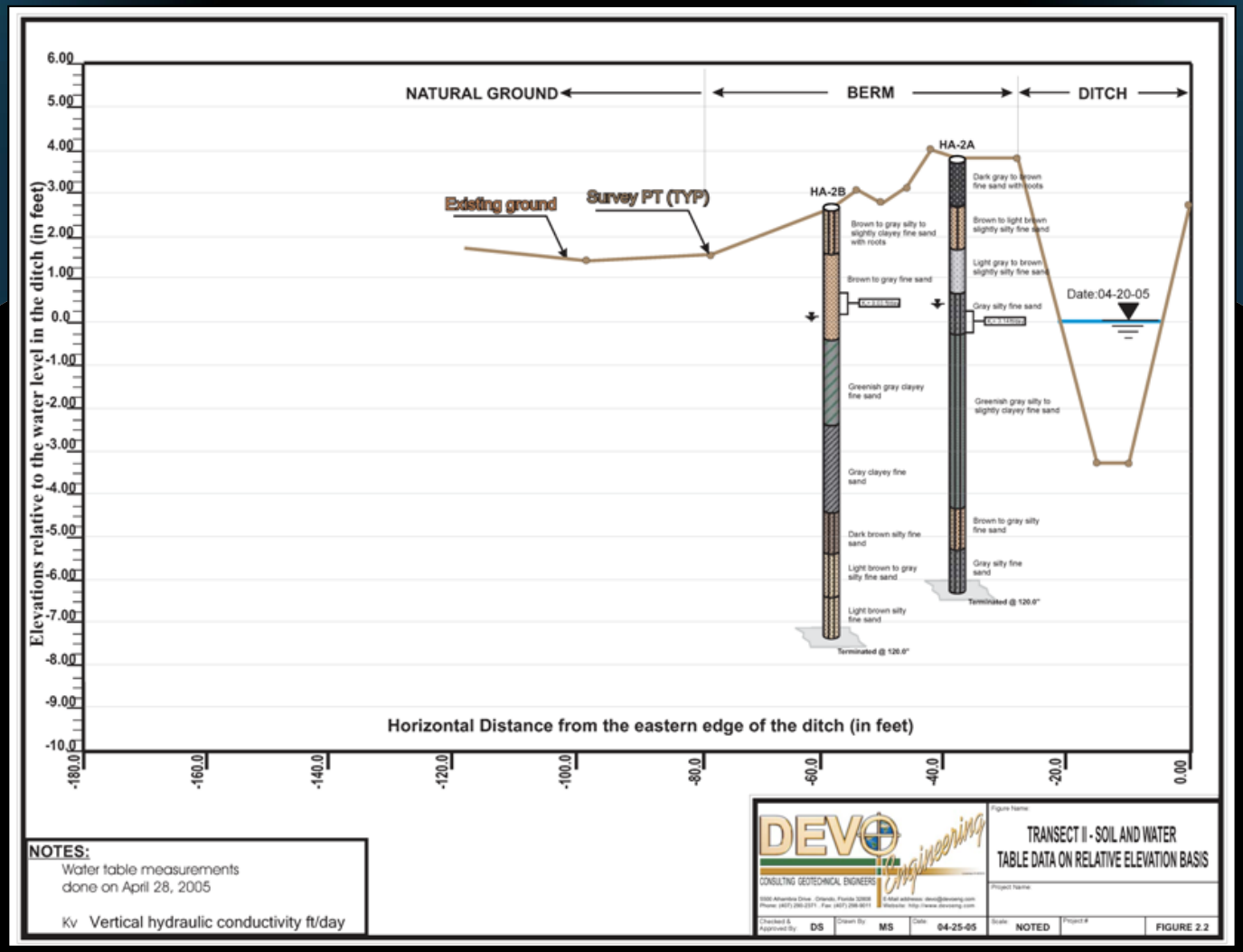

Site in Brevard County – Soil Cross Section, Transect 2

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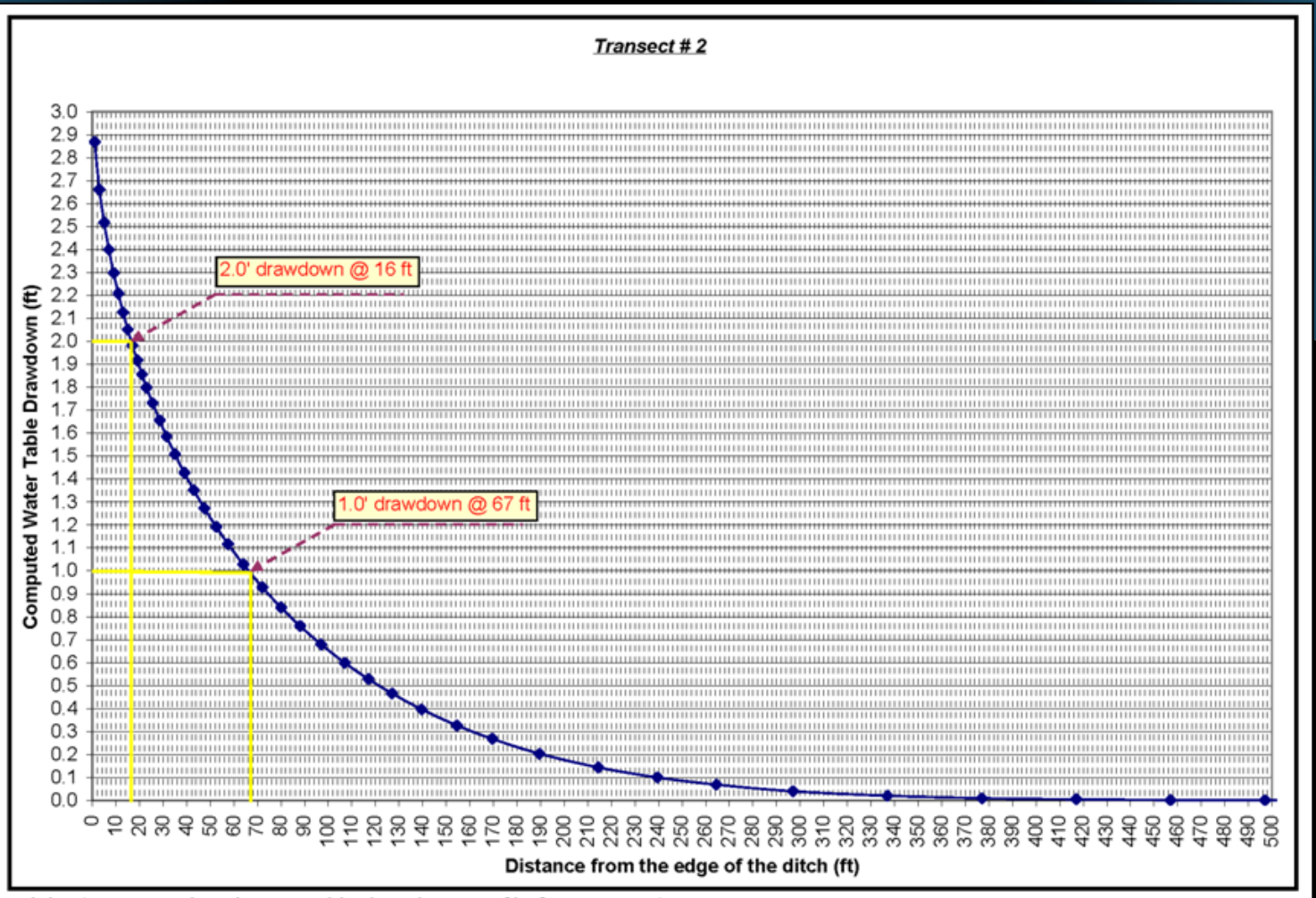


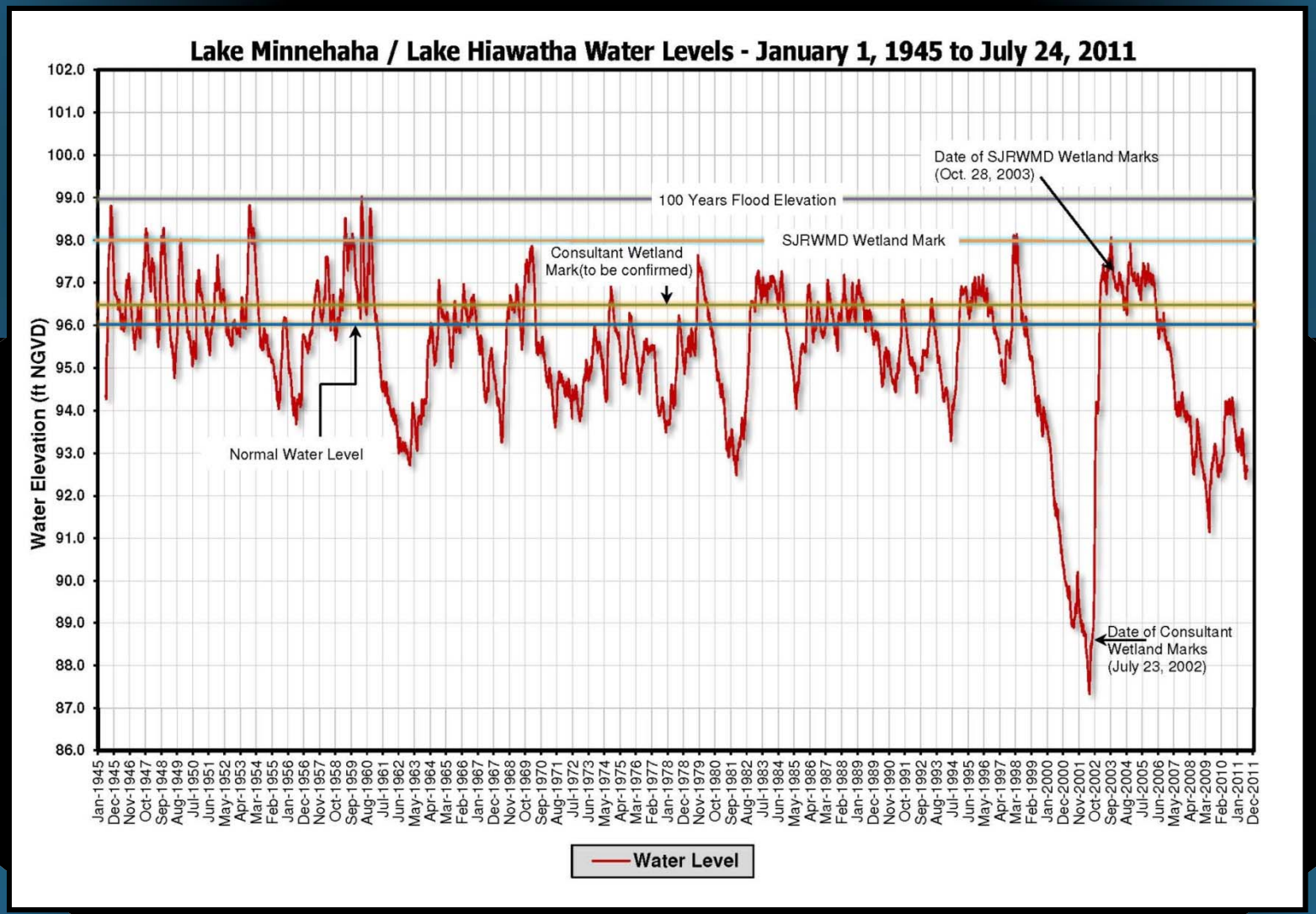
Exhibit 3. Predicted water table drawdown profile for transect 2

Site in Brevard County – Drawdown Predictions, Transect 2

ABERRANT FLOOD ELEVATIONS CONFUSE STAKING OF WETLAND LINES

Topic #20: An abnormally high lake level masks the true wetland line along a shoreline resulting in an overly conservative (high) elevation for the "flagged" wetland. This occurrence leads to un-necessary encumbrance of uplands which can lead to litigation. Tends to be an issue when there is a significant time lag between wetland specialist flagging line (during a drought) and when the agency comes out for verification and there is abnormal submergence.

ASCE-EWRI Water Resources Seminar



Lake Minnehaha / Lake Hiawatha Water Levels

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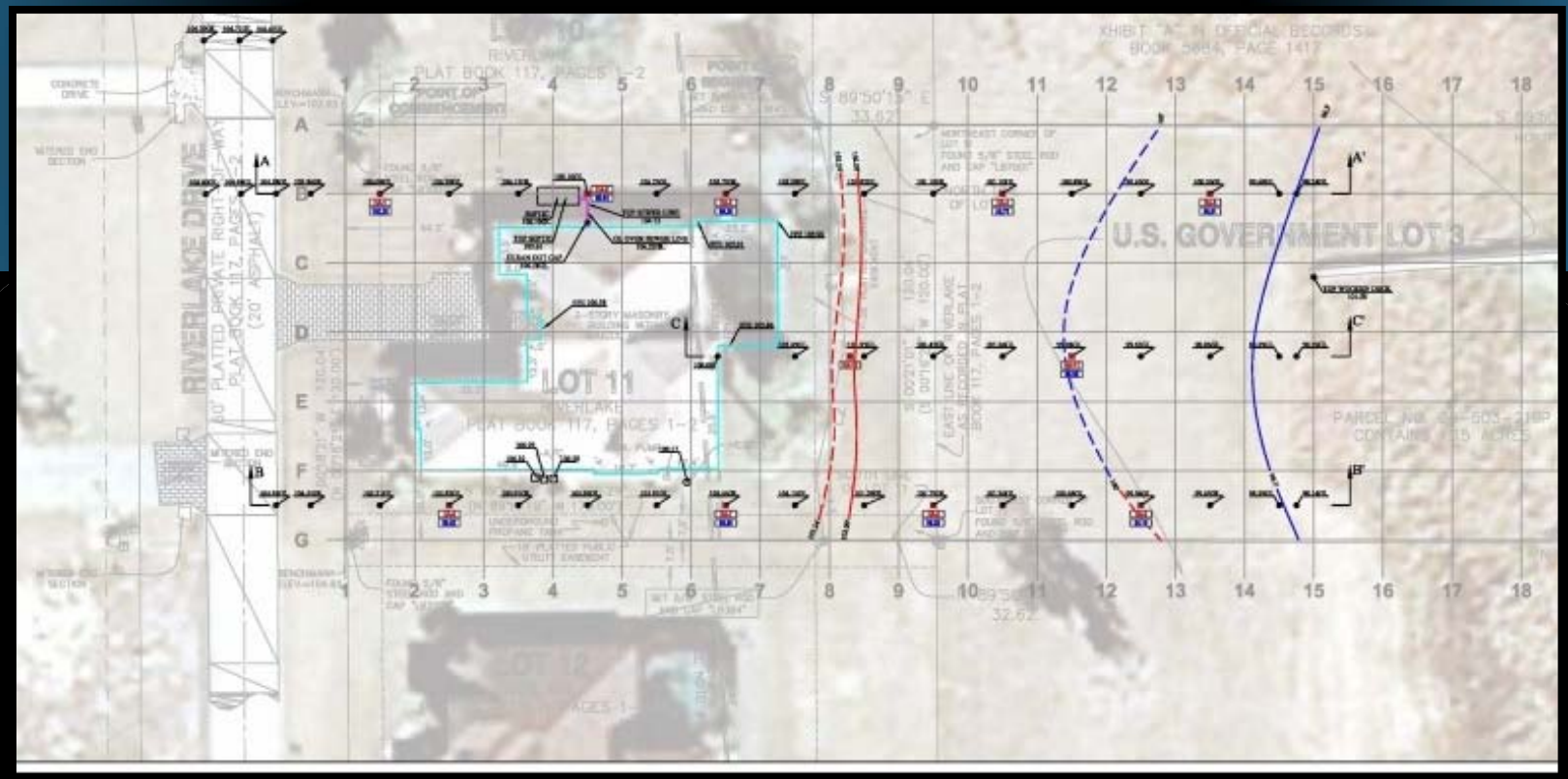

Dyer Property, Layout Plan

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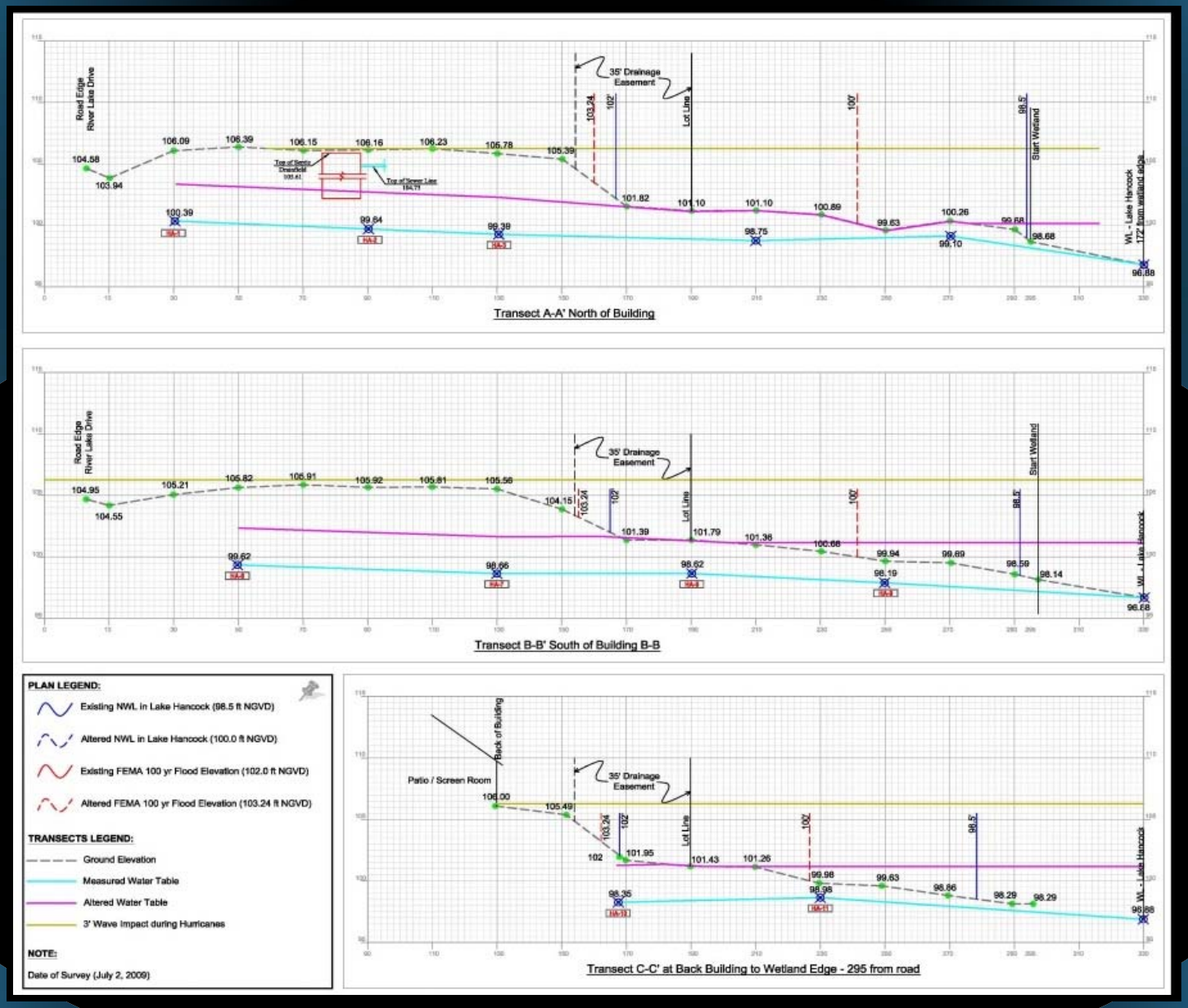

Dyer Property, Cross Section

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A LOT OF LAKES ARE NAMED AFTER GEOTECHS- SUPPOSED TO BE DRY PONDS

Topic #21: Dry pond turns out being a lake due to bad call of water table by geotechnical engineer. Developer sues geotech engineer since a wet pond redesign requires more land. Resulting lake is named after the geotech engineer so it does not suffer from anonymity.

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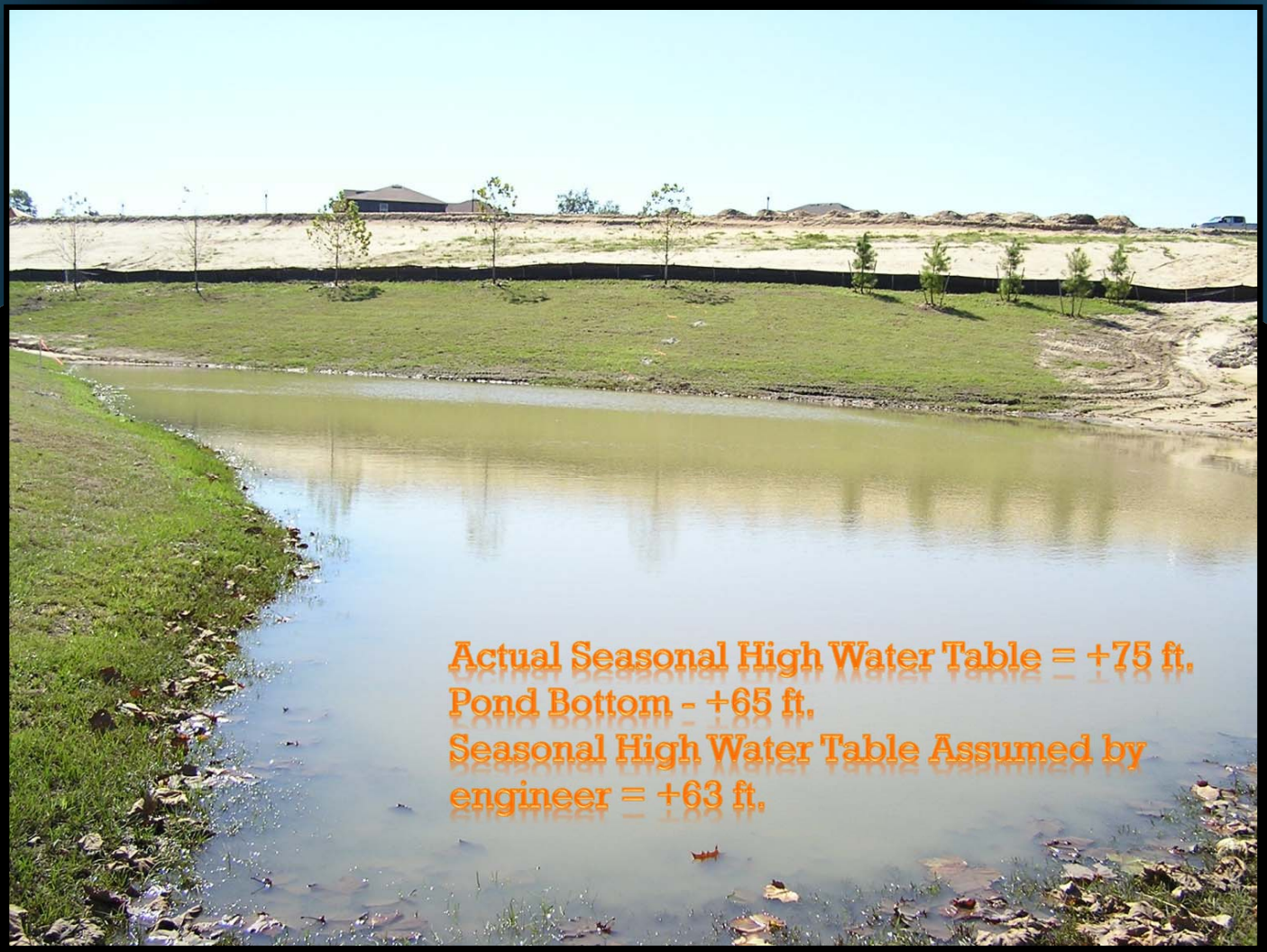

Dry Ponds and Mis-Estimated Seasonal High Water Table

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Dry Ponds and Mis-Estimated Seasonal High Water Table

SLOPE FAILURES IN SURFACE WATER IMPOUNDMENTS

Topic #24: Impoundment side-slope design errors which lead to slope failures or blowouts from seepage forces.

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Example of Cracking and Subsidence of Soil-Cement

Example of Test Pit Showing Shear Plane

Close-up view of the shear failure plane on the southern pit wall

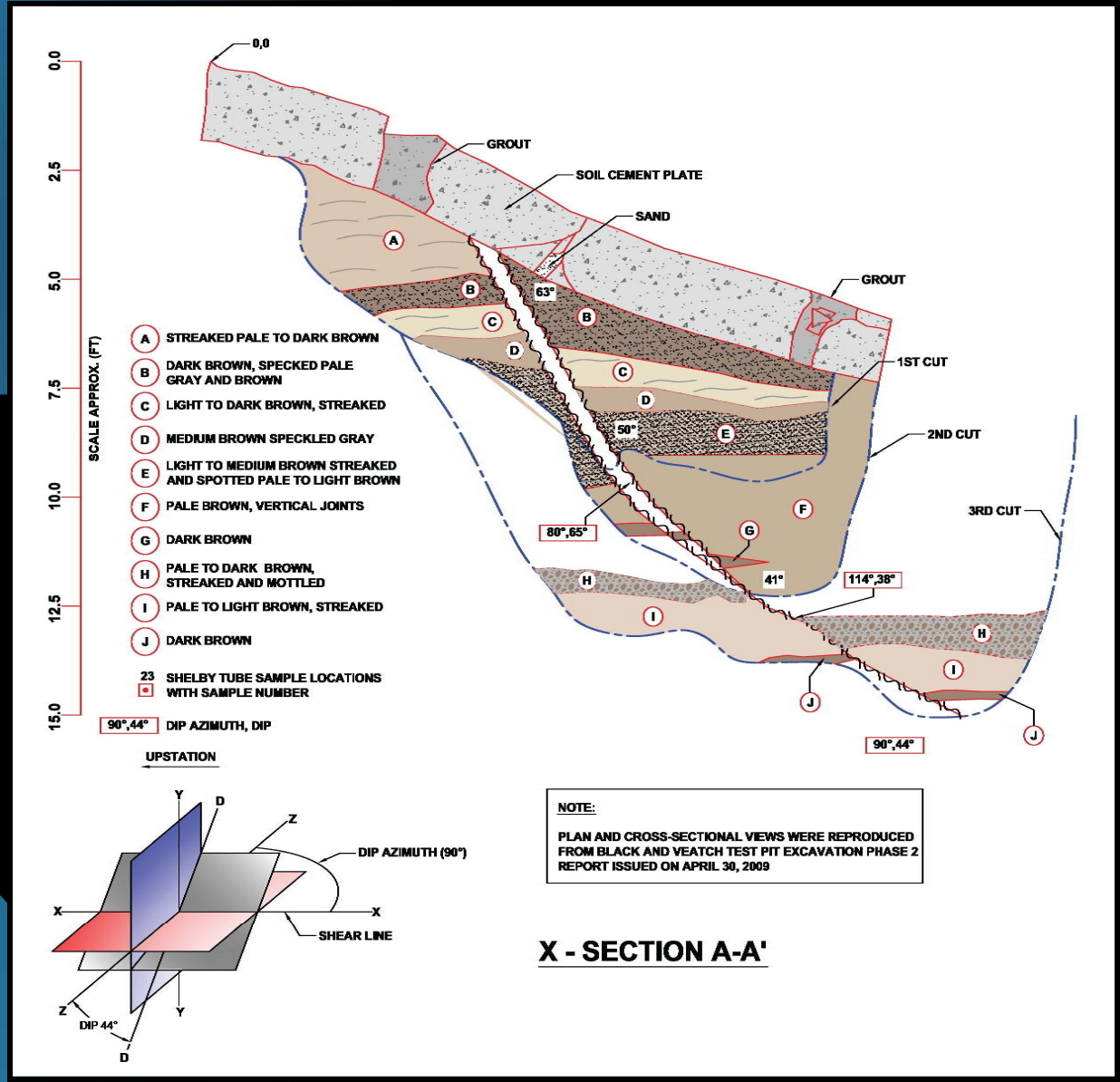
View looking at the shear failure plane on the northern pit wall

Close-up view of the shear failure plane on the northern pit wall

Test Pit Cross Section

ASCE-EWRI Water Resources Seminar

TEST PIT CROSS SECTION



NOTE:

PLAN AND CROSS-SECTIONAL VIEWS WERE REPRODUCED FROM BLACK AND VEATCH TEST PIT EXCAVATION PHASE 2 REPORT ISSUED ON APRIL 30, 2009

X - SECTION A-A'

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TAILWATER, TAILWATER, TAILWATER.....

Topic #11: Under-estimating the "tailwater conditions" which means that the water surface elevation for the outfall water body is estimated too low with the result that the outfall system backups into the facility instead of flowing the other way.

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CHEMICAL FINGER PRINTING

Topic#22: Finger printing water sources suspected of leaking into buildings: stormwater runoff, direct rainfall, reclaimed water, deep well water. Lack of roof guttering creating concentration of stormwater around immediate perimeter of buildings causing subsurface water pressure build-up under building slabs and leakage/mold.

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AESTHETIC VALUE

Topic #23: Client is not happy with aesthetic look of shallow gradient swale drainage and the look of what he thought were high end lots.

INEFFECTIVE OF PERMANENT DEWATERING SYSTEMS

Topic #26: Permanent Dewatering System

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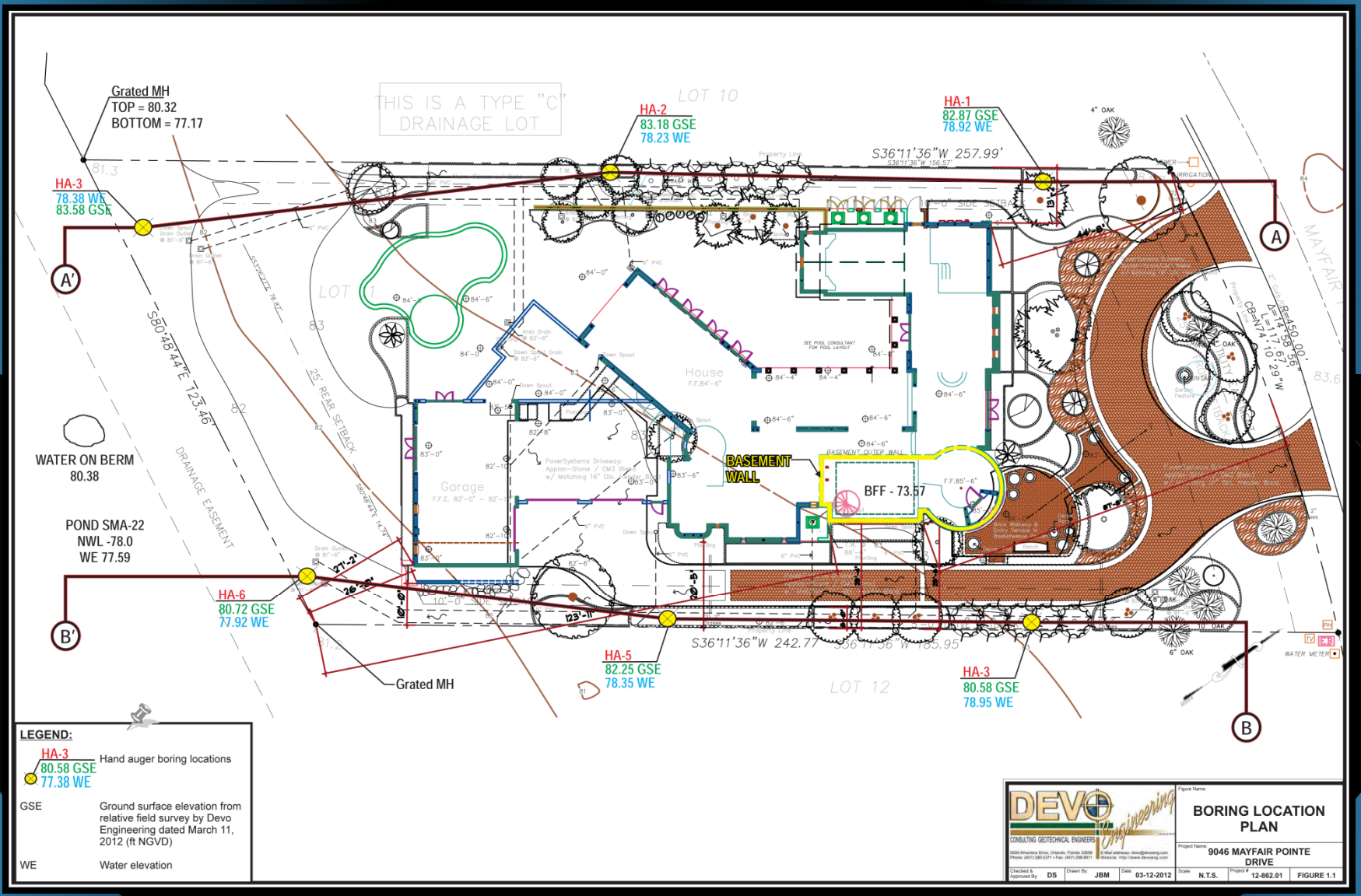

LEGEND:

HA-3 80.58 GSE 77.38 WE	Hand auger boring locations
GSE	Ground surface elevation from relative field survey by Devo Engineering dated March 11, 2012 (ft NGVD)
WE	Water elevation

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Figure Name: **BORING LOCATION PLAN**

Project Name: 9046 MAYFAIR POINTE DRIVE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	JBM	03-12-2012	N.T.S.	12-862.01	FIGURE 1.1

Mayfair Residential – Layout

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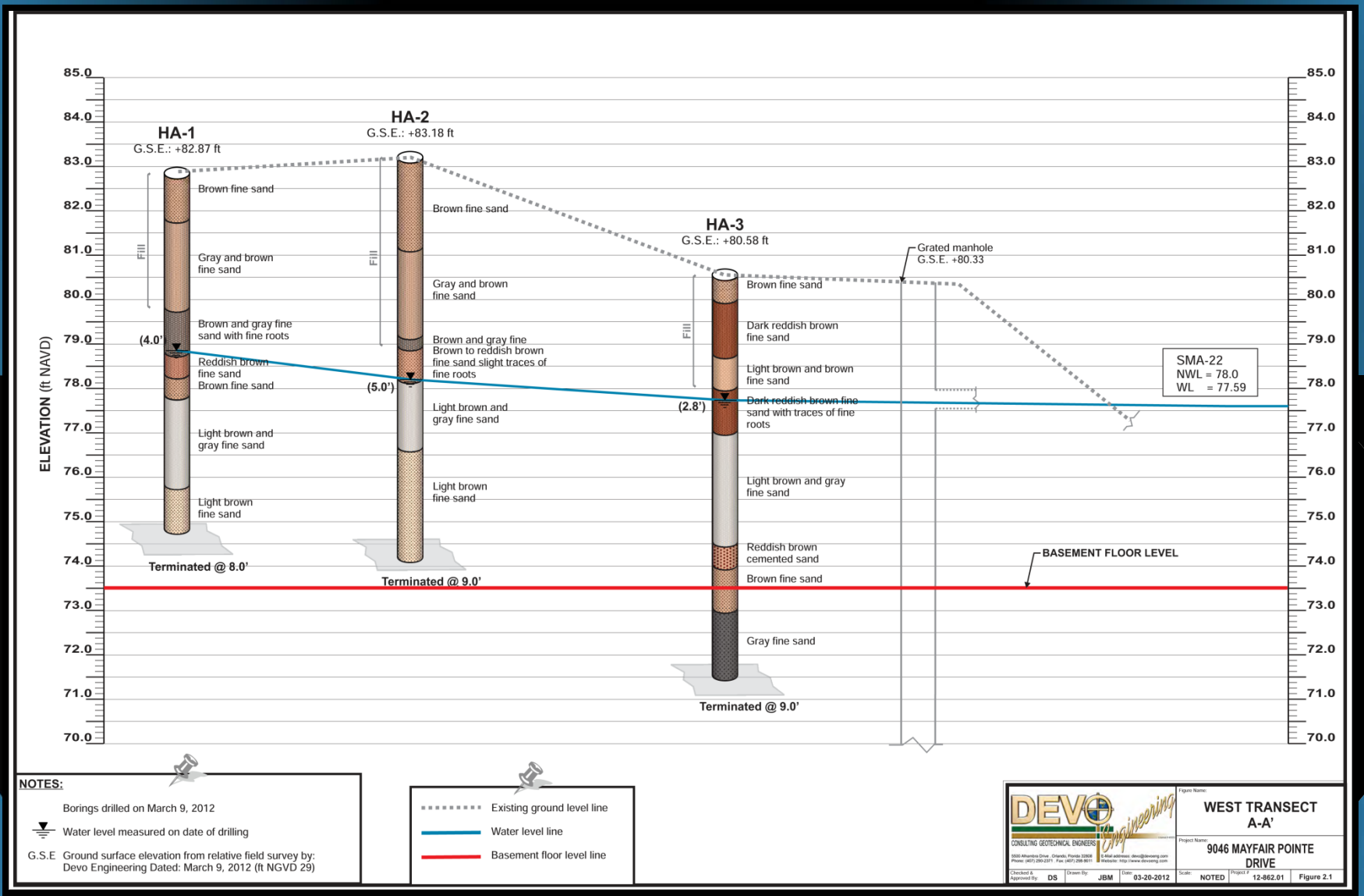

NOTES:

- Borings drilled on March 9, 2012
- Water level measured on date of drilling
- G.S.E Ground surface elevation from relative field survey by: Devo Engineering Dated: March 9, 2012 (ft NGVD 29)

- Existing ground level line
- Water level line
- Basement floor level line

DEVO Engineering
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E-Mail address: devo@devoeng.com
Website: http://www.devoeng.com

Figure Name:	WEST TRANSECT A-A'
Project Name:	9046 MAYFAIR POINTE DRIVE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	Figure
DS	JBM	03-20-2012	NOTED	12-862.01	Figure 2.1

Mayfair Residential – West Transect

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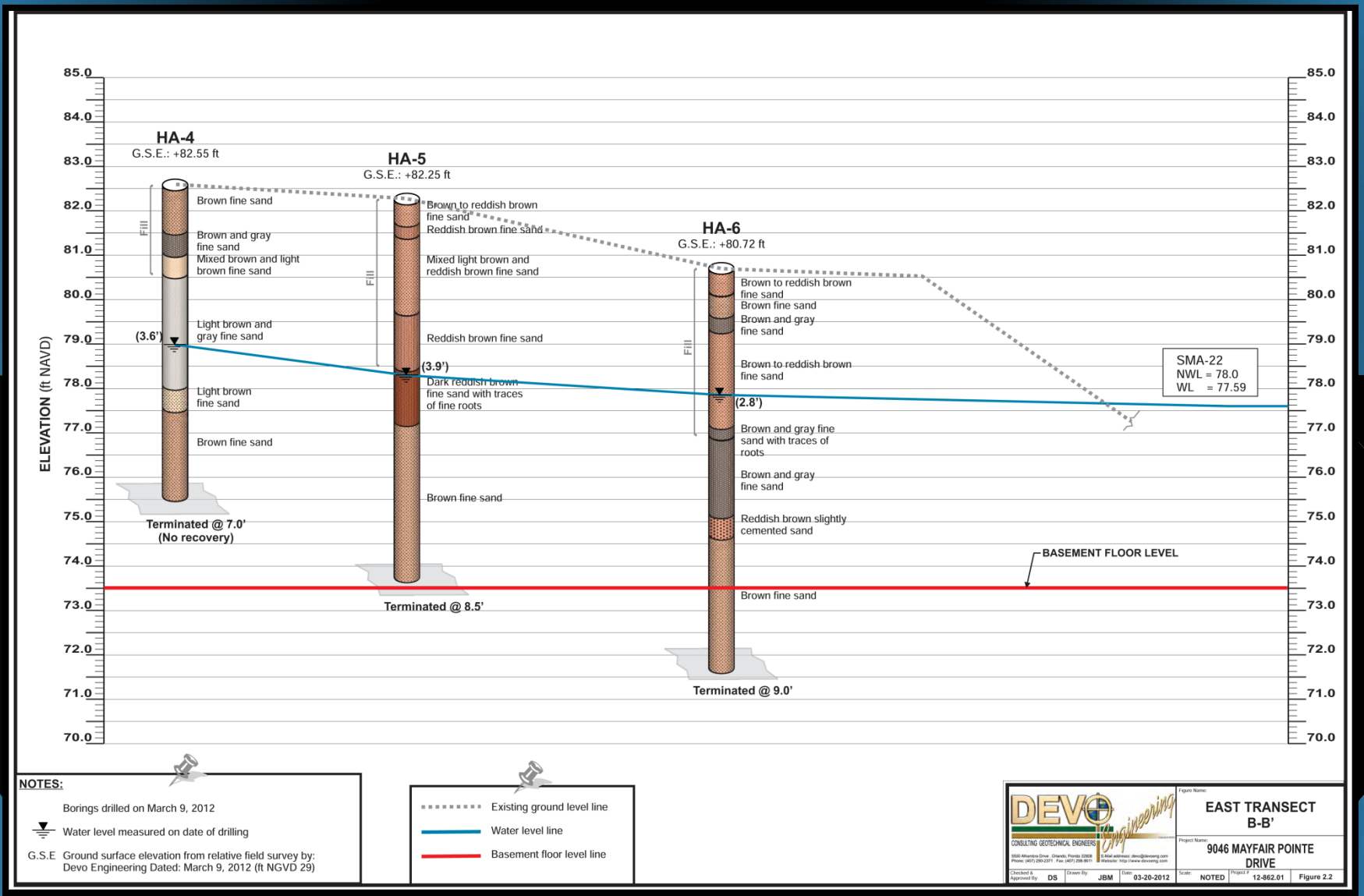

NOTES:

Borings drilled on March 9, 2012

Water level measured on date of drilling

G.S.E Ground surface elevation from relative field survey by: Devo Engineering Dated: March 9, 2012 (ft NGVD 29)

Existing ground level line

Water level line

Basement floor level line

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

Figure Name:	EAST TRANSECT B-B'
Project Name:	9046 MAYFAIR POINTE DRIVE
Checked & Approved By: DS	Drawn By: JBM
Date: 03-20-2012	Scale: NOTED
Project # 12-862.01	Figure 2.2

Mayfair Residential – East Transect

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ASCE-EWRI Water Resources Seminar

Mayfair Residential - Photos of Basement Construction

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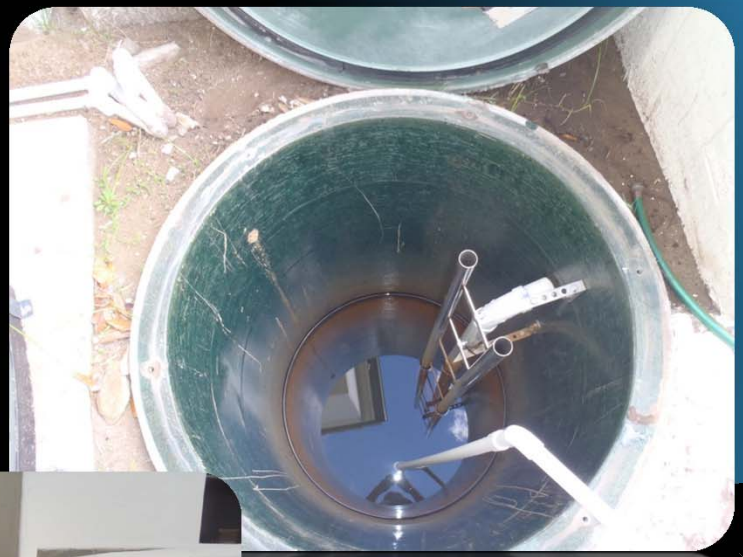

Mayfair Residential - Photos of Drawdown Testing

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LACK OF MAINTENACE OF OUTFALL SYSTEM & STRUCTURES

Topic #7: Maintenance issues which result in system being plugged up and performing below its design intent.

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